ANNUAL REPORT
OF THE
PROFESSOR OF DAIRYING
AT THE
ONTARIO AGRICULTURAL COLLEGE.
1886.

SPECIAL EDITION.

Printed by Order of the Legislative Assembly.

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REPORT OF

THE PROFESSOR OF DAIRYING.

Guelph, 1st February, 1887.

To the Honourable A. M. Ross,
Commissioner of Agriculture:

Dear Sir,—I have the honour to submit a brief report of work done in connection with the Dairy Department during 1886.

My duties commenced on 1st April. The time consumed attending conventions and general farmers' meetings in the interests of the dairy industry of the Province left less time for purely college work and experimental investigation than these matters would otherwise have received.

My trip to England, in charge of Ontario's contribution of butter and cheese to the Colonial and Indian Exhibition—which mission you were good enough to entrust to me—occupied, with its associated duties, quite three and a-half months of the remainder of the year.

The work done outside, in our own Province, as well as that attended to while abroad, was doubtless valuable to the dairy interests of the country, though the results will not be found tabulated in this statement. For the sake of clearness, as well as for service of those seeking information from this report, it is framed into seven parts.

I. Creamery Management.
II. Dairy Investigations.
III. College Lectures.
IV. Outside Instruction and Experiment.
V. Cheese and Butter from Ontario at the Colonial and Indian Exhibition.
VI. The Farming and Dairy System of Denmark.
VII. General Remarks and Conclusions.
I. CREAMERY MANAGEMENT.

Three objects were sought to be attained in all that was done in connection with, at and for the Ontario Creamery and its patrons. I judge the same three-fold purpose to have been the essence of the Government’s intention in the erection, equipment and operation of a creamery near the Agricultural College.

(a) The Government Creamery should have educational value and be of service in that sense to the whole farming community of the Province. The farmers in districts where none have yet been built, and where cheese factories are not established, may learn from its reports what to expect in the way of returns from the creamery business, if introduced into their neighbourhood. Its working has been illustrative of the comparative suitability of the two systems of operation—cream gathering and milk collecting—to different localities.

A study of the matter to follow will yield some reliable information on the details of methods best suited for the profitable handling of milk, cream and butter in the stages of the process of preparation for the market.

Enterprising farmers in backward sections may be encouraged by the measure of its success, in a neighbourhood where dairying had been neglected for the supposedly more remunerative branches of stock-raising and cattle feeding. The success on its own merits of a creamery near Guelph is evidence that no district in Ontario which has not already a cheese factory can afford to be without the one or the other.

(b) The creamery has been made a school for practical dairy instruction to students. Butter-makers from other creameries may visit it; and all its acquired information is available for the trade.

(c) The Government Creamery affords its patrons no special benefit beyond what may be realized from any joint stock or private concern in any part of Ontario. Those who furnish cream are paid for it at the price realized from sales of the butter manufactured, after all expenses for cream-gathering, management and labour and furnishings, tubs, fuel, ice, etc., etc., have been deducted. These expenses are kept as low as possible and close economy is practised in all outlays. Notwithstanding that, the rate of expenses per lb. of butter is very high. The cost of cream-gathering depends so much upon the distance to be travelled for the quantity collected, that the number of patrons and cows within a given area largely determine the rate per lb. For the ground covered, the number of patrons and the quantity of cream supplied were unexpectedly and unnecessarily small. This rate of expense is correspondingly high. Such a difficulty will hardly be experienced another year.

The small number of cows kept by each patron, together with unfavourably dry weather, lessened the supply rapidly after July, while the cost for gathering remained at a fixed sum per day.

At a public meeting of the patrons, held before the creamery opened for the season, an advisory committee of five gentlemen from their number was appointed. This committee has been helpful in the satisfactory conducting of the business. Its members have been consulted as to times for selling and prices at which to sell the butter. The committee has by its judicious advice made the task of running the creamery on a sound business basis much easier of accomplishment. People look for much more from any Government institution than from a private business concern.

The agreement with the patrons was to the effect that they were each to receive after the end of each month a cash advance on cream supplied at the following rates:—

For May—14c. per lb. of butter yielded.

" June—14c. "
" July—14c. "
" August—14c. "
" September and October 15c."

After paying these prices and providing out of the receipts from sales of butter for all expenses, including $325 to the Government for the management and the partial
use of one horse, there is a balance on hand of $601.18, which is still due, and will be distributed to the patrons.

**Summary.**

<table>
<thead>
<tr>
<th>Receipts</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total value of butter</td>
<td>$10,645.34</td>
</tr>
<tr>
<td>Total sales of buttermilk</td>
<td>$10,645.34</td>
</tr>
<tr>
<td>and profit from feeding</td>
<td></td>
</tr>
<tr>
<td>buttermilk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$10,645.34</td>
</tr>
<tr>
<td>Butter manufactured</td>
<td>50,281 lbs.</td>
</tr>
<tr>
<td>Number of guages of</td>
<td></td>
</tr>
<tr>
<td>cream received, (4 guages</td>
<td></td>
</tr>
<tr>
<td>to each inch)</td>
<td></td>
</tr>
<tr>
<td>diameter of the can used</td>
<td>413,210</td>
</tr>
<tr>
<td>8(\frac{3}{4}) inches</td>
<td></td>
</tr>
<tr>
<td>Number of guages of</td>
<td>8.21</td>
</tr>
<tr>
<td>cream per lb. of butter</td>
<td></td>
</tr>
<tr>
<td>Average price per lb. of</td>
<td>20.53 cents.</td>
</tr>
<tr>
<td>butter</td>
<td></td>
</tr>
<tr>
<td>Number of patrons</td>
<td>152</td>
</tr>
<tr>
<td>Number of days in</td>
<td>118</td>
</tr>
<tr>
<td>operation</td>
<td></td>
</tr>
<tr>
<td>Seven routes were taken</td>
<td></td>
</tr>
<tr>
<td>up.</td>
<td></td>
</tr>
<tr>
<td>Average distance for</td>
<td></td>
</tr>
<tr>
<td>each round trip, about</td>
<td>22 miles.</td>
</tr>
<tr>
<td>Cost of gathering cream</td>
<td>2.45 cents per lb. of</td>
</tr>
<tr>
<td></td>
<td>Butter.</td>
</tr>
<tr>
<td>Cost of management and</td>
<td>1.49</td>
</tr>
<tr>
<td>labour</td>
<td>&quot;</td>
</tr>
<tr>
<td>Cost of furnishings, etc.</td>
<td>1.56</td>
</tr>
<tr>
<td></td>
<td>&quot;</td>
</tr>
<tr>
<td>Total cost for expenses</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td>&quot;</td>
</tr>
<tr>
<td>Receipts from buttermilk</td>
<td>0.64</td>
</tr>
<tr>
<td>account</td>
<td>&quot;</td>
</tr>
<tr>
<td>Net cost for</td>
<td>4.86</td>
</tr>
<tr>
<td>manufacturing</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

I offer a few explanatory remarks on these facts. The plan followed was that of collecting the cream only. The plain shot-gun can, with side glass and measuring gauge divided into quarter-inch markings, was used. The cream was gathered only every second day. The quantity of cream wao reckoned by the gauges shown before the skimming was commenced.

Every other day's skimming was performed by the patrons, to permit them the use of the skim-milk every day for feeding calves. The average quality of the season's cream was below the standard for butter production. That was mainly due to the too early skimming of the cream.

A commencement was made to test the comparative value of each patron's cream. Samples were regularly and systematically collected by the cream gatherers. These samples were examined by the usual oscillating test-churn; but as all the samples were in various conditions of ripeness, with widely different degrees of acidity, the results were not accurate nor exactly reliable. So impractical in our case were the results considered, as a basis for adoption as the paying standard, that they were abandoned after the end of July. There is a very great difference between the fat qualities of some samples of cream. Cream itself bears no unvarying ratio to the quantity of milk from which it is taken. It may be defined as merely a portion of the milk into which the fat globules have been gathered in a comparatively large per cent. Sometimes seven-eighths of the whole butter-fat contained in the milk may be collected into a cream not measuring by bulk more than one-twelfth of the whole volume of the milk, while one-third of the bulk of the same milk might be separated as cream, and then contain exactly seven-eighths of the whole butter-fat of the milk. We are behind in not having in use an efficient, easily-practicable,
accurate and reliable method of testing cream. Some attention has been paid to the lactoscope. It is valuable in examining sweet creams, but is altogether unsuited to the testing of cream even slightly sour. It is thus ruled out of everyday use in creameries collecting cream every second day. The ether-test has been found expensive and wanting when measured by the needs of the ordinary, or extraordinary, butter-maker. The centrifugal test is unworkable with sour cream.

The oil test churn is apparently the best apparatus so far invented for the purpose. Every creamery should have some method of making such tests; and payments for cream should invariably be made according to quality and quantity. The Ontario Creamery can seek no credit for taking the lead in this matter. For the coming summer I hope to see an oil-test churn in steady and satisfactory use.

The butter market has shared in the depression of prices for all farm products. The price realized—rather more than 20\frac{1}{2} cents per lb.—may be considered rather under than over what might reasonably be expected as the average for the next five or ten years. The butter was sold at four times during the season, as soon as sufficient for economical export shipment was made.

By reason of the unfavourable conditions already mentioned—dry weather, etc.—the advisory committee recommended that the creamery be closed after the end of September; hence the short season (118 days) of operation.

The causes for the to-be-regretted high rates per lb for cream gathering, etc., have already been discussed.

The receipts from butter-milk account were largely from sales for delivery in Guelph city, for house and bakers’ use.

The butter was salted during May, June and part of July at the rate of 1 oz. of salt per lb. of butter. During the remainder of the season, \frac{3}{8} oz. per lb. was used.

A series of tests with different brands of salt, English and Canadian, was undertaken. These will be described under the head of Dairy Investigations.

The butter was packed for the most part in tin-lined tubs. This was done in compliance with the request of the customer in Scotland who purchased the bulk of our make. Satisfactory reports were received from the buyer.

Our butter-maker, Mr. McHardy, is to be commended for his skill and care in the making of the butter, as well as for the interest taken in giving the students practical instruction in the creamery.

The cold storage-room is not large enough, and advantage was taken of the College cellars for storing part of the butter.

The lower the temperature of the room in which butter is kept—if that be above freezing point—the better will the butter keep while there, and the better will it keep when brought into the the warmer temperature of the English warehouses. The same conclusion is applicable to its treatment for shipment and during transit. Therefore, every creamery should have, as part of its buildings, sufficient and suitable cold-storage for its make of butter. College or other convenient cellars are not adjacent to, nor available by, most creameries.

Before comparing the returns to the average farmer from the cream supplied to a creamery with those realized from home butter-making, let me point out a leak entailing serious loss upon those supplying cream who do not make adequate provision for the proper care of their milk for cream separation.

During the month of August I visited the farms of a large number of the patrons, and by measurement and calculation learned that on the average 33 lbs. of milk were taken to yield enough cream to make 1 lb. of butter. During the same period by the ordinary 12 and 24-hour setting in ice water, 28 lbs. of milk yielded sufficient cream to make 1 lb. of butter. Had the same milk been used with the centrifugal separator, 26 lbs. of milk would have give as much cream as would have given 1 lb. of butter.

From these figures it follows that by the ordinary and very insufficient care given to the setting and cold-keeping of their milk by patrons, the butter yield was 3.03 lbs. butter per 100 lbs. milk.

By ordinary setting in ice water the yield was 3.57 lbs. butter per 100 lbs. milk.
By use of centrifugal separator, 3.85 lbs. butter per 100 lbs. milk.
From these facts it will be seen that the increased yield of butter from a given quantity of milk, set in ice water, is 17.8 per cent. on the quantity realized by ordinary practice. The increase by the use of the centrifugal separator over ordinary practice would be 27 per cent. The increase by use of centrifugal separator over setting in ice water would be 7.8 per cent. Hence, where cream only is supplied to a creamery, every patron should provide for use a liberal supply of ice.

The larger returns in butter from the centrifugal separators point to an advantage from their use where the increased cost of drawing the whole milk and returning to the farms the skim-milk would not more than equal the value of the increase of butter realized.

As this is a live question for those interested in the starting of new creameries, I state four points for consideration in connection with the facts of circumstance in every locality.

(1) Proportion of cream separation that may be effected.
(2) Effect of the process on the quality and condition of the cream.
(3) Effect of the process on the quality of the skim-milk.
(4) Costs.

In connection with (1) the above stated ratio of separation may be taken as reliable.

(2) Where cream has to be carried a number of miles during hot weather its condition and quality are not as good for butter-making as where the separation is effected at the creamery.

(3) For profitable calf-feeding the skim-milk must be sweet. Both processes, when well managed, leave it at the farm in that condition.

(4) Under the head of "Costs" are to be compared: cost of machines and pails; cost of maintenance; expense of operation against increased cost for collecting milk over cream; saving in expense and labour in setting and caring for the milk at the farm.

The foregoing information should enable those interested to intelligently decide for themselves which plan to adopt. This general guiding conclusion may be added where a small quantity of milk is available, and then only by collecting from long distances: the setting plan would be more economical, but where a large supply of milk may be obtained within a small area the centrifugal plan will be most profitable.

In pointing out the advantage to the farmers of the creamery system of butter-making over the plan of home butter-making, I have little to say about the character and reputation of the average Canadian dairy butter. As many farmers' wives aver—and of course the farmers peacefully agree—it may be just as good or better than creamery butter when it leaves the churn, but the awkward and unfortunate fact still remains that whereas the average price of creamery butter in Ontario during '86 would be about 20 cents per lb., the average price for dairy butter made during the same months was only 13 cents per lb.

In each neighbourhood of, say, ten miles square, over 300 farmers might as well be supporting a creamery at some central point, or two creameries at convenient centres, with the milk of 1,500 cows. If each cow yielded, during the summer enough milk to make only 100 lbs. of butter (and with proper feeding and care during winter, spring summer and fall, they would give at least 150 lbs.), the product from these 1,800 cows would bring just $12,600 more money into the neighbourhood through the creamery than by the ordinary home methods of making and marketing. Every farmer would get his own share of the increased returns, and his family would be spared the taxing work of butter-making during the hot summer months. Then the extra attention paid to dairying would result in the cows being better and more economically fed; more milk would be produced at less cost; the coarse grains would be mostly consumed on the farm; increased fertility of the fields would follow; better condition of the skim-milk would make possible the rearing of more stock with more profit. How that may
best be done will be discussed under heads II. and VI. of this report. The destiny of profitable farming in Ontario will be found along the line of careful, economical, and progressive dairying, and the sooner Canadians recognize the fact and shape their plans and course accordingly, the sooner will there be no occasion for complaint of "hard times."

II. DAIRY INVESTIGATIONS.

That the results of enquiry, observation, investigation, experiment and study may have the largest practical value, these should be carried on and out according to a systematic plan. The student in every line of science and practice will occasionally stumble into acquaintance with an unexpected fact, the knowledge of which will be serviceable. But in a field where so many painstaking scientists have ploughed and searched so long and thoroughly as that of dairy science, it was not to be expected that one season's working would turn up much absolutely new. The plan laid down for guidance here during 1886 was made for the purpose of making accessible and acceptable to the general farmer such information as would enable him to put into immediate and profitable practice better methods of managing the cows he already owns, the fields he tills for their feed, the milk he handles, the calves he tries to rear and the hogs he feeds on the products of his dairy. One summer's trial would be but a very inadequate experience from which alone to draw conclusions for the guidance of Ontario farmers. Hence I have not hesitated to supplement the information gained this season by that formerly acquired by years of practice in dairy work, as well as by that available from the investigations of other reliable dairymen before framing any conclusions for publication. Four divisions will be made for the sake of plainness.

I. The management and feeding of milking cows.

II. The handling of milk.

III. The rearing of calves.

IV. The disposal of the by-products by hog feeding.

THE MANAGEMENT AND FEEDING OF MILKING COWS.

Twelve ordinary cows such as might be obtained from almost any six farms in the Province were purchased. They were bought in the open fair. In passing I cannot suppress the thought that the fair is still too often used as a dumping place on which to weed out the poor milkers, merely to have them transplanted to some other farm. Let every dairyman weed out his poor, unprofitable milkers by fattening for the butcher and not by selling into another herd. The perpetuation of every kind of farm weed is a practice from which, all round, we are happily becoming free. In selecting a cow for milking purposes, a careful observation of certain "points" will guide the buyer in making a good choice. Where a reliable record of the animal's past performance may be examined, it is of unquestionable use in estimating her milk-producing value. Descent from stock with creditable records is of much worth. But so much depends upon the individuality of the animal that the values just mentioned can best be rated in conjunction with their apparent evidences in her body.

When buying cows on a fair ground the animals have to be taken for what they are worth by appearance. There are some general characteristics peculiar to all animals of individual merit in all the milking breeds; a course, rough, bullish appearance is not one of these. Size is a matter of secondary consequence. Temperament is a matter of prime importance. Cattle, as well as horses, may be classified in temperament as nervous or lymphatic.
The "nervous" in the cow is indicative of good milking power; in the horse it is associated with speed and action. The "lymphatic" in the cow means a tendency to lay on beef; in the horse it stays with draught and heavy weight.

Milk and butter are essentially the products of nervous force. Hence a good milker should have abundant nerve power. That does not necessarily imply nervousness. Her organs are to be considered merely as so much nervous machinery for the accomplishment of a given end. The purpose of her life is to make the largest possible quantity of the best milk out of the least possible consumption of food. That faculty will generally reveal itself in what are called the "points" of the animal. Specifically these might be described in the following order, which begins with the head and follows around the outline of the animal's body as viewed from the side. The ideal cow should have a broad forehead, a wide poll. The seat of nervous power is in the brain, and the room for that organ should be ample. Her eyes should be prominent, bright, and mild looking. All the better is the indication if they stand out so well as to give the face a dished shape—the hollow up and down the face. Such eyes promise nerve power if their owner be well used. A broad muzzle is a good point. Fairly large and open nostrils should be looked for; but a cow with constantly gaping nostrils is a little too expensive to keep. The face should be rather long, lean, and clean cut. An instructive model for comparison is the face of the blood horse. Waxy smooth horns and fine ears usually accompany the delicately yet strongly-strung nervous organization we seek. The head will be small in proportion to the weight of the body, and tapering in fine lines. The neck should reveal a strong jointure between the backbone (containing the spinal cord) and the skull. There is a large nervous connection from the spine to the uterus and the udder. A fine tapering neck, with no superfluous flesh, is a desirable point. The top of the shoulder had better be sharp than broad. In a young cow a hollow back is often indicative of weakness. A slightly arched or straight back is preferable. The loin should be wide, flat and thin. The pelvis—the boney framework whereby the hind legs are attached to the backbone for locomotion—should be broad, large and somewhat arched. A hollow pelvis is the omen of danger from milk-fever or an early breakdown. The ham will be in-sloping and in-hollowing, leaving lots of udder-room. The shape is merely indicative of the tendency of the animal. The pitch or symmetry of the udder's shape may be ignored except in the case of a "fancy" animal. The surface extent of the udder's attachment to the body is all important. It is generally a measure of the arterial and nervous activity in the milk-secreting glands. Taking a side view of a cow in full milk, the line of connection or the line of absorption will be the direct measure between the upper and lower points of attachment between the udder and the body. The longer that line is, the better is that "point." A fleshy udder is not wanted. The milk veins are mostly in size and prominence proportionate to the flow of venous blood from the udder, consequently the larger the better. Good barrel room is required to hold and permit of the proper digestion of abundance of suitable feed. In such a cow the energy of digestion is allied to the energy of milk secretion. The chest should be deep, leaving full play for the heart and lungs—these vital organs for blood-circulation and purification. Good blood promotes the activity and energy of the nervous system, and thus stimulates the secretion of milk. Many other "points" might be mentioned, some of them important, such as a soft, mellow skin, fine silky hair, etc., but enough has been written to help the ordinary farmer in the selection of a good milker. The form of a good milking cow might be briefly described as tending to the wedge-shape from three points of view: as looked at from the front, rather sharp on the top of the shoulder and widening to the chest; as looked at from behind, along the back, broad and wide across the pelvis and narrowing towards the shoulder; as seen from the side, deep from the back to the lower line of the udder and lighter in the forequarters.

When the twelve ordinary cows were bought, as many of these points as possible were sought for in each one. They were, with one exception, in poor condition as to flesh. The eleven had calved within a fortnight prior to the 24th of May. From the 25th May till July 7th they each received 4 lbs. of wheat bran per day, besides the fair grass of a common pasture field, part of which was still bush. During that period, the average milk yield per day was 34½ lbs. per head. They were milked regularly between the hours of five and six o'clock in the morning and evening, in a stable. They had free
access to pure water and salt. From July 8th to July 20th, each cow received 2 lbs. of bran in the morning and a feed of fresh cut oats and vetches in the evening. By this time the grass had become comparatively bare and dry. The average yield per day during those thirteen days was 28 lbs. per head. These returns were not surprisingly large, but taking into account the poor body condition of the cows they show what may be expected from ordinary Canadian cows when kindly cared for, regularly milked and supplied with the most economic feed. The supplying of bran as a supplementary feed, when the early grass is rank and watery, and when the pastures fail from drought, is a profitable plan for increasing the milk yield. It most satisfactorily takes the place of supplementary green feed, and saves the troublesome and expensive work of handling so much weight. The cost involved in the labour of partial soiling in early summer and autumn is the only objection to undertaking it and recommending its general adoption throughout Ontario.

On July 21st the cows were divided into three groups. No further bran was allowed. Group 1 had no feed besides the grass on the pasture field. Groups 2 and 3 received a feed of green oats and vetches just before milking, morning and evening. The first result apparent was an immediate loss in the weight of milk from group 1, equal to 16 per cent., and from groups 2 and 3 of 7 per cent. The feeding was continued in the same way till July 30. The average loss in weight of milk from the average of the previous eight days was—

Group 1 (no extra green feed) .................. 16.6 per cent. loss.
Groups 2 and 3 (extra green feed) ............... 12.2 " "

From July 31 to August 7, groups 1 and 3 received a supply of the same formerly mentioned kind of green feed, while the cows of group 2 had only pasture with the others.

Group 1 showed an immediate gain of 9.7 per cent. by weight.
" 2 " no appreciable change " "
" 3 " " "

On the period of eight days—

Group 1 showed average gain of 9.3 per cent. by weight.
" 2 " no appreciable change " "
" 3 " " "

From August 8 to August 15, groups 2 and 3 received a supply of the same kind of supplementary green feed, while the cows of group 1 had only pasture with the others.

Group 1 showed an immediate loss of 14.3 per cent. by weight,
" 2 " " gain of 14 " "
" 3 " no apparent change.

On the period of eight days—

Group 1 showed an average loss of 3 per cent. by weight.
" 2 " " gain of 4.4 " "
" 3 " no appreciable difference " "

After August 16 all the cows were fed green corn stalks twice per day.

The conclusion has been drawn from other data, and with it the foregoing figures agree that a frequent change of feed during summer, even a change of pasture fields, will largely increase the flow of milk.

The extra yield of milk from feeding supplementary green feed will largely pay for the extra cost at the time, but the keeping of the herd up to a full flow while the pastures are bare will enable them to give a much larger yield when feed is abundant on the stubble fields and aftermath.
The changes of feed had some uniform influence on the quality of the milk for butter-making. There was no perceptible difference in the milk to the taste or smell. The milk from each group was accurately weighed, set in deep setting pails, in ice water, at an average temperature of 86° Fahr. It was cooled to an average temperature of 40° Fahr. The skimming was performed after the lapse of about twenty-two hours. The cream was ripened and soured in the usual way, and after each churning the weight of salted butter (1 oz. salt per lb. of butter) was recorded. Over thirty analyses were made, and the following table shows the differences attributable to the use or absence of supplementary green feed:

<table>
<thead>
<tr>
<th></th>
<th>Loss of milk per lb. of butter</th>
<th>Loss of milk per inch of cream in a can</th>
<th>Loss of butter per 100 lbs. milk</th>
<th>Per cent. of fat in Skim milk</th>
<th>Per cent. of fat in Butter milk</th>
<th>Per cent. of other solids in Skim milk</th>
<th>Per cent. of other solids in Butter milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average results from milk when no supplementary green feed was supplied</td>
<td>26.34</td>
<td>12.79</td>
<td>3.82</td>
<td>.514</td>
<td>.996</td>
<td>8.91</td>
<td>7.14</td>
</tr>
<tr>
<td>Average results from milk from same cows, during same total period, when green feed was supplied as before described</td>
<td>25.47</td>
<td>12.61</td>
<td>3.95</td>
<td>.506</td>
<td>.748</td>
<td>8.84</td>
<td>7.75</td>
</tr>
</tbody>
</table>

It will be seen that while there is hardly any chemical difference in the composition of the whole milk (butter, fat and solids in skim-milk and butter-milk) from the two treatments of cows, there is an appreciable commercial difference in the readiness with which, under similar treatments of milk, the green feed milk yields its fat to the butter-maker. The supposition that when cows were given an extra supply of succulent feed, and gave a larger quantity of milk, that it was therefore poorer in quality as to per cent. of solids, has no foundation in fact. The larger the quantity of milk a cow can be made to give on suitable feed, the more the milk is worth per 100 lbs. When just made, the butter from both qualities of milk seemed equally good. It is being kept to note the effect of age on its keeping properties.

For many years it has been recognised by observant and thoughtful dairymen that when milking cows were denied access to salt, the quantity and quality of the milk yield was at once affected. A little investigation, more to define into accuracy the facts known than to bring to light any new ideas, was undertaken with eleven of the cows already mentioned. Until August 15 these cows had access to salt at will in their pasture fields. Then all salt was removed from places within their reach. Small boxes were procured for attachment to the mangers of the stable in which the cows were tied twice a day for milking. The cows were divided into four groups. Groups 1 and 2 (five cows) received no salt. In the boxes before the six cows of groups 3 and 4 a supply of common barrel salt was placed. No change was made for twelve days. Then salt was placed before the three animals of group 1, and still continued to the three animals of group 4. No salt was allowed to groups 2 and 3. This treatment was continued for a like period. The cows of group 4 could take as much salt as they liked twice a day during both periods. In every other respect all the cows received similar treatment. The feed, as before mentioned, was pasture supplemented now by a feed of green corn fodder twice a day.

The following are the results from the observations and record: The average immediate loss (taking a period of two days after each change) was 17½ per cent. in the weight of the milk yield when salt was withheld. The average total loss in the weight of milk yield from the eight cows of groups 1, 2 and 3, which were insufficiently or irregularly salted, was 14½ per cent. for the whole period. There was no loss in the
weight of the milk yielded from cows of group 4, which had access to salt daily during the same period.

It was required that I should leave for England before the experiment was nearly completed. Still, I am safe in drawing the conclusion that the irregular and insufficient salting of cows is a cause which lessens their production of milk. Just how the cause brings about the result I do not yet know.

The quality of the milk as to its constituents and condition was examined. Cans of milk from the cows taking salt, and from those from which salt had been withheld, were placed under like conditions. The milk was set as usual for cream. Then after twenty-four hours it was exposed to the ordinary temperature of the room, about 65° Fahr. The milk from the cows not receiving salt was perceptibly sour to the taste and smell twenty-four hours sooner than that from cows taking salt. Moreover, an easily distinguishable difference in the flavor and "fullness" to the taste in favor of the salt-used samples was at once detected by all to whom the comparison was submitted. The conclusion drawn is, that the irregular or insufficient salting of cows leaves their milk not so easily kept sweet for supplying to cheese factories. The further examination and analysis of the milk was prevented by my absence at the Colonial and Indian Exhibition.

For butter making the observed result may be seen in the following table. The milk was set as formerly at an average of 86° Fahr., and cooled to under 42° Fahr. Both kinds were treated alike as to daily temperature and time set.

<table>
<thead>
<tr>
<th></th>
<th>Lbs. of milk per lb. of butter</th>
<th>Lbs. of milk per inch of cream in can 8½ in. diam.</th>
<th>Lbs. of butter per 100 lbs. of milk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average results from milk when cows had access to salt regularly</td>
<td>29.67</td>
<td>14.58</td>
<td>3.37</td>
</tr>
<tr>
<td>Average results from milk when cows had no access to salt for periods of twelve days</td>
<td>30.7</td>
<td>14.48</td>
<td>3.26</td>
</tr>
</tbody>
</table>

The cows having a continuous supply of salt consumed on the average one-quarter pound per head per day. The exposure of rock salt to milking cows is evidently not sufficient. The cow's palate may be readily satisfied before she has licked off enough for her system's needs. The cows from which salt had been withheld for twelve days were too greedy for it when supplied. They each licked enough to make their milk taste salty. The preferable plan, and one which leaves forgetfulness less wasteful, is to have a protected trough or salt-box from which the animals may help themselves as disposed.

An abundant supply of water—and pure water only—should be where milking cows may drink freely twice or three times a day.

Milk is so much the product of nervous operation that any undue excitement, no matter how induced, lessens the milk supply and injures its quality. The kind and gentle treatment of his cows by the sensible dairyman in one source of his profit.

The average yield of the eleven cows that milked during the whole period was 3,264 pounds of milk per head of 117 days, notwithstanding the changeful usage already referred to. Were the present herds of milking cows in Ontario but properly stabled and fed and watered and salted and handled, there would be an immediate increase of not less than 25 per cent. in their milk returns, and that at no extra cost to their owners.

**The Handling of Milk.**

The subjoined bulletin was issued early in the season:

*Agricultural College—Bulletin II.*

Points for the attention of the patrons of cheese factories and creameries:

The business of dairying when intelligently and carefully followed insures to the farmer a safe and steady income. The Province of Ontario is favored with all the natural
advantage needed for the production of cheese and butter of the finest quality; and as the permanent success of the dairy industry depends upon the quality of the product, every dairy farmer is or should be interested in its improvement. To help in that direction is the purpose of this bulletin. In producing and supplying milk to cheese factories and creameries the following points require attention in order that the best results may be obtained.

**General Rules.**

1. Milk from healthy cows only should be used, and not until at least four days after calving.

2. Any harsh treatment that excites the cow lessens the quantity and injures the quality of her yield.

3. Cows should be allowed an abundant supply of wholesome, suitable food, and as much pure water as they will drink.

4. A supply of salt should be placed where cows have access to it *every day*.

5. Cows should not be permitted to drink stagnant, impure water, nor to eat cleanings from horse stables, leeks, turnip tops, or anything that would give the milk an offensive taint.

6. All milk vessels should be thoroughly cleansed; first being well washed, then scalded with boiling water, and afterwards sufficiently aired to keep them perfectly sweet.

7. Cows should be milked with dry hands, and *only after* the udders have been washed or well brushed.

8. Milking should be done and milk should be kept only where the surrounding air is pure and free from all objectionable and tainting odours. Milking in a foul smelling stable or yard imparts to milk an injurious taint. Sour whey should never be fed, nor should hogs be kept in a milking yard nor near a milk stand.

9. Tin pails only should be used.

10. All milk should be properly strained immediately after milking, and for that purpose a detached strainer is preferable to a strainer-pail.

**For Cheese Factories.**

11. In preparing milk for delivery to a cheese factory it should, immediately after straining, be *thoroughly aired* by pouring, dipping, or stirring. This treatment is as beneficial for the morning's milk as for the evening's, and is even more necessary when the weather is cool than when it is warm.

12. In warm weather all milk should be *cooled* after it has been aired, but not before.

13. Milk kept over night in small quantities—say in tin pails—will be in better condition than if kept in larger quantity in one vessel.

14. When both messes of milk are conveyed to the factory in one can, the mixing of the morning with the evening's milk should be delayed till the milk-waggon reaches the stand.

15. While the milk is warmer than the surrounding air it should be left uncovered, but when colder it may with advantage be covered.

16. Milk-pails and cans should be protected from the rain, and milk-stands should be constructed to shade the cans from the sun.

17. Only honest milk with its full cream and full share of strippings should be offered; violation of this requirement leaves the patron liable to a heavy penalty.

**For Creameries.**

18. In preparing milk for delivery once a day to a creamery where the whole milk is received, the treatment should be similar to that recommended for cheese factories.
19. For creameries receiving cream only, the milk should be well aired, but not cooled before setting.

20. Milk should be set for the separation of the cream where no impure air will reach it.

21. Cream rises best with a falling temperature, and the separation of cream from milk is promoted by cooling, after setting, to at least 40°.

For Butter-Making at Farm Dairies.

22. When the cream is used for butter-making at the farm the foregoing treatment and conditions may be observed with profit.

23. Good ventilation for a milk-house, milk-cellar or dairy-room, is most essential, and may be provided for by leading an air-drain underground, for say 200 feet. Through it a supply of pure, fresh, cool air may be admitted. The foul or warm air may be allowed to escape through ventilators or windows in or near the ceiling.

24. Cream should invariably be removed from the milk before the milk is sour.

25. The cream for each churning should be gathered into and kept in one vessel.

26. The whole of the cream should be well stirred every time fresh cream is added.

27. In summer cream should not be left longer than three days before churning.

28. The best churning temperatures are between 57° and 60° during the summer, and between 60° and 64° during the winter.

29. Butter can be more thoroughly washed free from butter-milk while in the granular condition than after it is gathered or pressed into a roll.

30. Only the best pure salt, of medium and uniform fineness of grain, should be used, and from three-quarters to one ounce of salt per pound of butter will be found satisfactory for the summer.

31. The utmost cleanliness in milking, in vessels, in utensils, and in all surroundings must be observed to preserve the flavour and body of milk, cream, butter and cheese from contamination.

A Dairy Class.

A desire has been expressed for the formation of a Dairy Class, to be trained in butter-making at the Ontario Creamery during the forenoons, and to receive general instructions in dairying in the lecture-room during the afternoon. September would be the most suitable month. Farmers' sons and daughters and others proposing to attend will please address the Dairy Department, O. A. C., Guelph. No fee will be charged. Let applicants write soon.

Enquiries on matters pertaining to the dairy industry of the province, addressed to the undersigned at the Dairy Department, Ontario Agricultural College, Guelph, will receive attention.

JAS. W. ROBERTSON.

Later researches during the summer have but confirmed the correctness of each of the thirty-one points mentioned. To elaborate each paragraph would fill the pages of a large volume. Some examination was made of the temperature conditions most suitable for cream-raising. These have been partly presented and discussed under the head of Creamery Management. It was found that practically as full a separation of cream was effected by setting at any temperature between 85° and 98° Fahr. and then causing the temperature to fall 40°, as by setting at 98° and then causing the temperature to fall to the same point.

Samples of cream were churned at six different degrees of ripeness or sourness, and the butter-milk was analyzed to discover the comparative effectiveness of the churning operation.
The following table shows the average per cent. of fat left in the butter-milk from cream in different stages of maturity. No. 1 represents the average from creams churned sweet, and No. 6 the average from creams churned quite sour. The degree of ripeness or perceptible acidity was gradual from No. 1 (sweet) onward to No. 6 (sour):

<table>
<thead>
<tr>
<th>No.</th>
<th>Per cent. of fat left in Butter-milk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.255</td>
</tr>
<tr>
<td>2</td>
<td>3.101</td>
</tr>
<tr>
<td>3</td>
<td>3.344</td>
</tr>
<tr>
<td>4</td>
<td>2.542</td>
</tr>
<tr>
<td>5</td>
<td>1.019</td>
</tr>
<tr>
<td>6</td>
<td>.739</td>
</tr>
</tbody>
</table>

These percentages of fat left in the butter-milk prove nothing absolute about the quantity of fat necessarily left in butter-milk.

The effectiveness of the process depends much upon the construction, the motion and the speed of the churn. But as the churning treatment in all these cases was similar, the varying percentages of fat left in the butter-milk were solely due to the condition of the cream.

Sour cream will yield its butter by churning in less time than sweet cream, other conditions being alike.

Besides the instructive fact, apparent on the face of the table, this may be learned: The mixing of creams of different ages and acidity together, just before churning, makes large loss of the butter-fat in the butter-milk unavoidable.

To points 25, 26 and 27 of the Bulletin, this may be added: The best method of preparing cream for churning is to have the whole cream kept cool and sweet till about twenty-four hours before the churning. Then add to it about two per cent. by bulk of cream that has been raised, exposed to pure air, and afterwards kept as warm as 70° Fahr., to promote souring. The best kind of fermentation, resulting in sourness, is thus induced, and all bitterness in flavour and loss of fat are avoided.

A series of tests, to throw light upon the comparative values of the Canadian and English brands of dairy salt in butter-making, was undertaken.

Some forty-five tubs, salted from 1 oz. per pound to ¾ oz. per pound, are still on hand.

The matter of salting butter and the salt interests involved are so important that this Department looks for the assistance of a committee of experts from the Creamery Association of Ontario, in judging of the present qualities of the butter, after having been kept for five months. A bulletin will be issued, stating the conclusions reached after such judging has been completed. Meanwhile a general standard, whereby to select a salt for butter making, may be presented:

1st. The salt should be pure and clean.

2nd. It should be easily dissolved, and not hard in the crystal from roasting.

3rd. It should be of medium fineness, and nearly uniform in the quality and size of its grains. If it be pure in composition, a salt with a velvety body to the touch is well suited for use in butter.

The addition of coarse, hard salt to butter not only injures its grain in the working, but remaining undissolved it is easily recognized by the touch of the butter trier, or tongue as well as the taste. When such is the case the value is very much lessened, especially in the British market.

The Rearing of Calves.

Eight calves were reared on skim-milk and supplementary feed after they were a fortnight old. They were sold for further rearing to a neighbouring farmer. The value
realized for the skim milk was slightly under two and three-quarter cents per gallon. That need not be accepted as applicable to all calf-feeding. According to conditions of stock and market, it may be more or less. This much is assured: fine, thrifty, healthy and large calves can be reared without whole milk after they are two weeks old.

Following the style of communicating information already adopted in this Report, permit me to gather into a chapter of instruction and advice the knowledge on this subject, gleaned from experience during the past and previous years:

The “heredity” and “individuality” of the farmer have more to do with the successful raising of profitable milking cows for his dairy, or steers for his stalls, than the “pedigree” of his herd.

Breed and blood are of much service to the stock-raiser. So are a good steam boiler and engine to the grain thrasher. What fuel and oil are to the latter, feed and care are to the former. A good thrasher, with good fuel and skill, will get more efficient work out of a poor boiler and second-rate engine than a shiftless, careless engineer will get out of the best machinery.

As a rule there is no profit in trying to raise the late calves. In any case the calves from the best milking cows only should be selected for rearing. The herd bull should have a pedigree linking him to a family distinguished for milking qualities. If a calf with a big body at one, two, three, or six months old be what is wanted, it had better be allowed to suck its dam. But if a calf leaving a large profit on its rearing at two years old, and a large profit on its milking or fattening be the object sought for, then it should be reared the other way. Where the calf is allowed to suck the cow, for even a few days, the cow is in a less contented condition of nerve to yield her milk to the hand for some weeks. The restlessness thus caused will tend to the lessening of the milk yield in most cases. The task of teaching the calf to drink is doubly difficult after it has acquired the habit of getting its supply in the natural way. Invariably where a calf has been permitted to run with its mother for ten days, I have found it to go back, or at least fail to gain in condition for a fortnight or more, when a change was made to hand feeding. The checking of its growth and thrift at that early stage in its development entails more loss of possible profit in after years than a partial winter's starvation when eighteen months old. The organs of digestion, whose function it is to get for the animal all possible good out of its food for maintenance, growth, beef, milk or work, can never be injured with impunity. The treatment from the day of birth should be to preserve and, if possible, improve the assimilating power. Milk from the first six milkings of the mother should be fed to her calf three times a day. The first milk, "colostrum" or "beastings," is of medicinal as well as food value to the young calf. For two weeks the calf will not need nor take much besides the two or three quarts of whole milk of each feed. The milk should be fed as near the blood temperature, 98° Fahr., as practicable. After the lapse of a fortnight a gradual change, during the third week, may be made from whole milk to sweet skim milk. Such a change can be best effected by putting skim milk in gradually increasing quantity with the whole milk till it is wholly substituted for it. The skim milk should always be fed sweet. The sourness of milk is evidence that some of the feeding value of its large per cent. of sugar of milk has been lost by the change into acid. Besides, the sourness renders the food unsuited to the stomach of a yet tender calf. Sour feed in such a case favours growth in but two ways. The calf so fed will develop marvellous girth extension. "Pot-bellied" is hardly sufficiently expressive of the chronic enlargement from that cause. Then the growth of hair is effectually and speedily promoted. It becomes so strong in "stalk" that it stands out in daily protestation against that kind of feed. The skim milk should also be fed warm. The blood heat is the best. Where no better convenience exists for the heating of the milk, hot water may be added with advantage. A feed of ice-cold milk, such as comes from the deep setting cans—by the use of which fine dairy butter can be most economically made—will leave the calf uncomfortable. That is but the evidence that indigestion exists. It may easily be made partially permanent by a continuation of such injurious treatment. The power and practice of digesting and appropriating all that is possible out of its feed should be encouraged into a fixed habit, by giving the young animal only suitable feed in the best condition of
preparation. These points about the feeding of skim milk will apply to young pigs as well as calves. A gutty, thriftless hog is the necessary product of a careless and wasteful mode of feeding even excellent skim milk.

To make up for the fat taken out of the milk in the shape of cream, some supplementary feed should be given with the skim milk: Linseed, oil cake, bran, oats and pease are all good. Bran is frequently mixed with chopped oats and pease, and fed raw in the milk. That practice is most objectionable, and frequently results in the loss of the full value of the grain fed, besides inflicting injury upon the calf by scouring. The better plan is to put the bran and chopped oats and pease, with linseed in a dry state, into a box conveniently placed within reach of the calf. Between the ages of one and three weeks most calves will begin to eat the mixture. The chewing necessary to a comfortable swallowing fits the feed for proper digestion, and prevents all risks of scouring from that cause. The chewing also favours the free flow in the mouth of a good deal of saliva, needed to thoroughly digest the milk gulped down so hurriedly from the feeding pail. Linseed and oil-cake may be boiled, or well scalded, and mixed in a syrupy state with the milk. Such preparation means time and trouble. Equally good results follow from the feeding of both, in the raw and dry state, with the mixture of bran and chop. They should first have been ground very fine. The composition of the additional feed should be about equal parts by bulk of bran, oat, and pea chop, with a teacupful of ground linseed to each quart of the mixture. No fixed quantity per head for feeding need be mentioned. It has been found desirable to allow the calves to take as much as they care to eat. Handfuls of the best hay—and all hay for fodder should be cut on the green side—may be offered, and most calves will eat with relish at a month old. As soon as the grass can be got it should be given in liberal quantity.

Opinions differ as to the relative advantages of keeping calves in the stable all summer and allowing them the run of a small pasture field. A grass plot with no shade from the sun, and where flies are numerous and diligent, is not the best place for calves. But if the calves be kept in a dark, cool stable during the hot days of "fly time," and turned out for the evening and nights, the protection of the soiling system will be coupled with the benefits of exercise and feed outside. Some farmers report very satisfactory results from adding pulped turnips to the forementioned grain mixture from the time the calves are three weeks old. No matter where fed—in the stable or out—each calf should receive only its own allowance of milk. The distension of stomach by overfeeding is very harmful. The oldfashioned implements for the feeding of six calves in the field, being but three buckets and one big stick, had better be exchanged for more sensible and economical conveniences. Outside feeding from a trough is unsatisfactory, as the big and greedy calves get more than their share, while the weaker ones get barely enough. The construction of small stalls for the calves against a fence in the plot will make it easy to give every calf its own share in its own pail, and successfully avoid the respective risks of gorging and starving.

Calves reared in this way will gain in size and strength of constitution all spring and summer and autumn. When the severe weather of late fall and winter comes, it finds these calves accustomed to live mainly on grass and dry chop feed, so that the change to stable and winter conditions of existence is not very trying. The best conditions for profitable growth having been supplied by the intelligence of the owner, the inherited good qualities of the calf will get fair play. But if good qualities of breed inherited from the best of stock be baulked at the beginning by unsuitable conditions for growth and thrift, all chance of after profit from milk or fattening is gone. The profits of dairymen are to be largely augmented by proper attention to the early feeding of early calves. Such stock-raising will foster the export trade of fat cattle, and enable farmers more numerously and satisfactorily to patronize either a cheese factory or a creamery.
at most places no adequate provision has been made for the disposal of the refuse from the pens. A hog-pen was constructed on the Experimental Farm in June, for the purpose of testing the adaptability of a system of draining and filtrating such refuse, rather than to gauge the gallon-value of butter-milk or skim-milk for pork production. The site for such a building should, if possible, be chosen near a piece of land with a gentle slope. The building was so planned and erected as (1) to most conveniently meet the needs of the hogs for fattening; (2) to prevent the escape, except by the gutters, of any liquid manure; (3) to be economical in cost.

The inclination of both floors toward the centre of the building permits of the hogs lying on dry floors all the time. This is important for thrift. The cleaning out is easy of accomplishment, and the disagreeable smells are reduced to a minimum. From the gutters the liquid refuse passed into a cross-head open trench about one foot deep. From it were made five lateral trenches running down the slope. A 12-foot distance was placed between the first two, then 14 feet to the next one, 16 feet to the next, and 18 feet to the last. Between these lateral trenches, and running parallel with them, were dug four drains 2 feet 6 inches deep. These were laid with 2\(\frac{1}{2}\) inch tiles and filled up. The liquid refuse was diverted by turns into the trenches and, by a plan combining irrigation and downward filtration, passed off into the tile drains. The method worked well during the past summer. The soil between the trenches was cultivated and sown with rape, as the season was rather advanced before the drain-making was finished. The solid refuse was treated with dry earth in a shed at the end of the pens. Another year’s experience may reveal some weakness or defect in the method described, but so far I am led to hope that it will prove effective in abating all objectionable and dangerous smells from cheese factory, creamery or hog-pen refuse.

A sketch of positions may make the description more fully understood by all interested.

![Diagram of Hog Pen and Trenches]

Fifty hogs were fed in the experiment.

III.—COLLEGE LECTURES.

Lectures on Dairying were delivered to the students of both years during the Spring term. Further instruction in practical butter-making was given to some eight students during parts of the Summer term.

A short course of lectures during the Winter term for the special benefit of practical cheese and butter-makers would doubtless prove a popular and valuable provision for
those engaged in these increasingly important industries. The enterprising and energetic young men in both of these businesses would carry back into their own districts added knowledge and skill that would effectually tell for the profit of their patrons. A fortnight or three weeks would suffice, and I am confident such an opportunity would be appreciated and taken advantage of by many of our older as well as younger dairymen. Discussions could be encouraged after each lecture, and much valuable information thus elicited could not so fully be made available in any other way.

IV.—OUTSIDE INSTRUCTION AND EXPERIMENT.

The suggestion and recommendation in the preceding Part will not be taken to imply an undervaluing of the superior uses of practical instruction and demonstration at the factories during their working season.

By request of the Dairymen’s Association of Western Ontario, a number of cheese factories were visited during the summer. The cheese-makers from neighbouring factories were invited to meet at central ones. The best methods of handling the milk, etc., in all stages of the process of manufacture were illustrated in practice, and the scientific reasons for such treatments were explained.

A number of creameries were visited for a like purpose. Reports credit these visits with beneficial results.

There is need for organized Provincial supervision, including systematic instruction by competent men at the various factories of the whole cheese factory and creamery systems of Ontario. One man’s time is not at all equal to a task at which seven good workers could be fully occupied, with much benefit to the industry and gain to the country.

No experiments in cheese-making were practicable at the creamery. The only milk available was that from the twelve cows mentioned in Part II. To meet the need, the Dairymen’s Association of Western Ontario voted a sum of $300 to purchase milk at a cheese factory for experimental work.

Milk was obtained at the Brussels cheese factory, and a quantity of cheese was made there. Different lines of investigation were followed in connection therewith. A careful test was made to determine the comparative merits of the various brands of Canadian and English salt for cheese-making use. The results on the whole, taking into account the qualities of the cheese at five weeks and five months old, were decidedly in favour of the Canadian salt. A full statement of the experiments and conclusions will be found in the “Report of the Proceedings of the Convention of the Dairymen’s Association held at Ingersoll, January, 1887.” The cheese, of course, became the property of the Association.

The want of a salt for butter-making that would meet the needs of the creamery-men all round, both as to quality and price, was recognized. The essential points of quality have already been stated. At my request a sample of salt was prepared for this Department in the following simple way: Brine—practically pure—was evaporated rapidly. The rapid evaporation induced the formation of much thinner flakes of salt-crystals than when a less intense heat was applied. The bulk of salt from these thin crystals was dried by exposure to the air, and not by roasting. It just met the case for butter-making. It was practically pure. It dissolved easily. The grains were fairly uniform in size. It had no sharp-edged, roasted crystals that might have escaped the grinder. It was velvety to the touch. Canadian salt manufacturers are losing a valuable customer while they neglect to meet the wants of the Canadian dairyman with such a salt, put up specially for butter-making.
V.—OUR CHEESE AND BUTTER AT THE COLONIAL EXHIBITION.

The holding of Industrial Exhibitions in the different parts of the world, and their development and extension have been at least contemporaneous with marked progress in the arts and industries therein represented. The stimulus given to trade, from the prospect of the unexpected competition in all branches of commerce which a largely patronized exhibition always reveals, must have had some influence on that progress. There is the incidental inducement to the visitors to become purchasers, then or afterward, by seeing a varied and novel collection of goods. There follows the enquiry by the private citizens from their merchant suppliers as to where and how certain goods seen at the Exhibition can be purchased. Thousands of permanent customers are thus obtained for all classes of goods. Then from visiting such places the shopkeepers and merchants conclude that they may with advantage add some new articles or features to their business in their own towns, all of which means more customers. Besides, there is the best kind of commercial education offered to all contributors by the displays of their competitors.

The aim of those who proposed and promoted this great Colonial and Indian Exhibition in London was to bring together evidences of the resources, products and manufactures of the several colonies and dependencies for the promotion of the commerce of the Empire. There was no intention of making the Exhibition a competitive one, by giving awards of juries as to the particular merits of any class of exhibits. The only competition that existed was a friendly rivalry between the exhibitors and colonies, as to which of them could bring forward the most conclusive evidences of their natural prosperity and commercial wealth and strength. In preparing for the beforementioned object, the Royal Commission who had charge of the arrangements secured the use of the South Kensington buildings and grounds adjoining and attached to the Albert Hall. The buildings are quite commodious and extensive, and are very well adapted for such occupation. The beautifully laid-out gardens and playing fountains were additional attractions for visitors.

The time at which the Exhibition was held was, perhaps, the most fitting that could have been chosen. The population of the whole empire for some time before had their attention drawn to the possibility of a closer administrative, fiscal and defensive union of its many dependencies. A full recognition by the different colonies and the mother country of each other’s resources, manufactures, commerce, customs and capabilities would make perhaps the most substantial foundation, or basis, for any such agreement or federation. Indeed, if any such federation should ever be consummated, the credit will be largely due to the success of this Exhibition, and the facilities it afforded the people of all parts of the empire for becoming acquainted with each other in the manner just indicated. The Courts of the Exhibition may be said to have been a series of object lessons, informing the visitors what each colony could and did do, and thus making a succinct history of the agricultural, commercial and social development of each. Those who examined them with care and thought could not but leave with a higher estimate and more just appreciation of the value to the mother country of both Canada and Australia.

It was expected that the Exhibition would continue for six months; as a matter of fact it lasted six months and ten days. The attendance during the whole of that time was surprisingly large for one of its class. The visitors numbered, in round figures, five and a-half millions, being an average of about 34,000 per day. The largest number attending upon one day was 81,000. It is reasonable to expect that many benefits will accrue to this country from having its products examined by this incessant stream of 34,000 people per day. A valuable stimulus to immigration of the right classes will doubtless result from the impressions left upon so many minds, the effects of which will probably be felt with advantage by Ontario for twenty-five years to come.

The Dominion Government having referred the matter of making a worthy display of dairy products to the Governments of the Provinces, I may be allowed to rehearse the steps taken to make the Exhibition truly creditable and serviceable to all those interested in this increasingly important industry in Ontario. The Presidents of the Dairymen’s Associations of Eastern and Western Ontario were consulted as to the best mode of procedure.
In accordance with their recommendation, a quantity of fine fall cheese of 1885 make were purchased and held for shipment to reach London in time for the opening in May. Through some unfortunate failure on the part of the companies employed by the Dominion Government to carry the Exhibition goods through as expeditiously as usual, these cheese did not arrive in time to be used in making an opening display. Some of them were stored in London, to be used later in the season. Further on, mention will be made of the excellent service they rendered.

During the summer of 1886, when it was possible to procure cheese of the summer make, another consultation was held with T. Ballantyne, Esq., M.P.P., representing the Dairymen's Association of Western Ontario; D. M. Macpherson, Esq., Lancaster, attending on behalf of the Dairymen's Association of Eastern Ontario; John Hannah, Esq., President of the Ontario Creamery Association, and the Professor of Dairying from the Ontario Agricultural College. To them was entrusted the task of selecting and collecting contributions from cheese factories and creameries. In the west the local dairy boards of trade were invited to appoint experts to assist in the work. John Podmore, Esq., Ingersoll, and John Robertson, Esq., London, rendered excellent help. The ready response on the part of the dairymen in all the districts of the Province enabled the committee to obtain such samples as to make the whole exhibit fairly representative of the cheese and butter made both east and west. The Provincial Government had further agreed to advance money to pay for the goods so selected. In this way the exhibit became in every sense Provincial, and not sectional or individual. It was recognized that all possible advantage could not be reaped from the Exhibition unless some person should take charge of the goods upon their arrival in London who would be competent to compare, contrast, and point out the characteristic excellencies of Ontario's cheese and butter over those from other countries, competing with ours in the British markets. It fell to my lot to try to accomplish that. The fine goods sent forward made the duty light. On the 11th September I sailed for England. The display was well commenced by 1st October. There was decided gain in reaching the Exhibition with a new feature when the other departments were comparatively old and threshed out in the press of the Metropolis and country. The public interest and attendance continued unabated. The courts were daily thronged by enquiring crowds of sight-seers who evidently came to be amused, and left largely instructed. The space allotted to Canada in the building was scant enough, and not in itself the most desirable. But it became the most attractive by reason of its varied and interesting contents, and their admirable arrangement. Just enough room was got to indicate what Canada could do, had she a full opportunity to do justice to her desire and powers.

By the courtesy and help of Mr. C. C. Chipman, the acting commissioner for the Canadian court, space in a prominent place was secured on my arrival. At the side the Canadian Agriculture trophy were placed Ontario's pyramids of butter and cheese.

The total quantity received was:—

618 Boxes Canadian cheddars (white and coloured);
300 Canadian truckle cheese;
8 Monster Canadian cheese;
299 Tubs Canadian creamery butter;
10 Firkins do do do
2 Tierces do do do
480 5 lb. Tins do do do

With these, it will be seen, it was possible to make a display even in point of magnitude worthy of the industry. Two pyramid frames with surrounding shelves were erected. The edges of these were decorated with strips of colored paper on cloth, on which were printed instructive facts relating to the exhibition, and inviting visitors to "take home a sample" from "Ontario's display of butter and cheese," etc. Then ornamental cards of varied shapes and colours were attached. These had such information as "Ontario's cheese and butter are all from pure whole milk." "Ontario makes no oleomargarine, no butterine, no imitations." "Ontario leads the world in cheese-making." "Ontario has
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752 cheese factories.” “Ontario has 40 creameries.” “Ask your grocer for Canadian cheese and butter,” etc., etc.

It was not thought that the mere display on the shelves would serve our interests as well as might be done by the distribution of samples. Hence your representative considered that some means should be taken to put samples of the best in the mouths of the visitors while they admired the general appearance of the dairy pyramids. Facilities were soon provided at four counters in different parts of the grounds. Samples of cheese to be sold at a penny and twopence each were done up in neatly printed oil paper wrappers. The call for these was very good. In less than five weeks nearly 40,000 samples were so sold, and in many cases the cheese and wrappers were carried back to mechanics' and farmers' homes. The wrappers set forth such information as this:

**Ask Your Grocer for Canadian Cheese.**

**SAMPLE OF CANADIAN CHEESE**

**FROM THE**

**ONTARIO GOVERNMENT'S EXHIBIT**

**AT THE**

**COLONIAL AND INDIAN EXHIBITION.**

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The Province of Ontario, Canada, has now over 750 Cheese Factories in Operation.

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Canadian Cheese is as fine as English Cheddar Cheese and finer than three-fourths of the English make.

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Canadian Cheese sells for 4s. per cwt. above American Cheese.

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The average price of Farms in Ontario is $37.00 (£7 12s.) per acre.

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The average rent value of farms in the older settlements is from $2.30 (9/5) per acre to $3.50 (14/4) per acre per annum.

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ONTARIO HAS A SPLENDID CLIMATE FOR DAIRYING.

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Ask Your Grocer for Canadian Cheese.

That means of advertising the lands, etc., of the country will be of service to Canadian farmers for many years to come. It was complained by some from our own Dominion, that
the retailing of samples in this way should have been thought quite beneath the dignity of the Government of the Province of Ontario. I thought then, and have continued to think since, that the smallness of the common sense and commercial sense faculty of these croakers was alone responsible for such small talk. No matter how large in the aggregate may be the value of butter and cheese exported by Ontario annually, it must be ultimately distributed in small quantities and consumed by not more than mouthfuls. To give away samples to all who would have taken them would have involved heavy additional expenditure, while the desired end could be more advantageously attained by selling at a small price than by giving away for nothing. The exhibition throngs talked more about and tasted and tested with more interest and took home with more care what cost them only a penny than what they got free.

Enquiries directed by persons so tasting our cheese butter to their grocers brought me from the latter many letters, asking where and how equal qualities could be regularly obtained. Instead of seeking to supply these shop-keepers from the exhibition, I referred them to wholesale firms in their own districts accustomed to handling Canadian goods. I judged that such using of already established agencies of trade was preferable to arousing the jealousy, and perhaps the opposition, of importing houses by selling direct to grocers. I think he best serves the interests of the industry he represents who encourages and strengthens as far as possible the already established and legitimate agencies in commerce.

In another part of the ground a further display of butter and cheese was made. The use of a suitable building at one side of the gardens was obtained for the storing of surplus boxes and tubs. There it was convenient to show goods to persons directly interested in the trade, by whom a closer examination and comparison of the different lots was desired than was practicable at the central pyramids.

The subjecting of the different lots of butter to much boring by the "tester," lessened the immediate market value of many of the tubs, but that loss was of little consequence in view of the after advantage to the industry from the high quality of "Canadian creamery" being well known by the trade.

I did not find the re-packing of samples of butter in small tins easily practicable nor prospectively serviceable, and hence very few packages smaller than the five pound tins which had been prepared at the Ontario Agricultural College Creamery were offered on the counters.

Good service was rendered by the cheese of the make of 1885 before mentioned, and sent over in care of Messrs. Ballantyne and Macpherson. Often prominent dairy experts would say that while our Canadian cheese was very fine when comparatively new, it lacked good keeping properties. To such I would sample these cheese over one year old. Among the well known dairy experts to whom I showed these cheese were Mr. H. F. Moore, of Frome, and Prof. Fream, of Downton Agricultural College. The expressed opinion of both was that these old cheese were as fine then as any cheese in the whole exhibit, and so fine that to them the cheese awarded the first prize at Frome dairy show would have made but an indifferent second. At Frome is held the largest cheese show in England. Mr. Moore did us the justice and service of writing an article to the London Times containing the same statement.

I also sent samples of the cheese of 1885 and '86 and some tubs of butter to the dairy show held at Kilmarnock in Scotland. It is by far the largest dairy show in the United Kingdom. On this occasion there were no less than 645 entries, and in the show and fair not less than 18,000 cheese of British make. The unanimous verdict of experts who carefully examined the Canadian cheese was that there was nothing on exhibition finer than the cheese of 1885 from Ontario, then over twelve months old.

The dairy display received a good deal of attention from the press of London and England, which will not fail to effect some valuable results for dairymen. I quote parts of articles from only three of the many papers containing favourable comment.
The Canadian Gazette had the following and a number of other articles:

**ONTARIO DAIRY PRODUCTS IN BRITISH MARKETS.**

It has been left to the closing weeks of the exhibition to witness one of the most practical of Canadian exhibits from a directly commercial point of view. Visitors acquainted with the leading industries of the Dominion must often have been struck, when visiting the Canadian section, with the absence of any adequate representation of the cattle raising and dairying trades of eastern Canada. This deficiency is now fully made up at least from one Province by the joint action of the Eastern Dairymen's Association of Ontario, the Western Dairymen's Association of the Province, and the Ontario Creamery Association. These three bodies have united, and together sent out over 500 boxes of the finest Ontario and Stilton cheeses, contributed by some forty different factories throughout the eastern and western sections of the Province, and about 100 tubs of fancy creamery butter, to be followed by 150 further tubs this week. These goods are now being arranged on the south side of the eastern transept of the central gallery, in the form of two trophies of cheese and butter, and a side display of fancy packages of butter and small Stilton cheeses. The exhibit is in charge of Mr. James W. Robertson, of the Dairy Department of the Ontario Agricultural College, at Guelph, from whom the following information, in regard to the exhibit, was elicited in the course of a conversation with our representative:

"'The object of our display is,' said Mr. Robertson, 'to introduce our best Canadian cheese to English consumers. Hence a good portion of the cheese will be sold in small quantities to visitors in the course of the exhibition, while the balance may be disposed of direct to retailers here, so as to allow of no mistake as to its being Canadian cheese. We feel very strongly in Ontario the imperative necessity of taking active steps to bring the good quality of our cheeses before the direct notice of the consumers here. We have not had fair play in the past. Formerly—i.e., eight or nine years ago—Canadian cheese was sold here as American, but the Centennial Exhibition so revealed the superiority of the Canadian Product, and we have since so steadily kept the lead, that our best Canadian Cheddar is often now, on reaching this market, sold as English Cheddar, while inferior English qualities are often sold as Canadian. Hence a prejudice has not unnaturally arisen against our cheeses, though we hope yet to prove how unwarranted this prejudice is. Then in doing this we hope also to promote emigration. We are earnestly looking for the settlement on our fertile lands in Ontario of the English farmer, who has capital enough to enable him to buy land and have a surplus sufficient to stock it well, and at once enter upon dairying on a profitable scale. Nothing will appeal so much to this class of English agriculturists as the excellence of our product, and seeing that the best Ontario cheese is equal to the purest English Cheddar, and superior to three-fourths of English Cheddar, and is quoted at four shillings per cwt. above the finest United States cheese, we don't anticipate any great difficulty.'

"'How does the industry stand in Ontario?'

"'According to the last returns for 1885 we have in the province 752 factories in operation, with an output of nearly seventy-one and one-fourth million pounds, of the value of one and one-fifth million pounds sterling. The increase in the number of factories last year is thus only one, and in the output of four and one-fourth million pounds, though the fall in prices, which affected Ontario less than English dairymen, made the value of the 1885 output less by a quarter of a million sterling than that of 1884. Our present policy is to strengthen in every possible way by co-operation and instruction the hands of each dairyman, and past success gives reason for the expectation that we shall thus be able to keep in the front rank even in the face of keen competition. The great thing we have to fight against here is prejudice. This alone prevents Canadian cheese from selling as high as the fancy makes of English cheese. In this respect the London market seems as yet the most satisfactory, in that it regards our products with less of that unreasoning prejudice so common in many parts. English dealers need not, however, fear that we are
going to overdo the business. We are careful of that, and what development takes place will now tend in the direction of butter rather than cheese production.'

"‘Ah, yes. Canadian butter might be improved with advantage, might it not?"

"Yes, it might, and will be, for we want to introduce it fairly into this market. It is true that our butter has a bad reputation here, and perhaps deservedly so, but the Canadian Creamery butter is now made in sufficient quantities with us to be exported. We have good samples of this creamery butter in the exhibit, so as to open up a market for it."

"‘What is the distinction between dairy and creamery butter?"

"‘Well, dairy butter is just the butter made at a private dairy by farmers and their wives, without either of them being skilled in its manufacture. Creamery butter is the product of the butter factory, where the cream from, perhaps, one hundred dairies is collected and made into the purest butter by those skilled in every improvement. We are thus, you see, adopting with our butter the same factory system that has proved so successful with our cheese. Canadian cheese, when it used to be made at the farmhouses, was a complete failure, so far, at all events, as outside markets were concerned; but since the factory system has been introduced it has been a marked success. We have the prospect of at least twenty-five new creameries being erected in Ontario before next spring—that is, twenty-five butter-making factories. The farmers form joint-stock companies, and erect the factories in many cases for the disposal of their produce. In other cases the factories are built by private capital, and the owner of the creamery charges a commission for the manufacture. It is easy to see the great aid this system is to the best methods of manufacture, and how the market naturally discourages the home production of dairy butter and favours the product of the creameries. The difference is that, were Ontario dairy butter may be worth barely 12 cents per pound, creamery butter will be worth 20 cents per pound. The commission of the creamery owner would be, say about 4½ cents per pound, leaving an advantage of 3½ cents per pound to the farmer who makes use of the creamery rather than attempting home production. We have a creamery at the College at Guelph, and have sent over samples of butter made there. We have also something new here in the way of five pound tin package for retail sale in the place of fifty pound or one hundred pound firkins. The experiment is, we think, worth a trial, a five pound package being of a convenient size for family use,'" etc., etc.

The Morning Post wrote as follows:

"During the past two weeks there has been in the Exhibition at South Kensington a display made by the Canadian Government of the greatest importance to the British farmer. It is that of cheese and butter from Ontario, the whole having been collected from some fifty factories, and brought over to the Exhibition by Professor J. W. Robertson, who is the head of the dairy department at the Ontario Agricultural College. An examination of this extensive exhibit ought to be the aim of every cheese-maker in the country, for without an examination he can have no idea of the perfection to which the Canadian competition has been brought. The writer of these reports spent an afternoon in company with Professor Robertson and Captain Clarke (who is in charge of the Canadian agricultural exhibits), in an examination of these dairy products, the high quality of which would fairly astonish the cheese and butter makers of the country. That which was tried was two months old, and had been for ten days (and ten days of heat), in the exhibition. It was not at all salt, the natural texture was well preserved, it was well and solidly worked, and of fine meaty flavour. It was equal to our best butter, and this, it is said, can be placed on the English market at 1s. a pound. There was none better at the London dairy show. The Canadians are trying hard to meet the markets in this country, and this butter will be imported fresh in five pound tins, which can be obtained regularly by the householder. But it was in the cheese department that the greatest perfection has been obtained. Here there are in all some 400 cheeses, all made on the Cheddar system, and all of a uniform high quality. Out of the 1,000 cheeses shown at Frome last month it would have been impossible to have selected 50 cheeses of such a uniform quality as the 400 on exhibition at the Canadian court, while the first prize
A co-operative dairying was commenced as late as 1855, when the first 100 or so farms under the auspices of the Government was commenced in the Glengarry district, near Gananoque. The idea of this system is that the farmers of a district possessing 500 to 1,000 cows among them send their milk to a creamery. There it is treated in a most scientific manner by skilled hands using the best machinery, the result being that butter is produced of a uniformly high quality, the farmer receives a better price and the public a better article. Professor Robertson, of the Ontario College, is now in London representing his Government at the Colonial Exhibition, and he has explained the principles of the system under which the creameries are worked in his Province, which has led the way in the Dominion; and his exposition goes to show that the colonists have applied strictly scientific theory and art in the attainment of their object. They have recognized first of all that butter has a natural texture which is destroyed by mixing and too much handling; and second, that it is a material which undergoes a natural ripening or maturing process, and that this may be hastened or retarded to suit the requirements of commerce. Taking these points together, it may be said that the finest product is only possible where the butter is made from the best milk, by the most careful processes, untouched by hand, and when it is brought to market just at the time when its oxidation or mellowing by contact with the air brings about the mature or ripe flavour. In Brittany, England and Ireland, butter is usually made in shallow vessels, and at a rather warm temperature. The result is quick oxidation—soon ripe, soon spoil; and an excess of salt is used to prevent it from becoming rancid. The Canadians, on the contrary, deeper cases, submerged in cold water, and their fresh butter will keep easily from three to five weeks; with a very slight covering of salt, and packed in suitable tins, it will keep good for a year. They can send perfectly fresh butter to the English market, and the probability is that in a few years this will be done to a large extent. In Canada the whole cost of collecting, churning, providing packages, salt and other necessaries, is 2 1/2d. per pound."

My own pen was not idle in the matter of commending our dairy products and the natural and good features of Ontario for farmers' homes. Thinking that two of these
letters may contain some information of interest to Canadian readers I take them from The Daily News.

**Butter Making.**

*To the Editor of the Daily News:*

"Sir,—I read with much interest your remarks on the butter trade in your Agricultural Notes the other day. It cannot be without commercial benefit to the country that your paper evidences such a lively concern in its great agricultural interests. Very timely, indeed is any discussion that tends to enlighten on the dairy industry, which is fast coming to the front, in the northern latitudes of the Empire, as the main and most profitable branch of farming. The town and city people need information as much as the dairymaid of the country. And the instruction of the city consumers as to the 'hows,' 'whys,' and 'wherefores' of butter-making, would quickly and forcibly tell in a prosperous propulsion to the trade wherever intelligently, tidily, and scientifically carried on. Fine butter is a table luxury which will always be cheerfully paid for by the masses, at a price profitable to the makers; and while its 'fineness' of quality is eminently the characteristic which gives to it, and through it to the dairyman, superior and profitable value, the same 'fineness' is that which really costs nothing extra of cream or labour to produce. When British dairymen—English, Irish, Scotch and Canadian—all learn how to add or rather conserve the natural 'fineness' of flavour in their really nutritious butter, the price will come up to an abundantly profitable figure. By butter-making there is hardly any appreciable exhaustion of the fertility of the soil; by it there is provided remunerative employment for many extra workers; and out of it the producer (the farmer) realizes a larger percentage of its ultimate cost to the consumer than from almost any other article he sells. That all being so, why is it that the British and Canadian farmers do not supply all the butter England and Scotland want? If British farmers would but adopt the Canadian methods of manufacture, and British consumers but become acquainted with the excellencies of Canadian creamery butter, the question would not need to be asked. Herein is a subject for the investigation and consideration of agitators for Imperial federation. The vitality of any scheme of federation will be proportionate to its power for promoting the interests of all the individual citizens concerned. The increase by it of everybody's comfort and safety, and the making of life to the people richer in its opportunities and enjoyments, will alone make federation desirable, durable, or endurable, or by it strengthen the Empire. Whatever facilitates the interchange of excellent food commodities will be the harbinger of closer union. Therefore, through your columns, I seek to speak to Canada of England's unsupplied need of fine, pure butter, and to England of Canada's power and resources to supply it; and, besides, in the supplying of this food-need, to give therewith such apt and acceptable dairy information and instruction as will direct England's and Ireland's and Scotland's farmers to do better for themselves.

"In every department of agriculture, the colonies have learned and are learning much from the mother country. But the impetus given to life, in every avenue, in a new country, impels its population to the speedy development and combination of old and merely local methods into comprehensive, adaptable and applicable systems. This is true as applied to the dairying industry and other minor things, such as newspaper making, public policies, social customs, etc. The love of the new—the changed—for its own sake, is characteristic of the mental and mechanical methods of all young countries. However, in the case of a colony like Canada, healthfully fed by numerous additions of immigrants from old countries, with their tersely conservative habits, the native tendency is well corrected, and safe progress only is made. But what has that to do particularly with butter-making? Well, this. Canada can and does make as fine and finer and as uniform a quality of butter as the 'Brittany mixture' so highly commended by the well-known butter merchant mentioned in your article, before referred to. Moreover the uniformity of Canadian creamery butter is not due to the 'grinding,' 'milling,' or 'mixing' of different samples into one homogeneous mass, whereby the natural texture and grain are all destroyed and the butter left as greasy as goose gravy. Canadians have adopted the good and the good only of the 'mixing' system. They mix the cream, not the butter,
from fifty to two hundred dairies at each creamery where finest butter—every package alike—is made by skilled butter-makers. Uniformity and fineness of flavour, body and colour are thus obtained without the destruction of the keeping properties by the objectionable ‘milling’ process. Canadian creamery butter has only to be well-known in the London market to divert the trade that now goes to a foreign country into the channels which are being more widely opened between England and her Colonies. Let but English butter dealers lend their aid by introducing Canadian creamery butter to their customers—and here let me remark that Canada manufactures no oleomargarine, no butterine, no imitations)—and much of the desired end of increased, closer, and more profitable trade relations between the mother country and her enterprising children will be brought about. Then, as soon as Canadian creamery butter is well known, English and Irish farmers will begin to inquire about the ‘hows’ of the system by which such results are obtained; and an early adoption of the creamery system into their own districts will soon be sought. Let the landlords, who are said to find many tenants unable to meet their rent obligations, take the lead in this matter, and the money which may be invested in factory buildings will yield 1,000 per cent. in the prosperity of the tenants and the consequent increased value of properties. The Government of the Province of Ontario, having in view the development of a butter trade with England, on a scale equal to the export cheese business of the province—now over $6,000,000 annually—are about to exhibit a large quantity of butter and cheese, contributed from all parts of the province, at the Colonial and Indian Exhibition. Sample packages of both may be obtained by visitors. Inquiries as to the resources of the province and the nature of Canadian dairy systems, so far as the knowledge may further fore-mentioned objects, may be addressed to the under-signed at the Canadian court, Colonial and Indian Exhibition.

Your obedient servant,

JAS. W. ROBERTSON,

Government Superintendent of Dairying for
the Province of Ontario, Canada.

Ontario Agricultural College, (Dairy Department),

"CREAMERY" BUTTER.

The following statements are made in the form of a letter by Mr. J. W. Robertson, Government Superintendent of Dairying for Ontario, dated from the Canadian court of the Colonial Exhibition:

"For the moment the butter industry is exciting unusual attention and comment in the Press. Producers and consumers alike manifest lively concern for the improvement and extension of this most profitable branch of farming. Nor is the quickened interest confined to London and England. The news from Cork tells that Irish farmers and merchants are bestirring themselves, in the hope of recovering their once enriching trade, which lately foreigners have won from them. Nearly every article and letter on agricultural affairs makes more apparent the urgent need for some action. The Government might well implement their expressed intention ‘to investigate the capacity of Irish resources for development by public works on a remunerative scale,’ in connection with this business, and that, too, with unique advantage to Ireland at this particular time. By a simple calculation, founded upon the data of last week’s market reports from Cork, it appears there is a difference of about £6,000 between the total value of the butter sold there during the week (about £33,300) and the sum that would have been realized (about £39,300) had it all fetched the price quoted for best quality. What a large loss every week to the producers on the butter of one market, due to the manufacture of irregular and inferior qualities. The loss indicated is not local nor peculiar to Cork, but is all too general over dairying Ireland and England, where butter is made at the farms without system. To prevent the continuance of such an enormous loss to the farmers of the country, and to protect and foster this valuable and elastic industry, surely comes within the
scope of Government duty. I am convinced that such a desirable end can be efficiently attained by the establishment of suitable creameries, after the Canadian system. By their general introduction a profitably and permanent enlargement of the trade would be immediately possible by the production within our own Empire of sufficient uniformly fine butter for our own people. Such a quality would always be in demand at remunerative rates. At the Ontario Agricultural College in Canada, the Government erected an experimental creamery some two years ago. The cream from nearly 1,000 cows is now received. The system of butter-making throughout the whole province is being rapidly changed and much increase of wealth is going into the country in consequence. The institution is educational, and free instruction in the management of creameries and the details of scientific butter-making is given to eligible young men. Why does not the Imperial Government aid English and Irish farmers in a similar way? Contrasted with the mixing, milling Brittany process, the Canadian creamery system has everything to commend it. The desirable keeping properties, which add much to the butter's worth, are by it conserved, and the natural and exquisitely delicious creamy flavour is preserved for weeks. The national importance of the subject will excuse me in encroaching further on your space to state in popular terms some interesting facts recognized by only a few experts.

1. The natural flavour of milk and its products reside mainly in their fat constituents.
2. While milk is quite new its cream or fatty portion is comparatively insipid or lacking in flavour.
3. By exposure to the action of the air (oxidation) the flavour is ripened or developed, and the colour of the cream and butter made therefrom is deepened.
4. A warm temperature facilitates and a cool temperature retards the development of flavour.
5. Thus, butter made from cream raised at the ordinary temperature of the atmosphere, in open shallow vessels (such as are commonly used in Brittany, England, and Ireland), has a much fuller and riper flavour when just made than butter manufactured from cream raised in deep cans, submerged in cold water, as by the creamery system of Canada.
6. The former butter has its best flavour within two days after it is made, while the latter, the creamery, may continue to have its best taste from three to five weeks afterwards.
7. The earlier development of flavour in that butter which is at its best just after churning proclaims it of the character defined by the fruit adage, "Quick ripe, quick rotten." For such butter, delicious while fresh, nobody claims keeping properties any more than for harvest apples the quality of keeping sound till Spring time.
8. On the other hand, the quality of creamery butter (as evidenced by the Ontario Government's display at the Colonial and Indian Exhibition free for inspection and examination by all interested) shows that it has excellent keeping properties.
9. The butter fat of milk is in the condition of minute globules. These are collected into mass by the impaction of churning.
10. Any after-working, "mixing," or milling, that destroys the natural grain or texture of butter, thereby destroys its keeping properties, just as the bruising of fruit or the breaking of egg shells renders both of these commodities subject to speedy decay.
11. As an article of diet, delicious butter is very different in its gastronomic effect from oleomargarine or any imitation compounds.
12. Fine butter—its peculiarity—aids weak digestion by instilling its own atoms between the atoms of more solid foods, thus assisting in their disintegration for assimilation.

It will be to my satisfaction, as an humble servant of my own Province and of the Great Britain, to give any further information I can that will be helpful in promoting the prosperity of the farmers of the empire along the lines indicated."
These have since been copied into the leading British papers and journals devoted to the provision trade. Many inquiries came in consequence, and the information thus given about Ontario and Ontario’s butter and cheese may be of some help in the further development of her natural resources. Numerous letters came from English, Scotch and Irish dairymen, seeking information about how to improve the quality of their goods. Any help in that direction that can be given would leave a larger and more profitable market for Canadian products. Though this is perhaps not the place to fully discuss that proposition, it may not be amiss to point out that during the months of November and December the consumption of some of the inferior and cheaper qualities of late-made English cheese very much weakened the demand for higher priced Canadian. The consumer is a very much longer time about consuming two pounds of inferior cheese than in disposing with satisfaction of four pounds of excellent quality. Every pound of inferior butter or cheese made anywhere shuts off the demand—by lessening the consumption—for at least twice its quantity of fine quality. The conclusion that the higher is the standard of quality of dairy products of our own and all other countries that compete with us, the more profitable will be the business for all producers, is indisputably correct. The exhibition is to be credited with doing something in that direction.

The criticism of some of the best buyers drew my attention to some of the defects which lessen the value of our average shipments of both cheese and butter. At the three dairy conventions I have pointed out these and detailed the slight changes in the process of manufacture that are needed to remedy or avoid them. I may condense the important points as lessons for cheese and butter makers.

**Lessons for Cheese-Makers.**

I. Uniform fineness of quality is required in *every* cheese of *every* lot.

II. A cheese with fine flavour and solid and buttery body, which will retain its richness after exposure by cutting, is wanted.

III. A smooth, bright rind, without cracks, gives additional value; also a neat finish as to shape and general appearance.

IV. Scaleboards should be put on just before boxing, and so as to stick closely to the surface of every cheese.

V. Cheese boxes should be made with stronger covers to safely stand the rough handling of transhipment. The cover bands should be $\frac{5}{6}$ of an inch thick.

**Lessons for Creamery Butter-Makers.**

I. An attractive, neat and clean butter package that will be decently ornamental to a provision shop will increase the value of the butter. Besides the packages already in use, a Canadian cask with wooden hoops and holding 112 pounds would meet with favour.

II. The use of impure butter cloth leaves an objectionable taste on the top of the butter, very seriously lessening its value.

III. Such salt should be used as may be tasted, but not felt by the touch of tongue or finger in the butter.

IV. Pure brine should be frequently poured on the butter while in store. A tallowy taste for an inch on the top is induced by neglect of that.

V. All butter for export shipment should be stored in suitably cold store-rooms from the time of making.

The need for attention to the last mentioned matter is so urgent that I take the liberty of stating the case at some length. In our competition with butter from Ireland, Denmark, France, Sweden, Holland, etc., we labour under difficulty in trying to put Canadian butter on the consumer’s plate in the best condition to please the palate and nourish the body. In the matter of freight charges we are comparatively well off, but the circumstances presently existing of our largest production being at a time when safe
transportation is most difficult, and when the price in all consuming centres is lowest, is against us. The adoption, in a measure, of winter dairying might be recommended as a partial relief and remedy. Still this state of things exists, that in most of the June and July creamery butter is stored somewhere, either on this side the ocean or the other. Hence the providing of suitable storage that will prevent deterioration in quality, and consequent depreciation in price, is a manifest need of the business. In visiting creameries during the past summer I generally found the storage accommodation quite inadequate and unsuitable. Large refrigerators at convenient centres would be more economical for use than the erection of small ones at every creamery. Then there would be less risk of butter "going off in flavour" when kept in buildings exclusively used for that purpose, and looked after by men engaged for the definite work of regulating its temperature and preserving its contents. Such buildings would be of Provincial and national service and benefit. Watchful attention to a continuance of suitable conditions for preserving quality, with proper selection and classification, would gain us a higher reputation and price. Any quality under fresh-flavoured, sweet, delicious-tasting butter will be pushed out of the market by the finest brands of butterine. I am satisfied that by treatment as advised, June butter in nine cases out of ten would reach the consumer in better condition in November and December, or later, than by immediate and direct shipment in midsummer, followed by exposure to the humid air of English warehouses and shops. Probably the farmers would not receive their full share of the increased prices for a time, but additional wealth would be brought into the country, and the competition of commerce would soon equalize the distribution of profits. A rate of 5 cents per tub per month would amply cover all expense and allow a fair dividend on the cost of buildings. It would thus be possible to preserve the creamery butter, and put it before the consumer in England or elsewhere in its best state, and at the season of the year when the highest price may reasonably be expected.

The interests of the carrying companies are closely identified with those of dairymen. When the latter use only reasonably strong boxes and packages, the former should look after their safe carriage. The heated and damaged condition in which I observed some cheese to be discharged from the ships' holds will, if continued, speedily and justly lead to the withdrawal of Canadian dairy patronage from such vessels.

With the consumers, the shop-keepers, the wholesale dealers, and the importing firms, the butter and cheese from Ontario now stand in higher repute than ever.

Of the general influence of the dairy display from an immigration-fostering standpoint, I am not prepared to report. But this I can confidently write, that the apple, the honey, and the cheese and butter exhibits, all mainly under the care of Ontario men, did more to bring a true knowledge of the resources and climate of the Dominion of Canada before the public in an acceptable way than all the other departments of the Colonial and Indian Exhibition put together.

Commemorative medals and diplomas will be issued to all who contributed cheese and butter to the Exhibition.

My thanks are due and hereby tendered to all who aided me in the endeavour to make the display of cheese and butter from Ontario a success.

VI.—THE FARMING AND DAIRY SYSTEM OF DENMARK.

A few lines may be devoted to the mentioning of some things observed while on the journey from England to Denmark, which may have educational value for farmers in Ontario.

The route taken was by way of Queensboro'; thence by boat to Flushing in Holland; thence by rail via Bréda, Boxtel, Goch, Wesel and Hamburg to Kiel; thence by steamer to Korsør in Denmark and on to Copenhagen by rail. London was left on the 3rd December.

The continental railroads travelled over were well equipped. The roadbeds, in respect of their construction, were between the English and Canadian styles in point of solidity
and durability. The engines seen were mostly of English make. The passenger coaches which were comfortably upholstered and heated by steam, were built after the English pattern, with compartments across the cars, having entrances from both sides. The freight box-cars and trucks were much smaller and lighter than those in use on the Grand Trunk and Canadian Pacific Railways. The average rate of passengers' fare is lower than in Canada. On the German state railways there are no less than four classes of carriages. The fourth-class have no seats and are largely used by labourers travelling short distances to their work at very low rates.

A thin sprinkling of snow lay on the ground. The country of the Dutch surprises one by its generally flat aspect. The monotony of a prairie scene is absent, as canals and ditches scarify its whole surface. The fields have a rich alluvial soil of dark colour. Trees, visible from the car windows, were all of light timber and mostly scrubby-looking. After Tilburg is passed the soil has lighter colour; and stunted shrub beech it plentiful. What seemed to be thriftless thorn and beech hedges disfigured the landscape.

The fields were mostly ridged up with deep furrows between the lands. Large fields of turnips looked very well. The kinds were mostly yellow and soft purple tops. On meadow lands the pasture was still fresh looking, with a good roughness of top for feeding or winter protection.

Great Don Quixote wind-mills, for grinding, were here and there lazily rolling round. The farm-houses were generally built of brick of smaller size than ours, and roofed with red or dark coloured tiles. Occasional groups of three or four houses close together, with moss-covered thatch roofs, seemed to have grown out of the ground on which they stood. After crossing the German frontier the country had very similar appearance to the undulating and fertile districts of Ontario. The woods were large in area and their trees looked as large as those in Canadian forests.

The farms appeared to be smaller and the barns were quite dwarf-like in comparison with bank barns on 100-acre farms in Canada. The peasants are rather slow-moving and sedate-looking people. The farm labourers still wear wooden clogs, kept on by the movement of the toes. Their stockings are without soles, and are kept in place by a leather strap around the instep and toe. For fuel, wood, peat or turf, and coal are used.

From Hamburg to Kiel through Holstein the county is generally flat, with blotches of turf, whence the peat is obtained for burning. The soil is very much assorted, many different colours being seen in single fields. The hedges of hazel, thorn and beech are neglected looking. The woods are about as heavy as in Ontario and mainly of elm and beech, with some light birch. At Kiel I inspected a creamery, but instead of detailing what was seen at each creamery or dairy visited I will gather into one place a description of the best points in butter making seen at the different places.

On reaching Denmark one is struck by the clean and well cultivated appearance of the farms. The soil is of boulder clay or boulder sand. Geological researches have revealed the history of its timber clothing at different periods. There was first poplar, then elm, followed in turn by pine, oak, hazel and beech. The present is still the beech period there.

The average annual rainfall is from 23 to 24 inches. The mean yearly temperature is 45°.

For a small country, Denmark deserves much praise for the long and thorough attention given to agricultural investigation and education. Outside the kingdom, the impression prevails that the Government of the country has financially and otherwise borne most of the burdens inseparable from the establishment and maintenance of educational means and facilities, which have been of much national benefit and have enabled the Danes, particularly in the making and exporting of butter, to gain the foremost place in the world for quantity and quality exported per acre of kingdom area.

The Government has all along maintained a friendly and fostering attitude towards the improvement of agricultural methods and implements, and has given liberal grants towards furthering scientific investigation and the dissemination of sound knowledge relating to land and its cultivation, as well as to stock and the manufacture of their products. But the agricultural and dairy instructors of the country have not been very
liberally fed at the public crib. Their success, and the really telling education which the young men and women have received, I judge to be due to the necessity laid upon all of them of largely helping themselves before they received Government assistance. That the Government should support agricultural and educational concerns merely for the sake of appearances does not seem to have come within the range of Danish administration.

As long ago as 1769 the Royal Agricultural Society of Denmark was established. It was originally founded for the purpose of promoting interest in and spreading useful information in relation to all rural industries. The main objects sought to be attained through its organization might be summed up as:

1. Holding of meetings for the discussion of matters having scientific and practical bearing on agricultural interests, as well as the publication and distribution of books and pamphlets thereon.

2. The employment of persons competent to advise farmers on dairying, on the care of stock and on the treatment of diseases of farm animals.

3. The institution and supervision of experiments, embracing chemical analyses, etc.

4. Arranging for and superintending the placing of apprentices on farms and in dairies, and granting certificates to such as comply with the conditions of service and prove deserving.

5. Acting as a central organization for the numerous local agricultural societies in the kingdom, and joining with them for the purpose of holding one comprehensive exhibition every five years at different centres.

6. Assisting in fostering the export trade of farm produce, and submitting to the Government reports on agricultural subjects.

In 1853 its membership was only about seventy, while now it has on its roll nearly one thousand members paying an annual subscription of a little over $3 each. Up to last year it received an annual grant from the Government of rather more than $800. That is now somewhat increased. It has a funded capital of about $90,000, part of the revenue from which is devoted to the maintenance of a few deserving pupils at the Royal Agricultural College at Copenhagen.

The local agricultural societies are very numerous and keep alive an active interest in the progress of farming knowledge and methods in the remoter districts. From these clubs delegates are sent yearly to form one agricultural society for each of the four provincial districts into which the country is divided for that purpose.

Both these and the local societies hold exhibitions every year, and the Government contributes to the premium fund dollar for dollar provided by the societies themselves.

Before proceeding to briefly trace the part taken by the Royal Agricultural Society in the development of agricultural education, mention should be made of the Polytechnic School, established in Copenhagen in 1829, and also the Royal Agricultural College of Denmark. This first institution, which seems to cover the same ground, educationally, as the School of Practical Science in Toronto, is very highly esteemed for its work in preparing thoroughly competent teachers for the Royal Veterinary and Agricultural College. At this school, in 1849, Prof. Jorgensen first commenced to lecture on rural economy.

A veterinary school had been in existence at Copenhagen from 1773. In 1856 it was decided to add to it a full course of instruction in all branches of agriculture. Then it became the Royal Agricultural and Veterinary College of Denmark. It is now entirely a Government institution, the expenses being met by an annual grant from the public treasury, which however is supplemented to a considerable extent by revenue from legacies and gifts invested for its benefit. There are twenty-two professors and thirteen assistants, besides the inspector and other officials upon its staff. The total annual expense is about $33,000, of which the Government pays about $28,000.

Its curriculum embraces five divisions, Veterinary Science, Agriculture, Surveying, Forestry and Horticulture. Then there is a ten months' preparatory course for those
needing further elementary instruction before taking up any special subjects. Two years' study are required to pass in either of the five divisions. A few students stay for four years and thus graduate in two departments. The fees are about $15 per annum for all lectures and the use of the laboratories and chemicals; books are extra.

The students find for themselves boarding places in the city. The cost, of course, varies with the accommodation required. The average expense for the year for fees, boarding, books, clothing, etc., was put by one of the professors at $250 per student. The plan of College boarding for the students was considered by the authorities as very undesirable and unsatisfactory.

The College buildings seem spacious for the number of students yet an early enlargement is looked for and promised. The class-rooms are fitted up in admirable arrangement. The museums are replete with specimens of every creature and skeleton that might be found on a farm. The skeletons of cattle, horses and sheep, which, while naturally clothed with flesh and skin had once won prizes at leading shows, now serve as models from which to lecture, demonstrating the desirable points of frame and build. Samples of all kinds of seeds and farm plants are daily handled in the class-rooms; working models of implements and machinery (ancient and modern) are taken apart in the class-rooms as far as practicable, and the names, uses and manner of construction of each piece explained. So, also, with the various fertilizers of commerce.

The chemical laboratories are fitted up most completely and ample opportunity is afforded all students for practical work in analyses. The O. A. C. laboratory at Guelph is like a blacksmith shop beside a well-equipped engine works when compared with that at Copenhagen.

There is also a large botanical garden adjoining the college. One feature that delighted me was the full and clear labels attached to every shrub and bush. Some twenty acres are used to illustrate agricultural operations. The students visit the plots in company with the professors to watch and note the progress, differences and likenesses between plants and grasses at their various stages of growth.

For the use of veterinary students there is a suitable dissecting room, with excellent appointments. Under the charge of the same department there is a commodious horse hospital, where the disabled and sick equines of the city are stabled and doctored. The students accompany one of the professors of veterinary science on his morning rounds and receive clinical instruction.

A branch hospital is a retreat for the sick dog-and-cat pets of the capital. At this place we received a very noisy welcome. Horse-shoeing is taught in an adjoining building. A small dispensing laboratory is attached, where students learn how to prepare and compound medicines.

For use in his lectures on Dairying, Prof. Segelcké has models of all kinds of apparatus, used in nearly every country where cows are milked and butter and cheese are made. Especial attention is given to instruction in the use of and parts of the centrifugal cream separators.

Apart from the College stands the special dairy laboratory, under the charge of Prof. Fjord, who is assisted by three chemists and a number of other helpers. A Government grant is also made for its support (about $5,000 annually), and the whole time of these enthusiastic experts is given to investigation and experiment with milk, butter and cheese, and the utensils used in their manufacture. The chief chemist, M. Storch, whose name, together with Prof. Fjord's will be premanently engraved in the dairy literature of the century, kindly showed me over the place. The necessary limits of this report, and my unavoidably hurried visit, forbid an attempt at fully detailed description. Everything useful, seen or learned, will be communicated to the professor of chemistry at Ontario Agricultural College, who is with commendable vigour devoting much time to scientific dairy investigation. Besides the work carried on at this laboratory, many of the leading dairies of the country have appliances and conveniences for Prof. Fjord's use when he wishes to work at their places. Whatever improvement in dairy machinery is effected is made known freely to the public, and all useful discoveries are regularly published for the benefit of dairymen. Such elaborate care is exercised in all the work that the confidence reposed by the public in Prof. Fjord's conclusions is fully warranted and justified.
There have passed through the college course at the Royal Agricultural College—

455 in Veterinary Science during the last 25 years.
258 in Agriculture  "  "  "  25 "  
71 in Surveying  "  "  "  25 "  
55 in Horticulture  "  "  "  18 "  
82 in Forestry  "  "  "  18 "  

These graduates become teachers in the lower agricultural schools, managers of estates, or follow the special vocation for which they have been educated, on their own account. By way of incitement to diligence the Royal Agricultural Society—formerly mentioned—awards to successful students premiums of sums of money, sufficient to enable them to visit different parts of their own or some foreign country, for further culture and acquisition of knowledge relating to their intended calling. Many instances are on record where diligent and persevering youths have risen from poverty and obscurity, to occupy foremost places of usefulness and influence.

I return to the part taken by the Royal Agricultural Society outside of the College, for the improvement of agricultural operations. From the beginning of the present century, it has been a very important factor in developing the country's resources. It first undertook the task of apprenticing young men to the best farmers all over the Kingdom for training and instruction. The conditions upon which youths were received were briefly: they must be native Danes, of good health and irreproachable moral character; they must have a recommendation from a magistrate and clergyman, and express an intention to follow farming. When everything of that sort was satisfactory, the applicants were accepted for two or three years. Good farmers of approved standing were glad to take these youths as learners, paying them a small sum yearly, besides giving them board and lodging. Each apprentice was left for one year only on one farm, when he was removed to a farm in another part of the Kingdom. His third year was spent on still a different farm in one of the other districts. At the outset each apprentice received from the Society a number of books bearing on agriculture, which became his own property upon the completion of the three years. Reports were made to the Society at stated intervals by each apprentice. Then from these, and the youths' records at the places where they had spent three years, the Society judged of their progress and merits, and granted diplomas accordingly.

Such varied training gave the apprentices a wider knowledge, and more skill in regard to all farm work, than if they spent the whole period on one farm under one manager. After the Society had laid the foundations for the success of the system, the demand for apprentices, and the desire to be apprenticed, quite out-grew its capacity for oversight and management. Then the terms of the Society were accepted as the basis of engagement between youths and farmers direct. Thus the leading farms of the Kingdom have each become a centre for agricultural education. The plan whereby the young men learn the systems of farming, in all the districts of their country might be transplanted with much advantage, to the farming community of Ontario. The student apprentice's life was not by any means half work and half pay. They were at work by four o'clock in the morning, and, except for meals, did not knock off till seven in the evening.

By 1873 this same Society began to recognise the value of the dairy industry and the importance of and need for instruction. It took steps to learn of the best methods in dairy husbandry, followed in their own and other countries and by means of pamphlets and lectures set out to improve the manufacture of butter. In 1860 Prof. Segeleke was engaged as dairy chemist. Then his whole time was occupied in the work of apprenticing young women to the best dairies in the country. Considerable difficult was at first experienced by reason of the opposition of the chief dairymaids, who were secretive. This was finally overcome, and a small fee in every case, for a two or three months' course, allayed their jealousy and directed their tongues to teaching. From 1864, young men were apprenticed in the same way. They were accepted by the Society upon conditions similar to those affecting candidates for apprenticeship for general farming. The term of service, however, was usually three months, instead of three years. Each apprentice was
furnished with blank report forms, on which he was required to report to Prof. Segelcke, once a week, a record of the operations of the dairy in detail. The supervisions and necessity for recording details of everything done, were very helpful in furthering the young men's education and progress.

By 1885 no less than 945 youths had passed through the course of training and received the society's diplomas. They were required to pay their own way, but no fees were charged for the Society's help. As in the apprenticing of youths to general farming, this, also, soon outgrew the need of the Society's control. Now nearly every dairy of note has many learners, accepted and trained by private agreement and arrangement. All this has told with marked effect on the general progress and appearance of the country. No antagonism is apparent between dairymen and other branches of farming. But as more attention has been paid to this specialty, so more progress and prosperity have attended the other departments of farm labour. While the Danes have been appropriately called a nation of dairy farmers they have not neglected the thorough cultivation of their farms for grain and root growing, nor ignored the profits to be made from stock raising and fattening cattle. From the export statistics it is learned that during the four years from 1869 to 1872 Denmark exported 65,838,730 lbs. of butter and 207,513 head of cattle; from 1870 to 1873, inclusive, Canada exported 61,976,234 lbs. of butter and 233,402 head of cattle; from 1881 to 1884 Denmark exported 133,061,193 lbs. of butter and 445,498 head of cattle; from 1882 to 1885 Canada exported 38,674,611 lbs. of butter and 360,771 head of cattle. These figures show that the development of the dairy industry is not at all incompatible with, but rather helpful to, the profitable extension of the export cattle trade.

For sixteen years, each, the export figures are:

<table>
<thead>
<tr>
<th>Country</th>
<th>Lbs. Butter</th>
<th>No. of Cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark, 1869-1884</td>
<td>433,492,488</td>
<td>1,401,918</td>
</tr>
<tr>
<td>Canada, 1870-1885</td>
<td>212,593,246</td>
<td>914,462</td>
</tr>
</tbody>
</table>

Enthusiastic engagement in the dairy business has led the farmers to keep more stock, and the keeping of additional stock has made the raising of larger crops of feed a necessity. It has also made the latter an easy possibility by the consequent increased fertility of the lands.

I had the honour and pleasure of visiting the estate of Baron Tesdorpf, who wears the proud honour of being acknowledged as perhaps the leading farmer in the Kingdom. He has under his direction no less than seventy student apprentices, besides his small army of labourers. I quote two of his courses of rotation of crops, which will give a general idea of the system of farming followed:

Eight-course rotation.
- Clean fallow.
- Wheat.
- Sugar Beets.
- Barley.
- Pease, Beans, Turnips.
- Oats.
- Clover to cut.
- Pasture.

Four-course rotation.
- Wheat.
- Roots.
- Barley.
- ½ Clover, ½ Beans.

The same gentleman uses a phosphate fertilizer in the shape of ground bones very liberally. He applies from 600 to 700 lbs. per acre about every fourth or fifth year. His large herd, at the home farm, of some 250 milking cows, were a lot of very fine milkers. The daily ration for stable feeding while in milk for a 1,000 lb. cow was:

- 3 lbs. Bran.
- 2 lbs. Cake (Oil or Cotton Seed).
- 5 lbs. mixed Barley and Oats.
- 7 lbs. Clover Hay.
- 30 lbs. Mangels.
- Straw without stint.

The mixture of chopped barley and oats for milking cows was very highly commended. For Canadian dairymen, I should recommend a mixture of barley, oats and
pease. General feeding practices that had been successful in different parts of the Kingdom I found to be very much as followed by our best feeders. A word or two of comment here will not come amiss. Bran was found to be more economical for milk production, together with grain, than the feeding of grain alone. All the richer feeds are fed with the coarse feed, both to encourage a large consumption of coarse feed and to promote the best results from digestion. The feeding of clover hay gives better results in milk than the feeding of timothy hay. A mixture of grasses will be found best in Ontario. These should be cut rather on the green side and well saved and kept. An excessive feeding of roots, even to the extent of one bushel a day, is judged to be wasteful and injurious. Straw from a grain crop cut on the green side is held to make excellent fodder. Ontario farmers may note that the practice of cutting crops rather on the green side would avoid loss of grain, leave it of brighter colour and better weight, and make the straw much more valuable for milk production.

The breed of cows now finding most favour are the Angels (\( g \) is pronounced hard). In appearance they resemble a cross between the Ayshire and Jerseys. It is not believed that they are descended from either of these breeds; but possessing similar powers for milk production, they reflect these in forms somewhat alike. They are of a dun-red colour, shading into black on the neck and head.

The price in Denmark of a first-rate Angel Bull, with good pedigree, would be about $165, and that of a choice picked cow about $75. I do not recommend their importation. The average annual milk yield will be about 6,700 lbs. per cow, with an average weight of under 1,000 lbs.

The stables are constructed to provide for thorough ventilation, as the cows are often stabled for eleven months continually. Every care is taken to preserve the manure for use on the fields. Both liquids and solids are guarded from losing their fertilizing value. In some stables the manure is pitched under the cows feet, then covered with straw, and so allowed to accumulate for three months. No bad odour was detected as arising from that practice. At other farms, covered manure yards protect their contents against the washing of rains and the bleaching of the sun. At such places the liquids are conveyed to a central tank, and frequently pumped over the compost heaps.

The stable feeding has already been described. The ration mentioned is the usual one, and is divided into three feeds per day.

Water is given in the stables. Attention is paid to its purity, and it is offered freely. Cows have access to salt at all times.

On large farms the soiling system prevails, and cows are allowed out only one month in the year. That is either June or August. Where allowed to pasture during the summer the cows are usually tethered. Water is supplied by a watering cart driven along between the rows, and with convenience for each cow to drink.

The milking is mostly performed by women, who, generally in large dairies, milk twenty cows each, morning and evening. Attention is paid to the equal division of time between the milkings. From four to six o'clock in the morning, and from four to six o'clock in the evening, are the times taken. A superintendent sees to it that each milker washes her hands after milking every two cows. The utmost cleanliness is observed in all the handling of milk and its products.

A record is kept of the milk yield of each cow by weight once a week, and occasional tests are made of its quality. The average quantity of milk required to yield one pound of butter is about 25 lbs., by the centrifugal separator. At some creameries where deep setting was followed the average was 31 lbs.

The heifers drop their first calves when from twenty-two to thirty months old. The season of the year when most cows calve is from early December to late January.

Cheese-making is followed, to only a very limited extent. Skim milk mostly is used in its manufacture. The product is not very palatable, though it is rather more so than the soft varieties to be found in North Germany. The taste in North Europe seems to be for a soft, a very soft cheese, when made from whole milk; and if the odour is of an indescribably vile description, no objection is taken. The sense of smell seems to be dulled into enduring, or cultivated into relishing every kind of assult.
Butter-making is followed both on the home-dairy and creamery plans. The smaller dairies frequently unite to support a creamery, while the larger dairies of from 100 cows and upwards, can afford to manufacture their own butter economically. The shallow pan, deep-setting and centrifugal systems of cream separation, have all been tried, and in different places, are all still in practice. Progressive dairymen have abandoned the shallow-pan method for the deep-setting, during most of the season; and are now adopting the centrifugal, as an advance and improvement on the latter. It is allowed that a fuller separation of cream is effected by the mechanical than by the natural plan—that the skim milk is left in better condition for calf-feeding—and that the butter has better keeping properties. The cream is better under the control of the butter-maker for ripening, and its butter has a higher melting temperature than when milk is set in the ordinary way for cream to rise.

Care is taken to have the centrifugal machines run at a regular rate of speed. The inflow is regulated to a nicety. Then the separation can be adjusted to any per cent. desired. The usual temperature of the milk is 86° Fahr. for mechanical separation. Where deep setting is practised the milk is heated to 100° Fahr. and immediately placed in ice-water tanks, and so allowed to stand till cream separates. For the best results from shallow pans the milk is poured into them while warm, and then left in a cool room. In both of the latter cases, the skimming is performed in the well-known manner, and always while the milk is sweet. Thus the cream obtained in bulk is always sweet.

To properly ripen the cream for churning a "fermentation starter" is prepared daily in the following way: As much milk as will yield cream, equal to two per cent. by bulk of the whole cream to be churned each day is taken from the evening's milk and set in deep-setting cans in ice-water. Sometimes it is set in shallow pans. The surface in both cases is left exposed to the air. In the morning this is skimmed. About 11 o'clock in the forenoon it is warmed to 72° Fahr. and placed under cover so as to retain its heat. By the following morning it will have become sour. The sourness is merely a result of the fermentation induced by the exposure to the air and after maintenance of warmth. This is now what is called the "fermentation starter." After the bulk of the cream is separated, if by the centrifugal machine, it is heated to 72° Fahr. and then put in tinned cream tubs. To it is added "fermentation starter" equal to two per cent. of its bulk about 11 a.m. The whole mass is allowed to gradually cool to 58° Fahr., and by the following morning, or after the lapse of about 18 hours, it is in the right condition for churning.

When the separation of cream has been effected by the natural method of setting, the bulk of the cream is heated to 59° Fahr., and then the "fermentation starter" is added, and the treatment is as above. These temperatures vary slightly with the season of the year and the length of time the most of the cows have been milking. So also the temperatures at which the churning is performed, the range being from 57° to 64° Fahr.

The churns in common use are the Holstein churns. The churn body is cylindrical and stands perpendicular, the bottom being wider than the top. On the inside and standing perpendicularly, are three or four blades of wood, fastened at equal distances around the inside. These stand out in width from three to four inches, and are about one inch thick. The churning is performed by means of a revolving dash whose axle stands perpendicularly. The churns vary in size, holding from 150 pounds to 300 pounds of cream.

The speed of revolution varies with the diameter of the churn. The smaller in diameter the greater number of revolutions per minute. By a simple calculation I arrived at the ratio of speed to diameter. The outside of the blades on the dash are made to travel about 700 feet per minute. Churning is completed in from 30 to 40 minutes. In the cover of the churn, provision is made for the insertion of a small stick or tube, while the churn is in motion, on which to withdraw a sample and learn the condition of the cream. As soon as the cream is churned into butter-particles about the size of clover seed, the churning is instantly stopped. This stage is watched very closely, as churning too long or stopping too soon are regarded as injurious.

The butter in the granular state is then dipped out by a hair sieve. As much as possible of the butter-milk is shaken off. The remaining butter-milk is worked out by hand
in hollow troughs. No water is used to wash the butter; the hand-pressing only is applied. The working is performed on small quantities of less than half a pound each, and each piece is folded and pressed some eight or nine times. They are then placed on an ice-box to cool for an hour.

Salt is then added. From three to four per cent. by weight is the usual quantity, though the salt is generally measured and not weighed. By measuring, instead of weighing, the moist or dry condition of the salt does not affect the salting power of the quantity added. In from one hour to three hours the salt will have fully dissolved and the second working is proceeded with. The highest temperature at which butter is worked is 60° Fahr. The firkin to be filled will have been previously prepared by soaking with cold water and then washing with hot water and rubbing with salt inside. The butter is immediately and finally packed away. Usually within four hours or less from the time when it leaves the churn, the butter is packed. In that way all disturbance of the grain of the butter by re-working after it has commenced to set is avoided. The butter has better keeping properties in consequence.

The package mostly used is the Danish cask, which is barrel-shaped, and headed in at both ends. It holds 112 pounds of butter, and is finished with wooden hoops. The butter is packed in very firm and close, and covered with a clean cloth, free from all impurity that would impart offensive flavour to its surface. A slight sprinkling of coarse salt is put both under and over the cloth.

Examination has been made by trial of the effect of cold storage on the after-keeping qualities of butter when exposed to the warm summer weather of England. It was found that the cold-stored and cold-carried butter was in every way better than butter from the same churnings that had not been so treated.

A considerable quantity of the Danish butter is packed in hermetically sealed tins in Copenhagen and shipped at very remunerative prices to markets in the East and West Indies, China, Brazil, etc.

A measure has been framed, and by this time I believe it has become law, making it a penal offence to manufacture any compound in imitation of the colour of butter in the Kingdom of Denmark. Having won for themselves an excellent and valuable reputation, the Danes are setting their faces against the making of all counterfeit vilenesses.

For assistance rendered to me in the making of enquiries and gleaning the foregoing information, which I trust will be useful to the Dairymen of Ontario, my hearty thanks are due to Baron Tesdorpf, Rev. M. Weber, Prof. Segelcké, and Drs. Faber of London and Copenhagen.

VII.—GENERAL REMARKS AND CONCLUSIONS.

Looked at in its relation to other branches of farming in Ontario, dairying needs and deserves more attention from farmers and educators than it has received in the past. Everybody acknowledges that the most economical way in which to increase and maintain the fertility of farms is by thorough cultivation, and the keeping of large numbers of some kind of stock to consume the coarser grains and fodders. To those who prefer horses and sheep I have no advice to offer. But to those who go in for cattle I would say that dairying offers the best profits. Good milking cows leave margins above the cost of their keep; and better stock for economical and profitable fattening may generally be got from such cows, and reared in conjunction with dairying, than in any other way. There is an endless chain of annually increasing profit from the keeping of good cows on any farm. The more the cows kept, the more the stock reared and fed; the more the stock, the more the barn-yard manure; the more the manure, the richer the fields; the richer the fields, the better the crops; the better the crops, the more the stock that can be fed; the more the stock, etc., etc.
In those districts where milking cows are already numerous, but where no cheese factories or creameries are in operation, the farmers cannot too soon set about establishing the one or the other. The profits to the farmers from both are, on the average of years, about equal, when counting in the value of the skim-milk for calf feeding. The loss from dairy butter-making where a market for immediate consumption cannot be reached is very great, as has been already pointed out.

Then the dairy industry, even where well established, needs to be conducted on more progressive and profitable lines. The average yield per cow in Ontario is still deplorably small. Too much time has been spent in trying by manipulation to get the selling prices up, to the neglect of trying the more easily accomplished task of putting the producing prices down. That can speedily be effected by suitable and economical feeding and proper stabling, watering, salting and handling, as recommended. The line of possible profit is between the two prices mentioned, and nearly every farmer can make the line for himself a good deal longer than it has been, in the way just suggested.

At the factories and creameries the men whose special work it is to handle milk and manufacture cheese and butter need to keep on improving the quality of the goods turned out. As compared with the same industry in other and competing countries, our cheese-makers cannot afford to weaken effort at further improvement by too much confidence and boasting. The need now is to have all the cheese from the Province as fine as the "make" of the best factories. Systematic supervision and instruction would much facilitate that work.

In butter-making our creamery men have made some advances during the past few years. It is needed that the quality of the butter from the best creameries be better in 1887 than during 1886, and that the "make" from the creameries of the whole Province be as nearly uniform as possible. Judicious superintendence and practical instruction at the creameries during their working season would further that end. All of which is respectfully submitted by

Your obedient servant,

JAS. W. ROBERTSON.