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## Suggestions relating to proper methods of operating butter and cheese factories. 1915

Madison, Wisconsin: Wisconsin Dairy and Food Commission, 1915

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DAIRY AND FOOD COMMISSION  
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SUGGESTIONS

Relating to

**Proper Methods of Operating  
Butter and Cheese Factories**

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Issued by

**GEORGE J. WEIGLE**

Dairy and Food Commissioner

Under authority of Chapter 597 of the  
Laws of 1915



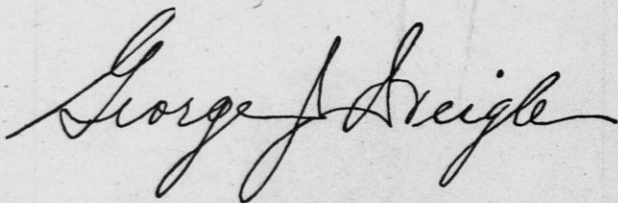
MADISON, WISCONSIN

December, 1915

## FOREWORD

Under the provisions of section 1410b-1 of the statutes (chapter 597 of the laws of 1915 relating to the licensing of butter makers and cheese makers and operators of butter and cheese factories) it is made the duty of the dairy and food commissioner to furnish to applicants for butter makers' and cheese makers' licenses suggestions relating to proper methods of operating butter or cheese factories.

In accordance with such requirement, the following suggestions, touching mainly upon those features which in the operation of factories have been most neglected or ignored and to which careful attention should be given, are offered with the hope that they may assist operators and makers in producing butter and cheese of best quality and in meeting the requirements of the rules and regulations prescribed by the dairy and food commissioner in granting licenses.

A handwritten signature in cursive script, reading "George J. Drighl". The signature is written in dark ink and is positioned above the printed name of the commissioner.

*Dairy and Food Commissioner.*

# Suggestions Relating to Proper Methods of Operating Butter and Cheese Factories

## FACTORY LOCATION AND CONSTRUCTION

**Consider general suitability** Each year factories will be rebuilt and new buildings erected. The general suitability or adaptability of location and construction of building should first be considered.

The location should afford opportunity for efficient drainage and should be a safe distance from barnyards or other objectionable surroundings or conditions.

A plentiful supply of good water should be available.

If it is desired to conduct liquid products by gravity to avoid using pipes and pumps, a sidehill location should be considered.

The factory should be located near the center of the community to be served, except when the raw material consists mostly of cream, when proximity to a railway station may be more suitable.

**Build substantially** For factories to be erected in well established dairy sections, it is recommended that buildings be made large enough for the needs of the future. Such buildings should be of substantial and permanent construction. A structure of masonry is advisable because it is more sanitary and in the end more economical.

Plans for new buildings should be carefully made. The dairy and food commission and the Wisconsin agricultural experiment station will render any assistance possible, upon request.

**Light and ventilation essential** Unless the factory is well lighted, it is impossible for the employes to do their work well. Where sufficient light is not available from the sides, a skylight is recommended. The intake room especially should be well lighted from two or three sides so that the milk or cream and the cans may be properly inspected.

In butter factories that are not well ventilated the air is so damp as to be detrimental to the health of employes and favorable to the growth of mold. Every butter factory should have an efficient system of ventilation, so regulated as to be under control.

**Smooth, water-tight floors**      Concrete floors should be water-tight with rounded corners, free from cracks, with a smooth, hard surface and a pitch of one inch for each three or four feet towards the drain.

To secure proper drainage, the make-room floor should be above grade of factory grounds on at least one side.

Some ninety per cent of concrete floors now in factories were spoiled in the making, the common faults being: the soil not properly drained; improper packing of the foundation before placing the concrete; improper materials; lack of hard, smooth surfaces and of uniform pitch.

**Plan carefully**      A concrete floor is economical and serviceable for many years when constructed on proper plans, from proper materials and by competent workmen.

Soil which retains a large amount of water will heave with frost and must be underdrained. If the foundation is not properly packed, the floors will settle and crack. For the surface mixture, one part of cement to two parts of clean sand is recommended. Waterproof paints are on the market which will render floors more nearly impervious to water, and are particularly recommended for floors with rough surfaces.

It is not safe to resurface an old concrete floor without first roughening it. If left smooth, the new floor will not adhere to the old one and if cracks form, liquids will seep between the two floors and become foul.

If a floor is defaced in spots; such places should be cut down and repaired.

**Protect the floor**      Oils, grease, salt, brine, whey, butter-milk and acids of all kinds are considered injurious to concrete. Concrete floors should be protected from those substances.

Brick floors are as a rule unsatisfactory in make-rooms and curing rooms. They are rough, full of cracks, and not water-tight. Ordinary bricks will absorb 15 per cent of their weight of water.

Wood floors should be sound, water-tight and so supported that they will not sag.

## EQUIPMENT AND UTENSILS

**Smooth surfaces best**      It is very important that all factory fixtures and apparatus be so located and arranged as to be easily cleaned. Tables, benches, wooden supports, etc., if made of rough lumber, are difficult to clean, and it is, therefore, recommended that surfaces of such fixtures be smooth and when practicable coated with paint or other suitable covering.

The exterior of vats, ripeners, churns and tanks, when possible, should be kept coated with paint or other suitable covering.

**Proper arrangement saves time** In many factories vats have been placed against the wall or within a few inches of it. This is objectionable because walls become bespattered. The narrow space between the vat and the wall cannot be cleaned easily and the vat is accessible for cleaning from one side only.



“THE WRONG KIND”

Vats should not be too deep and they should be so stationed as to be accessible for cleaning from both sides. When a vat is placed near a floor, the arrangement should be such that the space underneath the vat can be cleaned.

A steam jet of the type here shown is very difficult to clean.

The use of rubber hose for conducting food products is objectionable. Rubber is porous and the ends of hose become ragged and cannot be cleaned.

A smokestack that furnishes a good draft is necessary for the economical use of fuel and for the prevention of an excessive amount of soot in and about the building.

**Make-room no place for boiler** When a boiler is separated from the make-room by partition, the heat from the boiler may, when desired, be utilized in heating the make-room by leaving open the door between the two rooms when there is no danger of dust or soot entering the make-room.

Oil and other waste from engines cause an unsightly condition. Odors from gasoline engines are absorbed by milk and cream. For these reasons, engines should not be stationed in make-rooms.

Factory boilers should have such pipe connections as to render the steam available for heating water when and where needed and for steaming utensils.

### Utensils and Curing Facilities at Brick and Limburger Cheese Factories

Drain tables and salting tables should not leak and the supports of such tables should be of planed lumber and painted.

Molds should be sound and receive hot water treatment daily.

**Porous brick unsanitary** Common bricks are very porous, therefore only smooth-faced pressed bricks or bricks with glazed surfaces should be used for pressing Brick cheese.

Brine tanks should not leak and should be clean. Indications of impure brine are: foamy surface; slime on sides and deposit of calcium salts on bottom of tank.

In Brick and Limburger cellars the shelves should be cleaned each time the cheeses are smeared and after removing them from the shelves for packing.

**Cloths require careful treatment** Cheese cloths should be thoroughly cleaned after each use. After using hot water containing cleansing material that will remove grease, they should be thoroughly rinsed and dried. Cloths properly cleaned will be free from odor and will not attract flies.

Desirable features of curing cellars are: plenty of light, double windows with facilities for shading them on the outside, and a sub-earth air duct for ventilating the cellar with cool, moist air in summer.

**Curing cellars** Cheese cellars should be kept as cool as possible in summer. In fall or winter the temperature will be too low for proper curing unless artificial heat is supplied. Under normal conditions, a curing temperature of 70 to 75 degrees during cold weather is recommended. When a cellar is artificially heated, the air will be too dry unless moisture is supplied.

### **Utensils and Curing Facilities at Swiss Cheese Factories**

**Cheese kettle** The interior of kettles used in the manufacture of Swiss cheese should be scoured brightly. Fine sand and wood ashes are suitable for scouring. When acid is used for brightening the kettle, that treatment should be followed by careful washing or rinsing with water so as to remove any copper salts that may have formed.

A bright copper kettle used in making Brick or Limburger will tend to give such cheese a dark color. When used for such cheese, the kettle should not be scoured brightly. The treatment should consist mainly in washing with hot water.

The outside of the kettle when exposed should be clean. Jackets of kettles should be painted.

**Soot makes factory dirty** Old-fashioned heating systems that cause smoke and soot in the factory should not be used. The modern fire-heating system, when provided with a good draft, gives good results. The steam-heating system is best for heating the kettle. Steam is also very convenient in cleaning pipes and other utensils, and in supplying humidity to the curing room.

**Press needs improving** The solid base of masonry commonly used to support the press table is objectionable because, in many cases, whey leaks underneath

such table where it becomes foul, and because the narrow space under the table is inaccessible for cleaning and furnishes a harboring place for mice. The table should be so supported that the space beneath it is large enough to be accessible for cleaning. The table should have such slant as to furnish the desired drainage for whey.

Wooden press beams or levers are objectionable because they obstruct light, catch dust and because they are usually wormy. Steel press beams are recommended.

It is desirable to have three rooms with the temperature of each under control. The first room should be large enough to hold the brine tank and about three weeks' make of cheese. The second room should have a capacity of at least six weeks' make of cheese, and the third room should have a capacity of about eight weeks' make of cheese.

The desirable temperature for the first room is 60 to 65 degrees F., for the second room 75 to 85 degrees F., and for the third room about 55 degrees F.

### **Followers for American Cheese**

**Discard wooden followers** Wooden followers have at many factories been used in a very unclean condition. Whey penetrates such followers from both sides, rendering them very difficult to clean. Inasmuch as followers practically come in contact with cheese, it is essential that wooden followers be sound, and thoroughly scrubbed daily, and then rinsed.

Metal followers are being successfully used in pressing practically all the standard varieties of American cheese of circular form, and to some extent in pressing squares. Such followers are so easily cleaned that they should be used wherever possible.

Presses, hoops, and followers should be cleaned regularly.

### **WATER AND ICE SUPPLY**

It is very essential that the water supply of the factory be pure. Wells should be protected in such manner that there be no chance for pollution from factory sewage or from other source.

Pure ice is equally important for factory use.

### **CARE OF FACTORY AND UTENSILS**

Ceilings should be white. In painting walls, white or light tints should be used. Whitewashed walls and ceilings should be recoated as often as necessary to preserve a good appearance. Walls or parts of walls and ceilings should not be allowed to remain in an unclean or bespattered condition.



**Maker  
should  
be good  
manager**

One of the essential qualifications of a good maker is to know how properly to clean floors and equipment and to manage to have this done. The factory can at all times be reasonably clean and free from objectionable odors. Regular and systematic cleaning is what counts.

Unclean aprons or overalls, dirty cloths, discarded utensils and unnecessary articles of any kind in factory rooms render them unsightly or worse.

No waste or dirt should remain on floors. At the close of each day's operation floors should be thoroughly scrubbed with hot water to which has been added a cleansing material, and thoroughly rinsed after scrubbing and dried with a rubber mop.

Properly slaked lime diluted is an efficient cleansing material for floors and churns. It is easy to keep slaked lime on hand.

**Wood  
floors**

Wood floors in cheese factories should be kept dry during the regular factory operations.

**Proper  
cleaning  
counts**

After a utensil is used, it should be cleaned as soon as possible by first removing any adhering material by means of cold or lukewarm water, then by washing thoroughly with hot water containing a cleansing material, then steaming or rinsing with scalding water. Never wash with a dirty cloth or wipe a clean surface with an unclean cloth.

When utensils are greasy to the touch, they are not clean.

**Cloth  
strainers**

Cloth strainers must receive such thorough cleansing and scalding as to render them free from odor or discoloration. Such strainers should be renewed frequently.

All piping used for the purpose of conducting food products should have a sufficient number of unions that no piece will exceed ten feet in length. Tee elbows with removable caps are recommended.

All gates and pipes should be cleaned with proper fibre brushes. Such apparatus should not be passed as clean unless inspected daily.

**Examine  
pipes  
daily**

In cleaning pipes, first rinse with cold or lukewarm water, then clean with fibre brush, using hot water with cleansing material, then steam for from five to ten minutes. Where steam is not available, the pipes after washing should be rinsed with hot water. Using steam or hot water on pipes that have not first been rinsed with cold or lukewarm water will cause them to become coated on the inside. A hard coating in pipes may be removed by keeping them filled with a solution of sal soda or other cleanser until the coating is loose, then washing.

Porcelain lined faucets are recommended.

**Churns  
easily  
cleaned**

Directly after the churn is emptied, it should be rinsed with cold or lukewarm water to remove brine and particles of butter; then washed twice, each time using a liberal amount of boiling water. For the first washing, the churn should be revolved thirty to forty times and for the second washing until it becomes thoroughly heated. If any foam or deposit is left in the churn, it should be rinsed with hot water. After the water has all drained out, the churn should be allowed to dry. It should never be rinsed with cold water immediately after washing. It should be left open with the doors at the top and the gate open. As a rule it is not necessary to use anything but water in cleansing churns unless they have been badly neglected, in which case well slaked lime properly used is effective. The churn should be rinsed with cold water before the cream is put into it.

Wooden utensils used in handling and packing butter should be thoroughly scalded and placed in cold water before being used. Boxes used for holding butter to be printed should receive the same treatment. Soiled or greasy ladles, boxes, tables, etc., are not tolerated by a careful maker.

#### BY-PRODUCTS.

**Tanks  
require  
care**

The practice of storing by-products in containers that are foul is indefensible, the more so when such products are carried away from the factory in cans used for transporting milk or cream: All containers used for by-products should be well constructed, not too deep, free from leaks and so arranged that they can be conveniently drained and cleaned. They should receive regular care and at all times be kept free from filth, sediment or coating of any kind.

When containers and utensils used in handling or conducting by-products are stationed in factory rooms where food for man is handled or prepared, they should be clean.

Pipes, pumps and conductors, if filthy, will befoul the by-products and liberate foul odors.

A few concrete tanks have been constructed for the purpose of holding by-products. Such tanks as a rule have been failures because of the action of the acid on the concrete, leaving it rough and porous.

**Clean  
whey tanks  
insure  
better  
milk**

Unclean utensils and containers used for by-products that are carried away from the factory in milk or cream cans may be the direct cause of tainted milk or cream. Troublesome ferments may be propagated from day to day in a whey tank and transmitted to the milk in the farmer's cans. Heating the whey in the tank to 150 degrees F. will tend to stop such trouble.

## SEWAGE DISPOSAL

In the past, many factories have not been provided with an efficient system for disposing of factory waste. Foul odors were common about many factories. The manufacture of any food product in a place surrounded by foul odors is intolerable from any viewpoint.

**Study your sewage problem** When liquid waste can be conducted into a city sewer, or into a nearby stream of water without being objectionable, this should be done. Where such means are not available, and where sand, gravel or porous soil can be easily reached, a blind well or cesspool may be installed, which should be tightly covered and located a safe distance from any well.

In some cases liquid waste, moderate in amount, may be carried underground to a place safely distant from the factory and where it will not create a nuisance.

**Don't tolerate foul odors** Where the soil is of such character that a blind well or cesspool cannot be used, and there is no chance for drainage, a large tank may be placed in the ground, into which the factory waste other than clear water may be conducted, and from which tank the waste may be pumped into a tank wagon and hauled away.

In the disposal of liquid waste septic tanks have been more or less satisfactory. Such tanks, properly constructed and cared for, may be helpful. Bulletins dealing with the construction of septic tanks may be obtained from the Wisconsin agricultural experiment station and from the Wisconsin state board of health.

**Trap drains** Underground drains are foul. Closed drains that begin inside the factory should be trapped, otherwise they will discharge foul odors in the building.

**Catch basin** In order to prevent the clogging of tile drains, it is advisable to conduct liquid waste through a catch basin located a short distance from the building, for the purpose of separating heavy materials such as sand, nails, etc., from such waste. The bottom of the basin should be about three feet lower than the tile that leads away from it. The catch basin should be tightly covered to prevent odors from escaping. In no case should liquid waste be deposited on the ground near the factory.

**Concrete platform** The place where factory by-products are loaded should have a platform of concrete of sufficient size to prevent such products from being spilled on the ground. Such platform should have a drain connection.

## FACTORY GROUNDS

**Make premises attractive .** Factory grounds should be free from weeds, junk, mudholes and rubbish of all kinds. In their place let there be lawns, shrubbery and flower beds.

The driveways should be fixed and definite and may be lined with whitewashed stones.

Attractive factory buildings and grounds are good examples for the patrons and furnish good advertising for the dairy industry.

## FLY PROTECTION

**Flies spread disease** Flies spread disease. A single fly carries many thousands of bacteria obtained from filth. When flies are in a factory room, the walls, ceiling, and the utensils therein are not clean.

Flies are attracted by odors from manure, decaying matter, filth, garbage, foul soil, etc. They deposit their eggs in those substances. In from ten days to two weeks thereafter the new crop of flies is matured.

Flies do not deposit eggs until after they are two weeks old. Most of them can be caught before that age is reached. Flies caught out of doors will not deposit eggs or get into the factory.

Effective fly-fighting means:

**Catch the fly first** (a) To keep the factory surroundings free from breeding places and from the odors that attract flies.

(b) To catch as many as possible of the flies around the building.

(c) To keep the factory doors and windows screened where necessary.

(d) To destroy the flies that get into the building.

A large wire cage trap set over a plateful of bait is best for outdoor work. Several of these traps should be used about the whey tank, intake and in sunny places where flies gather.

For inside work the sticky fly paper is effective and should be used liberally. In cool weather when flies seek warmth at the upper part of the room some of that paper should be placed near the ceiling.

**Fight flies daily** A liberal amount of sticky fly paper and several good traps working daily together with a few minutes' use each day of the swatter will keep the flies in the factory reduced to a negligible number.

Flies are never numerous in a factory except where the maker is willing to have it so.

On the farm the milk or cream and the dairy utensils should be protected from flies. Makers can be helpful to their patrons by showing them how to obtain that result.

## RAW MATERIAL

The condition of the raw material received at factories is an index to the flavor of the finished product. Every maker should realize that it requires clean-flavored raw material to make an article that is a credit to himself and to the dairy industry. The laws are clear and definite as to the kind of milk and cream that may be used. The average patron will do his part in furnishing good raw material when there is no market for an inferior article. Operators can do a great deal in bringing about improvement. Coöperation among factorymen and between factorymen and patrons is essential.

**Keep watch of the milk and cream** In factories receiving whole milk, the sediment tester should be a part of the intake equipment. A display of cotton discs showing the foreign matter taken from samples of the milk of the patrons should be made at frequent intervals, and in cheese factories the curd test should be used to locate tainted milk.

It is advisable that cream furnished to butter factories test between 30 per cent and 40 per cent in fat.

The factory management should work out the method that will insure good cream. Wherever possible the cream should be brought to the factory in the farmer's individual cans. After cream from different farms is mixed there is no opportunity for grading.

**Cream hauler can help** The gathering of cream by haulers has been unsatisfactory from the standpoint of controlling quality. This situation can be much improved by requiring haulers to fill out blanks which call for information as follows: location of separator; condition of separator room; how often separator is washed; whether rusty, open-seamed or dirty utensils are used; whether cream is sweet or sour; other information which may be given under the head "Comments."

Information so obtained will enable the creamery management to locate the source of unsuitable cream and to apply the remedy needed.

**Preservatives** The adding to dairy products of chemicals or gases from chemicals having disinfecting, deodorizing or preservative properties makes such dairy products unlawful as food for man.

**Accurate work necessary** The Babcock tester should not shake while being operated. A concrete foundation for the tester is recommended. Where cream is to be tested it is advisable that new testers be of such size as to permit the use of nine-inch bottles.

Test bottles, milk pipettes and cream scales should be in conformity with the Wisconsin specifications. All glassware should be clean.

Test bottle and composite sample jars should be numbered when in use. Glass-stoppered jars are recommended for composite samples.

Milk or cream is suitable for sampling only when thoroughly mixed and when "smooth" and free from churned particles or lumps of any kind.

The sulphuric acid should be clear and should have a specific gravity of 1.82 to 1.83. When the acid is to be added to the milk the temperature of each should be from 65 to 70 degrees F.

The temperature of the water added to test bottles should be from 140 to 180 degrees F. Soft water is best for that purpose. Hard water may cause foam on the fat.

The temperature of the fat when read should be 135 to 140 degrees F. The fat should be clear and yellow. If it is black or cloudy, or if it contains grayish substances or curd particles immediately below the fat column, the test is faulty.

Black fat is caused by: too strong or too much acid; dropping acid through milk or not mixing promptly; too high temperature of milk or acid.

Cloudy fat or fat containing grayish matter or curd particles is caused by: too weak or insufficient acid; insufficient mixing; too low temperature of milk or acid; too low speed of tester.

**Use the Babcock test** The Babcock tester should be used regularly at all factories. Where milk is received the lactometer should also be used. Competency in the use of the Babcock test should be considered by every maker an important part of his training.

### FINISHED PACKAGE

**Neat butter packages sell best** It is essential that finished dairy products be of high quality and packed in neat, attractive form.

The parchment paper used in wrapping print butter should be kept in boiling water for fifteen minutes, then in cold water or in a weak brine, before being used.

Butter tubs should be well made and properly treated before being filled with butter. The supply of tubs should be stored in a clean, dry room and each day only the number of tubs necessary to hold the day's make should be brought into the make-room. They should be thoroughly steamed or kept in boiling water for five minutes, then submerged in or kept filled with cold water for two hours, then drained. Just before filling with butter, they should be rinsed with cold water and a little salt sprinkled on the inner surface.

**Guard against mold** The tub liner and bottom circle should be kept in boiling water for fifteen minutes, then cooled in a weak brine as a preventive against mold. Divide the surplus length of the tub

liners equally between the bottom and top of the tub. Weigh each tub before and after filling, that the net weight may be known.

Tubs should be protected while in transit from factory to shipping station and while at depot platform.

Next to the flavor, commission men give consideration to a line of butter in clean, well packed tubs.

**Cheese should look neat**

A maker who takes pride in his work will turn out cheeses that are well shaped, trim and neat. Unsightly cheeses indicate slovenly workmanship.

The common defects in "make-up" are: ill shape, high edges, wrinkles, and checked rinds.

There should be no wrinkles in caps or bandages and the latter should lap over the ends of the cheese about one inch or somewhat less than that in cheeses of small diameter.

Cloth circles pressed on the ends of the cheese should be large enough to meet the bandage, otherwise cracks may form on the face.

Checked rinds may be caused by the curd being too greasy or too cold when put to press; by pressing in a cold room or by using unclean followers and presscloths.

**Checked rinds a serious defect**

An excessive amount of fat may be removed from curd just before salting by rinsing the same with water at 110 degrees F. Rinsing can be done only when curd is perfectly loose and so divided that the water will run

through it rapidly.

The temperature of curd when put to press should be 80 to 85 degrees F. When the make-room is cold, the hoops may be warmed in the cheese vat before being filled. Press-cloths should be soft and clean.

When dressing cheeses, if they are not "faced," hot water should be applied to the "open" surfaces.

Open or checked rinds are a serious defect because mold will start in the cracks and penetrate deep into the cheese. Such cheese is not worth the market price. Checked rinds can be avoided. None will be found in cheeses from a factory in charge of a reliable maker.

In late years cheese has been kept at the factory for so short a time that little need be said about curing. Under normal conditions a curing temperature ranging between 50 and 65 degrees F. is desirable. Cheese is liable to be injured in quality if kept at a temperature above 65 degrees F.

**Curing rooms**

Some factories are provided with a small room (cooler) the walls and ceilings of which are specially insulated and the temperature of which in summer is regulated by the use of ice. Such arrangement is very desirable during the hottest weather, particularly when troublesome ferments are at work in the cheese.

**Paraffin properly**

Very good results in paraffining are obtained when the surfaces of the cheese are dry, free from mold, and when the temperature of the paraffin is 230 to 250 degrees F.

It is advisable that cheeses be not paraffined until after they are three days out of the press. If paraffined too young or before the surfaces are dry, the wax will not adhere well and will blister or peel off. Rind rotting may also result.

If the temperature of the paraffine is not high enough, the wax coating will be too thick and will crack.

### WHEY CREAM PRODUCTION

The cheese vat, holding vat, and separator should be near each other to avoid the use of much piping. Valves on jets or on steam pipes connected with whey pipes should be tight. If they leak they may carry rust into the whey pipes.

**Tinned vats are best**

Where whey cannot be conducted from cheese vat to separator entirely by gravity, it may be carried conveniently and economically by stationing the holding vat and separator on a floor about three feet lower than the main floor. In that case, whey is conducted from cheese vat to holding vat by gravity in an open conductor. A container of a few gallons capacity, with an overflow, is stationed above the holding vat just high enough that whey will flow from it to the separator. Instead of the small container, a very short overflow pipe, about one foot higher than the pipe which feeds the separator, will answer the purpose. Whey is elevated from holding vat to separator by a steam jet or pump.

Holding vats constructed of wood or galvanized metal are not recommended. Wood is porous and in many cases joints are open, making it impossible to keep the vat clean. Whey will in a short time remove a galvanized coating leaving the black metal bare. Vats made of tinned metal have proven most satisfactory.

**Don't neglect the cream water.**

Whey cream should be promptly cooled to a temperature of 55 degrees F. or lower. This can best be done in cans of small diameter placed in ice water.

Cream sold should be sweet. Daily delivery is recommended.

For churning, whey cream should be rich enough to permit the use of 25 per cent to 35 per cent of starter. When mixed with the starter the fat content should be about 30 per cent.

Good butter can be made from whey cream produced under sanitary conditions and no one but the cheese maker is at fault when whey cream is not of the best quality.



## WISCONSIN'S REPUTATION AT STAKE

**Satisfied  
consumers  
a good  
asset**

Wisconsin butter and cheese factories are the kitchens wherein some sixty million dollars worth of food is annually prepared for sale. It is imperative that in the manufacture of this food only milk and cream that is clean and of high quality be used; that this food be produced only at clean factories, by properly trained makers, to the end that those who expend that vast amount of money (the consumers) be not deceived as to the character of our dairy products.

Let the motto of each factory operator and employe be: **GIVE THE CONSUMER A SQUARE DEAL.**

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**WISCONSIN**  
**DAIRY AND FOOD COMMISSION**

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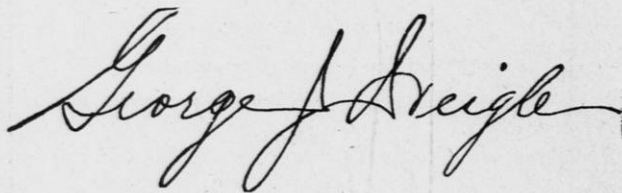


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In accordance with such requirement, the following suggestions, touching mainly upon those features which in the operation of factories have been most neglected or ignored and to which careful attention should be given, are offered with the hope that they may assist operators and makers in producing butter and cheese of best quality and in meeting the requirements of the rules and regulations prescribed by the dairy and food commissioner in granting licenses.

A handwritten signature in cursive script, reading "George J. Drayton". The signature is written in dark ink and is centered on the page.

*Dairy and Food Commissioner.*

# Suggestions Relating to Proper Methods of Operating Butter and Cheese Factories

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## FACTORY LOCATION AND CONSTRUCTION

### **Consider general suitability**

Each year factories will be rebuilt and new buildings erected. The general suitability or adaptability of location and construction of building should first be considered.

The location should afford opportunity for efficient drainage and should be a safe distance from barnyards or other objectionable surroundings or conditions.

A plentiful supply of good water should be available.

If it is desired to conduct liquid products by gravity to avoid using pipes and pumps, a sidehill location should be considered.

The factory should be located near the center of the community to be served, except when the raw material consists mostly of cream, when proximity to a railway station may be more suitable.

### **Build substantially**

For factories to be erected in well established dairy sections, it is recommended that buildings be made large enough for the needs of the future. Such buildings should be of substantial and permanent construction. A structure of masonry is advisable because it is more sanitary and in the end more economical.

Plans for new buildings should be carefully made. The dairy and food commission and the Wisconsin agricultural experiment station will render any assistance possible, upon request.

### **Light and ventilation essential**

Unless the factory is well lighted, it is impossible for the employes to do their work well. Where sufficient light is not available from the sides, a skylight is recommended. The intake room especially should

be well lighted from two or three sides so that the milk or cream and the cans may be properly inspected.

In butter factories that are not well ventilated the air is frequently so damp as to be detrimental to the health of employes and favorable to the growth of mold and destructive to the building, fixtures and utensils. Every butter factory should have an efficient system of ventilation, so regulated as to be under control.

**Smooth,  
water-tight  
floors  
fundamental** Concrete floors should be water-tight with rounded corners, free from cracks, with a smooth, hard surface and a pitch of one inch for each three or four feet towards the drain.

To secure proper drainage, the make-room floor should be above grade of factory grounds on at least one side.

Some ninety per cent of concrete floors now in factories were spoiled in the making, the common faults being: the soil not properly drained; improper packing of the foundation before placing the concrete; improper materials; lack of hard, smooth surfaces and of uniform pitch.

**Plan  
carefully** A concrete floor is economical and serviceable for many years when constructed on proper plans, from proper materials and by competent workmen.

Soil which retains a large amount of water will heave with frost and must be underdrained. If the foundation is not properly packed, the floors will settle and crack. For the surface mixture, one part of cement to two parts of clean sand is recommended. Waterproof paints are on the market which will render floors more nearly impervious to water, and are particularly recommended for floors with rough surfaces.

It is not safe to resurface an old concrete floor without first roughening it. If left smooth, the new floor will not adhere to the old one, and if cracks form, liquids will seep between the two floors and become foul.

If a floor is defaced in spots, such places should be cut down and repaired.

**Protect  
the  
floor**

Oils, grease, salt, brine, whey, buttermilk and acids of all kinds are considered injurious to concrete. Concrete floors should be protected from those substances.

Brick floors are as a rule unsatisfactory in make-rooms and curing rooms. They are rough, full of cracks, and not water-tight. Ordinary bricks will absorb 15 per cent of their weight of water.

Wood floors should be sound, water-tight and so supported that they will not sag.

**EQUIPMENT AND UTENSILS**

**Smooth  
surfaces  
best**

It is very important that all factory fixtures and apparatus be so located and arranged as to be easily cleaned. Tables, benches, wooden supports, etc., if made of rough lumber, are difficult to clean, and it is, therefore, recommended that surfaces of such fixtures be smooth and when practicable coated with paint or other suitable covering.

The exterior of vats, ripeners, churns and tanks, when possible, should be kept coated with paint or other suitable covering.

**Proper  
arrangement  
saves time**

In many factories vats have been placed against the wall or within a few inches of it. This is objectionable because walls become bespattered. The narrow space between the vat and the wall cannot be cleaned easily, and the vat is accessible for cleaning from one side only.



**"THE WRONG  
KIND"**

Vats should not be too deep and they should be so stationed as to be accessible for cleaning from both sides. When a vat is placed near a floor the arrangement should be such that the space underneath the vat can be cleaned.

A steam jet of the type here shown is very difficult to clean.

The use of rubber hose for conducting food products is objectionable. Rubber is porous and the ends of hose become ragged and cannot be cleaned.

A smokestack that furnishes a good draft is necessary for the economical use of fuel and for the prevention of an excessive amount of soot in and about the building.

**Make-room  
no place for  
boiler** When a boiler is separated from the make-room by partition, the heat from the boiler may, when desired, be utilized in heating the make-room by leaving the door open between the two rooms when there is no danger of dust or soot entering the make-room.

Oil and other waste from engines cause an unsightly condition. Odors from gasoline engines are absorbed by milk and cream. For these reasons, engines should not be stationed in make-rooms.

Factory boilers should have such pipe connections as to render the steam available for heating water when and where needed and for steaming utensils.

### **Utensils and Curing Facilities at Brick and Limburger Cheese Factories**

Drain tables and salting tables should not leak and the supports of such tables should be of planed lumber and painted.

Molds should be sound and receive hot water treatment daily.

**Porous brick  
unsanitary** Common bricks are very porous, therefore only smooth-faced pressed bricks or bricks with glazed surfaces should be used for pressing Brick cheese.

Brine tanks should not leak and should be clean. Indications of impure brine are: foamy surface; slime on sides and deposit of calcium salts on bottom of tank.

In Brick and Limburger cellars the shelves should be cleaned each time the cheeses are smeared and after removing them from the shelves for packing.

**Cloths require careful treatment** Cheese cloths should be thoroughly cleaned after each use. After using hot water containing cleansing material that will remove grease, they should be thoroughly rinsed and dried. Cloths properly cleaned will be free from odor and will not attract flies.

Desirable features of curing cellars are: plenty of light, double windows with facilities for shading them on the outside, and a sub-earth air duct for ventilating the cellar with cool, moist air in summer.

**Curing cellars** Cheese cellars should be kept as cool as possible in summer. In fall or winter the temperature will be too low for proper curing unless artificial heat is supplied. Under normal conditions, a curing temperature of 70 to 75 degrees during cold weather is recommended. When a cellar is artificially heated, the air will be too dry unless moisture is supplied.

### **Utensils and Curing Facilities at Swiss Cheese Factories**

**Cheese kettle** The interior of kettles used in the manufacture of Swiss cheese should be scoured brightly. Fine sand and wood ashes are suitable for scouring. When acid is used for brightening the kettle, that treatment should be followed by careful washing or rinsing with water so as to remove any copper salts that may have formed.

A bright copper kettle used in making Brick or Limburger will tend to give such cheese a dark color. When used for such cheese, the kettle should not be scoured brightly. The treatment should consist mainly in washing with hot water.

The outside of the kettle when exposed should be clean. Jackets of kettles should be painted.

**Soot makes factory dirty** Old-fashioned heating systems that cause smoke and soot in the factory should not be used. The modern fire-heating system, when provided with a good draft, gives good results. The steam-heating system is best for heating the



kettle. Steam is also very convenient in cleaning pipes and other utensils, and in supplying humidity to the curing room.

**Press needs improving** The solid base of masonry commonly used to support the press table is objectionable because, in many cases, whey leaks underneath such table where it becomes foul, and because the narrow space under the table is inaccessible for cleaning and furnishes a harboring place for mice. The table should be so supported that the space beneath it is large enough to be accessible for cleaning. The table should have such slant as to furnish the desired drainage for whey.

Wooden press beams or levers are objectionable because they obstruct light, catch dust, and because they are usually wormy. Steel press beams are recommended.

**Curing rooms** It is desirable to have three rooms with the temperature of each under control. The first room should be large enough to hold the brine tank and about three weeks' make of cheese. The second room should have a capacity of at least six weeks' make of cheese, and the third room should have a capacity of about eight weeks' make of cheese.

The desirable temperature for the first room is 60 to 65 degrees F., for the second room 75 to 85 degrees F., and for the third room about 55 degrees F.

### Followers for American Cheese

**Discard wooden followers** Wooden followers have at many factories been used in a very unclean condition. Whey penetrates such followers from both sides, rendering them very difficult to clean. Inasmuch as followers practically come in contact with cheese, it is essential that wooden followers be sound, and thoroughly scrubbed daily, and then rinsed.

Metal followers are being successfully used in pressing practically all the standard varieties of American cheese of circular form, and to some extent in pressing squares. Such followers are so

easily cleaned that they should be used wherever possible.

Presses, hoops, and followers should be cleaned regularly.

### WATER AND ICE SUPPLY

It is very essential that the water supply of the factory be pure. Wells should be protected in such manner that there be no chance for pollution from factory sewage or from other source.

Pure ice is equally important for factory use.

### CARE OF FACTORY AND UTENSILS

Ceilings should be white. In painting walls, white or light tints should be used. Whitewashed walls and ceilings should be recoated as often as necessary to preserve a good appearance. Walls or parts of walls and ceilings should not be allowed to remain in an unclean or bespattered condition.

One of the essential qualifications of a good maker is to know how properly to clean floors and equipment and to manage to have this done. The factory can at all times be reasonably clean and free from objectionable odors. Regular and systematic cleaning is what counts.

Unclean aprons or overalls, dirty cloths, discarded utensils and unnecessary articles of any kind in factory rooms render them unsightly or worse.

No waste or dirt should remain on floors. At the close of each day's operation floors should be thoroughly scrubbed with hot water to which has been added a cleansing material, and thoroughly rinsed after scrubbing and dried with a rubber mop.

Properly slaked lime diluted is an efficient cleansing material for floors and churns. It is easy to keep slaked lime on hand.

**Wood floors**

Wood floors in cheese factories should be kept dry during the regular factory operations.

**Proper  
cleaning  
counts**

After a utensil is used, it should be cleaned as soon as possible by first removing any adhering material by means of cold or lukewarm water, then by washing thoroughly with hot water containing a cleansing material, then steaming or rinsing with scalding water. Never wash with a dirty cloth or wipe a clean surface with an unclean cloth.

When utensils are greasy to the touch, they are not clean.

**Cloth  
strainers**

Cloth strainers must receive such thorough cleansing and scalding as to render them free from odor or discoloration. Such strainers should be renewed frequently.

All piping used for the purpose of conducting food products should have a sufficient number of unions that no piece will exceed ten feet in length. Tee elbows with removable caps are recommended.

All gates and pipes should be cleaned with proper fibre brushes. Such apparatus should not be passed as clean unless inspected daily.

**Examine  
pipes  
daily**

In cleaning pipes, first rinse with cold or lukewarm water, then clean with fibre brush, using hot water with cleansing material, then steam for from five to ten minutes. Where steam is not available, the pipes after washing should be rinsed with hot water. Using steam or hot water on pipes that have not first been rinsed with cold or lukewarm water will cause them to become coated on the inside. A hard coating in pipes may be removed by keeping them filled with a solution of sal soda or other cleanser until the coating is loose, then washing.

Porcelain lined faucets are recommended.

**Churns  
easily  
cleaned**

Directly after the churn is emptied, it should be rinsed with cold or lukewarm water to remove brine and particles of butter; then washed twice, each time using a liberal amount of boiling water. For the first washing, the churn should be revolved thirty to forty times, and for the second washing until it be-

becomes thoroughly heated. If any foam or deposit is left in the churn, it should be rinsed with hot water. After the water has all drained out, the churn should be allowed to dry. It should never be rinsed with cold water immediately after washing. It should be left open with the doors at the top and the gate open. As a rule it is not necessary to use anything but water in cleaning churns unless they have been badly neglected, in which case well slaked lime properly used is effective. The churn should be rinsed with cold water before the cream is put into it.

Wooden utensils used in handling and packing butter should be thoroughly scalded and placed in cold water before being used. Boxes used for holding butter to be printed should receive the same treatment. Soiled or greasy ladles, boxes, tables, etc., are not tolerated by a careful maker.

## BY-PRODUCTS

### **Tanks require care**

The practice of storing by-products in containers that are foul is indefensible, the more so when such products are carried away from the factory in cans used for transporting milk or cream. All containers used for by-products should be well constructed, not too deep, free from leaks and so arranged that they can be conveniently drained and cleaned. They should receive regular care and at all times be kept free from filth, sediment or coating of any kind.

When containers and utensils used in handling or conducting by-products are stationed in factory rooms where food for man is handled or prepared, they should be clean.

Pipes, pumps and conductors, if filthy, will befoul the by-products and liberate foul odors.

A few concrete tanks have been constructed for the purpose of holding by-products. Such tanks as a rule have been failures because of the action of the acid on the concrete, leaving it rough and porous.

**Clean  
whey tanks  
insure  
better  
milk**

Unclean utensils and containers used for by-products that are carried away from the factory in milk or cream cans may be the direct cause of tainted milk or cream. Troublesome ferments may be propagated from day to day in a whey tank and transmitted to the milk in the farmer's cans. Heating the whey in the tank to 150 degrees F. will tend to stop such trouble.

### SEWAGE DISPOSAL

In the past, many factories have not been provided with an efficient system for disposing of factory waste. Foul odors were common about many factories. The manufacture of any food product in a place surrounded by foul odors is intolerable from any viewpoint.

**Study your  
sewage  
problem**

When liquid waste can be conducted into a city sewer, or into a nearby stream of water without being objectionable, this should be done. Where such means are not available, and where sand, gravel or porous soil can be easily reached, a blind well or cesspool may be installed, which should be tightly covered and located a safe distance from any well.

In some cases liquid waste, moderate in amount, may be carried underground to a place safely distant from the factory and where it will not create a nuisance.

**Don't  
tolerate  
foul odors**

Where the soil is of such character that a blind well or cesspool cannot be used, and there is no chance for drainage, a large tank may be placed in the ground, into which the factory waste other than clear water may be conducted, and from which tank the waste may be pumped into a tank wagon and hauled away.

In the disposal of liquid waste, septic tanks have been more or less satisfactory. Such tanks, properly constructed and cared for, may be helpful. Bulletins dealing with the construction of septic tanks may be obtained from the Wisconsin state board of health.

**Trap drains**                      Underground drains are foul. Closed drains that begin inside the factory should be trapped, otherwise they will discharge foul odors in the building.

**Catch basin**                      In order to prevent the clogging of tile drains, it is advisable to conduct liquid waste through a catch basin located a short distance from the building, for the purpose of separating heavy materials such as sand, nails, etc., from such waste. The bottom of the basin should be about three feet lower than the tile that leads away from it. The catch basin should be tightly covered to prevent odors from escaping. In no case should liquid waste be deposited on the ground near the factory.

**Concrete platform**                The place where factory by-products are loaded should have a platform of concrete of sufficient size to prevent such products from being spilled on the ground. Such platform should have a drain connection.

## FACTORY GROUNDS

**Make premises attractive**            Factory grounds should be free from weeds, junk, mudholes and rubbish of all kinds. In their place let there be lawns, shrubbery and flower beds.

The driveways should be fixed and definite and may be lined with whitewashed stones.

Attractive factory buildings and grounds are good examples for the patrons and furnish good advertising for the dairy industry.

## FLY PROTECTION

**Flies spread disease**              Flies spread disease. A single fly carries many thousands of bacteria obtained from filth. When flies are in a factory room, the walls, ceiling, and the utensils therein are not clean.

Flies are attracted by odors from manure, decaying matter, filth, garbage, foul soil, etc. They de-

posit their eggs in those substances. In from ten days to two weeks thereafter the new crop of flies is matured.

Flies do not deposit eggs until after they are two weeks old. Most of them can be caught before that age is reached. Flies caught out of doors will not deposit eggs or get into the factory.

Effective fly-fighting means:

**Catch the fly first** (a) To keep the factory surroundings free from breeding places and from the odors that attract flies.

(b) To catch as many as possible of the flies around the building.

(c) To keep the factory doors and windows screened where necessary.

(d) To destroy the flies that get into the building.

A large wire cage trap set over a plateful of bait is best for outdoor work. Several of these traps should be used about the whey tank, intake and in sunny places where flies gather.

For inside work the sticky fly paper is effective and should be used liberally. In cool weather when flies seek warmth at the upper part of the room some of that paper should be placed near the ceiling.

**Fight flies daily** A liberal amount of sticky fly paper and several good traps working daily, together with a few minutes' use each day of the swatter, will keep the flies in the factory reduced to a negligible number.

Flies are never numerous in a factory except where the maker is willing to have it so.

On the farm the milk or cream and the dairy utensils should be protected from flies. Makers can be helpful to their patrons by showing them how to obtain that result.

## RAW MATERIAL

**Quality first**      The condition of the raw material received at factories is an index to the flavor of the finished product. Every maker should realize that it requires clean-flavored raw material to make an article that is a credit to himself and to the dairy industry. The laws are clear and definite as to the kind of milk and cream that may be used. The average patron will do his part in furnishing good raw material when there is no market for an inferior article. Operators can do a great deal in bringing about improvement. Cooperation among factorymen and between factorymen and patrons is essential.

**Keep watch of the milk and cream**      In factories receiving whole milk, the sediment tester should be a part of the intake equipment. A display of cotton discs showing the foreign matter taken from samples of the milk of the patrons should be made at frequent intervals, and in cheese factories the curd test should be used to locate tainted milk.

It is advisable that cream furnished to butter factories test between 30 per cent and 40 per cent in fat.

**Pasteurization**      It is advisable to pasteurize all cream before it is made into butter to insure a safer product.

The factory management should work out the method that will insure good cream. Wherever possible the cream should be brought to the factory in the farmer's individual cans. After cream from different farms is mixed there is no opportunity for grading.

**Cream hauler can help**      The gathering of cream by haulers has been unsatisfactory from the standpoint of controlling quality. This situation can be much improved by requiring haulers to fill out blanks which call for information as follows: location of separator; condition of separator room; how often separator is washed; whether rusty, open-seamed or dirty utensils are used; whether cream is sweet or sour; other in-



formation which may be given under the head "Comments".

Information so obtained will enable the creamery management to locate the source of unsuitable cream and to apply the remedy needed.

**Preservatives** The adding to dairy products of chemicals or gases from chemicals having disinfecting, deodorizing or preservative properties makes such dairy products unlawful as food for man.

**Accurate work necessary** The Babcock tester should not shake while being operated. A concrete foundation for the tester is recommended. Where cream is to be tested it is advisable that new testers be of such size as to permit the use of nine-inch bottles.

Test bottles, milk pipettes and cream scales should be in conformity with the Wisconsin specifications. All glassware should be clean.

Test bottle and composite sample jars should be numbered when in use. Glass-stoppered jars are recommended for composite samples.

Milk or cream is suitable for sampling only when thoroughly mixed and when "smooth" and free from churned particles or lumps of any kind.

The sulphuric acid should be clear and should have a specific gravity of 1.82 to 1.83. When the acid is to be added to the milk the temperature of each should be from 65 to 70 degrees F.

The temperature of the water added to test bottles should be from 140 to 180 degrees F. Soft water is best for that purpose. Hard water may cause foam on the fat. If hard water is used, add 10 to 15 drops of sulphuric acid to one quart of water. This will prevent the foam from appearing on the top of the fat column.

The temperature of the fat when read should be 135 to 140 degrees F. The fat should be clear and yellow. If it is black or cloudy, or if it contains grayish substances or curd particles immediately below the fat column, the test is faulty.

Black fat is caused by: too strong or too much acid; dropping acid through milk or not mixing promptly; too high temperature of milk or acid.

Cloudy fat or fat containing grayish matter or curd particles is caused by: too weak or insufficient

acid; insufficient mixing; too low temperature of milk or acid; too low speed of tester.

**Use the Babcock test** The Babcock tester should be used regularly at all factories. Where milk is received the lactometer should also be used. Competency in the use of the Babcock test should be considered by every maker an important part of his training.

### FINISHED PACKAGE

**Neat butter packages sell best**

It is essential that finished dairy products be of high quality and packed in neat, attractive form.

The parchment paper used in wrapping print butter should be kept in boiling water for fifteen minutes, then in cold water or in a weak brine, before being used.

Butter tubs should be well made and properly treated before being filled with butter. The supply of tubs should be stored in a clean, dry room and each day only the number of tubs necessary to hold the day's make should be brought into the make-room. They should be thoroughly steamed or kept in boiling water for five minutes, then submerged in or kept filled with cold water for two hours, then drained. Just before filling with butter, they should be rinsed with cold water and a little salt sprinkled on the inner surface.

**Guard against mold**

The tub liner and bottom circle should be kept in boiling water for fifteen minutes, then cooled in a weak brine as a preventive against mold. Divide the surplus length of the tub liners equally between the bottom and top of the tub. Weigh each tub before and after filling, that the net weight may be known.

Tubs should be protected while in transit from factory to shipping station and while at depot platform.

Next to the flavor, commission men give consideration to a line of butter in clean, well packed tubs.

**Cheese  
should  
look neat**

A maker who takes pride in his work will turn out cheeses that are well shaped, trim and neat. Unsightly cheeses indicate slovenly workmanship.

The common defects in "make-up" are: ill-shape, high edges, wrinkles, and checked rinds.

There should be no wrinkles in caps or bandages and the latter should lap over the ends of the cheese about one inch or somewhat less than that in cheeses of small diameter.

Cloth circles pressed on the ends of the cheese should be large enough to meet the bandage, otherwise cracks may form on the face.

Checked rinds may be caused by the curd being too greasy or too cold when put to press; by pressing in a cold room or by using unclean followers and presscloths.

**Checked  
rinds a  
serious  
defect**

An excessive amount of fat may be removed from curd just before salting by rinsing the same with water at 110 degrees F. Rinsing can be done only when curd is perfectly loose and so divided that

the water will run through it rapidly.

The temperature of curd when put to press should be 80 to 85 degrees F. When the make-room is cold, the hoops may be warmed in the cheese vat before being filled. Press-cloths should be soft and clean.

When dressing cheeses, if they are not "faced", hot water should be applied to the "open" surfaces.

Open or checked rinds are a serious defect because mold will start in the cracks and penetrate deep into the cheese. Such cheese is not worth the market price. Checked rinds can be avoided. None will be found in the cheeses from a factory in charge of a reliable maker.

In late years cheese has been kept at the factory for so short a time that little need be said about curing. Under normal conditions a curing temperature ranging between 50 and 65 degrees F. is desirable. Cheese is liable to be injured in quality if kept at a temperature above 65 degrees F.

**Curing  
rooms**

Some factories are provided with a small room (cooler) the walls and ceilings of which are specially insulated and the tem-

perature of which in summer is regulated by the use of ice. Such arrangement is very desirable during the hottest weather, particularly when troublesome ferments are at work in the cheese.

**Paraffin properly**

Very good results in paraffining are obtained when the surfaces of the cheese are dry, free from mold, and when the temperature of the paraffin is 230 to 250 degrees F.

It is advisable that cheeses be not paraffined until after they are three days out of the press. If paraffined too young or before the surfaces are dry, the wax will not adhere well and will blister or peel off. Rind rotting may also result.

If the temperature of the paraffine is not high enough, the wax coating will be too thick and will crack.

### WHEY CREAM PRODUCTION

The cheese vat, holding vat, and separator should be near each other to avoid the use of much piping. Valves on jets or on steam pipes connected with whey pipes should be tight. If they leak they may carry rust into the whey pipes.

**Tinned vats are best**

Where whey cannot be conducted from cheese vat to separator entirely by gravity, it may be carried conveniently and economically by stationing the holding vat and separator on a floor about three feet lower than the main floor. In that case, whey is conducted from cheese vat to holding vat by gravity in an open conductor. A container of a few gallons capacity, with an overflow, is stationed above the holding vat just high enough that whey will flow from it to the separator. Instead of the small container, a very short overflow pipe, about one foot higher than the pipe which feeds the separator, will answer the purpose. Whey is elevated from holding vat to separator by a steam jet or pump.

Holding vats constructed of wood or galvanized metal are not recommended. Wood is porous and in many cases joints are open, making it impossible to keep the vat clean. Whey will in a short time remove a galvanized coating, leaving the black

metal bare. Vats made of tinned metal have proven most satisfactory. \*

**Don't neglect the cream**                      Whey cream should be promptly cooled to a temperature of 55 degrees F. or lower. This can best be done in cans of small diameter placed in ice water.

Cream sold should be sweet. Daily delivery is recommended.

For churning, whey cream should be rich enough to permit the use of 25 per cent to 35 per cent of starter. When mixed with the starter the fat content should be about 30 per cent.

Good butter can be made from whey cream produced under sanitary conditions, and no one but the cheese maker is at fault when whey cream is not of the best quality.

#### **WISCONSIN'S REPUTATION AT STAKE**

**Satisfied consumers a good asset**                      Wisconsin butter and cheese factories are the kitchens wherein some sixty million dollars worth of food is annually prepared for sale. It is imperative that in the manufacture of this food only milk and cream that is clean and of high quality be used; that this food be produced only at clean factories, by properly trained makers, to the end that those who expend that vast amount of money (the consumers) be not deceived as to the character of our dairy products.

Let the motto of each factory operator and employe be: **GIVE THE CONSUMER A SQUARE DEAL.**





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**Wisconsin  
Dairy and Food Department**

**SUGGESTIONS**

Relating to  
Proper Methods of Operating Butter and  
Cheese Factories

Issued  
Pursuant to the Requirements of Law

**J. Q. EMERY**  
Dairy and Food Commissioner



Wis. Historical Society

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Public MADISON, WISCONSIN

April, 1922



Wisconsin  
Dairy and Food Department

SUGGESTIONS

relating to

Food Methods of Operating Dairies and  
Dairy Factories

Issued

in response to the requirements of law

J. D. STONEY

Dairy and Food Commissioner



State of Wisconsin

1917

Madison, Wisconsin

April 1917

# Suggestions Relating to Proper Methods of Operating Butter and Cheese Factories

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## FACTORY LOCATION AND CONSTRUCTION

**Consider general suitability** Each year factories will be rebuilt or repaired and new buildings erected. The general suitability or adaptability of location and construction of building should first be considered.

The location should afford ample means for sewage disposal and should be a safe distance from barnyards or other unsanitary surroundings or conditions.

**Build substantially** When new factories are to be built, it is recommended that buildings be made large enough for the needs of the future. Such buildings should be of substantial and permanent construction.

Plans for new buildings should be carefully made. The Wisconsin College of Agriculture and Experiment Station offers to furnish plans on request.

**Light and ventilation essential** To enable the employes to efficiently perform their work, the factory work rooms should be well lighted. The intake room should be of such size and arrangement as to facilitate the important work of inspecting the milk, cream and cans as received. The walls and ceilings should be ceiled or otherwise finished so as to be easily cleaned. The receiving door should open to the floor of the intake room to permit of ready access to the cans before being unloaded. When milk is received through a hole in the wall, thorough inspection is practically impossible.

Every factory should have sufficient ventilation. Inadequate ventilation is conducive to damp air, promotes the growth of mold, creates unsanitary condi-



tions, may be detrimental to the health of the employes and causes deterioration of building.

**Smooth,  
water-tight  
floors**

The surface of the floors of whatever materials should be smooth, hard, even, and with sufficient pitch for good drainage. A person skilled in concrete work should supervise the construction, as the durability and suitability of the floor depends upon a solid, well-drained foundation and suitable materials mixed in the right proportion.

Brick floors are not recommended; but if used should be constructed only by a workman skilled in such work, using special floor brick and the proper cement.

### EQUIPMENT AND UTENSILS

**Smooth  
surfaces  
best**

It is highly important that all factory fixtures and apparatus be so located and arranged as to be easily cleaned. Tables, benches, wooden supports, etc., if made of rough lumber, are difficult to clean, and it is, therefore, recommended that surfaces of such fixtures be coated with paint or other suitable covering. The exterior of vats, ripeners, churns and tanks should be smooth and coated with paint or other suitable coating.

**Suitable  
arrangement  
saves time**

In some factories vats are placed against the wall or within a few inches of it. This is objectionable because walls become bespattered. The narrow space between the vat and the wall cannot be cleaned easily. Vats should be so located as to afford ample space for thorough cleaning between vats, between vat and wall and floor under vat.

**Jets**

Steam jets not readily accessible for cleaning should not be used.

**Rubber hose**

Where rubber hose is used in cheese factories or butter factories to conduct milk and cream and its by-products, it very soon becomes unclean and unsanitary; and for this reason pipe lines should be installed as to make the use of hose unnecessary.



**Make-room  
no place  
for boiler  
or engine**

A smoke stack that furnishes a good draft is necessary for economical use of fuel and for the prevention of an excessive amount of soot in and about the building.

A steam boiler should not be located in the make-room. Soot and ashes create an unclean condition. During summer the heat from the boiler makes the work room extremely hot. In cold weather the make-room may be heated by the use of steam coils or a stove. Boilers should have the necessary pipe lines to render the steam available for heating water when and where needed and for steaming utensils. Boilers of ample capacity for the work required, such as heating water, steaming utensils, and pasteurizing the by-products, should be provided.

Oil and other waste from engines cause an unsanitary and unseemly condition. Odors from gasoline engines are absorbed by milk, cream and butter. For these reasons engines should not be stationed in make-rooms.

## **UTENSILS AND CURING FACILITIES AT BRICK AND LIMBURGER CHEESE FACTORIES**

**Tables,  
molds, etc.**

Drain tables and salting tables should not leak, should be made of smooth lumber and coated with paint or other suitable covering.

Molds should be sound and free from cracks and be thoroughly cleaned and scalded after each time used.

Brine tanks should be clean and should not leak. Foamy surface and slime on sides of tank are indications of impure brine.

In Brick and Limburger cellars the shelves should be cleaned each time the cheese are smeared and after removing them from the shelves for packing.

**Porous brick  
unsanitary**

Common bricks are very porous; therefore, only smooth-faced pressed bricks or bricks with glazed surfaces should be used for pressing

**Brick cheese.**

**Cloths require  
careful  
treatment**

Cheese cloths should be thoroughly cleaned after each using. After using hot water containing cleansing material that will remove grease, they should be thoroughly

A series of tests were conducted to determine the effect of the various factors on the rate of the reaction. The results are given in the following table. It is seen that the rate of the reaction is increased by the presence of the catalyst and is decreased by the presence of the inhibitor. The effect of the concentration of the reactants is also shown.

**STUDY OF THE REACTION BETWEEN HYDROGEN PEROXIDE AND POTASSIUM IODIDE**

The reaction between hydrogen peroxide and potassium iodide is a classic example of a catalyzed reaction. The reaction is as follows:

$$2H_2O_2 \xrightarrow{KI} 2H_2O + O_2$$

The rate of this reaction is affected by several factors, including the concentration of the reactants, the presence of a catalyst, and the temperature. In this study, the effect of the concentration of the reactants and the presence of a catalyst on the rate of the reaction was investigated.

The following table shows the results of the experiments. It is seen that the rate of the reaction is increased by the presence of the catalyst and is decreased by the presence of the inhibitor. The effect of the concentration of the reactants is also shown.

rinsed and dried. Cloths properly cleaned will be free from odor and will not attract flies.

Necessary features of curing cellars are: plenty of light, double windows with facilities for shading them on the outside, and suitable ventilation.

Cheese cellars should be kept cool in summer. In fall or winter, the temperature will be too low for proper curing unless artificial heat is supplied. Under normal conditions, a curing temperature of 70 to 75 F. degrees during cold weather is recommended. When a cellar is artificially heated, the air will be too dry unless moisture is supplied.

### UTENSILS AND CURING FACILITIES AT SWISS CHEESE FACTORIES

**Cheese kettle** The interior of kettles used in the manufacture of Swiss cheese should be scoured brightly. Fine sand and wood ashes are suitable for scouring. When acid is used for brightening the kettle, that treatment should be followed by careful washing or rinsing with water so as to remove any copper salts that may have formed.

The steam heating system is best and is strongly recommended. Steam and hot water are essential for maintaining the factory in a sanitary condition.

**Press improvement needs** The solid base of masonry commonly used to support the press table should be so constructed as to permit ample space underneath the table to render it readily accessible for cleaning. The table should have such slant as to furnish the necessary drainage for whey.

Steel press beams or levers well painted are recommended. Wooden beams obstruct the light, are more difficult to keep clean and free from dust and may become wormy.

**Curing rooms** Three rooms with the temperature of each under control are required. The first room should be large enough to hold the brine tank and about three weeks' make of cheese. The second room should have a capacity of at least six weeks' make of cheese, and the third room should have a capacity of about eight weeks' make of cheese.





The desirable temperature for the first room is 60 to 65 degrees F.; for the second room, 75 to 85 degrees F.; and for the third room, about 55 degrees F.

### PRESS AND FOLLOWERS FOR AMERICAN CHEESE

Metal followers are in general use and are recommended. They are durable and easily cleaned. Presses of the continuous pressure type should be used in preference to the older type of screw press. Presses, hoops and followers should after each time they are used be thoroughly cleaned by using hot water and washing compound, then rinsing with scalding water.

### WATER AND ICE SUPPLY

A sufficient supply of pure water should be provided. The use of impure water that in any way whatsoever comes in contact with the product or utensils in the process of manufacture is dangerous and is a violation of law. Pure ice is equally important for like factory use.

### CARE OF FACTORY AND UTENSILS

As a protection against weather conditions, factories should be painted. The interior should be painted, as it protects the walls and ceilings against the deterioration caused by moisture, adds much to the appearance and aids to good sanitation. White or light tints are advisable, especially in rooms deficient in lighting.

One of the essential qualifications of a good maker is to know how properly to clean floors and equipment and to plan to have this done.

Maker should be good at planning

Systematic planning aids in getting the work thoroughly and effectively done. By keeping the factory rooms and appliances in a neat, orderly condition, by following as nearly as possible a daily schedule, the labor necessary will be materially lessened. All utensils should be cleaned immediately after using, because at no other time can the cleaning be so readily done. This may be done by first removing any adhering material by means of



cold or lukewarm water, then by the use of a suitable brush, washing thoroughly with warm water containing a cleansing material, then steaming or rinsing with scalding water. Never wash with a dirty cloth or wipe a clean surface with an unclean cloth. Utensils are not clean when they are greasy to the touch.

**Cloth strainers** Cloth strainers need thorough washing to keep them clean. After each time used, the strainer cloth should be rinsed in lukewarm water, then washed in warm water and washing powder or soap, then rinsed and scalded and allowed to dry in the open air.

**Examine pipes daily** All piping used for conducting food products should be installed with sufficient elbow, crosses and tees to render the same readily accessible for cleaning. All piping and valves should be cleaned each time used by rinsing with cold or lukewarm water, then washing with warm water and washing powder, then rinsing, then scalding by the use of boiling water or steam. Suitable brushes for cleaning the interior of pipe lines should be used daily. Using steam or hot water on pipes that have not first been rinsed with cold or lukewarm water will cause them to be coated on the inside.

**Easy cleaning of churn and implements** Immediately after the churn is emptied, it should be rinsed with cold or lukewarm water to remove brine and particles of butter; then washed twice, each time using a liberal amount of boiling water. For the first washing, the churn should be revolved thirty to forty times and for the second washing until it becomes thoroughly heated. If any foam or deposit is left in the churn, it should be rinsed with hot water. After the water has all drained out, the churn should be allowed to dry. It should never be rinsed with cold water immediately after washing. It should be left open with the doors at the top and the gate open. As a rule it is not necessary to use anything but water in cleansing churns unless they have been badly neglected, in which case well-slaked lime properly used is effective. The churn should be rinsed with cold water before the cream is put into it.



Wooden utensils used in handling and packing butter should be thoroughly scalded and placed in cold water before being used. Boxes used for holding butter to be printed should receive the same treatment. Soiled or greasy ladles, boxes, tables, etc., are not tolerated by an efficient maker.

### BY-PRODUCTS

#### Care of tanks

Tanks and other utensils used for handling by-products should be kept scrupulously clean. Failure so to do is a violation of section 4607b-7 of the dairy laws of Wisconsin. Containers used for by-products should be so constructed and arranged that they can be kept clean and sanitary. Concrete tanks are not generally suitable for whey and skim milk. The surfaces of concrete tanks as usually constructed are susceptible to the acid in whey and skim milk; and they generally become rough and porous.

#### Unclean whey tanks are contaminators of milk

Unclean whey tanks and containers that are used to carry away by-products from the factory in milk or cream cans may be the direct cause of tainted milk or cream. Troublesome ferments may be propagated from day to day in a whey tank and transmitted to the milk in the farmer's cans.

### SEWAGE DISPOSAL

An efficient system of sewage disposal is necessary to prevent the pollution of the factory and its premises. Foul odors emanating from decayed matter in sewage if allowed to accumulate on or near the factory premises, may have a dangerous and contaminating effect upon the products in course of manufacture. Noxious conditions may result in noxious cheese for which the courts hold the manufacturer responsible.

Information pertaining to the best methods of sewage disposal may be obtained from the Wisconsin State Board of Health, Madison, Wisconsin.

Wherever by-products are loaded, a concrete drive of sufficient area and slope with drain connection should be provided to prevent such products from



being spilled on the ground. A drive of concrete at the intake with sewer connection is recommended. This drive should be so constructed to accommodate the haulers' wagon and team and take care of wash water or spilled milk or cream. A roof should be provided.

### FACTORY GROUNDS

**Attractive premises**      Factory grounds should be free from weeds, junk, mudholes and rubbish of all kinds. Attractive factory buildings and grounds are inspiring examples for the patrons and furnish good advertising for the dairy industry.

### FLY PROTECTION

**Flies spread disease**      Flies spread disease. A single fly carries many thousands of bacteria obtained from filth. When flies are in a factory room, the walls, ceiling, and the utensils therein are not clean.

Flies are attracted by odors from manure, decaying matter, filth, garbage, foul soil, etc. They deposit their eggs in those substances. In from ten days to two weeks thereafter the new crop of flies is matured.

Flies do not deposit eggs until after they are two weeks old. Most of them can be caught before that age is reached. Flies caught out-of-doors will not deposit eggs or get into the factory.

Odors arise through ventilating flues and attract flies. Flies enter the factory through wide, short ventilators.

Effective fly-fighting means:

**Catch the fly first**      (a) To keep the factory surroundings free from breeding places and from the odors that attract flies.

(b) To catch as many as possible of the flies around the building.

(c) To keep the factory doors, windows, ventilating flues and other openings screened as necessary.

(d) To destroy the flies that get into the building.

A large wire cage trap set over a plateful of bait is best for outdoor work. Several of these traps should be used about the whey tank, intake and in sunny places where flies gather.





For inside work the sticky flypaper is effective and should be used liberally. In cool weather when flies seek warmth at the upper part of the room some of that paper should be placed near the ceiling. Never use poison or poison flypaper.

**Fight flies daily** A liberal amount of sticky flypaper and several good traps working daily together with a few minutes' use each day of the swatter, will keep the flies in the factory reduced to a negligible number.

Flies are never numerous in a factory except where the maker is willing to have them there. Filth is a breeder of flies. Scrupulous cleanliness is the greatest protection against flies.

On the farm, the milk or cream and the dairy utensils should be protected from flies. Makers can be helpful to their patrons by showing them how to obtain that result.

#### RAW MATERIAL

**Quality first** Milk and cream of good quality are fundamentally necessary to make a good finished product. Quality in the finished product is the first consideration. At no time should quality be sacrificed to secure a good yield.

"When good butter is competing against poorer grades; when high flavored, clean butter is competing against unclean flavors; when solid, waxy-bodied butter is competing against weak bodies; when desirable color, salt and style is competing against undesirable color, salt and style and general workmanship, on a basis of price and distribution, the better grades get the preference over the poorer grades; and the poorer grades are absorbed only after satisfactory concession has been made in price." (Eschenbrenner.) Precisely the same principles apply to cheese.

**Persistently scrutinize the milk and cream** Every can of cream and milk should be very carefully inspected at the intake, and if not of lawful quality, its faults should be pointed out to patron. Lawful milk is clean. The factory employe who receives the milk or cream should have the qualifications to do this work properly; also he should be able



to explain to the patrons how best to produce and deliver good milk and cream; and he should use the necessary tact to secure the cooperation of the patrons. Cheese makers should be skilled in the use of the sediment test, fermentation test, curd test, Babcock test, and the lactometer. Intelligent use of these tests aid in detecting adulterated and faulty milk.

**Accurate use of the Babcock test**      The Babcock tester should be placed upon a solid foundation and should run smoothly without vibration and at proper speed.

All glassware should be kept strictly clean and scales used in testing should be kept clean and in good working condition to insure accuracy and an equitable distribution of payments. Only sealed glassware and scales can be used lawfully.

Test bottles and composite sample jars should be numbered when in use. For securing accuracy in the testing, composite samples should be kept in bottles that can be tightly stoppered.

Milk or cream is suitable for sampling only when thoroughly mixed and when "smooth" and free from churned particles or lumps of any kind.

The sulphuric acid should be clear and should have a specific gravity of 1.82 to 1.83. When the acid is to be added to the milk, the temperature of each should be from 65 to 75 degrees F.

The temperature of the water added to test bottles should be from 140 to 180 degrees F. Soft water is best for that purpose. Hard water may cause foam on the fat.

The temperature of the fat when read should be 140 degrees F. To insure this temperature a hot water bath is necessary. The fat should be clear and yellow. If it is black or cloudy, or if it contains grayish substances or curd particles immediately below the fat column, the test is faulty.

Black fat is caused by too strong or too much acid; dropping acid through milk or not mixing promptly; too high temperature of milk or acid.

Cloudy fat or fat containing grayish matter or curd particles is caused by too weak or insufficient acid, insufficient mixing, too low temperature of milk or acid or too low speed of tester.



## FINISHED PACKAGE

**Neatness** The parchment paper used for wrapping butter prints should be of good quality. Before using the wrappers should be immersed in boiling water or brine for not less than five minutes, then cooled by dipping in cold water or brine.

**Guard against mold** The parchment butter tub liners should be of good stock and of ample size to allow for the proper lap and fold. The stock of liners should be kept in a clean, dry room protected from dust and dirt. Before using, the liners should be soaked in boiling water or saturated salt brine for five minutes or longer. Before using they should be dipped in cold water or brine.

Butter tubs should be soaked in boiling water or brine and as a further precaution against mold may be steamed from five to ten minutes.

The practice of paraffining butter tubs not only protects butter from mold, but also reduces the shrinkage in weight to a minimum. Before paraffining, the tubs should be steamed until they are hot and dry. If the tub is wet, the paraffin will not penetrate the wood sufficiently and is liable to peel off. The temperature of the paraffin should not be less than 250 degrees F. to insure the best results.

Tubs should be protected from sun, rain or dust while in transit from factory to shipping station and while at depot platform.

Second only to the flavor in butter, the commission men give consideration to neat, well-packed tubs.

**Cheese should appear neat** Cheese makers should at all times aim to make a cheese of good appearance. The appearance of the cheese and the package are directly related to the market value of the product. The cheese should be straight and of even height. The different types of cheese should be of uniform weight. The bandages should be free from wrinkles. Should any of the cheese when removed from the press be imperfect in finish and appearance, the faults should be at once corrected and receive further pressing. If the surface of the cheese has not closed perfectly, it should be washed in hot water to soften the curd and remove any accumulation of fat and then re-



turned to the press for a sufficient time to perfect the rind.

When the curd has lost an excess of fat and considerable fat remains on the surface of the curd, the curd before salting may be rinsed with water at 105 to 110 degrees F. A greasy curd hinders the formation of a perfect rind.

If the factory room is cold and the curd is rather low in temperature at the time of putting to press, hot water may be poured over the hoops after they are placed in the press. This will warm the hoop and curd and aid in closing the surface of the cheese and getting a perfect rind.

Cap cloths and circles should be large enough to meet the top of the bandage. If too small, the exposed surface will often crack. Cracked or checked rinds are a serious defect, allowing mold to penetrate deep into the cheese. Exposure of the cheese to strong drafts and air of low humidity in the curing room cause checked rinds.

**Curing rooms** Curing rooms should be of ample size and furnished with sufficient shelving to hold the make of cheese for the required time without placing the cheese too deep.

The cheese should be turned at least daily to allow the ends of the cheese to dry and prevent the sticking to the shelving.

Shelving should be cleaned as often as necessary to keep it in fit condition. A thorough scrubbing with boiling water and washing powder and drying in the sun will render the shelves clean and free of mold.

As a further preventive against mold, the shelves may be washed with a disinfecting solution.

**Paraffin properly** To secure the best results in paraffining, the surfaces of the cheese must be dry, free from mold and the temperature of the paraffin 250 degrees F. It is advisable that cheese be not paraffined until after they are three days out of the press. If paraffined too young or before the surfaces are dry, the wax will not adhere well, but will blister and peel off. Rind rotting may also result. If the temperature of the paraffin is not high enough, the wax coating will be too thick and will crack.





## WHEY CREAM PRODUCTION

**Production and care of whey cream** Separators, tanks, vats and other equipment used in the production of whey cream should be so installed and arranged as to require a minimum amount of piping and be readily accessible for cleaning.

Whey cream immediately after separation should be cooled to 60 degrees F. or lower. The cream should be kept cold and daily delivery in hot weather is recommended.

## PASTEURIZATION OF BY-PRODUCTS

**Incoming milk or cream** When the incoming milk or cream is heated to at least 145 degrees F. for at least 25 minutes, or in the case of instantaneous pasteurization to at least 180 degrees F., no further treatment of skim milk, buttermilk or whey is required. The pasteurization of cream for butter making or of milk for cheese making at any of the temperatures given above will insure the freedom of the buttermilk or whey from disease-producing organisms and satisfy the requirements of the law.

**Skim milk** Skim milk may be heated by passing steam into it as the milk runs from the separator to the skim milk tank. Either direct or exhaust steam may be used. When only a few cans of skim milk are returned each day, a simple and cheap method of heating the milk is by inserting a steam pipe or hose into the can. A noiseless heater may be attached to the end of the pipe or hose. Rapid skim milk pasteurizers may be purchased from supply houses or they can be made from pipe fittings.

**Buttermilk** An easy way to satisfy the requirements of the law in the case of buttermilk is to pasteurize the incoming cream in the cream ripener at a temperature of 145 degrees F. for 25 minutes or in a continuous machine at a temperature not less than 180 degrees F. If in the use of special devices for pasteurizing buttermilk it should be found that the curd forms rapidly due to the action of superheat tending



to clog the pipes, the buttermilk in such cases may be pasteurized in the tank.

**Whey** The cheese maker will find it desirable to heat the whey to about 155 degrees F. If higher temperatures are used, the albumen will be coagulated and will settle to the bottom of the tank. If much lower temperatures are used, the destruction of the bacteria will not be so complete as to secure the greatest success in keeping the whey sweet and in preventing the contamination of the fresh milk from the cans. If the whey is heated in the tank to 155 degrees F., under ordinary conditions it will be found that the temperature will not fall below 145 degrees F. in less than twenty-five minutes.

**Important** To secure the full advantage of the process in improving the feeding value of the whey, and in preventing the contamination of the milk from the cans in which whey has been carried, and in keeping the whey tank in good condition, care must be taken not to add drainings from the press, wash water, etc., to the whey after it has been heated, for these materials serve to seed the whey with bacteria which will grow rapidly in the warm whey and cause it to be in no better condition when returned to the farm than if it had not been heated at all.

### A STRAIGHT DEAL

Wisconsin butter and cheese factories are kitchens wherein vast quantities of food are annually prepared, for which Wisconsin producers are annually receiving millions of dollars. Let us assure the purchasers of these products a straight deal by furnishing them butter and cheese produced from clean, pure milk or cream, manufactured in clean factories by clean and competent makers. Upon this depends the permanent success of the Wisconsin dairy industry.