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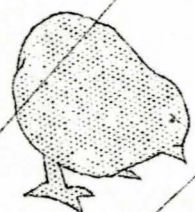
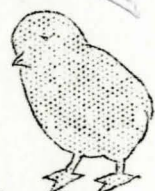
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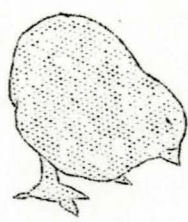
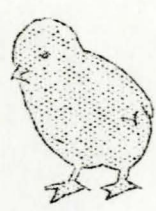
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AN ELECTRIC CHICK BROODER



Prepared by
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Ass't. Extension Agricultural Engineer

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AN ELECTRIC CHICK BROODER

Chicks have been brooded on Nebraska farms by a number of methods using different types of equipment. Of these methods, electric brooding offers many advantages to the farmer who has electricity available. Electricity is thus put to another use on the farm.

Experimental work has been conducted at many of the State Agricultural Colleges to determine the effectiveness of electric brooders. Brooder studies have been carried on at the Nebraska Experiment Station for several seasons. A brooder constructed from one-half inch insulation board mounted on frames made from 1" x 2" material and heated with lead-covered soil heating cable has been tested. Experiments have shown that this brooder offers many possibilities. Plans for this type of brooder are shown in this circular.

Safety

Loss by fire is one of the chief hazards of chick brooding. Over-heated stoves have been responsible for many of these fires resulting in the loss of a great many chicks and brooder houses.

The temperature of the electric brooder is controlled by an automatic thermostat. The heating unit does not become warm enough to ignite materials such as wood shavings, commonly used for litter. The result is a brooder with the fire hazard reduced to a minimum.

Advantages of Electric Brooders

The use of electric brooders would not be justified unless they offered advantages which are not found in other types of brooders. Some of the outstanding advantages of this electric brooder are as follows:

1. Ordinary farm tools can be used in its construction. The brooder can be built during the winter months when work is slack and will be ready for early spring brooding.
2. An electric brooder requires little or no attention to maintain a uniform temperature. The thermostat automatically maintains the desired temperature after being regulated for the proper range.
3. The heating cable which covers the under side of the top tends to distribute the heat throughout the brooder thus helping to prevent crowding of the chicks. Auxiliary heat will not be required except in extremely cold weather in well-insulated brooder houses.

4. The electric brooder, being well insulated, is economical to operate and at the same time supplies ample heat to produce healthy chicks. Tests indicate that it will require from 0.5 to 0.8 kilowatt hours per chick for the brooding season. The number of kilowatt hours used will vary depending on the condition of the brooder house, outside temperatures, length of the brooding season, and the number of chicks brooded.
5. The fire hazard in electric brooding is reduced to a minimum. This advantage alone makes electric brooding very desirable.

Convenience and Dependability

In weighing the advantages of the various methods of brooding, there are a number of factors which should be considered in addition to the comparative cost of fuel or electricity. The amount of labor required in caring for the chicks and brooder, added convenience, safety, and dependability must also be considered. It has been shown that only about 75% of the usual time spent in caring for the chicks is required for electric brooding. The additional time for coal and kerosene brooding is taken up in caring for the brooder, adding fuel, and disposing of ashes. Once the thermostat in the electric brooder has been adjusted for the desired temperature, no further care need be given.

Relative Humidity

It has been found in electric brooding that the relative humidity tends to run higher than in many other types of brooders. However, no bad results have been evident from the increase in humidity. More frequent changes of litter are required. This brings about a more sanitary condition in the brooder house.

BUILDING THE BROODER

Materials for Constructing the Brooder

The following bill of materials will be required for building the brooder.

Lumber (white pine, free from knots)

3 pc. - 1" x 4" x 12'-0"
1 pc. - 1" x 6" x 10'-0"
1 pc. - $\frac{1}{4}$ " x 3/4" x 6'-0"

Insulation Board

2 pc. - $\frac{1}{2}$ " insulation board 4'-0" x 6'-0"

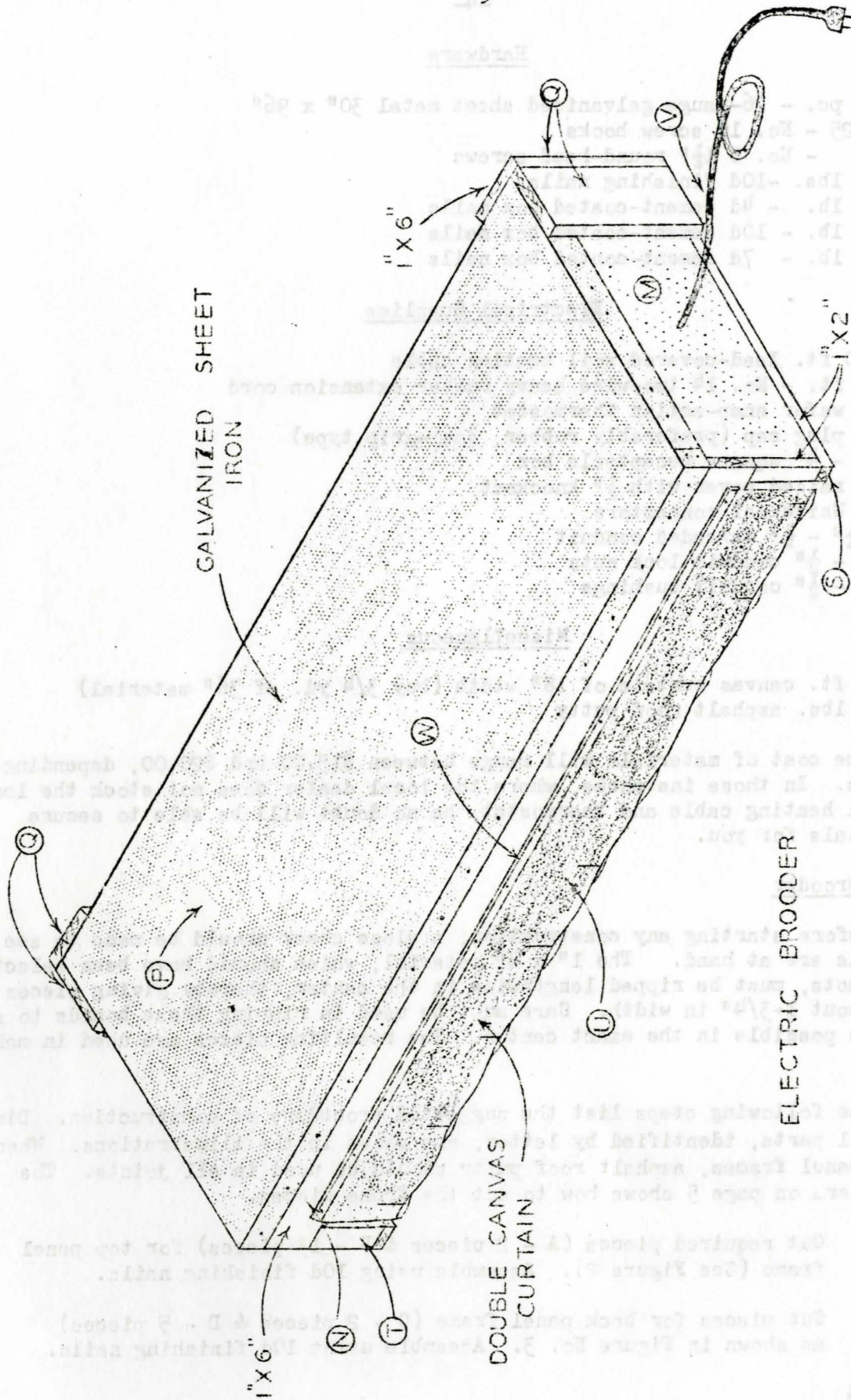


FIGURE NO. 1

Hardware

1 pc. - 26-gauge galvanized sheet metal 30" x 96"
125 - No. 10 screw hooks
8 - No. 8 $1\frac{1}{4}$ " round-head screws
2 lbs. - 10d finishing nails
1 lb. - 4d cement-coated box nails
1 lb. - 10d cement-coated box nails
 $\frac{1}{2}$ lb. - 7d cement-coated box nails

Electrical Supplies

60 ft. lead-covered soil heating cable
6 ft. - No. 14 two-wire heavy rubber extension cord
1 wafer snap-action thermostat
1 plug cap (preferably rubber, easy-grip type)
1 - 4" square receptacle box
1 raised cover with $\frac{1}{2}$ " knockout
3 Universal connectors
 $2\frac{1}{4}$ " - $\frac{1}{2}$ " threaded conduit
3 - $\frac{1}{8}$ " conduit lock nuts
2 - $\frac{1}{2}$ " conduit bushings

Miscellaneous

6 ft. canvas curtain of 18" width (buy $\frac{3}{4}$ yd. of 36" material)
2 lbs. asphalt roof putty

The cost of materials will range between \$15.00 and \$20.00, depending on local prices. In those instances, where the local dealer does not stock the lead-covered soil heating cable and thermostat, he no doubt will be able to secure these materials for you.

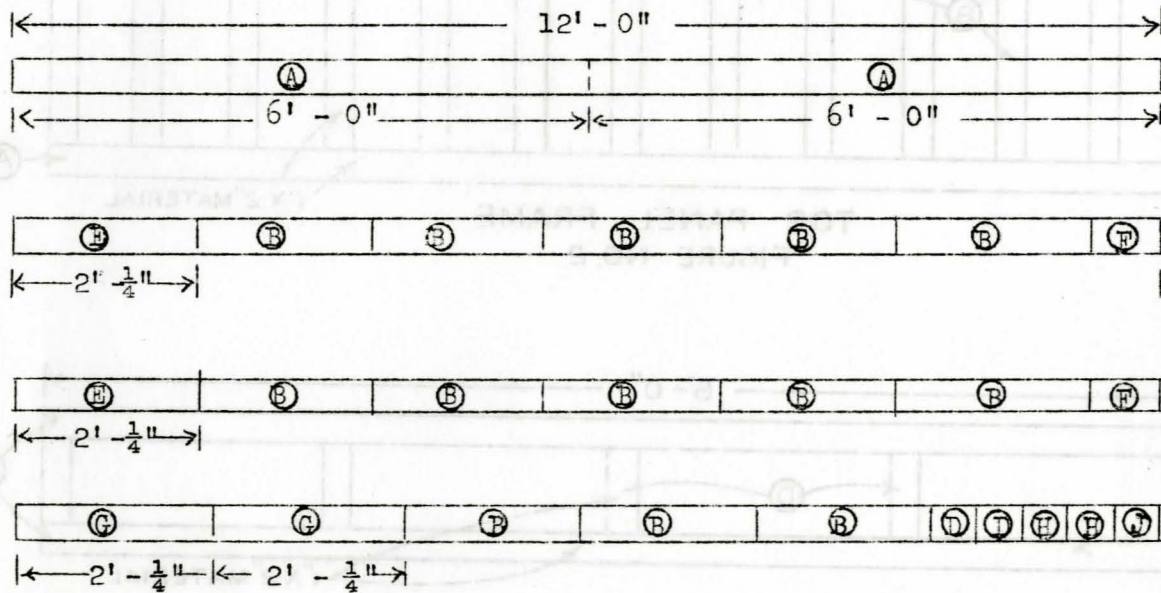
Making the Brooder

Before starting any construction, a close check should be made to see that all materials are at hand. The 1" x 4" material, which should have been selected free from knots, must be ripped lengthwise in the center, thereby giving pieces which are about 1- $\frac{3}{4}$ " in width. Care must be used in ripping these boards to saw as nearly as possible in the exact center. The resulting pieces are used in making the frames.

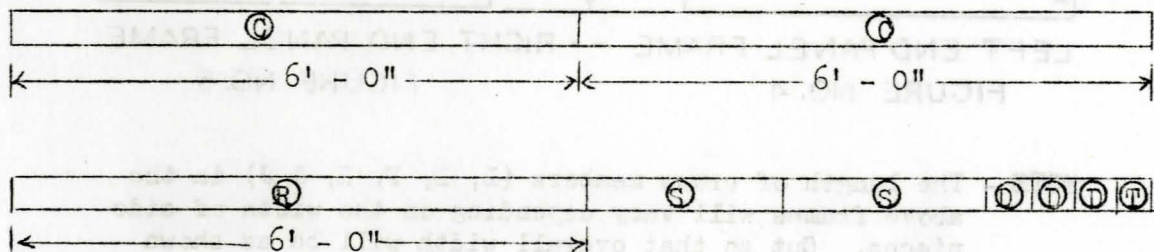
The following steps list the suggested procedure of construction. Dimensions for all parts, identified by letter, are shown in the illustrations. When assembling panel frames, asphalt roof putty should be used in all joints. The cutting pattern on page 5 shows how to cut the frame pieces.

1. Cut required pieces (A - 2 pieces & B - 13 pieces) for top panel frame (See Figure 2). Assemble using 10d finishing nails.
2. Cut pieces for back panel frame (C - 2 pieces & D - 5 pieces) as shown in Figure No. 3. Assemble using 10d finishing nails.

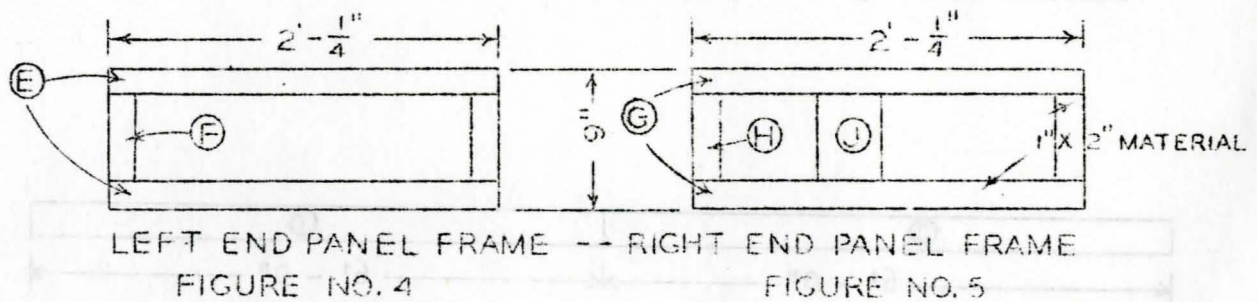
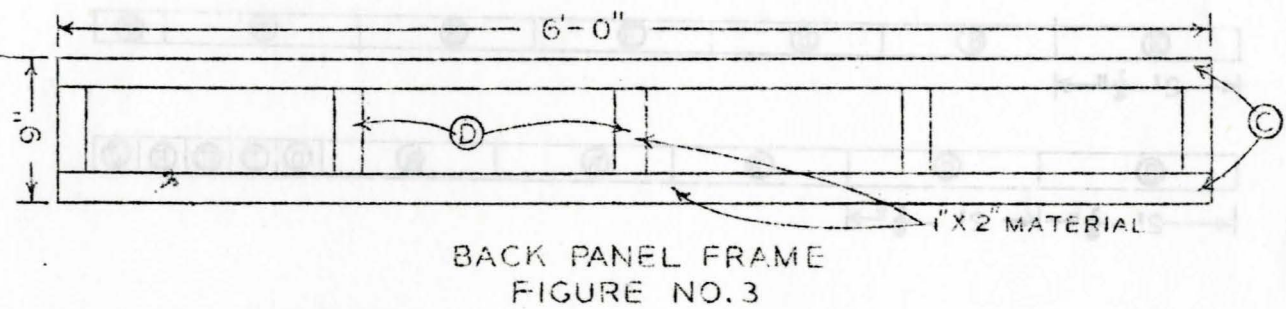
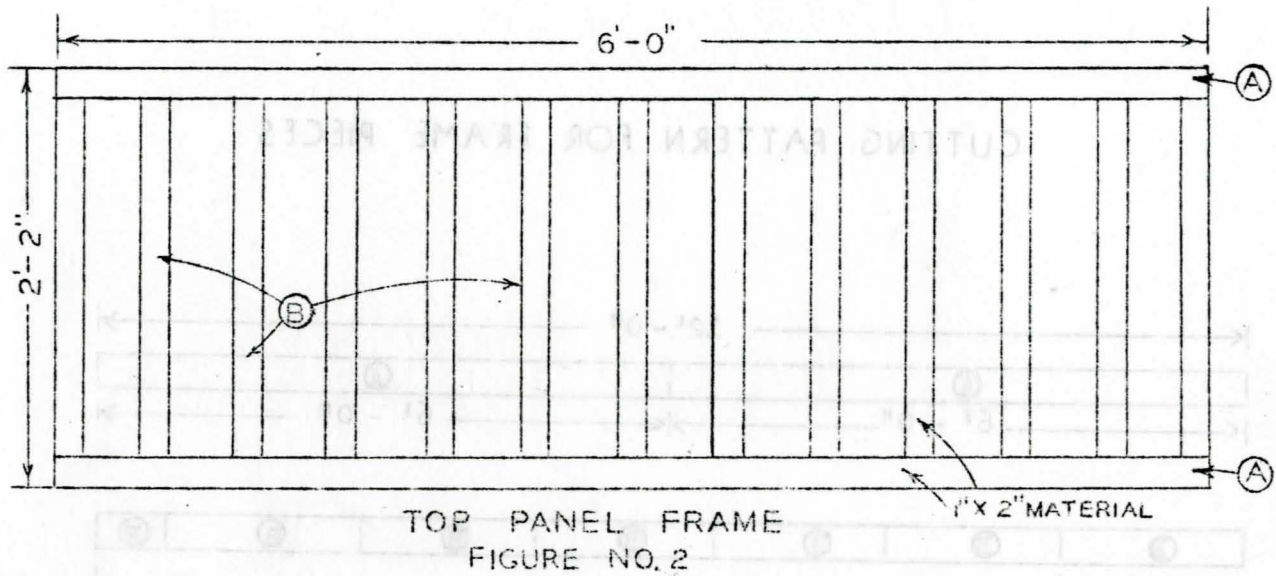
CUTTING PATTERN FOR FRAME PIECES



Length of members "B", "D", "F", "H", "J" & "T" are not shown as their length will be determined by the width of side members. See Fig. No. 2, 3, 4 & 5.

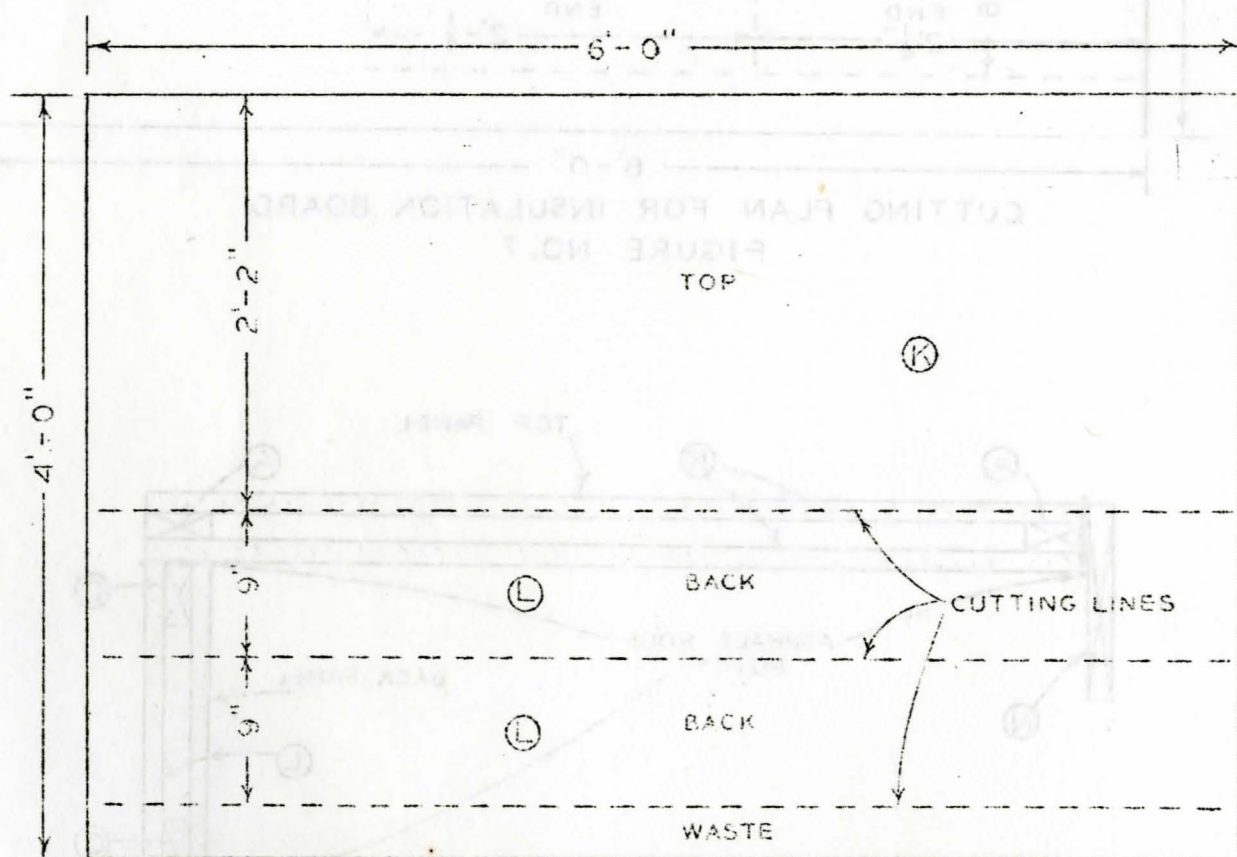


The length of members "S" will vary and can be determined by measuring the brooder base.

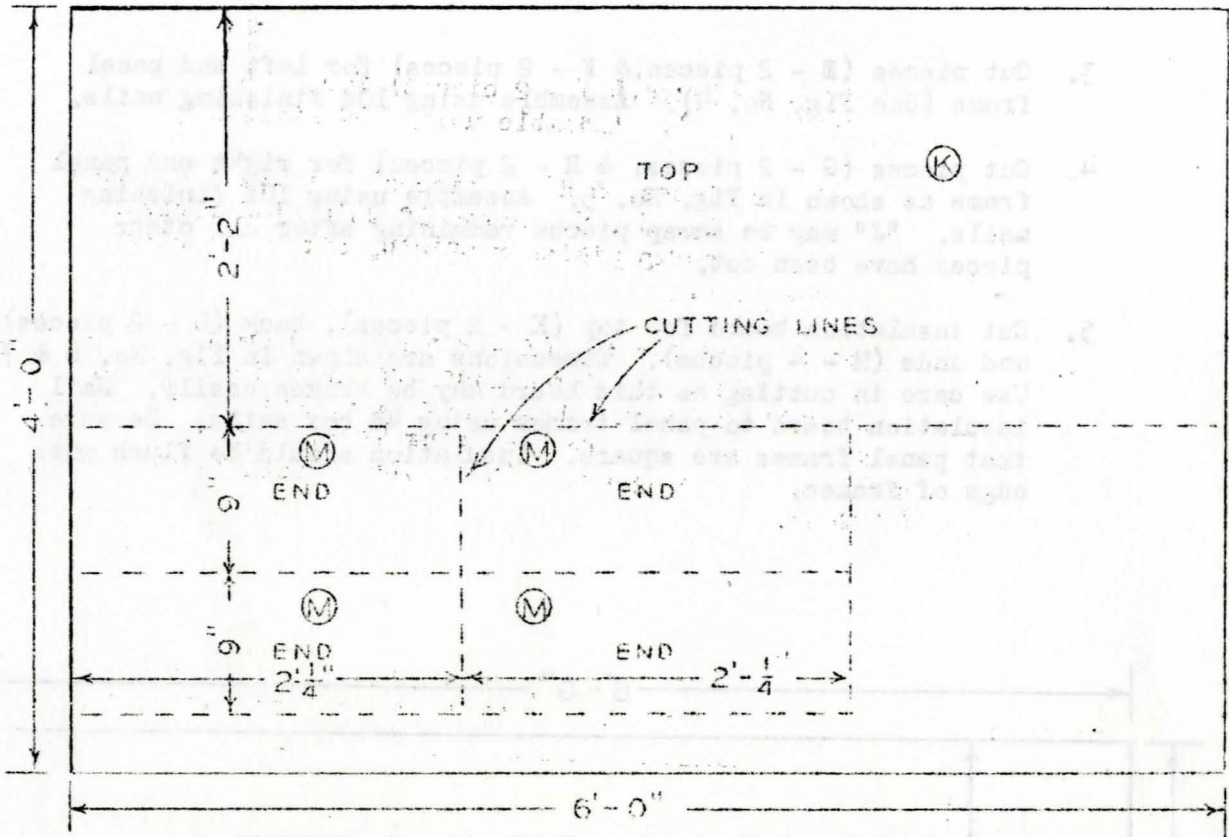


NOTE - The length of cross members (B, D, F, H, & J) in the above frames will vary depending on the width of side pieces. Cut so that overall width will be as shown by dimensions.

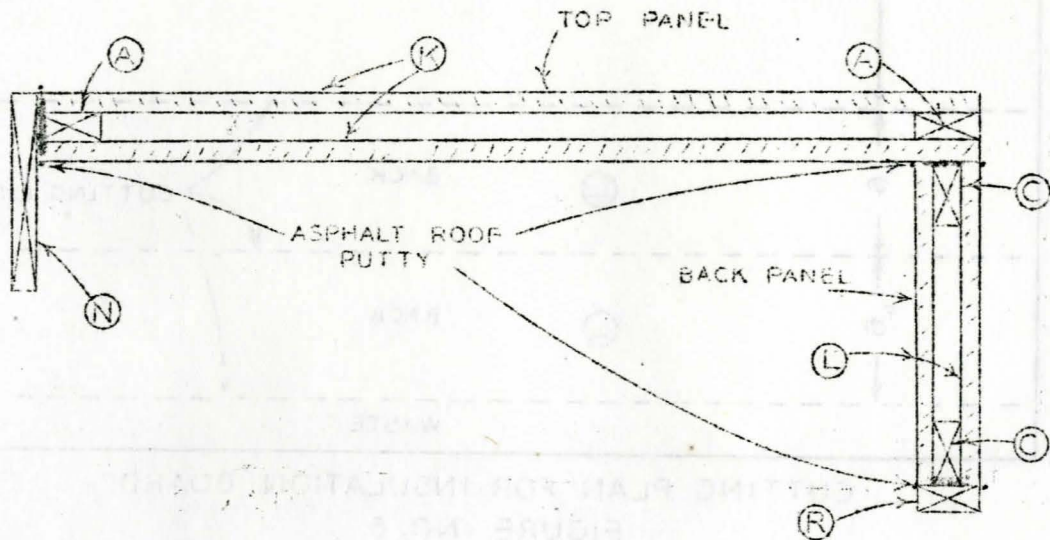
3. Cut pieces (E - 2 pieces, & F - 2 pieces) for left end panel frame (See Fig. No. 4). Assemble using 10d finishing nails.
4. Cut pieces (G - 2 pieces, & H - 2 pieces) for right end panel frame as shown in Fig. No. 5. Assemble using 10d finishing nails. "J" may be scrap pieces remaining after all other pieces have been cut.
5. Cut insulation board for top (K - 2 pieces), back (L - 2 pieces) and ends (M - 4 pieces). Dimensions are shown in Fig. No. 6 & 7. Use care in cutting as this board may be broken easily. Nail insulation board to panel frames using 4d box nails. Be sure that panel frames are square. Insulation should be flush with edge of frames.



CUTTING PLAN FOR INSULATION BOARD
FIGURE NO. 6



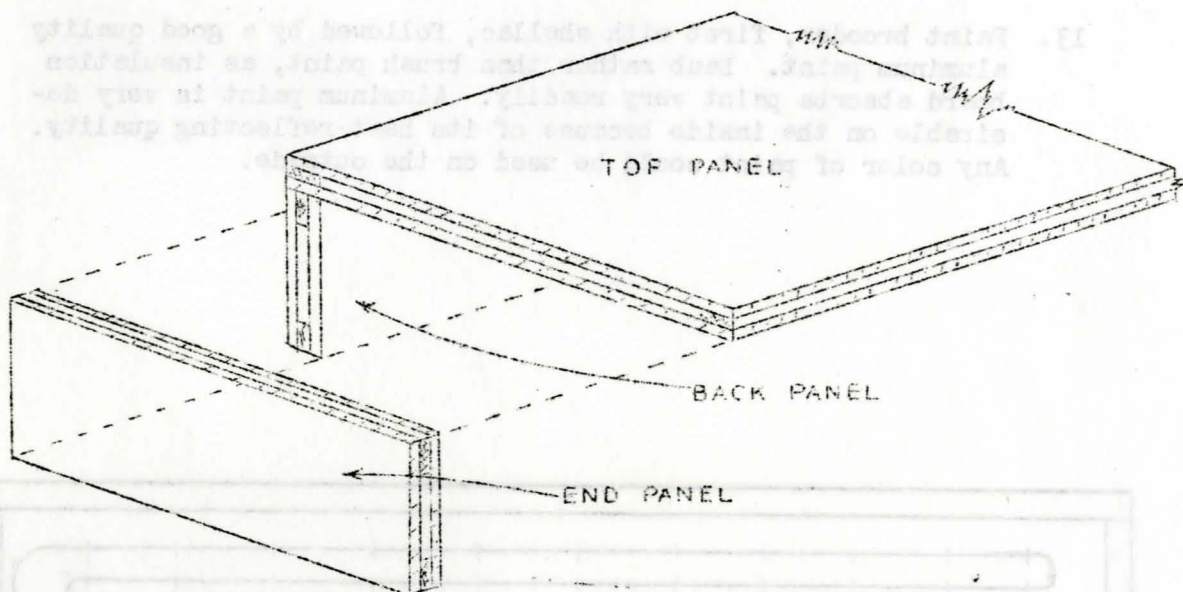
CUTTING PLAN FOR INSULATION BOARD
FIGURE NO. 7



BROODER CROSS SECTION
FIGURE NO. 8

NOTE: ASPHALT ROOF PUTTY IS PLACED IN ALL JOINTS WHEN NAILING BROODER PARTS TOGETHER.

6. Nail top panel to back panel (See Fig. No. 8) using 10d cement-coated box nails. Asphalt roof putty should be placed on top of back panel before assembling.
7. Nail right and left end panels in place (See Fig. No. 9) using 10d cement-coated box nails. Note that right end panel has extra member "J" for outlet box mounting. Asphalt roof putty is placed on top and end of panels.



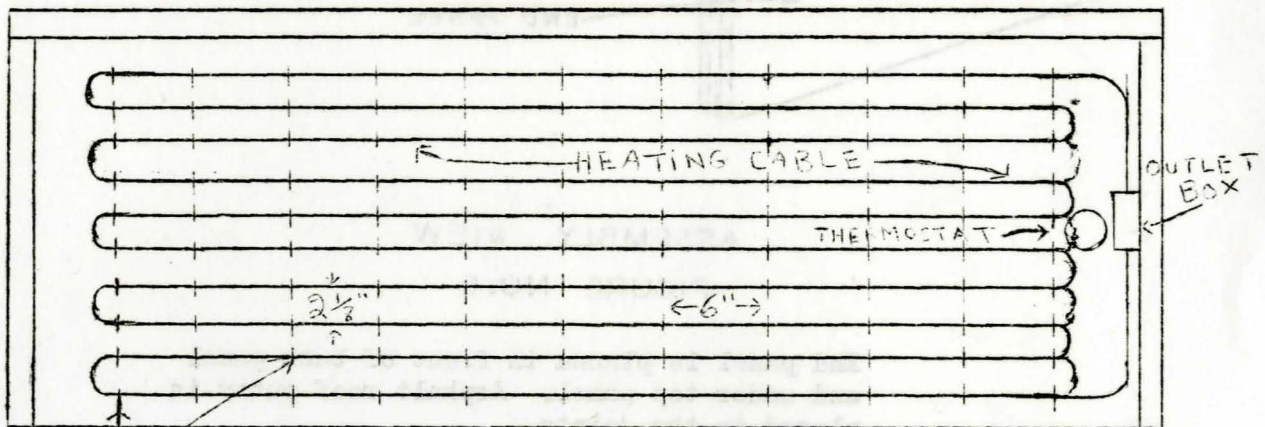
ASSEMBLY VIEW

FIGURE NO. 9

End panel is placed in front of back panel and under top panel. Asphalt roof putty is placed in the joints.

8. Cut from 1" x 6" material, member "N" (See Fig. 1) and nail on front of brooder using 7d cement-coated box nails.
9. Cut sill pieces (S - 2 pieces and R - 1 piece as shown in Fig. No. 1 and No. 8). Nail with 7d cement-coated box nails using asphalt roof putty in the joints.

10. Cut front trim (T - 2 pieces) as shown in Fig. No. 1 and nail with 7d cement-coated box nails. Asphalt roof putty is again used in the joint.
11. Cut galvanized sheet metal "P" to a length of 77". (See Fig. No. 1.) Bend to fit top of brooder, leaving $2\frac{1}{4}$ " on back side to cover joint between top and back. Bend edges and other side to fit brooder top. Apply asphalt roof putty under edges and nail with 4d cement-coated box nails.
12. Cut from 1" x 6" material 4-corner pieces "Q", (See Fig. No. 1) and nail with 7d cement-coated box nails.
13. Paint brooder, first with shellac, followed by a good quality aluminum paint. Daub rather than brush paint, as insulation board absorbs paint very readily. Aluminum paint is very desirable on the inside because of its heat-reflecting quality. Any color of paint could be used on the outside.



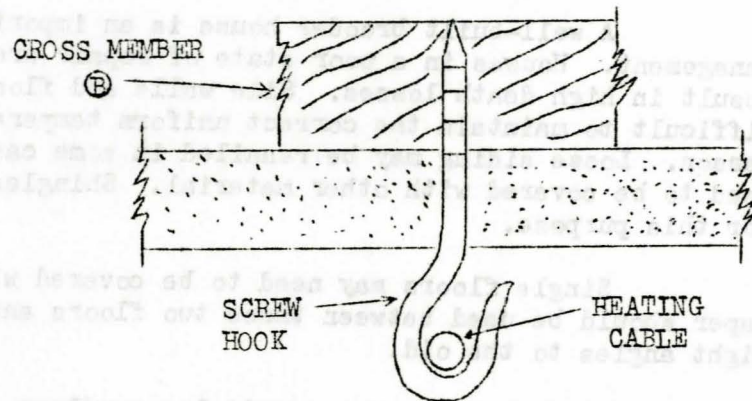
SCREW
HOOKS

PLAN VIEW OF UNDER SIDE OF TOP PANEL
SHOWING WIRING DIAGRAM-FIGURE NO. 10

14. Locate positions of screw hooks. (See Fig. No. 10.) It is essential that hooks are screwed into top frame members "B". Ten rows running lengthwise spaced approximately $2\frac{1}{8}$ " apart. Hooks are located six inches apart in the row and screwed well into the board. (See Fig. No. 11.)
15. Lay soil heating cable in position (Fig. No. 10) being careful that cable is not bent too sharply.

16. Bend hooks until cable is held securely.
Caution: Do not bend far enough to pinch cable.

See Fig. No. 11.



WIRE SUPPORT DETAIL

FIGURE NO. 11

17. Place outlet box in position (Fig. No. 10). As thermostat is located on box cover, place box so that wafer is midway between top and bottom of brooder end. A $7/8$ " hole must be bored (for the $1/2$ " conduit nipple which is attached to back center hole of outlet box) in right end panel.
18. All splices and connections must be made inside of outlet box. Connector clamps must be used to hold the ends of the soil heating cable brought into the box. Splice and solder one of the two wires of the extension cord to one end of the soil heating cable. Attach other wire of extension cord to one of thermostat terminals and other end of the soil heating cable to other thermostat terminal. All these splices must be made in the receptacle box and wrapped with rubber and friction tape.
19. Attach other end of extension cord to plug cap.
20. A double canvas curtain "V" may be attached as shown in Figure No. 1 by screwing a strip of wood "W" to the outside of member "N". The double curtain should be cut or slit as shown in Fig. No. 1. Each curtain should be slit on 1 foot intervals. However, the slits in one curtain should fall midway between the slits in the other curtain.

Trial Run on Brooder

It is very desirable to make a trial run on the brooder to check its operation. This, also, offers an opportunity to regulate the thermostat for the desired temperature. The brooder should be operated for a period of 36 to 48 hours to remove the paint odor before the chicks are placed in the brooder.

Capacity of the Brooder

The maximum number of chicks brooded in this size brooder should not be more than 200, this figure being based on about 8.5 square inches per chick. Overcrowding is very undesirable and should be avoided.

Brooder House Requirements

A well-built brooder house is an important factor in successful poultry management. Houses in a poor state of repair are often cold, drafty, or damp, and result in high death losses. Side walls and floors having large cracks make it difficult to maintain the correct uniform temperature under the hover during brooding season. Loose siding may be renailed in some cases, while in others the siding may need to be covered with other material. Shingles or heavy prepared roofing are good for this purpose.

Single floors may need to be covered with new or used lumber. Building paper should be used between these two floors and the new floor should be laid at right angles to the old.

Tight houses are essential regardless of the type of brooding equipment used but are doubly so when the brooder is heated by electricity. Even more economical operation will result in this case, if the house itself is insulated. This may be done in a number of ways. Rigid commercial type insulation board may be nailed to the inside face of the studs and the under side of the rafters. Since insulation boards are 4' - 0" wide and the rafters are spaced 2' - 0" on centers, difficulty in nailing sometimes occurs. Some owners have found it more satisfactory to nail the insulation boards in place so that they run across the rafters rather than with the roof slope. Trouble from mites and lice can be reduced if the cracks between the insulation boards are filled with asphalt roof putty. Batten strips are often used over these cracks, particularly on the ceiling, and in such cases the coating of the putty should be thick enough to form a seal between the insulation board and the bat when the latter is nailed in place.

To prevent absorption of moisture, the insulation board should be painted as soon as it is in place. The manufacturer's directions for painting should be followed carefully.

Chicks sometimes try to pick the fibers out of the insulation board but this can be prevented by nailing 1" lumber over the insulation material for a distance of about 8" or 10" above the floor. Window screen may be used in place of lumber if desired.

If used lumber, such as flooring, shiplap, ceiling, or even 1" x 4"s or 1" x 6"s is available, it can be used in place of commercial insulation board. This material should be nailed on the inside face of the studs and under side of the rafters. The space between studs may be stuffed full of straw, shavings or ground corn cobs. If this is done, it will be necessary to replace with clean stuffing before more chicks are brooded to lessen the troubles with mites and lice.

* * * * *

Acknowledgement is hereby made to F. D. Yung, Research Agricultural Engineer, Nebraska College of Agriculture, Lincoln, Nebraska, for suggestions and assistance in the preparation of this circular. It is under Mr. Yung's supervision that experimental work in electric brooders is being done.