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THE
PRODUCTION
OF
CLEAN MILK AND CREAM
FOR
INDUSTRIAL PURPOSES

ILLUSTRATED



BY
J. POSTMA
MILK INSPECTOR
LOLETA, HUMBOLDT COUNTY
CALIFORNIA

PUBLISHED BY THE AUTHOR



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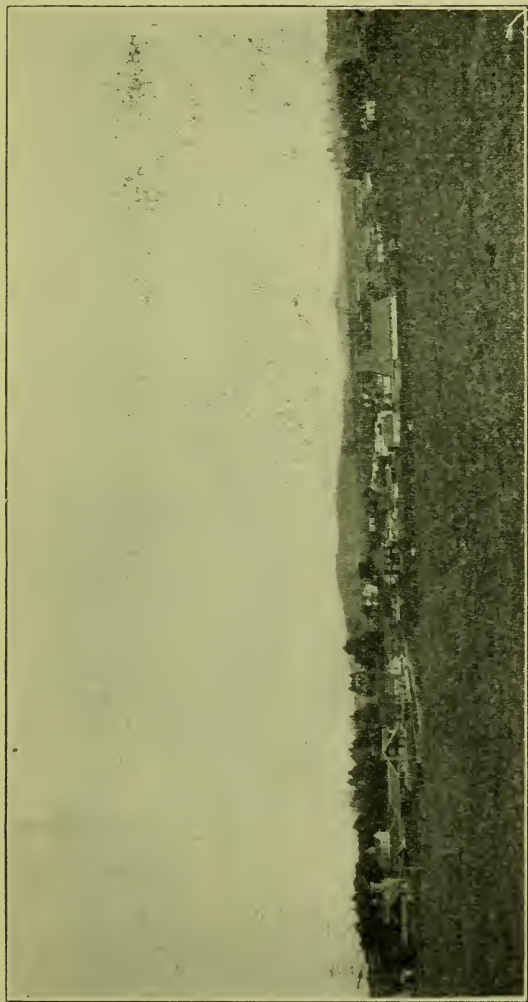
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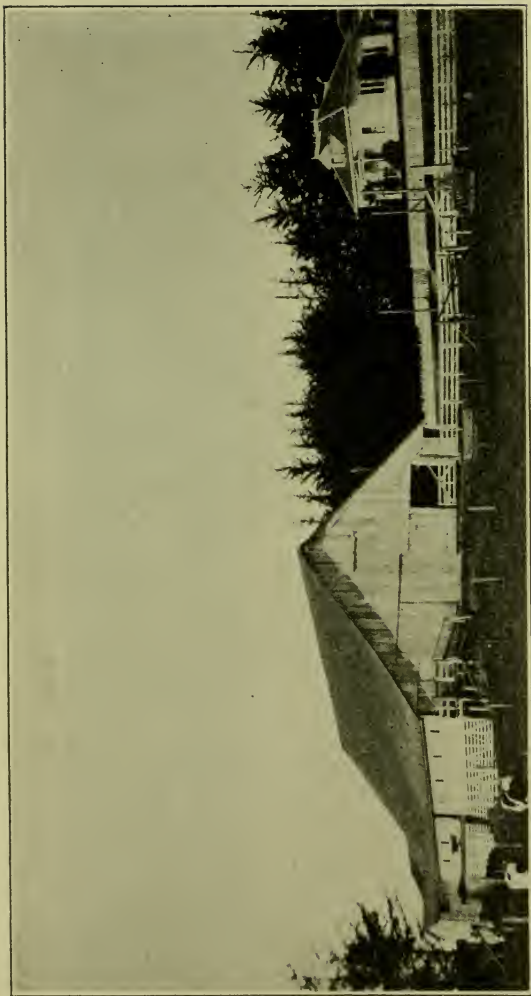
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VIEW OF LOLETA, HUMBOLDT COUNTY, CALIFORNIA

Photo by the Author, February, 1920



TYPICAL HUMBOLDT COUNTY FARM BUILDINGS
RESIDENCE AND BARN OF MR. JESS PETERSEN, NEAR LOLETA, CAL.

Preface

This booklet has been written for dairymen and milkers who produce milk and cream, destined for delivery to a creamery.

Its object is to contribute to the incessant efforts for the improvement of milk as a raw material for the manufacture of dairy-products.

It is kept free, as far as possible, of learned expressions and figures, in order to make it a practical guide for those dairymen and milkers, who have not had the privilege of attending instruction-courses in dairying.

The problems of the eradication of Tuberculosis in milk cows, and other diseases in cattle have not been dealt with in this treatise, as being of a veterinary nature and outside its scope.

The hope is felt that it may help to impress on a great numbers of dairymen and milkers the urgency of greater efforts for the production of clean milk; the raw material for a class of food-products, that has such an important part in the feeding of the people.

Loleta, Calif.,
May, 1920.

J. POSTMA.



Introduction.

Those who have been intimately connected with the dairy and creamery business during the last thirty years, and witnessed the glorious period of progress in the science of dairying, will often wonder why, in the face of all that progress, the sanitary production of industrial milk has improved so little.

To be sure, there are in every district where dairying is practised, a certain number of dairy-farmers who produce a milk of good sanitary value, and in districts where dairying has been practised through generations, this number is larger than in the newer ones. But even in the best dairy-districts the majority of the farmers produce milk that is periodically or regularly unclean, which causes serious loss and difficulties for the creamerymen.

What are the reasons for this condition of affairs?

Is it lack of information, or has the information not reached the greater number of dairymen? Or are there other obstacles in the way of general adoption of improved methods?

In the next chapters of this booklet this question will be subjected to a short discussion and the ways for improvement, as the author sees them, laid out.



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The Production of Clean Milk and Cream for Industrial Purposes

CHAPTER I.

Bacteria

Where Bacteria are the cause of nearly all the processes of fermentation and deterioration in milk, and therefore intimately connected with the question of clean milk production, a short description of their nature seems advisable for a good understanding of the contents of this booklet.

Bacteria are the smallest of living plants we know. Each Bacteria is made of only one cell. The cell is composed of a cell-wall with transparent contents, termed protoplasm, of which the exact composition is not yet known.

Bacteria are very small. They can be observed and studied only with the aid of a powerful microscope. Some bacteria are so small that 25,000 could be placed side by side and form a chain of less than one inch in length.

They are present everywhere; in the soil, in the air of rooms, stables and outside, in water, on all food stuffs, on the milktools, adhering to the hairs of all animals, but particularly in all decaying and rotting organic matter like dung, sour milk, and fermenting foodrests.

Under favorable conditions for their growth, billions may be found in *one* cubic centimeter. (a cubic centimeter is about 1-16 part of a cubic inch.)

They grow extremely rapidly. One single bacterium may grow to several millions in 24 hours.

The reproduction takes place by division of cells,

each cell forming two bacteria, which in turn divide again, forming four, etc.

Some species of bacteria, which reproduce under ordinary circumstances by cell-division, are capable of forming spores, if their life is imperiled by unfavorable conditions. These spores form in the mothercell and the very resistant to outside influences like heat and cold. When coming under favorable conditions again the spores begin to grow and the reproduction goes on in the usual way by cell-division.

Bacteria of the spore-forming species are a great danger to the quality of milk-products. The spores can be killed only by heating to temperatures by which the nature of the milk or the products is altered and thus lowered.

Some species are useful in the manufacturing-processes of various articles of human food, i. e. butter, cheese, etc., or by promoting the growth of useful plants like clovers, vetches, peas and beans, while others may cause troubles by producing compounds that are undesirable (racidity in butter, bitter taste in milk,) or plant diseases.

All the dangerous contagious diseases in man and animals are caused by bacteria.

The undesirable kinds are most often found in filth and manure, on dusty and rotting feedstuffs, bedding material, etc.; hence the great danger connected with feeding, manuring of stables, and bedding during milking time. By these actions the bacteria, adhering to dust-particles are stirred up in the air and fall in the shape of an invisible rain in the milk-pail.

The rapidity of bacterial growth depends upon the character of the medium in which they live and upon the temperature thereof. The more water a medium contains the more rapid is, in general, their growth.

Each species of bacteria is limited in its reproduction to certain temperatures, above and below which it ceases ;

the *maximum* and *minimum* temperatures. It has further a temperature at which it reaches its greatest development, the *optimum* temperature. That at which bacteria are destroyed is termed the *death temperature*.

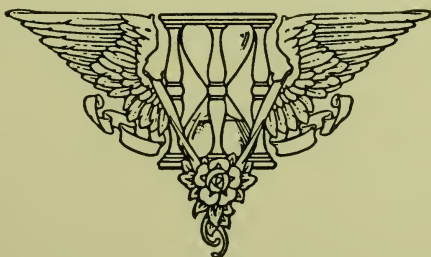
Some will grow at temperatures approaching the freezing point of water, others at a heat of 150 degrees Fahrenheit; the greater number however find their maximum growth at a heat of 90 to 100 degrees Fahrenheit, the heat of the animal body and of freshly drawn milk.

The growth of most of the bacteria ceases or is very slow at temperatures lower than 50 degrees Fahrenheit.

Milk is one of the very best media for the growth of a great variety of bacteria, especially if the temperature is near body-heat, thus immediately after milking.

The aim of the creameryman is to receive the milk at the creameries as fresh as possible, with the lowest possible number of bacteria in it. He may then, by judicious means, lead the fermentation processes in the direction best fitted for the quality of the products he intends to make.

It is up to the dairymen to see that the milk is handled on the farm in such a manner as is most favorable to the requirements of the creamerymen.



CHAPTER II.

Discussion

The production of clean milk and the delivery of this milk at the creamery in a clean condition, is a problem which a considerable number of milk producers have not yet solved.

From the very moment the first creamery began to operate, the most difficult problem of the creamerymen has been how to obtain the milk from the dairymen in such a state of cleanliness, that products of high quality can be made from it, and that it may *conscientiously* be used for the manufacture of such articles that are used for food for adults as well as for infants and invalids, like sterilized, evaporated and condensed milk.

For this purpose, as stated in the previous chapter, the milk should only contain a small number of bacteria, when delivered at the creamery; it should be almost in its natural condition, as it was drawn from the cow.

It should contain no sediment resulting from unhygienic handling. The milk must be *clean*.

Clean milk. For a good understanding of this work the term *clean milk* will be used for milk answering to the above description. It must not be confused with *Certified* and other milk produced under rigid sanitary conditions and destined for immediate consumption in its raw state, and commanding a higher price than milk used for creamery purposes.

Unclean Milk. This term will be used for milk that has been produced under unhygienic conditions and contains impurities like flies, cowdung, hairs, dandruff, etc., carrying a great number of bacteria of unknown species.

In every creamery a part of the milk accepted must be considered unclean, even where skillful grading is practised. Milk may have fermented considerably be-

fore this can be detected by the grader with the means he has at his disposal.

Altho the creameryman may correct, by scientific methods, to a certain degree, the quality of the products made of unclean milk, it must be well understood that high class products can only be made of a milk without visible or hidden defects.

Consequences for the Creameryman. If unclean milk is received in a creamery in perceptible quantities, the troubles of the operator are very great indeed. He has to bear the risks, probable losses and all the troubles resulting from the manufacture and sale of articles which are not perfectly sound.

He may, under circumstances, have to discontinue the making of products, giving the best profits. The consequences may be enormous and fatal for the prosperity of the enterprise.

Consequences for the Dairyman. It is self-speaking that the results of the delivery of unclean milk make themselves felt by a lower payment for the same.

Enterprises, working on a co-operative basis feel almost immediately the decrease in revenue, caused by the sale of inferior products. Those operated by private concerns may be compelled by competition to maintain competitive milk-prices for a certain time, only in the long run a dairyman may not expect to receive a higher price for his milk than is warranted by its contents in solids and its state of cleanliness at the time of delivery to the creamery.

The losses, resulting from the delivery of defective raw material must necessarily fall back on the producer thereof.

Influence of Creameries on the Cleanliness of Milk

At the time, now almost gone by, when the dairymen made butter and cheese on the farm, there was a continuous endeavor to maintain the greatest possible

cleanliness in and about everything that was connected with the production of milk and its products.

The feeding of the cows, bedding, grooming, and milking were performed with the greatest care. The handling of the milk was done promptly and was considered the most important work on the farm. Experience had told that the slightest trespassing in these matters was promptly followed by a lower price for the products.

During the last decades creameries have to a great extent relieved the individual dairyman from the manufacturing part of his profession. A more uniform quality of the products, greater quantities of the same quality, the possibility of using new and labor-saving machines, and many other reasons have resulted in the transferring of the greater part of the dairying from the farm to the creamery.

This period has been remarkable for the industry in many respects. Along with its technical-scientific development could be seen a great progress in dairy-hygenics and in the teaching of the same by courses of Agricultural Colleges, Short-Courses, Lecturing of Government Officers and last but not least by the Agricultural press.

However, this educational work has not resulted in such a general improvement in the clean handling of the milk as might be expected. Several drawbacks connected with the new system came to light and acted as so many brakes on progress.

The result of sending unclean milk was not distinctly noticed by the individual producer, because the milk of all was mixed and worked together, and further, the producer of clean milk did not as a rule receive a higher price for his milk, as a compensation for his greater care and work, than those who were less particular in this respect. This could not fail to give the im-

pression that the milk was all right as long as it was not rejected by the creameryman for perceptible defects.

Impressions of this sort lead easily to laxity and indifference, which stand directly in the way of progress. They can be combatted only by an efficient system of education in the principles of dairying, a strict enforcement of the dairy laws and above all by a more nearly correct payment of the milk.

Technical and Hygienical Instruction

A considerable number of dairymen have not had sufficient technical and hygienical instruction to understand the importance of the production of clean milk by all producers *without exception*. The important work done by Agricultural Colleges, Government Officers, Farm Advisers, County Agents, Dairy Inspectors, etc., is inadequate to fill the need. It reaches only a small number of the more intellectual dairymen and is not understood and therefore not valued by those who need it most.

In this country the business of dairying is often taken up by persons who have no theoretical or practical experience and knowledge of the industry. They are often a discredit to their new profession. This influx of newcomers annihilates, to a great extent, the results of the efforts made by the above named institutions and officials.

As only few of the farmers' sons and daughters are for various reasons able to attend an Agricultural College and obtain the indispensable knowledge of the industry, it seems practical to make the teaching of the elementary principles of agriculture and dairying more general and compulsory in the country schools and to devote a reasonable time thereto

Considering that in this country almost everybody is directly or indirectly interested in the farming and

dairy business it seems a sound policy to enable every scholar to get the indispensable knowledge therefore at the home school.

Scarcity of Labor

The outbreak of the European war and its consequences have brought severe hardships on the dairymen. A number of skilled workers answered the call of the country, here or abroad, and enlisted in the army or navy or were drafted for the same. Besides that the mobilization in almost every country in Europe, and the danger in navigation completely stopped the arrival of immigrants. At the end of the war many foreigners returned to their native countries to take part in the restoration work; for the same reason those who intended to emigrate to the United States stayed at home.

Now the milking of cows is not a favorite work for the American laborer. It is too binding for him and he leaves it with pleasure to the aliens, on whom for this reason rested the greater share of the milking and care of dairy cattle.

Where they are not now disposable there exists a shortage of help in this industry. The considerable raise in salaries, caused by this shortage, has not remedied the evil and the result is that on many a dairy farm the work is not accomplished in an efficient manner, which results inevitably in the production of unclean milk.

Dairymen who are continually short of help may find some relief by applying the following systems: Unless the herd has been carefully bred up to high production, there will be found on every farm a number of cows, usually larger than is expected, whose milk-yield and butterfat production is not high enough to pay for feed, care and labor. With the aid of Cow-testing

associations these cows should be weeded out and disposed of, by preference as butchers' cows.

By doing so, the dairyman will save much labor and be able to attend to his work in a thorough manner, at the same time having a larger income than before.

All hand labor should be, as far as practicable, mechanical labor. The use of milking-machines should be considered in all dairies where more than 20 cows are milked.

The breeding of the cows may be so regulated that all or a part of the cows will freshen in the fall. The greatest amount of work connected with milking is then performed in winter and more time will be available in summer for the care of feed-crops. The general experience is also that cows calving in fall give higher returns than those which drop their calves in spring.

Insufficient Capital

Clean dairying demands clean conditions, in and around the stables, in the milk-house, in the feed-house and in the farm-yards. The floors of stables and milk-house should be made of hard material, that will not absorb urine or milk (concrete is preferable.) In those districts which are visited by long rainy spells the outside yard should also be hardened so that it may be washed and provide a clean way to the stable. The cows must not be forced to wade kneedeep through mud and manure just before milking.

A part of the yard should have a roof, enabling the cows to find a dry and comfortable place to lie down. A sanitary milk-house with pressure water system and a milk-cooling plant should be made.

It costs money to make such arrangements as are necessary for the production of clean milk.

Many a dairyman begins his enterprise with too little money and invests too much of it in cows and too little

in improvements. He is for this reason unable to comply with the demands of the creameryman.

The Basis for Payment of Milk is Unjust

As long as the same price is paid for unclean milk as clean milk, no general improvements as mentioned above, may be expected, as the money invested in these improvements is not giving visible returns. As long as the money-end is not connected with the sanitary condition of the milk, only a small number of progressive dairymen will have enough idealism and sence for efficiency to go to the expense of making these improvements.

The existing Dairy laws in many of the United States give the authorities sufficient power to force the dairymen to produce milk in a sanitary way. The difficulty is that it is not possible to control the work, done on all the dairy-farms, permanently. Consequently the enforcement of the dairy laws is impractical and generally speaking, such laws are only put in operation in such districts from which milk is sent to the large cities, for direct consumption.

It seems more logical to introduce a better system for the payment of the milk and to make the price thereof dependent on the state of cleanliness in which it is delivered to the creamery.

The milk should be paid for not alone on the basis of its contents of fat and solids, but also in relation to the condition in which these fats and solids are at the moment of its delivery.

It is undisputable that clean milk has a greater value than unclean milk.

Of clean milk high class products can be made, easily salable, at the highest market price or even higher. High class articles increase the demand and enable the creameryman to build up his business and to pay the top price for the milk.

Of unclean milk, however, only more or less inferior products can be made, selling with difficulty and causing undesirable trade-risks and losses which make it impossible to build up a business and pay a high price for the milk.

As the milk of all the patrons is usually mixed together after arriving at the creamery, the quality of the products will be in accordance with the sanitary condition of the *mixed* milk. Likewise the price of the milk will depend thereon. The producers of clean milk have thus to bear a part of the abatement of the revenues caused by the inefficiency of the producers of the unclean stuff. This is neither just nor reasonable, and a divergement from the rules accepted for the sale of other farm-produce like grain, seeds, etc.

For the application of a sound scheme for the payment of milk on a basis of cleanliness, a score-card should be made of the milk of each patron. Points should be given for taste, flavour, acidity, absence of sediment, fermentation, etc. With the aid of the totals the milk could be classed in five qualities. For milk of the 3rd quality the regular price should be paid, while that for the 4th and 5th quality should be progressively reduced and for the 2nd and 1st increased accordingly.

The classification of the milk would have to be done by persons of high moral standing and under bond for impartiality and the system of payment made compulsory for all enterprises that manufacture milk-products from other milk than produced by their own cattle.

Under such a system of payment a great improvement in the sanitary condition of industrial milk may be expected. The owners of dairy-farms would be compelled to bring their farm-buildings up to such a standard of perfection as would enable them to make first quality milk or, in case they lease their property, to accept a rent lower in proportion to the inferiority of the conditions thereon.

The production of 4th and 5th quality milk would not be a paying proposition and such milk would soon be only produced by exception, and the intelligent and up to date dairyman would receive a just payment for the greater trouble and care connected with the production of the better product.

Competition Between Creameries

The existence of more than one creamery in the same district is often to the advantage of the milk-producers. It is often a security for a fair milk-price.

On the sanitary handling of the milk, however, it has sometimes a negative influence. Milk-producers whose milk has been rejected for sanitary reasons by one creamery, often are allowed to ship to the competitor who is anxious to have their patronage.

Creamerymen in such locations have to do either of two things: lose a patron or overlook milk defects which should not be tolerated.

Instead of improving conditions, cases of this nature cannot fail to lower the same. Here also a uniform system of payment as above mentioned would be the natural remedy.

Negligence of Milk-Producers

There are amongst the dairymen as in every large body of individuals a certain number who are totally indifferent to sanitary progress, of which they seem not to be able to grasp the importance.

They disregard the most serious complaints about the defects of their milk and cannot be brought to reason. It is no rare event that milk from a pail in which a cow has set a foot during milking, has been mixed with the other milk of the daily production and delivered to the creamery.

It requires all the unrelaxed attention of the creameryman to prevent such milk being rushed through during the busy season, with the inevitable results.

If for some reason milk from unreliable sources must be accepted in the creamery at all, it should be worked separate until the producer has been brought to reason, if necessary with the help of the Sanitary Authorities, and improvement is obtained.



SEDIMENT CARD

No.

Date

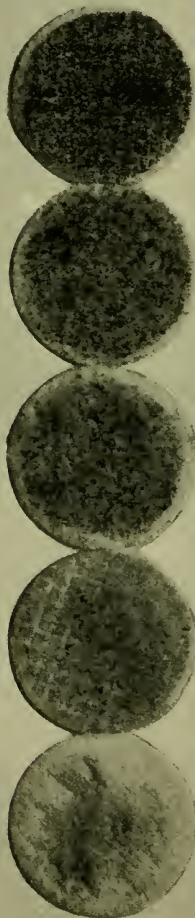
1

2

3

4

5



VERY GOOD

GOOD

MEDIUM

DIRTY

VERY DIRTY

YOUR MILK

SEDIMENT CARD—The sediment test is made by pressing one pint of a patron's milk, after thoroughly mixing, through a disc of compressed cotton. The sediment shows on the surface of the cotton disc, which may be fastened to the card at the proper place and mailed to the patron.

CHAPTER III.

How To Produce Clean Milk

The first and constant care for the production of clean milk is preventing it from becoming contaminated with Bacteria. As explained in the preceding pages, every particle of dust, manure, every hair, bit of dandruff or foul air may contain, or have adhering to it, bacteria in great numbers and of undesirable species which, once in the milk, will rapidly develop if the temperature is right for their growth.

Feeding of the Cows

The feed given to the cows should be wholesome and well balanced. If it is in a state of fermentation or rotting, is very sour, contains large quantities of water, like young grass, clover, mangel-wurtzel, beets and carrots, when much soil is adhering to it, when it is very cold or frozen, cows often get scours and soil their switches, udders, and hindquarters and also the stables.

The same thing happens if the nutritive ratio of the feed is too narrow: the cows are getting too much protein in the food in proportion to fat and other carbohydrates.

The dirt so formed is likely to come in the milk either at the next milking-time or later, after it has dried and is stirred up in different ways, sowing in the milk large numbers of bacteria.

Although one of the principal requirements for the health of the cows and for an abundant milk-yield is that the bowels be kept open and active, excesses should be avoided and met with great care in the cleaning of cows and stables. This should be done after each milking and thoroughly. (See also Page 30.)

Dusty and strong smelling feed should not be fed immediately before or during the milking process.

Ventilation of Stables

Every stable should be equipped with a system of ventilation that is capable of renewing in a short time the air in the stable, taking in pure fresh air and ejecting the foul, dust-saturated air, without causing a draught.

In the milder climates, where the cows are going in the pasture all the year round, the stables are as a rule so lightly constructed that there is ample ventilation.

In the colder ones the stables are made more substantial. No draught is coming thru the walls and the doors are kept closed to keep the temperature of the stable air up. Great care must be taken that sufficient circulation of fresh air is provided for, and it will prove an advantage to a dairyman, when constructing a barn, to consult a farm adviser or County agent or other agricultural authority, about the most advisable system of ventilation under the local conditions. Such advice is free of expense and based upon careful studies, made by competent men, on this important subject.

The stable air may contain, as above stated, large numbers of undesirable bacteria, resulting from manure, hay, straw, bedding material, etc., which by air currents, feeding and bedding, etc., come in motion, and may fall in the milkpail.

Consequently, no work should be done in the stables immediately before or during the milking process, by which dust of any kind is stirred up.

Cleaning of the Stables

The cleaning of stables and cows should be done between the milkings, taking care that sufficient time is left for ventilation, before the next milking commences.

In summer when the cows go in the pasture and are only stabled to be milked, no bedding is necessary. After the milking is finished and the cows have left the stables, the manure is removed and if possible, the walls and

floors should be washed with the aid of a strong jet of water.

The floors and stalls should be made water-tight and have sufficient slope to allow the water and liquid manure to flow into a tank outside the building. From there it may be run or pumped into a liquid manure spreader and be sprayed over the fields. In this way the cleaning of the stables can be performed in a very short time and in an efficient manner.

If for climatic reasons the cows must be kept inside for a long time, as is the case in the northern States and Canada, the cleaning of the stables is more complicated.

In such locations, the manure-gutters should be wider and deeper so that the cows may lie down without touching the manure. The manure should be removed at least once every day, twice is much better.

After the gutter has been emptied and cleaned the bedding nearest to the gutter should be taken from the stalls and spread in the same, thereby preventing splashing when the droppings fall.

The rest of the bedding is now brought backward and supplementary bedding brought under the front part of the cows. From time to time all the bedding should be removed, the floors of the stalls cleaned of dirt by scrubbing and scraping, and entirely fresh bedding put on.

Considerations When Constructing Stables

When constructing new stables, iron and concrete should be preferably used. Stables made of this material are not only more durable, but assure easy cleaning. However, a good sanitary stable may be built of wood (see illustration on page 27), although the cleaning is not as easy as one of concrete and requires therefore more time and labor.

The number of corners should be limited as far as possible. Corners are a nuisance in stables as they are



TYPICAL HUMBOLDT COUNTY COW BARN.
INSIDE OF MR. JESS PETERSEN'S STABLE, NEAR LOLETA, CONSTRUCTED OF WOOD.

gathering places for dirt and cobwebs and breeding places for flies.

The walls should be free of cracks and be smooth. Smooth surfaces are easily cleaned and whitewashed.

Plenty of light should be admitted; 5 square feet for every cow is the least window surface that is allowable. Screens for doors and windows should not be omitted, and sun-shutters may prove useful in many localities.

Barnyard

The barnyard should have a hardened surface with considerable slope, in order that it may be cleaned of manure and that the rainwater may drain off. A part should be covered to give protection against rain and other storms and to provide for a comfortable, shady and dry place to rest.

Very often barnyards are in a very dirty and unhygienic condition, which is inconsistent with the production of clean milk. The cows may be seen wading kneedeep thru a layer of mud and manure or even lying in the same, covering themselves with filth. No clean milk can be produced unless such cows are thoroughly cleaned and washed.

Whitewashing of Stables

The stables should be whitewashed at least two times every year. It should be done with great thoroughness and care. The whitewash should contain some sticking material like glue, or have skim or buttermilk mixed in (1-2 skim-milk and 1-2 water.) That will prevent the lime from falling off in scales.

Some disinfectant should be added, in order to destroy all larvae, nits, etc., which may adhere to the walls and ceilings or may be hidden in cracks.

Keep Flies Outside the Stables

Flies should be kept out of the stables; not only are they carriers of millions of the most dangerous bacteria, which may come in the milk with them, but they also induce the cows to whip their sides with their switches, to kick and to move during milking. All this results in less milk and in the falling in the milk of hairs and other dirt.

Cleanliness is the best preventive against flies. Where fermenting feedrests and other decaying matter is lying they are bound to come. For this reason all manure should be removed a distance from the stable. As flies are easily blown in the direction of the wind the manure pile is preferably made on the side of the stable to which the wind most often blows during the summer. Where practicable the manure should be removed to the field every day.

No hogs or poultry should be allowed to come into or near the stables.

The Cleaning of the Cows and Udders

When the cows are kept inside, they should be regularly brushed and cleaned, the loose hairs and dandruff removed and the skin kept clean from lice, nits, skin diseases, etc. This cleaning has to be done between the milkings, never during or just before milking.

If the flanks, udders and switches are soiled they should be washed and dried before milking. With the help of a soft brush and a fine spray of water this is not as great a work as it appears.

The cleaning of flanks and udder may be greatly facilitated by clipping the hair growing on these parts and on the tail. The latter should be clipped at the sides and to its base; only a switch should be left at its end. The switch must be kept free from lice and cockleburrs and be washed from time to time.

Cockleburs may be removed and the cowlice killed by washing with the following dip:

Dissolve one pound of white soap in 2 gallons of hot water. After the soap is entirely dissolved whip into the sud one pint of coal-oil and the half of a pint of Creolin. This can easily be done with a bunch of twigs. The 2 gallons may now be diluted with luke-warm water to 10 gallons. Use when lukewarm.

Preparing For Milking

The milkers should wear clean overalls, which have to be renewed often enough to prevent them from becoming soiled. He should have handy a pail of clean water in which a little of an odorless disinfectant has been dissolved, and a towel. With the water and towel he moistens the flanks and udder of the cow before he starts milking and cleans his hands.

The moistening of flank and udder has for object to fix loose hairs, dandruff and other dust to the skin so that it will not fall in the milkpail.

Milking With Wet or Dry Hands

If a milker has the habit of milking with wet hands, he should have the above mentioned moist towel hanging on his belt for the purpose of wetting his hands from time to time, taking care to wash the towel before it becomes soiled. He should never milk in his hands or dip his fingers in the milk. Nor should he make the hands so wet that moisture will drop into the milkpail.

Altho he may, with these precautions, eliminate many of the objections of wet hand milking, milking with dry hands must be considered preferable, being more hygienical.

Milking Machines

The use of a milking machine does not make the

above precautions superfluous. If the teats are not cleaned before milking, the teatcups of the machine will not fit tightly around the teats. Some air and dirt will enter into the pail through the space thus formed. This interferes with the efficiency of the milking-machine, at the same time soiling the milk.

Furthermore, during the stripping following the machine milking, the milker works under exactly the same conditions as an ordinary hand milker, hence should take the same precautions for clean work. The parts of the milking-machine, coming in direct contact with the milk, should be carefully kept clean according to the prescriptions, which the manufacturers send with every machine and the rubber parts and cups kept in an antiseptic solution when not in use. This to prevent the growth of bacteria and moulds in the microscopical cracks which form usually in the inside lining of the rubber parts.

For the same reason the tubes should be totally filled with the solution and no air-spaces left.

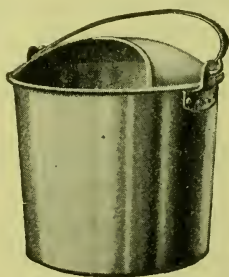
It will be found convenient to have a trough made with a sloping bottom. The trough should be so long that the rubber tubes may be laid in it without bending the same. When putting the tubes in the trough filled with disinfectant start at the deepest end and lower slowly. All the air is in this manner driven out of the tubing.

A milking machine may be a great help for labor saving and cleanliness when it is skillfully handled; in the hands of careless and neglectful milkers it is a most dangerous tool. Improperly cleaned machines cause a defect in the milk lately known as milking machine flavour which is very objectionable. Dairy men should therefore see that the smallest details of the cleaning are done with thoroughness.

Milkpails

Several types of sanitary milkpails have been constructed and recommended. A good milkpail should be made of well tinned metal, have smooth surfaces and corners so that it is very easy to clean. Its top should be partly covered (See illustration below.)

Even in the cleanest stables the air carries bacteria which are stirred up by air-currents and fall to the floor in a sort of invisible rain. During milking they fall also in the milkpail. If the top thereof is partly covered, the danger of bacteria falling into the pail is eliminated in proportion to the extent of the cover over the pail-opening. At the same time hair, dandruff and other impurities and eventual drops of perspiration of the milker's face are kept out.



SANITARY MILKPAIL

[Courtesy of Creamery Package Mfg. Co.]

Milking

The two first streams of each teat should be milked away. This milk contains usually only 0, 5 to 1, 5% of butterfat, but may contain large numbers of bacteria which have entered through the milk-duct of the teat into the udder. At the same time the milker makes sure by judging this milk and by feeling the udder, that all the quarters are sound. If any inflammation is detected, one or more of the quarters feel hard and hot, the milk of such quarters should not be milked into the pail, nor

milk which contains small lumps of a curd-like matter, that indicate the existence of garget or other diseases of the udder.

After milking cows that have garget or other diseases of the udder and teats the milker should wash his hands as some of these diseases may be transferred from one cow to the other by milking. For this reason it seems a wise precaution to clean the hands regularly when moving from cow to cow, and to milk the visibly affected cows after all the others have been milked. The wet towel mentioned above, will prove very handy for this purpose if kept clean and disinfected properly.

The milking is preferably done with the whole hand, or if the teats are small, by using one, two or more fingers, closing well around the teats.

Stripping between the thumbs and the first fingers can not be recommended as it may cause injury to the muscles of the teats and weaken the same to such a degree that the cow cannot hold its milk up and loses a part of it between the milkings.

The milking should be performed with strong regular streams and not be interrupted. When the milking process is often interrupted the cows may acquire the habit of holding the milk up and will dry up too soon. For this reason the stripping usually following the machine-milking, should be performed immediately after the latter has been done, so that the whole proceeding has the character of one uninterrupted process.

Milk of Kicking Cows

It may happen that during milking one of the cows kicks and that her foot gets into the pail. It is self-speaking that the milk which is in the pail at that moment, is not fit for delivery to the creamery. The pail should be emptied and cleansed before being used again.

Milkers to whom such an accident happens should

not been subjected to unjust reproaches which will tempt them to conceal further cases, by putting such dirty milk into the milkcans.

The use of a sanitary milkpail, with partly covered top, decreases the danger considerably. (See Page 33)

Colostrum Milk

The milk of newly calved cows contains a high percentage of albumen and also colostrum-cells. Albumen coagulates when subjected to temperatures applied often in the manufacture of dairy products.

Colostrum milk is the natural feed for the calves. It should never be sent to the creamery.

The fitness of new milk as a raw material for milk products may be tried by boiling a small quantity. If it does not clabber when heated to the boiling point it may be shipped. In case of doubt ship the milk in a separate can, bearing a label on which the nature of the milk is mentioned.

Milk is usually free from colostrum within five days after calving, sometimes however, not before the 10th day.

In the State of California it is *unlawful* to ship milk from cows within 5 days after calving.

Strippings

Milk from cows nearer than 6 weeks to freshening sometimes becomes abnormal. The cows should be dried and given a good rest. To induce the cows to dry they are usually milked once a day for a few days, then every other day and finally not at all.

The milk produced during this period is termed "strippings." It should not be sent to the creamery but after close examination, and under no circumstances if the cows are not milked every day. Milk from cows that are milked once every two days and less often, has an

abnormal composition which makes it unfit for creamery purposes.

As soon as the milk from cows, far in pregnancy, gets a salty taste the shipment must be discontinued.

The Straining or Filtering of Milk

The straining of the milk has for object the elimination of undissolved impurities, which have fallen into the milk during milking. To be effective it must be *done at once after each cow is milked*; before the bacteria that adhere to the impurities, have a chance to disperse in the milk and reproduce.

Altho a good strainer has a remarkable corrective influence on the quality of milk, it must not be forgotten that the very best strainer cannot remedy the evil effects of uncleanness before and during milking.

Milkstrainers

Several types of strainers have been made for the purpose of cleaning the milk of impurities or sediment. They have usually a cone shape and are constructed to fit the opening of milkcans; they serve also as funnels and facilitate the pouring of the milk into the cans. Some strainers are provided with finely perforated gauze, others with filtercloth, and still others with absorbent cotton placed between discs of fine mesh gauze or two layers of muslin or cheesecloth.

The cottonstrainers are the most effective. They have, however, the disadvantage of easily clogging of the filter material and of working too slow. Their filter-surface is too small. When clogged the filter-material must be renewed.

Moreover, strainers placed on the milkcans, make it difficult to control the filling of the same. Consequently a quantity of milk is frequently lost by over-filling of the milkcan, and also by transferring a partly filled strainer from one can to another.

A good sanitary strainer is illustrated on page 37. It has been made according to the author's design with the object to overcome the disadvantages above-named. It is not placed on the cans and the size therefore not limited; it may be made to suit the requirements of any size farm.

The strainer may be placed on any stool, box or table higher than the milkcans. By its tilting-spout arrangement, the transfer from one can to the other is avoided. The milker can easily control the degree of filling of the cans and thus prevent all losses of milk.

Altho intended as a cotton-strainer, all kinds of filter-material can be used in it. It is conveniently taken apart and cleaned.

On farms where a cream-separator is used the strainer may be used as a receiving tank for the same or for a milk-cooler.

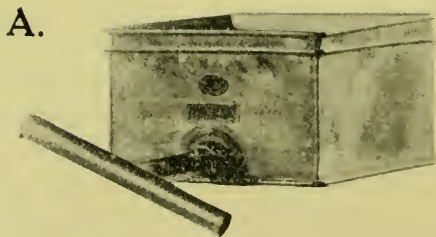
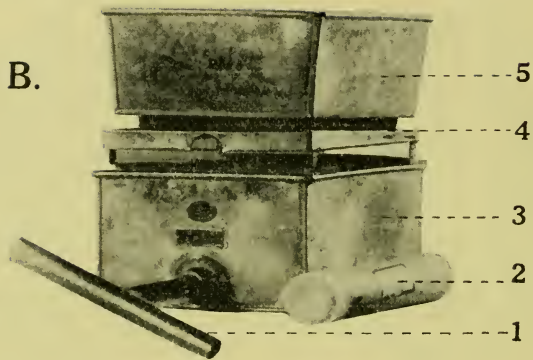
If cotton cloth is used for filter-material this must be cleaned after each milking and sterilized by boiling in water.

The Cooling of the Milk

As stated before the milk-bacteria find an ideal medium for their development in freshly drawn milk, having almost the body temperature of the cows.

For this reason the milk should be cooled *directly after the milking of each cow* and to a temperature, low enough, to prevent bacterial growth as nearly as possible. Every minute lost gives these micro-organisms a start that cannot be undone by later cooling. If the milking of all the cows is finished before the cooling is done, often two or three hours after the milking of the first cow, the growth of bacteria in the milk of the cows first milked, may have advanced so much that it has an influence on the quality of the products made from it.

From the above follows that milk-coolers should be



Postma's Sanitary Milkstrainer.
(Patent Applied for.)

- A. Ready for use. B. Inner parts lifted. 1. Tilting Spout.
2. Absorbent Cotton. 3. Outside Vat. 4. Filterbed Plate
5. Strainer for pressing cotton on the Filterplate.

used on every dairy farm, and that the milk should always be cooled. (If possible to 50 degrees Fahrenheit.)

The most effective milk-coolers for farms are the flat tubular—and the spiral-conical, illustrated on next pages.

The water enters these coolers at the bottom and leaves them at the top. The milk flows from a tank above the cooler, into a very thin layer over the outside of the cooling-surface and in its downward course, is constantly coming in contact with a colder surface. In a few seconds it may thus be cooled to a low temperature, 2 or 3 degrees higher than that of the cooling water.

It is important that the water used for cooling be taken direct from the well.

A satisfactory arrangement can be made by connecting the discharge-pipe of the water pump by a side-line and rubber hose pipe to the inlet of the milk-cooler. The pump should be kept working during cooling. The quantity of water needed for effective cooling may be regulated with the help of a faucet and is forced thru the cooler while the surplus water will follow the usual course and is forced in the higher standing reservoir.

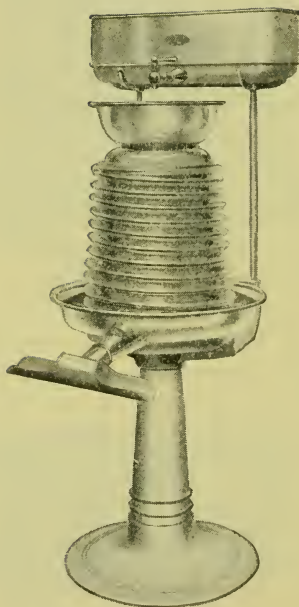
If the water is pumped into the reservoir previous to cooling, it may warm up considerably in hot summer weather and the result will not be as good as when taking the water direct from the well.

A reliable dairy thermometer should be regularly used to ascertain that the milk is cooled sufficiently.

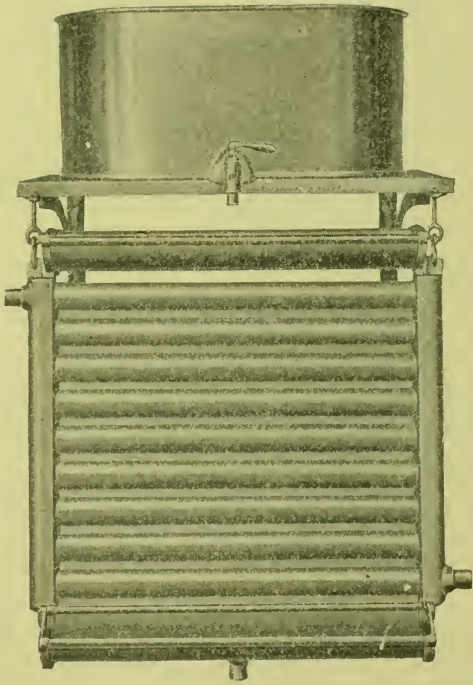
The milk-cooler should be placed in the milk-house, a sanitary building, separated from the stables by an open space, and with clean surroundings. The floor is by preference made of concrete, sloping to the sewer-opening which is covered with an air-trap.

Tank-Cooling

If no milk-cooler is available, the milkcans should



Spiral Conical Milkcooler
With Tilting Spout, Receiving Vat and Stand.
Courtesy of Creamery Package Mfg. Co.



Flat Tubular Milkcooler and Receiving Tank
Courtesy of Creamery Package Mfg. Co.

be placed, immediately after filling, in a tank containing cold water. The tank should have an overflow at such height that the water cannot reach higher than to the neck of the milkcans.

It should also have an outlet with stop at the bottom so that it may easily be emptied and cleaned.

The water in the tank should be often renewed and the milk stirred with a tinned metal stirrer by moving the latter *up and down*.

Cooling in tanks is not as effective as with a milk-cooler. It takes hours before the milk is cooled to a temperature near to that of the water. At the same time the amount of labor and loss of time connected with this system is considerable.

After cooling the milk should be stored in a fresh, cool place till it is delivered to the creamery.

Cooling By Air

Cooling by air is a system of very inferior value. It is, however, generally used, greatly to the prejudice of the quality of dairy products.

In places where the milk is delivered to the creamery but once a day, the evening milk is put in a cool place or outdoors and the air is supposed to do the cooling.

It is self-speaking that the result depends upon the temperature of the outside air and that every fluctuation of the same is noticeable in the quality of the milk. No regularity can be obtained with such a system and the milk so treated is unreliable as a raw material for creameries.

The Transportation of Milk

After the milk has been cooled it should be sent to the creamery without delay. In case of delivery once per day, the warm morning milk must not be mixed with

the evening milk until after cooling. There is always some bacterial growth even if the evening milk was well cooled. By mixing the warm morning milk with the evening milk and thus raising the temperature several degrees, a vigorous fermentation may be started, spoiling the milk before it arrives at the creamery.

If the evening milk is shipped in separate cans, care should be taken to mix the cream, in the top layer of the can, with the other contents of the same by stirring thoroughly before transportation. If this is neglected the cream may churn out during transport or, in case some accident happens, is likely to be lost. In both cases the milk will show a lower butterfat-test.

The transport is preferably done with a spring-wagon or truck. The bottom of the vehicle must be kept in a clean condition by frequent washing with an abundance of water. Dirty bottoms of milk wagons are an important source of contamination of the milk. The dirt often adheres to the bottoms of the cans and drops in the weighing tank when the milk is dumped therein.

For the same reason the milk-stands at the road-sides should be kept clean.

^{cow}
~~wag~~ In extreme weather, the cans may be protected by watering with a cloth or felt hoods.

Return Products

Skimmilk, buttermilk, whey, etc., returned to the farm for feeding purposes, should never be put in cans that are used for fresh milk transport. Special cans must be used for that purpose, as it is nearly impossible to clean such cans on the farm so well that fresh milk can safely be put in without endangering the quality. Milkcans must never be used for anything else but milk.

The Cleaning of Milkcans

If the cleaning of the milkcans is done by the creamery, the dairyman should convince himself that the

cans are properly cleaned. If they are not, he should immediately fix the attention of the creamery man on the fact and insist upon correction.

Improperly cleaned milkcans may be a cause of rapid deterioration of the milk and thus cause serious losses to the dairyman, by the rejection of his milk. Therefore, it is to his interest to see that the cans are well cleaned and not soiled during the transport back to the farm.

The Storage of Empty Milkcans

The empty cans may conveniently be placed on a shelf in or about the milkhouse. The shelf should be raised two feet or more above the ground or floor and the cans placed on it with the bottoms up. The lids may be laid on the bottoms of the cans. By this arrangement no dust can fall into the cans or on the side of the lid that comes in contact with the milk.

Empty cans must never be stored with the lids on. In milkcans which are kept closed when empty, a very disagreeable flavor soon develops, especially if the inside of the can is not perfectly dry. This flavor is bound to taint the milk and reduce its quality.

It has been found that the cleaning or rinsing of the milkcans with boiling water, just before milking, reduces the number of bacteria in milk to a remarkable degree.

Milkcans must not be stored in stables, dirty barnyards, near manure piles or other unhygienical places. Before filling, the milker should convince himself that they are clean inside and that no snails, etc., have entered.

CHAPTER IV.

The Production of Cream

Dairy men who separate the milk, produced on their farms and ship the cream to a creamery, should observe strictly all the rules, laid down in the preceding chapter for the production of clean milk.

Cream contains the most valuable part of the milk and should therefore be handled with the greatest care. Where cream is often graded at its delivery at the creamery and paid for according to the grade, the greater care given to it is amply rewarded by the higher returns for the better qualities.

Cream Separators

Several types of highly perfected cream separators are now on the market. Dairy men desiring to buy a cream separator may obtain ample information about the best type for the local conditions from neighbors, farm advisers, etc.

By carefully following the instructions sent by the makers with every machine that is shipped, it is not too difficult to become familiar with the handling of them. If necessary, some practice may be gained by attending the separation of milk at a farm in the neighborhood, or at a dairy school.

Separating of Milk

Connected with the separating of milk there are two matters which have a great influence on the quality of the cream and should therefore have the special attention of the dairyman. They are:

1st. The milk must be separated immediately after milking, and

2nd. The cream must be cooled at once, after sepa-

rating, to a temperature as near to 50 degrees Fahrenheit as is possible.

Directly after milking the milk has the right temperature for the separating process, viz: 90 to 95 degrees Fahrenheit. If worked at that temperature very little butterfat will go into the skimmilk, and a concentrated cream of about 40 per cent of butterfat may be produced without difficulty.

If the milk is allowed to stand any length of time between milking and separating it will cool more or less, in accordance with the temperature of the air at the place where it stands. More butterfat will pass into the skimmilk and the cream will be thinner; which means an unnecessary loss of skimmilk for the dairyman.

The cooling of the cream should be done *immediately after separating* for the same reasons which make cooling of the milk desirable directly after milking. (See page 37.)

A very practical illustration for separating and cooling is shown on page 47.

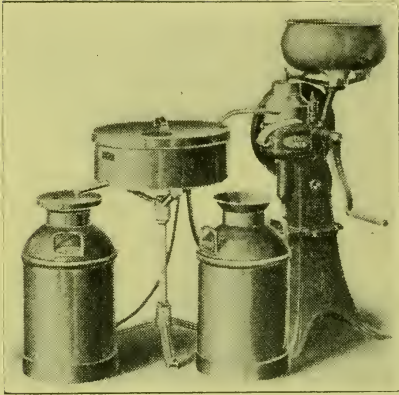
The cream, after leaving the separator, flows over a conical, closed-in cooler. The process is almost instantaneous and assures the greatest efficiency.

The cooling water should be taken direct from the well as described on page 39.

If no cold water is available, ice may be used for the cooling of cream. The ice is either placed inside the cooler or the cream, after separation, put into a can and the can in a vat containing water and ice.

Tank-cooling of Cream

Tank-cooling is still more undesirable for cream than it is for milk. The greater thickness of the cream makes very frequent stirring necessary before a good result may be attained. Even under the most favorable conditions tank-cooling is so much less efficient that the installation



The Ideal Sanitary Cream Cooler

Courtesy of the De Laval Dairy Supply Co.

The above Illustration shows a De Laval Hand Separator and conical enclosed Cream Cooler and Stand.

The Cooler is so constructed that it can be placed under the cream-spout of the smallest size Separator and still be high enough to deliver by gravity into a 5 or 10 gallon can.

It is strictly sanitary in every particular, in that the cream is at no time exposed to the air and as a consequence will not absorb bad odors or be contaminated with dust that may be floating in the air.

The stand is readily adjustable to any height, consequently it can be used in connection with any make or size Separator.

of a cream-cooler seems to be inseparable from that of a separator. The outlay of capital is soon recovered by the greater income caused by the greater returns of the better cream.

If the cream is not shipped at once after cooling the can should be placed in cold water or at a cool place in the milkhouse.

The lid should be put loosely on the can, allowing air circulation, but preventing the entrance of snails, mice, etc., and also of flies and falling bacteria.

Cream should be sent to the creamery as often as is practicable. Even the best handled cream loses its delicious flavor if it is kept too long, even at a low temperature.

Cleaning the Separator and the Milking Tools

The separator and all the milking tools should be thoroughly cleaned with hot water and soda and rinsed with hot water, after each milking.

Numerous bacteria are separated out with the milk sediment and remain in the separator. If left there during the night they may reproduce and infect the morning milk and cream.

After cleaning, the parts of the separator and the tools should be kept in a dust-free place in the milk-house. A shelf of lathwork answers the purpose very well.

The floor and the walls of the milk-house have to be cleaned daily and thoroughly. Water and soda to which a little lime has been added will make cleaning easy and keep everything fresh and hygienical.



CHAPTER V.

Undesirable Fermentations

With good management of the milk and cream, the dairyman will have little to fear from undesirable fermentations and his losses from this cause will be insignificant.

The rejection of milk by the creameryman on account of abnormality, is almost invariably the result of non-observance by the producer or his helpers, of one or more of the rules governing the production of clean milk.

Sour Milk

The lactic acid fermentation or the souring of milk is not, properly speaking, an undesirable fermentation; it is undesirable only when the souring takes place before the milk has been delivered to the creamery, and is one of the principal causes for rejection. On farms where the milk is produced with care and cooled near to 50 degrees Fahrenheit, immediately after milking, and shipped in due time, no untimely souring will occur, even when the milk is transported a considerable distance in warm weather.

Bitter Milk

When milk is kept at a temperature lower than 50 degrees Fahrenheit during a long time, the milk sometimes gets a bitter taste, caused by fermentation. The taste is very disagreeable and makes the milk unfit for use. The trouble may also be found in milk of cows very far advanced in lactation, or in stripper's-milk.

The bacteria causing the bitter taste grow at a lower temperature than the lactic acid bacteria. Lactic acid bacteria, under normal development, prevent the

growth of bitter milk bacteria. At temperatures at which the lactic acid bacteria cease to grow normally, the defect develops very rapidly.

For this reason milk which has a tendency to bitter fermentation should not be cooled to temperatures lower than 50 degrees.

Prompt shipment after milking and cooling, the drying of cows old in milk, and careful examination of stripper's milk are the remedies for this trouble.

Fishy or Oily Milk

Milk, and especially cream, which is held over a long time before shipment, occasionally acquires a very disagreeable taste and odor, reminding one of fish-oil. Such milk is termed "oily" or "fishy." The milk is unfit for creamery purposes and only inferior butter can be made of the cream.

Cleanliness and prompt shipment to the creamery after milking and cooling, as in the case of bitter milk, is the remedy.

Gassy Fermentation

This trouble is caused by bacteria which, when in the milk, cause practically all the milk-products to be of inferior and unreliable quality. The trouble is usually detected after the milk has been worked and is for this reason very dangerous and detrimental.

The bacteria are found in immense numbers in filth and dung. Their appearance in the milk is a sign of gross neglect of the rules for clean milk production. The strictest cleanliness is the only remedy for this evil.

Slimy or Ropy Milk

Slimy milk does not show abnormal immediately after milking. The trouble develops later and the milk

becomes very viscous; it may be strung out in long rope-like threads. The sliminess of milk is due to bacteria which are found in the water that is used for cooling and cleaning, in the air of the stables and in the dust.

The trouble may easily be carried from one farm to another. Great care should therefore be taken that no pails and milkcans that have been used in the production and transport of slimy milk get to another, not infected farm.

Slimy milk does not become sour, it cannot be separated and clabbers when boiled; it is unfit for creamery purposes, except perhaps for cheese making.

Where the trouble appears the strictest cleanliness should be practiced. All the milk-tools, milkcans, the clothing of the milkers, must be thoroughly cleaned and washed in boiling water. Hot water and soda with a little lime added to it will prove an efficient remedy. The rinsing must always be done with boiling hot water. Under no conditions should cold water be used.

If tank-cooling is practiced, the tank must be daily cleaned with soda and lime and some formaldehyde added to the cooling water.

Whitewashing the stables and the milkhouse is strongly recommended.

Garget and Inflammation of the Udder

Milk produced by cows that suffer from these diseases contains a great many undesirable bacteria, often a long time after apparent recovery and should not be sent to the creamery before the cows are cured.

Other Milk Defects

Bloody Milk. Bloody milk is a regular apparition in creameries, particularly at the time when the cows freshen. Colostrum-milk often contains a considerable quantity of blood. Milk may also become bloody by injury to one or more of the quarters of the udder, by

the bursting of a blood vessel in the udder, or by unskilled use of a milking-machine.

Milk which shows signs of being bloody is not fit for the manufacture of high grade products and should not be shipped to a creamery.

Salty Milk

(See page 36)

Several other milk defects have been experienced but their appearance is so infrequent that a discussion does not seem necessary.



CHAPTER VI.

Fermentation-Test

If a dairyman receives complaints about the cleanliness of the milk, and of defects therein, he will at once look into the matter and make sure that all the rules for clean milk production are observed. If he cannot detect the cause of the trouble, the fermentation-test should be applied to the milk of each cow. This test is too complicated and delicate to be made by the average farmer and the help of a competent man from the creamery, a milk-testing association or a veterinarian should be acquired.

The fermentation-test is made in the following manner :

A small quantity of the milk of each cow is put into a sterilized test tube and subjected to a heat of 98 to 100 degrees Fahrenheit for the duration of 12 continuous hours. This temperature is the most favorable for the greater number of the bacteria that cause defective milk and consequently provokes a very active development of the same.

After 12 hours the milk is examined and the names of the cows giving faulty milk noted. The milk of these cows is not sent to the creamery until a further test has proven it to be normal.

The results of the fermentation-test enable the dairyman to form conclusions about the efficiency and the sanitary condition of his business.

When all the tests show a same abnormality, he knows that there is a general cause, which may originate in :

- 1st. Mouldy and putrified feedstuff.
- 2nd. Impure water for drinking and the cleaning of the milking tools.

3rd. Badly ventilated stables and wrong system of ventilation.

4th. Dirty stables and yards and insufficient cleaning of the cows, udders and hands.

5th. The tubes and teatcups of the milking-machine, if in use, are not clean.

6th. The test-glasses have not been sterilized.

When only a few tests are abnormal, the cause may be found with the individual cows and may be:

7th. Carelessness of an individual milker, if all the defective tests originate from cows milked by the same person.

8th. The cows in question may be in heat.

9th. The cows may have garget in one or more quarters.

10th. They may be otherwise diseased.

11th. The milk may contain colostrum-milk, or

12th. The cows in question may be too far advanced in lactation.

The fermentation-test may be very helpful in detecting diseases in cows in time for successful treatment, especially those of the udder.

Summary and Conclusions:

From the above results that the business of dairying can only be carried out successfully by those who are willing to go to the trouble of looking after a number of details, and to see that the rules governing the production of clean milk are once and forever enforced.

Such enforcement need not necessarily lead to disagreement with the farmhands. It is more a question of tact than of authority.

The fact that many dairymen produce regularly clean milk, proves that such may be done with no unreasonable amount of work, trouble and expense.

The education of the milkers may be of great as-

sistance and the dairymen should never omit an opportunity to give them literature dealing with the matter.

The basic principles of agriculture and dairy-hygenics should be taught in all country schools.

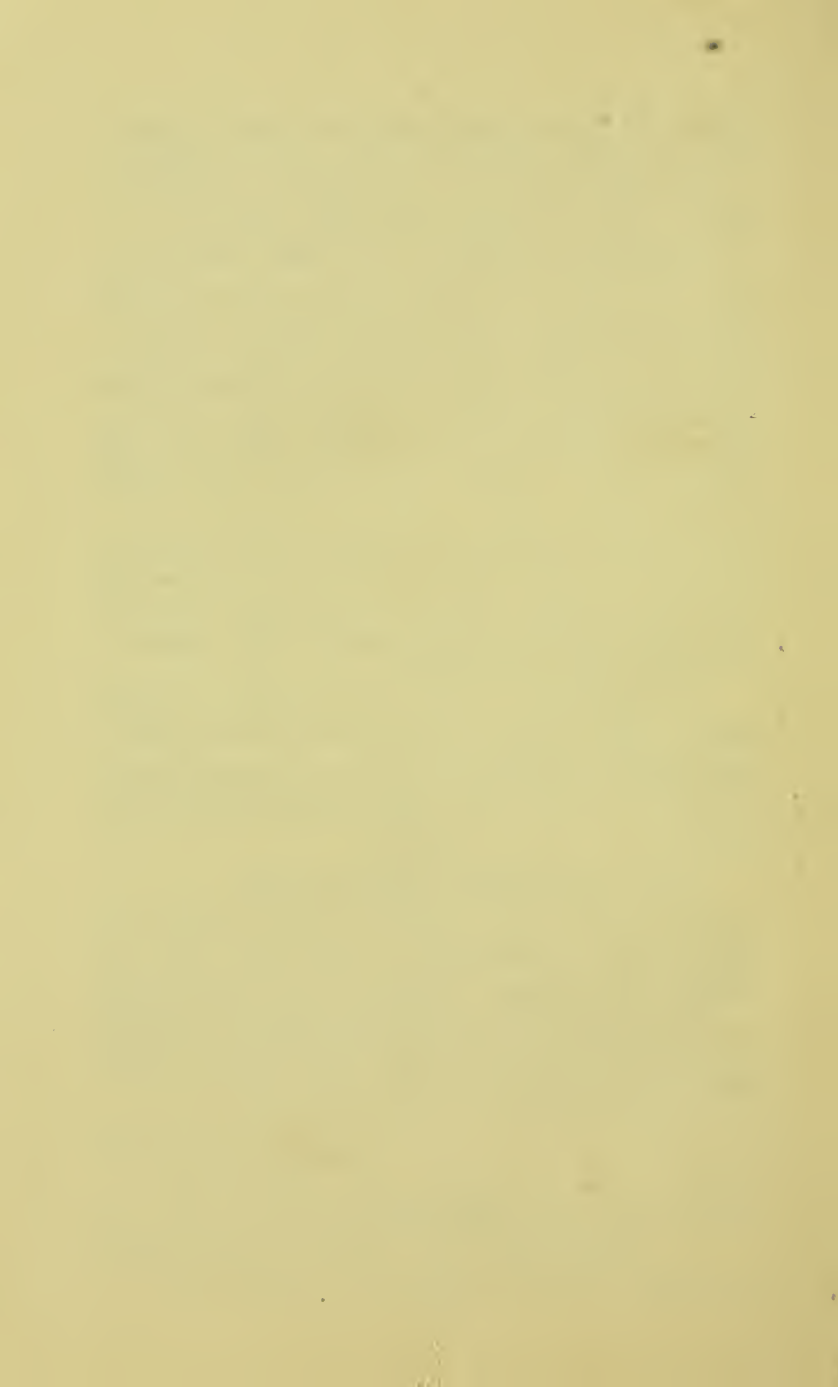
A system of payment for the milk should be accepted and made compulsory, whereby the price of the milk would be fixed in accordance with its contents in butterfat and other solids, and the hygienic properties thereof. A general progress in the cleanliness of the industrial milk may only be expected if the extra labor connected with the production of clean milk is rewarded by the receipt of a higher price for clean milk than for unclean.

The waste and losses resulting from the unsanitary production of large quantities of industrial milk are all the more regrettable where the international food situation presses for the greatest economy in the production, as well in quality as in quantity.

The production of clean industrial milk is a public interest. Where private enterprise has not been able to bring about a satisfactory progress in the methods of production, it seems logical and reasonable that measures should be taken by the legislature that will encourage the producers to greater efficiency.

Although, by scientific methods of manufacture we are able to correct many defects in milk, it must be well understood by producers that a clean milk is the basis for high class products. Where we may confidently look forward to science for further improvements in methods this may not divert our attention from the great possibilities of progress on the farm.

The End.





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