

SNOWBIRD

A 12-FOOT CATBOAT

Naval architect Edson I. Schock here brings up to modern standards of construction and rig the famed Olympic Monotype class which his father, Edson B. Schock, designed from the original California Snowbirds. This new Snowbird uses plywood, has a modern rig, will be faster and handier than either of her forerunners as befits a Schock masterpiece

THIS little cat is a modern version of the well-known Olympic Monotype class. This type of boat was selected by the Olympic Committee as a typical American small boat, and many of the original boats have been built both here and abroad.

In redesigning her especially for *SPORTS AFIELD*, I've modified the original lines of the boat only enough to make plywood planking possible, and the rig has been made a little more modern in style.

The boats built from this design should be lighter than the original boats were, and should sail a little faster.

Aside from putting on the bottom planks, the construction should be done easily by the amateur boat-builder. The bottom planks have no twist in them, but the bend at the bow is fairly sharp, and they will

By **EDSON I. SCHOCK**

have to be put on carefully. This is not an easy job, but it is well within the ability of any careful woodworker.

If you plan to make your own sails, *Sailmaking Simplified* by Gray will tell you all about it in the simplest terms. But most builders, by the time they get the boat completed are willing to let a professional make the sail.

This boat will make a fine racing class for any club, and an excellent boat in which to learn to sail.

The first job in building this boat is to lay down the lines and some of the construction details full size.

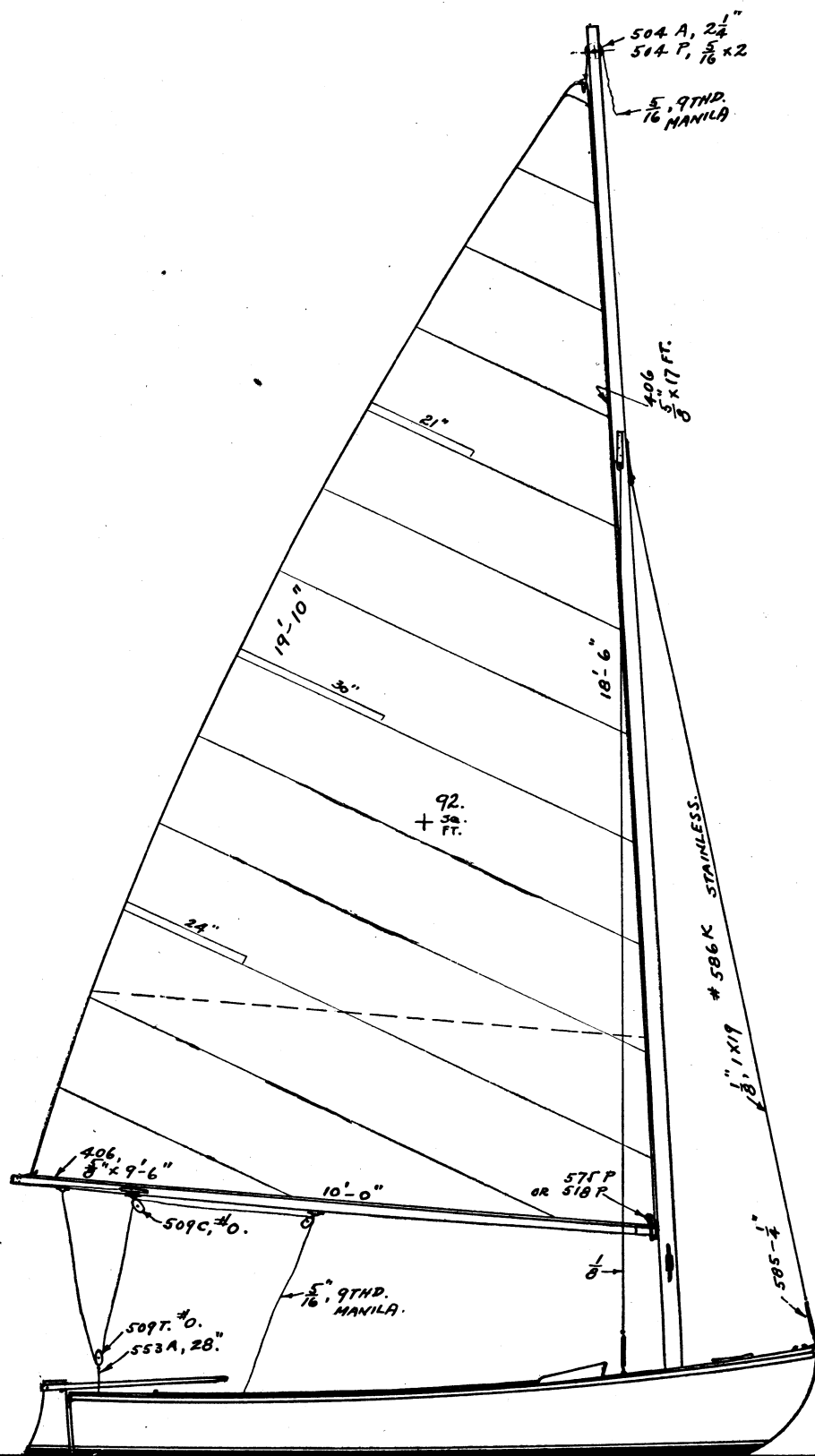
You will need a floor space three or four feet wide by thirteen or more

long. This job can be done in one day, and family cooperation should let you have the living room floor for that long. Get a piece of strong paper, wrapping or building paper, 32"x12½', and another piece 24"x5½'. The big piece is for the longitudinal plans, the little one for the sections.

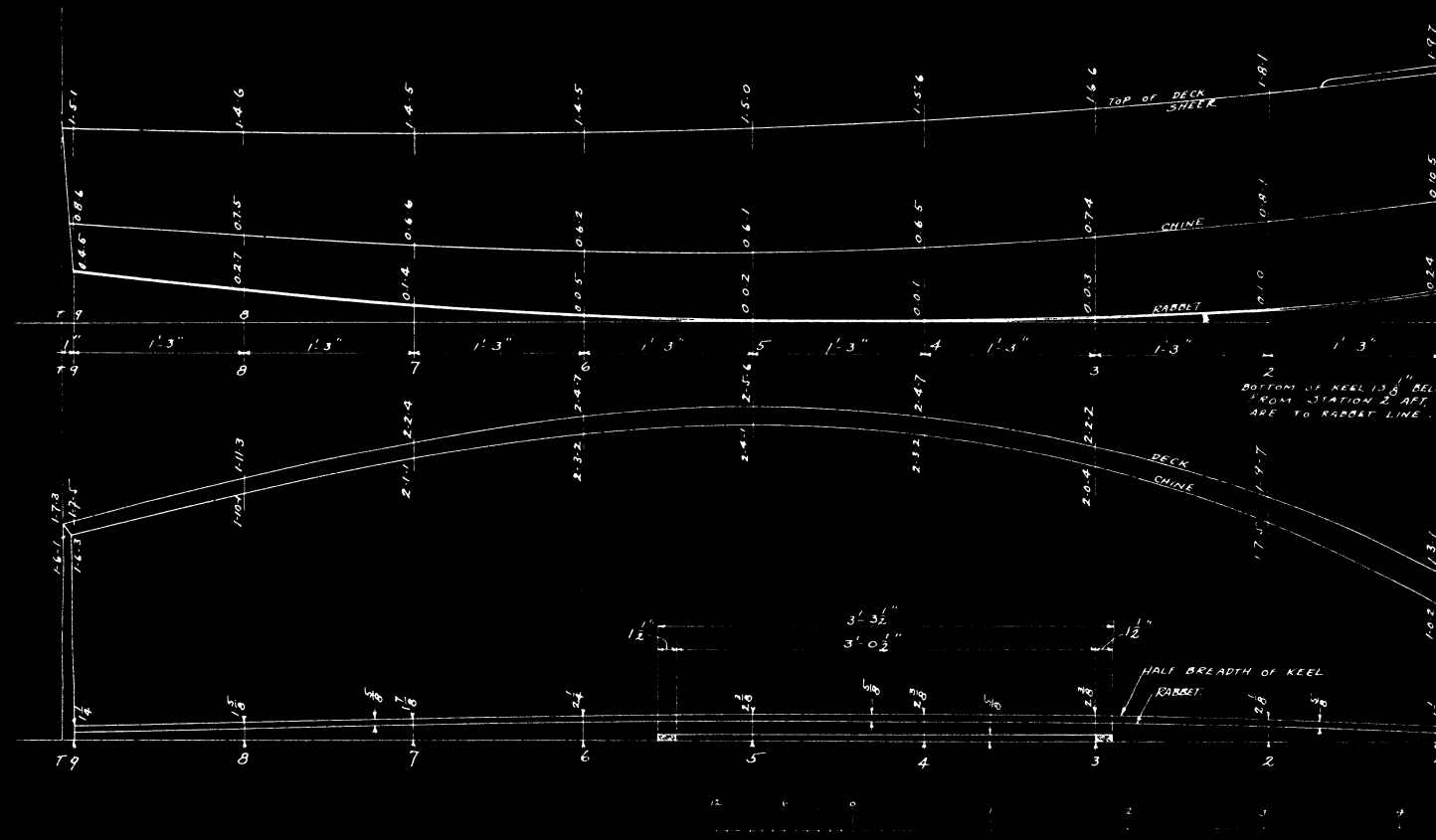
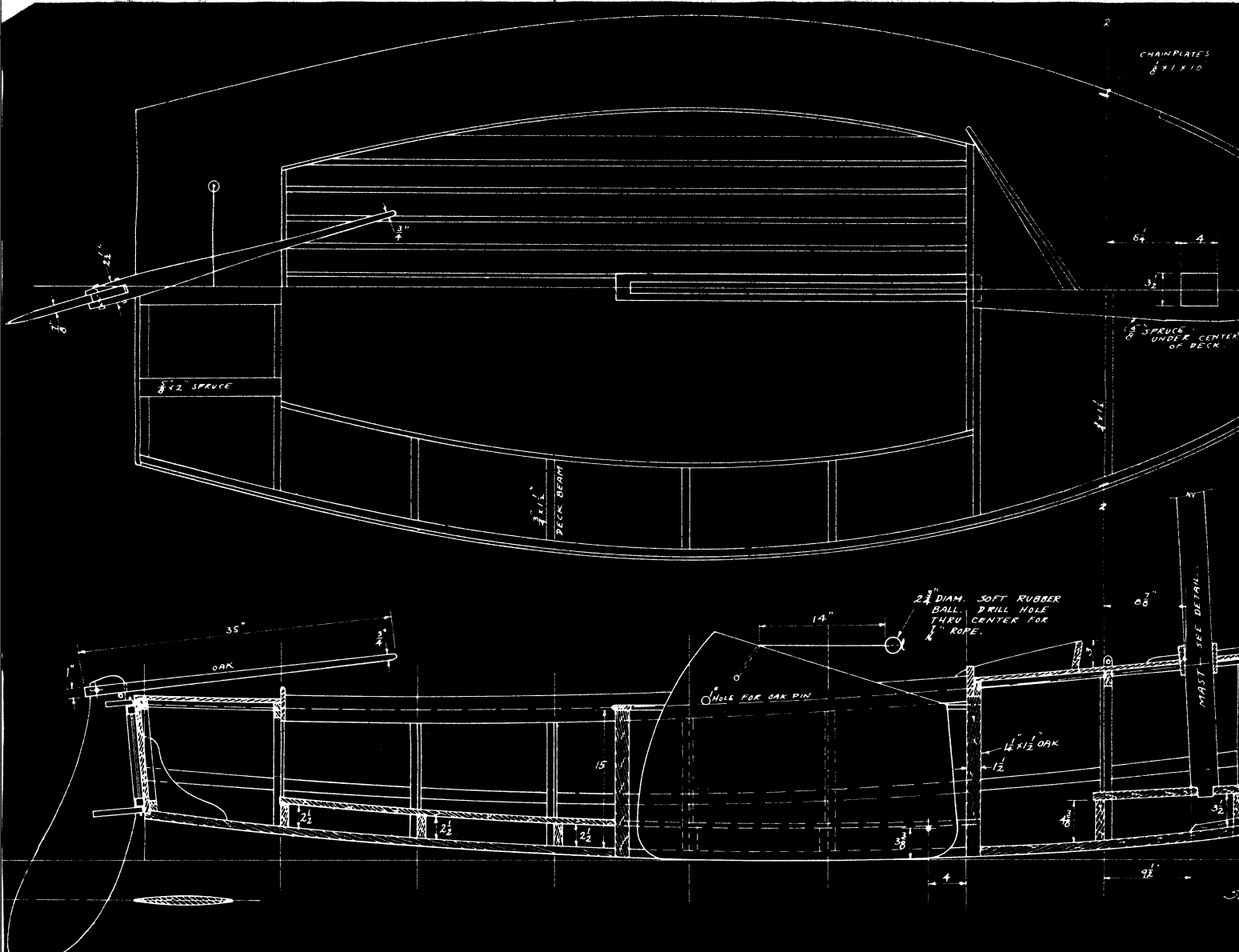
The *lines* of the boat give you necessary dimensions for copying on the paper the plan and elevation of the lines. These two drawings can be made one on top of the other, using two different color pencils, say black for elevation and red for plan view. Stick the big sheet to the floor with a few scraps of tape.

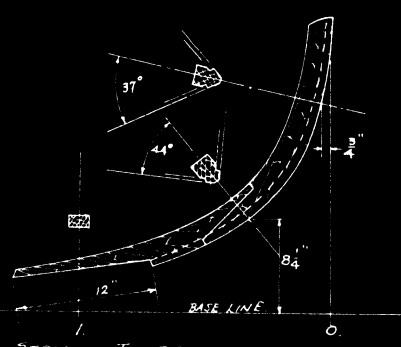
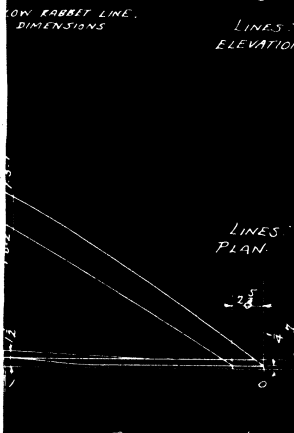
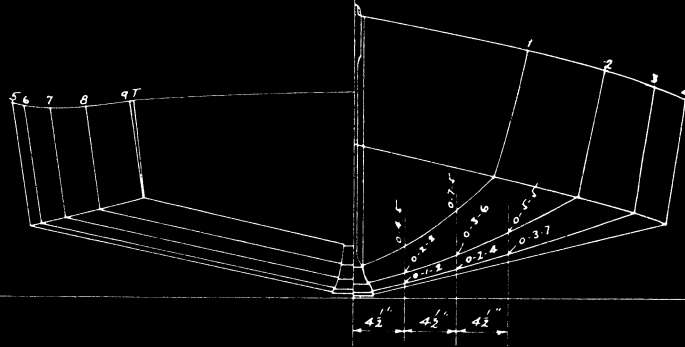
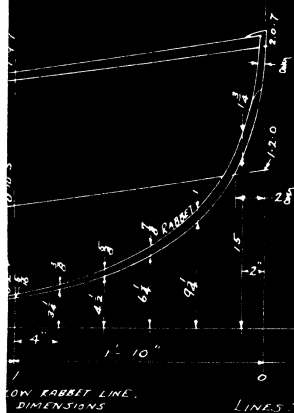
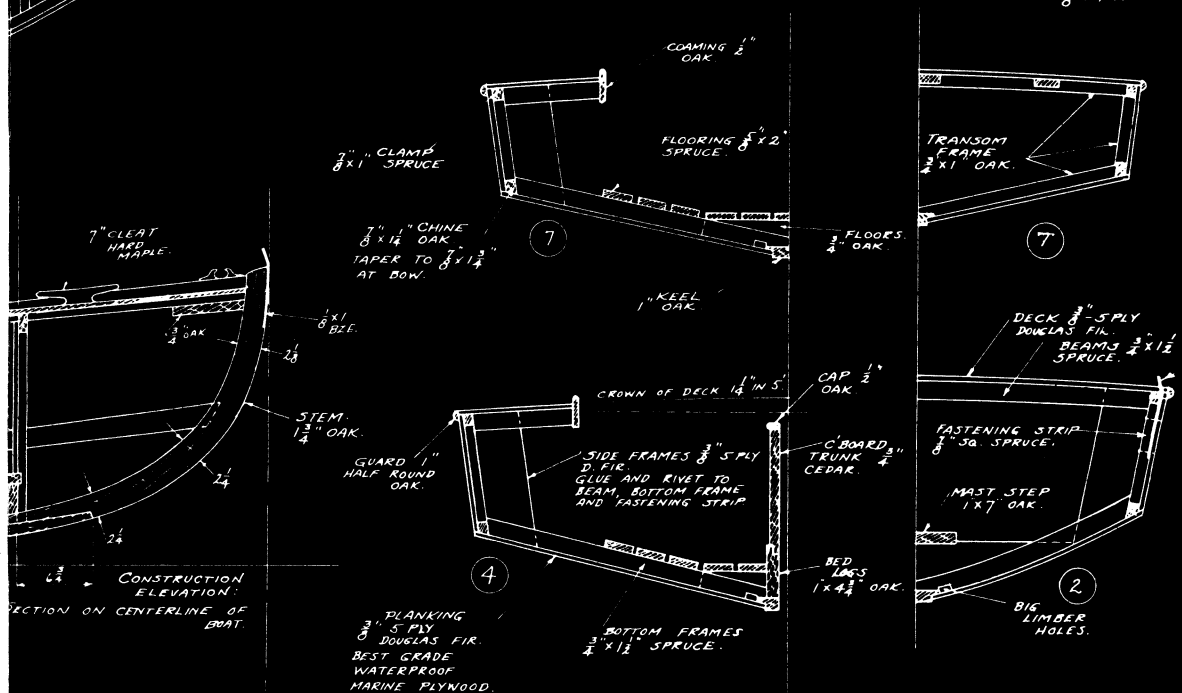
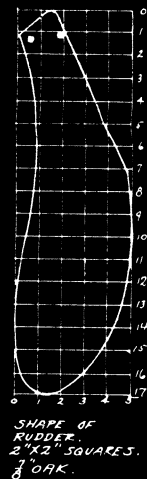
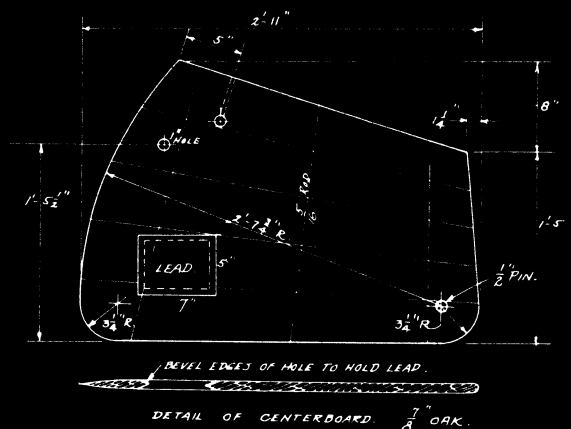
Draw the centerline on the edge of the paper. Or if the edge of the sheet is straight (stretch a string to check) you can use the edge as centerline. Measure along this line, starting at

HARDWARE FIG. NOS. ARE
FROM MERRIMAN BRGS.
185 AMORY ST. BOSTON 30
MASS. 1952 CATALOG.



NO. 129.
SAIL PLAN.
EDSON I. SCHOCK, KINGSTON, R.I.
SCALE $\frac{1}{2}$ " = 1'-0"





NO. 129
LINES, CONSTRUCTION PLAN.
EDSON I. SCHOCK, KINGSTON, R.I.
SCALE $\frac{1}{12}'' = 1'-0''$

the stern, 1" for the rake of the transom, then 8 spaces of 1' 3" each for the frame stations, then 1' 10" to the bow. Draw station lines across at each mark, square off the centerline.

The dimensions, called offsets, are given in feet, inches and eighths, thus: 2-4-1 means 2' 4 $\frac{1}{8}$ ".

Lay out the points on each station line, showing the half breadth of keel, chine, and deck. The rabbet line is not needed yet. Connect these points with a smooth curve. For this a wood strip or batten about 5/16"x $\frac{5}{8}$ ", 14' long is used. Such a batten is not easily come by, and you may spend some time hunting for a good straight piece with straight grain. White pine is the favorite wood for these. In drawing the lines hold the batten in place with weights of some kind—books, bits of junk, fingers (other people's fingers) or what have you.

The batten may not lie in a smooth curve. This may be due to inaccuracies in the offsets, or errors in copying them. The offset measurements are taken from a small scale drawing, and cannot be perfect, but they should not be more than $\frac{1}{8}$ " off. If errors are found move the point, or a couple of points, to make the curve smooth and "fair." When these lines are fair, draw the rabbet line $\frac{5}{8}$ " inside the keel half-breadth line from the stern to station 1, then $\frac{7}{8}$ " off center as shown. This completes the plan view of the lines.

For drawing the elevation, use the bottom edge of the paper (if straight) as a baseline, and the *same* station lines. Draw the sheer, chine and rabbet lines, using a *new* color of pencil to contrast these lines with those already drawn in the plan view. Draw the bottom of keel line $\frac{1}{8}$ " below rabbet line from stern to station 2, then fair it in to the stem profile shown. At station 2 the keel is $\frac{1}{8}$ " below the rabbet line dimensioned on the drawing. From this point forward dimensions are given. For drawing the curve of the stem, a light oak batten is good, or a draftsman's celluloid spline.

Take up the big piece of drawing paper, and stick down the little one. Draw a baseline along close to the bottom, and a centerline at right angles to it right in the middle of the sheet.

To draw the sections, transfer the dimensions from the two big drawings just made, *do not use* the offsets. The lines on the full-size draw-

ings have been faired, and should be more accurate than the dimensions on the plans.

As a sample, draw station 4, thus:

From the plan take the half breadth of the deck on station 4 and measure it out from the centerline about what you estimate the right height above the baseline. Make a mark. From the elevation transfer the correct height, thus locating this one point. For station 4 this will be 2' 4 $\frac{1}{8}$ " off-center and 1' 5 $\frac{3}{4}$ " up from the base, if the offsets are correct. Locate the corner of the chine, and the rabbet line point. Connect these points with straight lines.

To transfer distances from one drawing to another, a strip of paper about 2 $\frac{1}{2}$ " wide is handy. Mark the two points on the strip, then transfer the marks to the other view.

Draw *both* sides of the boat. You will need them later. Draw sections 1 to 4 one color, the rest a different color. This drawing will have a lot of lines on it when it is finished, and if it's all one color, it is just a muddle of lines.

When all sections are drawn, take off the plank. This process is simple. You draw a line *inside* of each section line, $\frac{3}{8}$ " away, to represent the inside of the planking. This line is the line of the *outside* of the frame, without allowance for any bevel there may be. By placing the frames carefully we do not need to worry about the bevels, they are all undercut, so no allowance is needed.

Mark each station "outside of plank," "inside of plank" No. 4, etc. Mark or label *all* lines *as you draw them*. Saves time later. This completes the sections, or body plan.

Now put down the big sheet of paper again, and draw some of the important construction details on the construction elevation. The top of the keel may be shown, 1" above the bottom of keel line. This makes a good line to measure from inside the boat. The centerboard trunk, and the board itself can be detailed on this drawing, as well as the stem. The advantage of drawing the details full-size is that the lumber can be laid down on the drawing and a glance will tell whether it is right or wrong. The more detail you put on the full-size plans, the easier it is to build the boat just like the plans.

Do not let people talk you into making changes. If you do not like this boat the way she is, don't build her. Select another design. But do

not improve the design. Boatbuilders are very prone to change boats as they build them. And usually before the job is finished, they run into some difficulty they did not foresee, which would not have cropped up had they followed the plans. Almost everyone who sees your boat will suggest changes. Just say good idea, and go on building her as you started her. You will be better off.

NOW to really get started. The frames make an easy job to begin on, and present no problems. The aft frames are the simplest. Start with No. 8. The floor timber is 2 $\frac{1}{2}$ " high and 15" wide. Lay the stock on the body plan with the bottom of the piece on top of the keel. Mark the angles of the bottom on each side and cut to shape. Check back on drawing. Cut the bottom frame pieces, two alike, $\frac{3}{4}$ "x1 $\frac{1}{2}$ ", a little too long. Then lay one on the frame drawing and mark the end bevels. Saw off. Make the other the same. Make the deck beams the same way.

The side frames are plywood, with a fastening strip along the outboard edge. Mark on the drawing and cut to shape. Notch corners for chine and clamp. Glue and screw (or rivet with copper rivets) the fastening strip to the plywood. This strip is to take the planking screws. Make one right-hand and one left-hand, and mark them P and S for port and starboard.

Watch yourself—it is easy to glue them up wrong, and that waterproof glue just won't come apart once it is set.

Let the glue stay quiet over night. Assemble the parts on the body plan drawing, each piece right on the line, and fasten them. Screw or rivet them together. The bevels on the edges of the frame can be planed on each piece as it is made, taking the bevels from the full-size drawings, or they can be done later after the frame is set up. Before assembly seems the easier, with a little final trimming later.

Notice that the frames in the after part of the boat are located so that the forward edge of the frame comes on the station line, while forward they are reversed. This simplifies bevelling.

Cut the notches for the timber holes. Drill a $\frac{1}{4}$ " hole through the floor timber vertically, in the center, for the bolt that fastens the floor to the keel. If you plan to fasten the

floors with long wood screws up through the keel this hole is not needed. This fastening is usually either a carriage bolt with washer and nut on the inside of boat, on top of the floor timber, or a long wood screw driven through the keel into the floor. Either method is good. Use 3" No. 14 or No. 16 Everdur screws, or 1/4" Everdur bolts.

Paint the edges of the plywood pieces with plywood sealer. Give the whole frame a priming coat of white.

Where the frame and floor butt against the centerboard trunk the frame is made in two parts, and assembled against the trunk bed logs when the boat is set up.

The transom is similar to the frames in general make-up, and can be made along with them. The transom is pretty wide to get it out of one piece, so two or more boards will have to be doweled or splined together. Glue the joint. All around the edge of the transom fits a frame, glued and screwed to the transom. This takes planking screws. Make the edges of this frame extend beyond the transom a quarter of an inch or so, to allow for bevelling, on the sides and bottom.

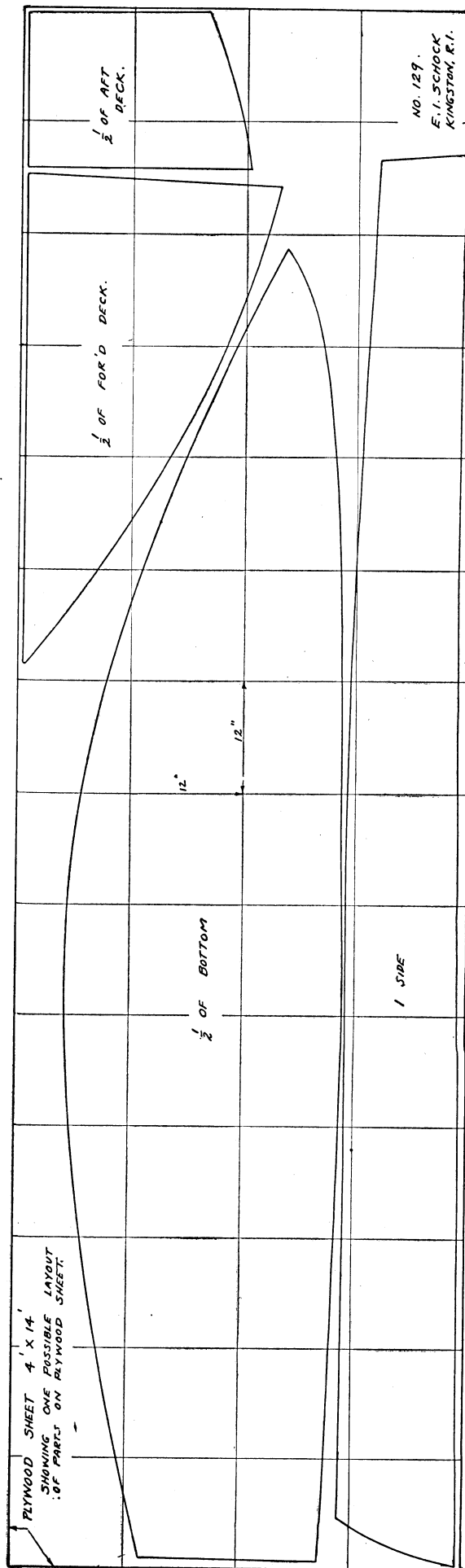
The transom frame is notched (or gained) for chine, clamp, and deck framing, but the transom is not. These pieces butt against the transom and are fastened to its frame.

Make the big knee that holds the transom to the keel. It should be oak or tamarack, a natural crook if you can get one. If not, use just a plain piece with the grain running diagonally. It will be fastened to the transom and keel with long wood screws.

Paint the transom and frame a priming coat.

Before setting up the frames, make the keel and stem. The keel is oak, white or yellow bark, 1"x4 3/4" finished, 10' 8" long. Check these dimensions on your full-size drawing before cutting. Snap a chalkline down the center of the stock, and mark the stations on it. Due to the curve, the stations may be more than 1' 3" apart. Measure on the construction elevation.

At each station mark the half breadth, draw the outline with your batten, and saw to this line. Plane the edge smooth. With a marking gauge, draw the rabbet line 5/8" from each edge. Some of the stock may be taken out for the rabbet on a circular saw, but since the angle



After your frame has been erected on the shop floor, you can make templates for the top-side and bottom panels which will lay out on the plywood about as shown here. The grid above is on 12" squares and graphically depicts how little waste is involved in using the plywood. You'll need two 4' x 14' panels. Naturally you'll use the exterior-grade plywood.

varies the finishing will have to be done by hand. The correct bevels, or angles, appear on the body plan. Cut each station point to the right bevel, then fair between with a rabbet plane or hammer and chisel. Mark and saw out the centerboard slot. Shellac the keel to retard checking.

The stem should be made of a natural crook of tamarack or oak—if you can locate such a piece. These are scarce, and it may be necessary to make the stem of two pieces. In this case, the scarf will come wherever it best suits your stock. Bolt the pieces together with seam compound in the joint.

Cut out the pattern for the stem from your full-size drawing on the construction elevation, and lay it on the wood and trace around it. Saw out on a band or jig saw. This is $1\frac{3}{4}$ " stock and the sawing should be done on a band saw to get the edges square. It can be done by hand, but is quite a job. Mark the rabbet line, and bevels, and cut to shape. This is all hand work. Shellac when finished.

The centerboard box should be bolted to the keel before the boat is set up, so make the box now.

The headledges are straight pieces of oak, $1\frac{1}{4}$ " x $1\frac{1}{2}$ ". Measure the lengths on the construction elevation, and cut a little too long.

The bed logs are 1 " x $4\frac{3}{4}$ " oak, with the bottom planed square and fitted to the curve of the keel, and the top edges rabbeted to take the sides of the box.

The sides are cedar, white pine, or cypress boards, splined or doweled together. Make all joints watertight.

The headledges and one side are assembled, then the inside surfaces painted before the other side is put on. Use copper paint from the bottom up 8", and whatever you like above that level. Put on at least four coats. The inside of the box is hard to paint after it is finished.

The headledges should extend below the bottom of the bed logs about $1\frac{1}{2}$ " to allow for cutting off flush after the box is fastened to the keel. The forward ledge should be long enough to form a post under the deck. They should be a tight fit in the slot in the keel, both sidewise and endwise. If you miss the fit, drive in little white pine wedges. Be careful you do not split the keel. Drill $\frac{1}{2}$ " hole in bed logs for hinge pin.

In assembling the keel and center-

board box, have a muslin gasket in the joint, set in white lead paste or seam compound. Screw the box bed logs to the keel with $3\frac{1}{2}$ " No. 16 Everdur flathead screws, leaving the heads flush with the bottom of the keel. The screws should be $4\frac{1}{2}$ " to 5" apart, staggered just a little to prevent splitting along the line of the grain of the keel or bed logs.

When assembled, put a couple of wedges in the slot in the keel and leave them there while you are building the boat. These are to check any tendency the slot may have to close up in the middle due to warping of the wood before the frames and planking are in place.

Now you set up the frames for planking. The usual procedure is to build the boat upside down. For this the frames may be set up on a floor, or on a backbone of a couple of 4 x 4's on strong horses. Whatever method you use have the keel about the right height above the floor for convenient working on the bottom.

WORK from a centerline with the stations marked on it, and set the frames, transom and stem square and plumb, using dimensions from your full-size drawings. Have everything braced well, because when you are fitting the plywood bottom and sides, you have to push in all directions on this framework. The frames which come opposite the centerboard box are not set up until the keel and box are in place.

Screw the big knee to the transom. Set the keel, with the centerboard box fastened to it, on the frames. Clamp it down, and bolt it to the stem. Screw it to the transom knee, and screw or bolt it to each floor timber. Drill for all screws, and soap the threads. The oak is so dense that you can twist a screw in two pieces if it drives too hard. Then it is quite a task to get the inner piece out.

Fit the chines. Fasten them to the transom, stem, and each frame. One screw per frame is enough. Plane the bottom edge of the chine so that it is fair with the bottom frames and forms a fair surface for the planking to rest on. This is an important watertight joint, so take your time. Fasten the chainplates to No. 2 frame. These must go on before the side planks.

The side planking can be put on next. The shape of these pieces is shown approximately on the layout of the plywood sheet, but do not

rely on this for cutting. Make some kind of a pattern and fit it to the sides of the boat before you cut the expensive plywood.

Furniture dealers often have very large sheets of heavy cardboard which are used to protect mattresses or furniture, and they will give you these for the asking. They make good patterns for plywood parts. Fit the pattern to the frames, then mark and cut the plywood, allowing something for fitting and smoothing the edges—say about $\frac{1}{8}$ " all around.

Clamp the plywood in place, mark where to cut off a little, cut and try until it fits everywhere. Clamp and mark for screws, take off, drill for screws. Use $\frac{3}{4}$ " No. 7 or 8 Everdur screws. *Do not countersink* for the heads, but pull the heads in flush when screwing them in. Use seam compound in the joint. Plane off the edge fair with the chine. Paint the plywood edge with sealer. Waterproof glue may be used instead of seam compound if you wish. It adds to the strength of the boat, and stays tight. The author has a 13' sailboat that is built this way. She is 11 years old, and the glued seams are still tight and strong. She has no leaks on glued seams.

Next come the bottom planks. Fit these the same way as the sides, using a pattern and the "cut and try" method of fitting. Screw them on, and finish the edges.

At the bow the bottom planks bend a bit hard. If you think they will break, very hot watersoaked towels or rags will relax them sufficiently to bend them without trouble. Fasten the bow end first, then work along towards the stern, keel side first, then chine. Screws are $\frac{3}{4}$ " No. 7 or 8, at about $2\frac{1}{2}$ ".

Paint plywood edges with sealer, and when dry put on a priming coat. Sand the planking and paint. If you are going to use copper paint on the bottom, put the copper right on the bare wood. No undercoat.

The hull should be ready to turn over. Let go the floor fastenings, and turn her over. Rest her on a couple of horses, making suitable braces to hold her upright.

The clamps should be put in now, if you did not put them in before you put on the side planks. Slide them down into the notches in the tops of the frames, and fasten with screws from the outside of the boat. An extra long screw can be put in at each frame.

Make and fit the mast step. If the floors are the correct height, the step will come at right angles to the mast itself, making it easy to fit the bottom of the mast to the step. Fasten the step to the floors. Do not step the mast on top of the keel, but make a step as shown. A mast stepped right on the keel makes a very concentrated load on the keel at that point, and has started leaks in a good many boats.

Flooring can be put in next. This requires no special instructions. Where the flooring rests on the floor timbers, the planks are straightedge. Where it rests on the frames, the edges will not be straight, and the amount of curve will have to be determined by trial, unless you know how to spile the planks.

The deck beams are already on the frames, so that part of the deck framing is done. Complete the framing under the deck, making it all as rigid as you can. It will not seem very strong until the deck is on.

Before the deck is put on, it is well to finish the inside painting, as it is a crawl-under job later.

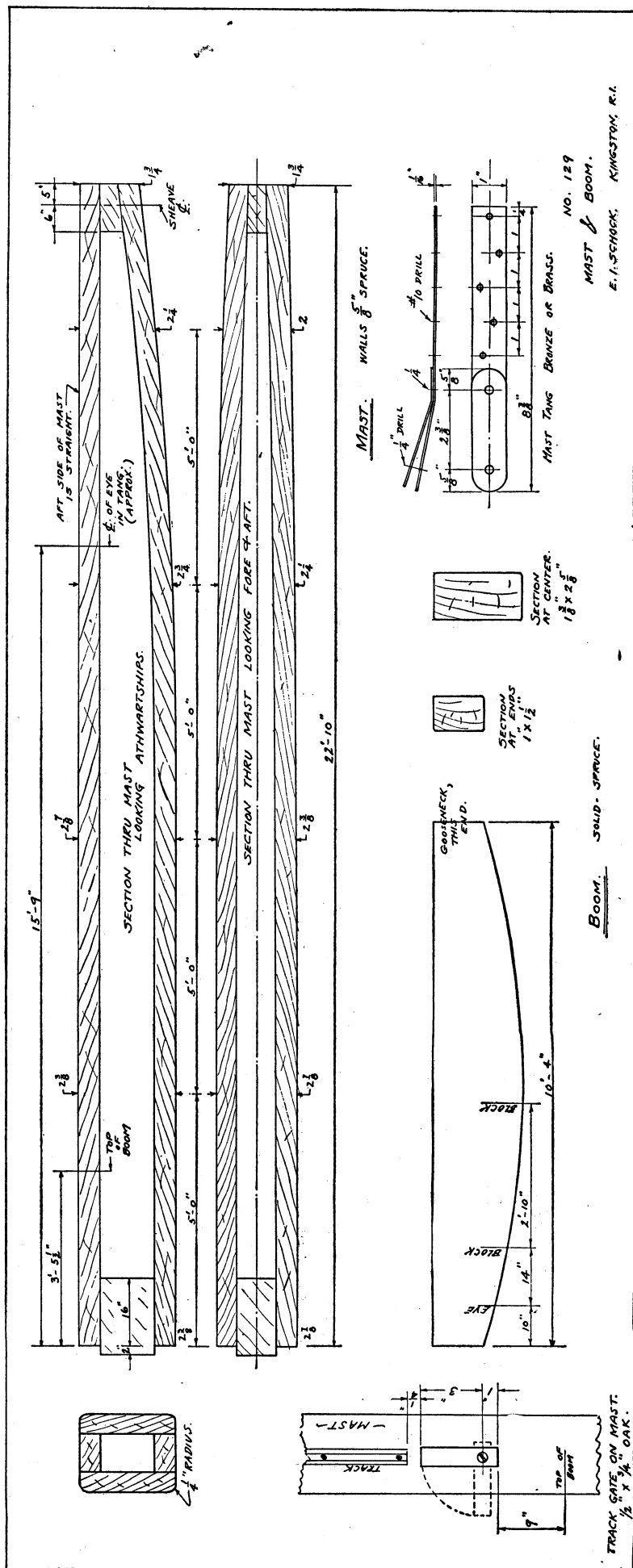
Fit the deck the same as you would the planking. Where a joint is necessary in the plywood put a butt-block under, well-fastened to each piece of decking. Spruce strips, $\frac{3}{4}$ "x2 $\frac{1}{2}$ " will give you plenty of room for two rows of screws. Stagger the screws, and do not get them too close to the plywood edges. Glue the joints. The fitting around the chainplates has to be watertight, and a thread of cotton wicking and some seam compound should do the trick.

Make and fit the coamings and chockrail.

Screw on the guard strips around the sheer, and make a cap for the centerboard box. Do not cover the opening with this cap, but leave room for removing the board through the top of the box. Install deck hardware, such as cleats and chocks. The traveler shown is of Merriman wire rope.

The rudder can be cut from a single piece of $\frac{7}{8}$ " oak or hard pine (southern yellow pine). Streamline the aft edge, bottom and forward edge underwater to a nice thin section. Get rudder fittings that will not allow the rudder to float off if you touch bottom, but allow the easy removal of the rudder by properly authorized crew members.

The tiller is arranged to hinge at the aft end and rest on a pin in the



This plan of Snowbird's mast is drawn on a condensed scale, showing the hollow construction. This spar is of $\frac{5}{8}$ " rift sawed Sitka spruce, preferably glued only; 6 penny galvanized finishing nails may be used in lieu of clamps in assembly.

rudder head. Using a wire rope traveler, the tiller can be lifted to pass it over your head as you shift sides when sitting on the bottom of the boat.

The centerboard may be made of steel, bronze plate, or wood. Wood is cheapest, and in most respects the best. It should be made of seasoned oak or hard pine using narrow boards. Dowels or bronze rods hold the pieces together.

Lay out the shape of the pieces to fit your centerboard drawing on the full-size plans, and mark on both sides of each piece a line to represent the centerline of the rods holding it together. Drill each piece for these rods. Bronze or galvanized iron, 5/16" diameter, threaded both ends will make these. The drilling can be done by hand or with a lathe or drill press or wood-boring machine. The machine methods are a lot easier and in most cases more accurate. It takes a good eye to drill or bore them by hand.

Glue the joints and clamp up with the through-rods. Keep the board flat. It will try to warp. Warping may be minimized by using good edge-grain stock, and reversing the grain in adjacent pieces. Looking at the end of the board, if one lift has grain sloping up to the right, have the next one show grain sloping up to the left. Also *narrow* pieces warp less than wide ones, and are easier to drill through.

The recess for the lead is bevelled all around so that the lead will be held in place without fastenings when poured. To pour the lead, make a sand floor big enough for the board to rest on. See that the sand fits tightly around the edges of the recess. Put heavy weights on the board to hold it down. Melt the lead and pour it into the recess, filling it a little above the top surface of the centerboard. Plane off smooth when cold. Lead planes easily and does not damage the plane.

Drill the holes for hinge pin, holdup pin, and pennant.

The underwater edges of the board should be streamlined to a thin edge.

When the board is up, the bottom six inches or so will be in the water, so paint this part with copper paint.

The mast is a box of 5/8" straight-grain rift-sawed Sitka spruce. This is available at lumber yards that specialize in boat lumber in long lengths. It is expensive, but you buy only a very small amount.

Make the two wide pieces for the sides, and the two narrow ones for the front and back from the dimensions on the mast detail. Have the edges smooth and square. Make the fillers for the top and bottom.

To assemble the mast you need a level bench, flat and all one plane (not warped), 3" wide or more, and 23' long. Since you are not likely to have such a mast bench, one can be improvised of sawhorses and a 2 x 4 or 2 x 6, carefully set up. Or you can use the floor in the hall or living room provided you remember the mast is there and do not trip over it. And be *sure* there's a way to get it out. If you use any finished surface, cover it with newspapers to protect it from glue.

Boatbuilders use no metal fastenings in these masts. They glue the pieces together and clamp the whole assembly with a great many clamps. Few amateur builders have enough clamps for the job (about 65 are needed) so nails may be substituted. This produces a good mast although it may be a little heavier.

Use 6-penny galvanized finish nails, driven about 2 to 2 1/2" apart to hold the joint tight until the glue sets. Do not try to remove the nails.

To assemble the spar, set the fore and aft pieces, the thin ones, on the mast bench or floor, on edge, about the right distance apart. Mix up a good supply of waterproof glue, and invite all your friends who are handy with tools to come help spread glue. The more help the better. If the glue sets on one end of the long joint while you are spreading the other end you are in trouble. The more help you have the faster you cover all the surfaces.

BRUSH glue on the two top surfaces with stiff brushes like tooth-brushes. Also put glue on the part of the side piece that forms the joint. Lay the top (side of mast) on the pieces on the bench like the lid of a box and nail from the butt end towards the top. Have a helper sight along to see that you are keeping the mast straight along the aft edge. A chalkline or other guide on the bench will help to keep the mast straight. Keep the edges flush. The glue will make the pieces slippery. A wet towel handy will keep your fingers from becoming completely glued together.

When all nailed turn the box over, put in the end filler blocks;

spread glue on the other edges and other side piece; glue and nail the opposite side into place.

As anyone can see, the difficulty in using this method is that the mast is not clamped rigid at any time, and it can easily be glued up curved instead of straight. The final result, however, is not bad if you are careful.

As soon as the nailing is all done, rest the mast on the bench with the back side down, and clamp it there in a straight line using a tight string for a centerline to check it for straightness. Weights will have to be used for clamps if you are working on a floor.

The boom is simply a rectangular section spar, straight on top and tapered towards the ends on the bottom and sides. Any smooth curve will do for the bottom. Spruce is probably the best material, but West Coast cedar makes a nice light boom, and looks well when varnished.

To rig the boat, have the stay and shroud assemblies made by Merri-man Brothers Co. or someone else who does that kind of work. The headstay is 14' 3" long including the turnbuckle, and the shrouds are each 14' 9", including the turnbuckles. Before you fasten the tangs to the mast, clamp them in place and put the mast in the boat. Try the shrouds and headstay length, and note how much, too long or short, they are.

Re-clamp them in the right place, and try again. If all is well fasten them. To make the tang fastening as strong as the wire stay will require one 1/4" bolt through the mast, and five No. 10 roundhead wood screws into the mast wall—3/4" No. 10 roundhead Everdur screws will be suitable. Stagger the screws so they do not come in line along the grain of the wood, as shown on the tang detail.

Cut the mortise in the masthead for the halyard sheave, and drill for the pin. Put on the cleat and gooseneck. The track should have a little stop of some kind to keep the slides from coming off the top, and a gate at the bottom. This can be simply a piece of oak about 1/2"x3/4", 4" long with a hole in one end for a screw. Swing it up to keep the slides on, and crosswise to take them off.

Put on the boom hardware—track, gooseneck, outhaul and blocks.

With a final painting and a last check-up for fittings, she should be finished.