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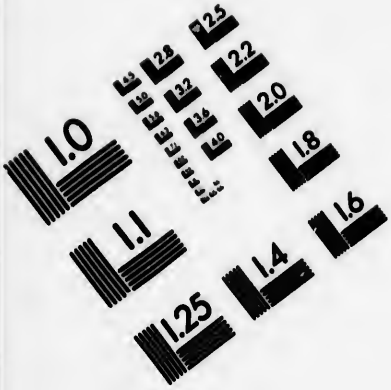

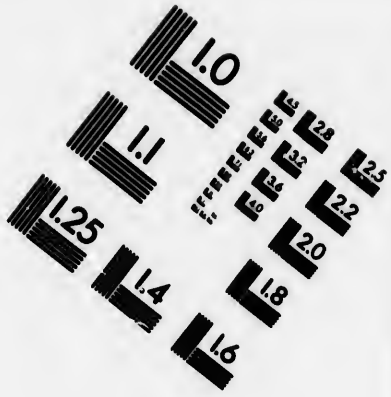

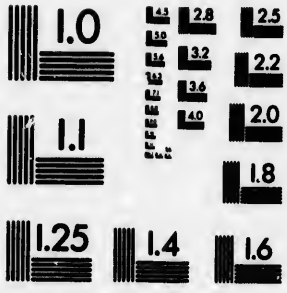

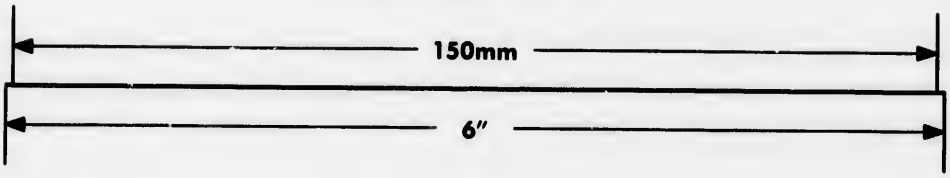

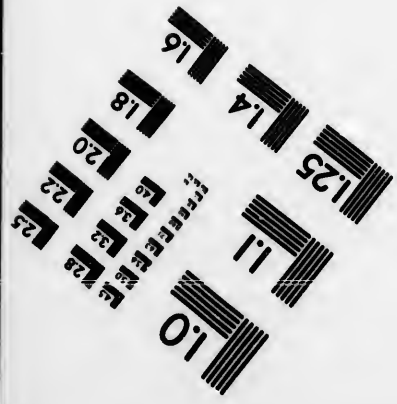

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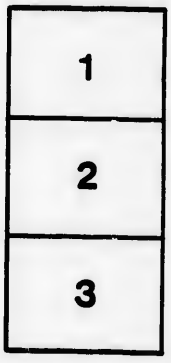

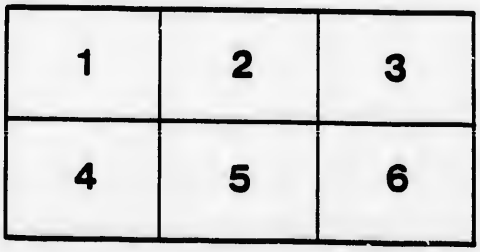

ERRATA

In [illegible] paragraph [illegible] page 15:

For six and two fifths READ three [illegible] one fifth o

And for six ounces READ three [illegible]

ONTARIO AGRICULTURAL COLLEGE,

DAIRY DEPARTMENT.

BULLETIN XCIII.

DAIRY BULLETIN,

BY THE

SPECIAL DAIRY SCHOOL.

MILK TESTING.
SEPARATOR CREAMERIES.
CREAM-GATHERING CREAMERIES.
SPRING CHEESE.
SUMMER CHEESE.
FALL CHEESE.

PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.

TORONTO, April 6th, 1894.

TORONTO:
PRINTED BY WARWICK BROS. & RUTTER.

MINISTER OF AGRICULTURE.

HON. JOHN DRYDEN, TORONTO,

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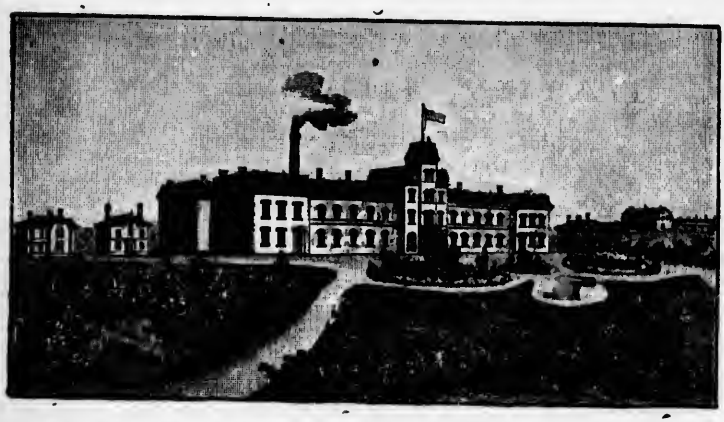

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BULLETIN XCIII.

DAIRY BULLETIN.

This Bulletin has been prepared by Committees of the Special Dairy School, 1894, at the Ontario Agricultural College. The portion relating to cheese is largely a reprint of Bulletin LXXXVIII. The committees are :

MILK-TESTING.—L. A. ZUFELT, Chesterville, Ont., Instructor in Milk-Testing; T. B. MILLAR, London, Ont., Assistant Instructor in Cheese-Making; WM. CAMPBELL, Cannamore, Ont.; MISS G. E. PEACOCK, Mt. Salem, Ont.

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FALL CHEESE.—A. T. BELL, Tavistock, Ont.; W. A. Edgar, Brussels, Ont.; J. T. HILL, Napanee, Ont.

MILK-TESTING.

The term, milk-testing, up to a few years ago, simply meant the detection of adulterations in milk. Now, however, it means a little more, viz., the comparative valuing of the different milks delivered, either to a cheese factory or creamery. We may, therefore, divide the work into two parts—first, the detection of adulterations in milk and second, paying for milk according to quality or, as it is commonly called, the test plan.

DETECTION OF ADULTERATIONS IN MILK.

The most usual adulterations of milk are the addition of water and removal of cream. Those factory men who pay for milk according to quality need have no fear of either of these, as the system makes it the interest of every man to supply as rich milk as possible, but as there are many factories that still do business on the pooling system, it is thought advisable to describe the methods by which said frauds may be detected.

The first step to be taken is to find out the specific gravity of the milk. This is done by means of the Quevenne lactometer, which has a scale corresponding to the Sp. G. (specific gravity) of milk. The graduated scale from 15 to 40 being equivalent to a Sp. G. of 1.015

to 1.040; thus a milk which has a Sp. G. of 1.032 would show on the lactometer a reading of 32. These lactometers are made to give the Sp. G. at a temperature of 60° F., and as it is not always convenient to have the temperature of the milk at 60° when the reading is taken, corrections may be made for slight variations (not more than 10°) by adding to the L. (lactometer) reading .1 ($\frac{1}{10}$) for each degree of temperature above 60°, or subtracting .1 for each degree below 60°. For example, the L. reading is 29, and the temperature 68°; then the correct reading or Sp. G. for 60° would be 29 + .8 = 29.8. Had the temperature been 56°, the correct reading would be 29 − .4 = 28.6.

The average composition of milk is as follows:

Water, 87 to 88 per cent.

Fat (F.), 3.0 per cent. and upwards.

Solids not fat (S. N. F.), 8.5 to 9.5 per cent.

The Sp. G. or L. reading of pure milk ranges from 28 to 34, skim-milk 33 to 36.

The next step to be taken is to find out the per cent. of fat. This we do by means of the Babcock Tester. Then having obtained the per cent. of fat and the Sp. G., the per cent. of S. N. F. (solids not fat) may be obtained by the following formula:

$$\frac{L \times F.}{4} = \text{per cent. of solids not fat.}$$

L = Lactometer reading or specific gravity at 60°.

F = Per cent. of fat.

To find the extent to which a known sample of milk has been watered, multiply the per cent. S. N. F. in the adulterated sample by 100 and divide by the per cent. S. N. F. in the pure sample. The result will be the number of pounds of pure milk in 100 pounds of the sample examined, and the remainder will be the number of pounds of water. Pure milk contains not less than 8.5 per cent S. N. F., and often as high as 9 and 9½ per cent., and where it is not possible to get a sample of the pure milk for testing, use 8.5 as a standard for the first half of the season and gradually increase to 9 as the season advances, say beginning to use 9 the 1st of September. To make the foregoing more plain, take the following example:

L. reading 28, temp. 54°, per cent. fat 2.6, and, suppose the pure milk to test 9 per cent. S. N. F. Required to find the per cent. of water added. The correct L. reading is 28 − .6 = 27.4, then substituting for formula we get:

$$\frac{27.4 + 2.6}{4} = \frac{30.0}{4} = 7.5 \text{ per cent. S. N. F.}$$

then $\frac{7.5 \times 100}{9 \text{ (per cent. S.N. F. in pure milk)}} = \frac{750}{9} = 83.\dot{3}$ per cent. pure milk.

Then 100 − 83.3̇ = 16.6̇ per cent water in the adulterated sample.

Points to be Observed.

1. Always mix milk well before taking the lact. reading. Do this in such a manner as not to make it froth or foam.
2. If it is desired to change the temperature of the milk, do so in such a way that it will be uniform throughout.
3. Always let milk stand an hour after being drawn from the cow before testing with the lactometer, as it is saturated with air and has not reached its maximum density.
4. When the L. reading is high (33 and upwards) and the per cent. of fat low (below 3 per cent.) it is an indication of skimming.
5. When the L. reading is low (below 28) and the per cent. of fat low, it indicates watering.
6. When the L. reading is normal and the per cent. of fat *very* low, it indicates both skimming and watering.

NOTES ON HANDLING THE BABCOCK TESTER.

1. See that bottles are properly graduated. This may be done by filling up to the O mark with water of the same temperature as the room, after which carefully wipe out the neck with filter paper. Then put in 2 c.c. of water with a 2 c.c. pipette, which should fill the neck up to the 10 per cent. mark. If the variation is more than .2 per cent. the bottle is not correct and should be discarded. Another very good way and perhaps the most practical, is to test one quality of milk with all the bottles and compare the readings, keeping only those bottles which give the same results.
2. Have bottles numbered.
3. Determir[illegible] strength of acid. This may be done by using different quantities and thus find out which gives the best result.
4. Be sure and get a representative sample of milk in the bottle, by thoroughly mixing before measuring with the pipette.
5. Be sure and get the correct amount (17.6 c.c.) in the bottle by blowing all the milk out of the pipette into the bottle.
6. Pour in the acid so that it will run down the side of the bottle under the milk, and not directly through it, otherwise you will be likely to have charred portions of casein and milk-sugar mixed with the fat.
7. Thoroughly mix acid and milk by giving the bottles a rotary motion, seeing that no portion of the milk enters the neck of the bottle.
8. Place immediately in the machine and revolve for four minutes at the rate of from seven to twelve hundred revolutions per minute, according to the size of the machine.
9. Then add water at a temperature of not less than 130°, being careful not to fill above the 10 per cent. mark.

10. Revolve again for one or two minutes.

11. Place bottles at once in a hot water bath, after which read carefully from highest to lowest limits of fat, holding the bottle in a perpendicular position and the fat on a level with the eye.

12. Empty bottles directly after reading and rinse out twice thoroughly with hot water, using when necessary a little sal soda in the first water.

13. Always keep bottles *clean*.

14. The warmer the milk the less acid is required, and *vice versa*; consequently in the fall of the year it is advisable to warm the milk to about 70° by placing test bottles in a pan of hot water, or else use more acid.

15. Always keep bottles warm.

16. Dark, cloudy readings are caused either by using too much acid, milk at too high a temperature or acid not being properly added. If butter-fat is of a light color with particles of a curdy matter mixed with it, it indicates either not enough acid has been used, or milk has been too cold, or milk and acid have not been thoroughly mixed.

17. Be careful and exact from beginning to end if you wish to be successful.

Paying for Milk According to Quality.

This system assumes that the relative values of all milks that are pooled together for either butter or cheese, are in direct proportion to the amount of fat which each contains. The method is applied by dividing the net proceeds among the patrons in proportion to the total amount of fat which the milk supplied by each contains. To illustrate take the following example :—A., B., C., D., represent the patrons of a factory. The amount of milk which each supplied and also the quality being as follows :

A.	1,000	lb. testing.....	3.7	per cent. fat.
B,	2,000	" "	3.5	"
C.	3,000	" "	3.8	"
D.	4,000	" "	4.0	"

From this milk was manufactured 1,000 lb. cheese which sold for 10c. per lb. and the cost of manufacturing being 1½ c. lb. Required to find the amount of money each should receive, the butter-fat as explained below, being worth 22.31c. per lb.

The total lb. of fat in each patron's milk is found by multiplying the number of lb. of milk by the per cent of fat and dividing by 100, as per cent. simply means, so much in 100. The total amount of cheese made was 1,000 lb. which sold for 10c. and cost of manu-

facture was 1½c. this would leave 1000x(10—1½) or 1000x8½ = $85.00 to be divided. Now divide this amount by the total number of pounds of fat, which is 381, and we will get the price for one pound which is $\frac{85.00}{381}$ =22.31 cts. Then by multiplying the number of lb. of fat which each patron supplied by 22.31 cts. we will get the amount of money which each should receive.

Name of Patron.	Lb. of Milk.	Per cent fat.	Total lb. fat.	Price per lb.	Amount which each should receive.
				cts.	$ c.
A	1,000	3.7	37.	22.31	8 25
B	2,000	3.5	70.	22.31	15 62
C	3,000	3.8	114.	22.31	25 43
D	4,000	4.0	160.	22.31	35 70
Total			381.		85 00

Again, supposing the milk had been made into butter and the yield was 425 lb., which sold for 24c. and cost of manufacturing was 4c.lb. we would then have 425x20c. =$85.00 to be divided among the patrons or the price per lb. of fat would be 22.31 cts. the same as in the previous example, and the amount which each would receive would be the same as before.

The Composite Test.

As it is impossible in large factories to make a test of each patron's milk every day without a great deal of extra expense and labor the best method to pursue is that of composite sampling. This is done by taking a sample of each patron's milk each morning, say 1 ounce, and put in a glass jar or sealer along with about 5 or 10 grains (or about what will lie on a 10-cent piece), of bichromate of potash. This quantity is sufficient to keep the milk in a perfectly liquid condition for one or two weeks, at the end of which time the test can be made in the usual way, care being taken however, to have the cream and milk thoroughly mixed before taking the sample with the pipette. The result will be the average per cent. of fat in all the milk supplied by each patron up to the time of making the test. Then to find the amount of fat which each delivered, multiply the total amount of milk sent, by the per cent. of fat and proceed as in the example given above.

In this way tests can be made once every one, two, three or four weeks with equally good results, as samples have been kept for two months and longer which tested as well as when kept only one week, but where convenient, testing every two weeks would perhaps give better satisfaction to the patrons.

Observe Carefully the Following Points.

1. Get a fair representative sample of milk each morning.
2. Shake the sealer or jar with a rotary motion each time a new sample is put in, being careful not to churn the milk.
3. If samples are kept for three or four weeks, use a corresponding larger quantity of the bichromate.
4. If cream should gather on the samples and become thick so as not to readily mix with the milk, before testing, stand the jars in warm water for a few minutes, shaking frequently when the cream will quickly dissolve again.

THE SEPARATOR CREAMERY.

In the creamery, as in the private dairy, the first and most important requisite to success is cleanliness.

As it is impossible to turn out a good finished article without good material to work upon, no milk should be accepted but that of good quality and free from any objectionable odor or taint. It is important that milk should be aerated as soon as drawn from the cow, care being taken to see that the air is pure. It should also be protected from rain ; rainwater in milk makes it impossible to secure a good quality of butter. Milk from healthy cows only, fed on wholesome food and having access to pure water, should be accepted by the buttermaker. The pastures, yards and lanes should at all times be kept free from carrion and all decaying matter.

The milking should always be done with dry hands and in a cleanly manner, the udder being well brushed or wiped with a damp cloth. All vessels, pails, etc., should be of tin, and should be thoroughly scalded each day. Wooden pails should never be used. The buttermaker should at once reject any milk that is found to contain any bad odor, or any that is delivered in cans not properly cleaned and scalded. It is well to accompany the rejected milk with a notice as to its defect, and also, if possible, with the remedy.

After strictly enforcing the foregoing, the butter-maker should keep the factory in the best possible condition, as an example to those of his patrons who may visit him.

In order to keep the separator in good running condition, all oil must be kept wiped off, and the bearings kept free from any water, dirt or grit. Keep all parts with which the milk comes in contact thoroughly clean and well scalded every day.

The temperature of the milk to be separated should be from 80° to 85°, not allowing it to go higher, as the cost in time and ice in cooling is increased, and the quality of the product is likely to be injured.

The cream should be cooled as soon as possible after separation to about 45° to 50°, and held at that temperature until about eighteen hours before churning, then warmed to about 60°, or churning temperature. If the cream should not ripen sufficiently, add sufficient starter to give the cream a sharp, acid taste and glassy appearance on the surface. About two per cent. of starter will usually be sufficient.

To prepare the starter, take fresh skim milk that is known to be free from any odor or taint and warm it to 90°, keeping it at that temperature for twenty-four hours, when it will be ready for use. It should be kept excluded from the air as much as possible, more especially if the air be at all impure. Use a small amount—about one per cent.—of the starter already made to stimulate the development of the next day's starter. This may be omitted on Saturdays, as the length of time over Sunday will give sufficient development of lactic acid, and the starter will be entirely fresh each week.

We favor cooling the cream to a low temperature immediately after separation, and ripening it in a few hours, using starter when the season and condition of the milk requires it, for the following reasons:

1. The solids in cream other than fat are subject to rapid decomposition.

2. This decomposition is not favorable to the keeping quality of whatever it effects.

3. Butter always contains a proportion of solid matter that is not fat, and the less this has advanced towards decomposition the better the flavor of the butter, and the longer will this flavor be retained.

4. This decomposition in cream is very rapid at a high temperature, while at a low temperature it is retarded.

Churning.

See that the churn is well cleaned inside, with a brush, at least once a week in cold and twice a week in hot weather, and scalded each day before and after using. Cool it before putting in the cream, which should always be strained into the churn.

Thick cream churns easier than that which is thinner; but to get the best results it should contain from 25 to 30 per cent. butter-fat.

If for any reason it should be thicker than this, it should be diluted with pure water or skim milk of the proper temperature. Churn at as low a temperature as is possible to get butter in from thirty-five to seventy minutes. To warm or cool cream, do so by putting warm or cold water or ice around the vat or vessel containing it, and stir it frequently. Never put hot water, steam or ice directly into the cream, as this tends to injure the grain of the butter, and causes in two many instances white streaks and poor flavor.

When necessary to use color, add sufficient to make the butter as nearly as possible the color of that made in June. Always add the color before starting the churn. About one-half ounce per thousand pounds of milk in winter will usually be found sufficient, gradually increasing to that amount in the fall, and lessening towards spring.

As soon as the cream breaks, or at the first signs of butter, add enough cold water to lower the contents of the churn 2° or 3°, and continue to churn until the butter granules are the size of wheat grains. Allow the churn to rest in a position to draw off the buttermilk for four or five minntes, that the particles may all rise to the top. Then draw off the buttermilk, straining it to prevent any loss of butter. Add at least as much water as there was buttermilk at a temperature of 50° or 52° in winter, and 45°, as nearly as possible, in summer. Revolve the churn as fast as possible for about two minutes, then draw off the water, straining as in the case of the buttermilk. Then add the second water—about the same quantity as for the first water—at 56° to 58° in winter and 52° to 58° in summer, and repeat as before. If for any reason the second water does not come off clear, or nearly so, repeat the washing until it does.

Allow the contents of the churn to drain well; then take the butter out carefully, using a wooden spade, care being taken to keep it in a granular form. Weigh, and place the butter on the worker, adding salt sufficient to suit the taste of the customer. From three-fourths to one ounce of salt to one pound of butter will usually be found sufficient.

Work carefully and evenly, avoiding any rubbing or friction, until the salt is evenly distributed and excessive moisture is expelled. From seven to eight times over will usually be sufficient. Turning inwards and outwards, then doubling, is meant to be once over on the power worker. Then pack in tub. If for prints, about five or six times over will be sufficient working.

To prepare ash or spruce tubs for use, they should be pickled in hot brine for twenty-four hours or steamed over a steam jet for thirty minutes. Tin-lined tubs should be thoroughly scalded and cooled before using. Remove any resin or specks on the tin. Put the butter in the tub in small quantities, pounding it thoroughly around the edges with a suitable pounder, keeping the surface of the

butter level. The tubs should be filled to within one-half an inch from the top, leaving the surface slightly crowning. Cover with parchment paper or butter cloth, or, what is better, with both. This should be covered with a salt paste, made by putting salt in cold water. The tubs should be filled until the salt is level with the top of the tub. Lining the tub with parchment paper before putting in the butter will be found to give good results.

The temperature of the storage room should not be higher than 56°, and as much lower as it can be kept uniform.

THE CREAM GATHERING CREAMERIES.

In order to attain a good reputation for our butter made in cream gathering creameries, the patrons who supply the cream should take a lively interest in supplying it sweet, clean and of pure flavor. To do this cleanliness must be the watchword. All pails and other utensils should be thoroughly washed and then scalded, after which they should be placed outside in a pure atmosphere to become well aired. Never use a cloth for drying any of the tinware after scalding them.

The milk room should be kept cool, clean and with no bad odors. Strain and set the milk immediately after milking, in water at a temperature of not more than 45 degrees in the summer and 38 to 40 degrees in the fall and winter for at least 12 hours in summer and 24 hours in winter. Every farmer who handles milk should use a thermometer, so that he may know that the milk has been cooled to the temperatures named above, as the loss of cream or butter-fat is very great when the milk has been cooled to but 50 degrees. To have profitable returns from the handling of milk for a creamery, the patrons should provide plenty of ice and have it stored in a convenient place near the milk room. The water in the tank should be changed frequently, and care should be taken to prevent any milk getting with it and allowing it to become tainted from this or any other cause. If care and good judgment is exercised much unnecessary trouble and labor can be avoided. It is not necessary to change the water more than once every second day where good clean ice is used. Where the skim milk is not drawn off from the can at the bottom a skimmer made 4½ inches in diameter at the top, without any wire around the edge and tapering to a point 7 inches deep, with a handle 10 to 12 inches long, will be found very convenient for skimming the cream from the top of the can. If the skim milk is drawn from the bottom of the can, a strip of glass should be soldered from the bottom upwards, so that the cream can be seen when it reaches the bottom. Tip the can a little so as to allow all

the skim milk to run out without taking any of the cream. We would suggest having a bottom with three inches slant to carry off all sediment that may be at the bottom along with the first skim milk. But for general use we would recommend skimming from the top, as there will be less sediment in the cream. Where the cream has been forced up in 12 hours there will be more inches of cream than if the same milk was allowed to set for 24 hours, but the yield of butter will be about the same per hundred pounds of milk. Where the temperature of the milk cannot be lowered to 45 degrees we would recommend setting the milk for 24 hours. The per cent. of butter-fat in the cream depends on the amount of skim milk in the cream. The depth or inches of cream on the top of the can depends on the per cent. of fat in the milk and the temperature to which the milk has been cooled. There will be more cream on milk containing 4 per cent. butter-fat than on milk containing 3 per cent. There will be more on milk cooled to 42 degrees than on the same milk cooled to 50 degrees.

As an educator for dairy farmers we know of nothing equal to the Babcock milk tester, which is simple and easy to operate, and would strongly recommend all dairy farmers to have, in some way, their individual cow's milk tested (also the skim milk) as we know there are a large number of unprofitable cows fed and kept which should be disposed of. Each cow should give at least 6,000 lb. milk, which should make about 250 lb. butter per year. The skim milk should be tested that the farmer may know whether he is getting all the cream out of the milk. We have frequently tested skim milk from farmers, showing from 1 to over 1½ per cent. of butter-fat, which means a loss of about 25 per cent. of all the butter-fat in the milk, or in other words a loss of from 20 to 25 cents per hundred pounds of milk. No expensive creamer is necessary to get all the cream out of the milk, so long as you can maintain the proper temperature, as it is the temperature of the water about the milk which does the work and not the creamer into which the cans or pails of milk are placed. Any ordinary box or barrel which is clean and will hold water, will do the work as efficiently as the most expensive creamer made.

Where shallow pan cream is taken to a creamery the milk should be set in a clean cool room at a temperature of 60 degrees and lower, for 24 hours, but no longer, as all the cream will be up in that time and of a better quality than if allowed to remain longer, as the cream being exposed to the air in warm weather becomes thick and tough and will not run through the strainer at the creamery, which means a loss to the other patrons who supply good cream. Such cream should be rejected, as it is better to lose one patron than ruin the reputation of the creamery, as it is difficult to make good flavored butter from shallow pan cream because there are very few milk rooms throughout the country which are fit to set milk in. Good flavor

is the most important point about butter. Buyers look for flavor first. If the flavor is bad, down goes the price. We would recommend for creameries that all milk should be submerged in the water to protect it from any foul odors that may be about the dairy.

(Some of our best creameries refuse to take shallow pan cream at all. This, no doubt, is the safest plan.)

Where cold water or ice cannot be got we would recommend for a herd of from 15 to 20 cows a cream separator. These separators usually leave about one-tenth of one per cent. of butter-fat in the skim milk, while milk from the deep setting when cooled to only 50 degrees usually has about one per cent. But if the same milk had been cooled to 42 degrees or 45 degrees the loss of fat would be but from one to three-tenths of one per cent.

Care of Cream

After the milk has been carefully skimmed the cream should be submerged in water in a can specially made for the purpose, keeping the temperature somewhat below 50 degrees, stirring well each time fresh cream is added. If the cream is cared for in this way there will be no complaints about sour cream and the patron will have done his duty in supplying the butter-maker with the raw material in prime condition to make gilt edge butter. Cream should not be set in open crocks or pails in cellars, pantries or any other place where the air is not perfectly pure, nor where the temperature is above 60 degrees, as it is sure to sour and may be in churning condition before taken to the creamery. When the cream vessel is emptied, it should be well washed and scalded, and placed where it will get plenty of fresh air. All cream vessels should have an air-tight cover, and we would recommend having the seams in all milk vessels well filled with solder, which if not filled, an accumulation of dirt having a yellow color which will taint the milk, will be seen.

The Cream Gatherer.

He should be clean, courteous, obliging and honest. He should keep the cream cans or tank thoroughly clean and in the best possible condition for the reception of the cream and should allow the cans or tank to get all the fresh air at night possible. The wagon should be kept clean. The managers of the creamery should see that this as well as many other things of like importance are attended to.

The collector should be very careful about the measurement and mixing of the cream before the samples are taken, as carelessness on his part may cause a shortage of butter and an unjust division of the proceeds. The cream should be stirred carefully after it is poured into the measuring pail so as to make it uniform before the sample

is taken for testing. Measure carefully and give the patron credit for the full number of inches. Give a statement of all cream received from each patron and the date to the person in charge of the creamery.

The manager of the creamery should take steps to have the cream delivered at a temperature not above 60°. To do this tanks or cans should be provided with dead air spaces around the cream so as to protect it from the heat, and the wagon should be covered to protect the tank or cans from the sun. If the patrons will do as directed in the care of the cream it can be delivered much cooler than is usually done, and a superior quality of butter can be made. The cream should be strained through a perforated tin bottom strainer into the vat, also from the vat into the churn. After the cream is in the vat, take the temperature and also ascertain if it is turning sour. If the cream is sour cool at once to 56° or 58°. Sweet cream should be set at 60° to 61° over night in warm weather and from 62° to 63° in cold weather. As a rule cream is delivered through the summer at too high a temperature, and generally it is soured more or less, and it is always safe to cool down to about 56° within an hour after it is delivered into the vat and held at that temperature over night. These temperatures are given only as a guide, and the butter-maker should bear in mind that the lower the temperature the cream is ripened at, so long as the desired amount of acidity is attained, the firmer will be the texture of the butter, if the churning temperature is right. Ripening cream and churning cream at a high temperature should be avoided, as the butter will have a soft texture or body. A good supply of ice should be stored for use in warm weather to cool the cream by breaking it up fine and putting in the water around the vat. Never put ice directly into the cream in the vat or churn.

(For churning see "Separator" portion of Bulletin.)

Oil Test Churn.

1. See that representative samples are taken and that test tubes are not over half full.
2. Place in water at a temperature of 70° over night to ensure a perfect ripening of the cream.
3. Churn at a temperature of from 75° to 80°.
4. After a thorough separation of the butter place in water at a temperature of not less than 170° for at least 20 minutes.
5. Cool again to 70° or 75°, churn and reheat after which the readings may be taken. Readings should be made carefully and the test recorded for each patron.
6. If the separation of butter oil is not perfect, cool, churn and reheat again.

SPRING CHEESE.

The cheese-maker who is desirous that his cheese shall be of the finest quality will accept nothing but good, pure milk. All tainted or sour milk and the first milkings (colostrum) should be refused.

Heat the milk to 86° Fahr. The rennet test should then be used to ascertain the degree of ripeness. To make this test take 8 oz. of milk from the vat, add to it one drachm of rennet, stir rapidly ten seconds and if coagulation takes place in from 17 to 20 seconds the milk is sufficiently matured for the addition of the rennet. A slight variation from this may be necessary to suit different localities, but a few trials will enable the maker to tell when the milk is properly ripened. A very simple way to tell the exact moment when coagulation takes place is to drop a bit of burnt match into the milk. It assumes a rotary motion when the milk is stirred. Then count the number of seconds from the addition of the rennet until the stick ceases to move. This gives you the exact time required for the milk to coagulate.

Ripen the milk to that condition that all the whey may be run off in 2½ hours after setting, and the curd showing ⅛ inch acid after dipping. Great care and watchfulness should be exercised at this season as acid develops very rapdily during the early period of lactation.

Use sufficient rennet (from 3 to 5 oz. per 1,000 lb.) to coagulate the milk fit for cutting in from 15 to 20 minutes. In cutting use the horizontal knife first and begin when the curd is somewhat tender. Cut slowly, with a firm, steady motion and continuously, until the cutting is completed.

Let the curd settle a few minutes to allow the surfaces to hea slightly, then stir with the hands—very gently and slowly at first—for about ten minutes. Rough handling at this period sets free a great number of small particles of curd, which go off in the whey and very materially lessen the yield. Then the agitators may be put in and the steam gradually turned on. Take about 30 or 35 minutes in heating up to 98°. Continue stirring about ten minutes after the steam has been turned off, when the curd may be allowed to settle. Draw off a portion of the whey at this time that you may not be caught by a rapid development of acid. Then stir the curd occasionally (a common hay rake is best suited for the purpose) to prevent matting and to secure a thorough cooking of each particle of curd.

When the curd is thoroughly cooked and shows about ⅛ inch of acid on the hot iron, the whey should be removed. After dipping, the curd should be well stirred with the hands to effectually drain off the whey before allowing to mat. When it has become sufficiently matted, cut into convenient strips (about 8 inches wide) and

turn. In about ten minutes they may be turned again and piled two deep. Turn frequently (four or five times an hour) to prevent any whey collecting on or about the curd and to ensure uniform ripening. The temperature should be maintained at about 94°. while the breaking-down process is going on, and when the curd presents a flaky appearance on being pulled apart and shows acid to about $\frac{3}{4}$ inches, it may be milled and then aired by stirring occasionally. When it becomes soft and velvety, smells like newly-made butter and shows some fat on being pressed in the hand, it may be salted at the rate of from $1\frac{1}{2}$ to 2 lb. of salt per 1,000 lb. milk.

The temperature when salting should not be higher than 86°. Put to press in about fifteen or twenty minutes, or when the salt is thoroughly dissolved. Have the temperature at this time between 80° and 85°.

Apply pressure gently at first, until the whey begins to run clear, then gradually increase. After the cheese have been in press about 45 minutes, they may be taken out and neatly bandaged; only pure water should be used. They should be turned again in the morning. See that no rims or shoulders are left on the cheese, but have them neat and stylish in appearance and of uniform size. They should be pressed for at least 20 hours before being removed to the curing room.

The curing room should be kept at an even temperature of about 65° or 70°, and should be well ventilated.

SUMMER CHEESE.

The same treatment is required in handling and caring for the milk as for spring cheese. Aeration and cleanliness should have the same careful attention. When the milk arrives at the factory each can should be subjected to strict examination by the cheese-maker (don't leave this to the poorest helper) to detect, if possible, and reject all bad flavored or tainted milk. There is no excuse for having milk of this kind. What one patron can do all can do—care for it properly and have it arrive at the factory in the very best possible condition.

When the milk has been received, heat up gradually to 86°. When this has been done, try it with the rennet test to ascertain the degree of ripeness. It is advisable to do this even in handling very ripe milk, for it enables the cheese-maker to know just about how fast the curd is going to work. If possible, have the milk in that condition that all the whey will be drawn in from $2\frac{1}{2}$ to 3 hours from the time the rennet is added, with $\frac{1}{4}$ inch acid on the

curd by the hot iron test. Use enough rennet to coagulate the milk sufficiently for cutting in 30 minutes. Start to cut a little early. Take plenty of time and don't hash or slash the curd. Use the horizontal knife first, finishing with the perpendicular. When the cutting is finished, start to stir very gently at first or until the curd is somewhat firm. Do not apply heat for ten or fifteen minutes after stirring has commenced. Heat gradually up to 96° or 98°, taking fully one-half hour to do so. Continue stirring for some time after the desired temperature has been reached to prevent matting and to ensure a more uniform cooking of the curd.

Draw off part of the whey soon after the heating has been finished, and if there are any bad odors or taints, draw the whey down quite close to the curd. By keeping it stirred and well aired, the flavor will be very much improved. Draw off all the whey when the curd shows $\frac{1}{4}$ inch acid by the hot iron test, and continue hand stirring until it is sufficiently dry before allowing it to mat, and, when matted, break or cut into convenient strips and turn it over at short intervals (about every fifteen minutes), piling a little deeper each time it is turned and never allow any whey to gather on or around it.

Grind early, or when the curd strings 1 to $1\frac{1}{4}$ in. on the hot iron. Keep it apart and well stirred and aired after grinding until ready for salting.

In handling over ripe milk, set at a lower temperature; use more rennet, cut finer, cook quickly, draw off part of the whey as soon as possible, dip curd with less acid, stir well before allowing to mat, grind early and mature well before salting.

In the case of gassy curd, try to retain more moisture in it when the whey is drawn off, by stirring less. Grind in about the usual time, and when it is partly ripe pile deep, and if the whey begins to lodge around it open the pile to allow the whey to drain off, then pile again. Continue in this way until the curd becomes velvety and buttery, when it is ready for salting. Use at the rate of $2\frac{1}{2}$ to $2\frac{3}{4}$ lb. of salt per 1,000 lb. milk. Hoop in from 15 to 20 minutes after the salt has been well stirred in.

Apply pressure very gently at first. After the whey begins to run clear, it may be safely increased. In from 45 to 60 minutes the pressure may be removed, the hoops taken off, the cheese dressed neatly, and put back to press again. Apply full pressure before leaving them for the night.

Turn in the hoops in the morning, pare off any corners or shoulders which may arise from imperfect fitting followers, putting back to press for five or six hours longer, when the cheese will be ready to take to the curing room, which should be kept as cool as possible during the summer.

We would strongly advise cheese-makers to keep a record of each vat, the condition of the milk, and how it works each day. Stencil each cheese with the date when made, the number of the vat it was made in, and by so doing a great many difficulties may be overcome.

FALL CHEESE.

Milk in the fall is usually sweeter and in better condition than in summer, so that the heat may be applied sooner or when it is being received into the vat; care being taken to have it stirred carefully all the while the steam is going on. Heat to 86° then apply the rennet test to ascertain the condition of milk, and if found too sweet for the application of rennet, use some clean flavored starter. Set vats at that stage of ripeness which will insure thorough cooking of the curd before the removal of the whey, which takes ordinarily three hours from the time the rennet is added until it is all removed and curd showing $\frac{1}{4}$ inch acid. Enough rennet should be used to cause perfect coagulatibn in from 40 to 45 minutes.

When ready for cutting, start by using the horizontal knife first and cut continuously until completed.

After the cutting is completed the curd should be stirred very carefully for 10 or 15 minutes before any heat is applied, then raise the temperature gradually to 98°, taking about 45 minutes to do so.

Stir the curd carefully all the while steam is going on and for some time after the desired temperature has been reached to prevent matting and to insure a more uniform and thorough cooking.

Remove the whey when the curd shows $\frac{1}{4}$ inch acid. Drain well by hand, stirring before allowing to mat and when matted sufficiently cut or break into convenient strips, and turn them over occasionally, reversing the position of the curd each time. Piling may be allowed at this stage two or three deep, but never allow any whey to gather in pools on or around the curd. If this is noticed at any time, the curd should be opened out at once and whey allowed to escape. Keep up the temperature to not less than 94° until grinding. When curd feels mellow and will pull apart in flakes or show $1\frac{1}{4}$ to $1\frac{1}{2}$ inches of acid, it should be put through the curd mill. Stir and air well immediately after milling and at intervals to keep it from matting until ready for the salt.

When the curd is well matured and has a velvety feel and a buttery appearance, the salt may be applied. Use at the rate of $2\frac{3}{4}$ to $3\frac{1}{4}$ lb. per 1000 lb. milk, varying the quantity to the amount of

moisture in the curd. The temperature at this stage should be about 86°. The curd may be hooped and put to press in from 15 to 20 minutes after the salting is done. Apply the pressure very slowly at first, or until the whey begins to run somewhat clear, when all the pressure can be safely applied.

Allow the cheese to remain in the press not less than 45 minutes before taking out to dress.

See that the dressing is done neatly. Do not allow any wrinkles to remain in the bandage, but have it drawn up smoothly and laid over each end about ¾ in. Use clean, sweet cap-cloths, one on each end of the cheese, and have them laid on smoothly. Only pure, warm water should be used in bandaging.

Turn the cheese in the hoops every morning and never allow a cheese to be placed in the curing room without a perfect finish. The temperature of the curing room should be maintained as near as possible to from 60° to 65°. Cheese when taken to the curing room should be placed on the top shelves and removed to the lower ones when room is required, as by doing so there will be more uniformity in curing.

When coloring pour the coloring into a dipper of warm milk from the vat, then draw the dipper quickly along under the surface of the milk from one end of the vat to the other, then stir well and there will be no danger of streaks in the curd. Have a dipper with a long handle for the purpose.

Rennet should be diluted to one gallon of pure water for each vat, and the milk should be well stirred for at least five minutes after the rennet has been added. In case the milk is very ripe two minutes will be ample time to stir after adding the rennet.

Everything in and about the factory should be kept scrupulously clean. The cheese-maker who fails to do this need not grumble if his patrons follow his example.

All strainers, sink-cloths, etc, should be well washed, then scalded and thoroughly aired each time they have been used.

The vats, pails, curd-sinks, etc., should be scalded with boiling hot water after washing, and if the water can run out readily they will dry off in a few minutes without wiping. Do not use a dish-cloth, as it usually leaves an unpleasant flavor.

A STARTER.

By A. T. Bell, Instructor in Cheese-making, Tavistock.

A starter is some milk in which the lactic acid has been allowed to develop. In using a starter, first provide a suitable can or vessel for holding it in. A can similar to the ordinary cream gathering can will do, having double walls with hollow space between. It should have two lids, one fitting closely inside of the can with a flange to keep it from going below the shoulder, and the other covering over all and fitting close to the outside.

In preparing the starter use the best cared for milk that comes to the factory; milk that has been well aired and free from any foreign flavors (it is best to use the same patron's milk). Save out say 20 lb. for each vat at a temperature of 75°, then take about one pound of the previous day's starter for every 25 or 30 lb. fresh milk saved, mix all thoroughly and allow to stand for say one hour, then add about as much water as there is milk. Stir well, cover up close and set it where it will not be disturbed until required for use.

To use, first break it up fine by stirring in the can, then take out what is required, pouring from one pail to another a few times when it will have a creamy consistency and be ready for use.

When to Use a Starter.

Be sure of the condition of the milk before adding the starter, which may be ascertained by applying the rennet test. It may be used with advantage at all times with gassy milk and in cold weather when milk is being delivered at the factory very sweet. If it is known for a certainty that all the milk being delivered into the vat is perfectly sweet, a little may be added on the start, but the bulk should always be kept until the application of the rennet test to ascertain the condition of the milk. Do not run the rennet test so low by 3 or 4 seconds when using a starter.

While a good clean flavored starter is an advantage, a poor flavored one should never be used under any conditions, for it will spoil the flavor of the whole vat.