REPORT

OF THE

CANADIAN

DAIRYMEN'S ASSOCIATION

WITH TRANSACTIONS AND ADDRESSES OF THE ANNUAL MEETING, &c.

FOR THE YEARS 1869 AND 1870:

TO WHICH IS ADDED, BY PERMISSION, THE PRIZE ESSAY OF L. C. ARNOLD, ESQ, AND OTHERS, BEFORE THE AMERICAN DAIRYMAN'S ASSOCIATION.,

PUBLISHED BY THE ASSOCIATION.

TORONTO:

PRINTED AT THE GUARDIAN OFFICE, KING STREET EAST.

1871.

DEPARTMENT OF CROWN LANDS,

TORONTO, 28TH MAY, 1869

NOTICE is hereby given, that the following Orders and Regulations have been made by His Excellency the Lieutenant-Governor in Council, under the "Free Grants and Homestead Act of 1868," and the "Public Lands Act of 1860," by Order in Council bearing date the 27th day of May instant.

ORDERS AND REGULATIONS

Made under "The Free Grants and Homestead Act of 1868," *and "The Public Lands Act of* 1860," *by Order of His Excellency the Lieutenant-Governor in Council, dated 27th May,* 1869.

1. The quantity of Land to be located to any person as a Free Grant, under "The Free Grants and Homestead Act of 1868," subsequently to the 23rd day of January, 1869, shall be 100 acres; but in case it shall be made to appear to the satisfaction of the Commissioner of Crown Lands, that any person located, or to be located as aforesaid, has not by reason of rock, lakes or swamp, 100 acres that can be made available for farming purposes, the quantity located to such person may be increased in the discretion of the Commissioner of Crown Lands, to any number of acres, not exceeding in the whole 200 acres, so as to make 100 acres of such farming land; and the male head of a family located, or to be located, under said Act, since the said 23rd day of January, 1869, having children under eighteen years of age residing with him, may be located for in all 200 acres.

2. Any locatee under said last mentioned Act, being the male head of a family as aforesaid, shall be allowed to purchase an additional 100 acres at 50 cents per acre cash, at the time of such location, subject to the same reservations and conditions, and the performance of the same settlement duties as are provided in respect of Free Grant locations by the 9th and 10th Sections of the said Act, except that actual residence and building on the land purchased will not be required.

3. Squatters upon land situate within any Township, or part of a Township, appropriated by Order in Council for Free Grants, and who had settled or improved upon such lands before the passing of the said Free Grants Act, shall be allowed to purchase said lands (not exceeding in quantity 200 acres to any person), at 50 cents an acre cash, such sale to be subject to the same conditions and reservations as are provided by the 9th and 40th sections of said Act in respect of Free Grant locations.

4. The right is reserved to the Crown to construct on any land located under said Act, or sold as hereinbefore provided, any colonization road, or any road in lieu of, or partly deviating from any Government allowance for road; also the right to take from such land any wood, gravel or other materials, required for the construction or improvement of any such road, without making any compensation for the land or materials so taken, or for any injury occasioned by the construction of such road; and such rights may be exercised by the Commissioner of Crown Lands, or any one authorized by him for that purpose.

5. Holders of Timber Licences, their servants, and agents, are to have the right to haul their timber or logs over the uncleared portion of any land located as a Free Grant, or purchased as before provided, and to make such roads thereon as may be necessary for that purpose, doing no unnecessary damage, and to use all slides, portages, roads, or other works previously constructed or existing on any land so located or sold, and the right of access to, and free use of all streams and lakes theretofore used, or that may be necessary for the passage of timber or logs; and all land necessary for such works is reserved.

6. All Pine Trees growing or being upon any land hereafter located as a Free Grant, under the said Act, or sold under the preceding regulations, shall be subject to any timber license in force at the time of such location or sale, or granted within five years subsequently thereto, and may at any time before the issue of the patent for such land, be cut and removed under the authority of any such timber license, while lawfully in force.

S. RICHARDS,
Commissioner of Crown Lands.

DEPARTMENT OF CROWN LANDS,

TORONTO, 28TH MAY, 1869.

NOTICE is hereby given, that the following Order and Regulation have been made by His Excellency the Lieutenant-Governor in Council, under "The Public Lands Act of 1860," by Order in Council, bearing date the 27th day of May instant.

ORDER AND REGULATION

Made under "The Public Lands Act of 1860," *by Order of His Excellency the Lieutenant-Governor in Council, dated 27th May,* 1869.

All Pine Trees growing or being upon any Public Land hereafter to be sold, and which at the time of such sale, or previously, was included in any Timber License, shall be considered as reserved from such sale; and such land shall be subject to any Timber License, covering or including such land, in force at the time of such sale, or granted within three years from the date of such sale; and such trees may be cut and removed from such land, under the authority of any such Timber License, while lawfully in force; but the purchaser at such sale, or those claiming under him or her, may cut and use such trees as may be necessary for the purpose of building, fencing and fuel on the land so purchased, and may also cut and dispose of all trees required to be removed in actually clearing said land for cultivation, but no pine trees, except for the necessary building, fencing, and fuel as aforesaid, shall be cut beyond the limit of such actual clearing before the issuing of the Patent for such land, and all pine trees so cut and disposed, (except for the necessary building, fencing, and fuel as aforesaid), shall be subject to the payment of the same dues as are at the time payable by the holders of licenses to cut timber or saw logs.

All trees remaining on the land at the time the Patent issues, shall pass to the patentee.

Provided, however, that this order shall not apply to any land to be sold as mining land, under "The General Mining Act of 1869," nor to land to be sold to any Free Grant locatee, under the regulations or Order in Council bearing date this day.

S. RICHARDS,
Commissioner of Crown Lands.

1399

REPORT

OF THE

Canadian Dairymen's Association,

WITH TRANSACTIONS AND ADDRESSES OF THE ANNUAL MEETING, &c.,

FOR THE YEARS 1869 AND 1870:

TO WHICH IS ADDED, BY PERMISSION, THE PRIZE ESSAY OF L. B. ARNOLD, ESQ., AND OTHERS, BEFORE THE AMERICAN DAIRYMEN'S ASSOCIATION.

PUBLISHED BY THE ASSOCIATION.

TORONTO:

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INTRODUCTORY REMARKS.

In publishing this Report, it is the earnest desire of the Executive to make known as widely as possible, the proceedings of the third and fourth annual meetings of the CANADIAN DAIRYMEN'S ASSOCIATION, two of the largest, most interesting, and profitable Conventions ever held in connection with dairy matters.

The Report is larger than anticipated, and will be found on perusal to contain much valuable information to the dairy farmer; and, we believe, will be read with satisfaction by all, especially those who were present and heard for themselves, and will serve to remind and impress more deeply the information and valuable lessons there received.

The desire that has been so frequently expressed that these annual gatherings might be appreciated and made more useful in disseminating knowledge was, we think, realized in the Convention held in February last.

This Convention was more largely attended by practical dairymen from every part of Ontario than its most sanguine friends anticipated,—densely filling the large Town Hall. We believe it to have been the largest gathering of intelligent agriculturalists that ever assembled in the Dominion for a free discussion, interchange of thought, and experience on subjects connected with the farm and dairy.

The Executive spared no pains to make this Convention more profitable, by securing the aid of scientific men in preparing and reading papers on various subjects. These addresses we especially commend to the careful perusal of the reader.

It is by the light, that science sheds, we shall be able to intelligently solve the problems that arise from day to day in prac-

tical operations, and we propose in the future to draw more largely from this fruitful source.

We regret not being able to present a full statistical report of the extent of the dairy business in this country. We have failed to secure the hearty co-operation of many of our leading factorymen: but comparatively few have sent us full reports. During the year, the Secretary proposes to collect a complete list of all the factories and dairies in each county in the Dominion, and desires the assistance of members and friends to accomplish so desirable a result.

In no former year has there been evinced such activity and interest in the dairy business. The factory system is rapidly increasing and extending into sections of the country, hitherto entirely devoted to the raising of grain. A large number of factories are being erected this spring throughout the Dominion, which will largely increase the production of cheese.

To the actual transactions of the Association are added several valuable articles taken from the American Dairymen's Report. Due credit has been given for all such papers. We would especially mention the $100 prize essay of L. B. Arnold, Esq., of Ithica, N. J., on "The claims of cheese as a wholesome, nutritious, and economical article of food," as meritorious.

Hoping that the Report will prove acceptable to the members of the Association, it is respectfully submitted.

R. A. JANES,
Secretary.

INGERSOLL, May, 1871.

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 fraudently 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 fraudently use, or direct any of his or her employes 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 and

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, first and second Vice-President, Secretary and Treasurer.

Article 3rd.—The President, Vice-Presidents, Secretary and Treasurer shall constitute the Executive Board of the Association, three of whom shall form a quorum for the transaction of business.

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.

OFFICE

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OFFICERS OF THE ASSOCIATION

FOR THE YEAR 1871.

President:

JAMES NOXON, Esq., *of Ingersoll.*

1st Vice-President:

W. S. YATES, Esq., *of Belleville.*

2nd Vice-President:

THOMAS BALANTINE, Esq., *of Stratford.*

Secretary and Treasurer:

R. A. JANES, *of Ingersoll.*

LIST OF MEMBERS

OF THE

CANADIAN DAIRYMEN'S ASSOCIATION,

FOR THE YEAR 1871.

Andrew, Philip..... Avon.
Anderson, Archibald G. Wyoming.
Atkins, John ..... Putnamville.
Atkinson, Francis ..... Embro'.
Ager, Robert..... Ingersoll.
Abernathy, William ... Embro'.
Anderson, William ..... Woodstock.
Ballantyne, James ..... Sebringville.
Burdick, S. S..... Goresend.
Burdick, J. N ..... Nilestown.
Bell, Matthew ..... Springford.
Bockett, Peter ..... Fenwick.
Brand, David ..... Hillsboro'.
Blinn, William..... London.
Brown, John E..... .. Nithburg.
Blair, John..... Embro'.
Bixell, 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 ..... Ingersoll.
Balantine, 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 ..... "
Chalcroft, Mark ..... "
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, Gilbert ..... Park Hill.
Cadman, Charles ..... Ingersoll.
Collins, Josiah ..... Mount Elgin.
Cook, Simeon ..... Ingersoll.
Clarke, W. F..... Guelph.

Craik, James..... Putnam.
Chisholm, John..... Brownsville.
Dempsey, Daniel ..... Fairview.
Dennis, John W ..... Harrietsville.
Dewel, J. C., Reynole Basin ..... New York.
Dyson, William ..... London.
Davis, A. J ..... Aylmer.
Davis, Joel W ..... "
Dager, Daniel ..... Mount Elgin.
Dibb, Richard ..... 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 ..... Cullodon.
Elliott, James ..... Brownsville.
Elliott, James ..... Peterboro'.
Elliott, Samuel..... Ingersoll.
Elliott, J. M..... Mount Elgin.
Elliott, David ..... "
Evans, John ..... Harrietsville.
Ellis, John E..... Toronto.
Facey, Robert ..... Harrietsville.
Frank, Joseph ..... "
Fullerton, Matthew..... Lyons.
Francis, William..... Fullarton.
Fraser, Alexander ..... Beachville.
Fierheller, Cirus ..... Ingersoll.
Freeman, J. D ..... Brownsville.
Faulds, Andrew N ..... Harrietsville.
Fearman, Chester..... Ingersoll.
Fronside, John ..... Beverly, Troy
Fretaz, M. C..... Whitevale.
Forsyth, Elijah..... Fairfield Plain.
Fryfogel, Miss Lizzie... Shakespeare.
Fowler, W. O ..... Clinton.
Farrington, H ..... Norwich.
Galloway, Geo ..... Ingersoll.
Golding, Edward ..... Thamesford.
Griere, Thomas..... Sebringville.
Gunn, John ..... Embro'.
Grane, Henry ..... Dermont.
Gillard, William ..... Springford.
Gilmore, David..... Nilestown.
Gardiner, Robert ..... Farquhar.
Galiver, Henry..... Ingersoll.
Gane, W. H ..... "
Hagle, Luke ..... Arkona.
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, George ..... Cromarta.
Harris, Warren..... Ingersoll.
Huxley, William ..... "
Hall, C. P ..... "
Hazelton, Cunham ..... Vallanovia.
Hadcock, Peter..... Mt. Elgin.
Hickson, J..... Seaforth.
Harrington, Jacob ..... Woodstock.
Hunter, E. A. ..... Cullodon.
Holcroft, M. B..... Ingersoll.
Hopkins, H. P ..... "
Harris, George H..... "
Harrington, Walter M... Strathallan.
Hadcock, Isaac..... Mt. Elgin.
Harris, George B ..... "
Harris, George M ..... "
Huffman, Paul ..... Kelvin.
Hopkins, Edward ..... Brownsville.
Hildebrand, J. George... Stratford.
Harris, William ..... Mt. Elgin.
Ireland James ..... Ingersoll.
Ingram, William ..... "
Janes, R. A ..... "
Jarvis, Jonathan ..... "
Johnson, D. D ..... Lobo.
Jopling, J.G ..... Port Hope.
Johnson, S. S ..... Clinton.
James, James A ..... Cullodon.
Jarvis, James ..... Ingersoll.

Jenvey, Charles ..... Springford.
Karn David .... Ingersoll.
King, William Scott ... "
Knisely, O. F. ..... Humberstone
Lane, James B ..... Dorch'sr St'n.
Lewis, E.. ..... Ingersoll.
Losee, S. H. ..... Norwich.
Longfield, George..... Putnamville.
Lang, Robert..... ..... Rodgersville.
Lane, William P ..... Cullodon.
McKay, John W ..... Fingall.
McWilliams, Donald ... Wallaceton.
Meadows, Charles..... Brooksdale.
Mabee, O. P ..... Tilsonburg.
McPherson, John..... Embro'.
McGorlick, James ..... Ingersoll.
Morey & Rothwell ..... "
Manning, L ..... Derwent.
Manning, J. G ..... Belmont.
Moulton, William..... Brownsville.
Malcolm, Andrew ..... Rodgersville.
Marlock, William..... Tavistock.
Manning, Richard ..... Exeter.
Moulton John ..... Verschoyle.
Miller, 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 ..... "
Meek, Peter ..... "
McIntyre, James..... "
More, James B..... Holbrook.
Meadows, Francis ..... Woodstock.
Mountain, John H ..... Dorchester.
Munroe, Angus..... Embro'.
McKenzie, George ... .. Dornock.
McCartney, Robert ..... Brucefield.
Nancekwell, Thomas ... Ingersoll.
Noxon, James ..... "
Noxon, F. C..... "
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 ..... "
Philips & Bros .... Newmarket.
Partlo, John .... Ingersoll.
Phelan, D[illegible]..... "
Philips, James ..... "
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 ... "
Rowal, John ..... Nilestown.
Rouse, James..... Harrietsville.
Rimph, Jerome... ..... Tilsonburg.
Ryan, Richard ..... Cullodon.
Ruckle, John ..... "
Robertson, W. Scott ... Seaforth.
Richardson, Lewis ..... Keyser.
Rogers, R. Y..... Grafton.
Risdon, J ..... Wallacetown.
Ransickle, George..... 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'wHamburg
Sutherland, Lachlin ... { Oxford / Dornoch.
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	"
Straith, Peter	Clinton.
Sage, Nelson.....	Nilestown.
Shirley, George	Waterford.
Sharon, F. H. A	Frome.
Smith, Benjamin	Fairfield / Plain,
Silverthorn, Morgan ...	Otterville.
Sharmon, John, jun.....	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.
Tullock, 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	"
Wilkinson, William ...	"
Wilmott, T. H	Milton.
Williams, J	Nilestown.
Weld, W	London.
Wild, William G	Clinton.
Walker, Hiram.....	Dornock.
Williams, Dr.....	Ingersoll.
Whyte, John.....	Cromarta.
Webber, Robert	Strathallan.
Whittet, R. C	Birkall.
Woodard, John C..... ...	New Durham
Weir, John B	Crumlin.
Wallace, William.....	Harrietsville.
Yorke, Jehiel	Union.
Yates, W. S	Belleville.
Yorke, Edward.....	Brownsville.

CONDENSED REPORT.

The followiny 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.
Dereham Centre	Mount Elgin	352	70	16	24,640	9¾
Newmarket	Mewmarket	700	60	16	42,000	.....
Springfield	Sprinfield	1215	76	15½	92,363	9¾
Norwich	Newark	2000	70	16½	140,000	10
Holbrook	Holbrook	1000	70	16½	70,000	10
Mapleton	Mapleton	1860	71	16	131,812	9 9/10
Northfield	Kelvin	153	58	16	8,820	10⅓
Lobo	Lobo	439	60	16	26,372	10
West Zora	Ingersoll	1601	69½	16	111,378	10¼
Avon	Avon	1564	71	16	103,500	10
Garner's	Drummondville	290	58	16	17,200	10½
North Middlesex	Duncrief	212	60	15	12,720	10¼
Front of Sidney	Belleville	3891	66	16	256,806	9 7/10
Norwich	Springford	400	78	16	3,120	10
Maple Grove	Strathallan	1395	72	16	101,446	9¾
East Nissouri	Ingersoll	4217	65	15½	277,678	10 1/20
Halloway	Halloway	3600	65	16	234,000	9 59/100
Belmont	Belmont	1700	70	16	114,926	9 54/100
Harrietsville	Harrietsville	2419	75	16	183,201	9½
Whitevale	Whitevale	500	60	15	30,000	10
S. Norwich	Otterville	375	75	16½	28,125	10
Dereham Centre	Mount Elgin	725	58	14	42,000	9¾
Middlesex and Bayham	Acacia	900	64	15	57,527	9¾
Mount Elgin Union	Mount Elgin	1124	72	16	80,717	9⅞
Faark's	Harrietsville	180	57	16	10,273	.....
Rimp's	Tilsonburg	220	68	16	15,000	9⅘

East Nissouri	Ingersoll	4217	65	$15\frac{1}{2}$	277,678	$10\frac{1}{20}$
Halloway	Halloway	3600	65	16	234,000	$9\frac{59}{100}$
Belmont	Belmont	1700	70	16	114,926	$9\frac{54}{100}$
Harrietsville	Harrietsville	2419	75	16	183,201	$9\frac{1}{2}$

Whitevale	Whitevale	500	60	15	30,000	10
S. Norwich	Otterville	375	75	$16\frac{1}{2}$	28,125	10
Dereham Centre	Mount Elgin	725	58	14	42,000	$9\frac{3}{4}$
Middlesex and Bayham	Acacia	900	64	15	57,527	$9\frac{3}{4}$
Mount Elgin Union	Mount Elgin	1124	72	16	80,717	$9\frac{7}{8}$
Faark's	Harrietsville	180	57	16	10,273	.....
Rimp's	Tilsonburg	220	68	16	15,000	$9\frac{4}{5}$
Forest	Woodstock	251	75	16	18,825	$9\frac{5}{8}$
Rodgerville	Rodgerville	1100	70	16	77,000	10
Adalaide	Keyser	1000	72	16	72,000	10
Willow Home	Brooksdale	406	73	16	29,638	$9\frac{2}{3}$
Brownsville	Brownsville	4546	68	16	309,124	$9\frac{9}{10}$
Cromarty	Cromarty	800	65	16	52,884	$10\frac{1}{8}$
Dilb's	Derwent	220	70	16	15,296	9
Maple Leaf	Ingersoll	1038	70	16	72,800	$9\frac{57}{100}$
West Oxford	Ingersoll	1048	68	16	71,000	$9\frac{3}{4}$
Culloden	Culloden	1668	76	16	127,292	$9\frac{3}{8}$
Crowland	Welland	285	55	15	14,369	10
Rose	Bridgeworth	216	61	16	13,375	10
Sager's	Troy	1150	60	16	69,800	$10\frac{1}{4}$
Moira	Moira	2500	62	$15\frac{1}{2}$	155,600	$9\frac{7}{16}$
Cherry Grove	Peterboro'	444	70	16	30,000	10
Culver's	Bloomsburg	482	68	16	32,766	$10\frac{1}{2}$
Boncifield	Boncifield	1180	60	15	70,000	.....
Washington Pioneer	Washington	686	70	16	39,000	$9\frac{4}{5}$
Brown's	Aylmer	540	60	15	32,000	$10\frac{1}{2}$
Goar	Ingersoll	240	65	16	15,150	10
Harris Street	Ingersoll	480	71	16	33,651	$9\frac{3}{4}$
Sydenham	Speedie	700	70	16	48,000	10

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.
West End	Clinton	551	64	16	35,026	10¼
Hadcock's	Mount Elgin	170	60	15½	10,200	.....
Quinte	Northport	975	68	16	65,505	9 1/3 5
Exeter	Exeter	350	55	16	20,000	9½
Stouffville	Stouffville	400	60	16	24,000	.....
Whitevale	Whitevale	395	60	15	23,900	.....
Zerschoyle	Culloden	683	76	.....	52,146	10
Black Creek	Seburgville	1835	68	16	124,765	.....
Willowdale	Belleville	302	62	15	19,559	.....
Thomasburg	Thomasburg	850	62½	15½	53,120	.....
East Yarmouth	Sparta	285	70	16	20,000	.....
Tyrconnell	Tyrconnell	475	68	16	32,104	.....
Middlesex	Bowood	560	62	16	34,720	10
Wilson's	Ingersoll	746	69	16	51,800	.....
Cedar Grove	Cedar Grove	1138	50	14	66,600	.....
Collins'	Mount Elgin	745	63	16	47,000	.....
Haldimand Union	Wicklow	1296	66	16	85,800	9 9/10
Sweet's	Orwell	190	65	16	12,536	.....
Bayham	Vienna	250	60	16	15,600	.....
Boston	Boston	196	68	16	13,200	.....
Hornby	Hornby	225	40	16	9,000	.....
Stone Road	Cathcart	244	60	16	14,640	.....

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Delivered before the

Boston	Boston	196	68	16	13,200	.....
Hornby	Hornby	225	40	16	9,000	.....
Stone Road	Cathcart	244	60	16	14,640	.....

ANNUAL ADDRESS

Delivered before the Canadian Dairymen's Association, at Ingersoll, Canada, Feb. 2nd, 1870,

BY

X. A. WILLARD, A.M.,

Of Littte Falls, Herkimer County, N. Y.

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ANNUAL ADDRESS

DELIVERED BEFORE THE CANADIAN DAIRYMEN'S ASSOCIATION, AT INGERSOLL, CANADA, FEBRUARY 2ND, 1870, BY

X. A. WILLARD, A.M.,

OF LITTLE FALLS, HERKIMER COUNTY, N.Y.

Mr. President and Members of the Canadian Dairymen's Association:

Ladies and Gentlemen:

I have no fitting words to express the pleasure of meeting with you in Convention, and of being called upon to address you again on the great interest which this Association represents.

I esteem it a high honour to have the privilege of numbering Canadians among my friends, and it would be a source of profound regret should I fail at any time to retain your kindly feelings. I hope I represent, in some degree, a large class of American citizens, who are not warped and cramped by narrow sectional views; but who can rejoice in the prosperity of a sister nation, which comes from a stock common to us both,—that Anglo-Saxon race which maintains its individuality with such tremendous tenacity—which electrifies all with which it comes in contact—which overcomes all difficulties—which unites continents—and has risen higher in the cycle of civilization and progress than that of all the other nations combined. Climate, soil, circumstances, may modify and change somewhat the exterior of the race, but when you probe down to the heart you find it of that wonderfully large British pattern that it cannot well be mistaken.

I think if you had seen the honest welcome of your President at the immense gathering of American Dairymen at Utica, and had heard the hearty applause that greeted his appearance on the stage, you could not have mistaken the kindly feeling of our people for Canadians.

The natural home of the milk-producer is in a belt between the 40th and 45th parallels of latitude.

It stretches from the Atlantic to the Mississippi, and possibly to the Pacific. Within its limits are New England, New York, Pennsylvania, the northern parts of Ohio, Illinois and Indianna, the greater portion of Michigan, Wisconsin and Iowa, and a part of the Canadas. Of all this belt, probably not more than a third of the land is adapted to dairying. The dairy lands are quite irregular in outline, lying not

always continuously together, but often detached, and not unfrequently, if represented on the map, would have the appearance of islands.

The characteristics of a good dairy country are, high undulating surfaces, numerous springs and streams of never-failing water, a soil retentive of moisture, a sweet and nutritious herbage that springs up spontaneously and continues to grow with great tenacity, a rather low average temperature, frequent showers, rather than periodical drought, and sufficient covering of the ground in winter to protect grass roots, so that the herbage may be permanent or enduring.

Doubtless, within the limits of the United States, on the lower slopes of mountainous ranges, there are lands eminently adapted to dairying; but we have no large and continuous stretch of country like that to which we have referred, where the business would naturally develop itself into a speciality. In my opinion, upon this northern belt of dairy lands, there is no description of farming that promises better prospects of remuneration than the dairy. I refer now to farming in the broadest sense of the word, where thousands grow the product, and compete with each other in the great markets of the world. If one happens to be possessed of land in the immediate vicinity of towns and cities, upon which market gardening may be conducted with facility, that land may, without doubt, be put to more profit in growing vegetables than in dairying. Fruit lands eligibly situated, and intelligently managed, may also be a source of greater profit.

Limited specialities of this kind, in which only the few comparatively can engage, must not be embraced in the statement. Compared with other great interests of the country, such as the production of wheat or corn, and other cereals, the raising and fattening of stock for the shambles, sheep husbandry, hop growing, and the like, each and all are inferior in their remunerative prospects to the dairy.

In the first place the milk-producer enters the great markets of the world with less competition than almost any other branch of farming. He has a wider range and a more diversified product to dispose of. The milk-farmer may be a breeder to some extent of thorough-bred cattle. After the first outlay (and that may be on a small scale at the commencement) the expense of raising a thorough-bred cow will be no more than the raising of the meanest scrub of our common stock. Then if there is any profit in fattening stock for the shambles, animals which fail in milk for the dairy, and are to be turned into beef, can be employed for this purpose.

Both of these specialities are in the line, and connected with the dairy, as is also the fattening of swine on dairy slops. Again, the yield of his cows takes three forms of a commercial product, each of which enters into universal consumption, and is regarded as a necessity—milk, butter, and cheese: the last two are highly concentrated forms of food, and less bulky of transport than other articles of food of the same value.

200 pounds of butter, costing $80, will occupy no more space in a railroad car than a barrel of flour costing but $6. In other words,

the $80 worth of butter can be carried as cheaply to market as the $6 worth of flour. This alone is an immense advantage; for when the farmer comes to deduct freights on a low-priced bulky product, together with commissions to the middlemen for handling, it will often take a microscope of great power to discover the profits saved by the producer.

In New York we have studied this question of the dairy and its relative advantages for many years. We cannot afford to grow corn; for the West, with its rich prairie and bottom lands easy of cultivation by machinery, can undersell us.

Look at the price of wheat and flour to-day, and tell me if the hard tenacious soils of New York, New England, and Canada, can produce it at a profit? How is it with wool? The immense plains of Texas and the West are competing with us, and can always afford to sell for less money than we can afford to produce it.

We have no chance to enter European markets with our wool, for Australia and South America stand in the way. There is nothing permanent in a protective tariff for the wool grower in the States. Work the card as skilfully as he may, the politician and the woollen manufacturer will always insist on having the "golden fleece." Now, a good dairy farm is a good stock farm; but stock farms are not necessarily good dairy farms. It is doubtful whether the great stock farms of Kentucky and the South-West will ever be employed largely for dairying. The lands are not so well provided with water, and the climate is too warm to secure the finest flavored goods.

Besides, the stock-farmer of the West and South-West can make more money in raising stock than by dairying.

With the great railroad facilities being developed in these directions, the New York and New England farmer will find it more and more difficult to compete with these people in making fat cattle for the shambles.

On the other hand, there has been for the past few years a gradual but constant increase in the demand and price of dairy products. If you take the gold prices for different kinds of food in London for a series of years, the statistics present the remarkable facts that dairy products have remained steady, while other products have fluctuated in price, and at times become very much depresssed. The reason of this is, that the whole world is not competing in this class of production. The supply being uniformly within the limits of consumption, a good article is always needed, and prices do not fall so low comparatively as for other products.

It must be observed, too, that upon dairy farms, the milk product year after year is pretty uniform as to quantity. Upon natural grazing lands, there is no crop so reliable as grass.

Grain, fruit, hops, and the like, are liable to numerous accidents, that lessen or destroy the yield, but which do not obtain in the grass crop. Hence the dairymen can count pretty accurately upon what his farm will yield, if stocked with an average lot of cows.

Again, his lands are not so liable to be exhausted as those devoted to grain growing; and with an abundant source of manure at his command, should be growing more and more productive from year to year.

The great question with dairy farmers has been with regard to overproduction of dairy goods. Since the inauguration of the associated dairy system, fears have been entertained that the cheese and butter product of the country would be beyond a healthy consumptive demand. Dairy products are so liable to decay, that dealers do not care to take the risk of storing and holding in large quantities. They must go into quick consumption, and hence any considerable surplus accumulating from year to year would so depreciate prices that the business could not be carried on with profit. Statistics thus far show that in Europe production does not keep pace with consumption, and this difference is every year growing wider and wider.

In the United States, the home consumption of late years has more than kept pace with production notwithstanding the extraordinary development of dairying under the associated system.

Previous to the war of the rebellion, we exported; butter but for some years past the home consumption has taken all our make, and at a price which consumers denounce as extortionate.

The best Normandy butter sells in London to-day at about 31 cents, gold. Deducting freight and commissions, and turning the gold into currency, it would net the shipper in the States about 36 cents; a price below what the best grades are worth at home.

In 1860, the production of butter in the States and Territories was 470 millions of pounds; it is, perhaps, to-day 700 millions of pounds; and if we were over-producing, prices would decline, so that shippers could afford to export. Wherever you go among consumers, in towns and cities, you hear loud complaints of the difficulty of getting good butter, and the monstrous prices which they are forced to pay. They talk bitterly against the cheese factories, charging them with the crime of absorbing the butter-makers, and thus cutting off production.

They forget that the rapid increase of population and the gormandizing habits of our people in the use of butter are the causes which have led to this condition of things. There are no such butter eaters on the globe as we Americans. Everything that we cook must be swimming in butter. Our Irish domestics, who never ate a pound of butter during their whole lives before reaching these shores, seem never able to get enough of this unctuous food.

The want of butter among all classes is enormous, and in an economic point of view is truly alarming. To those who have travelled in Europe, and contrasted the difference between the people there and here in the use of butter, it need be no surprise that our dairies are taxed to their utmost to satisfy the cravings of our butter eaters. If the habit increases with our continually increasing population, the prospects of butter dairying cannot be considered at all discouraging.

If we take the article of cheese, our people are evidently beginning to follow English tastes in their appreciation of this nutritious article

of food. We are exporting now but little more cheese, comparatively, than in 1861,—perhaps twenty millions pounds more,—and yet our production has increased from 103 millions of pounds in 1860, to 240 millions of pounds in 1869.

Notwithstanding the war of the rebellion, and the consequent poverty of the Southern States, which cut off the cheese trade in that direction, the home consumption has gone on increasing from sixty-three millions of pounds in 1860, to one hundred and eighty millions of pounds in 1869. The average increase of home consumption has been at the rate of thirteen millions of pounds per year.

When the Southern States get into a healthy and prosperous condition,—with the wonderful development of railroad facilities, the opening of the Pacific road, the influx of Chinese laborers, the direct trade with China,—it is doubtful whether the dairies in this country can be developed sufficiently large to supply the demand,

But there must always be a large dairy interest employed in supplying fresh milk to our cities and manufacturing towns. This is more apparent from year to year, and the real question of the dairy interest to-day should be to equalize the supply of the three products, milk, butter, and cheese, that the highest prices may be reached for each.

The difficulty is not so much the fear that dairying will be overdone, as that the equilibrium be disturbed, and either one or the other of these branches be increased beyond its proper proportions. If a large proportion of the cheese makers were to go to making butter, the butter interest would be overdone and prices decline, and the same would result to the cheese interest from a large change from butter to cheese dairying, while the milk interest would be greatly injured if a large proportion of dairymen should enter into that branch, either by furnishing condensed milk or fresh milk for city consumption.

When I was in Elgin, Illinois, last winter, I found the Elgin Condensed Milk Establishment putting up large quantities of condensed milk for Boston and New York markets. This business is yet in its infancy, but the time is coming, in my opinion, when a very large trade will be done in this direction.

City consumers, who are in the habit of using condensed milk, tell me they prefer it for ordinary use; that they are sure of getting a pure, unadulterated article; that it is cheaper, even at a high price, than milk ordinarily sold in cities, because the shameful adulterations practiced by milk-men, the liability of the milk getting sour, and losses of this kind, more than make up the difference in price; besides, the convenience of always having sweet pure milk in your house in small cans, ready for use, is an important consideration to the city consumer.

The condensing process at the Elgin Works is that under the patent of Mr. Gail Borden. At this establishment the very greatest attention is paid to having milk delivered pure and in perfect order. They have an admirable set of rules as a guide to each patron, and he is required to follow out the instructions to the letter.

I have these rules here, and they would be valuable to all milk-

farmers who furnish milk for the market; but I cannot now encroach upon time in reading them. The outlines of the condensing process are briefly as follows:

Each man's milk is examined as it is received, and if it is all right, it is strained and passes to the receiving vat; from this it is conducted off, passing through another strainer into the heating cans, each holding about 20 gallons. These cans set in hot water, and the milk is held here until it reaches a temperature of 90°. It there goes through another strainer and into a large wooden vat, at the bottom of which is a coil of copper pipe through which steam passes, and here it is heated up to near the boiling point. Then the best quality of white granulated sugar is added in the proportion of $1\frac{1}{4}$ pounds of sugar to the gallon of milk, when it is drawn into the vacuum pan, having a capacity of receiving 3,000 quarts at a time. This pan is a copper cylinder, with a coil of copper pipe inside, and jacket under side also for steam.

The milk remains in the vacuum pan subjected to steam for about three hours, losing 75 per cent. of its water, when it is drawn off into cans holding 40 quarts each. The cans are then set in a large vat, containing cold water, the water being of a height equal to the milk in the cans, when it is stirred until the temperature of the condensed milk is reduced to a little below 70 degrees. It is then emptied into large drawing cans with faucets, and from these drawn into small cans holding a pound each, immediately soldered to exclude the air, and when properly labelled is ready for market.

There are two kinds of condensed milk, the one containing sugar as above described, and the other simply the plain milk without the addition of the sugar. The wholesale price received at this factory for their milk is $3 50 for a dozen cans, or a trifle over twenty-nine cents per pound. It will be seen that four pounds of fresh milk as drawn from the cow, or about two quarts by measure when condensed by taking out 75 per cent. of water, will make one pound of condensed milk, and therefore a little more than $14\frac{1}{2}$ cents per quart is realized for it.

I am not prepared to give the expense of manufacturing, but if $4\frac{1}{2}$ cents per quart be taken to cover all expenses—this is doubtless too large an estimate—we have the milk worth ten cents per quart. And you farmers of Canada can readily tell me whether you can afford to produce it at that rate. The condensed milk is about the consistency of thick syrup, has a pleasant taste, and when used for tea or coffee is not to be distinguished from pure fresh country milk.

From what I saw of this establishment, and from a test of its products, I was convinced of its great benefits to all parties concerned, and could not but hope that more establishments of the kind were in operation throughout this country.

The factory at Elgin is managed by a company, and they were paying farmers in the winter 19 cents per gallon for milk.

In New York, the Orange County milk-farmers, finding themselves robbed by the middle men, entered into association a few years

since for protection. They established, convenient to railroad depots, their "creameries," or butter factories, and by organization were prepared to dictate a price upon their milk.

I am not acquainted with the manner in which the milk business is managed in Canada; but I know this, that the associated system, whether it be for cheese, or butter, or milk, has operated greatly to the farmers' advantage in New York.

The Orange County people established their creameries, and the farmers of a neighborhood associate together and deliver their milk at the nearest establishment. Here the milk is properly cooled or cared for, and what milk or cream can be sold at a good round price is disposed of in that way. The balance is made up into butter and "skim" cheese. A record is kept of all deliveries and sales, and each farmer gets his proportion of sales according to the quantity of milk delivered. Under this arrangement there is no mistake or loss of milk, and better terms can be made with the dealers or middle-men because the milk of a neighborhood being massed together, the salesman, if prices do not suit, can turn the milk into butter and cheese.

The system has another advantage, as it affords a basis for determining the value of milk. It has been found that 14 quarts of milk will make, on an average, one pound of butter and two pounds of skimmed cheese. The milk is not robbed of all its cream as when butter alone is the object, since a good quality of skimmed cheese is sought.

Now, under this butter factory system, the very best butter is made, which always commands a high price in market. Skim cheese if well made, is saleable at a few cents under whole milk cheese, and the estimate is made in this way :—

14 quarts of milk make 1 lb. of butter	46	cents.
2 lbs. of skim cheese, say	20	do.
Whey for hogs	04	do.
	70	do.
Value of milk for butter and skim cheese	05	do. per qt.

I do not pretend to give the exact figures in this estimate, as a very high price is often reached by these factories for fancy grades of butter. I have known factory butter to sell for 70 cents per lb. when the very best butter in Central N. Y., made at farm dairies, would sell only at 40 cents. Skim cheese has also been sold nearly as high as whole milk cheese.

I have referred to the profits to be realized from the associated system of dairying, as applied to condensed milk, as well as butter and skim cheese; it remains for me to give the result from turning whole milk into cheese.

Assuming that 14 quarts of milk will make, on an average, 3 lbs. of cheese, and that 15 cents per lb. has been the average net receipts after paying all expenses for manufacture (and our fancy factories have realized more than that the past season) we get the following :—

3lbs. of cheese, 15 cts	45	cents.
Butter from whey	04	do.
Whey for swine	04	do.
	53	do.
Add average for butter made spring and fall	03	do.
Total	56	do.
Value of milk for cheese-making	04	do. per qt.

Now, placing the three manufactured products together, and comparing values, we find that under the associated system the farmer would realize for his milk, at the condensing factory, 10 cents per qt., at the butter factory 5 cents, and at the cheese factory 4 cents. Now, how do these figures compare with the net receipts of Canadian farmers in the sale of milk, or in butter and cheese-making at factories and farm dairies? What I wish to impress upon farmers just now is, the importance of correctly estimating the value of the products which they have to sell.

It is a source of profound regret and infinite disadvantage that farmers, as a class, are not educated in a correct system of farm accounts. Not one farmer in twenty can tell the actual cost of any farm product, and hence the disposal of his goods is often made at a greater sacrifice than he imagines. To the dairyman, who has his product to sell, from week to week, or month to month, the cost should be accurately known. He is then prepared to take advantage of the markets, selling when it will pay, and holding when it will not pay. Many make the mistake of holding goods when prices are high and pushing them forward when the markets are dull. If it be necessary to sell below cost, we should always know what the loss is. The operations for the past year have demonstrated three things of considerable importance to the cheese dairyman.

1st. That a low, even temperature, and a comparative humid atmosphere in July and August, are of service in preserving cheese in flavor, and hence that more attention must be given in the construction of curing-rooms to meet the conditions of our hot dry weather.

2nd. That a healthy consumptive demand for cheese does not depend upon extreme low prices; and,

3rd. That there are markets and an outlet for our whole product at a price above cost.

It will be of considerable importance, I think, for dairymen to bear in mind these three propositions in next year's operations.

We have talked much in the States from time to time about the cheese business being overdone, and fears have been entertained that we have reached the limit of our production.

At the end of each season, both dealer and producer are surprised that so large a product has been made, and gone into consumption. And we are disposed to give England all the credit of helping us out of the difficulty. Well, she does help us in a certain way, and I want

her to have all the credit for it. But I wish to present some important facts which I think must be of interest to Canadians, and which seem to point to a time when the export trade in cheese will be mostly, if not wholly, Canadian. Assuming that such a condition of things should come to pass, it seems to me very clear that the prices on your goods must advance so as to be highly remunerative.

Now, in 1860, we produced in the States 103 millions of pounds; and in 1861, we exported 40 millions of pounds. We export now about 15 to 20 millions of pounds more than in 1861, and our production has more than doubled. The 55 millions that we now export, does not seem so large when compared with the 180 millions of pounds, and more which enters into home consumption. But how happens it that our home consumption has increased so rapidly? Well, we had but 30 millions of people in 1860, and we now have 40 millions.

During the last few years there has been a vast development of railroad facilities and intercommunication; and cheese now, from these facilities, commences to go among the people. It is true our cheese is more palatable now than formerly, and safer to be handled—that has also had its influence—but the greatest help has been from the other source.

It is the IRON HORSE that may be heard, snorting and galloping in hot haste at all hours of the day and night, dragging its heavy loads into distant cities, through widely separated towns and hamlets. It is this that has saved our cheese-makers from utter ruin. Had it not been for this, the fears of over-production would have been long since verified.

Last fall I made an extended tour through the West and South-West, and saw N. Y. factory cheese crossing the Mississippi, upon the docks at St. Louis, upon steamboats going up and down the river; and what was better, I saw men paying 30 cents per lb. for it, saying it was cheap enough.

If you will compare the railroad maps of 1870 with those of 1860, you will see the iron rails spreading out over the country like innumerable arteries, carrying commercial vitality along their course, where all was dead before; and they have made an outlet for our product of vastly more consequence to us in the States than the Atlantic Ocean.

Bye-and-bye, when the wide domain along the Pacific Roads become peopled, when our great mining districts shall have been interpenetrated by these iron arteries and brought near to us, when there will be less and less cheese for us to export, and sooner perhaps than we are aware, our dairies will be taxed to their utmost to supply home consumption.

We have not properly considered these things; and it is important that you (dairymen) on this side the line be made acquainted with all the facts bearing on the trade, that you may not be in too great haste to sell your product without reaping from it a decent profit.

I insist now, as I did years ago, that fine qualities of cheese should bring 18 cents, gold, at least. If English Chedder to-day is

worth 21 cents, gold, why ought Canadian cheese of the same quality to be sold here less than 18 cents? Of the poor and inferior grades, it does not much matter whether they go without profit to the producer; for those who persist in making such goods should be made to feel in some way that it is unprofitable.

I have given the comparative net values of milk under three forms of management. In butter making alone, when the skimmed milk is fed to swine, the average profits or value of the milk as drawn from the cow, will probably not vary much whether it be employed solely for butter and cheese; and this has reference to a good marketable article of each product. On poor stuff, the depreciation in price is perhaps the greatest on butter. And it may be remarked here that there is no profit in producing a poor article. The people now demand better things in this line of food than they did 10 or 15 years ago. In the progress of civilization, and the accumulation of wealth, the comforts of life are increased, and luxuries become a necessity.

There is a high premium to-day, both in this country and Great Britain, for extreme fancy products of the dairy. Some of our butter makers, as is well known, get a dollar a pound for all the butter they can make the year round. The finest grades of Chedder cheese sell to-day in London for 23 cents, gold, per pound. These high prices stimulate to improved manufacture, and we are every year approximating nearer and nearer to a high standard. The results accomplished within the past few years are quite astonishing. Take, for instance, the article of whey butter. Five years ago none supposed that this article could be properly utilized for human food, or be raised from a respectable grease standard. Millions of dollars have been lost annually in the waste of this material.

But we have a process now of making good marketable butter from the whey resulting from cheese manufacture. Five years ago the inventors sent for me to examine the process and test their samples; and I was so well satisfied with its utility that I advised its adoption and introduction in some of the factories of Herkimer County.

You will, perhaps, the more appreciate this discovery when I tell you that one of the Herkimer Co.'s cheese factories has put whey butter in the open market at Little Falls the whole of the past season, and received the usual market price for good table butter at that market. The experts who examined it were unable to distinguish it from butter made from cream in the ordinary way, and some of our leading hotels have at times selected it from samples of butter on sale for their tables: of course, not knowing its origin; for if you tell a man he is eating whey butter it at once impairs his taste, precisely as a home-made article of merchandise is often regarded as inferior to the imported article, though the latter may be the inferior.

I do not mean to say that whey butter is equal to the finest grades of butter made from cream, nor do I think it a butter that has long-keeping qualities; but what I mean to say is, that if a sample of whey butter, fresh and properly made, were placed here among fifty tubs of

other butter, ordinarily made, I do not believe there is an expert in this convention that could point out the sample. Whey butter that will bring from 36 cents to 40 cents per lb. must have some merit with consumers. Of course, in the production of good whey butter, there must be good milk, with neatness and care in its manufacture. This is imperatively demanded.

Five hundred gallons of whey make 20lbs. of butter, and factories running four or five vats turn off a tub a day, which, at the rate it has sold the past season, would amount to $24. This amounts to $700 per month, saved in a single factory in a material which has usually gone to the pigs, and been wasted. In a thousand factories this would amount to $700,000 per month. I say wasted, because however contradictory it may seem, the whey, after the butter is extracted, is found to be just as valuable as a feed for hogs as when not treated by this process. It is claimed to be more valuable on account of the high heat or cooking to which it is subjected. During the past season I have experimented with it in feeding swine, and am satisfied that it is quite as valuable as whey as ordinarily fed.

THE PROCESS.

In this process the whey is drawn sweet, directly from the curds, to a vat having a copper bottom, and setting over an arch similar to those used for boiling sap in sugar-making.

The butter works are separated from the cheese manufacturing department,—the arch and vat being arranged lower than the cheese-vat, so that the whey may be readily drawn, simply by having a conducting pipe from one vat to the other. After drawing the whey, one gallon of acid is a ded for every 50 gallons of milk, if the whey is sweet. If the whey is changed, a less quantity will be sufficient; and if the acid is not sharp, 1 lb. of salt should be incorporated with it.

The acid having been added in the above preparation, heat is immediately applied to the mass until it indicates a temperature of from 175° to 185°, Farenheit.

As the cream rises it is skimmed off and set in a cool place till next day; it is then churned at a temperature of from 46° to 68°, according to the temperature of the atmosphere, and is worked and salted according to the usual method of butter-making.

The acid is made by taking any quantity of whey, after extracting the cream, heating it to to the boiling point, and adding 1 gal. of sharp, sour whey to every 10 gals. of boiling whey, when all the casim and albuminous matter remaining in the whey will collect in a mass. This is skimmed off, and the whey left to stand from 24 to 48 hours, when it will be ready for use.

There is another process, called the cold process, which is said to make good butter; but I am not so familiar with its operations, or of the quality of the butter produced, as in the process I have described. In the cold process the whey is drawn into the zinc vat, or one having

a metal bottom. This vat is 15 in. high, 3 ft. wide, and of convenient length. It sets in a wooden vat, with space between the two for cold water. The whey is then drawn in the upper vat and a handful of salt added to every 10 gals. of whey. During the first 2 hours it is stirred thoroughly from the bottom every 15 minutes; afterward, it is left to stand quiet for about 24 hours, when it is skimmed.

The cream is churned at a temperature of about 58°. If the temperature of the cream is above 60°, cool it; if below 56°, warm it. It is churned until the butter becomes granulated about the size of buckwheat kernels, when it is left to stand about five minutes; then let the buttermilk run off and throw in cold water; let it stand until it is hard before stirring much, then rinse with cold water until the water runs off clear; then churn it together or gather it and press the water out, and salt at the rate of 1lb. salt to 18lbs. butter; let it stand till next day, and work and pack as with other butter.

On the very best dairy farms in Herkimer County—those that will carry a cow to three acres—the net receipts from cheese alone have been for the past season at the rate of $25 per acre. As dairy farms are rented in New York at the rate of two-fifths, this gives the proprietor $15 per acre, or 7 per cent. interest on the land when stocked at $214 per acre. The best dairy farms are selling at about $200 per acre, including stock. But the dairymen of Central New York have been more or less afflicted for the past ten years from cows prematurely losing their calves. No remedy has, as yet, been found for this bad habit, although two Commissions have been employed at the expense of the State to investigate the matter. Should this bad habit continue without relief, resort will, without doubt, be had to spaying the cows, or at least a test be made of the practical advantages of this operation. Spaying, it is claimed, produces a more abundant secretion of milk; which acquires, at the same time, a greater richness in quality, and results in the following advantages to the dairyman:—

1st.—An increase of one-third in quantity of milk.

2nd.—Certainty of having more constantly the same quantity.

3rd.—The cow is not exposed to accidents which often occur when she is in heat.

4th.—As she will not generate. all the accidents of gestation and calving will be avoided.

5th.—Greater disposition to fatten where the milk fails, or the owner wishes to part with them.

It is affirmed, as the result of experiments, that a cow operated upon when her lactative powers are fully developed—say at the age of six years, and about 40 days after calving—she will then continue the same flow of milk as long as her owner chooses to keep her in food, and other things being equal. If this be true, then, it must be obvious there is a very great advantage in such cows to those furnishing milk for city consumption, since as there is a flow of milk the year round, the necessity for two sets of cows is avoided. While with the cheese or butter dairymen, the flow of milk in winter must more than pay the cost of

keep, leaving the hay crop as so much profit to be added in the receipts.

The question is one of importance, and I leave it for your consideration. The most common fault of American farming to-day is lack of contentration. The separation and division of once's forces—the attempt to do too many things at once, having no speciality and performing nothing in the best manner—constantly patching up each branch of work for the present, and leaving real genuine improvement for the future.

I see farmers everywhere in great haste to get rich, merely scratching over large farms, growing scanty crops, poor in quality, hurrying from one piece of work half done to take up another, and thus accomplishing no improvement, or gaining no reputation in a lifetime. This, it seems to me, is a poor way. Every farmer ought to be noted for doing at least one thing well. I know a man that makes a good business simply by raising turkeys and other fowls for a local market. He makes them heavy and fat, and always sells for a third more money than the best in market. I know another man who fattens hogs and sells to private families. He is very particular in the care of hogs, keeping them sweet and clean, and making the best pork, and he always sells two or three cents per lb. above the market price. I know a boot-maker who made a fortune, simply by always making the best boot, and never allowing a poor article to go out of his shop.

There is so much deception and cheating in the world that wise men will always pay a premium for a certainty. If you look through the world, you will see the profits are mostly made in the long run in producing the best article of its kind, and this is particularly true in dairy products. If you are in the butter business it will cost no more to make a pound of butter which will sell readily at 50 cents, than a pound of grease that goes begging at 10 cents. On the one there is a profit, and the other is sold below cost.

Some people never find out the leading principles for producing good butter. They are simple enough, and may be simply summed up as follows :—

1st.—Securing rich, clean, healthy milk—milk obtained, if possible, on rich old pastures, free of weeds.

2nd.—Setting the milk in an untainted, well ventilated atmosphere, and keeping at an even temperature, say at about 55° to 60° while cream is rising.

3rd.—Proper management in churning.

4th.—Washing out, or otherwise thoroughly expelling the buttermilk so as not to injure the grain.

5th.—An even incorporation of pure salt, and packing in oaken tubs tight, clean, and well made, and storing in a perfectly sweet cellar.

Cleanliness in all the operations, is of imperative necessity. The first cream that arises is always richer and better than that which comes up later. The plan of setting the milk in vessels plunged in cold spring water until the cream rises, is the best way for securing an even

temperature. But among farmers, who have not the conveniences of a spring house, the best apparatus that I know of is the JENNINGS PAN. These pans are about four inches deep, and large enough to hold the entire mess of milk of the dairy at one milking. It is a double pan, the upper one of tin, setting in a wooden vat with space between the two at bottom and sides for water. The milk, as it comes from the cow, is strained in the uppper or tin vat, to the depth of two or three inches, and water either from the well or penstock is conducted between the vats; and in this way the temperature of the milk is rapidly reduced to 60°. If the weather is cool, and the temperature of the milk during the night is likely to fall below 56°, warm water may be added in the water box, and thus an even temperature is pretty well maintained. When treated in this way, most of the cream will rise in twelve hours, and the butter will be of a beautiful color, and fine quality. The apparatus costs much less than pans—there is less waste of cream in skimming—and it is easily cleaned. There is a gauze covering which goes over the apparatus, preventing dust and flies from entering the milk, and yet allowing exposure to the air, and proper ventilation.

In making fancy butter there are three essential points to be secured; color, texture, flavor. The color must be a rich golden yellow; the texture, firm, tenacious, approximating to waxy, not salvy, but easily moulded into any shape; it must have that nutty flavor and smell, which impart so high a degree of pleasure in eating it, and which enhances its value manifold The cream that rises first gives butter of the best color, texture, and flavor.

In making fancy butter, it is desirable to get the cream up quickly, skimming before the milk sours. There are a great many theories about butter-making. Some set in shallow pans, and skim when the cream is in a thick coat, like a "leather apron." Others set in water in the spring-house, adding a little sour milk to the pans at the time of setting. Others prefer to churn the milk either sweet or sour.

Of all the systems, the most rational it seems to me, is that adopted at the Orange Co. butter-factories. It is the most economical in the disposition of the milk, and the most certain in its results. I have been among the butter merchants in London, and tested thousands of samples of the best butter known in that fastidious market—Devonshire, Irish, Holstein, Jersey and Normandy.

The Normandy is the highest type of European butter, and brings from 10s. to 20s. per cent. in advance of Dutch brands; but I have found nothing superior to our best factory grades. The factories dip the cream off when it is sweet and fresh: they do not wait until the milk becomes old and decomposed and carries its taints to the cream. They get an exceedingly high price for their product, which is an evidence of its superior quality.

It would be impossible, in the brief limits of an address, to go into all the details of butter and cheese-making. These have been pretty elaborately discussed in previous addresses before this Convention, and

it is upon points not previously touched upon that I desire now to call your attention; and, before I close my remarks on this branch of the dairy, I wish to present some additional facts in reference to the means to be employed in producing an extreme fancy grade of butter.

At the recent meeting of the American Dairymen's Association, Mr. J. B. Lyman, of New York, presented samples of Philadelphia butter bought by him on the Saturday previous to the Convention, at the farmers' market, Philadelphia, for which he paid 90 cents per lb. It was the last of a tub, the rest of which had sold in that market for $1 per lb., and, he says, the manufacturer affirms that he is enabled to produce this high-priced fancy article by attention to three points:

1st.—The food of his cows.

2nd.—Temperature.

3rd.—Neatness and dainty refinement, at every step, from the moment when the milk flows from the udder, till the dollar in currency is paid for the pound of butter.

In regard to the food for the cow, this Philadelphia butter-maker says, "I find that I make my best butter when I feed on clover or early-mown hay. I cut fine, moisten, and mix in both corn meal and wheaten shorts. Indian meal I regard as important in every butter dairy. Next to meal I regard shorts and prefer to mix them. I feed often and not much at a time. I do not use roots unless it be carrots. My pastures and meadows are quite free of weeds. I cannot make this grade of butter from foul pastures or a low grade of hay. The sweet-scented vernal grass, for which our pastures west of Philadelphia have some fame, I do not regard as important. I would just as soon feed my cows on cut corn or let them range on clover."

The temperature of his milk-room does not vary much from 58°; the milk is skimmed clean, and as each skimming is put in the cream-pot it is stirred in the pot, and the churning performed once a week, summer and winter. Just before the butter gathers, a bucket of ice-cold water is thrown into the churn. This hardens the butter in the small particles and makes a firm grain. In the hot months this practice is unvarying. In working we get out all the buttermilk, but do not apply the hand.

A better way is to absorb the drops with a linen cloth wrung from cold water. The first working takes out all the milk, and the second we handle delicately with fingers as cool as may be. The salt is less than an ounce to the pound, but generally not much less. The balls all weigh one pound each, and receive a uniform stamp. On packing for market, each ball is wrapped in a linen cloth with the name and stall of the market-man written upon it. And he remarks, in conclusion, that the most scrupulous neatness in every act and in every utensil of the dairy is observed. Milk, which upon leaving the udder, flies through an atmosphere loaded with fumes, will never make butter for which we can get a dollar. No milk sours upon the floor of the milk-room; none is permitted to decompose in the crevices of the milk-pan.

The churn is scoured and scalded till no smell can be detected but the smell of white cedar.

The Pennsylvania butter-makers use a cedar tub for sending their butter to market. It is made of cedar plank about two inches thick, lined with tin, and having projections on the inside for shelves, on which the balls of butter are placed, so that they arrive in market as perfect as when they left the hands of the manufacturer. There is a small ice chamber at the ends of the tub, which is used in summer, so that the heat within the tub does not fall below 60°. Mr. Lyman states that there are a thousand families in New York city alone who would purchase 5,000 lbs. of butter of this kind per week, and to whom a price above 75 cents per lb. would not, for a moment, check their eagerness to buy. And this condition of things exists to a greater or less extent in all our cities. I do not know as this style of packing butter would be applicable to Canada; but I think it offers to butter-makers everywhere useful suggestions, as it shows that extreme care in producing a fancy article is abundantly rewarded.

CURING CHEESE.

There is nothing more satisfactorily established than the fact that an even temperature of about 70° is the one best suited for curing cheese so that clean, delicate flavor may be secured and maintained. And the best means of holding this temperature in the curing rooms has occupied more or less attention. The result of recent experiments has demonstrated that a low, even temperature, may be secured by means of subterranean ducts. By locating the dairy buildings on a side hill, and laying large tile pipes under ground, and arranged so as to communicate with the dry house or the milk room a constant supply of fresh air passing through the pipes is cooled, and thus an even temperature is maintained at very moderate expense.

In our hot dry summers, I am satisfied we shall never be able to hold our cheese in that perfect flavor which the markets demand, unless some change is made in our curing-rooms. Seasons like the one just past are exceptions, and the like may not occur again in years. It approximated more nearly to the summers in England than those common with us; and to the peculiar condition of the climate more than anything else, in my opinion, may be attributed the marked and uniform fine flavor of American cheese in 1869. And if there is anything more needed to establish this position of climatic influence, reference may be had to the hot summer of 1868, in England, and the very marked depreciation that year in English cheese as a consequence.

I do not wish it to be inferred that no improvements have been made in dairy practice the past year: for progress has been made. The use of the agitator in moving the night's milk in the vats; exposing its particles to the air; the more general disposition to habits of cleanliness in dairy products; as well as greater attention in removing the milk out of contact with foul odors and putrefactive germs; the

increased knowledge and skill in the development and management of acidity in the curds,—all have tended toward an improved product. But cheese-makers must not deceive themselves that the whole improvement in the character of our cheese is due to the causes named. The low average temperature of the season has been of important service in arresting the development of that putrefactive element, which is always so troublesome in our hot summers.

The inventive genius of our people must now be turned to this point: the production of artificial means of a temperature and condition of atmosphere best adapted for securing and preserving a delicate flavor in cheese. The man who can invent a practical and inexpensive method of regulating the temperature of factories, so as to be uniform at about 70°, would, by so doing, secure incalculable benefits to the dairy interest and make his invention, at once, a source of fortune to himself.

We know, practically, that a uniform temperature of 70° is best adapted to break down the casein in curing cheese, so that it will be transformed and amalgamated with the other ingredients of the cheese into that mellow and rich taste which the markets now demand as the highest type of this nutritious article of food. It is a well-known fact in science that the nitrogenous elements of food (casein) may be transformed into oil, but that fat or butter cannot be converted into the nitrogenous or flesh-forming elements of which casein is one form. It is to this particular transformation of the casein that cheese, not particularly rich in butter, when properly ripened, appears more mellow, rich, and buttery, than its analysis indicates. In other words, cheese made from milk that has been partially skimmed may, if properly cured, be more mellow and palatable than cheese made of whole milk when the curing process has been imperfectly carried on. These facts have been abundantly proved by the chemical experiments of Dr. Voelcker; hence you will see how important it is to the cheese interest of this country that the ripening process in cheese be conducted properly and at a temperature to produce the very best results.

Professor Caldwell, in his recent lecture before the Utica Convention, has explained how the coagulation of the milk in cheese-making, as well as the ripening of the cheese, are due to a species of fungi, so minute as to be only recognized by the powers of the microscope. Under certain conditions they reproduce themselves in vast numbers, and when temperature and other things are favorable, these fungi subserve the very important purpose of breaking down the casein and mellowing the cheese into a delicious morsel of food suitable to the wants of man. And he showed also that when temperature and other things were unfavorable, both the milk and the cheese were taken possession of by another class of fungi, injuring the product by its putrefactive element. It is this latter class of infusoria that the cheese-maker has most to contend with and keep in abeyance.

HOME CONSUMPTION.

I have referred to the benefits resulting from the home consumption of cheese, and I think it must be self-evident that the more we stimulate the use of cheese among our own people, the easier will it be to dispose of our product at remunerative prices. But how can home consumption be rapidly promoted? I answer, by the manufacture, to a certain extent, of small cheeses. What our people want to-day is a cheese weighing from 10 to 15 lbs., made in the Stilton shapes. And these shapes, to a moderate extent, could be exported, selling abroad at a higher rate than the 60 lb. Chedders.

A few have been shipped to England the past season, outselling the Chedder shapes of the same quality, and netting the producer more money by 2 cents per lb. I was informed by an English shipper, who had exported these cheeses, that they met with ready sale, and that a limited quantity, the coming season, could be used for export at great advantage. But it is for home consumption that they are mostly desired. Our habits here, and especially in the States, are in many respects different from the habits of people in England. The cutting of cheese upon the block, and selling by the penny-worth, does not prevail with us to any extent. We want a cheese that everybody can buy without cutting. Dealers want something that they can sell whole without peddling it out in pieces. There are thousands of people everywhere throughout Canada and the United States who could buy a ten pound cheese at 20 cents per pound, costing only $2, who would not purchase a large cheese costing $10, though offered at a much less price per lb.

Persons neglect often to eat cheese because of the difficulty of getting it in convenient shape. If you buy a large cheese there must always be more or less waste in cutting, from mould, from drying away, all which, if taken into account, often makes it more expensive than the smaller cheese at a higher price. Poor people, or those in moderate circumstances, would often be induced to take a cheese costing but $2, and would thus get in the habit of eating it.

In England, immense quantities of Dutch cheese are imported from Holland. The Edams are round, weighing only a few pounds, and any English dealer will tell you how popular they are with the working people. Then there are the Stilton and the Chedder-loaf, which have a high reputation in England, and they are of the same shape I am recommending.

Wherever I go I hear this complaint among the grocers, "We don't like the business of cutting cheese. Give us something that we can sell in a lump without waste, and we can do a good trade with it."

Now, such cheese could be pressed, several together, in a press; and it would not cost any more to box, because six or seven could be put in one package.

Recently, at the Vermont Dairyman's Convention, Mr. Mason, President of the Association, told me he had been making such cheese for two years past, and had sold them as high as 30 cents per lb., and no lower than 25 cents. When at the West last fall, I found them making such cheese to a limited extent, and they sold readily at the factory, at 30 cents.

Of course, it would not be advisable for every factory in the country to change at once, and entirely upon small cheeses; but factories, I think, could safely make up a portion of their milk into these shapes, and try the experiment of sales.

At the first meeting of the New York Cheese-makers' Association I recommended in my address the present style of Chedder shapes. At that time our people were making a large-sized cheese, and my friend, Mr. Farrington, can tell you how slow and difficult it was to get factories to see that it was for their interest to change their hoops and go to making smaller cheeses; but they, in time, found their profit in it.

In the States, I think, there is great need of these small Stilton-shaped cheeses; but as the trade in Canada may be somewhat different from that in the States, it will be safer, perhaps, to try the experiment first in a moderate way, and thus by degrees test your markets and the feelings of consumers.

And now, what are the practical points to be observed in the manufacture of a high-priced fancy cheese? Quite recently I was in conversation with a gentleman noted for his beautiful penmanship, and I asked him to tell me the one great principle of his success. Most every one in this country knows how to form letters, and has some style of penmanship, but the number of those distinguished for really fine penmanship is comparatively small There is a general outline for letters, and a general formula for cheese-making. But why is it that often by practising for weeks, and months, and years, we fail to reach the highest standard of excellence? Well, I said to this man, who had been a teacher, and was of an eminent, practical turn of mind, please tell me the one great principle that underlies this art of penmanship; and his reply was that it consisted more than anything in the education of the eye. Persons are careless, and fail to observe how letters are formed, and to measure with the eye the size of each, and the distance apart which they should be placed. This seemed to me a very practical explanation, and I could not help thinking what an immense advantage it would have been to me could I have had this single principle indelibly impressed upon my mind when young and learning to write.

Now, in cheese-making, the eye and the sense of smell and the sense of feeling must be educated. We must learn to distinguish the condition of milk, and the changes constantly going on in its transformation into curd. We must educate the sense of smell so as to distinguish at once, and with certainty, that peculiar odor which the curds assume when properly cooked. We must educate the sense of

feeling, so that by handling the curds their maturity can be determined to a certainty. It is the close application of the mind to the business at hand, and the education of these three senses, sight, smell, and feeling, as directed to cheese-making, that enables the maufacturer of "fancy cheese" to excel.

A great many cheese-makers do not readily form habits of close observation. They depend wholly upon formulas, doing the work by rule rather than by exercising judgment, and drawing inferences from observation as a guide in their operations. Such a course will not be likely to reach the highest results. Cheese-makers should be constantly studying their art, and be ready to take advantage of every circumstance that can be made to subserve a good purpose.

ENGLISH CHEESE PRODUCT.

I wish to add a word here, in conclusion, about the English production. A great many stories get afloat from year to year about the large English product, and it always has its influence in reducing prices on this side. The facts are simply these: the cheese product of England may be put down as a constant quantity. That is, the highest product to-day is no more than it was 10 or 15 years ago.

English farming has been reduced to a system. It is settled in grooves. Farmers are not dodging from one thing to another, as here in America, where farming is all adrift, and every man sets up his own standard. There is, therefore, no increase in cheese dairying in England, and one year with another the product is about the same.

Drouths and cattle disease may cut off the product for a time, but it does not increase above a certain standard. Ordinarily, grass and milk are very uniform, much more so than grain crops, and hence there is no such thing as these extraordinary cheese crops in England that we sometimes read about, and are often made to believe.

My friends, I need not say to you that I stand here to-day, as I have ever stood, on the side and in the interest of the producer. Farmers, as a class, rarely receive more than the value of their products. Many of us have no system of farm accounts, and never know the exact cost of the materials which we send to market. So long as the farmer allows others to dictate the prices and say what the profits shall be on his products, he need never expect a very liberal remuneration for his capital and labor. We need to organize everywhere for the protection of our interests. Dairymen need some standard showing the actual cost of producing milk, as a basis from which to fix its prices. The consumer cannot reasonably expect you to furnish an article less than cost. He is generally quite ignorant of the actual value of all farm products, and *always thinks* they are sold at a profit to the producer.

We have no machinery for cheapening the production of milk, butter, and cheese, like that in other departments of industry. There are machines for making certain manufactured articles that will do the work as fast as a thousand men. The dairyman must still rely mainly upon human muscle, and living muscle is always an expensive force.

I shall always rejoice at the prosperity of farmers in this Dominion; and God grant that honest labor here and everywhere be properly rewarded.

And now, farmers of Canada, you who have cows upon your farms, whether it be 5 or 100, let me impress upon you—let me earnestly impress upon you—that fine cheese and fine butter comes wholly from clean, healthy milk. I do not care how great may be the knowledge of your manufacturers, nor what superhuman efforts they may make to suit the markets, they cannot cleanse filthy milk, and out of it put upon the shelves and in the tubs clean flavored and high-priced butter and cheese. The great demand now, both at home and abroad, is for sweet, nutty, new milk-flavored goods.

It depends upon you, farmers, whether your dairies and factories shall become noted as the best in the land, and their goods be sought after and contended for by shippers and consumers.

There must be cleanliness in milking; there must be no dogging or racing of the herds in the stables—over-heating the milk, inducing ferments and decomposition; no kicking and banging of cows; no commingling of diseased milk with the good. If you have cows that are sick, or have diseased udders, throw their milk to the pigs: do not poison your own and your neighbor's product by turning it into butter and cheese.

I do not come here to accuse any particular farmers, or intimate that they practise any of these things, because I know nothing of your history; but I know such things have been common in New York and in other States where I have been, and I have raised my voice against it that we may be able to bring the character of American dairy products where they shall have no rival in the markets of the world.

It would be base in me to stand here and tell you that fine goods could be manufactured from bad, unclean milk; and you must not blame me for pointing out to you the true road to success. It may not be known to you that fear, or any nervous agitation of the cow, influences the quality of her milk. Fear acts powerfully upon the nervous system; destroying muscular fibre, deranging the secretions, and poisoning the blood. I have known colic and bowel complaint induced by taking milk from a badly frightened cow.

Prof. Horsford has given an account of the changes produced in muscular fibre by nervous agitation in animals slaughtered for beef. He has shown that in the frightened animal there was not only a disintegration of the fibre, but also a chemical decomposition of the substances of which the fibre is composed, causing it to lose its nutritiousness and accordingly impairing its value as an article of food. He cites many instances, showing how the strength and healthfulness of muscle are diminished by pain, fear, and fright, experienced by the animal immediately previous to death.

"At the burial of the dead at Fair Oaks, it was observed that the bodies of the soldiers who were exposed to the most dangerous part of the field, and consequently were the subjects of extreme mental disqui-

etude, were lacking in strength of muscle to such an extent that their arms drew out of their sockets whenever it was attempted to remove the corpses by taking hold of the hand.

"It appears that intense nervous agitation suffered by animals results in the softening of the muscular tissues, and in producing something like such a change in their composition, as well as in the composition of the juices that are in conjunction with them, as is effected by fermentation. The chemical substances may all remain, but they have arranged themselves in new forms of combination which are less fitted for the purpose of ministering to the wants of man."

I suspect that many of the troubles in manufacturing milk, which cannot be accounted for, is the direct result of harsh and brutal treatment of cows by cruel men employed in their care.

I wish you would think of these things, and be convinced that there is nothing pays better than kindness to milk-stock. No man has a right to abuse his stock and keep it in a constant tremor of fear and nervous excitement, and then poison consumers by the milk and beef of such animals.

Remember that the best milk comes from upland and well-drained pastures; and in the division of your lands, let the low or wetter portions, so far as possible, be devoted to meadows. Do not fall into the error of laying down pastures with one kind of grass.

Stock require variety in herbage. Seed with a variety of seeds: timothy, the clovers, blue grass, red top, foul, meadow grass, *(poa serotinea,)* meadow fescue, *(festuca prætensis,)* wire grass, *(poa compressa,)* sweet-scented vernal, and orchard grass, and with those native to your soil and climate. These will make the best pastures for your milk and beef.

Remember that many varieties of grasses growing together will produce more food and make a more enduring turf. Provide corn fodder at the rate of an acre for every 8 cows, so that when pastures begin to fail in July and August, you will also have an abundant store of succulent food at your command to keep up the flow of good milk. In this way you will turn your cattle to account, and get from your lands remunerative results.

CANADIAN DAIRYMEN'S ASSOCIATION.

TRANSACTIONS of the third Annual Meeting of the CANADIAN DAIRYMEN'S ASSOCIATION, held in the Town Hall, Ingersoll, on Wednesday and Thursday, February 2nd and 3rd, 1870.

Shortly after eleven o'clock, on Wednesday morning, the Convention was called to order by C. E. CHADWICK, Esq.

COMMITTEE ON ORDER OF BUSINESS.

On motion of GEORGE HAMILTON, Perth, the Chair was empowered to appoint a Committee of five to present a programme on the Order of Business for the Convention. The Chair named Messrs. E. V. BODWELL, M.P., THOMAS BALANTINE, GEORGE HAMILTON, GEORGE GALLOWAY, and W. S. YATES.

COMMITTEE ON NOMINATIONS.

On motion of R. A. JANES, the following Committee of five on Nomination of Officers for the ensuing year was appointed by the Chair:—Messrs. D. PHELAN, H. LOSSEE, R. A. JANES, J. W. SCOTT, and E. HAZARD.

COMMITTEE ON MEMBERSHIP.

On motion by B. HOPKINS, the Chair appointed Messrs. E. CASWELL, JOSEPH BRODY, THOMAS BROWN, R. MCDONALD, D. WHITE, D. ELLIOTT and G. J. SHROPWELL a Committee to receive Memberships during the Sessions of the Convention.

COMMITTEE ON FINANCE.

On motion of THOMAS BALANTINE, the following gentlemen were appointed by the Chair a Committee on Finance:—Messrs. T. H. WILMOT, GEORGE APPLEFORD, and B. HOPKINS.

On motion, an adjournment was taken till half-past one o'clock, p.m.

AFTERNOON SESSION.

The Convention re-assembled at half-past one, the President, Mr. CHADWICK, in the Chair.

Report of the Committee on Order of Business was received, and, on motion, was adopted.

PRESIDENT'S ADDRESS.

According to the programme the President, C. E. Chadwick, Esq., read the following address, which was listened to throughout with marked attention:

Members of the Canadian Dairymen's Association:

Ladies and Gentlemen:

This meeting marks the close of the past and the commencement of a new year with our Association. The year that is past closes also another decade in our history as a people, during which period great progress has been made in developing and perfecting Canadian husbandry, and it must be truly gratifying to every one who takes an interest in the material welfare of our country to witness those decided marks of substantial prosperity which meet the eye upon every turn amongst our rural population. Much of the improvement, and many of the advantages now enjoyed in this department of industry may be traced to suggestions made, and to ideas generated, by these periodical gatherings. Thoughts are here quickened into active enquiry and diverted into inventive channels by these comminglings of mind with mind, offering an opportunity for the husbandmen to meet together periodically, to cultivate each others acquaintance, to examine into each others productions, to learn each others wants, and to interchange with each other views as to the defects or improvements applicable to the business under consideration. Vast benefits are derived in the manner above suggested, and these are by no means the only ones resulting from it. Every branch of production upon the farm is stimulated by it. The farmer, at these gatherings, sees and hears something that is new to him, that he had not seen or heard before He revolves the matter over in his mind as he returns to his own quiet home, and comes to the conclusion that he will try the experiment. The trial is made; it proves a success, and he wonders that he had never thought of it before.

This Association, though but in its infancy, has already proved of very great advantage to the dairy interest, yet it is still far from being perfect, and far short of what it should, or what it is practicable to make it. Every dairyman and every patron of a factory has a deep interest in perfecting its usefulness, and in extending its influence and efficiency.

The labors of the dairyman, for the past year, have been abundantly rewarded; a ready and satisfactory market for his product has been found, and a more than full average, both in yield and price, has been obtained, and the year closes with light stocks in both the productive and consumptive markets of the world. The quality has also been much improved, and the question may very naturally be asked, How much of this improvement in quality is due to the influence of, and knowledge disseminated through, this Association? I leave the factory man to answer the question, satisfied in my own mind, what his convictions are, believing that his desire would be that every patron connected with his factory should come more directly within its influence.

The county of Oxford has the honor of being the pioneer county, in the dairy of Canada. It was here that the business first became developed as a speciality, and it was here that the factory system was first introduced from our American neighbors, and the advantage of the application of associated labor bids fair to revolutinize the old dairy system. Much has been accomplished in a very short time, and the energy and skill that is being brought to bear upon its proper development may almost be taken as a certain guarantee of success.

We meet on this occasion to talk over dairy matters, to give the experience of the past, to deliberate and advise for the future, and there is probably no subject relating to farming that needs more thorough investigation, or more close attention than the dairy. Much has been said, and much has been written on the subject, yet much remains to be done before our dairy products shall take rank as first-class articles in the markets of the world. The production of good cheese and butter is no more costly or laborious than that of poorer articles. All that is needed to produce an abundant supply of the best products, is knowledge, tact, and well-directed industry. Dairy productions are now becoming of great pecuniary value in our country. Our stake in these articles is now so great, the amount of capital and labor invested in cows, pasture, and meadow is so large that we cannot afford to be ignorant or careless with respect to anything by which the annual product can be augmented or the quality improved. It is not becoming in me, with my superficial knowledge of the details of dairy management, to criticise as with an air of authority; but as it is admitted that "eternal vigilance is the price of liberty," so would I impress upon dairymen that the same eternal vigilance is just as necessary to insure the successful and profitable management of a dairy. I have said I am not a practical dairyman: yet at the same time my business connection with those who handle and control large amounts of dairy produce give me a very good opportunity of knowing the value and estimation in which many of the cheese factories of our country are rated at in the market to which we must look for the consumption of our surplus production, and while many of our factories will compare very favorably with the best American ones, far too many are below, in quality, what they ought to be. This inferiority, if not remedied, must eventually tell against them, as more

discrimination must be exercised by the buyer than has heretofore been done, and the best article will command the highest price. Our factories have improved in this respect very much during the past season, which is a convincing proof that all our dairymen require is to be put upon the right track to produce the desired results. The foreign demand for cheese is likely to be permanent, and if the texture and flavor of the article can be made to suit the taste of the consumer, there is no doubt but that the business will be both remunerative and enduring.

Since our last annual meeting we have been able to get out a full report of the proceedings of the Association since its first inception, and, I think, without taking any credit to myself, your Executive Committees are entitled to the thanks of the Association for having produced so creditable a report. Much credit is due to your worthy Secretary for the untiring pains he has taken to make the report a success, and I am sure he is entitled to some more substantial recognition at your hands. I may here remark that I attended the last meeting of the American Dairymen's Association, held at Utica last month, as the representative of this Association, and I must express my very great gratification for the kindly feeling manifested, and the good wishes expressed, for the success of our efforts in the dairy business. The meeting was a most enthusiastic one, and the attendance very large. Great credit is due to their Executive for their interesting and instructive programme, and for the judgment exercised by them in selecting gentlemen of such marked ability to deliver the different lectures for the occasion—lectures replete with scientific lore appertaining to the dairy—beautiful in their simplicity by giving cause and effect, on scientific principles, for many of those results of dairy operations, which, to the uninitiated, appear shrouded in mystery. The great interest manifested by our neighbors on these occasions is a convincing proof of the value of organization, and should stimulate us to greater exertions to further our own interests by similar means.

The statistics of the cheese production for Canada is not to be accurately obtained, owing to the imperfect and irregular returns from the different factories. I have endeavored to obtain as correct a statement as I possibly could of the amount shipped at the Ingersoll and Woodstock stations of the Great Western Railway, which amount I find to be, from Ingersoll, 2,337,687 lbs.; from Woodstock, 256,867 lbs. This is about 40,000 boxes, at a cost of $350,000, and of this sum $315,000 have been paid by two Ingersoll buyers alone. These few figures give some idea of the extent to which the business has been developed in a very few years, and it is, I think, destined to be very largely and very rapidly increased.

I hear a variety of opinions advanced as to the durability of this factory system, many asserting that it is not destined to continue, that there will be a return to the old system of cheese-making by private dairies. This is contrary to all the teachings of history, as the factory system is a progressive step, and progress being one of the laws of

nature, this step once taken it is difficult to retrace. One thing is certain—it requires more knowledge, more skill and science, and greater business ability, to manage a factory successfully over a private dairy; but the results of the consolidated system, when judiciously and intelligently managed, is rapidly forcing itself into favor even among the most prejudiced. But if we are to excel as dairymen, if we wish our products to compete with the dairymen of the old world in quality and price, then must we avail ourselves of all the valuable discoveries and appliances the intelligence of the age is developing; if we aspire to become distinguished in this department of agriculture, we must abandon the too fallacious idea that the farmer needs no education or knowledge of science.

It is said there are products quite as important to the farmer in this age as wheat, corn, cheese, choice animals, or delicious fruitage; these are elevating ideas and ennobling sentiments; products which can be grown through every month in the year, uninjured by cold, or heat, or rains, or drouth. Our ordinary business should be but secondary to the growth of the higher faculties. The man should be more important than his occupation, and not merged in it. This is an age that demands the highest improvement in every department. Society is moving upward and onward, and the farmer must move with it. Success in agriculture is not completed by adding barn to barn, and field to field, however desirable this may be; yet I consider that he is an unsuccessful farmer who has not improved *himself* from year to year, constantly ministering to the success of his household, cultivating the heart as well as the soil. Imbued with the idea that if we wish to see our country accomplish its highest destines we must have loftier objects of ambition than the mere attainment of wealth, at the same time appreciating the dignity of labor, also realizing that labor becomes ennobled under the guidance of enlightened judgment, bringing in its turn a thousand blessings, proving a quotation of the poet:

> "Life without work is unenjoyed—
> The happiest are the best employed;
> Work moves and moulds the weightiest birth,
> And grasps the destinies of earth."

But I must conclude, as I fear I am already trespassing upon your patience. I would announce that your executive have again engaged Mr. Willard to deliver the annual address, who, I have no doubt, will on the present occasion add to his many well-earned laurels in giving to the Society an address replete with useful information appertaining to the dairy interest. His practical and scientific knowledge, together with his great ability, will, I trust, make him very acceptable to the Association. We also hope to have others present who will add to the interest of the meeting, by delivering practical articles, tending to disseminate knowledge, useful and available, to the dairymen. Your treasurer will be able to show a better record, financially, than heretofore, and I trust that an increasing effort will be made each year to

put the Society upon a better footing in this respect, in order that its usefulness and efficiency may be enlarged. In making this appeal to your dairymen, I feel that I am but touching a chord that affects your individual interest, as much of the success of dairying now depends upon an intelligent administration of affairs connected with it. I thank you very kindly for your courtesy and attention extended to me during my official position as President. I trust that a bright future will characterize the records of the Association; that its influence and usefulness may be extended till every dairymen of our country is enrolled among its members; and that its efforts will not be relaxed till our dairy products command the highest prices among the markets of the world.

TO WHAT EXTENT HAS THE SYSTEM OF MAKING CHEESE ONCE A DAY BEEN PRACTICED THE PAST YEAR? HAVE CURD MILLS BEEN MORE GENERALLY USED, AND WHAT HAVE BEEN THE RESULTS.

Mr. YATES, of Belleville, said he was connected with a factory where the system had been adopted, and had been found to work well, saving labor, and producing cheese of a better quality and firmer texture. They used the milk of from 700 to 800 cows, divided over seven beats, the furthest point being about seven miles distant. In the evening the milk was put in the vats, to some of which ice in pails was applied, and in others Alguire's Milk Agitator was employed. The Saturday evening's milk was in this way kept over till Monday, and had not been found deteriorated, except for a short time during the very hot weather. There was a slight difference in the cheese of Monday's make, but not enough to require any selection or culling in the sales. Preferred the Agitator to the ice, as it kept the cream from rising, which, if separated, could not again be properly incorporated. Cheese was considered better if made from a portion of old milk, provided it was sweet. Used 300 gallon vats, setting about 2,000 pounds of milk in each. The average yield of cheese had been 9.40 pounds to the 100 pounds of milk.

WILLIAM HARRIS had practiced the sytem of making cheese once a day with good success. Used Alguire's Agitator, but no ice.

Mr. YATES—We obtain better cheese by making once a day, and find a closer and firmer texture can be secured by this system. We use water from a flowing spring, and could reduce the milk to 60 degrees. Have found no difficulty in keeping milk over night after having been brought, while warm, a distance of seven miles to the factory. Making once a day requires more vats. We put a portion of the night's milk in each of the vats, and in

the morning add the morning's milk. Had found the system to work very satisfactorily.

Mr. LOSEE, of Norwich, was next called on to give his views on the question. He said he could not make a speech, but if there were any present who had any questions to ask him he would answer them to the best of his ability. As was the case with the former speakers, several questions relating to the subject were propounded to him, and from the answers given by Mr. L. we deduce the following:—He could not say to what extent the system had been practiced in cheese-making, but in his own factory they had adopted it for the past two years; he thought the yield was much larger, the quality better, and it required less color; when milk is of a proper age it will work off the whey better. Any factory, where there was a running supply of water, either naturally, or elevated by means of steam, horse, or other power, the system could very easily be adopted; he had used ice during the past year only once or twice, and then very little; he mixed the morning's and night's milk together; the main thing is to have the milk come in early and in good order; if any came to him otherwise he sent it home again; never had a can of sour milk in the factory; the milk is brought in to his factory twice a day, and made once. The cream is not allowed to rise on the night's milk by use of the Agitator. As soon as the milk comes in the Agitator is set to work, and works of itself all night. In the morning we always found it all right and in good condition. He thought that when the cream once rises it could never be thoroughly worked back again. The morning's milk is brought to the factory right from milking, and as soon as there was enough to set a vat, he did so. The average price he had obtained the past season was 12½c. per lb., and a little over. He could not say as to what was the difference of cost in manufacturing once or twice a day; but the first year he was in the business he had made twice a day, and he came to the conclusion that if it could not be done once a day he would give up the business. He employed three hands in his factory, and received daily about 8,000 lbs. of milk.

Mr. BALLANTINE, of Stratford, had made cheese once a day and twice a day, and from experience in the two systems he was not such a convert to the once a day plan as Mr. Losee seemed to be. It was imsossible to evaporate the animal heat from the milk so soon after milking as Mr. L. says he uses it. If the night's milk was improved by standing, surely the morning's milk would improve by standing also. By making twice a day we had a closer cheese. He knew this was a delicate matter to touch upon, as Mr. L.'s goods, we all knew, were of first quality. It is not one

thing alone that must be attended to to make good cheese, but everything connected wiih it, as it was such a very perishable and delicate article. His experience had taught him that a better cheese could be made by making twice a day than by making once. In their factory they reduced the milk to various degrees of temperature, as the season required, sometimes to 60° and sometimes to 70°. For making good cheese it is not so particular to cool the milk as it is to ventilate it. They never made the morning's milk up before eleven o'clock. The prices obtained for their cheese was 12½c., 10c., 11c., and 11½c.

CURD MILLS.

Mr. FARRINGTON, Norwich, said he would like to have the experience of some one who had used the Curd Mill during the past year.

Mr. GRIFFIN said he had found benefit from their use in producing a better texture of cheese. There was, however, considerable difference in these machines, some of which scarcely altered the condition of the curd, and others tore it asunder too much, and thereby deprived it partially of its richness. The curd should rather be ground fine than torn asunder. In very hot weather he had used a temporary press, in which the curd had been subjected to slight pressure before adding the salt,—the curd mill being used twice, before and after the addition.

Mr. FACEY, of Harrietsville, had used a Curd Mill, but not generally. In some curds it is a benefit, especially when they are tough; had been troubled with the oil leaking out of the cheese after being put on the shelves. Last summer he had visited some of the best factories in New York State, among them Mr. McAdams' factory, in Montgomery County. His mill cuts the curds into pieces about the size of walnuts. Not one of the factories which he visited made their cheese twice a day; the fancy factories all made once a day; they use little ice. The morning's milk is put in with the evening's; they contend that the night's milk is so far reduced that when the morning's is put into it, it brings it about 70°.

MR. FARRINGTON thought the discussion a very important one, particularly in reference to the first question, which had brought out some points of special interest. He did not think that the subject of the animal odour had been definitely settled,—some eminent physiologists contending that its presence was not an essential condition, while others maintained that it was present in all milk, without being derived from any extraneous causes. He thought the night's milk have more of this odour than the

morning's milk, and, for this reason, required time and exposure to get rid of it; while the morning's milk, being comparatively free, might be made up at once, and that hence the mixture of the two was not injurious to the flavour of the cheese. During the day the cow was heated, perhaps excited and over driven, and the milk was of too high a temperature, feverish and odorous: but, during the night, the cow being cool and quiet, the morning's milk was destitute of the animal taints. He thought it best, however, that in all cases there should be some interval between the time of receiving the milk and commencing operations in the vat. The plan of making once a day was universal in the States, and quite successful.

On motion of R. A. JANES, the subject was laid on the table.

The PRESIDENT, on account of indisposition, was compelled to leave the chair, and called on the Vice-President, GEORGE HAMILTON, Esq., to preside.

THE PROPER TREATMENT OF ACIDITY IN CHEESE MAKING.

H. FARRINGTON—It is well known that perfectly new milk is productive of an inferior cheese. Sugar being one of the properties of milk, it is important that the process of making should not be hurried, for, if commenced too soon, the fermentation is too violent, and injures the flavor. Experience teaches that in milk reduced to 70° the sugar becomes acid, and is of a milder form and action than when the acid is developed at a higher degree of heat. No infallible rule can be adopted as to the proper treatment of acid, but must be judged by the smell.

H. LOSEE—It is a difficult thing to explain the amount of acidity required on curds. Mr. Weble, of New York, when at my place last summer, explained the system of trying the curd with a hot iron. Take a piece of curd, when you think it ready to take out of the vat, and apply it to a hot iron, and if it comes from the iron in numerous small fibres, it is then fit to take out. I have frequently tried the experiment and found it a correct test. The iron should not be heated red, but about as hot as you would heat a smoothing iron. I let the acid in the whey develope quite decidedly, but do not want acid in the curd before dipping.

On motion, the subject was laid on the table.

RENNET: ITS VARIED NATURE AND EFFECTS.

H. FARRINGTON read an article on the subject from the *Utica Herald*, by S. B. ARNOLD, Ithica, New York:—

I rise to a difficult undertaking. It is difficult enough for us farmers to arrange our thoughts and present them to the public when our theme is clearly comprehended; but when we are called to discourse to an audience like this upon a subject that has long baffled the efforts both of practical and scientific men, and is still deeply involved in mystery, as is the nature of rennet, it is, to say the least, asking a great deal of a farmer.

Though cheese dairying has been long practiced, it is notorious that in many of its operations we are still working blindly, not knowing what laws we are obeying or disobeying, and in no respect are we more in the dark than in the use of rennet. Who has not wondered for the thousandth time what there was so peculiar about the action of rennet, and whether it were not possible to curdle milk by some other agency, and thus avoid this objectionable accompaniment of cheese-making?

That so many queries remain unsolved is not to me a strange fact. It is to be expected of us practical men that we should be able to fathom such subtleties. This task belongs to men of science, and to them we must look for the solution of the theoretical problems that loom up in the field of our labors.

That the principles involved in the manufacture of cheese will be ferreted out, and cheese-making become a science instead of an empyric art, I confidently believe; and I believe the reason this has not already been done is because the attention of scientific men has not been sufficiently directed to our necessities. But science is coming gradually to our aid. The presence here to-day of so goodly a number of men eminent for ability and scientific attainments is an evidence of the fact and augurs well for the future. I believe there is a good time coming for dairymen, and that we shall have a taste of it before the close of this Convention.

But we must not rely too much upon outside aid, we must help ourselves to the best of our ability. We have, since the organization of this Association, done much toward educating ourselves by a mutual interchange of thoughts and experience, at these, our annual gatherings; and our hopes of future advancement, in my opinion, depend largely upon a continuance of that exchange. It is from this consideration only, Mr. President, that I could now be induced, at the risk of exposing ignorance, or of repeating what is already known, to approach the discussion of this formidable subject, and to present a brief statement of experiments made and facts observed in reference to the nature, use, and treatment of rennet.

I began the investigation of this subject when I began cheese-making on my own account, some twenty-five years ago. It was then supposed that rennet acted upon milk first, by the acid it contained; and, second, by generating an acid in the milk, through its mysterious ability to convert milk sugar into lactic acid, and by this means neutralizing the soda that was supposed to hold the cheesy matter in solution, and leaving the casein free to assume its naturally solid condition, and hence formed curd.

There was some plausibility in this theory, from the fact that casein, being feebly acid, combines readily with soda, but upon the presentation of a stronger acid the soda lets go the feebler, to unite with the stronger acid, and leaves the casein free to form curd. I followed out this theory by curdling milk with a variety of acid, but never succeeded in producing a perfect coagulation, nor in obtaining a cheesy flavor to the pressed curd.

In the next place, the usual preparation of rennet being strongly acid, I put potash enough in my rennet jar to make its contents so alkaline that they would make the milk they were to be mixed with assume the same condition. The rennet so treated curdled the milk perfectly, and showed an efficiency but little inferior to its former strength. The alkaline rennet was used several times with like effect.

This experiment completely upset the old theory, as it showed that the coagulating agent was not necessarily connected with any acid or alkaline condition, either of the milk or rennet. The matter was thus left in the dark, and remained so for some time. At length the thought occurred to me that since the active principle in rennet was not changed either by the presence of an acid or an alkali, but was independent of both, it must depend upon some organic structure in the gastric juice; for if it was a simple liquid, it could not be otherwise than that either an acid or alkali would change it and prevent a check, if not destroy its action. An experiment was made to test this suggestion. A large piece of pine charcoal was taken and made concave on one side, so as to hold a small amount of liquid, and used as a filter. If there was organic matter in the rennet, it would, in passing through, be caught and retained in the cavities of the coal while the liquid would pass through. The rennet so filtered, lost all its strength and all its peculiar odor—nothing apparently, but pure brine came through. The presence of some organic matter was now more probable. After a time, a microscope was procured to looked for the supposed structure. Upon examination, the liquid rennet was found to contain myriads of minute globular bodies, having a uniform appearance. Experiments, which I need not here repeat, were then made to ascertain whether these globular bodies were necessarily connected with the strength of the rennet, and the result showed that its efficiency depended upon their presence and relative numbers. This was considered an important point gained, and the investigation of the infinitesimal bodies was pursued with a deeper interest. They were found to be composed of an almost infinitely small speck of light-colored liquid, inclosed with a very delicate sack, and to have a darker colored nucleus in the centre. They were found to be what are called animal cells. By examining the stomachs of other animals, their existence and office was found to be not peculiar to the bovine race. Similar ones were found in the rennet of the lamb and pig, with slight variations peculiar to each. In the lamb they were small and feeble; in the omniverous pig they were large and powerful, and more often seen in clusters of singular shape, while in the calf they are generally single.

Nor are they confined to the stomach, though that organ appears to be the great centre of their production. I have found them in different sections of the alimentary canal, and quite plentifully in the bladder, and there is circumstantial evidence to indicate that they are generated in the lacteal glands, and exist sparingly in milk itself, though I have not yet succeeded in finding them there.

There are a good many curious facts connected with these cells, and some of them are of practical value. I will mention a few of them. They may be frozen and thawed, or wet and dried an indefinite number of times, if the changes are not made too suddenly, but they will burst and lose their power if much heated. They do not, however, all burst at the same temperature. They begin to break at a temperature a little above blood heat; and as it rises, more and more of them are destroyed. At 130 degrees more than half of them disappear, and at 160 degrees none of them are to be seen. I do not know precisely at what degree they are all destroyed, but think it is about 140 degrees. Their specific gravity is about the same as that of milk. They sink in water and float on brine. Neither acids nor alkalies destroy them if weak, but both destroy them if strong. An examination of sections of the stomach showed it to be nearly as porous as honey-comb, and full of minute tubes that lay imbedded between the fibres that crossed each other in every direction, the mouths of the tubes opening into the cavity of the stomach.

Cells were then seen in these tubes, and in them they are supposed to originate, and by aid of the liquid secreted in the tubes and peristalic motions of the stomach, to be worked out into the cavity of that organ to come in contact with its contents. But when the stomach is empty, they do not mingle much with the gastric juice, but adhere to the inside of the stomach and form a delicate coating of a light flesh colour. The cells of which this coating is composed adhere to each other slightly, and easily wash off or rub off in handling in the form of little flakes. This is the best part of the rennet, and should be carefully preserved. The cells in this coating appear to be larger than those that soak out of the skins, especially those that soak out last. There is a difference in their action. The first soakings of a stomach produce a better coagulation than those that soak out last. In the former the curd is firm, and the cream globules seem to adhere to it tenaciously, while the latter produced a softer curd, and is more like an acid effect, and the cream appears as if only mechanically enclosed. This difference occurs when the coagulation in the two cases takes place in the same time. It is greater in some rennets than in others. This peculiarity has been often observed, but I can see no reason why it should be so.

In size they are extremely minute, but their number is truly legion. Some idea of both may be gathered from the inspection of a drop of rennet. I put a stomach in a gallon of water, and after it had soaked a sufficient length of time, the water was well stirred and a drop of it taken and diluted and divided till 150th part of its contents

could be brought under the field of vision of a microscope and the cells counted, when it was found to contain upwards of 1,000, making the drop contain over 500,000. This number was then multiplied by the number of drops it took to fill a small measure (85), and this by the number of measures to make an ounce (24), and this again by the ounces in a gallon (128), giving 130,560,000,000 as the number contained in the rennet. This number, large as it is, is believed to be a great way below the number that rennets will average; and this vast number is poured out for the digestion of a single meal, and passes away to make room for an equal number for the next. From these facts some conception may be formed of the rapid changes that are constantly going on in the digestive apparatus. These infinitesimal bodies, though exercising an insignificant influence when acting alone, when taken together, like polypus in the coral, work out important results. They not only effect coagulation in the milk, but are the cause of changing that curd into cheese, so that without their aid our occupation, like Othello's, would be gone.

The structural nature of the active agent in rennet renders it susceptible of separation from the disagreeable odors that usually accompany it. To accomplish this has long been a desideratum among dairymen. It may be done by filtering rennet through charcoal. If the coal is finely pulverized and thoroughly saturated with water, so as to prevent the cells from lodging in its cavities, they will nearly all pass through with the fluid that contained them, while the odors will all be taken up by the absorbent power of the coal. A filter for this purpose may be made by perforating the bottom of a butter tub, or anything similar, and laying several thicknesses of muslin on the bottom to catch the coal dust; then lay on two or three inches of pulverized coal, and on it one thickness of muslin; then lay on clean sand enough to hold the coal in its place. The sand will assist also in distributing the rennet over the whole surface of the coal. Then pass water through the filter till it will run through clear. The liquid rennet may then be passed slowly through by falling upon the sand in a stream proportioned to the size of the filter, when it will come through sweet and pure, with its efficiency but little abated. Rennet thus deodorized loses all tendency to huffing, and also its ability to give any bad flavor or smell to the cheese. I have restored rennet in this way after it had become distinctly tainted, so that it was perfectly deodorized, and would keep for weeks. But, if very much tainted, the restoration will not be perfect.

In most rennets the amount of foul odor is so great that the coal will soon become saturated and need changing. The use of coal for this purpose is patented, but the members of this Association are at liberty to use it free of charge, until notice to the contrary is given.

I have used another method of deodorizing rennet that is more convenient, but not quite as perfect as the one just described. It consists simply in putting a small quantity of carbolic acid in the water, or whatever liquid the rennets are soaked in. Carbolic acid is a very

powerful disinfectant, and a small quantity will neutralize the odors in a batch of rennet. Ten drops to a gallon of water are sufficient. It does not act instantly. It unites with the water slowly, and is slow in deodorizing the rennet. It should be put in at the time of putting them to soak, and by occasional stirring it will have accomplished its work by the time the rennet is ready for use. If too much acid is used, the rennet skins will be dissolved, and animal matter be carried into the cheese, producing effects worse than if the acid had not been used. I have with this, as with coal, restored rennet that was distinctly tainted; but it also fails if the decomposition has been carried too far. The difficulty of obtaining the acid pure is an objection to its use. Carbolic acid is also a powerful antiseptic, and may be used in the place of salt in preserving rennet skins. Under the most favorable circumstances, the use of salt in preserving green rennets occasions considerable loss. If salted and hung up to dry, the best part is lost by dripping, and if packed in brine, the animal odor is so much of it retained in the brine as to make its use objectionable. In the use of carbolic acid these effects are avoided. I use it in this way: Ten drops of acid are dropped into a bowl of water, large enough to cover the green rennet when laid in it, say one pint. The stomach, when taken from the calf, is turned inside out and carefully cleaned and laid into the acidulated water and left there five minutes, and turned once in the time so as it shall be sure to be all wet. It is then stretched on a bow or crotched stick and hung up to dry, the same as if it had been salted. It will dry rapidly and without dripping. The acidulated water is turned into a bottle and kept for the next rennet, adding a few drops occasionally to keep its strength good. Five cents worth of acid would cure a hundred rennets, and may be procured at almost any drug store. The scent of the acid will escape in a little time, and with it will disappear the peculiar odor of the rennet. In soaking, they are treated as if cured with salt. The rennets I used the past season, were real rennets, and cured by being filled with salt and hung up to dry. They curdled the milk for 340 pounds of cheese each on an average. A single rennet cured with acid and used alone, curdled the milk for 640 pounds. This is less than what I have had salted rennets do, but it was evidently more than the one used would have done if treated in the ordinary way. I had but few rennets to preserve the past season, but what few I had were all preserved in this way, and their use has proved satisfactory. But my experience in the use of this acid has not been large enough to guarantee success under all the varying circumstances which may occur. As its use especially in preserving rennets bids fair to be of some value to the dairying interest, I have been somewhat minute in speaking of it, as also of some other item, because their newness has seemed to make it necessary, and hence have omitted some new points that might have afforded some interest, to avoid prolexity. I have also purposely omitted any inquiry as to the origin of the cells which have been described as the effective agent in rennet; nor have I inquired into their nature, whether they

are animal or vegetable; nor how they act, whether by catalytic or electrical action, or by their growth or decomposition, or by some transformation in their structure, or by some other agency, to produce their peculiar effects, because I anticipate that this branch of the subject will fall into better hands.

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

By permission of the Convention, Mr. WELD, of London, here enlivened the proceedings by a desultory speech, in which he diverged from the dairy business to pork-packing, and deprecated the interference of Americans, who foisted in the market an inferior quality of swill-fed pork, which was calculated to damage the reputation of the Canadian article. He took occasion to condemn the introduction into this country of so many American publications, adverted to the claims of his emporium, and concluded with a passing observation on the short comings of the Board of Agriculture.

Mr. GRIFFIN asked whether the at close of the ordinary season it would not be more profitable to make skim milk cheese?

E. CASWELL—I do not believe a market could be had for any considerable quantity of skim milk cheese. There is no demand in England for this quality of goods. I am informed that the Americans dispose of a certain quality of skim milk cheese in the Southern States; but as the market is very limited, I would not advise our dairymen to make the article.

H. FARRINGTON—I believe that late in the season the milk kept over night might be skimmed without detriment to the cheese. Referring to Mr. Weld's remarks, it is my opinion that to make pork when cheese is 12c. and 13c. per pound, would be pretty dear pork. I do not believe that a good marketable article can be made after the 20th of November or the 1st of December, owing to an over-abundance of cream. The cheese made after this date are salvy, and are liable to become soft and out of flavor in the spring. If the milk is not too much skimmed it may be made into very good cheese; but the better way is to make up your fall butter from the later milk, and then make the milk into a regular skimmed milk cheese. With the American dairies, this quality of cheese is found to command a high price in the New York and Philadelphia markets.

WM. HARRIS would recommend skimming milk late in the fall at the factory, but would allow no one else to skim it.

P. R. DALY—A small factory in my neighborhood made arrangements to make cheese twice a week, and skim the milk in the factory, with the very best success; so good, in fact, that the

dealers took it at 12 cents per lb. I may state that Mr. Graham, when in Liverpool, found a complaint that factories were disposed to smuggle cheese into market that is out of flavor, for cheese that is on flavor. Dealers there stated that they do not object to take a few hundred of this quality of cheese, as they have a demand for it from the hotels; what they want, is to know it when it passes through their hands.

H. FARRINGTON said, in answer to a question, that a better cheese can be made late in the fall from skim milk than from whole milk, only do not commence skimming too early in the fall. When the milk is allowed to stand over night, the cream is as well taken off as left on, as it cannot all be worked in.

WHAT BENEFITS ARISE FROM CUTTING AND COOKING FOOD FOR COWS?

Mr. BAILEY, of Norwich, said that cutting and wetting food, and feeding when cold, did not do well, and so he had tried scalding it, and found that two quarts of grain each day went as far as four by the old method not scalded: it increased the flow of milk. He fed it to his cattle when warm. The manner in which he did it was as follows:—Scald the hay first in a large vat, and then put in the grain, and so scald it altogether.

Mr. FARRINGTON gave an experiment which had been tried by one of the first dairymen in Herkimer county, N. Y. He had divided his herd, and fed half of them with cooked food and the other half raw. After a short time he found the former increasing beyond his expectations; and thinking, perhaps, it might be on account of their being a better class of stock, he changed the feed, giving the other half of the herd the cooked food, and the raw food to those who had formerly received the cooked, and he shortly found that the cattle that had the cooked food were increasing, while the others were going back. This was a convincing proof in his mind of the benefits to be derived from feeding the cattle with scalded food.

Mr. BAILEY had formerly fed his cows in the morning, but he found it better to feed them at night.

WM. HARRIS—I prefer feeding in the stalls, as if fed in the field the cows hang around; but if fed in the stalls when let out they go off at once.

The question being asked—AT WHAT COST A WINDMILL COULD BE ERECTED FOR PUMPING WATER?

Mr. BALLARD stated that he had made a windmill at a cost of not more than $5 that answered his purpose. His well is only

14ft. deep. The supply of water is not abundant, and the stock consumed all the well yielded. In a well with a plentiful supply of water they are very desirable, and can be used to advantage in supplying water for factories.

H. FARRINGTON—This is a very important question, as some power by which water could be supplied to factories has long been felt as a want with factorymen.

H. GALLIVER—I erected a windmill for Mr. Bailey 30ft. above his buildings, and had never seen one before. This mill has answered every purpose of the factory. It is erected on a derrick, with a plank on the top, and the mill is securely fastened to it. When put up the mill pumped water when there was not wind enough to ruffle one's hair. This mill cost about $50, and believes one could be built to answer all the purposes of a factory for $40. The mill built for Mr. Bailey has been in use three years and never got out of order. The well is about 16ft. deep, but the mill will pump from a well of any depth.

In answer to a question, Mr. CASWELL said he hoped in future the practice of skimming milk will be banished from all the factories. Our reputation is now improving in the markets, and as we have not been in the habit of skimming our cheese, do not let us change our practice now in this respect. I believe it is the practice in making Stilton cheese to add cream to the milk in order to make them richer; and if cream can be incorporated in Stilton cheese, certainly it can be in any other cheese.

H. GALLIVER stated that there was no difficulty in working all the cream in the cheese. I have made cheese as late as the last of November, and found the cheese made then amongst the best of the season. Had experimented by skimming the cream from one vat and added it to the other, and found a decided improvement in the cheese to which the cream had been added.

Mr. CULVER, Simcoe—Had made cheese as late as 28th of January without skimming, and they were excellent.

On motion, the Convention adjourned to 7.30 p.m.

EVENING SESSION.

Convention met pursuant to adjournment at 7½ o'clock.

THOMAS HAMILTON, Esq., in the absence of the President, took the Chair.

The VICE-PRESIDENT said he was sorry the worthy President of the Association was not able to take his proper place this even-

ing, the duties of which would be much better performed by him than he (the Vice-President) could possibly do. However, the duties devolving upon him this evening were of a light nature, as he had only to introduce to them the lecturer of the evening; and, from the manner he had been received on previous occasions, he was sure there was a treat in store for them which they could appreciate. He had much pleasure in introducing to them X. A. WILLARD, Esq., M.A., of Utica, New York.

[The address of Mr. Willard will be found printed in full on page 19.]

E. V. BODWELL, Esq., M.P., at the close of the address, came forward and said that, after listening to the able address which they had just heard, some expression of appreciation should be given. No one who had heard it could go away without being profited. The producer has heard something which must, if rightly applied, prove of great benefit to him in making the goods in which we are all more or less interested; and he could not possibly listen to the eloquent remarks of the talented lecturer without being profited thereby. Consumers, also, must be impressed with the very forcible manner in which he has urged the necessity of the most scrupulous cleanliness, which was required in the making of a good article of cheese. He was sure they could appreciate this part of the address. He then referred to the remarks of the speaker in reference to the international relations existing between the United States and Canada, and hoped that feelings of reciprocity, which he had mentioned as existing there, would in time grow stronger, and that a better feeling would exist than was the case at the present time. We cannot lose sight of the fact that dairymen are interested politically, as well as socially, in the relations between the two countries. Mr. Willard has spoken of the probability of the consumption of dairy articles in the States exceeding the production. Although dairymen are now independent of reciprocity, if that should be the case we might then be desirous of having a reciprocity treaty. After referring further to the address, he proposed a vote of thanks to the lecturer for the address, and hoped the feelings which had been expressed would be engendered among all classes.

Mr. W. WELD, of London, in a few fitting remarks, seconded the resolution.

On the CHAIRMAN putting the resolution, the large audience rose *en masse* in response.

Mr. P. R. DALY then rose and said it was a generally admitted fact that no good cause could prosper without the aid of the ladies, and he begged to move a vote of thanks to them for their presence, and the interest they displayed in this Convention.

Mr. BODWELL had much pleasure in seconding the resolution.

The Convention then adjourned until 10 o'clock on Thursday morning.

THURSDAY MORNING, 3rd February.

Convention met pursuant to adjournment.

The President, C. E. CHADWICK, Esq., in the Chair.

The report of the Committee on Order of Business received, and, on motion, adopted.

The report of the Committee on Nomination of Officers received, and, on motion, adopted.

PLACE OF HOLDING NEXT ANNUAL MEETING.

Mr. GEORGE HAMILTON moved that the next Annual Convention be held in Ingersoll.

P. R. DALY moved in amendment that the next Meeting be held in Belleville. He said in making this motion he did so with some degree of delicacy. He knew that many here now would not find it convenient to have the place moved; but he thought the benefits of the Convention would become more diversified if the place was changed from one section of the Dominion to another. Last year you said you could not let the Convention go from your doors, as it was still in its infancy; but he thought the boy had now gained sufficient strength to be allowed to go abroad for one year, at least. Hastings had exported $123,000 worth of cheese the past year, and must be considered of some importance; and the business had only been gone into within the past three years. There is a large dairy interest there as well as in Oxford. All credit is due to Oxford for developing this business as they have done. The question is—Do you wish to unite with us? If, by your votes, we are to understand that it is to be confined to Oxford, you may as well amend the Constitution and fix the place permanently in Ingersoll.

Mr. WELD, in seconding the amendment, did so believing it would be strongly opposed; but this was no reason why he should not express his views; he did so for the general good of the Association.

Mr. FARRINGTON, while conceding to Ingersoll the undoubted prior claim, and he might say the right to the appointment, contended that consideration of the general interest favored the removal of the Convention for at least one year to some other point. The Association professed to be provincial, but was in fact local.

Mr. CASWELL enquired what had been the practice in New York State?

Mr. WILLARD replied that, with the exception of the first year, the meetings had always been held in Utica, though several efforts had been made to move it to other places. Utica was selected chiefly as being most central.

Mr. NOXON thought that the slight attendance at Ingersoll of members from Hastings did not give evidence of a very warm or extended appreciation of the privilege sought, and that they had no guarantee, even by a constitutional rule, which was itself subject to change, that if the meeting were once held at Belleville, it might not be voted there by an overwhelming local majority, for it must be remembered that they had to deal with ordinary human nature, in which self-interest was ever paramount.

The amendment was put and lost. The original motion was then submitted, and carried by a very large majority.

WHAT HAS BEEN THE GENERAL REPUTATION OF OUR CHEESE IN THE ENGLISH MARKET THE LAST SEASON? AND WHAT ARE THE DEFECTS NECESSARY TO BE OVERCOME TO BRING IT NEARER THE STANDARD OF THE BEST ENGLISH CHEESE?

The CHAIRMAN called on Mr. Caswell to open the discussion.

Mr. CASWELL stated that during the past season the quality had been better by far than that of last year, owing in part no doubt to the season, but not entirely so, for the improvement had been specially marked in certain factories, whilst others had deteriorated. He had shipped very extensively, had been extremely careful in inspecting and testing every lot, branding each according to its true quality; and he had invariably observed that where a defect had been noted on this side, a corresponding depreciation in the price had resulted on the other. He had taken pains in many instances to trace the cause of the defect, and had found it attributable in some cases to want of cleanliness in the milk cans, in others to some fault in curing,—to the use of bad rennets, and to a loss of cream. The most frequent complaint against certain cheeses was that that they were "short of meat." In consequence of these differences of quality, the prices he had received had varied from $1 to $7 per cwt. in the same shipment. The first desideratum for cheese in the English market was quality, the next flavor. The best means to secure the finest quality were, in his opinion, besides scrupulous cleanliness throughout, the nicest care, an even temperature, and good ventilation in the curing room: no factoryman should ever allow his cheese to be shipped before it

was perfectly cured, and most emphatically no skimming should be permitted.

Mr. FARRINGTON observed that defect in cheese was often attributed to skimming, where none of the cream had been removed, the faulty condition being due to some other cause. June cheese, for instance, was apt to be tough, and to possess the appearance of skim cheese. The proper remedy in this case was to employ a lower temperature, and to continue the process longer. Some enquiry having been made on the effects of using the curd of the stomach with the rennet, Mr. Farrington had found no benefit whatever to result from the practice; but, on the contrary, it was apt to impart a sour flavor to the cheese.

Mr. DALY called attention to the importance of a prompt delivery of the cheese at its destination, and cited instances where cheese had been detained in the vessel after its arrival at Liverpool for several days, had heated in consequence, and suffered damage. He was pleased to be able to state that notwithstanding all these difficulties, he had found, during a recent visit to England, that the reputation of Canadian cheese was greatly raised, and had seen samples of our manufacture in Liverpool that were considered equal to the finest fancy brands.

At 12 o'clock the Convention adjourned, to meet again at 1 o'clock.

AFTERNOON SESSION.

At 1 o'clock the Convention resumed, pursuant to adjournment. The President, Mr. CHADWICK, in the chair.

THE BEST VARIETY OF CORN FOR SOILING, AND WHERE PURE SEED CAN BE OBTAINED.

Mr. GALWAY had used it and found it advantageous as green food when pastures were short; and when it was cured and fed dry it was more nutritious and productive of milk than the best hay. His method of growing it was to plant on sod ground, ploughed and harrowed, in drills 16 inches apart, using two bushels, or two and a-half for seed per acre.

Mr. BAILEY also testified to the value of this fodder, but his mode of culture was somewhat different. He chose rich ground, setting the rows as much as three feet apart, using three bushels of seed to the acre, and cultivating assiduously.

Mr. A. GARNER, of Drummondville, had found the best results from sowing the corn broadcast.

Mr. JAMES would not sow far apart, preferred sod land, was careful to put in the seed early, by about the 28th of May, and, if possible, not later than the 2nd of June. Had cut the crop last year with a reaping machine, the process by hand being tedious and expensive; had harvested with the reaper about four acres a day; preferred to cut while the plant was yet green and juicy, about the 1st of September. After cutting, left it for three or four days on the ground, then gathered it and piled it in shooks or stooks in the usual way, hauling it away by a team and chain during the winter, as it was wanted. By this feed he estimated more cows could be raised on the same land, one acre of corn being equal to five acres of meadow, and not more exhausting to the soil than grass. The Western corn was the variety best adapted for the purpose. It was to be procured from the Western States, and recommended the purchase of selected seed corn.

HOOF DISEASE—HAS IT PREVAILED AMONG DAIRY HERDS TO ANY EXTENT, AND THE BEST MODE OF TREATMENT?

Mr. BLACKMOR would read an article prepared by James Harris on this subject:

To the Canadian Dairymen's Association:

Gentlemen:

I deeply regret my inability, because of ill health, to be present and participate with you in the rich intellectual repast to which you will doubtless be served during the Convention. The subjects which are to come before you are deeply interesting, and cannot fail to undergo an able and profitable discussion by the array of talent there convened. One of the most important among them, to farmers and dairymen, is, "The Hoof Disease in Cattle;" and, since I cannot be present, it has been suggested that I should sketch a few thoughts.

The hoof disease in cattle, according to my best information, appeared in this part of Canada about the year 1838 or '40, and during its prevalence at that time many farmers and dairymen suffered great losses; but since that it has not prevailed to any considerable extent until quite recently.

The disease is of a peculiar nature, and one of its peculiarities is that it is confined almost exclusively to the hinder feet. One of the first symptoms is a slight lameness. Then, in a few days, the hoof begins to crack at the heel, suppuration follows, and the hoof soon sloughs off. Sometimes only one claw, but usually the whole foot, is effected. There are some indications that it is contagious, but however that may be, it is wise to be cautious in regard to it.

The disease seems to prevail more in some localities than in others, and it is to be feared that, unless it can be arrested, its ravages will

prove disastrous to the dairy interests of Canada. Until quite recently it was generally believed that it was the effect of frost; but it is now evident that it is a disease arising from an altogether different cause. It is most common and fatal in the older settled portions of the country, but is seldom or never seen in the newer settlements. From this it appears that it is generated in some way by the cultivation of the soil and vegetation. Perhaps the cold may have something to do with its development, since it prevails mostly in the winter season.

An English physician by the name of Stratford, who resided in Woodstock some years since, attributed it to the effect of the ergot of grass or grains; but what the real cause is, is hard to say. It has hitherto been considered incurable, but having observed and experimented in regard to the matter, I am satisfied that I have obtained a knowledge of an effectual remedy if applied properly in the early stages of the disease; and I deem it sufficiently valuable to take this method of giving it to the public.

The remedy is, to take one average or middling-sized common garlick, bruise it to a pomace, and take as much red precipitate as can be taken up at twice on the point of a common-sized penknife blade, and mix them together. With a sharp knife or lancet make a perpendicular incision, about one inch and a-half long on each side of the foot affected, extending from the hoof upward, and deep enough to let the blood flow freely. Then insert the mixture, bind up the wound with a strong cotton cloth, and keep the foot dry until well. This latter is quite important. Sometimes, though not often, a second application is necessary to a cure. This remedy has never been known to fail when duly applied and the animal properly cared for. It has been used by myself and others. Among those who have of late tried it quite to their satisfaction are, Mr. Chas. Jarvis, about four miles east of Ingersoll, and my brother, Gilbert, of Dereham. Several others might be referred to.

JAMES HARRIS.

INGERSOLL, Feb. 1st, 1870.

X. A. WILLARD—The disease mentioned is not what is known as the hoof and mouth disease of England. The treatment is to take up the diseased foot, wash out the hoof, open the claws and apply between corrosive sublimate in a fine powder, about as much as can be taken up on the point of a pen-knife blade. Keep the cow in a dry place, and confined in stanchion so as not to get at the diseased foot, the corrosive sublimate being a poison. Some use red precipitate made about double the strength of that at the shops. It is applied about the affected parts. The object of the corrosive sublimate is to produce a suppuration.

P. R. DALY—I think it would be well to take steps to prevent the importation of diseased cattle from England. The hoof and mouth disease prevails there, and is dangerous and contagious.

On the Frogmore farm, I saw no very fine cows; over one-third of the herd had become useless, owing to this disease. I throw out the suggestion, that being forewarned we may be forearmed.

WM. WILKINSON—Had known the hoof and mouth disease in England. The mouth becomes covered with a sort of yellow white blisters, which also make their appearance between the claws of the foot. It was not often fatal, and generally, after a time, gave way to a treatment of a purgative nature.

FINANCIAL STATEMENT, ETC.

The Finance Committee gave in their financial statement, which showed

The Receipts for the year to be	$306 49
The Expenditure	268 86
Leaving a balance in hand of	$37 63

A vote of thanks was given to the Executive Committee for the very efficient manner in which they had discharged their duties during the past year.

The question of the best breed of cattle for the dairy was slightly discussed, Mr. JANES giving the preference to grade Durhams; and Mr. FARRINGTON, looking more at the milking quality than the breed, preferred on the whole cows of comparatively small size.

On the subject of salt, it was generally conceded that the quality of the Goderich Salt would be superior to any if it were only dryer. In consequence of the defect of moisture, preference was given by some to the best Onondaga or the Liverpool dairy salt.

The Convention adjourned soon after 4 o'clock.

REPORT

OF

FOURTH ANNUAL MEETING

OF THE

CANADIAN DAIRYMEN'S ASSOCIATION,

FOR THE YEAR 1871.

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Mr. President a

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ANNUAL ADDRESS

DELIVERED BEFORE THE CANADIAN DAIRYMEN'S ASSOCIATION, AT INGERSOLL, CANADA, WEDNESDAY, FEB. 1st, 1871,

BY

REV. W. F. CLARKE,

Of Guelph, Ontario.

Mr. President and Members of the Canadian Dairymen's Association:

A couple of centuries ago, it was a very common thing for the significant initials "O. S." and "N. S." to be attached to dates. These initials meant "Old Style" and "New Style." They have long fallen into disuse, however, from the fact that "N. S." has become universally adopted, and "O. S." has gone completely out of vogue. The same sort of thing has been going on with human affairs generally. In political matters "O. S." represented irresponsible government, the subordination of the many to the few, the theory that the people existed for the special benefit of legislators and rulers; and "N. S." the rights of the people, the interests of the multitude, liberty of thought, speech, and act, and the responsibility of legislators and rulers. In all free and enlightened communities, "N. S." has carried everything before it. In education, "O. S." represented popular ignorance and the mental elevation of the few; "N. S." free schools and knowledge for the million. Here too "N. S." has won the day. In locomotion, "O. S." stands for "the old stage-coach," the one-horse cart, the luggage-van, the barge, the canal-boat; "N. S." for the railway train with its passenger palaces and freight cars; and "N. S." is pushing its dominion even into such wilds as those of Muskoka and Nipissing in this Canada of ours. In agriculture, "O. S." is suggestive of undrained soils, of surface scratching with clumsy ploughs, of wasted manures, of scanty crops, of the slow sickle and back-breaking scythe, of grain produced by hard hand-labour and marketed with difficulty at unremunerative prices; while "N. S." is as suggestive of drainage, deep cultivation, steam-ploughs, free use of fertilizers, reaping and mowing machines, good crops, near markets, and paying prices. In dairying, "O. S." represents "Dolly, the milk-maid,"—the pitiable damsel portrayed in the poetry of our childhood,—

"——— the maiden all forlorn,
Who milked the cow with the crumpled horn;

That tossed the dog, kicked over the milk-pail, nipped a bare pasture in the summer, and browsed off tree tops in the winter." It represents the dasher-churn worked with an aching arm and watched by a countenance rueful with grief that the butter doesn't come. It represents the curd-tub, the hand-press, the rule of thumb, and the over-worked dairywoman; while "N. S." represents the cheerful milkman, the cow quietly standing in a clean, comfortable stall—removed from all provocatives of hooking and kicking,—the dog-power and rocking-chair churn, the butter-factory, the scientifically made milk-vat, the thermometer and lactometer, the curd-mill, the power press, the curing-house, and last, but far from least, the Dairymen's Association. There are too many traces of "O. S." yet remaining, both in general agriculture, and in that special branch of it for the promotion of which we are met; but, as public addresses, like almanacs, if they are to be of any service, must be calculated to the meridian where they are to be used, it becomes me to remember that my audience consists of persons already converted to "N. S." dairying, and more or less conversant with its principles, methods, appliances, and manipulations. It will not therefore be necessary to argue in favour of the new system, or spend time in pointing out the objectionable features of the old one. My duty is rather to place before you such information, rules, and practical suggestions in regard to an accepted and understood system, as may tend to bring up its actual operation to a higher point of efficiency and remunerativeness. In doing this there is not much scope for originality or novelty; for although it cannot be said in dairying as in theology, that "what is true is not new, and what is new is not true," yet many of the facts on which success must be based are old as the hills, and the most recent improvements have been so thoroughly canvassed both by scientific and practical men, and so minutely reported by the newspaper and agricultural press, that I can but hope to bring you a bundle, in connection with which only the gathering, the string, the tying, and the exhibition will be my own.

Anything like a comprehensive treatment of the subject will take us back to first principles, and indeed to first things. Like "O. S." preachers we must begin with the creation, for unquestionably the starting point in dairying is

THE COW.

It may well be doubted whether Adam, when the animals passed in procession before him to be named, had any idea of the important uses his posterity would make of the cow. If we were imbued with a similarly grateful spirit to that which prompted the exclamation, "Blessings on the man who invented sleep," we should be ready to say, "Blessings on the man who invented milking," for it undoubtedly was an invention, and if history could tell us who first milked a cow, we should know who was the father of dairy husbandry, and we might do him the honor of calling some of our associations or factories

after him. Very likely, as with many useful inventions, milking was at first a happy accident. Some good-natured antidiluvian patriarch, perhaps, was petting and patting a favorite cow; and as he handled her familiarly here and there, at length stroked the udder and grasped the teat. How wonderfully it fitted the hand of a man, as well as the mouth of a calf! And on gentle pressure, strange to say, it readily yielded the fluid that nourished the young animal! To squeeze a little into a vessel, and to taste it, were natural exercises of curiosity; to like it, to take more, to find that it was wholesome and nutritious, to divide with the calf, to appropriate it all when the calf was weaned, were results that followed in due course. In keeping it from night to morning, or from morning to night, the phenomenon of cream was developed, and somehow or other, the ancients learnt how, by rude processes, to make butter and cheese. The moral of this digression is, that we moderns are just as dependent as were the ancients on the cow. We haven't succeeded in inventing a new style of milk-making machine. Nor shall we. Chemistry has revealed to us very accurately the elements that, compounded together, form milk; but we cannot take those elements and mix them into milk. They can only be compounded in the living laboratory of the creature whose honorable function it is to supply the human family with this important product. It has been well said that "a cow is a machine for converting vegetable food into veal, butter, cheese, and beef." That definition of the chief end of a cow, is as correct and comprehensive as the Assembly's catechism reply to the question,—"What is the chief end of man?" In yet briefer terms, a cow is a machine for making milk and meat. Perhaps we ought rather to say milk or meat, for with all our breeding and improving of cattle we have not realized any large amount of success in combining the two. The Ayrshire, noted for milk, has no reputation nor size for beef. The short-horn, unrivalled for meat, is not distinguished for milk. If we could get up a breed good as the Ayrshire for milk, and equal to the short-horn for meat, we should reach the *ne plus ultra* of dairy stock. We could avail ourselves of the milk while the creature was young and at her best for this purpose, and before age had toughened the meat, convert her easily and profitably into beef. Next to the Ayrshires, there can be no doubt our best milch cows are to be obtained by recourse to our common native cattle. By wise and careful selection, very excellent milkers may be procured from this source. Here and there we find instances of good milch cows occurring in breeds not specially noted for milk-yielding, but such cases are of much more frequent occurrence among our native stock. To experiment by crossing extraordinary specimens of milkers from our pure breeds of cattle with similar individuals from our native stock, is a line of things in which much important service may, and no doubt will yet be rendered to the dairy interest; but meantime our factories must be kept up, and this can only be done by picking and choosing among the animals now available. Observation and experience have taught some rules to be observed in the choice of good milkers,

which, though perhaps not infallible, are by no means to be despised. A few doggerel verses, which appeared some years since in the *Farmer's Magazine*, state what are popularly considered in England the points of a good cow, though, as already remarked, it is a rare thing to find them all combined in one animal, and therefore this brief cow poem is, to some little extent, a fancy sketch. As now quoted, it is slightly altered from the original:

"She's long in her face, she's fine in her horn,
She'll quickly get fat without cake or corn;
She's clean in her jaws, and full in her chine,
She's heavy in flank, and wide in her loin.

She's broad in her ribs, and long in her rump,
She's straight and flat-backed without e'er a hump;
She's wide in her hips, and calm in her eyes,
She's fine in her shoulders, and thin in her thighs.

She's light in her neck, and small in her tail,
She's wide in her breast, and will fill the milk pail,
She's fine in her bone, and silky of skin,
She's a dairy without,—a meat-market within."

To state in prose the characteristics of a good milker as a guide in purchasing dairy stock:—

1. *Youth.* A cow is in her prime at from four to six years, and the best paying time to buy is just after the birth of her second or third calf.

2. *Prominence and fulness of milk veins, and velvety softness of skin.* The milk-veins run down on either side of the animal toward the udder, and are easily perceptible to the eye, or can be readily found by pressure of the hand, if the creature is not over-fat. The skin should be soft and mellow, not hard, rough and "staring."

3. *Symmetry, fullness, and softness of udder.* It should be broad, well spread out, projecting behind the legs, and also reaching forward under the belly. There should be a softness and thinness to the touch, and an absence of fleshiness and thickness.

4. *Perfect number and condition of teats.* If one teat is wanting, about a fourth less milk will be the result. A cow's udder is not, as some suppose, a barrel with four taps, but is divided into four separate compartments, called "milk glands," each one of which has its own tap or teat. It is not only important that the full number of teats be present and in working order, but it is desirable that they be well placed, not crowded together, but pretty far and uniformly apart; rather long and tapering; all pointing out and downwards; equal in size, and even in appearance.

5. *Docility and quietness of disposition.* These are indicated by large, mild and clear eyes, and an air of contentment, generally. A cow that is quiet and contented feeds at ease, chews her cud with entire

satisfaction, and will secrete and yield more milk than a restless and turbulent animal, having similar milking characteristics in other respects.

The following remarks by Professor Turner, from a paper on "Breeding and Rearing Cattle," in the "Transactions of the Highland and Agricultural Society of Scotland," vol. for 1860, p. 346, will be of interest and value on the points which indicate a good milker :—

"The most prominent of these are the vessels which co-operate in the production of milk. These consist of the vessels which bring the blood, the glands which separate the milk, and the veins which carry away the blood when thus acted upon. Of the former, I may name those veins which show themselves between the bearing (*vulva*) and the udder. These are often buried so that they cannot be seen ; and although on pressure, immediately above the udder, they frequently appear, yet we must not immediately condemn the animal as a bad milker when they cannot be observed.

"Generally, if the skin is mellow, and not much fat present, these veins show themselves readily. Their presence is very desirable ; and, combined with a full development upon the surface of the udder, they indicate a free supply of blood to the milk glands. It is also considered a good point when these veins present a knotty appearance. The milk-glands are situated in the upper portion of the udder, and are generally four in number, each gland being in connection with its own quarter of the udder. The udder should be capacious, extending well behind the legs, and also forward under the belly ; the coat should be thin, with a soft skin, and show considerable decrease in size after the cow is milked. The teats, which are the channels from the four reservoirs in the udder, should be placed well apart from each other, and not cramped together, for this generally indicates want of sympathy in the udder. The udder may appear large, and yet be found fleshy, rather than capacious. After the blood has been acted on by the glands, it is conveyed away by the veins, but none of these can be seen externally. The milk-vein, which runs along the side of the belly, has been called so from its supposed connection with the udder ; but such is not the case. Especial attention is desirable to the mellowness of the skin, and more particularly if the animal is poor. This vein is a sure indication of the quality of the blood supplied, and for all practical purposes may be taken as a guide."

Professor Turner proceeds to call attention to a discovery made a few years ago by a French dairyman, Mons. Guenon, respecting the *escutcheon*, as it is termed, of a cow. Every careful observer of cattle must have noticed that the hair on their buttocks grows in different directions from a common centre, one portion slanting upwards, and another growing downwards, thus forming a sort of ridge or fringe at the point of junction, somewhat resembling what is called "a cow's lick," on the human forehead. The centre whence the hair diverges, is what is called the *escutcheon*. In some specimens it is large, smooth, and conspicious. In others it is small, so much so as to be hardly

discernible. Now, Guenon's theory is that the size and shape of this escutcheon furnish an infallible test of the cows milking qualities. He further contends that according to certain rules laid down by him, not only the quantity of milk the animal will produce may be estimated, but also the time during which she will keep up a supply of milk. Professor Turner is of opinion that there is truth in Guenon's theory, and believes that the larger the extent of the escutcheon, the greater is the promise of milk, and also of its continuance even after the cow is again in calf. He says: "A cow may have a small escutcheon, and yet be a good milker; but observation leads to the conclusion, that if she possessed a more fully developed escutcheon, she would have been a better milker. It may be considered a point of merit, not as deciding whether or not the cow is a good milker, but rather as an additional indication, which may be taken into consideration in conjunction with other characteristic points. It is also desirable, in estimating the extent of the escutcheon, to make full allowance for the folds in the skin, otherwise a large escutcheon may be taken for a small one. Besides the escutcheon, there are tufts of hair, (*epis*) which have a certain degree of value, when seen upon the udder of a cow."

It is questionable whether the writer just quoted attaches all the importance to the French dairyman's theory which it deserves. A careful study of it will enable those whose business it is to buy milch cows to form their own opinion; and I am greatly mistaken if, on trial, it is not found the most valuable and trustworthy of all the tests by which we can judge beforehand of a cow's qualifications as a milker. I recommend dairymen to buy "Guenon on Milch Cows." The American edition of the work is cheap, and contains, besides a full exposition of the theory just referred to, a large amount of useful information about cows and their management for dairy purposes.

After having selected the milk-making machine, according to our best judgment, the question arises, how to operate it to the greatest advantage? In other words, our next topic is

COW MANAGEMENT.

A most important subject this. It avails little to get a good machine, unless care be taken to keep it in proper working order, and to operate it skillfully. No man need expect to succeed in the dairy business, unless he is willing to make the wants, the well-being, the productiveness of his cows, a constant study and a ceaseless care. Many dairymen realize double what their neighbors do with no better cows and no better land, simply because they bestow proper and unremitting attention on the animals whose condition, "for better or worse," decides the problem of profit or loss. Start a man in the dairy business with the best lot of cows that can be picked out of all the herds in the country, and if he neglect them, his cash-account will soon come to grief, and he will pronounce dairy-farming a losing business.

Regularity and abundance of feed, plenty of pure, fresh water, thorough cleanliness of animal and stall, a proper degree of warmth, and sufficient ventilation, are matters that must never be overlooked. In addition to these, regularity in milking, careful and *complete* milking, and kind, gentle treatment, are very important requisites. On these points there is need of "line upon line and precept upon precept." So many people who ought to know better are continually allowing themselves and those about them to get into loose and slipshod ways, that there is need of persistent urgency in reference to these matters. All dairy operations should go on like clock-work, with regular, steady, faithful movement; no haste or hurry, but yet no lagging behind, or standing still.

In the early spring, before cows "come in" as it is termed, they should receive some extra feeding for a short time. Bran, chopped grain, or meal should be given them in addition to their allowance of hay and roots. Care must be taken not to over-do in this direction so as to cause inflammation. A fixed rule can hardly be given: each animal must be studied by the owner, and dealt with according to its peculiarities. After calving, the food should be gradually increased until green food becomes abundant. It is best for dairy cows to "come in" early; but this cannot always be accomplished. Such as do not calve until June or July are in extra danger of inflammation from the abundance of green food; and, to avoid risk, should be put into poorer pasturage than the milk-yielding herd, until after calving time. Many cows are lost in the dairy districts from want of attention to this point, while others are more or less injured and lessened in value through the loss of one or more of their teats.

There are two periods at which it is necessary to make special provision of green forage for dairy cows. One is the time between hay and grass, and the other the time when pastures fail through summer drought. Sowing rye in the fall is practised and recommended by some to meet the emergency in early spring; while others maintain that there are quick-springing grasses that can be grown and mown to better advantage at the juncture in question. If only enough of *something* be provided, it does not so much matter what it is, whether rye or grass. To provide for the other time of scarcity, recourse may be had to a variety of herbage plants. Lucerne is excellent where it can be grown to advantage; vetches are good, so is orchard grass if fed just before, or about the time the blossoms appear. Ordinary meadow grass is, of course, good. But best of all for this purpose, is Indian corn. It grows with great rapidity; derives a large amount of sustenance from the atmosphere; makes a thin, tall, spindling growth if sown thickly as it ought to be, and probably yields more to the acre than any other green forage plant that can be grown in this climate. The large dent corn will produce the greatest bulk and weight of food per acre; but sweet corn is probably preferable for feeding to dairy cows.

It may amuse you, as well as help to fix in your memories the

suggestions just given, if I read to you the remarks of a humorsome, but sensible correspondent of the *Hearth and Home*, who calls himself "Jeremiah Wilkerson:"

"WILKERSON ON GROWING GREEN FODDER."

"I see a good deal o' talk in the papers, off and on, about growin' corn for fodder: well, so far as green fodder goes, it's a good thing to do, I don't care how many doctors have their say ag'inst it; and I never had no great trouble in making my creaturs eat it, whether they were horses or milkin' cows. The sweet corn is rather the best, if you get the big evergreen sort; but I've had pretty good luck with what we call horse-tooth corn, which is the tall Southern sort. It makes a bigger stalk, and in the heat o' the season grows faster, so that you get a heavier bulk on it in the same time you do from any other.

"But you must manure well. It ain't no kind o' use tryin' to help our pastur' by sowin' corn on poorish ground, where it grows flimsy and turns yaller. You can't put too much manure, nor too rank, on the ground where you want corn-fodder.

"Then, my notion is, it should always be put in rows. You may sow it by hand, if you like, in a shallow furrow, same as you would peas; or you may put it in arter a good tidy fashion, with one o' Billin's corn-planters (which I don't think much of for plantin' corn in hills, because it won't do it regular.) With corn in drills about two feet apart, you can shrink up your cultivator and give it a good dressin'; most times you won't have a chance to do it more'n once, but that has an amazin' effect, and it keeps the weeds under till the corn comes to shade well. And when you come to cut your corn, you've got a cleanish piece o' ground in first rate order (considerin' the coarse manure that's been rottin') for a crop o' turnips.

"If I lived where I could keep a milk-cart agoin', as some folks do, I'd go in in a big way for sowed corn to feed green; but whenever I could, I'd give it one day's wiltin' afore bein' cut. You may depend on it, there's more milk in it. And if the doctors can tell why, let 'em.

"So much for green fodder; as for sowin' it to get a stock o' winter feed, all I've got to say is, it's the perkiest thing to cure ever I had anything to do with.

"If you've got an old open shed where you can set it up a ton at a time, so 's the wind'll draw through it, and can leave it there for a month, say, before you stack it or mow it, there's a good chance of its not gettin' hot; or if you can shock it up tidy on dry, gravelly ground, and let it stand with a cool snug cap on it for about six weeks, then fling down for a good hot day's sunshine on the butts, there's another pretty good chance; or if you've got an old airy loft where you can set it on end without mowin' at all, there's another chance o' your keepin' bright, sweet food; but in the general way, there's a pretty large chance o' corn fodder spoilin'.

"Clover is good too to help out with the cows; but a man must be mighty careful how he gives too much green clover to cows just off

a slim pastur'. I've had one cow blow herself up with it, as if she'd, been a foot-ball, and I don't want to try it ag'in. As for rye cut green, I don't much believe in it. I never could get my cows take to it much arter the first three days. It comes 'arly, and when there ain't much else that can be cut. If we could get hold o' some o' that Western winter barley they talk about, I've a notion it would serve a good deal better."

As our country becomes denuded of its forests, we are more and more subject to trying summer droughts. Tree slaughter has been perpetrated in so indiscriminate and wholesale a manner, that most of our farms are far too bare of trees, and need a large amount of planting to supply what might have been had in the natural way. Belts of timber should have been left, and a multitude of young saplings preserved for shade trees. Every farm-house and barn-yard should be encircled and embowered with evergreen and deciduous plantations. Every road-side should be lined with trees, and our way to market and church lead through shady avenues and pleasant groves. Beauty, comfort, shelter to crops, and a more constant rainfall, would result from such a state of things. As it is, we are courting drought and barrenness. The desert of Sahara is a barren, sandy waste, mainly because there are no forests to attract and precipitate passing showers; and if one half that "waste, howling wilderness" could be transformed into a timbered region, such as this was before the murderous axe dealt out death to every green thing, the other half would become available and fertile. The evil with us is growing so serious as to call for legislative interference, if not in the way of prohibiting the wholesale destruction of the forest and prescribing the proportions of timbered and cleared land on every farm, certainly in the way of giving bonuses and holding out inducements to judicious tree-planting. Meantime we can ameliorate, though we cannot rid ourselves of the evil. Many farms have facilities for *irrigation*, which might be turned to excellent account in a dry time, while *drainage* and *deep culture* will go a great way toward counteracting the effects of long drought.

One reason why it is important to have at all times a plentiful supply of succulent food for milk-yielding cows, is that it is a losing policy to let them fall off at any time, or even for a very short time. Not even for a single day should a cow be allowed to lessen her yield of milk. If this is permitted for only a few days, the creature will not fully regain her natural flow during the entire season.

Constant access to good, sweet, pure water, is well nigh as necessary as an unfailing supply of succulent, nutritious feed. Running water is preferable; where that cannot be had, spring wells must be resorted to. On no account should cows, or indeed stock of any kind, be compelled to drink at stagnant pools, or dirty hog holes. When creatures parched with thirst "must drink or die," they will of course do so at repulsive places; but let no man be such a fool as to expect pure milk without pure water, or such a wretch as to oblige his cattle to drink what would turn his own stomach.

It is a much-debated question among dairymen whether it is better to pasture cows wholly or nearly so, or to feed them entirely or for the most part in-doors. Generally speaking, a combination of the two systems will, in my opinion, be found to work best. The supply of grass fluctuates too much to depend wholly upon it; "a feast and a fast" is the history of the pure pasturage plan; while the soiling system involves too much hand labor to be profitable in a country like this where hired help is costly. Besides, cows are the better for the moderate exercise they get in moving about while pasturing, and for occasional quiet and shelter, under circumstances that render these grateful. There are multitudes of pasture-fields without a shade tree in them large enough to screen a sucking calf from our almost torrid sun. What a barbarous thing it is, and how certain to decrease the milk-yield, for the poor creatures to be kept out all through the burning noon-time in heat and sunshine fit to dry up all the juices, both white and red, in their scorched bodies! Until shade-trees are planted and well-grown in such pasture-fields, either temporary sheds should be knocked up, or the cattle housed through the blazing summer hours. At those times when insects are troublesome, cows ought to be housed, at least part of the time, for it is in the sunshine that insects buzz most tormentingly, and bite most fiercely. Who does not know that cows "fall off" in fly-time? Since you can't take the flies away from the cows, take the cows away from the flies, and leave the peskey insects to grow lean in the sun. If the mountain will not come to Mahomet, Mahomet must go the mountain. When there is a sudden fall in the temperature and we have chilly nights; when a June frost visits us, as it sometimes does; or when a September frost comes, as it seldom fails to do, the cows should be warmly housed. A sudden chill is detrimental to the milk-flow of nobler animals than dairy cows.

Change of pasturage is beneficial, as, indeed, is diversity of food at any time, provided a sufficiency is given. If a cow always receives the same kind of food, though in ample quantity, her yield of milk will gradually decrease; whereas if there is frequent change of diet, it will increase, or, at any rate, maintain its usual quota. It is well, therefore, and will be found to pay, to keep on hand chopped stuff,—meal, crushed cake, linseed meal, or, if they are accessible, to get occasionally brewer's grains. But oh, ye dairymen all! beware of distillery slop, whether for your cows or yourselves. Keep such vile stuff out of your milk and out of your blood.

The improvement of pastures and meadows, by stocking them well with the best grasses, is by no means a trifling or unimportant item of dairy management. Though the cow is not absolutely omniverous, even as to herbage, her assimilating powers are large and varied. But the fact that she will devour inferior kinds of grass does not prove that it is good policy to withold better. If, by giving her the same quantity of superior food, you can get more and better milk, it is surely wise to do it. Joseph Harris, of Rochester, N. Y., puts this matter very forcibly thus: He supposes that it may take 20 lbs. of hay per

day to keep a cow alive and well, without supplying any milk-making surplus. From that, up to the cow's utmost feeding capacity, there is return or profit from her keep. Persuade her to eat all she can digest and assimilate. Give her not only bulk of food, but food of the very best quality. Thus you will get the highest possible results. But it will be well to lay before you Mr. Harris' reasoning in full :—

"Twenty pounds of hay gives us nothing.

"Twenty-five pounds of hay gives us half a pound of cheese, or 40 pounds of cheese from one ton of hay.

"Thirty pounds gives us one pound or 66⅔ pounds of cheese from one ton of hay.

"Thirty-five pounds gives us 1¼ pound, or 86⅘ pounds of cheese from one ton of hay.

"Forty-five pounds gives us 2½ pounds of cheese, or 111 pounds of cheese from one ton of hay.

"Fifty pounds gives us three pounds of cheese, or 120 pounds of cheese from one ton of hay.

"On this basis, one ton of hay, *in excess of the amount required to keep up the animal heat and sustain the vital functions*, give us 200 pounds of cheese. The point I wish to illustrate by these figures, which are, of course, hypothetical, is, that it is exceedingly desirable to get animals that will eat, digest, and assimilate a large amount of food over and above that required to keep up the heat of the body and sustain the vital functions. When a cow only eats 25 pounds of hay a day, it requires one ton of hay to produce 40 pounds of cheese. But if we could induce her to eat, digest, and assimilate 50 pounds a day, one ton would produce 120 pounds of cheese. If a cow eats 33 pounds of hay per day, or its equivalent in grass, it will require four acres of land with a productive capacity equal to one and a half tons of hay per acre, to keep a cow a year. Such a cow, according to the figures given above, will produce 401½ pounds of cheese a year, or its equivalent in growth. A farm of 80 acres, on this basis, would support 20 cows, yielding say 8,000 pounds of cheese. Increase the productive power of the farm one-half, and keep 20 cows that will eat half as much again of food, and we should then get 21,400 pounds of cheese. If cheese is worth 15 cents per pound, a farm of 80 acres producing one and a half tons of hay or its equivalent per acre, and supporting 20 cows, would give us a gross return of $1,204 50. The same farm so improved as to produce 2¼ tons of hay or its equivalent per acre, and this fed to 20 cows, capable of eating, digesting, and assimilating it, would give a gross return of $3,240. In presenting these figures, I hope you will not think me a visionary. I do not think it is possible to get a cow to produce three pounds of cheese a day throughout the whole year. But I do think it quite possible to so breed and feed a cow that she will produce three pounds of cheese per day, or its equivalent in veal, flesh, or fat.

"We frequently have cows that produce three pounds of cheese a day for several weeks, or even months; but it is too often attained at the

expense of flesh and fat previously stored up by the cow. But a cow *can* be so fed that she will produce three pounds of cheese a day without losing weight; and if she can extract this amount of matter out of the food for a part of the year, why cannot she do so for the whole year? Are her powers of digestion weaker in the fall and winter than in spring and summer? If not, we unquestionably sustain great loss by allowing this digestive power to run to waste. This digestive power costs us 20 pounds of hay per day. We can ill afford to let it lie dormant.

"But I shall be told that the cows are allowed all the food they will eat, winter and summer. Then we must, if they have digestive power to spare, endeavor to persuade them to eat more. If they eat as much hay or grass as their stomachs are capable of holding, we must endeavor to give them richer hay or grass. Not one farmer in a thousand seems to appreciate the advantage of having hay or grass containing a high per centage of nutriment. I have endeavored to show that a cow eating six tons of hay, or its equivalent, in a year, would produce 400 pounds of cheese, and $60; while a cow capable of eating, digesting, and turning to good account nine tons of hay, or its equivalent, would produce 1,090 pounds of cheese, or its equivalent in other products worth $162! Now, the stomach of a cow may not allow her to eat nine tons of hay a year; but it will allow her to eat six tons. And if these six tons contain as much nutriment as the nine tons, what is the real difference in its value! Ordinarily agriculturalists would estimate the one at $10 per ton, and the other at $15. But according to the above figures, one is worth $10 per ton and the other $27. To get rich grass, therefore, should be the aim of the American dairyman. I do not mean merely a heavy growth of grass, but grass containing a high per centage of nutriment. Our long winters and heavy snows are a just advantage to us in this respect. Our grass in the spring, after its long rest, ought to start up like asparagus, and under the organizing influence of our clear skies and powerful sun ought to be exceedingly nutritious. Comparatively few farmers, however, live up to their privileges in this respect. The climate is better than our farming—the sun richer than our neglected soil. England may be able to produce more grass per year than we can, but we ought to produce richer grass, and consequently more cheese to a cow."

This matter was under discussion at the recent meeting of the American Dairymen's Association, before which body Mr. Harris' paper, from which I have quoted, was read. The suggestions then made by practical men, as reported in the *Utica Herald*, will doubtless interest aud profit you more than any observations of mine to the same effect could reasonably be expected to do:—

"Mr. Arnold, of Tompkins, called attention to the influence of grasses and other feed on the flavor of the cheese. All herbage has such an influence He had found sweet vernal grass to give cheese a desirable fragrance. Corn, of all kinds, possesses no fragrance and imparts none to the dairy product; at least none that is valuable.

Meadow grasses, of every kind, do. June grass, he considered, possesses and imparts the finest aroma; timothy and red-top next, and red clover but little. White clover has a better fragrance than red, but is inferior to the grasses proper. He thought from these facts we might gather the lesson, that all feed for the dairy should be selected with a view to the influence that it exercises upon the milk, and therefore upon butter and cheese."

"Mr. Staples, of Vermont, spoke of a dandelion grass that they had in Vermont, which was highly valued for the aroma which it imparted to cheese. But in that State dairymen had suffered largely the past year, from difficulty in properly curing cheese, owing, he thought, to the bad state of the atmosphere most of the season."

"Mr. B. B. Moon, of Herkimer, was quite sure that cows fed on corn, as grain in the spring, or the stalks in the summer and fall, produced richer milk, than when feeding only on grasses."

"Mr. Hawley grew very earnest in his remarks, intended to controvert this opinion."

"J. R. Chapman, of Madison, sowed four acres of orchard grass, some years ago, and there happened to be in the seed some seed of the sweet vernal grass. This latter, by ripening so much earlier than common grasses, had propagated itself and spread considerably. It now scents his mows; and is eagerly sought by stock. He thought it valuable. The English meadows contain numbers of flowering herbs, of delicious fragrance, which scent all the hay with their aroma. He had also noticed in the hay cut, in the towns of Floyd and Steuben, a similar peculiarity of fragrance."

It is undeniable that there is room for great improvement in this direction, both in our pastures and meadows. Weeds abound in many of them, and are not only cumberers of the ground, but depreciate the quality and value of the herbage. Top-dressing is neglected. The grass becomes poor, insipid, tough, wiry, or as we say, "runs out;" *i.e.*, like a famished man, it gets lean, poor, juiceless, and at length dies outright. Such pastures and meadows must be "re-constructed," if we are to have high dairy-farming.

When cows are pastured, the utmost care should be taken in driving them to and from their feeding-grounds. They should be suffered to go at their own pace, which will always be a very slow one, with numerous halts by the way. It would pay on a large dairy-farm, to keep a genuine loafer for the sole purpose of taking the cows to and from pasture. There are only two objections to this: *first*, loafing is infectious, and industrious hands might catch the lazy contagion; and *secondly*, a loafer usually has a dog at his heels, who makes up in wild, tearing energy for his master's total want of that commodity. Dogs ought on no account to be allowed near cows. In fact there should be a prohibitory dog-law, banishing them from all regions where cows and sheep are kept; and this would go very far toward ridding the globe of a costly luxury and an abominable nuisance. Very few dogs are fit to live anywhere on earth, except in Greenland and Labrador,

where there worrying propensities can be expended only on polar bears and northern seals.

Cows should be milked at stated hours, morning and evening, and, if possible, by the same persons. The milk should be extracted as quickly as possible after commencing. Slow milking decreases the yield. Milkmen should be selected from the quietest and most inoffensive of mankind. An importation of "The Heathen Chinee" into our dairy districts for this purpose would not be amiss. No loud tones, or rough, exciting movements should be permitted. No whipping, pounding, or maltreatment of any kind ought to be tolerated under any pretext. The quieter cows are kept the better. The penitentiary discipline of *working in silence* should be enforced in dairy stables, and not even whistling or singing permitted. The cow is a ruminating animal in more senses than one, and should be left to her own meditations as much as possible.

Too much cannot be said in enforcement of *complete* milking. The udder must be thoroughly emptied; first, because the last milk is the richest, and, *secondly*, because if the cow be not faithfully milked to the last drop, she will fall off, little by little, until she ceases to give milk at all.

Every dairyman should grow roots for fall and early spring feeding. Turnips are easiest raised and the best for a main dependence. The white globe is probably superior to all others for milk, but the Swede must be chosen for winter storing. Dairymen object to the use of turnips, because they impart an unpleasant taste to the milk. But this can be prevented. Alternating with mangels, it is said, will do this. But there is a more excellent way. If turnips are pulped, mixed with cut straw or chaff, and fermented, they give no bad taste to the milk. Moreover, thus prepared, more milk will be got than if the same weight of turnips is given whole and raw. Carrots, beets, radishes, potatoes, and even cabbages, are excellent variations of diet for dairy cows.

To keep up a good supply of dairy stock, the farmer should raise yearly a few calves from his best milkers. Other things been equal, a home-bred cow is better than one brought from a distance. Acclimation is of some importance; the lower animals have a share of the homely feeling as well as man, while it is beneficial that acquaintance and intimacy should exist between beasts and their human lords. "The ox knoweth his owner, and the ass his master's crib," and each cow should be the dairyman's old acquaintance and familiar friend.

Excellent calves may be raised on whey. They should come early enough to have three or four weeks' milk before cheese factory operations commence. Whey should be fed to them sweet, if possible, enriched and rendered more palatable by the addition of meal, so as to make a thin stir-a-bout. Calves should be put into sweet, tender pastures. With proper care they will thrive well. Young heifers destined for dairy use, may profitably be got with calf so as to "come in" at or about two years old. They will make better milkers if they

begin early, although perhaps they may not grow quite so large in consequence. But if they are to be precocious mothers and milkers, they must be well fed and well cared for generally, as indeed dairy stock should always be.

Many cows remain farrow, and the value of dairy herds is often greatly diminished from this cause. This, it is reported, has been more than usually the case, during the past season. One of our best dairymen is of opinion that this evil is mainly attributable to the use of aged bulls. His own practice is to use a two or three years old bull, and though he keeps a large herd, he seldom has more than two or three farrow cows per annum in it. Whatever bull is used, he should not be permitted to run indiscriminately with the cows, at any rate until the latter part of the season. This rule should be very stringently observed. The propensities of his nature lead him to tease a cow so soon as she begins to be in sexual heat, which may be several hours before she is actually ready to be put to him. He will neither feed himself nor let her feed. As a matter of course her secretion of milk is lessened, and what she does secrete will be fevered, and not only injured itself, but in a condition to injure other milk with which it may be mixed. Careful observation at milking-time will show what cows are in heat, and it is better to have a short interview and an effective service at the proper juncture, than to permit a long, worrying, teasing, milk-decreasing proce-s, just for the sake of saving a little trouble. Extra pains is the price we must always pay for extra gains.

It is said to be a fact,—I quote it on the high authority of Lewis F. Allen,—that one great cause of abortion among dairy cows is excessive copulation by loose bulls, that have become diseased in their generative organs from serving lately aborded cows. They take the aborting disorder, and communicate it to the wombs of healthy cows, thus reproducing the evil. A cow that has had an abortion should be separated from the herd and kept from the bull for a few weeks, until a healthy condition is restored. Mr. Allen says that experiments have established this theory beyond dispute.

A few remarks now on

DAIRY MANIPULATION.

Robert Scott Burn, in a work of his, entitled "Lessons of my Farm," says:—

"If I were asked what are the three essentials necessary to be attended to in order to secure success in dairy operations? I would say that the first is cleanliness. What is the second? Cleanliness. What is the third? Cleanliness,—still cleanliness—cleanliness *in* everything, and cleanliness *of* everything. Borrowing Mortimer's idea, it would pay, I believe, if we could have caged starlings in our dairies, calling out perpetually in the dairy maids' ears, 'cleanliness!' I do feel inclined to attribute many of the mistakes, misfortunes, and

failures met with in dairies to the want of attention to *complete* cleanliness. I once heard as thorough a housewife as ever had a true claim to the name, remark that she could get plenty of servants as surface-cleaners; but what she liked to see was the dirt 'bottomed.' Now there may be plenty of surface-cleaning in dairies; but unless everything is so cleaned that the dirt is 'bottomed,' the work has no right to be considered finished, and finished cleanliness is what *must* be attended to in a dairy, if the produce is wanted of good, first rate quality. To produce thorough cleanliness in vessels used in the dairy, they must all be well 'scalded' after being washed. Scalding implies the use of *boiling water*, but not warm merely: scalding hot as fire can make it. I have seen water used for 'scalding' so called, that would scarcely have warmed the tip of an infant's finger. Hot! Why Bardolph's (or any drunkard's) nose smelling at cold water would nearly have made it as warm. Let the water, then, used for the scalding of dairy utensils, be neither more nor less than boiling when it is used. Vessels that have had milk in them should first be rinsed with a small quantity of cold water, the rinsings being thrown into the hog-tub; they are next washed with a larger quantity of cold water, the *dairy dish-cloth* being used. I have italicised the dairy *dish-cloth* to indicate that it must be used for dairy purposes only. All other usage of it will be a desecration of the dairy."

This thorough, scrupulous cleanliness must begin at the cow stables, where everything should be the very pink of neatness, purity, and order. Stables reeking with filth, poisoned with foul odours, and in which feeding, milking, and other operations are carried on in a slovenly manner, will make their influence felt all the way through the manipulations of the dairy. Every precaution should be taken to keep the milk sweet and pure. The hay feed should be free from dust, the roots well washed, perfect drainage and thorough absorption of liquid manure provided for; fresh air, without exposure to draughts, amply supplied. The milk pails, the milker's hands, the cow's teats and udder cannot be too carefully and thoroughly cleansed. As quickly as possible after milking, the animal heat requires to be extracted from the milk. The simplest way to effect this is to set the carrying cans in tubs of cold water while the milking process is going on, and if ice can be used so much the better. The more thoroughly milk is cooled before starting on its journey to the factory, the less danger there will be of its becoming sour. Much of the milk sent to factories becomes tainted on the way, because of the animal heat left in it. Every dairyman, every farmer indeed, should lay in a stock of ice. This can be readily done. The roughest kind of a shed will do for an ice-house, even though shaky at the foundation, and uncovered at the top. The merest board shell that will hold against the ice-pile, a wall of non-conducting material, such as tan-bark, chaff, or saw-dust, will answer the purpose. Once more and incessantly, let the use of tinpails for milking be earnestly recommended. None but tin utensils indeed should be used in manipulating milk; anything of wood is almost certain to retain

more or less of taint. The carrying cans need to be closely watched lest adhering particles of milk should infuse their leaven of mischief into their contents. They should be thoroughly scalded after every emptying. Many are in the habit of allowing their cans to remain standing in the sun for hours before cleaning. This is a very bad practice. A good plan is to have a supply of cold water at hand at the factory, and whenever a can is emptied, dash in a pail or two to remain while driving home. During the journey, the swash caused by the motion of the vehicle will go very far toward cleaning the cans, and will render the scald on reaching home a perfectly effectual purifier. Milk should be strained at the milking-yard, and again at the factory.

At the recent meeting of the American Dairymen's Association, one of the topics considered was,

"THE CAUSES OF TAINTED MILK, FLOATING CURDS, AND THE REMEDIES."

The discussion was opened by Mr. S. A. Farrington, of Tompkins.

"Every factoryman knows the importance of this subject. The first cause mentioned was the feed of cows. This has a great deal to do with the milk of the cows. He had two factories under his charge the past season. The cows, whose milk came to one of them, were pastured on low, clay soils. Their feed was very poor, and during the hot weather it was impossible to make good cheese from it. It was diseased before it came to the factory. The cows at the other factory, had good nutritious grass, and it was easy to make good cheese, and no trouble was experienced with floating curds. The second cause was the bad health of the cow. This was too evident to need much illustration, as the cow is but the manufacturer of the milk, and if her body is diseased, the milk will be. The third cause is the treatment of the cows. Good milk can not be drawn from the cow when she is heated by driving or injured by bad treatment. The fourth cause was bad water. This is akin to bad feed, and needs no explanation. The fifth cause is uncleanliness of utensils. For patrons to send milk in dirty cans, or confining it in close cans, where it receives the heat of the sun, is unfair toward the manufacturer. Such milk will become quickly tainted and will cause floating curds. The sixth cause is bad odor in the atmosphere. He gave an instance of the influence of this cause. He had great difficulty in making the milk in one vat into cheese, a year ago last summer. He traced the difficulty to one dairy; and on following the matter still farther, he found that the carcass of a dead horse was found in the pasture of that herd. The carcass was buried, and there was no further difficulty experienced. It makes no difference whether the air comes in contact with the cow before she is milked, or with the milk after it is drawn from the cow. Thus far he had only spoken of causes dependent on the negligence or uncleanliness of the patrons. He did not intend to excuse any carelessness on the part of the manufacturer. The seventh cause is that of uncleanliness at the factory. There is not attention enough paid to draining off the

whey from the factories. When whey is putrid it gives off a very offensive and injurious odor. In fact, every item of uncleanliness about the factory has a tendency to produce floating curds. The last cause mentioned was tainted rennet. The remedy for these evils—one which he had found efficient in his own practice—was that of grinding floating curds. He made up tainted milk just as he did any other milk. Draw off the whey as soon as any acid is perceptible, and let it undergo a process of digestion. Then grind it. The object of grinding is to get the whey out of the curd, and this can not be done without grinding, or breaking up into small lumps, and exposing to the air. This remedy applies only to the manufacture of the milk, but the fundamental remedy is good feed and plenty of water for the cows, and entire cleanliness about the farm, the barn, and all utensils."

"Mr. Arnold said he was confident that the chief cause of tainted milk and its attendant evils was to be found in the wrong methods of carrying milk to the factory. It is carried in tight cans. The cans should be well ventilated. Oxygen in the air destroys the germs upon which putrefaction depends, if it is allowed to come freely in contact with the milk. He gave instances of dairies which had been delivered at his factory, and which were accustomed to come in a tainted condition when brought in tight cans, but as soon as covers, having good ventilation, were used, the milk ceased to come in a tainted condition. He believed that aerating milk, on its way to the factory, was a perfect preventive of taint, provided the milk is all right when put in the can, and the can is clean."

"Mr. Moon, of Herkimer, spoke of the necessity of cleaning with a brush. He does not object to the carrying home of whey in the can, if the cleaning is properly done. He dwelt at some length on the importance of keeping dippers, conductors, strainers and other things about the factory clean."

"Mr. Farrington, of Tompkins, thought there was something besides cleanliness requisite to prevent tainted milk. The food, drink, treatment, etc., of cows had something to do with it."

"Mr. Bonfoy, of Herkimer, thought if cows were often salted or given all the salt they want, it would prove a valuable preventive or corrective of taints."

"Mr. Farrington, of Canada, thought the drift of argument indicated the importance of ventilation. With a clear, strong atmosphere we are not troubled with taint. The atmosphere has much to do with the condition of milk. It develops certain diseases, and why not taints in milk?"

"The mixing of the warm morning's milk with the old night's milk, it was thought by one gentleman, developed taint."

"Another gentleman thought that dogging cows caused tainted milk. Young corn he found imparted its own peculiar flavor to milk."

"Mr. Chapman, of Madison, thought that aeration was the great point."

"Mr. McAdam, of Montgomery, thought cooling alone of no value."

"Mr. Hubbard, of Madison, found carrying whey in cans very pernicious. Filthy cans are the main cause of taint."

We come now to

FACTORY BUILDINGS, FIXTURES, AND WORK.

In discussing these topics, I shall avail myself of the wisdom of others, giving you, *first*, the gist of a paper prepared for the American Dairymen's Association, by Dr. L. L. Wight, one of the best practical factory-men in Oneida County, N. Y., and a brief digest of the discussion thereon as reported in the *Utica Herald; secondly*, a few remarks kindly supplied me by our well-known and skilled Ingersoll cheese-maker, Mr. Harris.

"Dr. Wight said that the first thing to be considered in selecting a site for building, after having secured a sufficient number of cows, is a plentiful supply of cold running water. The quantity should not be less than sufficient to fill a two-inch pipe for the milk of every five hundred cows. The temperature of this water should not rise above 60° in the warmest weather of summer. Instead of erecting the buildings over some low, marshy, swampy ground, where water, slop and whey will settle and stagnate and infect the superincumbent air, as is too often the case, by all means select some dry, hard, airy location, a little descending to the rear, and with a continuous descent from the building, to insure the escape of all decomposing liquids to a safe distance. The size of the main building should be thirty-two feet wide, two stories high of eight feet each in the clear, and the length will depend upon the amount of milk anticipated. A building seventy-five feet long will accommodate the milk from five or six hundred cows. Let the piers be made very substantial, extending to a depth beyond the possibility of frost, and not be over about ten feet apart in either direction. The main timbers, being 10 × 12 in. square, support 3 × 10 in. joists, not set in gains, but resting on the cross sills. The joists must be sound, and set not over 16 inches apart, being well bridged. The flooring of the manufactory, made of well-matched, sound, yellow pine plank, inclines three inches from the front to a substantial box drain made in the floor, four feet from the rear. The floor also inclines slightly from the rear to said drain. The drain drops from each end of the manufactory to the centre, where it enters another box which conveys all slop, whey, etc., to a safe distance from the building. The entire outside is covered with well seasoned, matched, sound pine siding. The entire sides and ends of the manufacturing part inside are ceiled with pine. The ceiling is well plastered. The curing rooms have floors laid with good sound seasoned spruce flooring. The sides are double plastered so as to make two fixed air spaces. The ceilings are also all well plastered. There need be no posts to support the floor. The second floor is supported by iron rods suspended from bridges in the attic. The entire building is well lighted by double-sash windows, which are supplied with good rotary outside blinds.

Thorough ventilation of the curing-rooms is secured by the building being elevated so far above the ground as to admit of an abundance of air; and the inserting of large registers in each bent under every counter in the first and second floors; and by good ventilators through the attic floor and roof. By careful attention to these registers, and keeping the blinds closed in hot and sunny days, the temperature can usually be kept at a sufficiently low degree, even in the warmest weather. An ice chamber in the attic so arranged as to register the cold moist air into the curing-rooms below, would likely at times be beneficial. The curing-rooms are supplied with counters twenty-four inches high, and three feet wide; each table being made of two seventeen inch wide pine plank, with a two inch space between them. Matched boards under cheese are objectionable from the greater difficulty of cleansing, and the danger of skippers infesting the cracks. It is better to have the counters apart two feet distant from each other for the convenience of the laborers, cheese-buyers, and visitors. The manufacturing room will be separated from the curing room below by a tight double partition, with a large sliding door in the centre, between the two lines of presses. The length of the manufacturing and pressing room, in a building of the size above mentioned, would be thirty-five or forty feet. The boiler room and wood or coal room will be erected at the end and adjoining the manufactory, having easy entrance thereto. A building about thirteen feet square should be attached to the front of the manufactory, containing a driveway and a receiving platform. The platform will be closed toward the driveway except a slide window to receive the milk through, and open through toward the vats. The centre of this building will correspond to the centre of the vats, so that the receiving can may stand equidistant from each outside vat. The ground of the drive-way is four and one-half feet below the top of the weighing can. The receiving platform is about one foot higher than the top of the milk vats. This bullding is supplied with means to hoist the cans of milk, either by a crane derrick, or what is preferable, a hoisting wheel. Permit no faucets in the transporting cans, as they cause the milk to taint when not cleansed thoroughly, and are liable to be neglected. The wooden vats being about fifteen feet in length, it gives three feet between the receiving platform and the end of the vats—two feet between the vats and the curd-sink—two feet between the curd-sink and the presses, and two feet between the presses and the rear of the building. The vats are separated two feet from each other, and three feet from the end of the building. The wooden vats almost invariably leak, and I think it would be better to have them lined with sheet lead. The tin vats should be made of the largest sheets of tin, of the best quality, and be soldered together very smoothly. The wooden vat should rest upon a frame-work extending the one-half length of the vat, and not coming to the edge or upper end within four inches. The wooden vats should not be incumbered with legs extending to the floor, to be in the way of the feet. The most convenient way of raising and lowering the foot of

the vat is by means of a standard, spring and catch attached to the floor and the lower end of the vat. The space between the last vat and the curing room will accommodate two tiers of presses and give sufficient room for storing salt, for rennet and anotta jars, for hanging syphons, conductors, pails, and knives, for washing sink, hot and cold water barrels, etc., etc. Supply each milk vat with a water pipe of at least three quarters of an inch bore. The water, after having circulated around and cooled the milk, will be conducted to a water wheel, and furnish the power to move the milk agitator."

GENERAL REMARKS.

Some discussion followed the reading of the paper.

Hon. Z. Platt, of Clinton, had found many new factories with the presses placed in another room from that in which the manufacture takes place. He wished to know whether there was any necessity for this?

Mr. Lewis, of Herkimer, said that we could not be too careful in keeping from the milk in the vats of the manufacturing-room any foul odors, such as are like to arise from the whey draining from the presses.

Dr. Wight, in answer to the question about the desirability of using the pretended patent cheese-rail and set, said that he preferred the counter by all odds.

Mr. Chapman agreed with Dr. Wight in this matter.

Mr. Wire, of Ohio, had never used tables. He did not think there was any necessity for odors about factories. He never allows a drop of whey to touch the floor; and there is by this plan no need for a ditch under the floor, and he would never have any ditches, or waste whey to be carried off by them. He uses sets, but he keeps them clean, and he thinks they are more easily cleaned than tables, and less labor is required to take care of cheese on rails and sets.

Mr. Moon, of Herkimer, thought there was more danger of breaking corners by turning on tables than with sets.

Mr. Dick, of Erie, had a living stream of water running under the factory continually. He had no stench about his factory, though there was a smell peculiar to a cheese factory, and he had never found any factory from which this smell is absent. But it does not injure the milk in the manufacturing-room, because the odor is perfectly sweet.

Mr. Burnham, of Chautauquay, preferred hemlock or white wood for counters, to pine.

Mr. Harris observes:—"Factories and making-rooms should be constructed to have plenty of fresh air, to be easily cleaned, and with ventilating and cleaning arrangements under complete and ready control. Drains should be constructed to carry off waste water, and the buildings should be plentifully supplied with water from a spring if possible. No stagnant water or slops must be allowed near the

factory; no hogs kept on or near the premises; all the utensils and fixtures, vats, presses, screws, &c., ought to be scrupulously clean.

"There is no doubt that it is desirable to make cheese but once a day. It is not only less work, but I believe a better article can be made. Once a day cheese making can easily be accomplished by the use of the agitator, and a sufficient flow of cold water to work it. Where a spring cannot be had, tanks will answer the purpose, and the use of ice is necessary in very hot weather; in fact the use of ice is almost an absolute necessity for the preservation of milk in our hot climate.

"The curing-house should be convenient to the making-room. I should recommend it to be two and a-half stories high, the top half-story not used for curing. If only two stories high, the upper story will be found too hot for curing in very warm weather. The building should be well set up from the ground, the ceilings should be high, plastered in preference to boarding, and well-ventilated from the bottom through the floors and ceilings by having openings cut from ground-floor to attic, which should have ventilators in the roof.

"Curing-rooms should be so constructed, if possible, that the temperature can be kept under perfect control, and should not be allowed to get higher than 70° for the proper curing of cheese. Could we keep the temperature down to this, we should hear less complaint of cheese getting off flavor; but as this is impossible in our climate, with our present system of building, the next best remedy is to sell as soon as cheese is fit to ship, say at four or five weeks old. Large factories should ship weekly, and small ones fortnightly."

I would next offer a few words on the much debated question of

SUNDAY CHEESE-MAKING.

This practice has been very thoroughly examined from every point of view, and is condemned by the great mass of dairymen, quite as much on practical as on religious grounds, and perhaps more. Men who have run factories seven days in the week, during the whole season, have acknowledged that it was unprofitable business, and have added their unwilling testimony to that of multitudes of witnesses in other lines of human occupation in proof of the fact that there is a *physical* as well as *moral* necessity for a day of rest, and that as our Saviour teaches, "The Sabbath was made for man," *i.e.*, out of an infinitely wise regard to his wants and his well-being.

There are, however, still those to be found who argue for Sunday cheese-making. They reason that to oblige the patron of a factory to keep his milk over Sabbath necessitates extra labour and compels him to supply himself with additional pans in which to set the accumulated milk, thereby subjecting him to needless expense, which in some cases, would be a serious inconvenience; that if the milk is not delivered regularly, dishonest patrons will carry skimmed milk to the factory on Monday, involving the risk of poor, sour cheese; and further, that it

is better for the few to take care of the Sunday's milk at the factory, than for the many to do so at home.

However plausible all this may seem, it is easily met. In regard to the need of extra milk-pans, it is enough to say that every farmer who keeps cows for dairy purposes, must have milk-pans enough for early spring and late fall use when factories are not in operation, and as at these seasons the milk remains in the pans for two or three days, to let the cream rise, there are few who have not pans enough to hold two milkings at any time, so that it is questionable if any additional expense is incurred in keeping milk at home on Sunday.

As to the idea that it is less work for the patron to take his milk to the factory than to dispose of it at home, it will not bear examination. How much longer will it require to strain milk into pans than into cans? Will it not take less time to set away the strained milk of a dairy than to harness up, drive to the factory and back, and then wash and scald the carrying cans?

With regard to sacrificing Sabbath rest of the few hands at the factory for the benefit of the many at home, it may be asked, is the cheese-maker to be the scape-goat and victim of the whole community? If there is any necessity in the matter, let the brunt of it be evenly and equally borne by all concerned, and let no tyrannical majority lord it over an oppressed and helpless few.

The plea that milk must be delivered at the factory on Sunday as on other days to prevent dishonesty, will not do. Are men specially addicted to dishonesty on the Sabbath? Do they perpetrate their *worst* actions on the *best* day of the week? The fact is that the patron who will cheat on Sunday will cheat all through the week, and if the argument is worth anything, it is fatal to the entire factory system. Vigilance, detection, and exposure are the guardian angels that must watch the unprincipled; and these watchers do not sleep on Sunday, nor lie in bed late on Monday morning. Let them do their work faithfully, and let evil-doers be held in check by visiting upon them when detected the just penalty of the law.

At the bottom of all pleas for Sunday work, is purblind greed of gain. It is imagined that a little more money can be made by sending milk to the factory, than by disposing of it at home. But this is a mistake and even if it were not, the Sabbath is worth so much to us that we ought not to grudge a little sacrifice for its maintenance.

I learn from Mr. Harris, that he finds no practical difficulty in dispensing with Sunday labor at his large factory. His own plan, and that of most of his patrons, is to dig trenches in the cellar, filling them with cold water, and setting the milk in tin pails in the trenches. Two years trial has demonstrated the practicability and success of this method. The milk of very large daries can be saved by the use of ice. Placing the cans in ice-water—in tubs or tight boxes made for the purpose—is found to answer well. The practice at Mr. Harris's factory is to have the Sunday's milk delivered at the factory as early as five o'clock on Monday morning; and the milk, when in large quan-

tities, is made up by itself. This may require a second vat, but as it adds one-sixth to the product of the season, it pays both the factoryman and the patron.

Mr. Palin, of Cheshire, England, a gentleman who has long occupied a high position as a dairy farmer, gives the following account of his Sunday management:—"The cows, as usual, are milked at 5 a.m. on Saturday, and the milk is put into vessels to remain until the evening; and the milk of Friday evening also, having been kept in a cool place, remains in the tin-pans undisturbed until it is wanted. It is added to the former with the Saturday evening's produce, thus making three meals in one. During the day the dairy servants are employed in turning the cheese, cleaning the dairy offices, and making everywhere comfortable for the Sunday. Milking is commenced an hour earlier on the Saturday afternoon—say four o'clock—and the milk is all prepared by half-past five o'clock, when the process of cheese making commences. By 11 p.m. the business of the day is over, the utensils being all in their places, and the dairy kitchen washed down. On Sunday morning the cows are milked at the usual time, and the milkers have a little assistance from the team men and others, who have no particular occupation on that day. After milking, the cheese of the previous evening, and any others which may require it, are turned in the vats, when the business of the day ceases until milking-time in the evening. The servants breakfast at eight o'clock, and the comfort of the Sabbath-day is enjoyed as it is—or ought to be—in other houses where cheese is not made at all. On Mondays the business of the day is precisely the same as on the four following ones, only that there is one meal's milk more to be made into cheese than the ordinary quantity. Thus the ordinary Sunday's labor in cheese making establishments is divided between Saturday evening and Monday morning."

It may further be observed, that dairymen require a supply of butter, and they must either buy it or make it for themselves. Generally speaking they make it, and for that purpose keep out a milking or two occasionally. The Sunday milk affords an excellent opportunity for providing the family supply of butter, without interfering with the operations of the factory. If it be said, more will thus be manufactured than the family needs, the reply is, that the butter-market is close at hand, and equally brisk in demand as the cheese-market. I am glad to find that the American Dairyman's Association, at its late annual meeting, adopted a resolution on this subject, in which the sacredness of the day is recognised, as well as its advantages as a physical good. Our own Association, in addition to former testimonies in reference to this matter, could hardly do better than adopt this resolution echoing back from our Northern hills and vales concurrence in action so wise and right:—

"Resolved,—That with a view to the enjoyment of the rest and privileges of the Sabbath by cheese manufacturers and their assistants, as well as out of regard to the sacredness of the day, the importance

of maintaining it unimpaired, for the benefit of the public and of individuals of every class, it is desirable that the delivery of milk to cheese factories on Sunday should be dispensed with, and that dairymen are requested to inquire whether this is not practicable, consistent with their interest, and whether the value of the Sabbath would not justify some sacrifice on their part, and that of their families, should this prove unavoidable."

Really, what with the want of conscientiousness in little things, the practice of deception and dishonesty about milk, and a disposition in many quarters to desecrate the Sabbath, it would seem as though Missionaries to teach the ways of righteousness were badly needed in our dairy districts. Certainly there is no cure for these evils a tithe so effectual as that deeply-rooted spirit of inward piety which led one of old to say in view of the injustice and wrong-doing indulged in by others, "But so did not I, because of the fear of God."

In conclusion, I desire just to touch on a few points which it is impossible to treat at any length, but which I do not like entirely to pass over in this annual address.

MISCELLANEOUS MATTERS.

Our American friends had under consideration at their yearly gathering, the question whether it was desirable to make a due proportion of small cheeses with a view to encouraging, and more conveniently supplying, the home demand for this product. It was argued that the trouble and waste of shop-cutting might thus be avoided, and a better price obtained that would more than cover the acknowledged extra cost of manufacturing small-sized cheeses. The Association, by resolution, declared it to be their opinion "that the dairymen of the country should strive to adopt all practicable means for increasing the home consumption of cheese, and that to this end it recommends that each factory should keep on hand some small hoops for the manufacture of small cheeses, such as seem to be required by the home trade, and that a portion of each factory's make be softer than is required for shipping and such as our home markets demand; and that a portion be made without colour."

A committee of three was also appointed to consider the propriety of petitioning the Legislature of the State to make an appropriation for the establishment of one or more experimental farms for the manufacture of dairy products. At this time, when our Provincial Legislature is being asked to make grants for an Agricultural College, also for a Model Reformatory, and Asylum farms, would it not be wise and opportune for this Association to send in a memorial praying that the dairy interest may have that prominent place in these arrangements to which from its present and prospective importance it is justly entitled?

Another important question which occupied the attention of our friends across the lines was this :—

IS THERE ANY WAY BY WHICH THE PATRONS OF BUTTER AND CHEESE FACTORIES CAN RECEIVE CREDIT FOR THE MILK DELIVERED ACCORDING TO ITS ACTUAL VALUE, AND NOT ACCORDING TO ITS WEIGHT OR MEASURE?

This subject was opened by Hon. H. Lewis, who contended that the present system was unfair, inasmuch as the richer the milk the lighter it weighs, and *vice versa*. The value of milk for making cheese depends on the amount of cream and casein it contains, the proportion of water, its freedom from filth, and its keeping qualities. The first two items can be tested by the lactometer; the last two by setting samples from the can of each patron. He thought this plan desirable and practicable.

After discussion. the following resolution was adopted :—

Resolved,—That a committee of three be appointed to consider the best means of making an equable apportionment to the patrons of butter and cheese factories, according to the quality of milk and not by weight, and to report at the next annual meeting of the Association.

Our old friend Mr. Willard introduced the question :—

IS THERE A DECLINE IN THE AMOUNT OF DAIRY PRODUCTS IN THE OLD DAIRY REGIONS? IF SO, WHAT IS THE CAUSE, AND WHAT THE REMEDY?

"Mr. Willard thought there was a decline in the cheese product, and that bad cultivation of the soil, bad treatment of the cows, and bad management generally were the causes."

"Mr. Farrington, of Canada, had heard, years ago, that the pastures of Herkimer county were deteriorating."

"Mr. Willard thought there was no diminution in the fertility of soil; but a want of proper cultivation may prevent their carrying stock as formerly. He did not believe, as was suggested by Mr. Farrington, that the cheese was being eaten out of Herkimer County."

"Mr. Moon, of Herkimer, thought that the amount of cheese made, had suffered just as the quality of cheese had been improved."

On the subject of colouring cheese, our good-natured, common-sense Canadian, Farrington, took strong ground in opposition, and maintained it well.

He strongly opposed the practice, because it did not improve the cheese, while it added about one per cent to its cost. If the consumer pays this extra cost, he gets only ninety-nine one-hundredths of what he pays for. The speaker estimated that the cost of colouring cheese averaged $100 to each factory, and when this sum was multiplied by the number of factories in the country, the total expense became enormous. All this, he claimed, was waste. Many of the substances used are badly adulterated, and absolutely harmful to the cheese and the consumer. The only colouring matter that he knew of, which was

not impure, was the anottoine; but he did not know how long this would remain pure. At present, he was well satisfied with it.

"Dr. Wight did not believe that cheese makers should make cheese for their own tastes, but for the tastes of the consumer; and these demanded a coloured article. He was, therefore, in favor of colouring the product, as long as he could do this without putting into it any harmful substances."

Did time permit, something might be said respecting butter-dairying, condensed milk factories, creameries, and a variety of other topics germane to the occasion. But I must close. In doing so, let me express the conviction that the dairy business is yet in its infancy, and is destined to prove not only a valuable commercial interest, but a mighty recuperative power in our agriculture. It has wondrously expanded in this locality since Mr. Hiram Rauney commenced an "Old Style" dairy, with five cows on a farm of 100 acres. His own progress to a "New Style" dairy of 100 cows, and the proprietorship of several hundred acres of land, proves that the business has paid; while the many thriving factories that cluster around the old Ranney homestead, give conclusive evidence of the public benefit which has accrued from the development of this branch of rural industry. Meantime, a better style of husbandry in general is being adopted. Farms are better manured, better tilled, and yield better crops. One dairyman in this vicinity has told me that he now raises as much produce from one acre of his land, as he got from three before he took to dairying; and such, doubtless, is the experience of many more. A too exclusive devotion to dairy farming is not desirable, for it will be followed by results akin to those that followed in the wake of a too exclusive practice of wheat-farming. A system of mixed husbandry is most desirable. It is unwise and hazardous *in love* to have more than one string to your bow, but it is wise and safe *in agriculture* to have several. Factories must not be too numerous, nor farms entirely given up to dairying. Rotation of crops, grass, roots and grain, meat, milk, wool and flour;—this is what we want the whole country over, with specialties, where, as in this region, there is peculiar adaptation to one particular product. During the past year, the cheese yield and the prices paid have been highly encouraging, and there is no cause for depression in regard to crops, markets, or business generally. Our country grows; the world moves; and now that, thanks be to God, "the sound of war's loud trumpet" has ceased to pierce the ears and hearts of a race weary of the din of strife,—"for every battle of the warrior is with confused noise and garments rolled in blood,"—let us hope and pray that the arts of peaceful industry may flourish everywhere, that the ties of universal brotherhood may draw all men closer together, that "breaking bread from house to house," in the cultivation of a friendly sociality, they may, as of old, "eat their meat with gladness and singleness of heart, praising God," from whom all blessings flow.

AN ADDRESS

DELIVERED BEFORE THE CANADIAN DAIRYMEN'S ASSOCIATION, AT INGERSOLL, CANADA, ON THURSDAY, FEBRUARY 2ND, 1871,

BY

PROFESSOR A. SMITH,

Veterinary College, Toronto.

Diseases of Cows, Hoof Disease, Abortion, etc.

In proceeding to notice a few of the diseases incident to dairy stock and of frequent occurence in all large dairies,

Mr. Smith said—I would first advert to one that demands special attention from the excitement it has created amongst owners of stock in various parts of Ontario during the past year. The affection to which I allude has generally been called "hoof disease," from the circumstance that it only affects the extremities and feet.

We have it stated, on good authority, that for a very long period cattle have been subject to various diseases of the extremities; and one frequent complaint has been known by different names in different countries and even in different parts of the same country, as "hoof disease," "foot disease," "rot," "dry gangrene," "foul in the foot," &c. Within the last thirty years there has appeared in Britain a malady called "foot and mouth disease," and according to late accounts it has made its appearance in the United States.

Before explaining the nature of these affections, I deem it advisable to notice briefly the structure of the parts affected, so that the changes which occur, the result of disease can be the more readily comprehended.

To better elucidate and illustrate the subject, the speaker produced several specimens showing the structure and formation of the foot. In describing the foot I must notice the internal, or what are called the sensitive structures; and the external, or insensitive parts; the former being composed of bone, of tendons, of ligaments, of bloodvessels, nerves, absorbent vessels, cartilage or that substance covering the ends of bones forming a joint, together with the synovial membrane and its secretion, the synovia, or what is familiarly known as joint oil. There

are also the sensitive laminæ, and sole. The external or insensitive parts are formed of the horny covering or case which nature has provided for the support and protection of the highly developed parts within. This horny box or casement is called the hoof.

Taking the structure of the limb of the horse as a standard, and comparing with it the leg of the ox, from the fetlock downwards, we observe a marked difference, the parts being double in the ox, which comes under the class of quadrupeds known as didactyles, or two-toed class.

The bones that have a direct connection with each division of the foot are three in number; two of which, the coffin and navicular bone, are enveloped by the horny covering, but only the lower extremity of the other (*small pastem*) bone. The union of the three bones forming a joint called the coffin joint presents all of its important structures in a well-marked degree. The tendons, or sinews, are those attached to the large muscles, extending from the arm or thigh downwards. The one in front is called the extensor, the other being known as the flexor, passing over the back part of the navicular bone to become firmly attached to the sole of the coffin bone. As it passes down the back of fetlock and pastem it is covered by a sheath which supports and protects its passage to the foot, and it glides smoothly over the cartilages and bursal membranes, so beautifully arranged and situated to facilitate the motion of the limb.

Covering the front part or wall of the coffin bone are a great many highly vascular plaits or folds, running in a parallel direction downwards, and designated the sensitive laminæ in contradistinction to those on the inner side of the wall of the hoof, that are named the horny or insensitive laminæ.

The sensitive are continuous with a highly organized and glandular part, called the coronary substance, which forms a connecting medium between the skin and hoof. This is a very important structure, and is formed of a basis of fibre-cartilagenous matter; of a cuticular covering continous with the skin, and between the two tissues is placed a beautiful and complex arrangement of bloodvessels.

The laminæ are attached to the bones by an underlayer of fibrous, elastic tissue, which appears to give them a certain amount of elasticity, and their external borders pass into the divisions of the horny laminæ, to which they are firmly united. The sole is the portion attached to the under surface of the bone, and is more highly organized than the laminæ.

The foot is well supplied with blood; and the large vessels passing to it give off numerous branches, which form minute and intricate plexuses. These tissues are also abundantly provided with nerves, and the whole parts possess great sensibility.

In comparing the laminated structure just described with that of the horse, it will be noticed that the connection between the horny plates of the hoof and the fleshy substance are neither so wide nor so

deep, and consequently the bond of union between the hoof and the foot is not so strong as in the horse.

The hoof is formed of two parts; each division presenting two parts, the wall, and the sole; the former being the portion visible when the foot is on the ground, and it differs from the horse's hoof in forming the straight side of the cleft of the foot. The wall is developed from the coronary substance: the sole is thinner, and is produced from the secreting villi of the sensitive sole.

The tissues forming the divisions I have been pointing out are firmly united to each other above the hoof by connecting tissue, and by the interdigital ligament, and the whole covered by strong and well-formed skin, which, in its composition and in its attachments to the parts underneath, shows a variety of structures, as sebaceous glands, &c.

The portion of skin forming the upper part of the cleft is very strong, and is devoid of hair, and in its substance are numerous small glands, the secretion from which renders the parts pliant and gives ease to motion. The least alteration in the structure or functions of this part soon leads to greater disease. The foot of the ox, although not equal to that of the horse, is nevertheless a beautiful but complicated structure.

You are all aware that the foot of the horse is very liable to disease; so, also, is the foot of the ox, perhaps even in a greater degree if exposed to the same exciting causes, in what has been termed the "hoof disease." The parts I have described are all more or less affected according to the severity of the attack. In mild cases the irritation first appears in the cleft of the feet. The skin is broken, and an ichorous matter is discharged, and this stage is speedily followed by the appearance of fungoid granulations, or proud flesh. The irritation extends, producing a considerable swelling of the pastern and fetlock joints; small sinuses or pipes form around the coronet, discharging matter, and frequently a bleeding fungus appears.

A marked peculiarity is the great tendency of the inflammatory process to spread in every direction; and owing to the increased vascularity of the parts above the hoof, and from the largeness of the venous bloodvessels, together with their tortuous course, it proves very serious in its consequences.

When inflammation attacks any part of the body, it must necessarily have a termination, and it terminates, when ending without altering the structure and function of a part, it is called resolution; when it runs to the formation of a yellowish matter, it is known as suppuration.

Inflammation, of the parts under consideration, frequently terminates in the process of suppuration; and when matter forms in any part of the body where it cannot freely escape, it is attended with great pain; and particularly when forming in the foot, covered as that is by the hard and resisting horn, the pain is increased ten-fold, unless relieved by an artificial opening. The suppuration gradually extends and breaks out around the head of the hoof; it may also proceed

inwards, causing such an amount of irritation as to affect the bony structure, and, if continued, resulting in the separation of the sensitive and insensitive parts, either partially or completely, so that the hoof falls off.

The inflammatory action may even be so great as to terminate in gangrene, producing a sloughing of one or more of the inferior articulations.

Gangrene, however, may result from other causes: for instance the arrest of the circulation from exposure to extreme cold, as in frost-bite, or from some internal inappreciable cause.

Such irritation and suffering usually produce well marked symptoms. There is lameness, the animal walking with difficulty, and, when standing, occasionally moving his feet in a manner indicative of pain. A swelling appears around the coronet, and extends upwards to the fetlock, the lameness and swelling increasing. The unnatural prominence becomes soft and fluctuating; the hair comes off; and if the imprisoned matter is not artificially liberated by a free vent, it will produce ulceration of the skin, forming an opening communicating with a sinus or pipe within, and the upper part of the hoof becomes separated from its connections underneath.

In many cases the swelling is not confined to the region of the coronet, but involves the upper joints, the irritation being extreme, finally leading to extensive sloughing, and exposing to view the tendons and the ligaments. Such severe pain must necessarily affect the system generally. The secretion of milk is impaired; the animal soon looses condition, becoming greatly emaciated, and even death may be the result. The symptoms I have enumerated vary in degree according to the intensity of the attack, and the extent of the tissues involved.

The causes of disease of the feet are numerous and varied. The foot of the cow, from its peculiar form, is especially liable to the lodgement of foreign bodies within the cleft, to punctures from nails or other sharp substances, and to bruises from stones, or from irregularity in the surface of the ground during frosty weather.

But, perhaps, the most common cause, and one which produces the most inveterate forms of disease, is the injurious effects arising from wet and dirt, common to some strawyards and other low-lying localities, or consequent on being housed in badly drained and ill-ventilated byres. The obnoxious gases continually generated from the decomposition of animal and vegetable matters are the prolific source of many disorders.

We also find a parallel case if we look to the horse and observe what is the consequence of exposing him to the baneful influences mentioned. In a short time are generated many diseases of the extremities, as scratches, grease, thrush, and canker; and the cow is more predisposed than the horse to diseases of the parts so affected.

Extreme cold, as in continued exposure during severe frosty weather, may affect the limb to the extent of arresting the circulation and producing gangrene.

It is a well established fact that cattle grazing on low, damp pastures, are exceedingly liable to disease of the feet, a fact very often noticed both in Britain and on the continent of Europe.

The wet and damp cause a softening of the hoof, and render the foot unable to resist the accidents to which it is continually exposed.

Another cause I have occasionally noticed in cows that are kept housed during the greater part of the year, is the irritation set up around the coronet from the extreme length of the hoof at the toe. When the toe becomes preternaturally long, it throws a great strain upon the heels and coronet; and this condition combined with the injurious effects of wet or exposure will very soon bring forth disease.

I have mentioned that the extremities occasionally present an abnormal condition that has been called dry gangrene, which is supposed to result from some peculiar irritant or poison acting upon the system. Now, certain plants, or rather, a diseased growth of these plants or grasses, when technically said to be ergotised, are supposed to produce this gangrenous condition. We have undoubted facts proving the effects of such diseased plants upon the human being; *but upon the lower animals I consider this peculiar action extremely doubtful; and recent experiments and investigations are decidedly opposed to this theory of ergotism as a cause of dry rot.*

It is recorded that in 1089, a pestilent year in certain districts of France, many persons became putrid in consequence of their inward parts being consumed by St. Anthony's fire. Their limbs were rotten and became black like coal. They either perished miserably, or, deprived of their putrid hands and feet, were reserved for a more wretched fate.

Christeson, in speaking of the action of the ergot of rye, says that "two distinct diseases have been referred to its protracted use, and since 1596 both of them have been repeatedly observed to prevail as epidemics in various parts of the European continent where rye constitutes a considerable portion of the food of man. One of these is termed convulsive ergotism, and is distinguished by the characters of acute comatose affections. The other is termed gangrenous ergotism, which commences with fever, and a peculiar feeling as if myriads of insects were creeping over the body, and in a short time dry gangrene of the fingers and toes, or even the legs, takes place, which drop off by the joints, and the patient either recovers slowly by granulation of the stump, or expires worn out during the process of repair. In regard to the action of fungoid and ergotised grasses upon the lower animals, I consider it is not well marked, and from the comparatively recent and careful experiments of Dr. Wright it seems extremely improbable that gangrene occurs in the domesticated animals from that cause."

In the treatment of hoof disease, the patient must be kept in a clean and comfortable place, and supplied with plenty of dry litter. The foot must be carefully examined, and the medical treatment must be adapted or varied in accordance with the stage of the affection. In

mild cases washing the parts daily with soap and water, and dressing with a lotion of carbolic acid, about one part of acid to twenty parts of water, will bring about a healthy action. In other cases a linseed meal poultice applied to the parts as soon as the inflammatory process is observed, will either abate the inflammation or hasten the suppurative process; and when the matters appear to form, the knife or lancet must be used to allow the pus to escape and prevent its extending inwards.

It is very often necessary to use the drawing knife to remove part of the wall, or give the matter a free opening at the sole. The granulations must be treated according to their extent. When very large they may be removed with the knife, and the surface touched with a mild caustic, as the chloride of antimony, carbolic acid, or the nitrate of silver, or the permanganate of potash. When small they can be effectually reduced by the action of the caustics mentioned.

Pressure is also beneficial in bringing about the healing process: and an easy and convenient method is to cover the parts with a pledget of tow saturated with carbolic lotion, and secured by means of a bandage, carefully and evenly applied around the limb and between the hoofs. If the toe is long it must be cut down so as to give the foot its proper and natural bearing.

There are other remedies which can be employed with very good success, their action being similar to that of the treatment I have mentioned. In using caustics they must be carefully applied. I have no hesitation in saying that many of the remedies frequently recommended and injudiciously applied are worse than the disease, increasing the pain and suffering in place of giving relief; and, in all cases, I cannot speak too forcibly of the great necessity of keeping the parts scrupulously clean. I believe diseases of the feet can be very much prevented by care and attention to cleanliness, and providing cows with comfortable and well drained stables, by keeping the feet in a proper condition; and during wet seasons, where the pastures are low and marshy, removing the herd to drier ground for two or three days at a time.

A serious drawback to dairy farming is the great yearly loss resulting from cows slipping their calves or aborting; and this misfortune appears to be on the increase. The usual period of gestation in the cow is nine months, or two hundred and seventy days; but the period of natural delivery may range considerably from the usual time. From close observation it has been noticed that the shortest period was two hundred and forty days, and the longest three hundred and twenty-one. Abortion is the act of expulsion of the fœtus before the completion of the full time of gestation. Of all the domestic animals the cow is the most subject to this affection, and it may occur at any time from the second to the seventh or eighth month, and usually about one of these periods corresponding to the period of alstrum or heat, it the cow was not in calf.

It is of most frequent occurrence among well-bred cows that are highly fed, and kept in what may be termed a somewhat artificial con-

dition. For experience tells us it is not so common amongst the wild animals of the bovine species. There are many other circumstances, however, that appear to produce abortion, through some influence either directly or indirectly, as injuries, over-driving, exposure; and on some occasions it assumes an epidemic or epizortic form,—possibly the result of sudden or extreme changes in the temperature which from their effect upon the system have a tendency to re-act upon the uterus and impair the connection between the fœtus and the mother. I have no doubt but it is also brought on from the eating of certain herbs or grasses; some of which may have a direct action upon the organs of generation, whilst others may prove injurious to the digestive organs, and affect the womb from the intestinal irritation created. It has been found that cows grazing on the coarse and rank grasses of low, marshy, and woody countries are very subject to abortion; and the same has been noticed from allowing cows to eat partially frozen turnip tops, or when covered with hoar frost. Youatt informs us that in Switzerland the commencement of the hoar frost is the signal for the appearance of abortion.

There is one circumstance attending abortion which is often noticed, and that is the rapidity with which the malady goes through a herd after one or two cases occur.

The cow is a highly sensitive animal in some respects, her sense of smelling being very keen; and, during the period of pregnancy, there is an increased irritability, rendering her very liable to sympathetic influences. She can readily detect the smell arising from the putrid discharge following abortion.

The fœtus is often putrid before it is expelled, and the placenta, or after-birth, is usually retained, becoming decomposed and dropping away in small pieces. The extremely offensive odour has a sympathetic and exciting effect upon other cows, as is very well exemplified by the state of excitement into which a whole herd is thrown when one of their number chances to be delivered in the open field. This sympathetic influence, I believe, is a great exciting cause.

Impure water, or an irregular and insufficient supply of liquids, may cause derangement of the system and form an excitant. I have also seen a few cases where it was attributed to the constant strain upon the posterior viscera, where cows have to stand with the fore quarters too much raised, as is the case in some stables.

The signs of approaching abortion are often very noticeable. There is dullness and uneasiness, rumination is suspended; and issuing from the vagina is a glairy discharge; the abdomen is enlarged, and the secretion of milk is impaired. If grazing in the field, she shows a tendency to leave the other animals, and occasionally there is observed an irregularity in the walk; the discharge from the vagina increases, and alters from a yellowish to a reddish colour; the labor pains come on, and the expulsion of the fœtus is sometimes attended with difficulty.

Whenever a case of abortion occurs, I cannot too strongly recom-

mend the necessity and importance of removing the affected animal from the rest of the stock. Even when any of the premonitory symptoms are shown I would advise segregation.

If the placenta does not pass away readily, it should be removed with the hand, which is very easily done, and the vagina and womb injected daily with carbolic lotion,—one part of the acid to forty parts of water. Also give a saline laxative, as four to six ounces of Epsom salts. It is advisable to have the byres well cleaned and aired, and the floors dusted every second day with a small quantity of the chloride of lime. The diet to all the cows should be restricted for a few days, to food that is easily digested, as bran mashes, &c.

In connection with parturition, there is a disease which appears to be on the increase in this country, and is known as "parturient apoplexy," or dropping after calving. It is one of the most serious affections to which the cow is liable, being so rapid in its course, often terminating fatally in a very short time.

It is a blood disease, which is characterised by the great tendency to a congestive state of the bloodvessels of the brain, and also the spinal cord, and frequently involving the sympathetic ganglia; hence the name parturient apoplexy, which explains its true nature. It occurs in cows of any breed, and especially such as are good milkers, and in a plethoric condition, apparently arising from the volume of blood not being directed to its proper channel for the secretion of milk, and being thrown upon the system producing cerebral disturbance.

Perhaps one of the most noticeable characteristics of this disease, is the alarming rapidity with which it is developed, very often attaining its full height in the course of six or eight hours; and it generally appears from the first to the third day after calving, and the earlier it comes on the more fatal it is.

A marked peculiarity of parturient fever is, that it has seldom or never been known to follow abortion, and generally attacks cows in their prime when they are in the most vigorous milking condition. It rarely occurs with poor milkers, but attacks those that give a large quantity of milk. No doubt the increased prevalence of this disease in many quarters, is due to the increased amount of artificial foods that are used; and with the advance of our agricultural enterprise, the aim of owners is to keep their cows in very high condition. No doubt good feeding is necessary in dairy stock to obtain good returns; but in some cases it is carried too far, and disease and death are the result.

The symptoms of this fatal complaint are unmistakable. After calving, the cow does not give her natural quantity of milk, and the yield gradually diminishes at each milking, and for a short period there may not be any signs of pain or fever; but soon the eye looks dull, she staggers in her gait, appears weak in her hind legs, and drops to the ground, and perhaps makes a few ineffectual attempts to rise. The secretion of milk is impaired, or altogether arrested; the bowels are unmoved, and the urine retained within the bladder; the eye appears perfectly fixed in its socket; the mouth, ears, and horns are

intensely hot; the pulse is quickened, and the breathing labored; as the cerebral symptoms become more and more developed, the eyesight is perfectly gone; the nerves of vision are paralysed, producing a widely dilated pupil; the head is turned backwards over the shoulder, and may be raised for a little and dashed violently to the ground; there she lies moaning, and perfectly insensible to all surrounding objects.

The pulse becomes almost imperceptible, and if you raise the head it will fall again like an inanimate body; the legs are cold, and occasionally there is a tendency to convulsions, followed by complete prostration; she lies without having the slightest power of motion; all sensibility gone, and death may occur from twenty to fifty hours from the beginning of the attack.

Parturient apoplexy, as I have just mentioned, is very fatal, and when the alarming head-symptoms are shown, its treatment is anything but satisfactory.

The treatment must be energetic. In the early stage, before there is a complete loss of power, I strongly recommend bloodletting; six or eight quarts should be abstracted; but it must be done in the early stage of the disease.

When coma and paralysis has supervened, bleeding is not attended with benefit. A full dose of purgative medicine should be administered without delay, as a pound to a pound and a half of Epsom salts dissolved in two or three quarts of water. Apply ice to the head, and cover the body warmly. An enema of soap and water, to which may be added two ounces of spirits of turpentine, should be given every two hours; and it is frequently necessary to use the catheter in order to relieve the distended bladder. The liquor ammonia should be given in two or three drachm doses, largely diluted with cold water, and repeated every three or four hours. The limbs and udder ought to be well handrubbed, and the teats should be drawn often, and the spine rubbed with mustard, and the general comfort of the patient must not be neglected. Great relief is afforded the poor sufferer, by turning her over from one side to the other, and by supporting the head in an elevated position by means of bundles of straw.

In this disease, medicines must be given with great care; for when the comatose symptoms are coming on there is a difficulty in swallowing, and the drench, if too quickly or too forcibly given, may partly pass into the larynx and trochea and produce suffocation.

I have no doubt but many of you have seen cows suddenly die with symptoms very like those of asphyxia, immediately after the careless and forcible administering of medicines; and I am confident that many animals are so destroyed.

When the comatose condition is fairly established, it is almost an impossibility to give medicines without the aid of a stomach pump, and in many cases it is better and much safer to persevere with the external applications and the free use of medicated clysters, and avoid the risk of suffocating your patients.

I have endeavoured to point out the causes and the treatment of this very serious and fatal malady, and I feel sure that with judicious management it can be prevented in a great measure, which is certainly more satisfactory than treatment.

As a matter of course, I may say, every stock owner, and every attendant upon dairy stock has a natural desire to keep the animals under his care in good condition, not only for the sake of appearances, but with the view of adding to or increasing the returns. It is the amount of food that is given to cows before parturition, and immediately afterwards, that brings on the disease: it is wholly the result of the full or plethoric state of the system; and this state can be counteracted by very simple and safe means.

For eight or ten days before calving, the animal should only be allowed a limited quantity of food; and after parturition, the food should also be restricted for some time. It can be gradually increased after four or five days, and when the secretion of milk is taking place in a regular manner.

No doubt the cow, for a short period, would not yield such a quantity of milk as if she was highly fed; but the temporary loss would be amply counterbalanced by escaping the dangers of parturient apoplexy.

When an animal is in excessive condition, a few doses of laxative medicine may be given; but in the majority of cases, restriction of diet will have the desired effect.

The udder or mammary gland of cows is very liable to disease. It often becomes inflamed, and the condition is known as mammitis, garget, felon, &c.

This affection proves very troublesome, from interfering with the function of the udder, either temporary or permanently. It may attack the whole organ, or be confined to one quarter.

It occurs in two forms; in the one the inflammatory process is situated in the mucous membrane and skin covering the gland, which feels hot and tender, and also reddened and swollen; there is fever, as is indicated by the dry muzzle, hot mouth, and quickened pulse; the animal may evince pain and distress in progression, and often one of the earliest symptoms is lameness in one of the hind legs.

The milk is curdled and mixed with streaks of blood, showing that an acid secretion has been formed; not unfrequently, abscesses form in the gland, followed by profuse suppuration, completely destroying the structure of the part. Mammitis may be caused by improper milking, as irregularity in the time of milking, or from sudden changes of temperature.

In the months of August and September it is common, and is produced by the heavy dews during the night, and the heat in daytime; and it often results from exposure to wet and cold, and from mechanical injuries, as blows or injuries from other cows.

If attended to in the early stage, and proper remedies applied, the symptoms are easily allayed. When occurring during the hot

season, the udder should be fomented with warm water, three or four times a day, and well dried and handrubbed; and a good dose of laxative medicine, as half a pound of Epsom salts.

The heat and moisture to be of benefit must be continued, and a convenient and effectual method is to apply a cloth over the udder, leaving holes for the teats, and securing by means of a bandage around the body.

The udder can then be covered with wool or tow, which should be kept moist by renewed applications every hour. The teats should be drawn regularly every four hours, and when milking is attended with great pain, the syphon should be used; it is a very simple and useful instrument, and every owner of cows ought to have it convenient.

In cold weather the cow must be kept in a comfortable place, and fed upon bran, and at other seasons green found in small quantities is preferable. In extremely cold weather, unless the animal is in a very warm stable, hot fomentations are seldom attended with any benefit; and instead, I recommend the udder to be stimulated several times a day with a mild camphorated liniment, and the body must be well clothed.

Many other remedies are applied; but I have just mentioned those that can be readily procured, and when resorted to in proper time, will frequently check the progress of the disease. Blisters and irritant dressings I do not advise, as the most desirable results can be accomplished by these safe and simple remedies.

The teats are liable to warts and other abnormal growths, both externally and internally; and although they are not attended with any serious consequences, yet they often create an irritation and suffering that may impair the secretion of milk, and also render the operation of milking difficult to perform.

When situated in the inner part, they may be felt on compressing the teat between the finger and the thumb, and can be removed by means of a silver probe, or by the concealed bistoury; but in doing so, no unnecessary violence should be used.

When forming externally, they can be removed either by the knife or ligature, and the parts dressed with a mild caustic, and afterwards applying morning and night, immediately after milking, a small quantity of sulphate of zinc ointment,—about one drachm of the sulphate to an ounce of lard.

Many a valuable cow becomes, comparatively speaking, worthless from stricture of the milk duct, which may diminish or completely stop the flow of milk; the stricture is often brought on from exposure to cold, or it may be caused by growths or tumorus irritating the mucous membrane.

Frequently, in young cows, the opening of the teat is not sufficiently large to allow the milk to flow freely, and the increased force required to draw the milk from the quarter may induce disease.

Most of such cases can be relieved by the use of the concealed bistoury, which can be safely introduced into the teat, and the duct enlarged.

I mentioned in the beginning of my address, that considerable alarm has lately been created in the State of New York, from the appearance, amongst the cattle in various districts, of a disease called foot and mouth disease. It has also been stated that the malady has been introduced through the medium of Canadian cattle going directly from Canada.

Gentlemen, it is my firm belief that the disease in question is altogether unknown among the cattle of our Province; and if they have it in the neighboring republic, in all probability it has been imported directly from England.

It may not prove uninteresting to notice briefly the nature and symptoms of this complaint, as many of them are similar to other affections that are not of a contagious nature.

The name foot and mouth disease is applied from the symptoms developed in the mouth, and about the feet. It is also called "Epizootic Aptha," Excema Epizoolica, Murrain, &c. Epizootic aptha is an eruptive fever, attacking the cow, the sheep, the pig, and the horse, and is highly contagious. It first appeared in Britain about thirty years ago, and I question very much if that country has been entirely clear of the disease since that period.

Long before that time it was noticed on the continent of Europe, which appears to be the hot-bed for epizootic diseases of a contagious nature. In 1861, aptha prevailed to an alarming extent in England, and during the past year has again broken out with increased violence. According to the *Veterinarian*, of December, in the month of October, there were over 3,000 centres of infection in Britain.

Epizootic aptha is a disease that is easily detected: it generally begins with a shivering fit, after which there is a marked dullness, a staring coat, and an increased frequency of the pulse; the temperature of the body is increased, which can be readily detected by a small thermometer introduced into the mouth or rectum; the appetite is impaired, and there is a discharge of saliva from the mouth, of a ropy, sticky nature; rumination is suspended, and the animal grinds its food; there is lameness in the feet, and small ulcers appear in the divisions of the feet, and also around the coronet, and the whole secreting structures may be so severely inflamed as to lead to casting off the hoof. Vesicles also appear on the mucous membrane of the mouth, and on the tongue. These vesicles vary in size, and very soon burst and discharge their contents, and the whole mouth presents an ulcerated condition, giving the animal great pain, and unable to masticate the food. In some cases there is a peculiar smacking of the lips, as represented in this plate. In milk cows, the vesicles also appear on the udder and teats, and are usually well raised, and soon burst and discharge a clear fluid.

The period of incubation varies from two to four days, and in the most of cases the fever subsides in about four or six days after the prominent symptoms are developed, and in ten to twenty days the animal will be convalescent. When occurring in dairy cows the milk

is unfit for use; but otherwise it is not a severe disorder, and is anything but a fatal complaint. The other day I noticed an account of cases in an English paper, and out of 7,429 cases, only 11 had proved fatal: a very small per centage of deaths. In the treatment of epizootic aptha, good nursing and cleanliness are the essential remedies.

In concluding my remarks, I would add an additional caution, as the disease is so near us, and of so highly contagious a nature. It would be well for our own authorities to be on their guard against the introduction amongst our cattle of this troublesome disease, from which, happily, they are exempt.

AN ADDRESS

DELIVERED BEFORE THE CANADIAN DAIRYMEN'S ASSOCIATION, AT INGERSOLL, CANADA, WEDNESDAY, FEB. 1ST, 1871,

BY

PROFESSOR GEORGE BUCKLAND,

Secretary of the Bureau of Agriculture, Toronto.

Dairy Husbandry as Affecting Canadian Agriculture.

It affords me much pleasure to meet with you at this annual gathering. This is the first opportunity I have had of meeting the members of the Canadian Dairymen's Association. I was through this district, a few years ago, just as the factory-system was about to be inaugurated. The County of Oxford now ranks exceedingly high in this most important branch of Canadian agriculture. I have had the gratification of knowing and esteeming a gentleman residing in this neighborhood, whom I might designate the father of the dairy and cheese manufacture in Canada. I allude, of course, to Mr. Ranney. I regret, Mr. President, the circumstances to which you referred in your opening address, that we have not reliable statistics of the extent and value to which the dairy business has arrived in this Province; but I am sure, when the census which is about to be taken is completed, and we have obtained accurate knowledge of the extent to which the manufacture of butter and cheese has obtained, we will find that, compared with the other Canadian agricultural industries, dairying is far more valuable than we have hitherto supposed. I am sorry that I have been unable, through press of business, to arrange my thoughts as I would like to have done, and committed them to writing. I must, therefore, ask your indulgence while I attempt to address you extemporaneously.

The history of Canadian agriculture leads us back to but a comparatively recent date Fifty years ago, instead of these fine towns, villages, and cultivated farms, nearly the whole of this large and wealthy district was covered with an unbroken forest. The first efforts of the new settler are of course devoted to the work of denuding the forest of its trees. This, I believe, has in some instances been carried

a little too far, and our climate and crops suffer thereby. The primary object of the new settler is to raise sufficient produce for himself and family, and provide means for carrying the surplus, if any, to the best market. At first our soil and climate, especially along the lakes, appear to have been peculiarly favorable for the raising of the finer varieties of winter wheat. As this was almost the only grain which at that time commanded a cash price, nearly the whole energies of the new settler were devoted to its production.

This was carried on year after year with little or no intermission, as long as a remunerative return could be obtained. We all know the results of such a course. There was soon a falling off in the yield, which became subjected to a gradual diminution. When I came to the country, 24 years ago, there were nearly whole counties where farmers could generally calculate on raising 15 to 30 bushels per acre, which, in a few years, produced scarcely any winter wheat whatever. At this early period to which I refer, it will be remembered that other products, especially cattle, butter, cheese, &c., commanded a very inferior price. The restrictions formerly placed upon the importation of grain into England from foreign countries, certain privileges being given to the colonists, the raising of wheat in Canada was for a number of years a profitable operation.

Soon, however, we were placed on the same footing as foreigners, by the introduction of free-trade. This, together with the diminished produce caused by the gradual exhaustion of the soil by over-cropping, placed Canadian agriculture, about the year 1847, in a very perilous situation. A change for the better was soon manifest, however. The reciprocity treaty with the United States was mutually agreed upon, and the value of cattle and dairy products advanced materially; a most fortunate circumstance at this trying juncture, when so large a portion of our virgin soil had become, by over-cropping, incapable of raising wheat as formerly; it was, I say, peculiarly fortunate that at this time an increased demand arose for stock and dairy products. The gradual failing of the wheat crop was caused by the imperfect system of cultivation, and the farmer's difficulty chiefly arose from the depending upon almost exclusively one kind of grain.

The indiscriminate removal of the forest, no doubt, has had in some districts an injurious effect; but the continual abstraction from the soil of those mineral ingredients constituting so large a portion of the food of plants, and which they imperatively demand, rendered them sickly, liable to disease, and an easy prey to insects. The midge, for example, and the Hessian fly, preyed upon them; blight and other maladies became gradually introduced, of which the early settlers had scarcely any knowledge whatever.

Now, it is a law of nature and of all good husbandry that if any property or ingredient be taken away from the soil by a particular crop, it should be returned by the application of manure, or restored by rotation and more thorough culture.

The business of the farmer is to endeavor to maintain the balance

between waste and supply, on which practically depend the success of his operations. As we had by continued wheat growing, to which the farmers mainly looked for their cash, comparatively exhausted much of our land, it was essentially necessary that a new and improved system of husbandry should be introduced, and it was peculiarly fortunate that the dairy business was at this critical period of our agricultural industry successfully inaugurated. It came at the right time, and I am glad to see so much intelligence and perseverance displayed in its pursuit, and that it is proving so remunerative to those who are engaged in it.

In familiar phrase the land required rest. By a change of crops and improved cultivation, the same result may be obtained. Our fields have not ceased to be productive, by being converted into pasture; and in many sections of country, the raising of winter wheat has been greatly restricted, or almost abandoned, and the spring varieties considerably curtailed. The increased number of cattle, and the improvement of their breeds, have already proved of the greatest advantage.

To increase the milk-giving properties of the cow, and to keep up a copious supply of milk, will be found of increasing importance. It is the skill and perseverance of our dairymen, and dairywomen too—he might say of farmers and their wives and daughters—engaged in this branch of rural industry, to which we must mainly look for successful results.

The resting of land, or changing from one kind of grain or vegetable production to another, is of the greatest advantage. This, we learn, not only from the experience of modern times, but also from old Latin writers, who frequently speak of the rotation of crops and the necessity of manure. This resting of land by putting it into pasturage, has already added, and will more materially add to our wealth, as an agricultural country.

But I would observe, Mr. President, that it must not be understood that dairying, or the raising and fattening of cattle, does not take anything from the soil. It is well known that the breeding of young animals, and the feeding of milch cows, draw largely from the mineral ingredients of the soil. I will endeavor to throw out a few practical hints in relation to these matters. Many of them, no doubt, have occupied your thoughts before, but it is necessary to have these primary principles impressed upon us in order that we may always have them before our minds to guide us in our practice. There is one thing with refer-ence to pasture land, particularly worth noteing,—nothing is more unremunerative than poor pasturage. I can remember when a large proportion of the pasturage in the old country was of that description. These lands, it was thought, should never be ploughed up, whether the tenant had succeeded in getting a good kind of mixed grasses to grow on them or not. By draining, deep and thorough cultivation, they had been converted into highly productive arable land, and into pasturage again of the best description.

In Canada, a great deal of land laid down to grass was unremunerative, the soil having been, to a great extent, exhausted by over cropping. The same ingredients which go to form wheat, oats, barley, &c., are required to a considerable extent, in different proportions, for the clovers, timothy, and other grasses, which we cultivate for forage. It is, therefore, hopeless for the farmer to expect to turn exhausted arable land at once, without considerable expense and time, into good pasturage. I would suggest that we should cultivate less grain crops, and perform the work of preparation more thoroughly. The great problem to be solved is this, how to produce the largest amount, whether of grain, cheese, butter, milk, or fruit, year by year, so as to sustain, or rather increase the producing powers of the soil.

It is the easiest thing in the world to raise excellent crops for a number of years, from a naturally rich virgin soil, without returning anything to it in the form of manures; but the time will assuredly, sooner or later, come when such a primitive system of cultivation will cease to be profitable, and this point has already been reached over large areas of this continent. Therefore in laying down land to pasture, whether for two, three, or a greater number of years, we should take especial care to bring it into a proper mechanical and chemical condition; that is to apply such artificial means as will suitably affect its density, porosity, &c., to the depth required by the roots of the grasses, which should be of suitable varieties, and also to supply any deficiency of those ingredients required for their food. There is another subject which occurs to me, and which I see by the programme, is to form a distinct subject for discussion, viz., the kind of crops most profitable for soiling.

We labor in this country under some peculiar disadvantages with regard to the raising of grasses; and I might say cattle, butter, and cheese, owing to our climate. In England, it is not an unfrequent thing to find pasturage, which has come down from time immemorial, maintaining its productiveness apparently as good as ever, without any extraordinary labor or expense. Here, however, we cannot thus preserve our pastures on account of the frequent droughts of summer and the severe frosts in winter. But much might be done to overcome these difficulties by means of draining and occasional top-dressings, of which lime, in some of its combinations, would be most advantageous.

We ought to be making experiments upon the grasses themselves. There were varieties, the roots of which penetrate deeper than the common kinds, and might be found of great advantage to us in mitigating the influence of drought and frost. Under-draining and deeper culture generally, is as essential for the grasses of our pastures, as for wheat, oats, barley, &c.

There is a herbage plant called lucerne which, I think, could be grown to advantage on good, dry, calcareous soils. It has been slightly experimented upon in a few instances in this country, but not to a sufficient extent. It is exceedingly productive; roots deeply, perennial, and gives no unpleasant taint to milk, and is extensively

cultivated on the chalky soils of England and continental Europe. It belongs to what Liebeg calls lime plants. From 35 to 50 per cent. of its ashes are lime. This fact is sufficient to show us that if the soil does not contain this ingredient in sufficient quantities, it must be supplied by art, or its culture will prove a failure. There is another plant which I believe has not been tried in Canada,—Italian rye grass. It is a grass that has been introduced into England within the last quarter of a century, and is exceedingly productive. How it would succeed here it is impossible to say apart from experiment. Our climate might be too extreme without artificial care; but if we could get any of these grasses to succeed it would be of great advantage to our agricultural resources, such as would throw down roots in a deeply prepared soil from one to three feet, enabling them to defy winter frosts, and in summer to go through the most severe droughts, comparatively unscathed. I would suggest the desirableness of experimenting in this direction.

Another important subject to which I was going to allude, and which I see from the programme you intend to discuss is, the method of feeding the domesticated animals. I have long felt there was room for great improvement in this respect. Summer soiling, as it is termed, is highly spoken of by many who have fairly tried it. Instead of allowing the animals to roam in search of their food, it is taken to them in their stalls or yards. This is quite a new question in this country. Allusion has frequently been made to it in our agricultural papers, but like all other subjects relating to practical matters it must be tested and decided by reliable experience. You must experiment with this as with the grasses, and as you often do with the operations of the dairy. The Hon. George Brown is conducting an experiment on a very extensive scale, at the present time, on his extensive farm at Brantford. He expresses himself as being quite satisfied that soiling is the most economical; whether it ultimately prove successful in this instance or not, its introducer will deserve the thanks of the country for making the experiment. There is considerable waste, both in food and manure, by turning out stock promiscuously to roam over the pastures. It is also unwise, as a rule, to put horses, cattle, and sheep together in the same pasture. This is considered to be a most heterodox practice by the best grazing farmers of the old country. When the grass is long, put horses or cattle in first; and after they have gone over and cropped it to a certain extent, turn the sheep in, and as they bite much closer they will find plenty of feed which the others have left.

Soiling under some form is an old practice. We find it mentioned by the old Roman rustic writers, and the practice of "tethering" is also spoken of: that is, tying the animals to a stake by a short rope so that they cannot roam over the whole pasture, and thus prevent much of the grass from being spoiled for food. This system might sometimes be advantageously practised where only a few cows are kept, but it is objectionable during the heat of the day; for what would be gained in economy of food would be more than counterbalanced by the un-

comfortable condition caused by the exposure of the animals. Undoubtedly, soiling possesses very great advantages. In the first place there is a great economy of food; the same amount of grass taken to the animals, punctually as to time and in appropriate quantities, will go much further than if they have to roam in search of it. There is another advantage which is usually lost sight of, and that is, the increase both in quantity and quality of the manure. I am very well aware that in a new country, where nature has lavishly bestowed her gifts, and during the introductory state of agriculture, manure is often much too little thought of. But this state of things cannot continue long, and farm-yard manure must now be the Canadian farmer's sheet-anchor.

I have seen in Southern Illinois, where they grow corn from 12 to 15ft. high, year after year, on those rich prairies, with hardly a thought about manure; but even much of this land has become impoverished by the exhaustive treatment, and the descendants of the early settlers have learned to look upon manure as a most valuable thing, not to be neglected or lost.

I look, therefore, upon the introduction of the dairy business as a seasonable and most important means of improving the general agricultural condition of this country.

Dairy husbandry requires for its successful conducting close attention, order, and system; conditions that are of the highest importance to all students, young or old, of a progressive agriculture. The man who keeps a large herd of cows will find great demand on his powers of observation He must be regular in seeing that all his operations are strictly and timely attended to; and I have no doubt but that the habits of correct observation and punctuality will have the same beneficial influence on all the other departments of farming.

Much of our want of success is owing to a deficiency in those strictly business habits so essential to advancement in all the pursuits of life. We must conduct our operations on unerring scientific principles, as far as they have been determined, and not, as formerly, merely guess at things.

My poor mother, more than half a century ago, used to make pretty good cheese, though sometimes but indifferent, by this system of guessing. A thermometer was then unknown in the dairy, and even twenty years ago many dairy people determined the temperature by the finger, and it is wonderful how long they worked by "the rule of thumb;" a method that certainly ought now to belong to the past. You will now very seldom find those who conduct important operations exposing themselves to risks and losses in so very imperfect and slovenly manner.

Meetings of this kind are well adapted to develop and improve our farming and breeds of cattle, as well as to diffuse information generally upon those subjects connected with dairy husbandry. You

are setting an example which might well be followed in connection with other agricultural pursuits. By these Conventions much valuable information is obtained from the experience and practices of different persons, and we should especially encourage our young men and young women to take a lively interest in these subjects.

I regret that I could not find time to put on paper my thoughts, and bring them before you in a more distinct and comprehensive manner. I shall have much pleasure in listening to the observations of gentlemen in relation to the various subjects that may come up for discussion, and shall be most happy to furnish what little knowledge I may possess in connection with them, and help forward the growing interests of this most useful organization.

AN ADDRESS

DELIVERED BEFORE THE CANADIAN DAIRYMEN'S ASSOCIATION, AT INGERSOLL, CANADA, FEBRUARY, 1871,

BY

C. E. CHADWICK, ESQ.,

Of Ingersoll.

Mr. President, Members of the Canadian Dairymen's Association:

Ladies and Gentlemen:

It affords me great pleasure in meeting you again at this our Annual Convention. The occasion, I hope, will be one of interest to all, especially to these immediately connected with the dairy; where the results accomplished by the ablest and most practical minds in the department will be ventilated for the benefit of the organization, which should be a school for mutual instruction, where the most successful dairymen should come to teach us by their practical knowledge, how much intelligence and skill, guiding the hand of labor, can effect in advancing this great interest! Being fully satisfi d in my own mind, that precisely the same principle prevails here as in all other departments of human industry,—the principle that intelligence, other things being equal, makes the superior dairyman. Dairy productions have now become of great pecuniary value in our country; they form no inconsiderable amount among our exports; our stake in these articles is so great, the amount of capital and labor invested in cows pastures, and meadows is so large, that we cannot afford to be ignorant or careless with respect to anything which will augment the annual product of our dairies or improve their quality.

The production of good cheese and butter is no more costly or laborious than that of poorer articles. What is most needed to produce an abundant supply of the best products, is knowledge, tact, and well-diverted industry. Cheese-making, like every other branch of manufacture, requires knowledge and skill: it is a nice chemical as well as mechanical process, made up of a multiplicity of small items, requiring the whole time and attention of the manufacturer; and it follows, as a matter of course, that any mistake or anything wrong, however small in itself, may be sufficient to injure the product and lessen its value.

One of the first items of knowledge the practical dairyman should aim to master, is the exact nature of the substance which forms the basis of his operations,—I mean the composition of milk, a few remarks on which may not be out of place on the present occasion. And I will here state that in the following remarks upon this branch of the subject, I am largely indebted to a prominent scientific Agriculturist of the adjoining state of New York, whose well-stored mind has contributed largely to the agricultural literature of the country. I refer to the Hon. J. Stanton Goold.

Milk is a fluid composed of different natures, whose elements are not all of them chemically compounded; when separated from the cow, they soon react upon each other, and in a short time the character of the fluid is entirely changed, so that the identity of the primitive and secondary forms can hardly be recognized. It contains a fatty substance, enveloped in delicate membranes which is called butter; a nitrogenous substance called casein, which is the base of cheese; a sweet substance resembling common sugar in many of its properties, but differing from it in others, called sugar-of-milk; some saline matters and water. It is slightly heavier than water in the proportion of 103 to 100 lbs. One hundred pounds of milk contains of casein, $4\frac{48}{100}$; of butter, $3\frac{13}{100}$; of sugar-of-milk, $4\frac{77}{100}$; of saline matter, $0\cdot\frac{66}{100}$, and of water, $87\frac{02}{100}$. This is the general average composition, but it varies in different breeds of cattle, in different modes of feeding, and different surrounding circumstances. These elements, you will see, resolve themselves into three different groups. 1st. Casein is a nitrogenous body, consisting of nitrogen, carbon, oxygen, and hydrogen, which are the elements of water. 2nd. Water, butter, and sugar-of-milk which consists of carbon united with the elements of water in different proportions. 3rd. Saline matters, consisting of the phosphate of lime, magnesia, and iron, and the chlorides of potassium and free soda. It is the function of the free soda to act as a bond of union between the casein and the water which, except for it presence, could no more unite than oil and water. The butter globules are mechanically suspended, not chemically united with the milk.

The first change which takes places after the milk has been drawn from the cow and set aside to rest, is the ascent of these globules, which, being specifically lighter than milk, arrange themselves on the surface. This change begins as soon as the milk is at rest, and continues up to thirty-six or forty hours, according to the temperature and electrical condition of the atmosphere, when they are completely separated from the milk and called cream. The second change which ensues after the milk is drawn from the cow is the transformation of sugar-of-milk into lactic acid, a substance which gives sourness to buttermilk. The casein, or cheesy portion of the milk, immediately begins to absorb carbon, hydrogen, and oxygen from the sugar-of-milk with a rapidity adjusted to the condition of the atmosphere, and as soon as eighteen atoms of each have been thus absorbed the transformation of the sugar-of-milk is completed, and it is changed into lactic acid.

The third change is in the combination of the lactic acid thus formed with the free soda, which, as I have said, holds the casein in solution.

The fourth change consists in the separation of the cheese or curd from the other portions of the milk in consequence of the formation of the lactic acid. This separation is hastened by an increase of the temperature. Thus you often see milk which, gives no appearance of a change, curdle as soon as it is poured into hot tea or coffee.

These four changes always take place in obedience to the inexorable laws of nature, but the rapidity with which they are effected and the character of the results may be greatly modified by human skill and ingenuity. Milk is most sensibly affected by surrounding circumstances. Its absorbtive properties are almost incredible until demonstrated by actual experience; hence the necessity on the part of dairymen, that it should be prevented being exposed to any sort of contagion offensive to the human nostril. Neither good cheese or butter can be made from milk that has undergone the least taint. Let the dairymen make a note of these facts and govern themselves accordingly.

Another important feature which should occupy or receive more attention from the dairymen, is the best means that can be taken to increase the quantity of milk from a given number of cows. The idea that quantity is influenced by breeds is, I think, a generally admitted fact, though there may be some who still adhere to that exploded theory that the breed is in the mouth, and assert that the best fed cows are the best milkers. That the quality and the amount of food does influence the flow of milk to a certain extent cannot be disputed, but experiments oft repeated, with very great care, under great variety of circumstances, have demonstrated that there is a great difference among different breeds in regard to the yield, both in quality and quantity. The observing practical dairyman must be well aware of these facts, and will know how to apply the remedy. The importance of growing good dairy stock cannot be too strongly urged upon the dairy farmer of our country. The time is not far distant when the dairymen will find it impossible to run a dairy on high-priced lands, with cows only averaging from 300 to 400 pounds of cheese. Oxford, at least, as the pioneer dairy county, should be noted for its improved breed of dairy cows, as well as for its large amount of dairy products. A poor cow should be disposed of at the earliest possible moment, and her place filled with an animal capable of yielding a larger profit. Every dairyman should strive to bring up the yield of his herd to an average of from 600 to 700 pounds of cheese per cow. The latter amount has been often reached, but in order to do it resort must be had to judicious breeding and raising stock on the farm, and not to the practice of annually filling up the herds with culls from other farmyards. Most dairy herds can boast of at least a few extra cows for milk, and stock from these should be selected and reared.

Good and experienced dairymen are becoming more and more im-

pressed with the importance of getting together a herd of cows that are good milkers, and in purchasing do not stick at price if quality can be obtained. There is, of course, great difference in the capacity of cows to give milk, and this capacity does not wholly depend upon careful breeding and a selected herd. The question of good and abundant food is closely allied to that of breeding. A large yield of milk will not be forthcoming if an abundance of good wholesome food is not liberally supplied, hence it is poor economy to overstock pastures. The actual requirements of the animal must be first attended to, life must be supported, and the waste of the system constantly going on has to be made up first, and after that the cow is willing to convert surplus food into milk; but if the pasture is overstocked, and the feed depreciated in value by drought, and such like causes, the yield of milk as a consequence must fall off, and the experienced dairyman will attest to the fact that when the flow of milk has been checked for any length of time, in consequence of such depreciation of food, it is difficult to get the cow back again to the old standard. The only effectual remedy in these cases is soiling, and every dairyman should avail himself of this simple remedy. Corn sown broadcast or in drills is admirably adapted to restore the flow of milk. It is nutritious and succulent, and, perhaps, second only to clover for this purpose. It is a profitable crop to raise, as an immense quantity can be grown to the acre, and there need be no loss in growing it, as any that is not required for soiling may be cut and cured for winter use, making excellent fodder. No one who keeps a dairy should neglect to sow a patch of corn to meet the probable wants of his stock during the months of August and September, and if it should happen not to be needed the crop is not lost, but will pay largely for winter fodder. There may be occasional seasons when, with an abundance of rain, the grass is kept fresh and vigorous, and corn is not needed for soiling purposes; but such seasons are exceptions, and it is poor economy to base operations upon chance. There is probably not in the western peninsula of Canada so large a continuous tract of country that presents, in the aggregate, so much prime dairy land as the county of Oxford, and, as yet, it takes the lead in the quality and quantity of its dairy products. It is, in fact, the great central dairying region of the Dominion; but if this position is to be retained, it behoves the dairyman to call to his aid all the wisdom and skill that knowledge and the practical experience of the most enlightened dairymen of the day suggests. In this he will find a reward which always crowns persistent and wise efforts. I take it for granted all that are here to-day are after knowledge—knowledge not only to be found in books, but knowledge to be derived from the cultivated and experienced minds of their associates. The progress of agriculture has been immense in every branch. We can, in a measure, appreciate its extent by passsng over in our minds the changes of the past within the period of our recollection. When we look back upon the past, and trace up through all the departments of a former art the gradual steps which have led to the developments of the

day, I say, in view of these great results, it behoves us to look well to it that the interests of our agriculturists should receive timely and proper attention; and if the agriculturists of this section are determined to maintain themselves in the foremost rank, and carry their efforts forward to profitable results, there is need for a more thorough agricultural education.

The subject of education, with a particular reference to agricultural pursuits, is one of such great importance to our community and to every individual citizen that I feel unwilling to pass it lightly over. It is much to be regretted that a feeling should so generally exist among the farming community that the mere rudiments of education are sufficient for the boy who intends to be a farmer. I conceive there is no man in any profession or pursuit of life who will be more benefitted by the aid of a thorough education than the farmer, no matter whether he farms for the production of the dairy or cereals, or gives his attention to the feeding of animals for market, or to the introduction and improvement of stock. He is constantly brought in contact with the great laws of nature; and though he may and does learn much that is valuable from practical experience, yet how much more might he learn and communicate for the general benefit if that experience were utilized by a general intelligence and a knowledge of the laws and principles that govern all production! It is said with truth that agriculture is a growth like the plant it cultivates, and like the mind also; the more it is developed the more it yields. There is no occupation of life where extensive knowledge is more necessary than in the proper cultivation of the soil. Among all our pursuits, agriculture is the first in order in necessity and importance. Agricultural knowledge begets productiveness, as well as developes the wealth and progress of our country. We value most what we have gained with effort, and success is the result of confidence in our own powers. We love our country better because we have seen it improved by our own talents and industry, and identify with our own interests the existence of those institutions and pursuits which have afforded us security, independence, and the many enjoyments of civilized life.

In closing, let me say I sincerely trust that the efforts of this Association will result in spreading a large amount of knowledge to all who may come within its influence, and that every member of this organization may feel that both his knowledge has been increased, and his interests sensibly benefitted by being connected therewith.

CANADIAN DAIRYMEN'S ASSOCIATION.

Transactions at the Fourth Annual Meeting of the CANADIAN DAIRYMEN'S ASSOCIATION, held at the Town Hall, Ingersoll, on Wednesday and Thursday, February 1st and 2nd, 1871.

At half-past ten 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 P. R. DALY, of Belleville, the Chair was empowered to appoint a Committee of five, to present a programme on the order of business for this Convention. The Chair named Messrs. GEORGE HAMILTON, T. H. WILMOTT, GEORGE GALLOWAY, H. FARRINGTON, and C. E. CHADWICK.

COMMITTEE ON NOMINATIONS.

On motion of W. WILKINSON, the following Committee of five, on Nomination of Officers for the ensuing year, was appointed by the chair: Messrs. THOS. BALANTINE, JAS. HARRIS, H. LOSEE, D. PHELAN, and P. R. DALY.

COMMITTEE ON MEMBERSHIP.

On motion of GEORGE HAMILTON, the Chair appointed Messrs. E. CASWELL, ROBT. MCDONALD, D. WHITE, THOMAS BROWN, DAVID ELLIOTT, and W. WATSON, a committee on membership.

COMMITTEE ON FINANCE.

On motion of Mr. BOBEN, a Committee of three on Finance was appointed by the Chair, consisting of the following gentlemen, Messrs. W. S. YATES, E. Y. BODWELL, and W. WILKINSON.

The PRESIDENT stated that he should not be able to proceed with the business of the Convention until these committees had reported, and in the meantime it would be well to make some explanations in behalf of the Executive.

Mr. CHADWICK thought we should wait for explanations by the President until after the adjournment, when there would be a larger number present. And in all probability the explanations would then have to be repeated, if given now.

The PRESIDENT said he was quite willing. He would like as many to hear them as possible; but wished to economize the time of the Convention, and if anything could be taken to fill up the time he was quite willing to withhold them for the present. But he would say, for the guidance of the Committee on Order of Business, that there were several lectures to be delivered before the Convention, and they should be careful to fix the time at which they should be delivered.

Mr. P. R. DALY, of Belleville, suggested that the Secretary should furnish a list of the names of members composing the several committees appointed, and, as the report of the last Annual Meeting has not been printed, perhaps the Secretary could read the minutes, or a portion of them, as it would be a guide for the committees just appointed to work upon.

The PRESIDENT stated, that as the minutes were in his writing it might be difficult for the Secretary to read them, but he had the printed report which was published by the Ingersoll *Chronicle*, from which the information required could be obtained.

The SECRETARY then read portions of the report of the Convention for 1870, from the *Chronicle*.

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

AFTERNOON SESSION.

The Convention was called to order at half-past one, the President, JAS. NOXON, Esq., in the chair.

The Committee on the Order of Business made the following report:—

1st. Report of Committees.

2nd. President's Address.

3rd. Best method of curing cheese, and the proper method of ventilating curing-houses.

4th. Prof. Buckland's Address.

5th. Should not every dairyman practice soiling his cows in

connection with pasturage, and what crop or crops are best for the purpose?

6th. Mr. C. E. Chadwick's Address.

After adjournment,—The Annual Address by the Rev. W. F. Clarke.

On motion, the report was received and adopted.

ADDRESS OF THE PRESIDENT.

We again assemble together in annual convention with the labors of another year added to our experience in the great and important interests which this Association was organized to foster and promote. It is most gratifying to know that the past year has been one of unusual prosperity to dairymen, and to whatever extent this organization may have contributed to the enlargement of the dairy interests of the country, we may accept it as the goodly fruit borne by the united and well directed efforts of its members. It were indeed a most worthy and most noble pursuit which seeks to elevate the condition by augmenting the wealth of the agricultural classes; and these being the objects and aims of this Association, we invoke the aid of men of science and those of observation and practical knowledge, in making this one of the most important and valuable institutions of the land. Progressive and self-reliant as I know dairymen to be, I feel justified in predicting a proud future to the dairymen of Canada. Only let the same earnest spirit of enquiry and improvement continue to characterize our efforts, and the obstacles that remain to be overcome in establishing the character of Canadian cheese will disappear forever. Favored as we are in climate and soil and in the wisdom and economy of our institutions, we are in a position to compete with the world in supplying the market of Europe with the products of the dairy. Much has been already accomplished. The avenues of trade have been cleared of the dishonesty and fraud that have been systematically practiced by American dealers against Canadian dairies, and we have to-day a channel opened up to the principal British markets, through which our dairy produce can pass without having heaped upon it other taints and imperfections than those of our own defective making. A spirit of inquiry has been set on foot, and instead of the almost universal ignorance on the subject of milk and its products, which existed a few years ago, we hear almost every day discussions on the constituent elements of milk and its products, and the various influences and changes to which they are subject. For much of this information,—for many valuable improvements,—we are directly indebted to the discussions, investigations and publications of this and kindred associations. Still there is work to be accomplished to which our untiring energies should be given. We cannot yet afford to sit down and hug the fond delusion that we have reached perfection, and that there is no need for further exertion. We may now be even with the foremost, but we

have yet to win the race, and to be successful requires the full, free, hearty co-operation of every person connected with the business. It is a fallacy to suppose that there are antagonistic interests existing between the patrons of factories and factory men, as that which is for the pecuniary interest of one is for the interest of all. It will be admitted that, other things being equal, the higher the skill and the greater the experience of the manufacturer, the better the result obtained both in regard to quality and quantity. Skilled labor always commands a high price, and it is right that it should; the better the quality of an article of produce, the higher the price to be obtained and the better the market; a really fine article never goes begging for customers, and consequently the dealer is never fearful of heavy losses when his entire stock is strictly gilt-edged goods. Therefore, it is for the interest of the cheese factory patron to have none but highly skilled labor engaged in the manufacture of dairy products. The better the success of a factory the greater the amount of patronage, and the larger its receipts the easier it is to effect sales and at better prices, and the better the dealer likes to handle the goods. I would say to the patrons of factories, that it is to your interest to patronize those factories only which employ the highest class of skilled makers, remembering always that it is more for your interest to pay a skilled cheese maker two cents per pound for making your cheese than to employ unskillful ones gratis; and I think I shall be able to satisfy you that this is susceptible of perfect demonstration. It is a well understood fact that our best cheese makers are able to produce a higher yield of cheese from the milk received, while the difference between a strictly fine article of cheese and a medium one is never less than from one to two cents per pound; so that taking into account the increase in the yield and the difference in the price, and we have a difference of from two to three cents a pound between a highly skilled cheese maker and an ordinary one. That there are difficulties besetting the factory system of cheese making, those of you who have had experience in the business will readily admit; these are incident to the system itself; but there are perils and dangers to be found outside of the system which threatens to be more destructive to the capital embarked in the enterprise than all the difficulties of its inner workings. The reckless rivalry displayed in certain localities in cutting down the charge for manufacturing below a remunerative point presents a danger to the business at large, that those who are about to erect factories where the wants of the section are already supplied would do well to take heed. No satisfactory progress can be made, and I am bound to say no permanent success secured, unless patrons are willing to pay such a price as will enable factory men to employ the highest skill attainable in the superintendence of their factories. I feel that I cannot too strongly urge upon all connected with this business, whether milk producers, factory proprietors or dealers, to unite and help one another to bring about an end so important to the establishment of the system on a satisfactory and permanent basis.

He also stated, that it had been the intention of the Executive, to publish the report of last year, but from the meagerness of the statistics furnished, and knowing that the proceedings of last year's Convention were widely diffused through the public press, they thought to print a report so deficient in necessary statistics would be a waste of the funds of the Association.

During the year, the Secretary had been in communication with the Minister of Agriculture, with reference to obtaining at the time of taking the census, statistics of the dairy business throughout the Dominion. This he felt would be of great interest to this Association. The Minister of Agriculture replied that he would be most happy to co-operate with the Association, in securing so important an object.

We will, I trust be able to incorporate in one publication, a full report of both years. While I regret that a report of last year could not be satisfactorily printed, I think you will all agree that the wisest course has been pursued. There is no question but that Ingersoll has become the centre of commerce with respect to cheese, and thinking our dairymen should be in possession of the market prices, we secured their weekly publication in the *Chronicle*, for the year, for which we agreed to pay $25.

Having felt on former occasions the want of prepared papers, on subjects connected with the object of our Association, we have obtained the assistance of C. E. Chadwick, Rev. W. F. Clarke, and Professors Smith and Buckland, some of whom are expected to be remunerated. I am pleased to be able to state that the finances are in a more prosperous state than ever before, there being now in the treasury about $130. We are anxious that every member shall have an opportunity to express his views on the various subjects that may be discussed. As chairman of the Convention, I shall have to exercise my privilege of insisting that speakers shall confine themselves to the subjects before the Con ention.

BEST METHOD OF CURING CHEESE, AND THE PROPER SYSTEM OF VENTILATING CURING-HOUSES,"

Was then introduced, but owing to the absence of the person expected to open the discussion, it was moved by GEORGE HAMILTON, seconded by J. GALIVER,—"That the discussion of this question be deferred."—Carried.

The CHAIRMAN then introduced to the audience Prof. Geo. Buckland, of the Bureau of Agriculture, Toronto, who proceeded to deliver an able and interesting address on "Dairy Husbandry, as effecting Canadian Agriculture," which will be found on page 107 of this volume.

At the conclusion of Prof. Buckland's address, the subject deferred was again introduced for discussion.

The PRESIDENT called upon Mr. Farrington to open the discussion.

MR. FARRINGTON wished to be excused: Mr. Balantine was present, and he would prefer to hear from him.

The PRESIDENT said—I am sure I shall not have to repeat the request to Mr. Farrington. I hope we shall throw off that reserve which we naturally feel in the presence of so large and intelligent an audience. I do not like this distrust of one's abilities. We did not come here to be listeners merely. I think it would be well to make a rule, that no excuse will be taken. Let every one discharge his duty when the opportunity is given. On former occasions we have been largely indebted to Mr. Farrington. If he would make a beginning others would follow.

MR. FARRINGTON—What I said to the Chairman, I said sincerely. It was not a formal excuse. I feel I am not able to interest you; but if a few remarks from me will have the effect of loosening the tongues of others, I will do what I can to obtain that result. The question before us, "The best method of curing cheese," &c., implies that we are acquainted with the different methods, and can give the best. I do not know of any great difference in the modes of curing cheese. It should be in a temperature neither too hot nor too cold: about 70° is the standard. If too warm it cures too fast; gets up too much fermentation. If too cold it accumulates moisture, becomes pasty, sours, and has a bad flavor. As to the curing-house, it must be of sufficient size and so thoroughly ventilated as too keep up a constant supply of air, or the cheese would mould. The first drying-house he ever saw built in America was what is called a bank-house, with one story underground; the ground was very dry, the floor of the lowest storey being cemented; the upper was of wood. The cheese cured far the best in the upper storey; in the other, do what they would, they could not keep it from moulding. The natural inference from this is that there must be ventilation. It needs a dry atmosphere, and at the same time a gentle current. Opening the windows was not just the thing; still, to open them at the top may do. Strong currents should be avoided. A gentle sifting of the air through the floor or walls was what was needed. He preferred battened walls to plastered, as it admitted a certain amount of ventilation; yet plastered walls seemed to be required in spring and fall, for the sake of warmth. The common shingle roof will supply ventilation sufficient if there is no ceiling. If the house is two stories the floor of the upper storey must be supplied with ventilators

Mr. LOSEE, of Norwich, being called upon said, he had not made any preparation to speak on this subject, but would just

give his experience in curing, and ventilating curing-houses. The temperature of the curing-house requires to be about 70°. The building should be elevated about two feet from the ground. He preferred lathed and plastered walls, filled in with sawdust, as that was a non-conductor. He would ventilate from the bottom by means of iron grating, the holes being continued through all the floors. At the top of the roof he would have two large ventilators 4 by 6 feet. His theory was that as the coolest and purest air ascended from the ground, it in its passage through the curing-house would lessen the temperature 6 or 8 degrees. He would have tables rather than ranges. His tables were two feet high and three feet wide.

Mr. GALIVER said he had some experience, having built one of the first factories in Canada. An important question was, How best to heat a curing-house in the fall and winter. Since he had erected his curing-house he had dug a cellar underneath, in which he had a large stove, allowing the pipes to run underneath the ranges of cheese, in the form of a T. He found this far better than the old way of having the stoves in the curing-house, whereby those near the stoves would be melting, while others would be cold. His curing house was three stories. He could cure cheese better in three weeks now than he could in four in the old way.

Mr. JAMES HARRIS—He had tried stoves and hot air: the latter was far preferable. The cheese would cure faster and was of better flavor, besides it was a great saving of wood.

W. F. CLARKE, Guelph, asked what kind of hot air arrangements he used.

Mr. HARRIS—He used a large box stove, which would take four feet wood. This was placed in a cellar or hot air chamber, constructed underneath the building. The hot air is conducted by tin pipes ten inches in diameter, through holes near the four corners of the curing-room, and so on through the building having drums on the smoke pipe in the second and third stories.

W. F. CLARKE said he asked what kind of apparatus was used, because as soon as hot air was spoken of some would think it was a very complicated affair. You may heat a curing-house, public building, or private residence in this way very easily. A stove in a small brick apartment, with pipes to distribute the heat, was all that was necessary, with the exercise of a little common sense. He had constructed one for his own house by enclosing the stove in a simple galvanized iron box, and succeeded admirably in warming thirteen rooms. The same method may be adopted in a curing-house.

Mr. E. CASWELL did not think of saying anything, as there

were so many able speakers present, but for his somewhat extended observations in the construction and warming of curing-houses, he thought he could offer a few hints to factory men on this important subject. The first requisite was a good house, and the second to have it well ventilated. Mr. Farrington had spoken of plastered and board walls. He thought plastered walls far preferable, because they were warmer in cold weather and cooler in summer, and very much cleaner. There was great need of care and attention after the cheese was made. Many good cheese are spoiled in the curing. He thought that all curing-houses should be plastered: this was a great preventation of dust falling, and this was especially to be avoided in newly-greased cheese. It gave them a bad appearance. It does not do to open the windows: the wind is apt to crack the cheese. Heat generated from smoke pipes, as explained by Mr. Galiver, may be very good, but in practice was bad; as the smoke gave the cheese a taint. The hot air arrangement was preferable; and urged parties to go out to Mr. James Harris' curing-house, a short distance from town, and examine for themselves: they would find the thermometer about the same in the different corners of the room. Cheese could be cured in winter as well as in summer, in a properly heated curing-house. The building should be elevated a few feet above ground, and care taken in properly grating the ventilating holes to prevent the entrance of anything to injure the cheese.

Mr. WHITELAW, Beachville, said he would like to make a few remarks with reference to heating arrangements, although he had no experience in curing cheese. He thought the hot air preferable to the ordinary stove; but there was an element of heat that was thus far over looked. Most large factories are now introducing steam engines; and by a small additional expense, steam pipes could be introduced into the curing-room, and the steam utilized in generating heat during those seasons of the year when it was most needed. It would be found every way practicable and far more economical.

Mr. CASWELL asked how the steam could be applied for heating? It certainly would not be allowed to come in contact with the cheese.

Mr. WHITELAW—The steam is conducted around the room in pipes. He had put them into conservatories and other buildings with perfect success. Perhaps the largest cabinet-factory in the Province, viz., Jacques & Hay's, of Toronto, employing two or three hundred men, was heated in this way, and he saw no reason why it might not be introduced into the curing-house.

W. F. CLARKE thought much depended upon the dryness or humidity of the heat required. Steam might do for conser-

vatories; but if any were to escape, it would not do for the curing-room.

Mr. JAMES HARRIS—The heat should be dry. There was moisture rising from the cheese. He thought there would be too much moisture in rooms heated by steam.

Mr. LOSEE thought curing houses could be perfectly heated by steam; we could regulate it more easily. When at Utica, he saw factories heated with steam at a small expense, by running pipes all round the building above and below.

Mr. FARRINGTON would like to say, before this subject was disposed of, that he hoped from the remarks that have been made, no one would suppose there was no other method of heating, except by some complicated hot-air or steam arrangements, and would on this account be deterred from erecting factories. You may, by common stoves, carefully regulated, cure cheese well enough.

Mr. DYSON, London, explained more fully the system of heating by hot-air; that it was simple and easily applied. The heat may be increased by pipes passing back and forth in the hot-air chamber. He thought it important that the supply of air for heating should be secured from the side of the building by conductors, rather than from underneath. In fact to secure thorough ventilating at any season, with pure air, it must be brought from the side by conductors.

W. F. CLARKE would like to qualify the remarks of Mr. Farrington, with regard to stove heat. They were no doubt intended for the encouragement of beginners. We should not be satisfied with what would do: our duty was not only to find out the best method, but to adopt it. At the present time we should not be content with that which was considered well enough years ago.

JAMES HARRIS asked if any person present had heated by steam?

On motion of C. E. CHADWICK, the question was laid on the table.

SHOULD NOT EVERY DAIRYMAN PRACTICE SOILING HIS COWS IN CONNECTION WITH PASTURAGE, AND WHAT CROP OR CROPS ARE BEST FOR THE PURPOSE?

Mr. P. R. DALY, Belleville, being loudly called for, said he could not understand why they were so persistent in bringing him forward. Although a farmer, and having had something to do in the dairy business, his experience had not been so extended and varied as many present, and was therefore not able to throw much

light upon the subject. As far as his experience went, he had found great benefit from sowing corn, and feeding it during the dry season while green. It is invaluable during seasons of drought. He would introduce to the Convention Mr. Vanderwater, whose experience was much greater, and could interest them.

Mr. VANDERWATER, Belleville, agreed with the last speaker with reference to the great profit obtained by soiling. He sowed the large western corn on old sod, broken up. He fed it from the first of August to November. His was sown in May; but thought it might be sown some time later. As it would keep more tender after cutting, he allowed it to lay in the sun several hours to wilt, before feeding. He thought it would produce more milk.

A DELEGATE—What did your cows average?

Mr. VANDERWATER—My cows averaged $39.50 each, in seven months.

Mr. BALANTINE, Perth, said he had promised his physician not to speak. The most profitable principle brought out in dairying was that of soiling. If we assume that the cow is a mere machine for the manufacture of milk, then it becomes indispensably necessary, in order to obtain the best results, that she be supplied to the greatest possible extent with the milk-producing material. In July and August, when the pastures fail, it is of the greatest importance that an abundance of succulent food be supplied, in the shape of corn or some other green crop. The Hon. George Brown contemplates soiling altogether: and doubtless a larger number of cows can be kept on the same quantity of land. He had visited a dairy in the county of Addington at which astonishing results of soiling were realized. He had made particular enquiry as regards the number of cows, patrons, &c.

Mr. NEMO, in connection with this factory, had realized to the fullest extent that the cow was a machine. From five cows, —Ayrshires, Durhams, and Alderneys—which he had soiled all the time, more or less, feeding them some grain in addition to the green food, he had obtained 3,700 lbs. of milk, averaging 720 lbs. of cheese, or $72 per cow. This was for six months, exclusive of Sunday's milk. It is evident that the milk goes in at the mouth: just as the cow is fed will the yield be. He knew of no crop for soiling equalling the western corn.

Mr. CLARKE asked how it was kept in a green, secculent condition.

Mr. BALANTINE—After cutting and curing a few hours in the sun, it was set up in shocks in the field. One acre was sufficient for eight or ten cows.

Mr. FARRINGTON—The last speaker has well said the cow

is a machine. She is a milk machine. The contents of the flour bin depends upon what you put into the hopper. A certain amount was necessary to keep the mill in running order. The surplus she is ready to work up into milk. We cannot always have corn as easily as we have drought. At Utica, when this question was discussed, the decision came to was that a variety of crops for soiling, such as rye, grasses, and corn should be sown. He believed that no other possessed to as great an extent the succulent milk-producing properties as corn. And it will grow too when the season is too dry for anything else. As to the manner of sowing it matters little whether it was in drills or broadcast. He had raised it in drills for twenty-five years, and if sown thick it would not grow too large. Corn was found to improve the quality of cheese.

Mr. JANES observed that if we were to have a repetition of the past season, with its multitudes of flies to pest our herds, it would be of the first importance to every dairyman to be prepared to furnish his cows with a supply of succulent green feed. The cows had refused to go to the pastures. Under such circumstances, soiling was absolutely indispensable. He had obtained large results from sowing broadcast on rich sod, ploughed either in the fall or early in the spring.

Prof. BUCKLAND had been on Mr. Brown's farm in October, and he was then soiling with corn and beans,—chopping them by machinery. The European horse-bean was admirably adapted for this purpose, and it would be wise if it could be introduced into Canada. There is no kind of grain that I am aware of that makes so much muscle as the horse-bean. By sowing very early he thought they might be raised successfully.

Mr. JAMES HARRIS believed that all dairymen were convinced that soiling was beneficial. Low lands might not need it as much as high lands: yet it would pay well for the labor and expense. In the case of two of his patrons, each milking about the same number of cows, one had corn to feed when the dry weather set in, the other had none. The falling off of milk of the one not feeding corn was very marked, and in the end made $80 difference. We cannot sow too much, as it is excellent for winter feeding. The sweet variety, he thought, would be better, as it grew in suckers from top to bottom; and not being so tough, stock would prefer it, especially late in the fall. He would sow corn on good, rich, clean land, well cultivated. Whenever he had sown on sod the wireworm had nearly destroyed the crop.

On motion of G. HAMILTON this question was laid on the table.

The CHAIR introduced C. E. Chadwick, Esq., of Ingersoll, to the Convention, who proceeded to deliver an address which was highly appreciated by the large audience. This address will be found on page 114 of this volume.

On motion, the Convention adjourned, to meet a 7 o'clock.

EVENING SESSION.

At seven, the Chair was taken by the President..

Moved by P. R. DAILY, seconded by G. HAMILTON, that a Committee of five be appointed to fix the next place of meeting. Said Committee to consist of Messrs. Farrington, Balantine, Caswell, Wilmot, and the mover.

Mr. CHADWICK said this resolution was taking a power out of the hands of the President which had hitherto been conceded to him, namely, the appointing of Committees.

Mr. CLARKE said there was another objection: it gave the power of fixing the place to the Committee instead of leaving it in the hands of the Convention.

Mr. CHADWICK moved in amendment, seconded by J. GALVIN, that the President be empowered to appoint a Committee of five, to recommend the place for holding the next meeting,—to report to-morrow morning.—Carried.

The PRESIDENT named Messrs. Chadwick, Daily, Phillips, Hamilton, and Farrington.

The Rev. W. F. CLARKE, of Guelph, Editor of the *Ontario Farmer*, was then introduced by the President to the Convention, and delivered the annual address. It will be found in full in this volume, beginning on page 67. The speaker was frequently applauded by the large audience.

At its conclusion, E. V. BODWELL, M.P., in a few appropriate remarks, moved a cordial vote of thanks to Mr. Clarke for his entertaining address, which was ably seconded by Mr. CHADWICK.

On motion of C. E. CHADWICK, the Convention adjourned, to meet again at 9 o'clock in the morning.

THURSDAY MORNING, 2nd February.

The Convention met pursuant to adjournment.

The PRESIDENT in the Chair.

The SECRETARY read the second report of the Committee on Order of Business, which, on motion of Mr. CLARKE, was adopted.

The Committee appointed to recommend the place for holding the next convention, reported, recommending Ingersoll.

Mr. CHADWICK moved the adoption of the report.

Mr. DAILY moved in amendment that the next Convention be held in the town of Belleville.

Mr. DAILY—At the last meeting he was given to understand by more than one person, that if the meeting of 1871 was held at Ingersoll, they would consent to have the next meeting in Belleville, and he thought by such a course the great interest of the Association would be best considered. It was not thought advisable to go to Toronto, a large commercial city. The county of Hastings was but in its infancy in dairying: great advances had been made during the past few years. He felt it would greatly increase the interest in the eastern section, and believed the system of joint-association was carried on to a greater extent in Hastings than in Oxford. There were enough people here from Belleville to guarantee that if it were taken there once we might depend upon its coming back again.

Mr. BENJ. HOPKINS moved in amendment to the amendment, that the constitution be amended by making Ingersoll the permanent place for holding the annual meeting. He thought the perambulating system a bad one, and would be dangerous to adopt, after we had, by hard work, succeeded in making it what we saw it to-day. Ingersoll was, no doubt, the most central place that could be found. We were pleased to learn that so great an interest in the work was extending in the eastern counties, but it was also extending in the west. Hastings might have an organization of its own, and would be found beneficial; but Ingersoll would certainly be the main centre of the dairy interest. He saw no good reason why the Convention of the Canadian Dairyman's Association should be moved to another place, and had much pleasure in moving the amendment.

Mr. GRIFFIN seconded the amendment. It was cheering to hear that such an interest had been developed in the east in dairying. And would be pleased to hear of their outstripping, if possible, even the old county of Oxford. To the west of us there were over 100 factories going up this season. The interest is widening each way. And it would be a hardship and a tax on western people to go so far east as Belleville, some as far as 100 to 150 miles west of this. Our object should be, to have the Convention where it would accommodate the greatest number. He had much pleasure in seconding the amendment.

Mr. JAMES HARRIS—It had been said that if the Convention were moved to Belleville, our American friends would attend.

They had never changed their place of meeting, and by their example we are taught to make ours permanent also.

Mr. DAILY—It would be an injustice to represent that Belleville was the extreem eastern limits of the cheese making interest. We have a larger east, than you have a west.

Mr. LOSEE said he had frequently attended the Convention of the American Dairymen's Association, held at Utica, for the whole Union, and he never heard the idea broached of moving it from that place, neither had he ever seen any eastern men from Belleville there. He thought that the interest of this Association would not be enhanced by changing.

Mr. W. F. CLARKE—I have no personal interest in either place: it might be that I am the better qualified to judge the matter. Taking a broad view of the whole snbject, he had a strong feeling in favor of Ingersoll. Mr. Daily had however put in a strong plea for Belleville; quite unselfishly, no doubt, from a desire to promote the interests of this Association at large; but notwithstanding this, he was inclined to support Ingersoll for several reasons. It is, geographically, the centre of the dairy interest of Canada. Its development towards the west has been referred to. If taken east, he was afraid it would be like the Provincial Exhibitions, which were never as successful east of Toronto as west. If we wish to have the Association go on gathering strength from year to year, I think it must be kept here, where the people have labored nobly for it, some, of course, for personal interests, but many others from purely patriotic motives. There is another thing to be remembered: not only the farmers around Ingersoll in the dairy business but the townspeople feel interested and proud of it. We have had a growing increase from year to year, and a largely increased attendance. The present meeting is a magnificent success. In view of all this we should be very careful how we moved the Convention to another locality. He should be sorry to see any undue rivalry or contention between the east and west in the matter, and hoped that they would all remain united wherever the place was fixed. He did not altogether approve of altering the constitution. The time might come when the east would get such a preponderance, that we might see the necessity of a change. He would be in favor of adopting the report.

Mr. CHADWICK said he arose to speak with some degree of diffidence on the question. It might be thought that personal interest influenced him in supporting Ingersoll. This, however, was not the case, and would use the words so forcibly expressed by our friend, A. Willard, Esq., in the opening part of his address

of last year, "We should know no North, no South, no East, no West." In disposing of this question we should take into consideration the objects we have in view, and adopt that course that will advance, to the greatest possible extent, the interests of this Association. Ingersoll is certainly the centre of the dairy region of Canada at the present time, and if there is any advantage to be derived from this circumstance, we are entitled to it. No doubt we would have larger gatherings here than if the meetings were held in any other place; and as our object was to bring together the greatest possible amount of knowledge, obtained year by year, from our varied experiences and progress, and to disseminate that knowledge to the greatest possible number, he thought the interests of this Association would be best conserved by meeting at Ingersoll.

The question being called for, it was put to the meeting, and the last amendment was carried, making Ingersoll the permanent place of holding the Annual Conventions.

The PRESIDENT then introduced to the Convention Professor A. Smith, of the Veternary College, Toronto, who proceeded to deliver an interesting and scientific address, illustrating every part with specimens and engravings, on the "Diseases of Cows, Hoof Disease, Abortion," &c., found on page 94 of this volume.

At the conclusion of Professor Smith's address, it was moved by C. E. CHADWICK, and seconded by W. F. CLARKE, that the thanks of this Association be tendered to Professors Smith and Buckland, for their very able and instructive addresses.—Carried with enthusiasm.

Mr. WELD, of London, asked Prof. Smith if the flies which had pestered our herds so much last summer left any deposits which were likely to be of future harm in spreading a contagion among our herds? Mr. Loch had taken a splendid herd to Illinois, where they were attacked with the flies so badly as to destroy the whole herd. Mr. Lock had told him that innumerable maggots seemed to oose or crawl from their flanks. He thought that Prof. Smith could throw some light on the subject. To be forewarned is to be forearmed.

Prof. SMITH said he had an opportunity of examining several animals that had been so affected. It seemed to be caused by the continued irritation of the flies. No serious danger was to be apprehended from it, as it was not contagious, and could be relieved by the use of the oil of tar and carbolic acid mixed with water,—in the proportion of one of tar and acid to fifteen of water.

QUESTION—Are they different from the common house-fly?

Prof. SMITH—Yes; the common house-fly does not sting as

they do. Last season was noted for the unprecedented numbers which infested our herds.

Prof. BUCKLAND—The fly in question was very well known to entomologists. The same fly makes its appearance every season, to a greater or less extent. Their great number last season is to be accounted for, by the prevailing dampness of the atmosphere in connection with the extraordinary heat.

Mr. HOPKINS, of Dereham, wished to hear from Mr. Moulton on the common hoof disease.

Mr. MOULTON, of Dereham, thought it out of place for him to say much, especially after the able address of Prof. Smith. He knew of the disease in England 33 years ago; and when he was in England three years ago, a similar disease made its appearance. The treatment he followed varied according to the nature of the disease. One of the worst forms of it was the cold leg, in that case not a drop of blood could be drawn from the foot. Nothing could be done until the circulation was renewed, to accomplish which he would wind the leg with a hay rope, then pour warm water upon it, after which it should be rubbed perfectly dry. The best remedy he had found was turpentine and lard.

Mr. BUTLER, of Mount Elgin, thought the disease was caused mainly by exposure to frost and dampness. He believed it commenced in the tip of the toe, which should be cut off so as to draw the blood. He had tried this and never knew it to fail.

On motion, the Convention adjourned to meet at half-past one.

AFTERNOON SESSION.

The Convention re-assembled pursuant to adjournment. The President, Jas. Noxon, Esq., in the chair.

NOMINATION OF OFFICERS.

The Committee on Nomination of Officers for the ensuing year made the following report:—

President—JAMES NOXON, Esq., of Ingersoll.
1st Vice-President—W. S. YATES, Esq., of Belleville.
2nd Vice-President—THOMAS BALANTINE, Esq., of Perth.
Secretary & Treasurer—R. A. JANES, of Ingersoll.

On motion of E. V. BODWELL, the report was adopted, and the gentlemen named were duly elected for the ensuing year.

Report of the Committee on Finance read, and, on motion of B. Hopkins, adopted.

CAUSES OF TAINTED MILK, AND THE REMEDY.

Mr. FARRINGTON—The question of tainted milk and floating curds has occupied, perhaps, more of the attention of our dairymen during the year than anything else connected with their business. He thought past experience would enable us to arrive at the cause and remedy on common-sense principles. Milk of itself possesses the elements of taint or decomposition. Under favorable circumstances, it must decompose; it is a law of nature. There are two causes or conditions of taint, in the absence of either of which it cannot exist. Milk cannot coagulate without heat and rennet. You cannot separate them. Rennet will not act in the absence of heat. Cold will check taint; heat promotes it. It is assisted by contamination, like ferment. These are the causes, as a general rule. There has been more complaints the past year than for five or ten previous. It is sometimes said that it comes from a peculiar state of the atmosphere. The season has been warm and moist, just the thing for corn, but too high for cereals. The peculiar sultry state of the atmosphere has affected the cows—made them uneasy—and this irritation has caused an unusual heat in the milk. He tried a can and found it two degrees above healthy milk. This extra heat was thought to be one of the causes of increased liability to taint, and with this heat a peculiar state of the atmosphere. We have at times the same degree of warmth, but not the same tendency to taint, when the atmosphere was free from that peculiar irritating, prostrating sultriness. This sultry condition of the air, with dampness, prostrates us, generates flies, vegetable matter decomposes on the surface of the earth, creating a miasma which settles on the grass at night, at which time the cows graze, seeking the shade in daytime to avoid the heat and flies. This, he thought, would account for the morning's milk being more liable to make floating curds. This is sufficient to indicate the general causes, as prevention is always better than cure. Let us see if it can be avoided. We cannot prevent these special causes, but we can do much to remove the conditions favorable to taint. If my thermometer tells me my milk is 100°, I should at once adopt means to cool it, and thus remove one of the conditions. Milk should be cooled as soon as taken from the cow. This, however, must be in connection with cleanliness; perfect cleanliness would accomplish wonders. Let everything that comes in contact with the milk be kept perfectly clean. Every man, woman, and child

that has anything to do with the dairy business, should constitute himself or herself a sanitary committee, and cleanse everything; thus arresting the causes of tainted milk. But what shall be the cure when we find we have a floating curd? Instead of putting it into the press immediately, let it lie until it gets over its fretting. The curd should be torn to pieces with a curd-mill, ground fine, so that the salt can easily penetrate every part.

Mr. BALANTINE regretted that he could not altogether agree with his friend that had just taken his seat, that a floating curd was owing to natural causes. He believed that uncleanliness was the principal cause, and the great preventative was cleanliness. He had visited many factories and was surprised, perfectly disgusted, to see such large quantities of cheese that fell so far short of the requirements of the English market. Cleanliness was the great essential. In connection with their own factory they had earnestly set to work to trace out the causes, and it had resolved itself into very few. They had procured tin pails for all of their patrons, and by keeping everything scrupulously clean, they had no difficulty. Even through the month of August they had no tainted milk. Previously, however, they had difficulty, and had traced it to some patrons using wooden pails. Wood, as a general rule, absorbed the taint, although you could not detect it without letting it stand for some time. He had visited factories that were so unclean in themselves and surroundings, that it was impossible to make good cheese in them. Factorymen would have less to complain of, were they not so anxious to increase the number of their patrons. No patron should be retained who was not a pattern of cleanliness, and no milk should be received that had any indication of taint, or the vessels containing it which exhibited a want of cleanliness.

Mr. FARRINGTON—I am very glad that I can agree with Mr. Balantine altogether in regard to the prevention of tainted milk and floating curds, although he had said he could not agree with me.

Mr. W. HARRIS said he would, in a few words, state what he knew to be a fact, which he thought plainly indicated that the state of the atmosphere had much to do with floating curds. On a certain very sultry day last summer, during which a thunder storm occurred, he had visited one of his factories, distant about thirty miles from home. At this factory they had a floating curd, and on returning home found they had experienced the same difficulty there. And, on enquiry, found that at several factories in the neighborhood it had occurred.

Mr. BALANTINE said it was very important that the factories be erected near a bountiful stream of water, no stagnant pool, or

pig pen, should be permitted near the factory. He had visited over 100 factories during the past summer, and found where they were in a unclean state, the cheese was invariably off flavor. In some cases, hardly a good cheese could be found.

Mr. MANNING, of Exeter, being called upon to describe his apparatus for cooling the milk as soon as drawn from the cow, said he could not well describe it without a model. He would, however, try to give them an outline of it. He intended to introduce it into the leading factories next spring. It was a very simple arrangement, costing from four to five dollars. He might compare it to two milk cans, one fitting within the other, leaving a small space between them, in which the milk ascended. A tube conducted the milk through the inside can to the space. These cans set in a tub. By this cooler, a small quantity of ice will cool several hundred pounds of milk; and the milk thus treated could be kept for three or four days. They never had a floating curd since they used the cooler.

QUESTION—How often are you required to make cheese?

Mr. MANNING—Two or three times a week usually. We have kept the milk from Thursday till Monday, and considered the cheese made on the fourth day equally good; but we never allow the milk to get above 50°.

On motion of R. A. JANES, the subject was laid on the table.

Mr. CHADWICK desired, at this stage of the proceedings, to have the liberty of moving a resolution, which he was anxious to submit to as large an audience as possible.

Moved by C. E. CHADWICK, seconded by S. BALANTINE, and *Resolved*,—"That in view of the establishment of a model farm by the Legislature of Ontario, the President and Secretary be empowered to memorialize the Government of Ontario, urging the establishment of the same; and that in connection therewith due provision be made for giving proper instruction in dairy matters, whereby this very important and rapidly growing branch of Canadian agriculture may receive that attention its importance deserves."—Carried.

THE EXPERIENCE OF THE PAST YEAR—HAVE FLOATING CURDS PREVAILED? TO WHAT EXTENT? AND THE REMEDY.

The discussion of this question was opened by

Mr. JOSIAH COLLINS, of Dereham.—He could endorse most of what had been said by Messrs. Farrington and Balantine, in their remarks on the last question, which were also applicable to this. It was his candid opinion, that hurrying cows from the

pastures was a great cause of tainted milk. This was the worst thing that could be done. There are too many dogs in the country. He had known cows, on the way from pasture, to be so worried by wild boys and dogs, that the milk when taken from them would stand as high as 110°. This milk is thrown into tight cans, and sometimes remains covered for two or three hours before it reaches the factory. He contended that such milk was quite unfit to be manufactured into cheese or butter. When they had a floating curd they would sour and salt well, and then grind the curd.

Mr. LOSEE said his experience in floating curds was not very large. He had but few the past season, and always run off the whey as soon as possible, salt heavily, and grind the curd.

Mr. CASWELL would like to know how it was that some factories had floating curds and others not? He thought it could only be accounted for in the clean or the unclean state of the factory.

Mr. BALANTINE said he visited a factory last November, in which he was confident you could not find a good cheese. Milk was an absorbent, and if surrounded with tainted effluvia it would absorb it. Of all causes, uncleanliness was the most fruitful.

Mr. THORMICROFT, of London, observed that he has had no floating curds for three years, and attributed it to a stream of water which flowed near the factory. He always cooled his milk as soon as possible: this is one of the best preventatives.

Mr. GALVIN had not had a floating curd during the season. When he found they were liable to float, they drew off the whey, and added a little hot water,—then went through the process previously described.

The following question was then laid on the table:—

TO WHAT EXTENT HAS THE SYSTEM OF GRINDING CURDS, AND MAKING CHEESE ONCE A DAY BEEN PRACTICED THE PAST SEASON, AND THE RESULTS?

Mr. CASWELL remarked that Mr. James, of Culloden, had ground curds a part of the season, and that the cheese made from ground curds was much better. He desired to hear him on this question.

Mr. JAMES had found the grinding of curds of great benefit. He had ground from the 1st of July. After they were ground he had no trouble with the cheese puffing, and they were much improved in flavor. His yield had not been injured—his average for the season being $9\frac{33}{100}$ lbs. of milk to 1lb. of cheese.

Mr. CASWELL stated that Mr. James' cheese, of the Culloden factory, had taken the first prize at the Belleville fair.

In answer to several questions, Mr. JAMES replied that he ground after pressing. The prize-cheese was ground twice. He allowed the acid to develop before dipping. He would prefer to press thirty-six hours. He exposed the curd to the atmosphere from an hour to an hour and a half.

Mr. WILMOT, of Milton, said he had ground all his curds, and made but once a day the past season, and with the most satisfactory results. He thought others would be equally well pleased with the practice. The carrying the milk twice a day to the factory was a great deal of labor and expense. As far as his experience went, drawing once a day was a perfect success. The method adopted by his patrons for keeping the milk, was to lower the can containing the night's milk into their well. If they had not wells suitable, they dug them. Some of his patrons lived from four to five miles away. The milk was not stirred, and each milking was brought to the factory in separate cans. He was glad that grinding curds had proved such a success. By letting the acid develop in the curd, he thought we could have better control over it. He dipped sweet, if he could, and always pressed about twenty minutes before grinding. Salted before pressing the second time, using about 2lbs. of salt to the 100. He could make a more uniform cheese by grinding.

On motion of H. FARRINGTON, the question was laid on the table.

PROPER CONSTRUCTION OF CHEESE FACTORIES, AS BEARING UPON THE QUALITY OF THE PRODUCT; AND ALSO WITH REFERENCE TO CONVENIENCE AND DURABILITY.

This subject was introduced by the reading of the following paper by George Hamilton, Esq., of Cromarta.

Mr. HAMILTON said that the first, and indeed one of the most important things to be taken into consideration in regard to the construction of a cheese factory, is the selection of a proper site; to secure which, it is necessary to get a never-failing spring of pure, cold water, with sufficient fall from the head of the spring to allow it to run freely into the vats, which convenience does away with all the labor of pumping. It is also of great importance to have a sufficient fall away from the factory, to allow the whey to be conducted at least from 20 to 40 rods from the factory. By so doing, the obnoxious practice of allowing the hogs to lie under, or around the factory, may be avoided. No hog-yard should be closer than from 20 to 40 rods from the factory;

and if there is a choice of locality, should be placed on the north side of the factory, as we have fewer winds from the north than from any other direction during the cheese season; and thus prevent the disagreeable odor which must necessarily arise from the hog-pen being in too close proximity to the factory.

In my opinion, there should be two separate buildings,—the one for manufacturing and pressing, the other expressly for curing. The manufacturing-room may be a frame building, one storey high, the end of which should stand towards the road or waggon-track, for the reception of the milk: the vats to occupy the portion of the room next to where the milk is received; the other end of the room to be used for pressing. The whole floor of the building should be made of good sound lumber, planed, tongued, and grooved; made with an incline from each side towards the centre, where there should be a good water-conductor, which may be made of a common scantling, with a groove run in one side of it, and the floor neatly jointed thereto. The inside of the press-room should all be lined with dressed-lumber, tongued, and grooved, so that in washing around the presses there may not be a particle of curd, or anything that has a tendency to create a smell, left. There should also be a proper conductor to carry away the whey from the factory, for if any of it is allowed to go to waste around the factory, it will certainly, during the warm weather, produce a very disagreeable odor. If the building does not stand on a running stream which would carry away the waste water, there should be a conductor, such as is generally used for whey, and joining the conductor which runs along the centre of the floor, to convey the waste water a sufficient distance from the factory, to allow every thing to be kept as clean as possible.

I am well aware that there are some factories in Canada where a portion of the whey, and all the waste water, are allowed to lie stagnant under and around the factory; but I hope they are few and far between; and I also hope that the time is not far distant when such a state of things will be unknown among our Canadian dairymen.

As I said before, there should be two buildings; the second and necessarily the largest of which is the curing-room, which should be separate from the other, but at a very convenient distance from it. This building may be two or three stories high, and the size in proportion to the amount of business done. It may be of frame, but should stand on a good stone foundation, and each flat should be lined inside with plaster or lumber, planed, tongued and grooved. The stone foundation and also the lining is necessary, so that the building may be kept at a proper

temperature for curing cheese in the fall and spring. The lining is also of great benefit in the warm weather in summer, as if not lined the flavour of the cheese will be materially injured by the action of the sun beating upon the walls and roof of the building. It is also necessary to have the building well ventilated, which I believe is highly beneficial in the warm weather in summer. I cannot too strongly urge upon you the necessity of constructing factories so that they can be kept scrupulously clean, as it is of the utmost importance that we receive milk in first-class condition, which we cannot expect with any degree of consistency so long as we continue to exhibit, in and around the factory, signs of keeping it in only second-class order.

There is one thing more on which I would like to say a few words before closing: that is, the desirability of planting shade-trees around our cheese factories. It is much to be regretted, that, in the country where we can get plenty of them for a very small sum, and in many cases for the trouble of transplanting, that this is not better attended to; for in a few years from the time of planting they will, besides adding to the beauty of the scenery, become materially beneficial as well as ornamental.

Mr. FARRINGTON wished to make a few remarks, to explain himself with reference to yesterday's discussion. Not that he had any objection to the most improved plan of building or heating adopted in our model factories. His object was to reassure the inexperienced, who might receive a wrong impression, that there were other ways of warming a curing-house than those described. He feared some might be deterred from building, on account of the fancied difficulties, or perhaps lose money by trying apparatus that had not been well attested, as he had known some to do.

Mr. GALIVER agreed with the main plan of building, but thought it rather expensive. He had been connected with the building of a good many factories and curing-houses. He thought it would be a great addition to the upper story to seal or plaster on the inside of the rafters: constructing ventilators on the top of the roof and leaving the cornice at the eaves open for circulation of air.

The PRESIDENT remarked that there was some time to spare, which might be devoted to answering questions on any miscellaneous subjects members might introduce. He reminded factorymen of the importance of filling up the blanks as soon as possible, and handing them to the Secretary; thus conferring a favor on the Association.

Mr. CASWELL, on behalf of the dry goods merchants, asked, what width of cotton would be best for them to import?

Mr. FARRINGTON and others replied that 39 inches was the best width. It was well adapted to cheese made with the 16 inch hoop, and from 9 to 10 inches thick.

Mr. CASWELL also wished to know what kind of salt and rennets factorymen preferred?

Mr. BALANTINE replied that no person should manufacture cheese who was not willing to use the very best materials in connection with it. He had found the Liverpool factory-filled salt to give the best results. It was strong, dry, and free from bitterness, and this last was a quality very objectionable to cheese. In the matter of coloring cheese, the very best material must be used. Some object to coloring, but it was necessary to color the cheese to suit the taste of the English market. He said he had used the genuine C. P. rennets, and they made excellent cheese. They were equal to any he had ever used; making from 5 to 6 hundred pounds of cheese to the rennet.

Mr. LOSEE had found the Liverpool factory-filled salt preferable, and would not use the Goderich while the other could be obtained.

Mr. CASWELL said he did not think there was any question more necessary to be discussed, than the merits of the different kinds of rennets. He had asked these questions, that he might not only be able to import those articles, that would meet with the most ready sale, but he felt desirious by only importing the very best furnishings to assist in improving the quality and raising the standard of Canadian cheese. It was a great loss to import poor rennets, as well as an injury to the quality of the cheese made from them. No class of persons were so competent to judge of these matters as factorymen, who had tested them from day to day. He thought, with regard to salt, that the Liverpool factory-filled would not only be found the best but the cheapest: it was much drier than the Goderich.

Mr. HAMILTON said there was another question he would like to have the opinion of dairymen upon, which was of great importance to them. Was there not a danger of multiplying factories too fast, or placing them too close together? I understand there will be a large number of factories erected in Canada this year. We should be very careful not to encroach on our neighbours. It is of great importance that factories, should be at a reasonable distance from each other. If they are too close together, injury and loss to all concerned will be the result. An inferior article would be manufactured, with which we could easily glut the market; but this cannot be done with a first-class article. They should not be nearer than four miles.

Mr. CHADWICK—This subject must commend itself to every

one. I cannot encroach upon my neighbour's privileges without injury both to myself and him. The larger the factories' business is, the better able we shall be to employ superior makers, and thus improve the quality of the cheese. To succeed we must produce an article that will command the highest price in the English market. Our success depends wholly upon the quality of the article. The time is past, when a second-rate article would do. Every facility should be used to produce an article equal to the best in the market.

After some desultory discussion on various subjects,

The PRESIDENT, (Mr. NOXON), congratulated the members of the Association on the improved attendance of the present Convention, as well as the ability and interest with which the subjects had been discussed. While a little hesitancy was manifested in expressing opinion in the opening, he was happy to find we were not only advancing in knowledge, but also able and willing to do something to disseminate that knowledge for the general good of all. He would urge the neccessity and importance of members coming to future Conventions, prepared to discuss the subjects that might be brought before them. He held that no man was fit for his business who was not willing to rise in his place and give what information he was able. By so doing, our meetings would be more interesting and beneficial to all concerned. The reports which the Association publish would ultimately form part of the literature and statistical history of the country, and it was our duty to make them as interesting and full as possible. We were running a race with the Americans for the production of an article best suited to the English market, and he hoped we should be able to excel in the race. He would have been pleased if some other gentleman had been elected President, but since you have seen fit to place me here again, I do not feel willing to decline the position.

On motion of Mr. FARRINGTON, a vote of thanks was passed to the President and Secretary, for the efficient manner in which they had performed the duties appertaining to their respective offices.

On motion of Mr. CHADWICK, the Convention adjourned to meet at Ingersoll on the first Wednesday of next February, 1872.

THE FOLLOWING

ADDRESSES, &c.,

ARE TAKEN FROM THE

FIFTH AND SIXTH ANNUAL REPORTS

OF THE

AMERICAN DAIRYMEN'S ASSOCIATION,

FOR THE YEARS 1869 AND 1870.

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"THE FEEDING OF CATTLE IN RELATION TO THEIR HEALTH AND PRODUCE,"

BY PROFESSOR JAMES LAW,

OF CORNELL UNIVERSITY, ITHACA, N. Y.

DELIVERED BEFORE THE AMERICAN DAIRYMEN'S ASSOCIATION, ON WEDNESDAY, JANUARY 12TH, 1870.

Mr. President and Gentlemen:

The subject I have chosen is a wide one, and might, perhaps, be more appropriately treated of in a huge 8vo. than within the short limits of a lecture. I cannot, therefore, hope to do it full justice, much less to exhaust it. My remarks must be, in the main, of a general kind, and if on some points I seek to arrest your attention more particularly, it is because I conceive that sound information upon these is an essential pre-requisite to the intelligent and profitable management of stock.

In a district like that in which we are met, where the composition and configuration of the soil, the proximity of rivers, lakes and hills, and the abundant rainfall seem to destine it to the maintenance of cattle, it is a matter for sincere congratulation that the destructive bovine plagues are comparatively unknown. Two of the maladies most dreaded by the stockowner of the Old World—Rinderpest and Epizootic Aphtha—are happily unknown on the American continent, and, in the nature of things, are likely to remain so until we can establish a more rapid means of communication across the Atlantic. The Texan Fever, now that the mode of its propagation is known, need never again find its way north of the 35th parallel of latitude. Pleuro-pneumonia alone threatens our doors, and, happily, the cattle trade is almost exclusively from west to east, for if circumstances were to concur to turn it westward, not only Western New York, but the vast States of the Occident must necessarily be devastated. As it is, the disease will continue to hover around our eastern homesteads, and whenever circumstances are favorable, will widen its area of prevalence and develop new centres of contagion. The justly dreaded features of this contagion consist in its property of fixing itself for months or years upon the component parts of infected buildings, and then starting with renewed vigor on its work of destruction whenever approached

by a susceptible subject. The sound policy for the American agriculturist to pursue in relation to this disease is to make a vigorous and sustained effort to annihilate it, and not to slacken in his endeavors until the last affected beast has perished, nor until the last germ of contagion has been purged from field, barn, and byre. As yet the isolation of diseased herds and the purification of infected places would be a matter of small moment as compared with the millions of stock that would thus be placed beyond reach of danger. But if we neglect the danger while yet it may be easily controlled, any sudden change of conditions, atmospheric or commercial, may insure its general spread, until what is at present but a noxious twig may swell into the proportions of a mighty tree, covering this great country with its shade of death. But as yet this evil influence is limited, and it is matter for thankfulness that the conditions are not likely to change so as to contribute to its rapid spread.

If, then, the farmer can count with some degree of certainty on escaping these destructive epizootics—if he is saved the sad prospect of at any time seeing the accumulated gain of a lifetime's work disappear like a dissolving vapor, he ought to direct his attention the more earnestly to the avoidance of all sources of occasional disease and loss, that the special favors awarded him by a beneficient Providence may not be marred by a reprehensible neglect on the part of the recipient.

The food of adult herbovora is derived from the inorganic world, as in the case of water, and from the vegetable world in the case of its other constituents. The *role* of the vegetable in taking up the elements of inorganic nature and the debris of the organic world, and of working these up into those complex and elaborate compounds, fitted for the nutrition of animals, is one of the most interesting studies in a universe, teeming with examples of beneficient design. The vegetable abstracts from the water, the ammonia, the nitrates, and other products of the decomposition of organized bodies, as well as the phosphates and other inorganic salts, and from the air the carbonic acid, and in the recesses of its own inscrutable laboratory, constructs from them those compounds which are susceptible of digestion and assimilation by the animal system, and capable of building up its constituent parts.

These vegetable products, or proximate principles as they are called, by virtue of their similarity to different constituent principles of the animal body, and their power of repairing such principles, are either *heat-producing* or *tissue-forming*. And this last-named class consists not merely in the nitrogenous or flesh forming elements, usually placed over against the heat-formers, but contains, also, the compounds containing phosphates and other salts, which go to make up the bulk of the bones and less considerable parts of most of the soft organs.

The heat-forming proximate principles are the *hydro-carbons*, including the numerous fats and oils, animal and vegetable, and the *carbhydrates*, which contain less of the carbon, or true heat-producing

principle, and comprise starch, sugar, gum, and lignin. The *nitrogenous tissue-forming bodies*, or *albuminoids*, are chiefly *gluten* or vegetable albumen, which abounds in the seeds of the various grasses, and especially in grain; and *legumen*, or *vegetable casein*, largely met with in the seeds of peas, beans, lentils, and other leguminous plants. The *saline* or *earthly constituents* comprise the *chloride of sodium and potassium*, the *phosphates of soda, potas*, and *magnesia, sulphate of soda and potas, phosphate and carbonate of lime, oxide of iron*, and traces of *manganese, silica* and *fluorine*. All of these are found in the blood, on their way to or from the different organs, but the lime salts are most abundant in the bones and teeth; the magnesia salts in the bones, muscles, and blood, the soda salts everywhere, but chiefly as common salt in the blood, the potas salts in the blood particles and muscles, the iron in the blood particles, and the silica in the bones and hair. These salts appear to be combined in the vegetable with the other proximate principles in such a way as renders them easily appropriated by the animal. Though they may vary in amount in different specimens of the same plant, yet this is only within certain limits, and as each plant demands for its healthy development a full supply of particular elements, we can, in selecting different species, virtually obtain the requisite kind and amount of inorganic salts, as well as of gluten, legumen, or starch. Thus, common salt is deficient in the grain of wheat and maize, and abundant in oats, potatoes, turnips, clover, meadow hay, and above all in beat, (Boussingault, Wolf.) Phosphates are equally scanty in Indian corn, but abound in wheat, oats, rye, beans, and above all in linseed cake and rape cake, (Lehmann.) And the experienced cultivator knows that plants requiring a large amount of any one of these constituents cannot be made to grow luxuriantly with a deficient supply in the soil, but will repay the neglect by their stinted growth and imperfect development. In the vegetable and animal kingdoms alike, nature will establish her claim, and any inattention to this cannot fail to bring its own punishment.

Water is not the least essential element of the body. It makes up the major part of the body weight, forming, according to Moleschott, as much as 68 per cent. of the whole. It exists as a constituent part of all the proximate principles, and if separated from them would destroy their identity, and unfit them for purposes of nutrition. It further occurs chemically uncombined in the blood and tissues generally; and, by dissolving their constituent elements, assist in the formative and destructive changes, and thus becomes the great medium of nutrition and repair. And the mode in which it assists in nutrition is probably by the addition or subtraction of an atom of water from certain bodies which are thus fitted for the formation of new tissue, or for removal when they have served that end.

For the mere maintenance of the body, each of these must be given in an amount sufficient to restore the waste continually going on. The well-known experiments of Majendie showed that no one proximate principle, however lavishly supplied, can of itself sustain

life. Dogs fed exclusively on sugar, gum or fat, died in from 30 to 34 days, with all the symptoms and, after death, appearances of starvation. The heat-producing elements were abundantly supplied; and on these the animals remained brisk and lively, though losing weight, for the first week, but as the constantly wasting tissues were not repaired, emaciation went on with rapid strides, and death ensued about as early as if entire abstinence had been secured.

When albuminoid principles are furnished, life is somewhat more prolonged, probably because, as Boussingault and others have shown, that these elements may undergo a fatty metamorphosis in the body, and thus become specially fitted for the production of animal heat. And yet the experiments of the Academies of France and Amsterdam are equally conclusive that albuminoids alone are insufficient to maintain life. The albuminoids and hydro-carbons combined are likewise incapable of sustaining an animal, and Majendie's dog fed on fine wheaten bread, containing a sufficiency of starch and gluten, but deficient in mineral constituents, died on the 50th day. It follows that not only must a portion of each of these classes of aliment be present in the food, but that they must exist in proportions corresponding to the wate of tissue and the products yielded by the animal. Not a molecule of the animal body can be removed with impunity unless its place is taken by an equivalent. A wasting and loss of vital power infallibly results from such a course, and sooner or later a time arrives when the condition is incompatible with life.

But in certain classes of animals more aliment is required than is alone sufficient for the repair of waste, and the maintenance of animal heat. In the *growing beast* the supply must be such as will contribute to increase of bulk in addition to the mere repair of waste. The addition too must be largely of the tissue-forming kind, or it will fail to effect the purpose desired. In the *feeding ox*, on the other hand, though there is a demand for additional material, this must be chiefly of the heat-giving variety, that it may be stored away in the form of adipose tissue in the animal body. Some experiments of Lawes and Gilbert, on feeding cattle, are interesting, as showing how animals instinctively crave that kind of food which is specially adapted to their conditions of existence. The beasts in question, pent up to feed, with no opportunity for exercise, and no animal product to yield, with, in other words, the demand for tissue-forming elements at a minimum, were allowed to choose their own food, and chose the non-nitrogenous, or heat-forming, to an extent altogether disproportionate to the tissue-forming elements. The *pregnant* cow experiences a large demand, more especially for the tissue-forming elements, that neither her own system nor that of her progeny, may suffer in nutrition or development. And here again the wise provisions of nature become manifest. Most animals in this condition have the powers of digestion and assimilation improved, and acquire a sluggishness of habit which obviates any rapid disintegration and waste of the body, and secures a

great part of the material appropriated from the food for the nutrition of the offspring. But it is in the cow, which is at the same time *pregnant* and a *heavy milker*, that the need for tissue-forming elements is the greatest. These are demanded alike for the nourishment of the unborn calf, and of the sucking one, or for the supply of dairy produce. If, then, she is stinted in the quantity or quality of her food, she is above all likely to fail in the yield of milk, in maintaining her own body in fair condition, or in producing a well-developed calf. In one or other of these functions she is likely to fail, and the particular one will be determined by the individual idiosyncrasy or the conditions in which the animal is placed. If she has a special tendency to heavy milking, her own system and that of the calf will suffer; if there is an irritable condition of the generative organs, the progeny is likely to be sacrificed; and if her chief aptitude is to feeding, her milk will dry up.

While these statements are made as general principles, and as showing that the presence of these different elements is a *sine qua non* of a healthy nutrition, the converse must not be hastily accepted, namely, that when these agents are supplied in a given amount, nutrition and produce must correspond. On the contrary, the presence in the food of a sufficiency of the different elements essential to nutrition fulfils only one of many conditions requisite for animal nourishment. Much will still depend on the constitution of the animal fed, on the hygienic conditions in which it is placed, and no less upon the state of the food when given.

To confine our attention to the last of these conditions, the proposition may be advanced:—that a certain amount of liquid in intimate connection with the proximate principles will serve to facilitate their assimilation, and thereby to increase their value. As an example, a bullock may be kept in fair condition on 120 lbs. of turnips daily, but could not be so supported on 8 or 9 lbs. of Timothy hay, though, as judged by their relative amounts of proximate principles, as shown by the accompanying table, their nutritive value should be nearly the same:

	Albuminoids.	(Fat.) Hydro-carbons.	(Starch, Sugar, &c.) Carbhydrates.
Timothy Hay, 9 lbs ...	1.02 lbs.	.319 lbs.	4.90 lbs.
Turnips, 120 lbs...	1.49 "	.20 "	3.73 "

Again, cattle which are fed in Scotland on turnips and uncut wheat or oat straw, occasionally make as much as 2 lbs. increase of weight daily, on a diet of 180 lbs. Swedish turnips, and 5 lbs. straw per day, yet no one would expect this daily increase on a diet of 20 lbs. of hay per diem, which would be a fair nutritive equivalent, as judged by its chemical constituents, and, moreover, is greatly superior to it in those fat-producing principles which are specially required in the feeding ox.

	Albuminoids.	(Fat.) Hydro-carbons.	(Sugar, Starch, &c.) Carbhydrates.
Turnips, 180 lbs...	2.23 lbs.	.40 lb.	6.72 lbs.
Straw, 5 lbs	.08 "	.04 "	2.13 "
Total.....	2.31 lbs.	.44 lb.	8.85 lbs.
Hay, 20 lbs..	2.272 lbs.	.71 lb.	10.71 lbs.

The difference in result is unquestionably due to the abundance of water in the turnips in intimate union with their nutritive constituents, and which renders them more easily assimilated. The plentiful supply of liquid to the blood and tissues not only favors the destructive and reparatory changes in those, but maintains in full activity the various secreting organs, counteracting costiveness, suppressed, concentrated and irritating urine, inspissated bile, and the like. The same result follows in all cases when this finely divided and watery food is supplied, and however the condition may have been brought about, whether by cooking, macerating, germinating, or otherwise. Other things being equal, the progress made in growth, in fattening, or in the yield of milk, testifies to the enhanced value of milk in this particular condition. The dealer who wishes to fatten a horse rapidly for sale does not feed him on dry grain and hay, but chooses rather boiled grain, bran mashes, carrots, turnips, potatoes, and other like sloppy food; and though he loses in hard condition, he gains in rotundity and weight. The food of the sucking animal affords one of the most striking examples of the value of a large amount of water intimately combined with the other and more nutritive constituents. The annexed tables, from M. Boussingault, illustrate this:

FOAL.	
Weight at birth.....	112.455 lbs.
Weight at weaning, 87 days old	355.105 "
Daily increase	2.674 "
Weight 65 days later.....	429.975 "
Daily increase since last weighing.....	1.151 "

CALF—Mean of 3.	
Weight at birth.....	78.4539 lbs.
Weight at 8 days old.....	102.8973 "
Daily increase.....	3.4912 "
Weight at 18 days old...	123.6564 "
Daily increase since last weighing	2.0759 "

These illustrations are confessedly subject to the objection that, at this early age, the powers of assimilation and growth are especially active, and that the stomach of the young animal is but ill adapted to the digestion of more solid food. Yet, after making all due allowances for these drawbacks, they sufficiently testify to the value of a standard food, in this special form, of intimate combination with water. The contrast betwen a calf which has been suckled nine months by its dam, and one that has been weaned at two or three months, sufficiently illustrates the value of this food. The whole subject, as affecting the feeding of the ox, may be stated in a nut shell, thus :—*the more minute the division of the nutritive elements in the food, the more readily are they digested and assimilated.*

I need not add that a soft aqueous and laxative diet of this kind is the worst possible for the hard-working horse. Though it secures a rapid formation of fat and increase of weight, it equally entails that the tissues generally shall be of that loose and flabby texture which is incompatible with active and continued exertion. For a work-horse, such a diet is only admissable when he is wanted to drag a heavy load at a snail's pace, by the mere effect of his body weight; and, with some limitation, this remark will apply equally to the working steer.

But the case of the fattening beast or milch cow is altogether different. A firm, hard condition of the muscles is not essential to her utility, and the ability to clear a high fence, or to distance and escape the mounted hunter on the wide prairie or pampa are far from desirable qualities. In these, and especially in the milch cow, we seek for the laxity of tissue, the capacious vascular system, and the quiet, docile, unexcitable temperament, which are calculated to secure the full benefit of the food taken, and to prevent any unwise expenditure of force. Though these qualities are inherent in certain breeds, they are, to some extent, begotten, fostered, and perpetuated by the system of diet in question, and the converse is equally true, that a stinted, dry, and innutritious regime would induce degeneration in our highest bred stock.

To this it must be added that the whole conformation of the ox testifies that nature designed to sustain it on a more aqueous and succulent diet than the smaller ruminants and the horse. I may point to one or two prominent indications of this. The solid foot of the horse sinks readily in the marshy ground, and the yielding soil, closing in above, prevents its withdrawal, so that he frequently gets *bogged*. The cloven foot of the ox spreads as it descends and prevents it from sinking to the depth it otherwise would, and the hoofs approach each other as it is lifted, so that they can be withdrawn from a much smaller hole than is made in planting the foot. The lips of the horse are used for seizing and placing the food between his teeth, so that he can crop the herbage much closer than the cow conveniently can. The sheep, too, lays hold of the food with its delicate mobile lips, and with its sharp projecting lower nippers cuts it so close to the ground that it will thrive where the larger ruminant will starve. The ox, in its turn, takes in its food with its tongue, and must have it sufficiently long to permit that organ to be twisted round it to allow of its feeding with any degree of ease and comfort. The horse's stomach, by virtue of its small size, is ill-adapted to receive a large amount of aqueous and comparatively innutritious food, which can only be retained in this organ for a very short time, while the capacious stomachs of the ox are in every way adapted to the retention of such aliments, and the abstraction from them of the greatest available amount of nutritive material. The food of the ox, then, is naturally, the rank aqueous grass of the low, rather than the short, aromatic products of the dry upland pasture, to which the sheep, goat, and horse are attracted by their instincts,

and adapted by their anatomical structure. I conclude that while it would be unwise to give our cows aliments deficient in nutritive constituents, we should follow the guidance of nature in giving them in that soluble condition in which the generous animals can avail of them most readily, and at the least expenditure of vital force.

It appears to me that I have furnished pretty cogent reasons why we should not condemn our stock to the simple hay and water on which they are too often compelled to subsist during winter. But as the question, "Will it pay?" is rightly made the test of all proposals for a change on the part of those who make stock a commercial investment, it is well to add that, within certain limits, the amount of aqueous materials in the food determines the amount of milk secreted. Another pre-requisite to profit is that the food be made sufficiently rich to bring up the milk to a proper standard of excellence.

I believe the day is not far distant when we shall have extensive plots of turnips, beets, and other root crops, grown on all our dairy farms, to secure in the winter a yield from the dairy in some degree commensurate to the summer supply. Already we see the indications of this in the more extended cultivation of these crops on the farms of those public spirited men who have collected the best herds of Durham, Jersey, Ayrshire, and other improved breeds of cattle. And in some districts the example is spreading among the farmers generally, as its advantages are being more fully realized. As the light soil of the greater part of the State would seem to encourage the growth of root crops, it is rather remarkable that they have not been more universally availed of. It must be acknowledged that the cultivation of an acre of turnips requires much more labor and care than an acre of hay, yet I feel assured that the twenty or thirty tons of roots obtained from each acre will more than compensate for the extra outlay. Furthermore, if I can show, as I hope to do before I conclude, that a dietary such as I have recommended will do away with some unhealthy conditions often met with in cattle, I trust that the labor objection will not be made an insuperable one.

In the absence of roots, or potatoes, wheat bran, bean and pea meal, brewer's grains, cut hay or straw, slightly fermented by admixture with water, or still better, boiled or steamed, may be profitably substituted. The advantage of cutting and cooking food cannot be gainsayed, neither from a practical nor theoretical point of view. If any one before me has not seen the essay of Mr. Stewart on "Cutting and Cooking Food for Animals," engrossed in the Report of the Commissioner of Agriculture, in 1865, and quoted by Mr. Allen in his work on "American Cattle," I can assure him that a careful perusal will not prove unprofitable. The cooking ruptures the starch granules, disintegrates the woody fibre, dissolves the salts, and presents the whole in a condition admirably adapted for easy and perfect digestion. When the cooking system has been fairly conducted, the enhanced value of the food has not been less than one-third and in many cases considerably more. Amongst other advantages of cooking may be named

the supply of the food in a warm condition and the avoidance of that chilling to which cows are often subjected in cold weather from the ingestion of large quantities of cold and aqueous food. This likewise encourages the flow of milk, which any tendency to chill counteracts.

But in encouraging the secretion of milk by warm and aqueous diet, we cannot be too careful to avoid establishing a drain on the system, for which there is no compensating supply in the food. The fatty, but above all, the albuminoid and saline constituents must be freely given, otherwise the strength will suffer, and the animal may fall into consumption or some other form of ill-health. Agents containing an abundance of these ingredients, such as bean meal, wheat bran, rape cake, oil cake, may be used to meet this indication, taking care, in the case of the two latter, that they do not bring about a fattening process, incompatible with a full secretion of milk. In estimating the needs of the system, we must consider that the pregnant cow parts with at least 70lbs. of tissue-forming elements during the nine months of gestation, for the growth of the calf, over and above what is yielded in milk. The annexed analysis will enable us to make an approximate estimate of the quantity of any of these agents needful to constitute an equivalent for a given amount of milk:

COW'S MILK.

Water	87.74 to 91	Butter	2.6 to 4.9
Casein	3. to 4.16	Salts	.49
Lactine	3.4 to 4.3	Phosphoric acid, 48 per cent. of salts.	

IN 100 PARTS.

	Albuminoids.	Fat Oil.	Sugar, Starch, &c.	Salts.	Phosph. Acid, per cent. of Salts.
Beans	32.5	2.4	53.1	3.10	31.
Rape Cake	28.	9.5	24.3	8.6	32.7
Oil Cake	28.	10.	31.6	6.	40.

In many Scotch dairies the winter daily food is about 50lbs. turnips, a bushel of brewer's grains, 6 to 10lbs. of bean meal, and straw at discretion. Under this regimen they not only yield an abundant supply of milk, but usually gain in condition. It deserves mention, however, that a turnip diet imparts a perceptibly bitter flavor to the butter, but this is entirely done away with if the roots are cooked. Beets are less objectionable in this respect.

In the case of all stock alike, the importance of having a variety of feeding agents is not to be lost sight of. Majendie found that the subjects of his experiments fed constantly upon the same diet, throve badly and frequently perished, though the food in question contained all the elements believed necessary to nutrition. And though our farm animals placed in better hygienic conditions may survive on such a diet, yet we ought not to ignore the lesson. All stock should have some variation in food: if hay alone, let it be composed of several

grasses; if not, let other agents be given in sufficient abundance to insure that nothing be wasted, but the full nutritious value of each agent secured.

Before leaving this part of my subject I wish to make just one more remark on the value of oily and fatty materials as constituents of food. A certain amount of heat-forming principles given in the shape of fat, is especially valuable as supplying this necessary ingredient in a form in which it can be most readily availed of for calorific or respiratory purposes, or for the deposition of fat, but it has a still more valuable property in the beneficial influence which it exerts on the whole process of nutrition. From the well-known effects of cod-oil on man, and from the experiments of Pollock and others on animals, it results incontestibly that under its use the albuminoid and other tissue-forming elements are more thoroughly digested, that the blood becomes richer in these materials, and that the nourishment of the different tissues becomes more perfect. This is an explanation of the excellent results of feeding on linseed, oil cake, rape cake, and other oleaginous foods. I may here state for the benefit of those who may have any misgivings on the subject, that the oil supplied in the food of cattle, as in oil cake, rape cake, wheat bran, and oats, is in a more wholesome condition than the melted butter and other fats in the pie crusts which produce dyspepsia in their owners. In the one case the melted fat permeates the whole mass of starchy and albuminoid matter, preventing the operation of the digestive fluid of the stomach, and rendering digestion difficult or impossible. The food passing from the stomach comparatively unchanged throws too much work on the intestines; work moreover of a kind for which their secretions specially unfit them, and the result is almost infallibly an impaired digestion and a consequent loss of strength and vigor. The unmelted oil of the raw foods on the other hand is enclosed in minute albuminoid capsules, or exists as granular particles detached from the albuminoid constituents. It cannot therefore prevent the infiltration of the food by the gastric juice, and being set free towards the end of gastric digestion it greatly facilitatea the absorption of albuminoid products by its presence in the first intestine.

One more suggestion. In feeding salt, which is so necessary in inland districts, it should be given at the animal's discretion, or at least daily, like other foods, and not once a week or fortnight, as is the practice with some.

These remarks have not been made with the view of furnishing a complete outline of the physiological principles of diet. We cannot afford the time necessary for this, nor enter into the necessary minutiæ. They are intended rather as an introduction to the remarks I have still to make on some conditions of ill-health in cattle resulting from errors in diet. I will class these under three heads. First,—Ill effects from the physical condition of the food. Second,—Ill effects from excess or deficiency of particular proximate principles; and

third,—Ill effects from the introduction of agents foreign to the food itself.

First,—The food may be too watery or too dry, or it may prove too injurious to an animal merely because that animal has not been habituated to its use. From a too watery food arise diarrhœas, dysentery, inflammation of the stomach and brain, and a predisposition to rot, or the aqueous cachexia, together with all other forms of parasitic disease which reveal especially in weakened systems. From too dry food we see arise indigestions, colic, the formation of stones or calculi by disposition from concentrated secretions, and, in some cases as a result, abortion.

Diarrhœa, Dysentery, &c.—The remarks already made concerning the value of succulent food for dairy stock must not be construed to mean that such food is in no case possessed of noxious properties. I need not tell my present audience that when cattle are suddenly turned from a dry aliment to one rich in liquid elements, scouring is almost a constant result. The digestive organs, which, if gradually habituated to the food, would have adapted themselves and secured, without injury, all the available nutriment, become irritated and relaxed, and discharge their contents prematurely in a liquid and undigested condition. This we habitually see if stock are turned out suddenly on the fresh and succulent grasses of spring, or if changed abruptly and without preparation to an exclusive diet of turnips or other roots. In many cases this continues for a few days only, and its greatest evil is the loss of a little flesh. But its effects are not always so slight and transient. Occasionally the irritation of the stomach is so great that it merges into congestion; like, as in all organs, in this initial stage of inflammation, its functions are placed in abeyance; this disturbed state of the stomach implicates the brain, and drowsiness and stupor set in, followed in the course of a few hours, by the wildest delirium. In some of these cases the irritant effects of the food, and resulting inflammation, leads to a drying of the contents of the manifolds, and the diarrhœa is early succeeded by costiveness. There is, then, scouring, followed by costiveness, drowsiness, dullness and delirium. In other cases, from the maintenance of the original cause of irritation, the large intestines become congested, and, added perhaps by a pre-disposition on the part of the patient, ulceration ensues, and the disease terminates as dysentery. These various results can usually be avoided by protecting the cattle against those sudden changes of diet, in which they have their origin. When about to put stock on an exclusive diet of turnips, beet, pumpkins, or the like, they should be allowed a few, in addition to their ordinary food for a few days, and then they may safely take them as an unmixed diet. So with grass, a little cut and mixed for several days with their usual provender will secure perfect safety when they are turned out. In all cases the principle is the same, that a habitude must be acquired, as the digestive apparatus cannot alone adapt itself to a system of work so entirely novel and contrary to its current experience.

Another and less manageable form of scouring, due to the diet, is that observed on some heavy, retentive, undrained soils, on which the rank marsh grasses acquire a principle that proves fatally irritating if the diet is not early changed. Nothing less than a thorough drainage of the soil, rendering it pervious, and purging it of its noxious principles, can efficiently protect the cattle grazed on such land.

Another condition which results from a diet at once too aqueous, and largely deficient in nutritive principles, is a diluted or watery state of the blood, which is no longer able to maintain a vigorous nutrition of the organs; the whole system becomes relaxed and weakened; the power of vital resistance is lowered, and the patient falls an easy prey to any health-disturbing cause. It is in such conditions that the liver gets filled with flukes, the lungs and bowels with round worms, and the solid organs with hydatids.

Impaction of the Third Stomach, &c.—When cattle are fed on dry, fibrous, and consequently irritating food, one of the most common results is that the contents of the manifolds, already deficient in liquid, become dried up in connection with the suppressed function and increased heat of the organ, and this ends in muscular paralysis of its coats, congestion, and even inflammation; and, if not relieved, loss of control over the hind limbs and symptoms of brain disease. This is not unfrequent toward the end of summer, when grass has been allowed to grow long and rank, has withered as it stands, and when, moreover, a newer and sweeter growth has sprung up, mixing with the withered herbage and tempting the animals to partake freely of both. It will occur equally on an exclusive hay diet, and especially when, from frozen troughs, or other accidents, water cannot be had at discretion. A sudden change from soft to very hard water sometimes appears to favor its development. A looseness of the bowels is the first symptom, and corresponds to the period of irritation caused by the presence of the dry, fibrous material, but this is quickly followed by obstinate costiveness, the dung being passed in small rounded masses, covered by a film of glairy mucus. A grunt or moan is present at the commencement of respiration, or, if not, is caused by striking the patient with the closed fist over the lower end of the short ribs on the right side. Swaying or unsteadiness of the hind limbs is next seen, or if the brain is affected, general unsteadiness, drowsiness, semi-closed and reddened eyes, involuntary movements, sometimes straight forward, sometimes in a circle, and loud bellowing, and disorderly and dangerous actions. It will thus be seen that the same condition of brain disease is arrived at from two widely different sources,—from a dry, irritating diet, and from an aqueous and hyper-stimulating one; yet, in both alike, the brain affection finds its determining cause in the vascular excitement and partial paralysis of the stomach common to the two cases.

Whenever cattle are unavoidably subjected to a diet of this kind, they should be closely watched, and on the slightest symptom of indigestion, even if this is manifested by scouring and abdominal pain,

from one to two pounds of Epsom salts, or a quart of linseed oil, combined with an ounce of ginger or other stimulant, should be administered, and a free access to soft water secured. If more than one are attacked, the whole herd should be at once treated in the same way, and thus, "taking time by the forelock," a disease may be anticipated and prevented which it is not always in our power to cure.

But the more rational course is, when animals are placed on such a diet, to add some laxative agent, such as roots, oil cake, or rape cake, in sufficient amount to counteract the tendency to drying and impaction of the manifolds, and thus secure a free digestion and a vigorous health.

Indigestions and colics are sometimes the result of dry food, the subject becoming bloated, or discharging very frequently in small masses, twisting about the tail, lifting the hind limbs uneasily, crouching, lying down and as suddenly rising again. One of the most troublesome results of these attacks is an occasional abortion, superinduced by the anatomical and physiological connection which exists between the stomach and womb. As illustrating the connection of these through the nervous system may be mentioned the depraved appetite so frequent in pregnant cows and which leads them to swallow bones, bolts, shoe leather, waistcoats, and other unheard of objects. The vomiting of pregnancy in certain other animals is another intimation of the physiological connection which exists between these two organs. But the mutual reactions of the stomach and womb in cattle is not alone due to nervous influence. The mass of the ox's stomach lies in immediate contact with the floor and left side of the abdominal walls, and directly above them and resting upon them in the gravid womb. It follows that any unwonted movement in the stomach affects the super-incumbent womb, and, conversely, any violent movement of the young animal disturbs the subjacent stomachs. This super-position of the stomach and womb is only met with in ruminating animals, and we cannot doubt that the proximity of these two systems of organs would lead to their iufluencing each other to a greater extent but for the comparative insensibility of the primary gastric cavities in the ox.

Amongst the troublesome effects of dry food are reckoned the formation of calculi or stones in the different liquid animal products.

In the ox fed, during the winter months, on an exclusive hay diet and other desiccated aliments, the liver is rarely in a sound state. The thick, concentrated bile deposits its solid constituents in the form of rounded masses, or as layers on the interior of the ducts, of which they form perfect casts. The incrustation on the bile ducts is more common than the formation of rounded masses, and is quite frequently seen in spring in the livers of cattle and sheep that have been thus fed and forbidden free exercise in the open air. When such a liver is examined, the bile ducts, in place of being concealed in its substance, are seen to stand out as branching white or yellowish cords on its posterior surface; and, if cut into, the knife grates against the hard

shells of the ducts. These concretions are mainly composed of the coloring matters of the bile, the resinous matter and a little fat (cholesterine.) That these clog the functions of the liver and cause retention of its secretions and slight indigestions, there can be do doubt, though it must be confessed they rarely directly induce serious illness. Yet, who can assure us that the fat, comfortable looking ox does not suffer as well as the equally obese and portly alderman, from that dull headache and oppressive langour which attends on biliary derangement? In neither case may the disease reach a climax, yet, as in both cases, it exists and owns the same cause—bodily inactivity and indulgence at meals—it were unphilosophical to conclude that the beast is entirely saved from the suffering which tortures the human being. Be that as it may, it remains, that as this condition lowers the tone of general health, and thus pre-disposes to other and more serious ailments, there can be no question as to the advisability of avoiding the diet upon which it depends. It is a remarkable fact that these accumulations in the gall ducts rapidly disappear on a succulent, green food, provided the animals are allowed to range the open fields in collecting this for themselves. If we follow this leading of nature in seeking a means of prevention, we shall find, in a more watery and succulent diet, the means of successfully arresting the development of such productions, or of preventing their formation.

Calculi deposited from the urine are often much more injurious. Those deposited from a too concentrated urine after its secretion from the kidneys may be arrested at any point of the urinary passages,—in the kidneys themselves,—in the tube which conveys the liquid to the bladder,—or in its excretory passages. As formed in the kidney these are chiefly composed of carbonates of lime and magnesia, a little organic matter and traces of iron. They represent, in other words, the salts of the urine. In the herbivora, lime is largely separated by the kidneys in the form of the soluble bicarbonate which becomes at once insoluble and is precipitated in the solid form when by the presence of a free base one equivalent of carbonic acid is abstracted from it. The presence of free ammonia from the slightest decomposition in urine unduly retained, may thus at any time lead to a deposition of solid matter, and once a nucleus is formed, however small—be it even microscopic—it becomes merely a question of time for layer after layer to be deposited and for the mass to acquire serious proportions. But how much more likely is this deposit to take place when the urine is concentrated, not only from the abundance of the products of tissue disintegration and those resulting from the vegetable acids and other *carbhydrates* in the food, but also from an insufficiency of liquid taken in with the aliment, and from the drinking of water highly charged with carbonates and other salts of lime. And these are precisely the conditions met with in many parts of this State. As showing their influence I have only to state that in Tomkins County, where cattle have dry feeding and very hard water, I examined, during the course of last winter, a large number of bullocks' kidneys, but failed to find one

entirely free from calculi. It is true, too, that serious results are rarely traced to such conditions, and the instance of a kidney kindly lent me by Dr. Manlius Smith, containing a stone over an ounce in weight, and yet furnished by a bullock in apparently perfect health, is far from being singular in its harmlessness. Yet in the course of the last year I have had occasion to cut out a large stone from the bladder of one animal, to wash out a sabulous deposit which quite filled up this organ in a second, and was consulted when too late to save them, concerning three others which died of ruptured bladder due to the arrest of a stone in the external urinary passages. And can we conceive of the constant irritation caused by the presence of these stones in the kidneys or urinary passages without a corresponding excitement in an organ so intimately connected with them as the womb? In most affections of the one the other extensively suffers. And is it not the case in Herkimer and Oneida Counties, where abortion is so prevalent, that the limestone formation yields the hardest of waters and the dry feeding contributes to bring about those deposits in the urinary organs? I would not, however, have my words misinterpreted. I do not charge abortion wholesale upon the urinary calculi. I would merely indicate that this may be one factor among many, and that in some cases it may be the last straw that breaks the camel's back. And while it is consistent with every day's experience to assume that when one cow has aborted others within reach of its discharges, and by virtue of that delicate susceptibility to odor for which the larger ruminants are so remarkable, will be led to part with their offspring prematurely, yet this constant source of irritation in the kidneys cannot fail to contribute to the result. It is a wise policy, then, if we can, by substitution of a more juicy diet, correct this lesser or supplementary cause of abortion, and the more so if we shall by so doing increase the produce of the dairy. From Dr. Carmalt's report on abortion, it appears that a question was inserted in the circular with a view to ascertain what roots, and how many, were supplied to the cattle, but I cannot find from the body of the report, that roots have been given at all on the affected farms. This subject of diet then deserves the greater attention, for though the great primary cause of this disease may still escape recognition, the removal of these accessory ones cannot fail to render that less powerful, if not indeed to strip it altogether of its noxious influence.

Among the injurious effects of an *excess of rich food* may be specially mentioned *fatty degeneration, barrenness, black leg, milk fever,* and *urinary calculi.*

In high bred English pigs, in which everything else has been sacrificed to early maturity and fattening qualities, the muscular substance is frequently replaced by fat and the pigs become unable to walk, or even to stand. In cattle this is not a common condition, yet in our finest Durhams how often do we find the heart overloaded with fat, and how frequently have we to regret barrenness as a concomitant of increased obesity. The substance of the ovary destined to produce the

germ of the future animal has undergone a fatty metamorphosis and its normal generative function is abolished. At other times, though the ovaries appear to be healthy, the tubes which connect them with the womb are too much loaded with fat to allow of the descent and impregnation of the ovun. Fortunately this condition is not necessarily irremediable unless as the result of long existing and excessive fatty charge. Some such barren cows have recovered this lost power of procreation when reduced by a spare diet and exercise.

The destructive disease of young cattle known as *black leg or black quarter*, though not alone due to a plethoric condition, is yet, in many cases, determined by the state of the blood. Its victims are above all those that are making blood most rapidly and in which this fluid has been suddenly raised to a state of abundance and richness to which the system has been altogether unaccustomed. Here the path of safety is to be sought, not so much in keeping the young animals in low condition as in maintaining them in a state of steady and satisfactory improvement, and thus warding off those sudden accessions of plethora which furnish a suitable field for the growth of the morbid poison. Hence it is that a fair allowance of oil cake has, by reason of its laxative and nutrient properties, protected a young stock against the ravages of this affection, though placed in circumstances in which, in previous years, the disease had invariably proved disastrous.

Milk fever, parturition fever or *parturient apoplexy*, as it is variously called, is another result of errors in diet and should be banished from every well conducted dairy. This is the disease of fleshy, plethoric cows, or rapid thrivers, and of heavy milkers. Hence its victims are always the most valuable in the herd. And yet I hesitate not to say that its very existence is a reflection on the management. I have often seen on adjacent farms, with the same conditions of soil, water, climate, quality of fodders, exposure and shelters; with cows of the same breed and precisely alike on an average in milk and fattening qualities, but with a little variety in the mode of feeding, that one herd has been yearly decimated by milk fever while the other never had a single victim. Cows with this tendency to plethora should be fed with a sparing hand for a week before, and the same time after calving, and the little allowed them must either be in itself of a laxative nature or some agent must be superadded to secure a loose state of the bowels. The owner must steel his heart against compassionate feelings towards his generous and valuable favorite, and support her for this fortnight upon a diet which in other circumstances would deserve to be stigmatised as starvation. In the circumstances this is the kindest as well as most profitable course, and the tender hearted owner must school himself to this if he would banish the malady from his farm. The period of greatest danger from this disease is doubtless toward the end of May, in June and July, when the luxuriant fields of red clover, which might well excite the envy of the Old World farmer, tempt the cattle to regale themselves upon the most nutrient of diets. Healthy calving cows, with large powers of digestion and assimilation,

must be forbidden such pastures and kept on a bare lot, or even indoors, until the first eight days have passed and until a full flow of milk has been for some days established. In all such cases it is a wise precaution to give 1 lb. to 2 lbs. Epsom salts to operate at the time of calving, or failing this, it should be given immediately after the completion of that process. The relaxed condition of the bowels, and the depletion established from the plethoric vascular system, will usually succeed in warding off the disease, even when a strong predisposition to it exists.

Further, from an excess of nutritive constituents, *urinary calculi* are sometimes found. This occurrence is more frequent in the sheep, but is not altogether unknown in the ox. The calculi are usually found in the kidney in the bovine races, and consist largely in ammonia-magnesian phosphate, with smaller quantities of carbonate, phosphate and oxalate of lime and organic matter. Their formation is usually traceable to want of exercise and excess of dry rich food, abounding in calcic and magnesian phosphates. Like other calculi, it may be largely prevented by rendering the food sufficiently aqueous.

Lastly, from overloading the stomach with dry, rich food, and particularly with grain, cattle are subject to a general stiffness and soreness, apparently of a rheumatic type, and known in some districts as *founder*. It is allied to the *founder* in horses, which is produced in the same way, and which occasionally attacks the muscular and tendinous sheaths, as well as the vascular structures of the feet. If this condition has supervened as the result of accident, the most urgent indication is to unload the bowels by means of active and stimulating purgatives, to clothe the patient warmly and apply active friction to the surface.

Deficiency of proximate principles in the food does not so much induce any particular disease, as it pre-disposes to the development of those complaints which abound among weak and debilitated herds. Thus *consumption* occurs in heavy milkers, in which the losses to the blood are not repaired, either from deficiency in quantity or quality of food, or want of power to assimilate it. An *enlarged, softened and brittle state of the bones* (fragilites ossium) is seen in cows kept in debilitating conditions and fed on soils in which the phosphates are deficient. Almost all *parasitic* diseases are due to a debility which pre-disposes the system, making it a ready prey to these contemptible enemies. A susceptibility to *pluero-pneumonia* is often engendered by a lack of that reparatory process of the blood and system at large, which is essential to vigorous health and vital resistance to morbid influences. Some excellent observers allege that abortion is often induced in growing animals by demanding from them at once the increase of her own body, the nourishment of an embryo, and the secretion of a large quantity of milk, and allowing them, meanwhile, a diet deficient in tissue-forming elements. It is needless to advance further instances. It is incontestible that the deficiency in the food of one essential element, though not immediately destructive to life,

as in Majeddie's experiments, when one element was *altogether* withheld, necessarily impairs the standard of health, reduces the power of vital resistance, and lays the system open to the attacks of disease.

As the result of certain injurious alterations and conditions of food, may be mentioned :—The skin eruption sometimes seen on cattle badly wintered and turned out suddenly on rich spring pasture; the swellings that appear on the skins of cattle fed on recently harvested grain; the indigestions, colics, diarrhœas and inflammations of the bowels which occasionally occur from the same cause. Among these, too, may be mentioned musty food, which disturbs the healthy function of the urinary organs, and even by sympathy, of the generative as well. And last, though not least, may be noticed the *white scour* of calves, taken from their dams, and fed, not oftener than twice a day on milk too often cold, soured, and in undue quantity.

Besides these, there are a large number of noxious agents occasionally taken in with the food, but essentially foreign to it in constitution and properties. Among these may be ranked poisons of whatever grade, animal, vegetable or mineral; also the different internal parasites, the germs of which are taken in with the food, and solid bodies which, by their mechanical effects in the stomach, prove inimical to proper digestion.

Among animal poisons may be specially named those of consumption and Texan Fever, each of which may be fatally introduced with the food and water. Amongst the vegetable,—acorns, which induce congestions, inflammations, and even ulcerations of the stomach, with sympathetic brain disease other astringent and irritant agents, such as the young shoots of oaks, firs, and the like, which induce indigestion, constipation and bloody water; and ergot, which proves such a prolific source of abortion in some localities, and occasionally gives rise to dry gangrene and sloughing of the hoofs. Amongst the mineral agents is probably the goitre poison, introduced with the water, and especially where that has percolated through magnesian limestone.

The prevalence of *goitre, abortion* and *dry gangrene* in the State of New York, would demand that I should dwell longer on these subjects than we can at present afford to do. Respecting goitre, I will only say that I have found it abounding and destructive, especially in sheep, on soils lying over the limestone formations, a fact which suggests the propriety of precipitating the solids in the drinking water by the addition of quick-lime, or, should that fail, of preserving rain water for the use of the stock in affected districts.

Abortion is notoriously prevalent in our State, and dry gangrene occasionally so, and in connection with these I have been strongly impressed with the fact that I have seen more ergoted grasses during last summer than I have ever met with before in any equal period of time. I have not, it is true, had an opportunity of examining the grasses from any of the affected districts, except in one instance of an outbreak of dry gangrene; and in this case I found that the ripe

grasses were ergoted. The specimen sent me was mainly composed of unripe grasses, yet the presumption is that the hay last cut and stored was first eaten, and the remaining ripe heads in the package sent me afforded the strongest circumstantial evidence that the riper portion must have contained ergot.

The able and comprehensive reports of Drs. Dalton and Carmalt throw considerable uncertainty around the supposed causation of the New York cattle abortions by ergot; but unfortunately, the reports for abortions are not made for the same years as those of the ergoted grasses. Without desiring to attach any undue importance to the presence of ergot in the food, in this case, I think it well to state what is the ascertained action of this agent on the system. Its special physiological action is to induce contraction of the involuntary muscular fibres. If this action becomes so extreme as to develop disease, the nature of the affection will be determined by the part on which the morbid action is concentrated. If the contraction takes place in the muscular walls of the blood-vessels of the brain and spinal cord, these nervous centres are perfectly nourished, and *convulsive* and *disorderly movements* ensue, as frequently seen in some of the more northern countries of Europe. If the contraction ensues in the walls of the vessels of the extremities, we have *dry gangrene*, as in some parts of New York. And if the contraction takes place in the muscular coat of the gravid womb, we have expulsion of its contents, or *abortion*. Granting, then, that ergot is not the main cause of abortion in New York—the opposite position being at present insusceptible of proof—yet it cannot fail to intensify the effect of such cause, by virtue of the property I have just named, and, as already remarked in reference to urinary calculi, all such auxiliaries should be sedulously guarded against. Again, as New York undoubtedly suffers largely from ergot, and as the moist weather of last summer casued a greater development of it than usual, threatening a wider prevalence of abortion, it is well to adopt all available means of counteracting its effects. With this view, I cannot say cut the grass green, though in summer this would have been good advice, as the ergot is only found in the seed already matured or approaching maturity. But its effects can be guarded against by rigidly withholding affected hay from all cows or heifers in calf, or, in case it must be used, to add as much of some other variety of food, in which there is no possibility of the existence of ergot, as will ensure that it shall remain innocuous. For this purpose, beans, peas, vetches, lentils, and other leguminous food may be given; but, above all, the succulent roots which, by reason of their aqueous and laxative properties, if not even by virtue of some neutralizing principle they contain, are especially preventative of the various forms of *ergotism*. Dr. Eckmann found, as the result of experiment, that the use of potatoes counteracted the evil effects of ergoted grain, and the same conclusion was arrived at by Dr. Hojer, as the result of some crucial experiments on this subject. If, as is probable, this result is mainly due to the relaxing effect of these foods

on the bowels and system at large, what a solid argument does this furnish for the more extended cultivation of root crops!

This conclusion, as well as the enhanced estimate I have made of an aqueous food for the ox, receive strongest confirmation from the recent experiments of Professor Gamgee, at Washington. He fed two cows with smut, each consuming, in the course of three weeks, no less than twenty-one pounds of the agent. The food of each was thrice daily one and-a-half pounds of corn meal, and hay *ad libitum*. To one cow these were given dry, for the second they were wetted. Both ate voraciously throughout, but while the cow fed on wet food gained in condition, that fed upon dry as sensibly lost.

I cannot now do more than glance at the parasites of cattle, whose germs are taken in with the food. Among these are the *distomata* or flukes of the liver, seen in rot or the aqueous cachixia, and whose germs are taken in with the stagnant water and rank herbage of marshy and low-lying districts; the bladder worm of the brain, the germ of which is deposited on the food by the ripe links of a tape worm of the dog; the bladder worm of the liver and other internal organs, whose germ is the ovum of another canine tape worm; the thread-like worms of the lungs and intestines (Strongylus Micrurus and Strongylus Radiatus) of calves, with *husk*, and whose ova are equally taken with the food; and the same remark applies to six or seven worms of less common varieties, which it were superfluous here to enumerate.

Lastly, among solid bodies taken in with the food, may be named sharp pointed objects, such as nails, needles, pins, &c., which becoming arrested in the cells of the second stomach, so often make their way to the heart and destroy life;—hair balls, the materials for which are obtained by licking themselves or their fellows, and matted together by the motion of the stomach;—bones, pieces of leather, iron, &c., swallowed from wantonness or dyspepsia, and which once in the stomach give rise to chronic hoven or bloating, showing itself whenever food is taken in. Such cases are always troublesome, though it is not impossible in many cases to fatten the subjects or even to cut into the viscus, as for an overloaded paunch, and take out the offending object.

And now, gentlemen, before I sit down, let me thank you for the courteous hearing that you have vouchsafed me. If I have failed to minister to the love of the marvelous;—if I have ignored brilliant theories, I hope to have earned your forbearance by not having despised or neglected the useful. And stern and matter of fact as it may appear, it is this utilitarian spirit applied to the rectifying of trifling abuses which have raised us to our present proud position of advancement in the arts and sciences Attention to small and individual improvements has perfected our manufacturing processes, and flooded our markets with all that is calculated to please the eye and minister to our well-being; it has enabled us to span the oceans and continents by the aid of steam and electricity, and bringing us side to side with

the very ends of the earth, has secured the products of the whole world to minister to our comfort and enjoyment; it has enabled us to apply new systems of culture and of land improvement, until the wilderness has been made to blossom as the rose, and the deadly malaria has given place to the pure and untainted breeze, alike grateful to the lungs and salubrious to the system. No great object was ever attained without the closest personal application and effort, and the stock-owner who will devote his best energies to the improvement of his own estate will be amply rewarded in its enhanced value, besides having made that unspeakably desirable acquisition of an approving conscience, satisfied with having benefited humanity and made the world better than he found it. While in this world we must look for suffering and death alike among the lower animals as in man, but since the God of nature has placed in our hands the means of in some degree counteracting these, we are recreant to our trust if we fail to avail ourselves of them. And as He has taught us to avoid despising small things in feeding the herbivora on isolated blades of grass, and furnishing man with the staff of life in grains so minute, let us profit by the lesson and by each checking the individual and apparently inconsiderable sources of failure, add our contribution to the progress of the world and the prosperity and well-being of our fellow-men.

"THE CLAIMS OF CHEESE, AS A WHOLESOME, NUTRITIOUS, AND ECONOMICAL ARTICLE OF FOOD."

ONE HUNDRED DOLLAR PRIZE ESSAY.

BY L. B. ARNOLD, ESQ.,

OF ITHACA, N.Y.

So extensively is cheese manufactured in the United States, and so commonly is it used in this community, that, at first thought, it seems almost a needless task to discuss its merits. But there are some objections urged against its use, as well as some considerations in its favor, that it may be worth while to notice.

A strong presumptive evidence in its favor is the fact of its being derived from milk. From the earliest records of our race the milk of animals has been extensively employed as an article of human food, and has been, by general consent, regarded as both wholesome and nutritious. Among all the multiplicity of foods used for the support of human life, milk is one of the most perfect. It is, in fact, almost the only food that will, when used alone, support life, and maintain health and vigor for an indefinite length of time.

The perfect proportions of its aliment are proven, if proof is necessary, by the fact that it is the only food of the young of all mammalia, and that they not only live upon it, but grow and thrive, and are perfectly developed in all their parts. Coming from such a source, it is very natural, and I may say fair, to presume that cheese should partake of the excellent qualities of the material from which it is derived.

But there are objections sometimes urged, even against milk. There are some people with strong vegetarian proclivities, so sensitive as to object to both milk and cheese, because of disease and a tendency to disease, in the cows from which it is produced. They say that domestic animals are reared under circumstances so artificial and often so unnatural, as to produce a constant tendency to disease and of disease itself, and that in the case of cows, both may be conveyed to their milk. And hence they object not only to milk and all its products, but also to the flesh of such animals. That the treatment of cows is sometimes so improper as to produce disease that will influence their milk, is doubtless true. The swill-milk of

the New York city stables is notorious. Milk from cows fed upon the slops of breweries and distilleries, and other improper and unwholesome food, will doubtless partake of the food from which it has been derived. But cheese is not made from the milk of stall-fed cows. It comes from the milk of cows that live in the open country and inhale its purest breezes; that feed upon the fresh green grass as it grows upon the turf-clad hills and valleys; and that drink from the crystal fountains and sparkling rivulets, as meandering along the undulations of the fields, they first start on their journey oceanward.

What better circumstances of health for cattle can be imagined than those which, as a rule, surround the herds of the dairy farmer in the season of lactation? Surely, the presumptions are strongly in favor of the healthful origin of milk for cheese-making.

An objection sometimes made to the use of cheese, is, that it does not fairly represent the good qualities of the milk out of which it was made; that it leaves out a part of the elements of milk, and those that it takes in are so altered in the process of manufacturing and curing, that they make the cheese a very different thing from the original milk.

That cheese does not take in all the elements of milk is true. It leaves out nothing, however, that is worthy of notice but the milk sugar, and this is so easily and abundantly supplied by the saccharine matter and starch in the food with which cheese is eaten, that its loss can hardly be held to have any weight in disturbing the just proportions of its aliment.

In respect to the idea that cheese, on account of changes made in manufacturing and curing does not represent the milk it was made from, let us look at the facts. They do not look alive to be sure, but appearances are sometimes deceitful, and cannot always be relied on to determine important points.

That milk must undergo many changes in appearance before it can be assimilated, is evident. Milk in the cow's udder, and milk two hours in the stomach of a calf, differ as much in appearance as milk in the dairyman's pail and milk in the form of a cheese; and yet, that the curd in the former case is uninjured and identical with the milk it was made from, will not be questioned. Nor will it be questioned that the solid condition of the curd in the calf's stomach is necessary to prepare it for assimilation, for it is one of the steps in nature's own method of converting it into blood. I hold that the conversion of milk into cheese involves the same changes that occur in the stomach of the calf, and that it is only carrying out a part of the process of digestion. Let us compare what happens to the milk in the two cases, and see. But first, let me remark, that the active agent in rennet is now known to reside in minute globular bodies called cells, which float in the gastric juice by myriads; that they are the cause of coagulation and digestion when applied to warm milk, whether in the stomach or out of it; and that they are, like

the globules of cream, which they somewhat resemble, mechanically inclosed in the coagulum they have formed, and remain there to continue the process of digestion they have begun.

Let us now suppose a gallon of milk to be taken into the stomach of a calf, and a quantity also placed in our cheese tub; gastric juice, containing an abundance of digestive cells, is applied to each, the one naturally, the other artificially; but with this difference: the quantity which the calf applies to one gallon of milk we apply to 300 or 400 gallons, and consequently one coagulates in ten minutes and the other in an hour. In one case the curd is broken up and kept stirred by the peristaltic motions of the stomach, in the other, with the curd knife and the hand of the dairymaid. The whey separates in each alke, but in one case it is absorbed away and carried into the circulation, and in the other it is carried away artificially. The curds, in each case, at first soft, gradually harden till the whey is nearly all separated and they become firm and solid, one rapidly, the other slowly. We may now suppose that the curd in the stomach has assumed its most compact form, and the artificial curd a corresponding condition; that it has been through the press and now lies on the shelf in the curing room. The curd in the stomach full of digestive cells, with new ones in multiplied thousands poured out upon it with the increased supply of gastric juice, is kept at 98°. The curd in the curing room, containing only the cells employed to coagulate it, is kept at 70°, or below. In the former, the digestive process is rapidly hurried on, and in a few hours the hard and tenacious structure of the curd begins to be broken down and appear soft and salvy, and to assume a cheesy texture, as well as a cheesy flavor and odor. In the latter, the process is slow. In a few weeks, instead of a few hours, its firm and tenacious structure begins to yield to the digestive agency, and also begins to soften and to assume the same salvy and disintegrated appearance, and the same cheesy flavor and odor of the former, but unaccompanied with its strong animal odor. In the former, the process of disintegrating and softening goes on rapidly, till the whole becomes liquid, and is carried away to serve the purposes of life. In the latter it is checked by drying and cooling, so that little change will be noticed for a long time. We now consider our cheese ready for use. It will be seen that all we have done is to carry the digestive process up to a certain point, and there to check it. We have digested the curd till it is just ready to dissolve, and there we hold it. We have the solid elements of the milk in our cheese tub in a good state for preservation, and yet so nearly digested as to require but little aid from the human stomach to dissolve it, and make it ready for the work of assimilation. Is it not plain, from the foregoing, that cheese is a fair representative of the milk from which it is made, and that it is entitled to the reputation we are in the habit of ascribing to that perfectly wholesome and nutritious luxury?

The last objection I shall notice is the one most commonly raised,

viz., that cheese is food in a state too concentrated for the human stomach. I shall not dispute this point, for I believe the human stomach was not made to hold food that contained nothing but pure nutriment, like cheese and meat. It is too large for such a purpose. Our food must have bulk enough to distend the stomach and bowels, so as to afford a sufficient substance for them to act upon. Cheese will not do this when taken alone, and hence some people would have us reject it altogether. But the same objection lies against beef, and pork, and mutton, and all similar food. Shall we reject them also? We do not, and should not, object to meat because of its being too concentrated to eat alone. We remedy its defective bulk by using with it some less nutritious food as bread, potatoes, or roots; and the remedy is perfectly efficacious. We should do the same with cheese, and the objection would lose all its force. And this we do instinctively. We never eat cheese with meat, or beans, or peas, or other strong food. We use it in connection with farinaceæ and fruit, with bread, pastry and the like, and we do so with the happiest effects. The practice which prevails generally in selecting food to use with cheese, is as much in accordance with reason as with taste. A little chemistry will illustrate this, and show us that we might, with profit, consume much more cheese than we now do. Chemistry divides our food into two classes; those which go to make up flesh and the framework of the body, and are called flesh-forming or albuminoids; and those which furnish the material for fat and animal heat, and are called fat-forming, or supporters of respiration. We do not use these two kinds of food in equal quantities; we take only one of the former to two and a fourth of the latter. They are found in just this proportion in milk. That it may be seen at a glance in what relative proportions the two classes of elements exist in some of the common articles of food, I have prepared a table, by selecting from some of the latest and best authors, to show what per cent. of albuminoids and fat-forming elements are contained, on an average, in the kinds of food named:

	Albuminoids. Per cent.	Fat-forming. Per cent.
Milk	3.8	8.2
Butchers' meat	14.4	29.9
Cheese	24.	31.
Wheat flour	11.8	74.1
Wheat meal	13.	67.6
Rye flour	10.5	72.5
Corn	10.	68.
Buckwheat	9.	59.6
Peas	22.4	52.3
Beans	22.5	45.5
Rice	7.5	76.5
Fruits, all kinds	0·5	11.3
Potatoes	2.	21.

I have said that we consume, on an average, about $2\frac{1}{4}$ parts of fat-forming to one of flesh-forming material, and that is all we can con-

sume. Whatever is in excess of these proportions is of no value. Wheat contains over 6 to 1, while cheese, it will be seen, contains an excess of albuminoids, that is, it has only $1\frac{1}{4}$ of the respiratory matter to one of flesh-forming, whereas it should have $2\frac{1}{4}$. This disproportion comes in consequence of its loss of milk-sugar. If eaten alone it would not be consumed to the best advantage. Wheat flour stands in the opposite relation. It has nearly three times as much starch, &c., as are necessary for, or that can be used with its albuminoids; and hence, if used alone, is used at a great loss, besides the liability to disturb the healthful conditions of the body by its great excess of starch, &c. A moment's thought will enable any one to understand, that to use cheese with any preparation of wheat flour, would tend to balance both their excesses, and make them both more valuable and nutritious than they could be alone. And the same is true with all the cereal grains, corn, buckwheat, rice and fruit. The use, of cheese, therefore, with every variety of bread, pastry, fruit, &c., is not only proper, but earnestly to be recommended, as a positive aid in preserving a proper equilibrium in the elements of food. Cheese used in connection with the bread grains, &c., as suggested above, has an economical value that it is well-worth while for purchasers of food to consider.

Cheese is an animal food, and may, with advantage, be substituted for meat. At the current prices, it is cheaper food than butchers' meat. The average retail price of the latter for the past season, at our markets, after divesting it of bone, has been twenty cents per pound, and cheese the same. But cheese contains more nutriment than meat when equal weights are taken. Meat, it is true, is perfect nutrition, and is all consumed. Assuming no waste, a pound of flesh may make a pound of flesh again It cannot do more; while a pound of cheese, simply by absorbing water, will furnish the material for more than a pound of flesh. It is, therefore, the cheaper food of the two, and may be profitably substituted for it. But its highest economical value arises from its enhancing the value of other food with which it is consumed. By the figures in the table it may be seen that if half a pound of flour, that will cost only four or five cents, is converted into bread, and consumed with a pound of cheese, the two together will furnish a little more nutriment than two pounds of meat. The figures which represent their value stands thus:

	Flesh-forming.	Fat-forming.
One pound cheese	24.	31.
One-half pound flour	5.9	36.
	29.9	67.
Two pounds meat	28.8	59.8

The pound of cheese and the one-half pound of flour will cost 25 cents, and the two pounds of meat 40 cents. Cheese sustains a similar relation to all the cereal grains, and in fact to almost all the food

derived from the vegetable kingdom, and is therefore used with that class of foods with great advantage. Thus consumed, it has an economical value that pertains to no other animal food. We cannot use butchers' meat, for instance, with wheat flour and produce any increased value over using them singly; for meat, as a rule contains just the right proportions of flesh and fat (1 to $2\frac{1}{4}$.) It has nothing, therefore, to offset with the excessive starch in the flour. Hence, when meat is consumed with bread, potatoes, roots, &c., all the excess of starch or sugar they contain is wasted. The only valuable purpose they can serve is to supply the deficient bulk in the meat. It cannot possibly utilize them. This relation of cheese to food containing an excess of the supporters of respiration ought to be better appreciated by our people than it now appears to be. We live mostly upon food that contains an excess of fat, starch, or sugar, which we pay for at a heavy expense, without its contributing anything toward the support of life. By a better understanding of the relation that the use of cheese sustains to such food, so much of that excess might be utilized as to be sensibly felt in the cost of living. A large amount of food now consumed without any benefit, might be rendered available.

There is another consideration connected with the use of cheese, as above suggested, that I would not have overlooked. I refer to its influence upon health. That a food in which the elements of nutrition are in the same proportions that they are used in sustaining life, is more healthful than a food in which they are in great disproportion, is a fact too evident to need argument or illustration. The nearer we approach to the perfect proportions in the elements of our food, the better must it be for our health. That cheese may be so used as to promote a better relation in the elements of food has been sufficiently shown, and hence the bearing which a more liberal consumption of it would have in promoting health may be inferred.

There is still another peculiarity in the use of cheese that I may notice in this connection. It has been previously stated that the coagulation of milk was effected by the aid of minute globular bodies, called cells, that float in the rennet, and that they are enclosed in the coagulum they have formed, and remain there during the process of manufacturing and curing the cheese. All this is true, *and more.* Unless they are destroyed by some unusual treatment, they remain in the cheese until it is consumed, and retain their power unimpaired. This may seem a strange assertion, but it is nevertheless true, and may be very easily verified. If any one desires to do so, let him take a piece of rich old cheese and dissolve it in tepid water. When it is dissolved, or so softened as to mix readily with the water, apply it to a little sweet milk and keep it warm, and in due time it will coagulate in the same way as by the use of rennet. If a microscope is at hand, he may see the cells floating about in the water in which the cheese was dissolved,

When cheese is dissolved in the stomach the cells are set free, and resume their former efficiency, and become a positive aid in digesting

other food. The opinion that cheese will digest other food, quite commonly prevails, and here we may see that it is founded in fact. This peculiarity which belongs to cheese may justly claim some weight while we are considering its merits.

Enough has been said, I think, to show that there are good and substantial reasons for regarding cheese as a wholesome and valuable food; and that it is worthy of a more liberal consumption than it now receives. This opinion is not only verified by the argument offered, but is sustained by experience. As a community, the dairying people of the United States are very large consumers of cheese. They have at all times an abundance of good cheese of their own manufacture on their tables and use it very freely, and they do so with the most favorable results. A more healthful and vigorous class of citizens cannot be found among us.

As a nation, the English people probably consume more cheese than any other nation on the globe. Their annual consumption amounts to 300,000,000 of pounds for 30,000,000 of people, or ten pounds to each inhabitant. In the United States the annual consumption amounts to 180,000,000 for 40,000,000 inhabitants, or four and one-half pounds to each inhabitant. The statistics of mortality in the two nations show the condition of longevity to be rather in favor of the English people. This difference may or may not result from the use of cheese, but in either case it shows that cheese does not hurt them, and that the people of the United States might annually consume more than double the quantity they do without doing them any injury.

In conclusion, there are many reasons for commending cheese to a more general use. Besides being, when properly used, a wholesome and nutritious diet and richer in nutrition than butchers' meat, or any other animal food; besides its peculiar ability to enhance the value, improve the healthfulness, and aid the digestion of other food with which it is consumed, its readiness for use at all times without loss or trouble in cooking, its convenient form for handling and transporting; the ease and certainty with which it may be preserved for many months without loss or injury that occurs to other food from an excess of salt, all commend it to the favor of the public, and especially to the army and navy, where it could not fail to prove not only a luxury to our soldiers and sailors, but a cheap, healthful, and substantial substitute for the continued use of salt meat.

"SOME OF THE RELATIONS OF SCIENCE TO FARM PRACTICE,"

BY DONALD G. MITCHELL, ESQ.,

OF NEW HAVEN, CONN.

DELIVERED BEFORE THE AMERICAN DAIRYMEN'S ASSOCIATION, AT UTICA, N.Y., ON WEDNESDAY, JAN. 11TH, 1871.

A year ago I had the pleasure of sitting on one of your back benches at this Convention, and of listening very interestedly to the close and exhaustive discussion of certain phases of science which are related to agricultural practice. I could not but observe the eagerness with which the discussions were followed by a great many working farmers. They listened as if they intended to get some good out of the things that were said; and I began to conjecture how they would make application of it all, and how fit it to their practice. We hear a great many good things said, first and last—on week days and on Sundays—which we greet kindly enough, but which somehow we do not fit into our practice. And we tell the parson that it is a fine thing he has told us about the heathen, and the contribution box, and talking against our neighbors, and there we let it rest. Some good things we hear we do not fit to our practice, because from our condition we cannot, and a great many more fine things we hear of, we never fit to our practice, because we will not. I feel more and more convinced that if every farmer were as good a farmer as he *knows* how to be,—that is to say, if his practice, and method, and industry, and zeal, were up to the level of his information, there would be a vast many better farmers, and vastly better farmers than there are now. It is quite as certain that if every man would be as good a Christian as he knows how to be, there would be far more of them. But, not being so, many a man finds it convenient to get up an intermittent worry about theologies, or possible interpretations of Scripture—thinking some new aspect of these will possibly bridge him over a larger self-content. And just so in practical farming—there are a vast many who do not practice half so well as they know how, or up to the level of their actual knowledge, and who run after scientific expositions of particular phases of farming,—just as old sinners will run after the theologies,—in the hope of finding excuse for their mal-practice, or some rare new bit of information that will put them in a safe place without any particular labour on their part.

Now I think we may lay it down as a rule—and I am sure the scientific men will agree with me—that all the science in the world will not enable any man to grow good wheat, or to manufacture good cheese, without taxing his brain and his handiwork very persistently in the making of each. Whoever comes to science for a short cut to good cheese or to a full pocket, will inevitably be lost in a bog. Science goes after the *why* of things, with most persistent search and unrelenting labor. Practice goes after the *how* of things, and never successfully, except with the same sort of indefatigable will. The two help each other, and always must, when both are earnest. But science makes no bridge by which a lazy, cunning man, who shirks work, can come to joy; and the expectation that the broadest acquaintance with scientific results will enable the shirk to make his land expectorate crops by the appliance of the right salts, as easy as a man would clear his throat, or blow his nose, is untenable and preposterous.

But how far can the man who is really in earnest to improve his farming put such a grip upon the special results of scientific inquiry as to help forward his practice?

I am not so bold as to think that one-half the ground opened by such an inquiry can be gone over in half a dozen pages, or in twenty. It is only possible, within the prescribed limits, to notice some few of the relations of scientific inquiry to agricultural practice which are to be kept fast in mind, and which are sure to give aid to good practice, though the contrary may sometimes seem true, and also to hint at certain other phases of scientific inquiry on matters pertaining to agricultural practice which we have no need to follow to their issues;—not because all legitimate science does not aim at the truth and ultimately achieve it, but because the aim of the scientist is different from the aim of the practical man—the scientist aiming at whatever is possible in growth, or promoting growth, and the farmer aiming at what is practicable and remunerative in vegetable or animal developement, or in promoting the same. The scientific man, who should devote himself to the investigation of what was remunerative and profitable in the way of feeding crops or animals, or in their treatment, would be brought into the presence of a great many variable and unsettled questions about labor, and markets, and wet or dry weather, which would disturb his calculations. He aims at those truths which can be severely and cleanly demonstrated, and hands them over to the practical man to deal with as his judgment and experience may dictate. Thus while the scientist proper, by the whole bent of his education, must in his researches overlook all that range of probabilities, about weather, and labor, and markets, which are of vast importance, and must be duly considered by the practical husbandman, he also pushes his researches to finer issues than will be of benefit to the practical farmer.

Thus the chemist tells us, perhaps, that phosphates applied to the soil promote largely the growth of certain plants, and that soluble

phosphates are far more easily and quickly available than those which are insoluble. This is clearly established by a long range of experience, and by carefully conducted experiments. This is a fact of importance of which the farmer should avail himself who wishes to manure wisely. But the chemist does not stop here; he goes on to inquire why it is that the phosphates prove so stimulative to the turnip, or the cabbage, or the clover, and how it is that the insoluble phosphates—whether by attrition, and tillage, and æration, or by the prolonged wrestle of the little fibrous rootlets of the plants with their unyielding surfaces—do at last give up their stores. Now, all such minute, specific inquiries may yield a great deal to science, but not necessarily to the practical farmer. Legitimate scientific investigation, in short, pushes the chemist farther than it is needful for the farmer to follow him, without neglect of those grosser and more palpable truths which are more nearly related to his business. The smith, working at his forge, wants to know when his iron is duly heated, and where and how he should direct his blows for best service; but the knowledge that the order and timeliness of the blows are directed by certain muscles, bearing such and such names, and that the volition which governs their action accomplishes its passage from the brain to the muscle in certain specified time, will in no way help the smith to make a better horse shoe. It may make him a fuller and more thoughtful man; but we cannot be full of all knowledge; life is too short for that, and the fullness which is most helpful is that which lies in the line of our daily practice.

In those times when our agricultural fairs were closed up with a rosy address, it was not unusual for our orators to declare that a good farmer ought to be a good chemist, and a good botanist, and a good geologist, and a good entomologist,—all of which, if he were a good Christian, and attended to the duties that lay before him day by day, he certainly could not be. A good chemist wants to put the largest part of his life into his work, and so does a good geologist, and the largest part of a long life, faithfully devoted, will leave a good part of his appointed road untrodden. Beside which, the habit of a farmer's mind does not fit him for that nicer and minute investigation which alone qualifies the apt student in chemistry. And if, with a love of it, the young farmer prosecutes inquiries in that direction, just so far he gives himself over to that engrossment with the subject which characterizes every true votary of science, just so far will he undervalue and lose sight of those grosser issues which belong to practical farming. The successful pursuit of any science is a love which demands devotion, and which will not tolerate the putting of any such question as whether such and such results will *pay* in a crop.

While asserting this, I do not for a moment mean to say that the possession of certain truths demonstrated by the chemists and botanists are not very important to the intelligent farmer; but I mean to say that he can lay hold of such in the agricultural text-books, pre-

pared by safe teachers, far better than to worry toward them by a tussle with the whole body of science. The dyer and the tanner must know certain laws of chemical action, and must know them so thoroughly as to make them a part of their trade; and the builder must know certain mathematical laws as fully; but no one supposes for a moment that a good practical dyer must needs be a chemist—that an accomplished builder must be a mathematician. And one great secret of the large practical success of either lies in the adroitness and shrewdness with which he seizes upon special revelations of scientific study, and warps them into the channels of his business. Indeed, it is the secret of success everywhere—to seize upon the *large facts* which will help us, and to let the *little ones* alone; the trouble with the unsuccessful man is that he can't determine what the large ones are.

This is specially true in the matter which we are considering—I mean the possible engagement of the ambitious farmer upon a long course of scientific study. Being without the full mastery which only exclusive devotion gives, he is apt to rate all facts alike in importance which have had scientific demonstration, and with undue pride in his special study, he is disposed to undervalue all the results of practical field experience, when compared with the results of his study. Now this is a thing which the conscientious scientist never does; he has an immense respect for actual field experience, provided only he can get—what it is, unfortunately, very difficult to get—an absolutely true account of it. But the superficial and cursory student has none of this respect. If he finds phosphoric acid largely present in a crop, he may rashly conclude that he must feed it mainly with the same. If he finds nitrogenous compounds he concludes here, too, perhaps, that he must feed mainly with the same. But the experienced scientist rushes to no such hasty conclusion. There lie long months of active and miraculous plant vitality between the issue and the application. That vitality is a subtle thing, far subtler and more complex than the pouring of the contents of one gallipot into another gallipot. Experience and carefully conducted experiment show the conscientious, scientific observer that phosphatic manures may very possibly best stimulate the plant which, in its ripened state, shows preponderance of nitrogenous material, and that nitrogenous manures may best stimulate the plant which ultimately shows preponderance of phosphatic material. The larger and important fact and conclusion is one made up of analysis and carefully conducted experiment combined, and the lesser and unimportant fact is the one which is due to analysis only, and which the neophyte pounces upon and rushes thereby to his own hasty conclusion.

Now, if phosphoric acid is largely present in a ripened plant it is clear enough that the source of it must form a part of the plant food, but it does not at all follow that direct application of its chemical sources in such crude form as we may command will best quicken and secure its full development. Nay, more, it would appear from abund-

ant experience that the application of some food wholly different in quality, and not mineral at all, will best push into exercise that vigor of the plant which will enable it to make successful forays for its phosphoric acid in the existing constituents of the soil. What I say here is in the way of illustration, and not with the intention of laying down the law on this particular question of phosphates and ammonia. But we may be sure that all analogous and similar facts will be brought to publicity by those qualified to speak authoritatively, just as soon as the experiment and investigation will warrant it.

Meantime it is a pity that we should be befogged, and science discredited, by the utterance of those smatterers who base their theories upon a mere course of scientific reading. A course of scientific reading may be a very wise thing to take, but it does not form basis sufficient to indoctrinate us in new theories on agricultural practice. Medical reading is interesting to many people, but if such fall sick in earnest, they are apt to have a very large distrust of mere medical reading. If farm writers would cultivate a nice habit of observation, and spend their writing force upon exactness of detail in regard to their personal experience, and leave scientific disquisition and theorizing to those who give their lives to such studies, I think we should all be much the better off for it. It is the wearisome iteration of unimportant facts in science and the deluge of a vague theorizing about them by amateurs in our journals that more than anything else befog practical men, and render them incredulous about the real validity of thorough scientific investigation. What a man *supposes* about the action of fertilizers may be very fine, but it is far better to tell what he knows.

I have alluded to the hasty conclusions to which a cultivator, with insufficient knowledge, and yet an overweening trust in science might be led—as in the matter of giving phosphates largely to wheat—by laying undue stress upon an isolated chemical fact, without due consideration of scores of related facts. I think, too, that the same overweening confidence is apt to breed great doubt and perplexity for quite insufficient reasons.

Thus the smatterer, with a lively sense of what the true odor of ammonia is, and knowing, or thinking, ammonia to be of supreme importance, almost the only gold, as he extravagantly counts it, in the whole treasury of fertilizers, is too prone to judge of a fertilizer by a snuff of it, and to disturb himself unduly by escaping odors from the barnyard and his compost heap. He wastes anxiety and resources in frantic endeavors to arrest a smell, and is far more disturbed by its escape than either the experienced farmer who is honestly ignorant, or the experienced chemist who is wisely cool. The fact is that a very minute quantity of ammonia will give its odor to a dealer's bag, and Dr. Graham has proved that air containing a seventy-five thousandth part of its weight in ammonia will effect test paper, as it will, doubtless, a well organized nose. And a manure heap, where there is a slight ooze of urine, will give out this odor for months without damage to the amount of a fifty cent currency note. Many things will spend

a strong smell without wasting much. A fopling, for instance, will exude a fearful amount of musk or jockey-club perfume without the diminution which we would all like to see in him. There is, again, that other familiar animal, the skunk, who can spend an equal amount of fetid odor without much waste of material substance. So, though an ammoniacal scent is good proof that ammonia is present, it is by no means an absolute proof that it is largely wasting. What will make the nose tingle very emphatically, will have much much less emphasis upon a crop.

In respect *to the analysis of soils*, from which enthusiasts once entertained very large expectations in aid of practical culture, there has been grave disappointment. Not because science has told untruths about soil, but because from the nature of the case, the truths it told were not broad enough and not wide-reaching enough to cover all the conditions of a varied practice. Carefully conducted, it developed possible sources of fertility which somehow the growing plants failed to grapple, and even the minuteness of its search failed to find, in such samples as analysis must needs deal with, that little modicum of nitrogen or other provocative of growth scattered over a broad field, which was good to make a crop of rye, in the face of apparent barrenness. We do not learn that the educated and experienced farmer of any country thinks it needful to secure an analysis of the various fields of a farm before committing himself to a purchase or to the rental. He finds sufficient means of determining a general range of quality and capacity, in the actual crops, in the native flora, in situation, in texture of soil, in climate, and in those grosser qualities and conditions of it which do not tempt or reward the finer investigation of the chemist. And this counts no whit against the validity of scientific teaching. If a patient were to consult a physician about his chances of taking fever in a certain low district of country, the physician might assure him that there were sources of miasma there, but he could never assure him that he would surely take the fever, or that he surely would not. And I do not think this fact would count one whit against medical science. It would only prove that many things are unproven by science which can only be proven by individual trial. And yet soil analysis is of the utmost importance in the conduct of minute experiment upon growth, under charge of those competent to pursue such investigations. We should never have learned without it, a great many of those wonderful facts about plant food and plant growth, of which we are now possessed, and which form the only sufficient basis of a sound vegetable physiology.

Chemical analysis is again of the utmost importance in determining the value of our muck deposits, our marl, our river mud, in which it may chance to bring to light wealth of which we have been utterly ignorant, and which we only discover in practice haltingly and uncertainly, after years of trial. I remember that in the early spring of 1853 I was walking with a planter upon the banks of the Ashley, in South Carolina, and he called my attention to a certain yellow looking

marl or mud which underlaid the soil in his flower garden, and he said that he had been applying it with conderable success, he thought, to his cotton and his sweet potatoes. And he had continued this for many seasons. It was some five or ten years after this that this marl fell under the close observation of science, and the result was the so-called discovery of the vast phosphatic deposits in that region, which have given birth to a new commerce, and turned old river banks into a mine of wealth. A hundred years ago vessels lay there under the shadows of the weird gray moss of the live oaks, laden with bricks from England to build planters' houses; now vessels lie there under the same shadows of the mosses taken in cargoes of fossiliferous deposit, sharks' teeth, and the bones of extinct monsters, to fertilize the turnip bearing downs of England. Baked earth came over to build houses, and a hundred years later, phosphatic earth goes back to build crops.

In the analysis of the concentrated fertilizers of commerce chemical analysis is doing some of its most directly and palpably effective work at present for the practical cultivator. He might indeed, arrive at a knowledge of manurial values by long and repeated trials, but he might attribute his failures to condition of soil or atmosphere, or anything rather than the deviltry of man which finds a profit in adulteration. And this adulteration is carried to an enormous extent. Guano is moistened to carry weight, and is treated with sand; the debris from the fish-oil works has its special adulteration; the superphosphates are charged with valueless addenda; and even wood-ashes are dosed with earth and hydrate of lime, to make full measure. Nothing but the watchful eye of those competent to detect the shortcomings in these fertilizers can save us from imposition.

Some two years since, the Connecticut Legislature, at the instance of the Board of Agriculture, passed an act requiring all packages of commercial fertilizers, whether in bags or barrels, to carry a plainly printed enumeration of their chemical constituents; if untrue to this, the fertilizers were liable to seizure and forfeiture. What the practical result has been cannot, as yet, be determined. It is to be observed, however, that the next Legislature put an end to the Board of Agriculture, as an unnecessary institution. It looked very much as if the manufacturers of fertilizers had strewn some of the corrupting material which lobbyists employ for the propagation of ideas, over the Legislature itself.

There are some indications by which, with a very moderate knowledge of science, a purchaser might be able to detect gross frauds, such as color or shape of crystals, specific gravity, fusibility, odor, &c. But the trouble is that the shrewd adulterator directs his disguises in view of just such cursory examinations, and the first dupes they make are ordinarily those who think they know most.

Again, it is to be considered, in connection with proper analysis, that a fertilizer which is almost worthless, so far as its chemical qualities go, will sometimes surprise us by noticeably good results;

and this is due, not to values overlooked, but to mechanical effect, in acting as a mulch, in retaining heat or moisture, or possibly in that happy and minute distribution of the little of chemical value which it possesses. And this matter of proper mechanical distribution of a fertilizer to the plant is a subject of far more importance than is currently believed. It is certainly well worthy of scientific experiment, and I believe the time is not far distant when we may reap double our present advantages out of a fertilizer, by so timing its application, and so minutely adjusting its distribution to the wants of the plants, as to forbid any waste of plant vigor in making long search for its nutrition.

At some future day, too, it is probable that a finer analysis than we now know of, will explain to us why it is that a grape in one vineyard will produce wine of a special and wonderful flavor, and the same grape, a stone's throw away, upon soil identical, so far as ordinary tests go, will give wine of a wholly different and inferior flavor; and how tobacco in one field will yield a delicious aroma, (if I may use that word in presence of "the coming man,") and in another field will fall away into the most beastly of flavors. At present the matter is a puzzle to scientists and everybody else. A more complete knowledge of the physiology of plants will doubtless have its part in making up any possible explanation, and however far physiology may push its investigations, I think it will be found that different members of the same fruit-bearing plants will have always their idiosyncrasies to perplex us, just as boys of the same parentage will one of them have red hair and the other brown, and one of them be given up to pipes and ale and the other to charity and good works. Again, in considering the aids offered by scientific inquiry to practical culture, it must be borne in mind that science does not stand still and leave us to revolve about it with our hoes and guano bags. What seems a fixed basis of departure may possibly be shifted by further and fuller investigation. Thus, in regard to the question whether or not growing plants could avail themselves of the free nitrogen in the air. In 1779 Dr. Priestly held that they could, and Dr. Priestly was a man whose opinion, in that day, would have staggered the guano market, if guano had been on sale. Twenty years later DeSaussure, with finer tests, declared that plants could have no gain from this source. Forty years later Boussingault, with further tests, decided that they could; and ten years later, continuing his experiments, he landed on the conclusion now held, that it is unavailable, and must remain so until we can, by some magnetic or electric discharges, knock a hole in the air, and let the nitrogen drop out.

Again, science, in its connection with agricultural experiments, establishes from time to time exceptions to previous rulings. Thus it has been laid down as an axiom, confirmed by good practice, that a plant which matured its seed robbed the soil of more fertilizing material than one which did not. But in the light of the recent very full and long continued experiments conducted by Dr. Voelcker, it

would seem to be established that there is an exception to this rule in the case of the clover crop, and he seems to have demonstrated conclusively that a field which is allowed to ripen its clover seed will thereby be richer in nitrogenous food, and in better condition for a succeeding wheat crop, than if the crop were removed in bloom, or even ploughed under in a green state.

Again, science, in its investigations, not unfrequently establishes and clinches the truth of some old tradition current among practical observers, yet coyly entertained by thinking people, because at variance with the ordinary laws of nature. Thus, old farmers of forty years ago, and longer, kept firmly by a strong prejudice against the barberry bush, as being injurious to their rye crops, if near them. It seemed very preposterous that an innocent shrub should blight grain, and traditional prejudice held ground only in virtue of the pertinacity with which many will cling to traditions because they are old. But now, science, in looking into the habits and qualities of a certain fungal growth which is incident to the barberry, discovers that the *Æcidium berberidis* represents one stage in the growth of a fungus, which, at a later stage, afflicts the rye. Whether the danger in the case is enough to warrant the extirpation of the barberry is quite another and doubtful question. But it is a curious illustration of the nicety with which scientific investigation will probe and detect every little germ of truth which lies mummied in tradition.

Another fact of the same nature is worthy your attention, and it is one which is specially related to the pursuits of dairymen. In the course of the exhaustive discussion by Prof. Caldwell, at the Dairymen's Convention of 1870, upon the fungal growths in dairy products, he stated that it had been clearly proven that the germs of this growth could be only effectively and surely destroyed by a certain extreme degree of heat; thus beautifully confirming the old ruling of good dairywomen: that nothing promotes sweetness and cleanliness in the milk-room like an occasional swash of scalding water.

In considering the relations of scientific inquiry to practical culture, it should be remembered that the obligations are not and ought not to be altogether on one side. Practical cultivators are indebted to scientific men for special and minute investigations which they cannot make. I say they are indebted, but the misfortune is that practical cultivators in general observe and make record with so little accuracy, that the scientific men cannot count upon them. This is worse than a misfortune—it is wrong. Professor Buckman, formerly of the Agricultural College of Cirencester, says: "Teach your boy a close and accurate habit of observation, and more good will accrue to agriculture than if he brought away all he learns at an agricultural college."

Accurate observations is a thing that can be cultivated, and it can be cultivated without scientific formula. Only gather and mass your facts in such way that they can be relied upon, and you will put a lever into the hands of the scientists that will lead you to better accomplishment than you have ever kown. Yet it is abominably true

that half the reports of experience with crops or fertilizers, floating through the agricultural journals, are worth no more in the way of guidance than if the writers had blown a soap bubble into the air. "A crop was planted on such a day, and manured so and so; and on such a day was harvested, and the product was so and so." What is such stuff good for, except to give work to the printers? What was the previous condition of the soil? What was the treatment of it? What was the seed? What was the season? What was the culture? How was it with adjoining fields, under different conditions? These are only a few of the questions to indicate what should be that fullness and minuteness of observation which alone can make the record of practical farm experience available to the scientific inquirer.

Now, not only does close and exact observation furnish a body of facts which will be of use in prosecuting scientific inquiry, but by such exact observation only can the practical farmer determine the value of scientific suggestion.

I remark again, that the scientific man seeks truths *purely;* while the practical cultivator seeks economic results. In a certain sense, truth is the parent of all economies. But a scientific truth may not develope an economy, this year or next year, or for ten years to come. Its effective employment in the product of economic results depends on combinations and comparisons, which are the resultant of diverse and cumulated truths. But a man intent only on scientific truth cannot be balked by the question of what he can carry to market, and what people, as now civilized, will soonest buy. The scientific man who over-slaughs or neglects the severity of his investigations to contrive a money-making scheme is prostituting science and weakening its momentum. The practical man, on the other hand, who in a fever of special scientific love, transcends the economies of culture to make good his theory, is weakening the educational effect of good practice.

I have used the term scientific man in this paper, with almost exclusive reference to those devoted to special study of those natural sciences which bear upon the practice of farming. But there is growing up year by year a proper Science of Agriculture, and the scientific agriculturist will be worthy of that name just so far as he has the discrimination to lay hold of those salient truths in the natural sciences, which bear on his work, and wed them to such practical method as shall ensure the largest and best economy.

I have endeavored to show that the practical cultivator will reap most gain from outside but related sciences, just in proportion as he exercises a discriminating choice and lays firm grip upon those truths which are helpful, to the neglect of those which are either unimportant or out of his range. And nothing will more aid in this discrimination than that nice habit of observation which is at the bottom of all good practice. He who does not watch closely what he has opportunity to see, will never be able intelligently to apply what others see for him.

Lastly, I remark that this discrimination, this pouncing upon what promises aid in science, and this close, and inflexible watchfulness of

processes and results will be all the more effective by limiting our investigations and observation to our special branch of farming, whatever that may be. I am inclined to think that Americans in general, and ambitious farmers with the rest, have a strong disposition to spread too much,—to know somewhat of almost everything, and thus lose the illuminating and burning power which always comes of concentrated effort.

In this connection one cannot too highly commend the well-directed zeal of those who have organized this Dairymen's Association and others of kindred stamp. The patrons of such have thus not only given a large commercial aspect and a healthy industrial ring to their special calling, but they have challenged the investigation of scientists to those points of practice, on which they are concerned to know the whole truth.

There is no reason why there should not be an annual parliament of graziers, and grain-growers, and nurserymen, as there is now of dairymen and fruit-growers, that they may the better rally about them those who can help forward the speciality, either by scientific suggestion or the results of experience.

The dairyman, more especially the one engaged in cheese-making, can afford to neglect a great many considerations which are of importance to the grain-grower, or the cattle-breeder, and thus by centralizing attention can equip himself more perfectly for his work. His main concern is with the forage of his herd, and such treatment of his land, whether by tillage or otherwise, as will maintain that forage at the best. Some of the old anxieties and perplexities about the dairy work are now gone by; that admirable factory system, which has been a lesson to the world, has simplified the proper work of the dairy-farmer to an extraordinary degree; and he will presently, if not already, have no more need to concern himself about the manufacture of cheese than the grazier has need to concern himself about the cutting up of the beef, or the butcher about the tanning of his hides. The cheese manufacturers, and soon the butter manufacturers, will make up a guild and trade of their own, interested by every possible motive to do their work in the best possible way. The farmer who furnishes the milk, may be sure of placing it in the hands of proficients who, under the stimulus and critical watch of the largest dealers in Europe—whose agents are brought face to face with them—are accomplishing themselves more and more every year.

What a change is this from the old days when we were worried with tormenting dairy-maids and uncleanly dairies! A marvelous change, to be sure, when the dairy-maids are drifting from their old pursuits into the learned professions, and those who drifted of old into the learned professions, find a more lucrative, if not a more useful employment, in the new cheese houses of the present. But this relief from anxieties should breed no sloth in the farmer; the narrower his range, the more intent and penetrating should he make his observation.

The main questions for him to consider are: What is the minimum of tillage that will keep his land up to the product of the best forage material? What age and class of cows will furnish fullest and most regular product of milk? And what treatment of milk, after coming from the cow, will insure its delivery in best condition at the factory?

On all these points I have not space to dwell at length; but I may remark in regard to the minimum of tillage, which should be an aim,—that large tillage supposes large planting of annual crops, and is further urged for its æration and just admixture and communition of the soil. But the dairyman's main dependence is not on annual but on perennial crops; and, with thoroughly drained land, which through its tile system supplies, in a large degree, the æration sought by tillage, I doubt much if we cannot profitably leave our grass lands (under a system of top-dressing, of course,) much longer undisturbed than we are wont to do. Where foul growth intrudes, of course we must till; and we must till, too, for a fair share of roots to splice over the dryer food of winter upon the succulence of May pasture,—and till, also, for the summer soiling, which dairymen are beginning to recognize as a wise and saving policy. With these exceptions, a minimum of tillage will involve a minimum of labor, and a minimum of labor for a given product is the true economy of farming, as in everything else.

And now, gentlemen,—and it is the last word I have to say to you to-day,—I cannot forbear felicitating you on forming part of an association which has reorganized a great department of farm industry, and with such zeal and success as to serve as an example for all the farm industries of the country.

You have brought science to your aid in your Annual Congress. You have brought, also, the keenest practical farmers to lay before you their experience, and wisely judge that the best lessons will flow from the comparison of the teachings of both. You have brought commercial shrewdness to your aid by inaugurating a system for putting your products in best marketable shape, which commands the respectful attention of large buyers in every mart of the world. The associated action of Dairymen, with their factory system, has given a commercial dignity to their calling. They have thus gained in independence; have gained in leisure; gained in opportunity to investigate more fully the bearings of every science on their special pursuit, and, as an incidental result of no small consequence, they have brought about the emancipation of women from the drudgery of the dairy. Whatever other emancipation may be in store for her, I can conceive of none which more than this will give opportunity to country women for self-culture, and to multiply those graces which make the charm of a country home. Whatever other sovereignty there is in store for her, there she is always queen.

Nor has the dairyman, or the farmer of any stamp, filled the whole cycle of his duty when he has enlisted science and the best practice to make a crop that will secure the largest marketable return. By

every law of good citizenship, and of good feeling, he is bound to do the best that in him lies to make his farm not only an exemplar of thrift, but of well ordered thrift. Neatness and fair proportions in our buildings; protecting belts of wood to the north of outlying fields; road-side trees; enjoyable gardens,—these all will win children and neighbors' children to respect for order; and within the limits of a far sighted economy, every farmer of this beautiful region of country can so invest all his belongings, not only with an air of thrift, but with such tokens the aptitude for higher enjoyments as shall, most of all, stay the drift of his young people to the empty vanities of the town. Add the culture and refinement which can see the good in order and neatness (and, if needs be, the beauty in flowers and trees,) to the vigor and foresight which can make a paying crop, and we have the tpye of country manhood which will most enlarge our wealth and will best ripen and illustrate ou Republican civilization.

"CHEDDAR PROCESS OF CHEESE MAKING—GRINDING CURDS."

BY MR. ALEXANDER MACADAM,

OF MONTGOMERY.

DELIVERED BEFORE THE AMERICAN DAIRYMEN'S ASSOCIATION, ON WEDNESDAY, JANUARY 11TH, 1871.

The chair introduced Mr. Alexander Macadam, of Montgomery, who read the following valuable paper on the topic above indicated:—

I have been requested by the Secretary of this Association to prepare and read a paper to this Convention, giving a complete account of how the milk was manufactured into cheese at the Smith Creek Cheese Factory. But I perceive by the circulars issued, and by the newspapers, that the subject marked out for me is "Grinding Curd—is it advantageous or otherwise?" I will give a description of the grinding process as I practice it, and state some of the reasons why I practice it. As you are probably all aware, the milk that is delivered at cheese factories is not always in the same state, sometimes being tainted or partially putrid, sometimes sour, or nearly so, and sometimes it is, what it always ought to be, perfect. I propose to describe the process,—first, when the milk is right and good; second, when it is partially sour; and third, when tainted.

The evening's milk, when delivered at the factory, ought to be cooled so as to reach a temperature of 58° to 62° in the morning. When the morning's milk is added, it is heated to 80°, then enough rennet is added to coagulate the mass in as nearly forty minutes' time as possible. When the curd has attained sufficient consistency, it is cut four times—twice with the horizontal curd-knife, and twice with the perpendicular one, with a short interval between each cutting. The curd is then gently manipulated and heated to 96°, care being taken to prevent the curd from packing on the bottom of the vat; the time required for heating being from an hour to an hour and a half. The stirring is continued for ten or fifteen minutes after this heat has been attained, and the curd is then allowed to pack on the bottom of the vat, where it lies undisturbed until the separation of the whey from the curd becomes necessary. Up to this stage the process is almost identical with that practiced in manufacturing cheese in the usual manner.

In the manufacture of American cheese (I will so designate the method usually practiced, to distinguish it from the grinding process, which I will term *Cheddar*,) it is of the utmost importance to determine the precise time at which to separate the whey from the curd, and it is also an operation requiring the greatest amount of skill and experience, as well as the exercise of the nicest sense of taste and smell. But in the manufacture of Cheddar cheese it is not of the same vital importance, as the whey can be separated from the curd from half an hour to an hour and a half before acidity is developed so as to be perceptible; and, on the other hand, the whey can be left on the curd till the acid is distinctly developed, without materially affecting the quality of the product. As the acid or souring generally makes its appearance about noon, in summer, the Cheddar system gives factory hands more time for dinner, and consequently they can masticate their food, instead of having to bolt it, as has to be done in many cases. When the whey is drawn off, and the vat tipped down on one end, the curd is then heaped on each side of the vat, leaving a space in the middle to allow the remainder of the whey to pass off. I may here state that when the "shute," or flood-gate, is not used, there ought to be, in the Cheddar system, a faucet in the vat, to allow the whey to pass off as it drains from the curd. After the curd has lain in a heap on the bottom of the vat for fifteen to twenty minutes, and the original particles of curd have become amalgamated into a solid mass, it is then cut into convenient pieces with a knife, and turned over, and so left until the curd has become sour enough for grinding and salting, which is determined by the taste of the whey that drains from the curd. This whey should now have a sharp, sour milk taste, which can be understood by any intelligent cheese-maker, after a few days' experience. The curd is then torn by hand into strips of two or three pounds weight, and allowed to cool for a short time, in order to allow the butter in it to become solid enough so as not to escape during the operation of grinding. The curd is then ground into pieces, averaging about the size of hickory nuts. Five hundred pounds of curd can be ground by hand, with Macadam's curd-mill, in from five to fifteen minutes, according to the toughness of the curd and the muscle of the operator. The salt is then immediately added and mixed thoroughly, at the rate of from $1\frac{1}{2}$ to $2\frac{1}{4}$ lbs. per 1,000 lbs. of milk, according to circumstances. The curd is then ready to be put into the hoops for pressing.

2. Mode of procedure when the milk we have to handle is (from whatever cause), sour, or partially so; and such cases are liable to happen in any factory, however well regulated. You are all aware that when milk is partially sour, it will coagulate in the same time as sweet milk with the addition of considerably less rennet. But to such milk I usually add more rennet, instead of less, so as to have the coagulation occur very quickly. As soon as the rennet has completed its office, I commence cutting and working the curd much more rapidly than usual. In such cases I use very little heat in scalding—seldom heating over 86° or 90°, according to the severity of the case.

Indeed, in some instances, when the milk is *very* sour, I do not think that it is advisable to heat the curd at all after coagulation. I reason in this way; just as good cheese can be made without scalding at all, as with it; the reason that we scald the curd (if heating it to a temperature of 98° can be called scalding), is to develop the acid sooner, and if, when the curd is inclined to develop acid sooner than usual, we heat it to a temperature of 96° to 98°, we hasten the action of the acid, which is the very thing we are trying to avoid. In other words, when the acid in the curd is developing too fast of its own acccord, we develop it still faster by means of heat, and thus aggravate the evil. After this curd is cut up, the whey must be removed from it as fast as it makes its appearance, and as soon as practicable, the vat must be tipped down, and the curd thrown to the upper end of the vat. The curd at this stage is very sloppy, as it contains considerable whey. One person should now cut it into small pieces with a knife, and another be employed in turning the pieces over and piling them up in heaps, so as to liberate the whey, which passes off in a continuous stream. When the curd has assumed a proper consistency it must be ground and salted; the quantity of salt used must be according to the amount of whey contained in the curd, which is generally, in such cases, considerably more than usual. In extreme cases, the whole process, from the adding of the rennet to the mixing in of the salt, can be performed in less than hour.

To explain why more rennet is needed when the milk is partially sour, I will refer to the address delivered by Professor Caldwell last year, before this Convention, and also to the able and highly useful paper read by L. B. Arnold, Esq., on "Rennet, its nature and use," before the same Convention. These gentlemen demonstrated to us very clearly that the acting principle of rennet consists of minute globules, or spores, which feed upon nitrogenous substances, and when placed in such, at a favorable temperature, multiply very rapidly. Now a quantity of rennet, containing a vast number of these spores, placed in a vat of milk which is highly nitrogenous, at a temperature of 80°, which is favorable to their growth, will multiply in a short time to such an extent as to cause its coagulation. And their action by no means stops here. They have still a very important mission to perform, viz., that of curing or ripening the cheese. And if the presence of these spores (Micrococci, I think they are called), in the cheese, cures or ripens it, an excess of them will ripen the cheese more quickly, and *vice versa*. Now we all know that a sour cheese, or a cheese which contains an excess of sour milk spores, (Arthrococci), takes a much longer time to ripen than a sweet cheese, and *vice versa*. Therefore, to have a cheese cured in a given time, the spores of the Micrococci and of the Arthrococci, must be contained in it in relative quantities. So, when we have a vat of sour milk to handle, where the Arthrococci are in abundance, we must add more rennet to counterbalance their action on the nitrogenous ingredients of the milk, and

thereby cause the cheese to ripen much quicker than if less rennet had been added.

I have found by experiment, during the past summer, that cheese made from sour milk in the above manner, will cure as fast as other cheese, but they will require more annatto to make them of the same color, these sour milk spores appearing to have a destructive effect upon annatto. I have likewise noticed that such cheese will have more tendency to mould, but the flavor will not be objectionable.

3. When the milk is tainted, or has an excess of putrefactive spores, which are also Micrococci. This tainted milk occurs, in some localities, in hot weather, no matter what care is taken in cleaning the utensils with which it comes in contact, and I think that the milk is damaged in most cases before it is drawn from the cow. But of course it can be greatly aggravated by being brought into contact with unclean milk-pails, strainers, cans, &c., which have not been properly cleansed, and therefore contain numbers of those putrefactive spores clinging to their seams and crevices, and which spring into new life and activity on being brought into contact with the warm milk. During the past season, from the middle of June to the middle of September, in a factory of over 900 cows, I did not have a vat of milk which was not tainted, most of it very badly, and over one-third of it so much that the curd floated. The cheese made from this milk sold for the highest price in the Little Falls market. In handling such milk, I prefer to have the temperature of the evening's mess about 68° or 70° in the morning, before the morning's milk is added, for two reasons. First, it has been shown that the putrefactive spores are in great abundance in such tainted milk: by leaving the evening's milk through the night at a higher temperature, we promote the growth of the Arthrococci, or sour milk spores, and these check the growth of the Micrococci, and counterbalance their action to a certain degree. Second, when the milk is left through the night at a higher temperature, a great number of the putrefactive spores pass off in the form of gas, especially where the milk agitator is used. This we know by the foul odor it emits when warm, but when the milk is cooled to a low temperature, this gas is not so volatile, and does not escape so readily, as we can perceive by its emitting little or no smell. But the cooling of the milk does not kill the Micrococci; it only partially prevents their escape, and though at the same time cooling the milk, also retards their growth as well as their escape; it also retards the growth of the sour milk spores, and these are a much more efficient agent for the prevention of putrefaction than cooling is. Therefore, I maintain that the less tainted or putrid milk is cooled, so as not to be absolutely sour in the morning, the better the product obtained will be, if the milk be properly handled. I know that some cheese-makers prefer cooling such milk to as low a temperature as possible, and add sour whey with the rennet in the morning, and have very good success; but I prefer the former method, as by it the formation of the putrefactive spores is checked at a much earlier stage of the proceedings.

With this difference of cooling the milk, my process is the same with tainted milk as with good milk, until the separation of the whey from the curd. When tainted, we allow the whey to remain on the curd until acid is slightly perceptible, whether the curd floats or not. The whey is then drawn off and the curd handled as before. If the curd is badly tainted, while lying in a mass at the bottom of the vat, it will swell up to twice its original size, like dough under the action of yeast, and when broken, emits a very offensive odor. The exact degree of acidity to be allowed to develope at this point is the most important, as well as the most difficult, thing to determine in the whole management of floating curds, as the odor and taste of both the curd and the whey that drains from it very much resembles acid, and, in a great many instances, mistaken for it. The acid ought to be developed just enough to kill the taint, and no more, and the result, notwithstanding the assertions of some to the contrary, will be a fine cheese. After the requisite amount of acid has been determined upon, and the curd ground and salted, (using the same amount of salt as when not tainted), the curd must be cooled and ventilated as much as possible, before being put to press.

I do not pretend to say that cheese can be made from tainted milk and floating curds, possessing quite as much of the fine nutty aroma, as from curds properly handled which are not tainted at all. But I do assert that I have seen cheese made from floating curds, in several factories during the past summer, that were perfectly close, rich, and meaty, having no objectionable flavor, and which not one expert in ten would object to.

One other fact I wish to mention. It requires more milk when tainted, to make a pound of cheese, than when it is not. One reason for this is, that more acid must be present in such cases; and, of course, the more acid the less cheese. In the Smith Creek Factory, last summer, it took two pounds more milk to make a pound of cheese in July than it did in April.

I have endeavored to tell you how I practice grinding curds. I will now try to tell you why I practice it. In the first place, I think that it requires less milk to make a pound of cheese; in the second place, it does not tax the judgment of the cheese-maker so much, or require so much skill and attention; and, in the third place, I think that cheese made by the Cheddar process will be closer, and at the same time appear more rich and buttery, and will cure faster. It takes less milk to make a pound of cheese because the whey is drawn from the curd before the acid is perceptible, while in the American system, the whey has to be left on the curd from ten to sixty minutes after acid is detected, in order to insure a good solid cheese, and you all know that sour whey will eat or digest grease from any substance containing it, with which it comes in contact. The longer the curd is exposed to this acidity in the whey the slimier the whey becomes, on account of the grease it has taken from the curd, and, in fact, some cheese-makers determine when the curd is ready to dip into the sink

by the sliminess or sudsing of the whey. The quantity of butter which passes off unseen in the American system is certainly more than contained in the small quantity of *white* whey which comes from the cheese when pressing, in the Cheddar system.

During the past season, notwithstanding the general complaint that the milk did not yield well, and the fact that over half of the cheese made at Smith Creek Factory was from tainted milk, we used only $9\frac{9}{16}$ pounds of milk for one pound of cured cheese. And the reason why the Cheddar cheese will appear more rich and buttery, with the same solidity, is that when the whey is drawn from the curd before the acid is detected, the action of the sour milk spores is retarded, and the rennet, at work in the mass of warm curd, is allowed full play. And as the rennet cures the cheese, it will therefore cure sooner, and, curing sooner, will be rich and more buttery at the same age.

I might state other advantages which are claimed for the Cheddar process, but I have already consumed too much of your time, and exhausted your patience, if not the subject.

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Which has been admitted to be unrivalled on this continent. Wherever it has been put up in competition with other Machines it has proved itself the Champion in every contest. The renowned *Ball's Ohio Combined Reaper and Mower*, with the Dodge Self-Rake, was brought to its present state of perfection by us last summer. A single trial of this Machine will convince any person of its great superiority. In addition to the above we are manufacturing a Single Mower, known as the EAGLE MOWER throughout the Province. It is a fact, worthy the attention of every farmer, that, as a Single Mower, this Machine is really the best the market offers. We would call particular attention to our

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Which are meeting with such unprecedented success throughout the Dominion. They took the First Prize and Diploma at the Provincial Exhibition, at London, in 1869. We also manufacture all kinds of

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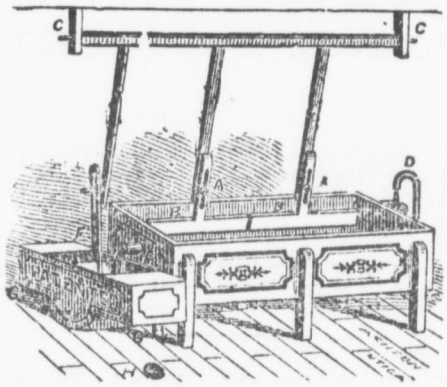

Patented April 15, 1868, *by* STERLING ALGUIRE, *Farmersville, Ont.*

Recommended by the *Canadian Dairyman's Convention,* at Ingersoll, 1869 and 1870, and by all who have used it, as a great

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It will STIR EVERY PARTICLE OF MILK IN THE VAT, as often or seldom as you choose, and so gentle that the milk is not injured in the least.

NO CREAM CAN POSSIBLY ARISE,

And Five Barrels of Water will run three Vats all Night.

It is Manufactured by A. Oliver & Co., Ingersoll,

Price $12.50, per Vat, Right Included.

REFERENCE is respectfully given to the Hon. David Reesor, Markham; E. V. Bodwell, M.P., Mount Elgin; Ketchum Graham, Esq., M.P.P., Belleville; H. S. Losee, Norwich; Thomas Balantyne, Esq., Stratford; E. Caswell, Ingersoll; B. S. Martin, Dunham Flats, P.Q.; Lyman Buck, East Farnham, P.Q.

J. B. HARRIS, Ingersoll,

Assignee of Patent.

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AN ACT

To Encourage Settlement in the Free Grant Territory.

Assented to 15th February, 1871.

WHEREAS it is expedient to ascertain how far immigration would be encouraged, and the welfare of settlers promoted, by the partial clearance of lands forming part of the public lands appropriated for free grants, and by the erection thereon of a house, and by the offer to settlers of such lands with such clearance and house thereon under the terms of "The Free Grants and Homestead Act of 1868," and under the further stipulation that the value of such clearance and house be paid by the locatee within five years from location; Therefore Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows: –

1. There shall be set apart from the Consoliated Revenue Fund the sum of twenty thousand dollars, to be applied for the purposes herein mentioned, and to be designated and known as the "Settler's Homestead Fund."

2. The Commissioner of Agriculture and Public Works is hereby authorized to cause to be cleared, fit for cultivation, and to be fenced, a plot of not exceding five acres on any parcel or parcels of land, which may thereafter be granted, or as to which authority is given to locate any person by or under the provisions of "The Free Grants and Homestead Act of 1868;" and to cause to be erected on every such plot a one story house fit for habitation, of the dimension of not less than sixteen by twenty feet; and to defray the expense of such clearance, fencing and erection out of the said fund: Provided however and it is enacted, that such expense as to any plot shall not exceed two hundred dollars, and that such clearances, fencing and erections in all, shall not be made to any greater extent or value than can be paid for out of the said fund, nor in any but such one township as may hereafter be decided on by the said Commissioner.

3. The amount of the expense of clearing, fencing and erection as aforesaid, on each separate parcel of land, shall be entered in a book to be kept for that purpose by the said Commissioner of Agriculture and Public Works, and information as to the same be given by him to all persons enquiring; and such amount and the terms of payment thereof, and of the interest thereon, shall be specified in every location ticket issued to a locatee.

4. Every such parcel of land shall continue subject to the provisions of "The Free Grants and Homestead Act of 1868," and to any regulations made or to be made by Order in Council thereunder, except so far as such regulations and provisions are varied by or are inconsistent with this Act. So much of the ninth section of the said Act as relates to building a house shall not apply to any such parcel after clearance, fencing, and erection thereon as aforesaid; provided however and it is enacted, that no patent shall issue for any such parcel till the locatee thereof, or those claiming under him, shall, within five years from the date of location, have paid to the Commissioner of Agriculture and Public Works the expense of such clearance, fencing, and erection, and the interest thereon from the date of location.

5. On failure in payment of such expense and interest, or in performance of settlement duties according to the said recited Act, the location shall be forfeited, and all rights of the locatee, and of every person claiming under him, in the land, shall cease.

The Township of Ryerson has been selected and set apart for the purposes of the Act, and Colonization Roads and the other improvements contemplated, are now in progress.

DOMINION OF CANADA.

EMIGRATION

TO THE

PROVINCE OF ONTARIO.

To Capitalists, Tenant Farmers, Agricultural Laborers, Mechanics, Day Laborers, and all parties desirous of Improving their circumstances by Emigrating to a New Country.

The attention of intending Emigrants is invited to the great advantages presented by the Province of Ontario. Persons living on the interest of their Money can easily get EIGHT PER CENT. on first-class security.

TENANT FARMERS, WITH LIMITED CAPITAL,

Can buy and stock a Freehold Estate with the money needed to carry on a small farm in Britain. Good Cleared Land, with a Dwelling and good Barn and Outhouses upon it, can be purchased in desirable localities, at from £4 to £10 sterling per acre.

Farm Hands can readily obtain work at GOOD WAGES.

Among the inducements offered to intending Emigrants, by Government, is a

A FREE GRANT OF LAND!

WITHOUT ANY CHARGE WHATEVER.

Every Head of a Family can obtain, on condition of settlement, a Free Grant of TWO HUNDRED ACRES of Land for himself, and ONE HUNDRED ACRES additional for each member of his family, male or female, over 18 years of age.

All persons over eighteen years of age can obtain a Free Grant of ONE HUNDRED ACRES.

The Free Grants are protected by a Homestead Exemption Act, and are not liable to seizure for any debt incurred before the issue of the patent, or for twenty years after its issue. They are within easy access of the front settlements, and are supplied with regular postal communication.

REGISTERS OF THE LABOR MARKET,

And of Improved Farms for sale, are kept at the Immigration Agencies in the Province, and arrangements are made for directing Immigrants to those points where employment can be most readily obtained. Several new lines of Railway and other Public Works are in course of construction, or about being commenced, which will afford employment to an almost unlimited number of laborers.

Persons desiring fuller information respecting the Province of Ontario are invited to apply personally, or by letter, to the Canadian Government Emigration Agents in Europe, viz: WILLIAM DIXON, 11 Adam Street, Adelphi, London, W. C.; J. G. MOYLAN, 14 South Frederick Street, Dublin; CHARLES FOY, 11 Claremont Street, Belfast; and DAVID SHAW, 24 Oswald Street, Glasgow. Also to the Immigration Agents in Canada, viz:—JOHN A. DONALDSON, Toronto; R. H. RAE, Hamilton; WM. J. WILLS, Ottawa; RICHARD MACPHERSON, Kingston; L. STAFFORD, Quebec; J. J. DALEY, Montreal; E. CLAY, Halifax, Nova Scotia; ROBERT SHIVE, St. John, and J. G. GLAYTON, Miramichi, New Brunswick,—from whom pamphlets issued under the authority of the Government of Ontario, containing full particulars in relation to the character and resources of, and the cost of living, wages, &c., in the Province, can be obtained.

JOHN CARLING,
Commissioner of Agriculture and Public Works for the Province of Ontario.

DEPARTMENT OF IMMIGRATION,
Toronto, February, 1871.