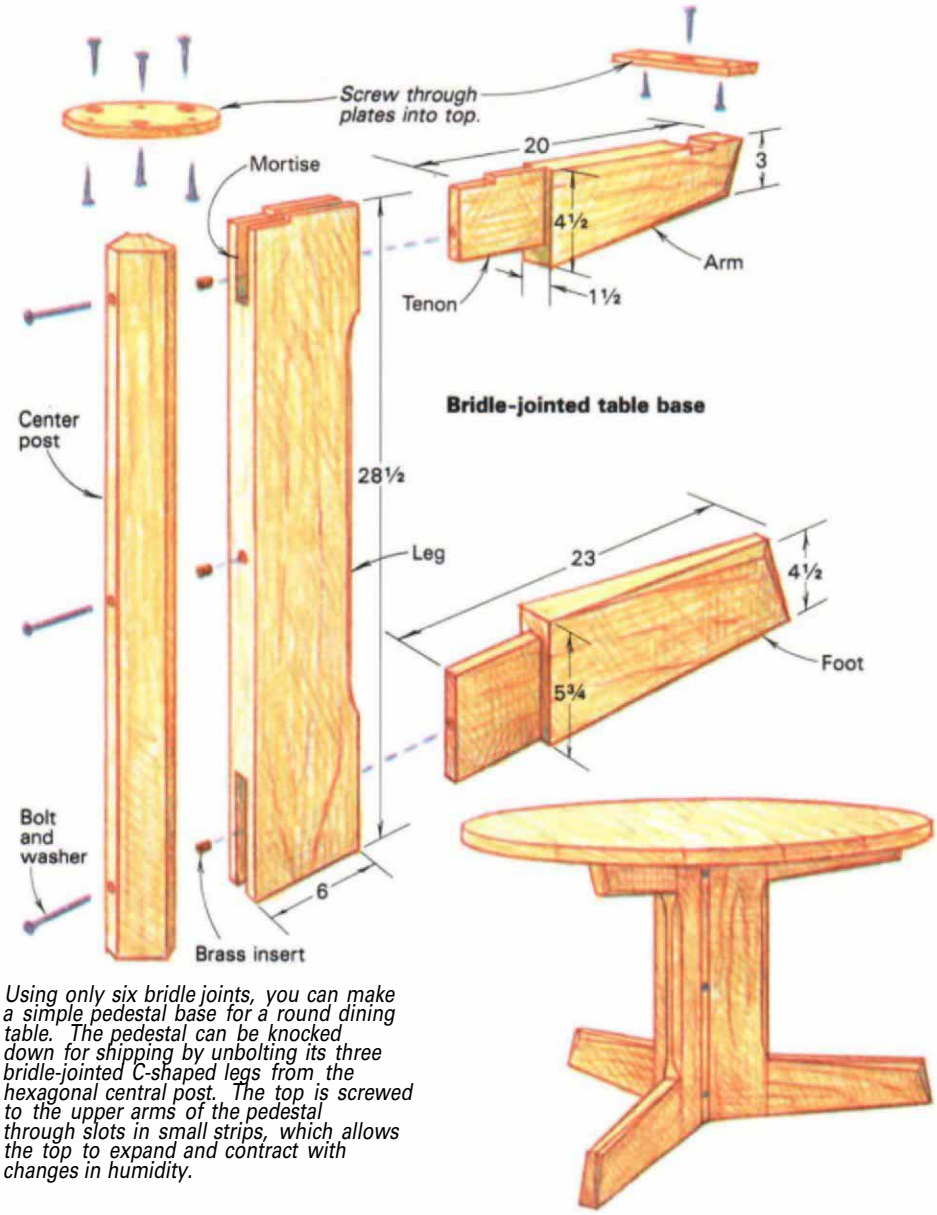
# Starting Out

## *Cutting a bridle joint*

by Roger Holmes




*Using only six bridle joints, you can make a simple pedestal base for a round dining table. The pedestal can be knocked down for shipping by unbolting its three bridle-jointed C-shaped legs from the hexagonal central post. The top is screwed to the upper arms of the pedestal through slots in small strips, which allows the top to expand and contract with changes in humidity.*

The mortise-and-tenon is one of the most basic and versatile woodworking joints. It can be as plain as the rung-to-leg joints in any stick chair, or as complicated as some of the three-dimensional, jigsaw-puzzle joints used in Japanese house carpentry. A mortise-and-tenon can be used almost any time you need to join the end of one piece to the edge of another. They're such effective joints that it's hard to find a piece of furniture without at least one, even if only a dowel in a hole.

The bridle joint (shown above) is one of the simplest garden-variety mortise-and-tenons. Its open-ended mortise doesn't have the mechanical (unglued) strength of an enclosed mortise, but modern glues and the joint's ample gluing surface make up the difference. And a bridle joint can be made more quickly and easily. Both tenon and mortise can be cut almost entirely with a saw, eliminating the excavation that would be required to clear out an enclosed mortise (see p. 73).

When I was figuring out the base for the round pine dining table shown here, bridle joints seemed ideal. A pedestal eliminates obstruction under the table, and the C-shaped, bridle-jointed frames are sturdy enough to support the tabletop, Thanksgiving turkey and a dozen or so elbows. And the six bridle joints are all the joinery needed for the entire base. (See the first part of this series in *FWW #48,* pp. 46-51, for how to join boards for a top.)

I cut the bridle joints with a bandsaw and backsaw, then used a chisel and shoulder plane to clean up and fit them together. If you don't have a bandsaw, you can do all the sawing with a backsaw and a bowsaw or handsaw (see p. 70). A shoulder plane is a handy tool, but if you're reluctant to dish out $40 or so for one, you can trim the shoulders with a chisel.

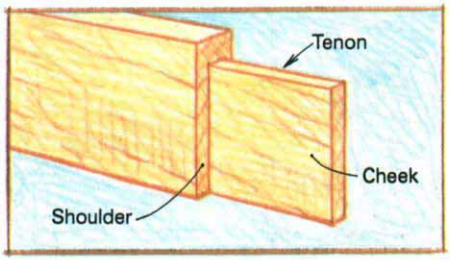
When I knew roughly what sort of table I wanted, I designed it on the workshop floor with a piece of chalk. I drew an elevation (side view) of half the top and one frame full-scale, then fiddled with the proportions until they looked good. If you start with the drawing shown here, sketching a full-scale elevation will help fix the project in your mind. You can change the dimensions and shapes, but I think you'll find the table too shaky if you make the arms, legs or feet much less than 4 in. wide or 1¼ in. thick. The feet will get in the way if they extend beyond the top's circumference. I made the top 4 ft. in diameter, but I think the table would look better with a 5-ft. top,

When your plans are chalked out, cut three sets of arms, legs and feet for the C-shaped frames. Cut all the parts to width and length, but don't shape them yet—it's a lot easier to cut joints in rectangular stock. Next plane the parts flat and to thickness—mine were 1½ in. thick. Try to make them all the same thickness, but don't get bogged down if there's 1/16 in. or so variance—the parts can be planed flush after the frames are glued up. Mark the flattest face of each piece, plane the edges straight and square to it, then mark the most accurate edge (I use a little squiggle on the good face, joined to a V on the good edge). The tolerances needn't be up to edge-joining standards, but the closer the better. Don't worry about making the ends exactly square; a good sawcut is fine.

**Laying out—**Like any mortise-and-tenon, bridle joints require accurate, organized marking out. To avoid errors, mark all the joints at once, before cutting. You'll

**Marking the shoulders**

*Knife the tenon shoulder lines around each arm and foot. Hold the square's stock against only the good edge or face as you go.*




need to mark wherever a sawcut must be made. As the drawings above and below show, I marked the shoulders with a square and knife, and the cheeks with a mortise gauge, which is just a marking gauge with two pins that scribe both cheeks at once. When laying out each joint, always reference the square and marking gauge from *only* the marked good face and good edge of each part.

For the pedestal, I arranged the parts for each frame on the bench: good-face marks up, good-edge marks to the top of the arm, the bottom of the foot and the inside of the leg. Mark one end of each leg for reference, then identify both parts of each joint with the same number or letter.

Lay out the tenons first. To reduce error, I avoid measuring wherever possible by scribing dimensions directly from the parts being joined. Here, all the tenons are as long as the legs are wide, so I laid one foot across its leg in the position it would be joined, and marked the shoulder position on the edge with a pencil. Using this foot as a guide, I marked the shoulders on the remaining feet and arms. (If the tenons are $\frac{1}{32}$ in. or so shorter than the leg width, clamping will be easier and the surfaces can be planed flush after assembly.)

When you've marked all the tenon lengths, scribe the shoulder lines using a try square and a sharp pocket knife or utility knife. I've devised a little ritual to ensure that I'm scribing only from the good face and edge: First I scribe across the good face, holding the stock of the square against the good edge. Then I scribe across each edge, holding the stock against the good face. Finally I scribe across the second face, holding the stock against the good edge. The lines should connect around the piece. If they don't, the good face is probably twisted. If they come close, don't worry about it—you can take care of the discrepancy when you fit the joint. If they're way off, I'd replane the face, or pick another board and start over.

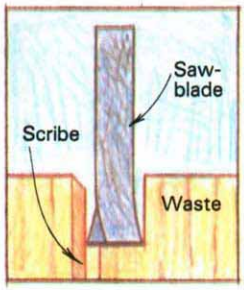
Lay out the ends of the mortises next. I made the tenons about 1 in. narrower than the full width of the arm and foot—the length of the mortise equals the width of the tenon, so there's less mortise to saw out. Pencil the mortise length on the good faces of the legs, then extend the line across the edges with a try square and knife.

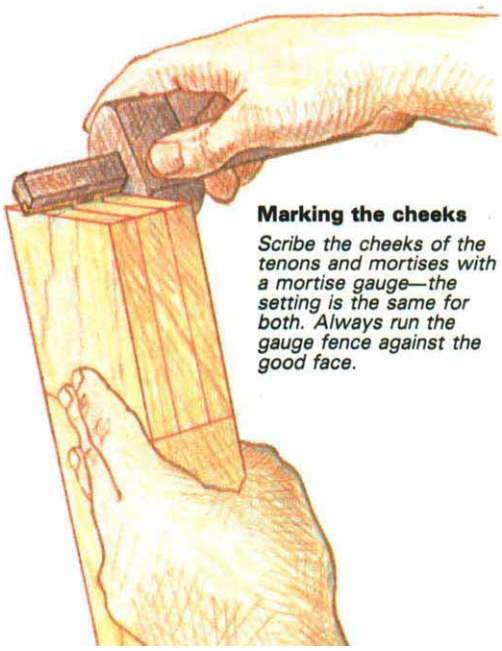
The cheeks of the tenons and the mortises can be scribed with a marking gauge or a mortise gauge. When the mortised and the tenoned pieces are the same thickness, I make tenons about three-fifths that thickness. If the tenon is much thicker, the width of the mortise will make its walls too thin and liable to break. Cutting and cleaning up the mortises will be easier if you make the tenon thickness match a standard auger-bit and chisel size—I made the tenons for the C-shaped frames $\frac{5}{8}$ in. thick.

Set the mortise gauge and scribe around the edges and ends of the pieces, from shoulder line to shoulder line. When setting up a mortise gauge, I set the distance between the pins, then adjust the fence so that the mortise will be centered on the edge. An easy way to set the fence is to gauge from both faces of the piece, tapping the fence until pin marks made from each face coincide. Scribe all the tenons and morrises with this gauge setting. (At the same time, scribe several offcuts from the frame pieces to use when setting up the bandsaw for cutting the joints.) Make sure you run the fence against the good faces so the

**Cutting the cheeks**

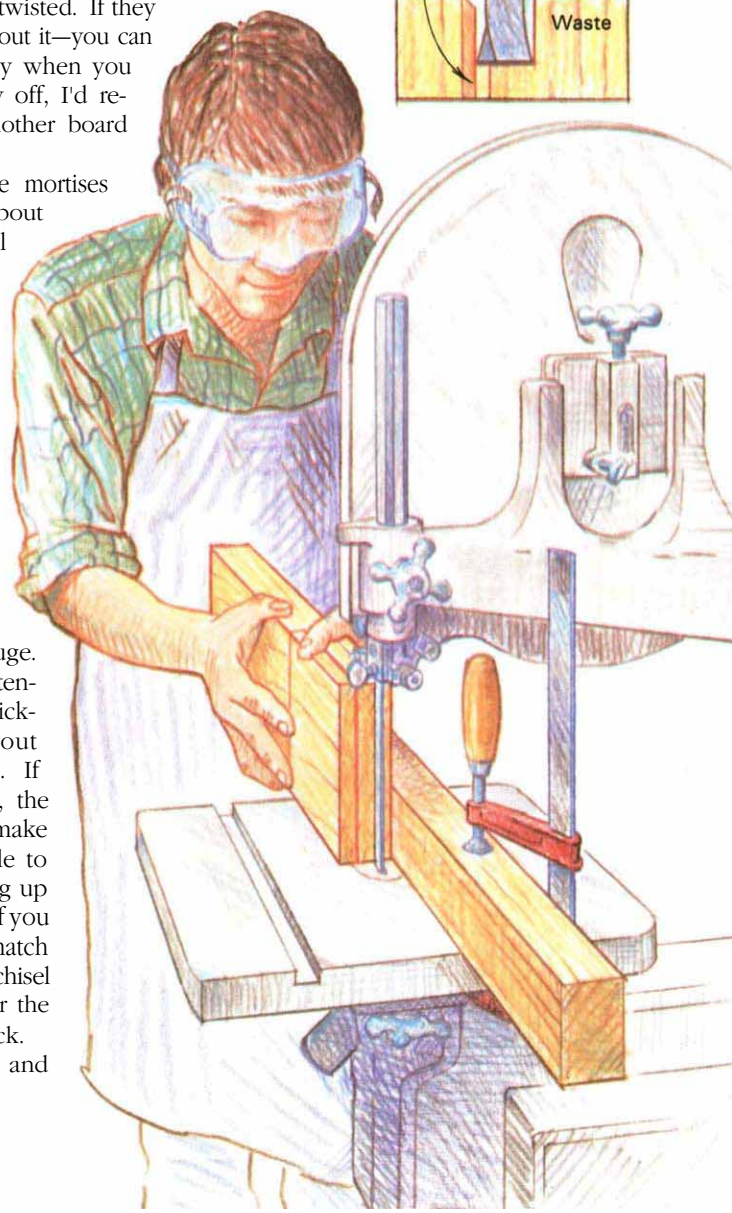
*Bandsaw the tenon cheeks against a straight, squared-up fence. Make sure the sawkerf is in the waste, and try to saw right to the scribe, leaving half of it on the tenon. (After boring the mortises, saw them the same way.)*



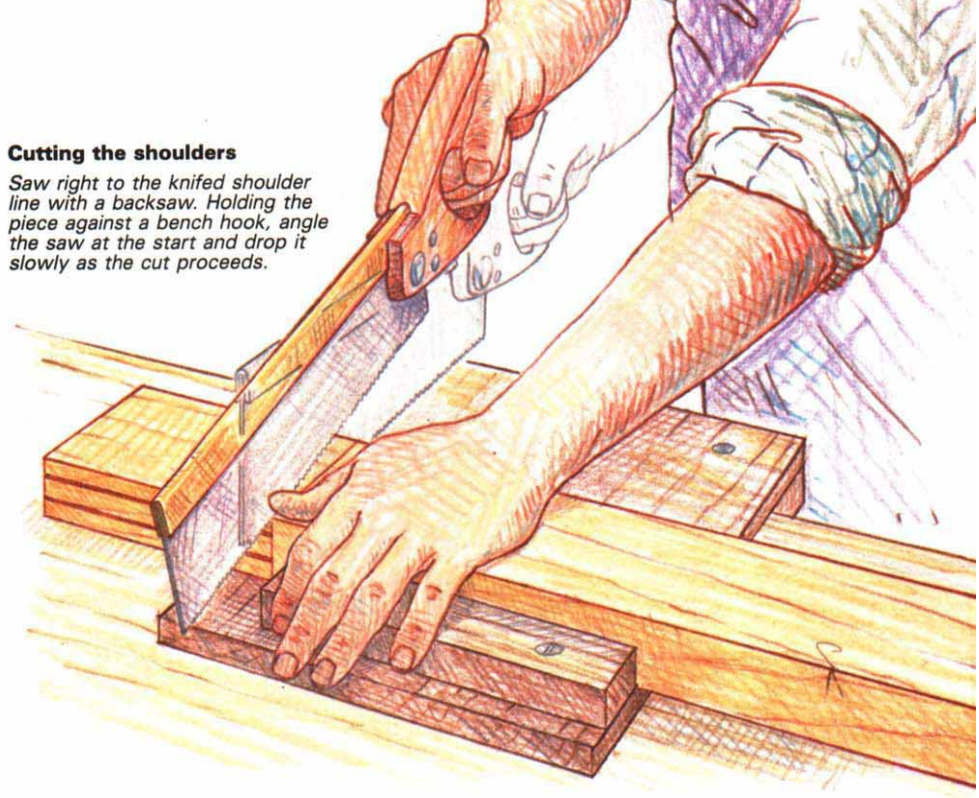
**Marking the cheeks**

*Scribe the cheeks of the tenons and mortises with a mortise gauge—the setting is the same for both. Always run the gauge fence against the good face.*



pieces will be aligned even if their thicknesses vary slightly. If you scribe with a one-pin marking gauge, set up once for each cheek and gauge only from the good faces. Gauging from both faces will produce mortises and tenons of varying thicknesses—a big headache.

**Cutting the cheeks** —Bandsawing the cheeks of the mortises and the tenons is easy, safe, and, if you set up and saw carefully, accurate. Pieces this large are best cut with a ½-in. or ¾-in. wide blade, though a ¼-in. will do if you feed slowly. Whichever blade you use, make sure it's sharp; there's no joy in burning your way through six inches of pine. My saw doesn't have a rip fence, so I attach a 2-ft. long, straight piece of pine, about 1½ in. by 3 in., to the table with two clamps.

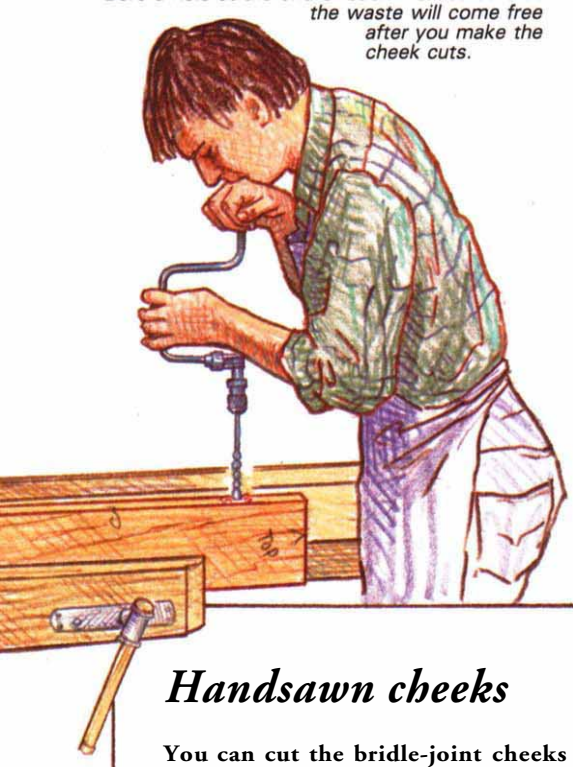


**Cutting the shoulders**

*Saw right to the knifed shoulder line with a backsaw. Holding the piece against a bench hook, angle the saw at the start and drop it slowly as the cut proceeds.*

**Boring the mortises**

*Bore a hole at the end of each mortise so that the waste will come free after you make the cheek cuts.*



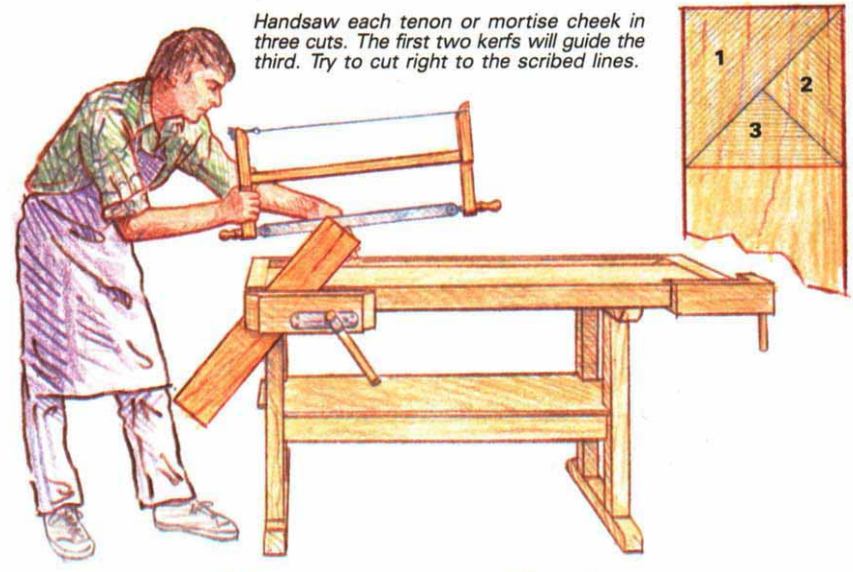
Set up for the tenons first, starting with the cheeks farthest from the fence. Mount the fence parallel to the blade and position it so that the sawkerf falls in the waste and the cut leaves half the scribe line on the tenon, as shown in the drawing on p. 69. (Remember to place the good face against the fence when setting up and Cutting). Use the scribed scrap pieces to check the setup, then saw away on the real thing. Set up and make the second-cheek cuts in the same way. Remember, the closer you are to splitting the gauge lines, the less work you'll have fitting the joints later.

The cheek cuts for the mortises are set up and bandsawn the same way. Before cutting the cheeks, I bore a hole through the piece at the end of the mortise so the waste will come away cleanly at the completion of the second-cheek cut. I use a brace and ½-in. auger bit to bore about halfway through from each edge. A drill press will work, too, but doesn't deliver the same cheap thrill I get when the holes meet in the center.

If the cheek cuts leave half the scribe line around the mortise and the tenon, the joint should slip together snugly without much fitting. The bandsaw isn't a preci-

## *Handsawn cheeks*

**You can cut the bridle-joint cheeks with a bowsaw (shown at right) or a crosscut handsaw. A handsawn cheek requires three cuts: two diagonal and one parallel to the shoulder line, guided by the first two kerfs. It's faster to make the cuts in pairs, working both cheeks simultaneously. For the angled cuts, tilt the workpiece so you can see the scribe marks on the edge and end at the same time. Saw right to the marks, leaving half the scribe outlining the mortise or the tenon. Use your thumb as a fence to start the cut, then lengthen the stroke. With practice, slight adjustments to keep the saw on the marks will become second nature.**




*Handsaw each tenon or mortise cheek in three cuts. The first two kerfs will guide the third. Try to cut right to the scribed lines.*

sion tool, however, so I usually adjust the second-cheek cut according to how the scrap tenon fits the scrap mortise. Better too tight than too loose; it's easier to shave the tenon down than to build it up.

When all the mortises have been sawn, square up the bored-out ends with a ½-in. or ⅝-in. chisel. Chop straight down or undercut slightly. There usually isn't much wood to remove, so I push the chisel rather than bashing it with a mallet. Holding the chisel as shown in the box on p. 73 affords good control from the bottom hand and plenty of power from the top.

What can be done by bandsaw can also be done by hand—not as quickly, maybe, but just as well. The cheeks of mortises and tenons on most furniture are small enough to be cut with a backsaw, but for the pedestal frames, you need a bowsaw or handsaw that can cut to a depth of 6 in. in the ends of the parts. I think that a bowsaw with a 1-in. wide blade gives more control than a handsaw, but I knew a joiner who cut perfectly good tenons—cheeks and shoulders—with a handsaw. Suit yourself; either saw takes practice. The box on the facing page outlines the basics.

**Shoulders—**I cut the tenon shoulders with a backsaw. It's possible to set up a tablesaw or radial-arm saw to make these cuts, but if there aren't many to do, it's just as fast to cut them by hand.

Accurate work like this demands a sharp saw. You'll also need a bench hook for holding the arms and legs while cutting the shoulders. It's easy enough to make a hook: just nail a 1x2 on each end of opposite faces of a piece of plywood or solid wood. As shown in the drawing at the top of the facing page, the bottom strip catches the edge of the bench and your own weight keeps the workpiece in place against the top strip.

Starting the shoulder cut accurately is important. The points of the sawteeth should be flush to the knife line. I use my thumb as a fence to position the blade. Start the cut at the far edge, at an angle to the face. As the cut deepens, lower the saw gradually until the stroke extends the full width of the piece and parallel to its face. The knife line is very fine, so you can't split it like a scribe line. The wood fibers, however, will break off cleanly at the line as the cut progresses, and a close look will tell if you're veering away from the line. The cut is also self-jigging: the kerf you've already cut will help guide the saw along the uncut line. Don't hurry; make the strokes regular and smooth. With practice, you'll be able to tell by feel if the saw is perpendicular to the face or not. At first, though, you'll just have to bend down and check the angle by eye. Save the waste from the cheeks to use for clamping pads when you glue up.

After cutting the shoulders, rip the tenons to width by hand or on the bandsaw (remember, tenon width equals mortise length). I mark the width with a pencil, holding it so I can run my fingers like a fence along the tenon's edge, ensuring that the line will be parallel to the edge.

**Fitting the joints—**If every cut has been right on the money, the tenons should slide snuggly into the mortises, the shoulders fit without gaps. My joints, however, always need some trimming to fit right. A shoulder plane comes in very handy for this work. The rectangular steel body of the plane, usually ¾ in. or 1 in. thick, fits comfortably in one hand. The edges of the blade are flush with the sides of the body, which is ideal for planing right up to the cheek or shoulder of a tenon.

It's easier to fit the tenon to the mortise than vice versa. If the tenon is too thick, pare off the excess with a shoulder plane and a bench plane. With the shoulder plane, I take a few shavings off one cheek, hard against the shoulder, then plane the rest of the cheek down to that level with a jointer plane. Try inserting the tenon again and take more off the other cheek if necessary. Be careful to remove an even layer of wood from each cheek so they will remain parallel and make full contact with the mortise cheeks.

A loose tenon is more of a nuisance. It's

**Fitting the shoulders**

*Clean up and adjust the shoulders with a finely set shoulder plane. To avoid chipping the far edge, reverse the plane and pull it toward you.*

possible to glue on a piece of veneer to fill out the tenon's thickness, or you can damp the slightly flexible walls of the mortise down on the tenon. If the tenon is rattling around in the mortise, cut another one. The extra practice won't do any harm, and if you're using pine, it's cheap enough that you shouldn't flinch as the mistake hits the firewood pile.

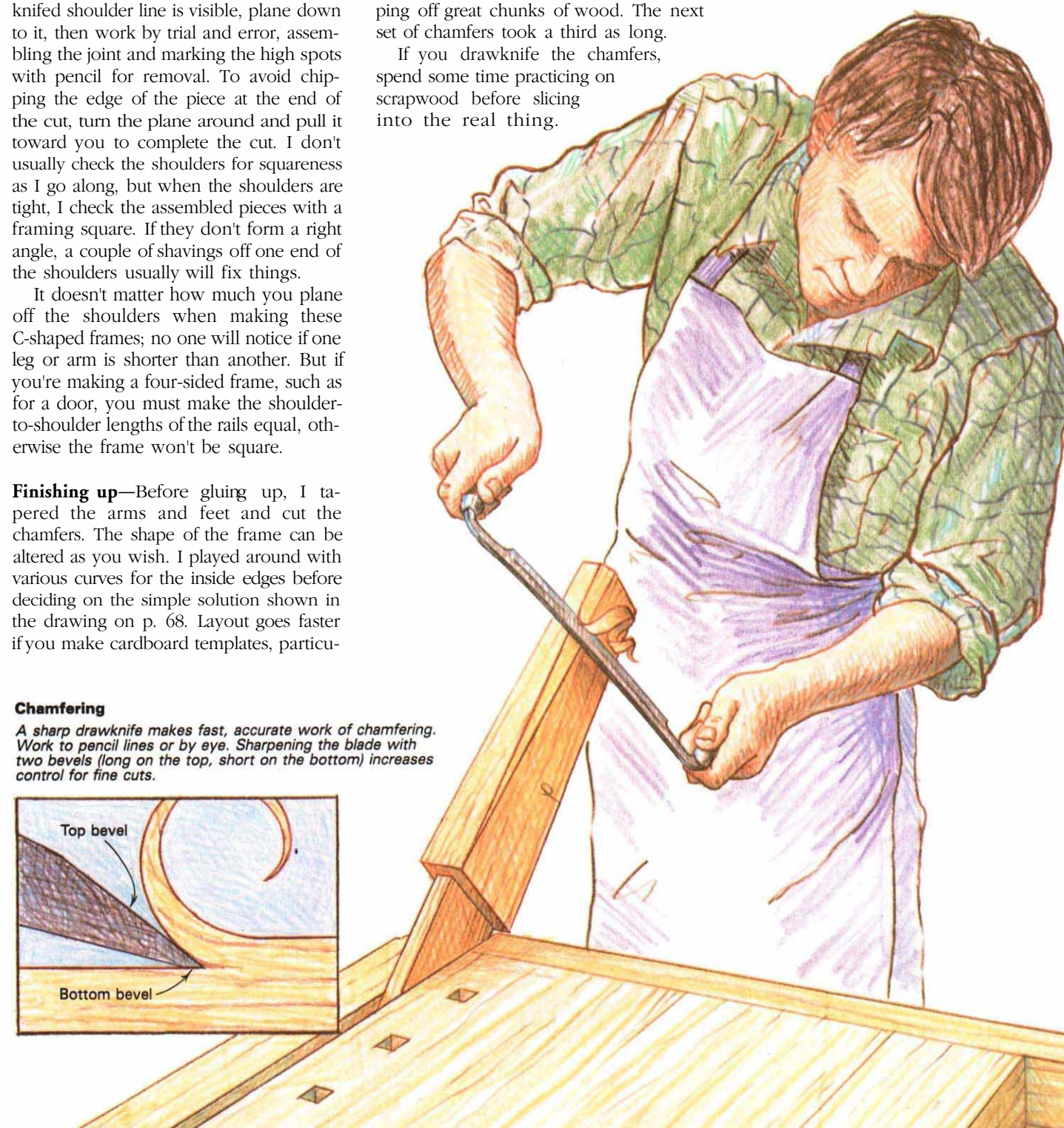
Even if the tenon shoulders have been perfectly cut, a pass with a finely set shoulder plane will smooth whatever roughness is left by the saw. Often more doctoring is required to make both shoulders tight to the mortised piece. If the knifed shoulder line is visible, plane down to it, then work by trial and error, assembling the joint and marking the high spots with pencil for removal. To avoid chipping the edge of the piece at the end of the cut, turn the plane around and pull it toward you to complete the cut. I don't usually check the shoulders for squareness as I go along, but when the shoulders are tight, I check the assembled pieces with a framing square. If they don't form a right angle, a couple of shavings off one end of the shoulders usually will fix things.

It doesn't matter how much you plane off the shoulders when making these C-shaped frames; no one will notice if one leg or arm is shorter than another. But if you're making a four-sided frame, such as for a door, you must make the shoulder-to-shoulder lengths of the rails equal, otherwise the frame won't be square.

**Finishing up**—Before gluing up, I tapered the arms and feet and cut the chamfers. The shape of the frame can be altered as you wish. I played around with various curves for the inside edges before deciding on the simple solution shown in the drawing on p. 68. Layout goes faster if you make cardboard templates, particularly if anything is curved. I traced around tapered templates for the arm and foot, bandsawed the waste and planed off the sawmarks. Leave the ends square for clamping, then trim and chamfer them after gluing up.

The first time I made one of these frames, I cut the arm and foot chamfers with a hand plane and the leg chamfers with a spokeshave. The job got done, but it took a long time. Prodded by a friend, I later tried a drawknife. Much to my surprise, it was not the crude implement I had expected, but a tool as capable of faking thin, controlled shavings as of lopping off great chunks of wood. The next set of chamfers took a third as long.

If you drawknife the chamfers, spend some time practicing on scrapwood before slicing into the real thing. You'll get used to the tool and discover pleasing proportions for your chamfers. The main prerequisite for successful drawknifing is a sharp blade. I sharpen mine like a carving tool: a large bevel on one side and a small bevel on the other. The small bevel helps you control the tool, which is important because a drawknife has no sole to govern its depth of cut. (I hold the blade still and move the stones over it; you may prefer the reverse. See *FWW* #48, p. 47, for more sharpening tips.) A slicing cut increases control and produces the cleanest surfaces. You can




**Chamfering**

*A sharp drawknife makes fast, accurate work of chamfering. Work to pencil lines or by eye. Sharpening the blade with two bevels (long on the top, short on the bottom) increases control for fine cuts.*

chamfer freehand or to penciled guidelines. If you're after precision, finish with a plane and a spokeshave.

Gluing up the frames is a snap. Squirt glue on the tenon and mortise cheeks and spread it around with a long, thin stick. The glue film needn't be thick; just make sure that all surfaces of the cheeks are covered to ensure a good bond. (If you aren't too quick with the stick or you're gluing up in hot weather, use a white glue, like Elmer's Glue-All, instead of a quick-setting yellow glue, like Titebond.)

Slide the tenons into the mortises, pushing the tenon hard up against the end of the mortise. I pull the shoulders tight with pipe clamps, which doesn't require much pressure, then take these off and clamp across the cheeks with quick-action clamps or C-clamps, using the offcuts from the cheeks for clamping pads. Thicker pads will distribute the pressure better and produce a thinner glueline. A thick glueline might be unsightly on a door, where the edges show, but it doesn't really matter here.

When the glue has cured, plane the faces of the frames flush with a jointer plane—there can be quite a bit to plane off a misaligned joint, but no one will notice if one frame is a little thinner than another. Next trim and chamfer the ends of the arms and feet. The three frames should all be the same size, with the outside edges of the arms and feet square to the outside edge of the leg. Stack the frames face to face to find the shortest one, then plane it square if necessary, checking with a framing square. Plane the other two to match, checking each against the first rather than checking with a tape measure and square. It's surprising how discrepancies that can hardly be seen can readily be detected with the fingertips.

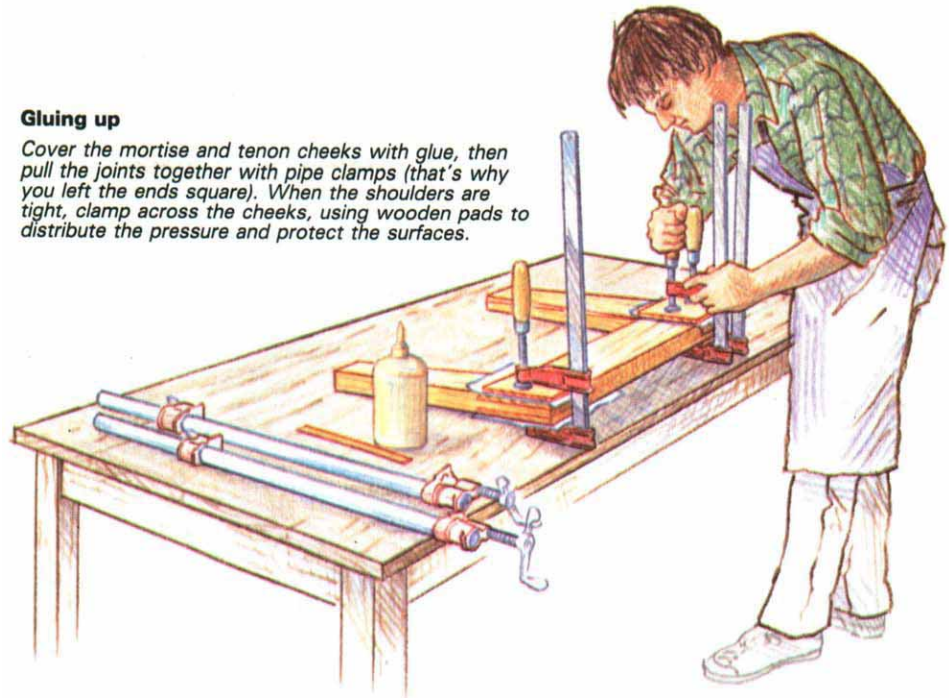
I attached each of the frames to a central hexagonal post with three bolts. If you'll never need to disassemble the pedestal, you could glue the frames to the post. I cut the post on the tablesaw, setting the blade at 30° to rip the corners off a 2¾-in. square. The post takes some fussing to fit. I planed three faces 1⅝ in. wide; the others finished narrower.

Bore the bolt holes in the post, offsetting the three holes at each location. Clamp the post to each leg in turn, marking through the holes onto the leg's edge, then bore pilot holes. You could lag-bolt the legs to the post, but the bolts will strip out after too many disassemblies. I used 5/16-in. dia. machine bolts and brass inserts, which have wood threads on the outside and machine threads on the inside. You can buy the inserts from Woodcraft Supply. (See *FWW #47,* p. 8, for an easy way to insert these.)

I bandsawed the top round, spokeshaved the edge smooth (a rasp or file would do, too) and chamfered the arrises with a drawknife. The base is screwed to the top through small wooden strips and a wooden center plate let into the arms. Single screw holes are fine in the center plate, but slotting the holes in the strips will help allow the top to move with changes in humidity.

I don't like the look of varnished pine, so I just paste-waxed the table. This doesn't provide a great deal of protection, so we scrub it down regularly with a potato brush and hot, soapy water. I wouldn't say the table has patina, but it wears its scars well and I don't worry when a guest spills wine or the baby bashes it with his spoon. □

*Roger Holmes is an associate editor at* FWW. *This is the second in a series of articles for beginning woodworkers.*



**Gluing up**

*Cover the mortise and tenon cheeks with glue, then pull the joints together with pipe clamps (that's why you left the ends square). When the shoulders are tight, clamp across the cheeks, using wooden pads to distribute the pressure and protect the surfaces.*

## *Enclosed mortises*

**Many mortise-and-tenon joints require an enclosed mortise, rather than the open mortise of the bridle joint. Lay out the mortise using the same marking-gauge setting as for the tenon. I clear the bulk of the waste by boring a series of adjoining holes with a bit the same width as or slightly smaller than the mortise width. Bore about 1/16 in. deeper than the tenon length. Then slice down the cheeks with a wide, sharp chisel, splitting the gauge line. The only tricky part is keeping the chisel straight. Clean up the mortise bottom with a narrow chisel, so the tenon doesn't bottom out.**