Shaker Nesting Trays

While not traditional, this form echoes the look of iconic Shaker box tops.

BY JOHN WILSON

LEAD PHOTO BY AL PARRISH; STEP PHOTOS BY THE AUTHOR; ILLUSTRATIONS BY MARY JANE FAVORITE

I have never seen an oval tray at a Shaker village, but these examples are certainly in the Shaker style. Trays are an extension of a well-known object of Shaker craft (the nesting sets of oval boxes) and possess utility, simplicity and economy of construction. Not much more is needed to qualify for the label "Shaker." Let's take each of these qualities to see what it means.

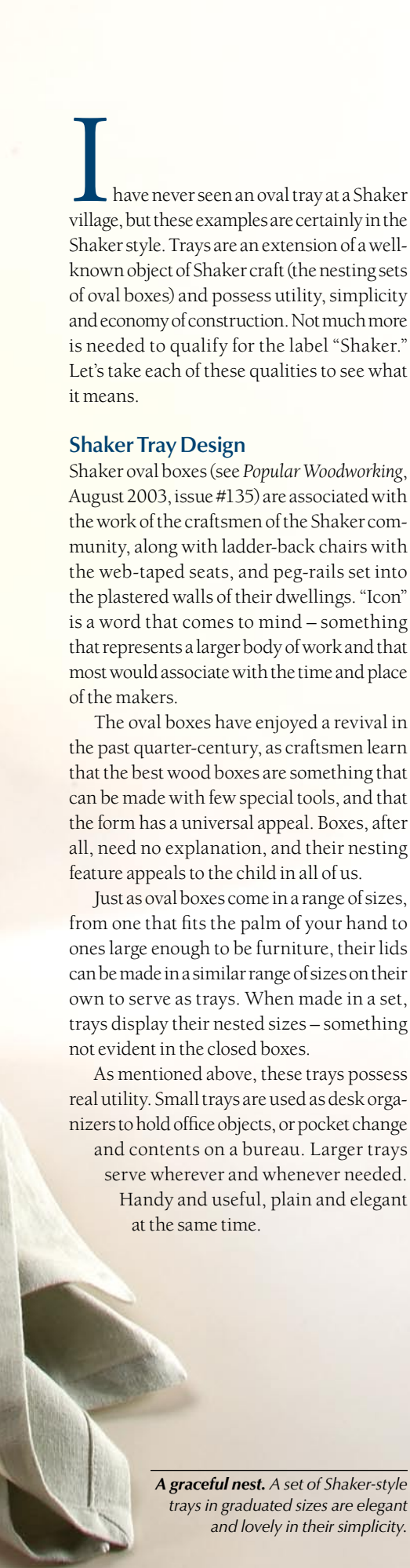
Shaker Tray Design

Shaker oval boxes (see *Popular Woodworking*, August 2003, issue #135) are associated with the work of the craftsmen of the Shaker community, along with ladder-back chairs with the web-taped seats, and peg-rails set into the plastered walls of their dwellings. "Icon" is a word that comes to mind – something that represents a larger body of work and that most would associate with the time and place of the makers.

The oval boxes have enjoyed a revival in the past quarter-century, as craftsmen learn that the best wood boxes are something that can be made with few special tools, and that the form has a universal appeal. Boxes, after all, need no explanation, and their nesting feature appeals to the child in all of us.

Just as oval boxes come in a range of sizes, from one that fits the palm of your hand to ones large enough to be furniture, their lids can be made in a similar range of sizes on their own to serve as trays. When made in a set, trays display their nested sizes – something not evident in the closed boxes.

As mentioned above, these trays possess real utility. Small trays are used as desk organizers to hold office objects, or pocket change and contents on a bureau. Larger trays serve wherever and whenever needed. Handy and useful, plain and elegant at the same time.



A graceful nest. *A set of Shaker-style trays in graduated sizes are elegant and lovely in their simplicity.*

Easy Construction Methods

But what of their construction? Does their making entail special techniques and tools? Are they time consuming? What skills are assumed in the hands of the maker? What does "economy of construction" mean? Let's start with the last first. Economy of construction means that the materials used, and the effort and time required, are all less than what would be expected of other construction methods to make a similar object, for example a rectangular dovetailed dining tray. An oval anything has no corner joints. The single act of bending encompasses the object. Herein is the simplicity and the economy of the tray.

What skills are required? Not many beyond what working with wood in a modest way assumes. Probably the most important step is the introduction to bending because water and wood don't seem to mix in the experience of most woodworkers. When bending is not part of one's lexicon, doing it is surrounded with mystery. But bending is really quite simple. Wood in the tree has lots of water – in fact more than half its weight is from water. It is not only living as annular rings are added, it is strong and flexible. Wood is dried to create dimensioned boards for shop use, and in the process wood loses flexibility. This means that green wood is bendable, and in fact your tray could be made directly from a band cut from a freshly felled tree.

Dry wood can be soaked for bending. How long to soak it depends on water temperature. Cold-water soaking takes hours; near-boiling water can do the job in 10 or 20 minutes.

Pick Your Tray Sizes

Serving trays are made in a range of sizes. I have given seven examples to choose from in the dimension chart below. You can make one or all seven, or a set of three, which for some reason seems to bespeak completeness. Let's just say three look good on display. If I were to choose, the three would be the #7-#9-#11, or the #8-#9-#10. (The numbers assigned to the trays derive from the numbers commonly used for oval boxes, the trays being in many ways similar to the lid of one of the boxes.)

Making an Ellipse

Today many people prefer a computer and printer to make an ellipse. Yet for hundreds of years a string, two nails and a pencil served as the way to generate this shape. It still serves the shop well today. On the paper used for a pattern, or directly on the foam board used in construction, lay out the major and minor axis of the ellipse. Two positions along the major axis are found by swinging an arc with a compass, the center of which is the end of the minor axis, and its radius being half the major axis. (Did I lose you here? Just look at the drawings on page 68 for help.)

Next you will need a string tied in a loop, two small nails and a pencil. The two nails are driven into the points you marked on the major axis. The size of the loop is one that goes

Oval Tray Sizes

With this set of dimensions and the techniques outlined in the article, you can generate all your ellipses and the parts for any of the seven sizes.

OVAL NUMBER*	MAJOR & MINOR AXIS**	BAND SIZE†	LENGTH TO DOUBLE TACK LINE ‡	FINGER LENGTH ‡
#6	$7\frac{5}{8}$" x 11"	$\frac{1}{8}$" x $1\frac{1}{8}$" x 36"	$2\frac{5}{8}$"	$2\frac{7}{16}$"
#7	$8\frac{3}{4}$" x $12\frac{1}{2}$"	$\frac{1}{8}$" x $1\frac{3}{16}$" x $40\frac{1}{2}$"	$2\frac{13}{16}$"	$2\frac{9}{16}$"
#8	$9\frac{7}{8}$" x $14\frac{1}{4}$"	$\frac{1}{8}$" x $1\frac{1}{4}$" x 45"	3"	$2\frac{11}{16}$"
#9	$11\frac{1}{8}$" x 16"	$\frac{1}{8}$" x $1\frac{5}{16}$" x 51"	$3\frac{3}{16}$"	$2\frac{13}{16}$"
#10	$12\frac{3}{8}$" x $17\frac{3}{4}$"	$\frac{1}{8}$" x $1\frac{3}{8}$" x 56"	$3\frac{3}{8}$"	$2\frac{7}{8}$"
#11	$13\frac{5}{8}$" x $19\frac{3}{4}$"	$\frac{1}{8}$" x $1\frac{3}{8}$" x 61"	$3\frac{9}{16}$"	3"
#12	$14\frac{15}{16}$" x $21\frac{3}{4}$"	$\frac{1}{8}$" x $1\frac{3}{8}$" x 67"	$3\frac{3}{4}$"	$3\frac{1}{8}$"

* Corresponds to the number in a nest of oval boxes sizes.

** The string and two nails method can be used to generate the ellipse for each size.

† Cut band stock on table saw from any straight-grained wood (hardwoods provide better strength and bending qualities than softwoods).

‡ The characteristic finger pattern of Shaker bent-wood projects is achieved by knowing where to locate the copper tacks and the length of the curved sides of the finger.

from a nail at the far end to the opposite end of the major axis. The string itself should not stretch, and be similar in size to the carpenter's chalk line. Then, holding the pencil inside the loop so the loop is held taut throughout the drawing, inscribe an ellipse that will touch the end points of the two axes.

Materials for Your Tray

The form, or core, used for making the tray is 1" foam board used in home construction. It is called polystyrene rigid foam board and comes in a variety of thicknesses from 1/2" to 3". The 1" thickness is just right for bending and drying your tray band. In fact, it is just right for the string and nail method of making an ellipse. Once you have drawn the ellipse, it can be cut out using a band saw, scroll saw or jigsaw, and sanded up to the pencil line using sandpaper on a wood block. (Note: while the actual size of your ellipse can vary, the band lengths given in the table presume that they will be within +/- 1/8" of the major and minor dimensions given.)

The tray bands are cut on a table saw using a zero-clearance insert to eliminate the gap between the blade and the table. This is made of wood about 1/4" thick and the shape of your metal insert. Clamp the insert to the table saw. Turn on the motor, raise the blade into the wood insert and, presto, you have a zero-clearance adapter.

The woods for tray bands are most often maple, cherry or walnut, but most any straight-grained wood will work. If necessary, soft-wood can be used. As long as the wood grain is straight, tray bands 1/8" thick and 1 3/8" wide can be cut on the table saw to provide bending stock.

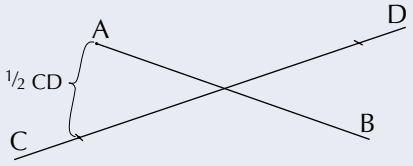
Preparing the Band for Soaking

The finger-shaped end is characteristic of Shaker boxes. It is not only assumed as part of the icon associated with Shaker work, it is functional. The narrow point is where the final copper tack will hold down the band, and it is the point your finger holds down while tacking the line of tacks. The shape is curved on both sides back from the tip and along the prescribed length (see chart on page 67), with the edges slightly beveled.

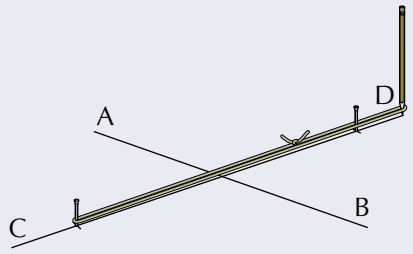
Follow the pattern for the finger end of the band that also gives the shape and the location of the 1/16" pilot holes for copper tacks. Cut the profile on a band saw or scroll saw, with the final shape trimmed with a knife. Wetting the finger end in water for a minute or two will ease the knife trimming.

Beginners often make beveled edges 45° or more, but bevels should be a slight 10°. This bevel is trimmed at the finger's end as well. The band is also thinned slightly at the finger ending. I want to underscore "slightly" here to be sure you know that this is not the feathering treatment given to the other end of the band. The amount is no more than half

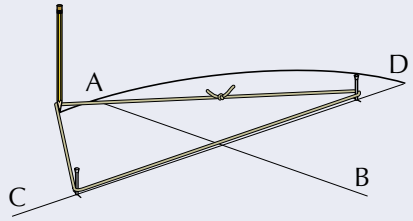
Drawing an Ellipse



1 ***A-B = Minor axis. C-D = Major axis.*** *Locate point for nails from A being 1/2 CD.*

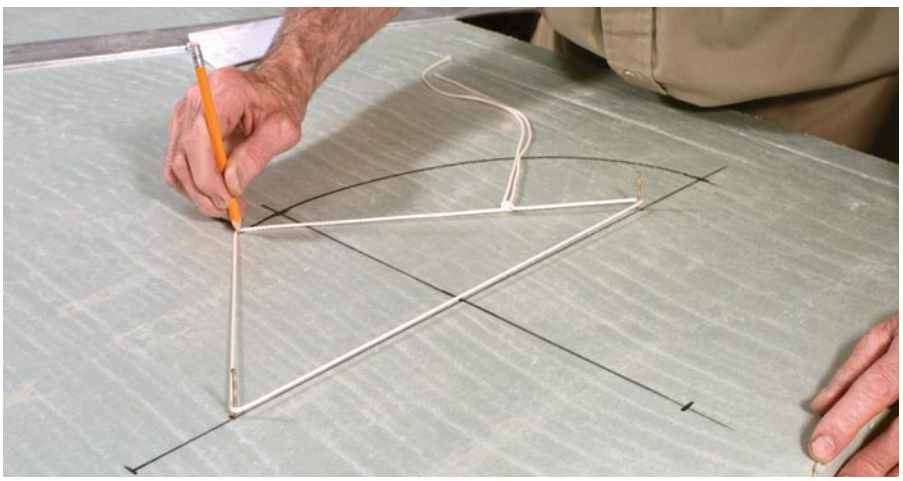


2 ***Drive nails*** *(2) where 1/2 CD intersects major axis. Tie off string so pencil is at end of major axis – use non-stretching string.*



3 ***Swing oval*** *with pencil inside string to complete your ellipse.*

Push stick at the ready. *Cut 1/8" tray bands from a straight-grained strip of wood 1 3/8" wide. The use of a zero-clearance table saw insert prevents the thin band from dropping below the table level. Keep push sticks handy!*



String and nail. *Trace an ellipse directly on 1" polystyrene rigid foam board used in home construction. This form will be used both for bending and holding the wet band until its dry.*

All trim. *After cutting the profile of the finger and drilling 1/16" holes for tacks, the edges are trimmed with a sharp knife.*

Gently now. *The tip is slightly sanded to help it be flexible. Only sand the last 1 1/2" of length, and taper only half the thickness at the end. Be careful to leave 1/16" thickness.*

Feathered. *The inside square end is feathered to give a smooth inside curve to the tray. Here the sanding tapers back 2 1/2" to 3" and removes thickness to almost nothing at the end.*

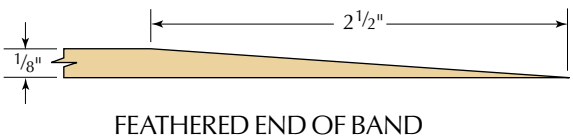
the thickness at the tip, and goes back no more than to the middle tack hole.

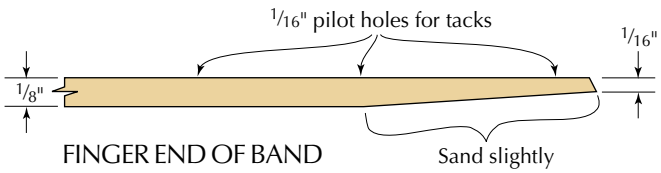
This accomplishes two things: The finger end wraps more easily and tacks tightly to the band, and the end looks a touch more graceful and not so chunky. Small things to be sure, but quality lies in the details. But please, don't overdo the amount of sanding.

The band ends need preparation before going into the hot water for soaking. The end on the inside of the tray is feathered back a distance of 2 1/2" to provide a blended ending. This can be done with a block plane or a belt sander. In either case, feathering is a straight ramp ending with just the touch of thickness at the end to prevent it from being ragged.

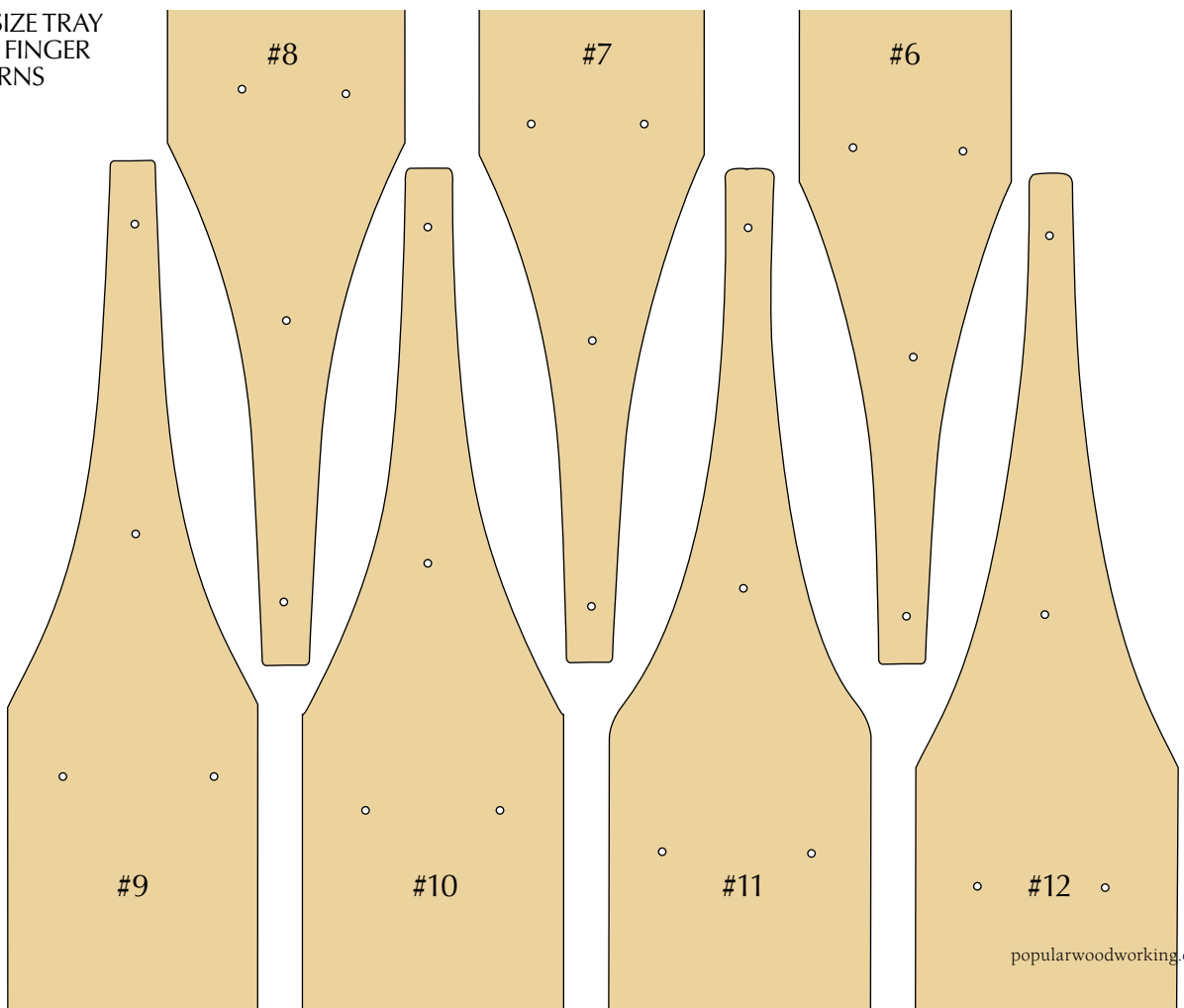
Bending and Tacking

The finished band needs its double tack line centered on the minor axis of the ellipse. To find where to start the bending, place a mark on the core that's to the right of the minor axis line and is the same length as the finger. This is the starting mark when bending. With this mark, you are ready to soak your band for 10





FULL-SIZE TRAY BAND FINGER PATTERNS



A nice hot bath. *Bands need to soak to make them flexible for bending. Hot water is heated in a 6' length of rain gutter. A hot plate provides the heat. Wood blocks under each end give stability to the long tray.*

to 20 minutes in hot water above 180° F.

You have several options for a soaking tray. With the bands long and narrow, a length of eaves trough (a gutter) works well. The end caps on eaves trough are secured with pop rivets and goop in a tube called gutter sealer. Regular construction adhesive would probably work as well, if that's what you have on hand. Any of these will resist the hot water. I have also used a length of PVC pipe with an end cap cemented on. Boiling water can be poured in, or straight tap water used if you wait hours to allow for sufficient limberness to happen. With the indulgence of other members of the household, you can also soak bands in the bath tub.

When it's soaked, wrap the band around the foam core, observing the start mark and ending with the main tack line centered. As soon as you have it tightly wrapped, make a pencil mark across the lap to record the circumference. Remove the core by opening the band slightly, then return to the lap mark.

What comes next is the tacking of the lap and the use of the foam core as a drying form. The economy of construction is seen here again in the use of the ellipse foam board for drying as well as bending. To be a good snug drying form, you should slightly reduce the size of your bent band. So, before tacking the lap, go past your lap mark by 1/8".

The lap is secured with #2 1/2 copper tacks. These tacks go into 1/16" pilot holes drilled in the finger layout and are clinched through the lapped band. They hit a steel pipe anvil, which J-hooks the tip on the inside for a very tight hold that belies the appearance of these tiny tacks. As soon as the band is tacked, return the band to the foam core to dry overnight. There will be some shrinkage in the band that would be a problem if a solid-wood core were used, and by problem I mean locking up permanently on the wood form! The beauty of the foam board is its flexibility, making it able to pop out when dry.

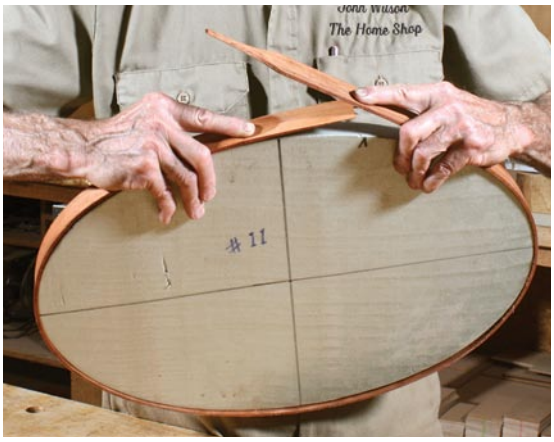
Fitting the Bottom Board

The second stage in tray construction is fitting a bottom board. In picking a suitable material, consider the fact that there is no room within the oval tray band for seasonal expansion and contraction. Therefore some kind of plywood will be used because of its stability. For this project I have used five-ply 6mm birch plywood, which sometimes is referred to as Baltic birch after the region from which it comes.

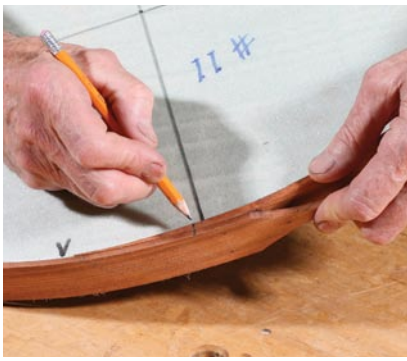
A no-nonsense, work-every-time method for fitting the bottom board is this. (1) Decide which direction you want the finger to point (normally right) and lay the band on your plywood. (2) Use a mechanical pencil for accuracy and trace the inside of the band. (3) Cut out the oval, staying just outside the line. (4) Sand the edges of the board with a 2° bevel on your disc sander and leave half a pencil mark showing all around. (5) If you miss step four and go too far, wipe yellow glue into the crack and sand immediately to deposit sanding dust on the wet glue line. It's a perfect fit every time, and a means of making it even if you are still learning your edge-sanding technique!

Wood Pegs Hold the Bottom

With the oval board fit, the edge of the band needs to be sanded flush with the bottom. When this is done, 5/64" holes are drilled 1/2" deep around the perimeter. Space them 2" to 3" apart. Wood pegs are made by cutting toothpicks in half. You can cut a whole box at once before this step, but be careful to hold the box securely together so the band saw will not scatter the pegs. No glue is needed for this



Wrap it up. *The 1" foam core is used as a bending form. The start mark is found by marking the length of the finger pattern for each size tray on the foam core as you can see. When the wrap is done, the main tack line will fall on the centerline.*



Mark it. *Record your tight wrap by a pencil mark. Remove the band from the foam core, and use this mark as a reference for sizing the tray. By going 1/8" past the mark when tacking, the resulting size will fit snugly back on the form.*

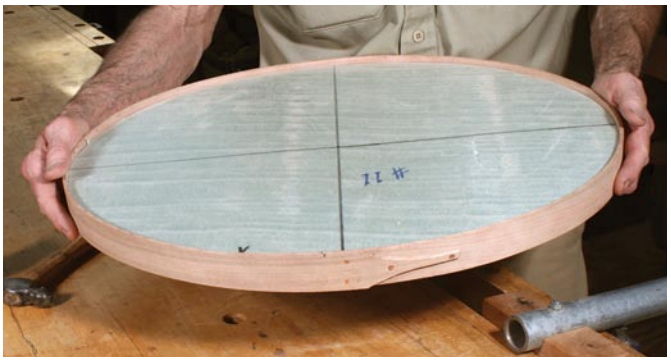
(or any other steps in the project) if you tap the peg securely in the hole. A diagonal cutter is just right for tapping and snipping pegs. Sand the pegs flush and you are done.

Finishing

Finishing is up to you. Milk paint or flat latex paint will provide a traditional look. Sand the copper tack heads bright and lightly sand the edges of the fingers to accent their shape (if you paint). Then apply a coat of dark furniture wax to give an aged patina to your paint. My standard finish is a clear coat of polyurethane varnish. The cherry bands contrast nicely with the birch bottom so I leave them unstained. No matter what finish you choose, everyone will be delighted with the effect of serving food and drinks on an oval tray. **PW**

John runs The Home Shop in Charlotte, Mich., which supplies wood, copper tacks and other critical supplies for the Shaker oval boxmaker. He also offers classes on a wide variety of woodworking topics, including a new class on making these Shaker-style trays, on Jan. 17, 2009. Contact him at shakerovalbox.com or 517-543-5325.

No glue needed. *Small copper tacks are used to secure the lap. No glue is necessary; the tacks clinch to the underside as they hit the pipe anvil. You will appreciate the slightly thinned end that makes tacking easier.*



Back again. *Return the tacked band to the foam core for drying. Normal drying time is 24 hours. In a pinch you can shorten this to an hour or two with help holding the ellipse when tracing the bottom board, since wood not fully dry doesn't hold its new shape well.*

Accuracy is key. *Use a mechanical pencil for achieving an accurate line. Be sure to hold the band in contact with the plywood all the way around. The "helping hand" here is a piece of iron anvil.*

Scrap jig. *Sand up to the pencil line after sawing the ellipse. The edge is slightly beveled, about 2°, to give a tight fit. Raise the disc sanding table to achieve this. If your sander stops at 0°, you can tape a scrap of 1/8" band stock to the outside edge of your disc table.*

Peg holes. *Drill holes every 2" to 3" around the edge of the tray for wood pegs. Here a 1/16" x 1/2" wood shim is taped to the edge of the bench to guide the 5/64" drill bit, which is extended 1" from the chuck.*

Cut to fit. *A diagonal cutter serves to tap the wood pegs securely into the 1/2"-deep holes. Then snip the surplus length.*