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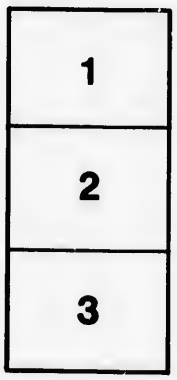

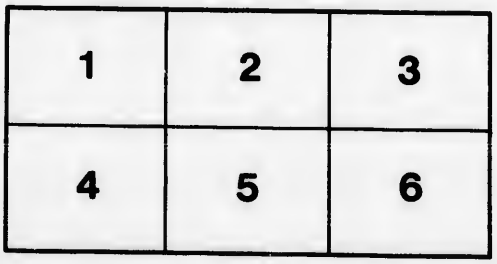

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BULLETIN 107. May, 1898.

ONTARIO AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM.

DAIRY BULLETIN

BY THE

DAIRY SCHOOL, GUELPH.

PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.

INTRODUCTION.

By H. H. Dean, B.S.A., Professor Dairy Husbandry.

A very important factor in the production of cheese or butter is the healthful condition of the factory and its surroundings. The building should have good drainage and a plentiful water supply. Hot water must be used in large quantities in order to keep everything clean. Where plenty of water is used, it is necessary to provide means to carry the water and its impurities to a safe distance from the factory. The practice of allowing whey, skim-milk, buttermilk and wash water to go through leaking floors, underneath the building, or to run on top of the ground near the factory, near a dwelling place, or near a public road, is one which cannot be longer tolerated. As these by-products decompose in the hot weather, the most objectionable flavors are produced, and at the same time a breeding ground for the worst types of bacteria is provided. Neither will it do to send this waste matter into a stream, or onto a farm, as it causes offence to owners of stock, and the maker runs the risk of tainting the milk supplied.

Methods of Sewage Disposal.

1. By running it through drains into a creek or ditch, or on top of the ground in a neighboring farm, swamp or waste land.

At the Black Creek factory, near Stratford, the waste water is forced through pump-logs into a ditch some distance from the factory, at which place the water filters through the natural soil into a creek. This plan is said to work very well. The danger of polluting the water or grass if dairy cows have access to the stream or pasture makes this plan, without filtering, very objectionable, although experiments made at Rugby farm, England, showed that the productive capacity of an acre of grass was increased three or four fold by applying sewage, and no bad effects on the milk given by the cows was reported.

2. By Irrigating a Field near the Factory or Creamery.

To do this properly a storage tank is needed in order that the sewage may be applied when needed by the crop. In cases where the building is above a sloping, sandy or gravelly field the sewage may be profitably applied for the growing of such crops as corn, potatoes, mangels, beets, grain, fruit trees, nursery stock, grass, hay and garden truck. Italian rye grass is said to be specially benefited by the application of sewage, and this grass has the power of absorbing large quantities of it.

3. The sewage may be run into a tank and thence be pumped and applied to the soil. In most cases this is too expensive. Where the soil is sandy or gravelly much of the liquid may soak away, but owing to the danger of polluting the water in the well, and the air about the factory, this plan is not to be recommended. Makers should be very careful not to use impure water for setting the vats, washing butter, or for any other purpose, if it can be avoided. It is a safe plan to have the sides of the well cemented, to guard against possible pollution from impure water in the surface soil. If there is any doubt about the purity of the water send a sample to Guelph or Ottawa to be analyzed.

4. The sub-earth system works well for private houses and is used at some public institutions. A portion of land is thoroughly underlaid with a system of drain tiling. The sewage is conducted into these tiles, and allowed to soak away in the sub-soil. As there is danger of polluting the well, unless the tiling is a long distance from the building, this plan can be recommended only where the water supply comes from a distant spring through iron piping, or where the water supply comes from town or city waterworks.

5. The filter bed system seems to be the best and most practicable plan where drainage from the bed can be obtained. After the sewage has been properly filtered it is safe for animals to drink. Town sewage water, after being filtered, has been found to be purer than the water in wells of the same town which was used for drinking purposes by some of the people. A properly constructed filter bed is more than a strainer. In addition to causing mechanical changes in the sewage, the process of filtration involves biological and chemical changes whereby the water becomes purified. The intermittent downward filtration system has been proved to be a success.

Points to Observe in the Construction of a Filter Bed.

1. Make a tight connection between the gutter and the drain outside.
2. Have a "trap" on the drain to prevent smells coming from the drain.
3. Ventilate the drain.
4. Make the drain as straight as possible

5. Use four or five inch glazed tiling with tight joints from the factory to the bed. These should be laid below frost. Ordinary drain tile may be used where there is no danger of polluting the water. A pump-log, or a tight wooden trough above ground may be used in summer to convey the liquid from the building.

6. Locate the filter bed as far as possible from factory—at least 300 feet.

7. A bed 20x20 would be ample for a factory making 150 to 200 tons of cheese, and also butter in winter. Two beds, 10x20, which could be used alternately would be more satisfactory than one bed.

8. Excavate about two feet below the surface of the ground, and use the dirt for banking the sides.

9. Place a row of five inch drain tile in the bottom and at the centre of the bed. They should extend through the outlet side of the bed with a clear fall of three or four inches to the ditch or stream below. The joints of the tile should be covered to prevent the sand getting inside.

10. Fill from three to five feet of coarse sand on top of the tiling. About fifty loads of sand would be needed.

11. If two beds are made, have the top surface slant six or eight inches towards the outlet side of the bed. If one bed is used have it slope from both sides towards the centre, and place the tiles at the bottom and in the centre.

12. A wooden trough placed at the outlet of the factory drain should have wooden slides or gates to run the water on one side or on one bed at a time. Alternate them daily or weekly. The distributing trough should scatter the material over the whole length of the bed.

13. Keep the bed clear of weeds. Rake the top surface occasionally.

14. In winter furrow the top of the bed and cover the furrows with boards in order that the water may get below the snow and ice.

15. The top three or four inches may have to be removed and fresh sand applied in four or five years.

16. If the bed receives a small amount of attention it will improve in purifying power each year, and will do service for many years.

17. To remove grease and dirt from an underground tile drain connect the "blow-off" of the boiler with the mouth of the drain. Where this is not practicable run plenty of hot water into the drain after cleaning up each day.

MILK TESTING.

By J. W. Mitchell, B.A., Instructor.

By the term "milk-testing" we usually mean the testing of milk to determine its richness in fat or other solids, and for the detection of adulterations.

The two instruments most commonly made use of in the testing of milk are the Babcock tester for the purpose of determining the percentage of fat, and the lactometer to determine the specific gravity of milk.

The Babcock Test.

While the Babcock test has other equally important fields of usefulness, there are two that we would make special reference to at the outset, as their importance is so frequently overlooked or underestimated.

One use is on the farm. Every dairy farmer should use the test in weeding out and raising the standard of his herd. If our farmers would only make free use of the test, many of them would be greatly surprised to find how many profitless, or worse than profitless, cows they are keeping.

A second use of the test is to ascertain the loss of fat in skim-milk, buttermilk and whey. Where no test of these bye-products is made, there is frequently a great and *unsuspected* loss of butter-fat, which could and would be avoided, were the maker only aware of the loss by his present careless and faulty methods.

The following is a brief explanation and outline of the Babcock test:

The scale on the neck of the ordinary test bottle is graduated to give a reading of the percentage of fat only when eighteen grams are used in a test, i.e., the fat extending over one of the larger divisions of the scale weighs *one per cent*, or the hundredth part, of eighteen grams. This fact borne carefully in mind will explain the various rules for determining the per cent. of fat when eighteen grams cannot be taken in a test—as in the case of cream or cheese, in which the percentage of fat is high.

Note.—The capacity of that part of the neck over which the scale extends is two cubic centimetres (c. c.), and of that of one of the larger divisions of the scale is .2 ($\frac{2}{10}$) c. c. As the specific gravity of the fat at the high temperature of reading is .9 ($\frac{9}{10}$), the weight of the fat extending over one of the larger divisions of the scale is .9 x .2 = .18 of a gram, which weight is the hundredth part, or one per cent. of 18 grams.

To Test Milk.

1. By means of a 17.6 c. c. pipette take 18 grams of milk. Have the milk at a temperature of sixty to seventy degrees.

2. To this add 17.5 c. c. of commercial sulphuric acid with a specific gravity of 1.82 to 1.83, and thoroughly mix the acid and milk by giving the bottles a gentle rotary motion.

3. Place the bottles in the tester and turn for from four to five minutes, at a speed varying from 700 to 1,200 revolutions per minute, according to the diameter of the machine (700 revolutions per minute with a machine twenty inches in diameter).

4. Add hot water at a temperature not lower than 140 degrees F. to float the fat into the neck of the bottle.

5. Turn the machine again for about two minutes and take the reading before the fat cools. If troubled with burnt readings add the water twice instead of all at once, filling the bottle just to the neck the first time, then turning the machine about a minute, filling to about the eight per cent. mark the second time, and turning for another minute.

Notes.

1. Be sure that the scale on the bottle is properly graduated. The most convenient way of knowing this is to test the same milk in the different test

bottles and compare the readings. A bottle that differs by more than .2 ($\frac{2}{10}$) in its reading from the rest should be discarded. As the capacity of that part of the neck over which the scale extends should be 2 c. c., the accuracy of the scale may be tested by filling the bottle to the bottom of the scale with water at the temperature of the room, and then adding 2 c. c. of water at the same temperature by means of a 2 c. c. pipette.

2. Mix the milk well to obtain a representative sample. Mix by pouring from one vessel to another, as violent shaking tends to churn the milk and does not ensure so thorough mixing.

3. Be very careful to measure the exact amount of milk for a test, and to blow out the pipette well.

4. The amount of acid used must be varied to suit its strength. The right amount is being used when the fat presents a bright golden appearance. Acid that is much too strong or too weak should be discarded, as satisfactory results cannot be obtained from its use.

5. Hold the test bottle at a slant when pouring in the milk and acid, to avoid choking the neck of the bottle.

6. Mix the milk and acid thoroughly.

7. If the temperature of the room be low, it is necessary to pour hot water into the tester to keep up the temperature.

8. The water added to the test bottles should be soft or distilled. If hard water be used add a little sulphuric acid (half an acid measure, or a little more to a gallon of water) to soften it; this will prevent foam above the fat.

9. Correct readings cannot be taken after the fat has cooled. In such cases set the bottles in hot water before reading.

Always do this when you have several readings to take. Adopt a fairly constant temperature of the water—130 to 140 degrees F.—for this purpose.

10. A pair of dividers or compasses is excellent for taking the length of the column of fat in reading. Measure from highest to lowest point in column.

11. The following are the causes of cloudy or burnt readings:

(1) The use of too much or too strong acid.

(2) Allowing the acid to fall directly upon the milk.

(3) Having the milk at too high a temperature when adding the acid—the higher the temperature the less acid is required.

(4) Allowing the sample to stand too long, after adding the acid, before mixing the milk and acid.

12. Light colored readings and floating particles of curd are due to—

(1) The use of too little or too weak acid.

(2) Having the milk or the acid at too low a temperature—the lower the temperature of either the more acid is required.

Note.—It is always better to bring the milk to the right temperature—about seventy degrees.

(3) Insufficient shaking of the bottles to completely unite the milk and acid.

13. See that your pipettes and test bottles are clean before using.

14. After using bottles, rinse them at least twice with *hot* water—the nearer to boiling the better. Rinsing with sulphuric acid before rinsing with water, or the use of a little sal soda in the first water, is often necessary.

15. Care and attention to details are the great requisites for accurate milk testing. Carelessness on the part of the operator has frequently thrown suspicion upon the accuracy of the Babcock test.

16. A sample of milk that has soured and thickened can be prepared for sampling by adding a small amount of some alkali to neutralize the lactic acid, and cause the curd to redissolve. A small amount of powdered concentrated lye is very suitable; add just a small amount of lye at a time, and pour the milk from one vessel to another to mix the lye with the milk, which causes the casein to become dissolved.

17. Milk that has been partially churned can be prepared for sampling for a Babcock test by heating it to about 110 degrees F. and pouring it from one vessel to another to mix it; then take sample as quickly as possible.

18. If the scale on the test bottle becomes indistinct, it can be much improved by rubbing over it some black paint and wiping the neck with a cloth. The paint should be quite viscous, as thin paint will run.

Skim-milk, Buttermilk and Whey.

1. Skim-milk, buttermilk and whey may be tested in the ordinary bottle just as whole milk is tested, taking 17.6 c. c. (or 18 grams) in a test.

Note.—It is not necessary to use quite the full amount of acid with whey.

2. As the percentage of fat in skim-milk, buttermilk and whey is so small, the best method of testing these is by the use of the double-necked skim-milk bottle. The usual amount of milk or whey is taken and the test is carried on in the usual way. Very fine readings can be taken, as a very small amount of fat will extend over quite a length in the small neck. Each division on the scale indicates half a tenth (.05) of one per cent. of fat.

After adding the water to the test bottle it is advisable to set the bottle in hot water before whirling in the machine for the last time; this heating of the small neck enables the fat to rise more freely by keeping it melted and preventing it from adhering to the neck.

If the fat does not rise sufficiently in the small neck, it can be raised by pressing gently with the finger on the mouth of the large neck.

To Test Cream, Using the Ordinary Test Bottle.

1. By means of a 6 c. c. pipette take six grams of cream, and to this add 12 c. c. of water. Add the usual amount of acid (17.5 c. c.) and proceed as in testing milk. Multiply the reading by three to obtain the percentage of fat.

2. Another way is by using the ordinary pipette. Take 17.6 c. c. of cream and to this add two pipettes, or twice 17.6 c. c. of water, and mix thoroughly. Take 17.6 c. c. of the diluted cream and put into the test bottle; add the usual amount of acid and proceed as in testing milk. Multiply the reading by three to obtain the per cent. of fat in the cream. This method is not strictly accurate, as 17.6 c. c. of cream will not weigh quite 18 grams; but it will give sufficiently close results for most purposes.

Weighing any suitable number of grams of cream for a test is the most accurate method.

To Test Cheese.

Obtain a representative sample of cheese by taking a plug extending from the outside well to the centre of the cheese; cut this into small strips extending from end to end of the plug—strips that will easily pass through the neck of the test bottle. Weigh out from four to five grams and put into the test bottle, and to this add 12 to 15 c. c. of hot water to dissolve the cheese. After shaking the bottle sufficiently to dissolve the cheese, cool the sample down and add 17.5 c. c. or the usual amount of acid, and proceed as in the testing of milk.

To obtain the percentage of fat in the cheese, multiply the reading by eighteen and divide by the number of grams taken in the test. If other than six grams of *cream* be taken in a test, apply this rule to determine per cent. of fat.

THE LACTOMETER AND THE DETECTION OF ADULTERATIONS IN MILK.

The lactometer is a specific gravity measure for milk. There are different kinds of lactometers; but as the Quevenne is the most suitable for milk testing, it is the one that we shall here describe.

By means of the Quevenne lactometer we compare the density at sixty degrees F. with that of pure water at sixty degrees. It has a scale graduated from 15 to 40, and indicates a specific gravity of from 1.015 to 1.040. For example, milk with a lactometer reading of 32 has a specific gravity of 1.032, or a vessel which would hold 1,000 pound of pure water (at 60° temp.) would hold 1,032 lbs. of this milk. As it is not always convenient to have milk at a temperature of sixty degrees when taking a lactometer reading, corrections for temperature are made as follows: To obtain the *corrected* lactometer reading, or reading at sixty degrees, add .1 ($\frac{1}{10}$) to the lactometer reading for each degree in temperature above sixty, and subtract .1 ($\frac{1}{10}$) from the reading for each degree in temperature that the milk is below sixty degrees. Thus, if the lactometer reading of milk at a temperature of sixty-five degrees be thirty-one, the corrected reading is $31 \times .5 = 31.5$; if the lactometer reading be 32.5, and the temperature fifty-seven, the corrected lactometer reading is $32.5 - .3 = 32.2$. This rule is practically correct, if the temperature be kept within a range of from fifty to seventy degrees.

The lactometer reading of whole milk usually ranges from 30 to 32.5, although it may fall as low as 27, or go as high as 34. The lactometer reading of skim milk varies from 33 to 38.

The composition of milk is about as follows:

Water	86 to 88 per cent.
Fat	3 per cent. and upwards.
Solids not fat	8.5 to 9.5 per cent.

Solids-not-fat (Or Solids Other Than Fat.)

In determining the percentage of solids-not-fat in milk, we require both its corrected lactometer reading and the percentage of fat in it. It is the solids-not-fat of milk that cause its specific gravity to exceed that of water, and consequently its lactometer reading to be greater than that of water. Since the presence of fat in milk lowers its lactometer reading, the first step in determining the percentage of solids-not-fat is to obtain what the lactometer reading of the milk would be if the fat were not present to interfere, i. e. the first step is to deter-

mine the lactometer reading of the milk when skimmed. As each per cent. of fat in milk makes its lactometer reading lower by about eight-tenths (.8) of a degree than it would be if this fat were not present, we obtain the lactometer reading of the skim milk by adding the lactometer reading of the milk and eight-tenths of the percentage of fat together. Next, since each per cent. of solids-not-fat in skim-milk gives it a reading of about four on the lactometer, we obtain the percentage of solids-not-fat in it by dividing its lactometer reading by four.

RULE: To determine the percentage of solids-not-fat (S. N. F.) in milk, add its corrected lactometer reading (L) and eight-tenths (.8) of the per cent. of fat (F) together, and divide by four. Briefly expressed thus:

$$\frac{L + .8\ F.}{4} = \text{S. N. F. (per cent. of solids-not-fat.)}$$

L = Corrected lactometer reading, or reading at sixty degrees.
F = Per cent. of fat.

The following rule for determining the per cent. of solids-not-fat is sufficiently accurate—excepting when unusually close results are required—and has its simplicity to recommend it:

To determine the per cent. of solids-not-fat in milk add its corrected lactometer reading and per cent of fat together and divide by four.

$$\frac{L + F}{4} = \text{S. N. F.}$$

EXAMPLE: Let the lactometer reading of a sample of milk at a temperature of 64 degrees be 32, and the per cent. of fat be 3.6. Find the per cent. of solids-not-fat.

Corrected lactometer reading = 32.4.

From the first rule we have,

$$\frac{L + .8F}{4} = \frac{32.4 + .8 \times 3.6}{4} = \frac{32.4 + 2.88}{4} = 8.82 \text{ per cent. S.N.F.}$$

From the second rule we have,

$$\frac{L + F}{4} = \frac{32.4 + 3.6}{4} = 9 \text{ per cent. S.N.F.}$$

Watered Milk.

To find the per cent. of pure milk in a watered sample, multiply the per cent. S.N.F. in it by 100, and divide by the per cent. S.N.F. in the pure milk. This substracted from 100 will give the per cent. of extraneous water in the watered sample. To take an example:

The per cent of solids-not-fat in a sample of pure milk is 9; but after being watered the per cent. of solids-not-fat in the watered sample is 7.2. Find the per cent. of pure milk in the watered sample.

$$\text{Per cent. of pure milk in watered sample} = \frac{7.2 \times 100}{9} = 80 \text{ per cent.}$$

Per cent. of extraneous water = 100 − 80 = 20 per cent.

NOTE: When a sample of the pure milk cannot be obtained, use 8.5 in the early part of the season, and 9 in the latter part, for the per cent. S.N.F. in pure milk.

The term "pure milk," as used in the foregoing, may mean either whole or skim milk, as the per cent. of solids-not-fat in milk is not materially affected by skimming.

Notes.

1. Have the temperature of the milk uniform throughout, and as near to sixty degrees as possible when taking a lactometer reading.

2. Always mix the milk well before taking a lactometer reading.

3. Do not have milk on the upper part of the stem of the lactometer when reading, as this weighs the lactometer down and causes the reading to be too small.

4. A lactometer reading should not be taken when the milk contains air. Milk fresh from the cows is saturated with air and should be allowed to stand an hour at least before a lactometer reading of it is taken.

5. Have the lactometer free from the side of the vessel, and perfectly still, when taking a reading.

6. A high lactometer reading accompanied by a low per cent. of fat indicates skimming, e. g., L = 34, F = 2.4.

7. A low lactometer reading accompanied by a low per cent. of fat, is indicative of watering, e. g., L = 22, F = 2.4.

8. A normal lactometer reading with a *very* low per cent. of fat indicates both watering and skimming. Also, if the lactometer reading of a sample of milk be low, yet not so low accordingly as the per cent. of fat, this is indicative of both watering and skimming. Both of the following indicate watering and skimming: L = 31, F = 2; L = 26, F = 1.8.

COMPOSITE SAMPLES.

In many of the more advanced creameries and cheese factories the patron receives payment, not in proportion to the amount of milk, but in proportion to the butter or cheese value of the milk supplied by him. Such a system, of course, necessitates the use of the Babcock test. A test of the milk cannot be made daily, but to overcome this difficulty a small sample of the milk supplied by each patron is taken at each time of delivery and put into a bottle, called a *composite sample bottle*, which contains a small amount of some kind of preservative—such as bichromate of potash or corrosive sublimate. It is not advisable to use the latter alone, as it is quite poisonous and imparts no color to the sample to indicate its presence in it. An excellent preservative is a mixture composed of about seven parts bichromate of potash to one part corrosive sublimate. We are using it with very satisfactory results. From what can be taken on a five-cent piece to what can be taken on a ten-cent piece will usually be found sufficient to preserve a sample for two weeks in summer, when an ounce of milk is taken daily. The amount of preservative required depends upon the weather, the size of the sample, and the length of time it is to be kept before testing. A Babcock test of the sample is made at the end of two weeks or a month, and if the daily sampling and the testing of the sample both be carefully done, this gives the average quality of the milk supplied by the patron during the time over which the test extends. It is not necessary to test oftener than twice a month; and we know factories in which, by keeping the samples in a fairly cool place, they are obtaining satisfactory results from testing but once a month.

Notes on Composite Sampling and Testing.

1. For holding composite samples use pint bottles with long corks.

2. The bottles should never be left uncorked, as the samples dry on the surface when left exposed to the atmosphere.

3. Write each patron's name plainly on a label with a pen; paste the label on the bottle fastening its edges down well, and give it at least two coatings of shellac to prevent it from washing off when cleaning the bottles. A label will easily remain on a bottle for an entire season when coated properly with shellac.

4. Racks are necessary for holding the bottles. A very satisfactory rack is one made to hold a single row of bottles, with partitions between. It is advisable to make a rack large enough to hold a sufficient number of bottles for a single route. Have a shelf above the weigh stand to set the racks on.

5. Add the preservative to the composite sample bottles at the beginning of the test period, *and before any milk has been put into them.*

6. Pour the milk into the weigh can and have it well mixed before taking a sample. Either an ounce or a half-ounce dipper may be used for this purpose. An ounce dipper is too large when testing but once a month.

7. Give the bottle a gentle rotary motion each time a sample is taken, to mix with it the cream that has risen, and also to incorporate the new sample with the part containing the preservative.

8. Place the composite samples in a cool place each day when through using them.

9. When the time for testing comes set the bottles in warm water, at about 110° F, to loosen the cream adhering to the sides of them, and also to sufficiently warm the samples to cause the cream that has risen to mix properly with the milk. Give each bottle a gentle rotary motion to wash the cream from its wall. and then complete the mixing by pouring from one vessel to another.

10. After preparing the samples proceed with a Babcock test of them just as you would with ordinary milk. Usually not quite so much acid is needed when testing samples containing bichromate of potash as with milk containing no preservative. When testing composite samples, it is a good plan to set the Babcock test bottles, as they are filled, into a vessel containing about an inch in depth of water at a temperature of about 60 degrees; they will then all be at about the same temperature when the acid is added.

11. Add the water to the test bottles at twice rather than all at once, filling each bottle just to the neck the first time, and to about the eight per cent. mark the second time. Turn the machine for a minute after each addition of water.

12. Set the test bottles in hot water, at 130 to 140 degrees, before taking readings. Have the water deep enough to rise to the top of the fat.

13. Wash the composite sample bottles well after testing the samples. It is a good plan to have a vessel of very coarse gravel, or rather minute pebbles, at hand when washing the composite sample bottles. After rinsing a bottle put into it some more water and a small handful of the gravel. Simply rinsing the gravel around the bottle will scour and clean it thoroughly. Finish by rinsing with specially clean water. Turn the bottles mouth downwards to drain.

If troubled with mould on the samples, it is wise, after washing the corks, either to place them under some inverted vessel and turn a jet of steam into it, or else place them in boiling water under an inverted pan with a perforated bottom, putting a weight upon the pan to sink it.

14 Too great care cannot be exercised in sampling the milk, in preparing the composite samples for testing, and in making a Babcock test of them. Carelessness is sure to create dissatisfaction with the test system.

Payment for Milk According to its Butter or Cheese Value.

While in creameries payment according to quality is always made in proportion to the amount of fat furnished by each patron, in cheese factories two different methods exist:

(1) According to the amount of fat in the milk, as in creameries.

(2) By taking into consideration the casein, as well as the fat, of the milk. As the per cent. of casein in milk is fairly constant, some constant number, usually 2, is added to the per cent. of fat as an allowance for the casein.

Extended experiments carried on at this station all go to prove that the second is the much preferable method to adopt in cheese factories. (For information on this question write the Dairy Department for a bulletin entitled "Experiments in Cheesemaking.")

To make a division of money according to the second, or fat-casein method, taking 2 to represent the per cent. of casein in the milk: During a certain month three patrons supply milk to a factory, as follows:

A, 3,462 pounds milk, testing 3.1 per cent. fat.
B, 5,220 " " 3.6 "
C, 8,371 " " 4.0 "

From the above milk are make 1,650 pounds cheese. The cheese sells for $9\frac{3}{4}$c. a pound and it costs $1\frac{1}{4}$c. per pound to manufacture it.

Net value of a pound of cheese, $(9\frac{3}{4} - 1\frac{1}{4}) = 8\frac{1}{2}$c.

Net value of 1,650 pounds of cheese $= 1{,}650 \times 8\frac{1}{2}$c. $= \$140.25$.

As seen below, there are 971 lbs. fat and casein.

971 pounds fat and casein are worth \$140.25

1 pound " is " $\frac{140.25}{971} = 14.44$c.

Name.	Pounds milk.	Per cent. fat.	Per cent. fat and casein.	Pounds of fat and casein.	Value at 14.44c. per pound.
					\$ c.
A	3,462	3.1	5.1	176.5	25 48
B	5,220	3.6	5.6	292.3	42 20
C	8,371	4.0	6.0	502.2	72 51
Total				971.0	140 19

Method of Constructing Tables for Use in the Secretary Work of a Factory.

In making a division of the proceeds of a cheese factory or creamery, a simple table can be readily made out which will materially lessen the labor of the secretary, and also the chances of making mistakes. The method is equally applicable, whether a division of the proceeds be made upon the fat basis, or the fat-casein basis, or according to the weight of the milk, and can probably be best explained by taking an example. Let us suppose that in a creamery, for a certain month, the net value of a pound of fat is 19.74 cents. This makes the net value of 100 pounds of fat equal \$19.74.

Multiplying $19.74 by 2, 3, etc., we obtain the value of 200 pounds, 300 pounds, etc., to be $39.48, $59.22, etc., which we place in a column in the left of a sheet of paper.

Next, dividing the value of 100 pounds, 200 pounds, etc., by 10 we obtain the value of 10 pound, 20 pounds, etc, which we place in another column to the right of the first: next, dividing the value of 10 pounds, 20 pounds, etc., by 10 we obtain the value of 1 pound, 2 pounds, etc.; and, lastly, dividing the value of 1 pound, 2 pounds, etc., by 10 we obtain the value of .1 ($\frac{1}{10}$) of a pound; 2 ($\frac{2}{10}$) of a pound, etc, which we place in still another column.

NOTE.—We divide any number by 10 by simply shifting the decimal point one place to the left; thus 19.74 divided by 10 gives 1.974.

Making use of the foregoing we can readily construct such a table as the following, the method of using which will be illustrated after the table:

Value of 1 pound fat = 19.74c.
Value of 100 pounds fat = $19.74.

Weight.	Value.	Weight.	Value.	Weight.	Value.	Weight.	Value.
	$ c.						
100.....	19 74	10.....	1.974	1.....	.197	.1.	.019
200.....	39 48	20.	3.948	2.....	.394	.2.....	.039
300.	59 22	30.....	5.922	3.....	.592	.3.....	.059
400.....	78 96	40.....	7.896	4.....	.789	.4.....	.078
500.....	98 70	50.....	9.870	5.....	.987	.5.....	.098
600.....	118 44	60.....	11.844	6.....	1.184	.6.....	.118
700.....	138 18	70.....	13.818	7.....	1.381	.7.....	.138
800.....	157 92	80.....	15.792	8	1.579	.8.....	.157
900.....	177 66	90.....	17.766	9.....	1.776	.9.....	.177

EXAMPLE.—Using the foregoing table find the value of 375.4 pounds of fat.

Value of 300	pounds	$59.22
" 70	"	13.818
" 5	"	.987
" .4 of a pound		.078
Value of 375.4 pounds		$74.10

Permanent tables can be constructed on a similar plan for determining the amount of fat or fat and casein in milk.

CREAM-GATHERING CREAMERIES AND THE OIL TEST.

In many sections of country which are sparsely populated, creameries are conducted on the cream-gathering plan, *i.e.*, the cream instead of the milk is collected, the patrons doing the creaming of the milk.

The cream gatherer's outfit consists of a covered spring wagon, insulated cream cans, or a tank, for holding the cream, a cream book, a cream pail twelve inches in diameter, a rule scaled to inches and tenths of an inch, a "card" or rack of test tubes for holding samples of cream, a small ounce dipper for sampling the cream, and a case for carrying the "card" or rack.

Upon receiving cream from a patron the cream-gatherer pours it into his cream pail, measures its depth in the pail in inches and tenths of an inch, records opposite the patron's name in the cream book the amount received from him, and after mixing the cream properly puts a sample of it into the test-tube whose number on the card or rack corresponds to the patron's number in the cream book. The samples of cream are afterwards churned at the creamery in a churn known as an "oil-test" churn. The test is known as the "oil test."

To Make an Oil Test.

Upon their arrival at the creamery, place the samples in a warm place, as over the boiler, and leave over night to ripen thoroughly. They will not churn properly unless well ripened.

The next morning, place the samples in water at a temperature of about 90 degrees; and as soon as the cream will flow freely from one end of the tube to the other, place in the oil test churn and begin the churning. Should the cream at any time cool and thicken, place the samples in warm water to liquefy the cream again. Continue churning until there is evidence of a clear separation of the fat; then place the samples in hot water, at a temperature of from 160 to 170 degrees, for from fifteen to twenty minutes.

If the separation be complete, the fat will be clear and yellow, and there will be three distinct columns with sharp lines of division between them, viz., a column of clear fat on top, one of whey next, and one of curdy matter at the bottom. If there be not a clear separation, cool to about 90 degrees, churn again, and proceed as before.

To Take a Reading. There is a chart prepared for the purpose. Placing the bottle in an upright position on the "base line" of the chart, move it along until, when looking by the right side of the bottle, the top of the column of fat comes even with the uppermost slanting line on the chart. Next, still looking by the right side of the bottle, observe the line to which the bottom of the fat comes; the number on this line gives the reading.

Meaning of the Reading. Cream that gives a reading of 100 in the oil test will make one pound of butter for every inch of such cream in a cream pail, twelve inches in diameter; cream testing 120 will make 1.20 pounds of butter.

Notes.

1. Sometimes the fat, though clear, is somewhat open. In such cases, or when the fat is not clear, allow the samples to become cold, and then place in water at a temperature of about 120 degrees before taking a reading. About 120 degrees is a very suitable temperature at which to take readings.

2. An inch of cream, testing 100, (or its equivalent in cream of another grade) in a pail twelve inches in diameter, is what is known as a *standard or creamery inch.*

3. The cream gatherer should exercise great care in measuring and sampling the cream. He should make sure to have the cream properly mixed before sampling, and should fill the test tubes carefully to the mark. The test tube is about nine inches long and the mark referred to encircles the tube at a distance of five inches from the bottom.

The butter-maker should exercise equally great care in churning the samples and in taking the readings; also there must be no undue loss of fat in the butter-milk.

14. Carelessness on the part of either the cream-gatherer or the butter-maker will lead to a considerable difference between the actual yield of butter and the yield as calculated from the oil test; while the actual and calculated yields will correspond closely if all parts of the work have been carefully done.

Where wide differences occur on account of carelessness on the part of some one or more of the cream-gatherers, it is advisable for the butter-maker, if possible, to churn the different loads of cream separately in order to locate the carelessness.

CARE OF MILK FOR CHEESE FACTORIES AND CREAMERIES.

By J. H. Findlay, Instructor in Home Dairy.

Patrons should exercise great care in the handling of milk supplied to cheese and butter factories. The cows should be kept in clean, light, warm and well ventilated stables during the winter. Food likely to taint the milk should not be fed at anytime. They should have access to pure water and salt at all times. The cow's udder should be brushed with a damp cloth or with a soft brush before commencing to milk. The milking should be done with clean, dry hands, and as quickly as possible, care being taken to get the "strippings," which are the richest part of the milk.

The main points to observe in caring for milk are:

1. Immediately after milking strain through a fine wire and cloth strainer.
2. Remove the milk as soon as possible to a place where the air is pure.
3. Aerate by using a dipper, by pouring, or by an aerator.
4. Keep the night's and morning's milk separate as long as possible. Use pails hung on hooks fastened to a pole under roof to hold each cow's milk separate over night.
5. Do not cool milk for cheese-making, unless when holding Saturday night's and Sunday morning's milk until Monday. In hot, muggy weather, or at any time when it is likely to be over-ripe, milk should be cooled.
6. Cool milk for the creamery to 60° or below after aerating.
7. Protect the milk from rain and sunshine by having covered stands with latticed sides to allow a free circulation of air around the milk can or pails.
8. Wash all cans, pails, etc., immediately after use, in warm water; then with scalding water; and where possible, steam them. Wash cans at the factory or creamery wherever practicable.
9. Do not return whey, sour skim-milk, or buttermilk in the milk can.

Care of Cream for Cream-Gathering Creamery.

Either deep-setting in ice water or the hand cream separator may be used in creaming milk for the cream-gathering creamery. Cream from deep-setting cans should be placed in cold water and be kept sweet until the driver calls for it. Cream from the hand separator ought to be cooled to the temperature of the cream in the can before it is mixed with the older cream in order to prevent souring, which would be likely to occur if the warm cream from the separator were mixed with previous skimmings. At each addition of fresh cream the whole should be well stirred to insure uniformity of test and to save time.

A STARTER.

By R. W. Stratton, Assistant Instructor in Cheese-making.

The first step in making a starter is to provide a suitable can, one having double walls with an airtight, hollow space between, and tight fitting covers, is preferred, as with such a can a more even temperature can be maintained. Care should be taken that all seams in the can are well soldered, so as to leave no lodging place for bad germs.

We believe that the time has come when the pasteurizing method of preparing a starter should be adopted, as by this method, if proper care be taken, a good starter can be propagated for an indefinite period, and a good, uniform flavor be insured. In making a pasteurized starter, it can be done only after you have secured something to propagate the lactic acid, as the process of pasteurizing kills all the lactic acid germs. So in making a start, heat a small quantity of good flavored milk to a temperature of ninety degrees and allow it to sour. If a good flavored starter cannot be secured in this way, which is sometimes the case in certain localities, it may be necessary to procure a commercial starter or lactic ferment.

After selecting the milk, add from 15 to 20 per cent. of pure, cold water and heat to 158°, stirring constantly while it is being heated. Allow the heated milk to stand for twenty to thirty minutes at this temperature; then cool to 80° and add from two to three per cent. of the old starter. Stir well, cover up, and do not disturb it until it is required for use.

Before using, it will be better to remove from one to two inches of the milk from the surface of the can, as the flavor of the surface will be found not so good as that which is below. Then break up the remainder by stirring it well in the can, take out what is required and pour from one pail to another a few times, until it has a creamy consistency, when it will be ready for use. The indications of a good starter are, that the whole mass is firmly coagulated and no water is found on the top; and the flavor is pleasant to both taste and smell.

A starter may be used to advantage when the milk is maturing slowly, and when it is tainted or gassy. One per cent. of starter is the most that should be used at any time, and this quantity should be used only after you have ascertained the acidity of the milk by the rennet test, and have found it necessary. Do not ripen the milk so low by two or three seconds when using a starter. Bear in mind that a starter may be used to advantage only when it has a good flavor, and when the milk is in such a condition that its use is a necessity. The practice of using a starter when not needed, or of using one with a poor flavor, should be avoided.

1. Don't prepare your starter in a haphazard manner by leaving it in an open can or vessel while in a room where the air is impure.

2. Don't propagate your starter with anything but one having a good flavor.

3. Don't use a starter when it is not needed.

4. Don't use too much starter.

5. Don't use a poor starter—rather put it into the whey tank.

6. Don't forget that the flavor of the starter used will largely determine the flavor of the cheese made.

7. Don't disturb your starter while it is ripening—if you do, it will separate.

8. Don't use a starter without using good judgment. This combination is very essential.

SEPARATORS AND THE SEPARATION OF MILK.

By Mark Sprague, Instructor.

As cream separators are coming more into use every day in the creameries of the Province, we feel that a few hints as to their care and management will be welcomed by all who are interested in butter-making.

As there are six or seven kinds of separators on the market, differing very much in construction, it would need as many sets of directions to make this part of our bulletin complete; but space will not permit of so full a treatment.

The principle of separation in each machine being the same, we shall divide our separators into two classes, viz., belt separators, and steam or turbine separators, the latter being driven by steam direct from the boiler.

1. *Belt Machines.* A stone foundation is not required for those makes of separators that are built with a rubber ring around the upper bearing, but the best results are got from having all separators solidly placed or set. First, place the intermediate, or jack, in position. Level it and put it in line with the driving shaft. Then fasten it in a position with bolts or lag-screws, bearing in mind that it may be placed immediately under, or several feet either way from the centre of the driving shaft, as best suits the requirements, and taking care that the pulley on the driving shaft be of sufficient width to carry the belt and allow of its being shifted from the tight to the loose pulley of the intermediate, and *vice versa*, and of the proper size to give the exact speed required.

Next, place the frame of the separator in position, far enough from the intermediate to give the proper tension to the endless belt. Level the machine both ways by placing your level on the top of the cast frame, which is turned true for this purpose. Line the separator with the intermediate by bringing the right hand outside surface of the spindle pulley in line with the centre of the face of the large intermediate pulley, having the vertical centre line of the spindle level with the under side of the intermediate pulley; then bolt the separator securely to the floor or foundation, unless it be one that has the spindle and bowl connected by a socket-joint. If the spindle is so connected, bolting down will be unnecessary.

Bear in mind that the separator bowl should revolve or turn to the right, or with the sun, and that the intermediate should run from the separator. Never put the idler or tightener on the drawside of the belt. Where only one separator is used, put on all the belting and start the separator with the engine, taking from ten to fifteen minutes to reach the proper speed. Wipe all bearings to free them from dust or dirt, and see that all oil tubes are cleaned and free to allow the oil to flow to the bearings. Look after this matter from day to day.

2. *Steam or Turbine Separators.* In setting a steam or turbine machine you have only to decide on the place to set it. This separator also must be set solid so as to be free from the possibility of vibration, and must be levelled in the same way as the belt machines. Turbine separators are all fitted with three-

quarter steam fittings, but if the separator be placed so that more than twenty feet of pipe is required to reach to the boiler, use a larger pipe to insure sufficient steam to drive it properly, adding one-quarter of an inch in size of pipe for every twenty feet in distance. Take care to remove all scales and cuttings from pipes before placing them in position.

The exhaust pipe is usually made of galvanized iron, four inches in diameter. It may be conducted through the side of the building, provided it is placed so as to drain well, or it may be put through the roof. The latter method is to be preferred, as the danger of frightening horses is thus done away with. It should be long enough to reach higher than any point of the roof, in order that the draft may not be interfered with. When it is put through the roof, a drain pipe must be connected with the elbow at the lowest point to carry away the condensed steam. This in most cases may be put through the floor or be allowed to run into a pail. Next, put the bowl and spindle in place, being sure to have all bearings cleansed and oiled. Then fill the bowl with water, if it be a separator that has steam turned directly against the bowl. This will keep the bowl cool until sufficient speed has been reached to cause a current of air around the bowl, which will keep it cool thereafter. Apply steam gradually, having the regulating valve set so that it will keep the pressure at from forty-five to fifty pounds on the steam guage. If there is no safety valve, the pressure will have to be regulated by the globe valve.

After speed has been reached in either the turbine or the belt separator, the milk should be turned on full feed, until both the cream and the skim-milk flow freely; then it should be closed off till the cream is the desired thickness.

Milk separates best when fresh or new, and at a temperature of 90 to 100 degrees. But in creameries the usual practice is to bring the night's and morning's milk together to the factory. In such cases, if the temperature has fallen below eighty-five degrees, the milk should be heated to eighty-five or ninety degree or higher, at least eight or ten minutes before going into the separator. This is done by means of a tempering vat, holding about 400 pounds, and attached to the receiving vat, so as to have a regular flow to the separator.

Heating increases the difference in the specific gravity between the serum and the fat of milk, and thus facilitates the separation of the latter. Frozen milk separates better when heated five to eight degrees higher than that which has not been frozen.

After all the milk has been separated, the cream left in the bowl may be forced out by putting in some skim-milk or warm water; about two pailfuls will be needed for this purpose. Shut off the feed tap for a few seconds when about one pailful has gone through; then turn it on again.

Always allow the bowl to stop of its own accord after the power has been taken off—never apply any brake or fricton to it. Wash in tepid water the bowl and all parts that come in contact with the milk or cream, cleaning all foreign substances from the skim-milk tubes, etc. Then scald with steam or boiling water and allow to dry, after which the parts may be put together.

Two thicknesses of quarter-inch rubber packing placed under the outside edge of the base, before bolting the separator down, improves the running of any separator. Four rubber rings, one under each corner, also have a beneficial effect in making the separator run smoothly and quietly.

In conclusion, we would say to anyone who gets a separator: If you are not familiar with it, get some person who has had experience to assist you in setting it up. The very high rate of speed at which cream separators run makes them somewhat dangerous in the hands of inexperienced operators.

BUTTER-MAKING IN THE CREAMERY.

By T. C. Rogers, Instructor.

Cleanliness.—Every butter-maker should be clean. All are not clean. Some of our creameries and cheese factories are not so clean and orderly as they should be. There is room for much improvement, both outside and inside. There is no good reason for lack of cleanliness. None should disgrace the dairy industry by careless, dirty habits. All should determine to clean up and be clean.

First, improve the outside appearance of the creamery by removing all stones and rubbish that may be lying around. Straighten the fences and wood-pile. Improve the approaches to the factory. Plant shade trees. Rake the yards, and keep them clean and orderly. The appearance of many old buildings may be improved by applying a coat of whitewash to the outside. A coat of thin whitewash on the inside is a good disinfectant and improves the appearance. Paint all the appliances a light color. A bright yellow looks well. Use something in the paint to give it a hard finish when dry. If you cannot get this work done for you, do it yourself. The rooms will have a more orderly appearance if everything, not in daily use, is removed from the shelves and tables.

Use plenty of salt and boiling water to clean the churn and other wooden utensils. First, rinse the inside of the churn to remove any butter that may be sticking to the sides; then scald three times with boiling water. Use a dipper of salt in the last water. Steam the churn frequently and scour with salt to keep it sweet and clean. A tablespoonful of borax in the last water is recommended. Do not cool the churn with cold water after cleaning it, but give it plenty of fresh air, and you will not be troubled with mould, nor with a foul smell in the churn. A rubber hose connected with a steam pipe in the centre of the room is very convenient. Use lye in the hot water occasionally when cleaning the floors and gutters. A rubber scraper is handy for drying the floors. Give the rooms plenty of fresh air.

Separator Creameries.

Flavors.—As flavor has the greatest influence on the market value of butter, it is necessary for the butter-maker to refuse in a courteous manner all milk tainted with bad flavors.

If troubled with bad flavors which cannot be overcome by the use of a good starter and ripening at a low temperature (60° F.), nor by appealing to the patrons, then pasteurization of either the whole milk or the cream may be practised.

Pasteurization is the heating of any liquid to a temperature of 155° to 160° F. and holding at that temperature for twenty to thirty minutes, and afterwards cooling it. Its use in butter-making is to remove bad flavors due to bacteria, feed, drink, or absorption by the milk from the surrounding atmosphere.

This process is reliable when a good flavored starter is used to ripen the cream. But if the starter is not good, it will seed the purified cream with bacteria which will produce undesirable results in flavor. The butter made from pasteurized milk or cream has a mild, uniform flavor ; it has good keeping qualities but lacks the high aroma characteristic of butter made from raw cream which has been separated from good milk.

The system may be adopted also in cream-gathering creameries in the late fall months when there is trouble with bad flavors. If the cream is delivered sweet it may be pasteurized with the same good results as in the separator creamery.

Points to Observe when Pasteurizing.

1. Stir the cream constantly while heating to 158°.

2. Do not have the temperature of the water surrounding the vat holding the cream above 180° F., or it will give the milk a cooked flavor.

3. Remove the hot water as soon as the cream has reached the proper temperature.

4. Allow it to stand twenty minutes and then cool rapidly to the ripening temperature.

5. Add 15 to 20 per cent. of starter as soon as the cream is cooled to 95°

6. Stir often while cooling.

7. Use a starter in pasteurized cream, or ripening will not take place, except very slowly.

Cream may be pasteurized in the ordinary cream vat, in a channel vat, or in the more costly but excellent pasteurizers that are now for sale.

Separating.

When the milk arrives at the creamery strain it through a cloth or fine perforated tin strainer.

(NOTE.—Boil the cloth strainer after the milk is washed out of it and give it plenty of sunlight and fresh air to keep it clean.)

Heat the milk to the temperature at which the separator will do the closest skimming, make smooth cream, and do the most skimming per hour. If the separator whips the cream heat the milk to a higher temperature before separating. Have the cream contain 30 to 33 per cent. of butter-fat. Rich cream gives less volume to cool and handle, and it can be churned at a lower temperature.

Ripeneng the Cream.

Have a good starter ready at all seasons of the year to put into the cream when separating commences. This hastens the ripening and controls undesirable flavors that may develop from the presence of undesirable forms of bacteria that may be in the milk. When the cream is to be ripened and churned in 24 hours, cool it to about 70° or 75° temperature, and use a starter in it equal to about two per cent. of the milk separated, or [illegible] 15 to 25 lbs. of starter for each 1,000 lbs. of milk. If the cream is to be pasteurized, do not put in the starter until after the cream has been heated and cooled again to 95°.

The quantity of starter used varies according to the ripeness of the milk, the time allowed for the cream to ripen and the temperature at which it is ripened. Less starter is required in summer than in winter.

As soon as the cream commences to thicken (which should be in about four hours after the starter is added) be ready to cool quickly to at least 55° temperature before leaving it at night. The sweet flavor of the butter may be injured by over-ripening, if the cream is allowed to stand at higher temperature over night. At high temperatures the cream can be well ripened and properly cooled in time for churning any hour the next morning. While equally good and sometimes better results in flavor can be had by ripening at lower temperatures than those here recommended, the high ripening temperatures are possibly best adapted for creamery work.

If the cream is to be held for two days before it is churned, use five to eight lbs. of starter for each 1,000 lbs. of milk; to ripen the cream cool quickly to about 52° and hold at this temperature until churned. The cream in this case should coagulate in about 24 hours after it is separated.

When the cream is cooled quickly to 60° to ripen, use more starter than when ripening at higher temperatures.

Sufficient lactic acid should develop in the cream to cause it to coagulate in at least six to eight hours before it is churned. Always stir the cream frequently while ripening it, to ripen it more uniformly and improve the flavor.

Properly ripened cream will have a smooth, glossy, mirror-like surface. It will pour like thick molasses, and have a sharp but pleasant acid taste and smell, and will show about .65 per cent. of lactic acid by the alkaline test.

Starters.

A good starter will show its strength by causing rapid and uniform coagulation of the cream from day to day. It is important that the starter have a good flavor. If it go wrong from some cause, a fresh culture may be had from the buttermilk of a lot of cream that has ripened by natural souring and produced good flavored butter. It may be had from a neighboring creamery or private dairy; from fresh milk or skim-milk that has been allowed to sour; or from some of the commercial cultures. Sometimes it is difficult to get the right flavor in the starter, even when the commercial cultures are used.

Butter-makers can co-operate with mutual advantage by passing from one creamery to another a small quantity of a choice starter that may be found in some one creamery as a culture, to make fresh starters in the others.

Churning.

In a warm room, prepare the churn with cold water only. If the churn is not in daily use rinse it with hot water, and then cool it with plenty of cold water. In a cold room, or if the cream is a little too cold, scald the churn and do not cool it. If there is more than one churning all that is necessary to prepare the churn for the next lot of cream is to rinse down the inside of the churn with cold water to remove any butter that may be sticking to the sides.

Strive to have the cream at the proper churning temperature at least two hours before it is churned in order to secure a firmer body and better texture in the butter. Churn at 52° to 54° in the fall and winter months, and at 48° to 52°

in the summer months. If the cream conains 27 per cent. or over of butter-fat, it will churn at lower temperatures than these; but if it contains only 18 to 20 per cent. it cannot be churned satisfactorily unless at higher temperatures.

The reasons for cream being difficult to churn in a creamery are:

1. The cream contains too much skim-milk and is churned at too low a temperature. Make richer cream.

2. Too much cream in the churn; it should be only one-third full.

3. The temperature is too low.

4. Adding too much cold water too soon after the butter begins to gather.

If the cream contains too much skim-milk or churned at too low a temperature, the butter forms into round, smooth granules, and considerable difficulty is sometimes experienced in gathering the butter properly. To overcome this difficulty, and when the same trouble results from adding too much cold water, draw off half the buttermilk, or a sufficient quantity to cause the butter to gather as desired in five minutes or less. Butter should always gather in less than ten minutes after it breaks.

When ready, strain the cream into the churn. Add butter coloring before starting, if the market demands it. Half an ounce of butter color per 1,000 lbs. of milk separated will be sufficient for the Canadian markets. Use one-eighth of an ounce or less for the British markets in the winter months. None should be used for either market in the summer months.

It should take 30 to 60 minutes to churn, according to the quantity of cream in the churn. The churn should run from 55 to 60 revolutions per minute.

If the cream thickens and concussion stops when churning (this will be known by sound of the churn) dilute it with some cold water, at about 55° temperature. Enough water should be added when the butter breaks, or when half gathered, to prevent the butter from gathering too soon or before the cream is properly churned.

The granules should be about the size of wheat grains, and not too small, or the butter will retain too much moisture.

If small particles of butter are seen on the first buttermilk drawn off the churning should be continued for a few turns.

Washing the Butter.

The volume of water used to wash the butter once should be equal to the amount of cream churned. A less amount may be used at each time when washing twice. The temperature of the water used should be at from 54° to 58° in the fall and winter months, and from 45° to 50° in the summer months. If the room is warm, and the water not cold enough, put some salt into the water and let the butter remain in it for 10 to 15 minutes to cool. If the butter is to be salted in the churn, it should be washed with water cold enough to prevent it from massing together too readily when the salt is being mixed in. Wash the butter twice when it is likely to be held in cold storage for some time. Wash once when it is known that the butter is to be consumed in less than two months. Use plenty of water; if the butter is forwarded weekly for immediate consumption it is not necessary to wash it. This method works well in the cold weather and where water is scarce or impure. When not intending to wash the butter

put three or four pails of the coldest water at hand into the churn, after the butter granules are the size of wheat grains, and revolve the churn quickly for 6 or 8 turns before drawing off the buttermilk. The cold water cools the butter and dilutes the buttermilk, so that it will give less trouble on the worker. Rinse the buttermilk from the worker when the butter is about half worked.

Salting and Working.

The salt should be kept in a clean, cool place, free from foul odors. It should be fresh, of good flavor, and have a fine even grain. About $\frac{3}{4}$ to 1 ounce of salt per lb. of butter is required for the Canadian markets, and $\frac{1}{2}$ to $\frac{5}{8}$ of an ounce for the British market, when the butter is washed, and when it is salted on the worker. When making unwashed butter or when salting in the churn, use $\frac{1}{8}$ to $\frac{1}{4}$ of an ounce more salt per lb. of butter. Salt the butter to suit the market.

To find the weight of salt required when salting the butter in the churn, multiply the weight of cream by the per cent. of butter fat in it, and divide by 84 to find the lbs. of butter.

Or, find the pounds of milk required to make one pound of butter on previous days, and divide this number into the weight of milk that represents the cream churned. The result will be the pounds of butter in the churn.

Sift on half of the salt that is to be used to salt the butter; give the churn a quarter turn and sift on some more; then give the churn a half turn back, and sift on the rest. (Note.—A fine, perforated tin-bottomed seive is the best and most durable). Mix the salt through the butter with a wooden fork or spade. The butter may remain in the churn after it is salted, if the room is the right temperature. But if the room is too cold or too warm it may be put into a large box made for the purpose, or into tubs, and be removed to a room at a suitable temperature, and there remain two to four hours. Salting the put into this way improves the texture for working, and less working is required to give it an even color. Do not allow the butter to become too warm or too cold before it is worked. About 10 to 16 revolutions of the Mason worker will give an even color and expel sufficient moisture. The amount of working required will depend on the length of time the butter has been salted before it is worked.

When the butter is salted on the worker and finished at one working, it will require at least 24 revolutions of the worker to remove sufficient moisture and give an even color. The lowest roller should be nearly two inches from the table. If the butter is soft and the room warm, it will be better to pass it about eight times under the rollers, and then put it in a cool room for a few hours and work a second time, in order to make the color even.

Working the butter twice may be the best method for the inexperienced butter-maker to adopt; but more butter can be handled in the same time when the butter is finished at one working. Butter is generally in its best condition for working as it is taken from the churn. Its temperature should be above 55° in the winter months, and below 54° in the summer months, when it is finished at one working. Too many make the mistake of not working the butter enough when adopting the one working method. This method requires more working than any other to give an even color and to remove the moisture.

Do not wait until a buyer or commission merchant tells you what defects are in the butter. Some of them will give you no useful information, but will

out the price. Examine it yourself the day after it is made, and see if the flavor, salt and color are right. If defects are found, then corrections can be made, and a loss avoided in a larger quantity of butter.

Mottled or an uneven color in butter is caused largely by an uneven distribution of the salt. More working will correct this defect, but too much working will give the butter a greasy texture.

Packages and Parchment Paper.

Ash or spruce tubs should be steamed for a few minutes, and then be soaked with a strong brine for about 36 hours. Then they should be washed clean and be lined with parchment paper before packing butter in them.

The square, spruce box lined with paraffin wax and parchment paper is the neatest and most suitable package. It should be 12 in. square and 12½ in. deep to hold 57 lbs. of butter, a thin coat of salt paste, and a loose lid.

The lumber used to make these boxes should be wide enough to make the sides without jointing, and it should be free from knots. The boxes should be well waxed in the corners and on the sides, and the loose lid needs to be well waxed on both sides and edges.

The parchment paper should be of the proper thickness (say 40 to 50 lbs. to the ream), should be sweet to the taste, and should tear more easily where it is dry than where it is wet. Each box should have two sheets of paper. One sheet should be 12 inches wide and 50 inches long, and the other should be 12 inches wide and 40 inches long.

Narrow strips of paper 2 inches wide and 12 inches long should be put in the corners. Some prefer having the long sheet 12½ inches wide and do without the strips in the corner.

As some of the dealers object to having salt on the top of the butter, and as salt is necessary to protect the butter from mould, this difficulty can be overcome by putting a sheet of paper 12½ inches square on top of the butter to hold a thin coating of wet salt and brine. If the edges of the paper are left so as to point upwards at the sides of the box, salt can be removed without coming in contact with the butter.

To Prevent Mould.

1. Soak the paper for a few hours in a strong brine before using it.

2. Reject boxes and lids that are not properly coated with the wax, and notify the manufacturer of this defect.

3. Rub a little wet salt around the sides and bottom of the box before putting in the paper.

4. Put an eighth of an inch of salt paste and a loose lid (well waxed on both sides) on top of the butter.

5. Keep the butter in a dry cool room.

Packing.

Stretch a thin rubber band around the outside of the box and over the paper, to hold it in position while packing the butter. Have a packer about six inches square, and commence packing the butter at the centre of the box to drive

out the air. Have another packer two inches thick and eight inches wide to pack the butter closer to the sides and corners. The latter is highly recommended by those who use it. Be sure to pack the butter close to the sides and corners, so that it will look close and solid when turned out in the retail stores. Do not have the butter too cold when packing.

Have a straight-edge notched at both ends to let it down, in order to take out what butter is required to have the right weight and leave a level top.

A sharp, wide wooden spade will do this work fairly well. Put three-quarters to one pound extra into each 56 lb. box to make it hold out the marked weight when it reaches the market.

After the butter is sealed and covered properly, put it into a cold room where the temperature is at least 56°, and as much lower as the temperature can be kept uniform. Changes in temperature have an injurious effect on the flavor.

Fresh brine should be used occasionally to keep the salt moist on top of the butter, when using tubs.

When the butter is put into pound prints, make the butter close and uniform in shape, and wrap the paper around it so it will look neat when it reaches the market. Handle the prints carefully until the butter becomes firm. If the paper is too wide take a straight-edge and cut a strip off one side, or off both sides if the paper is printed.

Shipping.

Protect your reputation and that of your creamery by having your butter turned out in clean, neat packages. Have the lids well fastened on, and the net weight of butter marked on the side. Have the same weight of butter in each package. The date and weight may be marked thus: 5/24—56, which means May 24, 56 lbs.

See that plenty of ice is used in warm weather to preserve the proper temperature of the butter until it reaches the market.

Cream-Gathering Creameries.

The managers of these creameries would be doing themselves and their patrons good service if they required their cream-gatherers to study the points necessary to be observed to get all the cream out of the milk and how cream should be cared for on the farm. There is enough cream or butter fat left in the skim-milk through carelessness and a lack of knowledge of the proper temperatures and right method of skimming, to pay the entire cost of manufacturing the butter. If the cream-gatherers understood this work, they could give valuable instruction to many of the patrons.

The cream should be stirred frequently by the patron, and then by the cream-gatherer, so as to get a just sample for testing.

The waggons should be covered to protect the tanks or cans from the sun, so that the cream may be delivered at the creamery as cool as possible in warm weather.

After the cream is strained into the vats, the butter-maker should examine its condition regarding temperature and lactic acid. A safe rule in warm weather is to cool the cream to 56° or 58° immediately after it is delivered, and hold it at this temperature over night. Churn at 58° or lower if the cream churns easily.

When the cream comes in cold and sweet, raise the temperature to 60°, and use some buttermilk as a starter to hasten the ripening process.

Thermometers.

When purchasing a thermometer, ask your dealer for a dipper of water, then put a few thermometers into the water to see what temperature each will register. Then choose the number you want from among those registering the same temperature.

A thermometer in each room will save many steps in a season's work.

Study and observe the influence of temperature to learn what temperatures will give you the best results.

Judging Butter.

In conclusion, a few notes on judging butter may be of some value. The scale of points used may be as follows:

Flavor	45 points.
Texture, grain and closeness	25 "
Color	15 "
Salt	10 "
Finish	5 "
Total	100 "

Flavor should be so pleasant to the sense of smell, and so sweet to the taste, that it will create a desire for more.

Texture, grain and closeness should be waxy and firm,—not salvy, greasy or crumbly; should be close in body, not spongy, and should not contain too much or too little moisture.

Color should be uniform and according to the requirements of the market.

Salt.—Judge the salt according to the market for which the butter is intended. Too much salt destroys the sweet taste of the butter for any market. Too little salt makes the butter insipid and tasteless for most Canadian people, but the British people demand light salting.

Finish.—Uniform, neat, clean and attractive in appearance.

BUTTER-MAKING ON THE FARM.

By Miss Laura Rose, Lady Instructor in the Home Dairy Department.

The first essential in the manufacture of any article is good raw material, and perhaps in no realm is this more necessary than in the production of high-class butter, which should be the aim of every farmer's wife or daughter.

More and more attention is being paid to the selection of dairy cows. Have cows whose milk record is good, both in regard to quality and quantity, for the two must be considered together. Contrive to weigh and test occasionally the milk from each individual cow. Discard all which do not reach a certain standard, say, 6,000 lbs. of 3.5 per cent. milk in the year. A Babcock tester, which is simple in construction and easy to use, will determine the per cent. of butter fat in the milk, and may reveal the fact that the cow which you considered your best is the least profitable one in the herd.

The cows must be comfortably housed, and well and regularly fed. If you want milk you must give plenty of good wholesome food and an abundance of pure water. The latter is just as essential as the former.

During milking special care should be exercised. The milkers' hands should be well washed, and the cows' udders thoroughly wiped or rubbed with a damp cloth before milking.

The Creaming of Milk.

As soon as the milk is drawn from the cows it should be taken from the stables, well aerated, and set to allow the cream to rise. If the deep-setting system is used, place the cans in water and cool the milk to 45° or below as soon as possible. Cool below 40° in winter.

Have the water the depth of the milk in the cans, and be sure there is always ice in the water, as this method requires less ice and better results follow. Unless plenty of ice has been put up, or there is a very cold, convenient spring on the farm, the deep cans are not advisable, as the loss in butter fat is very high when the milk is not sufficiently cooled. It is just as important to use ice in winter as in summer.

A thermometer is the only safe guide, and one should be used constantly in determining temperatures. For instance, by any other means it would be hard to tell whether the milk was cooled to 50° or 45°.

If cooled to 50°, the loss of butter fat in the skim-milk would be about one per cent., or one-fourth of the butter would be practically lost; while if cooled to 45°, the loss of butter fat in the skim-milk would be from two to three-tenths of one per cent. or a loss of about one-twelfth of the butter. Test the skim-milk to find out what you are doing. It is the unknown leakages which rob the dairy.

An ordinary box or barrel, which will hold water, answers as well as the most expensive creamer, but there must be room for plenty of ice. The water and tank must be kept sweet and clean. Avoid spilling milk in and around the tank or creamer box.

A can with tap to draw off the skim-milk should have a bottom with a four or five inch slant. This carries away any sediment and allows more skim-milk to be drawn off. When there is no tap use a funnel shaped dipper with no wire around the rim, and a long, straight handle. With a knife loosen the cream from the sides of the can, wet the dipper in water or milk, lower it, point first, into the can, allowing the cream to flow evenly into the dipper. Repeat until all the cream is removed.

If kept at the proper temperature, milk set in deep cans may be skimmed in 12 hours in summer, but in fall and winter it should stand at least 24 hours. The longer it stands, if kept sweet, the thicker and richer the cream.

Always keep the cans covered.

Tests from shallow-pan setting prove that there is no more loss of butter fat in the skim-milk from this method than in the deep setting. This is only the case where the greatest care is taken in skimming. The old fashioned perforated skimmer must be abandoned In using it the thin layer of cream next the milk drips through the perforations and readily mixes with the milk, as do also the large drops of thick cream which fall from the skimmer each time it is lifted to the cream crock or can. The following is the most economical way of removing the cream: Run a thin-bladed knife around the edge of the cream, pressing well to the sides of the pan, set the pan on the edge of the cream crock, tilt it sufficiently to allow a little of the milk to run over, holding back the cream with

the knife—this is done to prevent the cream from sticking to the edge of the pan—then with the aid of the knife glide the cream into the cream-crock. Considerable skim-milk may seem to go with the cream, but the cream is so thick that the milk does no harm.

Milk in shallow pans should stand twenty-four hours in summer, and thirty-six hours in winter. Always skim before the milk thickens. Keep in a cool, well-aired room, free from odors of any kind. Remember, nothing absorbs odors so readily as milk and its products; and it is flavor in milk or butter which chiefly determines its value. Avoid having a draft over the milk as it forms a hard, leathery crust on the cream.

Cream Separators.

For a herd of ten or more cows a cream separator will pay. More butter fat is recovered from the milk and the cream is in a sweeter and purer condition than when obtained by any other method. The skim-milk is warm and fresh for the young stock, and the problem of cooling and caring for such a large bulk of milk is solved. If water be scarce, or ice hard to procure, invest in a separator.

Care and Kipening of Cream.

Cream should never set in open crocks or pails in cellars, pantries, or any-place where there are odors or where the air is not pure. The cream crock or can should always be covered, and in summer it should stand in the coolest place in the milk cellar, while in the winter it may be brought into a room where the temperature is from 60° to 70°. Each time the cream can is emptied it should be thoroughly washed, scalded, and put out of doors for an hour or two before being used again.

When starting to collect cream for a fresh churning, add to your first skimming a starter which you know has a clean, good flavor. A pint or two of cream saved from your previous churning, or the same amount of good butter-milk or sour skim-milk answers. The reason for adding the starter is, that the bacteria, which you know produce a fine-flavored butter, get control of the new cream before other germs which might prove unfavorable take possession of it.

Stir well each time new cream is added. Do not add sweet cream shortly before churning. You will have a great loss of butter fat if you do.

Separator cream should be cooled to 60° in winter and to 55° in summer before it is added to the cream crock.

The day before churning examine your cream. If the lactic acid be developing slowly, heat the cream to 65° in winter and 60° in summer by placing the can in a dish of warm water at 100°, and stirring constantly until the desired temperature is reached. In warm weather care should be taken not to overheat the cream or it will become too sour before churning time, and too much acid is injurious to the flavor of the butter. It may not be necessary to warm the cream at all in summer time. Have the cream lowered to churning temperature several hours before churning. It gives a better texture to the butter.

With regard to pasteurization, see "Butter-making in the Creamery" in this bulletin.

Churning.

Before using, the churn should be scalded with boiling water and then rinsed with cold water. After using it should first be rinsed down with hot water, then thoroughly scalded with plenty of boiling water, and occasionally given a scouring with salt. Never allow water to remain in the churn when not in use, and do not leave the lid on. Keep in a cool place to prevent warping.

The ladles and butter printers should be scrubbed with a brush and hot water and then be put to soak in cold water. The worker may be prepared while the butter is draining. Scrub it also and cool well with cold water. A scouring with salt prevents the butter from sticking to wooden utensils.

Always strain the cream into the churn. In winter, if necessary, add just sufficient butter-coloring of a reliable brand to give a nice June tint. Better to err on the pale side than to over color.

No definite temperature for churning can be given; but the necessity for the constant use of a thermometer should be emphasised. The quantity of cream in the churn, the temperature and richness of the cream, the breed of cows, the length of time the cows have been milking, and other circumstances, influence the time required for churning. Try to regulate the temperature and quantity of cream so as to have the butter come in about thirty minutes.

The ordinary farm cream usually contains from eighteen to twenty per cent. of butter fat, and may be churned at from 56° to 60° in summer, but may vary in winter from 60° to 70°. Cream containing twenty-five to thirty per cent. of butter-fat may be churned at much lower temperatures. Low temperatures give a better grained butter and a more exhaustive churning.

Very rich cream is likely to thicken in the churn so that concussion will cease. If this occurs add enough water at the same temperature as the cream to dilute it so that it will churn. When the butter has just come, add the same quantity of water a few degrees colder. This gives the butter sufficient liquid to float in, and allows the buttermilk to run off more freely. When the granules are the size of wheat the butter is churned enough. If small specks of butter appear in the first buttermilk drawn, churning should be continued a short time to prevent loss; only a few turns are necessary sometimes.

Wash with fully as much water as you had cream, regulating the temperature according to the softness of the butter and the mode of salting. If salted in the churn colder water is needed. For butter going into immediate consumption one washing is all that is necessary, but if it is to be kept for a length of time two washings are better.

Allow the butter to drain fifteen minutes before salting. Salt according to the demand of the market, usually from three-quarters to one ounce of salt to the pound of butter. If salting in the churn, from one-eighth to one-quarter of an ounce more salt is required. We strongly recommend salting in the churn, as butter free from specks and streaks can be had with the least possible amount of working by this method, but the churn must be without dashers and the butter granules should be quite firm. The only difficulty in this method is gauging the amount of salt when the exact per cent. of butter-fat in the cream is not known. To salt in the churn tip the churn backward and forward several times, while sifting on the salt. Then revolve the churn slowly to mix in the salt more evenly. After allowing it to stand fifteen minutes gather in a lump and leave it in the churn from two to four hours, or if the room be warm, it may be lifted out into a butter tub and put into the cellar for that length of time.

For the home dairy there is nothing nicer than the V-shaped lever butter worker. Work by means of downward pressure. Avoid a sliding motion, as it injures the grain of the butter. Just work sufficiently to expel the moisture. If salting on the worker, after the butter has drained take it from the churn, weigh and put it on the worker, weigh the salt, sprinkle it over the butter, and give more working than with the other method.

Make into pound prints or any desired form. Have the package neat and attractive. Use parchment paper. Dip it in water before wrapping about the butter, as it prevents sticking.

Keep the butter in a cool, sweet place and get it to market as soon possible.

A Few Don'ts.

Don't be in such a hurry that you lose money for the sake of a little time.

Don't fail to put up ice if you use the deep-setting cans.

Don't put off churning too long. Your butter will have an old taste.

Don't fill the churn quite half full or you will be a long time in churning.

Don't take the temperature of the cream with your finger. You cannot depend on its accuracy.

Don't wash your milk pails, pans, cans, etc., with the dish cloth. Have either a hair or broom brush on purpose for these utensils and give it a boiling once in a while in salt brine.

Don't dry your milk utensils. Put them in a position to drain and allow the heat from the scalding water to dry them; also give them plenty of fresh air and sunshine.

Don't be satisfied till you have gained a reputation for making the very choicest butter.

Improvement consists in learning what others have done and going beyond that. Let this be your aim.

CHEESE-MAKING.

By T. B. Millar, Instructor.

Spring Cheese.

In the spring, before commencing cheese-making, it is necessary to see that the factory, apparatus, and everything connected with it, is perfectly clean, and in good repair. Then, on commencing, see that the milk delivered is clean, sweet, and free from bad odors. If it is not it is the cheese-maker's duty to instruct his patrons in the care of milk and to reject all milk that is not in good condition. In order to make the quality of cheese demanded at the present time we must get better milk, for we cannot make fine cheese unless we do, and this can be obtained only through the medium of the cheese-maker.

(Bulletins on the care of milk may be obtained by applying to the Department of Agriculture, Toronto.)

For early cheese, heat the milk to eighty-four or eighty-six degrees Fahr., and stir gently while heating, as quick or rough stirring causes a loss of butter-fat. Make a rennet test as soon as possible, and if the milk is ripening quickly set early. To make the test take eight ounces of milk at eighty-six degrees, add one dram of rennet of known strength, and stir rapidly for ten seconds, noting the number of seconds it takes to coagulate. If coagulation takes place in from twenty to twenty-two seconds the milk is matured sufficiently and the rennet should be added at once. It may be necessary to vary the test a few seconds to suit the conditions of different localities, but a few trials should enable the maker to tell when the milk is in the proper condition, care being taken not to mature the milk too far before setting.

If colored cheese is desired use about one and one-half ounces of coloring per 1,000 pounds milk, and have the coloring matter well mixed with the milk before the rennet is added.

Ripen or mature the milk so that sufficient acid for dipping will develop in from two and three-quarters to three hours after setting. When dipped the curd should not show more than one-eighth inch of acid by the hot iron test. Great care should be taken at this point, as the acid develops very rapidly.

Enough rennet should be used (from four to five ounces per 1,000 pounds milk) to coagulate the milk fit for cutting in from fifteen to twenty minutes. Use the horizontal knife first, then the perpendicular, cutting continuously until completed. Commence cutting early, taking plenty of time.

Stir the curd gently with your hands or with agitators for ten or fifteen minutes before any steam is turned on; also see that the curd is free from the sides of the vat before applying the steam.

Rough handling at this stage means a loss both in quantity and quality.

Heat the curd slowly to ninety-eight degrees, taking from thirty-five to forty minutes to do so. After the heat is up to the desired point, continue stirring for fifteen or twenty minutes to insure uniform cooking. Draw off part of the whey early and dip with a small acid, from one-sixteenth to one-eighth inches, having the curd in such condition that it will not require much stirring in the sink, then pack it from four to six inches deep, according to the condition of the curd, and when matted sufficiently, so that it can be turned without breaking, cut in strips from four to six inches wide and then turn every ten or fifteen minutes—or often enough to keep the whey from gathering on the curd. After they are turned once or twice, these strips may be piled two deep.

Keep up the temperature until the curd is ready for milling; then mill as soon as the curd becomes flaky and shows from three-fourths to one inch of acid. Stir often and air well. Salt when the curd becomes mellow, feels like velvet, and smells like newly-made butter. Use some brand of pure dairy salt, salting at the rate of one and one-half to two pounds of salt per 1,000 pounds of milk. The curd should be at a temperature of from eighty-three to eighty-five degrees, and when the salt is thoroughly dissolved the curd is ready to put to press.

Apply the pressure slowly at first. Do not be in a hurry to apply all the pressure until the whey runs clear, then gradually increase it. After the cheese has been in the press forty-five minutes or longer, take them out and pull up the bandages neatly, trimming them so as to leave about three-quarters of an inch on each end.

Turn all cheese in the hoops every morning and see that each cheese is finished perfectly before it leaves the press room.

The curing-room should be kept at an even temperature of from sixty-five to seventy degrees, and should be well ventilated.

NOTE.—When quick curing cheese (ready to ship in from ten days to two weeks) is not desired, use less rennet and more salt.

Many curing-rooms may be very much improved by placing two thicknesses of building paper on the inside of the present lining. Then nail two inch strapping on the paper and line with one or two thicknesses of matched lumber. The ceiling, as well as the walls, should be lined in this manner. Shutters on the windows, ventilators in the roof, and a supply of ice placed on suitable racks in the curing-room will save many dollars worth of cheese in hot weather. Sub-earth ducts are highly recommended by those who have used them.

For colder weather, a coal furnance which causes a circulation of air and an equal temperature in all parts of the room, night and day, is a necessity. An ordinary wood or coal stove is not suitable for heating a curing-room, as the heat is not evenly distributed among the cheese.

Summer Cheese.

Heat the milk to eighty-four or eighty-six degrees Fahr., and make a rennet test. In very hot weather it is advisable to make a test before the temperature quite reaches eighty-four degrees, and if the acid is developing quickly, set at eighty-four degrees, but if not, raise the temperature to eighty-six degrees.

Set the milk so that the curd will be ready to dip in from two and three-fourths to three hours with about one-quarter of an inch acid by the hot iron test.

If colored cheese is desired, add the coloring as soon as you can get the weight of the milk in the vat.

Use enough rennet to have perfect coagulation fit for cutting in from thirty to thirty-five minutes.

See directions for cutting, stirring and cooking the curd under the heading of Spring Cheese.

Draw off part of the whey early so as to be prepared for the quick development of acid. Dip the curd when it shows from one-eighth to one-fourth of an inch of acid and endeavor to have the curd in such condition that it will not require much stirring in the sink. When matted so that it can be turned without breaking, cut in strips about six inches wide and turn often enough to keep the whey from gathering on the curd; then pile two or three deep, leaving a space between the columns to allow the whey to escape.

Mill when the curd becomes flaky and shows from one to one and one-fourth inch acid, then air well by stirring immediately after milling and every few minutes until ready for salting.

Mature well before salting. Use at the rate of two and one-half to two and three-fourths pounds of salt per 1,000 pounds of milk, varying the weight of salt according to the amount of moisture in the curd.

In hot weather do not cover the curd after milling, and lower the temperature as much as possible before putting the curd into the press.

Fall Cheese.

In making fall cheese the system is similar to that used in making summer cheese, excepting the following points:—

If the milk is working slowly use some clean-flavored starter.

Use enough rennet to have coagulation take place in from thirty-six to forty minutes.

After dipping, keep the curd warm.

Mill when it is flaky and shows from one and one-quarter to one and one-half inch acid.

Salt at the rate of two and three-quarters to three pounds salt per 1,000 pounds of milk.

Leave the cheese in the press for one hour before bandaging. Use plenty of hot water and make sure that each cheese has a perfect rind before putting on the shelves in the curing-room.

Over-ripe Milk.

When the milk is over-ripe, set as soon as possible at a lower temperature than usual—at from eighty-two to eighty-four degrees. Then, as always, make a rennet test. In a case of this kind more rennet should be used—one ounce extra per 1,000 pounds of milk.

Commence to cut the curd early and cut finer than usual, that you may be enabled to cook the curd more quickly.

Cook quickly, draw off a portion of the whey early, and stir well. Dip the curd, when it can be accomplished, with less acid than usual, and stir well before allowing it to mat in the sink. Turn often, being very careful not to allow any whey to gather on the curd. Mill early, or when the curd will show three-quarters of an inch of acid, and try to have the curd in a flaky condition at this stage. Air and mature well. Do not be in a hurry to salt a curd of this description, for if it has been milled at the proper time and well stirred there is no danger of it getting too much acid in the sink.

Gassy Milk.

In treating gassy milk note the following points :—

The milk should be matured more than usual before setting (some two or three seconds more).

Let the curd become quite firm before cutting, and be careful to leave the cubes large, so as to retain more moisture. Stir for fifteen minutes before turning on any steam.

When cooking, heat slowly to ninety-six or ninety-eight degrees, and be careful not to get the curd hard at this stage. Raise the temperature two or three degrees just before dipping.

Dip the curd with one-quarter inch acid, and if it has been *cooked* properly it will not require much stirring in the sink. Turn frequently, at the same time piling the curd three or four deep in the sink. Mill when it is flaky and shows one and one-quarter inch acid. Air and *mature* well before salting.

Tainted Milk.

Heat tainted milk to eighty-eight degrees and air frequently by dipping or pouring, until the milk is ready for setting. If a sharp, clean-flavored starter is available, use a little extra with milk of this kind.

When the curd is heated to ninety-eight degrees draw off a portion of the whey, and when it is ready for dipping raise the temperature two or three degrees and stir well.

Dip the curd with a small amount of acid, about one-eighth of an inch, endeavoring to have it in such condition that it will not require much stirring in the sink. Keep the temperature at ninety-two or ninety-four degrees until the curd is ready for milling. Mill when the curd is in a flaky condition and shows about one inch acid.

Air by frequent stirring and mature well before salting.

Notes.—When making colored cheese, pour the coloring into a large dipper of milk taken from the vat, then draw the dipper quickly along under the surface of the milk from one end of the vat to the other, and be sure that the coloring is evenly mixed before the rennet is added.

The rennet should be diluted with one gallon of pure *cold* water to each vat, and the milk should be well stirred for from three to five minutes (according to the condition of the milk) after the rennet had been added. In the case of over-ripe milk two minutes will be time to stir after adding the rennet.

Important to Know and Practise : 1. That milk for cheese-making shall not be ripened so that it will dip in less than two and three-quarter hours. 2. That unless the curd is well *cooked*, you cannot make a *fine* cheese. 3. That the maker and factory should be as clean as hot water and scrubbing can make them.