



build banshee

"Z" Class racing runabout will do about 45 m.p.h. with Crosley 48-cu.-in. converted engine. Length: 10'-6". Beam: 4'-8".

By David D. Beach, Jr., Naval Architect

THE "Z" or 48-cu.-in. racing runabout is the smallest inboard raceboat recognized by the American Power Boat Association. This class is opening the door to organized racing for many boating enthusiasts because a complete racing outfit can be assembled for very little money. The 48's are probably the easiest-to-build raceboats that are capable of really high performance.

Class rules are fairly easy to comply with. They specify certain minimum hull dimensions and say that the power plant must not have a displacement of more than 48 cubic inches. The most popular engine is the lightweight Crosley, suitably converted for marine use. When properly tuned up, it develops almost 40 hp. and will drive *Banshee* at speeds up to 45 m.p.h.

Let's look at *Banshee*. She has a long,

low, hull and a raised, streamlined cowling around the engine and cockpit. The cockpit holds but one person. The boat is strictly a racer and has all the outward appearances of a right fast one, too.

The over-all dimensions are just a bit over the minimum specified for the class. The lines and offsets, Fig. 3, should be carefully studied. The three views must be laid down full size as the first step in the construction. Make a platform of two 4x8-ft. sheets of plywood and paint it white. The table of offsets and the dimensions shown are all that you'll need.

Start off by drawing the center line and the station lines. The station lines must form 90° angles with the center line or you will have difficulty making the frames come out right. Now, lay off the half breadths of the deck and, using a $\frac{3}{8}$ x $\frac{3}{8}$ -in. batten and



FIG. 1

OUTBOARD PROFILE

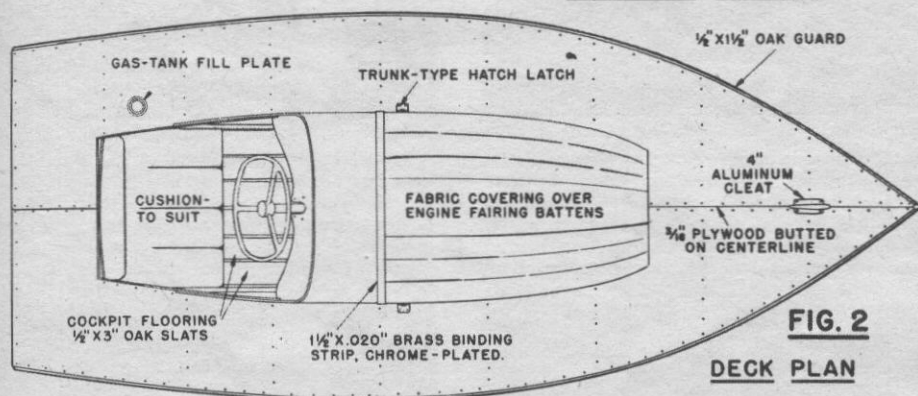


FIG. 2

DECK PLAN

brads or wire nails, connect these points in a smooth curve. If the curve is smooth and fair and the batten misses any point by a few sixteenths or so, it will work out all right; so, using a well-sharpened pencil, draw the line in. If your batten isn't long enough to draw in the full length at one setting, be sure there is at least a three-frame overlap when the second half of the line is drawn. The chine and stringer lines are drawn exactly the same way.

Using the center line as a base line, the boat's profile is next drawn, superimposing it on the plan. The center line of the propeller shaft is laid out between the points of intersection given on Station 3 and the transom. This center line as given is for most conversions of the Crosley engine, but it is well to check your engine before the hole is bored in the boat for the shaft.

When these two views are completed, the body plan is laid out. This need not be made on the same piece of plywood, but take the dimensions from the two views just made rather than from the table of offsets. This insures that any slight corrections in fairing are incorporated in the boat.

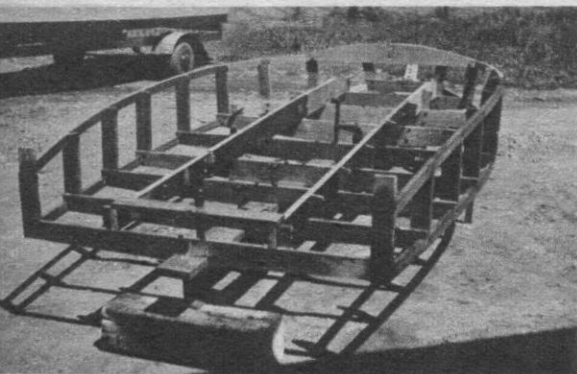
Take the Bill of Materials to your local lumber yard and hardware store and have it filled. The kinds and grades of wood to be used are specified. Since the structural

quality of wood varies with the grade, be sure you get what you ask for.

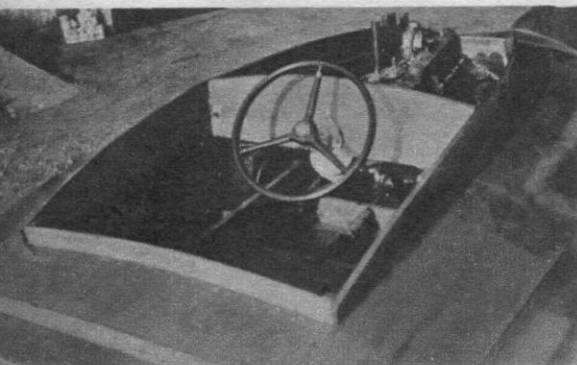
The keel is held by, and the boat is erected on, a two-by-six fir or yellow-pine strongback. As indicated on the lines plan, the keel is a straight line from Station 4 to the transom and all the frames are erected at right angles to the base line. Set up the strongback on a fairly level floor, using two fairly substantial sawhorses. Nail down (or otherwise securely anchor) the sawhorses 7 or 8 ft. apart and fasten the two-by-six on edge so its upper edge has the same slope as the straight part of the keel. With a sharp pencil, inscribe the base line on the strongback. On this base line, carefully lay off the stations. Remember that the station lines are perpendicular to the base line, not to the keel.

Taper the forward end of the keel, as shown in Fig. 5, and bevel the bottom to provide a flat landing for the bottom planking; then securely clamp it to the strongback. With wedges and blocks at each station, bend the forward end of the keel upwards to the proper curve, using clamps to hold it in place. If you desire to make the work a little less strenuous, a good steaming of the keel will do no harm.

Fig. 4 shows typical frame construction. Observe that the engine stringers bear on all frames except No. 1. The depths of the bottom frames must be figured to permit



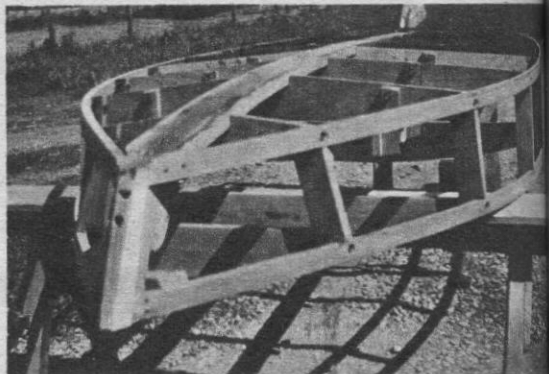
Above: The boat in frame. Note the sheer clamps, engine stringers, and rudder-bearing bracket. Below: Looking into the cockpit of the unpainted boat. A 15-in. steerer with drum is mounted on the dashboard. The fabric covering and fairing battens over the engine are yet to be installed.



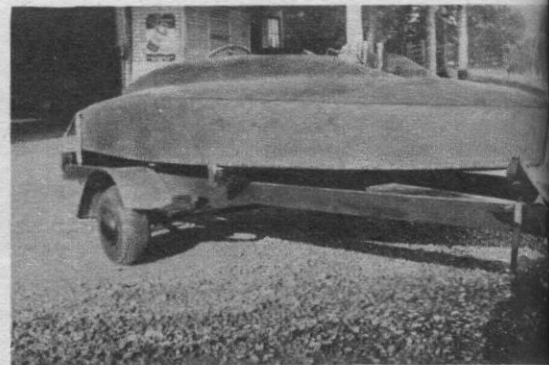
the stringers to land on the frames without needing shims. Each bottom frame is made in one piece from chine to chine. When the sides and bottoms are cut, assemble them right on the body plan with screws and ample glue at the joints. Clamp the chine laps until the glue dries. When making the transom, note that the side frames are half-lapped into both the bottom frame and the deck beam.

The stem and stem knee are shown in Fig. 5. Shape the stem as indicated on the profile and bevel it on the forward end to take the side planking. The stem knee is fitted to both stem and keel. Four $\frac{3}{8}$ -in. bolts tie stem, stem knee, and keel together. These bolts should be set in counterbores and plugged. Use ample glue in the joints and set the bolts up tight, making certain that the stem is not canted off to either port or starboard.

The frames are now erected on the keel, fitting the transom first. The notch in the transom for the keel should be exactly



Above: The framing inverted for planking. The keel has not yet been planed to the proper bevel for the bottom plywood. Below: The planked boat before painting. The builder has changed the engine fairing slightly from that shown on the plans. This engine has vertical exhaust stacks.

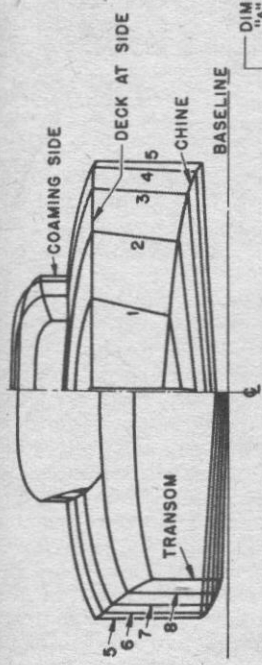


1x4 in. When the cutout is made, place the transom on the keel and clamp it plumb with the base line. Holes for $\frac{3}{8}$ -in. bolts are then bored 2½ in. apart through both keel and transom bottom frame. Unclamp the transom, spread glue on both keel and transom, and reclamp it. Drive in the bolts, put on washers and nuts, and tighten until the wood just begins to crush beneath each washer . . . and no more! Be sure to wipe off excess glue.

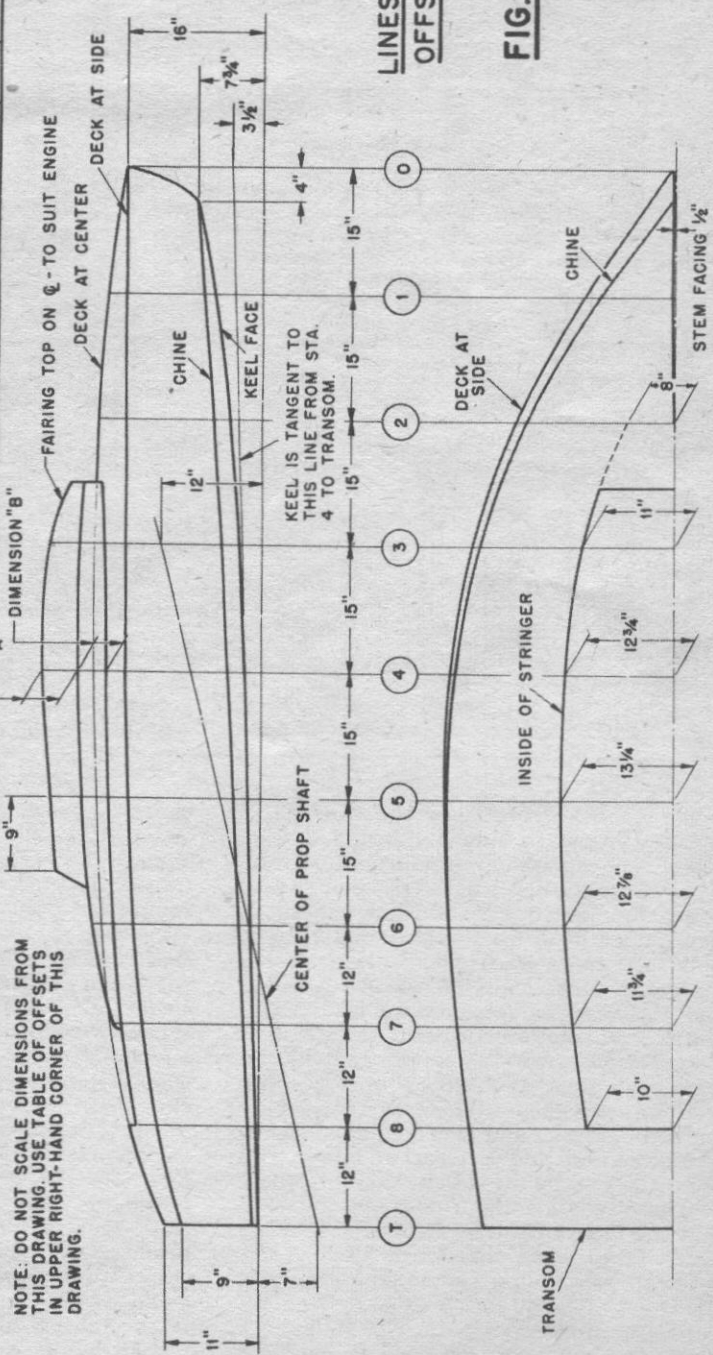
Next, string a wire from a nail driven into the stem head on the center line to a similarly located nail in the transom. This wire will be of considerable aid in erecting the remainder of the frames, which must be plumb and parallel. The procedure for erecting and fastening the frames is the same as was followed when the transom was fitted. When making the cutouts for the keel, remember that it tapers from Frame 2 to the stem, so the cutout on Frame 1 will be narrower than those from Frame 2 aft.

| HEIGHTS IN INCHES & EIGHTHS ABOVE BASE LINE - TO OUTSIDE OF PLANKING | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|
| STATION | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | TR. |
| KEEL FACE | 5-4 | 3-5 | 2-5 | 1-7 | 1-4 | 1-0 | 0-6 | 0-3 | — |
| CHINE | 6-6 | 5-5 | 4-6 | 3-7 | 3-1 | 2-3 | 1-7 | 1-2 | 0-6 |
| DECK AT SIDE | 16-0 | 16-0 | 16-0 | 16-0 | 15-5 | 14-6 | 13-6 | 12-1 | 9-0 |
| DECK AT CENTER | 18-0 | 19-2 | 19-6 | 19-6 | 19-2 | 18-4 | 17-4 | 15-3 | 11-0 |
| DIMENSION A | — | 3-5 | 4-1 | 3-5 | — | — | — | — | — |
| DIMENSION B | — | — | 3-0 | 3-3 | 3-1 | 2-4 | — | — | — |

| HALF BREADTHS FROM ϕ -IN INCHES & EIGHTHS - TO OUTSIDE OF PLANKING | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|
| CHINE | 8-5 | 17-5 | 23-0 | 25-7 | 27-0 | 26-4 | 25-4 | 24-1 | 22-4 |
| DECK AT SIDE | 10-6 | 18-6 | 23-7 | 26-4 | 27-1 | 26-4 | 25-4 | 24-1 | 22-4 |

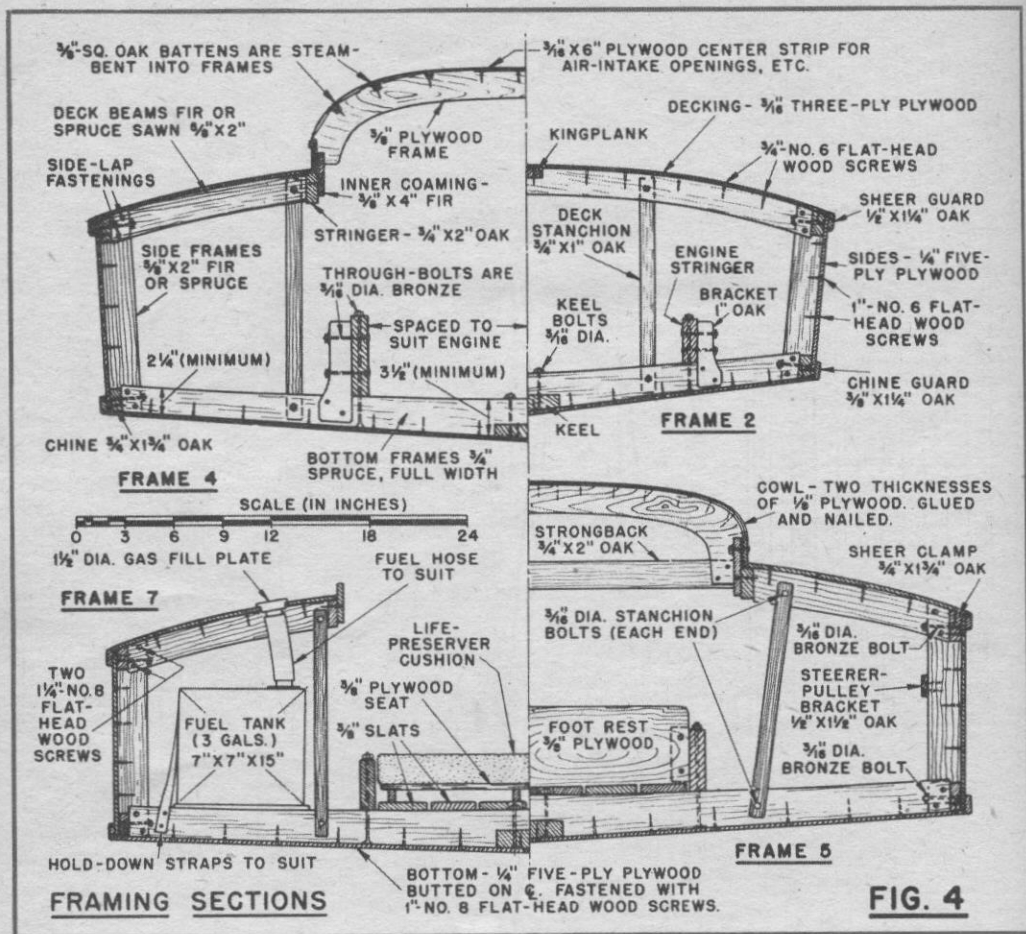


NOTE: DO NOT SCALE DIMENSIONS FROM THIS DRAWING. USE TABLE OF OFFSETS IN UPPER RIGHT-HAND CORNER OF THIS DRAWING.



LINES AND OFFSETS

FIG. 3



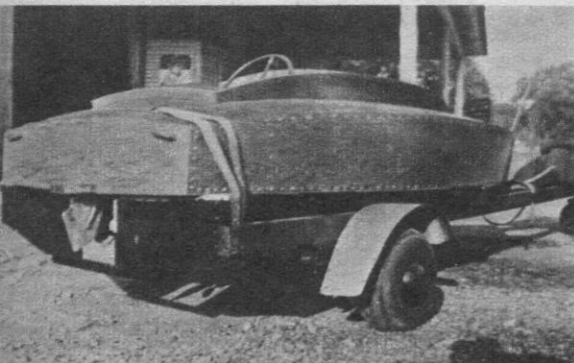
The engine stringers extend from Fr. 2 to the transom, as indicated in Fig. 5. The top of each is a straight line from the transom, where the depth of the stringer should not be less than 3 1/2 in., to Fr. 3, where the depth must be at least 5 in. A single 3/16-in. bolt secures each stringer to each frame and tripping brackets of oak are fitted as shown. Transom brackets are fastened to the top and bottom transom frames with 2-in. No. 12 screws. A couple of bolts secure each stringer to each bracket.

Make sure the oak used for the longitudinals (chines and sheer clamps) has a straight grain and is clear of knots. The chines should be fitted first. When suitable notches are cut in the frames and the stem and you have a fresh batch of glue, you are ready to go. Both chines are fitted at the same time, working from the stem aft to the transom. Secure each chine to the stem with glue and two 1 1/2-in. No. 10 screws. A clamp should also be used to hold the

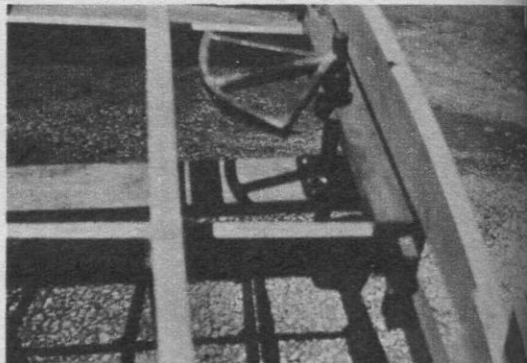
chines in until their entire lengths are fastened. A single bolt and glue hold each chine to each frame. When you get to the transom, use screws for fastening, as bolts cannot be fitted there.

Proceed similarly with the sheer clamps. Because these members bend down in sharp curves from Fr. 6 to the transom, steam the last four or five feet of each. When working with steamed structural members, clamp them in place until the wood dries; then proceed leisurely to secure them with glue and fastenings.

Your boat is now framed and most of the hard work is past. Your handiwork should look like Fig. 6. The next objective is to put in the deck structure shown in Fig. 7. Note that there are but three full deck beams. The remainder are partial beams, extending just to the hatch coaming. To avoid waste, template each beam from the lines and lay the templates out on the planks before cutting. The beams go on



Note the lifting handles on the transom for use when handling the raceboat on and off a trailer. Most inboard racers need cranes, but not Banshee!



Here the bronze rudder (with integral stock) and rudder quadrant are depicted. The rudder-stock bearing is secured to a transverse oak bracket.

the after sides of the side frames. When they are fitted, fasten each lap with glue and two 1-in. No. 8 screws. When fitting the partial beams, clamp each until the glue has set and dried.

Now, cut the kingplank notches in the beams and fit in the kingplank. Forward, this is sprung into place and fastened into each beam with two 1 1/4-in. No. 8 screws. A small breasthook can be fitted between the sheer clamps at the stem to take the kingplank if desired. Aft, between Fr. 8

and the transom, there is another small section of kingplank. Because of the sharp drop, this must be sawed to shape from thicker stock.

Next, spring the cockpit stringers into position and end-fasten them into the deck beams. Finally, fit the brace on Fr. 5, which is simply a straight piece of fir, and the partial beam between the stringers at the front end of the engine hatch.

The drawings show a cockpit that is only 20 in. wide. This can be widened, if so de-

BILL OF MATERIALS

(Approximate Quantities Required)

Plywood

Cowling: aircraft-grade mahogany, 2 sheets, 1/8" x 15" x 30"
Decking and Hatch Center Strip: exterior-grade mahogany, 2 sheets, 3/16" x 4'-0" x 8'-0"
Planking: exterior-grade fir, 2 sheets, 1/4" x 4'-0" x 12'-0"
Transom, Hatch Framing, and Seat: exterior-grade fir or mahogany, 1 sheet, 3/8" x 4'-0" x 8'-0"
Dashboard: exterior-grade mahogany, 1 sheet, 1/2" x 14" x 26"

Specify that all wood listed below is to be used for boat-building and is to be air dried to a maximum of 15% moisture content. All hardwood is to consist of first, second, and select grades only. All softwood is to consist of A and B grades only.

White Oak

Hatch Fairing Strips: 8 pieces, S4S 3/4" x 3/8", 3'-6" long
Chine Guards: 2 pieces, S4S 3/4" x 1 1/4", 10'-8" long
Flooring Slats: 6 pieces, S4S 3/8" x 4", 3'-6" long
Sheer Guard: 2 pieces, S2S 1/2" x 1 1/4", 10'-8" long
Pulley Brackets: 4 pieces, S4S 1 1/2" x 1 1/2", 15" long
Kingplank: 1 piece, S4S 1 1/2" x 2", 4'-6" long
Stem Cap: 1 piece, S4S 3/4" x 3/4", 12" long
Stanchions and Brackets: 40 lineal ft., S4S 3/4" x 1"
Chines and Sheer Clamps: 4 pieces, S4S 3/4" x 1 3/4", 10'-8" long
Hatch Stringers: 2 pieces, S4S 3/4" x 2", 8'-6" long
Rudder-Bearing Bracket: 1 piece, S4S 3/4" x 4", 24" long
Engine-Stringer Brackets: 10 pieces, S2S 1" x 2", 7" long
Stem Knee: 1 piece, S2S 1 1/4", 6" wide, 6" long

Douglas Fir or Sitka Spruce

Stem: 1 piece, S2S 1 3/4", 2" wide, 12" long

Sitka Spruce

Cowling: 2 pieces, S4S 3/4" x 4", 8'-0" long
Side Framing: 20 lineal ft., S4S 3/4" x 2"
Deck Framing: 30 lineal ft., S2S 3/8", 6" wide
Transom Brackets: 2 pieces, S4S 3/4" x 1 1/2", 12" long
Bottom Framing: 35 lineal ft., S2S 3/4", 5" wide
Engine Stringers: 2 pieces, S2S 7/8", 5" wide, 8'-2" long
Keel: 1 piece, S4S 1 1/8" x 4", 10'-8" long

Fastenings

Stanchions to Frames: 28 bronze bolts, 3/16" x 1 1/2"
Chines and Sheer Clamps to Frames and Stringers to Brackets: 68 bronze bolts, 3/16" x 3"
Keel to Frames and Stem: 14 bronze bolts, 3/16" x 4"
Engine Stringers to Frames: 14 bronze bolts, 3/16" x 8"
Strut, Shaft Log, Rudder Port, and Fin: about 20 bronze strut bolts, 1/4" dia.
3 gross bronze 3/4" No. 6 flathead wood screws
3 gross bronze 1" No. 6 flathead wood screws
3 gross bronze 1" No. 8 flathead wood screws
1 gross bronze 1 1/4" No. 12 flathead wood screws
2 dozen bronze 2 1/2" No. 12 flathead wood screws

Miscellaneous

Weldwood or Cascophen glue as required
1 1/2 quarts spar varnish or Phenoplast for interior
1/2 gallon hard, racing antifouling or bottom enamel
1/2 gallon topside enamel
1 quart airplane dope for fabric over engine fairing
Marine hardware and fittings, if unobtainable locally, can be purchased by mail from John Dory, Box 96, Fair Haven, New Jersey

sired, to about 34 in. With a wider cockpit, two passengers can be accommodated. With two aboard, no speed records will be broken, or even approached, but the ride will be fast.

The next step is to put on the planking, as shown in Fig. 8. The first part to be planked is the transom. Bed the plywood in glue and drive 1-in. No. 6 screws all around on 2-in. staggered centers.

Next comes the side planking. When cutting the plywood, leave a good half inch all around. Make sure that each panel fits flush against the frames, chine, sheer stringer, and stem, planing and shimming until you are satisfied that the fit will be smooth. Coat all the structural members with glue and clamp the plywood in place. Using a stoppered bit, bore pilot holes for the planking fastenings. These fastenings are 1-in. No. 6 screws on 3-in. centers and are driven in so the heads are just below the surface of the plywood. When both sides are fastened, wipe all squeezed-out glue off the insides. When the glue has set, plane off the excess plywood so the panels are flush with the chines, sheers, transom, and stem.

Unclamp the keel from the strongback and, with the aid of another person, turn the boat over so the bottom can be put on. With the boat resting securely on a couple of sawhorses, follow the same procedure used for the sides. The two bottom panels must be carefully beveled and butted on the center line. Note that these panels extend outboard and aft to cover the end grain of the sides and transom.

Before turning the boat right-side up, fit the chine guards over the exposed edges of the bottom plywood. [Continued on page 157]

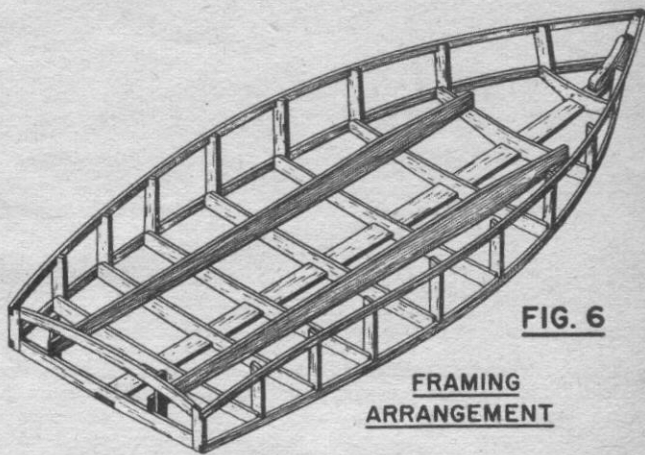


FIG. 6

FRAMING ARRANGEMENT

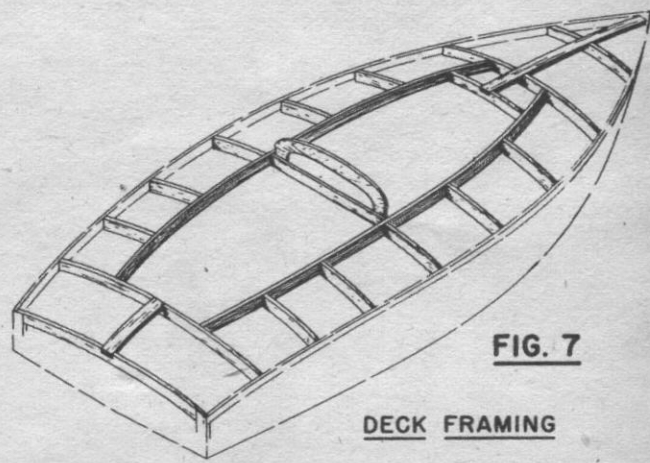


FIG. 7

DECK FRAMING

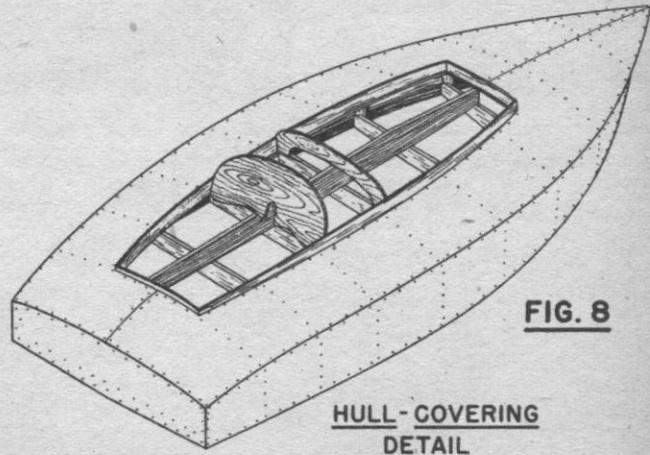


FIG. 8

HULL-COVERING DETAIL

LARGE-SCALE PLANS

will greatly simplify construction. Send \$3.00 to MECHANIX ILLUSTRATED Plans Service, Fawcett Building, Greenwich, Connecticut. Please specify Plan No. B-180.

