CIHM
Microfiche
Series
(Monographs)

ICMH
Collection de
microfiches
(monographies)

Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

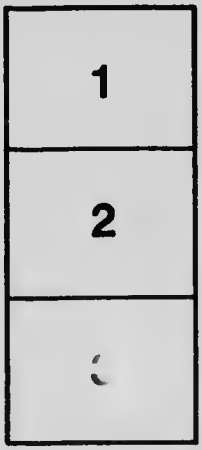
- ☐ Coloured covers / Couverture de couleur
- ☐ Covers damaged / Couverture endommagée
- ☐ Covers restored and/or laminated / Couverture restaurée et/ou pelliculée
- ☐ Cover title missing / Le titre de couverture manque
- ☐ Coloured maps / Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black) / Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations / Planches et/ou illustrations en couleur
- ☑ Bound with other material / Relié avec d'autres documents
- ☐ Only edition available / Seule édition disponible
- ☑ Tight binding may cause shadows or distortion along interior margin / La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure.
- ☐ Blank leaves added during restorations may appear within the text. Whenever possible, these have been omitted from filming / Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- ☐ Additional comments / Commentaires supplémentaires:

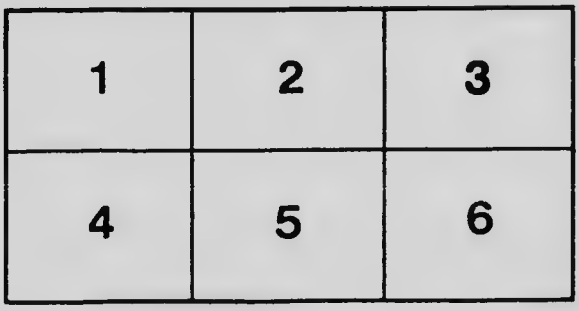
L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☐ Coloured pages / Pages de couleur
- ☐ Pages damaged / Pages endommagées
- ☐ Pages restored and/or laminated / Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed / Pages décolorées, tachetées ou piquées
- ☐ Pages detached / Pages détachées
- ☑ Showthrough / Transparence
- ☐ Quality of print varies / Qualité inégale de l'impression
- ☐ Includes supplementary material / Comprend du matériel supplémentaire
- ☐ Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image / Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.
- ☐ Opposing pages with varying colouration or discolourations are filmed twice to ensure the best possible image / Les pages s'opposant ayant des colorations variables ou des décolorations sont filmées deux fois afin d'obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below / Ce document est filmé au taux de réduction indiqué ci-dessous.

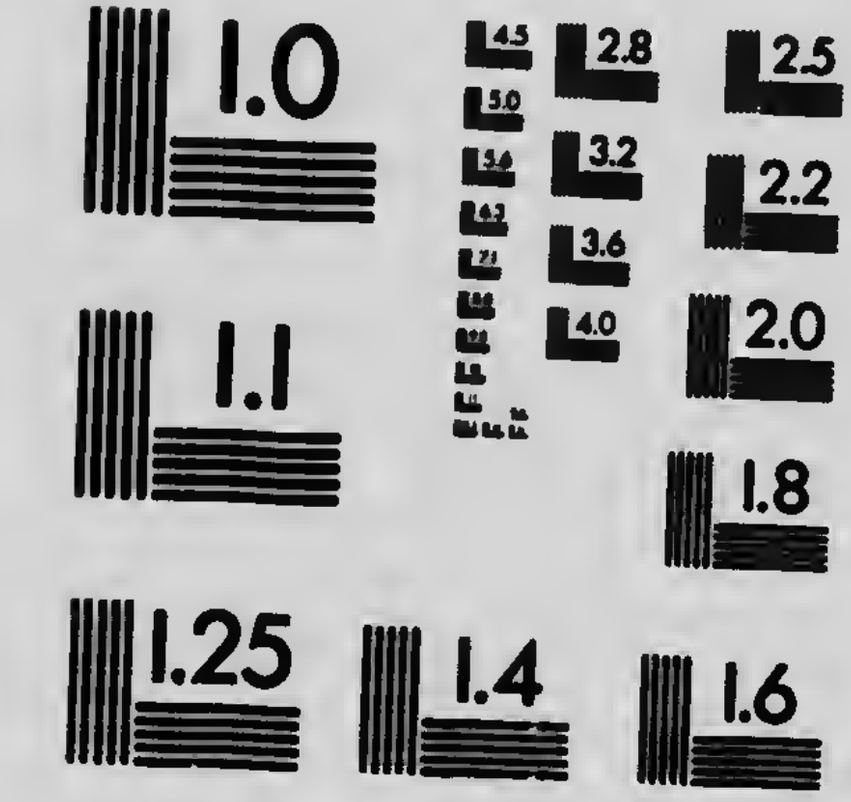
10x	12x	14x	16x	18x	20x	22x	24x	26x	28x	30x	32x
						✓					





MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc

1653 East Main Street
Rochester, New York 14609 USA
(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

Bulletin 135.

May 1904 Mc

Ontario Agricultural College and Experimental Farm

THE CREAM-GATHERING CREAMERY.

By H. H. Dean, B.S.A., Professor of Dairy Husbandry, and J. A. McFeeters, Instructor in Dairy School, O.A.C.

The manufacture of butter on the farms of Ontario is carried on in many cases under discouraging circumstances. Labor is becoming more difficult to secure each year, and especially the kind of labor required to make good butter. Not only is the labor problem a serious one, but the fact that many farms lack suitable utensils and a suitable place in which to set the milk and make butter, causes a very inferior quality to be produced. Then, again, this butter is often "traded out" for dry goods and groceries, where no discrimination in price is made between good and bad butter. This system does not encourage the good buttermaker, but places a premium on carelessness and inferior butter. In a discriminating market the difference in price between inferior dairy butter and the best creamery butter is from five to ten cents per pound. The difference is sufficient to pay the cost of manufacturing at the creamery, and leave a good margin of profit to the farmer. Besides this, the work on the farm is lessened very much by having the butter made in a creamery. If the persons producing "ten-cent butter" were able to produce it so cheaply that they make a profit at this price, the situation would not be so bad. However, when we consider that the average food-cost of one pound of butter is probably about ten cents, the profit on such butter is very small, if, indeed, it is not produced at a loss. Not only does the farmer lose money through inferior dairy buttter, but the merchant, the dealer, and the reputation of Canadian butter, all sustain a loss. The remedy for this in the majority of cases, is the adoption of the creamery or co-operative plan of buttermaking.

Cream-gathering and Whole Milk Creameries.

Many districts, owing to the small cow population scattered over a considerable extent of territory, are unsuitable for delivering the whole milk at the creamery. The cost of hauling the milk from the farm to the creamery and the skim-milk back to the farm is altogether too great, hence the plan of creaming the milk on the farm, by setting it in cans or pans, or by means of a cream separator, and sending only the cream to the creamery, is being more generally adopted. While the average quality of the butter is not so good under this system, the advantages outweigh the disadvantages in many cases. The cream-gathering creamery is a great improvement over the plan of making butter under the conditions which prevail on the average farm. There are farm dairies which turn out a quality of butter equal to the best creamery, but they are the exception rather than the rule.

The Cows.

The dairyman satisfied with anything short of the best cows obtainable may not be considered progressive. If the best native or grade cows

are used for foundation stock, the herd may be very much improved by raising the heifer calves from these cows, if sired by pure-bred males belonging to one of the dairy breeds. These heifers should be reared on new milk for about three weeks, then be gradually changed to warm, sweet skim-milk. In addition, they should be fed some ground oats and bran mixed in equal parts, green feed in summer, and clover hay and roots in winter. They should be kept in a thrifty, growing condition, but not too fat. They should freshen when about two and one-half years old, and again twelve to fifteen months later. At the end of the second lactation period all heifers which do not give at least 6,000 pounds of milk, or make 250 pounds of butter, should be disposed of, unless in special cases, when a third trial may seem to be advisable.

To find the individual production of the cows, it is necessary to weigh the milk from each cow at stated intervals throughout the year, and also to take samples for testing with the Babcock test, in order to determine the fat in the milk. The pounds of milk given in any period of time multiplied by the percentage of fat in the milk, plus one-sixth, is approximately the butter produced.

For example, if a cow produced 30 pounds of milk daily on three consecutive days in the month of April, the pounds of milk produced for the month would be about 900. If this tested 3.5 per cent. fat., the pounds of milk fat would be 900 x 3.5, divided by 100 equals 31.5 pounds fat; 31.5 plus 1-6 equals 36.75 pounds of butter for the month. The sums of the individual monthly milk and butter production would be the approximate amount of milk and butter produced by each cow during the year.

Feeding the Cows.

Where cows have plenty of good grass and are in good condition, no other feed is necessary. Where the pastures are short hay should receive green peas and oats, green clover, corn or mangels, ... preferable. considering the cost and convenience, a small silo sh... ...ed with good corn for summer feeding. This silo should not ha... ...an three or four square feet of surface for each cow to be fed. twenty pounds of corn silage and two to four pounds of bran or chopped oats will maintain the milk flow during a period of short pasture.

For winter feeding, a daily ration of corn silage (35 pounds), clover hay (8 to 10 pounds), mangels (20 to 30 pounds), bran (4 pounds), oats (3 pounds). and oil cake (1 to 2 pounds), will produce a satisfactory and economical flow of milk with good cows. If possible, the hay should be cut, the mangels pulped, and both mixed with the corn silage from six to twelve hours before feeding. The meal should be fed according to the milk flow, using about 8 pounds of the mixture for each 30 pounds (3 gallons) of milk produced, or for each pound of butter in the milk. The careful feeder will soon learn the capacity of each cow for economical milk and butter production.

Care and Management of Cows.

All cows should be treated kindly. This is especially necessary with the young cow. Vicious cows are usually the result of bad handling and harsh treatment. Cows should also be kept in clean stables, which are well ventilated, light, convenient and sanitary. While in the fields, and where possible in the stables, they should have access to plenty of pure water and clean salt.

The cows when inside should be kept clean. This can be done by having the stalls of proper length with a drop behind the cows, and by using the currycomb and brush frequently on the cows. If the hair on the hindquarters and tail is clipped in the fall, it is much easier to prevent dirt sticking to them.

Milking should be done regularly, with clean, dry hands. The milk pails should be clean and of uniform weight for weighing the milk. Immediately after milking the milk should be strained through a fine wire strainer and two to four thicknesses of cheesecloth. The milk should then be set or separated as soon as possible.

Creaming the Milk.

There are three common methods of getting the cream from milk—shallow pans, deep cans and the modern cream centrifuge or separator.

Shallow Pans. Cream from small, shallow pans is frequently not suitable for sending to the creamery in hot weather, because it is usually sour when removed from the milk or shortly after. If the patron has a clean, cool cellar, free from bad flavors, dust and draughts, where the temperature does not go above 60 degrees at any time, the cream from milk set in small pans may be in fairly good condition. Such cream should be removed from the pans about twenty-four or thirty-six hours after setting, and while the milk is still sweet. The cream should be taken off carefully by first separating the cream from the edge of the pan with a thin-bladed knife. Then wet the edge of the pan with some of the milk, when the cream may be carefully run into a cream can, removing as little of the skim-milk as possible. Perforated skimmers should not be used, as they are wasteful of the fat. The pans, after skimming, should be emptied at once, be rinsed with cold water, then washed with hot water, and afterwards scalded and put out in the air and sunshine. Pressed tin pans without seams, or graniteware, should be used.

Deep Setting. The best method of obtaining cream by gravity is by setting the milk in cans which are about eight inches in diameter and twenty inches deep. These cans of milk may be set in a stream or box of running cold water or in ice water. The temperature of the water should be from forty to forty-five degrees F. A very good rule is to have some ice in the tank all the time. The milk should be put into the cans as soon as possible after milking, then set in the cold water, with the covers on the cans. The water should be as high as the milk in the cans, or the cans may be put under the water, if made for that purpose. At the end of twelve or twenty

hours the cream may be taken off by means of a cone-shaped dipper from the top, or the skim-milk may be removed from below the cream through a suitable tap. It is necessary to have a glass in the side of the can near the tap, so that the operator can tell when the skim-milk is all removed. Cans which are skimmed from the bottom should be either cone-shaped or slanting on the bottom, so as to remove any sediment there may be with the first-drawn skim-milk, and also in order to assist in removing all the skim-milk from under the cream. The skim-milk next to the cream line may contain an extra amount of fat but as a rule it should be drawn quite closely to prevent the cream being too thin.

Some cans are stationary in the creamer box. This plan saves the labor of lifting the cans in and out of the water, but they are more difficult to clean, and more liable to rust and leak when so fixed.

The cans should be treated similarly to the pans when washing them—empty at once, rinse with cold water, then wash with hot water, scald and put outside. Where a double set of cans are available, it will pay to allow the cans to set twenty-four hours, otherwise they must be skimmed and washed twice a day.

The cream should be kept in cold water until it is called for by the driver, which should be daily in hot weather, and not less than three times a week at any time. It is very important that the cream be kept sweet until it is delivered at the creamery. The patrons can assist in this matter by keeping the cream cold. All the cream on hand should be given to the driver. The plan of holding some of the cream back in order to get a higher test is not advisable, as it tends to spoil the quality of the butter, and is of no advantage to the patron, but rather a disadvantage, when the Babcock test is used.

The Cream Separator. For those patrons who have six or more good cows a hand separator is a great help. If some power is available, such as steam, electric or tread, it reduces the labor and expense to have the separator run by power other than hand. However, these machines are now made so that hand power is practicable. There is no best separator. No one machine has all the good points, and no one is free from all defects. There is, also, in many cases, as much difference between machines of the same make as between those from different manufacturers. The best cream separator is the one which can cream the most milk in a given time, leaving not over five-one-hundredths of one per cent. fat in the skimmilk, and giving a cream testing not less than twenty-five per cent. fat, and at the same time can be purchased at a reasonable price, with a guarantee from the manufacturer that it will do the work claimed for it, or the machine is to be removed without cost to the purchaser.

The most convenient place for a separator is in a room connected with the stable. The whole milk is then convenient for separating and the skimmilk for feeding. This room, however, as well as the machine should be kept clean. This involves carrying hot water from the house for cleaning, and frequently this is neglected, and the room and the machine are often found in anything but a cleanly condition.

If extra help or mechanical power are available, the separator may be started soon after milking commences, so that the cream and skim-milk are separated shortly after the milking is done. Where this is not practicable, the separating should take place as soon as possible after milking. The bowl of the separator should be wet and warmed by pouring in a quart or two of hot water before allowing any milk to enter. This prevents the cream sticking to the bowl, and allows of a more complete separation. The speed should be as uniform as possible, at the rate recommended by the manufacturer. A little above this speed, five or six turns to the minute, will do no harm. The supply can should, as far as possible, be maintained nearly full of milk. After all the milk is out of the supply can, a quart of warm water may be added to the bowl to flush out the cream. The bowl should then be allowed to stop of its own accord, then be washed. The slime on the inside of the bowl should be burnt. After washing and scalding, the parts should be exposed to the air in a clean place. The skim-milk tubes and all parts not easily cleaned with a brush should receive special attention at the hands of the person responsible for washing. Sometimes bad flavors and sour cream result from improperly washed machines. It is needless to say that the machine should be thoroughly washed after each time of using. Merely rinsing with cold water and washing once a day or once a week is not sufficient.

Immediately after separating the cream should be set in cold water and stirred until it reaches a temperature of about 50 degrees. Fresh cream should not be added to cream from previous separations until it has been cooled down to below 60 degrees. Warm, fresh cream added to the older cream causes unpleasant fermentations, which give the cream a bad flavor.

Rich Cream Advisable.

Not more than ten or twelve per cent. of the whole milk should be taken in the form of cream. Where scales are convenient, it would be well for those using the hand separators to weigh the milk and cream occasionally in order to see how much cream is being taken. Where there are no scales, the cream should be measured. From ten gallons of milk not more than one to one and a quarter gallons of cream should be taken. Using too much water or skim-milk to flush out the bowl will cause a thin cream.

The advantages of rich cream are :

1. The patron has more skim-milk for feeding stock.
2. It costs less for hauling the cream to the creamery.
3. Less labor and expense are required in cooling the cream at home and factory.
4. Less vat and churn room are needed for a given amount of butter.
5. There is less danger of the cream becoming too sour.
6. There is less loss of fat in the buttermilk by churning rich cream, and the quality of the butter is better because it can be churned at a lower temperature than can poor cream, or cream containing a low percentage of fat. The cream at the farm should not test less than twenty-five per cent. fat from the hand separator.

Wooden stirrers should not be used for stirring cream in the can. These are difficult to keep clean, and often impart a bad flavor to the cream. The stirrer should be made of tin, with few seams, and all crevices should be filled with solder.

The patron's cream can should be rinsed with very little water when it is emptied into the driver's pail, as this dilutes the cream. It is preferable to remove the cream adhering to the sides of the can with some sort of a scraper, but this must be kept clean.

Delivery of Cream.

The importance of making frequent collections of cream is a matter too often underestimated by creamery managers. The facilities at the command of the average patron for keeping milk or cream in a clean, sweet condition are very limited, and it is very seldom that cream left in the hands of patrons for more than three days will prove to be of fine quality. It is quite safe to say that, other conditions being equal, the more frequent the collections of cream, the better will be the quality of butter produced.

On the other hand, the cost of collecting, which is one of the largest items in the cost of manufacture, has to be considered. The greater the amount of cream obtainable in a given area, the lower will be the cost per pound of butter for collecting.

While seeking to practice economy on one hand, quality of butter should not be lost sight of on the other. It is, or should be, quality which determines the commercial value of dairy products.

A district or route which will not furnish sufficient cream to warrant making at least three collections per week during the summer months will scarcely be profitable.

At times we find some drivers adopting the practice of omitting to call on patrons supplying small amounts of cream, and especially those located at outlying points. The fact should not be lost sight of that the addition of a few small lots of cream that have developed a high acidity or an objectionable flavor, from a pantry or cellar, may materially lower the grade of the butter manufactured from the entire load.

A really choice quality of cream will scarcely be obtained unless there are from four to six collections made each week.

Means of Delivery.

Oblong or oval tanks have proved very satisfactory for the use of cream collectors. The sides, top and bottom, should be well insulated, and the edges of the lids inlaid with cork in order to make a close joint. The inner lining should be of heavy tin (22 or 24 gauge), with as few seams as possible. Long, oblong tanks require some support for the sides, and should have two square "wings" or partitions, extending from the top to within one or two inches of the bottom. These "wings" prevent, to some extent, the swaying and splashing of the cream from one end of the tank to the other while en route to the creamery. The oval-shaped tanks, however, do not seem to require any special "splash-wings."

In placing an order for new tanks, such specifications of outlets or "taps" should be given as would best serve the requirements of the particular location of the factory. For instance, if the receiving door or window were accessible from one direction only, then it would be necessary to have the outlet of the tank on the side or end next the creamery. A tap or other outlet placed in one corner of a tank affords the best possible means of draining, as the platform or driveway may be levelled so as to throw the rear waggon wheel lower than the rest, thus causing the tank to drain readily.

As a creamery inch contains about 113 cubic inches, the capacity in inches may be estimated by dividing the number of cubic inches by 113. The capacity in pounds may be obtained by dividing the number of cubic inches by 27.5848—the number of cubic inches in one pound of cream.

Insulated or jacketed cans, holding from 30 to 35 creamery inches, are preferable in some ways to tanks. Where these are used a buttermaker is sometimes able to "grade" the cream when receiving it at the factory. If the contents of one can is found to be sour, curdy or "off" in flavor, a maker may locate the source of trouble with much less difficulty than when tanks are used. On the other hand, however, well constructed tanks give better protection to the cream during transit. At creameries where both tanks and cans are in use, the temperature of the cream received from the tanks during warm weather is frequently six degrees lower than that delivered in cans.

The ideal system of delivery would find its nearest approach in the use of separate cans for each patron. The measuring or weighing and sampling would then justly fall to the buttermaker, who would then be brought in close touch with the cream produced by each patron. This plan also enables the manager, if he wishes to do so, to grade the cream, and pay for it according to whether it is first or second class.

When cream collectors are provided with a means of straining each lot of cream, a patron's attention may be drawn to any curd or other matter found in the cream.

Waggons or other vehicles used by cream collectors should be equipped with suitable springs, in order to avoid, so far as possible, agitating the cream sufficiently to cause a partial churning. An undue loss of fat in the buttermilk and butter with a weak, greasy body or grain, will be the probable result of allowing the churning process to commence while the cream is on the waggons. A light canvas top or covering for the waggons makes a good protection from the sun.

The Collector. The value and importance of a competent, reliable cream collector is too often underestimated by the factory management. In the first place it is necessary that he be strictly honest in his weighing or measuring and sampling. Secondly, he should be so well informed along general dairy lines, and possess such keen sense of taste and smell that the slightest "off" or objectionable flavor would be detected, and a probable remedy for the defect given in a quiet, pleasant, tactful manner. Thirdly, he should be neat and clean.

Cream Testing.

Cream varies in richness much more widely than does milk. The yield of butter per 100 pounds of cream sometimes goes as low as 12 or 15 pounds, and as high as 45 or 50 pounds.

When operating a hand separator the richness of cream produced may be caused to vary from day to day by a variation in one or more of the following conditions :

1. Speed of Separator. A high speed produces a richer cream than a lower speed.

2. Temperature of the milk at time of separating.

3. The feed of milk to the separator. The faster the milk is allowed to enter the bowl of the separator the lower will the cream test.

4. The amount of liquid used to flush the bowl. The same amount should be used each time.

5. The percentage of fat in the whole milk.

The most accurate method of determining the richness of cream is by means of the Babcock test, which is becoming quite generally adopted by many progressive creamery managers.

The system may be briefly outlined as follows : The collectors are provided with suitable bottles to enable them to take a sample of the cream supplied by each patron. It is well to have the sampling done on some particular basis. The size of sample taken should be proportionate to the weight of cream supplied, say, a fluid ounce for every 30 or 40 pounds cream. Upon arrival at the creamery these small samples should be examined for flavor and acidity, and then be transferred to composite sample jars, to which a small amount of preservative has been added. In this way the samples received during a month may be so thoroughly mixed together that a Babcock test made at the end of the month will give the average fat content of the cream supplied by a patron during that period.

As the Babcock test is based on weight, it is necessary to either weigh the cream or estimate the weight from the number of creamery inches. According to experiments conducted at the Ontario Agricultural College, an inch of average cream in a pail 12 inches in diameter will weigh 4.1 pounds. Thus, if it were found more convenient to measure the cream than to weigh it, the weight could be determined by multiplying the number of inches by 4.1. The number of pounds of cream furnished by a patron during a month, multiplied by the test, or the per cent. fat, and divided by 100 will give the number of pounds of fat which the cream contained.

Requirements.

1. A Babcock tester. A 24-bottle steam turbine tester is the most satisfactory.

2. A double set of cream bottles (4 dozen), a portion graduated to read 30 per cent. and a portion 40 per cent.

3. An 18 c.c. pipette. A pipette graduated to 17.6 c.c. for milk, and 18 c.c. for cream is a convenience. The careful use of a sensitive scale which will weigh grams insures greater accuracy than measuring.

4. A supply of commercial sulphuric acid, which costs about 65 cents per gallon, or about 1-4 cent per test, and suitable acid measures.

5. A wooden case or rack that will hold 24 cream bottles. It is well to have a separate space or opening for each bottle.

6. Sufficient pint or half-pint milk bottles to furnish a composite sample jar for each patron.

7. Gummed labels bearing the patron's name, or number, should be pasted on the necks of the jars and coated with white shellac. This will prevent the labels being washed off.

8. The sample jars should have sound corks. Turned wooden corks are very satisfactory.

9. A supply of preservative in the form of tablets or powders, consisting of 7 parts of potassium bichromate to one part of corrosive sublimate.

10. Dividers or compasses to measure the fat column.

NOTES.

1. The quantity of preservative required for each sample jar is about what will lie on a ten-cent piece. This should be placed in the composite jar before the addition of any cream.

2. The addition of each subsequent sample of cream should be followed by a rotary motion to thoroughly unite the fresh sample with the preservative.

3. Sample jars should be kept well corked, and preferably in a cool place.

A detailed outline of the Babcock test may be found in Bulletin 114 from the Ontario Agricultural College.

OIL TESTS.

The value of cream for butter making may be approximately estimated by means of the oil test, which is simply a churning process. The outlines of this method of testing are generally known, and call for only a passing reference.

The readiness with which a separation of the oil is effected from the serum is governed very largely by the degree of acid developed in the samples before the commencement of the churning process. This being true, it necessarily follows that ripe or sour samples of cream will give a higher or more satisfactory test than samples of fresh, sweet cream; thus, the oil test may be said to place a premium on sour cream.

As the Babcock test is rapidly displacing the oil test in cream-gathering creameries, it may be well to become familiar with the relation between the readings of the two tests.

Viewing this relation from the theory of the Oil Test, we have somewhat as follows: A standard creamery inch is one inch of cream (in a pail 12 inches in diameter) testing 100. One inch, therefore, contains $\left(\frac{12}{2}\right)^2 \times 3.1416 \times 1$ equal to 113 cubic inches. One pound of butter contains about 25 cubic inches of butter oil, which is 22 per cent. of 113. Therefore, any sample of cream which will yield 22 per cent of its volume in butter oil should read 100 and make a pound of butter per inch. A reading of 100 by the oil test would, therefore, theoretically, be equal to 22 per cent of fat.

As viewed from the fat or Babcock test, we have the following: The overrun in cream-gathering creameries will probably range from 15 to 18 per cent. Then 100 pounds fat would yield 116.5 pounds butter.

One pound butter would require 100-116.5 pounds fat.

One inch of cream weighs 4.1 pounds.

Therefore, in order to yield one pound butter per inch :

4.1 lbs. cream must contain $\frac{100}{116.5}$ lbs. fat.

1 lb. cream must contain $\frac{100}{116.5} \times \frac{1}{4.1}$ lbs. fat.

100 lbs. cream must contain $\frac{100}{116.5} \times \frac{1}{4.1} \times 100$, equal to 20.98 lbs. fat. Or practically 21 per cent. fat.

According to experiments conducted at the Ontario Agricultural College Dairy School, the actual percentage of fat in cream yielding one pound of butter per inch is 21.1 per cent.

More attention should be given to the dimensions of the drivers' pails, which have been found to vary from 11 1-2 to 13 inches in diameter. The bottom and the sides should be free from bulges. Weighing the cream insures greater accuracy than measuring. A single beam with a sliding poise, such as butchers use on delivery waggons, answers well.

The relation between the value of a pound of fat and a pound of butter may be found to vary somewhat according to the percentage of overrun obtained.

With an average overrun of 16.5 per cent. and butter worth 17 cents per pound, the value of a pound of fat may be estimated as follows :

A 16.5 per cent overrun would prove 100 lbs. fat to yield 116.5 lbs. butter.

116.5 lbs. butter at 17 cents equals $19.805, then 100 lbs. fat must be worth $19.80 ; therefore, 1 lb. fat must be worth $\frac{19.80}{100}$ equal to 19.8 cents.

If fat were worth 17 cents per lb., the value of 1 lb. butter would be estimated as follows :

100 lbs. fat at 17 cents, $17.00 ; 100 lbs. fat will yield 116.5 lbs. butter : therefore, 116.5 lbs. butter are worth $17.00, then 1 lb. butter is worth $\frac{17.00}{116.5}$ equal to 14.58 cents.

Assuming the average overrun in cream-gathering creameries to be 16.5 per cent., the following relation will be found betwen the price of fat to the patron, and the price of butter according to the actual yield (not necessarily according to the oil test) :

Value of 1 lb. butter.	Value of 1 lb. fat.	Value of 1 lb. fat.	Value of 1 lb. butter.
cents.	cents.	cents.	cents.
15	17.47	15	12.87
16	18.64	16	13.73
17	19.81	17	14.59
18	20.98	18	15.45
19	22.15	19	16.31
20	23.32	20	17.17
		21	18.02
		22	18.87
		23	19.73

Pasteurizatign.

The quality of butter produced by cream-gathering creameries would be improved by the adoption of pasteurization. This treatment, however, has proved relatively more beneficial to sweet cream than to cream which has been allowed to ripen. The pasteurization of ripe cream may be considered to be yet in an experimental stage.

The chief advantages of pasteurization are :

1. A butter of mild flavor may be produced, and food flavors largely overcome.

2. Better keeping qualities may be imparted to the butter.

3. Greater uniformity obtained in the product.

The following disadvantages are found :

1. An increase in the cost of manufacture, which may be accounted for in the cost of the outfit, labor involved and the expense of fuel.

2. The absolute necesssity for good facilities for cooling. Where either water or ice is scarce, this adds considerable to the cost of manufacture. A pasteurizing plant is not complete without an effective continuous cooler.

The addition of from 10 to 20 per cent. of good culture will improve the butter made from pasteurized cream. As this increases the volume of cream for churning, it is well to have the fat content of the cream intended for pasteurization not lower than 30 per cent.

Churning.

The fat content of gathered cream is usually so low that a high churning temperature is necessary. This tends to cause an undue loss of fat in the buttermilk, as well as soft butter, which is likely to retain a high percentage of caseous matter and moisture.

Other conditions causing a loss in churning are : Making a churning from lots of cream which differ in temperature and degree of acidity, and also filling the churn too full.

The buttermilk should be allowed to drain well from the churn. It is well to add a pail or two of brine at this stage. Churns should be levelled to allow a free outlet.

Wash with water at a temperature which will give the butter the proper consistency for working and expelling the surplus moisture. It is well to give butter intended for export two washings.

Salting. Salt which has been sifted and is free from foreign flavor should be used in the proper proportion to meet the requirements of the markets. Care should be taken to distribute it uniformly.

Sometimes a preservative in the form of boracic acid in the proportion of one-half per cent. is used to improve the keeping quality of saltless butter.

Working. A more uniform distribution of the salt may be obtained by giving the churn a few revolutions before placing the rollers in motion. If, after partial working, the butter can be allowed to drain a short time without undue exposure, the more complete will the process be.

Packing. Butter intended for the export trade should be solidly packed in clean, tight packages, which have been well coated with paraffine, and lined with heavy parchment paper. If soaked several hours in a strong brine, to which formalin has been added there will be little tendency to mould. Care is necessary to insure a smooth finish without causing a greasy appearance on the surface. The paper ends, if kept moist, may be neatly and closely folded over the top of the package, so as to form a seal, thus excluding the air.

The length of time during which butter will retain its fine aroma depends very largely on the temperature of the storage in which it is held. A temperature not higher than 28 or 30 degrees F. should be maintained when butter is being held for two weeks.

A cold storage requires close attention in order to keep it clean and dry, and to insure a uniformly low temperature. The extreme variations in temperature may be readily noted if a self-registering maximum and minimum thermometer be kept in the cold storage.

It is not wise to hold butter more than a week in the average creamery cold storage. The depreciation in the actual worth of the butter usually more than offsets any rise in price.

The Creamery Building and Machinery.

The building should be neatly and substantially built, preferably of cement, brick or stone. If built of wood, the walls should be well insulated by the use of four to six thicknesses of lumber, two to four thicknesses of good building paper, and at least two "still-air" spaces. The outside should be neatly painted some light color, which will cause it to be cooler in summer. The floors should be made of cement. A wooden floor should not be used in a creamery, as it is almost impossible to prevent its leaking, and so harboring decaying organic matter. Old wooden floors should be replaced with cement as soon as possible. The cement should also extend up on the walls for at least six inches.

The ceiling of the making room should be at least twelve feet high. The inside of the creamery and cold storage should be coated with whitewash once a year. If not whitewashed, it should be painted, but the cold storage should be coated with shellac and not paint, owing to the smell from the paint which may taint the butter. When troubled with mould on the walls they should be thoroughly cleaned, then be sprayed with a solution of one part bichloride of mercury in one thousand parts of water.

The cream vats should have plenty of space for water and ice around the sides for cooling. The combined churn and worker saves labor, time, floor space, pulleys and belting, and can be recommended to those purchasing new churns and workers. All the machinery in a creamery requires extra good care, as otherwise it deteriorates in value very rapidly.