

Distributed for free at PDRacer.com, by permission from Kristofer J.  
"Harley" Harlson

Sailing is for Everybody with the  
"HARLEY 8" the ULTIMATE "One-Sheet"  
of plywood Sailing Craft!

### INTRODUCTION:

You hold in your hands, instructions for building the most ingeniously designed small dinghy in the world today. I know, because I'm Harley, and I designed her. I HAD to design her because I was infatuated with the idea of a real sailboat built from a single sheet of plywood. Believe me, it was NOT my idea! The fact is, I spent countless hours searching libraries and the World-Wide web for the boat I wanted and it could not be found. Don't get me wrong, it's not that there weren't one-sheet designs out there. In fact, I found many such designs, in a myriad of configurations, from simple boxes to 18-foot long canoes, all designed to be built from a single sheet of plywood.

Why didn't I build one of those? Because I found nothing but examples of guys sitting in boats with six inches of freeboard! The problem is, if you make the boat wide enough to possess any stability, there's just NOT enough plywood left for the nice deep sides I wanted.

1.

Those designs blessed with freeboard were too short of a boat for my tastes and in addition, the sides and bottoms were full of butt blocks! I thought to myself, "Butt blocks in a boat that is less than the length of a piece of plywood?" I could forgive butt blocks when the boat was considerably longer than available timber. I just didn't think they had any place in such a small boat! There just had to be a better way! But after studying all the designs I could find, I just couldn't figure it out! It seemed everything I thought of had already been tried, yet, I could not abandon the idea, that somehow, it could be done.

I wanted a boat that was nearly as long as a sheet of plywood and nearly as wide as well, a rather tall order for a single sheet. Of course, I also wanted the sides to be higher than a foot along their entire length and I wanted the sides and the bottom to be free of butt blocks. At the same time, I still insisted the hull be built from only one sheet of plywood.

Sounds impossible doesn't it? Well guess what? I did it. Enter the "HARLEV 8" - the only boat that fits all of the above criteria!

I drew her with sides that were 16 inches high at the bow and 13 inches at the transom so that she would have plenty of freeboard. Then, I designed the BOTTOM to be built with the plywood that was left over. This meant dividing the bottom in half lengthwise with the keel joining the two halves. It also meant that the boat would have a narrow bow and be wide aft like the early catboats.

This was a design that suited me very well as it meant that balance would be kept fore and aft with the pilot sitting toward the rear with the tiller. Perfect! I had always noticed that small dingy sailors, like those who raced El Toro's, were forced to sit in the middle of the boat to keep it balanced. This meant always reaching behind yourself to grasp the tiller. Having sailed El Toro's, I knew that I was not comfortable for very long with that arrangement. Having HARLEY B's breadth aft made a lot of sense to my way of thinking.

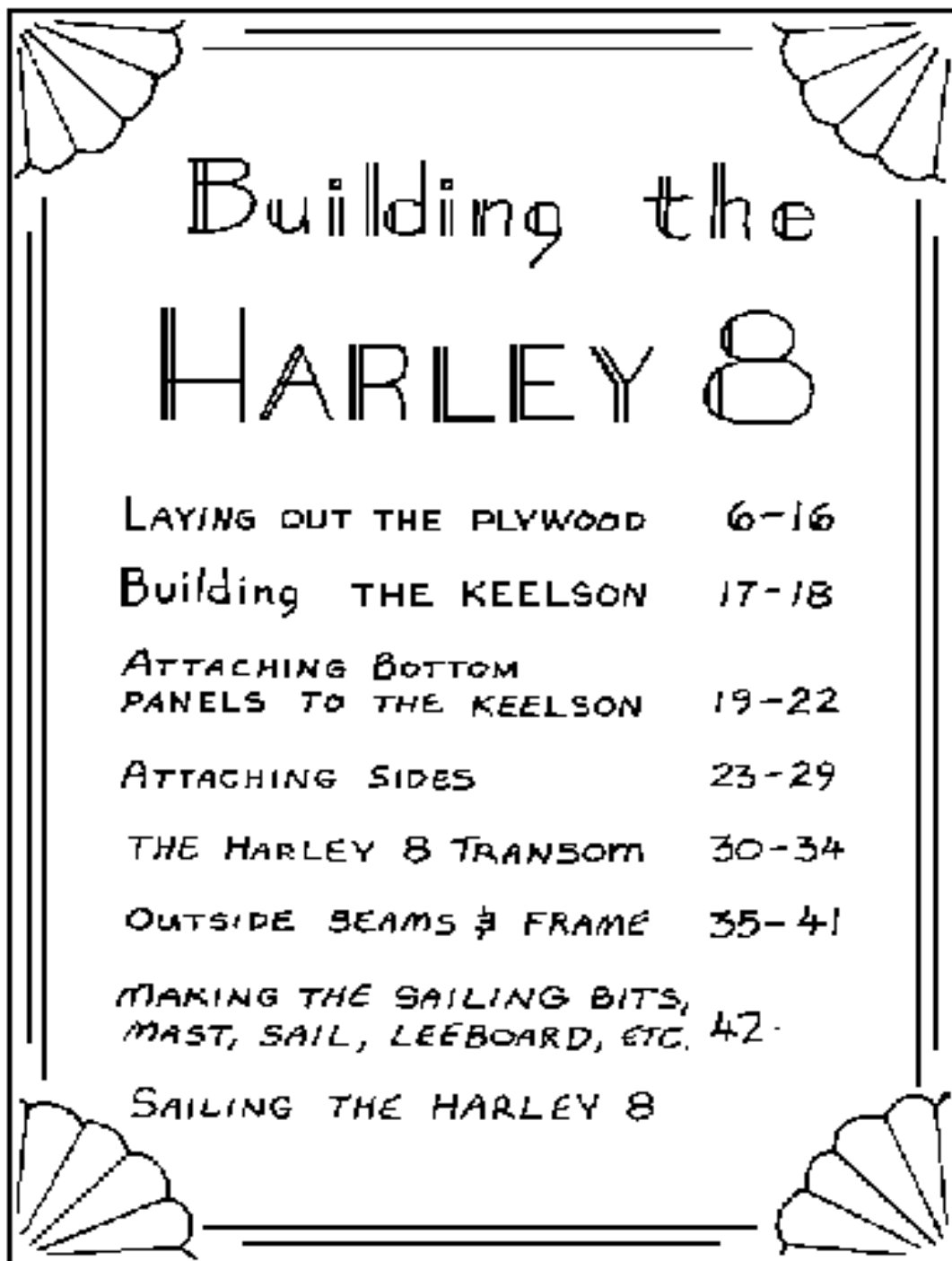
Another nice thing about dividing the bottom in half with the keel was that it allowed me to treat "HARLEY B's" bottom a little like a V-bottom and impart some curvature so that she wasn't so flat-bottomed.

In addition, having most of her girth aft meant that it naturally created a bottom with most of its rocker aft. I've noticed that many of the Sharpie hulls drawn by Phil Bolger, Matt Layden, and others were also designed that way and so I thought it put HARLEY 8 in some good company.

I designed her to be built with the stitch-and-glue method, but she could easily be built with internal chines as well. Using stitch-and-glue, she went together well and I am delighted with the way she looks and sails. She's a simple and affordable little boat that anyone should enjoy; a true folks-boat!

Please read through the entire instruction manual before you begin to build your boat. It could save some headaches later even if you've built boats before.

4.



Building the  
**HARLEY 8**

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5.

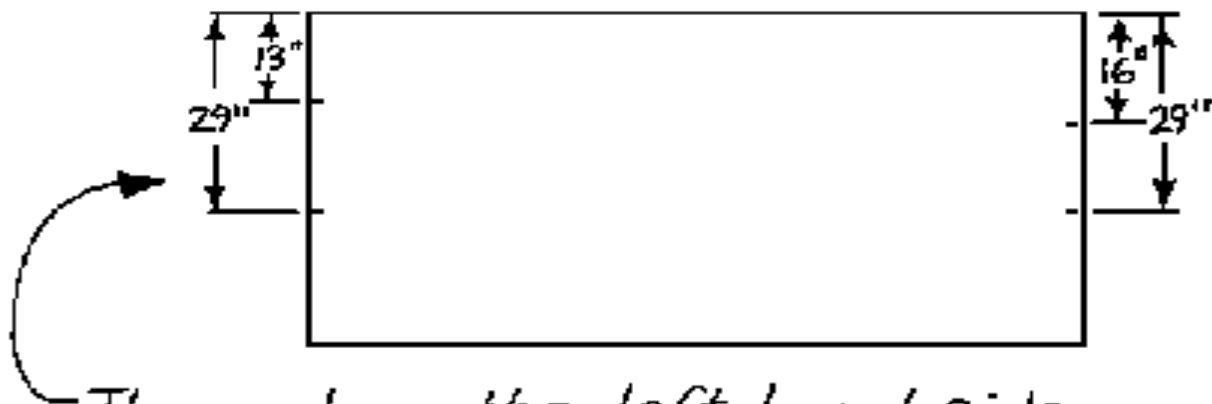
Laying out the plywood.....

One of the delightful attributes of the "HARLEY 8" is that she requires a minimum of lofting. Once the pieces are cut out, she goes together very easily.

Here's how to do it.

First, lay out your 4x8 sheet of plywood lengthwise, ie, the top is one of the 8-foot sides. If your plywood has only one good side, put the pretty side facing up.

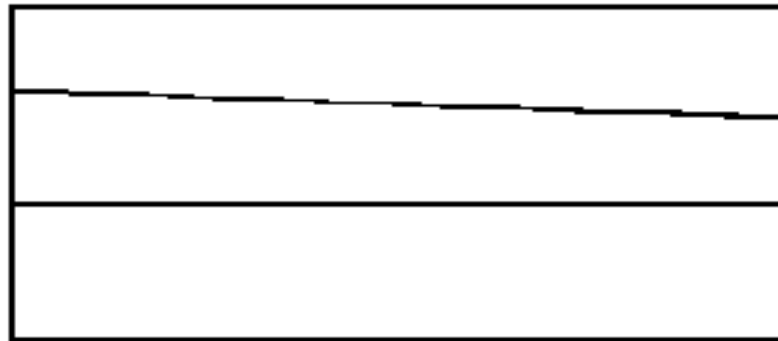
Along the right-hand side, make a mark 16 inches down and another 29 inches down. (or 13 inches beyond your first mark.)



Then along the left-hand side, make a mark 13 inches down and another 29 inches down. (or, 16 inches below your first mark.)

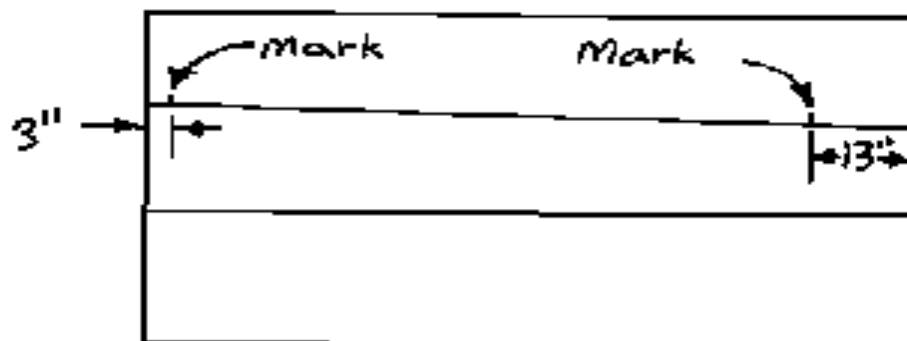
6.

Now, using an 8-ft long timber as a straight edge, (we used one of the keel timbers.), connect the marks with two straight lines as shown below.



The top two sections will be used to make our two sides and the bottom section will be just enough to create the two halves of the boats bottom.

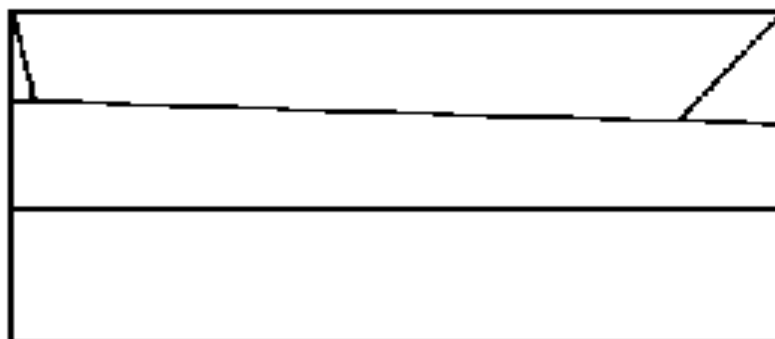
Now, make a mark on the top line that we drew, 13 inches from the right-hand side and another mark 3 inches from the left-hand side.



7.

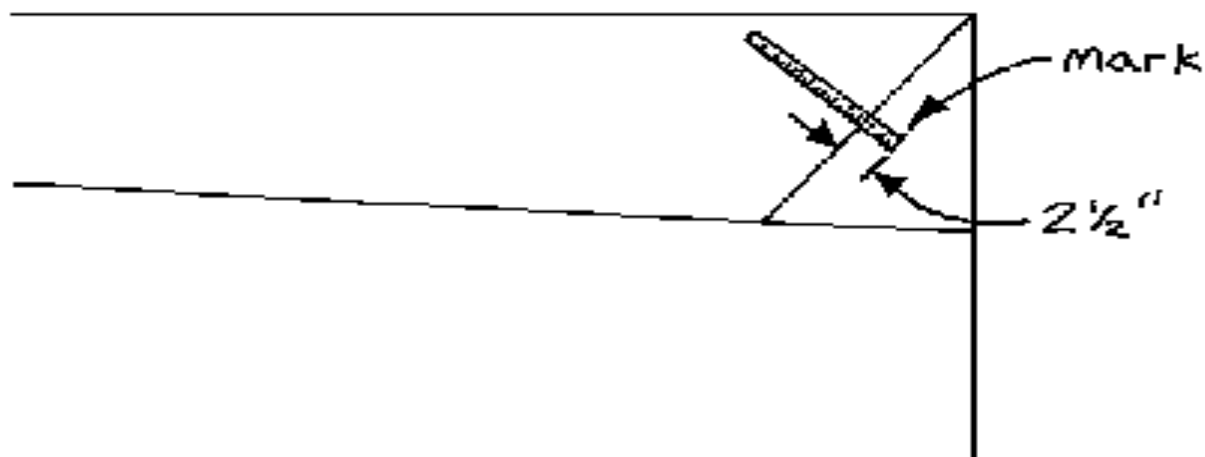


Then connect those two marks to the top corners as shown below.



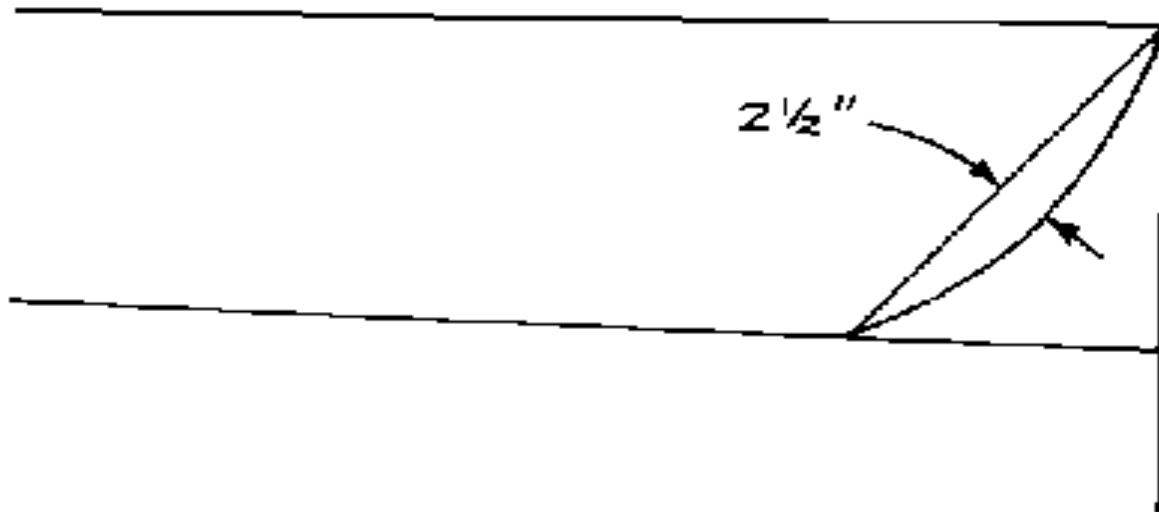
Now you can see our starboard side taking shape. All that's left is to draw our curved bow. Let's zoom in a little closer to the bow end on the top right corner of our plywood sheet.

Move a ruler or tape measure about half way down our diagonal line and make a mark  $2\frac{1}{2}$  inches to the right of it as shown below.



8.

Now, let's make that mark the apex of a curved line as shown below. This can be drawn freehand if you're good at that sort of thing. Many may find it easier to bend a yardstick or other thin piece of material in place and draw against its edge.



Now, it's time to go ahead and cut our starboard side out. You will need to cut right on the lines so you may find it helpful to use a skilsaw or bench saw to make the long straight cut. A jigsaw is handy for the rest. Here's what our side panel will look like cut out.

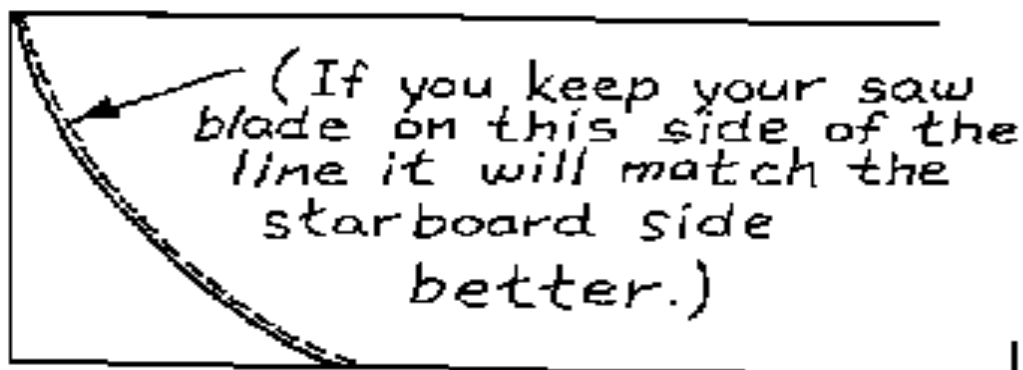


9.

Remembering that we've got the sanded and finished side up, and that we'll want the good side to face the outside of the boat, let's flop our newly cut starboard side over, place it on our port side panel, and simply trace the bow and transom lines onto the rest of the plywood sheet as shown below.



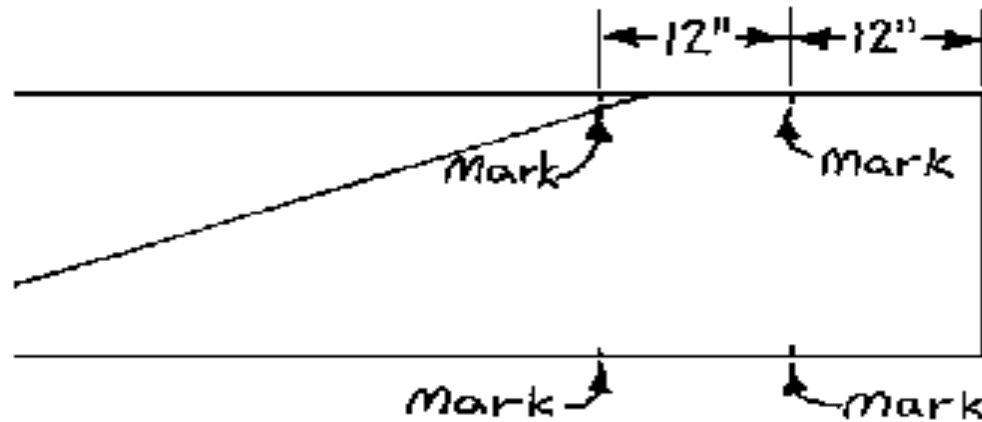
Then go ahead and saw that side out. You'll want to make the long cut right on the line, but since we traced the bow and the stern cuts, make those cuts on the inside of the lines



10.

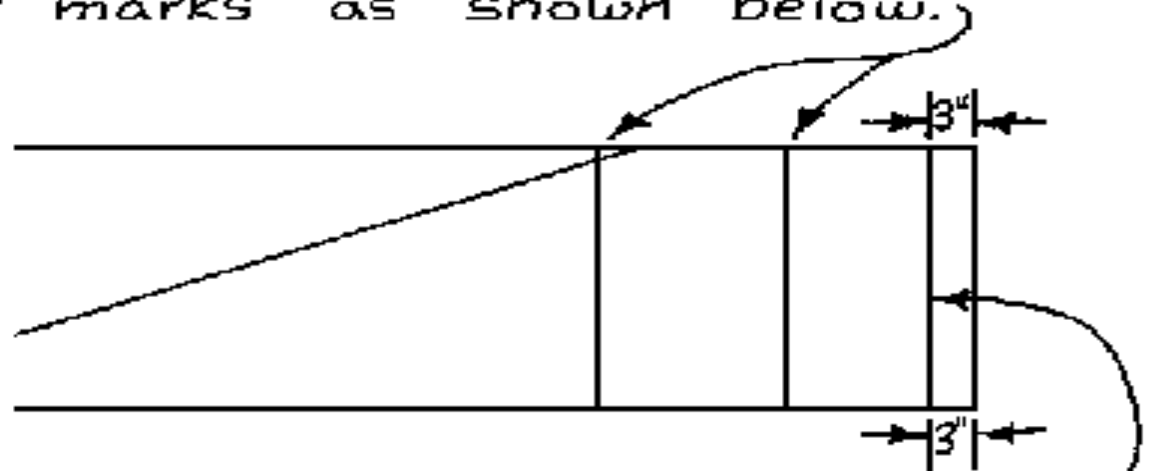


Let's zoom in again. First, let's make two marks along the top right edge, spaced 12 inches apart as shown below.



Then make two identical marks along the bottom edge as above.

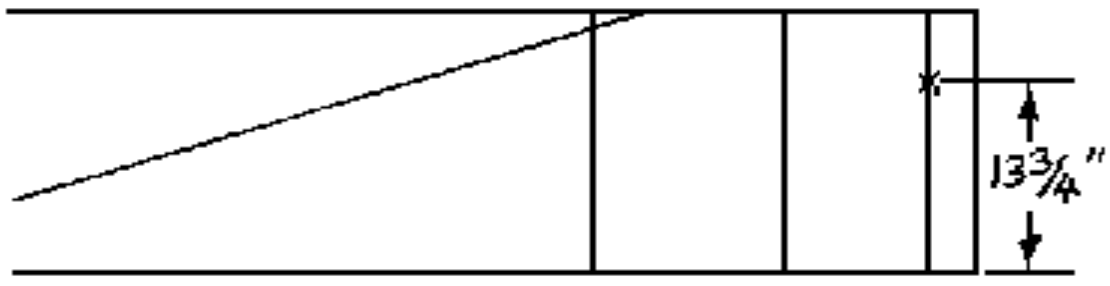
To make the next part of the "lofting" process easier, let's go ahead and make lines to connect our marks as shown below.



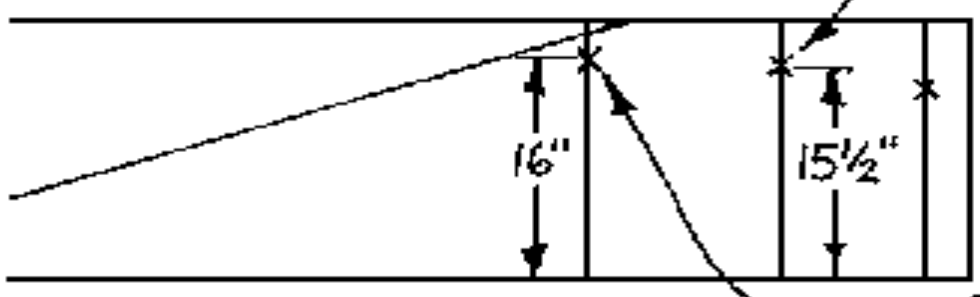
Now make another vertical line 3 inches from the right edge as shown above

12.

The three lines we just drew are strictly reference lines. On our first reference, located 3 inches from the right-hand side, make an "X" mark exactly  $13\frac{3}{4}$  inches from the bottom of our plywood as shown below.



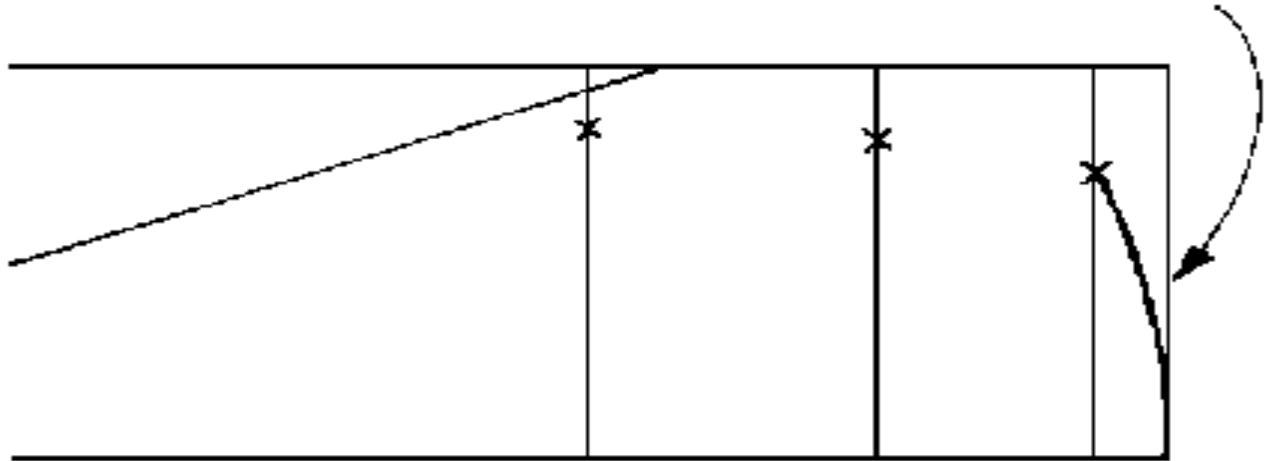
on the next reference line, make an "X" mark  $15\frac{1}{2}$  inches from the bottom edge of the sheet.



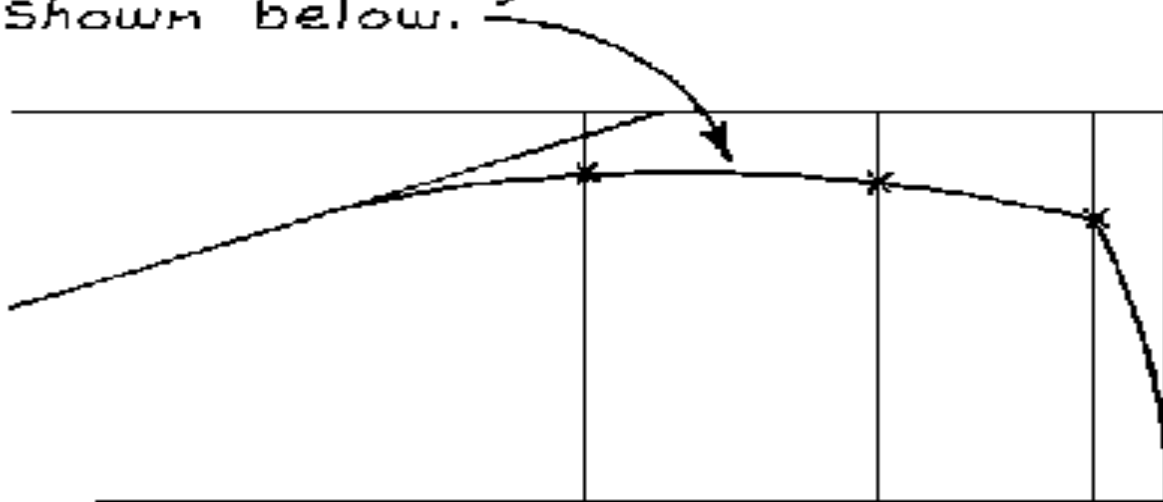
and on the 3<sup>rd</sup> reference line at 16 inches

Now, let's zoom in a little closer.

Using a yardstick or other flexible batten, draw a curved line from our "X" mark on the far right, to the bottom right corner as shown below.



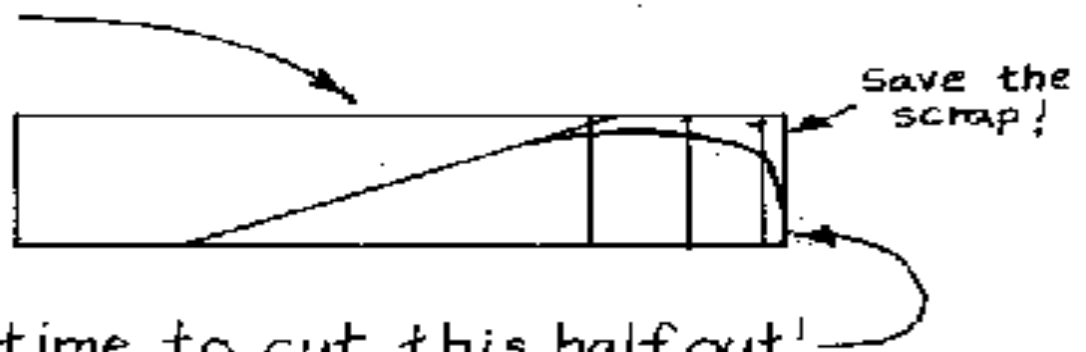
Now take our flexible yardstick or batten and connect all three X's with a curved line that continues on to the left to connect with our diagonal line as shown below.



14.

You've now completed drawing one half of the bottom. (We don't know which half yet! I'll explain that a little further along the building process.)

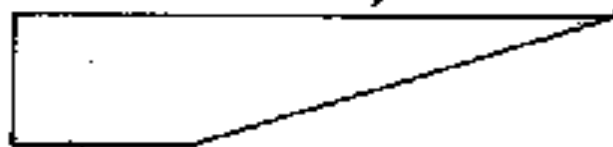
Our 19 inch X 8 foot plywood sheet should now look like the sketch below



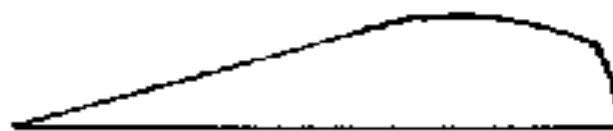
It's time to cut this half out!

Notes: the diagonal line is the most critical cut. You'll want to keep your blade centered on that line when cutting out your first bottom half!  
ie: divide your sheet in half by cutting the diagonal line, then you can cut your curved lines.

You should now have one piece that looks like this,



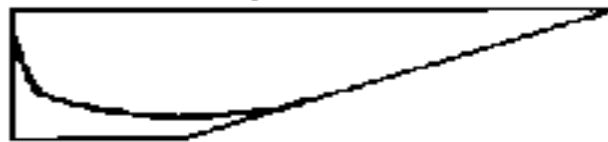
And your completed bottom half.



15.

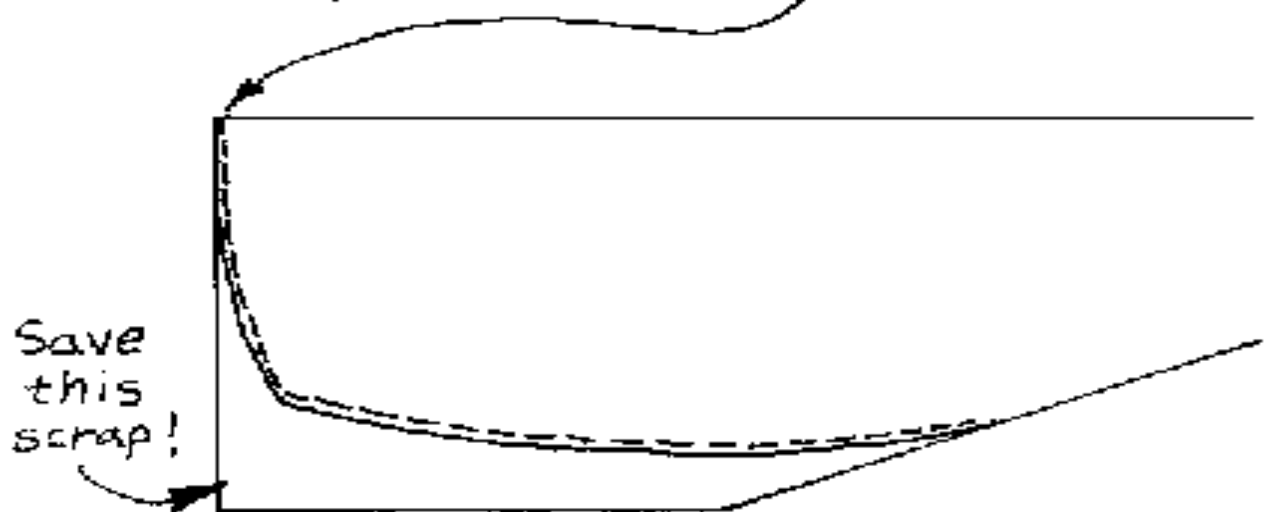


Now, rotate your completed half 180° (do not flip it over as we did the side) and place it directly over the top of your other half so that it looks like this



Yep, trace your curved lines onto the other half and cut it out.

Remember, as we did with the side panel we traced onto, keep your sawblade on the inside of our traced lines

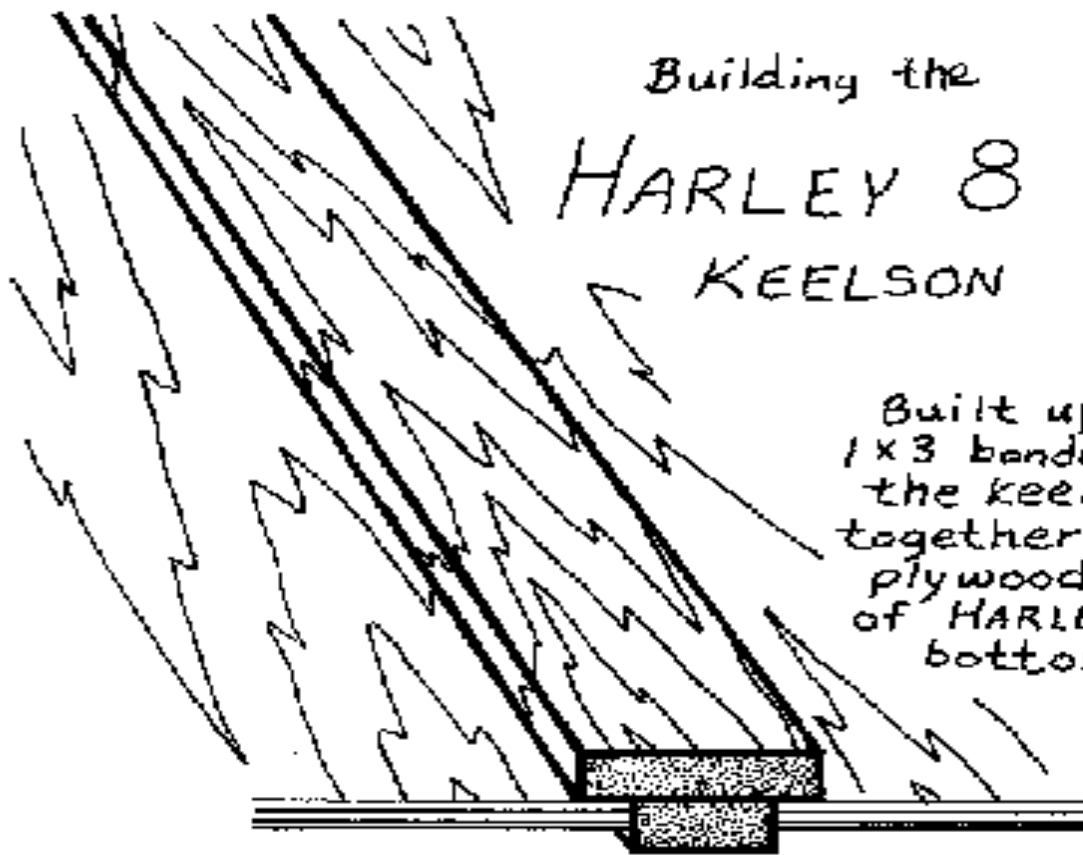


You're now finished cutting out ALL of your plywood for your "Harley 8"

**YEAH BABY! You Rock!**

16.

Building the  
**HARLEY 8**  
KEELSON



Built up from a 1x3 banded to a 1x2, the keelson ties together the two plywood halves of HARLEY 8's bottom.

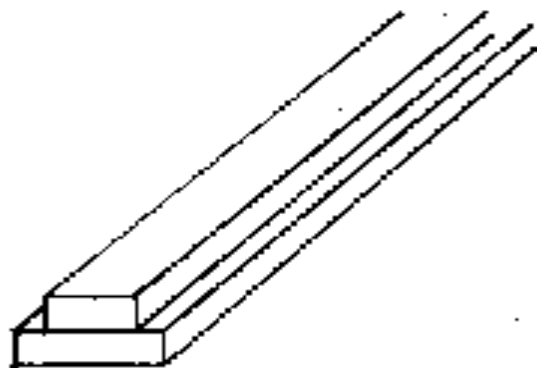
HARLEY 8's keelson is truly the secret to the whole design. It is the key to our ability to build a hull with lots of freeboard and with no buttblock or scarfs in the plywood.

In actuality, HARLEY 8's keelson IS a buttblock of sorts, as it ties together two pieces of plywood to form a larger piece. It's just that because it runs fore and aft instead of sideways, I get to call it a keel! (A matter of symantics.)

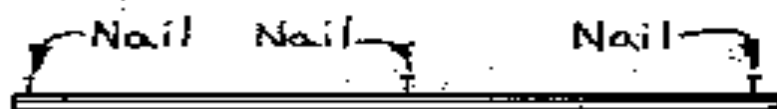
17.

Actually, to begin building the keel is to begin building the boat. That being said, let's get started.

The first step is quite simple. Take your 8-foot 1x2 and lay it atop your 8-foot long 1x3. Center it well with 1/2 inch of the 1x3 sticking out on each side as shown below.



Next, let's tack it there very temporarily by driving a 1/4" or 1/2" nail part of the way through each end and another in the center. Leave the heads of the nails protruding well above the 1x2 as we're going to want to be able to remove it quickly. You'll soon see why.



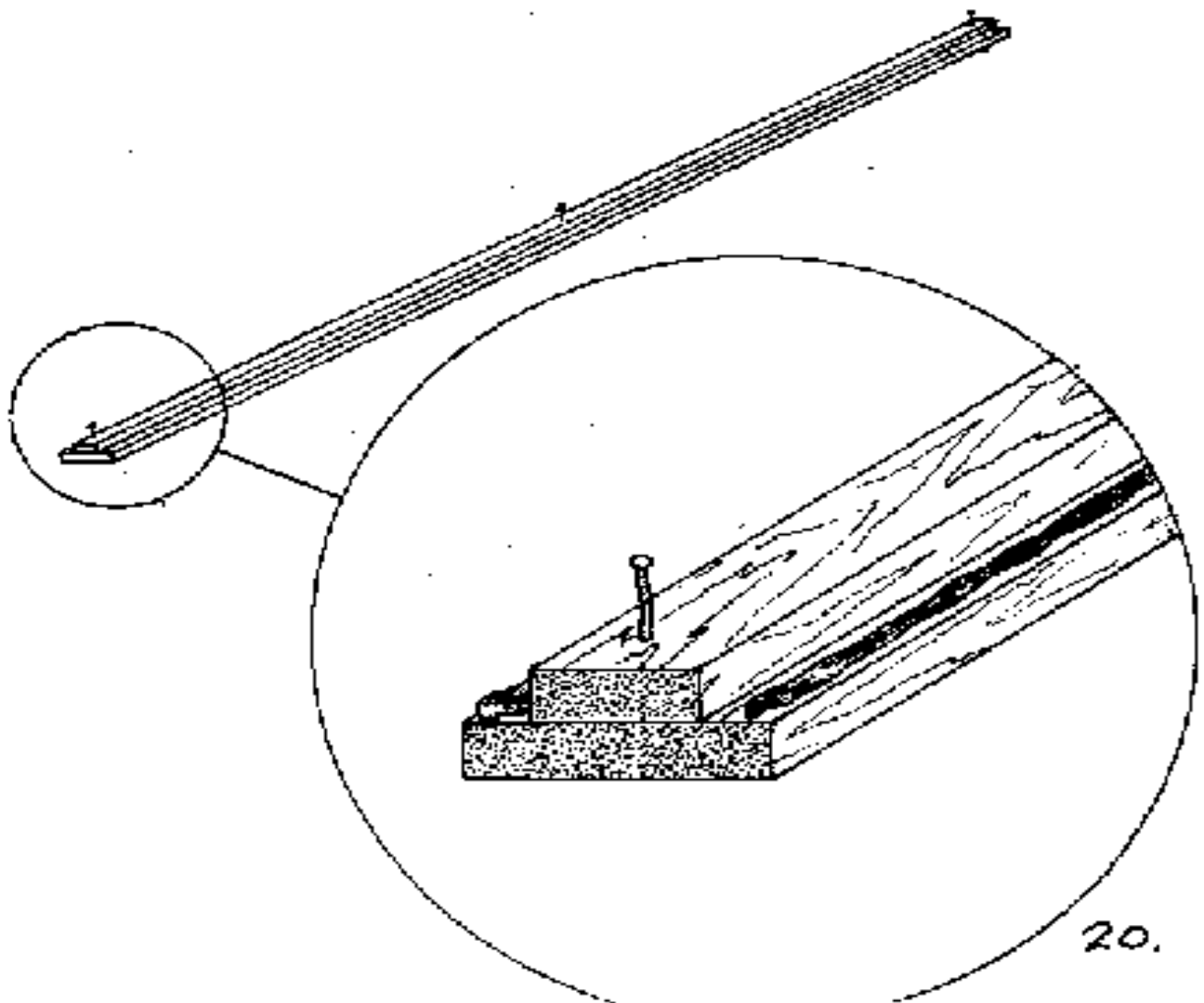
If you'll remember, on page 15, I told you that we weren't sure as yet, which bottom panel we had cut out first. Here's why.

Unlike the sides, where we were able to plan to have the good side of the panels facing outward, we didn't have that luxury when we created the bottom panels. Of course, this only applies if we are using a plywood sheet with only one side finished and sanded. If, on the other hand, we are using a high quality marine plywood with both sides finished, it won't matter much. Conversely, if we are using really poor-quality sheathing grade plywood, where neither side is finished, it won't matter much either.

I'm going to assume we are using ACX with only one side sanded. If that's the case, you are now going to want to inspect both sides of your two bottom panels and figure out which "bad" side is the better one and put that side facing the water. You might want to mark the two "good" sides in pencil so you don't get confused.

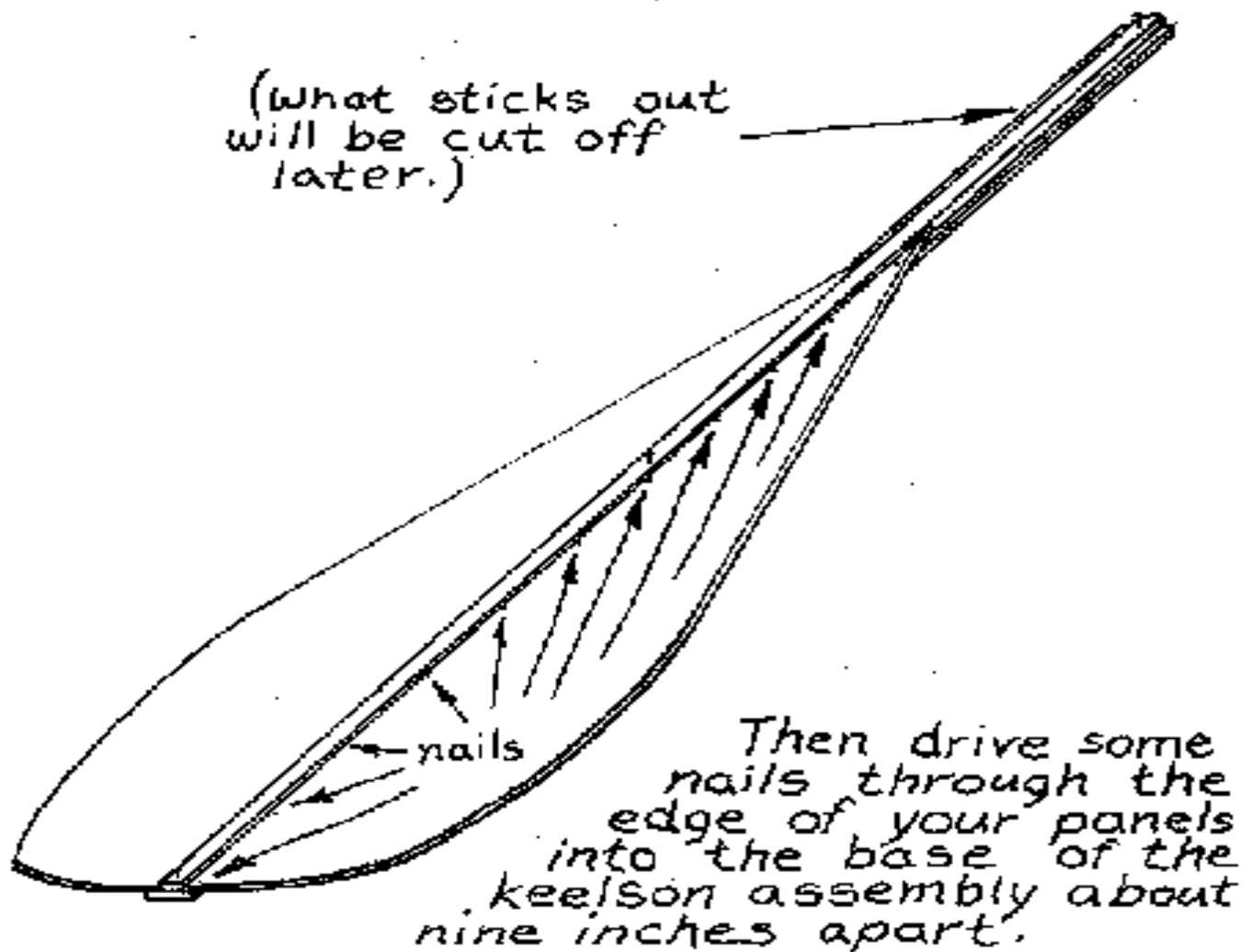
19.

We are now going to attach our two bottom panels to the keelson. Lay your keel assembly on a flat surface with the thinner timber facing upward. Now, coat the 1/2 inch surfaces that are sticking out with a bead of PL Premium Construction Adhesive (or your favorite waterproof adhesive) as shown below.



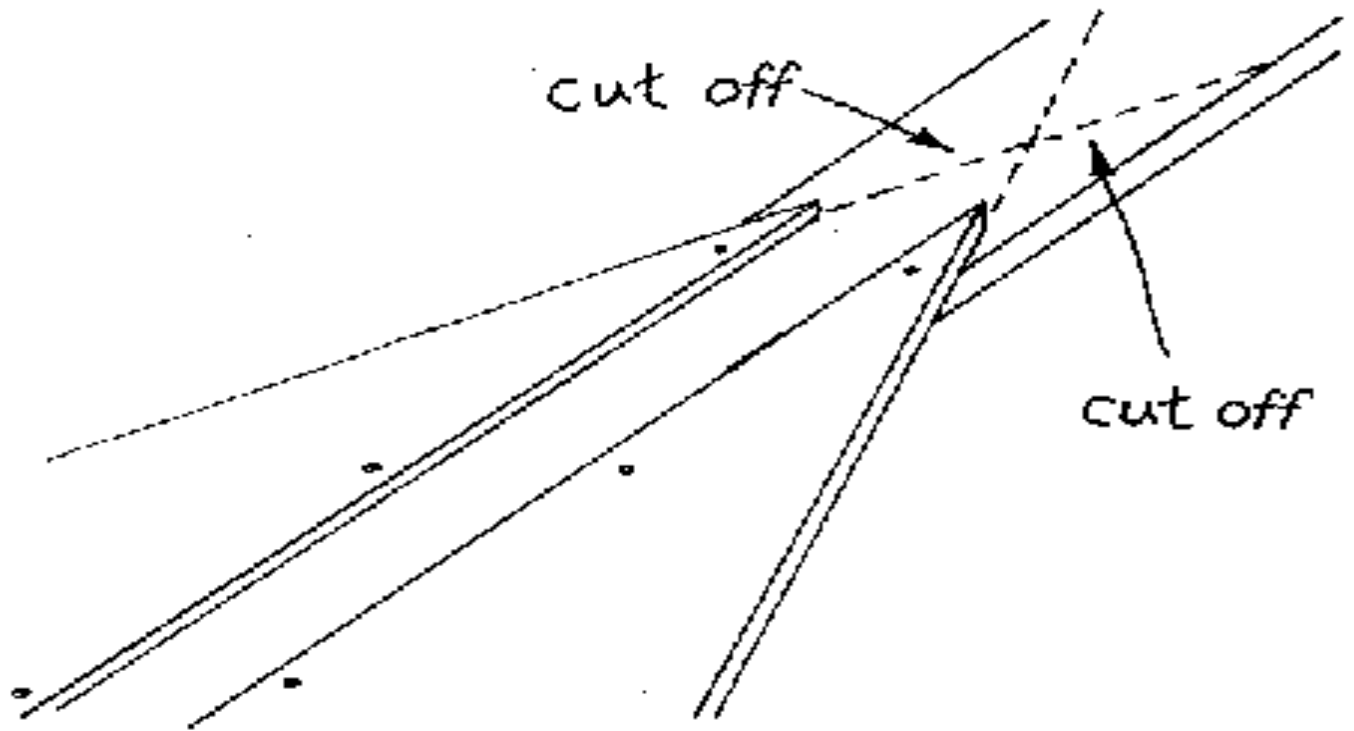
20.

Take your bottom panels, and with the "good" side up, lay them along your beads of glue as shown below.



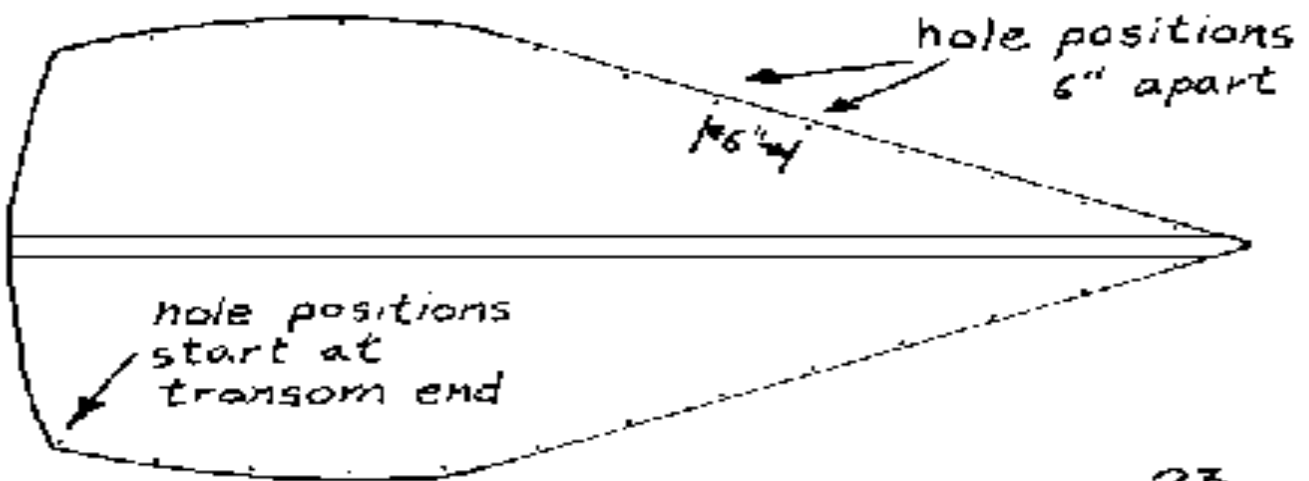
Now, before the adhesive begins to cure, remove the three nails holding the 1x2 in the center and remove the 1x2 and quickly remove any adhesive from it. 21.

Now it is time to cut the end off the keelson at the bow. To do this, we will continue the angles of the side panels to form the point at the bow as shown below.



We will utilize the "stitch and glue" method to attach our side panels to the bottom assembly. It is basically like "sewing" the sides on the boat with loops of wire.

To begin, start drilling holes with a small drill bit, (we used a  $\frac{3}{32}$ nd) at six inch intervals beginning at the transom end of the bottom assembly. It is important to drill your holes at exact 6 inch intervals because it will be much easier to duplicate the hole pattern on the side panels that way. You may find it helps to mark all your hole positions with a pencil first before you start drilling.



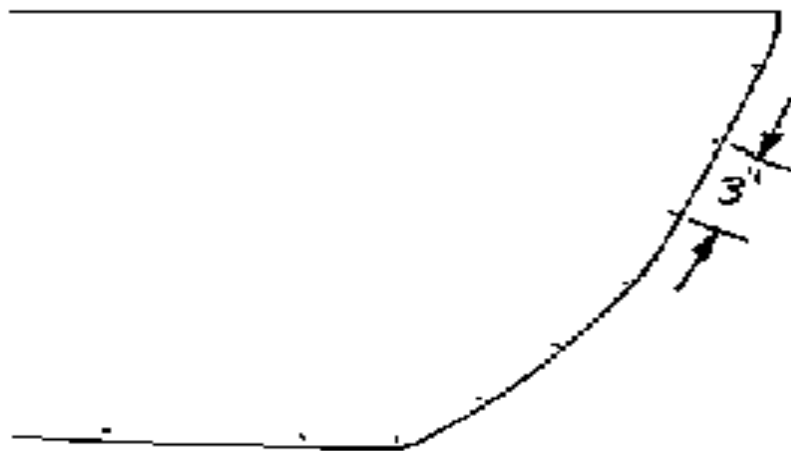
23.



Once all your holes are drilled in the bottom assembly, you will need to drill a matching set of holes into your side panels. Again, as you did with the bottom, start your holes at the transom end, spaced exactly six inches apart.



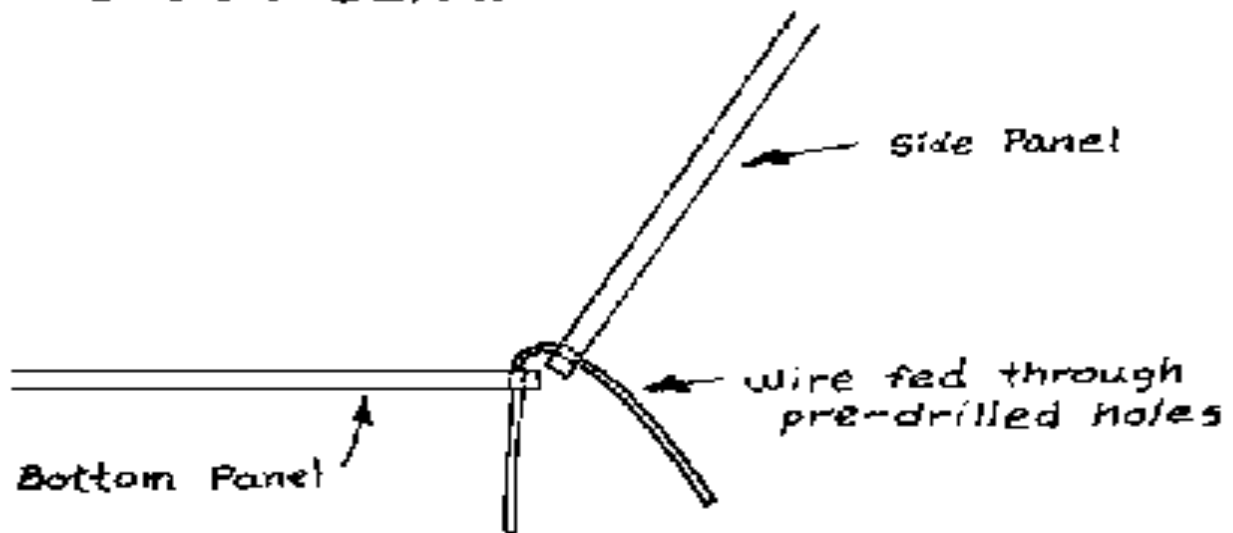
When you've drilled holes all the way up to the bow, we will change our hole pattern. For the curved section of the bow, we will now want the holes drilled 3 inches apart.



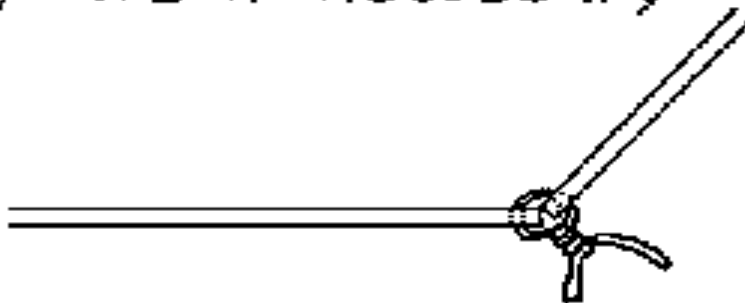
24.

Time to start "sewing" our boat together. Cut a bunch of short lengths of wire about three to four inches long. We'll start with either side at the transom end and work our way toward the bow.

Begin by feeding one of our short pieces of wire through the first hole at the transom end of the side and then through the first hole in the bottom as shown below.

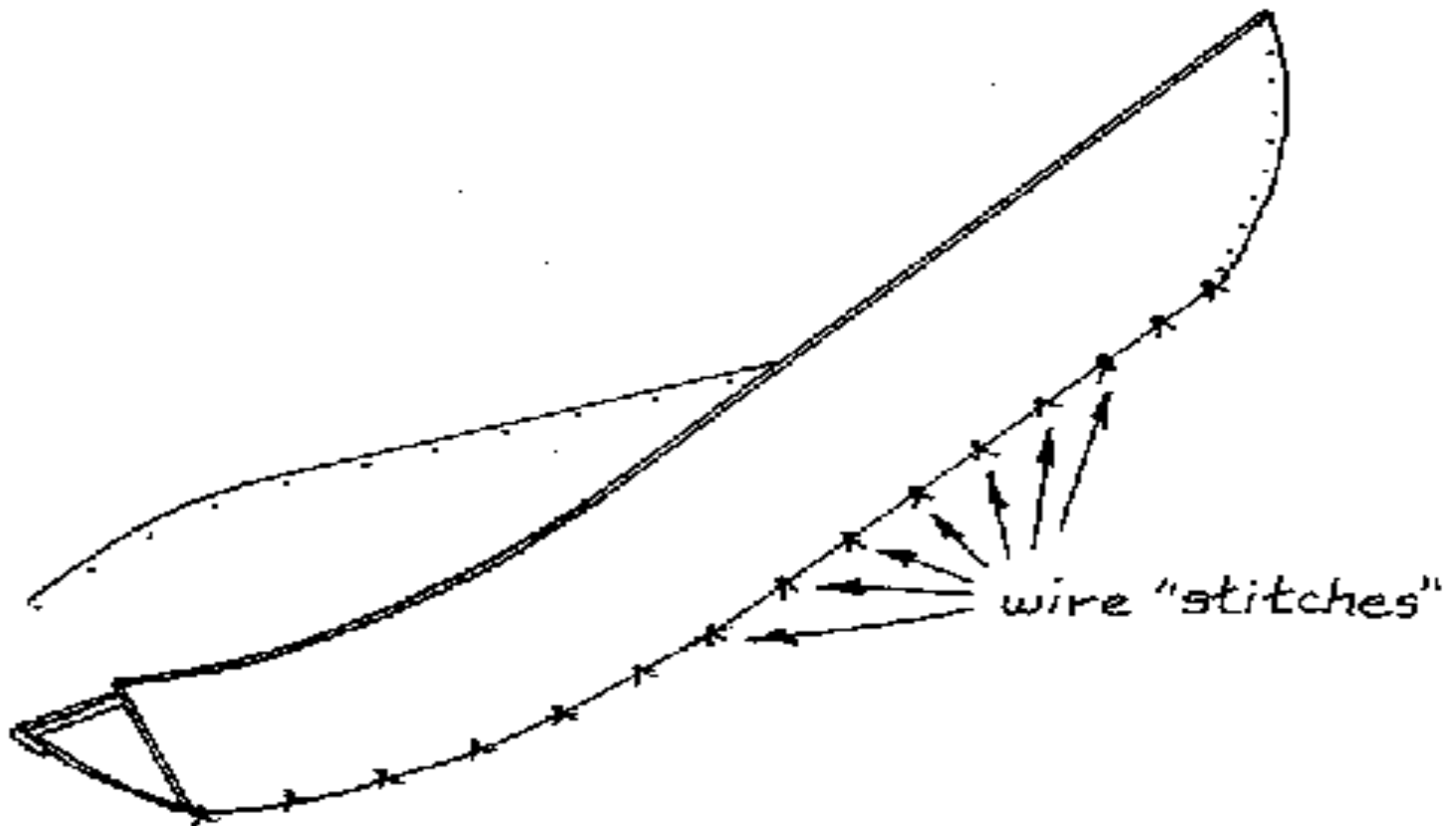


Then twist the ends of the wire together, tightening with a pair of pliers if necessary.

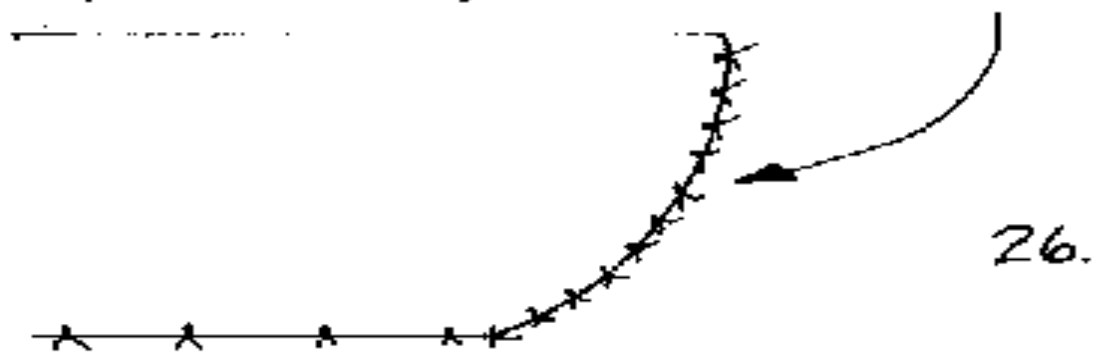


25.

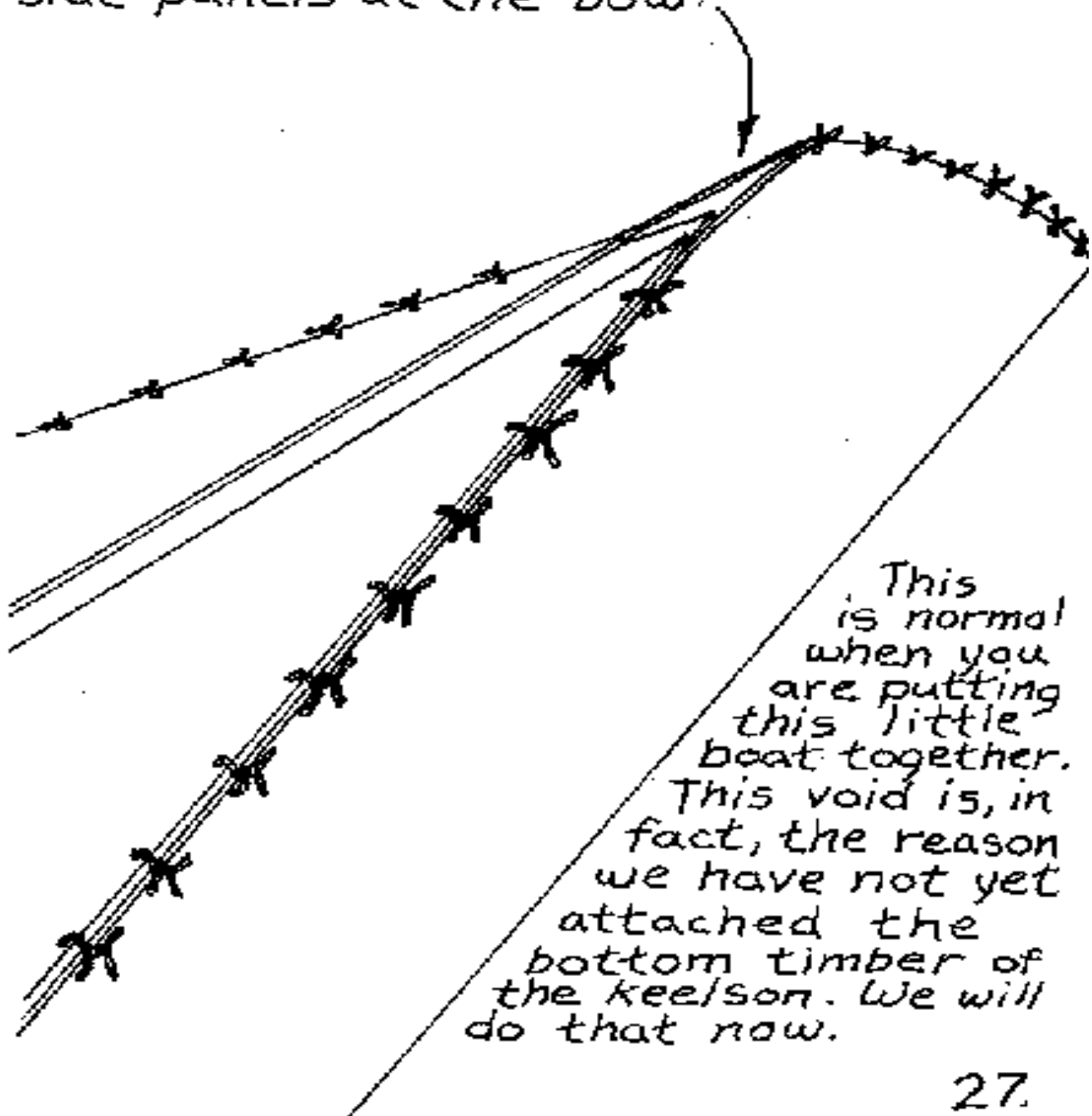
Continue "sewing" your side panel to the bottom panel until you reach the bow. Then repeat the process with the other side panel.



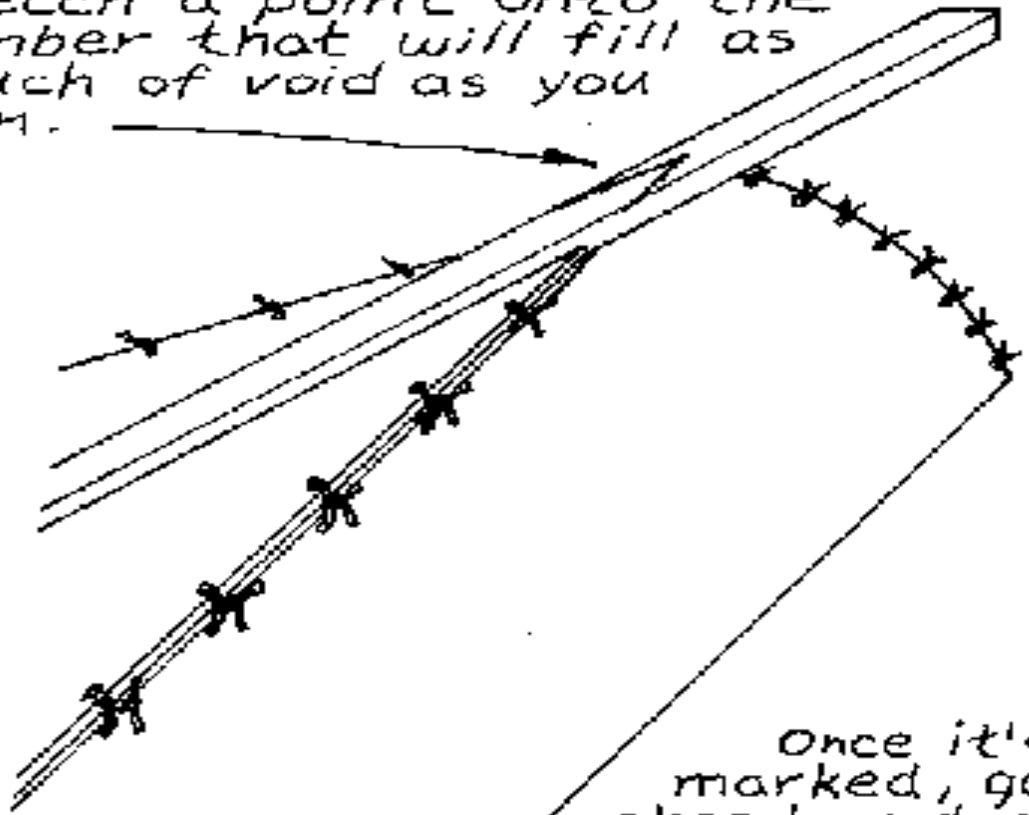
When you reach the bow with the other side panel, "stitch" the two side panels together at the bow.



When you attached the side panels, you noticed that there was quite a void where the bottom assembly meets the side panels at the bow.



Lay the bottom of the keel in the groove between the two bottom panels where it once temporarily resided. Then take a pencil or other marker and sketch a point onto the timber that will fill as much of void as you can.

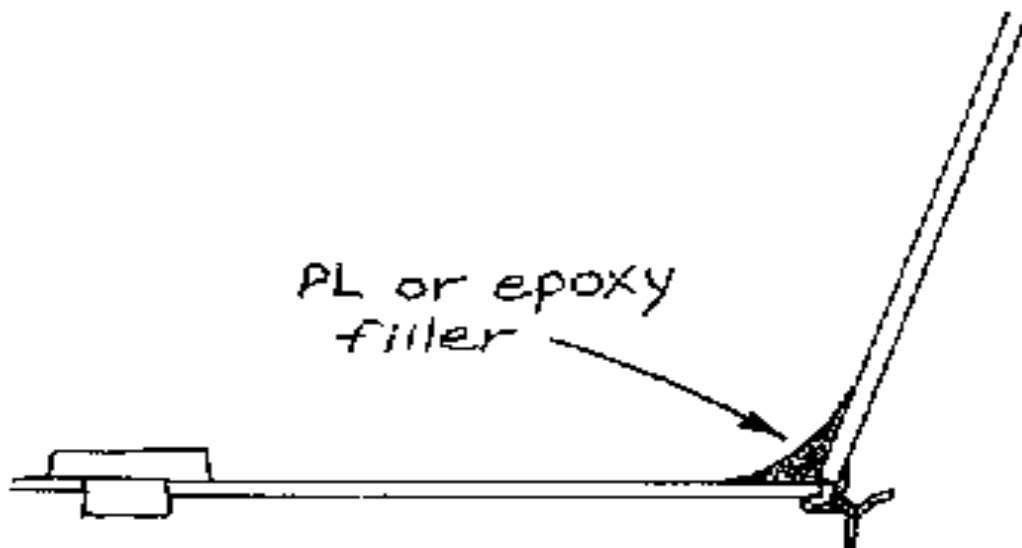


Once it's marked, go ahead and pull it off again and cut the point into the bottom timber with your jigsaw. Any remaining void we can fill with either our PL Premium or with an epoxy or other void-filling waterproof filler.

28.

This is a great time to glue the rub rails along the top of the sides. Now you can go ahead and glue and nail the timber in place.

Turn the boat back over and squirt a thick bead of PL Premium into the "stitched" together seams in both the bow and where the side and bottom panels meet. Then take a plastic spoon or other curved implement such as a wooden ice cream spoon and work the PL Premium into a nice radius as shown below.

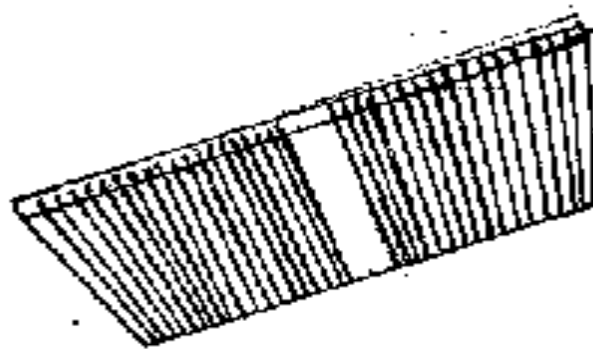


We can now begin work on the transom.

# "HARLEY 8" TRANSOM

A curved transom was indicated to provide an eight foot overall length. While plywood would have easily taken the curve, I felt that its use would break the "One-Sheet" rule. Others have used additional lumber for the transom; all but the "One-sheet purists" have not considered it "cheating". (For those folks, I do have a "One-Sheet Sailboat" design in which virtually all parts, including the sailing bits, are cut from a single sheet, but I would consider it no more than a "pool toy".)

Getting a tight curve into a four-foot one-by-twelve is not easy, I found. Below I have illustrated my solution. I had to cut deep kerfs into the transom after I cut it to shape. (Notes on taking dimensions follow on the next pages.) Kerfs were cut about  $\frac{2}{3}$ ds of the way through the wood and spaced about  $\frac{3}{16}$ " of an inch apart. I left the center solid.

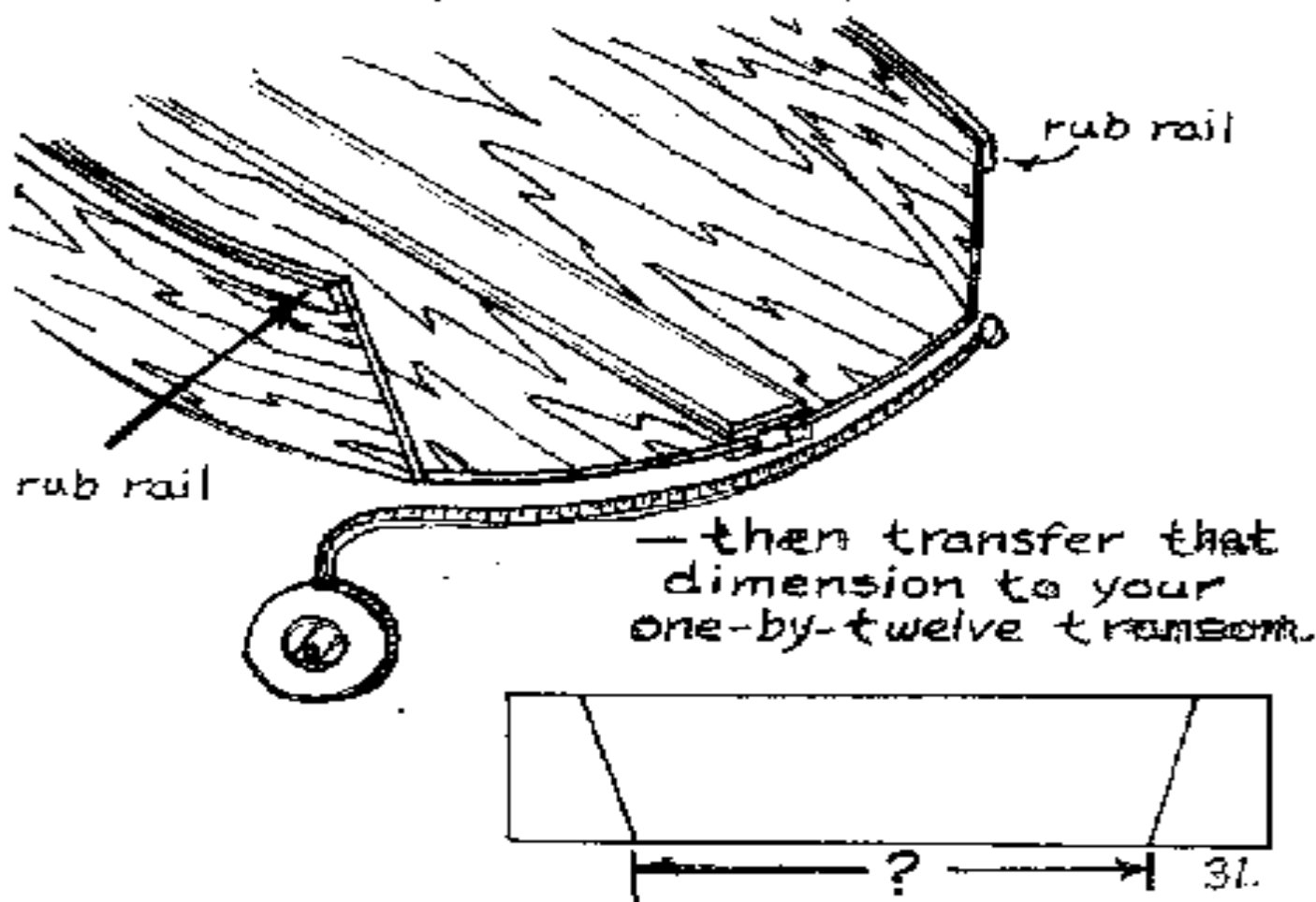


Note that the kerfs are tapered so that the top and bottom take the curve evenly.

" HARLEY 8 " TRANSON CONTINUED ....

As actual dimensions may vary slightly from the plans, and also because the transom is to be fit *inside* the plywood sides and bottom, I have not listed the transom measurements.

Cut the transom to fit *after* the side pieces have been attached to the bottom. Remember that it's a curved piece, so be sure to take your bottom transom dimension with a flexible tape measure—





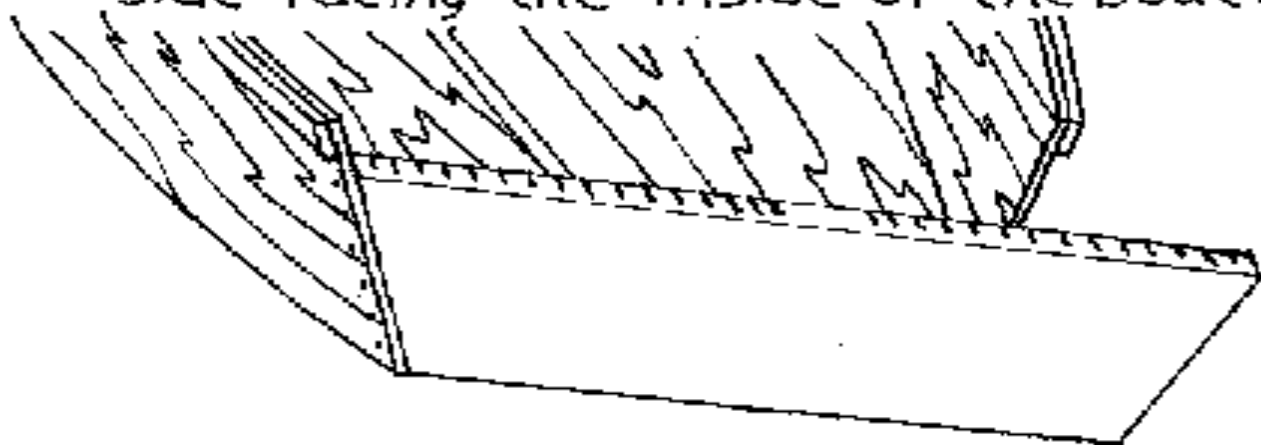
## "HARLEY 8" TRANSOM CONT.....

To fit the transom, you first have to cut away a bit of the keelson to the thickness of the transom.



section of keelson  
cut away.

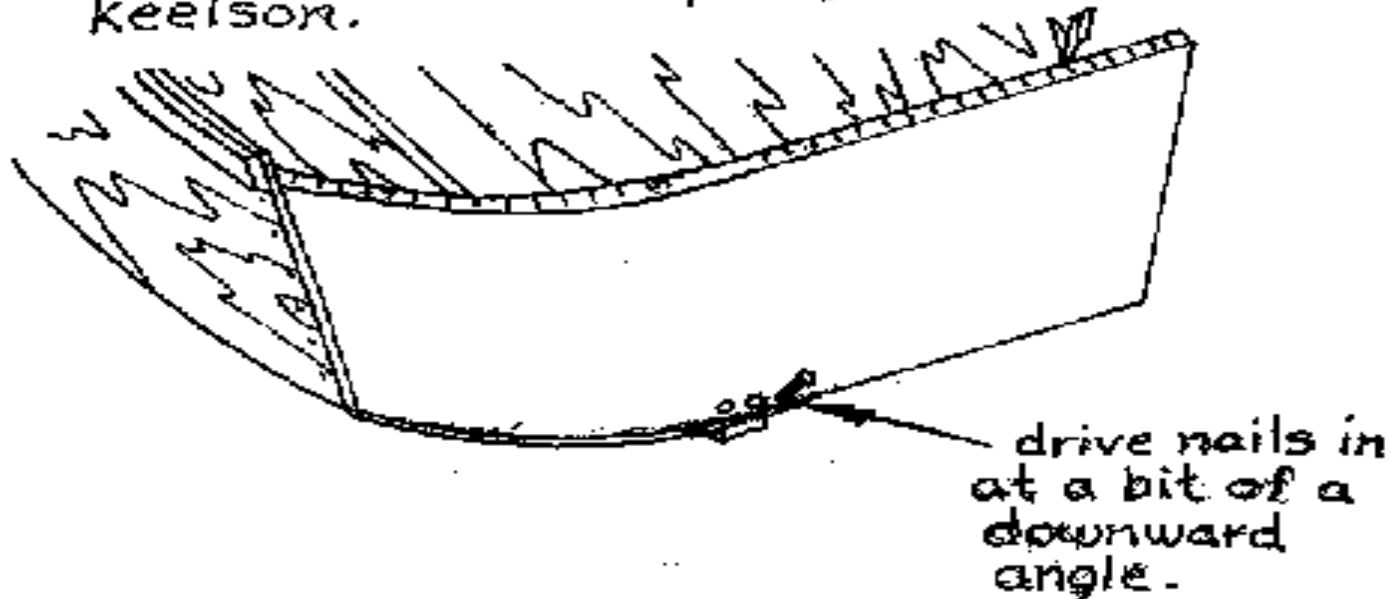
Once this was done, we first glued and nailed the port side of the transom in place, with the kerfed side facing the inside of the boat.



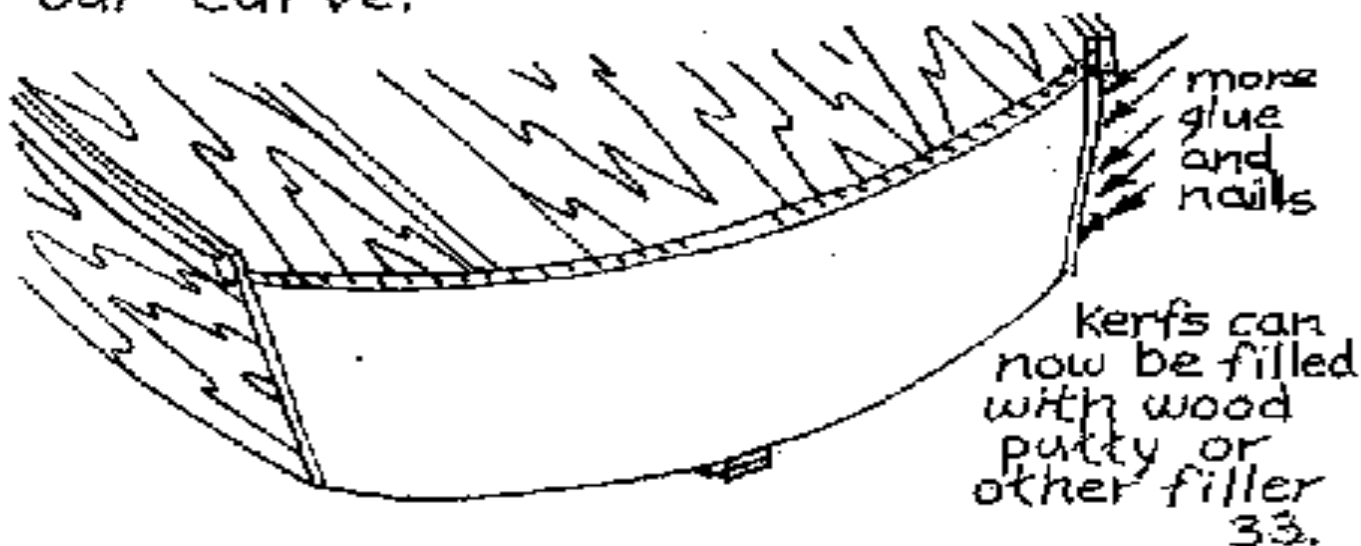
32.

## "HARLEY 8" TRANSOM CONT . . . . .

As we pushed the transom inward, glue and nails were applied where the solid middle section of the transom butts up against the keelson.

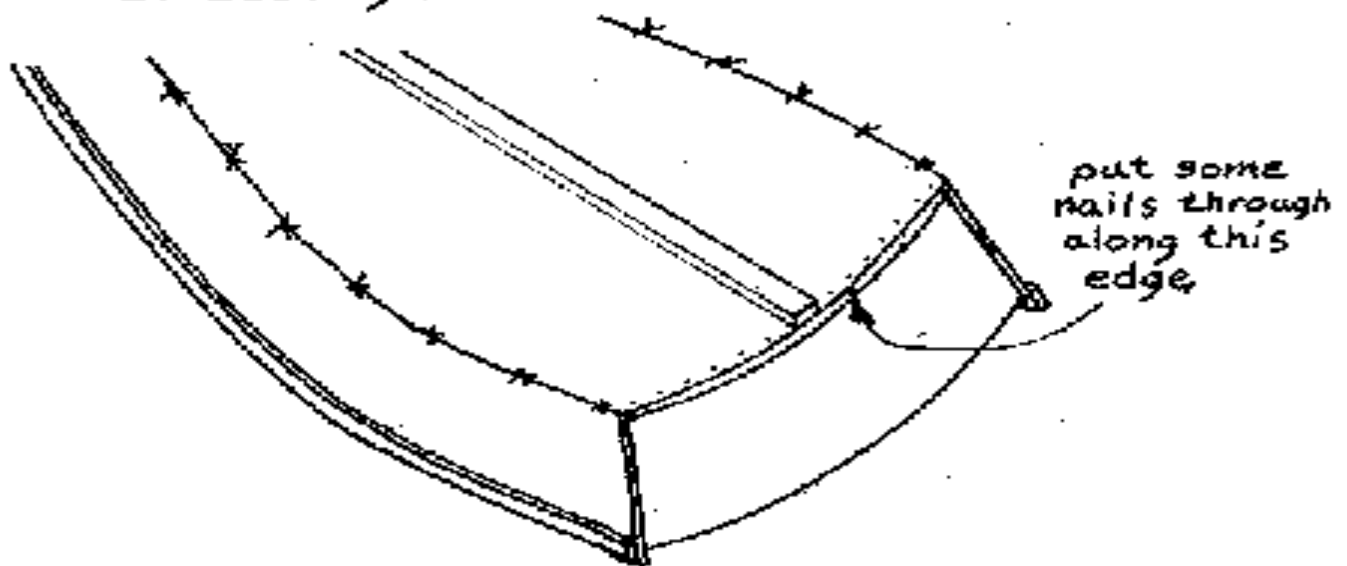


Finally, the starboard side of the transom was glued and nailed in as more pressure was applied to complete our curve.

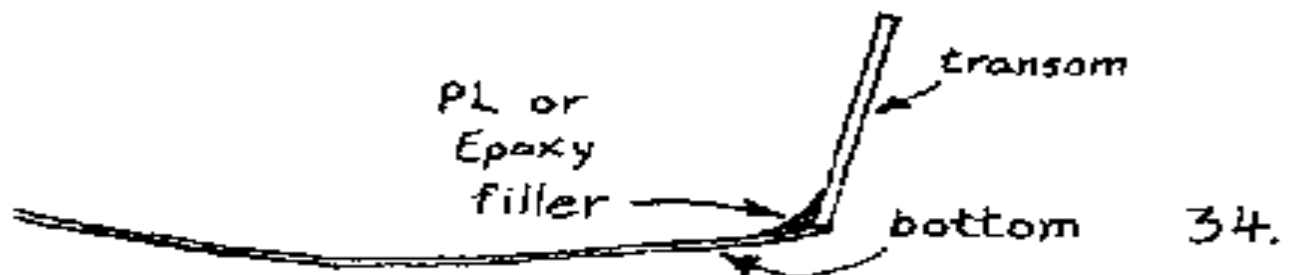


## THE "HARLEY 8" TRANSOM CONT. . . . .

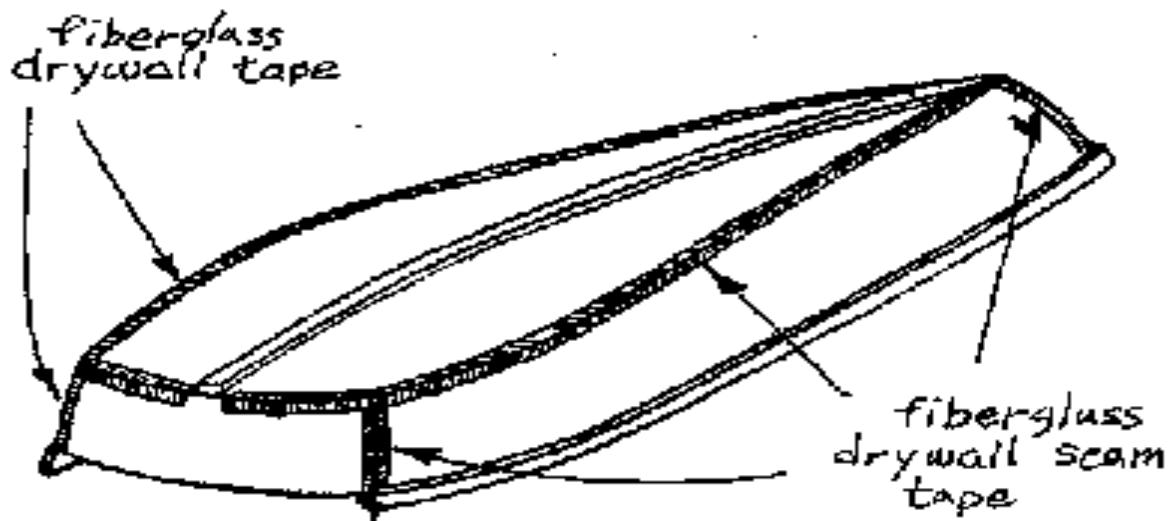
Now you can turn the hull bottom-side up and drive a few nails through the bottom panels into the transom. You will want to fill in the kerfs in the transom first to reduce breakage.



Turn the boat over again and apply a nice radius of PL Premium or epoxy filler to the seam where the bottom and transom meet. If there are any broken kerfs where you drove nails, fill them in as well.



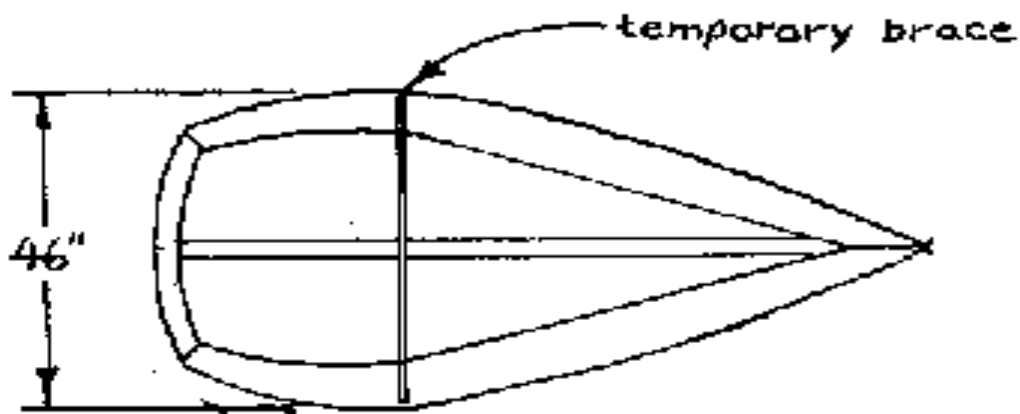
Assuming you've got all the inside seams well radiused, take a pair of pliers and untwist all your wire "stitches" and yank the wire out. After this is completed, take your roll of fiberglass self-adhesive drywall seam tape and cover all the outside seams as shown below.



Now squirt a bead of PL Premium onto the strips of tape and smear it through the tape with a putty knife. PL Premium will cure into a bubbly, ugly mess. After it has started to harden, smear another layer on. Make sure all the seam tape is well covered.

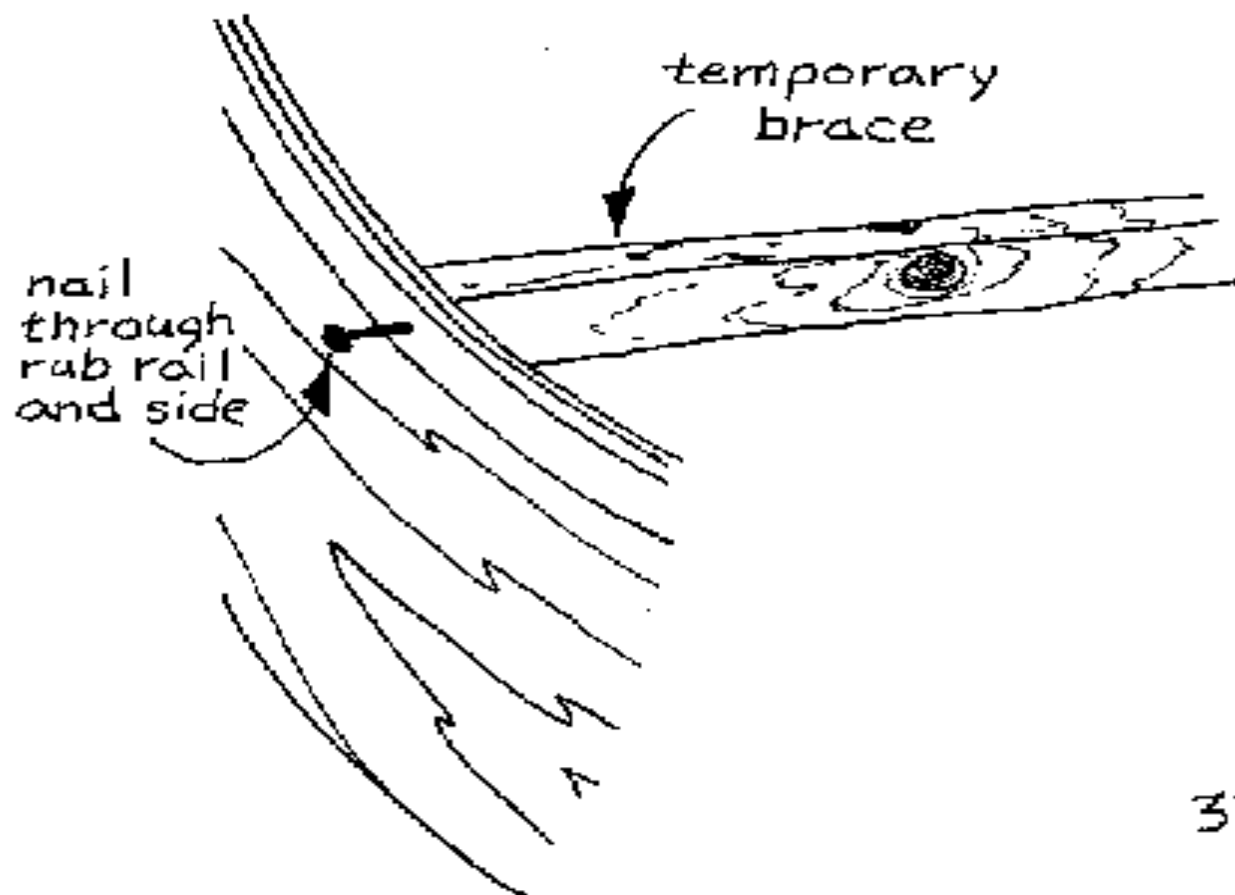
While the outside seams are curing, you can start working on the single frame that will both add some width to the hull, and create more rocker. Before we can start the frame itself, we are going to need a temporary brace to spread the sides to the proper width and give the hull the right amount of rocker. You can use any timber strong enough to hold the sides apart. We used a 1x2 stick for this which is probably minimal.

The temporary brace will need to be just long enough to spread the hull to a width of about 46 inches at the widest point as shown below.



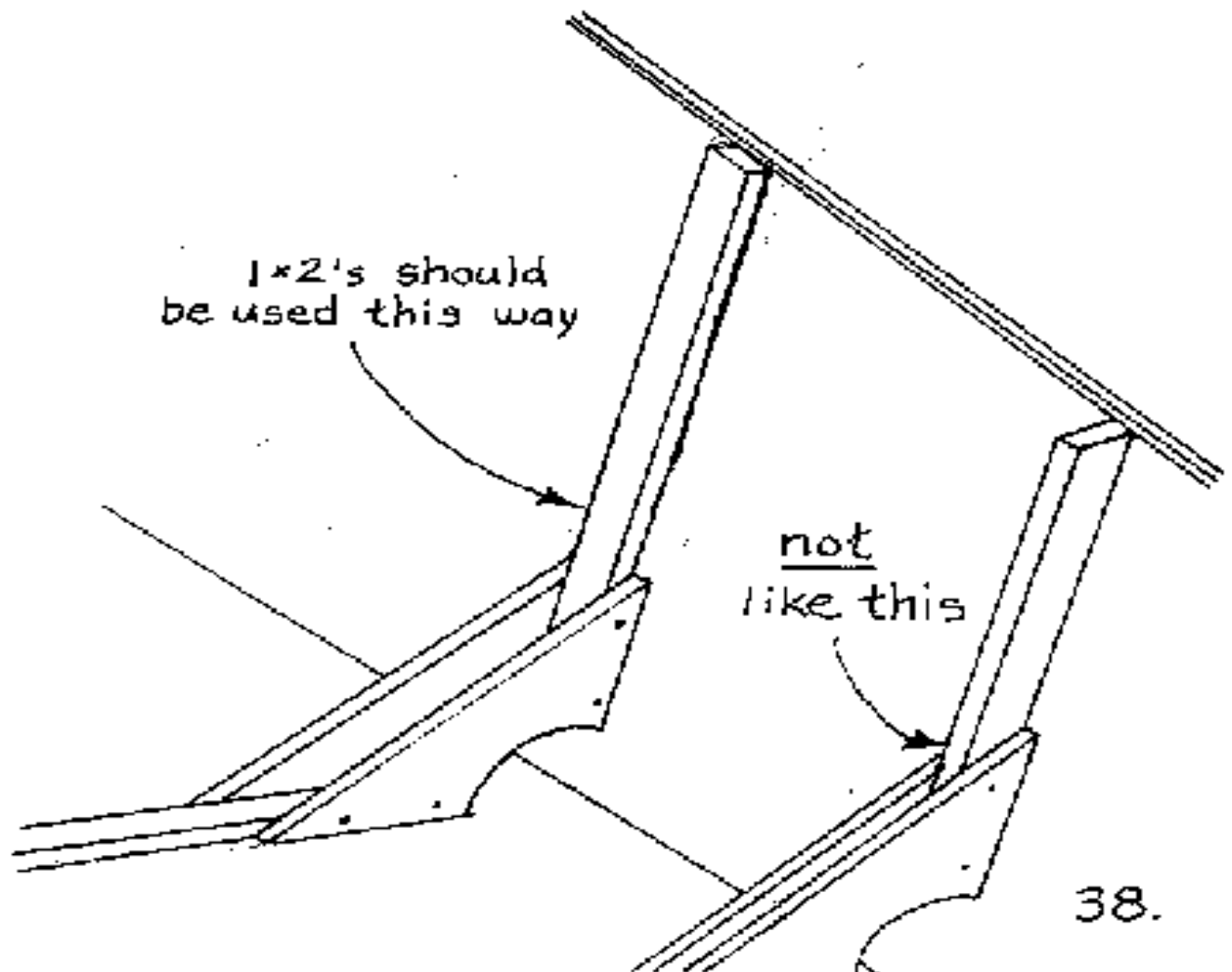
36.

We found it necessary to drive a nail through each side into the temporary brace so that it would stay put while we built the frame. Leave the head of each nail sticking out so it's easier to pull out when we remove the brace. Don't worry about the nail holes that will leave, you can plug them with a spot of PL or wood putty later. Put your temporary brace just behind the place where you'll build your frame.



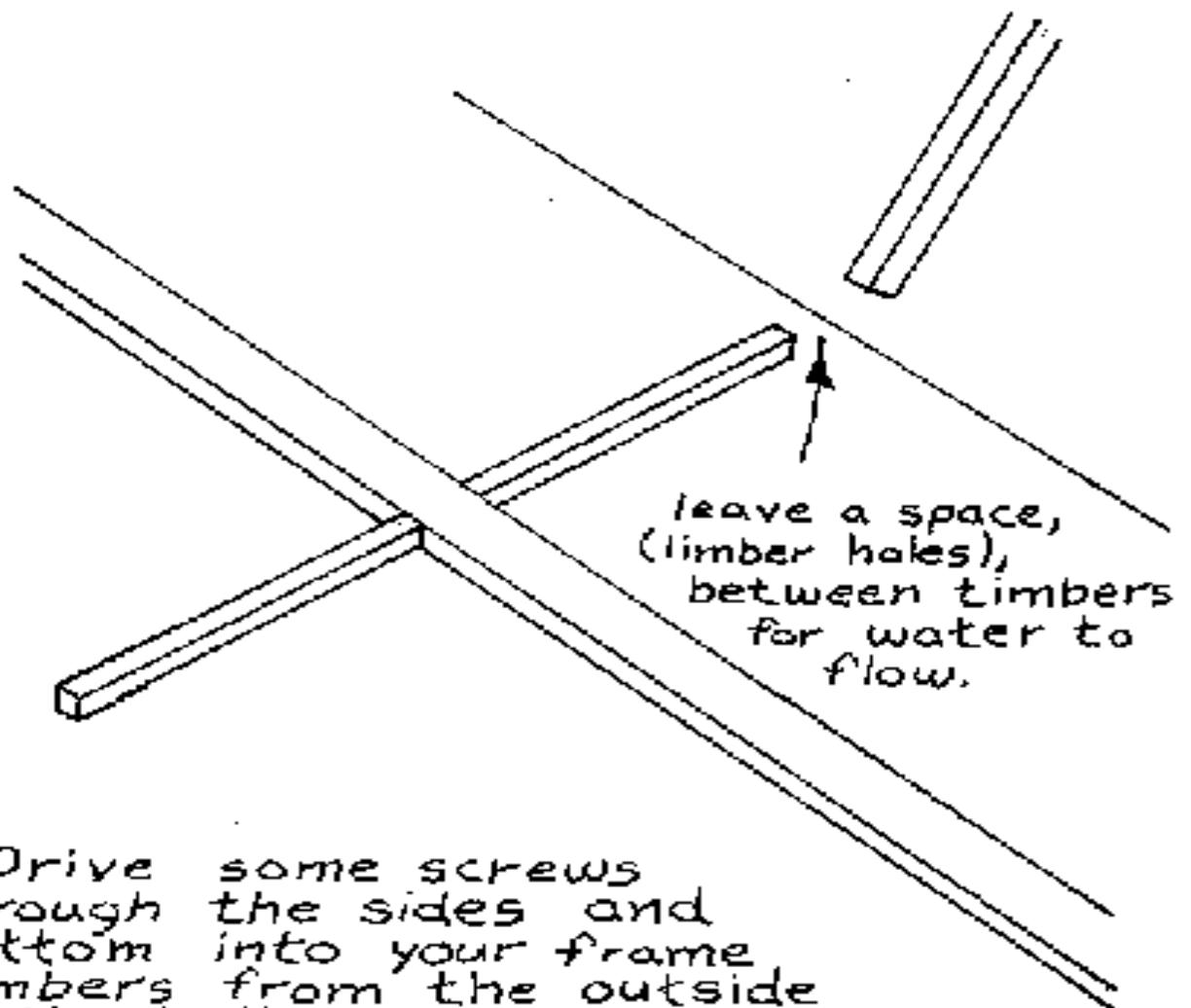
37.

The frame itself may be made from 1x2's if you don't have the ability to rip something smaller, or if you can't find smaller stock at a lumber store. We used 1x1's to build our frame. If you do have to use 1x2's, lay them flat on their side instead of standing them on their side. This is because you'll most likely spend some time with your backside sitting right on top of the frame.



38.

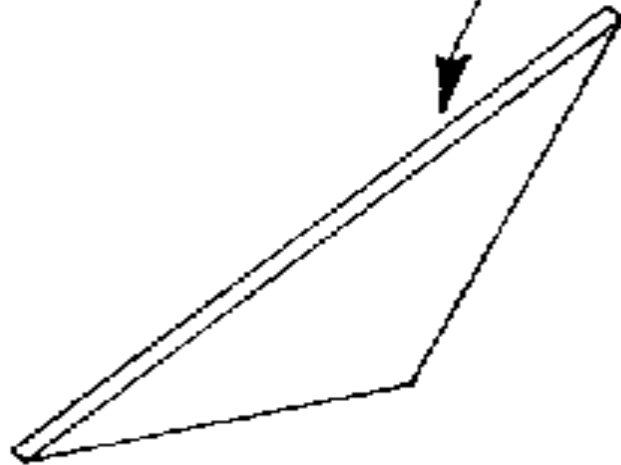
Building the frame is really quite simple. We just glued some 1x1's to the sides and bottom as shown below.



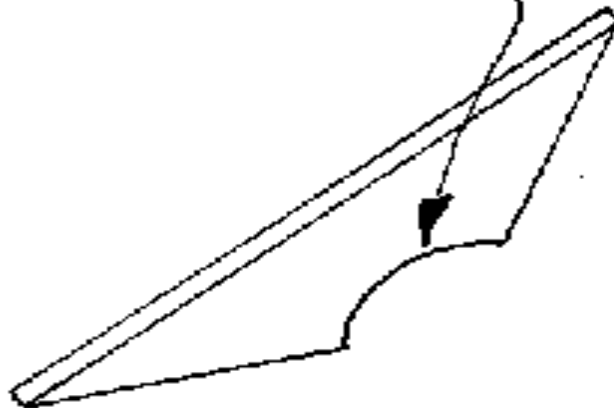
Drive some screws through the sides and bottom into your frame timbers from the outside of the hull.



You'll need to use some scrap plywood that you saved from cutting out your bottom panels to make four frame braces. We just cut some triangles to match the angle between the side and bottom as shown below.

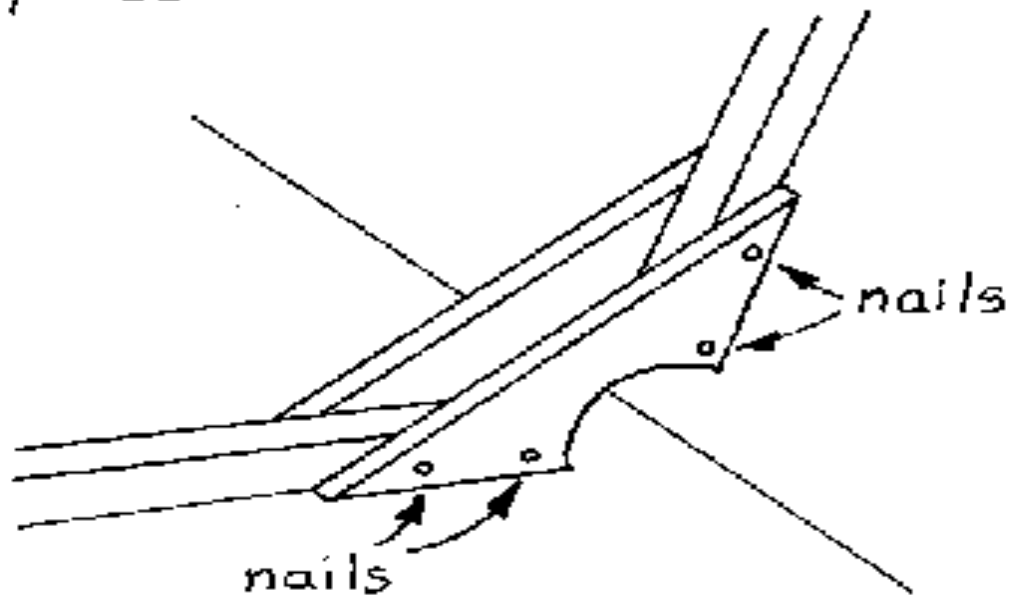


- then we took a jigsaw and cut the limber holes.



40.

Then we glued the braces to our frame timbers and drove in some nails to hold them in place.



After your outside seams and your frames have had a chance to cure overnight, you can pull the nails from the temp. brace and yank it out. Your new frame is now holding the sides out. It is normal for the side to flex back in just a hair when the temporary brace has been removed. Sand your outside seams smooth now.

IT'S A HULL! 41.

## THE SAILING STUFF!

Well, your HARLEY 8 is really looking like a boat now! BUT.... she's not ready to go sailing yet.

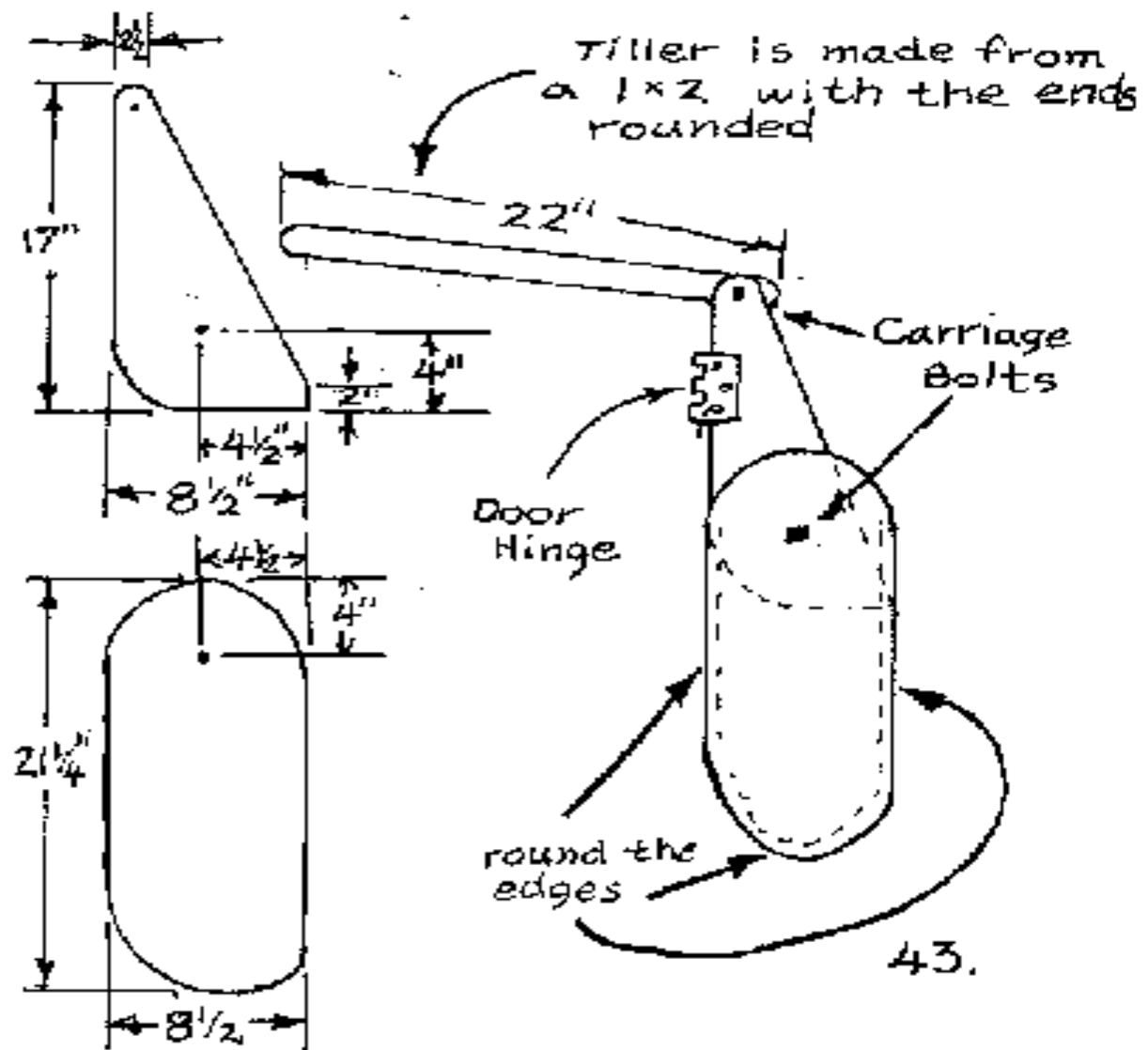
Time to put on all the finishing touches that will convert our "HARLEY 8" hull into a real sailboat.

### RUDDER:

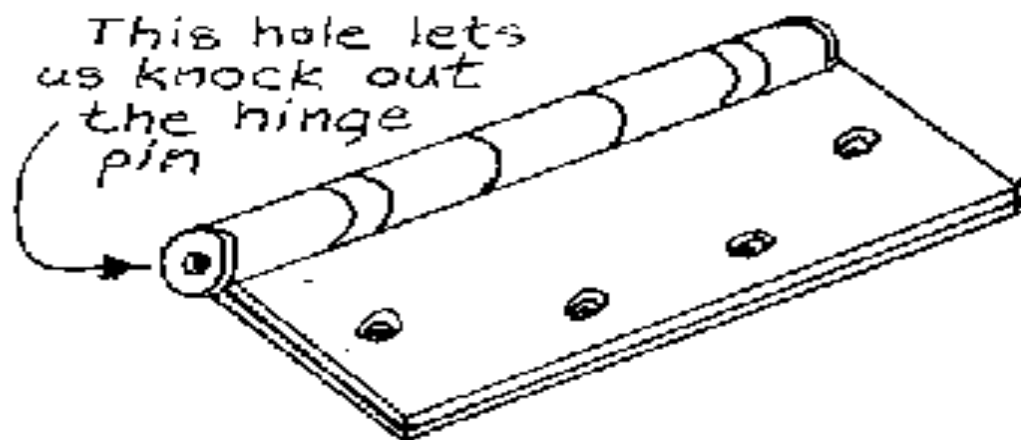
You can make the rudder from plywood if you like. We made ours with some scrap  $\frac{1}{2}$ " we had laying around. We've seen  $\frac{1}{2}$  inch stuff warp, though. Some say if you laminate from 2 layers of  $\frac{1}{4}$  inch instead, it won't warp. You could also make it from solid wood but this is likely to warp also.

The best type of rudder to make is the kick-up type so that you can beach the boat easily without having to unship the rudder. As this is a very small boat, a rudder can be very simple.

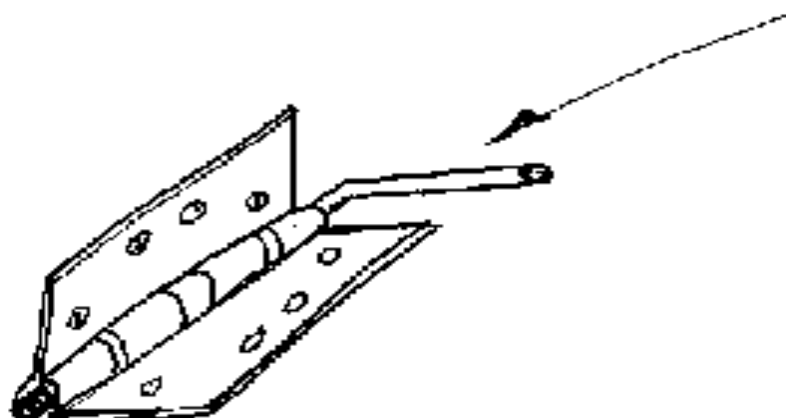
The rudder itself is made of two pieces, a single upper section that attaches to the transom and swivels on a hinge, and a lower piece, the rudder blade itself which pivots on a single carriage bolt. Below are illustrations and dimensions as we made them from  $\frac{1}{2}$  inch plywood. Round the leading and trailing edges of the blade.



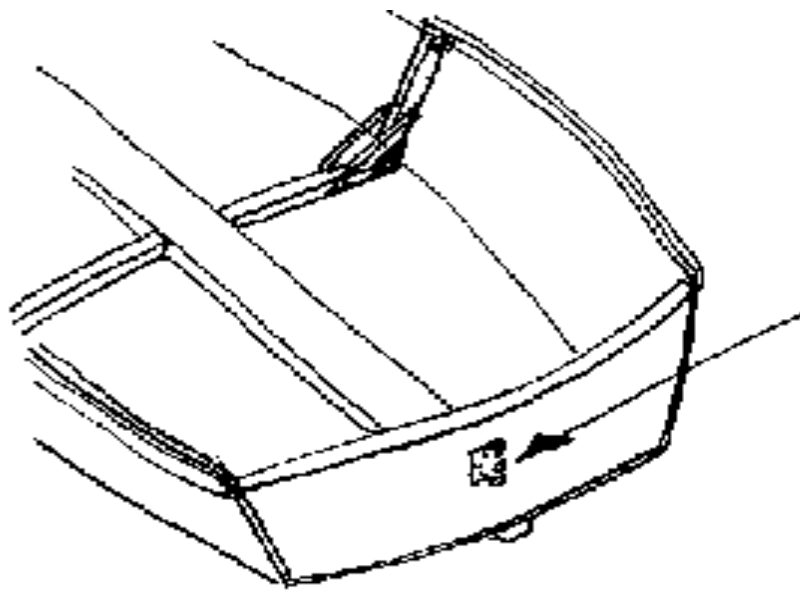
To attach our rudder to the transom, we used a standard 4 1/2 inch door hinge which we modified as follows.



First, we knocked the hinge pin out with a large nail and a hammer. We purchased a metal rod the same diameter as the hinge pin. We used the rod to knock out the bottom plug with the small hole in it. We then cut a piece of the rod off with a hack saw about ten inches long and bent the top four inches at a 90° angle to form a handle.



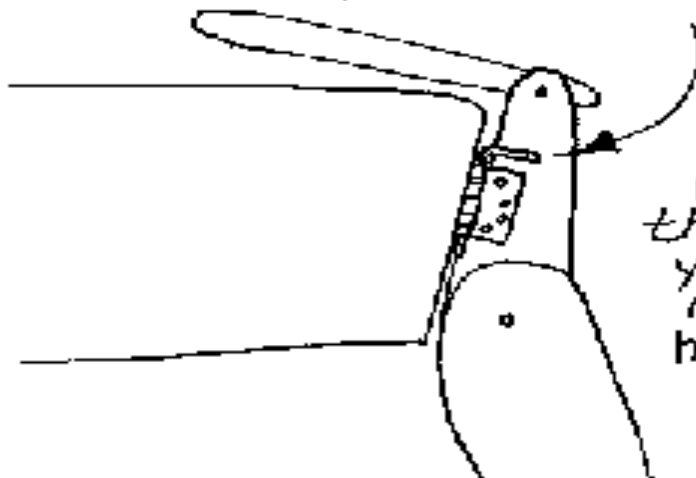
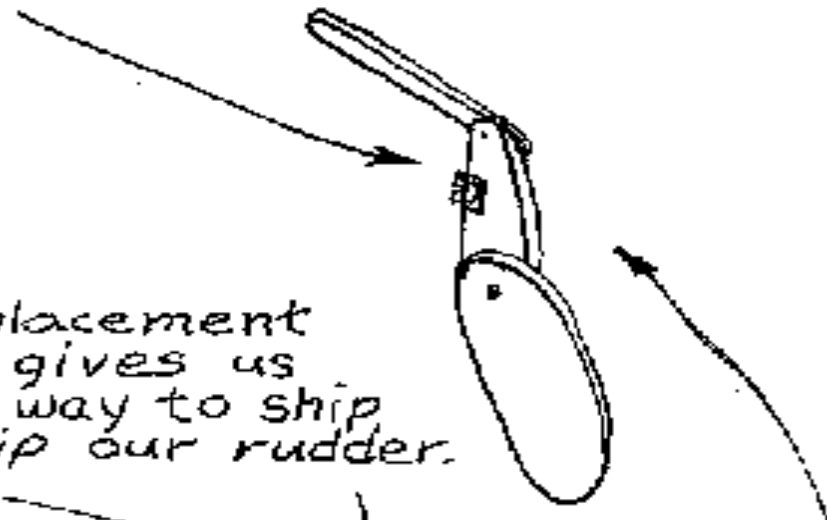
44.



By mounting one half of the door hinge on the transom—

And the other half on our rudder—

—Our replacement hinge pin gives us a handy way to ship and unship our rudder.

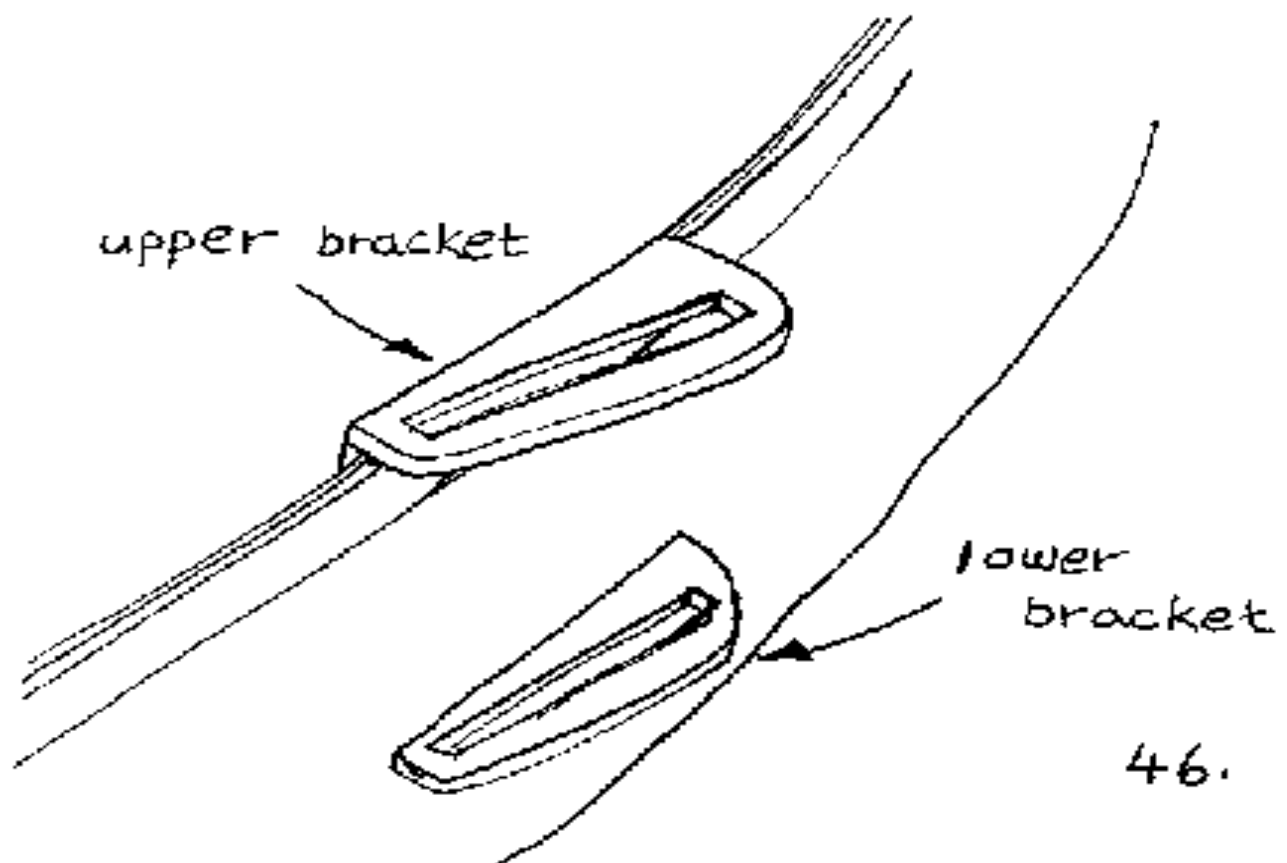


If you make the rudder with the blade on one side and the tiller on the other, your tiller won't get in the way of the hinge pin.

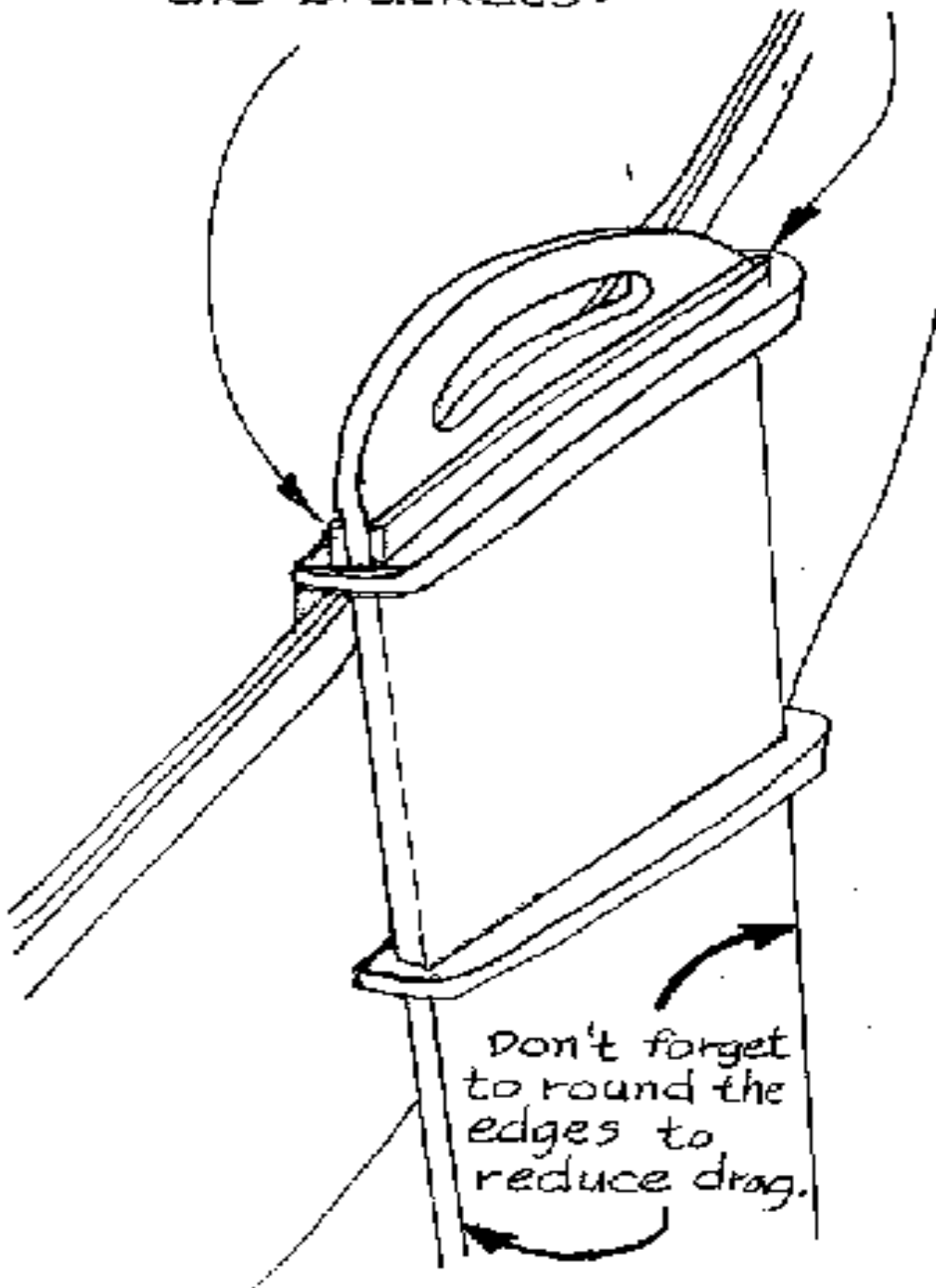
45.

## LEEBOARD:

We made our "HARLEY 8" leeboard from  $\frac{1}{2}$  inch plywood also. It has a handle cut into the top to make it quick and easy to raise and lower it while you're out sailing. It slides up and down through two plywood brackets. One of them is attached on top of the rub rail with one corner of the bracket centered on the top of the frame. The other bracket is mounted about  $\frac{2}{3}$ rd's the way down the side of the boat.



A stop on each side of the leeboard prevents it from sliding all the way through the brackets.

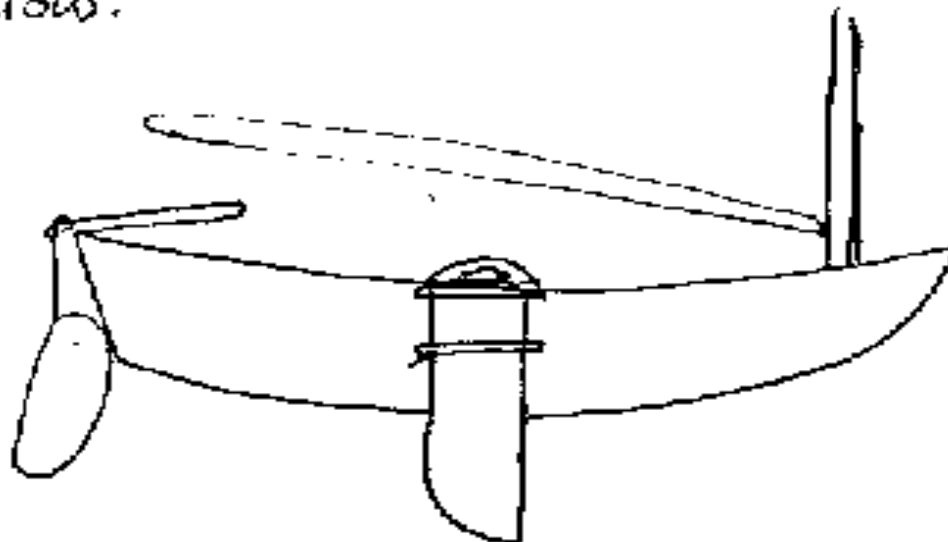


Don't forget to round the edges to reduce drag.

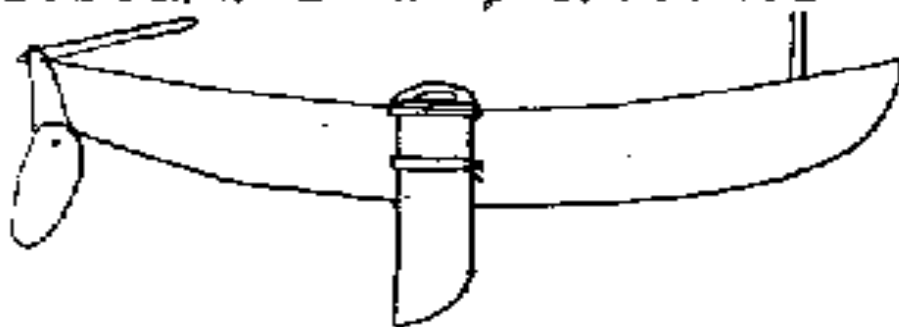
47.



The shape of the "Harley 8" leeboard allows you to change the trim a little. We have found she sails best in light to medium winds with the curved bottom of the leeboard facing aft like the sketch below.

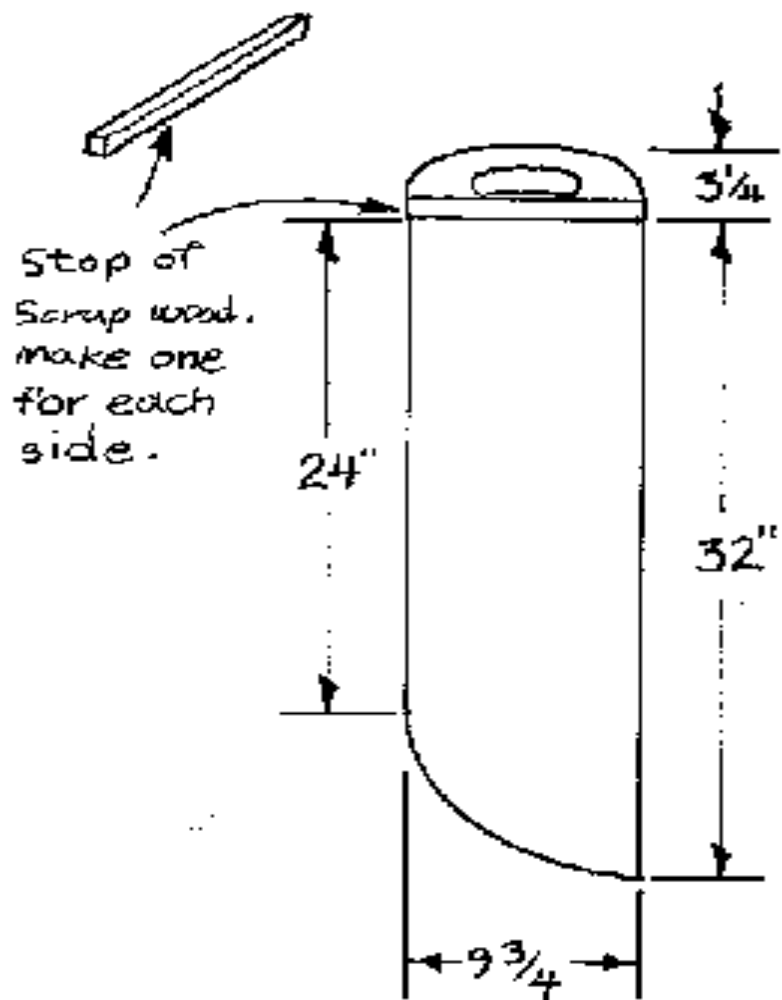


When the wind really picks up she'll develop a weather helm so that when a strong gust hits her, she'll want to round up into the wind. This can be rather pronounced in strong winds. If you get tired of fighting the helm, you can reverse the leeboard to help alleviate this.



48.

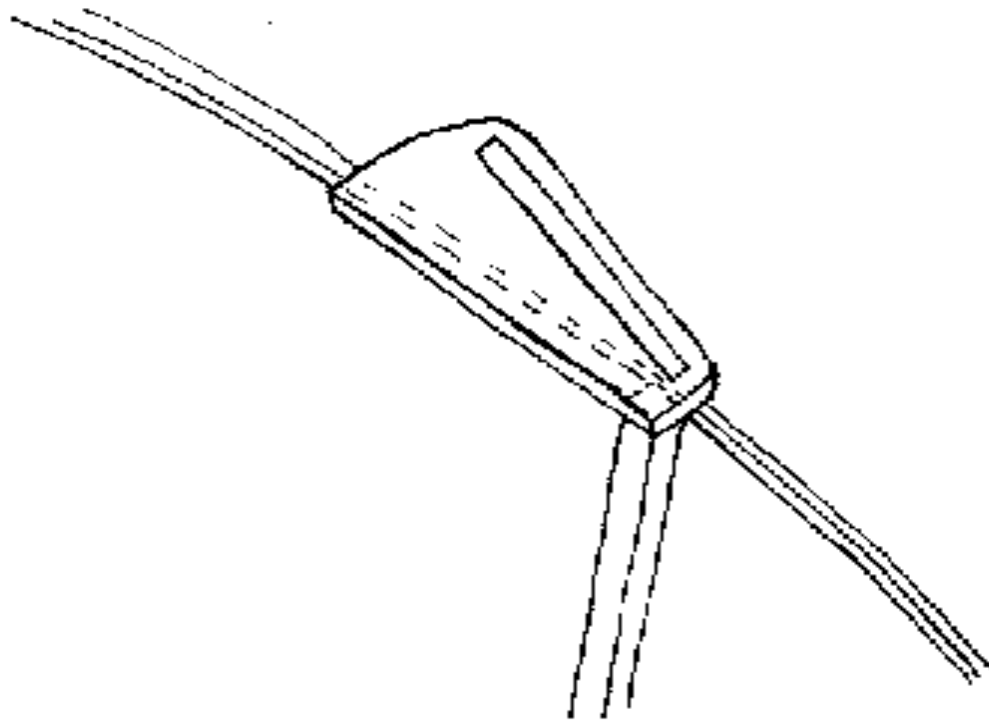
Below are the dimensions of the leeboard as we cut it from  $\frac{1}{2}$ " plywood. You'll want to round the leading and trailing edges just as we did the rudder blade.



49,

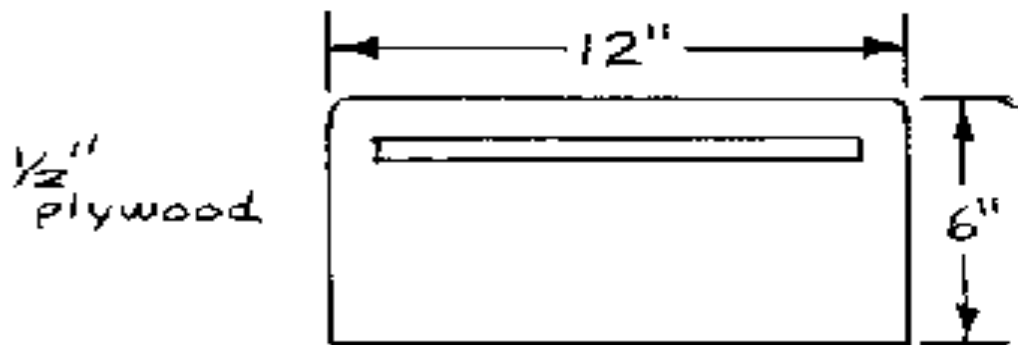
The leeboard must be parallel to the keel. Everyone will have slight differences in the curvature of their hull sides, so here's how we make sure the brackets will hold the leeboard correctly.

Make the top bracket first. It will be mounted on top of the side and rub rail of the boat with one corner atop the frame.



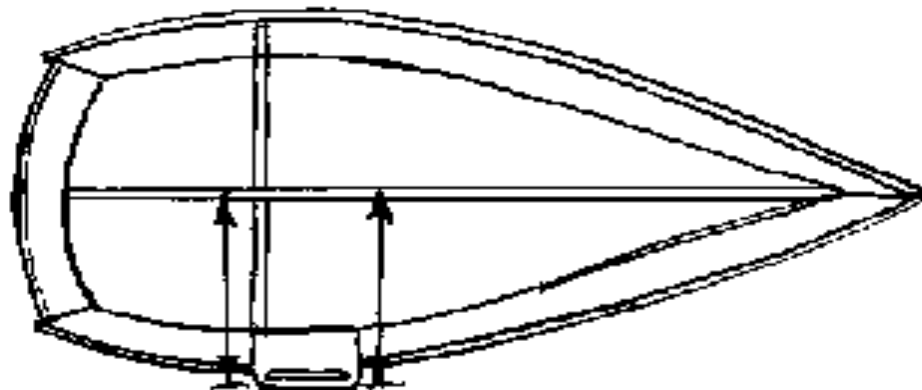
It is the slot for the leeboard which has to be parallel to the centerline of boat. We'll take advantage of the fact that the outside edge of the bracket is parallel to the slot.

50.



We cut our upper bracket to the dimensions shown above. Now is the best time to cut the  $\frac{1}{2}$ " slot for the leeboard also.

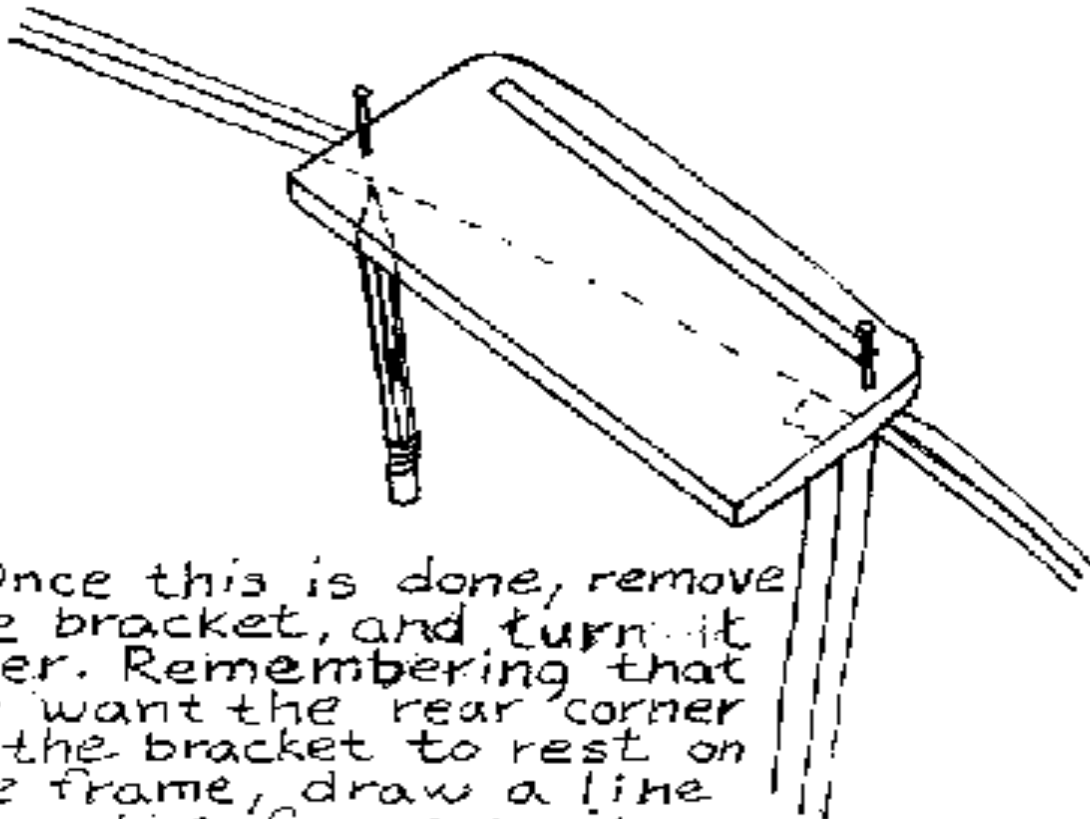
We then placed the bracket in place atop the starboard side of the boat. Then we took a tape measure and positioned the bracket so that both the ends were the same distance from the keelson as shown below.



Once you have the bracket in the correct position, you may want to tack it in place with couple small nails driven only half way so they can be easily removed.

51.

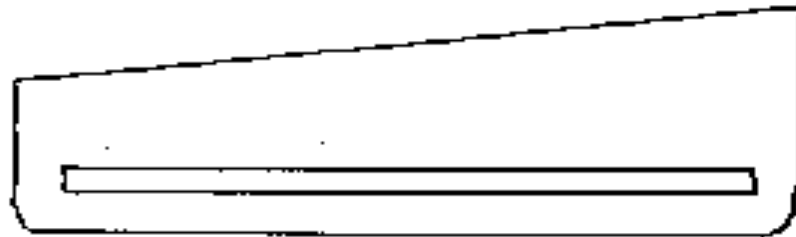
Now take a pencil and run it against the underside of the bracket tracing the curve of the side onto it as shown below.



Once this is done, remove the bracket, and turn it over. Remembering that we want the rear corner of the bracket to rest on the frame, draw a line from the frame position to the forward end of the curved line as shown below.



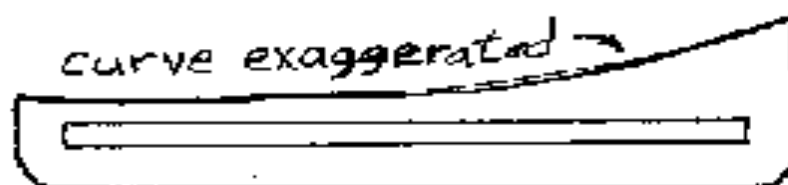
Cut off the excess wood at the straight line you drew and the upper bracket is complete. At least, the pattern for it is!



Here's why. First, duplicate the bracket we just made by tracing around it onto another piece of  $\frac{1}{2}$ " plywood and then cut it out, including the slot for the leeboard. Our duplicate will be our actual upper bracket.

The first one we made, with the curved line drawn on it will become our lower bracket. Just cut it along the curved line.

Now we have the lower bracket made to fit perfectly on the side of the boat.



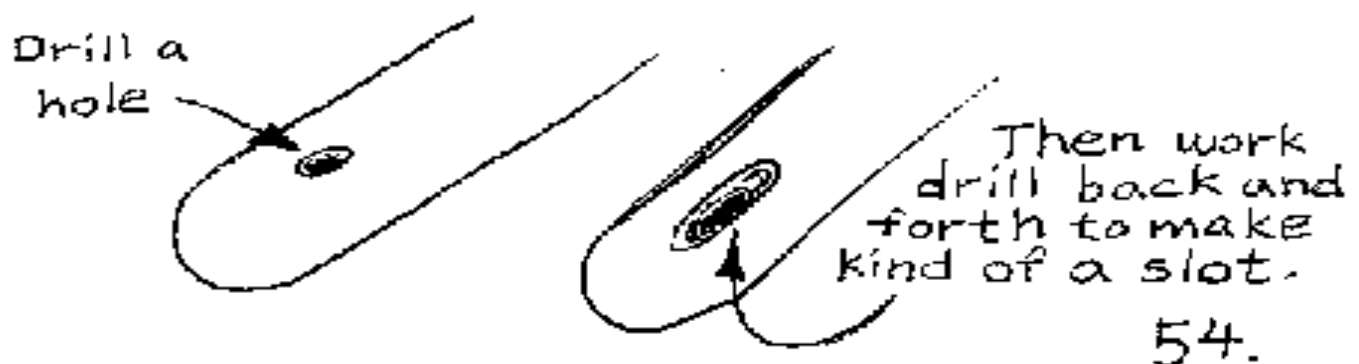
Glue and nail the upper bracket in its place atop the side of the boat. Then glue and nail the lower bracket against the side about 8 inches below the upper bracket.

Once the glue has cured, test fit the leeboard through the slots. You'll probably have to widen the slots in places for a smooth fit with a file or wood rasp.

Make sure that it slides in and out with the leeboard facing either direction as shown on page 48.

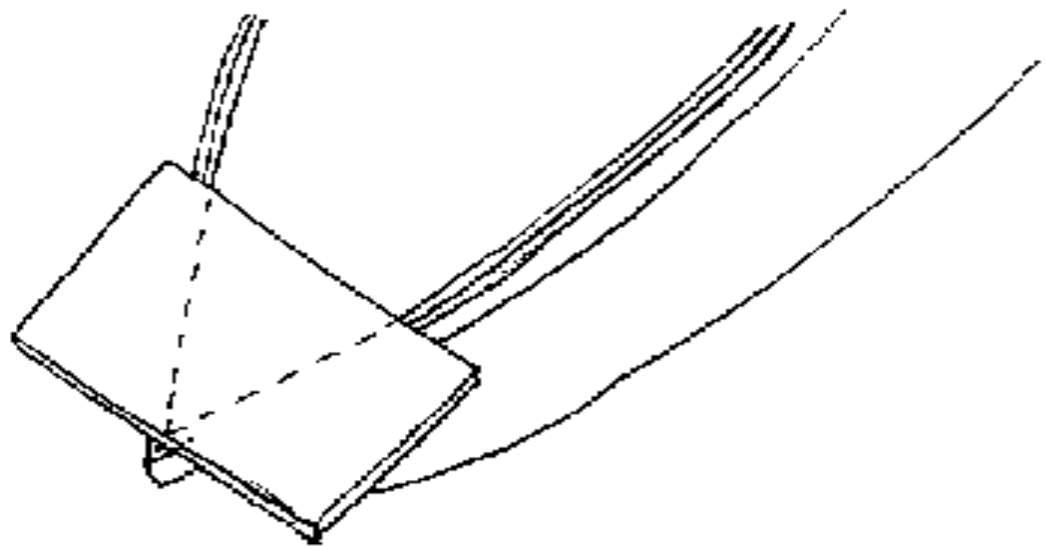
### Mast:

Harley 8's mast couldn't be easier. Just buy a 1 3/8th inch round closet pole 12 feet long. We rounded the top with a belt sander just for looks. Drill a hole near the top to run the halyard through.



## Mast Partners:

These parts we made from scrap also. For the bottom one we laid a scrap piece of plywood over the bow and marked the shape of the from underneath with a pencil.



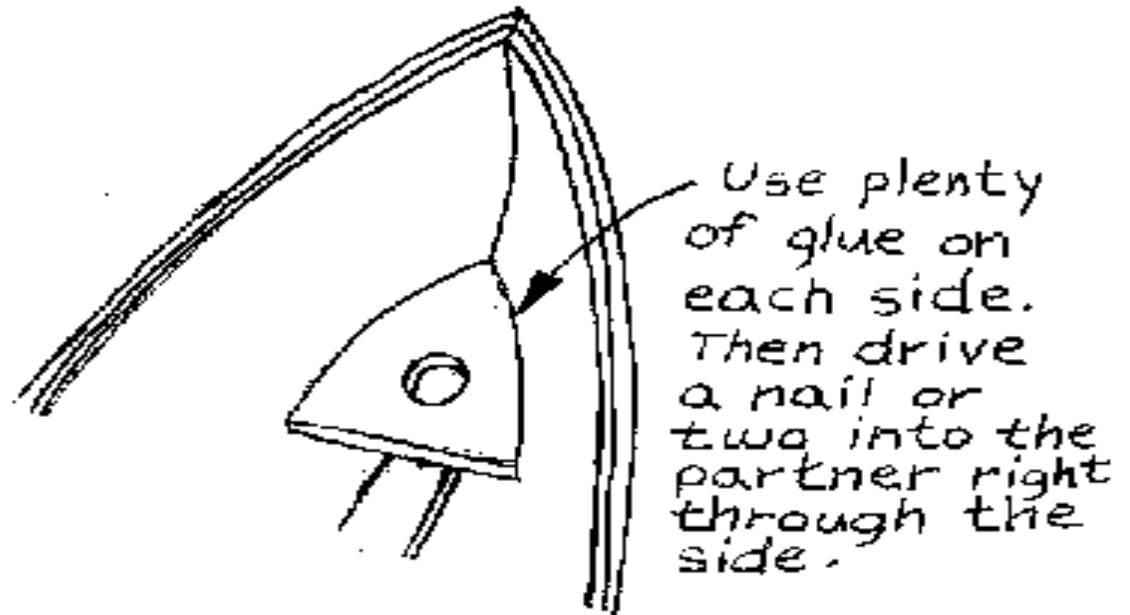
Then we cut it out, traced around the bottom of our mast right onto the piece, and cut the hole out with our jigsaw.



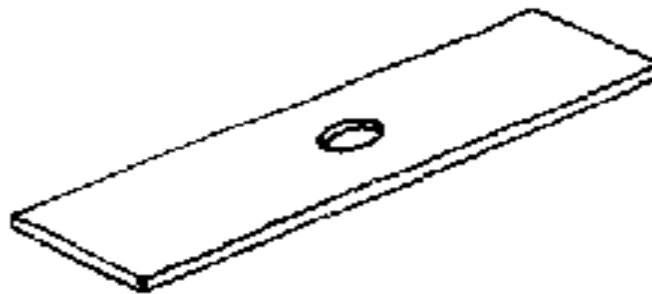
55.



Then we glued and nailed it in toward the bottom of the bow, a little better than half way down, as shown below.

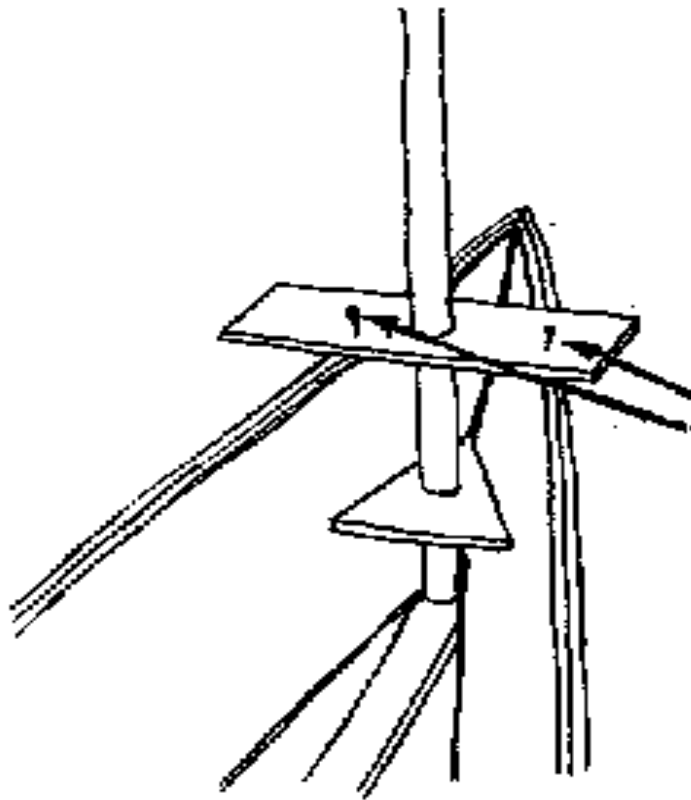


To make the upper mast partner we cut our mast hole into the middle of a scrap piece of lumber. Our scrap happened to be a 1x6 but you can use anything wider than the mast hole.



56.

The position of the upper mast partner is going to determine how straight the mast is. To get it in the right place, set the upper partner in place above the lower mast partner and mount the mast through the holes.

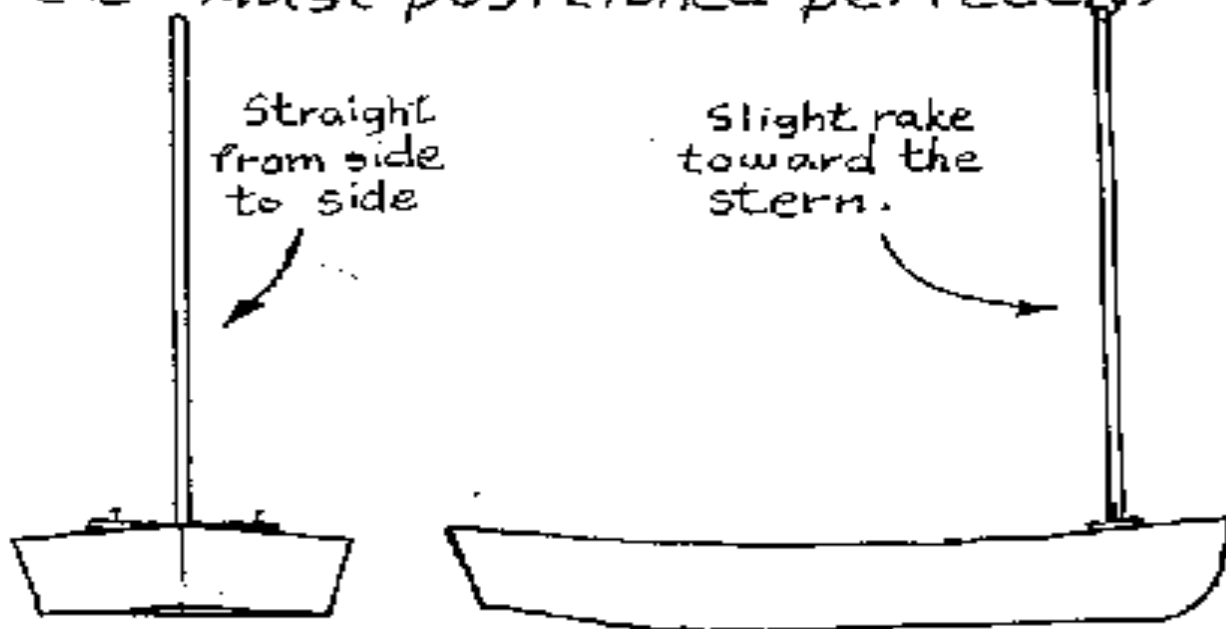


When your mast is straight, put a couple nails in part way to hold the upper partner in place.

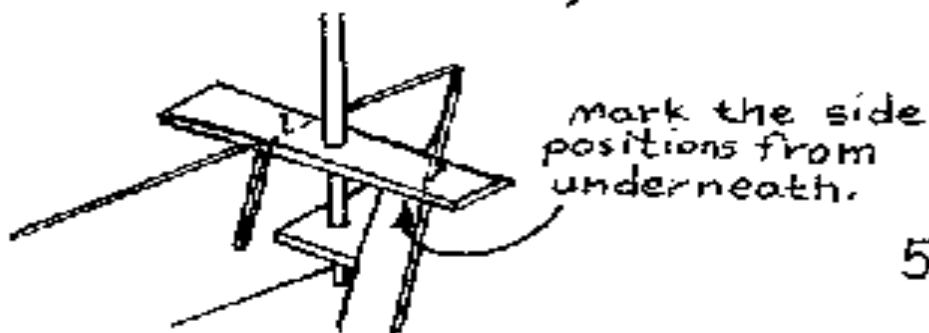
Now, make sure that the mast is in exactly the position that you want it to be. Drive a nail through each side of the upper partner to hold it in place. Stand back and make sure the mast is positioned correctly.

57.

We gave the mast a slight rake aft. If your mast, upon inspection, is not exactly the way you want it, pull the hails loose, and then reposition everything and drive them back in again. Do this as many times as it takes to get the mast positioned perfectly.

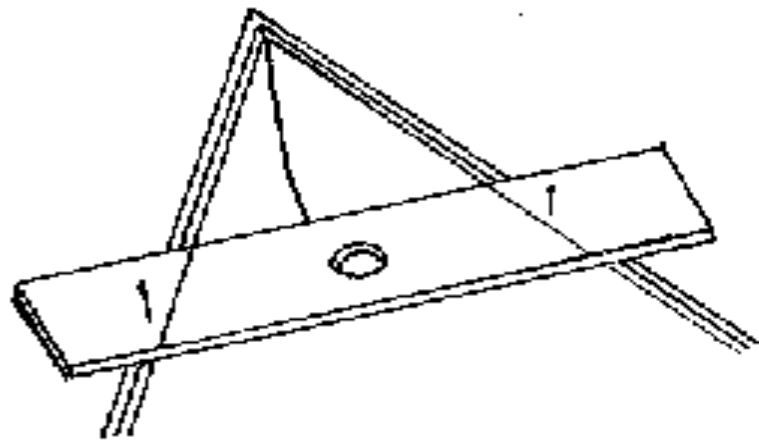


Once you've got it right, take a pencil and mark the underside of the upper mast partner, running a pencil mark along each side.



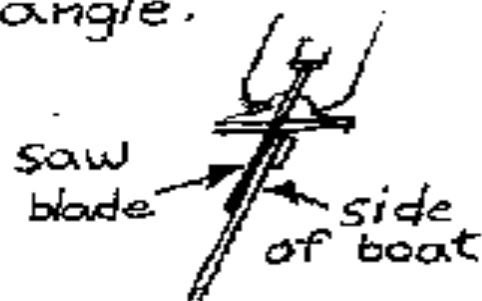
58.

Then take a ruler or other straight edge, and duplicate the two lines on the top of the mast partner.



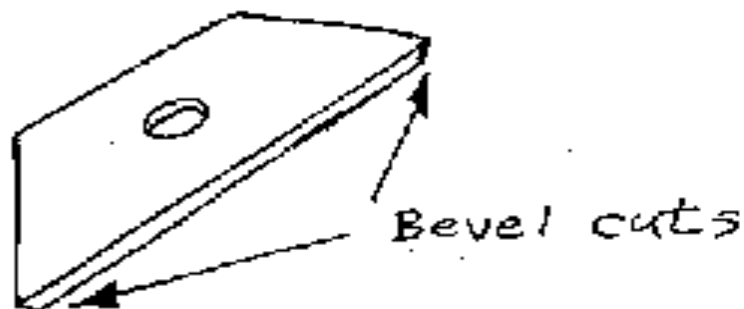
You can now pull the nails and set the partner aside face up, with the two lines we just drew on top.

You're going to want to make your cuts on the upper mast partner at the same angle as the sides. We found the easiest way to do that was to loosen the adjustment on the saw, set the blade right against the inside of the side, and then tighten the blade at the same angle.



59.

Then, when you cut your piece, the upper mast partner will be cut perfectly, fit flush against the inside of the bow, and hold our mast in exactly the proper position.



As this piece is glued in place, set the mast back through the holes, and don't drive nails through the sides to hold it until you've verified the correct position of the mast as shown on page 58. Once the nails are in, you may remove the mast.

#### THE BOOM:

Easy. Cut a 1x2 to a 6½ foot length.

Put a screw-in eye bolt in one end.



Round off the other end and put an eye bolt on the top edge.

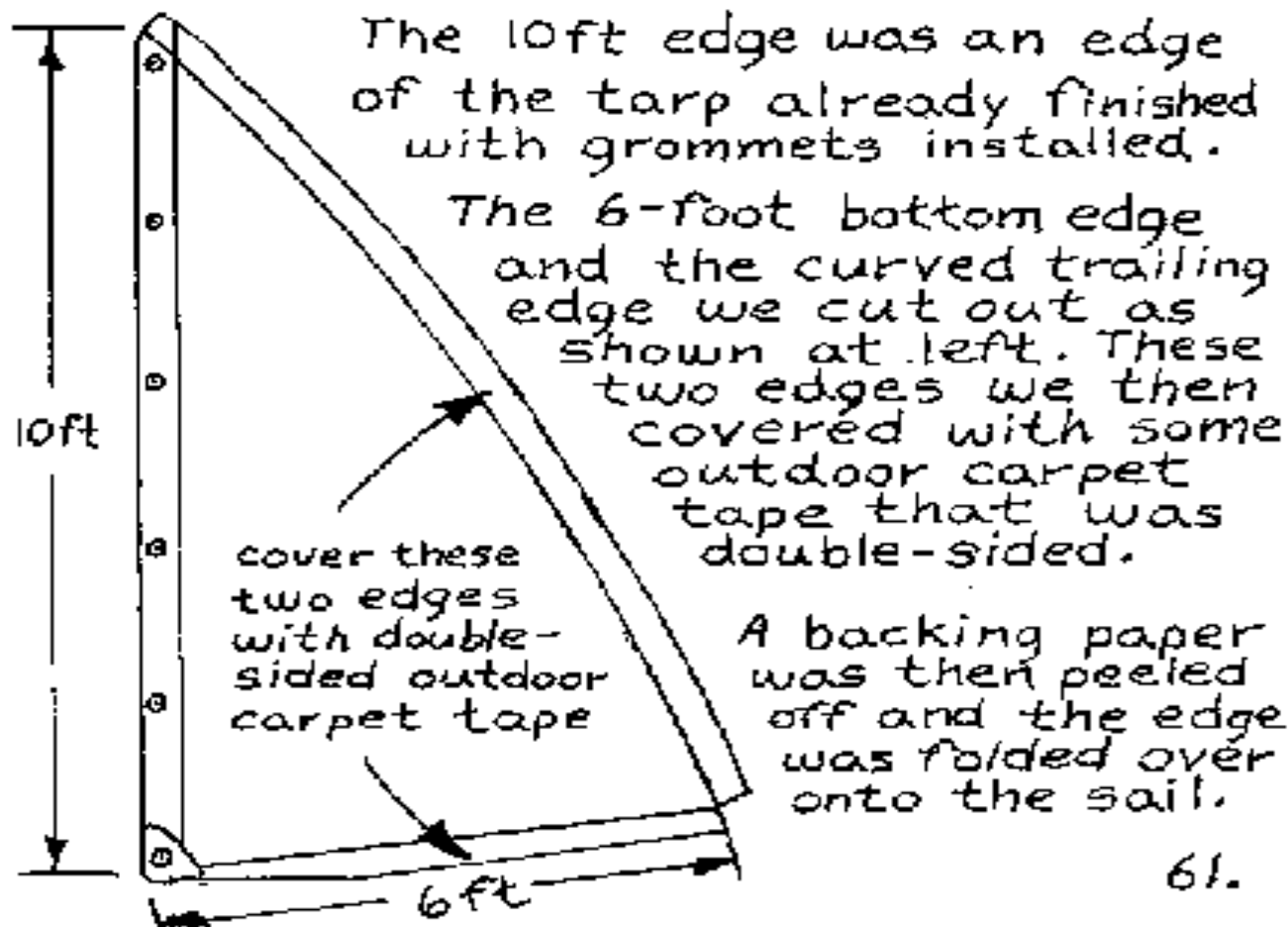


60.

## THE HARLEY 8 SAIL:

We made our sail from a heavy-duty UV-protected polytarp because they are inexpensive and durable. You can even use regular cheapo blue polytarp if you want but don't expect it to last more than a season. The stuff we used was blue on one side and silvery-grey on the other. If you insist on a white sail, there is white polytarp available but it is very expensive.

Here's how we made ours.

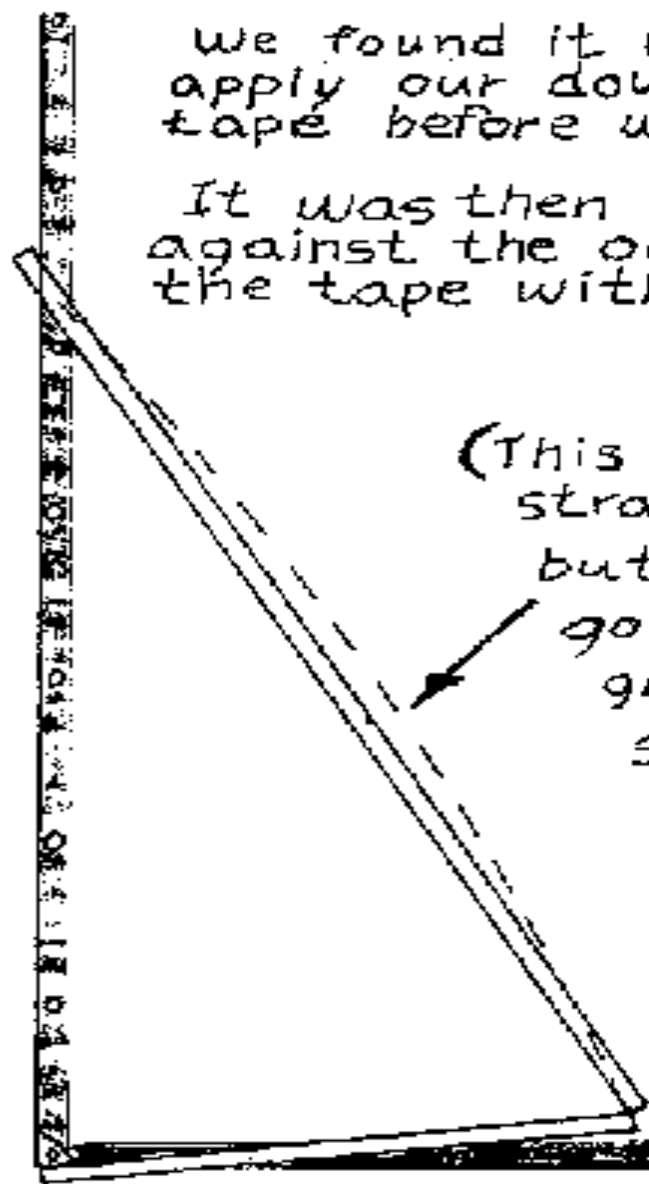


Sailmaking with polytarps is easy and fast. Here are some tips to help.

We bought a 2-pack of 12ft.x 16ft heavy duty UV protected polytarp for only 13 dollars. We found out that on one edge of the tarp, six grommet holes equalled the 10ft that would lace up perfectly to our 12 ft. mast.

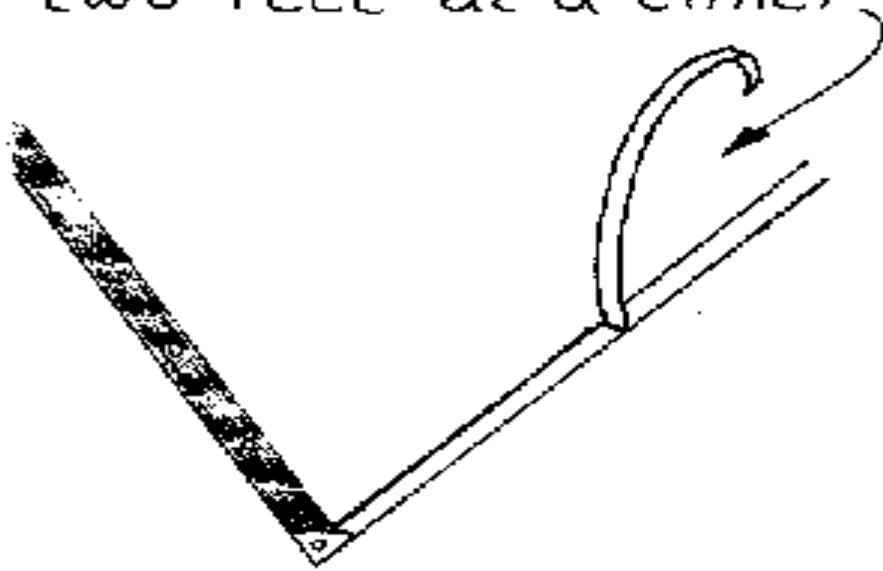
We found it was easiest to apply our double-sided carpet tape before we did any cutting.

It was then very simple to cut against the outside edge of the tape with a pair of scissors.

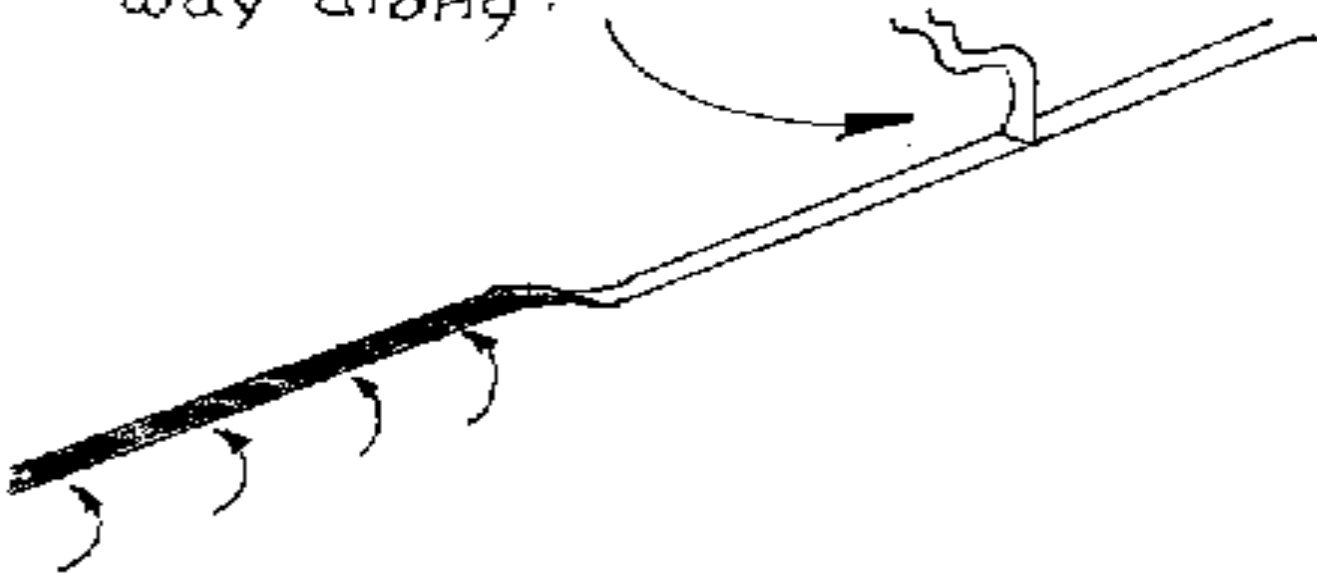


(This edge is shown straight for simplicity, but really you're going to want to give it a curve as shown by the dashed line. It's very easy to lay the tape in a curve.)

Once the seams are cut out, peel the backing off the tape about two feet at a time.



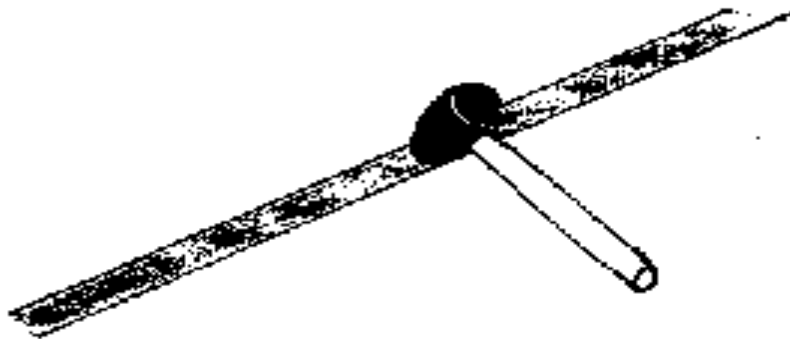
Then fold the exposed adhesive up against the sail a few inches at a time, peeling a little more backing off as you work your way along.



63.



After all the seams are folded, place the edges on a hard, flat surface and pound all along the seams with a rubber mallet to firmly set the pressure sensitive adhesive.



(If you don't have a mallet, you can use a shoe with a rubber heel. DON'T use a hammer.)

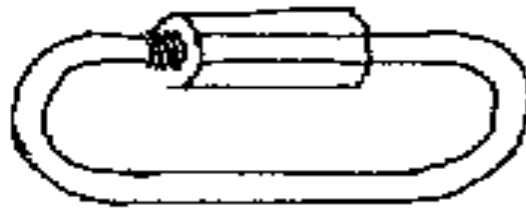
HARLEY 8 uses a loose-footed sail, so you need only add a single grommet to the bottom corner. If you can't find a grommet kit at your hardware store, they can often be found at a crafts or a fabric store.



add a grommet to this corner.

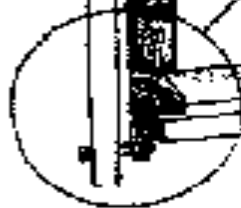
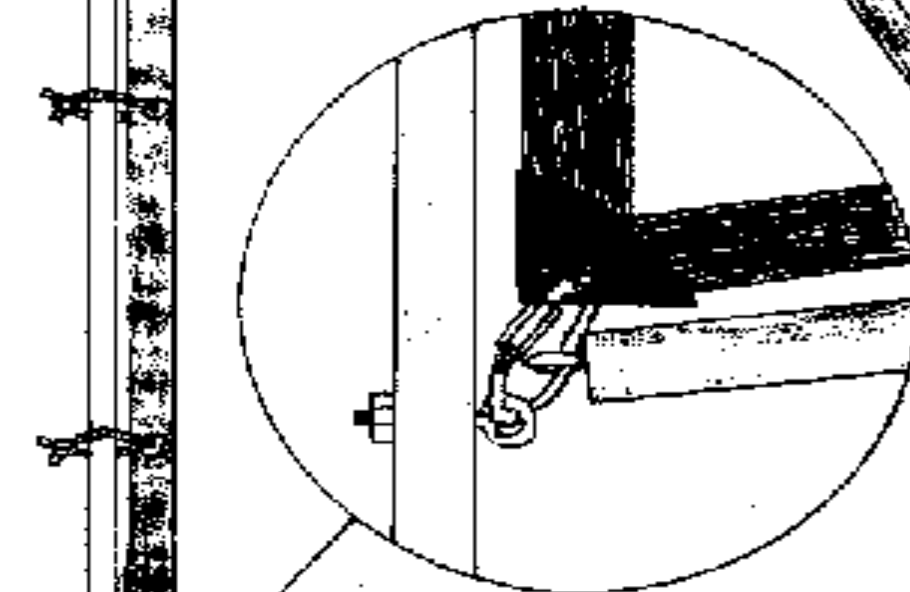
64.

We used this threaded link to connect both sail and boom at the mast.



The sail is held to the mast at the top only by the halyard

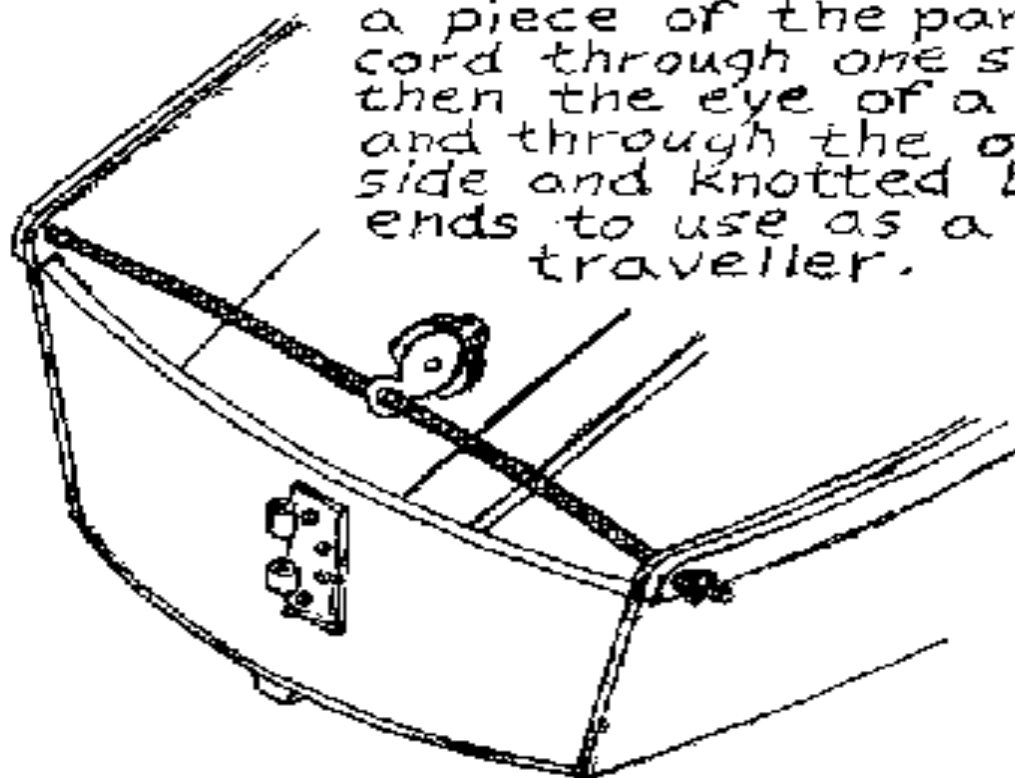
The other grommet are held by loops of parachute cord. (Braided nylon rope sold at the dollar store as 50ft of clothesline.) We'll call them mast hoops.



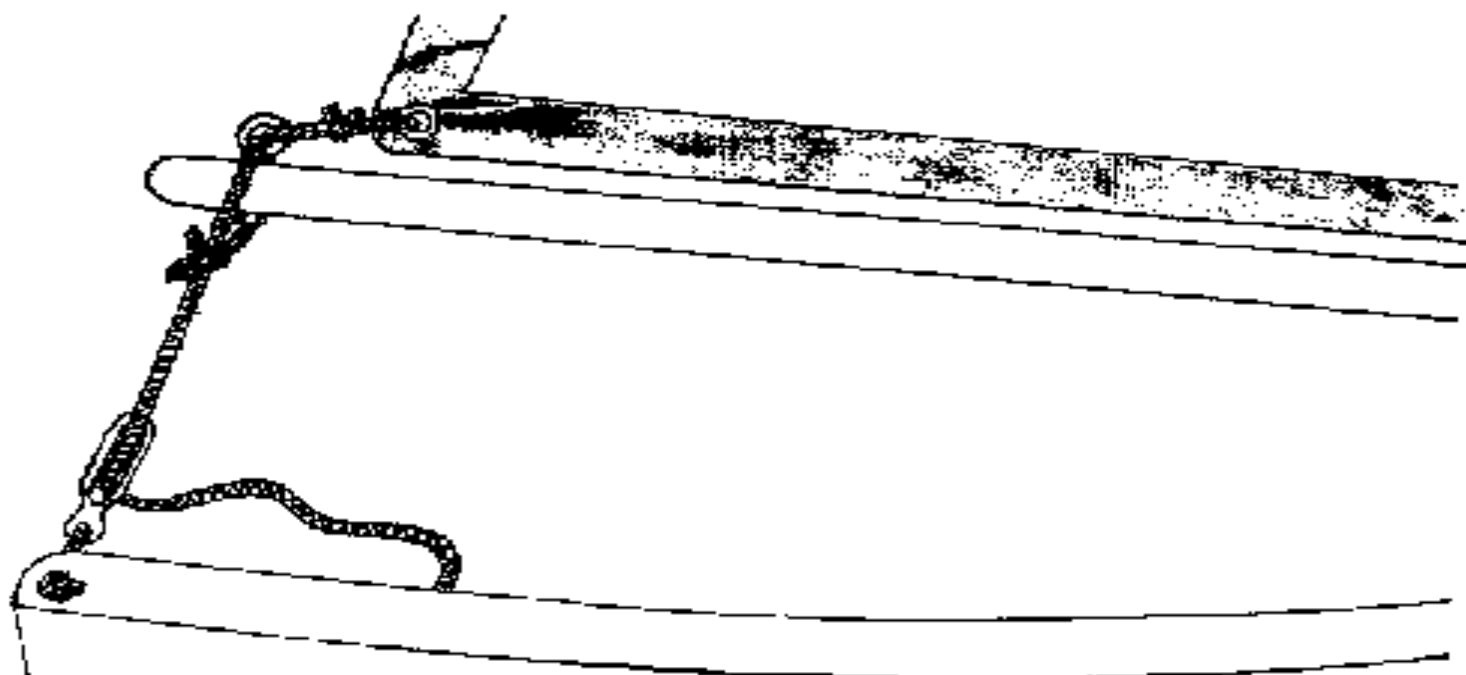


② We found a metal cleat with two screws at the hardware store for 99¢ to use for the halyard. This was screwed to the base of the mast below the eyebolt for the boom.

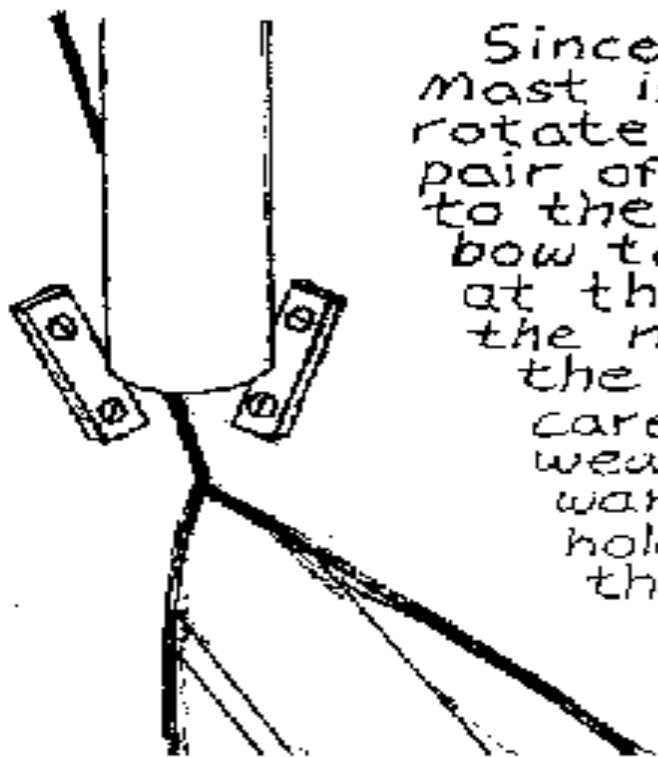
We rounded the bit of the sides that rise above the transom and drilled two holes. Then we fed a piece of the parachute cord through one side, then the eye of a pulley, and through the other side and knotted both ends to use as a traveller.



66.



We tied our mainsheet to the same eyebolt that we lashed our sail to, and fed it through the pulley on our traveller.



Since HARLEY 8's mast is allowed to rotate, we added a pair of metal plates to the inside of the bow to prevent wear at the points that the mast contacts the hull. We don't care if the mast wears, we just don't want it to wear any holes in the side of the boat!

67.

## PAINTING YOUR "Harley 8":

Now that your "HARLEY 8" is ready to sail, all that's left is to paint her.

If you want to, you can spend a boat-load of money on marine paint and sand and paint and sand and paint and sand and paint and sand and paint and sand and paint, ad nauseum, to give her that shiny "yacht finish".

We like the fact that our "HARLEY 8" is a quick and easy and inexpensive boat to build, and we like to keep her that way. The county we live in has a paint recycling program where they give away paint for free! So we poured latex house paint into a tray, grabbed a roller and had her painted inside and out in 5 minutes. An hour later, she was riding on top of our car, en route to her maiden voyage.

THAT is our kind of boat maintenance!

But, hey! Whatever floats your boat!

(If you do apply that "yacht finish";  
Be sure to send us pix! We've  
never seen one done that way!)

## SAILING YOUR "HARLEY 8":

Keep in mind that your boat is very small, almost a toy! She's as much boat as we've ever seen built from a single sheet of plywood, though. Like most flat-bottomed boats, Harley 8 likes to be sailed flat on her bottom. Fortunately, she's a surprisingly stable little boat, and you won't have much trouble keeping her that way.

In very light airs, she does benefit from the old "ghosting" trick of inducing heel by shifting your weight to one side and letting the boom hold some shape in the sail by force of gravity.

Because she's a small boat, her stability is very dependent on her crew weight being right on her bottom. Don't try to install seats in her, it would put the center of gravity too high. Certainly, don't stand up in her. Follow the usual small boat rules; keep your weight low and put it squarely in the middle of the boat when boarding her.

Although her rudder will kick up when you beach her, you'll want it in the down position when sailing. If the rudder wants to float up, you have to tighten the bolt that the blade swivels on so that friction can hold it down. Be sure that when you do beach her, you remember to yank up the leeboard. If you don't you may suddenly spin out of control when it contacts the soil.

69.

You could also damage the leeboard or it's mounts if you "bottom out" with the leeboard in the down position. If you've never sailed before, there are many excellent manuals available at book stores. Although really teaching you how to sail is beyond the scope of this document, I will give you some basic pointers to help you get started. If you are an experienced sailor, you can skip this section entirely and go sail your "HARLEY 8"!

First, let's review the parts of your "HARLEY 8". She has everything she needs and nothing she doesn't so it won't take long to memorize the names of all her parts. Having built her, you should know this stuff already, but it doesn't hurt to review.

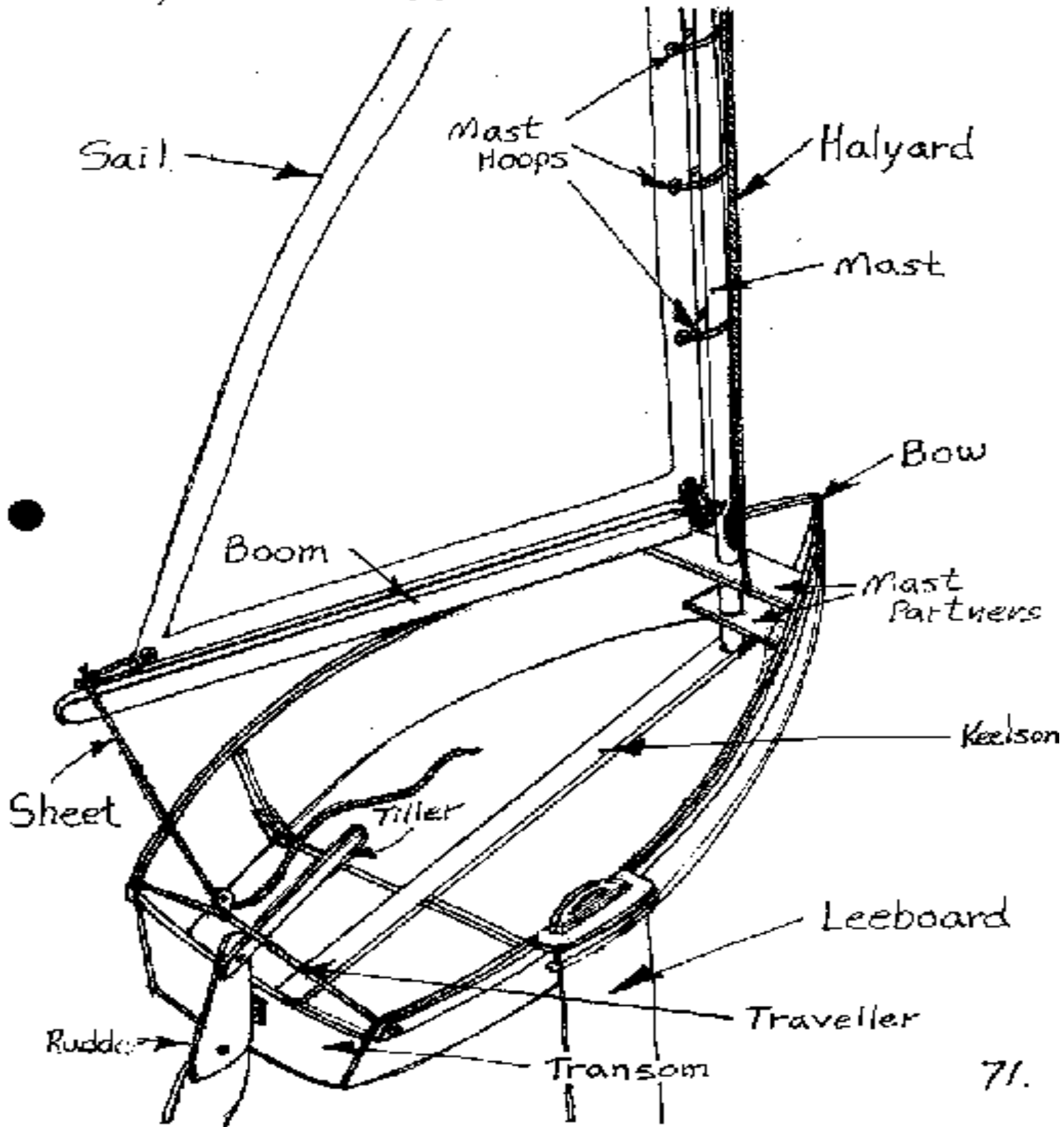
The leeboard provides "lateral resistance". In other words, it helps, along with the rudder, to keep her from skittering sideways so much when the wind is from the side.

The tiller and rudder allow you to steer the boat. Once you get some forward motion, it won't take you but seconds to figure out which way to push the tiller to send her the direction you want.

The rope that raises the sail is always referred to as a halyard and the rope that is attached to the boom is a sheet.

70.

The diagram below should help you remember the names of all the parts of your HARLEY 8.



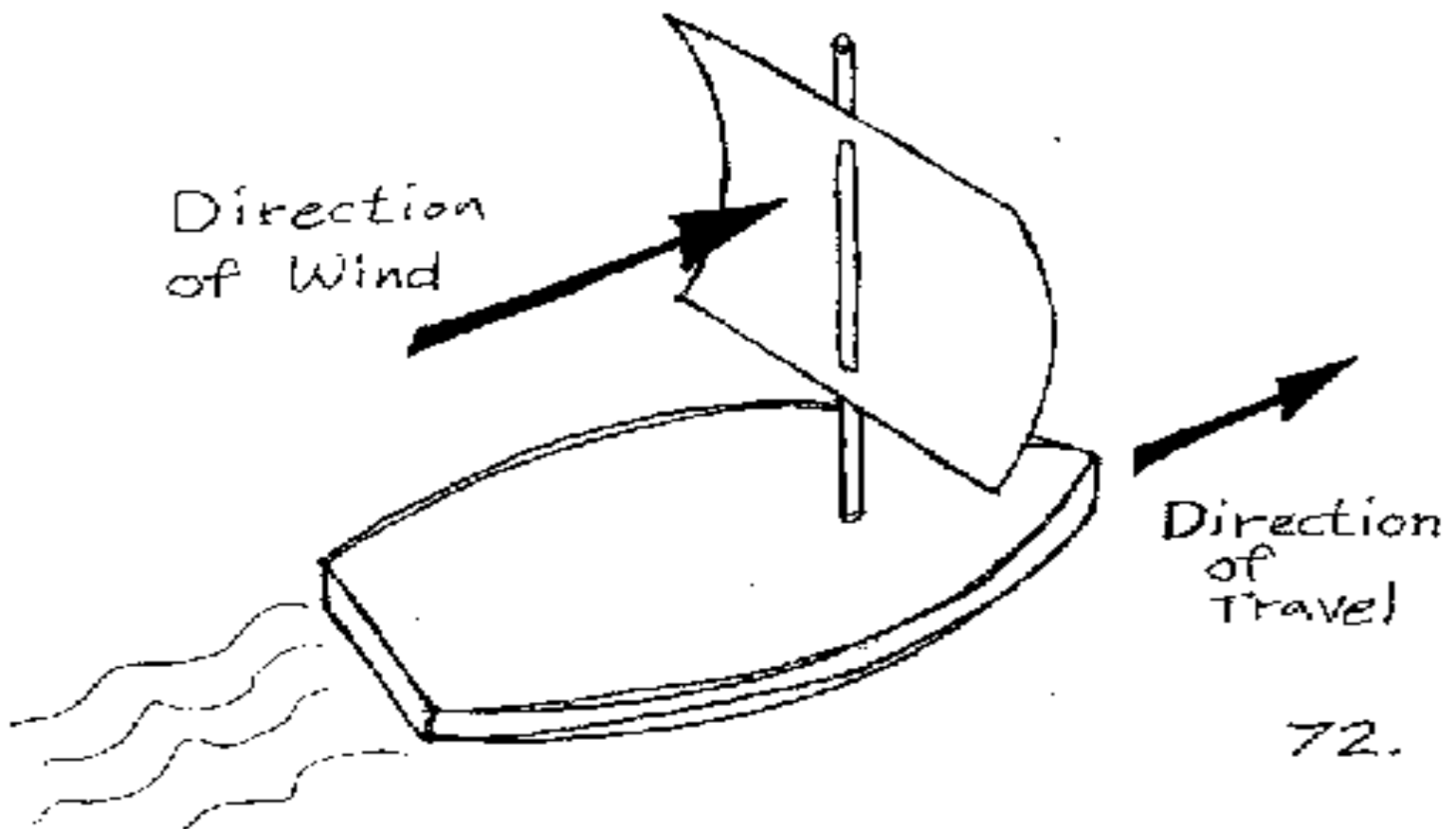


There are three basic "points" of sailing that you should know and understand. Of course there are various intermediate "points" also but if you know the three basic ones you will understand the rest.

### (1.) Sailing "DOWNWIND!"

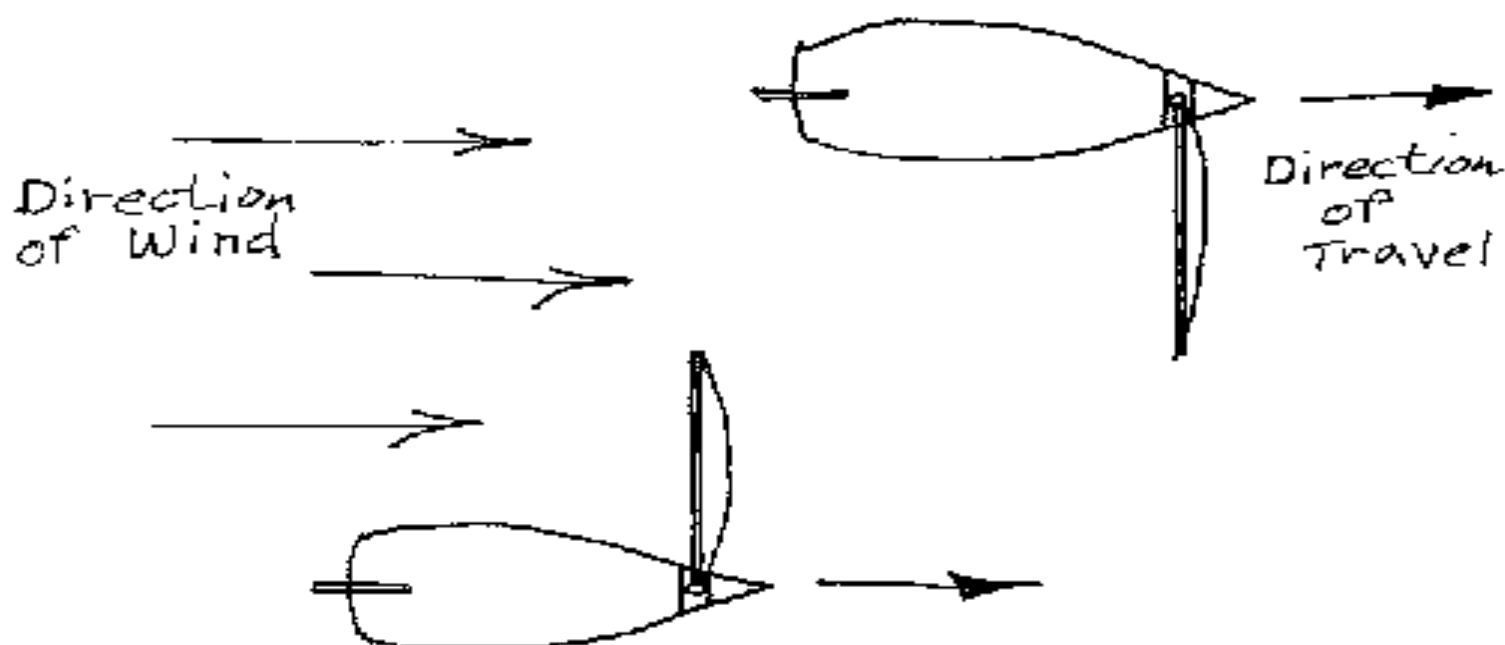
Everyone is familiar with the concept of sailing downwind, even if they didn't know that "sailing downwind" is what it is called.

It is what most people think of when they remember the simplest toy sailboats they played with as a child. Sailing "downwind" simply means sailing with the wind behind you as shown in the picture of the toy sailboat below.



72.

When sailing downwind in your HARLEY 8, the boom will be sticking straight out toward the side. (If you're sailing DIRECTLY downwind, that is, with the wind from straight behind you, it doesn't matter which side.) The diagram below shows a birdseye view of two HARLEY 8's racing each other on a "Downwind leg."



Sailing downwind isn't very fast and it feels even less so. This is because your direction is the same as the wind which is "pushing" the boat. If you have a 5 knot wind behind you and the boat is going 2 knots, The wind only feels like 3 knots.

73.

Sailing downwind is mostly what the "square-rigged" ships of old did. They would follow the "Tradewinds" basically letting the major prevailing air currents push them around the world.

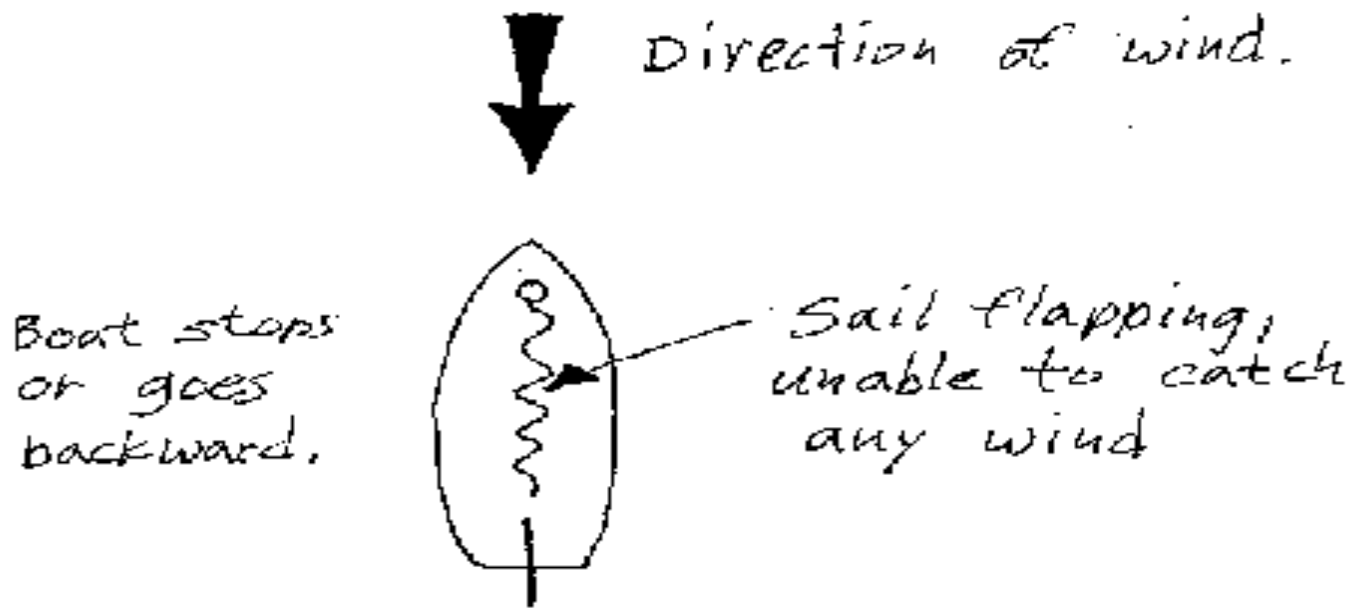
When you are sailing downwind in your HARLEY 8, you will go faster if you raise your leeboard out of the water. It is not needed on this point of sail and is only causing unnecessary drag. Just don't forget to put it back down before you change direction. If you don't, you'll just go skittering off sideways instead of moving forward.

## (2.) Sailing "UPWIND".

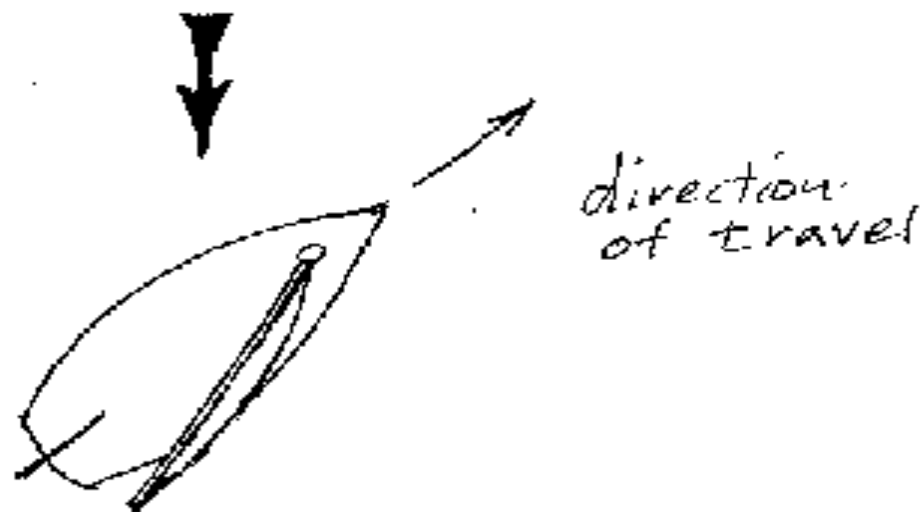
Sailing upwind is exactly what it sounds like. It is the least understood point of sail for non-sailors. Sailing upwind is sailing against the wind. Yup. Sailing upwind means sailing forward with the wind coming from in front of you! Of course you can't sail directly upwind. If you try to do that, your sail will flap wildly and helplessly. (If the wind is strong enough, the sail will flap so violently that it will beat the devil out of you with the sheet!) The boat stops and even starts moving backwards.

74.

This is called being "in irons",



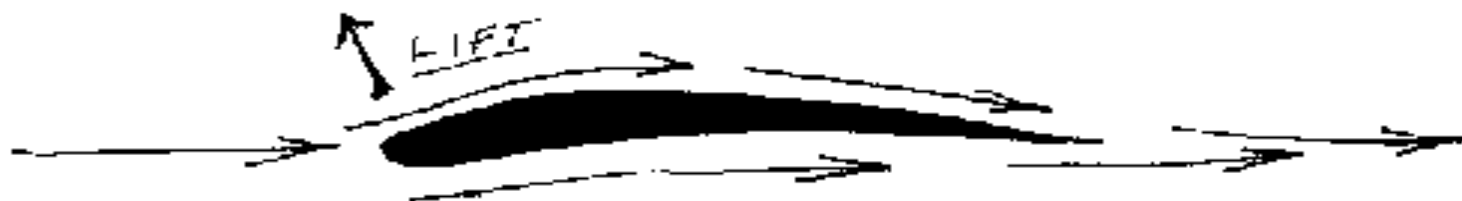
The best we can do is sail upwind at about a 45 degree angle.



How is it that this is possible?  
If you really want to know, ask  
an airplane pilot what makes his  
plane able to fly.

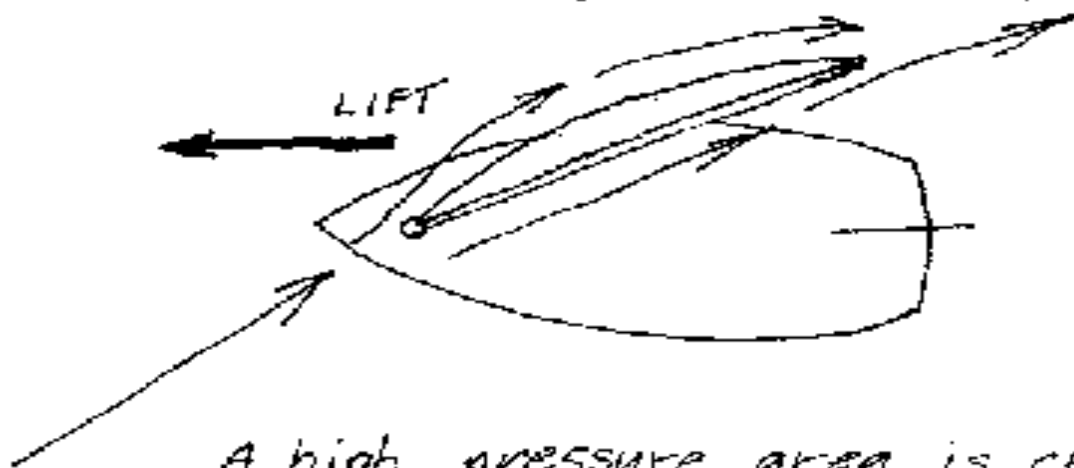
75.

On an airplane, air moves around both sides of the wing.



Because it travels a longer distance around the upper part of the wing, it has to move faster to get past the top than it does to get past the bottom. This creates an artificial high pressure area under the wing. The pressure tries to equalize and causes upward pressure, or lift, on the wing.

Yup. You guessed it. A sail is a wing too! At our 45 degree angle, the wind moves around the sail the same way as a wing.

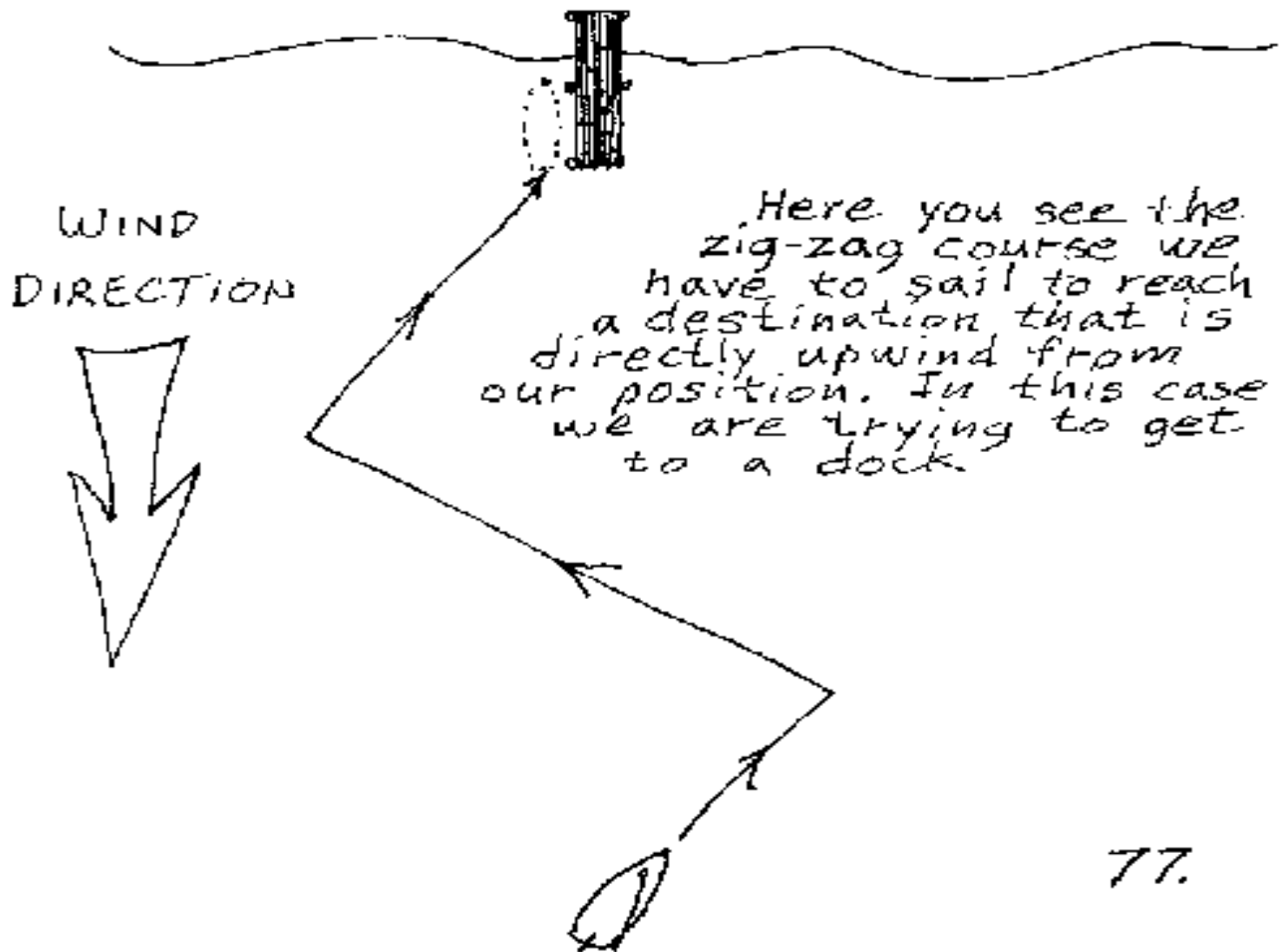


A high pressure area is created behind the sail. The pressure tries to equalize and causes lift which is translated as forward motion. In this way the sail is pulling the boat INTO the wind.

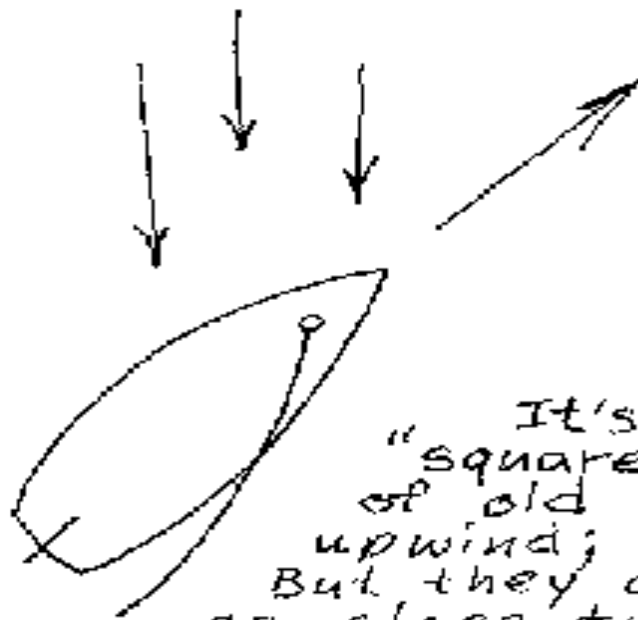
76.

When sailing upwind, there is a lot of air pushing against other parts of the boat from the direction that the boat is trying to move toward. This has the effect of slowing us down so sailing upwind isn't real fast either.

What happens when the wind is coming from the exact direction we are needing to go? We can still get there, but we have to take a zig-zag, sort of course to get there. This is called "tacking".

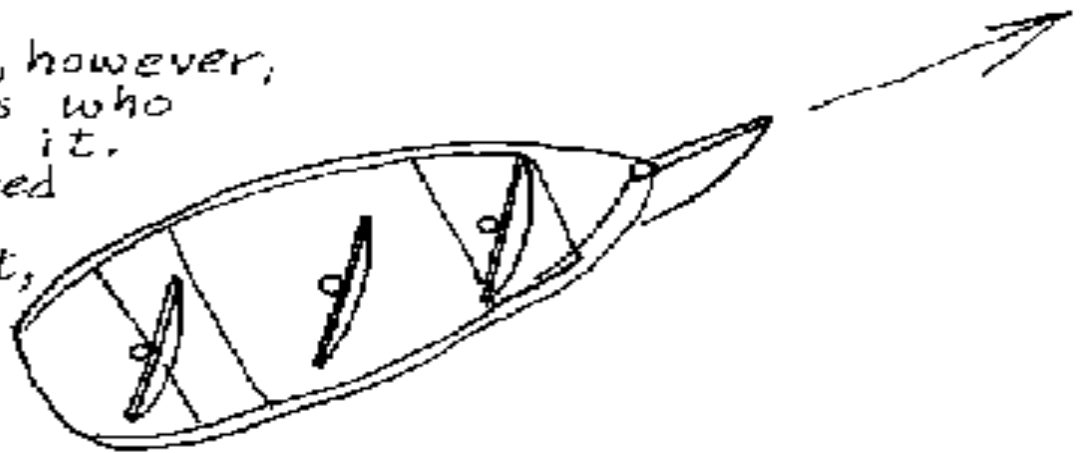


The type of rig on your HARLEY 8 is known as a "fore and aft" rig, as the sail is oriented from front to back. A fore and aft rig is more efficient at sailing upwind than the square sails of the old sailing ships. That is, with a fore and aft rig, you can sail "closer to the wind", out somewhat theoretical 45 degrees.



It's not that the "square-rigged" ships of old couldn't sail upwind; They could. But they couldn't point as close to the wind.

There were, however, sea-captains who wouldn't do it. They considered it a sort of witchcraft, as if sailing upwind was un-natural!

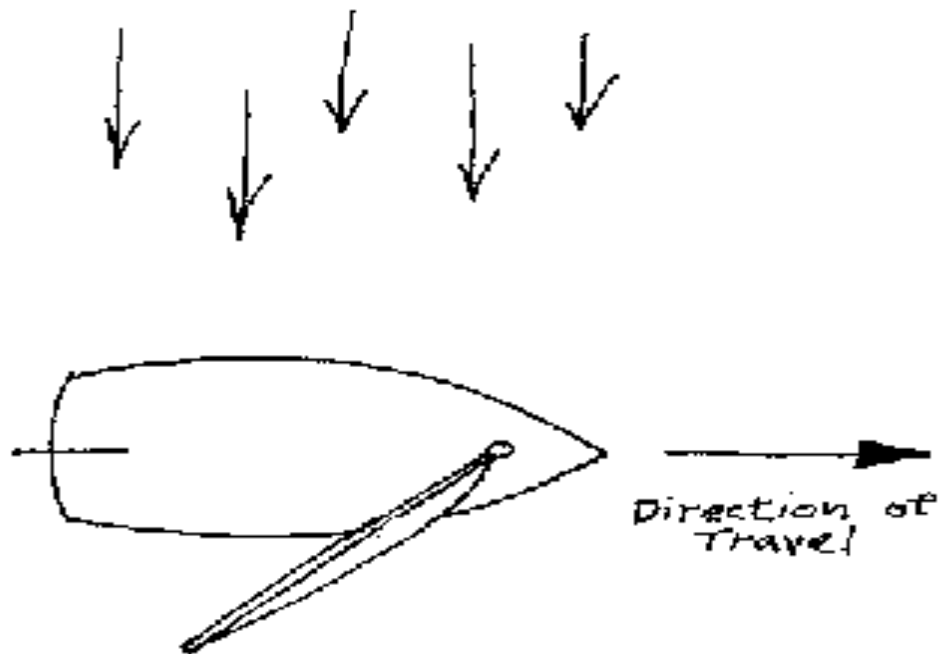


78.

## REACHING:

Sailing "on a reach" is sailing with the wind coming from the side of the boat.

WIND DIRECTION



"Reaching" is the fastest point of sail. It is generally understood that while reaching, the wind is both "pushing" the boat, as when sailing downwind, and, at the same time "pulling" the boat, as when sailing upwind. The most exhilarating sailing you will do in your HARLEY 8 will be reaching.

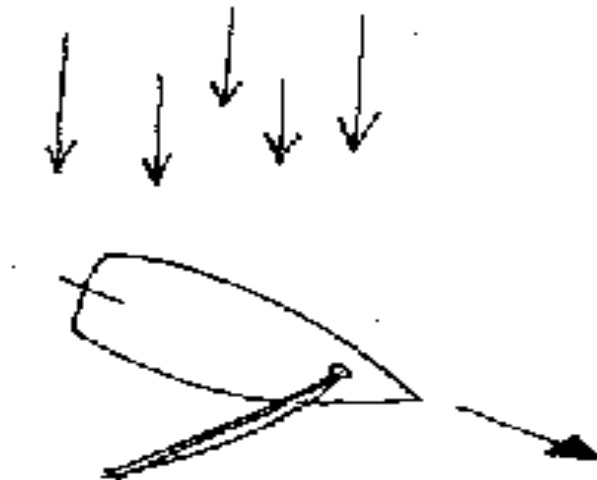
79.



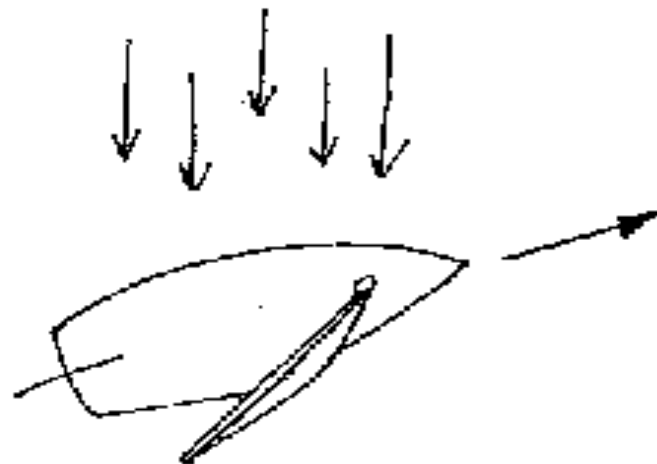
This is a good thing, because most of your sailing will be done on a reach.

If the wind is directly from the side you are on a reach.

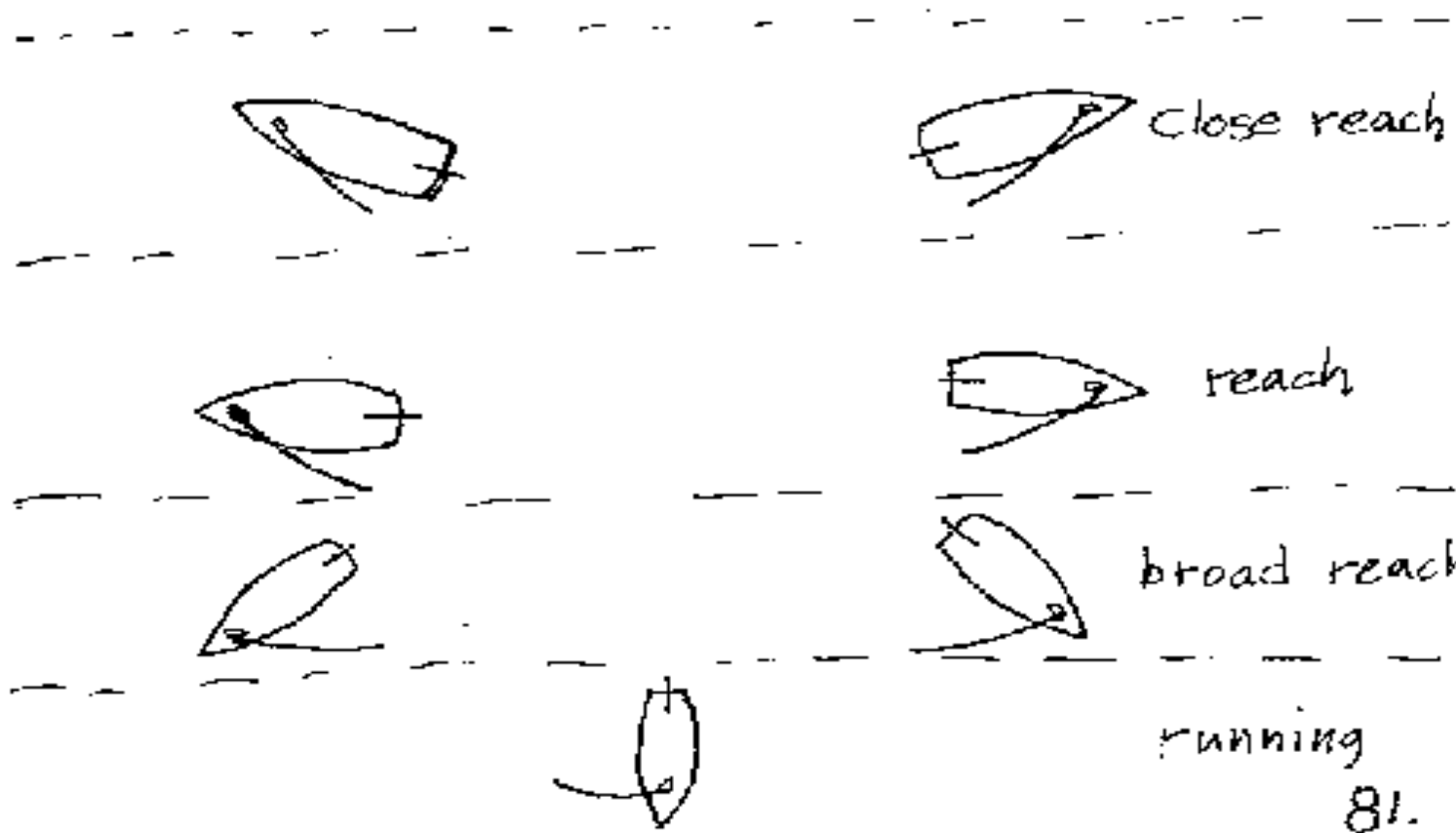
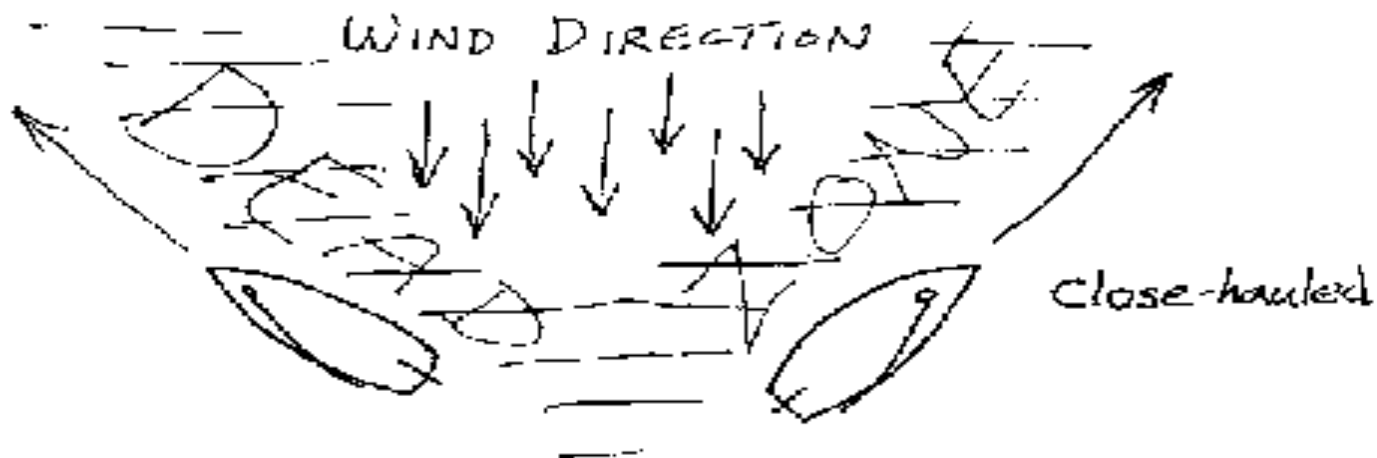
If you are sailing with the wind mostly from the side, but a little bit "downwind", too, it is called a "broad reach".



If you are sailing with the wind from the side, but a little bit "upwind", it is called a "close reach".



You can see then, that with sailing "close-hauled" (upwind), "reaching" and "running" (downwind), there is a sort of dead zone directly into the wind to 45 degrees "off the wind". "Tacking" allows us to reach a destination directly upwind, or nearly so.

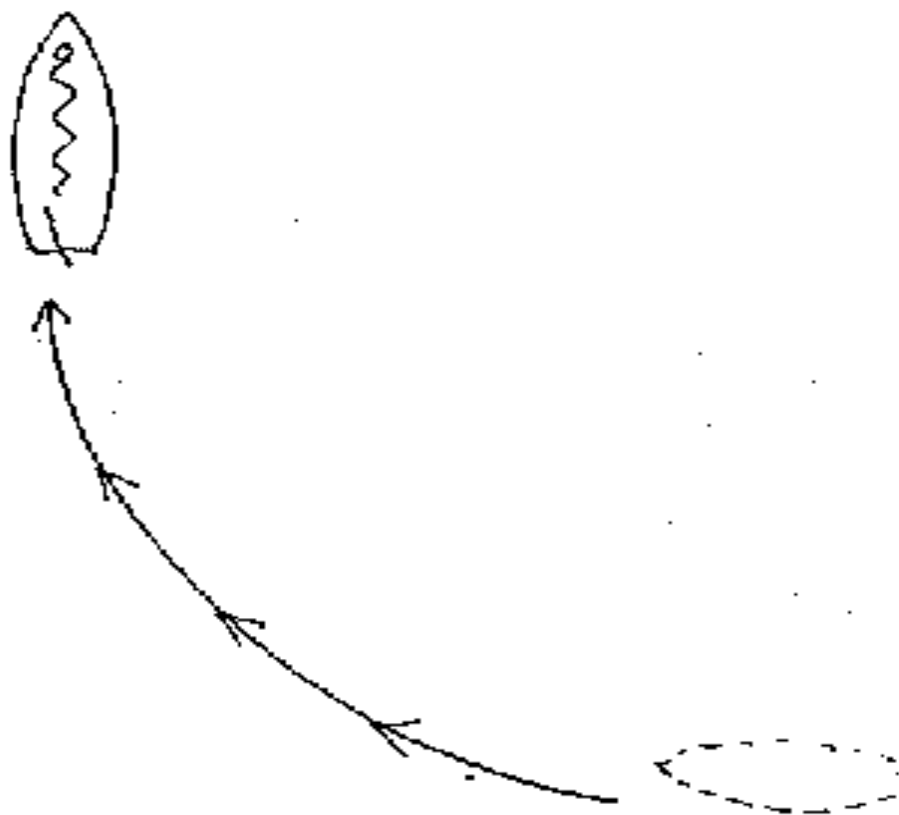


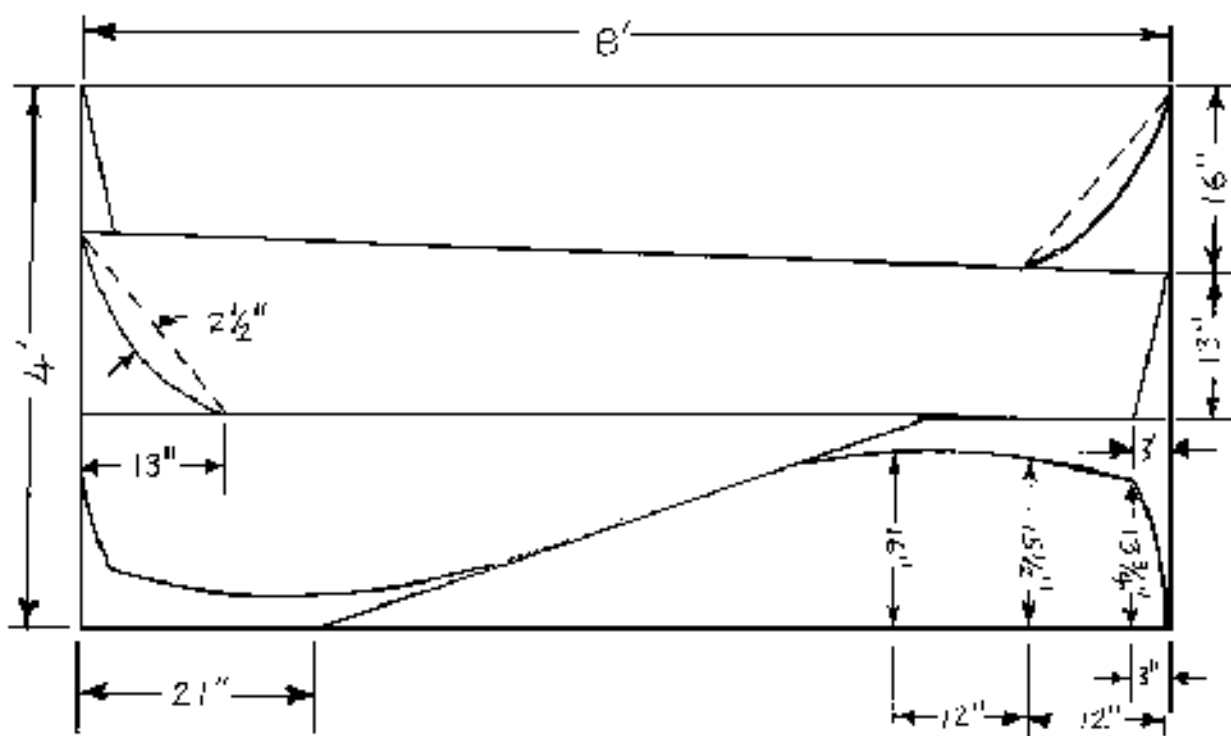
## TACKING YOUR HARLEY 8:

When tacking upwind in moderate to heavy wind, your HARLEY 8 can usually always keep up enough momentum to make it through that "Dead zone" area, and still have some forward motion as you "fall off" on the other tack.

In light winds this may not be so. If while "coming about" you find yourself "in irons", that is, stuck in the middle, you can employ a trick called "BACKWINDING" the sail.

Let's say we're tacking like the boat below, and we get stuck "in irons", unable to complete the tack.



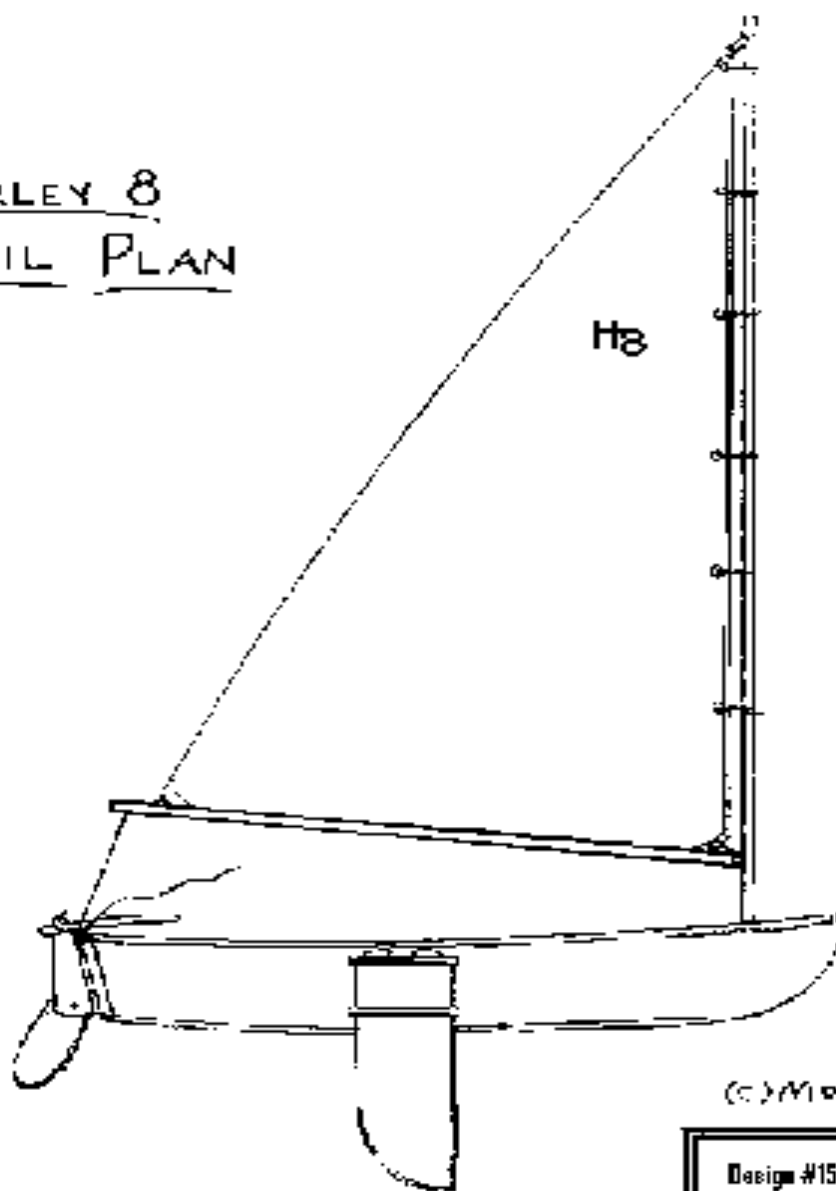


SCALE 1" = 1'

the ULTIMATE ONE-SHEET BOAT  
 (c) May, 2004 by *Kristofer J. Harlson*

Design # 15  
 8' x 4' x 2 1/2"  
 KRISTOFER J. HARLSON  
 - DESIGNER -  
 LYNWOOD, WASHINGTON

HARLEY 8  
SAIL PLAN



(c) May, 2004

Design #15

Harley D

Kristofer J. Harlson

Designer

Lynnwood, Washington