

# Straightforward

Three basic techniques  
are the bridge  
to more beautiful furniture

BY JEFF MILLER

**M**y first saw was a bandsaw, so from the very beginning of my woodworking career, I found myself working with curves. If you've only been a straight-shooter until now, you'll find that curves not only open up a world of design possibilities, but they also offer plenty of chances to expand your repertoire of woodworking skills: from laying out eye-pleasing shapes to cutting and smoothing those shapes, or even bending them (with steam or by lamination).

What stops most people, however, is the prospect of cutting and fitting joinery on these curved parts. I'll show you three techniques that I've used over the years with great success. There's nothing exotic or difficult about them, and once you see them in action, you'll soon be adding graceful curves to your own work.

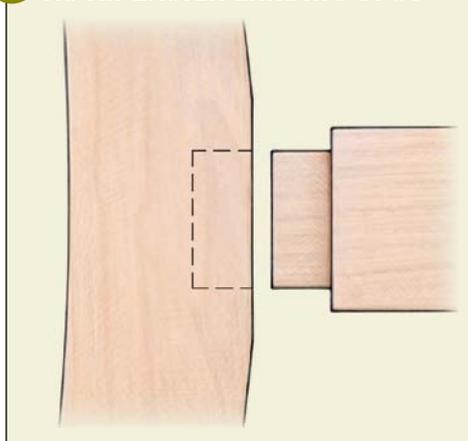
## Creating a flat spot on the curve

The simplest way to join two pieces when one of them is curved is by leaving or creating a flat area on the curved work where the mortise is to be cut.

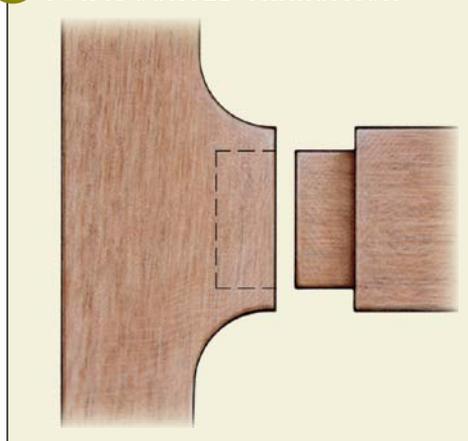
If you are cutting the curved piece out of square stock, it's easiest to locate and cut the mortise while the workpiece is still



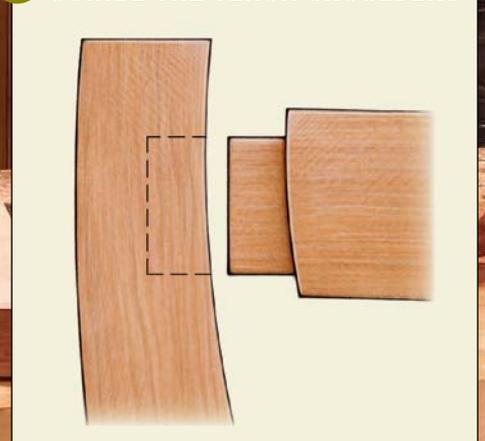
### 1 CREATE A SUBTLE FLAT AS AN EASIER LANDING SPOT



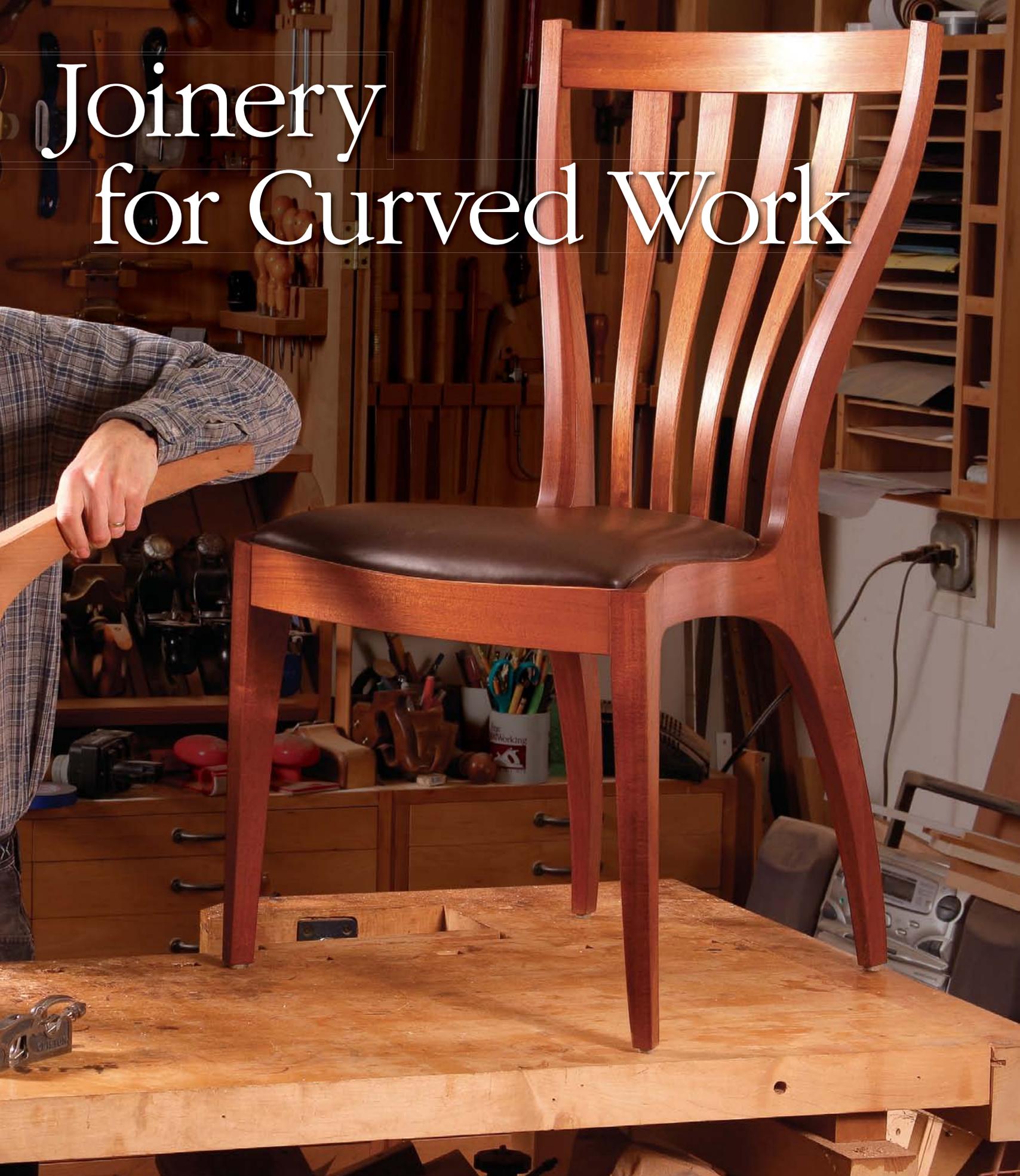
### 2 MAKE THE FLAT STAND OUT FOR A CURVED TRANSITION

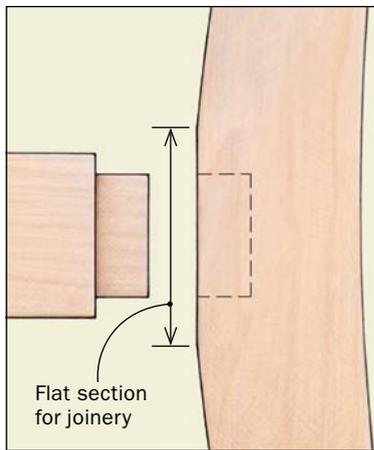


### 3 FOR INSIDE CURVES, SCRIBE THE TENON SHOULDERS



# Joinery for Curved Work



**OPTION ONE****For shallow, outside curves, create a flat**

This works best with shallow curves so the flat spot won't stand out. It's good for joining straight rails to curved posts on a chair or bed, or straight aprons to curved legs on a table.



square. Then you can leave the area around the joint flat when cutting the curve. The tenon on the mating rail can then be cut and fitted just as for any other mortise-and-tenon joint. When creating the flat, be sure to extend it  $\frac{1}{8}$  in. or so beyond the rail both above and below the joint to accommodate any expansion across the width of the rail. When the piece is glued up, you can sand lightly to ease the transition from flat to curve, leaving about  $\frac{1}{16}$  in. flat.

Things get more challenging if you're cutting several identical parts from square stock. If you want to minimize waste, you'll need to "nest" the layout of the parts and cut them all out before doing anything else. This means you'll then have to create the flat—and cut the mortise—in an already curved part. To do this, I make a simple jig that holds the work while I create the flat spot and then cut the mortise.

Clamp the curved piece into the jig so that the area to be flattened projects above the jig's fence. Now you can create the flat spot, using a handplane to remove the projecting material and bring the part flush with the top of the fence. To use the jig with a router, screw on a top plate to support the router. Use a spiral upcut bit or a straight bit, set to cut flush with the top of the jig's fence. The first cut should be a clockwise pass around the area to be flattened; this is a climb cut to avoid tearout.

To mortise with the same setup, equip a plunge router with a fence that will ride along the back of the jig. Adjust the fence to locate the mortise on the thickness of the workpiece. Rout between the layout lines in shallow passes (perhaps  $\frac{1}{32}$  in. of added depth per pass) until you reach the desired depth.

**Create a flat that stands proud**

Some designs call for seamless curves that flow from one part to the next, regardless of whether the parts themselves are curved.

In these cases, don't shape the curve, or much of it anyway, on the end of the tenoned piece. The outer tips of the curved ends will consist of very fragile short-grained stock. Instead, leave a raised area on the mortised part, and form the transitional curves there. Just rough them

**LEAVE A FLAT SECTION IF YOU CAN...**

**The easiest flat.** Leave a section of the stock's square edge intact when cutting the workpiece to shape. Mark the flat's boundaries on the pattern and let that section hang over the stock's edge when tracing the layout.

**Saw the piece to shape.** But before bringing the work to the bandsaw, go ahead and cut the mortise—a task that's much easier while the stock is still square.



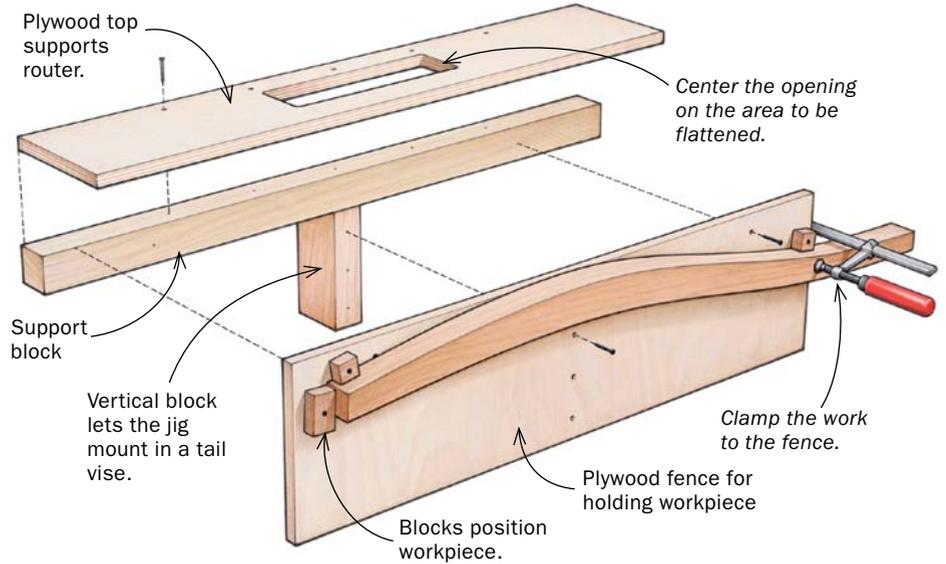
**...OR ROUT A FLAT ON NESTED PARTS**



**"Nesting" curved parts saves material. However, it also makes it impossible to leave a precise flat when sawing each part. So Miller uses a simple jig to shape the flat afterward.**

**SIMPLE JIG CAN FLATTEN AND MORTISE**

The assembly is based on a piece of thick, wide stock screwed to a vertical plywood fence so the mating edges are flush.

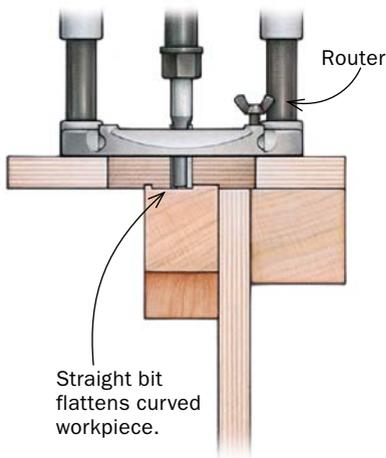


**Hold the jig in a bench vise. The workpiece clamps to the jig's fence. Three hardwood stops locate the workpiece so that the section to be milled protrudes above the fence.**



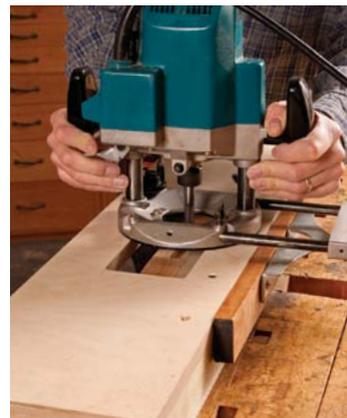
**Add a top plate to support the router. Use 3/4-in. plywood and make the plate opening larger than the desired flat by 1 1/2 in. in each direction.**

**1. ROUT THE FLAT**

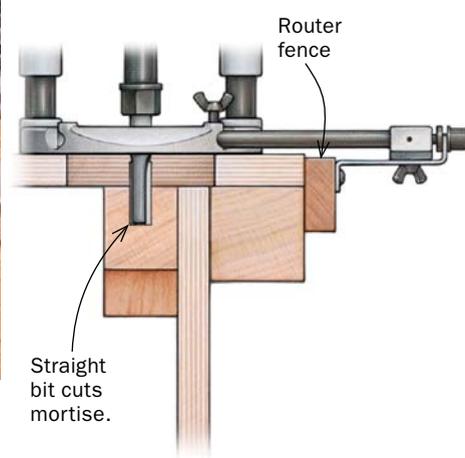


**Route the workpiece flush. Set the bit depth even with the top of the jig's fence.**

**2. ROUT THE MORTISE**



**The same jig lets you mortise, too! Attach the router's fence to guide it and locate the mortise.**



**OPTION TWO**

## For flowing curves, add a pad

For curves that flow into each other, there is a right way and a wrong way. This table by Chicago furniture maker Chris Bach shows how it should be done.

Cut the raised pad when sawing out the workpiece.



### AVOID SHORT GRAIN

**STRONG DESIGN**

Protruding pad is strong.

**WEAK DESIGN**

Short grain is fragile.



**Cut the joint while the stock is square. Then saw the shape as shown, making sure that the flat surface is 1/8 in. or so wider than the rail.**

in, and then refine the transitions after gluing the joint together. A well-known example of this technique can be seen on the leg-to-rocker joints of a Sam Maloof rocking chair.

By the way, another excellent solution to this problem is the gunstock joint used by Kevin Kauffinger in his hall table ("A Graceful Hall Table," *FWW* #212).

Here's a final point to consider when using this type of joinery: It makes a lot of sense to use quartersawn wood for the rail. This is because, after the joint has been smoothed to seamlessly flow together, seasonal expansion and contraction of the rail across its width could create minor misalignment between the parts. Quartersawn stock, which moves less across its width than flatsawn material, will minimize this problem.

### Match the shoulders to the curve

When you're joining a tenoned part like a chair's crest rail or a table apron to a concave section of curve, it won't work to create a flat spot on the curve. The simplest approach is to scribe the tenon shoulders on one piece to exactly match the curve of the adjoining piece. By the way, this is another instance where a quartersawn rail is a good idea. Excessive wood movement can cause gaps to appear in a scribed joint, because expansion or contraction will actually change the curvature of the shoulder.

The task of cutting the mortise and tenon is roughly the same as before. You can use the jig again to cut the mortise, although you may need to use a curved offcut as a brace between the jig and the



**Finish by hand.** After the joint is glued, remove the excess material and create a smooth transition using a round or half-round wood rasp (above), followed by a card scraper (right).



workpiece to help hold the work squarely when clamping.

The real trick in this technique lies in shaping the tenon shoulders to tightly hug the curve of the mating part and create a gap-free joint. This process will be simpler if, when cutting the tenon, you angle the tenon shoulder so that it generally follows the direction of the curve to which you'll be scribing. You can do this with a tablesaw tenoning jig, clamping the workpiece in the jig against a precut wedge. Cut the tenon to normal length to fit in the mortise.

Start the scribing process by inserting the tenon fully into the mortise. Next, use a marking knife to ride along the curved workpiece and scribe a line into the shoulder of the mating part. It's ideal if the scribed line is made with a single-bevel knife so that the straight side of the cut is toward the shoulder—this will leave a very crisp edge to pare toward. Facing the knife that way often will create the offset you need to transfer the full curve to the shoulder, while ultimately shortening the tenoned part as little as possible. But you can use a shim of some kind (an automotive feeler gauge or a small scrap of wood) to increase the scribing offset for deeper curves.

The paring requires a very sharp chisel with a flat back. Nibble a little bit away at a time, until you are just one or two paring cuts away from the scribe line. Now put the chisel's edge right in the scribed line and pare down. The easiest way to keep the cut perfectly on your line is to make each cut after the first one with only the leading quarter of the chisel, registering the rest of the chisel against the existing shoulder. A gentle twist of the chisel, applying a little extra force against the existing shoulder, should keep you from inadvertently crossing the line. It also helps to undercut the shoulder a little. Just be careful not to do that at the corners, where undercutting from one side will leave unsightly gaps on the adjacent face.

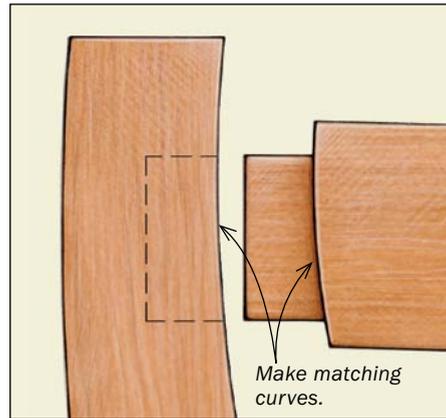
As you trim back the shoulders, you might also need to trim the tenon length back so the final depth is about  $\frac{1}{32}$  in. less than the depth of the mortise. This leaves room for excess glue. □

*Jeff Miller is a frequent Fine Woodworking contributor who teaches woodworking at his studio in Chicago and around the country.*

### OPTION THREE

## Inside curve? Scribe a shoulder

This technique creates tight joints between two pieces when one of them is a concave curve.



**A curved shoulder starts on an angle.** When cutting the tenon, angle the shoulders to follow the arc of the curved mating piece. Aim for a close fit to minimize the paring.



**Mark the shoulder.** An automotive feeler gauge hugs the curve when transferring the layout to the shoulder. Use a wood scrap for a wider gap.



**Pare to the scribe line.** Nibble away most of the waste, then seat the chisel in the scribe line and pare straight down. Use overlapping cuts, advancing only a quarter of the blade with each new stroke.



**Bring the joint home.** You may need to shorten the tenon slightly to allow the shoulder to seat completely. With the shoulder pared carefully, the joint should come together with no gaps.