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Fig 1
Parts and Terms

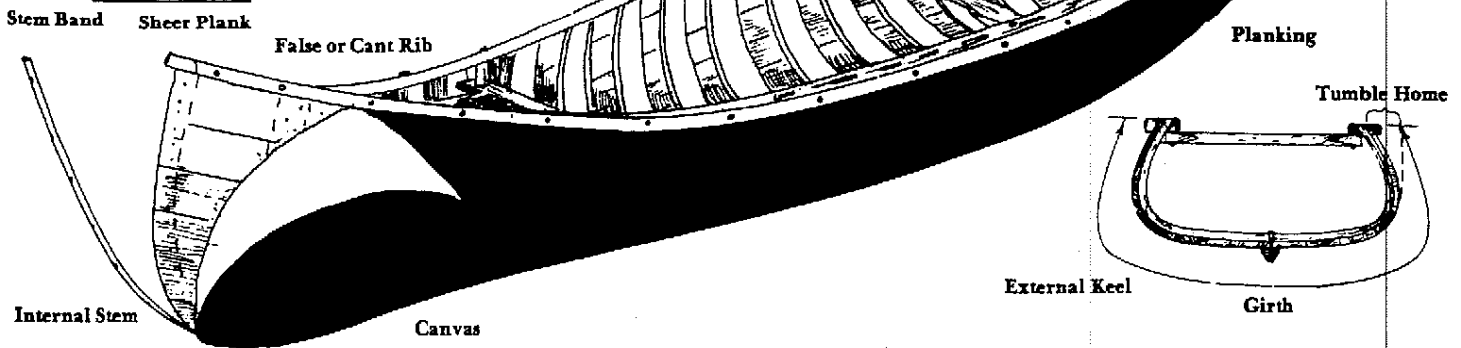
Rebuilding the Wood & Canvas Canoe

Text & Illustrations by Jerry Stelmok

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PART 1 ACQUISITION & RIPOUT

When the time comes to choose a small craft, you are not necessarily limited to a choice between a new, rather expensive custom wooden boat and a lusterless, synthetic production job. With elbow grease and determination, a used wood-canvas canoe just might be the ideal craft to fit your needs.

First consider a canoe's virtues. It is light in weight, durable, and suitable for water conditions that vary from a lazy saltwater inlet to a raging northern river. A canoe can be paddled, poled, rowed or sailed; it can be carried by airplane, automobile, or on your own back; and it can accommodate more gear than you will need in a lifetime of outdoor adventure. If the canoe is constructed of wood, it will be enduring and easily repaired if damaged, and it will exhibit sublime grace and authentic character.

With all this going for wooden canoes, it is little wonder that more and more people are rediscovering their wonders, and have found the rewards of recycling well-worn canoes.

Locating a canoe to repair is not that difficult in some parts of the country where canoeing is steeped in tradition. In other regions it may take more ingenuity to find one, but there are sure to be a few tucked away or abandoned somewhere. For many

years, the major canoe manufacturers turned out thousands of wooden canoes and shipped them throughout the world. Many have survived even after years of neglect.

Finding a canoe, however, is just the prelude. Before you buy it, and before you start ordering the supplies for your spring trip down the Rupert River, you must determine whether the repairs required are within your capability.

A list of common ailments found in old canoes includes wornout canvas, cracked planking, badly cracked ribs, a broken or rotted inwale, and rotted decks and stem tops. I have brought back numbers of canoes with problems like these to serviceable condition, and you can do it too. Let me take you through the necessary steps:

Step 1 -- Removing the Canvas

To repair a wooden canoe, you must first strip off the old canvas covering. First, remove the metal stem band (sometimes called a bang iron) at each end of the canoe. If there is an outside keel running the length of the hull, remove it also. The tapered ends of the keel are usually attached by screws driven through the keel, planking, and ribs into the stem of the canoe. However, the majority of the screws holding the keel are driven from inside the canoe, out through the ribs and planking. These can be seen from inside the hull and should be removed and saved, along with the little finishing washers that prevent them

from burrowing too deeply into the cedar frames. Most keels are about 3/4" by 7/8" in cross-section and are slightly hollowed out where they bear against the hull. The dried-up bedding compound that was originally used in this joint will have to be scraped out later.

Your next step in freeing the old canvas will be to remove the gunwales, which are the longitudinal strips on the outside of the hull at the sheer. When they are removed, you can see where the canvas is tacked in place at each rib near the very top of the uppermost, or sheer, plank. Now go to the ends of the canoe and remove all the tiny tacks that fasten the overlapped ends of the canvas to the stems. You will encounter dried-up canvas filler, which tends to bind the canvas to the wood. The canvas can be pulled free, however, once the tacks have been removed, and the filler residue can be scraped from the wood with a chisel.

The easiest method may be to rip off most of the canvas just under the line of gunwale fastenings. These tacks can then be removed by inserting the end of a tack puller under the canvas very close to the tack and pulling the canvas strip from the hull in one operation.

With the canvas removed, you may find a few more problems than you first anticipated, but don't let them bother you for long. The best approach is to remove all the offending rot and broken pieces, so you can begin the more heartening rebuilding process as soon as possible.

Step 2—Removing the Damaged Planking, Decks, Seats, and Thwarts

If the tops of the stems are rotten, the ends of the two or three uppermost planks must be removed for access. To do this you will need a standard tack puller and either a hooked linoleum knife or a straight-bladed utility knife. Using a block of wood as a guide and holding the knife blade at about 45 degrees to form a bevel, score across the grain of the plank in line with the center of the fourth or fifth rib from the end of the canoe. You should be able to snap off the end of the plank neatly if the fastenings have been removed ahead of time. (Later, when the plank section is replaced, the bevel thus cut can be matched by the new plank.)

It is important to use a tack puller with care when removing the clinched tacks to avoid damaging the rib. Lift the head of the tack just a hair above the surface of the wood, and move the tool around while exerting steady pressure until you find the angle of least resistance. Then pull the tack through by rolling the puller back on its curved section.

The ends of the plank were probably fastened to the stem with nails, and if they have rusted, you should cut away the plank there and pull out the nails with pliers. Take off enough planks to expose all of the rot in the stem, but stagger the cuts to avoid landing all the butts on the same rib. Normally, removing two or three planks will do the trick.

Now remove the breasthook; this is easily accomplished by backing out the screws that secure the inwales to it. Be sure to save it for a pattern. Also, if the stem has considerable curve in its upper end, you should make a pattern of the stem before ripping it out.

With the breasthook removed and the planking cut back, draw a diagonal line on the exposed stem, just below the rot, about two inches long. Cut along this line with a sharp, fine-toothed saw. This will not only cut away the rotted portion of the stem but also will leave a beveled surface onto which a new piece can be scarfed (Fig. 3).

The seats and thwarts are removed simply by unbolting them from the inwale. Although brass carriage bolts are the usual fastenings here and are easily removed, some may be stubborn and may require a hacksaw or cold chisel to cut them free. If the inwale is to be discarded, a small section in way of the fastenings can actually be cut away to save much fuss and bother.

Step 3—Removing the Inwale and Ribs

Before removing the inwale, measure the exact distance on each side of the boat between the aft corners of the breasthook and a reference point on a nearby rib, a measurement that will be important later for locating the new breasthook correctly between the new inwales.

In most old canoes, the ends of the ribs are attached to the inwale by steel nails, the heads of which are probably totally disintegrated by now. To keep from damaging the ribs, it is best to break away the old inwale with a chisel (Fig. 4).

With the inwales gone, there isn't much strength left in the hull, and the sides of the canoe will probably change shape. The craft will bounce back when the new inwale is installed and the thwarts are replaced.

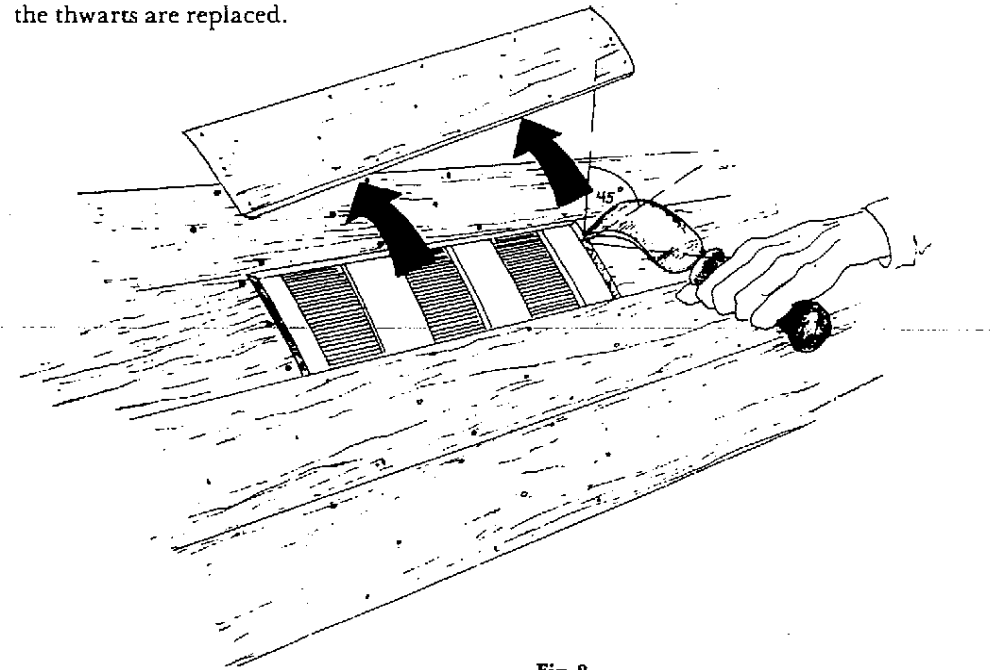


Fig. 2

Cutting out a section of planking.

Now is the time to determine which ribs have to come out. If there are more than two bad ones in a row, it is best to renew the ribs in stages by removing every other one and attacking the others after these have been replaced. Take care that the tacks fastening the ribs to the planking do not damage the planking as they are pulled. The best procedure is to work from the inside of the canoe with an old chisel and a tack puller. Break away the wood around the clinched end of each tack, then straighten or break off the point with the puller. The remnants of the tack can then be easily drawn out from the outside.

If you are not replacing the inwales of your canoe, to free the rib it must be split away from the nails that hold it to the inwales. The broken ends can be

slid out from between the planking and the rail. Tilt the midsection of the rib toward the center of the canoe and flex it as you pull steadily (Fig. 5).

Step 4—Removing Damaged Planking

With the canvas off the canoe, you will never have a better opportunity to deal with broken planking, so it is best to scrutinize the planking carefully and note all the badly damaged sections. Any planking that has broken across the grain should be replaced, as should any that has long, lengthwise splits. Short splits along the grain can usually be repaired by drilling 1/16" stop holes at each end of the split and adding a few tacks on each side of it to hold the planking down.

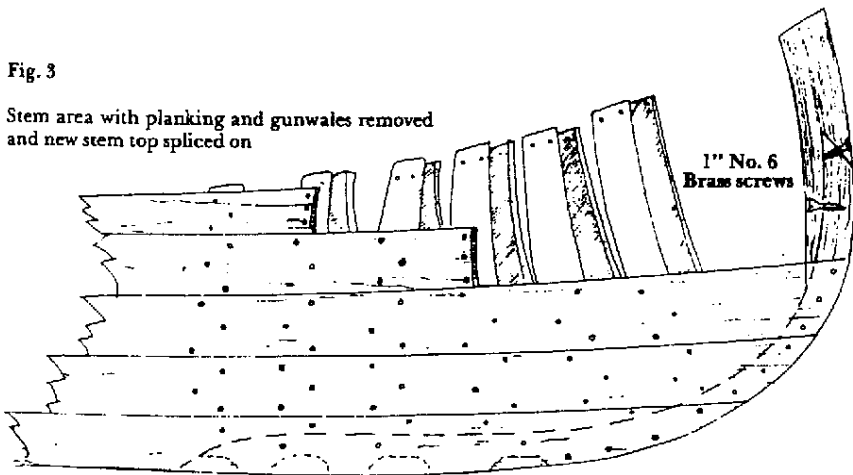
New planking should span at least three ribs. As described earlier for the

planking at the stem, damaged plank sections should be cut with a utility or linoleum knife with a bevel at each end (Fig. 2). The tacks should be removed carefully, and if they are troublesome, you may have to break away the planking with your chisel and push their heads in flush with the outside of the exposed rib. Then, by snipping off the clinched tips from inside the canoe, you can draw out the tack stubs from the inside.

When you have completed this step, the ripout is complete, and although what is left of the canoe is sad looking, at least it is wholesome and sound.

Fig. 3

Stem area with planking and gunwales removed and new stem top spliced on



PART II RENEWAL AND REFINISHING

Clear Eastern white cedar, used for ribs and planking, is unsurpassed in its qualities of lightness, resilience and resistance to rot. Likewise, clear, long lengths of Northern white spruce are pliable and exceedingly strong for their weight, making them ideal for gunwales. Although getting either of these native woods in grades suitable for canoe construction is difficult, good cedar and spruce can be found if you are willing to do some scouting.

Woods other than spruce can be used for rails, but for rib stock there is really no acceptable alternate to cedar. Hardwoods, because of their weight, are not suitable, and there are not many softwoods that can hold up under the tight bends required of canoe frames. Fortunately, rib stock does not have to be particularly long—four to five feet will do. Cedar shingle or post mills often have stock of this length on hand, sometimes even graded. The only drawback is that the wood is still in the round, and you will have to find someone to mill it square for workshop use.

For planking, you can substitute quality Western red cedar, which is widely available but expensive. Red cedar has very nice vertical grain, and clear grades are available in much longer lengths than white cedar. However, it is definitely more brittle than its eastern counterpart and not as rot resistant. Most wooden clapboards sold at lumberyards are made of Western red cedar. These, of course, are cut on a bevel, and if used would have to be planed to a uniform thickness, usually 5/32".

The gunwales inside and out can be made from a variety of woods. Spruce is the logical choice because of its pliability and excellent strength-to-weight ratio, and if you can get it, Northern white spruce is ideal. Stacks of long, normally ungraded 2 x 8s and 2 x 10s in most lumberyards are apt to contain a few clear planks. Sitka spruce is also very good and is normally available in much better grades than Eastern spruce. It is quite expensive, however.

Spruce does dent or nick relatively easily, so some canoe manufacturers use a harder wood for their outside rails. Philippine mahogany, ash, oak,

or even cherry are possible substitutes, and if spruce cannot be obtained, will serve as inwales also. Ash or oak can be used for seats and thwarts, and for splicing out the ends of the stems. The only disadvantage in using hardwoods is increased weight, which (and never forget it) should be avoided in canoe construction.

Fastenings can also be difficult to acquire. The 3/4" or 11/16" No. 12 brass tacks that traditionally are used to secure the planking to the ribs are particularly scarce. These are manufactured by PCI Consumer Products, Fall River, Massachusetts, but are sold by the company only in very large quantities. These tacks, which have rounded heads, are superior to the flathead variety, because it is easier to make them "clinch" into the rib once the head starts burrowing into the planking. But copper tacks are more readily available in most areas and actually are a longer-lasting metal. To work well, they must be 3/4" long, with a narrow shank and a very thin tip (Fig. 6).

Brass screws, at least in the small quantities you will need, should be available from your local hardware dealer. It would also be nice to have a few 3/4" No. 14 or 16 bronze ring nails (Anchorfast) for such jobs as attaching the ribs to the inwales, but these are not absolutely essential, since two- or three-penny galvanized box or ring nails can be used here as well.

There are other materials you will need, especially for recanvassing the hull, but these will be discussed later as we go along.

Step 1—Splicing the Stem

For strength, it is advisable to cut the new stem piece as shown in Fig. 3 so it overlaps the back side of the original stem and makes a scarf joint. Bevel the new piece on each side with a block plane to match the original, and carry the same angle through the extra depth you have added. It can then both be glued along the inclined surface and screwed with 7/8" No. 6 wood screws from both directions, which will make the stem top nearly as rugged as the original.

Step 2—The Rails

Mill out your new inwale to match the original. Examine the old one carefully, as its outboard surface may be beveled in a canoe with tumblehome sides. Usually, this bevel is constant for the entire length of the inwale, even though the tumblehome

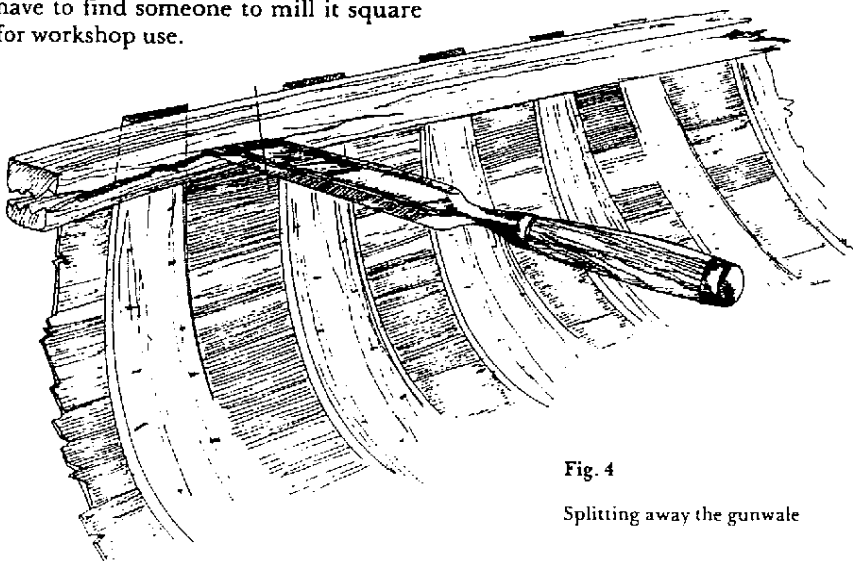


Fig. 4

Splitting away the gunwale

changes somewhat.

Installing the inwale is relatively straightforward. Clamp the inwale at its halfway point to the center rib, with the rail top flush with or perhaps just a fraction below the top of the rib. Move along toward each end, clamping wherever necessary (usually a clamp at every third or fourth rib will do). With the rail completely clamped in place, go along each unclamped rib and drive 3/4" bronze Anchorfast or four-penny galvanized box nails through the rib and into the rail, two in each rib. Then remove the clamps and fasten the frames that were under them.

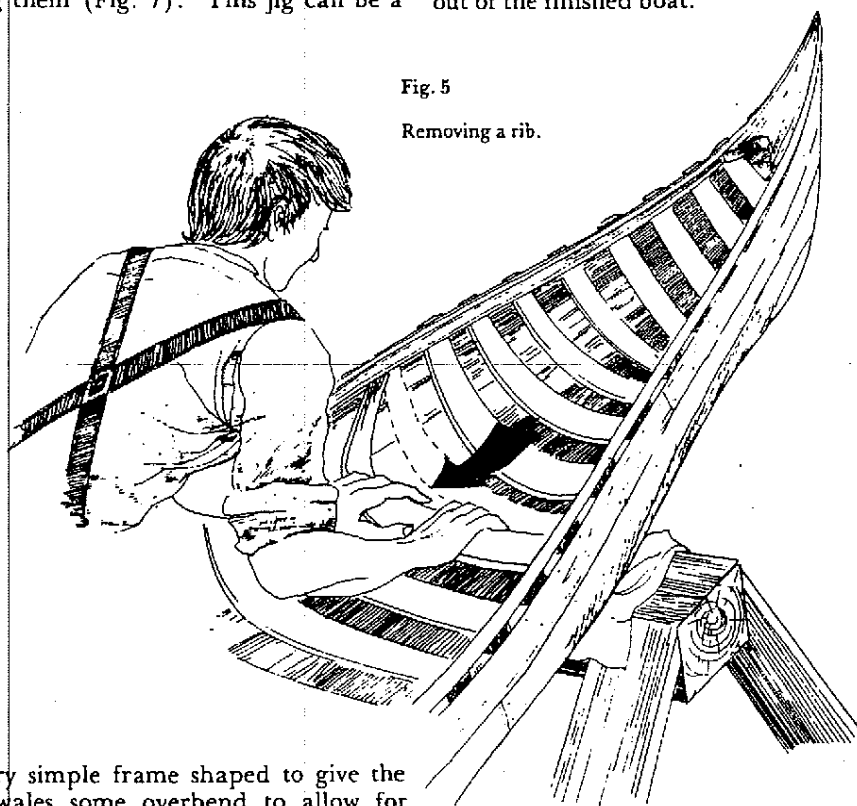
Should the sheer of your canoe have a pronounced sweep at the ends, you may have to pre-bend the ends of the rails on a jig after steaming or boiling them (Fig. 7). This jig can be a

will serve. You can also use spruce, which, although lighter, requires larger fastenings to achieve the same holding power.

After you have traced the original deck or a pattern made from it onto your stock, you can cut the shape out on a bandsaw or with a good sabresaw. If the sides must be beveled, as many must, a block plane will serve nicely. Any crown or camber in the deck should be roughed out before installation.

The deck is attached to one inwale at a time, and positioned so it conforms to the distances you earlier recorded on each side of the boat between a certain rib and the afterend of the original deck. The correct location of the deck is crucial to keep the stem in vertical alignment and to keep twist out of the finished boat.

Fig. 5
Removing a rib.



very simple frame shaped to give the inwales some overbend to allow for their tendency to straighten out when you unclamp them from the jig. I would suggest boiling the rails in an inclined pipe, since none of the woods used to make inwales bend as readily as cedar frames.

Step 3—Installing the Decks

The new inwales will do much to restore both the shape and the strength of your hull, but you must tie them together with the decks or breasthooks to appreciate the progress you have made. Ash is a common deck material because it holds fastenings well. Oak is equally fine, and indeed for this purpose any hardwood

After you achieve a good fit of the deck against one inwale, smear both contact edges with a marine bedding compound or a nonhardening caulking compound, and, positioning the deck on the mark, screw it in place with three 1 3/4" No. 10 brass or bronze screws. Now, draw the canoe together—a Spanish windlass will make this job easier—align the second mark with the back corner of the deck, and fasten this side similarly.

The easiest and most common way to join the deck to the stem is to use a single screw as shown in Fig. 8. To accomplish this, the end or point of the deck is cut off to match the width of the back of the stem. Since your

spliced piece is deeper and thus wider on its back surface than the original, this must be compensated for by cutting the point of the deck farther back than the original until its end fits against the back of the new stem. If the rails pass by the stem and meet forward of it, you will have to attach the stem to the deck after the first inwale is fastened, making your cut before securing the second one.

While this entire area is exposed, it is advisable to give it a generous application of clear Cuprinol wood preservative. This colorless liquid will help keep this vulnerable area free from rot, and later on, if desired, it can be varnished over.

Step 4—Steaming and Installing the Ribs

Now comes your first wood-bending exercise, and you will be surprised how easy this will be, especially with white cedar. Most canoe ribs are 5/16" thick, though there are variations. Some taper in thickness from 5/16" at the turn of the bilge to 3/16" at the rail, which is best accomplished by working a 5/16" frame down with a block plane.

Canoe ribs are also tapered in width toward their ends. You make this taper after cutting your planed ribstock to the right length, which is about 2" longer than the measured girth of the hull. Cut a wedge-shaped piece out of each end that is 3/8" wide at the top and about 9" long. Although the taper may look exaggerated and uneven, the frame will look right when bent into the canoe with the taper facing toward the middle of the canoe. Placing the frames this way helps compensate for the pronounced cant or lean of the ribs located near the ends of most canoes.

Duplicating the original shape of most rib edges is easy if you have a router or shaper—it is merely a question of getting the right bit. But the same thing can be accomplished by cutting the basic bevel on a table-saw and then sanding to relieve the hard corners. If you are inserting only a few new ribs, you can use a block plane and some sandpaper.

Ribs are made pliable by steaming or boiling. You can boil them in the inclined pipe you used for the tip of the inwales, or better yet, you can steam them in a simple chamber made from a few lengths of 6" or 8" galvanized stove pipe as shown in Fig. 9. To complete the rig, you need only caps for the ends, and internal support to lay the ribs on, a kettle of water, a heat source, and a rubber tube for channel-

ing the steam into the unit. Be sure there is a means for the steam to escape so it doesn't build up pressure inside the chamber.

Soaking the ribs in water before they are steamed sometimes makes them easier to bend. Once they have steamed for about 30 minutes, try bending one to see if it is suitably pliable. If it won't bend correctly, more steam is probably required. Yet care must be taken, since ribs that are steamed too long can become dried out and brittle.

The next step requires tacks and a device for clenching them back into the ribs as they are driven in from the outside. Professional builders use clenching irons that have a variety of surface shapes to match almost any contour in the canoe. The iron is held against the inside of the rib where the tack will be coming through, while the tack is driven home with a ballpeen hammer, a carpenter's hammer, or even a smooth, rounded stone as a clenching iron. Even a backing dolly used by auto-body repairmen to pound out dents will be very good.

Remove the steam-saturated rib from the steam box, and wrap it snugly around the outside of the canoe in line with the rib next to it. Hold it there for just a minute to give it shape, which will help in placing it on the inside, but not so long that it will dry out and become stiff. Now, working on the inside of the canoe, force the rib

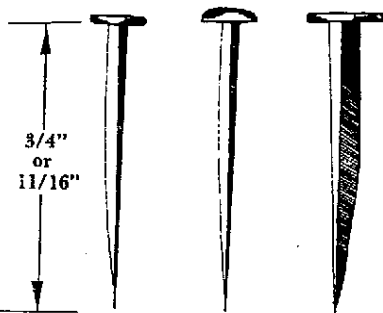


Fig. 6

Two acceptable tacks for fastening (left), and one that is too thick.

into place by tilting it and sliding the ends up between the planking and the inwale. Then move the center of the rib into place and clamp one end of it to the rail. Concentrate on getting the other half of the rib to fit against the planking all across the boat by applying force with your palm to the top of the rib (Fig. 10).

Clamp this end in place, go back to the other side, unclamp that end, and push down on it in the same way until a good fit is achieved. Do not, however, apply so much pressure that the planking's shape is distorted. Check this by running your hand along the outside of the canoe, feeling for bulges.

To fasten the rib in place, follow the same tacking pattern used on the original ribs and drive the tacks from

the outside, through both the planking and the rib, until they contact your clenching iron and turn themselves back into the rib. They are not properly clenched until you can run your hand along the inside of the rib without snagging it, or until the tack heads are sunk well into the outside of the planking. Hammer blossoms can be almost completely eradicated by applying a hot, soaking-wet rag across the surface. The tops of the ribs can now be nailed to the inwale.

Step 5—Planking Renewal

By now you should be eager to start replacing the planking you removed earlier. Planking is generally $5/32$ " in thickness and either 3" or 4" in width. Be sure to measure yours and duplicate it exactly. Sanding the plank's inside surface before attaching it will be greatly to your benefit when it comes time to finish the canoe later.

Cut your planking as before with a knife and block of wood, with bevels to complement those you made when removing the bad sections. In heavily convex areas, such as those at the turn of the bilge, you must apply hot water to the outside of the plank to get it to cup around the curve without cracking. Apply steady, slow pressure to the plank after fastening one edge. You

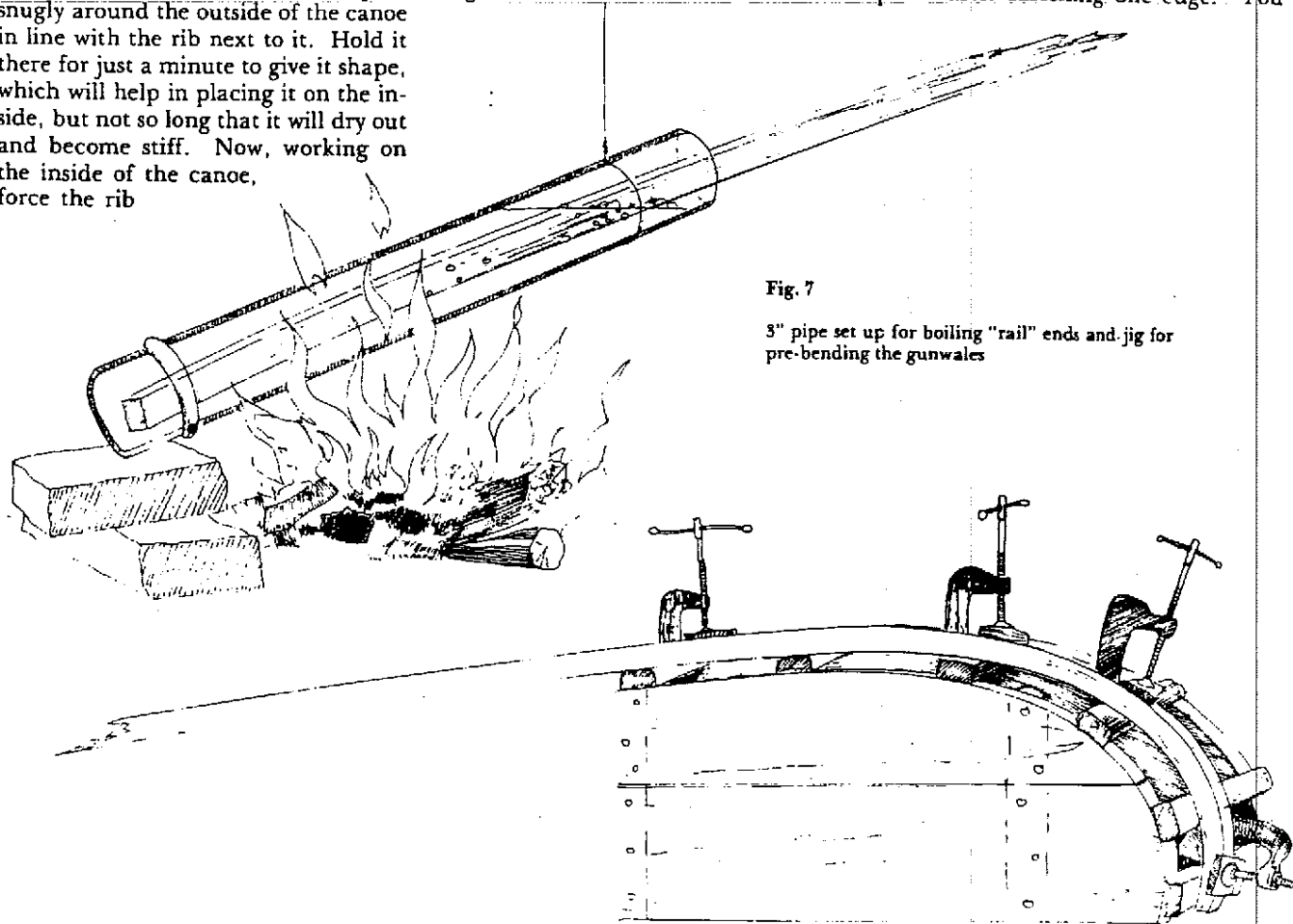


Fig. 7

3" pipe set up for boiling "rail" ends and jig for pre-bending the gunwales

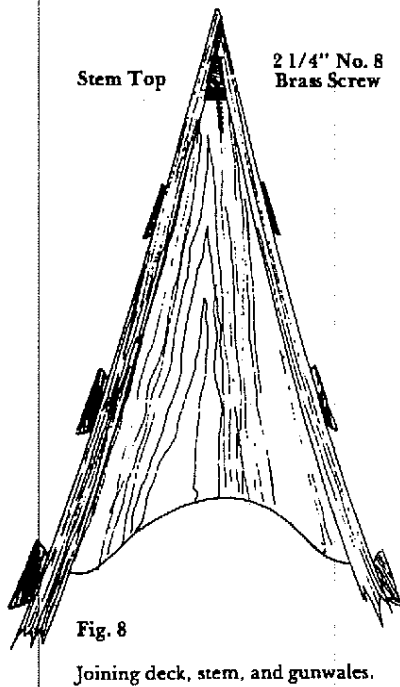


Fig. 8

Joining deck, stem, and gunwales.

will also have to adopt this procedure to replace the ends of the garboard planks if they have been removed (see Fig. 11).

Some of your new planks may vary in width to compensate for the changing girth of the hull. To gain these shapes it is a simple matter to trace them onto pieces of planking that are laid over the openings. Cut the planks out roughly with a linoleum knife and smooth them to an exact fit with your block plane.

Although you should replace the thwarts at this time, leave out the seats until the canoe is canvased. Now is also the time to smooth up the outside of the hull, especially where you put in new planks, and to strip down and re-finish the interior. Paint remover is the best way to get rid of the old—and no doubt discolored—finish, and if used should be applied before recanvasing, otherwise it will leak through in places and dissolve the special canvas filler and paint.

Step 6—Recanvasing

Canvasing your canoe is not difficult. To begin, locate all the tools and materials you will need. The canvas to use is No. 8 cotton duck, about 60" wide and a yard longer than your canoe. Awning makers, art supply dealers and marine retailers usually carry it. Small canoes may not need canvas 60" wide, but be sure to have on hand canvas that is 3" to 4" wider than the canoe's greatest girth. You will also need a good canvas weave filler to fill the weave of the cloth, waterproof it, and add strength to the whole system. This is not a readily available product, so most builders mix their own formulas. A 16' canoe

will require about a gallon of filler, and a 20' guide canoe will require about two gallons. It is available from the Old Town Canoe Company, Old Town, Maine, and the Island Falls Canoe Company, Atkinson, Maine.

A handful of brass canoe tacks and another of 3/8" brass tacks will also be required to hold the canvas in place after it has been stretched. A pair of upholsterer's pliers, vise grips, or artist's canvas-stretching pliers will be most helpful, but not absolutely essential. A "come-along" or winch is the only heavy tool required.

To hold the canvas as you pull it tight, you will have to construct a pair of stretching clamps with 36" lengths of 2 x 4 lumber and six or eight C-clamps. Pair up the 2 x 4s and drill a 1/2" hole through each, set 1 1/2" from the very top for suspending them from overhead. One eyebolt should then be installed through the center of each piece completely through the 3 1/2" width of the stock. These will be used to secure one of the clamp assemblies to a well-supported wall and the other to the winch or come-along at the opposite end of the canoe.

To begin the job, fold the canvas in half lengthwise and place one end in the clamp or stretcher assembly, which is hung from the overhead and secured to the wall of your shop. There will be considerable pull, so be certain that the force will be distributed horizontally among several of the wall studs with a horizontal timber. Clamp the stretchers together tightly over the canvas with several C-clamps and place the other end of the folded "envelope" in the other suspended clamp assembly. Secure it tightly with C-clamps as well. Care must be taken to insure that no bulges or folds are evident in the vicinity of the clamps. The folded canvas must be flat and taut vertically to avoid problems later on.

With your winch or come-along hooked into the eyebolts of the second stretcher, crank the envelope out horizontally until the canvas is absolutely flat and drum tight, which you can test by tapping it with your finger. When sighting along the top double edge of the canvas, the edges should appear even and uniformly rigid. If one is taut but the other slumps into a noticeable sag, you will have to ease the tension, unclamp one end, and pull out the slack or belly and then re-clamp it. When the canvas is perfectly even and taut, mark the position of the winch cable with a piece of string or a twist-tie, and ease off on the tension. Pick up the hull and stuff it into the slackened envelope by pushing its ends down forcefully. Take up about half

the slack in the cable, using the twist-tie as a guide.

The next step requires courage but is actually quite fun. Place protective padding and some planks into the canoe, and climb in, maintaining your balance in the swinging hammock as best you can. Jam a piece of shoring at an angle of about 30 degrees between the suspended canoe and the overhead. Place one of these in each end of the canoe just aft of the stems. Walk back and forth between the shores, applying more and more vertical force by decreasing the angle of the shores each time until they are nearly vertical. You are trying to build up force enough to hold the canoe down while you finish tightening the canvas envelope with your winch. When you are satisfied that this has been achieved, step out of the canoe and slowly tighten the winch all the way up to the mark. The canvas should now be uniformly tight around the canoe except for some small folds underneath at each end. Even these will disappear when you pull the canvas still tighter for tacking. If you have a series of diagonal wrinkles at the ends that slant upward toward the stretching clamps, you are probably exerting too much downward pressure, and you should ease up some.

With a sharp utility knife, cut the canvas around the sheer until there is a uniform 2" margin if you will be using stretching pliers, or a 4" or 5" margin if you will be stretching the canvas by hand. To keep canvas snug against the canoe at the ends, make a pair of simple 2' long C-clamp-operated clothes pins, and at each end jam one of them down over the opening between the end of the canoe and the stretching clamp.

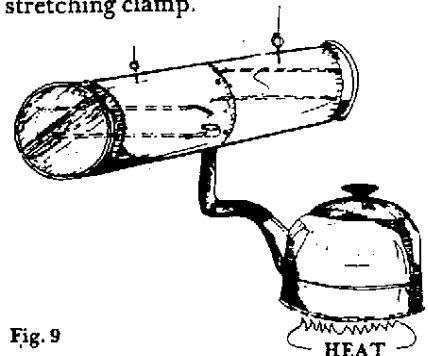


Fig. 9

Steam chamber from galvanized stovepipe sections. Note wires running through to form grate.

Beginning amidships, and alternating from side to side, pull the canvas tight at each rib and drive a tack as close to the top edge of the planking as you can. If you are using standard canvas-stretching pliers, grip the edge of the duck with them, rest the pliers on a protective pad of wood on top of

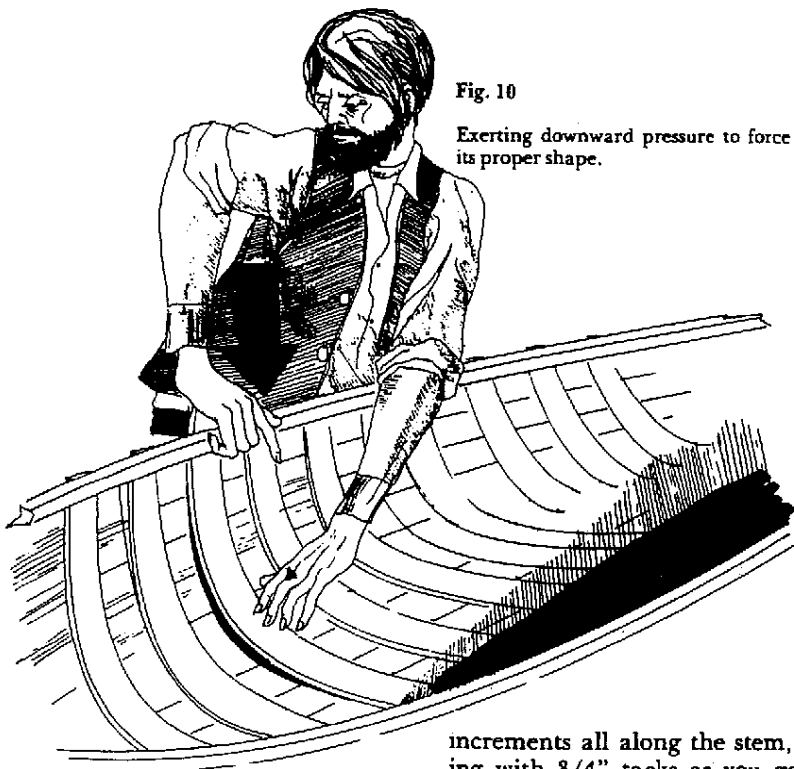


Fig. 10

Exerting downward pressure to force a rib into its proper shape.

the inwale and the rib, and rock it back about 45 degrees (Fig. 13). This should provide about the right tension.

If the canvas has been stretched properly, a tiny lip or tight fold of cloth along the top edge of each tack head should develop. A bulge that is too large or too loose indicates that not enough tension has been applied (Fig. 13). Continue tacking until you reach the last two false or cant ribs at the end of the canoe, then go back amidships and work toward the other end. When both sides have been completed, you can let the pressure off and unclamp the canvas.

Place the canoe upside down on horses and locate the spot at each end of the canoe where an imaginary line drawn between the last two tacks at the gunwale would bisect the centerline along the length of the stem (Fig. 14). With your utility knife, starting at the stem in line with where you left off, slit the canvas along its centerline all the way out to the end. You now have two independent flaps, one on each side. Drive a small tack at the beginning of the slit and overlap the two flaps enough so that three or four small tacks about 1/4" apart can be driven into the stem, through both pieces of canvas. This will require pulling without too much canvas to grip.

Curl the uppermost flap aside for now and concentrate on the underneath one, lapping it over the wood and pulling it at right angles to the curve until it is tight. Do this at 3/4"

increments all along the stem, fastening with 3/4" tacks as you go. The canvas at the end of the canoe should now be very taut, and any bagginess or small horizontal wrinkles will come out when you finish stretching and securing the canvas to the last two ribs along the sheer. To prevent fraying,

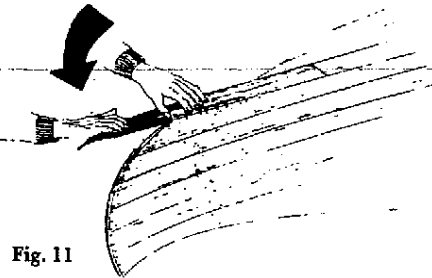


Fig. 11

Bending down a wetted garboard, after first securing it to the stem.

the ragged edge should be coated with a small amount of filler, rubbed in thoroughly with your finger, before the other canvas flap is lapped over and secured in the same manner.

Admire your project all you want at this stage. You have overcome many obstacles to get here, and there is something about the pure-white duck stretched tightly over the graceful form of the canoe that makes canvassing one of the most satisfying aspects of canoe restoration.

Step 7—Filling and Finishing The Canvas

You are not completely out of the woods yet. Filling the canoe is hard physical work; luckily, it is a one-time ordeal.

The filler itself is an extra-thick oily paint. As the directions specify, it must be stirred thoroughly before it is applied. The idea is to fill the weave of the cloth completely with the substance, which, after a couple of weeks, will cure into a slate-like waterproof covering that will take a good finish and will add overall strength to the wood-canvas system.

On a small area at a time, work the filler into the canvas with a large, stiff brush, preferably an old one. When this part is covered and the filler is thoroughly worked in with a circular motion of the brush, put on a heavy second coat, and with a simple mitten made from excess canvas, work the muddy substance into the weave with both circular and back-and-forth motions. Continue rubbing until the second coat appears smooth and almost dry.

Now examine the job closely. If the surface isn't perfectly smooth and is scattered with obvious scale-like patches, you will have to apply a light third coat cut with 10 to 20% paint thinner. After rubbing this coat in with your mitten, finish the job to a satin smoothness with the palm of your hand. By the time you finish the length of the canoe on both sides, you

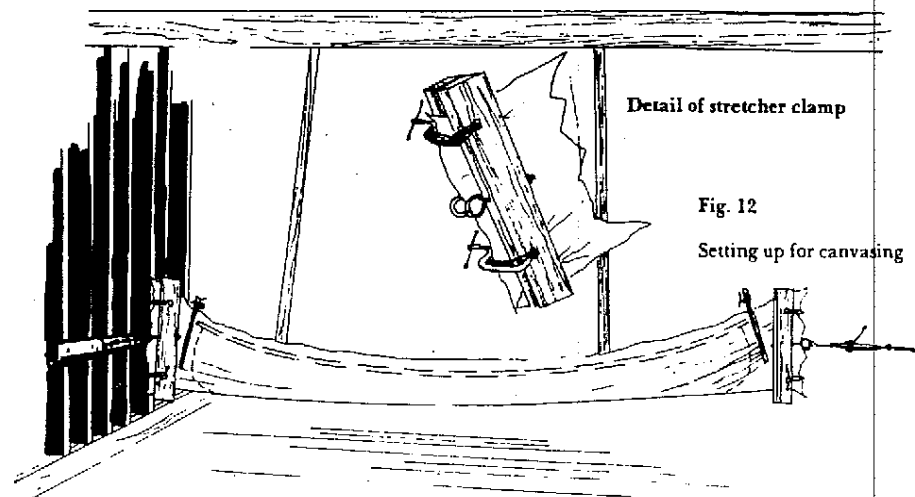
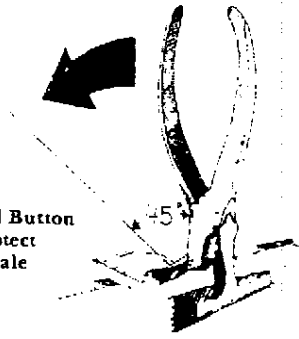


Fig. 12

Setting up for canvassing

Wood Button
to protect
gunwale



will appreciate how hard this job is; however, care taken at this stage will pay off in a handsomely-finished canoe. Allow the filler to cure for the required time—usually two to three weeks—and then you can prepare its hardened surface for painting.

Acrylic auto enamel seems to provide a harder finish than most of the marine paints that I have tried, and since canoes are used quite differently than yachts, I feel that the advantages of using the tougher paint outweigh the perhaps superior weathering qualities of marine paint. No matter which paint you choose, you will need a quart of appropriate primer to lay down the best painting base. Sand the dried filler with 120-grit sandpaper before applying the primer, getting it as smooth as possible but taking care not to wear away the canvas itself. Follow the directions for the application of the paint, and you should obtain a very satisfactory, if not dazzling, finished surface.

Step 8—Installing the Guard Rails

Installing the guard rails is not difficult. If you are replacing the old ones, use a section of the discarded rail as a pattern for the new ones. Fasten the rails in place with the same size and number of fastenings as the origi-

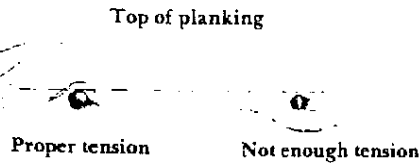


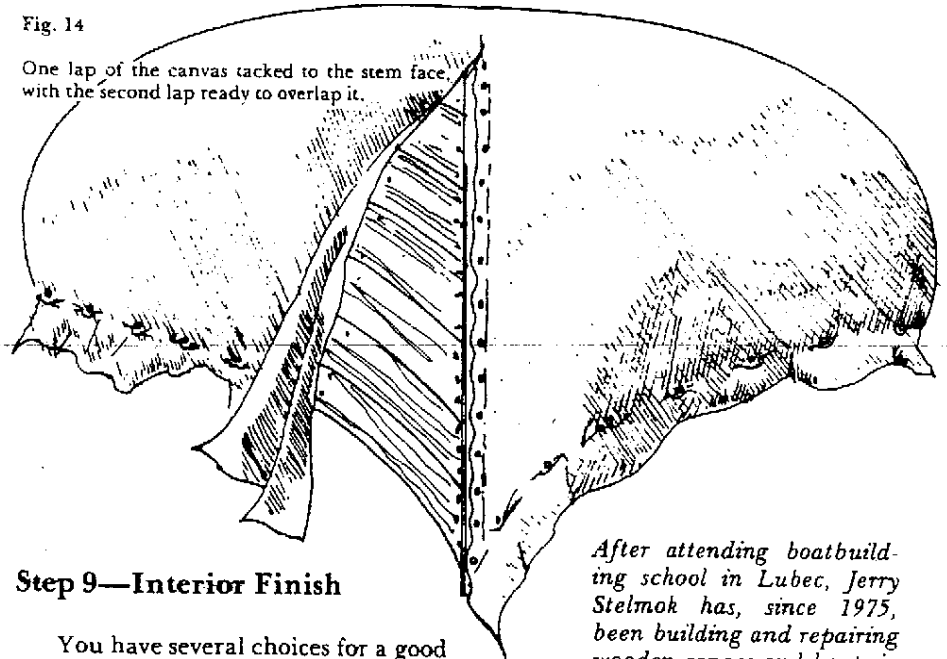
Fig 13

Stretching canvas with canvas pliers and right proper tension as indicated by pucked directly above tack head.

nal. After the guards are attached, run a belt sander over the tops of them, as well as the ribs and inwales, to get an even surface. Any shaping or relieving of the outside corner should be done after the rail is in place and dressed down.

Fig. 14

One lap of the canvas tacked to the stem face, with the second lap ready to overlap it.



Step 9—Interior Finish

You have several choices for a good interior finish. If the wood in your canoe is dark and has stains or other imperfections, you would do well to use a spar varnish, which dries much darker than the polyurethanes and

complements an old canoe. If the wood and existing varnish are still light in your canoe, perhaps you should add a light coat or two of marine polyurethane varnish with an ultraviolet shield. The new wood in your canoe will appear to be considerably lighter than the old wood around it, and if this should offend you, you might consider matching the old by staining the new before varnishing.

If your work is good, you will receive compliments. You have earned every one. Your reclaimed canoe did not come easily, and you did not acquire it merely by signing your name to a check. It's part of you, and without your sweat and determination, it might still be just so much kindling drying out in a forgotten loft.

After attending boatbuilding school in Lubec, Jerry Stelmok has, since 1975, been building and repairing wooden canoes and boats in a partnership with Rollin Thurlow, Island Falls Canoe Co. He is also currently writing a book on the construction of wooden canoes.

Wooden Canoe Heritage Association

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Mars, Pennsylvania 16046

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the Backyard Boatyard

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Restoring old wood-and-canvas canoes

by John Mc Greivey

The cost of new wood-and-canvas canoes long ago rose above the budgets of most recreational canoeists. Happily, however, thousands of vintage wood-and-canvas canoes have escaped wood piles and can be restored — not just made watertight — with a few common tools, unexceptional carpentry skills, a modest amount of money, and an abundance of time and love. Restored and properly cared for, these lovely, comfortable, and surprisingly light canoes will delight their owners for years to come.

Selecting the canoe

Knowing that wood canoes are becoming difficult to find, the canoeist may find it difficult to resist buying the first one he comes across. The wise buyer, therefore, should remind himself that enough old canoes exist to allow considerable selectivity in condition, model and price.

Certain maladies are normal in any old canoe. Rot in and around the decks, missing or broken thwarts and seats, cracked ribs and ruptured planking are not causes for alarm. But look closely at the inner rails. If one or both are cracked across the grain, replacement may involve more effort and expense than the canoe deserves, particularly if it needs other major repairs.

Usually, an old canoe will need a new canvas. Often, however, a sound canvas lies under many layers of cracked paint. A salvageable canvas represents a savings of between \$75 and \$100.

Where the canoe will be paddled and who will paddle it are important considerations. A wood canoe can stand a great deal of rough use, but it is not the most practical canoe for bouncing over boulders. If children will be using the canoe, be wary of an extremely old canoe. In the early decades of the century, the standard beam for a 16-foot canoe was 30 inches. These narrow-beamed canoes are light, fast and maneuverable, but they are unstable enough to unnerve even seasoned paddlers.

In common with anything possessing more than utilitarian value, the monetary value of an old canoe is difficult to determine. Both sellers and buyers often feel the

value of a canoe increases with age. To a certain extent, this assumption is true, but not always. Individual manufacturers built their most popular models for many years. Consequently, to buy an old canoe rather than its younger double may only buy unnecessary headaches. At the same time, a 60- or 70-year-old canoe need not be avoided. Properly restored, a very old canoe will last as long as a younger one. As a rule, plan to spend no more for a canoe and its restoration than the cost of a new metal or plastic canoe of good quality. Of course, a very old and rare canoe, such as a Rushton "American Beauty," is an exception to this rule.

Once a canoe has been obtained, the following procedures should cover most problems encountered during restoration. Individual canoes will present special problems, but solving these special problems is part of the fun.

Dismantling

CANVAS — Before removing the canvas, remove the outer gunwales, keel and stem bands. On some canoes the ends of the gunwales are fastened to the inner rails with sunken finishing nails. Try to drive these nails through the gunwales. If this fails, the nails must be drilled out.

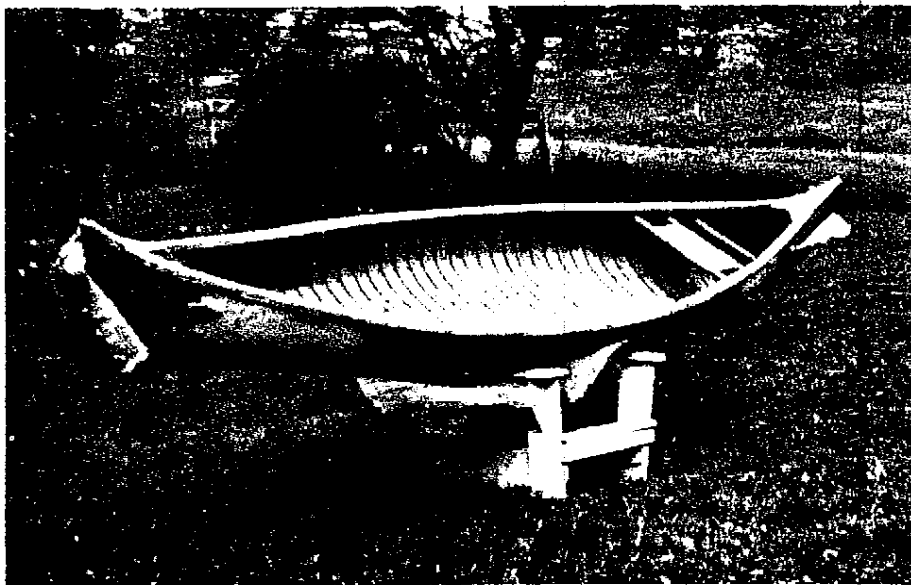
If the canoe is of closed gunwale construction, save the irreplaceable brass nails which fasten the finishing strips to the inner gunwales. Also, save broken brass stem bands: they will be useful for making hold-downs for floor racks. For a long-lasting restoration, remove the canvas even if it will be used again. Avoid folding a salvageable canvas.

DECKS — Inevitably, some of the eight or ten screws holding the decks to the inner rails are hidden beneath ribs. Try slipping a hacksaw blade between the deck and inner rail. If there is no room for the blade, locate the positions of the hidden screws and blind drill them through the ribs. Solid decks may be left in place, but their removal will make working in the narrow ends of the canoe considerably easier. Do not neglect to mark the position of the decks before removing them.

RIBS — Ribs passing under the stem can be removed by pulling the nails holding the stem to the planking. Loosen the stem only enough to withdraw the ribs.

Preparation

OLD CANVAS — Every method of paint removal has its advantages and disadvantages. Sanding allows the paint removal to stop at the original primer, but the process



Although it needs several new ribs, seats, thwarts and canvas, this canoe is structurally sound. Less than \$200 should put it back into perfect condition.

"...a 60 or 70-year old canoe need not be avoided. Properly restored, a very old canoe will last as long as a younger one."

is slow and dusty. Softening the paint with heat from an old flat iron or a propane torch fitted with a flame spreader is very effective, but requires considerable sanding afterwards. Paint remover, in addition to being messy and expensive, may require the application of a new coat of filler. The great advantage of paint remover is that it softens the old filler just enough so that the canvas can be stretched tightly over the hull. Removal of the paint by sanding or heating should be done with the canvas on the hull. If paint remover is used, remove the paint before tacking the canvas.

INTERIOR — After removing the old finish with paint and varnish remover, sand the ribs and planking, but do not try to remove every imperfection. As in antique furniture, "distress marks" enhance the beauty of an old wood canoe. Follow

of paper against the hull and draw a gently curved line from the tips of the inner rails to the remnant of the original stem. The paper can then be made into a template.

PLANKING — Repair small areas of damaged planking by cutting patches with a sharp knife from straight-grained red cedar. Using the patches as templates, outline the areas to be replaced, then cut out the sections to be removed. To avoid splitting small patches, use glue rather than tacks.

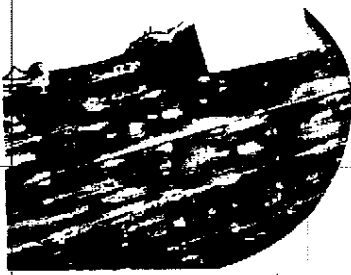
Because new wood will differ in color and grain from old wood, large or very visible patches may be cut from a section of planking under the decks. New wood in these areas will be almost invisible.

Sanding the interior loosens many tacks. Do not attempt to re-clinch these loose tacks; instead, pry them out and drive in

have been necessary to cut away narrow strips of planking to pull the nails holding the rib to the inner rail. If not, remove the strips at this time. Their removal will facilitate the insertion of the new rib.

Holding the rib inside the hull, bend the rib enough to insert the near end between the planking and the inner rail. While moving the rib toward its position at the opposite rail, pull the already inserted end upward far enough to allow the far end to slip into place. Press the rib into the hull. Once the wood fibers have been stretched, the rib will return to its proper curvature if pressure must be momentarily released.

With a small "C" clamp, attach one end of the rib to the inner rail. Press the rib back into the hull, then clinch-nail the rib to the planking with three or four tacks at the place where the hull bends most radically.



Neglect caused the deterioration of the bow of this canoe. (Light-colored stains are probably the result of using "airplane dope" as a filler in a previous recanvassing.)



Replacement of broken outwales may be required, but careful wood selection will often result in a satisfactory job.



Following repairs to stem and inwales and installation of a new deck, the bow shown at left is as good as new.

the sanding with the application of a mixture of five parts turpentine (*not* paint thinner) and one part boiled linseed oil. This mixture will restore the color of the wood and will replace evaporated natural oils. Do not, however, apply the mixture to new wood that will be visible when the restoration is complete.

STEMS — If a stem is rotted or broken near the deck, cut back to sound wood and shape a new piece from ash. Scarf-cut each piece and join them with waterproof glue. Finish the job by pressing wood dough into the old tack holes.

If, for one or another reason, there is not enough of the stem or contiguous planking to serve as pattern for the new piece, the original curve will have to be reconstructed. The easiest way to do this is to refer to another canoe of the same model. If another canoe is unavailable, install the deck and, if necessary, replace the missing ends of the inner rails. Hold a heavy sheet

new ones. Tacks with raised heads also should be replaced.

Nail down any buckled planking, sand the hull lightly, then brush on two coats of turpentine and boiled linseed oil mixed in equal proportions.

If the decks have not been installed already, install them at this time. Some work with a rasp may be necessary for new decks to follow the curve of the gunwales.

RIB INSTALLATION — For bending ribs, a steam cabinet is a necessity. Do not immerse ribs in boiling water — it extracts the protective oils from the wood. A serviceable steamer operable on the kitchen stove or backyard barbecue can be constructed from scrap materials. (I improvised one from plywood, aluminum flashing and a discarded refrigerator drawer.)

Using the old rib as a pattern, plane the new rib to the correct thickness and shape, but leave it two to four inches longer than the original. In removing the old rib, it may

Repeat the process with the other end of the rib. Clinch the remaining tacks, then remove the clamps and fasten each rib end to the inner rails with aluminum nails. On open gunwale canoes, trim the ends of the ribs after the outer gunwales have been mounted.

Ribs may be bent by pressing them over the hull rather than into it. However, this method risks inexact curvature and makes the installation of the ribs quite difficult.

SEATS AND THWARTS — Split seat rails may be tied together with glue and countersunk brass screws, but replacement of defective wood is preferable. For aesthetic reasons, it is best to replace all seats and thwarts if any new wood is needed. Caning is simple, inexpensive and boring, so plan to watch some television while doing it. New thwarts may be fashioned in a few hours with a saber saw, rasp and sandpaper.

continued

the Backyard Boatyard

Finishing

OLD CANVAS — A large pair of pliers and a lexicon of appropriate oaths are helpful in mounting an old canvas. Aligning holes in the canvas with the screw holes in the hull may be difficult. To prevent leaks, lay a strip of canvas along the keel line before placing the canvas on the hull. After the canvas has been tacked to the hull, fill any spots where the weave in the canvas is visible with canvas filler or canvas cement. If paint remover has been used, dampening the canvas with remover allows the canvas to be pulled tightly over the hull.

NEW CANVAS — Important to remember in applying a new canvas is that the canvas must be pulled across its bias as well as vertically toward the gunwales and horizontally toward the bow and stern. The bias and horizontal pulls become increasingly critical where the canoe begins to narrow. Flat-jawed, locking pliers are invaluable in stretching the canvas.

With the canoe resting on its gunwales on saw horses, locate the center rib, then drape the canvas evenly over the hull. For tacking the first three or four ribs in each direction from the center rib, the canvas needs only to be stretched vertically. After the canvas has been tacked through or near about eight ribs, begin pulling downward and across the bias simultaneously. When wrinkles appear, go to the ends of the canoe and give the canvas a firm horizontal tug. Secure the canvas temporarily with a tack driven into each stem piece. Repeat the horizontal pull frequently. Be sure to alternate the tacking from one side to the other and to work from center toward the ends.

When wrinkles refuse to disappear, return to the center rib and begin the process over again. After two or three complete re-tackings, the canvas will be tight and free of wrinkles.

Because the canvas must be stretched and tacked two or three times, do not waste expensive brass tacks on the temporary tackings. Use ordinary one-half inch steel tacks instead. To avoid splitting the planking, place the temporary tacks into the ribs above the planking. Angle the tacks toward the keel of the canoe to prevent splitting the ribs. On closed gunwale models, tack directly into the tops of the gunwales. Once the gunwale finishing strips are on, the tack holes will be hidden. A single tack in or near each rib suffices for the temporary tacking.

At the ends, slit the canvas enough to allow the canvas to lie smoothly. Pull one flap around the stem and secure it with $\frac{5}{16}$ -inch brass tacks spaced about a $\frac{1}{2}$ -inch

apart. With a razor, trim the excess canvas as closely as possible to the tack heads. Spread marine bedding compound over the tack heads and into the space between the planking and the tacked edge of the flap. Pull the second flap around the stem, tack it down and trim it in the same way as the first.

Permanent tacks may be driven at this time. A better procedure, however, is to delay the final tacking until the filler has been applied and allowed to dry for a few days. With the filler on, the canvas can be given a final smoothing. In either case, do not trim the excess canvas from the gunwales until after the final tacking. For the final tacking, use $\frac{11}{16}$ -inch brass tacks. Two tacks should pass through the planking and ribs and into the gunwales at each rib end.

Apply the canvas filler according to the directions on the container. After three weeks of optimum drying conditions, sand and prime the filled canvas. Prime the keel and spread a thin layer of bedding compound along its length before attaching it to the hull. Smooth the primed hull and keel with fine sandpaper and brass wool, then paint the hull with a good marine enamel.

Factory canvassing methods may be adapted for home use. Details are explained in Atwood Manley's "Rushton and His Times in American Canoeing" (Syracuse, 1968). (This volume may be obtained through the American Canoe Association's book service.)

VARNISHING — By deferring the interior hull varnishing until near the end of the restoration, the amount of water that



Hardly recognizable as the canoe with rotted bow, this 1910 Model XX Old Town is ready for another 70 years of active life, despite the apprehension on the paddler's face.

can seep between planking and canvas will be substantially reduced. The varnish fills the spaces between the planks.

Full authenticity suggests the use of orange shellac rather than varnish on some canoes. In deciding between shellac and varnish, consider that shellac diminishes the contrast between the red and white cedar and was probably used many years ago only because it was more durable than existing varnish.

Maintenance

Properly cared for, the canoe requires only a few hours' work each year. To prevent alligating, do not apply "hard" paint over "soft" paint. In other words, stick to the same *type* of paint, even when changing colors. Paint the entire hull only when spot painting proves unsatisfactory. The fewer layers of paint, the lighter the canoe will be.

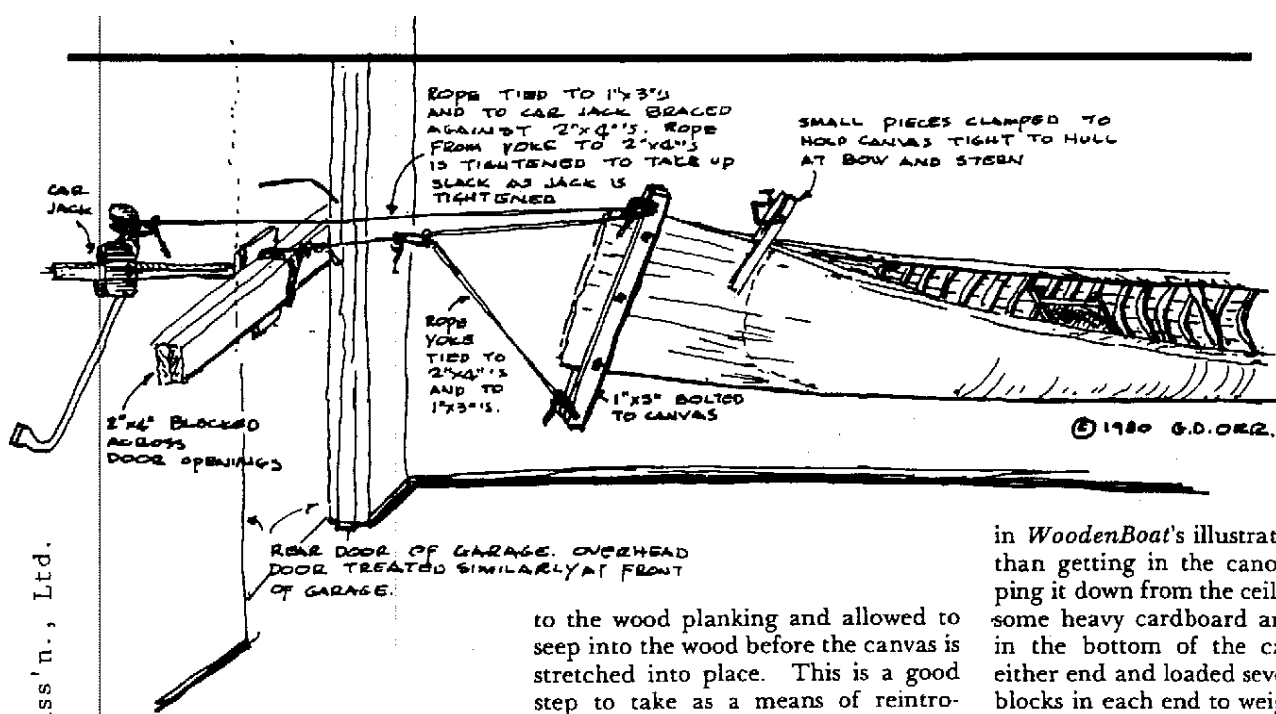
Pull the canoe from the water at the end of the day, and avoid leaving it upturned on wet grass for long periods. In winter, store it upside down and well above dampness. For everyday use and for trips without difficult portages, use a floor rack to minimize wear on the varnish and strain on the ribs.

A note on materials

The best, and probably only, source of parts for wood-and-canvas canoes is the Old Town Canoe Company (34 Jefferson St., Old Town, ME 04468) — a fortunate situation because the largest number of surviving wood canoes are Old Towns. Although an entire canoe could be constructed from Old Town's parts list, a little resourcefulness and a telephone call or two should enable home fabrication of all wooden parts except decks, which are less expensive to buy than to make. In most areas, however, canvas, filler, brass tacks and stem bands are either unavailable or available at no saving over Old Town's prices.

Feeling that there was enough wood and plastic in the woods already, being short on money, and having been spoiled for modern canoes after a spin in his grandfather's 1930-ish sponson model Old Town, John McGreivey claims it was inevitable that he would end up with a disreputable looking wood-and-canvas canoe.

Now a veteran of many such restoration projects — "for fun and very small profit" — John admits to being riled by those who claim wood-and-canvas canoes are terribly delicate. When he's not barbecuing ribs for another project, he spends much of his time on leisurely trips through the nearby Adirondack country enjoying the harmony between art and nature — obtainable only in a wooden canoe."



Stretching Canoe Canvas

The article published in the July/August issue of *WoodenBoat* by Jerry Stelmok, and one in the November, 1978 issue of *Canoe*, by John McGreivey, could provide one with a good background for the restoration of a wood/canvas canoe. I would like to make several comments, particularly in regard to the article in *WoodenBoat*. My comments are based upon limited experience in repairing and recovering two Old Town canoes, and numerous conversations with others of similar interests, tastes, and efforts, including the staff of the Old Town Canoe Company.

1. The problem of replacing wood ribs: A suggestion of the Old Town Canoe Company was that the rib be soaked in warm water and then bent around the outside of the hull at the approximate location of the adjoining rib, so that it would form about the hull. I have tried both this and the alternative of inserting the pliable rib and clamping it to the gunwales. I find that the choice between them is a matter of taste and personal judgment. Both systems seem to work. In bending the rib, I found it advantageous to limber it by bending it progressively rather than trying to make the total bend at one time, since I snapped several ribs that way.

2. On the preparation of the hull: Both the recommendations of the Old Town Canoe Company and the article in *Canoe* suggested an application of boiled linseed oil and turpentine, mixed approximately 50/50, applied

to the wood planking and allowed to seep into the wood before the canvas is stretched into place. This is a good step to take as a means of reintroducing some oil into the wood.

3. Stretching the canvas: I used a system similar to the recommendations of the *WoodenBoat* article. However, there are some modifications which seem to offer some advantages, at least in my own limited experience. I did create a hammock shape, much as was recommended, but rather than just C-clamping two boards at either end, I used bolts to fasten the canvas securely between the boards and hold it tight. Rather than a single rope on each end, I created a small yoke, as seen in the sketch, so that adjustments could be made in the tightening process to increase the tension at either the bottom or the top and achieve an evenness in fabric stretching. I braced two 2x4s across the front of my garage, a single 8'-wide opening, and two 2x4s across the 3'-wide access door at the rear. The canvas was stretched between these two, using the yokes as indicated. The canoe was placed in the hammock shape of the canvas and raised off the floor. I then used an additional rope tied through a hole in one of the bolted boards at the end of the canvas, braced a car jack against the 2x4s, and proceeded to tighten the canvas, stretching it around the canoe. The yoke portion then slackened as the jack tightened, and this was retied tight around the 2x4s before the jack was released. The jack was alternated from one end of the canoe to the other, while I carefully watched the stretching of the canvas. In an 18' length of canvas, a stretch of slightly more than 1 1/2" was obtained this way. I noticed, as was pointed out in the *WoodenBoat* article, that the canvas did not closely follow the contours of the hull at the ends. Therefore, I used a small wood clamp similar to the one

in *WoodenBoat's* illustration. Rather than getting in the canoe and propping it down from the ceiling, I placed some heavy cardboard and carpeting in the bottom of the canoe toward either end and loaded several concrete blocks in each end to weigh the canoe down and let it set into shape through several days. This amounted to about 100 lbs in each end of the canoe. I returned to the stretching when I felt that the canvas had achieved a good shape, and I proceeded to tack the edges and finish off the stems.

4. On filling the canvas: My first attempt was done on a beautiful sunny spring day in the backyard; however, the warmth of the day seemed to set the filler a little more rapidly than one would like, making the work more difficult and resulting in a finish not quite as smooth as one would like. My second attempt was done in the shade, and it was considerably easier. The final smoothing of the filler was done with steel wool, as recommended by Old Town, and it provided a better finish than the sandpaper I used on the first canoe.

5. On materials: I was pleased with everything that Old Town did for me. I used new gunwales, bent to shape, and attached these using C-clamps, working from amidships to each end. Old Town's filler, paint and brass tacks were also used. My Guide model used wider planking than Old Town now uses, and a local millwork shop was able to provide my planking quite economically. I bought the ribs from Old Town, and found that canvas can be obtained from local tent and awning makers.

The job was not as formidable as one might think, and the end result was a 40-year-old Old Town Guide restored to almost pristine condition. She has already made one lengthy wilderness trip through Central Ontario and I am sure she is destined to make others.

Gordon D. Orr, Jr.
 Madison, WI