December 2023 No. 306

TAUNTON'S

Fine WoodWorking

Teach · Inspire · Connect

- Miter-gauge review
- Divided-light doors
- A closer look at oak
- Tips for aging brass
- Classic Ming table

Smart clamping strategies, p. 44

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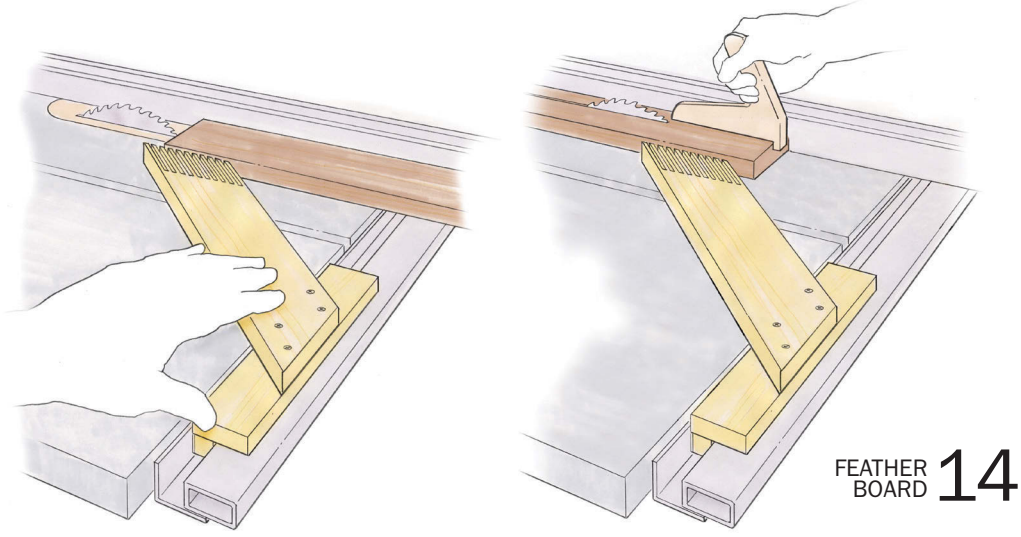
NOVEMBER/DECEMBER 2023 ■ ISSUE 306

features

Cover photo: Anissa Kapsales

in every issue

GALLERY: SIDEBOARD 68



FEATHER BOARD 14

20 VERITAS PLOW PLANE

72 ADDING PATINA TO HARDWARE

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BLOG

Clamp it like Krenov

David Welter (p. 58) demonstrates a Krenovian technique for gluing and clamping joints at odd angles.

VIDEO

Clever jig in action

Vince Fyie's eyebolt sharpening jig (p. 17 in Workshop Tips) is as simple as it is clever. See it in action in this video.

VIDEO

Massachusetts Ming

John Cameron (p. 26) has been building Chinese-inspired furniture for decades. In this video, learn more about his passion for fusing furniture styles from all over the world.

VIDEO

ABCs of CNC

We recently added a CNC to the Fine Woodworking shop. We'll show you what goes into preparing a space for a CNC and the first steps of using it.

BLOG

Helix how-to

Abraham Tesser's Helix Table (p. 70 in the Gallery) borrows its inspiration from Mother Nature and makes one wonder: How do you clamp that thing? In this blog, he explains how.

VIDEO WORKSHOP

Replicating a legend's side chair

Dan Faia painstakingly documents and builds a replica of a Queen Anne chair made in the 1980s by one of his mentors, Phil Lowe. In this series, you'll learn how to:

- Extract information from a museum piece and create exacting full-size plans
- Create strong mortise-and-tenon joinery on a complex form
- Shape cabriole legs accurately and repeatably.

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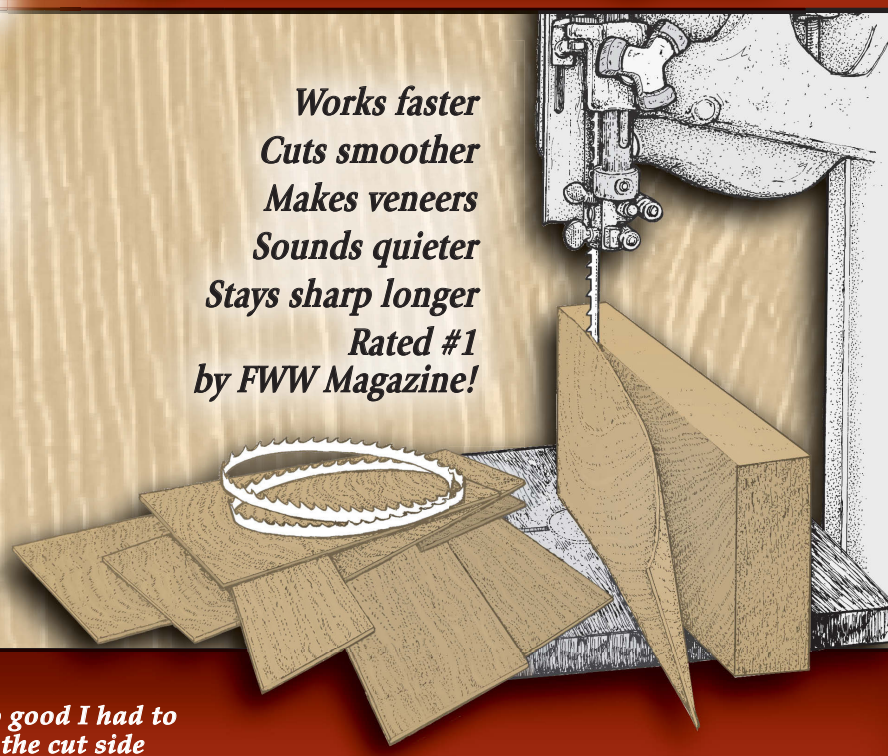
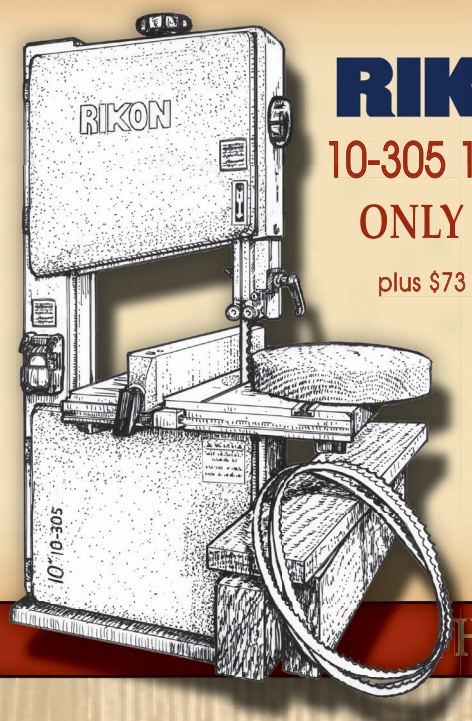


Scan to see a short video demo

R. Simon
"The cuts were so good I had to look twice to see the cut side from the machine planed face!"

D. Petrides
"I didn't think it was possible to get that smooth of a cut out of a bandsaw."



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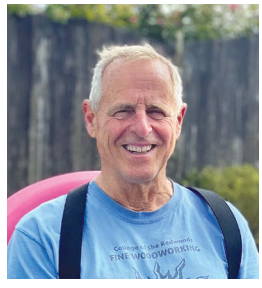
contributors

Matt Giossi and **Ron Kuhn** have their own business, Giossi and Kuhn Design, but got their start working for **Hank Gilpin** ("Custom Clamping Blocks") for more than a decade. They still do jobs for Hank these days, but out of their own space. Matt (at left in photo) came to Hank's shop when he decided to make furniture his vocation, and luckily, Hank was looking for a young, excited fella, so he took him on. Ron met Matt a few years later, while working as a bartender and taking cabinetry classes, and soon he, too, joined the shop. Hank says he takes on assistants because they help his business succeed. Of Matt and Ron, he says, "It was a crap shoot—one was a hair stylist and the other a very good bartender, but they were good guys who wanted to be woodworkers. And the good guy part is the most important. Turns out that hair styling and bartending are good pro preps for the world I live in."

Asa Christiana ("Tool Test: Miter Gauges") recently returned to the magazine full-time as an editor-at-large, working from his home in Portland, Ore. Aside from writing the occasional article of his own, he edits and photographs articles by others and manages the Workshop Tips and Tools & Materials departments. A Connecticut native, Asa worked full-time for *FWW* from 2000 to 2015 before he made the big move to the Pacific Northwest.

Dan Bollock ("Red Oak vs. White Oak") has worked for 10 years as a technician in the Wood Research Laboratory at Purdue University, a job that involves teaching, research, and industry outreach. He guest-lectures in the university's forestry and natural resources classes, and gives talks to wood clubs, school groups, and potential forestry students about wood and woodworking. He recently moved out of the shop space he rented for 20 years and into a new woodshop he built next to his home.



Upon deciding in the early 1970s that he wasn't cut out to teach industrial arts, **David Welter** ("A Riff on the Faceted Glass Door") dropped out and hitched around Europe. Eventually, he sought a bench at the College of the Redwoods under James Krenov. After a brief break following his two years as a student, he worked at the college for 30 years as the shop tech and secretary, helping countless woodworking students achieve their goals. Though now retired, he still engages with students, most recently at the Center for Furniture Craftsmanship in Maine.

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

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letters

Spotlight

The future of our craft

We receive a lot of entries for our Gallery, from furniture makers far and wide with skill levels from master craftsman to newcomer. We have rarely received one that gave us as much pleasure as this one, though, submitted by Tom Rutkowski of Bristol, Conn., on behalf of a young friend, 7-year-old Sebby Jaramillo of Plainville, Conn.

"Sebby made this covered box, with help from his grandfather, as a Father's Day gift for his dad. While his grandfather did all the milling, Sebby did the measuring, parts cutting (with Grandpa's help on the bandsaw), assembly, and finishing. Sebby has been working with his grandfather for about a year and has his own safety glasses and block plane. This is his first 'major' project."

The box is ash, 4½ in. wide by 11 in. long by 4 in. high. The finish is shellac.

Keep up the good work, Sebby.

—ELIZABETH KNAPP, managing editor

Chemical reaction

Thank you for the article "Dangerous Chemistry: Woods to be wary of" (*FWW* #304). Very useful. However, I regret that boxwood, a common wood used for turning and in particular for musical woodwind instruments, was not included. Would it be possible to provide an addendum?

—CHARLES STROOM, Amsterdam, the Netherlands

Author Seri Robinson replies: *It can be very hard to give toxicity information for an entire genus. Boxwood refers to the genus* Buxus spp.*, which has around 70 species. Each species will have its own set of traits, and potentially, differences in extractives.* Buxus sempervirens*, for instance, has extractives that are used in traditional medicine and one of its known effects is to increase pulse rate, which is not really something one wants to induce unknowingly.* Buxus wallichiana*, also used in traditional medicine, can make you sweaty, induces diarrhea, and is a diuretic, among many other effects. However,* Buxus sempervirens*, the first species mentioned, does not seem to have any sort of skin reaction with extended use (so far). No generalization can be made across such a large genus. However, noting that a good handful are bioactive, it would make sense to use boxwood, generally, for general woodworking but not for anything that comes in contact with food or the mouth.*

Editor's note: For those who want more detailed information about wood toxicity and safety, Seri Robinson has a Patreon page on wood education at http://www.patreon.com/woodsafety. This is a paid site, but any level gives you access to the Discord server, where people can discuss topics and ask questions directly.

Planer cool-off

I have a compact jointer-planer and it does what I need in my tiny shop. But I noticed that the motor is enclosed and was running hotter than it should for a long life.

I mounted the little machine on plywood with a small fan underneath and solved that problem. I love *Fine Woodworking*.

—ALBERT ECHT, Burlington Vt.

Sometimes the tool is the point

A letter in the October 2023 issue (#305) called out the author of a previous project article for not offering an alternative to joining with the Domino, since most people don't own one. I agree in principle, but occasionally the use of a particular tool is the point.

As an example, let me describe a similar situation I faced in a class that I teach in Boise, Idaho, on making a Morris rocking chair. Each chair includes two curved rails with mortises which hold five slats. At first, I had the students make the mortises the old-fashioned way—drilling with a drill press, then cleaning up the holes with chisels. Considering their different skill levels, the results varied, they were frustrated, and it was extremely time-consuming.

I struggled to come up with a better solution. A mortising machine would only be marginally better. Then I devised a jig with a router, that while providing clean results, was awkward to use, requiring multiple setups.

Finally, I developed a jig for the Domino that is quick, easy to use, and suitable for curves, with perfect results.

The Domino is a fantastic tool, and I think that we are still learning about its potential.

—DAVID DONNELLY, Boise, Idaho

Photos: courtesy of Tom Rutkowski

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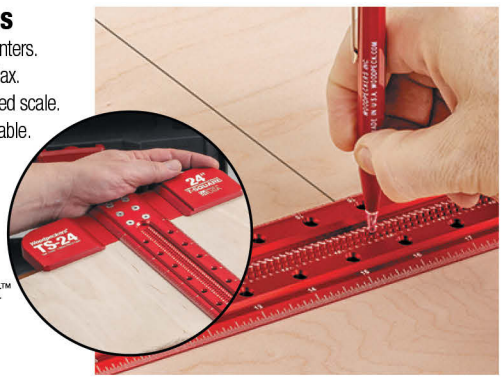

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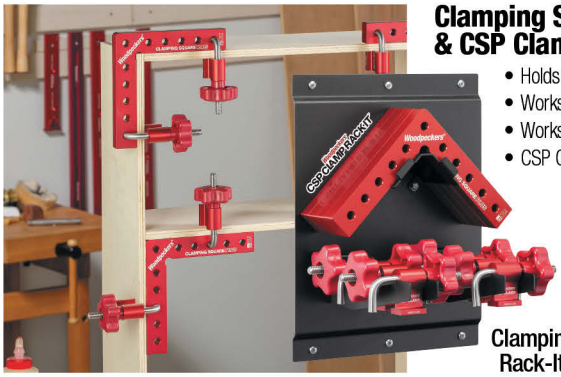

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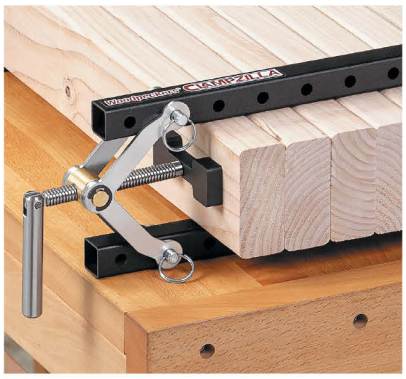

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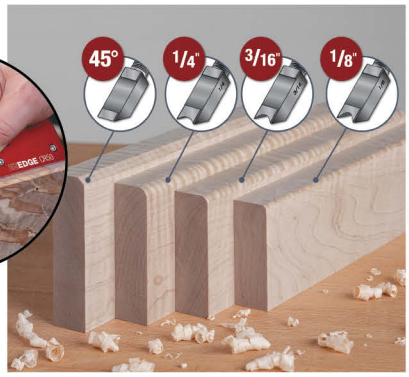

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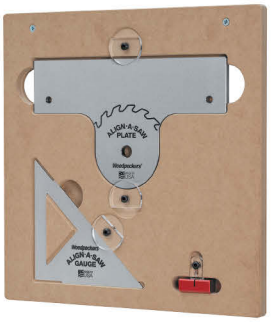

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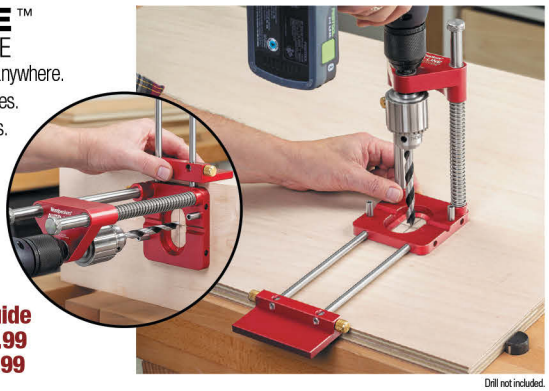

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workshop tips

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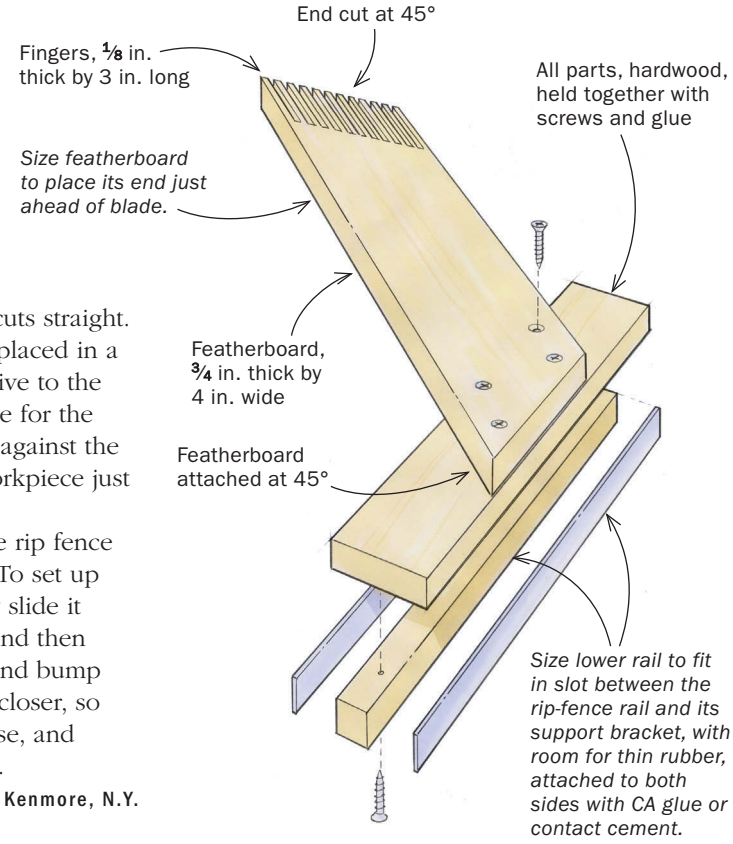


A featherboard's springy fingers hold work tightly against a table saw's rip fence, providing greater accuracy and an added measure of safety. But it can be tedious to clamp a featherboard in the perfect position, requiring two clamps and some fussing to apply the right pressure to the workpiece.

This featherboard sets up much more quickly and easily, needing only friction to keep it in place. The trick is a T-rail of sorts, which rides in the slot between the rip-fence rail and its support bracket. You'll find this sort of rip-fence setup on most modern cabinet saws. The slots can vary a bit, so shape the featherboard rail to fit your saw.

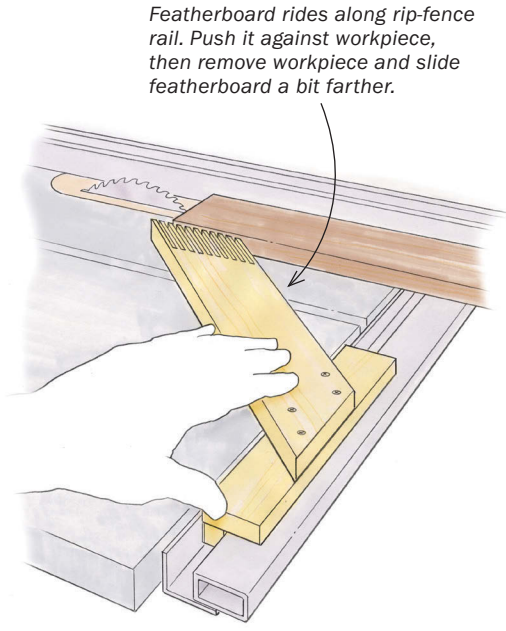
The friction is created by thin layers of rubber attached to both sides of the lower rail on the featherboard, glued on with cyanoacrylate glue or rubber cement. I used rubber-stamp sheets, available on Amazon, but other types of thin rubber will do. Make the rail narrow enough to accommodate the rubber and still slide easily, without being loose.

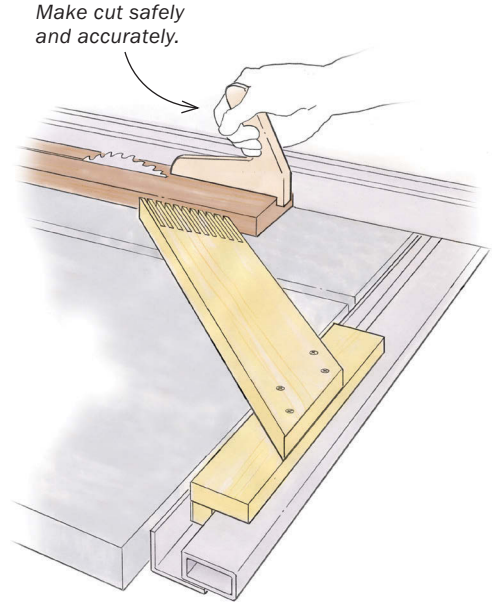
You can make the parts from any straight-grained hardwood, and they are simply glued and screwed together. I used the table saw to cut the slots in the featherboard itself, but a bandsaw also works if the blade cuts straight.

Featherboards can be placed in a variety of positions relative to the blade, but I built this one for the most common spot, flat against the table, bearing on the workpiece just ahead of the blade.

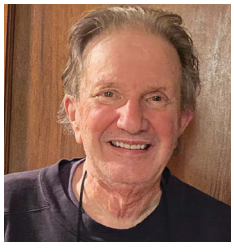
Start by positioning the rip fence as needed for your cut. To set up the featherboard, simply slide it against the workpiece, and then remove the workpiece and bump the featherboard a little closer, so the fingers will flex in use, and pressure will be exerted.

—TOM LOKKEN, Kenmore, N.Y.





Best Tip



By age 11, Tom Lokken had his own tools and workbench, which he used to remodel his parents' attic. He did a lot more of the same during his career as an attorney, with projects including a spiral staircase, a floor-to-ceiling library, a basement workshop, and lots of Asian-inspired furniture. Now 75, he prefers to work with hand tools when he can, avoiding as much dust, noise, and danger as possible.

A Reward for the Best Tip

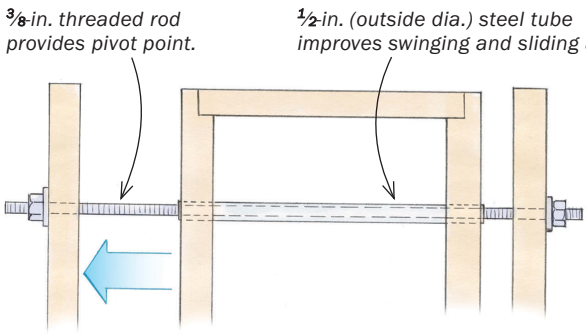
Send your original tips to fwtips@taunton.com. We pay $100 for a published tip with illustration; $50 for one without. The prize for this issue's best tip was a Veritas Mk.II Deluxe Honing Guide Set.

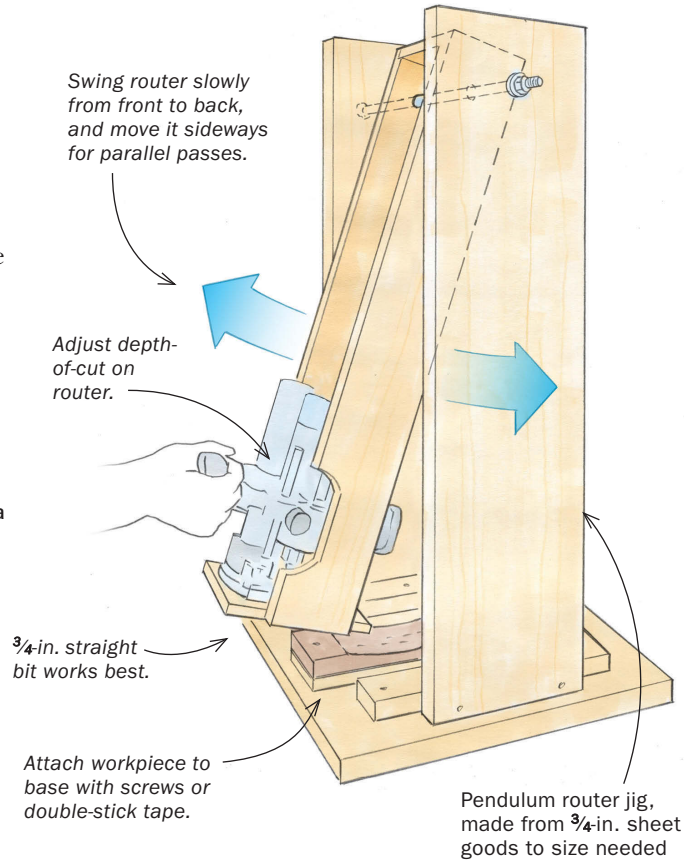
Drawings: Dan Thornton

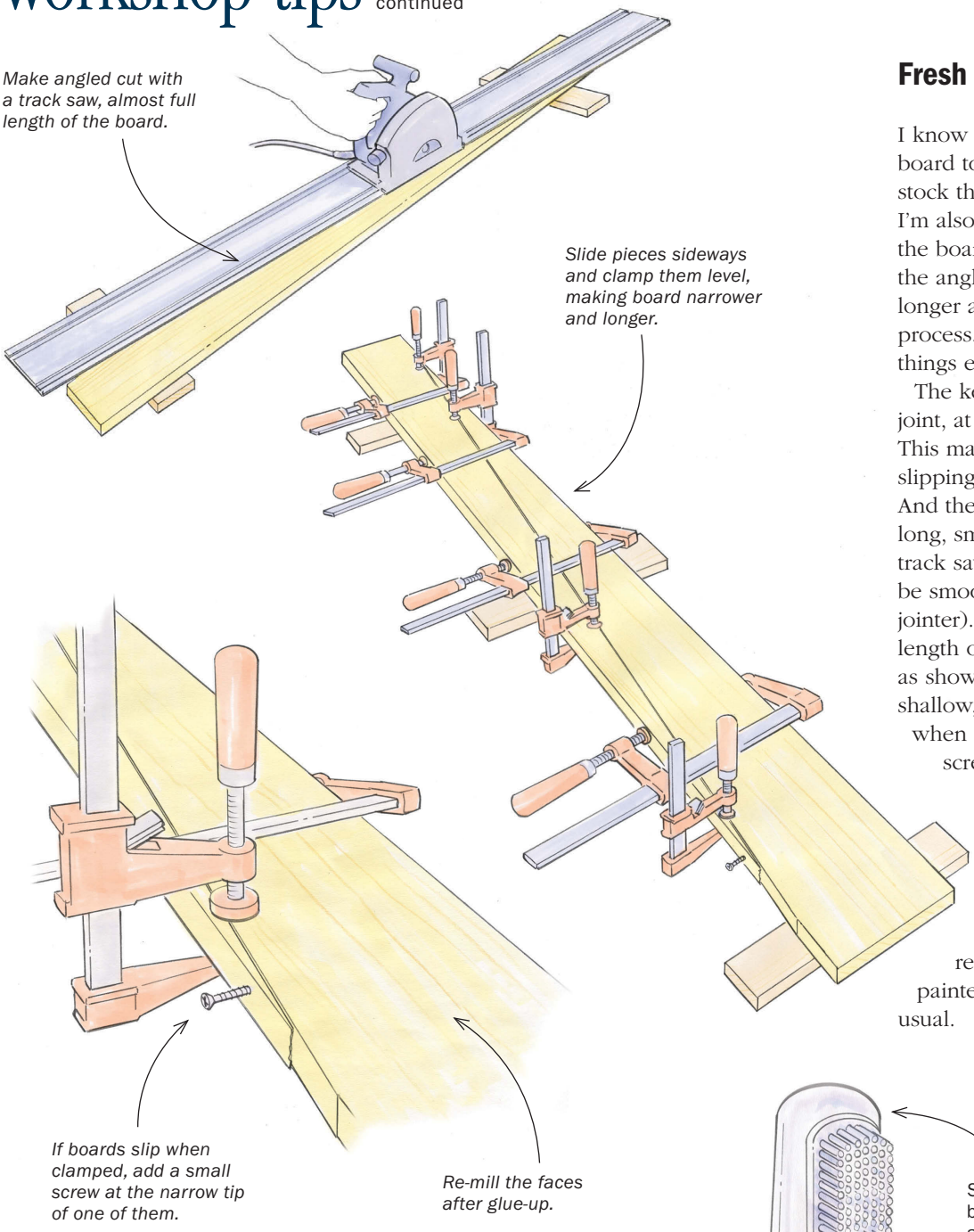
Pendulum jig routs shallow curves

I used this swinging router jig to make curved supports for some laminated seats I built, but it will work for hollowing solid seats as well. You can make cuts like these with a bandsaw, of course, but they will be a lot less consistent. A long threaded rod acts as the pivot on this jig, passing through a steel tube to make it easy to move the router sideways as you work. For wider work, the fixed sides of the jig can be relocated mid-stream. Workpieces can also be routed separately and glued together. I made the jig from scrap sheet goods, tall enough for the 24-in. radius I needed. To make small changes in radius, just change the depth of cut on the router. For larger ones, add spacers under the workpiece or under the legs of the jig, or reposition the pivot bolt.

—BRUCE DUDMAN, Tasmania, Australia







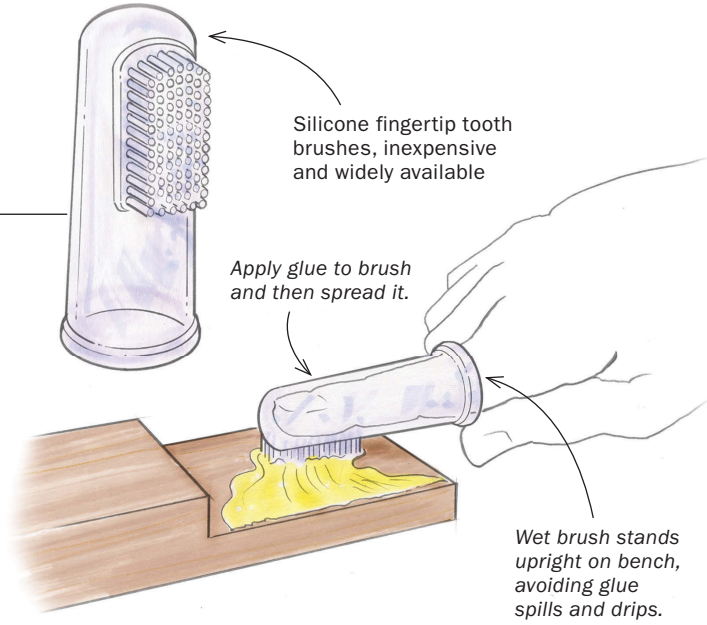
Fresh take on board-stretching

I know I'm not the first person to cut a board too short, or have a piece of rough stock that's a bit too short to start with. I'm also not the first person to "stretch" the board using a scarf joint, sliding the angled cuts to make the board longer and sacrificing some width in the process. But I think my method makes things easier.

The key is cutting a very long scarf joint, at the shallowest angle possible. This makes the pieces less prone to slipping sideways when clamped. And the secret weapon for making a long, smooth, straight cut like this is a track saw (though a bandsaw cut can be smoothed and straightened on the jointer). Make the cut almost the full length of the boards and then clamp as shown. If the cut is very long and shallow, the boards usually won't slip when glued, but you can add a small screw to stabilize them.

The grain on your new board won't match perfectly, but after you put it through the planer, the mismatch won't be very noticeable with most woods. I used this method recently to make long stiles for a painted built-in, and it worked great as usual.

—JAKE WRYE, Knoxville, Tenn.



Fingertip toothbrushes make great glue spreaders

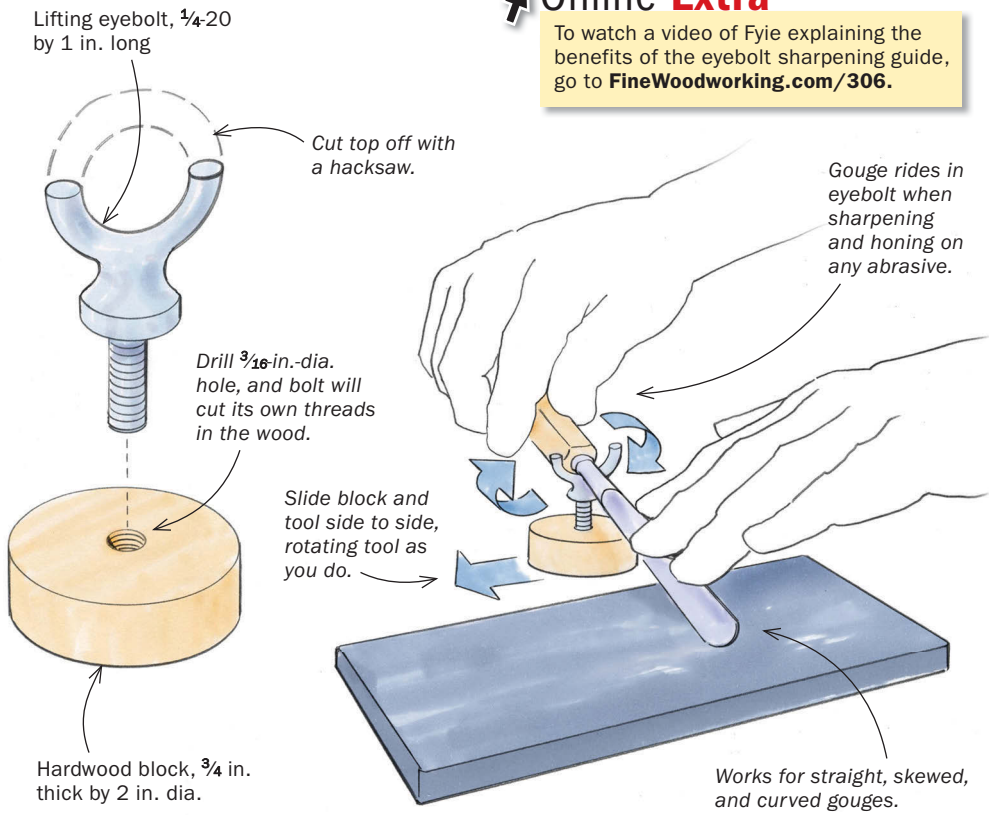
There are a variety of inexpensive silicone fingertip toothbrushes sold on Amazon and elsewhere, for use on pets and babies. These work wonderfully for spreading glue. I tend to apply the glue to the toothbrush first and then spread it. The toothbrush stands up nicely on the bench afterward, keeping everything clean. You can wash the glue off the toothbrush right away, or just let it dry and peel it off—and reuse your handy glue brush indefinitely.

—KRISTIINA VAHIMETS, Tallinn, Estonia

Easy, effective sharpening guide for carving gouges

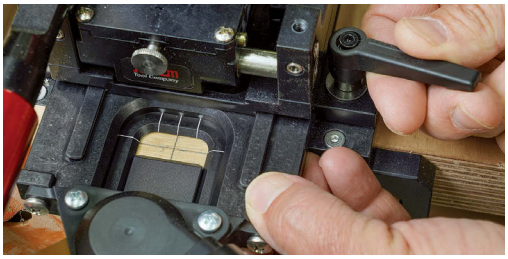
To create a great sharpening and honing guide for many of your carving gouges, whether curved, straight, or skewed, you can screw an eyebolt into a hardwood block. The eyebolt keeps the handle at a consistent angle as you rotate the tool and slide the block back and forth. To create a microbevel, you can simply unscrew the eyebolt a bit to raise its height, but I make separate guides for different sharpening and honing angles. By the way, a regular ¼-20 eyebolt works fine, but a specialized one, called a "lifting eyebolt," works even better. It's completely closed, which allows you to cut off the top half, so you can drop the gouge into it instead of poking it through the circle and possibly nicking the tip. To make sharpening smoother and more effective, place a smooth, flat material (like MDF) under everything for the block to slide on.

—VINCE FYIE, Port Sanilac, Mich.



Online Extra

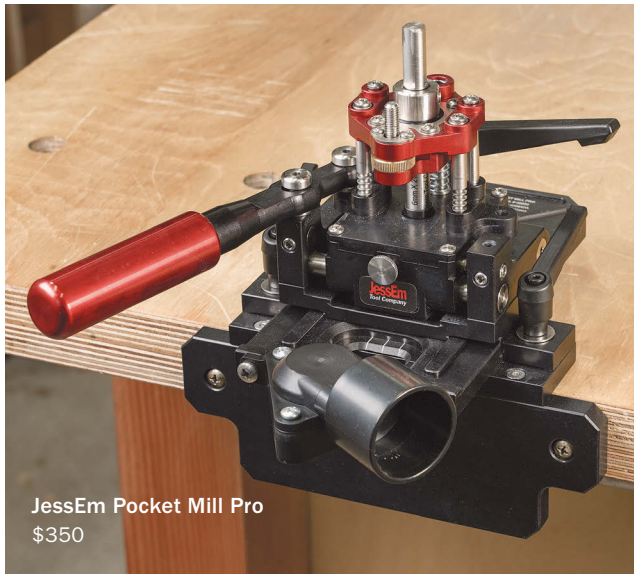
To watch a video of Fyie explaining the benefits of the eyebolt sharpening guide, go to **FineWoodworking.com/306.**



Easy setup. *The top of the jig slides backward and the base is quickly aligned with center marks.*

Clamping can be tricky with the basic jig. *The jig can be screwed to a benchtop as shown, which makes clamping a bit tricky, or held in a vise with room below it for pieces to extend downward.*

Simple to use. *The bit is driven with any handheld drill, and the handle pushes it side to side to form the mortises, with the bit automatically dropping 0.050 in. at the end of each stroke. Power and cutting action were great with an 18-volt drill.*



A full slip-tenon system. *JessEm sells tenon stock for all six carbide cutters (5mm, 6mm, 8mm, 10mm, ¼ in., ⅜ in.), and the fit is excellent in each size.*

■ JIGS

JessEm makes slip tenons easy

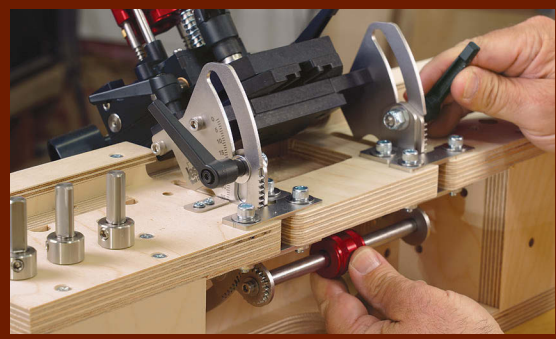
WHILE JESSEM'S NEW POCKET MILL PRO delivers mortises that are similar in size and quality to those made by the Festool Domino DF 500, it's powered by the handheld drill you already own, which brings its price down considerably. Even when you add JessEm's helpful work-holding station, designed for both the Pocket Mill Pro and JessEm's doweling jigs, the bottom line is half the price of the Domino. And like Festool, JessEm sells tenon stock for each mortise size.

Your handheld drill (I used an 18-volt cordless) attaches to one of six end mills, which are held in the jig as they spin. To cut a mortise, you pull the trigger on the drill and pivot the jig's handle with the other hand. The cutter automatically drops 0.050 in. at the end of each stroke until it reaches a preset depth (maximum depth is just over 1 in.). Then you just push a button to retract the cutter.

This is a robust, well-designed jig, and setup is as smooth and accurate as the cutting action. You can start with the basic jig to save cash, but I highly recommend adding the Baltic-birch workstation JessEm designed for the jig.

—Asa Christiana is FWW*'s editor-at-large.*

Workstation makes clamping much easier. *Dovetail-shaped slots hold MicroJig's MatchFit clamps and any other compatible accessories, like the MatchFit hardware used here to attach a vertical fence.*



Smart features. *The workstation's baseplate rotates for angled joinery, and there are storage holes for all six cutters.*

Photos: Asa Christiana

MACHINES

Benchtop planer includes Byrd cutterhead

OLIVER'S NEW BENCHTOP PLANER is the only one I've found that includes the unrivaled Byrd Shelix segmented cutterhead as standard equipment. It also happens to be an excellent machine. I put one into service in my school in early 2022, and I've recommended it to many woodworkers since.

Once you experience the flawless, tearout-free surface a Byrd cutterhead produces, along with the significant noise reduction, you'll never want to go back to straight steel knives. Each carbide cutter has four edges, and rotating them is easy and accurate. That said, I'm still using the first set of edges on mine.

Both tiger maple and quartersawn white oak planed flawlessly in my tests, no matter which way I fed them, with no snipe (with the planer head locked).

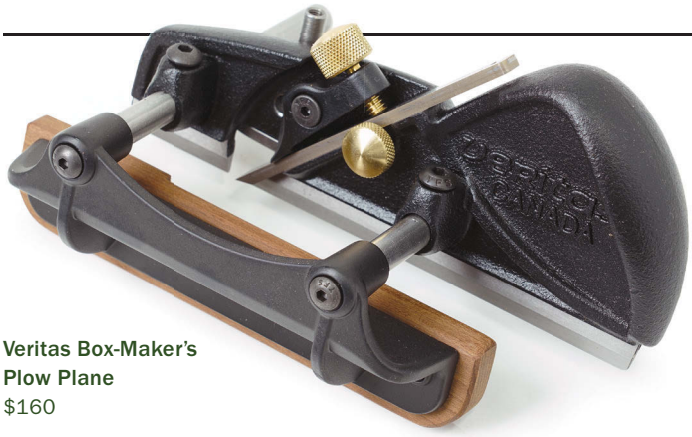
Thickness is uniform from edge to edge on the widest boards, and the dust collection is so good I tend to forget about it.

The depth of cut on a full-width board is limited to roughly 3/64 in., but that is to be expected with a 15-amp, 110-volt motor. My only complaint is the inconsistency of the digital thickness gauge, but I just use my trusty Starrett ruler instead.

—Bob Van Dyke runs the Connecticut Valley School of Woodworking in Manchester, Conn.

Oliver 10044 12½-in. thickness planer
$1,000

A segmented, shearing cut. *Oliver's benchtop planer includes a Byrd Shelix cutterhead, whose slightly curved teeth, arranged on a spiral, cut with a continuous shearing action that straight knives can't match.*



Veritas Box-Maker's Plow Plane
$160

Excellent performance. *The standard ¼-in.-wide blade cut clean grooves and rabbets, and the optional beading blades worked just as well, as shown here.*

HAND TOOLS

Small plow plane is a little gem

VERITAS RECENTLY UNVEILED the Box-Maker's Plow Plane, a diminutive tool that produces formidable results. It is simple to set up, comfortable to hold, easier to control than its larger cousins, and ideal for cutting small grooves, rabbets, and beads.

It comes with a ¼-in., A2-steel blade that holds a long-lasting edge, and it's available in right- and left-handed versions. Accessory blades include square profiles from ⅛ in. to ⅜ in. wide and beading blades from ⅛ in. to ¼ in. The plane also accepts blades designed for Stanley and Record combination planes.

While it's very easy to install the blade and set the depth stop, the plane requires a hex key to adjust the position of the fence.

I was especially impressed with the plane's ability to cut beads. It did a great job on grooves and rabbets too. Since the plane doesn't have a nicker (a scoring cutter), I used a marking gauge to define the width and depth of cross-grain rabbets, which ensured clean cuts.

Applying a bit of paste wax to the blade's face and chip deflector helped it evacuate chips more smoothly.

—Chris Gochnour is a contributing editor.

Photos: Michael Pekovich (top two); Asa Christiana (center left); Rose Serago (bottom left)

continued

ACCESSORIES

Incra sled makes any miter gauge better

INCRA SENT ME A NUMBER of excellent miter gauges for the head-to-head tool test on pp. 36–43 of this issue, along with this innovative sled. While the sled wasn't a fit for the miter-gauge roundup, it's just too good to stay quiet about.

The Miter Express turns your miter gauge into a crosscut sled, one that cuts miters as easily as it makes square cuts. It works on almost any table saw (check the website for parameters) and accepts any miter gauge, providing a large, stable surface that doubles the crosscutting capacity. Like any crosscut sled, the Miter Express carries work past the blade—which improves accuracy—instead of dragging it across the table the way a miter gauge does on its own.

The sled includes two panels: a larger one that holds the miter gauge and slides past the blade, and a support panel that clamps into its miter slot, preventing offcuts from dropping away and splintering. After assembling the parts and pieces of the jig, you slide each panel individually past the spinning blade, creating zero-clearance surfaces along both edges.

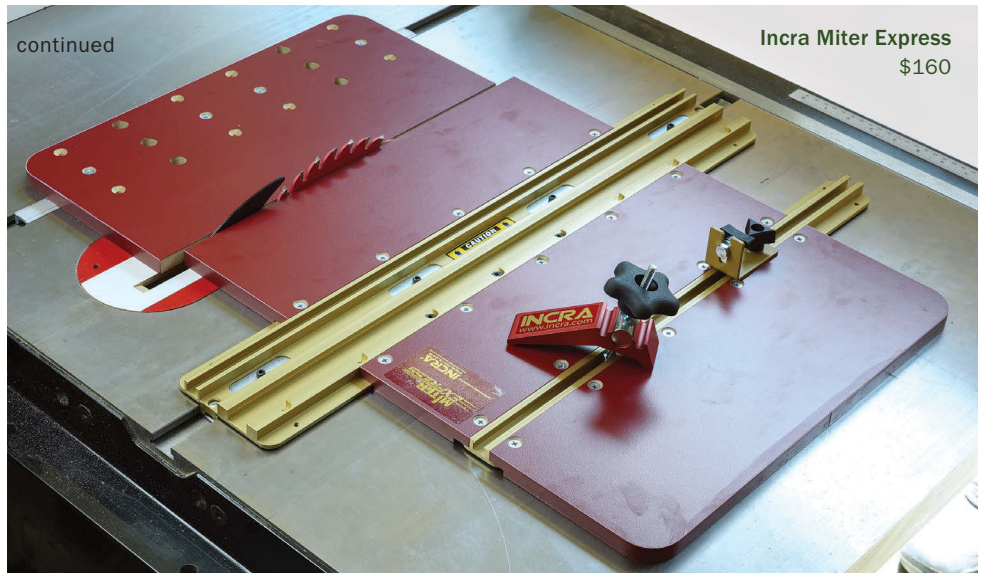
The sled is only as good as your miter gauge, so it works best with a good aftermarket model—with reliable stops at common angles and a solid flip stop on the fence. I used it with Incra's Miter 1000HD gauge, one of the winners in the head-to-head test.

Everything about this sled works well. Its own miter bar adjusts for a perfect fit in your saw table, very effective cam screws hold your miter gauge in place, and you can shift the position of the miter gauge and offcut panel to accommodate various workpieces and cutting angles.

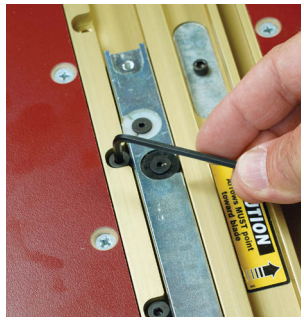
If you have a reliable miter gauge, the Incra Miter Express will make it work wonders.

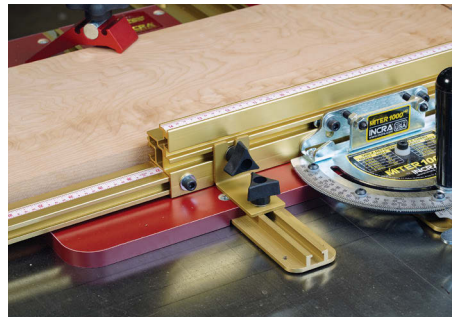
—Asa Christiana

Incra Miter Express
$160

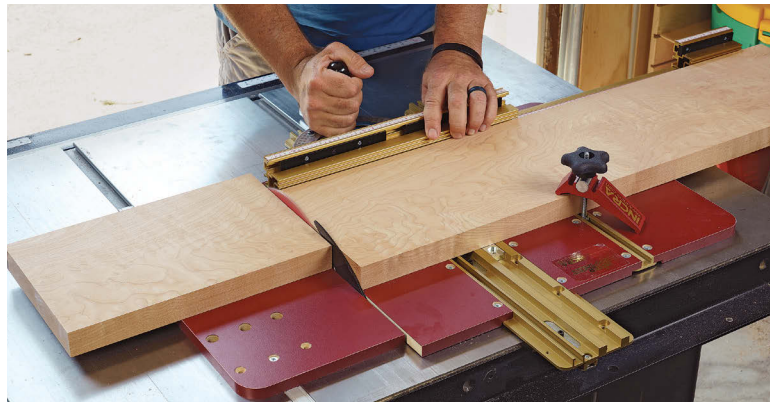


Versatile and effective. *The Incra Miter Express accepts any miter gauge (not shown here), doubling its crosscut capacity to 24 in., and includes the offcut-support panel at left.*

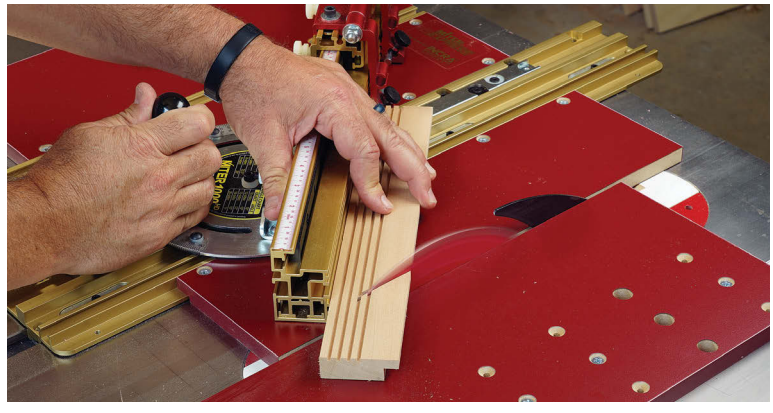




Smart features. *Small cam screws (far left) hold your miter gauge securely on the sled, and an optional support bracket (near left) prevents large workpieces from flexing the fence.*



Clean, square cuts on large workpieces. *The large base, zero-clearance edges, and handy hold-down clamp combine to deliver accurate crosscuts on workpieces large and small.*



Perfect miters. *If your miter gauge is accurate, with a reliable stop system, the Miter Express will deliver perfect mitered frames.*

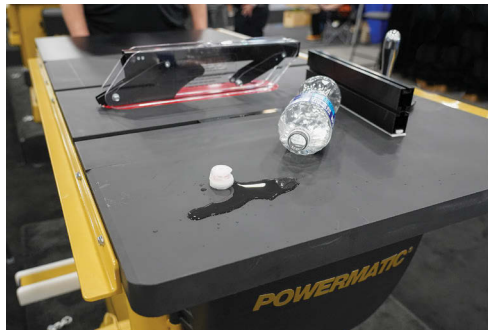
Photos: Asa Christiana

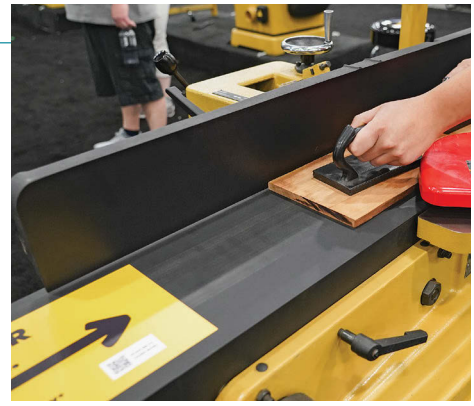
■ NEW TO MARKET

LATEST FROM AWFS 2023

The AWFS woodworking fair happens every other summer in Las Vegas, alternating with Atlanta's IWF, the industry's other main manufacturing showcase. Here are a few of the best new tools and accessories unveiled at AWFS this past summer.

Powermatic goes rust-free





Powermatic is offering a durable new coating, called ArmorGlide, on the tables of its new bandsaws, table saws, and jointers. Impermeable to water, and use-tested for 250,000 milling cycles, it also reduces sliding friction by 50%, according to the company. It adds roughly 10% to the retail price of each machine. Go to Powermatic.com to learn more.

A much better dust mask

RZ Industries' M3 model can be worn in three ways: with simple ear loops, a comfortable neck strap, or, for the best seal possible, a two-part head strap. The mask surpasses the HEPA standard while allowing better breathability and creating less fogging than its competitors, according to the manufacturer. Filters are replaceable, and snap easily into place. Go to RZMask.com for more info.

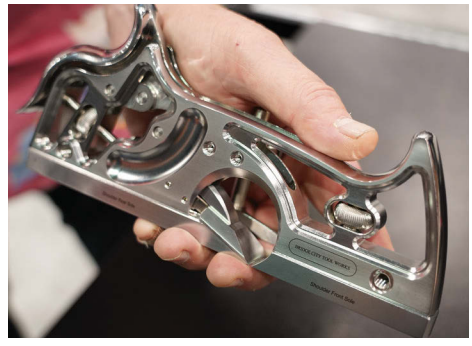
Smart featherboard from Harvey

These urethane roller guides work like a much better featherboard for bandsaws, table saws, and router tables, holding the work tight against the fence while allowing forward motion only, with very little resistance. They are also much easier to adjust for alignment and pressure. Go to HarveyWoodworking.com.

Jet drum sander is a smoother operator

Jet has added oscillation to its open-sided 1632 drum sander, making it an excellent option for small-shop woodworkers. The side-to-side motion produces a smoother finish with any given abrasive, and also helps to prevent the abrasive from loading and burning the wood. Learn about all of its features at JetTools.com.

Convertible plane from Bridge City



The HP-10 Foxtail Convertible Plane comes with a square blade and sole for use as a shoulder plane, with a finely adjustable fence and depth stop. What makes the plane "convertible" are optional blades and matching sole inserts for shaping coves and roundovers of various sizes. Buy it at BridgeCityTools.com.

Photos: Asa Christiana

Part 1: Build a

Complexity and serenity coexist in this exceptional Chinese piece

BY JOHN CAMERON

Fifteen years ago, I had a 400-year-old Ming Dynasty table sitting in front of me in pieces on my bench. I had been asked to clean it up and tighten some of its joints, but when I learned that the whole thing was unglued and could be taken apart, I carefully disassembled it. Then a light went on: I should grab the opportunity to make a reproduction directly from the real thing. I've since built a handful of copies in various hardwoods, including this one in cherry.

The original table was acquired by an American molasses merchant working in Shanghai in the 1920s who shipped it home. Like many Ming Dynasty pieces, it is clean and simple looking but constructed with a complicated system of joinery, most of it hidden. Making these glueless joints is a tricky business, one that rewards patience and solid sharpening skills. If you have not fashioned such joints before, I suggest making mockups of them before plunging into the real thing.

In this first of two articles I'll describe making the table's top and legs and its unusual apron-to-spandrel joinery. In *FWW* #308, Part 2 will cover the rest of the joinery and assembly.

A NOTE ON THE JOINERY

Furniture made in the Ming Dynasty (1368–1644) exemplifies much of what I aspire to in my own work—clean lines, considered proportions, conscious use of wood graphics. The beautiful bonus in much Ming furniture is the joinery: wonderfully complex, interlocking systems that link the various parts securely while allowing for wood movement and typically requiring no glue. Most surviving Ming furniture was made from oily, waxy tropical hardwoods, which are difficult to glue even with modern adhesives, let alone with the animal glues used at the time. The Chinese furniture maker's solution was brilliant—devising interlocking masterpieces that survive for centuries while avoiding cross-grain gluing and other problems that have helped destroy much historic Western work.

Photos: Jonathan Binzen

Classic Ming Table

Ming table is a master class in unglued joinery

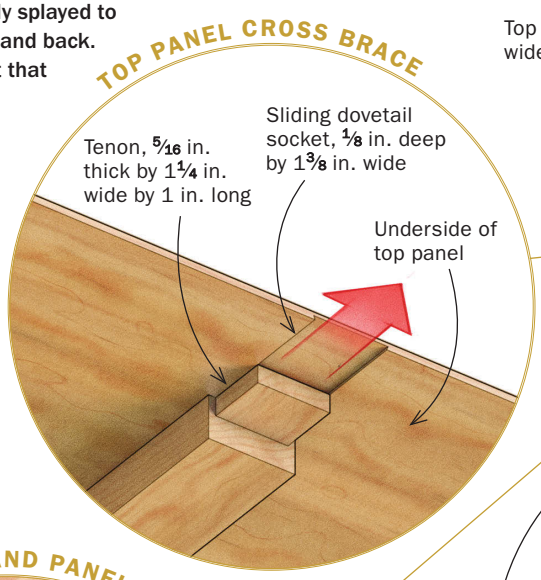
The table's legs are slightly splayed to the sides and raked front and back. The angle is just 1.5°, but that subtle slant, which is vital to the appearance of the piece, affects much of the joinery and adds a distinct level of difficulty to the project.

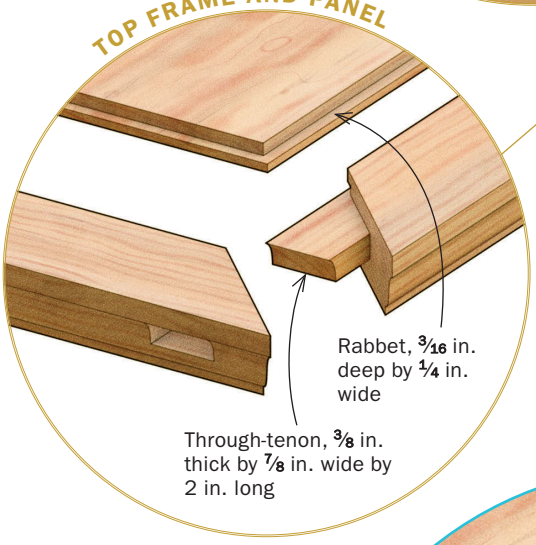
Part 1

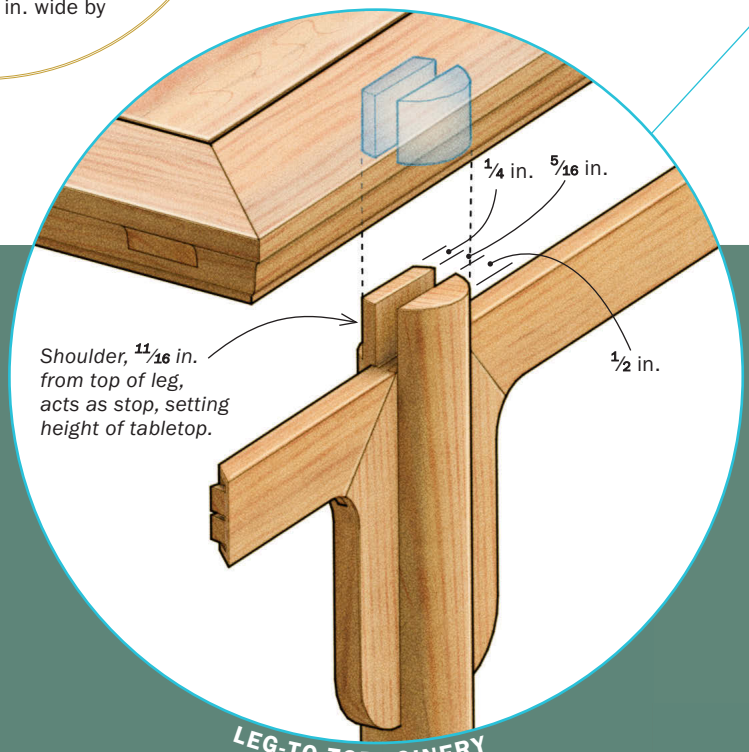
The joinery shown in yellow circles on this drawing is discussed in Part 1 of this two-part article.

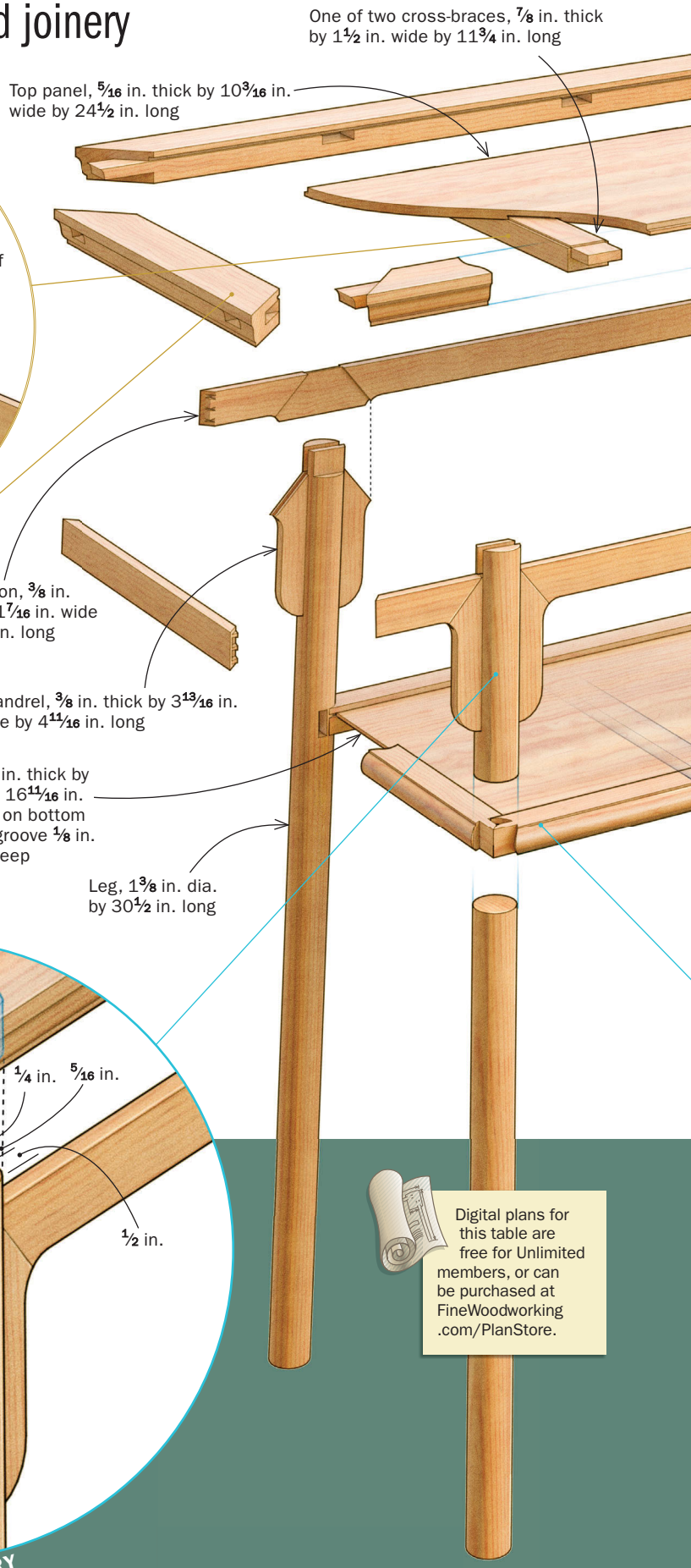
Part 2

The joinery shown here in the blue circles will be covered in Part 2 of the article, in *FWW* #308.



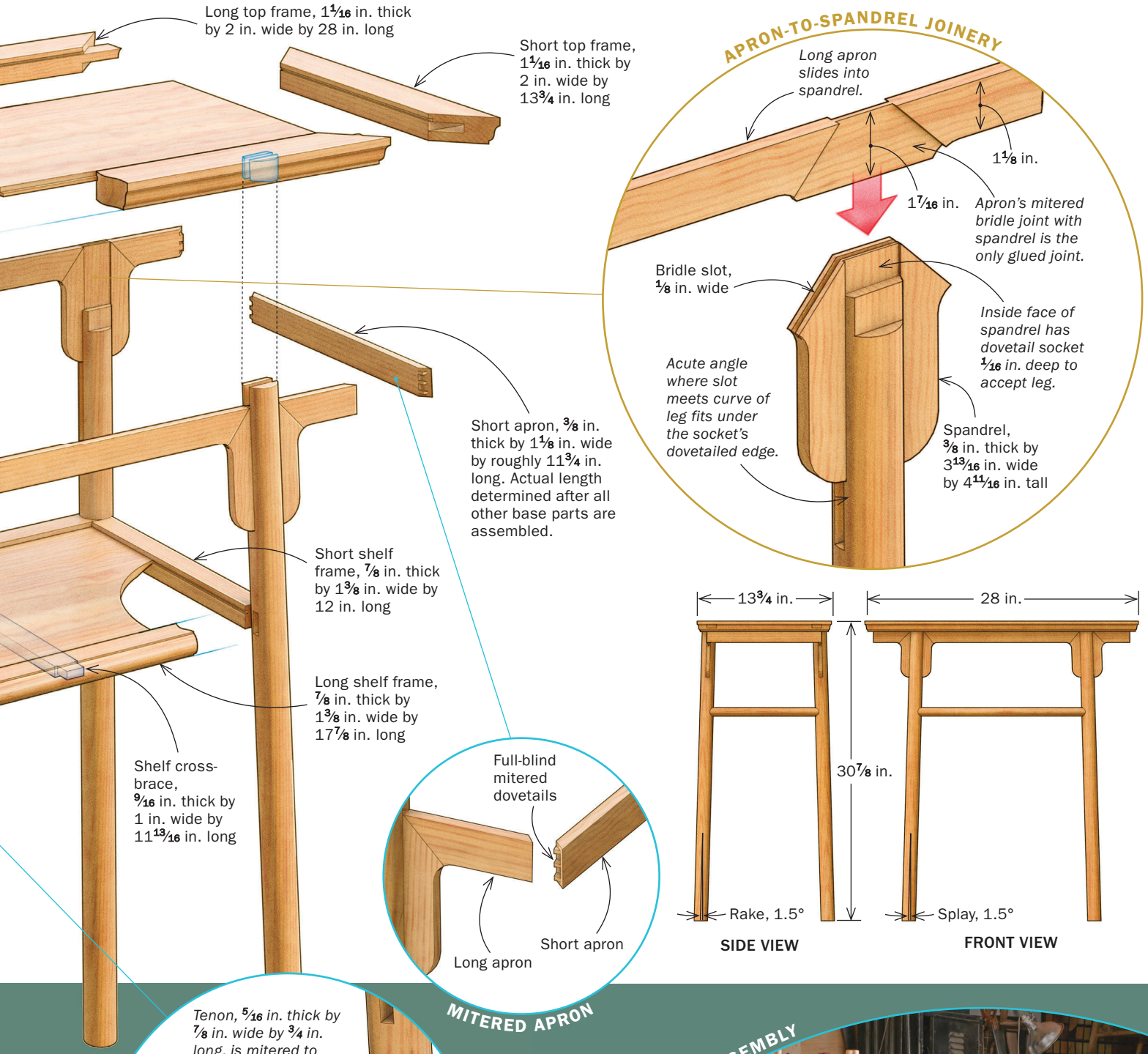






Digital plans for this table are free for Unlimited members, or can be purchased at FineWoodworking.com/PlanStore.

Drawings: John Hartman


Long top frame, 1 1/16 in. thick by 2 in. wide by 28 in. long
Short top frame, 1 1/16 in. thick by 2 in. wide by 13 3/4 in. long
Short apron, 3/8 in. thick by 1 1/8 in. wide by roughly 11 3/4 in. long. Actual length determined after all other base parts are assembled.
Short shelf frame, 7/8 in. thick by 1 3/8 in. wide by 12 in. long
Long shelf frame, 7/8 in. thick by 1 3/8 in. wide by 17 7/8 in. long
Shelf cross-brace, 9/16 in. thick by 1 in. wide by 11 13/16 in. long

APRON-TO-SPANDREL JOINERY
Long apron slides into spandrel.
1 1/8 in.
1 7/16 in.
Apron's mitered bridle joint with spandrel is the only glued joint.
Bridle slot, 1/8 in. wide
Inside face of spandrel has dovetail socket 1/16 in. deep to accept leg.
Acute angle where slot meets curve of leg fits under the socket's dovetailed edge.
Spandrel, 3/8 in. thick by 3 13/16 in. wide by 4 11/16 in. tall

13 3/4 in.
28 in.
30 7/8 in.
Rake, 1.5°
Splay, 1.5°
SIDE VIEW
FRONT VIEW

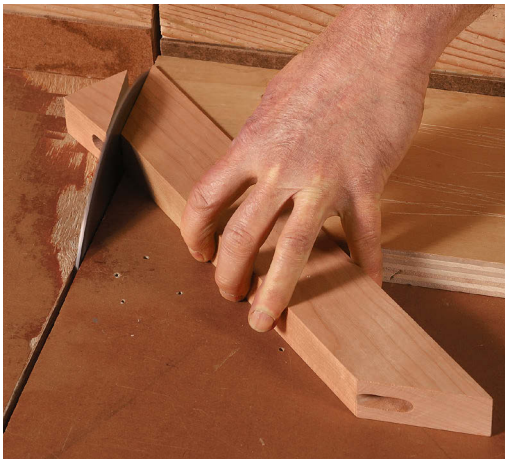
Full-blind mitered dovetails
Short apron
Long apron
MITERED APRON


Tenon, 5/16 in. thick by 7/8 in. wide by 3/4 in. long, is mitered to meet mating tenon inside leg.
SHELF-TO-LEG JOINERY


ASSEMBLY

MORTISES AND MITERS BY MACHINE

Milling the mortise. *The short members of the top frame get a through-mortise at each end. Cameron, who also does some metalwork, uses a Bridgeport milling machine to rough out the mortises.*



Making the miter. *Once the mortises are milled, Cameron cuts the miters with a sled at the table saw. Afterward, he'll square the ends of the mortises with a chisel.*

Top frame: miters with through-tenons

Begin the table by laying out the top's frame joinery. Then cut a through-mortise in the short frame members with the sharpest, most accurate tool you have. For many, it will be a hollow-chisel mortiser or a router; for me it is a small Bridgeport milling machine. I cut the miters on the short frame pieces at the table saw and plane them clean on a shooting board with a miter jig.

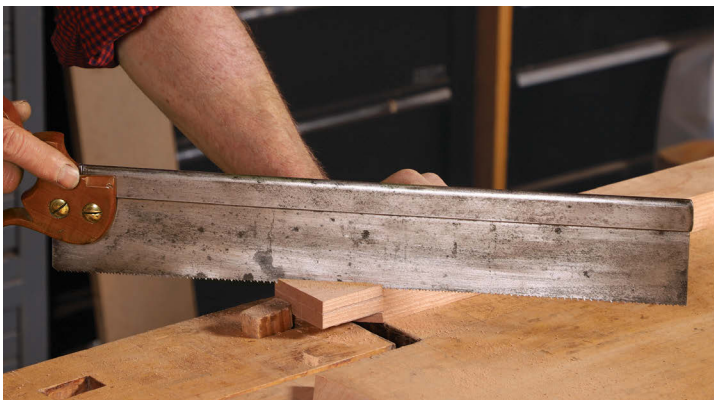
Now turn to the long frame members, where the hand joinery begins. With the workpiece clamped at an angle in a vise, cut the cheeks of the tenon; saw close to the lines, but leave a little waste. Then flip the piece on its face and saw along the miter line, leaving a bit of waste that you'll pare to the line later. The inside edge of the tenon is not shouldered, but the outside edge needs to be cut—first ripped, then sawn along the miter.

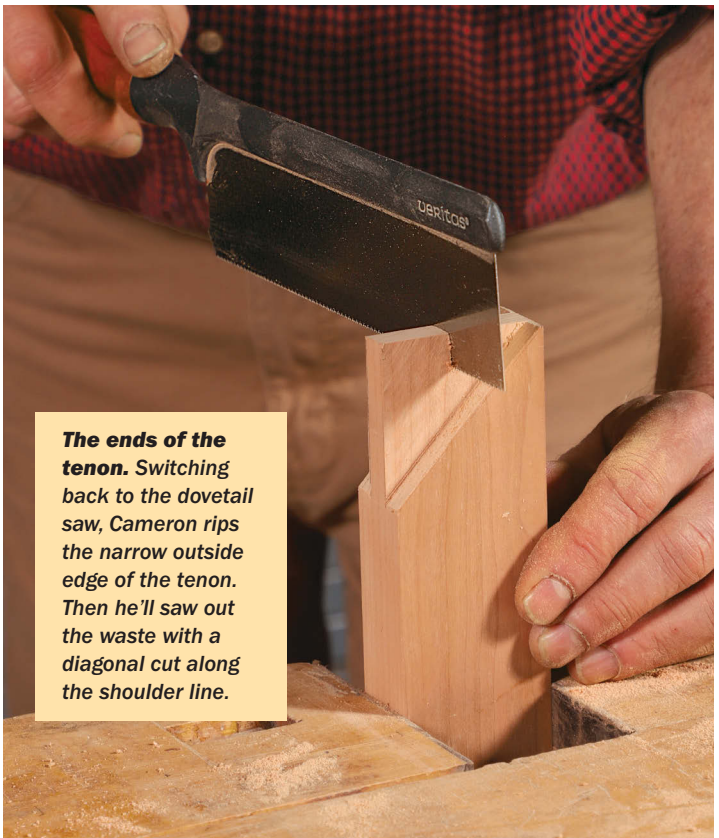
Saw like your grandfather taught you—slowly, letting the saw do the work.

TENONS BY HAND

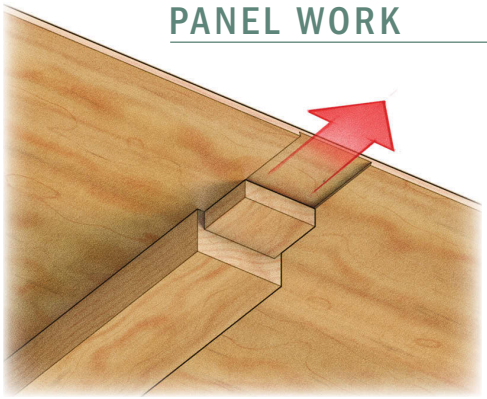
Cheeks first. *Cameron clamps the long frame member at an angle in his vise to cut the tenon cheeks with a dovetail saw.*

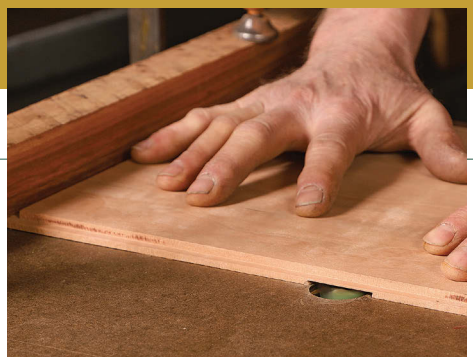
Slanted shoulder. *Next, with a crosscut saw, he cuts along the diagonal shoulder line, leaving a bit of waste that he'll pare away later with a chisel.*



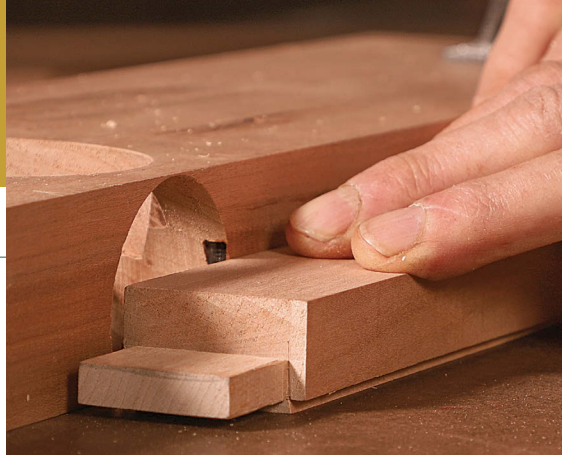


The ends of the tenon. *Switching back to the dovetail saw, Cameron rips the narrow outside edge of the tenon. Then he'll saw out the waste with a diagonal cut along the shoulder line.*





Sockets on the underside. *After rabbeting the perimeter of the panel to create a tongue to fit into the frame, Cameron routs a pair of sliding dovetail sockets on the panel's underside to accept the cross braces.*



Shallow tail. *Still at the router table, and with the dovetail bit at the same height, Cameron resets the fence and routs a ⅛-in.-deep dovetail along the cross brace.*

Successful test. *Cameron sneaks up on the fit of the cross braces, shifting the router table fence incrementally until the cross braces are snug but slide smoothly.*

Frame fitting. *With the cross braces fitted into their dovetail sockets, test fit the long frame members, being sure the brace tenons seat in their mortises and the panel tongue in its grooves.*

I go next to the router table and, with the workpiece face down, use a straight bit to make a skim cut across the tenon's top cheek. The bit height should be exactly 5⁄16 in. above the table—the distance from the top cheek of the tenon to the top face of the frame. This gives me a surface I can trust as I do the rest of the trimming and fitting with chisels and a shoulder plane. As you trim the tenon look for a fit that requires just hand pressure to assemble (not a mallet), but that is secure, not sloppy.

Fit each joint independently, and then assemble the whole frame and tweak where necessary to achieve tight miters and nicely aligned corners. With the frame still assembled, plane the top surface so the joints are flat and flush. This has the added benefit of providing a reference surface to run against the fence when you cut the grooves for the top panel. Do that next, at the table saw.

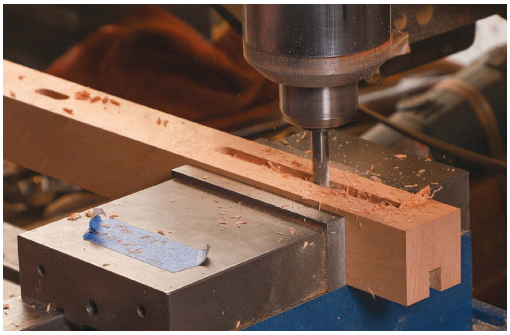
Top panel and braces

Make the top panel and cut a rabbet around its perimeter at the table saw to create the tongue to fit the frame groove. Leave the tongue slightly thick so you can hand fit it with a shoulder plane to achieve a tight slip fit, one without any rattle.

Next come the two cross braces that keep the top flat. They connect to the underside of the panel with shallow sliding dovetails and to the frame with tenons. Start by mortising the long frame members for the cross-brace tenons, then cut and fit the tenons. Assemble the frame without the panel to test the cross braces' fit,

On with the ends. *The short frame members are fitted next to complete the top. (Before fitting the panel, Cameron assembled the frame alone, in order to plane its joints flush and mold its perimeter.)*

Make the leg



Mill the slot with the leg still square. *When Cameron cuts the long slot for the spandrel and apron, he leaves a bridge of waste at the top for stability. He'll remove it once the leg is shaped. He also cuts the mortises now for the shelf tenons.*

Make them round. *After ripping off the corners of the blank at the table saw, Cameron uses a roundover bit at the router table to give the legs their circular shape. He'll follow up with hand tools to finesse the curves.*

A shoulder at the top. *With the leg resting on an L-shaped spacer that generates both the splay and rake angle, Cameron cuts the shoulder on the leg's inside tenon. The ⅜-in.-thick spacer is 14¼ in. from the blade.*

Cheek by hand. *After cutting the shoulder at the table saw, Cameron rips the cheek with his dovetail saw. He'll clean up the cheek with edge tools when he fits the joint.*

then take it apart and reassemble it, this time without the cross braces but including the top panel. This lets you accurately locate the sliding dovetail recesses by transferring the position of the cross-brace mortises to the panel. Rout shallow sliding dovetail sockets across the underside of the top panel and cut mating dovetails along the cross braces. With both cross braces fitted in their dovetail sockets, the whole top assembly can be put together.

Before setting the top aside to work on the table's base, profile the perimeter of the frame. The original table's edge profile, a shallow ogee, is hard to match. Not wanting to grind custom cutters, I used two commercially available router bits—a dish carving bit and a roundover bit—and then faired to the final shape with hand tools. A liberal use of test stock will allow you to do the same. Cut the profile with the top assembled, so the ends of the through-tenons get shaped at the same time. Shim any slight gaps beside the tenons before routing.

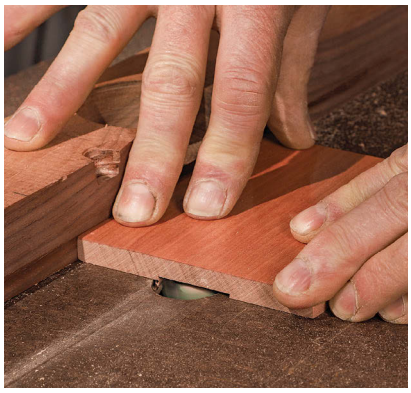
Making Ming legs

The slight splay of its legs is essential to the Ming table's elegant stance. But that innocent little 1.5° angle raises the difficulty quotient of almost every joint in the table's base. To make life easier, I fashioned a set of tapered shims and used them to cant the workpiece while I machined or shaped it. I also made a chart showing the splay angle in rise/run format; if my tapered shims were too short for an operation, the rise/run chart told me how thick to make a spacer and how far to place it from the blade.

After milling the leg blanks square and cutting them to final length, you can cut the slots at the top and the mortises for the shelf frame tenons. The slot is straightforward—no need to take splay into account. Cut in from both faces, and leave some waste

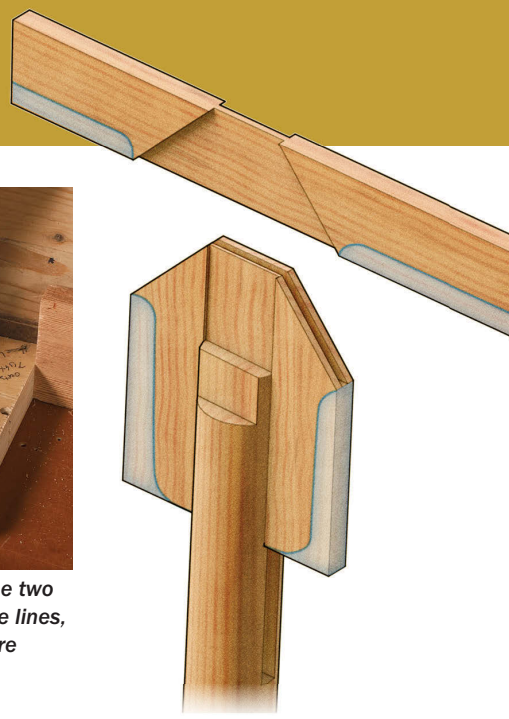
Away with the waste. *The last step is to remove the bridge of waste at the top of the slot. After sawing, smooth the inside surfaces with a chisel.*

Apron and spandrel

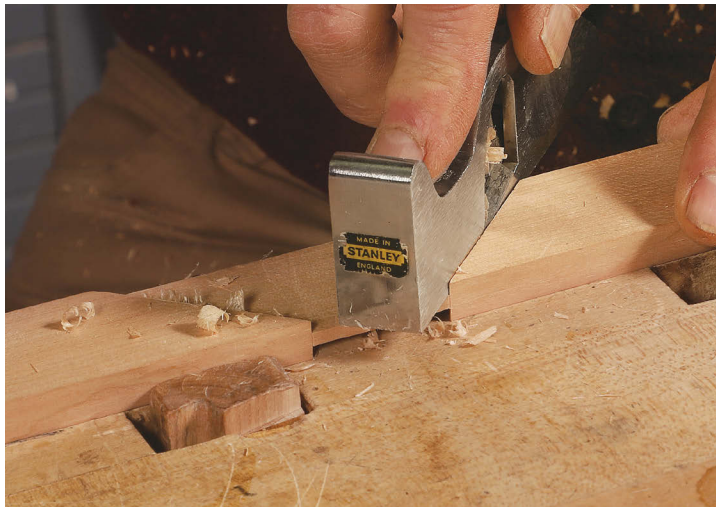


Spandrel gets a sliding dovetail. *On the inside face of the spandrel, Cameron routs a shallow sliding dovetail socket. The leg will lock into it.*

Mismatched miters. *Because the legs are splayed at 1.5°, the two miters on the spandrel differ. Cameron lays them out with knife lines, cutting one at 44.25°, the other at 45.75°. When the miters are done, he'll crosscut the top of the spandrel 1.5° off 90°.*



The slot in the spandrel. *The top of the spandrel gets slotted, allowing it to slide onto the apron in a bridle joint. Cameron makes the cut at the table saw, clamping sheet goods to the saw as a second fence.*



Double bevel transfer. *Cameron uses a pair of bevel gauges to transfer the miter angles from the spandrel to the apron (top). After removing most of the waste with a handheld router, cutting close to his layout lines, Cameron finishes the apron half of the mitered bridle joint with chisels and shoulder planes (above).*

intact at the top to bridge the slot so the leg remains stable while you shape it. Like the slot, the mortises for the shelf frame are cut with their long sides parallel to the length of the leg. But they enter the leg at a 91.5° angle, so I placed one of my 1.5° wedges on the mortising machine's table while making the cut.

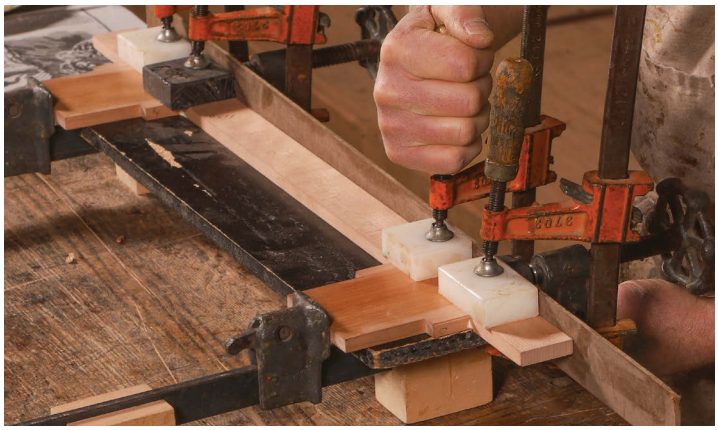
To shape the legs round, I first knocked the corners off at the table saw, then used a roundover bit on the router table. If you do the same, use a fence, not the bearing, to guide the cut, as the bearing can slip into a mortise and you'll cut too deeply. After routing, fair the curves with hand tools and sandpaper.

The top of the leg gets two tenons that fit into rounded mortises in the bottom of the top frame. The inside tenon has a shoulder that acts as a depth stop, and I started with that, cutting it at the table saw with a sled. Now that the leg was rounded, the tapered wedges were more awkward to use, so I used spacers instead, putting one beneath the leg and another between the leg and the sled's fence. I placed ⅜-in.-thick spacers 14¼ in. from the blade.

After cutting the shoulder, I moved to the bench and used a hand saw, chisels, and shoulder plane to finish the tenons and

Apron and spandrel continued

THE ONLY GLUE JOINT



Glue goes here. *All the table's joints except this one—the mitered bridle joint linking the spandrels to the apron—are assembled dry. For this glue-up, keep pressure on the miters as well as the bridle joint.*

Shape the apron. *Cameron cuts the straight parts of the apron's lower edge at the table saw, making stop cuts for the middle section by carefully tilting the workpiece onto and off of the blade. He moves to the bandsaw to cut the curving sections of the spandrel and apron.*

remove the bridge of waste at the top of the slot. Making the mating mortises for these tenons would need to wait; I would only know the precise distance between the legs after the base was assembled. That will be included in Part 2 of this article.

The spandrels are central

The joinery between the leg, spandrel, and apron needs to be spot on. The joint between the leg and spandrel, a combination of bridle and sliding dovetail, holds the leg solidly at its distinctive angle, providing stability and stance. The leg is let into a dovetailed recess on the inside face of the spandrel. To ensure a tight joint, the leg should be completely shaped and finished before fitting. Any scraping or sanding later would destroy a perfect fit.

Mill the spandrel blanks 1/16 in. thicker than the slot in the top of the legs. Then, with a dovetail bit at the router table, cut a 1/16-in.-deep dovetailed recess down the middle of the spandrel on its inside face. One slick feature of this joint is that you get the male half of the sliding dovetail for free—the acute angle where the rounded leg meets the slot works just like a dovetail.

With the sliding dovetail recess complete, cut the miters at the top of the spandrel. Because of the leg splay, these are not 45° miters; instead, one is 44.25° and the other is 45.75° These Ming makers were playing no games! Once the miters are cut, crosscut the top of the spandrel at 1.5° on the table-saw sled.

To make this section of the table yet more complicated (and more elegant and secure), the spandrel is fitted to the apron with a mitered bridle joint. I cut the bridle mortise in the top of the spandrel on the table saw using a flat-topped chisel-tip ripping blade with a full 1/8-in. kerf. A single pass with this blade yields the correct slot size—one third of the 3/8-in.-thick spandrel.

Mitered bridle on the apron

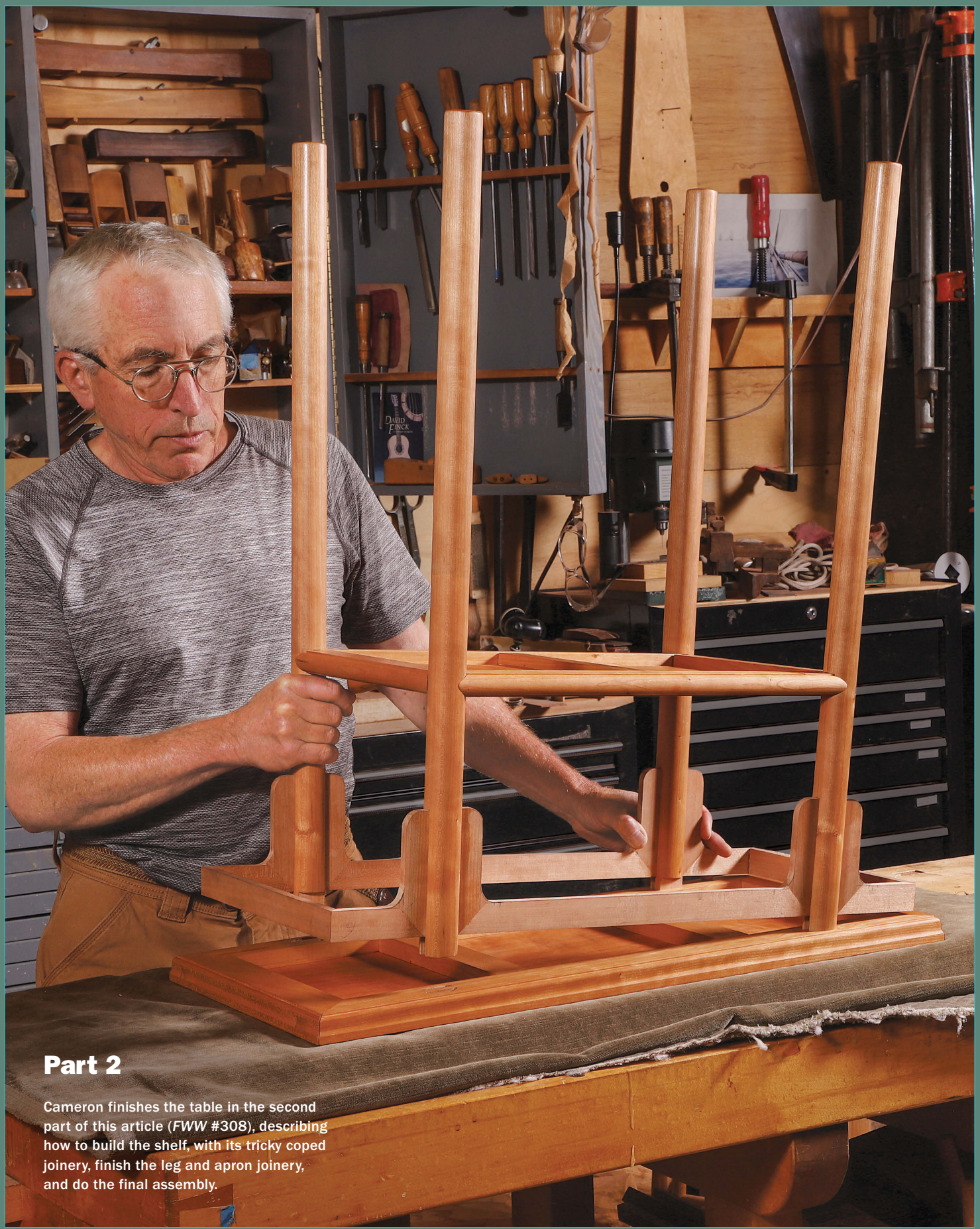
Cutting the apron half of the mitered bridle is a bit trickier. I began by knifing the miter angles onto the apron blank. Then I used a handheld router with a straight bit to mill away most of the waste. When I set the bit depth I erred on the shallow side so I could get to the final fit with a shoulder plane. And I stayed clear of the layout lines while routing. I trimmed to the miter lines with a wide chisel; be very careful on the second side as the part is thin and fragile at that point.

This table is an exercise in glueless joinery, but when I took apart the original, I found one glued joint—the mitered bridle between the apron and spandrel. I decided to glue mine as well. If you choose to glue yours, keep clamp pressure on both the miter and bridle joints when gluing.

With the glue-up complete and the apron and spandrels now one piece, I cut the bottom edge to shape. After laying out the rounded sections with circle templates, I made the straight cuts at the table saw and then cut the curves at the bandsaw. I faired the curves with files and with sandpaper wrapped around a dowel. □

Curved cleanup. *Files and sandpaper combine to fair the curves and smooth the straight sections of the apron and spandrel.*

John Cameron builds furniture in Gloucester, Mass.



Part 2

Cameron finishes the table in the second part of this article (*FWW* #308), describing how to build the shelf, with its tricky coped joinery, finish the leg and apron joinery, and do the final assembly.

Miter Gauges

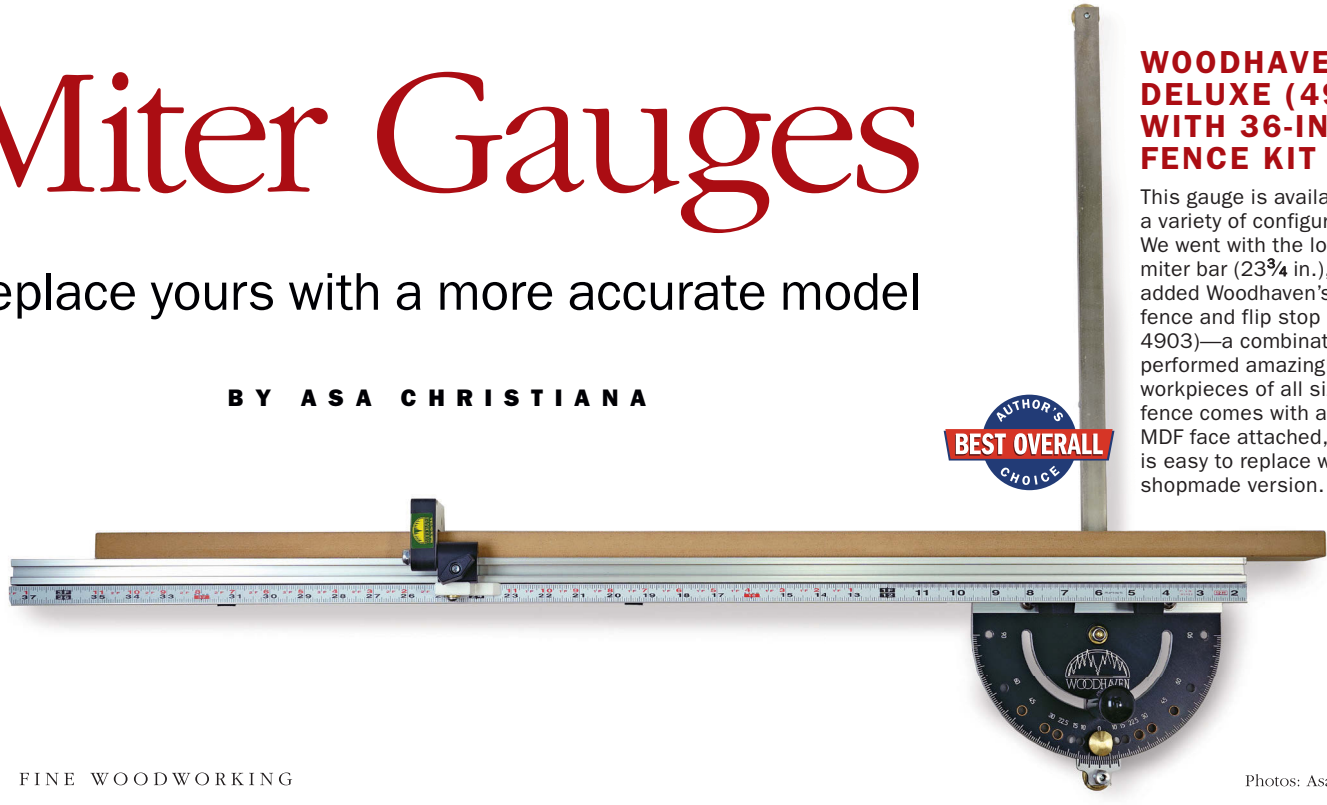
Replace yours with a more accurate model

BY ASA CHRISTIANA

Compared to a crosscut sled, a miter gauge has a tough job. With just one runner riding in the saw table and a pivoting fence that drags workpieces across the table, accuracy is tougher to achieve.

Compared to a big, heavy sled, however, a miter gauge is much easier to handle, it can crosscut wood at a variety of angles, and because there is no base it can cut thicker stock. Most also make it easy to add a sacrificial wood fence, so you won't have to blow out the base and fence of your crosscut sled with a dado cut, for example.

For a miter gauge to deliver accurate results, every component needs to function well. Unfortunately, the gauge that came with your table saw probably isn't up to the job. Manufacturers tend to focus their efforts on the machine itself, skimping on the accessories—blade, push stick, miter gauge—to keep prices as low as possible. This is why the market is flooded with replacement miter gauges, all promising to beat the one you already own. In fact, I ordered and examined two dozen of them for this test, with models ranging from well-established North American brands to inexpensive knockoffs on Amazon. In the end, there were 10 tools left standing, each capable of doing precise work. That said, some make that precision easier to achieve.



WOODHAVEN DELUXE (4911) WITH 36-IN. FENCE KIT

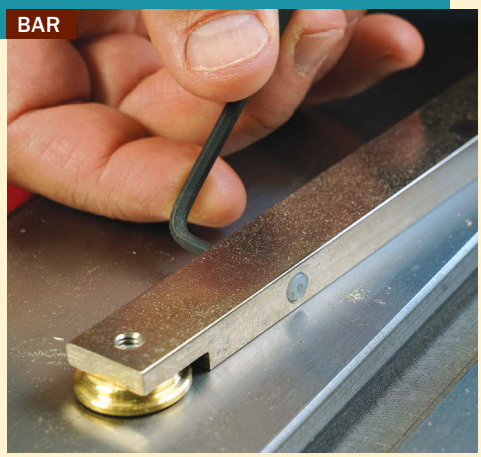
This gauge is available in a variety of configurations. We went with the longest miter bar (23¾ in.), and added Woodhaven's 36-in. fence and flip stop (Model 4903)—a combination that performed amazingly on workpieces of all sizes. The fence comes with a sliding MDF face attached, which is easy to replace with a shopmade version.

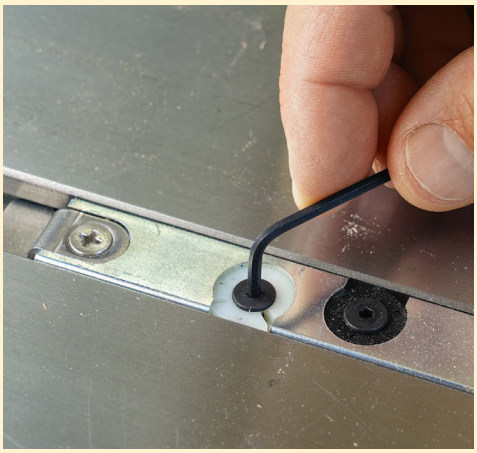
Photos: Asa Christiana

Key components

With just one runner to guide it, and a pivoting fence that drags workpieces across the saw table, a miter gauge has a tough job—so every component matters.

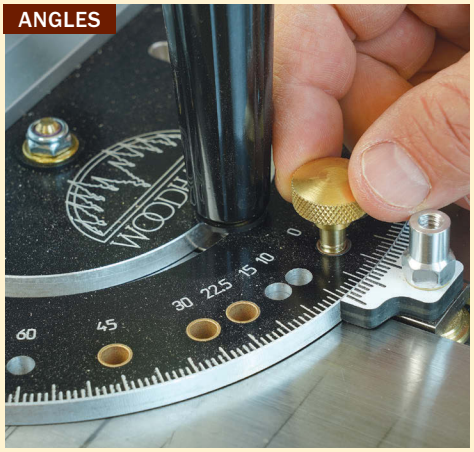
BAR

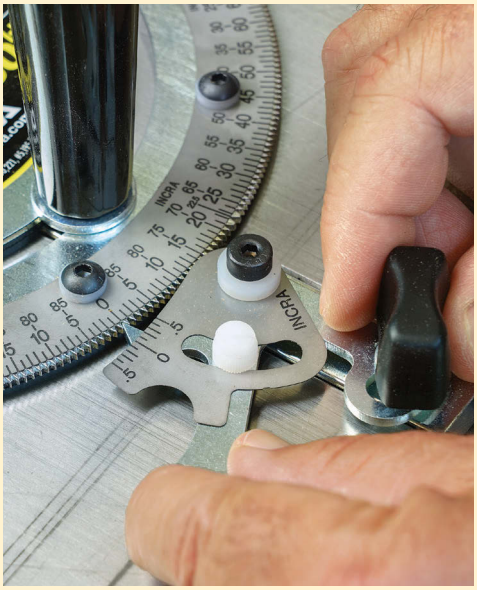




Solid bar adjusters are best. *The best are positive, like the threaded set screws on the Woodhaven bar (left), and the split plastic washers on the Incra (center) and others. While Woodpeckers' springy adjusters (right) require no adjustment, they allow the bar to twist sideways slightly in some situations.*

ANGLES



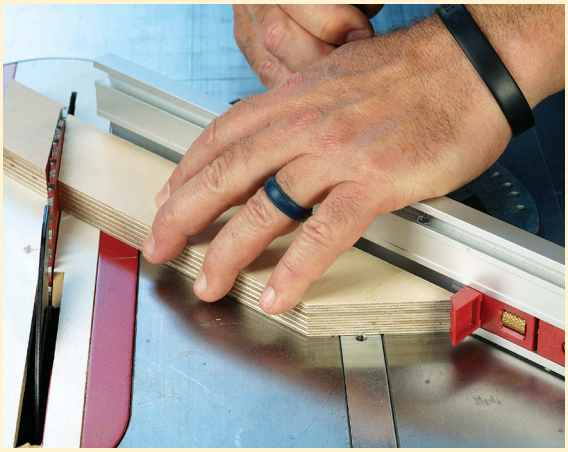


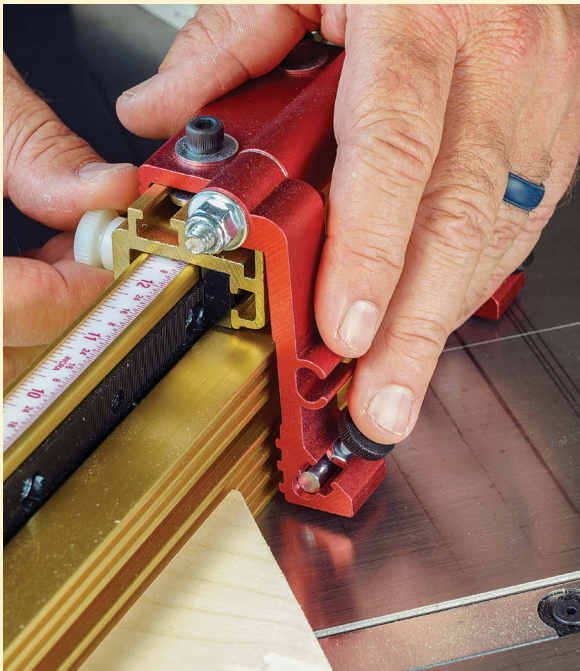
Indexing systems must be solid too. *No matter their design, the best angle-setting systems allow zero wobble. Great examples are Woodhaven's threaded pin (above) and Incra's toothed rack (right).*

FENCE

Sacrificial-fence capability. *Woodpeckers Exact-90, Woodhaven Deluxe, and Rockler Precision (shown) include a sliding sacrificial MDF fence face for zero-clearance cut support. Most of the others make it easy to add one.*

FLIP STOP





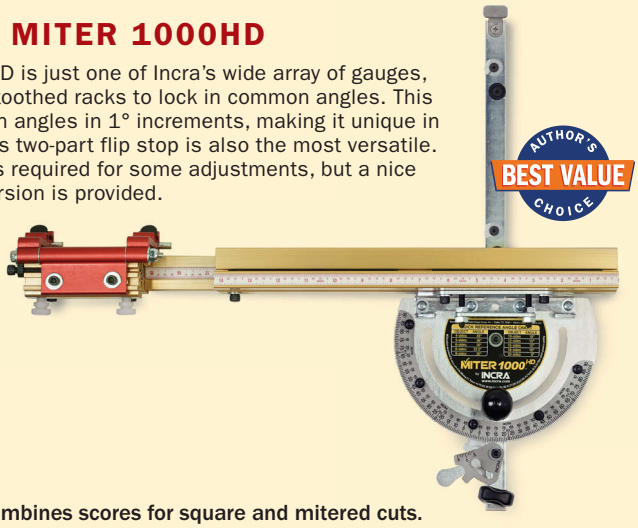
Flip stops should be versatile. *Like JessEm's excellent, micro-adjustable model (left), the flip stops on most models adjust to fit over a sacrificial fence. But only a few, such as the StealthStop (center) and Incra stop (right), fit into the fence to catch the pointy end of mitered pieces.*

HARVEY MG-36 PRO

A recent update of Harvey's Compass MG-36 miter gauge, the MG-36 Pro is a thing of beauty, with robust, refined construction and a host of user-friendly features, like a micro-adjustable flip stop that works for miters too. While it has a bit more play in its angle-indexing system than the three top gauges in this review, it is capable of precise work.

INCRA MITER 1000HD

The 1000HD is just one of Incra's wide array of gauges, which use toothed racks to lock in common angles. This one locks in angles in 1° increments, making it unique in this test. Its two-part flip stop is also the most versatile. A hex key is required for some adjustments, but a nice handled version is provided.



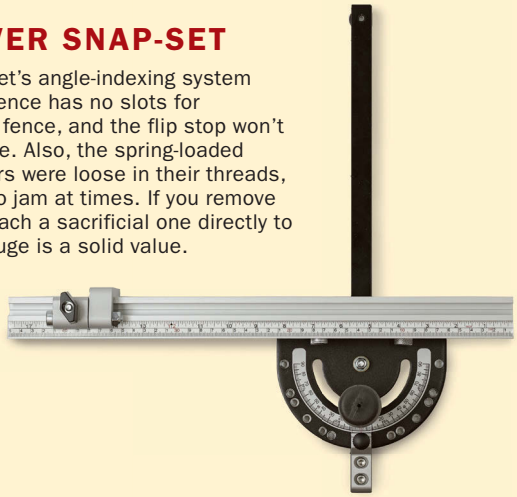
Top miter gauges, head to head

The rating for overall accuracy combines scores for square and mitered cuts. Each miter gauge's ability to maintain accuracy with larger workpieces is also noted. Prices listed are the lowest we could find.

MODEL	Price	Bar adjusters	Overall accuracy	Large workpieces	Angle range (degrees)	Angle stops (degrees)
HARVEY MG-36 PRO	$350	Eccentric plastic disks	Very good	Very good	+/-60	0, +/-15, 22.5, 30, 45, 60
INCRA MITER 1000HD	$220	Split plastic washers	Excellent	Excellent	+/-90	Every degree
JESSEM MITE-R-EXCEL II	$300	Eccentric metal disks	Very good	Excellent	+/-45	0, +/-15, 22.5, 30, 45
KREG PRECISION SYSTEM	$160	Plastic set screws	Good	Excellent	+/-50	0, +/-22.5, 30, 45
POWERTEC 71766	$300	Split plastic washers	Excellent	Very good	+/-60	0, +/-15, 22.5, 30, 45, 60
ROCKLER PRECISION	$190	Nylon set screws	Excellent	Excellent	+/-70	0, +/-15, 22.5, 30, 45, 60
WOOD HAVEN DELUXE	$320	Nylon set screws	Excellent	Excellent	+/-90	0, +/-10, 15, 22.5, 30, 45, 60, 90
WOODPECKERS EXACT-90	$330	Spring clips	Very good	Very good	N/A (0 only)	0
WOODPECKERS STEALTH-STOP	$120	Spring clips	Excellent	Good	+/-70	0, +/-15, 22.5, 30, 36, 45, 60
WOOD RIVER SNAP-SET	$100	Spring-loaded balls	Very good	Very good	+/-90	0, +/-22.5, 30, 45, 60, 67.5, 90

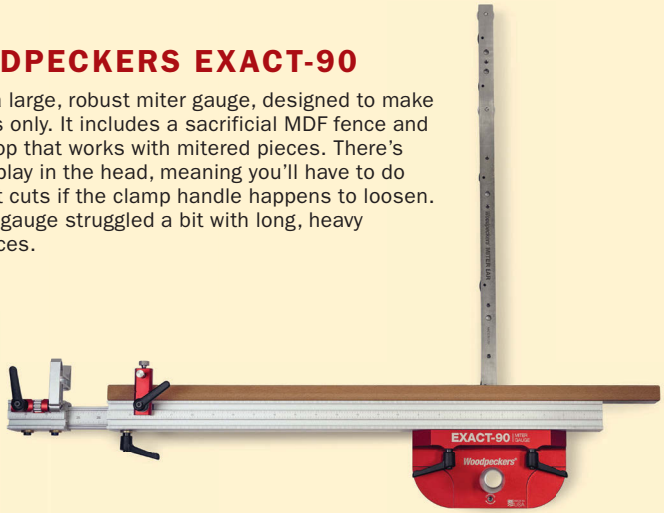
WOOD RIVER SNAP-SET

While the Snap-Set's angle-indexing system is accurate, the fence has no slots for attaching a wood fence, and the flip stop won't accommodate one. Also, the spring-loaded miter-bar adjusters were loose in their threads, causing the bar to jam at times. If you remove the fence and attach a sacrificial one directly to the head, this gauge is a solid value.



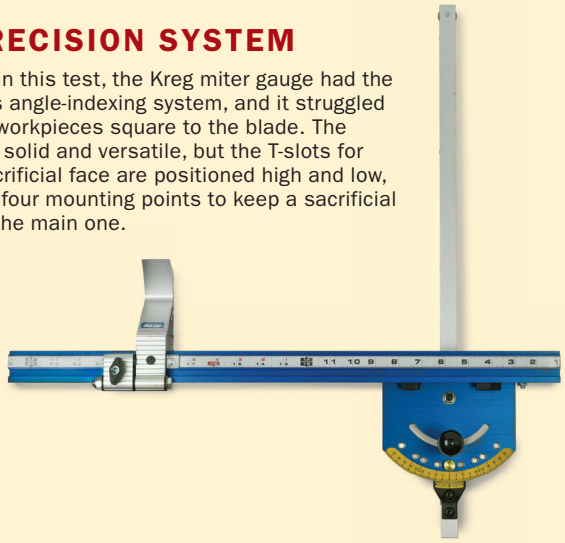
WOODPECKERS EXACT-90

This is a large, robust miter gauge, designed to make 90° cuts only. It includes a sacrificial MDF fence and a flip stop that works with mitered pieces. There's a bit of play in the head, meaning you'll have to do new test cuts if the clamp handle happens to loosen. And the gauge struggled a bit with long, heavy workpieces.



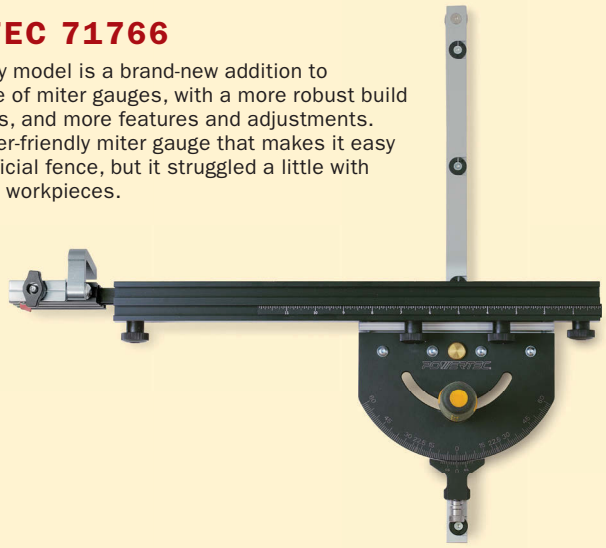
KREG PRECISION SYSTEM

Of the gauges in this test, the Kreg miter gauge had the most play in its angle-indexing system, and it struggled to keep larger workpieces square to the blade. The stop system is solid and versatile, but the T-slots for attaching a sacrificial face are positioned high and low, likely requiring four mounting points to keep a sacrificial fence snug to the main one.



POWERTEC 71766

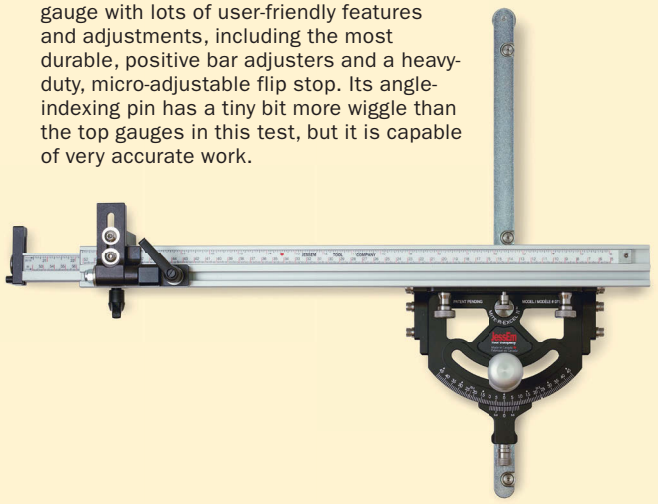
This heavy-duty model is a brand-new addition to Powertec's line of miter gauges, with a more robust build than the others, and more features and adjustments. It's a solid, user-friendly miter gauge that makes it easy to add a sacrificial fence, but it struggled a little with longer, heavier workpieces.



Angle scale	Max crosscut with stop	Stop works w/ sacrif. fence?	Stop works w/ miters?	Fence in same position at 90° and 45°?
1/10°	39 in.	Yes	Yes	Yes
1/10°	34 in.	Yes	Yes	No
1/10°	40 in.	Yes	No	Yes
1/10°	24 in.	Yes	No	Close
1/10°	36 in.	Yes	No	Yes
1°	26 in.	Yes	No	Close
1/10°	39 in.	Yes	No	Yes
N/A	48 in.	Yes	Yes	N/A
1°	28 in.	No	Yes	No
1°	18 in.	No	No	Yes

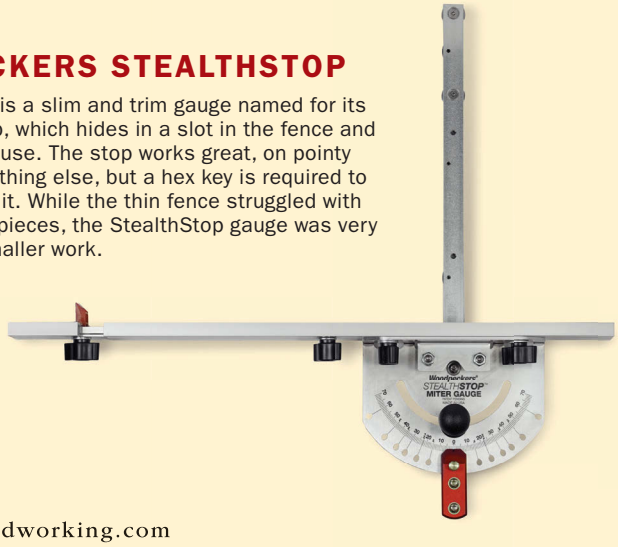
JESSEM MITE-R-EXCEL II

This is a heavy-duty, finely machined miter gauge with lots of user-friendly features and adjustments, including the most durable, positive bar adjusters and a heavy-duty, micro-adjustable flip stop. Its angle-indexing pin has a tiny bit more wiggle than the top gauges in this test, but it is capable of very accurate work.



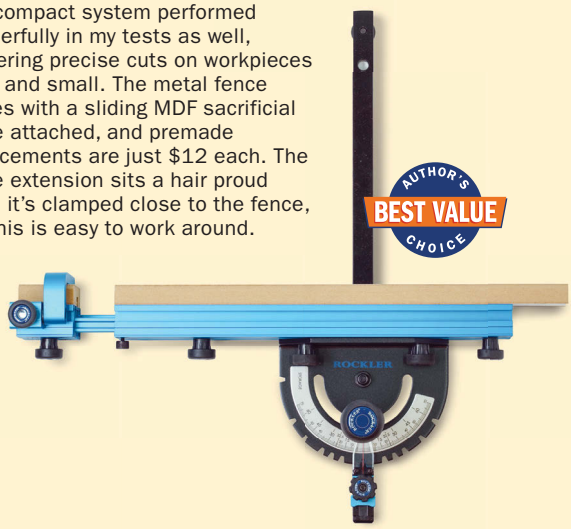
WOODPECKERS STEALTHSTOP

The StealthStop is a slim and trim gauge named for its unique work stop, which hides in a slot in the fence and flips outward for use. The stop works great, on pointy miters and everything else, but a hex key is required to move it and lock it. While the thin fence struggled with long, heavy workpieces, the StealthStop gauge was very accurate with smaller work.



ROCKLER PRECISION MITER GAUGE WITH TELESCOPING FENCE

Reviewed favorably in *FWW* #299, this compact system performed wonderfully in my tests as well, delivering precise cuts on workpieces large and small. The metal fence comes with a sliding MDF sacrificial fence attached, and premade replacements are just $12 each. The fence extension sits a hair proud when it's clamped close to the fence, but this is easy to work around.



Tough tests and tasks

Tests varied from measuring stresses to real-world cuts on a variety of workpieces.

Wiggle test. *With the angle-setting system engaged but the clamp handle unlocked, Christiana extended each fence 12 in. and flexed it gently to check for play in the system. Too much and you won't be sure the head will lock at the exact same angle each time you set it.*

Great expectations

A good aftermarket miter gauge should beat a stock model in every way. First, the miter bar needs reliable adjusters for perfecting its fit in the miter slot. Second, you should be able to rely on the head returning to a perfect 90° and other common angles every time you reset it, without the need for test cuts.

Metal fences are an asset—The best miter gauges have a long, straight, solid fence attached to the head, with a reliable stop system built in. Before I did this test, I used to think that a miter gauge didn't really need one of these fences, because a sacrificial wood fence can be screwed directly to the head, providing the same workpiece support while adding zero-clearance cut support and a place to clamp on stop blocks. I was wrong. Turns out those long, extruded-aluminum fences keep your sacrificial fence straighter and more accurate (see "Testing revealed helpful tips," p. 42). And they include a flip stop, which is handier than a clamped-on block.

SawStop owners beware—While the extruded aluminum fences are an asset, they can cost you some money if you happen to run one into the blade of a SawStop table saw and trigger the brake (other saws will cut into the aluminum without a problem).

But all of the fences adjust side to side on their brackets, so this SawStop issue should be easy to avoid—if you are paying attention. On some fences, the end stays in the same position relative to the blade at both 45° and 90°, which is a nice bonus.

Adding a sacrificial fence—To create a zero-clearance blade slot and avoid chipout at the back edge of your crosscuts, you'll need to attach a sacrificial wood fence to the metal one, extending it an inch or so past the blade. A few of the miter gauges in the test came with sacrificial fences, others offer them as options, and some require you to make your own. These are attached by means of T-slots in the metal fences, which accept common nuts and fasteners. The T-slots let you slide the sacrificial fence right and left, allowing you to cut a new zero-clearance blade slot when you need one.

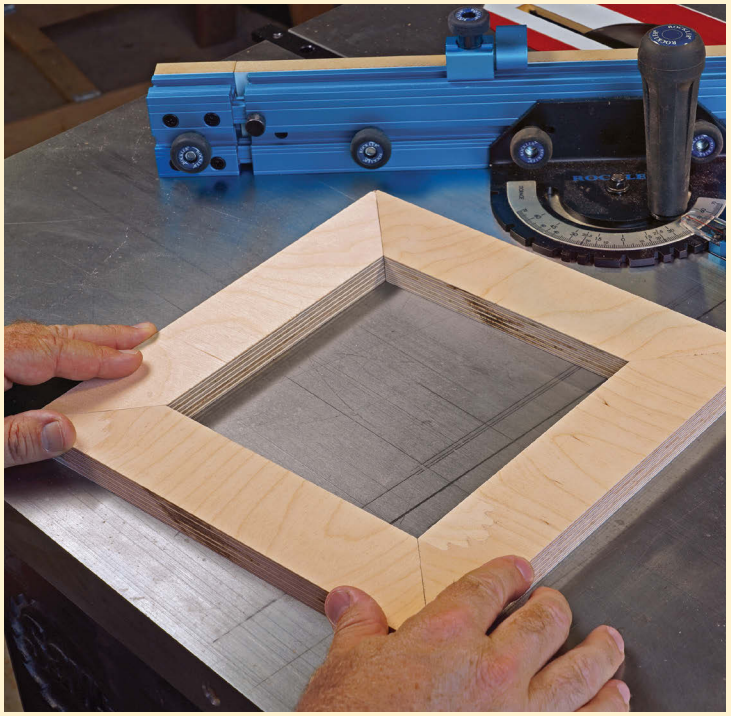
Inside the testing

My tests evaluated all of the above and more. First, I checked the adjusters for fitting the bar to the slot, and dialed them in (when possible) for a perfect sliding fit with no wiggle room. The adjusters vary from springy clips and ball-bearings that need little to no adjustment, to adjustable washers, disks, and set screws. My favorites offer positive adjustment with no springiness, and hold their settings. Their advantage was borne out in the cutting tests.

Next, I checked for play in the angle-indexing system. All of the gauges are solid once you lock down the clamp handle, but a few have a little more wiggle in the angle-setting system than I would like, which showed up in the cutting tests. I checked for wiggle in the flip stops too, and all were solid.

Before moving on to the cutting tests, I checked the initial squareness of each gauge by placing an accurate square between the miter bar and fence. If they were off a little, I adjusted them. All of the gauges have a way to fine-tune the fence angle, making the whole indexing system accurate.

Most importantly, I did a variety of cutting tests, including cuts at 90° and 45°, and cuts on large, heavy boards, making sure that all of the components teamed up to deliver the accuracy that furniture makers need. I repeated these many times, to make sure my results were solid, and to see if the gauges could be moved to different angles and returned reliably to a perfect 90°.



Real-world cuts. *Christiana made multiple square cuts, resetting the angle each time, to check for consistency (above), and made a mitered frame with each gauge (right) as well, which compounds any error in the 45° setting.*

Large workpieces. *This long, thick piece of hardwood represents some of the heavier stock a miter gauge might be asked to handle. Not all gauges were able to produce a perfectly square cut on this board, due to flex or play somewhere in the system.*

A few words about my favorites

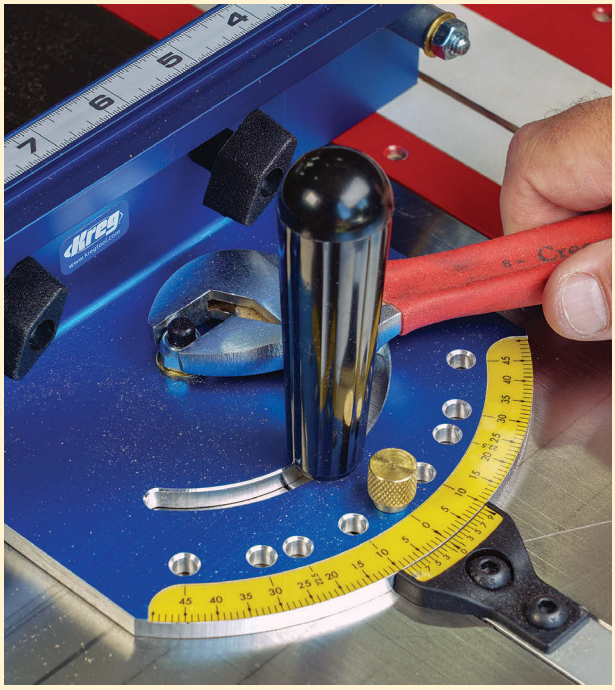
Each of my favorites has something unique going for it. The compact Rockler offers the best combination of size, price, and performance, with replacement MDF fence faces just a click away at Rockler's website. My only quibble is how the fence extension ends up a little proud of the main fence when it's locked close to it. To compensate, I would suggest unlocking its clamp when the extension isn't needed, or removing its sacrificial block when you need to lock the loupe stop close to the main fence.

For a bit more money, you can buy the Incra Miter 1000HD, which has positive stops at every degree and a very versatile flip stop, and includes handy hardware for adding a sacrificial fence. Incra has a lot of miter-gauge models, which share the same solid rack system for setting angles. And Incra fences are interchangeable, so you can add a longer one later if you like.

If cash is less of a concern, I would go for the big Woodhaven gauge I put together from their variety of possible configurations. With its long miter bar, extremely solid head, and long, rigid fence, it did the best job with workpieces large and small. And its MDF fence is very easy to replace.

Asa Christiana is Fine Woodworking's *editor-at-large.*

Testing revealed helpful tips



Tighten up the gauge. *After tightening the miter-bar adjusters, tighten the rest of the connections, like pivot points on the head of the gauge (above) and the flip stop (right).*

While reviewing these gauges, I discovered a few helpful tips and techniques as I worked my way through the battery of tests. These will benefit anyone who owns a miter gauge, whether they are shopping for a new one or not.

First, adjust the bar for a good fit in the left-hand miter slot on your table saw. The goal is to have each little adjuster rubbing slightly against the inside of the slot, without causing too much drag.

Then tighten up all of the connections on your miter gauge. There tend to be lots of these, depending on the design, and some had been left a bit looser than I would like. The same goal applies here: to eliminate as much wobble as you can without making it too hard to operate the tool. Most importantly, make sure the fence is attached solidly to the head, and tighten the pivot points in the flip stop and the head of the gauge, if possible.

Next, move on to the angle of the head/fence. All miter gauges have an indexing system for common angles, and almost all can be adjusted. First, engage the indexing pin or tooth in the 90° position, tighten the clamp handle, and place an accurate square between the bar and fence. If there's any light showing, adjust the indexing system as shown in the manual. If your tablesaw is dialed in, with the miter

Check it for squareness. *Clamp the fence in the 90° position, and put a good square between the fence and bar to look for light. Read the manual to find out how to correct misalignment.*

Follow up with test cuts. *Rip two edges straight and parallel on a thin piece of material, scribble across the cut line, and make a cut (right). Then flip the cutoff and set both pieces against a straight edge (below). Any gap is double the amount of error, so adjust the gauge accordingly.*

slots perfectly parallel to the blade, this simple step should deliver perfect cuts right away. But just to be sure, make test cuts as shown.

Along the way I discovered that the flip stop is as helpful for single cuts as it is for multiples. That's because workpieces—especially large ones or parts cut at an angle—can slide along the fence as the cut is made, no matter how firmly you hold them. But if you engage the stop, you can push the workpiece against it slightly as you cut, eliminating drift.

A number of gauges employ a tapered pin or tooth in their angle-indexing systems to ensure an accurate setting. It can be helpful to apply pressure to that tapered pin or tooth as you are tightening the clamp handle to make sure you are removing as much play as possible.

And last, if you have a long metal fence on your gauge, attach the sacrificial fence to that, instead of directly to the head of the miter gauge. If you're like me, it's tough to find a flat piece of MDF or plywood in your scrap pile, but the metal extrusion will tend to pull a scrap piece flat and keep it that way.

—A.C.

Use the flip stop to prevent drift. *Most of us use these for repeat cuts only, but they prevent a workpiece from sliding along the fence as you push it past the blade; such drift can result in a slightly curved cut.*

Custom Clamping Blocks

Extra effort ensures glue-up success

BY RON KUHN, MATT GIOSSI, AND HANK GILPIN

Aristotle said, "The whole is greater than the sum of its parts." Alright, Aristotle, but how do we get the parts together? Clamping blocks! The woodworking world deserves to know, or be reminded, that it's OK to spend half a day making clamping blocks that will protect a piece of furniture that's taken you weeks to create, blocks that will evenly distribute clamping pressure right where you need it.

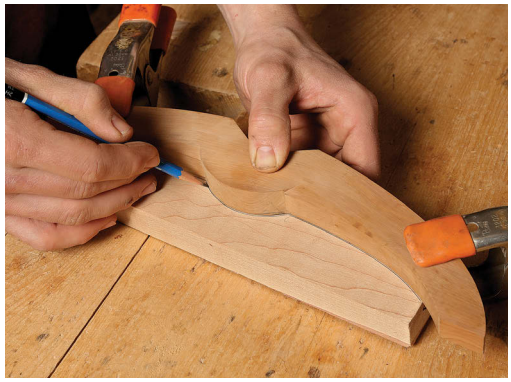
Proper clamping blocks provide insurance that the piece will go together smoothly, eliminating added stress

Photos, except where noted: Anissa Kapsales

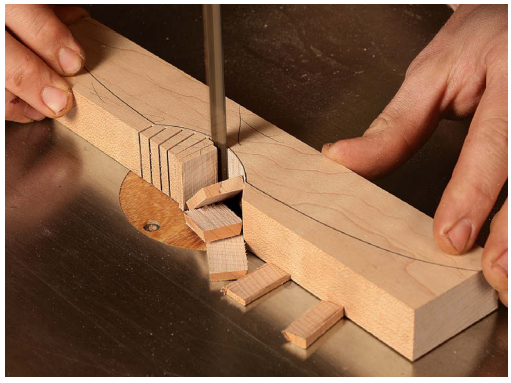
MIRROR IMAGES

When assembling uniquely shaped parts, create clamping blocks that mate with the pieces being clamped.

around a glue-up. The glue-up is the make-or-break moment in any shop, and you can't afford to risk a clumsy one. You could end up with open joinery, dented or broken parts, or a pile of expensive firewood. All these issues obviously diminish profit, value, and joy. Making the blocks can be as demanding as making the parts being assembled, so it's easy to feel like you need to rush to completion. But it's professional to understand that the way a piece of furniture is assembled is just as important as how its parts were made.



Mimic the part. *To create a custom clamping block, use the part you need to clamp as a template. Secure the part to the block stock, and trace its shape.*



Cut the shape. *On the bandsaw, carefully cut the block to shape. For tight curves, the authors cut a series of kerfs, and then cut to the line. Slow, steady cutting yields the best results.*

Add cardboard. *Use spray adhesive to attach a layer of thin cardboard to the block. The cardboard will prevent denting.*

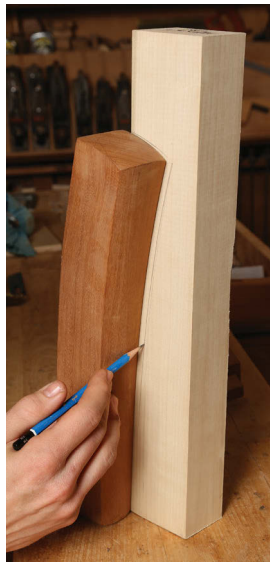
Tape and tighten. *Before clamping, tape the block to the furniture part to prevent sliding during assembly. The tape location is important. Make the block longer or wider if necessary to afford extra room for tape and to avoid getting tape in the glue joint.*

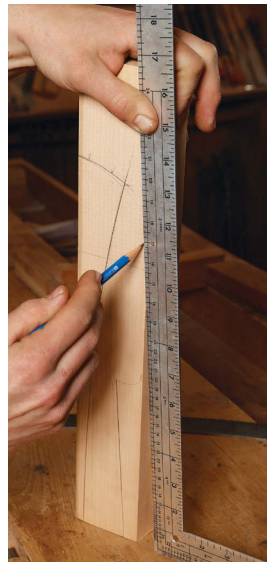
Photos of finished furniture: Hank Gilpin

PRESSURE

KEEP THE PRESSURE WHERE YOU NEED IT

This particular glue-up required curved legs to be glued to angled stretchers. The custom clamping blocks accommodated the curves and angles so the clamp jaws would remain parallel to each other.

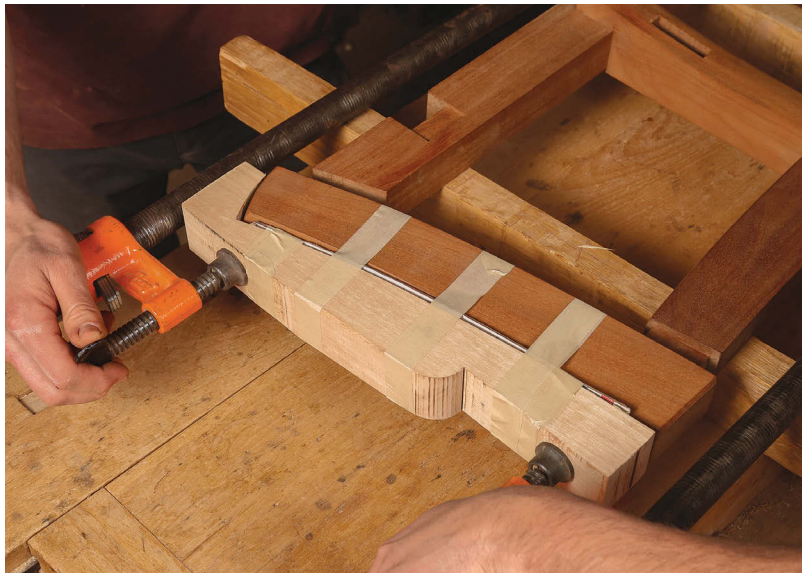




Negative shape holds the part. *Trace the part onto one side of the clamping block stock. On the outside of the clamping block, mark and cut out a square face to allow level clamping.*

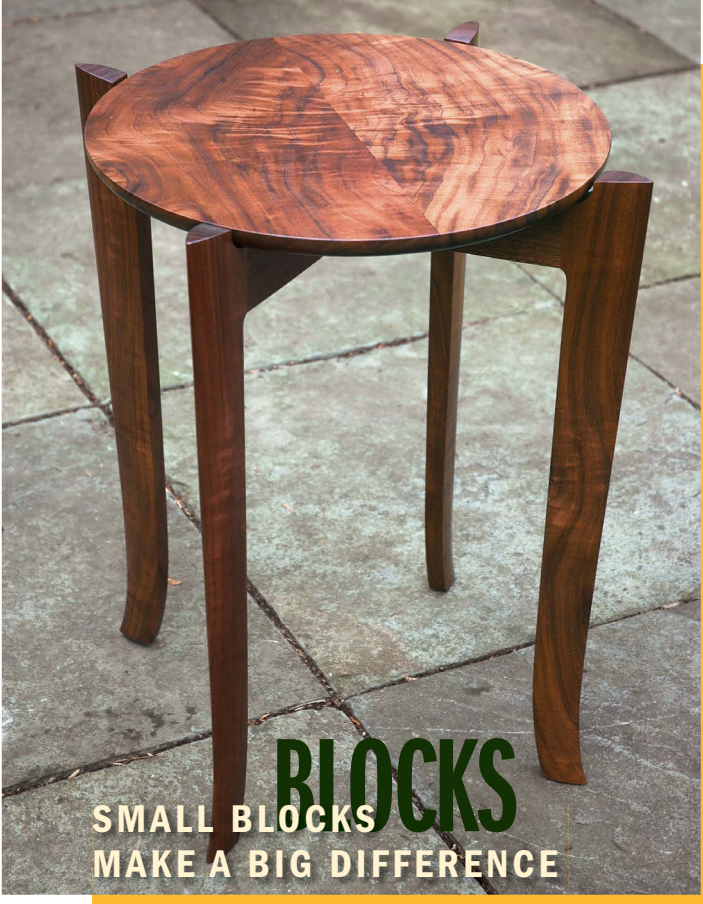
Prepare the block. *On the bandsaw, cut out the negative space that will cradle the part and the opposite side that the clamp will rest on. Then secure thin cardboard to the block with spray adhesive and tape.*

The pressure's on. *Tape the block to the piece, making sure the tape doesn't interfere with the joint, and apply clamping pressure.*



Maximize a joint's potential

Proper clamping blocks enable you to apply as much pressure as you need exactly where you need it. Glue is activated by pressure, and with a proper clamping system you can choose to target the clamping pressure over a tenon, say, or perhaps spread the pressure across a wider surface. Either way, you can ensure that you are getting the full potential out of the clamp. We often make blocks that not only allow us to seat a mortise onto a tenon, but also give us the flexibility to position the clamp how and where we want so that we can apply an additional cross clamp over the joint. Two-way



SMALL BLOCKS MAKE A BIG DIFFERENCE

Sometimes you just need a small block that straddles an oddly shaped part. The trick in making little blocks is to keep the block stock oversize until it is shaped.

Trace the part. *These shaped legs only require clamping pressure in a small area near the top where the legs meet the stretchers. Using the top of the leg as a pattern, trace the shape onto the block stock.*

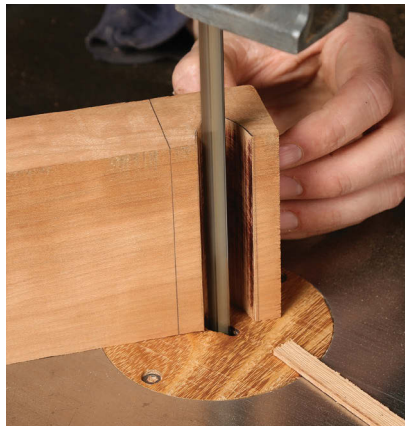
pressure is the result: tight shoulder pressure, and additional surface pressure, urging the glue deeper into the grain and helping it set stronger.

It's all about making clamping blocks that fit the specific shapes being assembled so that they work to your advantage. Most commonly, in our shop, these forces are directed to seat mortise-and-tenon joints. But this focus on clamping applies to anything being assembled.

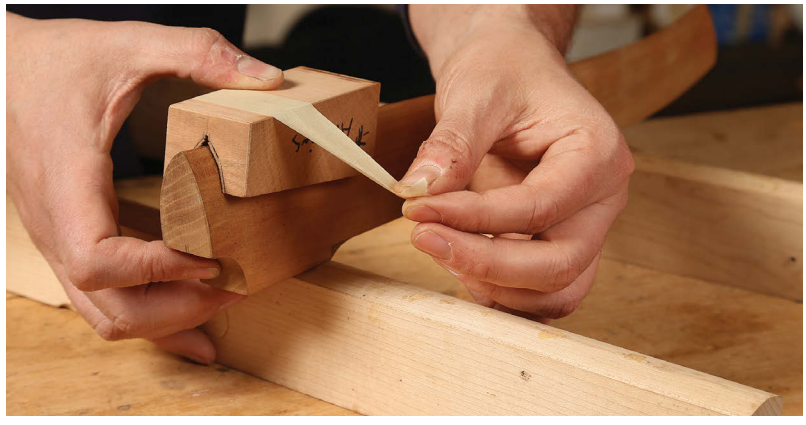
There is never a situation during assembly when we wouldn't use some sort of block, even if it's just a strip of plywood to protect a simple box assembly. A clamp placed directly on a finished piece can easily mar the surface and we all hate that.

For us, the bandsaw is the go-to tool for shaping clamping blocks, though we also use the table saw and some hand tools for compound curves.

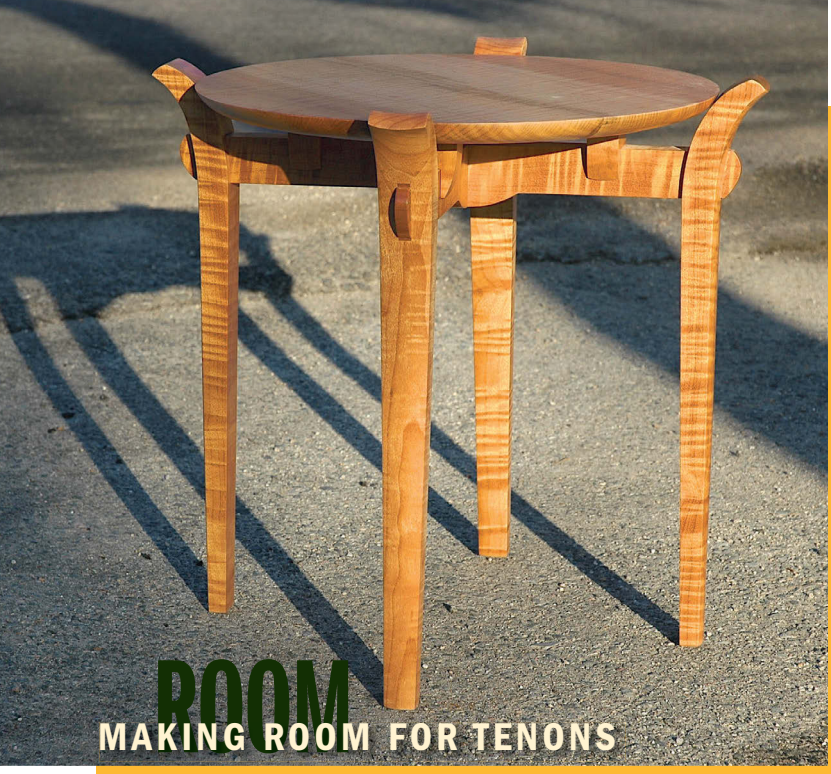
Each piece of furniture we make is unique, and therefore we can't say do this one thing all the time. But we can



Start large. *Working with a small block isn't safe or stable, so make your small block from a large blank. Bandsaw the tight radius of the leg shape with a series of kerfs, and then cut those out. After you've cut the shape, cut the block from the oversize blank.*



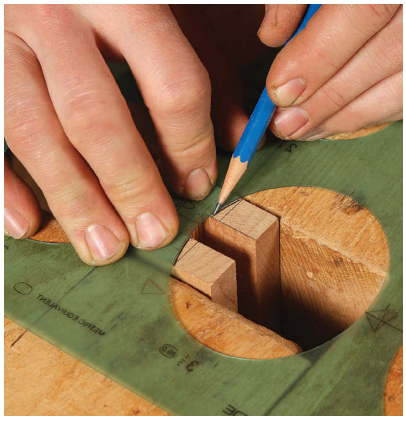
As always, cardboard and tape. *Line the inside of the block with thin cardboard, and make sure to tape the block to the workpiece before applying glue to the joint.*



MAKING ROOM FOR TENONS

When you make proud through-tenons you can't clamp on them. Instead, you must apply clamping pressure around them to seat the joint properly. Shape your clamping blocks accordingly.

Cut a groove. *On the table saw, take multiple rip cuts to create a groove wide enough to straddle the tenon.*

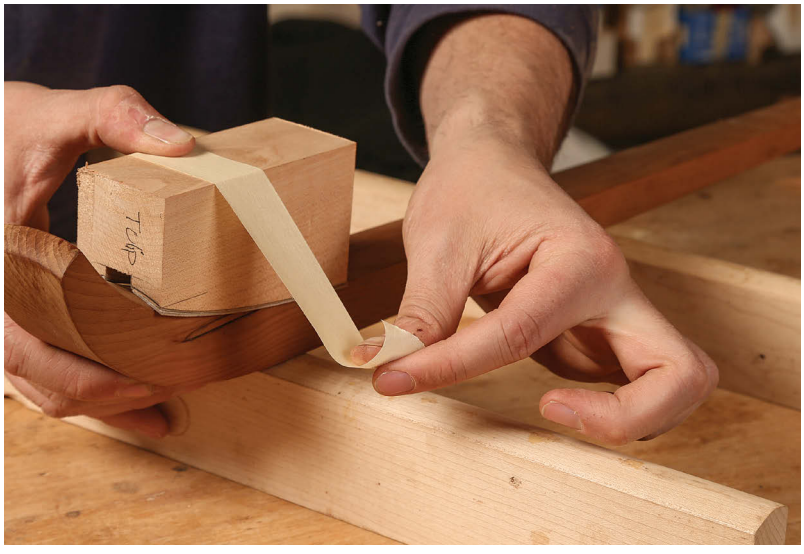


Accommodate curves. *If the parts are straight and square just cut a groove for the tenons, but if the parts are shaped then you'll have to use the workpiece or a template to trace that shape onto the grooved block, cut the shape out, and refine it.*

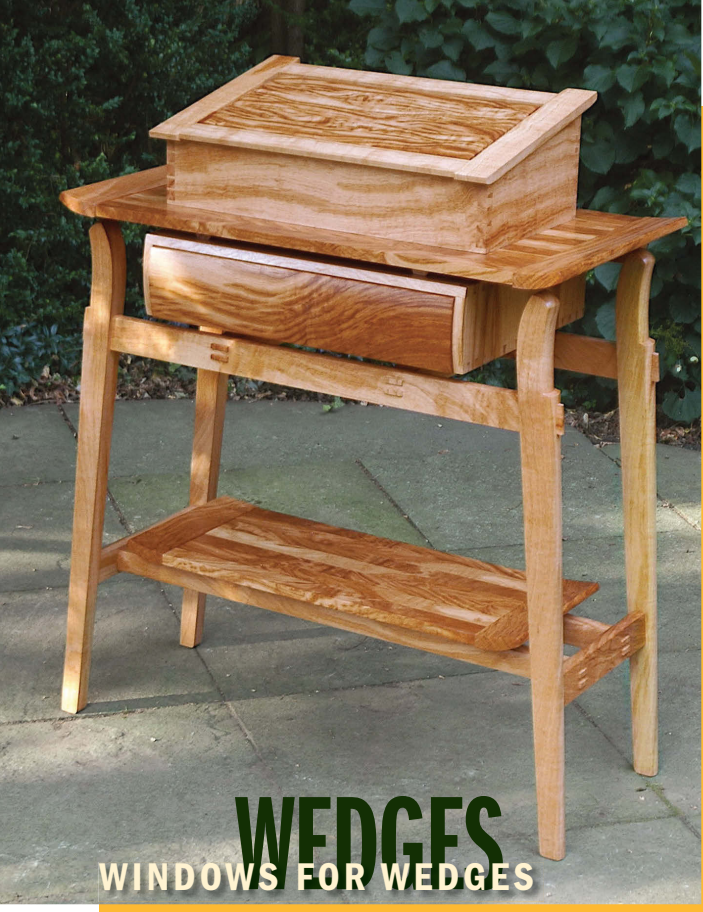
show you a few examples of what we've done on specific pieces and you can adapt our methods to your work.

Block material is important

We almost never make a block with a wood denser than the piece of furniture we're assembling is made of, as intense pressure while clamping can create dents. Make the block out of the same material or something a bit softer and pay attention to the pressure you're applying. Even with a less dense material, we commonly glue thin cardboard to the block to further diminish possible imprinting.



Tape and go. *Once you shape the block, add some thin cardboard, tape the block over the tenons, and add glue and clamping pressure.*

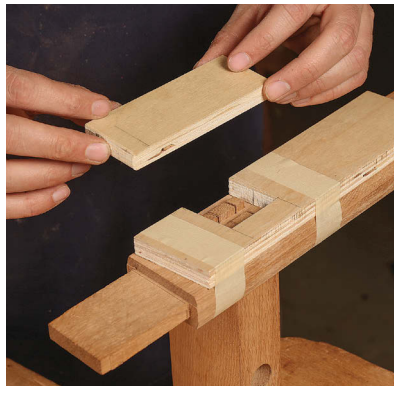


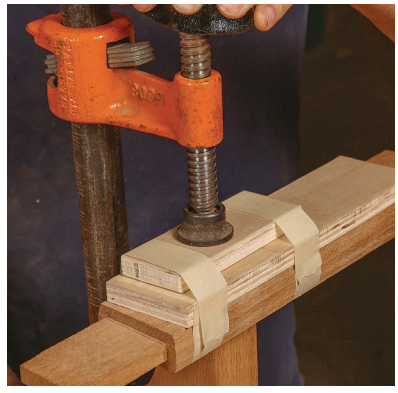
WEDGES

WINDOWS FOR WEDGES

A grooved block won't work with wedged tenons. Instead, you need a two-block system that lets you apply clamping pressure and still have access to wedge the tenons.

Notch the block. *Cut a notch out of the primary clamping block. The notch should closely surround the tenons but not cover them.*





Add a secondary block. *Once you add cardboard, tape the notched block to the workpiece. Then add a flat block over the notched one, covering the notch and overlapping the sides. With both blocks in place, glue and clamp the assembly, applying pressure directly over the secondary block, firmly seating the parts.*

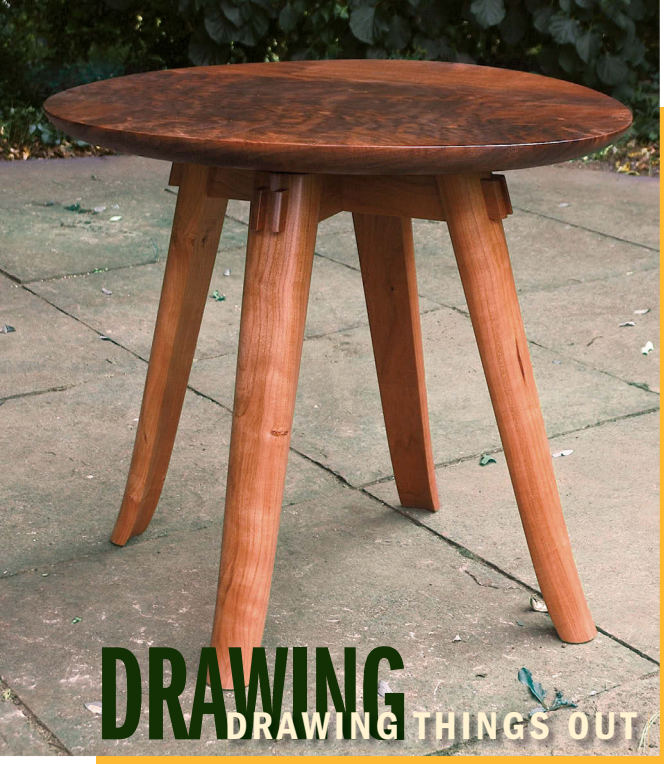
Another consideration is the grain direction of the block. Hank tends to design wildly tapered parts. For example, see the legs on the table (p. 47). If you run a long-grain block over some of these wedge-like shapes, the block will likely split under force. On the same table, notice the clamping block is oriented and cut so the cross grain is perpendicular to the point of the leg.

Proper padding

As we resolve the overall shape and function of each block, we consider the surface it will push against and how to minimize cleanup after the glue-up is complete. We often attach cardboard and 240-grit sandpaper to our blocks with spray adhesive. The sandpaper may leave a little scuff, but it really helps prevent the block from sliding, keeping the pressure where you need it, especially on pieces with steep angles.

When all that's needed is straight-on clamping force, we'll often use pieces

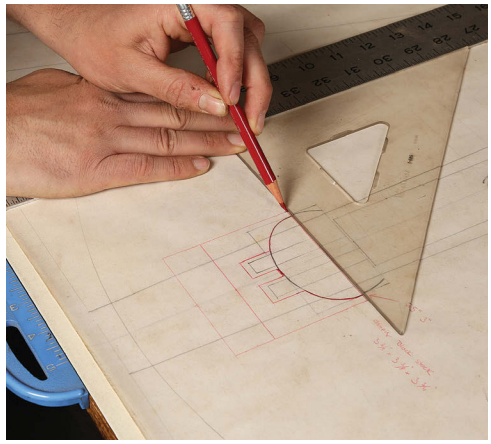
Add wedges. *Once the joint is fully seated, move the clamps from directly over the tenons to the sides, releasing the top block. Now you can tap the wedges in place.*



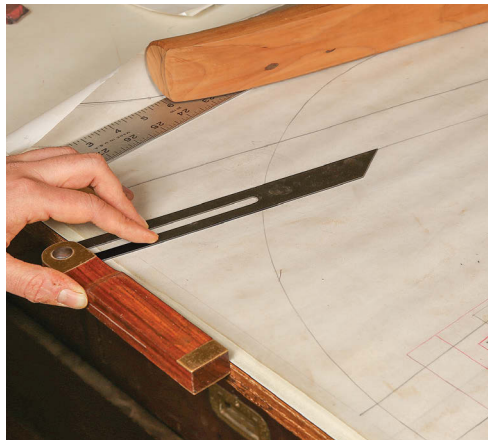
DRAWING

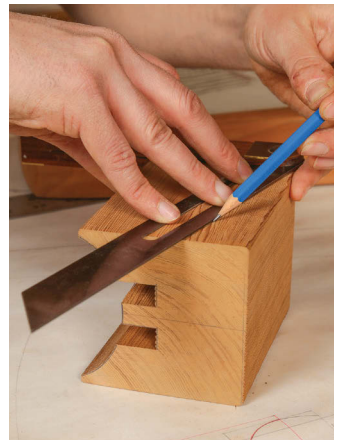
DRAWING THINGS OUT

Giossi, Kuhn, and Gilpin have been known to incorporate clamping blocks in their drawings, as with those for this curved, angled, through-tenoned leg.



Cutting curves. *Transfer the shapes and dimensions from the drawing to the clamping block blank. Then cut the grooves for the tenons on the table saw and the curves on the bandsaw.*





Transfer the angle. *Using a bevel gauge to grab the angle off the drawing, transfer it onto the clamping block and cut it on the bandsaw.*

Easy clamping. *Taking the extra time to make the proper clamping block turns a complicated glue-up into a simple one.*

of Homasote to protect the surfaces being clamped.

Reverse engineering

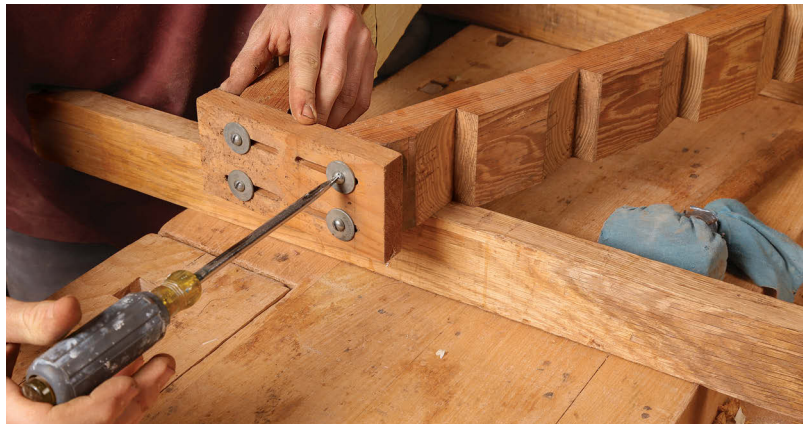
When designing a piece of furniture, we are already considering how it will go together. There have been instances where instead of shaping a part to completion and then making an overly complicated block, we will leave a clamping notch on a part, or perhaps leave a portion square to the joint in question, and then shape it off after assembly. The point of all this is efficiency, and this particular strategy can save a lot of time. Think about the assembly as you design. Sometimes, instead of tossing the offcuts of a part, you can quickly turn them into the clamping blocks you need because they already have the required angle, thickness, or shape. That's an advanced move!

Last, we often reference our full-scale drawing of the project to make clamping blocks, and sometimes we even sketch our blocks right on the drawing to help us determine the angles or limitations of size and other details. A lot of the information you need to make a custom block is right there.□

Ron Kuhn, Matt Giossi, and Hank Gilpin work together to make furniture in Rhode Island.

CLAMPING FRAME

It's not often that you'll need to clamp a triangular bank of drawers, but the clever clamping frame the authors devised for this desk demonstrates how important custom clamping solutions can be.



Adjustability is key. *The basic shape of the frame accommodates the triangular carcase. Grooves at the top and bottom with washers and screws allow adjustability when you have the parts in place.*

Notches provide parallel purchase. *The parts were glued and assembled outside the frame, then inserted and clamped. Angled notches in the sides of the frame create a place for the jaws of the clamps to rest parallel to each other and apply even pressure.*

Top photo courtesy of Hank Gilpin

Red Oak vs.

Learn where each works best, and

Civilization wouldn't be where it is without oak trees. Ships wouldn't have been as strong or seaworthy, nor buildings and bridges as large and durable, so trade, travel, and industry wouldn't have thrived as they did. Wine and bourbon certainly wouldn't be as tasty. And woodworkers wouldn't have one of their strongest and most abundant materials for furniture.

There are more than 500 species of oak in the world, with roughly 90 in North America alone. A dozen or so are sold commercially. These fall into two distinct categories, white and red. The differences *between* the two groups are much more significant than the minor differences *within* them.

Wood sold as "white oak" in North America ranges from actual white oak (*Quercus alba*) to chinkapin (*Quercus muehlenbergii*), swamp white oak (*Quercus bicolor*), and bur oak (*Quercus macrocarpa*). Europeans buy and use American white oak but have their own varieties as well. English oak (*Quercus robur*) and sessile oak (*Quercus patraea*) are two white oaks commonly used across the pond.

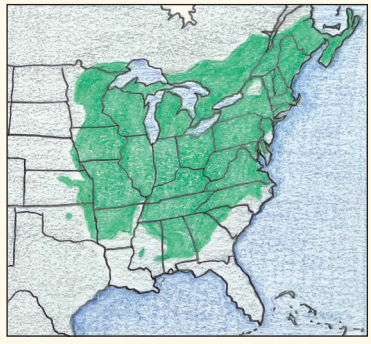
Other than the fact that bur oak has slightly darker heartwood, it's very hard to tell the difference between these white-oak species.

Wood sold as "red oak" in North America is usually Northern red oak (*Quercus rubra*) or black oak (*Quercus velutina*). But pin oak (*Quercus palustris*), Shumard oak (*Quercus shumardii*), and Southern red oak (*Quercus falcata*) are also in the mix.

Red oak

A variety of species are sold as "red oak" in North America, with very similar appearance, weight, strength, and workability. The most common are Northern red oak and black oak. Others include pin oak, Shumard oak, and Southern red oak. Red oak leaves have pointed or bristled tips.

Most-common species **Northern red oak**
Latin name **Quercus rubra**
Specific gravity (12% MC) **.7**
Average weight (dry) **43.8 lb./cubic foot**
Janka hardness **1220 lb.**
Radial shrinkage **4%**
Tangential shrinkage **8.6%**



Photos, except where noted: staff; drawings: John Tetreault

White Oak

BY DAN BOLLOCK

how to identify them like a pro

Sawmills take logs from these species, saw them into boards, and label them white or red oak. At that point, it's nearly impossible to tell their species without a DNA test. And for woodworkers, it's not important, as appearance, weight, strength, and workability are relatively consistent within each category.

What matters, then, is how to tell red oak from white, and understanding the unique qualities of each.

White oak has a lot of advantages

While red and white oak are similarly strong, and both work nicely with hand and power tools, there are lots of important differences between the two.

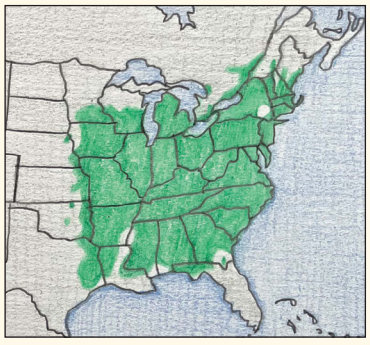
Red oak is more widely available than white, sold everywhere from home centers to hardware stores. Species sold as white oak, on the other hand, are available mostly from hardwood retailers and small sawmills, where they can be twice as costly as red oak, mostly because the logs are harder to come by.

Aside from price and availability, most of the differences between the types are related to the wood's appearance. Red oak usually has a reddish cast and often runs a little darker than white, though not always. In red oak the color of the heartwood—the larger, inner portion of the log that receives the most use—varies from pale reddish brown to light tan, while

White oak

Like "red oak," "white oak" is an umbrella term for a variety of species with similar appearance and performance. These include white oak, chinkapin, swamp white oak, and bur oak. In Europe, English oak and sessile oak are often used. White oak leaves have rounded tips.

Most-common species **White oak**
Latin name **Quercus alba**
Specific gravity (12% MC) **.75**
Average weight (dry) **47 lb./cubic foot**
Janka hardness **1350 lb.**
Radial shrinkage **5.6%**
Tangential shrinkage **10.5%**



Red oak

Red oak has coarser grain and a warmer tone, which gives projects a rustic look. It's also great for green woodworking, and it's significantly less expensive than white oak.

FLATSAWN

Flatsawn red oak has a somewhat coarse, common look, associated with hardwood flooring and less-expensive cabinetry. Chosen and used carefully, however, its strong grain lines can be an asset.

RIFTSAWN

The diagonally oriented growth rings in riftsawn material create straight grain lines on all four sides of a leg, for example, creating a calm look that emphasizes the lines of the piece.

QUARTERSAWN

All oaks have rays, which radiate out from the center of the log. They are bisected in quartersawn boards, creating interesting grain patterns. These are less pronounced in red oak than white.

Big, bold grain enlivens a table base. *Furniture maker Andrew Hunter chose red oak for the base of this trestle table. The cathedrals of the flatsawn wood at the center of the legs are framed by the straight grain of the riftsawn edges, offering visual pop along with a sense of order.*

white oak's heartwood runs from pale or greenish tan to grayish brown. The grain of the two woods is also very different. Red oak has a higher number of large pores, making its grain look coarser and its grain lines more prominent.

Ray fleck—All oaks have rays, an internal structure that radiates outward from the pith, or center, of the log like the spokes of a bicycle wheel. These are bisected when the wood is quartersawn, leaving stripes, called ray fleck, on a board's surface, that are distinct from the grain lines. But the rays in white oak are much wider than those in red, creating beautiful striped patterns on quartersawn boards.

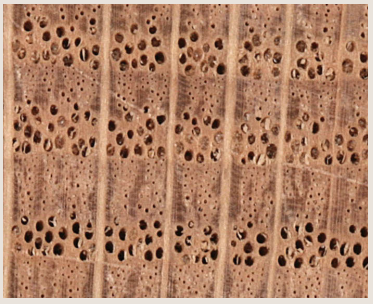
Fuming—Due to a higher amount of tannic acid, white oak is also more sensitive to ammonia, developing a deep golden-brown color when exposed to it. This phenomenon—along with white oak's prominent ray fleck—helped to launch a furniture movement, Arts and Crafts, whose makers relied on this beautifully figured material to bring understated elegance to simple forms.

Riftsawn white oak, on the other hand, has a quiet look, which allows the form and design of a piece to take center stage.

Weather resistance—Red oak's larger pores are wide open, letting water and air pass through easily (if you blow through a piece of red oak into a glass of soapy water, you'll get bubbles). White oak's pores are not only smaller overall, but also plugged with a shimmering, cottony-looking material called tyloses, which makes the wood more impervious to water and blocks fungal growth, making the wood rot-resistant and much more suitable for outdoor use.

White oak is also prized for barrels for aging wine and liquor, due to its strength and plugged pores, among other factors related to flavoring and filtering.

Telling white from red: The difference is in the pores



Red oak has big, empty pores. *The earlywood part of the growth ring has large, open pores, and the latewood pores are much more prominent in red oak than white.*

White oak has tyloses. *In white oak, the large, earlywood pores are filled with a shimmery material called tyloses, which makes the wood more waterproof and weather-resistant than red oak. And white oak's latewood pores, barely visible at 10x magnification, are much smaller than those in red oak.*

Red oak has its pluses—With its reddish cast and coarse grain, red oak is often associated with inexpensive hardwood flooring and stock cabinetry. But it has some advantages over white oak. For one, it offers similar strength with a much lower price tag. And clear, straight-grained, defect-free red oak is easy to find. Add the fact that it splits and steams as beautifully as white oak, and it's a wonderful material for greenwood furniture making.

Last, red oak's warm tones and prominent grain lines combine nicely with certain woods.

How to tell the two apart

Because their colors can overlap, it's easier than you might think to mistake red oak for white oak, or vice-versa. In the early years of my woodworking career, I accidentally mixed white and red oak in a tabletop. The mistake was obvious after I applied varnish,

A quiet look. *Riftsawn red oak has subtle grain when compared to the dark, exaggerated cathedrals common in flatsawn or rotary-cut red oak. This table by Mike Farrington is a great example. He recommends paying close attention to what the grain is doing when using red oak.*

Photo, bottom right: courtesy of Mike Farrington

White oak

While red and white oak are similarly strong and workable with all sorts of tools, white oak has a number of aesthetic advantages including its prominent ray fleck and ability to darken with ammonia.

QUARTERSAWN

Quartersawn white oak is prized for its tiger-striped ray patterns, called ray fleck. These are especially prominent when the growth rings are perpendicular to the surface, and the rays parallel.

RIFTSAWN

Riftsawn white oak has a relatively quiet look, with straight grain lines on all four faces of a board, making it perfect for the legs in the photo at lower right. It also pairs beautifully with quartersawn elements.

FLATSAWN

Because the pores in white oak are relatively smaller than they are in red, the grain lines in flatsawn white oak are much less prominent. White oak's cool, light-brown tone adds to its elegance.

generating some consternation and a few choice words.

Armed with a little knowledge of wood anatomy, however, you can easily tell white from red, every time. In many cases, you can do this with the naked eye. In others, you'll need a small magnifier called a loupe, or jeweler's loupe, which is cheap and widely available.

Start with color and rays—Start with color. If there is a hint or more of red, there is good chance you're looking at red oak. If the color is tan with no red, it's probably white oak.

Next, check the rays on a flatsawn, or "plainsawn," board. If the boards are weathered or roughsawn, clean up the face or edge with a hand plane, planer, or jointer. At the lumberyard, a block plane works well to clean up a small area for inspection.

The rays on a flatsawn oak board will show up as dashes that are parallel to the grain. If most of the dashes are shorter than ¾ in., the wood is very likely to be red oak. If most of the dashes are longer than ¾ in., the oak is very likely white. Another route to identification is the bubble test mentioned earlier.

Grab a loupe to be really sure—If an initial inspection leaves you confused, it's time to shave a small section of end grain with a sharp hand plane or razor and take a close look at the pores, using a 10x magnifying lens. Inspecting wood this way has helped me to better understand its structure and made me a better woodworker.

In the early part of the growing season, oak creates large pores, clustered three to five across in the outermost growth ring. These are seen as grain lines on the face and edges of a board. As spring turns to summer, however, rain diminishes, growth slows, and the tree produces smaller pores.

Start by looking at the latewood part of the growth rings. In both species, the earlywood pores are relatively large, clustered

The crown of Arts and Crafts furniture. *This bed by Kevin Rodel exemplifies the beauty of white oak. The tight straight grain of the quartersawn oak accentuates the structure of the piece while the prominent ray fleck decorates the wide, flat surfaces.*

three to five across. In the latewood part of the rings, however, the pores are much smaller in white than red, and more clustered together. This is easy to see with your loupe.

Next, look into the big earlywood pores. If they are open and empty, the wood you are scrutinizing is definitely red oak. If most of the pores have a shimmery substance in them (tyloses), the wood is white oak.

Red or white, oak is one of the strongest, most accessible hardwoods in the world. To be sure which type you are buying, take a handplane, razor, and loupe to the lumberyard. You'll learn more about the material you are working with, and appreciate wood even more deeply. □

Dan Bollock is a technician in the Wood Research Laboratory at Purdue University.

White oak fumes beautifully

Exposing white oak to ammonia fumes turns it a deep brown, seen often in Arts and Crafts furniture. The color change penetrates below the surface, so sanding won't affect it, and the darkness of the tone is easy to control. Red oak can be fumed also, but the difference is much more subtle.

WHITE OAK

RED OAK

A Riff on the Faceted Glass Door

Improv with some classic Krenovian techniques

BY DAVID WELTER

During my second year as a student in James Krenov's Fine Woodworking class, in 1984, my siblings asked me to create a gift for our parents' anniversary. Lacking time and confidence, I drew inspiration from Krenov's V-door display cabinet, featured in his book *The Impractical Cabinetmaker* (Van Nostrand Reinhold Co. 1979, Linden Publishing, 1999). That cabinet had a single door, but I saw that Krenov had adapted the method to double-doored cabinets. The formal bay-windowed appearance of a two-doored cabinet appealed to me, and I wondered if I could express the same feeling with a single door. My door owes its existence to the techniques Jim developed.

With a complex door like this one, I think it's easiest to make the door first and build the cabinet to match. Here I'll explain how to build the door. For a look at the cabinet construction, see my article "The Dowel Joint," in *FWW* #287.

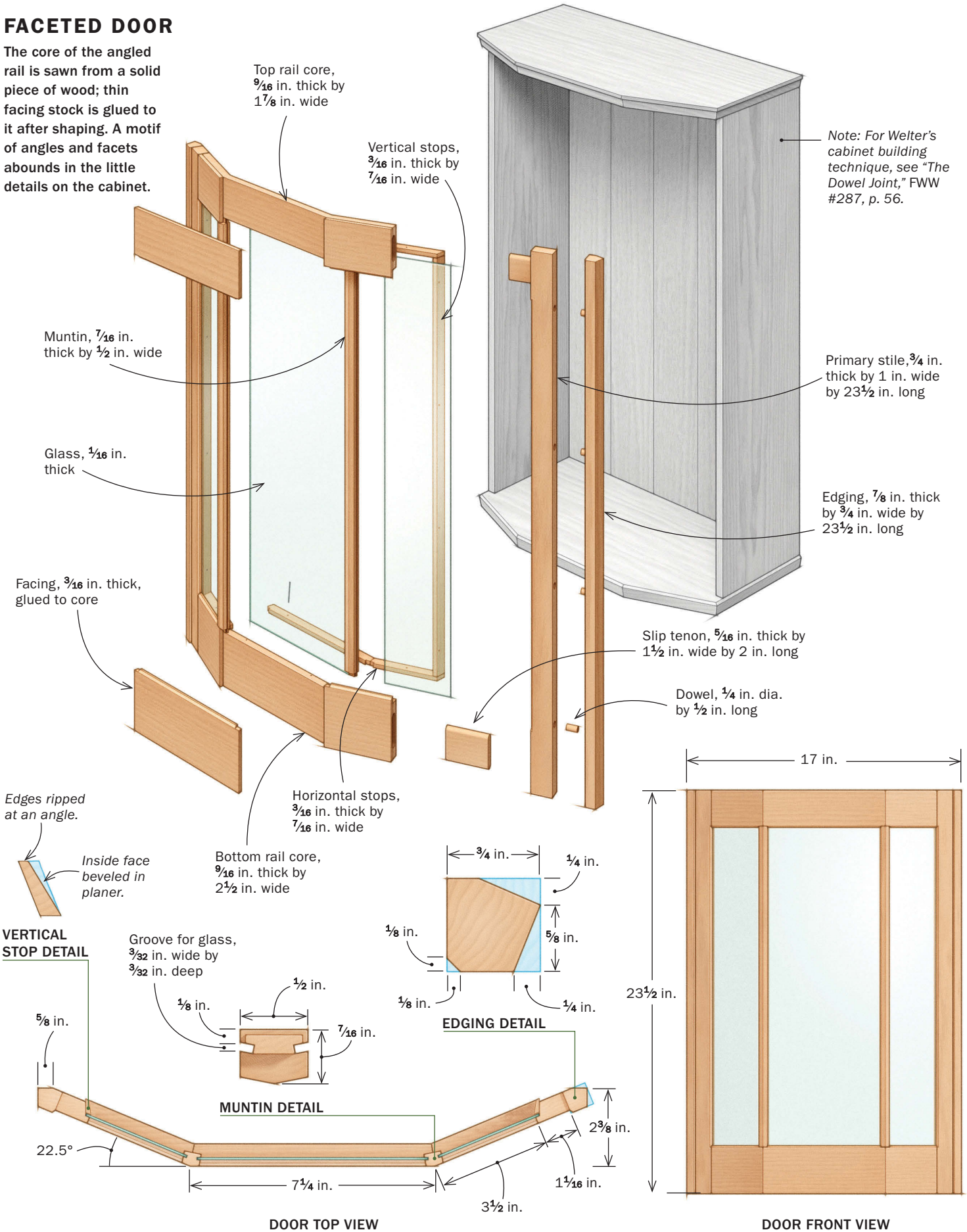
The rail core

Each of the door's angled rails is sawn from a single thick piece of solid wood. This avoids the short, weak tenons that would

Photo: David Welter; drawings: Christopher Mills

FACETED DOOR

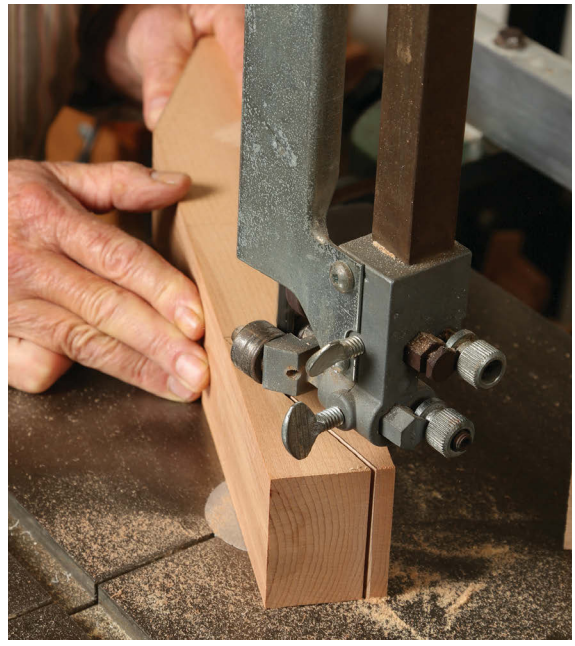
The core of the angled rail is sawn from a solid piece of wood; thin facing stock is glued to it after shaping. A motif of angles and facets abounds in the little details on the cabinet.



The core of the matter

The rails are made up of a solid-wood core with thin shopsawn facing. This clever workaround eliminates the need for short, weak tenons joining separate angled pieces.

Outside face first. *Lay out the double-V shape on the top edge of the rail blank, then carefully bandsaw the two angles off the outside face.*



Mirror the outside face. *Use a combination square registering off the outside face of the rail to lay out the inside face.*

result if the rail were made by joining three pieces end to end. However, unless you use quartersawn stock, the grain pattern revealed by the angled sawing isn't pleasing. Jim's solution was to laminate facings (thin stock) onto a solid core.

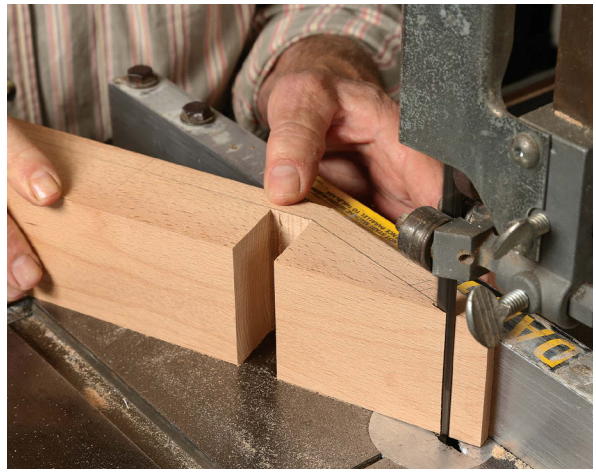
Begin with shaping the front of the double-V core stock. Lay out and bandsaw away the waste on both rails. Clamp the two pieces side by side and plane the bandsawn surfaces.

Using a marking gauge or combination square, lay out lines parallel to the front surfaces, then cut to the lines on the bandsaw to remove the interior waste.

Start the cleanup of the interior of the rails by running a rabbet plane crossgrain at the inside corners. Broaden the initial cleanup by cross-planing with a block plane. Finish the interior by planing toward the cross-planed surfaces. Use a hand scraper and sandpaper to refine the inside corners.

Facing out

The joints of the facings are butted miters. Find the miter angle by setting a bevel gauge to a line that connects the core's exterior and interior ver-

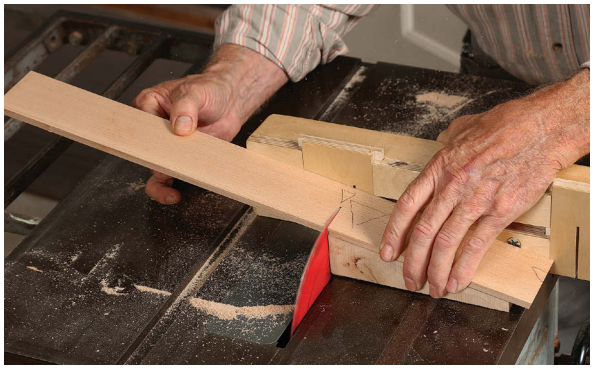


Inside faces are next. *Welter first makes incremental freehand cuts to create some blade clearance where the angled section meets the center section of the rail (far left), and then he rips the inside faces parallel to the outside faces by riding the stock against the fence. The more slowly you feed, the smoother the resulting surface.*

Photos, except where noted: Anissa Kapsales

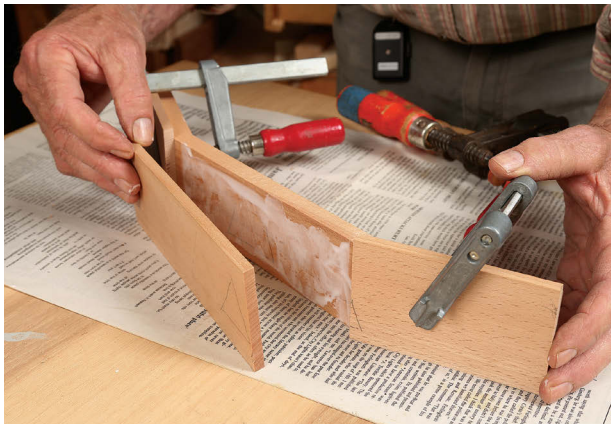
Show your facings

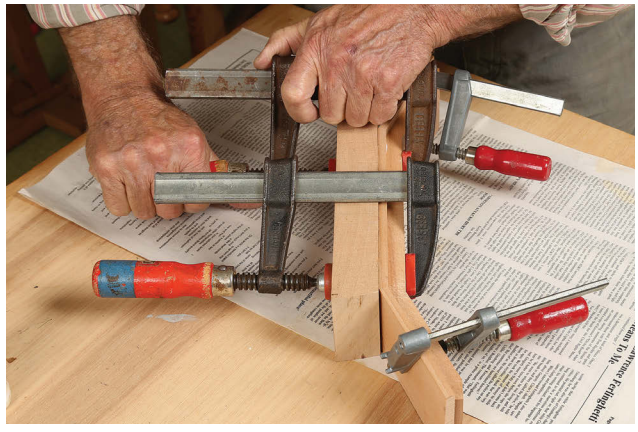
The three thin pieces of facing for each rail ideally come from a continuous length of stock. The facings are wider than the core, and Krenov would say that the extra width gives you a glass rabbet for free, no milling necessary.



Cutting the miters. *Welter rests the edging stock on a wedge at the table saw to cut the miters. To find the correct angle for the wedge, Welter draws a line between the vertices on the front and back of the core stock and sets a bevel gauge to that angle.*

Working between angles. *After cutting the first mating miters (left), clamp the end facing in place, butt the center piece up to it, and mark the second miter on the center piece. Cut conservatively even if that means you have to make a few trips to the table saw to line up the cut exactly to the angle on the core. You should now have a precisely cut center piece, and two overlength end pieces.*





Glue the center piece first. *Before applying glue to the center section of the core, clamp the two end pieces in place, and dry-fit the center piece. When the fit is right, glue and clamp the center piece in place. Once dry, glue and clamp the side pieces in place.*

tices. Cut the facings to that angle on a table saw. Refine one miter on the center facing with a plane and shooting board.

Clamp one of the end facings to the core, aligning the facing's mitered end with a vertex of the core. To determine the exact length of the center facing, butt its cleaned miter to the clamped end piece. Mark the other end of the center facing from the core's second vertex. Cut and shoot that miter.

Put the center facing in place and push the second end facing up to it. There should be no gap between the inside of the facing pieces and the outside of the core.

Clamp the center facing and the second end facing in place. Pinched between the two end facings, the center now has nowhere to go when being glued. Unclamp the center facing and spread glue on it, taking care to avoid the miters; then clamp.

When the glue cures, turn to the end facings. Shoot the miter of each facing again, shimming as necessary to match the mating miter of the center facing. Once you have satisfactory joints, you're ready to glue up the side facings. To see a

The final length. *When the glue is dry, trim the rails to length on the table saw.*

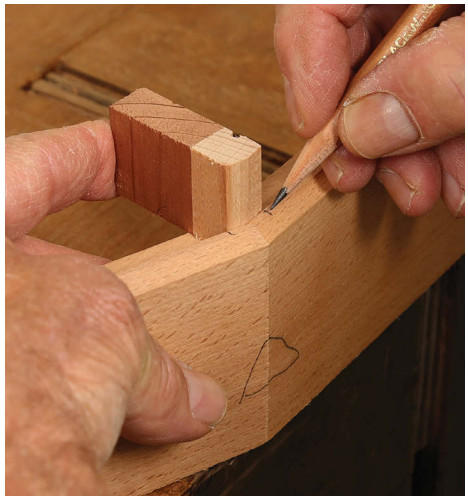
Odds and ends on the rails

Before you move on from the rails, you'll need to address the rail-to-stile joinery, bevel the front of the rail, and cut the muntin joinery.

Floating tenons. *Welter cuts the mortises for the floating tenons on the rails and stiles using his horizontal boring machine. Alternatively, you could use a Festool Domino or dowels.*

A beveled detail. *The bevel that runs around the inside perimeter of the frame is an aesthetic detail, not a structural one, and gets cut with a spokeshave and plane before the frame is glued together.*

Muntins hold the glass. *The muntins, which rest on the rabbet, are let into a socket cut into the facing. The socket is slightly narrower than the muntin and is the depth of the bevel on the rail. Mark the socket placement using a scrap of muntin stock (right). Cut the sides of the socket with a hand saw (far right), and then cut the rest with a chisel (below).*



Krenovian technique for gluing and clamping these joints super tight, go to FineWoodworking.com/306.

Stiles

Each stile is composed of two pieces. A thick piece of edging glued to the primary stile's outside edge stands proud toward the front and gives a pleasing definition to the door while hinting at the cabinet behind.

Rip a piece of edging stock from each of the stiles while they are still full thickness, and set the edgings aside where they won't be mistaken for scrap. Re-dimension the primary stile to match the thickness of the finished rails.

Frame joint

Because of the shape of the rails, cutting a shouldered tenon would be difficult to manage on a machine, so the frame will be joined with floating tenons. I use a horizontal boring machine with an end mill bit to make custom-size mortises. A Domino machine or dowels could be used instead.

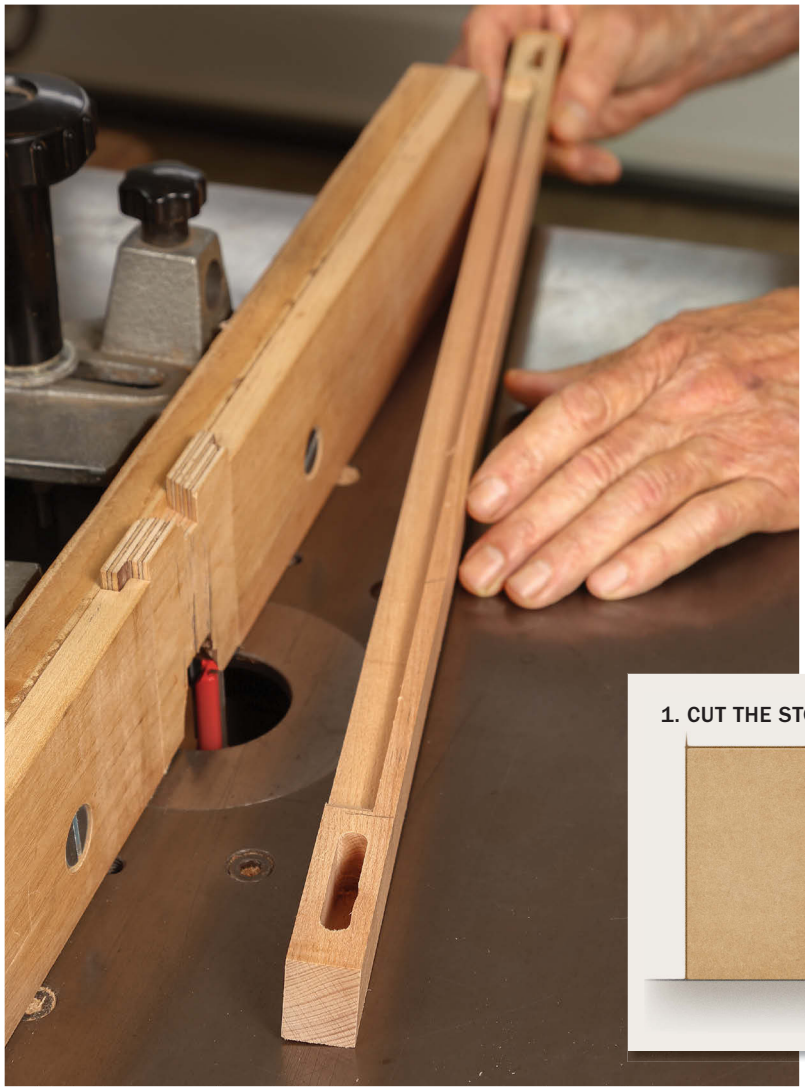
Angled rabbets let you install the glass

Rabbet and bevel the stiles

With the frame joinery cut, consider the stile rabbet that will receive the glass. It needs an angled cheek due to the way the glass is installed. The middle pane, fitted between the two muntins, will be placed first. Then come the outside panes: As one edge is fitted into the muntin groove, the pane is pivoted and the other edge swings into the rabbet in the stile. The rabbet must be angled to permit this action.

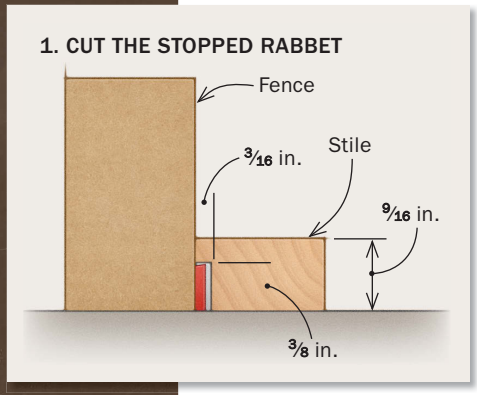
The stile rabbet is stopped, and its ends should coincide with the depth of the rabbets in the rails. I start by cutting an ordinary stopped rabbet. Then, to cut the angled cheek, I run the workpiece on an angled shim fastened to a shaper or router table. I make a succession of light cuts, moving the fence to broaden the rabbet. The bit leaves material to be removed after glue-up. Use a spokeshave and plane to create the bevel on the rabbet lip.

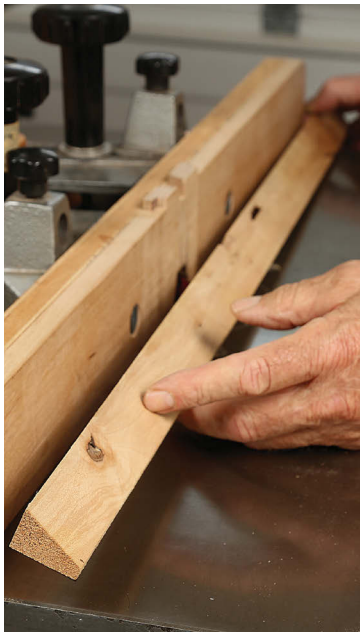
Before gluing the frame together, cut the dowel joints between the thick edging and the primary stiles. The dowels don't need to be long; they

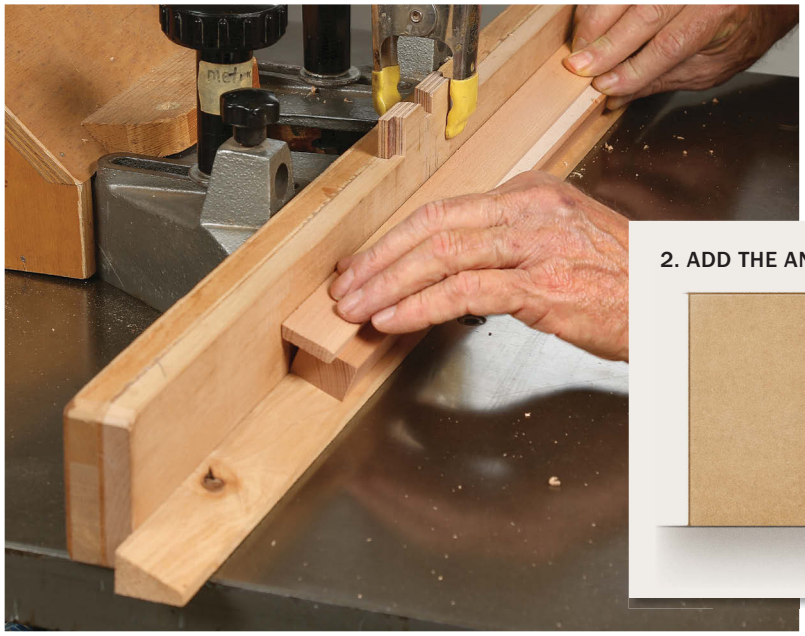


The side panes of glass will be inserted into the groove in the muntin and pivoted into place. To permit this, the stile rabbets for them must be angled.

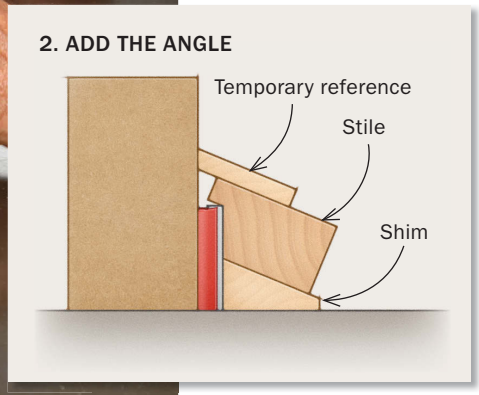
Cut the stile rabbet in two steps. *First cut a square rabbet on the stile, stopping the rabbet where the rabbets on the rails will meet the stile. Draw bit reference marks on the fence and end marks on the stile to guide you.*







Then cut the angle. *Use double-sided tape to secure a tapered shim to the router table. Run the stile on the shim to angle the rabbet. Tape a scrap to the stile to control the depth of cut.*



Frame assembly

This glue-up happens in stages. First glue one primary stile to the two rails, then the other primary stile to the other side of the rails, and finally add the edgings to the primary stiles.

Not your square glue-up. *The angles of the door present clamping challenges. But a few tricks will make gluing up a breeze. Work on one side at a time. Prop the assembly up on a block so that the short section of the rail is level. Angled clamping blocks provide a purchase point for pressure to be properly applied. Coarse sandpaper glued to the bottom of the clamping blocks helps resist slippage.*

are just for alignment. The long-grain-to-long-grain edge joint will provide more than adequate strength.

Assembly time

Glue the floating tenons into the rails as the first step of the frame assembly. When the glue has set, put the primary stiles on dry, checking alignment.

The primary stiles are glued to the rails one at a time with the aid of angled clamping blocks. Then, when the glue dries, glue the thick edging to the primary stiles.

With the door roughly completed, use its dimensions to build the cabinet, making allowance to finish-fit the door.

Muntins

To work safely while making the narrow muntins, glue a backer piece to the inside face of the muntin blank. Muntins ripped from solid stock may warp, wasting effort. Make sure the muntins are straight before gluing them to the backer. You'll rip the backer off later. Mill extra muntins and a setup piece.

Cut the muntins to a length that fits snugly into the frame

Add the doweled edging. *With the frame glued up, add the edging to the outside of the primary stile. Use the same clamping blocks as before along with a caul on the inside edge of the stile.*

Muntins for form and function

The muntins add to the aesthetics while providing support to the glass.

The slenderness of the muntins makes machining and fitting them difficult. You could leave the stock wide in one direction while milling the glass grooves, but in cutting to final dimension, tensions could be released causing warping. Krenov instead milled the muntin stock to a near-finished dimension, glued on a backer piece, and then finished the machining. Afterward, he ripped the backer off the muntin.

rabbets. Notch the ends of the muntin face to fit into the rail socket. Mark the socket's depth on the muntin. Lightly plane the sides of the muntins to fit into the rail socket. On the table saw, cut a notch at the top and bottom of the muntin to the depth that brings the face of the muntin flush to the vertex of the rail.

To shape the faceted front edge of the muntins, make two angled rips at the table saw, staying just shy of the final size of the facets. The sawn facets should nearly meet in the center of the muntin. Next, with the muntin fitted to the door frame, finish plane the facets flush to the rails.

Transfer the location of the rail rabbet to the muntin as a reference for cutting the grooves for the glass. To cut those grooves, use an angled auxiliary fence and a slotting cutter at the router table. Set the cutter height using the rabbet reference on the muntin

Mark directly from the rail. *With the muntin sockets already cut in the rails, place the muntins up to the frame and mark for the notches in the muntins.*

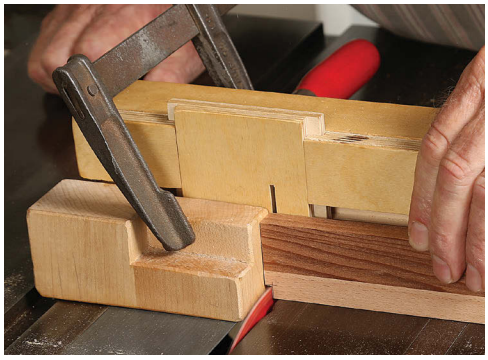
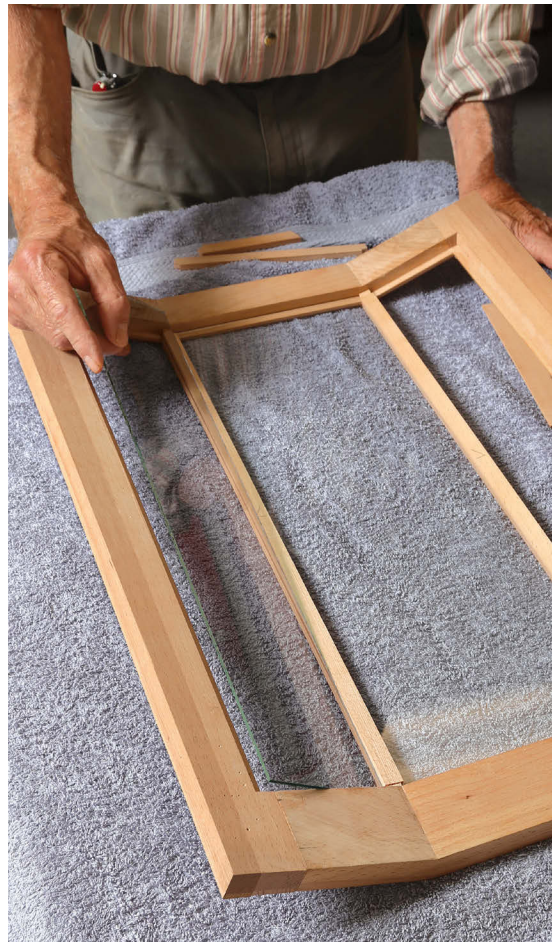


Table-saw tips. *With a stop on the crosscut fence, notch the muntin for the sockets. Then rip a slight facet on each side of the muntin (right). The facets will meet in the center of the muntin.*

Slots for glass panels. *You can use a slotting cutter to mill grooves for the glass. Make an angled auxiliary fence and attach it to the router table fence. The angled fence should place the muntin facets flat on the table.*

Stops secure the muntins and glass

Though stops are often mitered, Krenov avoided the technique whenever possible, reasoning that it was too difficult to get a good fit, and even with a good fit, gaps seem to grow. His method is to first place the horizontal stops, flat strips that protrude beyond the thickness of the door. The vertical stops slope toward the inside, giving a sense of openness to the view into the interior.



The middle pane of glass goes into place first. *Slide the muntins onto the glass and lay the unit into the door frame, fitting the muntins to their notches. The outside panes slide first into the muntin groove on one side, then pivot into the stile rabbet.*

Three horizontal stops per rail. *The horizontal stops are installed first; the vertical stops are fitted between them. When fitting the horizontal stops to the muntins, use short strips of thin wood as templates to find the right angles for the ends, then transfer those angles to the stop.*

setup stock. After cutting the grooves, saw off the backer.

This is a good time to order the glass for the door. With the muntins in place, find the distance between the rabbets and groove. Commercial glass cutting is not exact, so allow 1/16 in. of space in each direction.

Door edgings

At last, it's time to return to the stile edgings so carefully set aside early in this process. Put dowel pins in place, then attach the edgings to the stiles without glue. Mark the plane of the stile's face on the protruding part of the edging.

The edging is wider than it needs to be. Some of that width will be lost in trimming the outside edges of the stiles parallel to the cabinet. If you have a table saw that can accommodate the width of your door, that trimming can hap-

pen after gluing. If not, cut the trim angle before gluing the edging to the door.

Cutting the angle on the edge of the door will make the frame appear thicker than its actual dimension. Counteract this by making a flat on the inside edge of the door. I laid the door face up on a flat surface and drew a line parallel to the flat surface on the top and bottom of the door. Saw to an angle matching the drawn line. The result will be a flat about ½ in. wide that matches the carcase face.

Glass stops

Glass stops are the last element to be fabricated. The beveled vertical stops can be created with a simple custom planer sled. Make a carriage by beveling the top face of a long scrap. Tack a fence on the down side of the slope. Place the stop stock against the fence and send it through the planer.

The stops will hold the glass in place but they hold the muntins, too. Because the stop nestles under the shoulders of the muntin tenon, the sides of the notch need not be tight, but the depth of the notch should push the muntin snugly against the rabbet lip.

The horizontal stops are installed first; the vertical stops are fitted between them.

The middle pane of glass goes into place first. The outside panes slide into the muntins on one edge, then drop into the stile rabbet.

With all door parts made, the glass, muntins, and stops may be set aside until the door frame is hung on its cabinet. Make the width of the cabinet about ⅛ in. smaller than the door. The door can be trimmed to fit the finished cabinet. □

After a 30-year career at The Krenov School, David Welter is enjoying retirement in his home shop.

Glass and stops in place. *Use a manual drill to make holes for the pins. Protect the glass with thin cardboard. On the verticals, 6-in. pin spacing should be adequate. The horizontal stops are pressed in place by the vertical stops and muntins, so fewer pins are needed. Clamp the stops against the glass while the holes are drilled. Angle the holes slightly so when placing the pins the stop is tightened against the glass. Krenov used small finish nails, cut to length and recessed into small chamfered countersinks.*

Pulling out all the stops. *The possibility that glass may someday need to be replaced should be considered. It would be bad enough to have the accident; you don't want to do more damage in removing the stops. The fastening pins can be driven into pre-drilled holes. Size the holes so they will keep the pin in place but require little more than a very light tap or finger pressure to put them in place.*

gallery

Inspiration for our readers, from our readers

SEAN LAMBKIN
Staunton, Va.

Sean spent almost a year working with the client to come up with the final design of these pieces. "It was a challenging project that was, at times, a process of going backwards, but the result was well worth all the effort," he said. He used veneer, bent lamination, hand-cut and coped joinery, and relief carving. For the relief-carved tree branches, Sean created thin but stable floating panels. The bent laminated circles were keyed into the frame to ensure perfect alignment of the halves.

QUARTERSAWN ANIGRE, CURLY MAPLE, MAPLE
HUTCH: 16D X 52W X 84H,
SIDEBOARD: 20D X 48W X 30H

Photo: Dave Miller, Dementi Studio

JOHN BROGAN
Helena, Mont.

When building this piece inspired by Gary Rogowski's sushi box in *FWW* #139, John decided to experiment with some techniques he had never tried before. For the lid, he carved a mountain scene out of a block of white oak; and he ebonized the box sides with vinegar and steel wool and did not fill the pores, so you can still see some of the quartered white oak grain below. He was happy to have experimented with new techniques on a smaller project.

QUARTERSAWN WHITE OAK, 7D X 11W X 5H

NEIL PERLEBERG
Austin, Texas

Neil made this table as a student in the Austin School of Furniture's three-month Intensive Furniture Making Course. Aside from the general demilune form and certain elements of the joinery, students were free to design their piece as they saw fit. Philip Morley and Austin Waldo guided him in the construction, and guest instructors Mark Macek and Evan Court helped shape the design.

MAPLE AND CHERRY, 17D X 40W X 33H

Photo: Austin Waldo

23RD ANNUAL TEXAS FURNITURE MAKERS SHOW

The Texas Furniture Makers Show, an annual statewide competition, is held at the Kerr Arts and Cultural Center in downtown Kerrville, Texas. The show features handmade furniture from makers across Texas. The purpose is to focus on and improve the art and craft of furniture makers in the state. Here are just a few of the pieces from the 2022 show.

WAYNE DELYEA

Granbury, Texas
Art Style and People's Choice awards

Throughout a statewide Texas power outage, a bluebird tapped daily on Wayne's shop windows. The bird came back to the shop multiple times per day for three months, inspiring this door marquetry of a bluebird perched on a dogwood branch with flowers of holly and leaves of dyed koto. The branch goes 360° around the cabinet, ending on the left side panel.

SOLID BEECH AND VARIOUS VENEERS, 24D X 24W X 61H

Photo: Wayne Delyea

PAUL SAUDER

Fair Oaks Ranch, Texas

This media console blends minimalist design with kumiko latticework. The lower section was designed to keep digital equipment out of sight while still allowing airflow. The playful drawers help break up the symmetry of the design, while adding functional storage. Paul said he was inspired by a kumiko dresser (by user name "hzenno") that he saw in the gallery on FineWoodworking.com.

CHERRY, WALNUT, BASSWOOD, AND HONEY LOCUST
23D X 60W X 30H

Photo: Mike Roberts

DIEGO ZUBIZARRETA OTERO

Austin, Texas
Judge's Special Award

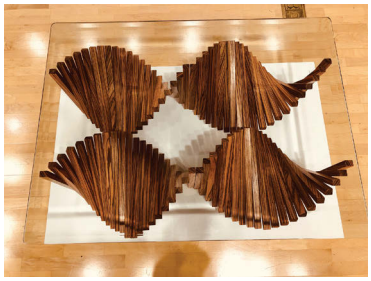
This lounge chair was Diego's first major woodworking project. Its structural members, which taper to surprisingly thin cross sections, remain sound thanks to bent lamination. Diego did extensive sculpting on the armrests, legs, back, and seat profiles to create ergonomic forms and a sleek figure. Utilizing six different types of connections, the chair celebrates its craft with half-lap joints, exposed walnut dowels, and accents in white oak veneer and cowhide upholstery.

WHITE ASH, WALNUT, WHITE OAK, 22D X 22W X 59H

Photo: Mike Roberts

ABRAHAM TESSER
Athens, Ga.

The helix or spiral is abundant in nature but certainly less so in furniture design. Abraham was seduced by the idea of using straight sticks to produce spirals; or, rather the perception of spirals. Perhaps the biggest surprise and the greatest source of joy for Abraham was the discovery of the multiple personalities the table would take on as he simply repositioned the base units: turning them, upending them, stacking or separating them.



AFRICAN ZEBRAWOOD, 36D X 48W X 18H

Photos: Shannon Williams

Online Extra

To read the complete story of Abraham's spiral table, go to **FineWoodworking.com/306.**

JAMES SEMLER
Randolph, N.J.

James made this chair for his daughters to practice cello. The details derive from the cello itself and from musical notation. The legs and side stretchers mimic a 16th rest symbol; the thin alternating walnut and maple laminates comprising the back represents the five-line musical staff; and the seat and back echo the shape of the cello body and the conductor's tuxedo, respectively.

WALNUT, QUILTED MAPLE, 16D X 16W X 28H

COLLIN HENRIE
Lititz, Pa.

Collin studied cabinetmaking and furniture making under Steve Latta and Rob Tobias at Thaddeus Stevens College in Lancaster, Pa. This project was inspired by Phil Lowe's bookcase design and Steve Latta's article on glass doors (*FWW* #171). Collin was drawn to the beauty and challenge of both the ogee bracket feet and the inset, true-divided-light glass doors. He sourced antique glass from old windows to give an authentic vintage look with bubbles and wavy distortions.

CHERRY AND ASH, 12¼D X 32½W X 50H

Photo: Light Studio

Customize your hardware

ELEVATE HINGES AND PULLS THROUGH AGING AND PATINATING

BY CHRISTIAN BECKSVOORT

Metal hardware will age and develop a patina over time. This can be both good and bad, depending on your desired results. As with wood, you have the choice of hurrying or almost stopping the aging process of metal hardware. Additionally, beyond aging, you can create some unique finishes on hardware that will make your custom furniture even more distinctive. Whether you just want to age hardware or to create a custom finish on it, there are simple ways to do both with commercially available products or ingredients you can find in your kitchen pantry.

If you are using hardware with screws, remember you must treat the screws the same way and at the same time as the rest of the hardware. Nothing looks more obvious than bright brass screws on aged or patinated hinges. It's also worth mentioning that I start with solid metal hardware without any factory

Photos: Anissa Kapsales

finish whatsoever. So with all these techniques, I'm starting with bare brass, zinc, or steel.

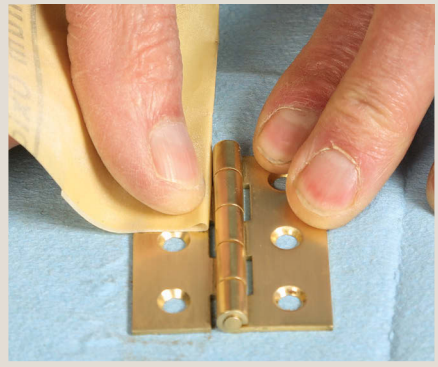
I begin all these treatments by prepping the hardware. I sand it with 220-grit sandpaper to get rid of mill marks, and then I rub it with 0000 steel wool.

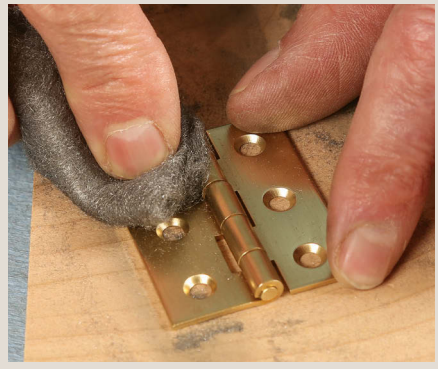
Stop aging in its tracks

Before we talk about aging or patinating your hardware, it's important to mention that sometimes you'll want to do the opposite and

Bright and fresh

If your work calls for light, shiny brass you can polish it up and add a clear coat on top. This will arrest the natural aging process.





Sandpaper and steel wool. *Sand the hardware with 220-grit sandpaper to remove any mill marks that may be left on the metal. Then rub with steel wool.*

Spray on a finish. *Apply a clear coat for UV protection. Becksvoort sprays a light coat, waits until the finish is fully dry, lightly buffs with steel wool, and then applies a second light coat.*

Kitchen pantry treatments

You can get remarkable results using common household items such as coffee grounds, ammonia, salt, and apple cider vinegar. The results are somewhat unpredictable but as beautiful as they are unique.

COFFEE GROUNDS

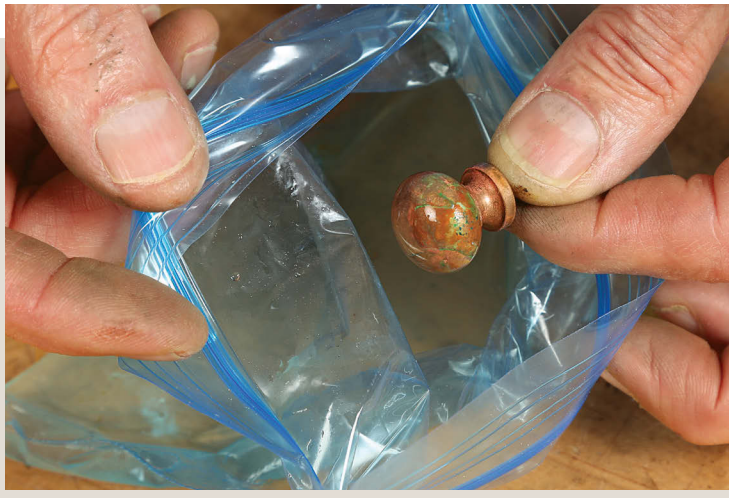
The daily grind. *Nestle your hardware in wet coffee grounds to create a dark, slightly mottled effect on hardware. Becksvoort wraps them right in the coffee filter, and then inserts the filter into a resealable plastic bag and waits.*

AMMONIA AND SALT

Ammonia, salt, and paper towels. *Place a folded paper towel in the bottom of an airtight plastic or glass container. Pour in enough ammonia to saturate the paper towel. Place the hardware on top and coat it with more ammonia. Generously shake salt onto the hardware and cover it with another paper towel and some more ammonia on top of that. Seal the container and let the concoction sit for 24 to 48 hours.*

APPLE CIDER VINEGAR AND SALT

Apple cider vinegar and salt. *Before treating the hardware, clean it with denatured alcohol. Mix apple cider vinegar and salt, at a 3:1 ratio in a plastic bag. Don't make too much solution; you don't want the hardware to be submerged in it. Places where the bag sticks to the hardware and restricts the solution produce nice variations in the finish. Leave the hardware in the mixture overnight. Remove it and gently brush off any salt without brushing the finish away. When it's dry, spray on a clear coat.*



Unearth the treasure. *After two to four days, unwrap the filter and pull out the hardware. Wipe off the grounds, let the metal dry completely, and then add a clear coat.*

Uncover the goods. *After 48 hours, remove the hardware from the ammonia and salt solution and wipe off the excess salt. When the metal is completely dry, clear-coat it.*

keep that shiny new metal looking youthful. To prevent oxidation, the usual method is to add a layer of protection on top. Paint or spray the metal with a sealer such as lacquer, or even polyurethane, something with a UV blocker. For outdoor exposure, the sealer will need to be renewed every few years.

Aging naturally

Brass, the most common hardware material, darkens naturally through use and oxidation. If you want your brass to age naturally, you don't have to do much. Simply sand and clean the hardware, and then install it. From there let nature take its course. The brass will darken over time.

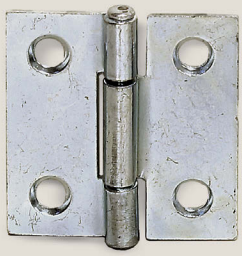
Unique, household-recipe finishes

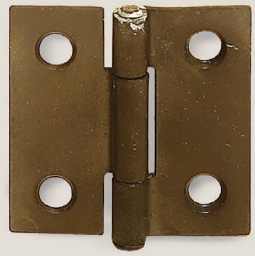
I've used a few recipes to get some interesting finishes on my brass hardware. If you have ammonia, salt, apple cider vinegar, or coffee grounds, you can do the same.

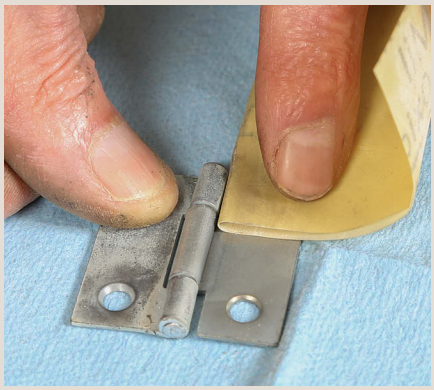
Brass can be patinated with a solution of salt and apple cider vinegar. Mix about one part salt to three parts vinegar, add the hardware, and place it in a sealed glass or plastic container. Leave the hardware in the solution overnight. When you remove the metal it will be

Heat and linseed oil

Heat can darken steel hardware, and linseed oil can add richness to the darkened metal. From left to right, these zinc hinges are: clear-coated, torched with a clear coat, torched with linseed oil. When heating zinc, always work in a well-ventilated area and wear a mask or respirator.







Zinc prep. *Use sandpaper and steel wool on zinc hardware just as you would brass.*

Add heat and quench. *Using a blowtorch on a fireproof surface like this piece of granite, heat the hardware until you get a color you like. Use pliers to pick up the hot metal and dip it in linseed oil. Set it aside to dry.*

Just linseed oil. *The bluish cast of wrought iron gets even more depth when you wipe on a coat of linseed oil.*

a swirl of green and copper. Brass is a combination of copper and zinc, and the apple cider vinegar really brings out the copper.

A treatment of ammonia and salt produces a textured, rich, colorful pattern on brass. Make sure to use a container that seals well. Leave the hardware in the container for 24 to 48 hours. Once you extract it and it dries, add a clear coat to it.

Reuse your morning coffee grounds to create a mottled, darkened brass finish.

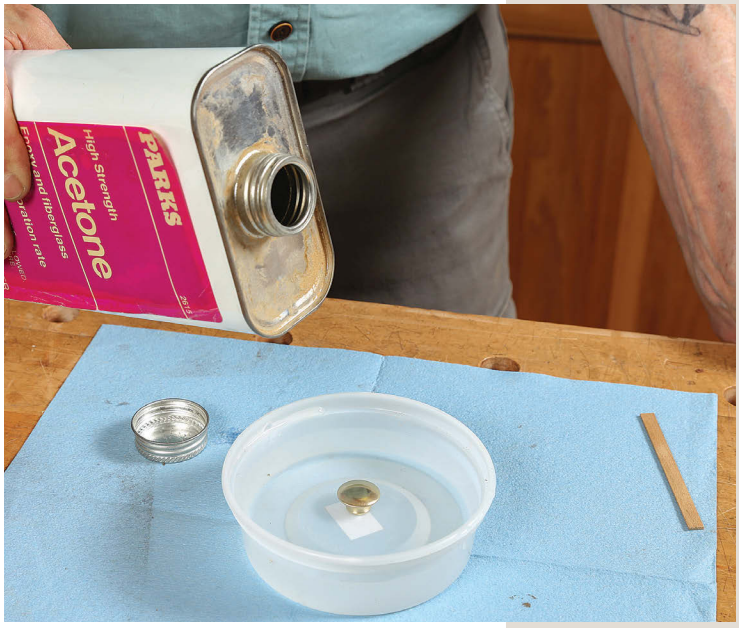
Simply bury the hardware in the grounds and seal it in a plastic bag for three to four days. Take the hardware out, let it dry, and then add a clear coat.

Things are heating up

Steel hardware is a different animal. If you are using hand-wrought steel, with that nice bluish patina, you can preserve that look with a few coats of linseed oil. Most "steel" hardware sold today is either zinc plated or stainless. Zinc can be burned off using a propane torch; use pliers to hold the hardware. Let the metal cool and if you like the color you can clear-coat it. But for a darker, richer look, the hot metal can be quenched in linseed oil.

Paint it black, or any other color

Of course, there is always the option of painting your hardware. The key is prepping and a light touch.



Clean and polish. *Before painting, it's important to remove any oils from the metal. Soak the hardware in acetone for a few minutes. Remove the hardware and polish it with oil-free steel wool.*

Mini spray area. *Use paper or plastic to protect the work surface, and elevate the hardware on blocks or dowels while spraying so the paint has a place to drip off without pooling. Becksvoort opts for a couple of light coats rather than one heavy one.*

Patinating chemicals speed things along

Commercially available chemicals can give you more control and consistency when antiquing your hardware. Two different types are available, a dipping solution and a paint-on solution. The results can range from light to dark, and you can monitor progress by eye.

DIPPING SOLUTION

Dipping method. *There are a number of brass agers on the market that contain selenious acid. Some must be diluted and others can be used straight out of the bottle. Follow the manufacturer's directions. Becksvoort dilutes the aging solution, pouring it into water.*

Remove the hardware. *When you see the color you want, pull the hardware out of the solution, and then rinse it with water. Once it's dry, you can spray a clear coat on it.*

There's always paint

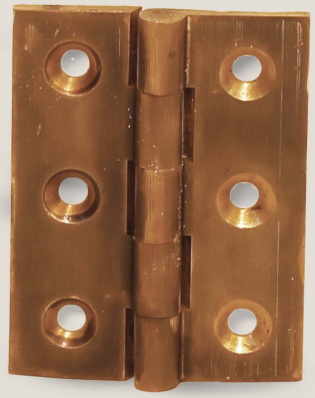
As a last resort, you can paint metal hardware. Oil-based enamel sprays are best. A medium, dark, or charcoal gray or even flat black will look good. But you can choose any color you desire. On the rare occasions that I've painted hardware, I've added a clear finish poly or lacquer over the paint for protection.

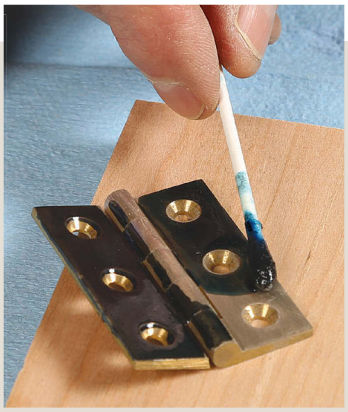
Chemical intervention

There are a lot of aging solutions on the market that will speed up the antiquing. These, usually containing selenious

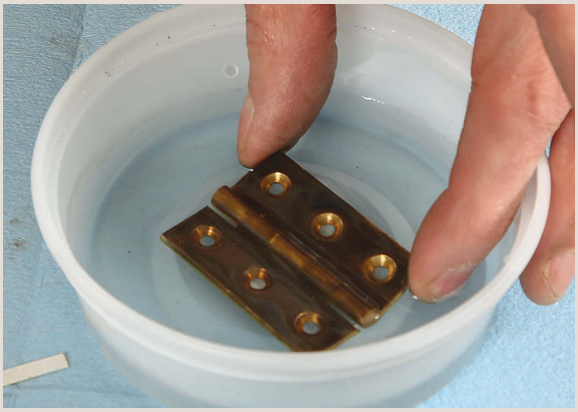
Patinating chemicals continued

PAINT-ON SOLUTION





Paint it on. *With Brass Black, you can use a cotton swab to apply the solution to the hardware and leave it on for a minute.*



Rinse it off. *Wash off the hardware with cold water, and then wipe it dry. Repeat this process until you achieve as dark a color as you'd like. After the metal is dry, spray on a clear coat.*

acid, do a nice job, but require care and gloves. They allow you to get a more traditional aged look than the household recipes. And it's easier to get consistent, exactly repeatable results with these types of products.

The solution is mixed with water (often 1:5 or 1:10), and the clean brass is submerged in the mixture in a container until the desired color is reached, then dried. Two or three dips in a stronger solution will turn the brass black. There is also a paint-on product I've used called Brass Black (selenious acid and phosphoric acid) that works in the same way as the dipping solution, but you paint it on, rinse it off, and then repeat if you want a darker color.

Final finishing

With all the hardware I age or patinate, I always top off the finish with a clear coat for added protection from scratches that could show the difference between the raw brass and the altered finish. □

Contributing editor Christian Becksvoort makes furniture in New Gloucester, Maine.

WOODWORKERS MART

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Handwork is strong medicine

BY GIUSEPPE DEEPAK BENTI

Hand-tool woodworking is my medicine against anginophobia.

This unusual course of medication started a few years ago, during Covid-19, here in Bergamo Province, Italy, which was the European center of the pandemic … tough times for anyone.

I had a job in sales then for a U.S. multinational company, and during the pandemic, when I had to stay home from work for months, anxiety arrived. And then my anxiety turned into a deep anginophobia, something I had never heard of: It is the fear of choking while eating. I lost around 20 kilos in a few months.

Then, by chance, I discovered hand-tool woodworking. I knew nothing about working with my hands, but reading books by Paul Sellers and Tom Fidgen completely changed my life. I started with a few basic projects made with softwood, like the workbench I am using now.

By the end of 2021 I decided to leave my job to try becoming a full-time hand-tool woodworker. It's pretty crazy, leaving something certain for uncertainty. But I realized during Covid that I needed to do what makes me happy. So, I am trying my best to learn the craft and to make woodworking with hand tools a full-time job. If it doesn't work out, I'll search again for a 9-to-5 job; but I want to have no regrets.

My approach to learning? I read lots of books and then practice, make mistakes, and learn from them. I am still definitely a newbie, but I am trying to build more complex furniture now, like an inlaid end table made with mahogany, cherry and maple, and a walnut workbench for a friend of mine.

I don't have a shop yet. I work in a small corridor at home that is a little less than 10 ft by 4 ft. Not much, but it's better than having no space. When the weather is good, I work on the patio behind the house. My own current bench shouldn't really be called a workbench. The first project I made, it's more of a worktable with drawers. But it does the job, though with lots of limitations. I recently bought some planks of beech so I can build a proper bench when I have a proper workspace.

I work mostly with hardwoods now, and every project gets started with rough boards, so I prepare the stock entirely with hand planes. I don't use a single power tool. I don't think woodworking should involve just pushing a board into a thickness planer. I am afraid that by 2050 woodworkers will not even touch the wood—machines and AI will do the job for them, and woodworkers will just be pressing buttons, like we do today with smartphones. The skills of an artisan aren't required for that.

I want to contribute to the craft by learning the hand skills that the best artisans master, and by passing on the knowledge to others in decades to come.

As I say, hand-tool woodworking is my medicine against extreme anxiety, which I am still fighting. Luckily for me, my medicine is a lifelong learning process. I'm hoping its effectiveness will never fade.

Giuseppe Deepak Benti lives and works in Bergamo, Italy.

Photo: Giuseppe Deepak Benti

Mesmerizing Tiles

In 2021, when he made this white oak and white lacquer standing screen in his Ottawa workshop, Christopher Solar was calling the spirit of Sébastien Truchet across three centuries. Truchet was a Dominican priest with an interest in mathematics and art. And in 1704, after seeing a batch of decorative ceramic tiles intended for the floor of a chapel, he wrote a paper about the patterns and permutations possible when ranks of identical tiles are rotated and rearranged. Solar, too, is fascinated with the intersection of math and visual art; after finding a swirling Truchet pattern on a website where you could rotate the tiles with a click of your mouse, he adapted the design to this screen. Creating 48 identical MDF tiles, each 8½ in. square, he veneered them, routed concentric fluted arcs into them using templates he'd made, then sprayed the tiles with white lacquer. After passing them through his abrasive planer to reveal the veneer on the flat surfaces, he splined and glued up the tiles and assembled them in their frames. It was a very demanding piece to make, Solar said. "I think if I were shrewder, I would not have embarked on it. But I guess I convinced myself that the headaches involved were worthwhile, because I wanted to see the thing happen."

—Jonathan Binzen

Photos: Christopher Solar