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Pick the right
PVA glue, p. 32



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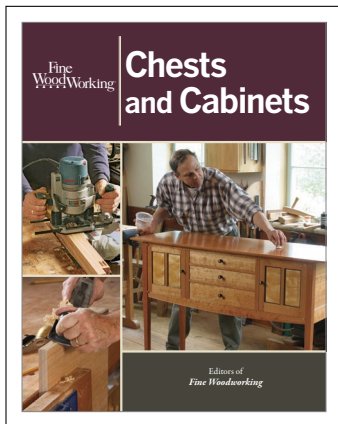
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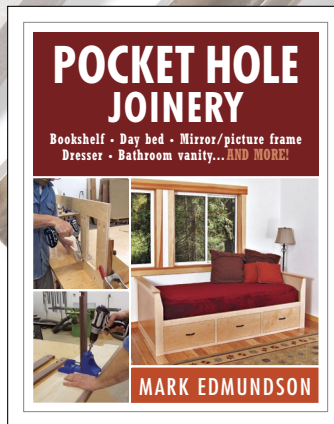


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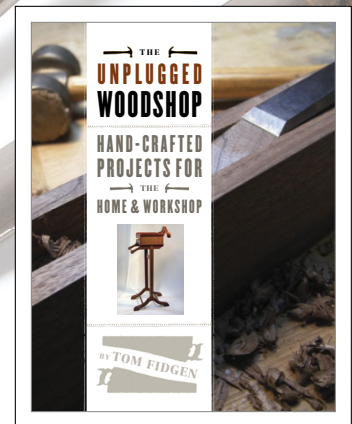


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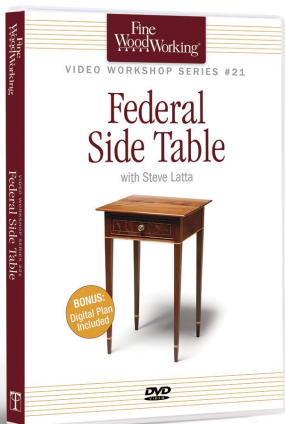


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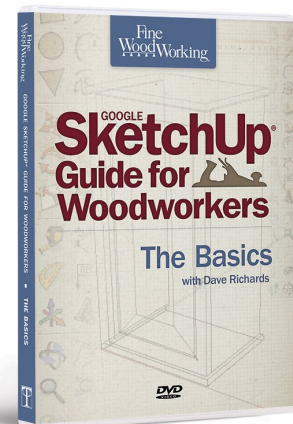
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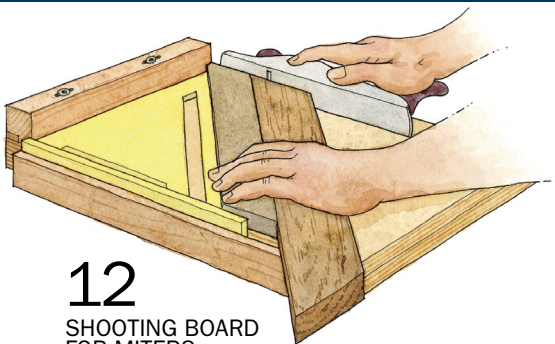
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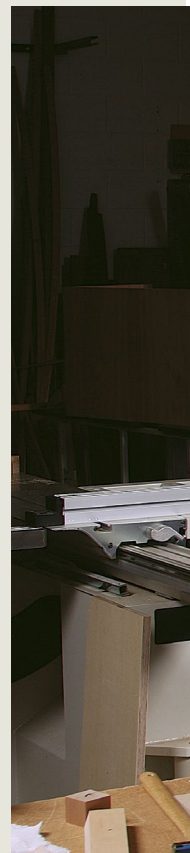
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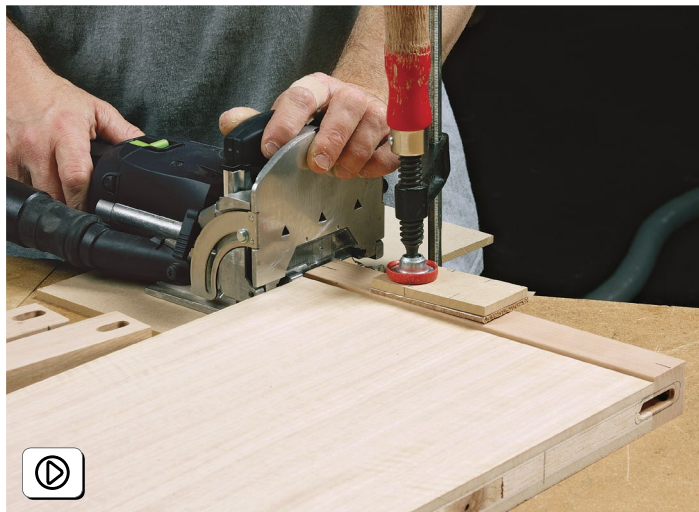
on the web

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Build a Shaker Icon

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contributors

Pete Baxter (*"Make a Shaker Box"*) is a first-generation woodworker specializing in Shaker chairs and oval boxes. The lifelong resident of Seymour, Ind., has deep roots in the community. His 700-sq.-ft., white block workshop was built by his maternal grandfather in the early 1950s as a cottage for Baxter's newlywed parents. Though the building was once located in the "country" outside the Seymour city limits, over time the city has grown and now surrounds it. The shop sits on a small rise overlooking the remnants of a once two-story horse barn that now holds stickered maple, walnut, and cherry boards. Baxter also operates an appointment-only gallery in the heart of the historic district in another building that has been in his family since 1940. His work has earned him membership into both the Indiana Artisan organization and the Kentucky Guild of Artists and Craftsmen.



Known to clients and fellow woodworkers as "Lord Godfrey," **Ian Godfrey** (*"Double Bridle Joint"*) has been building elegant custom furniture in British Columbia since the mid-2000s. When he's not in his shop, you are likely to find him at a computer workstation, creating equally elegant and visually animated advertisements for Canada's power industry and other clients. Why "Lord" Godfrey? "It started as a joking reference to a character from the World of Warcraft video game, and it stuck," he says.



At the rural Ontario workshop of **Michael Fortune** (*"User's Guide to PVA Glue"*), you are likely to run into a merry band of woodworkers from near and far. Aside from one or two assistants, Fortune has opened his doors to a series of lucky interns. They usually meet him at one of his far-flung classes, and find a way to spend a month or two at the Fortune homestead, trading cheap labor for tips and training. Posing here are, from left, longtime assistant Scott Lewis, intern Lynn McKnight, Fortune, and assistant-in-training Peter Rodin.

Craig Thibodeau (*"Beautiful Cases from Plywood"*) is a professional furniture maker in San Diego. He says that the recent economy has meant fewer clients looking for high-end work, but the ones who do appear "are interested in something special." Having a good website with lots of high-quality photos of your work is essential, he says. A couple of years ago that website (ctfinefurniture.com) landed Thibodeau his greatest commission ever, when a wealthy client on the East Coast ordered a houseful of furniture, 60 pieces to date.



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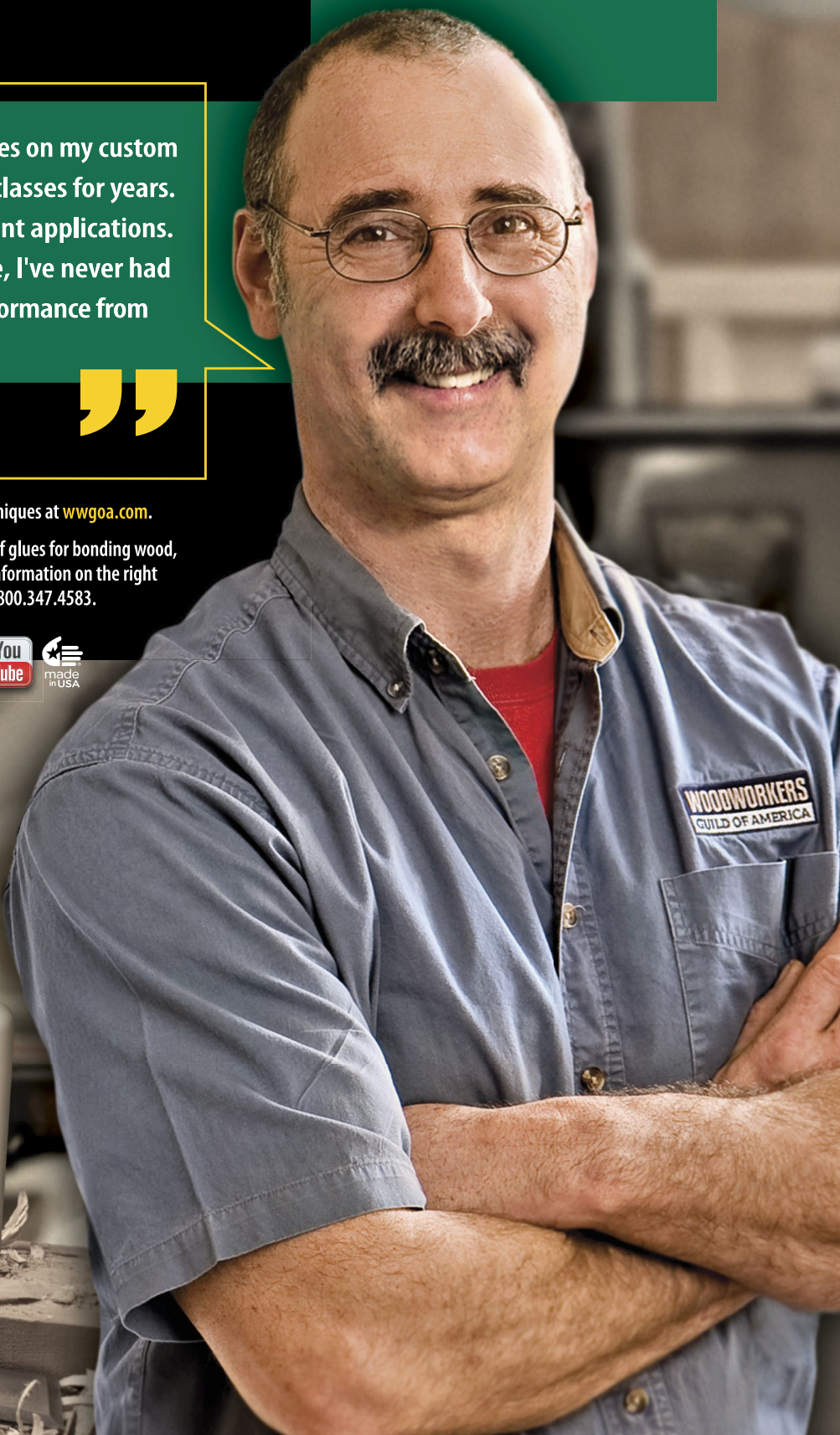
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Spotlight

ISSUE NO. 246
March/April 2015
p. 32



BOX MITERS: TO SPLINE OR NOT TO SPLINE

While Matt Kenney's article on making the "perfect" mitered box is great in most respects, the way Matt has constructed the box concerns me. Without a glued-in bottom to reinforce the construction, his box is essentially held together by the four corner miter joints, which are not strong enough to keep the box from coming apart during its life. The joint needs help through reinforcement, such as splines or biscuits. Also, using paper painter's tape in lieu of clamping is unlikely to supply the necessary clamping force to ensure a tight, even joint.

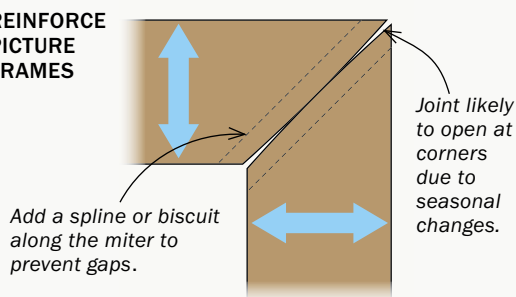
The article is very good in showing how to make all four corners of the box's wood grain line up. It also shows that one does not need to use contrasting woods to make a beautiful box. As with a gentlemen's attire, wearing a simple suit with a matching plain tie can often be the most elegant result. But using thread that is too thin and weak to bind the suit will result in eventual failure; the same must be said with the methodology used in this piece.

—HERBERT V. HEDEEN, Chicago, Ill.

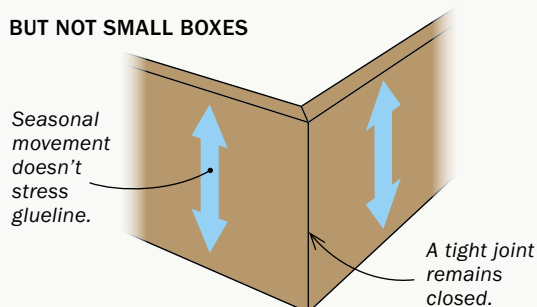
Matt Kenney replies: Miter joints on small boxes don't need splines, or other reinforcement, to remain gap-free. They are not like a frame miter, where wood movement over time stresses the joint and causes gaps. Wood movement in a box miter does not affect the joint in the same way. And the sides on my box are thin, and not very tall, two factors that help limit potential damage by seasonal movement. As for the tape-clamping method, it is quite legitimate. The way that I put the joint together causes the tape to really stretch and pull the joint closed tight. You do need a well-cut, tight joint to start with. I have mitered boxes built the same way that are 10-plus years old, with joints as tight as the day I made them.

HOW WOOD MOVEMENT AFFECTS MITERS

REINFORCE PICTURE FRAMES



BUT NOT SMALL BOXES



'Inherently dangerous?'

Having spent much of my adult career as the environmental safety and health director of a moderately sized metalworking business, I may be more sensitive than many to safe working practices.

Your magazine carries a "warning" for woodworkers on p. 12 (*FWW* #246), for which you should be commended. But several photos on p. 36 of your March/April issue show a crosscutting operation in which the blade projection exceeds good work practice. Overly critical? Perhaps. But what may seem like a minor safeguard may spell the difference between pleasurable time in the woodshop and an unplanned trip to the emergency room.

—FLETCHER E. WARD, Bemus Point, N.Y.

Out with the old!

I am a big fan of *Fine Woodworking* and have read every issue that I own over and over again. I was surprised to see yet another article about dovetails in a recent issue.

I went online to look for articles on dovetails. I had to stop counting at somewhere around 50. Do you realize that you have a propensity to stay with the trusted and the familiar? Boring!

Stop printing articles on the same tired subjects. Readers are looking for new and exciting ways to improve their woodworking experience. I've seen enough Frid and Maloof. Bring in the new guys with their energy, insight, and courage to go where builders have not yet gone.

—DAN THRASHER,
London, Ont., Canada

Correction

There were a couple of dimensional errors in the article "Oak Chest on Stand" (*FWW* #246). The lid panel in the case should be 21½ in. long, not 23⅝ in.; the side apron on the stand should be 15¼ in. long, not 14¾ in.

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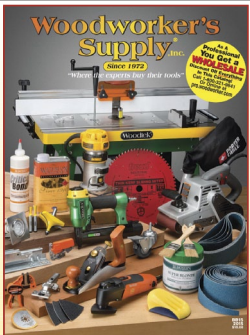
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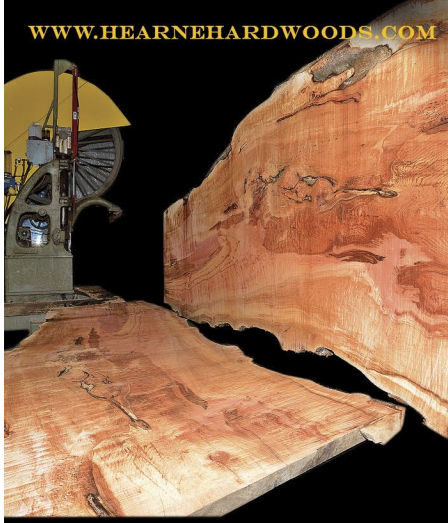
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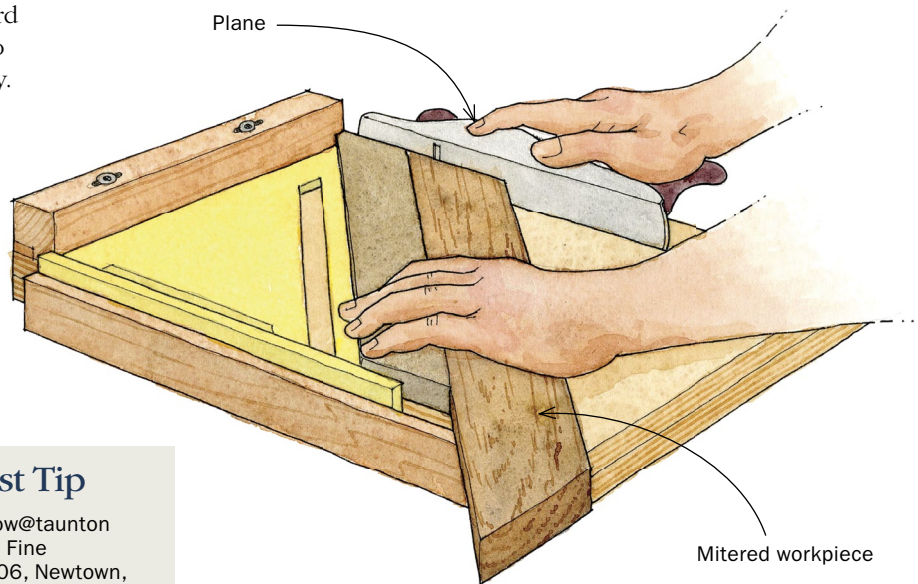
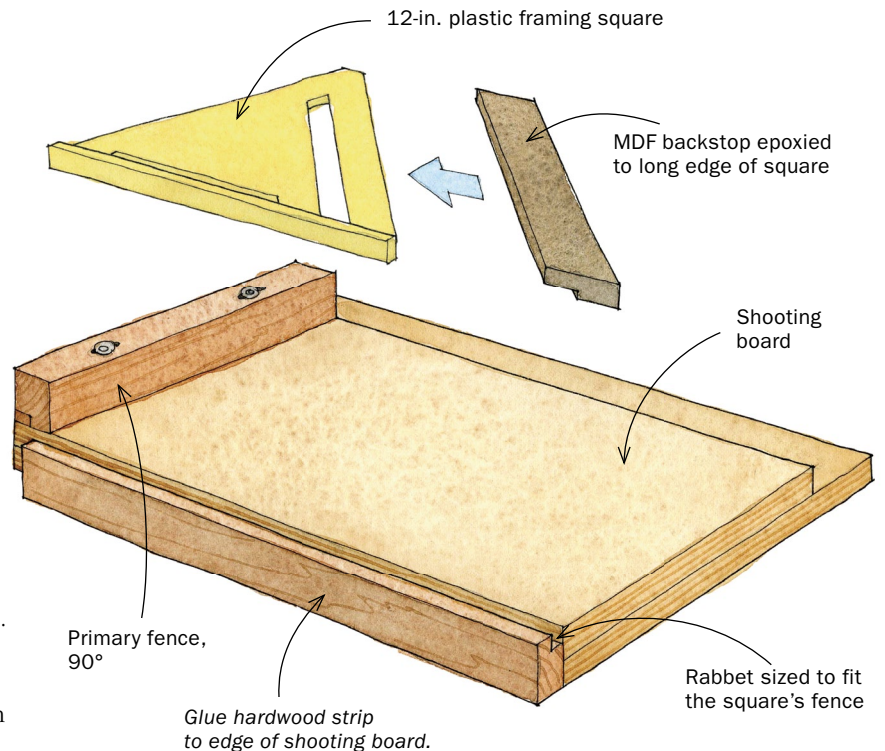


An engineer who designs and builds factories, Sean Montague was always drawn to woodworking. As a young man, his first experience was helping in a cabinet shop, and he has pursued furniture making ever since. He dries his own quartersawn white oak for his projects.

I built and use David Finck's well-designed shooting board (you can see it in operation on his blog or on FineWoodworking.com). But I wanted a quick way to convert it to 45° without using clamps or screws, so I added my own 45° jig using a \$10 plastic framing square.

Rabbet a hardwood strip to accommodate the square's fence and glue it to the side of your shooting board. Then epoxy a 1-in.-thick rabbeted strip of MDF to the long side of the framing square to create a solid 45° fence for shooting the miters. If the square is wider than the shooting board, trim it a little proud and shoot it flush with a plane. Now just drop the framing square into the groove and slide it up against the primary shooting-board fence, and you're ready to fine-tune miters accurately.

—SEAN MONTAGUE,
Raleigh, N.C.



A Reward for the Best Tip

Send your original tips to fwmow@taunton.com or to Methods of Work, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470. We pay \$100 for a published tip with illustration; \$50 for one without. The prize for this issue's best tip was a Veritas block plane.



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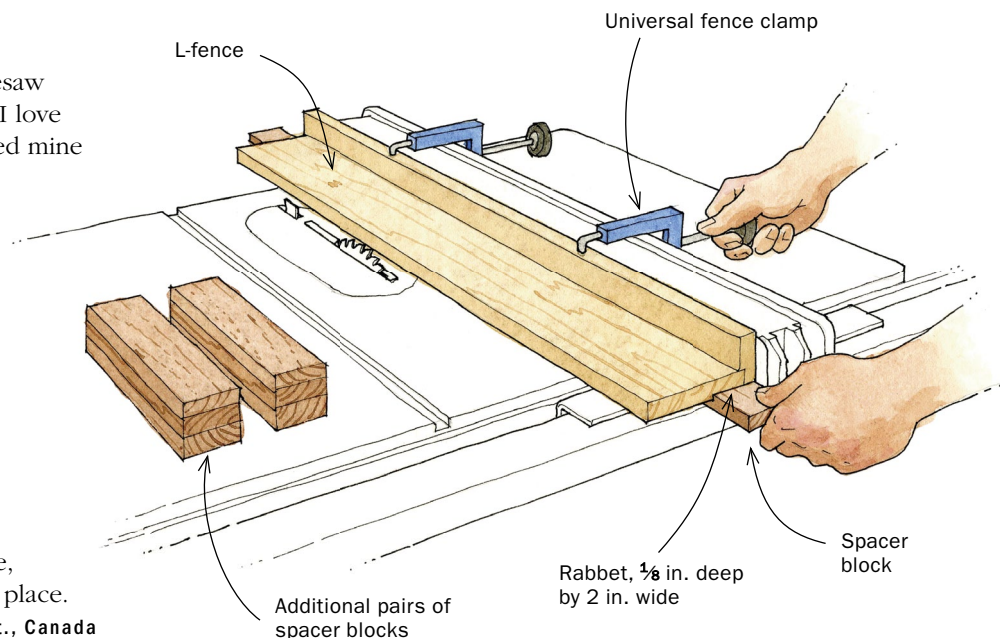
Speedier L-fence setup

I made Bob Van Dyke's L-fence for my tablesaw ("The Incredible L-Fence," *FWW* #237), and I love the versatility—I use it all the time. I modified mine to make it even easier to use.

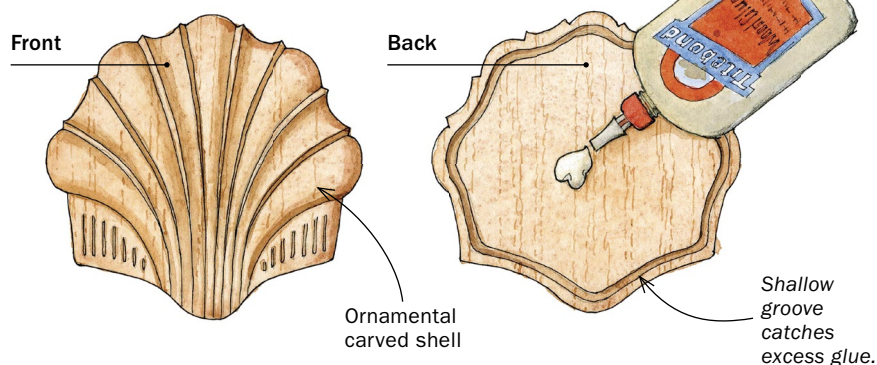
Instead of attaching it to the tablesaw fence with C-clamps, I use low-profile universal fence clamps, mounted via two holes drilled in the top edge of the L-fence.

I also use pairs of spacer blocks to set the fence height easily and fast. The blocks insert in a rabbet on the bottom of the L-fence. Cut the blocks in thickness increments of $\frac{1}{8}$ in., and label them. Use spacers $\frac{1}{8}$ in. thicker than the desired fence height in the rabbet at each end of the fence, then tighten the clamps to lock the fence in place.

—BILL WILSON, Warkworth, Ont., Canada



Prevent glue squeeze-out on applied carvings



When gluing a carved decoration like an ornamental shell to a piece of furniture, excess glue can squeeze out around the edges. It's messy, hard to remove, and can cause finishing problems later on. To prevent this, use a No. 9 gouge to carve a shallow groove around the perimeter of the back. This groove will act as a reservoir so that excess glue won't make it beyond the edge.

—JIM SHAPIRO, San Francisco, Calif.



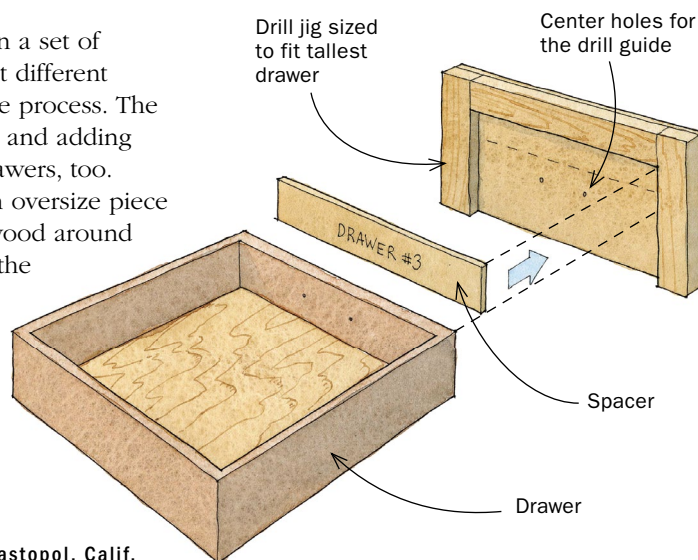
Pulls centered on drawers

Drilling jig for drawer pulls

When drilling holes for centered pulls on a set of drawers that were all the same width but different heights, I devised this jig to speed up the process. The jig centers the pull on the tallest drawer, and adding spacers lets you use it on the shorter drawers, too.

Lay the tallest drawer face down on an oversize piece of $\frac{1}{4}$ -in. plywood and nail on strips of wood around three sides to create a frame. Then drill the guide holes in the jig for the tallest drawer. Make the spacers from $\frac{1}{4}$ -in.-thick MDF and label them. Find the height of each spacer by subtracting half the drawer front's height from the distance between the top fence and the guide holes. To use it, slip the jig on the front of each drawer and drill the holes.

—ANTHONY FISHER, Sebastopol, Calif.



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■ MACHINES

Delta's new tablesaw has a lot to offer

DELTA HAS INTRODUCED A NEW TABLESAW that's available in multiple configurations. You can choose steel extension wings with either a 30-in. or 52-in. rip fence, or go with cast-iron wings and either fence. The saw I've been using has cast-iron wings and a 52-in. fence.

The saw's unique feature is its electronic motor brake, which brings the blade to a stop within a few seconds after the motor is switched off. The 15-amp induction motor, wired to run on a 110-volt circuit, had enough muscle to handle 8/4 hardwoods without trouble. A few other features really stood out. The riving knife, which is sized for standard-kerf blades, can be used either with or without a guard. When the guard is removed, you can push the knife lower than the top of the blade so that you can make non-through cuts without much fuss. I also liked the T-square-style fence, which locked down square and slid smoothly. The motor is completely enclosed in the base, and the saw has good dust collection, with a 2½-in. port in the



Tablesaw by Delta

5000 series
\$958-\$1,357

cabinet. The cast alloy trunnions and gears worked smoothly, and there's an arbor lock for single-wrench blade changes.

The built-in mobile base is handy, but the pedal used to raise and lower the saw was difficult to reach because of its location under the wide side extension table.

—Roland Johnson is a contributing editor.



■ HAND TOOLS

Paring chisels are great for joinery

BECAUSE OF THEIR LONG BLADES AND SHALLOW CUTTING ANGLE, the new paring chisels from Narex are well-suited for a variety of joinery tasks, from roughing out tenons to refining a joint's fit. The blades, made from silicon-chrome steel, held their edge very well, so I was able to use them longer between sharpenings. I was also impressed with the quality of the machining. The chisel backs were flat, and the bevels had no rough grinding marks. The sides of the blade angle to a narrow edge, which allows them to get into tight corners. The blades are stout, which I prefer over the thinner, flexible blades found on some paring chisels. The handles are a bit large for me, but are smooth and made from European hornbeam. I did not like the thick, protective finish on the blades when they arrived in my shop. It was difficult to remove—and you must remove it to sharpen the chisel. But all in all, the Narex chisels are excellent tools, and as they range in price from \$32 to \$37 (leevalley.com), they're a great value.

—Chris Gochnour is a professional woodworker in Murray, Utah.

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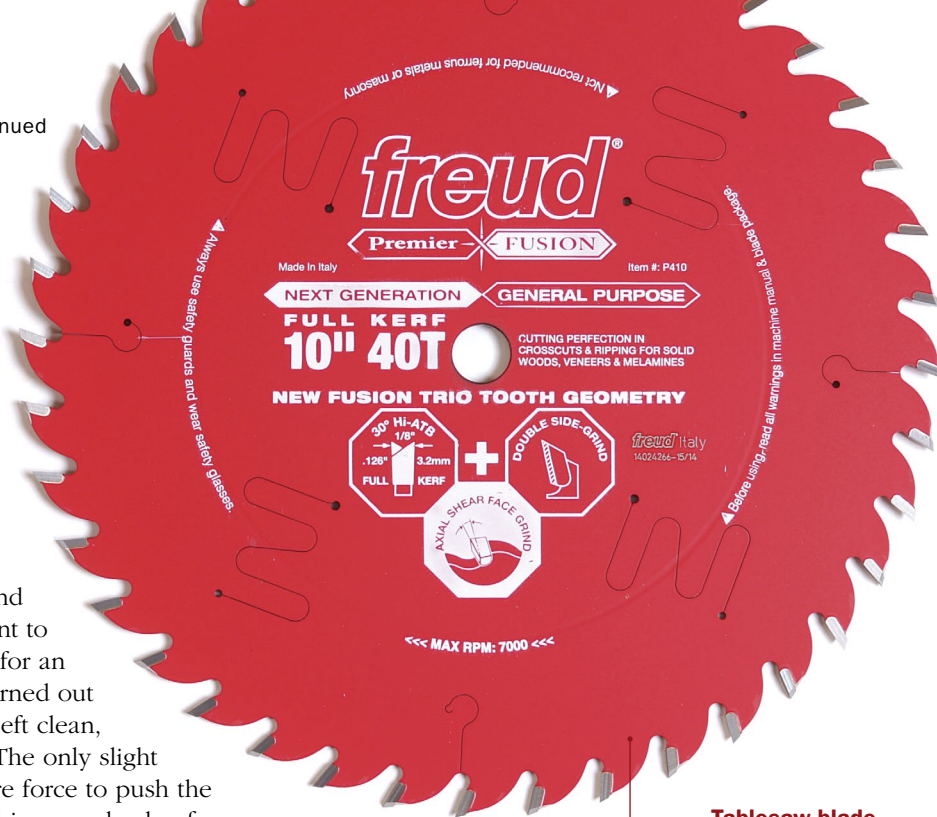


■ ACCESSORIES

Combination blade is a great value

I'VE HAD THE FREUD P410 COMBINATION BLADE in my tablesaw for the last few months so I could give it a real-world test. During that time I've built major projects ripping and crosscutting oak, cherry, butternut, and maple in various thicknesses. At first I was hesitant to trade out my trusty Forrest Woodworker II blade for an unfamiliar one, but in the end the Freud blade turned out to be a solid performer. It cut vibration-free and left clean, tearout-free surfaces on both rips and crosscuts. The only slight drawback was that it seemed to require a bit more force to push the stock through ripcuts. However, at \$84, the Freud is a good value for a top-quality combination blade. A thin-kerf version, the P410T, is available for \$75.

—Michael Pekovich is a furniture maker, instructor, and FWW's executive art director.



**Tablesaw blade
by Freud**

**Model P410
\$84**



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■ FINISHING

Storage bag keeps finishes fresh

MANY WOODWORKERS KNOW THIS STORY. You buy a can of finish, open it, and use it for the first time. When you're done, you close up the canister and put it on a shelf. You use it off and on during the year, but there comes a time when you open the container and the finish is no longer usable because it has oxidized, thickened, or skinned over. I've thrown out plenty of half-filled cans of finish because of this. Well, not any more. The StopLossBag is a bladder made from pliable plastic that has an airtight screw cap. After pouring in the finish (with the help of a funnel and an included tube), you squeeze out the air and screw on the cap. I've had some Waterlox stored in one of the bags for six months, and it's just as fresh now as it was the day I opened the can. That's impressive, and I'll definitely use StopLossBags to store my finishes from here on out.

—Matt Kenney is
a senior editor.



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File joints for a perfect fit

FINESSE PARTS AFTER HANDPLANING
TO CREATE SNUG JOINERY

BY CHRIS GOCHNOUR

Fitting a joint is best done with hand tools, because they remove wood slowly and with great precision. This is why so many furniture makers have a shoulder plane or two in their tool cabinet. Chisels are another popular tool for fitting joinery.

However, there are times when you've trimmed to your layout lines and the joint still won't go together. At this point, a plane or chisel shaving would remove too much wood, leaving the joint gappy or loose. When the fitting gets that fine, I reach for a file to delicately trim the joint so that it slides together with hand pressure and closes up with no gaps.

Files are the perfect tool for this job because they remove material more slowly than planes and chisels, affording you a great deal of control. You can target problem areas without turning a close fit into a bad one.

To hit the problem spots with the file, you must know where they are. Identify them with an old woodworking trick: Mark one side of the joint (tails, mortise) with pencil and then bring the joint together as far as you can with hand pressure. Take it apart. Look at the side that needs trimming (pins, tenon). Some areas will be marked with pencil where they rubbed against the mating part. This is where you file. If the joint still doesn't go together all the way, repeat the process until it does.

Chris Gochmour is a professional furniture maker in Salt Lake City.

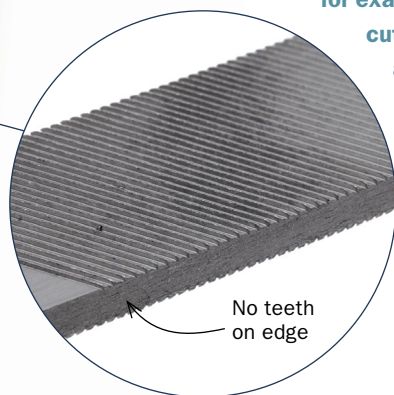
Pick the right file

Gochmour prefers an 8- to 10-in.-long flat file with at least one safe edge (see below). The cut of the file isn't critical, as long as it removes material with moderate speed and is easy to control. An 8-in. mill file (found at home centers as part of a set) is a good low-cost option. Gochmour's favorite joinery file is handmade in Japan (\$103, japanwoodworker.com, No. 156394).

THE SAFE-EDGE ADVANTAGE

To trim a dovetail pin or tenon, you must remove material from one part of the joint (the cheek, for example) without cutting into an adjacent surface (the shoulder).

A safe edge makes this possible, because it has no teeth.



No teeth on edge



Perfect for tenons. When a turned tenon is just a bit too big, a file with a safe edge is the best tool for trimming without damaging the shoulder.

Gap-free dovetails

Pencil lead scribbled on the tails reveals where the pins need trimming. Use the file like an eraser, carefully removing the lead with a light touch. Repeat as needed until the joint comes together without gaps.

Spread the lead.

Line both sides of every tail with pencil. Several lines across the face are enough to get the job done. Knock the joint together, stopping when it begins to resist. Then pull the joint apart. High spots on the pins, which are keeping the joint from seating completely, will be marked with pencil lead.



Hit the high spots. Extending your index finger over the handle helps the file to cut in a straight line so that you don't round over the pin. Pinch the other end of the file between your fingers.

Friction-fit tenons

A mortise-and-tenon joint should go together with hand pressure, and should not fall apart when one side of the joint hangs freely beneath the other. The controlled, fine cutting of a file is the perfect way to create this perfect fit.

Spread the pressure. To prevent the file from tapering or rounding tenon cheeks, use your fingers to hold the file squarely against the cheek.



The best tool for double tenons. Two fingers on the file about 1½ in. from the leading edge keep it flat on the tenon.

Out of Nakashima's shadow

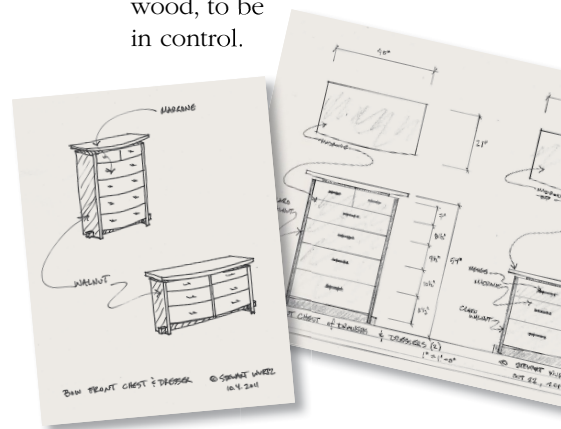
A CHEST DESIGNED WITH DEFERENCE AND DIFFERENCE

BY STEWART WURTZ



I built this chest of drawers for a couple near Seattle who have been avid collectors of George Nakashima's work since they bought a live-edge dining table from him in the early 1980s. Nakashima's vocabulary is a powerful presence in their modest waterfront home, and I wanted to honor this in the furniture I created. But I also wanted to bring my own sensibility to the project.

At heart, Nakashima's furniture is about celebrating the material: what the plank has brought to the piece. I really respect that, but deferring to the wood leaves a lot up to chance. I wanted this chest to have a similar emphasis on great wood, but I wanted the form, not the wood, to be in control.



I begin my designs by making rough concept sketches. These are gestural drawings, quick and informal, done in my sketchbook. Rather than pinning down details, I try to envision the overall design and capture a sense of what the stance and feeling of the piece will be. Even when I make presentation sketches for the client to review, the drawings are still fairly loose, because I think a freehand sketch is much more personal

than a scale drawing. When I get the go-ahead, I make scale drawings to refine details and proportions. And when it's time to build, I make full-scale working drawings.

This tall chest was part of a suite of furniture—a bed, two low dressers, and the chest—and I used the same materials throughout. I made the top and the drawer fronts from madrone, and framed the drawers with a carcass of claro walnut. The rich dark walnut, with its flickers of red and green, brings out the warm peach tones of the madrone and provides a contrast that accentuates the structure of the chest.

I slightly bowed the front of the chest to echo the curve across the top of the bed's headboard. I've always admired the bowfront form in period furniture, and I wanted to try using the

concept in a modern

context—no drawer dividers, no beading, just a clean and simple sweep of drawer fronts. I bent-laminated the drawer fronts, sawing the madrone into veneers and creating a cascading series of bookmatches down the front of the piece.

To keep the chest from looking heavy and monolithic, I designed the top to float above the case, tapering toward the ends and extending far out over the sides. I created the top's taper by shaping the underside to a curve that harmonizes with the curved drawer fronts.

I made an overt nod to Nakashima at the base of the

Details elevate the design.

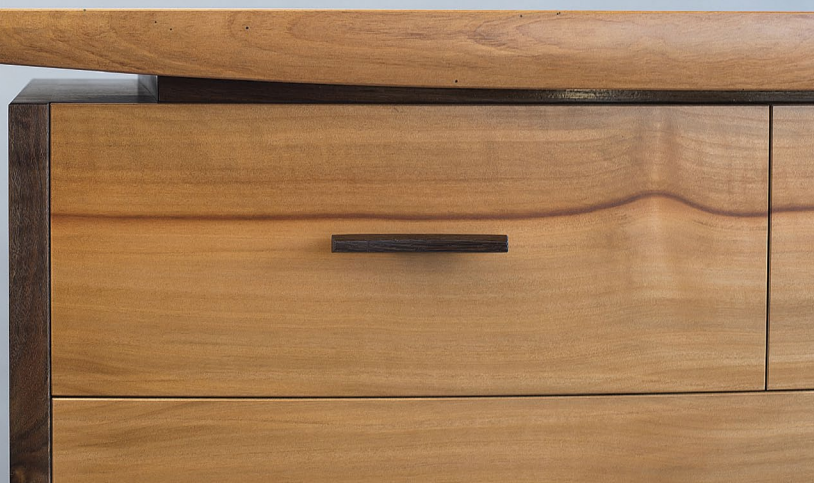
The curved taper and wide overhang of the madrone top give the whole chest a feeling of lightness. A walnut riser block creates a dark reveal below the top. The wenge pulls (center) are curved counter to the bow of the drawer fronts. The traditional joinery in this contemporary piece includes through- and half-blind dovetails (bottom).

chest, where I ran the toe kick right through the sides of the carcass, linking the parts with bridle joints. Nakashima used interlocked geometric forms on many of his table and cabinet bases. Here, in addition to acknowledging Nakashima, the detail lightened the chest and kept it from appearing blocky.

Despite its sleek, contemporary surfaces, the chest is traditional in its construction, with through-dovetails at the top of the carcass and wedged through-tenons and blind tenons joining the bottom to the sides. The curved drawer fronts are all half-blind dovetailed to the drawer sides, a labor of love that left me cross-eyed.

As the chest neared completion, I didn't have a concept for the pulls—I only knew I wanted them to reflect the bowfront form. I settled on handles with an arc that runs counter to the curve of the drawer fronts, giving a small amount of tension to the design. I made them from wenge and fixed each handle firmly to its shank with a single exposed steel pin. □

Stewart Wurtz builds custom furniture in Seattle.



Arts and Crafts Sideboard

Traditional joinery and modern fasteners team up to simplify construction

BY GREGORY PAOLINI

A sideboard is a welcome piece in the dining room, where its drawers are perfect for linens and silverware, its cupboards accommodate serving trays, and its top is a staging area for the dishes to be served. It's no surprise, then, that sideboards were common in Arts and Crafts dining rooms. The version I make here is scaled down from the original pieces that inspired it, so it will fit into tighter spaces (not everyone has a large, formal dining room these days). However, it retains their muscular design and is made from quartersawn white oak, just like the originals.

When it comes to joinery, Arts and Crafts furniture relies heavily on the strength of the mortise-and-tenon. It's the primary joint in this sideboard, too, which is made almost entirely with frame-and-panel construction.

It's not difficult to cut a bunch of mortise-and-tenon joints, but taken together, those joints can create serious headaches while assembling a piece of furniture with as many parts as this sideboard. To avoid problems, I broke the sideboard down into subassemblies that can be added one at a time. I also joined these subassemblies with screws, which makes the glue-up much easier.

Cut all of the casework joinery first

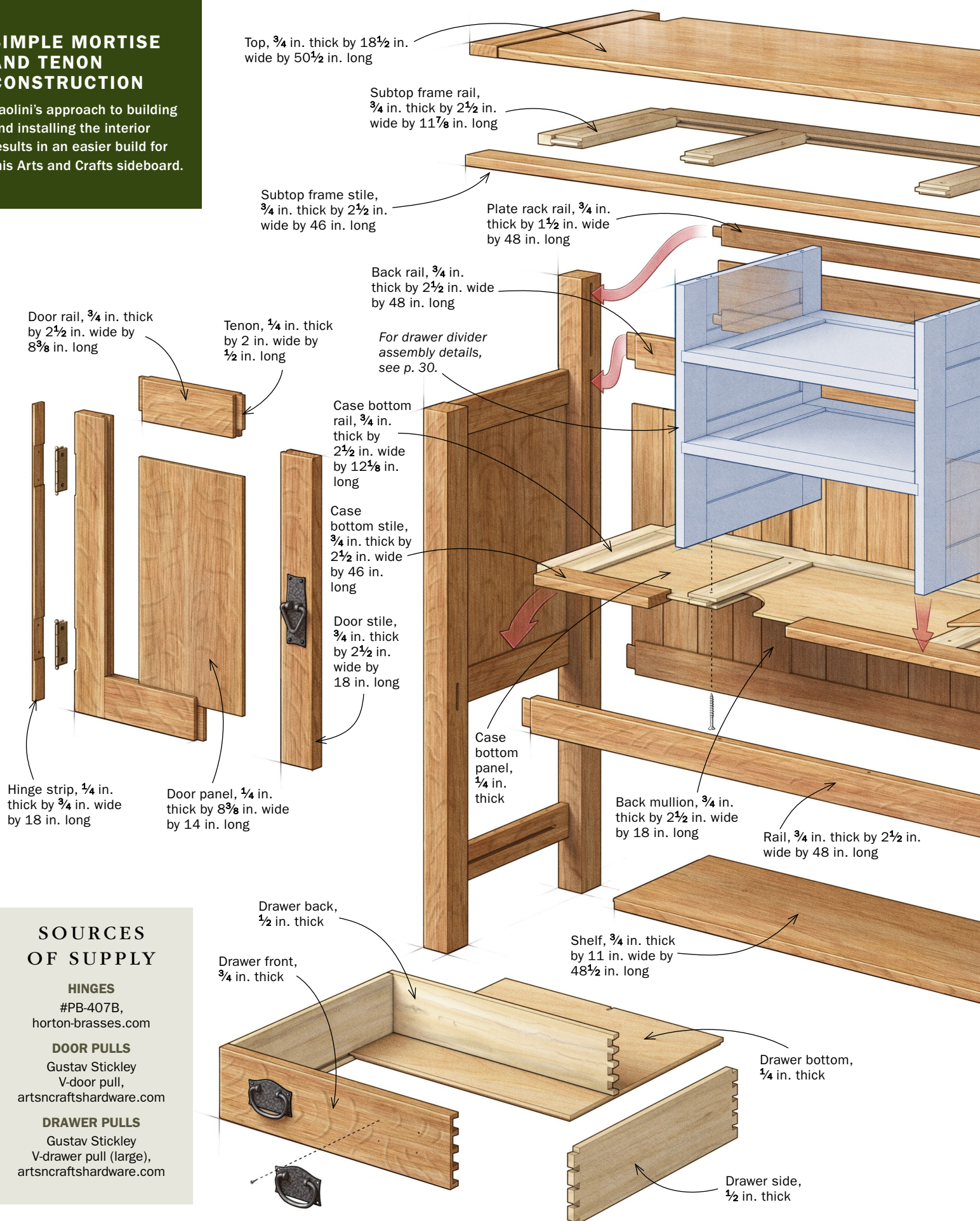
I begin by cutting all of the mortises. I use a router and a 1/4-in.-dia. spiral upcut bit, with an edge guide to keep the bit cutting in a straight line. There is nothing new about my technique. Plunge





SIMPLE MORTISE AND TENON CONSTRUCTION

Paolini's approach to building and installing the interior results in an easier build for this Arts and Crafts sideboard.



SOURCES OF SUPPLY

HINGES

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horton-brasses.com

DOOR PULLS

Gustav Stickley
V-door pull,
artscraftshardware.com

DRAWER PULLS

Gustav Stickley
V-drawer pull (large),
artscraftshardware.com

ONE JOINT TO BUILD IT ALL

Mortise-and-tenon joinery is the bedrock on which Arts and Crafts furniture is built, and this side-board is no different. Add some grooves and you have everything you need for the frame-and-panel construction.



Rout the mortises and stopped grooves. Use a 1/4-in.-dia. spiral upcut bit. The router's edge guide locates the bit and keeps it cutting straight (above). Cut through-grooves for the panels at the tablesaw (right) using a standard-kerf blade. Make the groove in two passes, registering the opposite face on the fence for the second cut. This centers the groove on the part's thickness.

to the full depth at each end of the mortise, and then use a series of passes to gradually rout the waste in between.

The legs have stopped grooves for the panels. Rout these after the mortises. Don't change the edge guide location, because the panel grooves are in line with the mortises. Cut to their final depth in multiple passes. Now rout the stopped grooves that hold the shelf. The remaining grooves are through-grooves, cut at the tablesaw using a standard-kerf blade. You can cut the full 1/4-in. width of the groove with a single fence setup by flipping the workpiece so that the opposite face is against the rip fence for the second cut.

I cut the tenons at the tablesaw using a miter gauge and a dado set. Then I cut all of the panels and back slats to their final dimension. Now you're ready for assembly.

Assemble from the outside in

The general assembly procedure is this: Glue up the outer frame of the case first, including the ends and the back. Next, drop in the case bottom and the drawer-



Quick tenons with a dado set. Cut the end of the tenon first. Register the opposite end of the board against a stop block to cut the shoulder (left). This ensures that all of the tenons are the same length. Paolini uses a utility knife to knock off the corners (above), allowing the tenons to fit into the rounded mortises.

GLUE UP THE CASE

This is where things get nontraditional. Assembly is from the outside in, which works because the drawer dividers, case bottom, and subtop are screwed to the casework.



Glue up the end assemblies. Put them in clamps and let them sit overnight before continuing the glue-up.



Put in the back. The mullions are already glued in place. Because the slats float in the grooves, hold them in the side panel as you lower the tenons into their mortises.



The shelf and plate rack come next. Then put in the remaining back slats, and spread glue on all of the exposed tenons before adding the second end assembly.



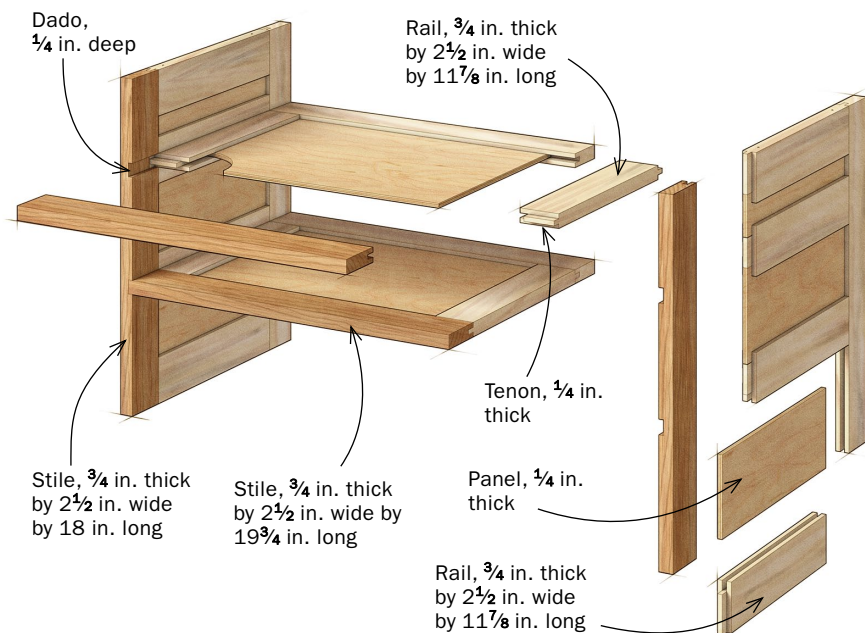
Clamp everything together. Do this on a flat, level surface, and check that the case is square. Let the glue dry overnight before removing the clamps.



Drop in the case bottom. Attach it by screwing up through the front rail. In the back and on the sides, it simply rests on the lower rail of the frame.

ADD THE DRAWER DIVIDERS

This assembly is completely independent of the main case, so it can be built, glued up, and installed after the case has been put together.



Build the drawer divider assembly. After gluing up the horizontal dust frames and panels, glue them into the dadoes cut into the frame of the vertical partitions (above).



No joinery means easy addition. The drawer-divider assembly sits on the case bottom. Lower it into place (left) and then clamp it there. Lay the case on its back, and attach the divider assembly with screws driven up through the case bottom (above). Two screws on each side are enough.



FINISH THE CASE

After the subtop frame is attached, drop solid-wood bottoms into the case, add hinge strips, and attach the top. Then make and fit the doors and drawers.



Set the subtop in place. The filler strips are glued to the end assembly (left). After screwing the subtop to the drawer divider assembly, lay (do not glue) the false bottoms on the case bottom (center). Then glue hinge strips—mortise them first—to the legs (right). Finally, place the top on the case (below), and secure it from below with screws.

divider assembly. The subtop frame goes on next, followed by the top. The doors and drawers come last.

Start by gluing up the two end assemblies. After the glue dries, connect them by gluing in the back, the plate rack, the shelf, and the front rail. This is a lot of joints at once, so use a glue like Titebond Extend, which has a long open time.

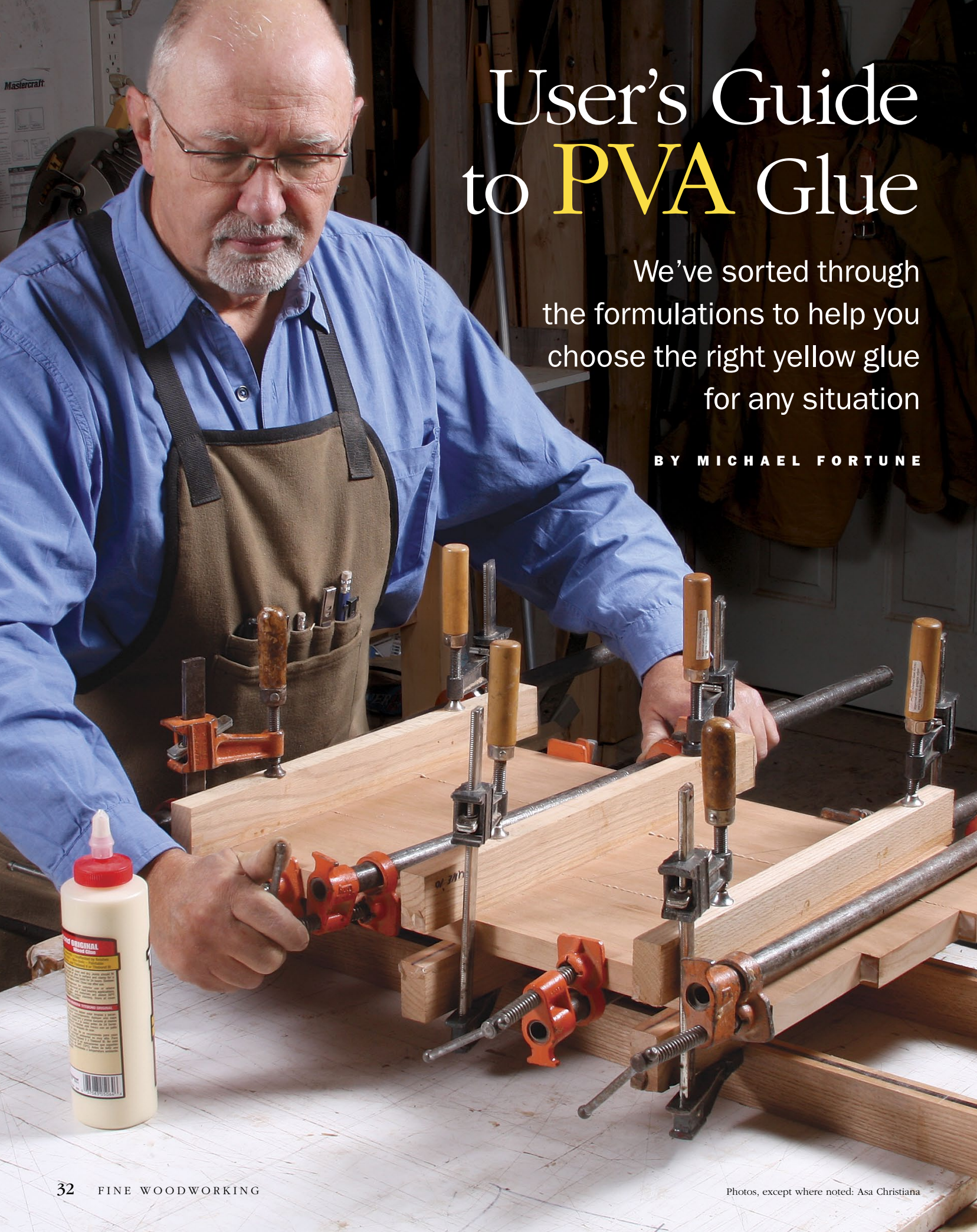
With the case in clamps, glue up the subtop frame and case bottom. The case bottom is a frame-and-panel assembly, while the subtop is just a frame that's covered by the sideboard's top. Glue the filler strips to the end rails.

Set the case bottom in place, and secure it with screws from beneath, through the front rail. Glue up the drawer divider assembly and set it down on the case bottom, securing it with screws from below. Install the subtop by screwing it to the drawer-divider assembly, and gluing the filler strips to the case. Place the top over it all and secure it from below with screws.

The doors can be hung now. Make and mortise a hinge strip and then glue it to the leg. Make, hang, and fit the doors. Finally, make and fit the drawers. □

Gregory Paolini is the author of Arts & Crafts Furniture Projects (The Taunton Press, 2015), scheduled to go on sale in March 2015.



A man with glasses and a goatee, wearing a blue shirt and a brown apron, is working in a workshop. He is using a bottle of yellow PVA glue to assemble a wooden frame. The frame is held together by several orange clamps. The background shows various tools and equipment in the workshop.

User's Guide to PVA Glue

We've sorted through
the formulations to help you
choose the right yellow glue
for any situation

BY MICHAEL FORTUNE

Woodworking isn't cheap, but glue isn't the problem. That's because our most common adhesive, yellow glue, is inexpensive and works for many tasks. We all know it and love it, but a better understanding of how this glue works, and the wide array of formulations available, will help you get the most from it.

Officially called polyvinyl acetate (PVA), this adhesive came into wide use after World War II. Its predecessor, animal-hide glue, reigned for centuries, going back to the furniture in King Tut's tomb. PVA came with a number of advantages: longer shelf life, more working time, and no need for a heated pot. Also, PVAs could be formulated for different jobs and characteristics, such as water resistance and working time.

PVA glues will bond all types of joinery, many bent laminations, and most veneered panels. And they work well on almost all woods, including plywood and MDF. But I avoid using PVAs on most tropical woods, which contain oils that will interfere with the glue's bond.

PVAs prefer fresh surfaces and tight joints

To get the most strength from PVA glue, you need to know how it works. One critical factor is absorption. Suspended in water, the glue particles are absorbed into the surrounding wood fibers. When the moisture dissipates and the glue hardens, the two adjacent pieces of wood are bonded. That's why joints should be glued right after cutting, sanding, or planing them. If a week or more has passed, surface contaminants can rise from inside the wood and stop the water from penetrating.

The other key to a strong bond is having a very thin, continuous film of glue in the joint. PVA glue is not a good gap-filler. That means good mating surfaces, and powerful clamping force when possible. When you can't clamp the faces of a joint together directly—as is the case with dovetails and mortise-and-tenon joints, for example—the joinery must be snug to ensure success.

Apply the right amount

It doesn't really matter what you use to apply PVA glue, as long as you spread it evenly and thinly over the entire surface of the joint.

If all of the surfaces are freshly cut, scraped, or sanded, you don't have to spread PVA on both mating surfaces to get it to soak in. For many years I have applied glue to only one face of each joint—whether an edge joint, dovetail, mortise, or lamination—with unqualified success.

Miters are basically end grain, so glue tends to soak into their fibers, starving the joint. I've tried a variety of approaches to solve this problem. Some woodworkers recommend applying a thin, preliminary layer of glue, and letting it set up and

Conditions for success

PVAs LIKE FRESH WOOD ...



Proper prep. If more than a day or two has passed since you cut the joints, you should scrape or sand the surfaces to remove oil and other contaminants that can rise from within to prevent absorption.



Absorption test. For full strength, a PVA glue needs to soak into the wood. You can test the joint's readiness with water. It beads on a surface that was cut a year ago (left), but soaks quickly into a freshly scraped area (right).

... AND WARM TEMPS



Too cold. PVAs only work down to certain temperatures, usually around 50°. If the wood, glue, or air is colder than that, the glue will turn chalky, rendering it useless.



Tools for applying a thin, even coat

Aside from absorption, the other key to achieving full strength with PVA glue is having a thin, continuous glue line.

THE FINGER METHOD



Apply glue straight from the bottle when possible. If the joints are freshly cut, you only have to apply glue to one of the mating surfaces in each joint.



The simplest spreader. Fortune uses his finger to spread the glue on edge joints, bending it a bit to get more glue in the middle than along the edges.

BRUSH GOES WHERE FINGERS CAN'T



Doctor it first. Trim the bristles on cheap flux brushes to make them stiffer, and hammer the ferrule to keep the bristles from falling out.



Reach into mortises. Squeeze glue into the mortise, and then spread it with the brush. Glue is not necessary on tight-fitting tenons.



Biscuits and miters, too. The brush reaches into biscuit slots and spreads glue on small surfaces like these miter joints.

SMALL STICKS FOR TIGHT SPACES



Dovetail trick. Thin sticks reach between tails to apply a thin, even coat. You don't need glue on the pins, but a little on the shoulders doesn't hurt.

NOTCHED SPREADER FOR BIG AREAS



Trowel is better than a roller. A spreader with $\frac{1}{32}$ -in. V-notches will deposit the perfect amount of PVA glue for veneering and laminations.



Easy fixes for squeeze-out

PVA glues will show up under almost all finishes, so don't leave any behind. Here is how to make the job as easy as possible.



Don't apply too much. On clamped joints like panels (left) and miters (above), you should see a small continuous line of squeeze-out. Big beads or drips will be harder to deal with afterward.

seal the grain before adding more glue, a process called “sizing” the joint. But I’ve experienced joint failure with this technique. That’s because glue does not stick well to glue that has already skinned over and begun to cure. So instead I move more quickly than usual, touching up dry spots before assembling. For tips on glue-ups of all kinds, read my articles in *FWW* #234 (“Fundamentals: Gear up for glue-ups” and “Great Glue-Ups, Guaranteed”) and #243 (“Tame Tricky Glue-Ups”).

Working time: The clock is ticking

The most important attributes of any glue are open and closed assembly time. Open assembly time, or open time, is the amount of time you have between spreading the glue and assembling the joint (but not necessarily clamping it yet). Once the glue is spread, the water begins to evaporate and the glue starts to skin over.

Closed assembly time starts after the surfaces are touching, and tells you how long you have to get the pieces aligned and the clamps tightened before the glue starts to fully cure. Adding open and closed time together tells you the working time—how long you have to complete the glue-up without the joints starting to freeze in place.

A warmer, dryer shop speeds up the clock—Keep in mind that manufacturers’ specs are based on an environment where the humidity is mid-range and the temperature is about 72°. In general, a colder or more humid shop will slow down the clock, and a warmer or dryer shop will speed it up.

Clamp time is pretty universal—Clamp time—how long you need to wait before you can remove the clamp pressure—varies based on wood species, humidity, and temperature. Clamps force surfaces and joints together, overcoming all sorts of resistance in the workpieces, from warping to unevenness. The moisture needs to evaporate and the glue has to harden, at least partially, before you can trust workpieces not to shift or move when clamp pressure is released.



Scrape it off in stages. When the glue starts to gel, after half hour or so, remove as much as you can with a flexible scraper (top). After about an hour, remove the clamps and get the rest of the gummy squeeze-out with a cheap, steel-bladed paint scraper (bottom). Grind a fresh edge on each tool for best results, and ease the corners so they don’t dig in.



TIP

DON'T LEAVE ANY BEHIND

The big blotch was a gluey fingerprint. The haze in the corner came from removing glue with a wet rag, which is a no-no.

The right PVA for your project

Standard PVA glues are a shop staple, but there are many reasons to pay more or go online for a special formula.

STANDARD PVA IS CHEAP AND VERSATILE

These have a shorter working time and are less expensive than other varieties, but just as strong.

Price: \$4-\$5 for 16 oz.
Open time: 5-10 min.
Total working time: 15 min.
Chalk temperature: 50°-55°
Dried color:
Translucent yellow



TITEBOND
ORIGINAL
WOOD GLUE

ELMER'S
CARPENTER'S
WOOD GLUE

TYPE I OFFERS MORE OPEN TIME

Type I PVA glues are very water-resistant, so they work well for outdoor furniture. They also offer significantly longer working time.

Price: \$7-\$8 for 16 oz.
Open time: 10-15 min.
Total working time: 25 min.
Chalk temperature: 47°-55°
Dried color: Translucent brown



TITEBOND
III ULTIMATE
WOOD GLUE

ELMER'S
CARPENTER'S
WOOD GLUE
MAX

WHY PAY MORE FOR TYPE II?

These varieties cost roughly \$1 more than standard PVA glues, but offer the same amount of working time and only moderate water-resistance.

Price: \$5-\$6 for 16 oz.
Open time: 5-10 min.
Total working time: 15 min.
Chalk temperature: 50°-55°
Dried color: Translucent orange



TITEBOND
II PREMIUM
WOOD GLUE

GORILLA
WOOD GLUE



Got 15 minutes? Standard PVA glue has a relatively short working time, but it's more than enough for many glue-ups. Always do a dry run to get everything set before spreading glue.

More time makes a big difference. For complicated glue-ups like this big lamination, a Type I PVA (here Titebond III) allows more time for spreading, positioning, and clamping.



A few specialists are worth tracking down

You might have to go online to find these products, but they can be lifesavers.

SLOW AND CLEAR

Titebond Extend has the same 25 minutes of working time as Titebond III but a lighter glue line, making it better for whiter woods.

Price: \$7.50 for 16 oz.
Open time: 15 min.
Total working time: 20-25 min.
Chalk temperature: 40°
Dried color: Translucent white

NO SQUEEZE-THROUGH

This PVA contains a filler that stops it from squeezing through porous veneers. It should be used for veneering only.

Price: \$10.50/qt.
Open time: 15 min.
Total working time: 20 min.
Chalk temperature: 50°
Dried color: Brown

GREAT ON END GRAIN

This PVA is thicker so it won't soak as quickly into miter joints. It also grabs quickly, making it great for rub joints.

Price: \$8 for 16 oz.
Open time: 35 min.
Total working time: 10-15 min.
Chalk temperature: 50°
Dried color: Translucent tan



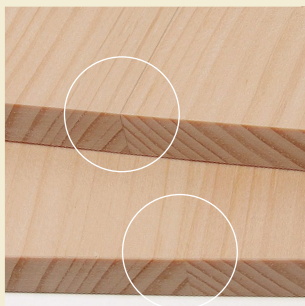
TITEBOND EXTEND WOOD GLUE



TITEBOND COLD PRESS FOR VENEER



TITEBOND NO-RUN, NO-DRIP WOOD GLUE



Perfect for pine. The glue line is dark (top) using Titebond III, but invisible (bottom) using Titebond Extend.



Stir it up. The filler in this PVA tends to settle. So stir it up with a mixing attachment before use.



Miter master. On end grain, this glue stays on the surface longer, giving you more time to complete the glue-up.

If you take off the clamps too soon and a joint opens up, it might be too late to reclamp it without compromising the strength of the joint. Worse, you might not notice the gap, and then let the workpieces freeze permanently in that position. On the other hand, if you wait too long, you won't be able to remove all the glue squeeze-out before it hardens completely. Usually one hour to 90 minutes is about right.

Freshness matters, too

The shelf life of PVA ranges from one year to two, so for most hobbyists, the ubiquitous 16-oz. bottle is the right amount to buy. But if you plan to do laminations or veneering, you can safely buy a gallon or more without much going to waste. If there is no obvious manufacturing date on the bottle, write the date of purchase on it.

Shelf life is shortened if the glue is stored in extreme temperatures: higher than 85° or lower than 55°.

Special situations

I use PVAs most of the time, even for laminations and veneering. But it's not always appropriate. For laminations, I go with Titebond III or Titebond Extend, depending on the color of the wood. The extra open time is invaluable for spreading glue and applying clamps. However, if the lamination will be unsupported for more than 4 ft. and carry a lot of weight, I go with System 3 G2 epoxy, which is much more rigid and offers even more open time.

I also use PVA glues for veneering. If the wood is tight-grained, like cherry or maple, I'll use a normal PVA. But for open-grained, ring-porous woods like ash and oak, or for burls, which have small voids in them, I love Titebond Cold Press for Veneer glue.

However, if the veneer has a lot of patternwork or marquetry on it, PVA is a bad choice. The water in the glue will expand the veneer and distort the pattern. I also avoid PVA for areas over roughly 4 ft. by 4 ft., because I run out of working time. In these cases, I turn to Unibond 800. □

Michael Fortune is a contributing editor. Special Projects Editor Asa Christiana also contributed to this article.

Make a Shaker Box



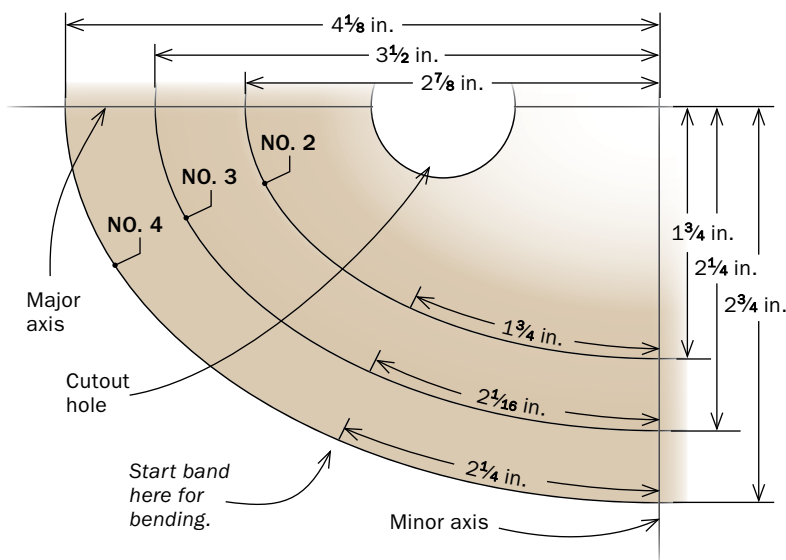
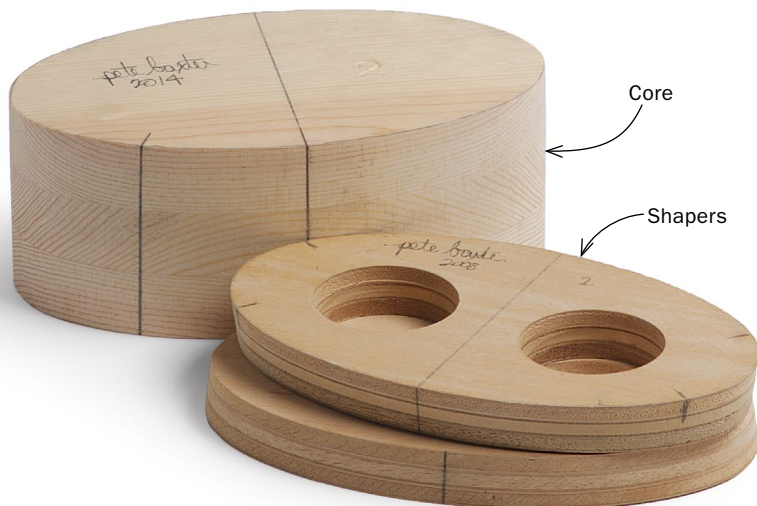
Master the basics, and you'll be building these iconic boxes in bunches

BY PETE BAXTER

At its best, Shaker design is a harmonious marriage of functionality, simplicity, and elegance. There may be no better embodiment of that harmony than the oval boxes the Shakers made to hold everything from sewing notions to seeds. Thankfully, Shaker craftsmen also had a good eye for simplifying construction, so the box is not difficult to make. The sides and top are made from thin pieces of straight-grain hardwood, called bands, soaked in hot water and then bent around a form. After tacking the box band together, drying forms are pressed into it. The lid band is bent around the box band and dried in place,

Bending and drying forms come first

It takes two steps to turn a thin band of wood into a Shaker box. First, the wet band is bent around a form, called the core. After the ends are tacked together, two drying forms, called shapers, are put inside the band. These give the box its iconic oval shape.



CORE/SHAPER PATTERNS

The Shakers made oval boxes in eight sizes. The three sizes here, Nos. 2, 3, and 4, are neither too small nor too big—just right for use around the house.

*Enlarge 133% for full-size pattern.

too. Panels are fitted to the top and bottom after the bands have dried. You need a few specialized tools—a water tray for soaking the bands and an anvil for peening over the tacks that hold the bands together—but I'll tell you where you can get them. Once you have these tools, you'll be making boxes in bunches.

Heated plies are easy to bend

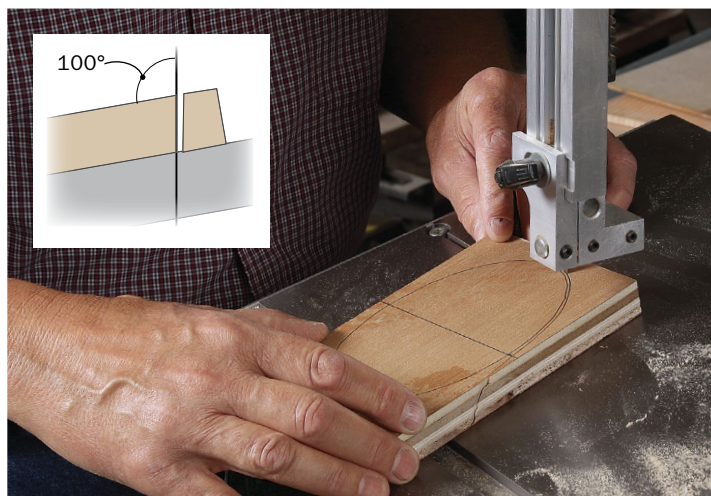
At the heart of the Shakers' technique are the bending form, called the core, and the drying templates, called shapers, that give the box and top their distinctive oval shape. You need one core and



Cut out the core. The core is sized to match the internal dimensions of the box. Cut close to the line, and then sand to it. It doesn't have to be perfect, because the core is just a tool for flexing the band into an oval.



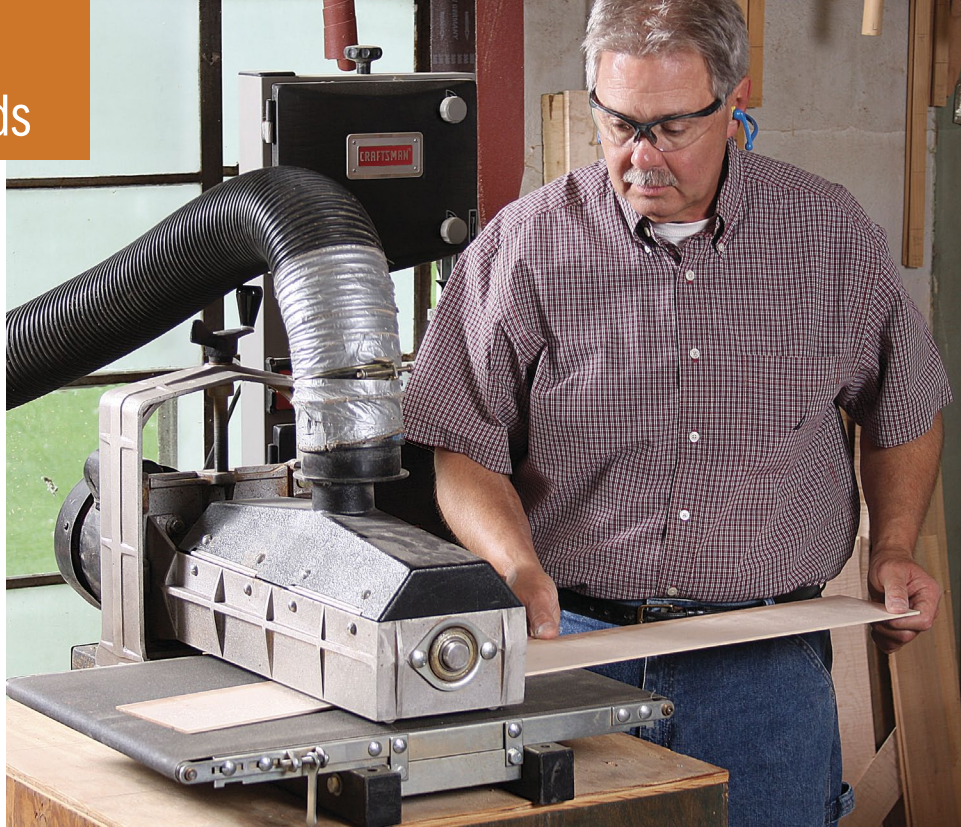
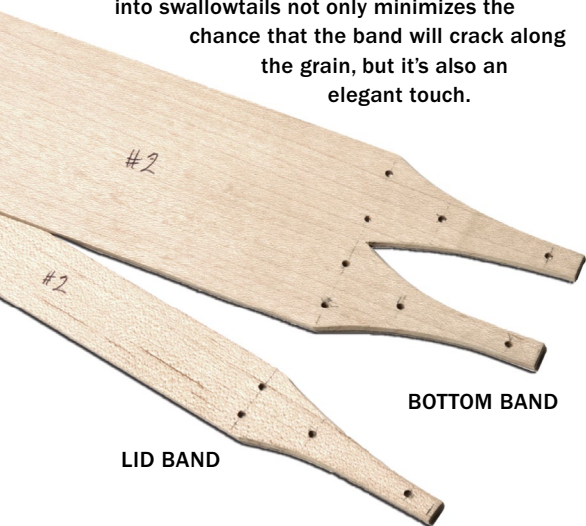
Trace the shaper from the core. You need two shapers. One is inserted from the top, and the other from the bottom. Drill two finger holes in each shaper, so you can pull it out after the band dries.



The sides are angled. Beveling the sides makes the shapers easier to insert and remove from the box band. Sand the edges and take care to create fair curves, as the shapers form the box.

Make and shape the bands

Although function always trumped form for the Shakers, they still knew how to make things beautiful. Cutting the exposed end of the band into swallowtails not only minimizes the chance that the band will crack along the grain, but it's also an elegant touch.



Mill the band stock. For the boxes shown here, the bands are $\frac{1}{16}$ in. thick—too thin for a planer. So after resawing the bands, remove the sawmarks with a drum sander or handplane.

SOURCE OF SUPPLY

Shakerovalbox.com

You can find all of the tools and hardware you need to make Shaker oval boxes at The Home Shop, which sells everything from water trays (starting at \$38 for a 32-in.-long galvanized steel tray) to cores, shapers, copper tacks, and pegs.



Lay out the swallowtails.

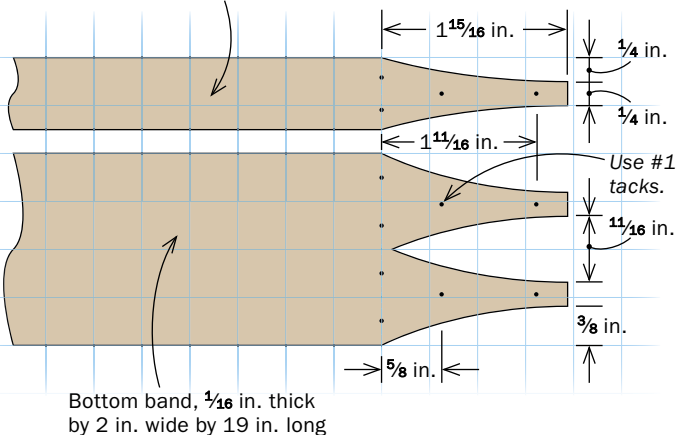
A master template allows you to make several boxes of the same size quickly. Use a mechanical pencil (0.5mm or 0.7mm thick) for its consistent line, which results in fairer curves when cutting out the swallowtails. Transfer the tack locations, too. The holes in the template should be the same size as the pilot holes you'll drill in the box bands.

SWALLOWTAIL TEMPLATES

NO. 2

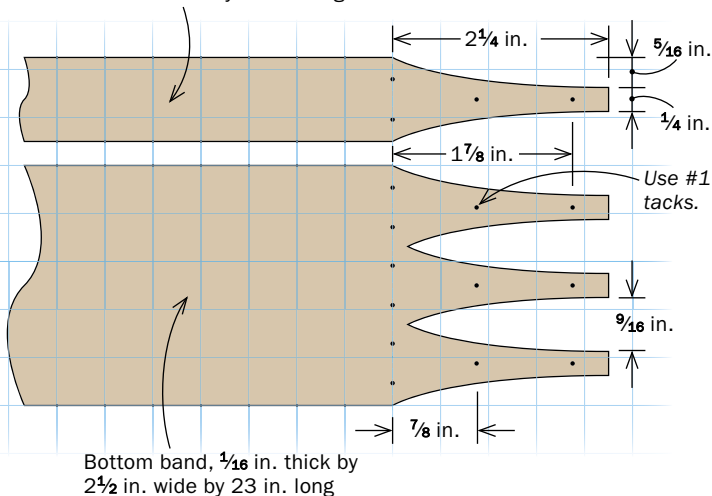
Lid band, $\frac{1}{16}$ in. thick by $\frac{3}{4}$ in. wide by $19\frac{3}{4}$ in. long

**Enlarge 200% for full-size pattern.*



NO. 3

Lid band, $\frac{1}{16}$ in. thick by $\frac{7}{8}$ in. wide by 24 in. long





Feather the ends on the inside face. Use a horizontal belt sander. A block spreads pressure and produces a more consistent taper. The taper makes it easier to cut the swallowtails, too.



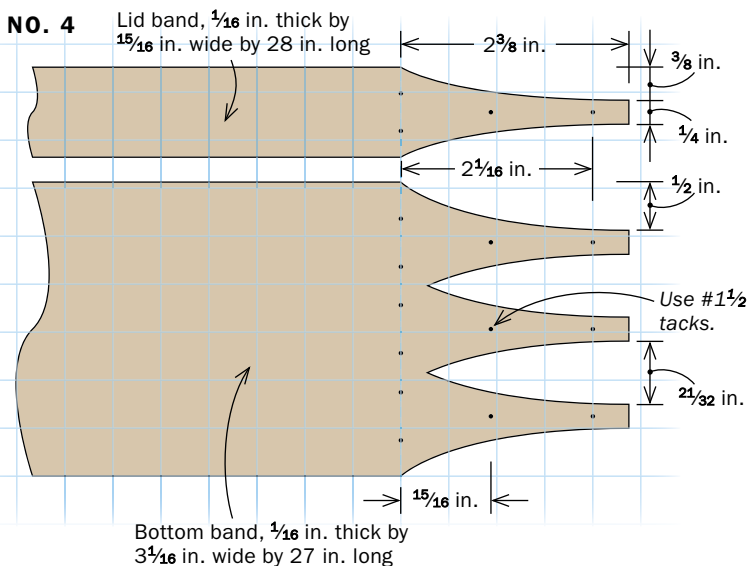
Cut the swallowtails. Clamp the band between a backer board and hardwood "hold-down." Use a new blade in a utility knife and move the backer board after each set of tails so that the blade won't fall into a kerf already there and get pulled off the layout line.

two shapers for each box size. If you are making more than one box of the same size (it's really no harder to make several than it is to make one), you'll need one additional pair of shapers for each box you plan to make. You can use the same core for all of them. Finally, you'll need to make templates for the swallowtail patterns.

Now make the lid and bottom box bands. I start with the bottom band (you'll see why later). Cherry and maple are the traditional woods for the bands. Use straight-grain stock, which bends the best, and mill it to $\frac{1}{16}$ in. thick. I choose stock that is wide enough for both bands so there is a nice grain match between them. Use a template to trace the swallowtail pattern on the end of the band. Taper the ends of the band on the inside face from the main tack line to the end, then cut the swallowtails and drill pilot holes for the tacks. Then put the band into the hot water for a 5- to 10-minute soak. When you pull out the band, quickly



Bevel the edges. Hold the blade perpendicular. Believe it or not, the blade will flex a bit as you pull it, resulting in the slight bevel (1° or 2°) that you want. Be careful at the tip. It needs to be $1\frac{1}{2}$ times as wide as the tack head.



Drill pilot holes. Be sure to hold the drill (a Dremel in this case) perpendicular to the band.

Bend each band

The bands are soaked in hot water so they bend easily. To minimize breaks when you bend, make the bands from straight-grain, quarter-sawn stock. Dry the band for a day or two before removing the shapers.

Hot bath. Use distilled water (to prevent mineral stains) heated to at least 180°F. It should take no more than 5 to 10 minutes to make the band pliable (right). Wrap the band around the form (far right). Hold the inside end at the “start” line and work from there.



Article Extra

Watch a video on how to bend the wood for a Shaker box.

Mark and tack. Draw witness marks where the band overlaps (right). The marks help you keep the band aligned in the oval shape after you take it off the bending form. Align the marks to tack the box together (far right). A short piece of galvanized (to prevent staining) pipe bolted to a block of wood works fine as an anvil. Start with the middle tack line.



Insert the shapers. Depth is important here. Don't press them in so far that the band bows out at the rim. The shaper's minor axis should align with the band's main tack line (above). Bend the lid band around the bottom band (right). To get a smoother transition at the overlap, bend the lid so that the ends overlap on the back, with the swallowtails underneath. Put them on top before you tack the lid band together.



Add the top and bottom



Make the bottom panel. To get the best match possible between the band and bottom, trace each band individually (far left) rather than using a pattern. Sand it to the line (left) with the bottom 90° to the sanding disk.



No glue needed. The bottom goes in dry (far left) and is held in place with copper shoe pegs. After the bottom is in, drill pilot holes for the pegs with a #56 bit. Driving the pegs flush with a hammer eventually results in a damaged box, so leave them just a hair proud and clean them up with a small bastard file (left).

bend it around the core. Put a witness mark where the two ends overlap (be sure to mark both ends of the band), then take the band off the core. Realign the witness mark and tack the ends together on an anvil. Now press one shaper in from the top and one from the bottom. The lid band is made the same way, but instead of bending it around the core, bend it around the box band. After tacking it together, put it back on the bottom band and let it dry in place.

The Shakers most often made the top and bottom panels from quartersawn white pine, and that's what I've done here. After it has dried for a few days, place the band on a piece of stock, and trace around the inside. Cut out the panel and sand to the line. Press the panel into the band until it's flush with the band's edge. Drill pilot holes for the copper shoe pegs, then drive in the pegs. Do not use glue.

If you like the look of natural wood, finish the box with wipe-on polyurethane. But don't be afraid to paint your boxes with milk paint, as the Shakers were fond of bright colors. □

Pete Baxter of Seymour, Ind., is a professional furniture maker who specializes in Shaker oval boxes and rockers.

Add a handle with the same techniques



The handle is made the same way as the box, but it is bent and dried on one form. Baxter drills holes in the form so he can clamp the handle in place to dry. Like the bands, it takes a day or two. He uses copper tacks to attach the handle.

Juice Up Your Joinery

Artistic tenons pack structural power with visual punch

BY HANK GILPIN

I was seduced into the woodworking field when I walked into a college class in 1973 and watched Tage Frid tie a piece of steamed ash in a knot. But it was my enchantment with joinery that sealed the deal. I quickly discovered that if I worked with solid wood and traditional joinery I could make simple, strong, practical pieces fairly quickly and get a thrill out of doing it. I became Mr. Mortise-and-Tenon. The more I used the joint, the more variations I discovered. Forty years later, I'm still experimenting with the mortise-and-tenon, finding new ways to add a little more strength and visual zing to the piece of furniture and a little more delight to the process of making it.

Hank Gilpin's first article for Fine Woodworking ran in issue #6. Special thanks to Hank's stellar assistant Matt Giossi for his help with this article.



DOUBLE TENONS



SHAPED TENONS



TUSK TENONS

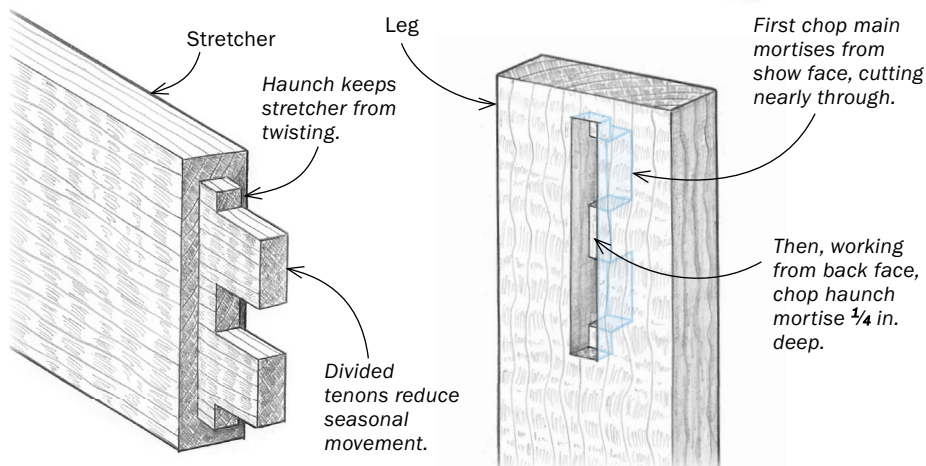
Multiple tenons multiply the impact

Through-tenons bring something special even to an otherwise simple piece, adding visual appeal and a good deal of strength. Soon after I made my first ones, I began doubling the tenons where it made sense structurally. I looked everywhere for ideas, and I found the vertically stacked and haunched tenons in an old English book on door-making. Separated tenons reduce problems with wood movement and take less meat out of the mortised member. As a bonus, they're beautiful. And if you cut the tenons in contrasting wood—poof!—they're as dramatic as inlay.

STACKED

Split vertically. Dividing a large tenon into two or more smaller ones is beneficial when the stretcher is wide.

CREATING MULTIPLE THROUGH-TENONS



Outside in. Start chopping the through-mortises from the show face of the board, and stop the cut $\frac{1}{8}$ in. before going through.



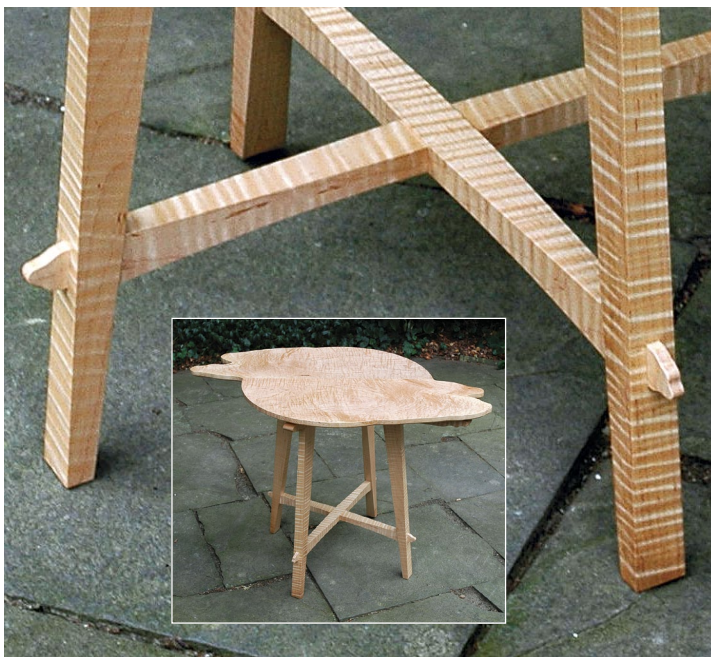
Flip and finish. Registering the same edge against the fence, flip the workpiece end for end and chop the housing from the inside face.

SIDE BY SIDE

Split sideways. Two tenons side by side create more glue surface than a single large tenon. The visual pop is doubled, too—unless it's quadrupled with contrasting woods, as it is here in this table made of spalted maple and tulip poplar.



Through-tenons with extra sizzle



Very proud tenons. Leave the through-tenon long and you can give it nearly any shape. On Gilpin's curly maple table, the extended stretcher tenons are profiled in response to the table's cloud-shaped top.

SHAPED TENONS MAKE A SHOWPIECE

Once you start using through-tenons, and then proud through-tenons, you open up a whole new realm—why not make really proud tenons? Then you can shape them any way you want. I typically give them a shape that picks up another detail in the piece. There are no rules. On the little curly maple table at left, I designed different shapes for each tenon. That makes it more fun to look at and more fun to make.



Tenon template. If the shaping on the tenons will be alike, a quick template can be used to transfer the design from the drawing to the workpiece.



Hand tools refine the shape. After bandsawing to the line, use files, rasps, scrapers, and sandpaper to achieve the final shape.



Carved to a curve. On his walnut and cypress table (left), Gilpin curved both the leg and the through-tenon to complement the circular tabletop. On his oak table (above), the through-tenon echoes the rounded bumps on the leg.

THE OPEN APPROACH

Having the top of a table rest on the leg is an ancient habit that I like to break. I often lift the top a smidge, which draws attention to the structure below. When I do, I'll often use an open-topped mortise. It gives me a good amount of glue surface and strength even while exposing the tenon on two edges.

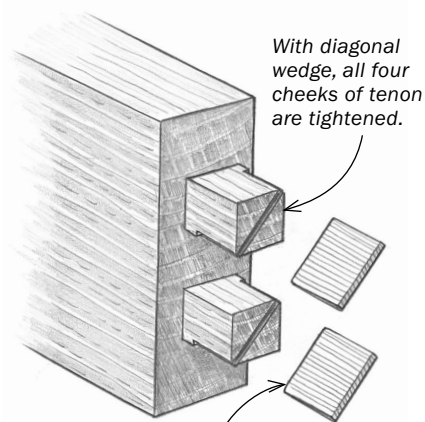


Taking the bridle path. On tables with tops raised off their legs, Gilpin often uses bridle joints, leaving the tenons proud and pinning them for insurance (top). A similar open-topped joint can be made in a dovetail version (above).



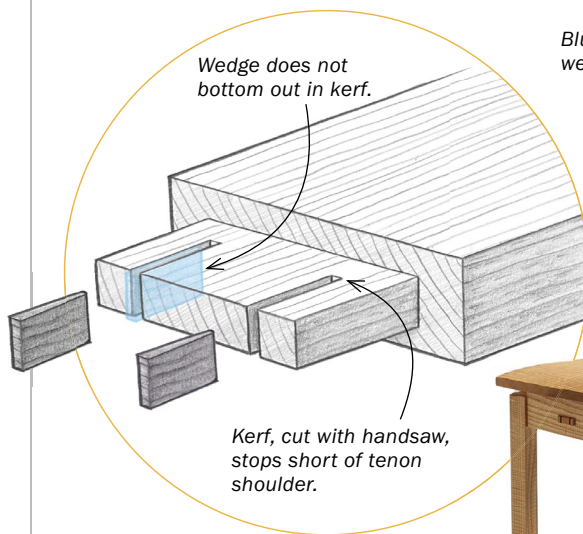
WEDGES ADD SPICE AND STRENGTH

Wedge a tenon and you instantly have a stronger joint—and a cooler looking one. If the wedge is on the diagonal in a square tenon, it will tighten all four cheeks of the joint. I sometimes use contrasting wood for the wedge. In the curly ash chair below, I used walnut wedges to echo the small walnut spacers in the doubled crest rail and side stretchers.



With diagonal wedge, all four cheeks of tenon are tightened.

Blunt the tip of the wedge slightly.



Wedge does not bottom out in kerf.

Kerf, cut with handsaw, stops short of tenon shoulder.





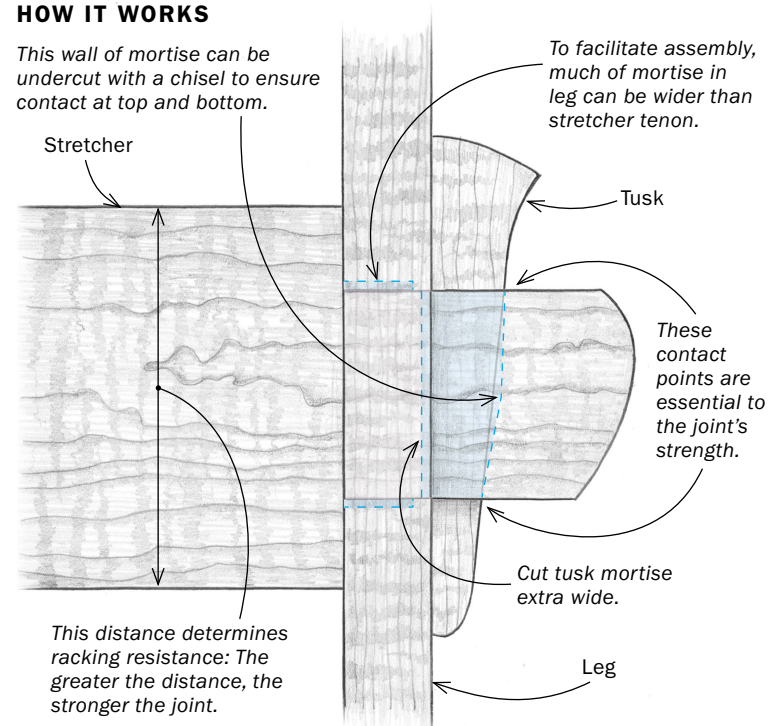
Tusk tenons: stylish and strong

Tusk tenons—they're a miracle, aren't they? Structurally, they create a perfectly rigid connection with a little wedge and not a drop of glue. You can knock them apart with the tap of a hammer and tighten them up the same way. And if you decide to spice things up a bit, you can make the tenons and wedges in limitless variations.

One important thing to note about making them is that the stretcher tenon should slide very easily into the leg mortise, so the whole assembly is rather loose until the wedge goes home—tap—and it's suddenly rock solid.

HOW IT WORKS

This wall of mortise can be undercut with a chisel to ensure contact at top and bottom.



Versatile and very strong. Tusk tenons can be used on tables of all sizes and styles. They provide a powerful connection without glue that can be disassembled for shipping and tightened with a tap.

VARY THE FORMAT

Tusk tenons are perfectly suited to trestle tables, and typically one stretcher will do the trick. On this dining table, though, which was quite wide, I made framed end panels and used a pair of upper stretchers, along with a lower stretcher that lies flat. The upper stretchers lock the table up tight, so the lower one isn't essential structurally. But it adds a nice lateral line to the design and also gave me the chance to make some short, stout tusks to fit it.

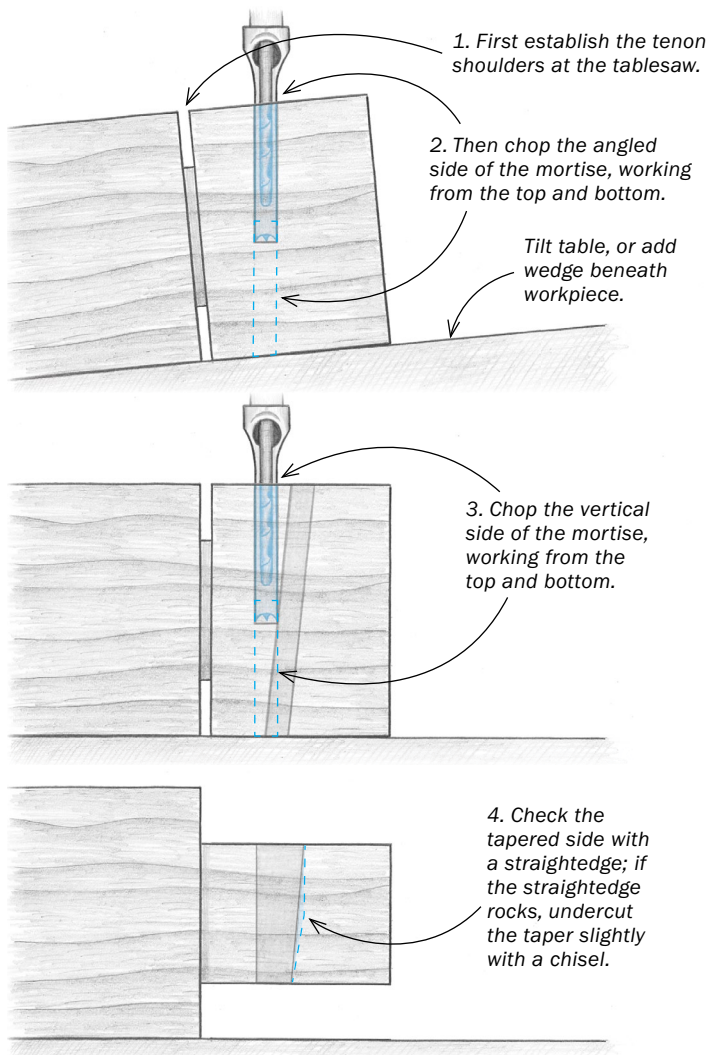
One table, two types of tusk. Tusk tenons are strongest—and most commonly used—with a stretcher oriented with its width vertical (left). But a stretcher lying flat and fitted with a wide tusk makes a sound connection too.



Making tusk tenons

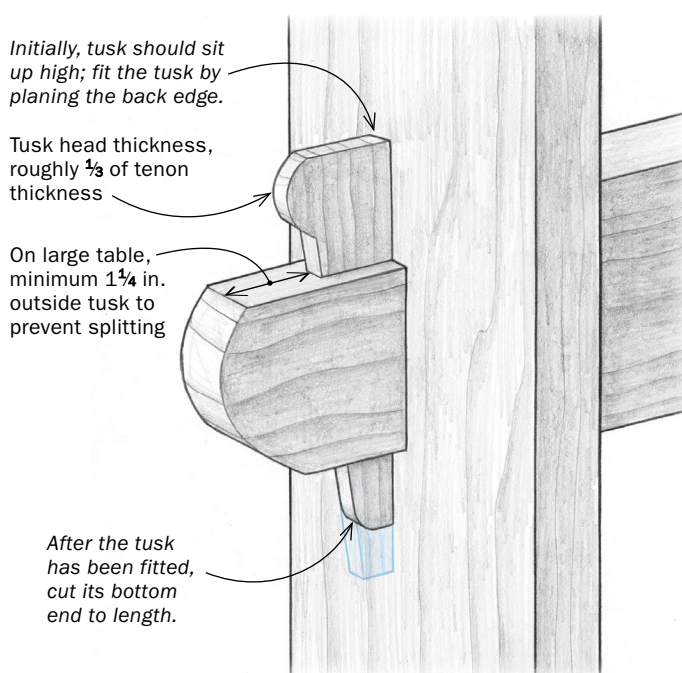
CUT THE MORTISE

Table stretchers tend to be too wide to be through-mortised from one side, so most tusk mortises are chopped from the top and bottom to the middle. Gilpin's hollow-chisel mortiser has a tilting table, but on a fixed table you could insert a wedge beneath the workpiece. These mortises also could be chopped by hand or cut on a drill press and squared up with a chisel.



FIT THE TUSK

After cutting and smoothing the tapered edge of the tusk, assemble the joint. At this point the tusk should sit above its final height by an inch or more. Fit the tusk to its final position by handplaning its back edge; proceed carefully, as it will drop down quickly. After fitting, label each tusk and tenon with permanent marker on a non-show face.



TIP

MORTISING NARROW STRETCHERS



Chop from the top. On stretchers narrow enough, you can chop the tusk mortise from one direction. Stop the cut before going through.



Saw off the bottom. With the mortise chopped nearly through, saw the bottom cheek to reveal a clean mortise opening.

SHAPE THE HEAD

You'd think a wedge would be a simple thing to make—and it can be. But once you start exploring the possibilities with tusks, you can wind up making some quite sophisticated shapes. The shaping may not make the joint stronger, but it can make the table sing. It's a little like car design—they all have four wheels, but it's the doo-dads and spangles that separate one from the rest.



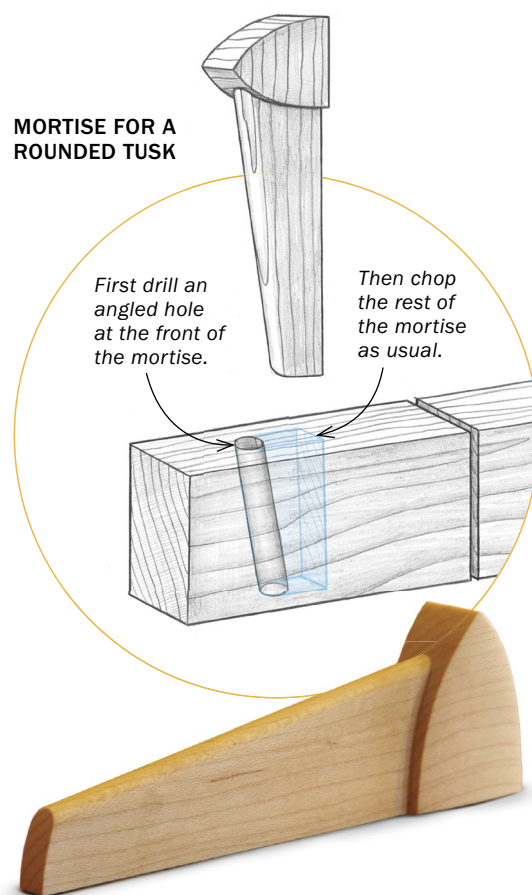
Heads of note. Twin tusks share a shapely head design on Gilpin's oval table, demonstrating the breadth of design possibilities offered by tusk tenons.



ROUND-EDGE VERSION



Rounding the tusk for a softer look. Gilpin sometimes gives the tapered side of his tusks a radiused edge and fits them in mortises with a front wall rounded to match.



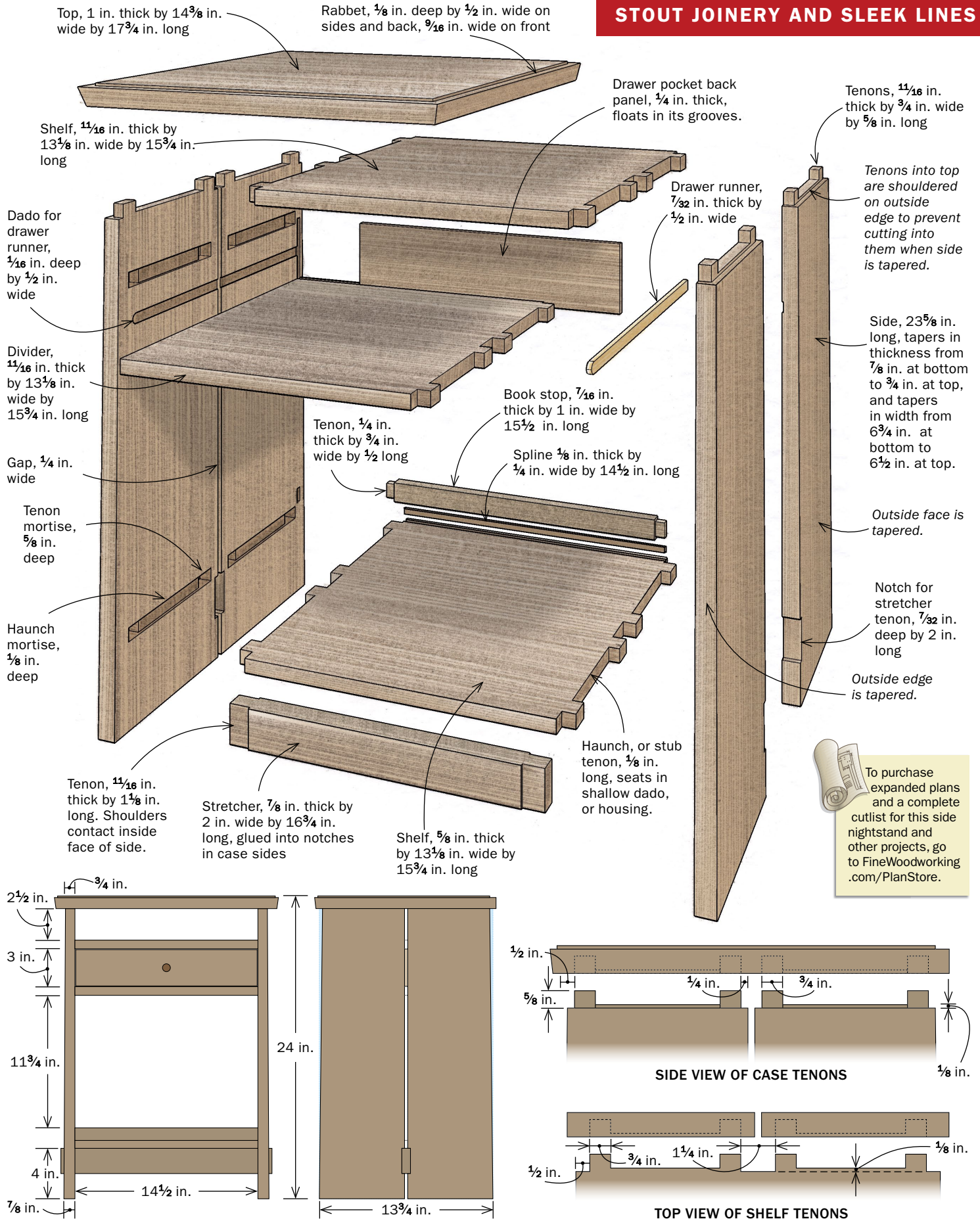
Build a Nightstand



Housed tenons deliver strength, and tapers create a refined appearance

BY MICHAEL CULLEN

I designed this piece for a retired librarian who wanted a nightstand that would double as a bookcase. Of course it needed a drawer, which I sized to accommodate pencils and paper or an iPad, along with other items. Since so many essential things compete for space on the top of a nightstand—lamp, water glass, books and periodicals, alarm clock, eyeglasses—I decided to drop the drawer a few inches below the top, creating an easily reached space for the night's reading matter. Below the drawer I left ample room to store a collection of favorite books and magazines.



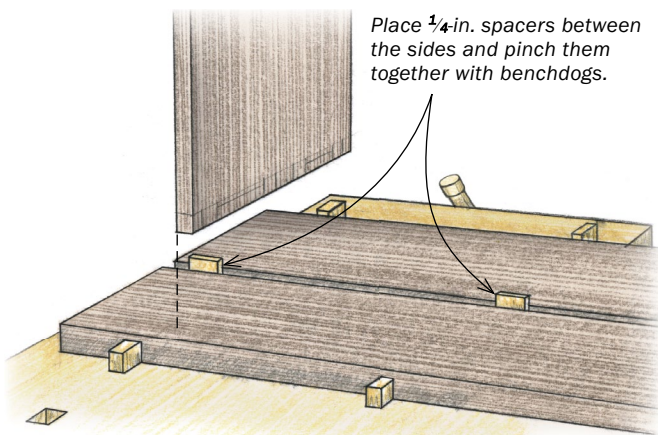
Making the housed mortise-and-tenon



Initial layout. Cullen lays out the full tenons and then the haunch between them. He uses a marking gauge for layout and a mechanical pencil to clarify the lines.

RAZOR-SHARP LAYOUT

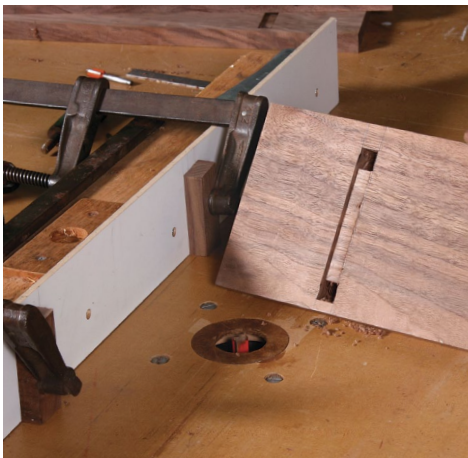
Transfer the tenon locations from the horizontal members to the sides.



Tenon transfer. Using an X-Acto knife for precision, Cullen transfers the tenon layout to the sides.



First drill, then chop. Using a Forstner bit in the drill press, Cullen removes most of the waste from the deep mortises. Then he uses a mallet and chisel to clean them up.



Rout the housing. A router table makes quick work of cutting the housing for the haunch between tenons. Cullen uses a bit that's slightly under width and cuts the housing in two passes.

the lower shelf with tenons that protrude through the case sides.

The nightstand's primary joinery is a favorite of mine for solid-wood casework: the housed mortise-and-tenon. Between its full tenons the joint has stub tenons, or haunches, that tuck into a mating dado, or housing. This arrangement gives the joint maximum shear strength; keeps the tenoned member from warping; hides any small openings that develop over time; and, because it has relatively small

shoulders, makes it easier to ensure a tight joint line. I learned the housed tenon from my mentor, David Powell, at the school he ran in Massachusetts, Leeds Design Workshops. I've relied on this joint heavily over the years, and I think it's unparalleled in soundness and strength.

Which wood?

I've made this nightstand a number of times, and almost any hardwood—maple, cherry, walnut, and oak, to name a few—would be well suited for it, and certainly many exotics as well. I've built one in wenge and another in bubinga. This time I chose claro walnut, taking all the parts from a single slab. As with any piece of



A jig for the cheeks. Cullen cuts the tenons to width on the tablesaw using his shopmade tenoning jig. For drawings of a similar jig, see p. 69.



Bandsaw to the haunch line. A slightly rough end-grain cut on the haunch is fine, because it won't bottom out in the housing.



Chisel cleanup. Pare precisely to the baseline on the outside edges of the board and between the center tenons.

furniture, it's crucial to match grain and color throughout the piece to ensure visual balance. If you are building a pair of nightstands, consider mirroring the patterns of color and grain between the two.

Prepare the parts

I cut out all the nightstand parts slightly oversize at the beginning of the project. This way they have plenty of time to acclimate and reach equilibrium in the workshop before being brought to final size.

In preparation for laying out the housed mortise-and-tenons, plane the sides to their maximum thickness ($7\frac{3}{8}$ in.) and cut them to maximum width ($6\frac{3}{4}$ in.). Then cut them to length. You won't cut the tapers in the sides' thickness or width until the joints are cut and fitted. The horizontal divider and the top and lower shelf should be milled to thickness and cut to size next. Be sure to leave them ever so slightly over thickness so you can sneak up on a perfect fit for the housed joints.

Begin layout with the tenons

The housed tenon joint calls for precise layout. All joinery should be scribed using a marking gauge and a sharp knife. I use an X-Acto. First lay out all the tenons—those on the horizontals and the ones at the top of the sides. To simplify the task,



Tip for fitting. With the shelf still slightly over thickness, test the spacing of the mortises by tipping the workpiece. Then plane the faces of the board to achieve the final fit.

Fit the stretcher



The stretcher needs notches. Several passes with a dado set on the tablesaw create one of the mating notches in the side that will accept the stretcher's tenon.

Fine-tune to fit. Before cutting the stretcher tenon's cheeks, Cullen planes the workpiece to width so it fits the notch exactly.



Shallow cheeks. After using the tenoning jig to shave the cheeks of the tenon, Cullen stays at the tablesaw but switches to the miter gauge to define the shoulders.



the tenons in the divider and the shelves should all be identically located. Four tenons per panel is ideal here. The tenons and haunches on the horizontal members are left the full thickness of the workpiece. But the tenons connecting the sides to the top are slightly different. Because the outside face of the sides will get tapered, you need a shoulder along the outside face. This way, the thickness of the tenons and the haunches will not change when the board is tapered.

At this point I use the tenon layout on the horizontal members to lay out the mortises in the sides. Since the pair of boards that make up each side will be separated by $\frac{1}{4}$ in., I put $\frac{1}{4}$ -in. spacers between them while making the transfer. Although I've already laid out the tenons on the top of the sides, I don't lay out the mating mortises in the underside of the top just yet. I'll wait until all the other joinery is cut and I can dry-assemble the case and be absolutely sure of the tenons' location.

Make some mortises

I make the full mortises by drilling out the waste with a Forstner bit, then cleaning up with a mallet and chisel. Alternately, you could rough out the mortises with a plunge router. Next I rout the dados for the haunched section of the joint. I cut these stopped dados at the router table, carefully lowering the workpiece onto the bit and using stop blocks to limit travel. The haunch, or stub tenon, will be $\frac{1}{8}$ in. long, but make the dados slightly deeper than that. When the joint is closed, the three shouldered areas on the tenoned workpiece will contact the sides, but the haunches won't bottom out in the dados.

I prefer side-hung drawers, which require a shallow dado in the case side to house the drawer runner. That can be cut now (or after the tenons are cut) at the router table. For details on making and hanging the drawer, see the Master Class, "Side-hung drawers," p. 84.

Take on the tenons

Once the mortises in the sides are complete, it's time to cut the tenons on the horizontal members. Use a tenoning jig on the tablesaw to cut the tenons to width, cutting right on the line. Then use a miter gauge with a tall fence to cut the outside shoulders. I cut slightly to the waste side of the baseline and later clean up by paring with

Groove for the back panel



Divider and top shelf get grooved. A dado head creates the $\frac{1}{4}$ -in.-wide groove to receive the back panel of the drawer pocket.

a chisel. After the tablesaw work is complete, bandsaw the waste from between the tenons, leaving a haunch $\frac{1}{8}$ in. long. Between the center two tenons, bandsaw close to the baseline, then pare down to the line with a chisel.

Now it's time for the fun—getting the joint to fit and seat. Since the tenoned panel is still slightly over thickness, it's not going to fit the mortises completely. But you can check the side-to-side fit by lifting up the far end of the board and inserting a tip of the tenons into the mortises. If necessary, return to the tablesaw to adjust the fit. The panel can then be carefully run through the planer to take off a whisper, or handplaned to fit using a sharp smoother. It's easy to go past the point of no return, so care and patience are essential. Plane the joints to a tight fit, and then finish-sand until the joint comes together snugly but with little effort. With such a complex assembly, you don't want much resistance when you apply the glue and pull the case together. The perfect dry-fit is one that just slides together and seats without any gaps.

More mortises

With most of the main joints cut and fitted, there are some smaller, simpler mortises to cut. The $\frac{1}{4}$ -in.-thick panel at the back of the drawer pocket is captured in four grooves. I cut through-grooves in the horizontal dividers at the tablesaw with a dado set. For the stopped grooves in the sides, I use a detail router with a $\frac{1}{4}$ -in.-dia. bit and a clamped-on fence. I don't put any glue



Easy transfer. With the divider dry-fitted into the sides, transfer the location of the groove for the back panel.



Small router for a stopped groove. Cut the stopped groove for the back panel with a detail router fitted with a fence (left). The small mortise for the book stop's tenon (below) can be routed with the same setup used to cut the stopped groove for the back panel.



Taper the sides

Create a shoulder, then the taper. The tenons at the top of the sides get shouldered on the outside face. This prevents the tenons from being altered when you taper the board's outside face.



Inclined plane. Taper the sides using a jointer plane and working to layout lines on the edge of the workpiece. Switch to a smoothing plane to create the final surface.

Taper number two. The cabinet sides are tapered in width as well as thickness. Make this angled cut on the bandsaw and clean it up with a handplane.



on the panel, and I leave a heavy $\frac{1}{16}$ -in. gap in the top groove to allow expansion of the panel.

The book stop at the back of the lower shelf gets tenoned into the sides and splined into the shelf. To cut the mortises for the book stop's tenons I again use the detail router, set up just as it was for the stopped grooves in the sides. For the spline groove—in both the book stop and the lower shelf—I use the tablesaw. Alternately, you could dispense with the spline and make a book stop with an integral tongue along its length that fits the groove in the shelf.

The final bit of joinery is for the stretcher that runs beneath the lower shelf and has proud through-tenons on each end. To make the “mortises” for the stretcher's tenons, cut mating notches in the sides using a miter gauge and a dado set on the tablesaw. Refine the notches with a chisel. To cut the tenons, start by using a handplane to shave the width of the stretcher to a perfect fit. Then use the tenoning jig at the tablesaw for the cheeks and the miter gauge for the shoulders.

Time to taper

The next step is to taper the sides. They taper $\frac{1}{8}$ in. in thickness from bottom to top, and I use handplanes for this. I remove the bulk of the wood with my jointer plane, stopping just shy of the layout line. Then I perfect the surface with a smoothing plane, which will give me a surface ready for finish. If I were making multiple nightstands, I might make a tapering jig for the planer, but for just one or two, tapering by hand is probably more efficient—and certainly more fun. To cut the taper in the width of the side, bandsaw to very



Last bit of layout. With the case dry-assembled, invert it and use the tenons to lay out the mortises in the top.

Exacting assembly

All finished but not done. Having already sanded all the parts to 320-grit and applied an oil and wax finish, Cullen starts the glue-up (left) on a moving blanket. To protect the sides during clamping, Cullen made plywood cauls with cutouts for the proud stretcher tenons. When the case joints were clamped tight, he dry-fit the top and left it in place as the glue on the case joints dried.



near the layout line and smooth the edge with hand-planes. Again, progress from a jointer to a smoother.

Getting to the glue-up

I sand and finish all the parts before assembly, which makes the finishing simpler and more consistent and prevents problems with glue squeeze-out. All the parts should be sanded to 320-grit, wiped down with a damp rag to raise the grain, and sanded again with 320-grit to prepare for the finish. I prefer a tung-oil finish for claro walnut followed by a light coat of wax. I use painter's tape to mask off the joinery so that no finish—and especially no wax—gets on the glue surfaces.

This is a fairly complex glue-up and is best approached in two steps. First glue up the case with the top just dry-fitted. Then, when the glue cures, the top can be glued to the base. It's paramount in the first glue-up that everything is well thought out; the clamps and cauls should all be ready and the parts should be clearly labeled and set out. I find that the best time for a glue-up of this magnitude is early in the morning when my mind is clear and bright. About 15 or 20 minutes after each glue-up, check the piece for squeeze-out; the semi-dried glue should peel from the waxed wood surface. □

Michael Cullen makes furniture in Petaluma, Calif.



The lid is last. With the case cured, Cullen glues on the top. He uses narrow cauls to focus the clamping pressure directly above the cabinet sides.

Beautiful



FRAMED BY SOLID WOOD

Two approaches, a world of possibilities

Thibodeau builds veneered furniture in two ways, framed by solid wood or mitered seamlessly. Either way, the veneer is a design playground, allowing techniques not possible in solid wood.



MITERED CASES



Cases from Plywood

Smart joinery turns eye-catching panels into sturdy furniture

A lot of articles have been written about making veneered panels with a vacuum bag. Most of these take you as far as trimming the panel and popping it into a door frame, or maybe applying edging and turning that panel into a tabletop. Those techniques are important, but there's much more you can do.

I've been building entire case pieces with veneered panels for years. With them, I can make pieces that are simply not possible with traditional methods. I love the cre-

BY CRAIG THIBODEAU

ative freedom: the variety of exotic woods and dramatic figure available, the ability to make patterns with these veneers (see Master Class, *FWW* #240), and then being able to wrap these woods and patterns around an entire piece. Another great benefit of veneered panels is that I can give the interior of a case a completely different look.

Although there is not a lot of information available on building furniture this way,

I've learned how to make the process easy and the results flawless. The first secret lies inside the panel itself.

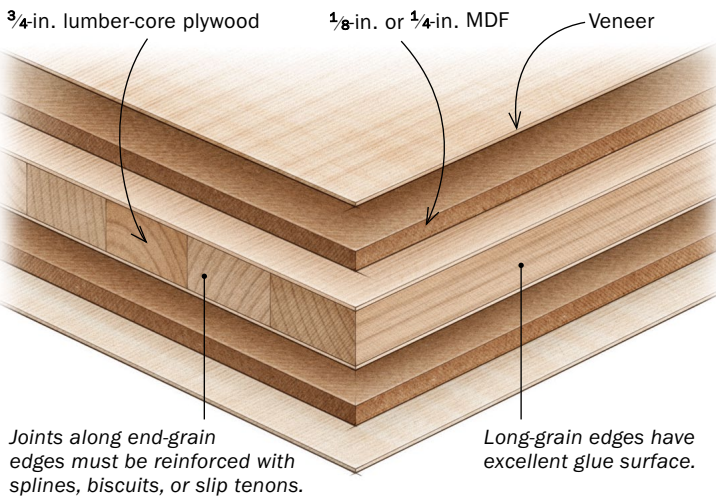
The core is the heart of the method

How you build with veneered panels depends a lot on what they're made of. The usual candidates for core materials involve a trade-off. Baltic-birch plywood, for instance, is very strong and stable, and holds fasteners well, but it's expensive and heavy. MDF, which I used for years, is cheap and

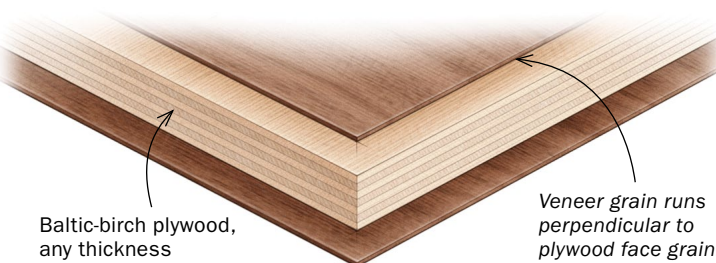
BETTER SUBSTRATE FOR VENEERING

Thibodeau's main substrate is lumber-core plywood, skinned with thin MDF. Lumber-core is relatively light but holds glue and fasteners better than other sheet goods. MDF thickens the panel and creates a flawless surface for veneering. For thinner parts like doors and dividers, he veneers directly onto Baltic-birch plywood.

CUSTOM CASE PANELS



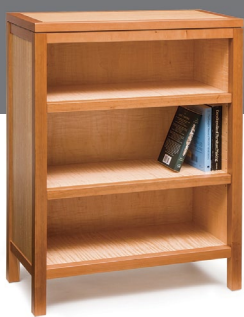
SOLUTION FOR THINNER PARTS



Before applying veneers, one extra step. Leave everything oversize at this point, but leave one edge of the plywood core slightly proud to act as a reference edge when trimming the panel later. Apply glue to just one face of each layer using a 3/4-in.-nap adhesives roller.



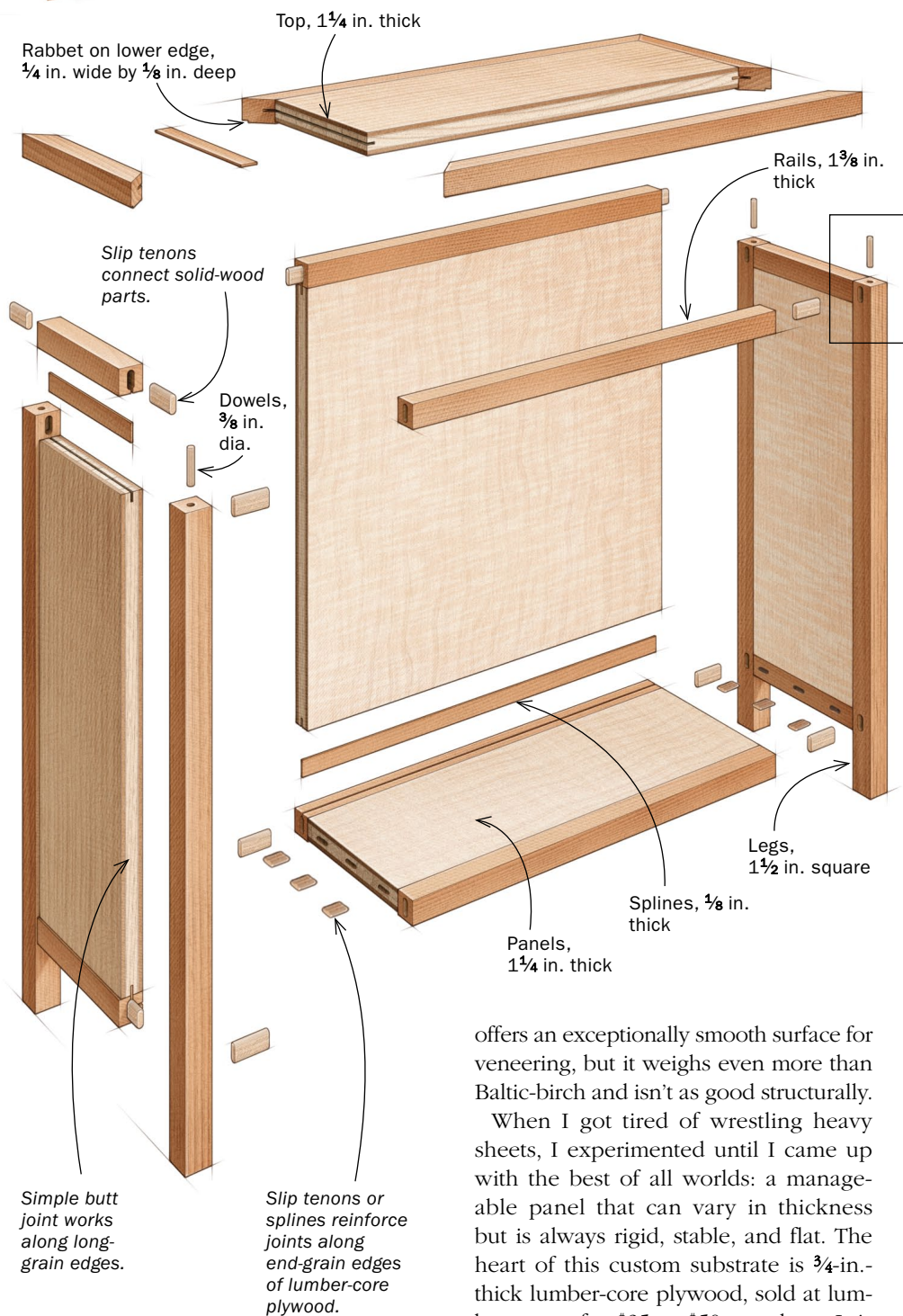
Vacuum bag is fast and easy. Thibodeau uses evacuation cloth to transfer the vacuum from the hose inlet to the glue-up and evacuation mesh to distribute the air pressure evenly. Both are available from vacuum-press.com (product Nos. EVC38 and EVN36).



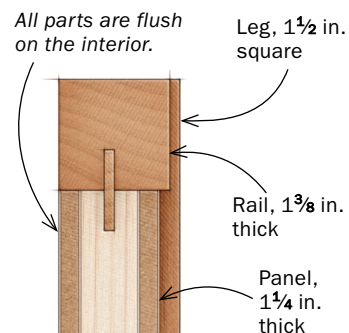
Frame-and-panel case

NEW METHOD FOR A TRADITIONAL LOOK

Thibodeau uses customized veneered panels and clever joinery to build a frame-and-panel case. He varies the thickness of the parts to create reveals and shadow lines on the outside. Inside, he keeps everything flush for a seamless interior.



THREE DIFFERENT THICKNESSES
A 1/8-in. reveal between each part creates attractive shadow lines.



glue joints, and the whole panel takes fasteners well, such as splines, screws, biscuits, and more.

To this core I typically add a skin of 1/8-in.-thick MDF on each side. This gives me the perfect surfaces I need for veneering. If I want thicker panels I use 1/4-in. MDF for the skins or add a second layer of lumber core in the center.

Making custom cores doesn't take much extra effort: it's just one more glue-up before the veneering stage. I cut the parts 1 in. oversize in each direction, so alignment isn't critical. I apply yellow glue to one face of each layer, and then put the sandwich in the vacuum bag for an hour or two. Then I apply the veneer in a separate step. One helpful tip is to leave one edge of the lumber-core plywood slightly proud so it can be used as a reference edge when trimming the panel to final size later.

For thinner case components like doors and drawer dividers, I go back to simple Baltic-birch plywood as the substrate. It's available in a variety of thicknesses. For a stable panel, be sure to run the veneer grain at right angles to the grain on the face of the plywood. These thin components tend to have exposed edges, which I veneer first before veneering the faces. To see how I do that, go to FineWoodworking.com/extras.

Frame the panels for a traditional feel

The bookcase at left illustrates how I use solid-wood members to frame veneered panels. When using this frame-and panel

START WITH THE SIDE PANELS

These frame-and-panel assemblies are the foundation for the rest of the piece. When cutting the joinery, Thibodeau references off the inside face, where everything should end up flush.

Attach the rails
first. A simple butt joint won't work on the end-grain edges of the plywood. Groove the rails and panels on the router table using a slot-cutting bit.



Glue in splines. For full strength, cut the splines so the grain runs across the short dimension.

anatomy, I vary the thicknesses of the parts to create reveals (little steps), while keeping everything flush on the inside surfaces to make joinery easier and the interior seamless. It's the best of both worlds: a traditional look on the outside and a nice surprise within. Make things easier on yourself by sanding all of the parts before assembly. By the way, the outside panels on this piece are curly anigre, the interior is curly maple, and the shelves are also curly maple, edged with cherry.

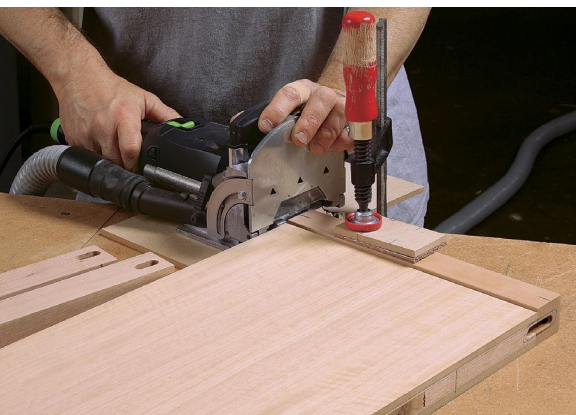
I always build the side assemblies first, because they act as a foundation for the



Trim everything to width. Now rip both edges clean on the panel-and-rail assemblies. The plywood panel was left proud on both sides to ride the rip fence effectively. Thibodeau puts blue tape on the leading and trailing edges to prevent blowout.

ADD THE LEGS

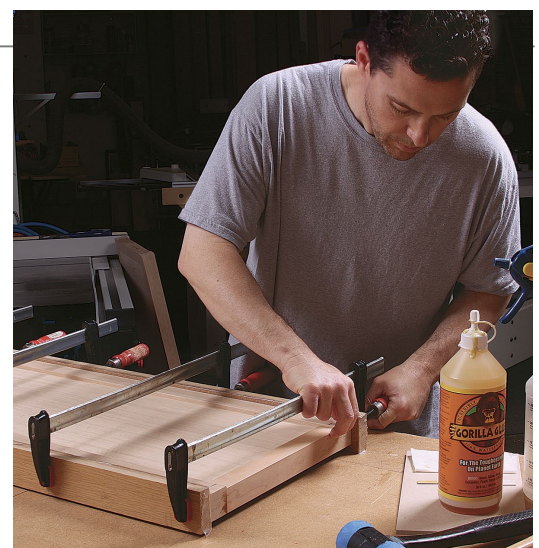
Slip tenons run between all the solid-wood parts in this cabinet. When cutting the tenon mortises, always reference off the inside surfaces.



Domino is slick and quick. It's as easy as a biscuit joiner, and the parts can usually lie flat on the bench. The Domino is designed to center joints on $\frac{3}{4}$ -in. plywood, so shim it up for thicker parts.



Router option. Another way to tackle the mortising is to use a plunge router equipped with a guide bushing and spiral upcut bit. A slotted template clamped to the workpiece guides the router.



Glue on the legs. Thibodeau protects the pre-sanded legs with cauls. Check that the tops of the legs and back of the panel end up flush. A dead-blow mallet corrects any misalignment.

ADD THE BOTTOM AND BACK

Glue on the rails, and then trim each panel to final width. Before joining the back and bottom to create a big L-shape, cut the mortises for the slip tenons that will join them to the side assemblies. Here Thibodeau uses the Domino system, but splines or biscuits would work, too.



Make an L. Join the back and bottom, which share a rail. Check for squareness with an accurate framing square, making adjustments by shifting the clamps slightly. Again, use cauls to protect sanded surfaces.



Transfer the joinery. Dry-fit the back and bottom assembly onto one of the sides, and transfer the joinery locations from one assembly to the other (top). Thibodeau uses an MDF or plywood panel as a fence for the Domino. He uses a saddle square to transfer the tick marks to the fence (bottom).

rest of the piece. The solid rails at the top and bottom of each panel are secured using full-length splines, a few small Domino tenons, or biscuits. I join the side assemblies to the legs using slip tenons inserted into the rails (the mortises can extend into the panel, too). You don't need splines along the sides of the panel, though you could use them to ensure alignment. The lumber-core plywood has long grain on those edges, so a simple glued butt joint is plenty strong.

It doesn't matter how you cut the mortises that join the rails to the legs, but it's important to reference off the interior surfaces so the parts end up flush there. These days I use the Domino system throughout my veneered pieces, but before that I used a simple router template (see p. 63 for a photo, and Gregory Paolini's article "A Guide to Guide Bushings," *FWW* #207, for a full explanation).

With a router jig, there is more measuring and marking to get the locations and

reveals right. The Domino requires far less fussing and you can work with the panels and assemblies flat on the benchtop. The Domino centers its mortises on $\frac{3}{4}$ -in.-thick stock (or close to it), but all it takes is a thin piece of MDF or plywood to shim it up for thicker panels and pieces.

At this point the top of the case is open. The actual top, with its edges framed with mitered solid-wood pieces, is simply doweled down onto the case. To be sure all the dowels line up, I use an elegantly simple guide, one of my favorite jigs (see drawing, opposite page).

The top seems to float, but that effect is created simply by cutting a small rabbet into its lower edge.

Mitered corners for a seamless look

The liquor cabinet on p. 66 is another example of the fun you can have with veneer. The main veneers and solid-wood parts are walnut, while the top panel, the interior, and the panels I cut into the sides

and doors are curly anigre. The little detail beads are wenge. These window inlays wouldn't be possible in solid wood. I cut them after the cabinet was assembled, to be sure they lined up, and used a router template for the job.

This cabinet showcases my other favorite method of joinery for veneered work. Its main box—the back, two sides, and the narrow solid edging that surrounds the doors—is built with miter joints.

The case then goes onto a base that is made up of a bottom panel surrounded by a frame, with legs doweled from below. The top's anatomy is just like the one on the bookcase, except that it is beveled on its lower edge instead of sitting on a rabbet. Both top and bottom are attached with dowels, using the same type of drilling guide I made for the bookcase.

It all starts with the mitered case. I use a sliding tablesaw to cut the long miters, but careful setup of a conventional tablesaw can produce clean bevel cuts. Attach a sacrificial



Fence ensures perfect alignment. Thibodeau uses the Domino vertically against the fence, following the tick marks.



Add one side at a time. Attach one side, clamp it, and let it dry. Then add the front rail and the final side as shown. Again, cauls protect the sanded surfaces.

fence to your rip fence and bury the blade in the fence at 45°—exactly at the height of the thickness of the panel. Take time to get the fence perfectly aligned so the blade cuts a clean miter without taking anything off the top face. Otherwise, the workpiece will dive inward as you finish the cut, creating a gap in the joint. To dial it in perfectly, use a cutoff section of one of the actual panels, and then cut one more piece to make sure two miters add up to a clean, square joint. Also, make sure all of the parts are trimmed to final size before beveling them.

Safety note: The offcut will be trapped between the blade and fence, and it does shoot out sometimes, so stand out of the way as you make the cut.

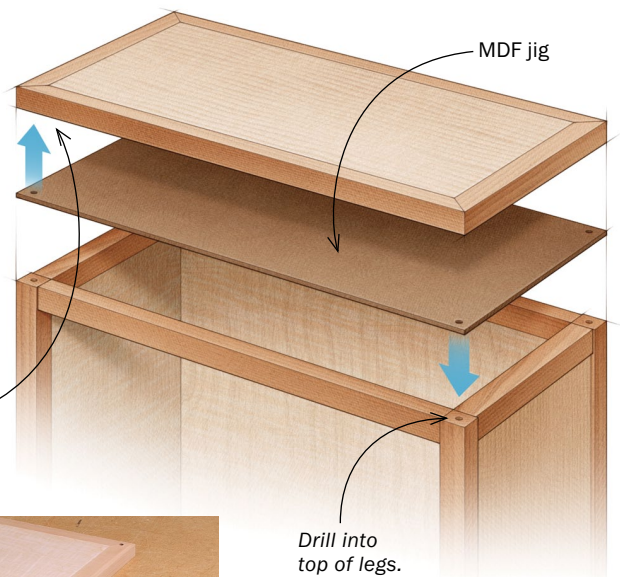
I made the two narrow stiles that flank the doors from solid walnut, veneering the door fronts with vertically oriented walnut veneer to create continuous grain across the front of the cabinet.

Front is actually four parts—The front of this cabinet is different from the

DOWELING JIG LINES UP THE TOP

A few dowels are all you need to align and attach the top. Since it is a veneered panel, wood movement is not an issue. A slick drilling jig lines up the dowel holes.

Drill into underside of top.



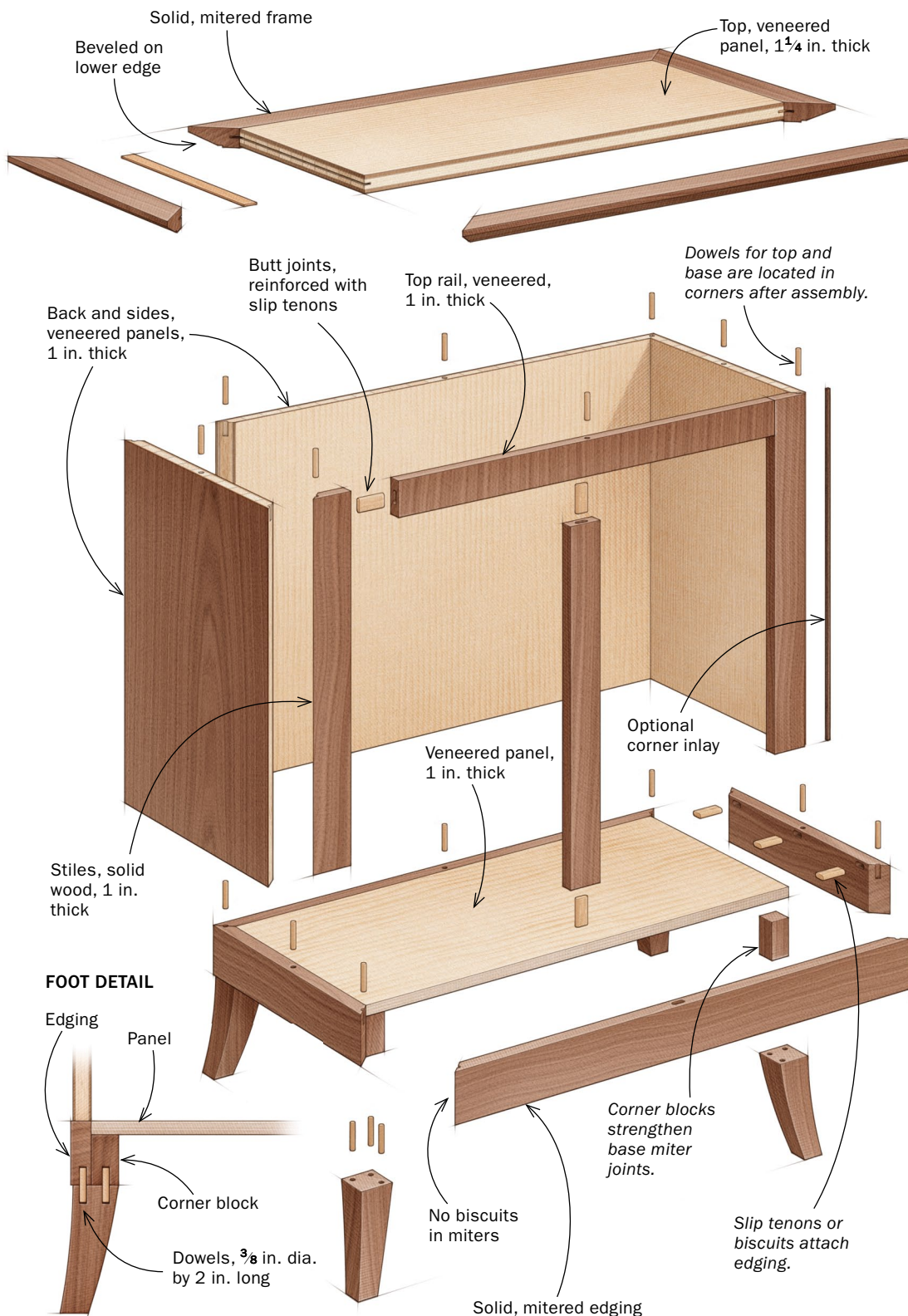
Case first. Cut a piece of MDF the same size as the case, and mark it so the holes will land squarely in the legs. Clamp the jig to the case and drill. Put tape on the bit to set the depth. Clamp the jig to the top to drill shallower holes into its underside.



Mitered case

MITERS ARE STRONG AND SEAMLESS

To wrap veneer seamlessly around an exterior, Thibodeau uses mitered joinery. This system is very fast, and the lumber-core plywood creates strong joints without the need for splines.



previous one, with stiles that take the place of the solid posts, and a veneered top rail that attaches to those stiles before final assembly. There is also a solid center stile, which goes in as the top and bottom are added to the case. So after mitering the edges of the side stiles, use more slip tenons to attach the upper rail that connects them. That rail is solid walnut, veneered on both sides, with the grain running vertically for invisible seams with the side stiles.

My favorite part about the miter approach is assembly. You simply apply packing tape tight along the outside of the pieces, add glue, and then fold up the miters to clamp them. I usually don't reinforce the miters with splines, since they have so much long-grain glue surface already. This is just another place where the lumber-core plywood is a big benefit.

Easy corner inlay—I sometimes inlay a strip of solid wood, like the wenge I used here, into the corners of mitered cabinets. These small details add flair, protect the veneer from dings and damage, and hide a not-so-perfect miter. You can notch the corners of small boxes on the tablesaw, but for big casework like this I use a handheld router and a rabbeting bit.

Once the case is done, build the base and top to fit, and then attach them using dowels and a drilling guide. □

Craig Thibodeau is an award-winning furniture maker in San Diego.



Article Extra

Learn how Thibodeau edges flat veneered panels like the doors on these cabinets.

SIMPLE APPROACH TO A FUSSY JOINT

Thibodeau cuts case miters at the tablesaw, burying the blade in a sacrificial fence. It takes some trial and error to fine-tune the setup, but the results are flawless.



Buried blade is foolproof. If the workpiece wanders, or you don't press it down near the blade, you won't ruin the edge. Just make another pass to ensure a clean miter.



Flip 'em and tape 'em. Flip all the parts outside-face up, stretch clear packing tape across each joint, and then run long pieces down each one to add strength and stop squeeze-out.



Stick trick. It's hard to turn over all of the parts without loosening the tape, but two sticks make it easy to grip and flip the panels.



Glue and fold. Brush a thin layer of glue on all of the mitered surfaces, and then fold up the whole assembly and add the front rail (left). Throw a clamp across that rail, and then add a spacer and clamp at the bottom of the cabinet to be sure the whole thing comes together square (above).

Corner inlay is a nice touch

If your miter joints have a few gaps or you want a contrasting detail, it's easy to add solid inlay to the corners.

Solid inlay, $\frac{3}{16}$ in. square



Rout a rabbet. Use the smallest router you have, and either an edge guide (shown) or rabbeting bit to cut a square recess in the edge. Start with a shallow climb cut to avoid tearout.



Tape trick. Cut the edging just a hair oversize. Strips of blue tape are all the clamps you need. Stretch them to pull the inlay tight in its channel. Trim the inlay flush after the glue dries.

Double Bridle Joint

Twin tenons maximize strength and add decorative flair

BY IAN GODFREY



When I was learning to build furniture at the Inside Passage School in British Columbia, I saw a chair by College of the Redwoods graduate Ben Green that used a double bridle joint. I immediately admired the joint for its strength and understated beauty.

Unlike the standard bridle joint, which is often used in cabinet-door frames, the double bridle joint is better suited to a structural role in furniture. The double mortises and interlocking tenons provide ample glue surface, making the joint incredibly strong even in narrow stock.

With an alternating pattern of end grain and edge grain, the joint is handsome enough. But it also can be dressed up with a mitered inside corner that can be shaped to create a smooth transition from rail to leg. I have been using the joint since I first saw it. It is great for joining a leg and sled foot for a stool, chair, or bench.

Here I'll show you how to cut the basic joint for a tight fit with minimal fussing. Then I'll show you how to cut and shape the mitered corner.

Start with the tenons

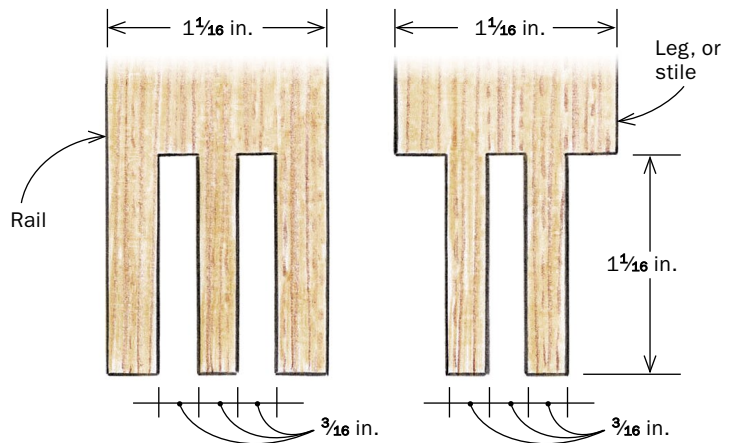
I cut the joint at the tablesaw and rely on setup pieces to help dial in the fit. You'll need a pair of them, one for each half of the joint. Use a full-size drawing to transfer the layout for the joinery to these pieces.

I cut the interlocking portion using a shop-built tenoning jig and a rip blade for a clean, flat-bottomed cut. The blade height will remain the same throughout this process, so get it set precisely using one of the setup pieces.

Start with the center mortise on the stile (or leg) and alternate between that

Strength and beauty

With its interlocking tenons, the double bridge joint ensures plenty of glue surface for a strong, long-lasting connection. The exposed joint draws the eye and is easily shaped to invite the hand, as on Godfrey's Danish-cord bench.

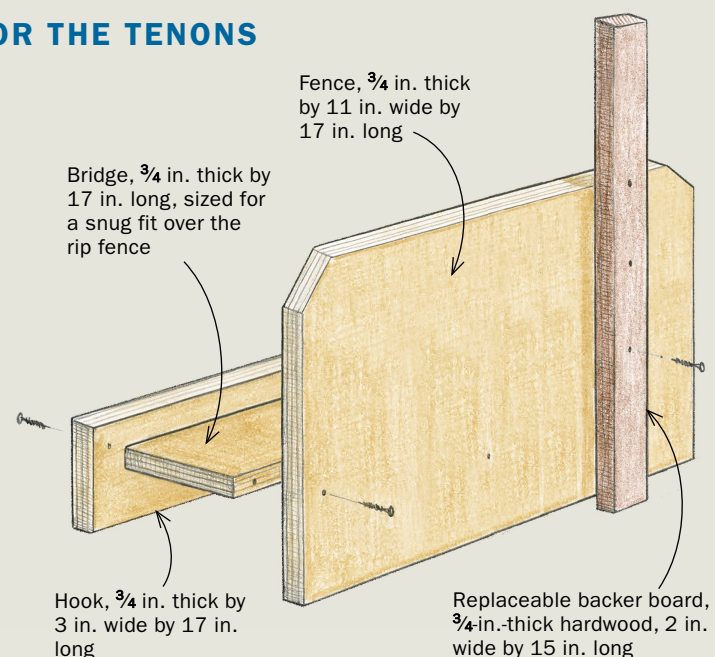


Layout helper. Godfrey uses adhesive paper to mark the layout on setup pieces. The paper makes it easy to see layout lines and prevents the pencil from wandering on coarse-textured stock.



SIMPLE JIG FOR THE TENONS

To cut the twin tenons, Godfrey uses a plywood jig that rides the rip fence. A rip blade with a flat-top grind ensures flat-bottomed cuts. A backer board prevents tearout and holds the work squarely to the table (attach the backer with screws so it can be replaced as needed). He coats the bottom of the bridge with wax to help it travel easily along the saw's fence.



Cutting and fitting

STILE MORTISE

1

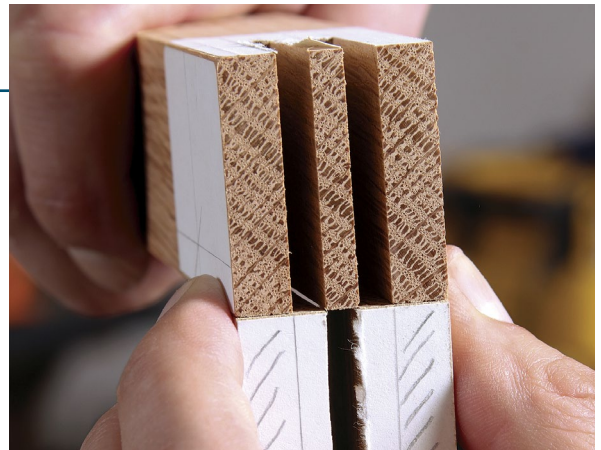
Align the blade to one face of the tenon cheek. Make a cut, then rotate the stock to cut the other cheek for a perfectly centered mortise. The blade height stays the same until you cut the shoulders.



RAIL MORTISES

2

Align the blade to one side of a mortise. Make a cut, and rotate the stock to make the same cut in the second mortise. Adjust the fence and repeat the process to finish the mortises. Eyeball the fit.



STILE CHEEKS

3

Cut the outside cheeks of the tenons one at a time, leaving a tab on each side. Remove most of the tab on the bandsaw so you can check the fit (far right) before trimming the shoulders on the tablesaw.



and the mating rail as you go. To position the fence, align the blade with the layout line of one of the tenon cheeks (see Step 1 above).

With the fence set, clamp the stile to the tenoning jig, making sure that it is tight against the saw table, the jig's fence, and the backer board, and make the cut. I typically design the mortise to be a little wider than the kerf of my sawblade. This lets me rotate the piece front to back to make the second cut and create a perfectly centered joint. To cut the twin mortises in the rail, use the setup piece to set the fence. Cut one cheek, then rotate the workpiece to cut the same cheek on the opposite side. Adjust the

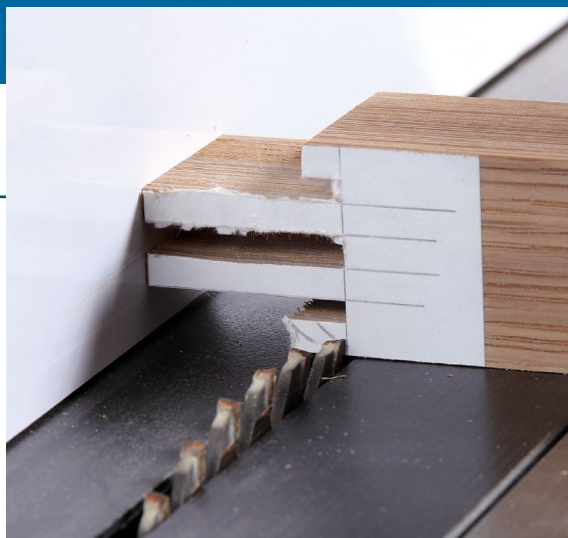
fence to cut the opposite walls. With this done, switch back to the stile and cut the outer cheeks of the two interlocking tenons. The final step is to remove the tabs of waste left behind when you cut these outer cheeks. First cut away the ends of these tabs at the bandsaw. This way, you can check the fit without altering the tablesaw setup.

When you're sure of the fit, use the tablesaw and miter gauge to cut the tenon shoulders. Reset the blade height so that it just removes the waste and does not cut into the tenons. You'll use the fence as a stop block. Position it to locate the cut in line with the base of the tenons. An added benefit of removing material at

4

STILE SHOULDERS

Trim the shoulders using a miter gauge and the fence as a stop block so the cut is right on the shoulder line. The joint should come together at this point.



5

FINE-TUNE AND GLUE UP

The final step is to fine-tune the fit if necessary and assemble the parts.

TIP



Sanding block for tight spaces. To ease a too-snug fit, Godfrey carefully sands using P120-grit paper glued to a thin plywood sanding block.



the bandsaw first is that you make the tablesaw cut safely, without binding the waste material between the blade and fence.

The joint should come together under moderate pressure with a snug friction fit. If it's too snug, lightly sand the tenons with P120-grit sandpaper on a flat sanding block. Once the fit is perfect, glue up the joints.

Mitered haunch is easy to do

The mitered version of the double bridle is cut the same way as the standard version. You just have to cut the stock a bit oversize so you'll have enough material to create the miters.

After cutting the interlocking portion of the joint, cut the miter on the inside edge of each workpiece using a crosscut blade, tilted to 45°. Clamp a stop block to your miter gauge to locate the workpieces precisely, dialing in the block's location with test cuts on the setup pieces. The point of the miter must meet the base of

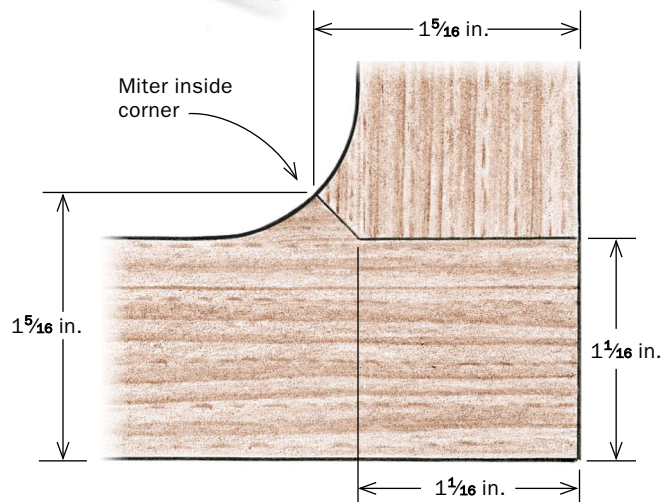


Elevate the work for glue-up. Godfrey supports the work on blocks and clamps each joint in both directions, ensuring that the joint fully seats (above). Finally, he clamps vertically across each joint (left) to ensure a good bond.

Add a miter for a rounded inside corner

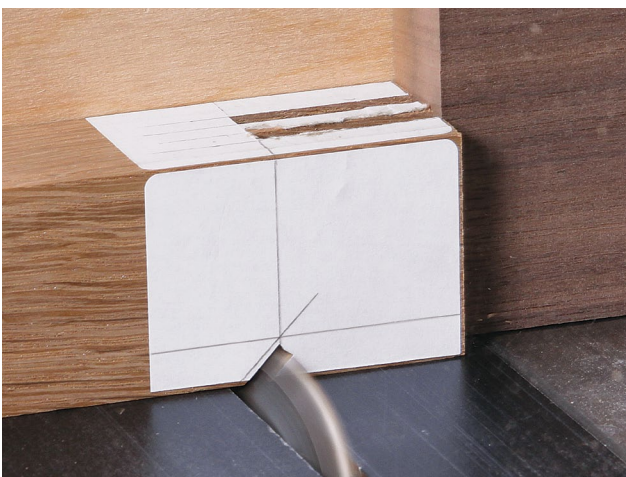


Godfrey's Danish-style rocker features the double-bridle joint at both the armrests and the rockers. Each joint is enhanced with a contoured inside miter.



the tenons; otherwise, you will wind up with a miter that comes together before the bridle does, or vice versa. Avoid setting the blade too high or you'll cut into the bridle joinery. Better to leave it low by $\frac{1}{32}$ in. or so and then clean up carefully with a chisel. The next step is to remove the short length of extra material along the tenons, between the miter cut and the end of the workpiece. I do this at the bandsaw, with the workpiece riding the fence.

To clean up the bandsawn surfaces and adjust the miter's fit, I use a router table and my widest straight-cutting bit raised so that it just touches the raised portion of the bandsawn surface. Use the fence on your router table and again make sure that you do not cut into the miter. You may have to make multiple passes. Check the fit as you go. Afterward, use a wide chisel to pare a crisp intersection between the miters and the bridle portion of the joint.



Angled cuts make the miter. Leave the blade a fraction low, to avoid cutting into the bridle joinery, but position the workpiece so that the miter's point will meet precisely with the bridle's shoulder (above). Trim the excess at the bandsaw (right), guiding the cut with the fence.

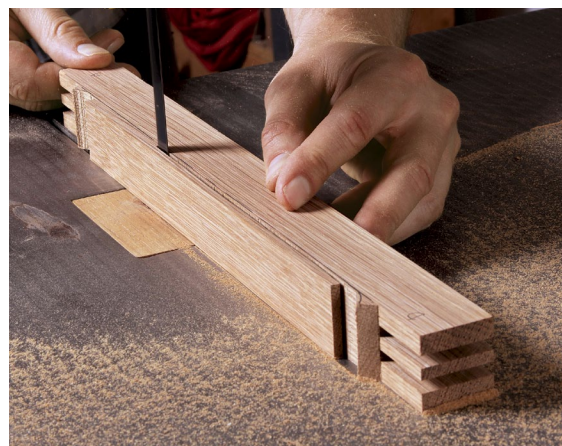




Fine-tune the fit. Godfrey uses a straight bit at the router table to trim the ends of the tenons (above). The table's fence is set to stop the cut at the bridle joint's shoulder. Then pare the miters so that their faces meet the shoulders of the bridle joint (right).



Shape the inside curve. Dry-fit the joint and lay out the curved profile (left). Bandsaw the waste on each part before glue-up (below) and fair the curve with a rasp and file after the joint is assembled (bottom).



If the miters are tight but there are gaps in the bridle joints, you'll need to remove material from the miters, recutting them at the tablesaw or paring them slightly. If the bridle joints are tight and flush but the miters have gaps, use the router-table setup to take a little more material off the edges of the tenons.

Now it's time to shape the inside corner. With the joint dry-assembled, mark the final thickness of the parts and use a template to trace the radius of the inside corner. Take apart the joint and use the bandsaw to trim the parts to width and to rough out the radiused portion. Clean up the sawn surfaces using a hand-plane, rasp, or sandpaper. (You could also pattern-rout the parts to save cleanup time.) After gluing up the joint, fair the adjoining surfaces with rasps, files, and sandpaper.

You now have some visually interesting, robust joinery that looks a lot more complicated than it actually is. □

Ian Godfrey makes custom furniture in Roberts Creek, B.C., Canada.



readers gallery

PETER BOTTEN

Lakewood, Ohio

Botten was inspired to build a Federal card table after seeing Steve Latta's table on the cover of *FWW*'s 30th anniversary issue (#180). Being an Ohio native, he replaced the traditional paterae motifs with carnations and cardinals—his home state's flower and bird—on the top and on the legs. It's hard to believe, but this was Botten's first attempt at veneer and marquetry work.

MAHOGANY, HOLLY, AND WHITE OAK,
18D X 36W X 29H



MARIO RODRIGUEZ

Philadelphia, Pa.

This book-matched slab coffee table pays homage to the work of George Nakashima. Making it allowed Rodriguez to introduce movement through details like the turned, tapered post and the serpentine stretcher. The hand-fit butterfly key caps off the piece and highlights the notch in the top.

ASH AND WALNUT, 24D X 44W X 17H



Submissions

Readers Gallery provides design inspiration by showcasing the work of our readers. For submission instructions and an entry form, go to FineWoodworking.com/rg.



KELLY PARKER

Parkville, Mo.

In this table, Parker harnesses repeating shapes, floating components, and negative space to enhance the design. Each of the top's nine pieces is connected with aluminum dowels. The beveled edge on the aluminum base was cut on the tablesaw.

RECLAIMED WALNUT, BIRD'S-EYE MAPLE,
AND ALUMINUM, 15D X 15W X 19H



JUSTIN DANGER

Fort Bragg, Calif.

Danger wanted to emulate the traditional fall-front desk while “progressing the form with a bit of a Danish Modern feel.” This was his first exploration into veneer work, and he focused the composition on the thin, dark streaks in the shopsawn acacia veneer.

KWILA, ACACIA, AND CHESTNUT,
14D X 26W X 54H

Photo: David Welter



THOMAS DOLESE

Bellingham, Wash.

This settle was designed to be featured in the center of a room where its curved, buttressed legs are visible. “I’ve made a number of settles for clients,” says Dolese, “but I wanted to add a sense of liveliness to the form with this piece.”

SAPELE AND BUBINGA,
33D X 62W X 29½H

Photo: Matt Bergsma

PETER MICHELINIE

Bridgewater, Vt.

In place of traditional stretchers, Michelinie used bent tapered laminations to join this desk's legs for improved stability. He said the design came out of his "love/hate relationship with the ever-popular Mid-Century Modern" style.

WALNUT, MAPLE, AND BRASS,
21D X 55W X 29H



KEITH NEER

Batavia, Ohio

Neer began woodworking 40 years ago when he bought a lathe and "made some really ugly Christmas gifts." He's come quite far in the years since then. This table and chairs were his final submission toward becoming a Fellow at the Marc Adams School of Woodworking.

CHERRY,
TABLE, 42DIA. X 29H,
CHAIRS, 22D X 18W X 40H

MICHAEL FORTUNE

Warsaw, Ont., Canada

This versatile set of tables has reversible tops that allow them to switch from a pair of side tables to one large coffee table to a pair of leather-padded seats, and every combination in between. Fortune reclaimed the steam-bent ash for this project from a tree killed by the emerald ash borer.

ASH AND JAPANESE TAMO, 22D X 46W X 16H





JERRY COUSINS

Weaverville, Calif.

Cousins built this music stand as a gift to thank the San Francisco Bay Area chamber music group that puts on a free festival in his rural community each year. "I present them with a music stand to be used for the group, given to a musician, or auctioned as a fundraiser."

BUBINGA, EBONY, AND WENGE, 20½W X 44H

Photo: Harvey Spector



HARVEY BAKER

Waynesboro, Tenn.

The lumber for this sugar chest was taken from a 46-in.-dia. cherry tree cut from the historic Grassmere plantation in Davidson County, Tenn., after the property was converted to a wildlife park. Baker based the design on the traditional Tennessee sugar chests from the Civil War era, which were made to store the precious commodity.

CHERRY AND POPLAR, 19D X 31¾W X 38¾H

Photo: Bob Schatz



THOMAS NORDSTROM

Encinitas, Calif.

- Inspired by the work of Sam Maloof, Nordstrom built this secretary for a client. The wooden hinge swivels around a solid aluminum rod and the desk's lower drawers have concealed locks for secure storage.

PERUVIAN AND CLARO WALNUT, 18D X 36W X 48H

Photo: Ed Kessler

Machinist's calipers

WHEN YOU NEED
AN EXACT MEASUREMENT,
NOTHING BEATS THIS PRECISION TOOL

BY TIMOTHY ROUSSEAU

Machinist's calipers may seem like a strange object to find in a woodshop, but when you need to measure something very accurately there isn't a better tool for the job. Consider joinery. For a strong glue bond, a joint should be snug enough that the pieces won't fall apart from gravity alone, but not so tight that they need to be pounded together. That's a small margin of error, and a few thousandths of an inch can make a big difference.

Having a tool that will tell you exactly how big a tenon or mortise is takes away the guesswork as you sneak up on the perfect fit.

The same goes for dados, rabbets, and many other joints. You can also use calipers for machine setups of all kinds, so you can nail the fit on the first try.

THREE TYPES

Vernier calipers are the oldest type, and take some effort to read precisely. Dial calipers are precise but have only one scale, in decimals, fractions, or metric. Digital calipers are Rousseau's favorite. They zero out and switch scales with the push of a button.



1 TWO SETS OF JAWS

Outside for thickness. Use the outside jaws to measure the thickness of a part such as a tenon, so you know how much more you have to trim off.



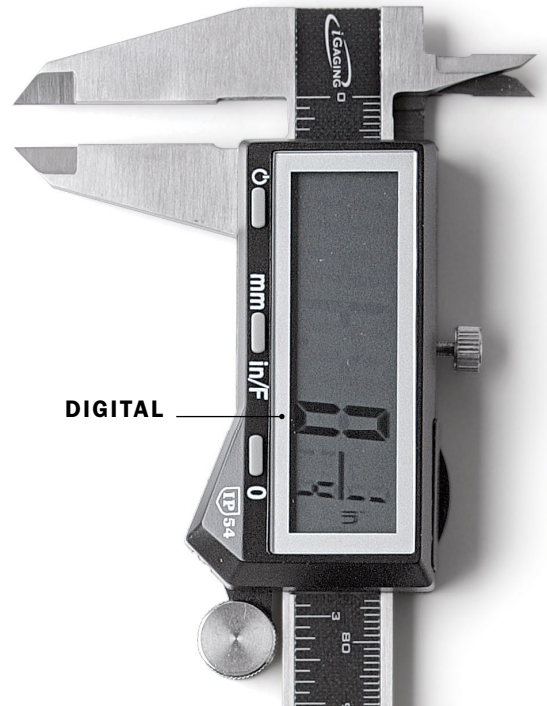
Inside for width. Use the inside jaws to find out exactly how wide a mortise is before cutting the tenon. They are also great for positioning a jig on a workpiece, and dozens of other tasks.



VERNIER



DIAL



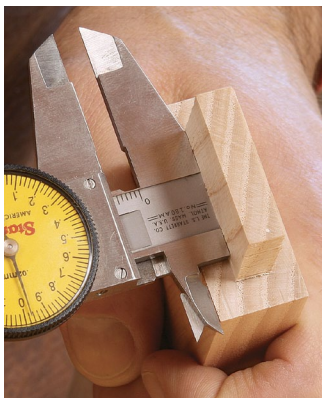
DIGITAL

A mortise-and-tenon joint shows how calipers can provide precise information to achieve perfect results.

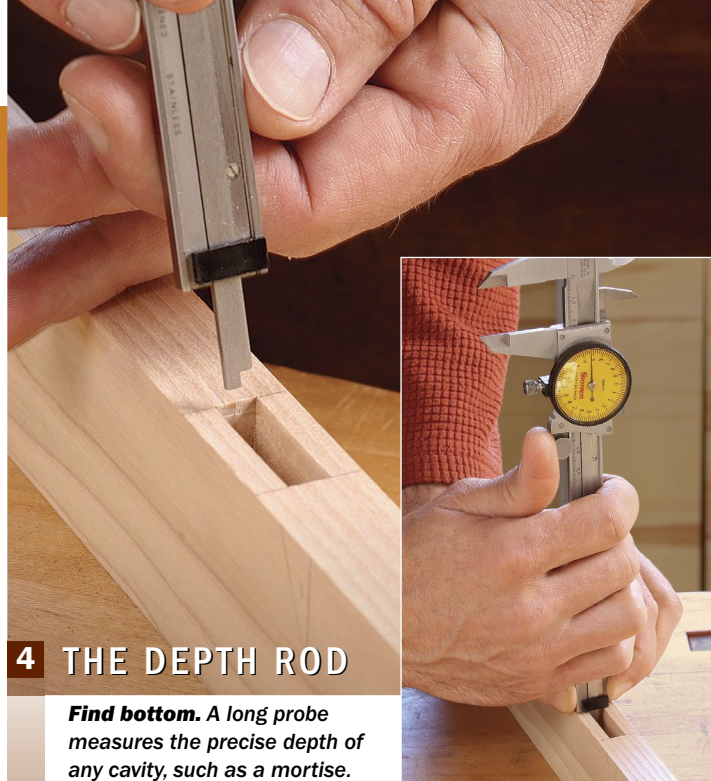


3 THE SECRET STEP

Square and steady. The step on the back of the sliding jaw is often overlooked. It registers squarely against the edge of a workpiece while the end of the tool is used for measuring.



Measure or mark. The step lets you use the end of the jaws as a depth stop of sorts, for measuring distances (left). You can also slide the tool along an edge for marking and scribing (right).



4 THE DEPTH ROD

Find bottom. A long probe measures the precise depth of any cavity, such as a mortise.



Add magnets and make machines digital. Use these standoff magnets from Lee Valley (leevalley.com) to attach calipers to a metal surface, and then use the depth rod to make precise adjustments to fences, jigs, and more.



Dial or digital, take your pick

There are three types of machinist's calipers. Vernier calipers, with their simple sliding scale and fractional markings, are bombproof but less precise than other types. That's because they are hard to read closely, especially if your eyesight is not 100%.

Dial calipers are very precise but vulnerable to breaking if dropped, especially if you buy a cheap one. They also take a moment to read accurately.

My favorite type of calipers is digital. The beauty of digital is instant readability and the ability to switch scales. Most will display thousandths of an inch, fractions of an inch, and metric. I find fractions pretty useless on calipers, but I often

switch to metric to make math easier. The model I recommend to my students is the 6-in. Electronic Digital Caliper from iGaging, a steal at around \$25 online.

How to take a measurement

Calipers can make a precise measurement in four ways. Most people know about the first three. At the business end you'll find two pairs of jaws that can grab the outside of a workpiece or the inside of a cavity or hole of some

kind. When using these jaws, you have to make sure you are not skewing them and getting a false reading. It helps to take a couple of measurements to be sure.

At the far end of the tool you'll find a probe, which moves when the jaws move and measures the depths of holes and mortises. Here, I make sure the body of the tool is touching the surface squarely and then I plunge the probe. Again, I take a couple of readings to make sure I'm getting an accurate one.

A fourth and lesser-known technique is to use the step between the two jaws, on the back of the tool, to measure the distance from an edge. All types of calipers have it. The probe can do a



Article Extra

Download a simple fraction-to-decimal conversion chart.

Perfect dado joints

Whether fitting a dado to plywood or planing a solid shelf to fit, calipers speed up the process.

Check the dado.

Use the inside jaws to find the precise width of any dado. For an accurate reading, lay down the calipers as flat as possible, so the jaws sit squarely in the opening.



Check your stock. As you plane down your stock to fit, take measurements to see how close you are.



Use the magnet trick. Attach the calipers to your planer with magnets, so you can adjust the bed precisely for the final pass.

similar measurement, but the advantage of the jaw step is that it registers squarely, without wobbling. With the step riding the edge of a workpiece you can also use the caliper as a layout tool, the way you would use a combination square, but with 0.001-in. precision.

There is a lock knob on top of the jaws, which is helpful when you are working to a specific dimension and you don't want the setting on the caliper to change. And the dial (both digital and analog) can also be zeroed out in any jaw position.

Perfect mortises and tenons

When making mortise-and-tenon joints with power tools, calipers are a real star. After the mortises are cut, calipers tell you exactly how big they are. You might think that the mortise will be the same size as your router or mortising bit, but runout in the router or problems with a jig or machine setup could change that dimension. By measuring the actual mortise, you can make tenons to fit.

If you prefer cutting joinery entirely by hand, calipers are just as indispensable, checking that the walls of a mortise are parallel to each other and to the outside of the workpiece. Once you have the mortise true and straight, the calipers will tell you if the tenon is staying even in thickness as you cut, and help you dial in the fit.

Precise machine setups, too

Calipers are also indispensable for machine setups, for example when running stock through the planer until it fits perfectly into a dado. I use the inside calipers to take a measurement of the dado, and then use the outside ones to sneak up on the right thickness.

When I get close, I actually stick the calipers onto the planer using a set of standoff magnetic tool holders from Lee Valley. This setup lets me gauge the exact amount I am moving the cutterhead. I just love getting a perfect fit on my second pass, simply by measuring. It saves a bunch of time over guessing.

When going in the other direction—fitting a dado to plywood, for

Nailed. After the final pass on the planer, the shelf fits its dado perfectly.



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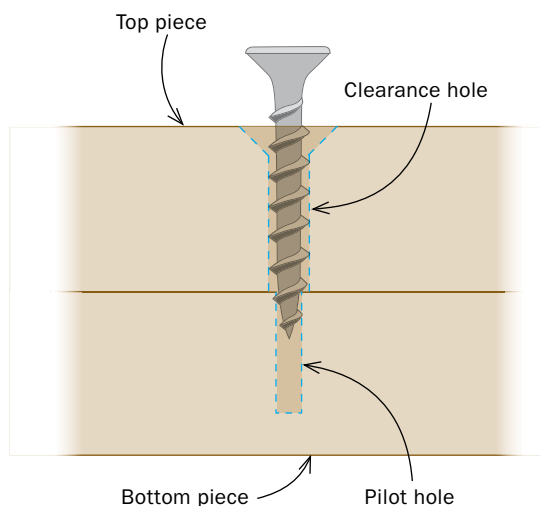
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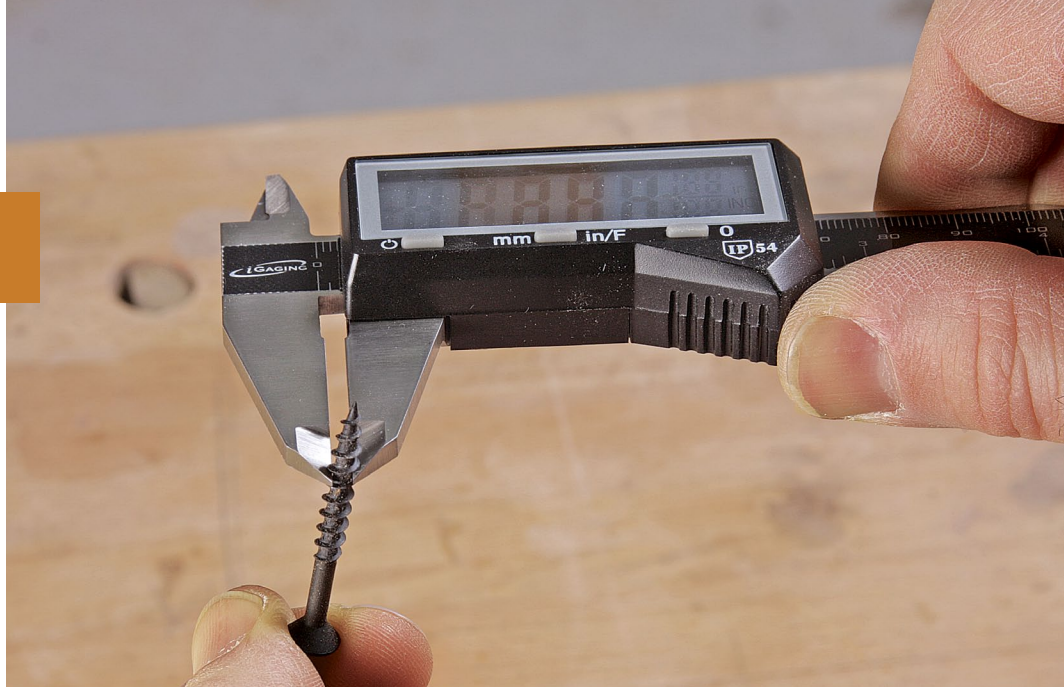
example—I use the calipers to micro-adjust the dado stack for a perfect fit. First I assemble a dado stack that is close, but just under, my shelf size and run a test piece. Then I measure the shelf again, and the dado, and hunt through the shim set with the calipers to find exactly what I need to add to the stack.

Stronger screw connections

Another great task for calipers is sizing the holes for screws. It is very important for the screw to pass freely through the top piece being attached. This is called a clearance hole. The lower piece of wood gets a pilot hole, which is smaller, letting the threads grab the wood firmly without splitting it.

Put simply, calipers are an information-gathering tool, maybe the best one in the shop. And better information leads to better accuracy. □

Timothy Rousseau builds furniture in Appleton, Maine, and teaches at the Center for Furniture Craftmanship in nearby Rockport.



Pilot and clearance holes.

Use the skinny part of the jaws to reach between the threads and measure the central section, called the root (above). Use the flat part of the jaws to measure the outside of the threads (left).



Dial in the bits.

Fractional drill sizes can be confusing. Keep it simple by using the decimal scale to pick the right bit.

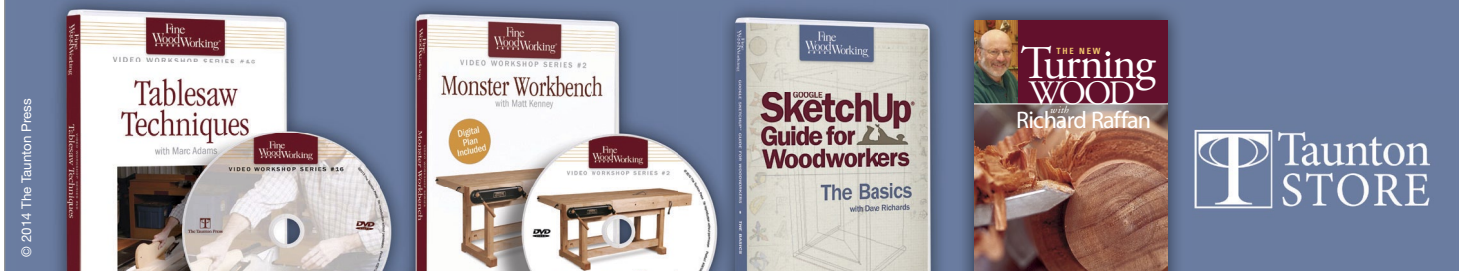


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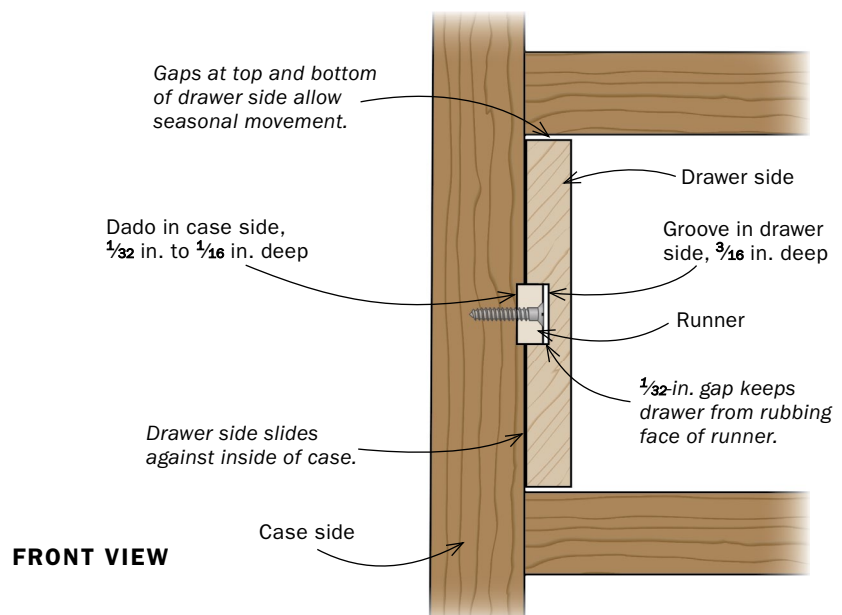
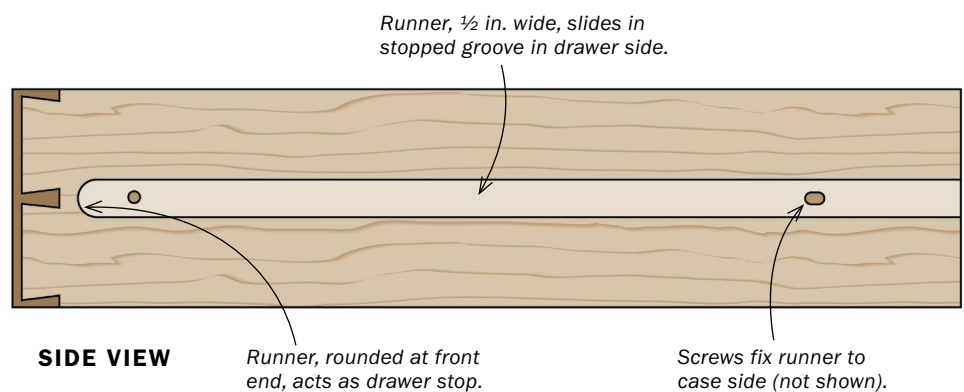
Side-hung drawers

BUILD SMOOTH-SLIDING
DRAWERS THAT SURVIVE
THE SEASONS

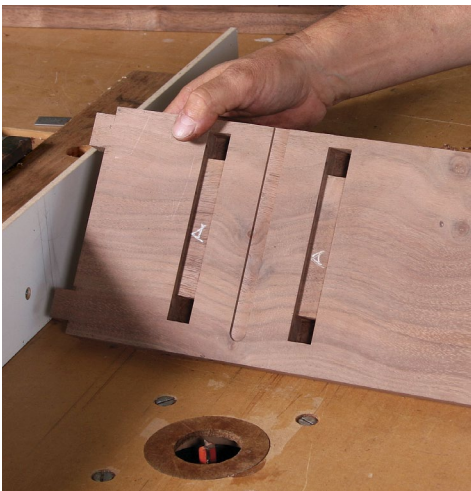
BY
MICHAEL CULLEN

I learned to make drawers under the tutelage of David Powell, who trained in the 1940s in his native England at the renowned Edward Barnsley Workshop, where furniture was still made entirely by hand. As a result of his training, Powell could do handwork with extraordinary efficiency and accuracy. The drawers he made were simply beautiful, each one so elegantly constructed it could have been a jewelry box. The proportions of the parts and the spacing of the finely cut dovetails immediately drew your eye and conveyed a sense of purpose and permanence. And how they functioned! They slid with a velvety smooth action and without the slightest jog or rattle.

After emigrating to the United States in the 1960s, Powell altered his drawer design. The drawers he'd learned to build at Barnsley's, sized to fit the drawer pocket snugly in height as well as width, couldn't deal with wild swings in humidity, so he began making drawers that were grooved on the sides and slid on wooden runners. Since the seasonal movement of a solid-wood drawer is almost entirely in its height, Powell made his drawers so they still fit snugly side to side, but were suspended in the pocket with space for expansion above and below. This solved the humidity problem, and Powell found that side-hung drawers were also easier



Mill the runners



Rout for the runner. To prepare for the side-hung drawers, Cullen routs the $\frac{1}{16}$ -in.-deep stopped dado for the drawer runner.

to fit and smoother in operation. A side-hung drawer, he saw, could be pulled way out without pitching forward, and when pushed in, the runner would act as a stop. In addition, the usual wide gap above a drawer front was replaced with equal, narrow reveals above and below it. And with the drawer sides snug to the pocket, the runner was never visible. I've been using side-hung drawers for 30 years now. Here's how I make them.

Do the dadoses

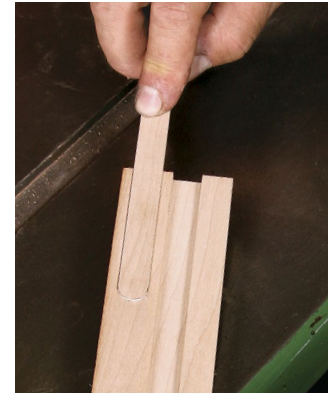
Begin by routing dadoses for the runners in the case sides. These are purely for location and can be as shallow as $\frac{1}{32}$ in. You'll be screwing the runners into them, but don't be tempted to skip the dado and rely on screws alone—the dado offers insurance that the runner won't migrate over time. To keep from compromising the integrity of the case side, I never make these dadoses deeper than $\frac{1}{16}$ in. While at the router table, cut two $\frac{3}{16}$ -in.-deep test grooves—one stopped, one through—in a scrap piece. The test piece will help you fit the runners.

Make the runners

Runners are best made from a dense, straight-grained hardwood like oak or maple, either rift- or quartersawn. Rough out blanks ahead of time so they acclimate to the shop. Make the blank wide enough



Fit the blank. Make a blank wide enough to produce all the runners you'll need. Plane the blank until it just fits a test groove.



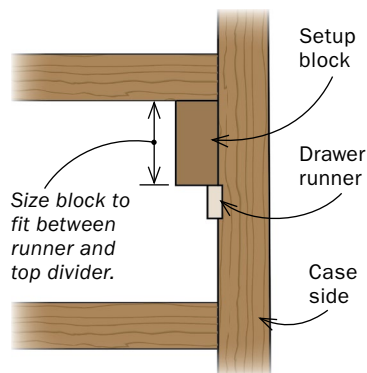
Round the nose. After slicing the blank into runners, sand the leading end round to match the end of the groove. Check the fit with a stopped test groove.



Screwed, not glued. Place the runner in the shallow locating dado in the case side, then fix it with screws. It's good practice to elongate the screw hole in back, for solid cases.

Groove the drawer sides

Size a block for setup. Using a setup block to locate the fence on the router table, rout the runner groove in the drawer side in one pass.



Contact the case, not the runner. Leave a gap between the face of the runner and the bottom of the drawer groove. The drawer will be suspended on the runner but will slide against the case side.



A little bit off the top and bottom. After fitting the drawer sides tight to the drawer pocket, trim $\frac{1}{16}$ in. off the top and bottom edges to allow for seasonal wood movement. Cullen gangs the drawer sides and trims them in the planer.



to slice into all your runners, and plane it so its thickness just fits the test groove, with little friction or play. Slice the blank into runners at the bandsaw, jointing the edge of the blank after every slice. For small drawers I make runners $\frac{3}{16}$ in. thick by $\frac{1}{2}$ in. wide; for large drawers $\frac{5}{16}$ in. thick by 1 in. wide. Runners for medium drawers fall in between. At the disk sander, round the leading end of each runner with a few quick pivots. Check the rounding in the stopped test groove.

Then cut the runners to length, and drill and countersink them for flathead screws. The screw at the front should be an inch from the end of the runner; the screw at the back should be 2 in. or 3 in. from that end to provide clearance for screwing it in after the case is assembled.

Groove the drawer sides

Next cut the stopped grooves in the drawer sides. The drawer should be ready to assemble at this stage, with all the joinery cut. For a middle-sized drawer like the one shown, the groove in the side needn't be more than $\frac{3}{16}$ in. deep. Cut this stopped groove on the router table. Determine the location of the stopped end based on how deep you want the drawer front to sit in the case.

Fit the drawer

The last and most important step is fitting the drawer; this should not be done

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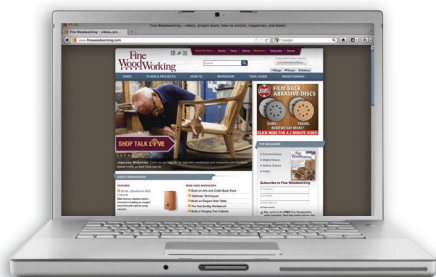


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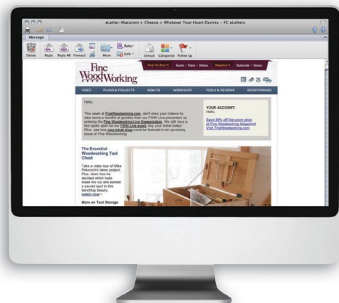


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Assemble and fit the drawer

Clamp and trim. After assembling the drawer box and letting the glue cure, plane the sides as needed to achieve a smooth, snug fit in the drawer pocket.



when you're tired or pressed for time. The drawer should fit snugly side to side in the drawer pocket at this point—it's good if there's some resistance to sliding. The trick is to figure out where the friction is. Unscrew the runners and see whether each one slides freely in its mating drawer groove. Next, check that the pocket is square and its sides parallel; do the same with the drawer. If everything checks out, begin handplaning the sides of the drawer, taking care to remove the same amount everywhere along the surface. Insert the drawer in its pocket and move it back and forth quickly; then, under a strong light, check the sides for burnished areas that will tell you where the drawer is hanging up. Plane off just a slight amount from these areas. Slow down and work ever closer to a perfect fit without going past it.

The last step, where I differ from Powell, is to add a very light coat of shellac and wax to the outside of the drawer side and the inside of the case. With the wax buffed, pull out the drawer and push it closed with one finger placed to one side. The drawer should slide back into the case without hesitation. This is a side-hung drawer with a piston fit. □

Michael Cullen carries on English Arts and Crafts furniture traditions in Petaluma, Calif.



The front is last. With the sides trimmed to fit, carefully plane the edges of the drawer front to achieve narrow, even reveals on all four edges.



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how they did it

Asian-flavored apprenticeship

BY JONATHAN BINZEN

For Aaron Levine, who built this quilted Western maple and lacewood tansu chest (see the back cover) during his apprenticeship, the cabinet was a curriculum unto itself. Among the techniques he learned in the process were cutting shopsawn veneers in

highly figured wood, shooting their edges with a handplane and laying them up into panels in a vacuum press; building and fitting frame-and-panel sliding doors; and building NK-style drawers. “None of this was extraordinary woodworking,” Levine says now, “but I remember it being very challenging to me.” All of this was welcome, since he picked the tansu precisely because it was packed with such an array of parts to make and challenges to meet.

DAZZLING VENEER



Out of the bag and into the cabinet. After sawing the quilted maple veneers for the sliding door panels, Levine glued them to a plywood substrate in a vacuum bag. He also veneered the cabinet top, bottom, sides, and back. The drawer fronts are solid.

QUILTED DRAWERS



Drawers without dovetails. To echo the drawers in traditional Japanese tansu, which are typically nailed or pinned, Levine joined his with small brass screws (left). He built NK-style drawers, which have runners fixed to the bottom. For details on NK drawers, see “A Better Way to Build Drawers,” FWW #150.



TANSU ON WHEELS

Make it mobile. Levine added wheels, traditional on certain tansu. His brother, a metalworker, welded up a set from sections of steel pipe and steel plate, and Levine patinated them to resemble stone. The axles are stainless steel. Levine used DeStaCo clamps as parking brakes.





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Traveling Tansu

When Aaron Levine built this rolling tansu chest, based on a traditional Japanese furniture form (like the one below right), he was at the beginning of his woodworking career, serving an apprenticeship under Ross Day in Seattle. Day, drawing on his own training under James Krenov, guided Levine through every step, teaching him dozens of new techniques. Despite all the technical lessons packed into the project, however, “the real epiphany,” Levine recalls, had to do with design. “I idolized Ross’s work, and I wanted to be just like him.” But Day’s furniture was understated and quietly refined, and Levine, with a background in fine art, was attracted to “surfaces that were decorative,

active, and complex.” After finding some astonishing quilted Western maple, he decided to use it for the chest. When it was built and he sprayed the lacquer finish, “this wood that had looked somewhat exciting just exploded in depth and color. It was thrilling—I’ll never forget it.” Looking back across the years now, Levine says that building the piece taught him that even if there was much still to learn from other craftsmen, “to progress as a designer I have to follow my own instincts.”

—Jonathan Binzen



Photos: courtesy Aaron Levine (top); Jonathan Binzen (inset)

How They Did It Turn to p. 90 to see how Levine tackled the challenges of making this tansu chest.



Audio Slide Show Watch an audio slideshow covering the dynamic furniture Levine has made since this chest.