DRAGONFLY II

By WILLIAM D. JACKSON, N. A.

Her mama was one of the speediest sweethearts of a speedboat we've ever seen. But daughter's new lines make her even speedier—and a more stable racing hydroplane

Craft Print Project No. 216

FEATURES

USES: A redesigned version of an exceedingly popular boat, this new model retains its planing shape, is faster, more maneuverable and smart appearing. Adapted to one-man operation upon smooth water.

LENGTH: 10 ft. over-all.

BEAM: 4 ft. over-all.

WEIGHT: 115 lb. without motor and steering gear.

SEATING CAPACITY: one person.

CONSTRUCTION: ¼-in. plywood over fir or spruce framework.

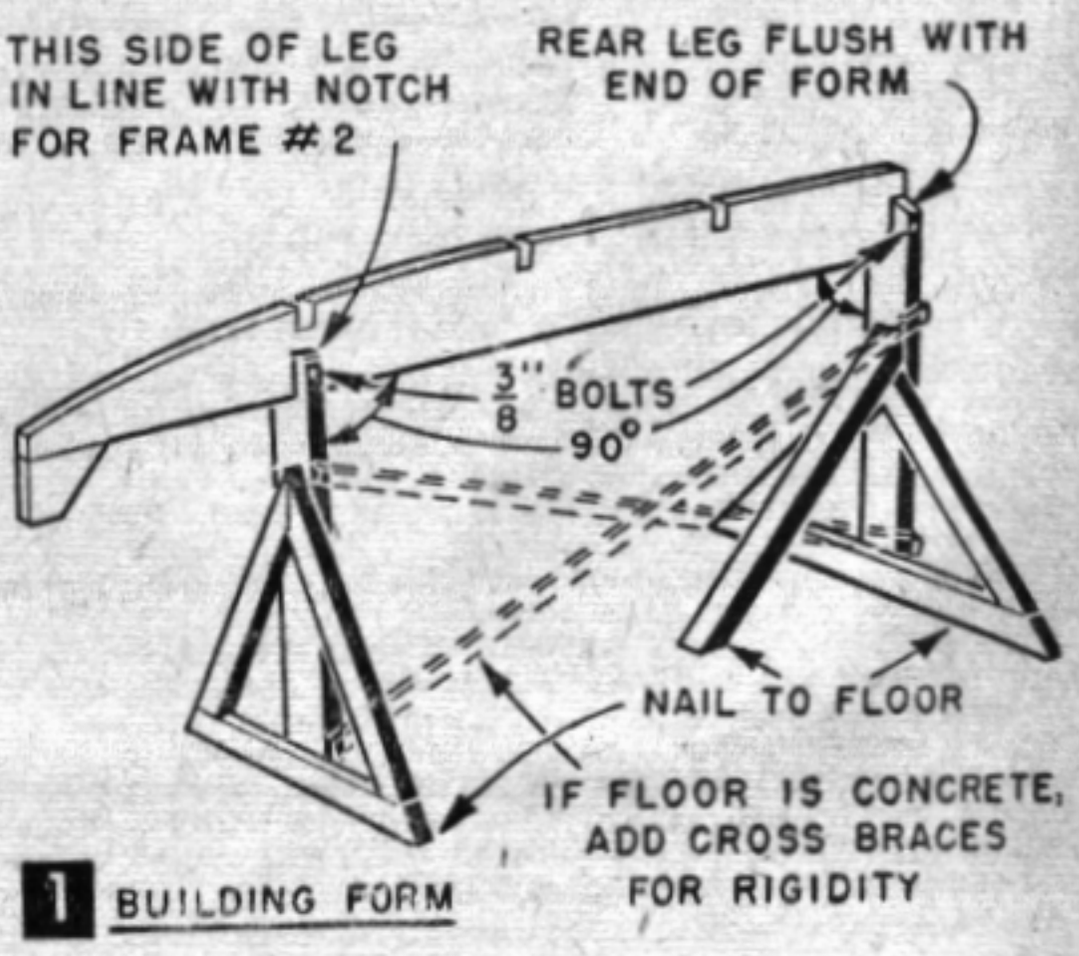
TYPE: Streamlined monoplane, with convex planing surfaces—an outboard hydroplane with projecting tail appendages designed to lift free of the water at high speed and assist in preventing hull turning over backwards with large motors when getting underway.

FIFTEEN years ago we published an article on how to build *Dragonfly*, a fast 10-ft. hydroplane racer for outboard motors. Of all the many designs we have given you since, *Dragonfly* remains the most popular. Hundreds of you built and raced this boat, and won first place in various meets throughout the country.

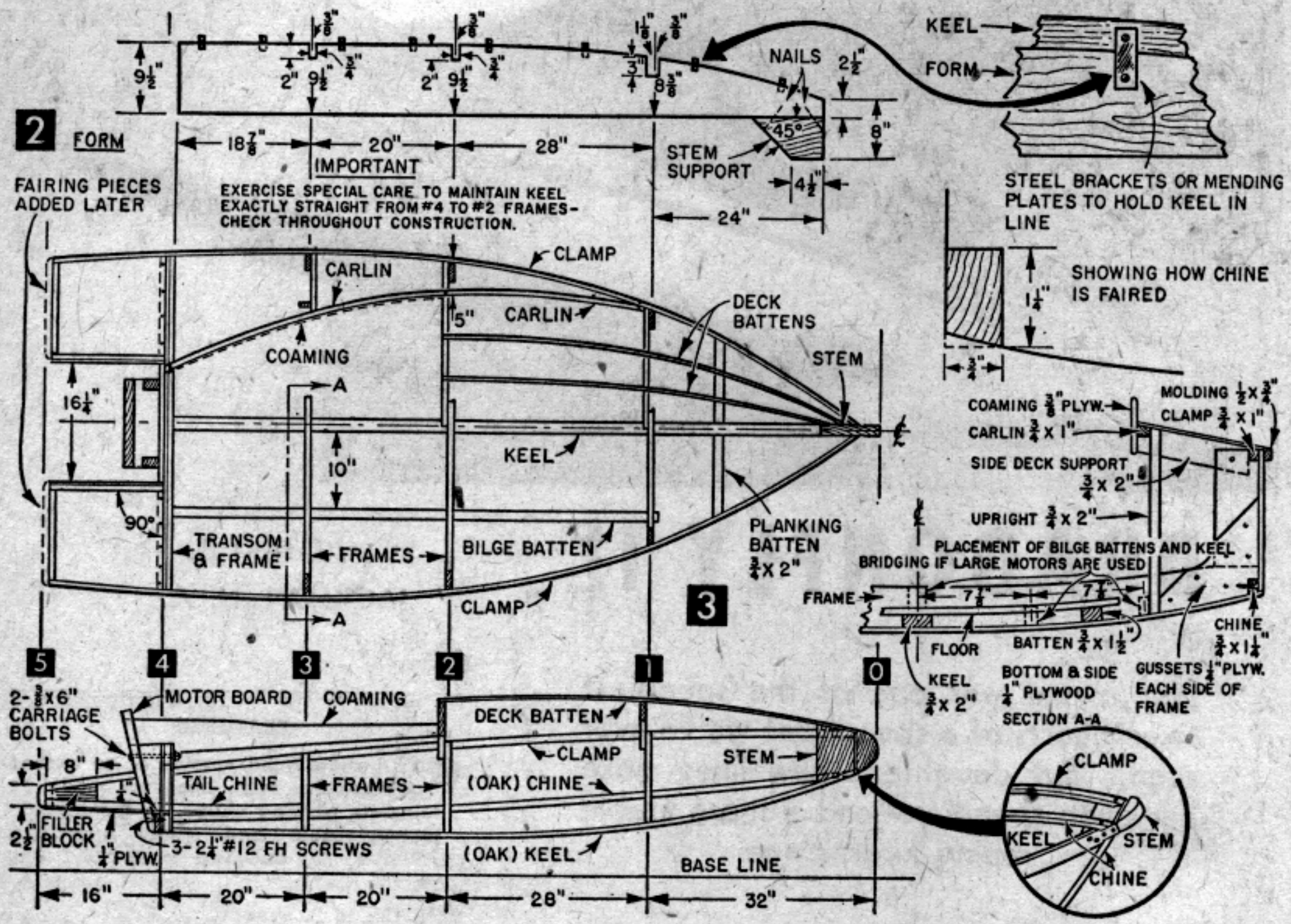
But let's face it. In the last two decades, boat builders (and that includes us) have learned a lot about how to increase speeds and improve stability by careful handling of the bottom lines. So here is a redesigned *Dragonfly II* which incorporates the latest speed-hull lines and maneuverability. Our test figures on the new model are good (Table A) and indicate that *Dragonfly II* should be able to meet and beat a lot of fast company. In fact, if you liked the original *Dragonfly* anywhere near as much as we did, you'll be itching to get started building this one.

To support the stem and hold the hull in line during construction, a building form (Fig. 1) is used. Lay out the form from dimensions given in Fig. 2 on a straight piece of 2 x 10" x 8' plank and bandsaw to shape. Cut and nail the stem support to the form. Then make two legs of 2 x 6-in. stock to support the form above the floor. Any scrap stock around the shop can be used for leg braces. Be sure to bolt the legs to the form at the locations indicated in Fig. 1, because they are used later for clamping the frames.

Draw full-size patterns on heavy paper of all frames, stem, transom and deck beams (Fig. 4).



1 BUILDING FORM



The heavy paper used to wrap wallboard will be given to you for the asking at most lumberyards. This paper is excellent for drawing boat patterns because the paper pattern, when cut out, is heavy enough to use as a template and transferring the outlines to the lumber is simply a matter of drawing around the pattern. Fir is satisfactory for the framing; however, hemlock or spruce is better. For such members as keel and chines, use oak for screw-holding ability.

Transfer frame shapes to lumber and saw to shape. Also saw out the deck beams and lay aside until later. Rabbet the stem at the angle indicated in Fig. 4 and notch for keel and center-deck batten. Follow with the transom providing framing for the forward side as indicated. Coat all contact surfaces with *Weldwood* glue, *Elmer's Waterproof* or *Penacolite G-1124* and nail plywood to framing with Herter's *simba* nails or 7/8-in. #6 *fh* screws, spaced about 3 in. apart. The cutouts in the transom permit carrying of tools and air circulation in the tail appendages to prevent rotting of the wood in this section of the hull.

Fasten the side and bottom members of #1-#2-#3 frames at the chine joints with 1/4-in. plywood gussets glued and nailed or screw fastened with 7/8-in. #6 *fh* screws. Fasten the bottom members of #1 frame together with a floor frame glued and screw fastened with six 1 1/2-in. #8 *fh* screws. When the glued frames are dry, notch out for the keel, chines and clamps. Cut these notches slightly undersize and square with the frames. A final and more precise mating of these members is accomplished previous to their final as-

TABLE A—SPEED CHART

Motor	Rated HP	Propeller	Lower Unit	Speed
Martin 75 (Stock)	7.5 hp	Service	Standard	25 mph
	7.5 hp	Aqua-Jet —7 1/2 x 8 1/2	Quicksilver	33 mph
Mercury	17 hp	Service	Standard	32 mph
Hurricane	17 hp	Aqua-Jet—6 x 8 1/2	Standard	36 mph
Hurricane	17 hp	Aqua-Jet—6 x 9 1/2	Quicksilver	44 mph

Transom height for stock motors 17 in.

Transom height for quicksilver units 13 1/2 in.

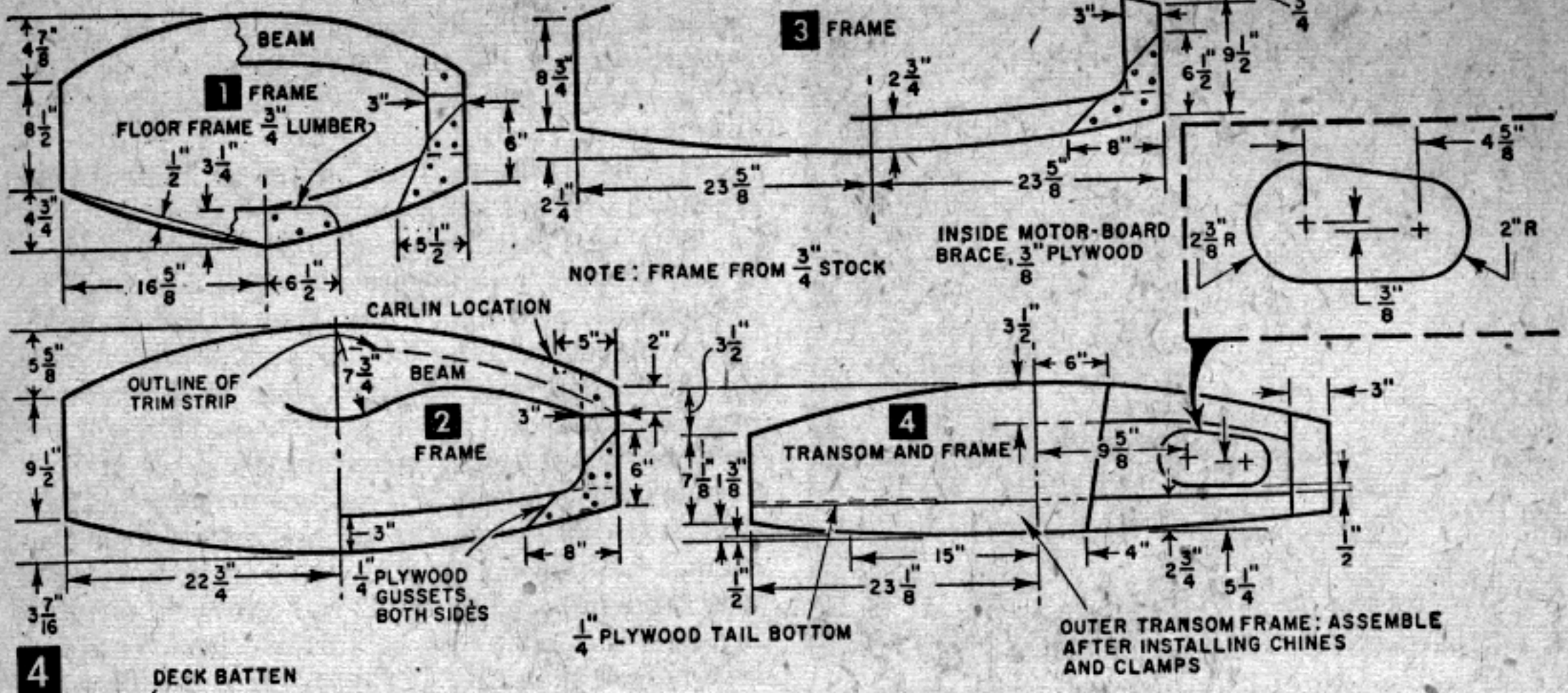
Class A or 7 1/2 hp motors are seriously affected by weight increase; lightweight drivers are needed to exact utmost speed.

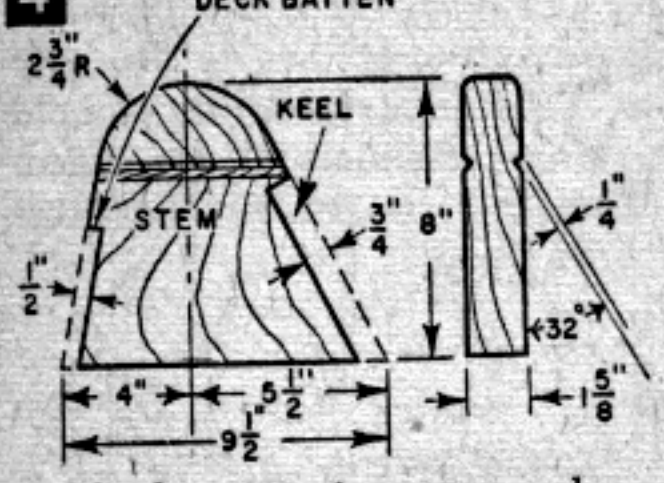
Note: Above are comparative readings and other makes of motors of similar hp produce similar results. By jacking motor to highest possible limit without cavitation slightly higher speeds may be obtained. An ultrasmooth bottom and exact motor angle to suit conditions also affects operation upwards.

Class A—7.5 hp stock motors can be steered by hand. Don't attempt to use any motor with quicksilver units or exceeding 7 1/2 hp and steer by hand because it usually results in an upset. Steering gear imperative to control higher-powered motors evenly. Also use a fin to provide lateral control.

Propellers: The propeller as supplied with stock motors is for average use and upon light fast boats such as DRAGONFLY II will not give results expected. Utmost performance may be expected by utilizing a special speed wheel such as AQUA-JET. A type and size of this wheel is available to fit each individual installation.

Water Speedometers: It is impossible to check exact speeds of propeller combinations, transom heights, motor angles, plugs, spark-plug settings and spark-lever advance without a suitable speedometer—all above results were obtained with an AQUA METER speedometer having a speed range of 0 to 45 mph.





sembly by running a saw between chine notch and chine or clamp, whichever is being worked on.

You are now ready to assemble the framing components upon the form. Fasten the stem at the fore end of the form with two ¾ x 2-in. wooden strips clamped to form and stem (Fig. 8). Clamp the transom at the after end of the form to the rear leg which serves as a support (Fig. 10). Then place frames #1, #2 and #3 in the form notches. Clamp #1 frame to the form with a crossbar under the form clamped to each side of the frame and the front leg (Fig. 5). Square each frame and transom with the form and nail temporary diagonal braces as shown in Fig. 5 to hold frames in place.

Carefully fit the keel to the stem, frames and transom and fasten to the form with mending plates (Fig. 5). Be especially careful when cutting the notches for the keel in the transom so the keel will fit exactly flush with the transom. If the keel is too low, place a shim under it, if too high, cut until it fits flush because a slight drop here of 1/16 to ⅛ in. will cause "galloping" later. Fasten the keel to frame members with two 1¾-in. #8 *fh* screws at each frame joint and four screws at the stem.

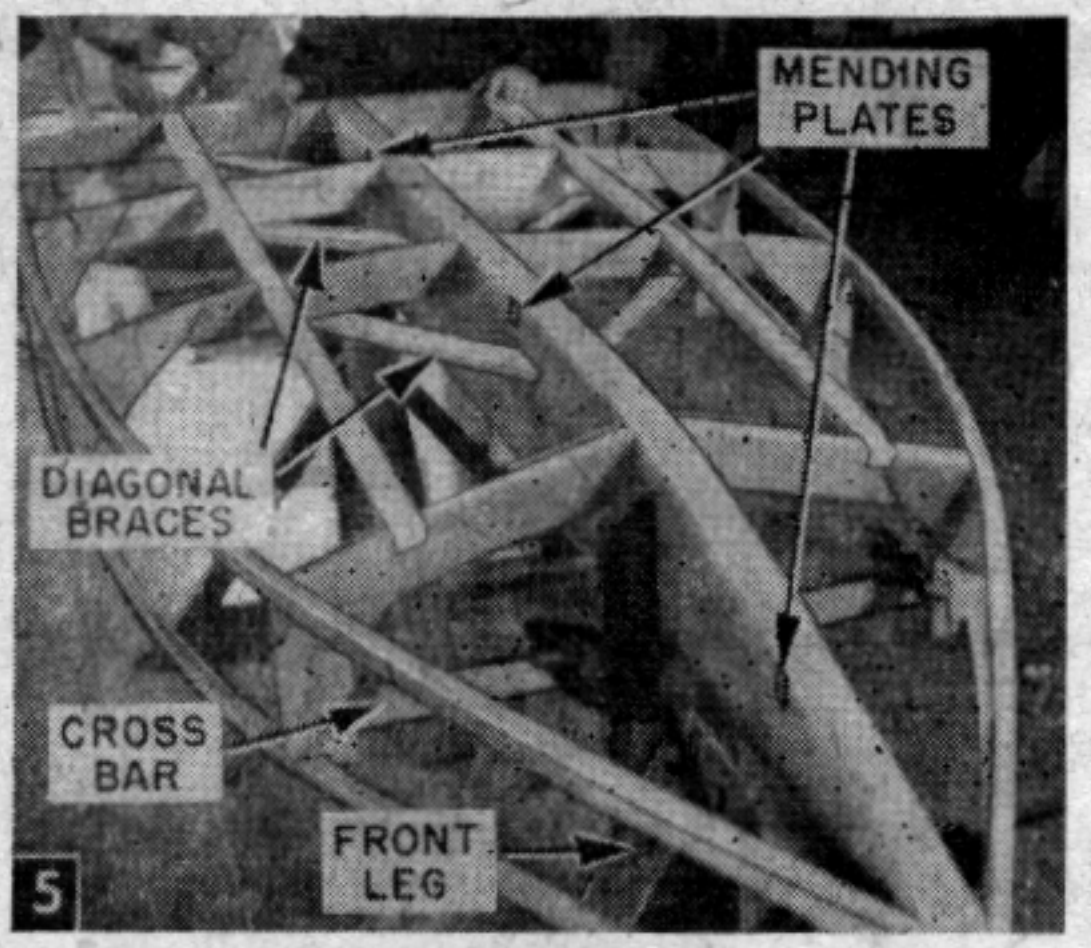
Install the chines and clamps next. Fit the chines in the notches cut in each frame and transom and taper the fore ends to fit against the keel and stem (Fig. 3). Fasten chines in place with one 1¾-in. #8 *fh* screw to each joint. Similarly

MATERIALS LIST—DRAGONFLY II

Use	Pieces	Size
PLYWOOD		
Sides	1	¼" x 2' x 10'
Bottom, Gussets, Tail Pieces	1	¼" x 4' x 8'
Bottom, Gussets	1	¼" x 2' x 3'
Transom, Coamings, Floor, Motor Boards	1	⅜ x 36 x 66"
Motor-board Brace	1	½ x 12 x 12"
Above plywood AA grade, Exterior Fir, branded Ex. D.F.P.A.-Mengel or Super Harboard		
Side Decks	1	⅛ or 3/16 x 26 x 42" Mahog., birch, gum, fir
If kept well varnished, plywood of water-resistant glue satisfactory, ¼" ext. fir plywood may be substituted if ⅛" unavailable.		
SOLID LUMBER		
Chines	2	¾ x 1¼" x 8'6" oak
Clamps	2	¾ x 1" x 10'
Bilge Battens	2	¾ x 1½" x 7'
Deck Stringers	4	½ x ¾" x 5'
	1	½ x 1½" x 5'
Keel	1	¾ x 2" x 8'6" oak
Carlins	2	¾ x 1" x 6'
Moldings	2	½ x ¾" x 10'
Tail Assembly	1	¾ x 1¼" x 10'
	1	¾ x 2" x 4'
	1	¾ x 2¾" x 3'
	1	¾ x 3½" x 3'—Tail Fairing
Motor Board Inner Core—¾ x 6" x 3' (plywood mentioned above)		
Stem	1	1⅝ x 9½ x 8" (2 x 10)
Form	1	2 x 10 x 8' (lumber measure 1⅝ x 9½ x 8')
Frame Sides	1	¾ x 3" x 6'
Frame Bottoms	3	¾ x 5½" x 8'
Transom Outerframe		
Deck Beams	2	¾ x 7½" x 8'
Non-Trip Chines	1	1⅝ x 2 x 30" (makes two pcs.)
Bottom Planking Butt Batten	1	¾ x 2" x 3'
Side Deck Supports—#3 frame	1	¾ x 2" x 4'
Steering-Wheel Bracket	1	¾ x 9½ x 20"
All of above pieces may be of fir with the exception of keel and chines which should be of oak (red or white).		

FASTENINGS

- 5 gross 7/8" #6 galv. fh screws
- 4 dozen 1¾" #8 galv. fh screws
- 8 2¼" #12 galv. fh screws
- 1 pound 1¼" Herter's simba nails
- 1 pint Kuhls Bedlast
- 1 pound Weldwood glue powder
- 2 quarts Nitrate Wing Dope
- 1 gallon Firzite Clear
- 1 quart Firzite White
- Muslin for Deck —30" wide x 6' long (sew together)
- 3 ounces 5/16" copper tacks
- 12 steel lugs or mending plates to hold keel to form
- 1 Steering wheel
- Steering gear-pulleys, etc., as shown
- 1 Fin, small-size aluminum
- 1 Speedometer
- 1 Throttle control—twist grip

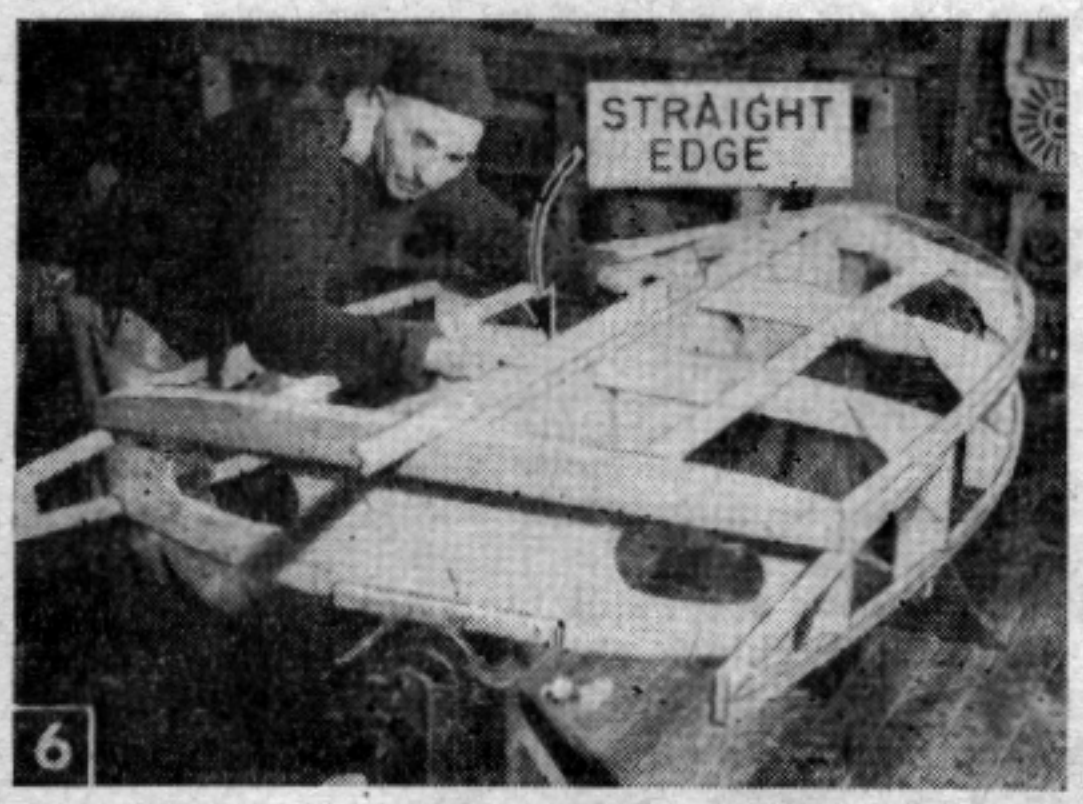


Building form may be used over and over again to make several Dragonfly II speedboats.

fit and fasten the clamps in place allowing 16 in. to extend aft of the transom to form the upper part of the tails. Leave this extension for the time being and continue by notching the bilge battens flush into the frames 10 in. from the keel (Fig. 3).

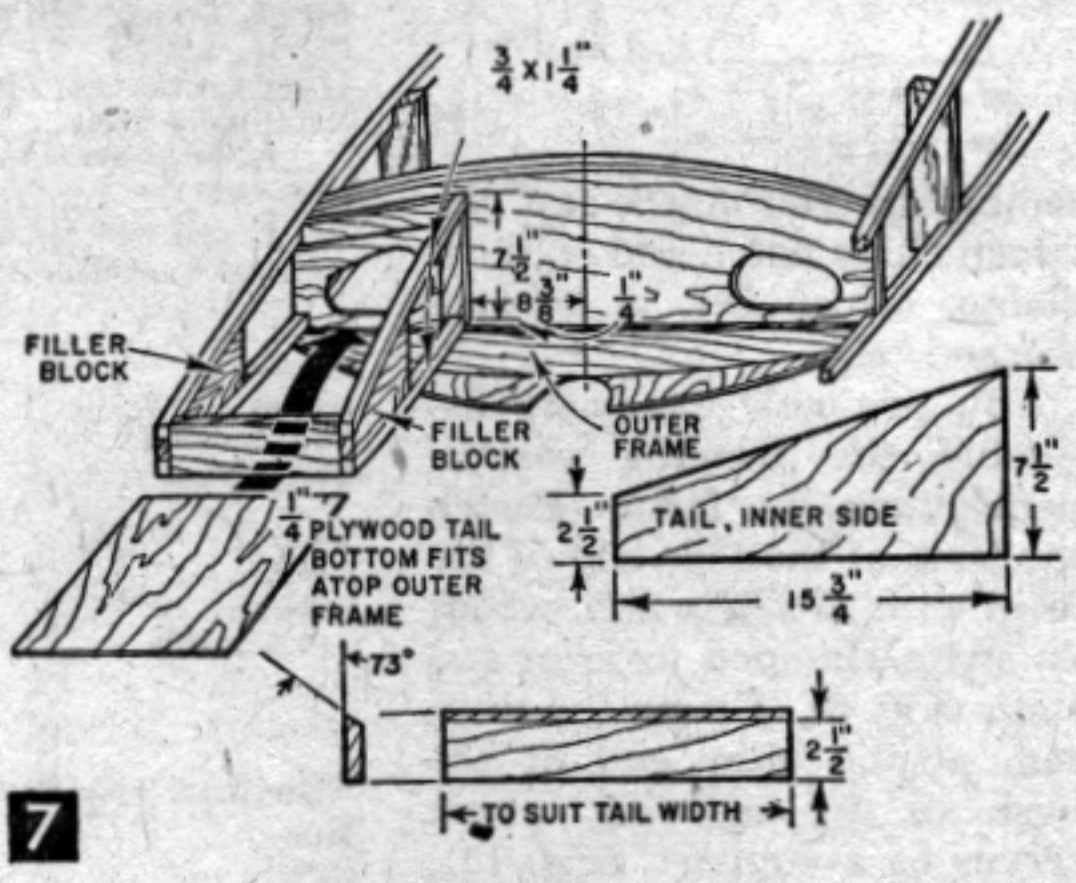
Two bilge battens are satisfactory for use with moderate-power outboard motors (5 to 15 *hp*) but if large outboard motors (25 *hp*) are to be used upon this craft, better place four ¾ x 1¼-in. battens on edge and for extra rugged usage would advise that the keel be bridged (Sec. A-A Fig. 3) after the hull is planked. Trim the keel, chines and bilge battens flush with the transom so that the outer transom frame can be installed to close these exposed joints. First coat contact areas of transom and outer frame liberally with Kuhls *Bedlast*, then clamp outer frame in position and fasten with 1¾-in. #8 *fh* screws spaced about 3 in. apart. Now trim and fair the entire framework so that the plywood planking will lie evenly at all points. A jack plane and wood rasp are useful for this purpose.

Install the tail chines in position by notching them flush into the transom ¼ in. from the outer transom frame (Figs. 3 and 7). Cut and fit filler pieces between clamp and tail chine as shown and fasten with six 1¾-in. #8 *fh* screws. Leave the tail assembly for the time being while the bottom is made ready for planking.



Keel must be straight and flat between transom and #2 frame to avoid a galloping hull.

First check the keel for alignment between the transom and #2 frame with a straightedge (Fig. 6). The keel must be perfectly straight and flat. If any dips or hollows are disclosed, eliminate by shimming. Also check the keel at the transom. Many times, by being too industrious with a hand plane when fairing, a slight drop at the transom or outer transom frame is ignored. Even if the boat you are building is a first-class piece of work at every other point, if it gallops or porpoises, the hull is a failure as far as performance is concerned. A porpoising hull used as a flower bed may have decorative value, but as a well performing boat it's a flop. So be sure to check that keel line before planking because, once the plywood is glued, nothing short of an overt act by the deity will restore it again. This dissertation by the old professor of "Bilge Water Academy" may seem superfluous but, it cannot be too strongly asserted—*check that keel line.*

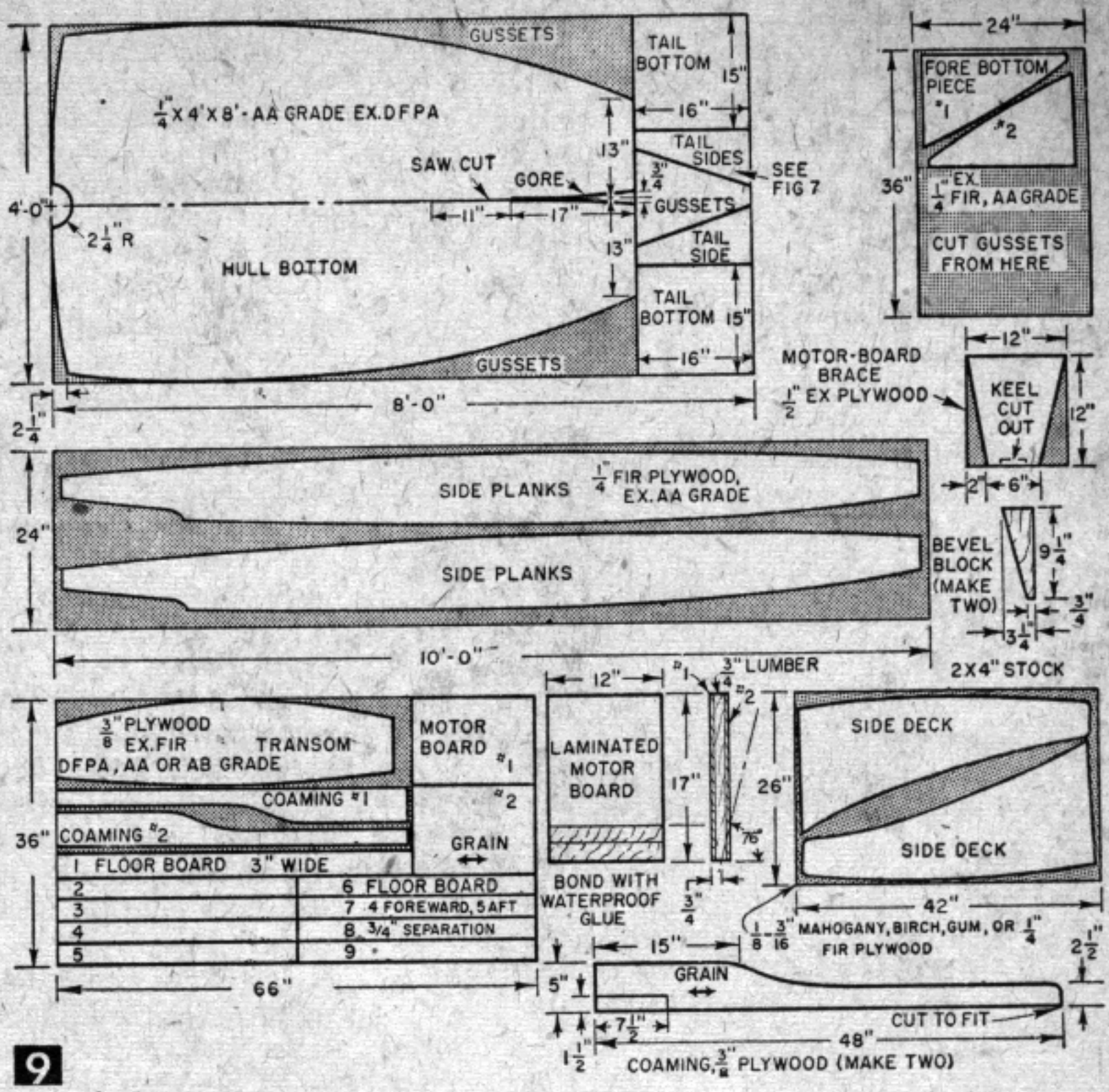


The bottom could be planked with one full-length piece of plywood but too much waste results, so take a tip from the maestro of maritime concertos and plank the bottom with three pieces. Lay out and cut a 4 x 8-ft. piece of ¼-in. plywood as indicated in Fig. 9. Saw a slit and small gore on the centerline at the forward end of the hull bottom piece and clamp in position on the framework. The small gore at the forward end should close completely when the plywood is clamped to the chines (Fig. 8) and transom (Fig. 10) with *Jorgensen* C-clamps.

Now crawl under the hull and pencil mark the outlines of all the frames, keel, chines and battens on the underside of the plywood. Remove the plywood and drill aligning holes about 18 in. apart through the plywood in the center of these pencil markings. Connect these drilled holes with a continuous pencil line on the outside of the plywood to use as a center guide when placing the screw fastenings into the framework.

Before placing this shaped and perforated piece of bottom plywood in position, coat all framing

members but the transom, with glue; also coat contacting surface of the plywood bottom with glue. Coat the transom with Kuhls *Bedlast* and place the plywood in position on the hull and clamp. Start driving screws along the keel first, then work out towards the chines, fastening with a double row of screws along the transom and a single row into each frame working on alternate sides to the chines until the fore end is reached. Drill lead holes for all 7/8-in. #6 *fh* screws and space about 2 in. apart. Place a 2 x 3-ft. piece of 1/4-in. plywood on the frame at the bow and mark the two triangular pieces to complete the bottom planking. Saw out these pieces and fasten to the frame using a 3/4 x 2-in. batten inside the hull to butt-



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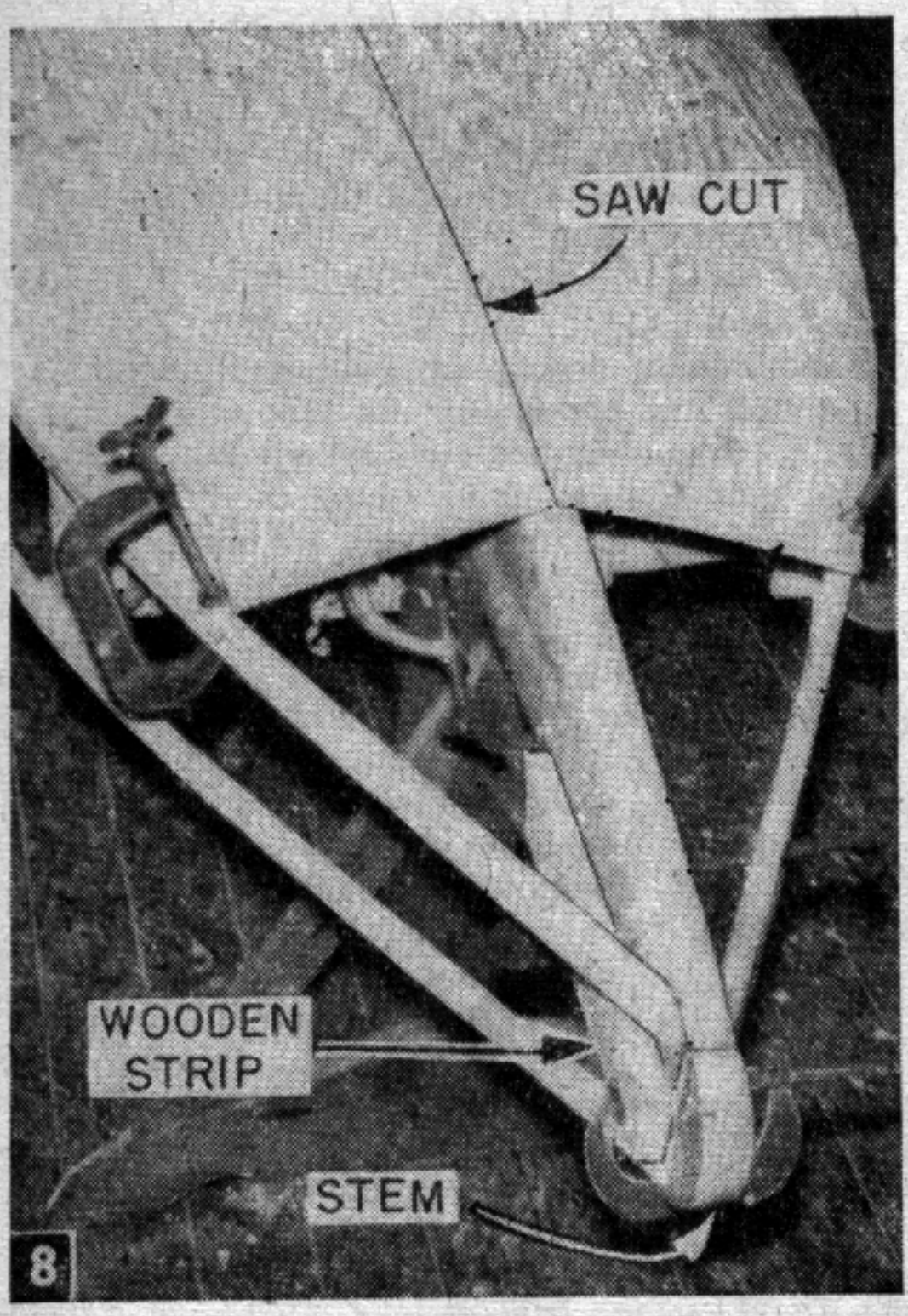
join the 1/4-in. plywood planking. When the glue is dry, trim the plywood planking evenly along the chines and prepare to plank the sides.

Although a 10-ft. length of plywood is shown for side planking (Fig. 9), an 8-ft. length with butt joints and a batten as used on the bottom planking can be used for side planking. Regardless of the length used, clamp the plywood in position, mark and cut to shape. The shaped piece of one side will serve as a pattern for the opposite side. Coat only the clamps with glue and use Kuhls *Bedlast* on the chines and tail chines. If we could maintain infinitely perfect mating surfaces between the plywood and chines, glue would be satisfactory, but *Bedlast* will easily absorb the difference of slightly irregular surfaces



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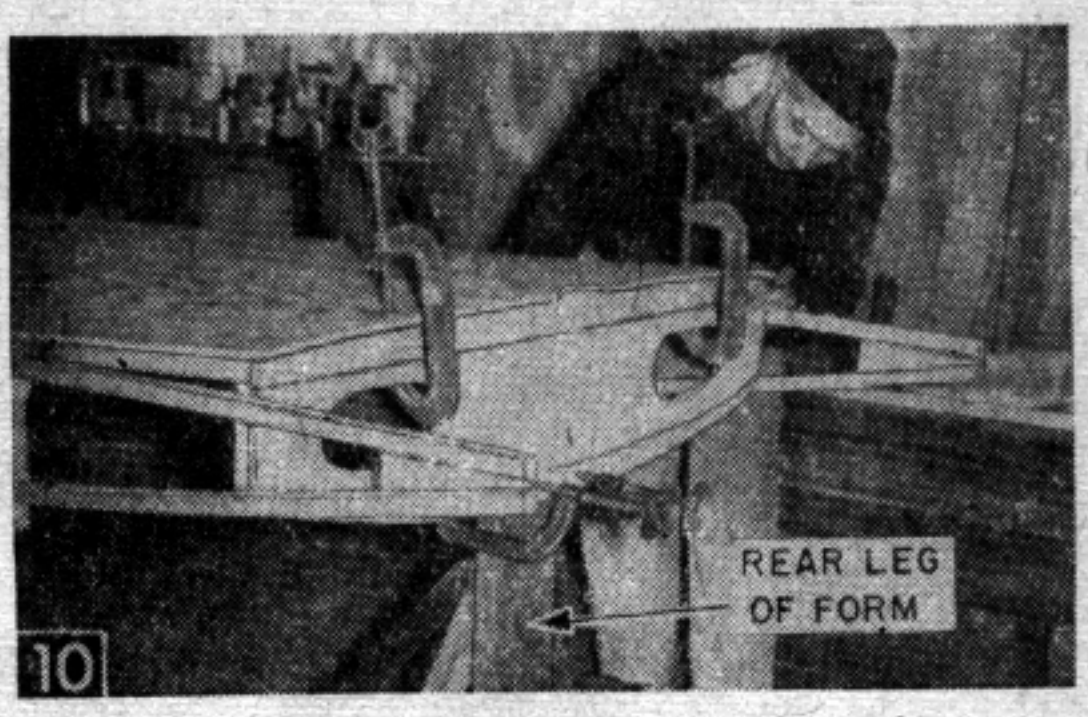
Triangular cutout at forward end of bottom planking should close completely when plywood is clamped down to frame.



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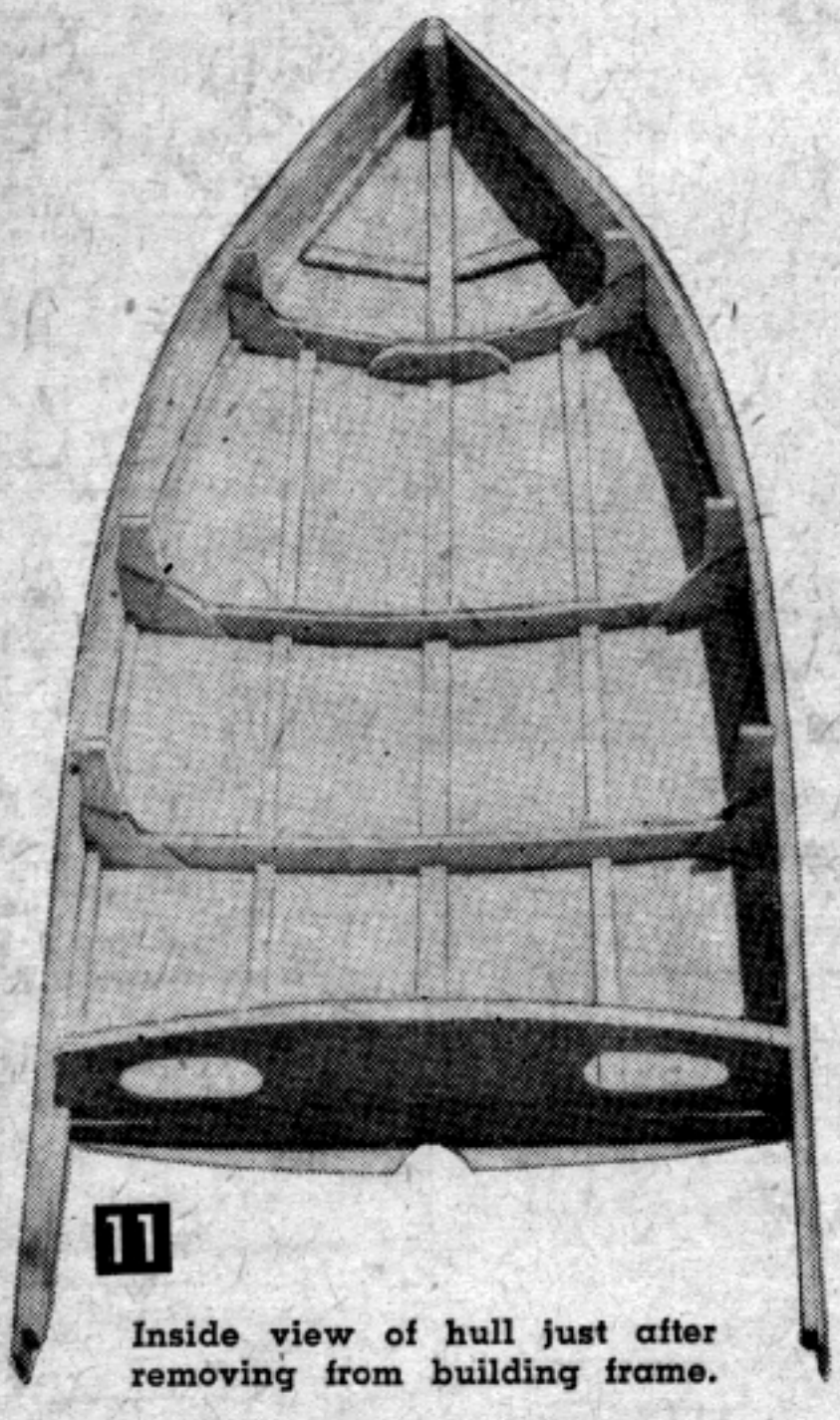
Bottom planking extends 2 1/4 in. beyond outer transom frame.



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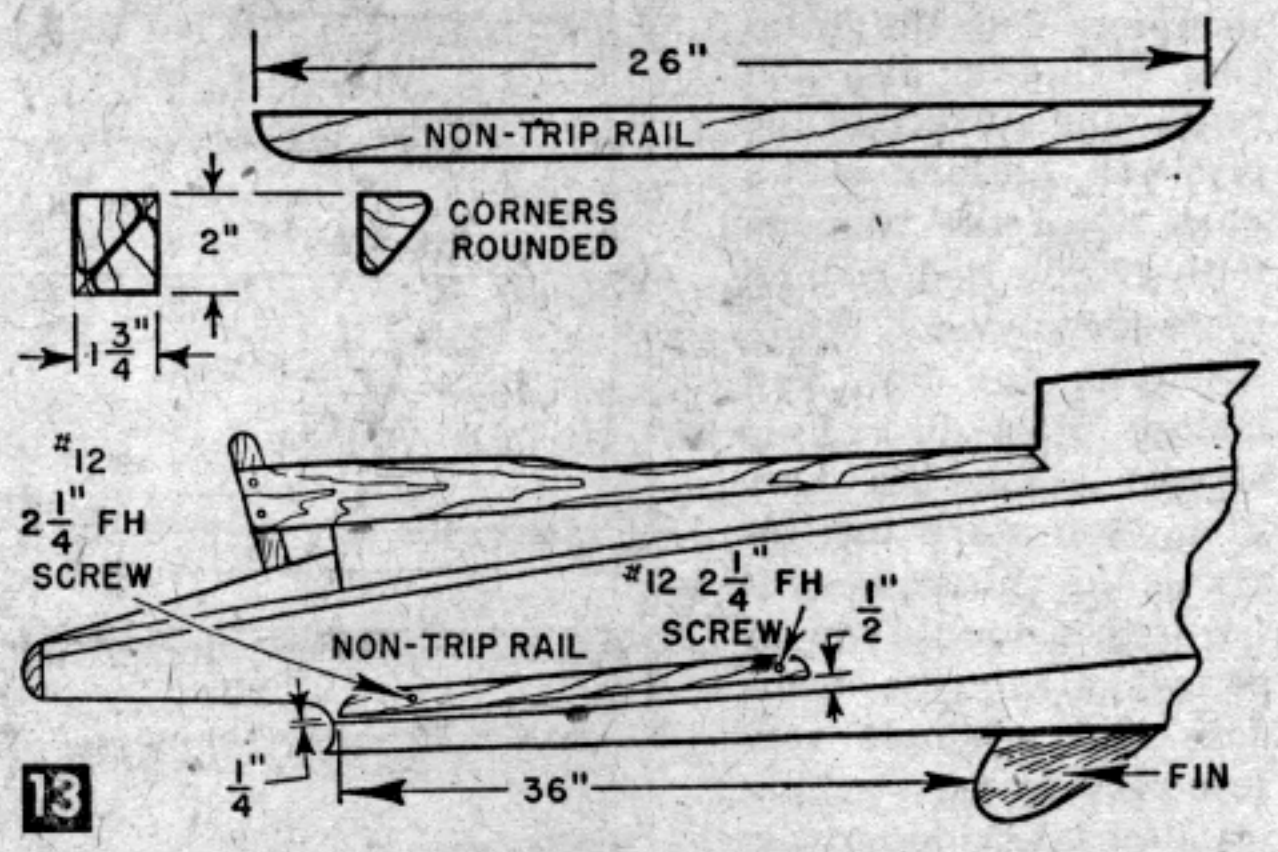
Inside view of hull just after removing from building frame.



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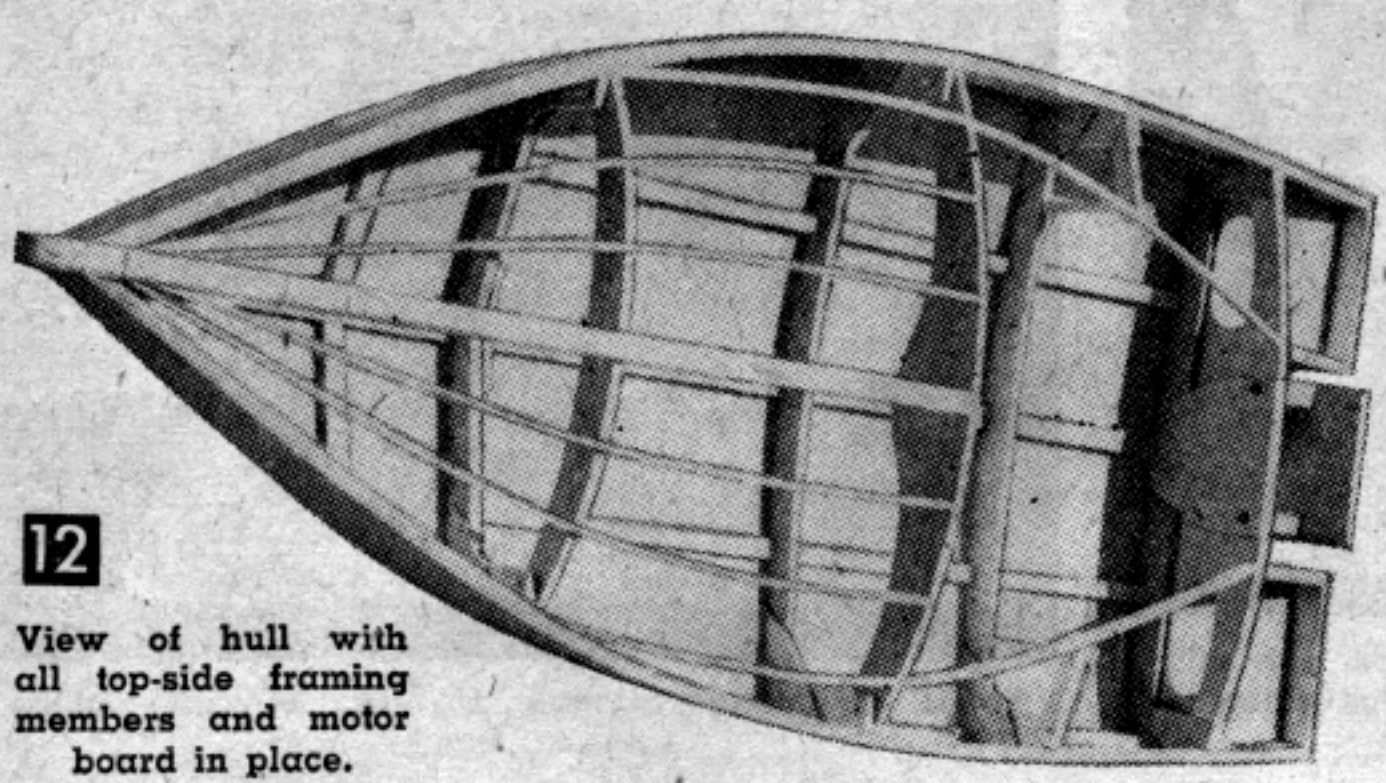
and being resilient, maintains a water-tight joint despite any and all pounding over rough water. Fit the side planking to stem rabbet and fasten in place with 7/8-in. #6 *fh* screws spaced 2 in. apart at all points.

When the glue is dry, remove the hull from the form (Fig. 11) and turn right-side-up on sawhorses. To make the tail appendages (Fig. 7), mark upon the transom exactly where each piece will be placed and cut and fasten the 1/4-in. plywood tail bottoms to the outer transom frame and tail chines with 7/8-in. #6 *fh* screws. Be sure to coat all adjoining surfaces of entire tail structure with *Bedlast*. Then cut out two tail innersides of 1/4-in. plywood (Fig. 7) and use as a pattern to build up inner-tail framework.

The motor board (Figs. 3 and 9) combined with carlins (to be installed later) will withstand considerably more stress than any transom to which an outboard motor is mounted. Then too, a separate motor board permits the transom being built "square" with the boat frame thus eliminating difficult angles to work out because the board provides the proper angle for mounting the motor. If motors with quicksilver units attached are to be used, simply make another interchangeable motor board to fit and there's no need to practically rebuild the boat transom to use a different motor.

The motor board detailed in Fig. 9 will support most standard outboard motors the correct distance out of the water. Sandwich 3/4-in. solid wood between two pieces of 3/8-in. plywood and glue, clamp and screw fasten together. When dry, saw the required 14-deg. bevel and make two bevel blocks (Fig. 9). Fasten the board to the outside transom frame with three 2 1/2-in. #12 *fh* screws and place bevel blocks in position. Make the motor board brace (Fig. 9) and screw fasten to inside of transom (Fig. 12). Then drill through board, blocks, transom and brace for 3/8-in. carriage bolts (Fig. 3) and bolt together. Use large washers under carriage-bolt nuts to distribute the load. Bolt the previously cut deck beams for #1 and #2 frames in place with 3/16 x 2-in. *rh* stove bolts, one to each joint. Notch the cockpit carlins flush into the transom and #2 beam and butt the fore ends against #1 frame. Fasten the carlins to the clamp at this point and to the beams and transom with one 1 3/4-in. #8 *fh* screw at each joint. Make the bracing for the carlins at #3 frame as indicated in Fig. 3 and screw fasten. The position of the carlin at #3 frame determines the height and length of the brace.

Install the 1/2 x 1 1/2-in. center deck batten and fasten to stem notch forward, atop #1 beam and notch flush into #2 beam. The four deck stringers, two on each side of the center line, are placed on edge equidistant between the center batten and carlins. Notch about half depth into #1 beam and flush into #2 beam. Fasten the fore ends to the stem, first beveling to fit and nailing in



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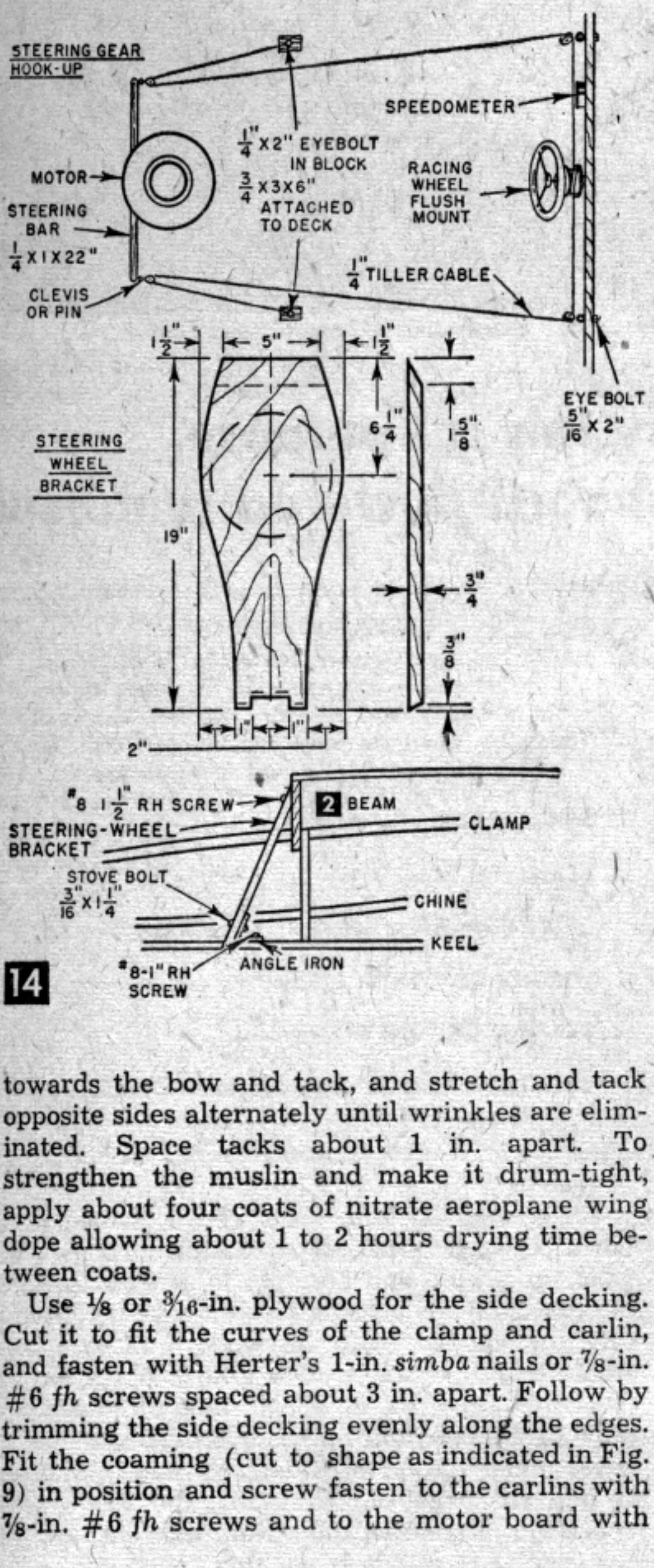
View of hull with all top-side framing members and motor board in place.

place with Herter's 1¼-in. *simba* nails.

At this stage of construction your boat hull should look like the one shown in Fig. 12, and now is a good time to give the interior a protective finish. A clear or natural finish somehow appears better upon a fast boat, so apply three coats of clear *Firzite* to the interior and follow with one coat of Spar Varnish, allowing ample drying time between coats. The forward deck is covered with a heavy-grade muslin. If you are unable to secure muslin in wide widths, simply sew two widths together with a seam down the center batten. Lay the cloth in place and tack with 5/16-in. copper tacks starting at #2 frame. Then pull the cloth



towards the bow and tack, and stretch and tack opposite sides alternately until wrinkles are eliminated. Space tacks about 1 in. apart. To strengthen the muslin and make it drum-tight, apply about four coats of nitrate aeroplane wing dope allowing about 1 to 2 hours drying time between coats.

Use ⅛ or 3/16-in. plywood for the side decking. Cut it to fit the curves of the clamp and carlin, and fasten with Herter's 1-in. *simba* nails or ⅞-in. #6 *fh* screws spaced about 3 in. apart. Follow by trimming the side decking evenly along the edges. Fit the coaming (cut to shape as indicated in Fig. 9) in position and screw fasten to the carlins with ⅞-in. #6 *fh* screws and to the motor board with two 1¾-in. #8 *fh* screws.

Cut and fit the tail top planking, coating the contact areas with Kuhls *Bedlast* and fasten with ⅞-in. #6 *fh* screws. Make the tail extremity fairing piece, coat with *Bedlast* and fasten in place with six 1¾-in. #8 *fh* screws in each piece. Follow by fairing and rounding all corners and sand smoothly.

Fasten a ½ x ¾-in. molding along the sheer edges with ⅞-in. #6 *fh* screws spaced at 6-in. intervals. Bevel the ends of the molding to fit snugly at the stem. For trim, use a ¼ x 1½-in. batten placed at the center of the fabric deck and a trim strip at the top of #2 frame beam (Fig. 15). These trim pieces may be of mahogany, redwood or stained fir for color contrast. Plywood is quite satisfactory. Lay the floor boards so as

Completed Dragonfly ready for a test run. Note speedometer on cockpit dash.

to be removable. Space them ¾ in. apart from the transom forward fastening them with four screws to the keel. Then make the bevel non-trips (Fig. 13) and fasten to the hull with screws from the outside and inside of the hull.

If a steering wheel is to be used, make and mount the steering wheel support bracket (Fig. 14), and hook up the wheel-to-motor cables as shown. For the exterior hull finish, apply three coats of white *Firzite* tinted to the color desired and follow with one coat of hi-gloss enamel. Paint or varnish the side decking with three coats of clear *Firzite* followed with one coat of Spar Varnish.

A speedometer will enable you to achieve utmost performance, and an aluminum fin mounted as shown in Fig. 13 will prevent side slip and give you better control of the boat. Well, there you have it—the new *Dragonfly*—a good old speedboat redesigned with new lines for a new crop of speed demons.