

Dairy and Creamery.

SCIENCE IN CHURNING.

The churn is an imperfect machine. No churn has every time extracted all the butter, but under favorable conditions, some of these conditions being as yet imperfectly understood, it has proved satisfactory. The loss is a variable quantity, sometimes as low as 1 or 2 per cent, and running up to a much greater amount. It is not improbable that 2 or 3 lbs loss for every 100 lbs of butter is a general condition in creamery management, while in private dairying it far exceeds this. To reduce this loss to the smallest amount is the problem. To do this we must know why it occurs, and to know why it occurs we must understand the philosophy of churning.

Churning consists in causing fat globules to stick together. Concussion is the force used to bring them into forcible contact, and if the proper conditions exist they will adhere to each other. These fat globules are very small. Placed side by side it would take 5000 to make an inch in length, and thousands of millions are required to make enough butter to spread on an ordinary slice of bread. Being so small, the weight is trifling and the force with which they strike each other in churning must mainly come from the concussion of the mass of cream or milk in which they exist. To get all the globules to unite in lumps that will separate from the buttermilk is a big job—too much so for literal accomplishment.

The first condition is the right temperature. If the cream is below 40 degrees or above 90 the fat globules will not unite. The best temperature is not known, but the limits have been narrowed down to a range of from 50 to 68, and this again can be more closely fixed in practice, as the local conditions are known. Fed is one local condition. Cottonseed meal produces hard fat globules, and cream from cows given this feed must be heated to 65 degrees. Bran facilitates churning, and "fresh" cows furnish cream which churns well. When cream is "obstinate" in winter, I buy bran to make it churn better. Farrow cows and strippers give milk with small fat globules, and small globules are more difficult to churn than larger ones. The butter fat found in skimmilk and buttermilk is in small globules. So the temperature suited to most exhaustive churning varies with the season and feed and time the cows have milked and also with the cows themselves—those furnishing small fat globules giving most trouble.

It also varies with the condition of the cream—whether it be sweet or sour. Sour cream churns easier and generally yields more butter. The W Va expersta conducted experiments to determine how much water can be loaded into butter and still produce a marketable article, and found that the greatest weight could be made from sweet cream if churned at a low temperature, say 52 to 54. The sweet cream butter seemed capable of holding more water, and 100 lbs of butter fat was at times made into 122 lbs of butter. In the north, the evidence seems to point to a general loss when cream is churned sweet, due perhaps to churning at sour cream temperature, but the evidence is strong that ripening cream renders the albuminous portion less tenacious and the churning liberates the fat globules more readily and consequently is more effective. Sour milk can be churned but not sweet milk, and this shows that souring facilitates churning. Butter extractors do not churn butter from sweet milk, they churn it from sweet cream as separated from the milk and deposited in a film inside of the drum.

And this brings us directly to an important point—concussion and how to produce it. Two errors exist, viz: Using too small a churn and filling the churn too full of cream. I have found that cream from strippers which was so albuminous that the fat globules would not adhere with a full churn, would stick together readily by dividing the quantity and taking half at a time. The reason is that the cream falls further and is subjected to greater concussion when the churn contains less. And the difference is greater than a dairyman or creameryman, for that matter, would imagine. A natural conclusion is that if the cream falls with twice the velocity it will have twice the striking force.

This is not the case. Here is where philosophy is a help, for it teaches that the striking force increases with the square of the velocity. Dairy-men appear not to have thought of this well known principle. They buy a little box or barrel churn and churn away for hours and wonder why the butter will not come. The reason is that the cream does not fall far enough to get sufficient velocity, and the striking force is too weak. If the distance the cream falls is increased so that the velocity with which it falls is one-half greater, the striking force will be more than doubled. It will be 2 1/2 times as great. If the velocity is doubled, the striking force will be four times as great. It is a common mistake to buy too small a churn. It will not prove satisfactory.

Another point is the speed of the churn. This should vary with the size of the churn and be so timed as to give the greatest thud to the cream, that is, cause the greatest striking force. The things to observe more particularly are—temperature, ripening, size of churn, amount of cream and speed of churn. The temperature must be ascertained by careful observation and will be in the neighborhood of 60 per cent for ordinary cream and lower for thick cream; it must be high enough to prevent excessive foaming and not so high as to come soft and loaded with water; it must be soured enough to "cut the albumen, but not sour enough to be in the early stage of putrefaction. The churn must have sufficient size and have enough vacant space to allow the cream sufficient fall. The velocity should be regulated to give the greatest fall to the cream, as an increase of 10 per cent in velocity of fall makes an increase of 21 per cent in the striking force. This is the general philosophy of churning and will give good general results. The smallest fat globules will some of them escape, and cream abnormally full of albumen, or in which the fat globules are particularly tallowy, will need special treatment. This last kind of cream needs an expert. Ordinary cream needs common sense and reasonable attention to business.—[E. C. Bennett, Ia.]

**Stringy Milk**—R. J. T.'s cow's milk is stringy and the udder becomes sore. The trouble is probably inflammation of the udder. If she was my cow I would give epsom salts 5 or 10 oz, with salt-peter 1/2 oz, repeating the latter in six hours. If milk is hard to draw, would use a tube, and would be sure to get it all out. Would inject a solution of carbonate of soda 1 oz in water 1 pt into the teat, and milk it out to cleanse it, and would rub udder with water as hot as I could bear my hands in, to allay inflammation.—[J. E. Hollis, Worcester Co, Mass.]

**fooling with Bulls** is expensive, for half of each calf is from him and one year is not enough, generally speaking, to decide on his merits. He should be kept in good hard flesh and be let run in a paddock. Never let him run with the cows, for he is liable at any moment to hurt some one. Ring him early in life and keep the ring in good repair. In winter, it is best to keep him along with the cows, as he will be quieter and more easily managed. If fall calving is adopted, his services will be required in Dec and Jan, and he should be prepared by being put in good hard condition.

**When Cream is Properly Ripened** it has a smooth, glossy appearance, a pleasant acid taste and smell and will pour like thick molasses and show about seven-tenths per cent of acid by the alkaline test. It should be the aim of every butter maker to make the same quality of butter every day, in order to make a good reputation for himself, and receive the highest price for his goods.

**From Fall Calving Cows** about 25 per cent more milk is obtained than from those having calves in spring: such is the uniform result of investigations all over the world. During winter the cow is not afflicted from drought by poor feed or shortage of water, heat and flies are not troublesome and her flow is thus not affected when right in the flush of the season. Spring grass coming toward the close of her period of lactation serves as an inspiration to her wearying powers and

greatly increases the waning flow. A cow is generally cared for better during winter than summer, as is her calf.—[Prof J. H. Grisdale, Ont.]

**American Butter in England** is said to be sold as the "best Dorset," all American tags and labels being carefully removed. English shop men have no more scruples in deceiving a customer than American manufacturers have in adulterating their food products.

Be gentle with the cow and sit down to her so that you can place your head against her flank and control the movement of her leg with your left arm, in case she steps around or is inclined to kick.

Warm stables save food in winter and secure an increase of product over cold stables. Warm drink in winter increases the flow and improves the quality of milk. Letting cows get chilled is a costly practice.

Keeping manure on the hams of cows is a mighty poor way of preserving it. To avoid this, the animals must be well bedded, for if good results are to be hoped for, comfort and kindness are above all things necessary.

Alternate sour and sweet milk will kill any calf.

To get best results in feeding skimmilk it must be separated on the farm. I believe the hand separator has come to stay, because it is profitable and is also labor saving. A good way to run it is to use his majesty, the dairy bull.—[Prof J. H. Grisdale, Ont Experiment Farm.]

**Keeping Cows for Profit** is a well-named booklet containing a wealth of information concerning winter dairying. The most up-to-date processes are clearly described so that the average dairyman can get a clear idea as to how money making dairymen are getting along. The chapters on feeding, butter-making, cheese production, their marketing, etc. are clear-cut statements as to how money is being made from the cow and her product. Profusely illustrated, the booklet is distributed free by the De Laval Separator Co of New York and Chicago.

**Where to Buy**—L. L.: Belgian hares are sold by John Rauscher, Jr, Freeport, Ill, or B. H. Greider, Florin, Pa.—Mrs T. O. L.: The birds you mention, also turkeys, can be had of C. C. Shoemaker, Freeport, Ill, or W. Altee Burpee & Co, Philadelphia, Pa.

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