

4th.—The feed of the cow. The drier the feed the higher the temperature; the more succulent the feed the lower the temperature. Feed changes the composition of the butter-fat. When no roots or corn silage is fed the butter-fat becomes harder and requires more heat to bring it into churning condition. It is wisdom, not only from the point of having easier churning cream and nicer butter, but from the increased flow of milk, to provide some kind of succulent food for the cows in winter.

5th.—The temperature of the room, the individuality of the cows, etc., are factors that must be considered in regulating the churning temperature.

Get conditions as nearly right as possible, then by taking careful note of the temperature and time watch the churning.

If the butter comes in ten minutes or sooner it

shows that the temperature has been too high. This invariably means soft butter—milky butter, and an excessive loss of butter in the buttermilk.

If the cream takes forty minutes or longer the temperature has been too low. If in the first case you had the cream at 64°, reduce it to 59° or 60° the next time you churn. If in the second case it was 56° or 58°, increase the temperature three or four degrees. This implies, of course, that the amount and kind of cream, etc., is the same from churning to churning.

By watching the time, find out that temperature which brings butter in from twenty to thirty minutes.

Endeavor to make conditions such as will enable you to churn at a reasonably low temperature—54° to 58° in summer, 56° to 62° in winter—and yet get butter within the half hour. You get more and better butter by having things under proper control.

The two chief conditions which cause long churning are: 1st, too poor cream; 2nd, too much in the churn; and these are conditions under our own control. Turn in the screw of your separator; don't let so much skim milk get in with the cream, and then you have less bulk of cream, but of richer quality.

If the cream is persistently hard to churn, pasteurize it while sweet. I know of nothing which helps so much in stubborn cases. To pasteurize, set the can in a vessel of hot water; stir the cream frequently until the cream is 160° or 170°; then set the can in cold water and reduce the temperature to 60°. If you wish to ripen the cream, add about ten per cent. of good flavored sour cream or milk. If kept at between 55° and 60° the cream should be in condition for churning the next day.

Winter Fair Discussion on Pasteurized Whey.

No feature of the meetings held at the recent Winter Fair, at Guelph, was followed with greater interest than the question of pasteurizing whey. The work done in that connection, and methods adopted, were outlined by Frank Hens, Chief Dairy Instructor for Western Ontario, and the discussion, which dealt largely with the economic side from the farmer's standpoint, was led by W. C. Shearer, of Bright.

The address given by Mr. Hens was, in part, as follows:

"The question of heating or pasteurizing whey returned from cheese factories has been given some attention in an irregular way for many years. It was tried, more or less successfully, by factory managers at different times. There is no claim made by those who have lately taken up the matter that the idea is new, or that they have made any discovery. Bacteriologists advised this system of dealing with whey long ago, particularly where bitter flavors developed in the curds. What is claimed, however, is that two years' close attention and experiment with fifty-eight cheese factories has warranted the assertion, and goes far to prove that proper and systematic pasteurization of whey before it is returned to the patron is a step towards securing a better milk supply at cheese factories, and a means, when properly done, of increasing the feeding value of the whey, and doing away, to some extent, at least, with the evils of unclean, ill-smelling whey tanks, and bitter and yeasty flavors. It is no doubt true that it would be much better for the cheese industry if no whey were returned in the cans, and this system has been repeatedly advocated by dairy authorities and others who know the evils of returning whey in cans, but, unfortunately, patrons do not always follow good advice. We find, therefore, that conditions bring us face to face with the fact that in Western Ontario at least the majority of factories return the whey, and so far there has not been offered any more practical method of returning this whey than in the cans in which the milk is delivered.

"For many years, the whey and whey-tank questions have been problems difficult to deal with. Admitted by nearly every one in the trade that returning whey in cans from the ordinary whey tanks, and under conditions that have prevailed for twenty years or longer, was a distinct means of injuring the flavor and quality of the cheese, yet no real practical solution of the difficulty has been offered, other than appeals to the maker and patrons for more sanitary conditions, which have had a marked effect. During the past four or five years, a great improvement has been brought about through dairy instruction and public opinion in the condition of whey tanks, yet we are still a long way from perfection, and many tanks are still sadly neglected and kept in bad condition. In fact, there are still a few tanks that are not cleaned during the season, in defiance of which neglect the very doubtful argument is put forth that the more filthy the whey tanks become, the more likely are the patrons to pay particular attention to cleaning the cans. I think factory managers sometimes underestimate the influence of clean whey tanks in the attitude patrons take in caring for milk.

"We have been looking forward to the time, and I hope and trust it will come, when human nature will be changed to such an extent that up-to-date methods will be followed, and no careless cheesemaker or patron will be known. Then will the evils of bacteria-laden whey, unclean whey tanks and improperly-cared-for milk disappear; then, no doubt, pasteurization of factory by-products will be unnecessary. But in the meantime, what? Depend on the slow process of education and perhaps compulsion to remedy the evil of unclean whey tanks, when, for a small cost to each patron, a partial remedy, at least, may be provided, and conditions improved, so far as the whey is concerned, right now, not ten years from now? In dealing with this matter, I sent straight to the men who produce the milk,

the women on the farm who usually have to wash the cans, who, to my mind, are in the best position to know the exact condition in which the whey has been coming home from the factories for many years past. I sent out 1,500 letters to patrons of 23 factories where the whey was being pasteurized for the first time, dealing with the claimed improvements of the whey, asking some twenty questions relative to these improvements; and out of the several hundred answers received, the opinion was almost unanimous that pasteurization of the whey was a distinct improvement, and expressing their willingness to pay their share of the cost to continue this system at their respective factories. I do not think the opinion of these patrons should be ignored, and I believe they know what they are talking about. The makers say the milk comes in better condition, and some of the cheese-buyers claim the quality of the cheese is improved, particularly as to flavor.

REASONS FOR PASTEURIZING.

"Let us look at a few reasons for continuing and extending this system. The fact is well known that the germ-life which produce certain putrefactive flavors develops very readily in ordinary sour whey, and that these germs are readily conveyed through the medium of the whey in the patrons' cans. This germ-life finds a breeding-ground in the crevices of the can, and are very difficult to dislodge. They rapidly develop in the milk when brought in contact, and produce yeasty, bitter, and other putrefactive flavors. It is not practical to pasteurize the milk for cheesemaking; consequently, to prevent as much as possible the contamination of the cans, we resort to pasteurization of the whey. A whey tank may be cleaned every day, but unless the tank is sterilized with live steam, it is not clean from a bacteriological standpoint. The wood being porous, allows the sour whey to penetrate, and, no doubt, many injurious bacteria. Steel whey tanks are very much to be preferred on this account. Whey, unpasteurized, from ordinary whey tanks goes into the cans with an acidity of from 1 to 1.7 per cent., depending on the cleanliness of the tank, or an average acidity of about 1.15 per cent. This means very sour whey, the sugar of which is nearly all changed to lactic acid, which readily affects the tin of the can. I have failed to meet the patron who would rather feed or have in his can old, sour, ill-smelling whey in preference to sweet whey. The average acidity of the whey going into the patron's can, where properly pasteurized, was .4 per cent., about three times as sweet as when not pasteurized. Some factories were able to return the whey with an acidity not greater than .25 per cent.

"There is a small mechanical loss of fat in the whey in the process of cheesemaking, even under the best conditions—less when the milk is in good condition, more when not. By all means, let us endeavor to have the milk sent in such condition that this loss will be the least possible. The average loss in the whey for the factories of Western Ontario this year was .23 per cent. I am not prepared to say what this fat is worth for feeding purposes, but if it is worth anything, let us see how much of this fat the patron really gets under ordinary conditions. The average per cent. of fat in the whey going into the patrons' cans where not pasteurized, this year was .09 per cent., less than one-tenth per cent.; as low in some cases as .03 per cent. Where does the remainder of it go? It floats on the top of the whey in the tank, and when the tanks are not cleaned regularly becomes a mass of decomposing floating material which is a nuisance to the cheesemaker; in fact, is given as an excuse by him, after it has accumulated, for not cleaning the tank. He says he doesn't know what to do with it, and it is certainly almost a total loss to the patron, except when the whey gets short some morning and his can gets a deluge of this stuff, which I defy anyone to cleanse out of the can properly with the ordinary facilities at hand at

the average farmhouse. It seems somewhat inconsistent to ask patrons to improve the methods of caring for milk, and then persist in putting into their cans this old, sour, foul-smelling, gravity-skimmed whey, and leave them to believe that this system of handling whey is the best that can be devised until more up-to-date methods are adopted by them in the care of the milk. On the other hand, we find that where a proper system of pasteurization has been introduced, the average per cent. of fat in the whey as it is returned is .22 per cent., or practically the same as when it came off the curd. This fat is evenly distributed through the whey, is liquid, is easily passed from the can with the whey, and does not interfere with easy and proper washing. If this fat is worth anything for feeding, you will notice there is two and one-half times as much fat returned in pasteurized whey as in unpasteurized; in the latter the fat is left in the whey tanks in most cases. When flavors develop in cheese, does it not look reasonable to suppose that such flavor may be induced by returning unclean whey in the cans. In fact, this is one of the strong arguments put forth for many years by those who are opposed to returning whey, that such a system gave the cheese a whey flavor. We may rest assured that human nature will always creep in, and some patrons will fail occasionally to get rid of the injurious bacteria from the cans. It is, therefore, reasonable to suggest that all patrons be put on the same footing, so far as the whey question is concerned, and send them home sweet, germ-free whey, and then look after the careless ones and see that they take proper care of the milk and cans.

"The question of tuberculosis might also be mentioned in this connection, since it is claimed that it is quite possible for bovine tuberculosis to be carried through the medium of the whey, and infection of the hogs or other animals to which it may be fed, take place. If this is true, then it becomes another strong reason for proper pasteurization of all by-products from the cheese factory and creamery.

PREVENTS SPREAD OF GERMS.

"Yeasty or bitter flavor may be developed in the milk of one or more patrons from unsanitary conditions at the farm, but heating the whey will prevent the infection of other patrons' cans, and the bacteria from being seeded at each farm. Consequently, the patron who is guilty of sending yeast-infected milk may easily be detected by the curd test, and dealt with accordingly. The cans are very much easier to wash where the whey is pasteurized. It is absolutely necessary that the cans be sterilized or scalded with boiling water, whether the whey is pasteurized or not. This should leave the cans sweet and clean, without that disagreeable old sour whey flavor so hard to remove from cans which contain whey from tanks where it is not heated or kept clean. The saving in cans alone should be considerable, since less tin is removed, because of less acidity. The chances of overripe milk during hot weather are lessened.

TIME TO PASTEURIZE.

"Pasteurization should begin as soon as possible after the whey reaches the tank, to prevent the development of acid, and to take advantage of the temperature of 98 degrees before it begins to cool. Care must be taken that the temperature does not rise above 160 degrees. A higher temperature will precipitate the albumen and cause the whey to be flocculent and slimy. A temperature less than 150 degrees is too low, as the growth of bacteria is not inhibited to a sufficient extent.

"Small or large quantities of whey should not be left in the tank from day to day, as this whey eventually becomes sour and acts as a culture in the new whey, rapidly raising the acidity, and nullifying to a great extent the work of pasteurization. The boiler must be large enough to furnish economically the steam required. Economical results cannot be obtained otherwise. The