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CONSTRUCTION MANUAL OF LCVP BOAT

Compiled by

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CONSTRUCTION MANUAL OF LCVP BOAT

Description:

Length Over All - 36' 0"
Beam - 11' 0"
Powered with 225 HP Diesel Engine
Weignt of Engine -2300 lbs.
Weight of Boat - 13,000 lbs.

The LCVP Boat is an assembly-line constructed boat. Complete assembly and construction is divided into different stages of operation. The purpose of this manual is to explain the most important operations and the procedure of assembly.

All parts reaching the assembly lines will be prefabricated or cut to size so that a minimum of cutting and trimming is required for assembly.

The most important operations occur in the hull section. Accuracy and skilled workmanship in this section will determine how easy and fast a boat will proceed thru the assembly line. Bad fits and poor fairing will result in additional work to the men farther down the line. The operations that occur in this section are as follows:

1. Place Frames in Forms
2. Fasten Headlog and Bow Posts to Form
3. Fasten Apron to Frames
4. Fasten Keel
5. Place Transom Framing in Form
6. Fasten Chine
7. Fasten Sheer
8. Fair Frames
9. Fasten Butt Blocks
10. Fasten Tunnel Chine (Knuckle)
11. Fasten Lift Pad Braces
12. Fasten Skin Planking
13. Fasten Canvas
14. Fasten Bottom Planking
15. Fasten Sides
16. Fasten Keel Plates
17. Fasten Skin Planking to Outer Planking
18. Drill Pilot Hole

Place Frames in Forms: All Frames are clearly marked with

their respective frame numbers. They should be set in the forms so that the frame numbers correspond to the form numbers. This is a very simple but important operation. Frames must be placed in their porper fore and aft line. That is the forward faces of the frames must be placed toward the bow of the form.

Fasten Headlog and Bow Posts to Forms: The headlog assembly is placed in the forward part of the form. It is centered and screwed into place against a guide plate in the form. The headlog assembly consists of the following parts:

1. Head Log
2. #1 and #2 Bow Posts (P & S)
3. Filler Blocks (P. & S)

See Fig. 1.

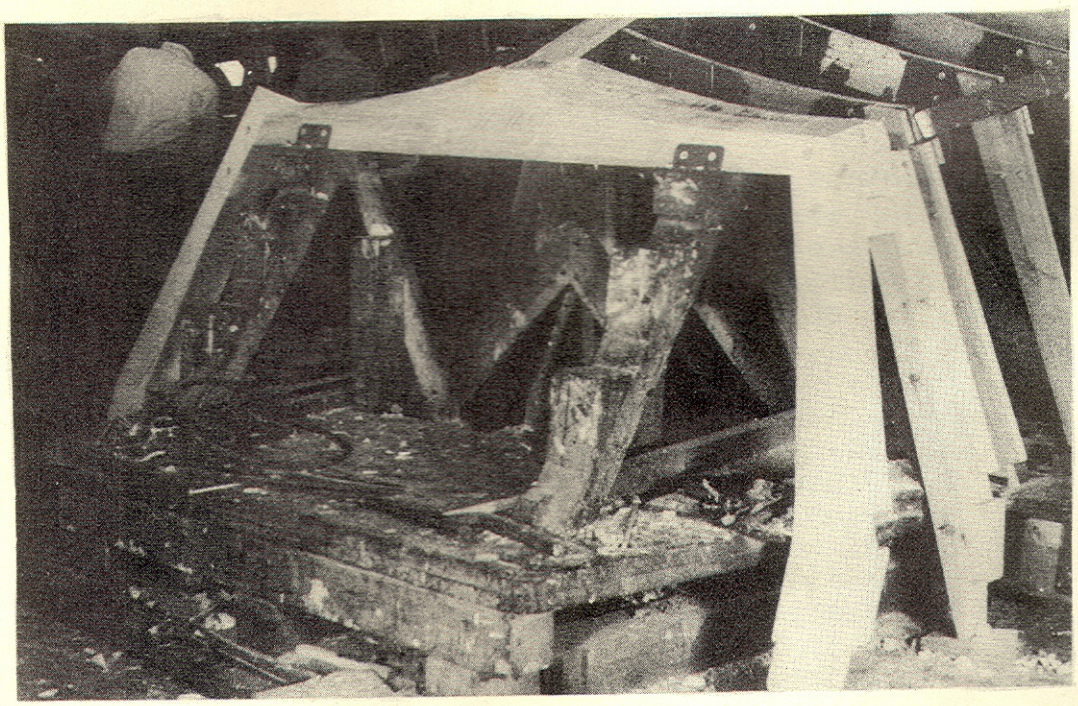


Figure 1

Fasten Apron to Frames: The apron or inner keel is bent over the frames and clamped into place. The fit should be tight in the bottom frame apron notches as shown in Figs. 1, 2, 3, and 5. Inasmuch as the frames will change shape and give a varying fit to the apron, it is necessary to pound the apron down tight in

some frames. Fig. 2 shows the clamps used to hold the apron in place.

The clamps are slacked-up forward of the transom in order to cut the after end of the apron so it will fit into the transom log. When the apron is fitted to the transom log the clamps are again tightened down and the assembly is ready to be fastened. Fastenings are as follows:

1. 2 5/16" x 8½" Carr. bolts to Headlog
2. 2 each 3½" #16 Screws to Fr. #3 thru #27
3. 2¼" x 4½" Carr. bolts to transom.

After the apron is in place the limbers are cut in the frames next to the apron.

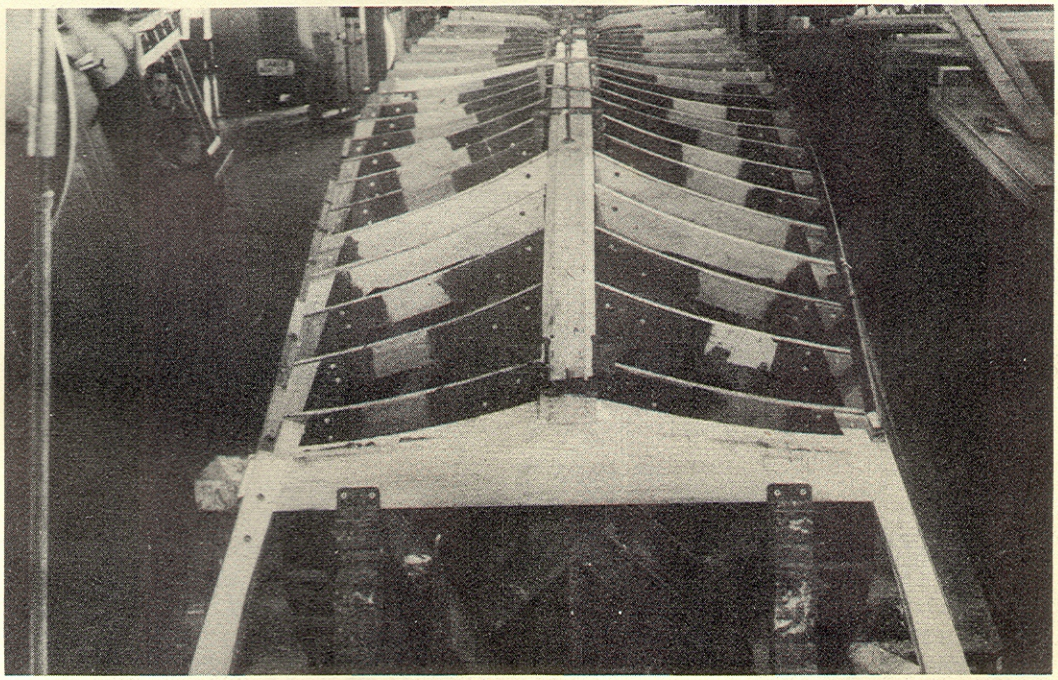


Figure 2

Fasten Keel to Apron: The first step in this operation is to glue and tack a strip of canvas over the apron. A notch is next cut in the headlog to receive the keel end. The keel is centered on the apron and clamped into place.

Fastenings are made with:

1. $\frac{1}{4}$"x3$\frac{1}{4}$" Galv. Carr. bolts from Fr #13 to #1
2. 2$\frac{1}{2}$" #14 Brze. Screws from Fr #13 aft
3. 5/16"x9" Carr. bolts to headlog

All fastenings in the keel are staggered and are not fastened thru to the frames. Fig. 3 shows how the keel is fastened.

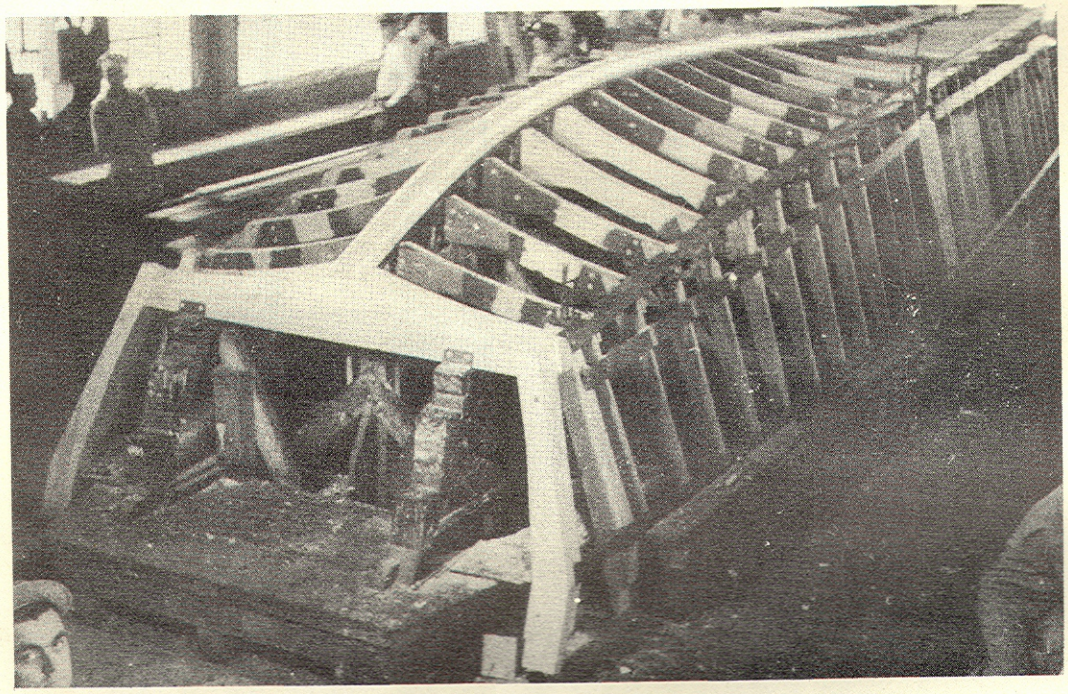


Figure 3.

Place Transom Frame in Form: The complete transom frame assembly is placed in the form and wedged into place. The additional transom frames are then fastened into place as they are not assembled on the transom jig. Bolt transom log to Fr #27 with 5/16"x10" Carr. bolts. See Figs. 4 and 5.

Fasten Chine and Sheer Clamp: The chine notches must be faired off in order to hold the chine firmly at all frames. Be sure that all frames are resting tight against the jig floor. The frames should be wedged into place and stringers fastened to the frame sides to keep them from moving in the fairing-up operation.

A batten is used to detect high spots in the chine notches. These are then faired off until both the horizontal and vertical chine lines are fair. The transom log must then be cut to the faired line.

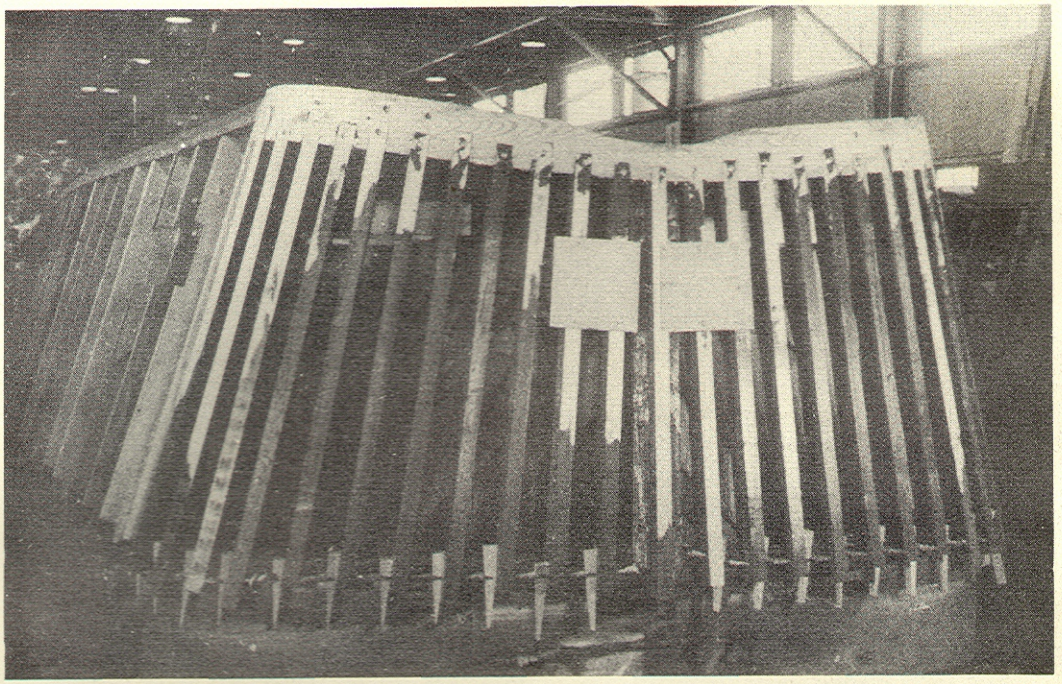


Figure 4.

After the notches have been faired-off the chine can be clamped into place. Holes are drilled for 5/16" bolts thru the chine and bottom frames at Fr #3-5-7-9-11-13-16-17-19-21-23-25 and thru the chine and side frames at Fr #2-4-6-8-10-12-14-15-18-20-22-26. Bolt in place with the following size bolts:

5/16"x5"	to side frames	#2-18-20-22-26
5/16"x5½"	" " "	#4-6-8-10-12-14
5/16"x7"	" " "	#15
5/16"x5½"	to bottom frames	#3-7-9-13
5/16"x6"	" " "	#5-11-16
5/16"x7"	" " "	#17
5/16"x8½"	" " "	#19
5/16"x10"	" " "	#21
5/16"x11"	" " "	#23
5/16"x11½"	" " "	#25
3/8"x12½"	" Bow Post	#2

Side frame #24 takes a 3½" #16 Brze. screw.

Fair off chine to take up shape of transom.

The sheer clamp is fastened to #1-#2 bow posts with 3½" #16 Brze. screws. Galvanized carriage bolts used to hold the sheer clamp in place are of the following sizes:

¼"x3"	fastened to Fr	#11 thru #27
¼"x3¼"	" " "	#5 " #10
¼"x3½"	" " "	#3 and #4

It is necessary to fair off the sheer notches in the same manner as the chine notches. The frames must be level with the jig floor.

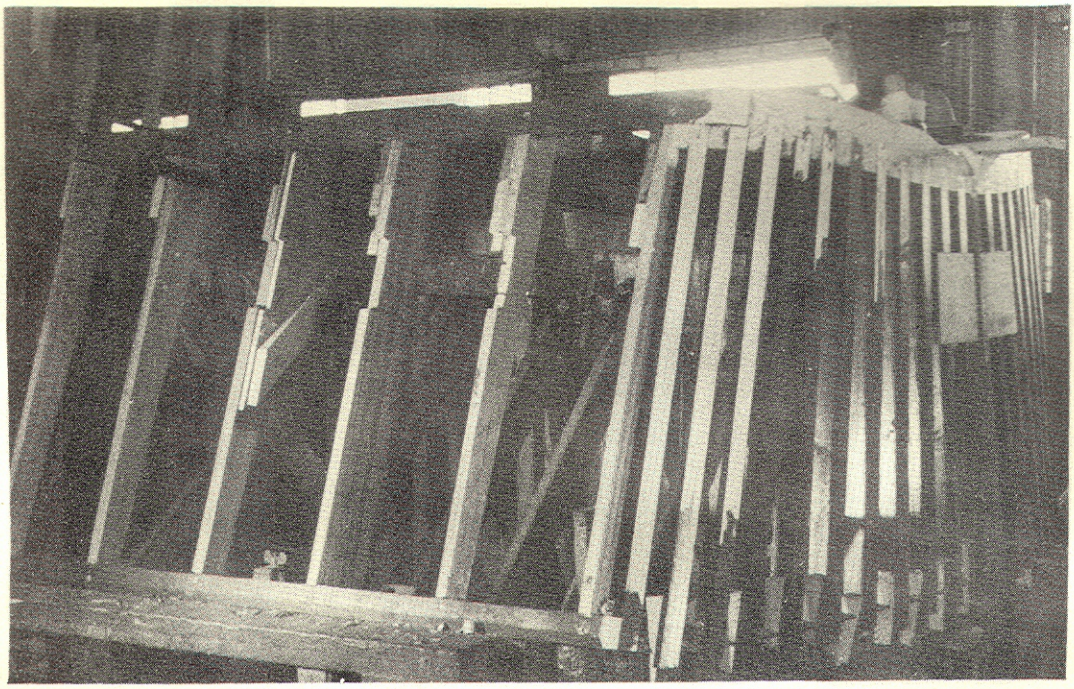


Figure 5.

Fair Frames: All frames should be faired up to present a smooth contour on which to fasten the skin planking. The assembled frames will have changed their shape to some extent due to shrinkage and warping of the wood. Therefore, it is necessary to remedy these errors by fairing-off those parts which will be out of line.

A long batten is used in this operation to detect high spots appearing on the frame bottoms. A spoke shave or plane are good tools to use.

Fasten Butt Blocks: There are 26 butt blocks fastened to the bottom frames--13 to port and 13 to starboard. The purpose of these blocks is to present a surface behind the butt joints of the outer planking. The bottom butt blocks are fastened between frames with common finishing nails.

1	block	between	frame	#8	and	#9
2	blocks	"	"	#10	and	#11
2	"	"	"	#12	"	#13
1	block	"	"	#13	"	#14
1	"	"	"	#14	"	#15
1	"	"	"	#17	"	#18
2	blocks	"	"	#18	"	#19
1	block	"	"	#19	"	#20
2	blocks,	"	"	#22	"	#23

The transom panel butt block is fastened between frames #26 and #27 with 8d common nails. See figs. 6 and 7.

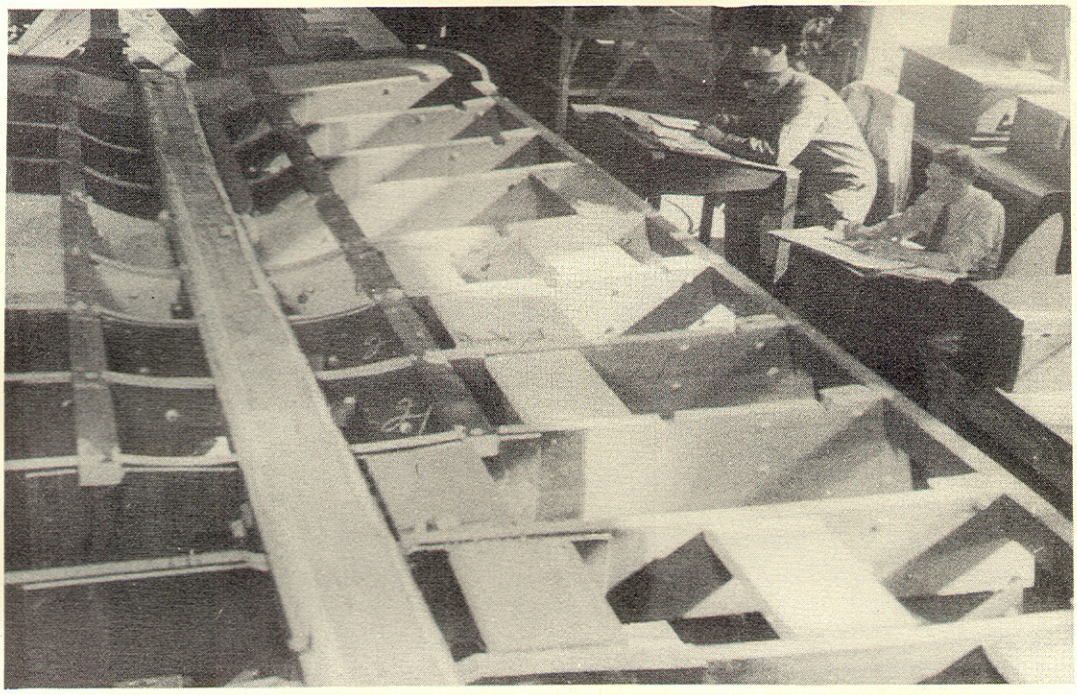


Figure 6

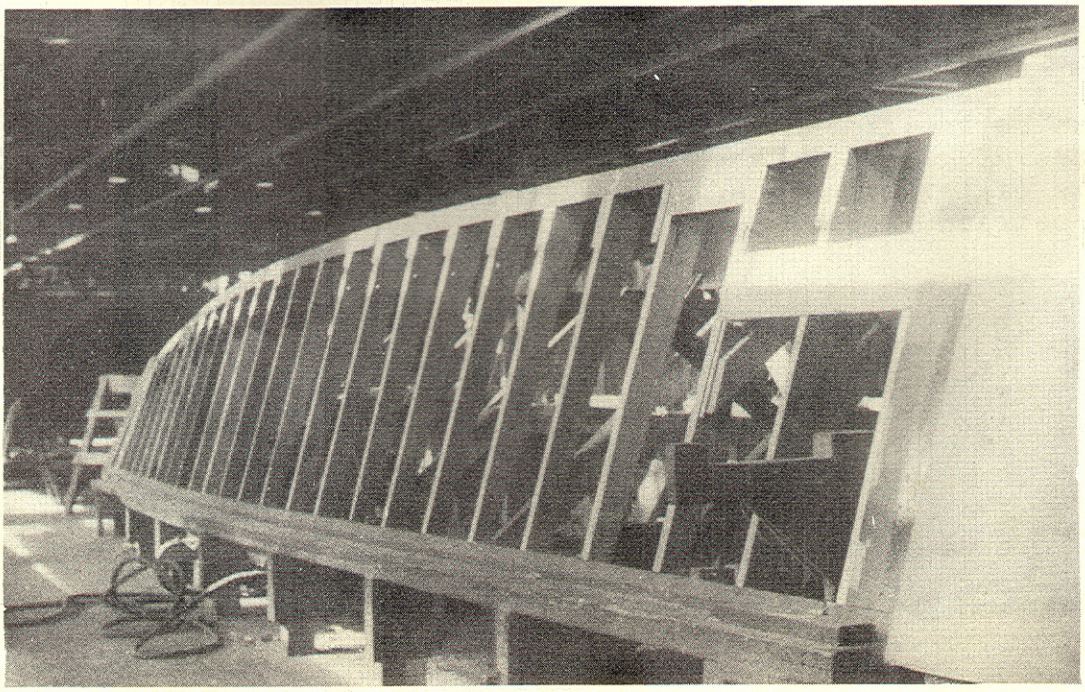


Fig. 7

Fasten Lift Pad Braces: The lift pad braces are fastened into frame #24-25-26 with 3½" #16 Brze screws. These pad braces form the foundation for the lifting pads later installed inside the boat.

Fasten Tunnel Chine: The tunnel chines are fastened to the notched frame bottoms and must be flush with the faired bottom frames. The tunnel chine forms the edge of the tunnel. The fastenings used to secure the tunnel chine are:

5/16"x 6"	carriage	bolt	to	transom	
5/16" x 8½"	carriage	bolt	to	frames	#22-23-24-26
5/16" x 9"	"	"	"	"	#25
5/16" x 8"	"	"	"	"	#20-21

See Fig. 6.

Fasten Transom Panel: The transom panel is a formed weldwood panel ready shaped to be fit into place. It is fastened to the stakes with 2½" #12 brze screws staggered in 10 rows. ¼" x 1 3/4" M B brze and 1¼" #12 brze screws are fastened along the side butt edge of transom. ¼" x 2½" M B brass are fastened along the top and bottom butt edge of panel. See Fig. 8.

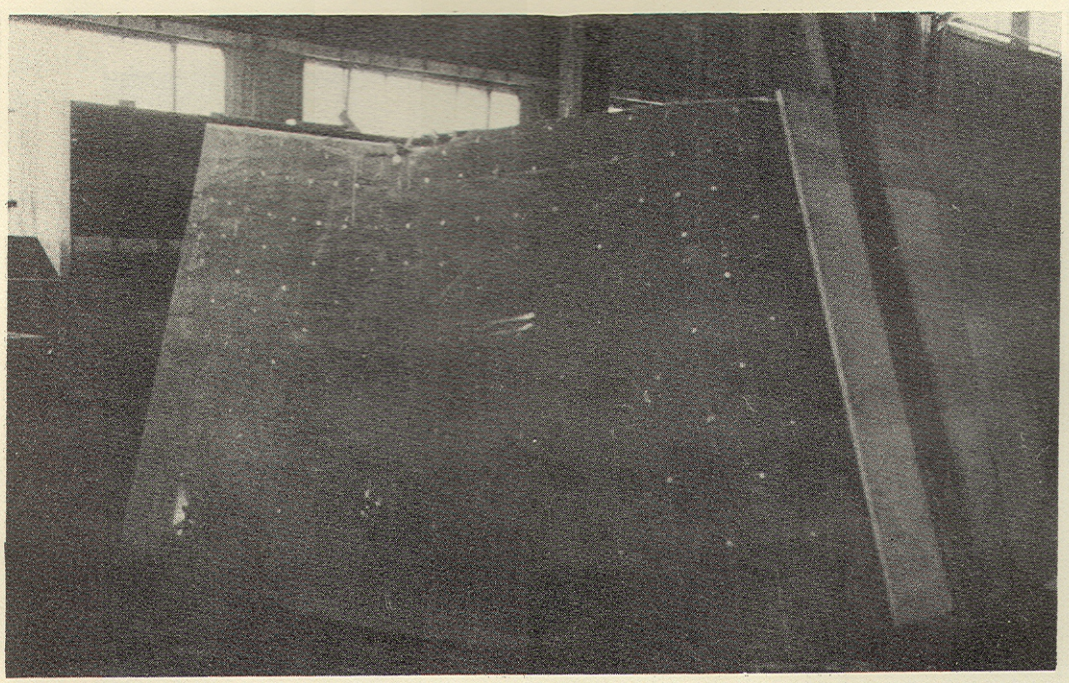


Figure 8

Fasten Skin Planking: Fastening of skin planking is a simple matter. The inner planking is laid on the frame bottoms diagonally and nailed into place with 4d common nails. Fitting is quite easy in this operation. See Fig. 9.

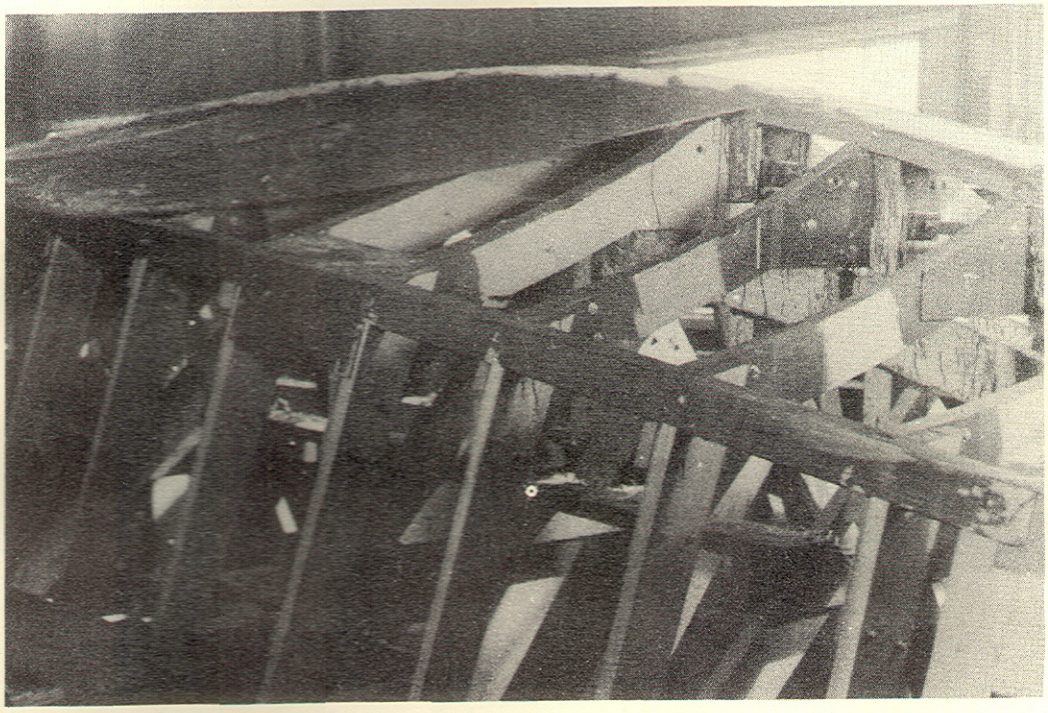


Figure 9

Fasten Canvas: The inner skin planking is sprayed with marine glue and the canvas is stapled over it. The canvas should be allowed to drape over the side enough to be firmly stapled to the chine. This arrangement forms a water-tight envelope around the boat bottom. See Fig. 10.

Scribe planking lines and inner sking screw lines. Holes are drilled along the inner skin s crew lines to facilitate simple fastening of inner skin to bottom planking from inside boat.

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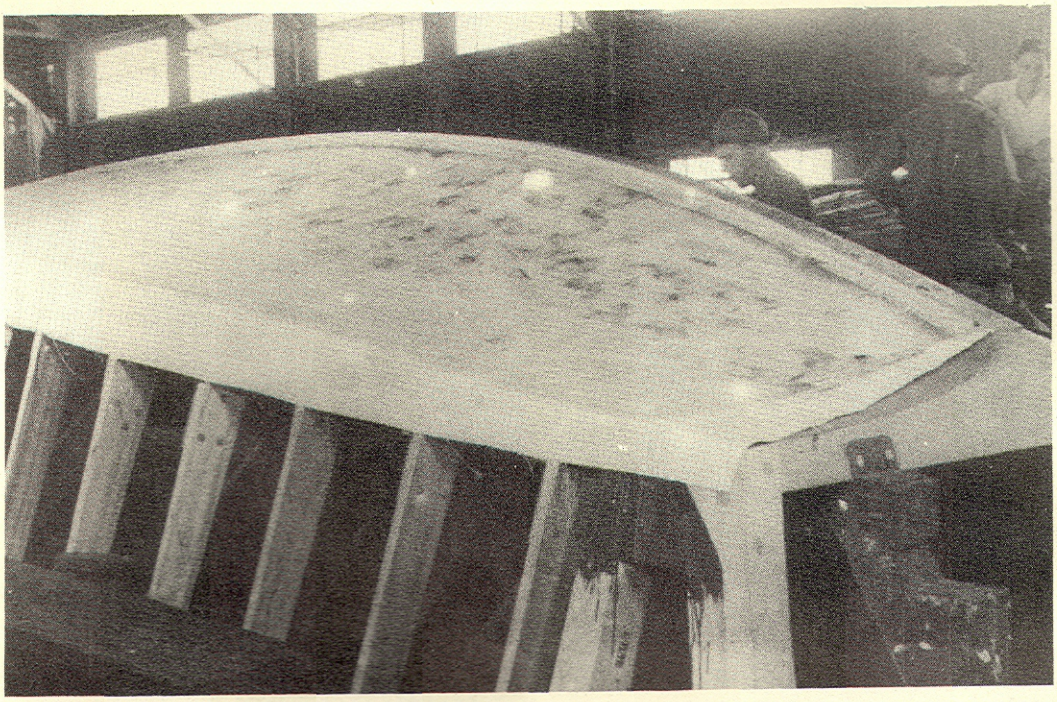


Figure 10

Fasten Side Panels: The side panels are fastened to the sheer, chine, headlog and frames #3 through #22 and #25-#26 with 2" #10 bronze screws. Additional fasteneings to frame #23 and #24 are:

$2\frac{1}{2}$" #12 Brass screws
5/16" x $4\frac{1}{2}$" Carriage Bolts
5/16" x $5\frac{1}{2}$" " "

The lift pad braces are fastened to with $1\frac{1}{4}$" #12 Brass screws.

$\frac{1}{4}$" x 1 3/4" Brass M.B. fastened to the butt edge aft
$1\frac{1}{4}$" x #12" Brass screw fastened to the butt edge aft upper
$1\frac{1}{4}$" x #12" Brass M. B. fastened to the butt edge aft lower

See Figs. 8 and 11. Figure 11 shows the manner in which the side is fitted and fastened into the bow post. Figure 8 explains how the over-lapping piece of side is scribed to be cut so it will butt against the transom.

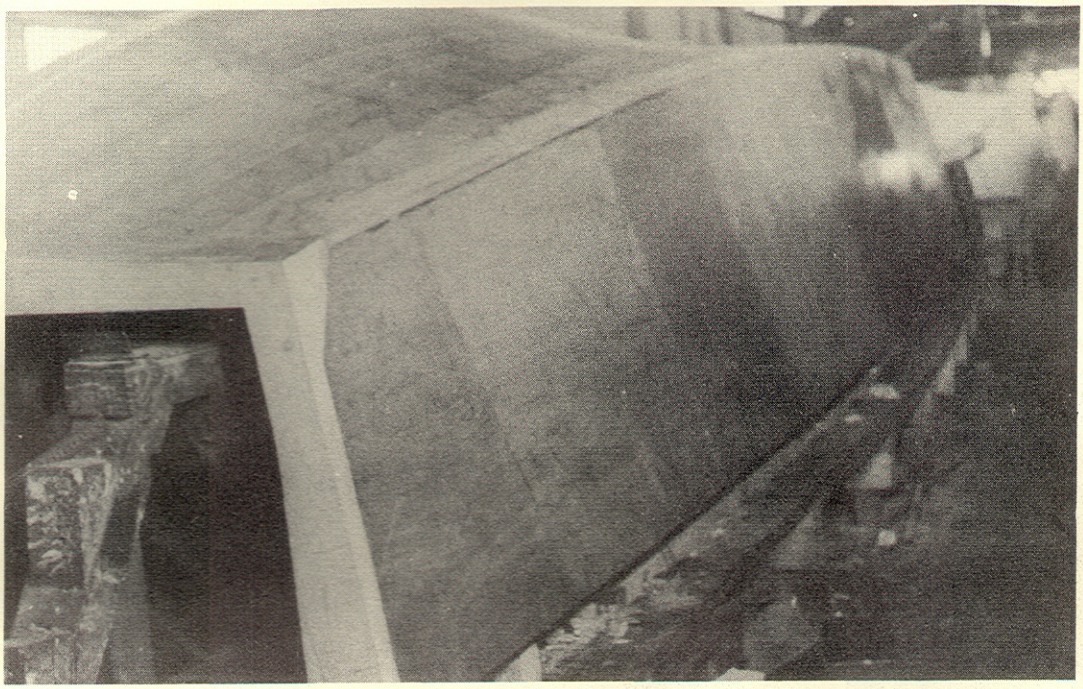


Figure 11

Fasten Outer Planking: The frame outlines are marked on the canvas as a guide for screwing bottom planking to the frames and butt blocks. Planking is laid from keel to the chine. Plankers should remember to drive all screws at an angle toward the keel. In other words, all planking screws should be toe-nailed to insure tight seams.

Fasten 2" #12 screws to frames and butt blocks. All planking fastenings to the apron, chine, transom, headlog, tunnel chines are 2¼" #12 brass screws. See Fig. 12.

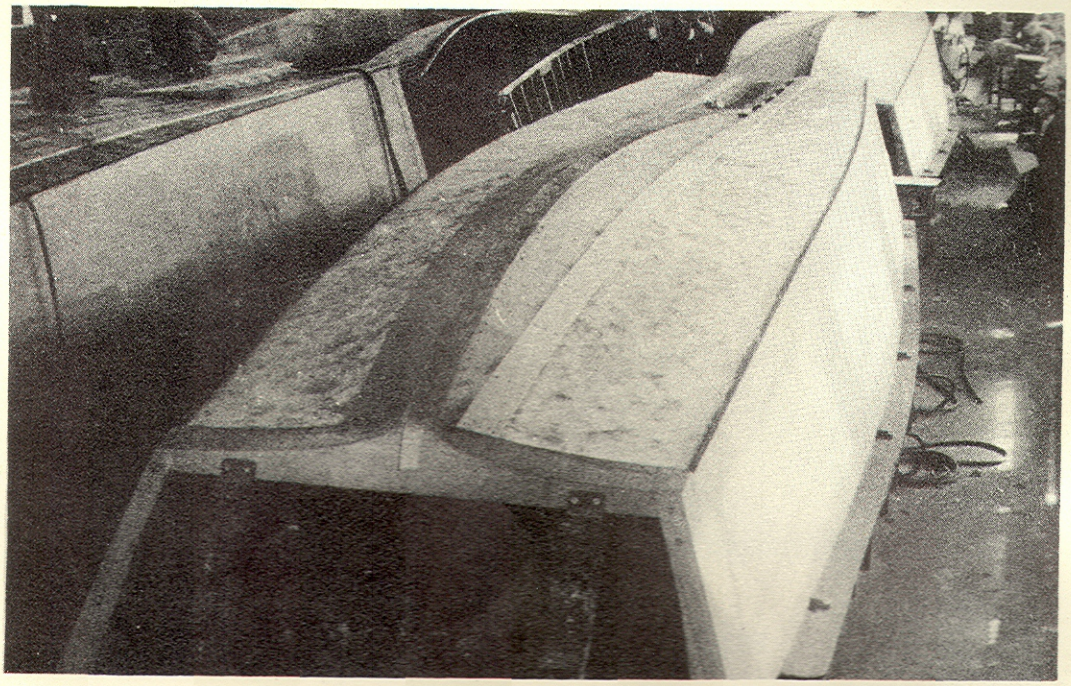


Figure 12

Place Keel Plates: To place the keel plates, it is necessary to rout out the keel in order to set the plates in flush. See fig. 13. The keel plates are placed only temporarily with finishing nails until the boat reaches another stage of construction.

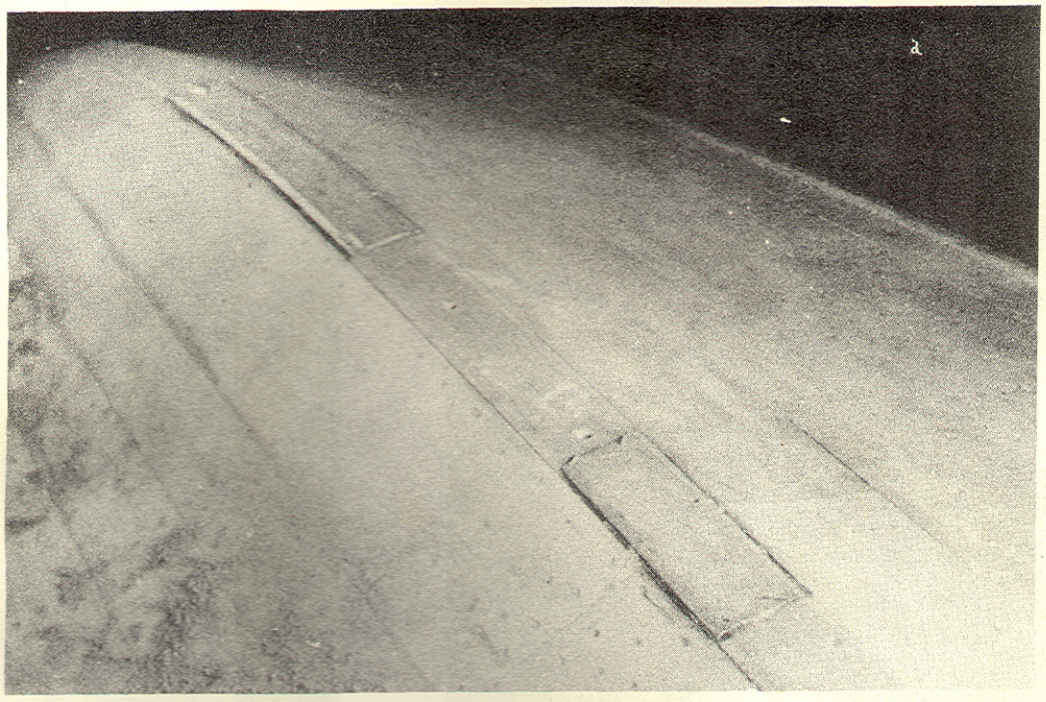


Figure 13

Skin Screws: Skin Screws are fastened upward through the inner skin into the bottom planking.

Fasten Frame Thru-Bolts: The thru bolts are fastened thru the frame centers into the keel. Holes are drilled upward from under the boat while upside down. 1/8" frame washers are used to seat the bolts. The frame washers can be seen in Fig. 16. Bolt sizes are as follows:

Frame	#3	5/16" x 10½"
"	#4-9	5/16" x 12"
"	#5-6-7	5/16" x 13"
"	#8	5/16" x 12½"
"	#10-11	5/16" x 11½"
"	#12-13	5/16" x11 "
"	#14-15	5 16" x 10½"
"	#16-17	5/16" x 10"
"	#18-19	5/16" x 9½"
"	#20	5/16" x 7"
"	#21	5/16" x 5½"
"	#24-25-26-27	5/16" x 7"

Drill Shaft Pilot Hole: The shaft pilot hole is drilled to enable a line-up string to be passed thru the hull in lining up the strut and skeg assembly. Figure 14 shows the method of marking the keel for the jig. Figure 15 shows the jig in place

and ready to be screwed fast to the keel. The ship auger can be seen started in the jig.



Figure 14

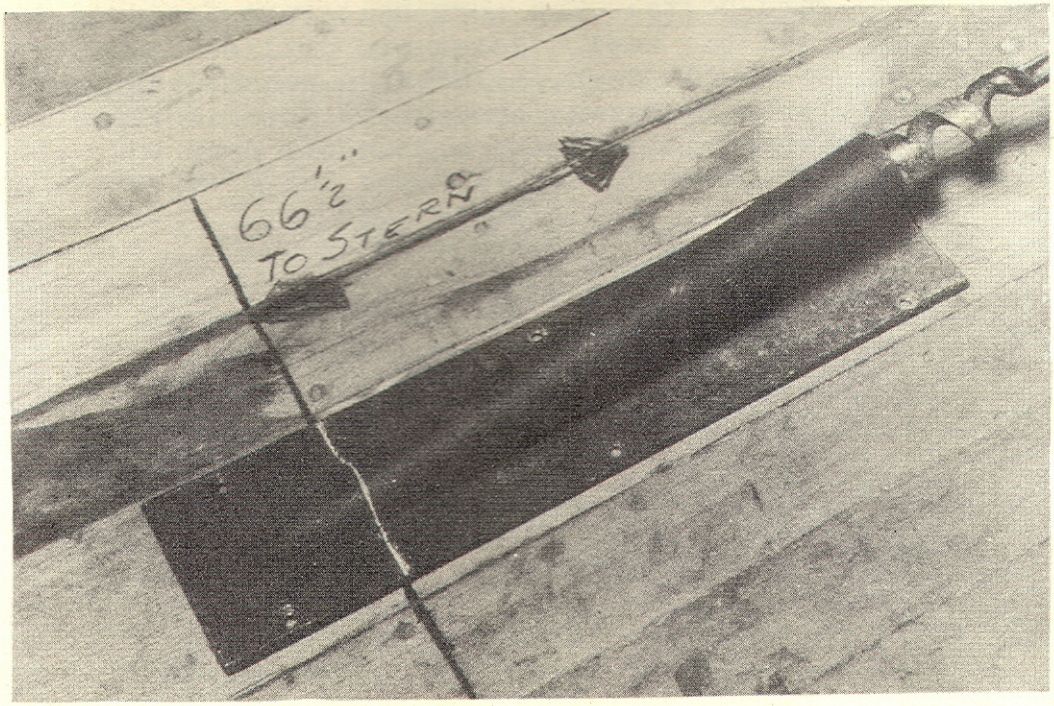


Figure 15

Fasten Forward Lifting Pads: Forward lifting pads consist of three parts. (1.) The pad between frames #6 and #7. (2.) The backing plate for the main pad. (3.) The pad between frames #7 and #8.

The lifting pads are fastened thru the keel pad plate with 3/8" x 4½" Brass Carriage Bolts. The backing plate is fastened thru frame #6 to the main pad with 5/8" x 3½" Brass Carrige Bolts. Both lifting pads are fastened together thru frame #7 with 5/8" x 3½" Brass Carriage Bolts. See Fig. 16.

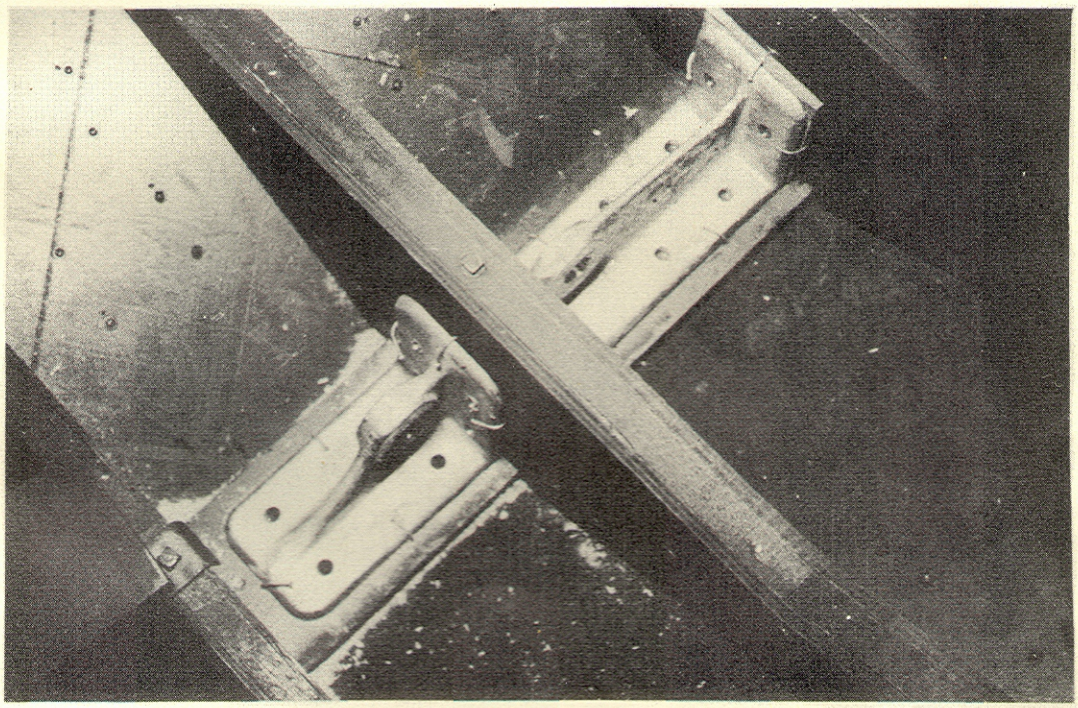


Figure 16

Fasten Center Lifting Pad: The center lifting pad is fastened between frames #10 and #11, and is secured to the center keel pad plate with 5/8" x 4½" Brass Carriage Bolts. See Fig. 17.

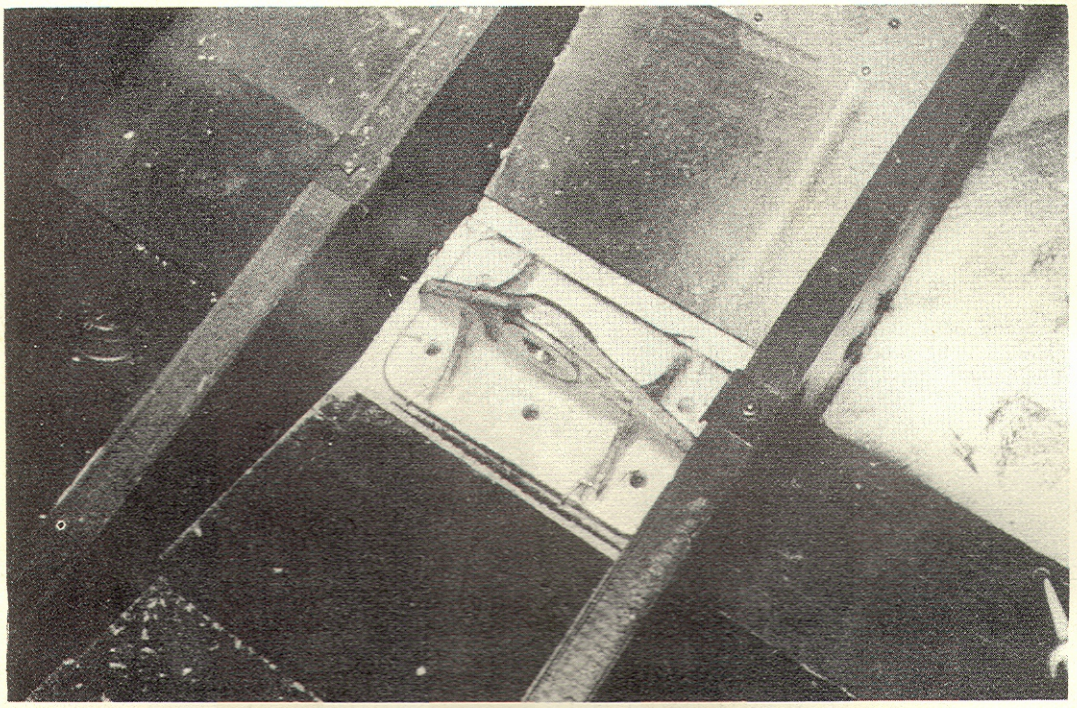


Figure 17

Skeg and Strut Line-up: This operation is one of the most exacting and important operations in the entire construction of the boat. A skillful tool man is needed for this work as the performance and life of the boat and under-water gear depends upon the accuracy of this operation.

Before attempting to run the shaft line, the boat must be level athwartships (side to side).

Set up a marker-stick at the after end of frame #15 at the center line of keel and plumb. Place another stick down from the after side of the transom and mark down 14 9/16" from under side of keel. Run a chalk line from the correct measurement of each stick thru the pilot hole. See figure 18. Measure 24" from after end of transom to place at after end of strut on the keel. Jack the skeg and strutassembly to the bottom of the

of the boat so that strut flange coincides with the mark on the keel. See Figure 19. Run the chalk line thru the bearing shaft hole in strut. Adjust the strut so that line will run thru the center line of bearing. This is checked with calipers. It may be necessary to bend the strut flange to bear evenly against the keel. In extreme cases it may be necessary to mortice the keel. Measure 51" from transom along the keel and plumb down to check thedistance between the keel and lip of shoe. Remove the strut and measure 10' 8" from the transom along the keel to get the point for the after end of the skeg at the keel. Wedge the skeg into place, lining up the center line of keel with the center line of skeg. The after end of skeg must be plumb. Scribe top of skeg to correspond with the measurement from the keel to lip of shoe. Measure 7' 3" from point where after end of skeg meets keel to after end of skeg. Apply the template to get the proper cut in skeg, so that the strut shoe will fit.

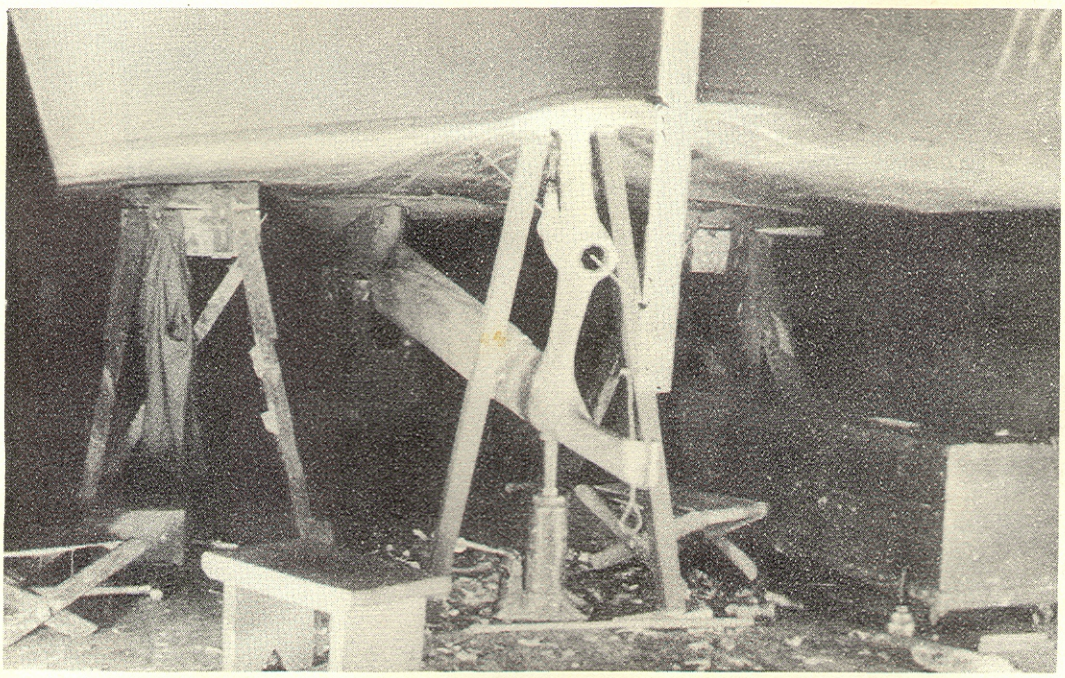


Figure 18

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The strut must be then guided back to its original position and cut to fit. Adjust the strut so the shaft line is again centered thru the outboard bearing. Drill the holes thru the keel from the outside to fasten strut.

Holes for carriage bolts are then drilled in the skeg and the keel, from inside the boat. Skeg and keel holes are drilled between the frames. After the holes are drilled, the skeg is removed and all holes are countersunk to allow bolts to extend 3 3/4" above the top side of the skeg. This will permit the bolts to be fastened thru the keel apron and washer. Before fastening bolts wrap with caulking cotton and white lead to insure watertight fit. Both ends of the bolts should be treated in this manner. This same procedure is carried out on the strut bolts.

The skeg and strut assembly is then raised back into place and bolted. Bolt the strut to the skeg with ½" x 8" and ½" x 8½" Monel bolts from below. Drill out the skeg and strut for 3/8" bronze rivets fastened horizontally across the skeg. See Fig. 20.

A strut is fastened to the keel with 6 -- ½" x 5½" Monel carriage bolts. Skeg is bolted with the following fastenings:

1	3/8" x 5½"	Gal. Carr. Bolts
1	3/8" x 6"	" " "
1	½" x 8"	" " "
1	½" x 9"	" " "
1	½" x 11"	" " "
1	½" x 13"	" " "
1	½" x 15"	" " "
1	½" x 17"	" " "
1	½" x 19"	" " "
3	½" x 4½"	" " "

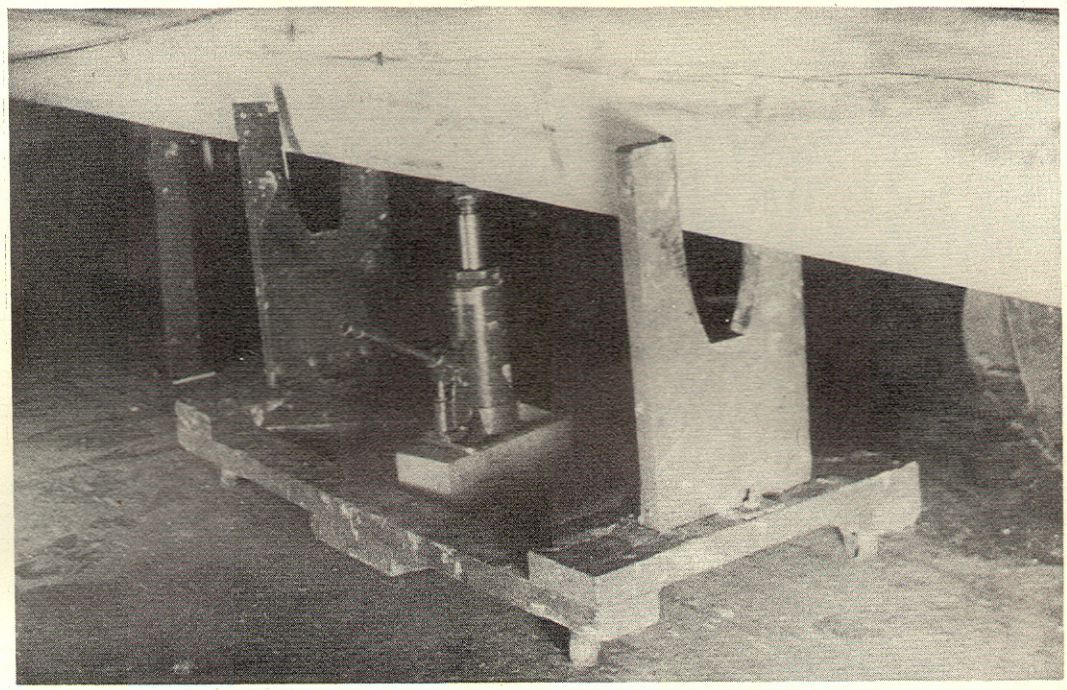


Figure 19

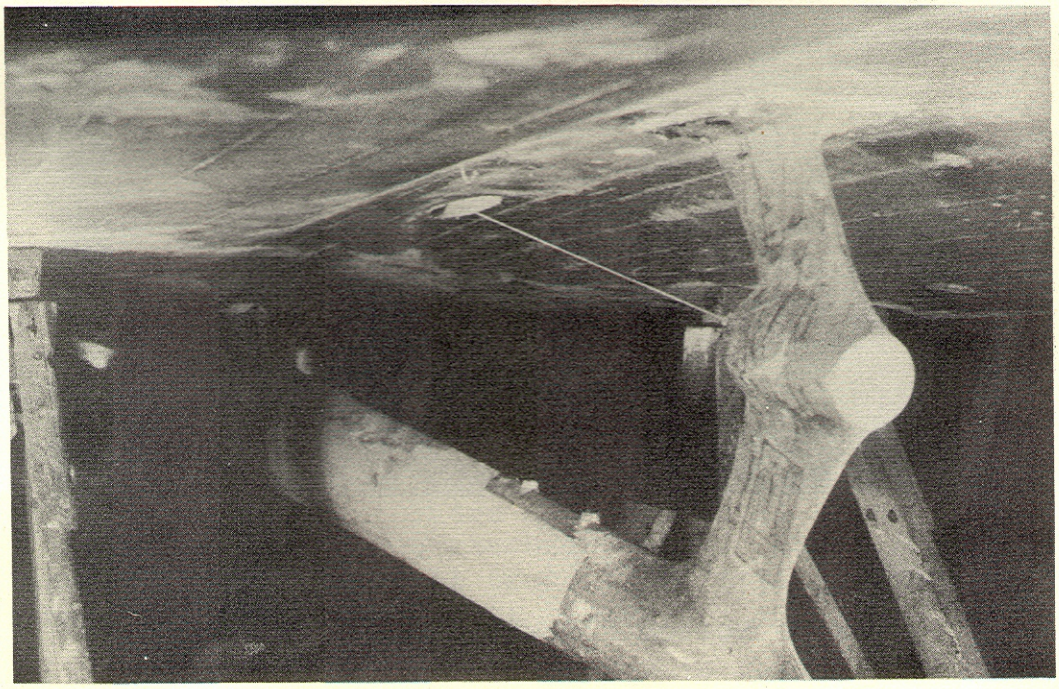


Figure 20

Fasten False Bottom: The false bottom consists of 1-Keel (false) and six planks. Fasten false keel with $\frac{1}{4}$" x $4\frac{1}{2}$" Brass Carr. Bolts, starting 1" back from forward end of main keel. Apply marine glue to bottom of boat from frame #4 aft 13' by 30" wide. Fasten and staple canvas over glue.

Fasten all planking to frames with 2" #12 screws. The outer edges of the planks are fastened to the bottom of the boat with $1\frac{1}{2}$" #12 screws. The planking must be fitted tight as there is no caulking used. See fig.21.

Fasten Keel Iron: The keel iron is designed to protect the keel during beaching operations. It is merely a 3" galvanized strip fastened with $1\frac{1}{4}$" #10 Monel screws.

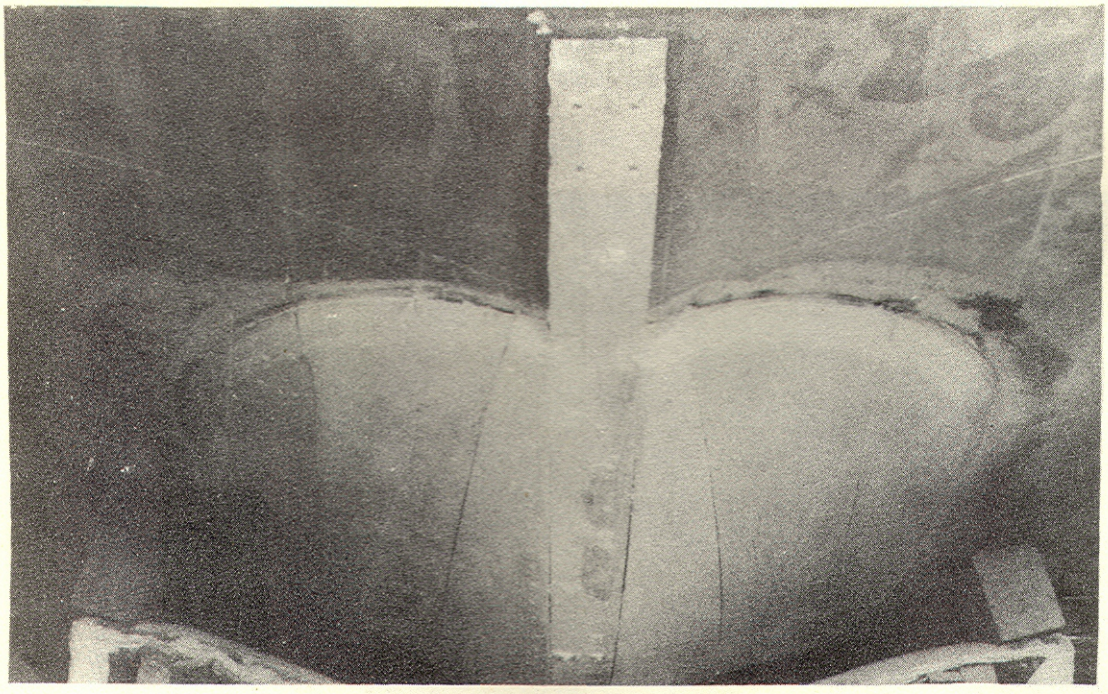


Figure 21

(False Bottom Planking)

Fasten Tunnel Plate: The purpose of the tunnel plate is to protect the tunnel from damage due to rocks and sand being thrown up into the propeller wash.

The tunnel plate is fastened with 1" #10 brass screws and 10/24" x 1 3/4" F.H. brass machine screws. See fig. 22.

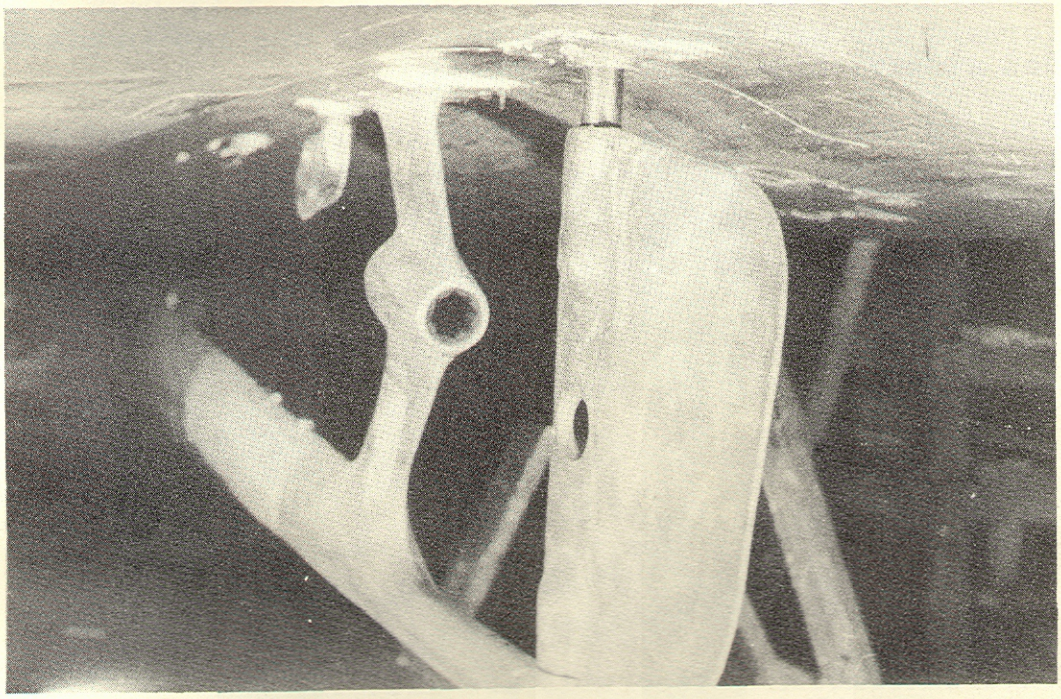


Figure 22

Fasten Quarter Brass: The quarter brass stripping is fastened over the butt joint of the side and transom panels with 1" #10 screws.

Fit Hull Connections: There are three hull connections, one on the bottom and two on the starboard side. Holes for the connections are 7/8". The hull connection fittings are 1½". All fittings bear against plywood butt blocks.

The bottom hull connection is to supply water to the cooling system of the engine. The starboard side connections provide openings for the bilge lines.

Fasten Scoop: The scoop is fastened over the bottom hull connection with ¼" x 2¼" machine screws.

Fasten Stringers: There are two sets of stringers fastened to the frame bottoms: one inboard set and one outboard set.

The bottom inboard rails are laid down on the frame bottoms and butted tight against frame #3. Fasten and countersink 3½" #16 bronze screws to the frames.

The bottom outboard rails are laid down on the frame bottoms and fastened to frame #4 thru #22 with 3½" #16 bronze screws to the frames.

Fourteen filler blocks on inboard stringers and two forward blocks (filler) on outboard stringers are toe-nailed in place.

The forward inboard and outboard top-rails are set in place and levelled athwartships.

The inboard forward top-rail fastenings are: 2 - 5/16" x 7½" carriage bolts and 3½" x 16" bronze screws. These are fast ened thru the filler block and bottom rail.

The intermediate top-rails are laid down on the filler blocks and levelled athwartships.

The intermediate rail fastenings are:

2 5/16" x 10" Carriage bolts (P & S)
2 5/16" x 8" " " " "
6d and 8d finishing nails

All fastenings are made thru top-rails, filler blocks and bottom rails.

Outboard intermediate top-rails are fastened with 5/16" x 8" carriage bolts and 5/16" x 6" carriage bolts thru top and bottom rails. Additional fastenings are made thru top rail and bottom rail with:

5/16" x 4½" Carriage bolt
5/16" x 5½" " "
5/16" x 6½" " "
5/16" x 7½" " "

Two aft filler blocks are toe-nailed in place on the inboard stringers and four filler blocks on the outboard stringers. The aft top-rails are placed over the filler blocks. 5/16" x 6" carriage bolts are fastened thru the top-rail and bottom rail on the inboard stringers. The following bolts are bolted thru the top-rail, filler blocks and bottom rail on the inboard stringers:

5/16" x 7½" Carriage bolts
5/16" x 10" " "
5/16" x 11½" " "

The outboard stringers are bolted thru the top-rail, filler blocks and bottom rail with:

5/16" x 8" Carriage bolts
5/16" x 6" " "
5/16" x 10" " "

Fasten stringer Angles: The stringers are fastened to the frames with angle irons. The inboard stringer angles are fastened with $\frac{1}{4}$" x 2" carriage bolts thru stringers and $\frac{1}{4}$" x 2$\frac{1}{4}$" carriage bolts thru frames. The outboard stringer angles are held in place with $\frac{1}{4}$" x 2" carriage bolts thru both stringers and frames. See fig. 23.

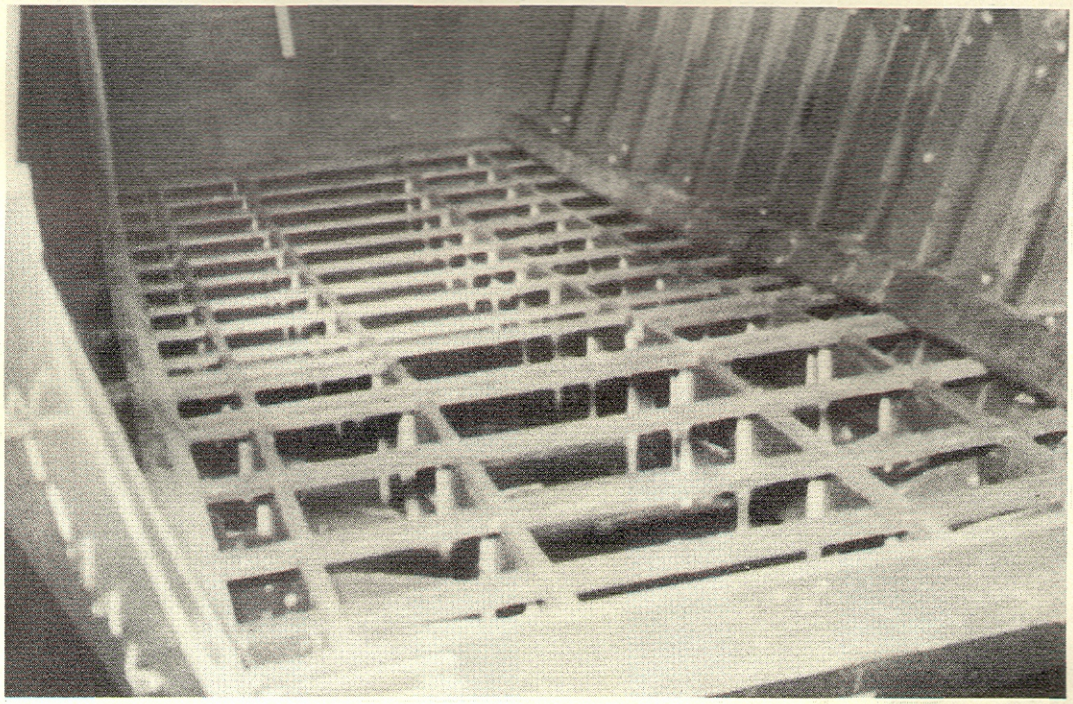


Figure 23

Fasten Engine Beds: Level boat athwartships. The engine bed is located between frames #16 and 22. Run shaft-line thru center-line of shaft log. Clamp engine bed in place temporarily to inboard stringers. The inboard edges of the bed timbers must be 11$\frac{1}{4}$" from the shaft-line. Adjust and level engine bed to 1$\frac{1}{2}$" below the shaft-line, by notching bed-timbers and frames.

The engine bed is then fastened to the inboard stringers with 3/8" x 5" carriage bolts.

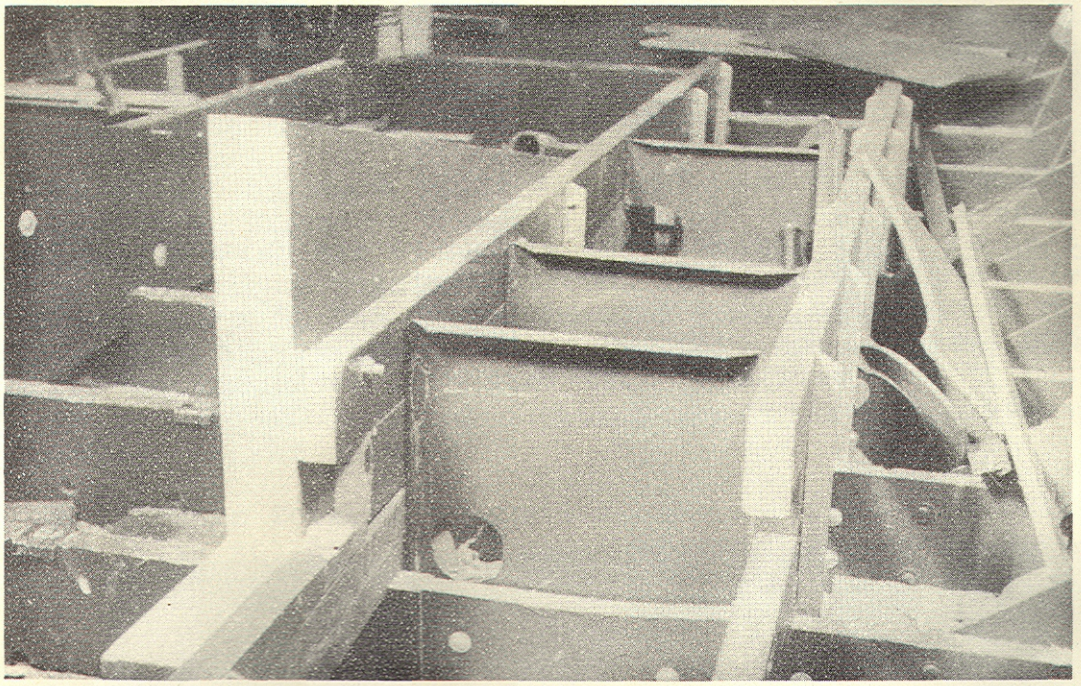


Figure 24

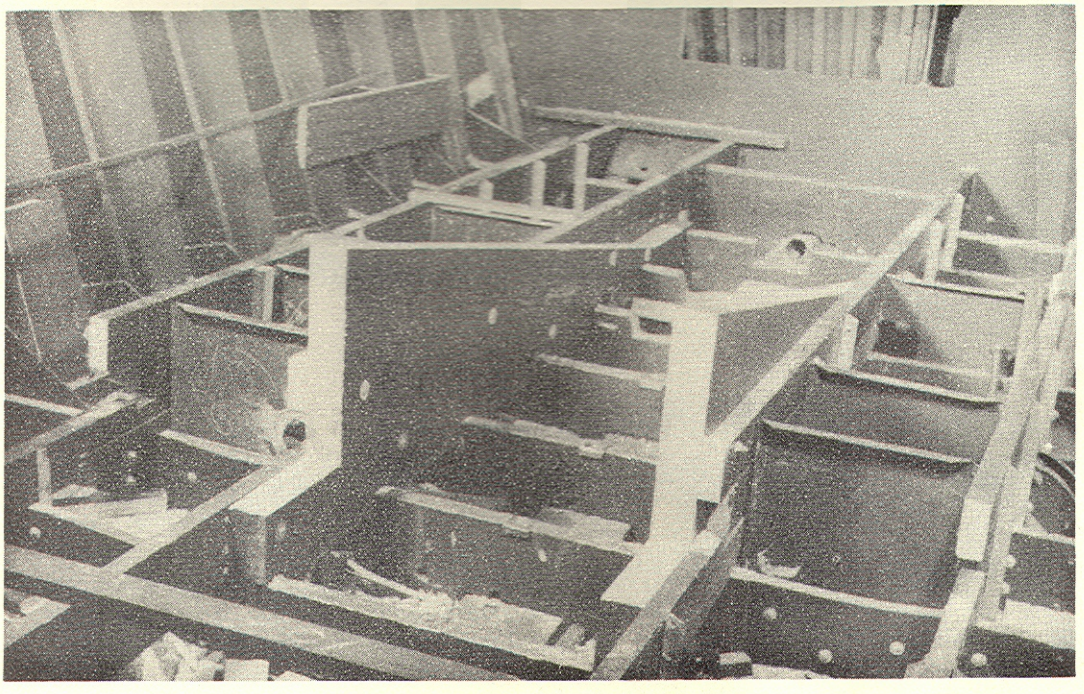


Figure 25

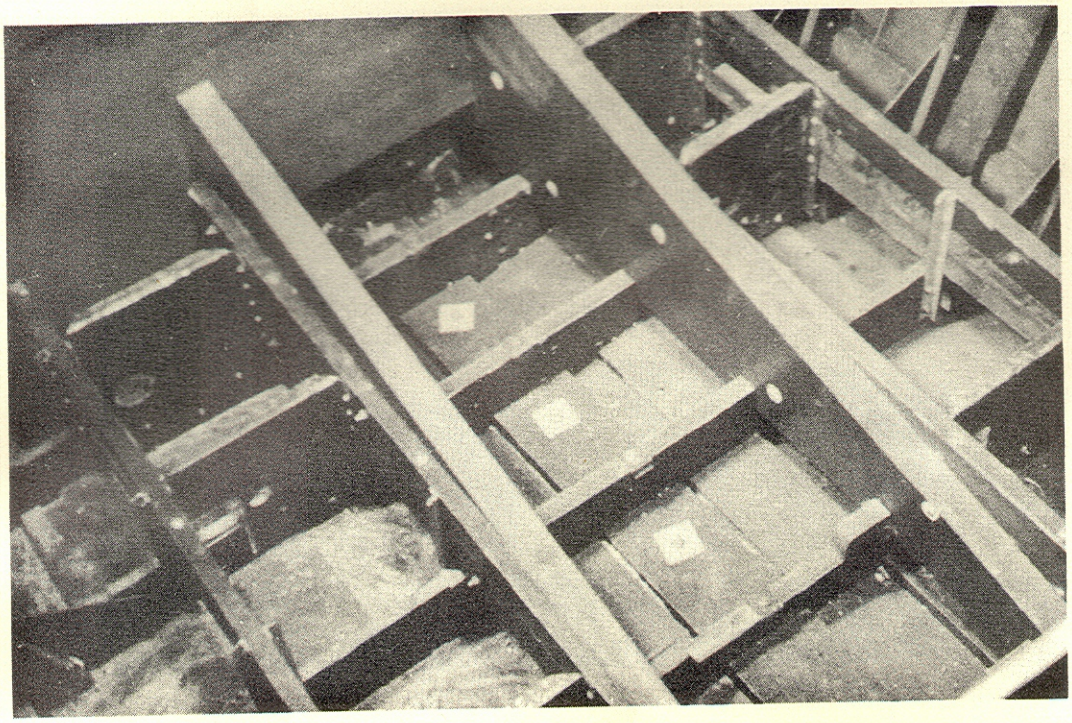


Figure 26

Fasten Rudder Shelf and Support: The rudder shelf is designed to support the rudder shaft assembly. It is fastened to the transom framed with 5/16" x 8½" galvanized bolts.

The shelf is held in place by the shelf support which is fastened to the shelf with ¼" x 6" carriage bolts and to the transom center frame with ¼" x 3½" carriage bolts. See fig. 28.

Rudder Ins tallation: The manoevering rudder assembly is installed between frames #25 and #26. A support plate to support the rudder assembly is fastened between frames #25 and #26 with ¼" x 2¼" carriage bolts. The rudder stuffing box is fastened to the center line of the keel under the support plate with ½" x 5½" brass carriage bolts. See figs. 27-28-29

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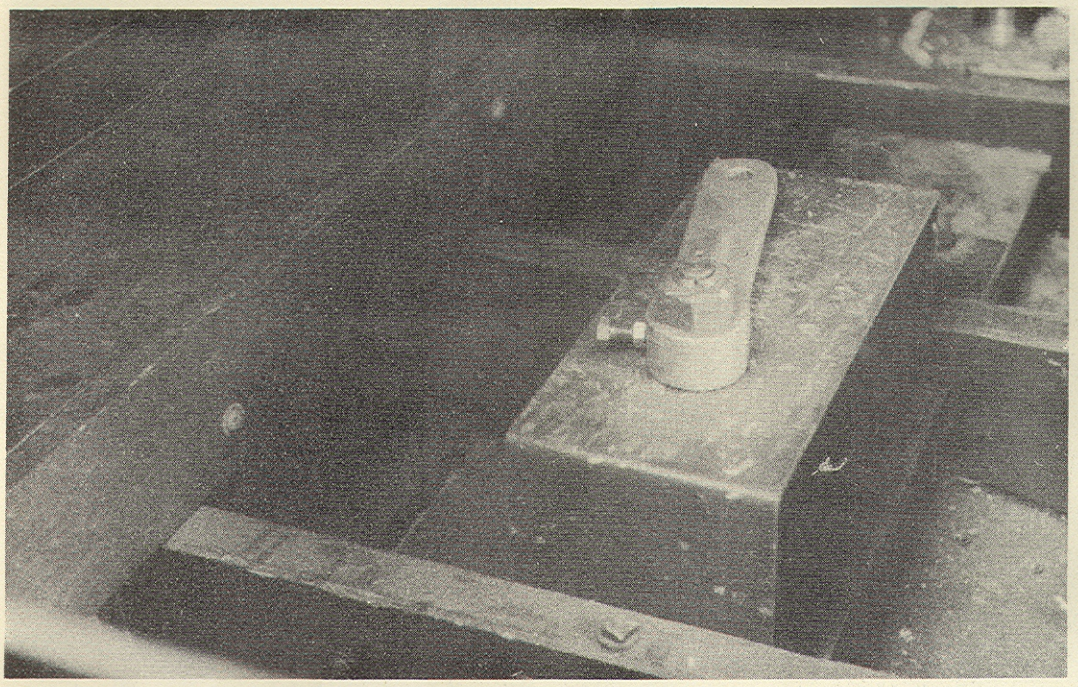


Figure 27

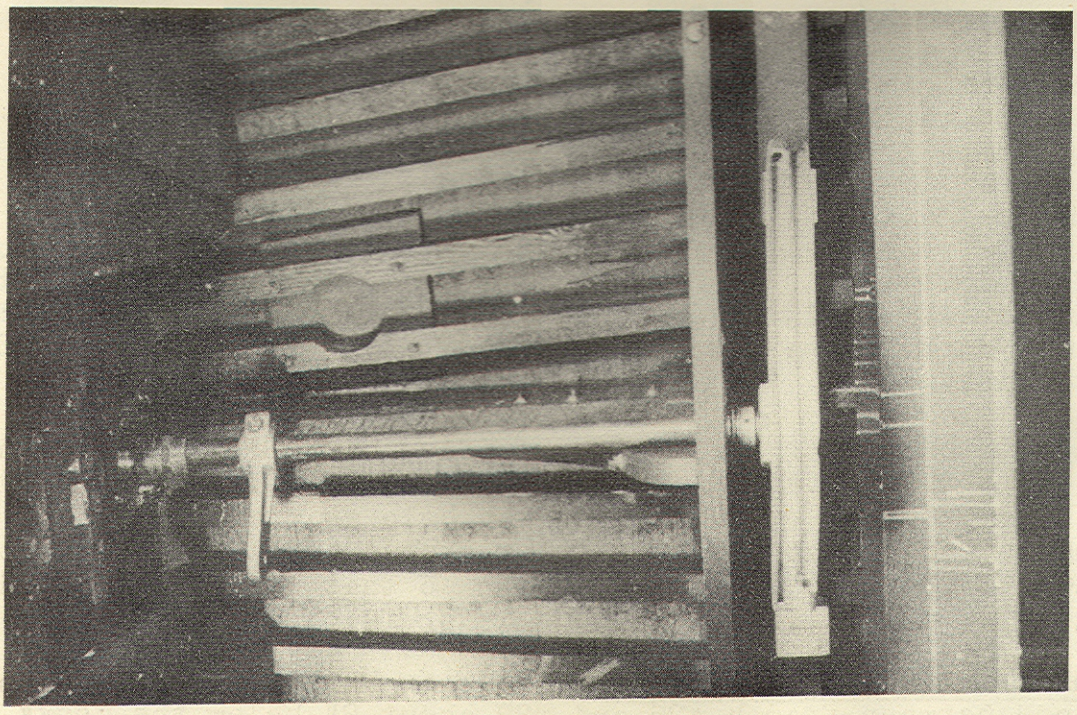


Figure 28

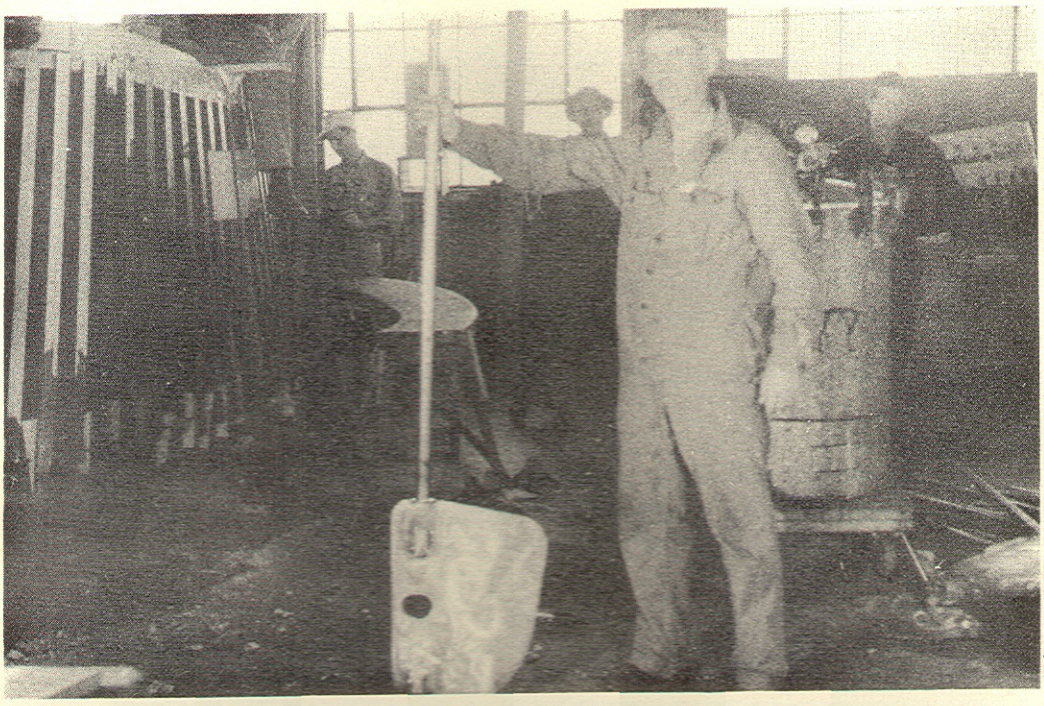


Figure 29

The main rudder assembly is inserted thru the stuffing box and supported by the tiller arm resting on the support plate. See fig. 40.

The rudder stop-blocks are fastened to the transom frames above the rudder shelf. They are supported by a wooden strip screwed to transom frames with 2½" x #12 screws. The blocks are fastened with ¼" galvanized bolts of varying sizes.

The main rudder shaft hole is lined up from the strut in order that the rudder shaft will seat true.

The outside shaft flange, inside shaft plate and rubber gasket are coated with white lead and bolted into place with 3/8" x 6" bolts.

Insert the rudder shaft into stuffing box and thru hole in shelf. Seat the rudder in strut and pin in place. Place thrust bearing plate on shelf over the hole and fasten with 1" #10 flat head screws. Put thrust bearing around shaft and on the plate. Set quadrant in place and tighten down so that the quadrant and bearing takes up the load.

Install Steering Sheaves and Cables: The aft steering sheaves are placed between frames #26 and #27 about 2" below the decks, in line with holes in gussets, one to Port and one to Starboard. Bolt a sheave block 7 3/4" from deck between frames #24 and #25

on the Port side. Fasten Starboard sheave block between frames #24 and #25, 5" down from deck.

The double sheave under the coaming is lined up opposite the control box sheaves, after the control box is in place in order for the cable to run to the wheel-drum properly.

Fasten cable to quadrant and pass thru sheaves and also fair leaders which are fastened under the port coaming.

Install Fuel Tank Foundation: The fuel tank foundations are fastened together with galvanized common nails; fig.30 shows foundations and shims which are fastened to frames #25, 26, and 27 to raise the foundation's level. Strip supports are fastened to transom frames and bulkhead level with chines. The slats are then fastened down.

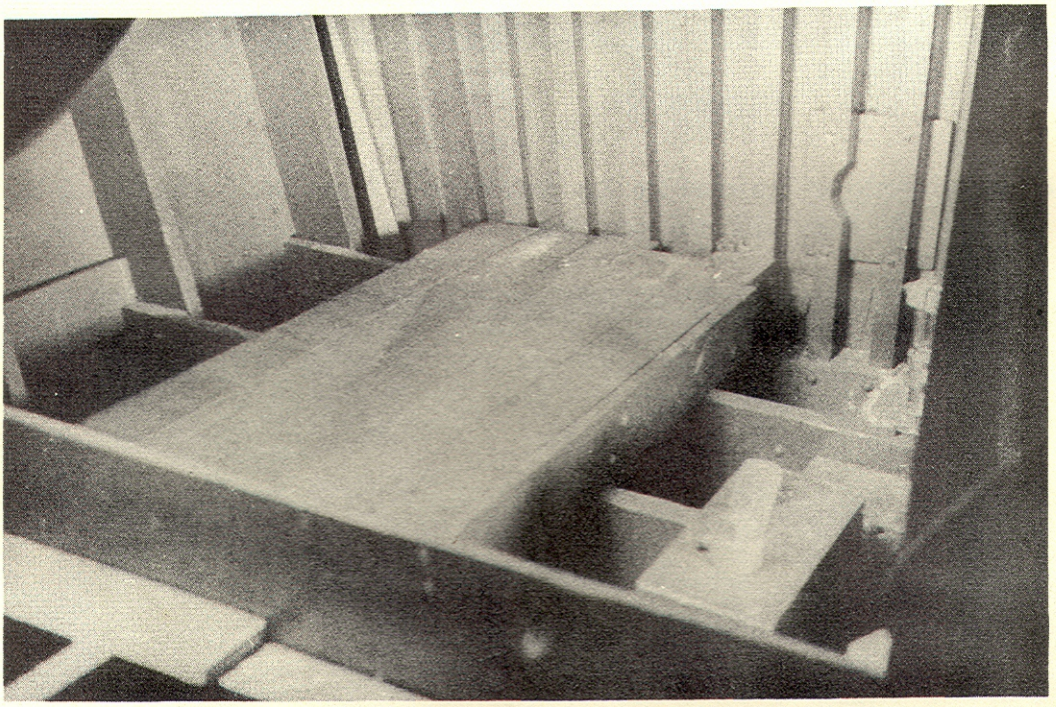


Figure 30

Install Frame Extentions: Frame extensions consist of side deck beams, gussets and frame extensions. These are fastened to the frames and are additions to increase the freeboard forward. A jig is fastened to the lower sheer to guide the frame extensions into place. The #1 bow post extensions are held in place with 5/16" x 7½" carriage bolt and 3½" #16 FH screws.

#2 bow post extensions are fastened with 5/16" x 7½" carriage bolts and 3½" #16 screws FH. The remaining 42 frame additions are held in place with ¼" x 2¼" carriage bolts fastened thru sheer gussets and frames.

The inboard edges of the deck beams are next faired off and the inside coaming is bolted to #1 bow post with 5/16" x 7½" carraige bolt and to #2 bow post with 5/16" x 9" carriage bolts. 3½" #16 screws are fastened to the remaining frame extensions.

Deck beams #23-25-26-27 complete with gussets are fastened into place with 1½" #10 screws.

Fasten forward upper sheer with 5/16" x 7½" carriage bolts thru sheer to frames. The sheer is also held in place with 5/16" x 9" carriage bolts at bow posts #2.

Fasten deck bow blocks flush with top of coaming and sheer with 5/16" x 7½" carriage bolts to #1 bow posts.

Upper sheer butt blocks are fastened with finsihing nails. The after sheer is fastened thru the butt blocks with ¼" x 3¼" carriage bolts. 3½" x #16 screws are made fast to frames and lower sheer. ¼" x 5" carriage bolts hold the upper sheer to the lower sheer.

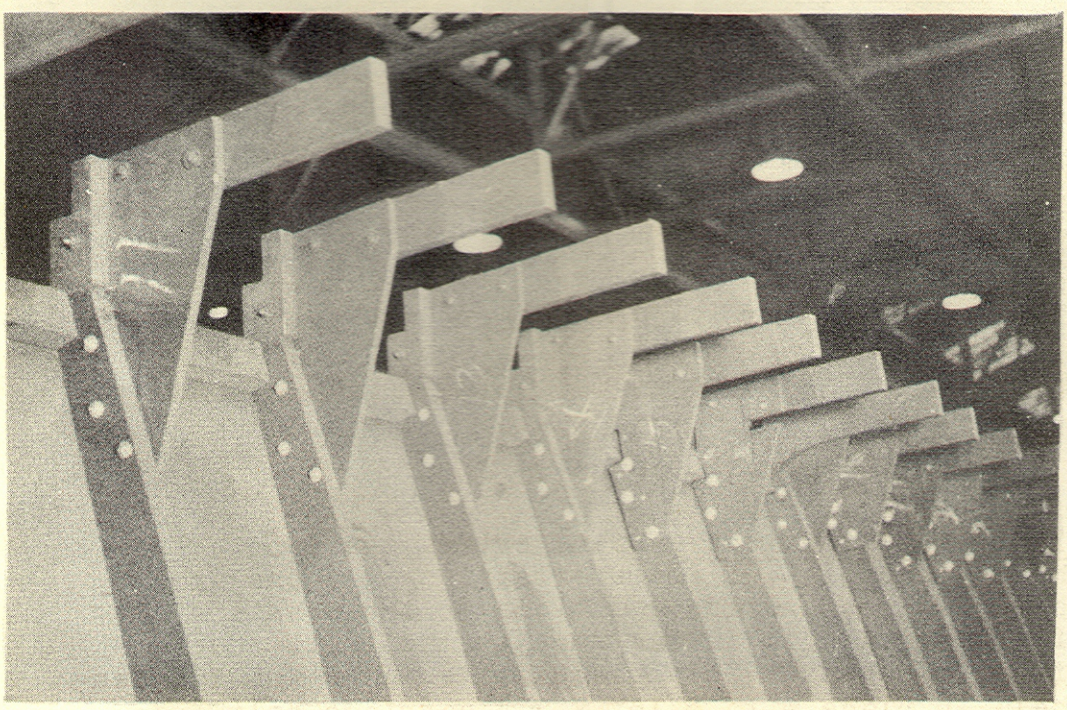


Figure 31

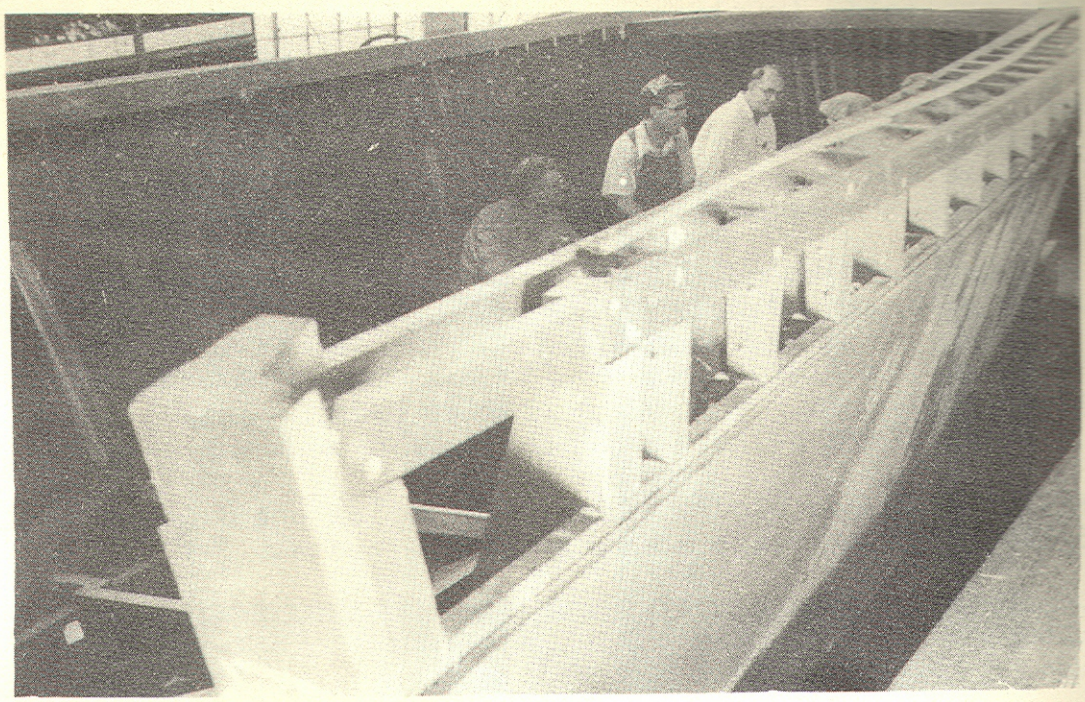


Figure 32

Fasten Upper Sides Filler Blocks: The upper side filler blocks are fastened to frames #5-6, 15-16-17 with 1 3/4 #10 brass screws. The filler block pads fit underneath the blocks and are fastened to the frames. Filler blocks are flush-fitted to the top of the sheer to allow the side deck to be flush.

Fasten Upper Side: The upper side is fitted between the lower sheer and the upper sheer and fastened into place with 2" #10 screws. See Fig. 33

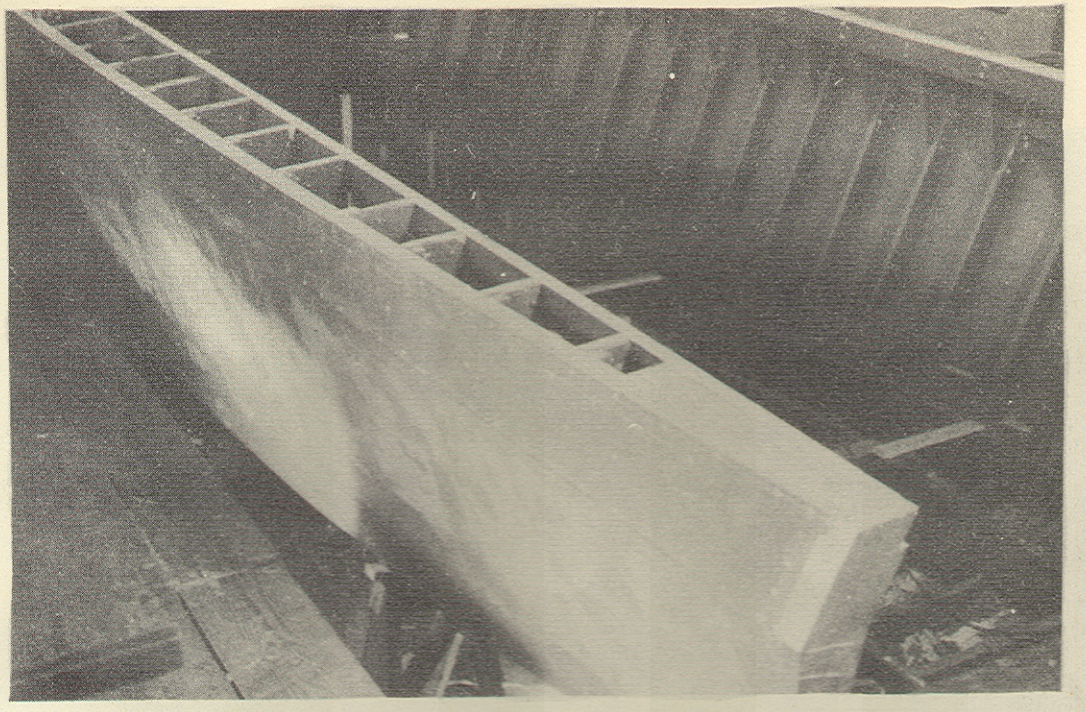


Figure 33

Fasten Transom Filler Blocks: The transom filler blocks are fitted to the top of the transom frames on an angular cut of the transom frame tops. The filler blocks are fastened thru the transom panel with 2 #12 screws. $\frac{1}{4}$" x 4" carriage bolts are used to hold t ransom and transom frame together. See fig. 34.

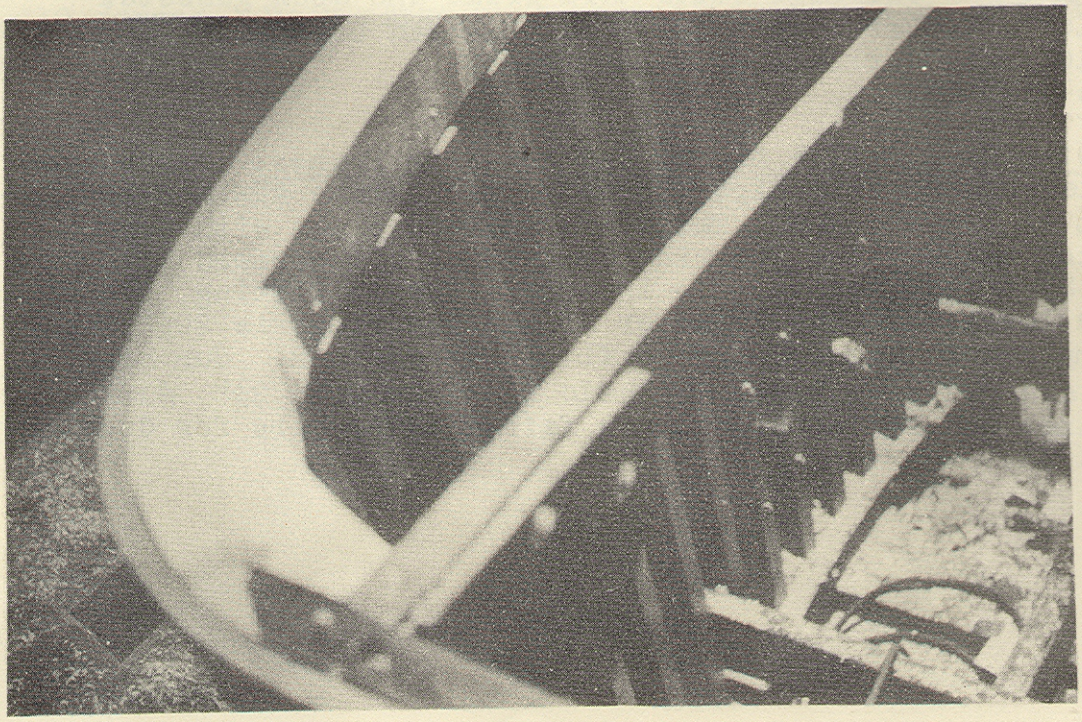


Figure 34

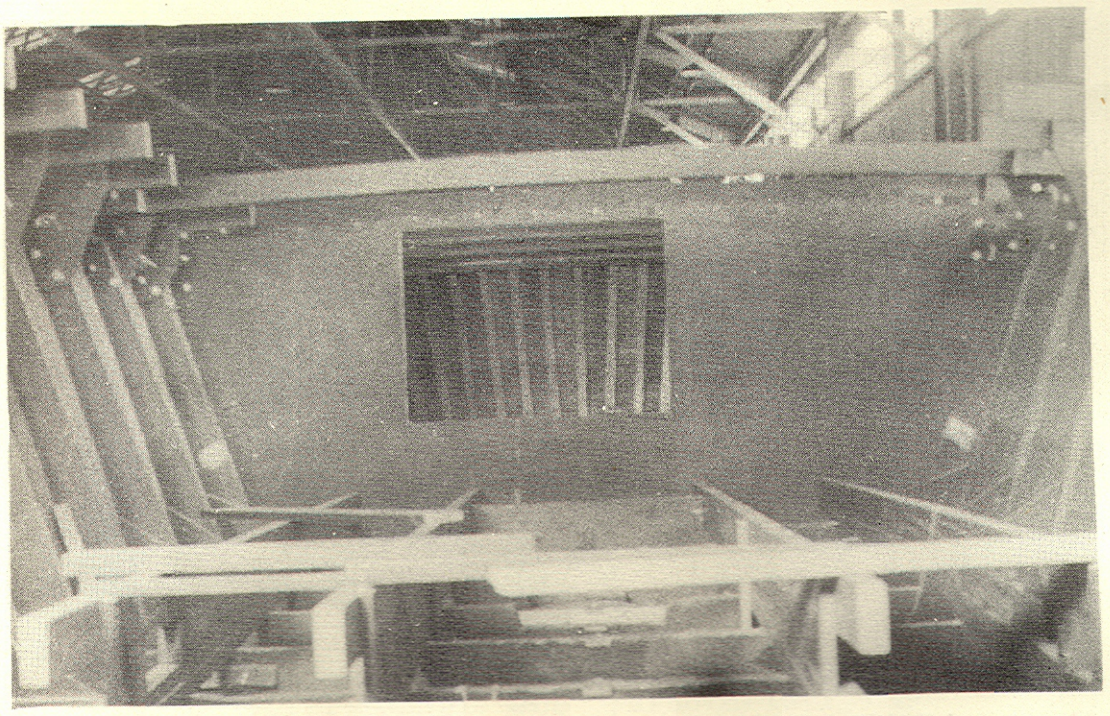


Figure 35

Place Bulkhead: A plywood bulkhead is fastened to frame #24 as follows:

1 3/4" #10 Brass screws to frame and deck beams.
¼" x 3" Carriage bolts thru frame and deck gussets.
5/16" x 4½" Carriage bolts thru bulkhead brace.
5/16" x 3½" Carriage bolts to frame.
See fig. 35.

Fasten Deck Filler Blocks and Gun Ring Frames: There are six filler blocks amidships beginning with Frame #22 and continuing aft to the transom. These are held in place with common galvanized nails. The gun ring deck beams are screwed into place with 1 3/4" #10 screws. To in sure accurate fitting, the boat is again levelled. The diameter of the gun rings is 29½", and it is important that framing be fitted to conform. Gun ring framing and gun ring knees are held in place with 2½" #12 screws.

Frames and filler blocks are faired to prepare for decking. See fig. 36.

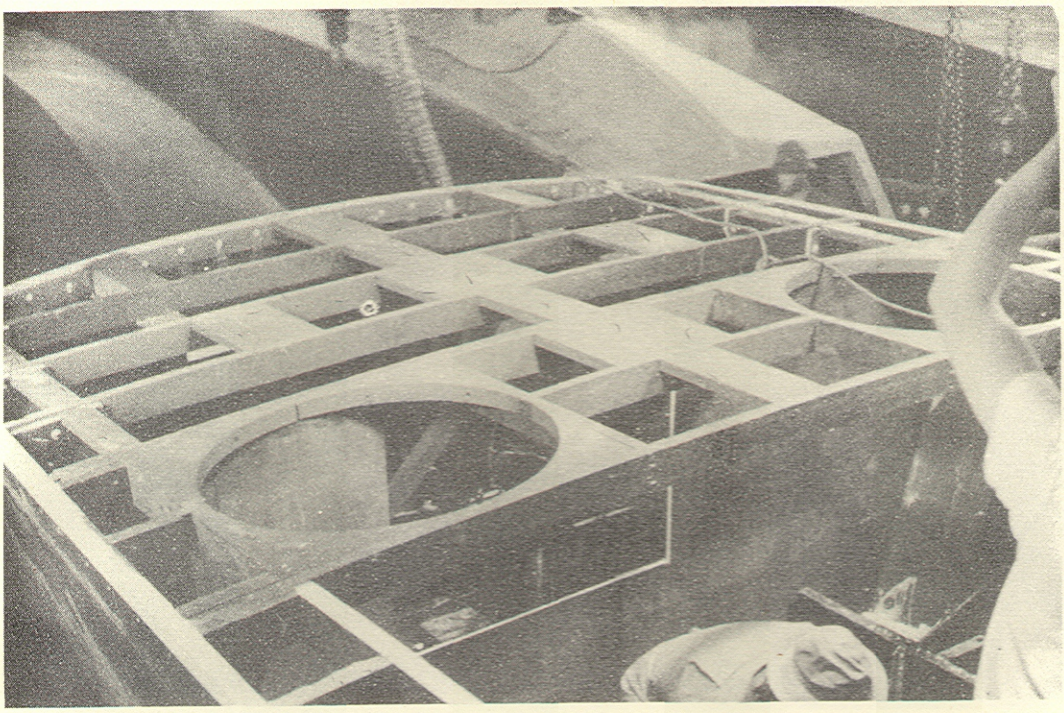


Figure 36

Fasten Deck Assembly: The deck assembly consists of two side deck panels and two after deck panels. These are fastened to deck beams, coaming rails, upper sheer and transom with 1 3/4" #10 screws. Deck seams must be puttied to insure watertight fit. See fig. 37.

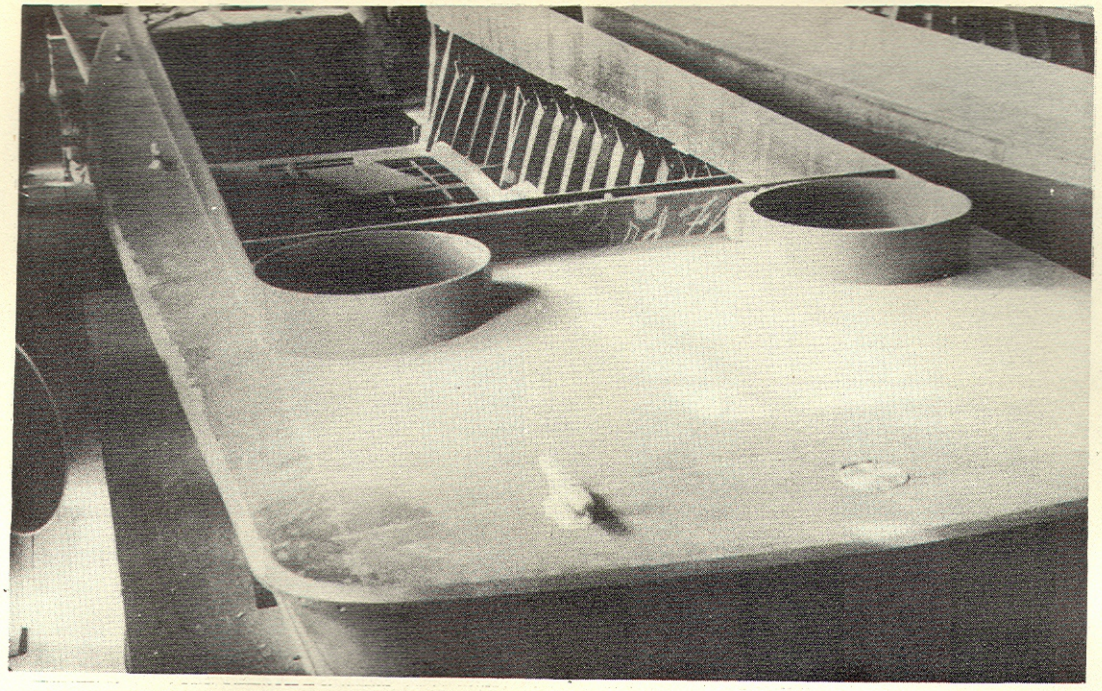


Figure 37

Fasten Coaming and Gun Rings: The two side coamings are fastened to the coaming headers with 2" #12 bronze screws. Screws must be staggered in order to miss the fastenings in the coaming header.

The aft coaming is fastened to deck beam #22 with 2" #12 bronze screws. Figure #38 shows how the aft coaming butts to the side coamings. 2" #10 screws are fastened thru the side coaming into the ends of the after coaming.

The coaming finish irons are fastened to the top edge of the coamings with 1" #8 galvanized screws.

Figure #38 shows the assembled coaming from inboard and the adjoining boat shows the outboard views. The deck and coaming seams must be caulked and puttied.

Before the gun rings can be installed, the after ends of the side coamings must be trimmed. Figure #39 shows how they hang over the gun ring holes.

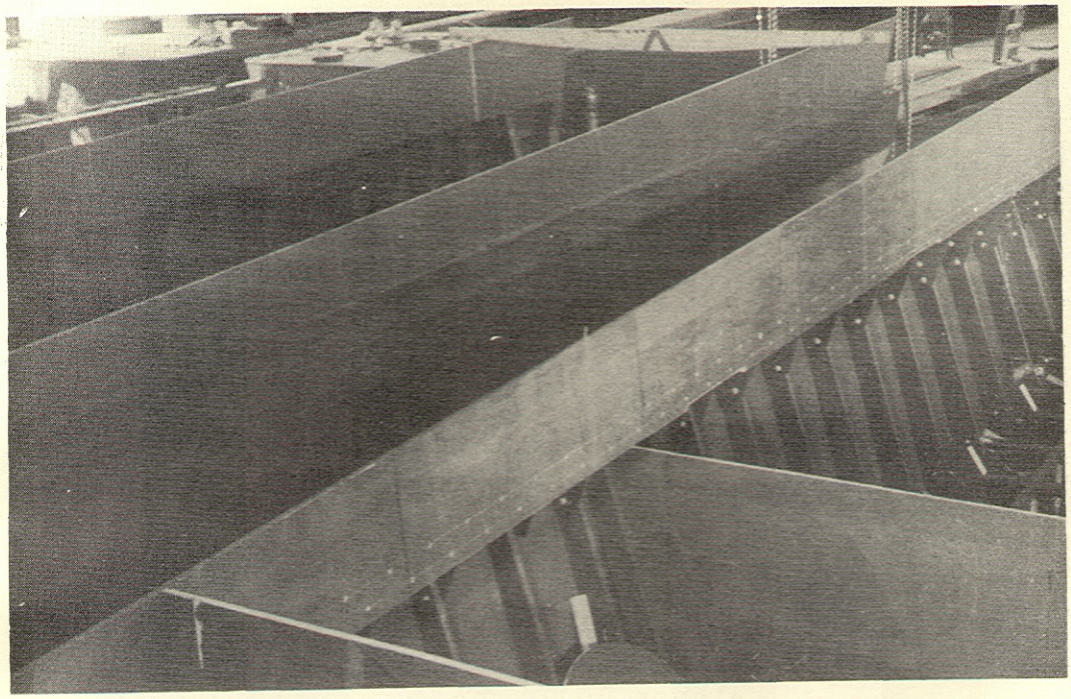


Figure 38

Fasten Coaming and Gun Rings: (Cont'd)

Gun ring holes are marked out and cut with router. Set gun rings in place and raise outboard edge of ring 8½" above deck. Level both rings athwartships with a batten. Fasten to ring frames with 1½" #10 brass screws spaced about three inches apart. Caulk and putty seams around gun rings at deck. See fig. 39.

Fasten brass strip at juncture of coaming and gun ring. Figure 37 illustrates completed deck with gun ring mounted.

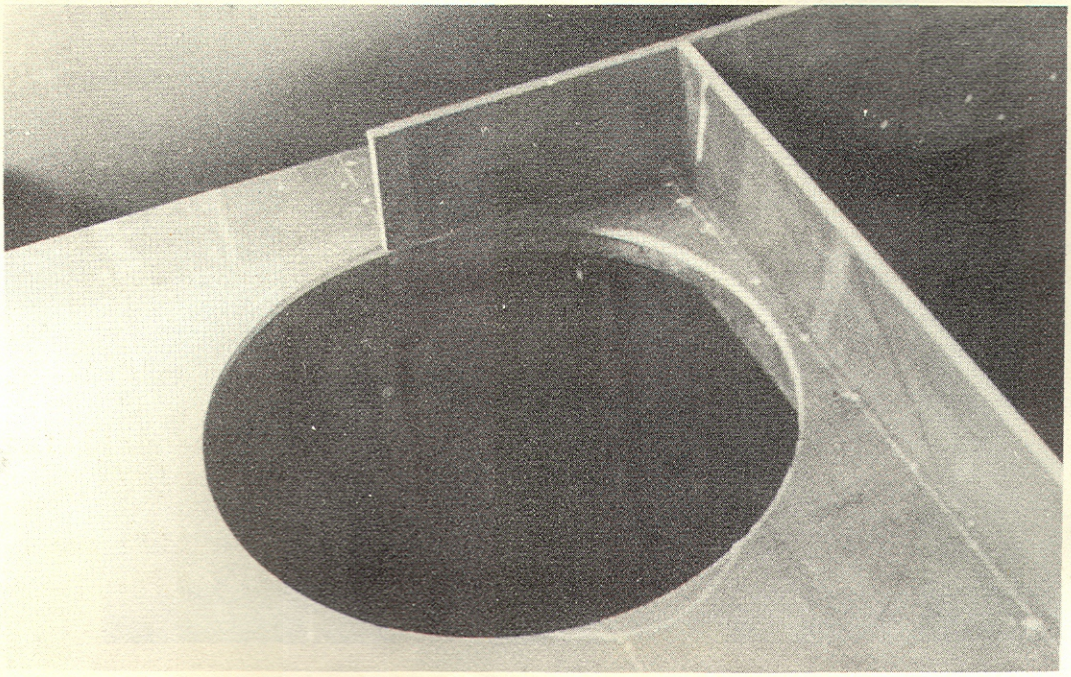


Figure 39

Fasten Rub Rails: Rub rails are fastened flush to deck along sides and stern with 2½" #12 screws. See fig. 37.

Fasten Deck Cleats: The four side deck cleats (P & S), are fastened between frames 5 & 6, and 15 & 16. These are 10" cleats held in place with ½" x 9" galvanized bolts.

The two 12" aft deck cleats are fastened with ½" x 9" galvanized bolts. See fig. 37.

Fasten Shaft Log Inside: The boat must be checked for level and the shaft line set up. Locate bearing for shaft hole cutter. The bracket holding the bushing is attached to the keel on the outside bottom. Bushing must then be centered on shaft line to insure an accurate cut. Insert cutter, then strut bearing and bushing and cut hole.

The inside shaft log is ready to be installed. Fit gasket around hole and set up inside shaft log true with shaft line. Drill thru ¼" hole in base of log spaced evenly forward of frame #23 (P & S). Drill and countersink for three 1½" # 12 brass screws in after section of log base. The six monel carriage bolts fasteneing the forward end of log are ¼" x 3½" driven in from bottom.

Outside Shaft Log and Aft Lift Pad: The hull must be level as in the preceding operation. Insert the outside shaft log and run shaft line thru both logs. Center shaft line thru inside log. Line up outside log so that the top edge rests on the shaft line. This is done to compensate for lifting of unit when bolts are tightened. The log is temporarily fastened with four 1½" #10 brass screws. The lift pad is fitted between frame #23 & #24 on center line of keel. As the lift pad is fitted between the frame spaces, it is necessary to insert a wooden filler block aft of the pad and against frame.

Bronze reinforcement brackets are temporarily held in place on the aft side of frame #24 and forward sides of frame #23. After these pieces are all in place, the drilling is done. All holes are drilled for 5/8" carriage bolts.

Bolts on the outside log continue up thru the lift pad. Reenforced brackets are drilled thru frame #23 and #24.

Fastenings are as follows:

5/8" x 4½"	carriage bolts	(Thru log, keel and pad)
2" #12	screws	" " " " "
5/8" x 4½"	carriage bolts	(Thru pad, frame #24 and brkt)
5/8" x 5"	carriage bolts	" " #23 "
5/8" x 4½"	carriage bolts	(Into frame #23)

Fasten Center Bulkhead: The center plywood bulkhead assembly is fastened to frame #16 with 1½" #10 screws. The bulkhead crosspiece is fastened across the bulkhead with 1" #10 screws.

Place bulkhead knee posts on bulkhead, and fasten with 2½" #12 and 3½" #16 screws. Bulkhead knee is fastened to starboard side of bulkhead and stringer with 1 3/4" #10 screws and ¼" x 2 3/4" carriage bolts.

Install Fuel Tanks: Tank is pushed thru aft bulkhead and placed on tank foundations. Six wooden wedges for each tank 44" long are fastened in place with ¼" screws, to keep the tanks from moving. A template is used to find center hole for filler pipes, and the holes are drilled. Insert filler pipes and fasten deck caps with white lead filler. See fig. 40.

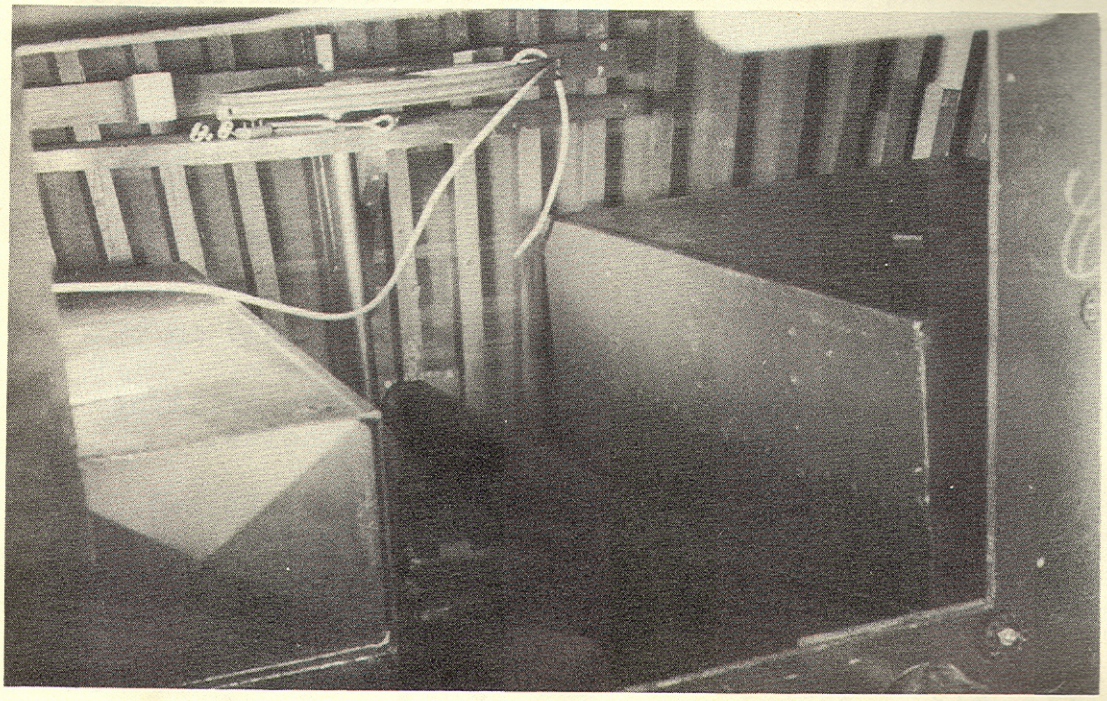


Figure 40

Fasten Floor Beams: There are fifteen beam length floor beams, fastened across the stringers with $2\frac{1}{2}$" #12 brass screws. The ends of the beams are notched and bolted to the frames. The following bolt sizes are used:

$\frac{1}{4}$"	x 5"	carriage bolts	to	frame #3
$\frac{1}{4}$"	x $3\frac{1}{2}$"	"	"	" frames #4, 5, 8, 9, 10, 11, 13, 14
$\frac{1}{4}$"	x 4"	"	"	" frame #15
$\frac{1}{4}$"	x $4\frac{1}{2}$"	"	"	" frame #16
$\frac{1}{4}$"	x 6"	"	"	" frame #6

Short floor beams are fastened to the stringers with $2\frac{1}{2}$" #12 brass screws. The beams that are fastened to the stringers are held with support blocks nailed to the chine. $\frac{1}{4}$" x $3\frac{1}{2}$" carriage bolts are used as fastenings to frames #17 thru 23. See fig. 23.

Install Gate Sheaves: There are six sheave assemblies and one double starboard sheave used. A sheave bracket filler board is fastened to the ramp edge of the side coaming. The sheave brackets are fastened thru the filler boards with

5/16" x 1¼" carriage bolts. Fasten bracket to deck with 5/16" x 4½" and 5/16" x 5" carriage bolts and 3/" x 4½" lag screws.

The bilge sheaves and sheave blocks are fastened so that the pulley centers are 45" back from bow, and the upper inside sheaves are placed 56½" back from the bow. The double sheave is fastened with six 5/16" x 3" carriage bolts.

Holes are bored thru stringers for cable alignment, making sure that all sheaves are lined up so that pulleys will not bind. Fig. 41 shows ramp sheave fastened to coaming.

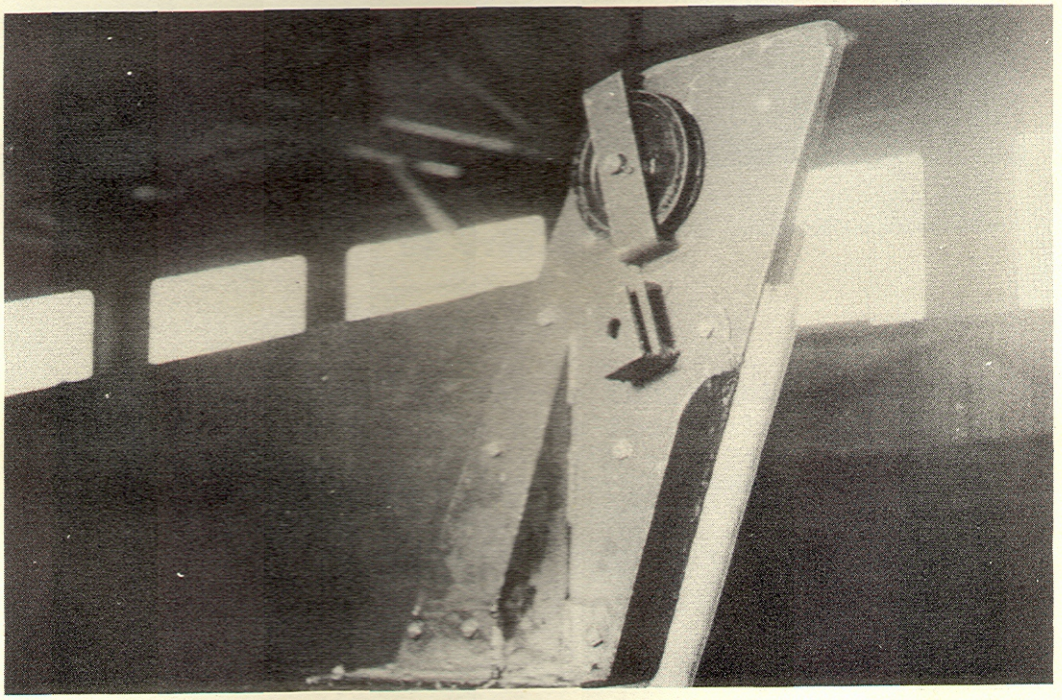


Figure 41

Install Winch and Winch Shelves: Two plywood winch shelf knees are bolted to frames #19 and 20, about 12" down from deck clamp. See fig. 42.

After the shelf is notched to fit the frames, the winch is put in place and fastened so that the gear cap lines with the coaming 30" forward of tank bulkhead. Fasten thru the shelf and 12" x 12" iron angle bracket with two 2" and two 1½" bolts.

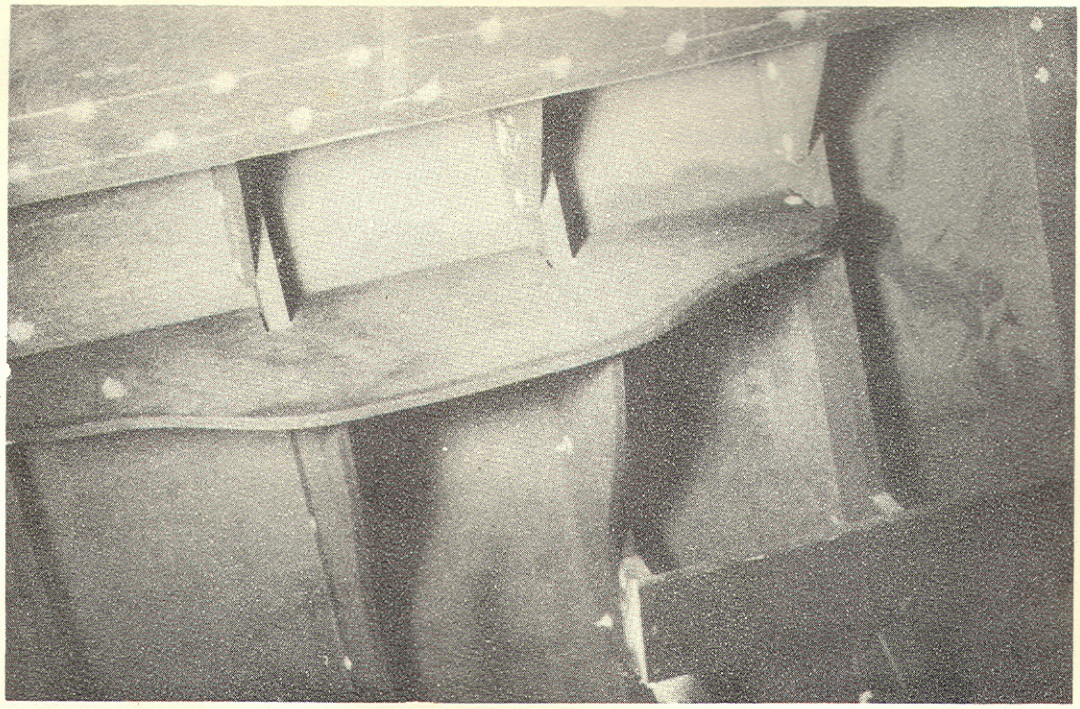


Figure 42

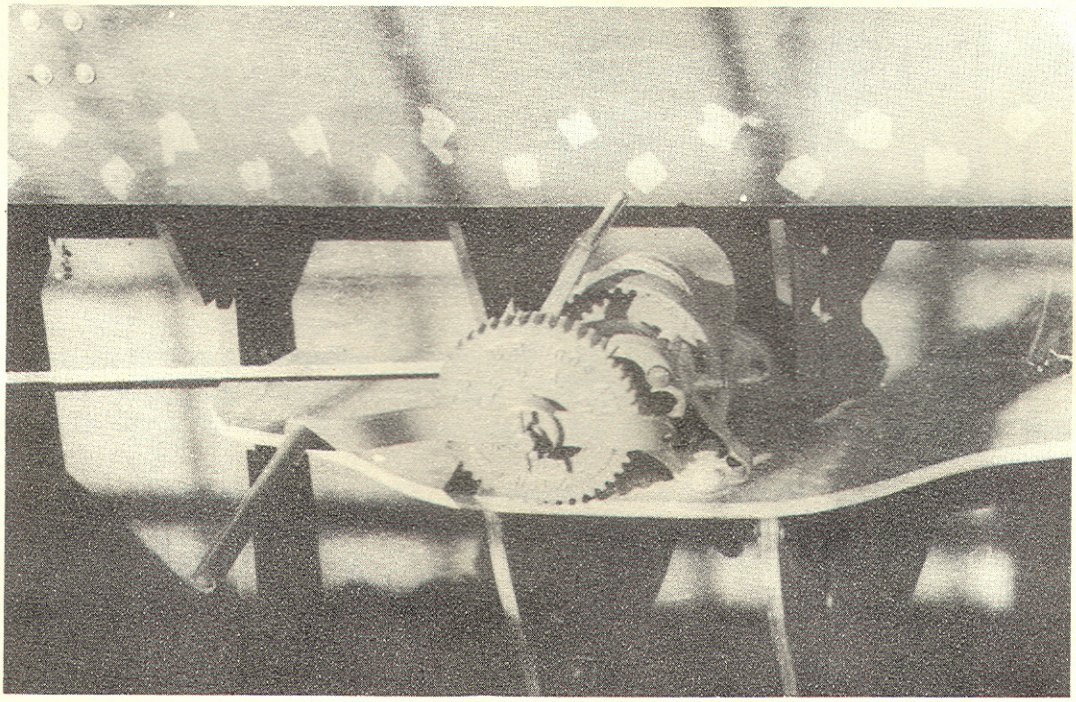


Figure 43



Figure 44

Install Chine Pads: There are four inside, and four outside chine pads used, together with four chine pad filler blocks. These are fastened between frames #23 and 24 (P & S) and frames #6 and 7 (P & S) with 5/8" x 4½" bronze bolts.

All bolts are wound with caulking cotton and white leaded to insure a watertight fit. See fig. 44.

Life Preserver Rack on Port Side: Cleats are fastened to frames #4 thru #15, 17" down from coaming, with 2¼" #10 screws. Slats are spaced and run forward and aft to form rack using battens for spacing. Use 1½" #10 screws, to fasten slats.

Limber Chains: Four limber chains and eight springs are used. The chains are passed thru the limber holes from bulkhead to 17½" forward of transom, and from aft bulkhead to a point 5½" from bow. Springs are fastened to spring ends (P & S) and are fastened with 1½" #12 brass screws.

Control Box Assembly: The control box assembly is 12" x 22" x 48". Place in position three inches from the coaming and bolt to after side of midships bulkhead with six brass bolts. Fasten thru molding at bottom with 1½" #10 brass screws.

Fasten Rail Supports and Rails: Rail supports are fastened to frames #5 - 8 - 10 - 12 - 14 with ¼" x 3½" carriage bolts and to frame #6 with ¼" x 6" carriage bolts.

The two forward rails are fastened to the rail supports and frame #4 with 3½" #6 brass screws and ¼" x 3½" carriage bolts to floor beams.

The aft floor rails are held in place to the supports with 3½" #16 brass screws and ¼" x 3½" carriage bolts to floor beams. See fig. 23.

Fit Forward Flooring: The outboard flooring is fastened to floor beams with 2" #12 brass screws and butted against rails. It is necessary to fit all pieces.

The inboard flooring is removable. Attach cleats to the bilge side of the flooring with 1¼" #10 screws. The unfastened flooring at this point leaves the bilge accessible.

Fasten Ramp Rubber and Bow Protector Strips: The ramp gate rubber is glued and stapled into place on the headlog and bow post #1.

The bow protector strips are fastened over the rubber edges. Coaming s trips are fastened with 1" #8 brass screws. The #1 bow post and headlog strips are held with 1½" #10 brass screws. See Figure 45.

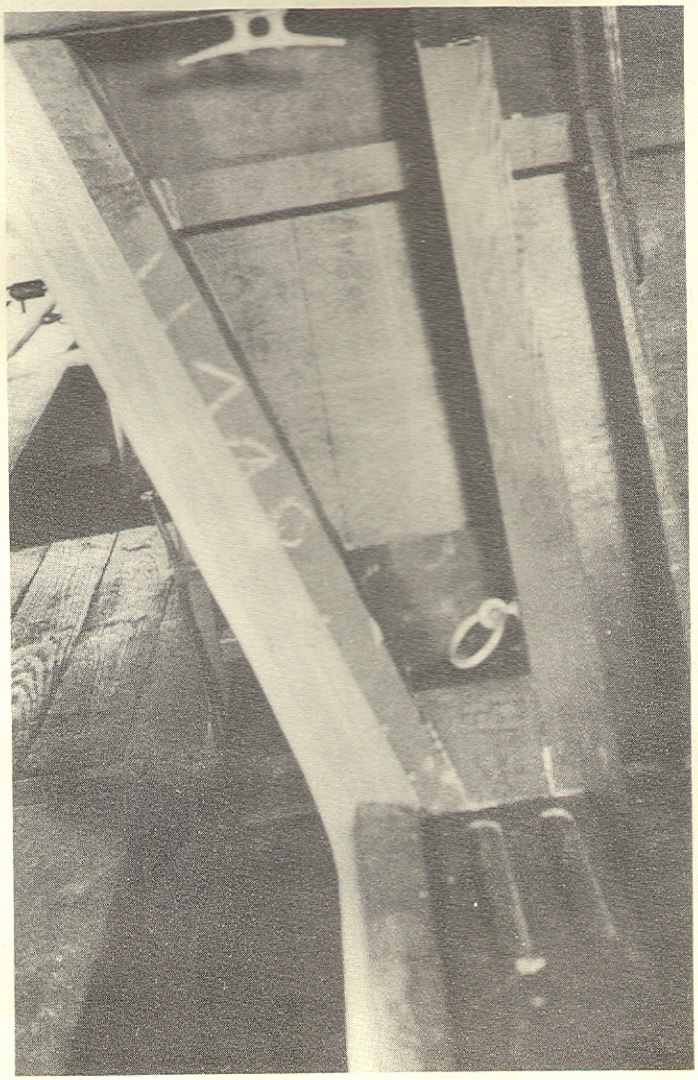


Figure 45

Bilge Line Installation: The forward hand bilge lines run from the hand pump aft of the center bulkhead forward to the center of the space between frame #12-13 along the outboard side of starboard stringers. From there it turns inboard and terminates at bilge strainer over keel.

The aft hand bilge line runs aft from the hand pump to the after edge of fr. #23. These lines are fastened with pipe straps and 3/4" #10 brass screws to frames #13 - 18 - 23.

The hand pump is fastened to the center bulkhead against wooden filler blocks with $\frac{3}{4}$" x $2\frac{1}{4}$" carriage bolts. The hand bilge lines are then attached to the pump with hoses and hose clamps. The overboard line is placed and connected with hoses and clamps.

The engine bilge lines are located aft from between frame #23-24 along the outboard side on inboard stringer to pump and forwa rd from pump along inboard side of inboard stringers to aft side of frame #9, s tarboard side. These are held in place with pipe straps and 3/4 #10 brass screws at frames #10 and #23. The lines cannot be connected until the engine and pump have been aligned. See fig. 46.

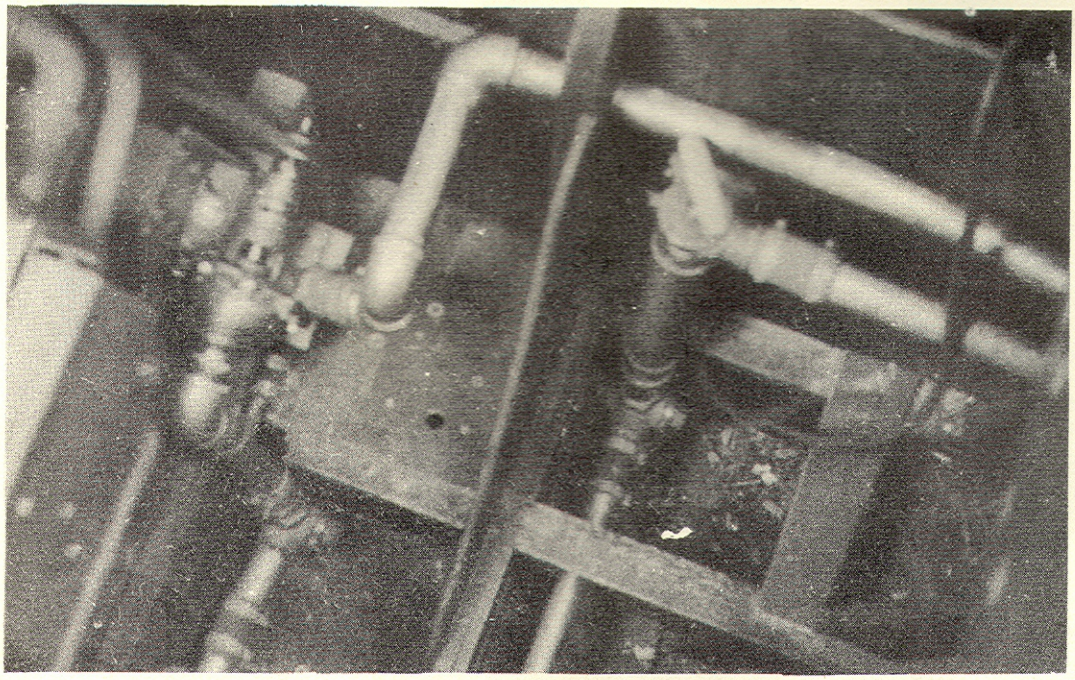


Figure 46

Ins tall Underwater Exhaust Fittings: Drill holes in port side of boat between frame #21 and 22 and 6" from outer edge of chine brass. Cut hole out to fit packing and install, using sufficient white lead and red gum packing to insure a water-tight fit. Fasten fitting and gasket with machine screws.

Set and Align Engine: Place engine bed shims on aligned bed timbers. Lower the engine in place on the shims. Insert the propeller shaft into position and attach the coupling. Move shaft aft to allow clearance of 1 3/4" between propeller hub and strut bearing. Move the engine into position so both engine and shaft flanges meet. By removing material from shims or adding short metal shims, the engine can be aligned so the shaft is 1/16" high in the shaft log. Center the shaft in the log by moving the engine athwartships.

The space between the couplings should be open about .004" at the top and .002" on the sides. The two rear stud bolt holes are drilled. ½" stud bolts are placed and tightened down. The coupling then must be rechecked for alignment of .002" all around.

Drill the remaining holes in the bed timbers with ½" drill 2" or 3" deep. Finish drilling with 3/8" drill. Bolt engine down to bed with ½" lag screws.

Remove the shaft flange and install the stuffing box. Pack the box with 3 rings of packing and tighten down until the shaft can just be turned by hand. Install the shaft couplings and connect to engine couplings.

Exhaust Installation: The exhaust flange on the engine is removed to be assembled outside the boat. The following parts are used on the exhaust assembly.

4" close nipple
4" 45° elbow.
4" clos e nipple
4" 'Y'
4" x 9" nipple (with butterfly on straight side of 'Y'.
4" x 10" flexible couplings
4" x 12" nipple
4" companion flange
companion flange gasket

The 9" nipple, 45° elbow, flexible couplings, 'Y', 12" nipple, are all fastened together and mounted in place in the boat. Hookup the connection to the engine and both exhaust fittings in the hull (underwater and transom)

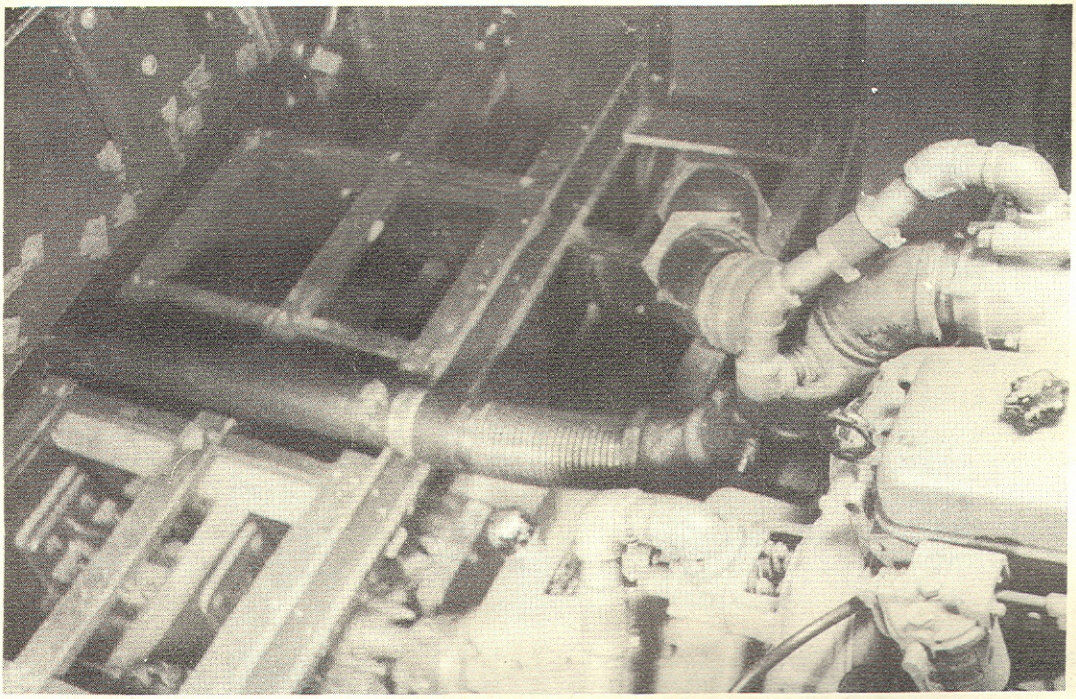


Figure 47

Connect Fuel Lines: The fuel lines are fastened from the fuel tanks to the engine.

Place the port and starboard fuel tank valve assemblies. Install the tank to tank line, the tank to Purolator line. Connect the port and starboard fuel return valves and the port and starboard return lines. These lines are connected to the 'T' of the main return line which in turn is fastened to the engine.

Install the Purolator assembly on the inboard stringers between frames #22 and 23. Attach the Purolator fitting assembly to the discharge side of Purolator.

Connect the main feed line from the Purolator fitting assembly to the fuel pump. From there install a line to the port side of engine into the heater box.

Fasten instrument panel in place on control box. Connect the water temperature guage line to the port side and top front of fresh water tank. Install the oil temperature guage line to the lower starboard side of the engine base. The oil

pressure line is made fast to the front starboard side of engine. Connect up tachometer cable to engine on starboard side.

Fasten Fuel Extention Valve Rods: The extention rods are fastened to the fuel tank valves.

Mount Eng ine Bilge Pump: The engine bilge pump is mounted and clamped in place on the engine bed. Put the drive belt over the engine and pump pulleys to get an approximate line up. Using a straight edge, line the pump up by lining the pulleys. Drill holes in engine bed and bolt in place. See fig. 46.

Install Grass Traps: The grass trap is mounted on the trap-board on the starboard side against the frames. Hook up the suctions line from the grass trap to the engine salt water pump. Install the engine bilge priming line from the discharge side of the saltwater pump to suction line on the bilge pump.

Connect Clutch Control and Throttle Assembly: Install upper hand control assembly and lower bell crank. Connect control linkage from upper control assembly to lower bell crank.

Remove the clutch cover on the engine and remove the clutch shaft on the port side. Install extention shaft which is furnished to replace short shaft. Replace clutch cover.

Install the pillow block to the clutch shaft. Fit the pillow block support block and align to the shaft. See fig. 48

The clutch arm should be installed to 90° with stringers. Attach the drag link to the clutch arm and the bell crank with the hand control in neutral position. Adjust all connections to take up excessive play.

Bolt the throttle bell crank to starboard side of heat exchanger upper studs. The friction plate is next fastened to the side of the heat exchanger. Install a throttle control rod between the clutch control and the bell crank. The clutch control should be set in neutral position and the bell crank at 90° to the engine.

Connect the linkage between the bell crank and throttle control on the engine. With the throttle stop arm set at "idle" connect the spring to release throttle stop. Adjust friction plate assembly so that throttle will stay at set positions.

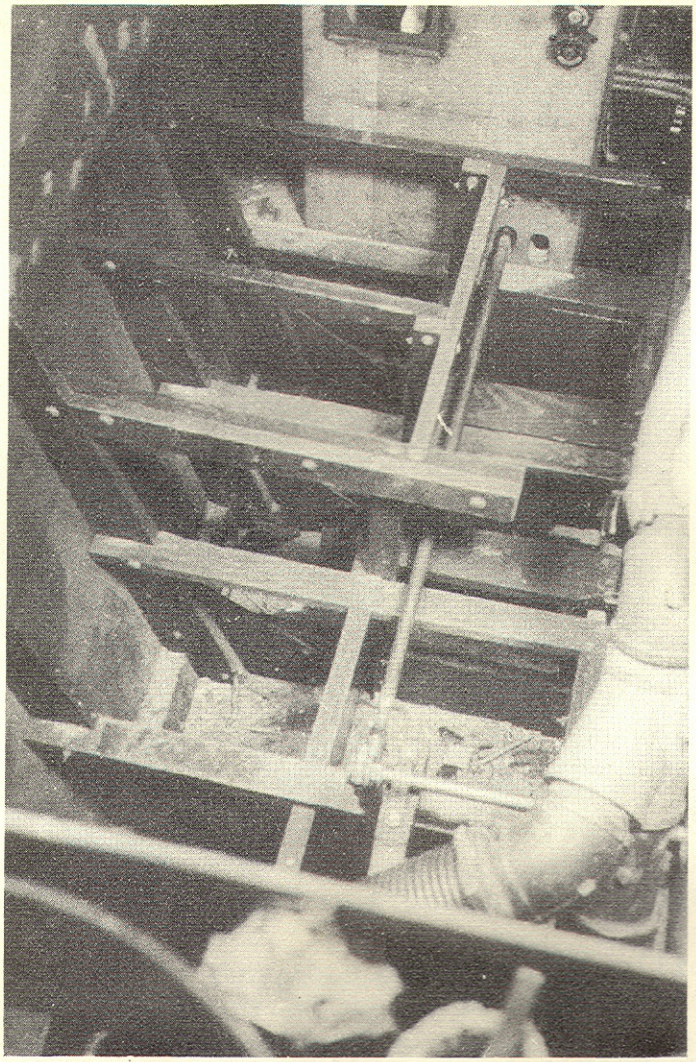


Figure 48

Install Armor Plating: Two pieces of armor plating are cut to fit the sides. Two holes are cut in starboard plate to fit the outside hull connections. Measure down 40" from rubrail, and tack on 6" piece of canvas, white leaded on both sides, to run from the bow to aft of #24 bulkhead.

Place armor plate 10½" down from rubrail forward and 3" down at #24 frame, even with form at bow, with outboard fitting holes lined up. Canvas is trimmed and dressed. Following fastenings are used:

¼" x 1 3/4" carriage bolts.
¼" x 4½" " "
¼" x 3" " "
5/16" x 7" " "
5/16" x 6" " "
5/16" x 5" " "
5/16" x 4" " "

Hang Ramp Gate: After the boat is levelled, the gate is picked up by chain fall and lined up in place. Holes are drilled thru the head log. Gate and head log are white-leaded, fitted and bolted in place. Temporary cable is used until welder has burned holes for cable, U bolts and safety latches. Gate is bolted in place with four 3/8" x 12" and seventeen 3/8" x 11" carriage bolts.

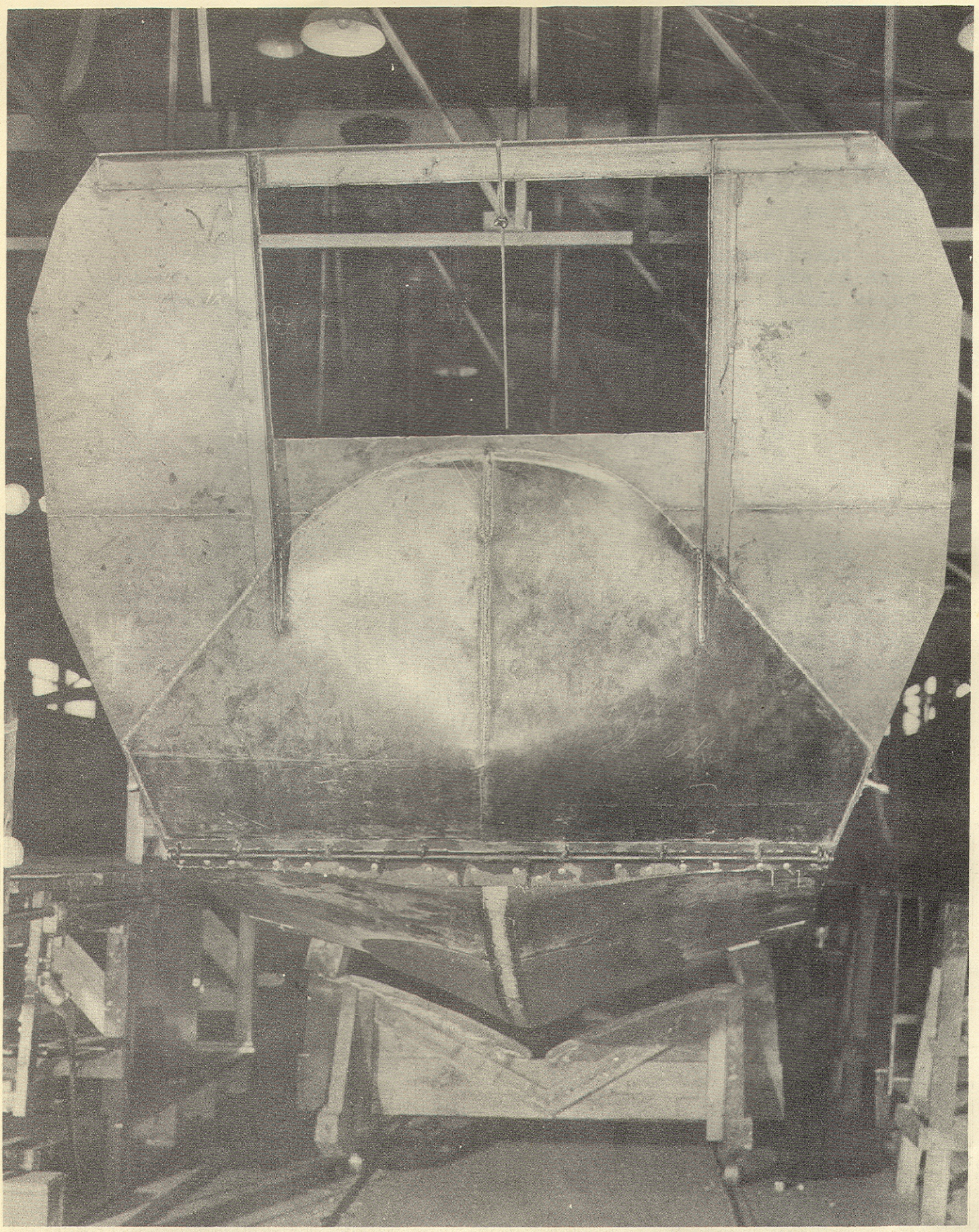


Figure 49

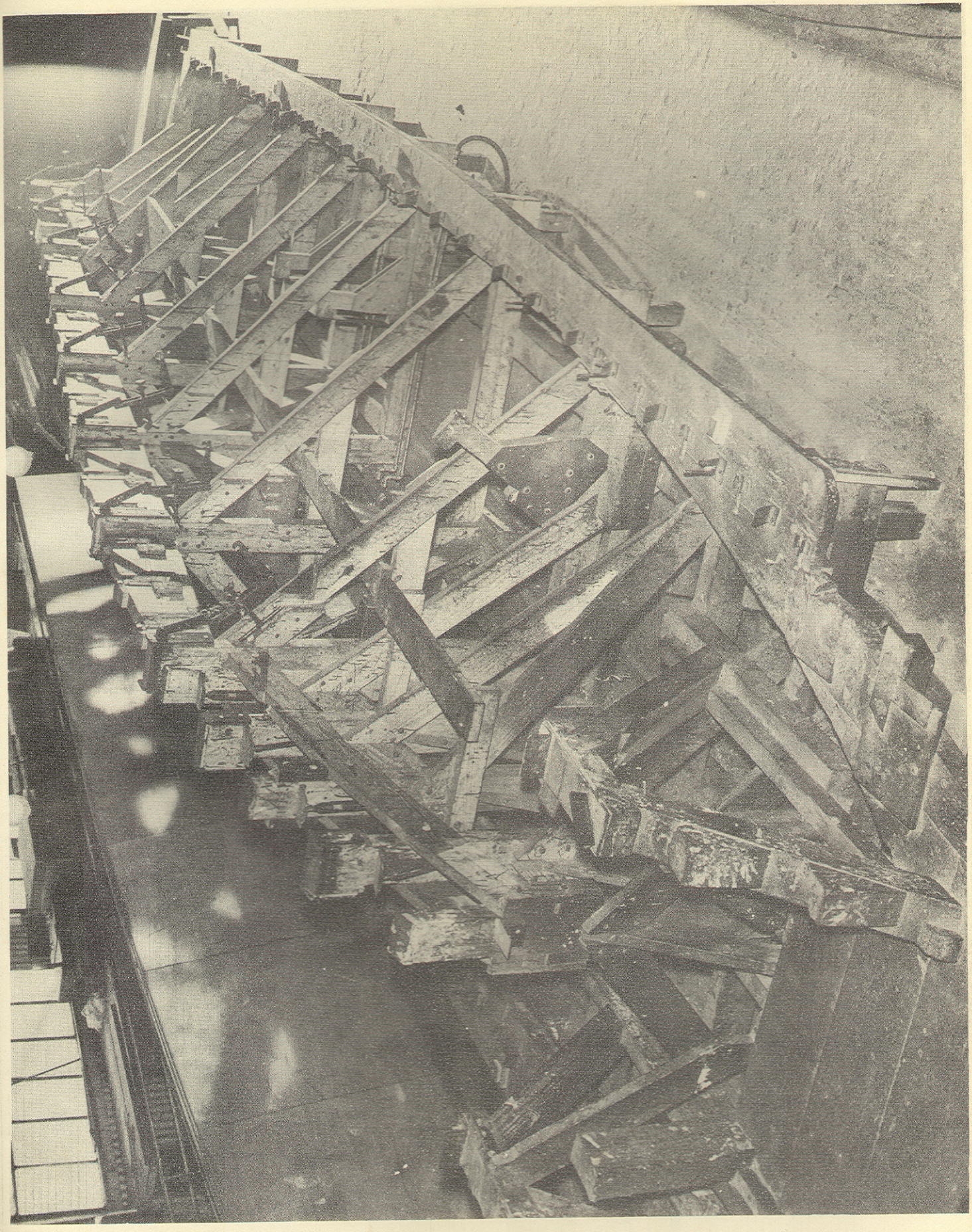
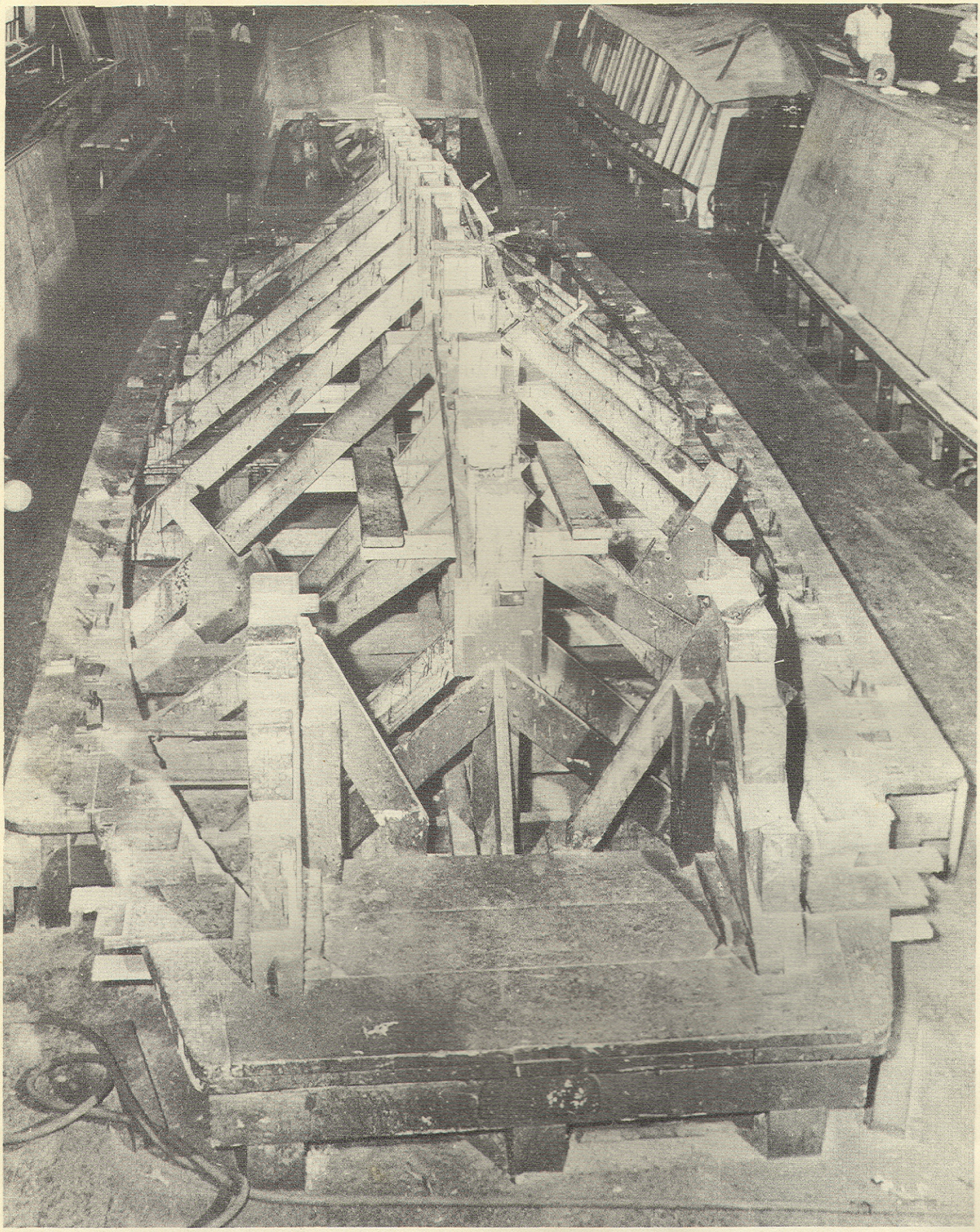
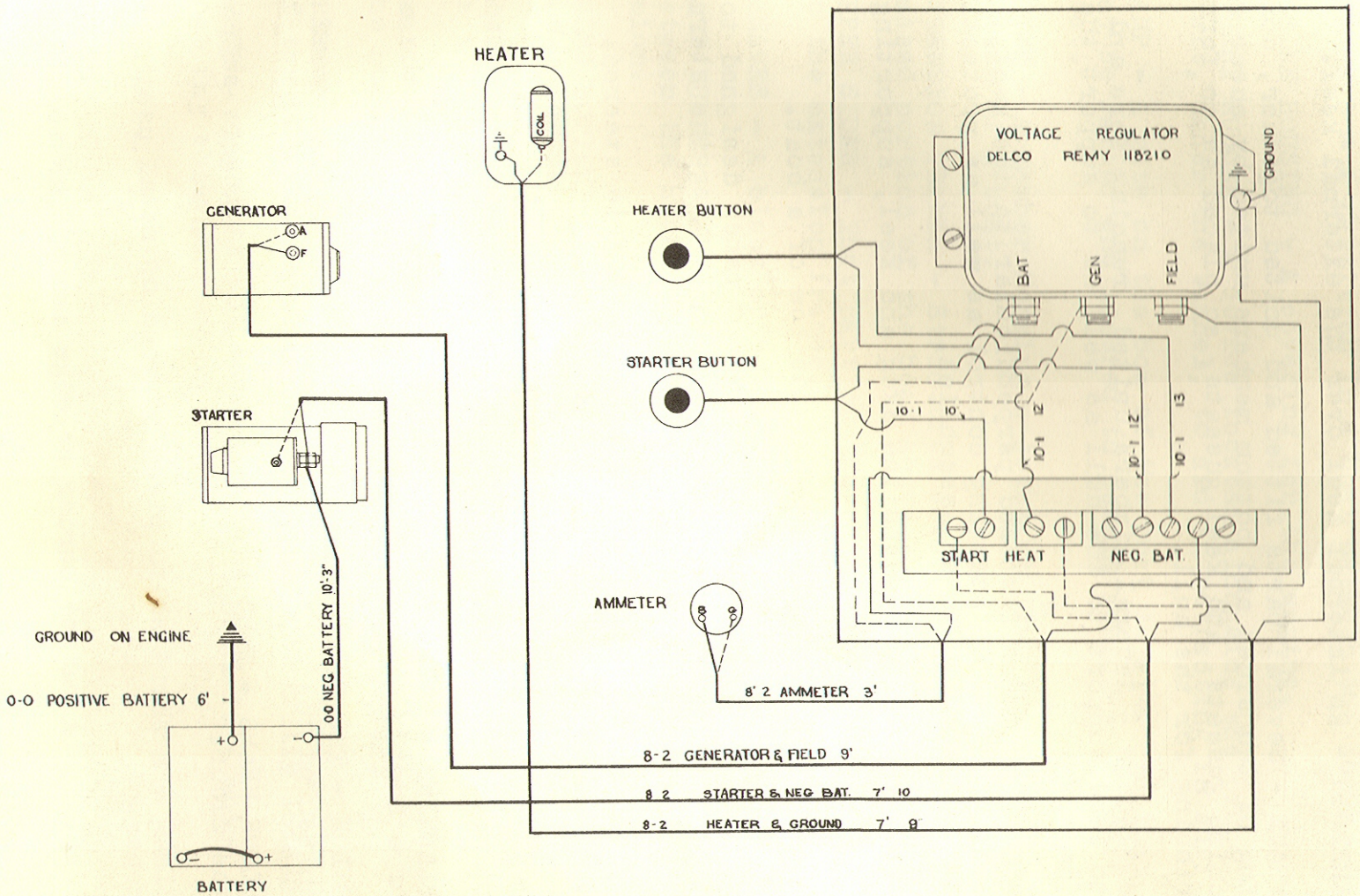


FIG- 50



Frame Form

FIGURE 51.



WIRING DIAGRAM

DEFINITIONS

1. HULL - The frame or body of a boat.

2. KEEL - The principal timber in a boat extending from stem to stern at the bottom, and supporting the whole frame.

3. KEELSON - An internal keel over the external keel.

4. FRAME - Several parts fitted and united together, consisting of two sides and bottom members united by sheer gussets, chine gussets, and keel gussets, so placed as to form the ribbing for the hull.

5. STRINGERS - Several timbers united, running fore and aft to lend support to the hull as well as to support the flooring.

6. SKEG - A timber fastened perpendicular to the keel, designed to give steering control as well as protection to certain underwater assemblies.

7. STRUT - A brace between the skeg and keel, supporting the shaft and the rudder.

8. HEADLOG - A sturdy timber at the bow of a boat.

9. TRANSOM - An assembly of frames and panel designed to support the deck, sides, and bottom forming the stern of a boat.

10. RUDDER - The instrument by which a ship is steered.

11. PROPELLER - A contrivance or instrument to propel a boat.

12. SKIN BOTTOM - A layer of plywood secured to the bottom portion of the frames.

13. PLANKING - A layer of boards so united, forming the outside of a boat.

14. BILGE - The inside area of the boat's bottom between the chine and the keel.

15. FLOOR BEAMS - Wood members across the stringers supporting the floor.

16. CLEAT - A short solid piece of wood or metal used to fasten ropes.

17. COAMING - A raised border or edge around the inside of the deck.

DEFINITIONS (Cont'd)

18. WINCH - A windlass to aid in raising and lowering the ramp or gate.

19. ENGINE BED - Two wooded members so arranged and aligned as to support the engine.

20. BULKHEAD - A partition in a boat between the decks.

21. ENGINE HOUSING - A covering for the engine.

22. MONKEY RUDDER - A device located alongside the propeller shaft, under the tunnel, to aid in retracting in surf.

23. RAMP - A gate on the bow of the boat so attached that it may be raised and lowered to permit vehicles to board the boat.

24. CHINE - A member forming a joint, uniting the sides and bottom of a boat.

25. EXTENSION FRAMES - Structures so arranged to form the raised portion of the boat above the sheer.

26. UPPER SIDES - That part of the sides that are fastened to the extension frames.

27. SHEAVES - A block or pulley.

28. GATE RUBBER - A canvas-covered rubber compound, placed between the headlog and ramp to insure a water-tight union.

29. FALSE BOTTOM - An extra layer of p lanking, placed on the forward part of the bottom; an added protection to the hull.

30. TUNNEL - A semi-circular cavity in the hull, so designed as to allow water to flow around the propeller.

31. DRAFT - The perpendicular distance of that portion of the boat that is under water when fully loaded.

32. FREEBOARD - The perpendicular distance of that portion of the boat that remains above water when fully loaded.

33. SHEER - The rise upward from a horizontal line which a boat may show at stem or stern.

U. S. GOVERNMENT PRINTING OFFICE: 1942 O - 497783