



The Slip Joint

This basic joint of the trade goes together fast and is designed to last

by Frank Klausz

Some years ago, I went to see a show at the Metropolitan Museum in New York that featured artifacts from the tomb of the Egyptian king Tutankhamen. On display was a chair built around 1350 B.C., on which I could see a slip joint. There are reasons this joint has been in use for so long. Also called an open mortise and tenon, the slip joint is hard to beat for ease of assembly. And because of the large gluing area where the pieces meet, a slip joint holds up to a lot of stress.

I build and repair furniture for a living, so I'm interested in not only doing a job well but also doing it efficiently. Unless an architect or designer has supplied me with very detailed drawings, it is often up to me to decide what joinery to use for a given job. The slip joint is one of my favorites. A doweled butt joint may go together faster, but it's not nearly as strong.

Where to use it? If I have a cabinet that calls for simple frame-and-panel doors, where rails and stiles are square-edged and the

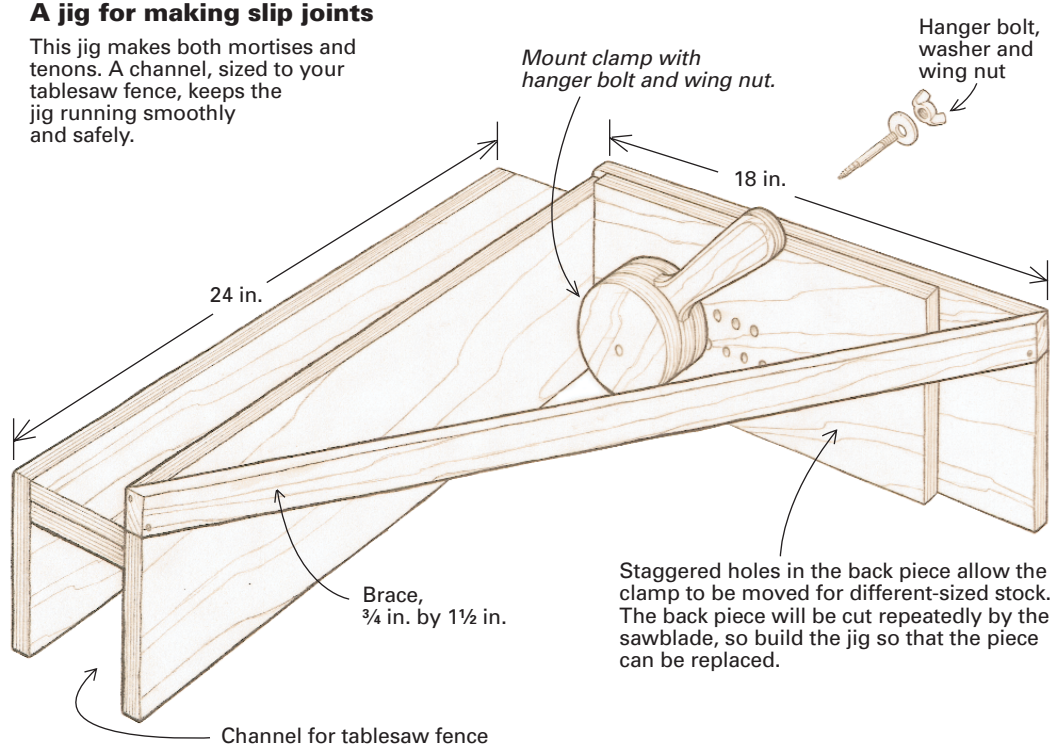
doors are inset, I don't have to think twice about which joint to use. For overlay doors, where the edges will show, I'd still use a slip joint, although I'd ask the clients first whether they had any objections to seeing end grain on the outside of the stile.

When I make a chair, I use this joint for the slip seat that gets upholstered and secured within the chair rails (see the photo above), because it's the best and most appropriate joint for the job. I don't do a lot of millwork, but if I were making window sash, I'd use a slip joint for the stiles and rails, even if the inside edges were shaped to a cope-and-stick profile.

What I really like about the slip joint is how fast it is to cut and assemble. I use a jig that I designed several years ago for use on my tablesaw (see the drawing below). If you don't have a tablesaw, you can cut this joint by hand or with a bandsaw, as I'll explain later. With either of these methods, take your time. If you use a bandsaw, make sure that the blade doesn't wander.

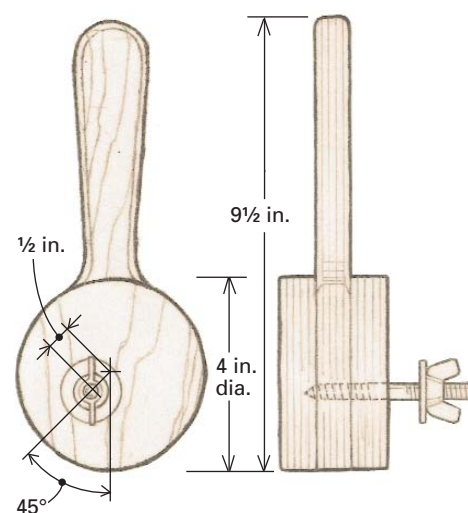
A jig for making slip joints

This jig makes both mortises and tenons. A channel, sized to your tablesaw fence, keeps the jig running smoothly and safely.



Quick clamp

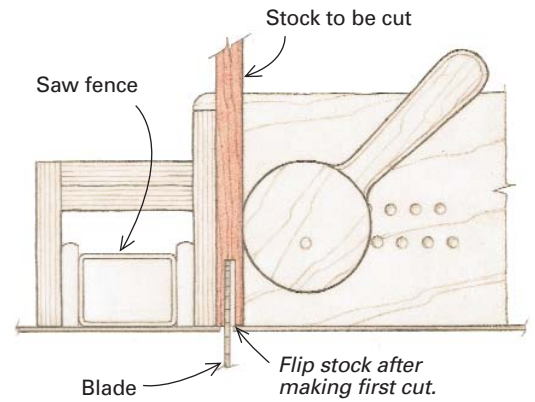
The eccentric clamp holds any thickness of stock tightly. The offset hole makes the clamp act as a cam.





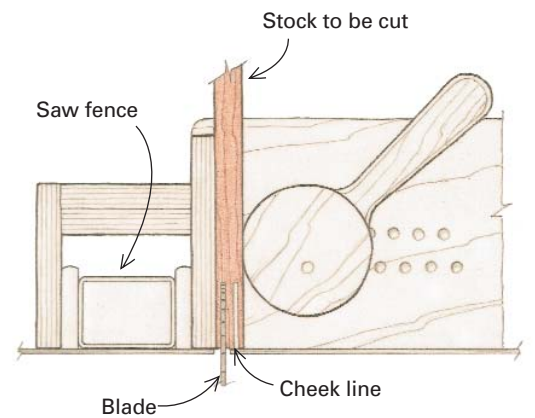
MORTISE

Cut the mortise first. With the clamp, secure the piece of stock to be cut firmly into the back corner of the jig. Make the first cut. Remove the stock, flip it around, reclamp it and make the next cut. Depending on the size of your slip joint, two passes are usually enough to complete the mortise. The one shown at left took three passes at two fence settings.



TENON

Change the setting from mortise to tenon. Use the mortised piece to reset the fence for the tenon cuts. Set the blade to cut on the other side of the cheek line. Always use scraps to test this fit. Once the fence is set, cut one side of the tenon, flip the piece in the jig and cut the other. Cut off the waste at the shoulder line later, using a miter gauge and a stop block.



Cutting mortises on the tablesaw—Whether you build a jig similar to mine or use a system of your own, start with the mortise when cutting this joint on the tablesaw. The beauty of this system is that you don't have to spend any time marking all the pieces with a gauge or pencil. The setup for the mortise is done by eye, and the tenon cuts are taken directly from the mortise.

When I was an apprentice, I learned to determine the thickness ratios of the mortise and tenon by dividing the stock into thirds. So a board $\frac{3}{4}$ in. thick would have a tenon $\frac{1}{4}$ in. thick, give or take. You can estimate the mortise dimensions without having to measure them. All that matters is that the pieces fit together well when you're done. I always make sure to keep some scrap pieces of wood on hand for setting up and testing the joints before I use the stock I've milled for the job. Test pieces should be of the same thickness and width as the stock you'll use later.

I make the first setup by cranking the sawblade up to the width of the stile. I place the jig over the top of the saw fence, which serves as a guide track, and clamp in a piece of scrap. I adjust the saw fence so that it's cutting into the middle third of the thickness of the wood. Then I push the piece through, flip it in the jig and push it through again. The first mortise is done. With the mahogany frame shown in the photos, my first setup left me with a sliver of waste between the first and second passes. I decided to leave it like that—making the tenon a little fat of one-third—and to make a second fence adjustment later to clean out the mortise (see the top photo on p. 63). Once I'm satisfied with the setup on the test piece, I can go ahead and cut all the mortises.

One important point: Keep your saw table free of debris that would prevent the wood from riding flat on the table. Also, be sure to clamp the wood firmly in the back of the jig. Losing track of either of these details will cause the mortises to be cut too shallow and out of square.

Cutting the tenons—After cutting all the mortises, I turn off the saw, leaving the last mortised piece clamped in the jig. I loosen the fence and tap it lightly toward the blade by the amount of the blade thickness ($\frac{1}{8}$ in. for most saws), as shown in the bottom photo on p. 63. With this setup, the cheek line of the mortise is cut on the inside of the sawblade, closest to the fence; the cheek line of the tenon is cut on the outside of the blade. Once the jig is at the new setting, I remove the workpiece and clamp in a fresh piece of scrap for a test tenon. I run the piece through the saw, turn it around and run it through again (see the top photo).

At this stage, I usually chop off the waste around the tenon, without marking it, to see if the tenon fits snugly into the mortise. (A handsaw or bandsaw works well.) I once asked my grandfather how tight this joint should be. He said, "If you need a mallet to force it, it is too tight and will split, but if you can use your hat instead of a mallet, it is too loose."

After these cuts have been made, the waste on either side of the tenon must be removed. I do that with the stock flat on the table. I remove the jig and dial the sawblade down to the right height to trim off the waste. I always clamp a stop block against the fence to serve as an index for trimming the cheeks to the exact shoulder line. The stop block also prevents the waste from being pinched between the fence and the blade. The miter gauge works well for this operation (see the photo at right). Getting this setup tuned correctly may take a few tries with scrap pieces, but the final trimming goes quickly. One tip—save your cutoff scraps as protective pads for gluing up the frames. □

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Cheek cuts for the tenon—To test the tenon setup, cut the cheeks first. The height of the sawblade off the table does not change. One pass per side is sufficient.



Shoulder cuts for the tenons are best done with a miter gauge. A scrap clamped to the fence acts as a stop. Self-stick aluminum carbide sandpaper on the miter gauge keeps stock from slipping.

Making the slip joint by hand



Mark the shoulder line. All pieces cut by hand must be marked on every side and end.



Mark mortises and tenons at the same setting. Fill in the scribed lines with pencil marks, so the lines are easier to read.

of what I'm doing. I cut straight down the marked lines to the shoulder lines drawn in pencil (see the top photo at right).

To finish cutting the tenons at the shoulder line, I use a fine dovetail saw while holding the pieces against a bench stop, as shown in the photo at right. I am very careful to cut precisely to the waste side of each shoulder line. This is important. Otherwise, I may end up with uneven tenon shoulders and a joint that will have to be adjusted later.

After the sawcuts have been made, mortises must be chiseled from both sides. I keep the flat of the chisel true to the marked pencil line as I remove the material. I cut halfway through the first side and then flip the piece over and work in from the other edge. A good size chunk will often pop out in one piece when working the second side. When all the mortises are done, I begin fitting the pieces together. This process takes a while.

Handwork is handwork—it's just not as precise as machined joinery and you're bound to have some adjustments to make. You may have to remove some material from a too-fat tenon or from the inside of one of the mortise cheeks, depending on how the joint fits together. Rasps and paring chisels will perform well for those tasks (see the photo at right). If you cut the tenons too thin and the mortises too wide, you can add shims of veneer (preferably of the same species) as gap fillers when you reach the glue-up stage.

Assembly and glue-up: I use a white PVA glue, applying it with a 1/2-in. acid brush. After I've dry-fit and adjusted the frame, I apply the glue evenly on all sides of all pieces. Then I put clamps loosely on

each corner, using the scraps from cutting the tenons to protect the frame pieces. After that, I check the frame for squareness and make sure all the shoulders are tight. Then I tighten the clamps all the way, make a final check for squareness, wipe off any excess glue with a wet rag and put the frame aside to dry. Later, I'll clean up the edges with a plane, working in from the corners to avoid chipout.

I remember once as a young man watching my father work, asking him, "How can you do that so fast?" He replied, "Don't worry. After five or 10 years, you're going to be a good beginner yourself." And now, after 35 years, I'm still learning. —F.K.



The bowsaw is Klausz's tool of choice for cutting this joint by hand because the long, wide blade tracks well and cuts quickly.



Cut the shoulders with a dovetail saw. For well-fitting joints, make sure that you cut to the same line on all the pieces.



Fine-tune the fit. Rasps and chisels are good choices for removing material from either the tenon or the mortise. Hand-cut frames need many test runs before you can call them done.