A Round Kitchen Classic

Learn the basics of bent lamination as you build this cherry table

A bending form and a shopmade tenoning jig served this author well. Including the time spent making the jigs, this project took him about 40 hours to complete.

BY THOMAS J. CALISTO

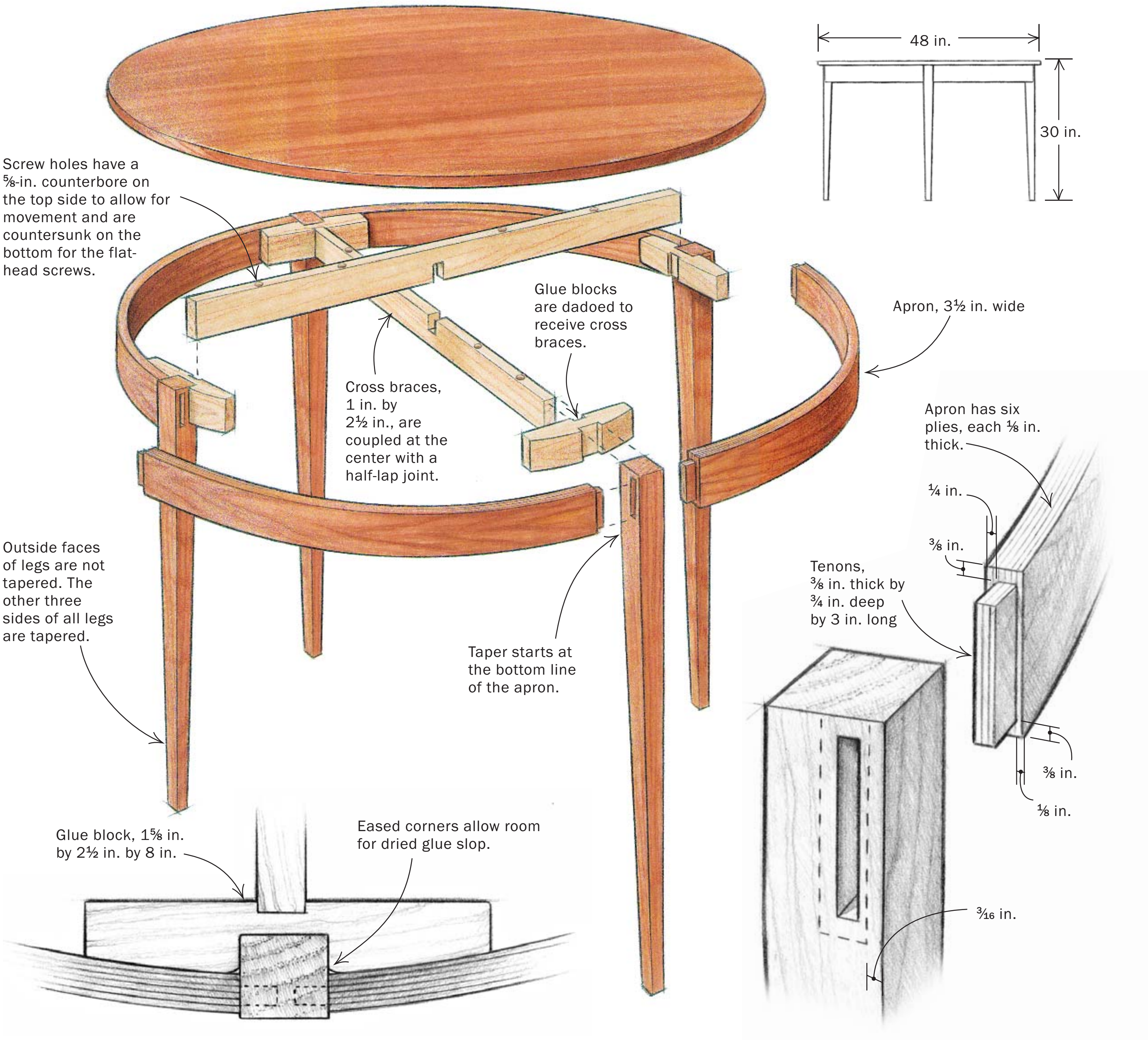
When I was about 10 years old I saw a guy on television demonstrate how to cut through-dovetails. Fascinated by the program, I had to try it myself. I borrowed my father's jigsaw and went outside to hack up some pine shelving. I cut my first set of through-dovetails that day. The dovetails weren't pretty, but they were a great leap from nailed butt joints. I have since refined my joinery skills enough to build some furniture, so when my wife wanted a new kitchen table, I knew what my next project would be.

Most of the furniture I've built has been inspired by Shaker pieces. I like this style, but we were looking for something with a few more curves. We searched through magazines and some design books before settling on a table based on one we found in Thomas Moser's book, *Measured Shop Drawings for American Furniture* (Sterling, 1988). The table has a round apron that makes it unique, and I knew it could be scaled down to fit our kitchen.

Photos: William Duckworth

STRONG JOINERY IS HIDDEN FROM VIEW

A curved apron and tapered legs distinguish this practical and elegant table. With mortise-and-tenon joinery where apron meets leg, backed up by beefy glue blocks and cross braces, this table is strong yet lightweight.



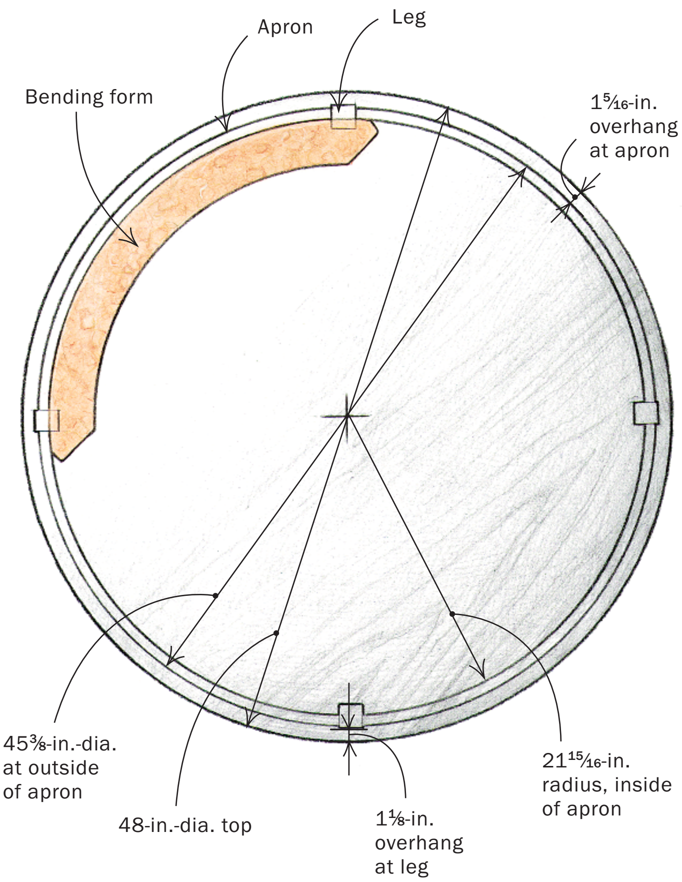
Construction of this table is straightforward with two exceptions: the laminated curved apron and the joinery involved in connecting the apron quadrants to the legs (see the drawings above). While the curved apron adds a little complexity to the construction, it is well within the scope of anyone who has basic joinery skills and some patience. The tenoning jig that I developed for this project greatly simplified the joinery (see the photos and drawing on p. 62). As with most furniture projects, it helps to draw the important views full scale. The full-scale plan view came in handy when I needed to construct the bending form and the tenoning jig for the curved apron pieces and later when I had to mark the curved aprons for length.

Start with the easy part: the top

Choose the lumber for color and grain patterns and proceed with the glue-up. Leave enough waste on the length of each of the boards so that you can easily avoid any knots or other trouble spots when the time comes to cut the table to size. The top can be

A BENDING FORM FOR THE CURVED APRONS

This particleboard bending form has an outside curve that matches the inside radius of the apron quadrants. The curve of the form is larger than the finished length of the quadrants to allow some leeway when gluing up the bent laminations. Sanding sealer and wax applied to the form keep the glue from sticking to it.



cut to its round shape by using a circle-cutting attachment on the bandsaw or by using a plunge router mounted on a scrap of plywood. The router method will take several passes, but riding on a pivot point guarantees a perfect circle (see the photo at right). Either way, the edges will need to be cleaned up with a little sanding. I like to follow that with a ⅛-in. radius roundover bit to break the sharp edges. Later on, after the table has been finished, the top will be attached to the base with screws through elongated holes in the undercarriage cross braces.

A curved bending form is a must

Whether you make the curved apron with clamps or use a vacuum press, you'll have to spend some time up front making a bending form (see the drawing above). I made one exactly to the correct radius, so that the outside curve of the form matches the inside curve of the apron. My experience has been that you get a little springback after pulling glued-up laminations off the form, but not enough to matter. The mortise-and-tenon joinery will pull slightly sprung pieces back into shape.

Lay out the curves onto a sheet of ¾-in.-thick particleboard or medium-density fiberboard (MDF). The arc length of the form must be longer than the length of a single apron quadrant. The glued-up apron laminations should be oversized in both width and length so that you can trim them neatly down to size after the glue has dried. Clamping the apron plies on the form is easier if the form has flats that act as feet. By standing the form upright, both sides are accessible for placing clamps.

After laying out the curves on the first piece of the form, cut out the arcs on the bandsaw, staying proud of the lines, or use a router. Fair the curves to the layout lines. Using the first piece as a template, trace the pattern onto other pieces of particleboard or MDF, and build up layers one at a time, using glue and nails. Trim any overhang on each piece with a flush-trimming router bit, and repeat the process until the form is six layers thick. When the form is complete, make sure that the face is square to the edge.

I chose particleboard for the form because it is inexpensive and easily shaped. One problem with particleboard, though, is that the edges are very porous, and the pores need to be filled to create a smooth surface on the outside of the form. A little putty and some sanding sealer will fill the porous edges fairly quickly. After the sealer dries, apply two coats of paste wax to the bending form to keep the glued-up apron quadrants from sticking to it.

The apron is a bent lamination

Before I had a bandsaw, I did several bent laminations using the tablesaw to cut the laminates and was amazed at how much wood

Around and around he goes. *Cutting circles in large pieces is easier if you use a router, and you're guaranteed a perfect circle, which you may not get with a wandering bandsaw blade.*

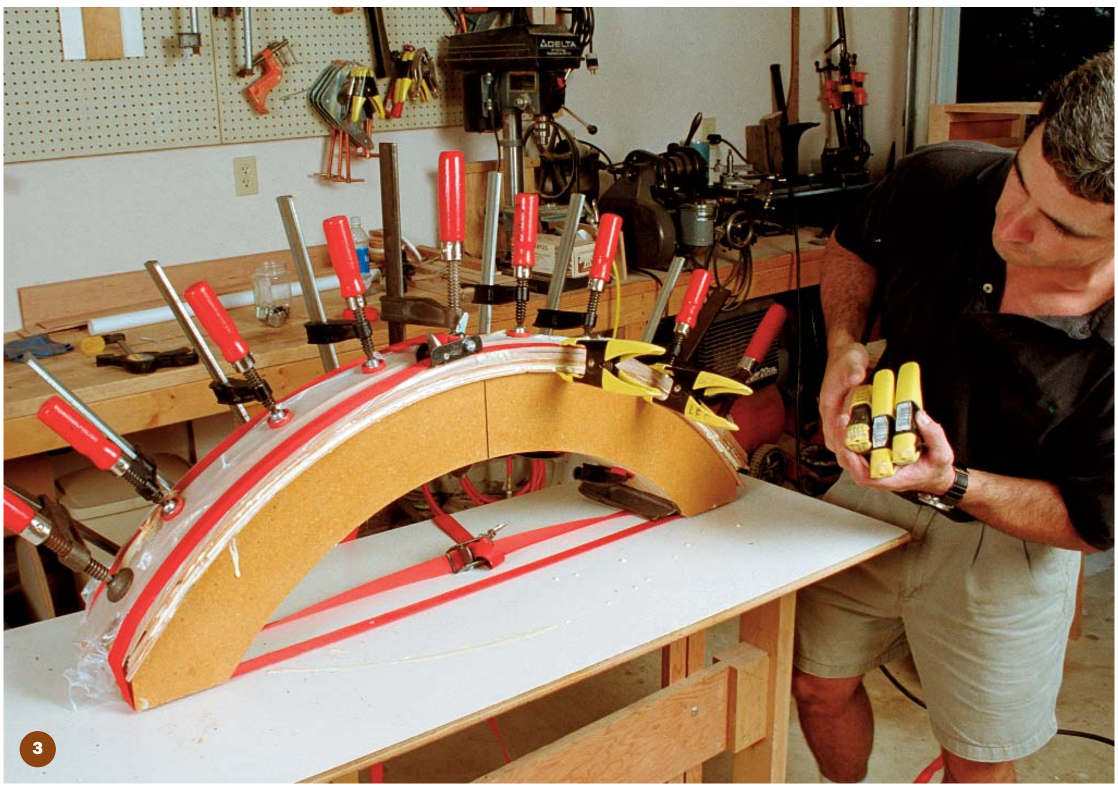
is wasted as sawdust. A good bandsaw with a sharp blade is the far better tool for resawing. Starting with rough 5/4 stock, I'm able to get as many as seven plies from each board.

For the laminate pieces, use either 5/4 or 4/4 stock, with nice, straight grain and no knots. Granted, most of the material will be hidden, but the wood needs to bend easily and not be at risk of self-destructing in the planer. With this table, each apron quadrant began as a 5/4 blank about 4¼ in. wide by 35 in. long. I surfaced one side flat on the jointer, then resawed the blank into ⅛-in.-thick plies. In theory, there should be enough material from each blank to make an entire apron quadrant. However, when planing stock this thin there is always a risk of pieces getting chewed up in the planer, so I recommend that you prepare an extra blank. Even if all of the pieces survive intact, you'll still need some extra pieces to serve as clamping cauls during the glue-up.

Gluing up the apron quadrants—Although the glue-up is not difficult, it's a good idea to try a dry run first. Select six apron plies

LAYING UP CURVED APRONS

For the aprons, solid lumber was resawed, planed and glued back together. The author cut the plies for the apron laminations on the bandsaw, then passed them through a planer to create a smooth surface and consistent thickness.



1 A small foam paint roller spreads glue evenly and quickly. *With all but the two outside surfaces getting coated, each apron lamination calls for gluing 10 surfaces before it can be clamped onto the bending form.*

2 The clamping sequence. *Place the cauls on top of the plies with plastic wrap between them. Place the first clamp in the middle and move out toward the ends.*

3 You can never have too many clamps. *Work as quickly as possible. The goal is to achieve even pressure across the face of the apron. If the result is not gap-free, add more cauls and clamps. Band clamps will help bring all of the plies together—especially at the edges.*

Rip and joint the apron edges. *After removing each quadrant from the bending form, clean up one edge on a jointer to establish a straight surface, then rip each piece to width. When ripping curved pieces on a tablesaw, keep the convex side of the workpiece in contact with the tabletop right at the point where the wood engages the blade, and keep the blade height to a minimum to lessen the danger of kickback. One final, light pass on the jointer will remove sawblade marks.*

and a minimum of four scrap plies to use as clamping cauls. The cauls are important because they distribute the clamping pressure more evenly.

Center the plies and then the cauls on the form and place a clamp in the middle, at the top. Next, clamp the ends loosely to the form. With the ends loosely held, begin placing clamps in the middle and work toward the ends. After snugging up the clamps, check to ensure that the plies haven't shifted excessively and are tight to one another across the entire surface.

The dry run should give a feel for the placement and number of clamps required to achieve even pressure across the face of the apron. If the result is not gap-free, try adding more cauls and clamps. Band clamps do a good job of bringing all of the plies together—especially at the edges, where any gaps will be obvious.

After a successful dry run, it is time for the glue-up (see the photos on p. 59). I have used regular yellow glue in almost all of the bent laminations that I've done. Rigid glues (such as epoxy) may be a better choice, but I haven't had any failures yet, and springback is not an issue with this project. Apply an even coat of glue to all sides of all six plies with a foam roller, except for the two outer surfaces of the apron. Set the plies on the form and place the cauls on top of the plies with a layer of plastic wrap between them. Clamp the laminates just as you did during the dry run. Allow each laminated apron section to cure for at least 24 hours before removing the clamps.

Cleaning up the apron quadrants—After removing the clamps, use the side of the bending form as a straightedge to draw a pencil line along the length of the inside of each apron quadrant, just below the edge. This mark will provide a reference when jointing the edge. Scrape off most of the glue squeeze-out and joint that edge until it is clean and parallel to your pencil line, then rip each apron to width.

I rip the aprons to size with a tablesaw, then clean up the sawblade marks with one final pass on the jointer (see the photos above). A safer alternative is to rip the pieces to width on a bandsaw; however, this will not give as clean a cut. If you use a tablesaw for the ripping operation, be extra careful. Be sure to place the convex side of the apron down and maintain contact between the saw top and the apron right where the blade first enters the wood. Once the aprons are cut to width, use the full-scale drawing to mark the ends for cutting them to length (see the photo below).

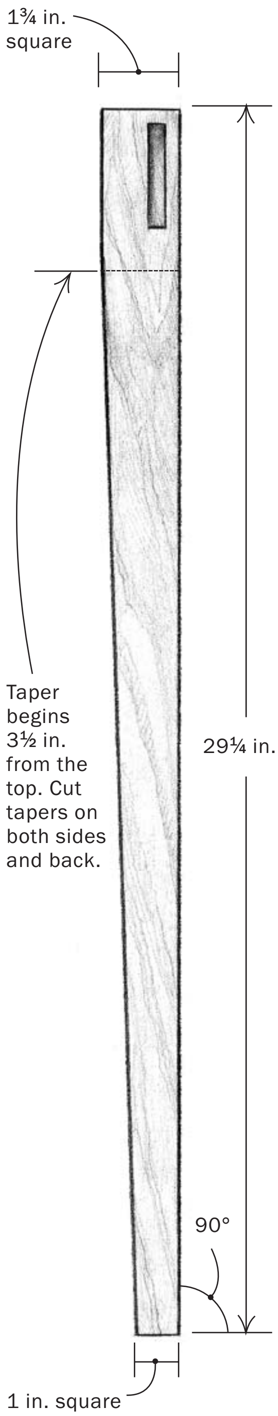
Full-scale drawings come in handy. *Use same-sized drawings to mark the cutoff length of the aprons and to build the bending form and the tenoning jig.*

Mortise the legs before tapering them to shape

Mill the legs into $1\frac{3}{4}$-in.-square by $29\frac{1}{4}$-in.-long blanks. While they're still square, before tapering them, cut the $\frac{3}{8}$-in.-wide mortises. This can be done many ways, but I use a router and square up the corners with a chisel. The legs on this table are tapered on three sides—left, right and back—all but the front side showing into the room. In section, the legs are $1\frac{3}{4}$ in. square at the top and 1 in. square at the bottom (see the drawing on the facing page). At $29\frac{1}{4}$ in. high, with the taper starting $3\frac{1}{2}$ in. from the top (right at the bottom edge of the apron), that means each left and right tapered side has to lose about $\frac{3}{8}$ in. of material at the foot, and the back side loses $\frac{3}{4}$ in. of waste at the foot.

I built a jig for cutting tapers on these table legs because it seemed like a safer alternative (see the photos on the facing page). With this jig, the

TAPERING THE LEGS



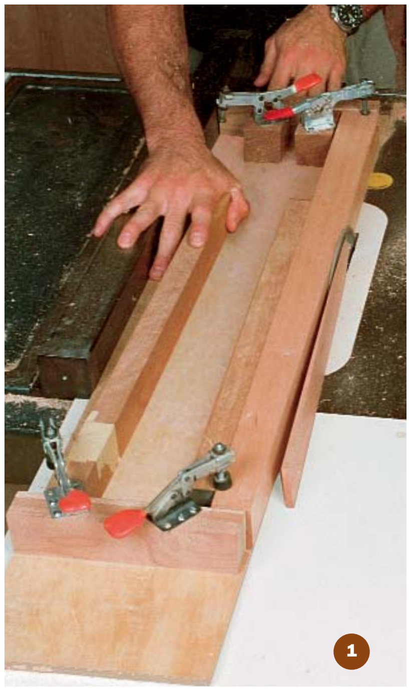
The legs for this table are tapered on three sides—left, right and back—all but the front side that shows into the room. You could cut these tapers with an adjustable tapering jig, or you could use a bandsaw and a jointer. I prefer my dedicated jig, to ensure that all of the cuts are consistent and fairly safe to execute. The fences are fixed, and the legs are held firmly in place with toggle clamps. Here's how this jig works:

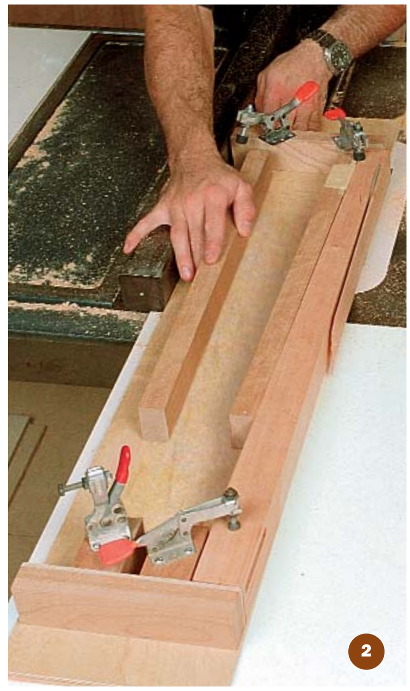
1 The first taper. *Set the saw fence 8 in. from the blade, which is the width of the jig. This setting does not change. Clamp a leg blank into the side that is set to remove ⅜ in. of material, and rip the first taper.*

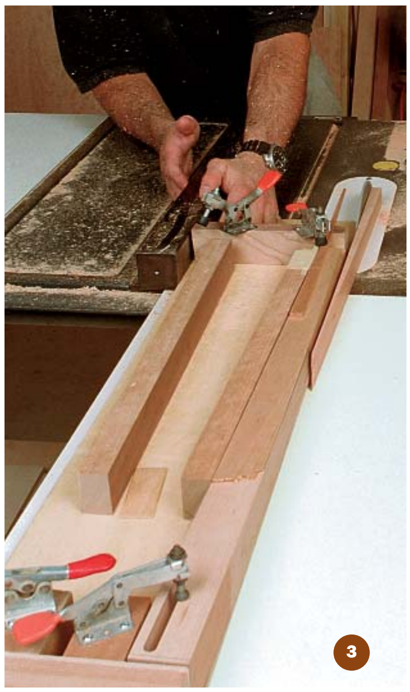
2 The second taper. *Move the leg blank to the other side of the jig, clamp it in place, turn around the jig and rip the second taper.*

3 The third taper. *Turn the leg blank 90°, clamp it in place and rip the third and last taper. You can use scrap wedges of the cutoffs as necessary to secure the leg blank firmly in the jig.*

4 Cleanup. *The sawn surfaces are cleaned up with a light pass over the jointer.*







fences that define the tapers are glued and screwed into permanent positions, and the legs are held in place by toggle clamps. Also, the jig is plenty wide, which helps keep fingers away from the sawblade—unlike what you often find with those adjustable aluminum tapering jigs.

Construct a jig to cut the tenons

I pondered how to cut the tenons on the curved apron quadrants, then I realized that my router table would be the perfect machine for the job. I made a jig out of plywood scraps that holds the apron securely in place (see the drawing and photos on p. 62), so that the ends of the aprons meet the router-table top in the same relationship as they meet the leg.

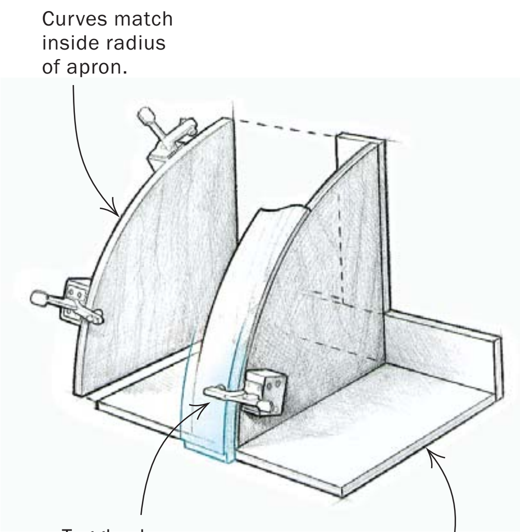
Time given to making this tenoning jig is well spent. This setup transforms what would otherwise be a difficult task—cutting tenons on the ends of curved aprons—into a simple one. The radius of the curve matches the inside radius of the apron pieces. The L-shaped base sits flat on the router-table top and rides against a fixed fence. Equip the router with a ½-in. upcut spiral bit, then adjust the fence and router to produce a ⅛-in. by ¾-in. rabbet cut into the front (convex) face of the apron.

Use the cutoffs from the apron quadrants as set-up pieces before committing to the actual aprons. After verifying the setup, clamp an apron onto the jig and make the first cut across the face. Without adjusting the fence setting, add a ⅞-in.-thick spacer between the jig and the fence. Run the apron through again and check the fit in one of the leg mortises.

This setup should provide an exact fit—assuming that the bit and the spacer are accurately sized. But when working wood, these tolerances are not always easy to achieve, so a little shimming or shaving may be in order.

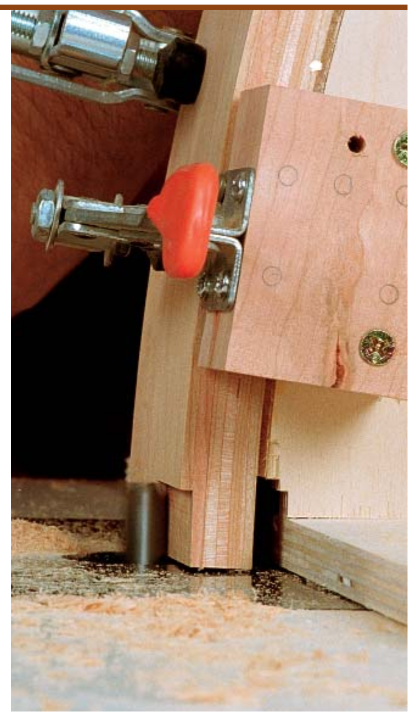
If the fit is too tight, plane a little off the spacer; if the fit is too loose, shim it out by adding a strip of masking tape to the spacer. The goal is to achieve a snug, sliding fit. Because the cutter remains fixed in relation to the fence, any discrepancies in the thickness of the aprons will not affect the size of the tenons: They will all end up being consistently the same ⅜-in. thickness. After milling the tenons on all of the aprons, the tenons need to be cut

CUTTING TENONS ON CURVED APRONS



Constructed of scraps of plywood, the outside curve of this jig matches the inside curve of the apron pieces. It holds them firmly in place, square to the work surface, making it easy to cut all of the tenons using a router table.

1



1 The first pass. *After setting the router bit to the proper height, use a fixed fence to slide the jig past the bit to cut the outside rabbet.*

2

2 The second pass. *Without moving the fence, insert a spacer block of wood between the fence and the jig and make the cut. The spacer guarantees a consistently sized tenon regardless of discrepancies in apron thickness.*

Gluing up the base assembly. *Use a flat, level surface to lay out and glue up the legs to the aprons. Any misalignments need to be adjusted before tightening the band clamps.*

Tweaking the alignment. *By hanging one leg joint over the edge of the worktable, the aprons and legs can be drawn flush together with a deadblow hammer before the clamps are fully tightened.*

to width. I trim them to width with a dozuki backsaw and clean up the cuts with a chisel.

Test the fit before glue-up

To ease tension during glue-up, I strongly recommend another dry run. As you might expect, some of the tenons may need a little tweaking with a shoulder plane until all of the joints draw up completely. Mark an identifying number on each one as you go.

Assemble the table base upside-down on a flat sheet of plywood or melamine (see the left photo above). Band clamps bring all of the joints together nicely. Before tightening down the clamps and leaving the assembly to cure overnight, clean up any excess glue, then make sure that the base is flat against the plywood and that the legs are perpendicular to the surface. If you need to tweak the alignment, move the table so that one leg joint hangs over the edge of your workbench. Then simply use a deadblow hammer to bring the aprons and legs flush (see the right photo above).

An undercarriage for securing the top

After the base assembly cures, clean up the top edges with a jointer plane, then begin constructing the undercarriage, which stiffens the base and provides a means to attach the tabletop. The undercarriage consists of a frame made from two cross braces of 1-in. by 2½-in. hardwood (I used maple) joined in the center with a half-lap joint. The cross braces are attached to the base in dadoed glue blocks that span the leg-to-apron joints (see the detail drawing on p. 57).

I did most of the sanding on the base pieces before gluing them up, so the table needed only a quick once-over by hand with 220-grit sandpaper. After sanding, I removed any dust from the surface and applied four coats of Garret Hack's oil-varnish mixture (*FWW* #122, pp. 48-51)—equal parts linseed or tung oil, varnish and turpentine—followed by a coat of paste wax. If I include the time spent making the bending form and tenoning jig, I put in about 40 hours on this project. □

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