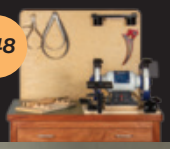
p.48



TURNING ACCESSORY CART

WOODCRAFT® magazine

Projects, Techniques, and Products

p.31

Make a classic
STICKLEY MUSIC CABINET

Custom traditional
INTERIOR SHUTTERS

Shop-made
PORE FILLER

CNC project:
DOG FEEDER

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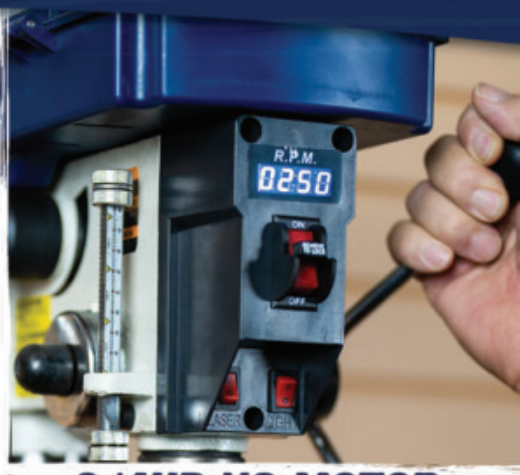

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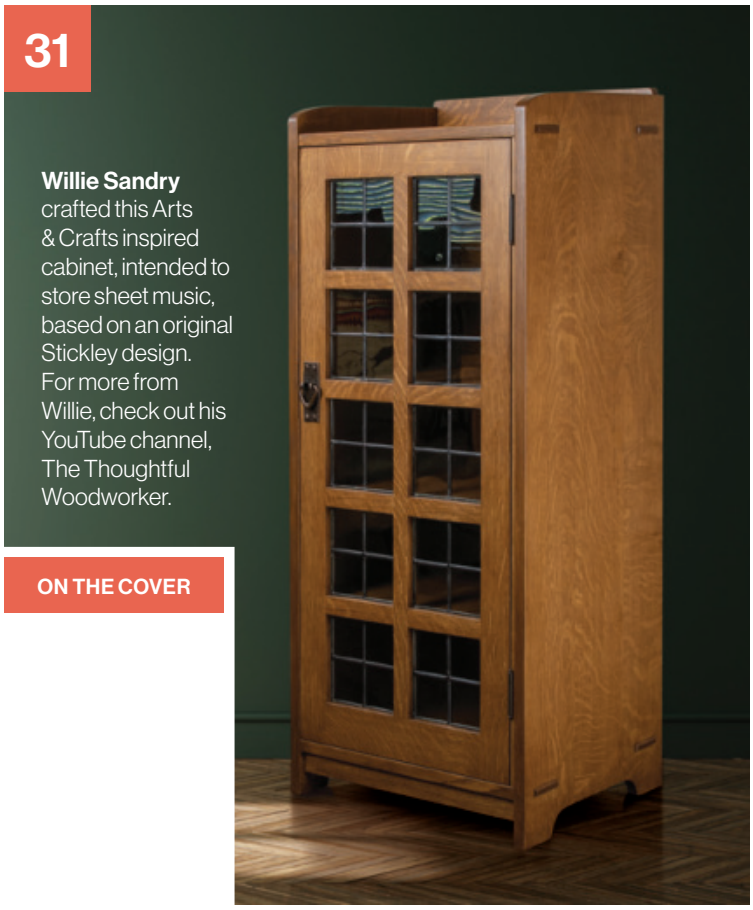
WOODCRAFT® magazine

Feb/Mar 2023 | Issue 111



Willie Sandry crafted this Arts & Crafts inspired cabinet, intended to store sheet music, based on an original Stickley design. For more from Willie, check out his YouTube channel, The Thoughtful Woodworker.

ON THE COVER

Features

Cover photo: Willie Sandry

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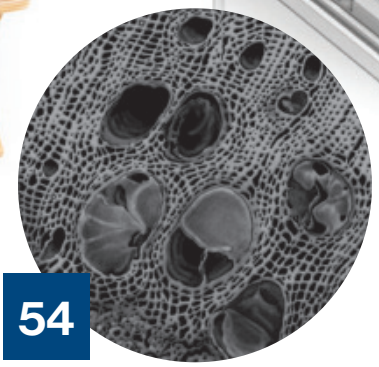

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10

Departments

This issue's Contributors

BOB BERNER, an Allentown, PA-based woodworker, is a lifelong tinkerer, and has loved to take things apart, modify, and improve them—even if they didn't need fixing. He recently added a CNC router to his garage shop and has been making high-end speaker kits for the audiophile community.
Read Bob's article on page 28.

SOPHIE GLENN is a metal worker, woodworker, furniture designer, and sculptor based in Reading, PA. Her work has exhibited nationally in museums and galleries including the Metal Museum in Memphis, TN, The Fuller Craft Museum in Brockton, MA, and the Mint Museum in Charlotte, NC.
Read Sophie's article on page 62.

DAVID SLOAN has been making stuff out of wood since he was a kid. He has been Editor of *This Old House* magazine, Editor and Publisher of *American Woodworker* magazine and co-author of three *New Yankee Workshop* books with Norm Abram.
David was a contributing editor in this issue.

DAN THORNTON has been creating how-to illustrations for over 35 years. He is a former art director at *Fine Homebuilding* and *Woodworker's Journal* magazines. He is now a full-time freelance illustrator. His spare time is spent woodworking or fly fishing the rivers of western Connecticut.
See Dan's illustrations on page 28 and 48.

In defense of abandoned projects

If you're anything like me and most of the woodworkers I know, you can glance around your shop and find more than a few abandoned projects. In one form or another, you have probably paused your progress on a project, small or large, and started something else. You may have had to set aside a personal project to make room for a job, a gift, or some other burst of creativity. Perhaps you needed a particular bit or a piece of hardware, and you just haven't made it to your local Woodcraft. Or maybe you simply got tired of working on your current project. Sometimes the well runs dry.

Whatever the reason, this phenomenon doesn't mean that we woodworkers enjoy shuffling parts from one corner of the shop to another or that we're quitters. You're not quitting your commitment to the craft. Don't let the cobweb-covered leg assemblies and empty carcasses bring you down. It's not inspiring to have guilt over ditched projects. I think these half-finished undertakings should be viewed as encouraging. Consider those dovetailed drawers in need of fronts as a testament to your quality work, lessons learned, or even future inspiration that keeps you creating. Whether it's finally making a panel for that empty frame or starting something new, it's about the journey.

I love having a variety of creative projects to work on. It's luxurious. Depending on my interest level or frame of mind, I might want to be working on something different. A project for every mood. In this issue, we offer an assortment of projects for folks of all sorts. CNC enthusiasts and pet lovers alike can find a fun feeder for your dog on page 28. Turners will enjoy the cart on page 48, designed to hold all your turning accessories and roll out of the way when not in use. The traditional louvered shutters (p. 22) will appeal to the home improvement crowd. Fans of Stickley furniture will find a classic music cabinet (p. 31) to construct. And for when you're in between near-finished projects, flip to page 43 to build your pore-filling skills.

We hope you finish one or more of these projects, but if not, we understand. Besides, abanded projects are good for our creativity. We have to keep fabricating believable excuses as to why the project isn't done. ■

Chad McClung, Chief Editor
Chad_McClung@woodcraftmagazine.com

Share your ideas.
We love hearing from readers! And there are all kinds of reasons to get in touch with the crew at *Woodcraft Magazine*. Check out the details below.

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Share a slick tip to win cash or a prize.
Here's your chance to help someone become a better woodworker and get rewarded for the effort. Published submissions become the property of *Woodcraft Magazine*.

Email us at *tips@woodcraftmagazine.com* and put "Tips & Tricks" in the subject line or visit *woodcraftmagazine.com*, and click on Contact.

Important: Please include your phone number, as an editor may need to call you if your trick is considered for publication.

Have a tough woodworking question?
We'll do our best to find the expert and provide the answer. Email us at *editor@woodcraftmagazine.com* and put "Expert Answers" in the subject line.

News & Views:
This catch-all column is where we do our best to correct mistakes, publish feedback from readers, and share other noteworthy news items. It's easy to participate in this discussion. Just email us at *editor@woodcraftmagazine.com* and put "N&V" in the subject line.

Share photos of your projects:
We'd like to see what you're building. To show off your work send your photos to *editor@woodcraftmagazine.com*, or find us on social media.

WOODCRAFT magazine

Feb/Mar 2023 Vol. 19, Issue 111

Chief Editor: Chad McClung
Senior Editor: Ken Burton
Associate Editors: Sarah Marriage, Derek Richmond
Art Director: Michael Church
Graphic Design Intern: Kelley Powell
Publisher: Beth Coffey
Advertising Sales Manager: Vic Lombard
Circulation Support: Christie Wagner, Rachel Herrod
Circulation: NPS Media Group
Video Producer: Kevin Reed

Subscriptions: (U.S. and Canada)
One year: $19.99
Single copy: $8.99
customer_service@woodcraftmagazine.com
(800) 542-9125

Woodcraft Magazine
(ISSN: 1553.2461, USPS 024-953) is published bimonthly (Dec/Jan, Feb/Mar, April/May, June/July, Aug/Sept, Oct/Nov) by Woodcraft Supply, LLC, 4420 Emerson Ave., Suite A, Parkersburg, WV 26104. Tel: (304) 485-2647. Printed in the United States. Periodicals postage paid at Parkersburg, WV, and at additional mailing offices.

POSTMASTER: Send address changes to *Woodcraft Magazine*, P.O. Box 7020, Parkersburg, WV 26102-7020.

Canada Post:
Publications Mail Agreement #40612608
Canada Returns to be sent to Pitney Bowes, P.O. Box 25542, London, ON N6C 6B2

Safety First! Working wood can be dangerous. Always make shop safety your first priority by reading and following the recommendations of your machine owner's manuals, using appropriate guards and safety devices, and maintaining all your tools properly. Use adequate sight and hearing protection. Please note that for purposes of illustrative clarity, guards and other safety devices may be removed from tools shown in photographs and illustrations in this publication.

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Way off base

The dimensions for the base of the Chimney Advent Calendar (Dec/Jan 2023) were incorrectly duplicated from the mantel dimensions. The correct dimensions for its base should be ¾ × 6 × 14". The base dimensions can also be customized to fit your own mantel or display space, as long as the tree and chimney are spaced and oriented so the tree doesn't interfere with pulling the dowel pins out of the chimney side.

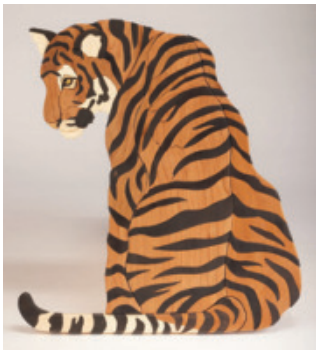
Correct dimensions

Reader-friendly

This torture device you have produced is not designed to be read by anyone over 20 years old. The infinitesimally small type and horrid contrast make it a painful process to attempt to read. The ads, of course, are clearly printed.
—Peter Chast, via email

Fine and fair

The San Diego Fine Woodworkers Association is accepting national and international entries for the 40th Annual Design in Wood Competition at the San Diego County Fair. The event will run from June 7 to July 4, 2023, with 23 categories including contemporary furniture, clocks, scrollsaw fretwork, veneering, and several carving and turning categories. More than $20,000 in prizes will be awarded, including a $1,000 best in show prize. Entries will be accepted through April 29, and more information can be found at sdfwa.org.



2022 Best New Entrant, Allan Price. *Gazing Tiger*

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Monkeying around

I enjoyed WoodSense (Oct/Nov 2022) on monkeypod. It brought back memories of my time in the Navy in 1970 at Pearl Harbor, Hawaii. As a newly married couple, my wife and I, living on base, needed furniture, and the hobby shop on base sold monkeypod. We made a coffee table, a 3-legged end table, and a small cribbage board. We used these tables for many years and then gave them to my in-laws. They used them at a vacation home for many more years. We still have the cribbage board.
—Ken Erickson, West Richland, WA

Refreshing tip

When I try to read an article online, I'm prompted to sign in. I click on the login page, sign in with my subscriber credentials, then go back to the article, only to see the same request to sign in. What gives?
—Jolene MacDougal, via emai

***Woodcraft Magazine* staff replies:**
After signing in and clicking back to the article, refresh your browser to complete the login. Usually, that's done by clicking a circular arrow near the navigation bar. Happy reading!

Stoolcraft Magazine?

What's with all the stools lately? You've had articles on a camp stool (June/July 2022) and a four-legged stool (Aug/Sep 2022). The most recent issue had another stool, and a tip about leveling stools! ■
—Theodore Laurence, Erin, TX

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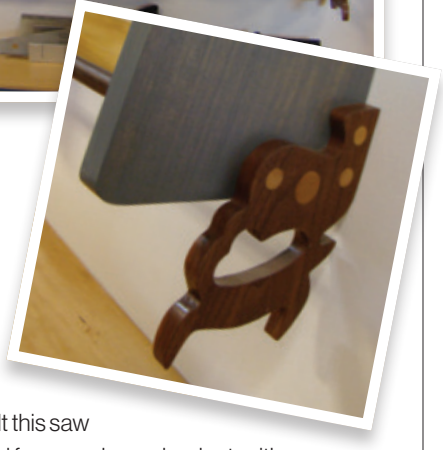
Reader Showcase

FRED WILLIAMS
PARKERSBURG, WV

Not built in a day. Retired schoolteacher and avid carver Williams gave the classic game of dominoes a twist. After cutting the tiles from basswood, he carved Roman numerals into each gamepiece, instead of traditional dots. Then he colored the carvings with artists paint. After making three double-twelve sets, each comprising 91 dominoes, he crafted and carved a trio of basswood boxes featuring simple miters, hinged lids, and brass clasps. The cases each measure 3 × 5 × 9". After months of carving, Williams dreamed up the unique name for his invention: "Roman Ominoes."



DOUGLAS HEAD
THAYNE, WY

See saws. Wanting to organize and display his restored antique handsaw collection, Head designed and built this saw rack. The body is crafted from poplar and walnut, with saw-shaped endcaps stained gray. Slots hold the Western saws, while magnets aid in hanging the Japanese saws. The rack measures 37¼ × 50 ⅞ × 8⅞". The grain-matched drawers feature brass Disston saw medallions as pulls. It looks saw-some!

EDWARD D'ANTONIO
BLUFFTON, SC

Cool beans. Novice woodworker D'Antonio picked up a cast-iron coffee grinder mechanism from Woodcraft (#163372), then mounted it atop a red oak and walnut box. The case measures 5½ × 5½ × 3", and both it and the drawer are assembled using box joints. D'Antonio attached the mechanism with lock washers to secure against vibration caused by grinding the beans. Grounds fall into the removable drawer, where they can be scooped to make the morning joe.

BOBBY GILHAM
MARIETTA, OH

Nice job! Gilham, an employee at the Parkersburg, WV Woodcraft, rummaged the store's stock of claro walnut blanks to create this beautiful chopping board. He wanted to show customers what could be done with the product. The board measures 19½ × 12⅝ × 1½", and stands on raised feet. After gluing up the board, he sanded it and applied a food-safe finish to enhance the walnut's spectacular figure. We hope our readers appreciate his efforts as much as his customers do. ■

Show off your work!

Do you want to see your work on these pages? Email us at ***editor@woodcraftmagazine.com***.

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WOODCRAFT magazine

SCAVENGER HUNT GIVEAWAY

Read this issue closely to answer the following questions:

1. **What ingredient combines with oil to create Bob Settich's pore filler?**

2. **The Stickley Music Cabinet appeared as what item number in Stickley's 1909 Craftsman Furniture Catalog?**

3. **What ingredient does Sophie Glenn combine with distilled water to create a green patina?**

Think you have the answers? Scan for instructions on how to enter or go to **woodcraftmagazine.com**

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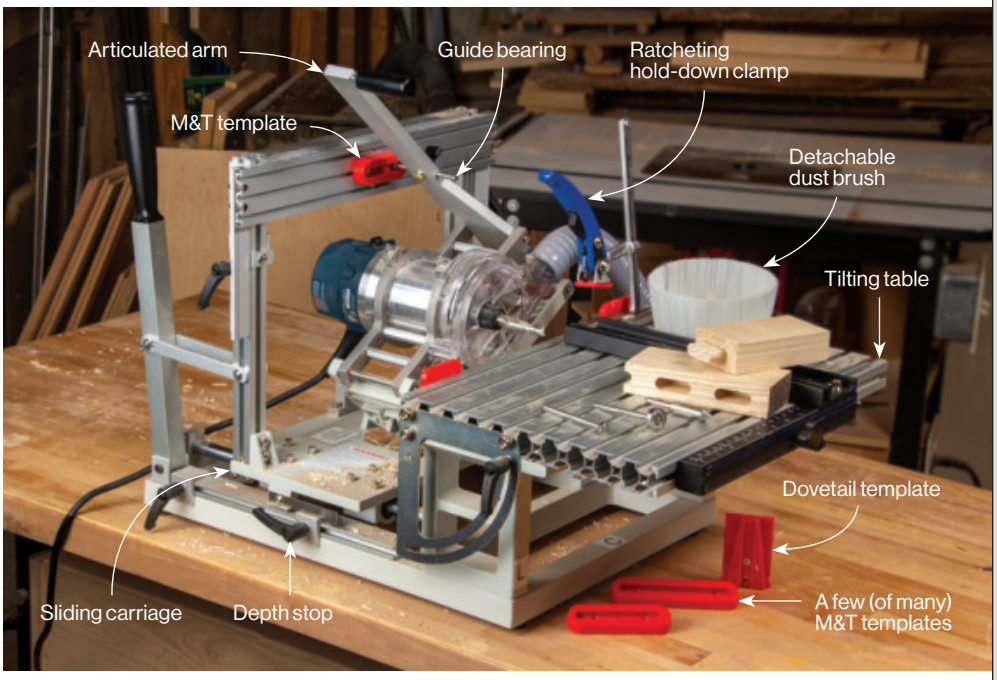

FEATURES

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- Built-in dust collection port
- Tilting table

Last summer I succumbed to a barrage of internet advertising and acquired a PantoRouter. I'd seen other horizontally-mounted routers before, but those were essentially just slot mortisers—a tool I already have access to. The PantoRouter promised to be a much more versatile joint-cutting machine capable not only of cutting mortises, but the matching tenons as well, along with through dovetails, box joints, dowel joints, and more. The way the machine works is clever. The included Bosch router is mounted to an articulated arm which is, in turn, attached to a sliding carriage. Two handles control the router's movement: one advances and retracts the carriage while the other moves the router from side-to-side and up-and-down. Above the router there is an aluminum extrusion where you mount the template(s) for the joint you're cutting. Various sizes of guide bearings inserted through the arm follow the template and control the router's path.

To cut a mortise and tenon joint, for example, start by cutting the mortise. Mount the appropriate length template on the extrusion and chuck a straight bit sized to match your mortise width (from ⅛-1" dia.) in the router. Position your work-piece on the table and clamp it down. Set the depth stop and move the router back

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Prices subject to change without notice.

and forth to cut the mortise with the smallest of the guide bearings running *inside* the template. To cut the matching tenon, switch to a ½" straight bit (appropriate for all tenon sizes) and choose the appropriate-sized guide bearing for the thickness of the tenon you need. Clamp your workpiece in place, set the depth, and run the bearing around the *outside* of the template to cut the tenon. To fine tune the fit, the outside of the template is tapered. Start with the guide bearing running around the fattest part then move to the thinner parts until you get the fit you want. While it may sound complicated, in practice it works quite well and is fairly intuitive to set up. For more photos of the tool in use, see page 48 where I use the PantoRouter to cut face frame joinery. Dovetails and other joints are cut with a similar process, making use of the appropriate templates and bits (all supplied with the All-In package).

In all, I'm pleased with the machine and am looking forward to exploring more of its capabilities in the coming months. A few things to note as you get started: There are *a lot* of loose pieces. You're going to want some way to keep them organized. A cart similar to the one on page 48 may be in order. The PantoRouter website offers similar plans (as well as an extensive library of how-to videos). Also, the dust extraction system is excellent, but after a few uses the detachable brush kept falling off. The company's tech support was great, but I still think I may need to add a more positive latch. And finally, while the instruction manual is comprehensive, I found its organization a little spotty. It definitely pays to go through it several times to familiarize yourself with everything before plugging in. ■

—Tester, Ken Burton

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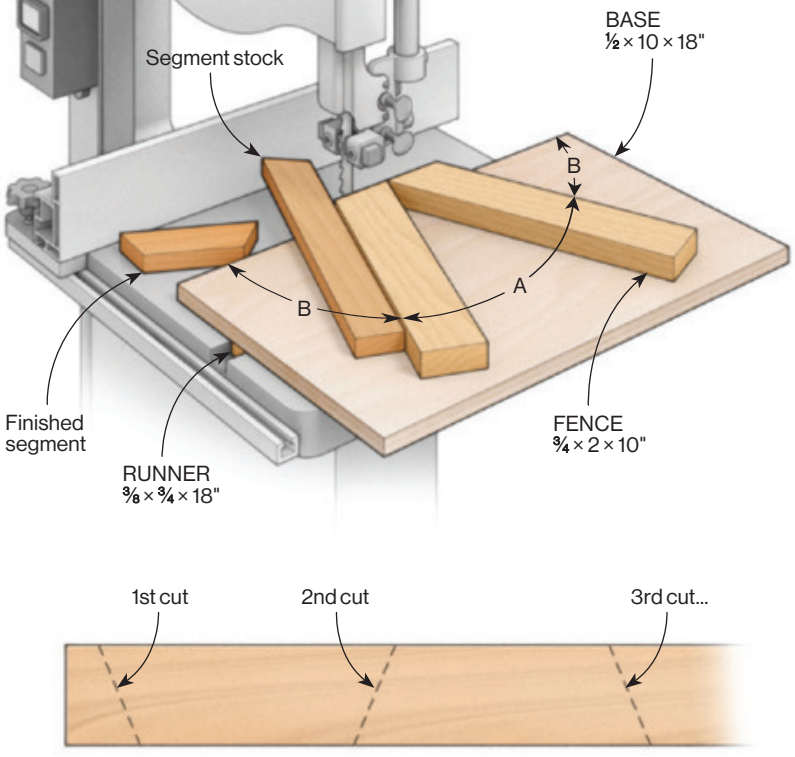
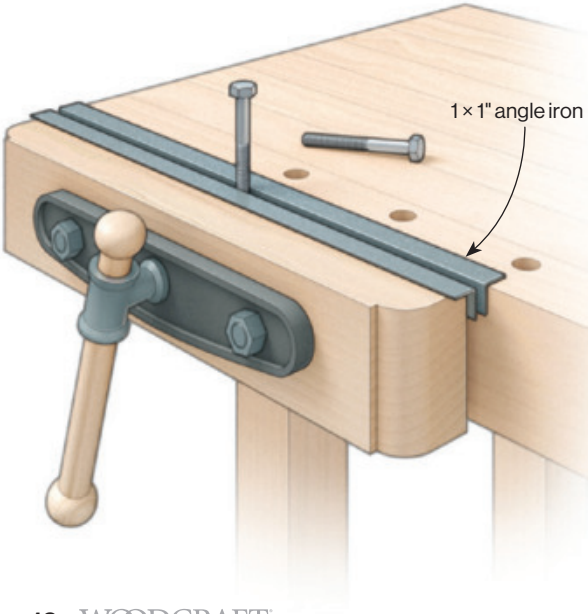
Segmented turning sled

I turn a lot of segmented bowls. To make cutting the segments for the blanks easier, I devised this runner-guided bandsaw sled which can be configured to cut nearly any number (N) of segments (as long as [N] divides evenly into 360). For example, to make a sled for cutting eight segments, divide 360 by 8 (360÷8=45). This gives you the angle (A) between the two fences. Subtract (A) from 180 (180-45=135) and divide by 2 (135÷2=67.5) to calculate the angle (B) between the fences and the edge of the sled. Lay out the angles and screw the fences to the base. To cut the segments, start with a strip of segment stock against the trailing fence and make a cut to establish the first bevel. Hold the strip against the sled's leading fence, with its tip against the saw's fence positioned to serve as a stop, and make the second cut to create the first segment. Continue alternating between the two fences as you cut the remaining seven segments. Note that the width and length of the segment pieces will vary depending on your bowl design.

—Jim Eckblad,
Decorah, Iowa



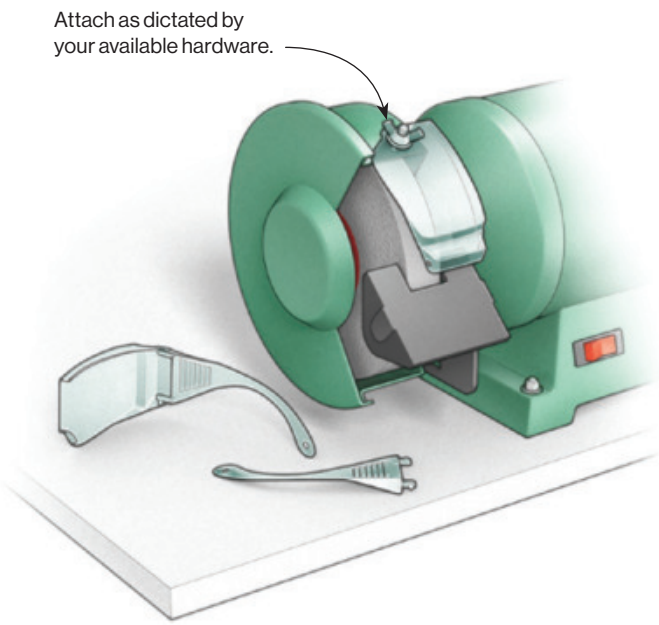
Vise-saving jaws



If you don't have a metalworking vise in your shop, securing metal parts such as screws and rods can be troublesome. They may slip in the jaws of your workbench vise, or the hard material may damage the vise's wooden faces. To solve both problems, rest lengths of steel or aluminum angle iron along the top of the jaws and grip the object in question between them. There is usually no need to fasten them in place; the pressure of the vise takes care of it for you.

—Larry Okrend,
Minneapolis, Minnesota

Illustrations: Christopher Mills



Shop-made grinder guards

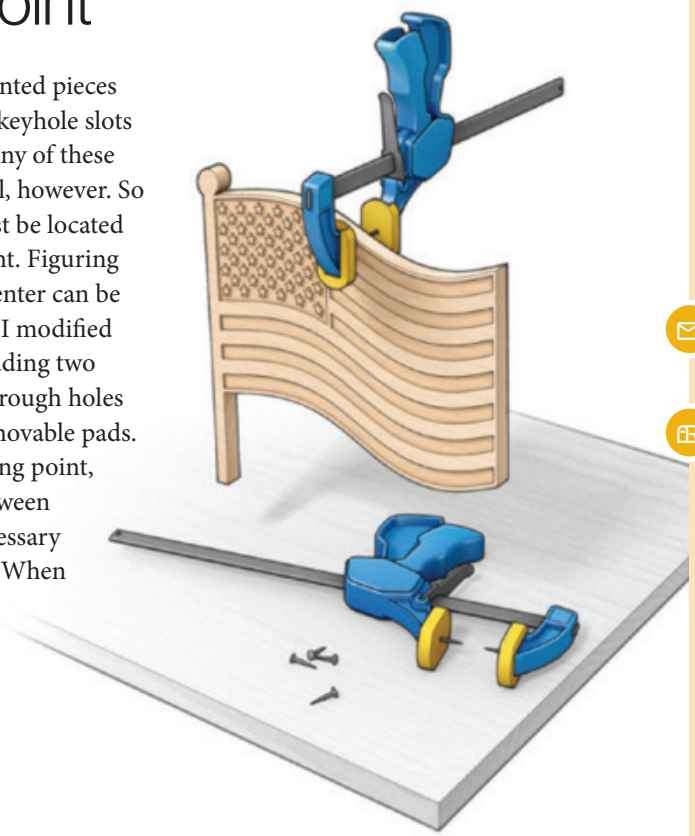
Over the years, my bench grinder has proved to be a valuable addition to my shop. It still runs like a champ, but the original, clear plastic guards yellowed and cracked some time ago. Rather than spend the time and effort to find OEM replacements, I made my own from a pair of inexpensive safety glasses meant for short-term visitors. The lenses, designed to fit over regular glasses, are large and offer excellent clarity. To make the guards, I removed the temples and cut through the bridge with a fine-toothed blade on my band saw. To fasten them to the grinder, I drilled holes near the nose pads and used the original bolts, washers, and wingnuts to attach them.

—David DePauw,
Cincinnati, Ohio

Finding the balance point

I make a lot of wall-mounted pieces designed to be hung via keyhole slots or sawtooth hangers. Many of these pieces aren't symmetrical, however. So the hardware or slot must be located off-center to hang straight. Figuring out just how much off-center can be tricky. To help with this, I modified a quick-grip clamp by adding two opposing carpet tacks through holes drilled in the clamp's removable pads. To find the proper hanging point, lightly grip the piece between the tacks, shifting as necessary until it hangs as desired. When I can't risk scarring the front face, I add a masking tape pad for the outer tack to grip. ■

—Jim Beauchamp,
Kingspot, Tennessee



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Historic style meets modern utility

By Derek Richmond

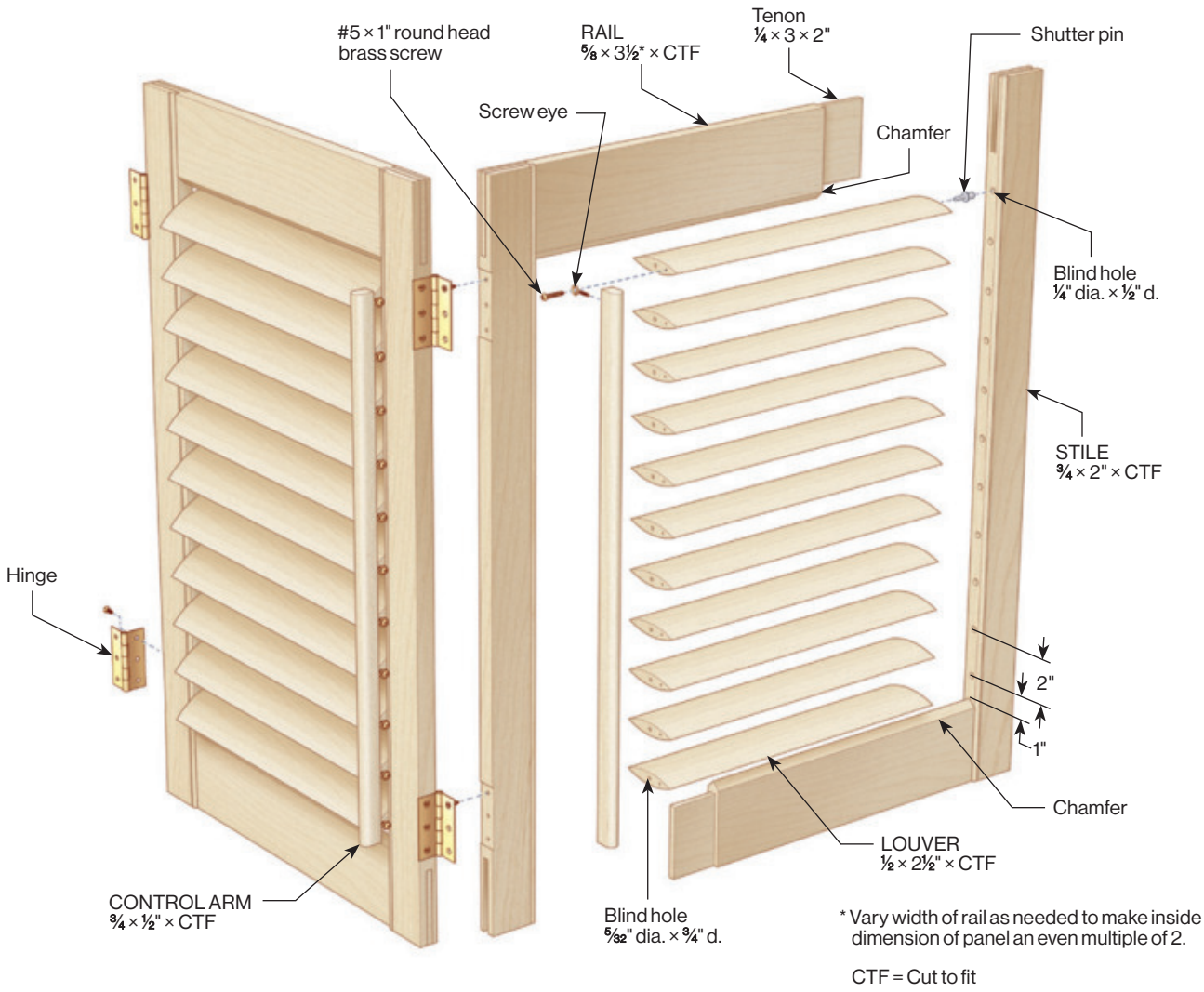
Custom interior shutters offer more style than Venetian or vertical blinds, and let in more light than curtains. Rotate the movable louvers to direct sunlight where you want it. Or open the double bifold panel to really let the outside in. My windows are tall, so I split the space into a top and bottom half; I can open the top panels for illumination while keeping the bottom panels closed for privacy. And the bifold setup means they take up surprisingly little space inside even the largest windows. Best of all, with a little bit of math (see Making a panel plan, p. 23), they can be custom-fit to your windows.

While sometimes called plantation shutters because of their popularity in antebellum estates of the American South, that name carries a troubled legacy, and anyway doesn't tell the shutters' full story. Interior shutters actually originated in Ancient Greece, where — made of marble — they served to keep coastal weather out of the un-glassed windows. As the shutters became more popular, wood replaced marble, allowing for movable louvers. Their fashion spread through Europe and they were eventually brought to the Americas by Spaniards. Lacking access to a suitable marble quarry, I built mine from poplar, painted white to match my window trim. Pine, basswood, or paulownia would work just as well; or use cherry or oak stained to match your home's existing trim.

Photos: Derek Richmond; Illustrations: Greg Maxson

Love your louvers

Each panel consists of a bridle-jointed frame filled with 2½" wide louvers. The louvers pivot on two types of specialized pins. Most of the pins allow the louvers to spin freely, while three or four sets of tension pins hold them in the desired orientation. A side-mounted control arm rotates all the louvers in a given panel at once. A router bit makes it easy to shape the many (or in my case many, many, many) louvers, and a drill press jig makes boring their ends for those pins easy. See the Buyers Guide, p. 60, for sources and part numbers of those special components. If your windows aren't deep enough for the panels to fit inside, add mounting strips to frame your shutters (see "Shutter mounting", p. 27).



Order of Work

- ✓ Cut bridle joint in frame
- ✓ Drill stiles for louver pins
- ✓ Drill louvers for pins
- ✓ Rout louvers to shape
- ✓ Create control rod
- ✓ Assemble panels
- ✓ Install in windows

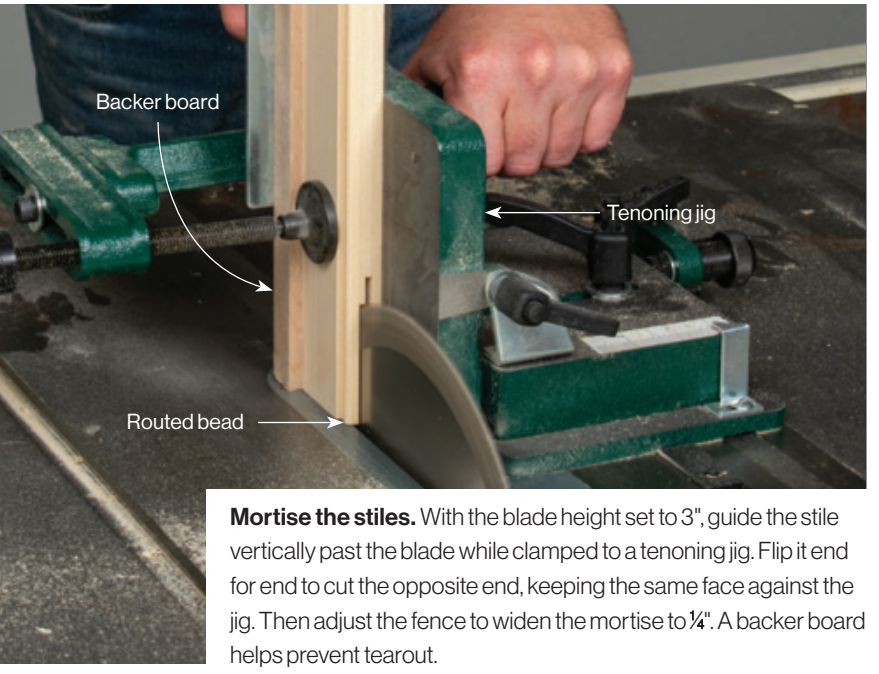
Making a panel plan

First, determine the area to be covered by the shutters — either the inside of the window opening, or the inside of the mounting frame. For full-height shutters, the panel height is the shutter opening height minus ¼" (for clearance). For shutters with upper and lower panels, divide the result by 2. The individual panel width is the total shutter opening width divided by the number of panels, less 3/16" (again, for clearance).

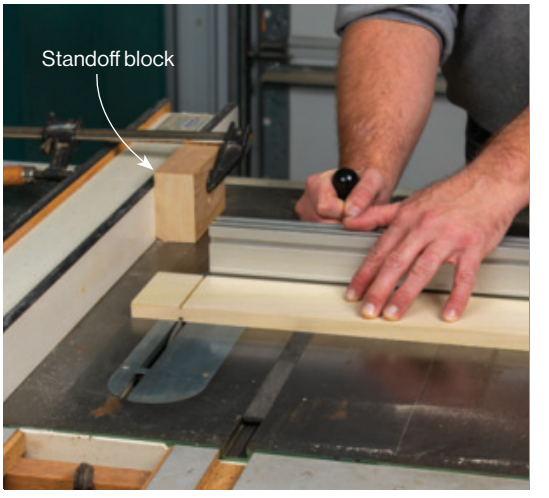
Determine the number of louvers by subtracting twice your desired rail width from the panel height, and divide by 2. Round to the nearest whole number. Then modify the width of the rails to make the opening in the panel frame equal to this whole number.

Prepare the frame

After determining your shutter panel sizes, mill the rails and stiles. Then rout a bead on one edge of a face of each stile. Cut the bridal joints at the table saw using a tenoning jig (see OnlineEXTRA for a shopmade option, p.27) in conjunction with a blade with a flat-top grind. To compensate for the pieces' different thicknesses, the mortises in the stiles are offset toward the stiles' outside face while the tenons on the rails are centered on the rails' thickness. After cutting the tenons, use a miter fence and dado blade to reduce the tenons' width to match the 3" depth of the mortises. Then chamfer the inside edges of the rails at the router table so the louvers can fully open and close. Drill the beaded edge of the stiles to accept the shutter pins (see Buyers Guide, p. 60). Locate the first pin hole on each stile. Then, using a fence with marks every two inches, drill holes for the shutter pins by advancing the initial layout mark along the fence for each consecutive hole.

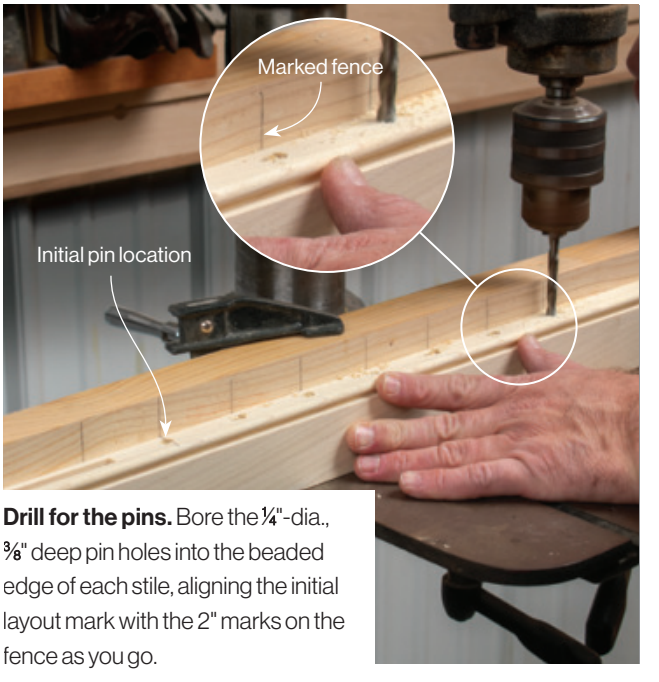


Mortise the stiles. With the blade height set to 3", guide the stile vertically past the blade while clamped to a tenoning jig. Flip it end for end to cut the opposite end, keeping the same face against the jig. Then adjust the fence to widen the mortise to ¼". A backer board helps prevent tearout.



Shoulders first. Cut the tenons' shoulders on the ends of the rails at the table saw using a miter gauge. Either attach a stop block to your miter fence or use a standoff block on your rip fence to position the cuts.

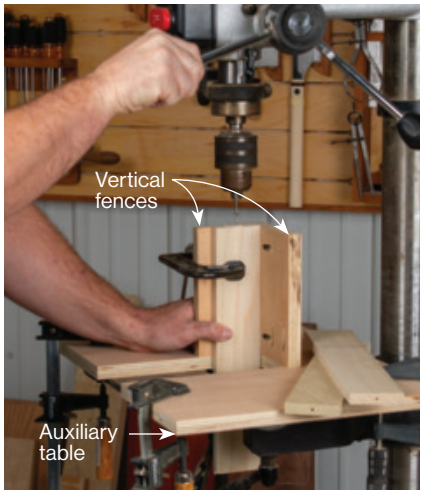
Cheeks next. With the shoulders cut, clamp the rails in a tenoning jig to make the two cheek cuts, flipping end for end and side to side to produce centered tenons.



Drill for the pins. Bore the ¼"-dia., ⅜" deep pin holes into the beaded edge of each stile, aligning the initial layout mark with the 2" marks on the fence as you go.

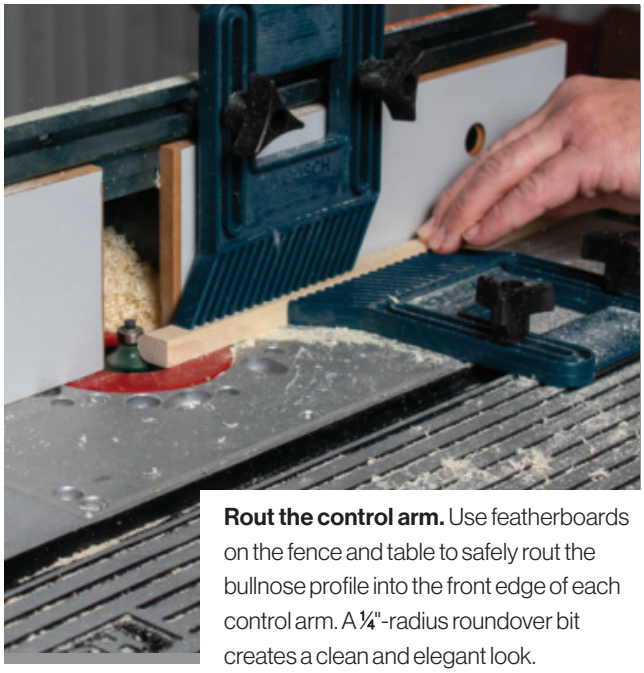
Create the louvers and control arm

Mill the louvers to ½ × 2½" and crosscut to 3/16" short of your frame opening width. Cut a few extra blanks to use for setup and as spares. Measure and mark the center of the end of one louver blank and use it to set up for drilling the pin holes in the ends of all the louvers. Dial in the louvers' shape with setup stock, using a beveled spacer for added support as shown. For my setup, a 10° bevel ripped off the corner of some ¾"-thick milled scrap served nicely. This operation requires a 1½-dia., 2" tall moulding bit, and bits this large typically call for slow speeds. But I found that 22,000 rpm is safe in this instance and produces a smooth cut that requires little sanding. Mill the control arm to size, leaving it an inch longer than the center-to-center distance between the topmost and lowest louvers. Rout a bullnose profile on one edge of the control arms. On the opposite edge, drill holes for the screw eyes (see Buyers Guide) that will attach it to the louvers.

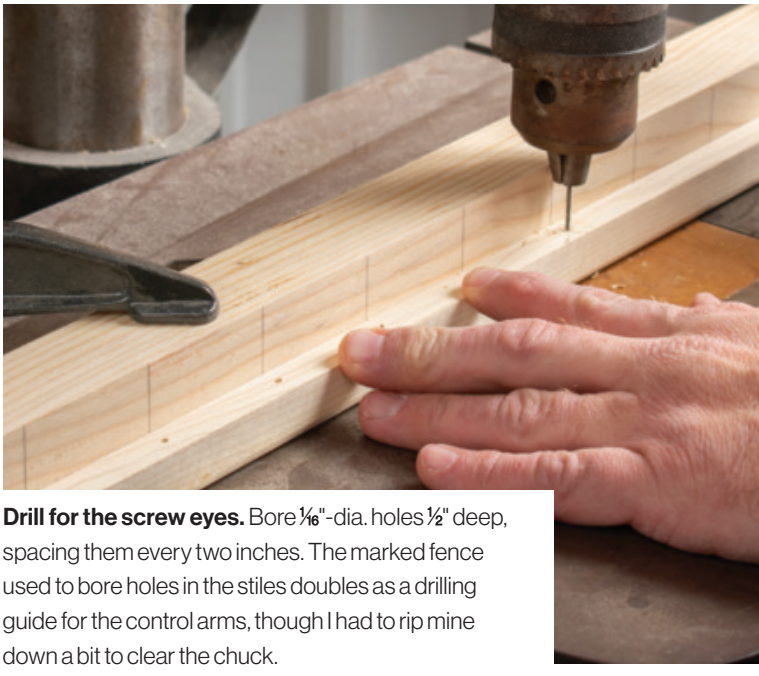


Drill the louvers. Use a pair of vertical fences attached to an auxiliary table to orient and hold the louvers, then bore a 9/64"-dia.× ¾" deep hole in both ends of every louver.

Rout the louvers. Locate the router bit and fence to leave a small flat on each face of the louvers when all four corners are routed. Adhere a spacer to the fence with double-faced tape to catch the otherwise wobbly piece on the outfeed side of the cut.



Rout the control arm. Use featherboards on the fence and table to safely rout the bullnose profile into the front edge of each control arm. A ¼"-radius roundover bit creates a clean and elegant look.



Drill for the screw eyes. Bore 1/16"-dia. holes ½" deep, spacing them every two inches. The marked fence used to bore holes in the stiles doubles as a drilling guide for the control arms, though I had to rip mine down a bit to clear the chuck.

Finish and assemble

Plan your finishing process carefully. If you've only got one or two panels, mask off the mortise and tenon joinery, then finish the louvers and frame parts separately before assembling and touching up; I built eight panels, so it made more sense to fully assemble them before spraying. Either way, when you glue up, install the shutter pins in the louvers. Then assemble the frame around the louvers. Twist the screw eyes into their pre-drilled holes, oriented with their loops parallel to the length of the control rod. Attach the control rod to the louvers before installing the panels in your windows. See the Shutter mounting sidebar (right) for tips on installation options.

Clamp a stile in a bench vise, then install the louvers without glue. Glue in the rails, and finally top with the opposite stile, slipping the shutter pins into their holes. Check for square, and clamp to dry.

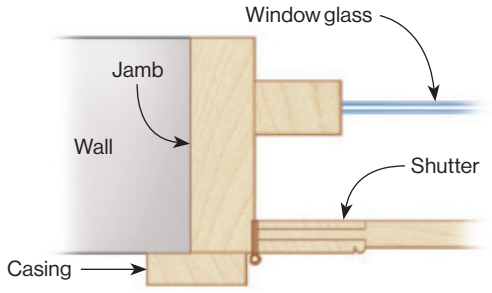
Install shutter pins. Press or tap the pins into the ends of each louver until the shoulders butt against the louver ends. Install tension pins in 3 or 4 louvers per panel to help the shutter set maintain its orientation.

Install the control arm. Pre-drill the front edge of each louver for screws then slip a round-head screw through a screw eye installed on the control arm, and drive it into the end of the corresponding louver. Continue down the panel, connecting all the louvers to the arm, allowing them to move in unison.

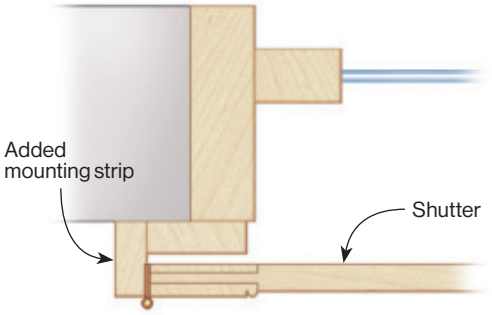
Shutter mounting

With so many different window configurations, I can't address them all here, but in general you have two options. If your windows are deeply set, you may be able to install the shutters directly in the window well, attaching the hinges to the window's jambs. For shutters with 2½" louvers, you'll need at least 1¾" of clearance behind the panels to allow the louvers to open properly. You may still need to add a mounting strip to the jambs so the shutters can swing past the casing.

If your windows don't have the required depth, you can add mounting strips to the wall surrounding the window to screw the hinges to. Either remove the window casing and attach the mounting strips in its place, or it may be possible to attach the strips directly to the casing. No matter what, figure out your mounting system before making the shutters. ■



INSIDE MOUNT



OUTSIDE MOUNT

onlineEXTRA

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Dog FEEDER

An elevated platform for Phydeaux

By Bob Berner

Why must our faithful companions be relegated to eating on the floor? This project will give them a stylish boost while helping to alleviate some potential health issues along the way. My material of choice is Baltic birch plywood. The uniform plys look good enough when sanded and finished that no edge banding is necessary. I topped the table surface with plastic laminate for durability and easy clean up.

Please note that this table is not species specific and works well for cats, too. Just don't tell your kitty that the paw print on the legs is modeled after a dog's foot. It may cause issues. It is, however, important to size this table to your pet; measure the height of your pup at the withers (top of the shoulder) and subtract about 6" to 8". This will give you the height of the table from the floor. Cats don't nearly vary so much in height, but the same general rules apply. The table in the photos is for a small dog, but there are cutting files for two larger sizes online should you need them.

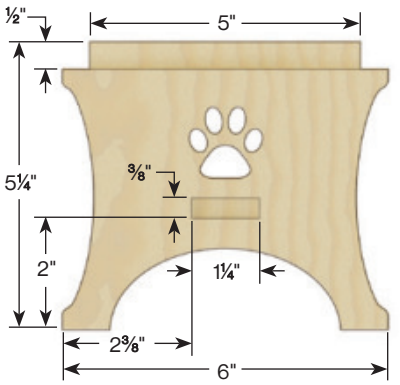
Photos: Ken Burton; Illustrations: Dan Thornton

Routed parts and joinery make for quick assembly

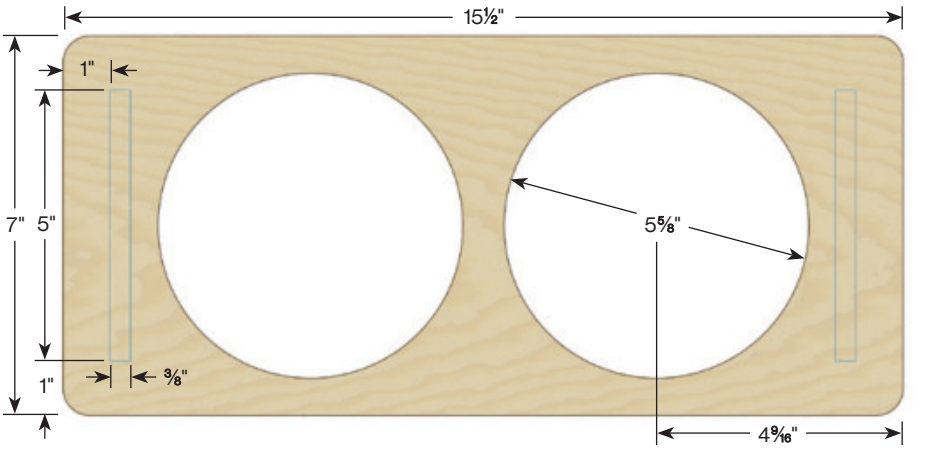
The feeder consists of four parts cut from 15mm (⅝") Baltic birch plywood: a top, two legs, and stretcher. While designed to be cut with a CNC router, you can also cut the pieces out conventionally. Get the bowls first (see Buyer's Guide on p. 60) and then size the holes in the top to suit.

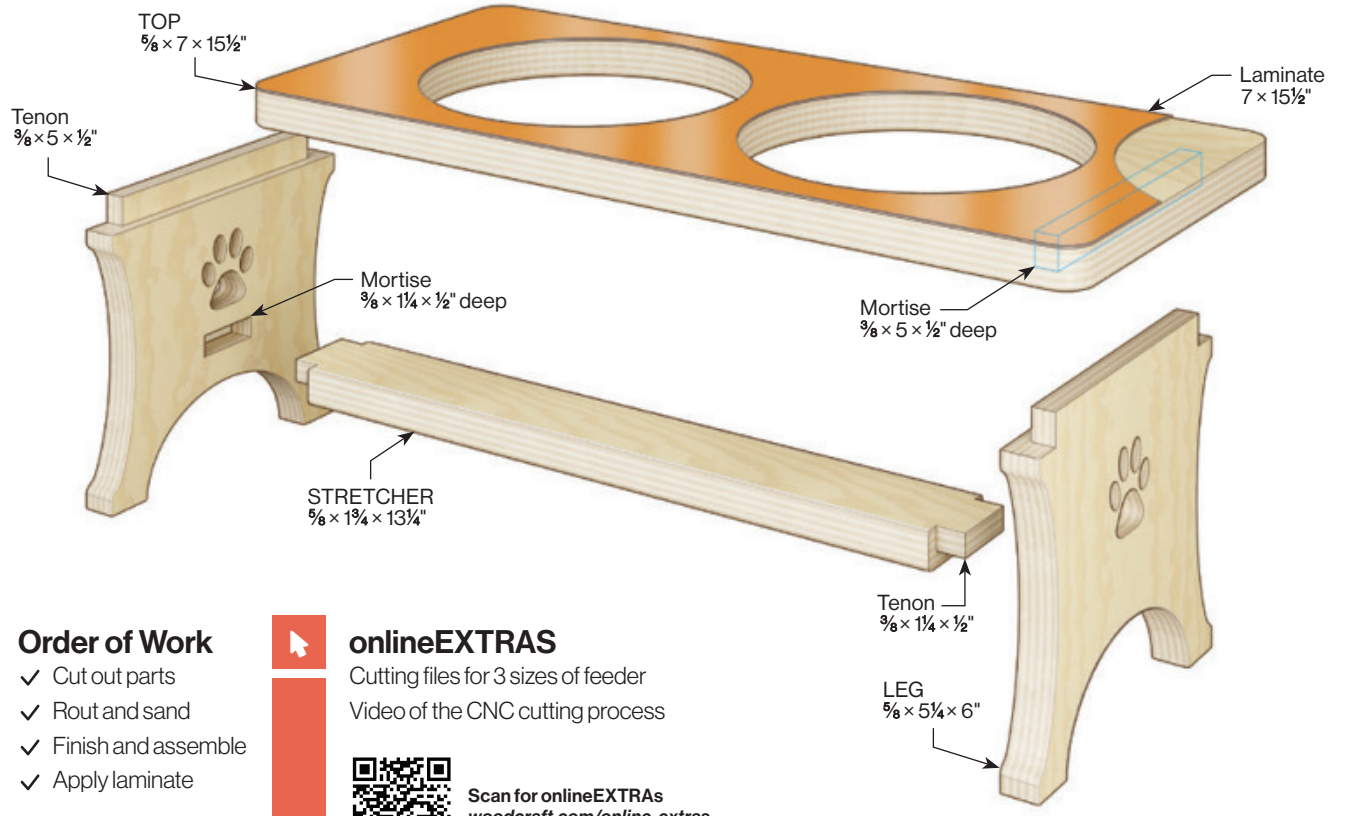
The cutting files are designed to use the surface of the CNC's spoil board as a reference. This yields tenons on the ends of the legs and stretchers that are of a consistent thickness, even if the plywood's thickness varies.

Side Detail



Top Detail





Order of Work

- ✓ Cut out parts
- ✓ Rout and sand
- ✓ Finish and assemble
- ✓ Apply laminate

onlineEXTRAS

Cutting files for 3 sizes of feeder

Video of the CNC cutting process

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woodcraft.com/online-extras

Cut, assemble, and laminate

After carefully zeroing the bit on the surface of the spoil board, cut the parts out. I used a ⅛" diameter "Wonder" bit (see Buyers Guide, p. 60) running at 22,000 RPM and 80" per minute. These bits are capable of making the entire cut in one pass. The resulting chips pack in the kerf eliminating the need for tabs. After the pieces are cut, round over all exposed edges of the legs and stretcher, and the bottom edge of the top at the router table with a ⅛" roundover bit. Sand everything before gluing the parts together. Finish the assembly with several coats of polyurethane before laminating the top surface.

Set the zero point. The X and Y origin point is at the lower left corner of the 16½ × 17¾" blank with the Z zero point on the surface of the spoil board. Two fixed fences with opposing wedge pairs make positioning and holding easy.

Trace and stick. Trace the table shape onto the back of the laminate. Spread contact cement on both the mating surfaces and allow to dry. Align the table with the tracing and press the pieces together firmly.

Trim away the excess. Drill a ½" access hole through each of the bowl holes. Trim the laminate even with the top using a flush trim bit chucked in a trim router. File the edges smooth. ■

FEATURE

Stickley MUSIC CABINET

An Arts-and-Crafts classic makes an heirloom display case

By Willie Sandry

In the early 20th century, furniture maker Gustav Stickley was famous for his solid oak Craftsman furniture. Also called "Mission" or "Arts & Crafts," this stout, no-frills style is as popular today as it was over a century ago. Stickley's straightforward designs—made of quartersawn white oak with prominent joinery—were intended to be an "honest" alternative to the fake joinery, gaudy frills, and shoddy work found on much of the mass-produced furniture of the time.

This handsome cabinet appeared as item No. 70 in Stickley's 1909 Craftsman Furniture catalog. It was dubbed a "music cabinet" because it was sized to store sheet music, which was very popular in its day. With four adjustable shelves and an open area on top, it makes a lovely display cabinet or bookcase.

In keeping with Stickley tradition, the cabinet is made of solid wood throughout. The side panels, top, bottom, and shelves are all quartersawn white oak.

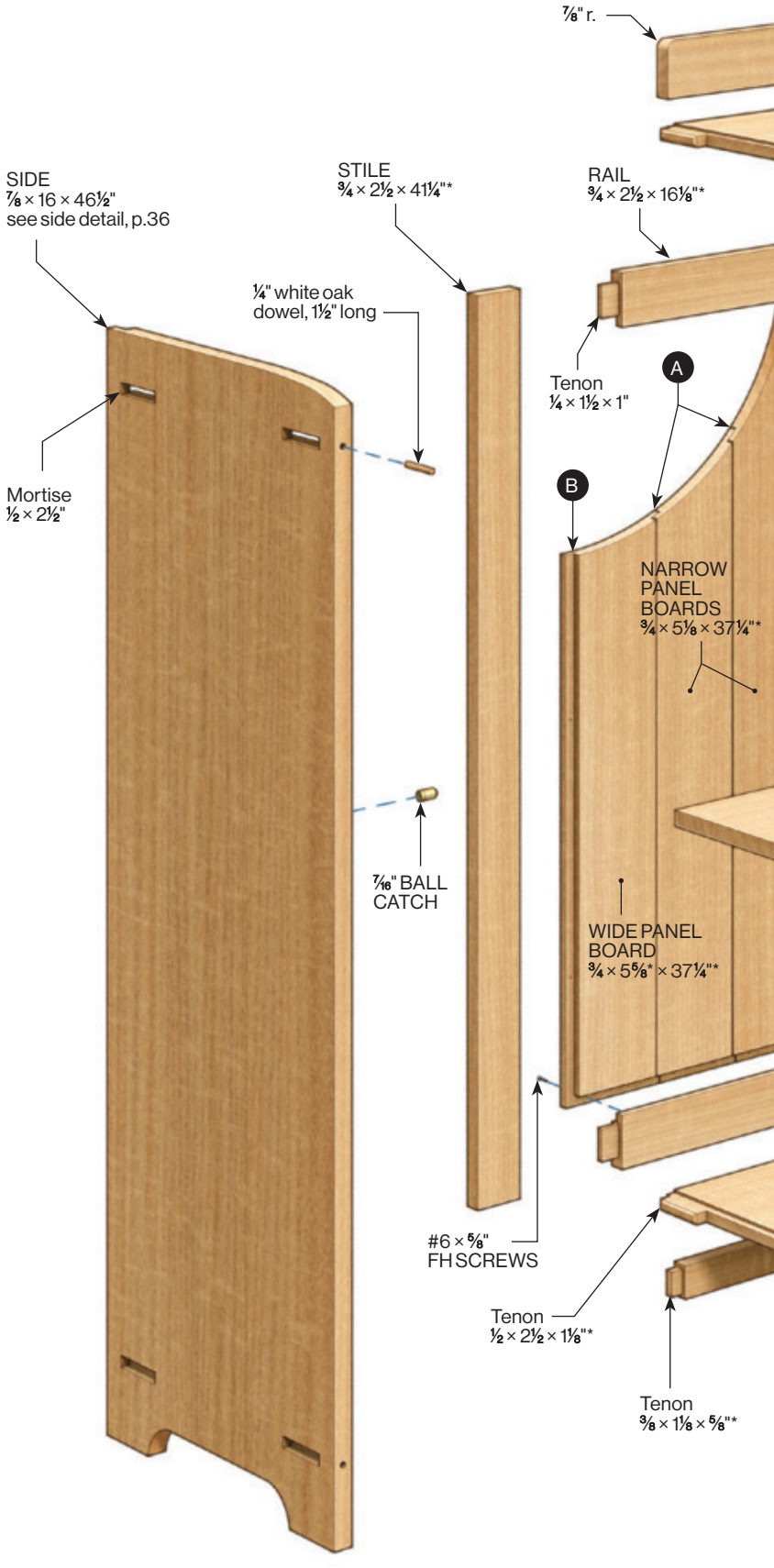
Stickley finished his original furniture by fuming with ammonium hydroxide fumes which react with the tannin in white oak to create a rich brown accentuating the quartersawn figure. I got similar results with an oil-based stain without all the hassle of fuming.

I made the leaded glass panels myself (see onlineEXTRAS, p. 32), but you could source them from a local artist if you prefer. But you could substitute plain glass panels or a frame-and-panel wooden door—an option Stickley offered in his 1909 catalog.

OVERALL DIMENSIONS:
20" wide × 47" tall × 16" deep

Solid oak panels with mortise and tenon joinery

Fixed shelves top and bottom connect the sides by stub and through mortise and tenon joinery. Lower rails are tenoned to fit mortises in the sides and then screwed to the bottom shelf. A backsplash is glued to the top between the sides. The back assembly consists of a rabbeted mortise and tenon frame that holds three shiplapped boards and sits in rabbets routed in the sides. Inside the case, four adjustable shelves sit on shelf pins, providing ample storage. The door frame is constructed using mortise and tenon joinery and mortised to accept muntins and a mullion, which are half-lapped together. All door parts are rabbeted to hold glass panels. Attractive details abound, from subtle reveals and shadow lines to chamfered tenons and oak dowel pins. The piece is finished with a stain that makes the white oak's ray fleck pop, and it's all topped with handsome hardware.



Order of Work

- ✓ Make and assemble case
- ✓ Make and assemble door
- ✓ Make and assemble back
- ✓ Sand and finish
- ✓ Hang door
- ✓ Attach back
- ✓ Install hardware & shelves

onlineEXTRA

Visit our site for the Cut List and Materials, a Leaded Glass Video Tutorial, and a free article download on Installing an Inset Door.

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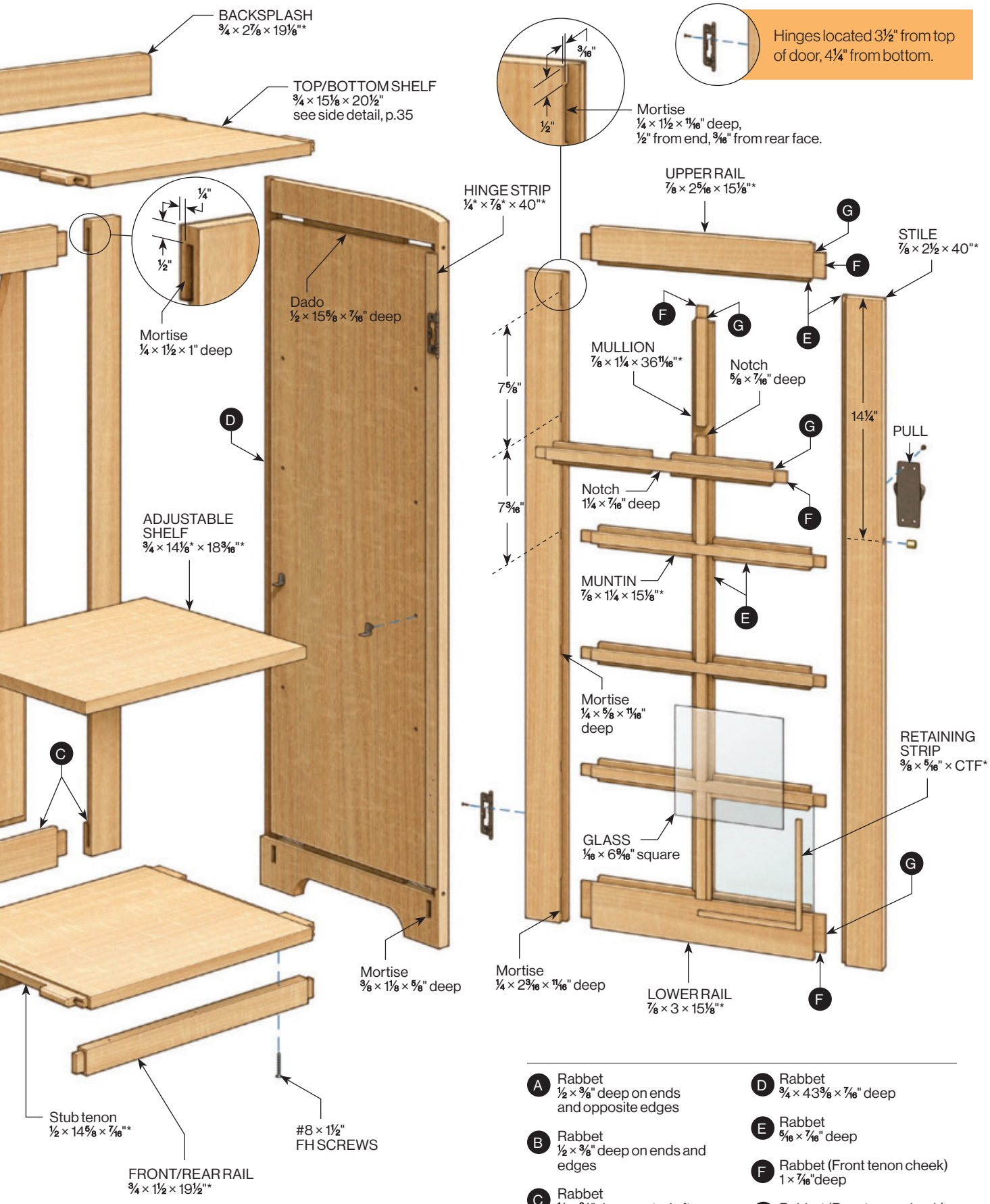
Illustrations: Christopher Mills

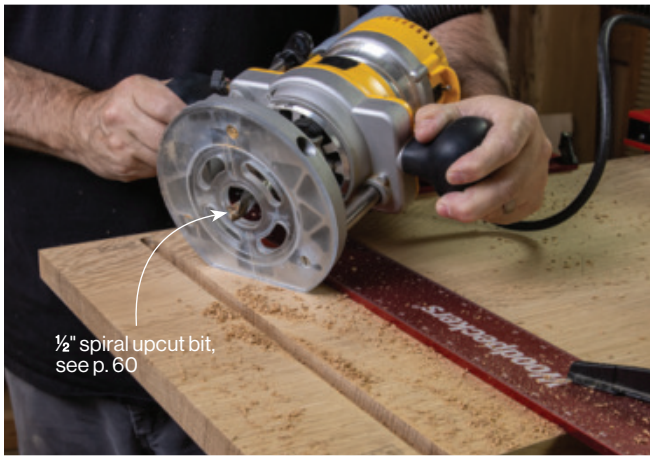

BACKSPLASH
¾ × 2⅞ × 19⅛"*
TOP/BOTTOM SHELF
¾ × 15⅛ × 20½"
see side detail, p.35
¼"
½"
Mortise
¼ × 1½ × 1" deep
Dado
½ × 15⅝ × 7⁄16" deep
HINGE STRIP
¼* × ⅞* × 40"*
3⁄16"
½"
Mortise
¼ × 1½ × 11⁄16" deep,
½" from end, 3⁄16" from rear face.
Hinges located 3½" from top of door, 4¼" from bottom.
UPPER RAIL
⅞ × 2⅝ × 15⅛"*
STILE
⅞ × 2½ × 40"*
MULLION
⅞ × 1¼ × 36 11⁄16"*
Notch
⅝ × 7⁄16" deep
7⅝"
7 3⁄16"
Notch
1¼ × 7⁄16" deep
MUNTIN
⅞ × 1¼ × 15⅛"*
14¼"
PULL
ADJUSTABLE SHELF
¾ × 14⅛* × 18 3⁄16"*
Mortise
¼ × ⅝ × 11⁄16" deep
RETAINING STRIP
⅜ × 5⁄16" × CTF*
GLASS
⅛ × 6 9⁄16" square
Mortise
⅜ × 1⅛ × ⅝" deep
Mortise
¼ × 2 3⁄16 × 11⁄16" deep
LOWER RAIL
⅞ × 3 × 15⅛"*
Stub tenon
½ × 14⅝ × 7⁄16"*
FRONT/REAR RAIL
¾ × 1½ × 19½"*
#8 × 1½" FH SCREWS
A Rabbet ½ × ⅜" deep on ends and opposite edges
B Rabbet ½ × ⅜" deep on ends and edges
C Rabbet ½ × ⅜" deep routed after frame assembly
D Rabbet ¾ × 43⅜ × 7⁄16" deep
E Rabbet 5⁄16 × 7⁄16" deep
F Rabbet (Front tenon cheek) 1 × 7⁄16"deep
G Rabbet (Rear tenon cheek) 11⁄16 × 3⁄16" deep

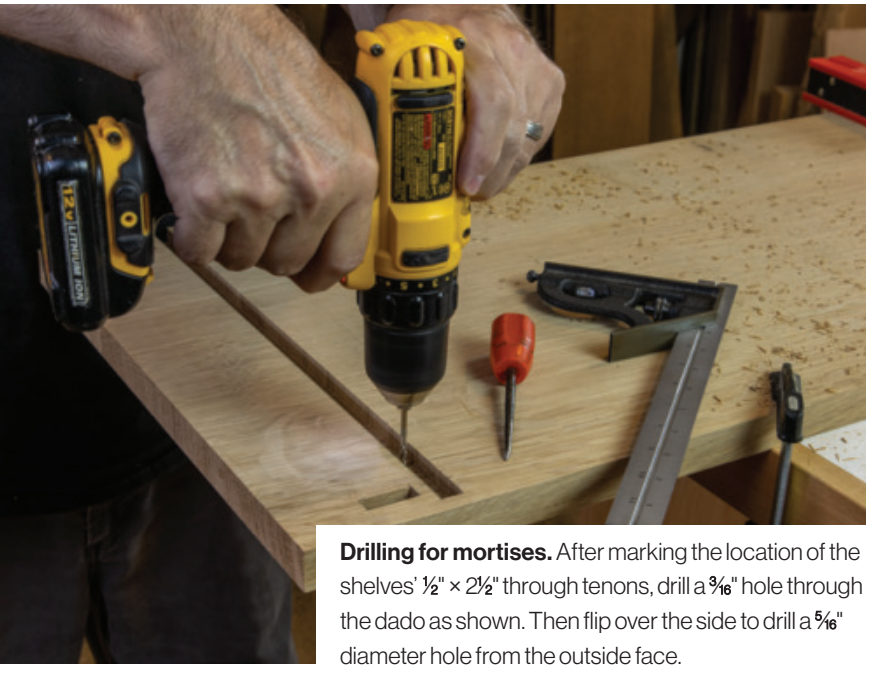
*Cut to fit

Cabinet Sides: dadoes, mortises, and rabbets

Glue up stock for the ⅞"-thick cabinet sides and ¾"-thick fixed and adjustable shelves, then cut the sides and fixed shelves to size. Rout stopped dadoes in the sides, as shown, and chisel their front ends square. Drill starter holes in the dadoes, then rout through mortises on the outside and square the ends. Finally, rout ¾"-wide x 7/16"-deep rabbets in the sides for the back, stopping 3⅛" from the bottom ends. Again, square the joints using a chisel.

Rout stopped dadoes. Clamp a straightedge to the side, and rout ½" wide dados where shown in the drawing on page 36, stopping ⅜" from the front edge. Make two passes to reach the 7/16" depth.





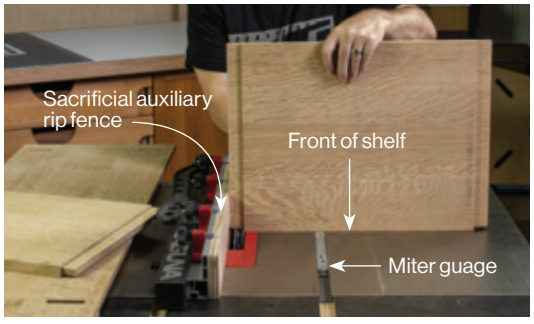
Drilling for mortises. After marking the location of the shelves' ½" × 2½" through tenons, drill a 3/16" hole through the dado as shown. Then flip over the side to drill a 5/16" diameter hole from the outside face.

Rout through mortises. The bearing rides along the edges of the dado to make through mortises the same width as the dado. But use your eyes to stop just shy of your layout lines at the ends.

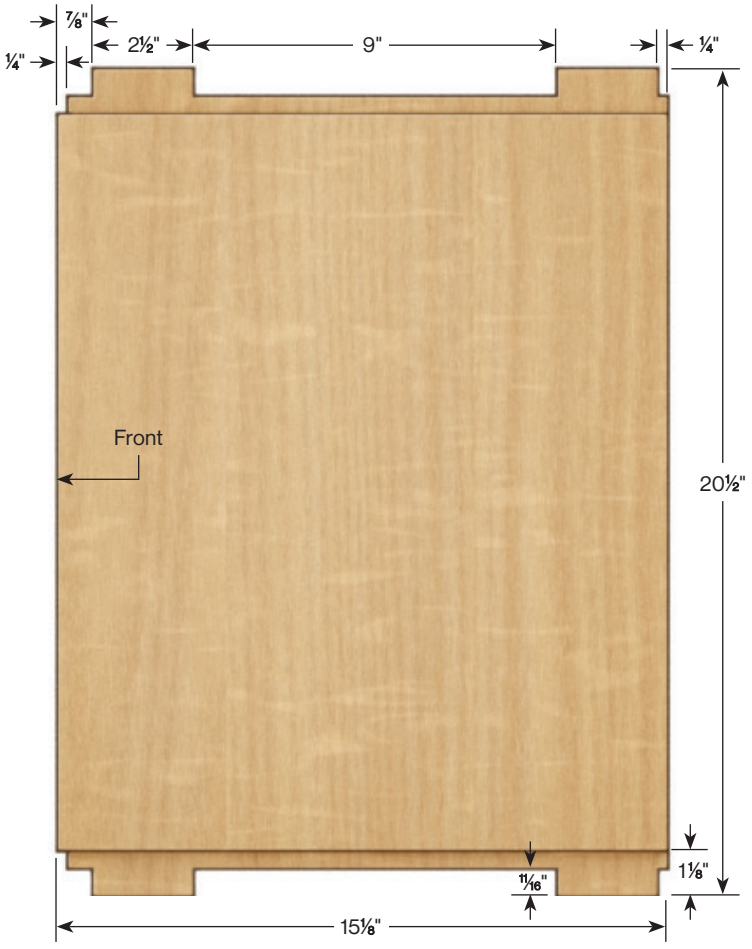
Photos: Willie Sandry

Through tenons for fixed shelves

Set your rip fence to establish the 1⅛" long tenons, and, using a dado stack, saw the tenons to thickness. Start a hair under 3/16" and raise the blade, milling both faces of both ends of each shelf until the tenons fit their respective mortises. Set your blade height to ¼" and hold the piece on its front edge to saw small shoulders on the front of both shelves. Set the blade height to 11/16", reset the fence, and hold the piece on end to cut the ¼" shoulders at the outside of the rear through tenons. Now, reset the fence once more to cut the shoulder ⅞" from the front, establishing the outside of the front through tenons. Finally, cut the waste from between the tenons, checking the fit as you go.



Sawing the shoulder. With a shelf's front against the table, raise the dado blade to ¼" and cut a shoulder in the fixed shelves. No shoulder is required on the back.



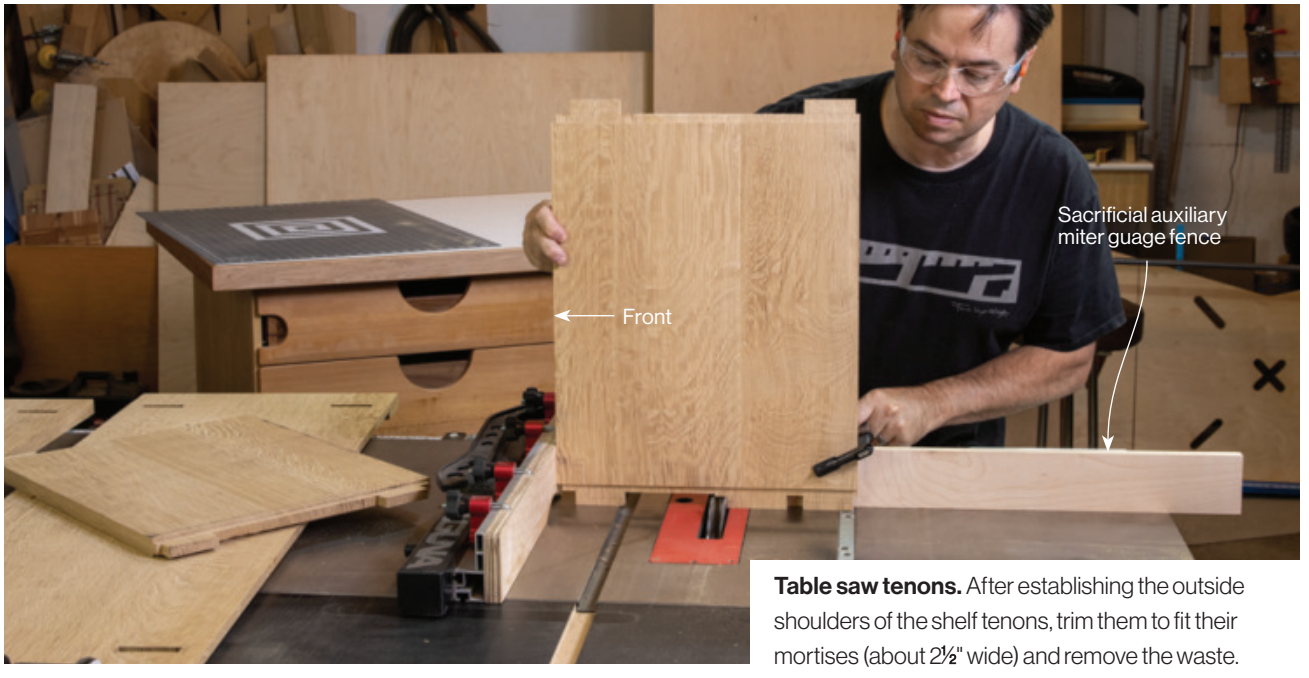
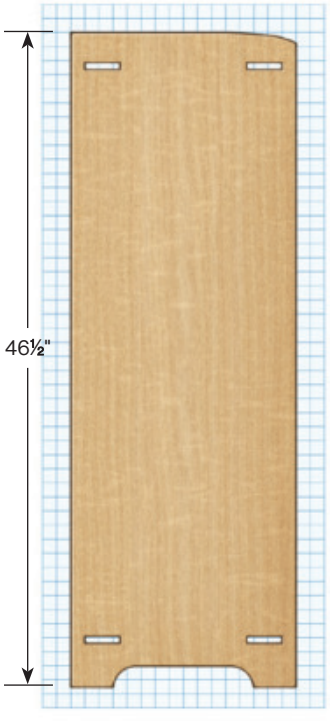


Table saw tenons. After establishing the outside shoulders of the shelf tenons, trim them to fit their mortises (about 2½" wide) and remove the waste.

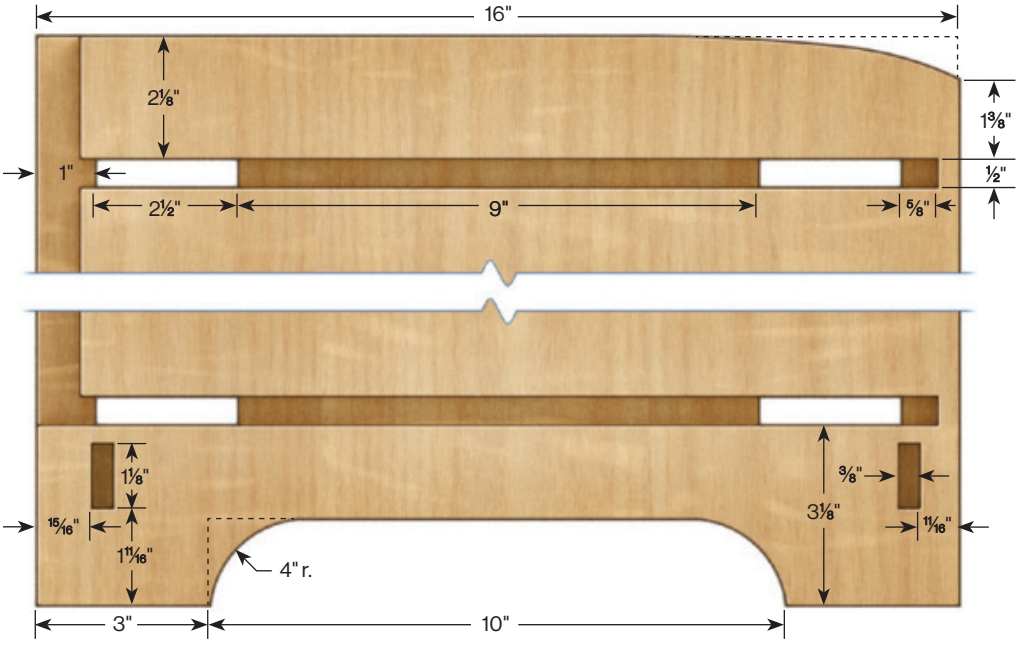
Shaping and connecting the sides

Make a template from ½" MDF using the side pattern (below). Use the template to draw the top profile and the bottom arch on the sides, and jigsaw just outside the line. Now, with the same template, flush-trim the profile and arch using a bearing-guided router bit. Using an edge guide on your plunge router and a ⅜"-diameter spiral bit, rout the 1⅛ × ⅜ × ⅝"-deep mortises for the rails, where shown in the drawing (below). Chisel the mortises square. Make the rails and cut their tenons to fit. Drill the holes in the sides to dowel the fixed shelves' frontmost tenons.

Side Pattern



Side Detail



Template rout the side. After sawing to rough shape, clamp the template to the workpiece and trim the arch using a router with a bearing-guided bit.

Assemble the case

At the drill press, bore and counterbore three clearance holes along the bottom of both rails to connect to the bottom shelf. Sand and dry-assemble the case. Measure diagonals to check for square and make any necessary adjustments. When satisfied, reassemble the case using glue and clamps. Apply glue sparingly to the cheeks of the through tenons, to keep the exposed joinery clean. Skip glue between the bottom rails and the fixed shelf, as screws will secure that joint. Once assembled, drill through the four tenon-dowel holes into the front tenons, and pin the joints with 1½" lengths of ¼" diameter white-oak dowel and glue. Saw them flush when dry and then chamfer the through tenons.

Glue-up strategy. After gluing in the fixed shelves and rails on one side, attach the opposite side. Allowing the case to overhang an assembly table grants clamping access, while small clamps keep the rails in place during glue-up.

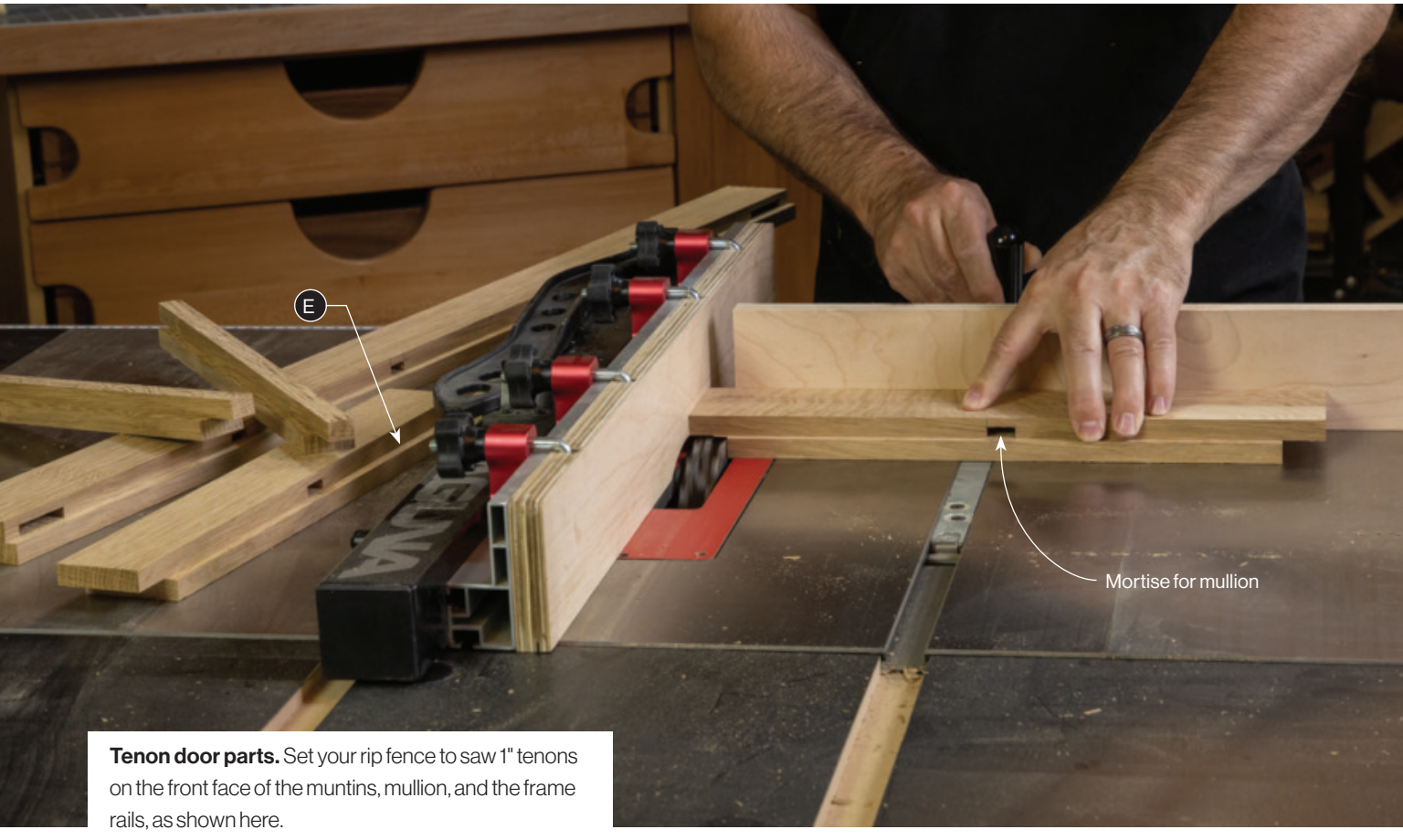
Drill for dowels. Use a doweling jig and ¼" brad-point bit to drill holes in the front edge of each side to dowel the fixed shelves' through tenons.

Fasten rails to shelf. Drill pilot holes into the bottom shelf before driving the #8 × 1½" screws to secure the rails.

Making the door

Mill your door parts plus setup stock to size. On the inside edges of the frame parts and both edges of the muntins and mullion, saw rabbets 5/16" wide and half the stock thickness deep (about 7/16"). For safety, use a featherboard and pushstick when milling the narrow parts. Layout the mortises in the frame parts according to the drawing (p. 33), and mill them 11/16" deep. Adjust to saw the 1" front tenon cheeks, and make the cuts with the workpiece against an auxiliary fence attached to your miter gauge. Readjust to saw the tenons to thickness and then create the haunch. Notch the muntin and mullions as shown. And dry fit before committing parts to glue.

Mortise the door frame. After rabbeting the frame parts at the table saw and marking their mortise locations, drill them using a ¼" bit at the hollow chisel mortiser.



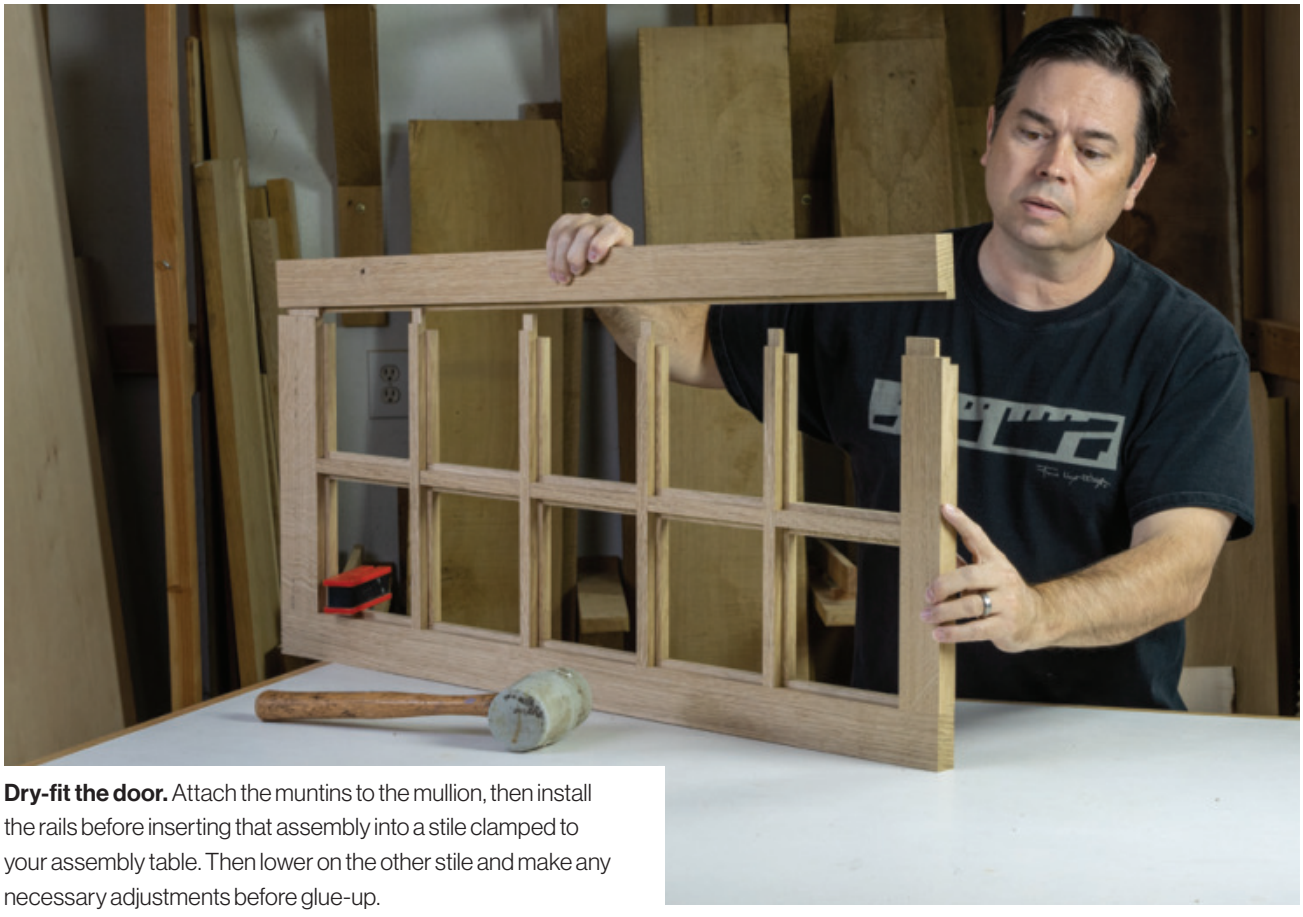
Tenon door parts. Set your rip fence to saw 1" tenons on the front face of the muntins, mullion, and the frame rails, as shown here.

Establish tenon thickness. Reset your fence to saw the 11/16" rear tenon cheek on the door parts. Raise the dado stack incrementally until the resulting tenon thickness fits its mortise.

Haunch the tenon. Without changing your fence setting, raise the dado stack height to ½". Then, notch the frame rails as shown to create the haunched tenon.

Notch the mullion. Set your dado stack to the narrow width of the muntins (about 5/8", but measure yours), and raise its height to half your stock thickness. Then notch four half-laps on the back of the mullion.

Notch the muntins. Use the fence to locate one end of the notch in the muntin's front face. Make the cut, flip the piece end for end, and make the second cut as shown. Adjust the fence and repeat the process until the half-lapped parts fit together tightly.



Dry-fit the door. Attach the muntins to the mullion, then install the rails before inserting that assembly into a stile clamped to your assembly table. Then lower on the other stile and make any necessary adjustments before glue-up.

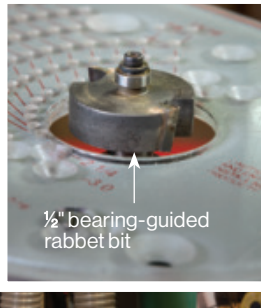
A frame and shiplap panel

Measure your cabinet back's opening to find the length of the ¾"-thick by 2½"-wide frame parts. Crosscut the parts to length. Rout ¼ × 1½ × 1" deep mortises in the stiles where shown in the drawing (p. 32), and cut the rail tenons to fit. Assemble the back frame. Secure the frame, and rout a ½"-wide, ⅜"-deep rabbet around the frame's interior in two passes. Chisel the corners square.

For the panel, mill two ¾"-thick boards 5⅛" wide and one about 5⅝" wide. (See drawing, p. 32.) Cut their length to fit the inside of your frame. For the two narrow boards, mill a ½" wide, ⅜" deep rabbet into one edge and then flip them over to rabbet the opposite edge. Saw rabbets in the same face for the wider board.

At the drill press, pre-drill pilot holes and countersinks in the boards. Install them as shown. Avoid using glue to allow for seasonal wood movement.

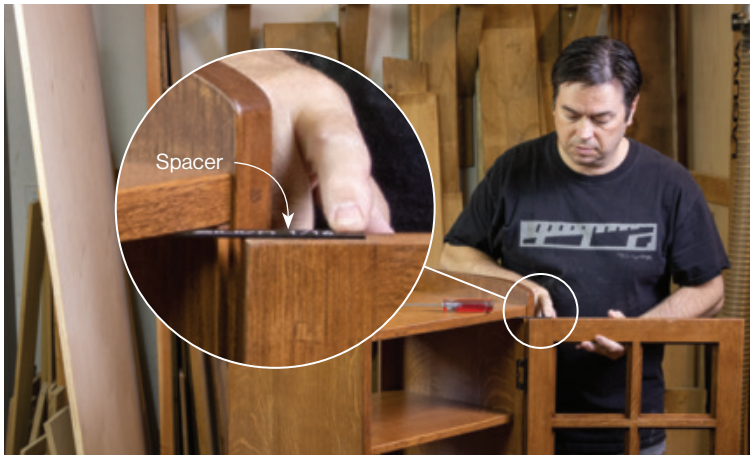
Assemble back frame. After making the frame parts to fit the back of your case and cutting the joinery, apply glue to each joint and tap them together as shown.



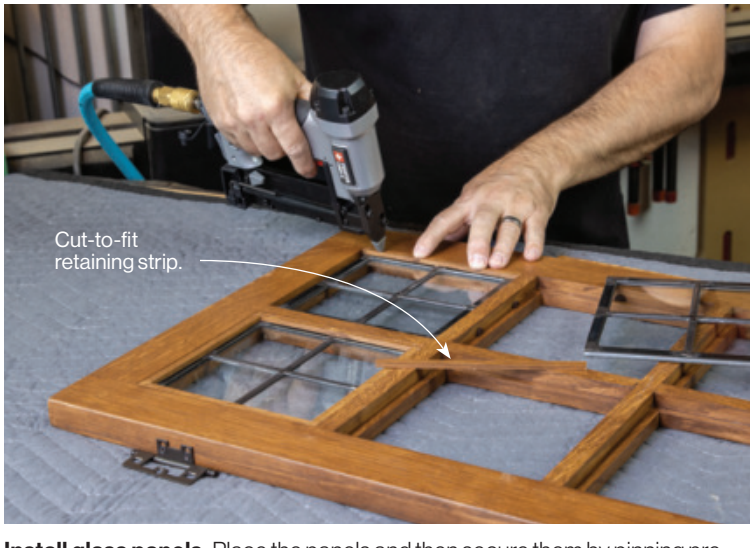
Rout the rabbet. Using a bearing-guided bit, rout a ½" wide rabbet ⅜" deep in two successively deeper passes, moving the router clockwise.

Install shiplap panel. Lay in one board at a time, hand-driving #6 × ⅝" screws through pre-drilled holes at their ends and along the outside edges of the outside boards. Use a 1/16" spacer to place the center board.

Drill for shelf pins. After locating the four adjustable shelves to align with the door's muntins, use a jig (see p. 60) to drill the shelf pin holes in the front and rear (shown) of the case sides.



Set the reveal. Install the hinges on the door first through pre-drilled holes. Then locate the door's vertical position using a 1/16" spacer and hand-tighten the hinge screws holding the door to the cabinet..

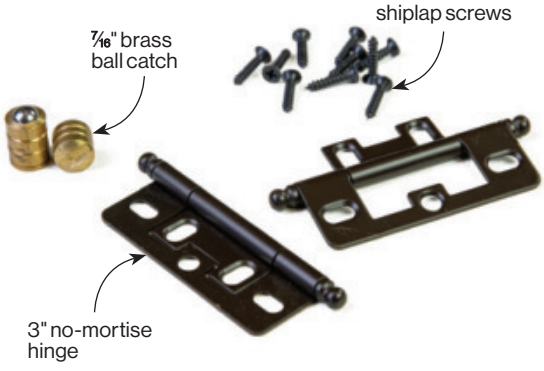


Install glass panels. Place the panels and then secure them by pinning pre-finished retaining strips into the frame as shown.

Finishing touches

Mill a ⅞"-wide hinge strip to match the thickness of your hinge barrel, and cut it to fit between the top and bottom shelves in the case front. Glue it in place. With the back panel temporarily installed, cut the backsplash to size. Cut the four adjustable shelve to fit, and trim the door to final size, aiming for a 1/16" reveal (see onlineEXTRAs). Glue the backsplash in place. Sand and finish all of the components. Locate and drill the ¼" shelf pin holes for the adjustable shelves.

Pre-drill for the hinge screws, then install the no-mortise hinges loosely to hang the door and set the vertical reveal. The barrel of the hinge abuts the hinge strip, and the 1/16"-thick hinge leaf sets the reveal side-to-side. Install the glass panels and reattach the door. Attach the ball catch and door pull. Finally, use 18 gauge × 1¼" brads to attach the back panel.



A note on finishing

An oil-based stain brings out the character of the quartersawn white oak. The color I use isn't available nationally, but it's similar to General Finishes Candlelight oil-based stain (See p. 60). Finish it off with the topcoat of your choice; I used two coats of satin lacquer, applied with a sprayer.

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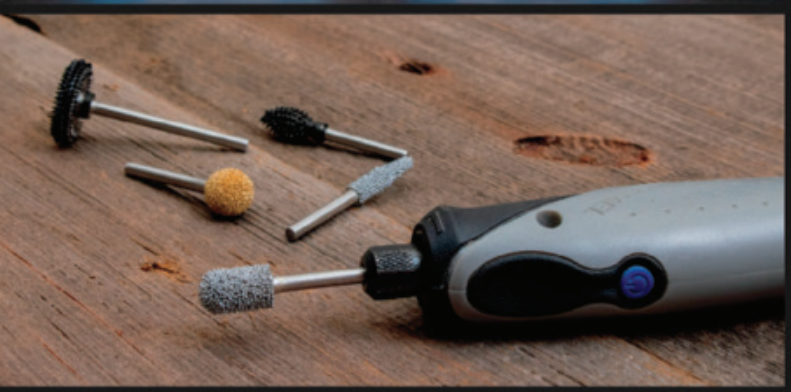

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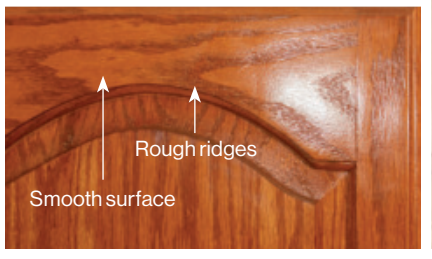
FEATURE

Pore FILLING

A recipe for enhancing your ring-porous projects

By Robert J. Settich



Pockmarked with pores. Ring-porous woods such as red oak can display a smooth surface followed by a darker band punctuated with large pores and rough ridges.

The cells in a tree perform an intricate symphony, harmonizing water, soil nutrients, carbon dioxide, and sunlight into a living composition that produces habitat, oxygen, shade, and beauty. But the music dramatically changes when a tree transitions into lumber. Some of the tree's previously hidden features can display incredible beauty, but the walls of some empty cells appear as prominent pores that can be completely out of tune with your project.

For example, if you apply a gloss finish to a ring-porous wood such as red oak, the smooth portions of the wood produced by the tree's latewood growth reflect light evenly. But the prominent pore structure in the earlywood appears as dark craters or even furrows, spoiling the overall effect.

Fortunately, it's not difficult to fill the distracting pores so that you'll have a uniformly smooth surface. The process relies on the simple ingredients painters traditionally used to make putty: oil and whiting powder—a pulverized form of calcium carbonate used as a mild abrasive and filler in paints. It's available at most paint and hardware stores (see Buyer's Guide, p. 60). The old-timers would dump a pile of whiting onto a mixing board, form a well in the center, pour in oil, and mix with a spatula until the mass congealed into a ball.

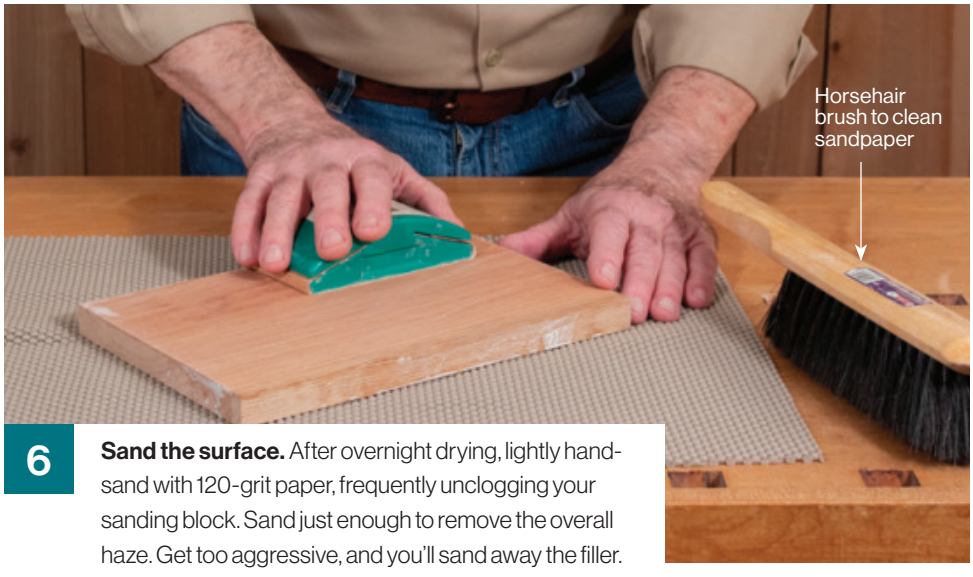
Even though you'll use identical ingredients, you're not aiming to make a putty for filling nail holes or repairing dented or missing wood. Instead, you're going to use the oil as a lubricant while you drive the whiting into the pores, creating an overall surface-smoothing treatment. And while the old recipe used a slow-drying oil such as linseed, you'll update that with a modern oil finish that has a drying agent for a firm grip in the pores. Let's get started.

Pore-packing procedure

Mix a few particular but easy-to-get items to form a paste. Oil the surface and then press the paste into the pores. Rub it in, squeegee it off, and let it dry. Then sand the surface smooth and seal it with shellac. A simple procedure, and there's even room to experiment.

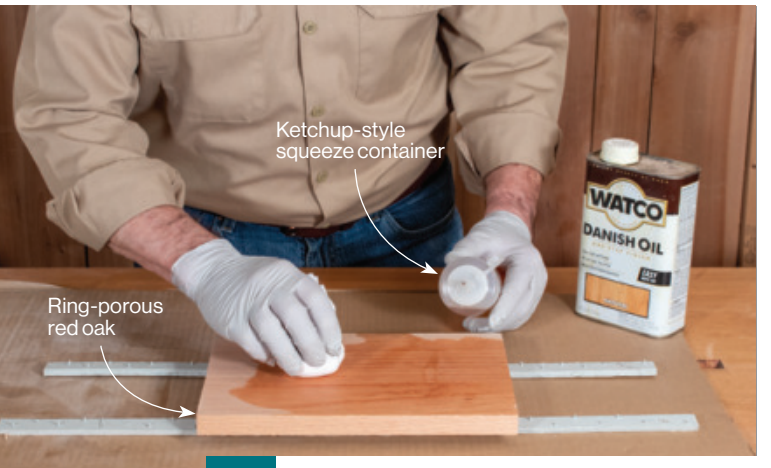
1 **Make the pad.** To make an applicator pad, cut cotton cloth into 8" squares. Old t-shirts are ideal. Wad two of them into the center of a third one and bind it with a rubber band.

4 **Wipe the excess.** Use a window squeegee to remove excess slurry. Stroke at a 45° angle to the grain direction. Wipe lightly with burlap scraps on edges and curved surfaces that you can't squeegee.



6 **Sand the surface.** After overnight drying, lightly hand-sand with 120-grit paper, frequently unclogging your sanding block. Sand just enough to remove the overall haze. Get too aggressive, and you'll sand away the filler.

Photos: Robert J. Settich



2 **Wet the work.** After sanding the wood to final smoothness, squirt on enough oil finish to liberally wet the surface when you spread it with your applicator pad.

3 **Mix a slurry.** Sprinkle whiting onto the oil, mixing it into a slurry resembling runny pancake batter. Add more oil or whiting to get the consistency right. Push the mixture into the pores with a figure-8 motion.

5 **Check your progress.** The surface will be slightly hazy, and a few squeegee lap marks are fine. The oil dries slowly, so you have plenty of open time. If the pores aren't completely filled, apply a fresh dose of slurry.

7 **Ready for finish.** Use a vacuum to remove all dust, then apply a thin coat of gloss shellac to check your success. You can apply more filler over the shellac or move ahead to your first coat of finish.

For darker woods

The dark side. To make a darker filler, keep some whiting in the mix as a binding agent but add rottenstone to deepen the tone. (Dark grey in color, rottenstone is powdered porous rock, usually weathered limestone mixed with silica, sold as a polishing abrasive.) You can premix the powders or do it on the fly.

Explore decorative filler effects

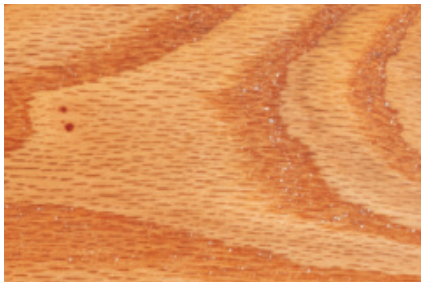
After you master the basic techniques of pore filling, you can expand your horizons to include decorative options. Whatever you add, it's a good idea to always include some whiting to provide body and help the filler grip the wood.

As with any new technique, preview the result on a small test panel instead of immediately slathering an untried compound all over a project. Exercising restraint is also a prudent approach. You have every right to satisfy your personal taste, but recognize that subtle effects are usually easier to live with than garish drama.

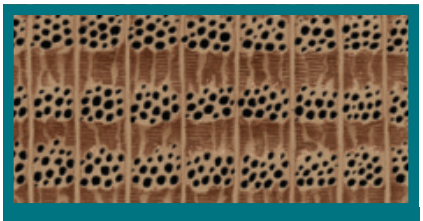
PolyColor powders usually tint Alumilite casting resin, but they can also provide interesting results as part of a filling compound. You can generate effects that are colorful, metallic, pearlescent, or all of the above. You can even buy a powder that will glow in the dark.

You can also experiment with powdered metals you buy in a crafts store or file yourself. These can add highlights of copper, brass, or aluminum to your project.

At a completely different level, you can literally spice up your project by exploring the spectrum at your grocery store. Choose among the subtle tone of cinnamon, the warm glow of turmeric, or the blazing colors of paprika and cayenne. Have fun and happy filling. ■



The spice is right. Here's a board filled with whiting but then spiced with a pinch of paprika and a dash of silver glitter.



To learn more about the formation of different pore types in living trees, please turn to the *Woodsense* article "Wood Pores" on page 54.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FEATURE

Turning Accessory CART

A sharpening "stooge" with tons of storage

By Ken Burton

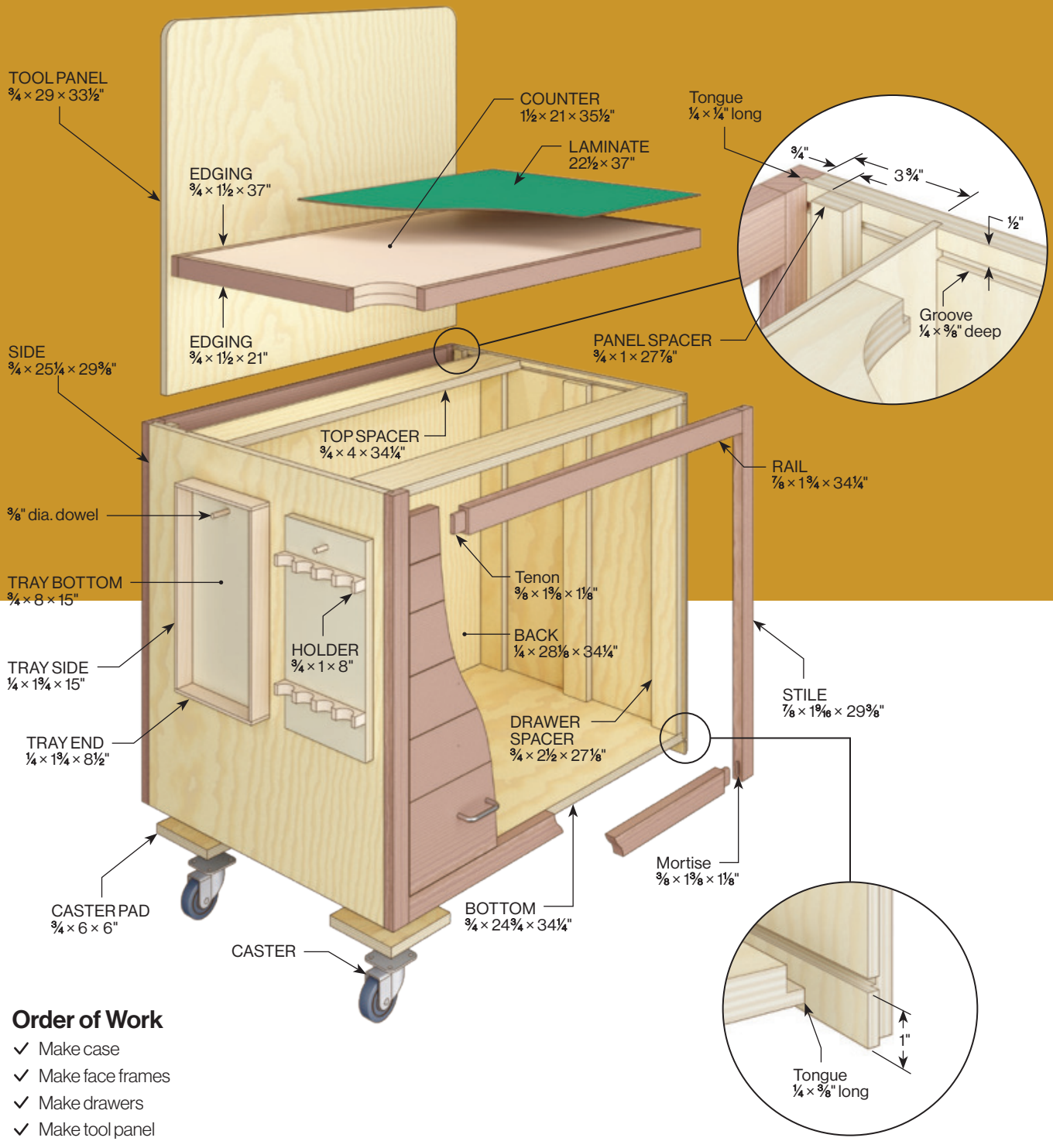
I needed to bring order to my burgeoning collection of turning tools and accessories. As I was thinking about how to do this, I recalled Jim Tolpin talking about his three shop "stooges" in the book *Working at Woodworking* (Taunton Press, 1991). These were a series of mobile carts and helpers that he used to make efficient use of his limited shop space. It occurred to me I could do something similar for my turning set up.

At the top of the list was a stand for my sharpening system followed by plenty of storage space for chucks, chisels, and the like. Finally, I wanted a panel for hanging calipers and other tools and supplies and a tray for the three or four chisels I'm actively turning with. The whole thing had to be mobile and not take up too much valuable real estate. A roll-around chest of drawers with a lift-up back panel seemed to fit the requirements. I sized the drawers to fit my chucks and chisels, with the top of the case at a good height for sharpening. Then I designed the back panel so it could be raised when needed, but collapsed quickly to get it out of the way. So far, my turning stooge has been a tremendous addition to the shop.

Photos: Ken Burton; Illustrations: Dan Thornton

A sturdy cabinet houses dovetailed drawers

The plywood cabinet is assembled with tongue and groove joinery. Mortise-and-tenoned face frames fore and aft along with the intermediate back panel prevent racking. The tool panel slides up and down in the space behind the plastic-laminated MDF countertop. Inside, dovetailed drawers glide in and out on heavy-duty, full-extension drawer slides (see page 52 for drawer details). The entire unit rolls around on 4" swiveling casters.



Order of Work

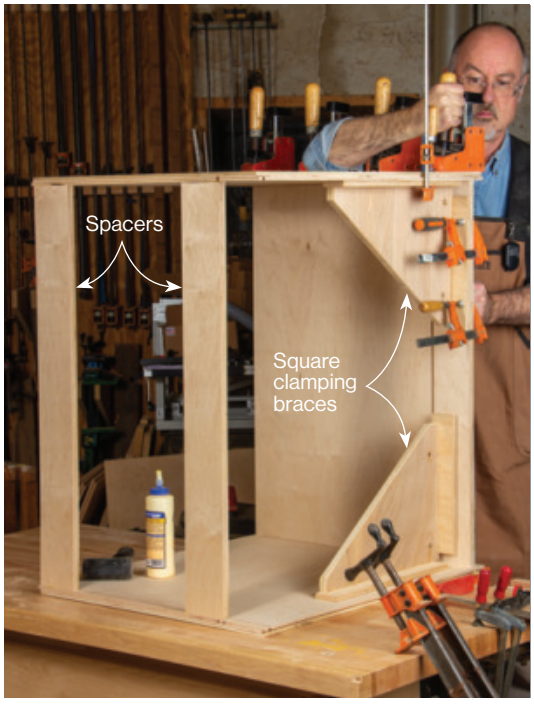
- ✓ Make case
- ✓ Make face frames
- ✓ Make drawers
- ✓ Make tool panel
- ✓ Laminate countertop
- ✓ Finish and assemble

Make the case

Cut the plywood for the sides and bottom to size. Also cut a piece for the top spacers to length, but leave it about 9" wide until after you cut the tongues on its ends. Set up a ¼" dado blade and cut grooves in the side pieces for the top and bottom joints as well as for the back. Also cut a matching groove in the bottom to receive the back. Increase the width of the dado to ⅝" and lower the cutting height a touch (<1/16") to guarantee the tongues aren't too long to seat properly. Cut tongues on the ends of the bottom and top spacers. Then lower the blade to ¼" and cut tongues on the front and back edges of the sides to mate with the face frames. Support the pieces with a tall auxiliary fence added to the saw's rip fence. Rip the top spacers to width before gluing up the case. Cut the back to fit and fasten it in place.

Cut the grooves. Set a ¼" dado to saw halfway through your plywood pieces. No need to measure, simply use the plywood's laminations as a gauge.

Cut the matching tongues. With a tall auxiliary fence in place, run the pieces vertically past the blade to cut the tongues. Start cutting them too thick, then bump the fence in to fine-tune the fit.



Assemble the case. Working alone, I found it easier to assemble the case on its side, clamping the bottom in place before turning everything upright to clamp across the top spacers. Shop-made braces clamped in the corners help to keep the assembly square.

Make the face frames and tool panel tracks

Mill the stiles and rails for the face frames to size—the dimensions given include the length of the tenons. Cut mortises in the stiles where shown in the drawing on page 49. I used a PantoRouter (see page 12), but there are many other methods. Cut the mating tenons on the ends of the rails. Glue the frames together. Then cut ¼ × ¼" grooves in the inside face of the stiles to match the tongues you cut on the case sides. Glue the frames to the case. Cut the panel spacers to size and screw them to the case sides as shown.

Cut the mortises. Attach a 1½" mortise template to the PantoRouter. Clamp the stiles to the table and rout the mortises with a ⅜" spiral bit. Because the bit is smaller than the inside of the template, the mortise will be shorter than the nominal size of the template.

Cut the tenons. Switch to a ½" bit to cut the tenons. Set the rear carriage stop so you can use the end of the bit to register the rails on the table before clamping them in place. Cut the tenons. For more information, see page 12.

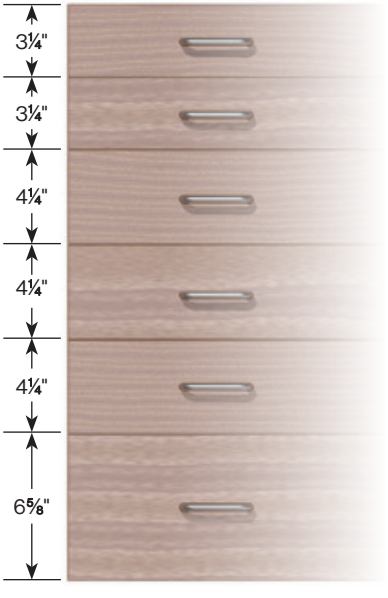
Add the panel spacers. Hold a scrap of the plywood you'll be using for the tool panel between the back of the face frame and the panel spacer as you screw the spacer in place.

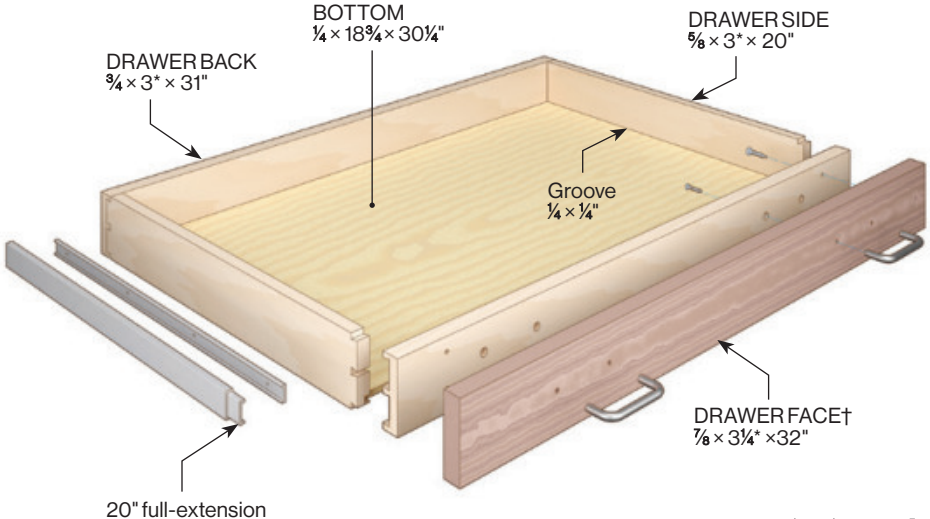
Make and hang the drawers

Mill the drawer sides and fronts to size and cut the corner joints. I used a router and a dovetail jig. Groove the pieces and install the drawer bottoms before gluing the drawers up. Mill drawer spacers to sit flush with the inside of the face frame and screw them to the case sides. Attach the drawer runners to the sides of the drawer boxes. Instead of centering them, I mount them flush with the bottom of the box meaning I can simply rest everything on my bench top as I screw the pieces together. Mount the other sides for the slides to the inside of the case using a spacer as shown.

Install the slides. To position the slides inside the case, cut a scrap of plywood to use as a spacer. Start with the top drawer then cut the spacer down for the second drawer and so on.

Drawer Details





* There are three drawer heights: 3¼", 4¼", and 6⅝". Drawer boxes are ¼" shorter.

† Cut to fit your face frame.

Make the tool panel, trays, and tool holders

Cut the plywood for the tool panel and tray bottoms to size. I used ¾" Baltic birch for both strength and looks—no need to edge band, just roundover and sand the edges. Cut and attach the tool holders to one of the trays and add sides to the other. Drill both trays for their hanging dowels. Position the tool panel in its slot and drill for the barrel bolts that will hold it up.

Cut the tool holder. To make the scalloped tool holder, cut a piece of stock to ¾ × 2⅛ × 8". Drill four 1½" holes along its length then cut the piece in half at the table saw.

Mark for the barrel bolt. With the tool panel propped up by two 24" long scraps, temporarily clamp ¼ × 2 × 5" spacers to its bottom edge and use the barrel bolts to mark the inside of the face frame for the support holes.

Make the counter top and finish up

Laminate two pieces of ¾" MDF to form the counter. Attach the edging and trim it flush with the surfaces before covering the counter with plastic laminate. Cut the drawer faces to size and fit them to the opening in the face frame before screwing them to their respective drawer boxes. Sand everything before finishing. I used a satin polyurethane for durability. Install the drawer pulls and screw the counter in place. Slip the tool panel in place and add the ¼" spacers before screwing the barrel bolts in place. Bolt the casters to the caster pads and screw them to the underside of the case. Hang your prefered selection of tools from the panel before taking your new stooge for a spin.

Add the laminate. Cut the laminate about 1" oversize in width and length. Spread contact cement on the mating surfaces and allow it to dry. Position the laminate over the counter on shelf standards or dowels. When you're happy with the placement, slip the standards out and apply firm pressure to set the bond, before trimming the plastic flush.

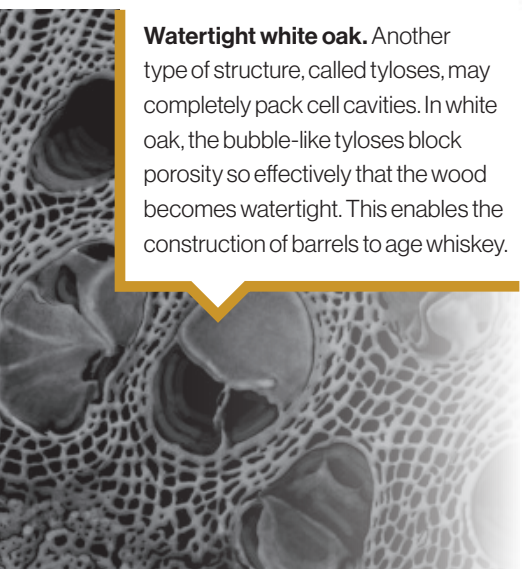
Wood Pores

Tiny holes that deserve a closer look

By Robert J. Settich

Your project's joinery may be absolutely airtight. Every surface may be sanded to perfection, and every angle may be spot-on accurate. But after applying a finish, you're disappointed with the result. For example, you make a small wall cabinet of white ash and lay down a coat of gloss finish. It initially looks great, but then the sunlight playing across its surface seems to magnify hundreds of tiny craters and dozens of shallow furrows. What's going on?

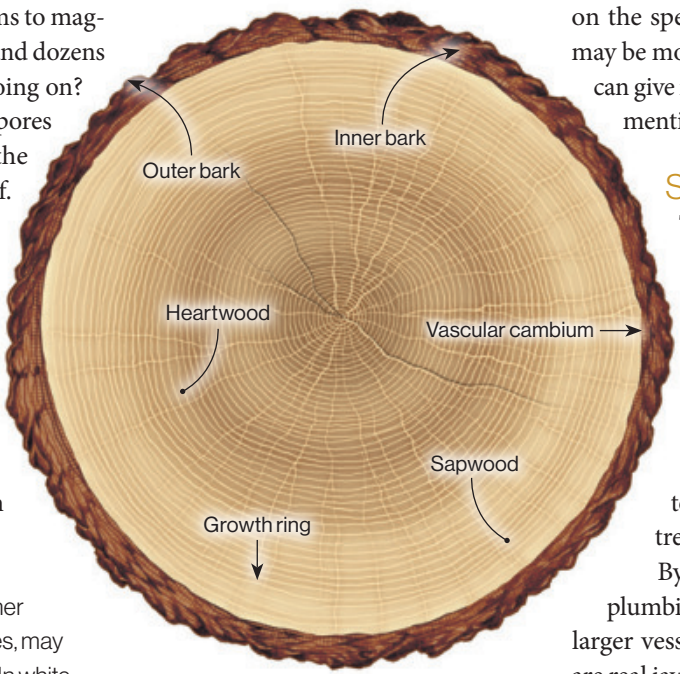
The answer lies in the tiny pores and vessels that are part of the architecture of the wood itself. I suggest a double-barreled approach to help you get the appearance you want. First, have a general knowledge of how the wood assembled itself in the tree. That will lead you to the second part: knowing how to overcome prominent pores with an appropriate finish.



Watertight white oak. Another type of structure, called tyloses, may completely pack cell cavities. In white oak, the bubble-like tyloses block porosity so effectively that the wood becomes watertight. This enables the construction of barrels to age whiskey.

Tree growth basics

The trunk of a tree is analogous to a bundle of soda straws—a series of tubes that conduct water and minerals up and down the tree. Each growing season, the sap moves throughout the sapwood, the living portion of the tree. In the vascular cambium—a very thin layer between the inner bark and sapwood—the tree creates new cells, increasing the diameter of the tree by one cell width at a time. The first cells of a growing period are called earlywood; subsequent cells form the latewood. Together, they create a growth ring. The outer group of rings are sapwood, the inner, heartwood.



White oak

As growth within a tree matures from sapwood into heartwood, profound changes occur at the cellular level. The contents of previously living cells die, and that space may be filled with water, resin, or other biochemical extractives that often give heartwood its darker hue.

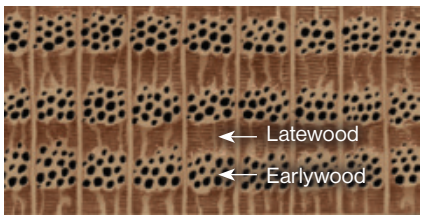
The basic tubular structure of sapwood and heartwood is the same. Depending on the species, these tubes, or "pores" may be more or less pronounced, which can give rise to the finishing problems I mentioned earlier.

Start at the end

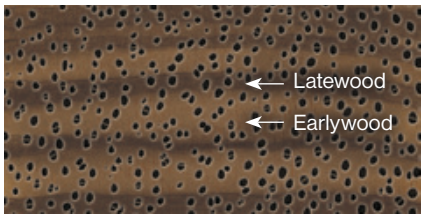
The easiest way to see tree rings and wood pores is by looking at a stump or the end of a board, commonly called end grain. In softwoods, you'll see rings but not pores. That's because conifers rely on microscopic resin canals to transport nutrients, so these trees are considered nonporous. By contrast, hardwoods have a plumbing system that utilizes much larger vessels. Some of these cell types are real jawbreakers to pronounce, but it isn't essential to distinguish them in this overview, so for convenience we'll call any open structure a pore.

Some hardwood pores are large enough to see with your naked eye, but a small hand lens or loupe with 8x to 10x magnification lets you see them—plus even smaller features—with greater clarity.

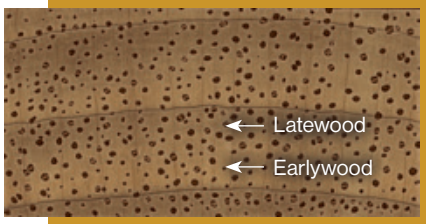
Illustrations: John Webster



Red oak (ring-porous)
10x scale



Koa (diffuse-porous)
10x scale



Butternut (semi-diffuse-porous)
10x scale

Three categories of pore patterns

In each hardwood species, the pores arrange themselves into one of three possible configurations. The first is called ring-porous. That simply means that the pores are concentrated along the newest growth region in the earlywood portion of the growth ring. This helps clearly define the starting line for each ring. This ring-porous pattern is typical for many—but not all—hardwood species grown in temperate climates with distinct seasonal patterns, such as North America. A few examples are red and white oak, black walnut, white ash, shagbark hickory, chestnut, and Osage orange. In general, it is these ring-porous species that benefit from using a filler as part of a glossy, film-building finish.

The second pattern is called diffuse-porous, meaning that pores of virtually identical diameter appear throughout the entire growth ring. This arrangement can make it very difficult to discern ring patterns. Diffuse porosity is very common in tropical hardwoods that can grow almost continuously throughout the year. Tropical examples include bubinga, Brazilian rosewood, cocobolo, koa, bloodwood, bocote, and Gaboon ebony. Some domestic examples are hard maple, boxwood, and basswood. These species generally do not require fillers.

The third category of pore distribution patterns is halfway between the bookends of the first two classes. It is called either semi-ring-porous or semi-diffuse-porous. (A distinction similar to a glass half empty or half full.) Whatever you call it, one distinguishing characteristic of this category is that the pore diameter decreases as they march into the latewood portion of the ring. Persimmon is one example, others include Spanish cedar, holly, cherry, and butternut. I recommend experimenting with these species to see whether or not you think a filler improves them. ■

Prior planning prevents poor results

High or low. High gloss finishes emphasize prominent pores. If you don't want to invest time in filling pores, consider a low-luster oil finish.

Proper preview. Scraps from your project are the perfect testing ground for new stains, dyes, or finishing techniques. For a proper preview, sand the scrap to the same level as your completed project.

Pore over these wood facts

Sap-moving stacks. Cells moving sap within the trunk are stacked on top of each other, and fluid conducts from the end of one cell into the next. The cell stack is collectively known as a vessel.

Shades of mystery. Heartwood formation processes are extremely complex, particularly those related to lumber color, and are not fully understood.

Empty cell. The walls of tree cells are not living elements. Their contents may be living (protoplast), water, or a wide variety of biochemicals, or the cell may simply be empty.

Busy grain. "Grain" may be the most hardworking word related to wood. One author lists 50 different ways that the term is used to describe timber.

Pore Filler

Flip to page 41 to see the author's method for filling pores.

Face grain furrows. When a cut reveals a side section of vessels, the voids can appear as coarse furrows, as seen in this illustration of ring-porous red oak.

WOODCRAFT magazine
EDITOR'S CHOICE

Valuable and reusable sandpaper

Diablo Sandpapers

In terms of material removal and eliminating scratch patterns as you move through the grits, I've found Diablo SandNet to have a slight edge over other mesh-style sandpapers. It's ceramic make-up cuts fast, and the nylon coating reduces pitch buildup. In the box, Diablo includes a connection pad that fits most sanders. Between this pad and the sheets' hook and loop design, it never loses grip. But where Diablo stands above is that it maintains efficiency for much longer. Plus, when a SandNet sheet clogs, simply pull it from your sander and shake off the dust or hit it with a burst of air from your compressor, reapply, and get back to work with the same sheet. If it gets really jammed up, run the sheet under water to clean it up. Sanding is notoriously boring, but it can be a little less tedious and costly with Diablo SandNet.
—Chad McClung

PRICE	50-pack for $20, available at The Home Depot
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Prices subject to change without notice.

Photos: Chad McClung

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No-math accuracy

General 147 Digital Caliper

One of my basic woodworking rules is that I can't make a measuring mistake if I don't measure. I'm a cut-to-fit guy. But when I do need to measure something, I want a fast, easy-to-read, and accurate result. That's when I reach for my stainless steel General 147 digital caliper with 6-inch capacity. The large LCD readout displays your choice of three modes: fractional inches, digital inches, and millimeters. Select the one you want by toggling the mode button at left. Rated accuracy is plus or minus 0.001" or 0.02 mm. The center button is the on/off switch, but the caliper also has automatic shut-off to preserve its battery. The zero button at right allows you to reset at any point along the beam to measure the difference between two points—no math required. In addition to inside and outside dimensions, the tool also measures depth. A fitted foam-lined plastic case houses the tool when not in use and stores a spare battery as well as a tiny screwdriver to access the compartment.
—Robert J. Settich

PRICE	$31.99, *acehardware.com*, #2133429
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Photo: Robert J. Settich

Buyer's Guide

Tool Reviews (p. 12)

1. PantoRouter All-In Machine Package ..... *pantorouter.com*, **$2,185.00**
2. Oneida Super Dust Deputy Deluxe Cyclone ..... #184393, **$269.99**
3. Festool CTC SYS Cordless Extractor ..... *festool.com*, **$399.00**
4. Jess-Em Pow-R-Tek SR ..... *jessem.com*, **$499.99**

Louvered Interior Shutters (p. 22)

1. Freud Traditional Beading Bit, ⅛" R, ¼" SH ..... #828782, **$38.97**
2. Shutter Moulding Router Bit ..... *eagleamerica.com*, #175-0735, **$64.95**
3. Shutter Tension Pin ..... *shuttermedic.com*, **$0.16**
4. Nylon Louver Pin ..... *shuttermedic.com*, **$0.12**
5. Wood Screws, Phillips Round Head, Zinc Plated, #5 x 1", 100 pc ..... *boltdepot.com*, #11589, **$9.53**
6. Screw eyes, Zinc Plated, 3/16" I.D., 100 pc ..... *boltdepot.com*, #15484, **$8.49**

Dog Feeder (p. 28)

1. Wonder Compression Bit, ⅛" ..... *bigwoodstudio.net*, **$12.00**
2. Vention Small Steel Dog Bowls, 2 pc ..... *amazon.com*, **$17.49**

Stickley Music Cabinet (p. 31)

1. Freud Spiral Upcut Router Bit, ½" D, 2" CL, ½" SH ..... #838515, **$88.97**
2. Whiteside Flush Trim Upcut Spiral Router Bit, ¼" D, 1" CL, ¼" SH ..... #127465, **$52.99**
3. Whiteside Flush Trim Spiral Combo, ⅞" D, 1⅛" CL, ½" SH ..... #154274, **$229.99**
4. Whiteside Rabbeting Bit Set, ½" SH ..... #143223, **$81.99**
5. General Finishes Oil-Based Wood Stain, Candlelight, qt ..... #828275, **$38.99**
6. WoodRiver 13-Hole 32mm Spacing Shelf Pin Drilling Jig ..... #150720, **$29.99**
7. WoodRiver ¼" Self-Centering Drill Bit ..... #150722, **$19.99**
8. Vertex Brass Ball Catch, 7/16" ..... #158218, **$10.99**
9. Solid Brass 2 1/2" Non-Mortise Ball-Tip Cabinet Hinges, Oil-Rubbed Bronze Finish (Pair) ..... *houseofantiquehardware.com*, **$37.99**
10. Stickley Style Arts & Crafts Vertical Pull with "V" Shape Ring ..... *houseofantiquehardware.com*, **$16.79**
11. Glass Panels (leaded or plain) ..... see your local custom glass dealer

Pore Filling (p. 43)

1. Whiting Powder, 1 cup ..... *atlaspreservation.com*, **$5.95**
2. Watco Natural Danish Oil, 1 qt. ..... #159437, **$26.99**
3. Rottenstone ..... *naturalpigments.com*, #510-13ROT, **$16.00**
4. Alumilite PolyColor Resin Glitter, Silver, 15g ..... #174906, **$15.99**
5. Alumilite PolyColor Resin Powder, Gold Metallic Dust, 15g ..... #174875, **$15.99**
6. Alumilite PolyColor Resin Powder, Diamond Dust Metallic, 15g ..... #174899, **$15.99**

Turning Accessory Cart (p. 48)

1. Torino Wire Pull, 3½" ..... #855717, **$2.49**
2. Highpoint 20" Full Extension Side Mount Drawer Slide ..... #160244, **$18.99**
3. WoodRiver 4" Swiveling Double Locking Caster ..... #141050, **$23.99**

Great Gear (p. 56)

1. Diablo SandNet ..... *homedepot.com*, **$19.97**
2. General 147 Digital Caliper ..... *acehardware.com*, #2133429, **$31.99**

Expert Answers (p.62)

Following available from sciencecompany.com

1. Cupric nitrate, 100g ..... #NC-0303, **$14.95**
2. Ferric nitrate, 100g ..... #NC-11220, **$13.95**
3. Potash, Sulfurated, 500g ..... #NC-0729, **$46.95**

Items above available at Woodcraft stores, at *woodcraft.com*, or by calling (800) 225-1153, unless otherwise noted. Prices subject to change without notice.

Ad Index

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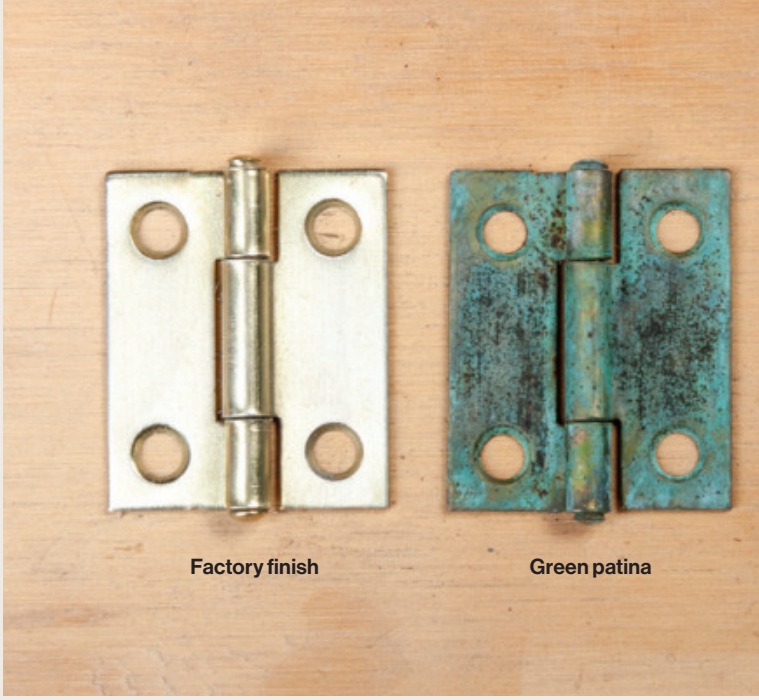
A custom patina

"I often use brass hinges, screws, and pulls in my work. I know I can buy products with various antique effects, but how can I customize my own colors and finishes on brass hardware?"

Regan Lumley
Henderson, NV



Q & A

Sophie Glenn is a metal worker, woodworker, furniture designer, and sculptor based in Reading, Pennsylvania.

Three common formulas

These three basic mixes will get you started customizing brass hardware, but you can also experiment to see their effects on other metals. Some patinas work better on copper alloys, such as brass and bronze, while others work better on steel or nickel.

Green patina
1 tsp cupric nitrate
1 pint distilled water
hot application

Brown patina
½ tsp ferric nitrate
1 pint distilled water
hot or cold application

Black patina
1 tsp sulfurated potash (liver of sulfur)
1 pint distilled water
hot or cold application

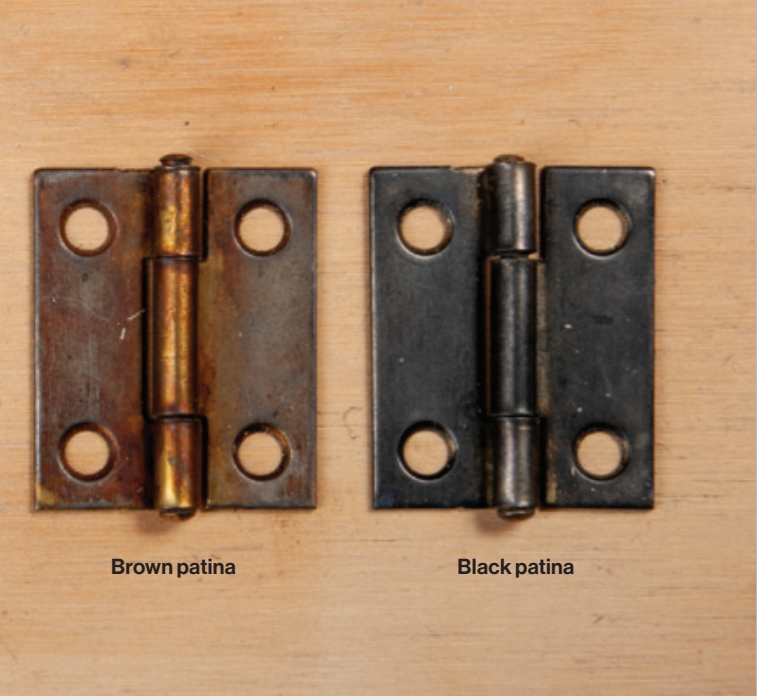
Crystalline solids can be purchased through *sciencecompany.com* (See Buyer's Guide p. 60).

Painting patina. Handle heated hardware with pliers or tongs and apply patina with a natural bristle brush. Drive screws into scrap wood to secure them before patinating their heads to match the hardware.

One of the more fun and foolproof methods of adding color to metal is through the process of patination or chemically oxidizing a metallic surface to change its color. Patinas develop naturally over time when metal is exposed to the elements, as in the case of green copper roofs or dark brown bronze statues. But by applying a few different chemicals, we can expedite this process and control the color. Some commercially available patina solutions come premixed so that achieving a particular color is as easy as following the directions on the bottle. And there are methods of using common household chemicals that work well. But neither allow much customization of the end result.

I prefer mixing my own patinas from crystalline solids that are easily diluted in water and can be mixed together to achieve a multitude of different colors. I've included a few staple recipes here, but if you want to experiment further,

Photos: Sarah Marriage



Brown patina

Black patina

check *sciencecompany.com* for additional recipes and safety info.

To start, ensure that the surface of the hardware is clean, which includes removing any clear coating applied by the manufacturer. I recommend soaking the hardware in acetone and then scrubbing the lacquer off with a brass wire brush. Patina recipes typically indicate whether they are a hot or cold application, meaning that the surface of the hardware needs to be either heated or left at room temperature before application. For hot applications, warm the hardware with a propane torch or heat gun on a fire-safe brick, or simply leave it in the sun for a few hours on a hot day.

Once the hardware is prepped, it's time to apply. Working in a well-ventilated area and wearing vinyl or nitrile gloves, mix your desired patina solution and use a bristle brush to paint a thin layer onto the hardware. Let it dry before applying another coat. Repeat this process until the desired color is achieved. If you don't like the results, you can sand it off and try a different solution. Keep experimenting until you reach a patina you prefer. To finish, buff the surface with a white scotch-brite pad and seal your custom creation with lacquer or wax. ■

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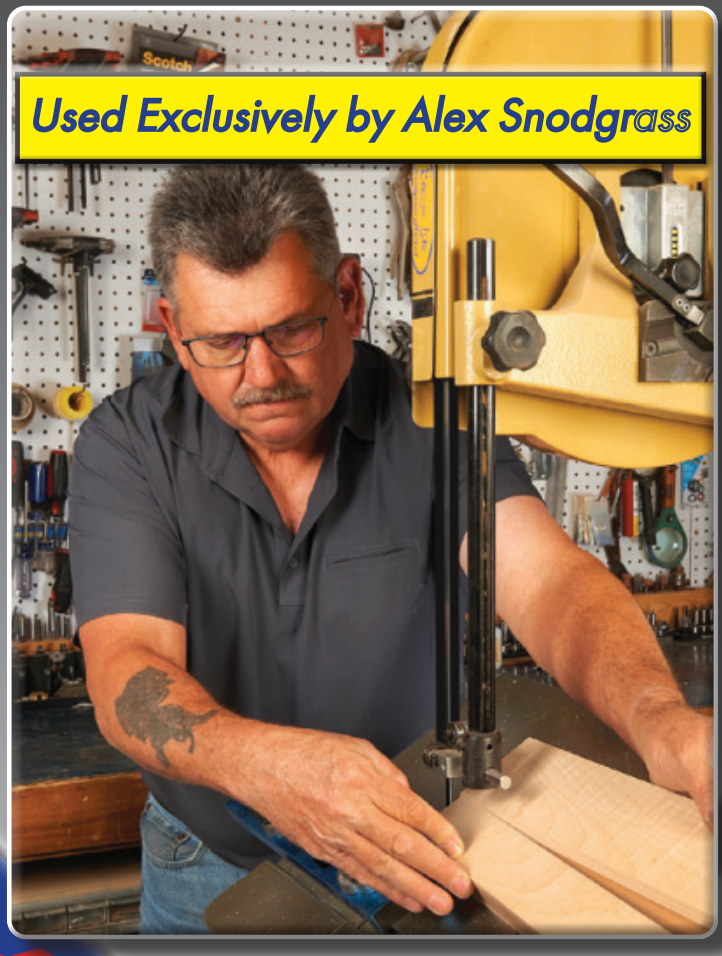

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