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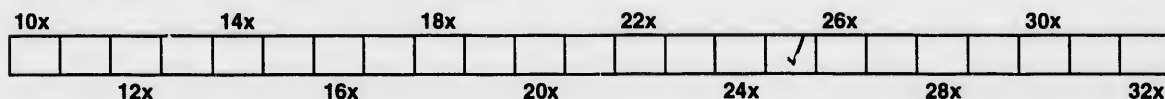
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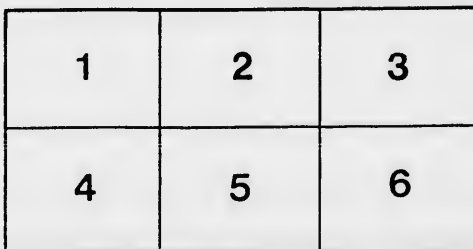
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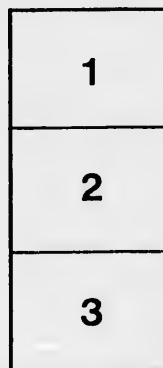
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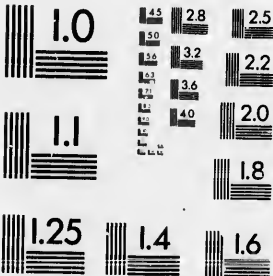
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BULLETIN No. 3.

The Manufacture
of BUTTER..

PUBLISHED BY THE DEPARTMENT OF AGRICULTURE
OF THE PROVINCE OF QUEBEC.

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THE MANUFACTURE OF BUTTER.

RECEPTION OF THE MILK.—SKIMMING.—PASTEURISATION.—COOLING CREAM.—RIPENING AND FERMENTATION.—CHURNING.—WORKING AND SALTING THE BUTTER.—QUALITY OF AND DEFECTS IN BUTTER.—PACKING.—PRESERVATION.—TRANSPORT.—COMPOSITION OF BUTTER.—RETURN OF BUTTER FROM MILK.—JUDGING BUTTER.—CHARGES FOR MANUFACTURE.—WINTER BUTTER.—BUTTER OR CHEESE, ETC.

RECEPTION OF THE MILK.

On principle, manufacturers should never accept any but milk of the best quality. As explained in Bulletin No. 2, by bad milk is understood, 1st. milk which has been creamed or to which water has been added; 2nd. milk which is dirty, badly aired or which has not a sweet fresh smell; 3rd. milk overkept or too sour; 4th. the milk of a sick or newly calved cow; 5th. milk tainted or adulterated, such as viscous milk, milk of a blueish tint, etc. or milk having a bad taste, owing to the nature of the feed given to the cows. All these various kinds of milk may cause much greater damage to the parties using the factory, than would be caused by the use of skim milk or milk to which water had been added. With bad milk, a maker can neither make good butter nor good cheese; it would be absolutely impossible to do so; and, unless he has the complete control of the reception of the milk, it is not just or right to hold him responsible for defects in the aroma of the cheese or butter, when there has been no mistake made in the manufacture; and especially is this the case when the defects in the milk are not apparent at the time it is brought in.

Makers should be exceedingly strict in the milk which they accept or receive; unfortunately the increasing number of small factories makes this duty or task a most delicate one to carry out; often, a simple observation upon the quality of his milk, although perfectly true and correct, will be sufficient to induce a patron of the factory to go to some rival establishment, frequently bringing with him some of his friends and relatives; thus putting to trouble and inconvenience a maker, who, as a matter of fact, has only conscientiously fulfilled his duty in protecting the general interests of his employers.

The patrons of factories, even more than the makers themselves, should be thoroughly convinced that the bringing of milk other than that of the very first quality in every respect, to a factory, is a fraud. So soon as this conviction becomes well established, the task of the maker will be simplified, to the great advantage of all persons concerned.

Nevertheless, before giving advice to others, makers should both in their persons and in their factories set an example of the most scrupulous cleanliness. A maker, of a dirty or slovenly appearance, will not carry any authority over his patrons, while otherwise the latter would hardly dare to present themselves at the factory with bad milk, if in the establishment every thing showed the highest degree of order and cleanliness. The maker should above all things set a good example in this respect.

From practice, a good maker is very soon able immediately to distinguish good milk from bad. The odour which escapes from the can, upon opening, and the appearance of the milk itself give good indications. Still there may be doubtful cases; and when these arise, the immediate employment of the Babcock and of the lactodensimeter and also of the acidimeter is fully pointed out. In Bulletin No. 2 the use of these instruments is explained in detail.

SKIMMING.

Importance of proper skimming.—The skimming of milk is an operation which demands the best attention of the maker. In well skimmed milk there should not remain more than one half pound of fat to 1000 lbs of milk: 0.05 by Babcock. If, from 4 to 5 lbs per 1000 lbs remain, which is frequently the case, especially in factories where the Babcock is never used, there is a return of from 4 to 5 lbs less of fat to the 1000 lbs than there was reason to expect (and this loss may take place even without any very great degree of negligence). If, for example, the factory receives an average quantity of 8000 lbs of milk per day, the loss would be from 32 to 40 lbs; and,

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calculating the fat as worth 20 cents per pound, this loss would amount to from \$6.40 to \$8.00 per day, or in six months, a loss ranging from \$1152.00 to \$1440.00; which proves the great importance of this question.

The necessity of driving the separator at a regular rate of speed.—

One of the chief conditions of thorough skimming, is a regular pace in the separator. To secure this, the boiler must be large enough to prevent the pressure from falling much, when water is being pumped in or the fire being made up. The engine should be of sufficient power, in good order, well adjusted, with the governor acting regularly. An engine should never be made to work faster or slower by the action of the valve, which, when the engine is at work, should always be wide open. The belts should be in good order, dry and sufficiently stretched on the pulleys although not too much so. The regularity of the work once ensured the pace of the separator should be sufficiently fast. This pace varies with the make of the separator used, and it must be adhered to.

Quantity of milk to be skimmed per hour.—

Too much milk must not be run through at the same time. To ascertain the proper quantity to run through per hour, a Babcock test must be made with skim-milk, experimental samples of which must be taken successively when passing, each time, through the separator, different quantities of milk per hour. By this means it is easy to get at the right quantity to be run through. It is not advisable always to stick to the quantities set down in the catalogues, and it is necessary to make the test above alluded to at least two or three times every year.

This quantity varies with the kind of separator used, from one season of the year to another and with the quality of the milk. In the autumn, when the milk is rich, very much less milk must be run through and the cream must be taken thinner, in order to skim as thoroughly as in spring when the milk is relatively of poorer quality. Less milk must be run through by the hour at the end of the skimming than at the beginning because the milk becomes richer in the reception vessel.

Heating and stirring the milk.—Much more milk may be skimmed per hour, if it is warmed. The cream is thus more easily separated. This practice is therefore generally recommended. In spring and autumn, the temperature should be run up to between 80 and 85 F. during the heat of summer heating is unnecessary.

The milk in the reception vessel should be stirred about every now and then to thoroughly mix it and to prevent the cream from rising to the surface.

Lastly a regular flow of milk into the separator must be secured.

Difficulties of skimming.—The chief difficulty met with by makers in obtaining satisfactory skimming arises from the irregular running of the milk into the separator. In adding milk to that already in the reception vessel, the level rises, the speed of running off is greater, the cream is thinner, and the skimming is less thorough. When the level is lowered the running off becomes slower and the cream becomes thicker. It will be readily seen that if at the same time, owing to the boiler being too weak, the pressure varies constantly, if the engine works irregularly, if the heater for warming the milk itself works fitfully on account of the variation of the pressure in the boiler, the maker, in such a case, would be kept running from the reception vessel to the boiler, to the separator, to the engine, and in spite of all his exertions would not obtain a thorough skimming, or a cream of regular consistence.

For all these reasons, skimming requires in the maker a complete acquaintance with his apparatus and at the same time a great deal of skill. But when the apparatus is badly arranged, ill calculated for its duties, it is absolutely impossible for him to do good work, and the patrons as well as the proprietor of the factory lose in one season many times as much as it would cost to put all things in order.

To increase the regularity of the running of the milk into the separator, it would be well to use a large wide vat, so that there would be less variation in the level of the milk. And the addition of floats to regulate automatically the flow of the milk would be an advantage; but, after all, perhaps the excellent turbine separators, now for sale, which work without the aid of the engine and whose speed depends solely on the pressure of the steam in the boiler, are the best to employ. With separators of this kind, a regular rate of speed is more easily obtained. The question of separators and the theory of skimming will be more fully treated in Bulletin No 4.

Tests of skim-milk. Great care must be observed in making the tests.—To verify the skimming of a whole morning, it is not sufficient to take samples of skim-milk directly from the separator several times during the morning, because the conditions of the skimming, as we have seen, vary constantly, and, at any given moment, we may easily find 0.001 at the discharge of the separator, and at the same time, 0.004 in a sample taken from the skim-milk vat. To give an exact idea of the average of the skim-milk of a morning, it is better to take samples at the tap of the skim-milk vat,

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and to take several during the course of the skimming when the skim-milk is being handed over to the patrons. A good skimming should not leave, on an average, more than $\frac{1}{2}$ lb of fat per 1,000 lbs of milk in the skim-milk vat (0.05 per 100 lbs by the P. cock test) at the conclusion of the skimming.

Consistence of the cream.—The proper consistence of the cream when it leaves the separator depends largely upon the season of the year. In early summer, when the milk is still poor, the authorities advise that 10 p. ct. of cream be taken; while towards the end of the season, when the milk is rich, as much as 18% may be the right quantity. If cream be too thin, churning is difficult and, to be successful, requires a higher temperature. For some time past there has been a tendency to use even a thicker cream still. We would recommend the following rule.—Multiply the percentage of fat in the milk by 3 or $3\frac{1}{2}$; the result of this multiplication will be the percentage of cream to be used. For example if milk carries 4 p. ct. of fat, from 12 p. ct. to 14 p. ct. of cream should be used. This is the rule recommended by the dairy school at St. Hyacinthe.

PASTEURISATION.

Definition.—Milk, in its natural state, as we have seen in Bulletin No. 2, contains a quantity of germs of every kind, which become developed therein and cause a serious change in its composition.

The nature and number of these germs depend upon the cleanliness of the cows and their sheds, upon the food they receive, the water they drink, the manner of milking and the place in which they are milked, and on the cleanness of the vessels in which the milk is collected and carried away. In order that the cream may ripen properly, it must be freed from all injurious germs, and should only contain those which cause what is called lactic fermentation. There are two methods of destroying the injurious germs which hinder the proper ripening of the cream.

The first consists in heating the milk, in a special apparatus, up to 155° or 160° F., keeping it there for 30 minutes, and then cooling it down to 80° or 85°, and skimming at once. In the second the cream as it leaves the se-

parator is raised to the temperature of 140° and kept at that for 20 minutes, only cooling it afterwards.

This operation, which aims at the destruction of a part of the injurious germs in milk or cream, is called *pasteurisation* of milk or cream.

Pasteurisation must not be confounded with sterilization. The object of the latter is to destroy all germs which the milk may contain and not only a portion of them, which occurs in the process of pasteurisation.

The pasteurisation of milk is more costly than the same process applied to cream because there is a larger volume of liquid to heat and to cool and because the milk, when slightly sour, is liable to curdle in the vats. The pasteurisation of cream is more economical. However some, practical butter makers claim that this latter system gives a greasy appearance to the butter. The fact is that this only occurs in exceptional cases.

Pasteurising either milk or cream with the addition of proper ferments, to be explained later on, gives us, at all seasons, a regular ripening of the cream and, consequently, a more uniform and regular quality of butter; it increases its keeping qualities, dispels any bad odours in the milk, but it may decrease in some degree the yield of butter, because a trifle more fat remains in the butter-milk, and because butter made from pasteurised milk or cream always contains less water. However, at the present day, there is no more loss than by the ordinary process.

Pasteurising cream is extensively practised in Denmark, but is as yet little known in the Province of Quebec. The dairy school at St. Hyacinthe is now teaching this process.

The process of pasteurisation in small factories.—Cream may be pasteurised by putting into boiling water each pail of cream as it leaves the separator, stirring until its temperature reaches 140 F., and then after a delay of 20 or 30 minutes placing the pails of cream in iced water to secure rapid cooling.

In large factories, a special apparatus, called a pasteuriser, may be employed. This will be treated of later in bulletin No. 4. This process may be operated in the cream vats.

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After having been pasteurised, the milk or the cream should be cooled, the former to the temperature of the skimming, the latter to a temperature of 50° or at least to a temperature at which ripening will take place. The refrigerators to be used in operating the cooling process will also be considered in bulletin No. 4.

COOLING OF THE CREAM.

Cream should always be cooled to at least 50° immediately after skimming.

It then contains numberless germs on the eve of development. Some of these are the germs which produce the lactic acid necessary for the proper ripening of the cream, the multiplication of these must be encouraged. Others of these germs are hurtful, during the ripening of the cream, and afterwards to the butter when made. They are often the cause of the objectionable smell and of the bad taste in butters. It is of importance that the development of these germs should be completely checked.

The temperature of 78° to 80° at which the cream leaves the separator is most favorable to the multiplication and growth of the various germs, both good and bad, which it contains. When cooled to 50° all these germs become almost inactive. Later on, when the temperature is raised for the purpose of ripening the cream, the bacteria of the lactic acid, which are generally in larger numbers than the others, become prominent, either from the larger numbers in which they exist, or owing to the lactic acid which they produce and which is prejudicial to the others, the result of this being that the evil germs are neither able to develop nor to communicate to the butter either bad taste or smell: Many of the evil odours escape during the cooling process.

Butter made from cooled cream has also greater firmness and a better grain than butter made from cream which has not been cooled; especially if it is cooled immediately before being churned.

The cream should be allowed to remain for one or two hours at 50° in the cream vat before being heated for ripening, so that all the globules of fat which it contains may have time to properly harden. Fatty matter is not a good conductor of heat and a certain time is required to allow the cold to penetrate to the center of the globules, so that they may become perfectly firm.

With the present refrigerating apparatus, which is now everywhere for sale, the cooling of cream is done quickly and economically, immediately after the skimming, as fast as the cream comes from the separator. It is in any case much easier and less expensive, to heat the cream from 50° to 64° in the cream vat, to start the ripening process than to cool it in the same vat from 80° to 64° after the skimming, generally a lengthy operation and one which is frequently neglected.

For these two latter reasons cream should be cooled to 50° even when taken from pasteurised milk or when the cream itself has been pasteurised.

RIPENING OF CREAM.—FERMENTS.

Utility of ripening.—The object of ripening the cream is to increase the aroma and flavour of the butter, besides, that from ripe cream, a greater yield of butter is produced than from sweet cream. The ripening of cream is a matter of the greatest importance in regard to the quality of the butter.

Further, with ripened cream there is less risk of a poor return after churning than there is from sweet cream.

The purpose and utility of ferments.—Milk, as stated above, and consequently cream, taken from it, always contains a large number of germs of various kinds.

These germs, as we have just seen, may be placed in two categories : 1st those which act favorably in ripening the cream and, 2nd. those which act unfavorably.

The object of pasteurisation is the destruction of the latter category, that is, the evil germs ; but in destroying them almost all the good germs are also destroyed ; a cream thus deprived of the greater part of its valuable germs, whether it has been pasteurised itself or whether the milk, from which it was taken, had been so pasteurised, can only ripen in the slowest manner.

Therefore to cause it to ripen properly, the valuable germs which have been destroyed must be replaced by a certain quantity of other germs of the same kind. These useful germs belong to the species known as " bacteria acidi lactici, " a lactic ferment. This species contains many varieties from which to choose. Ferments are the more or less pure products or culture of

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these germs and their introduction into the cream when it is heated to cause it to ripen, restarts the ripening process arrested by the pasteurisation and subsequent cooling.

It is readily understood that cream, thus deprived of evil and provided with good germs, will ripen in a much more regular manner, when the temperature has been raised.

Nature and preparation of ferments.—The following may be used as ferments :

1st. Butter-milk from the same factory where the butter making is going on and taken from the churning of the previous evening.

2nd. Butter-milk from another factory.

3rd. A ferment prepared with good milk.

4th. A ferment of pure cultures.

1st. Butter-milk, either from the factory where the manufacture is taking place or from some other factory, should only be used in the absence of other ferments and further, the cream, from which such butter-milk is taken should have ripened very regularly and the butter made from it should be of the finest quality. (It has been remarked that in some factories where butter-milk has been used as a ferment, the butter has taken on a fishy taste.)

The quantity required is collected in a can well cleaned and sterilized by steam ; this can is then placed in a cold place where it will be free from evil germs, and be kept until required.

Butter-milk should not be used for more than two days, in succession and then only in case of absolute necessity.

2nd. A ferment out of good milk, should be prepared in the following manner :

Take the best fresh and pure milk that can be had. The cow from which it is taken should be in a perfect state of health and not too fresh in milk. It should be placed in cans previously cleaned with soda and afterwards scalded or passed through steam. These cans should be placed in a

refrigerator or in ice water. In the afternoon, when half the cream has risen, it is removed. This milk is then heated to a temperature of 70° F. by placing the cans in warm water and by stirring with a dipper sterilized by steam. It should be allowed to remain in the heat until it has become sufficiently acid which will take place after 18 or 20 hours. Fermentation is then arrested by placing the cans in cold water, this ferment should be kept in a cool place until required for use; when the upper lair of the ferment to the thickness of about half an inch should be taken off and the ferment thoroughly stirred up so as to mix all the different parts.

3rd. To prepare a ferment from ferments concentrated from pure cultures, the instructions given by the persons manufacturing and selling these concentrated ferments must be strictly followed out.

For example, the following is one of the system sometimes adopted :

A quantity of skim-milk equal to 3 p. ct. of the weight of the cream to be acidified is pasteurised at 175° and rapidly cooled to 64°. That is if 600 lbs of cream are collected daily, 18 lbs of pasteurised milk must be prepared. This pasteurisation may be effected economically by placing the can containing the milk inside of another can containing hot water. To cool the milk the can is placed in ice water.

Care should be always taken to prepare 2 lbs more of the pasteurised milk than the quantity mentioned above, so as to keep enough of the ferment for the preparation of the mother for use in the manufacture of the following day. The pure concentrated ferment is poured into the pasteurised milk, the whole is stirred up and allowed to remain undisturbed; the vessel containing it being covered with a cloth or piece of fine muslin. The temperature of the liquid should be maintained at between 64° and 68°. After a time the milk becomes curdled; it is then ready for mixing with the cream. Two pounds should be set aside for the preparation of the mother for the following day.

We recommend the preparation of two pounds of mother for the following day as this will economize the use of ferments of pure cultures. The same allowance of concentrated ferment may thus be made to serve a great number of times in succession.

The milk used in the preparation of concentrated ferments of pure cultures should be of the very best quality, similar to that used in the prepara-

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tion of a ferment with good unpasteurised milk and without concentrated ferments of pure cultures.

Cream of the previous evening should never be used as a ferment on the following day.

Course to be followed in ripening cream and in the use of ferments.

—Unpasteurised cream, unpasteurised milk, cooled to 50° after skimming and heated afterwards, will ripen perfectly in the butter factories of this Province in from 10 to 12 hours at a temperature of from 65° to 75° and this without the employment of special ferments; the cream being again cooled for the night.

This is the method which is now followed in this Province during the summer months; but it will not suit during winter; as butter made from such milk would be of poor quality, if the cream had been ripened in this way. In winter pasteurisation and the use of ferments must be followed.

In such case the following course must be adopted: The cream, having been cooled to 50°, after skimming, remains in the vat for one or two hours at this temperature. It is then raised to the temperature suitable for ripening and the desired quantity of ferment is added; and then thoroughly stirred up and left to ripen. It is afterwards cooled down to the temperature necessary for churning.

The quantity of ferment to be added will depend largely upon the rapidity with which it is desired to ripen the cream; it depends also upon the temperature at which the ripening is to be effected. If a rapid ripening is desired, or if it is to be effected at a low temperature, a greater quantity of ferment will be required.

If the cream is to be ripened in 22 hours from 1 to 2p. c̄t. of ferment is used in summer and from 2 to 3 p. c̄t. in winter and the temperature must be kept between 64° and 65° during the whole of the time of ripening. Of course this cream (or the milk from which it was taken) must have been pasteurised to begin with. It is afterwards cooled to the temperature necessary for churning. This is the method recommended for adoption in this province.

A lower temperature is recommended for ripening in the summer say from 62° to 64° and a slightly higher temperature in winter say from 64°

to 66°. Butter will thus acquire more aroma. Useful germs are developed at slightly lower temperature than the evil ones and it is well to encourage them.

During the process of ripening, this is what takes place: The bacteria of the lactic acid attack the lactose or sugar of milk contained in the cream, are nourished by it and transform it into lactic acid. It is this acid which gives the acidity to the ripened cream, which is so advantageous during churning. Ripening is generally considered to have ended when the cream contains 5 or 6 lbs of lactic acid to the 1000 lbs.

When no acidimeter is in use, cream is recognized as ripe when the whole of the froth has disappeared, when it has slightly thickened, has become entirely homogeneous and without lumps and with a sharp although fresh and agreeable smell arising from it.

Cream should be ripened uniformly throughout; for there is a liability of a loss of fat in the butter-milk and of a smaller return of butter from cream unevenly ripened when churned.

When cream of two or more skimmings made at different times is mixed, care should be taken that they are thoroughly stirred together. The stirring up of the cream should be studiously attended to each day during the commencement of the ripening and must be repeated many times during the afternoon and evening.

The stirring up assists ripening, by introducing air into the cream, which excites the action of the ferment. It also aids in driving out the bad smells contained in the cream and prevents the development of certain evil germs which produce these smells and which can only exist in liquids deprived of air.

Cream, having an acid smell after ripening, indicates that fermentation has gone too far, as the result of the use of too large a quantity of ferment or of a ripening effected at too high a temperature. In such a case, either a smaller quantity of ferment should be used on the following day, the cream should be ripened at a lower temperature or churning should take place earlier.

If homogeneity is imperfect or if the cream contains lumps, the cause is that during ripening the cream has not been maintained at a sufficiently high degree of temperature.

The quantity of mother ferment to be added to the cream and the temperature to be maintained during fermentation, to obtain a proper ripening in

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20 or 22 hours, can only be determined by careful experiment or feeling one's way. As mentioned above, by means of an acidimeter, the amount of acid, required for the most successful manufacture both as regards return and quality is readily determined. Generally an acidity of 50° to 60° is necessary.

After a certain number of trials, excellent butter of uniform appearance and quality will be regularly produced.

The prepared milk intended for the production of the mother, should be kept in a cool place and protected from the air and occasionally the old cultures should be renewed by treating a-new with pure ferment a suitable quantity of pasteurised milk.

The highest degree of cleanliness is indispensable and all the instruments in use should be washed with boiling water or passed through steam. Ice should never be added to cream to cool it, nor hot water to rewarm it. The water thus added uselessly increases the bulk besides transmitting to the cream as well as to the butter all the impurities and foreign matters which it inevitably contains.

Composition of cream.—Cream is composed principally of butter fat with varying proportions of water, sugar and casein. The proportions vary so much with circumstances that it is almost impossible to establish even an average composition. Still to give a general idea, the following table drawn up by König gives the result of forty three analyses.

	AVERAGE	MINIMUM	MAXIMUM
Water	68.82	22.83	83.23
Fat	22.66	15.19	29.93
Casein and albumen	3.76	.63	7.88
Sugar of milk	4.23	.59	5.52
Ashes	53	.11	2.50

The dairy school at St. Hyacinthe recommends the use of cream so thick as to contain from 25 to 32 p. ct. of fat.

CHURNING.

The importance of this operation.—Not only the return of butter, but also its quality and keeping properties, are effected by the churning.

Manner in which the separation of butter is effected.—The fat in cream is found in small globules of various sizes mixed through the butter-milk.—The small globules are in a liquid state and are enclosed in a thin skin or film of serum. When the cream is violently shaken, immediate solidification takes place. Once solidified, they adhere to one another and collect in bodies which increase in size as fast and as long as the shaking of the cream continues. The large globules are the first to solidify and collect together, the smaller ones solidify with greater difficulty and adhere together less easily.

If the churning is begun by an immediate rapid shaking of the cream the large globules all collect together at once. Consequently after a short time the fat has concentrated into bodies, the number of which is much smaller than was the number of globules at the beginning of the churning, each of these bodies being formed of a certain number of globules which have adhered to one another, as the large globules have first solidified and collected together, the small ones which solidify with greater difficulty are found, so to speak, dispersed in a relatively larger quantity of liquid and can with greater difficulty come into contact with one another, a thinning of the fatty matter in the butter-milk takes place and there is danger that all these small globules may not readily unite with the mass, and the return be therefore less satisfactory.

On the other hand, if the churning is commenced by turning the churn slowly, the small globules have a better chance of solidifying at the same time as the larger ones and of uniting with them and fewer of them will remain in the butter-milk at the conclusion of the operation.

When the cream is well ripened and consequently more acid, the film of serum which encloses each globule is thinner and the latter adhere together more readily, especially the smaller ones. On the contrary, when the cream is sweet, the film of serum is stronger and the small globules in particular are difficult to collect together. Owing to this, from two creams of the same consistence, the one containing the most acid will give the larger return.

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When the cream is very thick, the globules are floating in a smaller quantity of butter-milk and more readily come in contact with one another. It is the best for churning. For this reason, in churning sweet cream it should be thicker in order to give a good return.

The temperature during churning is also of considerable importance. At a low temperature the globules become harder in solidifying and they adhere less easily to one another; on the other hand, when the temperature is too high, solidification takes place with greater difficulty and the globules cannot unite together.

For churning in a low temperature, a thick cream should be used. Thus the globules will adhere together more readily, as they will be closer together in the liquid, they will be more frequently in contact and the evil effect of the low temperature will be counterbalanced.

To churn sweet cream in a low temperature, it must be taken thicker still, because in such case not only is the influence of the temperature adverse to the collecting together of the globules, but also that of the film of serum which encloses them.

In sweet cream, it is this film of serum, which encloses the globules both big and small, which has the greatest effect in preventing them from collecting, the temperature is of less consequence and in this case to obtain a good churning a thick cream should be used.

With cream acidified by ripening, the film of serum, being much less tough, plays a secondary part and any difficulty in uniting the globules arises from the temperature. If it is very low, it is difficult to collect them together on account of their hardness; in such case a thicker cream must be used. If the temperature is raised too much they cannot solidify and subsequently collect and adhere together. In any case, as the tendency now is more and more to churn at a low temperature it is readily seen that a thick cream must be used.

The following rules are now recommended:

With reference to the consistency of the cream, see remarks on page 7.

The temperature during churning. In summer, it should be in the neighbourhood of 50° F. In autumn or winter, it may be raised or 55° to 58°.

The churning, at this temperature and with cream of the consistency mentioned above, should be done in about half an hour. Churning at a higher temperature than 60° should always be avoided, as butter produced at too high a temperature is soft, loses its aroma and always contains a large quantity of butter-milk, which, in consequence of the absence of consistency, is removed with difficulty and very imperfectly and makes butter of an inferior quality and less liable to keep. This is an important consideration.

The poor quality of much of the butter made in this Province is due to this cause. The temperature in the apartments in which the churning is done, is often very high during the summer so that the cream becomes heated in the churn, during the operation, especially as the fat in solidifying throws off a certain amount of heat. The churn should always be kept in a cool apartment.

On the other hand, if churning is done at too low a temperature, the butter is hard and lumpy and cannot be so well worked.

The first thing to be done in preparing the churn is to wash it well in hot water: To do this two or three buckets full of hot water are put into the churn, after which several revolutions are made and the water is then run off. As the hot water will have heated the inside of the churn, to cool it, it should be afterward rinsed with cold water applied in the same way. In the autumn and spring, when the weather is cold, it will not be necessary to rinse with cold water.

The churning is begun by turning slowly for a few minutes, when the gases which are thrown off by the cream are allowed to escape, after which the churning is continued but at a speed increased by degrees until a normal speed has been attained in about a quarter of an hour. The churning is stopped when the butter is in grains about as big as a hazel nut or perhaps a little smaller.

The butter-milk is then drawn off and the butter is washed a couple of times or more by half filling the churn with pure cold water and giving a few revolutions of the paddles.

The butter-milk, on leaving the churn, should be run into a sieve or strainer to take from it any grains of butter which may have escaped from the churn with it.

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When the cream has been well cooled and ripened and the churning done at a proper temperature, a single washing is often sufficient. On the conclusion of the washing the butter is allowed to drain for a certain time. The butter should also be dried by a rapid movement of the churn after the washing water has been drawn off.

As a general rule, neither hot nor cold water, nor should ice be added to the cream during the churning. When the butter does not come readily a little sweet skim-milk may be added to the cream in the churn, to remove the froth.

With the milk of some cows, especially those nearing the end of their milk, or cows that have been subjected to a change of diet, churning becomes sometimes almost impossible. In such case, the trouble must be sought for, where it exists; that is in certain cows, the milk from which is being brought to the factory; and this milk should be refused until it is improved.

Colouring matter is generally added to the cream immediately before churning. The question of the choice of churns and the attention to be paid to them will be treated in bulletin N^o 4.

The churn should be first rinsed in hot water and then in cold; it should then be allowed to drip and become dry, care being taken to remove all covers.

WORKING AND SALTING OF BUTTER.

The preparation of the malaxer, the machine for working up the butter.—Before using the table, the rollers of the malaxer and the pallets should be well scalded, the whole being afterwards washed in cold water.

Working.—The butter should be worked at a proper temperature, 60° to 62° F. is the best temperature for such work. Still in summer it is well to work it at a slightly lower temperature and in winter at a slightly higher. If the butter is too soft, it must be cooled and stiffened before undergoing the operation. In working up butter that is too soft, it is impossible to free it entirely of the milk and the grain of the butter is affected. Neither should butter be worked at too low a temperature on account of the grain which might also suffer in such case.

The working should be commenced by the removal of the greater part of the butter-milk, after which the butter should be spread out upon the table, salt should then be added and incorporated as rapidly as possible with the butter. It should be subjected to a continual pressure. A skilful butter maker can often expel the butter-milk, salt and properly press the butter in a single operation and in fact the more quickly this is done, if well done, the better, as the less handling butter receives the better it will be. But it often happens that circumstances will not allow of this and in such case after the butter is freed from the butter-milk and the salt has been quickly mixed in, it is taken into a cold room, where it is left to become firm; the working being afterwards completed as fast as possible. The butter must then be thoroughly dried, for butter which contains much water loses as much as two or three pounds per tub of 70 lbs in a fortnight. The working is given up when only a few light drops of water appear on the surface of the butter, it being then sufficiently firm. It is therefore always better to work it sufficiently, as in so doing the half pound on the draught of the scales that is customary may be saved without risk of losing the pound.

Salting.—The object of salting butter is :

1. To cleanse it completely of butter-milk.
2. To assure proper keeping.
3. To improve the flavour.

Salt added to butter from which the greater part of the butter-milk has been expelled, attracts to itself the small drops of milk remaining in the butter in which it is dissolved and forms a species of brine which permeates the whole mass of butter. It takes some time for the salt to dissolve and for this reason it is advisable to allow the butter to remain for several hours in a cool place after salting before finishing the working.

The grains of salt consequently cause the small drops of milk remaining in the butter to unite and form large drops which are pressed out of the butter by subsequent working up. A part of the salt used goes away with the butter milk in which it has been dissolved : about one third or one half the salt, which has been added to the butter, is lost in this way. Therefore the greater part of the butter-milk should be pressed out of the butter before the addition of the salt as without this precaution very much of it is lost.

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The salt acts as a preservative to the butter in preventing the decomposition of the casein, of the sugar of milk and even of the fatty matter itself.

For salt to produce all the desired effect upon the butter, it should be of a certain quality. It should be as pure as possible that is to say composed almost entirely of chloride of sodium; it should be free from all bitter impurities such as chloride of magnesia, chloride of calcium etc.

In color it should be a pure white. It should always be perfectly clean and not lumpy. Barreled salt is the best as it is less likely to have become dirty or spoiled. Salt is often transported in bags in dirty cars, from which it contracts foul smells which are afterwards transmitted to the butter. To discover these foul smells in salt, boiling water is placed in a kettle into which a couple of handfuls of salt are thrown; any bad odours, which may exist, will immediately make themselves felt.

The grains of salt should be neither too coarse nor too fine. When too coarse, the large grains frequently do not entirely dissolve, and when the butter, containing it, is eaten the salt is often felt under the teeth.

In the second case the fine grains of salt melt and mix thoroughly with the butter, salting it uniformly, but in that case the small drops of butter-milk which are formed are too small to be pressed out in the working. A salt therefore should be used, the grains of which should be neither too coarse nor too fine.

The quantity of salt to be added depends principally upon the taste of the consumer. Trade butter should be salted in the proportion of one half to five eighths of an ounce of salt to one pound of butter. This is the quantity of salt which should remain in the butter when completely finished; the quantity which should be used being one third greater; since during the working of the butter a part of the salt is pressed out with the butter-milk and the real quantity to be added depends largely upon the manner in which the butter is worked; three quarters of an ounce is not too much if the butter is fully worked and more especially if the butter-milk is only removed a short time before the salting.

Salt should always be weighed, not measured. To sprinkle the salt upon the butter, the latter should be spread out upon the table and a fine sifter should be used as by this means the salt is more evenly distributed than it would be by hand.

The working up of the butter being finished, the malaxer, the machine, the rollers and the pallets should be well washed with quantities of very warm water and then rinsed in cold water.

The question of the choice of malaxers, the machines for working up the butter and of the attention to be given them will be treated of in bulletin No. 4.

QUALITY OF AND DEFECTS IN BUTTER.

Colors, spots, motties.—Straw-coloured butter is preferred by the trade. The colour of butter varies with the breed of the cows from whose milk it is derived, with their condition, the kind of pasture, and the season. In autumn, butter is very white, and colouring must be used. The addition of colouring generally commences in August or September. At first a very small quantity is put in and this is increased progressively so as to give the butter always the same colour.

By "spotted butter," is meant butter full of white specks. These come from the presence in the butter of bits of curd from either cream that has dried on to the sides of the cream-vat, or from over-ripened cream, or from lumps of cream produced at certain times in the skimming, when that is badly managed.

"Mottled butter" applies to butter that has in it streaks of lighter colour than the mass; these proceed from different causes. When, in re-working, butter they vanish, it is because they originally came from an imperfect mixture of the salt resulting from working the butter at a temperature too low and not equally done throughout the mass, or from insufficient working. If in re-working the butter the mottles do not disappear, they are caused by bad, i. e., too long a churning, or to badly managed, irregular ripening. In both these cases small lumps of curd always are produced which are the cause of mottled appearance.

Aroma and flavour; cleanliness.—Aroma is the odoriferous (*odorant*) principle that disengages itself from butter and is perceived by the nose; flavour is the impression produced on the palate by the sense of taste. To judge butter thoroughly both must be taken into account. It is very regrettable that these two things are generally confounded.

The causes of inferior aroma and flavour are numerous; the following is an abstract of them:

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1. Bad smells in the cow-house, through want of ventilation, and cleanliness; foul smells in the pasture; these smells inhaled by the cows may pass into the milk;

2. Foods capable of imparting bad flavour to the milk; for instance, some weeds, too acid silage, certain roots given in excess:

3. Bad water either given to the cows, or used in the factory;

4. Milking the cows and leaving the milk in places where the air is not absolutely pure;

5. Neglect of cooling and airing the milk;

6. Filthy factories, neglected, badly ventilated, and emitting bad smells outside or inside;

7. Pans, vats, utensils, etc., which serve to hold milk, butter, cream, etc., and are not kept clean;

8. Incompetence of the maker, and badly ripened cream; as well as a badly suited place for the ripening;

9. As a general rule, everything that may communicate to the milk or butter a bad flavour or hinder the regular ripening of the cream.

Taste of fish, of oil or of tallow.—The origin of these bad tastes is not yet absolutely ascertained; but it is generally agreed that butter kept in storage, where there is oil or fish, will take on their flavours; and so with salt, kept in the same places; it will also communicate these bad flavours to the butter it is mixed with.

The taste of tallow arises from the action of the oxygen in the air upon fatty matters and perhaps also from the action of microbes.

Grain and texture.—The grain is judged by the size and shape of the grains of butter; the texture is the reunion, more or less compact, of the grains. The grain of butter may be perfect, and yet the texture be imperfect.

Well grained butter has a fracture like that of thick cast-iron; butter of good texture presents the appearance of wax. In this Province, the grain is generally good, but the texture is bad, on account of the butter-milk not being

sufficiently expelled, and the butter, therefore, not being dry enough. Churning at too high a temperature generally makes the expulsion of the butter-milk and the drying of the butter difficult, and produces a butter the grain of which is of improper size. Here, the working of butter, in summer, is generally done at too high a temperature, and both the grain and texture suffer in consequence.

PACKING BUTTER.

Unfortunately, this is an operation that is very negligently performed: makers ought to give it greater attention.

On the market, the appearance of the goods offered for sale has a great influence on prices. The mean appearance of any article produces a bad effect on the purchaser, who invariably offers a mean price for it. Besides, the taste of the purchaser ought to be consulted in packing. At present, barrels of 112 lbs. are seldom used; tubs of 70 lbs. are much used for butter for local consumption; but the most popular packages for the export trade are boxes of 56 lbs., of the following dimensions inside.

Some boxes are 10 $\frac{3}{8}$ inches high, 14" long, 12 $\frac{3}{8}$ wide;

Cheap boxes, common ones, 11" high, 12" long, 12" wide.

Tubs ought to be soaked before using. They are to be filled with boiling water, a handful of common coarse salt being thrown into each, and allowed to stand and soak for three or four days; then, empty them, roll them about under a steam-jet for five minutes, rub them briskly with a couch-grass wisp and hot water, followed by the same operation with a thin solution of salt in water, after having carefully rinsed in cold water. The wooden parts of boxes should also be soaked in water and the boxes themselves should be passed through steam.

But this treatment of tub or box ought never to be allowed to do away with the use of parchment-paper, any more than the use of this paper should allow the maker to dispense with the washing, etc., of the box as we have just described. Never use any but the best quality of parchment-paper. The traders now are selling, we regret to say, a great deal of inferior stuff.

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Before using, this paper should be steeped in brine. This brine is composed of 1 lb. boracic acid, 2 ounces saltpetre, 4 lbs. common salt boiled in two gallons of water, and cooled. Keep this brine in a cool place ; protect it from bad smells and noxious germs.

The parchment-paper is to be placed in the tubs or boxes with the greatest care and without creasing. English buyers complain that the paper is often carelessly adjusted. Butter ought to be carefully pressed down, so that no void places are left ; they are always injurious to the butter. The packing of butter should be done at a temperature of about 60°.

The boxes must be always as clean as possible, well made, well closed, and neatly stamped ; in a word, they ought to be made to look as attractive as possible.

Cask should be well rubbed with salt, and lined with parchment-paper. Before closing them, place on the surface of the butter a strong brine ; this will complete the exclusion of the air.

Packages, the inside of the wood of which have been dressed with paraffine, do not ensure the perfect preservation of the butter, and the use of parchment-paper must not be dispensed with.

The marks of the factory should be carefully placed on the side of the box with a red hot iron stamp so as to render it indelible.

PRESERVATION OF BUTTER.

Preservation of butter.—The principal causes of the deterioration of butter, in the factory as well as during transport and at the dealers, are : 1. heat ; 2. moisture or damp ; 3. bad smells. In most creameries, unfortunately there are no suitable refrigerators ; they are too often replaced by damp cellars, badly ventilated, and in direct communication with the ice-house ; where the temperature never falls below 50° or 55°. In a good refrigerator, the temperature ought to fall to 32°, for it is only at that degree that butter can be kept for any length of time without deterioration. It ought to be put there as soon as possible after packing.

CARRIAGE.

Carriage.—As regards the carriage of butter from one place to another, the following are the principal matters to which attention must be paid.

For the carriage of butter from the factory to the place of embarkation, refrigerator cars should be used as much as possible. The chief railway lines are now provided with them.

Neither on the rail cars nor in steamers should butter be piled up with other goods, whatever may be their nature and smell, nor should it be placed in dirty freight-cars. Tubs and boxes of butter should not be allowed to remain whole hours in the sun, either at the wharf of embarkation, or at the landing wharf.

In despatching butter to its destination, the boxes should always be enclosed in special packing bags; these bags are returned free of charge.

Care should be taken that the refrigerator cars are not short of ice. Frequently cars intended for meat, fish or other like products, without cleaning or disinfection, are offered to the factories. The proprietors of the butter should have them disinfected before using them for the carriage of their butter.

At ports of embarkation and disembarkation, the refrigerator compartments should be perfect as regards the isolation of the goods, the dampness, the temperature, the space, and the cleanliness.

EXAMINING AND JUDGING BUTTER

1. *Examination of the exterior appearance.*—Is the parcel clean and neat?—Is the size and shape of the box or tinet suitable to the market?—Is the wood of which they are made, sound, free from knots and cracks and well put together?—Are the lids or covers firmly put on?—Is the weight plainly and clearly stamped on the tinet or box and not on the lid?—Is the private mark of the factory stamped in the same way?

2. *On opening the box or tinet.*—Is the parchment-paper strong enough and has it been well put in place? Is the upper surface of the butter smooth? Is the box full enough without being too full?

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3. *To test and examine the butter.*—The colour of the sample should be a clear pale straw, regular and without white stains or mottles. Does the sample contain much water or butter milk? Good butter should be so dry that nothing but light small drops of clear water should appear on the surface of the sample. If the butter has been badly washed these drops will be of a whitish tint.

4. *To break off a piece of the sample.*—When a piece is broken off from the sample the break should resemble that of a piece of heavy cast iron. The grain of the butter should moreover be very firm and it should be homogeneous, it should be well pressed and have the appearance of wax.

5. *To smell the sample.*—The sample should not give off a disagreeable smell. The evil odours are, the odours of animals, of stables, of turnips, of silage, of decomposed milk, of tallow, &c. The smell ought to be perfectly fresh.

6. *To taste the sample.*—The sample should have no bad taste. The bad tastes most usually found are those of butter-milk, tallow, a rancid taste, a taste of fish, of oil, of curdled milk or of cheese and an acid or sour taste. The taste of nuts or almonds is on the other hand a point in favour of the butter;

Besides this the butter should be neither too much salted, nor yet not salted enough. For the English market 2 to 2½ p. ct. is required; the local market requires a little more; with a little practice a person soon learns to distinguish whether the salting is sufficient or has been overdone.

The following is the quotation or numbering in points.

Aroma and flavour	from 0 to 45
The grain	from 0 to 25
The colour	from 0 to 15
The salting	from 0 to 10
The general appearance	from 0 to 5

Or a possible total of 100 points for a perfect butter.

Butters reaching from 97 to 100 points are quoted as first class; as second class those reaching from 90 to 97 points, and as third class those obtaining less than 90 points.

Under the heading "general appearance" the quality of the parchment paper, the manner in which it has been placed over the butter, the way in which the butter has been packed and settled, are matters to which the

highest importance is attached, as upon these depend the preservation of the butter.

COMPOSITION OF BUTTER.

The butter of trade is not composed entirely of fat, it contains water casein, sugar of milk and salt.

The following table according to Fleischmann, gives the composition of various kinds of butter :

	Made from sweet cream unsalted		Made from ripened cream salted	
	Unwashed	Washed	Unwashed	Washed
	Per cent	Per cent	Per cent	Per cent
Water.....	15.00	15.00	12.00	12.50
Fat.....	83.47	83.73	84.75	84.62
Casein and albumen.....	.60	.55	.50	.48
Sugar of milk and some other organic substances.	.80	.60	.55	.40
Ashes or ashes and salt....	.13	.12	2.20	2.00

He shows that in these butters the quantity of water varies 12 p. ct. Cream churned at a high temperature, gives a butter containing a large quantity of water which it is impossible to get rid of. Butter may appear to be perfectly dry to look at and contain as much as 18 p. ct. of water, while another sample may be covered with drops and yet be comparatively free from water. This arises from the fact that water may be incorporated in the butter in the shape of invisible drops

RETURN OF BUTTER FROM MILK.

Generally in the butter factories of this Province, where the new methods of manufacture are followed, the quantity of butter produced exceeds the quantity of fat contained in the milk from which the butter is made by from 10 to 15 p. ct. So 100 lbs of fat in the milk will give from 110 to 115 lbs of butter. For example, 6000 lbs of milk, giving 3½ p. ct. of fat by the Babcock, will produce $60 \times 3\frac{1}{2} \times 1.15 = 241\frac{1}{2}$ lbs of butter.

In the spring milk gives about 110 lbs of butter to every 100 lbs of fat. This return increases up till the autumn, when it reaches 114 to 115 lbs of butter to every 100 lbs of fat.

RETURN OF BUTTER FROM MILKS OF VARIOUS DEGREES OF RICHNESS.
(Kirchner)

100 lbs of milk give the number of lbs of butter indicated in the following table (on the basis that 16 p. ct. of cream has been taken and that the butter contains 83 p. ct. of fat.)

PERCENTAGE OF FAT IN THE MILK	PERCENTAGE OF FAT REMAINING IN THE SKIM-MILK			
	0.20 p. ct.	0.30 p. ct.	0.40 p. ct.	0.50 p. ct.
	lbs	lbs	lbs	lbs
2.5	2.697	2.600	2.503	2.406
2.6	2.812	2.716	2.618	2.522
2.7	2.928	2.832	2.734	2.638
2.8	3.044	2.948	2.850	2.754
2.9	3.160	3.063	2.966	2.870
3.0	3.276	3.178	3.081	2.984
3.1	3.392	3.293	3.207	3.100
3.2	3.508	3.409	3.313	3.216
3.3	3.624	3.525	3.429	3.332
3.4	3.739	3.641	3.547	3.447
3.5	3.854	3.757	3.659	3.562
3.6	3.969	3.873	3.774	3.677
3.7	4.084	3.989	3.890	3.793
3.8	4.100	4.105	4.006	3.909
3.9	4.316	4.220	4.122	4.025
4.0	4.433	4.335	4.238	4.141
4.1	4.547	4.450	4.352	4.257
4.2	4.653	4.565	4.468	4.373
4.3	4.779	4.681	4.584	4.489
4.4	4.895	4.797	4.700	4.604
4.5	5.011	4.913	4.866	4.719
4.6	5.127	5.028	4.932	4.834
4.7	5.243	5.144	5.068	4.949
4.8	5.359	5.260	5.164	5.065
4.9	5.474	5.376	5.280	5.181
5.0	5.589	5.492	5.395	5.297

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The following table shows the quantity of milk required to make a pound of fat according to its richness. It is calculated on the basis of a return from the factory of 115 lbs of butter for each 100 lbs of fat.

QUANTITY OF MILK REQUIRED TO GIVE ONE POUND OF BUTTER
ACCORDING AS THE MILK IS RICH IN FAT.

Richness of the milk in fat	lbs of milk per lb of butter	Richness of the milk in fat	lbs of milk per lb of butter
2.8	31.1	5.0	17.4
3.0	29.0	5.2	16.7
3.2	27.2	5.4	16.1
3.4	25.5	5.6	15.5
3.6	24.2	5.8	15.0
3.8	22.9	6.0	14.5
4.0	21.7	6.2	14.0
4.2	20.7	6.4	13.6
4.4	19.8	6.6	13.2
4.6	18.9	6.8	12.8
4.8	18.1	7.0	12.4

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NUMBER OF POUNDS OF MILK NECESSARY TO MAKE ONE POUND OF BUTTER. (*Kirchner*.)

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BUTTER

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- 17.4
- 16.7
- 16.1
- 15.5
- 15.0
- 14.5
- 14.0
- 13.6
- 13.2
- 12.8
- 12.4

lbs of butter per 100 lbs of milk	lbs of milk for 1 lb of butter	lbs of butter per 100 lbs of milk	lbs of milk for 1 lb of butter
2.4	41.67	3.8	26.32
2.5	40.00	3.9	25.64
2.6	38.46	4.0	25.00
2.7	37.04	4.1	24.39
2.8	35.71	4.2	23.81
2.9	34.48	4.3	23.26
3.0	33.33	4.4	22.73
3.1	32.26	4.5	22.22
3.2	31.25	4.6	21.74
3.3	30.30	4.7	21.28
3.4	29.41	4.8	20.83
3.5	28.57	4.9	20.41
3.6	27.68	5.0	20.00
3.7	27.03	5.5	18.18

It must be remarked that these tables only give general averages, and that, in practice, the returns obtained may vary greatly from the figures therein given, without any blame, on that account being attached to the manufacturer.

PROPORTIONATE DIVISION OF THE COMPONENT PARTS OF MILK BY THE MANUFACTURE OF BUTTER FROM 1000 LBS OF MILK BY THE OLD SYSTEM. (Cooke)

	Total of solids	Fat	Casein	Albumen	Sugar of milk	Ashes	Proportion of fat in the product
	lbs	lbs	lbs	lbs	lbs	lbs	
1000 lbs of entire pure milk.....	130 0	40 0	26 0	7 0	49 5	7 5	1 00
800 lbs of skim-milk.....	78 0	2 4	22 0	6 0	41 2	6 4	6
200 lbs of cream..	52 0	37 6	4 0	1 0	8 3	1 1	94
187 lbs of butter-milk.....	14 91	8	3 77	94	8 3	1 1	2
433 lbs of butter..	37 09	36 8	53	06	92

CHARGES FOR MANUFACTURE.

This is an important question, as it is often productive of discussions between the patrons and the owner of the factory. The greater the quantity of milk the patrons bring to the factory, the lower the rate of charges they may hope to pay for the making, because in a butter factory, the expenses of manufacture are about the same for from 0 to 7000 lbs per day; they would also be about the same for from 7000 to 15000 lbs of milk per day; and because when the manufacture is operated on an extensive scale, these expenses are divided between a greater number of pounds of butter.

The following would be a reasonable charge for the manufacture :

- From 0 to 7000 lbs..... 3½ cents p. lb.
- From 7000 to 15000 lbs..... 3 cents p. lb.

Above 15000 lbs the charge might be still further reduced.

Under these conditions, a factory handling 5000 lbs per day, for 6 months would not do more than pay wages. By the handling of 6000 lbs per day, the factory would realize about \$200.00 dollars. At the outside at these

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rates it would be highly imprudent to start a factory before being assisted of handling at least 6000 lbs of milk per day :

Large well appointed factories employing a first class maker, are much more advantageous to all parties concerned than the smaller ones ; and the strongest advice should be given to farmers, in their own interests, to encourage and give the preference to the larger establishments. Better appointed and having the disposal of a larger capital, they are able to produce at a lower cost and to obtain a better price for their products on the market than the small factories can possibly do.

WINTER BUTTER.

The manufacture of winter butter of equal quality to that manufactured in summer is possible ; but such manufacture is attended with special conditions.

1. There should be to every 5 to 8 cows, old in milk, at least one fresh calved cow. This condition can easily be attained, if the farmers arrange for the calving of a portion of their cows in the autumn.

2. The cow-houses, which should be perfectly ventilated, should contain no bad smells, arising from any cause whatever. The smell of sour silage is the very worst of all.

3. The milk should be thoroughly aired before being cooled.

4. Too many turnips should not be fed to the cows and no fodder should be used which might communicate a bad taste to the milk : sour silage is one of these as well as musty forage, spoiled roots and fermented mashes.

5. Very old milk should not be used. The milk should be brought to the factory every day or every two days.

6. Milk ferments should be used and fermentation should not take place at too low a temperature.

7. The temperature of the factory should be under control during the whole winter. Under these conditions and by following the other rules for the manufacture of butter, choice butter may be made during the winter as well as in the summer : and such manufacture can not receive too much encouragement.

MILK BY THE
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Ashes	Proportion of fat in the product
lbs	
7 5	1 00
6 4	6
1 1	94
1 1	2
.....	92

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BUTTER AND CHEESE.

Cheese should never be made, either in the spring or late in the autumn (fodder cheese). Cheese made from hay fed cows is entirely unsuitable to the English market and the manufacture of this kind of cheese results every year in a lowering of prices highly expensive to the Province.

In the spring and autumn and during the winter the milk should all be brought to the butter factories. Cheese factories should only be worked during the summer. This fact has been proved by experience and it would be well for farmers to take note of it.

GABRIEL HENRY, C. E.

QUEBEC, 10th, April 1900.

