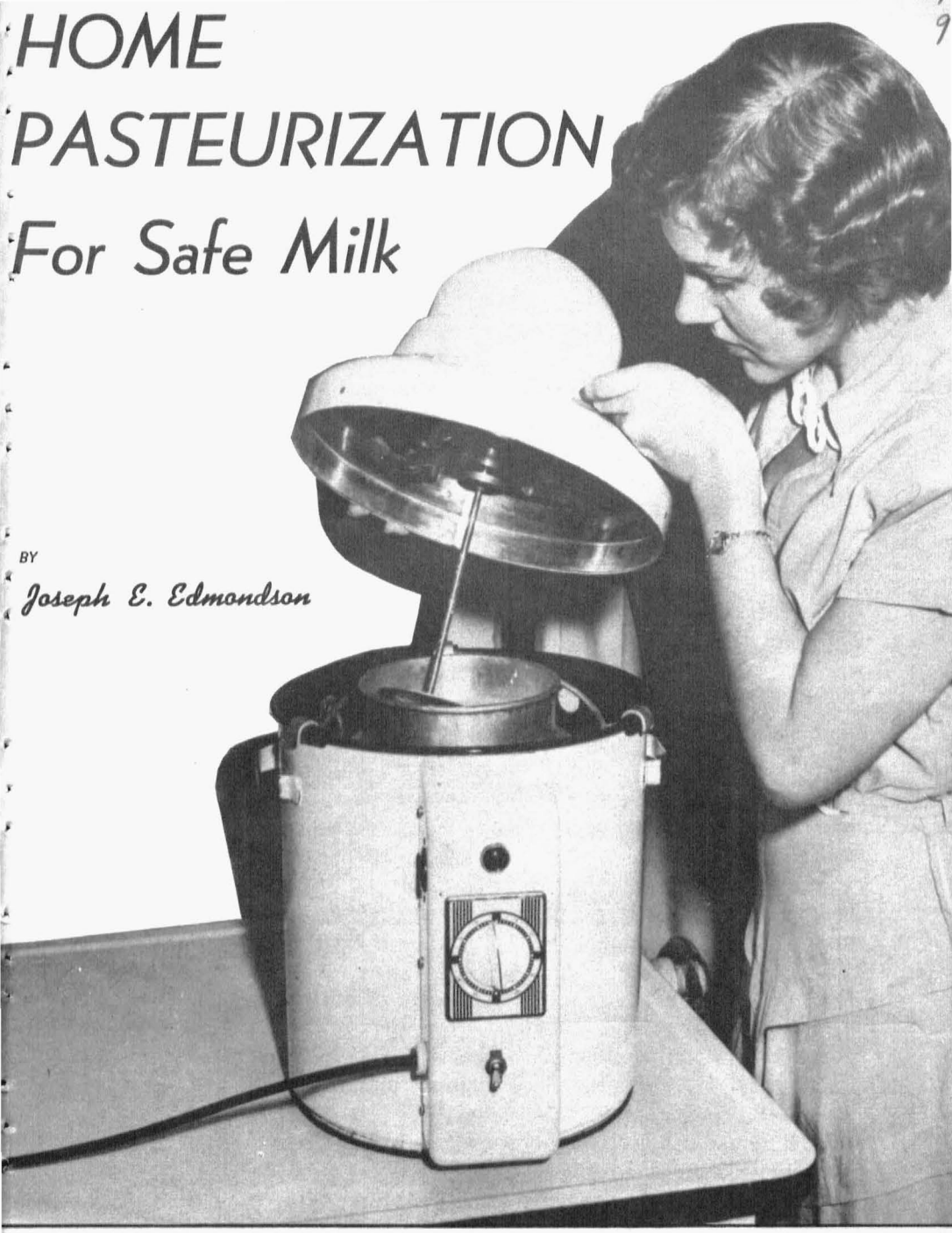
HOME PASTEURIZATION For Safe Milk



BY

Joseph E. Edmondson

UNIVERSITY OF MISSOURI **COLLEGE OF AGRICULTURE**

AGRICULTURAL EXPERIMENT STATION

J. H. LONGWELL, DIRECTOR

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BEGIN WITH CLEAN MILK

Pasteurization is not to be used as a substitute for clean, sanitary production. It is an added, necessary protection against bacteria that carry diseases. But first comes the production of clean, wholesome milk, and for this the minimum requirements are the following practices:

Before Milking

1. Provide clean milking barn, clean surroundings, and a storage room for milk and utensils free from dirt, dust and flies.
2. Rinse all utensils with 2 gallons of a chlorine sterilizer having a strength of about 200 parts per million. Follow directions carefully.
3. Brush loose hair off cow's flanks and udder with a stiff brush. Clip flanks and udder every 6 to 8 weeks, especially during the winter.
4. Wash cow's udder with soft cloth and sterilizing solution previously used for rinsing utensils. This checks spread of diseases such as mastitis and keeps loose hair and dirt out of the milk pail.

After Milking

1. Strain milk through cotton disc filter into sterilized can.
2. Cool or pasteurize milk immediately. It is best to pasteurize first, while milk is warm, for then the process takes less fuel or electricity and there is less absorption of off flavors. Quick pasteurization also reduces coagulation of milk proteins. If necessary, however, milk may be cooled to 50° F. or lower and held 12 to 24 hours with little change in quality. Place the milk container in cold running water rather than in a refrigerator. Cooling is at least five times faster in cold running water.
3. Rinse all milk utensils immediately after use with cool water (70 to 90° F.).
4. Scrub all milk utensils with a stiff bristle brush, using warm water at 130° F. and a soapless washing compound. Do not use ordinary soap or cloth.
5. Rinse thoroughly with hot water at 170° F. or higher, or rinse with chlorine solution of 200 parts per million strength.
6. Place utensils on a rack (metal preferred) in such a manner that they will rapidly drain and dry. Protect from dust and flies.

HOME PASTEURIZATION
For Safe Milk

JOSEPH E. EDMONDSON*

"How may milk be handled so it will be safe for the farm family?" This question is asked repeatedly. The answer now appears to be home pasteurization by means of simple, inexpensive equipment within the reach of all.

Pasteurization properly applied to fluid milk is the only known method that will destroy all the diseases that may be transmitted through milk. Long experience has shown the value of this process in preventing such diseases as tuberculosis, undulant fever, and typhoid fever.

On a commercial scale, pasteurization has long been used in our large milk markets to protect families who buy their milk and other dairy products. But only in recent years has the process been adapted for convenient use in the home.

Effects of Pasteurization

Properly pasteurized milk retains its nutritive value. Its protein, milk sugar (lactose), butterfat, calcium, phosphorus and vitamins A and B_2 (riboflavin) are not greatly changed by pasteurization. On the other hand, the heat of pasteurization may destroy some of the vitamin B_1 (thiamin), vitamin C (ascorbic acid), and vitamin D. But the loss of part of these vitamins is not considered detrimental to health since they are supplied abundantly in other foods.

Children who drink pasteurized milk grow and develop, it is shown by all available evidence, as well as those receiving raw milk. This indicates that the growth-promoting qualities of milk are not destroyed by pasteurization. And the increased safety provided by pasteurization far outweighs such slight difference as may occur in the food values of pasteurized and raw milk.

Methods For Safe Pasteurization

To insure proper pasteurization, every particle of milk must be heated to at least 143° F. and maintained at this temperature continuously for 30 minutes or to at least 160° F. and maintained at such temperature for 15 seconds. The use of either method will produce a safe milk which is free of disease-producing bacteria.

Small electric home pasteurizers are best adapted for the methods requiring 143° F. for 30 minutes, while the use of ordinary kitchen utensils can most advantageously be adapted

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Figure 1.—The Safgard pasteurizer showing complete assembly, with operator setting the temperature control.

Figure 2.—Cooling milk in Safgard pasteurizer by running cold water into the water jacket of pasteurizer.

to the method of heating to 160° F. for 15 seconds. Regardless of the method used a good floating dairy thermometer is essential for checking temperature to assure properly pasteurized milk. If these minimum temperatures are not maintained for the required time, the process will be useless and the milk not properly pasteurized. The dairy thermometer can be secured from the hardware, dairy supply company or a local dairy plant. In certain instances the temperature recommended is approximately 2° F. higher than is necessary to secure proper pasteurization of milk. The reason such recommendation is made is due to the inaccuracy of the floating dairy thermometer. These thermemeters are accurate only to 2 degrees plus or minus of the reading of the scale.

The Safgard pasteurizer, Figures 1 and 2, has a capacity of 2 gallons and is equipped with an agitator (see cover page). Only pasteurizers equipped with agitators have been approved by the U. S. Public Health Service and the Missouri State Health Department.

The agitation of milk during pasteurization gives assurance that every particle of milk will be heated to the proper temperature for the destruction of all harmful bacteria. The milk is heated by the use of hot water at 144° to 148° F., insuring a more constant heat and less danger of cooked flavor. Longer periods of time are required by this machine since about 9 quarts of water are used as the heating medium. Since the milk is mechanically agitated, the temperature remains rather constant, usually within the range of 144° to 146° F. The timing device is not electrically controlled, thus there is no compensation for time if the milk falls below the pasteurization temperature. However, a light on this machine indicates if pasteuriza-

Figure 5.—Pasteurizing milk in a water bath canner. (Upper left) Placing jars filled with milk in the canner, (upper right) checking pasteurization temperature at 163° F., and (lower right) cooling the milk with running water.

pasteurizing temperatures. Usually the temperature of the milk will be maintained between 144° to 151° F. during pasteurization. The timing device is electrically controlled so that it does not operate unless the temperature is above 143° F., thereby insuring that the milk will be pasteurized for the required 30 minutes. After pasteurization, the milk container should be placed in cold running water for prompt cooling.

Water Bath Canner.—Another home method which is gaining in popularity is one which makes use of a water bath canner. The water bath canning method, Figure 5, may also be called the "in the bottle method," which has proven to be very satisfactory according to tests conducted in the laboratory and farm home. This method requires the use

of a seven quart water bath canner, standard quart canning jars with glass lid and wire clamp, and a floating dairy thermometer. Other types of canning jars may be used but there my be some danger of recontamination of the milk particularly if the lids become defective.

The recommended procedure for this method is as follows: Fill the water bath canner with enough water to cover the top of the quart jars about ½ inch and place canner over heat. Bring the temperature of the water to 106° F. and place the jars of milk in the water. The milk should be warm when added to the hot water, otherwise there may be some breakage of the jars. Milk pasteurized immediately after milking, when it has a temperature of approximately 90 to 97° F., which is ideal for pasteurization by this method, gives a better quality of milk since there is no chance for bacterial development. If this is not feasible, good results can be obtained if the pasteurization is started within 2 hours after milking. The jars should be filled to about ¾ inch of the top and sealed tightly by the use of a good jar ring and lid. The capacity of a standard water canner is 7 quarts but only 6 quarts of milk can be pasteurized since one jar of water must be placed in the canner to check the temperature. The jar of water should be of the same temperature as the milk when placed in the canner. After adding the jars of milk and water to the canner, place a floating dairy thermometer in the jar of water and raise the temperature of the water as rapidly as possible. The thermometer should be moved as little as possible since any movement will bring about agitation of the water and result in faster heating of water than the milk. When the temperature of the water in the jar has reached 163° F., hold for one minute before starting the cooling process. The cooling may be accomplished by placing the water bath canner in the sink and running cool water around the jars. After the temperature has reached 70° F., cracked ice may be added to the water bath to bring the temperature to 50° F. or lower before storing.

The milk should be stored in the refrigerator or some other cool, dark place until used. By this method of pasteurization the milk will be free of all harmful bacteria and the dangers of recontamination are reduced provided proper temperatures are maintained during the process.

Double Boiler.—The simple home procedure of using a double boiler (Figure 6) can be done most conveniently and accurately as follows: With the milk in the top section, place over boiling water in the bottom section and stir until the temperature of the milk reaches 163° to 165° F. Avoid higher temperatures as they destroy the creaming ability of milk and may result in the formation of cooked flavors. Remove from the heat as soon as the right temperature is reached, and cool at once by setting the top section of the double boiler in a pan of running water.

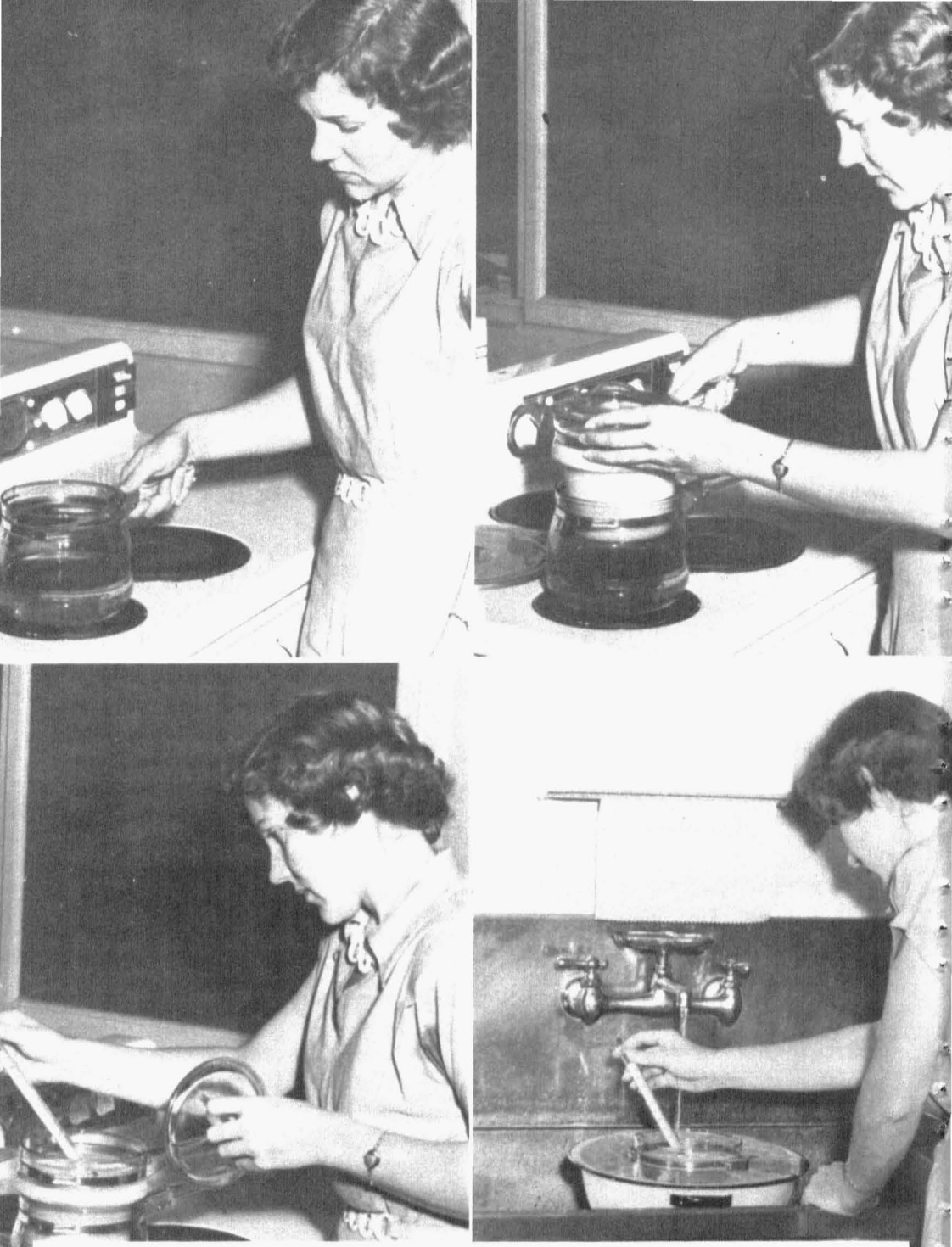

Figure 6.—Pasteurizing milk with the double boiler method. (Upper left) Heating the water to boiling, (upper right) placing top section containing milk over the boiling water, (lower left) checking the milk for pasteurization temperature, and (lower right) cooling the milk with running water.

Occasional stirring will greatly speed up the cooling process but may result in the formation of a surface film, which is the cause of slightly cooked flavors in pasteurized milk. A cover placed over the milk during cooling and subsequent storage will eliminate the formation of the film and cooked flavor. When the milk is cold, pour into clean bottles or jars that have been treated with chlorine or hot water, 170° F. or higher for one minute. Store in the refrigerator or other cool, dark place until used.

Milk may also be pasteurized by holding at 143° F. for 30 minutes with the double boiler. However, great care must be taken to see that the temperature does not drop below 143° F. during the holding period; otherwise the milk will not be sufficiently heated to destroy all of the disease producing bacteria that may be present. Unless you give constant attention to the temperature during the holding period, you cannot be sure of safely pasteurized milk.

Milk may also be pasteurized by heating the container over a direct flame, but milk thus pasteurized usually acquires an undesirable cooked or scorched flavor. Due to the strong flavors developed by this method it is not recommended for home use.

Cooling and Storage

Regardless of the method used for pasteurizing milk, it should be cooled immediately to 60° F. or lower before storage. In certain localities in summer, this temperature cannot be reached by the use of running water, therefore it is recommended that ice be added to the water for final cooling of the milk to 60° F. or lower. After cooling to a low temperature the milk should be stored in the refrigerator (as in Figure 7), or in a cool, dark place until used.

Where possible the milk should be stored in the container used for pasteurization. This may not always be feasible and in such cases, pour the milk into clean bottles or jars previously sanitized by immersing in a solution of 200 parts per million of chlorine, or in 170° F. water, for two minutes. Jars should be covered and labeled if other milk is stored in the same type of container.

After the milk has been properly pasteurized and cooled, precautions must be taken to prevent it becoming contaminated again. Pasteurization will provide a safe milk which in most cases will store for longer periods than raw milk. However, if recontamination occurs, spoilage may develop faster than before pasteurization. Milk used for cooking purposes need not be pasteurized since the bacteria will be destroyed in the cooking process.

Pasteurization of Cream

Cream may be successfully pasteurized by the same processes as applied to milk by merely increasing the holding time. For best results use temperatures of 143° to 145° F. for 45 minutes or 163° to 165° F. for 6 minutes. This longer holding period is necessary because the bac-

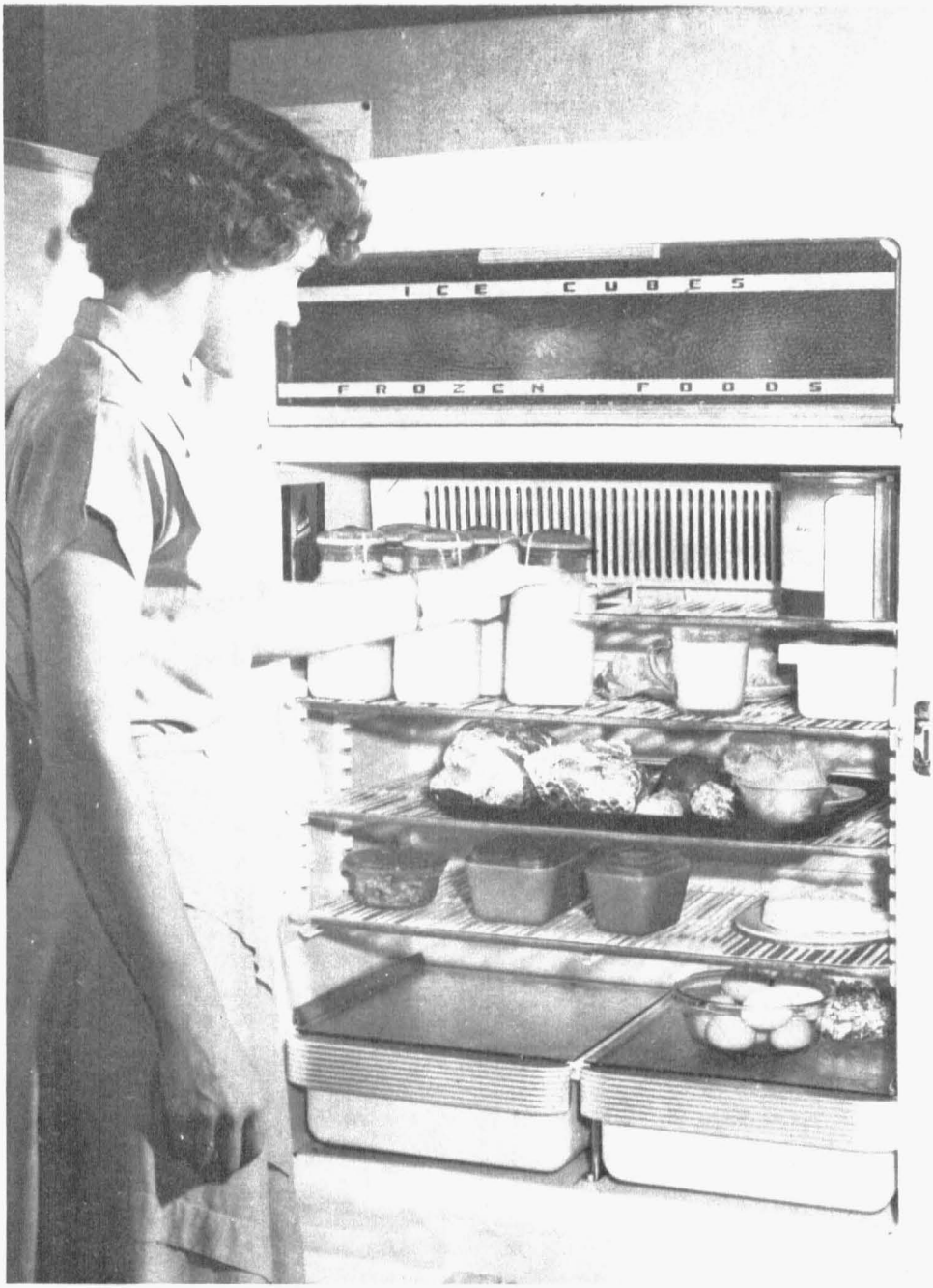

Figure 7.—Proper storage of milk is obtained by placing the jars or bottles as near the refrigeration unit as possible.

teria are harder to kill in higher fat concentrations. Pasteurization of cream is not necessary where the whole milk has been pasteurized before hand skimming. If mechanical separation is to be used, best results will be obtained by pasteurizing the cream after separation, since there is danger of recontamination by the cream separator.

Where butter is made for storage in a frozen food locker, it is most advantageous to pasteurize the cream. Butter made from pasteurized cream stores for longer periods of time without the danger of developing off-flavors. Usually the butter will be of higher quality since it will be made from sweet cream and all the destructive bacteria have been removed by pasteurization. Some of the harmful bacteria have been known to survive 0° F. for 150 days. Therefore, pasteurization of the cream is recommended for butter making to insure a product that is free from bacteria which cause undulant fever and other diseases.

You can prevent serious illness and provide better meals with clean, pasteurized milk safely stored in covered jars or bottles.

tion temperature is being maintained.

By pasteurizing milk in a water bath, the danger of temperature fluctuations is greatly reduced, but as a safety factor an additional 5 to 10 minutes may be added to the holding time with little or no effect on the flavor of the milk.

After pasteurization, the milk may be cooled by connecting a hose to a pressure water supply and circulating the water around the milk container. The use of the agitator during cooling will reduce the time required for cooling. In localities where recording thermometers are required for the home pasteurizers, small recording devices are now available which can be attached to either of the commercial pasteurizers discussed in this bulletin. These devices when added to the pasteurizers give conclusive proof that the milk has been properly pasteurized and reduces the danger of improper operation.

The Waters Conley pasteurizer, Figures 3 and 4, has a capacity of one gallon. The heat is applied by a hot plate located at the outer edge of the milk container, which causes convection currents to be set up in the milk. Heating it slowly in this manner prevents scorching or localized heating. The use of the direct heat is harder to control by thermostat since it causes a wider range of

Figure 3.—The Waters Conley pasteurizer showing complete assembly and setting of temperature control.

Figure 4.—Cooling milk in Waters Conley pasturizer by setting the container in a pan of running water.