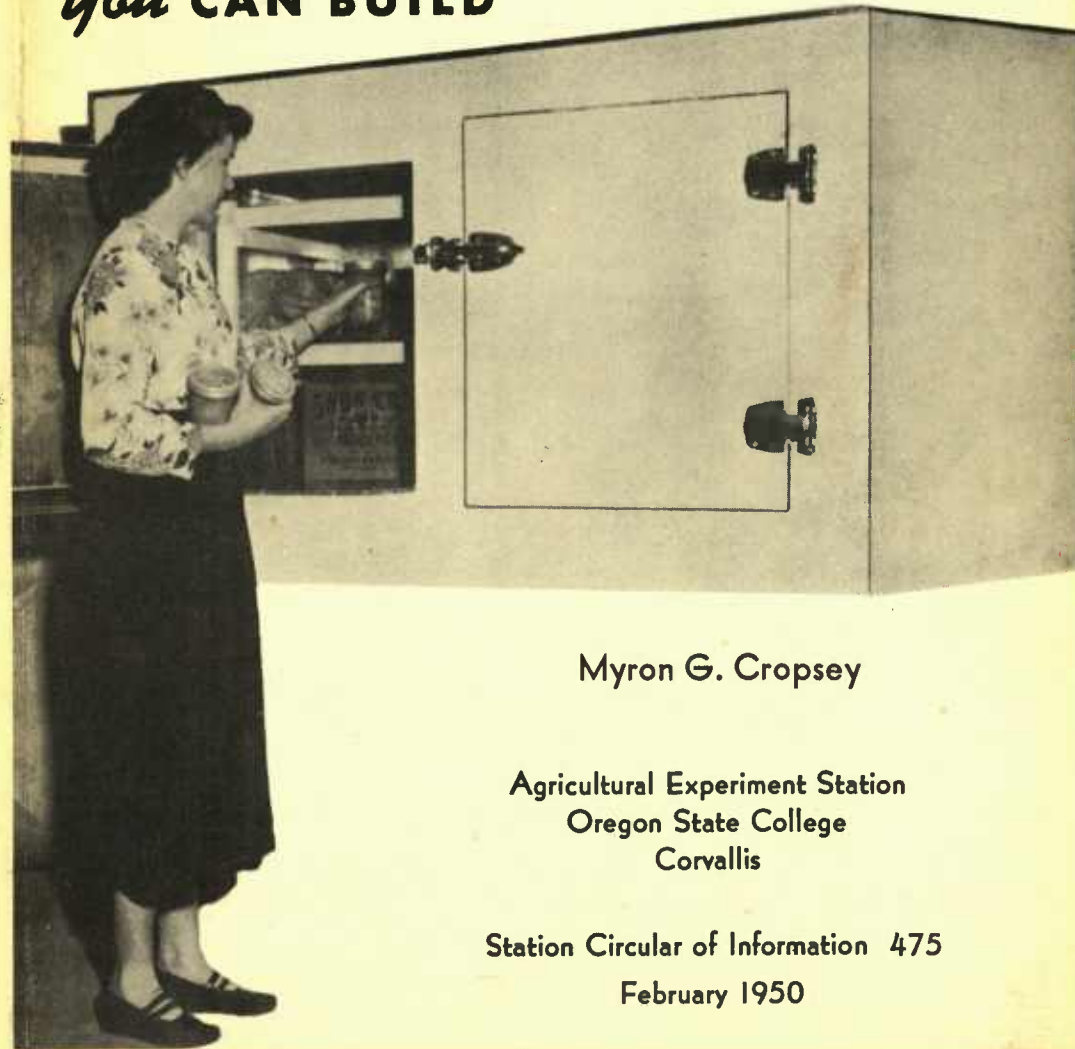


A Home Freezer

You CAN BUILD



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Agricultural Experiment Station
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A Home Freezer You Can Build

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Home freezers offer a convenient, easy, and safe way to keep all kinds of food--fruits, vegetables, and meats--for long periods of time. Being able to store these frozen foods means a saving in food costs and helps the housewife to plan more varied and better balanced meals for the family throughout the year.

A home freezer may serve as a convenient supplement to a rental locker in a commercial concern. Fruits, vegetables, and meats may be quick frozen and held in the home freezer awaiting transfer to the commercial locker. A quantity of food may be brought home from the locker and held in the freezer until it is to be used.

This publication tells you exactly how you can build your own home freezer. Designed for the convenience of the housewife and the needs of rural Oregon families, the freezer combines--

- ▶ Roominess----14 cubic foot size.
- ▶ Economy ----inexpensive to build and operate.
- ▶ Convenience--front-opening doors make it easy to put in and take out food.

Placing the freezer on a floor cabinet will bring the freezer doors up to working height, eliminating stooping and bending, and saving space. A pull-out board in the cabinet might serve as a convenient place to stack foods being put in or taken out of the freezer.

This freezer was planned and tested carefully. The temperature in it varies only 2° F. from top to bottom. At 0° F., it requires about 2.5 kilowatt hours per 24 hours.

The total cost of all materials needed to build the home freezer in the fall of 1949 was approximately \$300. This did not include labor or installation charges of the refrigeration service man.

Because costs of materials vary considerably from area to area, it is recommended that interested families take the bill of materials found on the next page, get a local cost estimate, and then compare the costs and advantages of this home-built freezer with those of commercial freezers. In many areas building the freezer will be found worthwhile; in other areas it may be too costly in relation to the buying possibilities.

No special skill in carpentry is needed to do the building job. Complete construction plans and steps in building the freezer are presented here. Builders are urged to follow the steps as outlined--doing so will reduce both time and labor and will help to insure a well-built freezer.

Materials Needed

- 56 pieces of insulation block 12" x 36" x 2"
- 2 pieces of 5/8" plywood 48" x 96"
- 2 pieces of 1/4" plywood 48" x 96"
- 2 pieces of aluminum 36" x 96" - about .025" thick
- 1 2 x 3 - 10' long
- 2 1 x 2 - 12' long
- 4 1 x 2 - 8' long
- 2 1 x 4 - 8' long
- 1 2 x 6 - 8' long
- 1 2 x 8 - 10' long
- 2 pair of heavy refrigerator or barn door hinges
- 2 pair of heavy latches - refrigerator type preferred
- 5 gallons of emulsified asphalt (odorless) and 70 sq. ft. of vapor-seal paper or 1 gallon of emulsified asphalt and 15 pounds of solid odorless asphalt
- 1 pound of casein glue
- 2 packages of brads 1" long
- 1 pint of cooler enamel
- 1 quart of white enamel
- 1 gross of 1 1/4" screws #10 or #12

Refrigeration Equipment Needed

- 2 freezer plates 48" x 16" or 140 ft. of 1/2" ID copper tubing
- 1 condensing unit 1/4 H.P. Freon
- 1 Thermal expansion valve (about 1/3 ton)
- 1 drier
- Tubing as required

Steps in Construction



Assemble the materials and cut the lumber to size as shown on drawings 1, 2, and 3 on pages 11 to 13. Measure carefully to make sure of an accurate fit.

◀ Figure 1. The floor has been fastened to 2 x 8's in this picture. Number 12, 1 1/4" screws were used.



Please note in Figure 3 that the 2 x 6's and the one 2 x 8 are flush on the front side. Note, however, that the 2 x 6's and 2 x 3's are set in 3/4" from the side and back edges to allow space for the 1 x 6 frame on top. Later, 1 x 2's will be nailed on the sides of these 2 x 6's and 2 x 3's to permit the 1/4" plywood to be supported throughout its length. The 2 x 8 separation center is placed in temporarily and fastened in so it can be easily removed. Fasten pieces together with 1 1/4" screws.

◀ Figure 2. Assembling the framework. Accuracy in assembling assures a good fit of the plywood later.



Place the $1/4$ " plywood over the framework. Glue the plywood on with casein glue and nail in place with 1" brads. Note in Figure 3 that the $5/8$ " plywood front has been left off at this time. Watch drawings 4, 5, and 6 for those pieces fit over the edges $1/4$ " and which are flush with the edges.

◀ Figure 3. Covering the framework with plywood.



Cut the blocks of insulation to size according to the table on page 5. Mark each piece of insulation with a lead pencil, giving it a letter according to the drawings 4, 5, and 6 and the cutting table. As each piece is cut, it is fitted in place in the box for size. If any fitting or cutting is necessary, it can be done at this time. (The drawing allows a $1/16$ " spacing between pieces.) Remove each piece of insulation and place in an orderly manner outside the box.

◀ Figure 4. The insulation cut to size.

Suggested Insulation Cutting

(For Insulation of 2-Inch Thickness)

Number of pieces of insulation blocks - 12" x 36" x 2" - 54

Note that all of the blocks are left 2" thick and 12" wide unless a cut in width is indicated. Most of the blocks have to be cut only in length.

Outside layer next to 1/4" plywood

G Top 2 pieces	36" long (not cut). Notch 1 for F
G Top 2 pieces	24" long. Notch 1 for F
G Top 1 piece	36" long by 3 $\frac{1}{2}$ " wide. Notch for A
G Top 1 piece	24" long by 3 $\frac{1}{2}$ " wide. Same piece, notch for A
L Sides 4 pieces	36" long (not cut)
O Back 4 pieces	36" long (not cut)
O Back 1 piece	36" long by 6 $\frac{3}{4}$ " wide
T Floor 2 pieces	36" long (not cut). Notch 1 for F
T Floor 2 pieces	21 $\frac{1}{2}$ " long. Notch 1 for F
* T Floor 1 piece	36" by 2 $\frac{1}{4}$ " wide) Use same piece for these two
* T Floor 1 piece	21 $\frac{1}{2}$ " by 2 $\frac{1}{4}$ " wide) Notch for A

Middle layer

J Top 4 pieces	27 $\frac{7}{8}$ " long
J Top 1 piece	27 $\frac{7}{8}$ " long by 5 $\frac{1}{2}$ " wide (use odd width for K)
M Sides 6 pieces	24 $\frac{5}{8}$ " long
P Back 2 pieces	36" long (not cut)
P Back 2 pieces	13 $\frac{1}{2}$ " long (1 piece)
P Back 1 piece	13 $\frac{1}{2}$ " long by 3 $\frac{3}{4}$ " wide)
P Back 1 piece	36" long by 3 $\frac{3}{4}$ " wide) 1 piece of insulation
S Floor 4 pieces	26 $\frac{1}{2}$ " long
* S Floor 1 piece	26 $\frac{1}{2}$ " long by 5 $\frac{1}{2}$ " wide (use odd width for R)

Inside layer

K Top 4 pieces	26 $\frac{1}{2}$ " long
K Top 1 piece	26 $\frac{1}{2}$ " long by 5 $\frac{1}{2}$ " wide (use other piece from J)
N Sides 4 pieces	25" long
N Sides 2 pieces	25" long by 3 $\frac{7}{8}$ " wide (notch for C)
Q Back 2 pieces	36" long (not cut)
Q Back 2 pieces	13 $\frac{1}{2}$ " long (1 piece of insulation block)
Q Back 1 piece	13 $\frac{1}{2}$ " long by 3 $\frac{3}{4}$ " wide
Q Back 1 piece	36" long by 3 $\frac{3}{4}$ " wide
R Floor 4 pieces	26 $\frac{1}{2}$ " long
* R Floor 1 piece	26 $\frac{1}{2}$ " long by 5 $\frac{1}{2}$ " wide (use other piece from S)

* Notch at door where required for center piece B.

Use odd length pieces to fit doors and separation piece B.

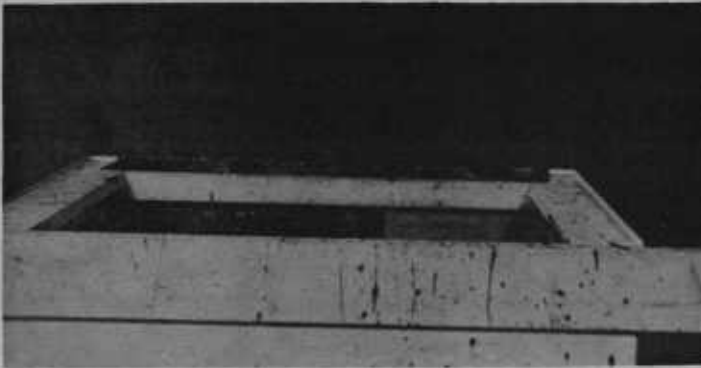
Place the freezer over on its back as shown in Figure 5. Give the entire inside surface a thorough and continuous coating of emulsified asphalt (odorless) to prevent the entrance of moisture. More home-built freezers have failed for this reason than any other. There are two methods of placing the insulation.

METHOD ONE: Use of hot asphalt. Make a pan out of sheet iron 3" x 14" x 40" and make the corners as shown in Figure 6. Melt an odorless asphalt and dip each block of insulation in on the side toward the outside and then place quickly in position inside the box. Always have the asphalt face toward the outside. Use welders' gloves or ice picks for lifting the blocks.

METHOD TWO: Use of emulsified asphalt (odorless). Line the box inside with a vapor-seal paper next to the inside coating of asphalt. Allow a 6" lap on the front for lapping over front edges. Paint each piece of insulation with emulsified asphalt on the side toward the outside and place in position.

Place the insulation in the following order: Set in position the back pieces "O" and then the side pieces "L". (See Drawings 4, 5, and 6.) The floor pieces "T" and the top pieces "G" may now be placed. The second layer side pieces "M" are now placed, then the top pieces "J" and "K" and bottom pieces "S" and "R", followed by side pieces "N". Finally, place the back pieces "P" and "Q".

The outside edges that face toward the front of pieces G, J, K, R, S, and T should be asphalt painted.



◀ Figure 5. Placing the insulation blocks after painting with asphalt. The freezer is turned over on its back.

Make the inside aluminum lining at this time. Measure the inside of the freezer to be sure inside dimensions check with Drawing 7. Cut the pieces according to drawing, allowing for any discrepancy in size. It will be necessary to lap a 6 3/4" piece onto the top piece if the size aluminum sheets as listed in the bill of materials are used. Make the entire bottom of one piece of metal.

Fold the corners for the bottom piece according to Figure 6. No soldering is required. Bend pieces with a "brake." Put the bottom piece in place. Now force the back and sides inside. It may be necessary to cut off a slim piece 1/8" or so on this last piece to make an easy fit. Raise the aluminum bottom piece up around the separation center with a "U" shaped piece of 1/4" plywood 2" wide to prevent water from running in at these joints during defrosting. The inside aluminum lining is not soldered.

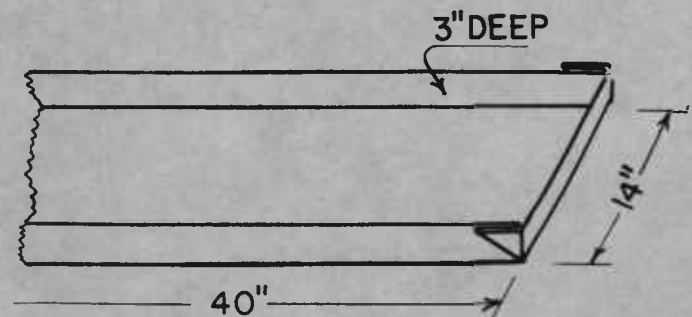


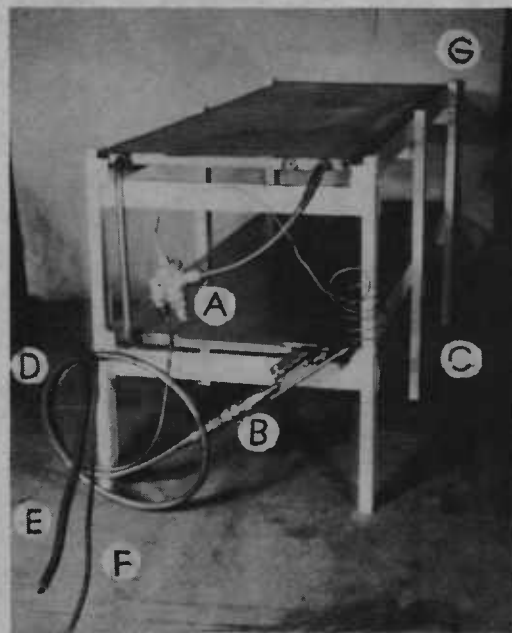
Figure 6. Method of making corners for bottom sheet water-tight without soldering. ▶

Now build the shelf and freezer plate support as shown on Drawing 8. This should either be painted with an odorless paint especially made for refrigerators or be left bare. Place the freezer plates or wind the copper tubing in place.

To be Done by Refrigeration Man

The freezer is now ready for the mechanical refrigeration equipment. See Figure 10. Make a heat exchanger by fastening soldering together, two pieces (each about eight feet long) of copper tubing the size of the suction-line tubing and pressure-line tubing of the compressor. These two pieces are fastened together for 4 feet, about 3 feet from one end, and made into a circle about 16 inches in diameter. The ends are left free temporarily. One end of the suction line is now fastened onto the freezer plate or copper tubing at coupling B and the other end left free to be connected to the compressor later. Connect one end of the pressure line (small line) to the thermal expansion valve at A. This valve is then connected to the freezer plate with the larger tubing. Drill a hole through the freezer 1" in diameter about 12" up from the floor and about 12" back from the front. Unfasten heat exchanger at A and B and place the two ends of the heat exchanger through this hole. Place the freezer plates or copper tubing and support inside the freezer. Fasten together the coupling at B and the copper tubing at A. Now fasten outside the suction line and pressure line onto the condenser unit. A drier is placed in the pressure line. Hard solder all non-compression junctions.

- A. Thermal expansion valve
- D. Heat exchanger
- E. Suction line



- G. Freezer plates
- C. Thermal expansion valve bulb
- B. Coupling
- F. Pressure line

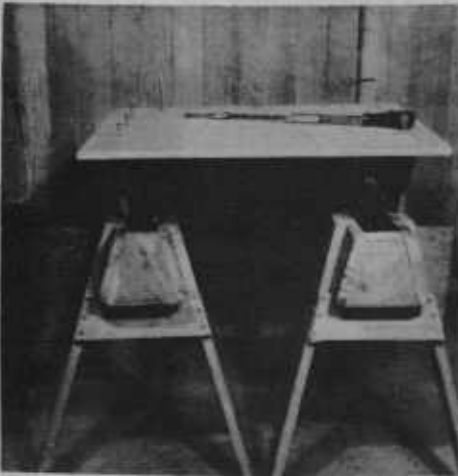
▲ Figure 7. A refrigerator service man should do this installation work as well as see that the compressor is running properly. He should check for leaks finally.

To be Done by Builder

The passageway for the tubing in the freezer wall should be well packed with emulsified asphalt, that has dried out slightly, so that it is of a stiff consistency.

Prepare the separation center B for installation at this time. Two pieces of insulation of the proper width and $27 \frac{3}{8}$ " long are fastened to one end of this 2 x 8 by painting with emulsified asphalt and placing first one and then the other on top of this 2 x 8. This piece can now be fastened in place with screws. It is necessary to remove a portion of the insulation on the bottom to make piece B fit.

Prepare the $\frac{5}{8}$ " plywood front for installation. Paint the back side with emulsified asphalt and give the top and side edges a coat. Lap the edges of the insulation with the vapor-seal paper. Shove the plywood in place and fasten with screws. Fill the cracks with emulsified asphalt. The side and top pieces of $\frac{1}{4}$ " plywood can be tacked into this front piece.



The first step in making the doors is to fasten with screws the $\frac{5}{8}$ " plywood pieces $6 \frac{1}{8}$ " wide to the $\frac{5}{8}$ " plywood doors. Three of these pieces are fastened together and then centered on the door. All screw holes are drilled before fastening.

◀ Figure 8. Five-eighths inch plywood doors are fastened to $\frac{5}{8}$ " plywood framing below.

Fasten the door latches and hinges on with small bolts as shown in Figure 9.

Figure 9. Placing the hardware on the ▶ door. Note that only common barn-door hinges and latches were used in this instance. Regular refrigerator doors and latches improve the appearance.



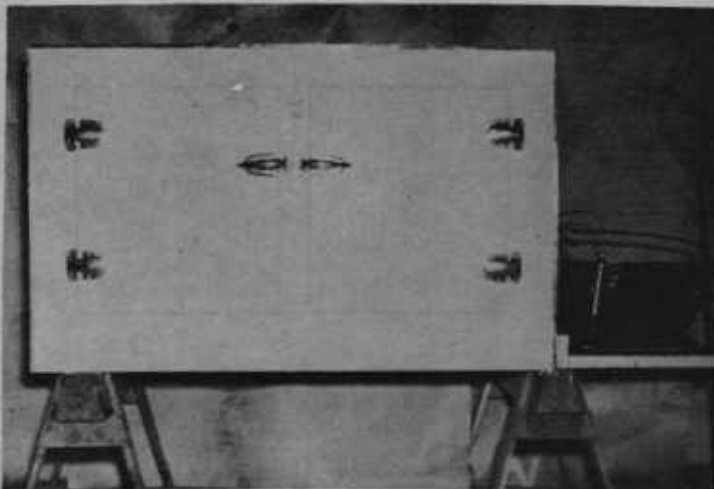
Figure 10. Placing the insulation in the door. The insulation is first placed in the door for fit. These blocks will then be taken out and the inside surface of the door coated with emulsified asphalt.

Paint each piece of insulation with emulsified asphalt on the side toward the outside and then place in position. Cover exposed insulation with aluminum or 1/4" plywood. Either regular refrigerator hinges and latches or common barn-door hinges and latches may be used. Be sure gasket on door will be compressed at least 1/16" when door is closed.



The freezer is now ready for painting and should be covered on the outside first with a good paint sealer and later with two coats of white enamel. The inside pieces should be painted with regular refrigeration enamel or paint that does not give an odor to the food.

For convenience, the freezer should be set up on a platform so that the bottom floor of the freezer is about 30" off the floor. This places all items within easy reach.



◀ Figure 11. Edging may be placed around the outside edges of the 5/8" plywood front piece to improve the appearance of the box.

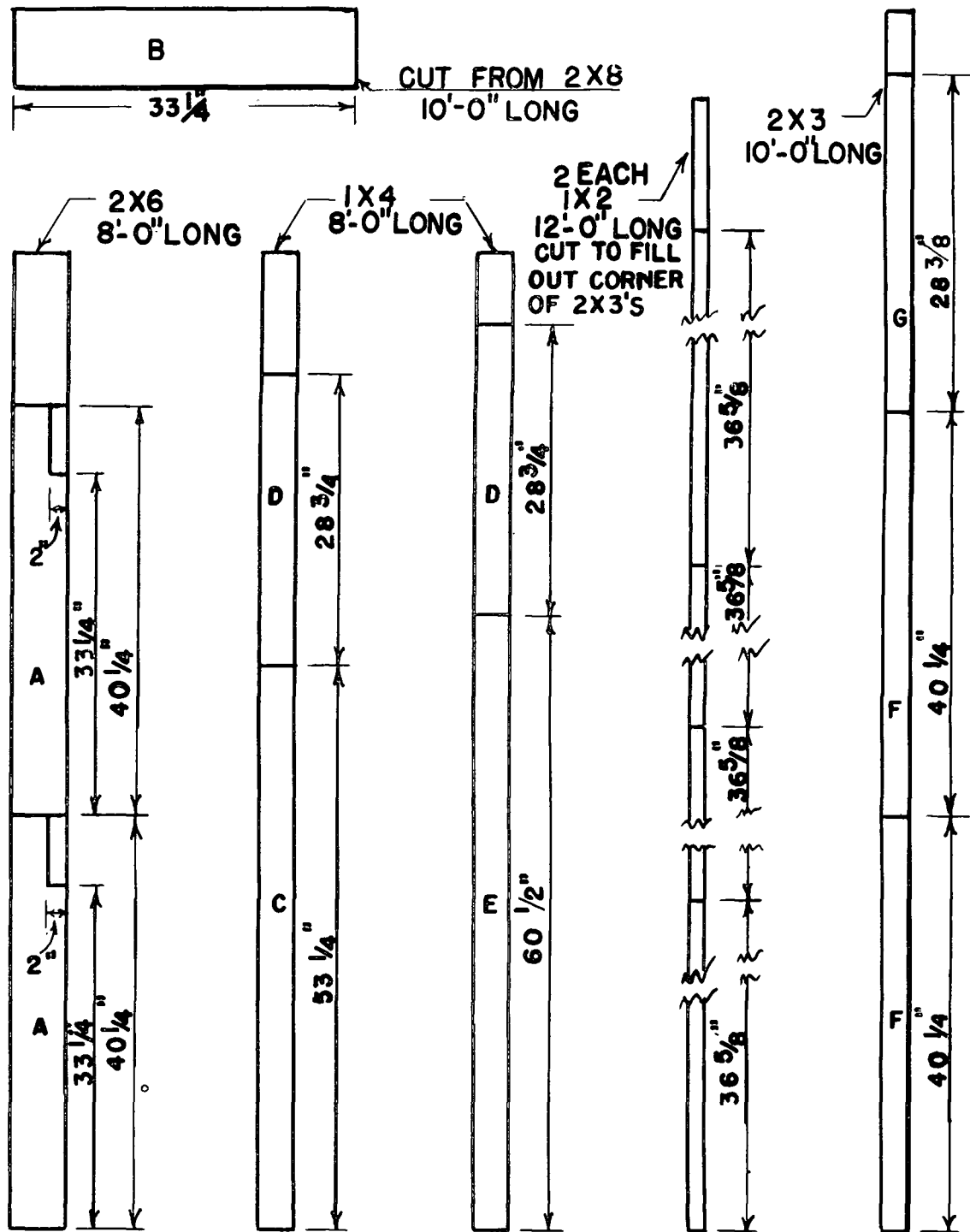
A slatted floor made of wood will be of help in the operation of the freezer.



Figure 12. Freezer is now ready for operation.

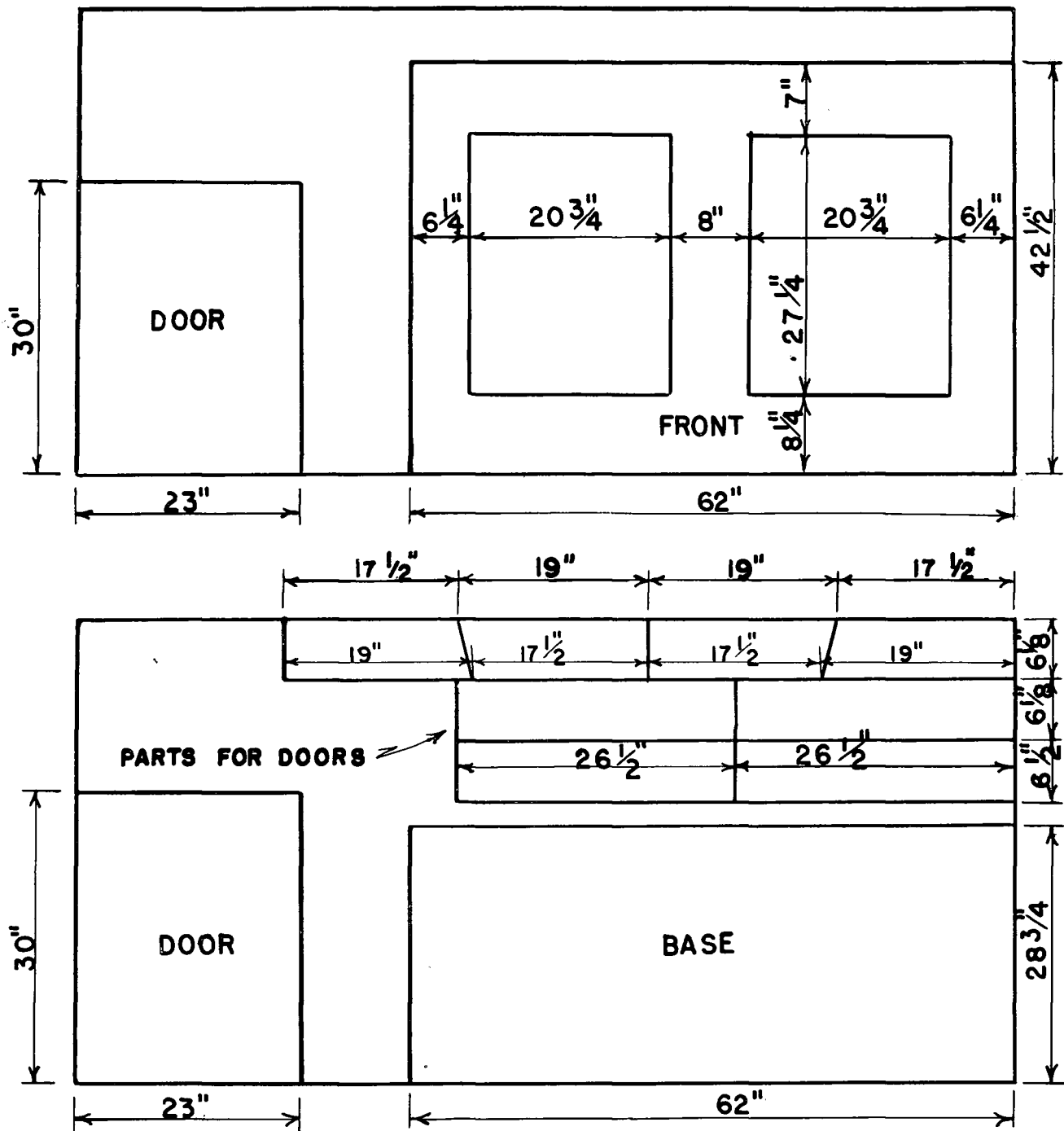
Defrosting

Freezers should be defrosted at regular intervals, as operating efficiency is lost when ice is thickly coated in the box. Defrosting should be done as quickly as possible without injury to the box. Never use an ice pick or any sharp instrument that might puncture the freezer plates or lining. First shut the electricity off and remove all packages from the freezer. A fan, set to circulate the air in the freezer, will speed the melting process. An infra-red lamp or a pan of hot water placed in the bottom of the freezer may be used. Sides, shelves, and all surface areas should be wiped dry before using the freezer again. This will help in keeping packages from freezing fast to the shelves. The freezer is then ready for use and packages should be replaced promptly.



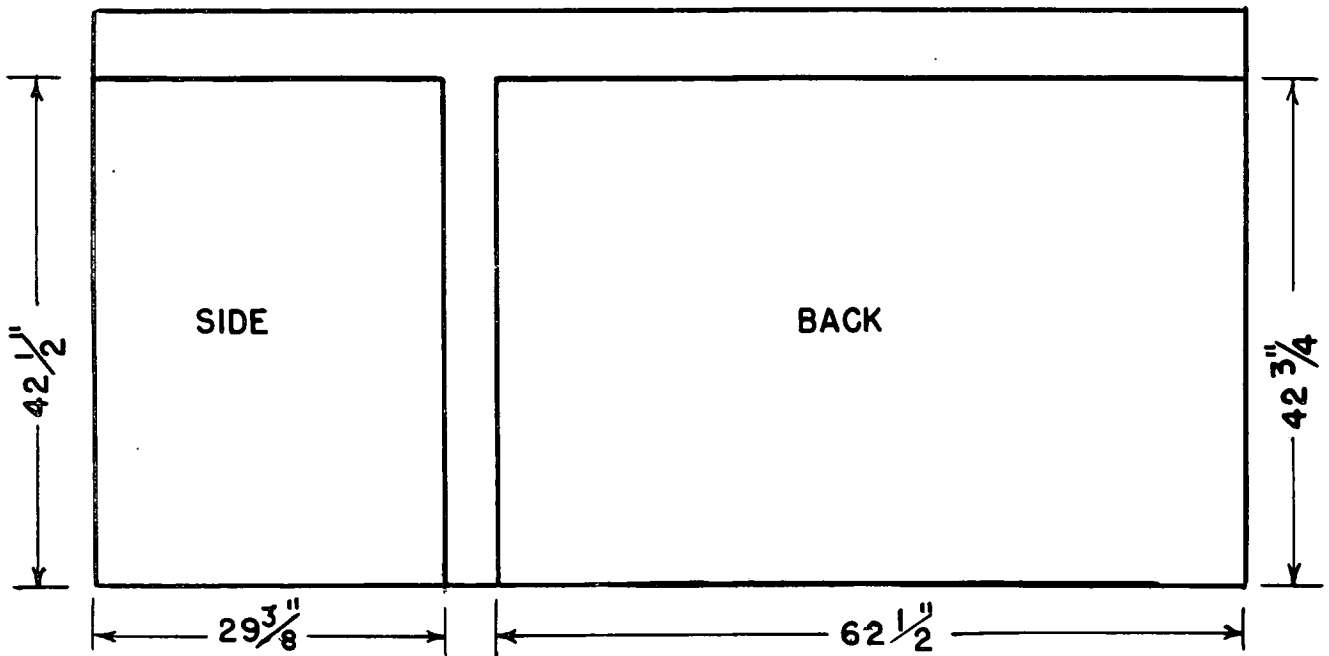
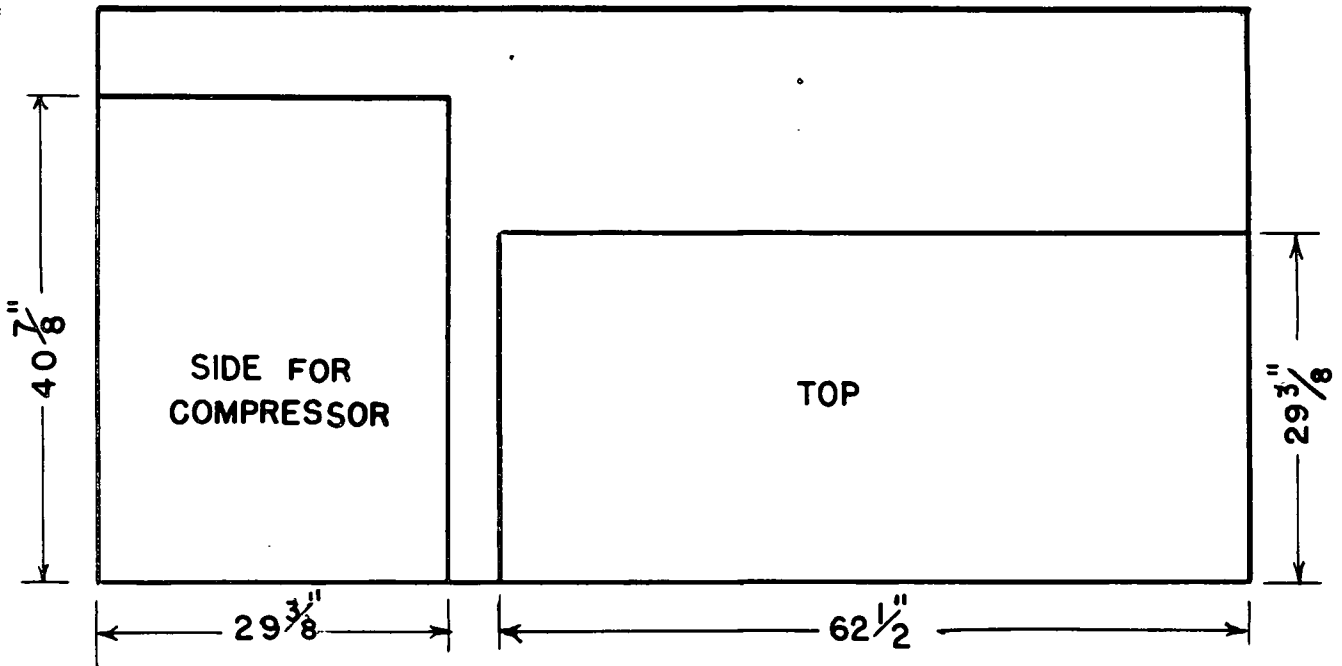
CUTTING OF DIMENSION LUMBER

5/8" PLYWOOD 48"X96"
 CUT IN THE FOLLOWING SIZES

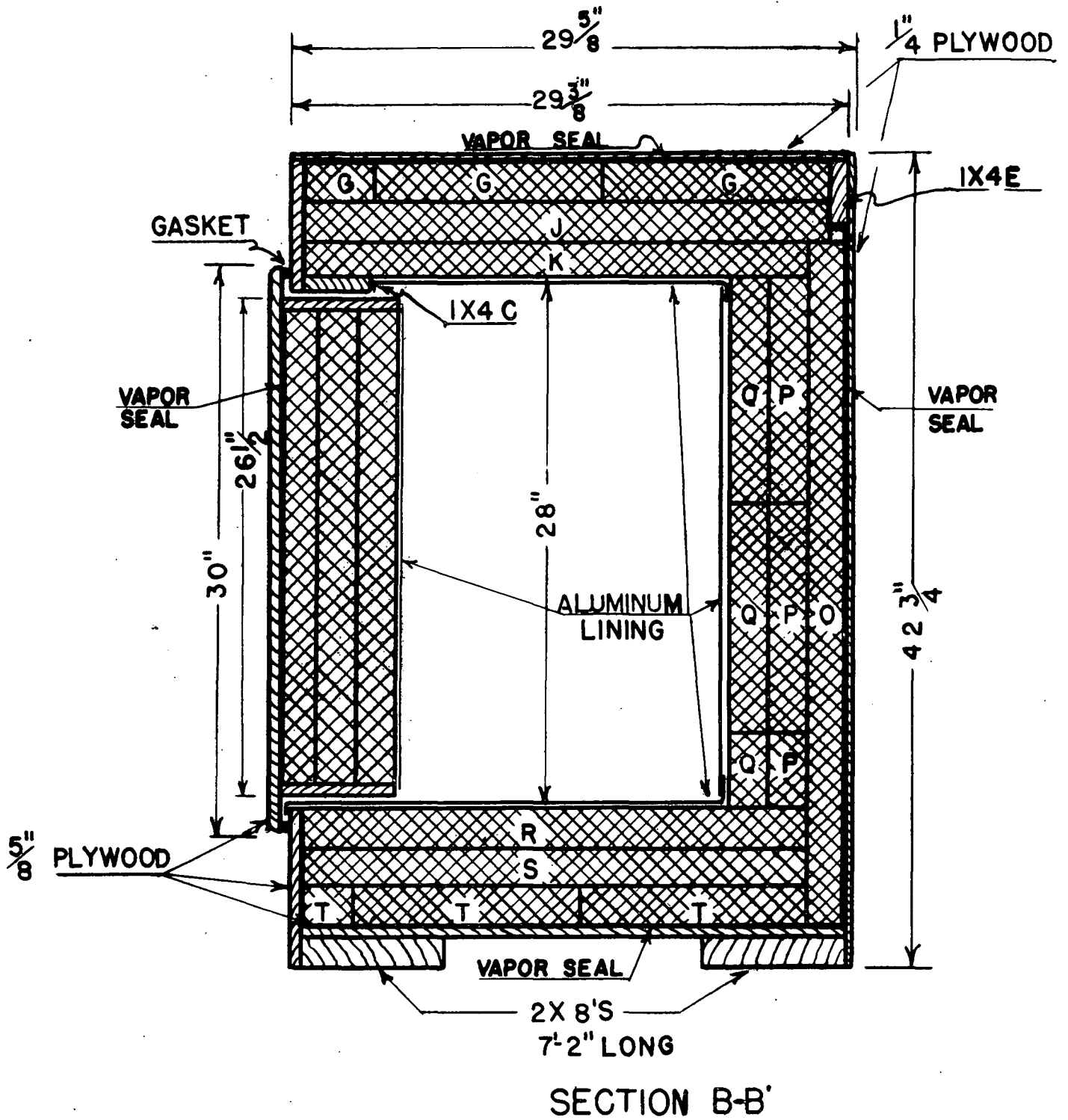


Drawing 2

$\frac{1}{4}$ " PLYWOOD 48"X96"
CUT IN THE FOLLOWING SIZES

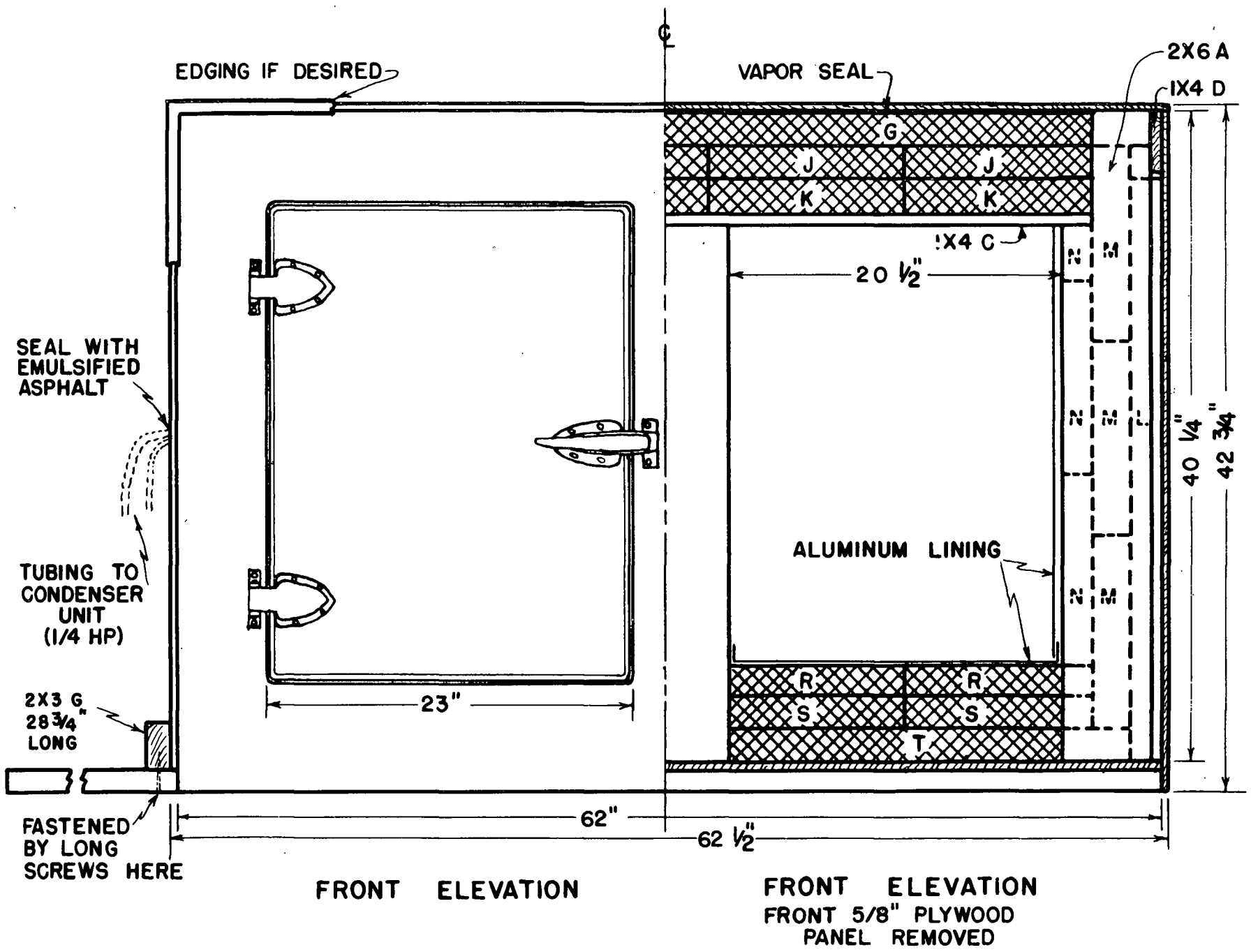


Drawing 3



Drawing 4

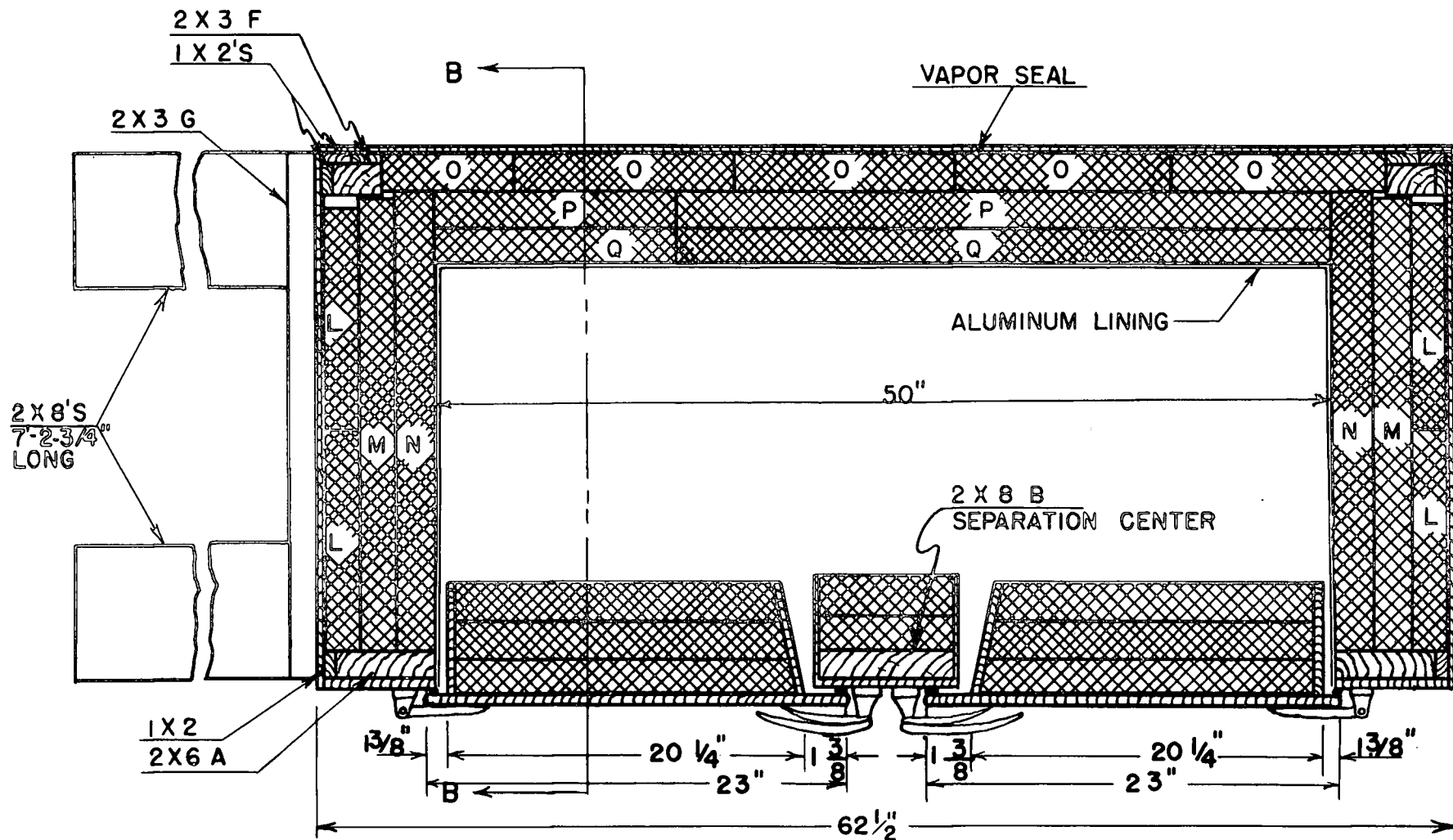
Drawing 5



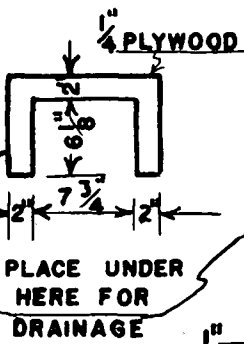
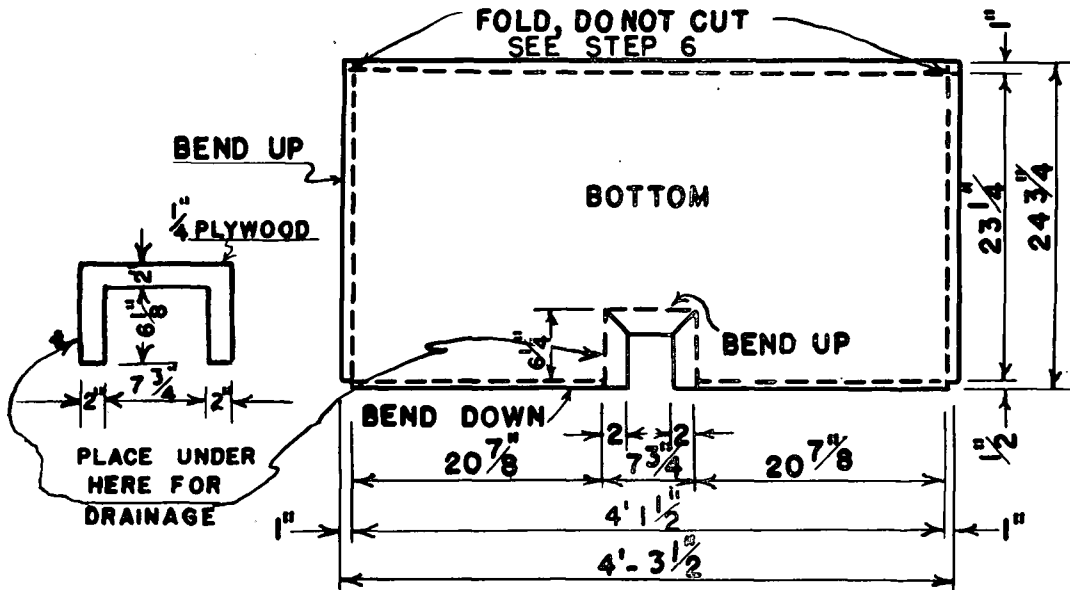
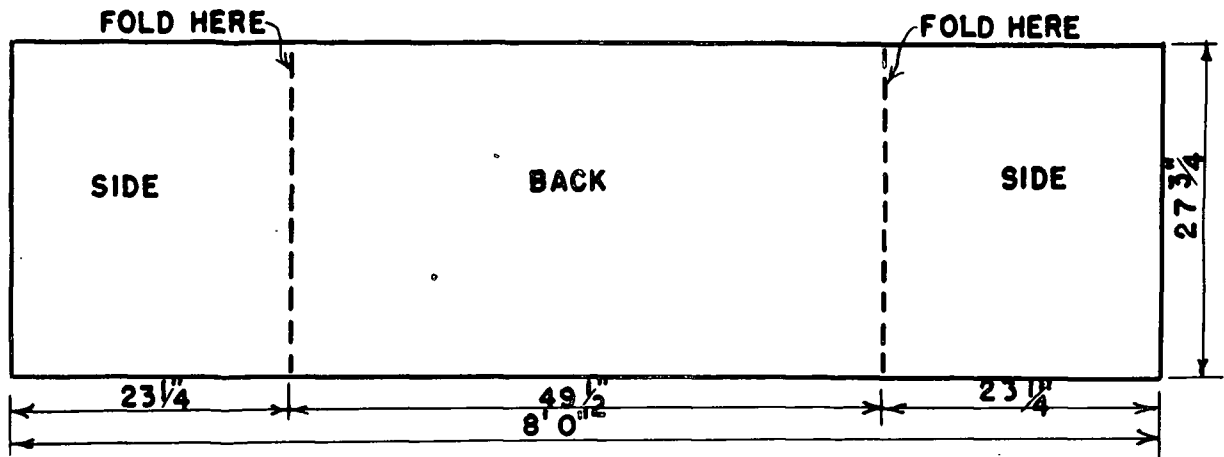
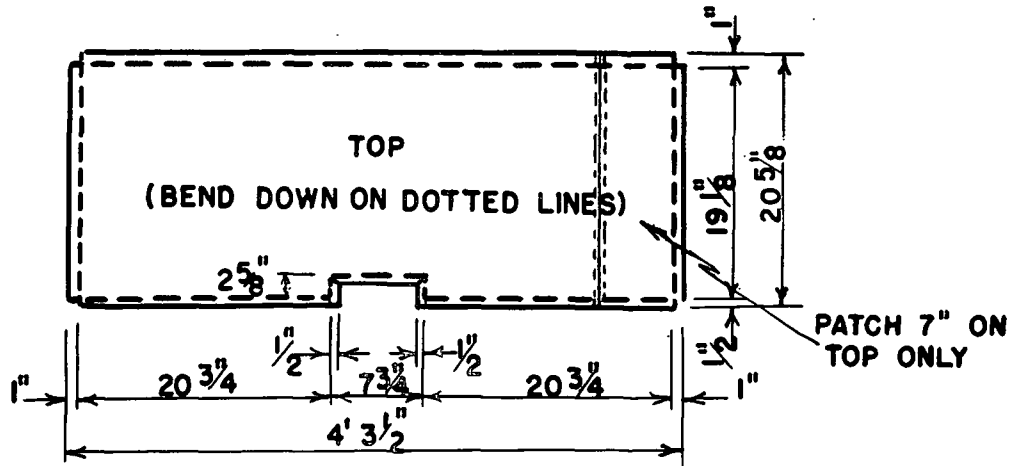
FRONT ELEVATION

FRONT ELEVATION
FRONT 5/8" PLYWOOD
PANEL REMOVED

Drawing 6

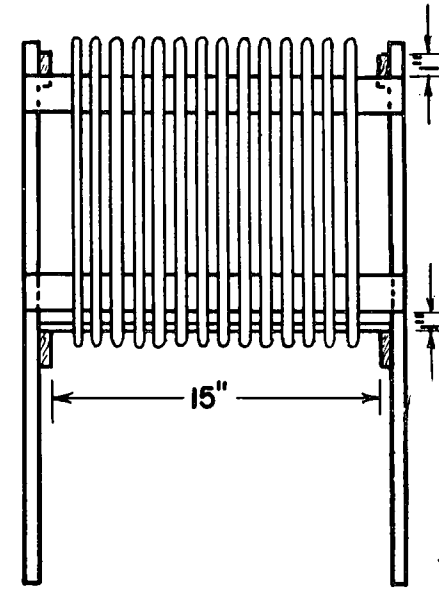
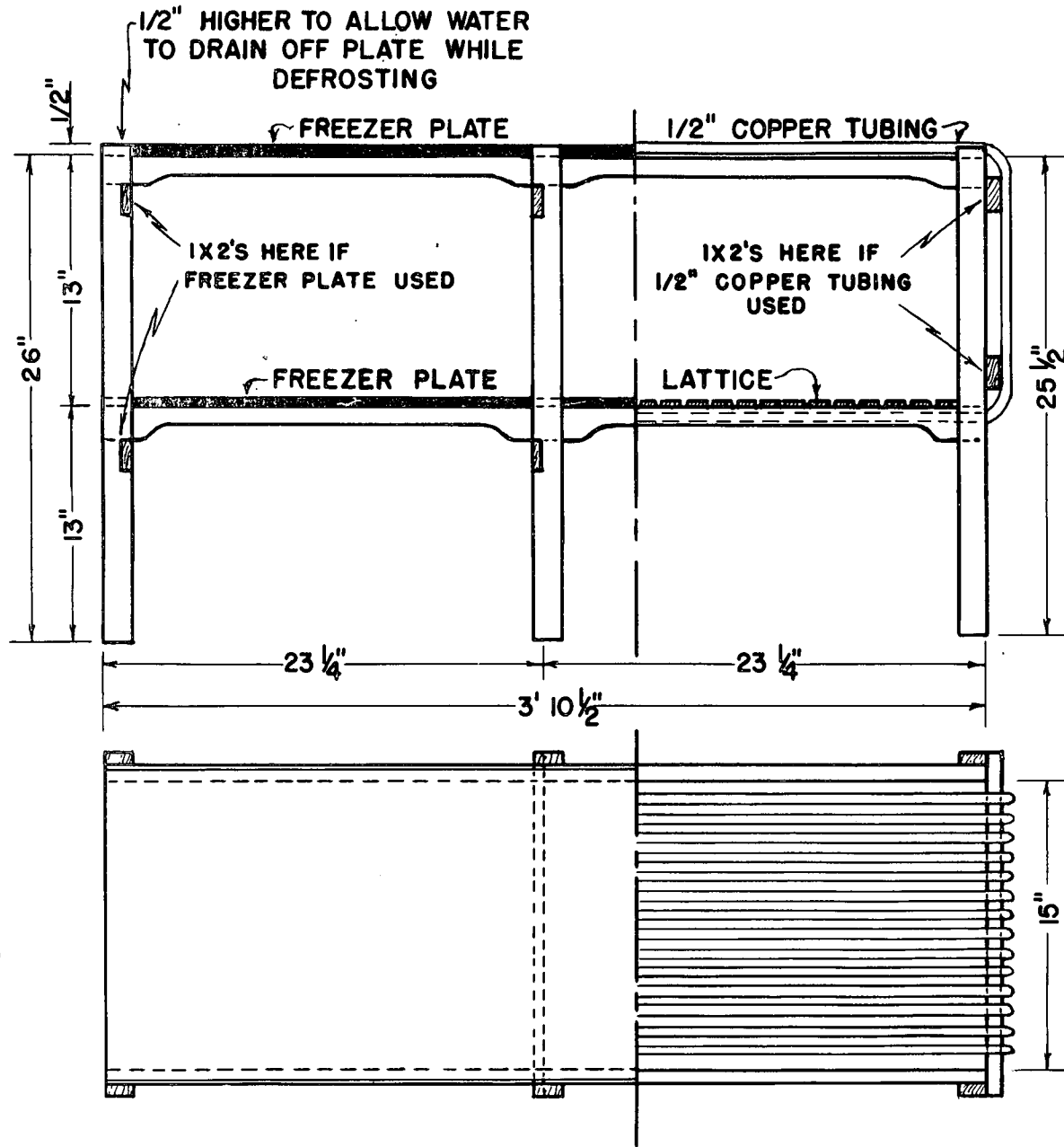


PLAN SECTION
SCALE 1 1/2" = 1'-0"



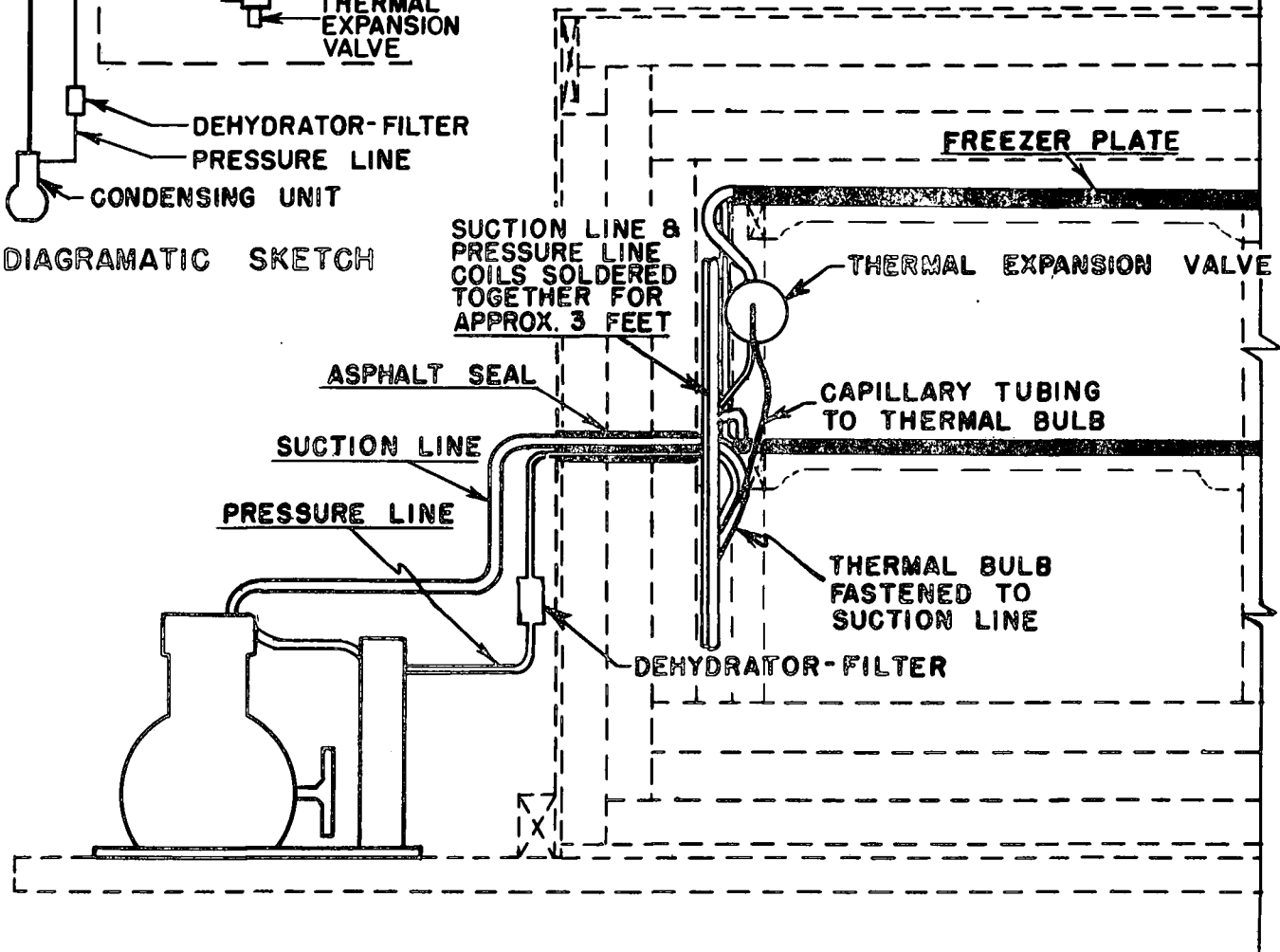
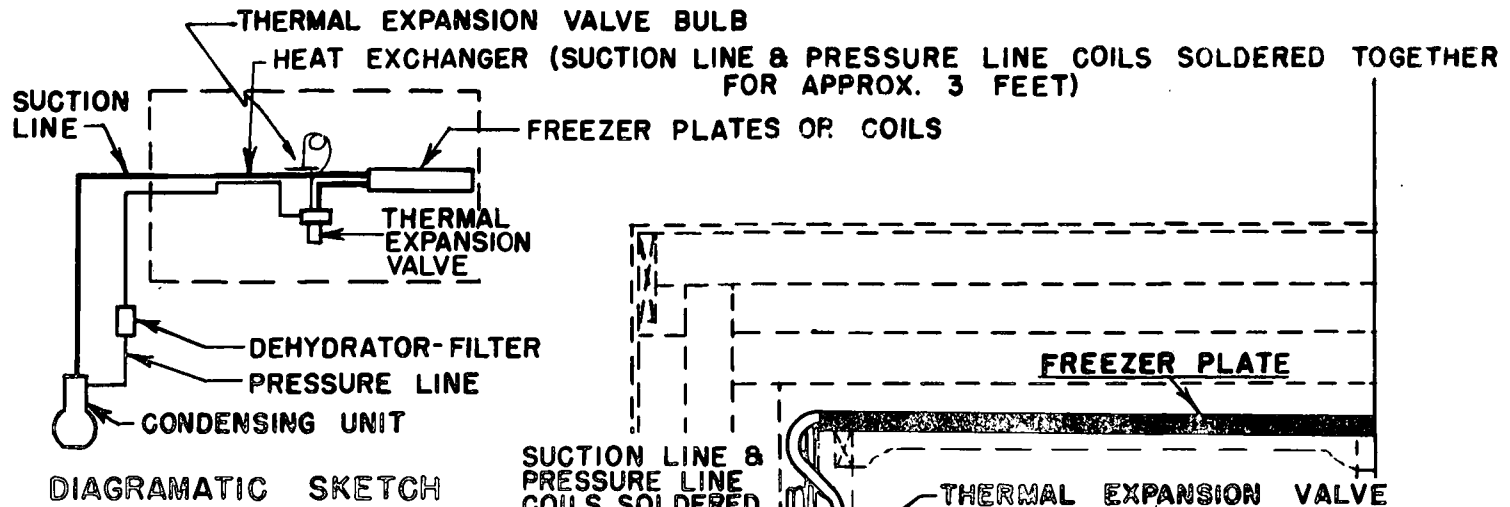
ALUMINUM LINING

Drawing 8



- BILL OF MATERIALS**
- CUT 4 PIECES 1X2 3' 10 1/2" LONG
 - CUT 2 PIECES 1X2 26 1/2" "
 - CUT 2 PIECES 1X2 26 1/4" "
 - CUT 2 PIECES 1X2 26" "
 - CUT 6 PIECES 1X2 18" "
 - 3 DZ. - 1 1/2" BRASS OR GAL. SCREWS
 - CUT LATTICE 16 1/2" LONG IF COPPER TUBING IS USED

FREEZER PLATE OR COIL SUPPORT



REFRIGERATION SYSTEM

Drawing 9