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PRODUCING QUALITY CREAM

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Rules For Producing Good Cream

1—Keep the cows and stables clean.

2—Feed clean wholesome feeds. Keep cows away from pastures infested with such weeds as leeks, onions, garlic, skunk cabbage or ragweed.

3—Milk with clean, dry hands.

4—Use a small top milk pail.

5—Remove milk from stable immediately after milking and separate while warm.

6—Adjust the cream screw to yield a 35 to 40 per cent cream.

7—Cool cream to 50° F. immediately after separation. After the fresh cream is thoroughly cooled pour it into the cream jar, mixing the old and new cream well by vigorous stirring.

8—Hold cream in a cool, well-ventilated place protected from vermin.

9—Wash the separator parts after each separation, using a washing powder instead of soap and a fibre brush.

10—Wash, rinse, scald, dry, sun, and air all dairy utensils.

11—Protect the cream from freezing.

12—Deliver the cream three times a week, in summer, and twice a week in winter.

13—Protect cans from exposure to sun during delivery by wrapping with a wet blanket or sack.

PRODUCING QUALITY CREAM

By A. C. BALTZER and G. MALCOLM TROUT

It is estimated that between 50 and 60 million pounds of butterfat are sold as cream annually to Michigan creameries. Some butterfat is also used in making a small amount of farm butter.

The quality of cream used in either event determines the quality of butter resulting and hence the price obtained. The difference in price between butter scoring 87 points and butter scoring 92 points is but a few cents, often only three to five cents. However, when this difference in price is applied to 65 to 70 million pounds of butter produced from the cream sold annually by Michigan farmers the aggregate amounts to two or more millions of dollars. The price difference, however, is of minor importance compared to the fact that there is always a great demand for high quality butter even in times of surplus when there is little demand or no market for the poorer grades.

Hence it should be clear that when a higher grade of cream is produced, a larger net return will result to the farmer as well as a more steady market for his product. The farmer controls the quality and hence the price. Inferior cream with such defects as described in this bulletin, when made into butter, either on the farm or at the creamery will result in inferior grades of butter.

Michigan offers first, a ready home market for high quality butter and second, an easy access to the nearby eastern markets. Creameries producing the highest grade of butter realize little difficulty in securing the top market price either in Michigan or in the eastern markets. This applies to both Michigan creameries and out-of-state creameries.

In order to meet the growing competition, it is necessary to offer the equivalent or higher quality of butter to the metropolitan areas of the state. Nearness to the home market is an advantage to Michigan creameries and cream producers. Both will realize the best price only when the highest quality of product is offered.

GRADES OF CREAM

Cream can be readily classified into several grades each having definite, well-defined, characteristics. Supplies of cream received daily at many creameries fall naturally into various grades. Although the creameryman may receive the cream without grading it, he is generally aware of the quality of cream being received and recognizes that a high quality product can not be made from inferior raw material. Consequently the average price received for his entire butter made from a churning of cream made up in part, at least, of poor cream is a few cents lower than quotations for extras. As a result, the price paid to the farmer for butterfat is lowered accordingly.

An understanding of the market grades of cream, its requirements, the characteristics of each grade, and the processes involved in the production of such cream are very essential to the dairy farmer. Without such knowledge the cream producer labors blindly without any definite goal toward which to center his efforts. In general the grades of cream recognized by creamerymen are as follows:

Special Grade: Special grade cream shall be that cream which is clean and entirely free from any "off" flavor or odor and which shall contain not to exceed .20 per cent acidity calculated as lactic acid. Such cream lends itself readily to the making of 92 to 94 score butter. This is commonly known as sweet cream.

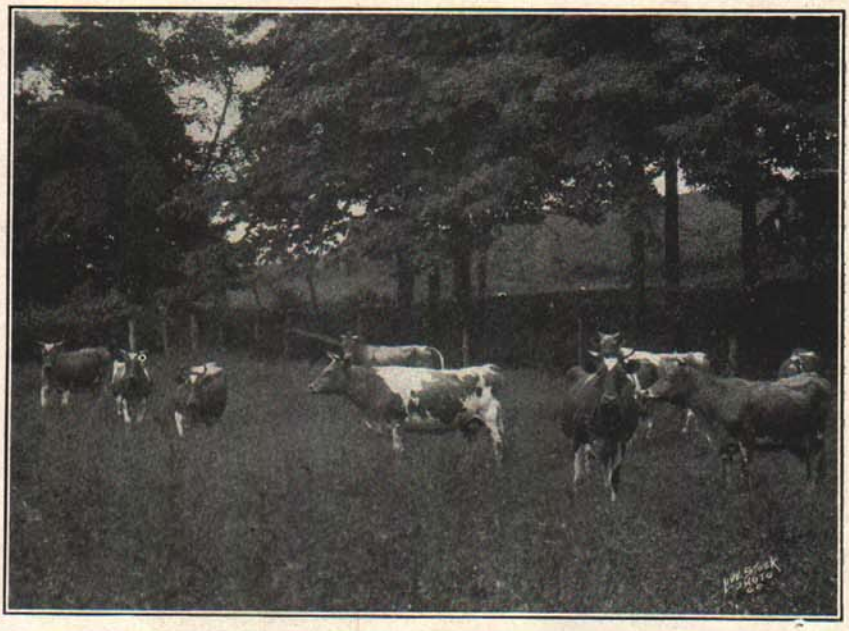

Fig. 1.—Quality cream from clean healthy cows will assist Michigan dairymen to obtain and hold the best markets at highest prices.

First Grade: First grade cream shall be that cream which is free from any objectionable flavor or odor and which shall contain not to exceed .60 per cent acidity, calculated as lactic acid. Such cream lends itself readily to the making of 90 or higher score butter. This is mildly sour cream.

Second Grade: Second grade cream shall be that cream which contains undesirable flavors such as weedy, cowy, unclean, barny, smothered, cellar, cheesy, stale, old, and others. It contains more than .60 per cent acidity calculated as lactic acid. Such cream lends itself readily to the making of 87 to 89 score butter. It is very sour and lacks good flavor.

Third Grade: Third grade cream shall be that cream which possesses objectionable flavor such as garlic, leeks, onions, kerosene, gasoline, and has excessively high acidity. Such cream should not be accepted by the creameryman. This grade cream lends itself readily to the making of an inferior, unmarketable butter.

SCORING OF CREAM

Cream is scored on the basis of what the butter made from it will score. It follows, then, that a cream scoring 92 points should yield a butter scoring 92 points; and a cream scoring 89 should yield an 89 score butter, the processes of manufacture being the same in each case. The butter flavor is obtained from and is identical with the flavor observed in the cream from which it was made.

SOURCE OF FLAVOR DEFECTS

The flavors observed in cream may be divided into two different classes which are:

Fig. 2.—Orderly preparation of utensils helps the dairyman produce higher quality dairy products.

ABSORBED FLAVORS

The cream or milk from which the cream was obtained may have been exposed to odorous surroundings, stables, feeds, unclean separator, or a cellar. Flavors derived from exposure to such places are known as *absorbed flavors*. Absorbed flavors in cream are the result of carelessness or neglect in the production, handling, or storing

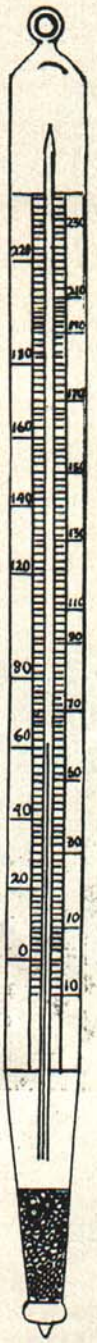

Fig. 3.—The thermometer will denote the temperature of the water supply and will determine how well the cream is cooled.

of cream. Butterfat readily absorbs odors from the surrounding air. Consequently many different flavors are to be found in this class. The more common of the absorbed flavors are:

Garlic, Leek or Onion Cream: Such cream has a strong odor and flavor suggestive of the plant itself. The flavor of garlic, leeks, or onions is associated with the butterfat of the milk and is present in the milk as early as three minutes after the cow has grazed on such plants and persists for a period of ten hours after having eaten the weeds.

Feedy Cream: Feed flavored cream is most noticeable during the winter months when the cows are being fed large quantities of such flavored feeds as turnips and potatoes, but is frequently noticeable also at other times of the year when the cows have access to fresh grass, ragweeds, skunk cabbage, rape, cabbage or beet tops. Undue exposure of milk to silage will result in a cream of a silage flavor.

Musty Cream: Musty cream is caused by storing cream in the cellar or cave where circulation of the air is poor and where the surroundings are usually damp and musty.

Smothered Cream: Smothered cream is a peculiar flavor appearing in cream when the cream is allowed to cool down in a closed container, or when warm cream is mixed with cold cream especially without stirring. Keeping rich cream in a tightly closed container may also cause this undesirable flavor.

Cowy Cream: This flavor is more common during the winter months when the cows are stabled most of the time. Cowy cream is associated with overcrowded stables, dirty cows, and poor ventilation.

Barny Cream: Barny flavor is somewhat different from cowy flavor yet the two have much in common. Barny flavor is common during the winter. The flavor results from exposing the milk to dirty, poorly ventilated stables or to contamination from bits of straw and manure which fall into the milk during milking.

Unclean Cream: Unclean cream is the result of uncleanliness in the washing and care of the utensils. The use of a dishcloth in washing utensils is one of the most common causes of an unclean flavor. Poorly washed separator parts on which are decomposed milk and slime always cause an unclean cream.

Metallic Cream: Metallic cream has a "puckery" taste. Such a flavor results from storing cream in rusty cans or from the use of rusty utensils.

Gasoline or Kerosene Cream: Cream having gasoline or kerosene flavors most frequently has been contaminated directly with gasoline or kerosene or has obtained the undesirable flavor from a can which has been used for transporting those liquids.

Oily Cream: Oily cream results from contamination with lubricating oil used about the separator.

Meaty Cream: Meaty cream results from storing the cream in the kitchen where the atmosphere is frequently laden with the odor of cooking meats.

Flat Cream: Flat, tasteless cream results from allowing too much flush water to flow into the cream especially when the cream being separated is very low in butterfat. Cream obtained by the water dilution system of skimming is generally flat in flavor.

DEVELOPED FLAVORS

The cream may have been held at a satisfactory temperature or for a sufficient period to permit bacterial growth. Flavors resulting from this condition are known as *developed flavors.* The following flavors are the most common of the developed flavors found in cream:

Fig. 4.—A covered top milk pail keeps out much of the falling dirt.

High Acid or Rancid Cream: Such cream is very sour and often bitter in taste. It is caused by use of unclean, unsterile milk pails and dirty separator, by lack of proper cooling, by mixing warm and cold cream together, or by holding at a high temperature.

Yeasty or Foamy Cream: Such cream has a characteristic yeasty pungent smell and fluffy, foamy body. Yeasty cream occurs most frequently during the summer months when the high temperatures are favorable to the growth of the yeast cells, which are carried into the cream with dust. This defect is brought about by uncleanliness, by failure to hold the cream at a low temperature and by exposure of the utensils and cream to dust laden air.

Cheesy Cream: Cheesy cream has the taste and smell of an aged cheddar cheese. Such flavor in cream results from unclean utensils, dirty separator, low butterfat content and to holding the cream for a long period of time.

Bitter Cream: Bitter flavor may result from storing cream at low temperature for a long time or may be a flavor carried over from the milk. Some cows far along in their period of lactation produce bitter milk.

Slimy or Ropy Cream: Such cream is very repulsive in appearance. When pouring the cream from one can to another, it has a thick, viscid, slimy appearance and forms into long threads, or "ropes." This defect results from the growth of a microorganism present. The bacteria causing this trouble live naturally in stagnant water, pools, ponds, marshes, overflowing spring, or in any surface water. These organisms become fastened to the flanks and udder of animals wading in such places. During milking the bacteria-laden particles fall into the milk and consequently are present in the cream.

Tallowy Cream: As the name suggests, tallowy cream tastes like old tallow. This flavor results from unclean production and holding for a long period of time at a low temperature and especially in the presence of light, particularly the direct rays of the sun.

Fishy Cream: Fishy cream tastes like dried fish, herring for example. This flavor developes in cream held for a long time at a low temperature. Fishy flavors in butter and cream are very objectionable.

CHARACTERISTICS OF GOOD CREAM

Good cream, irrespective as to whether it is special or first grade, is that cream testing 35-40 per cent butterfat which has been obtained from milk drawn from one or more healthy cows, handled throughout in clean utensils, has been properly cooled, has a clean pleasant taste, and has an even, smooth, velvety body.

Per Cent Fat Desired

The buttermaker desires a cream at the churn which will test about 32 per cent butterfat. This means then that in order to have a cream testing 32 per cent in the churn the individual lots of cream from the

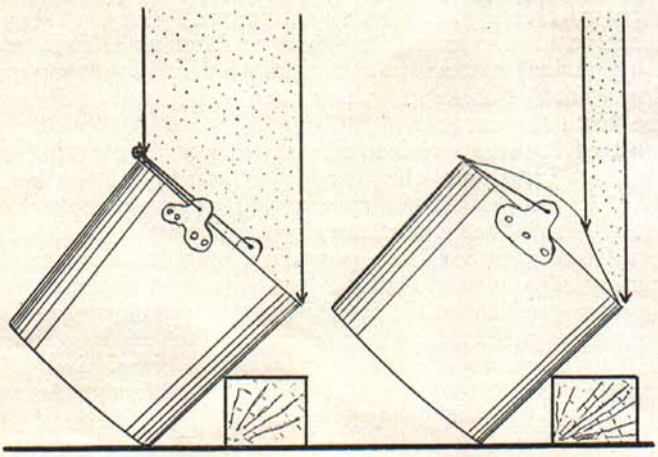

Fig. 5.—Open and covered top pails at "milking angle" showing how the covered top milk pail keeps out much of the falling dirt.

various patrons must test higher than this because the steamings and rinsings when added to the whole will reduce the per cent fat by several points. On the other hand, the buttermaker dislikes a high testing cream because of the difficulty in handling, sampling, and testing.

Accordingly a 35-40 per cent cream is the most satisfactory and economical cream to produce either from the farmer's or the creameryman's viewpoint. Fortunately the cream screw may be set to deliver at normal speed and proper temperature a cream testing approximately

35 per cent butterfat. As the fat percentage of whole milk varies throughout the year, the fat content of cream will vary proportionally but should continue to fall within the range desired for good cream.

Souring of the cream occurs in the skim milk portion of the cream and not in the fat portion. By removing a greater portion of the skim milk thus concentrating the fat portion, a cream of better keeping quality will be secured. Furthermore a 35-40 per cent cream has sufficient richness that, when souring does occur, the cream will be smooth and free from lumps of curd which are characteristic of sour, low-fat cream.

Souring Does Not Increase Fat Content

Contrary to the opinion of many, cream does not have to be sour to yield the correct or maximum test. Indeed, the opposite is more likely to be the result. During the souring of cream, especially of thin cream, lumps form, thus encasing and locking fast many fat globules. Such cream does not yield itself readily to the securing of a representative sample and consequently the test is apt to be inaccurate.

Sour cream is very deceiving in appearance since the development of acid is accompanied by a thickening of the cream. This physical property of sour cream is probably chiefly responsible for the belief that sour cream tests higher than sweet cream.

Sour cream results from holding cream either at a high temperature or for a long period of time or a combination of high temperature and long holding. Both of these conditions are conducive to the evaporation of moisture from the cream.

As a result of the evaporation of moisture the remaining cream will be richer in butterfat, but the pounds of cream will be less and the pounds of fat contained in the cream will remain constant. A slight gain in test will be offset, therefore, by a decrease in weight.

Souring neither increases the pounds of fat in the cream nor aids in the securing of a more accurate test. Rather the spontaneous uncontrolled souring of cream is detrimental to quality. For the buttermaker to make a uniform, high quality product from cream made up of several lots of various flavored high acid cream is as logical as a baker making the best bread by securing different dough from a dozen or more sources. The best product can not be made from such a practice.

BASIS OF GOOD CREAM PRODUCTION

Fortunately, the production of clean cream of high quality requires neither expensive equipment nor a great expenditure of effort. Neither is there anything difficult involved in the production of this higher grade cream which inevitably will lead to higher butterfat prices to the farmer. The foundation of success in producing good cream consists of four essentials, which are: *clean milk, clean utensils, thorough cooling, and frequent delivery.*

Necessity of Clean Milk

A quality product can never be obtained from poor, second-rate, raw material. If a good, clean-flavored cream is to be had, it must be obtained, first of all, from milk of similar characteristics. Dirty milk yields an unclean, off flavored cream and onion milk yields onion cream, and so on. Milk secreted normally from healthy cows which have not had access to highly flavored feeds or to weedy pastures is clean and free from undesirable flavors or odors.

Carelessness in milking or subsequent handling of the milk exposes it to contamination and permits the milk to absorb objectionable flavors

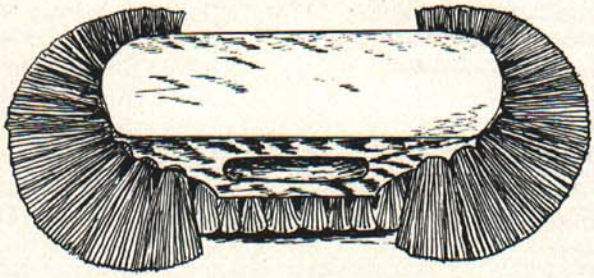

Fig. 6.—One of the aids in obtaining clean utensils is a fibre brush.

which are carried over with the fat into the cream. Any practice which will keep dirt out of milk during the milking is to be recommended.

During the winter cows stabled in stanchions and, even during the summer when the cows are on pasture, considerable dirt will fall from the flanks and udders into the milk during milking. By the use of the small top milk pail this can largely be eliminated.

Milking with hands wet by dipping them into the milk pail or by milking a few streams of milk directly onto them is an exceedingly filthy practice. Dirty milk fails to describe the milk obtained by such methods.

Milk readily absorbs odors from the surrounding atmosphere. These odors are readily transmitted to cream. Barny and cowy flavors result from milk which has been produced and allowed to remain about a dirty, poorly ventilated stable before being skimmed.

All bloody or lumpy milk, or milk from cows fifteen days before and four days after calving should be discarded.

To be assured of a clean milk supply, wipe the flanks and udder with a damp cloth previous to milking; milk with clean dry hands into a small top milk pail; strain the milk through a filter cloth into a milk can; and remove the milk from the stable as soon as possible and skim while the milk is yet warm.

Importance of Clean Utensils

Milk and cream sour as a result of the growth of bacteria. These bacteria get into milk and cream through dirt and unclean utensils. Improperly washed and unsterile utensils are the greatest source of bacterial contamination of milk and cream.

Unwashed Separator Bowl Yields Inferior Cream

Although every utensil with which the cream and milk comes in contact is a possible source of contamination, one of the most common causes of inferior cream of poor keeping quality and unclean flavor is a dirty separator bowl. During the separation of milk, considerable separator slime is deposited in the bowl which can not be removed by rinsing or by flushing the bowl.

The bowl should be flushed with water immediately following separation in order to remove the free milk, cream, and slime between the discs, but this rinsing is not intended to displace washing. The separator bowl and all parts should be washed after each use. An unwashed separator bowl harbors millions of bacteria. It is therefore, hopeless to attempt to produce cream of good keeping quality when it is exposed to such contamination.

Dishcloth Very Objectionable

The dishcloth should not be used in washing dairy utensils. A dishcloth is of little use in digging the solid material from difficult parts of the utensils. The fibre scrub brush has the advantage of actually scrubbing the utensils rather than sliding or smearing over the surface as with the dishcloth. Furthermore, the bristles of the brush being separated, permit airing and drying so the brush remains sweet smelling at all times.

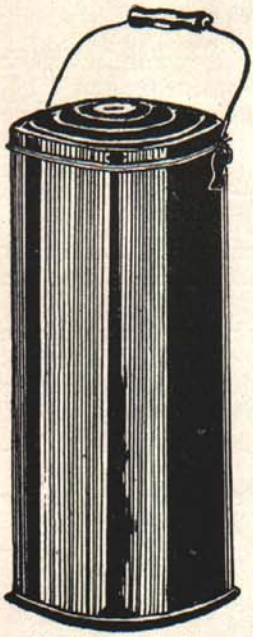

Fig. 7.—Desirable type of container for cooling and holding cream.

Steps in Cleaning Dairy Utensils

The proper cleaning of a dairy utensil involves five steps, which are:

First, rinsing: Rinsing should be done in clean, cold water. Hot water will not do, since it burns or "sets" the milk solids fast thus making difficult washing later. The separator slime itself can seldom be removed by rinsing but must be removed by the hand. After removing the slime from the separator bowl, it should again be flushed with cold water.

Second, washing: Washing should be done in warm water above 93° F. so as to melt the fat and allow greater action of the washing powder. Soap should not be used because it rinses with difficulty and is slow in neutralizing the fats and skimmilk solids. Use a good washing powder instead. A great variety of washing powders may be had at any grocery store, or if these are temporarily unavailable, use common baking soda. Since the butterfat is liquid above 93° F., the temperature of the wash water should be higher than that to facilitate the emulsion and removal of the fat.

Third, rinsing: The purpose of the second rinsing is to remove the washing powder solution and dissolved or emulsified milk solids. This rinsing should be done in warm water at a temperature approximately the same as that of the wash water.

Fourth, sterilizing: A properly washed and rinsed utensil is in a position for being sterilized, but not before. Satisfactory sterilization may be accomplished by the use of scalding water, steam, or chemicals. Sufficient scalding water for submerging the dairy utensils, particularly the parts of the separator bowl, may be had on every dairy farm.

The important factor to observe is that the temperature of the water be at, or near, the boiling temperature. Unless the utensil itself is so hot after scalding that it is painful to the bare hand, little sterilization has been accomplished. Keep the utensils in the boiler of hot water until they are hot.

Steam is a very effective agent for sterilizing. Again, the important factor is the heat of the utensil. Apply the steam until the utensil being steamed becomes hot. Unfortunately steam is not available on many dairy farms, but facilities for steam can be had at a low cost by making proper pipe connections through a laundry stove.

Chemical sterilization offers great possibilities in sterilizing dairy equipment used in cream production. The sterilizing agent, chlorine, can be had in liquid, powder, or tablet form in packages convenient for handling. There are many very satisfactory sterilizing compounds sold under various trade names. Since chlorine, the active agent, passes off in gaseous form when it is heated, it should be used only in cold or slightly warm water.

When used in hot water the chlorine soon passes off and the only sterilization accomplished is from the high temperature of the water which may not be sufficiently high to be of much sterilizing value.

Chlorine compounds are very effective sterilizing agents when the utensils to be sterilized are clean and free from any organic matter such as milk. When organic matter, dirt, straw or milk is present, the sterilizing solution is weakened and is soon valueless as a sterilizing agent. Submerge the previously washed and rinsed utensil in the chlorine solution for at least three minutes. In preparing the commercial chlorine solution, follow the directions which accompany the package.

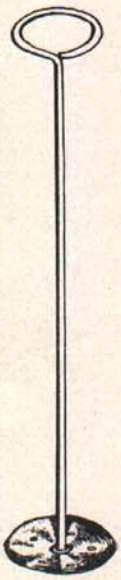

Fig. 8—Daily use of this type of stirrer will improve the body of the cream.

Fifth, drying: Every dairy utensil should be dried to prevent rusting, and aired to eliminate the possibility of undesirable odors. Never dry the utensils by wiping them with a cloth, but by inverting them on a dust-protected sunning and airing rack to dry of their own accord.

Scalded and steamed utensils dry quickly because of the heat held by the metal. Chemically sterilized utensils dry somewhat more slowly because of lack of heat but sufficiently fast to insure satisfactory results.

Prompt and Thorough Cooling

Unfortunately, many cream producers fail to realize the importance of cooling the cream immediately after separation and of keeping it cold until delivery. Cream may be clean as far as freedom from dirt, contact with unclean utensils, or "off" odors are concerned, yet there are always sufficient microorganisms present to sour the cream, if they are given the opportunity to grow. A favorable growth temperature furnishes this opportunity.

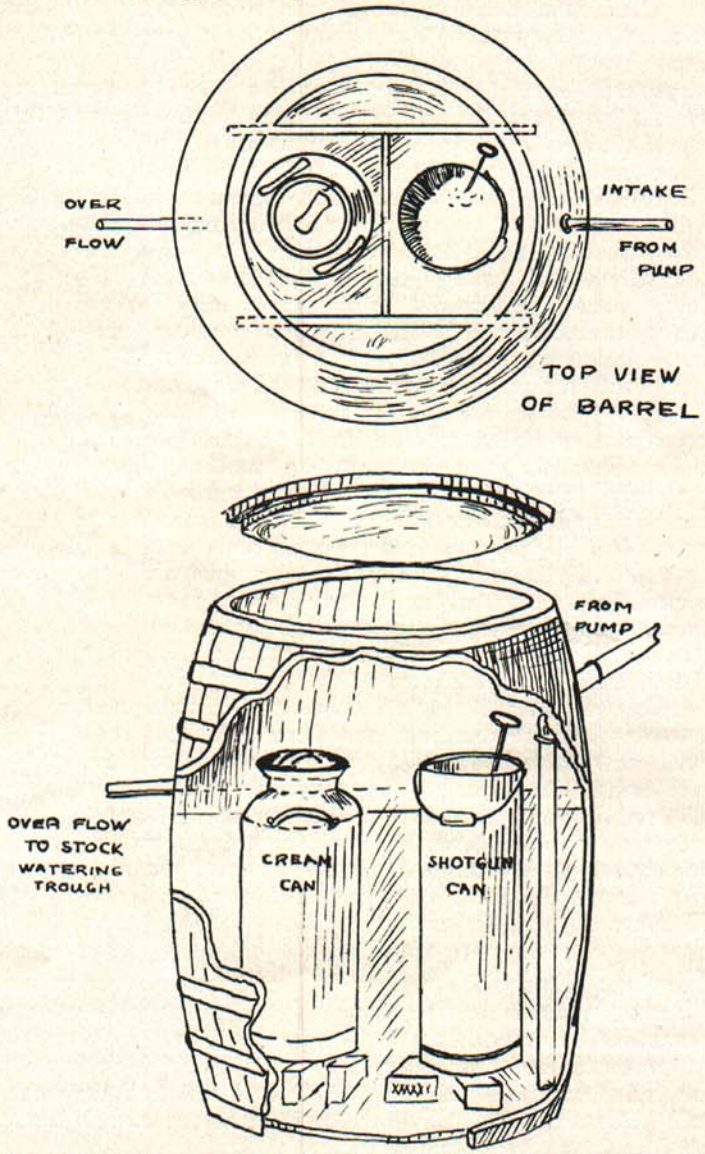

Fig. 9.—This home made device will assist in making a better quality of cream possible.

Practically all dairy bacteria grow well from 65° F. to 100° F. During growth they change the lactose or milk sugar into lactic acid. When a sufficient quantity of lactic acid is produced the cream becomes "sour." The dairyman is indeed fortunate who, by controlling the storage temperature of the cream, can control and practically eliminate the "souring" of the cream. The procedure is simple and easy to follow. *Immediately* after separation, place the cream can, with lid removed, in a tank or pan of cold water, stirring frequently, and cool the cream to a temperature of around 50° F. Unless several gallons of cream are skimmed at each separation, a special cooling device such as the miniature surface coolers are unnecessary.

Well water may be used very satisfactorily. Michigan well water has a temperature ranging from 46° to 55° F. throughout the year and is an excellent medium for cooling cream. Never cool fresh warm cream by placing it in the cellar. Cooling with air is too slow and low temperatures are seldom attained.

As soon as the fresh cream is cooled to the temperature of the main lot, the two lots should be mixed together. Stir the fresh cream vigorously into the second lot. During storage, keep the cream can covered to protect it from possible contamination. Never mix warm, fresh cream with cold cream as the warm cream will raise the temperature of the cold cream which will activate the slowly growing bacteria and lower the quality of the whole lot.

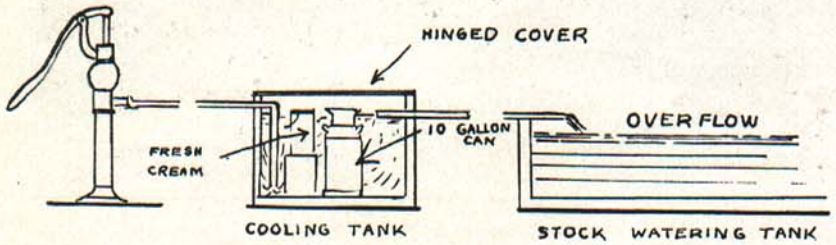

Fig. 10.—Cream cooling tank arrangement showing overflow water pipe connected with stock watering tank.

Frequent stirring of the cream during storage prevents the formation of lumps or of a leathery surface on the cream which makes accurate sampling and therefore, an accurate test difficult to obtain. A metal stirring rod such as is shown in Figure 8 should be used, rather than a wooden paddle or long handled spoon because it is more sanitary and permits more vigorous stirring.

Systems of Cooling

Different dairy farms have different facilities for cooling cream. Where a year around cold spring flows near the farmstead a good spring-house should be built by all means, since continuous and cheap refrigeration are available at all times. Where ice is available on the farm, the cream can be cooled in ice water after which the cooled cream can be placed in the ice box or refrigerator until delivery. The

fresh, uncooled cream should not be put directly into the refrigerator although the temperature of the refrigerator is low, because the cream cools too slowly in air.

In cases where only a small amount of cream is being produced a barrel cooler, such as is shown in Figure 9, can be used to advantage. The barrel is placed between the well and the stock tank and is connected in such a way that the cold water from the pump is delivered to the bottom of the barrel, thus forcing the warmer water in the barrel out to the stock tank. This same principle can be used in connection with the cooling tank built in the milk house.

Never hang the cream can in the well or cistern because at best there can be nothing more than slow cooling and there is always danger of spilling a can of cream in the well or dropping water into the cream. The cooling is the important thing, not the method.

Fig. 11.—Milk or cream cans properly protected with canvas while enroute to manufacturing plant.

Cool immediately after separation and hold at 50° F. or below. Do not allow cream to freeze as freezing destroys the waxy texture of the butter made from it.

Frequent Delivery

Although bacterial growth in cream may have been prohibited by control of temperature, cream does deteriorate with age. The cream should, therefore, be delivered to the creamery at frequent intervals to assure its arrival in first class condition. In general this means that the cream should be delivered twice a week during the winter and three times a week during the summer.

A wet sack or blanket thrown about the cans during summer delivery will keep the cream cool, due to the evaporation of moisture about the can. The cream should be protected from freezing during delivery in the more rigorous weather.