



ERECTION INSTRUCTIONS

FOR THE



20'-0" x 48'-0"
U.S. NAVY
STEEL ARCH RIB HUT
INCLUDING 2-4 FT. OVERHANGS
MANUFACTURED FOR
NAVY DEPARTMENT
BUREAU YARDS AND DOCKS
BY
STRAN-STEEL DIVISION
GREAT LAKES STEEL CORP.
PENOBSCOT BUILDING
DETROIT 26, MICHIGAN
UNIT OF NATIONAL STEEL CORP.

NORTHERN DESIGN
NOVEMBER 1, 1944

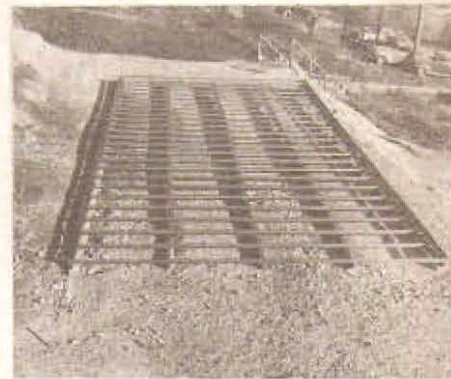
ERECTION SEQUENCE



INTERIOR COVERING



RIBS AND PURLINS



FLOOR FRAME



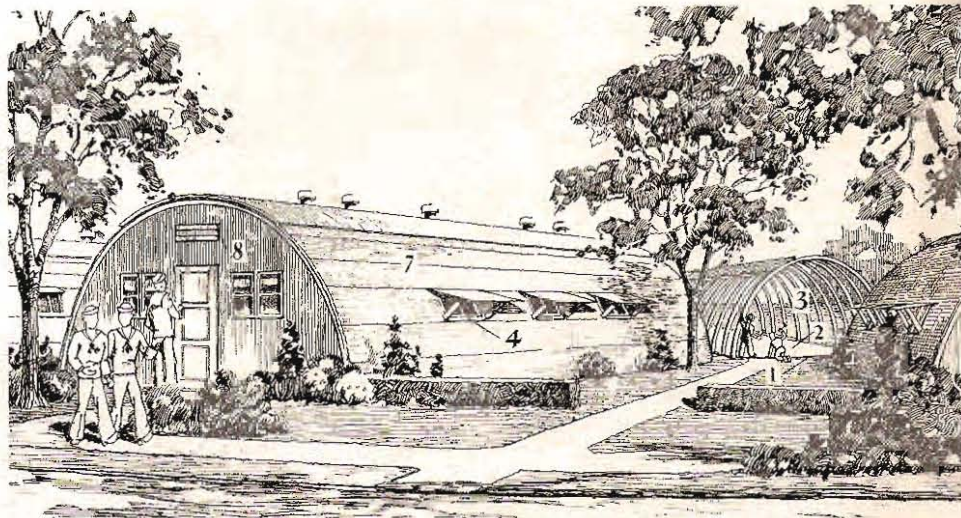
WINDOWS



INSULATION

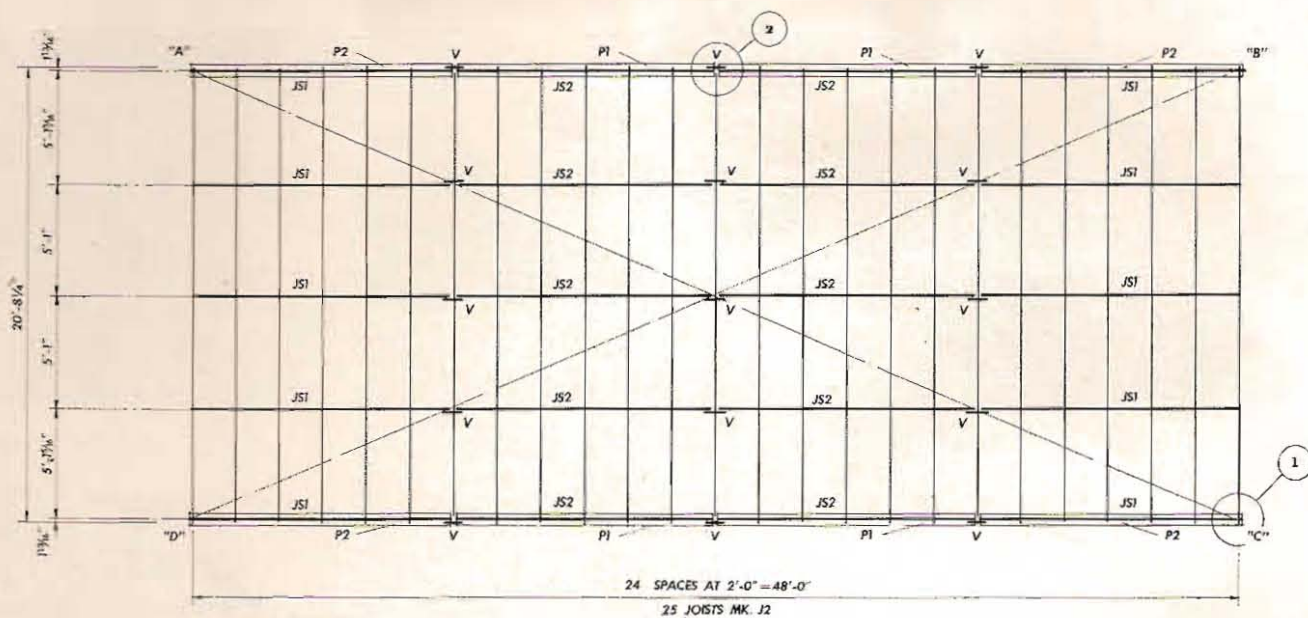


EXTERIOR COVERING

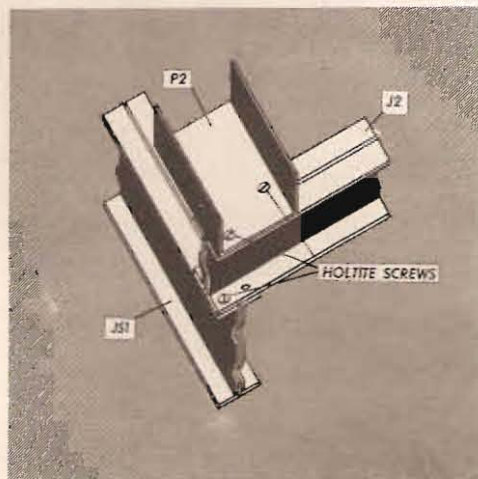


- 1. Floor Framing.** Lay the sills first; then the joists, then the channel plates. Level and square the whole assembly. (See pages 2 and 3.)
- 2. Erect Ribs, Purlins and Trimmers.** Fasten the half-ribs together, attach trimmers, raise into position and screw to channel plates. Erect purlins and plumb entire assembly. (See pages 4 and 5.)
- 3. Floor Panels.** Lay out plywood floor panels on the joists. Install metal splines at longitudinal joints, and nail the panels to the joists. (See pages 6 and 7.)
- 4. Inside Covering.** Lay the Masonite sheets in place and nail them to the ribs. Install metal splines at horizontal joints and nail Masonite battens over rib joints. (See pages 8 and 9.)
- 5. Windows.** Assemble the knocked down windows. Install in position and nail to ribs. (See pages 10 and 11.)
- 6. Insulation.** Stretch insulation to required length and lay over inside covering between ribs. (See pages 12 and 13.)
- 7. Outside Covering.** Nail corrugated sheets on sides to ribs and on top to purlins. (See pages 14 and 15.)
- 8. Ventilators and Smokestacks.** Assemble ventilators and smokestacks and install at center line of roof. (See pages 16 and 17.)
- 9. Bulkheads.** Frame bulkheads in field from pre-cut lumber. Install door, windows, louvre, etc. (See pages 18 and 19.)
- 10. Clean Up.** Save all scraps, bands, blocks, nails, screws, and crating material not used. Sort and save for further use.

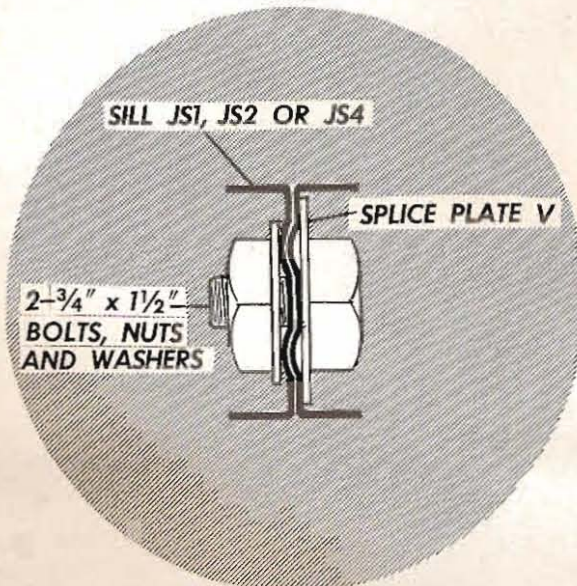
FLOOR FRAMING



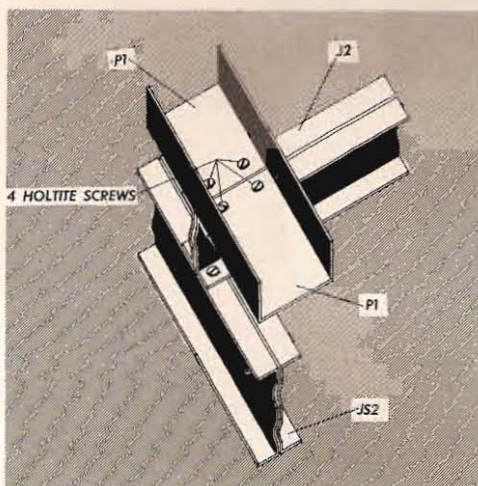
FLOOR FRAMING PLAN



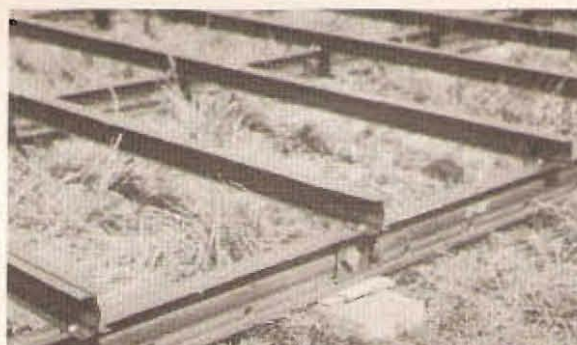
DETAIL 2



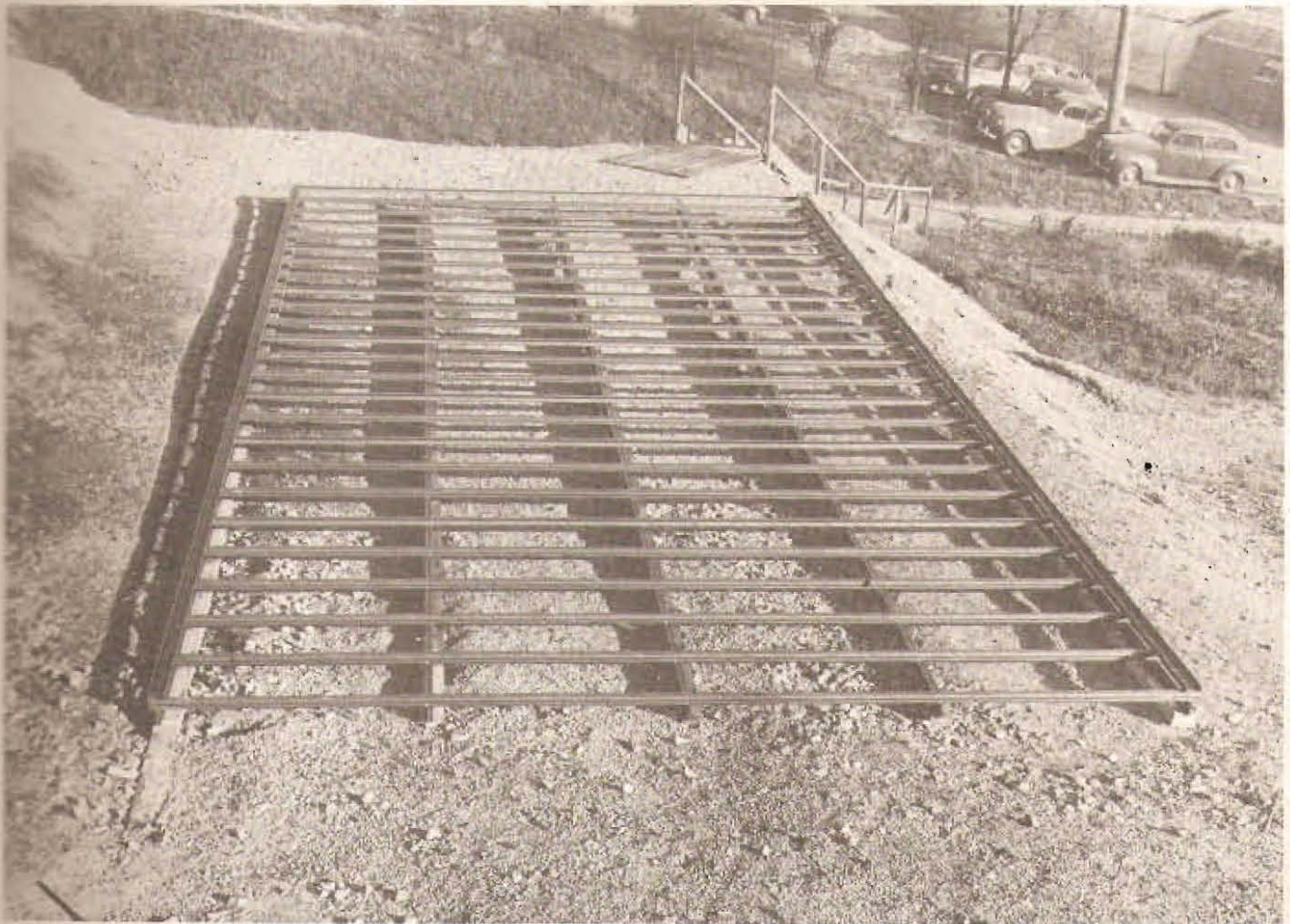
TYPICAL SILL SPLICE



DETAIL 1



SILL AND JOISTS



COMPLETE FLOOR FRAME

1 The floor joist assembly consists of steel sills, joists, and channel plates. The sills run lengthwise of the hut on the ground and support the joists, which are fastened to the sills at right angles to them. At the extreme ends of the joists channel plates are fastened for receiving the ribs.

1. Level and tamp an area of ground approximately 30' x 60' for the hut site. If site is too uneven to level easily, see Wood Foundation Adaptation, page 21.

2. Lay the sills on the tamped ground in five parallel lines about 5' apart with the holes (for connecting the joists) facing upward. Line up the sills with the nailing groove cures matching (see drawing). Otherwise, when the splice plate is tightened they will be forced out of line.

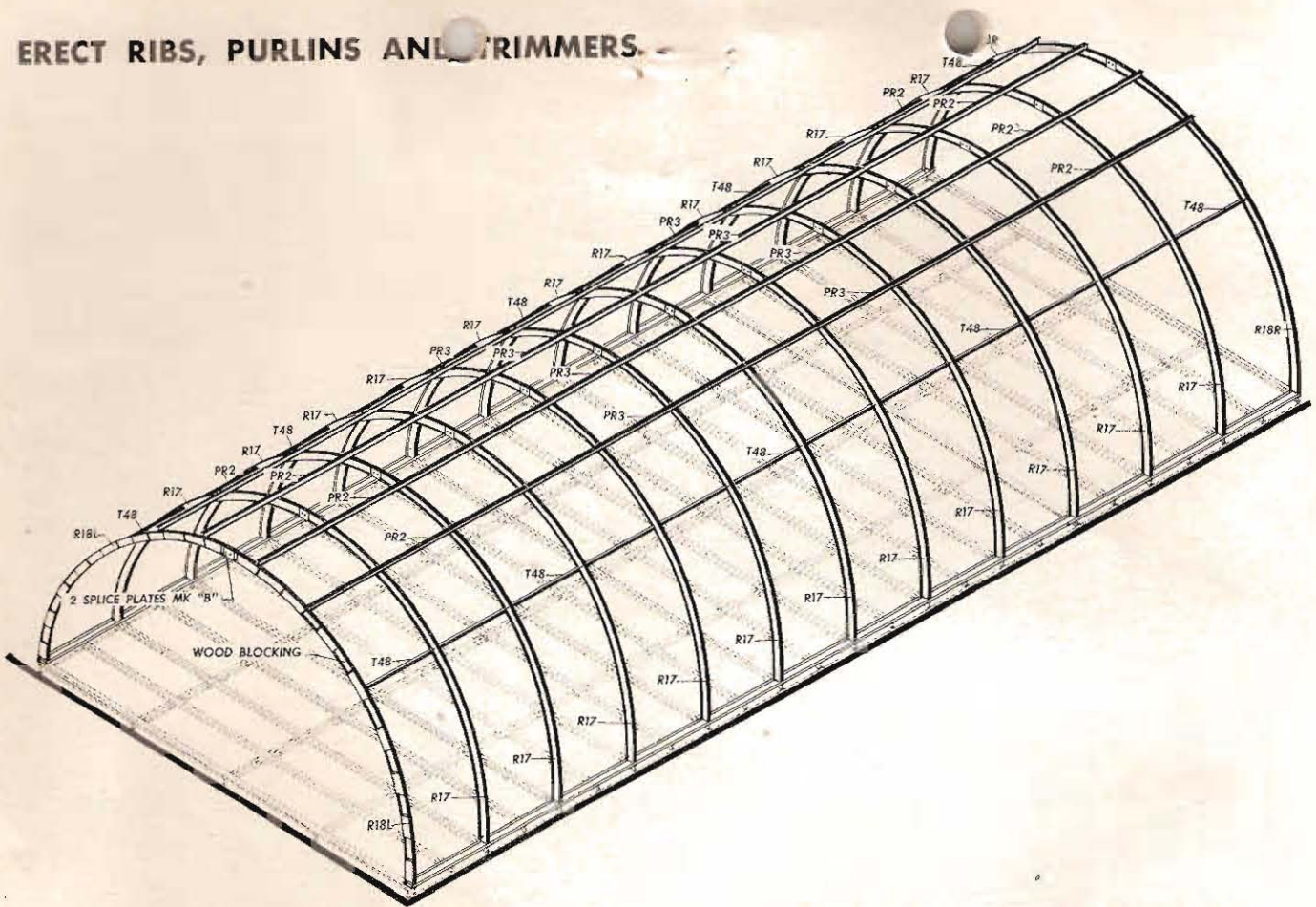
3. Lay the joists, connecting holes down, at right angles to the sills on 2' centers as shown. Use a drift pin to line up the holes and insert 2 screws diagonally opposite to each other at each connection. At each splice in the sills use 4 screws.

4. Place channel plates (Mk. P-1 and P-2) over ends of joists and parallel to outside sill joists. Screw these

to the joists. Use 2 screws diagonally at each joist but use 4 screws where there is a joint in the channel plate. (See detail.)

5. Square up the above floor assembly. Distance A-C should be the same as B-D. Use the roll of wire from the tool box for measuring these distances. Hold one end of the wire on the inside lip of the channel plate "A." Stretch to the same point at "C." Do the same from B to D. Shift the corners until distances A-C and B-D are equal. Check the ends and sides for straightness, using a line or wire and recheck for square. Then check the assembly for level starting at joist B-C. With this joist level, proceed to level the channel plate, working from C to D. Level the channel plate by placing the level on the lip of the plate in about four locations. When the channel plate is levelled, level the other end joist, working from D to A. Then proceed with levelling the channel plate from A to B. Bring the other joists to level, using level at four points as for opposite side. Use small wedges or blocking made from crating lumber to raise the sills, and scoop dirt from under the sills to lower. *Be sure the floor assembly is level before proceeding.*

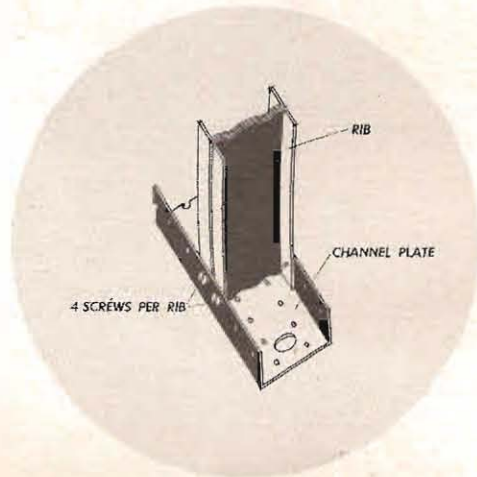
ERECT RIBS, PURLINS AND TRIMMERS



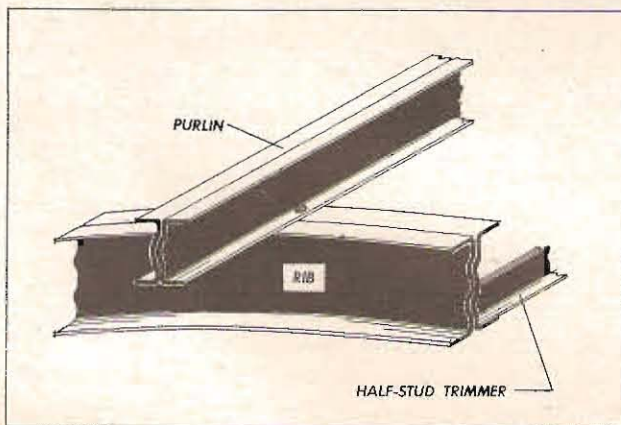
COMPLETE FRAMING



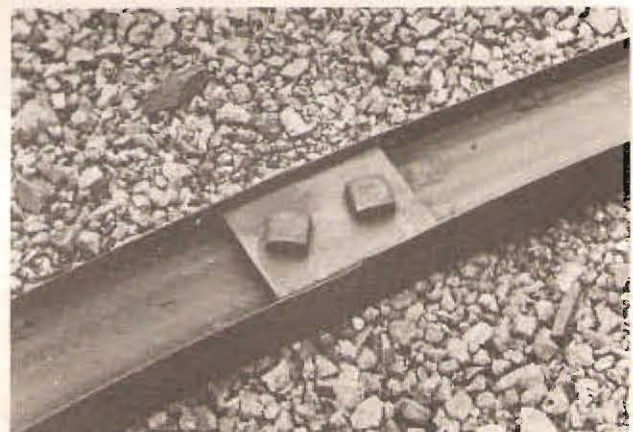
SPLICING RIB



DETAIL AT PLATE

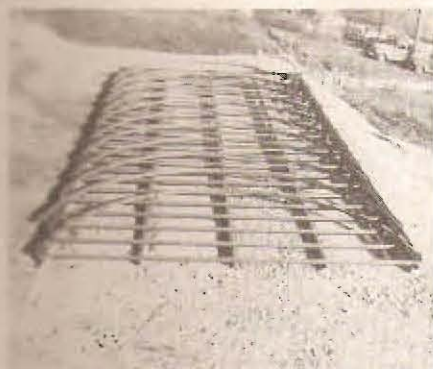


RIB AND PURLIN



COMPLETED SPLICE

RIBS IN PLACE



ASSEMBLE RIBS



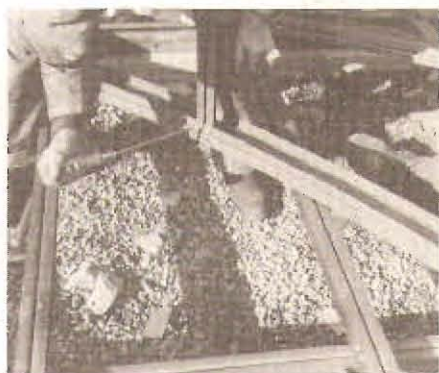
ON GROUND



ERECT END RIB



FASTEN TRIMMER



SCREW TO SILL



ERECT RIB



TRIMMER CONNECTION



RIBS AND PURLINS



PURLINS

2 The rib assembly consists of two steel sections, or "half-ribs," which are joined together at the top and whose ends fasten to the channel plate above every other joist beginning with the end joist. On top of the ribs are four rows of purlins for receiving the ends of the inside covering sheets. Construct a scaffold out of crate lumber to use for making purlin and trimmer connections at top of rib.

1. Assemble all ribs on the ground (see photograph) before raising any. The ribs are joined at the top with two channel splice plates $3\frac{7}{16}'' \times 5''$ x No. 12 gauge Mk. B and $2\frac{3}{4}'' \times 2\frac{1}{2}''$ bolts. (See photo.) In assembling the ribs with the wood blocking take care to have the bolt head on the block side of the rib so that later work

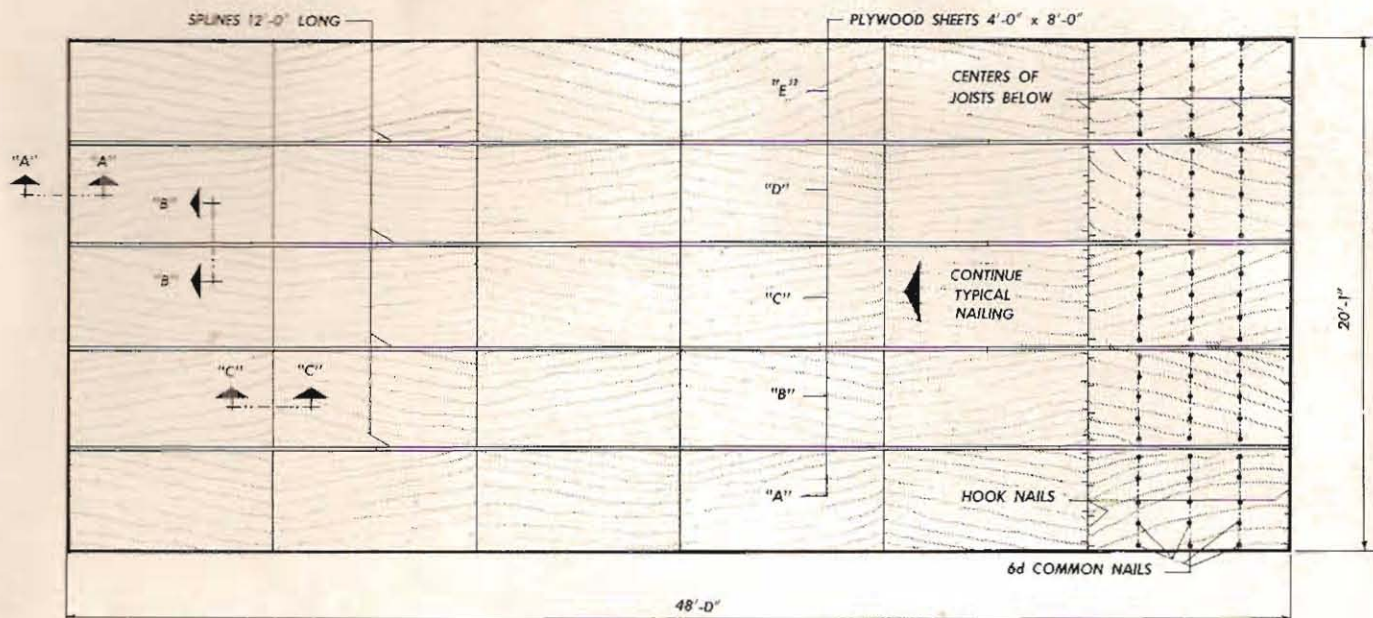
will clear. The ribs with the wood blocking will be the end ribs and the blocking side should face outward. Raise one of these ribs first and secure it into the channel plate, using 4 screws. (See detail.) Plumb and brace this rib.

2. Fasten the trimmers to the next rib while it is on the floor. Raise this rib, fasten the trimmers to the rib already raised (see photo), and secure the rib to the channel plate. Repeat this operation for each successive rib.

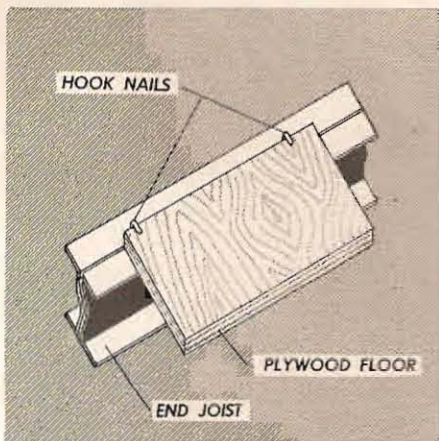
3. Fasten the purlins in place (see photo) after the ribs are raised, using two screws diagonally at each rib.

4. Recheck the entire structure to make certain it is plumb.

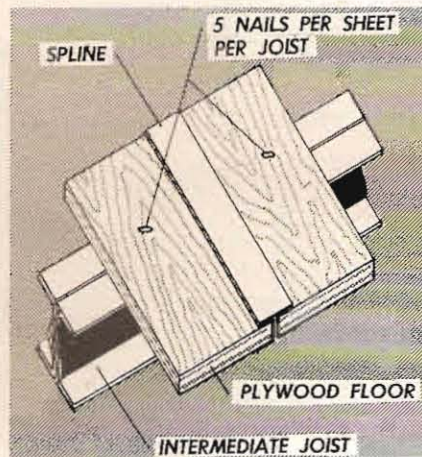
FLOOR PANELS



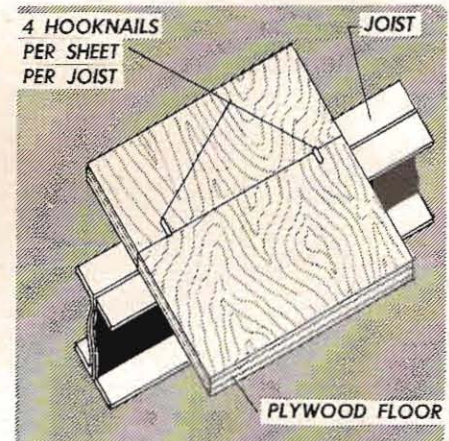
LAYOUT OF PLYWOOD PANELS



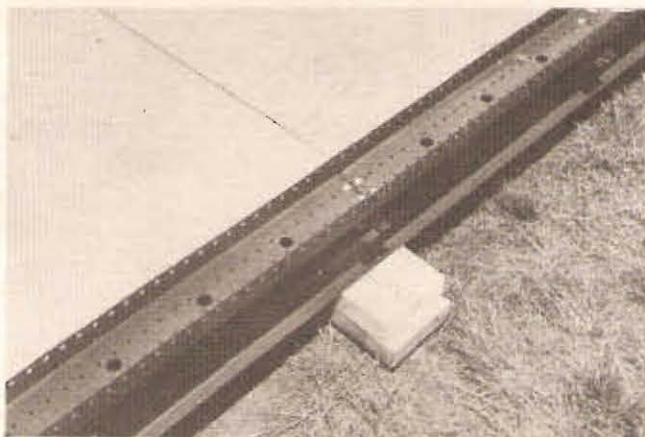
SECTION "A-A"



SECTION "B-B"



SECTION "C-C"



PANELS BUTT OVER JOIST



NAIL PANELS IN PLACE

FLOOR PANELS



INSTALL PANELS



HOOK NAILS



NAIL ON CHALK LINE

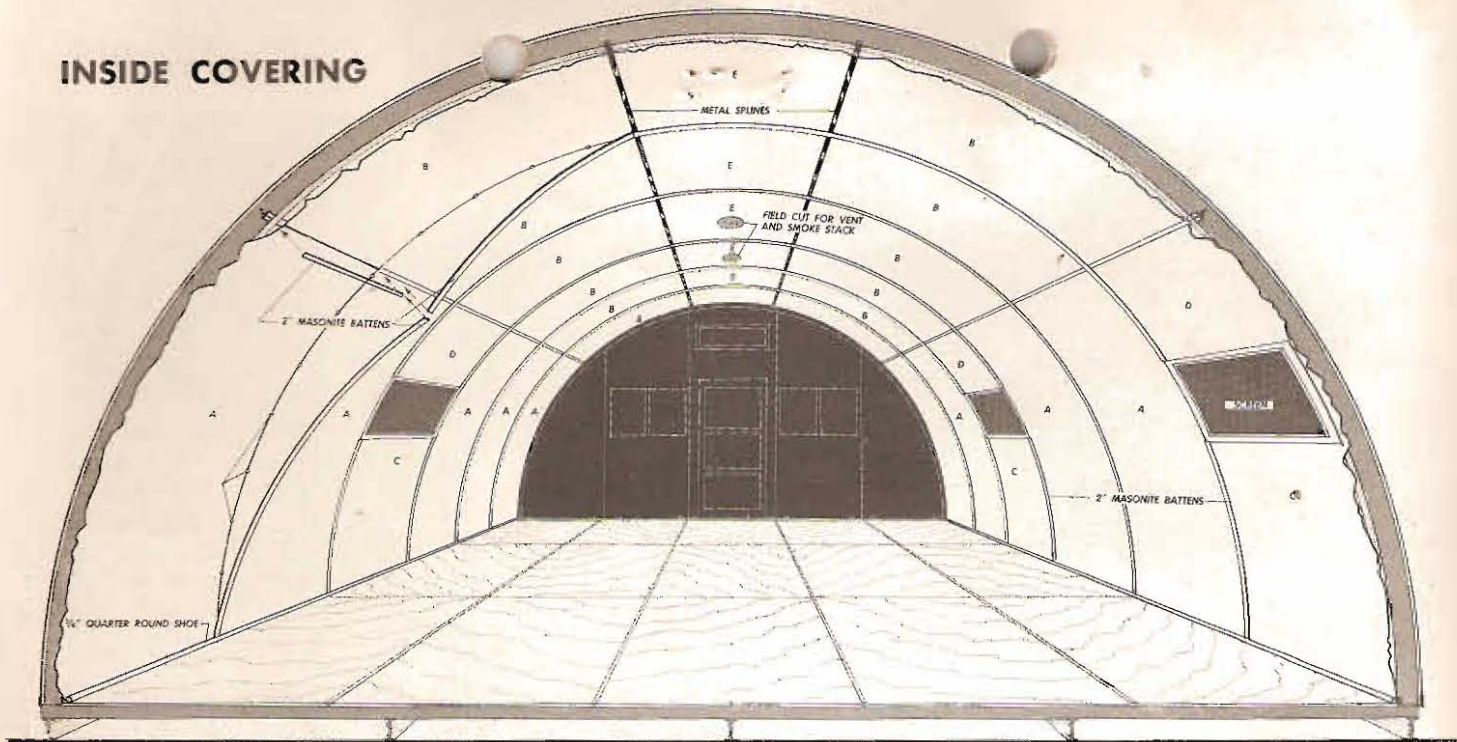
3

The floor is covered with 4' 0" x 8' 0" plywood panels nailed to the floor joists. Metal splines fit between the lengthwise joints.

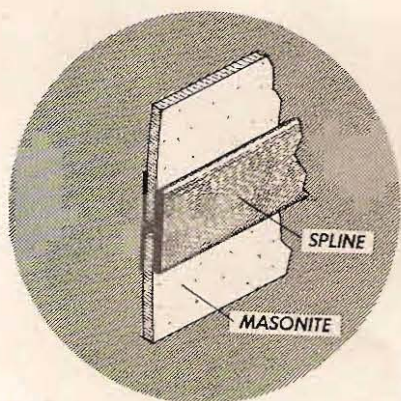
1. Lay out all the plywood panels (clear side up) starting with row "A" and proceeding to rows "B," "C," "D" and "E" fitting the metal splines between the rows as each is laid. (See Sect. B-B.) The ends of the panels should butt over the center of joists.

2. Nail the panels in place. Use 6d common nails at intermediate joists (see Sect. B-B), and hook nails at the ends of the panels (see Sect. C-C and A-A). To establish a nailing line for the intermediate rows of nails, take a chalk line, hold each end over the center of the joist, pull the line taut and snap. This will leave a guide line on the panel. Do not use more nails than the sketches call for. (See Sect. B-B and C-C.)

INSIDE COVERING



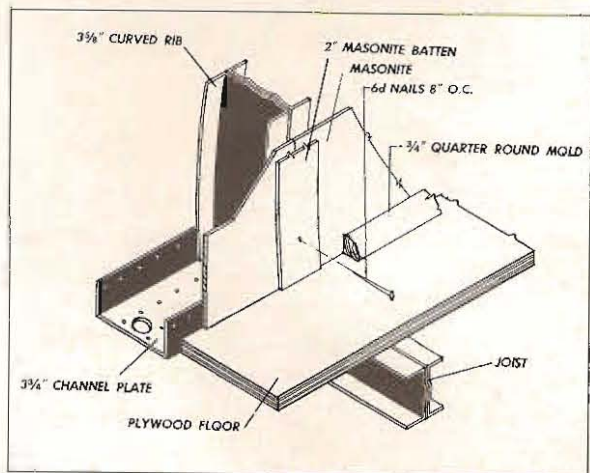
CUT AWAY VIEW



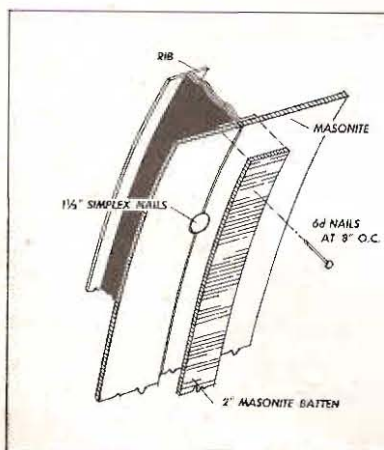
METAL SPLINE



"A" AND "C" SHEETS



DETAIL AT FLOOR



MASONITE BATTEN



"A" SHEETS

INSIDE COVERING



NAIL TO RIBS



INSERT SPLINE



"C" SHEET

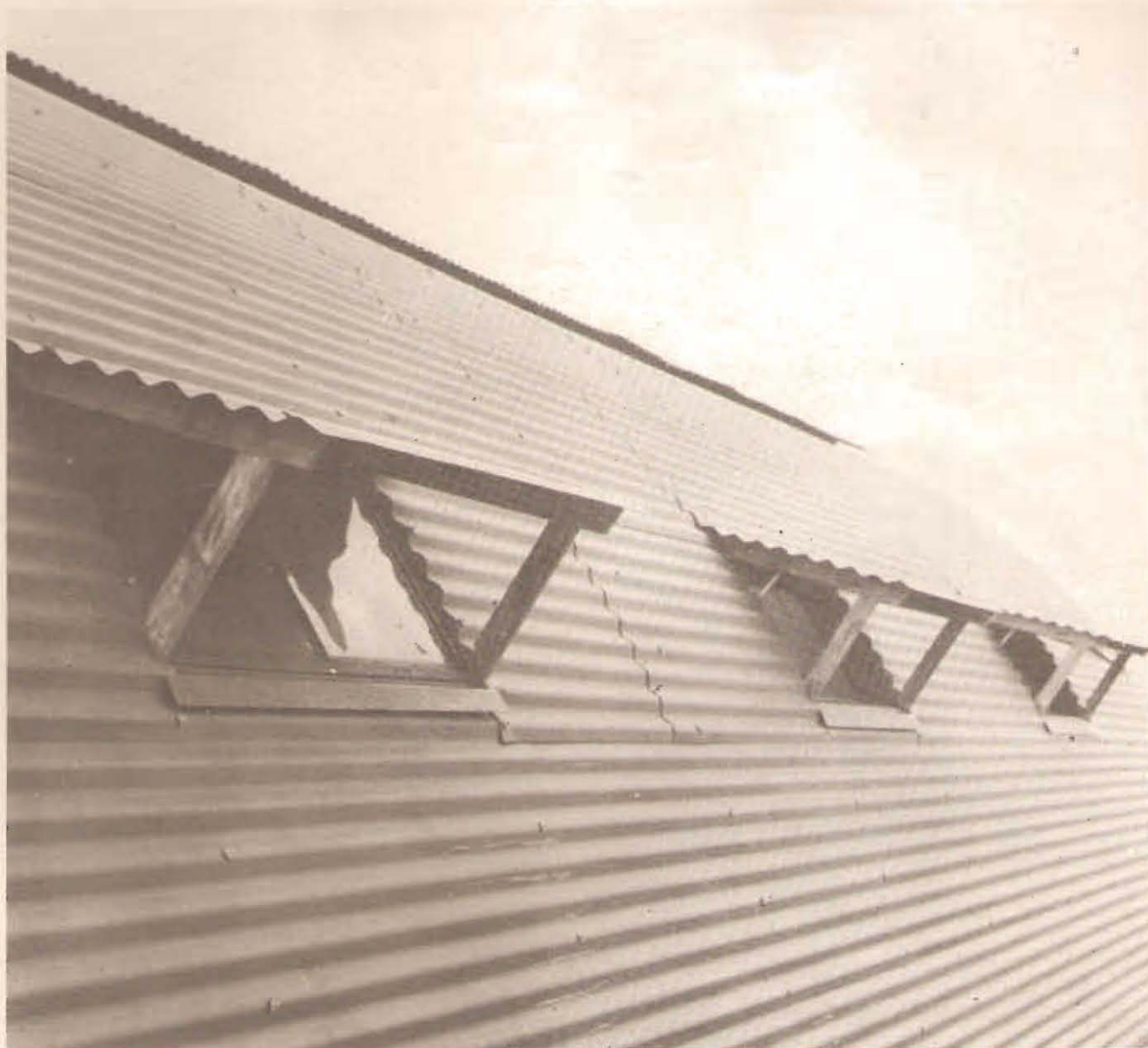
4

The inside of the hut is covered with $\frac{1}{8}$ " thick Masonite sheets, nailed to ribs and trimmers, smooth side facing inside of hut.

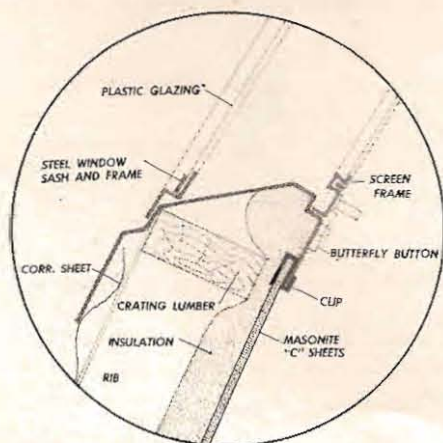
1. Start with an "A" sheet ($3' 11\frac{7}{8}" \times 8' 0"$) near the middle of the building. Hold it in place against the ribs, and check to see that ribs are true and vertical, with nailing grooves $4' 0"$ o.c., before nailing sheet in place with Simplex nails, approximately $24"$ o.c. Repeat this process at ends of building, trueing up frame, if necessary, before applying the balance of "A" sheets.
2. Nail six "C" sheets ($3' 11\frac{7}{8}" \times 4' 0"$) in place under window openings.

3. Nail twenty-four (24) "B" sheets ($3' 11\frac{7}{8}" \times 6' 0"$) to ribs and trimmers.

4. Apply six (6) "E" sheets ($3' 4\frac{1}{2}" \times 7' 11\frac{7}{8}"$), sliding the metal splines between "B" and "E" as work progresses.
5. Fasten 2" Masonite battens at all joints between sheets, except where metal splines occur.
6. Do not apply "D" sheets over window openings until after sash is in place, and omit wood shoe until bulkheads are installed.

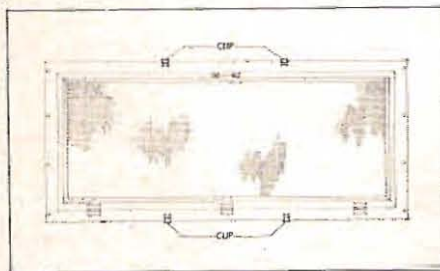


COMPLETED WINDOWS

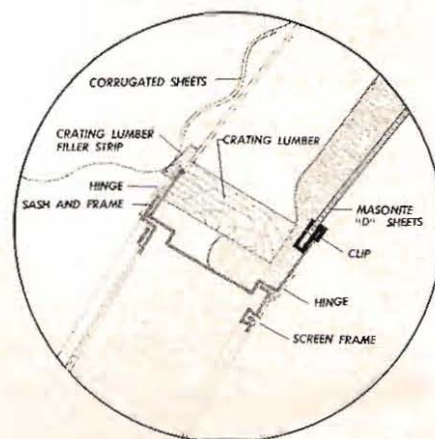


10

SILL

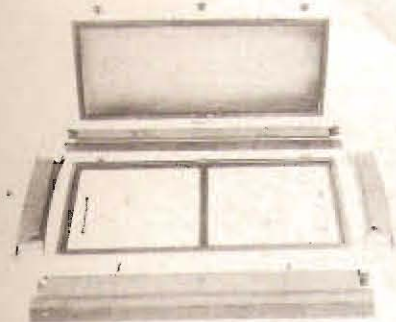


CLIPS



HEAD

WINDOWS



EXPLODED VIEW



INSTALL SILL



INSTALL JAMB



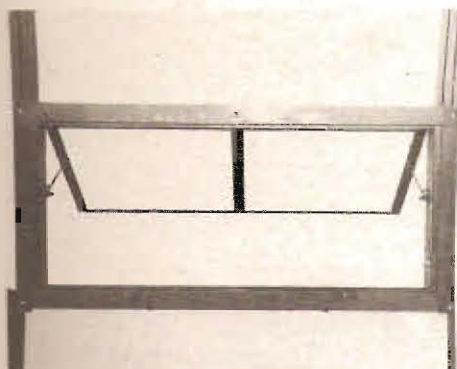
INSTALL HEAD



NAIL TO RIBS



FASTEN SASH



STAY BARS



FASTEN SCREEN



INSTALL "D" SHEETS

5

There are six metal windows to a hut, three on each side. On one side of the hut they are installed between the fourth and fifth ribs, the seventh and eighth ribs, and the tenth and eleventh ribs. On the other side of the hut, they are installed between the third and fourth ribs, the sixth and seventh ribs, and the ninth and tenth ribs. The window frames are furnished knocked down and the hardware is shipped loose.

Study the nine photographs above. Then proceed to assemble and install the metal windows, following the method and order indicated.

1. Place two clips (see detail) over top of Masonite "C" sheet, about 16" from edges. Then install window

sill, slipping it over "C" sheet to engage clips.

2. Slide jambs over rib sections, matching holes in sill.

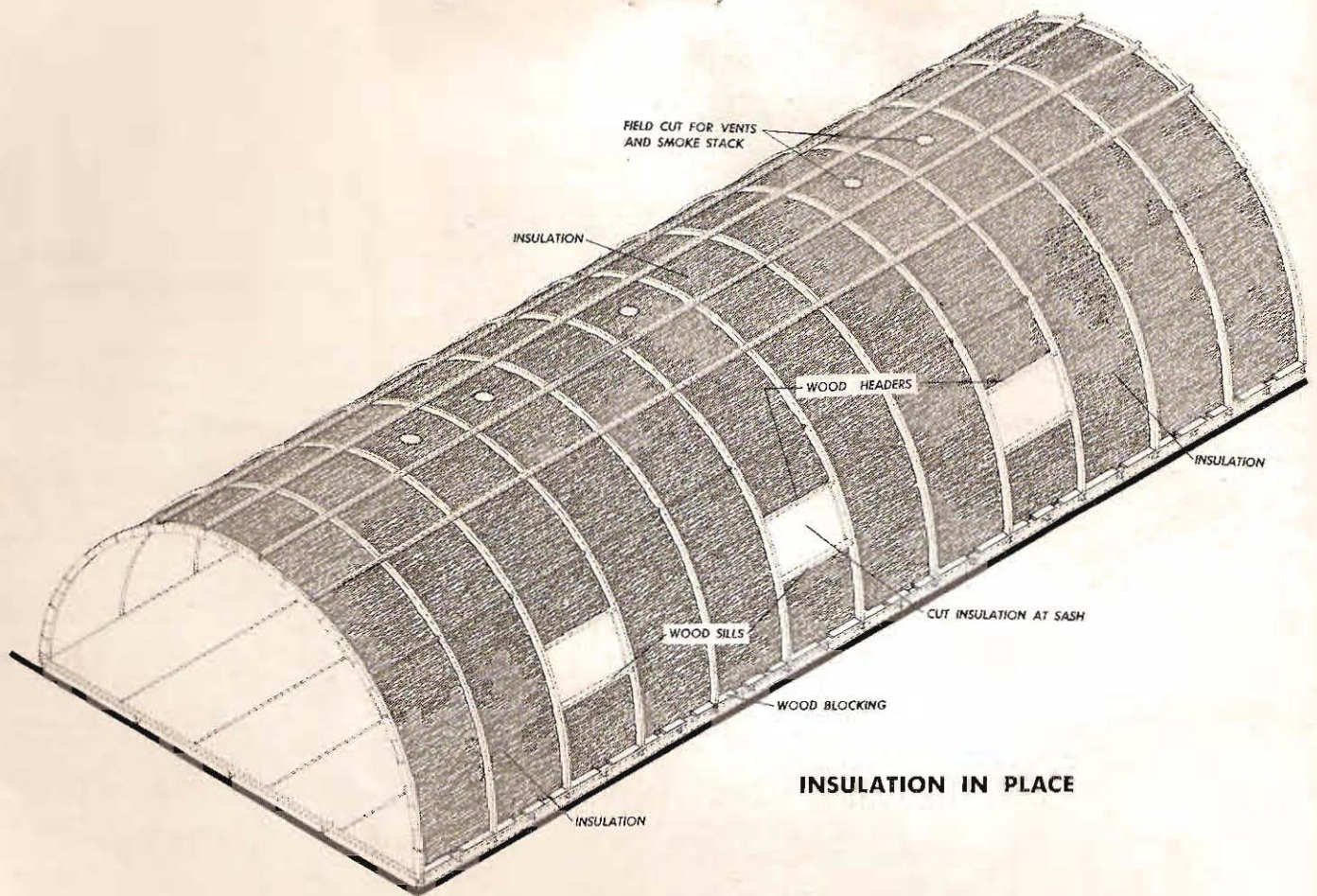
3. Install head, matching holes in jambs, and nail complete frame to ribs, inside and outside hut, through holes provided for that purpose.

4. Fasten sash to outside of frame.

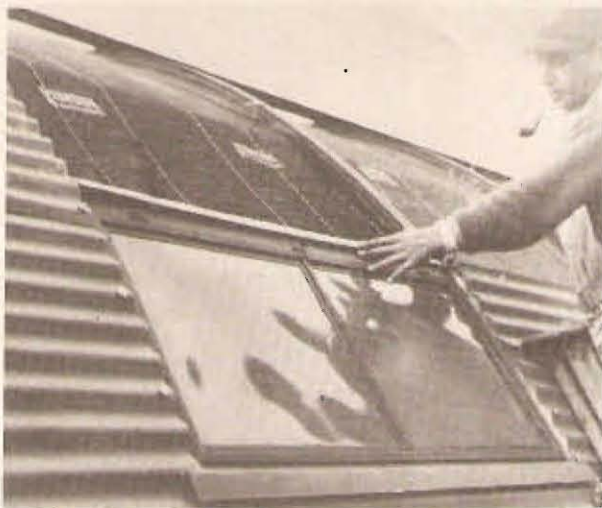
5. Install stay bars and fittings.

6. Fasten screen and butterfly catches to inside of frame.

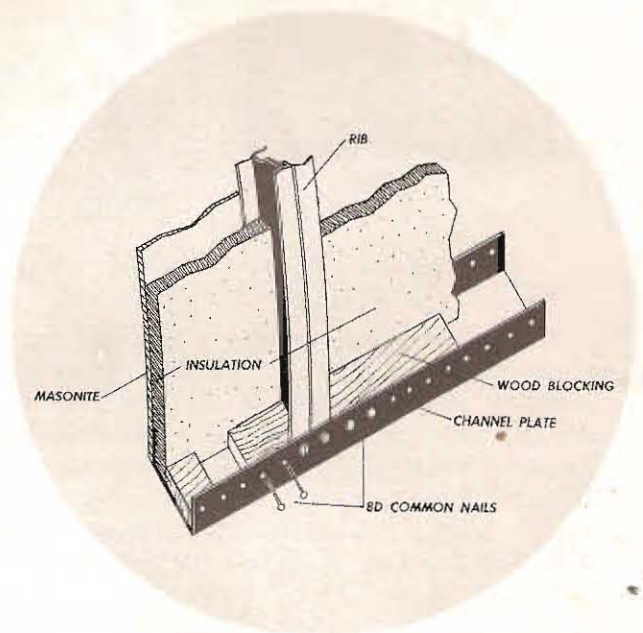
7. Place two clips (see detail) over top of window frame, about 16" from each end, and install "D" sheets of Masonite above window, complete with 2" wide battens.



INSULATION IN PLACE



CRATING LUMBER BATTEN



DETAIL AT PLATE

INSULATION



AT ROOF



UNDER PURLINS



AT FLOOR



AT SASH

6 Over the Masonite inside covering and between the ribs of the hut is a layer of flexible-type insulation. The insulation is furnished in short lengths which will stretch to cover the entire area between a pair of ribs.

1. Stretch each piece of insulation to the required length of 31' 6".

2. Roll up the insulation just stretched. Start at each end of the piece and roll toward the middle.

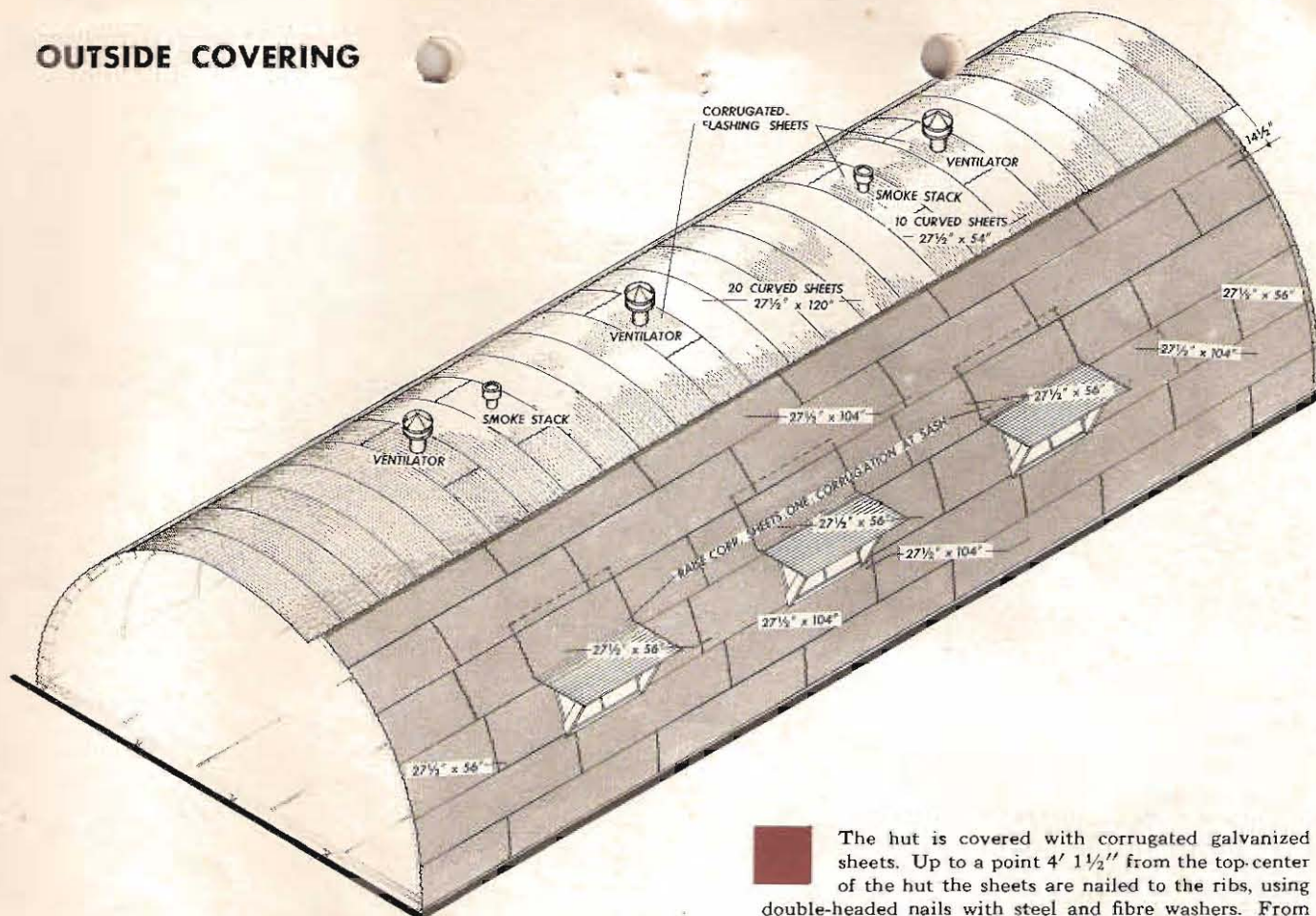
3. Unroll it between the ribs over the inside covering of the hut starting at the center top and unrolling down each side.

4. Wedge blocks of wood between the channel plate and the insulation to hold each end of the insulation (see figure 2) and nail to channel with 8d nails.

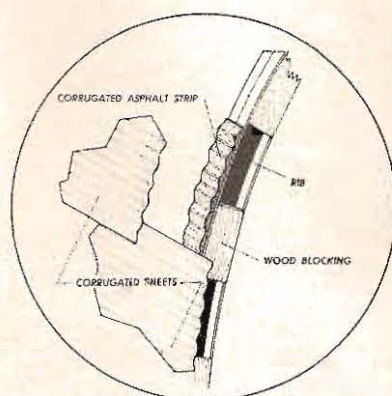
5. Cut the insulation around the windows.

6. Fasten insulation above and below windows with crating lumber batten wedged between ribs.

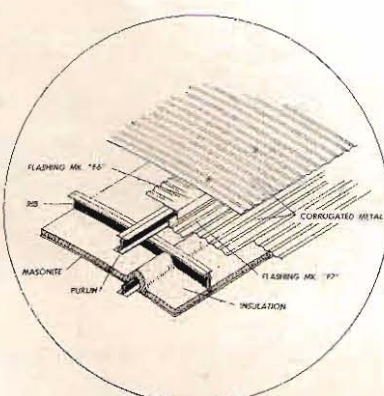
OUTSIDE COVERING



LAYOUT OF CORRUGATED SHEETS



DETAIL AT END RIB



DETAIL AT RAISED ROOF



WINDOW HOOD

The hut is covered with corrugated galvanized sheets. Up to a point $4' 1\frac{1}{2}''$ from the top center of the hut the sheets are nailed to the ribs, using double-headed nails with steel and fibre washers. From there up and over the top they are nailed to the purlins. The sheets nailed to the ribs are flat and have the corrugations running lengthwise of the hut. Those nailed to the purlins are curved and have the corrugations running at right angles to the purlins.

1. Start the sheets with the row running under the window sill (see photo). At one of the windows take an $8' 8''$ sheet, fit it snugly under the window sill, turning the top edge of sheet out. One end of the sheet should project $4''$ beyond the center line of the rib adjoining the window. Drive one 8d nail at each rib in the valley of the first corrugation at the top of the sheet. (This is to hold the sheet temporarily.)

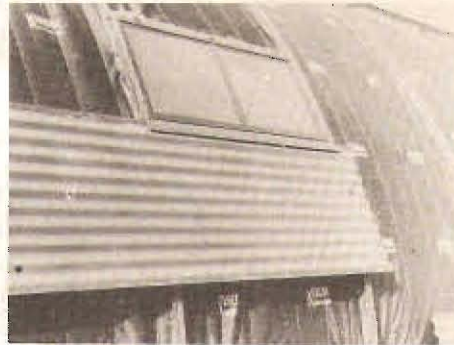
2. Place the adjoining sheets in the same row. Each sheet should extend $4''$ past the center line of the rib, which produces an $8''$ lap. Lap all sheets the same direction. Each end lap should be "buttered" with mastic for a width of $2''$ between the sheets to provide a seal. When each sheet is in place and lined with the starting sheet nail it temporarily as described in item 1 above. At each bulkhead rib (the ones with the wood blocks) insert strips of corrugated asphalt between the rib and the horizontal corrugated iron covering. Take care that the asphalt strip and corrugated iron corrugations match, then nail corrugated strip to rib with common nails before nailing corrugated iron.

3. Place the sheets below the starting row next, lapping them under the starting row $1\frac{1}{2}$ corrugations ($3\frac{1}{2}''$). "Butter" and nail these sheets, using double-headed nails with steel and fibre washers, placing the fibre against the corrugated iron. Each sheet shall be nailed at each rib, placing one nail at the laps and two nails evenly spaced between laps ($8''$ on center). Proceed with the row of sheets above the starting row, lapping these sheets over the row below $1\frac{1}{2}$ corrugations ($3\frac{1}{2}''$). Nail this row as described above. Do not drive top nails in rows until row above has been put into position. Proceed this way, row by row, until the first purlin is reached, completing each row before the new row is started.

OUTSIDE COVERING



DETAIL AT END RIB



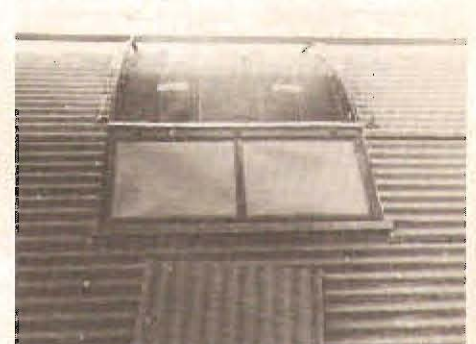
STARTING SHEET



BUTTER LAPS



SLOT AT SILL



AT SASH

7 4. The sheets at the sides of the windows extend only to the edge of the rib. Cut a slot about 2" long in these sheets at top of window sill, and insert lower edge of sheet under sill. (See photo.) Place corrugated asphalt strip between rib and sheet, and nail sheet to rib through strip.

5. The window hoods are formed from 27½" x 56" corrugated sheets, with their upper ends inserted under 27½" x 56" sheets above window. The lower edge of hood is supported on 2" x 4" crating lumber struts about 16½" long and crating lumber rafters. (See photographs of this work.)

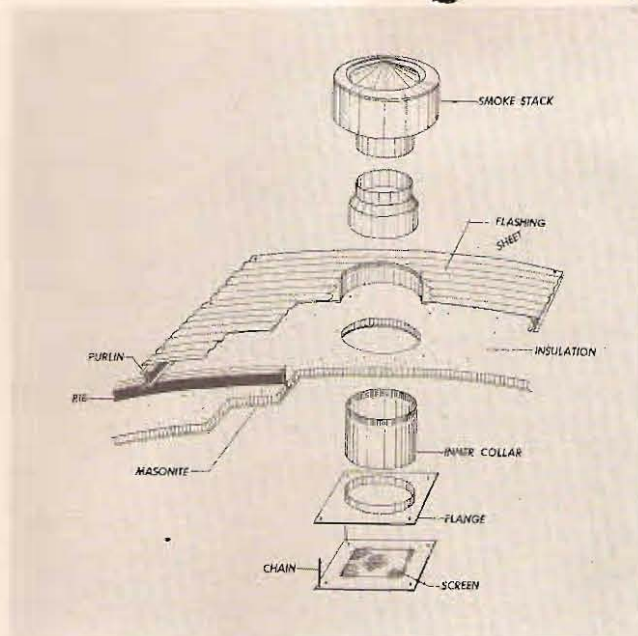
6. Nail the lower flashing piece Mk. F-7 to the ribs with common nails to bring the vertical part of the flashing as near the purlin as possible. After this is

done nail the top piece of flashing Mk. F-6 to the purlin with only enough common nails to hold the flashing while the curved roof sheets are placed.

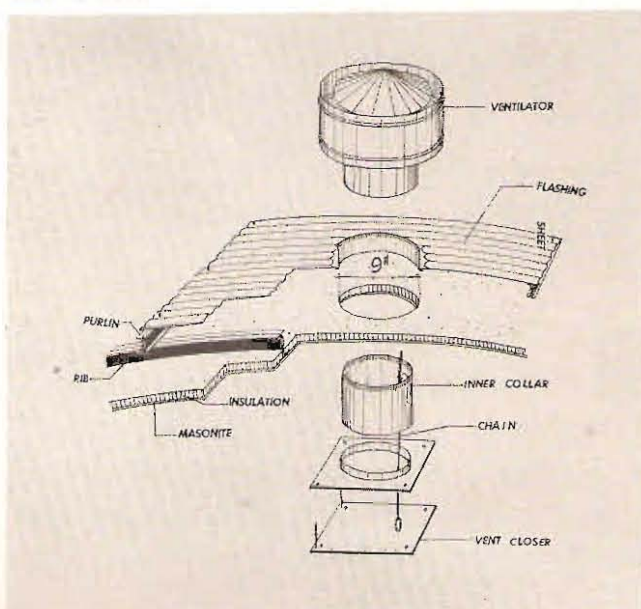
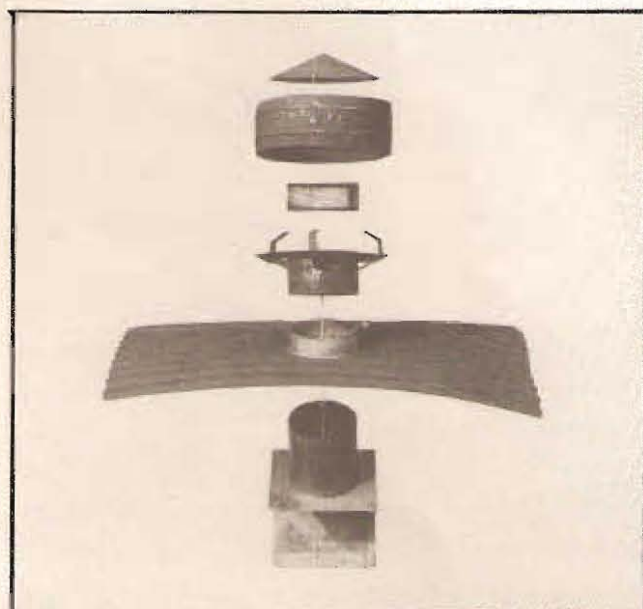
7. Curved sheets. Start with a sheet at one end of the hut, project it 1' 1" past the center line of the end rib and turn it so the outside edge of this sheet (corrugation) is turned down. Center the sheet on the purlins so that the overhangs are equal and nail sheet to purlins at 8" on centers, using double head nails and steel and fibre washers. Proceed sheet by sheet, lapping each sheet over the previous one 1½ corrugations (3½") until the top of the hut is covered. Always nail through the high point of a corrugation.

8. Touch up scratches, abrasions, etc., with paint supply.

VENTILATORS AND SMOKE STACKS



EXPLODED SMOKE STACK



EXPLODED VENTILATOR

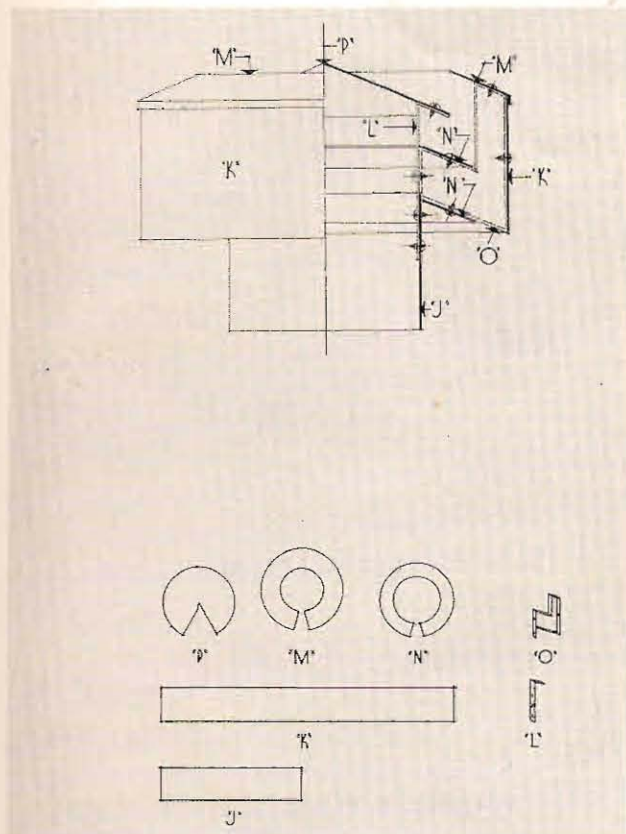


CUT MASONITE

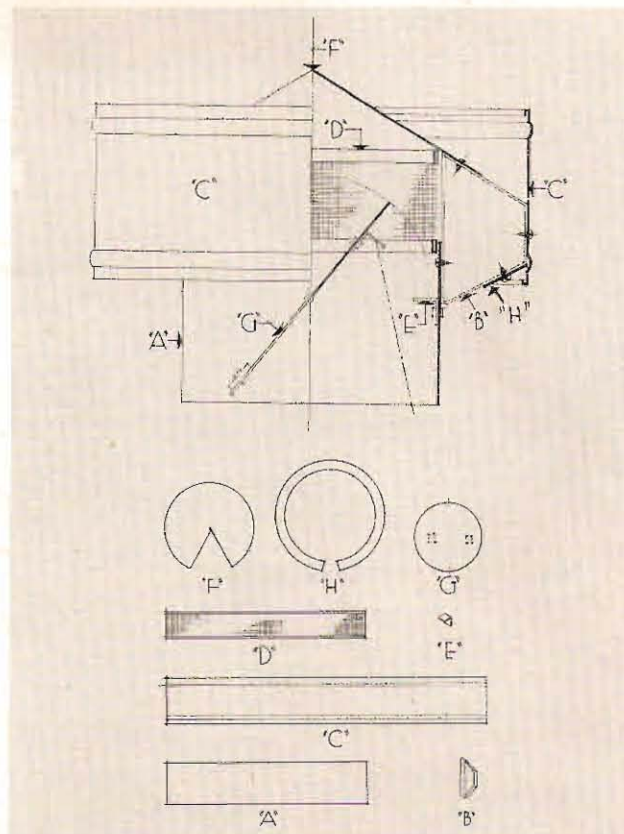


COMPLETE

VENTILATORS AND SMOKE STACKS



KNOCKED DOWN SMOKE STACK



KNOCKED DOWN VENTILATOR



FLASHING SHEET



INSTALL SMOKE STACK

8

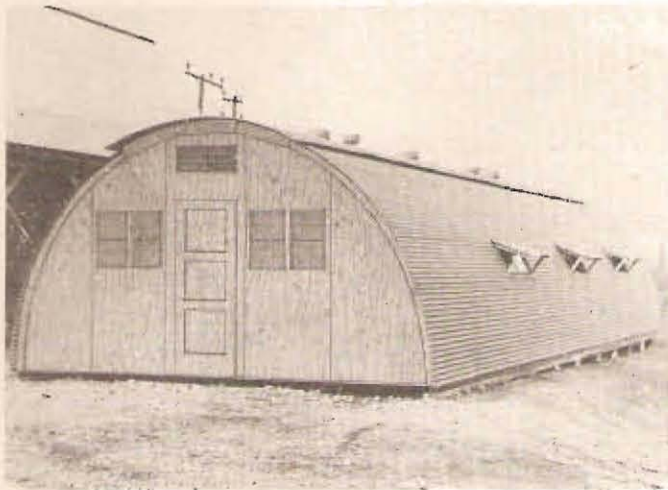
Two smoke stacks and three ventilators are furnished for each hut. These are shipped knocked down with special curved flashing sheets for installing them.

1. Assemble the smoke stacks and ventilators. (See drawings.)
2. Install special flashing sheets at center of hut, lapping them at sides like regular curved roofing sheets.

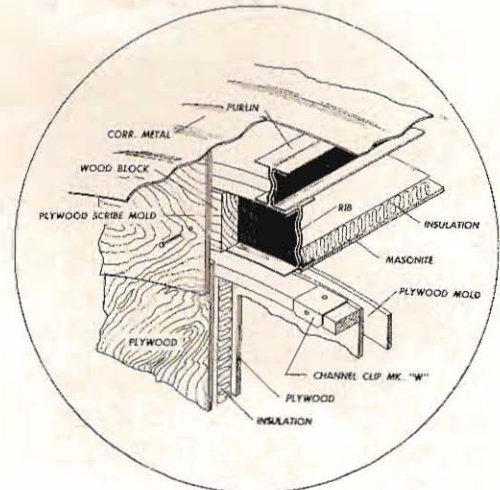
3. Cut holes in Masonite and insulation to line with those in special sheets.

4. Fit inner sleeve through this hole and screw the flange to the Masonite with holtite screws. Slip ventilator over the collar on flashing sheet and secure to it by means of holtite screws. For the smoke stack the adapter ring or hood must first be placed over the collar on the flashing sheet and screwed to it. Then slip the smoke jack over the hood and fasten it with holtite screws.

BULKHEADS



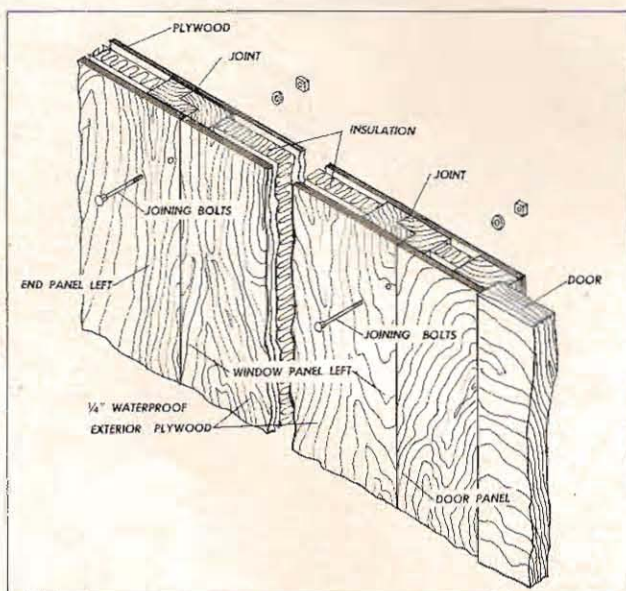
EXTERIOR VIEW



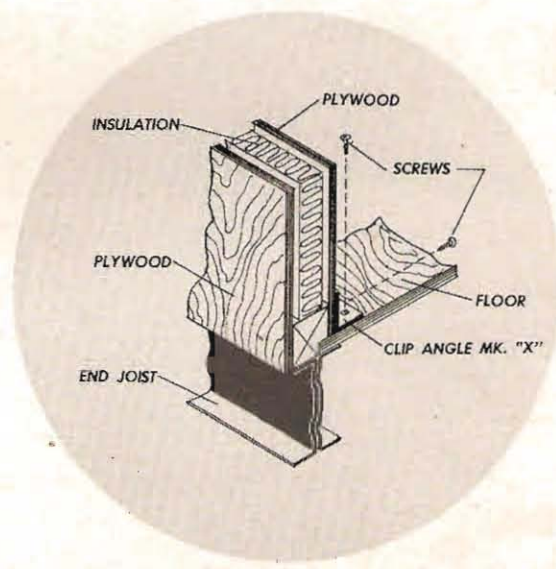
DETAIL AT ROOF



INTERIOR VIEW

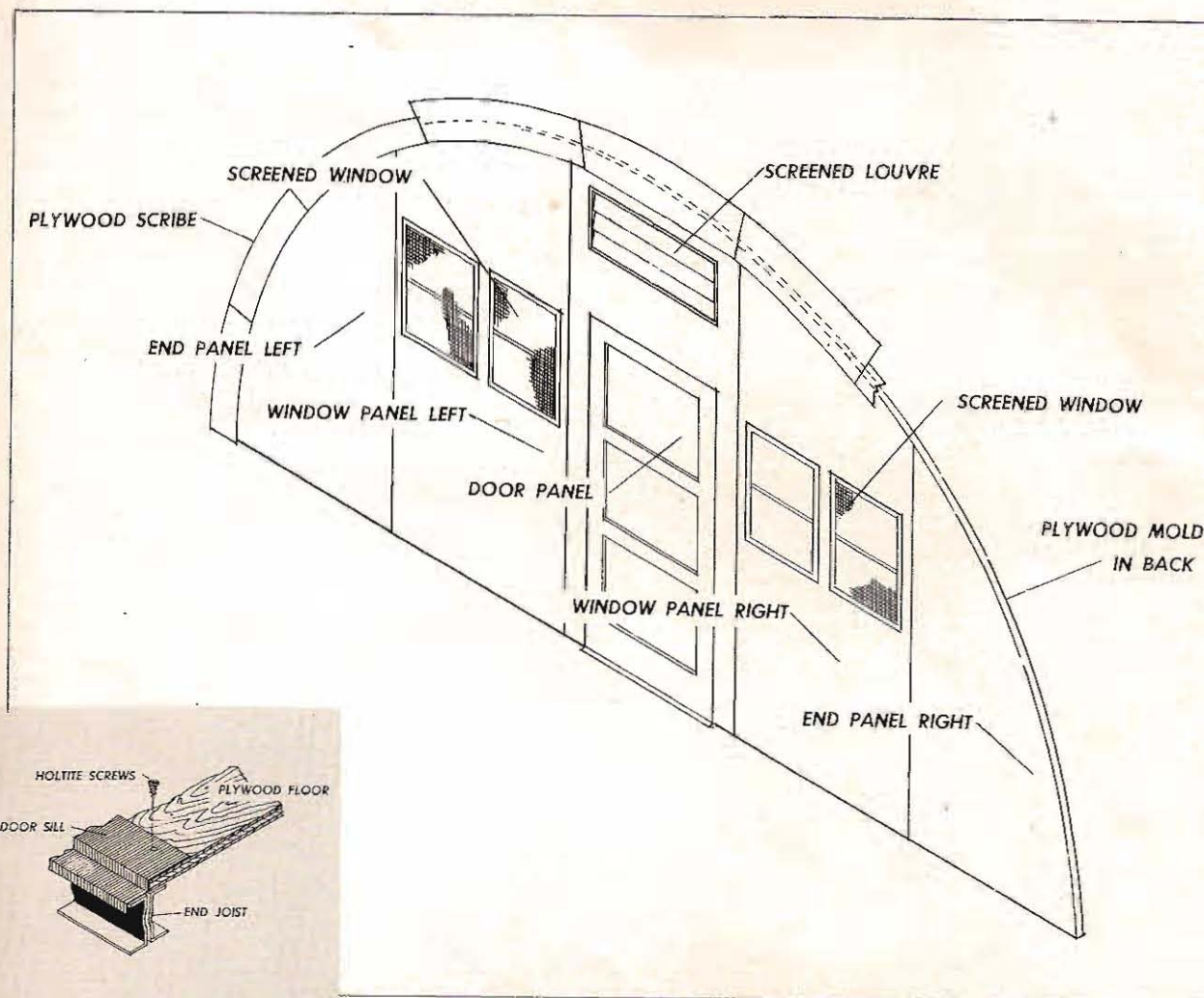


PANEL CONNECTIONS



DETAIL AT FLOOR

BULKHEADS



ASSEMBLED BULKHEAD

DOOR SILL

The bulkhead is furnished in five sections—2 end panels, 2 window panels and a door panel.

These panels connect to each other by means of bolts and to the floor and end rib by means of clips. (See drawing.)

1. Before setting any of the bulkhead panels in place, nail the clips marked "W" to the underside of the end ribs. Place these at the center of the 2nd, 3rd, 4th, 5th, and 7th wooden blocks in the ribs, counting from the splice plate down. With the "W" clips in place, set up the panels temporarily, starting with the door Panel No. 1, followed by the window panels, and then the end panels.

2. When all five panels are thus temporarily placed, bolt them together. (See drawing.)

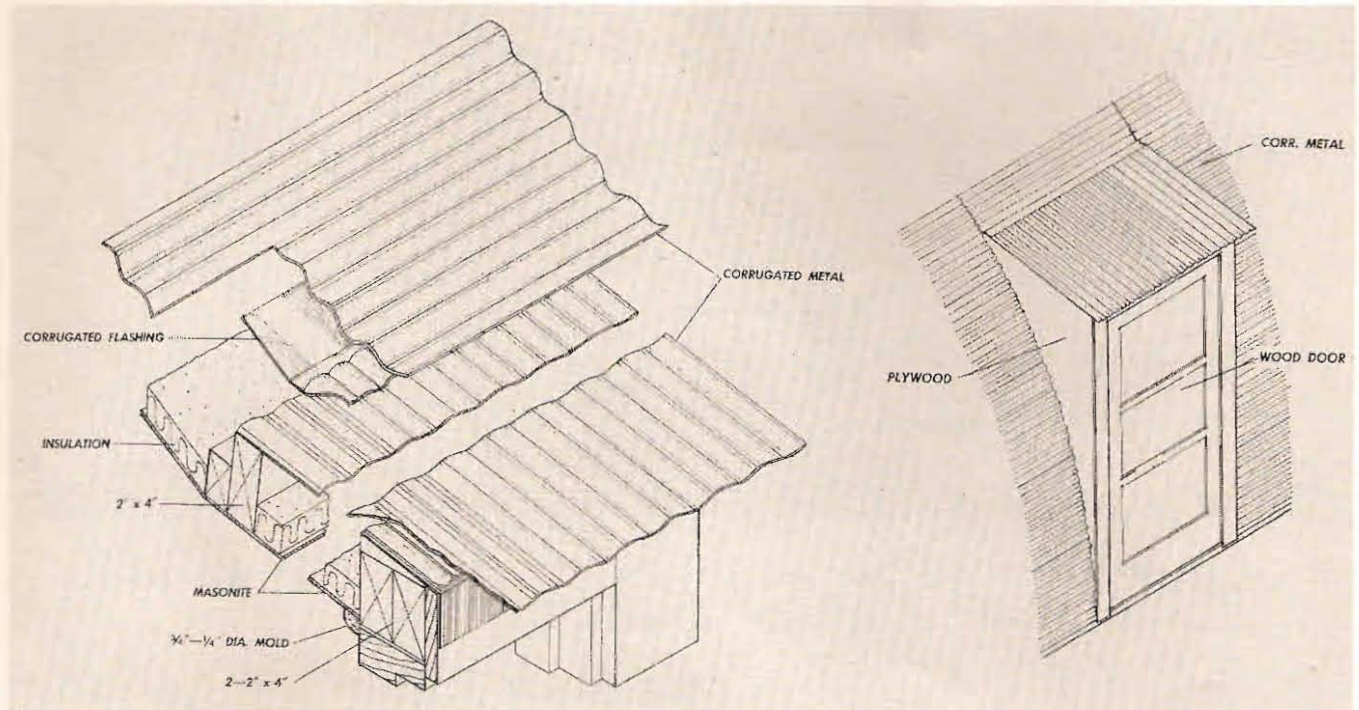
3. Then secure bulkhead to the floor by means of the clips marked "X" screwed to the floor and to the panels. (See detail.) Attach the clips about 2" from each side of the door panel and 7" from each side of the outer panels. Finally, nail the top end of the panels to the "W" clips.

4. After the panels have been set in place, fasten the metal door sill to the floor by means of holtite screws. (See detail.)

5. Nail the plywood scribe mold to the blocking in the end rib. Start nailing these pieces from the top center, working each way. Install the interior plywood scribe mold in similar manner, but nail it to the panel itself.

6. Install wood shoe.

ADAPTATION — SIDE DOOR



DOOR HEAD

Determine location of side door.

Remove (or omit) channel plate, corrugated iron siding, insulation, inside covering, shoe mold and depending on door location, the window.

Carefully cut the corrugated sheets along the inside edge of each rib to provide for nailing the sheets to the ribs. Before nailing the corrugated siding, install the flashing sheets between the corrugated hut siding and the plywood siding of the doorway.

Erect the 2 x 4 framing for the door opening and roof. Bend two (2) 2 x 4's along the ribs each side of opening. This can be accomplished by making saw cuts across the 2 x 4, 2" apart and $\frac{3}{4}$ " deep, then bend to radius.

Nail Masonite to frame, using salvaged Masonite—cut to fit.

Install sill (see detail) using crating lumber blocks nailed to the floor joists. Screw sill to blocks and floor with holtite screws.

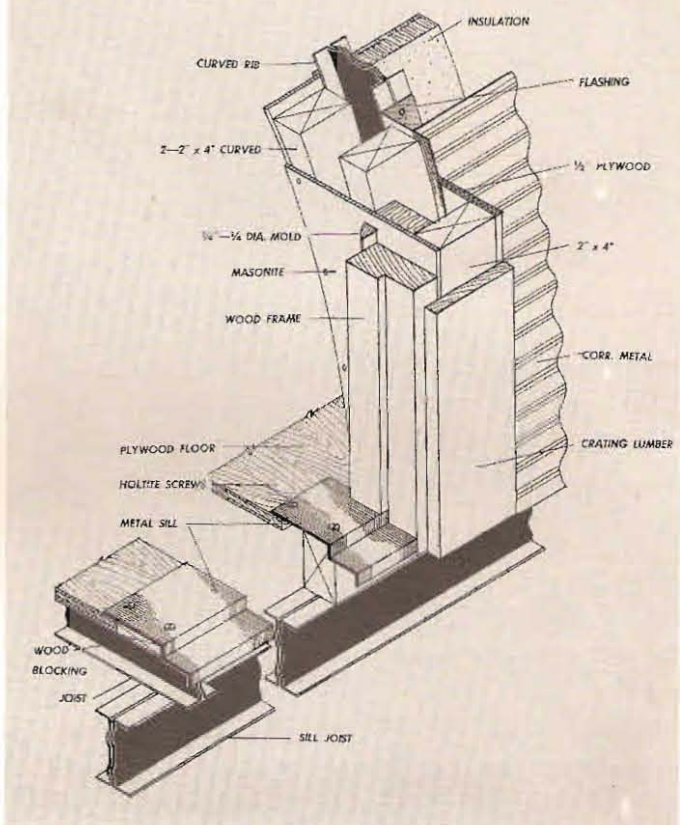
Place insulation over ceiling and sidewalls, using salvaged insulation.

Nail plywood sides, door trim and trim along edge of roof at each side, using crate lumber.

Install the corrugated flashing pieces over the door and along the joint between the hut siding and the doorway roofing. Cut and bend the hut siding, corrugated sheet in order to give the proper slope to the doorway roof. (See drawing.)

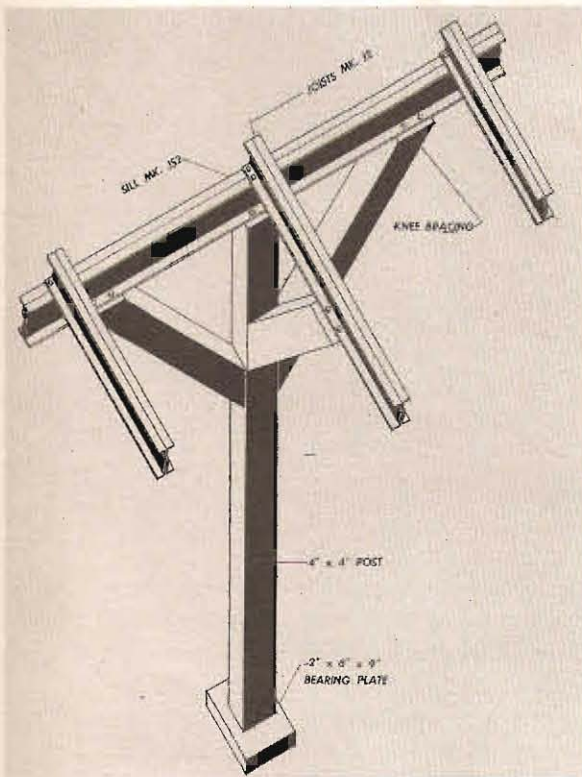
Install the corrugated roof sheets, using salvaged sheets.

COMPLETE DOOR

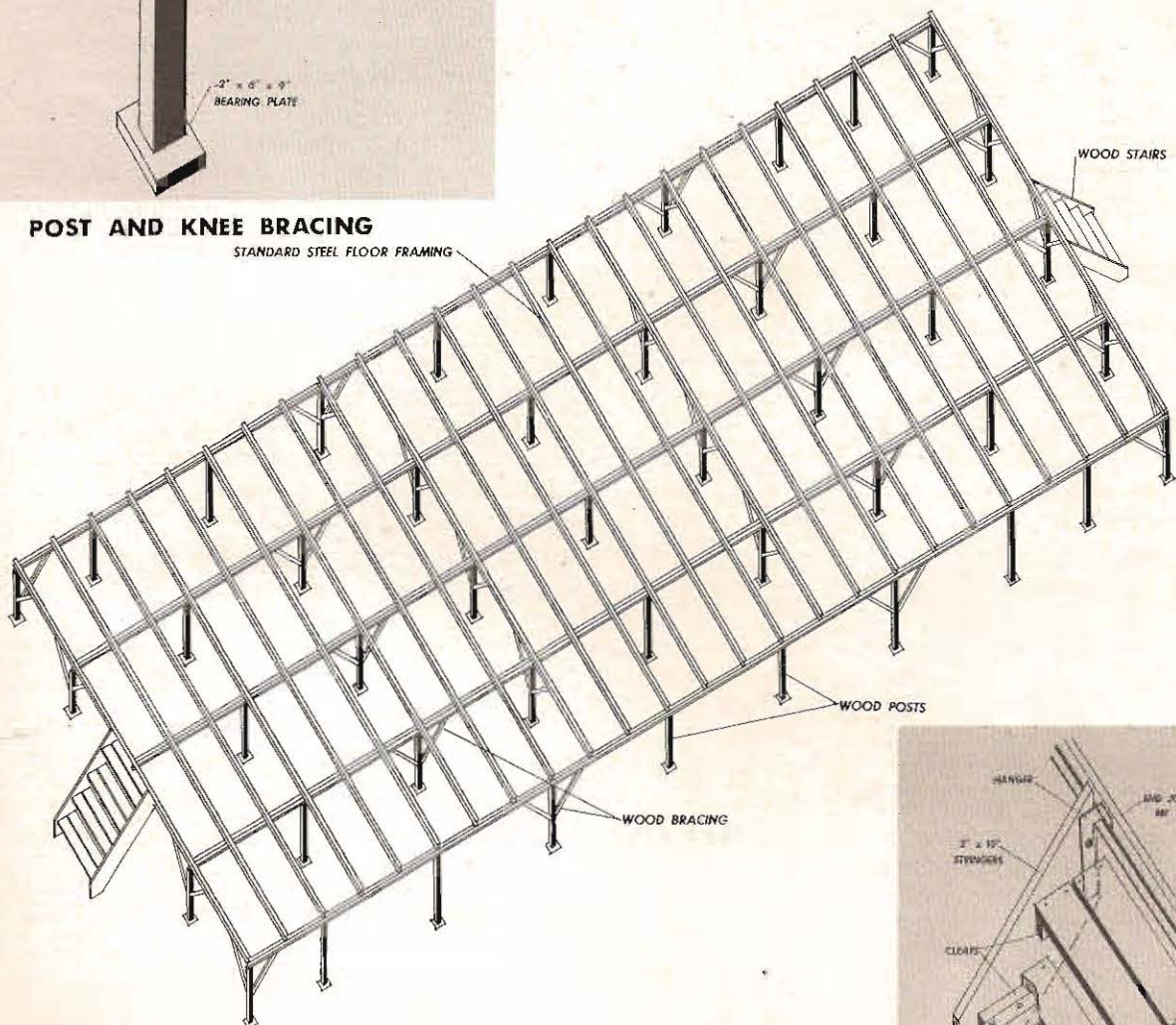


DOOR SILL

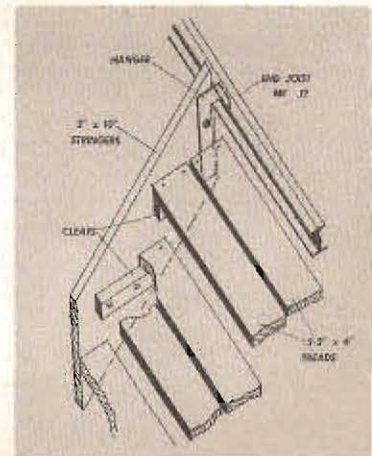
AD. TATION WOOD POST FOUNDATION



POST AND KNEE BRACING



SUPPORTED FLOOR FRAMING



DETAIL OF STAIR

Although materials for this work are not furnished it is suggested that for conditions under which the ground cannot be conveniently levelled, wood posts may be used to level the hut. See sketches on this sheet for suggestions.

Crews. The erection of the Arch Rib Hut is simple and fast. One operation quickly follows another—if the first one is done properly. What is most important is getting off to the right start in having the floor joist assembly level and square and having the rib assembly plumb. This insures that subsequent operations will proceed without difficulty. Therefore, your best mechanics should be assigned to setting the frame even though the actual assembly of this portion of the work is the easiest of all. Likewise the roofing operation requires the care of a mechanic or mechanically-minded person. A sensible division of personnel is into separate crews for (1) leveling the site, (2) setting the frame, (3) applying flooring, inside covering and insulation, (4) applying ventilators and roofing, (5) setting bulkheads.

Hints. If any of the steel members have become damaged in shipment, the easiest way to straighten them is by placing the bent part over a crate or saw horse and having a man bear down on each end. The hardest way to straighten is by using a hammer. There is a trick to opening the banded crates. When this is known and used, much time and effort can be saved. Take one of the screwdrivers furnished for assembling the frame, insert flat side under steel band about an inch or inch-and-half. Turn the screwdriver about the handle roughly an eighth turn. This brings the sharp edge of the screwdriver in contact with the band. Pull up quickly. This motion cuts the band rather than breaking it. The latter operation requires a heavy bar and much strength. When the knack of using a screwdriver is learned, opening the crates is an easy job.

The importance of using the right nails, screws, and attachments cannot be too strongly stressed. Follow the instructions closely in this regard because if the wrong ones are used, it will mean borrowing from another Hut all down the line with consequent loss of time.

Tools. A complete set of necessary tools is furnished for erecting the complete Hut. There is one set for every four Huts. They should be supplied to the men who will use them. If there are many Huts to be erected at one location, the best scheme is to open all the boxes containing tools and pool them. Then issue by tool check.

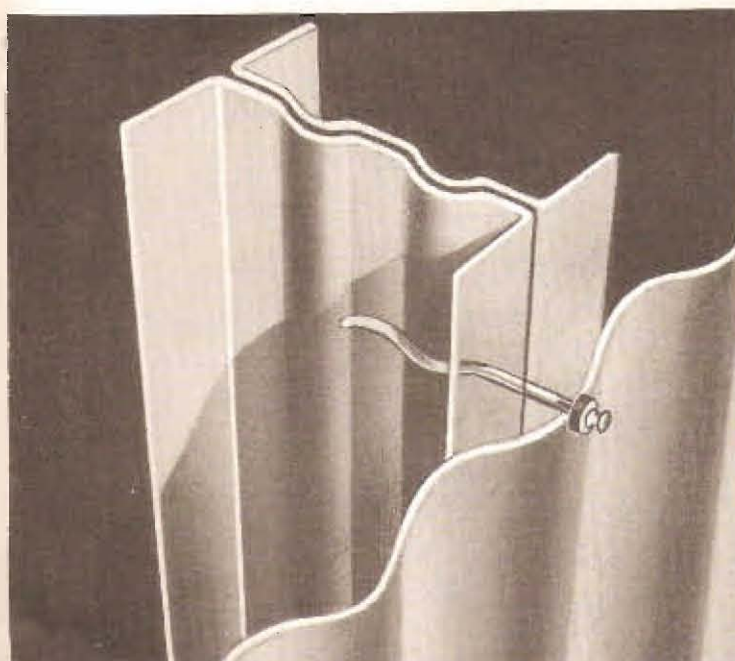
Take good care of the tools.

INDEX

	PAGE
Erection Sequence	1
Floor Framing	2 and 3
Ribs, Purlins and Trimmers.....	4 and 5
Floor Panels	6 and 7
Inside Covering	8 and 9
Windows	10 and 11
Insulation	12 and 13
Outside Covering	14 and 15
Ventilators and Smoke Stacks.....	16 and 17
Bulkheads	18 and 19

ADAPTATION SUGGESTIONS

Side Door	20
Wood Post Foundation	21
Suggestions to Erector.....	22



PHANTOM VIEW SHOWING NAIL IN NAILING GROOVE

THE STRAN-STEEL NAILING GROOVE

The distinctive feature of Stran-Steel is the nailing groove. This groove is in all Stran-Steel joists, arch ribs and studs, which are made by welding two pieces of steel together. The small space remaining between these pieces is just large enough to admit an ordinary nail. When a nail is driven into the groove, it is deformed and clinched in a grip of steel with a holding power much greater than that of wood. In this manner collateral materials are secured to the steel framework with the ordinary hammer-and-nails method.

Construction in which Stran-Steel framing is used proceeds in the same way as with ordinary framing. Dimensions of Stran-Steel members conform exactly to the requirements of the collateral materials used with it.

**STRAN STEEL DIVISION
GREAT LAKES STEEL CORPORATION
DETROIT 26, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION**