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THE INSTALLATION AND EQUIPMENT OF AN EGG-BREAKING PLANT.

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CONTENTS.

PURPOSE OF THE INVESTIGATION.

To assist egg breakers to select effective apparatus and to arrange their plants to handle liquid egg in a sanitary manner and with maximum economy of space and labor is the purpose of this bulletin. The essentials for successful egg breaking are sanitary quarters, excellent lighting, proper ventilation, well-designed apparatus, facilities for quick freezing of liquid egg, and, of course, trained operatives.

The thoroughly modern plant must provide a chill room for the eggs in the shell, a chilled candling room, a refrigerated breaking room in which the egg contents are removed from the shell, a room in which to wash and sterilize apparatus used in breaking, and a sharp freezer for the quick freezing of the liquid egg and its storage. Economy in handling eggs demands that proper space be allotted to the several departments, and that each be so located with reference to the others that unnecessary walking and trucking are avoided. The egg-breaking room and that for cleansing the apparatus are of peculiar importance. On these subjects this bulletin gives conclusions based upon a special study of frozen and dried eggs. It recommends certain improvements in the distribution of space, and discusses new equipment devised to meet special requirements of the industry. To assist the egg breaker who wishes to improve his

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plant, floor plans are offered, and the construction of egg-breaking and sterilizing rooms, as well as that of the various pieces of apparatus, is described in detail.

CONSTRUCTION AND ARRANGEMENT OF ROOMS.

An abundant supply of natural light is the first essential in successful egg breaking. Serious faults may be expected in a product prepared other than in full daylight. For this reason the actual egg breaking should be done, if possible, in a corner room, as opened eggs can not be graded accurately by artificial light. The room where the utensils are washed and sterilized also should have natural lighting. Well-lighted, up-to-date breaking and sterilizing rooms are shown in Plate I.

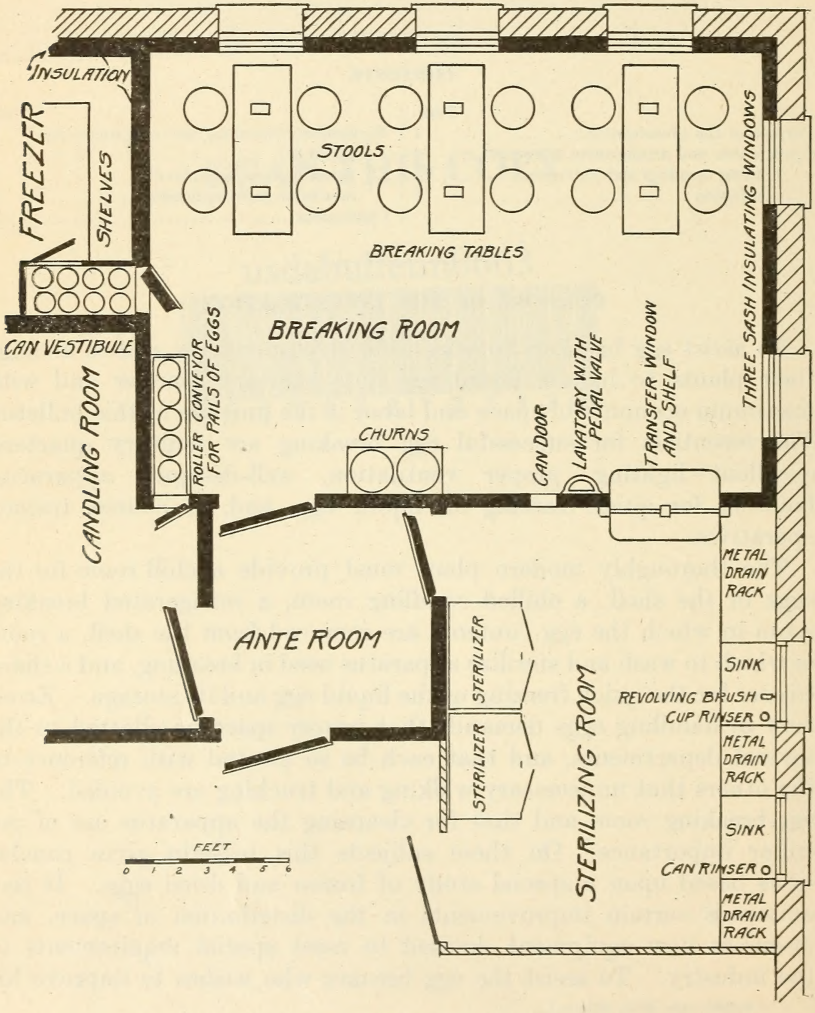

FIG. 1.—Typical layout of breaking and sterilizing rooms.

To avoid unnecessary walking and trucking, the various rooms should be placed as compactly as possible. The plan shown in figure 1, which provides space for 12 breakers, and has a daily capacity up to 120 cases, when whites and yolks are packed separately, or up to 180 cases, when eggs are packed whole, has proven satisfactory. In such an establishment a trained breaker may be expected to open from 12 to 15 cases a day when preparing whole eggs, and from 8 to 10 if whites and yolks are kept separate. The sterilizing room shown accommodates two workers at a time. The vestibule or anteroom has been found a distinct economy, because it saves refrigeration, and at the same time protects the important breaking room from the dust of the more frequented space beyond. Although this plan can not be followed rigidly in all plants, slight modifications doubtless being necessary to meet varying conditions, the ideal arrangement and equipment should suggest many readily effected improvements, and afford a practicable standard by which egg breakers can measure the efficiency of their establishments.

Those who wish larger egg-breaking rooms can increase the overall dimensions, but they should allow 5 feet for the center aisles between the tables and 3 feet between the tables and walls. The unit tables for two girls are 2 feet wide and 3 feet long, although these may be lengthened to seat the number of breakers desired. In any rearrangement of the plan, however, the egg-breaking and sterilizing rooms should not be separated. For convenience the candling room should connect with the breaking room, which can be accomplished by placing it next to or above the breaking room. The freezer, whenever possible, should be located next to the breaking room.

The general requirements of construction of the different rooms are given in Table 1.

TABLE 1.—*General requirements of construction of the rooms of an egg-breaking plant.*

Room.	Cork insulation (or its equivalent) in walls and floor.	Temperatures to be maintained.	Wall finish.	Floor.	Windows.
	Inches.	° *F.*			
Chill room	4	32 to 40	Plastered to smooth finish.	Concrete or wood.	Not required.
Candling room	2	50 to 55	do	do	Do.
Breaking room	2	60 to 65	Plastered and white enameled.	Concrete with drain.	Essential.
Freezer	6	0 to 10	Plastered to smooth finish.	Concrete or wood.	Not required.
Sterilizing room	None.	Room temperature.	Plastered and white enameled.	Concrete with drain.	Essential.

The windows in the breaking room should be treble paned for insulation. Prism glass is frequently used for the outer panes in order to distribute the light more evenly.

The freezer should be equipped with shelves of piping through which brine is circulated for freezing the cans of liquid egg (Pl. II, fig. 1). For accommodating two rows of cans of 30 pounds capacity, these shelves should be about 20 inches wide and about 15 inches apart. Such brine pipe shelves may be used as a "sharp freezer," while the body of the room, which can be maintained at about 10° F., may be used for holding.

TRANSFER OPENINGS AND CONVEYORS.

TRANSFER OF SHELL EGGS.

Trucks ordinarily are used for moving cases of eggs from the receiving floor to the chillroom and thence to the candling room. If the candling room adjoins the breaking room, it is convenient to use a roller conveyor (fig. 1) for transferring the candled eggs in pails to the breaking room. If the space is not suited to a conveyor, the pails of eggs may be pushed by hand on a metal-covered slide through a small door into the breaking room (fig. 2). When the candling room is above or below the breaking room, the pails of shell eggs may be moved by means of a chain conveyor of the type shown in Plate II, figure 2. If the breaking and candling rooms do not adjoin, it is usually less expensive to use trucks for moving the eggs. The taking of trucks into the breaking room should be obviated, however, whenever possible, because the wheels are carriers of dirt and dust.

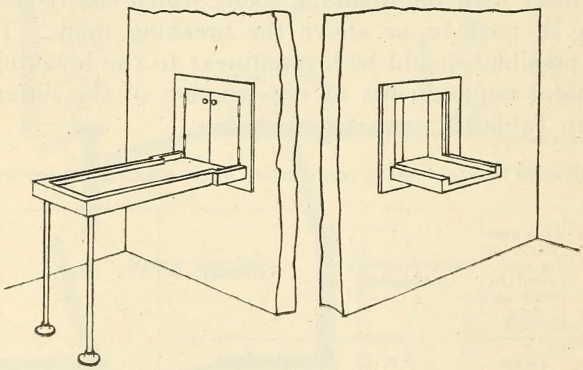

FIG. 2.—Chute for transferring shell eggs.

TRANSFER OF LIQUID EGG.

The prompt transference of the liquid egg from the breaking room to the freezer is important. If the breaking room and freezer adjoin, this may be accomplished very conveniently by means of a small refrigerator door, about 2 feet square and 3 feet from the floor, leading to a vestibule, 2 feet wide by 2 feet high and several feet long, with a door in the side or in the opposite end. The floor

of the vestibule should be covered with galvanized iron or other metal to permit easy cleaning. By this arrangement, the filled cans as soon as weighed may be placed in the can vestibule and later removed from the freezer side, resulting in a saving of refrigeration and labor (fig.1). If the breaking room and freezer are not adjoining, trucks are ordinarily used for moving the cans of liquid egg. If the plant is large enough to justify the expense of installing the chain conveyor, it may be modified by using trays instead of hooks for carrying both the pails of shell eggs and cans of liquid egg from one floor to the next.

TRANSFER OF EQUIPMENT FOR WASHING.

A sliding insulated window (figs. 1 and 3) has been found almost indispensable for transferring small equipment between the breaking and sterilizing rooms. The detail plans for its construction are

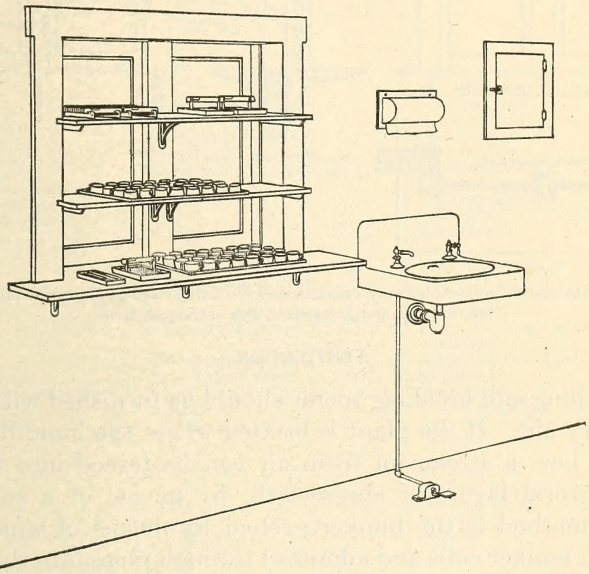

FIG. 3.—Section of wall of breaking room showing transfer window, can door, roll of paper towels, and sink with pedal valve attachment.

given in figure 4. The weight boxes should be built on the sterilizing room side of the wall. On the breaking room side of the window shelves may be erected to hold a supply of small equipment, such as cups, knives, and breaking trays for immediate use by the breakers. Clean utensils are kept on the two upper shelves, and soiled utensils only on the bottom shelf. The equal division of the middle shelf, so that one-half may be removed, makes it possible to deliver larger apparatus, such as cans and pails, to the sterilizing room and vice versa.

With such a window, the breakers may secure individual pieces of equipment as needed, and the operator in the washroom may

remove a tray full of equipment for cleaning with one raising of the window. Large apparatus, such as shell cans, which are cleaned only at night, are carried through the anteroom into the sterilizing room. A small door (fig. 3) may be used for passing sterilized cans into the breaking room.

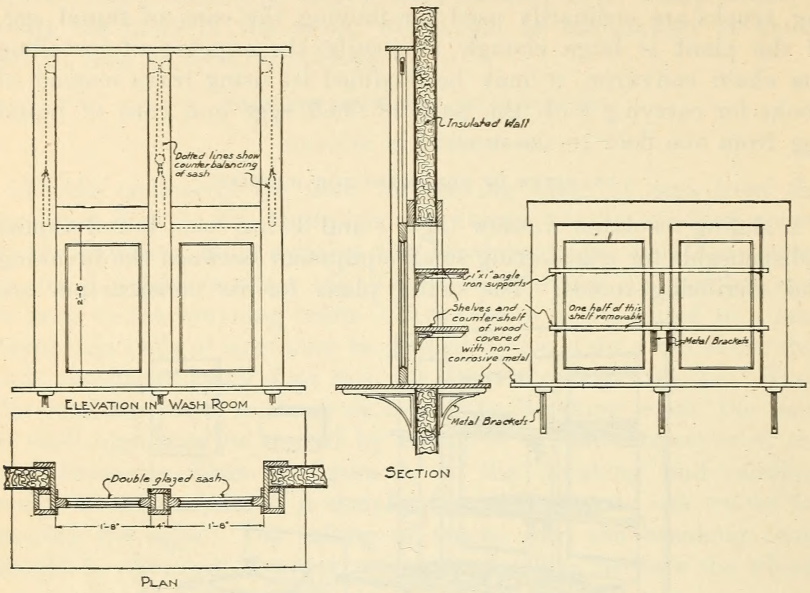

FIG. 4.—Detail of transfer window between breaking and sterilizing rooms. Be sure to build the weight boxes on the sterilizing room side of the partition.

VENTILATION.

The candling and breaking rooms should be furnished with a supply of fresh, dry air. If the plant is located where the humidity is comparatively low, a stream of fresh air can be forced into the rooms through several layers of cheesecloth, by means of a suction fan. The ideal method is the bunker system by means of which the air is cooled on bunker coils and admitted through pipes into the breaking and candling rooms. When this method is the only source of refrigeration for the rooms, care should be taken that the bunker room is of adequate size to provide sufficient refrigeration during the warm summer weather.

In small candling and breaking rooms refrigerated with brine coils, an electric fan is usually sufficient to keep the air fresh, especially if the doors are opened frequently for the admission or transmission of material. The difference in temperatures within and without causes a rapid change of air.

EQUIPMENT OF BREAKING AND STERILIZING ROOMS.

The equipment of an egg-breaking plant, like that of creameries, must be so made that it is readily cleaned, and from materials which will not rust or tarnish easily. Although some of the apparatus required may be purchased ready made on the market, a number of pieces, which have been specially developed for egg-breaking work, at the present time must be made to order.

OUTFIT LIST.

Table 2 gives an outfit list to serve as a guide in ordering equipment for egg-breaking and sterilizing rooms.

TABLE 2.—*Outfit list for egg-breaking plants.*

Item.	Sold or made by—	Number required.	Figure No.	Description.
EQUIPMENT PURCHASABLE ON THE MARKET.				
Breaking room:				Page.
Pails for eggs	Hardware firms	3 to 6 per breaker	5	8
Pails for liquid product	do	1½ per breaker		15
Leaker trays	Special tinning firms	3 per candler	7	8
Separators	Special manufacturers	2 per breaker	Pl. I	11
Glass cups	House-furnishing stores	12 per breaker	8	9
Storage cans for shells	do	See page 14		14
Holders for toilet paper	do	1 per breaker		16
Rack for paper towels	do	1 per room	3	16
Spoons	do	1½ per breaker		10
Stools—				
In wood	do	1 per breaker	15	15
In iron	Hospital-supply firms			
Lavatory with pedal-valve attachment	Plumbing-supply firms	1 per room	3	16
Scales	Scale manufacturers	1 per churn and 1 for whites.		19
Cans	Can manufacturers	According to output	Pl. II	20
Refrigerated churn	Dairy-supply firms	See page 17	Pl. I	17
Dasher for hand churning	do	See page 19		19
Uniform for men	do	3 per worker		19
Waterproof apron	do	1 for each operator in wash room.		19
Sterilizing room:				
Sinks	do	See page 21	21	20
Sterilizers	do	See page 23	24	23
Cup rinser	do	See page 21	22	22
Can rinser	do	See page 22	23	22
Cup-washing machine	do	See page 20	21	20
EQUIPMENT MADE TO ORDER.				
Breaking room:				
False bottoms for pails for shell eggs.	Tinner	1 for each pail for shell eggs.	5	8
Breaking trays	Tinner and machinist	1½ per breaker	9	10
Breaking knives	Machinist	6 per breaker	9	12
Uniforms for women	Seamstress	3 per worker	Pl. I	19
Breaking table	Tinner	1 unit table per 2 breakers.	11	12
Funnels	do	1 per unit table	12	13
Shell cans	do	1 per unit table; few additional.	13	14
Shell tampers—				
Small	do	1 per breaker	14	14
Large	do	1 to 2 per room		14
Cup trays	do	1 per 24 cups	16	15
Knife racks	Machinist or tinner	1 per 36 knives	17	16
Churn without refrigeration	Tinner	See page 17	18, 19, 20	17
Sterilizing room:				
Draining racks for sink	do	See page 21	21	21

BREAKING ROOM EQUIPMENT.

PAIL FOR SHELL EGGS.

(Fig. 5.)

Because cases with their accompanying fillers, flats, and excelsior carry litter and dust, the eggs should be transferred to metal containers before being taken to the breaking room. Ordinary pails

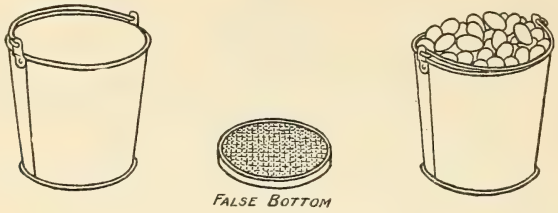

FIG. 5.—Pail for shell eggs.

holding from 12 to 15 dozen eggs have been found very satisfactory for this purpose. When filled they are not too heavy for the girls to lift upon the breaking tables. These tables are made so that two pails may be placed side by side at each end, one for the unopened eggs and the other for the liquid product (fig. 6). By this arrangement each of the two girls working opposite one another has an individual supply of eggs at her right, so that both can work from right to left. When one large container is used by two operators, it is necessary for one of them to pick up each egg with her left hand and pass it to the right hand for cracking on the knife. This extra movement may be avoided by the use of individual pails for holding the breaking stock. To prevent the lower layers of eggs from becoming soiled with the leakage from damaged eggs, a false bottom is placed in each pail.

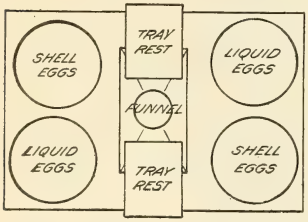

FIG. 6.—Diagram showing position of utensils on breaking table.

Satisfactory pails may be made of galvanized iron 0.0159 [1] inch thick with a wire 0.1144 [2] inch in diameter in the top, and with a heavy iron bail riveted to the sides. Tinplated iron or copper pails may be obtained if desired. Pails holding from 12 to 15 quarts are ordinarily used. The false bottom is made usually of galvanized iron cloth of $\frac{3}{8}$-inch mesh, soldered neatly to a rim of galvanized iron 0.0159 inch thick. It is $\frac{3}{4}$ inch high, with a diameter $\frac{1}{8}$ inch less than the diameter of the pail.

NESTING LEAKER TRAY.

(Fig. 7.)

Leaking eggs which are sufficiently well preserved to be used for breaking stock should be sent to the breaking room in trays. If made

[1] Equivalent to No. 26 Brown & Sharpe gauge. [2] Equivalent to No. 9 Brown & Sharpe gauge.

to nest much time and space in the handling will be saved. The eggs are placed by the candlers in the holes, with the leaking end at the top.[1]

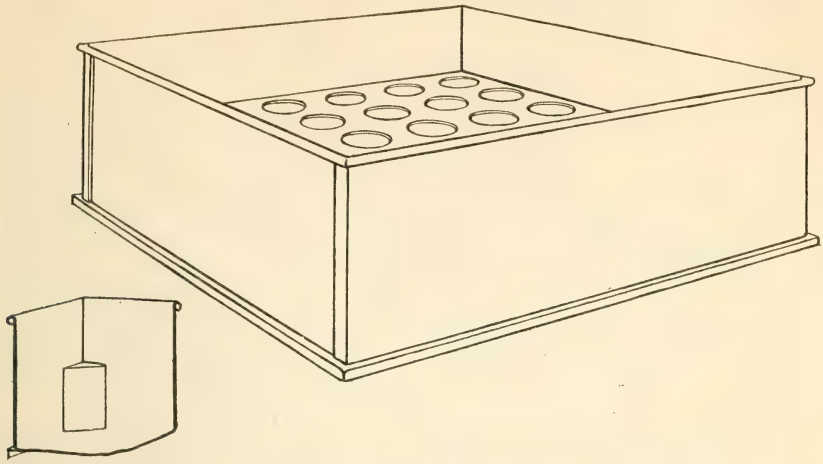

FIG. 7.—A nesting tray for leaking eggs (capacity, 3 dozen eggs).

Specifications.—The tray, which is usually made to hold three dozen eggs, consists of a pan and a perforated plate for holding the eggs. The pan is made of galvanized iron 0.0159 inch thick, and is 12¼ inches square and 3½ inches high, with the rim rolled on wire 0.1144 inch in diameter. The plate for holding the eggs, made of galvanized iron 0.0201 inch thick,[2] has 36 perforations, 1⅜ inches in diameter, with centers 2 inches apart and ⅜ inch from the edge. The plate is supported upon triangular posts of metal or solder 1½ inches high and 1½ inches on the face of the sides and the top. A flange ¼ inch in width is soldered to the bottom, so that it fits over the top of another tray for nesting.

GLASS GRADING CUP.

(Fig. 8.)

Glass cups should always be used for the grading of eggs as they are broken from the shell. Certain kinds of bad eggs, such as eggs with green whites, frequently escape detection when opened into nontransparent cups. The cup should have heavy walls and be made of smooth, clear white glass, which will stand repeated sterilization with steam, and should hold about one-half a gill. A cup of this size will hold two eggs conveniently. More than two eggs should not be broken into the first container for grading. Some plants break only one egg to the cup before emptying, so that all loss of good eggs from contamination with bad eggs is avoided. A plain

[1] The details of the handling and grading of leaking eggs are discussed in U. S. Dept. Agr. Bul. 224, pp. 9 to 12, inclusive.

[2] Equivalent to No. 24 Brown & Sharpe gauge.

glass sherbet cup with a large handle, which may be purchased from house-furnishing stores, has proven very satisfactory for this purpose.

FIG. 8.—Glass grading cup.

The type of support for the cups in some breaking trays requires a cup with a "tumbler bottom," the walls of which are not curved toward the base as in a sherbet cup. Such cups must be made on a special mold. They have not proven satisfactory because the glass furnished in filling these small private orders is so brittle that it does not withstand the heat of sterilization. For this reason it is best to choose a breaking tray on which the glass cups already available on the market may be used.

SPOONS.

When breaking eggs, spoons are needed to remove pieces of shell and portions of yolk from white when separating. Cheap spoons of aluminum or tin may be used. Nickel-plated bouillon spoons have also been found very convenient for this purpose.

BREAKING TRAY.

(Fig. 9.)

The breaking tray should measure 9 by 10 by $1\frac{1}{2}$ inches (inside measurements), and be made of tinned copper 0.0188 inch thick,[1] or monel metal 0.0201 inch thick. As monel metal does not rust or tarnish, it is much to be preferred for this piece of equipment. For firmness, the edges are turned over wire 0.1144 inch in diameter which will not rust. The corners are full soldered and smoothed.

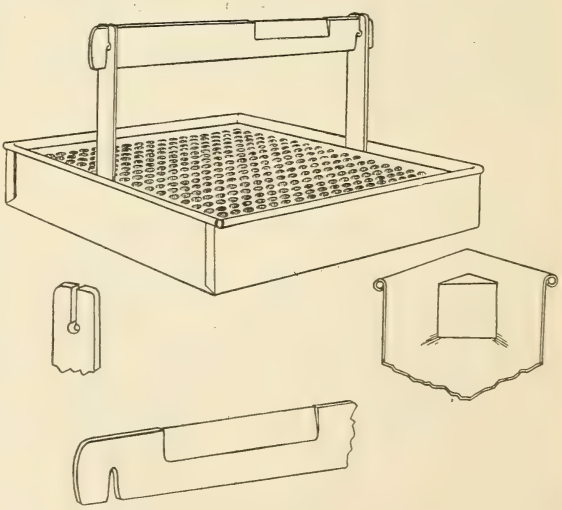

FIG. 9.—Egg-breaking tray and knife.

The standards for holding the knife are $\frac{3}{4}$ by $\frac{3}{32}$ by $4\frac{3}{8}$ inches, extending $3\frac{5}{8}$ inches above the tray, and both soldered and riveted to the short sides. The slots in the standard

[1] Equivalent to 14 ounces per square foot.

are $\frac{5}{8}$ inch deep by $\frac{3}{32}$ inch wide. The knife must be easily removable from the slots and at the same time rest firmly; otherwise the bowl of the separator for whites and yolks will not rest in a level position when sliding on the breaking knife. The separator ordinarily used is patented and can be purchased on the market.

To keep the bottom of the breaking cups from coming in contact with the drip from the eggs, the cups are held on an open support. The following are some of the types of supports used:

1. Galvanized-iron wire cloth of $\frac{1}{2}$-inch mesh, with edges turned neatly over galvanized-iron wire 0.1144 inch in diameter. This rack is supported at the corners of the tray by posts of solder or metal (fig. 9). To keep the cups from slipping, the rack should rest $\frac{3}{8}$ inch below the top of the tray. This rack is easily made, but is not as easy to clean as Types 2 and 3. Nor does it carry off the drip as effectively as Type 3.

2. Monel metal 0.0201 inch thick or tinned copper plate 0.0188 inch thick, perforated with holes $\frac{3}{8}$ inch in diameter, separated by a wall $\frac{1}{8}$ inch wide, with outside row of holes $\frac{1}{2}$ inch from the edge (fig. 9). This is supported upon posts at the corner of the tray just like the wire rack already described. The drip does not drain from this support as well as from Type 2. It is easily cleaned.

3. An aluminum rack consisting of parallel rods $\frac{1}{4}$ inch in diameter, riveted $\frac{1}{2}$ inch apart to flat end pieces $\frac{1}{2}$ inch wide by $\frac{3}{16}$ inch thick. This rack, made to fit loosely in the tray, rests like the others on supports in the corners of the tray. This support is very satisfactory, because it keeps the bottom of the cups free from drip and is easy to clean.

Other efficient devices for supporting the cups above the bottom of the tray have been developed by individual firms. As some of these are patented and others are not easily made with the ordinary machinery, they will not be described here.

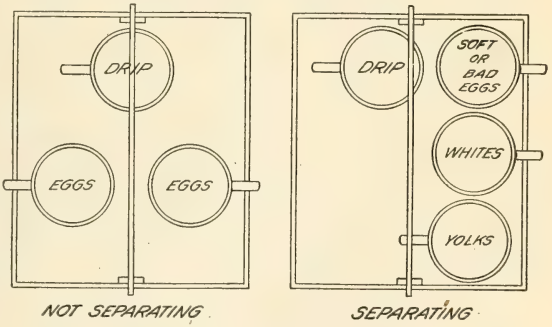

FIG. 10.—Diagram showing position of cups on breaking tray.

The position of the cups on the tray is shown in figure 10. If desired, the standards may be placed $2\frac{1}{2}$ inches from the corners of the tray, in which case the two grading cups are placed on the right-hand side of the knife, whether separating white and yolk or not. The cup, emptied with the left hand, is removed from the tray by pulling under the knife.

BREAKING KNIFE.

(Fig. 9.)

The breaking knife is constructed to fit the tray just described. It is $11\frac{3}{8}$ inches long, 1 inch wide, and $\frac{1}{16}$ inch thick. The slots on the lower edge are $\frac{9}{16}$ inch deep and are made to fit into the slots of the standard. The cutting edge of the knife is $2\frac{3}{8}$ inches long and $\frac{3}{4}$ inch from the center of the slot. The only satisfactory metals for breaking knives are monel metal and tinned brass, as cheaper metals invariably rust and tarnish, so that the expense of scouring and retinning soon equals the original cost of monel metal or brass.

BREAKING TABLE.

(Fig. 11.)

Tables are made for two, four, six, and sometimes eight operators. The size of the table depends upon the space in which it is to be

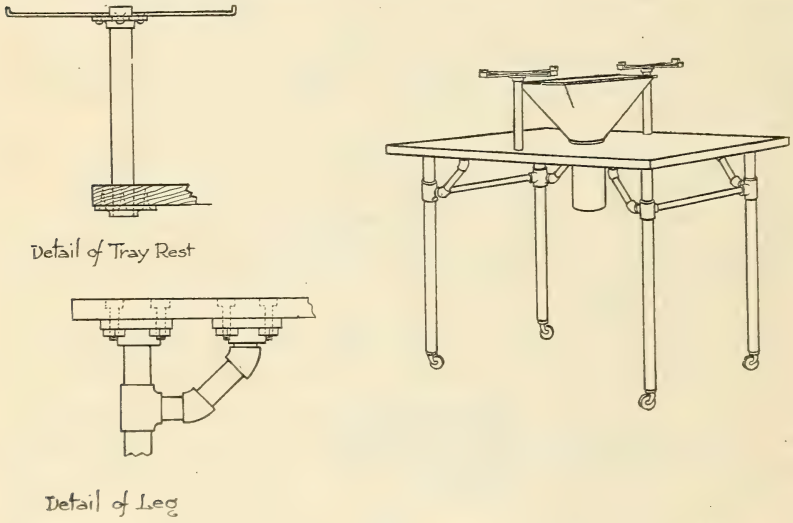

FIG. 11.—Breaking table.

used. Generally speaking, tables seating from two to four girls are most convenient, because the pails of shell eggs, liquid egg, and shells may be removed by helpers at the ends of the tables without interrupting the work of the breakers. A table for two girls, which may be lengthened according to the capacity desired, using the distance from center to center of the legs as a unit, may be made as follows:

Specifications.—The top of the table is 36 inches long and 24 inches wide, with a central opening $5\frac{1}{2}$ inches in diameter to receive the funnel. The kind of top depends upon the materials

available and individual preferences. It may be made of $\frac{7}{8}$-inch pine boards battened on the under side and covered neatly with zinc 0.0201 inch thick,[1] tin or nickel-plated copper 0.0188 inch thick, or monel metal 0.0201 inch thick. The lower side of the table may be covered with the metal also, if desired. Boiler iron $\frac{1}{4}$ inch thick, which may be painted with white enamel, or iron on which the enamel has been applied by a baking process, is also used for table tops without a foundation of wood. The enamel in each case chips, so that it must be renewed every season. Sometimes heavy galvanized iron is riveted at the edges to an angle iron frame and used without the wood support. Occasionally white glass, cemented into an angle iron frame, is used for a table top. The sides of the central opening for the funnels should, in this case, be lined with metal to prevent chipping.

The legs are made of 1-inch and the braces and crosspieces of $\frac{3}{4}$-inch galvanized iron pipes (inside measurements). They are fastened to the table by means of flanges, using square-headed bolts countersunk in the wood before the metal covering is laid. In tops without wood, flat-headed bolts countersunk in the metal are used. The center of the top of each leg should be 3 inches away from the edge of the table. Angle iron legs bolted at the corners to the angle iron frames are used for tables having glass tops. The legs should be furnished with a roller or ball castor 1 inch in diameter. Tables made for more than four girls require central supporting legs which should be braced on both sides and connected with crosspieces.

The tray rest is mounted on a galvanized iron pipe or nickel-plated brass tubing 8 inches long and $\frac{3}{4}$ inch in diameter (outside measurements), which passes through the table into a pipe flange screwed to the under side of the table. The metal covering of the table is soldered to the pipe. The tray rest may be made of two pieces of $\frac{3}{16}$-inch by 1-inch bar iron welded together at right angles at the center, with the ends turned up $\frac{1}{4}$ inch. The two arms are made to receive the breaking tray, the distance between the turned-up ends being 10 inches on the arm parallel with the short side of the table and 9 inches on the other arm. Countersunk flat rivets are used to fasten the arms to a pipe flange connected at the top of the pipe support. If preferred, the tray rest may be made of metal cut in the shape of a diamond, with the corners turned up to hold the breaking tray in position. Circular rests are also used.

SHELL FUNNEL.

(Figs. 11 and 12.)

The shell funnel fits loosely in an opening in the center of the breaking table, in front of the rests for holding the breaking trays.

[1] Equivalent to No. 10 sheet zinc gauge.

The shells are dropped by the breaker through the funnel into the shell can beneath.

Specifications.—The funnel may be made of tinned copper 0.0188 inch thick, zinc, monel metal, or galvanized iron 0.0201 inch thick. The top of the funnel is 8½ inches wide and 14¾ inches long. The distance from the top of the spout to the top of the funnel is 6 inches. The spout is 7 inches long and 5⅜ inches in diameter. Both the top and bottom of the funnel should be rolled on wire 0.1144 inch in diameter.

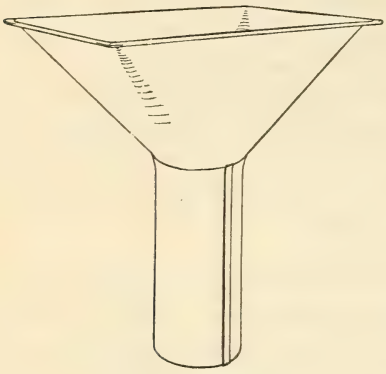

FIG. 12.—Shell funnel.

SHELL CAN.

(Fig. 13.)

It is advisable to make the shell can as large as the dimensions of the table will permit, in order to lessen the frequency of the removal of shells. When there is but little space between the top of the can and the lower side of the top of the table, the scattering of shells on the floor is also prevented.

Specifications.—The shell can is usually made of galvanized iron, and need not be corrugated horizontally for stiffness unless under 0.0159 inch in thickness. Both the top and the bottom should be turned over wire 0.162 inch thick. The diameter of the can is 14 inches; the height 23½ inches, ½ inch less than the distance from the floor to the lower side of the table top. Ordinary garbage cans may be purchased for the temporary storage of shells emptied from the cans from the breaking room, the number required depending upon the frequency of emptying.

FIG. 13.—Shell can.

SHELL TAMPER.

(Fig. 14.)

FIG. 14.—Shell tamper.

A tamper is always needed for pounding down the shells emptied into the storage cans, and may be used to advantage in the shell cans at the table. When used at the table, a tamper is kept in each shell can with the handle projecting through the funnel.

Specifications.—The total length is 34 inches. An iron bar ¾ inch in diameter constitutes the handle. If the tamper is to be used in the storage cans, the cone may be made 7¼ inches high and 5½ inches in diameter at the base, or, if used in the shell cans at the table, 6 inches high and 5

inches in diameter. If desired, the iron bar may be made long enough to have a handle, which is 5 inches wide and $5\frac{3}{4}$ inches long, bent on one end and similar to that shown in figure 14. The cone is made of galvanized iron 0.0201 inch thick, or tinned copper 0.0188 inch thick. The cone is filled with sand, cement, or melted lead, the handle inserted, and the top of the cone smooth soldered to the handle.

STOOL.

(Fig. 15.)

Comfortable stools adjustable in height should be provided for the breakers. These may be purchased in wood from house-furnishing stores, or in steel covered with white enamel from hospital-supply firms. The white-enamel stools, although more expensive, are more sanitary. If purchased in wood they should be ordered unvarnished, so that they may be finished with white enamel.

Specifications.—The stool used with the egg-breaking table should be adjustable from $16\frac{1}{2}$ inches to $23\frac{1}{2}$ inches in height. The diameter of the seat and the distance between the feet at the base should be about 13 inches.

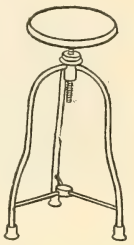

FIG. 15.—Stool with adjustable seat.

PAIL FOR LIQUID PRODUCT.

In many egg-breaking plants new sterilized cans are used on the breaking tables to receive the liquid product. After one-half day's service they are cleaned and used as final containers for the liquid egg, new cans taking their places at the tables. In some houses small pails with handles are used, because they are more convenient to remove from the tables and because less spoilage occurs if a breaker by accident fails to detect a musty egg.

Specifications.—The pail should be made of tinned iron or copper 0.0159 inch thick, and should have a heavy iron bail riveted to the sides. All seams should be full soldered to permit easy cleaning. Pails holding 5 to 10 quarts are ordinarily used.

CUP TRAY.

(Fig. 16.)

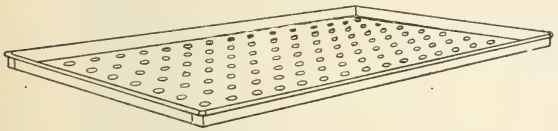

FIG. 16.—Cup tray.

While cups are draining and being sterilized they may be conveniently handled on trays. It is advisable that the bottoms of the trays be perforated so that the water may drain off. The little rim prevents breakage.

Specifications.—Cup trays are usually made of galvanized iron 0.0159 inch thick. Monel metal is sometimes used. The size of the

tray is 1 foot wide, 2 feet long, with sides ½ inch high, turned over wire 0.1144 inch in diameter. The bottom is perforated with ½-inch holes with centers ½ inch apart.

KNIFE RACK.

(Fig. 17.)

Knife racks hold the supply of breaking knives while draining, during sterilization, and before use by the breakers. Racks with a capacity of 18 knives have been found most convenient.

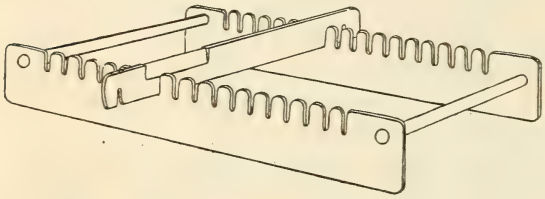

FIG. 17.—Knife rack.

Specifications.—The knife rack is made of two pieces of metal, 1¾ inches wide and 11½ inches long, held together by an iron rod ⅜ inch in diameter and 7¼ inches long, riveted at the ends. The slots for the knives are ⅝ inch deep and ½ inch apart. The notched pieces may be made of galvanized iron 0.0508 inch thick,[1] cold rolled steel $\frac{1}{16}$ inch thick, or monel metal 0.0907 inch thick.

LAVATORY.

(Fig. 3.)

A lavatory with hot and cold water mixer, controlled by knee or pedal valve, should be installed near the transfer window, so that when a breaker finds a bad egg and has taken the soiled utensils to the window, she can wash her hands before obtaining clean equipment. The knee or pedal valve attachment obviates the necessity of touching faucets with soiled hands. A rack for paper towels should be located near the lavatory. The relative position of transfer window, lavatory, can door, and rack for towels is shown in figure 3. The lavatory with knee or pedal attachment may be purchased from firms selling plumbing supplies.

HOLDERS FOR TOILET PAPER.

Toilet paper is used for drying fingers during breaking. The rectangular boxes ordinarily used for holding packets of sheet toilet paper may be clamped to the standard supporting the tray rest of the breaking table. This arrangement is very satisfactory, as it brings the paper within easy reach of the breaker and keeps it from becoming soiled.

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[1] Equivalent to No. 16 Brown & Sharpe gauge.

FIG. 1.—WELL-LIGHTED UP-TO-DATE EGG-BREAKING ROOM.

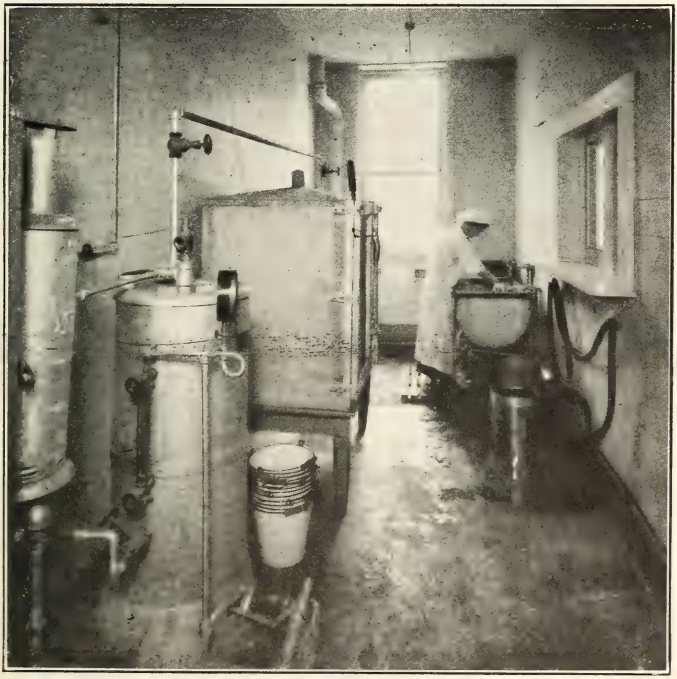

FIG. 2.—WELL-LIGHTED UP-TO-DATE STERILIZING ROOM

FIG. 1.—FREEZER FOR CANNED EGGS.

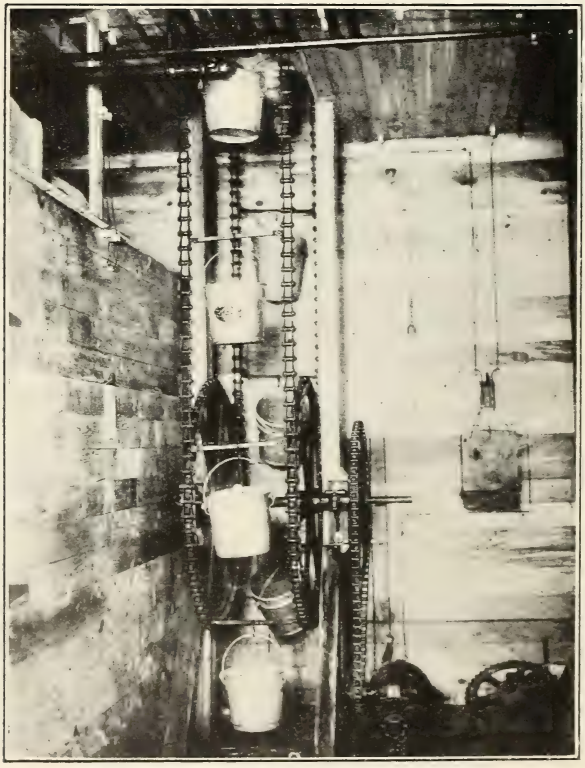

FIG. 2.—CHAIN CONVEYOR FOR SHELL EGGS.

CHURNS.

The churn in which the yolks are broken and mixed with the whites preparatory to freezing is one of the most important pieces of apparatus in the breaking room. Much money has been spent in building different kinds of churns, and the results often have been unsatisfactory. At present two types of churns are in use: One chills the eggs to nearly freezing during the churning process, and the other simply mixes the egg. In plants with ample refrigeration for chilling the eggs before they are broken and for freezing the liquid egg promptly it is not necessary that the eggs be cooled during churning. If these facilities are not at hand, however, it is most important that the liquid egg be cooled thoroughly before leaving the breaking room. Holding the egg in a warm condition, even for a few hours, results in rapid multiplication of bacteria.

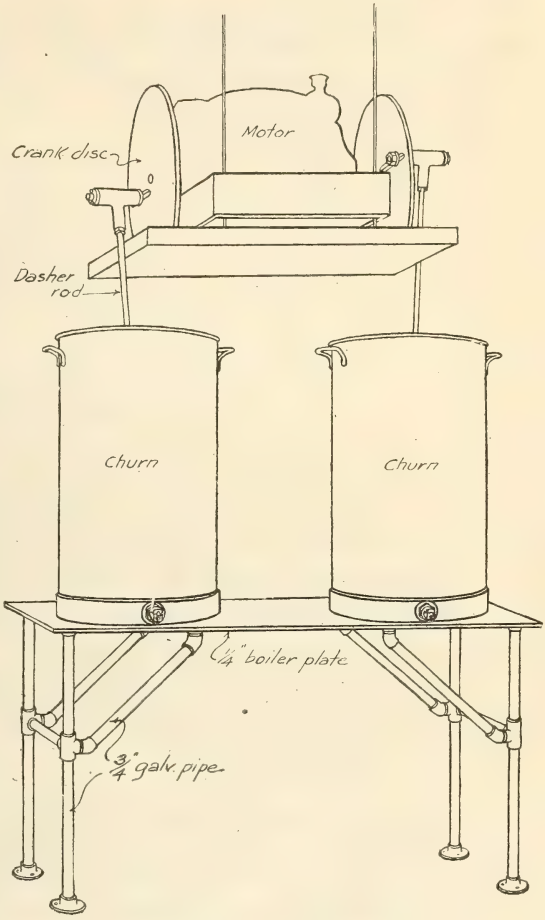

FIG. 18.—Churns in position for operation.

Refrigerated churn.—The type of refrigerated churn (Plate 1) which is being used more and more widely is a modified pasteurizing machine that may be purchased from dairy supply houses. This machine has a rectangular insulated tank in which is suspended a motor-driven paddle consisting of a coil through which brine is circulated to chill the liquid egg. The yolks of the egg must be broken before being put into the tank. This may conveniently be done by passing them through a motor-driven, sanitary pump attachment, which may be purchased from firms selling dairy supplies. This

machine has a sanitary faucet, through which the egg is drawn into the cans. It is simple in construction and easily cleaned. A small opening in the top allows the insertion of a hose for steaming. In other refrigerated churns an upright cylindrical tank is surrounded by brine coils inclosed by an insulated wall. A spiral dasher driven by a motor rotates in the machine and churns the eggs. The eggs usually are passed through a sieve into the machine. This churn must be made to order.

Churns without refrigeration.—This churn (figs. 18, 19, and 20) consists of a metal barrel and a dasher. The dasher is connected with the motor to a point off center of a crank disc, so that the same rotary motion is obtained as when the eggs are churned by hand. The churn is governed by automatic stops, which insures churning of each lot of eggs for a uniform length of time. Two churns commonly are operated by the same motor, a convenient arrangement, for one may be used for whole eggs and the other for yolks if desired.

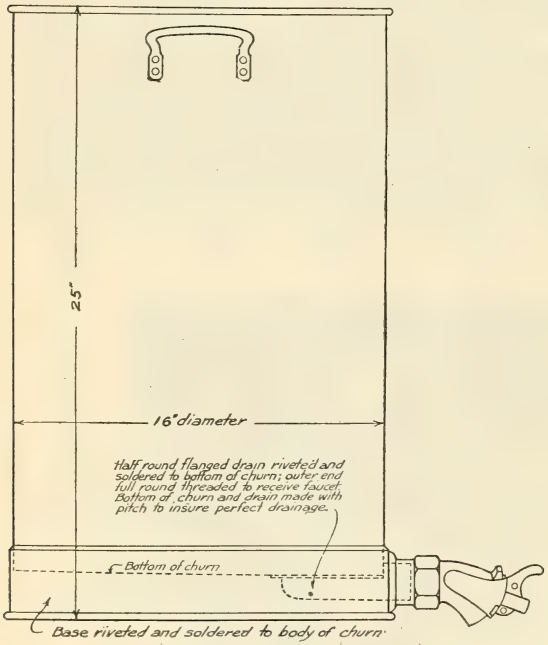

FIG. 19.—Churn barrel.

The barrels are made of monel metal 0.0320 inch thick,[1] or tinned or nickeled copper 0.0322 inch thick.[2] They are 14 inches in diameter and 23 inches high, with an additional rim or base 2 inches high at the bottom. The flange for draining is riveted and soldered to the bottom of the barrel, which is made with a pitch to the outlet, and extends through the base to receive a sliding gate porcelain-lined valve. This arrangement permits the draining of the contents of the barrel without tilting. The dasher (fig. 20) is made of monel metal or copper 0.1285 inch thick,[3] covered with nickel or tin, and is 1 inch less in diameter than the diameter of the barrel. The dasher may be equipped with one or two blades as desired. This machine

[1] Equivalent to No. 20 Brown & Sharpe gauge.
[2] Equivalent to 24 ounces per square foot.
[3] Equivalent to No. 8 Brown & Sharpe gauge.

has great advantage over the other churns described, because the parts are so light that they readily may be taken to the sterilizing room for washing and steaming.

A milk stirrer or a wire potato masher with the wooden handle removed and a wire handle soldered to the stem may be used for churning by hand small quantities of liquid egg in a can.

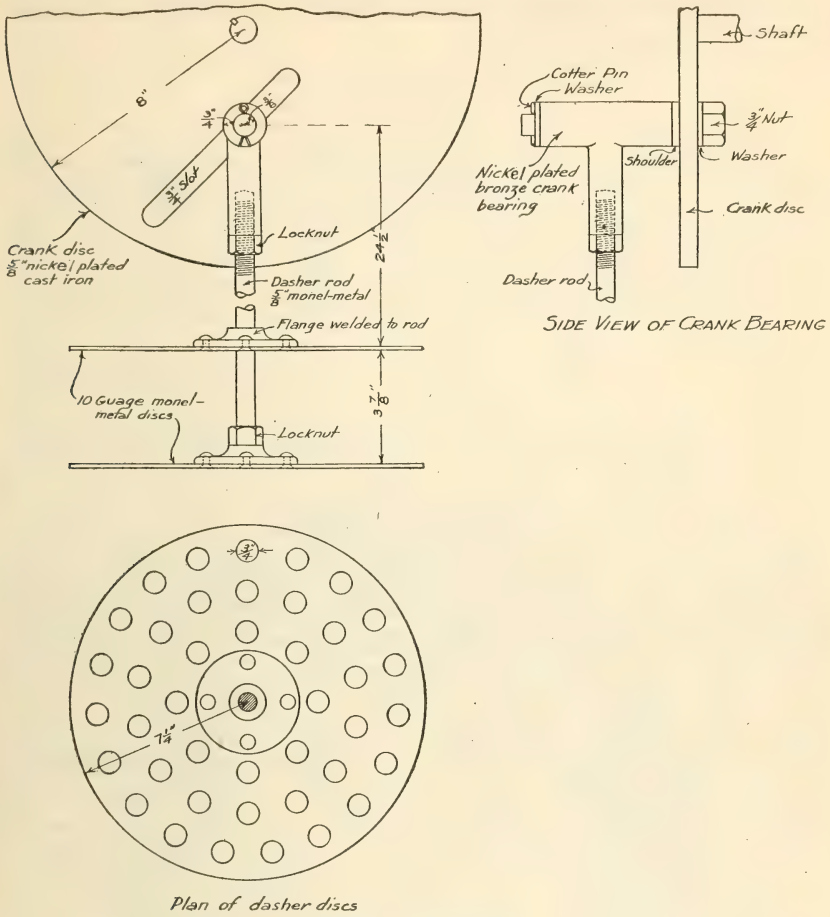

FIG. 20.—Detail of dasher.

SCALES.

Scales with a capacity of 100 pounds by 1 to 2 ounces are suitable for weighing cans of liquid egg. Platform scales with a double beam, or trip scales with a side beam, ordinarily are employed.

UNIFORMS.

(Pl. I.)

Three sets of uniforms should be provided for each worker in the breaking room. The aprons and caps for the women may be made

of heavy muslin or ducking from patterns purchased at dry goods stores. The aprons should be made with long sleeves, and cover the entire clothing of the worker. The operator in the sterilizing room should have a waterproof apron covering the white uniform. The men working in the breaking room should wear white caps, coats, and overalls made of ducking or other suitable material. These may be purchased from firms selling creamery supplies, and in some cases from dry goods stores.

CANS FOR FROZEN EGG.

(Pl. II, fig. 1.)

It is customary to sell frozen egg in cans with a capacity of 30 pounds. Sometimes smaller cans with a capacity of 20, 10, or 5 pounds are used, particularly for whites. The cans are usually made of 90-pound tin, and have slip covers. They may be obtained from practically any manufacturer of cans. The dimensions of the cans are as follows:

	30-pound can.	20-pound can.	10-pound can.	5-pound can.
	Inches.	*Inches.*	*Inches.*	*Inches.*
Diameter	$9\frac{3}{4}$	$9\frac{3}{4}$	$7\frac{1}{4}$	$5\frac{7}{8}$
Height	$12\frac{3}{8}$	8	$7\frac{1}{4}$	$6\frac{3}{8}$

STERILIZING ROOM EQUIPMENT.

The proper equipping of the sterilizing room is very important in the preparation of a clean product. The equipment should include sinks with draining racks, mechanical rinsers, and steam sterilizers. The arrangement of apparatus shown in figure 1 has been found very convenient for cleaning a large number of utensils in a short space of time. The sinks are placed next to the windows where they receive the best light. The trays of soiled utensils from the bottom shelf of the transfer window are placed on the nearest draining rack, washed and rinsed in the adjoining sink, collected on the draining rack to the right, sterilized, then returned to the upper shelves of the window. The other sink is used for cleaning larger utensils, particularly cans. The sterilizers ordinarily are placed against the wall opposite the sinks.

WASHING FACILITIES.

Sinks.—The sinks (fig. 21) should be connected with trapped ventilated drains, and should be supplied with hot and cold water. The sink ordinarily used has a round bottom with a steel body, wrought iron legs and supports, and angle iron around the top. It is entirely galvanized. It is 2 feet wide, 16 inches deep, 33 inches high, and may be purchased in lengths varying from 3 to 6 feet. Two sinks, 3 feet long, separated by a draining rack (fig. 1), are more con-

venient than one large sink. In small plants one sink 3 or 4 feet long, equipped with draining racks and a rinser, will be sufficient. The legs of the sink should be spliced or set upon blocks, so that the top of the sink is 36 inches from the floor, because the sinks usually sold are too low for comfortable work.

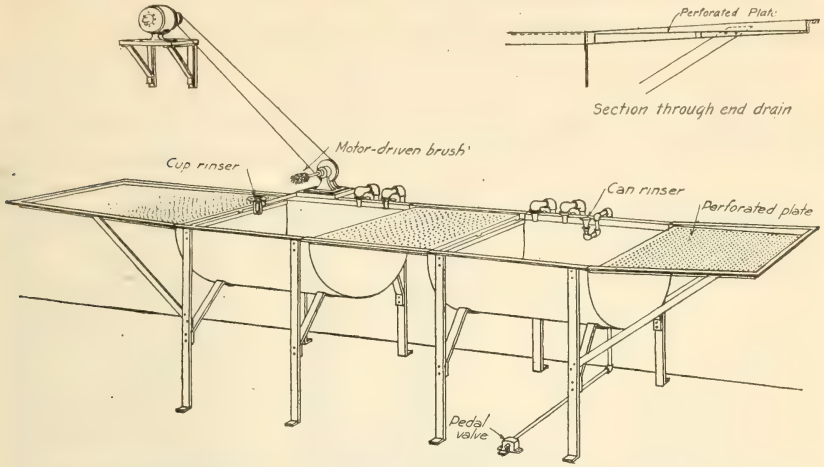

FIG. 21.—Sinks in sterilizing room, showing arrangement of cup rinser, motor-driven brush, drains, and can rinser with pedal valve attachment.

Draining rack.—The draining racks (fig. 21) are made by riveting and bracing a 1½-inch angle iron frame to the ends of the sinks and covering neatly with galvanized iron 0.0201 inch thick. The outer drains are made with a slight pitch, so that the water from the wet utensils will run back into the sink. The length of the drains depends

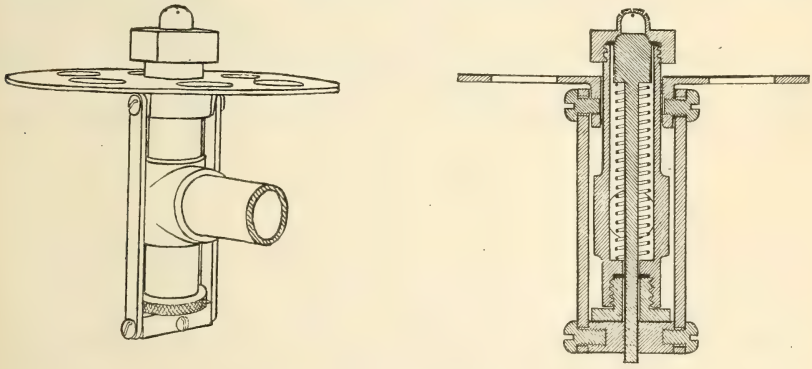

FIG. 22.—Cup rinser (perspective and cross section.)

upon the size of the sterilizing room. It is convenient to have the draining rack for the sink next to the transfer window 5 feet long, and the others 2 feet long. On each drain rests a galvanized iron plate 0.0201 inch thick, with perforations ¼ inch in diameter and with centers 1 inch apart. It is supported above the drain in a

level position by means of legs soldered to the drain itself or by means of solder or metal posts in the corners of the draining rack. This perforated plate permits the drippings from the utensils to drain in the sink.

Rinsers.—It is important that after washing the utensils they be rinsed in clean water before sterilization. This can best be accomplished by mechanical rinsers (figs. 21, 22, and 23).

Rinsers of the percussion valve type, obtainable from plumbing supply firms, may be used for rinsing cups (fig. 22). A nozzle threaded to attach to a water pipe and operated by a pedal valve located on the floor may be used for rinsing large utensils (fig. 23). Bottle rinsers, which may be purchased from bottle machinery firms, are also used, and are much less expensive than the percussion valve type. By the attachment of a perforated metal plate about 1 foot in diameter, this rinser may be used for both cups and larger utensils. Each sink should be equipped with a rinser.

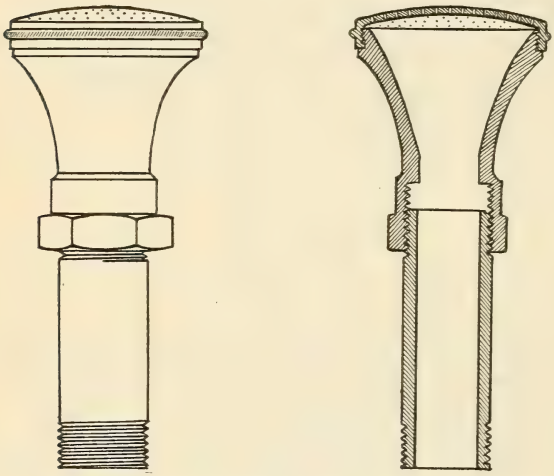

FIG. 23.—Nozzle for rinsing pails and cans (in perspective and cross section).

In plants with eight breakers or more, it is economical to install a mechanically rotating brush for washing cups. Bottle-washing machines, driven by a quarter horsepower motor, may be purchased for this purpose from dairy-supply firms.

STEAM STERILIZER.

(Fig. 24.)

The steam sterilizer is an essential part of the equipment of a sterilizing room. Bottle sterilizers suitable for the purpose may be purchased from firms selling dairy supplies. It is more economical of steam and time for plants with more than eight breakers to have two small sterilizers rather than one large one, because one may be operated while the other is being filled and less steam is used when small lots of equipment are sterilized. In smaller plants one sterilizer will be sufficient. In plants where one or two girls are breaking, or in houses where only leaking eggs are opened, a small sterilizer used on a gas stove (fig. 25) may be substituted. This sterilizer, which

is inexpensive and which may be made by any tinner, is described in detail by Ayers and Taylor.[1]

Specifications.—Sterilizers usually are made of galvanized iron or steel well braced. They are made approximately 3 feet high, from 2½ to 3 feet deep, and 4 to 5 feet wide. The doors should have self-tightening locks, and be fitted with rubber gasket or cork. The steam is distributed through the sterilizer by means of a perforated

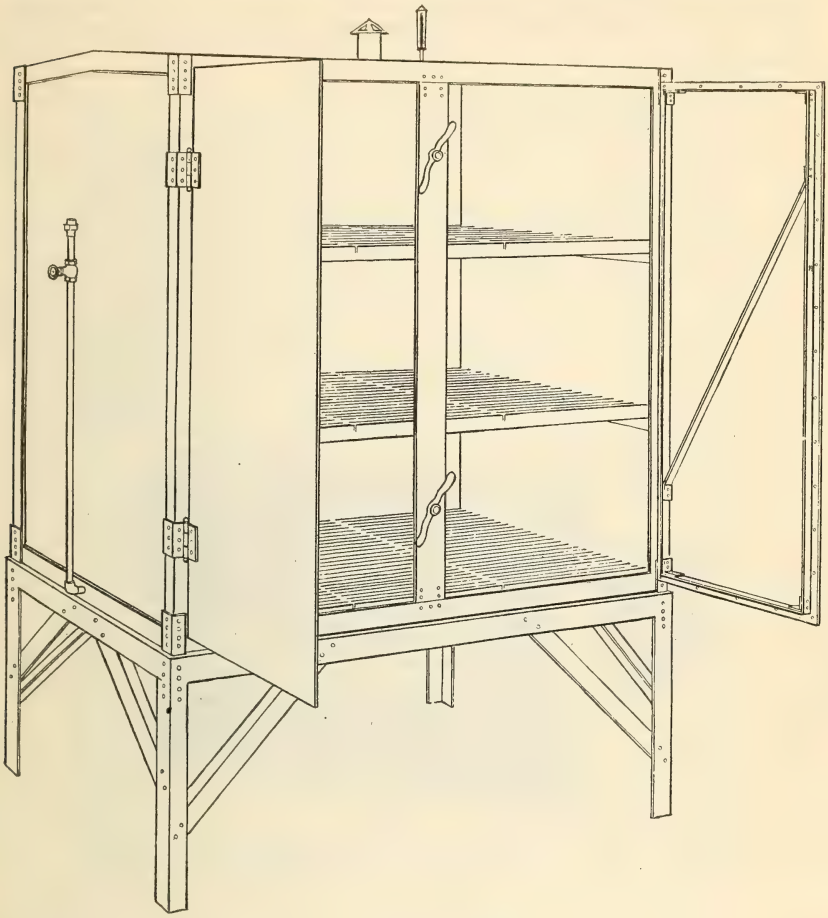

FIG. 24.—Steam sterilizer.

pipe placed near the bottom. The floor of the sterilizers should be pitched toward the center, and should be connected to a drain protected by a steam trap, and, when practicable, there should be a flue provided with a valve or damper. Each sterilizer should be equipped with a thermometer and have removable shelves. The sterilizers should rest on bases about 2 feet high, made of pipe or

[1] U. S. Dept. Agr., Farmers' Bul. 748, "A Simple Steam Sterilizer for Farm Dairy Utensils."

angle iron. The pressure of steam should be sufficient to maintain temperatures of 210° to 212° F. If there is not an available supply of steam, a boiler heated with coal or gas should be installed (Plate I). Gas boilers have been found very convenient for this purpose.

CONCLUSIONS.

An egg-breaking plant should have an insulated refrigerated chillroom, candling room, freezer, and breaking room. Adjoining the breaking room should be a room for the washing and sterilizing of utensils.

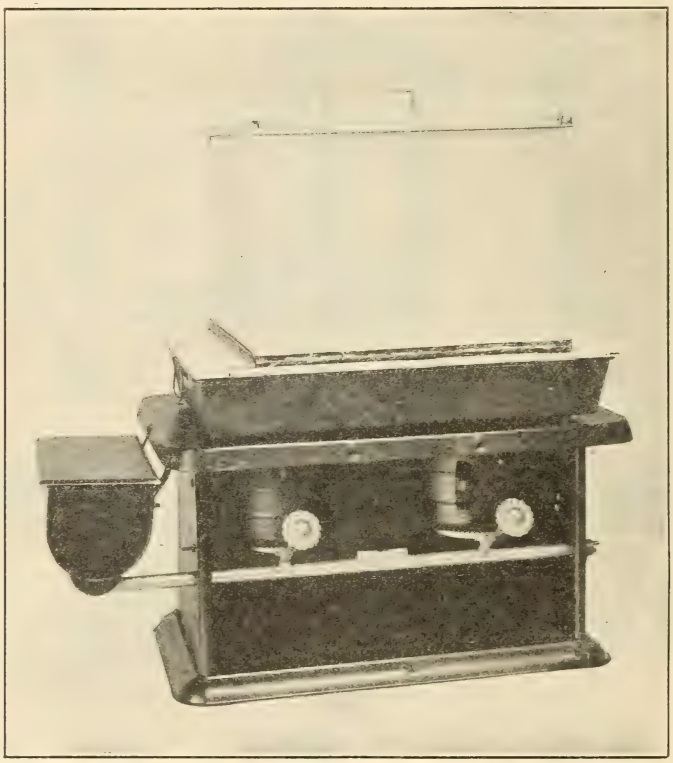

FIG. 25.—Small steam sterilizer used on gas stove. (Reprint from Farmers' Bulletin 748.)

The breaking and sterilizing rooms should have a plentiful supply of natural light. The walls and ceilings should be plastered and white enameled, and the floors should be concrete with trapped drains. In the partition between the two rooms a sliding window for the transfer of equipment should be built.

The freezer should be equipped with shelves of brine piping, through which brine is circulated for freezing the cans of liquid egg.

The candled eggs should be taken to the breaking room in metal

pails, because cases with the accompanying packing material are dirty. Leaking eggs after candling should be placed on special trays for transferring to the breaking room.

The egg-breaking outfit consists of a tray, on which is placed an open rack for supporting the cups, and a detachable knife on which the eggs are broken. This knife rests in slots in standards fastened to the ends of the breaking tray. Glass cups should be used for the grading of the opened eggs, because certain types of bad eggs can not be detected in nontransparent containers. When whites and yolks are separated it should be done by means of a sanitary mechanical device.

The egg-breaking tables should be covered with a nonabsorbing material, such as metal or porcelain.

A churn for mixing the egg before freezing should be provided. It should be constructed so that it can be readily washed and sterilized.

A lavatory with knee or pedal valve attachment should be installed in the breaking room near the transfer window for the washing of hands after breaking bad eggs.

White uniforms should be provided for operators in the breaking room.

The sterilizing room should be furnished with sinks and steam sterilizers. The sinks should be equipped with drains and mechanical rinsers and should be supplied with hot and cold water and connected to trapped drains.

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