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EC709 Homemade Food Driers : Their Construction and Use

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HOMEMADE FOOD DRIERS

THEIR CONSTRUCTION AND USE

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HOMEMADE FOOD DRIERS

History of Drying

Drying is one of the oldest known methods of preserving perishable foods. There are no definite records of when it was first used but histories of ancient times mention it briefly. The early settlers of this country dried must of their food and the practice has been continued to some extent throughout the years. Other methods of preservation have gradually replaced it, for one reason or another, but the present emergency is reviving interest in it.

Methods of Preservation

Drying, canning, freezing and storing are four effective processes used in the preservation of perishable and semi-perishable foods. No one of these methods is suitable for all types of products. Asparagus should not be dried, potatoes can be kept without canning, peas should not be stored and cabbage is not adapted to freezing. Some products can be preserved successfully in one or two and sometimes three ways. The method used, in such cases, is governed by the time and equipment available and personal preferences.

Factors Governing Selection of Method to be Used

Each method has its advantages and disadvantages. Freezing requires access to locker plants, canning requires considerable equipment and a plentiful supply of storage containers, while drying requires less equipment and fewer storage containers than canning. The time needed for drying, however, is greater than for either of the other two methods. Present conditions are creating other complications which undoubtedly will influence the homemaker's selection of the methods she will use. Tire shortages will curtail travel to and from freezing plants. Tin for home canning is not available. The manufacture of jar lids, jar rubbers and pressure cookers is being curtailed. Therefore, any method of preserving food which eliminates or reduces the need for such items merits consideration even though labor shortages exist. The equipment needed for drying is not expensive and can be built by anyone who can use a hammer and saw.

Purposes and Principles of Drying

The growth of bacteria and molds are the two main causes of spoilage in raw food. Such growth can be prevented by the removal of the greater part of the water present in the raw food. Drying is an effective means of removing this water but must be done correctly if a nutritive, palatable product is to be obtained. Best results occur when the food is exposed to dry air having sufficiently high temperatures to assure drying at a fairly rapid rate, but not so high as to produce "cooking" or "scorching." Successful drying depends upon four things:

1. The quality of the product to be dried.
2. The protection of the product against dust and insects while being dried.
3. The completeness and speed of the drying operations.
4. The correct storage of the dried product.

Drying should never be considered as a means of utilizing inferior products. If they are not good enough to can, freeze, or use fresh they are not good enough to dry. Food which is to be dried needs just as careful preparation as if it were to be canned or frozen. The results will be best when the fruit or vegetables

are taken from the orchard or garden, correctly prepared and dried in the shortest possible time. Detailed instructions on preparation of food for drying are given in C. C. #49, "Drying and Brining."

Not all fruits or vegetables lend themselves to drying and the homemaker will avoid disappointment and waste if she will dry only those products which are most suitable for this process. Apples, apricots, cherries, peaches, pears, and plums have been dried successfully for many years. Beans, corn, kale, peas, pumpkin and squash, as well as some of the seasonings, such as parsley, celery leaves and sage also have been processed in this manner with excellent results. Undoubtedly there are other fruits and vegetables which may be dried but under the present conditions it is doubtful whether the homemaker should risk large quantities of other products as an experiment. Small trial amounts might well be dried however, in anticipation of more extensive drying in the future.

Factors Involved in Drying

There are two main factors involved in successful drying. These are:

1. The temperature of the air surrounding the product.
2. The rate of air movement.

Warm, dry air moving over the exposed surfaces of the product to be dried will absorb moisture from it. The higher the temperature of the air the more moisture it will absorb, and the greater the air movement the faster the moisture will be carried away. Air at a temperature of 82° will carry over twice as much moisture as 62° air, while air at 130° has over eight times the moisture-carrying capacity of 62° air. Experiments have shown that the most successful drying usually is accomplished when the air temperature is between 120° and 160°. Temperatures below 120° result in slow drying and permit a certain amount of deterioration to take place before the product is dried completely. Starting temperatures over 160° may cause some "cooking" which in turn results in an inferior product. Best results are obtained in most cases by starting the drying operation at about 135° and if possible gradually increasing the heat up to 160°. This is not always possible but for products which require a high finishing temperature a few moments in the oven, after they have been removed from the drier, will suffice. Too much heat at the start causes excessive drying of the outside surface, thereby retarding evaporation of moisture from the inside. This is particularly true in the case of halved fruits.

Drying Methods

There are two main methods of drying - one by utilizing the heat from the sun and the other by the use of artificial heat. Each of these two main methods has several variations. Adequate air movement is essential in both methods. One of the main causes of unsatisfactory drying is insufficient air movement and lack of uniformity of the air flow. All types of driers must be so constructed that the air moves over or through the entire tray or trays of food, and is not short circuited through any particular part of the drier.

Sun Drying

The simplest process is to expose the product to the direct rays of the sun on a screen-covered frame. This frame must be supported in such a manner as to encourage the flow of air through it. The food must be protected from dust and insects by a screen or cheese cloth covering.

Effective drying can be done in this manner although it is the slowest of all methods. Success is possible only when temperatures remain high and the air is dry over a period of several days.

Heat from the sun can be utilized more effectively if trays of fruit or vegetables can be placed under glass with proper control of air circulation.

Artificial Heat

Artificial heat may be obtained for drying from the ordinary wood-coal kitchen range or by the use of electricity. The former source requires a drier which can be placed upon the cooking surface of the range while an electric drier can be located any place where there is access to a convenience outlet. It is not practical to use electric driers on 32-volt current.

Drier Design and Construction

Complete construction details for different types of driers, along with bills of material, construction hints and suggested uses, are given on the following pages. Every attempt has been made to use common materials in a simple manner, thereby making construction easy and keeping costs at a minimum. Those dimensions which may have to be altered to meet individual circumstances are indicated. Other dimensions which should not be changed are noted and the reasons given.

Materials:

Framework: White pine is preferred for all framwork as it is easy to use, is straight and free from knots and does not split easily when nailed.

Trays: Wire-covered white pine frames are durable, lightweight and permit adequate air circulation.

Wire: Galvanized window screen or 1/4 inch mesh galvanized hail screen is recommended for tray coverings. Hail screen also is called muskrat or hardware cloth. Copper screen has been recommended in the past for trays because it did not discolor the product being dried. It is no longer available. Galvanized material may be used without difficulty if the trays are scrubbed vigorously with a strong vinegar solution and then rinsed with clear water before they are used the first time. Any slight discoloration which may appear on the first load dried need not cause alarm. It does not injure the product and will disappear shortly after drying is finished.

Black window screen should not be used for tray coverings because of resulting difficulties from the paint.

Air vent coverings: Galvanized house screen, cheese cloth or mosquito netting may be used to cover all openings needed for air movement. Hail screen should not be used as it is not fly tight. Cheese cloth and mosquito netting are less expensive than house screen, but are much more subject to damage.

Wall Coverings: Sturdy, lightweight material such as any of the 1/8 inch hardboards or 1/4 inch plywood are recommended for the exterior material of driers using artificial heat. Such material has a smooth surface which eliminates cracks, is easy to work, simplifies construction, and results in a rigid, lightweight article.

Screen Type Sun Drier

Bill of Material

Lumber

A	4 - 1"x2"x5'-0"	white pine
B	2 - 1"x2"x5'-0"	" "
C	4 - 1"x2"x1'-0"	" "
D	3 - 1"x2"x2'-0"	" "
E	2 - 1"x2"x2'-6"	" "
F	3 - 1"x2"x2'-0"	" "
G	1 - ¼"x12"x1'-6"	plywood (lid braces)

Hardware

1 pair 2" butt hinges
24 6d box nails for frame
12 10d finish nails for fastening side rails of bottom to cross pieces
6 3" round head screws for fastening side rails of lid to cross pieces
1 box tacks or screen staples for fastening screen wire or cheese cloth
36 blue lath nails for lid braces

Screen

1 piece 26" width galvanized house screen 5 feet long for bottom.

1 piece 26" width galvanized house screen 5 feet long for lid (cheese cloth may be used if preferred, but is not recommended.)

1 piece 24" width galvanized house screen 5 feet long for sides and ends. This should be cut into 3 strips 8 inches wide and 5 feet long. Two of these strips are used for the sides and the other is cut into 2 pieces 2 feet 6 inches long for the ends. (Cheese cloth may be used for side and end coverings if preferred).

Construction Hints

No difficulty should be experienced in constructing this drier if the details on page 5 are followed.

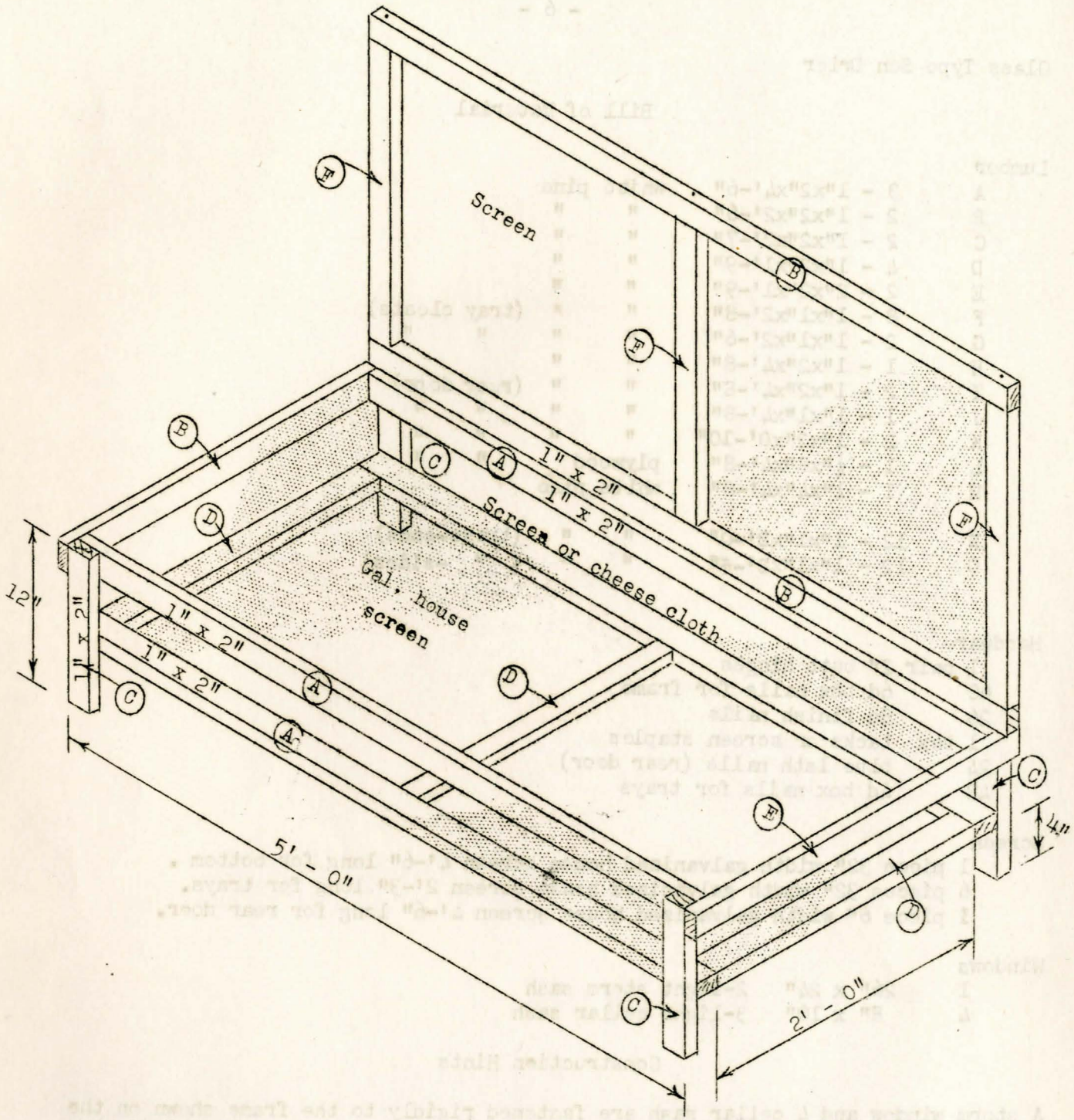
The side pieces of the bottom should be end nailed to the cross pieces with 10d finish nails - 2 to each joint.

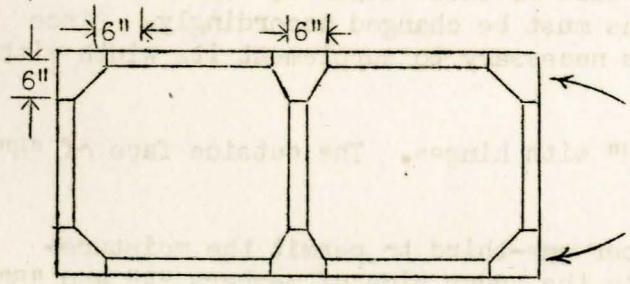
The side pieces of the lid should be fastened to the cross pieces with 3" round head screws - 1 to each joint.

Thin strips of wood may be used to cover ragged edges of screen wire.

Should cheese cloth be used wrapping the edges around thin strips of wood permits taut stretching.

The lid should be braced as shown and the bottom of the drier should be at least 4 inches above the ends of the legs as indicated.





Small scale view of top lid showing corner braces of thin material

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Glass Type Sun Drier

Bill of Material

Lumber

A	3 - 1"x2"x4'-6"	white pine	
B	2 - 1"x2"x2'-6"	" "	
C	2 - 1"x2"x2'-7"	" "	
D	4 - 1"x2"x1'-9"	" "	
E	2 - 2"x2"x1'-9"	" "	
F	8 - 1"x1"x2'-8"	" "	(tray cleats)
G	2 - 1"x1"x2'-6"	" "	" "
H	1 - 1"x2"x4'-8"	" "	
I	2 - 1"x2"x4'-8"	" "	(rear door)
J	1 - 1"x1"x4'-8"	" "	" "
K	2 - 1"x2"x0'-10"	" "	" "
L	1 - ¼"x8"x4'-8"	plywood	" "
M	1 - 1"x4"x4'-8"	white pine	
N	12 - 1"x1"x2'-0"	" "	(trays-ends)
O	12 - 1"x1"x2'-6"	" "	(" -sides)

Hardware

1 pair	2" butt hinges
60	6d box nails for frame
26	8d finish nails
1 box	tacks or screen staples
24	blue lath nails (rear door)
48	4d box nails for trays

Screen

1 piece 32" width galvanized house screen 4'-6" long for bottom .
6 pieces 32" width galvanized house screen 2'-3" long for trays.
1 piece 6" width galvanized house screen 4'-6" long for rear door.

Windows

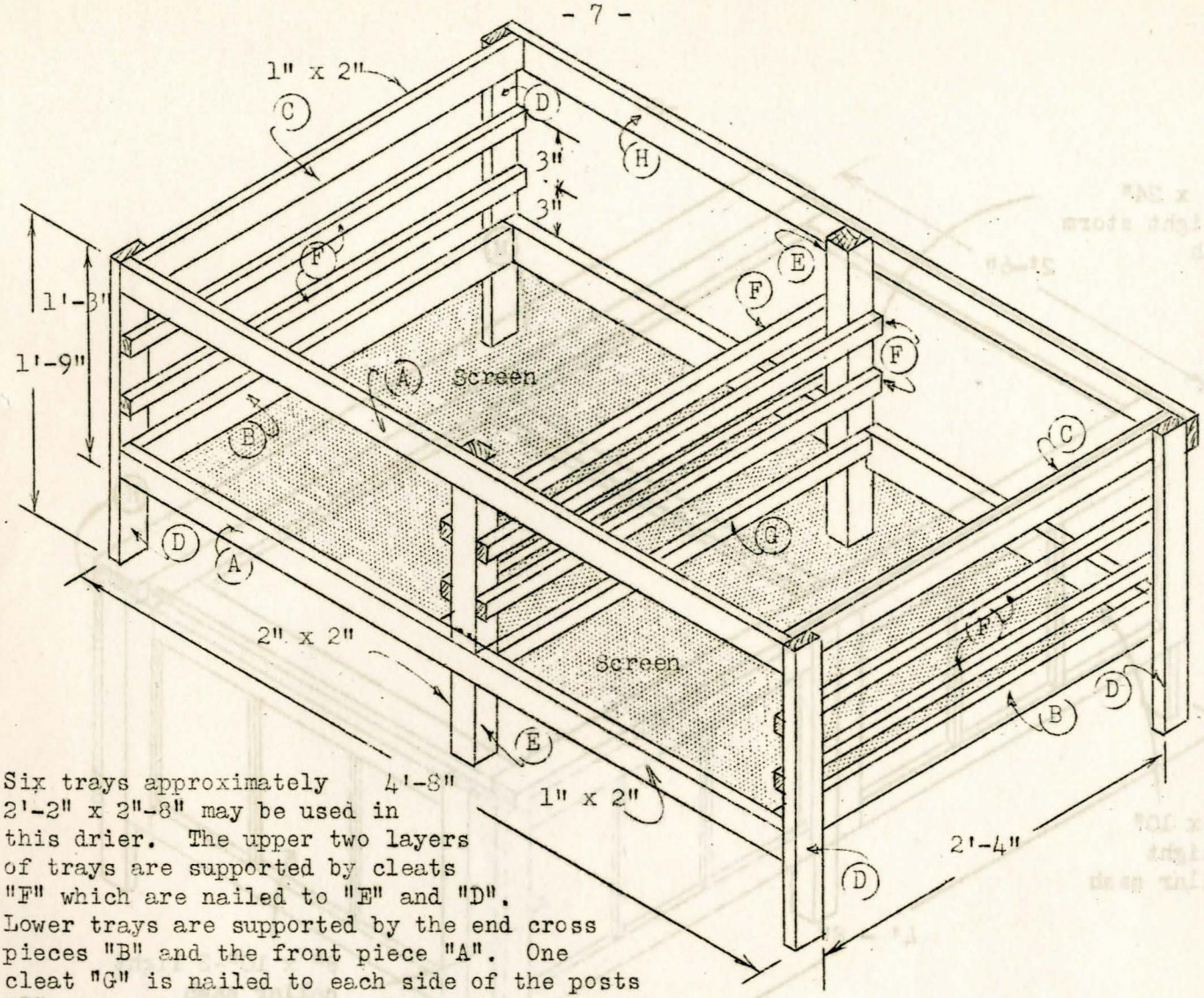
1	26" x 24"	2-light storm sash
4	8" x 10"	3-light cellar sash

Construction Hints

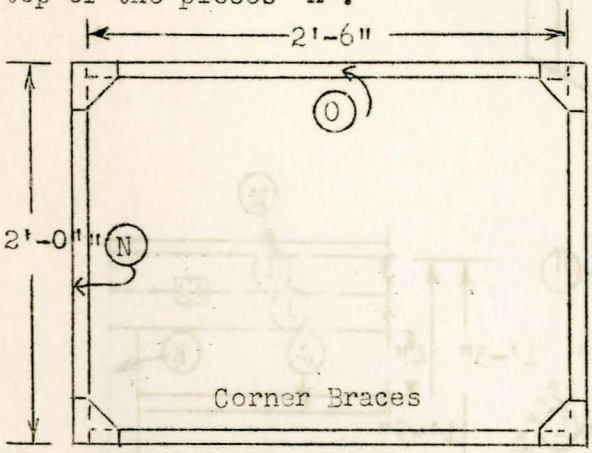
A storm window and 4 cellar sash are fastened rigidly to the frame shown on the next page. Attention is called to the size of these windows. Should other sized sash be used, the frame dimensions must be changed accordingly. Since the storm sash is only 2'-6" wide it is necessary to supplement its width with a 1"x4" marked "M".

A rear door is attached to the 1"x2" "H" with hinges. The outside face of "H" is flush with the rear edge of "M".

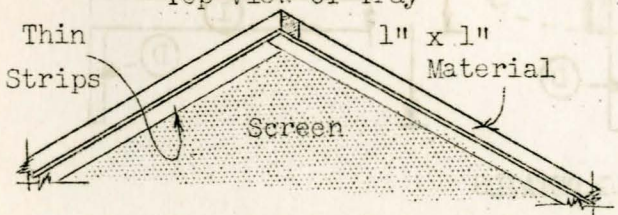
The rear door has screen across the upper one-third to permit the moisture-laden air to escape. Screen fastened to the under side of members "A" and "B" allows air to enter but prevents flys from getting on the food.



Six trays approximately 4'-8" 2'-2" x 2"-8" may be used in this drier. The upper two layers of trays are supported by cleats "F" which are nailed to "E" and "D". Lower trays are supported by the end cross pieces "B" and the front piece "A". One cleat "G" is nailed to each side of the posts "E", the top of the cleats being flush with the top of the pieces "A".



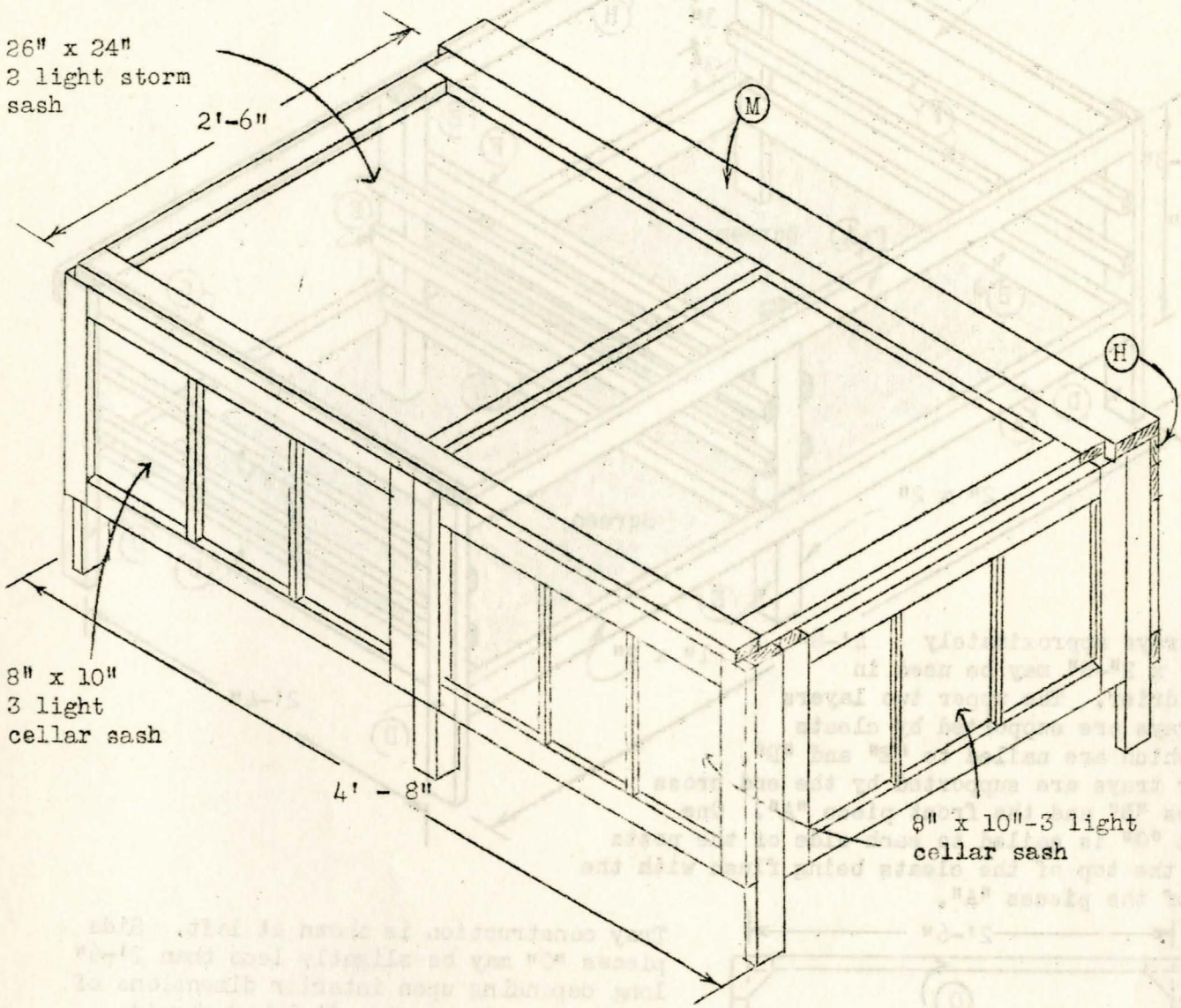
Top View of Tray

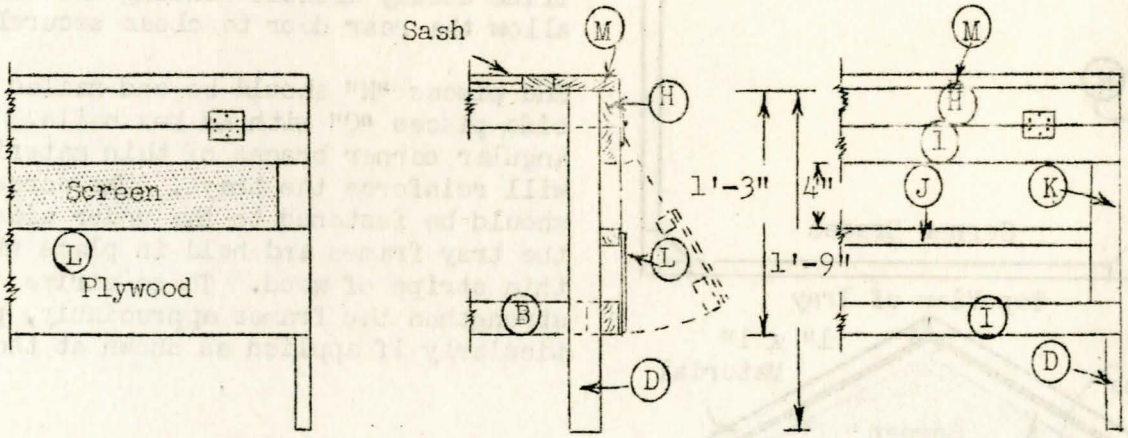


Tray Corner from Underneath

Tray construction is shown at left. Side pieces "O" may be slightly less than 2'-6" long depending upon interior dimensions of the drier. Trays when finished should slide easily without binding and should allow the rear door to close securely.

End pieces "N" should be end nailed to side pieces "O" with 4d box nails. Triangular corner braces of thin material will reinforce the trays. The screen should be fastened to the under side of the tray frames and held in place with thin strips of wood. These strips strengthen the frames appreciably, particularly if applied as shown at the left.





REAR DOOR FRAMING DETAILS

Completed door from rear

Framing from end showing way door swings

Framing from rear

Range Type Artifical Heat Drier

This drier is to be used on top of a wood - coal range. It must be constructed or used in a manner to prevent danger from fire. It could be placed on bricks thereby eliminating the necessity of the legs being extended below the body of the drier. Since this might not always be convenient, long furniture screws could be inserted into the ends of the legs as shown. Such an arrangement would provide an easy method of leveling the drier.

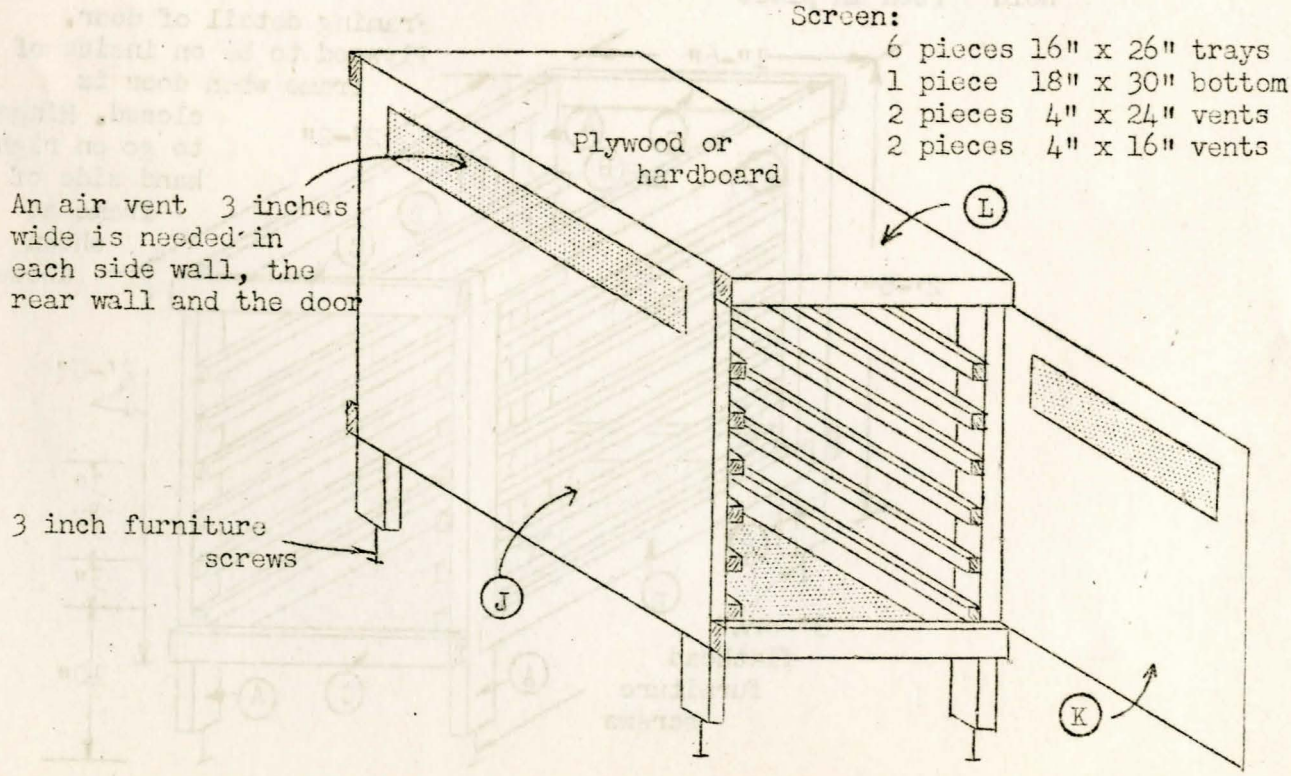
Air circulation and fly protection are provided by the use of screen wire on the bottom of the framework, over the air vent openings near the top of the side and rear walls and in the door.

The construction of the frame is shown on the next page. The exterior covering may be plywood or any of the hardboards. Such material is light weight and rigid thereby giving a sturdy drier and yet one which may be moved easily.

The dimensions of this drier may be changed to fit the range upon which it will be used. Three dimensions should not be changed. The lower tray should be 10 inches above the surface of the range. The tray cleats should not be spaced less than $2\frac{1}{2}$ inches from top to top - and not over 3 inches. The top of the upper cleats should be even with the bottom edge of the air vent and at least 3 inches from the top of the drier.

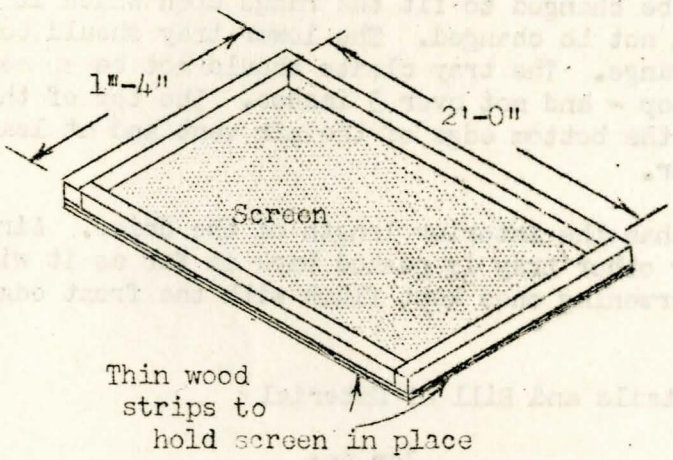
The trays are slightly shorter than the interior length of the drier. Air flow will be facilitated if every other tray is pushed back as far as it will go and the front edge of the intervening ones kept flush with the front edge of the front legs.

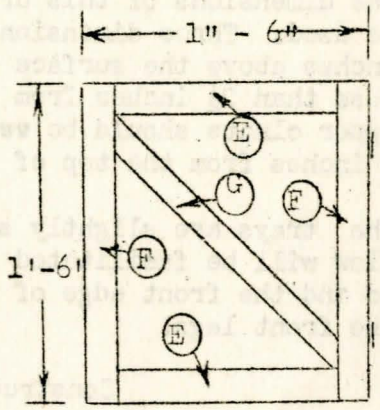
Construction Details and Bill of Material



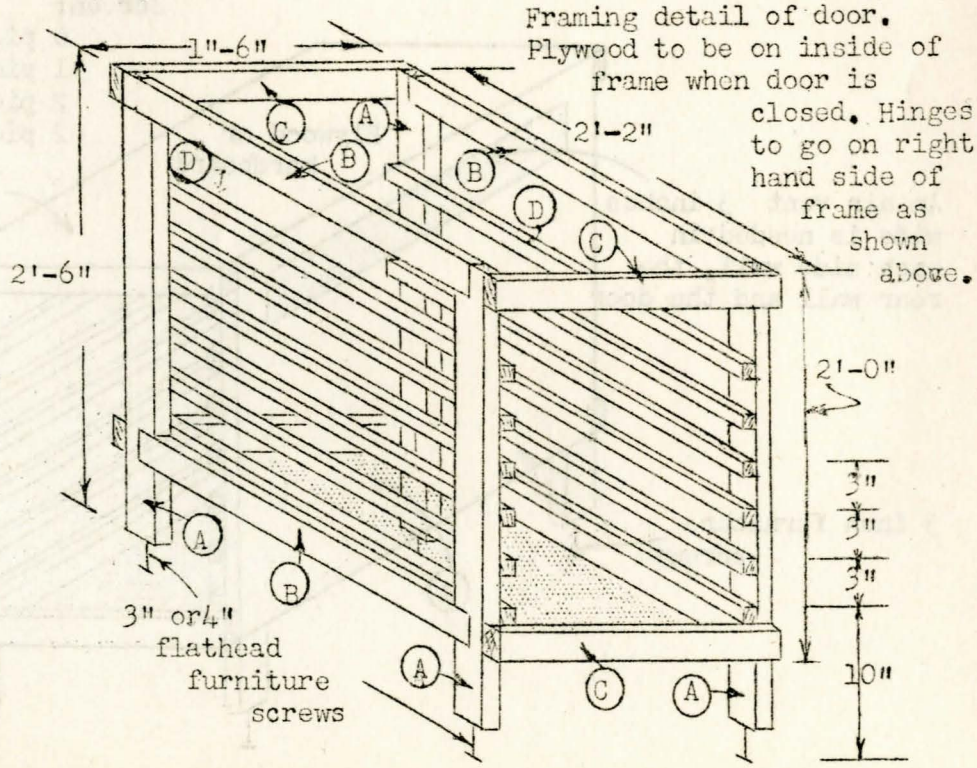
Bill of Material continued

Lumber		Hardware	
A	4 - 1" x 2" x 2'-6" white pine	1	pair 2" butt hinges
B	4 - 1" x 2" x 2'-0" " "	1	door knob or handle
C	4 - 1" x 2" x 1'-6" " "	2	friction catches for door
D	12 - 1" x 1" x 2'-2" " " -cleats	1	box tacks or screen staples
E	2 - 1" x 2" x 1'-3" " " -door	28	6d box nails for frame
F	2 - 1" x 2" x 1'-9" " " -door	10	8d finish nails - door
G	1 - 1" x 2" x 1'-10" " " -door	64	4d box nails - trays and cleats
H	12 - 1" x 1" x 2'-0" " " -trays		
I	12 - 1" x 1" x 1'-4" " " -trays	60	blue lath nails for exterior covering
J	2 - $\frac{1}{4}$" x 24" x 26" plywood-sides		
K	2 - $\frac{1}{4}$" x 18" x 20" " -rear & door	4	3" or 4" furniture screws
L	1 - $\frac{1}{4}$" x 18" x 28" " -top		





Framing detail of door. Plywood to be on inside of frame when door is closed. Hinges to go on right hand side of frame as shown above.



Electric Type Artificial Heat Drier

This drier is designed so that the heat from nine 100-watt bulbs is utilized to dry food. In the past, electric heating elements have been used in electric driers, but as these are now off the market, lamp bulbs have been substituted.

The top is hinged at the front edge so that a fan can be installed at the back, which will exhaust the moisture-laden air from the drier. If the drier is used in front of an open window this air will be blown out of the room, thereby not adding to the heat or humidity which already may be present.

BILL OF MATERIAL

Lumber

A	2 – 1" x 6" x 1'–6"	white pine	
B	2 – 1" x 2" x 2'–8"	" "	
C	2 – 1" x 2" x 3' – 0"	" "	
D	2 – 1" x 2" x 1'–6"	" "	
E	2 – 1" x 2" x 1'–8"	" "	
F	1 – 1" x 6" x 1'–8"	" "	
G	2 – 1" x 6" x 1'–8"	" "	(ripped to size)
H	12 – 1" x 1" x 1'–8"	" "	(tray cleats)
I	2 – 1" x 2" x 2'–0"	" "	(base cleats)
J	2 – ½" x 1" x 1'–6"	" "	(base cleats)
K	2 – ½" x 1" x 1'–4"	" "	
L	1 – ¼" x 1'–5" x 1'–6"	plywood for base	
M	7 ft. of ½" x 1"	strip	
N	1 – 1" x 8" x 1'–6"	white pine	(fan shelf)
O	2 – ¼" x 1' – 10" x 3'–0"	plywood	(sides)
P	1 – ¼" x 1'–7" x 2'–6"	"	(door)
Q	2 – 1" x 10" x 2'–0"	white pine	(top)
R	1 – ¼" x 1'–6" x 2'–0"	plywood	(top)
S	1 – ½" x 1'–8" x 2'–6"	insulation board	(back)
T	2 – ½" x 1'–6" x 2'–6"	" "	(sides)
U	1 – ½" x 1'–6" x 2'–3"	" "	(door)
V	1 – ¼" x 1'–6" x 6'–0"	plywood	(air shields)
W	24 – 1" x 1" x 1'–6"	white pine	(trays)

Hardware

1 pair	1½" butt hinges
1 pair	1½" offset cabinet hinges
2	friction catches
1	cabinet knob
2	hooks & eyes made of #9 wire
14	10d finish nails for end nailing
72	6d box nails for framing
1	box tacks or screen staples

Screen

6 pieces	18-inch width galvanized house screen (or hardware cloth) 1'–6" long (trays)
1 piece	18-inch width galvanized house screen 1'–6" long for under side of base to screen air inlets.
2 pieces	4" width galvanized house screen 1'–6" long for inside of piece "E" and "F" to screen air inlets.

Electrical Materials

9	two-piece porcelain cleat receptacle with screws
20 ft.	#14 brewery cord (2 wire)
1	plug cap
9	100-watt mazda lamp bulbs

Construction Hints

Air enters the drier through small holes in boards "G" and "F", is drawn up through holes in the board "L" on which the receptacles are fastened, and is heated as it passes over and around the lamp bulbs. It is important that the total area of the holes in "G" and "F" be greater than the total area of the holes in "L". The holes in "L" should be located approximately as shown to assure an even flow of air. Galvanized house screen should be used on the under side of "L" and on the inside of "G" and "F" to stop the entrance of flies.

The drawings on page 14 show the frame construction. Attention is called to the 2 pieces "E". The front one should be shorter than the rear one so that it will fit between pieces "B".

Pieces "G" must be ripped to the correct width from 1" x 6" material. The strip ripped off will provide material with which the insulation board may be blocked into place.

A halved joint is used where the braces "I" cross. Cleats "J" and "K" upon which the base "L" rests are far enough above braces "I" to permit easy flow of air through inlet holes. All joints must be snug and tight to prevent air leakage.

Tray cleats are spaced as shown. Stop blocks are placed on the far ends of every other cleat and on the near ends of the intervening cleats. This assures staggering the trays to facilitate air circulation.

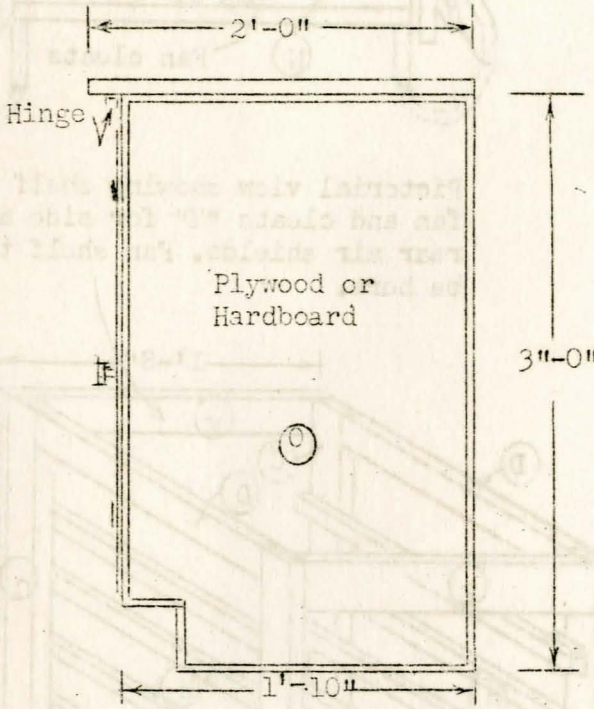
The location of fan shelf "N" and the dimensions of the air shields "V" are determined by the size and shape of the fan used. An 8-inch fan has been used with success.

The trays are square so that no difficulty will arise if they are turned.

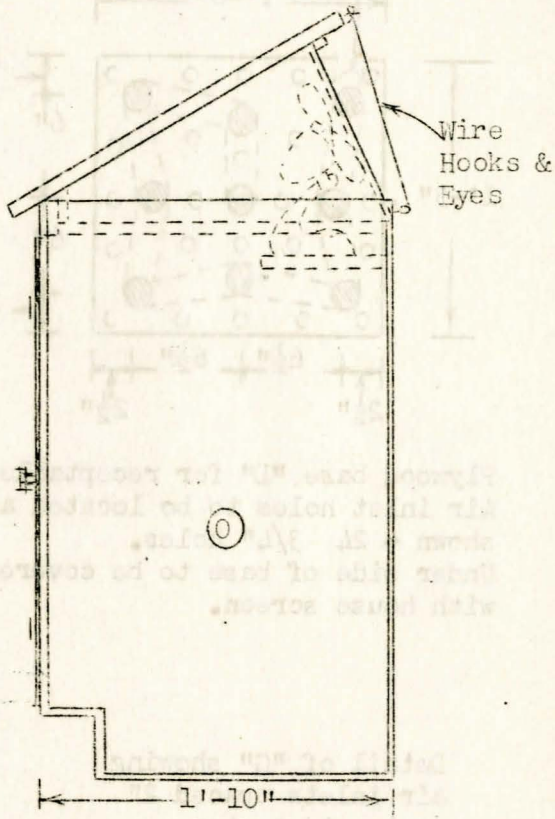
To keep operation costs at a minimum it is suggested that the interior of this drier be vapor sealed. Two coats of best quality aluminum paint are recommended. Such sealing prevents moisture being absorbed by the insulating material. Insulation of any type is effective only when completely dry. Ordinary lead and oil paint should not be used on the inside of this drier.

When the drier is not being used for food drying it can be used as a work surface and kitchen cabinet. The top, finished with hardboard or linoleum, lowers into position when the air shields are removed. The tray cleats are far enough apart to permit two trays on each cleat. By "doubling up" the trays on the lower cleats storage space is available in the upper part of the cabinet. Plywood shelves the same size as the trays may then be used on some of the upper cleats.

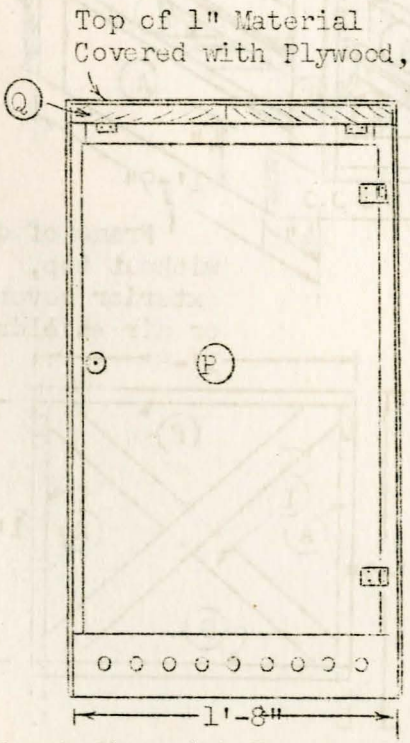
The exterior of the cabinet may be painted or stained to match other equipment in the kitchen.



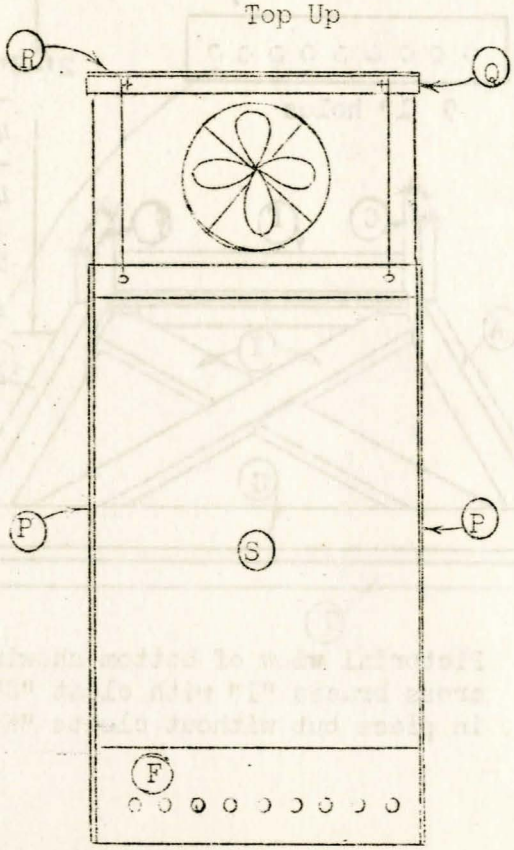
Side View of Drier with Top Down



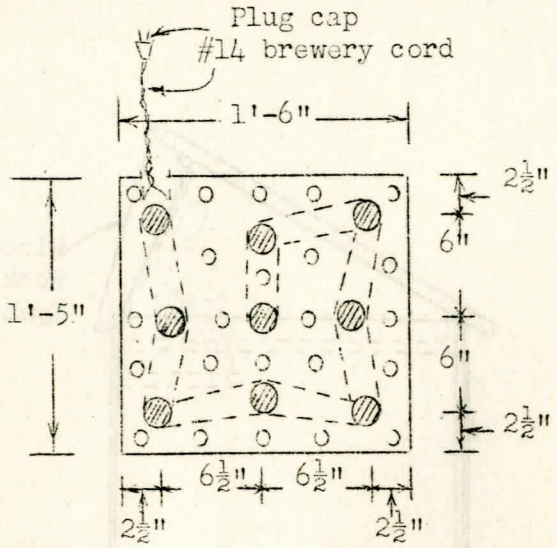
Side View of Drier with Top Up



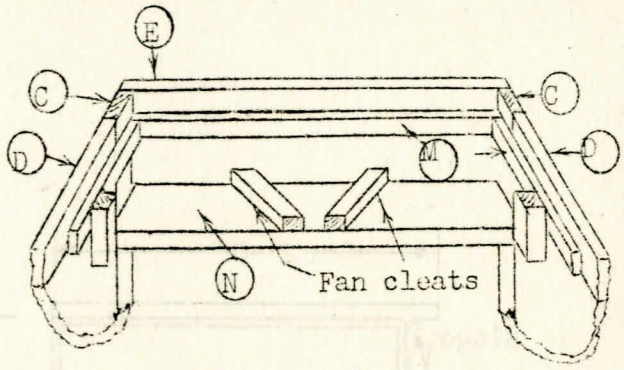
Front View with Top Down and Door Closed. Note Air Inlets



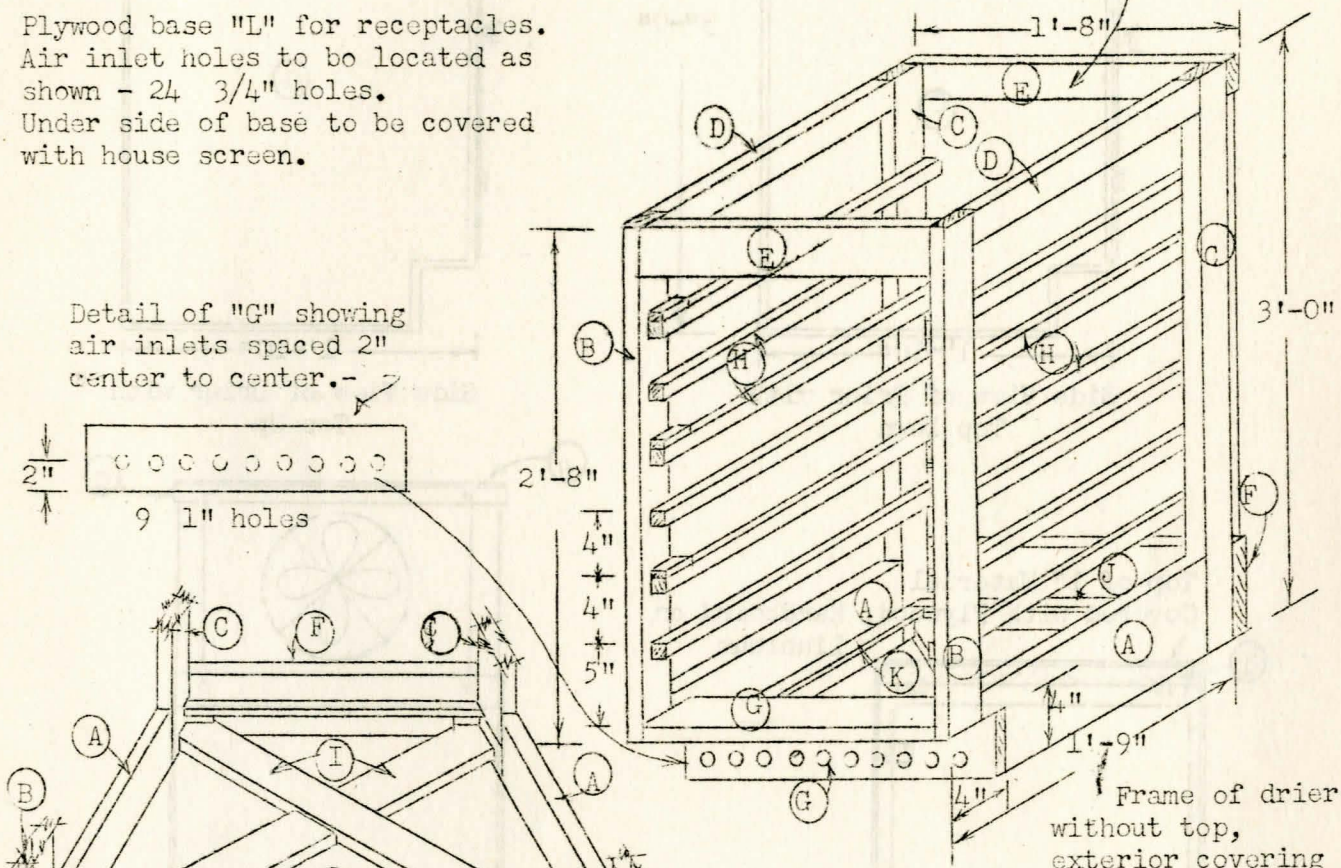
Rear View with Top Up and Fan in Place. Note Air Inlets



Plywood base "L" for receptacles. Air inlet holes to bo located as shown - 24 3/4" holes. Under side of base to be covered with house screen.



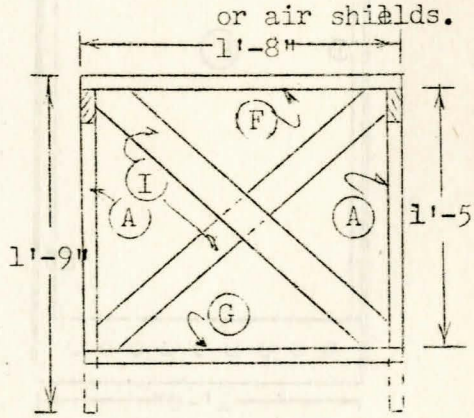
Pictorial view showing shelf for fan and cleats "M" for side and rear air shields. Fan shelf to be here.



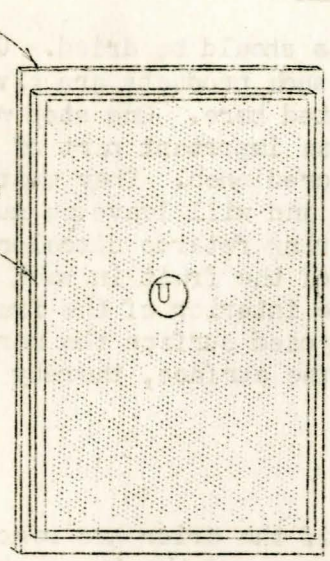
Frame of drier without top, exterior covering or air shields.

Detail of "G" showing air inlets spaced 2" center to center.-

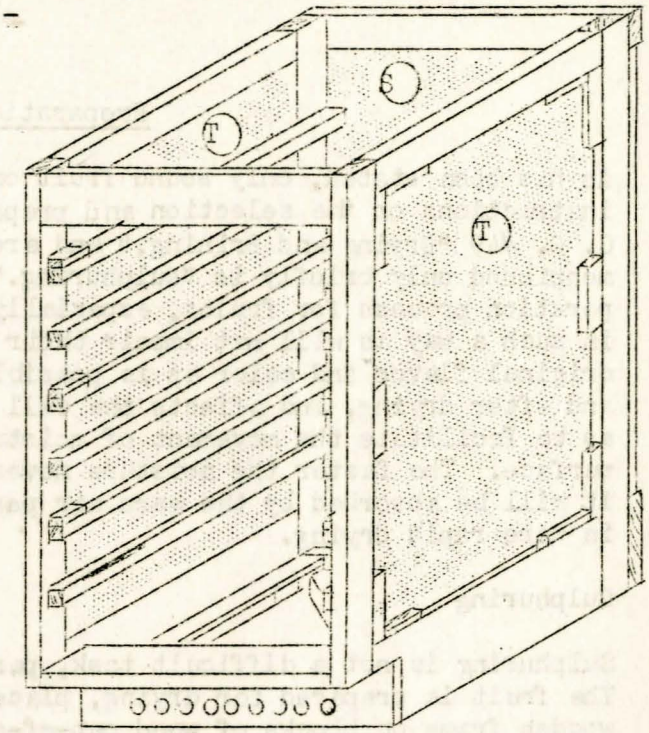
Pictorial view of bottom showing cross braces "I" with cleat "J" in place but without cleats "K".



Plan of bottom of drier showing cross braces.

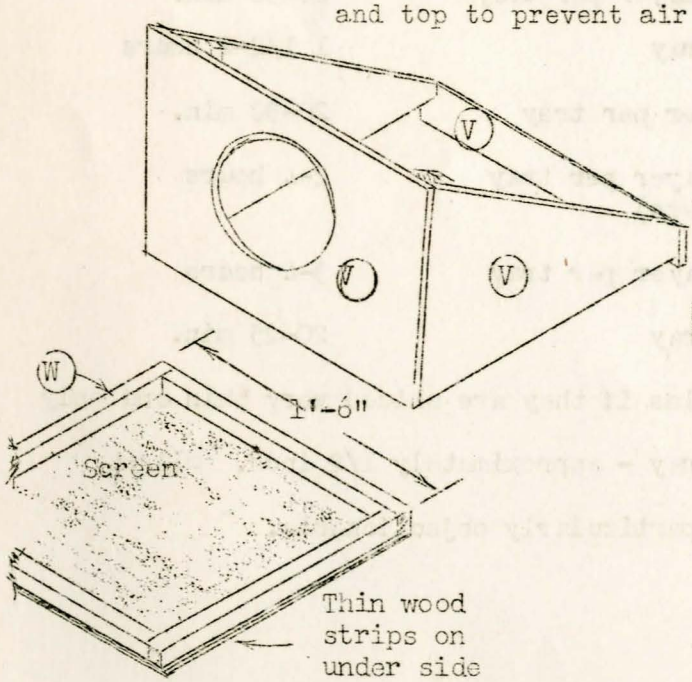


Inside view of door showing insulation material in place

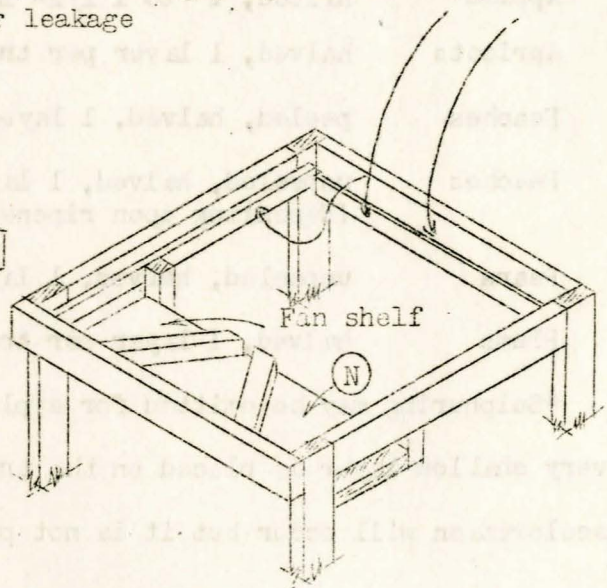


Frame with ½" insulation material on back and sides. Note blocks holding insulation in place on sides. Fan shelf and air shield cleats not in place.

Air shields may be nailed together to form a complete unit or may be left as separate pieces to facilitate storing when not in use. The air shields should fit snugly against cleats, frame and top to prevent air leakage



Thin wood strips on under side



View of drier from rear without top. Note manner in which air shields fit into place.

Preparation of Product

As has been stated, only sound fruit or vegetables should be dried. Complete instructions on the selection and preparation of such products are given in C. C. #49 "Drying and Brining," and are not repeated here. One step which is mentioned only briefly is "sulphuring." This is an important part of the preparation process for fruits, especially light colored ones. They must be dried in such a way as will not impair their food value and will leave as much of the original flavor and color as is possible. Sulphuring retards discoloration during and after drying, and affects the cell structure of the fruit in such a manner as to facilitate the movement of moisture from the interior of the fruit to the surface. The faster the moisture moves to the exposed surface the more rapidly it will be absorbed by the warm air passing over the surface, thereby resulting in more rapid drying.

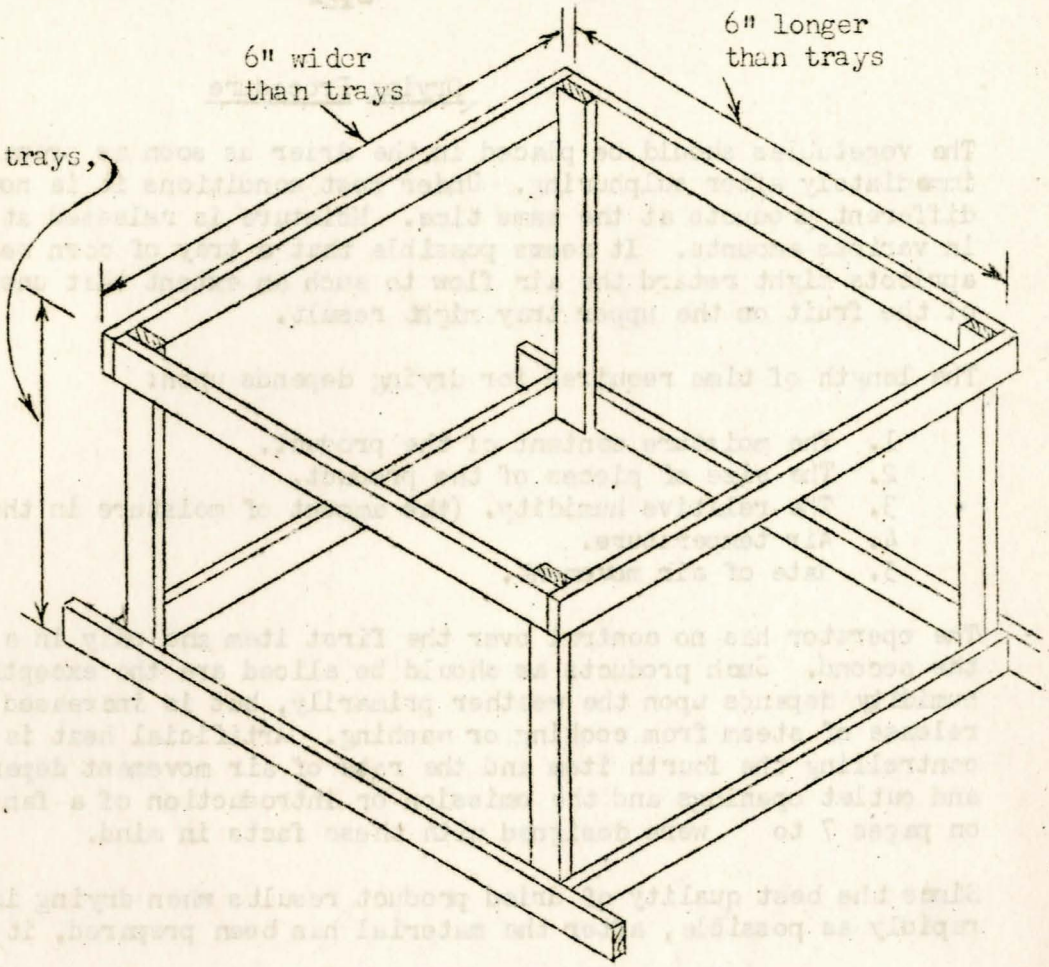
Sulphuring

Sulphuring is not a difficult task, particularly if the drier has removable trays. The fruit is prepared for drying, placed on the trays and the trays stacked on a wooden frame or blocks of wood out-of-doors. The bottom tray should be several inches above the ground to allow room for the container in which the sulphur is to be burned. Some type of iron pan is best suited for this use. Approximately one teaspoon of sulphur per pound of fruit is recommended. A sulphuring box which fits tightly against the ground should be inverted over the trays as soon as the sulphur is lighted and left in place the necessary length of time.

Following are the sulphuring times for various fruits as recommended by the U. S. Department of Agriculture.

Apples*	sliced, 1" to 1 1/2" layer per tray	20-30 min.
Apricots	halved, 1 layer per tray	1 1/2-2 hours
Peaches	peeled, halved, 1 layer per tray	20-30 min.
Peaches	unpeeled, halved, 1 layer per tray (depending upon ripeness)	2-4 hours
Pears	unpeeled, halved, 1 layer per tray	3-4 hours
Plums	halved, 1 layer per tray	20-25 min.

*Sulphuring may be omitted for apples if they are sliced very thin and only a very shallow layer is placed on the tray - approximately 1/2 inch. Slight discoloration will occur but it is not particularly objectionable.

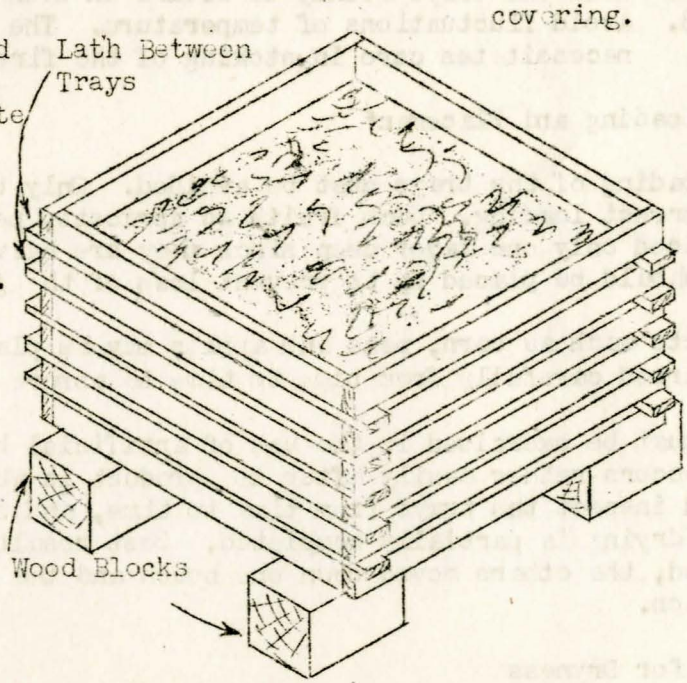


Sulphuring Box

FRAMEWORK OF SULPHUR BOX
1"x2" Material - Heavy Roofing Paper, Plywood or Hardboard may be used as covering.

A method of stacking trays for sulphuring and construction details of a sulphuring box are shown here. Attention is called to the size of the box. The extra width and length facilitate placing it in position and assure complete circulation of the fumes within the box. Trays could be upset easily if the box were fitted too tightly.

The framework may be made of 1"x2" material and covered tightly with heavy roofing paper, plywood or one of the hardboards.



METHOD OF STACKING TRAYS

Drying Procedure

The vegetables should be placed in the drier as soon as prepared, and the fruit immediately after sulphuring. Under most conditions it is not advisable to dry different products at the same time. Moisture is released at various rates and in various amounts. It seems possible that a tray of corn between two trays of apricots might retard the air flow to such an extent that unsatisfactory drying of the fruit on the upper tray might result.

The length of time required for drying depends upon:

1. The moisture content of the product.
2. The size of pieces of the product.
3. The relative humidity. (the amount of moisture in the air)
4. Air temperature.
5. Rate of air movement.

The operator has no control over the first item and only in a few cases any over the second. Such products as should be sliced are the exceptions. Relative humidity depends upon the weather primarily, but is increased in kitchens by the release of steam from cooking or washing. Artificial heat is the only way of controlling the fourth item and the rate of air movement depends upon the intake and outlet openings and the omission or introduction of a fan. The driers shown on pages 7 to were designed with these facts in mind.

Since the best quality of dried product results when drying is accomplished as rapidly as possible, after the material has been prepared, it is important to

1. Prepare only the amount of food which can be accommodated in the drier at one time.
2. Load the trays evenly to assure an even flow of air.
3. Avoid fluctuations of temperature. The use of a drier on a stove necessitates care in stoking of the fire.

Tray Loading and Placement

Overloading of the trays must be avoided. Only by trial will the operator learn the correct loading. Such fruits as apricots, peaches, pears and plums should be placed only one layer deep since they are halved and not sliced. The cavity side should be placed up to prevent loss of the juice.

Products such as corn, peas and apples may be placed in thicker layers but should be stirred carefully from time to time to assure even drying throughout the mass.

Care must be exercised in the use of artificial heat to prevent "scorching." This occurs rather easily after the product is about one-half dry. The operator should inspect the trays from time to time, and shift them every hour or two after drying is partially completed. Best results occur when the bottom tray is removed, the others moved down one notch and the bottom one placed in the top position.

Tests for Dryness

dry in exactly the same length of time on different days. Vegetables such as corn should be dried until "bone dry." If it "rattles" on the tray when it is shaken and feels "horny" when touched, it usually is sufficiently dry. Fruits should not be dried until they are brittle. A convenient testing method for fruits is as follows:

1. Scoop up a double handful of the product.
2. Compress it firmly with the hands.
3. Release the pressure.

If the fruit springs back into its original shape and the particles separate from each other in a moment or so, it is considered sufficiently dry, and sometimes is referred to as "leathery." Should it stay in a crushed mass or leave an appreciable amount of moisture on the palms of the hands it needs additional drying. Shattering of the pieces indicates too much drying.

Treatment after Drying

Food should not be stored immediately after drying, as it still contains some moisture which is unevenly distributed within the pieces. All pieces are not the same size and shape and consequently are not equally dry. Exposure to air at room temperature allows this moisture to redistribute itself throughout the piece and permits additional drying, thereby lessening the danger of spoilage. This process is called "curing" or "conditioning" and sometimes "sweating."

Curing

No definite recommendations can be made as to the amount of time needed for curing. Corn has been satisfactorily cured in 24 hours but in some cases longer periods were needed. Fruit usually requires a greater curing time. Air temperatures and relative humidity are influencing factors. Protection from dust and insects and adequate air circulation are essential to good curing.

If the trays will not be needed again immediately the product may be cured on them. They can be stacked with separating blocks between and the entire stack covered with tightly stretched cheese cloth. The cheese cloth should not be allowed to sag and touch the product or insects may be able to lay their eggs directly on the food.

Curing boxes may be made out of orange crates. Screen wire tacked over the openings and a screen or cheese cloth covered lid will not retard air flow but will keep out insects. The box should be kept in a warm dry place and the contents stirred daily.

Storing

Storing dried food after it is cured presents a problem at the present time. Insect and moisture proof containers are necessary to avoid trouble from weevils. Tin cans with tight fitting lids have been used successfully, since they excluded light also, but are becoming increasingly scarce. It is thought that old coffee cans might be satisfactory if the tops could be sealed to the cans in an effective manner. Transparent cellulose tape approximately one inch wide might be used for such sealing. It should be drawn tightly around the joint of the lid and the can and pressed smooth. Bulges or creases might permit the entrance of insects.

Glass fruit jars can be used if stored in a dark place. The amount of dried food which may be stored in a quart jar is much greater than the amount which may be canned in it. Experiments conducted in 1941 with the electric drier, shown on pages 13 to 15, resulted in the reduction in volume of 2.38 quarts of corn as it came from the can to one quart of dried corn.

Waxed paper cartons having tight fitting lids also may be used. Dried corn has been stored successfully in cloth bags such as sugar, flour or salt sacks. The bags should be suspended so that they hang without touching anything. Difficulty from weevils may occur when bags are used and therefore frequent periodic inspection of the product is recommended.

The containers of dried food should be placed in a dark, warm room which has as much protection from dust and insects as is possible. A pantry usually is not suitable and dried food should never be stored in a basement. Finished attics sometimes are satisfactory if temperatures do not drop too low in the winter.

Summary

Drying may well be considered as a method of preserving part of the family's food supply. The necessary equipment is inexpensive to construct and operate.

Only sound products should be used. They must be prepared carefully and dried thoroughly. Adequate curing after drying, the use of insect proof containers, and storage in a dry, warm location are essential.

The authors wish to express their appreciation to F. D. Yung, Research Engineer in Rural Electrification. The electric drier was constructed and tested under his supervision in the summer of 1941 and the final design based upon data thus obtained.

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