Although there are differences among boats, the first step in a total rebuild usually involves removing the deck, the transom, the stem, and two planks on each side of the boat—the garboard and another plank at the turn of the bilge. The boat shown is approaching that state, and has been blocked high off the floor for access, and braced securely to hold her in shape while the work is going on.

# Restoration of 12 1/2-Footers

## Part I

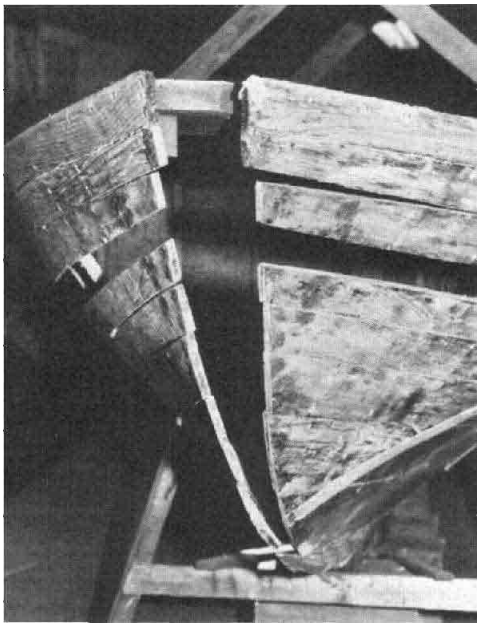
by Maynard Bray
Photographs by Benjamin Mendlowitz

In 1914 Nathanael Herreshoff created what would become one of his best-loved designs: the Herreshoff 12 1/2-footer. Twenty boats of this new class were built that year and the drawings for them were titled, simply, "Buzzards Bay Boys Boats." Some 400 more were built by the Herreshoff Manufacturing Co. before production ceased in 1943. After the war the Quincy Adams Yacht Yard built a few more under license from Herreshoff, followed by yet more from the Cape Cod Shipbuilding Co., which purchased all rights to this and several other Herreshoff designs in the late 1940s. Cape Cod soon ceased construction in wood and commenced in the then-new fiberglass, calling the updated version a "Bullseye." Quite recently another builder got into the act: Edey and Duff started building its version, also in fiberglass, called the "Doughdish".

In spite of all the new construction in glass, you can't buy a *new* wooden-hulled Herreshoff 12 1/2-footer. No one is building them—or is even allowed to, according to Mr. E.L. Goodwin of Cape Cod Shipbuilding, who claims to own all the rights to both design and construction in wood. Many owners of 12 1/2-footers wouldn't want a new boat, anyway; either they're too attached to the one that's been in the family for three or four generations, or else they value owning an "original" Herreshoff for its own sake. Keeping that old boat going is their main interest.

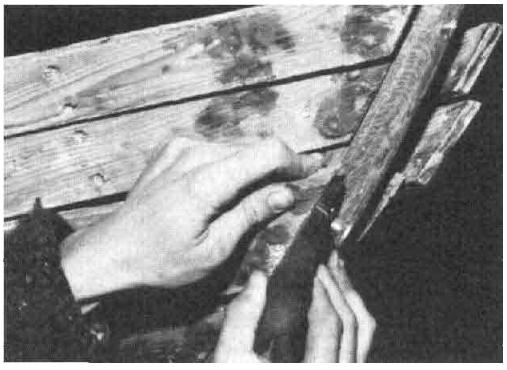
Wooden 12 1/2-footers are showing their age, almost without exception these days. Remember, the Herreshoff-built ones are at least 40 years old, and most of the class are a good deal older than that. But breathing new life into these old hulls can indeed be done, although it takes a good bit of skill if it's to be done well. The man who does this best and who has had far, far more experience at it than anyone is Steve Ballentine, whose yard in Cataumet on Cape Cod has repaired some 60 12 1/2-footers, about 20 of them being total rebuilds. It's fussy work and it isn't by any means cheap, but as Steve and his crew do it, the boats come out as strong as the day they were built, and they look just about the same as well. Here is how Steve goes about it.

1



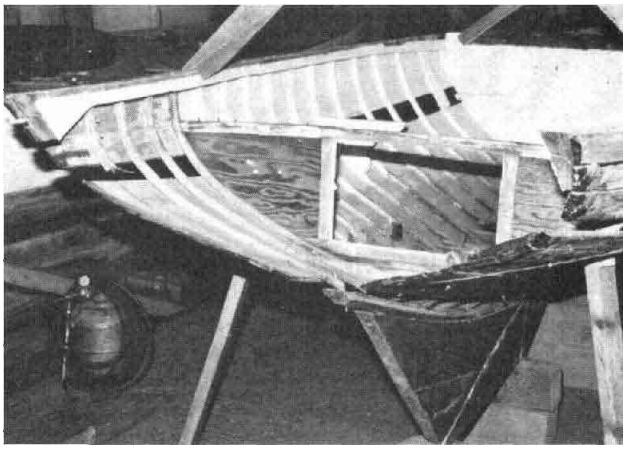
## THE STEM

Steve has found over the years that the stems in these boats have held up quite well. Made of stem-bent oak, they rarely become rotten, and generally require only refastening. But to refasten a stem properly, it has to be removed from the boat. Out on the bench, where it is accessible on all sides, the stem is cleaned up with a sharp scraper, particularly along the rabbet, where an accumulation of caulking and compound would interfere with refitting the planks. All the old screw holes are then filled with whittled oak plugs set in thickened epoxy, so that the planking screws can be driven anywhere along it with the confidence that they'll hold. Similarly, the plank ends are cleaned up and their screw holes and damaged areas are filled—this time with thickened epoxy alone. The stem is then ready for installation, new bolts being used at its lower end where it scarfs against the keel. Plenty of bedding compound is applied to this joint beforehand, and a stopwater is bored for and driven in afterwards to keep it from leaking.



The use of thickened epoxy shows clearly in this photo. It gives the planking a new lease on life and allows these full-length cedar planks, even though slightly damaged and worn, to be used again. For a good fit the second time around, some of the plank ends are dressed down with a block plane, as shown.

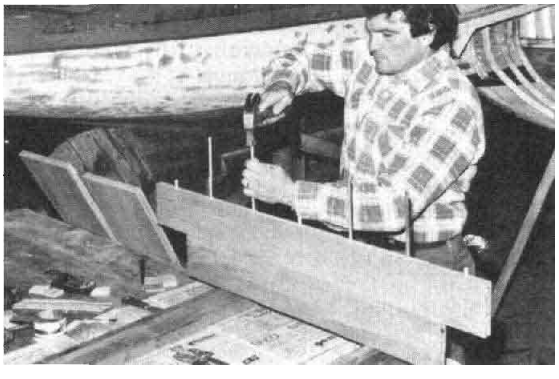
3



## THE TRANSOM

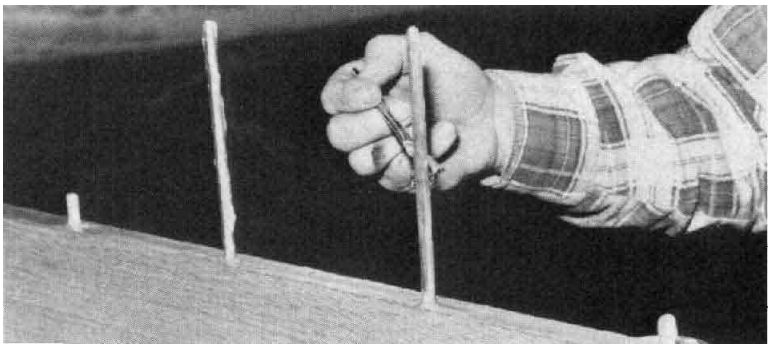
The story is quite different at the other end of the boat—with the transom, that is. If there is one thing that all 12 1/2-footers generally need, it's a new transom. The original ones were iron-drifted together, and their aft-raking inner faces made for easy entry of salt water. As always happens in a union of ferrous metal fastenings and seawater, rusting sapped the strength from the drifts and caused the surrounding wood to go bad. Steve Ballentine corrects the immediate problem with a wholly new transom, and prevents a reoccurrence by using bronze rather than iron for the drifts and by backing up their strength with epoxy glue. The first step in this process is to carefully remove the old transom in one piece so it can be used as a reference for making a duplicate one. In this boat the vertical transom knee has been removed as well.

4



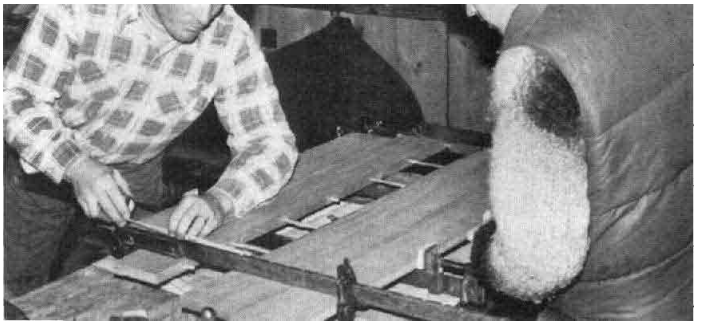
Oak 7/8" thick is used as stock for the new transom. The oak has to be quite dry before assembly if the joints are not to open up afterwards. Here, Steve drives the bronze drifts, which will hold the transom planks together, into epoxy-coated holes. Wooden dowels are used in the middle and ends to help with the alignment; metal has to be kept away from these areas so as not to risk damaging the edge tools that will later be used in cutting the finished shape and forming the hole for the tiller. (Since most of the lower piece will be cut away, no metal at all is used to fasten it—just glue. During gluing, it is held in alignment by a spline, which can be seen at the lower right in the photo.)

5



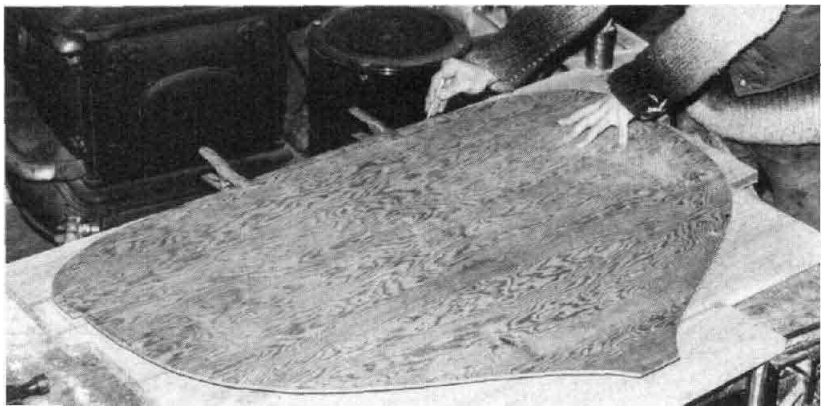
With the drifts driven half their length into one piece, the other (projecting) halves are coated with epoxy, as are the edges of both pieces of oak being joined. All the drifts have been carefully laid out so as to not conflict with any hardware that will later be attached to the transom, and the holes into which they are driven are sized for a fairly tight drive fit. Note that a blunt point has been ground on the end of each drift so that the fastening will start more easily and drive without hanging up.

6



"Driving" is done by clamping one piece to another, as shown here. Steve is careful to bring the pieces together evenly so that they don't bind, and measures frequently to assure good alignment. He'll also make sure that the pieces, once in contact and securely clamped, lie in a flat plane. There will be one more piece after this one, also drifted and glued, to provide the required width as indicated by the transom pattern, which is shown standing against the bench in the background.

7

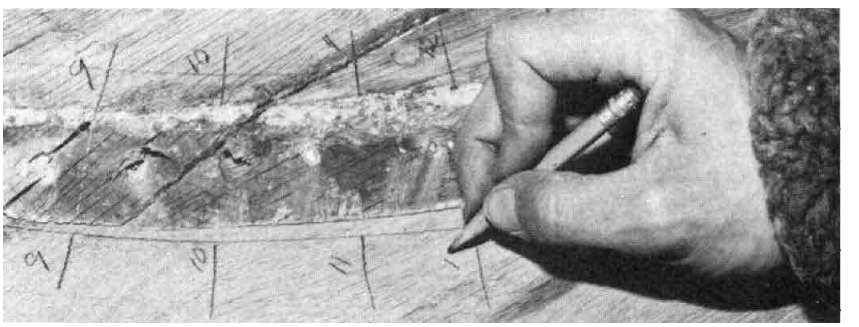


With the glue cured on all of the four pieces making up the transom, the clamps can be removed and a cutting outline can be marked in pencil from a master pattern that Steve has developed for these boats.

8

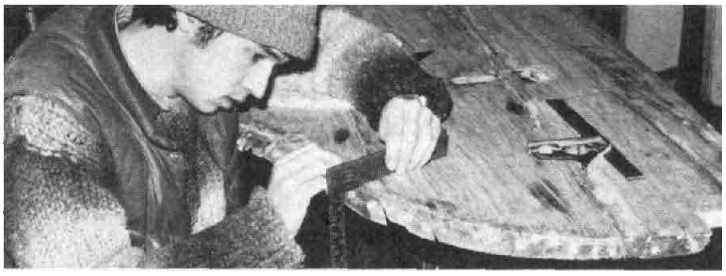
But not all 12 1/2-footer transoms are exactly alike, and differences from boat to boat show up when the old transom is laid on the master pattern. In most cases, the stripped-out hull can be pushed and pulled a little to conform to the pattern, since differences seldom amount to more than 1/4".

9



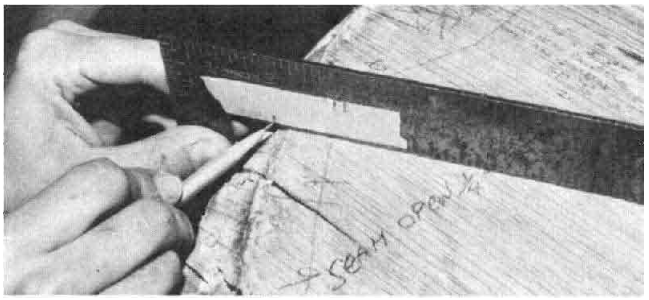
With the old transom in place on the new material, common station marks are drawn about 2" apart and numbered as reference locations for lifting and marking the proper bevels along the edges of the new transom. The slight difference in outline between the old transom and the master pattern shows up here.

10



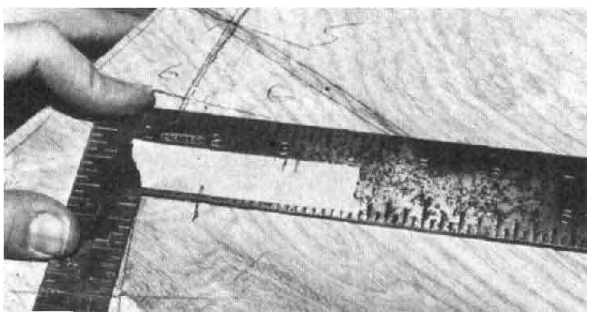
Bevels are now picked up very carefully from the old transom at each of the marked stations. This can be done in a number of ways; the method Dexter Cooper is using here involves marking the difference between the inner and outer transom faces on a piece of masking tape stuck onto a small framing square.

11



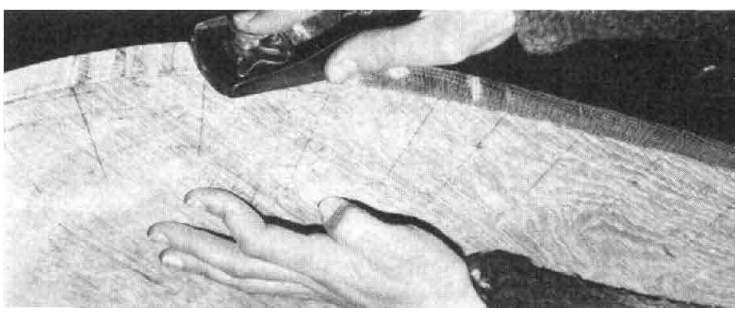

This is the time to correct any gaps that existed between the transom and hull planking before the old transom was taken out. While the upper part of this transom appeared to fit well enough, it will be necessary to close up the gap or seam starting at station 7, as noted in pencil on the old transom before its removal.

12



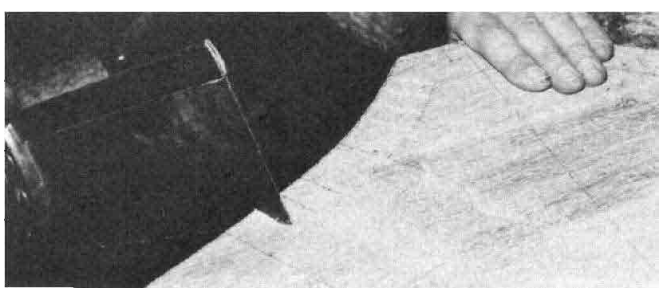
The mark on the tape is now transferred to the new transom, and after all the stations have been so marked, the marks are connected with a fair line run through them.

13



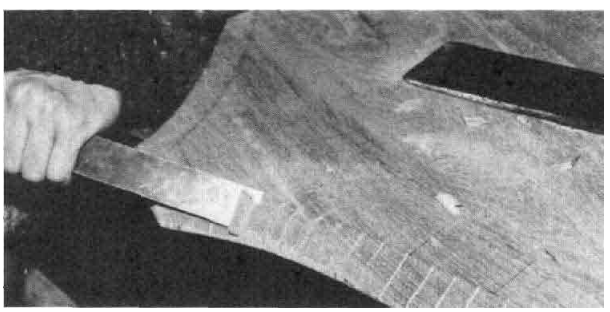
The outermost of the two lines, representing the inner face of the transom, can then be sawn out and planed square, fair, and to the line.

14



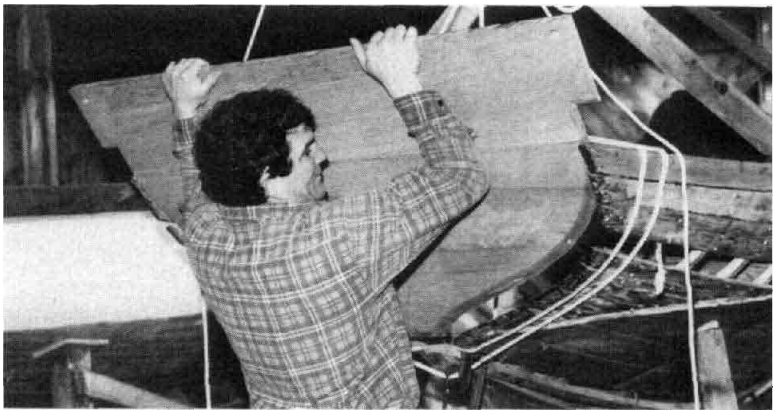
Cutting the bevel, like marking for it, can be done in various ways—the idea being simply to remove the wood down to the marked line as quickly as possible, yet keeping the control needed for a good job. This bevel is being cut in several steps, the first of which is making close-together saw cuts as shown, with the saw held so that it hits the line at the same time as it hits the lower corner. A bevel gauge is used at this point and again on the finished transom edge to confirm that the bevel matches the old transom, except where deliberate departures have been made.

15



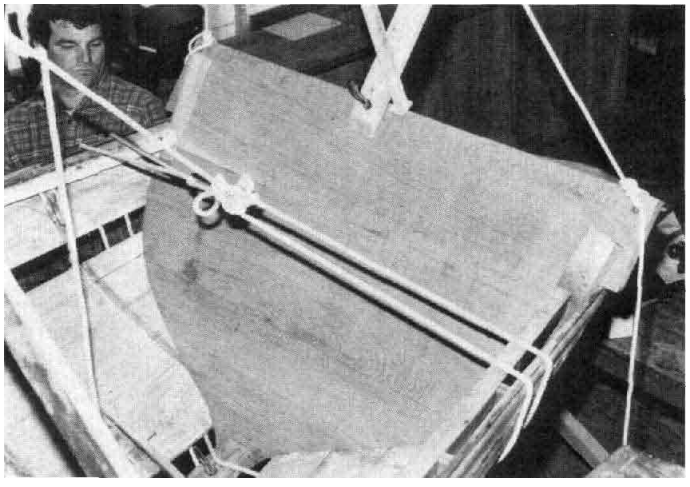
With a slick, a chisel, and later with a spokeshave and block plane, the wood between the saw cuts is removed and the beveled edge trued up.

16



The partially finished transom is ready for a trial fitting.

17

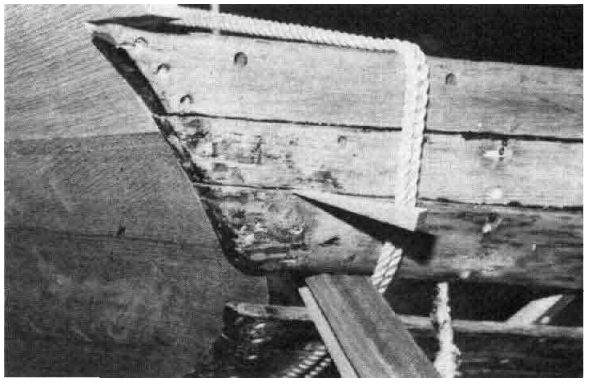


All the careful measuring and cutting has paid off. After the hull has been pulled into its proper place against the new transom and held there with straps, braces, and clamps, very little trimming is required. At this stage, before fastening, the transom has to be held aft with a block of wood clamped to the keel at the bottom, and with wedges against the sheer clamps at the top.

18

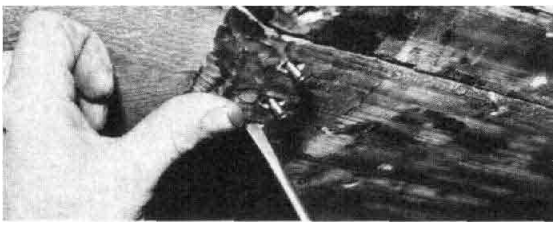
For planing off the few high spots for a perfect fit, the transom is removed and clamped to the bench. Because it will be finished bright, this is also a good time to do the final smoothing of its surfaces. After that, as Steve has done here with a blanket pad, the surfaces must be protected against scratches and dents.

19



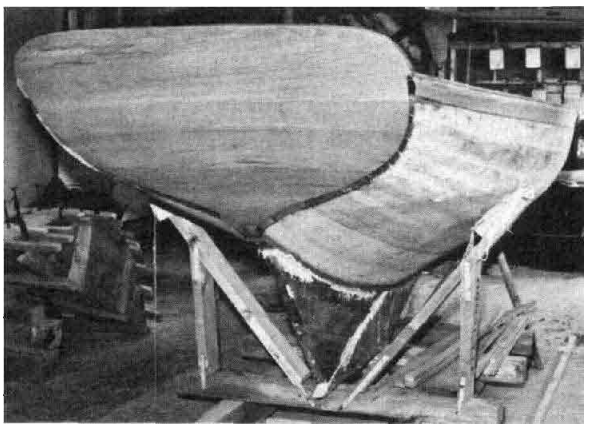
Screw holes in the planking aft, as at the forward end of the boat, have been filled with thickened epoxy, so that new holes may be drilled in optimum locations. The varnished sheer strake, however, is an exception, and in it the old screw holes are reused so as not to change the finished appearance. Before any drilling or fastening is carried out, the planks are wedged as necessary to get seams of even width.

**20**



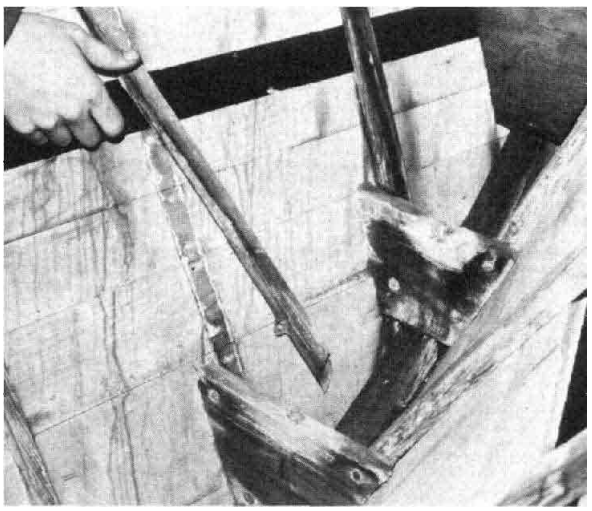
Fastening can then proceed, with care taken to drill at the proper angle so the screws will get a good grip and not poke through the transom's inner face.

**21**



Here's the new transom, after the plank ends have been planed flush and the top has been shaped to the right curve. The hole for the tiller has yet to be cut. A new centerline knee (not visible) has also been made up and fastened to the inside face of the transom and the top of the keel. Now that the knee is in, the sternpost that covers its through-bolt at the keel can be installed. Actually, far more has been accomplished here than putting in the transom: the fin outside the keel timber has been rebedded and rebolted, some new planking has been hung, the sheer area has been rebuilt, and the boat has been completely reframed. The photos that follow show how this framing was done.

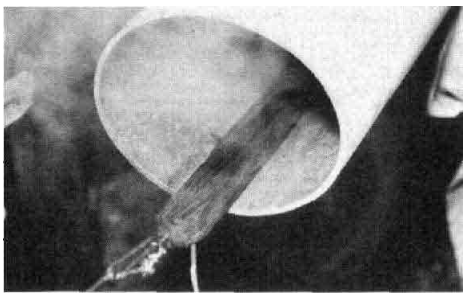
**22**



## THE FRAMES

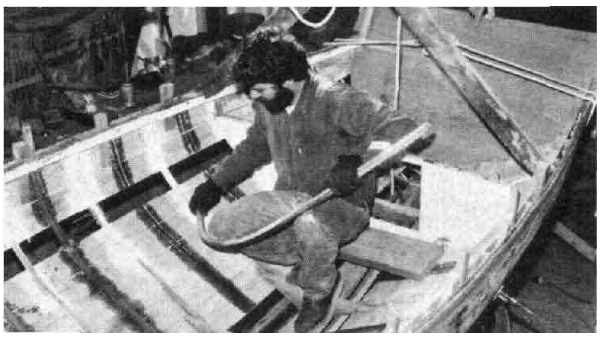
Steve has found that most 12 1/2-footers need new frames. Even though they look good on the three surfaces normally visible, the face against the planking usually shows signs of fatigue. The plank fastenings always need renewal, yet they're too weak to be backed out without breaking. New screws can be added, but drilling for them takes yet more strength from the already aged frames. More importantly, the planking suffers from the additional screws. Thus, replacing the frames seems to be the best course of action. Every other frame is removed in whatever way is quickest without damaging the rest of the boat. A hacksaw is sometimes useful here to cut off old fastenings, but splitting out the frames usually has to be resorted to. The remains of the screws are then driven out of the planking, using a hammer on the inside and a softwood backup block on the outside so as not to damage the soft cedar. The putty over the screw heads has to first be dug out, of course, and afterwards the holes are filled with thickened epoxy.

**23**



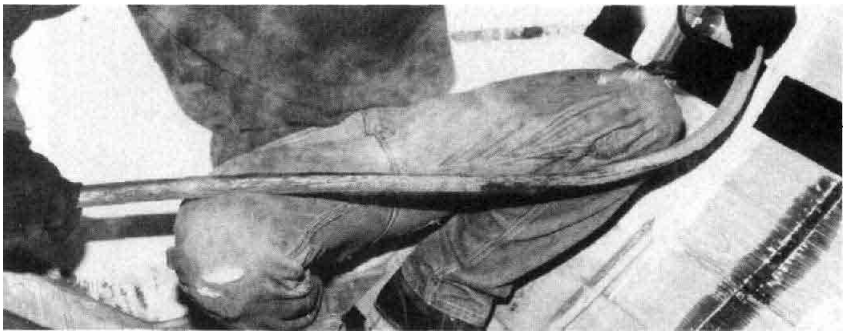
New frames of straight-grained oak are gotten out, measuring close to the right length (with an allowance of an extra 6") and having the correct heel bevel. Each is tagged for location before being put in the steambox. After steaming for a half-hour or so, the frames are taken out of the steambox one at a time and quickly handed up into the boat.

**24**



Here's what the overall job looks like so far. You can see that the way has been cleared for every other frame, and the planking in these areas has been cleaned of old paint and coated with linseed oil. The sheer clamp has also been wedged away from the remaining old frames so that the new frames can be slid up behind it. The new transom and the two bulkheads, one forward (not shown) and one aft, help hold the hull in shape while the new frames are being bent in. And having the garboards and a plank at the turn of the bilge removed makes it possible to draw the new frames into position with C-clamps. Here, a hot frame fresh from the steambox is being limbered up by Robert Williams into the approximate shape it will have to assume when in place.

25



This pre-bending involves some ingenuity. This frame has an "S" shape and is being so formed by bending it over one knee and under the other, with the hands helping with the bend at the ends. The idea is to have the bend always fair and gradual; never allow the piece to bend sharply at a single place. That's how frames are broken.

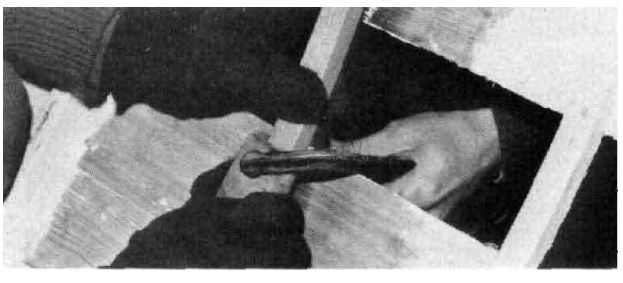
26

Installation of a bent frame takes place in seconds—it has to, because the wood is only flexible while it's hot, and out of the steambox at room temperature it cools quickly. The first move after pre-bending is to drive the top up behind the sheer clamp, all the while trying to retain its pre-bent shape. This takes some practice, but it's really easier than it sounds.

27

The first clamping takes place down at the heel of the frame near where it bears against the keel. This is where the reverse bend is located, and to get the right amount of curve in it, a full-length ribband has been temporarily fastened about halfway up in the opening where the new garboard will go.

28

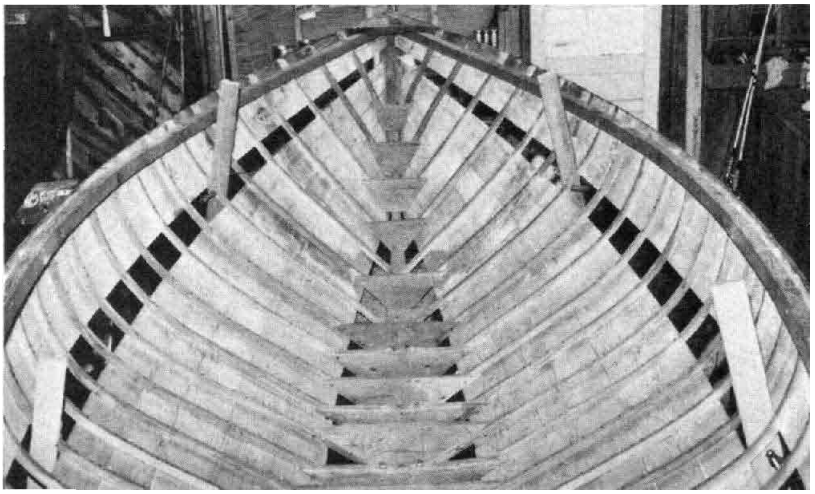


Once its heel is clamped to a good fit, the frame can be drawn out against the hull planking at the bilge with another clamp. Pads are placed under all the C-clamps so that the frames are not marred when the clamps are drawn up tight. Care should be taken that the planking pulls the frame, rather than vice versa, to keep the plank lines fair.

29

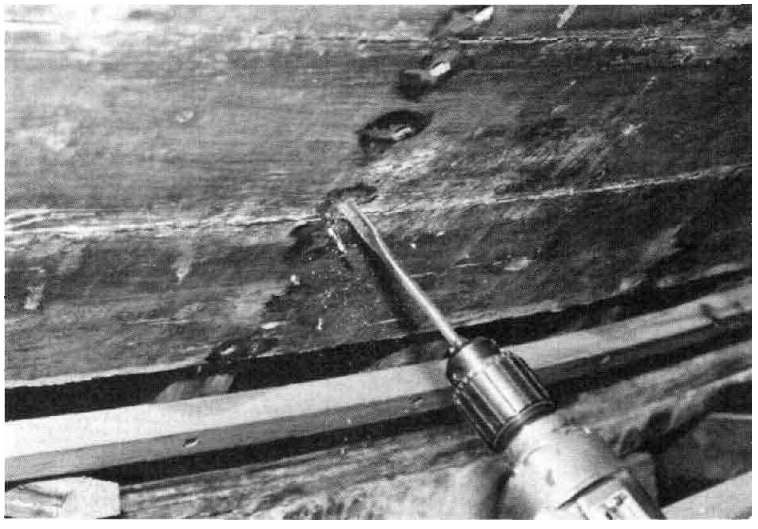
Although the hull has been stripped of paint, enough of a mark is left to clearly indicate where the old frame was and where the new frame must go. This frame line sometimes needs improvement—each frame should have proper alignment to those adjacent. A rawhide mallet tunks the frame whichever way is needed for alignment. After the first batch of frames are in place and fastened, the alternate ones will be split out, the surrounding planking stripped of paint, and its screw holes filled with epoxy to make way for new frames.

30



This is what the finished framing job looks like. This boat has also been given new floor timbers and new sheer clamps. With these additional members, the hull had enough stiffness so that the bulkheads could be removed. Fastening of the floors and the clamps was originally with copper rivets, and that is what Steve put back in the new work. He also selected rivets for the new plank-to-frame fastenings, rather than the flathead screws that had to be used when the boat was built (there was a mold for every frame for all Herreshoff boats and their presence made riveting out of the question). Let's look at how the rivets were put in..

31



## THE RIVETS

As mentioned earlier, all the old screw holes in the planking were filled with epoxy thickened with microballoons. From the inside face of the frame, pilot holes for each rivet were drilled all the way through the hull. The point of the twist drill shows in this picture, just emerging from the upper part of the lower plank. Rivet heads have to be countersunk; a spade drill, centered in the pilot hole on the outside of the planking, does this job.

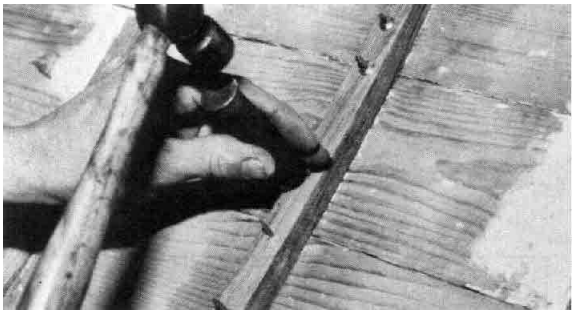
32

Copper rivets are then driven through each of the holes, most planks having three rivets per crossing. A nail set drives them all the way into their counterbores. Although it's doubtful that they'd ever leak, just to be on the safe side Dexter wraps a strand of caulking cotton around the shank of each rivet just under its head. The cotton is held there with the sticky bedding compound he daubs on beforehand.

33

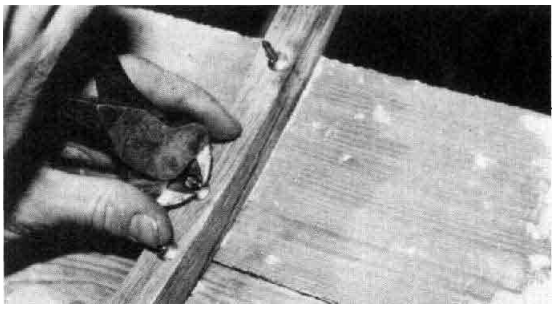
Now for the burrs, or roves, as they're sometimes called. These are a force fit over the rivet shanks, and a short length of round bar with a hole drilled along its axis serves as a tool to drive them on.

34



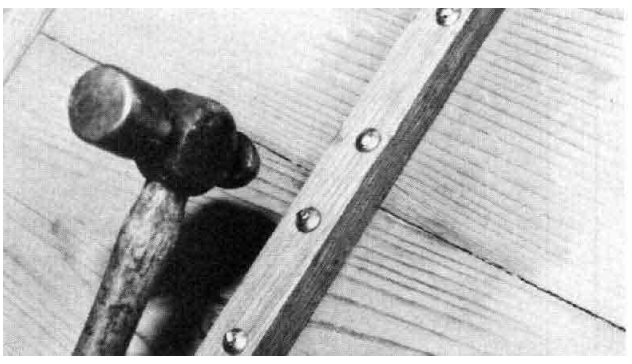
This tool is used with a hammer on the inside of the boat, while someone bucks up the head of the rivet on the outside using a special iron (see photo #37).

35



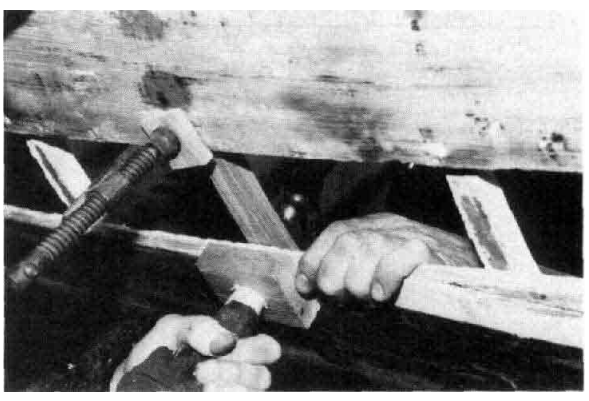
End-nippers cut off the excess length of shank, leaving just enough for peening. Usually about a shank diameter is enough.

36



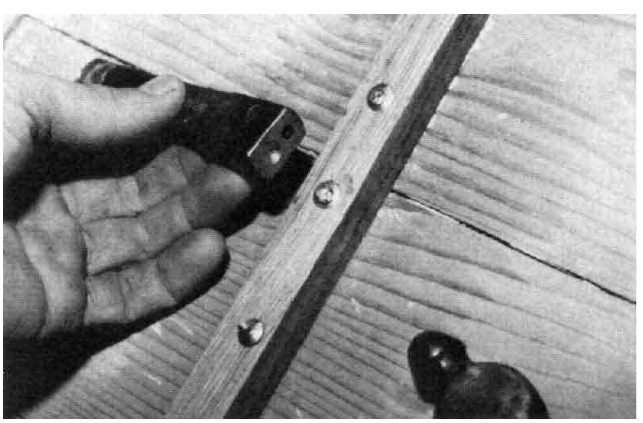
Peening is the next step. A light ball-peen hammer used with many light taps upsets the projecting end and forms it over the burr. Hard blows risk bending the shank inside the wood.

37



As with the burr setting, the rivet head has to be bucked up on the outside while the riveting takes place. The tool for the job is a heavy iron weight whose end has been shaped to fit into the counterbore and against the rivet head. Steve uses a wooden block on this bucking iron to keep it from sinking the rivet head too deeply in the soft cedar.

38



Since the peened-over ends of the rivets will show on the inside of the hull, Steve dresses up their appearance with this tool. It smooths out the surface after peening and gives the rivets a more finished look. Outboard bucking is also required here.

(We'll continue with more repairs to this Herreshoff 12 1/2 in our next issue.)