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- Cherry bar stool
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Mitered dividers for casework, p. 52

10" 2 HP HYBRID TABLE SAW 40TH ANNIVERSARY EDITION

- Motor: 2 HP, 120V/240V (prewired for 120V) single-phase, 15A/7.5A
- Rip capacity: 30" right 15" left of blade
- Max. depth of cut @ 90°: 3/4"
- Max. depth of cut @ 45°: 2 1/4"
- Table size: 40 1/4" W x 27" D
- Distance from front of table to center of blade: 15 1/2"
- Floor-to-table height: 35 3/4"
- Arbor: 5/8", 3450 RPM
- Max. width of dado: 1 3/16"
- Overall dimensions: 64" W x 40 1/2" D x 36" H
- Approx. shipping weight: 297 lbs.



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WARNING! †

10" 5 HP 240V TABLE SAW 40TH ANNIVERSARY EDITION

- Motor: 5 HP, 240V single-phase, 23A
- Rip capacity: 32" right 14" left of blade
- Max. depth of cut @ 90°: 3"
- Max. depth of cut @ 45°: 2 1/2"
- Table size: 48" W x 27" D
- Floor-to-table height: 34"
- Arbor: 5/8", 4200 RPM
- Max. width of dado: 1 3/16"
- Overall dimensions: 66" W x 47" D x 40" H
- Approx. shipping weight: 575 lbs.



CSA 177335

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WARNING! †

22" X 42" VARIABLE-SPEED WOOD LATHE

- Motor: 3 HP, 240V, 3-phase, 8A
- Required power supply: 240V, single-phase, 20A
- Swing over bed: 22"
- Swing over tool rest base: 18"
- Distance between centers: 42"
- Spindle speed: Variable, 100-3200 RPM
- Spindle threads: 1 1/4" x 8 TPI RH
- Spindle taper: MT#2
- Tailstock taper: MT#2
- Tool rest width: 14"
- Tool rest post diameter: 3"
- Overall dimensions: 81" x W 23" D x 49 1/2" H
- Approx. shipping weight: 611 lbs.



ETL Intertek 4000909

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G0766 ONLY \$2795

WARNING! †

6" JOINTER 40TH ANNIVERSARY EDITION

- Motor: 1 1/2 HP, 110V single-phase, 18A
- Max. width of cut: 6"
- Max. depth of cut: 1/8"
- Max. rabbeting depth: 1/2"
- Min. stock length: 8"
- Cutterhead type: 4-row V-helical, 24 inserts
- Insert size, type: 15mm x 15mm x 2.5mm indexable carbide
- Table size: 7 1/4" x 60"
- Fence size: 29 1/4" L x 4" H
- Overall dimensions: 60" W x 20 1/2" D x 40 1/2" H
- Approx. shipping weight: 307 lbs.



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WARNING! †

15" 3 HP EXTREME SERIES PLANER W/ HELICAL CUTTERHEAD

- Motor: 3 HP, 230V single-phase, 12A
- Max. stock width: 15"
- Max. stock thickness: 6 1/8"
- Min. stock length: 6"
- Max. cutting depth: 1/8"
- Cutterhead diameter: 3"
- Cutterhead type: 4-row helical, 52 inserts
- Insert size & type: 15mm x 15mm x 2.5mm, indexable carbide
- Cutterhead speed: 5000 RPM
- Feed rate: 16 FPM, 28 FPM
- Table size: 15" x 48"
- Overall dimensions: 37" W x 48" D x 44" H
- Approx. shipping weight: 553 lbs.



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WARNING! †

12" 5 HP PLANER/JOINTER W/ V-HELICAL CUTTERHEAD

- Motor: 5 HP, 220V single-phase, 25A
- Max. jointer cut width: 12"
- Max. jointer cut depth: 1/8"
- Max. planer cut width: 11 3/4"
- Cutterhead type: V-helical, 4-row, 48 inserts
- Cutterhead insert size: 15 x 15 x 2.5mm
- Planer feed rate: 22 FPM
- Bevel jointing: 0°-45°
- Jointer table size: 14" x 59 1/2"
- Fence: 5 3/4" x 51 1/2"
- end-mounted
- Fence stops: 45° and 90°
- Overall size: 67 1/2" W x 24" D x 41 1/2" H
- Approx. shipping weight: 704 lbs.



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G0634X ONLY \$3595

WARNING! †

17" 2 HP BANDSAW 40TH ANNIVERSARY EDITION

- Motor: 2 HP, 110V/220V (prewired 220V), single-phase, 20A/10A
- Cutting capacity: 16 1/4" left of blade
- Max. cutting height: 12 1/8"
- Blade size: 131 1/2" long
- Blade width range: 1/8"-1" wide
- Blade speeds: 1700, 3500 FPM
- Table size: 17" x 17" x 1 1/2" thick
- Table tilt: 10° left, 45° right
- Fence size: 6" H x 23" L
- Floor to table height: 37 1/2"
- Overall dimensions: 32" W x 32" D x 73" H
- Approx. shipping weight: 364 lbs.



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WARNING! †

3 HP PORTABLE CYCLONE DUST COLLECTOR

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WARNING! †

3 HP SHAPER

- Motor: 3 HP, 240V single-phase, 12A
- Max. cutter height: 2 1/2"
- Max. cutter diameter: 5 1/2"
- Spindle diameters: 1/2", 3/4", 1"
- Spindle lengths: 2 3/4", 3", 3 1/2"
- Spindle capacity under nut: 2", 2 1/4", 2 1/2"
- Spindle speeds: 7000, 10,000 RPM
- Spindle travel: 3"
- Table size: 28 1/4" W x 30 1/2" D
- Overall dimensions: 30" W x 30 1/2" D x 39 1/2" H
- Approx. shipping weight: 392 lbs.



CSA 177335

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Made you look

Follow along as we pick out our favorite woodworking videos that intrigue and inspire us. We hope they inspire you, too.

Online extras

Visit finewoodworking.com/303

VIDEO

At home in the shop

Built for living as well as working, the Maine woodshop of Charlie Durfee (p. 60) has evolved with its maker.



VIDEO

Router table mortises

Bob Van Dyke (p. 46) turns to the router table to create accurate and repeatable mortises.



VIDEO

Simple box, tricky lid

Barry Dima's box (p. 32) features a lipped, inset lid that can be difficult to make in quantity. Here's how he uses two uncommon but affordable router bits to do the heavy lifting.



VIDEO

Mix your own shellac

Canned shellac is convenient, but if you want more control over your finish, you'll need to mix your own. In this video, Mike Pekovich shows you how easy it is to make a batch of shellac from flakes.

VIDEO WORKSHOP

Learning Curve: Turning

Join two woodworkers—Anissa Kapsales and Ben Strano—right from the start as they learn to turn under the watchful eye of an expert, Windsor chair maker David Douyard. In this series, you'll learn the basics of turning, including:

- Initial shaping with a roughing gouge
- Creating V-cuts and beads with a skew chisel
- Accurately sizing tenons with a parting tool



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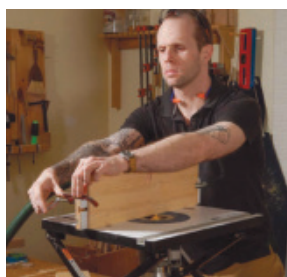
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contributors

Alex Dolese (“Floating-Top Table”) grew up in a family of builders and artists. After working alongside her dad, Tom Dolese, a professional furniture maker in Bellingham, Wash., Alex designed and built her own house in Bozeman, Mont., and embarked on her own woodworking career. She teaches and builds custom furniture at her Bozeman shop, and also teaches classes at Montana State University and the Port Townsend School of Woodworking. Alex helped to found the Bozeman Woodworking Guild, which supports novice woodworkers and local pros.



By the time you read this issue, **Barry NM Dima** (“Box with a Built-in Hinge”) will have left the United States and his job as *Fine Woodworking* associate editor to teach English in Vietnam. A graduate of Loyola University and the University of Maryland, College Park, Barry worked as an editor in Philadelphia before discovering the love of woodworking—in particular, carving—that brought him to *Fine Woodworking*. In his six years here, he’s grown as a woodworker and an editor, and he will be missed.

Readers who call us on the phone are always surprised to find that an actual human being picks up and talks to them. They soon find out that they have reached our secret weapon, **Betsy Engel**. She’s served as the voice of *Fine Woodworking* for 18 years, helping all sorts of readers, whether they have a woodworking question or a problem with technology or even if they can’t find a particular product. While she’s at it, she keeps our own band of ragtag woodworkers in line. Betsy, who grew up in Connecticut, is an accomplished rug hooker. And when she isn’t holding down the fort at *FWW*, she does the same job over at our sister publication, *Fine Gardening*.



In terms of shops, **Bill Pavlak** (Handwork: “Build a traditional frame-and-panel door: Part 2”) has come a long way from the workbench in his old apartment’s bathroom. His most notable space is Colonial Williamsburg’s Hay Cabinet Shop, where Bill serves as the supervising cabinetmaker, meaning he’s earned the bench with the best natural light. His home shop is less historic, but that makes it a better fit for his 18-in. bandsaw and combo jointer/planer. Bill doesn’t only burn electrons there though. His bench’s location took priority once more; it’s also near windows that let in wonderful light for handwork.

We are a reader-written magazine. To learn how to propose an article, go to FineWoodworking.com/submissions.

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Spotlight

ISSUE NO. 242
Sept/Oct 2014
p. 82

A sea chest for keepsakes

I just wanted to say thank you for your article on compound-angle dovetails. A few months back a friend and fellow shipmate (USCG) asked me to make him a shadow box chest. I have made shadow box chests for other shipmates but they resemble treasure chests (below). My friend wanted a sea chest. I'm ashamed to say that in the 23 years that I served, I thought a sea chest was only in the bilge of a ship! After some research, I found how deep in tradition and history this chest is and I was hooked. I didn't know where to begin. Compound angles and dovetails were my first concern. I have only completed three projects where I hand cut the dovetails.



Now I was going to try compound-angled dovetails! That's nuts! Your Master Class article "Compound-angle dovetails" (by Chris Gochnour, *FWW* #242) helped me a lot. It took out all the guesswork and all I had to worry about was cutting and chopping away all 48 dovetails.

This chest is made of sapele. Most work, including the dovetails, was done with hand tools. For the stand and lid handle I used red oak that I ebonized using steel wool and vinegar. The wood inside the chest is cedar from a barn in North Carolina. The boards were very old and beaten but beautiful after being planed. The dark wood that is used in the inlay is old decking from the USS North Carolina.

—MATT SCLAFANI, Newport N.C.



A better way to rip

I was delighted to see "The Bandsaw is a Ripping Machine" (*FWW* #302) encouraging us to expand our use of the bandsaw. I believe far too many people default to the table saw because setup and adjustment on a bandsaw

can be intimidating. Over time, the bandsaw becomes relegated to only small craft jobs. Keep up the good work by providing more articles on large projects that rely on a bandsaw over a table saw and while you're at it, how about a reprint of the *FWW* #174 article

"Shopmade Tension Gauge" to help folks tune up their bandsaws.

—MARK CONLEY, York, Pa.

Easier hold-down for carving

There is a much easier solution for holding work when carving than the Workshop Tip shown in the February issue (*FWW* #301). To hold a carving, simply place it on a router mat. To achieve a different "angle of attack," lift the carving, rotate it, and plop it back down. There are no vises or clamps to loosen and tighten, and nothing to build.

The simple friction of the router mat is sufficient to hold the carving, since as Mary May illustrates on p. 27 of the same issue, one wrist usually applies downward pressure on the carving. I learned this router mat trick over 20 years ago, and I have never had a carving slide. Also, occasionally you will want to rest your elbow on the surrounding bench surface for extra support. With the router mat solution, you have the whole table/bench surface at your disposal.

—JOHN OWEN, Cherry Hill, N.J.

A fix for broken teeth

Denny Spector's tip about fixing damaged teeth on a pull saw, ("Quick fix for a bent or damaged saw tooth," *FWW* #302) has been a tremendous help. As with so many who use the narrow-kerf, and somewhat fragile saws, his solution to removing bent teeth employing a stone worked for me in my shop (just now, actually). As with many other reader contributions and articles in *FWW*, I have learned a new process that makes my work just that much easier, and affordable. Kudos to Denny, and *FWW*!

—ED MAURER, Dunedin, Fla.

Correction

The drawing for "Hanging Shelf with Pegboard," (*FWW* #302, p. 35) has the wrong dimension for the depth of the shelf dados. They should be 1/4 in. deep.

Fine Woodworking®

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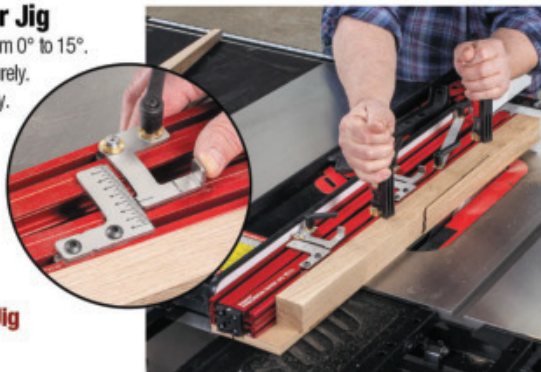
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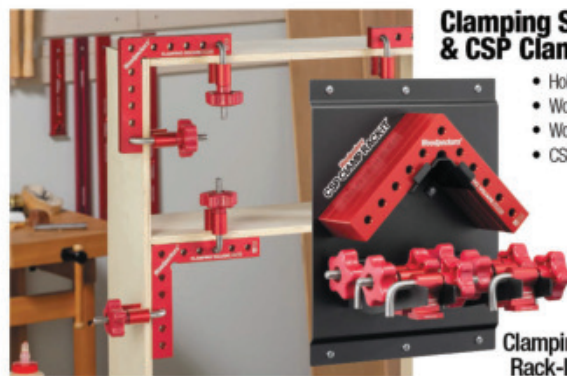
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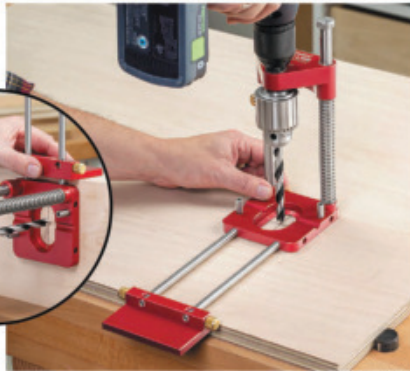
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workshop tips

Use your workbench as a vertical glue-up station

I've been working wood since my early 20s, and I've always found panel glue-ups to be both stressful and space-consuming. Tired of tying up my outfeed table for hours at a time, I came up with a vertical glue-up station that's both effective and efficient, and takes up minimal shop space.

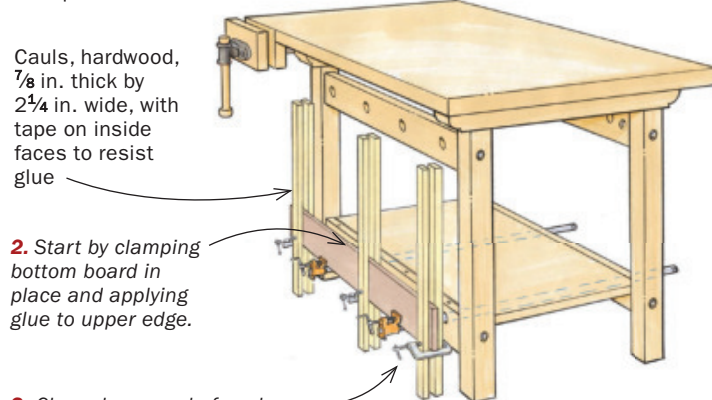
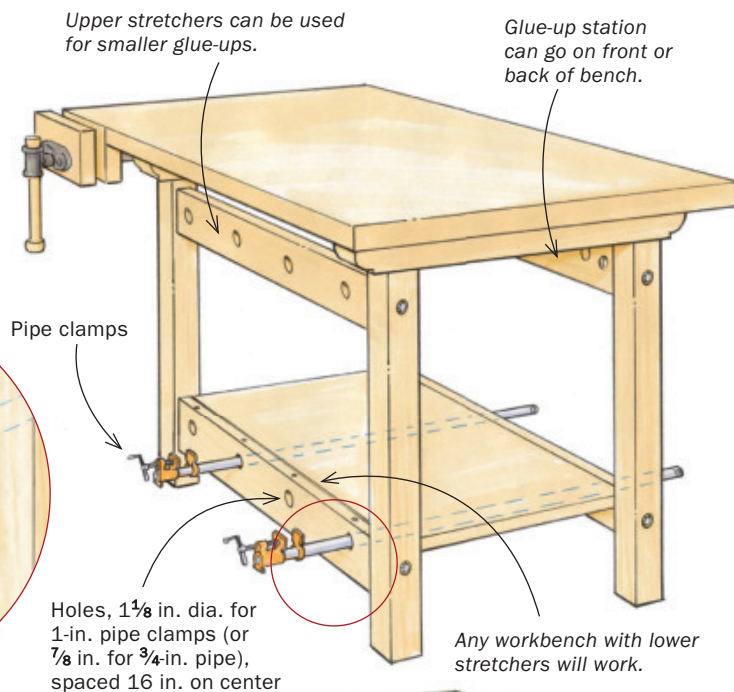
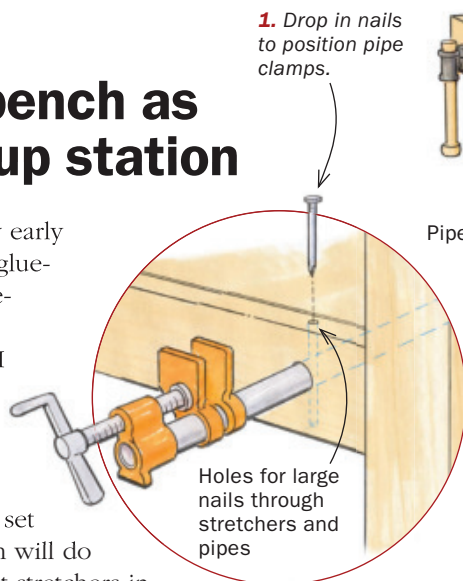
I used a wheeled workbench to set up my station, but any workbench will do as long as it has low to mid-height stretchers in the base that will hold pipe clamps as shown. If you have upper stretchers or wide aprons on your bench, you can place holes and clamps there for smaller glue-ups, so you don't have to bend over. But I usually place the pipe clamps in the lower stretchers, so I can rest the clamping cauls on the floor.

By the way, you can still work on the benchtop with a glue-up in place, and afterward, you can either slide the clamps back and out of the way or remove them altogether. The setup can also go on the backside of a workbench, keeping it completely out of the way.

I used 1-in. pipe clamps, but $\frac{3}{4}$ -in. pipes will work too. Drill the holes as squarely as you can. To prevent the clamps from spinning and ensure that they project the same amount from the front of the bench, I drilled small holes in the pipes and stretchers, so I can simply drop a nail down into each pipe. The cauls are flat, straight maple beams with tape along the inside faces to make it easy to remove dried glue.

To use the setup, I position the pipe clamps as needed, place the first board in the clamps, and tighten them. After running glue along the top edge of that board, I clamp cauls onto it. I drop the next board into place between the cauls, run glue along its top edge, and so on, until all boards are positioned. Then I clamp the tops of the cauls, and finally, run clamps from top to bottom to draw the joints together, alternating them on each side of the glue-up.

—BRIAN IRVINE, Telkwa, B.C., Canada



3. Clamp lower end of cauls.

4. Add rest of boards, applying glue on top edges.

5. Clamp upper end of cauls and run pipe or bar clamps across boards.

Best Tip



Brian Irvine became fascinated with wood while working at Katimavik, an Ontario school for training youth in community service, when FWW contributor Scott Landis taught students to make traditional snowshoes. He later used his woodworking skills to build his dream home in northern British Columbia and all of the furniture in it. Now retired from teaching, Irvine is focusing on woodworking and tending his 80-acre hobby farm.

A Reward for the Best Tip

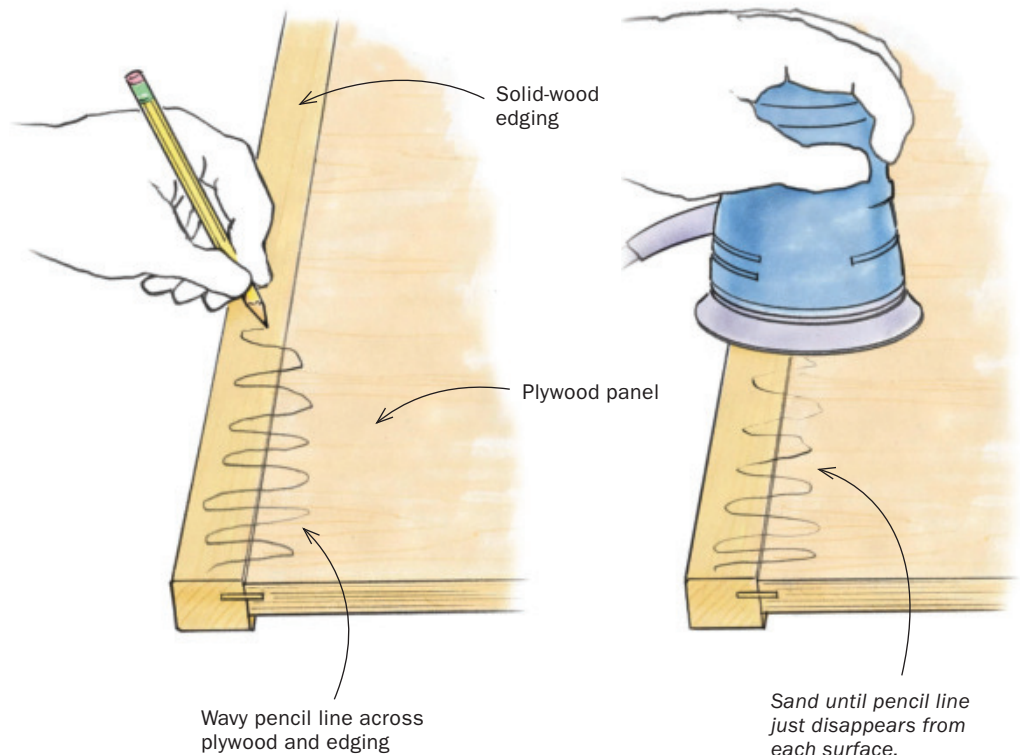
Send your original tips to fwtips@taunton.com. We pay \$100 for a published tip with illustration; \$50 for one without. The prize for this issue's best tip was a set of precision miter gauge alignment jigs by MiterSet.



Use pencil squiggles to sand edging safely

As a professional cabinetmaker, I'm constantly gluing solid-wood edging to plywood cabinet parts. I typically use a continuous spline or biscuits to align the parts. When cutting the slots for these, I try to err on the side of leaving the solid wood a little higher than the veneered plywood surface. But if the veneer side is flush—or a tiny bit higher, which can happen—it's all too easy to sand through the veneer when leveling the joints. The solution is simple. Before sanding I run a squiggly pencil line along the joint. As I sand, the pencil marks gradually disappear, first on the slightly higher areas and then across both surfaces. It's a simple guide for perfect sanding, with no unsightly sand-throughs on the plywood.

—TONY O'MALLEY, Emmaus, Pa.



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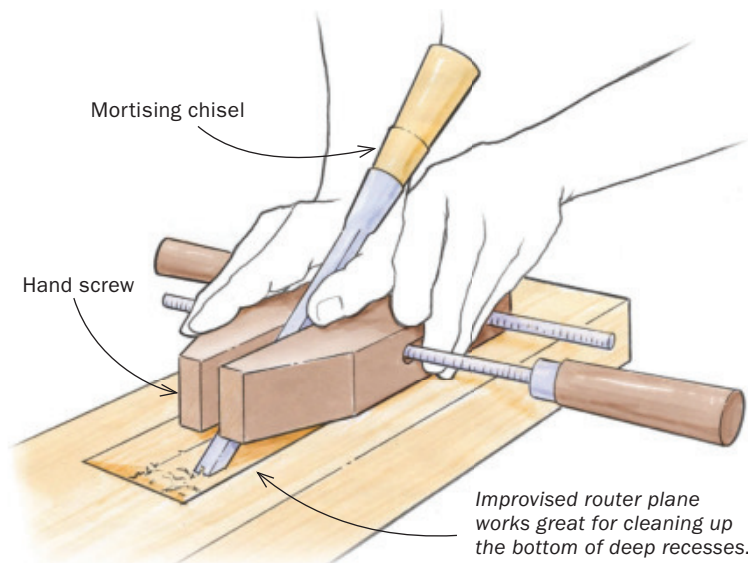
besseytools.com



Hand-screw clamp and chisel make a quick router plane

By clamping a chisel in a hand screw, you can create an improvised router plane that works surprisingly well. A mortise chisel works best, as it has square, parallel edges, but other chisels might work too. Obviously a real router plane is more precise, but this improvised plane is quick and free, and reaches deeper than the dedicated tool can. It works great for tasks like cleaning up the bottom of drilled mortises.

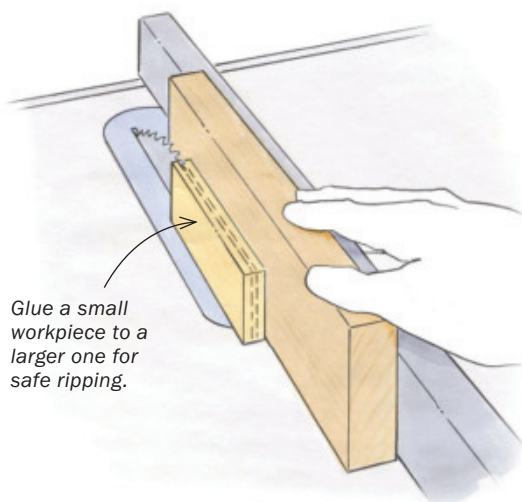
—NICK KROLL, Telfes im Stubai, Austria



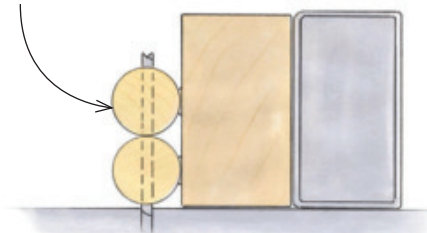
Safe way to rip unwieldy workpieces

It can be dangerous to rip small, unwieldy items on the table saw. I've used the following method for ripping veneers and dowels, among other things. Simply glue the workpiece to a larger board that is straight and flat, and run the larger piece against the rip fence.

—MIKE GUNDERSON, Yakima, Wash.



Same method works for ripping dowels or other unwieldy items.

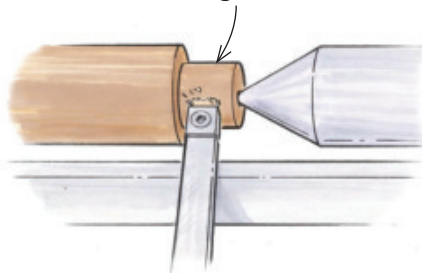


Compress round tenons before gluing them in

Round tenons are notorious for coming loose over time. To build stronger chairs and benches, I compress tenons before gluing them in. Then, as the glue soaks in, they swell back to their former size, which makes them extremely tight in their mortises. I start by turning the tenons $\frac{1}{64}$ in. oversize on the lathe. Then I put them into a simple jig, which works with any vise to compress the tenons evenly. Make the jig by drilling through a block of very hard wood, using the same bit you're using for the mortises. Then bandsaw it down the middle. This makes the hole undersize when you rejoin the halves. To make the blocks easier to align in the vise, I put dovetailed sliders in them as shown, but those are optional. Position the tenon between the two halves of the block as you clamp it tightly in a vise. Then unclamp the tenon, turn it 90°, and re-clamp. This will compress the tenon just enough for a nice fit, and glue will do the rest.

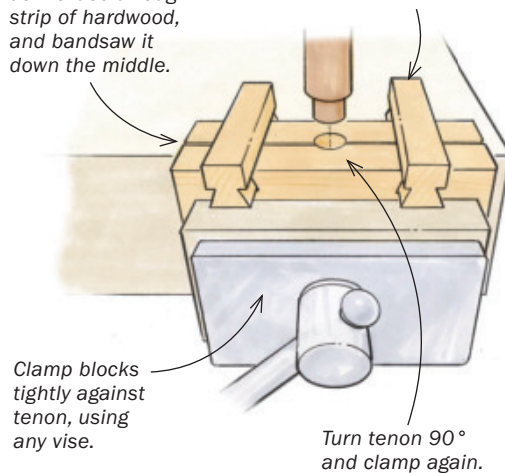
—ROGER LAFLEUR, Brookfield, Mass.

Turn tenon $\frac{1}{64}$ in. larger than mortise.

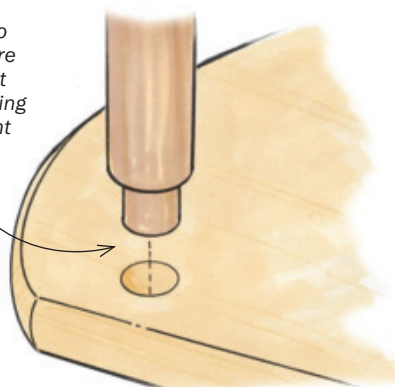


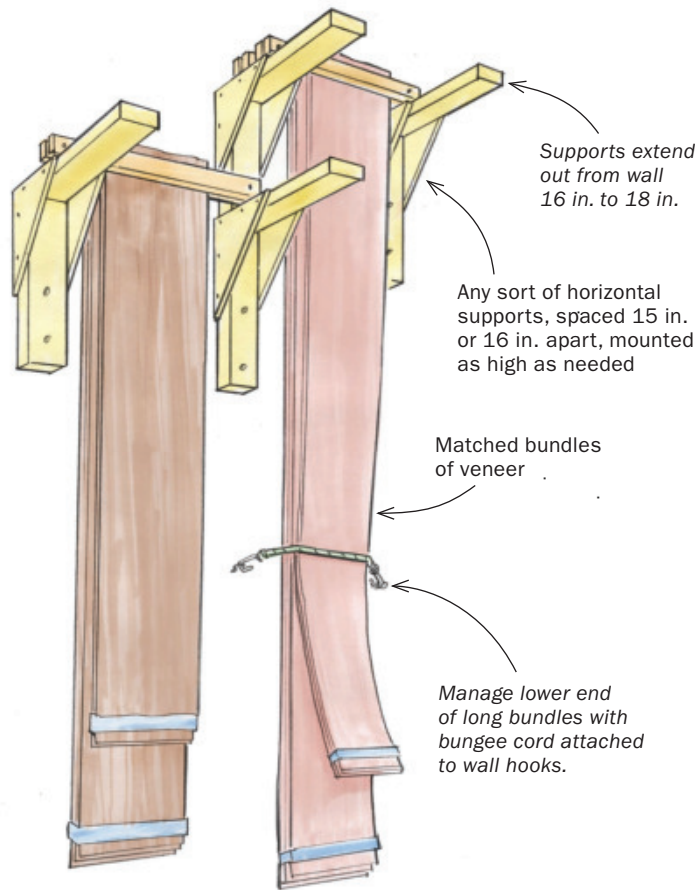
Drill hole same size as mortise through strip of hardwood, and bandsaw it down the middle.

Add optional dovetail sliders if desired.



Compressed tenon fits into mortise, where glue causes it to swell, making joint very tight and strong.

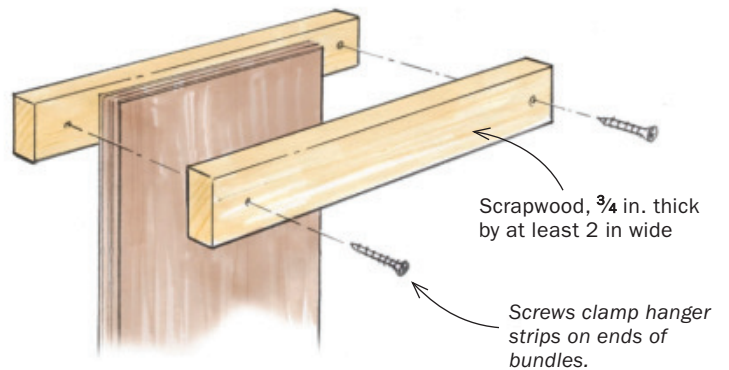




Store long veneers on pants-style hangers

Longer veneers often arrive in rolls, but they are difficult to store that way. I've tried storing the rolls on shelves, but they can be hard to identify and access. Inspired by pants hangers, my new method keeps matched veneers bundled together, protects them from harm, makes them easy to identify, and uses shop space efficiently. I clamp the long bundles between scrapwood strips, and then hang them on wall supports. I often use painter's tape to bind the end of a bundle, and bungee cords to pull long bundles against the wall and out of harm's way. By the way, I keep shorter veneers in shallow drawers.

—ROGER MYERS, Rollinsford, N.H.





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■ MACHINES

Compact SawStop is a win for smaller shops and budgets

THE NEW COMPACT TABLE SAW (CTS) brings SawStop's proven safety technology to a wider range of customers, while carrying on the company's tradition of well-designed and well-constructed tools. With a winning combination of price, size, portability, accuracy, surprising power, and a full 10-in. blade, the CTS is unlike anything on the market for small shops or newer woodworkers.

While the 120-volt CTS can rip through 8/4 maple with relative ease, it doesn't accept dado sets, which means woodworkers will have to get more creative with some joinery cuts. The well-engineered fence stands out. Riding on front and rear gear racks, it stays perfectly parallel to the blade, and adjusts precisely with a clever knob that pulls out to engage the gears and pushes in to lock. The blade's bevel angle micro-adjusts in a similar way.

The innovative fence includes an auxiliary bar that flips into place to act as a low fence for narrow rips. And, when the bar is lowered slightly, it doubles as a shelf to support wide pieces, helping this compact saw overcome a drawback of its relatively small tabletop. Stops at the front of the table that keep the fence from being inadvertently pushed into the spinning blade (and triggering the brake), can be pushed in for narrower rip cuts.

With the blade encased in a tight lower shroud, dust collection is nearly 100% effective below the saw when a vacuum source is attached. Last but not least, the fence, riving knives (shark fin and standard), multi-leaf blade guard, blade-change and adjustment wrenches, miter gauge, and extra blade cartridge (available separately) all store neatly in a removable plastic box on the back of the saw. One caveat: I would replace the stock miter gauge with a better, aftermarket model.

—Roland Johnson is a contributing editor.



Table saw by SawStop
Model CTS
\$900



Plenty of power. With a 10-in. blade and standard 120-volt power, the SawStop CTS easily rips through 2-in.-thick maple. Full blade height is 3¼ in., comparable to a full-size cabinet saw.



Smart fence. The rip fence rides on gear racks at the front and back, keeping it square to the blade, and it adjusts and locks precisely with a front-mounted knob. It includes a low fence for narrow rip cuts, which drops to support wide stock for ripping, as shown.

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■ HAND TOOLS

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While its blade-clamping mechanism only works with slotted hand-plane blades, the narrow roller makes it excellent for honing both flat and cambered edges. And it has a built-in ruler that sets the blade extension for 25° and 30°, the most common angles for grinding and honing.

The high-quality metal parts and simple roller design make it suitable for honing with waterstones or any other abrasives. And it's completely self-contained. You can set the angle, lock it in, and roll it on the stones without the add-ons or setup blocks required by other guides.

I used it on several plane irons, including vintage Stanley blades and current Lie-Nielsen and Veritas blades, with a variety of edge profiles, from straight to slightly and extremely cambered. In every case the guide performed flawlessly. It was easy to maintain a straight edge by applying even pressure at both corners of a blade, and it rocked effortlessly to hone curved edges—doing this better than any other guide I've used.

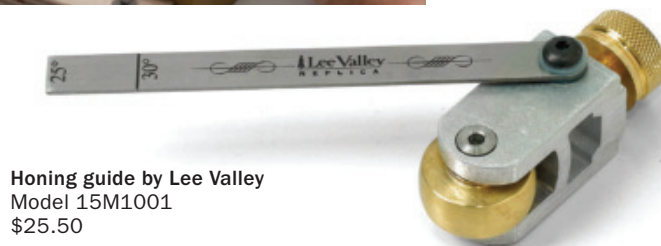
—Chris Gochnour is a contributing editor.



Built-in setup gauge. Designed to work only with slotted plane blades, this honing guide has a built-in ruler that sets the blade extension for the two most common grinding and honing angles.



Equally great for straight or cambered edges. The narrow roller lets you rock the guide side to side for grinding and honing curved edges, but it's just as easy to balance the pressure on straight ones.



Honing guide by Lee Valley
Model 15M1001
\$25.50

■ NEW TO MARKET

Tools to look out for

Better Bluetooth earbuds

With its latest Bluetooth-connected earbuds, Free 2.0 (\$120), IsoTunes has cut the little cord that connected its earlier pair, and improved performance at the same time, giving the new set the freedom and feel of Apple AirPods. The system includes a charging case (much like Apple's), which can charge the earbuds a number of times before you need to plug the case in again. We've tried both old and new, and found Free 2.0 to be easier to insert, better sounding, and

more effective at mitigating shop noise. Importantly, with Free 2.0 IsoTunes has eliminated the loud ringtone volume in the old pair when phone calls came in. IsoTunes has also added two new versions of its Bluetooth-equipped earmuffs.



HEPA-rated air cleaners

While ceiling-mounted air-filtration units will keep your shop cleaner, if their filters aren't fine enough they can do the opposite for your lungs, by keeping the finest, most dangerous particles circulating longer in the air, right around head height. Grizzly has addressed that potential problem with a pair of HEPA-rated units that will capture particles as small as 0.3 microns. That level of filtration (MERV 17) matches that of the best dust collectors, so you can build a cohesive approach to dust mitigation. There are two models. Model T33150 (\$495) has a ¾-hp motor with a top speed of 620 cfm, enough to handle a one-car garage, more or less, while Model T33151 (\$600) has a 1½-hp motor that can move up to 1,400 cfm, enough for much larger shops.

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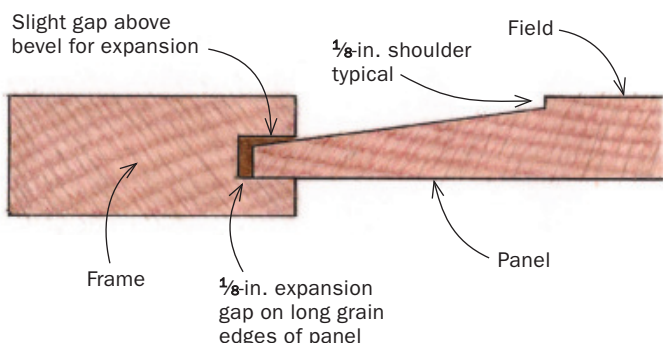




Traditional frame-and-panel door

PART 2: RAISING A FIELDED PANEL

BY BILL PAVLAK

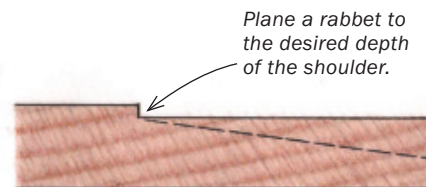


You don't need all the tools that you think you do. I wish that wasn't one of the toughest lessons in woodworking, but for a lot of us, it is.

When I first started making furniture, I found something irresistible about raised-panel doors. Iconic without being irrelevant, intimidating without seeming unapproachable, they captured my attention, and I wanted to make some as soon as possible. In particular, I wanted to create the raised and fielded panel with a panel-raising plane. Maybe I just wanted a fancy new tool. Well, I definitely wanted that, but I lived in something of an antique-tool desert at the time, and the decent online options were all priced beyond my budget—especially for such a specialized tool destined for only occasional use.

A couple of years and a number of cabinet doors later, I started working at Colonial Williamsburg, where I was eager to gain access

Start with a rabbet



Score the width and depth of the bevel.

A crisp, deep line along the edges of the face of the panel is essential to avoid torn fibers, so mark these lines (left) even if your plane has a cross-grain nicker. Then scribe the bottom of the bevel (right). Note that this is the depth of the bevel, not the rabbet. The depth stop on your rabbeting plane will determine that.



Rabbet the ends first.

Set the depth stop to cut a rabbet a little under $\frac{1}{8}$ in. deep. Start with the cross-grain ends since any blowout will likely be planed away when you rabbet the edges. Keeping the shoulder 90° should be your priority. Hang the board slightly off the bench so it doesn't interfere with the fence.

to a shop full of good hand tools. I distinctly remember being excited about checking out the shop's panel raisers on my first day, only to discover there weren't any. My surprised "Why not?" was answered with something to the effect of "We don't need them; most raised panels are just beveled rabbets, so we use rabbet planes."

Instead of feeling relieved that I could knock one tool off my wish list, I was kind of disappointed. But I got over it pretty quickly. A rabbet plane is essential for woodworkers who choose to use hand tools, and its versatility really shines in crafting raised panels without added jigs or fixtures. A rabbet plane gives you an easy, effective, and efficient way to cut a raised and fielded panel, since it allows you both to rabbet for the field and, when it is tipped, to cut the subsequent bevels.

Many types of rabbet planes are available, and while any will work for raised panels, the best have skewed blades to make cross-grain work cleaner. With a sharp skewed blade you should only need limited sanding or scraping—if any—to get the surface finish-ready. If you are limited to a plane with a straight iron, follow the tried-and-true principles of keeping the



Rabbet the edges next. There's a chance that you'll be going against the grain on one side, but a sharp skewed blade set finely should produce acceptable results. Again, maintaining a square shoulder is your main aesthetic concern.

Bevel to fit the groove

Set the fence a hair under the length of your bevel. The bevel will be longer than the rabbet is wide. Still, move the fence in about $\frac{1}{32}$ in. from this dimension to reduce the risk of catching the raised field and marring its shoulder.



Tilt the plane to bevel the ends until they fit in the groove. Guess the correct angle at first, then check your progress by eye and feel after several passes. Adjust the plane's angle as necessary and continue. Eventually the plane will register itself, right or wrong, so check your work regularly.



blade finely set and extra sharp. This will get you close enough to finish things out with light scraping and sanding.

My preferred rabbet plane is a moving fillister. It adds an adjustable fence to the mix, which brings increased accuracy and easy repeatability. A lot of metal-bodied rabbet planes are essentially moving fillisters. Whether wood or metal, something with a $1\frac{1}{2}$ -in. maximum width of cut is ideal, though $1\frac{1}{4}$ in. can work, too. Depth stops are nice as well.

Raised and fielded

Raised panels come in a great variety of styles, from intricate, molded profiles to unadorned bevels. The design featured here is the type I encounter most often on American period furniture (and the type I prefer to create). Some folks worry that an angled bevel instead of a flat tongue around the perimeter



Bevel the edges, spot-treating the corners if necessary. On top of having these bevels be consistent and smooth, you want them to intersect with the cross-grain bevels and produce a nice, clean, straight line from the corner of the raised field to the corner of the panel.





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Skip the rabbet for fast work

For drawer bottoms and other rough work, skip the shoulder and don't fuss about clean bevels. For those parts, the panel just needs to fit in the groove.

Scribe only the depth of the bevel. There's no defined field, so simply scribe the depth of the bevel, ensuring it fits into the groove. If you want to mark the width of the bevel, do so in pencil to avoid a score mark on the face.



Plane the bevels. A bench plane works fine here. Since the goal is a panel that fits, not one with perfect bevels, a fence is unnecessary. Skew the cut to help minimize blowout when planing cross-grain.



Install the panel. On drawer bottoms, only one end needs to be beveled since there's no groove in the drawer back. Instead, the bottom extends over the narrow back and is nailed to it.



might inhibit wood movement. But I've found that as long as you don't aggressively jam the panel into the frame during construction or glue it in place, there will be room for seasonal movement. A typical cabinet door panel is only about $\frac{1}{2}$ in. thick, so once you bevel off the edges you're left with almost a knife edge around the panel. This is perfectly fine. Indeed, there are only two crucial dimensions to guide your design. First, ensure a $\frac{1}{8}$ -in. gap between the long-grain edge of your board and the bottom of the groove for expansion. Second, make sure the bevel's angle, and therefore its thickness, will allow the board to enter the groove without bottoming out or preventing the frame from coming together.

Bevels only with a bench plane

Sometimes a rabbeted field is out of the question. Perhaps you are without a rabbet plane, or you just need a rough-and-ready drawer bottom. Either way, forgo the shouldered field and just bevel the panels



with a bench plane. If the panel is for a frame-and-panel, I work as carefully as possible. But for drawer bottoms, I simply mark the depth of the bevel and plane without much fuss to save time and effort.

As for design considerations for drawer bottoms, in the 18th century there was no right way to run the grain. You see it side to side or front to back on pieces of the highest quality. On a little drawer like the one pictured, I'm fine with running the bottom's grain front to back. First, the bevel and groove will still allow for expansion and contraction. Second, running the grain this way makes it less likely that I have to glue up a bottom, which saves time. □

Bill Pavlak is the supervising cabinetmaker at the Anthony Hay Cabinet Shop at Colonial Williamsburg in Virginia.

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Designing the embedded message

BY JOMO TARIKU

For me, designing furniture involves a fair amount of research. A lot of looking, that is. In museums, but largely in books; books and a sketch pad are my favorite research tools. I tend not to go on the computer, because I'll too easily wind up in a rabbit hole. I make thumbnail sketches of anything that strikes me. Just silhouette sketches; I don't get carried away with the details. The things I draw don't have to be related to furniture at all. I'm just looking for things that make me think, "Hunh, that's interesting." It could be a shape or a pattern or a texture or a color, a hairstyle, a piece of pottery, a detail of a building.

Most of the time I'm not at all sure what I might want to do with one of these ideas; putting it in my idea sketchpad is just saying it's worth reviewing in a week, two months, a



MEEDO CHAIR

I sketched this piece again and again as it went through many transitions on paper and in 3D models. I knew it would be expensive to build, and in a way I'm happy I wasn't able to make it sooner, because I really like this last version.

In my very first sketch I had a face on the back rest. I had been looking at traditional African combs with faces carved on the handle, and that first sketch was a kind of literal interpretation. That's something I usually try to avoid—taking what I see and turning it directly into furniture. Instead, through multiple iterations, I try to see what I can come up with where the central theme remains, but the form progressively changes, reinterpreted into something very modern, for our time.

There's another layer of meaning in the piece, because in America in the 1970s the Afro pick became a symbol of Black beauty. After combing their Afro, people here would leave the comb in their hair; it was a symbol of defiance. Kind of, "It's OK to keep my hair natural, the way it should be, if I want to."

Even though I was a very young man in Ethiopia at that time, I got this message through my uncles, who were influenced by watching American movies with Black actors like Richard Roundtree, Jim Brown, and Jim Kelly, who had a huge Afro along with bell bottoms and elevator shoes. So to me the comb had all these themes embedded in it.

Like most of my chairs, the first Meedo was made by David Bohnhoff in Columbia, Va. It was commissioned for the Afro-Futurist period room at the Metropolitan Museum of Art. It's made from 16 layers of walnut veneer bent laminated in a mold extracted from the 3D design.





BORAATII

The shape of this adjustable stool was derived from the silhouette of a tribal headrest, or boraatii, found in Ethiopia. There are many many different headrest shapes and designs throughout Africa. Various tribes—mostly of nomads or herdsmen driving camels or cattle—still use them. Some of the men have very intricate hairstyles, and when they rest they don't want them squashed. That's where the headrest comes in handy.

I looked at the shape of one of these and said, I could easily scale this up and call it a day. But I generally try to avoid doing that. I try not to take the easy route, unfortunately. The height adjustability would let you use it as a stool, or a footrest, or an end table, and would work for people of different sizes.



year down the line. I really like this approach, where I'm a little bit divorced from the idea that this will be a piece of furniture. I really want my work to stand out, and I think this approach gives me a leg up when it comes to creating unique pieces. If I had just been looking at Mid-Century furniture all day, I'm afraid what you're going to get out of me is just a slightly different Mid-Century piece.

I was raised in Ethiopia, and I focus my research on objects of African culture and elements of the African environment. I try to encourage other designers, especially those with an African background, to use their heritage as part of their design vocabulary. A rich heritage is a powerful thing, and I use mine as a launch pad. It helps me create unique things. All my work has that message embedded in it.

The high-end furniture market is very exclusive, and design has been codified as something Western. You can't say design is a global language while omitting the global south. Very little of Africa or African American culture is reflected in it. Changing that aspect of the industry has always been part of my goal.

Jomo Tariku, who lives in Springfield, Va., designs, builds, and collaborates on his furniture with other craftsmen. You can dig deeper into his work at jomofurniture.com.

MUKECHA

A traditional African mortar for grinding grain, a mukecha, inspired the overall shape of this stool. The mukecha is usually used by women, and grain grinding is a communal activity. I put a hole in the middle of the seat to suggest the concept of the mortar.

But the piece is a fusion of two ideas. The outline of the traditional mortar is not as intricate as mine. Instead of simplifying things as I typically do, I went in the opposite direction, adding ribs all the way up. The ribs are inspired by the neck-extending rings that you can find among Dogon people in Mali and Nigeria.

From the very first version we did, the rings were drawn freehand while the stool was on the lathe. The paint is orange acrylic marker—made for drawing on sneakers. The black is a stain.





MEQUAMYA

A prayer staff used by deacons and priests in the Ethiopian Orthodox Church inspired the shape of the back of this chair. In their processions they spend many hours standing and chanting, and the prayer staff provides some support. You can rest your arm on the staff; you can lean against it.

I call this my stealth chair because it has so many different planes. The legs are six-sided; the back rest has seven sides. Again, it's not the easiest thing to make, because it's got so many angles, but I think that's what makes it interesting to look at from different directions.



E'NSERA

This stool is based on a clay water jug, or e'nserra, that is used in Ethiopia and throughout Africa. Women, mostly, will carry water in one of these from a river or other water source. It's back-breaking work. I grew up watching people do this. This is the inspiration behind this piece.

Where I grew up everybody had these clay jugs in their kitchen, either for brewing local beer, or to store water and keep it cool overnight.

The first version of this stool was made from turned plywood. I used my CNC to make circular cutouts in a stack of pieces, then glued up the stack and my woodturner, David Sterling, shaped the outside. The more recent ones are made of solid ash.





QWANTA TOTEM CHAIR

This piece is based on a traditional Ethiopian birthing chair called a qwanta, which is composed of two diagonal planks; one slides through a slot in the other and can be pulled out to disassemble the chair.

My piece combines a redefinition of the traditional birthing chair with spare back rests inspired by totems. Totems have significant storytelling and religious meanings in various cultures. My thinking was to see if I could create a chair where the back rest is swappable, and when you take one out, it can be displayed on the wall as a sculptural piece, like a totem.

The back with brass hemispheres was inspired by the traditional mud mosques in Timbuktu, Mali, that have the ends of timbers sticking out of the walls, creating an amazing-looking pattern.





Box with a Built-in Hinge

Splined miters and
a flip-top lid add character
to a simple project

BY BARRY NM DIMA

This box was a happy accident. I wanted to make a salt cellar for my brother, a serious cook, but that's just a box, right? No design inspired me until I saw chef J. Kenji López-Alt's salt box. He flipped its overhanging lid open and shut with ease, letting him grab a pinch of seasoning with one hand while the other minded the food. I used his box as a jumping-off point and landed somewhere much more my own, both stylistically and functionally. Mine combines continuous grain, $\frac{1}{16}$ -in. shadowlines around the lid, and paint—my mix of fussy and fun.

The key detail is the back. It sits lower than the sides, and is dadoed into them. This lets it act as a stop for the lid, which hinges

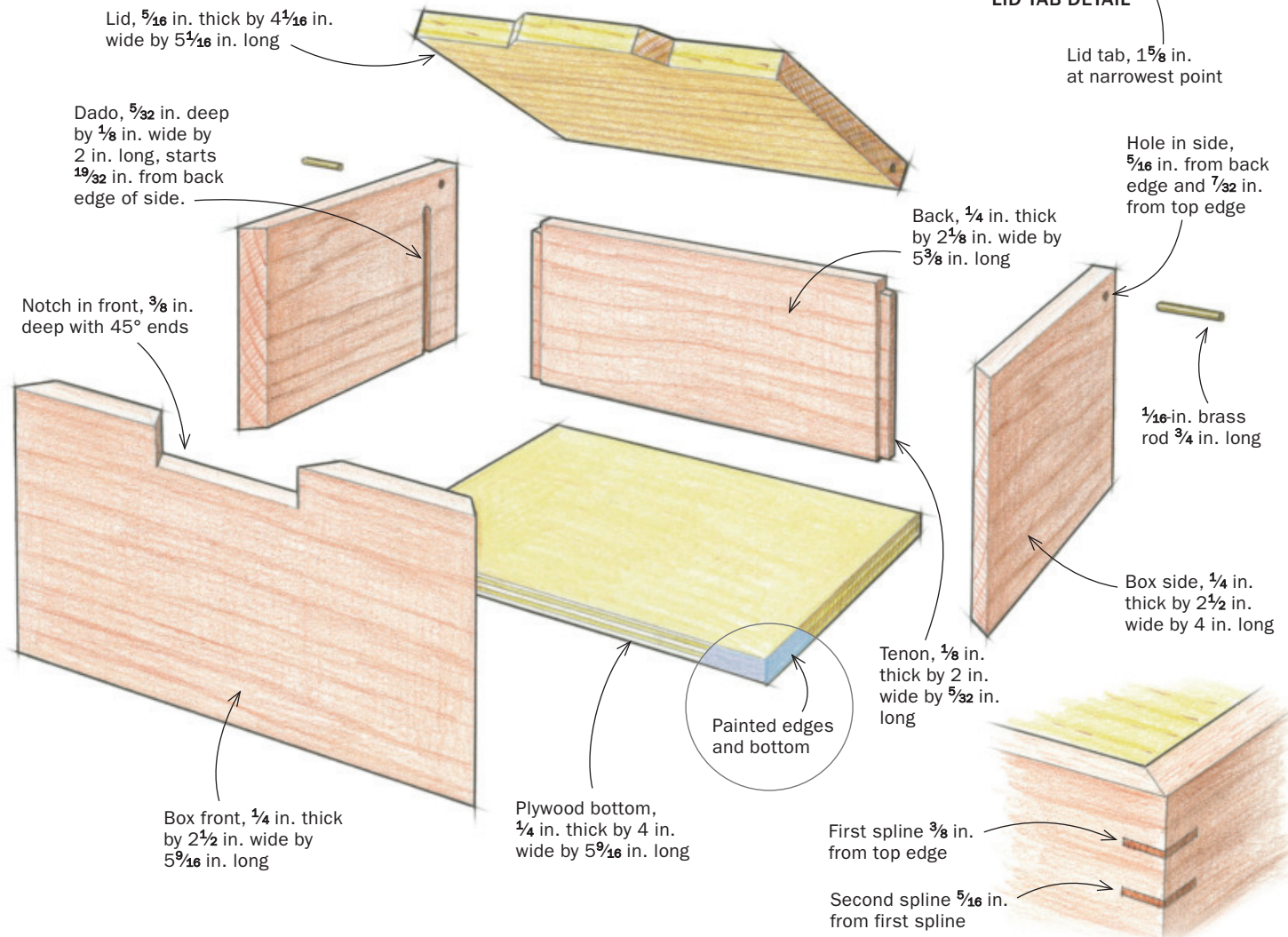
FOUR SIDES, BUT ONE'S A HIDDEN STOP

By mitering the front but insetting the back, you can reap benefits both aesthetic and structural. Similarly, the painted plywood bottom strengthens the box while simultaneously opening design opportunities. All the box parts are solid wood except the bottom.



LID TAB DETAIL

Lid tab, $1\frac{5}{8}$ in. at narrowest point



SPLINE DETAIL

MITER THE FRONT CORNERS



Cut the miters using a mitering bit. Dima lines up the router table's fence with the bit's bearing and raises the bit to the stock's top face. He uses a push block long enough to leave good support on the infeed fence even after the cut, since the fence opening is large.



Miter both ends of the box front, and only the front ends of the sides. Since the box has only two miters, it's easy to wrap the grain around the show faces. Make sure the side pieces remain the same length after the cut.



STOPPED DADOES AND TENONS



Mark the stop and start points on the fence. After setting the fence, transfer the bit's diameter to it. Then extend these lines up the fence for better visibility.



One cut stops at the top of the dado; the other starts on it. Mark the dado's top on the outside face of each side. Stop one side's dado when that mark meets the right line on the fence. For the other side, pivot the piece onto the bit by lining up its mark with the left line. Continue that cut through the workpiece.



Drill for the hinge with a stop clamped to the fence. These are mirrored holes, so you'll drill from the inside out on one side and vice versa on the other. Use a backer to absorb any blowout.



on brass pins through the sides—an easy, inexpensive alternative to leaved hinges. A notch in the front lets the lid lie flush with the back's top edge, sealing the box all around.

Locating the hinges may be the most pivotal part of the build, but it's just a matter of measuring correctly. The joinery, mostly done at the router table with affordable bits, is simple miters and stopped dados. To strengthen the miters, you'll add thin splines toward the top and glue on plywood at the bottom.

This box is cherry with a pine lid and a painted plywood bottom. In previous versions I used different woods with differently colored plywood bottoms. Thanks to their size, these boxes are a fun, low-stakes way to experiment with wood selection, contrast, and color.

Miters with continuous grain

One of the lovely advantages of miters is that they let you wrap grain around corners without interruption. To wrap grain on a typical four-sided box, you need to carefully resaw a board, and then

crosscut and assemble the parts in sequence. This box requires far fewer brain cells. Because only three sides are visible, you just need a board the combined length of the front and sides, plus a little for sawkerfs. I don't treat the grain on the back as an afterthought, but I don't prioritize it either.

Because I don't have a table saw, I miter on the router table; I crosscut and shoot the sides to length before mitering. It's a fine option provided you have a good, square fence; the bit's vertical travel is 90° to the tabletop and the bit itself is 45°. I like a ½-in. shank too. I use a push block behind the workpieces to stabilize the stock and limit blowout.

Ensure the sides remain the same length. If you need to take an additional pass on one side, do so on the other side too, even if the miter is already sharp on that one.

Stopped dado houses the back's tenons

The back is tenoned to fit in a narrow, shallow stopped dado in each side. You can clamp stops on the router fence for the dados, but I just use pencil lines. Because the tenons are notched up top, the lengths of the tenons and dados don't need to match perfectly. I don't even bother squaring the end of the dado.

On the other hand, the distance between the back's shoulders defi-



Rout centered tenons with a straight bit and push block. Dima first dials in the tenon's thickness before incrementally nudging the fence to achieve the exact shoulder-to-shoulder dimension he wants, which must be the same as the inside dimension of the mitered front.



Notch the tops of the tenons. After knifing the edge at the shoulder, saw away most of the waste. Then slowly pare to the knife line with a chisel.

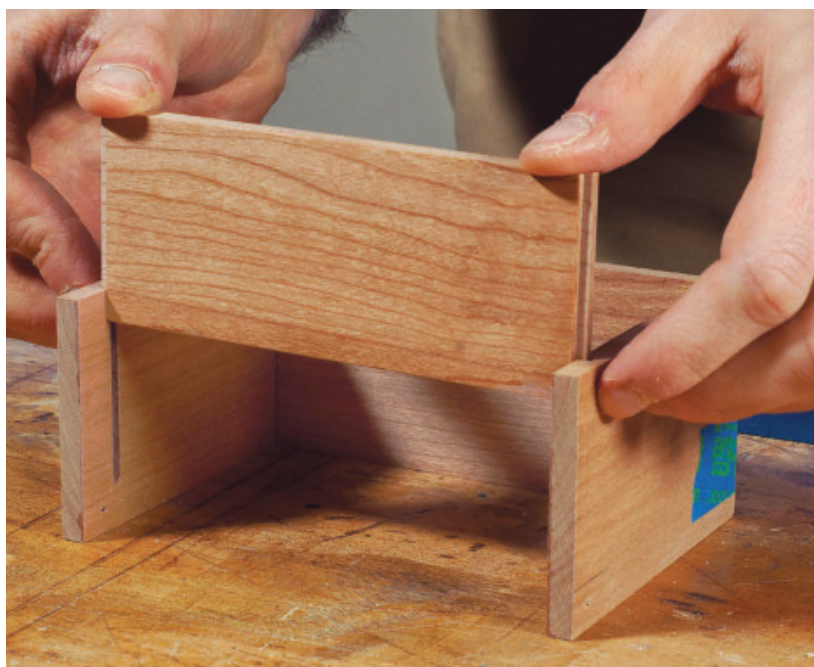


Blue tape taut across the miters acts as clamps. Dima stretches the tape over the joints while registering the box's bottom edge against a straightedge (above). When he folds up the miters (right), the tape stretches further to keep pressure along the joint while the glue dries.



nately needs to be bang-on. If it's not, the box won't end up square, which will lead to a nightmare fitting the lid, unsightly gaps around it, or both. Fortunately, the front serves as an easy reference for this dimension. The shoulder-to-shoulder measurement of the back must match the inside distance between the front's miters. If the tenons end up long, trim them. The priority is the distance between the shoulders.

The lid pivots on $\frac{1}{16}$ -in.-dia. brass pins. I locate the hole through the side so the pin is centered on the lid's thickness and the lid lies $\frac{1}{16}$ in. below the top of the side. Front-to-back, the hole is placed so the top can open entirely before it hits the back, which acts as a stop. Locating this hole correctly is



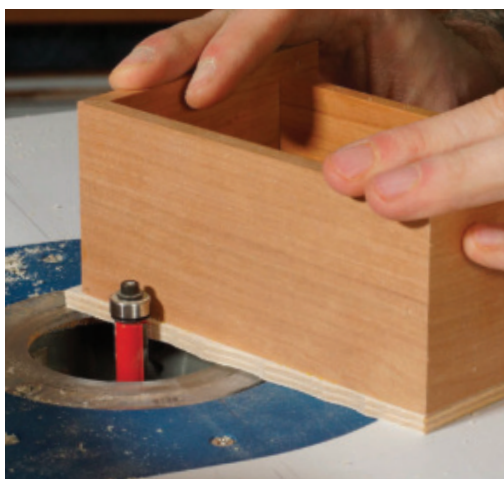
Install the back next. Before the glue begins to set on the miters, glue in the back and clamp across the joint. There's not much reference surface along the joints to square the box, so check and double-check to make sure it's square.



PLYWOOD AND SPLINES ADD STRENGTH

Align the bottom with the back of the sides when gluing it on. The bottom should overhang at the sides and front, which will be flush-cut after the glue-up. Dima doesn't rout at the back of the box.

Flush-trim the bottom at the router table. Raise the bearing on a flush-trimming bit to the box body and rout. Take small cuts and, where possible, enter the cut with a starting pin for control.



Plywood and splines for strength

The small joinery surfaces mean that at this stage, the box is rather fragile. To shore up the bottom, I glue plywood directly to the box. It locks the joints closed, and I gussy it up later. Use good plywood if you can, with solid, visible plys, like Baltic-birch. If solid wood is more your speed, stick to quartersawn pine, which has almost zero seasonal movement.

Make sure the back edge of the plywood is flush with the back edges of the sides when you glue it on. When the glue is dry, head to the router table to trim the bottom flush to the box's front and sides. Because the bottom is glued on flush to the back edge of the sides and the back is inset, I don't flush-trim back there.

While the plywood strengthens the bottom of the box, the top needs some help. That's what the splines are for. I have veneer that fits excellently in my ryoba's sawkerf. Do test cuts with your saw to see what works.



Saw the slots for the splines. Lay out both the length and depth of the slots. Saw slowly and carefully, since the splines will be highly visible.



Glue in the splines. Dima uses two-layer veneer, which fits nicely in the kerf from his saw's rip teeth. If the fit's too tight, he hammers the veneer thinner before installation. The glue will swell it to fill the slot.



Flush the splines to the box. Dima first cuts close with a fine-tooth saw, which is gentler on the thin veneer. He then pares the veneer flush with a chisel, working in from each corner to prevent blowout.

crucial. I figured out its placement in SketchUp.

Pay attention at glue-up

The box's size belies how finicky the glue-up can be. I use tape at the miters and miniature bar clamps (hatagane clamps, specifically) at the dado—simple enough. But with just two miters and small tenon shoulders to reference the joints, it's easy to fall out of square. This is why I prefer small clamps here: They more easily limit how much pressure I apply to the box. Check the box for square at several stages during glue-up.

If I want to finish the box's interior, I do so before assembly. Leave the bottom edges bare, however, because they're a glue surface.

PAINTED PLYWOOD'S PRETTIER



Protect the box body with tape. Instead of trying to align the tape perfectly, use a cutting gauge to trim it exactly where the bottom meets the box. In the back, use a knife at the seam or apply the tape very carefully. Firmly press down the remaining tape to avoid paint bleeding.

I like plywood bottoms because when glued on, they provide instant reinforcement. They're ugly too, so I paint them. I start by finish-sanding the whole box. I then tape off the box, including around back, to shield it from paint. Press the tape down firmly to prevent paint from leaking underneath. I used an acrylic paint because I wanted a solid, stark, playful contrast with the wood. If you want a little more warmth and charm, go with milk paint. For richness so deep you could dive into it, I recommend oil paint.

If you plan to add a finish after paint, test it to make sure it doesn't smear, pull, or dissolve the paint.



Paint the bottom. Dima applies two coats of acrylic paint. After each coat, he knocks back rough spots with pieces of a brown paper bag.

Lipped lid, notched box

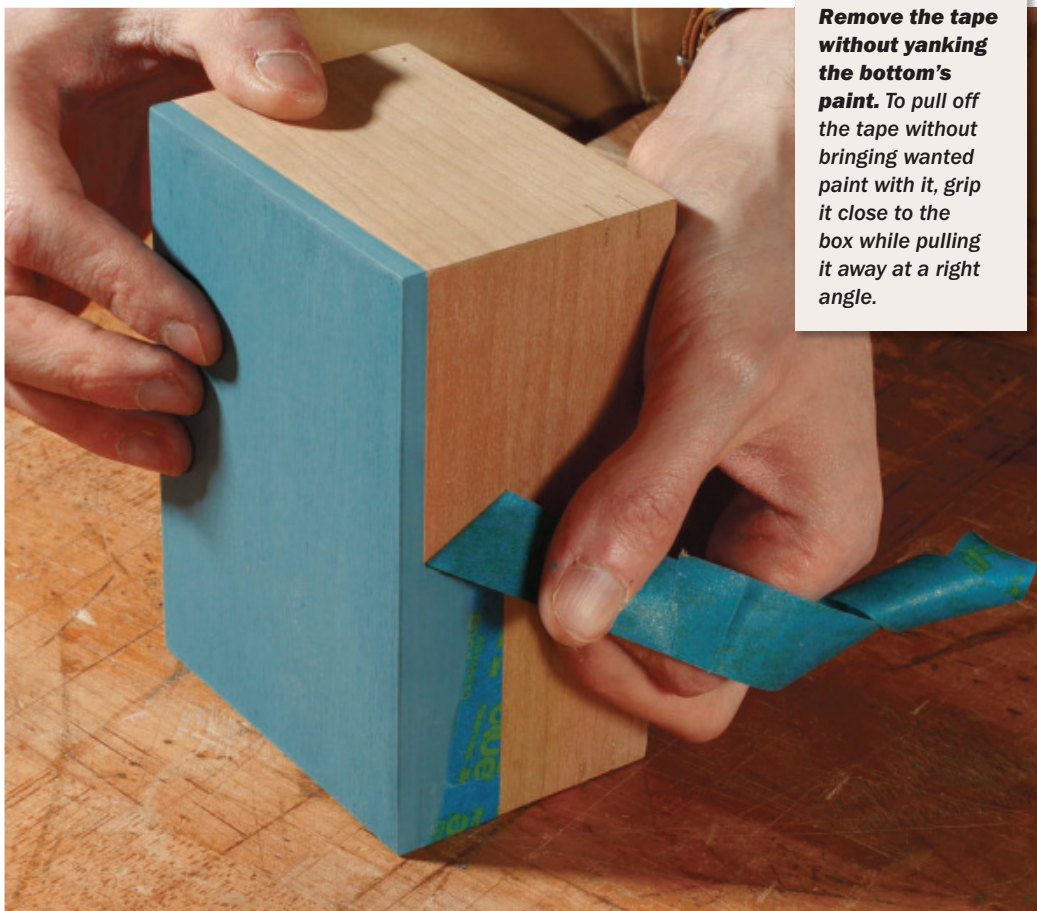
On earlier boxes, I notched the box front, created the tab on the lid separately, and then tried to marry them. Then editor Michael Pekovich asked, "Why not just make the tab and then trace it to the box?" So I did. Trust me, his method is much easier.

To make the tab, I use a 45° V-groove flat-bottom router bit, which looks like my miter bit but with flat cutters up top instead of a bearing. For the notch, I saw the ends, cope out most of the waste, and then use a pattern bit with a cutter $\frac{1}{8}$ in. long. There are myriad ways to do either method, though, so choose what fits you and your tooling.

I recommend making the lid slightly oversize and trimming it to size. This way, you can sneak up on the $\frac{1}{16}$ -in. shadow lines around the lid, especially tricky if the box isn't square.

Drill the lid for the hinge

After you cut the lid to size and shape, put it in place to drill it for the hinge. The holes in the sides will guide your drill. Lightly file the pin's leading end so that it enters the hole easily.



Remove the tape without yanking the bottom's paint. To pull off the tape without bringing wanted paint with it, grip it close to the box while pulling it away at a right angle.

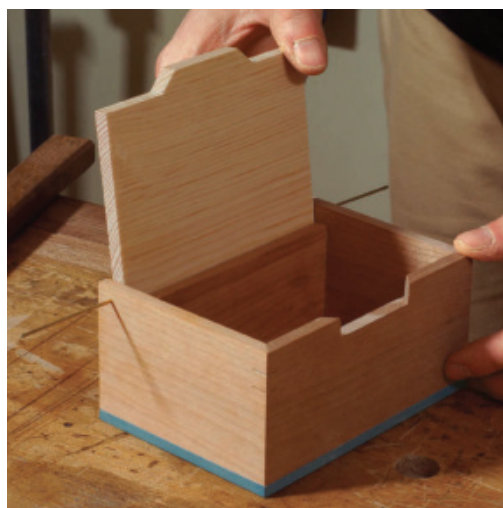
LIPPED LID HINGES INTO A NOTCH



Trace the lid onto the box, then cut and refine the notch to fit. This is easier than trying to cut the notch first, especially if the box isn't perfectly square. For small adjustments, Dima uses sandpaper affixed to a block with double-faced tape. He aims for a $\frac{1}{16}$ -in. shadow line between the lid and the box.



Use the pre-drilled holes in the sides when drilling into the lid. Clamp the lid in place to keep it from slipping and ruining the hinge action. Drill carefully to avoid going out of alignment.



Insert the pins just far enough to check the hinge action. Drive the pins so they just meet the lid's holes. Then test how the lid works. If the lid doesn't open far enough, slightly bevel its lower back arris before rechecking.

Even though the holes are located so the top doesn't hang up on the back, sometimes they're not perfect. So, I test the hinge with the brass pins inserted just far enough to grip the lid gingerly but still let me slide it on and off. If the top prematurely catches on the back, round over or chamfer the lid there with a hand plane.

When your lid's good to go, hammer the pins home; snip them as close to the box as you can manage; and file the snipped ends very, very carefully.

All that's left is to fill the box with stuff. I hear it's good with salt. □

Barry NM Dima, former FWW associate editor, moved in February to Vietnam, where he will teach English.



Flush the pins after seating them. Use flush-cutters to get the soft brass close, then finish with gentle passes with a fine file.

Floating-Top Side Table

Elegant curves and subtle tapers invite a closer look

BY ALEX DOLESE



My dad and I are both professional furniture makers and teachers, and furniture design was something we liked to do together while I was growing up. This table design is one of our collaborations.

The first version was taller, but when my grandmother asked for a small, round end table, I revisited the design. I enjoy how the table looks at this smaller scale, though it can be scaled up in a variety of ways.

The smaller size adds versatility in how the table can be used and fit into a home. It can serve as a side table in a living room, a nightstand, a plant stand, or a pedestal for an art piece. And you can elevate the look by placing a small rock, ceramic pot, or other sort of art atop the lower rail assembly, which is partly why I made that joint flush at the top edge. You could also add a round shelf in that same spot.

How to simplify curved, angled joinery

The curves and angles in this table not only make it really fun to build, but also teach valuable techniques you can use on future projects.

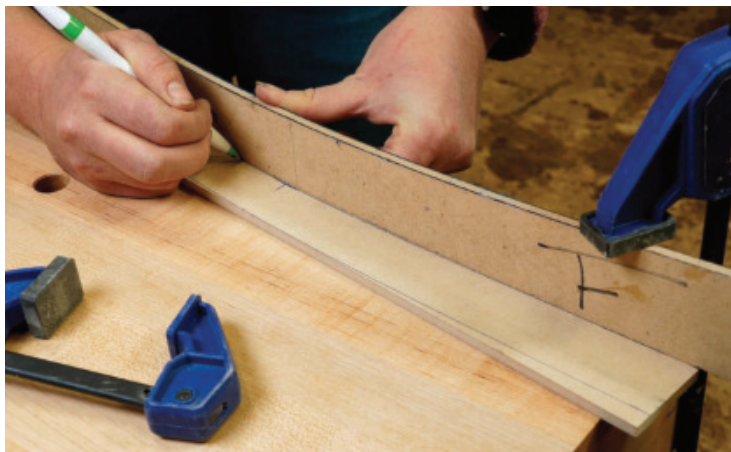
The legs are curved along their inner and outer edges and tapered on their sides, which requires a couple of different shaping techniques. You'll also learn how to use a drawing to find the angle of the legs where the rails hit them. And making the round top involves a handy router jig.

I prefer using slip tenons where parts meet at angles and curves. They let me cut simple butt joints at these tricky junctions, rather than angling or curving the shoulders of integral tenons, which is a lot harder. There are a variety of ways to make matching mortises for slip tenons. While I sometimes use a horizontal mortiser, I'm using my Domino DF 500 joiner here, a

Make a leg template

The legs are curved along their inner and outer edges, and they get flats on the inside edge so the rail joinery is gap-free. Start by making a leg template, which will be transferred to a router jig for shaping the legs.

Lay out the template. Using $\frac{1}{4}$ -in. MDF, make a template that represents the curved leg outline. Use the dimensions in the drawing to lay out the apex of the inward curve and the end points of the outward curve. Then bend an MDF strip as shown to draw the curves at each edge.



Cut and smooth the template. Rough out the shape on the bandsaw, leaving approximately $\frac{1}{16}$ in. of waste outside the line. Then smooth the curves to the line using your preferred sanding or planing tools. Dolese used her curved-platen edge sander here.



Sand flats where the rails hit. To make it easier to eliminate gaps where the rails meet the legs, Dolese sands small, nearly undetectable flats on the leg template, which template routing will transfer to the legs themselves. Start by laying out the mortise locations and the edges of the rails, and then sand up to those marks. Check that these landing spots are flat using one of the rails or another flat piece.



handheld power tool that cuts precise mortises in a variety of sizes, and comes with ready-made tenons that fit those mortises perfectly.

Shape the legs first

Making complex, repeatable shapes using shaper and router jigs has opened up a lot of possibilities in my work. I generally prefer using my shaper for template work, as it has a large, helical head that cuts very smoothly with minimal tearout. But I know many woodworkers lack a shaper, so I'll demonstrate a very similar router-table technique here.

You might be tempted to skip the router jig and shape the curves by hand, but bear in mind that any inconsistencies can leave gaps in the joints where the rails meet the legs. Note that we are shaping the curves on the legs before tapering their sides. That way they will sit flat on the router jig.

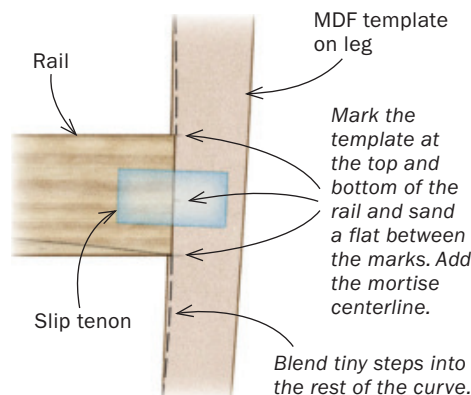
Start by making a leg template. You'll use it to make a two-sided leg-shaping jig, which shapes the concave edge on one side and the convex one on the other.

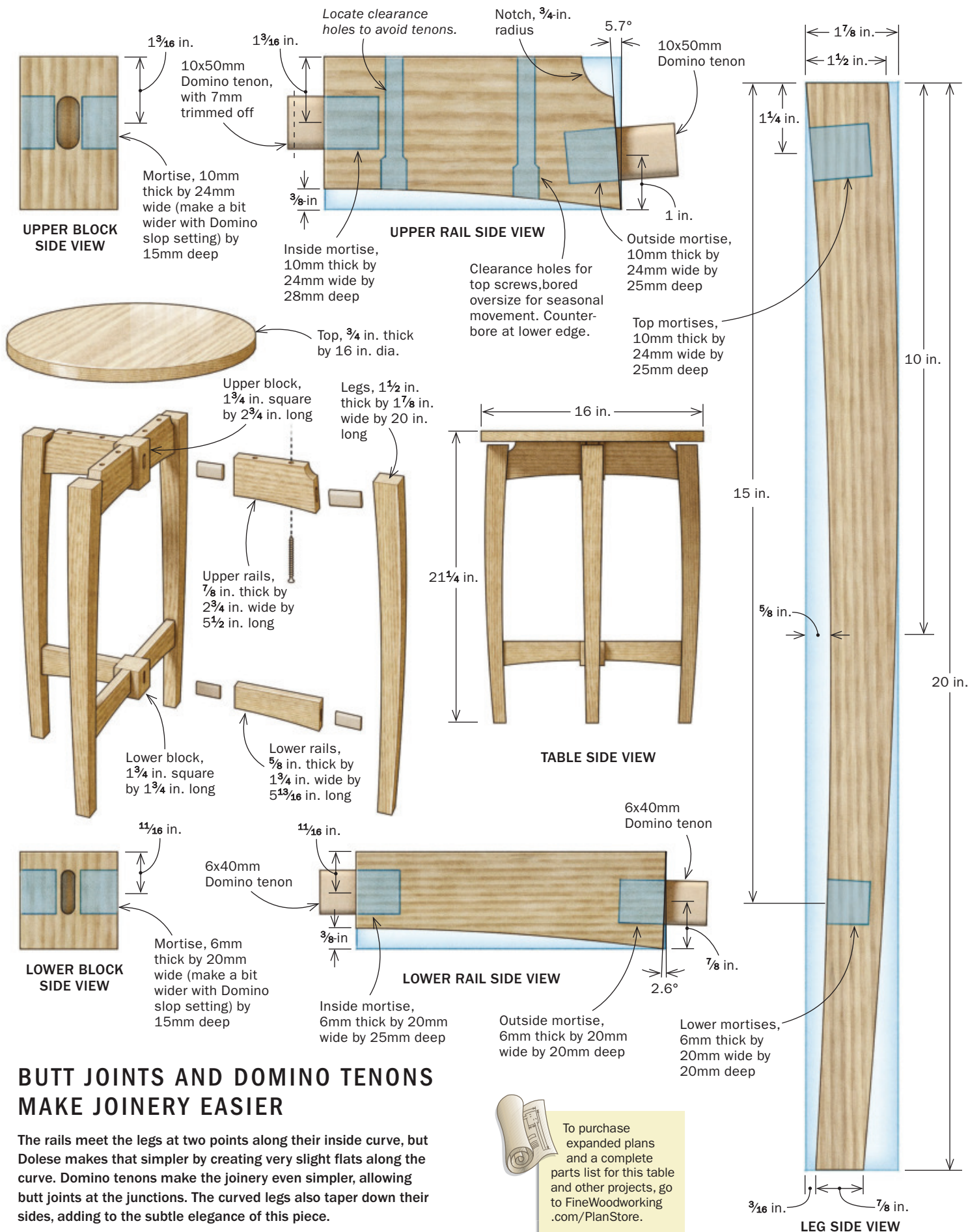
Hand-sand the joinery flats—To simplify the rail-to-leg joints, I create very small, almost undetectable flats along the leg curves, allowing me to cut a simple angle on the ends of those rails and know the joints will be gap-free. That's a lesson I learned from my dad—Tom Dolese, a chair-making specialist in Bellingham, Wash.

On the leg template, make center marks for the mortises. Then work from those to mark the top and bottom edges of the rails.

MAKE SMALL FLATS WHERE THE RAILS HIT THE CURVE

Small flats on the concave edge of the leg will let you cut the ends of the rails to a simple angle, simplifying the joinery. You'll get a tiny step at the end of each flat, which you can feather into the rest of the curve.





Shape the legs

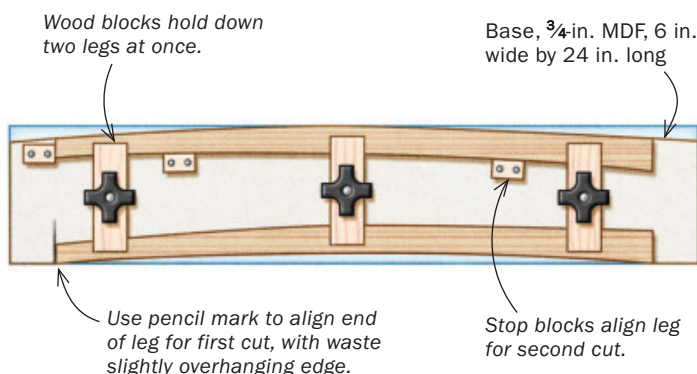
Use the leg template to make a router jig for shaping the leg curves. Before shaping the legs, you'll trace the leg template onto the leg blanks and bandsaw away most of the waste. The legs get tapered after the curves are cut.



Shape the router jig. Screw the leg template to the jig's base and cut the curve using a pattern-routing bit. On the convex side, add blocks to the ends of the template to create smooth entry and exit areas for the router bearing. Before removing the template from the jig, trace its back edge and ends, to show where stop blocks need to go.

ROUTER JIG HOLDS TWO LEGS

This handy jig works with a long flush-trimming bit in the router table. The concave side is shaped first on each leg, and then that side goes against stop blocks as you shape the convex side. The jig includes safe areas for entering and exiting the cut.



Now use a flat sanding block to create flat landing areas for the upper and lower rails, stopping as soon as the area between the layout marks is flat. Sanding these flats is a lot easier to do on the $\frac{1}{4}$ -in. template than it would be on the actual legs. Once it's done on the template, it then transfers to the routing jig and all four legs.

Use the leg template to make the routing jig—Once the leg template is done, you can use it to make the leg routing jig. Before routing the legs, use the leg template to trace the curves on the leg stock, and cut away most of the waste on the bandsaw, without going past the lines.

To shape both the jig and the legs, I used the same $2\frac{1}{2}$ -in. by $\frac{3}{4}$ -in. bit, which has a bearing at both ends. Whichever bit you use, its cutting teeth should be at least $1\frac{1}{2}$ in. long. My bit was $\frac{3}{4}$ in. dia., but a fatter one will be even less prone to tearout.

The legs will be tapered along their other two edges, but hold off on the tapering for now.

Cut all of the joinery

On projects with curves, I cut all of the joinery while I still have square reference faces on the parts. So cut the rails to overall size now, and chop their outside ends to the correct angles. Also, lay out their curves and notches—as a reference for



Route the concave side first. Use a long flush-trimming bit. Line up the leg with the pencil mark on the jig, let the waste part of the leg overhang the edge, and clamp it in place (you'll need another leg in the jig to make the clamp blocks work). Move the jig right to left to rout.



Route the convex edge second. The concave edge is placed against stop blocks on this side of the jig, as is the end of the leg. Move the jig from right to left again.

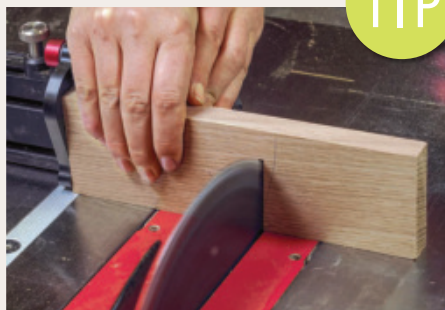
Cut all of the mortises now

The Domino joiner makes short work of these matching mortises, though other methods will work too. The trick here is finding a way to hold the small pieces without getting in the way of the tool's fence. Note that two different bit/tenon sizes are used and mortise depths vary, so check the drawing carefully.

PRECISE RAIL END ANGLES

To angle the ends of the rails, tilt the blade and position the workpieces on edge against the miter gauge. Put a digital angle gauge against the blade to dial in the angle.

Top rail end: 5.7°,
Bottom rail end: 2.6°



TIP



Mortise both ends of each rail. Mark centerlines for the mortises, choose the right mortise width on the machine, and set the fence for the correct mortise position.

laying out their mortises—but don't shape those details yet.

Be sure to check the drawing carefully for the fence position, mortise depth, and bit size for each set of mortises. The Domino machine works from centerlines, so mark those on all of the parts.

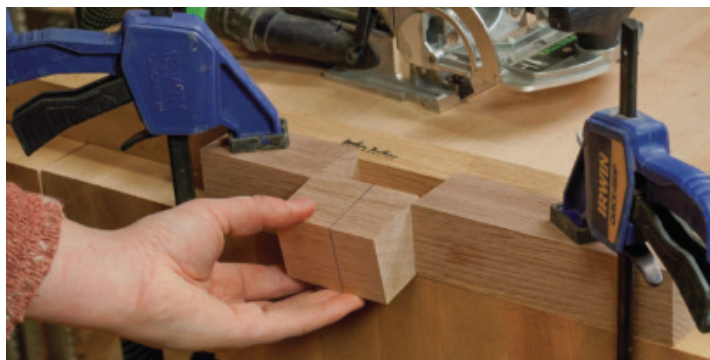
Note that the upper and lower rails are two different thicknesses, because the legs taper as they head downward. So I'm using two different-size tenons in them, which means the mortises are cut with two different bits in the Domino joiner. They are also cut to different depths.

Note also that the mortise locations are different in the upper and lower center blocks (where the rails intersect). These blocks also need to align with the top edges of the rails, so set the Domino for some extra wiggle room in these mortises, which will let you position the parts perfectly flush with each other during the glue-up. Also, to prevent the 50mm-long tenons from colliding inside the upper block, you'll need to cut 7mm off them. You can also start with the longer Domino tenon blanks, and simply cut tenons off those as needed.

Your leg template has centerlines marked on it for each mortise, so use the template to transfer those lines to the legs.

Shape the parts and assemble

Now you can finally shape the rails and taper the legs. Both upper and lower rails get a long curve along their bottom edges, and the top ones get a small, curved notch at the outside end of their upper edges.



Mark and clamp the center blocks. Each set of rails and blocks must end up flush at the top edges, so the centerlines for their mortises need to be the same also. This simple clamping setup, made with leftover stock, is enough to stabilize the parts for mortising with the Domino.



Mortise the blocks. Another long piece, clamped at the back, stabilizes the front pieces, and the machine does the rest. Set the Domino for slightly wider mortises here, to give you some wiggle room for bringing the rails and blocks flush during assembly.



Mark and mortise the legs. Carry the mortise centerlines from the leg template down onto the legs, and use a simple backer piece as shown to hold them for mortising. Remember to change out the bit for the upper and lower mortises.

Finish shaping

With the joinery done and a panel glued up for the top, you can shape the rails, taper the legs, and cut out the top.



Shape the rails. Both sets get a long curve along their bottom edge—cut on the bandsaw and then sanded smooth—and the top rails get a small, round notch, sawn out, then smoothed on a spindle sander.

Lay out those shapes using the tools you prefer. I suggest using a strip of $\frac{1}{4}$ -in. MDF for the long curves and a compass or circle guide for the round notch.

Cut the long curves close on the band-saw, and then simply smooth them to the line with any of the same tools I used for the leg template. Cut the round notches with a scroll saw, coping saw, or band-saw, and then smooth them with a spindle sander, if you have one, or a large dowel and sandpaper.

You'll be laying out the leg tapers on the curved edges we shaped earlier, so use a flexible ruler or a straight piece of $\frac{1}{4}$ -in. MDF to hug the curves as you draw sharp, dark lines. Then rough out the tapers on



Mark and saw the leg tapers. Use a straight, $\frac{1}{4}$ -in.-thick strip of MDF to hug the leg curves as you mark their tapers, and then saw close to the lines on the bandsaw, with the concave curves facing down as shown. If your bandsaw cuts are relatively straight, you can smooth these tapers to the line with light passes on the jointer or with a hand plane.



Cut out the tabletop. Dolese uses Rockler's Ellipse/Circle Cutting Jig here, with the tabletop panel attached to a scrap board with double-sided tape. Rout the circle with light, progressively deeper clockwise passes.



Round everything over. All of the parts get a $\frac{1}{8}$ -in. roundover on the router table, except for edges that meet other parts, like those at the ends of the rails.

Assemble in stages

The Domino creates uniform mortises that fit its pre-made tenons, and the butt joints tend to self-align the pieces. Start with a dry-fit to make sure the mortises are deep enough, and use Titebond III to allow additional working time.



Insert the tenons. Squirt some glue in each mortise, spread it around with a little stick, and press Domino tenons into both ends of each rail.



Start with the center assemblies. Spread glue in the mortises in the center blocks, and assemble each rail system upside down, clamping it down to make sure it stays flat and flush on its top side. Assemble just two opposite rails at a time.



Legs complete the base. Use thin pads to protect the curved legs, and make sure all four legs are flat on the benchtop as you clamp the assembly.

the bandsaw as shown, with the concave side of the legs facing down for best control.

Glue up the top panel from multiple boards; two or three look best. Some folks use a bandsaw jig to cut out round tops, but I prefer to use a router jig, which leaves the edges smooth and even with less sanding to do. I've used a shopmade jig in the past, until I tried Rockler's Ellipse/Circle Cutting Jig for Routers (\$80 at Rockler.com), which adjusts more easily and is a lot more durable.

After gluing up the base, I finished it and the top separately before screwing them together. I used three coats of Livos Kunos Natural Oil Sealer, which I like because it's non-toxic, low-VOC, easy to apply, and relatively durable for an oil finish, with a bit of water resistance as well. Like all oil finishes, it's also easy to repair. □

Alex Dolese is a professional furniture maker in Bozeman, Mont.



Finish the parts and attach the top. The attachment holes include wiggle room for seasonal movement. After evening out the overhang, mark pilot holes in the top. Drill those carefully and then drive the screws by hand.

Quick and Accurate Mortises

A plunge router and router
box make this method
simplicity itself

BY BOB VAN DYKE

I have cut more mortises using a plunge router and a router box than with any other method, including a hollow-chisel mortiser. Think of all the ways there are to cut mortises in a table leg. They can be chopped by hand with a mortising chisel and a mallet, or you can drill out the mortise and pare to your layout lines. A hollow-chisel mortiser works great, but mortises are the only thing it can do. A router table with a fence is certainly a viable method, or you can always use trained termites. A plunge router with a router box is hands down one of the easiest and most accurate methods that I have used. In my school, I figure we have made over 8,000 mortises this way. And the same router can also make moldings, roundovers, curves, and so much more. Try doing a Roman ogee with a hollow-chisel mortiser!

Making the box

The router box is a basic affair. For the base, glue and screw two pieces of $\frac{3}{4}$ -in. plywood to-

gether, then straighten one edge and rip the other edge parallel. The sides are plywood screwed to the base. The top edges of both sides must be the same height above the surface of the base, or your mortises won't be square to the face of the workpiece.

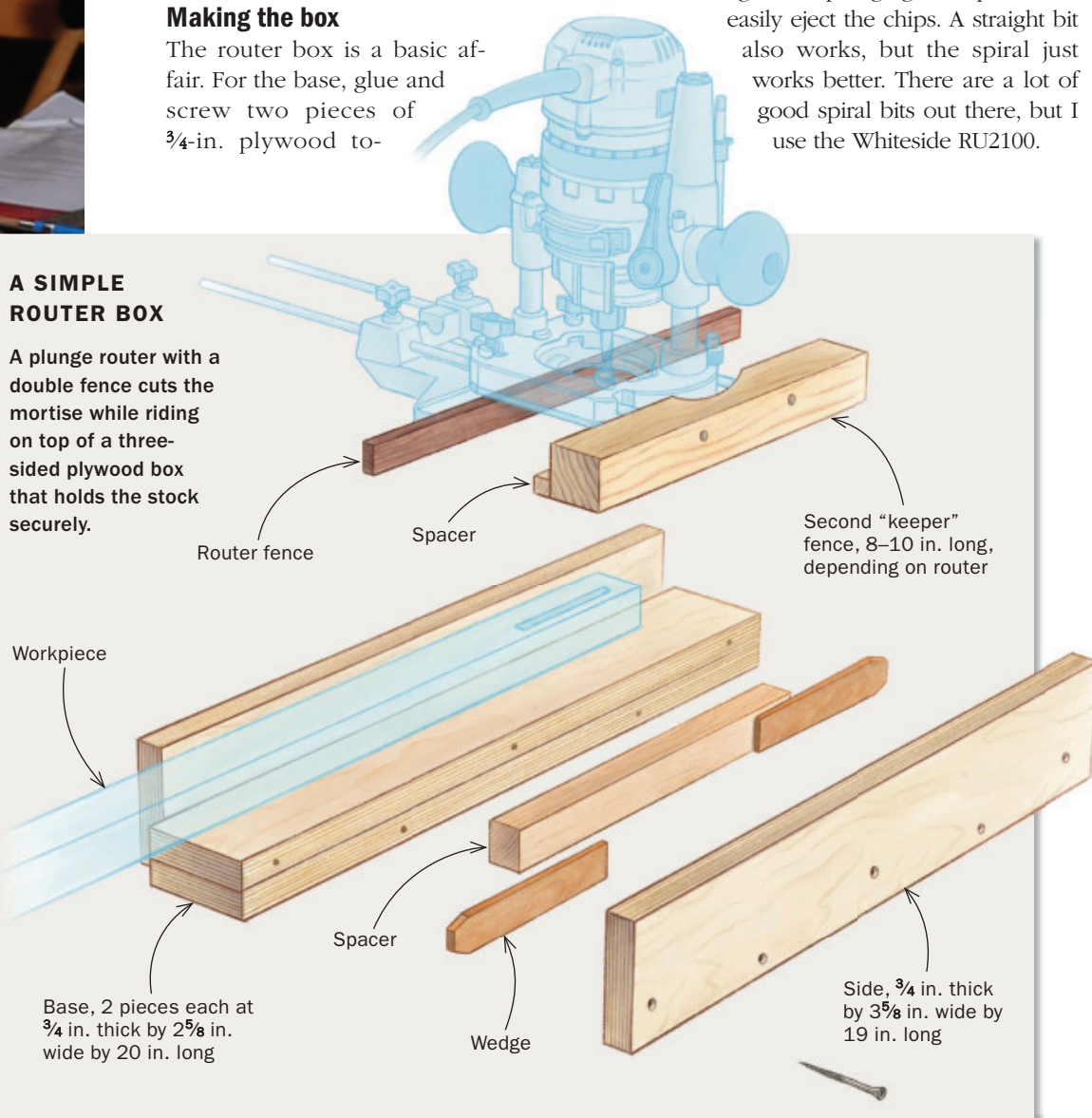
I make the box large enough to accommodate a range of different-size legs. The height of the sides is $2\frac{1}{8}$ in. above the base ($\frac{1}{8}$ in. higher than the biggest leg I would do in this jig) and the width between the sides is around $2\frac{5}{8}$ in., wide enough to fit a $1\frac{1}{2}$ -in.-square leg, plus a $\frac{7}{8}$ -in. spacer and a few wedges to hold it. Use a thinner spacer when mortising bigger legs. The exact length of the box is not important.

The bit

I prefer a solid carbide spiral bit specifically designed for plunging. The spiral flutes easily eject the chips. A straight bit also works, but the spiral just works better. There are a lot of good spiral bits out there, but I use the Whiteside RU2100.

A SIMPLE ROUTER BOX

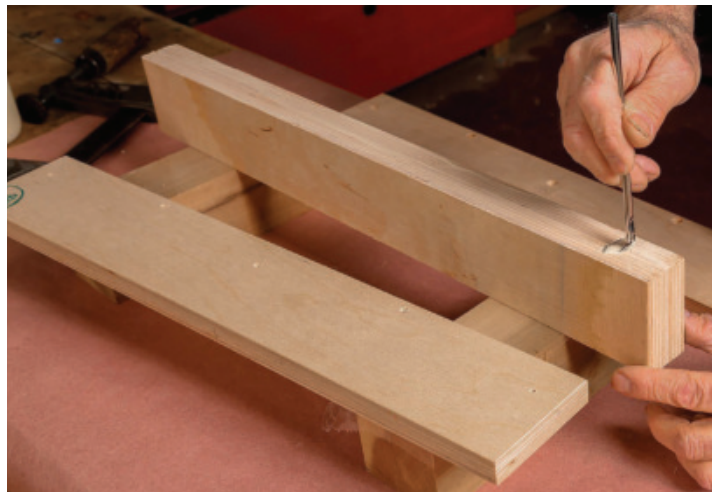
A plunge router with a double fence cuts the mortise while riding on top of a three-sided plywood box that holds the stock securely.



Building the router box

Construction doesn't get much easier than this: four pieces of plywood glued, clamped, and screwed together.

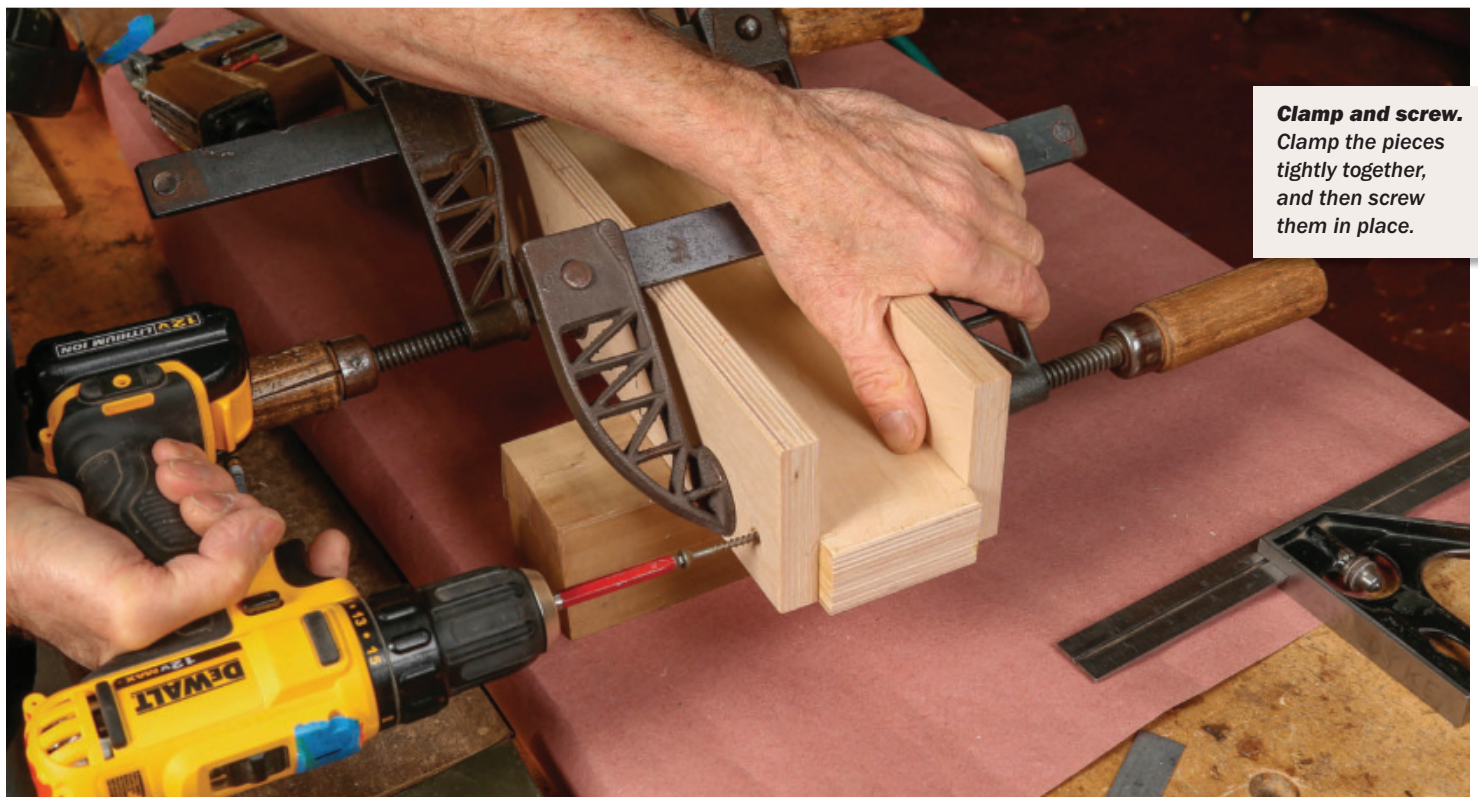
Predrill for screws. Using a countersink bit, predrill the holes in the side pieces of the box.



Ready to glue. Spread glue on the edges of the bottom piece (two ganged pieces of $\frac{3}{4}$ -in. plywood).



Tack them together. Use finish nails to tack the sides to the bottom so they won't shift.



Clamp and screw. Clamp the pieces tightly together, and then screw them in place.

Begin with a setup leg

To get a feel for laying out and using the box, mill a piece the same width and thickness as the piece you'll mortise. The length doesn't matter.

Lay out the sides of the mortise. Using a square, draw a line for the first side of the mortise. Then place a spacer, the thickness of your mortise, against the square and draw a line to mark out the other side of the mortise.

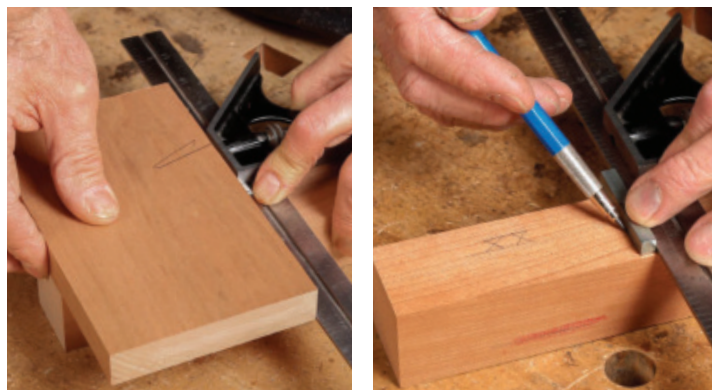


Tips on depth setting, climb cuts, and a keeper fence

I usually set the bit's final depth by plunging the bit on the turned-off router to match a layout line I have marked on the end of the setup leg. This is the simplest method, but you can also plunge the router so the bit just touches the work surface and then insert a spacer equal to the depth of the mortise between the turret stop and the plunge depth bar. Don't forget to lock the bar.

To avoid making a climb cut, always set the router fence on the right side and only cut while pushing the router away from you. If you pull the router toward you while the fence is on the right side, you will be making a climb cut, a potentially dangerous situation that will almost always result in a ruined mortise.

To further ensure success, I like to add a "keeper" fence on the left side, which helps keep the router in place. The fence is easily made with scrap stock around 1 in. to 1½ in. thick and two 18-in. steel rods, available from any hardware store. These longer rods replace the original rods that came with the router fence you are



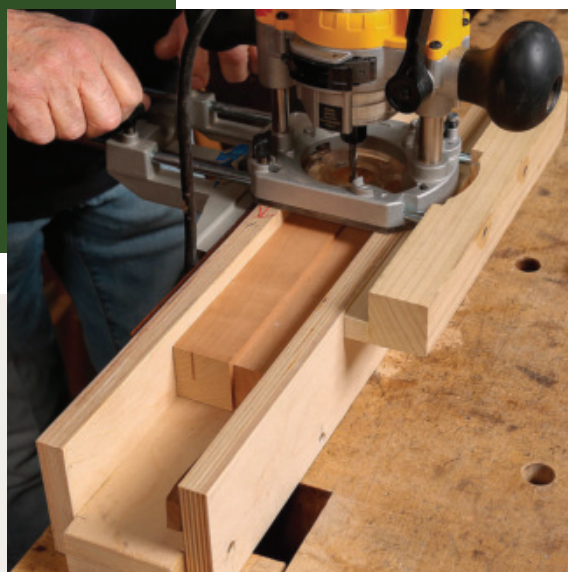
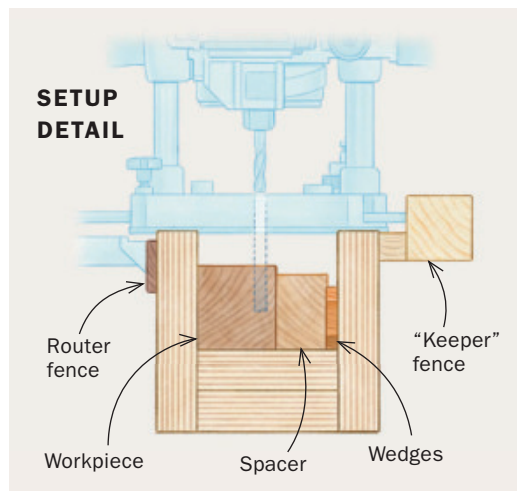
Lay out the top and bottom of the mortise. Line up the top edge of an apron with the top of the test leg and set your square on the bottom edge of the apron. Butt a spacer to the square, and strike a line to represent the bottom of the mortise. Use the square to mark the top of the mortise if it's a straight-up mortise or the bottom of the haunch if it's haunched.



Set the test piece in place. Put your setup leg into the box against the right side. Insert a spacer to the left of the leg and use two wedges between the spacer and the left side of the box to hold the leg in place.

Time to cut a real mortise

Once you've tested the setup piece, put the real leg into the mortise box and cut the mortise.



Adjust the fence. Place the router, with its primary fence and keeper fence, on the top of the router box so the bit lines up with the mortise. Secure the fences. With a fence on each side, the router is effectively trapped, and won't stray as you cut.

Set the depth. An easy way to set the depth of cut is to draw a line on the end of the leg. With the leg in place and the router turned off and resting on the box sides, plunge the bit to the layout line and lock the depth stop.



using. They must be the same diameter as the original rods. Drill holes for them in the keeper fence spaced to match your router, then epoxy them into the keeper fence.

Two mortising methods

Two methods of cutting the mortise work equally well. The first is to plunge the bit down full depth—and retract it straight up—at the beginning and then at the end of the laid-out mortise. Now return to the beginning and make a series of overlapping full-depth plunges, down and up. After the last plunge, retract the router bit, go back to the start, and plunge the bit full depth again. Keeping the bit at full depth and pushing forward, rout the length of the mortise. Retract the router and turn it off.

The other method, which I use more frequently, starts the same way: Plunge the router full depth to define the beginning and end of the cut. Now, go back to the end closest to you and make a series of progressively deeper passes (usually around $\frac{1}{8}$ in. to $\frac{3}{16}$ in. at a time) the length of the mortise, always pushing the router away from you, until the final depth is reached.

I find that using the different turret depth stops to control the progressively deeper cuts is laborious and unnecessary. It is easy enough to make these cuts by feel. You can tell you are taking too deep a cut if the noise from the router increases dramatically, the bit chatters, and the



Plunge, plunge, and back and forth. Van Dyke's preferred cutting method is to make full-depth plunge cuts at the start and end of the mortise, and then make progressively deeper passes the length of the mortise until he reaches full depth. His pro tip: Don't change the router depth at the end of each pass. Instead, first slide the router back to the beginning. This pass will clear any chips without cutting wood.



Cut a haunched mortise

Often used in leg-to-apron joints, the haunched mortise has a shallow section at the top end that adds twisting resistance without overly weakening the leg. It's easily cut on the router box.



Turret stop sets depth. Once you cut the full mortise, you can focus on the haunch. The only thing you need to change on the router is the depth of cut.



Cutting the haunch is simple. After cutting the main mortise, you can cut the haunch in one or two passes. Depending on which mortise you are cutting, you'll start from the end of the leg and cut toward the main mortise, or start in the main mortise and cut to the end of the leg.

surface is noticeably rougher. Usually, the only turret depth stop I use is for the final depth.

Haunched mortises

I do use an intermediate turret stop when making a mortise with two different depths, as is the case when making a haunched mortise. In this case I set the full depth of the mortise using the deepest turret setting and set one of the adjustable turret stops to the desired haunch depth. The exact haunch depth is usually not critical—a typical leg mortise can have a haunch anywhere between $\frac{1}{8}$ in. and $\frac{1}{4}$ in. deep. If you run the full-depth mortise before running the haunch, your layout line for the haunch will not be erased.

Final touches

After the machine work, I square the mortise to my original layout line. The bottom layout line determines where the top edge of the table apron will sit. Making an accurate chisel cut ensures this. If you round over the tenon instead of squaring the mortise, you won't have an accurate reference. What if you stopped the router cut too early? A chisel cut on the layout line is a simple way to ensure consistency.

You will find this method of making mortises very accurate and straightforward. The best part is that you don't need to buy another machine! □

Contributing editor Bob Van Dyke runs the Connecticut Valley School of Woodworking.



Check your depths. Before you remove the leg, use a metal ruler inside the mortise to double check the depth of the main mortise and the haunch.



Chisel the mortise square. Once you rout the haunch, use a chisel the same width as the mortise to clean up the mortise, making sure to cut the ends straight up and down.



Enliven a Case with Mitered Dividers

Simple, versatile method yields fast, accurate results

BY MICHAEL PEKOVICH

A case with a lot of internal dividers can be difficult to assemble if everything must come together at once. In addition, on a smaller piece, the divider thickness needs to fit the overall scale or you quickly run the risk of ending up with a clunky design.

Making dividers in mitered subassemblies provides a simple solution to both challenges. It allows you to assemble the case first, and install the dividers later. The case houses the divider assemblies, keeping them square and adding support.

Because of that support, the dimensions of the divider stock can be thin and still provide the necessary strength. I often use stock as thin as $\frac{3}{16}$ in., which lends a light, delicate look to a piece. Another advantage is that mitered dividers offer a flexible way to design, allowing you to explore different combinations of drawers, shelves, and vertical compartments in a case.

Accurate miters are a must

A miter joint is simple in concept yet often difficult to execute precisely. When

making mitered dividers, the length of the parts is just as critical as the angle of the miters. I've gone about it in a few different ways over the years, and I'd like to share a method that uses a simple shooting board to dial in perfect miters.

Start with the divider stock

Before you get going, mill your divider stock to thickness and width, but leave it long. I usually work with stock 30 in. to 36 in. long depending on the size of the parts I'll need. Anything longer than



For drawers and more. Mitered divider units make it easy to break up space within a case. They are commonly used to make drawer pockets, but they can also create shelves and vertical partitions within a case.

SIZE THE DIVIDER PARTS



Cut oversize and trim to fit. At the table saw, crosscut the parts a little longer than necessary, and plane them to size with a shooting board. Square one end first, and then flip the stock to plane the opposite end. Check the fit in the case; the goal is a nice slip fit that doesn't bind.



that gets cumbersome to handle. It might sound contradictory, but when milling thin pieces, I start with thick stock, usually 8/4 material if I can find it. When resawing a board into thin pieces, I find that the outer blanks tend to bow, while the remaining blanks tend to stay flatter. If you have access to air-dried lumber, that's best. The air-dried lumber I've used in the past had very little tension and resulted in dead-flat divider stock.

It's impossible to joint and plane a thin piece of stock by machine once it has been cut, so I joint the outer faces of the blank flat before resawing each strip. I then run the jointed face down when planing the stock to final thickness. I install a 1/2-in.-thick MDF platen in my planer to help

TIP

A trick for even dividers in a case with a center partition. Start by sizing the partition to fit and inserting it along one wall of the case (right). Then cut a pair of parts to the same length and trim them until they fit side-by-side in the case (far right).



Sizing internal dividers. Parts of the divider assembly that fit into V-grooves start out a divider thickness shorter than the case opening. Remove one of the side-by-side parts, install a vertical divider against the partition (above), then size the divider to fit the remaining opening (right).



ensure good results when planing such thin stock.

Shoot the parts to length

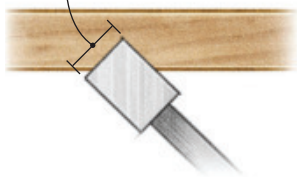
The key to success with this technique is taking an extra step that might seem odd at first. Rather than mitering the parts as I dial in their precise lengths, I start by cutting square ends on the parts when fitting them, and turn to mitering only after they are at the proper length.

The process begins with parts cut slightly overlong. It's not critical how you go about it since you'll square each end using a hand plane and shooting board. I prefer not to leave too much work to do at the bench, so at the table saw I cut the parts just slightly overlong, not more than 1/16 in.

CUT THE V-GROOVES

Use a flat-top blade for the V-grooves. For thin stock, a standard FTG rip blade will work. For wider stock, the author uses a blade from a box-joint blade set.

Blade's tooth should be wider than the V-groove wall.



Sneak up on the groove depth.

Tilt the blade to 45°, and set the height just below half the thickness of the stock. Take test cuts, raising the blade until the groove width equals the thickness of the stock.

The next step is to plane one end square. A shooting board with a square fence is essential. The one I use has an adjustable fence that I can square up before every job (see "6 Essential Bench Jigs," *FWW* #258). Try not to remove too much stock on the first end; the part must still be overlong when you start on the second end. Once both ends are square, check the fit against the case opening. Aim for a snug fit that doesn't require too much force to slide in-to place. If the case will have a center partition, insert the partition along one side of the case and trim a pair of parts until they fit side by side. Any internal dividers that fit into V-grooves need to be one divider thickness shorter than the case opening.

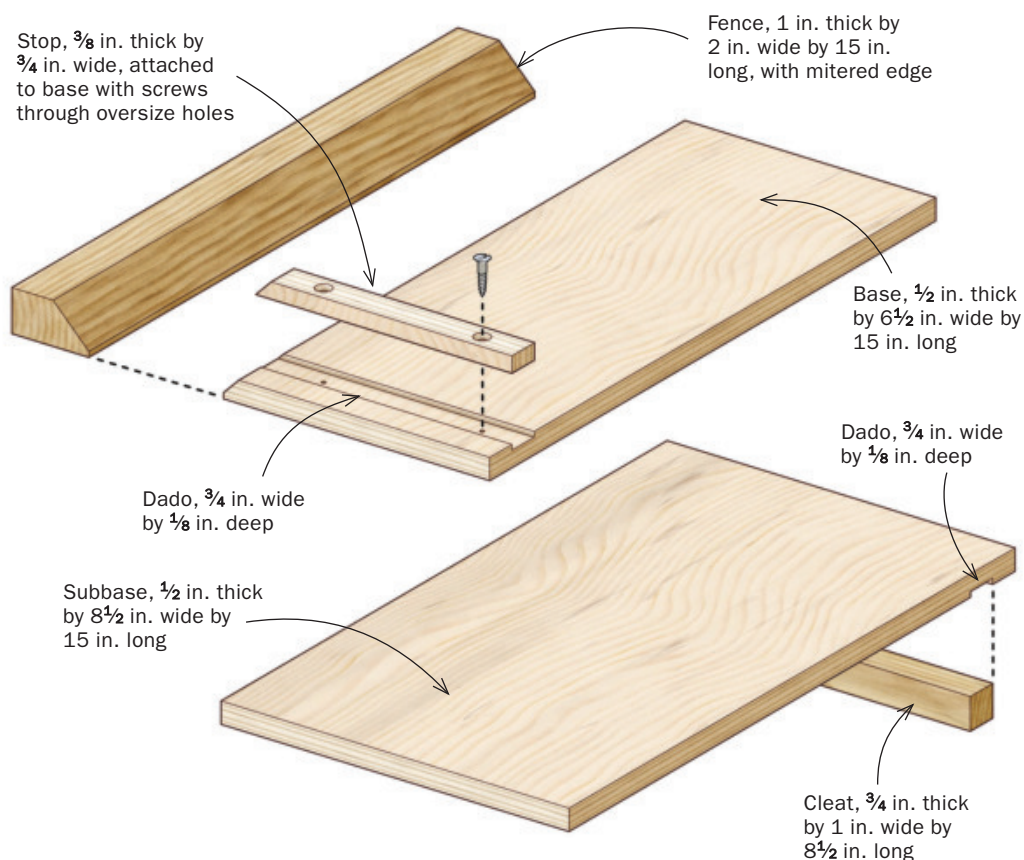
Next up are the V-grooves

I prefer to cut the grooves for the dividers before I miter the ends of the parts. A

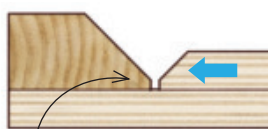


Adjust the fence and cut the grooves. Once the blade is at final height, adjust the rip fence to the desired groove location and make the cut. Use a push pad to ensure a groove of consistent depth.

A SHOOTING BOARD FOR MITERS



Miter the fence and base. Leave a small flat at the tip of the miter to aid with assembly.



Small flats on fence and base mitered ends allow for easy alignment when assembling the shooting board.

Attach the base and fence. After dadoing for the stop and the cleat, glue and nail the fence along one edge of the subbase. Then position the base against the fence and glue and nail it in place.



Add the stop. The stop acts as a zero-clearance support and prevents chipout when planing. It gets worn out over time, but oversize holes allow for adjustment for a fresh cut on occasion.

square end will ride along the rip fence or router table fence more easily than the knife edge of a mitered end. Cutting the grooves for the dividers can be handled a couple of different ways. I've used a V-groove bit at the router table with good success, but I'll demonstrate a table saw technique here. I think the table saw cuts

more efficiently than a router bit, but the downside is that with the blade set at 45° the distance from the fence to the tip of the blade changes as the blade is raised or lowered. On a router table, the position of the point of the bit is consistent.

When cutting a groove at the table saw, the tops of the teeth define one wall of the

V and the sides define the other. Because of this, you need a blade with a flat-top grind that is wider than a typical blade. I like to use a box-joint blade set. The wide, flat teeth do a great job of cutting a V-groove. Box-joint blades range in price from \$50 on up, and while it may represent a bigger investment than a V-groove bit,



Planing a miter.
Rest the plane in the V-groove of the shooting board. Hold the side of the plane tight to the fence while planing, and resist the temptation to tilt the plane toward the stock. Instead, feed the stock into the plane as you go.

you'll use this set for a lot of joinery tasks once you have it.

The height of the blade will determine the width of the V-groove. Too shallow and the grooves will be too narrow. Too deep, and they'll be too wide. The aim is to set the blade height equal to half the thickness of the stock. This will yield a groove of the correct width and, just as important, will help ensure that the dividers you've already cut will fit correctly.

Starting with the blade too low, take successive cuts in a piece of scrap until the width of the groove equals the thickness of the stock. Since adjusting the height of the blade will change its lateral alignment as well, wait until the height is correct before positioning the rip fence. Use a push pad to ensure a consistent groove depth.

Miter the ends

Planing miters by hand may sound like a big chore, but on thin stock it goes quickly. The key is having a well-suited shooting board. Rather than angling the workpiece to cut the miter, my shooting board angles the hand plane at 45° and the stock lies flat on the base. This makes it easy to hold the stock flat while planing in the event that there is a slight cup (which is not uncommon in thin stock).



Check the flat to gauge your progress. A flat of even width across the tip is a good indication that you are planing level. Continue until the flat disappears, leaving a knife edge; but be sure not to plane too far.



Insert the dividers for a final check. It's common to have the dividers fit individually yet create too tight a fit once they are all in place. Often, an extra pass on the end of one divider is all that is needed to get them to seat.

CENTERED MITERS



Plane a centered miter. Flip the stock as you plane to ensure bevels of equal width and a centered point. Watch the remaining flat to gauge your progress, and check the fit often as you go.



PREP AND FINISH THE PARTS

Dress the edges.

Planing the mitered ends often results in tearout at the corners. It's easier to remove it with a couple of passes with a hand plane rather than wait to address it after glue-up.



Pre-finish the inside faces.

Pekovich uses a 50/50 mix of Zinsser SealCoat dewaxed blond shellac and denatured alcohol. Pad on a light coat, wait for it to dry, and scuff-sand the surface with fine sandpaper. Apply one more coat and you're done.



Check the miter as you plane; it should be even along the width of the stock. Make any adjustments as you go. Watch the remaining flat to determine how much you need to plane. I shoot for a knife edge but guard against removing too much stock. After mitering all of the parts, double check the fit by sliding all four sides into the case. It's common for all of the individual parts to fit, only to have a fit that's too snug once everything is in place. Resist the urge to force the last piece in. Instead, trim as needed for a slip fit that doesn't require a lot of pressure to insert.

Bevel the dividers

The internal dividers receive a centered miter on each end that fits into the V-grooves of the outer pieces. Take equal passes on each face as you go to ensure the miter's point is centered. Look at the remaining flat to judge your progress. Plane a complete miter on one end and then plane the opposite end leaving a small flat. This should result in a too-snug fit and guards against a divider that is too short for the opening. Continue planing the end with the flat as needed to dial in the final fit.

Glue up the divider assemblies

It's tempting to slide the divider parts in dry and leave them. However, I find they can shift over time and the case doesn't always do a good job of keeping the joinery tight, so gluing everything into a single

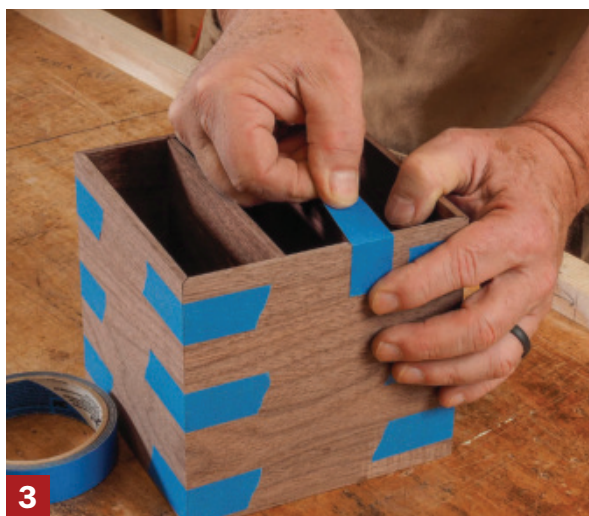
GLUE THE ASSEMBLIES



1



2



3



4

Use tape as a clamp. Arrange the dividers along a straightedge clamped to your benchtop and stretch a few pieces of tape across each joint (1). Apply glue to the mitered ends and V-grooves and roll everything up together, stretching the tape across the final corner (2). Add tape at the V-groove intersections to ensure that those joints are tight (3). Stretch-wrap is a good way to apply a little extra pressure (4). After the glue dries, check the final fit of the divider assembly (5). Sand as needed, taking care not to stress the joints.

unit is a good idea. Start by surfacing the inside faces of the parts and planing the front edges to remove any tearout at the corners from mitering. Then finish the inside surfaces with shellac before glue-up. It's much easier than finishing the parts once they're assembled, and any squeeze-out will pop off the shellacked surface.

When gluing, I treat the divider assemblies like a mitered box, using blue tape to hinge the parts together and provide the necessary clamping pressure. I usually apply additional tape and stretch-wrap at the divider locations.

The glued assemblies may be a bit tighter in the case than when the pieces were dry-fit. But they typically only require minimal sanding to get them to slide in place. □

In addition to being editor and creative director of Fine Woodworking, Michael Pekovich teaches woodworking online and across the country.



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About 20 years ago, a customer asked me to design a stool that was “comfortable, well proportioned, and graceful.” I designed and built a set of them, and the client was very pleased with the results. I had first made a prototype, with mixed woods and a painted finish, and it’s still in constant use in our kitchen and standing up well. Paint finish, a Windsor tradition, makes for a wonderfully uniform design, emphasizing the shapes and curves instead of the wood’s grain and color. But natural wood is more my style, so over the years I’ve built many of these in cherry. They’ve been sized at various heights to work with kitchen counters, bar counters, and other places.

Windsor construction and modern tooling give a timeless result

BY CHARLIE DURFEE

The design’s stayed about the same, but the construction process became more refined in subsequent builds. In fact, while doing another set recently, I realized the piece had remained a work in progress. Structurally, it’s a basic Windsor form: a thick plank seat with the legs and spindles tenoned into it. For comfort, the seat is well sculpted, and a curved low back gives support in just the right place. Using classic Windsor construction, the legs are attached with wedged through-tenons. The lower stretchers are similarly fastened. To avoid the straight dowel look seen on a lot of commercial stools, all the turned parts have a gentle swell and taper. The swell’s location depends on the function of the part.

Classic Kitchen Stool

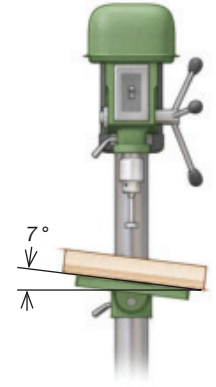
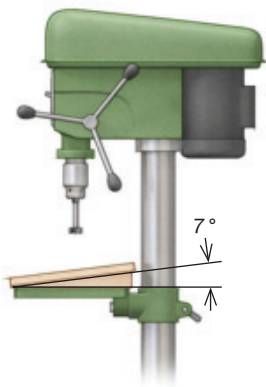


Beautiful with a clear finish or painted, this understated form will look at home whether alone or in a set.



Drilling the seat

Use a template to lay out the seat. After gluing up the seat blank, Durfee grabs his template to transfer all the crucial layout information, including the depth hole (near right), joinery locations, and perimeter shape (far right). He'll drill into both faces of the blank, so he uses centerlines on both sides of it to orient the template.



Add a ramp and tilt the table to drill at the correct rake and splay angles. To tilt the seat blank to the rake angle, Durfee screws a plywood ramp to his drill-press table. He then tilts the table itself for the splay angle.

In addition to the Windsor construction, the stool offers some techniques involved in flat work, namely bent-lamination for the crest rail. While you could forgo the back altogether and just build the seat, legs, and stretchers and call the stool good to go, take the challenge. It's worth it functionally and aesthetically.

The seat height is set for use with a kitchen counter of 36 in. But that can be easily adapted to other uses by lengthening or shortening the

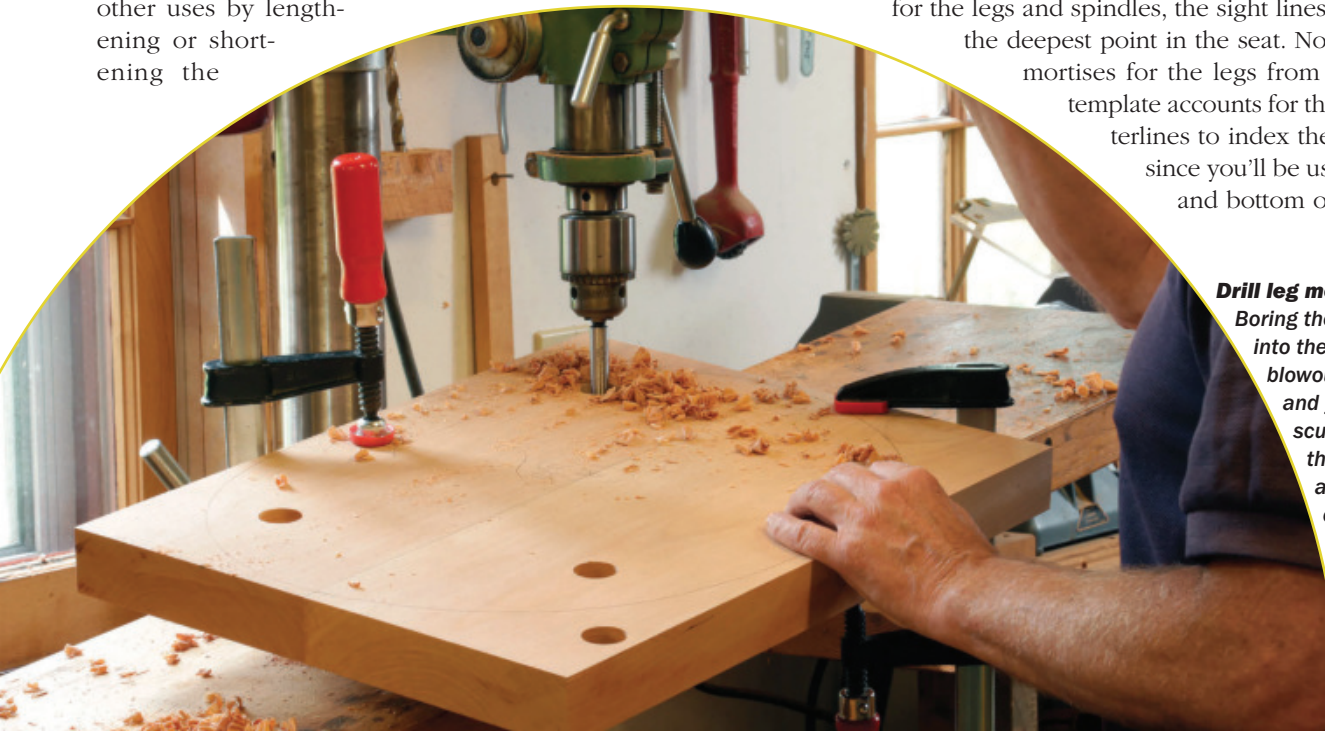
legs below the stretchers. A rule of thumb is to have the seat height about 9 to 10 in. below the corresponding surface height.

Start with the seat

All the other parts flow from the seat. You'll likely need to glue up a pair of boards to make the blank; I used cherry for mine. Make a seat template and use it to lay out the centerlines, the mortises for the legs and spindles, the sight lines for the spindles, and the deepest point in the seat. Note that you'll drill the mortises for the legs from the bottom, and the template accounts for their splay. Use the centerlines to index the template accurately, since you'll be using it on both the top and bottom of the blank.

Drill leg mortises from below.

Boring these through-holes into the bottom face means blowout is limited to the top, and you'll remove it when sculpting the seat. Because the rake and splay angles are the same, Durfee can simply rotate the blank 90° between mortises.





Determine the spindle sight lines. On the top of the blank, connect the spindle locations to their convergence point along the centerline. You'll sight down these lines when drilling mortises for the spindles.



Reset the drill-press table but leave the ramp. The spindles tilt back, but they don't splay. So bring the table back to square without moving the ramp.

Bore these mortises on the drill press. I tackle the ones for the legs first. The rake and splay are both 7°. Then flip the blank to drill the stopped mortises for the back spindles. These angle back at 7°, so keep the ramp in place but square the table.

Next up are shaping and saddling the seat. While I cut out its oval profile on the front now, I leave the back section square to ease clamping the seat to the bench. I power-carve the seat, and I don't want the workpiece moving at all.

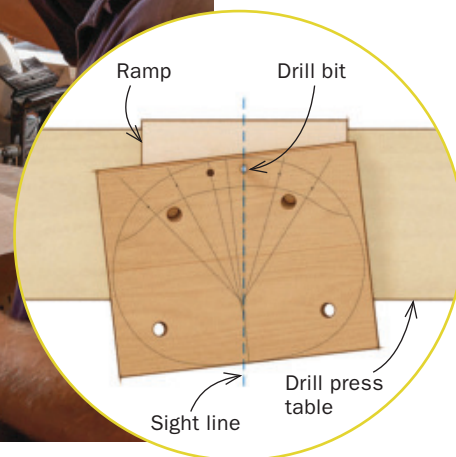
Drill a depth hole in the center. You could do more of these at different depths, but I rely on my eyes and fingers to achieve the saddle shape. I also occasionally check the thickness with a bowl turner's caliper to ensure the shape is symmetrical. In addition to the saddling, there's a strong roundover at the seat's front edge. This is for comfort under the sitter's thighs. Again, use your hands to test the seat as you go.

I've used a wide variety of techniques to shape the seat. The challenge has always been how to efficiently rough out the saddle. Scorps and inshaves work well, but are slow and laborious in hardwood. Instead, I rough out the seats using a pair of power-carving disks mounted in an angle grinder. Don't be put off if you're limited to hand tools, though. They've worked just fine for centuries. Plus, I always finish shaping with spokeshaves, scrapers, and sandpaper.

The work is well worth it, as the seat will be demonstrably more comfortable than most commercial efforts. Once the saddling is complete, finish cutting out the perimeter around the back section of the seat,



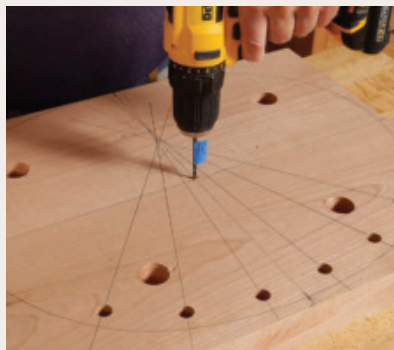
Start with the two center spindles. These are stopped mortises. Set the point of the drill into the spot for the spindle hole, then rotate the seat blank so the sight line is straight toward you.



The outer spindles need a shim. The four remaining spindles need a touch higher ramp angle than the others to line up correctly. To adjust them, Durfee shims up the seat $\frac{3}{32}$ in. before drilling.

Shaping the seat

GETTING READY

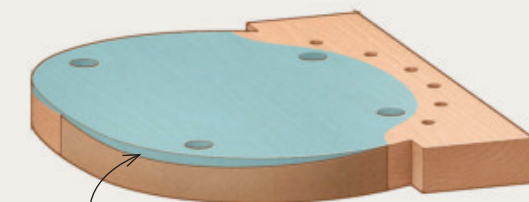
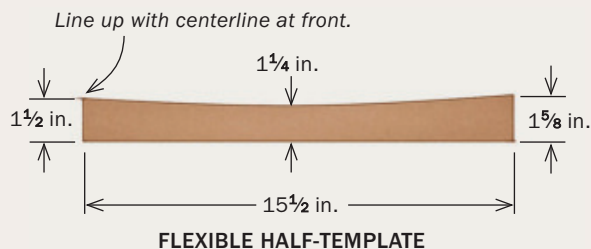


A depth hole helps when saddling. A small-diameter hole at the deepest part of the seat gives some guidance when you shape the saddle.



Bandsaw the front, but leave the back square. Shaping the front now lets you better track the saddling against the seat's shape. Keeping the back square makes clamping easier.

SADDLE THE SEAT



The template lays out the shape and depth of the saddling.



The saddling template should be flexible but firm. Durfee uses cardboard from a cereal box, which wraps around the seat well but won't deflect from the pencil's pressure.



Power-carve away most of the waste. Start with a coarse disk (left and below) before moving to something finer (bottom). Frequently check the seat's shape and depth, looking at it from all angles while taking it as close as possible with the angle grinder.



Lancelot 22-tooth carving disk by King Arthur's Tools Model #45822

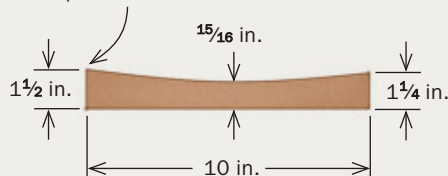


Original fine shaping disk by Kutzall Model SD4120230

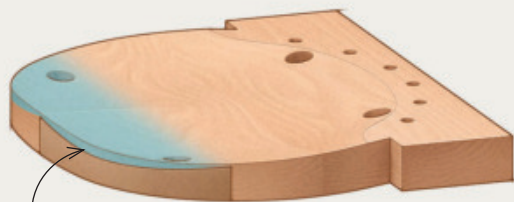


ROLL OVER THE FRONT EDGE

Line up with centerline at front.



ROLLOVER HALF-TEMPLATE



The rollover template lays out a deeper cut at the seat's front edge to accommodate the sitter's thighs.

bevel the bottom of the front edge, and give the bottom back edge a $\frac{5}{8}$ -in. roundover.

Move down to the legs and stretchers

Find some nice, straight-grained stock for the turned legs and stretchers. This stock should also be quite dry so the tenons don't shrink in their mortises. Use a story stick for consistent layout among the legs, and mark the stretcher locations in pencil.

Turn the legs but leave the tenons long, and chamfer their ends slightly to ease assembly. You'll trim their through-tenons to length afterward.

When the legs are done, dry-fit them into the chair. You need to bore angled mortises in the legs for the stretchers, and it's better to mock up the stool and pull the angles from what you've built than to rely on a plan or drawing. Especially with the through-mortises for the stretchers, it's easy for a slight difference in the angle to make for an inaccurate fit during assembly.

Drill these mortises on the drill press with the table set to the correct angle and the stretcher held in a V-block jig to secure it parallel to the table. Orient the grain of the legs uniformly, with the quartersawn edges facing front and back. Drill the mortises for the front and rear stretchers first. Drill almost through with the Forstner bit, but use a $\frac{1}{16}$ -in. bit to drill the rest of the way through. Use that small hole when aligning the Forstner bit to finish drilling the mortise from the other side of the leg. This avoids blowout.

For the foot rest, use the same drill-press table settings as for the front stretcher, but put a dowel into

FINAL SHAPING



Hand tools even out the power carving's irregular surface. Starting with a small spokeshave (top) and finishing with a scraper (above), Durfee smooths the seat. A sander with a soft fine-grit pad is the final step.



Front of the seat gets undercut at a 15° angle. Make the cut at the bandsaw with the table tilted.



Bandsaw the back to shape. With the saddling done, you no longer need the back as a clamping surface. Trim to just outside your line and clean up the cut with hand tools.

Legs, stretchers, and dry-fitting



Test the turned tenons. While turning the legs and tenons, Durfee frequently checks the latter against a test hole bored with the same bit he used to drill the leg holes in the seat.

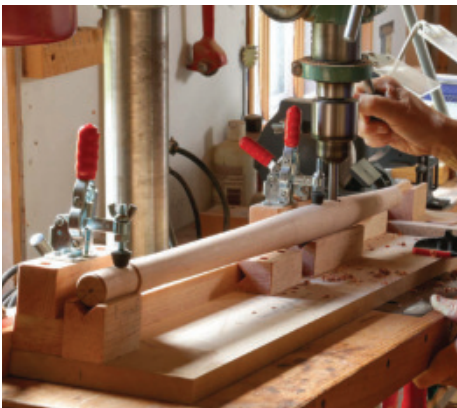
the stretcher mortise and line that up with the drill bit. This ensures that the two mortises will lie in the same plane. This one is smaller in diameter and stopped.

The mortises for the side stretchers are drilled in the same manner, but you will need to reset the drill-press angle for both the front and back leg mortises, which are different. Again, verify the angles on your actual piece. And mark the legs with the side stretchers' center points as well.

Turning the stretchers is pretty straightforward. The swell is centered, and it gently tapers out toward the ends. Again, get the overall lengths from the piece itself. Similarly, using dowels in the existing mortises to mark off the shoulder distances is helpful when locating the tenons. As with the legs, leave the tenons long (except on the



Mock up the stool to get the drilling angles for the front and rear stretchers and foot rest. The holes for the stretchers and foot rest need to be drilled at an angle. Get this by putting the legs into the seat and clamping a straightedge across the stretcher location (above). Then adjust a bevel gauge until it sits in line with the leg. This is the angle for that hole. Repeat the process for each leg.



Support the leg while drilling. After tilting the drill press table to the correct angle, Durfee sets up a jig to stabilize the leg. Its long platform has V-blocks to cradle the workpiece, including one right under the drilling locations. Its toggle clamps ensure the leg stays put, too.



Dowels align legs for determining angle for side stretchers' holes. To make sure the legs are oriented correctly, insert a dowel through the stretcher holes you just drilled. Dowels also help when getting the shoulder-to-shoulder dimensions for the stretchers.



Mark the drilling location too. A pencil secured in a long V-block lets Durfee mark exactly where to drill. A straight stick of wood clamped to the leg ensures the block sits in the same plane as the leg.



Kerf the leg and stretcher tenons. These kerfs are for wedges. A V-block supports the workpiece and allows for safe, repetitive cuts.

foot rest) and slightly chamfer the ends.

The last thing to do with the legs and stretchers is to cut the wedge slots. At the bandsaw, I cut these so they'll be perpendicular to the grain direction of the seat. If they weren't, the wedges could split it.

Assemble the undercarriage

Glue-ups can be stressful, and the angled mortise-and-tenons here don't help. But the dozens of these stools I've built have taught a few lessons that keep things manageable. For one, use a glue with a long open time, such as Titebond III or Old Brown Glue. Next, get creative with clamping. Options include band clamps, rubber tubing wrapped around the joints, one-handed trigger clamps, or bar clamps with foam pads attached to the heads (which are what I use).

Assemble the undercarriage. Using glue with a long open time, coat all the mortises. Insert the stretchers into the legs, and the legs into the seat. This can take some push and pull as the angled parts work against one another.



Drive the wedges. You'll know the wedge has seated when the sound it makes changes pitch. Check the piece for overall alignment once more. Trim the wedges after the glue cures.

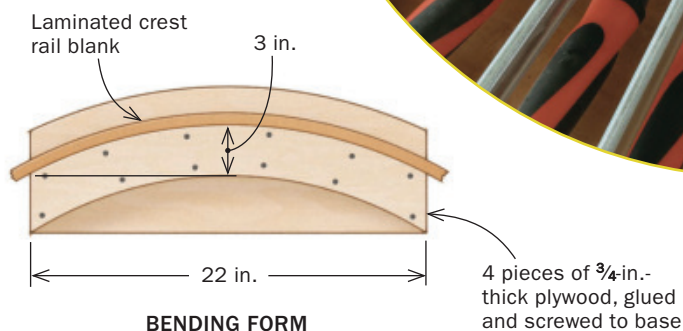


Mark and trim the legs to length. After shimming the stool so the seat is level horizontally but tilts down slightly toward the back, use a pencil on a spacer to mark your cut lines. Saw to the lines with a handsaw.

Curved, bent-lam back

Glue up the laminations using a bending form and plenty of clamps.

Start by clamping the middle before moving toward the ends. To give continuous flow to the grain, cut the laminations from a single piece of stock and keep them in order during the glue-up.



Scribe along the bottom with the crest rail tilted back. The crest rail will sit in line with the angled spindles, so its bottom edge needs to be cut to accommodate this tilt. To lay out the cut, Durfee clamps the rail to a block cut at an 83° angle and then scribes it using a compass.



Once the seat, legs, stretchers, and foot rest are clamped in place, check the leg angles for proper alignment. Don't get too caught up in degree numbers; just eyeball it. Check the alignment again after you have driven the wedges.

When the glue has set, trim off the leg tenons' protruding ends and fair up the surfaces. This is a good time to do the final sanding on the seat saddle too. Also, trim the rear legs $\frac{3}{8}$ in. shorter than the front, giving the seat a slight backward tilt for comfort.

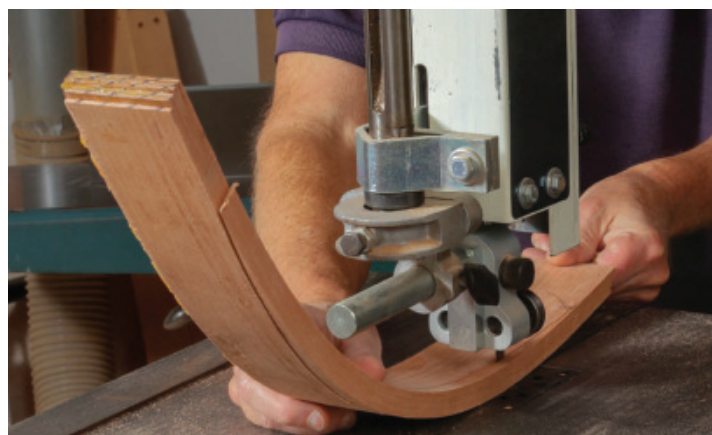
The back is last

At this point, you have a functioning stool, but I encourage moving ahead and adding the back. Made up of spindles and a curved back rest, it gives the design a graceful lift and offers lumbar support. I make the curved crest rail using bent lamination.

For the bending form, use layers of plywood or MDF to make a stack about 3 in. high. I glue and screw four layers of $\frac{3}{4}$ -in. plywood, lining the face with plastic wrap.

I cut the laminations from a single piece of stock for grain and color continuity. Each of the six lams should be about 22 in. long by $2\frac{1}{2}$ in. wide and a bit under $\frac{1}{8}$ in. thick, making a stack about $\frac{5}{8}$ in. thick. Mark their sequence so you can glue them back together in the order they came from the plank.

After glue-up, the crest rail's bottom edge needs to be cut to a concave curve to accommodate the back's backward tilt. I hold



Trim the bottom edge at the bandsaw. For safety while making this cut on a curved workpiece, be sure to hold it firmly to the table and rotate the crest rail as you follow the line so the contact point on the table is always right by the blade.

Mark the spindle locations. As you did with the stretchers, dry-fit the parts to lay out these joints. Durfee clamps the back to the spindles and pencils on both sides of their tenons.



Bore the mortises for the spindles. Drill each hole between the layout lines from the previous step. You may have to shim one end of the back rest to align the mortise angle with the drill bit.



Finish shaping the back. With all of the joinery done, you can wrap up the workpiece. Safely cut its top and rounded ends freehand before smoothing it with hand tools and sandpaper.



it at the correct tilt using an angled block, then scribe the curve and cut it on the bandsaw.

To lay out the mortises for the spindles, dry-fit the spindles in the seat, and clamp the crest rail to their upper tenons. Mark where those mortises will fall, and bore them on the drill press. When those are done, saw and shape the crest rail's top edge and ends to final form. Then glue the spindles to the seat and the crest rail.

I sand the stool to 150-grit. This may not seem smooth enough, but this stool will be sat on, pulled around, and hopefully put to a lot of use, so there's no need to be precious about it. I then use a couple of coats of an oil/varnish mix, namely Minwax Antique Oil. Leave it at that, or top it with a coat of clear gel varnish. □

Charlie Durfee is a furniture maker in Woolwich, Maine.



Put it all together. At glue-up, gentle tapping with a dead-blow mallet should prevent dents. Put the seat on a corner of your bench for support. Glue the spindles into their seat sockets, then tap the crest rail onto them until seated. As with the legs, it may involve some push and pull.

gallery

Inspiration for our readers,
from our readers

MICHAEL JURY

Springfield, Va.

This piece, which won Best in Show—Furniture Design at the 2022 Annual Fine Furnishings Show in Providence, draws inspiration from a combination of Shaker, Danish Modern, and Japanese design. The two sliding door panels feature asa-no-ha kumiko. This lattice pattern represents a hemp leaf, symbolizing health, resilience, and prosperity in traditional Japanese culture. The kumiko is backed with black momigami paper to highlight the form.

CHERRY, MAPLE, AND BASSWOOD, 16 $\frac{3}{4}$ D X 50W X 37H

Photo: Greg Staley



DOUGLAS SOFFE

Mercersburg, Pa.

“A Time and Motion Study” on the back cover of *FWW* #35 (July/August 1982) featured a desk by Jere Osgood. As Douglas tried to figure out how Osgood made the tapered bent laminated legs on that desk, he was inspired to build this version, which he calls “Form in Motion.”

MAHOGANY CORE, ZEBRAWOOD VENEER, AFRICAN BLACKWOOD, VEGAN LEATHER, 30D X 48W X 30H

Photo: Andy Smetzer Photography

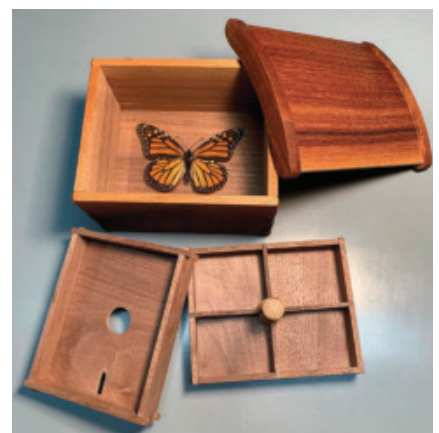


JIM CICCHINI

Flemington, N.J.

Jim made this jewelry box for his wife as a Valentine's Day gift. All the joints are hand cut and the lid was bent by making fine kerf cuts. Inside the box are two nesting trays.

BLACK WALNUT, 4 $\frac{1}{2}$ D X 5 $\frac{1}{2}$ W X 4H





JOHN JACOBS

Old Mission, Mich.

About 10 years ago, John acquired a summer home in northern Michigan. The house came partially furnished with pieces made by the Swedish craftsmen who built the house in 1932. He was inspired to create other pieces in the style of that furniture. After making nearly 30 pieces, including beds, dressers, and tables, his woodworking skills have grown tremendously. This table replaces a factory-made 1950s era dressing table/desk in a guest room.

ASH, WALNUT, 23½ D X 37W X 30H

Photo: Michael Drilling

PHIL GRUPPUSO

Seekonk, Mass.

Experimenting with acrylic ink and an old drafting set (ruling pen and compass), Phil's goal was to refine his techniques for decorating furniture—tabletops, cabinet doors, etc. He stumbled on a configuration of circles on drawer fronts and applied it to this modern version of an old spice cabinet.

POMMELE SAPELE, WENGE, TULIP POPLAR, 12D X 12W X 13¼H



ARMIN GOETSCH

High Point, N.C.

Armin began building this table without a plan, other than wanting to avoid straight lines. He started with the top and legs and designed and built as he went. The basket weave on the drawer front, a focal point of the piece, turns out to be a design element that covers up a mistake.

CHERRY, 22D X 36W X 22H

ALBERT KLEINE

Laurel, Md.

To Albert, building a Shaker blanket chest was a woodworking rite of passage and something he aspired to for years. He finally got the opportunity to try when a family member got married; this chest was the wedding gift. Over the course of two months, he completed the chest

using primarily hand tools; all the joinery and marquetry was cut by hand. The marquetry on the inner tray was a personalized touch for the couple; they are both farmers, so an onion and garlic seemed appropriate.

CHERRY, SUGAR PINE, VARIOUS WOODS,
21D X 42W X 23H

Photo: Daniel Bottner



RONAN MORRISON

Williton, Somerset, U.K.

Ronan drew inspiration for this dressing table from Art Deco and Mid-Century classics, particularly the work of Emile-Jacques Ruhlmann and Gio Ponti. The biggest challenge was cutting the half-blind dovetails in the concave front of the main drawer.

BURR ELM, RIPPLED SYCAMORE, BRASS, 23½D X 60W X 60H

Photo: Mike Pawley

LILY TILTON

Somerville, Mass.

The desire to create a Southwestern-style version of a modern chair started Lily on the path to designing and building this piece. She also wanted to explore making banding. She managed to meld the style, form, and ornamentation into a chair with subtle detail instead of decorative excess.

CHERRY, WALNUT, AND MAPLE
20D X 20W X 39H

Photo: Lance Patterson





NICHOLAS ZACHRY

Las Vegas, Nevada

This cabinet was specifically designed to display a small mahogany vase Nicholas found in an antique shop. He wanted the feel of the cabinet to match the style of the vase: natural and sleek. Originally, Nicholas had intended this to be a wall cabinet but instead he put the cabinet on legs, allowing light to come in from the back.

RIFTSAWN CHERRY, RIFTSAWN RADIATA PINE, KATALOX, COPPER, 5D X 5W X 27H



RON SAWYER

Tuscaloosa, Ala.

Using locally sourced walnut, Ron set out to challenge himself with the build of this Arts and Crafts-inspired settee. Challenges came in the form of compound angled tenons, inlay, stringing, and template-routed legs.

WALNUT AND MAPLE, 22D X 49W X 44H



NICHOLAS VANARIA

Romeoville, Ill.

Two things played heavily into the design and construction of this chest. First, Nicholas is a period furniture maker, so when he needed storage he turned to historical examples for inspiration. Additionally, he wanted to design the piece around a stash of curly maple he had.

TIGER MAPLE AND CURLY MAPLE
23D X 50W X 25½H

Photo: James Vanaria

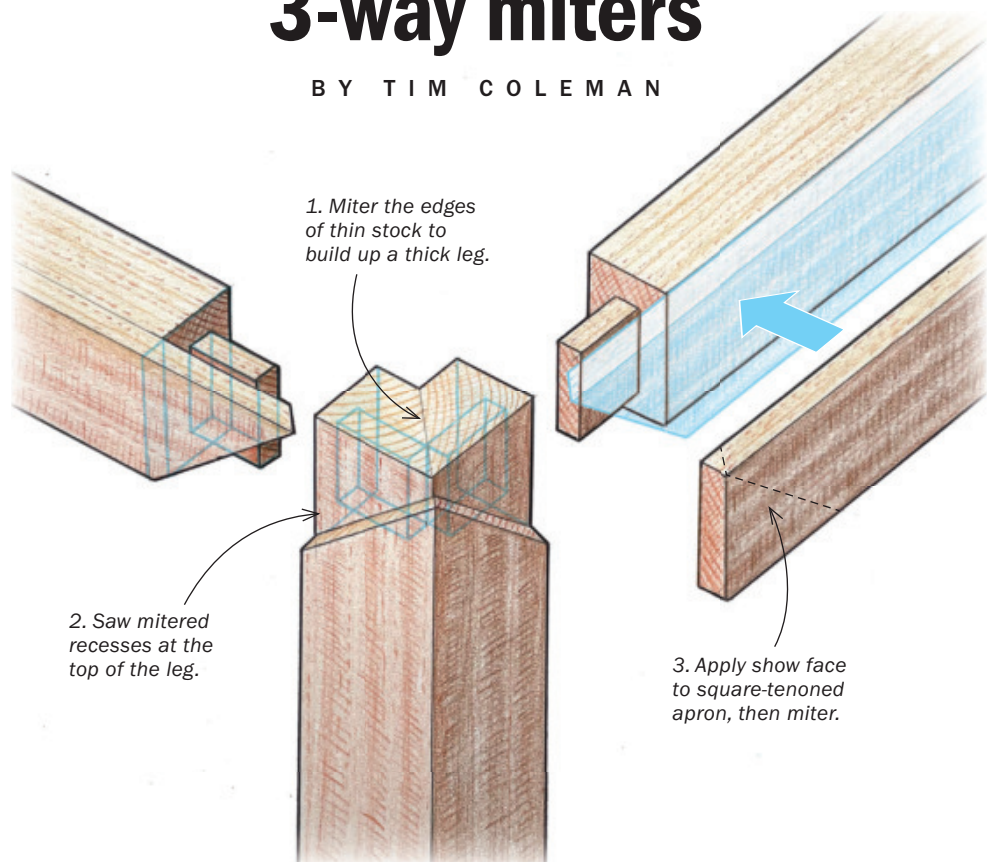
My furniture designs often rely on joinery in compact areas, so I've had to devise ways to maximize joint strength without compromising the integrity of small parts or cluttering a sleek design.

I faced this challenge on a recent dining table commission. The table was designed to sit in an alcove in front of several large windows overlooking a harbor, and the objective was to create a graceful, uncomplicated silhouette made up of slender parts. Curves on the underside of the aprons would flow seamlessly into the legs and down to the floor, and there would be no lower stretchers to disrupt these lines. I proposed three-way miters for the leg-to-apron joint, a detail seen in historic Chinese furniture. Done well, it is a strong joint, but it relies on a complex arrangement of integral tenons and miters, and requires tricky cuts. Eventually, I came up with a way to simplify the process of making it.

Cutting the mortises and the mitered recesses on the legs wasn't daunting. But I wanted to simplify the aprons. So I decided to make them as two layers: a thick inside layer with a substantial integral tenon, and a thinner outside layer that I would laminate to the inside one after the tenons were cut.

3 steps to strong and slick 3-way miters

BY TIM COLEMAN



Once the apron was laminated, I would cut the miter on the thin layer, forming a wing that gets glued into the mitered recess in the leg. After cutting that main miter on the wing, I would make the small miter cut at its tip where it mates with the wing of the adjacent apron.

I got the best of both worlds with this arrangement—the predictable strength and easy assembly of a large 90° mortise-and-tenon, and the appearance of a mitered corner. Plus, the mitered wing adds glue surface to reinforce the joint, a welcome boon considering the lack of stretchers. Made this way, the legs are a design element that improves strength and involves a clever technique.

Check your tools

You want your machines and jigs to be properly set up and tuned with any project, but it's worthwhile



Tape the miter. Coleman runs a strip of tape along the whole joint. The tape keeps the leg halves aligned, first with the miter dry, as he attaches clamping cauls with a paper joint; and later when he glues and clamps the long miter.

to stress the point here. With such a complex joint, “a little out of square” will multiply fast. The front-end work of checking your tools and jigs will spare you plenty of futzing and headaches on the back end.

A bevel builds up the legs

Thick legs are half the equation in the strength and easy assembly of a large, square mortise-and-tenon joint on a table. But I did not have solid stock thick enough to make these legs out of one piece. As a workaround, I constructed the leg blanks from two pieces, mitering them along one long edge and gluing them together. As a result, the legs look and act like thick ones even though they're made up of thinner stock.



Rip the leg stock at 45°. The ripped edge will be a glue surface, so check it with a miter square and straightedge. Coleman uses offcuts from these rips to make clamping cauls.



Paper joint allows for secure, but temporary, clamping cauls. Using wood glue, adhere the paper to a caul. Then glue this papered face to the leg, avoiding the tape. Align the clamping surface on the trapezoidal cauls with the middle of the leg's miter.



Glue the leg halves together. This joint relies on glue alone, so be liberal and use plenty of clamps. After the glue sets, pry off the cauls and clean up the surfaces. Keep the faces straight and square for the joinery. Cut the ends square and to length.

2

MITERS AT THE TOP OF THE LEG



Cut the shoulders using a miter gauge. Coleman uses his table saw fence as an end stop. He starts with it too close to the blade as he checks his settings.



This long miter can be tricky to clamp, so I use shaped cauls glued temporarily to the leg halves. The cauls' shape matters. I take the triangular cutoffs from sawing the long miters and trim off their apexes, yielding a shape with two parallel faces and 45° edges. I glue the cauls to the leg halves with a paper joint, placing the clamps on the flattened apexes. When that glue dries, I glue up the two halves of the leg, using the 45° edges of the cauls to clamp across the miter.

Remove the cauls by slipping a chisel into the paper glue joints and popping them off. Using a hand plane, clean and true the outside faces to make them square to each other, then check that the joinery faces are square to these outside faces.

Cut the joinery in the leg

To receive the aprons, each leg needs two mortises and two triangular recesses. I cut the mortises on my hollow-chisel mortiser. The recesses require a shoulder cut and then a cheek cut, both at 45°.

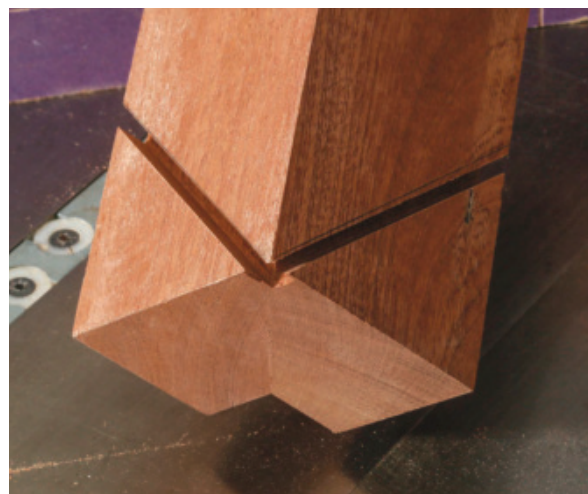
To cut the shoulders, I use a miter gauge with positive stops at 45°, which makes it easy to switch back and forth for the shoulders on each leg.

The setup for the cheeks involves a stout flat-top rip blade and a simple but crucial jig that operates like a tenoning jig, but with two fixed 45° ramps. These ramps hold the leg at the correct angle for the cheek cuts. Pair it with a tall fence on your table saw for safety and accuracy.

I position the leg's outside face against the jig's tall fence for a consistent cut. This does result in the waste being trapped between the workpiece and the fence; it's never been a safety issue for me, but



Cut the second shoulder after adjusting the miter gauge to its other 45° setting. Having a reliable miter gauge with positive stops at 45° will make these cuts (and subsequent ones) much more manageable. Make this second shoulder cut with the fence at the same setting.



The miters should meet at the corner. The meeting point of the angled shoulders should be at the corner of the leg. If it's slightly below, that's OK, because you'll trim the apron's mitered wing to fill the space.

One jig for both cheeks. With opposing 45° ramps and toggle clamps, the jig holds the leg for the cheek cuts. The blade will be raised high, so make sure it won't hit any hardware on the jig.



Press the jig tight to a tall fence and the saw table to rip the cheeks. The jig's tall fence needs an auxiliary tall fence on the table saw for safety and accuracy. For cuts on both sides of the ramp, Coleman pushes the entire jig through the cut.



it's something to be mindful of as you complete the cut. After making all the rips, clean them up and undercut the shoulders slightly with a broad chisel.

Aprons get tenons, lamination, and wing miters

When you select material for the aprons, keep in mind that the thin outside layer is what's seen in the finished joint. Pick those carefully, but don't fret over aesthetics with the thicker, inside layer.

First I cut the tenons on the thicker piece. I like to



leave the tenon about $\frac{1}{32}$ in. undersize in height—trimming an extra $\frac{1}{64}$ in. off each edge cheek—to create space for the tenon to move up or down in the mortise. Check the fit of all the mortise-and-tenons before moving on.

Next, the lamination. It's crucial that the thin layer's thickness matches the depth of the recess in the legs, or is a touch proud to allow for cleanup. As for its width and length, leave them over final size for now. The overhang means you don't have to position the piece precisely when laminating it. Flush the edges after the glue dries.

When laying out the miter on the face of the now-laminated apron, I draw the joint $\frac{1}{8}$ in. long so that



Undercut the shoulder. This precautionary measure ensures there are no high spots of end grain that will prevent the finished joint from closing.



Mortise the leg. These mortises accept the tenons on the apron. Be mindful of your reference faces as you flip the workpiece for mortising.

3 MITER THE APRON LAMINATION



Glue the apron's thinner outer layer to the tenoned rear board. The applied show face is overlong and slightly wide here, so Coleman doesn't have to fret about locating it perfectly on the tenoned piece. He flushes the edges of the applied face to the rear piece after the glue dries.

Mark the miter $\frac{1}{8}$ in. long. Then sneak up on the cut. Because of this joint's complex geometry, don't try to lay it out perfectly. Rather, use a pencil mark to get you in the ballpark before working up to the final fit at the table saw.



The miter should close when the tenon seats. This is why you gradually sneak up on the cut. If the miter or the tenon shoulders don't close, the joint could be unsightly or weakened. When fitted properly, though, the joint is incredibly strong.

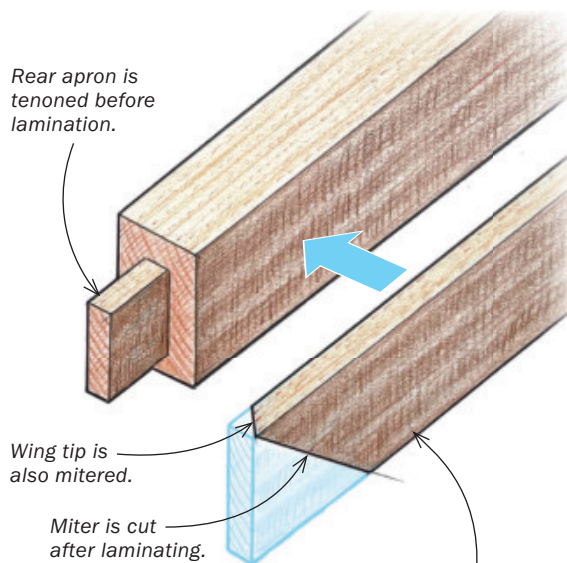


Rear apron is tenoned before lamination.

Wing tip is also mitered.

Miter is cut after laminating.

Applied outer layer



IF YOU OVERSHOOT THE MITER, PLANE THE LEG



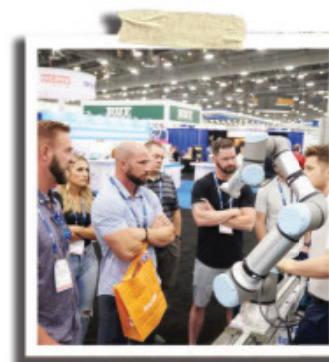
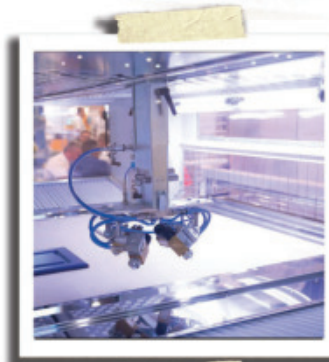
If the tenons seat but the miter remains open, carefully plane the leg's mortise face. This will make the mortise shallower, so be sure the tenon does not bottom out. Shorten it if necessary.

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Mark the wing tip, then sneak up on the cut. In order for both aprons to seat at the same time so the full joint can come together, you need to cut a second miter at the outside tip of the apron. This miter runs from the outside tip to the inside face. When sawing it, Coleman lines up the outside tip of the apron's miter with the sawblade.



Assemble the three-way miters after dry-fitting with clamps. During the final testing of the joint, apply clamping pressure to simulate final assembly.

I can approach the fit gradually at the table saw. I want the apron miter to meet the corner of the leg recess at the same time the tenon shoulders seat. You can only fit one joint at a time until the tip of the miter is itself trimmed at 45° (see the photos above). After you trim the tip, check all the joints.

Careful cauls and slow-setting epoxy

To prepare for the glue-up, I prep triangular clamping pads made from cardboard and long wooden cauls. I also ready a thick epoxy with plenty of open time.

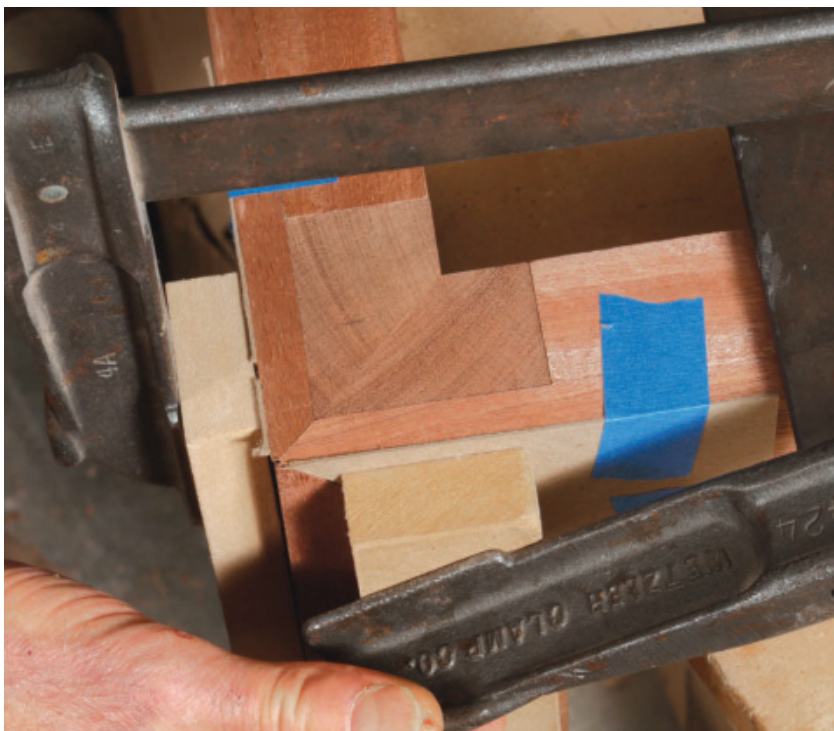
The cardboard should match the apron's miters—so cut it to the width of the apron and cut its end to 45°. These triangular pads, which I tape to the apron's miters, guarantee the wooden caul will press against the miter even if it is slightly recessed from the leg. To make the wooden cauls easier to handle, I cut them 10 in. long. Before I assemble the joint, I clamp the cauls to the leg so that they overhang the leg's top end, leaving them perfectly placed for applying pressure to the apron miter.

Spread epoxy on the tenon, in the mortise, and on the apron miter and wing tip. Clamp across the joint from both directions and use a dead-blow mallet to seat the miters if necessary. Finally, check the assembly's diagonals before letting the glue set overnight. □

Longtime FWW author Tim Coleman is a furniture maker in Shelburne, Mass.



Tape triangles of cardboard over the apron's miters. The cardboard, cut to match the shape of the mitered wing of the apron, ensures the clamping cauls focus their pressure only there. The cardboard's necessary in case the wing sits too low in the leg recess, allowing the leg to interfere with the cauls.



Glue up all at once. The narrow cauls direct pressure right over the apron's miter, keeping it tight to the leg recess. Coleman uses heavy-body epoxy from Epo-Tek because of its 30-minute open time, letting him seat and check all four corners. Plus, the epoxy's paste consistency keeps it from running.

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My mom kept a hammer in a kitchen drawer.

It was a smallish thing for tacks and brads with a head that was square on one end and wedge-shaped on the other. It was neatly tucked into a compartment that would have housed such things as spatulas, stirring spoons, and tongs. It remained in that drawer for 50 years and only came out on rare occasions for a tap or two before carefully being placed in the exact spot it was before.

When it came to being a perfectionist and minimalist there's no doubt that my mom set the precedent. Everything she owned had a purpose and was kept in tip-top shape. When I once rehanded a carbon steel paring knife for her, she simply set it aside because the balance and the grip were now different and unfamiliar. To anyone else it would have gone unnoticed, but she was an expert with a knife and immediately sensed the difference. As a youth she completed a four-year apprenticeship in a butcher shop in Germany, and her sharpening and knife skills were legendary.

Most important, everything she owned came with a story. She once turned to me and said—"All my belongings have meaning." Oddly enough, she never mentioned a word about the tack hammer. To me, it simply lived in that drawer—an image that is still deeply burned into my memory.

Over the years, she took notice of my developing skills as a furniture maker, first during my rigorous apprenticeship at Leeds Design Workshop under the tutelage of English furniture maker David Powell in Massachusetts, and then later when I returned to California to set

The tack hammer's story

BY MICHAEL CULLEN



up my own workshop. Her keen eye caught every detail in my pieces and she never missed an opportunity to point out how well the hinges were set and how all the screws were aligned.

One day not long before her death we were talking about her belongings and what to do with them. At one point in the discussion, she turned and opened the kitchen drawer and took out that small hammer and began telling me how it came into her possession.

When she was 21, she came to America from Germany with my dad to start a new life. She was leaving her family and the only home she knew. It was at the airport, right there on the tarmac when everyone was tearing up and saying their goodbyes that her father, a master of all machine trades, stepped forward holding a small hammer for her to keep safe and take on the journey.

These are his words: "This hammer symbolizes that if you take the time to learn how to do something, you will be useful, and you will always survive. Take this with you and keep it in clear view." I now keep the hammer safe in a drawer of my tool chest as a reminder of those words of wisdom.

A while back I was in Petaluma, Calif., where I lived and had a workshop out in the country. One day I was walking along the store fronts down Kentucky street in town and noticed a sign in the window: "Help Wanted—Woodworker." I immediately thought of that hammer my mom kept in the drawer. I stood there for a moment and then said to myself—I can do that. I can make things! I will survive.

Michael Cullen is finding just the right place for all his tools as he sets up his new shop in an old hilltop barn in Kent, Conn.

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Inspiring Heritage

The spiraling horns of the nyala, a mountain antelope native to the Bale Mountains of Ethiopia, have long fascinated furniture designer Jomo Tariku. Born in Kenya and raised in Ethiopia, Tariku studied industrial design at the University of Kansas before settling near Washington, D.C., in 2000. Somewhere along the line, those horns made their way into his sketchbook and, as he has in a range of other recent seating pieces, Tariku drew inspiration from an element of his African heritage as he designed his Nyala chairs. This pair, in ebonized ash, were built by David Bohnhoff, Tariku's frequent collaborator. "Through my work," Tariku says, "I aspire to change the world's perception of African design while exploring contemporary form. I want to continue the African tradition of creating objects with embedded



meaning while maintaining their utility." He is certainly succeeding; for more evidence of that, see Designer's Notebook on p. 28. And you can see Nyala chairs in person at Philadelphia's Wexler Gallery.

—Jonathan Binzen



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