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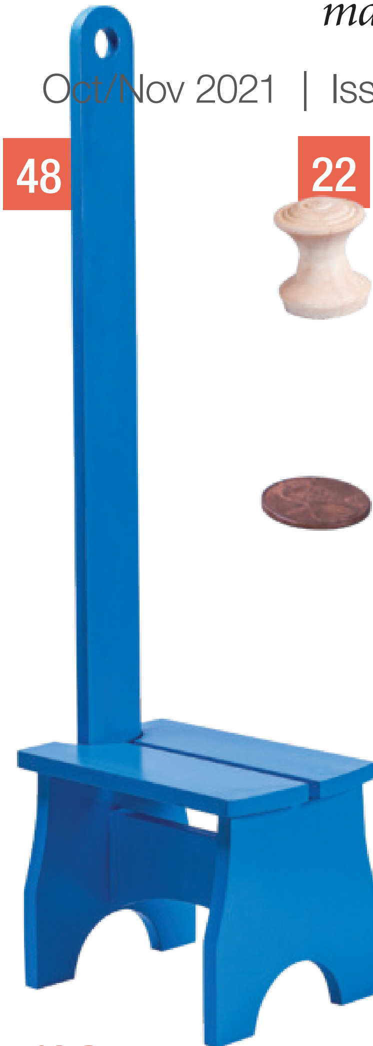

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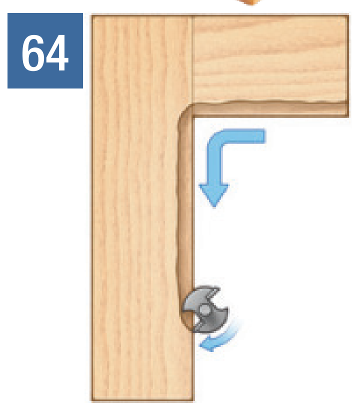

Cover photo: Asa Christiana

Sending our work into the world

As both of my daughters pack for college, preparing to empty the nest, I've been busy preparing for my next project. As I take measurements, lay out parts, and cut joints, it strikes me how much building projects in our shops is akin to raising children in our homes.

As we do with our children, we can't help but imbue our projects with a certain amount of ourselves. We strive to incorporate beauty, integrity, strength, and stability into our tables and chairs and cabinetry. Wielding the tools we have, we make the best decisions we can, some based on experience, others driven by gut instinct. Along the way, of course, things don't always go smoothly. Wood often misbehaves, requiring patience and finesse on our parts to make things come together (since force seldom works). And we certainly make our share of mistakes that we just have to do our best to repair. But we persevere, hoping our building techniques are sound and that our work will prove itself worthwhile in the world.

On the pages ahead, you'll find plenty of projects to parent from a mere notion to a piece with purpose. Take the Murphy bed (p. 38)—a perfect solution for a family in flux. One minute, it's an office, and the next it's a place for visiting college kids to crash. Count the minutes until the kids leave again with a Craftsman-style wall-hung clock (p. 32). Its design features decorative coves and steep bevels cut at the table saw (p. 26). Learn other valuable techniques and have fun while doing it with the fridge magnet project (p. 22), which is also a great starter for fledgling turners. For younger kids who need a boost, build the simple Shaker-inspired step stool (p. 48).

As for me, it's time to relinquish the two projects I'm most proud of. As my daughters set out into the world, I can only hope that my best work will thrive and do good work of its own. ■

Chad McClung

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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Have a tough woodworking question?
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Share photos of your projects:
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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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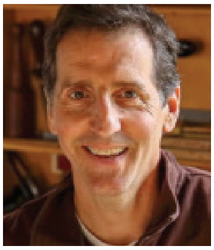
Tim Rousseau


Gary Rogowski

The Center for Furniture Craftsmanship in Rockport, Maine, has launched a free online library of best practices in woodworking, available on its website, *www.woodschool.org/videolibrary*. "Welcome to Woodschool" is a series of 50 instructional videos presented by Tim Rousseau. Topics range from tool sharpening to hand-cut dovetails.

Meanwhile, Gary Rogowski has closed the actual doors to The Northwest Woodworking Studio, his school in Portland, Oregon, but its virtual doors remain open. Students will learn traditional woodworking techniques in live-streamed, build-along classes called the Online Mastery Program.

Nuts about squirrels

The Oven Squirrel (Aug/Sept 21) has been used in our house for many years. My father-in-law gifted us a couple 30 years ago. Having made some myself, I find them easier to cut on a scroll saw than a band saw. Anyway, thanks for the memory!
—Bryan Swenson, Carrollton, TX

After creating a template to make several oven squirrels, I discovered not all cookie sheets are the same. Even after making one that worked with my favorite sheet, I found I had to change the shape to work with another. Still a handy project.
—Ron Roase, Via email

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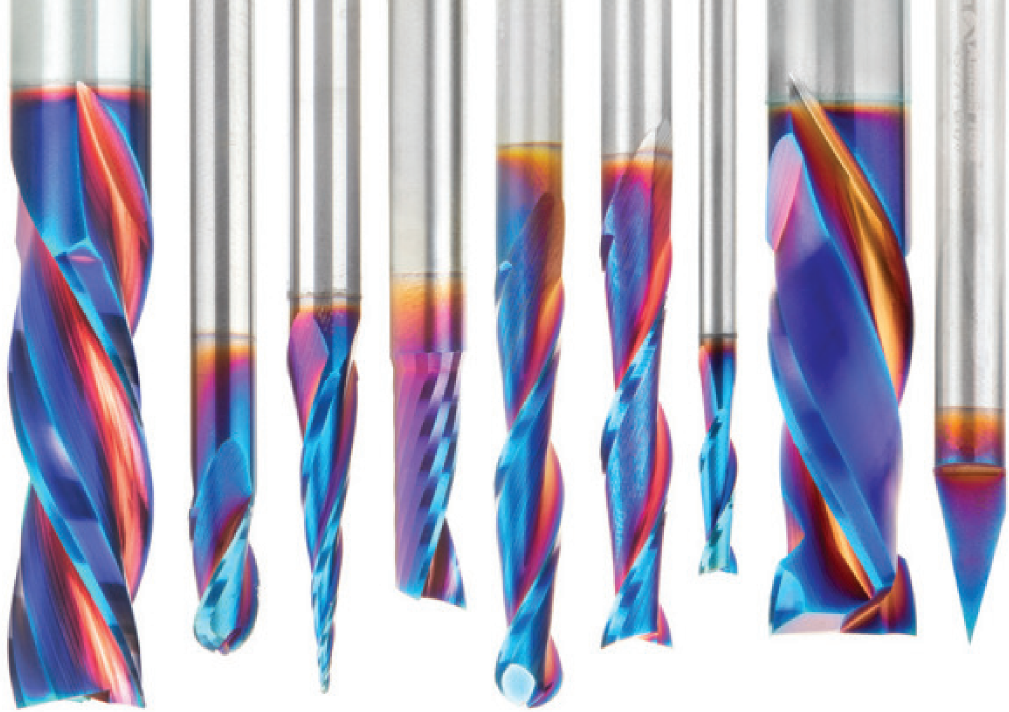

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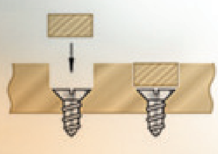

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Demanding supplies

A perfect storm of factors has delayed shipping worldwide, and the woodworking tool industry is not exempt. "Demand continues to be high in the power tool industry while overseas factories are experiencing the same COVID and labor issues we're seeing domestically," said Jessica Douglas, Woodcraft's Director of Multi-Channel Sales. Demand surged as people spent more time at home early in the pandemic. But on the supply side, a shortage of dockworkers and truck drivers has meant delays in offloading ship containers and getting their contents to distributors. This results in fewer ships and cargo containers available to transport goods from overseas. The supply/demand imbalance has led to increased costs, according to Joe Taylor, Rikon's Vice President. "Freight costs have gone up 1000% over the past six months. This could continue for another 6-12 months." ■


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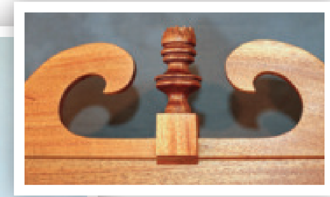
Reader Showcase



BUD BROOK,
KENNESAW, GA

Fit for a queen. Even though he's only been building furniture for a few years, Georgia woodworker Bud Brook pulled off this beautiful Queen Anne-style dressing table. The project marked a few firsts for him, including making cabriole legs, half-blind lipped drawers, and a turned finial. Designed and built for his girlfriend, the lowboy measures 39" wide, 18" deep, and stands 65" tall. The matching upholstered seat measures 20 × 14 × 18". Brook built both of African mahogany, using pine and poplar as secondary woods.

JIM SMOLLER,
PITTSBURGH, PA

More horsepower. Jim Smoller enjoys building toys for his grandchildren. He followed up his ride-on Ford woody (Dec/Jan 21) with this oak equine. Smoller's take on the kid-friendly classic features leather ears and a saddle he upholstered. The yarn mane and tail are attached with hot glue, and the steed was given a paste wax rub-down. We're sure his grandchildren agree, this toy rocks!

JOE GASS,
CHARDON, OH

Turning the table. At his daughter's request, woodworker Joe Gass crafted this elegant side table inspired by Michael Kehs's turned table (April/May 21). Gass glued up blanks from assorted flat scraps of oak, walnut, poplar, cherry, and alder before turning them on the lathe. He finished the project with Waterlox sealer. At 24" tall with a 14" diameter top, Gass's table stands a bit shorter and wider than Kehs's original, making it more stable around his three active grandsons.

ZANE EDGE,
ALPHARETTA, GA

It's about time. Working on the project on and off for a couple of years, hobbyist woodworker Zane Edge designed and built this clock in honor of his uncle, a woodworker and clockmaker. The timepiece stands 82" tall and 17" wide. The case is constructed of quartersawn sapele, with a pommele sapele back panel. A large beveled glass front displays the impressive weight-driven Hermle clock movement. Edge's work on this beauty was definitely not a waste of time! ■

onlineEXTRA

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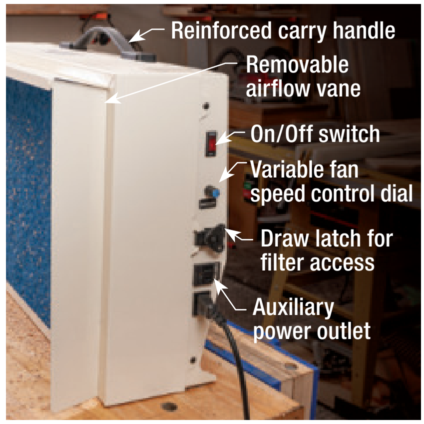

Air filtration units are essential to a safe shop; no dust collection system is complete without one. They pull particles from the air that would otherwise make their way to our lungs—a serious health risk. Rather than whole-shop filtration, the BenchTop DC from Oneida Air Systems captures these hazardous particles at the source. Here's what I found after testing this personal dust collector in my shop for a few weeks.

The $600 machine is ready to go with virtually no assembly, only a detachable 110V power cord to plug in and a trio of airflow-directing vanes to install. Its carry handle and 20-lb weight make it easy to tote around the shop. The rocker switch triggers the 0.3 HP motor for up to 535 CFM of airflow. A simple analog dial controls the six variable speed fans. Draw latches at each end unlock to access the dual-filter system—a MERV 5 pre-filter and MERV 15 primary filter. Cleaning the filters was easy: I placed them in bags and tapped them on the floor, and then rinsed the pre-filter with water. Replacement filters are available from Oneida and hardware stores.

The 25¼ × 16½ × 9¾" BenchTop DC should sit within 20" of the work. If you find it tough to clear a space on your bench, a shop-made stand may help. Once in position, I noticed an appreciable decrease in dust. Oneida claims the MERV 15 filter captures 85-95% of particles sized 0.3-1 microns and 95-100% of particles between 3-10 microns. This machine is not designed to filter fumes or for use in a spray booth.

As a test, I plugged my random orbit sander into the unit's auxiliary power outlet and sanded some padauk. Later, I placed the unit behind my lathe while sanding a project. I also tried it near my old contractor saw while ripping a few boards to capture the fine dust coming off the top of the blade. And I set up the machine while hand-sanding between coats of finish on another project. In all cases, the BenchTop DC collected fine dust that may have otherwise drifted to my lungs.

Oneida has designed a machine to fill a specific niche—capturing dust from sanding, turning, sawing, and other operations such as power carving that generate hard-to-contain dust. The Bench-top DC immediately filters those fine dust particles that would otherwise escape capture and float around your shop before being lifted to your ceiling-mounted unit. This at-source filter will help to protect your lungs. ■

—Tester, Chad McClung

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Photos: Chad McClung

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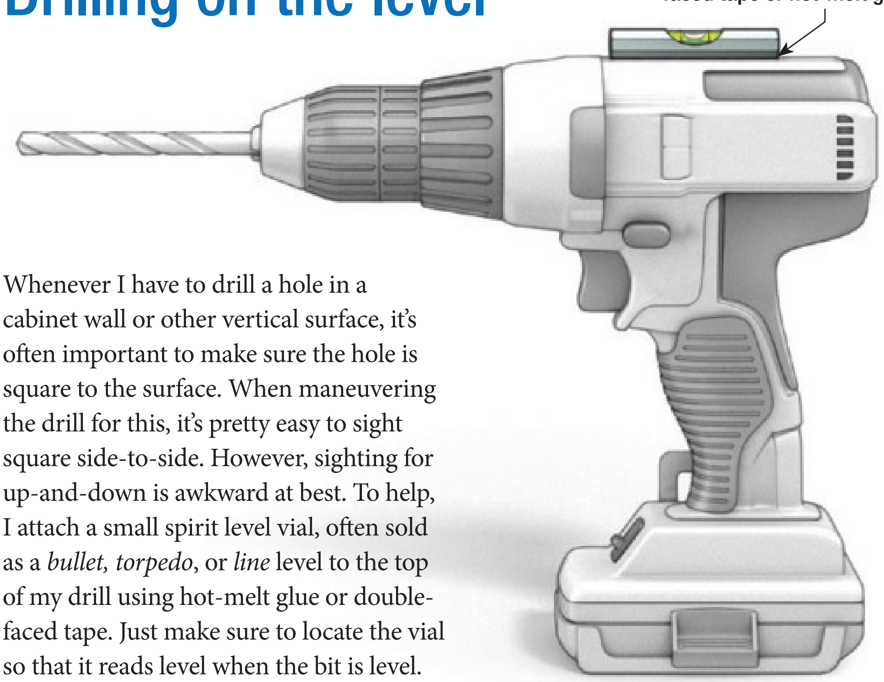
TOP TIP

Drilling on the level



Whenever I have to drill a hole in a cabinet wall or other vertical surface, it's often important to make sure the hole is square to the surface. When maneuvering the drill for this, it's pretty easy to sight square side-to-side. However, sighting for up-and-down is awkward at best. To help, I attach a small spirit level vial, often sold as a *bullet, torpedo*, or *line* level to the top of my drill using hot-melt glue or double-faced tape. Just make sure to locate the vial so that it reads level when the bit is level.

—Joe Pestana,
Stoneham, Massachusetts

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BUILDING.
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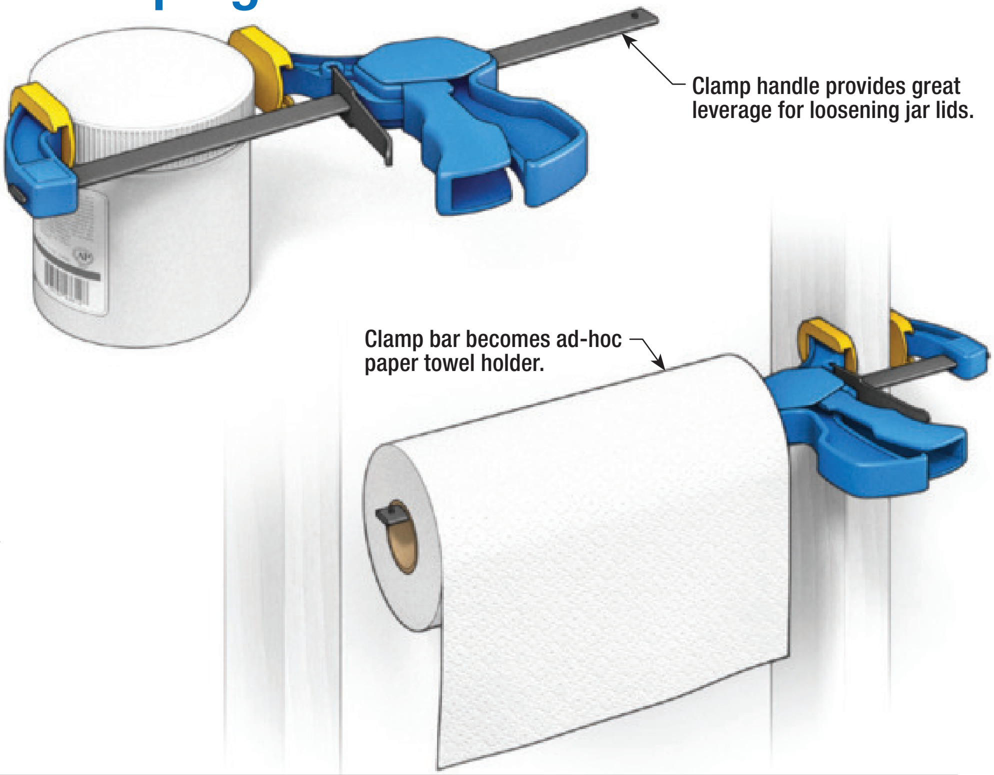
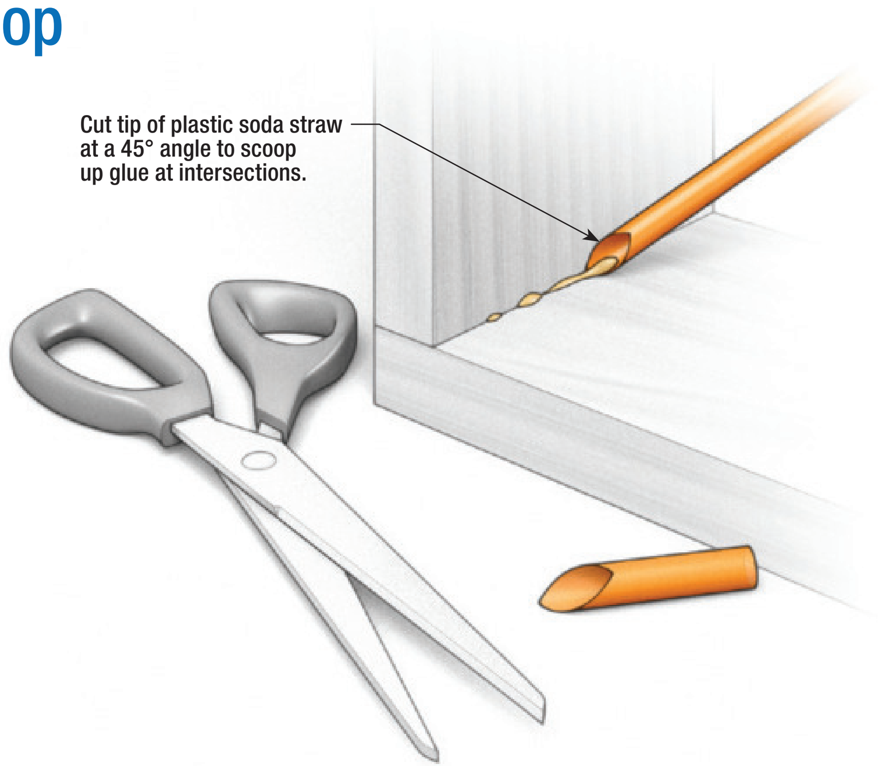
Multi-purpose clamping



I find that quick-grip clamps have lots of other uses besides holding workpieces together. The strong, deep jaws and long bar on such a clamp makes it a great levered wrench of a sort for loosening everything from jar lids to blanks stuck on the lathe. These clamps are just as useful in the same fashion around the home and garage for wrenching plumbing fittings, oil filters, and many other stubborn parts of different sizes and shapes. To top it all off, I recently discovered that clamping one to an exposed wall stud makes a great paper towel holder!
—Richard Entwhistle, Highland Lakes, New Jersey

Straw glue-scoop

Glue squeeze-out at panel intersections can be difficult to clean up. If you wipe it up with a wet rag, you risk dragging diluted glue into the wood grain, where it will resist finish. Scraping it up with a putty knife or other tool can be a similarly messy proposition. Try this instead: Nip the end off of a plastic soda straw at a 45° angle and use it to scoop up the wet glue. The sharp tip targets the corner, while the edges hug the walls, neatly forcing the glue up into the tube. Once you've gotten rid of the majority of the squeezeout this way, a follow-up swipe with a clean, wet rag takes care of any residual glue.
—Kat Nash, Richmond, VA

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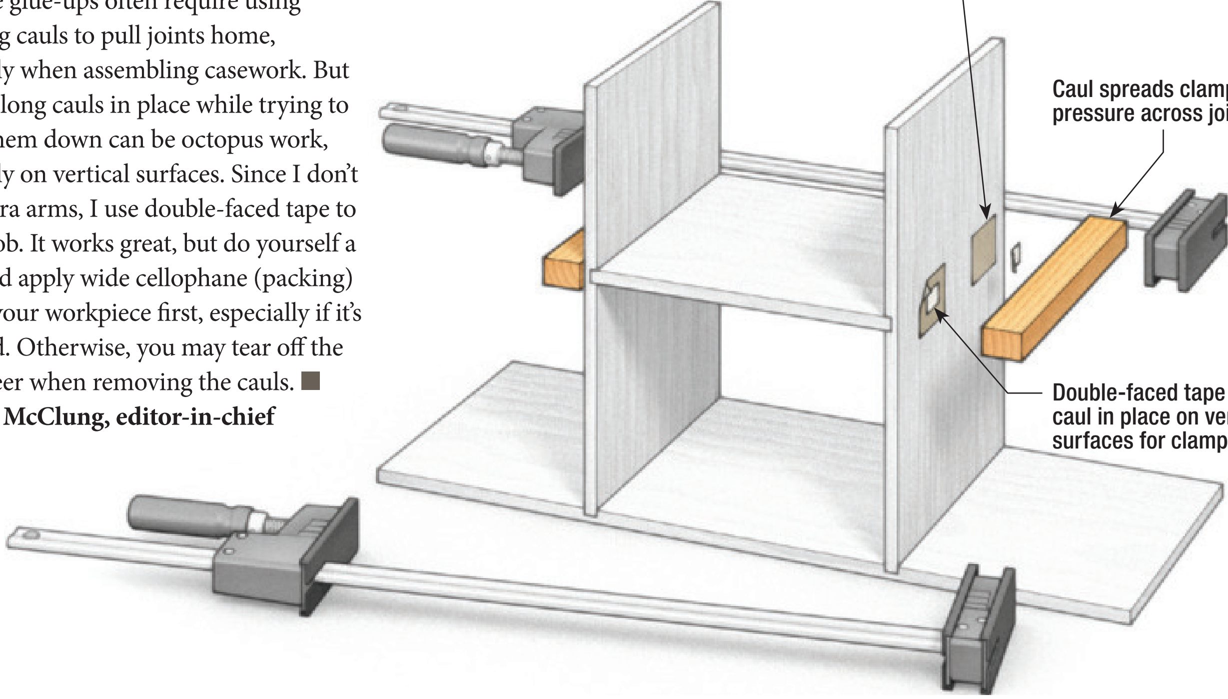
Taping your cauls

Effective glue-ups often require using clamping cauls to pull joints home, especially when assembling casework. But holding long cauls in place while trying to clamp them down can be octopus work, especially on vertical surfaces. Since I don't have extra arms, I use double-faced tape to do the job. It works great, but do yourself a favor and apply wide cellophane (packing) tape to your workpiece first, especially if it's plywood. Otherwise, you may tear off the top veneer when removing the cauls. ■

—Chad McClung, editor-in-chief



FUN with FRIDGE MAGNETS

Have a micro-blast turning precious scrap into useful hangers-on

By Paul Anthony

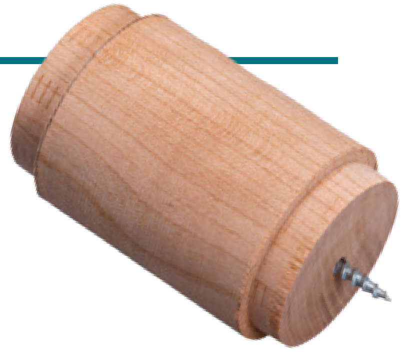
It's the rare woodworking endeavor that's low-cost, no-risk, and that offers the reward of honing your skills while producing nice-looking, useful items. Making refrigerator magnets checks all those boxes. It doesn't involve any special commercial equipment—just regular turning tools, a 4-jaw chuck, and a lathe-mounted drill chuck. As for materials, this is the perfect opportunity to use those scraps of precious wood that you can't bring yourself to throw away. There's no real risk involved because even if you ruin a piece, it's just a tiny bit of wood. This dispensability gives you the freedom to practice cutting coves, beads, fair curves, and other basic shapes. All in all, it's great fun that yields li'l surprises you can stick on friends' fridges when they're not looking.

The system I've developed here focuses on creativity and efficiency using commonly available ¾" stock and ⅜"-diameter rare-earth magnets. The finished pieces are small enough that they don't obscure photos, yet strong enough to hold postcards and multiple pieces of paper. The key to quick production is a simple shop-made screw chuck and double-faced tape, which together securely hold a small blank for shaping, sanding, and finishing a piece, typically in 20 minutes or so. So if you're looking for some productive fun and perhaps a safe way to teach a youngster at the lathe, take a turn for the refrigerator!

Order of Work

- Make screw chuck
- Prepare blanks
- Shape, sand, & finish

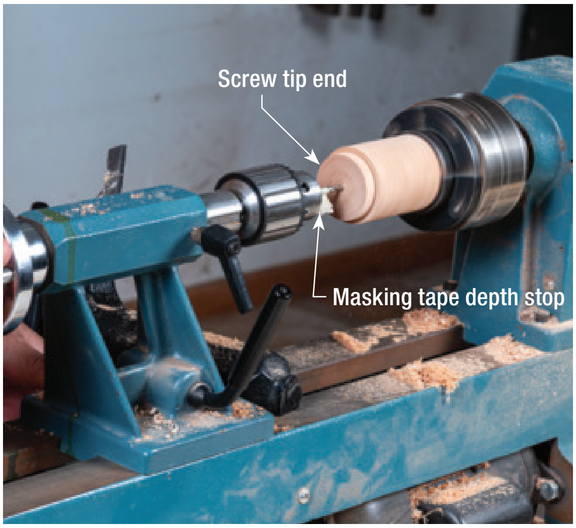
Make the screw chuck



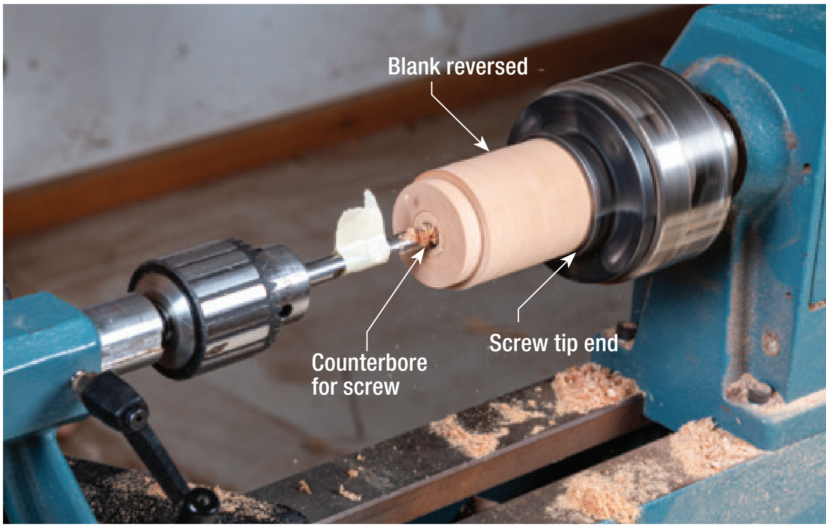
Mount a 4-5"-long maple (or other dense hardwood) blank in a 4-jaw chuck and turn a cylinder with a tenon as shown. I work at about 1800 rpm when turning the chuck and magnet blank, using a roughing gouge and parting tool. Reverse the blank in the chuck, and part it off to 3" long (including the previously turned tenon). Then true the end, and turn another tenon. Bore the pilot hole, reverse the blank, and drill the counterbore in the other end. Remove the piece and drive in a #8 × 2½" woodworking screw. You now have a wooden screw chuck with a tip that projects about ¾", which is perfect for the job.

Turn a cylinder with a tenon. Turn most of a 4-5"-long blank to a 2"-dia. cylinder, then shape a 1⅞"-dia. × ⅜"-long tenon on the end. When the blank is reversed for the next step, the tenon shoulders will register against the chuck's jaws to ensure that the piece runs true.

True the end. After reversing the blank in your 4-jaw chuck, part off the square end, leaving the piece 3" long. Then use a fingernail spindle gouge to true the end of the blank for good contact with the workpieces later. Afterward, turn another 1⅞"-dia. × ⅜"-long tenon on the end. (The tenon shoulders will make the blank run true when drilling the counterbore.)



Drill the screw pilot hole. Use a lathe-mounted drill chuck to bore a 5⁄32" hole 2" deep into the blank to serve as a pilot hole for a #8 screw.

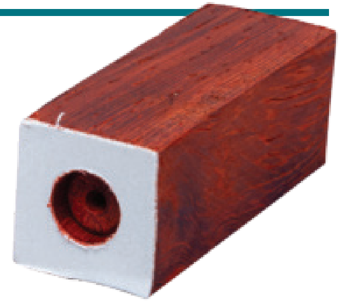


Drill the counterbore. Reverse the blank for the third and final time and drill a ⅜" hole 1¼" deep into the blank to create a counterbore for a #8 × 2½" woodworking screw.

Photos: Paul Anthony

Prepare your blanks

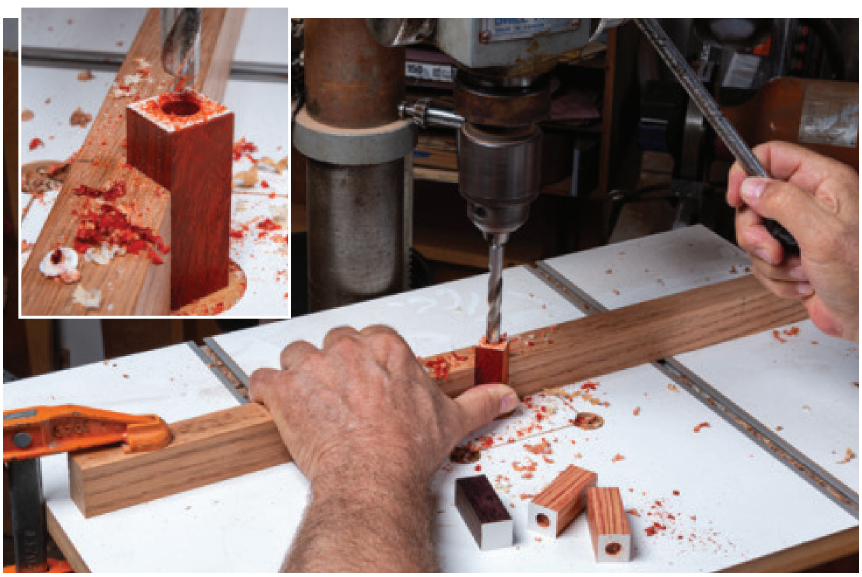
To make your blanks, crosscut ¾ × ¾" strips into 2" lengths, using a stop block to ensure consistency. (See sidebar below, right). Adhere double-faced tape to one end of each block, trimming off the excess and leaving the backer on for the moment. Next, use your table saw to make a fence for your drill press table, tilting the blade to 45°, and crosscutting a ½"-deep V-notch at the center. Using a ⅜" brad-point bit, drill a mortise in the end of each blank as shown. Follow up by drilling a ⅜"-deep pilot hole for a #8 screw in each blank.



Quick tape trimming. For efficiency, align multiple blanks along one edge of a strip of double-faced tape, and then slice off the excess. Afterward, slice between the blanks to separate them. Then press the tape firmly down against each blank with your finger.

Safe Short Cuts

Working with small pieces requires an extra measure of safety for your fingers. For crosscutting these fridge magnet body blanks to a consistent length, a great approach is to set up a stop block on a table saw sled. Use a short stick as a hold-down when making the cut. For more on sawing small parts, visit *woodcraftmagazine.com*, and click on "onlineEXTRAS."

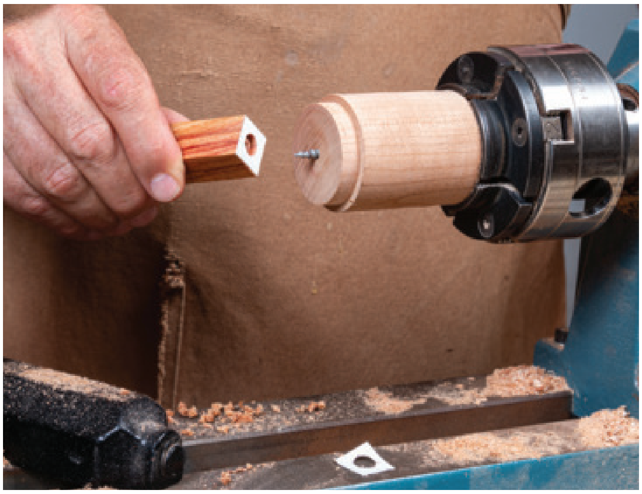


Drill the magnet mortise. Register a blank in the fence's V-notch and adjust the fence to center the blank under a ⅜"-dia. brad-point. Drill to a depth that's just a hair less than the magnet's thickness. As soon as the bit breaks through the tape, stop and clear its tip before continuing.

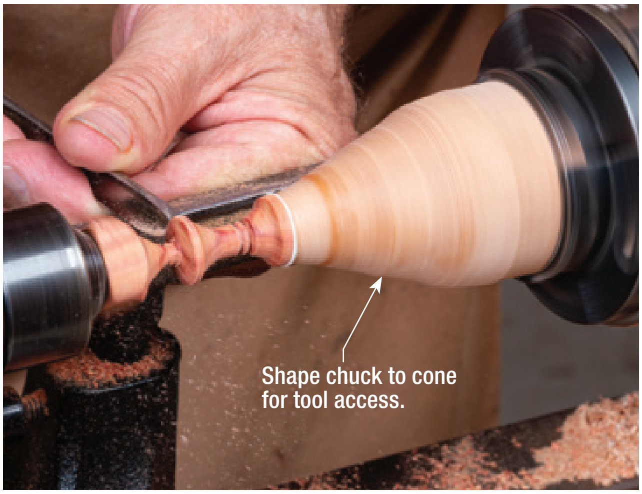
Drill the pilot. Again registering a blank in the fence's V-notch, drill a ⅛"-dia. × ⅜"-deep hole into the bottom of the mortise.

Spin some fun

Remove the tape backer from one blank, thread it onto your screw chuck, and bring a live tailstock center into play. Begin by turning the chuck to a cone shape, which provides tool access to the magnet body blank. The cone shape also allows for chuck adjustment, as noted in the box below. Turn the magnet body blank to a cylinder using a bowl gouge, then play with profiling. (See right and p. 22 for inspiration.) I mostly use a fingernail spindle gouge for general shaping and a skew and/or parting tool for detailing. Leave a thin connection at the top until you're done with the follow-up sanding. Then part off the excess and finesse the top. Apply a friction polish (see p. 62), dismount the piece, and then drag the bottom across fine sandpaper to remove any tape residue. Finally, use CA glue or epoxy to install a magnet in the mortise.



Screw-and-tape mounting. After removing the tape backer, thread the blank onto the screw chuck just until it seats. Don't overtighten it, which risks stripping the end-grain pilot hole. Then reinforce the set-up with a live tailstock center.



Profile play. Have fun playing with the shape of the profile while the tailstock support is in place. Leave just enough of a connection at the top end to provide sufficient resistance for the sanding pressure that follows.

Adjust-a-chuck

To ensure sufficient tape area after first-time use of the chuck, avoid reducing its end to more than about 11⁄16" in diameter. If the tape surface gets too small to hold pieces, simply retract the screw tip and shorten the conical chuck to widen the surface. Then reset the screw tip to project again.

Finesse the top. After sanding, trim away the waste, retract the tailstock, and then finish shaping the top. A small gouge usually works well for this. A sharp tool and a light touch ensure clean work. Then sand the spot if necessary, and apply finish to the piece. ■

COVE CUTTING

Dramatic curves from your table saw

By Ken Burton

Wide, sweeping coves such as those found in crown molding and raised panels are a hallmark of good woodworking. But how do you achieve them without a large-scale molding machine? On the table saw, of course.

Cutting coves on a machine used primarily for ripping, crosscutting, and joinery is unorthodox. But if done correctly, it's a safe and efficient method. Essentially, you run a workpiece along a fence and diagonally over the blade in a series of shallow passes, to take advantage of the blade's curvature.

Adjusting the height of the blade and the feed angle of the piece varies the depth and width. While the resulting cut requires a lot of sanding to remove the saw marks, the technique offers more versatility than stock profiles on cutters you'd use in a router or shaper.

While there is no magic in setting up to cut coves, a parallelogram jig simplifies the process. In this article, I'll demonstrate how to set up and cut coves—and half-coves—first using typical layout tools, then with the jig.

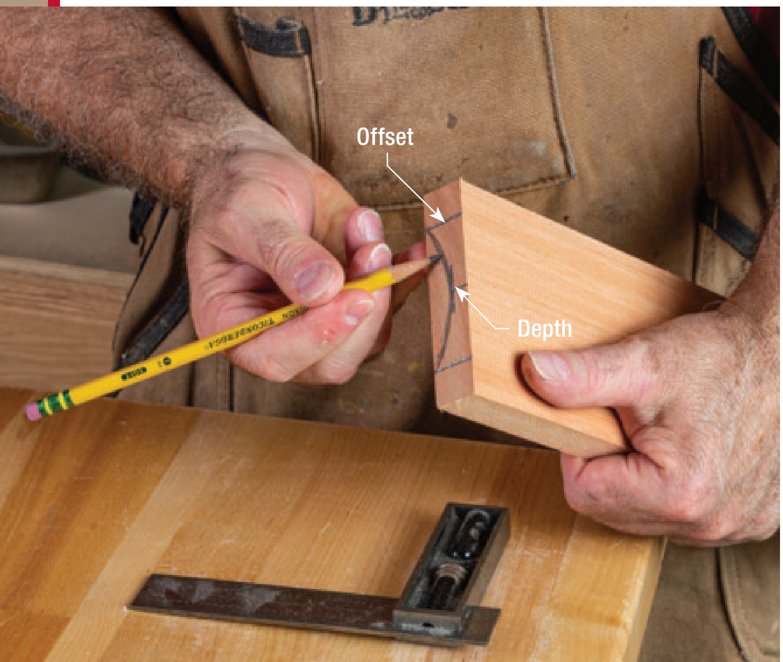
onlineEXTRA
To see cove cutting in action, visit
www.woodcraftmagazine.com/onlineextras

Photos: Ken Burton

Cove terminology and layout

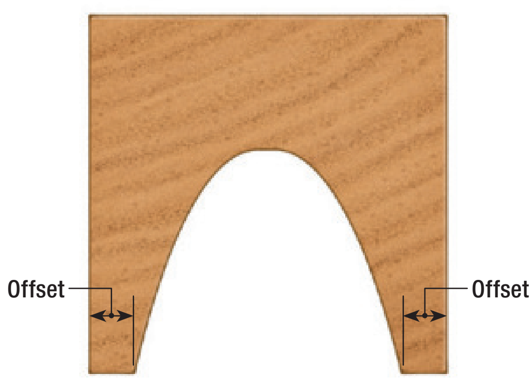
A cove cut is defined by its width and depth. With wide, shallow coves, the curve is close to being a true arc, but with narrow, deep coves, the shape is more elliptical. The other key dimension is the offset, or distance from the edge of the board to the edge of the cove.

In the drawings below, the offsets on either side are equal, but they don't have to be. And if your cove design goes right to the edge of the stock, start with a pieces wide enough to leave a minimum of ⅛" offsets to provide a bearing surface. These small offsets can be trimmed away later if desired. While you don't need to draw out the curve, it can help you visualize what the cove will look like if you make a sketch on the end of your stock.



Sneak peek. After marking the offset and depth, preview your cove by sketching a line to connect the layout marks.

Narrow, Deep Cove



Wide, Shallow Cove

Blades for Coving

For best results, cut coves with clean and sharp full-thickness 40-tooth ATB or 50-tooth combination blades. Adding a stiffener (or two) can reduce vibration. Thin kerf blades don't stand up well to excessive sideways pressure. If you do a lot of coving, consider investing in a designated coving blade. Several manufacturers offer these chunky 7" (+/-) diameter blades with rounded carbide teeth that leave a much smoother surface than a regular sawblade. Be aware that the smaller diameter does somewhat limit the size of the coves you can make, and (as of this writing) the blades are not compatible with SawStop's brake technology.

Dedicated to coving. While it may appear to be more of an overgrown shaper cutter, this blade from CMT is designed to cut coves on the table saw.

Rough cut. The profile to the right was cut with a 40-tooth ATB blade, the one to the left was cut with a coving blade. Both require sanding, but the marks from the ATB blade are significantly rougher.

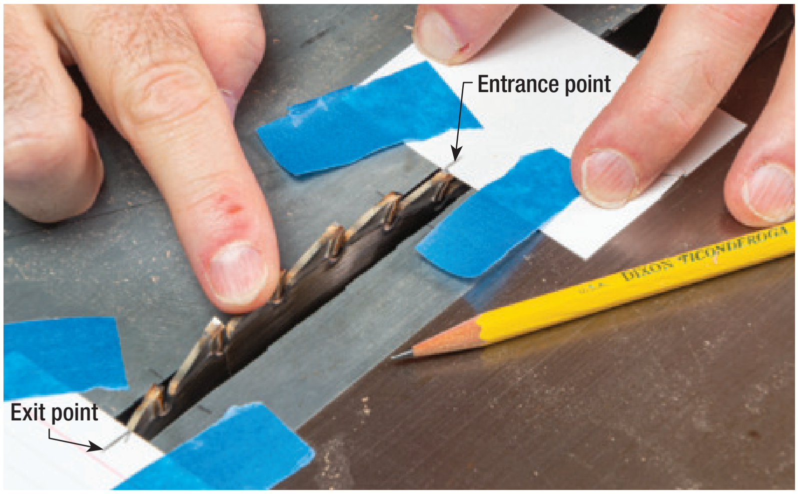
The basic set up

Once you have determined a cove's size, use those dimensions to place your primary fence. Since the force from the blade will push the workpiece into this fence, make it from a stout length of scrap (I keep a length of 2 × 2 on hand). Your secondary fence can be lighter.

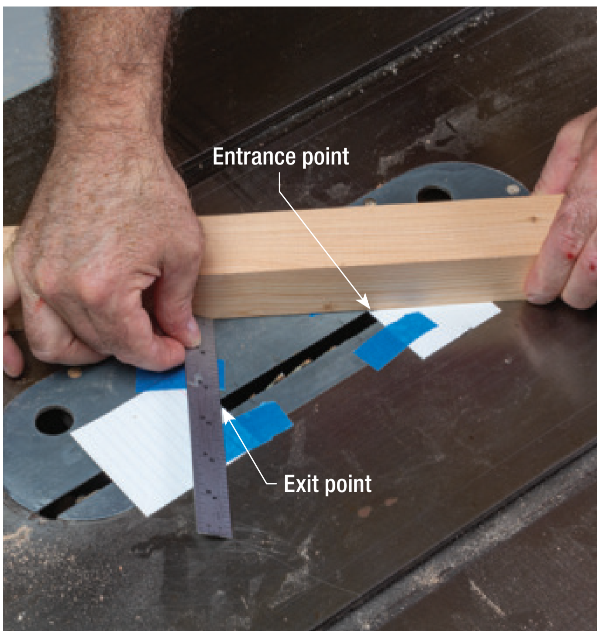
Adjusting the blade height to equal the cove depth, then determine where the blade's teeth enter and exit the saw table. Drop the blade completely, align the fence as shown, and mark the feed angle on the saw table. Shift the fence away from your marks a distance equal to your desired cove offset, and secure the fence at each end to complete the setup. This can be tricky—you may need to make spacers to clamp to your saw's fence rail.

Once the primary fence is in place, add a secondary fence to make the set up more secure. Use your workpiece as a spacer to position it.

Set cove depth. Raise the blade to your desired cove depth, measuring to the blade's highest point. It's better to err on the low side.



Determine the in and outs. Bridge the throat plate gap with stiff paper, locating it so that a hand-turned blade just grazes the sheets. Tape the paper in place. Then mark the exit point to the left of the teeth, and the entrance point to their right.



Set cove width. With the blade lowered, position the primary fence so that it intersects the teeth entrance point. Pivot the rear end of the fence until the distance from the fence to the exit point is equal to the width of the desired cove.

SAFETY ALERT
Position the primary fence to the front of the blade so the teeth push the workpiece *against* it.

Set the offset. After determining the feed angle with the fence, mark its location at the front and rear of the saw table. (Painter's tape aids visibility.) Shift the fence away from the feed angle line a distance equal to your desired offset, then clamp the fence in place.

Illustrations: Christopher Mills

Cutting the cove

Making the cove is a straightforward though repetitive task. (It's also dusty, so use dust collection and wear a mask!) Due to the forces inherent in feeding stock over the blade diagonally—something the blade isn't designed to accommodate—make multiple shallow passes. Raise the blade so its highest point is about 1/16" above the table, and feed your workpiece along the fence and over the blade to make the first pass. Use push sticks to keep your fingers safe. Raise the blade another 1/16", and repeat. Continue like this until the cove reaches its full depth. Taking very light cuts (<1/32") for the last two or three passes can reduce the amount of sanding needed. Scrape and sand away the saw marks to finish up.

A little at a time. A 1/2" deep cove will take about ten passes. Raise the blade about 1/16" at a time and follow up with two, light finish passes. Listen to the saw. It will sound a little different than a regular cut, but shouldn't scream in protest. A steady, consistent feed rate yields the best surface.

Cutting a half-cove

When making a raised panel, you need to cut half a cove. The setup is similar to making a full cove, except the fence will be clamped atop the blade instead of in front of it.

Set the blade height first, then determine the feed angle for a cut twice the width of your half-cove. For example, if you want a panel with a 2"-wide bevel, determine the feed angle for a 4" wide full cove, by pivoting the fence away from the exit point (p. 29).

Once you have the angle established and the blade lowered, mark the offset, in this case 2", *towards* the blade, and clamp your fence there. Now as you raise the blade, its front portion will cut partially into the fence, leaving the rear portion to make the cut. Guide your piece along the fence in several shallow passes.

Offset toward the blade. For a half-cove, measure from the initial feed angle towards the rear of the saw. The offset should be equal to the width of the half-cove you're after.

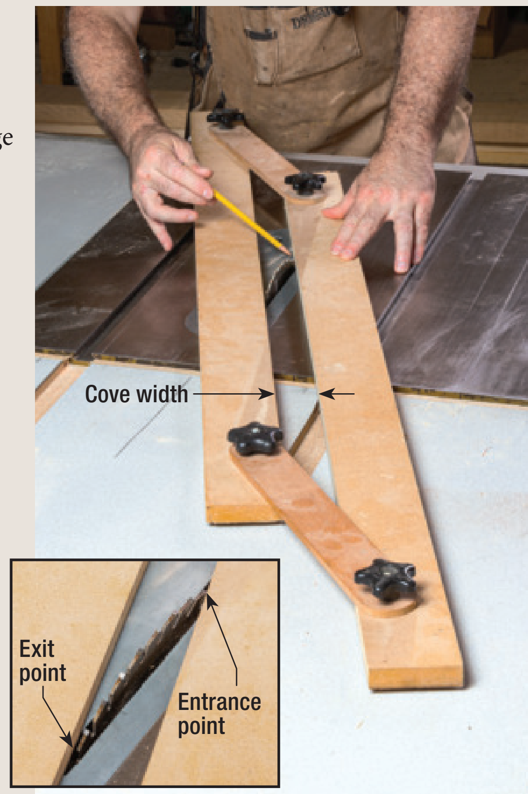
Cut into the fence. As you raise the blade, it will cut a slot for itself in the fence. Cutting a half-cove on all four edges of a piece produces an elegant raised panel.

Off-center? Since your saw arbor pivots to raise the blade, your cove will appear off-center at first. But don't worry. Any wonkiness will work itself out by the time the blade reaches its full height.

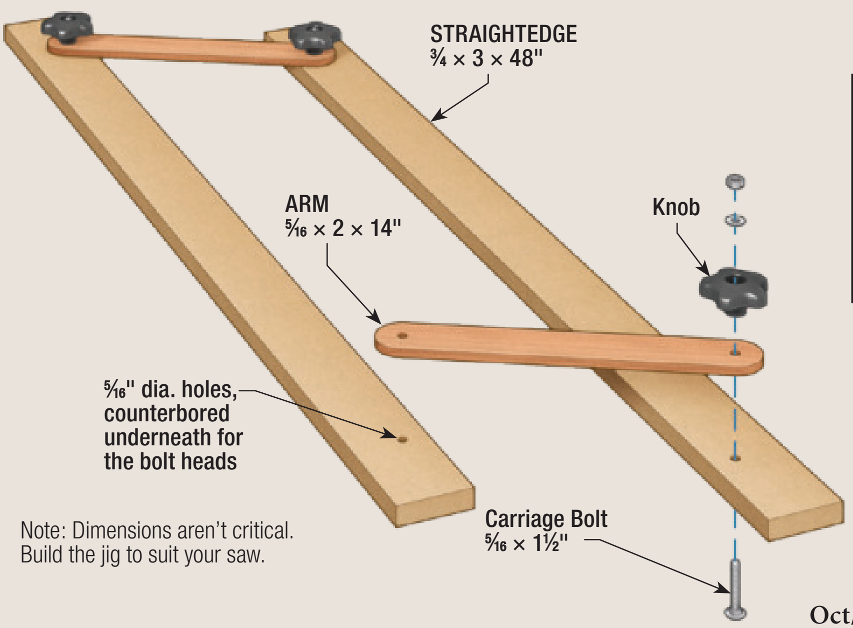
Lotsa clean up. The only drawback to cove cutting is the sanding required. A curved scraper and a convex sanding block will ease some of the task. To make the block match the cove's curvature, bandsaw it close to shape then finish up by taping coarse sandpaper inside the cove and lapping the block to final shape.

The parallelogram jig setup

If you find yourself cutting coves frequently, it's worth the time to make a parallelogram jig. The jig makes determining the feed angle a snap. It consists of two long straightedges connected by two arms. The exact part sizes aren't critical, just make sure the pivot holes are placed consistently so the straightedges remain parallel as you adjust the space in between. To use the jig, set the distance between the straightedges to match the width of the cove you wish to cut. Set the blade height to match the cove depth and place the jig on the saw table straddling the blade. Pivot the jig so the straightedge in front of the blade intersects the entry point, and the straightedge behind the blade intersects the exit point. This establishes the feed angle. Then set up your primary fence to accommodate the offset as described on p. 29. Remember to locate the primary fence in front of the blade to resist the cutting force.



Fast feed-angle setup. With the blade height set to match the cove depth, align the parallelogram jig's two straightedges with the blade entrance and exit points. Note that you can cut coves from left to right or right to left. The choice is often made by where you find purchase for the clamps. ■



Note: Dimensions aren't critical. Build the jig to suit your saw.

Arts & Crafts WALL CLOCK

My mission to create a Craftsman clock on the table saw

By Derek Richmond

The Arts & Crafts (or Mission) style has always appealed to me. I find myself drawn to its typically simple, clean lines and unobscured wood grain. So, when my wife requested a striking clock for our living room, I had a good idea of where to start my design. I also had just acquired a new table saw and wanted to take advantage of all that tool has to offer. Several sketches and a mock-up later, I had developed the clock shown here. True to the Arts & Crafts style, it's made from quartersawn white oak and, while not a reproduction, incorporates a lot of key A&C elements.

What's more, it can be built entirely on the table saw, from its beveled crown and base to the case and door joinery. Perhaps the most challenging part of the build is creating the coved panels that make up the case sides. See p. 26 for more information on cutting coves. The through-slots in the sides reflect the style and provide sound holes for the chimes. They also allow light to reach the mechanism's day/night sensor, which prevents chiming at night. The electronic mechanism (see Buyer's Guide, p. 62) also features a pendulum and several chime options.

Functional, elegant, evocative

The coved and slotted side panels are joined to the case top and bottom with rabbet-and-dado joints. The glass-paneled door is assembled with half-lap joints and is flanked by two face stiles adorned with saw-kerf shadow lines. The partial back panel allows easy access to the interior for battery changes, while the French cleat under the crown makes for secure hanging.

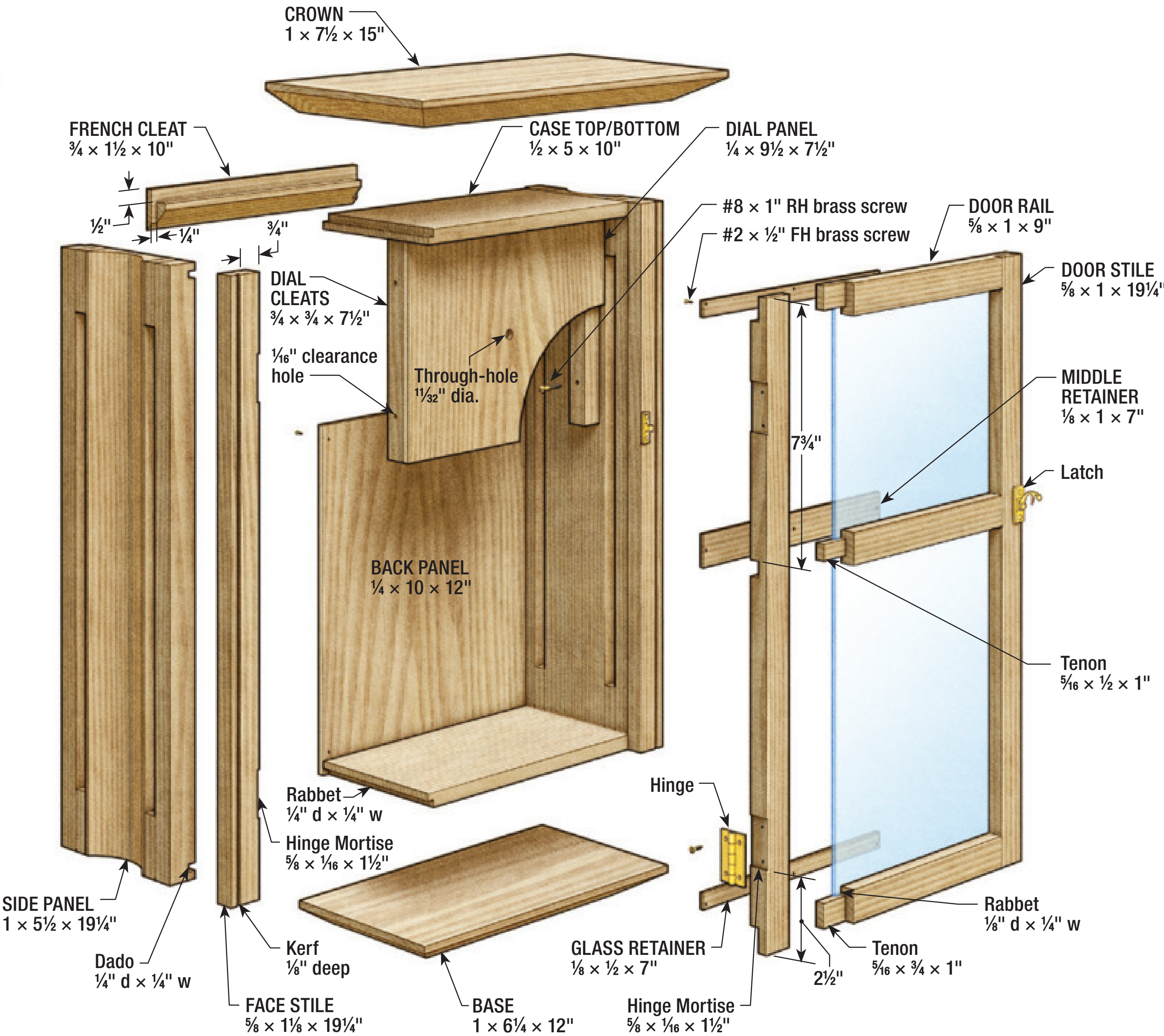
onlineEXTRAS

Free article downloads:

- Mission Finish Two-Step
- Installing an Inset Door

Order of Work

- Make side panels
- Construct case
- Build door
- Apply finish
- Install glass and mechanism

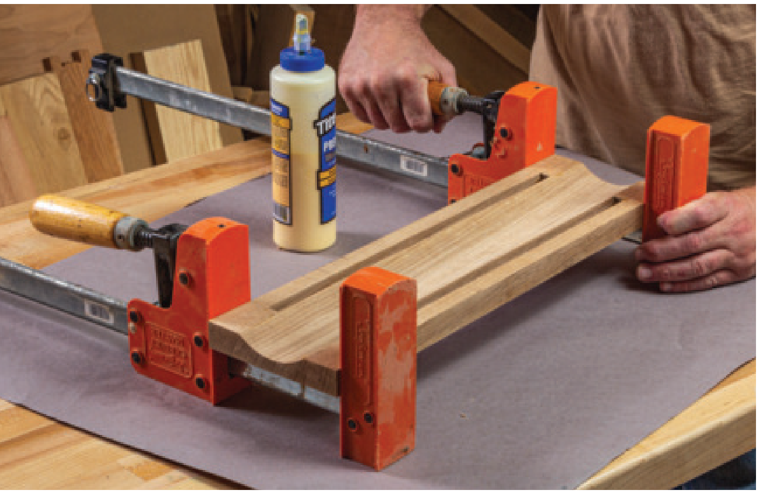


Photos: Ken Burton; Illustrations: John Hartman

Make the coved and slotted sides

For grain consistency across the finished side panels, start with two 1 × 6 × 19⅜" blanks. After coving the pieces down the center, rip and crosscut each blank to yield the parts shown in the drawing below, making sure to crosscut the spacers from the ends of their strips. Before gluing up the panels, sand what will be the internal edges of the slots. After glue-up, trim the panels to final length and rabbet their back edges to accept the back panel and French cleat.

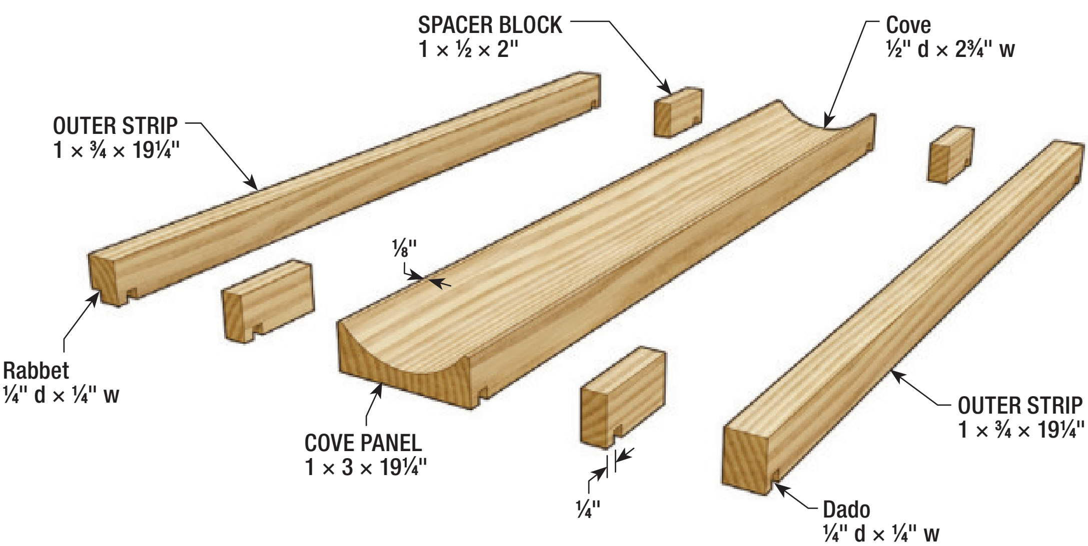
Cove the side. Set up a primary and secondary fence to cut a ½"-deep × 2¾"-wide cove centered across the width of each side panel blank. The primary fence should be offset from the feed angle by 1½". (See p. 26 for tips on setting up and cutting the cove).



Glue up. By reassembling the panel parts in their original orientation, you'll preserve the impression that each panel is made from a single piece.

Dado the ends. Use a standoff block and dado blade to position and cut a ¼" dado in each end of the panels.

Side Panel Detail

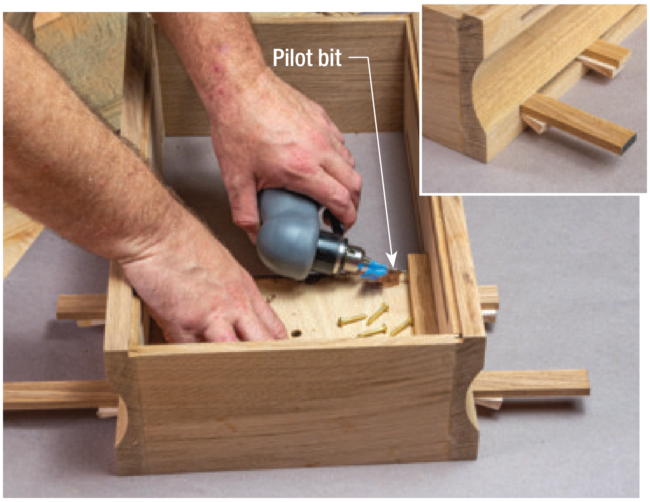


Multi-part panel. The side panel slots are created with spacer blocks glued between the outer strips and the coved panel. Mark the ends of the rear face of each panel blank with reference lines, numbers, or letters, before ripping it into strips to make orienting and reassembling each panel easier.

Construct the case

Cut the rabbets on the ends of the case top and bottom to create tongues that fit the dadoes cut in the side panels. Sand all inside faces before gluing up the case. Pre-drill clearance holes through the dial panel cleats before gluing them to the back of the dial panel. Then install the dial panel assembly as shown. Shape and install the French cleat in the back of the clock. Finally, bevel the crown and base as shown, then attach them with glue.

Rabbet the top and bottom. Cut the rabbets on the ends of the case top and bottom by running the pieces vertically past a ⅜" dado set up on your table saw. The fence position controls the tongue thickness while the blade height controls its length. Clamp the workpiece to a board that rides along the top of the fence for added stability.



Install the dial panel. Wedge two ¼"-thick scraps in the front slots to create a platform for installing the dial panel assembly. Then guide a bit through the previously drilled clearance holes in the cleats for screws to attach the assembly.

Bevel the crown and base. With a saw blade tilted to 23˚, use the same fence-rider trick for the bevel cuts on the ends of the crown and base pieces. You won't need the added support for the long-grain bevel cuts.

Install the French cleat. Rabbet the top edge and the ends of the French cleat to fit into the side panels' rabbets and against the rear edge of the case top. Then bevel both the cleat and its mate at 45˚.

Make the door

Cut ⅛"-deep × ¼"-wide rabbets (for the glass) in the inside edge of the door stiles and the top and bottom rails. The center rail gets two. Then dado the stiles for the middle rail (see drawing, p. 33), and rabbet the ends of the pieces to create the half-lap joints. Cut a shallow kerf on the face frame stiles to create a shadow line and add visual interest. Then mortise the inside of the left-hand face stile for the hinges. After mortising, glue both face stiles onto the carcass. Mark, then mortise the door and pre-drill for the hinge screws. With the door temporarily hung, lay out and pre-drill for the latch.

Half-lap the door. Cut the rabbets on the top and bottom rails ¾" wide. Make those for the middle rail ½" wide.

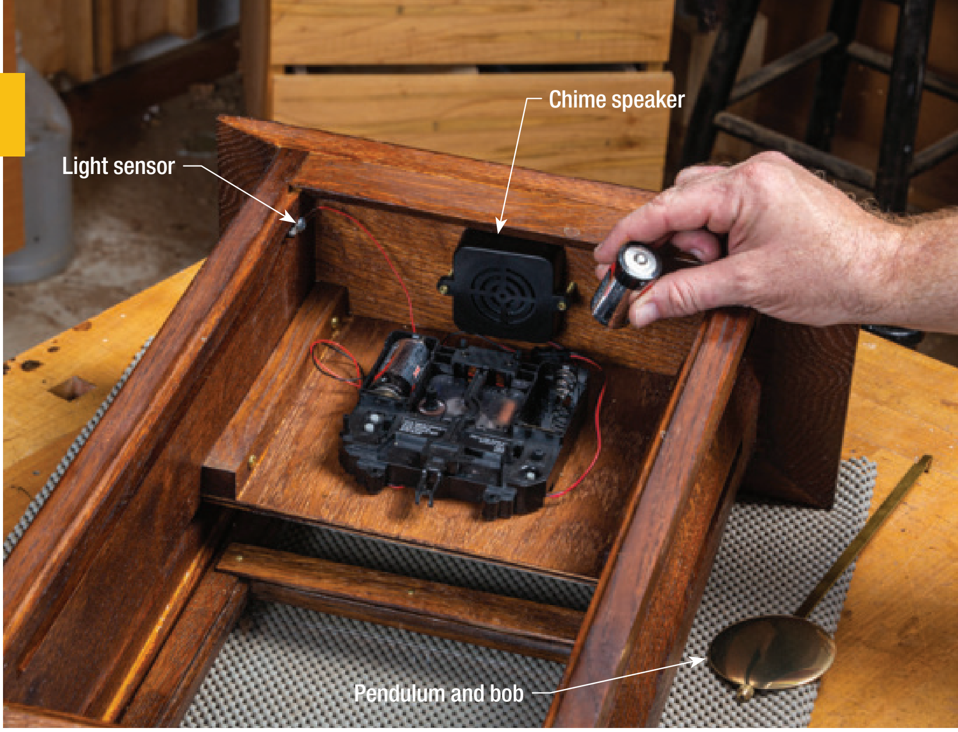
Glue up the door. After test-fitting all the joints, glue up the door. Pressure in all planes makes for tight joints and square corners, but do double-check for square after clamping up.

Mortise for the hinges. Mortise the face frame stile for the hinges, setting the cutting depth for a hair less than half the thickness of the hinge barrel. A standoff block and fence stop set accurate limits for the mortise length.

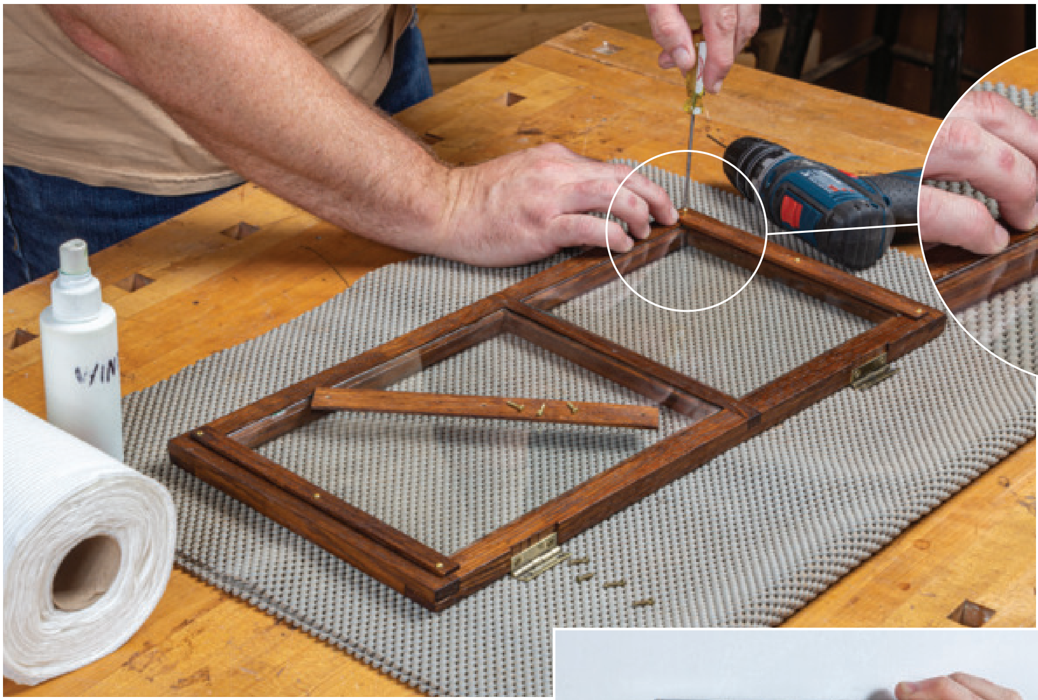
Mark the door. Transfer the hinge mortise locations to the completed door, then mortise the door stile in the same manner as the face frame stile, with the door standing on edge. See onlineEXTRAS for tips on hanging the door.

Finish and hang

Sand and finish the clock body, door, dial panel assembly, and glass retainer strips. See OnlineEXTRAS for a simple way to duplicate an authentic Arts & Crafts style finish. I opted to finish the back panel the same way, though a soft gray or green milk paint would add contrast while keeping with the Arts & Crafts style. Secure the glass in the door with the retainer strips. If your glass is a little too loose, tuck a snipped length of rubber band into the rabbet before tightening the retainer strip. Then attach the latch and hang the door. Install the speaker and light sensor as shown, then install the mechanism, securing it to the back of the dial panel with double-faced tape. Hang the pendulum and attach the hands. Then set the time, and enjoy the chimes!

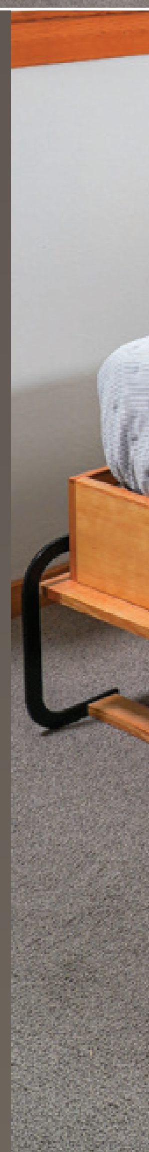


Install the internals. Attach the mechanism's separate speaker by screwing it to the underside of the case top, facing down into the clock body. Drive a screw into the back of a rear spacer block to secure the light sensor so it just peeks into the slot.



Add the glass. Pre-drill for the retainer strip screws, then install both panes of glass.

Hang the cleat. Mount the mating French cleat to the wall with appropriate hardware for a 15 lb. clock. On drywall, it is ideal if you can get at least one screw into a stud. ■



Murphy BED

Create a convertible bedroom with cool cabinetry, the right hardware kit, and clear instructions.

By Asa Christiana

I suspect that a lot of empty nesters would like to convert a kid's former room into a usable space for other pursuits while still having it available for visiting friends and family. The solution is a comfy, standard-sized Murphy bed that quickly flips out of the way when not needed. I wanted one myself.

After some research, I found a nice, well-made, reasonably priced Murphy bed hardware kit for the job. (See page 62.) What's not so nice is the kit's instruction booklet, with its metric dimensions, minimal illustrations, and a bed cabinet design that leaves a lot to be desired. After puzzling through the hardware installation, I designed much nicer cabinetry to accommodate it, and I have to say the unit looks and works great! The cleverly designed spring-loaded bed mechanism is adjustable for tension and lets you lower the bed with one hand while swinging the legs down for support. When raising the bed back into the cabinet, swing the leg stretcher up onto the mattress to help hold it in place while vertical.

I based the bed cabinet design on an 8"-thick, full-size mattress, which will suit most guest rooms. I flanked the cabinet with bookcases, tying all three units together visually with molding at the base and a square bead that runs along the top. Soffit boards atop the square bead reach to the ceiling to hide the metal mounting brackets and prevent a dust trap. A mantel reinforces the door while providing a pretty platform for decorative items. I built the project with clear, vertical-grain fir plywood trimmed out with solid vertical-grain fir to match my room's trim. Build and style your version to suit your own décor.

Photos: Asa Christiana

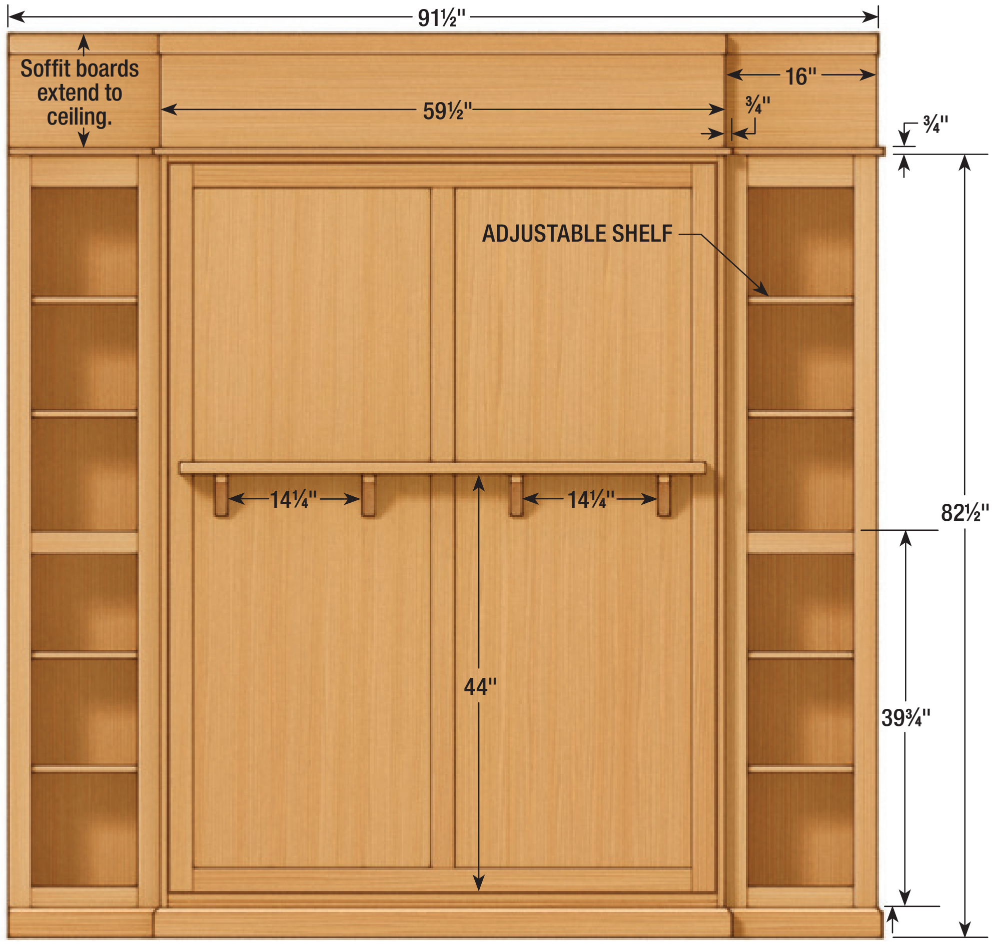
Plywood panels, solid wood trim, and simple joinery

The bed- and side-cabinet assembly sits on a base and is topped with a square-bead frame and soffit. The bed frame attaches to the bed cabinet via axles on the balancers that protrude through the frame sides and connect to rotation plates within the cabinet sides. Slats riding on ledger strips on the bed frame provide the platform for a mattress. (The unit is designed to transfer body weight to the frame, not the door, which is chiefly cosmetic.) Plywood panels are edged with solid wood where plies would otherwise be visible, and all parts connect with biscuits and/or screws, with moldings nailed in place.

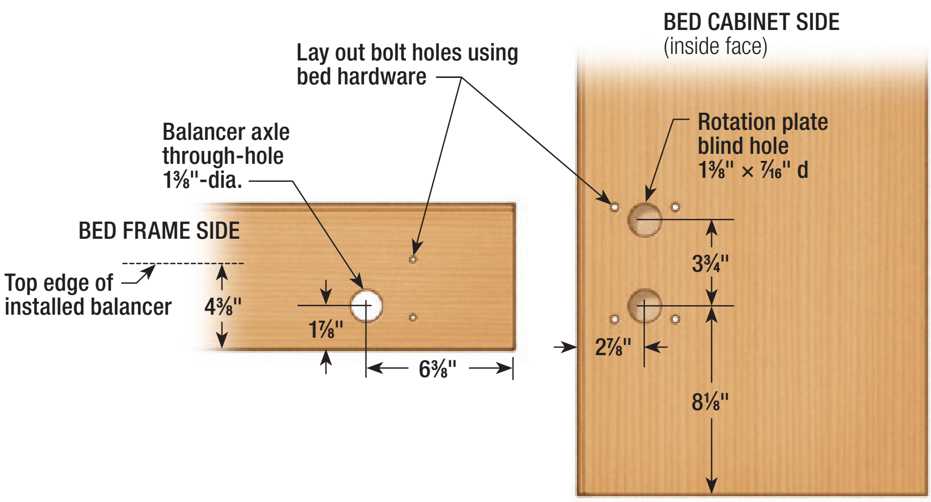
Order of Work

- Build bed frame and cabinet
- Make and attach door
- Build side cabinets
- Install cabinets
- Add moldings

Front View



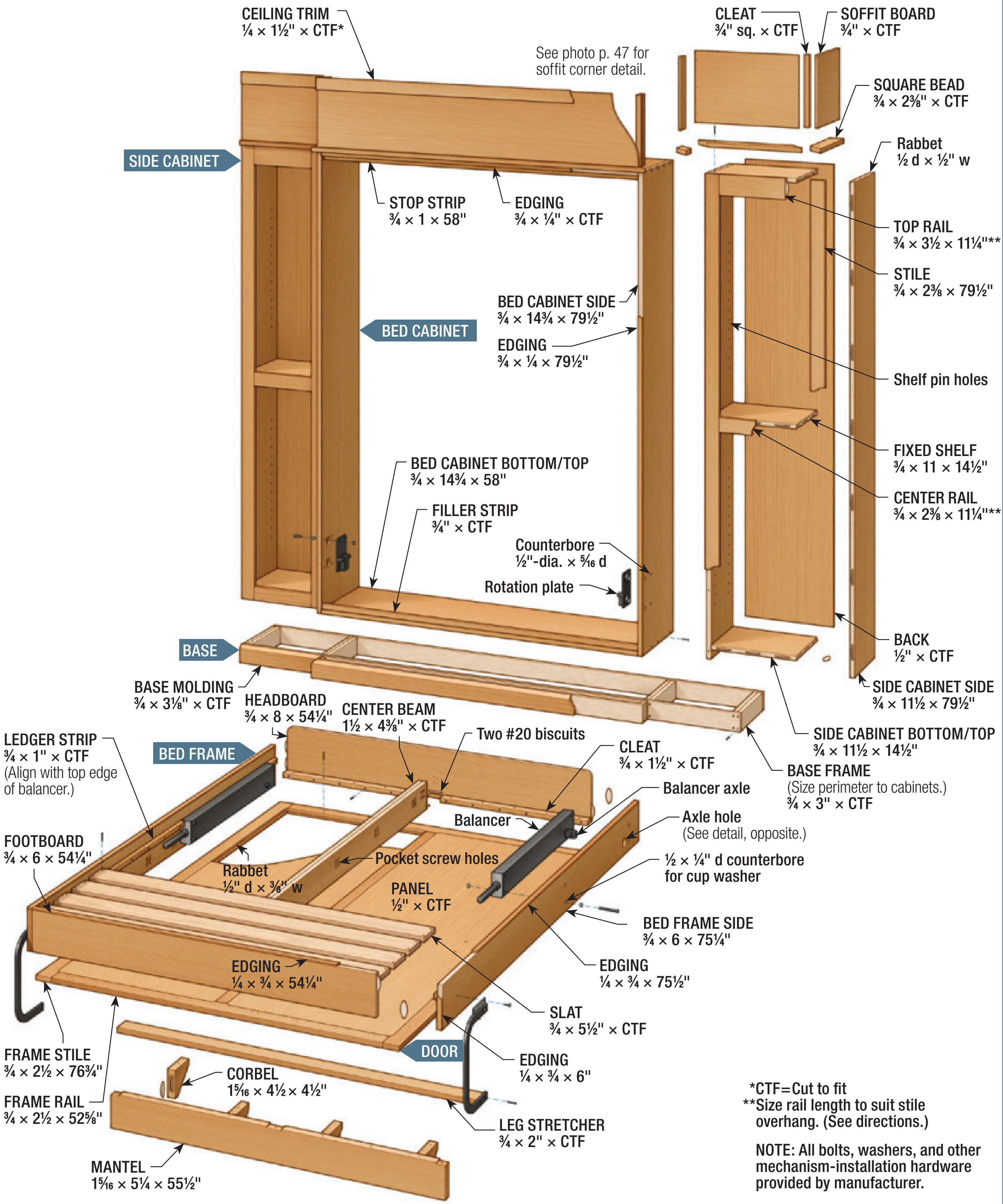
Hardware Mounting Holes



The Question of Customization

The hardware kit and the 8 × 54 × 73½" full-size mattress I used (see p. 62) are both excellent, reasonably priced products that work well for this design, and I recommend them highly. But can you customize this build to suit different sized mattresses? Sure, but it will change the location of the pivot point, so you'll need to work that out in a drawing and/or mock-up.

Exploded View



*CTF=Cut to fit
**Size rail length to suit stile overhang. (See directions.)

NOTE: All bolts, washers, and other mechanism-installation hardware provided by manufacturer.

Illustrations: Christopher Mills

Build the bed frame and cabinet

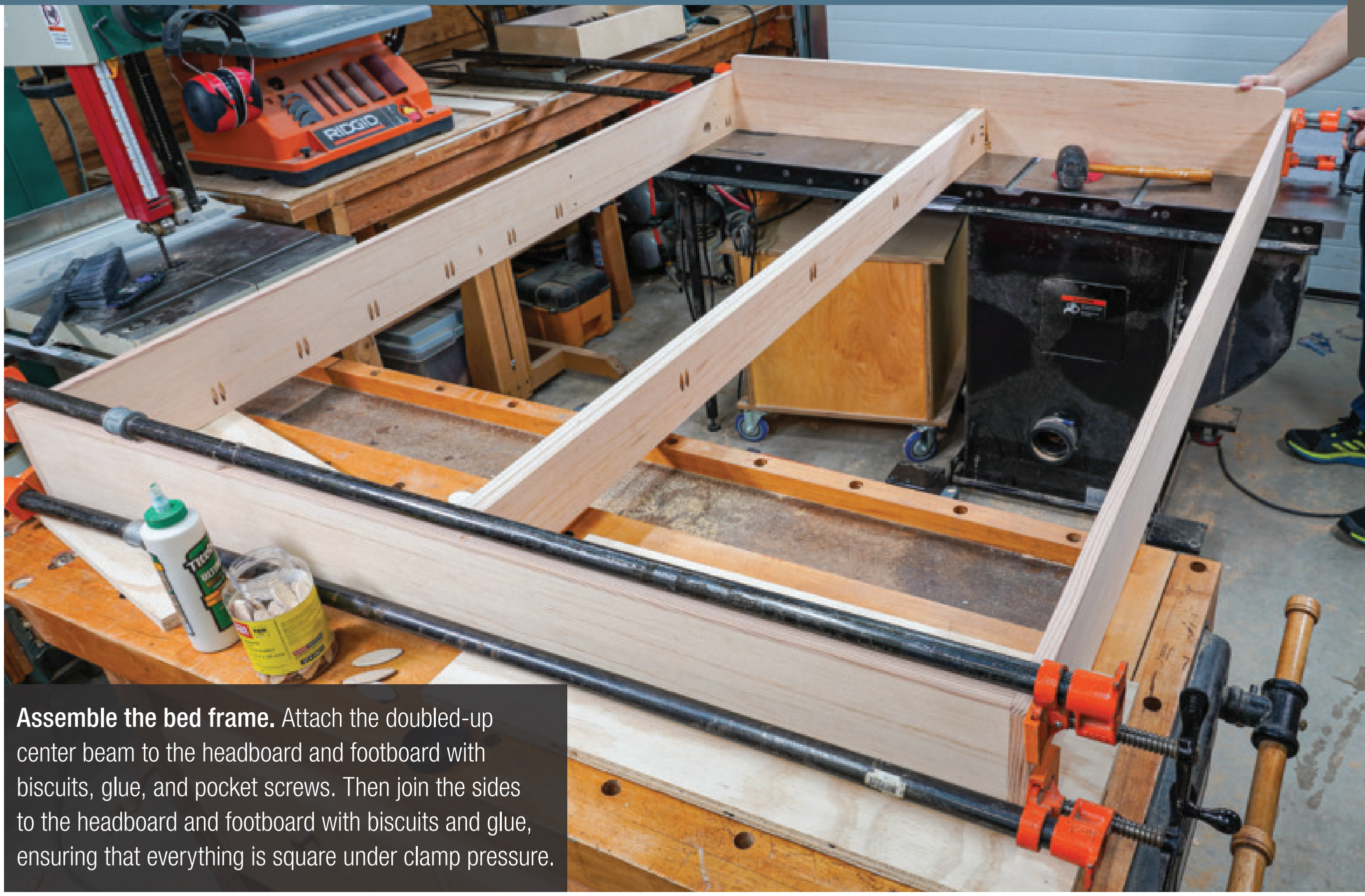
Referring to the drawings, make the top, bottom, and sides for the bed cabinet. Also make the headboard, footboard, sides, and double-thickness center beam for the bed frame. Apply solid wood edging where shown. Precisely lay out and drill the axle holes in the bed frame sides, then use each balancer to lay out its bolt holes, counterboring them on the outside faces for the cup washers. *(Important: Make sure the top edge of the installed balancer will sit exactly 4⅜" up from the bottom edge of its frame side to align with the tops of the ledger strips.)* Similarly, lay out and drill the rotation plate blind holes in the bed cabinet sides, and then use the plates to lay out their bolt holes. After drilling the bolt holes, lay out and drill the pocket screw holes for attaching the door later. Then assemble the bed frame, make and attach the cleats at the bottom edge of the headboard, and mount the balancers. Next, assemble the bed cabinet. Screw the glued-and-biscuited joints together, except at the exposed front edges of the cabinet. Simply clamp there.

A Good Case for Prefinishing

This project presents a great opportunity to "prefinish" parts as you build. For example, I wiped varnish on the exposed sections of the bed cabinet sides before assembling the case. Same thing with the door before attaching it to the bed frame. Just make sure to avoid joint surfaces. This approach leads to better, more efficient finish work. It just requires some forethought to ensure that the entire build isn't stalled while waiting for finish to dry.

Biscuit the bed frame and cabinet members. After drilling the hardware attachment holes for the balancers and rotation plates, cut the #20 biscuit slots for joining the parts, including slots for two laterally oriented biscuits at the bottom of each end of the center beam.

Drill pocket screw holes. Drill pairs of pocket screw holes about 8" apart on the sides, center beam, and footboard, avoiding the balancer locations. Skip the headboard, which receives a screw cleat instead.



Assemble the bed frame. Attach the doubled-up center beam to the headboard and footboard with biscuits, glue, and pocket screws. Then join the sides to the headboard and footboard with biscuits and glue, ensuring that everything is square under clamp pressure.

Bed balancers. Bolt the balancers in place through the holes you drilled in the frame sides prior to its assembly. Make sure that the tip of the axle bolt projects ⅛" from the axle, which will aid in frame adjustment during its installation.

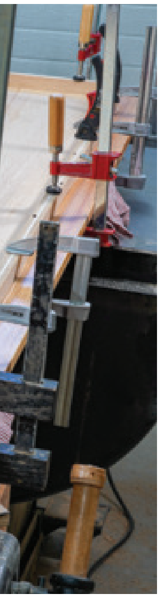
Rotation plates. The blind holes you drilled in the cabinet sides accept lugs on the rotation plates. These help the plates bear the weight of the bed frame and mattress and withstand the torque from the mechanism.

Build and attach the door

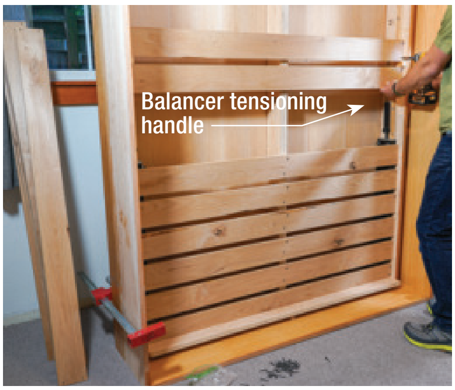
Build the door frame, connecting the stiles and rails with #10 biscuits. Use the dimensions given as a general reference, but make sure that your door width is ½" less than your actual cabinet opening width, which will create a nice gap of about ¼" around the door. Rout a ½ × ⅜" rabbet in the back of each frame opening, climb-cutting to prevent tear-out. (See p. 64.) Now make the panels, rounding their corners to match the rabbet corners, and glue them in place as shown. Make the mantel, attaching the corbels with #20 biscuits. Apply finish to it and to the show face of the door. Then attach the mantel. Install the bed frame in its cabinet by lowering the balancer axles into their rotation plate housings. If necessary, adjust the axle bolts to bring the frame sides parallel to the cabinet sides. Then shim and attach the door to the bed frame as shown. Finally, install the slats.

Mount the mantel. The mantel is not just decorative; it's crucial to the rigidity of the large door, and provides a pull-bar of sorts to open the bed. To install it, drive in long screws from the back side.

Attach the door. After installing the bed frame in the cabinet, shim and clamp the door in place as shown. Ensure that it's plumb, with consistent gaps at the sides and top. Then attach it to the bed frame with pocket screws from the back side, driving them through the bed frame members and the cleat on the headboard.



Install the panels. Glue each panel into its opening in turn, using clamping cauls over the rabbets. The first panel is easy to clamp along all four edges, but the second requires some improvisation in the form of a long bar clamp and wedges to apply pressure to the inboard edge.



Install the bed slats. Screw the ledger strips inside the frame, then screw the slats to them. The slats that rest on the balancers should be screwed to the center beam. Leave a couple of slats off for now to provide access to the tensioning handles on the balancers.

Kit for a Queen

When reviewing the product information on p.62, you may notice that I have paired a full-size mattress with a queen-size hardware kit. It's because my custom build here is heavy, and the mechanism designed for a queen-size mattress has an additional 80 lbs. of lifting capacity over the version for full-size mattresses.

Build the side cabinets

Build the side cabinet boxes to the dimensions shown in the drawing, using biscuits and screws throughout, but omitting screws on the exposed side of the right-hand cabinet. The rear edges of the panels are rabbeted to accept ½"-thick plywood backs, and I drilled rows of ¼"-diameter shelf pin holes in each side. Next, build the face frames, biscuit joining the rails to the stiles. Make the left-hand stile for the left-hand cabinet's frame about ⅜" oversize in width to allow a scribe-fit to the wall during installation. Make the right-hand face-frame about 3⁄16" wider than its cabinet to allow flush-trimming to the cabinet sides. Then attach the face frames as shown.

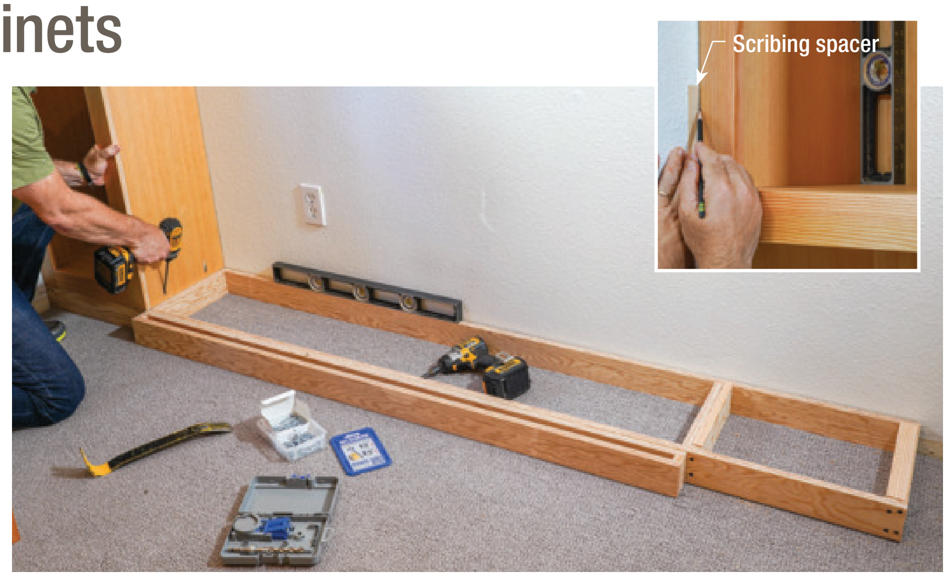
Right-hand stile attachment. To achieve a slight overlap at the edge of each right-hand face frame stile, register the bottom of the biscuit joiner on the bench when cutting the case biscuits. Then, when cutting the slots in the mating stile, rest the joiner on a thin piece of cardboard.

Left-hand stile attachment. Pocket-screw the left-hand stiles to the cases, drilling in from the cabinet exterior, where the holes will be hidden.

Flush-trim finish. Use a router outfitted with a flush-trim bit to flush up the stiles to the cases, excluding the left-hand scribe stile on the left cabinet. Climb-cut to prevent splintering and tear-out.

Install the cabinets

The cabinets all sit on a single base to keep them level with each other. The base is screwed together from strips of plywood, with a projecting section added in front to accommodate the deeper bed cabinet. Referring to the footprint of your cabinets, make the base a little undersized overall. During installation, shift it forward to align its front edges with your cabinets. Place shims under the base to level it if necessary. If your cabinets come out at slightly different heights, glue thin wood shims to the base to level the tops to each other.



Scribe, then anchor. Place the left-hand cabinet on the base, pressed lightly against the side wall. Then guide a pencil against a thin spacer to transfer the contour of the wall onto the stile (inset). After trimming to this scribe line with a block plane or belt sander, screw through the cabinet back into a rear wall stud, and pocket-screw the side to the base.

Install the bed cabinet. Without an upper stop strip in the cabinet, the door/bed frame assembly will rest tilted inward as shown. Get help tipping the cabinet in place onto the base, then screw it to the adjacent cabinet and attach its right-hand side to the base with pocket screws.

Top braces are critical. The bed cabinet will pull extremely hard on the wall when the bed is lowered, so attach three heavy-duty corner braces to the top of the cabinet, driving long screws deep into the wall studs.

Add two strips. Brace the door partway open, and screw a stop strip under the top edge of the cabinet, making sure to locate it for a consistent door inset all around. Then make a filler strip for the bottom, and nail it into place, making sure the door will clear it.

Finishing touches

All that's left is to attach the legs and then trim out the unit, beginning with the base moldings. I made mine by chamfering ¾ × 3⅛" stock to yield a ¼"-wide flat on top, and I prefinished it before fitting and attaching it as shown. Also mill and finish enough stock for the square bead at the top. Fit the pieces for a ¾" overhang, mitering and screwing them in place as you go. Then build the soffit assembly as shown, and tack on the ceiling trim.

Add the legs. Adjust the tension of the balancers so the bed frame sits perfectly level while carrying not quite as much weight as the mattress. Then attach the legs. Afterward, measure between them, and make and attach the stretcher.

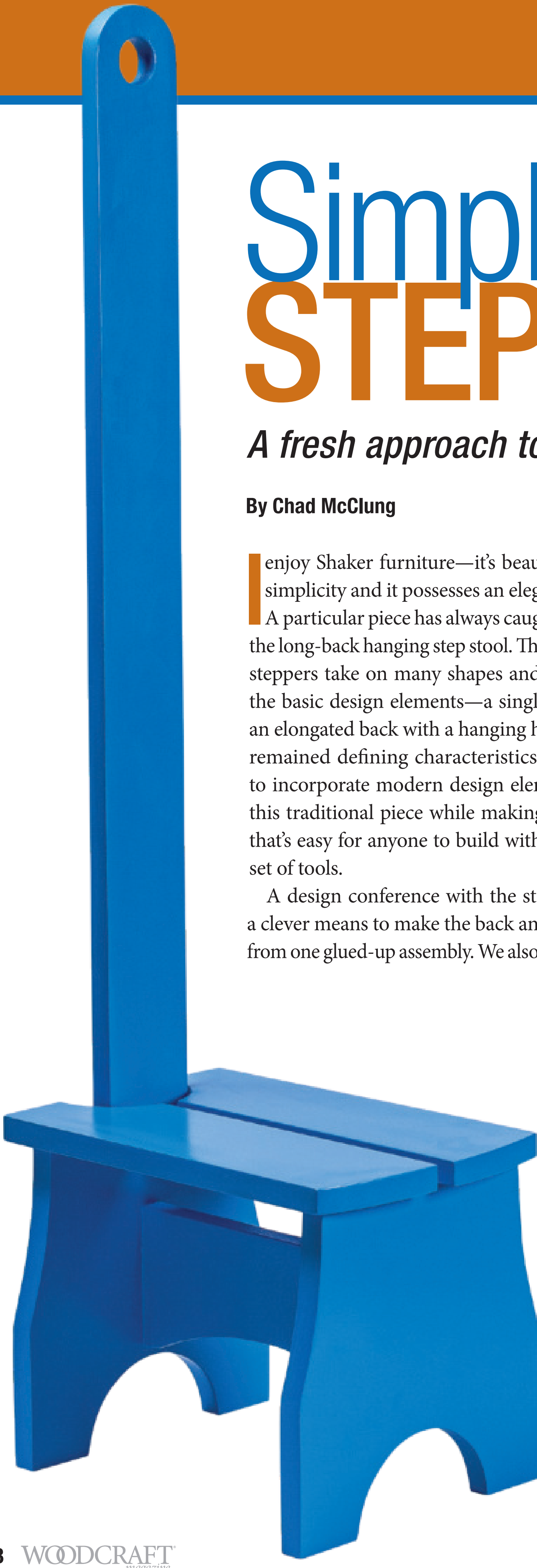
Base moldings. To fit the molding at the corners, you'll need to attach some pieces in advance of others and use sample cutoffs to position parts properly. Add a filler strip to the base if necessary to bring a piece parallel to the cabinets. Shooting through a thin wood strip prevents scarring the finished parts.

Build the soffit assembly. Use leftover hardwood plywood to build a soffit assembly that follows the lines of the cabinets and stops just short of the ceiling. Join outside miters using cleats, brads, and glue. Create inside corners by overlapping soffit boards as shown here.

About the Author

Asa Christiana is the former editor of *Fine Woodworking magazine*, now working as a freelancer in Portland, Oregon, where he teaches, writes, edits, shoots photos, and designs projects for a range of skill levels. His 2018 book, *Build Stuff with Wood* (Taunton Press), is a guide for true beginners, packed with stylish projects anyone can build with a limited tool set. Find him on Instagram @buildstuffwithasa.

Apply ceiling trim. Cover the gap between the soffit and ceiling with thin trim strips, mitering their ends, and attaching them with small brads or headless pins. ■



Basic BUILDS

Simple STEP STOOL

A fresh approach to a Shaker tradition

By Chad McClung

I enjoy Shaker furniture—it's beautiful in its simplicity and it possesses an elegant utility. A particular piece has always caught my eye: the long-back hanging step stool. These unique steppers take on many shapes and sizes, but the basic design elements—a single step and an elongated back with a hanging hole—have remained defining characteristics. I wanted to incorporate modern design elements into this traditional piece while making a project that's easy for anyone to build with a modest set of tools.

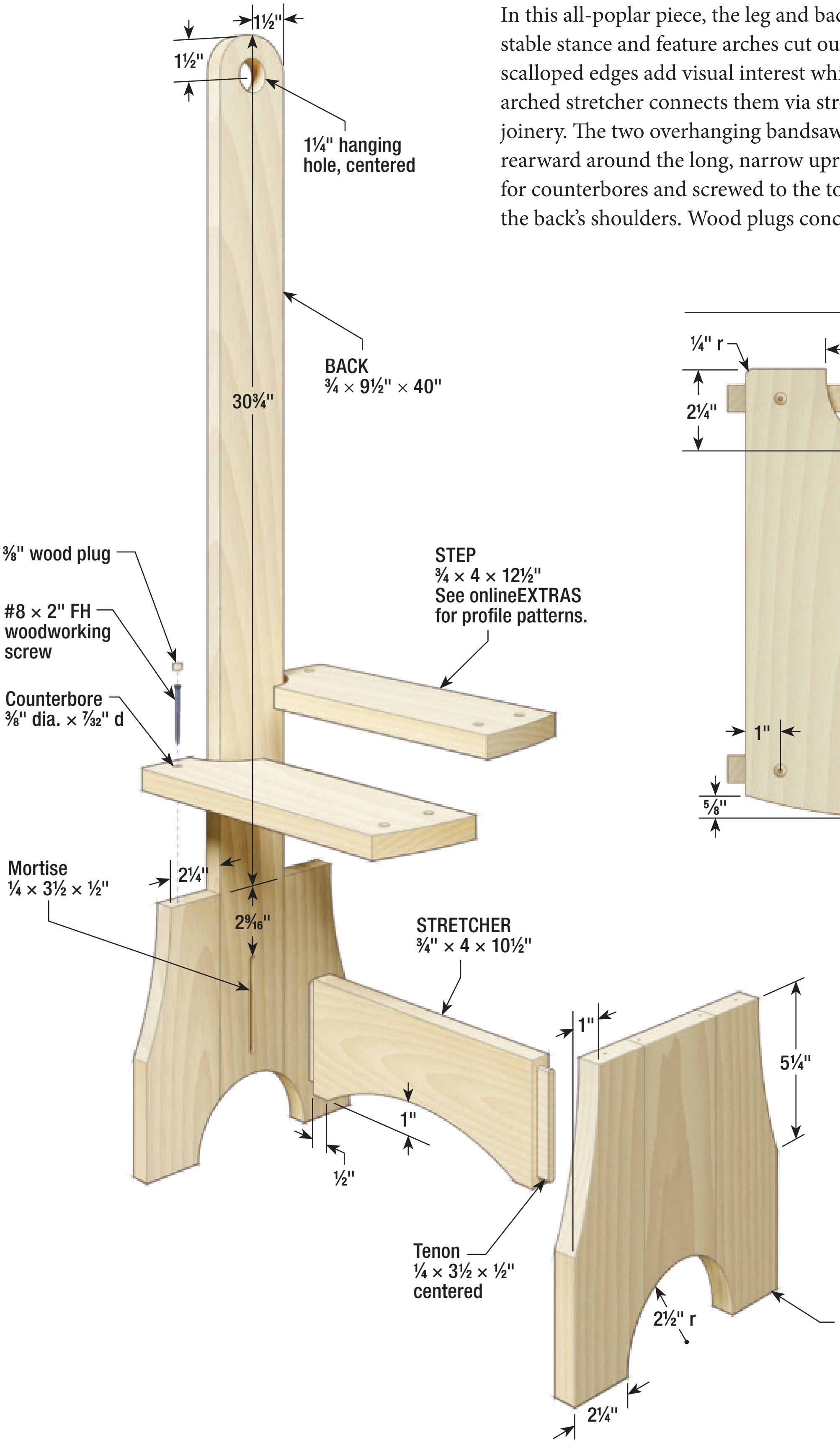
A design conference with the staff yielded a clever means to make the back and front leg from one glued-up assembly. We also developed easy methods for routing mortises and sawing tenons, along with a few other valuable tips. In many traditional versions of this stool, dovetails join the front leg and step—and you can adapt this design to do that if you'd like to. However, I wanted to simplify the joinery. While not as invincible as dovetails, the screwed construction approach will endure for generations.

In addition to providing adults a step up to high cabinet shelves, this stool elevates tykes to counter height for handwashing or helping in the kitchen. It will also allow them to take a peek at workbench activities in the shop. But when not in use, you can hang it up out of the way and out of reach (see onlineEXTRAS).

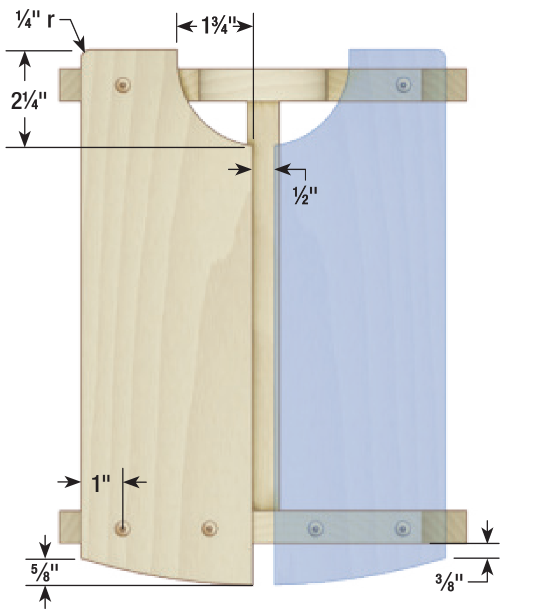
Order of Work

- Glue up back/leg panel
- Cut leg arches and rout mortises
- Separate, then bandsaw to shape
- Make the stretcher, and assemble
- Make and attach step boards
- Sand and paint

In this all-poplar piece, the leg and back provide a wide, stable stance and feature arches cut out at the drill press. Their scalloped edges add visual interest while reducing mass. An arched stretcher connects them via strong mortise-and-tenon joinery. The two overhanging bandsawn step boards sweep rearward around the long, narrow upright. The steps are drilled for counterbores and screwed to the top of the front leg and the back's shoulders. Wood plugs conceal the screws.



Top View

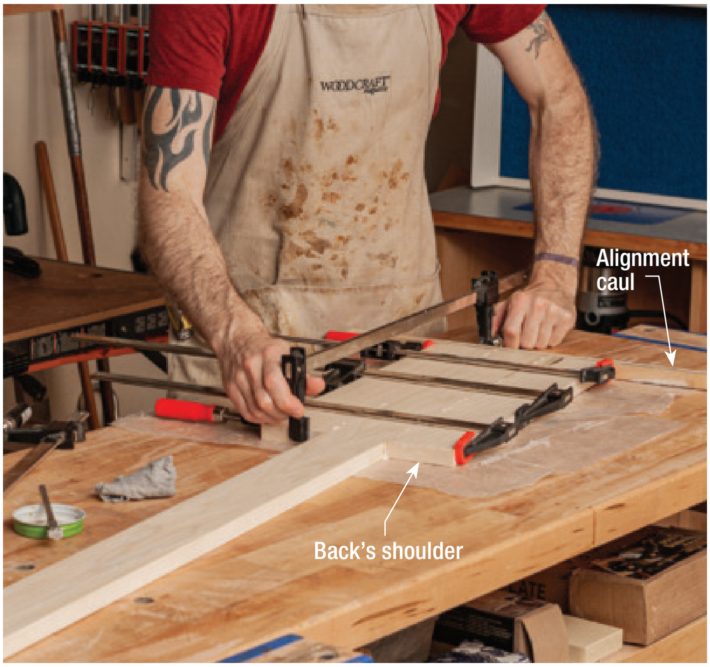


onlineEXTRAS
- Full-size patterns
- Free project: Peg Rack

Photos: Chad McClung; Illustrations: Dan Thornton

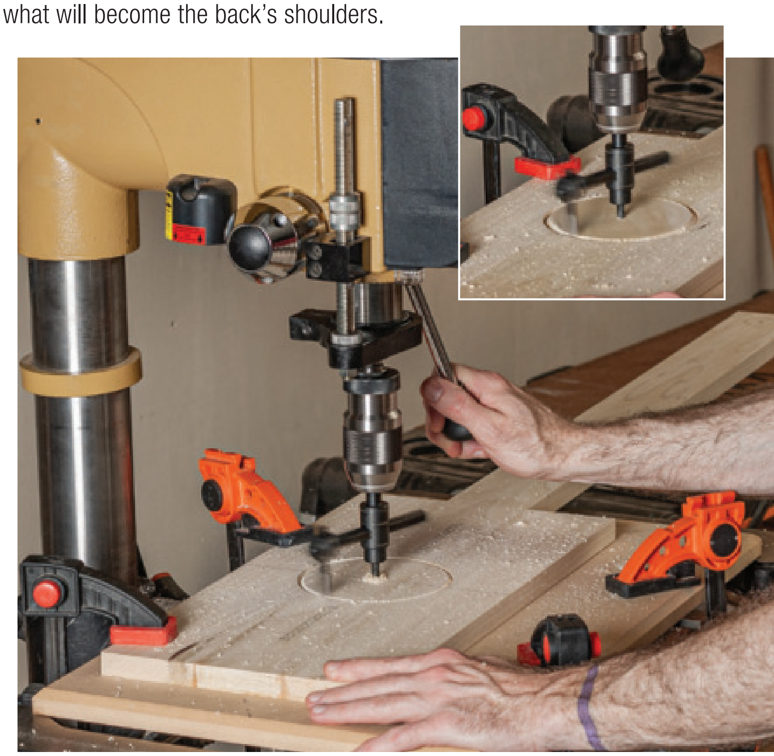
Make the back and leg

Download and print the patterns, then adhere them to template material such as the inexpensive chipboard available at most craft or office supply stores. Knife out the templates and set them aside. Rip two ¾" boards to 3¼" wide and, using a stop to ensure identical length, crosscut them to about 19" long, which is double the leg's length plus extra. Cut a third board to 3" wide by about 50" long, which is double the leg length plus the length of the back. Edge-glue these boards as shown. Clean up as needed when dry, then gather your layout tools. From the back's shoulders, measure down and mark the bottom of the back's leg portion, adding half your table saw blade's thickness to account for separating the pieces later. Lay out the arch and joinery. At the drill press, cut out the circle that will become the arches, and then rout the mortises. Separate the leg and back at the table saw. Bandsaw the leg profiles and clean up at the spindle sander as shown before detaching the pieces. Finally, bandsaw and sand the back's top profile and drill the hanging hole using a Forstner bit and backer board to prevent tearout.



Edge-glue. With the long board in the center, edge-glue the three pieces that comprise the stool body. A caul at the end of the assembly helps to align what will become the back's shoulders.

Layout lines. Lay out the arch locations as a 5"-dia circle. Then, mark the mortise locations and the hanging hole and top profile (inset), where shown in the drawing on p. 49.



Drill the arches. Chuck a circle cutter set to a 2½" radius in your drill press. With the assembly secured to a backer board clamped to your drill press table, drill the hole**.** Use a slow speed, and raise and lower the bit as you go to avoid burning. Once the center bit exits the workpiece, flip the piece over, reclamp, and finish drilling the hole from the opposite face (inset).

Rout the mortises. Clamp a piece of straight scrap parallel to your mortise locations. Chuck a ¼" upcut spiral bit in your handheld plunge router. Guide the router along your straightedge to rout the ½" deep mortises in a couple of passes.

Separate the pieces. Align your separation line with the blade, set a miter gauge fence stop against a back shoulder, and separate the front leg from the back. Then slide the bottom of the leg piece over against the stop and trim the piece to perfect length.

Managing Double-Faced Tape

Double-face tape is invaluable for myriad shop tasks, but many woodworkers tend to use more than necessary. You may only need a few small pieces, depending on the size of your workpiece, the strength of your tape, and the particular operation you're performing. Here, I stuck a single 1" square of white tape near each corner. This provides plenty of grip for bandsawing and spindle sanding, since there's no strong working force trying to separate the pieces. When you do want to increase bond, clamp the taped parts together for a few seconds. But beware: too much pressure, too much tape, or too much time together, and the parts will be hard to separate. In that case, drizzle denatured alcohol into the seam at the tape location to weaken the adhesive. You can also use denatured alcohol on a clean cloth to remove tape residue from the seperated workpieces.

Bandsaw the profiles. With the leg and back double-face taped together and the pattern traced on the leg, saw the parts to shape.

Make the stretcher and assemble

Cut the stretcher to size, and then prepare your table saw for cutting the tenons. Set your dado stack to about ⅝" wide, partially burying it in an auxiliary fence that's double-face taped to your rip fence. Raise the height of the dado stack to a hair under ¼". Saw the tenons' cheeks as shown.

Cut the shoulders using the same setup and procedure, and then finesse the tenons to fit your mortises. Trace the pattern from your template, and cut the arch in the stretcher at the bandsaw, following up at the spindle sander. Sand the pieces through 220 grit before assembling.

Saw the cheeks. Run the stretcher on the flat over the partially buried dado blade as shown. Rotate the workpiece to cut the opposite cheek for the same face. Then flip the piece over to saw the cheeks on the opposite face in the same manner.

Saw the shoulders. Using the same setup, run the stretcher over the dado blade on edge. Repeat for each tenon shoulder, flipping and rotating the piece as before.

Finesse the fit. After cutting the tenons a bit fat at the table saw, plane them for a perfect fit. A few swipes with a sharp shoulder plane should trim the tenon to just the right thickness. Use a chisel to round off tenon corners to fit in the routed mortises. Chamfered ends help the tenon slide in.

Assembly. A single parallel jaw clamp brings the parts together so long as the jaws of your clamp completely cover the joint. Gauging with a square, cock the clamp as needed to ensure 90° corners. A pair of I-beam risers allow clamp access and elevate the work to a comfortable height.

Make and install steps, and paint

Cut both step boards to size. Trace the profiles from the template to the show face of one step board. Then, double-face tape the inside faces of both step boards and stack-cut them to rough shape at the bandsaw, following up at the spindle sander before pulling the pieces apart. After sanding the step boards through 220 grit, clamp them in place on the assembly. The steps should overhang the sides and back about ½", with ½" between the two pieces and a little space between the steps' rear profiles and the long back. Drill the holes as shown, and then drive the screws. Drip glue in the counterbores and brush a little on the edges of the plugs before inserting them in their holes. (If you don't plan to paint, align the plugs' grain with the step board grain.) Tap them in place with a lightweight hammer until a thud indicates full seating. When the glue dries, trim the plugs flush. Finish up with any final sanding, and ease the exposed edges. Finally, apply your finish of choice.

Smooth at the spindle sander. Double-face tape the two step blanks together, trace the pattern template, and rough-cut them at the bandsaw. Then sand to your layout lines, using a spindle sander for the concave curves as shown here.

Drill and drive. Drill the holes after laying out their locations (see drawing, p. 49). One bit can drill your pilot hole, your clearance hole, and the counterbore all in one shot. (See the Buyer's Guide on p. 62 for more details.) After drilling, drive the screws.

Saw flush. Use a flush-cut saw and a block plane or chisel to trim the proud plugs. Follow up with a card scraper to smooth the surface. ■

HICKORY

Sapwood

As tough as they come

By Ken Burton

As Presidential nicknames go, they don't get much better than that of Andrew Jackson. He was dubbed "Old Hickory" after exhibiting his toughness during the War of 1812. And tough is an apt word to describe hickory. Its combination of hardness, stiffness, shock resistance, and density make it the toughest of the commonly available North American hardwoods. While not as showy as some of the other more prized hardwoods, hickory is not without its aesthetic merits. The creamy yellow sapwood is reminiscent of birch and pine, but a lot more hardwearing. And the tawny brown heartwood compares with cherry before it ages. A lot of hickory flooring comes through with "calico" boards displaying a combination of sapwood and heartwood that adds a bit of down-home charm.

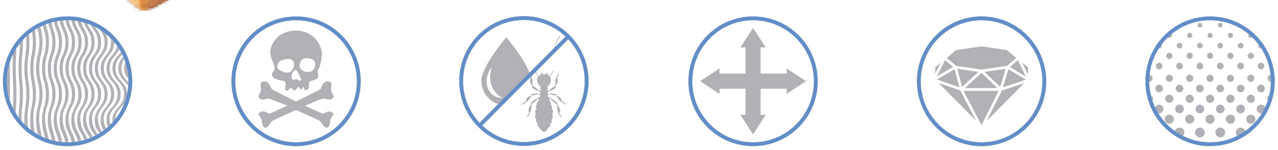
Where the wood comes from

A handful of species from the hickory and pecan family (genus *Carya*) are sold generically as hickory. True hickories such as shagbark are slightly stronger than those from the pecan side of the family, though the pecan-hickory species are more stable. But, as the species tend to be lumped together, the differences are moot. Essentially, if you're after maximum strength, check the end grain for boards with wide growth rings. In hickory, faster growth makes for stronger wood. Hickory (and pecan) trees grow abundantly throughout eastern North America and are not listed on the CITES or IUCN Red List.

History in woodworking

For centuries, woodworkers have utilized hickory's inherent strength for bows, wheel spokes, drumsticks, paddles, and handles for tools such as hammers, shovels, axes, and picks. In the world of sports, hickory makes great lacrosse stick handles, baseball bats, skis, and golf club shafts. And if you're old enough, you may remember the sting of a hickory switch from your school days. Early aircraft were constructed with canvas stretched over hickory frames. And the bark from certain species was harvested for chair seats and basket weaving. Outside of woodworking, hickory makes for excellent firewood due to its high BTU yeild. It also adds flavor to barbeque and smoked meats. More recently, it has become popular for flooring and cabinetry.

Strong and straight. Hickory's heartwood is typically a bronze-ish medium brown with straight grain. What the wood lacks in pizzazz, it more than makes up for in strength.



TEXTURE	TOXICITY	ROT/INSECT RESISTANCE	STABILITY	HARDNESS	DENSITY
COARSE	LOW	LOW	LOW-MEDIUM	VERY HARD	50 LBS./CU. FT.

Varied coloring. Don't let the light color of hickory's sapwood (left) fool you; it's every bit as tough as the darker heartwood. "Calico" boards (center) with a mix of sapwood and heartwood are commonly available, especially as flooring. Spalted hickory (right) is rarer but quite spectacular if you can find it.

Working and finishing

Hickory is sold as solid lumber, veneer, and plywood. In solid stock, 4/4 to 8/4 thicknesses are readily available, though boards tend to be narrower (4-12") and shorter (12' and under) than other common species such as poplar and red oak. Pricing is in the $3-5 per board foot range. While solid hickory can be worked with both machine and hand tools, you'll get a taste of how tough it is from the beginning. It tends to tear and burn with all but the sharpest of machine knives and saw blades and quickly blunts honed edges. Don't let this discourage you. Working hard, dense woods such as this with well-sharpened tools can be a delight. The endgrain pares without tearing, while scraping and sanding the face grain quickly yields shimmering surfaces. Hickory glues well, holds nails and screws tenaciously (be sure to pre-drill), and stains and finishes to a nice sheen. It has excellent bending properties, whether steamed or laminated. Its one major limitation is that it doesn't hold up well outdoors.

Hickory

- Tool handles
- Flooring
- Baseball bats
- Ladder rungs
- Wheel spokes

Not just tough, darn tough

In my experience, counter-height stools and bar stools take a beating. Not only do they see heavy use, but they are frequently sat and stood upon in ways they weren't necessarily designed to accommodate. In designing the piece shown here, I wanted to develop a stool that could stand up to all sorts of abuse—one worthy of being called darn tough. And what better wood to choose than hickory? If some part of this stool fails, it won't be because of wood choice.

Building this piece revealed hickory's challenges. The 1" Forstner bit I used for the seat joints needed sharpening after drilling only two holes. Paring the shoulders at the tops of the legs required a particularly sharp chisel, but the end grain sliced cleanly. And smoothing out the seat scoop with a spokeshave after bandsawing took far more time than anticipated, though the wood did cut without tearing. When I make more of these, I'll design a router jig to facilitate this.

In all, I'm pleased with the result from both a functional and aesthetic standpoint. The stool is rock-solid, substantial, and stable, with hickory's coloration lending it an air of rustic sophistication. ■

Robust construction for a hardy stool. Wedged through-tenons in the seat, mortise-and-tenon joinery for the stretchers, and trapezoidal geometry combine for a solid place to sit.

Photos: Ken Burton

Surface prep superstar

Of the many simple woodworking tools in my shop, one of the most versatile might be a rectangle of steel. The card scraper is inexpensive and easy to use once you get the hang of sharpening it by turning a hook on each edge. Available in a variety of thicknesses and shapes, these humble helpers handle surface refining jobs ranging from removing saw marks, glue clean up, and taming rough grain to flushing surfaces (as shown) and leveling exposed joints. And they do it all without noise, dust, or tearout.

I like this two-piece, twenty dollar set from Bahco. The larger, thicker card works best for heavy-duty work, while finessing falls to the smaller, thinner one. For instructions on how to sharpen your scraper and put it to proper use, visit *woodcraftmagazine.com* and click on onlineEXTRAS. You'll soon see just how invaluable these unassuming tools really are. ■
—Chad McClung

Bahco Cabinet Scrapers
2pc, #100102, $21.99

Prices subject to change without notice.

Photo: Chad McClung

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Read this issue closely to answer the following questions.

1. **How many fridge magnets appear in the Table of Contents?**
2. **What's the geometric name given to the jig Ken Burton suggests using to set up a cove cut?**
3. **What time does the Arts & Crafts Wall Clock say it is in the story's opening photo?**

Go to our Facebook page for instructions on how to win.

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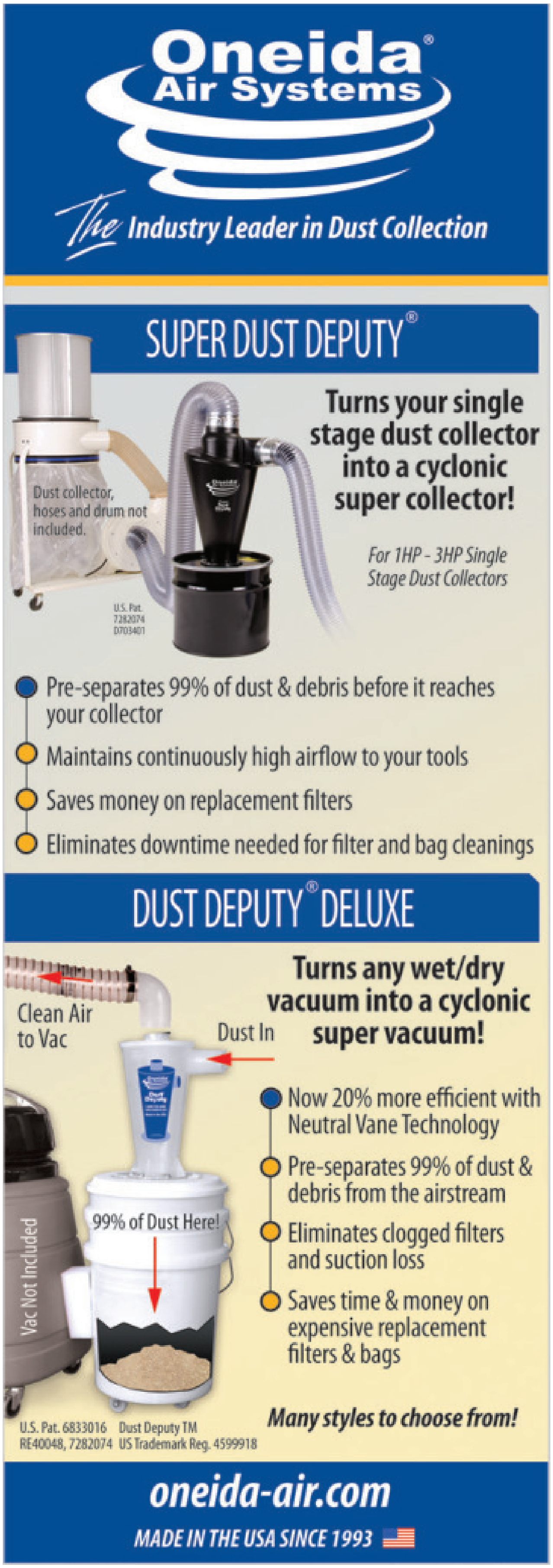
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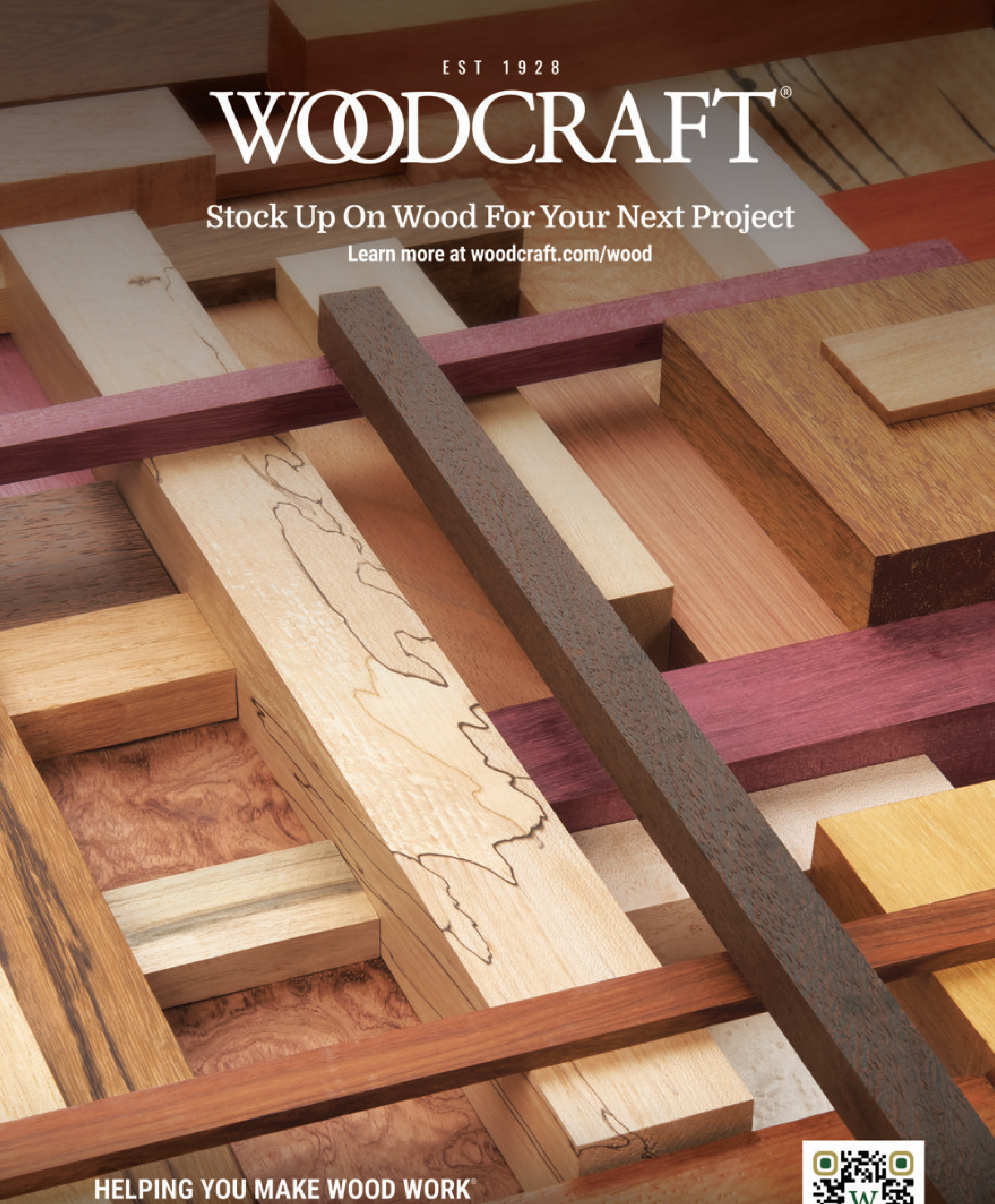
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Buyer's **Guide**

Tool Reviews (p. 12)

1. Oneida Air Systems BenchTop DC Personal Dust Collector......*oneida-air.com*, **$599.00**

Fun with Fridge Magnets (p. 22)

1. WoodRiver Rare Earth Magnet, ⅜" × ⅒", 10-piece........................... #150950, **$7.99**
2. Doctor's Woodshop High Build Friction Polish, 16 oz. ....#843051, **$21.99**

Cove Cutting (p. 26)

1. CMT Cove Cutter... *mcfeelys.com*, #CM-0235-07, **$172.82**
2. WoodRiver Knob, 5 star with Through Hole, 5⁄16"-18 Insert.................. #142224, **$2.79**

Arts & Crafts Wall Clock (p. 32)

1. National Miniature Narrow Solid Antique Brass Hinge, 1½ × ⅞".........#150645, **$5.99**
2. Highpoint Hook Latch Small Antique Brass, ...#162716, **$3.99**
3. Transfast Dark Mission Brown Water Soluble Dye, 1 oz....................#123828, **$14.99**
4. Waterlox Semi-Gloss Sealer/Finish Original Solvent Based, qt. ....#37J21, **$31.99**

Following available from *clockworks.com*

5. Premium Chime Clock Movement...#QU40P-B, **$60.00**
6. Quartz Clock Pendulum, 2¾" dia. ....#Q-BOB275, **$7.00**
7. Spade Quartz Clock Hands, 2½" ....#H2G-64B, **$1.00**
8. Square Cottage Clock Dial ....#SD75IACOTT, **$15.00**

Murphy Bed (p. 38)

1. Selby Cabinet Wall Bed Mechanism Inside Mount, Queen..............#419558, **$454.99**
2. Linenspa 8" Memory Foam and Innerspring Hybrid Mattress, Full..*amazon.com*, **$143.58**

Simple Step Stool (p. 48)

1. General Tools Circle Cutter .... #16N41, **$41.99**
2. Whiteside Spiral Upcut Bit, ¼" D, 1" CL, ¼" SH................................ #03K33, **$20.99**
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6. Cindoco Flat Head Screw Hole Plugs, Birch, ⅜"..................................#161890, **$3.99**

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1. Bahco Cabinet Scrapers, 2 pc...#100102, **$21.99**

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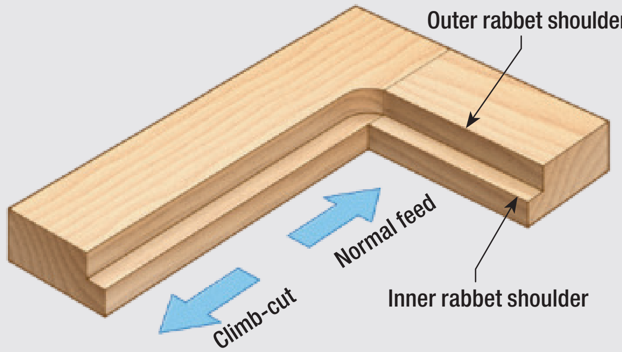
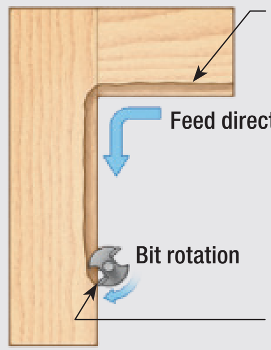
Climb-cutting: a safe, effective way to tame tearout?

Q: *I've read that climb-cutting (feeding a router opposite the normal direction) can reduce tearout. But I've also heard that it's dangerous. I'm relatively new to routing, and would appreciate any clarification on the matter.*

Stan Beckford
Birmingham, AL



STEP 1: Climb-cut



STEP 2: Feed normally

A: Climb-cutting definitely reduces tearout, but it also involves an element of risk. First, the benefit: When feeding the router "backwards" like this, the bit cuts inward cleanly because the wood fibers are backed up by the workpiece itself. When fed in the normal direction, an outwardly rotating cutter that encounters contrary grain will often tear out the unsupported fibers. This is particularly a problem with tearout-prone hardwoods such as oak, ash, and just about any figured wood, as well as splintery softwoods like fir, cypress, and cedar.

Tearout can happen during any number of routing operations, including simply rounding over an edge. But it's a notable concern when cutting panel rabbets in frames, where the shoulders can tear out. Although tearout on the outer shoulder is often hidden on the back of a frame, damage to the inner shoulder is very apparent on the finished piece. Because of this, I almost always initially climb-cut these rabbets, as shown in the drawings. I also regularly climb-cut when profiling any tearout-prone woods.

So why not climb-cut everything? Well, here's where the risk comes in. Climb-cutting causes the cutter to aggressively self-feed, pulling the tool along with it. Countering this requires a firm grip on the router to keep it from lurching out of your hands. Because of this, always take a series of light cuts to do the job. Also, always finish up with a pass in the normal direction to ensure a cut of consistent width.

I climb-cut as needed using a *hand-held* router and have never ventured into danger. That said, *I do not advise climb-cutting on a router table under any circumstances*. It's too easy for the bit to suddenly grab and hurl a workpiece, damaging it and exposing your hands to the cutter in the process. As with any woodworking operation, climb-cutting demands safe, sensible working practices. If something doesn't feel right, don't do it. ■

Paul Anthony
Senior Editor,
Woodcraft Magazine

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