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No. 220

(1939 EDITION)

MILK ORDINANCE AND CODE

RECOMMENDED BY THE UNITED STATES
PUBLIC HEALTH SERVICE

1939

FEDERAL SECURITY AGENCY
U. S. PUBLIC HEALTH SERVICE
WASHINGTON, D. C.

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From the Division of Public Health Methods
National Institute of Health

PREPARED BY DIRECTION OF THE SURGEON GENERAL

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THOMAS PARRAN, *Surgeon General, United States Public Health Service*
L. R. THOMPSON, *Director, National Institute of Health*

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National Cancer Institute—Chief, Pharmacologist Director CARL VOEGTLIN.

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FOREWORD

The following milk ordinance and code, approved by the Public Health Service, Federal Security Agency, and the Bureau of Dairy Industry, United States Department of Agriculture, is recommended for adoption by States and communities in order to encourage a greater uniformity of milk-control practice in the United States.

This ordinance and code embodies the best information at present available on milk-control legislation, but it should be considered subject to change as improvements are developed.

In order that it may have at its command the technical advice of a comprehensive group of experts in the various phases of the public health control of milk and milk products, and in allied problems relating to production, processing, and distribution, the United States Public Health Service has appointed a board of consultants, termed the Public Health Service Sanitation Advisory Board, composed of the following members:

Mr. H. A. Whittaker, director, division of sanitation, State health department, Minneapolis, Minn., chairman.

Mr. C. A. Abele, director, bureau of inspection, State health department, Montgomery, Ala., member.

Dr. Paul B. Brooks, deputy commissioner of health, State health department, Albany, N. Y., member.

Mr. W. D. Dotterrer, Bowman Dairy Co., 140 West Ontario Street, Chicago, Ill., member.

Mr. V. M. Ehlers, director, bureau of sanitary engineering, State board of health, Austin, Tex., member.

Mr. Alfred H. Fletcher, city health department, Memphis, Tenn., member.

Dr. John G. Hardenbergh, Walker-Gordon Laboratory Co., Inc., Plainsboro, N. J., member.

Mr. Henry F. Judkins, Sealtest, Inc., 230 Park Avenue, New York, N. Y., member.

Mr. Ernest Kelly, Chief, Division of Market-Milk Investigations, United States Department of Agriculture, Washington, D. C., member.

Mr. H. A. Kroeze, director, bureau of sanitary engineering, State board of health, Jackson, Miss., member.

Mr. Paul F. Krueger, Board of Health, Chicago, Ill., member.

Mr. Alan Leighton, Bureau of Dairy Industry, United States Department of Agriculture, Washington, D. C., member.

Mr. George W. Putnam, Creamery Package Mfg. Co., Chicago, Ill., member.

Mr. Seth W. Shoemaker, 825 Sunset Street, Scranton, Pa., member.

Mr. E. S. Tisdale, formerly chief engineer, division of sanitary engineering, State health department, Charleston, W. Va., member.

Mr. L. C. Frank, Senior Sanitary Engineer, Sanitation Section, United States Public Health Service, Washington, D. C., secretary.

Advantage has been taken of the recommendations of the Advisory Board in preparing this edition of the ordinance and code.

The milk code should be used as the legal interpretation of the ordinance.

A list of communities in which the milk ordinance recommended by the Public Health Service is in effect is issued from time to time by the Public Health Service. Inclusion in this list means that the State health department has reported that the milk ordinance in effect in that community is the Public Health Service milk ordinance without downward revisions, or changes in grade names, or significant changes in the form of the ordinance. Upward modifications do not bar from inclusion, but should be contemplated with extreme caution in order not to render the ordinance unenforceable. In the interest of national uniformity it is recommended that no changes be made in this ordinance when adopted locally unless upward revision is necessary to avoid conflict with the State laws. State health departments are requested to use the above rules in making reports to the Public Health Service.

PART I

SHORT ENABLING FORM OF UNITED STATES PUBLIC HEALTH SERVICE MILK ORDINANCE

(This short form is suggested for adoption by States, municipalities, counties, or health districts, subject to the approval of the local legal authority, to reduce cost of publishing and printing, and to promote keeping the milk ordinance up to date. In many States the adoption of this short form is considered legal.)

An ordinance to regulate the production, transportation, processing, handling, sampling, examination, grading, labeling, regrading, and sale of milk and milk products; the inspection of dairy herds, dairies, and milk plants; the issuing and revocation of permits to milk producers and distributors; the placarding of restaurants and other establishments serving milk or milk products; and the fixing of penalties.

The city of _____ ordains:

SECTION 1. The production, transportation, processing, handling, sampling, examination, grading, labeling, regrading, and sale of all milk and milk products sold for ultimate consumption within the city of _____, or its police jurisdiction, the inspection of dairy herds, dairies, and milk plants, the issuing and revocation of permits to milk producers and distributors, the placarding of restaurants and other establishments serving milk or milk products, and the fixing of penalties shall [1] be regulated in accordance with the terms of the unabridged form of the 1939 edition of the United States Public Health Service milk ordinance, a certified copy of which shall be on file in the office of the city clerk: *Provided*, That the blank spaces following the words "city of" in said unabridged form shall be understood to refer to the city of _____: *Provided further*, That in section 7, item 1r, of said unabridged form the abortion-testing requirement shall be effective within _____ years after the adoption of this ordinance: *Provided further*, That sections 8, 16, and 17 of said unabridged form shall be replaced, respectively, by sections 2, 3, and 4 below.

SEC. 2. From and after 12 months from the date on which this ordinance takes effect no milk or milk products shall be sold to the

[1] Communities in which the adoption of legislation by reference is not considered legal may delete the remainder of section 1 and substitute the following: "* * * conform with the regulations which the health officer (or board of health) of the city of _____ may adopt under authority hereby conferred." If the regulations then adopted conform to the 1939 edition of the U. S. Public Health Service milk ordinance, said city will be considered as having adopted the ordinance.

final consumer, or to restaurants, soda fountains, grocery stores, or similar establishments except [2] _____: *Provided*, That when any milk distributor fails to qualify for one of the above grades the health officer is authorized to revoke his permit,[3] or in lieu thereof to degrade his product and permit its sale during a temporary period not exceeding 30 days or in emergencies such longer period as he may deem necessary.

SEC. 3. Any person, firm, or corporation violating any provision of this ordinance shall upon conviction be punished by _____.

SEC. 4. All ordinances and parts of ordinances in conflict with this ordinance are hereby repealed; and this ordinance shall take effect _____ its adoption and publication.

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[1] The names of the grades to which sale is to be restricted will depend on local conditions and should be inserted when the ordinance is adopted. The community may prohibit the sale of all raw milk if it has reached the state of public health education which will permit a majority vote in favor of such action. See public health reason for pasteurization under item 16 p of the code, also the following publications, copies of which may be secured from the U. S. Public Health Service, Washington, D. C.: (1) What Every Person Should Know About Milk; (2) Do Children Who Drink Raw Milk Thrive Better Than Children Who Drink Pasteurized or Other Heated Milk; (3) The Responsibility of Health Authorities and Physicians With Reference to the Pasteurization of Milk in Communities in Which Pasteurization Is Not Compulsory.

[3] Communities which wish to restrict the health officer to the permit revocation method of punishing violations may delete the remainder of this sentence. However, this is not recommended, as both punishment devices are better than only one.

PART II

UNITED STATES PUBLIC HEALTH SERVICE MILK ORDINANCE

(This unabridged form of the ordinance should be adopted only where the short enabling form in part I is not considered legal.)

An ordinance defining "milk" and certain "milk products," "milk producer," "pasteurization," etc., prohibiting the sale of adulterated and misbranded milk and milk products, requiring permits for the sale of milk and milk products, regulating the inspection of dairy farms and milk plants, the examination, grading, labeling, placarding, pasteurization, regrading, distribution, and sale of milk and milk products, providing for the publishing of milk grades, the construction of future dairies and milk plants, the enforcement of this ordinance, and the fixing of penalties.

Be it ordained by the _____ of the city of _____ as follows:

SECTION 1. *Definitions.*—The following definitions shall apply in the interpretation and the enforcement of this ordinance:

A. *Milk.*—Milk is hereby defined to be the lacteal secretion obtained by the complete milking of one or more healthy cows, excluding that obtained within 15 days before and 5 days after calving, or such longer period as may be necessary to render the milk practically colostrum free; which contains not less than 8 percent of milk solids not fat, and not less than 3¼ percent of milk fat.

B. *Milk fat or butter fat.*—Milk fat or butter fat is the fat of milk.

C. *Cream and sour cream.*—Cream is a portion of milk which contains not less than 18 percent milk fat. Sour cream is cream the acidity of which is more than 0.20 percent, expressed as lactic acid.

D. *Skimmed milk.*—Skimmed milk is milk from which a sufficient portion of milk fat has been removed to reduce its milk-fat percentage to less than 3¼ percent.

E. *Milk or skimmed-milk beverage.*—A milk beverage or a skimmed-milk beverage is a food compound or confection consisting of milk or skimmed milk, as the case may be, to which has been added a sirup or flavor consisting of wholesome ingredients.

F. *Buttermilk.*—Buttermilk is a product resulting from the churning of milk or cream, or from the souring or treatment by a lactic acid or other culture of milk, skimmed milk, reconstituted skimmed milk,

evaporated or condensed milk or skimmed milk, or milk or skimmed-milk powder. It contains not less than 8 percent of milk solids not fat.

G. *Vitamin D milk.*—Vitamin D milk is milk the vitamin D content of which has been increased by a method and in an amount approved by the health officer.

H. *Reconstituted or recombined milk and cream.*—Reconstituted or recombined milk is a product resulting from the recombining of milk constituents with water, and which complies with the standards for milk fat and solids not fat of milk as defined herein. Reconstituted or recombined cream is a product resulting from the combination of dried cream, butter, or butter fat with cream, milk, skimmed milk, or water.

I. *Goat milk.*—Goat milk is the lacteal secretion, free from colostrum, obtained by the complete milking of healthy goats, and shall comply with all the requirements of this ordinance. The word "cows" shall be interpreted to include goats.

J. *Homogenized milk.*—Homogenized milk is milk which has been treated in such manner as to insure break-up of the fat globules to such an extent that after 48 hours storage no visible cream separation occurs on the milk and the fat percentage of the top 100 cc. of milk in a quart bottle, or of proportionate volumes in containers of other sizes, does not differ by more than 5 percent of itself from the fat percentage of the remaining milk as determined after thorough mixing.

K. *Milk products.*—Milk products shall be taken to mean and include cream, sour cream, homogenized milk, goat milk, vitamin D milk, buttermilk, skimmed milk, reconstituted or recombined milk and cream, milk beverages, skimmed-milk beverages, and any other product made by the addition of any substance to milk or any of these products and used for similar purposes and designated as a milk product by the health officer.

L. *Pasteurization.*—The terms "pasteurization," "pasteurized," and similar terms shall be taken to refer to the process of heating every particle of milk or milk products to at least 143° F., and holding at such temperature for at least 30 minutes, or to at least 160° F., and holding at such temperature for at least 15 seconds, in approved and properly operated equipment: *Provided,* That nothing contained in this definition shall be construed as disbarring any other process which has been demonstrated to be equally efficient and is approved by the State health authority.

M. *Adulterated milk and milk products.*—Any milk or milk product which contains any unwholesome substance, or which if defined in this ordinance does not conform with its definition, or which carries

a grade label unless such grade label has been awarded by the health officer and not revoked, shall be deemed adulterated and misbranded.

N. *Milk producer.*—A milk producer is any person who owns or controls one or more cows a part or all of the milk or milk products from which is sold or offered for sale.

O. *Milk distributor.*—A milk distributor is any person who offers for sale or sells to another any milk or milk products for human consumption as such.

P. *Dairy or dairy farm.*—A dairy or dairy farm is any place or premises where one or more cows are kept, a part or all of the milk or milk products from which is sold or offered for sale.

Q. *Milk plant.*—A milk plant is any place or premises or establishment where milk or milk products are collected, handled, processed, stored, bottled, pasteurized, or prepared for distribution.

R. *Health officer.*—The term "health officer" shall mean the health authority of the city of _____, or his authorized representative.

S. *Average bacterial plate count, direct microscopic count, reduction time, and cooling temperature.*—Average bacterial plate count and average direct microscopic count shall be taken to mean the logarithmic average, and average reduction time and average cooling temperature shall be taken to mean the arithmetic average, of the respective results of the last four consecutive samples, taken upon separate days, irrespective of the date of grading or regrading.

T. *Grading period.*—The grading period shall be such period of time as the health officer may designate within which grades shall be determined for all milk and milk products, provided that the grading period shall in no case exceed 6 months.

U. *Person.*—The word "person" as used in this ordinance shall mean "person, firm, corporation, or association."

V. *And/or.*—Where the term "and/or" is used "and" shall apply where possible, otherwise "or" shall apply.

SEC. 2. *The sale of adulterated, misbranded, or ungraded milk or milk products prohibited.*—No person shall within the city of _____, or its police jurisdiction, produce, sell, offer, or expose for sale, or have in possession with intent to sell, any milk or milk product which is adulterated, misbranded, or ungraded. It shall be unlawful for any person, elsewhere than in a private home, to have in possession any adulterated, misbranded, or ungraded milk or milk product.

SEC. 3. *Permits.*—It shall be unlawful for any person to bring into or receive into the city of _____, or its police jurisdiction, for sale, or to sell, or offer for sale therein, or to have in storage where milk or milk products are sold or served, any milk or milk product defined in this ordinance, who does not possess a permit from the health officer of the city of _____.

Only a person who complies with the requirements of this ordinance shall be entitled to receive and retain such a permit.

Such a permit may be suspended by the health officer, or revoked after an opportunity for a hearing by the health officer, upon the violation by the holder of any of the terms of this ordinance.

SEC. 4. *Labeling and placarding.*—All bottles, cans, packages, and other containers enclosing milk or any milk product defined in this ordinance shall be plainly labeled or marked with (1) the name of the contents as given in the definitions in this ordinance; (2) the grade of the contents; (3) the word "pasteurized" only if the contents have been pasteurized; (4) the word "raw" only if the contents are raw; (5) the phrase "for pasteurization" if the contents are to be pasteurized; (6) the name of the producer if the contents are raw, and the name of the plant at which the contents were pasteurized, if the contents are pasteurized; and (7) in the case of vitamin D milk, the designation "Vitamin D Milk" and the source of the vitamin D. The label or mark shall be in letters of a size, kind, and color approved by the health officer and shall contain no marks or words which are misleading.

Every restaurant, cafe, soda fountain, or other establishment serving milk or milk products shall display at all times, in a place designated by the health officer, a notice approved by the health officer, stating the lowest grade of milk and/or milk products served.[4]

SEC. 5. *Inspection of dairy farms and milk plants for the purpose of grading or regrading.*—At least once during each grading period the health officer shall inspect all dairy farms and all milk plants whose milk or milk products are intended for consumption within the city of _____, or its police jurisdiction. In case the health officer discovers the violation of any item of sanitation, he shall make a second inspection after a lapse of such time as he deems necessary for the defect to be remedied, but not before the lapse of 3 days; and the second inspection shall be used in determining the grade of milk and/or milk products. Any violation of the same item of this ordinance on two consecutive inspections shall call for immediate degrading.

One copy of the inspection report shall be posted by the health officer in a conspicuous place upon an inside wall of one of the dairy farm or milk plant buildings, and said inspection report shall not be defaced or removed by any person except the health officer. Another copy of the inspection report shall be filed with the records of the health department.

[4] Cities in which only grade A pasteurized milk or only certified milk and grade A pasteurized milk are permitted to be sold may delete this paragraph and nevertheless be recognized as having adopted this ordinance.

SEC. 6. *The examination of milk and milk products.*—During each grading period at least four samples of milk and cream from each dairy farm and each milk plant shall be taken on separate days and examined by the health officer. Samples of other milk products may be taken and examined by the health officer as often as he deems necessary. Samples of milk and milk products from stores, cafes, soda fountains, restaurants, and other places where milk or milk products are sold shall be examined as often as the health officer may require. Bacterial plate counts and direct microscopic counts shall be made in conformity with the latest standard methods recommended by the American Public Health Association.[5] Examinations may include such other chemical and physical determinations as the health officer may deem necessary for the detection of adulteration, these examinations to be made in accordance with the latest standard methods of the American Public Health Association and the Association of Official Agricultural Chemists.[5] Samples may be taken by the health officer at any time prior to the final delivery of the milk or milk products. All proprietors of stores, cafes, restaurants, soda fountains, and other similar places shall furnish the health officer, upon his request, with the names of all distributors from whom their milk and milk products are obtained. Bio-assays of the vitamin D content of vitamin D milk shall be made when required by the health officer in a laboratory approved by him for such examinations.

Whenever the average bacterial count, the average reduction-time, or the average cooling temperature falls beyond the limit for the grade then held, the health officer shall send written notice thereof to the person concerned, and shall take an additional sample, but not before the lapse of 3 days, for determining a new average in accordance with section 1 (S). Violation of the grade requirement by the new average or by any subsequent average during the remainder of the current grading period shall call for immediate degrading or suspension of the permit, unless the last individual result is within the grade limit.

SEC. 7. *The grading of milk and milk products.*—At least once every 6 months the health officer shall announce the grades of all milk and milk products delivered by all producers or distributors and ultimately consumed within the city of _____, or its police jurisdiction. Said grades shall be based upon the following

[5] Municipalities in which the adoption of legislation by reference is not considered legal may substitute the following wording: " * * * in conformity with the regulations of the health officer (or board of health)." If the regulations then adopted by the health officer are equivalent to those contained in the reference thus replaced, they will not be considered as constituting a downward revision of the U. S. Public Health Service milk ordinance.

All other references in this ordinance to standards and methods not specifically described may be treated in the same manner, such as the requirements of the American Association of Medical Milk Commissions under the definition of certified milk-raw, the requirements of the Bureau of Animal Industry relative to accredited herds and modified accredited areas in item 1r, and the U. S. Public Health Service milk code in section 15.

standards, the grading of milk products being identical with the grading of milk except that the bacterial standards shall be doubled in the case of cream, and omitted in the case of sour cream and buttermilk. Vitamin D milk shall be only of grade A or grade B pasteurized, certified, or grade A raw quality.

Certified milk-raw.—Certified milk-raw is raw milk which conforms with the requirements of the American Association of Medical Milk Commissions [6] in force at the time of production and is produced under the supervision of a medical milk commission and of the State board of health or of the city or county health officer of _____.

Grade A raw milk.—Grade A raw milk is raw milk the average bacterial plate count of which as determined under sections 1 (S) and 6 of this ordinance does not exceed 50,000 per cubic centimeter, or the average direct microscopic count of which does not exceed 50,000 per cubic centimeter if clumps are counted or 200,000 per cubic centimeter if individual organisms are counted, or the average reduction time of which is not less than 8 hours: *Provided*, That if it is to be pasteurized the corresponding limits shall be 200,000 per cubic centimeter, 200,000 per cubic centimeter, 800,000 per cubic centimeter, and 6 hours, respectively; and which is produced upon dairy farms conforming with all of the following items of sanitation.

ITEM 1r. *Cows, tuberculosis and other diseases.*—Except as provided hereinafter, a tuberculin test of all herds and additions thereto shall be made before any milk therefrom is sold, and at least once every 12 months thereafter, by a licensed veterinarian approved by the State livestock sanitary authority. Said tests shall be made and and reactors disposed of in accordance with the requirements approved by the United States Department of Agriculture, Bureau of Animal Industry,[6] for accredited herds. A certificate signed by the veterinarian or attested to by the health officer and filed with the health officer shall be evidence of the above test: *Provided*, That in modified accredited counties in which the modified accredited area plan is applied to the dairy herds the modified accredited area system approved by the United States Bureau of Animal Industry [6] shall be accepted in lieu of annual testing.

Within _____[7] years after the adoption of this ordinance all milk and milk products consumed raw shall be from herds or additions thereto which have been found free from Bang's disease, as shown by blood serum tests for agglutinins against *Brucella abortus* made in a laboratory approved by the health officer. All such herds shall be retested at least every 12 months and all reactors removed from the herd. A certificate identifying each animal by number, and signed by the laboratory making the test, shall be evidence of the above test.

[6] See footnote 5, p. 7.

[7] The number should be inserted when the ordinance is adopted. It should not exceed 5 years if the community wishes to be recognized as having adopted this ordinance.

Cows which show an extensive or entire induration of one or more quarters of the udder upon physical examination, whether secreting abnormal milk or not, shall be permanently excluded from the milking herd. Cows giving bloody, stringy, or otherwise abnormal milk, but with only slight induration of the udder, shall be excluded from the herd until re-examination shows that the milk has become normal.

For other diseases such tests and examinations as the health officer may require shall be made at intervals and by methods prescribed by him, and any diseased animals or reactors shall be disposed of as he may require.

ITEM 2r. *Dairy barn, lighting.*—A dairy or milking barn shall be required and in such sections thereof where cows are milked windows shall be provided and kept clean and so arranged as to insure adequate light properly distributed, and when necessary shall be provided with adequate supplementary artificial light.

ITEM 3r. *Dairy barn, air space and ventilation.*—Such sections of all dairy barns where cows are kept or milked shall be well ventilated and shall be so arranged as to avoid overcrowding.

ITEM 4r. *Dairy barn, floors.*—The floors and gutters of such parts of all dairy barns in which cows are milked shall be constructed of concrete or other approved impervious and easily cleaned material, provided that if the milk is to be pasteurized tight wood may be used, shall be graded to drain properly, and shall be kept clean and in good repair. No horses, pigs, fowl, calves, etc. shall be permitted in parts of the barn used for milking.

ITEM 5r. *Dairy barn, walls and ceilings.*—The walls and ceilings of all dairy barns shall be whitewashed once each year or painted once every 2 years, or oftener, if necessary, or finished in an approved manner, and shall be kept clean and in good repair. In case there is a second story above that part of the barn in which cows are milked, the ceiling shall be tight. If the feed room adjoins the milking space, it shall be separated therefrom by a dust-tight partition and door. No feed shall be stored in the milking portion of the barn.

ITEM 6r. *Dairy barn, cowyard.*—All cowyards shall be graded and drained as well as practicable and kept clean.

ITEM 7r. *Manure disposal.*—All manure shall be removed and stored or disposed of in such manner as best to prevent the breeding of flies therein or the access of cows to piles thereof.

ITEM 8r. *Milk house or room, construction.*—There shall be provided a milk house or milk room in which the cooling, handling, and storing of milk and milk products and the washing, bactericidal treatment, and storing of milk containers and utensils shall be done. (*a*) The milk house or room shall be provided with a tight floor constructed of concrete or other impervious material, in good repair, and graded

to provide proper drainage. (*b*) It shall have walls and ceilings of such construction as to permit easy cleaning, and shall be well painted or finished in an approved manner. (*c*) It shall be well lighted and ventilated. (*d*) It shall have all openings effectively screened including outward-opening, self-closing doors, unless other effective means are provided to prevent the entrance of flies. (*e*) It shall be used for no other purposes than those specified above except as may be approved by the health officer; shall not open directly into a stable or into any room used for domestic purposes; shall, unless the milk is to be pasteurized, have water piped into it; shall be provided with adequate facilities for the heating of water for the cleaning of utensils; shall be equipped with two-compartment stationary wash and rinse vats, except that in the case of retail raw milk, if chlorine is employed as the principal bactericidal treatment, the three-compartment type must be used; and shall, unless the milk is to be pasteurized, be partitioned to separate the handling of milk and the storage of cleansed utensils from the cleaning and other operations, which shall be so located and conducted as to prevent any contamination of the milk or of cleaned equipment.

ITEM 9r. *Milk house or room, cleanliness and flies.*—The floors, walls, ceilings, and equipment of the milk house or room shall be kept clean at all times. All means necessary for the elimination of flies shall be used.

ITEM 10r. *Toilet.*—Every dairy farm shall be provided with one or more sanitary toilets conveniently located and properly constructed, operated, and maintained, so that the waste is inaccessible to flies and does not pollute the surface soil or contaminate any water supply.

ITEM 11r. *Water supply.*—The water supply for the milk room and dairy barn shall be properly located, constructed, and operated, and shall be easily accessible, adequate, and of a safe sanitary quality.

ITEM 12r. *Utensils, construction.*—All multi-use containers or other utensils used in the handling, storage, or transportation of milk or milk products must be made of smooth nonabsorbent material and of such construction as to be easily cleaned, and must be in good repair. Joints and seams shall be soldered flush. Woven wire cloth shall not be used for straining milk. All milk pails shall be of a small-mouth design approved by the health officer. The manufacture, packing, transportation, and handling of single-service containers and container caps and covers shall be conducted in a sanitary manner.

ITEM 13r. *Utensils, cleaning.*—All multi-use containers, equipment, and other utensils used in the handling, storage, or transportation of milk and milk products must be thoroughly cleaned after each usage.

ITEM 14r. *Utensils, bactericidal treatment.*—All multi-use containers, equipment, and other utensils used in the handling, storage, or transportation of milk or milk products shall between each usage be sub-

jected to an approved bactericidal process with steam, hot water, chlorine, or hot air.

ITEM 15r. *Utensils, storage.*—All containers and other utensils used in the handling, storage, or transportation of milk or milk products shall be stored so as not to become contaminated before being used.

ITEM 16r. *Utensils, handling.*—After bactericidal treatment no container or other milk or milk product utensil shall be handled in such manner as to permit any part of any person or his clothing to come in contact with any surface with which milk or milk products come in contact.

ITEM 17r. *Milking, udders and teats, abnormal milk.*—The udders and teats of all milking cows shall be clean and rinsed with a bactericidal solution at the time of milking. Abnormal milk shall be kept out of the milk supply and shall be so handled and disposed of as to preclude the infection of the cows and the contamination of milk utensils.

ITEM 18r. *Milking, flanks.*—The flanks, bellies, and tails of all milking cows shall be free from visible dirt at the time of milking.

ITEM 19r. *Milkers' hands.*—Milkers' hands shall be clean, rinsed with a bactericidal solution, and dried with a clean towel immediately before milking and following any interruption in the milking operation. Wet-hand milking is prohibited. Convenient facilities shall be provided for the washing of milkers' hands.

ITEM 20r. *Clean clothing.*—Milkers and milk handlers shall wear clean outer garments while milking or handling milk, milk products, containers, utensils, or equipment.

ITEM 21r. *Milk stools.*—Milk stools shall be kept clean.

ITEM 22r. *Removal of milk.*—Each pail of milk shall be removed immediately to the milk house or straining room. No milk shall be strained or poured in the dairy barn.

ITEM 23r. *Cooling.*—Milk must be cooled immediately after completion of milking to 50° F. or less, and maintained at that average temperature, as defined in section 1 (S), until delivery. If milk is delivered to a milk plant or receiving station for pasteurization or separation, it must be delivered within 2 hours after completion of milking or cooled to 70° F. or less and maintained at that average temperature until delivered.

ITEM 24r. *Bottling and capping.*—Milk and milk products shall be bottled from a container with a readily cleanable valve, or by means of an approved bottling machine. Bottles shall be capped by machine. Caps or cap stock shall be purchased in sanitary containers and kept therein in a clean dry place until used.

ITEM 25r. *Personnel, health.*—The health officer or a physician authorized by him shall examine and take a careful morbidity history of every person connected with a retail raw dairy, or about to be

employed, whose work brings him in contact with the production, handling, storage, or transportation of milk, milk products, containers, or equipment. If such examination or history suggests that such person may be a carrier of or infected with the organisms of typhoid or paratyphoid fever or any other communicable diseases likely to be transmitted through milk, he shall secure appropriate specimens of body discharges and cause them to be examined in a laboratory approved by him or by the State health authorities for such examinations, and if the results justify such person shall be barred from such employment.

Such persons shall furnish such information, submit to such physical examinations, and submit such laboratory specimens as the health officer may require for the purpose of determining freedom from infection.

ITEM 26r. *Miscellaneous.*—All vehicles used for the transportation of milk or milk products shall be so constructed and operated as to protect their contents from the sun and from contamination. All vehicles used for the transportation of milk or milk products in their final delivery containers shall be constructed with permanent tops and with permanent or roll-down sides and back, provided that openings of the size necessary to pass the delivery man may be permitted in the sides or back for loading and unloading purposes. All vehicles shall be kept clean, and no substance capable of contaminating milk or milk products shall be transported with milk or milk products in such manner as to permit contamination. All vehicles used for the distribution of milk or milk products shall have the name of the distributor prominently displayed.

The immediate surroundings of the dairy shall be kept in a neat, clean condition.

Grade B raw milk.—Grade B raw milk is raw milk which violates the bacterial standard and/or the abortion testing requirement for grade A raw milk, but which conforms with all other requirements for grade A raw milk, and has an average bacterial plate count not exceeding 1,000,000 per cubic centimeter, or an average direct microscopic count not exceeding 1,000,000 per cubic centimeter if clumps are counted or 4,000,000 per cubic centimeter if individual organisms are counted, or an average reduction time of not less than 3½ hours, as determined under sections 1 (S) and 6.

Grade C raw milk.—Grade C raw milk is raw milk which violates any of the requirements for grade B raw milk.

Certified milk-pasteurized.—Certified milk-pasteurized is certified milk-raw which has been pasteurized, cooled, and bottled in a milk plant conforming with the requirements for grade A pasteurized milk.

Grade A pasteurized milk.—Grade A pasteurized milk is grade A raw milk, with such exceptions as are indicated if the milk is to be

pasteurized, which has been pasteurized, cooled, and bottled in a milk plant conforming with all of the following items of sanitation and the average bacterial plate count of which at no time after pasteurization and until delivery exceeds 30,000 per cubic centimeter, as determined under sections 1 (S) and 6.

The grading of a pasteurized milk supply shall include the inspection of receiving and collecting stations with respect to items 1p to 15p, inclusive, and 17p, 19p, 22p, and 23p, except that the partitioning requirement of item 5p shall not apply.

ITEM 1p. *Floors.*—The floors of all rooms in which milk or milk products are handled or stored or in which milk utensils are washed shall be constructed of concrete or other equally impervious and easily cleaned material and shall be smooth, properly drained, provided with trapped drains, and kept clean.

ITEM 2p. *Walls and ceilings.*—Walls and ceilings of rooms in which milk or milk products are handled or stored or in which milk utensils are washed shall have a smooth, washable, light-colored surface and shall be kept clean.

ITEM 3p. *Doors and windows.*—Unless other effective means are provided to prevent the access of flies, all openings into the outer air shall be effectively screened and doors shall be self-closing.

ITEM 4p. *Lighting and ventilation.*—All rooms shall be well lighted and ventilated.

ITEM 5p. *Miscellaneous protection from contamination.*—The various milk-plant operations shall be so located and conducted as to prevent any contamination of the milk or of the cleaned equipment. All means necessary for the elimination of flies shall be used. There shall be separate rooms for (*a*) the pasteurizing, processing, cooling, and bottling operations, and (*b*) the washing and bactericidal treatment of containers. Cans of raw milk shall not be unloaded directly into the pasteurizing room. Pasteurized milk or milk products shall not be permitted to come in contact with equipment with which unpasteurized milk or milk products have been in contact, unless such equipment has first been thoroughly cleaned and subjected to bactericidal treatment. Rooms in which milk, milk products, cleaned utensils, or containers are handled or stored shall not open directly into any stable or living quarters. The pasteurization plant shall be used for no other purposes than the processing of milk and milk products and the operations incident thereto, except as may be approved by the health officer.

ITEM 6p. *Toilet facilities.*—Every milk plant shall be provided with toilet facilities conforming with the ordinances of the city of _____. Toilet rooms shall not open directly into any room in which milk, milk products, equipment, or containers are handled or stored. The doors of all toilet rooms shall be self-closing.

Toilet rooms shall be kept in a clean condition, in good repair, and well ventilated. In case privies or earth closets are permitted and used, they shall be separate from the building, and shall be of a sanitary type constructed and operated in conformity with the requirements of item 10r, grade A raw milk.

ITEM 7p. *Water supply.*—The water supply shall be easily accessible, adequate, and of a safe, sanitary quality.

ITEM 8p. *Hand-washing facilities.*—Convenient hand-washing facilities shall be provided, including warm running water, soap, and approved sanitary towels. The use of a common towel is prohibited.

ITEM 9p. *Sanitary piping.*—All piping used to conduct milk or milk products shall be "sanitary milk piping" of a type which can be easily cleaned with a brush. Pasteurized milk and milk products shall be conducted from one piece of equipment to another only through sanitary milk piping.

ITEM 10p. *Construction and repair of containers and equipment.*—All multi-use containers and equipment with which milk or milk products come in contact shall be constructed in such manner as to be easily cleaned and shall be kept in good repair. The manufacture, packing, transportation, and handling of single-service containers and container caps and covers shall be conducted in a sanitary manner.

ITEM 11p. *Disposal of wastes.*—All wastes shall be properly disposed of.

ITEM 12p. *Cleaning and bactericidal treatment of containers and equipment.*—All milk and milk products containers and equipment, except single-service containers, shall be thoroughly cleaned after each usage. All containers shall be subjected to an approved bactericidal process after each cleaning and all equipment immediately before each usage. When empty and before being returned to a producer by a milk plant each container shall be effectively cleaned and subjected to bactericidal treatment.

ITEM 13p. *Storage of containers and equipment.*—After bactericidal treatment all bottles, cans, and other multi-use milk or milk-products containers and equipment shall be stored in such manner as to be protected from contamination.

ITEM 14p. *Handling of containers and equipment.*—Between bactericidal treatment and usage, and during usage, containers and equipment shall not be handled or operated in such manner as to permit contamination of the milk.

ITEM 15p. *Storage of caps, parchment paper, and single-service containers.*—Milk-bottle caps or cap stock, parchment paper for milk cans, and single-service containers shall be purchased and stored only in sanitary tubes and cartons, respectively, and shall be kept therein in a clean dry place.

ITEM 16p. *Pasteurization.*—Pasteurization shall be performed as described in section 1 (L) of this ordinance.

ITEM 17p. *Cooling.*—All milk and milk products received for pasteurization shall immediately be cooled in approved equipment to 50° F. or less and maintained at that temperature until pasteurized, unless they are to be pasteurized within 2 hours after receipt; and all pasteurized milk and milk products shall be immediately cooled in approved equipment to an average temperature of 50° F. or less, as defined in section 1 (S), and maintained thereat until delivery.

ITEM 18p. *Bottling.*—Bottling of milk and milk products shall be done at the place of pasteurization in approved mechanical equipment.

ITEM 19p. *Overflow milk.*—Overflow milk or milk products shall not be sold for human consumption.

ITEM 20p. *Capping.*—Capping of milk and milk products shall be done by approved mechanical equipment. Hand capping is prohibited. The cap or cover shall cover the pouring lip to at least its largest diameter.

ITEM 21p. *Personnel, health.*—The health officer or a physician authorized by him shall examine and take a careful morbidity history of every person connected with a pasteurization plant, or about to be employed, whose work brings him in contact with the production, handling, storage, or transportation of milk, milk products, containers, or equipment. If such examination or history suggests that such person may be a carrier of or infected with the organisms of typhoid or paratyphoid fever or any other communicable diseases likely to be transmitted through milk, he shall secure appropriate specimens of body discharges and cause them to be examined in a laboratory approved by him or by the State health authorities for such examinations, and if the results justify such person shall be barred from such employment.

Such persons shall furnish such information, submit to such physical examinations, and submit such laboratory specimens as the health officer may require for the purpose of determining freedom from infection.

ITEM 22p. *Personnel, cleanliness.*—All persons coming in contact with milk, milk products, containers, or equipment shall wear clean outer garments and shall keep their hands clean at all times while thus engaged.

ITEM 23p. *Miscellaneous.*—All vehicles used for the transportation of milk or milk products shall be so constructed and operated as to protect their contents from the sun and from contamination. All vehicles used for the transportation of milk or milk products in their final delivery containers shall be constructed with permanent tops and with permanent or roll-down sides and back, provided that openings of the size necessary to pass the delivery man may be permitted in

the sides or back for loading and unloading purposes. All vehicles shall be kept clean, and no substance capable of contaminating milk or milk products shall be transported with milk or milk products in such manner as to permit contamination. All vehicles used for the distribution of milk or milk products shall have the name of the distributor prominently displayed.

The immediate surroundings of the milk plant shall be kept in a neat, clean condition.

Grade B pasteurized milk.—Grade B pasteurized milk is pasteurized milk which violates the bacterial standard for grade A pasteurized milk and/or the provision of lip-cover caps of item 20p and/or the requirement that grade A raw milk be used, but which conforms with all other requirements for grade A pasteurized milk, has been made from raw milk of not less than grade B quality, and has an average bacterial plate count after pasteurization and before delivery not exceeding 50,000 per cubic centimeter, as determined under sections 1 (S) and 6.

Grade C pasteurized milk.—Grade C pasteurized milk is pasteurized milk which violates any of the requirements for grade B pasteurized milk.

SEC. 8. *Grades of milk and milk products which may be sold.*—From and after 12 months from the date on which this ordinance takes effect no milk or milk products shall be sold to the final consumer or to restaurants, soda fountains, grocery stores, or similar establishments except [8]_____: *Provided*, That when any milk distributor fails to qualify for one of the above grades the health officer is authorized to revoke his permit,[9] or in lieu thereof to degrade his product and permit its sale during a temporary period not exceeding 30 days or in emergencies such longer period as he may deem necessary.

SEC. 9. *Supplementary grading prescribed and regrading authorized.*—If, at any time between the regular announcements of the grades of milk or milk products, a lower grade shall become justified, in accordance with sections 5, 6, and 7 of this ordinance, the health officer shall immediately lower the grade of such milk or milk products, and shall enforce proper labeling and placarding thereof.

Any producer or distributor of milk or milk products the grade of which has been lowered by the health officer, and who is properly labeling his milk and milk products, may at any time make application for the regrading of his product.

Upon receipt of a satisfactory application, in case the lowered grade is the result of an excessive average bacterial plate count, direct microscopic count, reduction time, or cooling temperature, the

[8] See footnote 2, p. 2.
[9] See footnote 3, p. 2.

health officer shall take further samples of the applicant's output, at a rate of not more than two samples per week. The health officer shall regrade the milk or milk products upward whenever the average of the last four sample results indicates the necessary quality, but not before the lapse of 2 weeks from the date of degrading.

In case the lowered grade of the applicant's product is due to a violation of an item of the specifications prescribed in section 7, other than average bacterial plate count, direct microscopic count, reduction time, or cooling temperature, the said application must be accompanied by a statement signed by the applicant to the effect that the violated item of the specifications has been conformed with. Within 1 week of the receipt of such an application and statement the health officer shall make a reinspection of the applicant's establishment, and thereafter as many additional reinspections as he may deem necessary to assure himself that the applicant is again complying with the higher grade requirements, and, in case the findings justify, shall regrade the milk or milk products upward, but not before the lapse of 2 weeks from the date of degrading.

SEC. 10. *Transferring or dipping milk; delivery containers; handling of more than one grade; delivery of milk at quarantined residences.*— Except as permitted in this section, no milk producer or distributor shall transfer milk or milk products from one container to another on the street, or in any vehicle or store, or in any place except a bottling or milk room especially used for that purpose. The sale of dip milk is hereby prohibited.

All pasteurized milk and milk products shall be placed in their final delivery containers in the plant in which they are pasteurized, and all raw milk and milk products sold for consumption in the raw state shall be placed in their final delivery containers at the farm at which they are produced. Milk and milk products sold in the distributor's containers in quantities less than 1 gallon shall be delivered in standard milk bottles or in single-service containers. It shall be unlawful for hotels, soda fountains, restaurants, groceries, and similar establishments to sell or serve any milk or milk product except in the original container in which it was received from the distributor or from a bulk container equipped with an approved dispensing device: *Provided*, That this requirement shall not apply to cream consumed on the premises, which may be served from the original bottle or from a dispenser approved for such service.

It shall be unlawful for any hotel, soda fountain, restaurant, grocery, or similar establishment to sell or serve any milk or milk products which have not been maintained, while in its possession, at a temperature of 50° F. or less.

No milk or milk products shall be permitted to come in contact with equipment with which a lower grade of milk or milk products

has been in contact unless such equipment has first been thoroughly cleaned and subjected to bactericidal treatment.

Bottled milk or milk products, if stored in water, shall be so stored that the tops of the bottles will not be submerged.

It shall be the duty of all persons to whom milk or milk products are delivered to clean thoroughly the containers in which such milk or milk products are delivered before returning such containers. Apparatus, containers, equipment, and utensils used in the handling, storage, processing, or transporting of milk or milk products shall not be used for any other purpose without the permission of the health officer.

The delivery of milk or milk products to and the collection of milk or milk-products containers from residences in which cases of communicable disease transmissible through milk supplies exist shall be subject to the special requirements of the health officer.

SEC. 11. *Milk and milk products from points beyond the limits of routine inspection.*—Milk and milk products from points beyond the limits of routine inspection of the city of _____ may not be sold in the city of _____, or its police jurisdiction, unless produced and/or pasteurized under provisions equivalent to the requirements of this ordinance: *Provided*, That the health officer shall satisfy himself that the health officer having jurisdiction over the production and processing is properly enforcing such provisions.

SEC. 12. *Future dairies and milk plants.*—All dairies and milk plants from which milk or milk products are supplied to the city of _____ which are hereafter constructed, reconstructed, or extensively altered shall conform in their construction to the requirements of this ordinance for grade A dairy farms producing milk for consumption in the raw state, or for grade A pasteurization plants, respectively: *Provided*, That the requirement of a two-room milk house shall be waived in the case of dairies the milk from which is to be pasteurized. Properly prepared plans for all dairies and milk plants which are hereafter constructed, reconstructed, or extensively altered shall be submitted to the health officer for approval before work is begun. In the case of milk plants signed approval shall be obtained from the health officer and/or the State health department.

SEC. 13. *Notification of disease.*—Notice shall be sent to the health officer immediately by any producer or distributor of milk or milk products upon whose dairy farm or in whose milk plant any infectious, contagious, or communicable disease occurs.

SEC. 14. *Procedure when infection suspected.*—When suspicion arises as to the possibility of transmission of infection from any person concerned with the handling of milk or milk products, the health

officer is authorized to require any or all of the following measures: (1) The immediate exclusion of that person from milk handling, (2) the immediate exclusion of the milk supply concerned from distribution and use, (3) adequate medical and bacteriological examination of the person, of his associates, and of his and their body discharges.

SEC. 15. *Enforcement interpretation.*—This ordinance shall be enforced by the health officer in accordance with the interpretations thereof contained in the 1939 edition of the United States Public Health Service Milk Code, a certified copy of which shall be on file in the city clerk's office.[10]

SEC. 16. *Penalty.*—Any person who shall violate any provision of this ordinance shall be fined not more than _____ at the discretion of the court. Each and every violation of the provisions of this ordinance shall constitute a separate offense.

SEC. 17. *Repeal and date of effect.*—All ordinances and parts of ordinances in conflict with this ordinance are hereby repealed; and this ordinance shall be in full force and effect immediately upon its adoption and its publication, as provided by law.

SEC. 18. *Unconstitutionality clause.*—Should any section, paragraph, sentence, clause, or phrase of this ordinance be declared unconstitutional or invalid for any reason, the remainder of said ordinance shall not be affected thereby.

[10] See footnote 5, p. 7.

PART III

UNITED STATES PUBLIC HEALTH SERVICE MILK CODE

(To be used as the legal interpretation of the ordinance.)

An ordinance defining "milk" and certain "milk products," "milk producer," "pasteurization," etc., prohibiting the sale of adulterated and misbranded milk and milk products, requiring permits for the sale of milk and milk products, regulating the inspection of dairy farms and milk plants, the examination, grading, labeling, placarding, pasteurization, regrading, distribution, and sale of milk and milk products, providing for the publishing of milk grades, the construction of future dairies and milk plants, the enforcement of this ordinance, and the fixing of penalties.

Be it ordained by the ---------- *of the city of* ---------- *as follows:*

SECTION 1. DEFINITIONS

The following definitions shall apply in the interpretation and the enforcement of this ordinance:

A. *Milk.—Milk is hereby defined to be the lacteal secretion obtained by the complete milking of one or more healthy cows, excluding that obtained within 15 days before and 5 days after calving, or such longer period as may be necessary to render the milk practically colostrum free; which contains not less than 8 percent of milk solids not fat, and not less than 3¼ percent of milk fat.*

Public-health reason.—The food value of milk depends upon its milk-fat and its solids-not-fat content (which in turn determine the content of proteins, carbohydrates, minerals, and certain vitamins). If either of these is reduced below the range for normal market milk the food value is unnecessarily reduced. Practical experience shows that 3¼ percent milk fat and 8 percent solids not fat are reasonable minima for mixed-herd milk. Colostrum tends to produce intestinal disturbance in children, and milk is apt to contain colostrum if obtained within 15 days before or 5 days after calving.

Satisfactory compliance.—This definition shall be deemed to have been satisfied:

(1) When the inspector notes no evidence that cows are milked within 15 days before or 5 days after calving, and when no colostrum can be detected in the milk.

(2) When the milk-fat content, as determined by the Babcock, Mojonnier, or other recognized test, is 3¼ percent or more.

(3) When the milk solid-not-fat content is 8 percent or more, as determined from the milk-fat precentage and the specific gravity, or by other approved methods, provided that failure to satisfy this requirement shall be regarded as merely presumptive evidence of watering and that this evidence shall be confirmed by cryoscope, refractometer, or other approved test for added water.

B. *Milk fat or butterfat.—Milk fat or butterfat is the fat of milk.*

C. *Cream and sour cream.—Cream is a portion of milk which contains not less than 18 percent milk fat. Sour cream is cream the acidity of which is more than 0.20 percent, expressed as lactic acid.*

D. *Skimmed milk.—Skimmed milk is milk from which a sufficient portion of milk fat has been removed to reduce its milk-fat percentage to less than 3¼ percent.*

E. *Milk or skimmed-milk beverage.—A milk beverage or a skimmed-milk beverage is a food compound or confection consisting of milk or skimmed milk, as the case may be, to which has been added a sirup or flavor consisting of wholesome ingredients.*

F. *Buttermilk.—Buttermilk is a product resulting from the churning of milk or cream, or from the souring or treatment by a lactic acid or other culture of milk, skimmed milk, reconstituted skimmed milk, evaporated or condensed milk or skimmed milk, or milk or skimmed-milk powder. It contains not less than 8 percent of milk solids not fat.*

G. *Vitamin D milk.—Vitamin D milk is milk the vitamin D content of which has been increased by a method and in an amount approved by the health officer.*

H. *Reconstituted or recombined milk and cream.—Reconstituted or recombined milk is a product resulting from the recombining of milk constituents with water, and which complies with the standards for milk fat and solids not fat of milk as defined herein. Reconstituted or recombined cream is a product resulting from the combination of dried cream, butter, or butterfat with cream, milk, skimmed milk, or water.*

I. *Goat milk.—Goat milk is the lacteal secretion, free from colostrum, obtained by the complete milking of healthy goats, and shall comply with all the requirements of this ordinance. The word "cows" shall be interpreted to include goats.*

J. *Homogenized milk.—Homogenized milk is milk which has been treated in such manner as to insure break-up of the fat globules to such an extent that after 48 hours storage no visible cream separation occurs on the milk and the fat percentage of the top 100 cc. of milk in a quart bottle, or of proportionate volumes in containers of other sizes, does not differ by more than 5 percent of itself from the fat percentage of the remaining milk as determined after thorough mixing.*

The above definitions require no explanation.

K. *Milk products.—Milk products shall be taken to mean and include cream, sour cream, homogenized milk, goat milk, vitamin D milk,*

buttermilk, skimmed milk, reconstituted or recombined milk and cream, milk beverages, skimmed-milk beverages, and any other product made by the addition of any substance to milk or any of these products and used for similar purposes and designated as a milk product by the health officer.

The last part of this definition will permit the sanitary control of such products as whipped cream, modified milk, and soft-curd milk made by the base-exchange method, which are not defined in this ordinance, but which the health officer considers to be within the province of a milk ordinance, and which are sold locally in sufficient quantities to warrant the time and effort required to control them. This definition is not intended to include such products as milk powder, evaporated milk, and butter, except when combined with other substances to produce buttermilk, reconstituted milk, or reconstituted cream. Ice cream and other frozen desserts should not be designated as milk products under this ordinance, but should preferably be controlled under a separate frozen desserts ordinance.

L. *Pasteurization.—The terms "pasteurization," "pasteurized," and similar terms shall be taken to refer to the process of heating every particle of milk or milk products to at least 143° F., and holding at such temperature for at least 30 minutes, or to at least 160° F., and holding at such temperature for at least 15 seconds, in approved and properly operated equipment: Provided, That nothing contained in this definition shall be construed as disbarring any other process which has been demonstrated to be equally efficient and is approved by the State health authority.*

For the discussion of the enforcement of this definition, see item 16p, grade A pasteurized milk, of this code.

M. *Adulterated milk and milk products.—Any milk or milk product which contains any unwholesome substance, or which if defined in this ordinance does not conform with its definition, or which carries a grade label unless such grade label has been awarded by the health officer and not revoked, shall be deemed adulterated and misbranded.*

The intent of this definition with reference to adulteration is obvious. Any milk or milk product shall be deemed to have been misbranded if it is not labeled in accordance with the requirements of section 4 of this ordinance.

N. *Milk producer.—A milk producer is any person who owns or controls one or more cows, a part or all of the milk or milk products from which is sold or offered for sale.*

O. *Milk distributor.—A milk distributor is any person who offers for sale or sells to another any milk or milk products for human consumption as such.*

P. *Dairy or dairy farm.—A dairy or dairy farm is any place or premises where one or more cows are kept, a part or all of the milk or milk products from which is sold or offered for sale.*

Q. *Milk plant.—A milk plant is any place or premises or establishment where milk or milk products are collected, handled, processed, stored, bottled, pasteurized, or prepared for distribution.*

R. *Health officer.—The term "health officer" shall mean the health authority of the city of _____, or his authorized representative.*

These definitions require no explanation.

S. *Average bacterial plate count, direct microscopic count, reduction time, and cooling temperature.—Average bacterial plate count and average direct microscopic count shall be taken to mean the logarithmic average, and average reduction time and average cooling temperature shall be taken to mean the arithmetic average, of the respective results of the last four consecutive samples, taken upon separate days, irrespective of the date of grading or regrading.*

For a discussion of bacterial plate count, direct microscopic count, and reduction time see section 6 of this code. For a discussion of cooling temperature see section 7, items 23r and 17p.

T. *Grading period.—The grading period shall be such period of time as the health officer may designate within which grades shall be determined for all milk and milk products, provided that the grading period shall in no case exceed 6 months.*

Wide experience in the operation of this ordinance has indicated that it is undesirable to make the grading period shorter than 3 months. This is because most towns find it difficult to make inspections and analyses often enough to permit a shorter grading period.

On the other hand, the ordinance does not permit grading periods longer than 6 months. Experience has indicated that grading periods longer than 6 months result in inadequate supervision of the supply.

A grading period of 6 months does not imply an excessive enforcement cost. As a matter of fact, many of the cities enforcing this ordinance are grading every 3 months without prohibitive expense.[11]

Finally, it is imperative that the grading periods be of equal length. If grades are not announced with rigid regularity procrastination is apt to set in and milk supervision become lax. A poor impression is made upon both dairyman and consumer when the milk grades are not regularly announced.

U. *Person.—The word "person" as used in this ordinance shall mean "person, firm, corporation, or association."*

V. *And/or.—Where the term "and/or" is used "and" shall apply where possible, otherwise "or" shall apply.*

[11] For figures on the cost of milk control see:

(1) Fuchs, A. W., and Frank, L. C., Cost of local enforcement of the U. S. Public Health Service Milk Ordinance. Public Health Reports 1935, *50;* 1762. Reprint No. 1723.

(2) Fuchs, A. W., and Frank, L. C., Milk supplies and their control in American urban communities of over 1,000 population in 1936. Public Health Bulletin No. 245.

SECTION 2. THE SALE OF ADULTERATED, MISBRANDED, OR UNGRADED MILK OR MILK PRODUCTS PROHIBITED

No person shall within the city of _____, or its police jurisdiction, produce, sell, offer, or expose for sale, or have in possession with intent to sell, any milk or milk product which is adulterated, misbranded, or ungraded. It shall be unlawful for any person, elsewhere than in a private home, to have in possession any adulterated, misbranded, or ungraded milk or milk product.

This section of the ordinance may be used in preferring charges against persons who adulterate their milk or label their milk or milk products with any grade designation not awarded by the health officer under the terms of this ordinance, or who sell or deliver ungraded milk products except as may be permitted under section 11 of this ordinance.

This section shall not be interpreted as prohibiting the use of ungraded milk for the manufacture of milk products other than those included in section 1, definition K.

SECTION 3. PERMITS

It shall be unlawful for any person to bring into or receive into the city of _____, or its police jurisdiction, for sale, or to sell, or offer for sale therein, or to have in storage where milk or milk products are sold or served, any milk or milk product defined in this ordinance, who does not possess a permit from the health officer of the city of _____.

Only a person who complies with the requirements of this ordinance shall be entitled to receive and retain such a permit.

Such a permit may be suspended by the health officer, or revoked after an opportunity for a hearing by the health officer, upon the violation by the holder of any of the terms of this ordinance.

It is not the intent of this section to require annual permits. The section is of value primarily as a registration device. It permits the health officer to prosecute any persons who begin distributing milk without notifying him, and thus without being graded. The periodic grading principle of the ordinance makes it unnecessary that the permit be renewed annually, inasmuch as the periodic announcement of grades is equivalent to the periodic granting of permits.

SECTION 4. LABELING AND PLACARDING

All bottles, cans, packages, and other containers enclosing milk or any milk product defined in this ordinance shall be plainly labeled or marked with (1) the name of the contents as given in the definitions in this ordinance; (2) the grade of the contents; (3) the word "pasteurized" only if

the contents have been pasteurized; (4) the word "raw" only if the contents are raw; (5) the phrase "for pasteurization" if the contents are to be pasteurized; (6) the name of the producer if the contents are raw, and the name of the plant at which the contents were pasteurized, if the contents are pasteurized; and (7) in the case of vitamin D milk, the designation "Vitamin D Milk" and the source of the vitamin D. The label or mark shall be in letters of a size, kind, and color approved by the health officer and shall contain no marks or words which are misleading.

Every restaurant, cafe, soda fountain, or other establishment serving milk or milk products shall display at all times, in a place designated by the health officer, a notice approved by the health officer, stating the lowest grade of milk and/or milk products served.[12]

The outstanding principle of this ordinance is that, while particularly advanced cities may require all milk to be of the highest grade, other cities, in which milk control has not reached such an advanced status or which prefer the grading and degrading method of elevating and sustaining milk quality, may under the same ordinance permit lower grades to be sold, provided every bottle is labeled according to the grade, and provided all restaurants, soda fountains, etc., are placarded according to the grades of milk served. This is in order that consumers in such towns as do not require all milk to be of the highest grade may be at all times aware of the grade of milk purchased and thus be encouraged to buy on grade, thereby promoting the production of the higher grades and gradually eliminating the lower grades from the market. When supplies are reduced in grade the health officer shall require a different and contrasting color of bottle cap lettering from that previously used, or if a metal cap is used the embossing or printing shall have a different color background.

For such cities, and they are the vast majority, the labeling and placarding sections of this ordinance assume particular importance, and should be rigidly enforced.

Enforcement of labeling.—In order to obviate the claim on the part of the distributors, when degraded, that lower grade caps are not available, arrangement should be made, if possible, with a local dairy supply or hardware firm to carry lower grade caps constantly in stock. If this arrangement cannot be made the local health department should stock the lower grade caps in sufficient quantities to meet emergencies. A sufficient number of caps for this purpose, 10,000 or 20,000 of each grade, can usually be purchased for not more than $50. The distributors must pay for the caps, which during a temporary period of degrading need not carry the name of the distributor.

If the health department keeps caps on hand for this purpose, they should be stored under the same sanitary conditions as would be expected of the dairy or dairy supply house.

[12] See footnote 4, p. 6.

It is imperative that the health officer rigidly enforce the proper labeling of bottle caps immediately after the award of grades, excepting immediately after the first grading announcement, when a short period of time may advisably be allowed for the purchase of the proper caps. The health officer should prefer a case against any dairyman or milk plant failing to carry the properly labeled bottle cap within 48 hours after receipt of notification from the health officer as to lowering of grade.

The health officer shall not permit the use upon the label of any misleading marks or words, such as the term "natural milk" and similar terms which may cause the milk consumer to believe that raw milk is more natural than pasteurized milk.

This requirement is made because, as stated by the Committee on Milk of the 1932 Conference of State and Provincial Health Authorities, "the only true natural milk for human babies is human milk. Nature intended cows' milk for calves, and cows' milk is used for babies only as the next best thing to human milk. Raw milk which has been cooled is not more natural than raw milk which has been heated or pasteurized. Both cooling and heating retard the growth of certain kinds of bacteria. Heating, however, also devitalizes all disease bacteria which can be conveyed through milk supplies. This is not true of cooling. Therefore, while cooling is an important public health measure, heating is an even more important one. For these reasons the committee considers dangerous to the public health any movement or policy the result of which would be to mislead the milk consumer into thinking that grade A raw milk is more natural and therefore better for babies than grade A pasteurized milk. Public health authorities should, therefore, not permit the use of the word 'natural' on the labeling of either raw or pasteurized milk or cream."

FIGURE 1.—Suggested form of grade placard. Reccommended size not less than 8 inches by 10 inches (Stickers with lower grade letters can be pasted on as required. The blank line is for the name of the health department.)

Enforcement of placarding.—It is not necessary that the local health officer carry in stock any other than grade A raw and grade A pasteurized placards. When lower grade placards are required the simplest course is to paste the lower grade letters over the letter A on the stock placard.

Immediately following the announcement of grades, the inspector should see to it that the grade letters are changed in every restaurant, soda fountain, etc., in which a change is required.

Placards should preferably be enclosed in a glazed frame. This can be easily brought about by the health officer if he will purchase a stock of inexpensive frames and carry them with him in distributing placards. Practically all establishments will willingly pay 25 to 50 cents in order to secure the more favorable impression upon customers which will be afforded by an attractive placard properly framed. Distributors may be interested in providing these frames for their customers. The inspector should himself select a conspicuous location for the placard. Es-

tablishments using menu cards may, in lieu of a grade placard, display on their menu card a statement approved by the health officer, giving the lowest grade of milk served, and stating whether the milk is raw or pasteurized.

SECTION 5. INSPECTION OF DAIRY FARMS AND MILK PLANTS FOR THE PURPOSE OF GRADING OR REGRADING

At least once during each grading period the health officer shall inspect all dairy farms and all milk plants whose milk or milk products are intended for consumption within the city of _____, or its police jurisdiction. In case the health officer discovers the violation of any item of sanitation, he shall make a second inspection after a lapse of such time as he deems necessary for the defect to be remedied, but not before the lapse of 3 days; and the second inspection shall be used in determining the grade of milk and/or milk products. Any violation of the same item of this ordinance on two consecutive inspections shall call for immediate degrading.

One copy of the inspection report shall be posted by the health officer in a conspicuous place upon an inside wall of one of the dairy farm or milk plant buildings, and said inspection report shall not be defaced or removed by any person except the health officer. Another copy of the inspection report shall be filed with the records of the health department.

The first sentence of this section should not be taken to imply that one inspection per grading period is a desirable frequency. It should instead be regarded as the legal minimum. In actual practice it is desirable to inspect every dairy farm at least two or three times during each grading period and every milk plant at least every month. As often as possible inspection of farms should be made during milking time, and of plants while pasteurization or processing is in progress.

Special attention is directed to the last sentence of the first paragraph, which requires that a dairy or milk plant shall be immediately degraded if two successive inspections in either the same or different grading periods disclose violation of the same requirement.

Experience has demonstrated conclusively that a strict enforcement of the ordinance with regard to routine grading and degrading leads to a far better and more friendly relationsnip between the health officer and the dairy industry than does a policy of enforcement which seeks to excuse violations and defer punishment therefor. The inspector's criterion of satisfactory compliance should be neither too lenient on the one hand nor unreasonably stringent on the other.

The health officer should not fail to post one copy of the inspection report at the dairy or milk plant. The milk-house wall of the dairy farm and a wall of the plant office are suggested as effective locations. If the inspection is made in the absence of the owner and manager the inspection report should be posted nevertheless, but in addition a written notification should be mailed to the owner or manager.

Form 8976-A
U. S. TREASURY DEPARTMENT
PUBLIC HEALTH SERVICE
Rev. March 1939

MILK PRODUCER-DISTRIBUTOR INSPECTION FORM

GALLONS SOLD DAILY IN COMMUNITY

Whole milk _____
Buttermilk _____
Cream _____
TOTAL _____

_____
(City, county, or district)

NAME _____ LOCATION _____

SIR: An inspection of your dairy has this day been made and you are notified of the defects marked below with a cross (X). Violation of the same item on two successive inspections calls for immediate degrading.

Item No.[1]

COWS

(1) *Tuberculosis and other diseases.*—Tuberculin test annually except in modified accredited counties ( ), annual abortion test effective _____, 19___ ([2]), certificates of both tests on file ( ), other tests as required ( ), no cows with extensive induration of udder ( ), no cows giving abnormal milk ( ) _____ ( )

DAIRY BARN

(2) *Lighting, milking barn.*—Adequate light openings ( ), adequate artificial light for night milking ( ) _____ ( )

(3) *Air space and ventilation.*—Well ventilated ( ), no overcrowding ( ) _____ ( )

(4*a*) *Floor construction, milking barn.*—Floors and gutters, concrete or other impervious and easily cleaned material in good repair ( ), graded ( ) _____ ( )

(4*b*) *Floor cleanliness, milking barn.*—No accumulations beyond one milking ( ), no horses, pigs, fowl, calves, etc. ( ) _____ ( )

(5) *Walls and ceilings.*—Painted biennially or white-washed annually or other satisfactory finish ( ), clean and in good repair ( ), ceiling tight if feedstuffs over ( ), feed-room partition dusttight with door ( ) _____ ( )

(6*a*) *Cowyard, grading and draining.*—Graded ( ), drained ( ), no pooled wastes ( ) _____ ( )

(6*b*) *Cowyard, cleanliness.*—Clean ( ), no swine ( ) _____ ( )

(7) *Manure disposal.*—Stored inaccessible to cows and, during fly season: (*a*) Spread upon fields, or (*b*) piled not more than 4 days and then spread, or (*c*) stored not more than 7 days in impervious bin or curbed platform and then spread, or (*d*) stored in tight, screened, and trapped manure shed, or (*e*) fly breeding minimized by other approved methods _____ ( )

MILK HOUSE

(8*a*) *Floors.*—Smooth concrete or other impervious material ( ), graded to drain ( ) _____ ( )

(8*b*) *Walls and ceilings.*—Smooth dressed lumber, sheet metal, or plasterboard, well painted with washable paint; hollow tile, cement blocks, bricks, concrete, or cement plaster, surfaces and joints smooth _____ ( )

(8*c*) *Lighting and ventilation.*—Effective window area at least 10 percent of floor area ( ), adequate artificial lighting (see Code) ( ), adequate ventilation ( ), doors and windows closed during dusty weather ( ) _____ ( )

(8*d*) *Screening.*—All openings effectively screened and doors open outward and self-closing, unless flies otherwise kept out _____ ( )

(8*e*) *Miscellaneous requirements.*—Used for milk purposes only, except by permission ( ), milk house operations not conducted elsewhere ( ), no opening into living quarters or stable ( ), piped water ( ), wastes properly disposed of ( ), processes partitioned ( ), 2-compartment stationary wash and rinse vats, 3 compartments if chlorine used ( ), adequate water-heating facilities ( ) _____ ( )

(9) *Cleanliness and flies.*—Floors, walls, windows, shelves, tables, and equipment clean ( ), no trash or unnecessary articles ( ), all necessary fly-control methods ( ) _____ ( )

TOILET

(10) *Toilet.*—Conveniently located ( ), constructed and operated according to Code ( ), no evidence of defecation or urination about premises ( ) _____ ( )

Item No.[1]

WATER SUPPLY

(11) *Water supply.*—Easily accessible ( ), adequate ( ), no surface or cistern water unless approved ( ), safe, sanitary quality (see Code) ( ) _____ ( )

UTENSILS

(12) *Construction.*—Smooth heavy-gage material ( ), corrosion-proof surface, no agateware ( ), easily cleanable shape ( ), joints soldered flush ( ), good repair ( ), no woven-wire cloth ( ), milk pails small-mouth design ( ), approved single-service containers ( ) _____ ( )

(13) *Cleaning.*—Cleaned after each usage ( ), must look and feel clean ( ) _____ ( )

(14) *Bactericidal treatment.*—Steam cabinet 170° F. for 15 minutes or 200° F. for 5 minutes, or steam jet 1 minute, or immersed in standard chlorine or 170° F. water for 2 minutes, or flow of standard chlorine or 170° F. water at outlet for 5 minutes, or hot-air cabinet 180° F. for 20 minutes ( ), cabinets have thermometer in coldest zone ( ) _____ ( )

(15) *Storage.*—Left in treating chamber until used or stored inverted on racks or in clean crates above floor in milk house ( ), cotton disks in original package until used ( ) _____ ( )

(16) *Handling.*—After bactericidal treatment no handling of surfaces to which milk is exposed _____ ( )

MILKING

(17) *Udders and teats.*—Clean and rinsed with standard chlorine solution at time of milking ( ), abnormal milk excluded ( ) _____ ( )

(18) *Flanks.*—Flanks, bellies, and tails free from visible dirt at time of milking ( ), brushing completed before milking begun ( ) _____ ( )

(19) *Milkers' hands.*—Clean ( ), rinsed in standard chlorine solution just before milking each cow ( ), dry while milking ( ), hand-washing facilities including soap, water, and individual clean towels convenient to milking barn ( ) _____ ( )

(20) *Clothing.*—Clean outer garments _____ ( )

(21) *Milk stools.*—Clean, not padded ( ), stored above floor ( ) _____ ( )

(22) *Removal of milk.*—Immediate removal of milk to milk house or straining room ( ), no straining or pouring in barn ( ) _____ ( )

(23) *Cooling.*—Milk cooled immediately after milking completed to 50° F. or less and so maintained until delivery to consumer _____ ( )

BOTTLING AND CAPPING

(24) *Bottling and capping.*—Sanitary bottle filler ( ), no hand capping ( ), caps kept in sanitary tubes in clean, dry place until used ( ), first cap discarded ( ) _____ ( )

EMPLOYEES

(25) *Personnel, health.*—Required examinations and tests ( ), rejected persons not employed ( ), no person with infected wound or lesion ( ) _____ ( )

MISCELLANEOUS

(26) *Vehicles.*—Clean ( ), permanent top and permanent or roll-down sides and back ( ), no contaminating substances transported ( ), distributor's name shown ( ). *Premises.*—Surroundings kept neat and clean ( ) _____ ( )

Date _____ _____, *Inspector.*

[1] Item numbers correspond to item numbers for Grade A raw milk in 1939 edition of United States Public Health Service Milk Ordinance and Code, to which please refer.
[2] Not required for Grade B raw. All other Grade B raw requirements (except bacterial standard) are the same as for Grade A raw.

FIGURE 2.—Milk producer-distributor inspection form.

Form 8976-D
U. S. TREASURY DEPARTMENT
PUBLIC HEALTH SERVICE
March 1939

MILK PLANT-PRODUCER INSPECTION FORM

GALLONS SOLD DAILY TO

	Plant
Whole milk	
Skim milk	
Cream	
TOTAL	

(City, county, or district)

NAME _____ LOCATION _____

SIR: An inspection of your dairy has this day been made and you are notified of the defects marked below with a cross (X). Violation of the same item on two successive inspections calls for immediate degrading.

COWS

Item No.[1]

(1) *Tuberculosis and other diseases.*—Tuberculin test annually except in modified accredited counties ( ), certificates on file ( ), other tests as required ( ), no cows with extensive induration of udder ( ), no cows giving abnormal milk ( ) ( )

DAIRY BARN

(2) *Lighting, milking barn.*—Adequate light openings ( ), adequate artificial light for night milking ( ) ( )

(3) *Air space and ventilation.*—Well ventilated ( ), no overcrowding ( ) ( )

(4*a*) *Floor construction, milking barn.*—Floors and gutters, concrete, tight wood, or other impervious and easily cleaned material in good repair ( ), graded ( ) ( )

(4*b*) *Floor cleanliness, milking barn.*—No accumulations beyond one milking ( ), no horses, pigs, fowl, calves, etc. ( ) ( )

(5) *Walls and ceilings.*—Painted biennially or whitewashed annually or other satisfactory finish ( ), clean and in good repair ( ), ceiling tight if feedstuffs over ( ), feed-room partition dust-tight with door ( ) ( )

(6*a*) *Cowyard, grading and draining.*—Graded ( ), drained ( ), no pooled wastes ( ) ( )

(6*b*) *Cowyard, cleanliness.*—Clean ( ), no swine ( ) ( )

(7) *Manure disposal.*—Stored inaccessible to cows and, during fly season: (*a*) Spread upon fields, or (*b*) piled not more than 4 days and then spread, or (*c*) stored not more than 7 days in impervious bin or curbed platform and then spread, or (*d*) stored in tight, screened, and trapped manure shed, or (*e*) fly breeding minimized by other approved methods ( )

MILK HOUSE

(8*a*) *Floors.*—Smooth concrete or other impervious material ( ), graded to drain ( ) ( )

(8*b*) *Walls and ceilings.*—Smooth dressed lumber, sheet metal, or plasterboard, well painted with washable paint; hollow tile, cement blocks, bricks, concrete, or cement plaster, surfaces and joints smooth ( )

(8*c*) *Lighting and ventilation.*—Effective window area at least 10 percent of floor area ( ), adequate artificial lighting (see Code) ( ), adequate ventilation ( ), doors and windows closed during dusty weather ( ) ( )

(8*d*) *Screening.*—All openings effectively screened and doors open outward and self-closing, unless flies otherwise kept out ( )

(8*e*) *Miscellaneous requirements.*—Used for milk purposes only, except by permission ( ), milk house operations not conducted elsewhere ( ), no opening into living quarters or stable ( ), wastes properly disposed of ( ), 2-compartment stationary wash and rinse vats ( ), adequate water-heating facilities ( ) ( )

(9) *Cleanliness and flies.*—Floors, walls, windows, shelves, tables, and equipment clean ( ), no trash or unnecessary articles ( ), all necessary fly-control methods ( ) ( )

TOILET

Item No.[1]

(10) *Toilet.*—Conveniently located ( ), constructed and operated according to Code ( ), no evidence of defecation or urination about premises ( ) ( )

WATER SUPPLY

(11) *Water supply.*—Easily accessible ( ), adequate ( ), no surface or cistern water unless approved ( ), safe, sanitary quality (see Code) ( ) ( )

UTENSILS

(12) *Construction.*—Smooth heavy-gage material ( ), corrosion-proof surface, no agateware ( ), easily cleanable shape ( ), joints soldered flush ( ), good repair ( ), no woven-wire cloth ( ), milk pails small-mouth design ( ) ( )

(13) *Cleaning.*—Cleaned after each usage ( ), must look and feel clean ( ) ( )

(14) *Bactericidal treatment.*—Steam cabinet 170° F. for 15 minutes or 200° F. for 5 minutes, or steam jet 1 minute, or immersed in standard chlorine or 170° F. water for 2 minutes, or flow of standard chlorine or 170° F. water at outlet for 5 minutes, or hot-air cabinet 180° F. for 20 minutes ( ), cabinets have thermometer in coldest zone ( ) ( )

(15) *Storage.*—Left in treating chamber until used or stored inverted in protected place in milk house ( ), cotton disks in original package until used ( ) ( )

(16) *Handling.*—After bactericidal treatment no handling of surfaces to which milk is exposed ( )

MILKING

(17) *Udders and teats.*—Clean and rinsed with standard chlorine solution at time of milking ( ), abnormal milk excluded ( ) ( )

(18) *Flanks.*—Flanks, bellies, and tails free from visible dirt at time of milking ( ), brushing completed before milking begun ( ) ( )

(19) *Milkers' hands.*—Clean ( ), rinsed in standard chlorine solution just before milking each cow ( ), dry while milking ( ), hand-washing facilities including soap, water, and individual clean towels convenient to milking barn ( ) ( )

(20) *Clothing.*—Clean outer garments ( )

(21) *Milk stools.*—Clean, not padded ( ), stored above floor ( ) ( )

(22) *Removal of milk.*—Immediate removal of milk to milk house or straining room ( ), no straining or pouring in barn ( ) ( )

(23) *Cooling.*—Milk either delivered to plant or cooled to 70° F., within 2 hours after milking completed ( )

MISCELLANEOUS

(26) *Vehicles.*—Clean ( ), covered ( ), no contaminating substances transported ( ). *Premises.*—Surroundings kept neat and clean ( ) ( )

Date _____ _____ *Inspector.*

[1] Item numbers correspond to item numbers for Grade A raw milk (for pasteurization) in 1939 edition of United States Public Health Service Milk Ordinance and Code, to which please refer. The requirements for Grade B raw (for pasteurization) are the same except for the bacterial standard.

FIGURE 3.—Milk plant-producer inspection form.

147674°—40 (Face p. 29) No. 2

Form 8978-C
U. S. TREASURY DEPARTMENT
PUBLIC HEALTH SERVICE
Rev. March 1939

PASTEURIZATION PLANT INSPECTION FORM

(INCLUDING RECEIVING STATIONS)

GALLONS SOLD DAILY IN COMMUNITY

Whole milk	
Buttermilk	
Cream	
Other milk products	
TOTAL	

(City, county, or district)

NAME _____ LOCATION _____

SIR: An inspection of your plant has this day been made and you are notified of the defects marked below with a cross (X). Violation of the same item on two successive inspections calls for immediate degrading.

Item No.[1]

(1) *Floors.*—Smooth finish, no pools ( ), wall joints and floor surface impervious ( ), trapped drains, no sewage backflow ( ), clean and free of litter ( ). ( )

(2) *Walls and ceilings.*—Smooth, washable, light-colored finish, good repair ( ), clean ( ) ( )

(3) *Doors and windows.*—In fly season, outer openings with effective screens and self-closing doors, or fly-repellent fans or flaps ( )

(4a) *Lighting.*—Adequate artificial light evenly distributed (see Code) ( ), in new plants, window and skylight area 10% of floor area ( ) ( )

(4b) *Ventilation.*—No undue condensation and odors ( )

(5) *Miscellaneous protection from contamination.*—Processes partitioned (*), rooms of sufficient size ( ), raw milk not unloaded directly into pasteurization room ( ), dump vats covered, ports protected ( ), flies under control ( ), no woven-wire strainers, pasteurized milk strained only through perforated metal ( ), unsterilized raw-milk equipment not used for pasteurized milk ( ), no raw-milk bypass around pasteurizers ( ), no direct opening to stables or living quarters ( ), no drip from mezzanine ( ), ingredients properly stored and handled ( ), no unapproved products handled ( ) ( )

(6) *Toilet facilities.*—Comply with plumbing code ( ), good repair ( ), clean ( ), ventilated ( ), no direct opening ( ), self-closing doors ( ), free of flies ( ), washing sign ( ), privies, if used, comply item 10r ( ) ( )

(7) *Water supply.*—Sufficient outlets ( ), adequate ( ), safe, source complies item 11r ( ) ( )

(8) *Hand-washing facilities.*—Adequate, convenient ( ), warm water, soap, sanitary towels ( ), hands washed after toilet ( ) ( )

(9) *Sanitary piping.*—Easily cleanable size and length ( ), smooth uncorroded surfaces ( ), sanitary fittings, interior surfaces assessible for inspection ( ) ( )

(10) *Construction and repair of containers and equipment.*—Easily cleanable, smooth, noncorrodible surfaces ( ), no open seams ( ), good repair ( ), self-draining ( ), pressure-tight seats on submerged thermometers ( ), approved single-service containers ( ) ( )

(11) *Disposal of wastes.*—In public sewer or as approved by State board of health ( ), trash and garbage kept in covered containers ( ) ( )

(12a) *Cleaning of containers and equipment.*—Containers thoroughly cleaned after each usage (test 10) ( ), equipment each day ( ) ( )

(12b) *Bactericidal treatment of containers and equipment.*—Containers treated (see item 14r for manual methods) after each cleaning to reduce bacterial count to 1 per cc. of capacity (test 11) ( ), assembled equipment once daily immediately before run, with steam flow 200° F., or hot-water flow 170° F., or standard chlorine solution flow, at outlets for 5 minutes (test 12); supplementary treatment for equipment not thus reached ( ) (see Code) ( )

(13) *Storage of containers and equipment.*—In clean crates or racks above floor, protected from flies, splash, dust, inverted when practicable ( )

(14) *Handling of containers and equipment.*—No handling of surfaces to which milk is exposed ( )

(15) *Storage of caps, etc.*—Caps purchased in tubes, parchment papers and single-service containers in cartons

Item No.[1]

( ), kept therein in cabinet or other clean dry place ( ), first cap and paper discarded ( ) ( )

(16a)* *Specifications for pasteurization thermometers.*—All Code specifications met by all new indicating and recording thermometers, by all replacements, and by recording thermometers under repair which require renewal of tube system ( ); existing thermometers meet at least accuracy and lag specifications (tests 1, 2, 3, and 13) ( ) ( )

(16b)* *Maintenance of pasteurization temperature and time.*—

(A) *For manual-discharge heated holders:*

Temperature control.—Adequate agitation throughout holding period, agitator sufficiently submerged ( ); indicating and recording thermometers on each vat throughout pasteurization ( ); recorder reads no higher than indicator (test 4) ( ); thermometer bulbs submerged ( ) ( )

Time control.—Charts show 143° F. for 30 minutes, plus emptying time if cooling begun after outlet valve opened (test 6) ( ); no milk added after holding begun ( ) ( )

Charts.—Used only 1 day, preserved 3 months ( ); must show date, location, daily check against indicating thermometer, amount, grade, and product represented, unusual occurrences, and operator's signature ( ) ( )

(B) *For all automatic-discharge holders and unheated manual-discharge holders:*

Temperature control.—Dependable thermostatic control and approved milk-flow stop: no manual switch on milk-pump stops; new stops combined with recorder bulb, but cut-out independent of temperature pen arm; power failure stops forward flow; lag of controller-recorder not over 5 seconds for new, 10 for existing, forward flow stops within 1 second after power cuts out (test 16); flow-diversion valves of approved design (test 8), and bulb not over 18 inches upstream; no bypass around stop bulb ( ). Cut-in and cut-out at or above 143° F. or 160° F. (tests 14, 15), setting sealed, cut-out infrequent ( ). No holder-heater permanently connected with water make-up line ( ). Requirements when flow stop used only upstream from holder: (*a*) no significant temperature drop in holder (test 17), (*b*) bulb of pump stop in milk at heated point, (*c*) no forward gravity flow in stop position, (*d*) all parts of inlet lines below stop bulb have continuous flow during operation and are self-draining when forward flow stops, (*e*) no temperature loss due to cold holder metal or contents (test 15) or due to (*f*) backflow into holder ( ). Requirements when flow stop used only downstream from holder: (*a*) holder unheated, (*b*) flow-diversion device used, and (*c*) simultaneous temperature difference not over 1° F. (test 18) ( ). Indicating and recording thermometers at each stop bulb, on each manual-discharge vat and pocket, and at outlet of automatic-discharge system unless each pocket so equipped; bulbs close together ( ). Recorder reads no higher than indicator (test 4) ( ). Pasteurization temperature must be shown by charts near flow stops throughout forward flow; by charts on individual vats for 30 minutes, plus filling time if cooling begun before outlet valve opened, or plus filling and emptying times if cooling begun after outlet opened (test 6); by all other charts while milk passes thermometer bulb, otherwise milk repasteurized ( ) ( )

Date _____ _____, *Inspector.*

[1] The item numbers correspond to the item numbers for Grade A pasteurized milk in the 1939 edition of the Public Health Service Milk Ordinance and Code, to which please refer.
[2] Lip-cover caps are not required for Grade B pasteurized. All other Grade B pasteurized requirements (except bacterial count before and after pasteurization) are the same as for Grade A pasteurized. †Required for newly installed equipment only. *Items or parts of items not required for receiving stations.

(OVER)

FIGURE 4.—Pasteurization plant inspection form.

Item No.		
	Time control.—No milk added to vats or pockets after holding begun ( ). Maximum speeds of motor and drive for timing devices of automatic batch holders and for milk pumps of tubular holders give adequate holding time (test 19); sealed if speed variable ( ). No overflow from one pocket to another ( ). No air or gas accumulates in tubular holders ( ). Special requirements for 30-minute tubular holders ( )	( )
	Charts.—Same as for (A) ( ); must also show periods of forward flow, and daily check of cut-in and cut-out temperatures ( )	( )
(16c)*	*Inlet and outlet valves and connections.*—Any inlet and outlet valves used on single-vat installations must be leak-protector type,† otherwise piping disconnected ( ), all multiple-vat installations have leak-protector inlets, also leak-protector outlets except where Code permits disconnecting outlet piping instead ( ), 30-minute tubular holders have leak-protector outlet or outlet piping disconnected until 30 minutes after filling begun ( ); leak-protector valves of approved design, effective in all† closed positions, and installed in proper position (test 8) ( ); inlets and outlets below milk level have close-coupled valves ( ), plug-type valves have approved stops (†); top inlets have air relief if submerged ( ). Valves kept fully closed except inlet while filling and outlet while emptying ( ); outlet valves sterilized automatically† before opening if not leak protected or if milk accumulates in channel (test 9) ( )	( )
(16d)*	*Air heating.*—Air in vats and pockets heated to at least 5° F. above milk temperature during heating and kept at 148° F. or higher during holding, with approved device ( ), approved trap on steam line ( ), approved air thermometer (test 7), bulb at least 1 inch above milk ( )	( )
(16e)*	*Vat and pocket covers and cover ports.*—No drainage from top of cover into vat, open or closed ( ), ports surrounded by raised edges ( ), pipes, thermometers, etc., through cover have aprons unless joint watertight ( ); covers kept closed ( )	( )
(16f)*	*Preheating holders.*—Holders not used as heaters are preheated to pasteurization temperature just before run, also when empty after shutdown exceeding holding period, unless outlet has flow-diversion valve	( )
(17)	*Cooling.*—All raw milk and cream cooled to 50° F. on receipt unless to be pasteurized within 2 hours ( ), pasteurized milk cooled to 50° F. and held thereat until delivery ( ); header gap on surface coolers not less than ¼ inch or thickness of header at gap (†), condensation and leakage from cooler supports and headers, unless completely enclosed in covers, directed away from tubes and milk trough (†), recirculated water and refrigerant of required sanitary quality ( ), cooler covered or in separate room ( ), cooler shields tight fitting ( ); pasteurized-milk (or heat-transfer medium) side automatically under greater pressure than raw milk in regenerators at all times (test 20) (see Code) ( )	( )
(18)*	*Bottling.*—Mechanical bottler, simple design requiring infrequent adjustment ( ), properly covered ( ), float adjustable without lifting cover ( ), filler pipe with condensation diverting apron ( ), infeed conveyors with overhead shields ( )	( )
(19)	*Overflow milk.*—Discarded	( )
(20)*	*Capping.*—Mechanical capper integral with bottler requiring infrequent adjustment ( ), imperfectly capped bottles dumped and repasteurized ( ), cap protects pouring lip to at least greatest diameter ([2])	( )
(21)*	*Personnel, health.*—Required examinations and tests ( ), rejected persons not employed ( ), no person with infected wound or lesion ( )	( )
(22)	*Personnel, cleanliness.*—Clean outer garment, washable for inside employees ( ), hands clean ( )	( )
(23)	*Miscellaneous—Vehicles.*—Clean ( ), covered ( ), no contaminating substances transported ( ), distributor's name shown ( ). *Surroundings.*—Kept neat and clean ( )	( )

TESTS OF PASTEURIZATION EQUIPMENT, ETC., TO BE MADE BY HEALTH DEPARTMENT

(These tests are in addition to equipment requirements for which compliance is determined by inspection)

Test	When Required (All periodic tests are also required initially)	See 1939 Code (Item and page)	Tests Made Today (✓)	Identity of Equipment and Results of Tests					
All types of pasteurizers:									
1. All indicating thermometers: temperature accuracy	Monthly	16p(a) p. 99							
2. All recording thermometers: temperature accuracy	Semiannually and when frequent adjustments necessary.	16p(a) p. 100							
3. All recording thermometers: time accuracy	Monthly	16p(a) p. 100							
4. All recording thermometers: temperature [1] check against indicating thermometer.	Monthly	16p(b) pp. 103, 112							
6. All manual-discharge vats and pockets: filling and/or emptying time where required by Code (see 16b above).	Initially and after any change which may affect these times.	16p(b) pp. 103, 112							
7. All air-temperature indicating thermometers: temperature accuracy.	Initially	16p(d) p. 127							
8. All pasteurizer inlet, outlet, and diversion valves: any leakage past seat in any closed position when downstream pipe disconnected?	Plug types initially, poppet types monthly.	16p(c) pp. 106, 117							
9. All outlet valves: when milk flow stopped, does channelful discharge through leak grooves in all closed positions?	Initially	16p(c) p. 118							
10. All soaker bottle washers: percent caustic	Monthly	12p p. 95							
11. Bactericidal treatment of bottles and cans: samples for bacterial count.	Monthly	12p p. 95							
12. Treatment of assembled equipment: temperature (or chlorine strength) and time (see 12b over).	Monthly	12p p. 93							
Additional tests for automatic pasteurizers:									
13. All indicating thermometers on pipe lines: thermometric lag	Initially	16p(a) p. 99							
14. All milk-flow stops: milk temperatures at cut-in and cut-out [3]	Monthly	16p(b) pp. 105, 111							
15. All automatically controlled holder heaters: temperature of heating medium at cut-in and cut-out.[3]	Monthly	16p(b) pp. 106, 111							
16. All recorder-controllers: thermometric lag [4]	Monthly	16p(b) p. 107							
17. All 30-minute holders with upstream flow stops: significant temperature drop.	Initially and when controller seal of automatic holder heater broken.	16p(b) p. 108							
18. All holders with downstream flow stops: simultaneous temperature difference.	Initially	16p(b) p. 111							
19. All automatic holders: holding time (if satisfactory, seal the setting of variable-speed drives and motor governors).	Initially and when seal broken or after change affecting holding time.	16p(b) p. 114							
20. All non-self-draining milk-to-milk regenerators with pasteurized milk closed to atmosphere: sufficient storage in pasteurized line to maintain milk level for 1 hour during shutdown.	Monthly	17p p. 133							

[1] Enter on chart. Adjust thermometer if necessary.
[2] Enter on chart. If necessary, adjust controller setting and reseal.
[3] Enter on chart. If necessary, adjust holder heater controller setting and reseal.
[4] Enter on chart.

FIGURE 4.—Pasteurization plant inspection form—Continued

Producer-distributor inspection forms (Form 8976–A), plant-producer inspection forms (Form 8976–D), and pasteurization plant inspection forms (Form 8978–C) based on the requirements of this edition of the ordinance and code are shown in figures 2, 3, and 4 and may be purchased from the Superintendent of Documents, Washington, D. C.

SECTION 6. THE EXAMINATION OF MILK AND MILK PRODUCTS

During each grading period at least four samples of milk and cream from each dairy farm and each milk plant shall be taken on separate days and examined by the health officer. Samples of other milk products may be taken and examined by the health officer as often as he deems necessary. Samples of milk and milk products from stores, cafes, soda fountains, restaurants, and other places where milk or milk products are sold shall be examined as often as the health officer may require. Bacterial plate counts and direct microscopic counts shall be made in conformity with the latest standard methods recommended by the American Public Health Association.[13] *Examinations may include such other chemical and physical determinations as the health officer may deem necessary for the detection of adulteration, these examinations to be made in accordance with the latest standard methods of the American Public Health Association and the Association of Official Agricultural Chemists.*[13] *Samples may be taken by the health officer at any time prior to the final delivery of the milk or milk products. All proprietors of stores, cafes, restaurants, soda fountains, and other similar places shall furnish the health officer, upon his request, with the names of all distributors from whom their milk and milk products are obtained. Bioassays of the vitamin D content of vitamin D milk shall be made when required by the health officer in a laboratory approved by him for such examinations.*

Whenever the average bacterial count, the average reduction time, or the average cooling temperature falls beyond the limit for the grade then held, the health officer shall send written notice thereof to the person concerned, and shall take an additional sample, but not before the lapse of 3 days, for determining a new average in accordance with section 1 (S). Violation of the grade requirement by the new average or by any subsequent average during the remainder of the current grading period shall call for immediate degrading or suspension of the permit, unless the last individual result is within the grade limit.

Experience has indicated that four or more samples of a given milk supply should be examined before attempting to grade the supply. Therefore it is required that at least four samples be taken from each supply during each grading period.

[13] See footnote 5, p. 5.

The third sentence of this section refers to store and restaurant samples. Ordinarily the enforcement of this sentence is limited to the taking of temperatures so as to determine whether the establishment is keeping the milk at or below 50° F. as required by section 10. Such temperatures should, however, be charged only to the establishment, and not to the dairyman supplying the milk, as the latter practice would be obviously unjust to the dairyman.

Samples upon which grades are to be based should be taken from supplies while they are still in the possession of the dairyman. Any other practice would be unfair to the dairyman, as once the milk is out of his possession it is beyond his control. For this reason section 6 contains the sentence requiring that milk samples must be taken while in the possession of the dairyman.

The last paragraph of section 6 provides for degrading or suspension of the permit upon violation of the bacterial or cooling requirement. The intent is to avoid punishment until the dairyman has been notified and has been given an opportunity to correct the condition. Thus, if the last four consecutive cooling temperature results are 49, 50, 49, and 56, so that the average of 51 is beyond the limit for the grade held, an additional determination is made. If the additional result is above 50 it is obvious that adequate correction has not been made, and as the new average is still beyond the limit for the grade the supply should be degraded or the permit suspended. However, if the additional result is 50 or less, it is obvious that satisfactory corrective steps have been taken, and it would be unfair to inflict punishment even though the new average is still beyond the grade requirement. Similarly, if any additional sampling is done thereafter during the remainder of the current grading period, the average of the last 4 consecutive results must not fall beyond the grade limit unless the last individual result is within the limit; otherwise the supply is degraded or the permit suspended.

Bacterial counts and reductase tests.—This ordinance requires that the various grades of milk fall within the following limits of average bacterial plate counts, or average reduction time as determined by the reductase test, or average direct microscopic counts. When the latter are used, the limits are the same as for average bacterial plate counts if clumps are counted, but four times as high if individual organisms are counted.

Alternative bacterial standards established by section 7 for milk and milk products, except that these limits are doubled for cream and omitted for buttermilk and sour cream

Grade	Log average plate count per cc. not to exceed—	Log average direct microscopic count of clumps per cc. not to exceed—	Log average direct microscopic count of individual organisms per cc. not to exceed—	Arithmetic average reduction time in hours to be not less than—	
				Milk, etc.	Cream[2]
A consumed raw	50, 000	50, 000	200, 000	8	7
B consumed raw	1, 000, 000	1, 000, 000	4, 000, 000	3½	2½
C consumed raw	(1)	(1)	(1)	(1)	(1)
A to be pasteurized	200, 000	200, 000	800, 000	6	5
B to be pasteurized	1, 000, 000	1, 000, 000	4, 000, 000	3½	2½
C to be pasteurized	(1)	(1)	(1)	(1)	(1)
A pasteurized	30, 000				
B pasteurized	50, 000				
C pasteurized	(1)				

[1] No limit.

[2] These arithmetic average reduction time limits represent twice the log average plate count limits corresponding to the figures in the preceding column.

Public-health reason.—It is widely accepted that the bacterial count of milk is an index of the sanitary quality of milk. A high count does not necessarily mean that disease organisms are present, and a low count does not necessarily mean that disease organisms are absent; but a high bacterial count does mean that the milk has either come from diseased udders, has been milked or handled under undesirable conditions, or has been kept warm enough to permit bacterial growth. This means, in the first two cases, that the chances of infection have been increased, and, in the last case, that any infection which has reached the milk has been permitted to grow to more dangerous proportions. In general, therefore, a high count means a greater likelihood of disease transmission.

On the other hand, a wrong interpretation of the significance of low bacterial counts should be avoided, since low-count milk may be secured from tuberculous cows, may have been handled by typhoid carriers, and may even have been handled under moderately unclean conditions.

The above constitutes the public-health reason for grading milk partly on the basis of the bacterial count or the reductase test.

The collection of milk samples.—In order to yield significant results milk samples must be collected so as to represent the condition of the milk when reaching the consumer or milk-plant receiving station. Therefore they may not be taken at the dairy, but must be collected either from the delivery vehicles or at the milk plant or its country receiving stations.

Furthermore, in order that the laboratory findings may represent the true condition of the samples when taken, these must without fail be kept below 50° F. until plated. This will require, except in freezing weather, that the samples be packed in ice until examined. The inspector should be provided with a case in which samples may be delivered to the laboratory. A metal-lined wooden box, of such size as to fit on the running board or inside the inspector's car, has been found satisfactory. The box should be drained to prevent the accumulation of ice water.

In case of bottled milk, a pint or quart bottle shall be taken at random from the truck by the inspector, and the top covered with paraffined or parchment paper so as to assure the dairyman that the milk will not be contaminated en route to the laboratory by the hands of the inspector or by the ice in the sample case. The sample tag must be filled out by the inspector at the time the sample is taken, and the wire twisted tightly about the neck of the bottle, thus binding tight the paper cover.

When samples are to be shipped to a laboratory located in another city (a central or branch State laboratory) the same procedure must be followed, the milk being transferred to the shipping-case containers at the health office or some other suitable place. In transferring the milk from the original bottles to the shipping-case containers, the bottles shall first be thoroughly shaken and the cap and lip carefully swabbed with alcohol or a chlorine solution. The milk shall then be carefully poured into the shipping bottle, the tag being immediately transferred, so as to avoid mixing of tags.

Shipping cases must be constructed and iced so as to keep the temperature of the samples below 50° F. until they reach the laboratory.

For the collection of samples at pasteurizing plants or at their country cooling stations, the following procedure is recommended. Five ounces of stock chlorine solution are added to a 5-gallon can of water. A long-handled dipper is kept in this solution for a few moments and then used to stir the milk and collect the sample. It may be used without further bactericidal treatment for taking samples from any number of cans from the same producer, but must be retreated before proceeding to sample milk from the next producer. The small amount of chlorine carried into the milk on the dipper will not affect its bacterial count. The cans of milk should be well stirred before the samples are taken, in order that the samples may be representative. Sample bottles should be of not less than 4-ounce capacity.

Reporting bacterial plate counts.—The number of routine samples which must be examined in many cities makes the use of more than two dilutions per sample impracticable. For this reason it has become general practice for laboratories in cities enforcing this ordinance to make only two dilutions. In all except known high-count milk the dilutions used are 1:100 and 1:1,000; on the latter 1:1,000 and 1:10,000. The following special rules for reporting counts are now being used:

(1) When the higher plate count is more than twice the lower, record the lower count.

(2) When the higher plate count is not more than twice the lower apply the Standard Methods rules for counting, which may be sum-

marized as follows: (*a*) If there are plates with 30 to 300 colonies, use all of them and no others; (*b*) otherwise use that nearest 300.

(3) In case one plate cannot be counted because of a spreader covering more than half the plate, the result is to be reported as unsatisfactory unless the count of the other plate is within the grade then held by the supply in question.

(4) Report bacterial plate counts to the nearest 1,000, unless the count exceeds 100,000, in which case report to the nearest 10,000, or unless the count exceeds 1,000,000, in which case report to the nearest 100,000.

(5) If all plates show no growth the result shall be reported as unsatisfactory.

A good method by which milk control officials may judge laboratory technique and the correctness of reporting is to have the laboratory enter its results upon the following form of milk analysis journal.

Milk-sample laboratory record

Sample No.	Fat	Specific gravity	S. N. F.	Adulterants	1:100 count	1:1,000 count	Count ratio [1]	Recorded count	Rules for reporting
	Percent		*Percent*	*Percent*					
2383	4.1	1.031	8.57	-----	8,600	32,000	3.72	9,000	1, 4.
2384	3.6	1.032	8.72	-----	29,300	41,000	1.40	35,000	2a, 4.
2385	3.7	1.031	8.49	-----	210,000	234,000	1.11	230.000	2a, 4.
2386	4.2	1.030	8.34	-----	280,000	347,000	1.24	350,000	2b, 4.
2387	4.1	1.031	8.57	-----	1,800	[2]	----	2,000	2b, 4.
2388	3.6	1.032	8.72	-----	[3]	190,000	----	[4]	3 (Gr. A).
2389	3.7	1.031	8.49	-----	13,800	[3]	----	14,000	3, 4.
2390	4.2	1.030	8.34	-----	[2]	[2]	----	[4]	5.
2391	2.3	1.025	6.71	9	------	--------	----	------	Water.

[1] Count ratio is the ratio of the greater to the lesser plate count.
[2] No growth.
[3] Spreader.
[4] Unsatisfactory.

The State representatives should determine the following data each grading period as a part of the State records:

(1) Average of the count ratios of those samples for which both dilutions show between 30 and 300 colonies. This should not be over 2.0.

(2) Percent unsatisfactory counts (spreaders). This should not be over 2 percent.

(3) Percent incorrectly recorded counts. This should be practically 0.

These three figures are measures with which to judge the work of the laboratory.

All counts should be recorded on the milk ledger (Treasury Department Form 8976–B for producer-distributors, Form 8976–E for plant-producers, and Form 8976–C for pasteurization plants) as soon as reported by the laboratory.

Averaging bacterial counts in determining grades.—In grading milk supplies the average of the last four consecutive counts or reductase hours is used because less

than this number has been found by experience not to give a dependable picture of the bacteriological condition of a milk supply. The averaging of bacterial counts in the determination of grades under this ordinance is done by the logarithmic instead of the arithmetic method. This is because the arithmetic method is sometimes unfair to the dairyman. Suppose, for example, the laboratory reports the last four consecutive counts to be 10,000, 10,000, 10,000, and 1,000,000. The one unusually high count may have been the result of accident and is not fair cause for degrading, yet if an arithmetic average is used the milk supply will be placed in grade B, whereas its most usual quality is grade A.

For this reason the logarithmic average is specified in connection with the enforcement of this ordinance. By its use high counts are "snubbed," so to speak, unless all counts are high, in which case the snubbing effect tends to disappear and the logarithmic average approaches the arithmetic average. For example, the same counts previously listed would yield a logarithmic average of 32,000, thus keeping the milk supply in grade A, where it obviously belongs.

How to find the average bacterial count by logarithms.—The logarithms of bacterial counts from 1,000 to 300,000,000 are given directly in the following table. The logarithms should be entered opposite the counts in the milk-control ledger. To find the average bacterial count find the average of the logarithms and then find the bacterial count in the table which is opposite the average logarithm.

Following is an example:

Counts	Logarithms
35,000	4.54
11,000	4.04
9,000	3.95
95,000	4.98
	4)17.51
	4.38=average log

4.38 in the table is opposite 24,000, which is therefore the average bacterial count.

If it is found that the average logarithm occurs opposite more than one bacterial count in the table, take the lowest bacterial count as the average.

Reductase test.—When the reductase test is used the procedure shall be as follows: Follow Standard Methods except that samples are to be examined at the end of each hour but not beyond 8 hours. The reduction time shall be expressed as the number of elapsed full hours when decolorization is first observed. Samples not reduced at the end of 8 hours are to be reported as reduced in 9 hours. For purposes of grading the simple arithmetic average (not the logarithmic average) of the last four consecutive samples is to be used.

Table to be used in computing logarithmic averages of bacterial counts

Counts	Logarithms	Counts	Logarithms	Counts	Logarithms	Counts	Logarithms	Counts	Logarithms
1,000	3.00	61,000	4.79	310,000	5.49	910,000	5.96	6,100,000	6.79
2,000	3.30	62,000	4.79	320,000	5.51	920,000	5.96	6,200,000	6.79
3,000	3.48	63,000	4.80	330,000	5.52	930,000	5.97	6,300,000	6.80
4,000	3.60	64,000	4.81	340,000	5.53	940,000	5.97	6,400,000	6.81
5,000	3.70	65,000	4.81	350,000	5.54	950,000	5.98	6,500,000	6.81
6,000	3.78	66,000	4.82	360,000	5.56	960,000	5.98	6,600,000	6.82
7,000	3.85	67,000	4.83	370,000	5.57	970,000	5.99	6,700,000	6.83
8,000	3.90	68,000	4.83	380,000	5.58	980,000	5.99	6,800,000	6.83
9,000	3.95	69,000	4.84	390,000	5.59	990,000	5.99	6,900,000	6.84
10,000	4.00	70,000	4.85	400,000	5.60	1,000,000	6.00	7,000,000	6.85
11,000	4.04	71,000	4.85	410,000	5.61	1,100,000	6.04	7,100,000	6.85
12,000	4.08	72,000	4.86	420,000	5.62	1,200,000	6.08	7,200,000	6.86
13,000	4.11	73,000	4.86	430,000	5.63	1,300,000	6.11	7,300,000	6.86
14,000	4.15	74,000	4.87	440,000	5.64	1,400,000	6.15	7,400,000	6.87
15,000	4.18	75,000	4.88	450,000	5.65	1,500,000	6.18	7,500,000	6.88
16,000	4.20	76,000	4.88	460,000	5.66	1,600,000	6.20	7,600,000	6.88
17,000	4.23	77,000	4.89	470,000	5.67	1,700,000	6.23	7,700,000	6.89
18,000	4.26	78,000	4.89	480,000	5.68	1,800,000	6.26	7,800,000	6.89
19,000	4.28	79,000	4.90	490,000	5.69	1,900,000	6.28	7,900,000	6.90
20,000	4.30	80,000	4.90	500,000	5.70	2,000,000	6.30	8,000,000	6.90
21,000	4.32	81,000	4.91	510,000	5.71	2,100,000	6.32	8,100,000	6.91
22,000	4.34	82,000	4.91	520,000	5.72	2,200,000	6.34	8,200,000	6.91
23,000	4.36	83,000	4.92	530,000	5.72	2,300,000	6.36	8,300,000	6.92
24,000	4.38	84,000	4.92	540,000	5.73	2,400,000	6.38	8,400,000	6.92
25,000	4.40	85,000	4.93	550,000	5.74	2,500,000	6.40	8,500,000	6.93
26,000	4.42	86,000	4.93	560,000	5.75	2,600,000	6.42	8,600,000	6.93
27,000	4.43	87,000	4.94	570,000	5.76	2,700,000	6.43	8,700,000	6.94
28,000	4.45	88,000	4.94	580,000	5.76	2,800,000	6.45	8,800,000	6.94
29,000	4.46	89,000	4.95	590,000	5.77	2,900,000	6.46	8,900,000	6.95
30,000	4.48	90,000	4.95	600,000	5.78	3,000,000	6.48	9,000,000	6.95
31,000	4.49	91,000	4.96	610,000	5.79	3,100,000	6.49	9,100,000	6.96
32,000	4.51	92,000	4.96	620,000	5.79	3,200,000	6.51	9,200,000	6.96
33,000	4.52	93,000	4.97	630,000	5.80	3,300,000	6.52	9,300,000	6.97
34,000	4.53	94,000	4.97	640,000	5.81	3,400,000	6.53	9,400,000	6.97
35,000	4.54	95,000	4.98	650,000	5.81	3,500,000	6.54	9,500,000	6.98
36,000	4.56	96,000	4.98	660,000	5.82	3,600,000	6.56	9,600,000	6.98
37,000	4.57	97,000	4.99	670,000	5.83	3,700,000	6.57	9,700,000	6.99
38,000	4.58	98,000	4.99	680,000	5.83	3,800,000	6.58	9,800,000	6.99
39,000	4.59	99,000	4.99	690,000	5.84	3,900,000	6.59	9,900,000	6.99
40,000	4.60	100,000	5.00	700,000	5.85	4,000,000	6.60	10,000,000	7.00
41,000	4.61	110,000	5.04	710,000	5.85	4,100,000	6.61	11,000,000	7.04
42,000	4.62	120,000	5.08	720,000	5.86	4,200,000	6.62	12,000,000	7.08
43,000	4.63	130,000	5.11	730,000	5.86	4,300,000	6.63	13,000,000	7.11
44,000	4.64	140,000	5.15	740,000	5.87	4,400,000	6.64	14,000,000	7.15
45,000	4.65	150,000	5.18	750,000	5.88	4,500,000	6.65	15,000,000	7.18
46,000	4.66	160,000	5.20	760,000	5.88	4,600,000	6.66	16,000,000	7.20
47,000	4.67	170,000	5.23	770,000	5.89	4,700,000	6.67	17,000,000	7.23
48,000	4.68	180,000	5.26	780,000	5.89	4,800,000	6.68	18,000,000	7.26
49,000	4.69	190,000	5.28	790,000	5.90	4,900,000	6.69	19,000,000	7.28
50,000	4.70	200,000	5.30	800,000	5.90	5,000,000	6.70	20,000,000	7.30
51,000	4.71	210,000	5.32	810,000	5.91	5,100,000	6.71	30,000,000	7.48
52,000	4.72	220,000	5.34	820,000	5.91	5,200,000	6.72	40,000,000	7.60
53,000	4.72	230,000	5.36	830,000	5.92	5,300,000	6.72	50,000,000	7.70
54,000	4.73	240,000	5.38	840,000	5.92	5,400,000	6.73	60,000,000	7.78
55,000	4.74	250,000	5.40	850,000	5.93	5,500,000	6.74	70,000,000	7.85
56,000	4.75	260,000	5.42	860,000	5.93	5,600,000	6.75	80,000,000	7.90
57,000	4.76	270,000	5.43	870,000	5.94	5,700,000	6.76	90,000,000	7.95
58,000	4.76	280,000	5.45	880,000	5.94	5,800,000	6.76	100,000,000	8.00
59,000	4.77	290,000	5.46	890,000	5.95	5,900,000	6.77	200,000,000	8.30
60,000	4.78	300,000	5.48	900,000	5.95	6,000,000	6.78	300,000,000	8.48

SECTION 7. THE GRADING OF MILK AND MILK PRODUCTS

At least once every 6 months the health officer shall announce the grades of all milk and milk products delivered by all producers or distributors and ultimately consumed within the city of _____, or its police jurisdiction. Said grades shall be based upon the following standards, the grading of milk products being identical with the grading of milk except that the bacterial standards shall be doubled in the case of cream, and omitted in the case of sour cream and buttermilk. Vitamin D milk shall be only of grade A or grade B pasteurized, certified, or grade A raw quality.

The following suggestions should be observed in the announcement of grades:

(1) The announcement should contain as a first section the statement that the grades of all milk supplies have been determined by the local health department in accordance with the grade specifications of this code.

(2) The second section should urge all consumers to purchase milk on the basis of grade; should state that the grades appear on each bottle cap and (where placards are used) are posted in every restaurant, soda fountain, etc.; should state that certified-pasteurized and grade A pasteurized milk are the safest grades of milk and that certified-raw and grade A raw milk are as safe as raw milk can be made short of pasteurization. In addition, consumers should be urged to use only certified-pasteurized or grade A pasteurized if available or high-grade raw milk which has been boiled or home-pasteurized as described in *What Every Person Should Know About Milk*, copies of which may be obtained from the Public Health Service.

(3) The third and last section of the announcement should list the names of the distributors and their grades, in the order of the grades and in the alphabetical order of the distributors.

(4) The statement of grades should be limited to the names of the distributors and the grade of their supplies. No details, such as bacterial counts, etc., should be included in the announcement, as they confuse the buying public. For example, if one distributor's bacterial plate count is given as 20,000 and that of another as 25,000, some customers of the latter will tend to shift to the former, whereas no significant public health distinction exists between the two. The consuming public is not trained to know that bacteriological laboratory results do not permit of such fine distinctions. Furthermore, when grades are next announced, the positions of the two distributors may be reversed, and a second shift of customers occur, all unjustified by significant quality differences. Such fictitious accuracy in announcing grades tends to give the public the idea that the quality of a given milk supply is not stable. Furthermore, the resulting frequent shifting of customers leads to friction among competitive dairymen, and resentment on the part of the dairy industry toward the health department.

(5) The announcement need not include the names of raw milk producers delivering to pasteurization plants, since their milk supplies do not reach the final consumer as individual supplies.

CERTIFIED MILK-RAW

Certified milk-raw is raw milk which conforms with the requirements of the American Association of Medical Milk Commissions [14] *in force*

[14] See footnote 5, p. 7.

at the time of production and is produced under the supervision of a medical milk commission and of the State board of health or of the city or county health officer of _____.

The health officer should assure himself by frequent inspections and sample examinations that any certified milk produced for sale in his community fully meets the requirements of the American Association of Medical Milk Commissions in force at the time of production, copies of which may be obtained by addressing the American Association of Medical Milk Commissions, 1265 Broadway, New York, N. Y.

GRADE A RAW MILK

Grade A raw milk is raw milk the average bacterial plate count of which as determined under sections 1 (S) and 6 of this ordinance does not exceed 50,000 per cubic centimeter, or the average direct microscopic count of which does not exceed 50,000 per cubic centimeter if clumps are counted or 200,000 per cubic centimeter if individual organisms are counted, or the average reduction time of which is not less than 8 hours: Provided, That if it is to be pasteurized the corresponding limits shall be 200,000 per cubic centimeter, 200,000 per cubic centimeter, 800,000 per cubic centimeter, and 6 hours, respectively; and which is produced upon dairy farms conforming with all of the following items of sanitation.

A convenient summary of the following sanitation requirements will be found in the dairy farm inspection forms shown in figures 2 and 3.

Item 1r. Cows, Tuberculosis and Other Diseases

Except as provided hereinafter, a tuberculin test of all herds and additions thereto shall be made before any milk therefrom is sold, and at least once every 12 months thereafter, by a licensed veterinarian approved by the State livestock sanitary authority. Said tests shall be made and any reactors disposed of in accordance with the requirements approved by the United States Department of Agriculture, Bureau of Animal Industry [15] *for accredited herds. A certificate signed by the veterinarian or attested to by the health officer and filed with the health officer shall be evidence of the above test: Provided, That in modified accredited counties in which the modified accredited area plan is applied to the dairy herds the modified accredited area system approved by the United States Bureau of Animal Industry* [15] *shall be accepted in lieu of annual testing.*

Within _____ [16] *years after the adoption of this ordinance all milk and milk products consumed raw shall be from herds or additions thereto which have been found free from Bang's disease, as shown by blood serum tests for agglutinins against Brucella abortus made in a laboratory approved by the health officer. All such herds shall be retested*

[15] See footnote 5, p. 7.
[16] See footnote 7, p. 8.

at least every 12 months and all reactors removed from the herd. A certificate identifying each animal by number, and signed by the laboratory making the test, shall be evidence of the above test.

Cows which show an extensive or entire induration of one or more quarters of the udder upon physical examination, whether secreting abnormal milk or not, shall be permanently excluded from the milking herd. Cows giving bloody, stringy, or otherwise abnormal milk, but with only slight induration of the udder, shall be excluded from the herd until reexamination shows that the milk has become normal.

For other diseases such tests and examinations as the health officer may require shall be made at intervals and by methods prescribed by him, and any diseased animals or reactors shall be disposed of as he may require.

Public-health reason.—This item is important because tuberculosis is one of the most important diseases of cows transmitted through milk supplies. Park and Krumwiede's figures indicate that in some regions about one-fourth of all cases of tuberculosis in children under 16 years of age were of bovine origin (Park and Krumwiede, *The Relative Importance of the Bovine and Human Types of Tubercle Bacilli in the Different Forms of Tuberculosis*, collected studies from the research laboratory, Department of Health of New York City, vol. 7, pp. 88–92, 1912–13). Rosenau states that it is estimated that perhaps 7 percent of all tuberculosis in man is of bovine origin (Rosenau, *Preventive Medicine and Hygiene*).

The organisms of tuberculosis get into the milk either directly from the udder or indirectly through cow manure. Manure may become a source of infection directly in the case of active intestinal tuberculosis, or indirectly in the case of respiratory tuberculosis as a result of coughing up the organisms and swallowing them. The infected manure then reaches the milk by dropping into it from the udder, etc., during milking or otherwise.

In addition to the transmission of tuberculosis, it is generally considered that milk supplies may transmit infection to man from infected udders, contagious abortion, running sores, "lumpy jaw," etc.

Bovine mastitis is an inflamatory and, usually, contagious disease of the bovine milk secreting organ. Ordinarily the inciting organism is a streptococcus of bovine origin but the condition may be caused by staphylococci or other organisms. Occasionally cows' udders become infected with hemolytic streptococci of human origin. When epidemics of scarlet fever or septic sore throat are traced to milk, the inciting organism is of human origin. The toxins of staphylococci and possibly other organisms in milk may cause severe gastroenteritis. Milk from badly inflamed udders is practically always of unsatisfactory sanitary quality.

Satisfactory compliance.—The herd must have been tested with tuberculin by a United States accredited veterinarian, or one approved by the State livestock sanitary authority, within 12 months if no reactors were found on the last test, or within 6 months if reactors were found on the last test, except as noted in the ordinance for modified accredited counties. Reactors must have been immediately excluded from the premises and must have been disposed of in accordance with accredited herd requirements. A certificate signed by the veterinarian and filed with the health officer is valid evidence of the T B test. The veterinarian must furnish the health officer with a copy of the test charts, describing every animal and giving ear-tag

numbers. Additions to the herd, as well as bulls and heifers, must be tested and reported as required above. Certificates signed by the local inspector to the effect that he has seen an original certificate, and giving the date of the original certificate and the name of the veterinarian who made the test, shall be valid.

The Bureau of Animal Industry of the United States Department of Agriculture and the State livestock board or the State veterinarian will cooperate with the city or county boards of health in testing dairy cattle, provided certain requirements are met. The nature of these requirements can be ascertained from the State veterinarian. The health officer should file his request for cooperative testing with the State veterinarian. He may strengthen his appeal for the testing by enlisting the support of the county agent, farm bureau, board of trade, and civic clubs.

Evidence of satisfactory compliance with respect to diseases other than tuberculosis and Bang's disease shall be based upon such physical examinations supported by such clinical or laboratory tests as may be deemed necessary by the control officials. Diseased animals found at any time shall be removed from the herd and no milk therefrom offered for sale. (Local inspectors should in the regular line of duty be on the lookout for diseased udder conditions.)

"Indurations of the udder" means replacement of the normal glandular tissue with fibrous tissue.

Item 2r. Dairy Barn, Lighting

A dairy or milking barn shall be required and in such sections thereof where cows are milked windows shall be provided and kept clean and so arranged as to insure adequate light properly distributed, and when necessary shall be provided with adequate supplementary artificial light.

Public-health reason.—Adequate light makes it more likely that the barn will be clean, and that the cows will be milked in a cleanly manner.

Satisfactory compliance.—The milking portion of the barn must be provided with windows or other openings sufficient in area and so arranged as to insure adequate light properly distributed. If glazed windows are used they shall be kept clean. For new construction 4 square feet of window space per stanchion is recommended.

Adequate artificial lighting must be provided for night milking. The inspector shall consider the requirement of adequate artificial light to be satisfied if the milking portion of the barn is so lighted that cleaning and milking operations can be efficiently performed.

Item 3r. Dairy Barn, Air Space and Ventilation

Such sections of all dairy barns where cows are kept or milked shall be well ventilated and shall be so arranged as to avoid overcrowding.

Public-health reason.—This item is required in order to avoid overcrowding and to insure proper ventilation.

Satisfactory compliance.—This item shall be deemed to have been satisfied when, in the judgment of the inspector, conditions are such as to result in sufficient fresh air at all times and no overcrowding.

Item 4r. Dairy Barn, Floors

The floors and gutters of such parts of all dairy barns in which cows are milked shall be constructed of concrete or other approved impervious and easily cleaned material, provided that if the milk is to be pasteurized tight wood may be used, shall be graded to drain properly, and shall be kept clean and in good repair. No horses, pigs, fowl, calves, etc., shall be permitted in parts of the barn used for milking.

4r (a). Floor construction

Public-health reason.—Floors constructed of concrete or other impervious materials can be kept clean more easily than floors constructed of wood, earth, or similar materials, and are therefore more apt to be kept clean.

Satisfactory compliance.—Plans and directions for laying dairy-barn floors may be found in *Dairy Farm Improvements*, published by the Portland Cement Association, Chicago, Ill., or in United States Department of Agriculture Farmers' Bulletin No. 1342.

The floors should preferably be of concrete, but may be of other similarly impervious material. Cork bricks or creosoted wood blocks, so long as these are impervious to water and permit no pooling of liquids or wash-water, are approved. Manure gutters shall be of concrete. If the milk is to be pasteurized tight wooden floors and gutters may be permitted.

Earth floors are not approved because they are not deemed impervious.

Only such portions of milking-barn floors to which cows have access shall be required to be surfaced with impervious material. Feed alleys are included in this exemption provided that they are floored with tight wood or its equivalent and protected from washings or drainage from other parts of the barn floor.

Other portions of the barn shall be separated from the milking portion by railings or partitions. If such other portions of the barn are not kept clean and free of dust and objectionable odors, tight partitions are required; in fact, tight partitions are recommended for all cases.

It is recommended, but not required, that feed troughs be of smooth-surfaced concrete in order to facilitate bactericidal treatment when necessary.

Although it has become general practice among modern dairymen to build milking-barn floors of concrete, some dairymen still hesitate to take this step because of the fear of possible injury to their cattle. This objection is answered by the experience of the great number of dairymen who milk on concrete floors. The danger of injuries is not great enough to counterbalance the many advan-

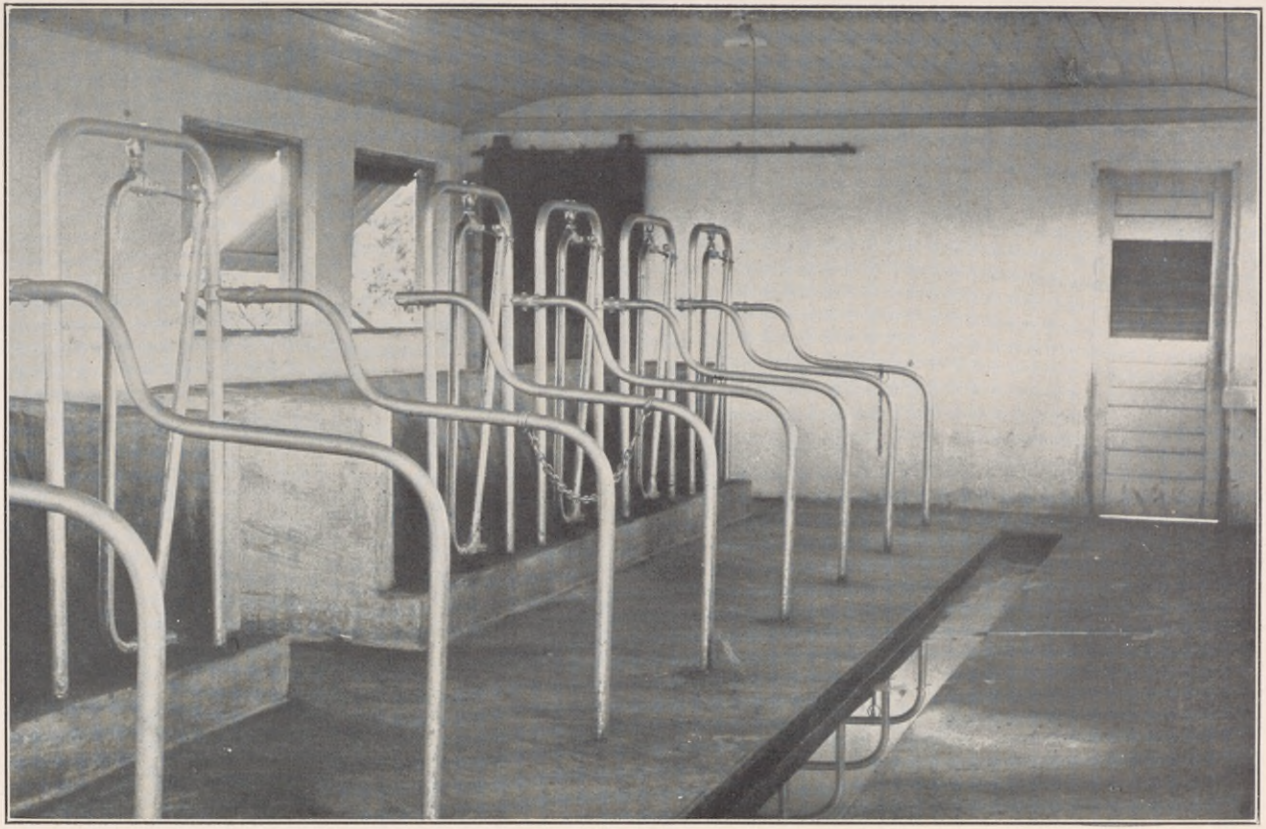


FIGURE 5.—SATISFACTORY TYPE OF MILKING BARN.

tages of a well-drained, impervious barn floor. The floor should have an untroweled surface in order to prevent slipping. When necessary to keep the cattle in the milking barn the floors may be bedded in order to prevent discomfort.

Concrete floors in barns under construction or reconstruction should have curbs where the floor joins the walls. These are desirable in order to promote cleanliness in the angles of the floor and walls and to avoid rotting of wall sills and studs.

Gutters are not technically required under the wording of this section, but they should be urged by the inspector as a means of promoting cleanliness and improving drainage.

4r (b). FLOOR CLEANLINESS

Public-health reason.—A clean floor reduces the chances of contamination of the milk or milk pails during milking. The presence of other animals increases uncleanliness.

Satisfactory compliance.—This item shall be deemed to have been satisfied if the milking-barn floor is free of accumulations of filth or litter except such as have accumulated since the beginning of the last milking period; provided that the floor must be clean at the beginning of each milking period; and if horses, pigs, fowl, calves, etc., are kept out of the milking barn.

When floors of milking barns are bedded, bedding containing more than one milking's collection of manure shall be considered as equivalent to unclean floors.

The method of cleaning is immaterial. Dairymen whose barns are provided with water under pressure should scrub the floors after each milking with a stiff-bristled brush. In barns in which water under pressure is not available the floors may be brushed dry and limed. In the latter event care should be exercised to prevent caking of the lime. If clean floors are not maintained by this method the inspector should require cleansing with water.

ITEM 5r. DAIRY BARN, WALLS AND CEILINGS

The walls and ceilings of all dairy barns shall be whitewashed once each year or painted once every 2 years, or oftener if necessary, or finished in an approved manner, and shall be kept clean and in good repair. In case there is a second story above that part of the barn in which cows are milked, the ceiling shall be tight. If the feed room adjoins the milking space, it shall be separated therefrom by a dust-tight partition and door. No feed shall be stored in the milking portion of the barn.

Public-health reason.—Whitewashed, painted, or properly finished walls and ceilings encourage cleanliness. Tight ceilings and feed rooms reduce the likelihood of dust and trash getting into the milk and thus increasing its bacterial count.

Satisfactory compliance.—This item shall be deemed to have been satisfied if the walls and ceilings—

(1) Have been whitewashed or finished with cold-water paint once every year or oftener if necessary; or

(2) Have been painted once every 2 years or oftener if necessary; or

(3) Have interior surfaces of finished concrete, concrete block, brick, tile, galvanized iron, plaster, or similar material, which may be accepted without painting; joints and rafters of the roof structure shall not be required to be whitewashed or painted, but must be kept clean; the use of wallboard attached to the rafters to make the ceiling tight shall be accepted; and

(4) Are in good condition, with ceiling tight if there is a second story above the milking portion of the barn, and with a dust-tight partition, provided with doors, separating the milking space from the feed room. No feed shall be stored in the milking portion of the barn except in covered, dust-tight bins or boxes.

It is not required that the barn have four walls extending from the floor to the roof. A shed-type barn shall be approved provided the requirements of item 4r as to animals entering the barn is satisfied. Barns newly constructed of wood shall be required to be painted or whitewashed when completed.

Whitewash formula.—The following formula for whitewash has given satisfaction:

Unslacked lime	pecks	2
Spanish whiting (barium sulphate)	pound	½
Salt	peck	1
Powdered glue	pound	1
Rice flour	do	3

Add water so that it can be applied easily and thoroughly. For full painting and whitewashing instructions, see United States Department of Agriculture Farmers' Bulletin No. 1452.

Item 6r. Dairy Barn, Cow Yard

All cow yards shall be graded and drained as well as practicable and kept clean.

6r (a). Grading and draining of the cow yard

Public-health reason.—The cow yard is interpreted to be that enclosed or unenclosed area in which the cows are apt to congregate, approximately adjacent to the barn. This area is, therefore, particularly apt to become filthy with manure droppings, and being nearest the barn, may be a public health menace through the breeding of flies. The grading and drainage of the cow yard as far as practicable are required because wet conditions are conducive to fly breeding, make it difficult to keep manure removed, and make it difficult to keep the cows clean.

Satisfactory compliance.—This item shall be deemed to have been satisfied—

(1) When the cow yard has been graded and drained as well as local conditions will permit. Low places must in all cases be filled in. Approaches to the barn door and to stock tanks should preferably be of concrete.

(2) When the wastes from the barn and milk room are not allowed to pool in the cow yard.

The most satisfactory method of conducting milking-barn wastes and wash water beyond the cow yard limit is the construction of a drain. The drain should preferably be lined with concrete, tile, or brick, although a well-kept open earth ditch shall be accepted. Open drains should be recommended because of the danger of frequent clogging of closed drains, unless closed drains of adequate diameter and slope can be provided.

Cow yards which are muddy due to recent rains should not be considered as defective.

6r (b). CLEANLINESS OF THE COW YARD

Public-health reason.—If manure and barn sweepings are allowed to accumulate in the cow yard, fly breeding will be promoted, and the cows will, because of their habit of lying down, be more apt to have manure-soiled udders.

Satisfactory compliance.—This item shall be deemed to have been satisfied if the cow yard is kept clean. Swine shall not be permitted in the cow yard.

"Resting barns" used in connection with milking parlors shall be considered part of the cow yard, and this item as applied to "resting barns" shall be deemed to have been satisfied if the manure droppings are removed or clean bedding is added at sufficiently frequent intervals to prevent the soiling of cows' udders and flanks and the breeding of flies.

ITEM 7r. MANURE DISPOSAL

All manure shall be removed and stored or disposed of in such manner as best to prevent the breeding of flies therein or the access of cows to piles thereof.

Public-health reason.—Improper manure disposal induces the breeding of flies, which are considered capable of transmitting infection to milk or milk utensils.

Satisfactory compliance.—This item shall be deemed to have been satisfied when the manure is—

(1) Spread upon the fields; or

(2) Stored for not more than 4 days in a pile on the ground surface and then spread upon the field; or

(3) Stored for not more than 7 days in an impervious floored bin or upon an impervious curbed platform, and then spread or stored in a tight, screened, and trapped manure shed; or

(4) Fly breeding is minimized by methods equivalent to the following recommendations of the United States Department of Agriculture, Bureau of Dairying, Milk Inspector Letter No. 104, May 1926:

Any program to eradicate flies from dairies should begin with the elimination of breeding places. The premises should be cleared of piles of manure and other refuse, such as spoiled silage and accumulations of wet and decaying hay and straw. Even with the utmost care flies cannot be entirely prevented from breed-

ing, and it is necessary to destroy those which do appear from undetected breeding places and the premises of neighbors. In carrying on this work, traps properly constructed and baited and the judicious use of sprays will be found helpful and not exorbitantly expensive.

The baited traps are used for catching the flies which do not bite but get their nourishment from foods they can suck through their elongated mouth parts. Most of these are the common houseflies. The spray is used to kill or repel the biting type of flies that live on blood, which they obtain by piercing the skins of animals. Stable and horn flies are examples of this type.

Last year the Bureau of Dairying, on its experimental farm at Beltsville, Md., with the cooperation of the Bureau of Entomology, made effective use of the fly-fighting measures outlined above. The premises were kept as free as possible from accumulations of manure. Box stalls were cleaned and scraped regularly. As a rule, manure was not allowed to accumulate near the buildings for more than 3 or 4 days, and an effort was made to have the immediate premises entirely freed from accumulations of manure at least once each week. Cylindrical traps like those described in Farmers' Bulletin 734 were set as soon as the first flies appeared. They were baited with blackstrap molasses from sugarcane diluted with 3 or 4 parts of water. The bait was removed once a week and the traps emptied when the accumulation of dead flies was so great as to reduce seriously the light under the trap. Before emptying the traps the living flies were killed by steaming the traps for about a minute in a steam sterilizer. During the season the 10 traps used caught 86 gallons, or approximately a half billion flies. The milk room was practically free from flies throughout the whole season.

In order to protect the cattle as much as possible from horn and stable flies a spray was used. It was thought best to apply a spray which would kill the flies rather than merely repel them.

A good killing spray may be made by suspending 5–10 pounds of unground, half-closed pyrethrum flowers (inclosed in a double-thickness cheesecloth bag) in a mixture of 9 gallons of kerosene and 4 quarts of fuel oil of 28–32 gravity. The mixture should stand 24 hours before being used. It may not kill all the flies immediately, but many flies that are hit will fly away and eventually die. Fuel oil is the ordinary low-grade oil that is burned in furnaces for heating and usually can be bought from fuel dealers. The "28–32 gravity" does not mean "specific gravity," but is a commercial term used in the oil business. If 28–32 oil is not available, use any furnace oil. Lubricating oils, including waste oils from engines, should not be used. When only small quantities of spray are required, concentrated pyrethrum extracts may be bought. These need only the addition of kerosene and fuel oil to make them effective.

To apply this extract an air-pressure sprayer was used which held about 1 gallon and could easily be operated with one hand. In spraying for horn flies an attempt was made to catch them in a cloud of vapor as they swarmed up after the first spray struck them, and this was very effective. They were easily killed by the pyrethrum extract. In applying this spray, a nozzle which will produce a very fine vapor should be used. This is facilitated by using plenty of pressure.

In spraying for stable flies, which are in most cases found sucking blood from the cows' legs, the spray was shot directly on them, usually with telling effect. Since the major part of the spray is kerosene, care was taken not to cover the cattle with it unnecessarily, and they were not curried or brushed, or turned out in the hot sun immediately after being sprayed. By observing these precautions no trouble was experienced from blistering.

Although in both seasons the horn flies had appeared in considerable numbers before the spray was used, their numbers were appreciably reduced after a week of daily spraying, and they were easily kept under control the rest of the season.

Requirements (1) to (4) shall apply only during the fly-breeding season. Manure, if stored in a pile, shall be stored in such a way as to be inaccessible to the cows.

Item 8r. Milk House or Room, Construction

There shall be provided a milk house or milk room in which the cooling, handling, and storing of milk and milk products and the washing, bactericidal treatment, and storing of milk containers and utensils shall be done. (a) The milk-house or room shall be provided with a tight floor constructed of concrete or other impervious material, in good repair, and graded to provide proper drainage. (b) It shall have walls and ceilings of such construction as to permit easy cleaning, and shall be well painted or finished in an approved manner. (c) It shall be well lighted and ventilated. (d) It shall have all openings effectively screened including outward-opening, self-closing doors, unless other effective means are provided to prevent the entrance of flies. (e) It shall be used for no other purposes than those specified above except as may be approved by the health officer; shall not open directly into a stable or into any room used or domestic purposes; shall, unless the milk is to be pasteurized, have water piped into it; shall be provided with adequate facilities for the heating of water for the cleaning of utensils; shall be equipped with two-compartment stationary wash and rinse vats, except that in the case of retail raw milk, if chlorine is employed as the principal bactericidal treatment, the three-compartment type must be used; and shall, unless the milk is to be pasteurized, be partitioned to separate the handling of milk and the storage of cleansed utensils from the cleaning and other operations, which shall be so located and conducted as to prevent any contamination of the milk or of cleaned equipment.

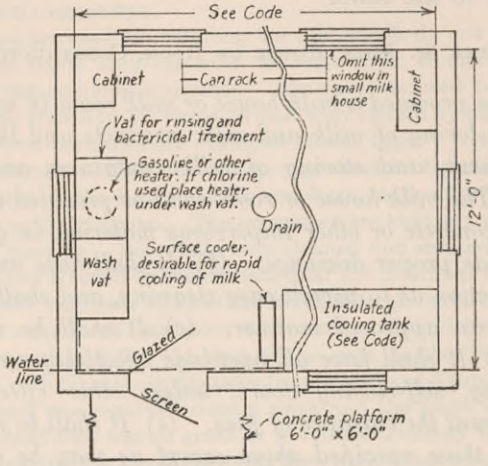
8r (a). floors

Public-health reason.—A well-drained concrete or other impervious floor promotes cleanliness.

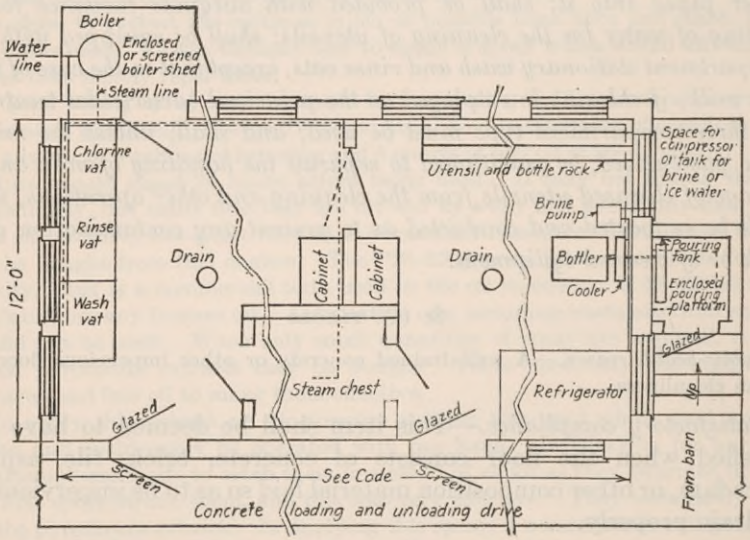
Satisfactory compliance.—This item shall be deemed to have been satisfied when the floor consists of concrete, brick, tile, asphalt-macadam, or other composition material laid so as to be impervious and to drain properly.

Drain pipes should be carefully set before the floor is laid. A grade of one-fourth to one-half inch per foot gives ample floor drainage. The finish of the floor should be as smooth as possible, and the junction of the floors and walls should be curbed and the joints rounded to avoid angles for collecting and holding dirt. If the milk house is of frame construction, all walls (including partitions) should be made of the floor material up to a height of 10 or 12 inches.

If the milk house, including the floor, was in existence when this ordinance was passed, a tight floor of tongue-and-groove flooring,



Raw-to-plant dairy.



Retail raw dairy.

FIGURE 6.—Suggested milk-house plans for raw-to-plant dairy and for retail raw dairy.

NOTES.—Floors slope ¼ inch in 1 foot toward drains. Walls concreted to at least 12 inches above floor level, and joints rounded. Doors and windows screened with 16-mesh wire. Doors self-closing. Total window and glazed-door area to be at least 10 percent of floor area.

In retail raw dairy plan, if dry heat from a gasoline or electric heater is used in bactericidal chest, same heater may be used under wash vat, thus eliminating steam boiler. Ordinance does not require both chlorine and heat treatment of utensils.

rubber composition, or sheet metal which has been painted or otherwise treated to make it waterproof, may be taken by the inspector to

comply with the specifications for the production of grade A raw milk until it needs repairs, at which time it must be covered or replaced with surfacing satisfying the previous specifications of this item.

Milk-house floors of brick or concrete in which depressions have been worn so that liquids stand in them are unsatisfactory. Smooth floors, the drainage of which is not good, are unsatisfactory. Such conditions can usually be remedied by a new covering of rich cement or fine-aggregate concrete, preferably at least 2 inches thick to avoid frequent repairs.

8r (b). WALLS AND CEILING

Public-health reason.—Construction which permits easy cleaning promotes cleanliness.

Satisfactory compliance.—This item shall be deemed to have been satisfied when all parts of the walls and ceiling, except light openings, are in good repair and composed of—

(1) Smooth-dressed lumber, sheet metal, or plaster board, well painted with washable paint; or

(2) Tile, cement blocks, bricks, concrete, or cement plaster, provided that the surfaces and joints are smooth.

The milk room should not be required to be ceiled overhead unless flies cannot otherwise be kept out, as in the case of corrugated-metal roofing, where openings under corrugations cannot easily be fly-proofed, or unless the roof construction is such that the underside cannot easily be kept clean and free of cobwebs.

The inside walls of the milk room may be approved unsheathed, provided the inside surfaces of the outer sheathing and all framing surfaces are smooth-dressed and painted. This interpretation applies to partitions also.

8r (c). LIGHTING AND VENTILATION

Public-health reason.—Ample light promotes cleanliness, and proper ventilation reduces likelihood of odors.

Satisfactory compliance.—This item shall be deemed to have been satisfied if the window space is not less than 10 percent of the floor area and light is reasonably evenly distributed, and if the milk house is adequately ventilated in the judgment of the inspector.

Milk houses in dusty locations shall be required to have glazed windows, which shall be kept closed during dusty weather.

Artificial lighting is also important. The milk house must be well lighted for periods when there is not sufficient natural light. The inspector shall consider the milk house to be adequately provided with artificial light if it is equipped with at least one 25-watt electric light or its equivalent for each 100 square feet of floor area, reasonably evenly distributed. An ordinary 1-inch-wide flat-wick oil lamp in

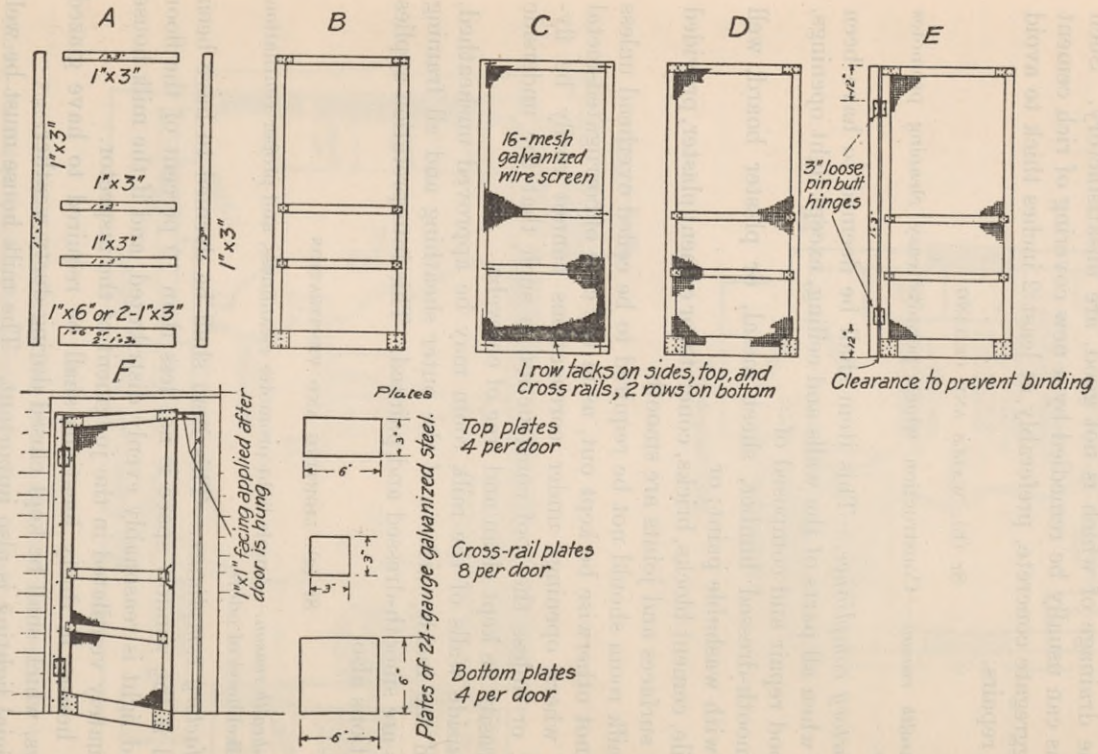


FIGURE 7.—Home-made screen door. (U. S. P. H. S. screen-door model 2.)

SCHEDULE OF OPERATIONS

1. Cut frame members as shown in sketch A.
2. Attach cover plates. All nails should clinch. Sketch B.
3. Turn door over. Insert ½- by 5-inch corrugated fasteners across joints to stiffen. Tack on screen. Two rows of tacks at bottom. Sketch C.
4. Nail cover plates over screen. Clinch nails. Sketch D.
5. Turn door screen side down and attach hinges and hanging strip. Sketch E.
6. Attach door to house to overlap opening. Sketch F. Put 1- by 1-inch facing strips along top and open side.
7. Attach good coil spring to cross member to keep door closed. Examine door for good fit.

good condition shall be considered the approximate equivalent of one 25-watt electric light. A gasoline or gas mantel lamp in good condition shall be considered the equivalent of four 25-watt electric lights.

8r (d). SCREENING

Public-health reason.—Effective screening tends to prevent the presence of flies, which are a public-health menace. Flies may infect the milk with disease germs, which may multiply and become sufficiently numerous to spread disease to the consumers.

Satisfactory compliance.—This item shall be deemed to have been satisfied if all openings are effectively screened whenever flies are evident and outer doors open outward and are self-closing, unless other effective means are provided to prevent the entrance of flies.

Broken, torn, or poorly fitted screens shall not be accepted as satisfactory compliance. Fly exclusion can be made more effective when screen doors open outward and are provided with closing devices, such as spring hinge, pulley and weight, coil spring, or similar measures. Poorly fitting doors can be provided with flaps of canvas, linoleum, or other material.

A frequently overlooked entrance for the flies is an open drain through the wall of the milk house. All such openings need to be properly screened or provided with flaps.

Screen cloth tacked on the outside of the window frames, so as to cover the openings completely, shall be approved. If the screens are exposed to stress of any kind, light bars of wood across them will prevent breaks or tears. Screen cloth coarser than 16-mesh to the inch shall not be used.

Screen doors to fit standard door frames may be purchased in most hardware stores. The screen cloth of such doors should be protected by strips of wood or by a piece of hardware cloth placed across the bottom panel, and at the level where the hands or elbows are generally placed in opening the door.

Screened milk-house extensions used for storage of utensils shall be approved as part of the milk house if provided with a tight roof and not exposed to dust. If such extensions are exposed to dust they shall be made dust proof.

8r (e). MISCELLANEOUS REQUIREMENTS

When milk or milk utensils are handled in a room used for sleeping or domestic purposes or which opens directly into a room so used, the milk is apt to be exposed to infection from persons other than regularly examined milk handlers.

The milk house or room must, in order to comply with this item, be a separate room used for no other purpose, except as may be permitted by the health officer, than the cooling, handling, and storage

of milk and milk products and the cleaning, storage, and bactericidal treatment of equipment; and these operations may not be conducted elsewhere except as subsequently noted. The health officer should permit the handling of no other products in the milk room which would be likely to create a public health hazard. Permission to handle other products should be provisional and subject to revocation if found objectionable.

The milk barn is usually infested with some flies. If the milk room opens directly into the barn, so that a door is the only barrier between it and the barn, flies are certain to enter the milk room in larger numbers. When the milk house or straining room is a part of or attached to the barn or dwelling, this part of item 8r shall be deemed to have been satisfied if there is an outside entrance but no entrance through the partition wall, or, if entered from the barn, the entrance is through self-closing doors having a vestibule between them and so arranged that both doors will not be open at the same time. Pouring milk into conductors which are protected or passing the pails of milk through self-closing openings not exceeding 4 square feet into the milk house will be considered satisfactory compliance.

The factors and conditions which should determine the location of the milk house are—

(1) Availability of water.
(2) Transportation of every bucketful of milk from the barn.
(3) Drainage.

Each milk house shall be provided with adequate facilities for the heating of water for the cleansing of utensils. The piping of water into the milk house shall be required, unless the milk is to be pasteurized.

All milk houses shall be equipped with stationary wash and rinse vats having at least two compartments, one for washing and the other for rinsing and bactericidal treatment. Both compartments shall be of sufficient size to hold the largest milk can used. These requirements apply to both grade A and grade B raw milk dairies and to both retail raw and raw-to-plant dairies. However, grades A and B retail raw milk dairies which employ chlorine as the principal bactericidal treatment must use a stationary three-compartment vat, or an equivalent combination of vats, the first compartment for washing, the second for plain rinsing, and the third for chlorine immersion, thus preventing the rapid loss of strength of the chlorine solution by organic matter and washing compound carried over from the washing compartment.

The waste water from the washing of utensils and the scrubbing of the milk house must be led away, and the surroundings of the milk room should be clean and dry. For these reasons the milk house should preferably be located where the natural drainage is

FIGURE 8.—SMALL-MOUTH MILKING PAIL OF APPROVED DESIGN.

FIGURE 9.—EXTERIOR OF MILK HOUSE.

good. Wastes from the milk room shall be disposed of as indicated for barn wastes under item 6r (*a*).

The rooms in which milk or milk products are handled and cleansed utensils are stored shall be partitioned from rooms in which other processes are conducted, but this requirement shall not apply to the production of milk for pasteurization. Such partitions shall be solid to a sufficient height to intercept splash, but the upper portion may be solid, glazed, or screened so as to be flytight. The partition shall be provided with self-closing doors. For existing milk rooms this partitioning requirement may be waived, provided the room is obviously large enough so as to preclude contamination of the milk or cleansed utensils from the washing operations.

The milk inspector may be guided by the following suggested approximate milk-house dimensions, exclusive of any space for pouring platform, boiler, compressor, or brine tank.

Suggested floor space of milk house

Milk output in gallons	Existing milk houses		Future milk houses	
	Retail raw	Raw-to-plant	Retail raw	Raw-to-plant
	Feet	*Feet*	*Feet*	*Feet*
Under 20	12 by 14	10 by 8	12 by 18	12 by 10.
20 to 50	12 by 16	10 by 10	12 by 20	12 by 12.
50 to 100	12 by 18	10 by 12	12 by 22	12 by 14.
Over 100	12 by 20	10 by 14	12 by 24	12 by 16.

See accompanying suggested designs, and also Farmers' Bulletin No. 1214.

Item 9r. Milk House or Room, Cleanliness and Flies

The floors, walls, ceilings, and equipment of the milk house or room shall be kept clean at all times. All means necessary for the elimination of flies shall be used.

Public-health reason.—Cleanliness and freedom from flies in the milk room reduce the likelihood of contamination of the milk.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) The floors, walls, windows, shelves, tables, and equipment are clean.

(2) The milk room is free of trash and articles not used in milk-room work, such as empty cap cartons, pasteboard boxes, old papers, feed sacks, broken crates or bottles, etc.

(3) Very few or no flies are present.

The milk house floors should be flushed and swept immediately after the operations incidental to each milking are completed. Tables should be scrubbed daily. Unless the boards of table tops are tight fitting they should be separated

by spaces at least three-eighths inch wide. The walls and ceiling should be flushed down as often as necessary.

Accumulations of rubbish have no place in the milk house and should be removed.

The washing vat and its surroundings should receive careful inspection. Coagulated grease is often permitted to accumulate in corners and crevices, and especially between the vat and the wall. The bottle brush and shaft are sometimes badly in need of cleaning.

Some flies inevitably enter the milk house in spite of good screening. These should be killed daily by means of flypaper, fly traps, or fly-killing sprays or powders or other means.

This item does not specifically forbid the location of gas engines in the milk room, but experience has indicated that it is extremely difficult to keep clean those milk rooms in which gas engines are located. There are also the disadvantages of heat and odor. The inspector should, therefore, advise against this practice, because if uncleanliness is later observed by him he will be obliged to report a violation of this requirement and the dairyman may be forced to relocate his machinery in order to regain his grade.

Item 10r. Toilet

Every dairy farm shall be provided with one or more sanitary toilets conveniently located and properly constructed, operated, and maintained, so that the waste is inaccessible to flies and does not pollute the surface soil or contaminate any water supply.

Public-health reason.—The organisms of typhoid fever, dysentery, and colitis are present in the body wastes of persons sick with these diseases. In the case of typhoid fever well persons (carriers) may discharge the organism in their body wastes. If a toilet is not fly tight and so constructed as to prevent overflow, infection may be carried from the excreta to the milk by flies or through the pollution of water supplies or streams in which the cows wade.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) There is one or more flush toilets connected to a sewer system or to a residential sewage-disposal plant and constructed and operated in accordance with plans and instructions of the State board of health; or

(2) A chemical toilet or pit privy or other type of privy is provided, constructed and operated in accordance with plans and instructions of the State board of health in those States permitting the use of these types of toilets; and

(3) There is no evidence of human defecation or urination about the dairy premises except in the toilets provided for these purposes.

Provided further, That (1) and (2) shall include at least the following minimum standards:

A. *Flush toilets.*—At dairy farms provided with water under pressure, flush toilets are preferable, and their installation shall conform to the local or State plumbing regulations, or in the absence of these, to good plumbing practice which shall be interpreted to mean (*a*) water

pressure at all times sufficient to fill the toilet reservoir; (*b*) toilet bowl of nonabsorbent material, rim-flush, properly vented and trapped, and with tight joints; (*c*) toilet placed in a well lighted and ventilated room which does not open directly into the milk room; (*d*) fixtures protected against freezing.

Satisfactory disposal of the effluent from such toilets should preferably be into a sanitary sewer system, otherwise treatment in a septic tank should be required and the effluent discharged into the soil. If proper soil is not available, the effluent shall be disposed of in accordance with the rules of the State board of health.

Plans for septic tanks and disposal fields are usually furnished by the State board of health or else inquiries directed there are referred to sources from which such plans may be obtained.

The following shall be considered defects in flush-toilet installations: (*a*) Insufficient water pressure or volume; (*b*) leaky plumbing; (*c*) clogged sewers as evidenced by overflowing toilet bowl; (*d*) broken tile lines or clogged disposal field; (*e*) dairy cows having access to the effluent below the sewer or disposal field discharge; (*f*) the effluent coming to the surface of the ground in the absorption field; (*g*) toilet-room floor soaked with urine or other discharges; (*h*) offensive odors or other evidence of lack of cleanliness.

B. *Chemical toilets.*—In areas where pit toilets might menace water supplies, or where a sufficient volume of water for the operation of flush toilets is not available, and where there is no statute or ordinance prohibiting its installation, the chemical toilet may be accepted, provided it (*a*) has a receiving tank of acid-resisting material with an opening easily accessible for cleaning; (*b*) has a bowl of nonabsorbent materials sufficiently elevated above the receiving basin to avoid splashing the user; (*c*) has the tank and bowl vented with at least a 3-inch screened pipe, preferably of cast iron, which extends at least 2 feet above the roof line; (*d*) has the tank charged at proper intervals with chemicals of a bactericidal nature and concentration; (*e*) is placed in a well lighted and ventilated room which does not open directly into the milk room; (*f*) has an effective method of final disposal, including burning, burial, or leaching vat or cesspool where such cesspool will not endanger any water supply.

The following shall be considered defects in a chemical toilet installation: (*a*) Violation of any of the above requirements; (*b*) disagreeable odors indicating too infrequent charging with chemicals, or inadequate concentration of chemicals in the charge; (*c*) evidence of improper disposal of the tank contents; and (*d*) lack of cleanliness in the toilet compartment and room.

C. *Pit toilets.*—For satisfactory compliance the following specifications shall apply:

(*a*) *Location.*—Pit toilets shall not be installed in cavernous or loosely stratified formations, nor in the close proximity of shallow wells. The location of the pit shall be consistent with the require-

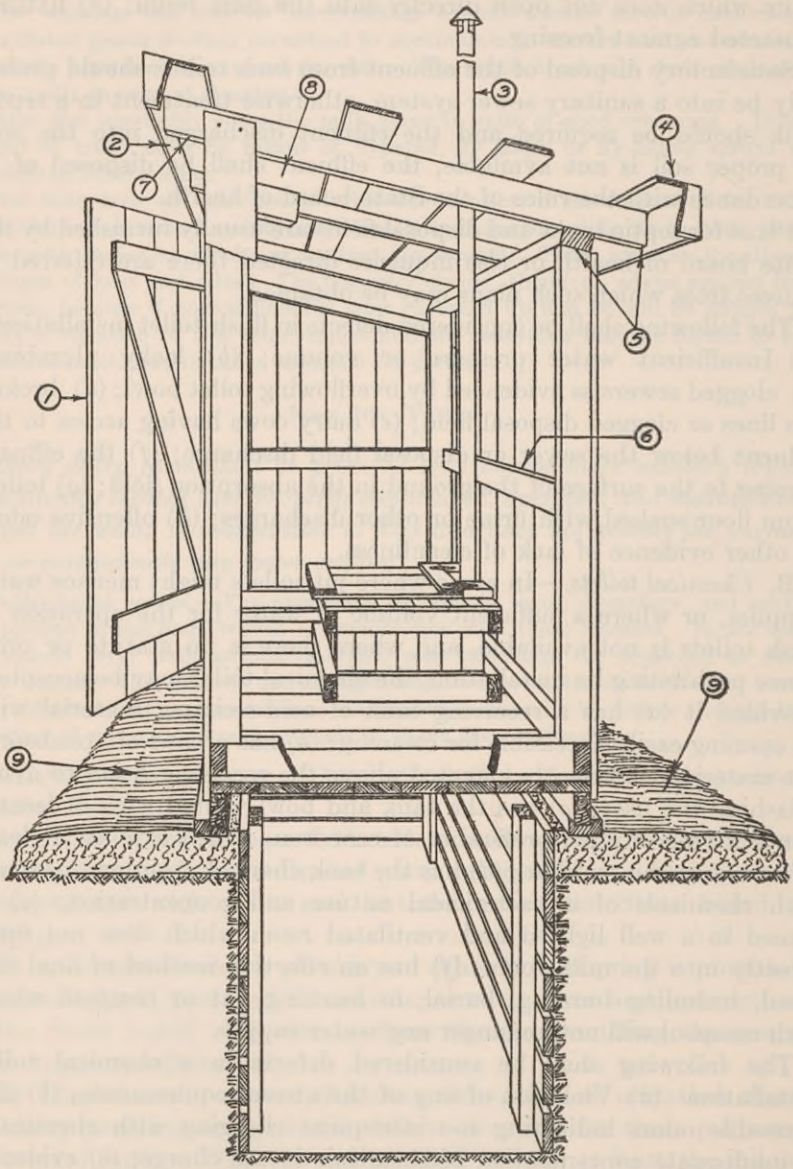


FIGURE 10.—Suggested wood-floor wood-riser pit privy with floor constructed on sills independent of curbing. (From Supplement No. 108, P. H. Reports.)

ments of item 11r. The pit should preferably be at least 50 feet distant from any well, spring, or other source of domestic water supply and if possible upon ground sloping downward from the water supply.

Distances of less than 50 feet should be permitted only upon the approval of the health authority having jurisdiction.

(b) *The pit.*—The pit shall have an original minimum capacity of not less than 60 cubic feet and shall be so excavated that the cribbing,

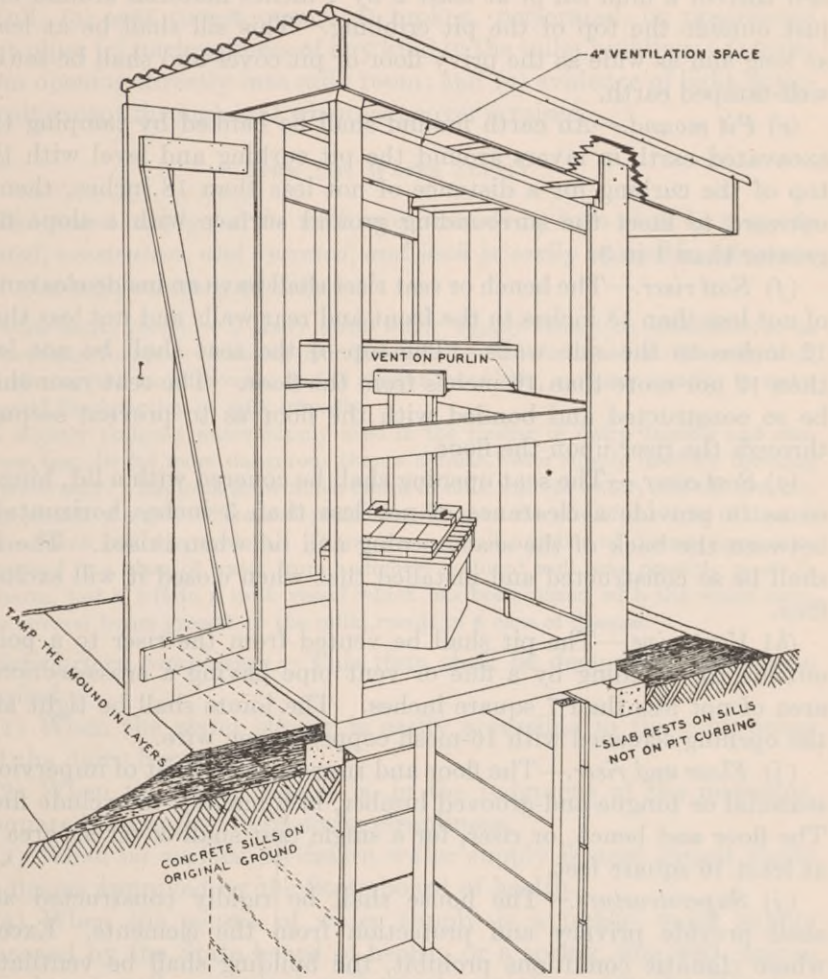


FIGURE 11.—Suggested concrete-floor concrete riser pit privy. (Revised Type No. IV of Supplement No. 108, P. H. Reports.)

when inserted, shall make a firm, uniform contact with the earth walls on all sides.

(*c*) *Pit cribbing.*—The pit cribbing shall extend to the full depth of the pit except in rock formation or in very tight soil in which cases the lower section of the cribbing may be omitted.

(*d*) *Pit curbing.*—In case of concrete or metal-slab privies, an additional collar of reinforced concrete shall be constructed around and

just outside the top of the pit cribbing on which to set the slab. This collar shall be at least 3 inches wide and extend down at least 4 inches into firm earth. In the case of wood-slab privies, if such a concrete collar is not constructed, there shall be constructed in lieu thereof a mud sill of at least 2 by 4 inches material around and just outside the top of the pit cribbing. This sill shall be at least as long and as wide as the privy floor or pit cover and shall be set on well-tamped earth.

(*e*) *Pit mound.*—An earth mound shall be banked by tamping the excavated earth in layers around the pit curbing and level with the top of the curbing for a distance of not less than 18 inches, thence outward to meet the surrounding ground surface with a slope not greater than 1 in 3.

(*f*) *Seat riser.*—The bench or seat riser shall have an inside clearance of not less than 18 inches to the front and rear walls and not less than 12 inches to the side walls. The top of the seat shall be not less than 12 nor more than 16 inches from the floor. The seat riser shall be so constructed and bonded with the floor as to prevent seepage through the riser upon the floor.

(*g*) *Seat cover.*—The seat opening shall be covered with a lid, hinged so as to provide a clearance of not less than 3 inches horizontally between the back of the seat opening and lid when raised. The lid shall be so constructed and installed that when closed it will exclude flies.

(*h*) *Vent pipe.*—The pit shall be vented from the riser to a point outside the building by a flue or vent pipe having a cross-sectional area of not less than 7 square inches. The joints shall be tight and the opening screened with 16-mesh copper screen wire.

(*i*) *Floor and riser.*—The floor and riser shall be built of impervious material or tongue-and-grooved lumber, in a manner to exclude flies. The floor and bench, or riser, for a single unit shall cover an area of at least 16 square feet.

(*j*) *Superstructure.*—The house shall be rigidly constructed and shall provide privacy and protection from the elements. Except where climatic conditions prohibit, the building shall be ventilated by leaving a 4-inch opening at the top of the walls just beneath the roof. The building should preferably be covered with a single-plane roof having a pitch of 1 in 4 and with an overhang of not less than 5 inches front, 13 inches back, and 9 inches on each side, with a facing board not less than 4 inches wide extending around the entire margin of the roof.

(*k*) *Drain board.*—In order to deflect rainfall from the rear of the house foundation a drain board at least 30 inches wide shall be placed at an angle of approximately 45° at the rear base of the building and in such manner as to extend beyond the edge of the roof; or, in lieu

thereof, the roof may be provided with a gutter with the discharge end extending not less than 18 inches beyond the edge of the roof.

(*l*) *Maintenance and operation.*—The following shall be considered defects in pit-toilet installations: (*a*) Evidence of caving around the edges of the pit; (*b*) signs of overflow or other evidence that the pit is full; (*c*) seat covers open; (*d*) broken, perforated, or unscreened vent pipe; (*e*) uncleanliness of any kind in the toilet building; (*f*) toilet room opening directly into milk room; and (*g*) evidence of light entering pit except through seat when seat cover is raised.

Item 11r. Water Supply

The water supply for the milk room and dairy barn shall be properly located, constructed, and operated, and shall be easily accessible, adequate, and of a safe, sanitary quality.

Public-health reason.—A dairy farm water supply should be accessible so as to encourage its use in cleansing operations; it should be adequate so that cleansing and rinsing will be thorough; and it should be of safe, sanitary quality in order to avoid the infection of milk utensils.

A slightly polluted water supply used in the rinsing of dairy utensils and containers may be far more dangerous than a similar water supply used for drinking purposes only. Bacteria grow much faster in milk than in water, and the severity of an attack of a given disease depends largely upon the size of the dose of disease germs taken into the system. Therefore, a small number of disease organisms consumed in a glass of water from a slightly polluted well may possibly result in no harm, but if left in a milk vessel which has been rinsed with the water may, after several hours growth in the milk, result in a case of disease.

Satisfactory compliance.—This item shall be deemed to have been satisfied—

(1) When the water supply is easily accessible to the milk house and the dairy barn.

(2) When the water supply is, in the judgment of the inspector, adequate in quantity to promote cleanliness.

(3) When no surface or cistern water supply is used except under conditions approved by the State board of health.

(4) When the source of water supply is a public water supply approved by the State board of health, or a spring, dug well, driven well, bored well, or drilled well which complies with the following specifications; provided that items (*c*), (*f*), and (*j*) shall be required only for water-supply structures which are installed subsequent to the first inspection based upon these requirements.

(5) When there is no connection between the safe water supply and an unsafe water source through which it is possible to contaminate the safe water supply.

At least one inspection shall be made each grading period to determine whether the location, construction, and operation of the supply

comply with the specifications which follow. Bacteriological results on samples of water shall comply with the United States Treasury standards for drinking water.

(*a*) *Privies, etc., near wells.*—Every well or spring shall be located in such manner that neither underground nor surface contamination

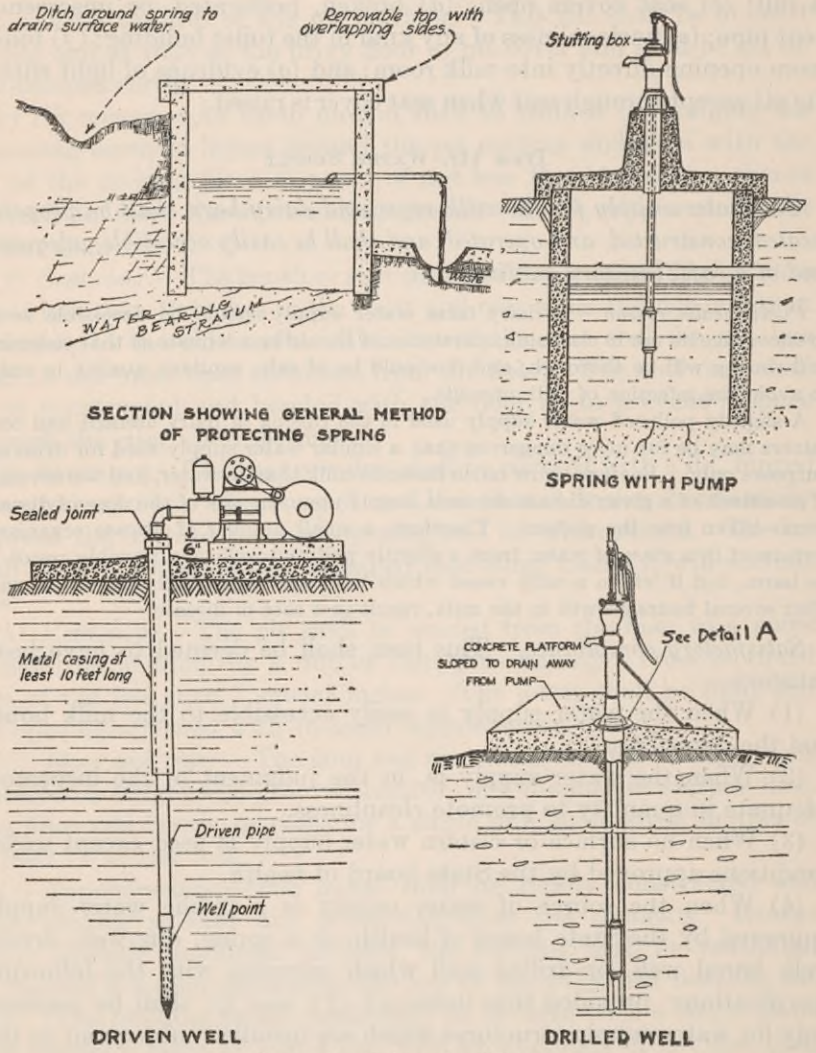


FIGURE 12.—Spring and well designs.

from any cesspool, privy, or other possible source of pollution can reach such water supply. The horizontal distance from any such possible source of pollution shall be not less than 50 feet, except as provided under (*b*). If bacteriological examinations or other evidence indicate pollution, the distance shall be increased or the location of the water supply changed to meet these specifications.

(*b*) *Sewers near wells.*—No floor drain, soil pipe, main drain, or other pipe which is directly connected to a storm or sanitary sewer, or through which water or sewage from any source may back up, shall be located nearer than 10 feet to any well. All pipes and drains or parts thereof through which sewage or waste water flows, or into which sewage or waste water may back up, which are located within 50 feet

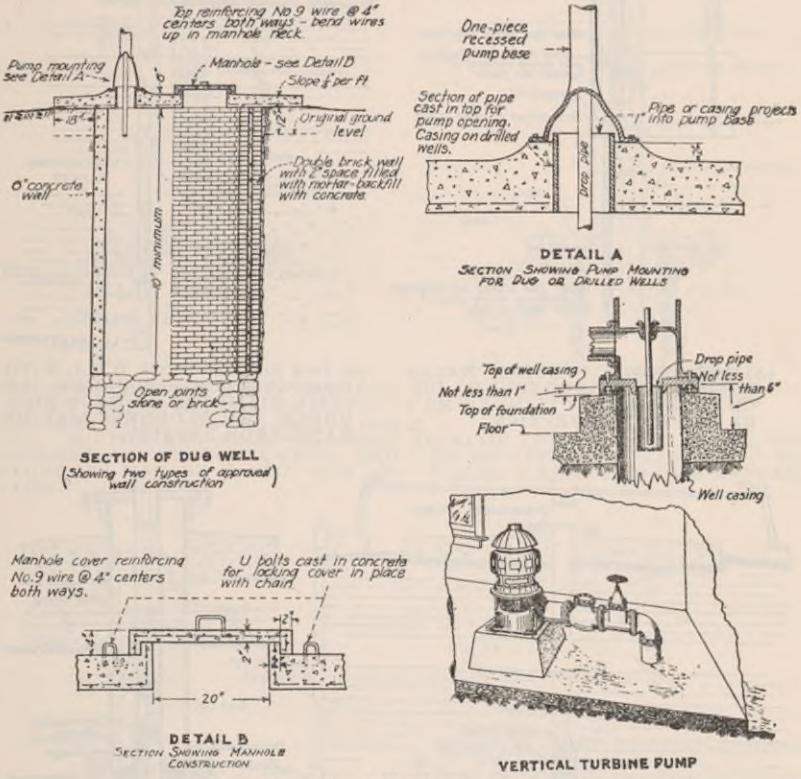
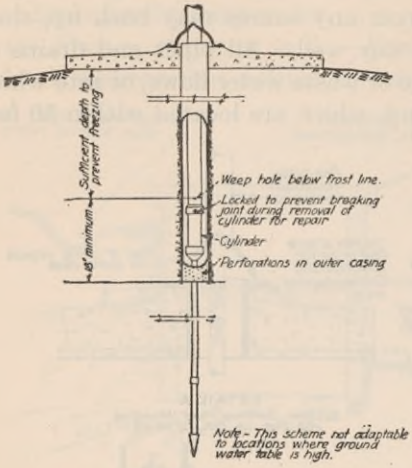


FIGURE 13.—Spring and well designs.—Continued.

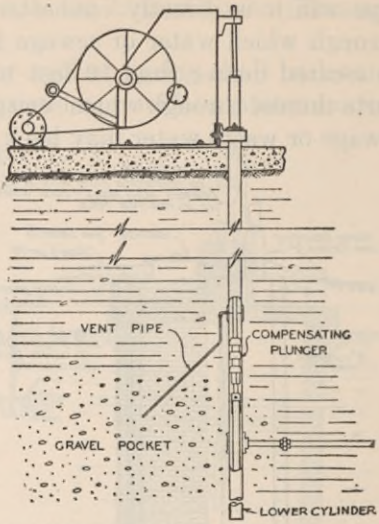
of any such water supply or more than 10 feet from any well, shall be constructed of cast-iron pipe with leaded joints.

(*c*) *Sewers near water lines.*—No water pipe shall be closer than 10 feet, measured horizontally, to any sewer or drain which may at any time contain polluted water, provided that water pipes and sewers or drains may cross each other at distances less than 10 feet if the water pipe is above the sewer or drain, and if such parts of the sewer or drain lying within 10 feet horizontally of the water pipe are constructed of cast-iron pipe with leaded joints.

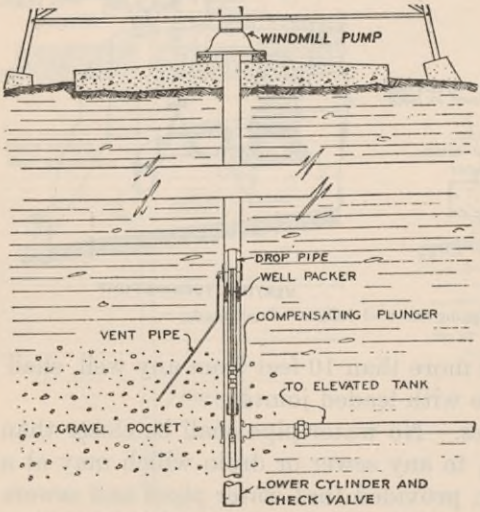
(*d*) *Leakage from toilets and sewers.*—No toilet, sewer, soil pipe, or drain shall be located over or where leakage therefrom can reach any water storage basin, reservoir, source of water supply, or pump room.



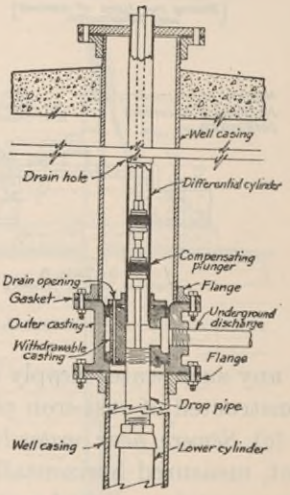
(A) FOR SINGLE TUBULAR WELLS WITHOUT UNDERGROUND DISCHARGE LINES. CYLINDER MAY BE RAISED FOR REPAIRS.



(B) FOR SINGLE DROP WELL WITH COMPENSATING PLUNGER OF SAME DIAMETER AS DROP PIPE. CHECK AND PLUNGERS MAY BE RAISED FOR REPAIRS.



(C) FOR SINGLE DROP WELL WITH COMPENSATING PLUNGER REDUCED IN DIAMETER (THUS REDUCING UPWARD THRUST, TO AVOID BUCKLING WINDMILL ROD.) CHECK AND PLUNGERS MAY BE RAISED FOR REPAIRS.

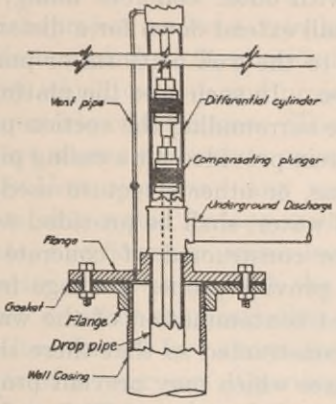


(D) FOR WELL WITH DROP PIPE AND CASING AND EXPANDED LOWER CYLINDER. SPECIAL WITHDRAWABLE CASTING USED IN CASING SO THAT DROP PIPE AND EXPANDED CYLINDER MAY BE RAISED FOR REPAIRS.

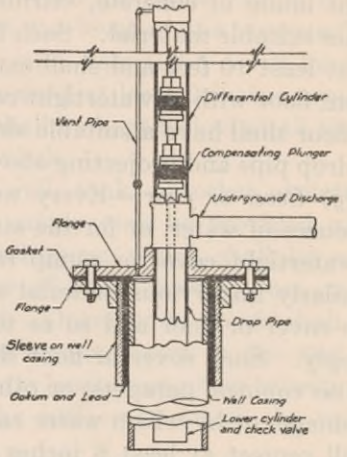
FIGURE 14.—Well designs for elimination of frost pits.

(*e*) *Pits near water supply.*—There shall be no pit or unfilled space below ground surface level, any part of which is within 10 feet of such water supply.

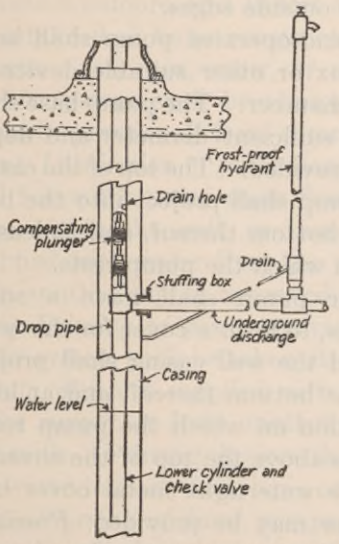
(*f*) *Well casing or lining.*—All that part of the suction pipe or drop pipe of any well within 10 feet of and below the ground surface shall be



(E) FOR WELL WITH DROP PIPE AND CASING AND LOWER CYLINDER NOT LARGER THAN DROP PIPE. DROP PIPE SUPPORTED FROM FLANGES SCREWED TO CASING. CHECK AND PLUNGERS MAY BE RAISED FOR REPAIRS.



(F) SAME AS (E), EXCEPT SHOWS METHOD OF APPLYING FLANGES TO WELL CASING WHERE CASING IS BATTERED.



G) ALTERNATE TO METHOD (E) USING STUFFING BOX. CHECK AND PLUNGERS MAY BE RAISED FOR REPAIRS.

NOTES ON FIGS. 11 AND 12

Type (A) is without underground discharge, (B) to (G) with underground discharge.

Types (A), (B), (C) not adaptable to locations where ground water table is above frost line.

Drain hole in (A) and (D) and junction of vent pipe with well in (B), (C), (E), and (F) should be located below frost line.

Highest point at which ground water may enter well should be at least 10 feet below surface of ground, as at perforations in casing in (A), lower end of vent pipe in (B) and (C).

FIGURE 15.—Well designs for elimination of frost pits—Continued.

surrounded by a water-tight casing pipe extending above the ground, platform, or floor surface, as the case may be, and covered at the top as herein provided. If a well has a lower casing disconnected from the upper casing required as aforesaid, such lower casing shall be cut

off at least 10 feet below the ground surface, and the top of the casing shall be closed with a suitable watertight cover and shall be covered with a compact earth fill so that there shall be no depression at the ground surface above the casing top: *Provided*, That a dug well, in lieu of such casing pipe, may be provided with a substantial watertight lining of concrete, vitrified tile with outer concrete lining, or other suitable material. Such lining shall extend down for a distance of at least 10 feet and shall extend up to the well platform or pump room floor with a watertight connection. In such case the platform or floor shall have a suitable sleeve pipe surrounding the suction pipe or drop pipe and projecting above as herein provided for a casing pipe.

(*g*) *Cover or floor.*—Every well, spring, or other structure used as a source of water, or for the storage of water, shall be provided with a watertight cover or pump room floor constructed of concrete or similarly impervious material so as to provide proper drainage from the cover or floor and so as to prevent contamination of the water supply. Such cover or floor shall be constructed so that there shall be no copings, parapets, or other features which may prevent proper drainage, or by which water can be held on the cover. Well casings shall project at least 6 inches above the top of this cover or floor, except as noted in (*h*), and the cover or floor shall slope away from a well casing or suction pipe in all directions, and shall be at least 6 inches above the ground surface at the outside edges.

(*h*) *Pump head and base.*—Every hand-operated pump shall have the pump head closed by a stuffing box or other suitable device to exclude contamination from the water chamber. The pump base shall be of solid one-piece recessed type of sufficient diameter and depth to admit the well casing as hereinafter provided. The top of the casing of every well equipped with such a pump shall project into the base of the pump at least 1 inch above the bottom thereof, and at least 1 inch above the level of the platform on which the pump rests.

(*i*) *Power-pump base.*—Every power pump shall have a solid, watertight metal base without openings, to form a cover for the well, recessed to admit the well casing, and the well casing shall project into the base at least 1 inch above the bottom thereof, and at least 1 inch above the level of the foundation on which the pump rests, which in turn shall be at least 5 inches above the top of the cover or floor, or in lieu of such base a separate watertight metal cover into which the casing projects in like manner may be provided: *Provided*, That the base or cover may have an air vent constructed as hereinafter prescribed.

(*j*) *Drainage.*—No wellhead, well casing, pump, pumping machinery, valve connected with the suction pump, or exposed suction pipe shall be located in any pit, room, or space extending below ground level, or in any room or space above the ground which is walled in or other-

wise enclosed so that it does not have free drainage by gravity to the surface of the ground: *Provided*, That this shall not apply to a dug well properly constructed, lined, and covered as herein prescribed.

(*k*) *Manholes.*—Manholes may be provided on dug wells, reservoirs, tanks, and other similar features of water supplies. Every such manhole shall be fitted with a watertight collar or frame having edges which project at least 2 inches above the level of the surrounding surface, and shall be provided with a solid watertight cover having edges which overlap and project downward at least 2 inches around the outside of the frame. The cover shall be kept locked at all times except when necessary to open the manhole.

(*l*) *Vent openings.*—Any reservoir, well, tank, or other structure containing water for any such water supply may be provided with vents, overflows, or water-level control gages, which shall be constructed so as to prevent the entrance of birds, insects, dust, rain, snow, or other contaminating material. Openings on vents shall be not less than 2 feet above the floor of a pump room or the roof or cover of a reservoir. Openings on vents located on other structures shall be not less than 2 feet above the surface on which the vents are located.

(*m*) *Air-lift systems.*—The air intake for any air-lift system or mechanical aerating apparatus shall be at least 6 feet above the floor surface if indoors, and 10 feet above the ground if out of doors. The air intake shall be so constructed as to prevent the entrance of birds, insects, dust, rain, snow, or other contaminating material. Every air-lift system shall be equipped with effective oil traps, tanks, or filters to prevent oil from entering the water.

(*n*) *Lubrication of pump bearings.*—Pump bearings situated in any well below the pump-room floor shall be lubricated with water taken from within the well, or from the reservoir or distribution system supplied with water from the original source of the water supply, or from another supply approved by the State board of health.

(*o*) *Priming of power pumps.*—Water for priming pumps on any water system shall be taken directly from the reservoir or distribution system which is supplied with water from the original source of the water supply or from another supply approved by the State board of health. Priming devices shall be so constructed as not to expose the water to dust, drippings, or other sources of contamination.

(*p*) *Priming of hand pumps; buckets.*—No hand-operated type of pump or cylinder which requires priming shall be used. No pail and rope, bailer, or chain-bucket systems shall be used.

(*q*) *Disinfection of water supplies.*—New water supplies and water supplies which may have become contaminated accidentally or otherwise shall be thoroughly disinfected before being placed in use. Disinfection shall consist of passing a chlorine solution through all

of the units until a chlorine residual of at least one p. p. m. is in evidence at all of the outlets, and the water supply meets the requirements of this ordinance.

Suggested designs.—The accompanying designs of springs and wells are intended merely as suggestions, and not to indicate mandatory details, except as the details shown are made mandatory by the foregoing specifications.

ITEM 12r. UTENSILS, CONSTRUCTION

All multi-use containers or other utensils used in the handling, storage, or transportation of milk or milk products must be made of smooth nonabsorbent material and of such construction as to be easily cleaned, and must be in good repair. Joints and seams shall be soldered flush. Woven wire cloth shall not be used for straining milk. All milk pails shall be of small-mouth design approved by the health officer. The manufacture, packing, transportation, and handling of single-service containers and container caps and covers shall be conducted in a sanitary manner.

Public-health reason.—Milk containers and other utensils not having flush joints and seams, smooth, easily cleaned, and accessible surfaces, and not made of durable, not readily corrodible material are apt to harbor accumulations in which undesirable bacterial growth is produced. Single-service containers, etc., which have not been manufactured and handled in a sanitary manner may contaminate the milk.

Milk pails of small-mouth design, sometimes known as the hooded milk pail, decrease the chance of hairs, dust, chaff, and other undesirable foreign substances getting into the milk at the time of milking.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) All multi-use containers, utensils, and other equipment are constructed of smooth heavy-gage material with a not readily corrodible surface, of a shape that will make cleaning easy, and with all joints and seams soldered flush.

(2) All multi-use containers, utensils, and other equipment are in good repair, free of breaks and corroded places.

(3) Woven wire cloth milk strainers are not used.

(4) All milk pails are of an approved small-mouth design.

(5) All single-service containers, etc., comply with the requirements of item 10p.

The use of agateware or unsubstantial milking pails is not acceptable. The enamel of agateware is subject to chipping, and many unsubstantial pails rarely have the seams filled with solder, and in addition rust easily.

Some so-called small-mouth milking pails are merely open-top pails with a wide lip covering about one-fourth of the top. These are not

satisfactory, since the opening should not be more than one-third of the area of the top of an open-top pail of the same size. Some patented small-mouth pails are designed to hold a strainer cloth. These shall be approved, provided the construction does not include wire screen cloth and the pails meet the other specifications of this item.

Milking into small cups and pouring into pails shall not be approved. If milking machines are used and stripping is done by hand, small-mouth pails shall be used.

All milk cans should preferably have umbrella-type covers.

Item 13r. Utensils, Cleaning

All multi-use containers, equipment, and other utensils used in the handling, storage, or transportation of milk and milk products must be thoroughly cleaned after each usage.

Public-health reason.—Milk cannot be kept clean in contact with unclean milk vessels and utensils.

Satisfactory compliance.—This item shall be deemed to have been satisfied when all multi-use containers, utensils, milking-machine pails and tubing, separator parts, bottlers, cappers, bottle crates, and other equipment used in the cooling, handling, storage, or transportation of milk and milk products are thoroughly cleaned after each milking. Unless bottles, equipment, and utensils are clean to the sight and touch, this item shall be deemed to have been violated.

Item 14r. Utensils, Bactericidal Treatment

All multi-use containers, equipment, and other utensils used in the handling, storage, or transportation of milk or milk products shall between each usage be subjected to an approved bactericidal process with steam, hot water, chlorine, or hot air.

Public-health reason.—Mere cleansing of containers, equipment, and utensils does not insure that all disease organisms which may have been present will have been removed or destroyed. Even very small numbers thus remaining may grow to dangerous proportions in the milk, since many kinds of disease bacteria grow rapidly in milk.

For this reason all milk containers, equipment, and utensils must be treated with a bactericidal agent between each usage.

Satisfactory compliance.—A bactericidal process is the application of any method or substance for the destruction of bacteria which, in the opinion of the health officer, does not adversely affect the equipment or the milk or milk products or the health of the consumer, and which is effective.

This item shall be deemed to have been satisfied if all milk containers, utensils, strainer cloths, and other equipment have been:

(1) Exposed for at least 15 minutes to at least 170° F. or for at least 5 minutes to at least 200° F. in a steam cabinet equipped with an indicating thermometer located in the coldest zone; or

(2) Exposed to a jet of steam for at least 1 minute; or

(3) Immersed in or exposed to a flow of a chlorine solution of approved strength for at least 2 minutes. (For *Approval strength of chlorine solutions* see p. 69); or

(4) Immersed in hot water at 170° F. or more for at least 2 minutes, or exposed to a flow of hot water at 170° F. or more (at the outlet) for at least 5 minutes; or

(5) Exposed to hot air at a temperature of at least 180° F. for at least 20 minutes in a properly designed oven or hot-air cabinet equipped with an indicating thermometer located in the coldest zone.[17]

The inspector should satisfy himself that the efficiency of the process is such as to produce bottles and cans having a residual bacterial plate count of not more than one per cc. of capacity.

Any equipment touched by the inspector shall be again subjected to bactericidal treatment before being used.

CABINETS WITH AUXILIARY STEAM BOILERS

For medium-sized and large dairies this is the most satisfactory *type* of steam cabinet. Everything considered, the most satisfactory construction *material* is wood or metal. A wood cabinet is less durable than one of concrete, brick, or hollow tile, but is, on the other hand, both cheaper to build and cheaper to operate. A metal cabinet is somewhat more expensive to build, but is about as cheap to operate as a wood cabinet.

In the case of concrete, brick, or hollow-tile cabinets, care must be taken to see that the boiler is large enough to provide the extra amount of steam required to offset the greater amount of heat absorbed by the walls of these materials.

The *size* of cabinet must be determined by each individual dairyman to suit his conditions. He must first decide whether he wishes to use it once a day or for each milking. If the former, his cabinet must be large enough to accommodate all utensils and containers used in a day's operation. The best method of determining the size is to stack together all articles to be treated at one time and thus determine the required cabinet dimensions. Care should be taken to allow for any immediately expected expansion of business, but an excessively large design which would be wasteful of steam should be avoided.

The cabinet may be very simply constructed of 2- by 4-inch framing, sheathed inside and out with tongue-and-groove lumber. Local builders or carpenters should be consulted as to the kind of locally available wood which will best withstand moisture and as to the advisability of using narrow flooring for inside sheathing to prevent warping. The inside surface may be painted or lined with metal, wallboard, or asbestos board, as may be preferred.

The *floor* may be of any wear-resisting material and should be sloped for proper drainage. A drain pipe should be provided for the escape of water of condensation.

The *door* should be substantially constructed so as to withstand warping, and should fit snugly, but allowance must be made for swelling.

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[17] See Frank, L. C., and others, Studies of the bactericidal treatment of milk cans in hot-air cabinets Public Health Reports, 1938, *53*: 329. Reprint No. 1912.

The principal advantage to be sought in connection with the *location* of the cabinet is that it shall open conveniently into the milk room. The milk room and the cabinet should not be separated by an unscreened or uncovered space, as this causes milk-room equipment to be unnecessarily exposed to flies and dust. However, since a considerable number of cabinets have already been so located with the approval of the local inspector, such location for cabinets already constructed shall be approved.

The size of *boiler* needed depends upon the size of cabinet to be heated and upon the material of which it is made. In general, the following scale of horsepower will hold for brick, concrete, or hollow-tile cabinets:

Size of cabinet	Boiler horsepower
2½ by 2½ by 4½ feet	2
4 by 4 by 4 feet	4
5 by 5 by 5 feet	5
6 by 6 by 6 feet	6

For cabinets constructed of wood or sheet iron approximately half the above boiler horsepower will be required. The admission of steam into the cabinet is simple. The steam line should enter the cabinet near the bottom, and the steam preferably be permitted to discharge through a number of outlets. The pipe line between boiler and cabinet should preferably be insulated.

Steaming should proceed about as follows: Store all containers (bottles, pails, and cans in an inverted position) and other equipment in the cabinet, taking care that no article is closer than 6 inches to the floor. Raise steam to full pressure in the boiler and then admit steam to the cabinet slowly. Do not open the steam valve wide, as this may carry over boiler water and reduce boiler efficiency. Maintain steam flow sufficiently long to keep the thermometer reading above 170° F. for 15 minutes, or above 200° F. for 5 minutes.

CABINETS WITH STEAM GENERATED IN BOTTOM

For small-sized dairies a satisfactory device consists of a metal cabinet located over a direct flame (grate fire, kerosene, or gasoline burner, etc.). The cabinet consists of a galvanized or other not readily corrodible sheet-metal tank large enough to hold all articles which it is desired to treat. (Size to be determined as previously described.) A drain cock should be located at such distance above the bottom so as to leave three-fourths inch of water. The tank should be provided with a false bottom or rack. The cover should be tight-fitting.

The cover or one of the sides of the cabinet may be provided with a small flanged opening into which should be plugged a stem thermometer reading to 212° F. or higher (see suggested specificatons below). The heating unit may consist of a simple grate and flue, or of gas or liquid-fuel burners. Some dairymen are using a 3-burner oil or gasoline stove.

The operation of the cabinet is simple. The cabinet is generally filled with sufficient water for washing purposes. This is heated to the desired temperature for washing, and then drained off to the level of the cock. After being washed all articles to be treated are placed in the cabinet, the lid replaced, and the remaining water kept at a boil for such period as will keep the thermometer reading above 170° F. for at least 15 minutes, or 200° F. for 5 minutes.

SUGGESTED SPECIFICATIONS FOR INDICATING THERMOMETERS FOR STEAM AND HOT-AIR CABINETS

Type.—Metal scale case, mercury actuated, regular angle or straight style.

Magnification of mercury column.—To apparent width of not loss than one-sixteenth inch.

Scale range.—130° F. to 220° F. with extension on either side permissive.

Temperature represented by smallest scale division.—Not more than 2° F.

Number of degrees per inch of scale.—Not more than 32.

Accuracy.—Within 2° F., plus or minus, between 150° F. and 212° F.

Stem.—Two inches long beyond face of flange for single-thickness metal sterilizers; 8 inches long for walls not over 6 inches thick.

Stem fitting.—Iron or other metal floor flange.

STEAM JETS

Steam jets are sometimes used by producers delivering to pasteurization plants, particularly where milk is delivered without cooling, thus limiting articles to be treated to pails, cans, and strainers. Jets, properly constructed and operated, will bring the equipment to a considerably higher temperature than is generally true of steam cabinets, and for this reason the shorter exposure period of 1 minute is approved.

Sometimes the following arrangement is used in place of a standard boiler. A 50-gallon barrel is connected to a coil or jacket water heater. A check valve is placed in the pipe between the barrel and the heater in order to prevent the steam blowing back through the barrel. A water trap, consisting of a 12-inch length of 4-inch pipe, is located in the line between the heater and the jet, a return drain connecting the trap with the water pipe leading to the heater. The water trap should be located above the top of the barrel. A simple pop valve is located in the top of the water trap, the exhaust from the pop valve leading back into the water barrel near the bottom. A throttle valve is located just behind the steam jet. The jet nozzle is simply a one-fourth-inch nipple connected by means of a reducer to the main steam line. The whole equipment can be set up for about $20 to $25.

In operation the barrel is filled and the throttle closed. Then a hot fire is built in the heater. When the pop valve blows (it should be set for about 20 pounds pressure) the outfit is ready for use.

In using the steam jet care must be taken that each article is kept over the jet for at least 1 minute. Before removing any article it must be so hot that it is impossible to handle it with the bare hands. If crates of bottles are treated by a steam jet the steam must emerge from a perforated plate the size of the crate, so that it will be uniformly distributed, and the crate must be covered with a tight hood to confine the steam. (See Farmers' Bulletin No. 1675.)

TREATMENT WITH CHLORINE SOLUTION

Method.—It is possible to treat bottles and pails with chlorine solution without special apparatus, simply by filling the last compartment of the washing vat with water containing chlorine solution of standard strength, and by fully submerging each article to be treated for at least 2 minutes.

The principal objection to this method is that it is difficult to make sure that air will not be trapped in some of the bottles, and that there is a temptation to place so many bottles in the tank as to have some of them protrude above the surface of the solution. To meet this objection the Minnesota State Board of Health has suggested the following method:

"As the bottles are washed by hand, revolving brushes, or by machine, they are placed in the crates in an inverted position. A wooden or metal perforated cover or grate is placed over the top of the crate of washed bottles. The crate is then inverted and submerged in the solution, the cover being held in place by gripping it to the top of the crate at both ends with the hands. While the crate is in the solution it is in an inverted position, but the bottles are upright.

"When another crate of bottles has been washed, the crate in the solution is taken out, turned right side up, and drained. The cover is then placed on the freshly washed crate of bottles, and it is inverted and submerged.

"If the cover is not constructed so as to allow the fingers to be easily inserted under it when in the solution, metal rods should be placed on the bottom of the tank so as to keep the cover off the bottom. Where the tank is large enough, 2 crates of bottles should be kept submerged, thus allowing each crate to be subjected to the solution for twice as long as it takes to wash 1 crate of bottles. Two covers will then be necessary."

Crates should be washed before immersion in the solution.

Chlorine bactericides.—There are several bactericides which may be used by the industry in complying with this ordinance. These consist generally of calcium hypochlorite, sodium hypochlorite, or certain chloramine solutions.

Calcium hypochlorite (chlorinated lime) is a chemical compound used as a disinfectant for public water supplies, and is also used in laundries as a bleaching agent. It can be obtained from drug supply houses in 12-ounce cans at about 15 cents per can, or less if purchased in larger quantities. A can should supply the needs of the average dairy about 1 week.

The most satisfactory method of preparation is to make a smooth watery paste of 12 ounces of calcium hypochlorite, adding the water in very small quantities at first, and bringing the final volume of this stock solution to 1 gallon. This solution should be kept tightly stoppered in a cool dark place. An earthenware or brown glass jug is a satisfactory container. One tablespoonful of this stock solution to each gallon of rinse water will make a solution of approximately 100 p. p. m. of available chlorine, which will not be so strong as to injure hands or udders. A fresh stock solution should be made every 10 days and any old solution thown away, or used to deodorize privies, etc.

A highly concentrated calcium hypochlorite is now available which is more stable and more soluble than ordinary chlorinated lime.

Solutions of sodium hypochlorite are on the market under various trade names. These have usually been found to be as strong as the stock chlorinated-lime solutions when prepared as above directed. Unless otherwise instructed by the inspector, these commercial preparations of sodium hypochlorite should be made up in the proportion of one tablespoonful per gallon of rinse water.

Approved strength of chlorine solutions.—Sodium or calcium hypochlorite solutions used as bactericidal rinses on dairy farms and at milk plants must be discarded when the strength is reduced to 50 parts per million of available chlorine. Hypochlorite solutions employed as bactericidal sprays must be made up to an initial concentration of sufficient strength so that the excess which runs off or collects in the equipment contains at least 50 parts per million.

Solutions made from compounds containing chloramine or chloramine-T have a slower bactericidal action than hypochlorites containing equal concentrations of available chlorine. The former must, therefore, be made up to a sufficiently greater strength to produce a

bactericidal effect within the required exposure period equivalent to that of the above hypochlorite concentration. The chloramine and chloramine-T concentration necessary will vary with the different compounds.

Chlorine solutions once used shall not be reused for bactericidal treatment on any succeeding day, but may be reused for other purposes.

The health officer shall satisfy himself by frequent test that the chlorine solutions being used are of the required strength. The following test suitable for this purpose has been devised by the Sanitation Section of the United States Public Health Service.

Test for chlorine strength.—The test makes use of the fact that when the proper amount of o'tolidin is added to a chlorine solution containing 20 parts per million or more a precipitate is formed, except that in the case of certain chloramines the solution becomes cloudy at chlorine concentrations having a 2-minute bactericidal strength equivalent to at least the bactericidal strength of 20 parts per million of available chlorine in the form of hypochlorite.

The testing outfit consists of two test tubes $\frac{7}{16}$ by 4 inches, one of which contains o'tolidin.[18] The other is fitted with a medicine dropper and is used for testing the chlorine solution. It is etched at the 2 cc. and 5 cc. levels so as to make possible the dilution of the solution to be tested to two-fifths of its original strength, thus diluting an original solution of 50 parts per million or more to one of 20 parts per million or more, which, as above stated, is the critical point for the formation of the precipitate when hypochlorites are tested.

Before any tests are made with the apparatus the medicine dropper should be tested to determine whether it delivers drops of the proper size. To do this, simply count the number of drops required to fill to the first mark of the testing tube. If the number required lies between 30 and 50 the dropper is satisfactory. If not, discard it and secure one of the proper size.

The test procedure is as follows:

(1) Rinse the testing tube and its dropper thoroughly with clean water.

(2) Fill the testing tube to the lower mark with the chlorine solution to be tested, using the dropper for this purpose. (Avoid including floating particles.)

(3) Fill to the second mark with clean water, using the dropper for this purpose.

(4) Add 1 drop of o'tolidin.

(5) Hold the upper part of the testing tube firmly with one hand and tap the lower end of it sharply 50 times with one or two fingers of the other hand.

(6) If, in the case of hypochlorites, reddish or brownish particles separate out within 5 minutes, the solution tested contains at least 50 parts per million of available chlorine. If, in the case of certain chloramines the solution becomes cloudy within 5 minutes, the solution tested has a bactericidal strength for a 2-minute exposure equivalent to at least the bactericidal strength of 50 parts per million of available chlorine in the form of hypochlorite.

Dairymen will frequently ask the inspector whether a certain commercial preparation is strong enough for dairy use when mixed as directed on the label. In order to determine this the inspector should mix a portion as directed on the label, then dilute half and half, and test for 50 parts per million by means of the above-described test. If a precipitate appears, the directions upon the label result in a solution containing at least 100 parts per million in the form of hypochlorites or

[18] For composition of o'tolidin solution see Standard Methods of Water Analysis published by the American Public Health Association.

the bactericidal equivalent thereof and may be approved. Otherwise, such larger quantity of the stock solution should be used by the dairyman as will give a satisfactory test.

Other bactericides.—The inspector should not permit the dairy industry to use any other form of bactericide until he has satisfied himself by his own or other official tests that they are satisfactory for use in connection with milk handling, and that they are of adequate strength. The local inspector should consult his State board of health regarding all bactericides in use in his territory, so that he may be certain he is using the proper test. Under no circumstances shall formaldehyde or other preservatives be used.

Any proprietary bactericide regarding the dairy sanitation efficiency of which the local or State health authority is in doubt should be referred to the Food and Drug Administration of the United States Department of Agriculture for opinion.

HOT-WATER TREATMENT

Hot-water treatment shall not be accepted as satisfactory compliance unless the articles are completely immersed for at least 2 minutes in water maintained at 170° F. or higher throughout the period of immersion, or are exposed to a flow of hot water at 170° F. or more (at the outlet) for at least 5 minutes. Pouring hot, or so-called boiling water, from vessel to vessel is not adequate and shall not be accepted.

TREATMENT OF EQUIPMENT OTHER THAN BOTTLES AND PAILS

The treatment of milk cans, coolers, bottling machines, milking machines (all their parts), etc., requires special consideration. Articles which cannot be placed in the steam cabinet can probably best be treated by swabbing thoroughly with a cloth saturated with standard chlorine solution, allowing the solution film to remain at least 2 minutes. Rubber milking-machine parts can be satisfactorily treated by immersing them for 2 minutes in water brought to 170° F. and leaving them in standard chlorine solution until the next milking. (Also see Farmers' Bulletin No. 1315.) Milking-machine rubbers may also be treated by submerging them in a 0.3–0.5 percent lye solution and, just before again using, draining off the lye solution and rinsing out the rubbers with a standard chlorine solution. When the dairy is provided with a steam jet instead of a cabinet, pails and cans may be treated over the jet, but chlorine swabbing must be used for larger equipment unsuited to that method.

Strainer cloths shall be treated (only after thorough washing) by boiling, or by exposure in steam cabinets, or by immersion in standard chlorine solution. If treated in the steam cabinet they must be physically separated from each other to insure free access of steam.

ITEM 15r. UTENSILS, STORAGE

All containers and other utensils used in the handling, storage, or transportation of milk or milk products shall be stored so as not to become contaminated before being used.

Public-health reason.—Careless storage of milk utensils which have previously been properly treated is apt to result in recontamination by flies and dust and thus to render them unsafe.

Satisfactory compliance.—This item shall be deemed to have been satisfied when all utensils and vessels, including strainer cloths, are—

(1) Left in the treating chamber until used; or

(2) Stored in the milk house in a place protected from contamination, inverting such articles as can be inverted. Storage racks shall preferably be constructed of metal protected against rusting. Crates in which clean bottles are stored shall be clean and elevated above the floor.

If cotton discs are used they shall be kept, until used, in the original package, protected from contamination by storage in a suitable box or cabinet.

Item 16r. Utensils, Handling

After bactericidal treatment no container or other milk or milk product utensil shall be handled in such manner as to permit any part of any person or his clothing to come in contact with any surface with which milk or milk products come in contact.

Public-health reason.—Handling bottles by inserting the fingers into their mouths, carrying milk pails by inserting the fingers under the hood, carrying an armful of milk-can covers against a soiled shirt or jacket, carrying a strainer cloth over the shoulder or in a pocket, and similar handling of vessels and utensils, undo the effect of bactericidal treatment.

Satisfactory compliance.—This item shall be deemed to have been satisfied when none of the above or similar practices is in evidence.

Item 17r. Milking, Udders and Teats, Abnormal Milk

The udders and teats of all milking cows shall be clean and rinsed with a bactericidal solution at the time of milking. Abnormal milk shall be kept out of the milk supply and shall be so handled and disposed of as to preclude the infection of the cows and the contamination of milk utensils.

Public-health reason.—Cows frequently contaminate their udders by standing in polluted water or lying down in the pasture or barnyard. Unless the udders and teats are carefully cleaned just before milking, particles of filth are apt to drop into the milk. Such contamination of the milk is particularly dangerous because cow manure may contain the organisms of tuberculosis and polluted water may contain the organisms of typhoid fever and other intestinal diseases. Rinsing the udders and teats with a chlorine solution has the advantage of giving an additional factor of safety with reference to such disease organisms as are not removed by ordinary cleansing.

Abnormal milk may indicate mastitis or other diseased condition, and should therefore be kept out of the milk supply and away from the cows and the milk utensils.

Satisfactory compliance.—This item shall be deemed to have been satisfied when the cows' udders look and feel clean and have been rinsed with a bactericidal solution (see item 14r) at the time of milking, and if any abnormal milk is detected it is kept out of the milk supply and so handled and disposed of as to preclude the infection of the cows and the contamination of milk utensils.

A number of States and cities have for years required that the udders and teats must, in addition to being clean, be treated with the previously described chlorine

solution. Some authorities in cold climates fear that the use of water in extremely cold weather will, whether or not it contains chlorine, cause chapping. Long experience has proven that this objection does not hold for warm climates. The measure is best carried out by following the preliminary cleansing by scrubbing the udders and teats with a large cloth saturated with the chlorine solution. The cloth is then wrung as dry as possible and the bag mopped free of excess solution. After thus treating 6 or 8 cows a fresh pail of solution should be prepared. Tests made by the Public Health Service gave quicker and more complete bacterial removal of udder contamination by means of a chlorine solution than with plain water or with soap and water.

It is recommended that for grade A raw milk the strip cup be used once each week and the fore milk examined and discarded.

An additional precaution not required by the ordinance, but which inspectors should encourage, is the discarding of the first several streams of milk from each teat. They can be discarded into a calf bucket and wasting the milk or soiling the floor thereby avoided. This precaution will help keep the bacterial count of the milk low, as it is the first few streams of milk which contain most of the bacteria in fresh milk.

Item 18r. Milking, Flanks

The flanks, bellies, and tails of all milking cows shall be free from visible dirt at the time of milking.

Public-health reason.—Cleanliness of the cows is one of the most important factors affecting the bacterial count of the milk. Under usual farm conditions cows accumulate on their bodies quantities of manure, caked mud, dust, chaff, loose hairs, etc. Practically all of these materials carry bacteria and are apt to fall into the milking pail during the process of milking. This may result in contaminating the milk with bacteria.

Satisfactory compliance.—This item shall be deemed to have been satisfied when the flanks, bellies, and tails are free of dirt at the time of milking, as evidenced by sight and touch.

A satisfactory method of cleaning the cows is to go over each one with a stiff brush, preferably using water freely at the same time to assist in the cleansing and to prevent dust. Grooming is facilitated by clipping the flanks, belly, and bag, and by cutting the brush of the tail so that it does not drag. The brushing of part of the herd while other cows are being milked is undesirable because of the dust which may be raised. Therefore all brushing should be completed before milking is begun.

Item 19r. Milkers' Hands

Milkers' hands shall be clean, rinsed with a bactericidal solution, and dried with a clean towel immediately before milking and following any interruption in the milking operation. Wet-hand milking is prohibited. Convenient facilities shall be provided for the washing of milkers' hands.

Public-health reason.—The reasons for bactericidal treatment of the hands of milkers are similar to those for bactericidal treatment of the udders. In the course of the preparation for milking, the hands of the milkers have come into contact with almost identically the same kind of materials as may have contaminated the udders. During the course of his duties and natural habits outside of the milking

barn, the dairyman's hands must be assumed to have been exposed to body discharges.

Wet-hand milking increases the likelihood of contaminating the milk. Washing facilities are required in order to increase the assurance that milkers' hands will be washed.

Satisfactory compliance.—This item shall be deemed to have been satisfied when:

(1) The milker's hands have been rinsed with water to which an approved bactericide has been added. (See item 14r.)

(2) Hands are clean and dry at the time of milking. Hands may be considered dry when they have been wiped with a wrung-out cloth that has been used for applying the bactericidal solution.

(3) Hand-washing facilities in or convenient to the barn are provided, including either running water or a suitable vessel and an adequate supply of clean water, soap, and a clean cloth or towel for each milker.

The hands of all milkers must be dipped and rinsed in a standard bactericidal solution and wiped dry before milking is begun. This applies to the person who handles the milking machines and applies and removes them from the cows, and to the stripper.

A bucketful of bactericidal solution should be handy in the barn during milking. Every time a milker has finished milking a cow, has carried out and strained the milk, has removed his stool to the next cow, and has applied the cow hobblers or anti-kickers (if used), he should rinse his hands in the solution. The first rinsing in the solution does not afford subsequent protection against recontamination from the cow's flanks, or even from the clothes and person of the milker.

Item 20r. Clean Clothing

Milkers and milk handlers shall wear clean outer garments while milking or handling milk, milk products, containers, utensils, or equipment.

Public-health reason.—Because of the fact that the hands of all workers frequently come into contact with their clothing, it is important that the clothes worn during the milking and handling of the milk be clean.

Satisfactory compliance.—This item shall be deemed to have been satisfied when milkers are found wearing outer garments that are not excessively soiled.

Washable overgarments are not required, but milkers should be urged to have one suit of overalls for milking and another for general work. The suits are changed just before milking. If milkers wear clean aprons this shall be considered as satisfactory.

Item 21r. Milk Stools

Milk stools shall be kept clean.

Public-health reason.—Clean milk stools reduce the likelihood of contamination of milkers' hands between the milking of individual cows.

Satisfactory compliance.—This item shall be deemed to have been satisfied when the milk stools are so constructed as to be easily kept clean, look and feel clean, and are stored above the floor when not in use.

The usual practice is to scrub the stools several times a week and keep them on hooks or pegs when not in use. Otherwise they are inevitably kicked around on the floor or in the gutters, or thrown into a corner, and quickly become soiled. Many dairies have for years used metal milk stools, which are easy to wash and keep clean.

Milk stools are frequently padded with old carpet or sacking for the comfort of the milkers. Such stools cannot be washed and cannot be kept clean. Their use does not comply with the requirements of the ordinance.

Item 22r. Removal of Milk

Each pail of milk shall be removed immediately to the milk house or straining room. No milk shall be strained or poured in the dairy barn.

Public-health reason.—Keeping the milk in the barn until all or a large part of the herd has been milked is apt to expose it to flies and dust, and to delay cooling. Straining milk in the barn likewise exposes it to dust and flies.

Satisfactory compliance.—If the milk house and barn are too widely separated to make practicable the straining of milk in the milk house, the construction of a small screened straining room in or near the barn, but not opening directly into it, is satisfactory. This method still has the disadvantage of delaying cooling, though this can be reduced by taking every can full of milk to the milk house as soon as filled.

Pouring milk into conductors which are protected, as provided under item 8r (e), shall be permitted.

Dairymen sometimes use the feed room or a similar enclosure for a straining room. This is not approved unless all feedstuffs or other materials are removed and the room is so located that it does not open directly into the milking barn.

Item 23r. Cooling

Milk must be cooled immediately after completion of milking to 50° F. or less, and maintained at that average temperature, as defined in section 1 (S), until delivery. If milk is delivered to a milk plant or receiving station for pasteurization or separation, it must be delivered within 2 hours after completion of milking or cooled to 70° F. or less and maintained at that average temperature until delivered.

Public health reason.—Milk produced under cleanly conditions usually contains from 1,000 to 10,000 bacteria per cc. immediately after milking. These multiply to enormous numbers in a few hours if the milk is not cooled. When the milk is quickly cooled to 50° F. or less, however, there is but a very slow increase in

numbers of bacteria. In order to understand this it is merely necessary to recall that bacteria are very small plants, and that most plants do not grow in cold weather.

Usually the bacteria in milk are harmless, and if this were always true there would be no reason to cool milk except to delay souring. There is, however, no way for the dairyman or health officer to make absolutely sure that no disease bacteria have entered the milk (even though observance of the other items of this ordinance will much reduce this likelihood), and frequent epidemics among milk consumers prove without question that this happens. The likelihood of contracting disease is much increased when the milk contains large numbers of disease bacteria, and for this reason it is extremely important that milk be quickly cooled so that any small numbers of disease bacteria which may have entered shall not be permitted to multiply.

Satisfactory compliance.—This item shall be deemed to have been satisfied when—

(1) Milk delivered raw to the consumer is cooled immediately after completion of milking to 50° F. or less, and maintained at or below that average temperature, as defined in section 1 (S), until delivery to the final cunsumer.

(2) Milk delivered to a milk plant or one of its receiving stations for pasteurization or separation is either delivered within 2 hours after completion of milking, or, if delivered after the expiration of 2 hours, has been cooled before the expiration of 2 hours to 70° F. or less, and maintained at or below that average temperature until delivery.

The inspector shall determine in the following manner the milk temperature every time a sample for bacterial examination or reductase test is taken. In the case of bottled milk the temperature of a bottle other than the one used for determining the bacterial count shall be taken. The bottle shall be selected at random by the inspector and well shaken before inserting the thermometer. The thermometer must be kept in the milk long enough to insure a correct reading. The dairyman should be instructed not to sell the bottle of milk which has been opened for temperature test. In the case of bulk milk the contents of the can or vat shall be thoroughly stirred before the thermometer is inserted. The stirring dipper may be treated between samples in a 5-gallon can of water to which has been added 5 ounces of standard stock chlorine solution. The small amount of chlorine which is carried into a can of milk on the stirrer will not affect the bacterial count of the milk.

In no case shall the temperature of the milk be estimated by the inspector, as such a practice is certain to result either in unfairness to the dairyman or in lax grading.

The following specifications for inspectors' milk temperature thermometers are designed to make this a general-purpose thermometer suitable for determining not only refrigeration temperatures but also bactericidal treatment temperatures at dairies and restaurants.

INSPECTORS' THERMOMETERS TO BE USED IN DETERMINING MILK SAMPLE TEMPERATURE

Type.—Pocket type, mercury actuated.

Magnification of mercury column.—To apparent width of not less than one-sixteenth inch.

Scale range.—30° to 212° F. with the extension either side permissive.

Temperature represented by smallest scale division.—2° F.

Number of degrees per inch of scale.—Not more than 52.

Accuracy.—Within 2° F., plus or minus.

Case.—Metal, provided with suspension ring and fountain-pen clip.

Bulb.—Corning normal, or equally suitable thermometric glass.

COOLING METHODS

Cooling in the vat.—A simple and frequently used method of cooling is to pour the milk as it comes from the barn directly into cans set in a vat of ice water, and then to stir the cooling water thoroughly each time another pailful is added to the can. A can of milk can be cooled to below 50° F. in this manner in about half an hour.

The advantage of this method is its simplicity. The disadvantages include excessive use of ice, the necessity for stirring, which is apt to be neglected, and slowness of cooling.

It is recommended that where ice is used the size of cooling vats be determined from the following tables:

Inside dimensions, in inches, of cooling vats for 5-gallon cans

Numbers of cans	2	4	6	8
Width	26	26	26	30
Length	36	46	70	80

Inside dimensions, in inches, of cooling vats for 10-gallon cans

Number of cans	2	4	6	8
Width	30	30	36	42
Length	36	60	75	84

The bottom of the vat should be provided with a removable wooden rack to protect it from undue wear. The vat should be provided with a lid in order to reduce ice consumption. If it be assumed that the thickness of the wooden rack is 2 inches, the total inside height of the vat from the vat floor to the under surface of the lid should be 26 inches for vats for 5-gallon cans and 30 inches for vats for 10-gallon cans. The vat must be provided with an overflow outlet which, assuming again that the wooden rack is 2 inches thick, must be 18 inches above the vat floor in the case of vats for 5-gallon cans and 23 inches for vats for 10-gallon cans.

If the dairyman wishes to cool both 10- and 5-gallon cans at the same time, it will be necessary to divide the vat into two compartments by means of a watertight partition and to provide each compartment with an overflow outlet located as above instructed.

All cooling vats should be provided with bottom drains to permit emptying and cleaning.

Kelly and Clement in *Market Milk* recommend that, in order to provide for fluctuations in quantity of milk to be cooled, vats may be divided into two compartments, one double the size of the other, which may be used either separately or together. This, in effect, provides the dairyman with three sizes of vat and insures a very flexible cooling equipment.

The vat may be constructed of metal, wood, or concrete. In any case, a saving in ice is secured by insulating the vat. United States Department of Agriculture Farmers' Bulletin No. 976 contains the following statement regarding insulated cooling vats:

"While, from the point of view of cooling, wooden tanks give good results, an insulated concrete is much more desirable, as it is easily built and can be set partly in the ground. A wooden or galvanized iron tank does not last long under similar conditions. When the tank is set low, cans of milk can be lifted in or out with much less effort than when it is entirely above the ground. The total thickness of the walls of an insulated concrete tank should be 8 inches, divided into two walls, the outside being 2 inches, then 2 inches of good insulation, and the inside wall 4 inches thick. The concrete mix should consist of one part portland cement, two parts clean, sharp sand, and four parts broken stone or gravel. For the purpose of waterproofing, hydrated lime equal to 10 percent by weight of the cement should be added to the mixture. The insulation used should be coated with and set in hot asphalt, which should be allowed to become thoroughly dry before the inner walls of the tank are put up. The inside walls should be very carefully troweled so as to insure a smooth surface without projecting particles."

One good type of insulating material is 2-inch sheet cork. If cork is considered too costly, 2-inch plank, carefully dried and then thoroughly coated on all surfaces with hot asphalt, has probably a fairly high insulating value when imbedded in concrete.

The quantity of ice necessary to cool the milk to a certain temperature is dependent upon the size of the vat, the atmospheric temperature, the amount of milk to be cooled, and the extent to which it has been precooled.

In areas where electric power is available, electric refrigeration may be advantageous.

Cooling over surface coolers.—One of the disadvantages of simple vat cooling was given as slowness of cooling. It is obvious that milk could be cooled more quickly by causing it to flow in a thin film over a metal surface constantly cooled by a cold liquid behind it. This principle has been applied in the so-called surface cooler.

One device for applying this principle is the plain *conical cooler*, with which every dairyman is familiar. This device is usually operated by filling it with a mixture of ice and water and stirring the mixture as the milk flows over the cooler. The advantages of this method of cooling are its low first cost and the fact that milk is cooled more quickly than by the previously described vat method. The disadvantages include the necessity for stirring, the excessive use of ice, and the fact that one cooling cannot be depended upon to bring the milk below 50° F.

The first two disadvantages may be overcome by cooling the milk in two stages: First cooling it as far as possible over a conical cooler equipped so as to permit the constant flow through it of the farm water supply unchilled by ice, and then doing the remainder of the cooling in cans in a vat; or the dairyman may use two conical coolers in series, one using the farm water supply, and the other containing ice water. These methods save ice because considerable of the cooling is done before the use of ice or ice water comes into play.

Another type of surface cooler, somewhat more expensive in first cost, but better designed, is the corrugated or *tubular cooler* designed to permit the constant flow of water through it while the milk flows over its outer surface. Because of its efficient design this type of cooler can be made to cool milk to within 2 or 3 degrees of the temperature of the water (impossible with the conical cooler). This utilizes the maximum cooling effect of the water supply. If the temperature of the natural water supply is somewhat below 50° F., no ice is necessary, except for icing the crates during delivery. Usually, however, the water supply is not cold enough to permit this, and the two-stage method of cooling previously described will be necessary.

Another type of tubular cooler is composed of two sections, uniced water flowing through the upper section, and cold brine or ice water through the lower section. This type also utilizes the full cooling effect of the natural water supply. The principal advantage of this layout lies in the fact that the desired milk temperature is achieved more rapidly than by any other means.

Keeping milk cold.—The keeping of milk at a temperature of 50° F. or less during delivery necessitates the icing of the bottles in the crates. The ice should be broken into fist-size pieces and packed closely around the necks of the bottles. All crates should be iced, except when the weather is cold, when part or all of the icing may be eliminated, depending upon the atmospheric temperature.

Many dairymen are using metal crates, by means of which it is somewhat easier to keep the milk cold because of the tight bottom, which prevents the ice water from escaping and prevents the circulation of warm air around the bottles.

Covering the crates with a close-woven cloth or tarpaulin during delivery will retard the melting of ice on the crates by reducing the circulation of warm air.

Dairymen who can deliver milk twice a day to a milk pasteurizing plant or cooling station are not required to cool the milk if it can be delivered within 2 hours after completion of milking. However, prompt cooling immediately after milking is to be recommended in all cases.

Cost of cooling.—The inspector is frequently questioned as to the cost of cooling milk. This depends almost entirely upon the amount of ice required, which in turn is dependent upon the method of cooling used.

The most expensive method is that in which the milk is precooled over a plain conical cooler in which ice is used, and the cooling then completed in a vat. This is because the entire cooling effect is obtained from ice, and because of the relatively large exposure of ice-cooled surface to the air temperature.

Somewhat less ice is used when the milk is cooled entirely by immersing the cans in a vat of ice water, since in this case the exposure of ice-cooled surface to the air is avoided.

The greatest saving in ice is effected by precooling the milk over a surface cooler connected with the uniced water supply, and then securing the final cooling by means of one of the ice-water or brine methods previously described.

The United States Department of Agriculture estimates the amount of ice required with the last method at 2 to 2½ pounds per gallon of milk cooled and held below 50° F., provided it has been precooled to 60° F. If either of the first two methods is used, the amount of ice required will be 4 pounds or more per gallon. In the case of bottled milk the above figures do not include the ice required in icing crates, which will vary from nothing to 2 pounds per gallon, depending upon the weather.

Item 24r. Bottling and Capping

Milk and milk products shall be bottled from a container with a readily cleanable valve, or by means of an approved bottling machine.

Bottles shall be capped by machine. Caps or cap stock shall be purchased in sanitary containers and kept therein in a clean, dry place until used.

Public-health reason.—If milk is bottled in an unclean manner, or milk bottles are capped with unclean or infected bottle caps, most of the value of the items of sanitation hitherto discussed will have been lost.

Satisfactory compliance.—This item shall be deemed to have been satisfied when bottling and capping are done as described, and caps or cap stock are purchased in sanitary tubes or cartons, respectively, and kept therein in a clean, dry place until used.

The first cap from each tube and the first few caps from each roll of cap stock should be discarded as they have been exposed and may be contaminated.

ITEM 25r. PERSONNEL, HEALTH

The health officer or a physician authorized by him shall examine and take a careful morbidity history of every person connected with a retail raw dairy, or about to be employed, whose work brings him in contact with the production, handling, storage, or transportation of milk, milk products, containers, or equipment. If such examination or history suggests that such person may be a carrier of or infected with the organisms of typhoid or paratyphoid fever or any other communicable diseases likely to be transmitted through milk, he shall secure appropriate specimens of body discharges and cause them to be examined in a laboratory approved by him or by the State health authorities for such examinations, and if the results justify such person shall be barred from such employment.

Such persons shall furnish such information, submit to such physical examinations, and submit such laboratory specimens as the health officer may require for the purpose of determining freedom from infection.

Public-health reason.—Investigations of milk-borne diseases have shown that the most frequent source of infection is the presence of the disease organisms in the discharges of milk handlers. The diseases so transmitted through milk include typhoid fever, dysentery, diphtheria, septic sore throat, scarlet fever, and tuberculosis. However, most health officers feel that the practical application of the health-examination principle is limited to examinations for active tuberculosis, diphtheria, and typhoid and paratyphoid fevers, and that even these examinations should not be required for milk which is to be pasteurized.

Satisfactory compliance.—In carrying out this item the following procedure shall be required for every employee of retail raw milk dairies who comes in contact with milk, milk products, containers, or equipment. The examination shall include a history and, where necessary, examinations for typhoid fever, paratyphoid fever, diphtheria, and tuberculosis, blood specimens for typhoid and paratyphoid agglutination tests, nose and throat cultures on Loeffler's blood serum, and, in cases showing clinical symptoms of tuberculosis, specimens of

sputum. The examination of laboratory specimens shall be consid-sidered necessary when the history suggests the occurrence at any time of typhoid or paratyphoid fever, or recent infection with or exposure to any other disease transmissible through milk supplies.

The following shall be barred from employment in connection with a retail raw dairy:

(*a*) A person who has not been immunized against typhoid fever within 2 years, and who shows a positive or atypical Widal, or a person who gives a history of typhoid fever, unless such person is willing to have 3 sets, or more if required, of specimens of feces and urine collected by the health officer, in a manner prescribed by the health officer, or if any of said specimens prove positive, or

(*b*) A person who is found to harbor virulent diphtheria organisms, or

(*c*) A person showing significant clinical or laboratory evidence of active tuberculosis.

Any of the above determinations which the local laboratory is not equipped to make may be made by the State health department laboratory.

No person having a discharging or presumably infected wound, sore, or lesion on any part of his body shall handle milk, milk products, containers, or equipment, or engage in milking.

Item 26r. Miscellaneous

All vehicles used for the transportation of milk or milk products shall be so constructed and operated as to protect their contents from the sun and from contamination. All vehicles used for the transportation of milk or milk products in their final delivery containers shall be constructed with permanent tops and with permanent or roll-down sides and back, provided that openings of the size necessary to pass the delivery man may be permitted in the sides or back for loading and unloading purposes. All vehicles shall be kept clean, and no substance capable of contaminating milk or milk products shall be transported with milk or milk products in such manner as to permit contamination. All vehicles used for the distribution of milk or milk products shall have the name of the distributor prominently displayed.

The immediate surroundings of the dairy shall be kept in a neat, clean condition.

The condition and appearance of the delivery vehicles and of the immediate surroundings of the dairy do much to credit or discredit milk control in the mind of the consumer. It is important, therefore, in order to encourage the consumption of milk, as well as in order to protect it from contamination during delivery, that the health officer rigidly enforce this item, both as to the cleanly appearance of

the vehicle, as to its being a covered type, and as to the carrying of material capable of contaminating milk supplies. The distributor's name should be prominently displayed on each vehicle for convenience in inspection and sampling.

GRADE B RAW MILK

Grade B raw milk is raw milk which violates the bacterial standard and/or the abortion testing requirement for grade A raw milk, but which conforms with all other requirements for grade A raw milk, and has an average bacterial plate count not exceeding 1,000,000 per cubic centimeter, or an average direct microscopic count not exceeding 1,000,000 per cubic centimeter if clumps are counted or 4,000,000 per cubic centimeter if individual organisms are counted, or an average reduction time of not less than 3½ hours, as determined under sections 1 (S) and 6.

GRADE C RAW MILK

Grade C raw milk is raw milk which violates any of the requirements for grade B raw milk.

CERTIFIED MILK-PASTEURIZED

Certified milk-pasteurized is certified milk-raw which has been pasteurized, cooled, and bottled in a milk plant conforming with the requirements for grade A pasteurized milk.

GRADE A PASTEURIZED MILK

Grade A pasteurized milk is grade A raw milk, with such exceptions as are indicated if the milk is to be pasteurized, which has been pasteurized, cooled, and bottled in a milk plant conforming with all of the following items of sanitation and the average bacterial plate count of which at no time after pasteurization and until delivery exceeds 30,000 per cubic centimeter, as determined under sections 1 (S) and 6.

The grading of a pasteurized-milk supply shall include the inspection of receiving and collecting stations with respect to items 1p to 15p, inclusive, and 17p, 19p, 22p, and 23p, except that the partitioning requirement of item 5p shall not apply.

A convenient summary of the following sanitation requirments will be found in the pasteurization plant inspection form (Form 8978–C) shown in figure 4.

On the reverse side of the inspection form are listed the tests which should be made by the health officer to determine compliance with these requirements, and space is provided for entering the test results for each piece of equipment. Large cities which wish to have available an office record for checking whether all necessary tests are

kept up to date at each plant may print test record forms like that suggested in figure 16.

---------- Health Department

RECORD OF PASTEURIZATION PLANT TESTS, 19--

Name of plant ---------- Address ----------

[*Instructions.*—Enter day of month at top of appropriate column, and the number of pieces of equipment tested opposite each test number, as reported on reverse side of plant inspection form.]

Tests listed on inspection form	Number of pieces of equipment subject to each test	When test required	Number of pieces of equipment tested on date indicated											
			Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1		Monthly												
2		Semiannually, etc												
3		Monthly												
4		Monthly												
6		Initially, etc												
7		Initially												
8		Monthly (poppet)												
		Initially (plug)												
9		Initially												
10		Monthly												
11		Monthly												
12		Monthly												
13		Initially												
14		Monthly												
15		Monthly												
16		Monthly												
17		Initially, etc												
18		Initially												
19		Initially, etc												
20		Monthly												

FIGURE 16.—Record form for pasteurization-plant tests.

ITEM 1p. FLOORS

The floors of all rooms in which milk or milk products are handled or stored or in which milk utensils are washed shall be constructed of concrete or other equally impervious and easily cleaned material and shall be smooth, properly drained, provided with trapped drains, and kept clean.

Public-health reason.—Floors constructed of concrete or other similarly impervious material can be kept clean more easily than floors constructed of wood or other pervious or easily disintegrating material, will not absorb organic matter, and are, therefore, more apt to be kept clean and free of odors. Properly sloped floors facilitate flushing and avoid sloppiness. Trapping of drains prevents sewer gas entering the plant. Clean floors are conducive to clean milk-handling methods.

Satisfactory compliance.—This item shall be deemed to have been satisfied—

(1) When the floors of all rooms in which milk is handled or stored or in which milk utensils are washed are constructed of good-quality concrete, equally impervious tile, or brick laid closely with imper-

vious joint material, metal surfacing with impervious joints, or of other material which is the equivalent of good-quality concrete.

(2) When the floor surface is smooth and sloped so that there will be no pools of standing water after flushing and the joints of the floor and walls are constructed so as to be impervious.

(3) When the floors are provided with trapped drains so constructed as to minimize clogging, and the plumbing is so installed that no sewage can back up into any drain line and flood the floor.

(4) When the floors are kept clean at all times. Floors shall be kept free not only of organic filth, but also of litter. Materials and equipment not routinely used in a given room shall not be stored therein, as this practice renders it difficult to keep the floors clean. Materials and equipment not in routine use shall be stored in a special storage room or rooms in which milk-handling operations are not conducted.

Item 2p. Walls and Ceilings

Walls and ceilings of rooms in which milk or milk products are handled or stored or in which milk utensils are washed shall have a smooth, washable, light-colored surface, and shall be kept clean.

Public-health reason.—Painted or otherwise properly finished walls and ceilings are more easily kept clean and are, therefore, more apt to be kept clean. A light-colored paint or finish aids in the even distribution of light and the detection of unclean conditions. Clean walls and ceilings are conducive to clean milk-handling operations.

Satisfactory compliance.—This item shall be deemed to have been satisfied if walls and ceilings are finished with light-painted wood, tile, smooth-surface concrete or cement plaster, brick, or other equivalent materials with a washable light-colored surface, and walls, glass in partitions, and ceilings are kept clean and refinished as often as the finish wears off or becomes discolored. A darker colored paint may be used for the lower part of the wall to a height not exceeding 36 inches.

Item 3p. Doors and Windows

Unless other effective means are provided to prevent the access of flies, all openings into the outer air shall be effectively screened and doors shall be self-closing.

Public-health reason.—Flies may infect the milk with disease germs after it has been pasteurized, thus nullifying the effectiveness of pasteurization.

Satisfactory compliance.—This item shall be deemed to have been satisfied—

(1) If all openings to the outer air are effectively screened; and all doors are self-closing and all screen doors to the outer air open outward; or

(2) If fans of sufficient power to prevent the entrance of flies are in use at all ineffectively protected openings; or

(3) If flies are absent.

Openings through which cans or crates or other articles are loaded in rapid succession so as to make impracticable the proper use of self-closing screens may be protected by properly constructed flaps or by fans of sufficient power to prevent the entrance of flies. Such fans must be operated at all times when doors are open.

Window and door screens must be tight-fitting and free of holes. This includes the screens for skylights and transoms.

This item must be satisfied during the seasons of the year when flies are present.

Item 4p. Lighting and Ventilation

All rooms shall be well lighted and ventilated.

Public-health reason.—Ample light promotes cleanliness. Proper ventilation reduces odors and prevents condensation upon interior surfaces.

Satisfactory compliance.—This item shall be deemed to have been satisfied—

(1) If the unobstructed window or skylight space in each room of pasteurization plants hereafter constructed is not less than 10 percent of the floor area of said room, and the light is reasonably evenly distributed so that all operations and equipment are adequately lighted; or

(2) If artificial light is provided equivalent to one 50-watt electric light per 100 square feet of floor area, reasonably evenly distributed; and

(3) If all rooms are adequately ventilated, in the opinion of the inspector. Ventilation equipment supplementary to windows and doors is to be provided if necessary.

Item 5p. Miscellaneous Protection from Contamination

The various milk-plant operations shall be so located and conducted as to prevent any contamination of the milk or of the cleaned equipment. All means necessary for the elimination of flies shall be used. There shall be separate rooms for (a) the pasteurizing, processing, cooling, and bottling operations, and (b) the washing and bactericidal treatment of containers. Cans of raw milk shall not be unloaded directly into the pasteurizing room. Pasteurized milk or milk products shall not be permitted to come in contact with equipment with which unpasteurized milk or milk products have been in contact, unless such equipment has first been thoroughly cleaned and subjected to bactericidal treatment. Rooms in which milk, milk products, cleaned utensils, or containers are handled or stored shall not open directly into any stable or living quarters. The

pasteurization plant shall be used for no other purposes than the processing of milk and milk products and the operations incident thereto, except as may be approved by the health officer.

Public-health reason.—This item deals with such miscellaneous precautions against contamination as are not included in the other plant items.

If the washing and bactericidal treatment of containers are conducted in the same room in which the pasteurizing, processing, cooling, or bottling is done, there is opportunity for the pasteurized product to become contaminated, particularly by flies. For this reason separate rooms are required as indicated. The unloading of cans of raw milk directly into the pasteurizing room is apt to increase the prevalence of flies therein and to render it too public.

Sometimes simple screening is not sufficient to keep out flies. For this reason other methods are required if screening proves insufficient.

Satisfactory compliance.—This item shall be deemed to have been satisfied under the following conditions:

(1) The plant contains separate rooms for (*a*) the pasteurizing, processing, cooling, and bottling operations, and (*b*) the washing and bactericidal treatment of containers. The pasteurizing, processing, cooling, and bottling operations may be conducted as a group in a single room, if desired, and the washing and treatment of containers may be conducted in a single room; but the two groups of operations must be kept in separate rooms. All rooms shall be of sufficient size for the purpose for which they are intended.

Inspectors are urged to encourage the provision of a receiving room separate from rooms (*a*) and (*b*) defined above, containing a dump vat the milk from which is piped into the pasteurizing room. In all proposed plants a separate receiving room is mandatory. However, the can washer may be located in the receiving room.

(2) Cans of raw milk are unloaded either into a receiving room separated by solid or screened partitions from the pasteurizing room, or upon an outside platform and then pushed through a flap or fan-protected opening into the receiving or pasteurizing room. The purpose of this provision is to prevent the unloading of cans directly from the trucks through open doors into the pasteurizing room, which would make the pasteurizing room too public.

(3) All equipment with which milk comes in contact is covered and otherwise protected to prevent the access of flies, dust, and other contamination during operation. (For protection during pasteurization see item 16p (e); for protection during cooling see item 17p; for protection during bottling see item 18p; for protection during conduction from one piece of equipment to another see item 9p.) Receiving or dump vats shall be completely covered except during washing and bactericidal treatment, and except when milk is being received therein, when an opening of sufficient size for this purpose may be uncovered. Where strainers are used the cover for the dump opening shall be so designed as to cover the opening with the strainer in place.

All openings into tanks and vats shall be protected by raised edges or otherwise to prevent drainage into the opening from the surface of the tank or vat. Condensation-diverting aprons shall be provided as close to the tank or vat as possible on all pipes, thermometers, and other equipment extending into the tank unless a water-tight joint with the tank is provided.

(4) All necessary means supplementary to the use of screens are used for the elimination of flies.

(5) Raw milk shall not be strained through woven wire cloth. Pasteurized milk shall not be strained or filtered except through a metal strainer constructed of not readily corrodible material other than woven wire.

(6) Pasteurized milk or milk products are not permitted to come into contact with equipment with which unpasteurized milk or milk products have been in contact, unless such equipment has first been thoroughly cleaned and subjected to bactericidal treatment. There shall be no raw milk by-pass around the pasteurization holder.

(7) Rooms in which milk or milk products or cleaned utensils or containers are handled or stored shall not open directly into any stable or living quarters.

(8) If the design of the plant provides for pasteurizing or other equipment upon an elevated platform or mezzanine floor, the construction must be such as to prevent contamination of equipment on the lower floor from cleaning or other operations on the upper floor.

(9) All food substances used in the preparation of milk products shall be stored in a clean place and shall be so handled as to be protected from contamination.

(10) The health officer should permit the handling of no other product in the pasteurization plant which would be likely to create a public-health hazard. Permission to handle other products should be provisional and subject to revocation if found objectionable.

Item 6p. Toilet Facilities

Every milk plant shall be provided with toilet facilities conforming with the ordinances of the city of _____. *Toilet rooms shall not open directly into any room in which milk, milk products, equipment, or containers are handled or stored. The doors of all toilet rooms shall be self-closing. Toilet rooms shall be kept in a clean condition, in good repair, and well ventilated. In case privies or earth closets are permitted and used, they shall be separate from the building, and shall be of a sanitary type constructed and operated in conformity with the requirements of item 10r, grade A raw milk.*

Public-health reason.—The need for toilet facilities and the necessity for protecting the plant processes from toilet-contaminated flies are obvious.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) Toilet facilities complying with the city or State plumbing code are provided.

(2) The toilet room does not open directly into any room in which milk, milk products, containers, or equipment used in connection therewith are handled or stored.

(3) The toilet-room doors are provided with springs or checks to make them self-closing.

(4) The toilet room, stool, etc., are kept clean, sanitary, and in good repair.

(5) The toilet room is well ventilated, and free from flies.

(6) Durable, legible signs are posted conspicuously in each toilet room directing employees to wash their hands before returning to work.

A booth open at the top shall not qualify as a toilet room.

Privies shall be constructed and operated in accordance with the requirements of item 10r, grade A raw milk.

Item 7p. Water Supply

The water supply shall be easily accessible, adequate, and of a safe, sanitary quality.

Public-health reason.—The water supply should be accessible so as to encourage its use in cleaning operations; it should be adequate so that cleaning and rinsing will be thorough; and it should be of safe, sanitary quality in order to avoid the infection of milk equipment and containers.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) All rooms of the plant in which milk or milk products are handled or containers are washed are provided with an adequate number of water outlets.

(2) The water supply is ample in quantity to insure proper cleaning of the plant and its equipment.

(3) The water supply is approved as safe by the State board of health.

(4) The source of water supply complies with the specifications contained under item 11r, water supply, grade A raw milk, satisfactory compliance, paragraph (4).

Item 8p. Hand-Washing Facilities

Convenient hand-washing facilities shall be provided, including warm running water, soap, and approved sanitary towels. The use of a common towel is prohibited.

Public-health reason.—Washing facilities and sanitary towels are essential to the personal cleanliness of the milk handlers.

Satisfactory compliance.—This item shall be deemed to have been satisfied if hand-washing facilities, including warm running water, soap, and individual cloth or paper towels, are provided. Washing facilities must be convenient to all toilets and all rooms in which plant operations are conducted. Bottle- or can-washing vats shall not be used as washing facilities for personnel. Warm water must be on hand at all times or within a reasonable time after opening the faucets. Soap and towels should be provided by the plant management. No employee shall return from a toilet to a room where milk or milk utensils are handled without first having washed his hands.

Item 9p. Sanitary Piping

All piping used to conduct milk or milk products shall be "sanitary milk piping" of a type which can be easily cleaned with a brush. Pasteurized milk and milk products shall be conducted from one piece of equipment to another only through sanitary milk piping.

Public-health reason.—Milk piping and fittings are sometimes so designed as to be difficult to clean or they may be constructed of metal which corrodes easily. If piping and fittings are used which are difficult to clean or which corrode easily, or if exceptionally long lines or individual lengths of piping are used, it is unlikely that they will be kept clean. So-called "sanitary milk piping" is a term which applies to properly designed standard equipment.

The ideal is to prevent exposing the pasteurized product to contamination from the moment pasteurization begins until the product is consumed.

Satisfactory compliance.—This item shall be deemed to have been satisfied—

(1) When the milk piping, fittings, and connections are of such a diameter and so designed as to permit easy cleaning with a brush.

(2) When the milk piping and connections have a heavy, not readily corrodible, smooth finish, and all sweated connections are soldered smooth and flush.

(3) When the connections are of such design as to avoid sharp corners or crevices which are difficult to clean.

(4) When all parts of interior surfaces of pipe or fittings (including valves, fittings, and connections) are of such size and shape as to be accessible either to the sight or the touch, thus making it possible to determine whether they are clean. Bent or dented milk piping shall be considered as violating this item, also couplings or other types of fittings the joints of which are not visible for inspection. Except in small installations at least 1½-inch piping shall be urged. One-inch sanitary piping may be used in straight lengths not exceeding 6 feet.

(5) When the length of milk pipe lines is reduced to the minimum practicable.

(6) When pasteurized milk and milk products are conducted from one piece of equipment to another only through sanitary milk piping. Even plants handling small quantities of cream or buttermilk can usually comply with this requirement by processing such product every second or third day only, or by purchasing it in bottles from another plant, or by cooling the pasteurized cream in a separate small cooler located in the line between the separator and the bottler, or by employing a small buttermilk vat instead of a can for culturing the pasteurized skim milk. Pasteurizers are now available in sizes of 10, 20, and 30 gallons, equipped for both heating and cooling.

However, in plants handling small quantities of cream or buttermilk where the above methods are impracticable, the piping requirements may be waived provided the procedure followed involves as little handling and exposure as is possible without the use of sanitary piping.

A suggested method is to pipe the pasteurized milk from the pasteurizer to a covered separator from which the cream is discharged, either directly or through a cooler, into a milk can protected by a metal hood resting on the can, with the inlet end either connected by a tight sanitary fitting to the separator discharge opening, or fitting snugly over the latter and provided with a condensation-diverting apron. A similar method may be used simultaneously for receiving the skim milk. When filled the can should be covered as soon as the hood is removed, and in the case of skim milk the buttermilk culture may be later introduced. The contents may be cooled, if necessary, by setting the can in ice water and agitating the can, and after cooling the contents may be poured directly into the bottle filler.

Item 10p. Construction and Repair of Containers and Equipment

All multi-use containers and equipment with which milk or milk products come in contact shall be constructed in such manner as to be easily cleaned and shall be kept in good repair. The manufacture, packing, transportation, and handling of single-service containers and container caps and covers shall be conducted in a sanitary manner.

Public-health reason.—If the equipment is not so constructed that it can easily be cleaned, and is not kept in good repair, it is unlikely that it will be properly cleaned.

Single-service containers, etc., which have not been manufactured and handled in a sanitary manner may contaminate the milk.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) All milk-contact surfaces of multi-use containers and equipment consist of smooth, impervious, not readily corrodible material. The use of rubber and similar materials should be permitted only where other approved materials are impracticable in preventing leakage.

(2) All joints are soldered flush with the surface or otherwise fitted to avoid open seams, or the surface if vitreous is continuous.

(3) All surfaces with which milk or milk products come in contact are easily accessible for cleaning, and are self-draining.

(4) All containers and other equipment are in good repair, free of breaks and corroded places.

(5) The manufacture, packing, transportation, and handling of single-service containers and container caps and covers are conducted in accordance with the following requirements. Inspections required herein may be made by the health officer or by any agency authorized by him.

(a) The buildings and rooms in which single-service containers and container caps and covers are manufactured, packed, stored, and handled shall be clean, well lighted, and ventilated, and free of dust and flies, as prescribed in items 1p, 2p, 3p, 4p, 6p, 7p, 8p, and 11p.

(b) The average bacterial plate count of the stock from which single-service containers and container caps and covers are made shall not exceed 250 colonies per gram. No substance shall be present in finished single-service containers and container caps and covers which is toxic.

(c) All operations at the fabrication plant and during transportation of the manufactured articles shall be so conducted as to reduce to a minimum the possibility of contaminating the manufactured articles, as prescribed in items 13p, 14p, and 15p.

(d) All of those parts of machinery and equipment with which the article being manufactured comes in contact shall be kept clean.

(e) All single-service containers and container caps and covers shall be so treated as to be as impervious to milk and milk products as practicable.

The porous condition of paraffined containers now available and the sloughing off of particles of paraffin into the product are undesirable, and manufacturers of single-service containers are urged to make every effort to provide a nonabsorbent nonflaking surface.

(f) All single-service containers and container caps and covers shall prior to use be given bactericidal treatment equivalent to contact with paraffin for at least 20 seconds at at least 180° F., or for at least 35 seconds at at least 175° F., or for at least 1 second at at least 225° F., in approved equipment operated in an approved manner. The bactericidal treatment equipment shall be provided with approved indicating and recording thermometers, and shall be so designed as automatically to insure the required temperature and contact time.

The above requirements preclude the use of milk pumps which are not constructed of smooth, not readily corrodible metal, and all parts of which cannot be readily taken apart for cleaning.

The above requirement also precludes the use of any type of equipment so designed as to permit milk or milk products routinely to come in contact with V-type threaded surfaces.

In all cases where a rotating shaft is inserted through a surface with which milk or milk products come in contact, the inspector shall assure himself that the joint between the moving and stationary surfaces is close fitting.

In cases where the thermometer bulbs are inserted through the surfaces with which milk or milk products come in contact, the thermometer bulb shall be provided with a pressure-tight seat ahead of all threads or crevices.

All milk cans should preferably have umbrella-type covers.

Equipment used for homogenization or viscolization of milk and cream shall comply with this item and shall be readily dismantled for cleaning. Homogenization of pasteurized milk and cream is permitted, but when preheating is done homogenization before pasteurization is preferable and practicable.

Item 11p. Disposal of Wastes

All wastes shall be properly disposed of.

Public-health reason.—The wastes resulting from the cleaning and rinsing of containers, equipment, and floors, from flush toilets, and from washing facilities should be properly disposed of so as not to create a nuisance or a public-health menace.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) All wastes are disposed of in a public sewer.

(2) In the absence of a public sewer, all wastes are disposed of by a method approved by the State board of health.

(3) No trash or garbage is present upon the plant premises except in properly covered containers. Trash containers in the pasteurizing rooms should preferably be of the automatic-cover type.

Item 12p. Cleaning and Bactericidal Treatment of Containers and Equipment

All milk and milk products containers and equipment, except single-service containers, shall be thoroughly cleaned after each usage. All containers shall be subjected to an approved bactericidal process after each cleaning and all equipment immediately before each usage. When empty and before being returned to a producer by a milk plant each container shall be effectively cleaned and subjected to bactercidal treatment.

Public-health reason.—Milk and milk products cannot be kept clean and safe if permitted to come into contact with containers and equipment which have not been properly cleaned and treated. By bactericidal treatment is meant the destruction of such pathogens as are transmissible through milk supplies and all other organisms so far as practicable.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) All multi-use containers are thoroughly cleaned after each usage, and all equipment is thoroughly cleaned once each day on a clean support such as a tank or rack (not the floor). Greasy or rough surfaces shall not be considered sufficiently clean. All demountable equipment shall be taken down once each day for cleaning, including thermometer fittings where pressure-tight seats are not employed. The storage on racks of all demountable equipment until just before bactericidal treatment and usage is urged.

(2) All containers are given bactericidal treatment after each cleaning and all equipment is given bactericidal treatment at least once each day immediately before the beginning of the day's operations, in the following manner:

Bactericidal treatment of entire assembled equipment immediately prior to day's run.—The bactericidal treatment of the entire assembled equipment immediately prior to the day's run is required. This may be done by means of steam, hot water, or chlorine solution, as follows:

If *steam* is used, each group of assembled piping shall be treated separately by inserting the steam hose into the inlet and maintaining steam flow from the outlet for 5 minutes after the temperature of the steam at the outlet has reached 200° F. (The period of exposure required here is longer than that required for individual cans, etc., because of the heat lost through the large surface exposed to the air.) Any completely enclosed equipment continuous with the pipe system, and under pressure from the pipe system, such as preheaters, pumps, filters, valves, tubular holders, regenerative heater-coolers, etc., may be considered as having been adequately treated by means of the above procedure. Covers and other closures and unions should be cracked loose to insure joints being thoroughly steamed, and to lessen expansion and contraction cracks or strains.

Equipment not under pressure from the pipe line, however, such as weigh cans, storage vats, forewarmers, clarifiers, separators, pasteurization vats and pockets, coolers, and bottlers, must be treated separately.

Coolers should either be drained of refrigerant and the refrigerant valves closed before treatment, or the refrigerant intake valve closed and the return valve left open to provide for the expansion of the refrigerant. Covers must be in place during treatment.

If *hot water* is used, this may be done by pumping hot water through the entire equipment, the temperature of the water and the period of pumping being such that the temperature of the water at both the inlet and the outlet end of the assembly will have been at least 170° F. for at least 5 minutes.

If the assembly is so long that it is difficult to secure this temperature and time at the outlet end, the equipment should be treated in sections.

Supplementary treatment should be applied to any holder or to any other equipment the entire surface of which is not reached by the hot water.

Coolers should either be drained of refrigerant and the refrigerant valves closed before treatment, or the refrigerant intake valve closed and the return valve left open to provide for the expansion of the refrigerant. Covers, which must have been separately treated previously, must be in place during treatment of the cooler proper. Care should be taken to see that the hot water covers the entire surface of all coolers.

If *chlorine* solution is used, the solution appearing at the outlet end shall show the required strength (see section 7, item 14r of the code). The chlorine solution should be pumped through the entire equipment for at least 2 minutes.

Here again, such surfaces as are not reached by the chlorine solution shall be treated with steam as previously described, or the spray method of applying chlorine solution may be used for such surfaces as are not reached by the flowing chlorine solution.

Bottler treatment.—The bottler must be completely assembled before using any of the above methods. In the case of hot water or chlorine treatment, the bottler must be operated during the process so as to insure bactericidal treatment of all valves and fittings. This is not necessary in the case of steam treatment, but in this case the valves must be individually treated in place. This operation can be made most effective by attaching a device to the end of the steam hose which will enclose the valve and confine the steam.

Thermophiles.—If the pasteurization plant becomes infected with thermophilic organisms, it may prove that more intensive bactericidal treatment or a change in methods may be necessary. If the steam or hot-water method has been in use, an attempt should be made to use higher temperatures and for longer periods (above 200° F. for more than 10 minutes).

Bottle and can treatment.—Small plants, for which automatic washers may be deemed too large, frequently wash their bottles manually, in which case a two-compartment vat should be provided—one for washing, the other for rinsing. For these the use of the steam cabinet, of an individual steam-jet plate provided with a hood, or of chlorine immersion-type apparatus is accepted as compliance. If chlorine is used there should be a rinse treatment between the wash and chlorine treatments. The bactericidal treatment shall comply with the requirements of item 14r.

Larger plants should be encouraged to use automatic washers which include steam, hot-water, or chlorine treatment. In these types of equipment the use of a strong alkali solution makes it possible to

use a shorter exposure period for the final treatment. In a soaker-type bottle washer the alkali strength must be at least 2.4 percent, including at least 1.6 percent caustic soda. For determining the strength of the soaker solution the A. B. C. B. *alkali test*,[19] the A. B. C. B. *caustic test*,[19] or other suitable tests may be used.

After bactericidal treatment cans shall be so treated as to dry rapidly.

The inspector should satisfy himself by bacteriological examination that the effect of the combination of the various agents is such as to produce bottles and cans having a residual bacterial plate count of not more than one per cc. of capacity.

Item 13p. Storage of Containers and Equipment

After bactericidal treatment all bottles, cans, and other multi-use milk or milk-products containers and equipment shall be stored in such manner as to be protected from contamination.

Public-health reason.—If containers and equipment are not protected from contamination the value of bactericidal treatment will be partly or entirely nullified.

Satisfactory compliance.—This item shall be deemed to have been satisfied if all bottles, cans, and other multi-use containers are stored in clean crates or on racks in a clean place protected from splash, flies, and dust. Such containers as can practicably be inverted shall be stored in an inverted position. Storage racks shall preferably be constructed of metal protected against rusting.

Floors of any room shall not be flushed when crates of cleaned bottles are stacked thereon.

Item 14p. Handling of Containers and Equipment

Between bactericidal treatment and usage, and during usage, containers and equipment shall not be handled or operated in such manner as to permit contamination of the milk.

Public-health reason.—Carrying bottles by inverting fingers into the mouths, running the hands over the surfaces of milk coolers, bottling machines, or pasteurization equipment, or allowing the clothing to brush against cleaned surfaces with which milk or milk products come in contact, will obviously nullify the effect of bactericidal treatment.

Satisfactory compliance.—This item shall be deemed to have been satisfied if the health officer is assured that the employees of the pasteurization plant are using every reasonable precaution to prevent the milk-contact surfaces of containers and equipment from coming into contact with their persons or clothing between the time they are given bactericidal treatment and the time they are again used, or while in use.

[19] Developed by the American Bottlers of Carbonated Beverages, Washington, D. C., from whom the test procedure may be secured.

Item 15p. Storage of Caps, Parchment Paper, and Single-Service Containers

Milk bottle caps or cap stock, parchment paper for milk cans, and single-service containers shall be purchased and stored only in sanitary tubes and cartons, respectively, and shall be kept therein in a clean, dry place.

Public-health reason.—Soiled or contaminated caps, parchment papers, and single-service containers nullify the benefits of the safeguards prescribed throughout the ordinance. Packing the caps in tubes which are unbroken until they are placed in the bottling machine is the best manner of assuring cap cleanliness.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) All bottle caps are purchased in tubes, and all cap stock, parchment paper for milk cans, and all single-service containers are purchased in cartons.

(2) The tubes and cartons are stored so as to be kept clean and dry.

The storage of cap tubes or parchment-paper cartons in wet or dusty places or the refilling of tubes or cartons with spilled caps or papers violates this item. Suitable cabinets shall be provided for storage of tubes and cartons after removal from the large outer box. At the beginning of each run the first cap from each tube, or the first few caps from each roll of cap stock, or the first parchment paper shall be discarded, as they have been exposed and may be contaminated.

Item 16p. Pasteurization

Pasteurization shall be performed as described in section 1 (L) of this ordinance.

The definition of pasteurization reads as follows:

The terms "pasteurization," "pasteurized," and similar terms shall be taken to refer to the process of heating every particle of milk or milk products to at least 143° F., and holding at such temperature for at least 30 minutes, or to at least 160° F., and holding at such temperature for at least 15 seconds, in approved and properly operated equipment: Provided, That nothing contained in this definition shall be construed as disbarring any other process which has been demonstrated to be equally efficient and is approved by the State health authority.

Public-health reason.—The public-health value of pasteurization is unanimously agreed upon by health officials. Long experience shows conclusively its value in the prevention of diseases which may be transmitted through milk. Pasteurization is the only measure known which if properly applied to all milk will prevent all milk-borne disease. Examination of cows and milk handlers, while desirable and of great value, can be done at intervals only and therefore may permit pathogenic bacteria to enter the milk for varying periods before the disease condition

is discovered.[20] Disease bacteria may also enter milk accidentally from other sources such as flies, contaminated water, utensils, etc. It has been demonstrated that the time-temperature combinations of 143° F. for 30 minutes and 160° F. for 15 seconds will, if actually applied to every particle of milk, devitalize all milk-borne pathogens.

Numerous studies and observations clearly prove that the food value of milk is not significantly impaired by pasteurization.[21]

It may be asked, if the above is true, why the Public Health Service Milk Ordinance does not require the pasteurization of all milk. The answer is simply that if the ordinance were so worded only a small percentage of cities could be induced to adopt it. It was considered wiser to frame the ordinance so as to make it adaptable not only to cities which were ready for the pasteurization of all milk but also to the many other communities in which there still persists a strong sentiment against pasteurization. In the latter group this ordinance will at least provide the maximum protection afforded by the raw milk precautions alone. Pending the time when the pasteurization of all milk can be required by ordinance, health officers should persistently urge the consumption of pasteurized or boiled milk only.

Satisfactory compliance.—This item shall be deemed to have been satisfied if the design and operation of the equipment meet the specifications of the following subitems, 16p (a) to (f).[22] [23]

16p (a). SPECIFICATIONS FOR PASTEURIZATION INDICATING, RECORDING, AND TEST THERMOMETERS

Public-health reason.—Unless the thermometers used on pasteurization equipment and those used for checking their accuracy are reasonably accurate, there can be no assurance that the proper pasteurization temperature is applied.

Satisfactory compliance.—All indicating and recording thermometers used in connection with the pasteurization of milk or milk

[20] See Frank, L. C., What Every Person Should Know About Milk. Supplement No. 150 to Public Health Reports. (Supersedes Reprint No. 1659 from the Public Health Reports of December 14, 1934.)

[21] See (1) Frank, L. C., and others, Do Children Who Drink Raw Milk Thrive Better Than Children Who Drink Pasteurized or Other Heated Milk? Reprint No. 1549 from Public Health Reports of September 23, 1932, 47: 1951. (2) The Nutritive Value of Raw and Pasteurized Milk for Calves, by G. S. Wilson, F. C. Minett, and H. F. Carling, Journal of Hygiene (London), April 1937, p. 243. (3) Raw or Pasteurized Milk? Editorial, A. J. P. H., December 1938. (4) The Responsibility of Health Authorities and Physicians With Reference to the Pasteurization of Milk in Communities in Which Pasteurization Is Not Compulsory. Mimeographed publication, U. S. Public Health Service, November 1932.

[22] The *phosphatase test* for pasteurization is based on the inactivation by heat of the enzyme phosphatase which is naturally present in fresh milk. It will not indicate all under-pasteurization, nor whether the defect is under-pasteurization in temperature, under-pasteurization in time, or the addition of raw milk. Nevertheless, the test is of considerable value as a check of the pasteurization process, but it should be used only as a supplement to plant inspection. To be dependable, the test must be performed by competent personnel and with adequate controls. For methods of testing and experiences with the test reference is made to the following: (1) F. W. Gilcreas, Journal of the Association of Official Agricultural Chemists, August 1938, pp. 372-380; (2) Report of Committee on Phosphatase Test, 1938 Milk Transactions of the U. S. Public Health Service Sanitation Advisory Board, pp. 5-12 (mimeographed publication, U. S. Public Health Service); (3) H. D. Kay and W. R. Graham, Jr., The Phosphatase Test for Pasteurized Milk, Journal of Dairy Research, 1935, 6, 191-203; (4) Harry Scharer, Journal of Dairy Science, XXI, 1 (January 1938), 21-34; (5) F. W. Gilcreas and W. S. Davis, The Practical Value of the Phosphatase Test for Pasteurization, Eleventh Annual Report (1937) of the New York State Association of Dairy and Milk Inspectors, pp. 83-100.

[23] It is of utmost importance that the superintendent or chief *operator of a pasteurization plant* be familiar with the pasteurization requirements of this ordinance and code, with the operation of pasteurization equipment, and with the diseases that may be transmitted through milk. State milk control officials are urged to survey their educational facilities for the purpose of developing a training program for pasteurization plant operators with a view to future licensing of such operators.

products, and all test thermometers used by the health officer in checking plant thermometers, shall comply with the following specifications.

These specifications shall be complied with in the case of all new equipment and in the case of all replacements of indicating and recording thermometers. They shall also apply to all repairs of recording thermometers requiring a renewal of the tube system. The accuracy and lag specifications shall apply to old as well as new equipment.

Indicating thermometers located on pasteurization vats or pockets

Type.—V-shaped brass or equally noncorrodible scale case, with removable glass front, mercury actuated, line etched in glass tube at 143° F., filling above mercury, nitrogen, or equally suitable gas.

Magnification of mercury column.—To apparent width of not less than one-sixteenth inch.

Scale range.—130° to 210° F., extension either side permissive, protected against damage at 220° F.

Temperature represented by smallest scale division.—Not more than 1° F. between 130° and 150° F.

Number of degrees per inch of scale.—Not more than 16.

Accuracy.—Within 0.5° F., plus or minus, between 142° F. and 145° F.

Submerged stem fittings.—Pressure-tight seat against inside wall of holder. No threads exposed to milk. Location of seat to conform to that of standard I. A. M. D. wall-type fitting.

Bulb.—Corning normal, or equally suitable thermometric glass.

Indicating thermometers located on pasteurization pipe lines

Type.—V-shaped brass or equally noncorrodible scale case, with removable glass front, mercury actuated, lines etched on stem at 143° F. and at 160° F., filling above mercury, nitrogen, or equally suitable gas.

Magnification of mercury column.—To apparent width of not less than one-sixteenth inch.

Scale range.—138° to 165° F., with extension on either side permissive, protected against damage at 220° F.

Temperature represented by smallest scale division.—0.5° F. between 138° and 165° F.

Number of degrees per inch of scale.—Not more than 8.

Accuracy.—Within 0.5° F., plus or minus, throughout specified scale range.

Stem fittings.—Pressure-tight seat against inside wall of fittings; no threads exposed to milk; distance from under side of ferrule to top of bulb not less than 2 inches.

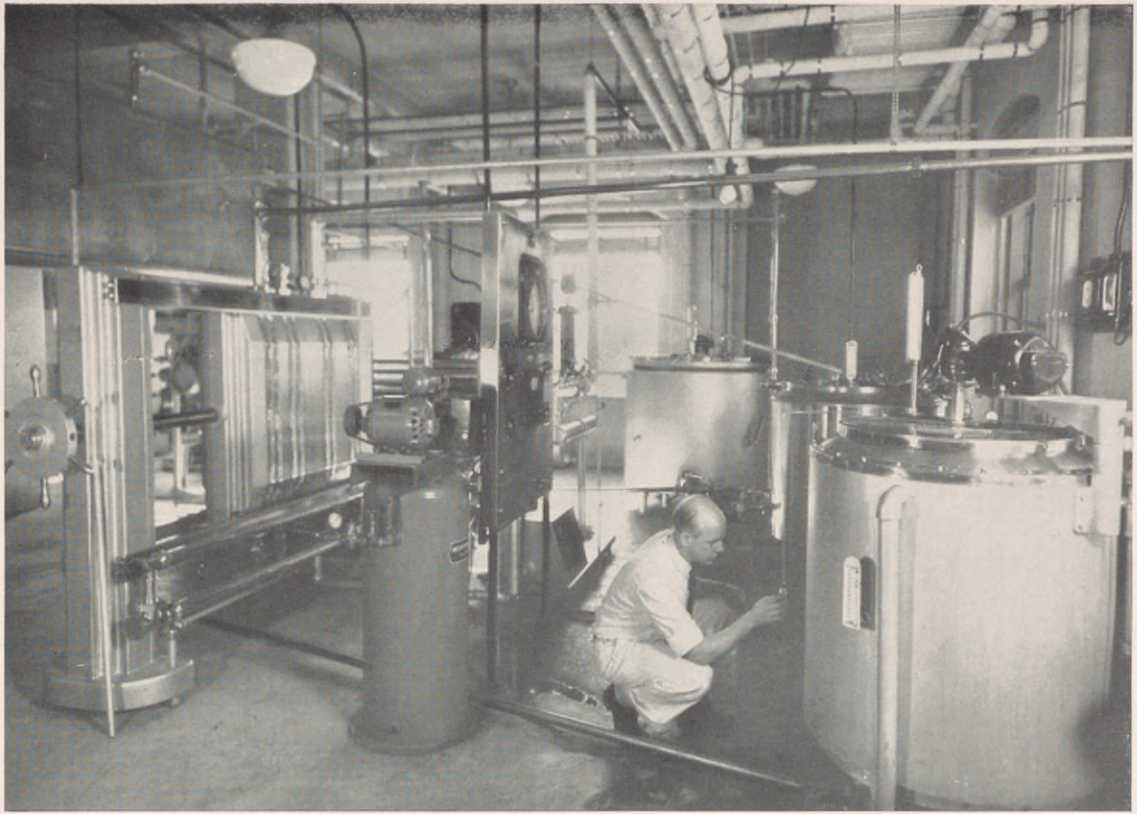


FIGURE 17.—U. S. P. H. S. EXPERIMENTAL PASTEURIZATION PLANT.

(Note manually controlled batch-type pasteurizers on right. On left, automatic high-temperature short-time pasteurizer with tubular holder section and plate-type regenerator, heater, and cooler, with control panel in center.)

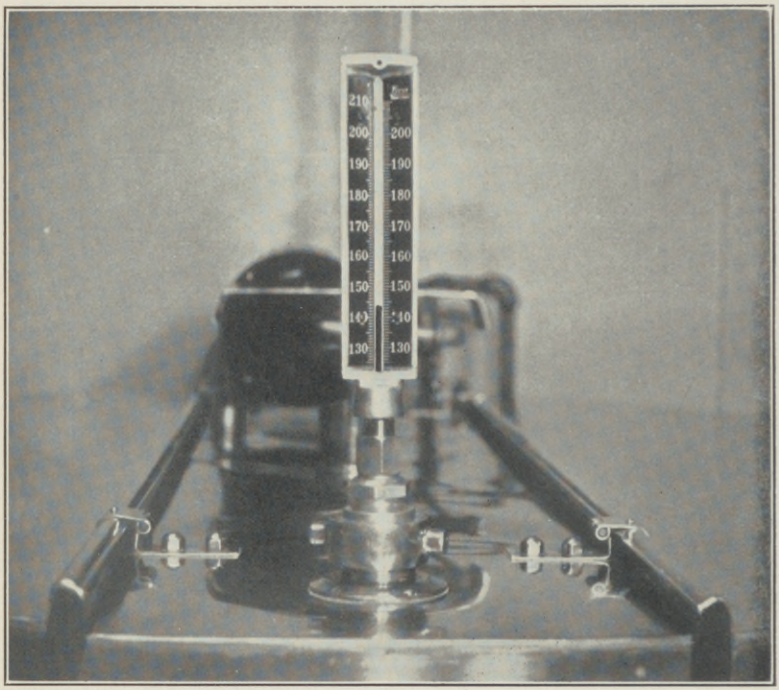


FIGURE 18.—PASTEURIZATION INDICATING THERMOMETER.

Thermometric lag.—When thermometer is at room temperature and then immersed in a well-stirred water bath maintained at a temperature at which the thermometer to be tested reads 160° F., the time required for the reading to increase from 141° F. to 153° F. shall not be more than 4 seconds.

Bulb.—Corning normal, or equally suitable thermometric glass.

Tests of indicating thermometers.—The local or State inspector shall once each month check the accuracy of all indicating thermometers at the legally required temperature of pasteurization by means of a standardized thermometer reading within 0.2° F. In the case of indicating thermometers located on vats or pockets, this may be done by lowering a standardized maximum-self-registering test thermometer to the position of the bulb of the indicating thermometer in the holder during the holding period with the milk in agitation. In the case of indicating thermometers located on pipe lines this may be done by fitting the indicating thermometer to a sanitary cross and inserting a standardized test thermometer through a thermometer holder (I. A. M. D. fitting No. 55–A) equipped with a rubber washer for holding the thermometer in place against pressure in the milk line, and attached to one of the arms of the cross by means of a union nut (I. A. M. D. fitting No. 13). The inspector should carry with him thermometer holders of the sizes necessary for the plants in his territory. Ordinarily the 1½-inch and 2-inch sizes will be sufficient.

The thermometric lag of all indicating thermometers located on pasteurization pipe lines shall be tested by the inspector before approval.

The inspector shall identify by number, seal, or otherwise the indicating thermometer when tested.

Recording thermometers for pasteurization apparatus

Case.—Moisture proof (under operating conditions obtaining in pasteurization plants).

Scale range.—130° to 150° F., or, in the case of 15-second pasteurization, 145° to 200° F., with extension of scale on either side permissive.

Temperature represented by smallest temperature-scale division.—1° F. between 140° and 145° F., or, in the case of 15-second pasteurization, between 157° and 162° F.

Length of 1° F. scale division.—Not less than one-sixteenth inch between 142° and 145° F., or, in the case of 15-second pasteurization, between 159° and 162° F.

Time represented by smallest time-scale division.—Not more than 10 minutes.

Chord or straight-line length of 10-minute scale division.—Not less than one-fourth inch between 142° and 145° F., or, in the case of 15-second pasteurization, between 159° and 162° F.

Time accuracy.—The recorded elapsed time as indicated by the chart rotation shall not exceed the true elapsed time as shown by a correct watch over a period of at least 30 minutes. All new recorders, except those used as recorder-controllers for milk-flow stops, shall be equipped with spring-operated clocks, which may, however, be electrically wound.

Temperature accuracy.—Within 1° F., plus or minus, between 142° and 145° F., or, in the case of 15-second pasteurization, between 159° and 162° F. The accuracy may be determined by the following mode of procedure:

(1) The instrument shall be adjusted, if necessary, to read correctly at some point between 142° and 145° F., or, in the case of 15-second pasteurization, between 159° and 162° F., while it is connected with the pasteurization apparatus, and as shown by the tested indicating thermometer after a stabilization period of 5 minutes at constant temperature with the agitation device in operation.

(2) The bulb shall be removed from the pasteurizer and immersed for not less than 5 minutes in boiling water.

(3) The bulb shall then be immersed for not less than 5 minutes in melting ice.

(4) The bulb shall be again connected with the pasteurizer and the temperature brought to a point between 142° and 145° F., or, in the case of 15-second pasteurization, between 159° and 162° F., as shown by the tested indicating thermometer under the same test conditions outlined under (1). At this time the deviation of the recording thermometer reading from that of the indicating thermometer shall not be more than 1° F., plus or minus.

Frequency of accuracy tests.—The temperature accuracy of the recording thermometer shall be tested by the health officer upon installation and at least semiannually thereafter and at such other times as the operator's daily check with the indicating thermometer shows the recording thermometer to be frequently incorrect. The time accuracy of the recorder shall be tested monthly by the health officer.

Pen-arm setting device.—Easily accessible, simple to adjust.

Pen and chart paper.—Designed to give line not over one-fortieth inch thick when in proper adjustment, which shall be easy to maintain.

Pressure system (bulb, tube, spring, etc.).—Protected against damage at bulb temperature of 220° F.

Stem fitting.—Pressure-tight seat against inside wall of holder or pipe. No threads exposed to milk. Location of seat in batch-type pasteurizers to conform to that of a standard I. A. M. D. wall-type fitting.

Chart speed.—The chart shall make one revolution in 12 hours, and shall be graduated for a 12-hour record. The rotating chart support

shall be provided with a pin to puncture the chart in a manner to prevent its fraudulent rotation.

Record of milk flow.—On installations equipped with a milk-flow stop the recording thermometer located nearest the milk-flow stop shall be provided with an additional pen arm for recording upon the chart the full record of the time during which the milk-flow stop is in the forward-flow position.

Inspectors' maximum-self-registering thermometers to be used in the testing of indicating thermometers on pasteurization vats or pockets

Type.—Maximum-self-registering, mercury-actuated, pocket type, readily cleanable.

Magnification of mercury column.—To apparent width of not less than one-sixteenth inch.

Protection against high-temperature damage.—At 155° F.

Scale range.—138° to 148° F., with extension of scale on either side permissive, 138° point to be not less than three-fourths inch above contraction.

Temperature represented by smallest scale division.—0.2° F.

Number of degrees per inch of scale.—Not more than 6.

Accuracy.—Within 0.2° F., plus or minus, between 142° and 145° F. The accuracy shall be checked against a thermometer which has been tested by the United States Bureau of Standards.

Case.—Metal, provided with suspension ring and fountain-pen clip.

Armor.—Thermometers, if armored, to be easily removable for cleaning, armor to be fenestrated opposite thermometer bulb; scale to be visible without removing armor.

Bulb.—Corning normal, or equally suitable thermometric glass.

The inspector should check maximum-self-registering test thermometers against themselves occasionally for failure to hold reading when taken from the liquid in which they have been immersed. This may be done by holding them in clear water at approximately 142° F., reading the temperature while immersed, and then reading the temperature again after the thermometer has been removed from the water.

Inspectors' thermometers to be used in the testing of indicating thermometers located on pasteurization pipe lines

Type.—Mercury actuated, readily cleanable, plain front, enameled back, top finish with glass ring, length 12 inches, standardized for 4-inch immersion, immersion point to be etched on stem; contraction chamber to be of narrow type immediately above bulb, not over 1 inch long, mercury to stand in contraction chamber at 32° F.

Protection against high-temperature damage.—At 220° F.

Scale range.—138° to 165° F., with extension of scale on either side permissive, 138° point to be not less than 1 inch above immersion line.

Temperature represented by smallest scale division.—0.2° F.

Number of degrees per inch of scale.—Not more than 6.

Accuracy.—Within 0.2° F., plus or minus, throughout specified scale range. The accuracy shall be checked against a thermometer which has been tested by the United States Bureau of Standards.

Carrying case.—Felt-lined metal.

Bulb.—Corning normal, or equally suitable thermometric glass.

16p (b). SPECIFICATIONS TO INSURE THAT THE REQUIRED PASTEURIZATION TEMPERATURE AND TIME WILL BE APPLIED TO EVERY PARTICLE OF MILK AND MILK PRODUCTS

Public-health reason.—Recording thermometers are the only means available for furnishing the health officer with a record of the time and temperature of pasteurization. Experience has shown that recording thermometers, due to their mechanical complexity, are not entirely reliable. Therefore, mercury indicating thermometers, which are much more reliable, are necessary to check the recording thermometers and to assure that proper temperatures are applied.

The recording thermometer shows the temperature of the milk immediately surrounding its bulb, and shows the holding time in certain designs, but cannot indicate the temperature of the milk in other portions of the holder, nor the holding time in certain other types of equipment. The pasteurizer must, therefore, be so designed and operated and, where necessary, provided with such automatic controls, as to insure that every portion of the milk will be subjected to the proper temperature for the required length of time.

Satisfactory compliance.—The following specifications shall be satisfied for the respective types of pasteurization equipment:

(A) REQUIREMENTS FOR MANUAL-DISCHARGE SYSTEMS EQUIPPED FOR HEATING IN THE HOLDER

Temperature control

(1) *Limitation of simultaneous temperature differences.*—The holder shall be so designed that the simultaneous temperature difference between the milk at the center of the holder vat and the coldest milk in the vat will not exceed 1° F. at any time during the holding period.

This requirement may be assumed to have been satisfied if the holder is provided with adequate agitation operating throughout the holding period. By *adequate agitation* is meant agitation so designed as to sweep the milk currents effectively through all zones occupied by the milk, including the outlet port, but excluding inlet or outlet pipes surrounded by milk in the process of pasteurization and open to the holder at the bottom. No batch of milk or milk products shall be pasteurized unless it covers a sufficient portion of the agitator to insure adequate agitation.

(2) *Location and required readings of indicating and recording thermometers.*—Each such holder shall be equipped with both an indicating and a recording thermometer: *Provided*, That thermometer

equipment may be transferred from one holder to another if the required thermometer equipment is in place on each holder during the entire filling, heating, holding, and emptying periods.

Said thermometers shall read for each batch at least the required pasteurization temperature throughout the required holding period. The temperature shown by the recording thermometer shall be checked daily by the plant operator against the temperature shown by the indicating theremometer and at least monthly by the health officer, and the readings recorded on the instrument chart. The recording thermometer shall be kept adjusted so as at no time to read higher than the indicating thermometer. No batch of milk or milk products shall be pasteurized unless it is sufficient in volume to cover the bulbs of the indicating and recording thermometers.

Time control

(3) *Insurance of minimum holding period.*—Holders shall be so operated that the record charts will indicate at least 143° F. for a period of not less than the following:

(*a*) If cooling is begun in the holder simultaneously with, or before, the opening of the outlet valve, 30 minutes.

(*b*) If cooling is either begun in the holder after the opening of the outlet valve or is done entirely outside of the holder, 30 minutes plus the emptying time to the level of the recording thermometer bulb. The emptying time shall be determined by the health officer for each holder so operated, initially and after any change which may affect this time.

No milk shall be added to the holder after the start of the holding period.

Record of temperature and time

(4) *Recording thermometer charts.*—All recording thermometer charts shall be preserved for a period of 3 months for the information of the health officer. No chart shall be used more than 1 day except with the permission of the health officer. All charts shall contain the following information:

(*a*) Date.

(*b*) Number or location of the recorder if more than one is used.

(*c*) Reading of indicating thermometer at some time indicated by the chart during the holding period. Monthly, initials of health officer opposite reading.

(*d*) Monthly, the time accuracy of the recorder, as found by official test.

(*e*) Amount and grade of pasteurized milk or milk products represented by chart.

(*f*) Record of unusual occurrences.

(*g*) Signature or initials of operator.

These chart entries may be conveniently made if each plant provides itself with a rubber stamp containing the above items with blank spaces for entries. A suggested stamp is shown below.

Date_____(Identity of pasteurization plant.)
Number or location of recorder_____
Indicating thermometer read_____° F. at_____o'clock.
*Indicating thermometer reading when milk-flow stop cut-in _____° F.; cut-out_____° F.
Product_____, Grade_____, Gals_____
No unusual occurrence, except as noted on reverse side.
Signature or initials of operator_____

*This item to be included only if milk-flow stop is used.

(B) REQUIREMENTS FOR AUTOMATIC-DISCHARGE SYSTEMS, AND FOR MANUAL-DISCHARGE SYSTEMS NOT EQUIPPED FOR HEATING IN THE HOLDER

Temperature control

(1) *Thermostatic control.*—Each such system shall be equipped with a dependable thermostatic control so designed and set as to cause every particle of milk and milk products to be heated automatically to at least the required pasteurization temperature.

(2) *Milk-flow stop required.*—Automatic milk-flow stops are devices which stop the forward flow of milk whenever its temperature drops below the required limit in case the thermostat or the heat source fails. Such devices include automatic milk-pump stops (which automatically start and stop the milk-pump motors at the required temperature), and automatic flow-diversion devices (which automatically divert the milk away from all downstream points whenever it drops below the required temperature, and automatically resume forward flow when it again reaches the required temperature).

All automatic-discharge systems, and manual-discharge systems not equipped for heating the milk in the holder, shall be equipped with an automatic milk-flow stop which complies with the following specifications.

(3) *Milk-flow stop specifications.*—The design and *temperature setting* of milk-flow stops shall be such that the flow of milk will, during descending temperatures, completely stop or be diverted before or when the indicating thermometer reaches the pasteurization temperature, and will not, during ascending temperatures, resume forward flow before the pasteurization temperature is again reached. Milk-flow stops are intended as safety devices and not as a part of the routine temperature control equipment. The routine operating milk temperature shall, therefore, be sufficiently above the temperature setting of the milk-flow stop so that the latter will not be brought into frequent

operation. The stop shall be so designed that the plant operator cannot lower the temperature setting without the knowledge of the health officer. This may be done by means of seals, which shall not be broken by the plant operator without promptly notifying the health officer.

The *control mechanism* of all flow-stops shall be so designed that the forward flow of milk cannot start unless the temperature of the stop-bulb is at or above the cut-in setting. Manual switches for starting milk pumps are prohibited where milk-pump stops are used, but not where flow-diversion devices are used. The system shall be so designed that no milk can be bypassed around the flow-stop bulb, which shall not be removed from its proper position during the pasteurization process.

Manual starting switches are prohibited for milk-pump stops because they can be operated manually to permit forward flow of milk even if it is below the pasteurization temperature. They are permitted for flow-diversion devices because the operation of the milk pump does not cause forward flow of sub-temperature milk but merely recirculates the milk through the heater until it attains the temperature necessary to shift the device into its forward-flow position.

When the milk-pump-stop bulb is surrounded by air, as at the beginning of a run or in some cases after lengthy shut-downs, starting may be difficult without a manual switch. Quick starting may be provided by installing in the milk line, just upstream from the bulb and extending through the heat-jacketing, a sanitary tee to which is soldered a sanitary valve with the outer end unthreaded, so that the valve may be opened to permit the application of steam from a hose and then closed as soon as the milk pump starts.

All newly installed automatic milk-flow stops shall be combined with a *recording thermometer* actuated by the same bulb system, as otherwise it is impossible to determine satisfactorily the thermometric lag of the recorder-controller; but the cut-out response shall be independent of the temperature pen-arm response, as by means of separate elements actuated by the same bulb system, so that if the friction lag of the pen arm increases beyond that existing when the thermometric lag was last tested the speed of the cut-out response will not be reduced. In existing installations the recording thermometer bulb shall be located as near as practicable to the bulb of the milk-flow stop. The recording thermometer shall be so designed as to record the times of cut-in and cut-out of the flow stop.

The *cut-out and cut-in milk temperatures* shown by the indicating thermometer shall be determined daily by the plant operator and at least monthly by the health officer, and entered upon the recording thermometer chart. This test may be made at any time during the day's run by reducing the steam supply to the heater so as slowly to reduce the milk temperature (not over 1° F. per each 30 seconds). If the flow stop operates of its own accord at any time during the day's run the above test may be omitted for that day, since the record-

ing thermometer will automatically record the cut-out and cut-in responses.

In case *automatically controlled holder heaters* are used, as described below under (4), the holder-heating-medium temperatures at which the holder-heater controller cuts out and cuts in the milk flow shall be determined at least monthly by the health officer and entered upon the recording thermometer chart.

Automatic flow-stops shall be so designed that *failure of the primary motivating power* will automatically stop or divert the flow.

All flow-stops shall be so designed and installed that in the stop position *sub-temperature milk* will not enter the forward-flow line. In the case of *flow-diversion valves* this requirement will be satisfied if all of the following conditions are met:

(1) Forward flow of sub-temperature milk due to the omission or jarring loose of the connecting clip shall be avoided (a) by making the valve and its actuating mechanism integral; or (b) if there is a connecting device, by making it impossible to assemble the valve and its actuating mechanism except in such manner as to function properly; or (c) if there is a connecting device which may be omitted or shaken loose, by providing for pushing instead of pulling the valve stem to the diverting position, or by providing that the pump will shut down when the milk is below the pasteurization temperature and the valve is not in the fully diverting position, or by any other equally satisfactory means.

(2) It shall be impossible to tighten the stem packing to such an extent as to prevent the valve from assuming the fully diverting position. The health officer can test compliance with this requirement by tightening the packing nut as tightly as is physically possible with the valve in the forward-flow position, then reducing the milk temperature to below the pasteurization temperature, and noting whether the valve is free to assume the fully diverting position.

(3) A leak escape shall be installed on the forward-flow side of the valve seat. However, if back pressure is exerted on the forward-flow side of the valve seat while the milk flow is being diverted, the leak escape should lie between two valve seats or between two portions of the same seat, one upstream and the other downstream from the leak escape, as otherwise there would be continuous loss of milk through the leak escape during diversion periods. The leak escape shall be so designed and the valve so installed as to drain all leakage to the outside. For design of leak escapes see item 16p (c).

(4) The closure of the forward-flow seat shall be sufficiently tight so that leakage past it will not exceed the capacity of the leak escape device, as evidenced when the forward-flow line is disconnected; and in order that proper seating may not be disturbed, the length of the connecting rod shall not be adjustable by the user.

(5) Specifications (1), (2), and (4) above shall apply to all equipment installed after January 1, 1940. Specification (3) applies to existing as well as newly installed equipment.

The actuating bulb of automatic flow-diversion devices shall be located in the milk line immediately upstream from the diversion device (not over 18 inches distant), since if located downstream forward flow could not be resumed when the required milk temperature is again reached, and since if not located immediately upstream subtemperature milk may flow forward. However, the bulb may be located downstream from the flow-diversion device if the bulb is within the influence of a heating medium.

It is suggested that automatic milk-pump stops be so connected as simultaneously to stop all milk pumps in the system which would be likely to cause overflow if operating when flow to the holder has stopped. This is better than to stop automatically only the milk pump to the holder proper and depend upon manual operation of a switch to stop other milk pumps in the system.

The *thermometric lag* of the recorder-controller shall be such as to meet the following test, which shall be applied immediately after installation and at least monthly thereafter.

Thermometric lag tests are required because the volume of milk which will pass the flow-stop after the actual milk temperature drops below the pasteurization temperature will increase with the thermometric lag, which is merely a measure of speed of response. Periodic tests are necessary because the lag is not constant but is affected by the smoothness of the recorder-chart paper and the pen point, the pressure of the pen arm, and the length of bulb immersion.

(*a*) Adjust the recording thermometer which forms a part of the milk-flow-stop controller to read correctly the pasteurization temperature when checked against a standard test thermometer under approximately constant temperature conditions.

(*b*) Adjust the controller setting so that cut-in will occur when the recording thermometer reads the pasteurization temperature during slowly rising temperatures. This can be done by placing the bulb of the controller in a can of water at 5° F. below the pasteurization temperature and slowly increasing the temperature (as with a steam hose) at a rate not to exceed 1° F. per each 30 seconds.

(*c*) Allow the controller bulb to cool to about room temperature and then immerse it in a can filled with water which has been brought to 7° F. above the pasteurization temperature and is kept agitated. The interval between the moment when the recording thermometer reads 12° F. below the pasteurization temperature and the moment of power cut-in shall be not more than 10 seconds for existing installations and not more than 5 seconds for new installations.

(*d*) The interval between the moment of power cut-out during descending temperatures and the moment when the forward flow of milk ceases shall not exceed 1 second.

(4) *Milk-flow stop location.*—The milk-flow stop may be located *either upstream or downstream* from the holder system if the system is so designed that the milk can neither increase nor significantly drop in temperature, as defined below, between the time it leaves the heater and the end of the holding period.

A flow-stop shall be located *upstream* from the holder if any part of the holder is provided with a heating device capable of raising the temperature of the milk therein. Otherwise the milk may enter the holder below and leave the holder at or above the pasteurization temperature and thus not have been at the pasteurization temperature for the full holding period.

A milk-flow stop shall be located *downstream* from the holder if the holder is so designed that any particle of milk can drop significantly in temperature after leaving the heater and before the end of the holding period, such as by failure of the holder heater, or by permitting the hot inflowing milk to be cooled, after a shut-down exceeding the holding time, by the cooled holder contents or metal.

By *significant temperature drop* shall be meant a temperature drop of more than 1° F. when all automatically controlled holder heaters, as defined below, are operating continuously, or of more than 2½° F. when all automatically controlled holder heaters cease operating at the beginning of the holding period, in both cases with all non-automatically controlled holder heaters cold, as determined by the official tests described below.

An *automatically controlled holder heater* shall be taken to mean one so designed and connected with the upstream milk-flow stop as to stop the milk flow into the holder when its heating medium drops below the required temperature setting of its thermostat, and so as automatically to restart the milk flow but not before the required temperature is reestablished. Such holder heaters shall be equipped with a thermometer for indicating the temperature of the heating medium.

To prevent the heating medium of any holder heater from accidentally becoming a cooling medium, it shall not be permanently connected with a water make-up line. However, steam heaters which are provided with a trap to eliminate water from the line may be accepted.

Test of "significant temperature drop" in 30-minute holders shall be made by the health officer before such equipment is approved and whenever the seal of the controller setting of the holder heater is broken.

The test shall be started with the holders at room temperature. Water may be used in lieu of milk. Turn on all automatically controlled holder heaters, but do not turn on holder heaters not automatically controlled. Operate the system at routine operating temperature for a sufficient period to bring about equilibrium of outlet temperatures, so as to provide standardized preheating of the entire system.

After equilibrium is established, in case automatic adequate agitation, as defined below, is provided, observe the milk temperature at the inlet at 15-second intervals during filling of one of the holder units and at the outlet shortly after the start of emptying, by means of standardized test thermometers. If the outlet

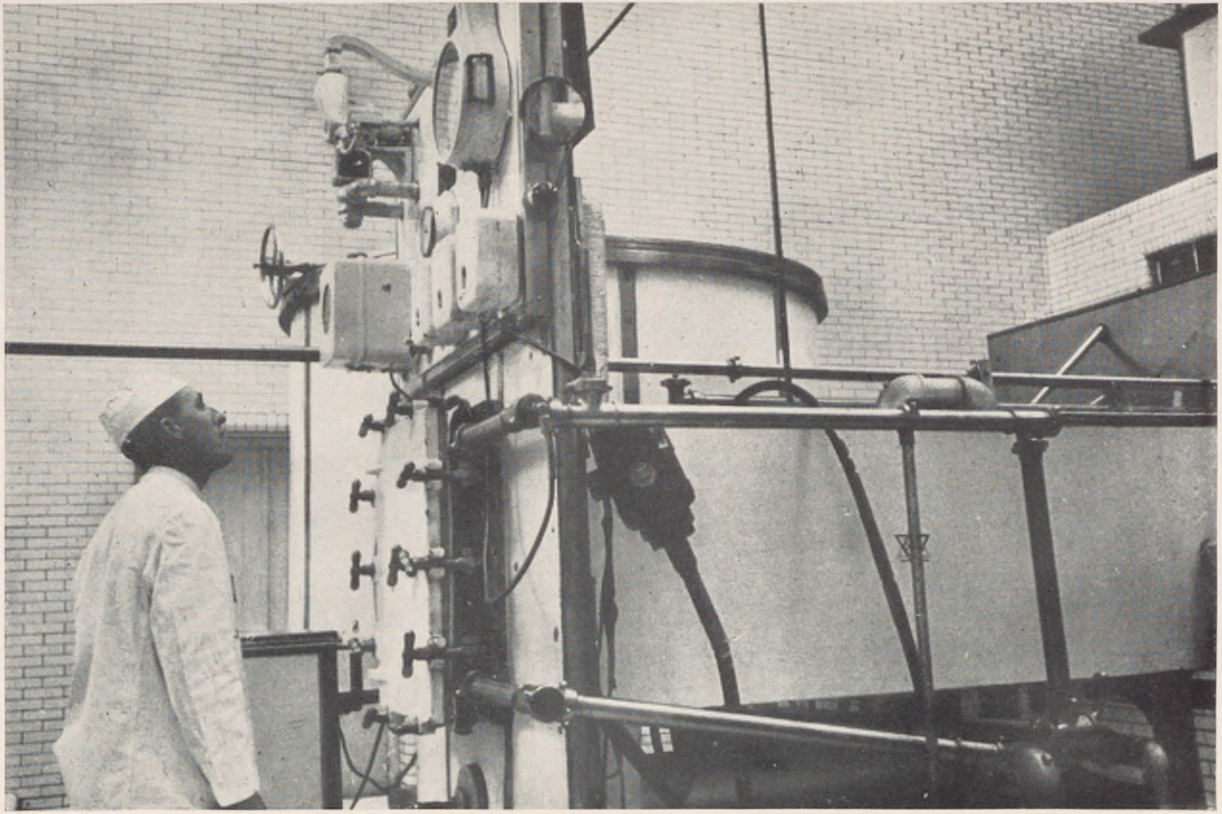


FIGURE 19.—AUTOMATIC POCKET-TYPE PASTEURIZER WITH MILK-FLOW STOP.

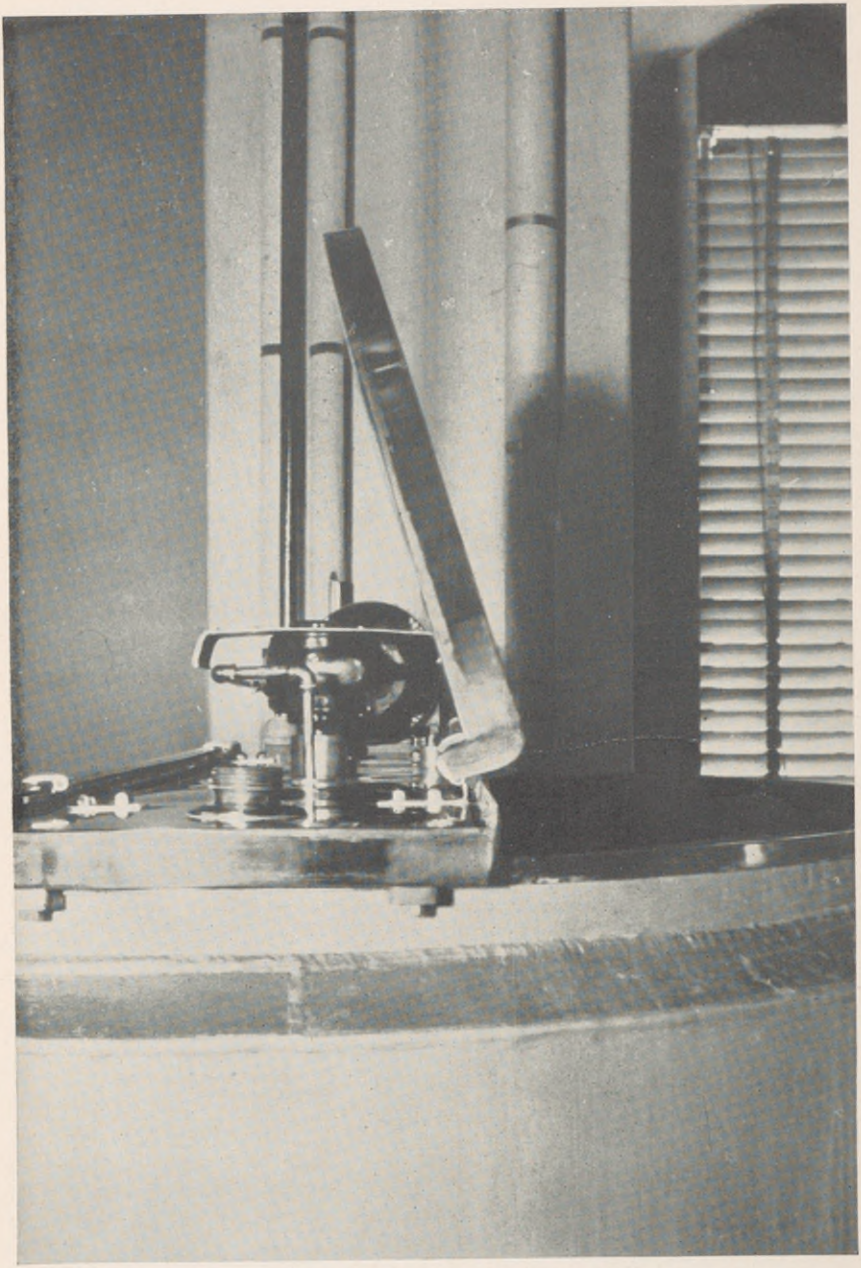


FIGURE 20.—VAT COVER OF APPROVED DESIGN.

(Note set-back hinges, raised edges, and cover edges which overlap in both open and closed positions.)

temperature is within 1° F. of the mean inlet temperature, the setting of the thermostat of the automatically controlled holder heater is satisfactory for normal operation. If the outlet temperature is not within 1° F. of the mean inlet temperature, raise the thermostat setting of the holder heater and repeat the test until the outlet temperature comes within 1° F. of the mean inlet temperature. Now repeat the test but with all automatically controlled holder heaters turned off at the beginning of the holding period of one of the holder units, and raise the thermostat setting of the holder heater, if necessary, until the outlet temperature comes within 2½° F. of the mean inlet temperature. Finally, adjust the controller setting of the holder heater so that the milk-flow stop cuts out when the holder-heating-medium temperature drops below the thermostat setting, and seal this controller setting. The operator should be advised to raise the thermostat setting sufficiently to prevent frequent operation of the cut-out.

In case automatic adequate agitation, as defined below, is not provided, the same procedure is followed except that the thermostat setting of the automatically controlled holder heater is raised, if necessary, until the coldest particle of milk in the holder at any time during the holding period comes within 1° F. and 2½° F., respectively, of the mean inlet temperature. The test shall be conducted in such manner as not to alter the radiation or conduction characteristics of the coldest zone.

By *automatic adequate agitation* is meant adequate agitation, as previously defined (p. 102), and so designed that the timing mechanism cannot operate unless the agitator is operating.

(5) *Special requirements for systems with the flow-stop located upstream from the holder and with none located downstream.*

(*a*) *Temperature loss during holding period.*—The system shall be so designed that no particle of milk therein can, from the time it leaves the flow-stop bulb until the termination of the required holding period, drop significantly in temperature, as hereinbefore defined. This limitation of milk temperature drop may be accomplished, so far as the holder is concerned, either by adequate insulation, by automatically controlled holder heating, by insulation combined with such holder heating, or by combining any of these methods with agitation.

(*b*) *Location of milk-pump-stop bulb.*—If the milk-flow-stop is of the pump-stop type its bulb shall be located in the milk within the influence of the heating medium, either at the heater outlet or in the holder inlet line if the latter is heat-jacketed from the heater to the bulb position.

(*c*) *Gravity flow of sub-temperature milk.*—Where the milk-flow-stop is of the milk-pump-stop type, all forward gravity flow when the device is in the stop position shall be prevented by some method such as (1) by placing the pump-stop bulb above the level of all milk which lies between it and the nearest upstream point at which the milk is open to the atmosphere, and by locating the latter level below the elevation of the nearest point downstream from the bulb at which the milk emerges to the atmosphere;[24] or (2) by installing

[24] Method (1) may permit the milk to recede from the pump-stop bulb during shut-downs, leaving the bulb surrounded by air and making restarting difficult. This difficulty may be avoided by installing a tight pump or a check valve in the milk line upstream from the stop bulb.

immediately downstream from the bulb a valve which will automatically stop forward flow and drain the inlet line downstream from the bulb when the pump stop goes into the stop position. Where the flow-stop is of the flow-diversion type the prevention of all forward flow, including gravity flow, in the stop position is inherent in the design because of the hereinbefore required specifications.

(*d*) *Temperature loss in holder inlet lines.*—To prevent appreciable milk-temperature drop between the milk-flow-stop bulb and the holder, all inlet lines between the milk-flow-stop bulb and the holder should be as short as practicable, and all milk in all parts thereof shall flow constantly toward the holder when the milk-flow-stop is in the forward-flow position, and the inlet lines downstream from the milk-flow-stop bulb shall automatically drain completely and quickly either forward into the holder or back to the milk-flow-stop bulb when the milk-flow-stop goes into the stop position; or temperature loss in the holder inlet lines shall be prevented by other equally satisfactory means.

For multiple-holder systems in which the milk inlet line enters the holders *above* the maximum level of the milk therein, and which have separate inlet valves to each vat or pocket, such inlet valves and the inlet header connecting them shall be at the same level in order to insure automatic drainage when the flow-stop assumes the stop position, and the header must be so looped or otherwise so arranged as to insure constant forward flow at all points and at all times when the flow-stop is in the forward-flow position.

For holder systems in which the milk inlet line enters the holder at any point *below* the maximum level of the milk therein, a milk-flow-stop bulb shall, unless the inlet lines are designed to drain back to the bulb or forward into the holder immediately following each assumption of the stop position, be located immediately adjacent to the point at which the milk enters each holder.

(*e*) *Temperature loss due to cooled holder metal or contents.*—In order to prevent the inflowing hot milk from being cooled, after a lengthy shut-down, by the cooled holder contents or metal, all systems in which the milk-flow-stop is located upstream from the holder shall be so designed that the milk-flow-stop cannot assume the forward-flow position unless the holder metal and the holder contents, if any, are at pasteurization temperature.

In the case of batch-type holders it may be impracticable to satisfy this requirement automatically. However, a practicable compromise is to provide that after a shut-down exceeding the holding time at least one holder space will be completely emptied either manually or automatically, and will be preheated manually, to receive the first milk entering the holder system upon resumption of forward flow.

In the case of short-time installations equipped with a milk-pump stop upstream from the holder, instead of a downstream flow-diversion

valve, this requirement may be satisfied automatically by heat-jacketing the entire line between the heater outlet and the holder outlet with a thermostatically controlled heating medium, and by installing a milk-pump-stop bulb (1) in the milk at the holder outlet if said line is *not* automatically self-draining whenever the milk pump shuts down, or (2) in the heating medium if said line *is* automatically self-draining; and the bulb shall be so connected as to permit the milk pump to operate only when the bulb temperature is at or above 160° F.[25] The cut-out and cut-in temperatures shall be tested as described under (3).

(*f*) *Temperature loss due to backflow into holder.*—Since the pasteurized milk downstream from the holder may have cooled after discharge, there shall be no backflow of pasteurized milk from the outlet line into any batch-type holder, as such backflow might cool the incoming hot milk. This requirement may be satisfied by providing gravity discharge to a free milk level below the inside bottom of the holder, or by using a positive-type pump or a check valve at the holder system outlet, or by other satisfactory means.

(6) *Special requirements for systems with the milk-flow-stop located downstream from the holder.*

(*a*) *Holder heating.*—No part of the system between the holder inlet and the flow-stop bulb shall be heated unless there is also an upstream flow-stop, as otherwise milk entering at a sublegal temperature might thereafter be raised to the legal temperature and thus be passed by the downstream flow-stop without having been held at pasteurization temperature for the required holding time.

(*b*) *Flow-diversion type required.*—Downstream flow-stops shall be of the flow-diversion type, unless an upstream flow-stop and a holder heater are also provided, since a pump-stop bulb must be located within the influence of a heating medium to permit resumption of forward flow, and since such holder heating is prohibited by the preceding paragraph unless there is also an upstream flow-stop.

(*c*) *Simultaneous temperature difference.*—The holder shall be designed so that in the case of a tubular or equivalent stream-flow holder the simultaneous temperature difference between the hottest and the coldest milk in any flow cross-section at any time during the holding period will not be greater than 1° F., and so that in the case of batch-type holders the simultaneous temperature difference between the milk at the center of any holder pocket and the coldest milk in that pocket will not at any time during the holding period be greater than 1° F.

[25] The effect of cold metal and of cold holder contents is more serious in the case of tubular holders than in the case of batch-type holders, inasmuch as in the former the first small volume of inflowing milk loses considerable temperature, while in the latter the temperature loss is relatively small as mixing distributes it through the entire batch of milk.

This requirement may be assumed to have been satisfied without test in the case of batch-type holders if the holder is equipped with automatic adequate agitation as previously defined under (4).

This requirement may be assumed to have been satisfied without test in tubular holders of 7 inches or less in diameter, which are free of any fittings through which the milk is not thoroughly swept.

(7) *Location and required readings of indicating and recording thermometers.*—Both an indicating and a recording thermometer shall be installed and used (1) at the bulb of each milk-flow-stop, (2) on each vat or pocket of manual-discharge systems, and (3) at the outlet of all holder systems with automatic discharge, unless each vat or pocket is so equipped. In the case of thermometers on pipe lines, the bulb of the indicating thermometer shall be located as near as practicable to the bulb of the recording thermometer, but may be located some distance upstream from the latter if the milk between the two bulbs is not within the influence of any heating medium.

All thermometers located adjacent to milk-flow-stop bulbs shall read at least the required pasteurization temperature at all times when the stop is in the forward-flow position. All thermometers located on the holder proper shall read at least the required pasteurization temperature for a period of not less than the following: (*a*) the required holding time plus the filling time from the level of the recording thermometer bulb, where cooling is begun in the holder simultaneously with, or before, the opening of the outlet valve; and (*b*) the required holding time plus the filling time and the emptying time from and to the level of the recording thermometer bulb, where cooling is either begun in the holder after the opening of the outlet valve, or is done entirely outside the holder. These filling and/or emptying times shall be determined by the health officer for each vat so operated, initially and after any change which may affect these times. All thermometers located at the inlet or outlet of a multiple holder system but not adjacent to a milk-flow-stop bulb shall read at least the pasteurization temperature at all times when milk is flowing past the bulbs of said thermometers; otherwise the milk shall be repasteurized.

The temperature shown by the recording thermometer shall be checked daily by the plant operator and at least monthly by the health officer against the temperature shown by the indicating thermometer, and the readings recorded on the instrument chart. The recording thermometer shall be kept adjusted so as at no time to read higher than the indicating thermometer.

Time control

(8) *Insurance of minimum holding period.*—Each automatic installation shall be so designed as to make it impossible for any milk to be

discharged from the holder unless it has been held therein for at least the required holding time. Each manual-discharge installation shall be operated to provide the full required holding time for every particle of milk and milk products. No milk or milk products shall be added to batch-type holders after the start of the holding period.

All automatic batch-type installations shall be equipped with a holder timing device driven by a motor the maximum attainable speed of which is such as to insure at least the required holding time. The motor may be either a constant-speed induction-type motor or in lieu thereof any other type of motor which is so connected with a governor as to limit its maximum speed so as to insure the required holding time, provided the setting of the governor is so sealed that it cannot be changed without the knowledge of the health officer. In all cases the motor shall be connected to the timing device by means of a common drive shaft, or by means of gears, pulleys, or a variable-speed drive, with the gear box, the pulley box, or the setting of the variable-speed drive protected in such manner that the holding time cannot be changed without the knowledge of the health officer.

Batch-type holders shall be so constructed that milk from one pocket cannot overflow into any other pocket, as otherwise such milk may be discharged from the holder without having been held 30 minutes.

All tubular or equivalent stream-flow holders shall have all holder inlet and outlet pumps connected with a motor system complying with the above requirements for batch-type holder timing devices.

Tubular and equivalent stream-flow holders shall be so designed as to prevent the accumulation of air or gases therein, as this may decrease the holding time. Unless the holder slopes continuously upward from inlet to outlet, this will require (1) the installation, at the high point nearest upstream from the holder but downstream from the pump, of an automatic sanitary pipe vent of a type and size which can be easily cleaned, provided that an opening to the atmosphere shall be accepted in lieu thereof, and provided that the installation of automatic vents may be waived if tests by means of a manually operated vent such as a simple valve, located at the above required vent location, demonstrate that no air or gases accumulate in the system after the forward flow of milk has begun, and (2) a continuous upward slope from the lowest point of the holder to the holder outlet, and also to the vent (or valve) if the latter is at a higher level. The milk may be sucked through the regenerator and the heater, but shall not be sucked through the holder.

In order to insure that all milk will be held for not less than 30 minutes, all 30-minute tubular installations shall comply with the following requirements: (1) The holder outlet shall be equipped with a valve which shall be kept closed until the holder is full and which

shall not be opened before the lapse of 30 minutes from the beginning of filling; (2) the holder outlet piping must rise to an elevation above the top of the holder; (3) if there is a pump downstream as well as upstream from the holder the pumps shall be so connected that the downstream pump will stop whenever the upstream pump stops.

(9) *Test for holding time.*—Immediately after installation or any replacement or alteration in design or arrangement, and whenever the seal of the setting of any variable-speed drive or motor governor has been broken, each pasteurizer shall be tested by the health officer for compliance with the detention requirement.

In the case of *pocket-type* installations this may be done by checking the timing device with a watch. The interval between the closing of the inlet valve and the opening of the outlet valve shall be not less than 30 minutes.

In the case of *tubular* or equivalent stream-flow holders this may be done by means of either methylene blue, chloramine, uranine, or starch-iodide pumped through the holder at the pasteurization temperature. The test shall be made with all valves and any other flow-impeding devices open to their fullest extent, and in case filters are used, with a new filter in place. The holding time of tubular or equivalent stream-flow holders equipped with a downstream flow-diversion valve shall be tested during both forward flow and diversion.

The following is a suggested method of testing by means of methylene blue, chloramine, uranine, or starch solutions.

The inlet to the holder is drilled to receive a one-eighth-inch straightway petcock. A large veterinary-type syringe, with a flat rubber washer slipped over its glass nipple in place of the needle, is filled with a saturated solution of methylene blue, chloramine, uranine (fluorescin), or starch, and the syringe pressed into the petcock opening. In making the injection the petcock is opened, the syringe discharged, and the petcock closed again. The solution is injected after the installation is in smooth operation with water at the pasteurization temperature in lieu of milk. The time of beginning injection must be observed accurately.

Twenty-five minutes after the solution has been injected the taking of samples at a petcock installed at the outlet end of the holder is begun and continued at 30-second intervals. (For high-temperature short-time pasteurizers the holding time is determined in the same manner, except that sampling is begun 10 seconds after the solution has been injected and continued at intervals of 1 second.) These samples are observed or tested for the presence of methylene blue, chloramine, uranine, or starch. The difference in time between injection and appearance at the effluent end is the observed holding time.

All tubular and equivalent stream-flow holders shall be equipped with a petcock at the inlet for the purpose of testing the holding time, also at the outlet unless the outlet discharges to the atmosphere, provided that in lieu thereof the manufacturer may provide the health officer with substitute fittings containing petcocks.

The holding time during filling or emptying of a 30-minute tubular holder may not be identical with the holding time observed for normal flow conditions. The holding time during filling may be determined by (1) injecting the solution 10 minutes after filling has begun; (2) opening the effluent valve and beginning

routine flow through the holder as soon as the holder is full, but not before the lapse of 30 minutes from the beginning of filling; and (3) taking samples at the effluent end at 30-second intervals from and after 25 minutes from the time the solution was injected. The holding time is then computed as before. The holding time during emptying may be determined by injecting the solution at the moment the emptying operation begins and observing the time taken to reach the effluent end by taking samples as before.

Record of temperature and time

(10) *Recording thermometer charts.*—Same as paragraph (4) under (A), except that the chart shall contain the following additional information:

(*h*) A record of the time during which the milk-flow stop is in the forward-flow position.

(*i*) The milk temperatures, determined daily, at which the cut-in and cut-out function, and monthly the initials of the health officer opposite the readings.

(*j*) Monthly, the health officer's initials opposite the holder-heating medium temperatures at which the controller of the automatically controlled holder heater, if any, cuts out and cuts in the milk flow.

(*k*) Monthly, the thermometric lag of the recorder-controller, as found by official test.

16p (c). INLET AND OUTLET VALVES AND CONNECTIONS

Public-health reason.—Unless the inlet and outlet valves and connections are properly designed and operated, the following conditions may result: (*a*) Cold pockets of milk may be held in the outlet valve or pipe line; (*b*) raw milk may leak into the vat or pocket during the holding or emptying time; or (*c*) raw or incompletely pasteurized milk may leak into the outlet lines during the filling, heating, or holding period.

Satisfactory compliance.—Inlet and outlet valves and pipe-line connections to pasteurization holders shall conform with the following design and operation requirements.

Definitions

The following definitions shall apply in connection with these specifications:

(1) A *90° stop* shall mean a stop so designed as to prevent turning the plug more than 90°. A *120° stop* shall mean a stop which prevents turning the plug more than 120°. A *180° stop* shall mean a stop which prevents turning the plug more than 180°, but which permits two "fully closed" positions, each diametrically opposite the other. A valve with an *irreversible plug* shall mean one in which the plug cannot be reversed in the shell. A *single-quadrant stop* shall mean a 90° stop in a valve with an irreversible plug.

(2) The *fully open position* shall mean that position of the valve seat which permits the maximum flow into or out of the holder. The *closed position* shall mean any position of the valve seat which stops the flow of milk into or out of

the holder. *The fully closed position* shall mean the position of the valve which requires the maximum movement of the valve to reach the "fully open" position. The *just-closed position* shall mean, in the case of a plug-type valve, that position of the plug in which the flow into or out of the holder is just stopped, or any closed position within five sixty-fourths inch thereof as measured along the circumference of the valve seat.

(3) *Leakage* shall be taken to mean the entrance of unpasteurized milk into a pasteurization holder during the holding or emptying period or the entrance of unpasteurized milk into any pasteurized-milk line at any time.

(4) A *leak-protector valve* shall mean a valve which is provided with a leak-diverting device which, when the valve is in any closed position,[26] will prevent leakage of milk past the valve or, in the case of holders filled or emptied by suction or compressed air, will prevent leakage of milk due to the leakage of air past the suction valve or the compressed-air valve, as the case may be.

(5) A *close-coupled valve* shall mean a valve the seat of which is either flush with the inner wall of the holder or so closely coupled that all milk in the valve pocket is not more than 1° F. colder than the milk at the center of the holder at any time during the holding period: *Provided*, That in the absence of tests to the contrary, a close-coupled valve which is not truly flush shall be considered as satisfying this requirement (*a*) if the holder outlet is so flared that the smallest diameter of the large end of the flare is not less than the diameter of the outlet line plus the depth of the flare, and (*b*) if the greatest distance from the valve seat to the small end of the flare is not more than one and one-half times the diameter of the outlet line in the case of existing equipment, and not greater than the diameter in the case of newly installed equipment, and (*c*) if, in the case of vat and pocket holders, the outlet and the agitator are so placed as to insure that milk currents will be swept into the outlet.

Design

All valves and connections shall comply with the following requirements:

(1) Valves and pipe-line connections shall meet the requirements of item 10p, construction and repair of equipment.

(2) All pipe lines and fittings shall be so constructed and located that "leakage" will not occur.

(3) Dependence shall not be placed on soldered joints to prevent "leakage."

(4) All multiple-vat or pocket installations shall be equipped with leak-protector inlet and outlet valves (see definition of leak-protector valve for compressed air systems), provided that existing installations for which no satisfactory leak-protector outlet valve can be reasonably provided shall be considered satisfactory if (a) each vat is disconnected from the outlet piping during the filling, heating, and holding periods, and (b) the outlet piping is so arranged that only one vat can be connected to the discharge line at a time. All inlet and outlet valves, if any, on single-vat installations shall be of the leak-protector type,

[26] For existing valves the term "any closed position" may be limited in meaning to the fully closed or approximately fully closed position.

except in the case of existing installations. For leak escapes on flow-diversion valves see item 16p (b).

(5) Leak-protector valves shall be provided at the outlets of all 30-minute tubular holders, or the outlet piping shall be left disconnected until at least 30 minutes after the filling of the holder is begun.

(6) Inlet and outlet connections other than through "close-coupled valves" shall not enter or leave the holder below the level of the milk therein. This is in order to insure adequate pasteurization of all milk in inlet and outlet connections.

(7) To prevent clogging and to promote drainage all grooves shall be at least three-sixteenths inch wide and at least three thirty-seconds inch deep at the center.

(8) Mating grooves shall provide these dimensions throughout their combined length whenever the valve is in or approximately in the "fully closed position."

(9) All single leak grooves and all mating leak grooves when mated shall extend throughout the entire depth of the seat, so as to divert "leakage" occurring at all points throughout the depth of the seat, and so as to prevent air binding.

(10) All valves shall be so located as to be readily accessible for cleaning.

(11) Washers or other parts shall not obstruct leak-protector grooves.

(12) A stop shall be provided on all plug-type outlet valves and on all plug-type inlet valves hereafter installed in order to guide the operator in closing the valve so that unpasteurized milk may not inadvertently be permitted to enter the outlet line or the holder, respectively. The stop shall be so designed that the plug will be "irreversible" if the plug is provided with any grooves or their equivalent, unless duplicate diametrically opposite grooves are also provided. In the case of two-way plug type valves (i. e., those having only one inlet and one outlet), a 180° stop or any combination of stops permitting two fully closed positions may be substituted for a 90° stop if there are no air-relief grooves in the plug and if all leak grooves are located symmetrically with respect to the valve inlet.

(13) All leak-protector valves shall be installed in the proper position to insure the proper functioning of the leak-diverting device.

Inlet valves and connections shall, in addition, comply with the following requirements:

(1) Pipe lines between the inlet valve and the holder shall be as short as practicable, and shall be sloped to drain.

(2) In cases where the inlet line enters the holder above the milk level and in which the inlet line may be submerged and thus prevent its complete emptying when the inlet valve is closed, the inlet line shall be provided with an automatic air relief located either at the

valve or elsewhere and so designed as to function in every closed position of the valve. In the case of vat and pocket holders a vent may be provided by drilling a hole at least one-eighth inch in diameter in each vat or pocket inlet pipe below the vat or pocket cover but above the maximum milk level.

Outlet valves shall, in addition to the requirements listed above under "All valves and connections," be designed so as to prevent the accumulation of unpasteurized milk in the milk passages of the valve when the valve is in any closed position; or, in lieu thereof, shall be provided with steam or hot-water connections for bactericidal treatment; provided that these alternatives shall not be required in the case of valves on existing single-vat installations.

Such connections for bactericidal treatment shall (*a*) open automatically when the milk valve is closed and close automatically when the milk valve is opened, except in the case of existing manually operated valves, and (*b*) be of sufficient size and so operated as not to clog readily.

Operation

Existing single-vat installations, if not provided with "leak-protector" inlet valves, shall be disconnected from the raw milk supply during the holding and emptying periods, and, if not provided with "leak-protector" outlet valves, shall be disconnected from the outlet piping during the filling, heating, and holding periods. Multiple-vat installations and thirty-minute tubular holders not provided with leak-protector outlet valves shall be disconnected from the outlet piping as required in (4) and (5) above.

All outlet valves shall be kept "fully closed" during the filling, heating, and holding periods, and all inlet valves shall be kept "fully closed" during the holding and emptying periods.

All outlet valves required above to be provided with connections for bactericidal treatment shall immediately before the discharge of pasteurized milk be given bactericidal treatment for at least 2 minutes at 170° F. or more, or for at least 30 minutes at 143° F. or more. In the case of existing single-vat installations bactericidal treatment shall be accomplished by injecting steam or 170° F. water into the valve for not less than 2 minutes from a hose, or by any other method approved by the health officer.

Discussion of valve design drawings

The accompanying drawings suggest four designs of outlet valves, one design of inlet valve, and one design of holder outlet connection, which may be considered as complying with the above design specifications.

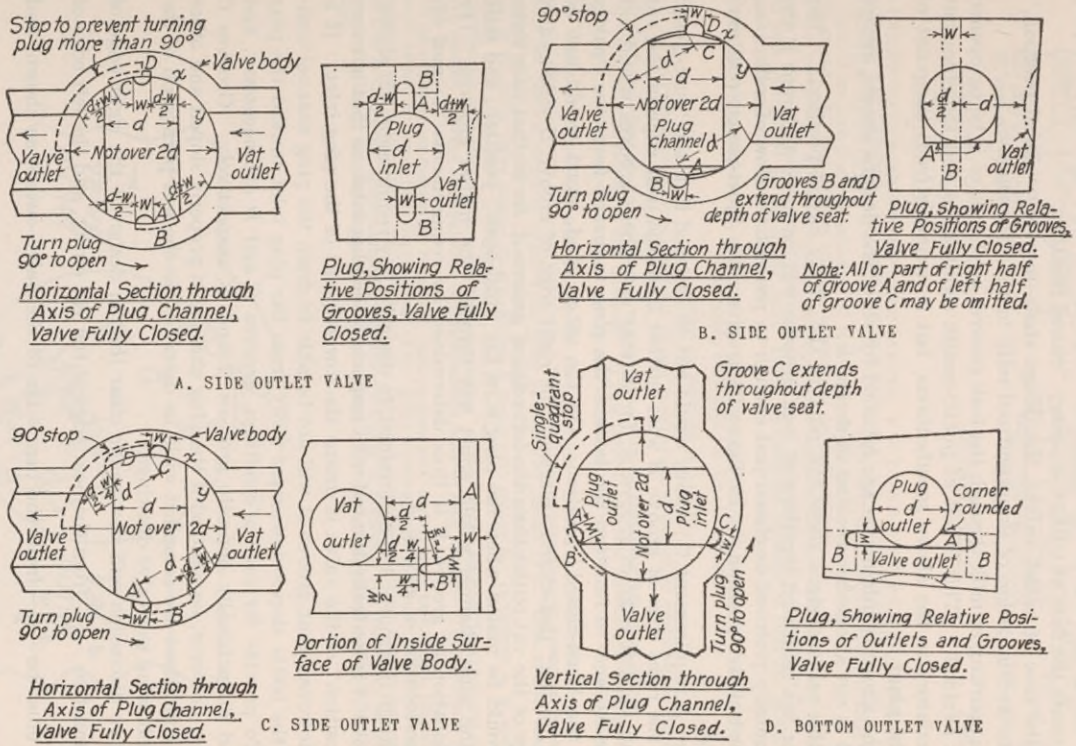


FIGURE 21.—Suggested designs of gravity-flow plug-type leak-protector pasteurizer valves and connections conforming with item 16p (c).

(NOTE.—The plug diameter need no longer be limited to "not over 2d" in these designs, which are from the 1936 edition, as the former wetted-area limitation has been deleted.)

The reasons for and the methods of arriving at some of the design elements shown on the accompanying valve drawings follow:

The three requirements which determine the location of leak-protector grooves on plug-type valves are:

(1) The design shall protect against "leakage" in every position of the plug which prevents the flow of milk, i. e., every "closed position."

(2) In the case of outlet valves, the design shall, in every "closed position," prevent the accumulation of unpasteurized milk in the plug channel.

(3) The spurting of milk through the leak grooves as the valve is being opened should be avoided. (This is not of public-health significance and therefore not made mandatory in the above specifications, but is desirable from the point of view of the plant.)

All of the above requirements are satisfied by all of the designs shown, except that spurt is not altogether avoided in design *D*.

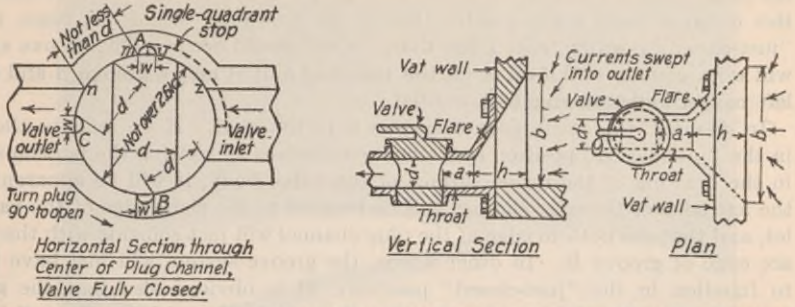
All of the valve designs show the plug in the "fully closed position." The reasons for the indicated locations of leak grooves will be more apparent if the plug is mentally pictured as closed just enough to prevent the flow of milk, i. e., in the "just-closed position." In figure 23 is given the "just-closed position" of design *A*.

In *design A* requirement (1) above would not be satisfied if in the "just-closed position" the right edge of groove *B* were further from the near edge of the vat outlet than the left edge of groove *A*, for in that case these grooves would not begin to mate and to function the instant the plug is turned from the "partly open" to the "just-closed" position. On the other hand, spurt would not be avoided if, in the "just-closed" position, the right edge of groove *B* were nearer to the edge of the vat outlet than the left edge of groove *A*, for in that case these grooves would be mated when the plug is in the "just-open" position, and milk entering the plug channel would spurt out through the mated grooves. The size and location of groove *B* is thus determined by requirements (1) and (3) and by the location of groove *A*.

The location of groove *A* is determined, in design *A*, by requirement (2) above. Thus, groove *A* is centrally located with respect to the plug inlet, so that in every "closed position" of the valve it drains the lowest point of the plug inlet. It is obvious, however, that groove *A* will not be able to drain the plug channel completely if the latter slopes downward away from the plug inlet toward the plug outlet. To provide for such a condition, grooves *C* and *D* are necessary, and are located diametrically opposite grooves *A* and *B*, respectively. Grooves *C* and *D* may, however, be omitted if the plug channel is properly sloped and other necessary conditions are complied with, as described in the last paragraph of the "Notes" following the valve drawings.

The above discussion will now make clear that in design *A* the right edge of groove *B* must be $\frac{d+w}{2}$ from the near edge of the vat outlet, and the left edge of groove *D* must be $\frac{d+w}{2}$ from the near edge of the valve outlet, as shown, and that the sides of grooves *A* and *C* must be $\frac{d-w}{2}$ from the near sides of the plug channel, thus centering grooves *A* and *C*. These distances are not lengths of arcs or chords, but are measured parallel to a chord of length *d*.

In *design B* the lower half of each end of the plug channel is milled (termed milled grooves *A* and *C*). It will be apparent that if the right edge of groove *B* is placed at a distance of *d* (the diameter of the plug channel) from the near edge of the vat outlet, grooves *A* and *B* will function as mating leak grooves in every position of the plug from the "just-closed" to the "fully-closed" position,



E. INLET VALVE, SHOWING ONE METHOD OF PROVIDING AIR RELIEF WHEN LATTER REQUIRED.

A and B are leak-protector grooves. C is an air-relief groove. All leak grooves extend throughout depth of valve seat. When air relief is not required, groove C may be omitted, and "single-quadrant" stop may be replaced by 90° or 180° stop. If 180° stop is provided, chord yz must equal d.

F. CLOSE-COUPLED SIDE OUTLET VALVE CONNECTED TO HOLDER, SHOWING DESIGN REQUIREMENTS.

d=diameter of outlet.
h=depth of flare.
a=greatest distance from valve seat to small end of flare (shall be not more than d).
b=smallest diameter at large end of flare (shall be not less than $h+d$).

FIGURE 22.—Suggested designs of gravity-flow plug-type leak-protector pasteurizer valves and connections, conforming with item 16p (c)—Continued

NOTES ON FIGURES 21 AND 22

(1) All valve designs shown are suitable for new installations as well as for modification of existing plug-type valves, both grooved and ungrooved.

(2) Sectional views are not technically correct, but are drawn thus for greater simplicity.

(3) Stops may be located in any quadrant. If plug turns in opposite direction to open, grooves shown located near or with respect to plug inlet should be located near or with respect to plug outlet, and vice versa.

(4) Width of grooves (w) must be not less than $\frac{3}{16}$ inch. Distances shown between ends of arcs are lengths of chords or parts of chords, not of arcs. Distances involving fractions of d, such as $\frac{1}{2}d$–$\frac{1}{4}w$, are not chords but parts of chords of length d and must be measured parallel to it. Leak grooves must begin to function within $\frac{5}{64}$" after the "just-closed" position is passed in closing.

(5) In all outlet valve designs shown, groove A mates with groove B. In designs A, B, and C, groove C mates with D; groove C is like groove A, and D is like B.

(6) Grooves as located will in every "closed position" of plug protect against "leakage" and, in all outlet valve designs, prevent accumulation of unpasteurized milk in plug channel. They will also avoid spurt except in design D.

(7) In outlet valve designs A, B, and C, mating grooves C and D may be omitted, provided a single groove, extending throughout depth of seat at any point between x and y, is substituted, provided "single-quadrant" stop is substituted for "90° stop", and provided plug channel drains toward mating grooves A and B so as to prevent accumulation of unpasteurized milk in channel. The latter may be accomplished by grooving invert of plug channel on a slope, by attaching valve to holder at a tilt, or by tilting entire holder.

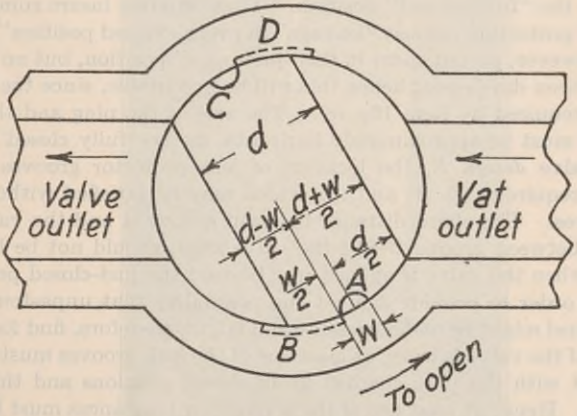


FIGURE 23.—Valve design A, horizontal section through axis of plug channel, valve in "Just-closed" position.

the plug channel will drain in every such position, and spurt will be avoided. If this distance were made greater than d the "mating" would not begin in the "just-closed" position, and if less than d spurt would occur. The groove system will work equally well if all or part of the right half of milled groove A and of the left half of milled groove C is omitted.

In *design C* the entire groove system is in the shell. If we imagine the plug in the "just-closed" position and imagine ourselves as viewing the portion shown in the drawing of the inside surface of the valve body, it will be apparent that the left edge of the plug channel will be tangent to the right edge of the vat outlet, and that the bottom edge of the plug channel will just coincide with the upper arc edge of groove B. In other words, the groove system will just have begun to function in the "just-closed" position. It is obvious also that the groove system will still be functioning in the "fully-closed" position. To satisfy this requirement, therefore, the center of the circle of which the arc edge of groove B is a part must be on a level with the center of the vat outlet and must be $\frac{d}{2}$ from the right edge of the vat outlet. The radius of the arc must also be $\frac{d}{2}$. The lower edge of groove B has been shown as $\frac{w}{2}$ below the lower edge of the vat outlet in order to insure proper drainage immediately beyond the "just-closed" position. It may also be desirable to slope the lower edge of groove B down toward groove A. The dimension $\frac{d}{2}-\frac{w}{4}$ is intended to permit the rounding of the left end of groove B to a radius of $\frac{w}{4}$. The near edge of groove A should be not less than d from the vat outlet in order to prevent spurt.

Design D is a bottom outlet valve designed for vertical discharge of milk from the holder. In this case, in order to insure complete drainage of the plug channel in all positions from the "just-closed" to the "fully closed," it was necessary to place groove A in the plug with its lower edge tangent to the invert of the plug outlet. Groove B must extend from the upper edge of groove A in the "fully-closed" position of the valve to the near edge of the valve outlet, in order that the grooves may mate and the plug channel may drain in all "closed positions." On the opposite side of the valve the only groove necessary is groove C in the shell, which must be located so that its lower edge is tangent to the invert of the plug inlet when in the "fully closed" position. These grooves insure complete channel drainage and protection against "leakage" in every "closed position" of the valve. They will, however, permit spurt in the "just-open" position, but no better design has thus far been developed; hence this will be acceptable, since the avoidance of spurt is not required by item 16p (c). The axis of the plug and the axis of the plug channel must be approximately horizontal in the "fully closed" position.

In inlet valve *design E*, the location of leak-protector grooves A and B is governed by requirements (1) and (3), which may be satisfied without the use of mating grooves. The chord distance between groove A and the valve outlet, as well as that between groove B and the valve inlet, should not be less than d to avoid spurt when the valve is opened just beyond the just-closed position. Furthermore, in order to provide against the possibility that unpasteurized milk in the plug channel might be under pressure and might, therefore, find its way into the valve outlet if the valve is worn, at least one of the leak grooves must in this design be in contact with the plug channel in all closed positions and thus serve as a safety valve. Hence at least one of the above chord distances must be not greater than d as well as not less than d, i. e., it must equal d. These conditions limit the diameter of the plug at the center of the plug channel to not over that of a circle circumscribing an octagon with all sides of length d, i. e., not over $2.61d$.

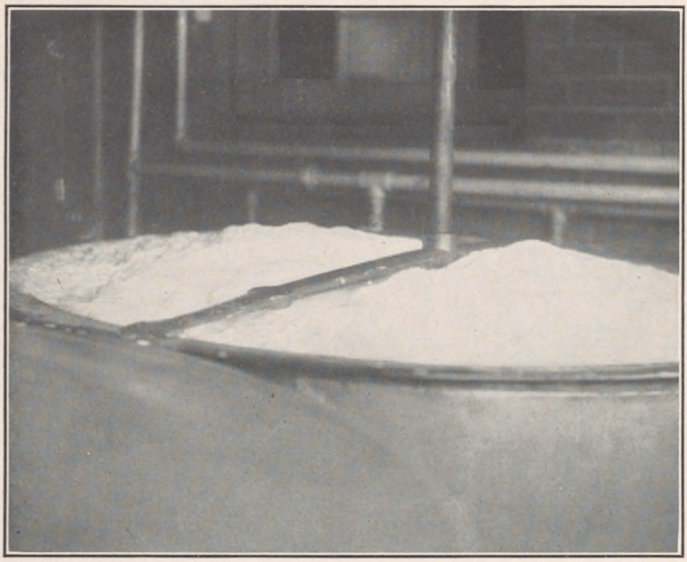


FIGURE 24.—FOAM OVER MILK IN PASTEURIZER.
(Cover of vat removed.)

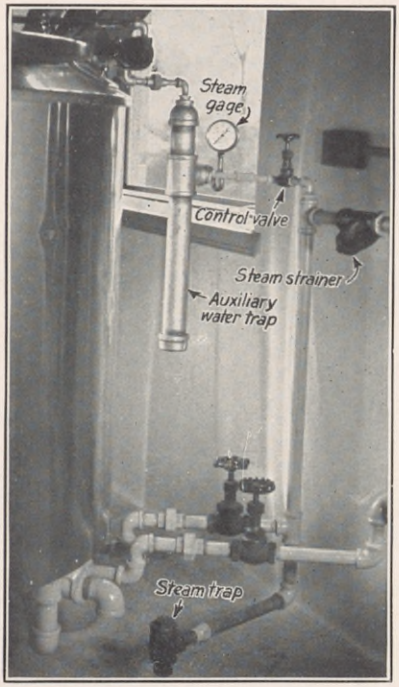


FIGURE 25.—STEAM-CONTROL ASSEMBLY OF AIR-HEATING EQUIPMENT.

In design E air relief is provided in all closed positions by groove C, the upper or the lower half of which may be omitted without interfering with its proper functioning. The chord distance between groove C and the plug outlet must be not less than d to avoid spurt when the valve is opened just beyond the just-closed position, and not more than d so as to be in contact with the vat inlet and thus provide air relief as soon as the valve is closed just beyond the just-closed position. Furthermore, groove C must still be in contact with the valve outlet in order to

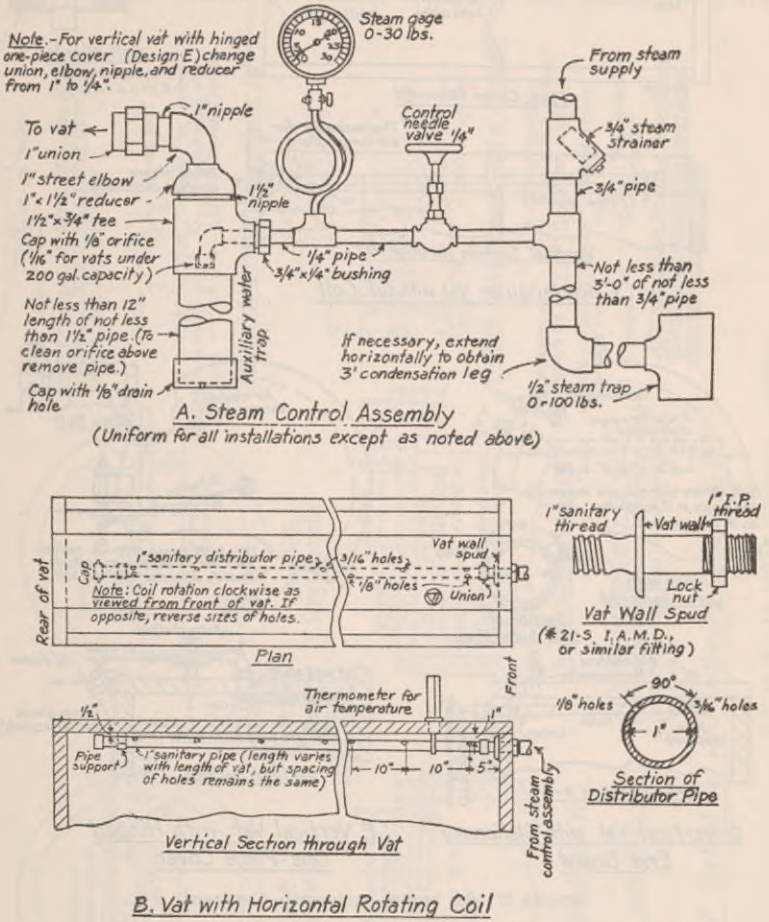


FIGURE 26.—Air heating equipment.

provide air relief, when the valve is fully closed. These conditions limit the plug diameter at the center of the plug channel to not over that of a circle circumscribing an octagon with all sides of length d, i. e., not over $2.61d$. Since this is the maximum plug diameter permitted by the leak-groove design, a single air-relief groove is sufficient in this design.

In design E, when the plug is equipped with an air-relief groove, a "single quadrant" stop is necessary to prevent the plug from being either reversed or turned so far that the air-relief groove is not in contact with the valve outlet in all "closed positions." If the plug is not provided with an air-relief groove, either a "90° stop" or a "180° stop" is satisfactory; but if a "180° stop" is used grooves

A and *B* must, in addition to meeting the requirements previously discussed, be equidistant from the valve inlet (i. e., chord *yz* must equal *d*) in order to function in all "closed positions" for counterclockwise as well as clockwise closing. Whether the plug is reversible or not is immaterial in this design when the air-relief groove

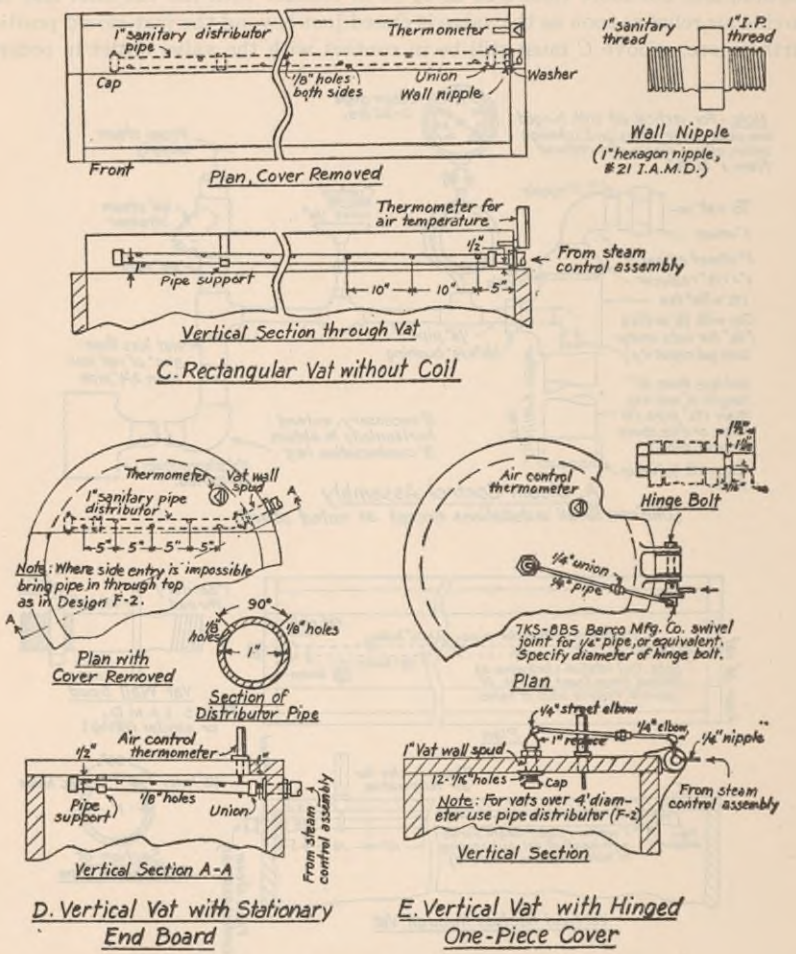


FIGURE 27.—Air heating equipment—Continued.

is omitted from the plug, since with no grooves in the plug the latter may be reversed without affecting the functioning of the grooves.

16p (d). AIR HEATING

Public-health reason.—Tests have shown that when foam is present on milk in vats and pockets during pasteurization the temperature of the foam may be well below the pasteurization temperature. In such cases all pathogenic organisms in the foam may not be killed.

In filling vats, splash frequently occurs on the surfaces of the vat and the fixtures above the milk level as well as on the underside of the vat cover and cools off. Portions of this splash may drop back into the body of the milk. When the air

above the milk is heated to above pasteurization temperature these conditions are remedied.

Many plant operators have reported that the use of air heaters (especially with partly filled vats and vats with uninsulated lids) makes it easier to maintain a uniform and sufficiently high temperature of the milk itself.

Satisfactory compliance.—For holders of vat or pocket types, means shall be provided and used which will keep the atmosphere above

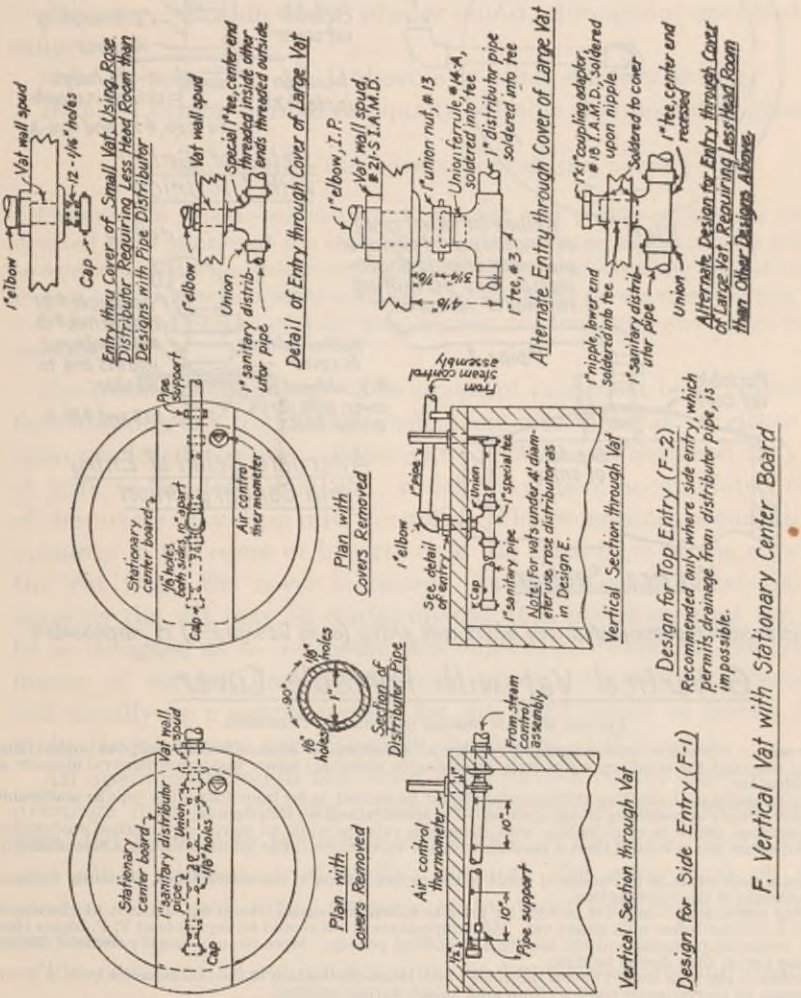
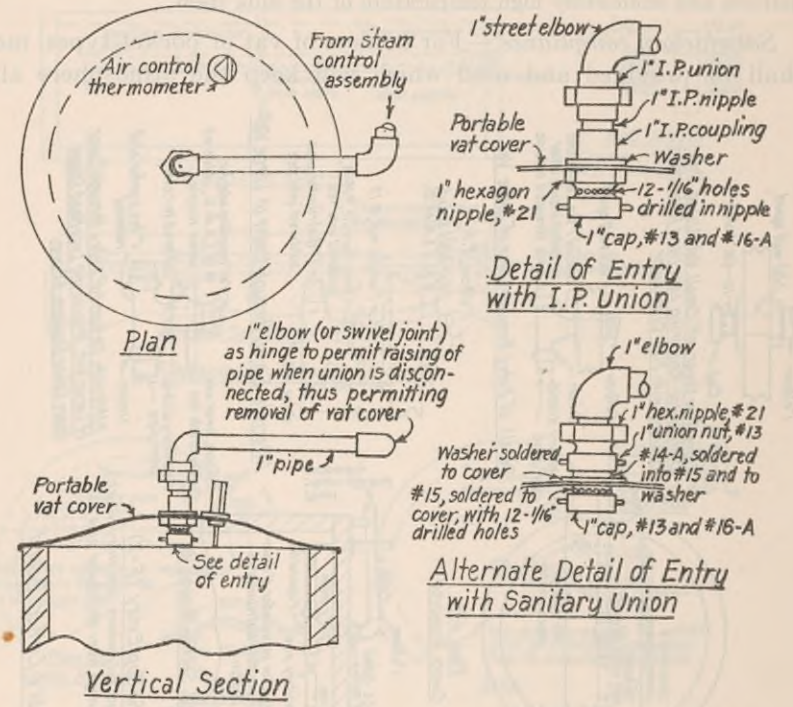


FIGURE 28.—Air heating equipment—Continued.

the milk at a temperature at least 5° F. higher than the existing milk temperature during the heating period and at least 5° F. higher than the required temperature of pasteurization during the holding period. If steam is admitted into the holder, the steam line shall be provided with a trap properly designed to avoid the discharge of water into the milk. In all cases an approved air temperature indicating thermometer shall be installed.

The accompanying illustrations show several types of air-heating equipment which will satisfy this item. Other types shall not be used unless tested and approved by the health officer.



This design recommended only where side entry (as in Design F-1) is impossible.

G. Vertical Vat with Portable Cover

FIGURE 29.—Air heating equipment—Continued.

Design notes.—The steam control assembly (design A) is uniform for all installations except as noted. The steam trap and the auxiliary water trap (or expansion chamber) insure maximum removal of water of condensation.

The air temperature indicating thermometer should be located as far from distributor pipe as practicable and not directly opposite any steam opening. For specifications see text, item 16p (d).

The resistance orifice in combination with the needle valve provides an inexpensive method of obtaining more delicate steam control than is possible with the valve alone. The orifice is simply a hole drilled in cap.

The steam gage serves as a convenient guide to the proper setting of the needle valve, obviating frequent adjustments of the valve setting.

Operating instructions.—In order to heat air prior to filling vat, steam should be admitted to distributor about 5 minutes before milk enters vat. Air temperature in vat should be kept at least 5° F. higher than milk temperature throughout the heating and holding periods. More steam is usually required during heating period than during holding.

The surface of the milk should be not less than 1 inch below the bottom of the thermometer bulb to avoid erroneous air thermometer readings from milk splash during agitation.

The steam distributor and its openings should be thoroughly cleaned every day.

Air temperature indicating thermometers

Type.—V-shaped brass or equally noncorrodible scale case with removable glass front, mercury actuated, bottom of bulb chamber not less than 2 inches and not more than 3½ inches below under side of cover, filling above mercury, nitrogen or equally suitable gas.

Magnification of mercury column.—To apparent width of not less than one-sixteenth inch.

Scale range.—130° to 210° F., extension either side permissive, protected against damage at 220° F.

Temperature represented by smallest scale division.—Not more than 2° F.

Number of degress per inch of scale.—Not more than 16.

Accuracy.—Within 1° F., plus or minus, throughout specified scale range.

Stem fitting.—I. A. M. D. ferrule or other sanitary fitting.

Bulb.—Corning normal or equally suitable thermometric glass.

16p (e). VAT AND POCKET COVERS AND COVER PORTS

Public-health reason.—Obviously, if the vat and pocket covers are not constructed so as to prevent the entrance of water, leakage, and dust, the milk may be contaminated with such material, which in turn might contain disease bacteria, since it is from nondisinfected surfaces. Keeping the covers closed during operation reduces the chance of dust, flies, sputum droplets, drip, and splash entering the milk.

Satisfactory compliance.—The covers of vats must be so constructed that nothing on top thereof will drop into the vat in either their open or closed position. Some vat covers are so designed that pools of milk or condensation, etc., which may have accumulated on top of the covers may drop into the milk. This sometimes occurs through openings in the cover or by drip over the back edge of the cover into the vat when the cover is raised. Inasmuch as the material thus entering the vat may be contaminated, it is necessary that the cover be so designed as to overcome this objection. This may be done by means of vertical fins, overlapping edges, and setback hinges. It will usually be a simple matter for the plant owner to have a tinner make the necessary corrections in the design of the cover.

All openings through the cover shall have a raised edge to prevent drainage into the opening. Condensation diverting aprons shall be provided as close to the cover as possible on all pipes, thermometers, and other equipment extending through the cover and on which condensation may form, unless a water-tight joint with the cover is provided.

The covers of all equipment must be kept closed during operation, except in case of emergency.

16p (f). PREHEATING HOLDERS

Public-health reason.—Cold vats or pockets may cool the first milk entering them to below the pasteurization temperature.

Satisfactory compliance.—All holders used for holding milk which has been heated to the pasteurization temperature before entering

the holders shall be preheated with steam or otherwise so that the metal shall be at least at the pasteurization temperature before milk is admitted at the beginning of the day's run, and all empty holders shall be similarly preheated or the temperature shall be otherwise maintained after a shut-down exceeding the holding time, unless the holder outlet is equipped with an automatic flow-diversion valve. Where preheating at the beginning of the run is done by means of steam admitted near the top of the holder, such as the air heater, the outlet valve shall be opened to permit a flow of steam so as adequately to heat the metal in the bottom of the holder.

Item 17p. Cooling

All milk and milk products received for pasteurization shall immediately be cooled in approved equipment to 50° F. or less and maintained at that temperature until pasteurized, unless they are to be pasteurized within 2 hours after receipt; and all pasteurized milk and milk products shall be immediately cooled in approved equipment to an average temperature of 50° F., or less, as defined in section 1 (S), and maintained thereat until delivery.

Public-health reason.—If milk is not cooled within a reasonable time after it is received at the pasteurization plant its bacterial content will be materially increased.

The same public-health reason applies to the cooling of the milk and milk products after pasteurization.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) All milk and milk products intended for pasteurization, but not to be pasteurized within 2 hours after receipt at the plant or cooling station, are cooled immediately on receipt to 50° F. or below, and maintained thereat until pasteurized.

(2) All pasteurized milk and milk products are cooled immediately after pasteurization to 50° F. or below and maintained at that average temperature, as defined in section 1 (S), until delivery.

(3) All newly installed surface coolers, as well as regenerators, where so specified below, meet the following specifications. For existing equipment only (*d*), (*e*), and (*f*) are required.

(*a*) The sections of open-surface coolers shall be installed so as to leave a gap of at least one-fourth inch between the header sections to permit easy cleaning, unless the gap is at least equal to the thickness of the header lengthwise of the section.

(*b*) Where header ends are not completely enclosed within the cooler covers, condensation or leakage from the headers shall be prevented from entering the milk by so shaping the exposed header faces above and below all gaps as to direct condensation away from the

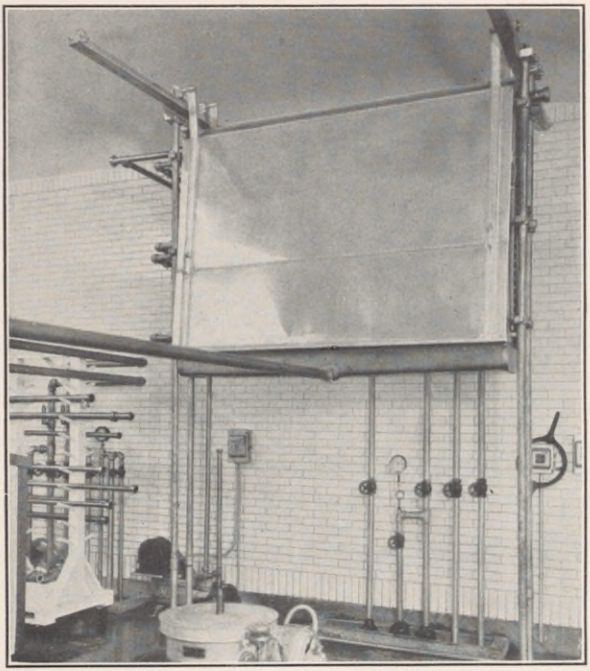


FIGURE 30.—TUBULAR SURFACE COOLER, WITH COVERS AND TROLLEYS.
(Note rack for milk piping at left, and box at bottom of rack for valves, etc.)

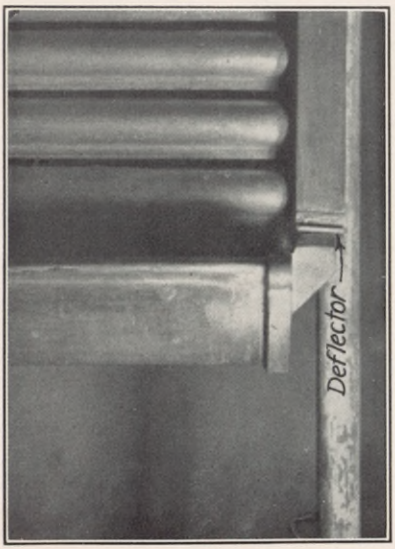


FIGURE 31.—SURFACE COOLER WITH DRIP DEFLECTOR AT BOTTOM OF HEADER AND SHORT BOTTOM TROUGH TO PREVENT CONDENSATION GETTING INTO MILK.

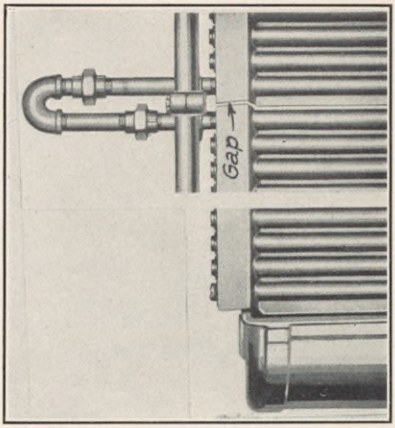


FIGURE 32.—SURFACE COOLER WITH GAP BETWEEN HEADER SECTIONS TO PERMIT EASY CLEANING.

(Slope of bottom of header directs condensation away from trough.)

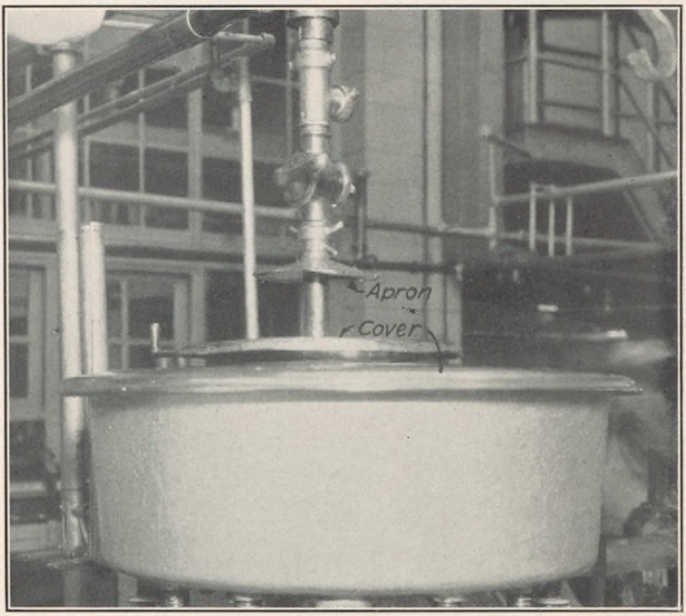


FIGURE 33.—BOTTLER-BOWL COVER, AND DRIP-DIVERTING APRON ON FILLER PIPE.

tubes, and by the use of deflectors at the bottom of the headers or by shortening the bottom trough or by other approved method.

(*c*) The supports of the cooler sections shall be so located as to prevent drip therefrom reaching the milk.

(*d*) Recirculated water and refrigerant used in coolers and regenerators shall be properly protected or treated so as to comply at all times with the quality standards of item 7p. Such water or refrigerant may be under greater pressure than the pasteurized milk and may if impure contaminate the latter if flaws develop in the joints or the metal separating the two.

(*e*) All open-surface coolers and open-surface regenerative coolers shall be located in a separate well ventilated room or shall be provided with tight-fitting shields, preferably suspended on trolleys. Special exceptions may be made by the health officer when clearly warranted. The health officer is clearly warranted in making exceptions only when the room is so constructed and the cooler is so located as to eliminate all danger of contamination by flies, dust, drip, splash, manual contact, and droplet infection from coughing and sneezing. If the milk surface of the pasteurized-milk cooler is exposed at least part of the service rendered by pasteurization is nullified, since the milk cooler represents the largest single exposure of milk which takes place at any time in its course. The ideal requirement is, obviously, that pasteurized milk shall not be exposed again from the moment pasteurization begins until the pasteurized milk is in the bottle. A separate cooler room shall be taken to mean a room used exclusively for the cooler and through which there is no traffic except for work necessary for the operation of the cooler.

The shields shall be tight fitting and shall effectively protect all milk surfaces from contamination by flies, dust, drip, splash, manual contact, and droplet infection.

(*f*) Regenerative heater-coolers shall be so constructed, installed, and operated that, in the case of milk-to-milk regenerators, the pasteurized-milk side will automatically be under greater pressure than the raw milk at all times, and, in the case of milk-to-water-to-milk regenerators, the heat-transfer-medium side will automatically be under greater pressure than the raw milk at all times.

This will prevent contamination of the pasteurized product by the raw milk in case flaws develop in the metal or the joints separating the two. In the case of milk-to-water-to-milk equipment the intent of this requirement is to prevent the raw milk from contaminating the heat-transfer medium, which in turn could contaminate the pasteurized product. The heat-transfer water, for which a potable supply must be used and which is confined in a closed circuit and is periodically reheated by the pasteurized milk, will not contaminate the latter unless such medium has first been mixed with raw milk. The pasteurized product could also be properly protected by requiring that it be kept at all times under higher pressure than the heat-transfer water, but this alternative method would not prevent the

objectionable fouling of the water by the raw milk if flaws developed in the metal or the joints between them.

The following methods (adapted from Reprint No. 1921, from the Public Health Reports of April 1, 1938) will automatically insure the required relative pressures in the various types of regenerators described. These or equally satisfactory means of complying with this provision shall be required by the health officer.

MILK-TO-MILK REGENERATORS

Four types of milk-to-milk regenerators are possible. In the most common design both the raw milk and the pasteurized product flow through either a series of connected plates or two concentric pipes, so that both sides are closed to the atmosphere. In others the pasteurized milk is on the inside of a pipe, while the raw milk flows downward on the outside open to the atmosphere. The third design is like the second, but the raw milk is on the inside and the pasteurized on the outside. In the fourth possible type, not used at present, the raw milk flows

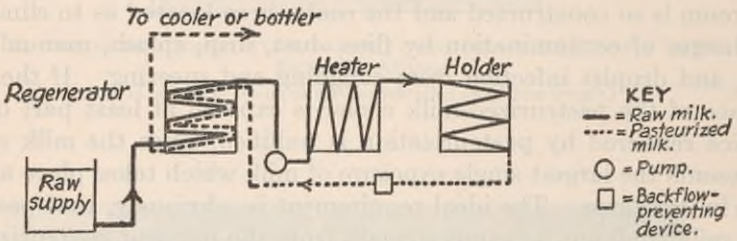


FIGURE 34.—Milk-to-milk regenerator with both sides closed to atmosphere (diagrammatic elevation).

downward on one side of a corrugated partition and the pasteurized on the other side, with both sides open to atmospheric pressure.

In *milk-to-milk regenerators with both sides closed to the atmosphere* (fig. 34) the required relative pressures will be automatically insured when the following conditions obtain:

(*a*) The pasteurized milk, between its outlet from the regenerator and its nearest downstream point open to the atmosphere, rises to a higher elevation than any raw milk between the free raw-milk level nearest upstream from the regenerator and the raw-milk outlet from the regenerator, and is open to the atmosphere at said elevation; provided that such excess rise is at least 6 percent of the maximum height of said raw milk above the bottom of the regenerator if water or chlorine solution precedes the milk at the beginning of a run, and at least 3 percent if previously pasteurized milk is introduced instead; provided further that if alternative (1) of (*f*) below is satisfied the pasteurized milk need rise only to above the top of the regenerator; and

(*b*) No pump is located between the pasteurized-milk outlet from the regenerator and the nearest downstream point open to the atmosphere; and

(*c*) Unless alternative (1) of (*f*) below is satisfied, a backflow-preventing device, such as a positive-type pump or a check valve, is installed in the line between the pasteurized-milk inlet to the regenerator and either the nearest upstream point open to the atmosphere or the raw-milk outlet from the regenerator, whichever is farther downstream: *Provided*, That if said valve or pump or any portion of the system downstream therefrom leaks, storage for the pasterurized milk shall be provided downstream from its outlet from the regenerator and at the elevation specified in (*a*), either in the pipe line or in a tank equipped with a bottom inlet, equal in volume to at least 1 hour's leakage; and

(*d*) No pump is located between the raw-milk inlet to the regenerator and the free raw-milk level nearest upstream therefrom; and

(*e*) The free raw-milk level nearest upstream from the regenerator is in a tank the overflow of which is below the level of the lowest milk passage in the regenerator; and

(*f*) Either (1) all raw milk in the regenerator drains freely into such tank when the raw-milk line is disconnected from the regenerator outlet; or (2) the raw-milk pump is so connected with a pressure switch that it cannot start unless liquid or air pressure, of at least one pound per square inch greater than the corresponding maximum static raw-milk pressure, is introduced on the pasteurized-milk side of the regenerator at the beginning of a run; and such pressure is indicated by an approved sanitary pressure gage of either dial or column type located at the pressure switch, and is maintained automatically until the freshly pasteurized milk has reached the elevation specified in (*a*). The requirements of (*f*) shall be mandatory for all regenerators of this type after July 1, 1940.

The reasons for these specifications may not be apparent.

During normal operation, i. e., while the raw-milk pump is operating, the raw milk will be sucked through the regenerator and will be at subatmospheric pressure, provided the raw-supply tank is below the regenerator level, as required in (*e*), and there is no pump between this tank and the regenerator, as required in (*d*). The pasteurized milk in the regenerator need therefore be only at or above atmospheric pressure during normal operation. This will be assured if there is no pasteurized-milk pump downstream from the regenerator to suck the pasteurized milk through the regenerator, as required in (*b*), and if the pasteurized milk downstream from the regenerator rises to an elevation above the top of the regenerator and is open to the atmosphere at said elevation, as required in (*a*). If the pasteurized milk discharges at a lower level, a satisfactory opening to the atmosphere must be provided at the required elevation to insure absence of subatmospheric conditions, as by installing a sanitary vertical standpipe in the line with its upper end fully open to the atmosphere (but protected by a hood against the entrance of contamination).

During a shut-down, i. e., when the raw-milk pump stops, the raw milk in the regenerator will remain under suction unless air is drawn into the line upstream from the pump through leaky gaskets (which could long go undiscovered because no milk would leak to the outside). If the pump does not soon start operating

and air continues to leak in, it will accumulate at some high point and will replace the milk upstream therefrom, causing it to drain backward into the raw-supply tank; and although the suction will gradually be destroyed, such milk will be at subatmospheric pressure as long as any of it remains in the regenerator. (If the air leak opening is large some of the milk may momentarily be above atmospheric pressure as it leaves the regenerator, but in actual practice this danger may be ignored as the air leak opening will ordinarily be very small as compared to the milk-discharge opening.) However, if there is any raw milk in the regenerator downstream from such high point it will not drain, and its pressure may gradually increase up to a maximum head above atmospheric equal to the height above the bottom of the regenerator of the highest point upstream from the regenerator outlet. If alternative (1) of (*f*) is used, there will be no high point upstream from the regenerator outlet, hence all raw milk in the regenerator will remain at subatmospheric pressure even if air is drawn in. (The height to which the raw milk rises downstream from the regenerator outlet is immaterial, since air leaking into this section will not increase to atmospheric the pressure on any raw milk remaining in the regenerator.)

If the pasteurized milk in the regenerator is to be under greater pressure than the raw milk during a shut-down, it must therefore be maintained at atmospheric pressure or above if alternative (1) of (*f*) is used, and under a greater static head than the maximum possible raw-milk head just described if alternative (2) of (*f*) is used. This is accomplished by the elevation requirement of (*a*). At the same time all loss of pressure head on the pasteurized milk during a shut-down must be prevented. That due to siphonage when the point of discharge is below the required elevation is prevented by the requirement of (*a*) that the pasteurized milk shall be open to the atmosphere at the required elevation. Loss due to suction is prevented by prohibiting a downstream pump in (*b*). That due to the lowering of the downstream free pasteurized-milk level is prevented by (*c*), as will be shown in the second paragraph below.

The 3 percent excess head provided in (*a*) is intended to compensate, during shut-downs, for the difference in specific gravity between pasteurized milk at 160° F. and raw milk at 40° F. Similarly, the 6 percent excess head required when water or chlorine solution is used at the beginning of a run serves to compensate, during shut-downs occurring at the beginning of a run, for the difference in specific gravity between water at 160° F. and milk at 40° F. No excess head need be provided when alternative (1) of (*f*) is used, since atmospheric pressure is sufficient.

The positive-type pump or the check valve specified in (*c*) will prevent backflow of the pasteurized milk through the regenerator, provided no leakage occurs. (A flow-diversion valve cannot be relied upon to prevent backflow, because during the first few minutes following a pump shut-down the milk is still at a sufficiently high temperature to keep the diversion valve in the forward-flow position.) Backflow would lower the level of the pasteurized milk during pump shut-downs and thus might reduce its pressure to below that of the raw milk in the regenerator. However, if alternat ve (1) of (*f*) is satisfied, the raw milk in the regenerator will be under suction at all times (as was previously shown), hence the pasteurized-milk side need be maintained only at atmospheric pressure, so that backflow of the pasteurized milk need not be prevented. The first alternative location for the backflow-preventing device applies to systems with pasteurizer-holders or other intermediate tanks open to the atmosphere; the second, to completely closed systems. The second provision of (*c*) will insure an adequate pasteurized-milk pressure throughout a shut-down of at least 1 hour's duration, even if there is some backflow due to leakage. Shut-downs of such duration are infrequent. The

adequacy of the storage provided to compensate for leakage should be checked monthly by the health officer by determining, by means of a petcock installed in the line at the elevation specified in (*a*), whether the pasteurized milk in the line has fallen below the specified level after a pump shut-down of 1 hour. If at that time such petcock is opened momentarily and no milk escapes, additional storage is needed, the volume of which may be determined with a sterile probe.

At the beginning of a run, from the time the raw milk enters the regenerator until it has been pasteurized, pushed through the regenerator to replace the air therein, and has finally risen to the elevation specified in (*a*), the pasteurized-milk side of the regenerator may not be under sufficient pressure to insure an excess over the raw-milk pressure. There is no danger while the raw-milk pump is operating, since the raw milk is then at sub-atmospheric pressure; but if the raw-milk pump shuts down during this period the raw-milk pressure may exceed atmospheric (as was previously shown) and may therefore exceed that on the pasteurized-milk side. Specification (*f*) therefore provides two alternative safeguards. Alternative (1) may be considered as automatically insuring a sub-atmospheric pressure in the raw milk at all times, as has been shown above in the discussion of air leakage. In alternative (2) water or chlorine solution or previously pasteurized milk or compressed air will temporarily provide the necessary pressure on the pasteurized-milk side until replaced by the freshly pasteurized milk.

To guard against the possible failure of the operator to introduce this pressure at the beginning of a run, alternative (2) provides that the raw-milk pump cannot start sucking the raw milk through the regenerator unless adequate pressure is present on the pasteurized-milk side. An excess pressure of one pound per square inch is required as a margin of safety to cover inaccuracies in the switch and the gage; this is equivalent to an additional hydrostatic pressure head of 2.3 feet above the elevation required in (*a*). The minimum pressure at which the switch should be set for starting the pump will depend on its elevation and on the pressure medium used. Thus, assume the elevation specified in (*a*) is 6 feet above the bottom of the regenerator, and water is used to provide pressure; then the switch should be set for one pound per square inch if it is located at the elevation specified in (*a*), but should be set for $1+\frac{6}{2.3}=3.6$ pounds if it is on a level with the bottom of the regenerator. In the same case, if compressed air is used, the switch should be set for 3.6 pounds irrespective of its location. In case the milk pump stops again before the freshly pasteurized milk has reached the elevation specified in (*a*), the backflow-prevention and storage requirements of (*c*) will prevent loss of pressure due to leakage for as long as an hour if liquid has been introduced; but if compressed air is used it may be necessary to provide automatic means to replace pressure loss due to leakage.

The health officer should require the introduction of pressure on the pasteurized-milk side of the regenerator at the beginning of each run unless the regenerator is self-draining, but the automatic features of (*f*) should not be made mandatory until July 1, 1940, in order to allow the industry a reasonable time to develop and install the necessary equipment.

Different specifications can, of course, be devised to secure proper relative pressures in this type of regenerator without requiring the raw milk to be at sub-atmospheric pressure while flowing through the regenerator. They could require, instead, that the pasteurized milk be maintained at a higher pressure than the raw milk in the regenerator irrespective of the pressure on the raw milk. (See Reprint No 1921 from the Public Health Reports.) The latter method would give completely automatic insurance of proper relative pressures during

operation and during pump shut-downs, but not at the beginning of a run unless automatic means are provided to prevent the entrance of raw milk into the regenerator until the pasteurized-milk side is under the required pressure.

In *milk-to-milk regenerators with only the raw milk open to the atmosphere* (fig. 35) the required relative pressures are insured when—

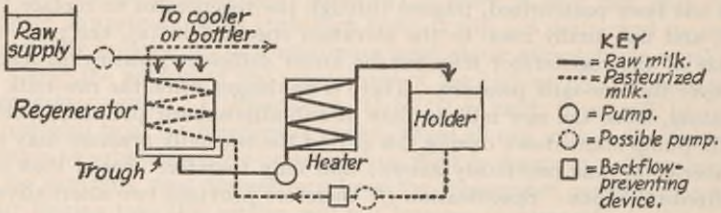


FIGURE 35.—Milk-to-milk regenerator with only raw milk open to atmosphere (diagrammatic elevation).

(*a*) The pasteurized milk downstream from the regenerator rises higher than the top of the regenerator, and is open to the atmosphere at said elevation; and

(*b*) No pump is located between the pasteurized-milk outlet from the regenerator and the nearest downstream point open to the atmosphere; and

(*c*) A backflow-preventing device, such as a positive-type pump or a check valve, is installed in the line between the pasteurized-milk inlet to the regenerator and either the nearest upstream point open to the atmosphere or the raw-milk outlet from the regenerator, whichever is farther downstream: *Provided*, That if said valve or pump or any portion of the system downstream therefrom leaks, storage for the pasteurized milk shall be provided downstream from its outlet from the regenerator, either in the pipe line or in a tank equipped with a bottom inlet, at a higher elevation than the top of the regenerator, equal in volume to at least 1 hour's leakage; and

(*d*) The raw-milk pump is so connected with a pressure switch that it cannot start unless liquid or air pressure, of at least one pound per square inch greater than the static pressure when the pasteurized-milk side is full of milk, is introduced on the pasteurized-milk side of the regenerator at the beginning of a run; and such pressure is indicated by an approved sanitary pressure gage, of either dial or column type, located at the pressure switch, and is maintained automatically until the freshly pasteurized milk has reached the elevation specified in (*a*). This requirement shall be mandatory for all regenerators of this type after July 1, 1940.

The reasons for these specifications are similar to those for the preceding type. In both designs the purpose is to maintain the pasteurized product under greater pressure than the raw at all times, the only difference being that where the raw milk in the regenerator is always at atmospheric pressure, the pasteurized-milk side need be kept only above atmospheric pressure. If (*a*) is complied with, all

pasteurized milk in the regenerator will be under greater pressure than atmospheric, provided (*b*) is satisfied at all times, (*c*) during shut-downs, and (*d*) at the beginning of the run. In this type there is no objection to a raw-milk pump upstream from the regenerator, since the raw-milk side is open to the atmosphere and cannot be above atmospheric pressure.

In *milk-to-milk regenerators with only the pasteurized milk open to the atmosphere* (fig. 36) the required relative pressures are automatically

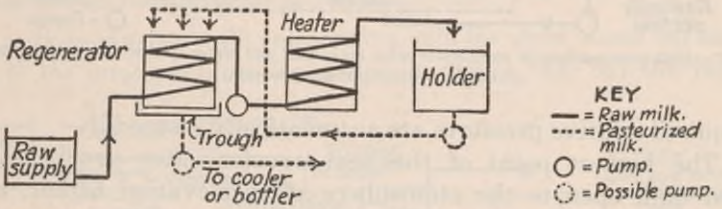


FIGURE 36.—Milk-to-milk regenerator with only pasteurized milk open to atmosphere (diagrammatic elevation).

insured when—

(*a*) No pump is located between the raw-milk inlet to the regenerator and the free raw-milk level nearest upstream therefrom; and

(*b*) The free raw-milk level nearest upstream from the regenerator is in a tank the overflow of which is below the level of the lowest milk passage in the regenerator; and

(*c*) All raw milk in the regenerator drains freely into such tank when the raw-milk line is disconnected from the regenerator outlet.

The reasons for these specifications differ somewhat from the preceding type inasmuch as any raw milk in the regenerator must at all times be maintained at, subatmospheric pressure. Provisions (*a*), (*b*), and (*c*) will automatically insure this not only during operation and during pump shut-downs but also at the beginning of a run, for the same reason as that given in the discussion of free-draining regenerators in the first type of regenerator described.

Milk-to-milk regenerators with both sides open to the atmosphere should not be approved, since with both sides at atmospheric pressure the pasteurized-milk side cannot ever be under greater pressure than the raw-milk side. This type of regenerator is not, however, being used nor is it likely to be used because of its inefficiency. It is subject to large heat losses to the atmosphere, and as the raw milk and the pasteurized milk must both flow downward it cannot utilize countercurrent flow.

MILK-TO-WATER-TO-MILK REGENERATORS

Many types of milk-to-water-to-milk regenerators could be designed, but only the two types on the market will be discussed. The number of possible combinations may be gaged by the fact that in either or both the raw-milk and the pasteurized-milk sections the milk or the heat-transfer medium or both may be either open or closed to the atmosphere. In connection with the relative-pressure requirement, conditions existing in the pasteurized-milk section are immaterial and only the raw-milk section need be considered.

In *milk-to-water-to-milk regenerators with both the milk and the heat-transfer water in the raw-milk section closed to the atmosphere* (fig. 37)

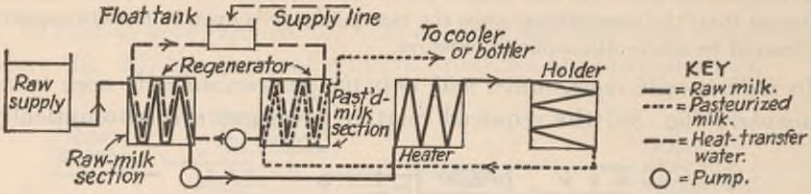


FIGURE 37.—Milk-to-water-to-milk regenerator with both milk and water in raw-milk section closed to atmosphere (diagrammatic elevation).

the required relative pressures are automatically insured if—

(*a*) The highest point of the heat-transfer-water circuit is in a covered tank open to the atmosphere at an elevation higher, by at least 6 percent of the static raw-milk head on the bottom of the regenerator, than any raw milk between the free raw-milk level nearest upstream from the regenerator and the outlet from the raw-milk section of the regenerator; and

(*b*) No heat-transfer-water pump is located in that portion of the heat-transfer-water circuit which lies upstream from such tank and downstream from the heat-transfer-water inlet to the raw-milk section of the regenerator; and

(*c*) No milk pump is located between the raw-milk inlet to the regenerator and the free raw-milk level nearest upstream therefrom; and

(*d*) The heat-transfer-water circuit is full of water at the beginning of the run, and all loss of water from the circuit (through back-siphonage, open drain valve, leakage, evaporation, etc.) is prevented or automatically and immediately replenished whenever raw milk is present in the regenerator.

Most of these requirements and the reasons therefor are similar to those already discussed for milk-to-milk regenerators with both sides closed to the atmosphere. Compliance with (*a*) will place all of the heat-transfer water in the raw-milk section of the regenerator under greater pressure than the raw milk at all times, provided (*b*), (*c*), and (*d*) are also satisfied. The 6 percent excess head specified in (*a*) for the heat-transfer-water circuit will compensate, during shut-downs, for the difference in specific gravity between milk at 40° F. and water at 160° F.

A heat-transfer-medium pump located as described in (*b*) could, when operating, reduce the heat-transfer-water pressure on its suction side to below that of the raw milk in the regenerator. A milk pump located as shown in (*c*) could during operation increase the raw-milk pressure to above that of the heat-transfer water in the regenerator even if all other requirements were satisfied.

The full heat-transfer-water circuit required at all times by (*d*) is considered the simplest means of insuring proper relative pressures. The heat-transfer-water pump could, when operating, satisfy the pressure requirement even if the circuit were not full; but when not operating it will not satisfy this requirement unless there is enough water in the circuit to fill the upstream portion between the

pump and the tank, and unless all backflow and loss of water from this portion of the circuit are prevented. The most practical solution is, therefore, a constant-level tank at the highest point specified in (*a*). A covered tank will protect the water against contamination, but the cover should not be airtight. Although the float in the tank will automatically open the supply-line valve whenever any loss of water from the circuit occurs, the drain valve should be kept closed throughout the day's run to avoid unnecessary risks. The tank should be supplied with an overflow, and all supply lines feeding the heat-transfer-water circuit should enter at the tank and through a sufficient air gap to prevent loss of water through backsiphonage into the supply line.

In *milk-to-water-to-milk regenerators with the water closed but the milk open to the atmosphere in the raw-milk section* (fig. 38) the required

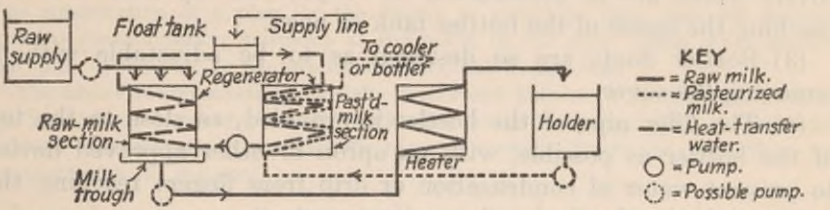


FIGURE 38.—Milk-to-water-to-milk regenerator with water closed but milk open to atmosphere in raw-milk section (diagrammatic elevation).

relative pressures are automatically insured when the following conditions are satisfied:

(*a*) The highest point of the heat-transfer-water circuit is in a covered tank open to the atmosphere at a higher elevation than the top of the raw-milk section of the regenerator; and

(*b*) No heat-transfer-water pump is located in that portion of the heat-transfer-water circuit which lies upstream from such tank and downstream from the heat-transfer-water inlet to the raw-milk section of the regenerator; and

(*c*) The heat-transfer-water circuit is full of water at the beginning of the run, and all loss of water from the circuit (through backsiphonage, open drain valve, leakage, evaporation, etc.) is prevented or automatically and immediately replenished whenever raw milk is present in the regenerator.

These specifications and the reasons therefor are almost identical with those of the type immediately preceding, except that the raw-milk pump upstream from the regenerator is not prohibited and a lower tank elevation is permitted, since the raw-milk pressure in this type of regenerator cannot exceed atmospheric.

ITEM 18p. BOTTLING

Bottling of milk and milk products shall be done at the place of pasteurization in approved mechanical equipment.

Public-health reason.—Hand-bottling is very apt to result in the exposure of the milk and milk products to infection, which would nullify the effect of pasteurization.

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Satisfactory compliance.—This item shall be deemed to have been satisfied if the bottling is done by mechanical equipment conforming with the following requirements:

The term "mechanical equipment" is not interpreted to exclude machinery operated by manpower, but is interpreted to exclude methods in which the bottling and capping devices are not integral in one machine.

(1) The bottler is of a design which does not require frequent adjustment during operation, thus exposing the milk to danger of contamination.

(2) Bottling machine supply tanks and bowls are provided with covers which are so constructed as to prevent any contamination reaching the inside of the bottler tank or bowl.

(3) Bottler floats are so designed as to be adjustable without removing the cover.

(4) The filler pipe of the bottler is provided, as close to the top of the bottler as possible, with an apron or other approved device to prevent water of condensation or drip from fingers reaching the inside of the bottler during float adjustments.

Bottler designs which do not include filler pipes or floats shall not be required to comply with items (3) or (4).

(5) Automatically operated bottler infeed conveyors are provided with overhead shields from the bottle washer to the bottler feed star to protect the bottles from contamination. Overhead shields shall also be required on can infeed conveyors if the cans are fed to the filler with covers off.

Item 19p. Overflow Milk

Overflow milk or milk products shall not be sold for human consumption.

Public-health reason.—Milk or milk products which have come in contact with equipment surfaces which have not been treated with a bactericide and safeguarded after treatment, have been exposed to contamination, and are therefore dangerous.

Satisfactory compliance.—This item shall be deemed to have been satisfied so long as there is no evidence of the use of spilled or overflow milk or milk products for delivery to consumers.

Item 20p. Capping

Capping of milk and milk products shall be done by approved mechanical equipment. Hand capping is prohibited. The cap or cover shall cover the pouring lip to at least its largest diameter.

Public-health reason.—Hand capping is apt to expose the milk to contamination. A cover extending over the pouring lip of the container protects it from contamination by handling, and prevents the sucking back into the bottle by temperature contraction of any milk which has been squeezed out by temperature expansion and which may have become contaminated.

Satisfactory compliance.—(For definition of "mechanical equipment" see item 18p.) This item shall be deemed to have been satisfied if—

(1) All bottlers are equipped with a mechanical capping mechanism of a design which does not require frequent adjustment.

(2) Bottles imperfectly capped are dumped into cans or other containers and the dumped milk or milk products repasteurized.

(3) The cap or cover of all containers covers the pouring lip to at least its largest diameter.

Attemps to adjust caps by hand, or to remove them and recap either by hand or by machine, inevitably expose the milk in the bottle to manual contamination. The substitution of a pick for the fingers in removing caps does not prevent manual contamination inasmuch as the point of the pick, which often touches the milk, is exposed to contamination from the fingers, etc.

The above requirement is specially important because a fundamental rule in the case of pasteurized milk and milk products is that they shall be protected against contamination, particularly manual contact, from the time they are pasteurized until delivery.

Item 21p. Personnel, Health

The health officer or a physician authorized by him shall examine and take a careful morbidity history of every person connected with a pasteurization plant, or about to be employed, whose work brings him in contact with the production, handling, storage, or transportation of milk, milk products, containers, or equipment. If such examination or history suggests that such person may be a carrier of or infected with the organisms of typhoid or paratyphoid fever or any other communicable diseases likely to be transmitted through milk, he shall secure appropriate specimens of body discharges and cause them to be examined in a laboratory approved by him or by the State health authorities for such examinations, and if the results justify such person shall be barred from such employment.

Such persons shall furnish such information, submit to such physical examinations, and submit such laboratory specimens as the health officer may require for the purpose of determining freedom from infection.

(See item 25r, grade A raw milk, for public-health reason and satisfactory compliance.)

Item 22p. Personnel, Cleanliness

All persons coming in contact with milk, milk products, containers, or equipment shall wear clean outer garments and shall keep their hands clean at all times while thus engaged.

Public-health reason.—The public-health reason for this requirement is obvious.

Satisfactory compliance.—This item shall be deemed to have been satisfied if—

(1) The outer garments of all milk handlers, including delivery personnel, are reasonably clean. Inside employees must wear washable outer garments especially provided and used for no other than milk-plant duty.

(2) The hands of all milk handlers are clean.

ITEM 23p. MISCELLANEOUS

All vehicles used for the transportation of milk or milk products shall be so constructed and operated as to protect their contents from the sun and from contamination. All vehicles used for the transportation of milk or milk products in their final delivery containers shall be constructed with permanent tops and with permanent or roll-down sides and back, provided that openings of the size necessary to pass the delivery man may be permitted in the sides or back for loading and unloading purposes. All vehicles shall be kept clean, and no substance capable of contaminating milk or milk products shall be transported with milk or milk products in such manner as to permit contamination. All vehicles used for the distribution of milk or milk products shall have the name of the distributor prominently displayed.

The immediate surroundings of the milk plant shall be kept in a neat, clean condition.

(See item 26r, grade A raw milk specifications.)

GRADE B PASTEURIZED MILK

Grade B pasteurized milk is pasteurized milk which violates the bacterial standard for grade A pasteurized milk and/or the provision of lip-cover caps of item 20p and/or the requirement that grade A raw milk be used, but which conforms with all other requirements for grade A pasteurized milk, has been made from raw milk of not less than grade B quality, and has an average bacterial plate count after pasteurization and before delivery not exceeding 50,000 per cubic centimeter, as determined under sections 1 (S) and 6.

GRADE C PASTEURIZED MILK

Grade C pasteurized milk is pasteurized milk which violates any of the requirements for grade B pasteurized milk.

SECTION 8. GRADES OF MILK AND MILK PRODUCTS WHICH MAY BE SOLD

From and after 12 months from the date on which this ordinance takes effect no milk or milk products shall be sold to the final consumer or to restaurants, soda fountains, grocery stores, or similar establishments except [27] _____: *Provided, That when any milk distributor fails to qualify for one of the above grades the health*

[27] See footnote 2, p. 2.

officer is authorized to revoke his permit,[28] *or in lieu thereof to degrade his product and permit its sale during a temporary period not exceeding 30 days or in emergencies such longer period as he may deem necessary.*

SECTION 9. SUPPLEMENTARY GRADING PRESCRIBED AND REGRADING AUTHORIZED

If, at any time between the regular announcements of the grades of milk or milk products, a lower grade shall become justified, in accordance with sections, 5, 6, and 7 of this ordinance, the health officer shall immediately lower the grade of such milk or milk products, and shall enforce proper labeling and placarding thereof.

Any producer or distributor of milk or milk products the grade of which has been lowered by the health officer, and who is properly labeling his milk and milk products, may at any time make application for the regrading of his products.

Upon receipt of a satisfactory application, in case the lowered grade is the result of an excessive average bacterial plate count, direct microscopic count, reduction time, or cooling temperature, the health officer shall take further samples of the applicant's output, at a rate of not more than two samples per week. The health officer shall regrade the milk or milk products upward whenever the average of the last four sample results indicates the necessary quality, but not before the lapse of two weeks from the date of degrading.

In case the lowered grade of the applicant's product is due to a violation of an item of the specifications prescribed in section 7, other than average bacterial plate count, direct microscopic count, reduction time, or cooling temperature, the said application must be accompanied by a statement signed by the applicant to the effect that the violated item of the specifications has been conformed with. Within 1 week of the receipt of such an application and statement the health officer shall make a reinspection of the applicant's establishment, and thereafter as many additional reinspections as he may deem necessary to assure himself that the applicant is again complying with the higher-grade requirements, and, in case the findings justify, shall regrade the milk or milk products upward, but not before the lapse of two weeks from the date of degrading.

Supplementary regrading downward.—The first paragraph of this section provides for regrading downward between regular announcements of grades. This provision is necessary in order to insure adequate protection to the consuming public in case a dairyman, once having obtained a high grade, evidences repeated carelessness which warrants his being degraded before the end of the next regular grading period.

[28] See footnote 3, page 2.

As stated under section 5, the supply of a dairy or milk plant shall be immediately degraded (between regular grading announcements) if the same item of sanitation is found violated on two successive inspections.

Supplementary regrading upward.—The last three paragraphs of this section deal with the problem of regrading upward at any time between routine announcements of grades. This provision is made in order to avoid unnecessarily long punishment of the dairyman who has corrected the defects responsible for his lower grade.

No application for regrading upward should be considered by the health officer unless the dairyman or milk plant in question has complied with the requirements and interpretation of section 4 of this ordinance relative to the use of proper bottle caps after having been degraded. In no case should a milk supply be regraded upward before the lapse of two weeks from the date of degrading.

SECTION 10. TRANSFERRING OR DIPPING MILK; DELIVERY CONTAINERS; HANDLING OF MORE THAN ONE GRADE; DELIVERY OF MILK AT QUARANTINED RESIDENCES

Except as permitted in this section, no milk producer or distributor shall transfer milk or milk products from one container to another on the street, or in any vehicle or store, or in any place except a bottling or milk room especially used for that purpose. The sale of dip milk is hereby prohibited.

All pasteurized milk and milk products shall be placed in their final delivery containers in the plant in which they are pasteurized, and all raw milk and milk products sold for consumption in the raw state shall be placed in their final delivery containers at the farm at which they are produced. Milk and milk products sold in the distributor's containers in quantities less than 1 gallon shall be delivered in standard milk bottles or in single-service containers. It shall be unlawful for hotels, soda fountains, restaurants, groceries, and similar establishments to sell or serve any milk or milk product except in the original container in which it was received from the distributor or from a bulk container equipped with an approved dispensing device: Provided, That this requirement shall not apply to cream consumed on the premises, which may be served from the original bottle or from a dispenser approved for such service.

It shall be unlawful for any hotel, soda fountain, restaurant, grocery, or similar establishment to sell or serve any milk or milk products which have not been maintained, while in its possession, at a temperature of 50° F. or less.

No milk or milk products shall be permitted to come in contact with equipment with which a lower grade of milk or milk product has been in contact unless such equipment has first been thoroughly cleaned and subjected to bactericidal treatment.

Bottled milk or milk products, if stored in water, shall be so stored that the tops of the bottles will not be submerged.

It shall be the duty of all persons to whom milk or milk products are delivered to clean thoroughly the containers in which such milk or milk products are delivered before returning such containers. Apparatus, containers, equipment, and utensils used in the handling, storage, processing, or transporting of milk or milk products shall not be used for any other purpose without the permission of the health officer.

The delivery of milk or milk products to and the collection of milk or milk-products containers from residences in which cases of communicable disease transmissible through milk supplies exist shall be subject to the special requirements of the health officer.

The purpose of this section is to prevent, so far as practicable, exposing the milk to contamination from the time it is placed in its container at the dairy or milk plant until the time it is delivered to the final consumer. The practice, formerly quite prevalent, of transferring milk from a bulk container located in the delivery vehicle to the household container, either by dipping or by drawing from a faucet, is dangerous because of the opportunity for contamination by dust and flies or manually. This practice has now practically died out, but may occasionally be discovered by the inspector.

Another practice on the part of some distributors, still occasionally observed, is the filling of returned bottles, which have not been treated with a bactericide, with milk or milk products along the milk route, particularly at retail depots. This section expressly forbids this practice.

The use of standard milk bottles or single-service containers for delivering milk and milk products in quantities less than one gallon is required in order to prohibit delivery in such containers as buckets, fruit jars, etc., which may be difficult to wash and to subject to adequate bactericidal treatment, which cannot be filled and capped with the proper equipment used for these purposes, and which it is often difficult to label properly.

The portion of this section dealing with the method of selling or serving of milk or milk products in restaurants, groceries, etc., is designed to prevent contamination of the milk in handling or serving. Such contamination is frequently observed in the dipping of milk from a bulk container into the container or glass in which it is sold or served to the customer, the container or glass frequently overflowing and the milk coming in contact with the fingers and then dripping back into the bulk container from which it was dipped. Furthermore, even if milk is poured into glasses from bottles in the kitchen there is more opportunity for carelessness and consequent contamination than if it is served in the original container, because the transferring is done out of sight of the customer.

The selling or serving of milk in the original container has been found to be practical. In fact, many establishments report increased sales because of the reaction of the consumer to the improved service sanitation, and to the fact that he is assured of receiving all of the cream in the original container.

However, there are rapidly being developed sanitary bulk dispensers which may result in reducing the cost of milk distribution. For this reason this section is so worded as to permit the selling or serving of milk or milk products from approved sanitary bulk dispensers which insure correct mixing of the milk and cream. The health officer should not approve any bulk dispenser which does not satisfy the following design and operation requirements:

(1) It shall comply with the requirements of item 10p, construction and repair of equipment.

(2) No surfaces with which milk or milk products come in contact shall while in use be accessible to manual contact, droplet infection, dust, or flies, but the delivery orifice may be exempted from this requirement.

(3) All parts of the dispensing device with which milk comes in contact, including any measuring device, shall be cleaned and subjected to bactericidal treatment at the milk plant, not at the retail vendor's establishment.

(4) The dispensing device shall be filled and sealed with two seals at the milk plant in such manner as to make it impossible to withdraw any part of its contents without breaking one seal and impossible to introduce any substance without breaking the other.

(5) It shall mix the milk and cream thoroughly and automatically with each dispensing operation. This requirement may be waived in the case of milk products which remain homogeneous without mixing.

In the case of milk drinks mixed at soda fountains, etc., this section shall be interpreted as requiring that the milk used shall include the entire contents of the original container or shall be from an approved bulk dispenser. The sanitary control of methods used in mixing such milk drinks is considered to be within the province of a restaurant or food ordinance rather than the milk ordinance.

In enforcing this section the health officer may make an exception in the case of cream served with coffee, cereals, etc., as in this case it is impracticable to serve in the original container because of the fact that it is impossible for the distributor to deliver cream to the establishment in the unit-size containers which would be required in each case. Furthermore, the use of expensive bulk dispensers as described above may not be a defensible requirement for all soda fountains, restaurants, and similar establishments in the case of cream used for coffee, cereals, etc. For such service the health officer may permit transferring from the original bottle, or from a pump, urn, or other dis-

penser which complies with requirements (1) and (2) above, and which is filled in a sanitary manner, kept clean, and frequently subjected to bactericidal treatment complying with the requirements of item 12p.

Bottled milk should not be submerged in water for cooling because the contraction of the contents accompanying the cooling process may create a sufficient vacuum within the bottle to suck in water around the edge of the cap. Tests have shown that milk may thus be contaminated.

SECTION 11. MILK AND MILK PRODUCTS FROM POINTS BEYOND THE LIMITS OF ROUTINE INSPECTION

Milk and milk products from points beyond the limits of routine inspection of the city of _____ may not be sold in the city of _____, or its police jurisdiction, unless produced and/or pasteurized under provisions equivalent to the requirements of this ordinance; provided that the health officer shall satisfy himself that the health officer having jurisdiction over the production and processing is properly enforcing such provisions.

This section is intended to permit the health officer to bar milk and milk products shipped in from great distances unless he can assure himself that they meet the provisions of the ordinance. Under no conditions should the health officer authorize the receipt of such shipments if arrangements cannot be made for supervision, unless an emergency exists, in which case permission should be given for its receipt, provided it is labeled "ungraded milk" when distributed.

It is suggested that the health officer approve milk or milk products from distant points without his inspection if they are produced and processed under regulations equivalent to those of this ordinance, and if the milk or milk products have been awarded by the State control agency a rating of 90 percent or more on the basis of the Public Health Service rating method.[29]

SECTION 12. FUTURE DAIRIES AND MILK PLANTS

All dairies and milk plants from which milk or milk products are supplied to the city of _____ which are hereafter constructed, reconstructed, or extensively altered shall conform in their construction to the requirements of this ordinance for grade A dairy farms producing milk for consumption in the raw state, or for grade A pasteurization plants, respectively: Provided, That the requirement of a two-room milk house shall be waived in the case of dairies the milk from which is to be pasteurized. Properly prepared plans for all dairies and milk plants which are hereafter constructed, reconstructed, or extensively altered

[29] See Methods of Making Sanitation Ratings of Milk Sheds, Reprint No. 1970 from the Public Health Reports of Aug. 12, 1938, p. 1386.

shall be submitted to the health officer for approval before work is begun. In the case of milk plants signed approval shall be obtained from the health officer and/or the State health department.

This section is designed to insure that all new construction, reconstruction, or extensive alterations made subsequent to the adoption of this ordinance will comply with the highest grade A requirements of this ordinance. For example, a plant-producer whose barn floor is of tight wood or whose milk house does not have water piped into it, and a pasteurization plant which does not have a separate receiving room, are entitled to a grade A rating on these items. But when such plant-producer constructs a new barn or extensively alters his existing barn this section requires him to replace the wood floor with a concrete or equally impervious floor; and when he builds a new milk house or extensively alters his existing milk house he must pipe water into it. Similarly, when the aforesaid plant owner builds a new plant or extensively alters his existing plant a separate receiving room is mandatory.

This provision represents a reasonable compromise between public health ideals and excessive production costs. It may be unreasonable to require a plant-producer to tear out a tight wood floor in good condition and replace it with concrete; but when this dairyman rebuilds his barn the health officer is justified in requiring such a step.

This section shall not be interpreted as setting up any higher construction requirements for dairies and plants which seek to enter the market after the ordinance has become effective than for those supplying the community before that date.

SECTION 13. NOTIFICATION OF DISEASE

Notice shall be sent to the health officer immediately by any producer or distributor of milk or milk products upon whose dairy farm or in whose milk plant any infectious, contagious, or communicable disease occurs.

SECTION 14. PROCEDURE WHEN INFECTION SUSPECTED

When suspicion arises as to the possibility of transmission of infection from any person concerned with the handling of milk or milk products, the health officer is authorized to require any or all of the following measures: (1) The immediate exclusion of that person from milk handling, (2) the immediate exclusion of the milk supply concerned from distribution and use, (3) adequate medical and bacteriological examination of the person, of his associates, and of his and their body discharges.

SECTION 15. ENFORCEMENT INTERPRETATION

This ordinance shall be enforced by the health officer in accordance with the interpretations thereof contained in the 1939 edition of the

United States Public Health Service Milk Code, a certified copy of which shall be on file in the city clerk's office.[30]

SECTION 16. PENALTY

Any person who shall violate any provision of this ordinance shall be fined not more than _____ at the discretion of the court. Each and every violation of the provisions of this ordinance shall constitute a separate offense.

This section must be worded in accordance with the city charter and the State constitution. Where legally possible the desirability is suggested of prescribing a minimum fine and an increase in fine for second and subsequent offenses.

SECTION 17. REPEAL AND DATE OF EFFECT

All ordinances and parts of ordinances in conflict with this ordinance are hereby repealed; and this ordinance shall be in full force and effect immediately upon its adoption and its publication, as provided by law.

SECTION 18. UNCONSTITUTIONALITY CLAUSE

Should any section, paragraph, sentence, clause, or phrase of this ordinance be declared unconstitutional or invalid for any reason, the remainder of said ordinance shall not be affected thereby.

These sections need no explanation.

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[30] See footnote 5, p. 7.

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AMENDMENT NO. 2 TO 1939 EDITION OF U. S. PUBLIC HEALTH SERVICE MILK ORDINANCE AND CODE

Adopted by Public Health Service Sanitation Advisory Board, December 3, 1942.

There is given below a brief summary of the more important changes adopted in the 1939 edition of Public Health Bulletin No. 220. Following the summary, the revisions are given in detail. A number of other proposed changes included in the agenda were not acted upon for lack of time but will be considered at a future meeting of the Board. It was agreed that it would be advisable to postpone the printing of a new edition of the ordinance and code until after the war, and instead to issue a separate list of the changes.

SUMMARY

A non-degrading form of the ordinance is to be prepared for communities which prefer to penalize violations of the grade A standards by suspension of permit instead of by degrading.

The definition of homogenized milk (Definition J, p. 22) is made less stringent by changing from 5 to 10% the allowable maximum percentage difference in fat content between the top 100 cc. of milk and the remaining milk in quart containers.

In item 1r (p. 37), calfhood vaccination against Bang's disease under official supervision is permitted and animals which become reactors but are not producing milk may be retained in the herd until they are 16 months old. The modified accredited Bang's-disease-free area system of the U. S. Bureau of Animal Industry is accepted in lieu of annual testing in non-infected herds. Bang's testing shall be done and reactors disposed of in accordance with the B.A.I. requirements.

Pouring, but not straining, is permitted in the barn into containers provided with covers and so located as to protect the milk from contamination (Item 22r, p. 75).

Hot and cold running water, instead of warm running water, is required at pasteurization plant lavatories (Item 8p, pp. 88-89).

A recommendation that the phosphatase test be run frequently on pasteurized milk is included in item 16p (p. 97).

To protect bottles of pasteurized milk during filling against the entrance of condensation from the outside of the bottler bowl, it is required that drip-deflecting aprons must be installed just above the filler valve rubbers, or a suitable air blast may be used. Drip deflectors shall be so designed as to divert drip away from the path of travel of the bottles. (Item 18p, p. 138.)

The wording of Section 13, Notification of Disease, is modified to prohibit any person having or suspected of having any disease in a communicable form, or of being a carrier of such disease, from working in or being employed by any dairy farm or milk plant in any capacity which brings him in contact with the production, handling, storage, or transportation of milk, milk products, containers, or equipment (p. 146).

In addition to the above changes, certain explanatory material has been added, and in several cases the ordinance wording has been made more explicit without changing the original intent.

DETAILED STATEMENT OF CHANGES

A non-degrading form of the ordinance is to be prepared for communities which prefer to penalize violations of the grade A standards by permit suspension rather than by degrading.

DEFINITION J. HOMOGENIZED MILK (page 22).- In line 6, delete "5" and substitute "10."

ITEM 1r. COWS, TUBERCULOSIS AND OTHER DISEASES (pages 37-39).- In the first paragraph of the ordinance insert "tuberculosis-free" before "accredited" in lines 7, 9, and 11.

Delete the second paragraph of the ordinance entirely and substitute the following:

> Within _____ [16] years after the adoption of this ordinance all milk and milk products consumed raw shall be from herds or additions thereto which have been found free from Bang's disease, as shown by blood serum tests for agglutinins against Brucella abortus made in a laboratory approved by the health officer. Said tests shall be made and reactors disposed of in accordance with the requirements approved by the United States Department of Agriculture, Bureau of Animal Industry,[15] for Bang's-disease-free accredited areas. All such herds shall be retested at least every 12 months and all reactors disposed of in accordance with the above requirements: Provided, That cattle which have been vaccinated with an approved vaccine as calves between the ages of 4 and 8 months and which react to the above test but are not producing milk may be retained in the herd until they are 16 months of age, at which time they shall be tested and if they react shall be disposed of as required above. A certificate identifying each animal by number, and signed by the laboratory making the test, shall be evidence of the above test: Provided, That in modified Bang's-disease-free accredited counties in which the modified accredited area plan is applied to the dairy herds, the modified Bang's-disease-free accredited area system approved by the United States Bureau of Animal Industry[15] shall be accepted in lieu of annual testing in non-infected herds of cattle.

Insert the following on page 39, after the second paragraph of Satisfactory compliance under item 1r (all except third paragraph to be in small type):

The following is a brief summary of the U. S. Bureau of Animal Industry regulations for modified tuberculosis-free accredited areas. If less than 0.5 percent of the cattle react on the first complete* test of all cattle in the area, the area is designated as an official modified accredited area for a period of 3 years. Infected herds must be quarantined and tested as required in the Individual Accredited Herd Plan. If more than 0.5 percent but not more than 1.0 percent react on the first complete* test, the infected herds must be quarantined and retested; and if less than 0.5 percent react on this partial retest, the area is designated as a modified accredited area. If more than 1 percent react on the initial complete* test, all cattle in the area must be retested, and the area may be accredited if not more than 0.5 percent of the cattle react. All the provisions of the Individual Accredited Herd Plan that relate to testing, removal of reactors, cleaning, disinfecting, and sanitation also apply to the area plan. All counties in the United States have now been designated as modified tuberculosis-free accredited areas.

Modified accredited areas may be reaccredited under the following conditions: (a) If a complete area retest indicates a degree of infection not exceeding 0.2 percent, the area may remain in the modified accredited status for a period of 6 years from the date of remodification. All infected herds must be quarantined and tested, and reaccreditation tests on 6-year areas must include all the cattle in the area. (b) If the original test of all the cattle in the area* (or the last complete test of all cattle, in the case of areas which have already been reaccredited) showed a degree of infection not exceeding 0.5 percent, the area may be reaccredited if not more than 0.5 percent of the cattle react on a test of all herds in which infection has been found at any time, plus such other herds as are designated by the proper State and Federal officials. (c) If the original test of all the cattle in the area* showed that the degree of infection did not exceed 2 percent (or, in the case of areas which have been reaccredited, if the last complete test of all cattle showed a degree of infection exceeding 0.5 percent but not 1.0 percent) the area may be reaccredited if less than 0.5 percent react as the result of testing at least 20 percent of the total number of herds plus all herds in which infection has been found at any time. (d) If the original test of all the cattle in the area showed a degree of infection exceeding 2 percent, the area may be reaccredited on the basis of a complete test of all cattle in the area. For a more complete discussion, see the "Uniform Methods and Rules For The Establishment and Maintenance of Tuberculosis-Free Accredited Herds of Cattle and Modified Accredited Areas" adopted by the Bureau of Animal Industry, U. S. Department of Agriculture, Dec. 19, 1940.

It is not the intent of the ordinance that milk may qualify as grade A for consumption raw if calfhood vaccination is being applied in infected herds. The intent is that the herds shall be maintained Bang's-disease-free, but that in such free herds, calves which have been vaccinated between the ages of 4 and 8 months with an approved vaccine under official supervision, and hence may react to the agglutination test, may be retained in the herd until the age of 16 months,

*Special provisions are made for range and semi-range areas.

provided they do not become milk-producers before this time. The presence of properly vaccinated calves in a free herd is not considered a menace to the other cattle. The intent of the ordinance, then, is that all milking animals, and all over 16 months of age, must be free from Bang's disease as shown by the test. Vaccinated calves which are still reactors when tested at the time required by the ordinance must be disposed of as the ordinance requires. By approved vaccine is meant such vaccine as is approved by the U. S. Bureau of Animal Industry for vaccination of calves against Bang's disease.

The following is a brief summary of the U. S. Bureau of Animal Industry regulations providing for modified Bang's-disease-free accredited areas. The extent of the area is determined by the cooperating State and Federal agencies. When testing is begun, the area is placed under quarantine and certain rules must be observed in importing cattle. All cattle 6 months of age or over, except steers, are tested for Bang's disease and reactors must be slaughtered within 15 days. If not more than 1% of the cattle react and not more than 5% of the herds are infected, the area may be declared a modified Bang's-disease-free area for a period of 3 years, provided that all infected herds are quarantined and retested at intervals of 30 to 90 days until all cattle in them pass two consecutive negative tests and a third negative test not less than 6 months from the date of the second negative test. At the end of the three-year period the area may be reaccredited if not less than 10% of the herds, including 10% of the cattle 6 months of age and over, and including all herds found to contain reactors in the last complete area test or county check test, are retested, and not more than one percent of the cattle react.

ITEM 14r. UTENSILS, BACTERICIDAL TREATMENT (page 69).- Insert the following sentences in Satisfactory compliance, at the end of the first paragraph under Approved strength of chlorine solutions:

Bactericidal treatment with chlorine is ineffective if the utensils have not been thoroughly cleaned. Where chlorine is relied upon for bactericidal treatment, this item shall therefore be considered as violated if the containers or equipment so treated do not comply with item 13r.

ITEM 22r. REMOVAL OF MILK (page 75).- Delete the present ordinance and code material and substitute the following:

Each pail or can of milk shall be removed immediately to the milk house or straining room. No milk shall be strained in the dairy barn.

Public-health reason.- Keeping the milk in the barn until all or a large part of the herd has been milked is apt to expose it to flies and dust, and to delay cooling. Straining milk in the barn likewise exposes it to dust and flies.

Satisfactory compliance.- To comply with this item,

(1) Each pail of milk shall be removed as soon as it is filled to the milk house or straining room; or

(2) Milk may be poured from the milk pails or milking machine units into a 5 or 10 gallon milk can which shall be removed as soon as it is filled to the milk house or straining room. The can shall be provided with a cover which shall be removed only during pouring and which shall be protected from contamination while so removed. The can shall be placed at such distance from the cows or sufficiently raised above the floor (as in a cart) as to be protected from manure and splash.

(3) No milk shall be strained elsewhere than in the milk house or in a straining room provided for this purpose.

If the milk house and barn are too widely separated to make practicable the straining of milk in the milk house, the construction of a small screened straining room in or near the barn, but not opening directly into it, is satisfactory. This method still has the disadvantage of delaying cooling, though this can be reduced by taking every can full of milk to the milk house as soon as filled. Dairymen sometimes use the feed room or a similar enclosure for a straining room. This is not approved unless all feedstuffs or other materials are removed and the room is so located that it does not open directly into the milking barn.

Pouring milk into conductors which are protected, as provided under item 8r(e), shall be permitted.

ITEM 5p. MISCELLANEOUS PROTECTION FROM CONTAMINATION (page 87).- Add the following at the end of Satisfactory compliance:

(11) No milk, milk products, containers or equipment shall be handled or stored beneath overhead sewer or drain pipes unless such pipes are completely enclosed by a watertight casing or provided with suitable means to carry off possible leakage or condensation. In all proposed plants, sewer and drain lines shall, insofar as possible, be so located that drip therefrom cannot reach the milk, milk products, containers or equipment.

ITEM 6p. TOILET FACILITIES (pages 87-88).- Delete the Public-health reason and substitute the following:

Public-health reason.- Human excreta is potentially dangerous and must be properly disposed of. The organisms causing typhoid fever, paratyphoid fever, and dysentery may be present in the body discharges of cases or carriers. Sanitary toilet facilities are necessary to protect the milk, equipment, and containers from fecal contamination carried by flies, other insects, hands or clothing. When the toilet facilities are of a satisfactory type and are kept clean and in good repair, the opportunities for the spread of contamination by the above means are minimized.

The provision of an intervening room or vestibule between the toilet room and any room in which milk, milk products, equipment or containers are handled or stored makes it less likely that toilet-contaminated flies will enter these rooms. It will also minimize the spread of odors.

Where pit privies are used, it is essential that they be of a sanitary type in which the excreta is protected from flies and other agents of transmission, and that they be not rendered ineffective by improper operation.

Delete (2) and (3) of Satisfactory compliance and insert the following:

(2) There is an intervening room or vestibule between any toilet room and any room in which milk, milk products, containers or equipment used in connection therewith are handled or stored. The intervening room or vestibule shall be equipped with tight-fitting, self-closing doors, and shall be of such dimensions as to prevent both doors from being opened simultaneously by the same person.

Re-number the subsequent paragraphs, and in the next to the last sentence of Satisfactory compliance, insert "or bottom" after "top."

ITEM 7p. HAND-WASHING FACILITIES (pages 88-89).- In the first sentence of the ordinance, delete "warm" and substitute "hot and cold." In the first sentence of Satisfactory compliance, make the same change, and in the fourth sentence, delete "Warm" and substitute "Hot."

ITEM 16p. PASTEURIZATION (page 97).- At the end of Satisfactory compliance on page 97, add the following:

The phosphatase test should be run frequently on pasteurized milk samples.[22]

On the same page, add the following to the references given in footnote 22.

(6) Standard Methods for the Examination of Dairy Products, 1941, American Public Health Association, pp. 258-278.

ITEM 18p. BOTTLING (page 138).- Add the following at the end of Satisfactory compliance:

(6) Bottling machine filling valves shall be provided with an apron or other approved device to prevent water of condensation from reaching the milk- and bottle-contact surfaces of the valves or from dripping into bottles. Deflecting aprons shall be located immediately above the valve rubbers and shall be so designed as to divert the condensation away from the path of travel of the milk bottles, as toward the center of the circle of travel in rotary machines, because otherwise the drip may enter bottles when they approach and leave the filling position. Suitable air blasts may be used in lieu of diverting aprons.

SECTION 10 (pages 142-145).- In the third sentence of the second paragraph of the ordinance, insert "individual" before "original container." Also make the same insertion before "original" in the last sentence of Code material on page 143; and, on page 144, in the first sentence, in the first sentence of the paragraph following (5), and in the first sentence of the last paragraph.

Delete the fifth paragraph of the ordinance and substitute "The pouring lips of bottles containing milk or milk products in non-leakproof containers shall not be submerged in water for cooling." In the last paragraph of Satisfactory compliance under Section 10 on page 145, insert "in non-leakproof containers" after "Bottled milk."

SECTION 13. NOTIFICATION OF DISEASE (page 146).- Delete the present ordinance wording and substitute the following:

> No person who is affected with any disease in a communicable form or is a carrier of such disease shall work at any dairy farm or milk plant in any capacity which brings him in contact with the production, handling, storage, or transportation of milk, milk products, containers, or equipment; and no dairy farm or milk plant shall employ in any such capacity any such person or any person suspected of being affected with any disease in a communicable form or of being a carrier of such disease. Any producer or distributor of milk or milk products upon whose dairy farm or in whose milk plant any communicable disease occurs, or who suspects that any employee has contracted any disease in a communicable form or has become a carrier of such disease, shall notify the health officer immediately. A placard containing this section shall be posted in all toilet rooms or privies.

FEDERAL SECURITY AGENCY
Public Health Service
Washington

Sanitary Engineering Division,
Milk and Food Section

AMENDMENT NO. 1 TO PUBLIC HEALTH BULLETIN NO. 220
(Adopted by Public Health Service Sanitation Advisory Board
July 1941)

ITEM 10p

The following changes have been adopted under Satisfactory Compliance of item 10p, page 91, of the printed 1939 edition of the Milk Ordinance and Code recommended by the U. S. Public Health Service:

In (5), last sentence, insert "and tests" after "inspections."

In (b), insert after the first sentence: "The disintegration test technic described in the latest (eighth) edition of Standard Methods for the Examination of Dairy Products should be followed. Samples of paperboard or cut blanks for this test should be taken before paraffining, at the milk plant, if possible, otherwise at the fabricating plant."

Change paragraph (f) to read as follows: "(f) All single-service containers and container caps and covers shall prior to use be so processed as to produce containers having a residual bacterial plate count of not more than one per cc. of capacity and caps or covers with not more than 10 colonies each, as determined by the rinse technic described in the latest Standard Methods."