DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

BULLETINS 1 - 20

1905-1907

DAIRY AND COLD STORAGE
COMMISSIONER'S SERIES

In only a small percentage of the above trials could the readings be made with certainty. In the majority of instances the demarkation between the fat and water and curd was so confused that an approximation only could be arrived at.

After the cylinders had been used several times it was found that the soft rubber stoppers were very apt to come out during the whirling in the Babcock, with the result that the determination was lost.

Readings from butter B., showing 13·06 per cent water by gravimetric analysis:—

Tester No. 1. No line of demarkation between water and mixed water and curd, the reading of the column of the aqueous mixture being 18·5 per cent.

NOTE.—If this is considered as all water (see above instructions), and 2 per cent deducted for salt, the corrected reading for water would be 16·5 per cent.

Tester No. 2. Reading of water line. 6
Reading of combined curd and water line 16
16 — 1·0 = 15 — 2 per cent for salt = 13 per cent.

Tester No. 3. Reading of water line. 6
Reading of combined curd and water line. . . . 16
16 — 1·0 = 15 — 2 per cent for salt = 13 per cent.

Tester No. 4. Reading of water line. 6
Reading of combined curd and water line. . . . 16·5
16·5 — 1·05 = 15·45 — 2 per cent for salt = 13·45 per cent.

Several of these readings were mere approximations owing to indistinctness or lack of sharpness between the several layers.

The writer, after considerable experience with this hygrometer, cannot speak in unqualified terms as to its general satisfactoriness. It is quite true that in a number of trials the readings, after calculations, gave data sufficiently near the true water content for all practical purposes, but the uncertainty in obtaining distinct layers which can be readily read off seems to be too great to make the instrument of value in the warehouse or dairy, where it is particularly desirable that the readings should not only be fairly accurate, but also easily and quickly made.

The writer desires to record his thanks to Mr. A. T. Charron, Assistant Chemist, for much valuable help in these investigations.

DEPARTMENT OF AGRICULTURE
DAIRY AND COLD STORAGE COMMISSIONER'S BRANCH
OTTAWA, CANADA

GATHERED CREAM

FOR

BUTTERMAKING

BY J. A. RUDDICK AND GEO. H. BARR.

BULLETIN No. 15
DAIRY AND COLD STORAGE COMMISSIONER'S SERIES

Published by direction of the Hon. SYDNEY A. FISHER, Minister of Agriculture, Ottawa, Ont.

APRIL, 1907

LETTER OF TRANSMITTAL.

To the Honourable
The Minister of Agriculture.

SIR,—I have the honour to submit Bulletin No. 15, Dairy and Cold Storage Commissioner's Series, entitled 'Gathered Cream for Buttermaking.' This Bulletin has not been prepared for the purpose of encouraging the gathered cream system, but rather to give information to those already working under that system. There is room for much improvement in the methods followed in the handling and care of cream intended for buttermaking, and it is in the interests of the whole creamery industry that the gathered cream section should adopt every possible means to secure a uniformly fine quality of butter.

I have the honour to recommend that this bulletin be printed for general distribution.

I have the honour to be, sir,
Your obedient servant,

J. A. RUDDICK,
Commissioner.

GATHERED CREAM

FOR

BUTTERMAKING

BY

J. A. RUDDICK AND GEO. H. BARR.

INTRODUCTION.

The following extract is taken from the report of the Dairy Commissioner for 1906:—

'The introduction of the hand power cream separator into some districts, and the substitution of that system of creamery buttermaking for the central separator system in others, have been viewed with alarm by many who have the best interests of the creamery industry at heart. It is claimed, and not without reason, that the quality of the butter manufactured under the hand separator or gathered cream system has, generally speaking, been inferior in quality to that which is made at whole-milk creameries. It has been particularly noticed that where the central separator system has been abandoned for the other, the flavour of the butter has almost invariably shown more or less deterioration. It is quite natural that this movement, producing as it has, results so menacing to the butter industry, should be opposed and condemned in some quarters. The exporters have been unanimous in denouncing the system and have complained bitterly of the inferiority of some of the gathered cream butter.

'While we agree with the claim that much of the gathered cream butter has so far been inferior, and believe that it is easier to reach a high standard of excellence with the central separator or whole-milk system, we do not agree with the contention that it is impossible to make first-class butter on that system. The common mistake which is made in discussing this question is to blame the system for defects that are due simply to the methods that are employed in carrying it out. If the buttermaker at a whole-milk creamery were to allow all his cream to stand, after separation, for several days without any particular attention as to temperature, acidity or exposure to injurious influences of any kind, does any one suppose he would achieve much success as a maker of fancy butter? And yet that is just what occurs, as a rule, in connection with a hand separator creamery, when the cream is delivered only twice or even three times a week. The proper ripening of the cream is an essential part of the process of making first-class butter. There can be no proper ripening by the buttermaker when the cream

is delivered to him in a sour, tainted and sometimes highly fermented condition. The reasons for cream being delivered in this undesirable condition are obvious. In too many cases the cream is not well cooled, or even not cooled at all, after separation, and being kept for several days at comparatively high temperatures, soon develops the inferior qualities which have been enumerated.

'Here we have a wrong method, rather than an inherent defect in the system. There is no reason why cream from hand separators should not be delivered to the creamery in a sweet, unfermented condition. As a matter of fact, it is easier to properly care for the cream than it is to handle the whole milk. There is less bulk to cool; the vessel in which it is kept can be cleaned as soon as emptied; it is easier to find a suitable place for storage, &c.

'A common practice is to dump the cream belonging to several patrons into a common carrying can before there is an opportunity of its being inspected or examined by some person competent to judge of its condition, or to offer intelligent criticism and advice looking towards improvement. Here again we have a wrong method and not an inseparable defect of a system.

'Unfortunately this hand separator creamery business was started on wrong lines, and the separator agents are largely to blame for it. The separator manufacturer finds more money in selling a number of small machines than he does in selling one large one, and therefore bends his energies in that direction, which means hand separator creameries. Plausible agents have been employed to push the sale of separators and even to organize creameries. In order to promote business, the agents have represented that cream need not be delivered more than once or twice a week, that once a day is often enough to wash the separator, &c. As has been said, these men are plausible,—they are selected for the work on that account; they get close to the milk producer and they have exerted considerable influence, to the detriment of the creamery industry, which it will take some time to overcome.'

The methods followed in the gathered cream system have not received much attention up to the present time. Some dairy leaders have felt that it was unwise to give any assistance to a system which did not receive their approval. There are, however, large territories in Canada where the gathered cream system is the only practicable one, and it seems to be popular in Ontario. It is important even to the separator creameries that the large quantity of butter manufactured on the gathered cream system should be of the highest possible quality.

If the milk producers in some districts, for various economic reasons, consider the gathered cream or hand separator system the better suited to their circumstances and decide to adopt it, they must make up their minds to do one of two things,—either to cool the cream immediately after separating to 55 degrees or under, and keep it cool and sweet until delivered at the creamery, or else be prepared to accept a lower price for their butter than they would otherwise get.

It is admitted by all creamery authorities that finer butter can be made from cream which is sweet when delivered at the creamery, than from cream which is sour and curdled. It is also well known that any taint that may be in the milk or cream will be to some extent carried into the butter. Therefore, the producer will see at once the responsibility resting upon him in securing a fine flavoured butter at the creamery.

In the production of fine flavoured cream, the same precautions must be observed as those which are necessary in furnishing milk to separator creameries or to cheese factories. The following are some of the essential points:—

Feeds that will injure the flavour of the Butter and which should not be fed to Milch Cows.

1. Turnips and turnip tops.
2. Rape or rye.
3. Decayed ensilage.
4. Leaks, onions, or apples in large quantities.

Other causes of taints in Cream.

1. Cows' udders and teats in an unclean condition at milking time.
2. Milking in unclean stables.
3. Using unclean, wooden, galvanized or rusty milking pails.
4. Separating the milk in the stable.
5. Improperly cleaned separators.
6. Keeping the cream in cellars or other places where there are roots or vegetables.
7. Keeping the cream for several days at a temperature over 55 degrees.
8. Cows drinking water from stagnant ponds, or the leakage from barnyards.

Conditions that are Necessary to Produce Fine-flavoured Cream.

Pure Water.—The cows should have at all times an abundant supply of pure water to drink. When cows are compelled to drink the water of swamps, muddy ponds or sluggish streams and ditches, in which there is decaying animal matter, including their own droppings, there is a constant menace to their health, and unless the cows are in good health, they cannot give first-class milk. Moreover, the mud, often full of foul germs, which collects on the legs, flanks and udders of the cows and falls into the milk at the time of milking, is a direct source of infection.

Salt.—When cows have free access to salt at all times, they will keep in better health, will give more milk, and the cream from this milk will have a better flavour, and keep sweet longer, than when they do not get any at all, or receive it only at intervals.

Milking.—Cleanliness in the stable is desirable at all times, but especially at milking time the stable should be clean and free from dust. The udders, teats and flanks of the cows should be well brushed before milking. Only bright, clean, tin pails should be used to milk in. Galvanized pails are difficult to keep clean, and bad flavours have been traced to their use.

Methods of Creaming.

There are three common methods of removing the cream from the milk: (1) the shallow pan, (2) deep setting, and (3) the hand separator. All these methods are used to some extent.

The Shallow Pan.

This method is the oldest of the three and has been pretty generally superseded by the 'deep setting' cans and the hand separator. In fact, many creameries refuse to accept shallow pan cream, and we think they are justified in doing so. Cream from this method is apt to be too thin, by having too much milk incorporated in skimming. The large surface exposed in the pans and the length of time that it stands, result in the cream becoming leathery, and thus difficult to test or even to churn, and also favour the absorption of odours and the infection which comes from dust, &c. The comparatively high temperature of the milk and cream in shallow pans encourages the development of bad flavours. Like all other gravity methods, the shallow pan leaves a large percentage of the fat in the skim milk.

Deep Setting.

The deep setting method is a very decided improvement on the shallow pans. The best results, both as to quality and effective creaming, are secured by putting the milk, as soon as drawn, into cans about 8 inches in diameter and 20 inches deep. (Fig. 1.) The cans are then placed in a tank containing ice water (Figs. 2 and 3) and left for at least twenty-four hours before skimming. The tank will require to be 24 inches deep and large enough to hold as many cans as the herd will fill at two or three milkings. The tank must be water-tight and provided with a three-inch overflow 17 inches from the bottom, and also a plug at the bottom to drain off the water for cleaning. The tank should be fitted with a cover, and the whole protected from the weather. It would be folly to use the deep setting method without ice in this country, where it can be put up so easily and cheaply, but if it is not available for any reason, the next best thing is to have the tank placed near the well, so that all water used for various purposes may be first pumped into the tank, as shown in the illustration, and then allowed to overflow into the stock trough or other receptacle. If ice is used, running water in the tank would only waste the ice.

The ideal arrangement would be to have a special milk room with ice-house attached.

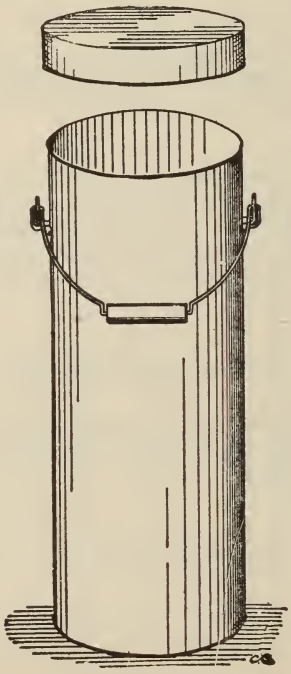

Fig. 1.

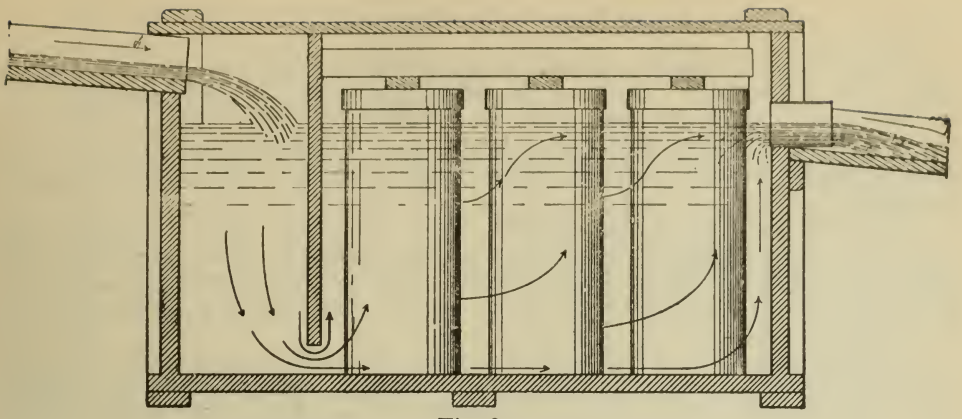

Fig. 2.

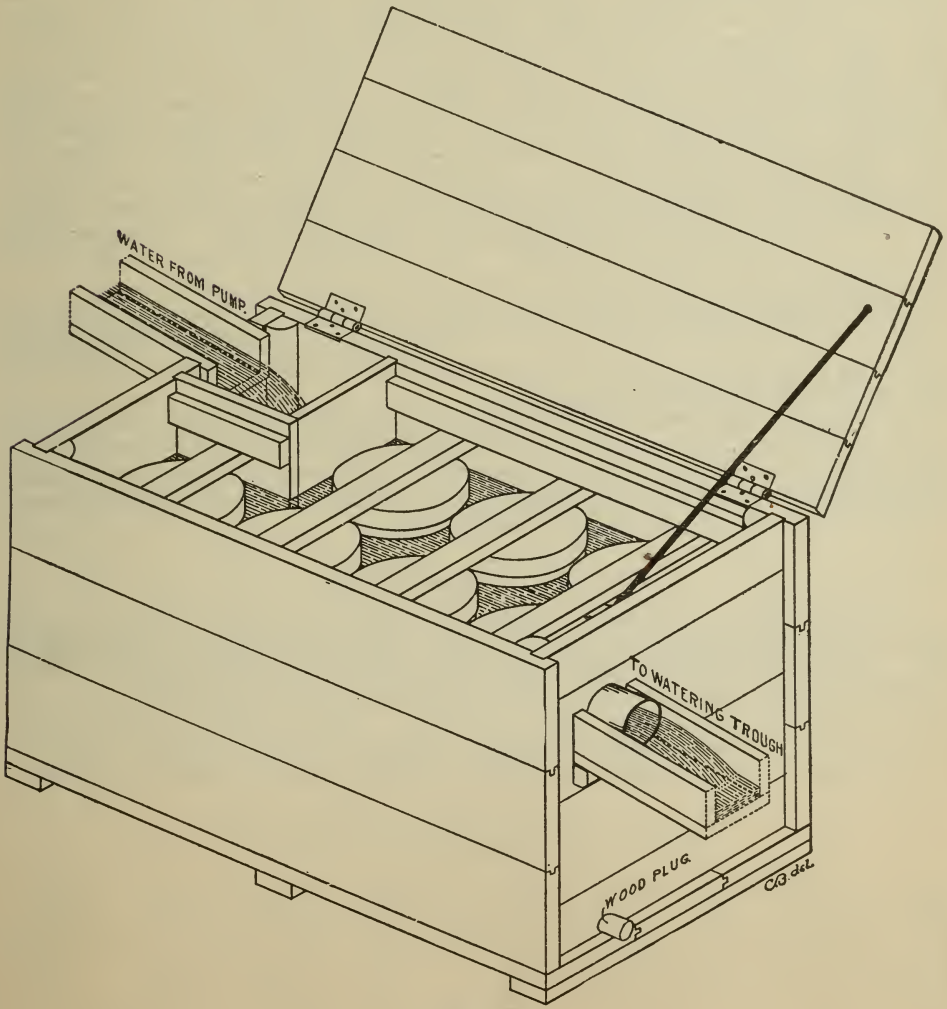

Fig. 3.

The Hand Power Separator.

The hand power cream separator is the most reliable and best method of skimming milk at the farm. Some of the advantages over the other methods are: (1) less loss of fat in the skim milk, (2) a better and more uniform quality of cream, and (3) the skim milk is in the best possible condition for feeding young stock. All the separators on the market will do efficient skimming if properly handled.

Handling and Care of the Separator.—It is important that the separator run smoothly. Any trembling or shaking of the separator while skimming will cause a loss of butter fat in the skim milk. Only special separator oil should be used, and it is well to make a run about once in three weeks, using kerosene oil on all the bearings.

In skimming, three things must be observed: (1) The speed of the separator must be maintained according to the directions sent with it. The only reliable way to do this, is to count the number of revolutions of the crank by the watch. A low speed means loss of fat in the skim milk. (2) The flow of the milk into the separator should be uniform. (3) The temperature of the milk should not be under 90 degrees, and for that reason, the best time to separate the milk is immediately after milking. A low temperature is also liable to cause loss of fat in the skim milk. The faster the milk passes through the separator, the less complete is the separation, and a thinner cream is given. One of the questions often asked by patrons is: Why does my test vary so? When one knows that the speed of the machine, the flow of the milk, and the temperature of the milk all affect the test of the cream, it is not difficult to understand why it may vary considerably. A variation in the test does not necessarily mean any loss to the patron. Every separator has some device for changing the test of the cream. In most cases the adjustment is at the cream outlet. If so, by turning the cream screw in, the cream will be richer, and by turning it out, the cream will be thinner.

All the parts of the separator which come in contact with the milk or cream should be washed in luke warm water, to which has been added a small quantity of sal soda or other cleansing powder, and then thoroughly scalded with boiling water each time the separator is used.

Location of Separator.—In some cases the separators are placed in the cow stables. This may be a convenient arrangement, but it is not by any means a proper place for separating milk, unless a special room, well ventilated and lighted, is partitioned off to exclude the stable odours and dust. This room should have a smooth cement floor, which can be easily cleaned.

The Cream and its Care.

Relation between percentage of Fat and quantity of Cream.—The following table will show the pounds of cream produced for 100 pounds of milk, testing from 3.3 to 4 per cent of fat, the cream testing from 20 to 40 per cent.

Milk.	Fat in Milk.	20% Cream.	25% Cream.	30% Cream.	35% Cream.	40% Cream.
Lbs.	%	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
100	3.3	16.5	13.2	11.	9.43	8.25
100	3.4	17.	13.6	11.33	9.71	8.5
100	3.5	17.5	14.	11.66	10.	8.75
100	3.6	18.	14.4	12.	10.28	9.
100	3.7	18.5	14.8	12.33	10.57	9.25
100	3.8	19.	15.2	12.66	10.85	9.5
100	3.9	19.5	15.6	13.	11.14	9.75
100	4.	20.	16.	13.33	11.43	10.

This table may assist patrons to adjust their separators to skim nearly the kind of cream they wish by weighing the milk and cream. For instance, if the milk tests 3.6 per cent fat and a 30 per cent cream is desired, there should be 12 pounds of cream from 100 pounds of milk.

Advantages of Rich Cream.—Many patrons have the idea that a large amount of cream should give a correspondingly large amount of money, forgetting that it is only the butter fat in the cream, or the butter made from that fat which they get pay for.

For instance, if 100 pounds of 4 per cent milk is separated so as to give a cream testing only 20 per cent of fat, there will be 20 pounds of cream containing 4 pounds of fat and 16 pounds would be left as buttermilk after churning. If the same quantity of 4 per cent milk is separated so as to yield cream testing 30 per cent of fat, there would only be 13.33 pounds of cream, making 6.67 pounds less to haul to the creamery and that much more skim milk retained on the farm, and the same money for the patron at the creamery in either case. The above figures do not allow for the slight loss of fat that would occur in skimming. Then there is the further advantage that rich cream will keep sweet very much longer than thin cream will, other conditions being equal.

The patron who supplies sweet cream will most likely get a better 'test' than if he allows the cream to become sour. Nearly all the creameries using the Babcock tester measure the sample for the test, taking 18 cubic centimeters. Sour cream contains gases, produced by fermentation, which decrease the weight of a given quantity of cream. That is to say, 18 c.c. of *sweet* cream will really contain more fat than 18 c.c. of the same cream after it has become sour, and will, therefore, give a higher test. The same thing will apply to a sample taken for the oil test, when the sampling tube is filled to a certain mark.

Cooling the Cream.—This point is of the greatest importance and is probably the most neglected part of all the work in connection with the producing of cream on the farm intended for creameries.

There is a tendency to assume that there is no need of cooling the cream, and for that reason, there is often a poorer quality of cream sent from farms where separators are used than from farms where deep setting is practised. Why? Because the cream from deep setting is cool when skimmed—probably about 50 or 55 degrees; it does not require much cooling to keep it sweet afterwards, while the temperature of the cream from the separator will be about 85 or 90 degrees, and it will spoil very quickly if left at that temperature.

Begin the cooling of the cream immediately after separating is finished. To do this effectually, ice should be stored for summer use. We recommend the use of a tank similar to the one shown in Figs. 2 and 3, in which the cans containing the cream may be placed. The best vessel for holding cream is a plain 'shotgun can,' about eight inches in diameter and twenty inches deep. (See Fig. 1.) These cans should be smooth on the inside and well soldered, with no taps or channels in the bottom. Such a can will hold about 3½ gallons of cream.

Proper cooling of the cream at the farm will improve the quality of gathered cream butter more than anything else that can be done with that end in view.

The Creamery Owner's Responsibility.

While asking the patrons to make improvement in their methods, we do not wish to relieve the creamery owners and managers of their responsibilities to the patrons. They must see to it that the equipment of the creamery is such that the cream supplied is handled in the most efficient manner; that the testing is done accurately and honestly, and that the creamery is a model of cleanliness and a standing object lesson for the patrons.

These conditions cannot be secured or maintained unless there is a reasonable price paid for manufacturing. Modern creamery equipment is expensive, and it is an unwise policy on the part of the producers of cream to insist on such low prices for manufacturing that the creamerymen cannot afford to equip the creamery with modern appliances or to collect the cream at least four times a week. Cheap creamery equipment and cheap buttermakers may be very expensive in the end to cream producers. Both creamerymen and patrons should remember that a reputation for finest goods will ensure the highest current price and often a premium in addition. This enviable position can only be reached by every one doing his or her best and by having the closest co-operation and harmony in all the work relating to the creamery and the farm.

Summary of Important Notes.

For the Patron.

1. It pays to make cows comfortable at all times.
2. It pays to treat cows with invariable kindness. They should never be driven fast or worried by dogs.
3. Pure water should be provided for the cows, and they should be prohibited from drinking stagnant, impure water.
4. A box or trough containing salt, to which the cows have free access, should always be provided.
5. Care must be taken to avoid feeds that will taint the milk.
6. The udders and flanks of the cows should always be washed or brushed clean before milking is commenced.
7. Milk from a freshly calved cow should not be skimmed until after the eighth milking.
8. Only cream from cows in good health should be sent to the creamery.
9. Tin pails only should be used.
10. Cream should be cooled as quickly as possible to 55 degrees and kept at that temperature or lower.
11. Warm cream should never be mixed with cream already cooled.
12. All vessels, *including separator bowl*, used in the handling of milk or cream, should be thoroughly cleaned immediately after they are used by washing in luke warm water and then thoroughly scalding with boiling water. A brush is preferable to a cloth for washing tinware.

For Creamery Owners.

1. Provide for cooling the cream quickly when delivered at the creamery.
2. Provide an abundant supply of good, pure water for the purpose of the creamery.
3. Provide cold storage that will keep the butter under 40 degrees.
4. Support your buttermaker in dealing firmly with patrons who send cream which is not in good condition.

For the Buttermaker.

1. Attend personally, as far as possible, to the taking in, sampling and testing of the cream.
2. Keep your creamery clean, bright and tidy. Also yourself and assistants.
3. Be satisfied with only the finest quality of butter, the cleanest and the most attractive surroundings.

Copies of this Bulletin may be obtained free for each patron of a creamery, by application to the Dairy and Cold Storage Commissioner, Ottawa.

LIST OF PUBLICATIONS

OF THE

DAIRY AND COLD STORAGE COMMISSIONER'S BRANCH.

Date Issued.	No.	Title.
1905	1	List of some British Importers of Farm Products.
1905	*2	Milk for Cheese Factories.
1905	*3	Milk for Creameries.
1905	4	Some Phases of Dairying in Denmark.
1905	5	Improvement of Dairy Herds.
1905	6	Chemical Investigations Relating to Dairying in 1904.
1905	7	List of Exporters of Some Canadian Products.
1906	8	Some of the Factors that Control the Water Content of Butter.
1906	9	Instructions for Testing Individual Cows, &c.
1906	10	Creamery Cold Storage.
1906	11	General Instructions *re* Fruit Marks Act as Amended, 1902 and 1906.
1906	12	Cow Testing Associations, with Notes on the Sampling and Testing of Milk.
1907	13	Sweet-Cream Butter.
1907	14	Apparatus for the Determination of Water and Fat in Butter.
1903		Notes for Cheesemakers.
1905		Report of the Dairy Division, 1904.
1905		Report of Extension of Markets Division, 1904.
1905		Evidence of J. A. Ruddick, before Committee on Agriculture and Colonization, 1905.
1905		Evidence of A. McNeill, before Committee on Agriculture and Colonization, 1905.
1906		Evidence of J. A. Ruddick, before Committee on Agriculture and Colonization, 1906.
1906		Proceedings of the Second Conference of Fruit Growers of the Dominion of Canada.
1906		Report of the Dairy Commissioner, January, 1905, to March, 1906.

Any of these publications will be sent free of charge on application to the Dairy and Cold Storage Commissioner, Ottawa, Ont.

* A sufficient number of bulletins No. 2 and 3 will be sent to the manager of any cheese factory or creamery, to supply one to each patron.