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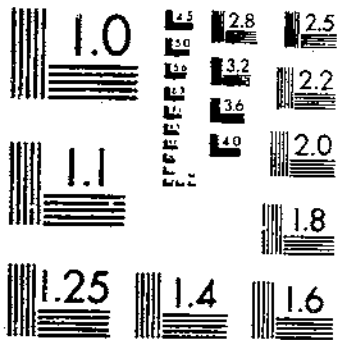
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SPACE REQUIREMENTS FOR HOME FOOD PRESERVATION

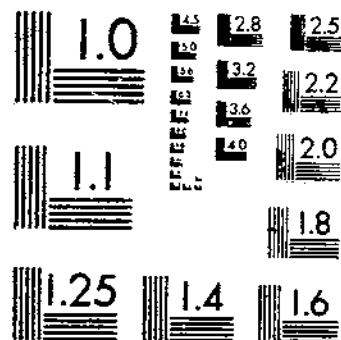
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Space Requirements

for HOME FOOD PRESERVATION¹

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INTRODUCTION

This bulletin reports the results of an investigation of counter space requirements, efficient arrangements of counters and equipment for the preservation of food in the farm home, and storage requirements for food preservation utensils and canned food. The study was part of the coordinated housing research program of the State agricultural experiment stations and the Home Economics Research Branch of the United States Department of Agriculture.

The first phase of the cooperative program consisted of four regional surveys (1, 2, 3, 4)² that revealed the type and scope of household activities of farm families, their preference for location of activities, and their storage needs.

Since over 90 percent of the farm homemakers in each region reported preserving food, it is highly important that adequate space, efficiently arranged, be provided for this activity in a farmhouse. No information has been available, however, as to the specific type and amount of space needed; thus, it has been impossible to formulate wholly satisfactory plans for farm kitchens or utility rooms in which food preservation could be done. To obtain such facts for a basis in developing space standards, the second phase of the cooperative program included the study reported here. Canning was used to establish the space requirements, since it was the method of preservation reported most extensively in the four regions. Although freezing was used much less extensively as a method of preservation, it is becoming increasingly popular, as indicated by the reports of sales of freezers (2). Therefore, the space required for canning was tested for adequacy for preparing foods for freezing and dimensions for the special utensils needed were included.

¹ Submitted for publication July 1, 1955.

² Italic numbers in parentheses refer to Literature Cited, p. 37.

EXPERIMENTAL PROCEDURES

Equipment and Canning Methods

This study was conducted at the Agricultural Research Center, Beltsville, Md. The laboratory had movable walls (6) and equipment. A double-bowl sink in a wooden frame and with flexible hose for water supply and drain was used. Two counters, each 4 feet wide, 3 feet deep,³ and 3 feet high, were provided. For a counter 8 feet wide, the two were placed end to end. Preliminary work had shown that counters of these dimensions were more than adequate for convenient placement of utensils during the canning operation.

A four-unit, 39-inch tabletop electric range was mounted on a platform with casters. Supplies and utensils were stored in a utility cabinet and a wall cabinet. A footrest and an adjustable stool were included in the laboratory equipment.

UTENSILS AND CONTAINERS.—The regional housing surveys did not report all utensils used for food preservation. However, specialized items were reported, as shown in table 1. The selection of utensils

TABLE 1.—Food preservation utensils reported by farm homemakers in four regions¹

Surveys	Percentage of families owning							
	Pressure canner	Round water-bath canner	Meat saw	Household scales	Kraut cutter	Bottle capper	Tin can sealer	Canning kettles
12 Northeastern States, farm owner-operators.....	40	67	72	76	45	32	(2)	54
7 Southern States, farm owner-operators.....	51	30	28	44	21	8	6	17
12 North Central States, farm and nonfarm families.....	37	41	48	46		16	2	
11 Western States, farm operators.....	50	22	64	59	23	19	3	45

¹ Reports of regional surveys (1, 3, 5, 11).

² Less than 1 percent.

for this research was based on these data and on the results of a United States Department of Agriculture study, "Development of a Basic Set of Cooking Utensils" (10). Because the size and shape of utensils influence to a great extent the counter space required, care was taken to select those of typical household design and size. The number and dimensions of the utensils used are given in table 2.

³ Depth is defined as the front-to-back and width as the side-to-side measurement.

TABLE 2.—*Size and number of specified utensils selected for canning*¹

Utensil	Dimension ²			Number used
	Length or diameter	Width	Height	
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	
Cooling rack.....	11		1/2	3
Cutting board.....	18	12	3	1
Cutting board.....	13	9	1	1
Dishpan.....	³ 18	16 1/2	5 1/2	2
Funnel.....	5 1/2	4 1/2	2 1/2	1
Kettle (10-quart).....	³ 13 1/2	11 1/2	7 1/2	1
Kettle (8-quart).....	³ 12	12	9	2
Measure (quart).....	³ 7 1/2	5 1/2	5 1/2	1
Measure (pint).....	³ 6	4 1/2	4 1/2	1
Mixing bowl (1 1/2-quart).....	10		4	1
Pie pan.....	10		1	1
Pressure canner (7 quart jars).....	³ 17	16 1/2	14 1/2	1
Processing kettle (7 quart jars).....	³ 16	13 1/2	13 1/2	1
Pudding pan.....	11		2 1/2	2
Strainer (quart).....	14	6 1/2	3 1/2	1
Tea kettle (3-quart).....	10	8	7 1/2	1
Utility pan.....	16 1/2	11	2 1/2	2

¹ In addition to the utensils listed, the following were used: 2 butcher knives, 2 paring knives, 1 case knife, 1 ladle, 1 wooden spoon, 1 set of measuring spoons, 1 pair of tongs, 1 thermometer.

² Top dimensions measured to the nearest half-inch.

³ Overall dimension including handles or bail.

Since the surveys showed that families stored few tin containers of food, glass jars were used with three types of closures—zinc caps, glass lids, and two-piece metal lids.

CANNER LOADS PER DAY AND NUMBER OF WORKERS.—The homemakers interviewed for the surveys reported the number of quarts of each food usually canned in one day. From these data the number of canner loads of 7 quarts was calculated, since the majority of pressure and water-bath canners owned were of this capacity. In each of the four regions most of the families canned (or prepared for preservation) from one to three canner loads of fruits, vegetables, or meat in a day. These quantities were therefore canned in this study.

In two regions, canning was done by one person for the majority of families of six persons or less and by two for larger families. In the third region it was done by one worker in most families of four or less and by two for larger families. In the fourth region similar data were not obtained. Space needed for one and two workers was therefore determined in this study.

FOODS AND CANNING METHODS.—In the three regions for which data on food preservation practices were available almost all families reported canning fruits; between 60 and 90 percent canned vegetables; 17 to 60 percent, meat; and 4 to 10 percent, poultry. Apples, peaches, corn, and meat were selected for this study as examples of foods commonly canned and of different types of preparation.

Methods used were those recommended by the U. S. Department of Agriculture (7, 8). A water-bath canner was used for processing apples and peaches, and a pressure canner for corn and meat.

Jars needed were all washed at one time. When fruits and vegetables were to be canned, seven jars were placed in the canner to heat and the rest put into a dishpan on the counter. When canning meat, all washed jars were placed on the counter.

Apples were washed, pared, and quartered, put into a salt and vinegar solution to prevent darkening, and precooked in a sugar sirup. Peaches were washed, scalded, cooled, peeled, and halved, put into a salt and vinegar solution, and precooked in a sugar sirup. Corn was husked, desilked, washed, cut from the cob, and precooked in water.

The kettle of hot food was placed on the work counter for packing. One hot jar was transferred at a time from the canner to the counter, filled, sealed, and replaced in the canner. After being processed, the jars were placed on the counter to cool.

Meat was brought into the laboratory as saddle, chuck, or loin, cut into pieces, and packed raw into the jars. The filled jars without lids were heated in a pan of water until the temperature of the meat in the center of the jar had risen to that recommended. The jars were then sealed and processed. Processed jars were placed on the counter to cool.

When there were two workers, one, seated at the work counter, peeled and cut fruits, prepared and cut corn from the cob, trimmed and cut meat. All other operations were done by the second worker, who also assisted with trimming and cutting meat when 21 quarts were canned in a day.

Establishing Counter Dimensions

To establish the dimensions of counters needed, three steps were followed—securing dye patterns that showed the utensils needed for canning and their placement on the counter, adjusting these space-use patterns to two counter depths and determining the widths of counter of these two depths that would be adequate for the utensils and the worker. Descriptions of the procedures used in the three steps follow:

UTENSILS NEEDED AND THEIR PLACEMENT ON THE COUNTER.—For this first step, one, two, and three canner loads (7, 14, and 21 quarts) of fruits, vegetables, and meat were prepared and processed by one and two workers, using (a) a counter 3 feet deep and 8 feet wide⁴ and (b) two counters each 3 feet deep and 4 feet wide.

No limitations were placed on the amount of the available counter space that could be used. Utensils for canning each food were selected from a storage cabinet and arranged on the counter for logical sequence of work with a minimum of motions. Both workers were right-handed.

Dye patterns furnished a record of how the counter space was used. The counters were covered with white sulfate-bond paper and each utensil was fitted with a hardware-cloth basket which had a bottom of cellulose sponge (fig. 1). The sponge was dampened with a solution made of one-half teaspoon of vegetable coloring, one tablespoon of

⁴ See footnote 3, p. 2.

glycerin, and one pint of water. As a utensil was placed or moved about during the canning process it made a print on the paper-covered counter (fig. 2). To facilitate study of these space-use patterns, they were reproduced on a 4-inch scale.



FIG. 1.—Sponge and hardware-cloth baskets used on utensils.

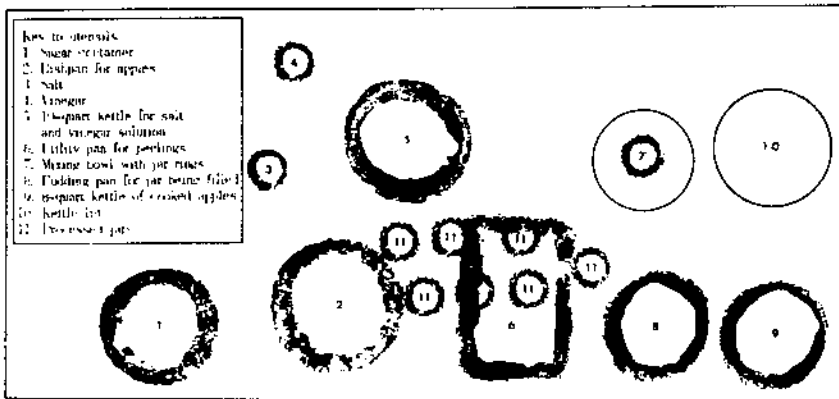


FIG. 2.—Space-use pattern of utensils used for canning apples.

A tape recorder was used to make a detailed narrative record of how the worker proceeded during each canning operation. When one worker did the canning, the second served as observer and narrator. When two persons were working, the tape recorder was placed so that either could describe operations.

ADJUSTMENT OF SPACE-USE PATTERNS TO TWO DEPTHS OF COUNTERS.—Study of the space patterns showed that a 28-inch depth of counter was adequate for the desired arrangement, without crowding, of the utensils used for the preparation of the food and the packing of the jars. Since a large proportion of the homemakers interviewed had indicated a preference for the kitchen as the place to preserve food, space patterns were also adjusted to a depth of 24 inches, the usual depth of kitchen base cabinets. The arrangement of utensils on 24-inch-deep counters was similar to that on 28-inch depths, except that the utility pan had to be placed with the longer dimension parallel to the edge of the counter. Moreover, in order to fit the utensils on the 24-inch depth, advantage had to be taken of the difference in top and bottom dimensions and height of utensils. For example, since the utility pan was not so high as the dishpan and the top diameter of the dishpan was greater than the bottom, the top of the dishpan could overlap the utility pan.

DETERMINATION OF COUNTER WIDTHS.—The widths of counters needed were based on the space required for the utensils and the space required by the worker.

The space needed for the utensils was usually determined by those that, for convenience, had to be placed at the front edge of the counter. When canning fruits and vegetables, the same utensils were placed at the front of the counter. Different utensils were needed for meat.

The space required for the utensils was not always adequate for the worker. For example, when foods were prepared on the right end of a straightline or L-shaped counter and jars packed on the left, the worker stood in front of the utensils placed at the ends of the counter. Unless the counter was free at the ends, the width had to be increased to provide sufficient space for the worker. The space between the peeling pan and the pan used for the jar being filled was, however, sufficient for two workers. When foods were prepared on the left end of the counter and jars packed on the right end, the worker stood at the utensils second from the ends, and the space provided for the utensils was sufficient for the worker for all arrangements of the counter, walls, and equipment. However, additional space was needed between the peeling and the packing pan when there were two workers. Exploratory work showed that the following four space allowances for the worker or workers were needed for determining counter widths:

1. Space between the center of the utensil in front of which the worker stands and a wall or high equipment, sufficient to allow for lifting large pans of food at counter height.

2. Space between the center of the utensil in front of which the worker stands, and a range, sink, or bend of an L-shaped counter, sufficient to permit working without extending the arm over the sink or range or having the body in contact with the adjoining section of the counter.

3. Space between the centers of the utensils on a straightline counter in front of which each of two workers stands, sufficient to permit one to raise her elbow for lifting and the other to stand with her arm at her side.

4. Space between the bend of an L-shaped counter and the center of the utensil in front of which a worker stands, sufficient to permit

another person to work, without interference, at the adjoining section of the counter.

Since no data were available for these space needs of the worker, they were estimated in the laboratory by observing and measuring a limited number of persons.

From the space allowances established for workers and the placement of the principal utensils as determined from the laboratory records, the widths needed for 28- and 24-inch-deep counters were calculated for nine arrangements of the straightline, L-shaped, and divided counters in relation to sink, range, and walls.⁵ These nine arrangements of counters were as follows:

<i>At left end of counter</i>	<i>At right end of counter</i>
Free.....	1. Free
	2. Wall
	3. Range or sink
Wall.....	4. Free
	5. Wall
	6. Range or sink
Range or sink.....	7. Free
	8. Wall
	9. Range or sink

Two work arrangements were considered for both straightline and L-shaped counters—(a) food preparation utensils on the right end of the counter, packing utensils on the left end, and (b) preparation utensils on the left end and packing utensils on the right end.

Scaled drawings were made for each type of counter and templates used to position utensils. The widths of the counters needed were calculated from the drawings. These widths were verified and the arrangement of utensils tested by canning 21 quarts of peaches.

Comparing Efficiency of Different Arrangements of Counter, Range, and Sink

As a basis for judging efficiency, a comparison was made of the distance it would be necessary to walk while canning with the following arrangements of straightline, L-shaped, and divided counters:

Straightline and L-shaped counters—

1. Sink at the left end, range at the right end.
2. Sink at the right end, range at the left end.

Divided counters—

1. On one wall from left to right—counter, sink, counter, range.
2. On opposite walls, fronts of counters 4 feet apart—one counter with sink at the left end, other counter with range at the right end.

The number of trips the worker made from one position to another, when canning 14 quarts of fruits, vegetables or meat, was taken from the tape records. To arrive at the distance walked in each arrange-

⁵ Walls also represent high equipment such as refrigerator or floor-to-ceiling cabinets.

ment, the number of trips was multiplied by the distance for each trip as measured from scaled drawings. No trips were counted for bringing the food into the laboratory or for placing food in the sink for washing.

Determining Storage Requirements

The number of special food preservation utensils reported by the homemakers in the surveys was small (table 1), an indication that the same utensils and tools serve for both meal preparation and food preservation. Storage requirements were therefore determined for those utensils and supplies usually used only for food preservation.

MEASUREMENT OF UTENSILS AND SUPPLIES.—Various types of water-bath and pressure canners, blanchers, jars, and freezer packagings, used in the laboratory or sold in Washington, D. C., stores, were measured to determine typical sizes. To these measurements were added the amounts of clearance needed at the sides and above the utensils for easy and safe removal from storage. The clearance allowance was established by laboratory tests in which a limited number of workers placed the articles on and removed them from shelves set at various heights.

MEASUREMENTS OF SHELF SPACE FOR STORING CANNED FOODS.—The families surveyed had reported the number and kinds of containers, full and empty, requiring storage at the time of the year when the maximum amount of canned food was on hand. Over three-fourths of the families in the Northeastern, Southern, and Western States had pint and quart jars to store. Half of the families in the South needed storage for half-gallon jars also, and over half in the Northeast and West for jelly glasses.

The number of feet of shelving needed for single-, double-, and three-row storage of the median and third quartile number of full and empty containers was calculated for the types reported by half or more of the homemakers in the three regions. The distance between shelves was established by measuring the diagonal height of the tallest style of jar of each capacity and adding the minimum clearance needed for removing it easily.

RESULTS

Utensils Needed and Their Placement on the Counter

The utensils for which space was required on the counter were determined from the tape records and space patterns.

For canning fruit, space on the counter was needed for utensils for (1) washed jars, (2) fruit to be cut, (3) peelings, (4) antidarkening solution, (5) jar when being filled, (6) precooked fruit, (7) jar lids, (8) sugar, and (9) processed jars when cooling. A wire strainer was used to lift the fruit from the salt and vinegar solution but was left in the kettle so did not require counter space. Cheesecloth was used to hold the peaches for dipping and a piepan was used to transport the scalded peaches from the range to the sink and from the sink to the counter. When not in use this pan was placed in the sink.

For canning corn, utensils were needed on the counter for (1) washed jars, (2) corn to be cut, (3) cut corn, (4) jar when being filled, (5) jar lids, (6) preheated corn, (7) salt, and (8) processed jars when cooling.

Space on the counter was not provided for utensils used in husking the corn, since preliminary tests had established that this part of the operation could be done best outside of the work area. For cutting the corn a small board in a utility pan was found to be as convenient as a larger board placed on the counter. Additional space was not required when the small board was used. The container for cobs was placed on the floor to the left of the worker and did not affect counter requirements.

For canning meat, in addition to knives, thermometer, and cutting board, utensils were placed on the counter for (1) meat to be cut, (2) cut meat, (3) usable trimmings, (4) washed jars, (5) jar lids, (6) salt, (7) hot jars when being sealed, and (8) processed jars when cooling. A container was placed on the floor to the left of the worker for nonusable trimmings and bones.

Since in the first phase of the study no restriction had been placed on the amount of available counter that could be used, the workers tended to use the space uneconomically. However, they always placed the utensils for the food to be prepared, for the prepared food, and for the trimmings or peelings close together and in the same relationship to each other. This was also true for the utensils used for packing the food—the kettle of hot food, the pan in which the jar was placed for filling, and the bowl with lids. When the space patterns were adjusted to uniform depths, these utensils were placed on the counters first in the positions shown on the dye patterns. Other utensils such as the dishpan of washed jars, sugar container, and cooling rack were then placed so as to make good use of the remaining counter space even though the positions were not those shown on the dye patterns.

Space-Use Patterns Adjusted to Two Depths

In adjusting the space patterns of the counters to depths of 28 and 24 inches, space was provided for the utensils needed for canning three canner loads (21 quarts) of food. The survey data (4) revealed that space for canning this quantity would meet the needs of most farm families. Initial work had shown that essentially the same utensils were required for one, two, or three canner loads.

The adjusted space patterns for canning fruit were adequate for the following utensils: (1) Two dishpans, one for washed jars and one for washed fruit, (2) one utility pan for peelings, (3) one 10-quart kettle for the antidarkening solution, (4) one mixing bowl for jar lids, (5) one 8-quart kettle for precooked fruit, (6) one pudding pan for jars being filled, (7) one container of sugar, and (8) one cooling rack for the first seven processed jars. Two kettles were used for precooking the fruit, but only one was placed on the counter at a time. The second cooling rack could be placed on the counter after the dishpan for the jars had been removed. Most of the preparation utensils were removed from the counter before the third cooling rack was needed.

For corn, provision was made for the same utensils, except that the sugar container and the 10-quart kettle were removed and a container for salt was added.

For canning meat, counter space was provided for the following utensils: (1) One dishpan for meat to be cut, (2) one cutting board,

(3) one 8-quart kettle for usable trimmings, (4) one dishpan for washed jars, (5) one mixing bowl for jar lids, (6) one utility pan for cut meat, and (7) one container for salt. When two workers were planned for, the following were added: A cutting board, a kettle for trimmings, and a utility pan for cut meat. An additional pan for meat to be cut was needed in arrangements where both workers could not conveniently use the same supply of meat. No space was provided for cooling racks, since they were not needed until other utensils had been removed from the counter.

Canner and kettle lids were placed on the range top when not in use. If the range top is considered part of the work counter or the range is of a type that does not provide sufficient space for the lids (apartment-type, or 30-inch range), another surface will be needed.

The scaled drawings and the actual placement of the utensils on the counters showed that on the 28-inch depth, the utensils could be arranged conveniently without crowding. On counters 24 inches deep the utensils could not be arranged for effective work without crowding. Utensils of less capacity were not considered satisfactory, since they would have to be filled or emptied more often depending on their use. Increasing the width of the counter would not only increase the walking required but the arrangement of the utensils would be less convenient.

Space Needed for Worker

Observation and measurement of workers showed that the following allowances were adequate:

1. Sixteen inches between the center of the utensil in front of which the worker stands and the wall (or equipment of more than elbow height) at the end of the counter.

2. Twelve inches between the center of the utensil in front of which the worker stands and the range,⁹ sink, or bend of an L-shaped counter.

3. Twenty-eight inches between the centers of the utensils in front of which each of two workers stands at a straightline counter.

4. Thirty inches between the bend of an L-shaped counter and the center of the utensil on one arm of the counter, when there is a second worker at the other arm.

Widths Needed for Counters 28 and 24 Inches Deep

The counter widths adequate for one and two workers and the utensils required for canning three canner loads of each food were calculated from scaled drawings of straightline, L-shaped, and divided counters.

Straightline Counters

The widths needed for straightline counters 28 and 24 inches deep are shown in table 3 and representative arrangements of utensils for canning fruit and meat on counters 28 inches deep in figure 3.

⁹ This allowance could be satisfied by the portion of the tabletop range that does not include the cooking elements but other space would have to be provided for the kettle lids.

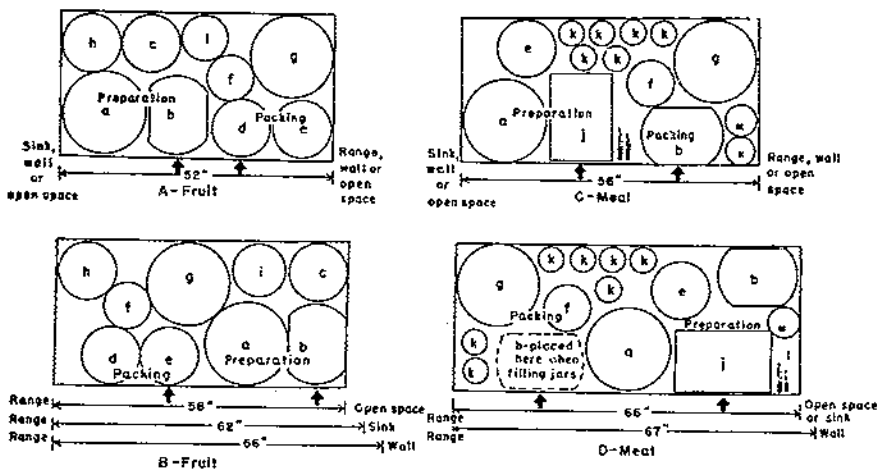


FIGURE 3.—Arrangement of utensils on straightline counters 28 inches deep for 1 worker to can 3 canner loads of food. (Arrows indicate the position of the worker when preparing the food and when packing the jars.)

Key to utensils. (a) Dishpan for food to be prepared, (b) utility pan for peelings or cut meat, (c) 10-quart kettle for antidarkening solution, (d) pudding pan for jar when filling, cut meat, or food to be prepared, (e) 8-quart kettle for precooked fruit or vegetable or meat trimmings, (f) mixing bowl for jar lids, (g) dishpan for washed jars, (h) cooling rack, (i) sugar container, (j) cutting board, (k) jars to be filled, (l) knives, (m) salt container.

When utensils were arranged for preparing fruit and vegetables on the left end of the counter (fig. 3, A), one width, 52 inches, and one arrangement of utensils could be used for all positions of the counter. The space needed for the utensils was adequate for the worker, because she stood at the utensils second from the ends of the counter.

For two workers the arrangement of utensils was the same as for one worker, except that 28 inches was allowed between the center of the pan used for peelings and the pan used for the jar being filled. This increased the width of the counter to 66 inches.

When the depth of the counter was decreased to 24 inches, the width needed was increased to 61 inches for one worker and to 68 inches for two workers, because the utility pan "b" had to be placed with the longer dimension parallel to the edge of the counter to allow room for the 10-quart kettle "c" placed behind it.

Preparing fruit or vegetables on the right end of a 28-inch-deep counter required from 54 to 70 inches. Only one arrangement of utensils is illustrated (fig. 3, B)—that which was used when the range was at the left end of the counter. A wall at the left end of the counter would necessitate rearranging the utensils in order to provide sufficient space for the worker when packing the jars. The space between the peeling pan "b" and the packing pan "d" was always sufficient to permit two workers to work comfortably. When the counter depth was decreased to 24 inches, the pan "b" was placed with the longer dimension parallel to the edge of the counter. The widths required ranged from 64 to 72 inches, the greater width being needed when the counter was placed between walls or between a wall on the right end and a range at the left end.

TABLE 3.—Widths of straightline counters 28 and 24 inches deep adequate for 1 and 2 workers and the utensils needed for canning 3 canner loads of food, by arrangement of work and position of counter

Work arrangement and number of workers	Width needed for canning when right end of counter is next to—							
	Sink		Range		Wall		Open space	
	Fruits and vegetables	Meat	Fruits and vegetables	Meat	Fruits and vegetables	Meat	Fruits and vegetables	Meat
COUNTER 28 INCHES DEEP								
Preparation on left end of counter, packing on right end:								
Sink, wall, or open space at left end of counter:	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
1 worker.....			52	56	52	56	52	56
2 workers.....			66	70	66	70	66	70
Preparation on right end of counter, packing on left end:								
Range at left end of counter:								
1 worker.....	62	66			66	67	56	66
2 workers.....	62	68			66	69	56	68
Wall at left end of counter:								
1 worker.....	66	66			70	67	60	66
2 workers.....	66	68			70	69	60	68
Open space at left end of counter:								
1 worker.....	56	66			60	67	54	66
2 workers.....	56	68			60	69	54	68

COUNTER 24 INCHES DEEP

Preparation on left end of counter, packing on right end:								
Sink, wall, or open space at left end of counter:								
1 worker-----			61	68	61	68	61	68
2 workers-----			68	78	68	78	68	78
Preparation on right end of counter, packing on left end:								
Range at left end of counter:								
1 worker-----	68	68			72	69	64	68
2 workers-----	68	76			72	77	64	76
Wall at left end of counter:								
1 worker-----	68	68			72	69	64	68
2 workers-----	68	76			72	77	64	76
Open space at left end of counter:								
1 worker-----	68	68			68	69	64	68
2 workers-----	68	76			68	77	64	76

For canning meat, one arrangement of utensils and one width—56 inches—was adequate for all positions of the 28-inch-deep counter when the meat was prepared on the left end of the counter and when there was only one worker (fig. 3, C). The counter had to be 70 inches wide for two workers in order to provide for the second cutting board, extra utensils, and sufficient space between workers. When the counter depth was decreased to 24 inches, the width had to be increased to 68 inches for one worker and to 78 inches for two workers.

When the meat was prepared on the right end of the counter, a single arrangement of utensils was satisfactory for one worker, whatever the position of the counter (fig. 3, D). A width of 66 or 67 inches was needed for a 28-inch depth and 68 or 69 inches for a 24-inch depth. For two workers extra utensils were added, and the width was increased to 68 and 69 inches for the 28-inch-deep counter and to 76 and 77 inches for the 24-inch depth.

L-Shaped Counters

ONE WORKER.—On an L-shaped counter food was prepared on one arm of the counter and the jars were packed on the other. The widths needed for each arm of counters 28 and 24 inches deep are given in table 4. The arrangements of utensils on 28-inch-deep counters are shown in figure 4.

With a few exceptions, more counter space was required for preparing the food than for packing the jars.

When fruits or vegetables were prepared on the right arm of the 24-inch-deep counter, it had to be 4 inches wider than one 28 inches deep, if free at the end, and 2 inches wider if a wall or sink was at the end; the left arm had to be 2 inches wider for all arrangements. For packing meat, either arm of a 24-inch-deep counter, when free at the end, had to be 2 inches wider than one 28 inches deep.

TWO WORKERS.—To determine the widths of L-shaped counters needed for two workers, it was necessary to know how close to the corner of the "L" a worker could stand when there was a second worker at the other arm of the counter. The front-to-back space allowance needed for standing is 14 inches. This allowance could be made in either portion of the counter. The space requirement for one worker was measured from the corner of the "L" and for the worker at the other portion of the counter from a point 14 inches from the corner.

The widths needed for each arm of 28- and 24-inch-deep counters are shown in table 5. With a few exceptions the width required was the same for both depths. When the left arm of a 24-inch-deep counter was used for the preparation of fruits or vegetables, it had to be 2 inches wider than the 28-inch-deep counter and when used for the preparation of meat, 3 inches wider. With a counter depth of 24 inches, either arm when used for packing meat had to be 2 inches wider than with a 28-inch depth, if the counter was free at the end.

Representative arrangements of utensils on a 28-inch-deep counter with allowance for the second worker made in the width of the right arm are illustrated in figures 5 and 6, and arrangements with the allowance in the width of the left arm, in figure 7.

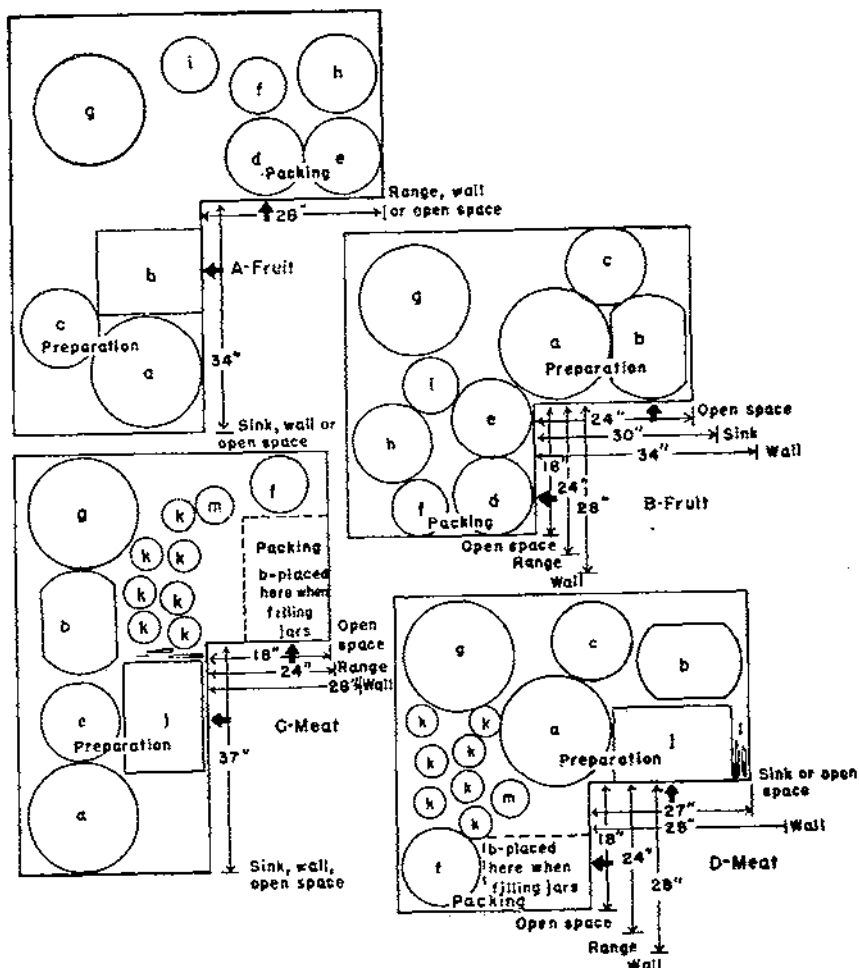


FIGURE 4.—Arrangement of utensils on L-shaped counters 28 inches deep for 1 worker to can 3 canner loads of food. (See figure 3 for key to utensils. Arrows indicate the position of the worker when preparing the food and when packing the jars.)

Divided Counters

When two separate counters were arranged on either one or two walls, canning was most conveniently done if one portion was adequate for one worker and one job—preparing the food or packing the jars. When two workers canned meat, however, better use could be made of time if both workers cut meat. It was more convenient for the second worker to cut meat on the packing counter, so that only one person would be working at each counter at one time. The width of the packing counter was therefore increased to provide space for a small cutting board and for the utensils for cutting the meat, cut meat, and trimmings.

TABLE 4.—Widths of each arm of L-shaped counters 28 and 24 inches deep adequate for 1 worker and for utensils needed for canning 3 canner loads of food by arrangement of work and position of counter

Depth of counter, portion and use	Width needed for canning when end of counter is next to—							
	Sink		Range		Wall		Open space	
	Fruits and vegetables	Meat	Fruits and vegetables	Meat	Fruits and vegetables	Meat	Fruits and vegetables	Meat
28 inches deep:								
Right arm used for—	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
Preparation	30	27	28	24	34	28	24	27
Packing					28	28	28	18
Left arm used for—								
Preparation	34	37	24	24	34	37	34	37
Packing					28	28	18	18
24 inches deep:								
Right arm used for—								
Preparation	32	27	28	24	36	28	28	27
Packing					28	28	28	20
Left arm used for—								
Preparation	36	37	24	24	36	37	36	37
Packing					28	28	18	20

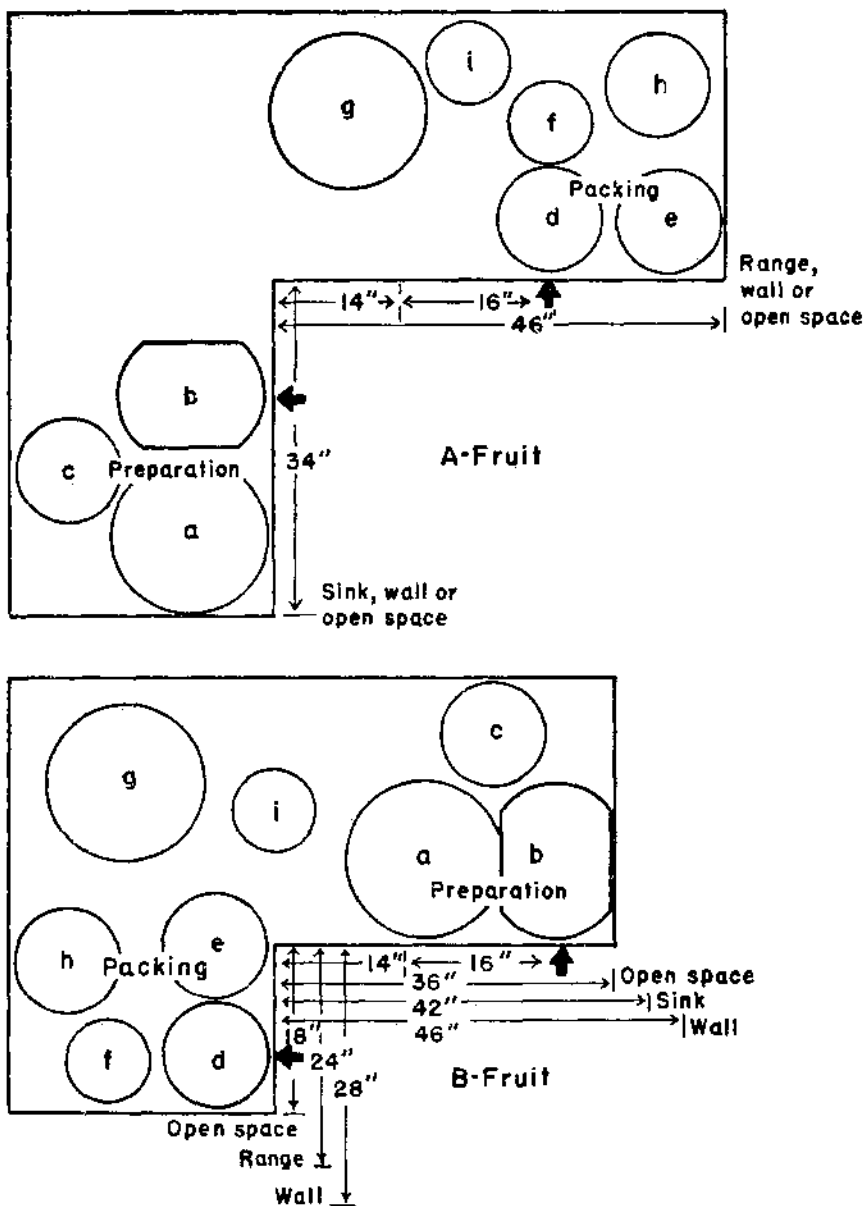


FIGURE 5.—Arrangement of utensils on L-shaped counters 28 inches deep for 2 workers to can 3 canner loads of fruit, when 14 inches is added to the right arm for standing room for the worker at the left arm. (See figure 3 for key to utensils. Arrows indicate the position of the workers.)

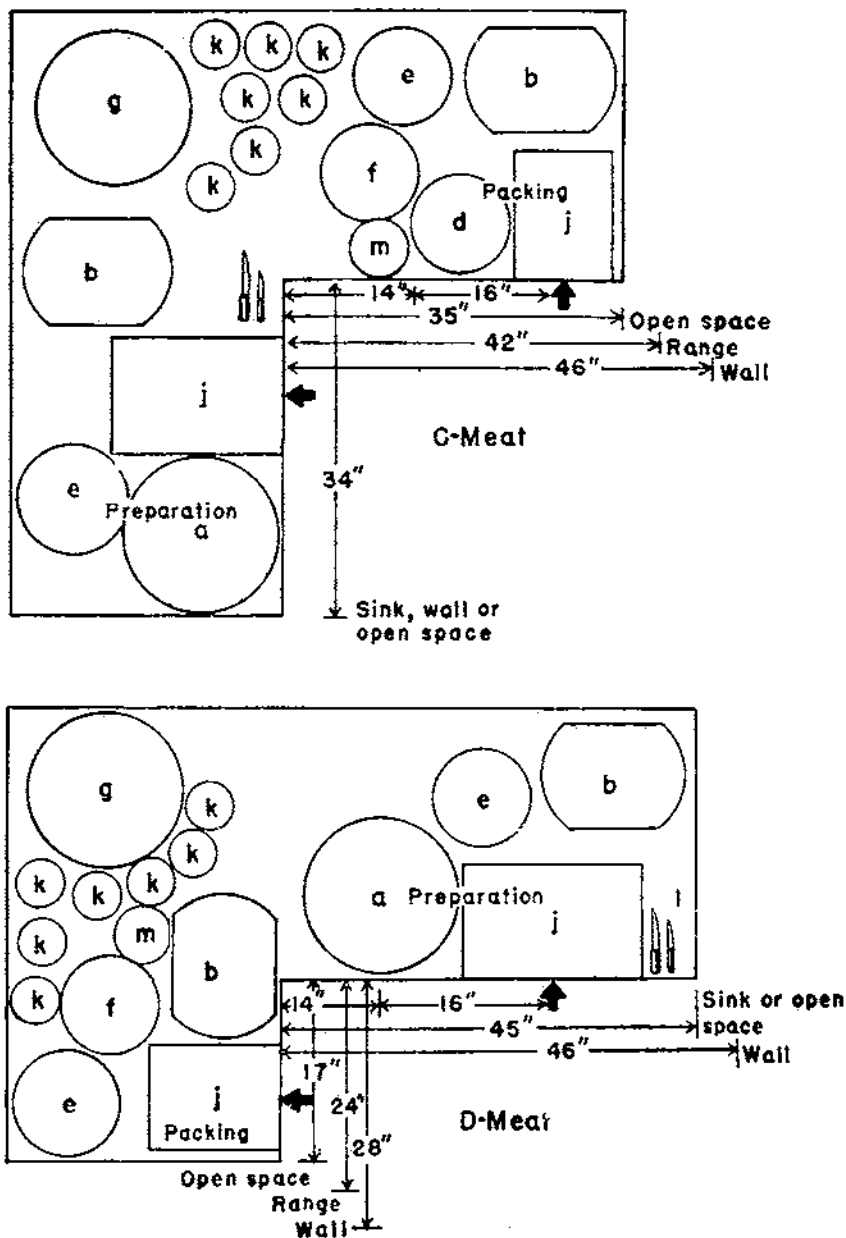


FIGURE 6.—Arrangement of utensils on L-shaped counters 28 inches deep, for 2 workers to can 3 canner loads of meat, when 14 inches is added to the right arm for standing room for the worker at the left arm. (See figure 3 for key to utensils. Arrows indicate the position of the workers.)

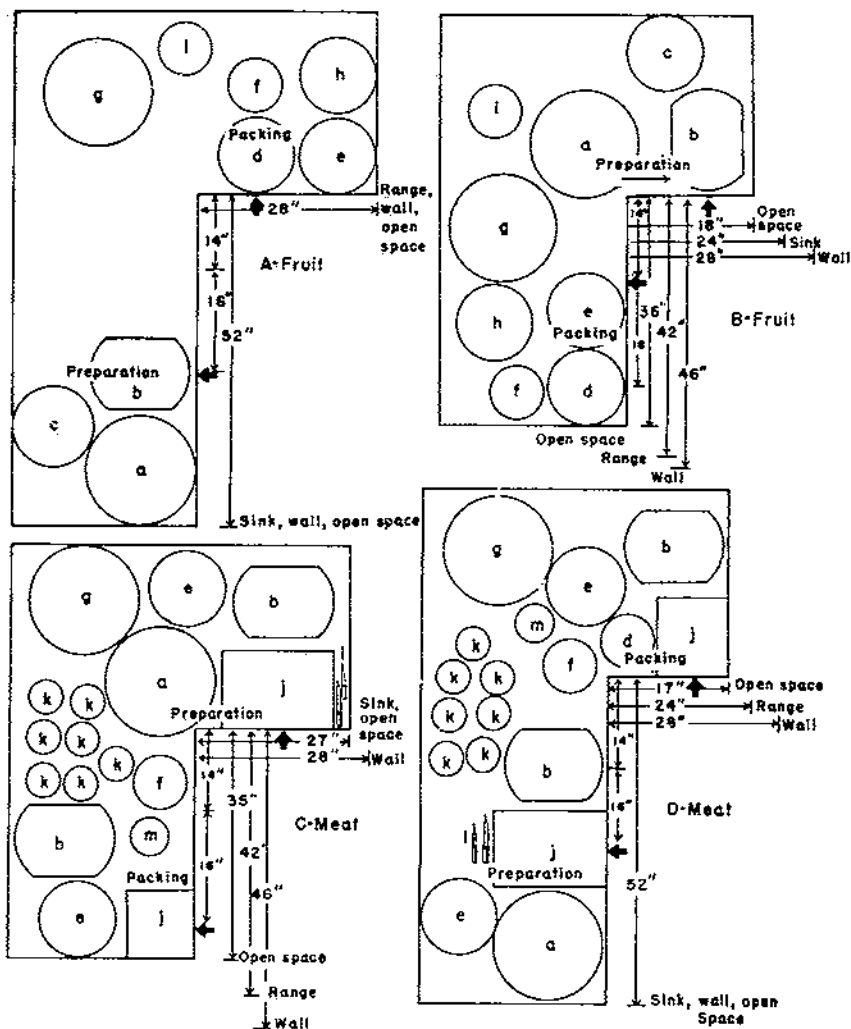


FIGURE 7.—Arrangement of utensils on L-shaped counters 28 inches deep, for 2 workers to can 3 canner loads of fruit and meat, when 14 inches is added to the left arm for standing room for the worker at the right arm. (See figure 3 for key to utensils. Arrows indicate the positions of the workers.)

The width needed for two separate counters 28 and 24 inches deep are given in table 6. The placement of utensils on 28-inch deep counters is illustrated in figure 8.

In the nine arrangements of counters considered, equipment or walls at the left end were found to have no effect on the width required.

For the preparation of fruits and vegetables a counter 24 inches deep had to be 2 to 4 inches wider than one 28 inches deep, but for

TABLE 5.—*Width of each arm of L-shaped counters adequate for 2 workers and for utensils needed for canning 3 canner loads of food with allowance for second worker on the right arm, and on the left arm*

Depth of counter, portion and use	Width needed for canning when end of counter is next to—							
	Sink		Range		Wall		Open space	
	Fruits and vegetables	Meat	Fruits and vegetables	Meat	Fruits and vegetables	Meat	Fruits and vegetables	Meat
WITH ALLOWANCE ON RIGHT ARM FOR SECOND WORKER								
28 inches deep:								
Right arm used for—	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
Preparation.....	42	45	46	42	46	46	36	45
Packing.....					46	46	46	35
Left arm used for—								
Preparation.....	34	34	24	21	34	34	34	34
Packing.....					28	28	18	17
24 inches deep:								
Right arm used for—								
Preparation.....	42	45	46	42	46	46	38	45
Packing.....					46	46	46	37
Left arm used for—								
Preparation.....	36	37	24	24	36	37	36	37
Packing.....					28	28	18	19

WITH ALLOWANCE ON LEFT ARM FOR SECOND WORKER

28 inches deep:								
Right arm used for—								
Preparation-----	24	27			28	28	18	27
Packing-----			28	24	28	28	28	17
Left arm used for—								
Preparation-----	52	52			52	52	52	52
Packing-----			42	42	46	46	36	35
24 inches deep:								
Right arm used for—								
Preparation-----	24	27			28	28	20	27
Packing-----			28	24	28	28	28	19
Left arm used for—								
Preparation-----	54	55			54	55	54	55
Packing-----			42	42	46	46	36	37

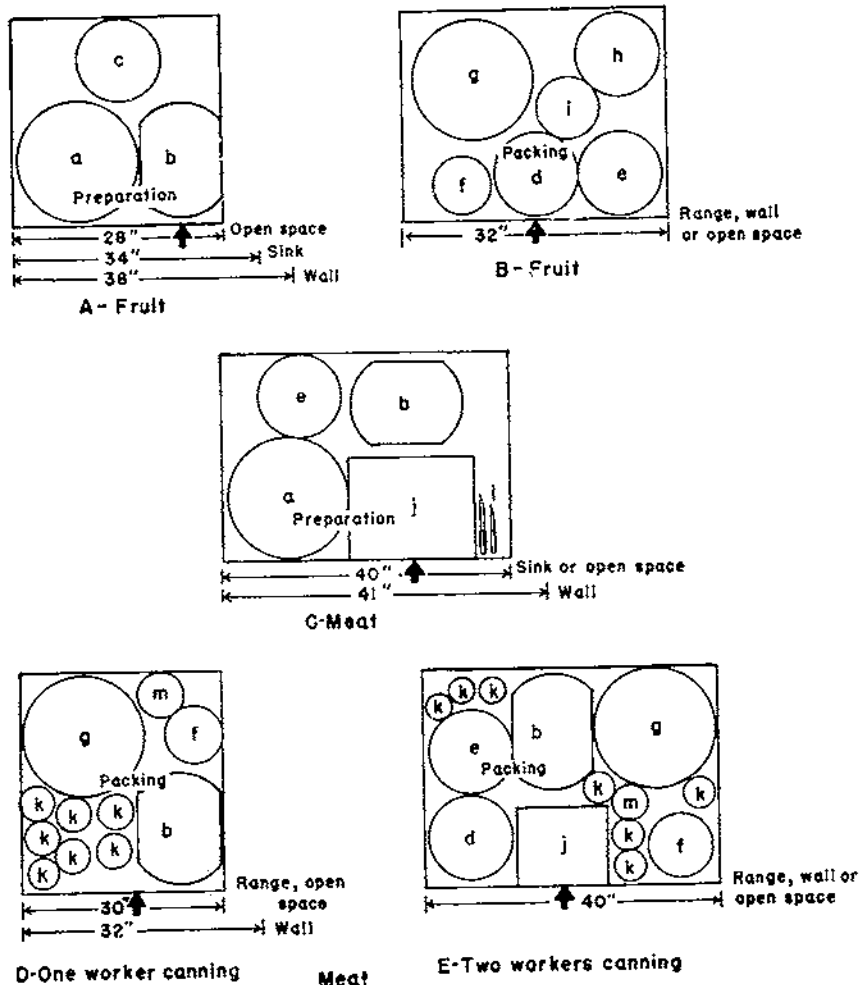


FIGURE 8.—Arrangement of utensils on 2 counters 28 inches deep. 1 for preparing food and the other for packing jars, each counter adequate for 1 worker. (See figure 3 for key to utensils. Arrows indicate the positions of the worker or workers.)

the preparation of meat the same width was required for both depths. Packing fruits and vegetables required 5 more inches in width on a counter 24 inches deep than on one 28 inches deep.

Packing meat required the same width of counter for both depths when there was one worker. However, when there were two workers, the 24-inch-deep counter had to be 6 inches wider than the deeper counter, since one of the workers cut meat as well as packed it in the jars at the counter designated as the packing counter.

TABLE 6.—Widths of 2 counters, one adequate for utensils for preparing the food and the other adequate for utensils for packing the jars; counter depths 28 and 24 inches

Counter, depth, and number of workers ¹	Width needed for canning when right end ² of counter is next to—								
	Sink		Range		Wall		Open space		
	Fruits and vegetables	Meat	Fruits and vegetables	Meat	Fruits and vegetables	Meat	Fruits and vegetables	Meat	
Preparation counter:	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
28 inches deep:									
1 or 2 workers.....	34	40			38	41	28	40	
24 inches deep:									
1 or 2 workers.....	36	40			40	41	32	40	
Packing counter:									
28 inches deep:									
1 worker.....			32	30	32	32	32	30	
2 workers.....			32	40	32	40	32	40	
24 inches deep:									
1 worker.....			37	30	37	32	37	30	
2 workers.....			37	46	37	46	37	46	

¹ Number of workers canning—each counter adequate for one worker.

² Equipment or wall at left end of counter did not affect width required.

Efficiency of Arrangements of Counter, Range, and Sink

The ease of work and the amount of walking required to perform a certain task are two criteria that can be used to judge the efficiency of work areas. One arrangement of work area, however, does not necessarily satisfy both criteria. This was found to be true for canning.

The number of trips made by one worker between counter, range, sink, and supply cabinet are shown in table 7. Regardless of the food canned, most of the trips were between the range and the work counter. For an efficient arrangement, therefore, the range and the counter must be adjacent.

The relationships of the sink and counter and the sink and range were of greater importance in canning peaches than in canning the other foods, because peaches were scalded at the range and cooled at the sink before being peeled at the counter. The same would be true in freezing vegetables, since most vegetables require scalding and cooling before being packed.

From the standpoint of the amount of walking required, arrangements with L-shaped counters were better than those with either straightline or divided counters (table 8). The divided counter on opposite walls was found to be the second best arrangement. The divided counter on one wall with the sink between the two sections required almost as much walking as the straightline counter. Placement of the sink and range in relation to the counter also affected the walking distance. Placement of the sink at the right end and the range at the left end of straightline or L-shaped counters resulted in a saving in steps, as compared with the reverse placement of the sink and range.

TABLE 7.—Trips made by one worker in canning 1½ quarts of food on a straightline counter

Trip	Number of trips made when canning—			
	Apples	Peaches	Corn	Meat
Range to and from counter.....	101	90	100	99
Range to and from supply cabinet.....	4	5	11	12
Sink to and from counter.....	19	38	13	11
Sink to and from supply cabinet.....	10	12	7	9
Sink to and from range.....	7	38	7	10
Counter to and from supply cabinet.....	15	16	14	10
From peeling position to packing position at counter.....	3	1	7	4
Total.....	159	200	159	155

From the standpoint of ease of work for right-handed persons, arrangements with the range at the right end of the counter and the sink at the left end were best. The kettle of hot food to be convenient for packing the jars had to be to the right of the pan holding the jar to be

TABLE 8.—Walking distance required for canning 14 quarts of food, by type and arrangement of counter ¹

Food	Straightline counter		L-shaped counter		Divided counter	
	Range right, sink left	Range left, sink right	Range right, sink left	Range left, sink right	On one wall, counter, sink, counter, range	On opposite walls, 4 feet between fronts of counters ²
	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>
Apples.....	476.3	484.5	366.7	298.3	506.3	422.0
Peaches.....	725.4	700.3	532.8	428.8	625.2	527.5
Corn.....	446.8	446.3	346.5	277.9	461.0	395.2
Meat.....	441.0	423.0	354.0	277.8	407.4	374.9
Mean.....	521.6	513.5	397.8	320.7	499.9	429.9

¹ Number and type of trips are the same for each arrangement. Supplies are stored at the counter used for packing jars.

² 1 counter at left of range, other at right of sink.

filled. With the range at the right end of the counter the kettle could be transferred from the range to the desired position on the counter without the kettle being lifted over other utensils. With the range at the left end, the kettle had to be lifted over the packing pan.

When the sink was placed at the left end of the counter, the container for the food to be canned could be pre-positioned on the counter and the heavy lifting eliminated. With the opposite placement of the sink, the dishpan of fruit or vegetables had to be moved from the position convenient for the washing operation to another position on the counter for peeling. In the divided counter arrangement, work was easier if one counter was placed to the right of the sink and the second counter to the left of the range.

Since the preparation of the food required the longer periods and more of the total time than the packing of the jars, sit-down space was provided at the portion of the counter used for this part of the task.

Storage Requirements

UTENSILS.—Dimensions and storage space requirements of special utensils needed for canning or preparing food for freezing are given in table 9. Dimensions of a limited number of freezer containers and

TABLE 9.—*Dimensions and storage space requirements for certain food preservation utensils and supplies*

Article	Dimensions of article ¹			Minimum dimensions of storage space ²		
	Length	Width	Height	Depth	Width ³	Height
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
Blancher.....	13	11	11	14	12	12
Freezer carton filler:						
On stand.....	8½	8	14	9½	9	15
Wire frame.....	4	3½	2	5	4½	3
Freezer cartons:						
Quarts, 25—folded.....	13½	6½	2	14½	7½	3
Pints, 25—folded.....	12	7½	2	13	8½	3
Bucket containers, 15.....	14	5	5	15	6	6
Freezer paper:						
Aluminum foil.....	18½	3½	3½	19½	4½	4½
Lined wrap.....	19	4½	4½	20	5½	5½
Glass containers:						
Pint.....	4	4	5½	4½	4	7
Quart.....	4	4	7½	4½	4	9
Half-gallon.....	5	5	9½	5½	5	10½
Jelly—tall.....	3	3	3½	3½	3	4½
Jelly—squat.....	3½	3½	2½	3½	3½	4
Kraut cutter.....	16	6	2	17	7	3
Pressure canner.....	17	16½	14½	18	17½	15½
Scales.....	8½	7	8	9½	8	9
Sealing block.....	10½	5½	6½	11½	6½	7½
Water-bath canner.....	16	13½	13½	17	14½	14½

¹ Overall measurements include handles, other projections, and lids.

² Includes clearance for handling.

³ The shortest dimension placed parallel to edge of shelf.

packages of special freezer wrappings are included. Kettles, pans, and bowls normally used for meal preparation are not included.

For convenience in removing utensils from storage, clearance above and at the sides of each item is needed. One inch of clear space above and one-half inch between utensils or between the utensil and a wall or door jamb were found to be sufficient.

A storage unit with inside width and depth of 18 inches, with the top shelf at 72 inches, was found more than adequate for storing the equipment reported by the homemakers in the four regions (table 1). The width of the door opening had to be 16 inches to accommodate the canners.

A base cabinet 24 inches deep had to be 28 to 34½ inches wide (inside dimensions) to accommodate one pressure canner and one water-bath canner. Because of the height of the canners (with lids) they could not be stored one above the other in a base cabinet 36 inches high. In a cabinet 28 inches wide one canner had to be placed to the side and back of the other, but in the wider cabinet the canners could be placed side-by-side at the front of the shelf. The remaining space in the cabinet was sufficient for storing other items reported.

CONTAINERS.--Measurements of various styles of jars showed that shelf space 4 inches square was needed for each pint and quart jar, 5 inches square for a half-gallon jar, and 3 inches square for a jelly glass. A free space allowance between jars was found unnecessary, if shelves were placed at a height that would permit the jars to be grasped at the neck for removing them from storage. When shelves were placed so that jars had to be removed by grasping them at the bottom, at least one-half inch between jars was needed for finger room. A margin of one-fourth to one-half inch at the front of the shelves was needed for safe storage. The minimum depths of shelves providing this allowance for 1-, 2-, and 3-row storage are:

	1-row storage (inches)	2-row storage (inches)	3-row storage (inches)
Pint jars.....	4½	8½	12½
Quart jars.....	4½	8½	12½
Half-gallon jars.....	5½	10½	15½
Jelly glasses.....	3½	6½	9½

A distance equal to the diagonal height of a jar, plus three-fourths inch, allowed sufficient clearance over it for removal. Thus, shelves for pint jars were placed 7 inches apart; for quarts, 9 inches; and for half-gallons, 10½ inches. Shelves for tall jelly glasses were placed 4½ inches apart and for squat jelly glasses, 4 inches.

Table 10 gives the median number of full and empty containers of the types reported by 50 percent or more of the homemakers in each region, and the running feet of shelving needed for single-, double-, and triple-row storage. Table 11 gives the third quartile number of containers and the shelving needed for their storage.

The dimensions of floor cabinets with nine shelves, adequate for two- and three-row storage of the median and third quartile number of full and empty containers reported in three regions, are given in table 12.

TABLE 10.—*Shelving required for median number of containers reported full and empty in three regions*¹

Region surveyed, and type of container	Number of containers	Length of shelving required for—		
		One-row storage	Two-row storage	Three-row storage
FULL CONTAINERS				
12 Northeastern States, farm owner-operators:				
Quart jars.....	223	74 ft. 4 in.	37 ft. 4 in.	25 ft.
Pint jars.....	56	18 ft. 8 in.	9 ft. 4 in.	6 ft. 4 in.
Jelly glasses.....	36	9 ft.	4 ft. 6 in.	3 ft.
Total.....		102 ft.	51 ft. 2 in.	34 ft. 4 in.
7 Southern States, farm owner-operators:				
Quart jars.....	208	69 ft. 4 in.	34 ft. 8 in.	23 ft. 4 in.
Pint jars.....	38	12 ft. 8 in.	6 ft. 4 in.	4 ft. 4 in.
Half-gallon jars.....	40	16 ft. 8 in.	8 ft. 4 in.	5 ft. 10 in.
Total.....		98 ft. 8 in.	49 ft. 4 in.	33 ft. 6 in.
11 Western States, farm operators:				
Quart jars.....	172	57 ft. 4 in.	28 ft. 8 in.	19 ft. 4 in.
Pint jars.....	50	16 ft. 8 in.	8 ft. 4 in.	5 ft. 8 in.
Jelly glasses.....	39	9 ft. 9 in.	5 ft.	3 ft. 3 in.
Total.....		83 ft. 9 in.	42 ft.	28 ft. 3 in.

EMPTY CONTAINERS

12 Northeastern States, farm owner-operators:				
Quart jars.....	49	16 ft. 4 in.	8 ft. 4 in.	5 ft. 8 in.
Pint jars.....	29	9 ft. 8 in.	5 ft.	3 ft. 4 in.
Jelly glasses.....	23	5 ft. 9 in.	3 ft.	2 ft.
Total.....		31 ft. 9 in.	16 ft. 4 in.	11 ft.
7 Southern States, farm owner-operators:				
Quart jars.....	42	14 ft.	7 ft.	4 ft. 8 in.
Pint jars.....	19	6 ft. 4 in.	3 ft. 4 in.	2 ft. 4 in.
Half-gallon jars.....	18	7 ft. 6 in.	3 ft. 9 in.	2 ft. 6 in.
Total.....		27 ft. 10 in.	14 ft. 1 in.	9 ft. 6 in.
11 Western States, farm operators:				
Quart jars.....	42	14 ft.	7 ft.	4 ft. 8 in.
Pint jars.....	33	11 ft.	5 ft. 8 in.	3 ft. 8 in.
Jelly glasses.....	30	7 ft. 6 in.	3 ft. 9 in.	2 ft. 6 in.
Total.....		32 ft. 6 in.	16 ft. 5 in.	10 ft. 10 in.

¹ Comparable data not available for the North Central region.

TABLE 11.—*Shelving required for third quartile number of containers reported full and empty in three regions*¹

Region surveyed, and type of container	Number of containers	Length of shelving required for—		
		One-row storage	Two-row storage	Three-row storage
FULL CONTAINERS				
12 Northeastern States, farm owner-operators:				
Quart jars.....	378	126 ft.	63 ft.	42 ft.
Pint jars.....	108	36 ft.	18 ft.	12 ft. 4 in.
Jelly glasses ²				
Total.....		162 ft.	81 ft.	54 ft. 4 in.
7 Southern States, farm owner-operators:				
Quart jars.....	330	113 ft.	56 ft. 8 in.	37 ft. 8 in.
Pint jars.....	77	25 ft. 8 in.	13 ft.	8 ft. 8 in.
Half-gallon jars.....	122	50 ft. 10 in.	25 ft. 5 in.	17 ft. 1 in.
Total.....		189 ft. 6 in.	95 ft. 1 in.	63 ft. 5 in.
11 Western States, farm operators:				
Quart jars.....	315	105 ft.	52 ft. 8 in.	35 ft.
Pint jars.....	84	28 ft.	14 ft.	9 ft. 4 in.
Jelly glasses.....	63	15 ft. 9 in.	8 ft.	4 ft. 3 in.
Total.....		148 ft. 9 in.	74 ft. 8 in.	48 ft. 7 in.

EMPTY CONTAINERS

12 Northeastern States, farm owner-operators:				
Quart jars.....	138	46 ft.	23 ft.	15 ft. 4 in.
Pint jars.....	51	17 ft.	8 ft. 8 in.	5 ft. 8 in.
Jelly glasses ²				
Total.....		63 ft.	31 ft. 8 in.	21 ft.
7 Southern States, farm owner-operators:				
Quart jars.....	108	36 ft.	18 ft.	12 ft.
Pint jars.....	30	10 ft.	5 ft.	3 ft. 4 in.
Half-gallon jars.....	30	12 ft. 6 in.	6 ft. 3 in.	4 ft. 2 in.
Total.....		58 ft. 6 in.	29 ft. 3 in.	19 ft. 6 in.
11 Western States, farm operators:				
Quart jars.....	77	25 ft. 8 in.	13 ft.	8 ft. 8 in.
Pint jars.....	53	17 ft. 8 in.	9 ft.	6 ft.
Jelly glasses.....	50	12 ft. 6 in.	6 ft. 3 in.	4 ft. 3 in.
Total.....		55 ft. 10 in.	28 ft. 3 in.	18 ft. 11 in.

¹ Comparable data not available for the North Central region.

² Number not available.

TABLE 12.—Dimensions of a 9-shelf storage unit¹ for the median and third quartile number of jars reported full and empty in 3 regions

Region	Two-row storage			Three-row storage		
	Width ²		Depth ²	Width ²		Depth ²
	Median number of jars	Third quartile number of jars		Median number of jars	Third quartile number of jars	
FULL JARS						
	<i>Feet</i>	<i>Feet</i>	<i>Inches</i>	<i>Feet</i>	<i>Feet</i>	<i>Inches</i>
12 Northeastern States.	5 $\frac{3}{4}$	9	8 $\frac{1}{2}$	4	6	12 $\frac{1}{2}$
7 Southern States.....	5 $\frac{2}{3}$	10 $\frac{2}{3}$	10 $\frac{1}{2}$	4	7	15 $\frac{1}{2}$
11 Western States.....	4 $\frac{2}{3}$	8 $\frac{1}{3}$	8 $\frac{1}{2}$	3 $\frac{1}{3}$	5 $\frac{3}{4}$	12 $\frac{1}{2}$
EMPTY JARS						
12 Northeastern States.	2	3 $\frac{3}{4}$	8 $\frac{1}{2}$	1 $\frac{1}{4}$	2 $\frac{1}{3}$	12 $\frac{1}{2}$
7 Southern States.....	1 $\frac{3}{4}$	3 $\frac{1}{3}$	10 $\frac{1}{2}$	1 $\frac{1}{3}$	2 $\frac{1}{3}$	15 $\frac{1}{2}$
11 Western States.....	2	3 $\frac{1}{4}$	8 $\frac{1}{2}$	1 $\frac{1}{4}$	2 $\frac{1}{3}$	12 $\frac{1}{2}$

¹ Height of the top shelf is 73 inches if 1-inch shelving is used and 4 shelves are spaced for pint jars and 5 for quart jars.

² Inside dimensions.

ADEQUACY OF COUNTER WIDTHS FOR PREPARING FOOD FOR FREEZING AND FOR MEALS

FREEZING.—Results of the farm housing surveys that were made in 1948-49 (4), showed that only one-eighth to one-third of the families preserved food by freezing. During the following 5 years, however, over 4 million home freezers were sold. The space recommendations developed for canning were therefore tested for adequacy for preparing foods for freezing.

The following three arrangements and widths of 24-inch-deep counters were used:

Straightline; 60 inches wide,⁷ placed between two walls.⁸

L-shaped; left arm 24 inches wide, range at end; right arm 44 inches wide,⁷ sink at end.

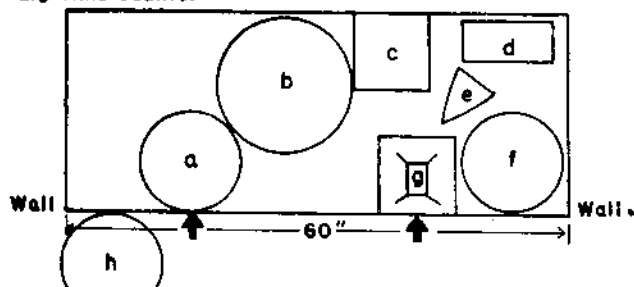
Divided; one counter 36 inches wide with sink at the right end and wall at the left end; second counter 36 inches wide on opposite wall,⁸ with range at the right end, wall at the left end.

Since vegetables generally require more preparation for freezing and therefore more utensils than fruit, the counter dimensions in each arrangement were tested by preparing peas and green beans. Peas were washed at the sink and shelled at the counter; beans were washed at the sink then trimmed and cut on a board on the counter or trimmed at the sink and cut at the counter. The vegetables were blanched and cooled before being packed, as recommended by the United States

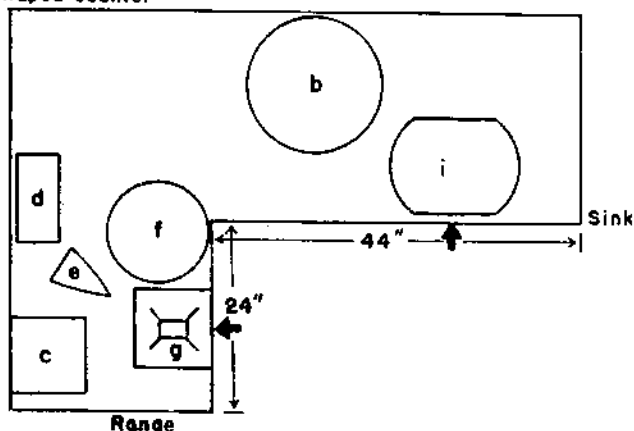
⁷ Widths determined for canning adjusted to the nearest 4-inch module.

⁸ Walls also represent high equipment such as refrigerator or floor-to-ceiling cabinets.

Straightline counter



L-shaped counter



Divided counter

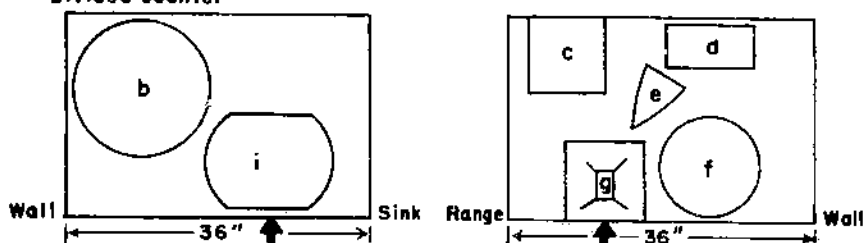


FIGURE 9.—Placement of utensils for preparing vegetables for freezing, on three types of counters 24 inches deep. (Arrows indicate the position of the worker when preparing the vegetables and when filling the containers.)

Key to utensils.—(a) Colander for shelled vegetable, (b) dishpan for washed vegetables, (c) square pan for boxes after being filled, (d) containers to be filled, (e) iron, (f) blancher with vegetable placed in pudding pan, (g) box filler, (h) container for hulls, (i) flat pan with cutting board across top.

Department of Agriculture (9). Cardboard cartons, rigid plastic containers, and plastic bags were used for packaging.

The 60-inch straightline counter was adequate for one and for two workers to prepare vegetables for freezing. This width was 6 inches less than that required for two persons to can vegetables. The widths of L-shaped and divided counters used were also adequate for one and two persons to work. Figure 9 shows the placement of utensils on each type of counter.

FAMILY MEALS.—Since a large proportion of the homemakers interviewed in the farm housing study (4) preferred the kitchen for food preservation activities, the space for canning was tested for adequacy in meal preparation.

A review of the housing survey data pertaining to meal service indicated that the preparation and serving of meals to six persons would be an adequate test for the counter space. In the majority of households, one person worked alone on meal preparation. The counters were therefore tested with one worker.

The following five arrangements of counters 24 inches deep were used for the tests:

Straightline; 60 inches wide,⁹ sink at the left end, range at the right end.

L-shaped counter; left arm 36 inches wide, sink at end; right arm 28 inches wide, range at end.

L-shaped counter; left arm 24 inches wide, range at end; right arm 32 inches wide, sink at end.

Divided counters; each 36 inches wide,⁹ arranged on one wall with sink between counters and range at right end.

Divided counters; each 36 inches wide,⁹ on opposite walls, one with sink at left end; other with range at right end.

Dinners were prepared and served, since this meal normally requires the preparation of more food than either breakfast or lunch. The following menus were used:

I	II
Fried Chicken and Gravy	Roast Beef and Gravy
Mashed Potatoes — Buttered Broccoli	Baked Potatoes — Glazed Carrots
Waldorf Salad (apples, celery, nuts)	Vegetable Salad
Hot Biscuits—Butter or Margarine	Bread—Butter or Margarine
Coconut Cream Pie	Fruit Gelatin with Whipped Cream
Milk—Coffee	Cookies
	Milk—Coffee
III	
Ham and Macaroni Loaf	
Snap Beans	
Whole Wheat Rolls—Butter or Margarine	
Relish Tray (celery, carrots, radishes, pickles)	
Pineapple Upside-down Cake with Whipped Cream	
Milk—Coffee	

Each dinner was prepared twice in the five arrangements of counters and equipment, once to familiarize the worker with the placement of supplies and equipment, and the second time to provide a record of how the counter space was used. Tape recordings were made of the procedure of work and diagrams drawn to show placement of utensils on the counter.

Biscuits, rolls, and pie were prepared at the same time as the other food for the dinner; loaf bread and cookies were prepared in advance, when no other preparation was under way.

In serving, the counter was used only for salads and desserts; vegetables and meats were put on platters placed on the range to warm. Before dessert and coffee were served, plates and serving dishes were removed from the dining table and stacked on the counter next to the sink.

⁹ Widths determined for canning adjusted to nearest 4-inch module.

The five widths and arrangements of 24-inch-deep counters were found to be more than adequate for one worker to prepare and serve dinner to six persons and to make cookies and bread.

Serving salads and desserts, and stacking dishes at the end of the meal required more space than any other operation. No attempt was made in this study to test the space for adequacy or convenience for dishwashing.

CONCLUSIONS

It is recognized that the kitchen and workroom cannot be planned independently from the rest of the house, and that frequently a room is so oriented that it is difficult to achieve the most desirable arrangements of work space and equipment. Therefore, detailed designs of food preservation areas have not been prepared. The recommendations made here, based on the results of the present study, serve as guides to the designer in providing the best possible arrangement of the specific area allocated in a given plan to food preservation activities.

SHAPE OF COUNTER.—L-shaped work spaces of the width found adequate permit greater choice in the way utensils are arranged and are less crowded than either straightline or divided counters of adequate width. The extra space in the corner of the L can be used for supplies such as washed jars. Walking is also less in arrangements with L-shaped counters.

RELATIONSHIP OF COUNTER TO RANGE AND SINK.—Arrangements with the range and sink contiguous to the counter are the most convenient, since less walking is required than when equipment is separate from the counter. Placing the sink at the right end of the straightline or L-shaped counter and the range at the left end is the best arrangement from the standpoint of walking required. However, for the right-handed person the reverse arrangement is generally more convenient for working. Utensils can be pre-positioned on the counter, thus eliminating heavy lifting, and the kettle of hot food does not have to be lifted over other utensils in order to place it in the desired position on the counter.

Arrangements with two counters, one adjacent to the range and the other adjacent to the sink, require less walking than the straightline counter arrangements. One counter should be placed to the right of the sink and the other to the left of the range, so that utensils can be pre-positioned and lifting held to a minimum.

DEPTH OF COUNTER.—For utensils of the size and shape used in this study, a work space 28 inches deep is more desirable than one 24 inches deep. Smaller utensils, which can be arranged without crowding on a 24-inch-deep counter, could be used but more walking would be required during the canning operation.

WIDTH OF COUNTER.—Because the width of a counter required for canning is dependent on the arrangement of the counter, the equipment and walls, the foods to be canned, and the number of workers, it is not possible to select one width for each type of counter as a general recommendation.

Table 13 presents recommended widths, adjusted to a 4-inch module, for each type of counter with the range and sink adjacent. Widths that were only 1 inch greater than a modular figure were lowered; all others were raised. In selecting these widths, greater weight was given to space needs for canning fruits and vegetables than to those

for meat, since few families reported canning meat. The width of counter to provide in kitchens where the range and sink cannot be placed adjacent to the counter can be found in tables 3 to 6.

The widths of counters recommended do not provide space for placing kettle lids when not on the kettles. If the range top cannot be used for them, an additional counter or surface will be needed.

The amount of counter required for canning is adequate for preparing food for freezing and family meals. However, for convenience in dishwashing, it is desirable to have counter space on both sides of the sink. Only one arrangement of this type was studied—the divided counter arranged on one wall with the sink between the counters.

TABLE 13.—Widths of straightline, L-shaped, and divided counters 28 and 24 inches deep, recommended for arrangements with sink and range adjacent to counter

Type of counter, location of equipment, and number of workers	Width recommended for counter—	
	28 inches deep	24 inches deep
Straightline counter:		
Sink at left end, range at right end:	<i>Inches</i>	<i>Inches</i>
1 worker.....	52	60
2 workers.....	68	68
Sink at right end, range at left end:		
1 or 2 workers.....	64	68
L-shaped counter:		
One worker:		
Right arm:		
Sink at end.....	32	32
Range at end.....	28	28
Left arm:		
Sink at end.....	36	36
Range at end.....	24	24
Two workers:		
14 inches added to right arm, to provide standing room for worker at left arm:		
Right arm:		
Sink at end.....	44	44
Range at end.....	48	48
Left arm:		
Sink at end.....	36	36
Range at end.....	24	24
14 inches added to left arm, to provide standing room for worker at right arm:		
Right arm:		
Sink at end.....	24	24
Range at end.....	28	28
Left arm:		
Sink at end.....	52	56
Range at end.....	44	44
Divided counter:		
Preparation counter:		
Sink at end:		
1 or 2 workers.....	36	36
Packing counter:		
Range at end:		
1 or 2 workers.....	32	36

STORAGE REQUIREMENTS.—A storage unit 4 to 6 feet wide, with 9 shelves 12½ inches deep, will be adequate for the canned food reported by most of the families in the Northeastern and Western States. Southern families need a cabinet 4 to 7 feet wide and 15½ inches deep. The smaller cabinet will take care of the median number of jars and the larger the third quartile number. In addition, another cabinet of the same height, 12½ or 15½ inches deep and 16 to 28 inches wide, is needed for the empty jars reported. A base cabinet with a minimum depth and width of 18 inches and a door at least 16 inches wide will accommodate one pressure canner and two kettles; a cabinet with an inside depth of 24 inches and width of 28 to 34½ inches will accommodate one pressure canner and one water-bath canner, as well as several kettles.

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