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ISSUE 300 DECEMBER 2024/JANUARY 2025

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BEVEL WITH SAFETY
AND PRECISION

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- Ornament Photo Frames p.36

- Art Deco Keepsake Box p.54
- Cozy Retro Cat Habitat p.66

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WE HAVE LOTS OF ISSUES

300 OF THEM, IN FACT.

Wow! Issue 300. That number represents 40 years of publishing; thousands of project plans, tips, and techniques; tens of thousands of pages of woodworking content; and most important, hundreds of thousands of our closest friends—you! From all of us at WOOD® magazine to all of you, we offer our sincere gratitude for making this possible.

Here are other numbers for you to consider:

- **46.5 million:** The number of U.S. households owned by a pet cat according to the American Pet Products Association. We have furnishings for your furry little landlord with a clever take on a cat bed—the “Kitty-Cat Console” on *page 66*. The retro television design caters to two of your feline’s favorite activities: sitting in a box and being the focus of attention.
- **140:** The number of ornaments you can fit on a 7½’ Christmas tree, according to leading artificial tree manufacturer Balsam Hill. Make room for a few more with the “Ornament Frames” on *page 36*. Five styles of frames will let you display your favorite holiday memories every year.
- **Two:** The number of axes (the geometry kind, not the lumberjack kind) that we used when turning the cabriole leg on *page 62*. Learn the secrets to designing and crafting a multi-axis project to take your woodturning to an entirely new dimension.
- **Just eight more:** The number of additional clamps the average woodworker perpetually needs, according to a survey of my household. Take a look at our test of one-handed, rapid-action clamps on *page 30*. We put eight mini models through their paces with testers of varying grip strength so you know which ones to stock.

Again, we can’t thank you enough for reading. Some of you have been with us a long time. Do me a favor and send a picture of yourself holding the earliest issue of WOOD that you own to woodmail@woodmagazine.com. I’d like to hear about your woodworking journey.

Then get out to the shop and make something.

We’ll help. 🌲

Lucas

LUCAS PETERS

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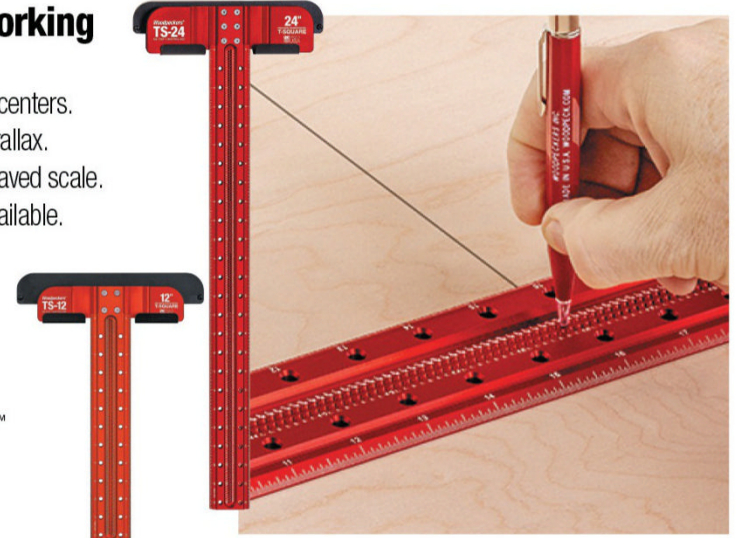
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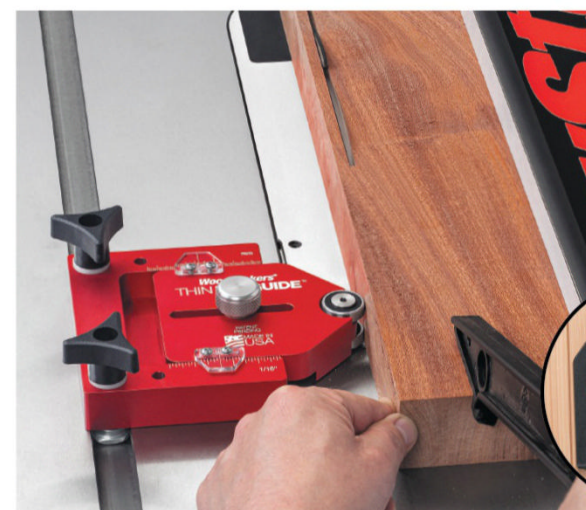
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WOOD

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Take the time to craft this giftable mantel clock. The sourced kit provides the movement and decorative tile.
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ORNAMENT PHOTO FRAMES
Five variations of little holiday frames garnish your tree with big holiday memories.
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Crosscuts, miter cuts, stopped cuts—this sled handles it all while T-track hold-downs keep your fingers safe.
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PRIME-TIME FELINE BED
Give your furry little friend a televised retreat for a comfortable catnap while you enjoy the show.



ON THE COVER



Once you build this multitasking and high-precision tablesaw sled, you'll never go back to your miter saw for crosscuts or miters again.

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COMPLEX SHAPES BY
ADDING A SECOND,
OFFSET AXIS.**



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FLYING HIGH

First of all, thank you for your great magazine and plans. I have built so many wonderful things for my family and friends including items for charity.

For each of my three grandchildren, I have built an heirloom rocker. My oldest granddaughter got a traditional rocking horse, my middle granddaughter got the biplane rocker shown here, and for my grandson, I made the motorcycle rocker from Issue 258 (December/January 2018/2019).

Ray Knutson

Bismark, North Dakota



See plans for the
rocking motorcycle.
woodstore.net/
motorcycle

I built a rocking motorcycle for one of my grandsons. To keep peace in the family, I made this rocking biplane for another grandson.

David Michael

Waynesville, North Carolina



I consider myself an amateur woodworker. I wanted to build a rocking biplane for my grandson's first birthday, but with my meager collection of basic hand tools, I knew this was going to be a challenge and stretch my skills.

I used black walnut and maple, applying dark walnut Danish oil to the walnut. I coated the maple with natural Danish oil. Four sprayed-on coats of clear satin lacquer add the finishing touch.

Using my bench grinder and a wood rasp, I shaped the prop spinner. I installed bearings for the propeller. Polished stainless steel tubes make up the exhaust stacks.

Intending to create a family heirloom that could be passed on, I'm pleased with the results and the opportunity to gain more experience with hand tools.

Bud Grimm

Lawrenceville, Georgia

Thanks for sharing your story, Bud. We are impressed with your hand tool skills and glad that you were willing to challenge yourself creating an heirloom piece for your grandson.

Dave Stone

Managing Editor



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ROUTER TABLE

Referring to the review of benchtop router tables in issue 296 (July 2024), I've had the Rockler table since it was first offered. I did have to drill additional mounting holes for my Craftsman router, though. By angling the router base, the router fits through the table's plate opening without removing the handles. I get double duty from the Rockler table using their spindle sander base that also fits the table.

Dave Oberg

Wausau, Wisconsin

WOODWORKER WONDERING

I love, love, love *WOOD*® magazine! I am a retired skilled tradeswoman (diemaker) and a self-taught beginning woodworker. I've been working on my shop and collecting machinery for about 15 years. My shop is in a big, old barn I've been renovating. I'm finally organized enough to churn out some projects, and your magazine has given me plenty of ideas.

Because I am a beginning woodworker, I'd like to request more crafty, or simple, projects geared for women. I need more beginner projects. For example, my burning question of the moment happens to be frames. How do I make one? It sure looks simple enough, but how do I fasten the corners together? What kind of interesting frame profiles can I create with a router?

I can't wait to receive my next issue of the magazine. Thanks so much for the useful information and ideas for my woodworking venture.

Laura Tilson

via email

Thanks for the kind words and taking the time to write, Laura. It's exciting that you are beginning your woodworking journey and we're happy to be a part of it. Skills from your extensive experience as a diemaker will come in handy in the woodworking shop.

We try to have a mix of projects in each issue to appeal to various skill levels and interests. Take a look at the ornament frames on *page 36*. They're made by routing profiles in long pieces and then miter-cutting them to length.

Kevin Boyle

Senior Design Editor



TAKING FLIGHT

After retiring as an aircraft technician of 46 years I have more time to spend in my wood shop. My latest project was a coffee table patterned after an antique aircraft wing. I used cherry for the wing's structure and fashioned the leading edge of the wing from sheet aluminum.

Dennis Rieke

Crestwood, Kentucky



Purchase plans for the vinyl revival record cabinet.
woodstore.net/records

RECORD HOLDER

When I saw the *Vinyl Revival Record Cabinet* from issue 292 (November 2023), it looked like the perfect fit for my newly constructed sun room. I built mine from cherry finished with Rubio Monocoat. I love how *WOOD* magazine has helped me to push the limits and grow my woodworking skills. 🌱

Steven Moore

Charlotte, North Carolina

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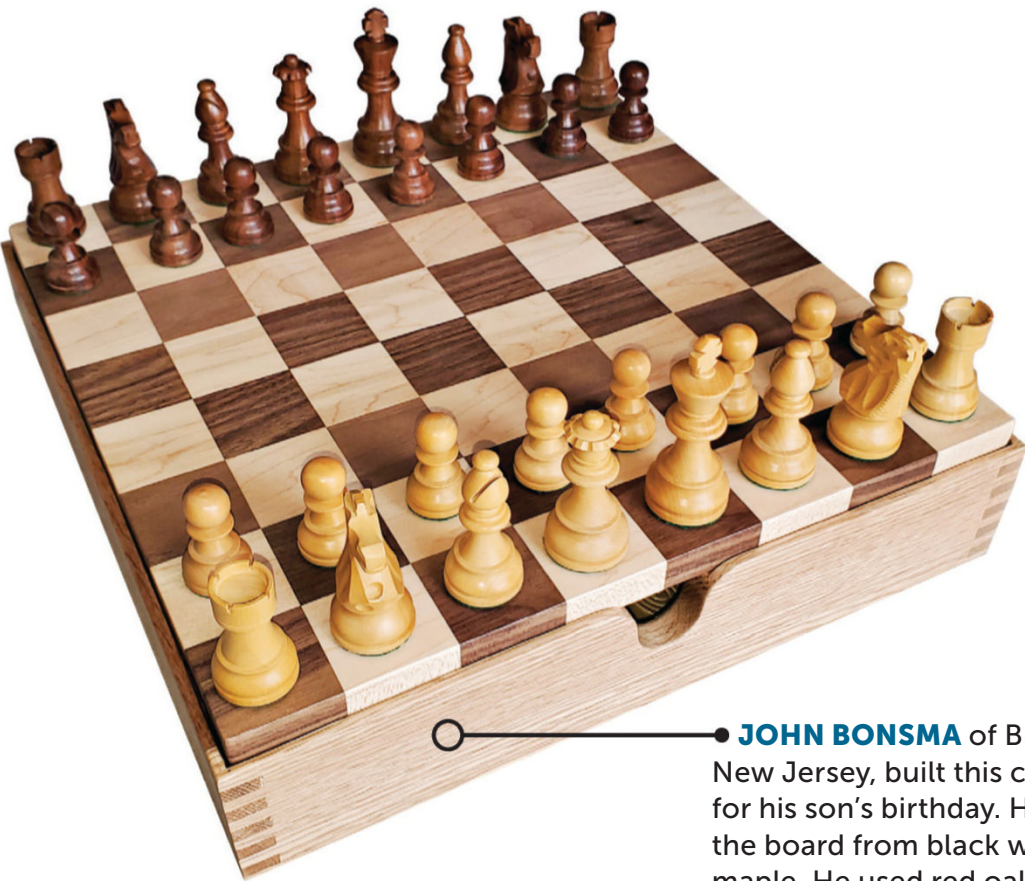




It took **CALEB WYATT** of Buckeye, Arizona, about nine months to build this workbench. He used hard maple with walnut accents. He built the vises using hardware from benchcrafted.com.



JOSEPH CONRAD of Flat Rock, Michigan, helped his 4-year-old grandson, Levi, build a kid-sized workbench from scrap lumber. The smile speaks for itself and grandpa felt pretty good too.



JOHN BONSMAN of Branchburg, New Jersey, built this chess board for his son's birthday. He made the board from black walnut and maple. He used red oak left over from a flooring job to make the storage compartment underneath.



ELAINE BLYTHE of Great Falls, Montana, made these horses based on a toy made by Alexander Calder. Calder made his from wire for his children while Elaine crafted her wood versions for her grandchildren. The wagon floors are made from lumber harvested by their great-grandfather.



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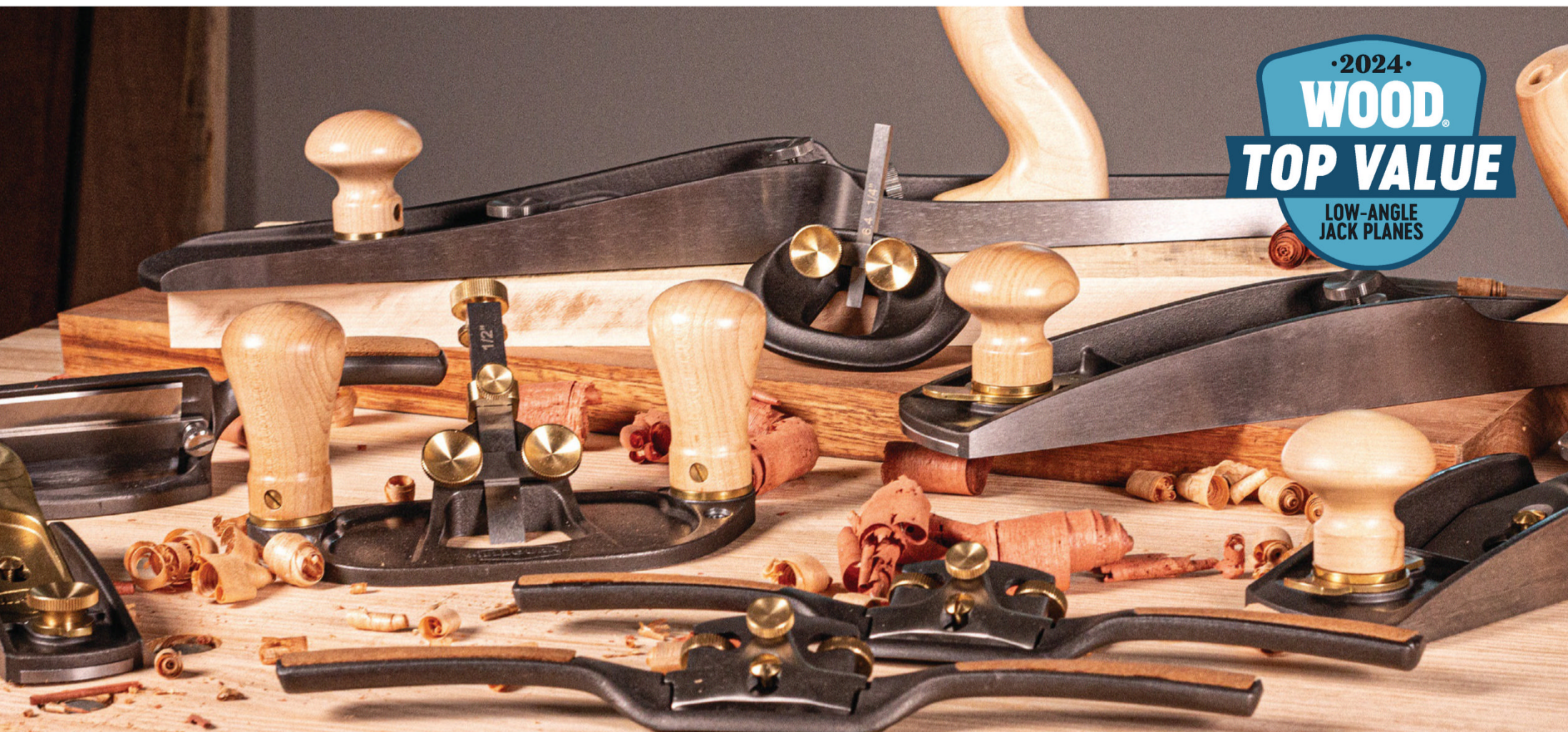
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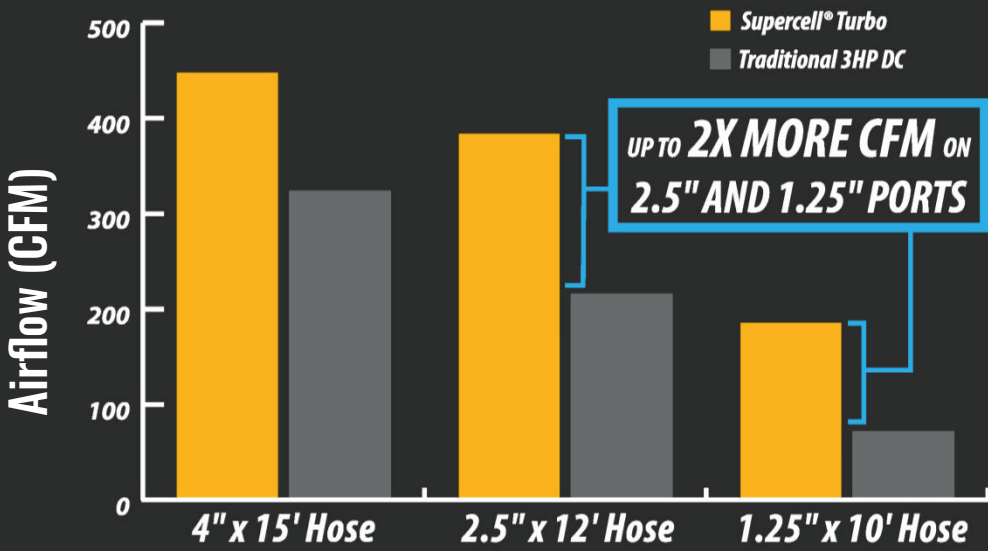


Inspired by a version featured in an 1894 Montgomery Ward catalog, **RICH LINVILLE** of Corvallis, Oregon built this revolving bookcase out of oak. He modified the original design, making his a little larger. A metal turntable capable of supporting up to 1,000 pounds allows the bookcase to rotate with little effort, even when loaded full with books.

Parker Stormquist, grandson of **DON PARSON** of Braham, Minnesota, submitted this photo of a model carousel that Don made. Don designed it himself and made the wood gears to make the carousel spin easily. 🌳



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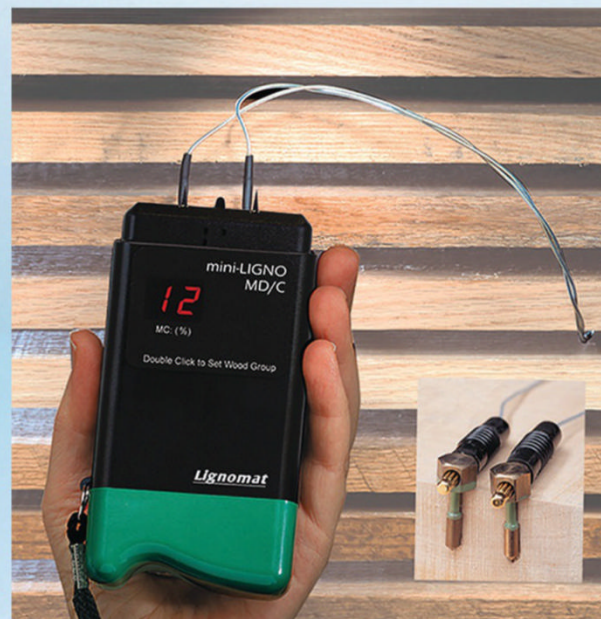
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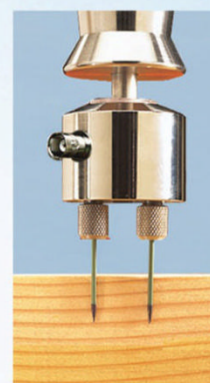


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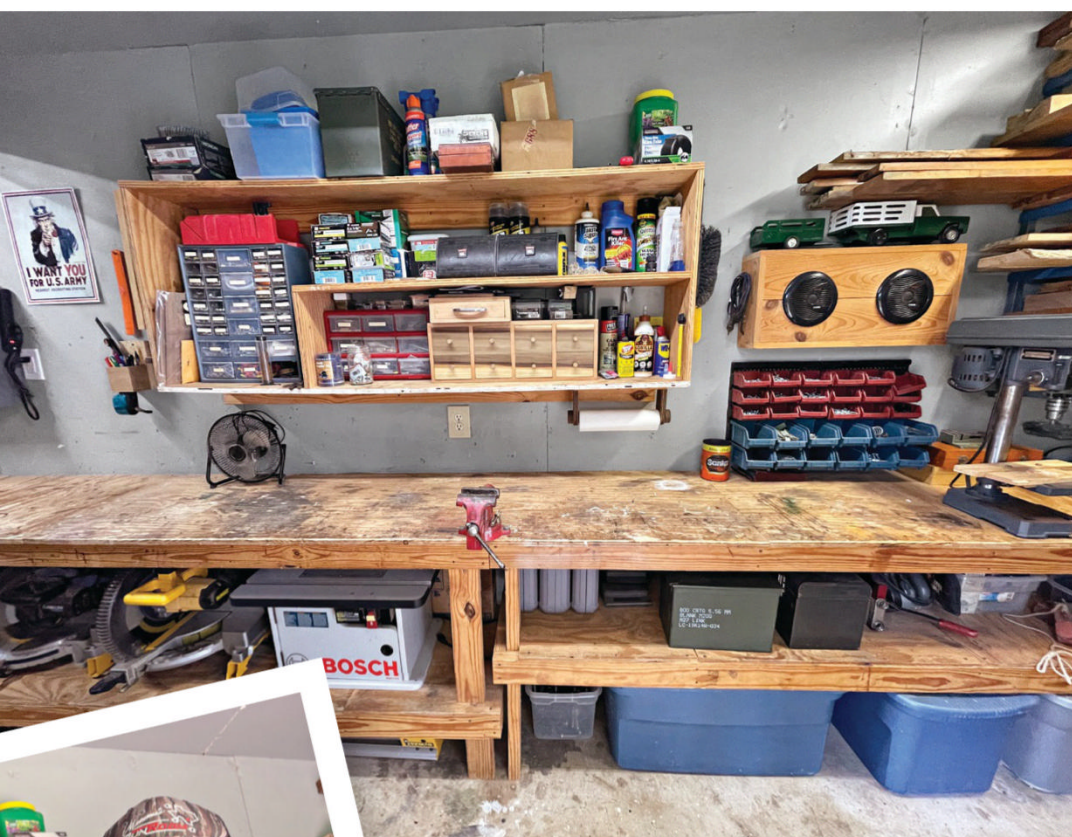
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WRITER: RANDY MAXEY



The custom, wall-mounted shelf unit holds hardware, nails, screws, glues, and lubricants. Two mitersaws and a router table reside under the bench.



Anthony's brother built the wall-mounted speaker to supply music in the shop. Hardware bins, a drill press, grinder, and lathe sit atop the bench. Storage bins tuck underneath and lumber storage above.



Between building small projects and restoring old relics, teenager Anthony Friddell likes nothing more than passing time in his small workshop.



SHOW US YOUR SHOP

Send high-resolution digital photos of your shop to **woodmail@woodmagazine.com** and we may showcase it in the magazine!

With plenty of bench space and well-organized storage, this 144 sq. ft. shop sufficiently serves Anthony Friddell's needs. As a home-schooled, 14-year-old from small-town Louisiana, he has plenty of time to work on his favorite projects: model trucks, toys, and kitchen utensils.

When his parents purchased their home, a storage room on one side of the one-car garage seemed like the perfect spot for an aspiring young woodworker to set up a shop. The 8'-tall walls in the shop and 9' walls in the garage are insulated with fiberglass and covered with 1/2" drywall. French doors centered on the long shop wall open to the exterior, bringing in plenty of

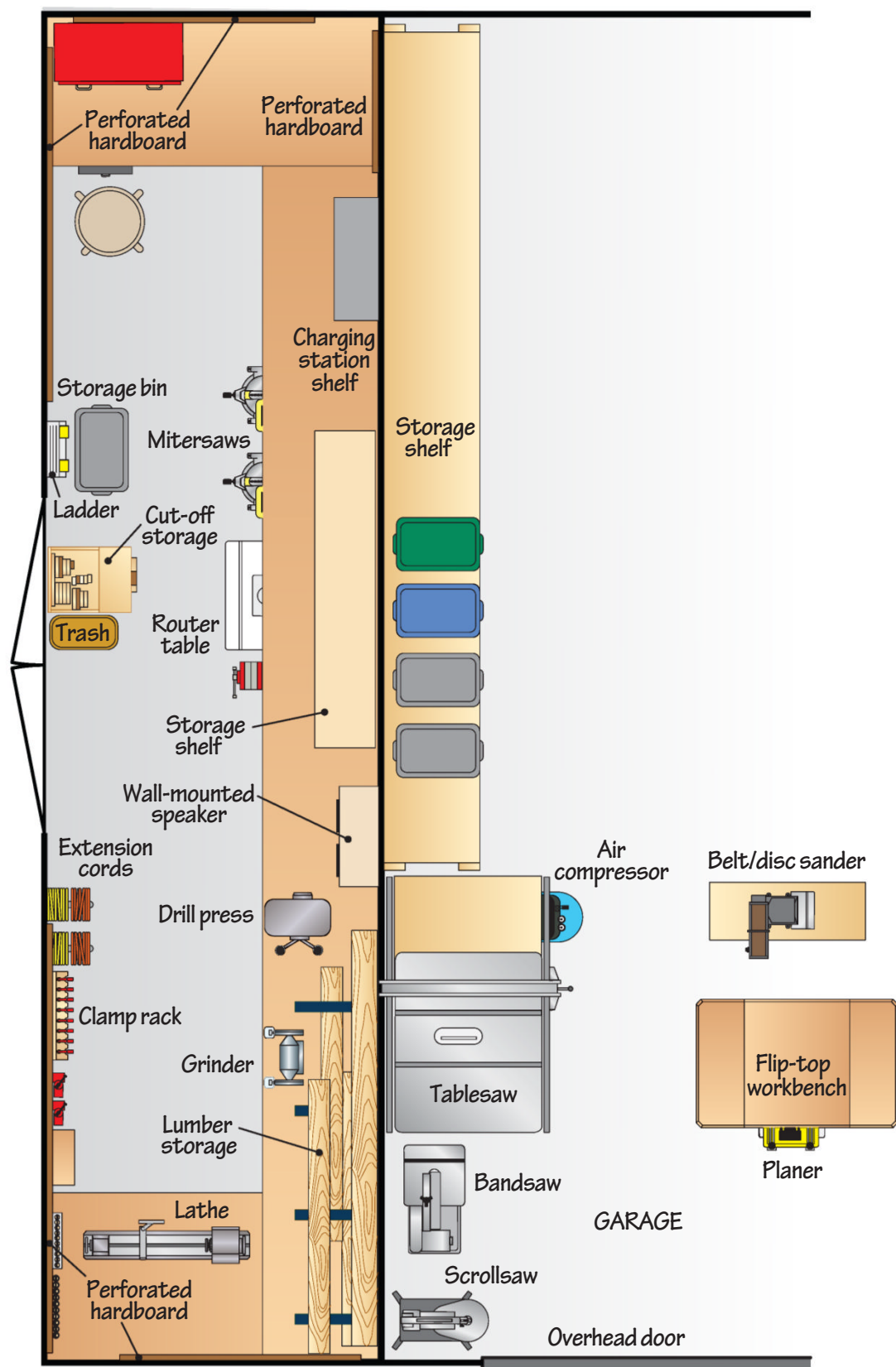
ventilation and natural light while eliminating the need for air conditioning or heat.

Anthony and his older brother built the shop's benches, pegboard walls, and shelves above the main workbench. "We just kept tweaking and adding things to it," Anthony said.

Benches with 2x4 base frames and plywood tops line the entire length of three walls, providing plenty of worksurface. Shelves below plus the floor space underneath the benches offer lots of real estate for storage, including large plastic bins.

In addition to portable power tools, a midi-lathe and benchtop drill press reside inside the shop space. A benchtop

PHOTOGRAPHER: ANTHONY FRIDDELL;
ILLUSTRATORS: ROXANNE LEMOINE, LORNA JOHNSON



The garage space adjacent to the shop serves as an overflow for larger tools. The tools remain stationary unless the forecast calls for a major storm. Then they're moved to accommodate the family car.



A wall-mounted charging station also holds sanding discs. The area below the bench houses portable power tools, a file cabinet for table saw accessories, and a bin filled with electrical supplies.

“
I FIRST STARTED WOODWORKING WHEN
I WAS 9 YEARS OLD AFTER I CONVINCED
MY DAD TO PURCHASE A SCROLLSAW
SO I COULD MAKE TOY ANIMALS.

-ANTHONY FRIDDELL, WOODWORKER

”





A simple, plywood cart keeps cutoffs contained and accessible for use in smaller projects like toys and kitchen utensils. Casters make the cart easily mobile.

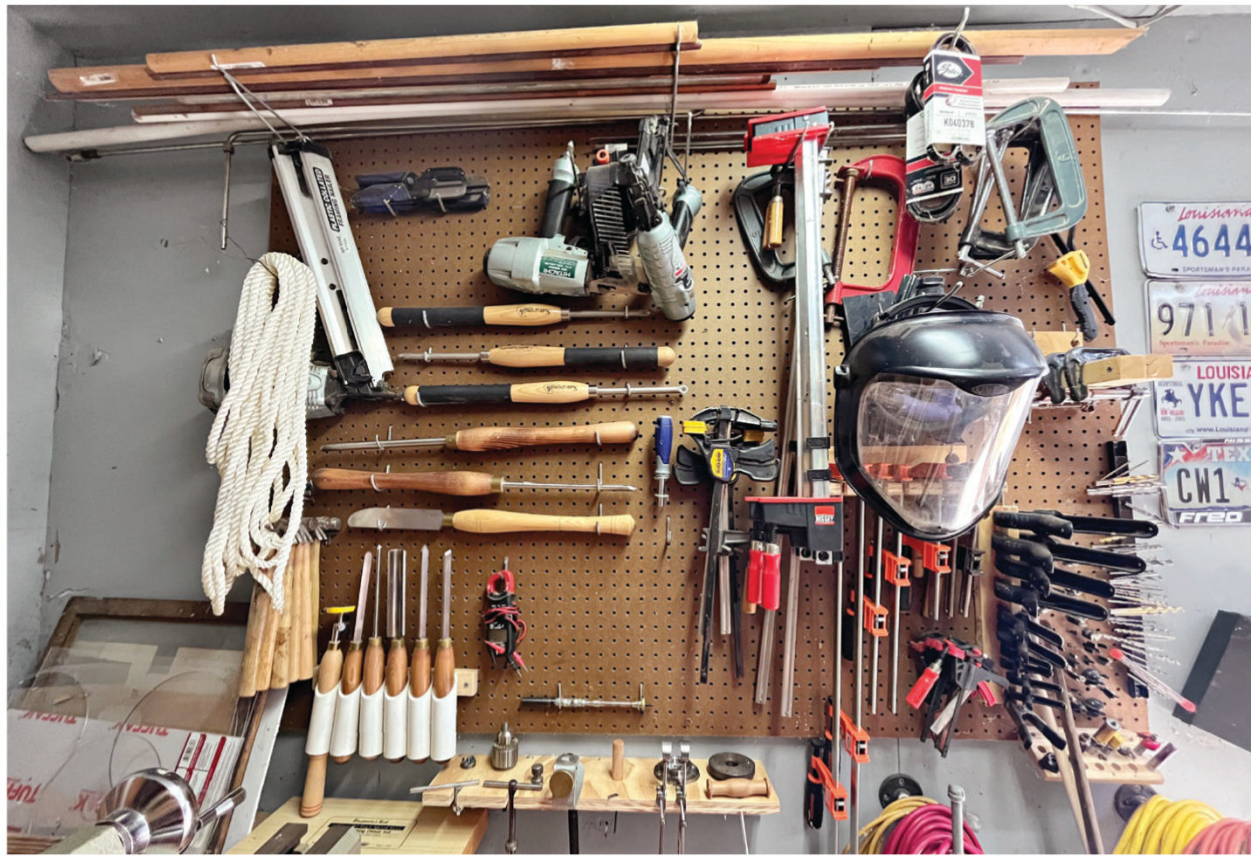


◀ To build this 8-drawer hardware storage cabinet, Anthony used salvaged oak floorboards for the carcass and poplar for the drawer fronts, maintaining a continuous grain pattern. Dowels act as pulls.

router table tucks away on a shelf under the main bench.

Because the dedicated shop space is so small, Anthony and his dad set up larger tools in the garage stall. This space houses a tablesaw, bandsaw, sander, and a flip-top workbench with a benchtop planer.

Besides woodworking, Anthony enjoys restoring old tools, toys, and other items. “I like to work on anything rusty and broken that I can get my hands on,” he says. He has restored hand planes, a wagon, handsaws, a floor-standing drum fan, and bookcases. He’s especially proud that he was able to restore his dad’s childhood toy truck and trailer. They sit in a place of honor above the speaker cabinet. 🌲



Anthony relies heavily on pegboard for shop organization. It’s a quick and easy way to add storage yet remains flexible as new tools are added. Custom racks allow similar tools to be grouped together in a compact space.

STORAGE IS KEY

The longer you look around his shop, the more you realize how Anthony takes advantage of every cubic inch with creative storage solutions.

WALL-MOUNTED SHELVING includes a custom cabinet for versatile storage.

PEGBOARD lines the walls to provide lots of reconfigurable options for tools and accessories.

TOOL RACKS near the lathe keep turning tools, chucks, and lathe centers within reach.

HEAVY-DUTY LUMBER RACK above the workbench provides sturdy storage with easy access.

CLAMP RACKS designed to hold spring clamps and small bar clamps keep them at the ready for glue-up tasks.

ROUTER-BIT STORAGE consists of a small rack for larger bits with 1/4"-shank bits fitting into pegboard holes.

CORD STORAGE HOOKS made from galvanized pipe and flanges mount to the wall for convenience.

BENCHTOP TOOLBOX holds mechanic’s tools like wrenches, socket sets, and pliers.

PENCIL STORAGE includes a small, open-top box with a sharpener attached to the bottom.

CHARGING STATION located above the bench keeps batteries charged and ready to go.

PLASTIC BIN BOXES mounted on a wall rack hold fasteners and other hardware.

STORAGE BINS throughout the shop keep tools and supplies accessible and organized.

TEARS FROM A VOLCANO

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CHOOSING THE RIGHT CONCEALED HINGES

I'm building cabinets and would like to use concealed door hinges. When I looked at hinges online, I was overwhelmed with the choices. How do I go about determining which hinges to use?

Ralph Haynes
Lubbock, Texas

A: You're not alone, Ralph. We face the same question on nearly every cabinet we build in the *WOOD*® magazine shop. The good news is that concealed hinge manufacturers make hinges to suit just about any application. While this makes for a lot of options, it's actually pretty easy to narrow down the possible choices based on the type of cabinet and doors you're building. Essentially, there are three things you need to know when selecting hinges: the cabinet type, the door type, and the desired swing.

To start with, does your cabinet have a face frame? Or is it frameless? With face frame cabinets, the hinges mount to the frame. Frameless cabinets require a different style of hinge that mounts to the interior face of the cabinet side.

Next, you'll need to know your door style. Full overlay doors cover the entire cabinet edge or frame so all you see is the door. Partial overlay doors cover only a portion of the face frame. With partial overlay doors, you'll also need to choose how much of an overlap you want. An overlay door can also

have a rabbeted or lipped edge so that it fits partially into the door opening. Inset doors fit flush with the face frame.

The third thing you'll need to know is how far you want the door to open. Standard hinges open from around 105° to 120°. For applications where the doors need to open wider, such as corner cabinets or cabinets with slide-out shelving, wide-angle hinges that open up to 180° are available.

Many online retailers, such as Rockler (rockler.com), have search filters to narrow down the selection quickly. By entering in your door's parameters, you'll quickly whittle the choices down from dozens to just a few. Once you get to this point, it's usually a matter of choosing options such as different finish choices, soft-closing, or touch-to-open features. 🌲



For more on choosing hinges, go to:
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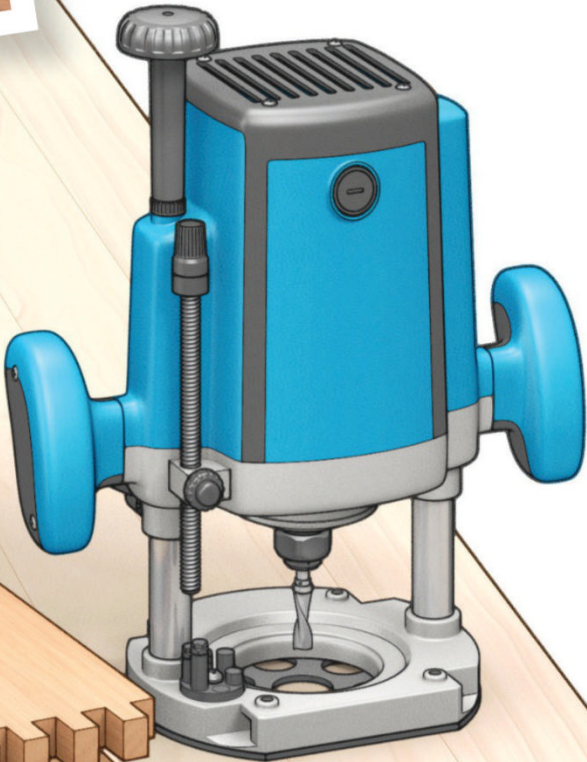
BETTER BOX JOINTS

Box-joint jigs always prove challenging to set up for a tight fit. So instead of a conventional jig, I built my own templates and jig that work with my handheld router and a flush-trim bit.

First, cut hardwood strips to match the desired width of the fingers and notches of the box joint. Then cut the strips to length; 2" long is plenty for box joints in 3/4" stock. Glue the cut strips together in alternating directions with a 1" overlap to make the template. Then mount the template, centered, on the edge of a 2x4 cleat, keeping one end of the template flush with an end of the cleat. Attach a stop at this end for positioning the workpiece. Label one side of the template "A" and the other side "B" to help with orienting the box sides and ends.

To use the jig, orient one end of a box side under the template and against the stop on side "A" and clamp it tight. I use the vise on my bench. Set the depth of the flush-trim bit then rout between the keys to create the box joint. Rout the other end of the piece this same way. To rout the mating piece, repeat the process, but this time using the "B" side of the template.

Keith Mealy
Oregonia, Ohio



For his tip, Keith wins an Orion 950 Smart Pinless Wood Moisture Meter Kit from Wagner Meters worth \$599.00



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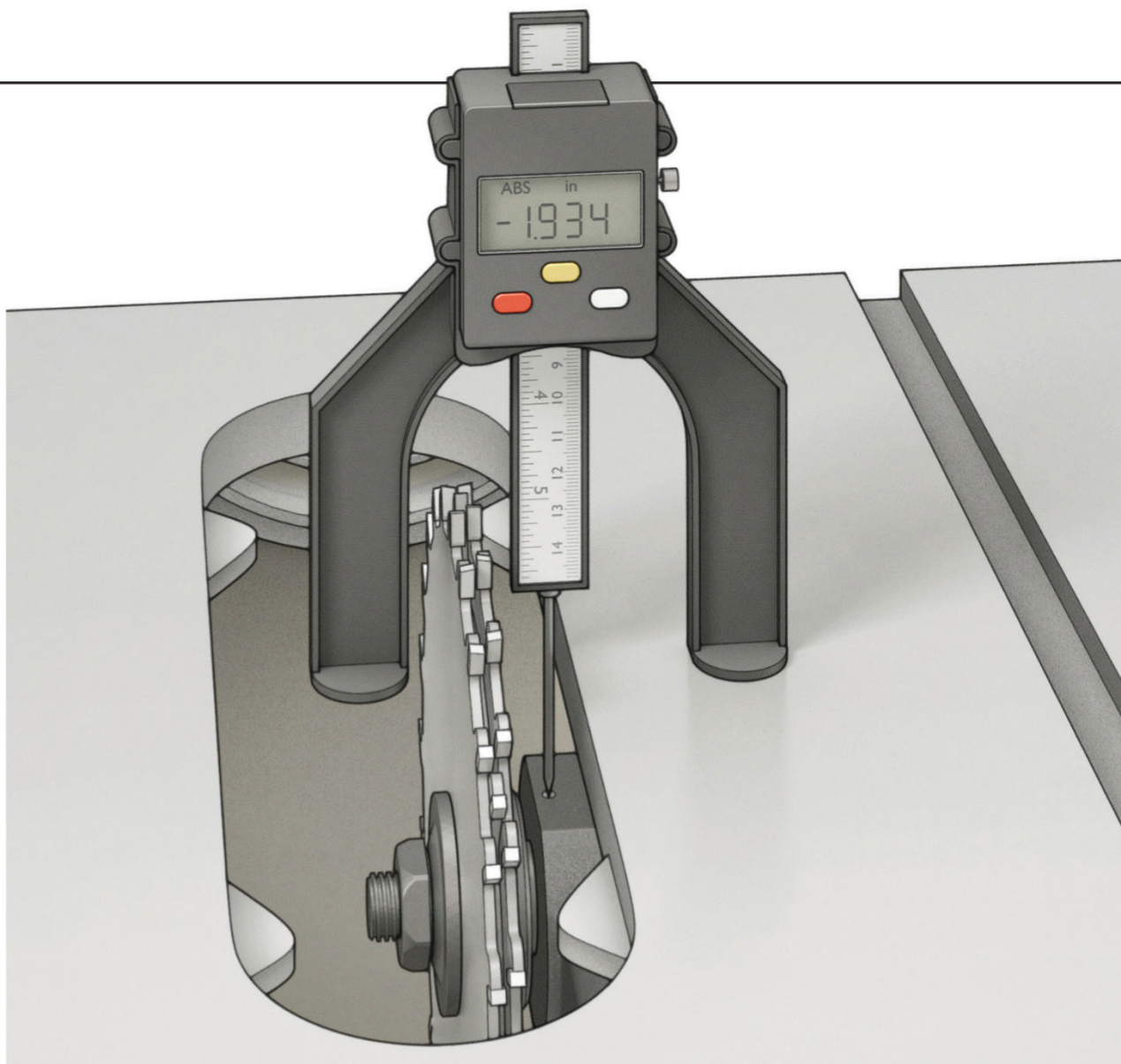
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Because we try to publish original tips, please send yours only to **WOOD**® magazine.

ILLUSTRATOR: CHRISTOPHER MILLS



DIVING INTO DIGITAL DEPTHS

Precisely returning to a previously used blade height on the tablesaw can be tricky. Finding the exact spot a tooth crosses the top of its arc is a guessing game at best. I eliminate reliance on the blade entirely by instead gauging the height of the trunnion before I change my blade setting.

With the probe attached to my digital height gauge, I first zero the gauge on the tablesaw top. Then, I lower the gauge until the probe drops into a small indent I drilled in the trunnion.

I make a note of the precise measurement, and use the same probe location to reliably return to that blade height after changing heights for other operations.

William Graff
Bellevue, Idaho

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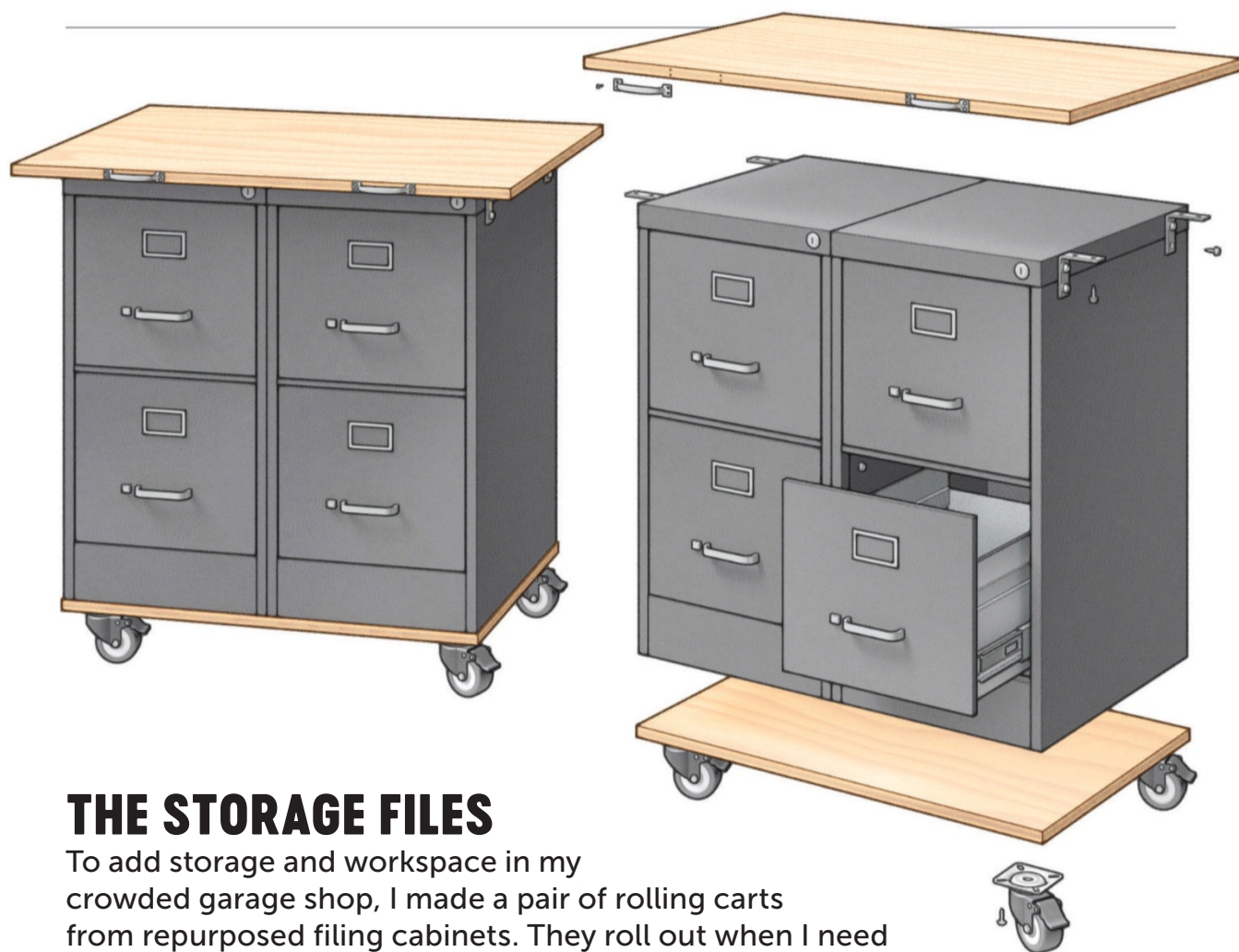
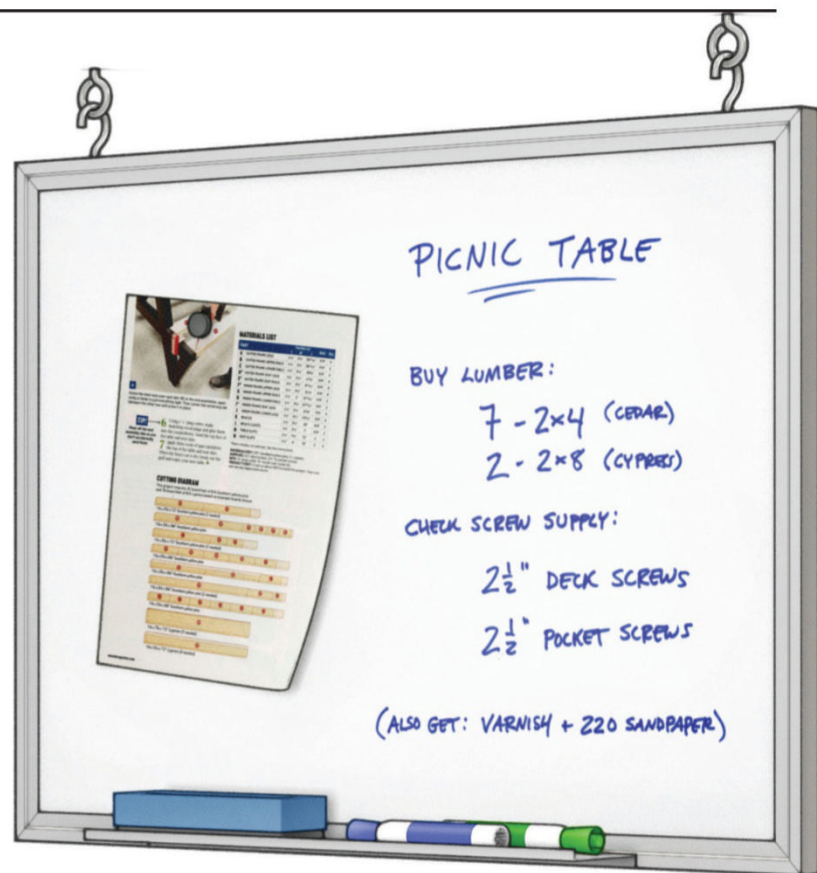
SHOP TIPS

BOARDED UP

When building projects, I use a ceiling-hung dry-erase board to keep a record of projects parts, quantities, and dimensions that I can reference at a glance. It's metal, allowing the use of magnets to keep small drill bits, steel rules, and *WOOD*® magazine project cut lists close at hand. The board swings on open eye hooks which make it easy to take it down to erase and add new information. I positioned it to be easily visible from my tablesaw.

Tom Carrell

Brookport, Illinois



THE STORAGE FILES

To add storage and workspace in my crowded garage shop, I made a pair of rolling carts from repurposed filing cabinets. They roll out when I need them, then stash under my mitersaw station when I don't.

I fastened the cabinets in pairs to plywood bases, and then added locking swivel casters. Oversize plywood tops mount using L-brackets. My tops and bases sit flush with the cabinet backs so I can attach the carts together back-to-back when I need a larger surface. Handles on the top edges make my low-budget work-and-storage stations easy to move.

Bob Sokolow

Portland, Oregon



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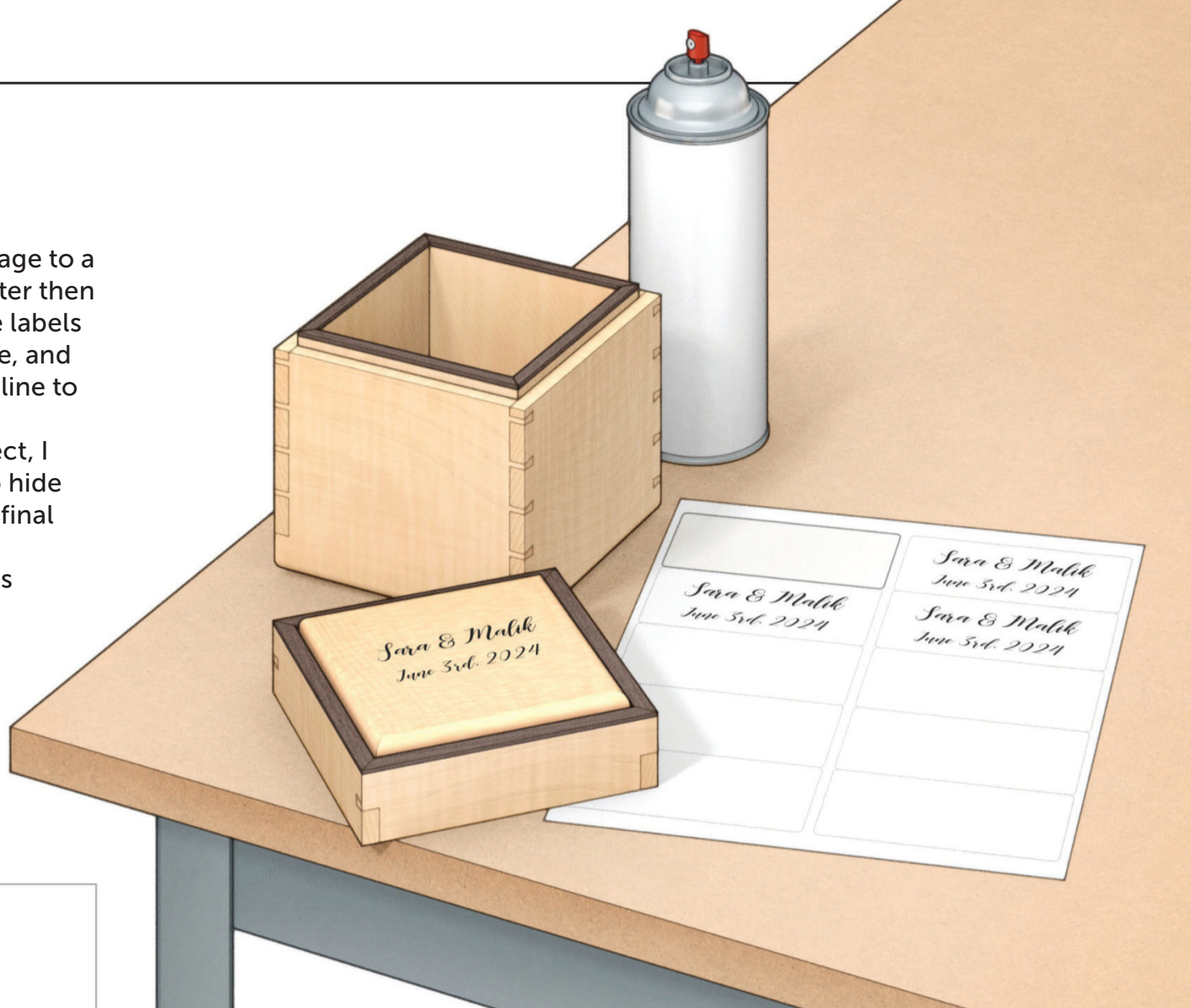
STICK IT TO 'EM!

When I want to add lettering or an image to a wood project, I draw it on the computer then print it on a clear address label. These labels are available at any office-supply store, and the manufacturers offer templates online to make layout easy.

After applying the label to the project, I spray several coats of clear lacquer to hide the edges. After a light sanding and a final coat of lacquer, the label disappears.

The only downside to this method is that you can't print white because white toner isn't available.

Roger Mickelson
Mesa, Arizona

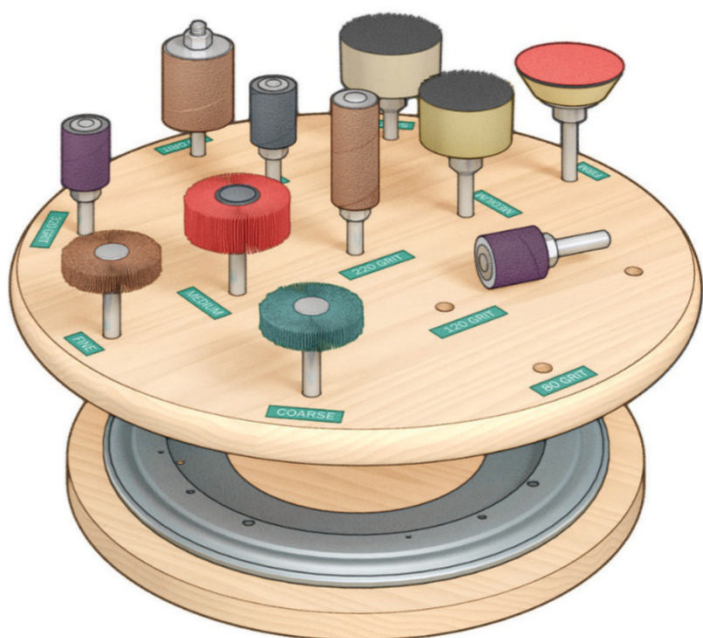


GRITTY CAROUSEL

Tired of rummaging through a drawer to find my sanding wheels and brushes, I made this simple organizer using an old lazy Susan bearing. A plywood disc serves as the base while a larger disc on top stores a wide range of accessories.

I drilled strategically placed holes in the top to hold the various wheels and brushes, and added labels to make it easy to find the right one. The carousel resides under my workbench for easy access.

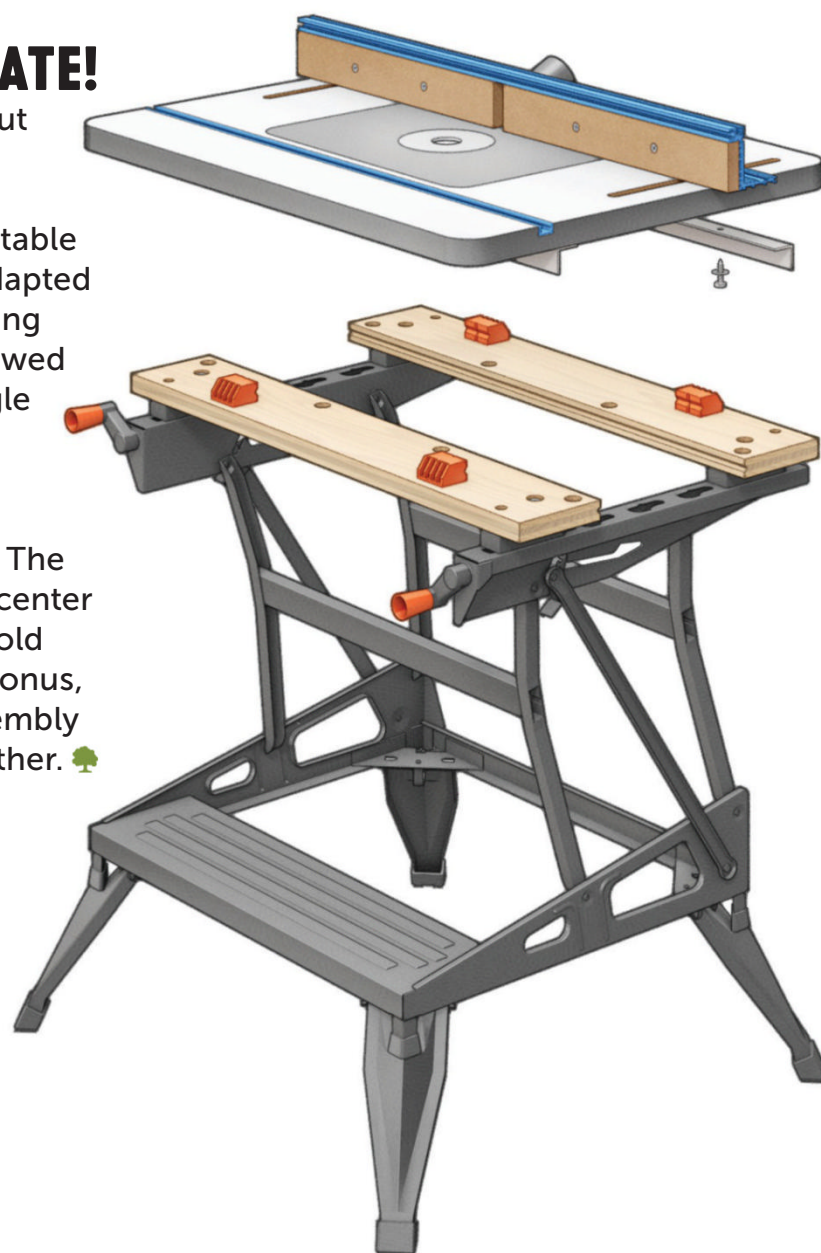
Richard Dorazio
Windsor, Connecticut



SUPPORT ME, MATE!

I wanted a router table but my small shop doesn't allow space for one. So I bought a full-size router table without the stand and adapted it to fit my portable, folding workcenter. I simply screwed lengths of aluminum angle to the underside of the table to act as cleats, making sure not to obstruct the insert plate. The bench dogs on the workcenter engage these cleats to hold the table securely. As a bonus, I can move my table assembly outside in favorable weather. 🌳

Steve Zaleski
Geneseo, Illinois



SACRED STONE OF THE SOUTHWEST IS ON THE BRINK OF EXTINCTION



Centuries ago, Persians, Tibetans and Mayans considered turquoise a gemstone of the heavens, believing the striking blue stones were sacred pieces of sky. Today, the rarest and most valuable turquoise is found in the American Southwest— but the future of the blue beauty is unclear.

On a recent trip to Tucson, we spoke with fourth generation turquoise traders who explained that less than five percent of turquoise mined worldwide can be set into jewelry and only about twenty mines in the Southwest supply gem-quality turquoise. Once a thriving industry, many Southwest mines have run dry and are now closed.

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MANTEL CLOCK

With its classic Scandinavian influence and art tile insert, this piece keeps time with timeless style.

WRITER: KERRY GIBSON
DESIGNER: JOHN SCHLABAUGH
BUILDER: KEVIN BOYLE



OVERALL DIMENSIONS
10"W x 4¾"D x 12"H

PHOTOGRAPHER: JACOB FOX; ILLUSTRATORS: ROXANNE LEMOINE, LORNA JOHNSON

EXPLODED VIEW

Printed clock dial included with project kit.

$\frac{3}{32} \times 4\frac{3}{8} \times 4\frac{3}{8}$ " single-strength glass

$\frac{1}{16}$ " chamfers

$4\frac{3}{4}$ "

10"

#8 $\times \frac{3}{4}$ " F.H. screw

Quartz clock movement

4x4" decorative tile

Countersunk, $\frac{9}{64}$ " shank hole

Labels: A, B, C, D, E, F, G, H, I, J, K, L, M, N

CRAFT THE CASE

2 Lay out the taper on the front edge of each side [Drawing 1]. Cut the tapers on the bandsaw [Photo A].



1 SIDE

3"

$\frac{3}{4}"$

$\frac{1}{4}"$

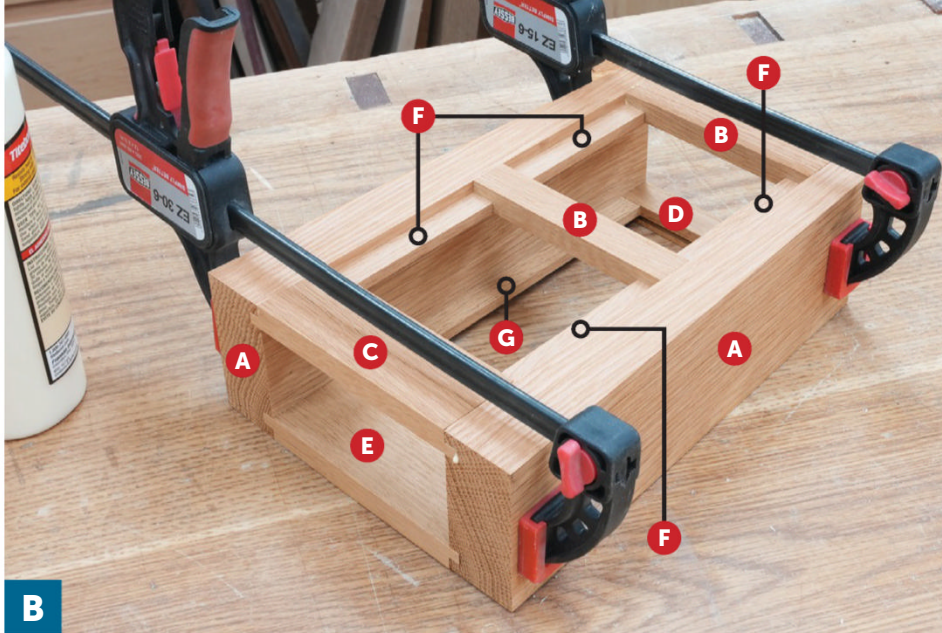
$\frac{1}{4}"$ grooves
 $\frac{1}{4}"$ deep

A

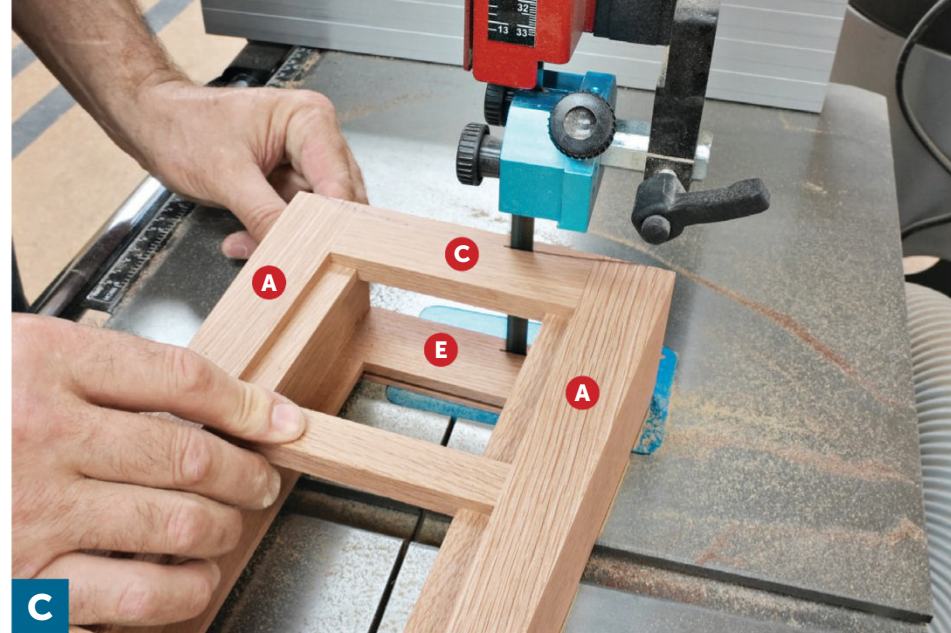
10"

Curve cut after case assembly.

$1\frac{3}{8}"$



B Apply glue to the grooves in the sides (A). Then assemble and clamp the clock case, keeping the top and bottom rails flush with the ends of the sides.



C Lay out the arc on lower portion of the clock case, then bandsaw the arc, cutting through the front and back lower rails (C, E). Stay just outside your marked line. Then sand the arc smooth.

3 From $\frac{1}{2}$ " stock, cut the front rails (B, C) and back rails (D, E) to size [Materials List, Drawing 2]. Rabbet the ends of all the rails to fit snugly into the sides (A), supporting each workpiece with a miter gauge and auxiliary fence. Switch to a full-kerf tablesaw blade to cut the $\frac{1}{8}$ " grooves in the back rails (D, E).

4 From $\frac{1}{4}$ " stock, cut the front and back stops (F, G) to length. Then glue and clamp the case assembly (A-G) together [Photo B].

5 After the glue dries, lay out the arc on the bottom of the case assembly [Drawing 2a]. Cut and sand it to shape [Photo C]. Then finish-sand the case.

ROUND UP THE LEGS

The secret to making a dowel from square stock is to start with an over-length blank and round over the corners, preserving the square ends for support. Those ends also support the blank while you cut the rabbets.

1 From 1" square stock, cut blanks for the legs (H) to 14" and mark a line 1" from each end of one blank. Install a $\frac{1}{2}$ " round-over bit in the router table and set the fence flush with the bit bearing. Using stopblocks, rout all four corners [Photo D].

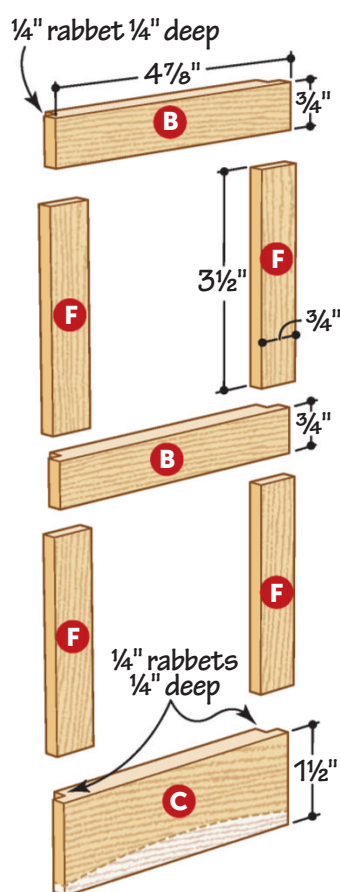
2 Cut the rabbets in the legs on the tablesaw [Photo E]. Trim one end off each leg, then set a stopblock on a miter gauge auxiliary fence to cut the legs to final length.

3 From $\frac{1}{2} \times 2$ " stock, cut a blank 12" long for the leg fillers (I). Rout a $\frac{1}{2}$ " round-over on one edge, rip the rounded portion from the blank, then cut the fillers to length [Materials List]. Glue and clamp the fillers to the legs (H).

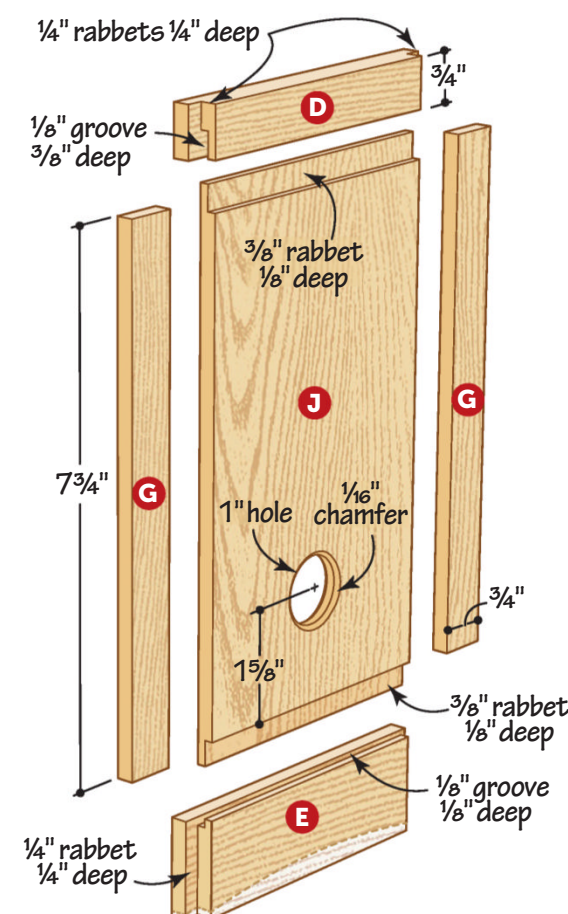
4 Finish-sand the legs, apply glue to the rabbets in the legs, and clamp them to the case [Exploded View]. When the glue dries, sand the legs flush with the case top, then sand the bottoms of the legs so they sit flat.

TIP!

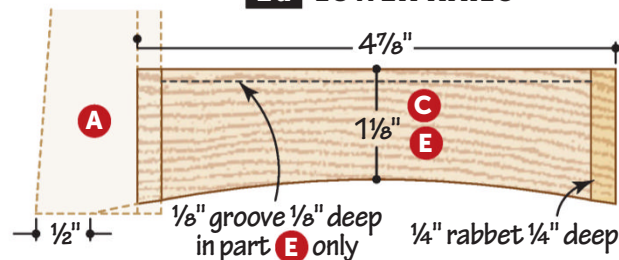
To sand the leg ends, mount self-adhesive sandpaper to a flat surface and slide the clock case over the sandpaper.



2 FRONT & BACK FRAMES (rear view)



2a LOWER RAILS





Align the marks with the center of a 1/2" round-over bit to set blocks for your starting and stopping point on the legs (H). Then rout all four corners of each leg, using a pushblock to guide the legs.



Cut a 1/2" rabbet 1/2" deep in each of the legs, using a pushblock to keep the squared ends of the legs tight against the fence and saw table. Cut the rabbet in two passes.

TIME TO FINISH UP

- 1 Cut the back (J) to size and rabbet the ends [Drawing 2]. Drill the access hole and sand its edges smooth.
- 2 Cut the top (K) to size, sand slight chamfers on the edges [Exploded View]. Finish-sand the top. Lay the top face down on your workbench, apply glue to the upper edges of the case, align it, centered on the top, and clamp the case in place.
- 3 Cut the horizontal stops (L) and glass stops (M) [Materials List]. Bevel-rip one edge from a piece of 3/4" stock for the retainer blocks (N). Cut the blocks to length and drill countersunk shank holes [Exploded View].
- 4 To prevent finish from interfering with the next glue-up, mask the back face of the front middle rail (B) and front bottom rail (C), as well as one edge of the horizontal stops (L) and glass stops (M). Apply the finish of your choice to the clock assembly and stops. We sprayed on two coats of aerosol satin lacquer.
- 5 Remove the tape and glue the glass stops (M) to the dial, taking care to prevent squeeze-out. Temporarily position the clock dial assembly and tile, centered in their openings, to mark the location of the horizontal stops (L) on the rails [Exploded View]. Remove the dial and tile and glue the stops to the rails.
- 6 Cut the glass to size and place it in its opening. With the dial assembly temporarily resting in the tile's opening, mount the clock movement and hands before positioning it behind the glass. Drop the tile in place and secure the dial and tile by screwing the retainer blocks (N) in place. Then set the clock and wile away some time admiring your craftsmanship. 🌳

MATERIALS LIST

PART	FINISHED SIZE			Matl.	Qty.
	T	W	L		
A* SIDES	1 3/8"	3"	10"	O	2
B FRONT UPPER RAILS	1/2"	3/4"	4 7/8"	O	2
C FRONT LOWER RAIL	1/2"	1 1/2"	4 7/8"	O	1
D BACK UPPER RAIL	1/2"	3/4"	4 7/8"	O	1
E BACK LOWER RAIL	1/2"	1 1/2"	4 7/8"	O	1
F FRONT STOPS	1/4"	3/4"	3 1/2"	O	4
G BACK STOPS	1/4"	3/4"	7 3/4"	O	2
H* LEGS	1"	1"	11 1/2"	O	4
I* LEG FILLERS	1/2"	1/2"	1 1/2"	O	4
J BACK	1/4"	4 3/8"	8 1/8"	OP	1
K TOP	1/2"	4 3/4"	10"	O	1
L HORIZONTAL STOPS	1/4"	7/8"	4 3/8"	O	2
M GLASS STOPS	1/4"	5/8"	4 1/4"	O	2
N RETAINER BLOCKS	3/4"	3/4"	3 3/4"	O	4

*Parts initially cut oversize. See the instructions.

MATERIALS KEY: O—oak, OP—oak plywood.

SUPPLIES: #8x3/4" flathead screws, 3/32" single-strength glass.

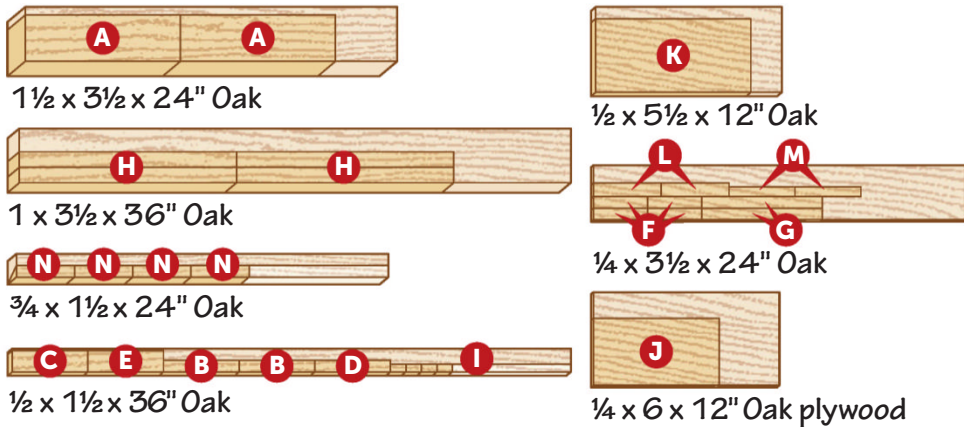
BLADES AND BITS: Dado blade, 1/2" round-over router bit.

SOURCES: Clockworks kit with movement, hands, and dial no. RS-01426, \$19; clockworks kit with movement, hands, dial and 4x4" Motawi tile no, RS-01426-T, \$64, woodstore.net/mantelclockkit

PROJECT COST: It cost us about \$120 to build this project. Your cost will vary by region and source.

CUTTING DIAGRAM

We purchased 3 board feet of 8/4 white oak, 1 board foot of 4/4 white oak, and 1 square foot of 1/2" white oak. Before cutting parts to size, we planed them to the thicknesses shown in these example boards.



• SHOP TESTED •

MINI ONE-HANDED CLAMPS

We put the squeeze on eight versions of these scaled-down clamps to determine which ones stand up to the pressure.

WRITER: VINCE ANCONA
TESTERS: WOOD STAFF

Since being introduced in the 1980s, one-handed bar clamps have become ubiquitous in woodworking shops. The defining feature of these tools is the pistol-grip clamping mechanism, which allows you to tighten the clamp with one hand by squeezing the handle repeatedly. Manufacturers offer these clamps in four capacities (see *One-Handed Clamp Capacity Classes*, below).

For this test, we focused specifically on “mini” clamps. These welterweights of the clamping world are smaller than their cousins and usually come in only two lengths—6" and 12". (The length refers to the maximum capacity between the jaws, not the overall length.) They also have a throat capacity in the neighborhood of 2½".

Their size and weight make these ideal for many everyday clamping tasks, making them the most-often-reached-for size in our shop. And because they cost less than larger clamps, you won't need a second mortgage if you want to stock up on them.

For our test, we looked at eight clamps from seven manufacturers. To evaluate them, we considered clamping pressure, release mechanisms, clamp pads, and ease of use, particularly when it comes to converting the clamps into spreaders (more on that later). We tested 6" and 12" versions of each clamp, but because the results between the two sizes were nearly identical, we show only the data from the 12" clamps in our chart, *One-Handed Clamps Under Pressure* on page 35.

ONE-HANDED CLAMP CAPACITY CLASSES

SIZE CLASS	CLAMPING FORCE (LBS)	TYPICAL THROAT CAPACITY	LENGTHS
HEAVY-DUTY	600	3⅝"	6" TO 50"
STANDARD-DUTY	300	3⅜"	6" TO 36"
MINI	100-150	2½"	6" TO 12"
MICRO	35-50	1½"	4"

PHOTOGRAPHER: KELSEY HANSEN





“

WHETHER PROPPING UP A WORKPIECE OR SECURING A MITERSAW ON THE JOBSITE, THESE SMALL, ONE-HANDED BAR CLAMPS FIND USES FAR BEYOND PROJECT ASSEMBLY.

-VINCE ANCONA, CONTRIBUTING EDITOR

”

FEELING THE PRESSURE

All of the clamps in our test are rated to exert between 100 to 150 pounds of clamping force. While this puts them at the lower end of the scale compared to screw clamps and larger one-handed clamps, this amount of pressure is adequate for most glue-ups. It isn't enough, though, to pull misaligned or poorly fitted assemblies into place.

To determine whether the clamps live up to their rated clamping force, we had a team of three people of varying hand strength test each clamp with a hydraulic hand dynamometer (*right*) and then averaged the results.

Using this methodology, most of the clamps came close to or exceeded their advertised clamping force. The Wen CLR122 was the only clamp that fell short, even in the burly paw of our strongest tester. (The Pittsburgh 62123 doesn't have a stated clamping force.)

We also conducted a pressure fade test by applying maximum force to each clamp and then checking the reading again after 10 minutes (the time it takes for most glues to set up). Most of the clamps experienced a loss of 10-15 lbs over a 10-minute interval. In practical use, we didn't find that this really affected performance.

GET A GRIP

Squeezing the handle engages a clutch plate against the bar, pushing the jaw forward a set distance. The more the jaw moves with each squeeze, the faster the clamp closes on the workpiece. On the flip side, we found that shorter travel distance builds clamping pressure more easily, especially for smaller hands.

All of the clamps feature ergonomic grip designs, but we found some more comfortable than others. Both models of



◀ With a hydraulic hand pressure gauge between the jaws, we squeezed each clamp's grip as hard as we could with one hand to determine the maximum clamping force.



Excessive clamping pressure can starve a glue joint. Learn more at: woodmagazine.com/clamp-pressure

Bessey clamps (EHKM12 and EZ30-6) have soft, rubber-padded grips for added comfort. The grips on all the other clamps are hard molded plastic. One of our testers found the ridges on the grips of the DeWalt DWHT83140 clamp uncomfortable, a situation that might compound with long use. The Pittsburgh clamp had larger grips than the others we tested, again proving less comfortable for smaller-handed users.

The heavy-duty release triggers on the DeWalt, Irwin, and Wen clamps put rapid adjustment of the jaw opening within a finger's reach. But this style of trigger becomes difficult to depress when the clamp is under tension.



RELIEVE SOME TENSION

Just as what goes up must come down, what is clamped must be unclamped. Pressure-release mechanisms vary among our tested clamps, but all disengage the clutch plate from the bar. This also allows the movable jaw to slide along the bar for quick initial placement.

The DeWalt, Wen, and Irwin 1964744 clamps have a large, steel trigger just in front of the grip, *left top*. This location lets you easily reach the trigger with one finger while sliding the jaw along the bar to adjust the clamp. However, when releasing the pressure we found that clamps with this style of trigger were slightly difficult to release and tended to let go with a jolt.

In contrast, the Jorgensen 33612, Eclipse EOBC12-MINI, and both Bessey models have a release mechanism integrated into the rear grip, *left middle*. This style isn't as convenient to reach, requiring you to contort your fingers or take your hand off the grip to depress it. But we found releasing the tension required less effort and the clamps relaxed their grip gently. These triggers are plastic, which raises some concern as to how well they'll hold up over time.

Like the DeWalt, Irwin, and Wen clamps, the Pittsburgh clamp has a steel release trigger. But it's much smaller and located at the back of the grip, *left bottom*. This one proved to be the most troublesome among our tested clamps. With the clamp under maximum pressure, depressing the release mechanism by hand required a great deal of force. In one case, we had to strike the trigger with a hammer to get it to release.



▲ The Jorgensen, Bessey, and Eclipse clamps integrate the release trigger into the rear grip. While not as conveniently located, this trigger style is easier to activate.



◀ The Pittsburgh clamp features a small trigger at the back of the grip. We found it to be the most difficult to depress when the clamp was under pressure.

NOTES ON PADS

All of the clamps in our test feature padded jaws. These pads grip and cushion the work at the same time to prevent slippage and damage to the wood. The removable pads seem designed to be replaceable, though none of the manufacturers appear to offer replacements. Nearly all of the pads incorporate tabs that snap onto the jaw, gripping the face. On the Bessey EZ30-6,

however, the open-ended pads slide on with a friction fit. In use, we found that this design sometimes caused the pads to slip, particularly when clamping rounded or beveled pieces.

The pads on the Irwin and Bessey EZ30-6 clamps are basic—small and smooth-faced. The other clamps have jaw pads with V-grooves or oversize faces, or both, *left*.



▲ Shallow grooves on the jaw pads of the Bessey EHKM12, DeWalt, and Pittsburgh clamps allow you to grip round objects or position the clamp on the corners of an assembly.



▲ We like the oversize jaw pads on the Eclipse, Jorgensen, and Wen clamps. The large surface area makes positioning the clamps for edge gluing easier.

SPREAD 'EM

All of the clamps we tested work as spreaders as well as clamps—a feature that comes in handy if you have to disassemble a chair or pull apart a mortise-and-tenon assembly. Converting a clamp to a spreader involves removing the fixed jaw, *right*, and relocating it to the opposite end of the bar with the pad facing outward. The most user-friendly designs (found on the Bessey EHKM12, Jorgensen, Wen, and Eclipse clamps) have a spring-loaded release mechanism in the form of a button or slide that you depress to remove the jaw.

On the Bessey EZ30-6 and Pittsburgh clamps, the fixed jaws are held in place with a thumbscrew and hex nut. While still tool-free, this design takes more time to change over, and you run the risk of dropping and potentially losing the hardware while making the conversion. Additionally, we found that the thumbscrews have an annoying tendency to work loose during normal, everyday use.

The DeWalt and Irwin clamps were the least convenient of all to convert to spreaders. These two clamps require the use of a screwdriver to remove the fixed jaw. And with the Irwin clamp, before you can remount the jaw to the opposite end of the bar, you have to drill or press out a roll pin in the bar that acts as a retainer for the sliding jaw.

In addition to converting to a spreader, the Jorgensen clamps have one other trick up their sleeves. The fixed jaws are dovetailed to allow you to connect two clamps together to double the clamping length, *left*. This novel feature comes in handy when you're in a pinch for a longer clamp.



▲ The spring-loaded jaw releases on the top two clamps come off quickly and easily. Clamps that use threaded connectors require more time to convert and carry the risk of losing parts.



Reverse the fixed jaws on the Jorgensen clamps and the dovetails allow you to connect two clamps together end to end, doubling the clamping length.



CHOOSING A MAIN SQUEEZE

All of the clamps we tested performed the basic duty of clamping workpieces together. But choosing the best out of the bunch came down to more than holding ability. Our Top Tool honor goes to the Bessey EHKM12. It significantly exceeded its rated clamping force, possesses most of the features we look for in this style of clamp, and has a solid, well-built feel. It's also one of the more affordable clamps in our test, especially when purchased in multipacks.

Honorable mentions go to the Eclipse and Jorgensen clamps. The Eclipse had the highest clamping-force rating in our test. The Jorgensen also proved itself to be a solid performer, and we like the added bonus of being able to connect two clamps together for an extended reach. 🌳

ONE-HANDED CLAMPS UNDER PRESSURE

MODEL	PRIMARY			THROAT DEPTH	ADVERTISED CLAMPING FORCE (LBS) [3]	PRESSURE FADE TEST (LBS) [4]	JAW TRAVEL PER SQUEEZE	JAW PAD FEATURES [5]	WEIGHT (OZ)	PRICE [6]	WEBSITE
	MEASURED CLAMPING FORCE (LBS) [2]	EASE OF RELEASING JAWS	EASE OF CONVERTING TO SPREADER								
BESSEY EHKM12	121	A	A	2 3/8"	100	12	5/32"	V	13.9	\$15	besseytools.com/en-us
BESSEY EZ30-6	137	A	B	2 3/8"	150	15	17/64"		13.2	\$19	besseytools.com/en-us
DEWALT DWHT83140	106	B	C	2 7/16"	100	10	19/64"	V	12.1	\$13	dewalt.com
ECLIPSE E0BC12-MINI	164	A	A	2 1/2"	150	10	7/32"	0	12.1	\$23	spear-and-jackson.com
IRWIN 1964744	126	B	D	2 5/16"	140	13	9/32"		12.5	\$20	irwintools.com
JORGENSEN 33612	148	A	A	2 1/2"	150	16	17/64"	0	13.4	\$19	ponyjorgensen.com
PITTSBURGH 62123	111	D	B	2 3/8"	-	20	3/8"	V, 0	21.1	\$5	harborfreight.com
WEN CLR122	97	B	A	2 1/2"	150	10	7/32"	0	13.0	\$11	wenproducts.com

1.

A Excellent

B Good

C Fair

D Poor

N/A Not applicable

2. Average, using three people with varying hand strength.

3. Advertised clamping force not provided for Pittsburgh clamps.

4. Drop in clamping force 10 minutes after clamping.

5. (V) V-groove jaw pads
(O) Oversize jaw pads

6. Prices are per one 12" clamp. Some models are sold only in pairs or sets. Prices current at time of article production.
- woodmagazine.com
- 35

OVERALL DIMENSIONS
3 1/4" W x 1 1/2" — 9/16" D x 4 1/4" H

ORNAMENT FRAMES

Decorate your tree with photo memories in these small frames. Five easy-to-build options add variety and make great gifts that are sure to delight.

WRITER: KERRY GIBSON
DESIGNER/BUILDER: KEVIN BOYLE

PHOTOGRAPHER: JACOB FOX; ILLUSTRATORS: ROXANNE LEMOINE, LORNA JOHNSON



We created five different frame profiles you can replicate on a router table with a few bits and your choice of stock from your scrap bin. And once you're set up, you can easily turn out just a few or dozens.

1 Cut the frame stock to size. All profiles start with 20" lengths of $\frac{1}{2} \times \frac{5}{8}$ " stock for each frame. Only the chamfer-and-bead profile differs. For that profile, cut 20" lengths of $\frac{1}{2} \times \frac{1}{2}$ " stock for the chamfer portion and $\frac{1}{8} \times \frac{9}{16}$ " stock for the bead portion.

2 Rout the rabbet for the glass and back [Exploded View]. Then use the appropriate chamfer, fluting, and round-over bits to rout the face of the frame stock to the profiles shown [Profile Drawings].

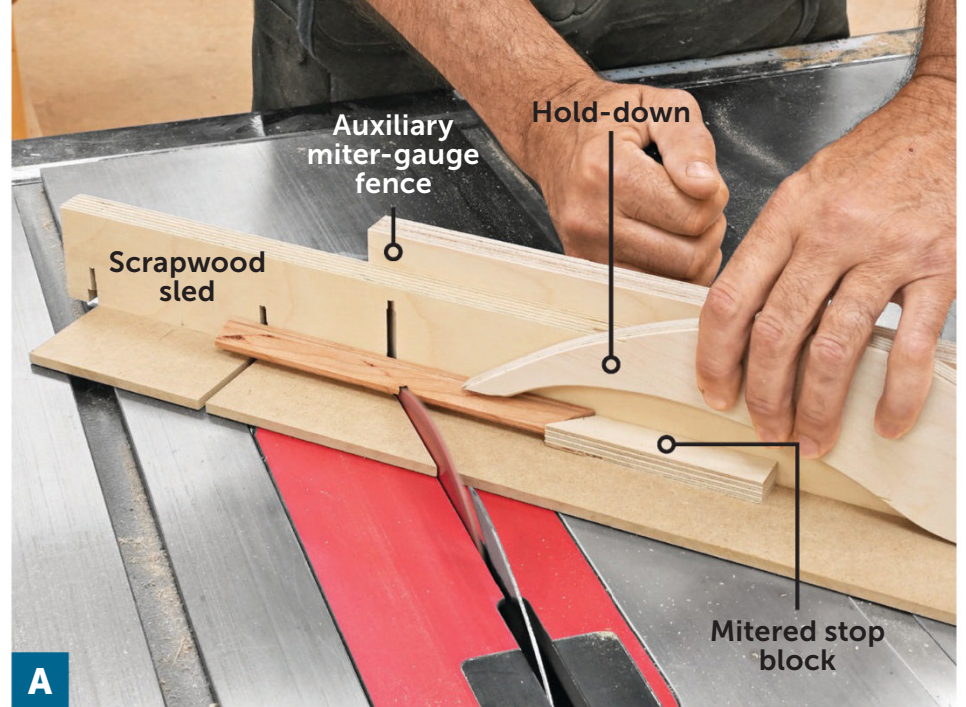
3 For the chamfer-and-bead profile, rout $\frac{1}{16}$ " round-overs on the $\frac{1}{8}$ " stock and a $22\frac{1}{2}^\circ$ chamfer on the face of the $\frac{1}{2} \times \frac{1}{2}$ " stock. Then glue and clamp the pieces together with the back edges flush. Finish-sand each frame blank.

4 First miter both ends of the blank. Then attach a stopblock to a scrapwood sled to cut the frame sides to length [Photo A]. Reset the stopblock to cut the frame tops and bottoms.

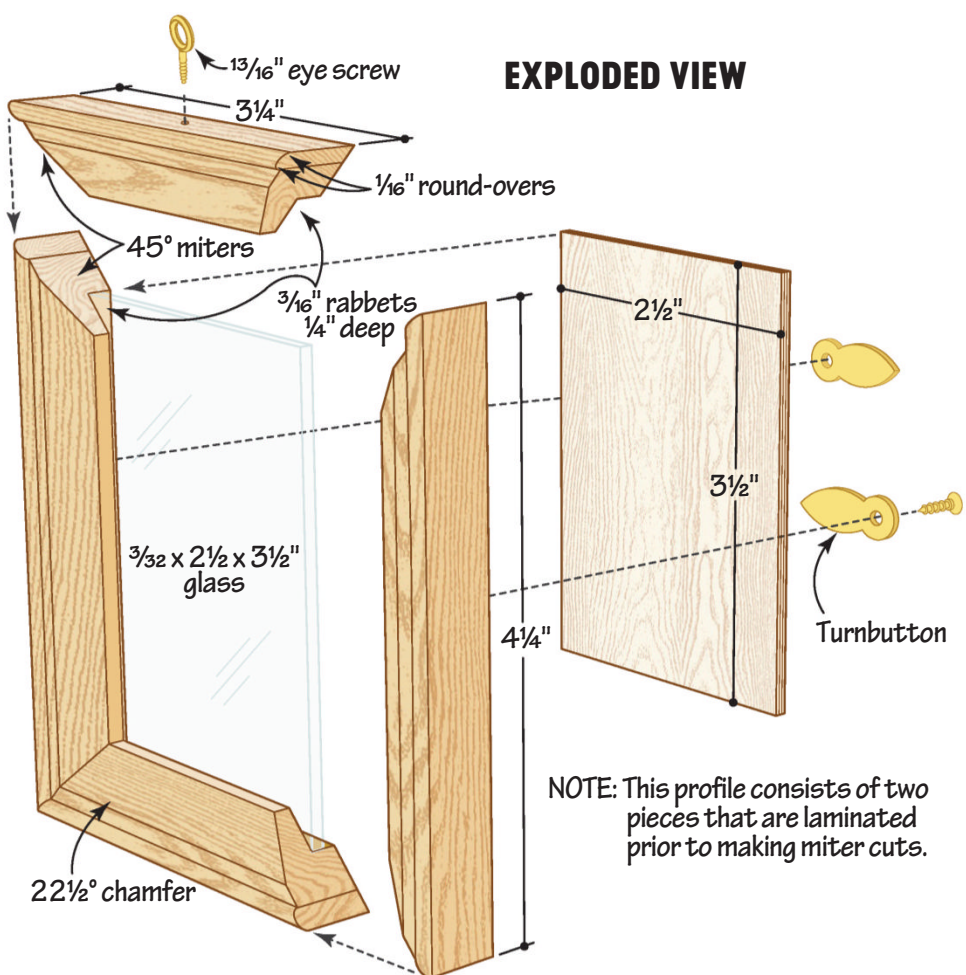
5 Apply masking tape to each outer corner of each frame and align the miters to check the fit. Then glue the frames together.

6 Once the glue dries, touch up any minor spots with sandpaper and apply the finish of your choice. We used aerosol lacquer.

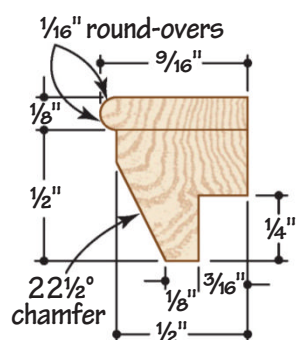
7 Cut glass and $\frac{1}{8}$ " plywood backs to fit the rabbeted openings and add turnbuttons on both sides to hold the backs in place. Add the eye screws to the top of each frame and a length of ribbon for hanging them on the tree. 🌲



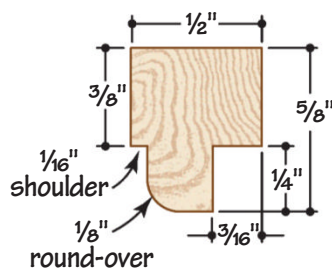
To safely cut small frame pieces, glue scrapwood to form a simple L-shaped sled and clamp it to your auxiliary-fence-equipped miter gauge. Use a mitered stopblock and hold-down to make the cuts.



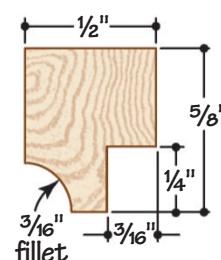
SUPPLIES: Frame turnbuttons with screws, $\frac{13}{16}$ " brass eye screws, $\frac{3}{32}$ " glass.
BITS: $\frac{1}{4}$ " rabbeting, fluting, 45° and $22\frac{1}{2}^\circ$ chamfer, and $\frac{1}{8}$ " and $\frac{1}{16}$ " round-over router bits.



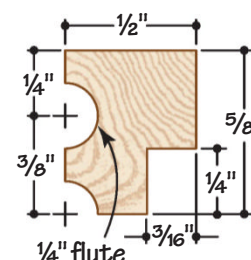
CHAMFER-AND-BEAD
FRAME PROFILE



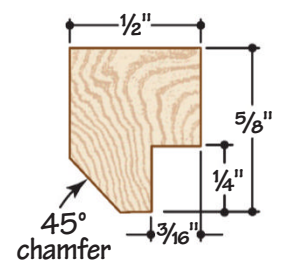
BEAD FRAME
PROFILE



FILLET FRAME
PROFILE



DOUBLE FLUTE
FRAME PROFILE



CHAMFER FRAME
PROFILE

PROFILE DRAWINGS

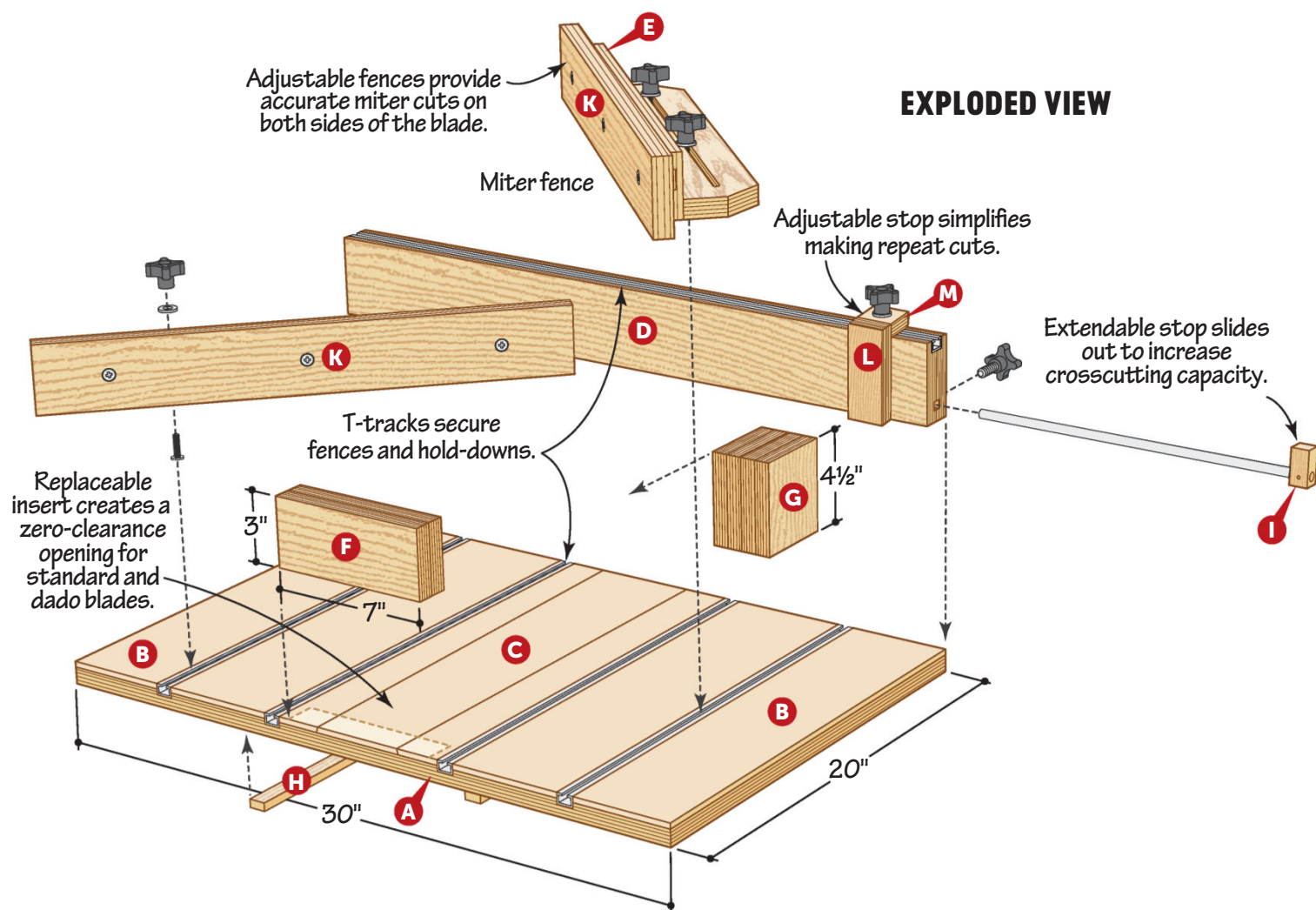
DOES-IT-ALL TABLESAW SLED

Boost the versatility of your tablesaw with this crosscutting, miter-making, accuracy-increasing dream machine.

WRITER: ZACH BROWN
DESIGNER/BUILDER: KEVIN BOYLE

OVERALL DIMENSIONS
30"W x 20"D x 4½"H

PHOTOGRAPHER: CARSON DOWNING; ILLUSTRATORS: ROXANNE LEMOINE, LORNA JOHNSON



A good tablesaw sled will greatly improve the ease and safety of making repeatable, accurate crosscuts. We've designed this simple, yet full-featured sled to handle nearly any crosscutting task you throw at it.

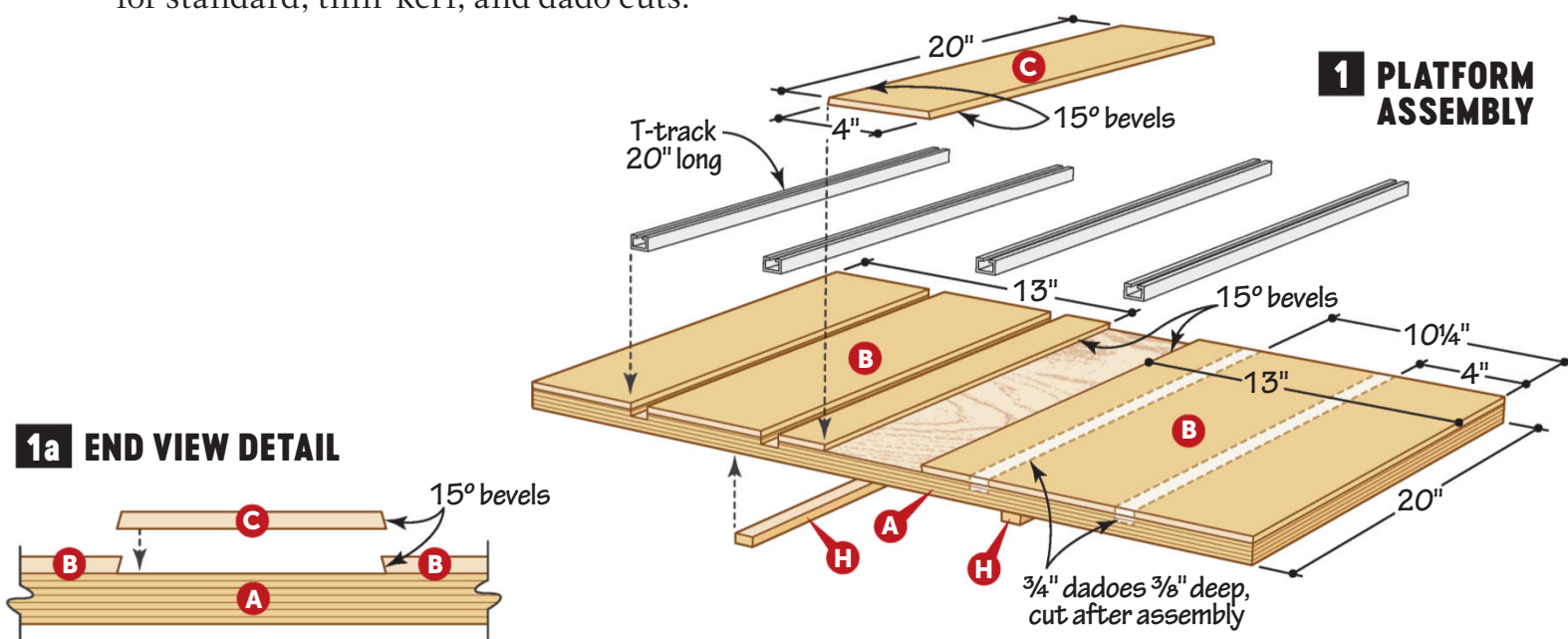
The rear fence has a sliding stop, plus an extendable stop for extra-long workpieces. Fully adjustable miter fences support a workpiece at nearly any angle on both sides of the blade. The T-tracks on the surface of the sled support the miter fences as well as customizable hold-downs, so you can clamp almost anything safely and securely.

Finally, a replaceable insert around the blade allows for zero-clearance cutting, so you can make separate inserts to swap out for standard, thin-kerf, and dado cuts.

SLIDE RIGHT IN

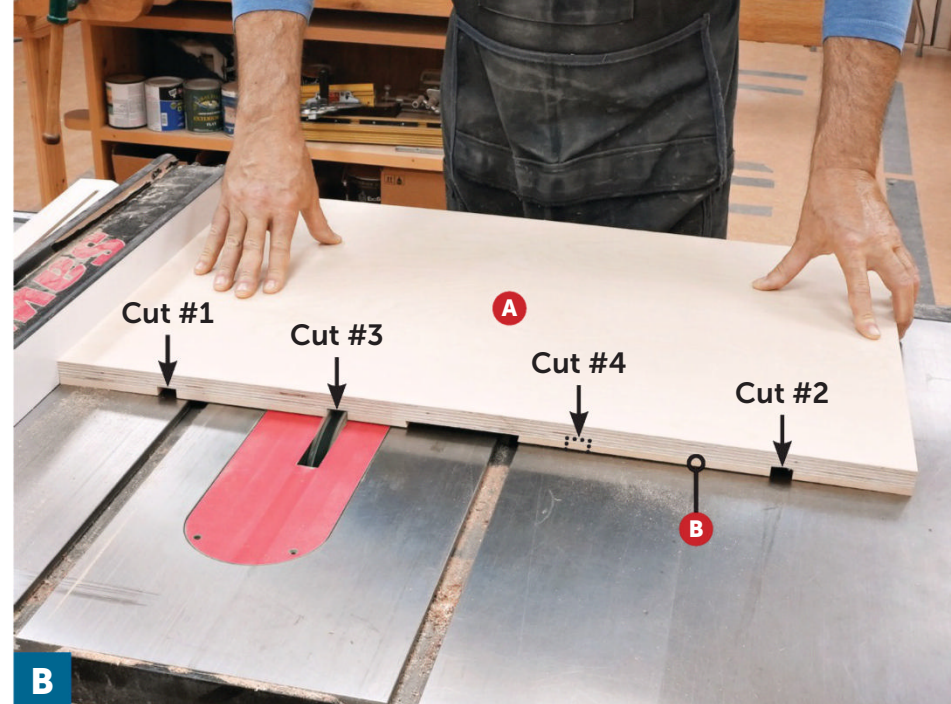
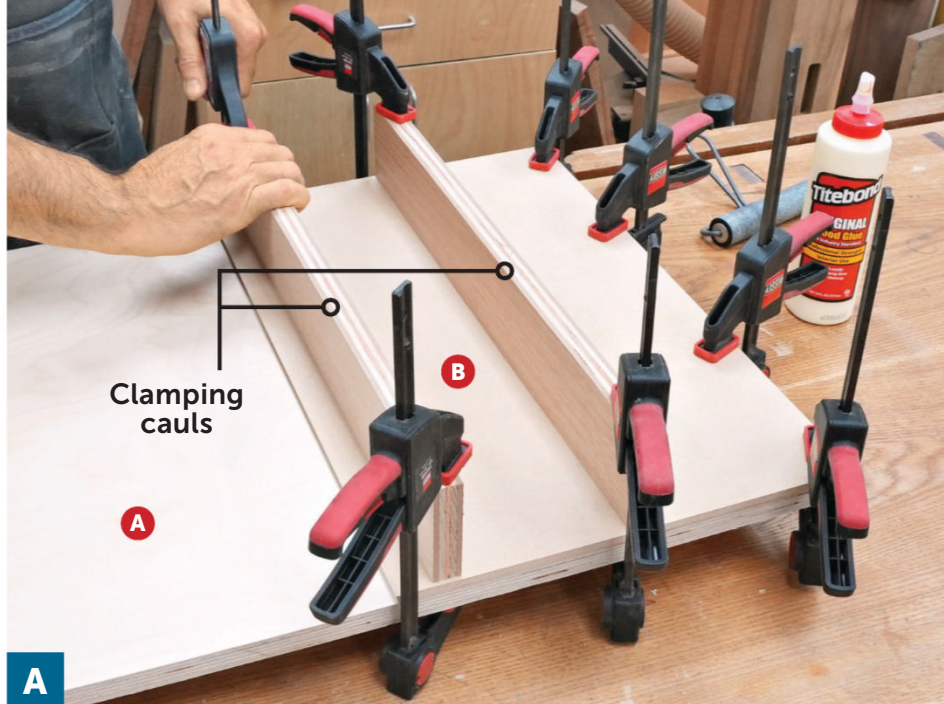
The platform of the sled is made from $\frac{3}{4}$ " Baltic birch plywood covered with a layer of $\frac{1}{4}$ " medium-density fiberboard (MDF). The center of the MDF layer is replaceable and secured in a beveled socket.

1 From $\frac{3}{4}$ " Baltic birch plywood, cut the base (A) to size [Exploded View, Materials List]. From $\frac{1}{4}$ " MDF, cut the top plates and insert plate (B, C) to size. Adjust the tablesaw blade to 15° and bevel-cut one edge of each top plate (B) with the pieces face up [Drawings 1 and 1a]. Then create corresponding angles by bevel-cutting both edges of the insert (C) with it facedown.



Before building the sled, tune up your tablesaw to ensure that the blade and fence are perfectly parallel to the miter slots.

woodmagazine.com/
tablesawtuneup



Apply glue to the top plate (B) using a roller, then clamp it to the base (A), flush to the outside edges. Use cauls to apply even clamping pressure over the large surface area.

Adjust the tablesaw fence, cut the first outer dado, then flip the platform assembly (A/B) end for end to cut the other outer dado. Reposition the fence and repeat for the two inner dados.

2 Glue the first top plate to the base [Photo A]. (See *Roll On for Large Glue-Ups*, next page.) Repeat for the second top plate, using the insert plate as a spacer. After clamping the second top plate, slide out the insert plate and clean up any glue squeeze-out along the beveled edges.

TIP!

Apply glue thinly near the groove so squeeze-out doesn't interfere with the rod.

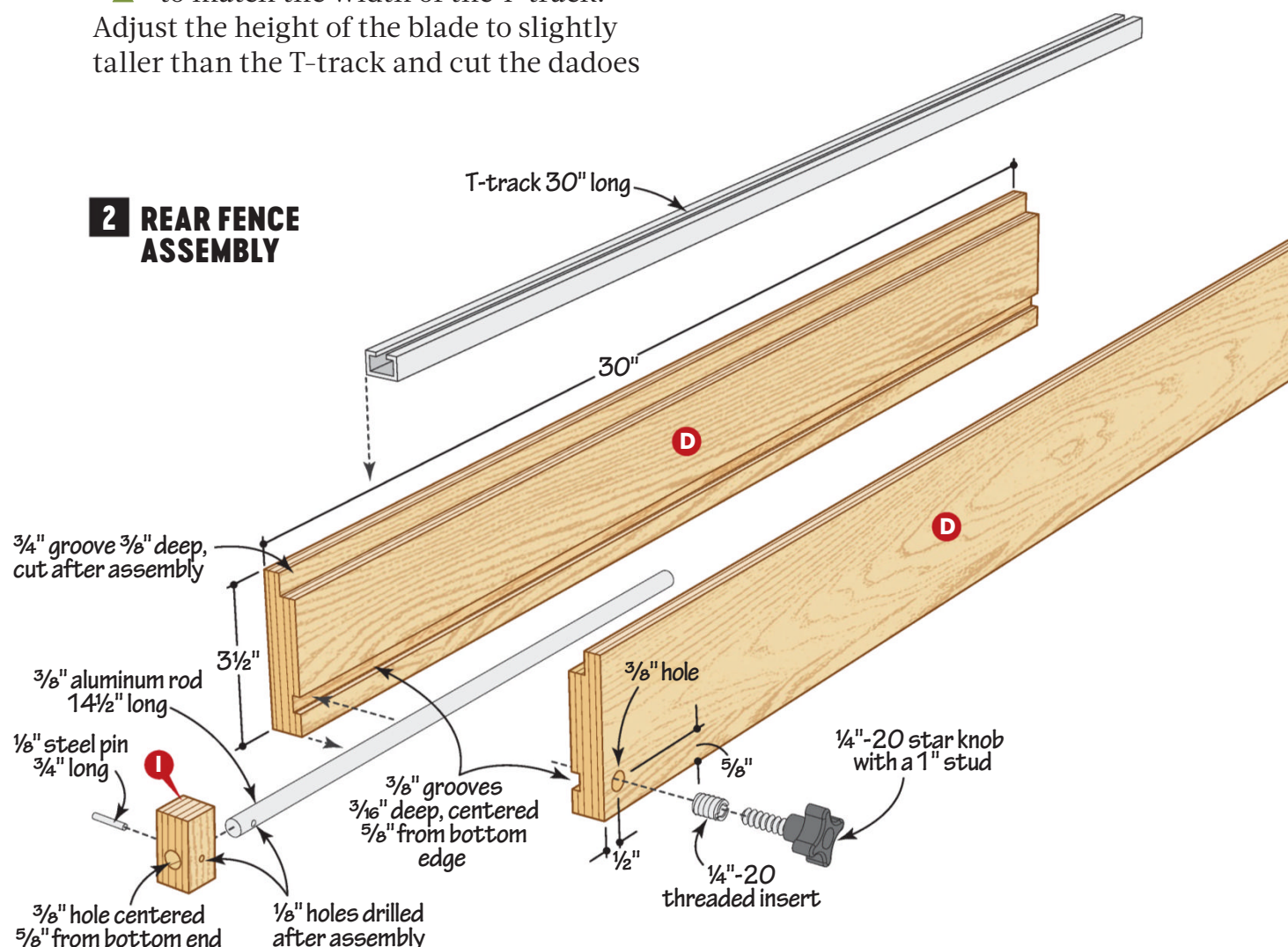
3 From Baltic birch plywood, cut two pieces to size for the rear fence (D) [Drawing 2]. Form the $\frac{3}{8}$ " grooves for the extendable stop on the inside faces, then glue and clamp the two halves together face to face. Cut the miter fence back plates (E) to size [Drawing 3].

4 Set up a dado stack in the tablesaw to match the width of the T-track. Adjust the height of the blade to slightly taller than the T-track and cut the dados

on the top of the platform assembly (A/B) [Drawing 1, Photo B]. Use the same dado setup to cut the T-track groove in the laminated rear fence (D) [Drawing 2] and the miter fence back plates (E) [Drawing 3].

5 Drill the hole for the threaded insert in the rear fence (D), then install the threaded insert [Drawing 2]. See *Go Nuts with Threaded Inserts* on page 42 for an easy installation trick. With the insert plate (C) removed, glue the rear fence to the top of the platform assembly (A/B) along the back edge making sure the fence sits square to the platform sides [Exploded View].

2 REAR FENCE ASSEMBLY



BRING IN REINFORCEMENTS

A front fence holds the front edge of the sled together after you cut through the platform during initial use. A fence block captures the saw blade as it exits the back of the sled to minimize accidental hand contact. And runners guide the sled on the saw table as you cut.

1 Cut two laminations to size for the front fence (F) and four for the fence block (G) [Exploded View]. Glue and clamp together the laminations for both parts with the edges flush.

2 Once the glue dries, glue the front fence (F) to the platform assembly, flush with the front edge and centered side to side. Glue the fence block (G) centered on the back face of the rear fence (D).

3 Cut the runners (H) to size from $\frac{3}{8}$ "-thick hardwood. Sneak up on the width to match your tablesaw miter slots. They should slide easily in the slots with zero side-to-side movement.

TIP!

Use dimes or washers to shim the runners (H) just above the surface of the saw table.

4 Adjust the tablesaw rip fence to center the sled over the blade. Stick double-faced tape to the top of each runner (H) and place them in the tablesaw miter slots, flush with the back end of the saw table and shimmed slightly above the surface. Lower the sled onto the runners [Photo C]. If the sled doesn't maintain even contact with the fence when sliding in the miter slots, remove the runners and try again or check your saw's alignment before flipping the sled over and securing the runners with countersunk screws.



With the back edge of the sled aligned with the back of the saw table and the side of the sled against the fence, carefully lower the sled onto the runners (D).

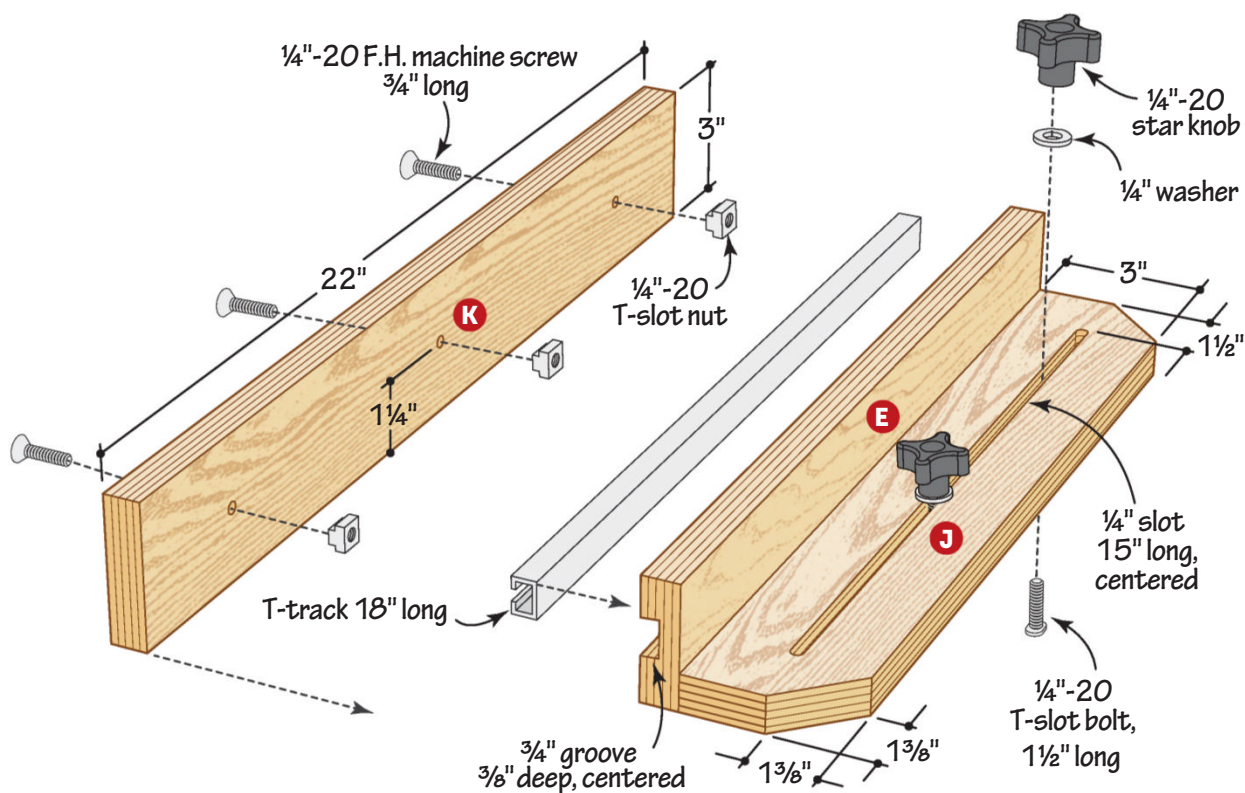
“

A TABLESAW SLED INCREASES CUTTING ACCURACY AND IT HELPS MAINTAIN CONTROL OF THE WORKPIECE AND CUTOFF.

-ZACH BROWN, CONTRIBUTING EDITOR

”

3 MITER FENCE ASSEMBLY



ROLL ON FOR LARGE GLUE-UPS

A glue roller, available from many woodworking suppliers, excels at spreading a thin, even coating on large surfaces. It also greatly speeds up the application process, so you don't run out of open time.



STOPS ALONG THE WAY

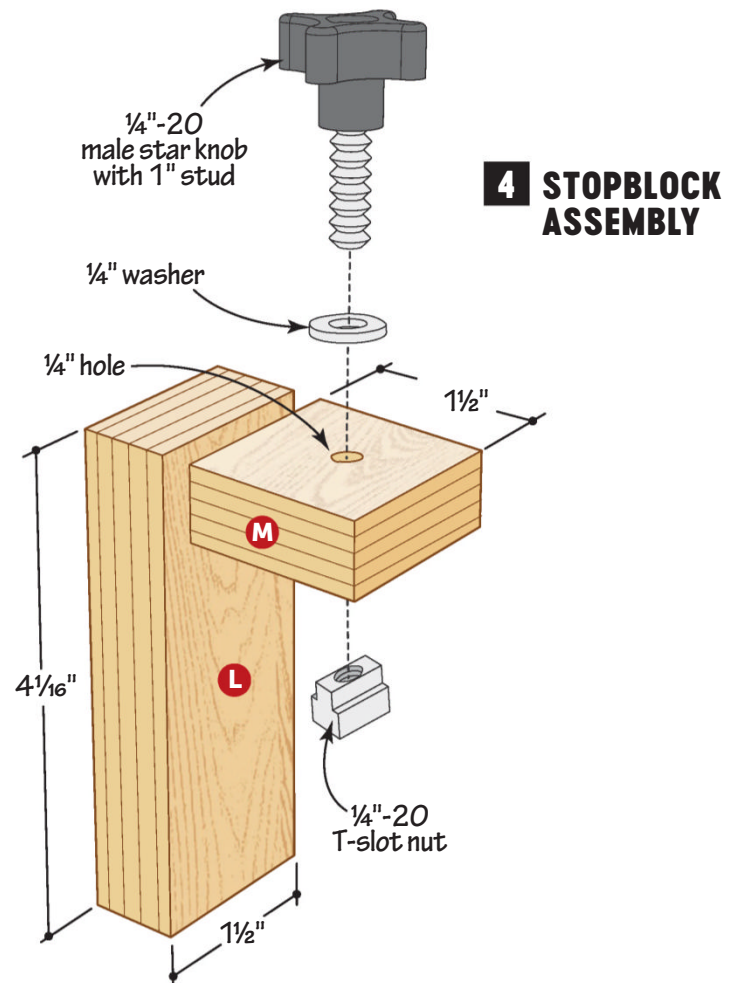
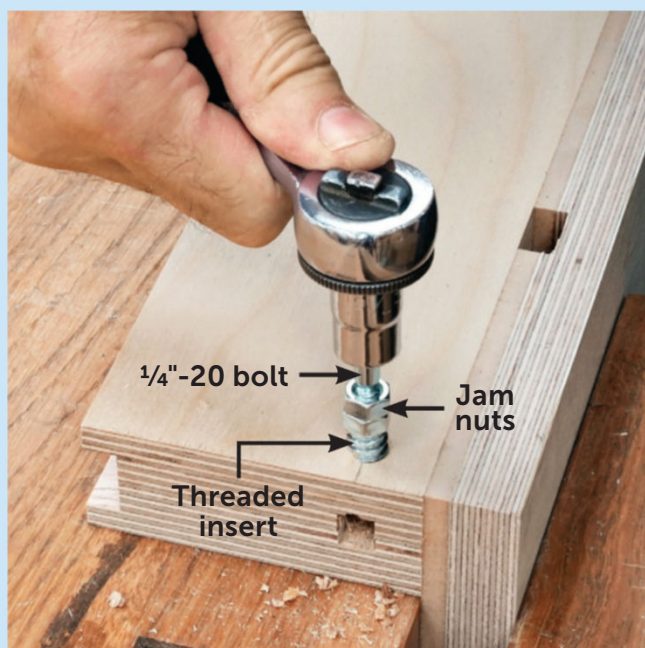
- 1** Cut the extension stop (I) to size and drill a $\frac{3}{8}$ " hole $\frac{5}{8}$ " from the bottom end [Drawing 2]. Cut $\frac{3}{8}$ " aluminum rod to $14\frac{1}{2}$ "-long and epoxy it into the hole, flush with the end. Once the epoxy cures, drill a $\frac{1}{8}$ " hole through the stop and rod and epoxy a pin into the hole.
- 2** Cut the miter fence bases (J) to size. Install a $\frac{1}{4}$ " spiral upcut bit in the router table and adjust the fence to center the bit on the face of a miter fence base (J). Rout the slot in the bases [Drawing 3, Photo D], then notch the corners. Glue and clamp the bases to the rear face of the back plates (E), flush with the lower edge.
- 3** Cut the miter fence front plates (K) to size, then lay out and drill the countersunk holes on the front face [Drawing 3]. Cut the stopblock (L) and clamp block (M) to size. Drill the centered hole in the clamp block, then glue it to the stopblock [Drawing 4].



Rout the fence base (J) slot in multiple passes, raising the bit between each pass. Use stopblocks to ensure the starting and stopping points stay the same.

GO NUTS WHEN INSTALLING INSERTS

A pair of nuts forced against a threaded insert at the end of a bolt secures the insert while you drive it with a ratchet. When the insert is seated, loosen the nuts to remove the bolt.



- 4** Cut T-track to length for the slots in the sled platform, rear fence, and miter fences [Drawings 1, 2, & 3]. Epoxy each section of T-track into place. Once the epoxy cures, attach the miter fence front plates (K) to the miter fence T-tracks with machine screws and T-slot nuts. Attach the stop block (L/M) to the rear fence and the miter fences to the platform with $\frac{1}{4}$ " knobs, washers, and T-slot bolts.

USING THE SLED

Whether you're making perfect 90° cuts (*top*) or cuts at an angle (*bottom*), this sled supports it all.



Use the main fence to make perfectly square cuts. The built-in stop makes it easy to cut multiple parts to exactly the same length.

“

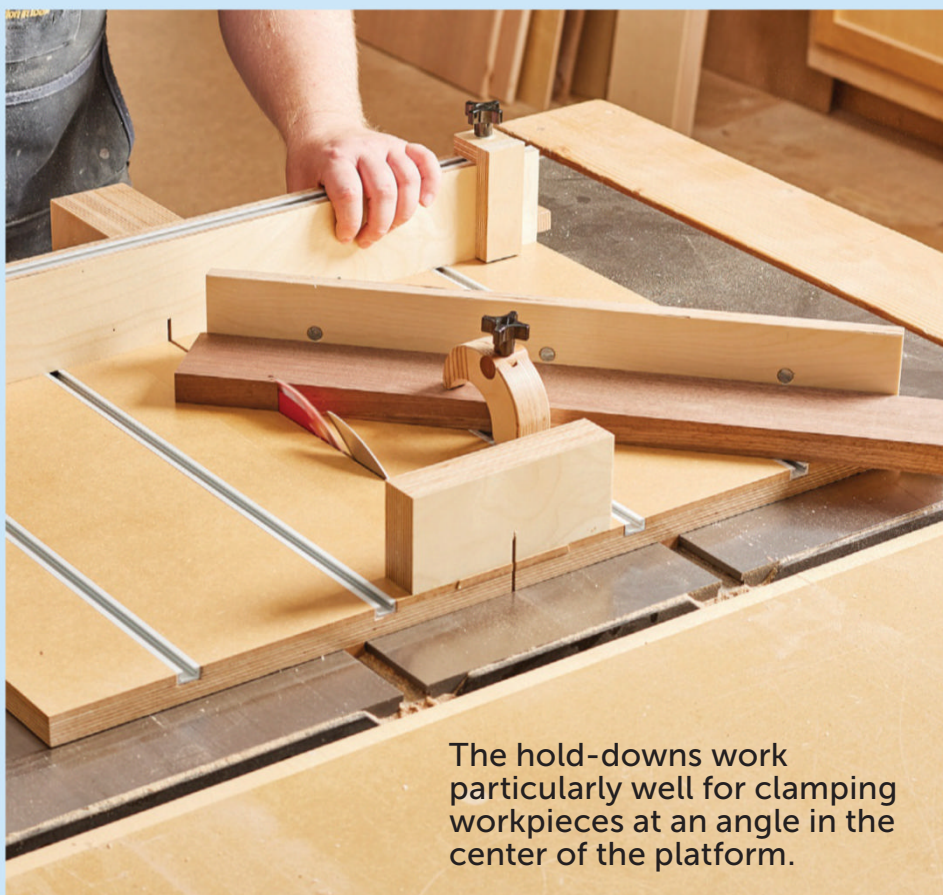
ONCE YOU START USING AN ACCURATE, DEDICATED TABLESAW SLED FOR CROSS-CUTTING AND MITERS, YOU WON'T WANT TO RETURN TO YOUR MITER GAUGE OR MITERSAW.

-KEVIN BOYLE, SENIOR DESIGN EDITOR

”



Remove the standard stop, and use the extendable stop for extra-long workpieces.



The hold-downs work particularly well for clamping workpieces at an angle in the center of the platform.



Use a digital angle gauge to accurately set the miter fence.

HOLD ON FOR HOLD-DOWNS

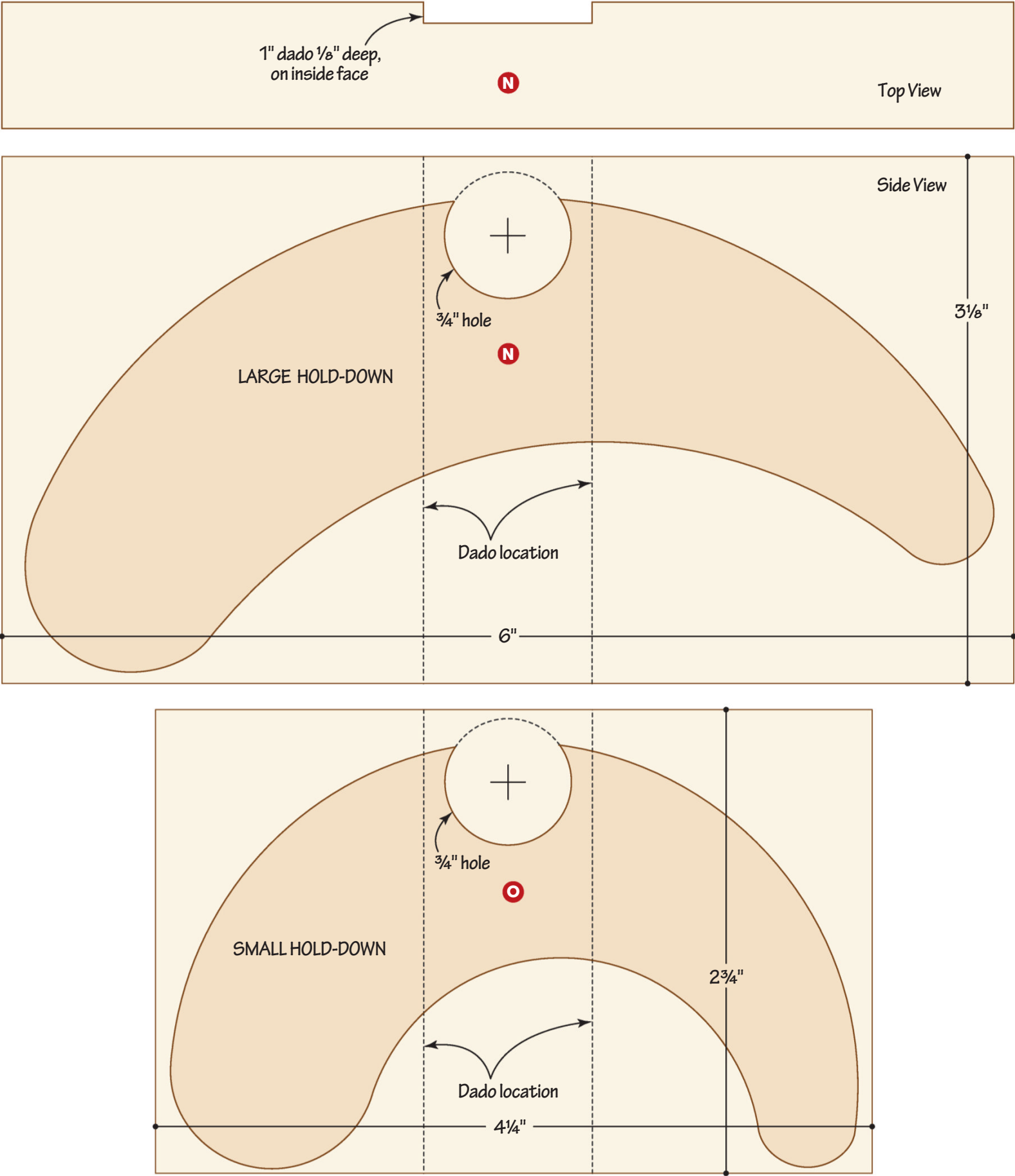
Made from two layers of plywood and a piece of dowel, these hold-downs are great for clamping your work (and keeping your fingers clear of the blade) while using your new sled.

1 From 3/4" Baltic birch plywood, cut two workpieces 3 1/8 x 6" for the large hold-down (N), and two pieces 2 3/4 x 4 1/4" for the small hold-down (O).

Use the full-size patterns [\[Drawing 5\]](#) to lay out the hold-down shapes and hole locations. Lay out the dado on the inner face of each workpiece, making a mirrored pair for each hold-down.

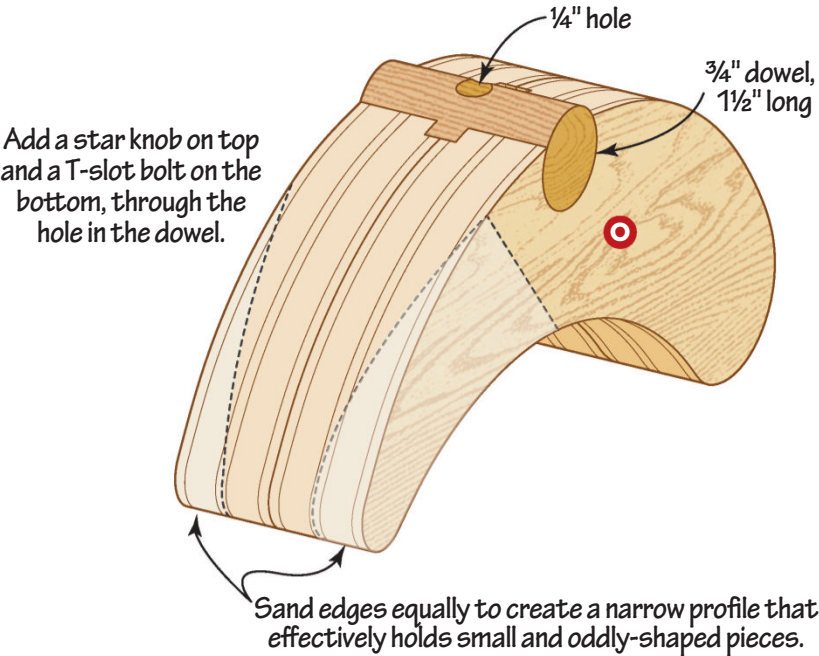
2 Bore the holes, form the dados, then cut each hold-down half to shape. If necessary, sand the holes until a 3/4" dowel rotates freely in the hole.

5 HOLD-DOWN FULL-SIZE PATTERNS

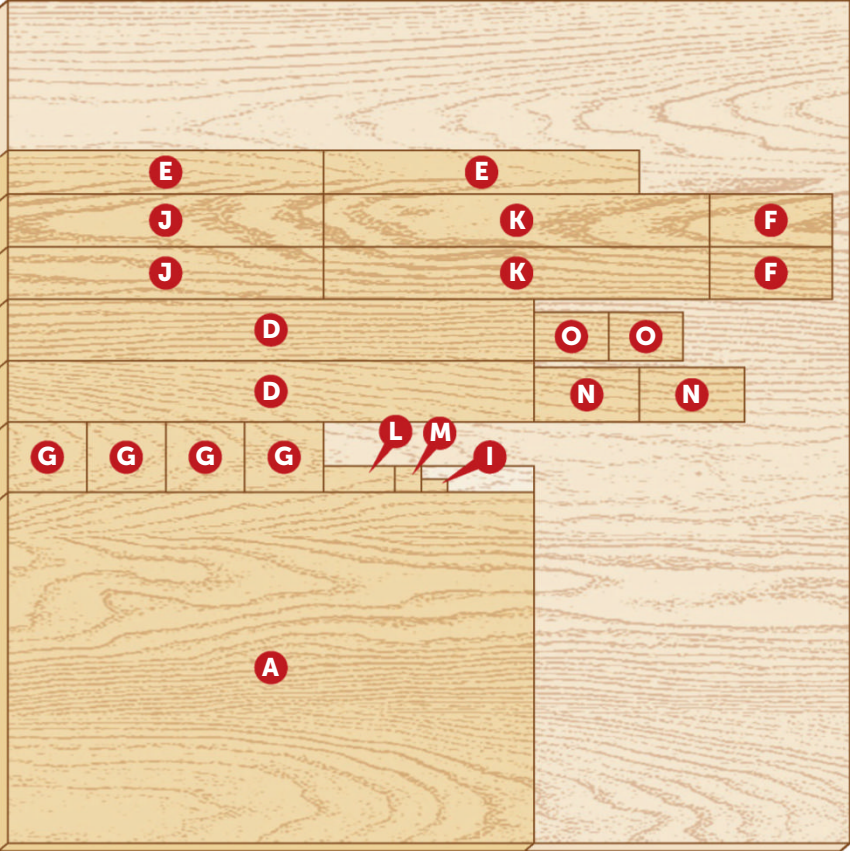


- 3** Glue and clamp the halves together, aligning the dados [Drawing 5a]. Cut the dowels to length, insert them into the holes (without glue), then drill a 1/4" hole through each one, centered.
- 4** If you'd like, sand the nose of one or both hold-downs to a tapered tip [Drawing 5a]. Attach the hold-downs to the sled using T-slot bolts and star knobs.
- 5** Put your sled to work making confident crosscuts at the tablesaw. See *Using the Sled* on page 43. 🌲

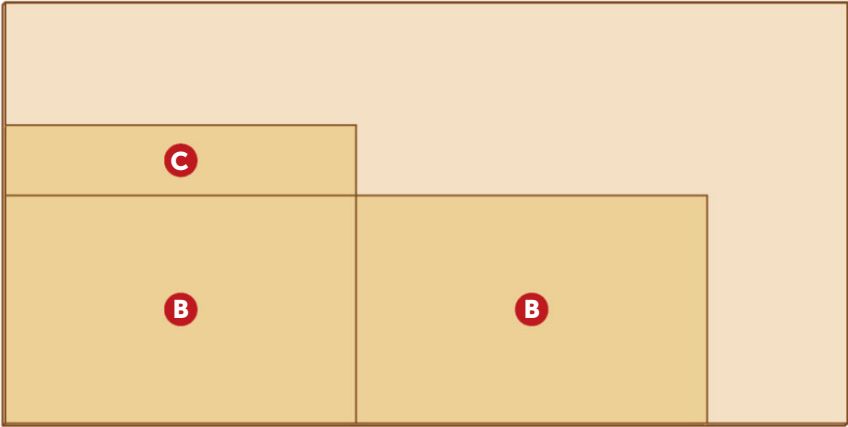
5a NARROW-NOSE HOLD-DOWN



CUTTING DIAGRAM



3/4 x 48 x 48" Baltic birch plywood



1/4 x 24 x 48" Medium-density fiberboard



3/8 x 3 1/2 x 24" Hardwood

MATERIALS LIST

PART		FINISHED SIZE			Matl.	Qty.
		T	W	L		
A	BASE	3/4"	20"	30"	BB	1
B	TOP PLATES	1/4"	13"	20"	MDF	2
C	INSERT PLATE	1/4"	4"	20"	MDF	1
D	REAR FENCE	1 1/2"	3 1/2"	30"	LBB	1
E	MITER FENCE BACK PLATES	3/4"	2 1/2"	18"	BB	2
F	FRONT FENCE	1 1/2"	3"	7"	LBB	1
G	REAR FENCE BLOCK	3"	4"	4 1/2"	LBB	1
H	RUNNERS	3/8"	3/4"	20"	H	2
I	EXTENSION STOP	3/4"	3/4"	1 1/2"	BB	1
J	MITER FENCE BASES	3/4"	3"	18"	BB	2
K	MITER FENCE FRONT PLATES	3/4"	3"	22"	BB	2
L	STOPBLOCK	3/4"	1 1/2"	4 1/16"	BB	1
M	CLAMP BLOCK	3/4"	1 1/2"	1 1/2"	BB	1
N	LARGE HOLD-DOWN	1 1/2"	3 1/8"	6"	LBB	1
O	SMALL HOLD-DOWN	1 1/2"	2 3/4"	4 1/4"	LBB	1

MATERIALS KEY: BB—Baltic birch plywood, MDF—medium-density fiberboard, H—hardwood, LBB—laminated Baltic birch plywood.

SUPPLIES: 3/8" aluminum rod, 1/8" steel pin, 1/4"-20x3/4" flathead machine screws, 3/4x12" hardwood dowel, epoxy.

BLADE AND BITS: Dado set, 1/4" spiral upcut router bit, 3/4" Forstner bit.

SOURCE: 1/4" T-track 2' no. 12K7922 (4), \$12 each; 1/4" T-track 3' no. 12K7924 (2), \$16 each; 1/4" washers no. 12K7980 [pack of 10], \$5; 1 1/2" female four-arm knob 1/4"-20 no. 00M5530 (6), \$3 each; 1 1/2" four-arm 1/4"-20 knob with 1" stud no. 00M5531 (2), \$2 each; 1/4"-20x1 1/2" T-bolts no. 12K7971 [pack of 10], \$5; 1/4"-20x3 1/2" T-bolts no. 12K7975 [pack of 10], \$7; 1/4"-20 T-slot nuts no. 05J2115 [pack of 10], \$8; 1/4"-20 insert nuts no. 00M9001 [pack of 10], \$11, Lee Valley, leevalley.com.

PROJECT COST: It cost us about \$200 to build this project. Your cost will vary by region and source.

AIR UP - YOUR - WORKSHOP



Inflate your shop's usefulness with compressed-air lines that easily reach every corner. Install them yourself—it's a breeze.

WRITER: CRAIG RUEGSEGGER
PHOTOGRAPHER: CARSON DOWNING
ILLUSTRATOR: CHRISTOPHER MILLS

Compressed air may not be the first tool you think of in a woodworking shop. But it can power a nail gun or stapler for assembly chores, a pencil grinder for carving, a spray gun for finishing, and can blast dust off project parts. If you share shop space with vehicles, you'll find compressed air convenient for filling tires and running mechanic's tools, too.

TIP!

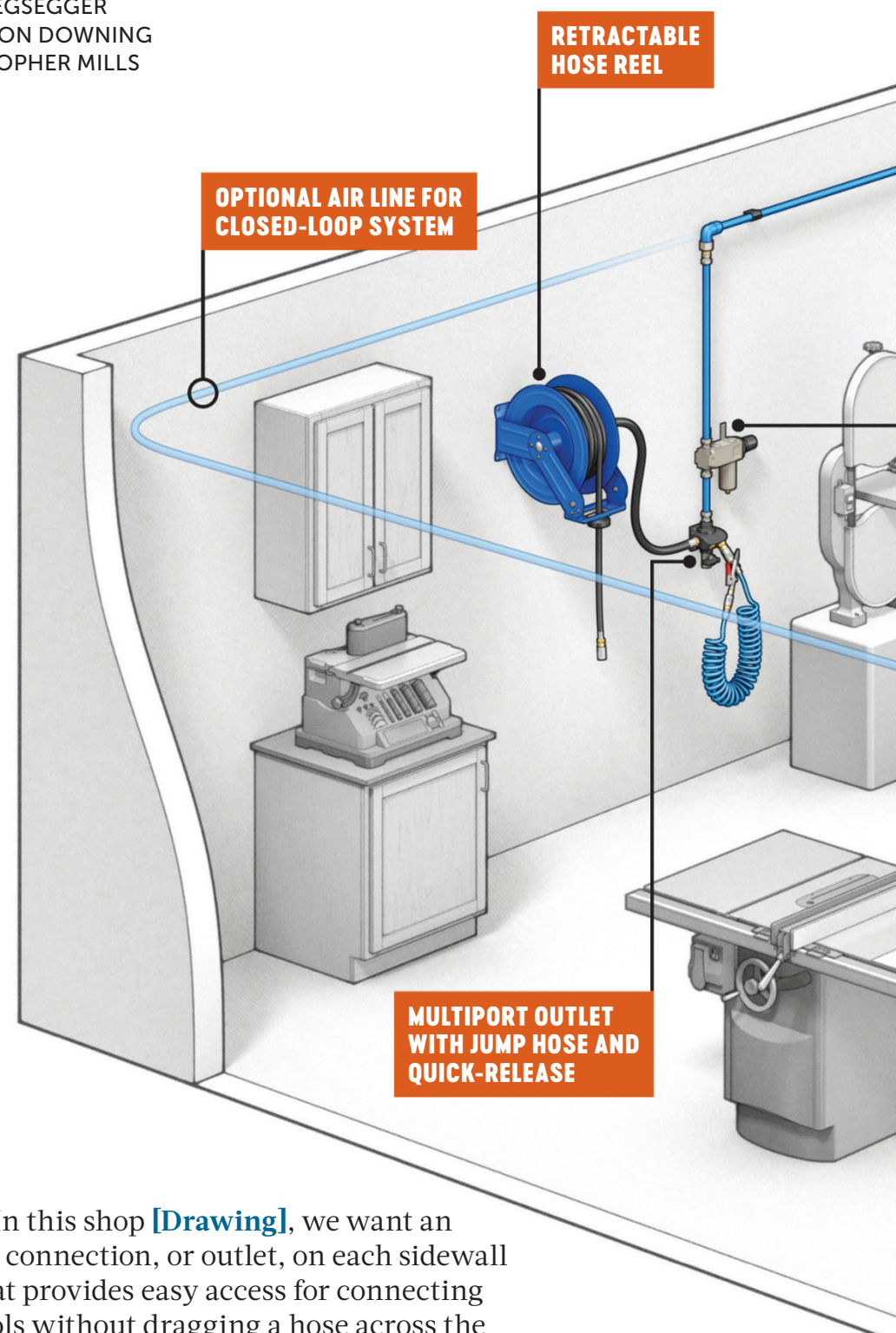
Don't worry about getting your layout perfect the first time. Modular assembly allows you to take the system apart and reconfigure as your needs evolve.

In a small shop, 25–50' of hose on a reel may suffice for powering a nailer and a blowgun. But stretching a long air hose to the corners of your shop invites snagging it on obstructions and knocking things around. Instead, install air lines to key points in your shop and use shorter hoses where they're most needed. Whether you need a full range of pneumatic tools or only a second outlet at the opposite corner from your compressor, today's do-it-yourself kits make it easy to design and install a system, even around obstructions such as doors, columns, and cabinets. We chose one from RapidAir Products (rapidairproducts.com) for our installation.

GET PUMPED

To start setting up a system, sketch out where you need air lines and for what purposes. This also affects picking the right size air compressor. (See *A Compressed Guide to Compressors*, page 49.) For this article, we've outfitted a woodworking shop in a two-car garage that also sees some automotive maintenance work.

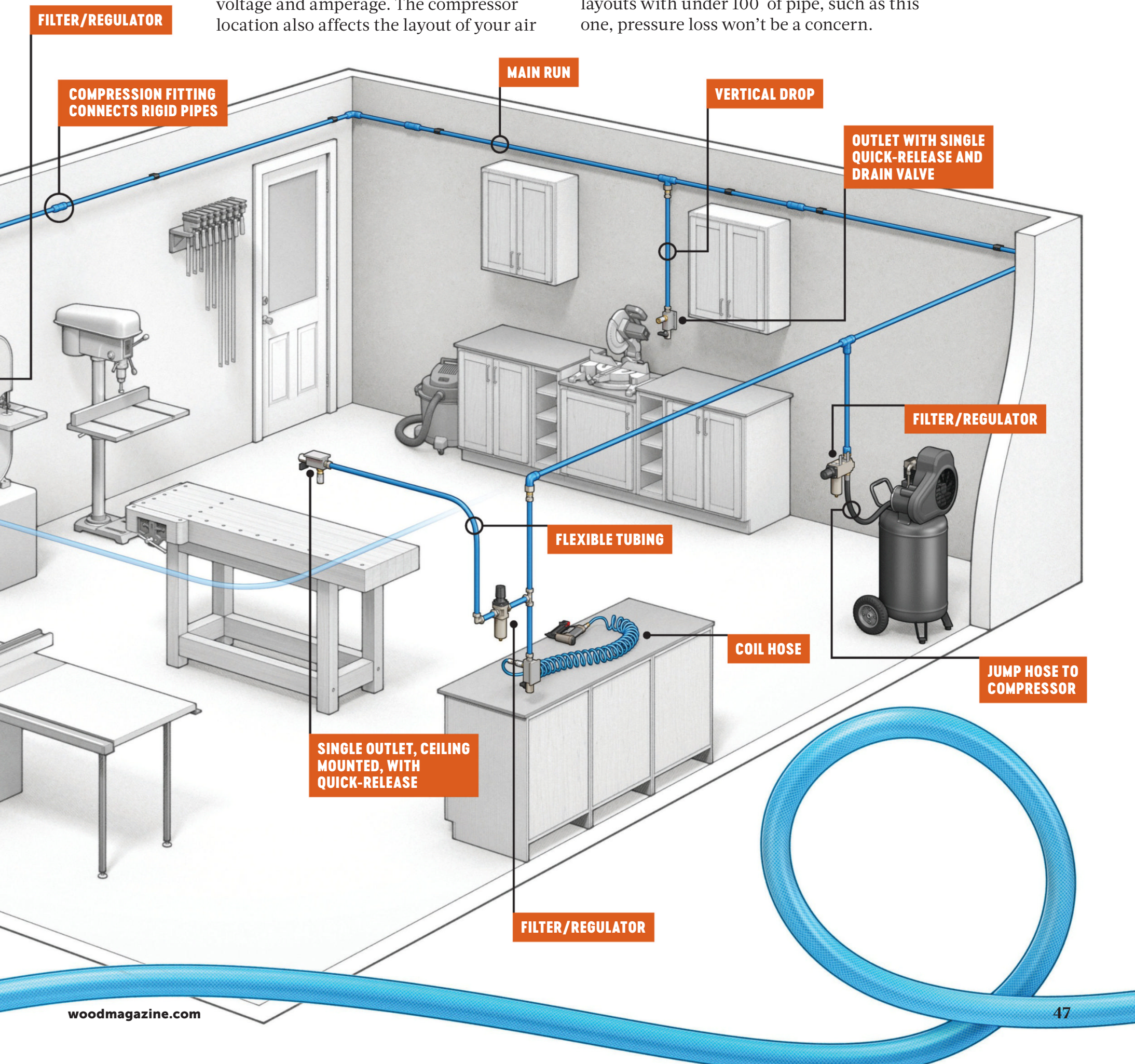
In this shop [\[Drawing\]](#), we want an air connection, or outlet, on each sidewall that provides easy access for connecting tools without dragging a hose across the floor. A hose reel near the overhead door provides air for spraying finish, allowing



fumes and overspray to exhaust outdoors. This hose also reaches outside for airing up tires and other auto maintenance. To get air to the bench in the center of the shop, a ceiling-mounted outlet keeps the hose up out of the way.

The size of the air compressor and its power requirements are the major factors determining its location within the shop. Compressors should not connect to extension cords, so make sure the plug can reach an electrical outlet of sufficient voltage and amperage. The compressor location also affects the layout of your air

pipes. For the main run (the horizontal pipe that feeds the vertical drop lines around the shop), routing to a dead end typically uses the least pipe. However, the farther the air travels, the more pressure drops, so a single long run may cause lower pressure at the most distant outlet. This can be addressed in a couple of ways: one, by placing the compressor in the middle of the layout to create two shorter runs **[Drawing]**; or two, by creating a loop of pipe. This keeps the air pressure more consistent at all points. For layouts with under 100' of pipe, such as this one, pressure loss won't be a concern.



READY TO GO? THEN PIPE UP

Many DIY air-plumbing kits supply flexible pipe (*below*), which surface-mounts to walls and ceilings, or installs inside walls (similar to electrical wiring), and even in floors before pouring concrete. Easily route it around obstructions and corners by bending it by hand, or use 90° compression-fit elbows for tighter turns. Long runs require fittings only where you choose to place a drop, speeding installation and reducing the number of potential leaks.

Some manufacturers offer rigid lengths of aluminum pipe for surface-mounting, *above right*. Join sections together with purpose-made compression fittings to create long runs. Flexible and rigid pipe can be mixed within a system. Both types of pipe allow for disassembling a run to reconfigure it and can be installed by one person. For a small shop, 1/2" - or



3/4"-diameter pipe provides sufficient airflow. If your needs require high airflow, go with 3/4". For our installation, we used 3/4" rigid pipe for the main line and 1/2" flexible pipe for the drops, all surface mounted. While 1/2" would have sufficed, we chose to use both types and diameters to show installation methods for each.

Kits may include up to 200' of flexible pipe and the parts needed to install three outlets. Purchase additional outlets and accessories to suit your needs.



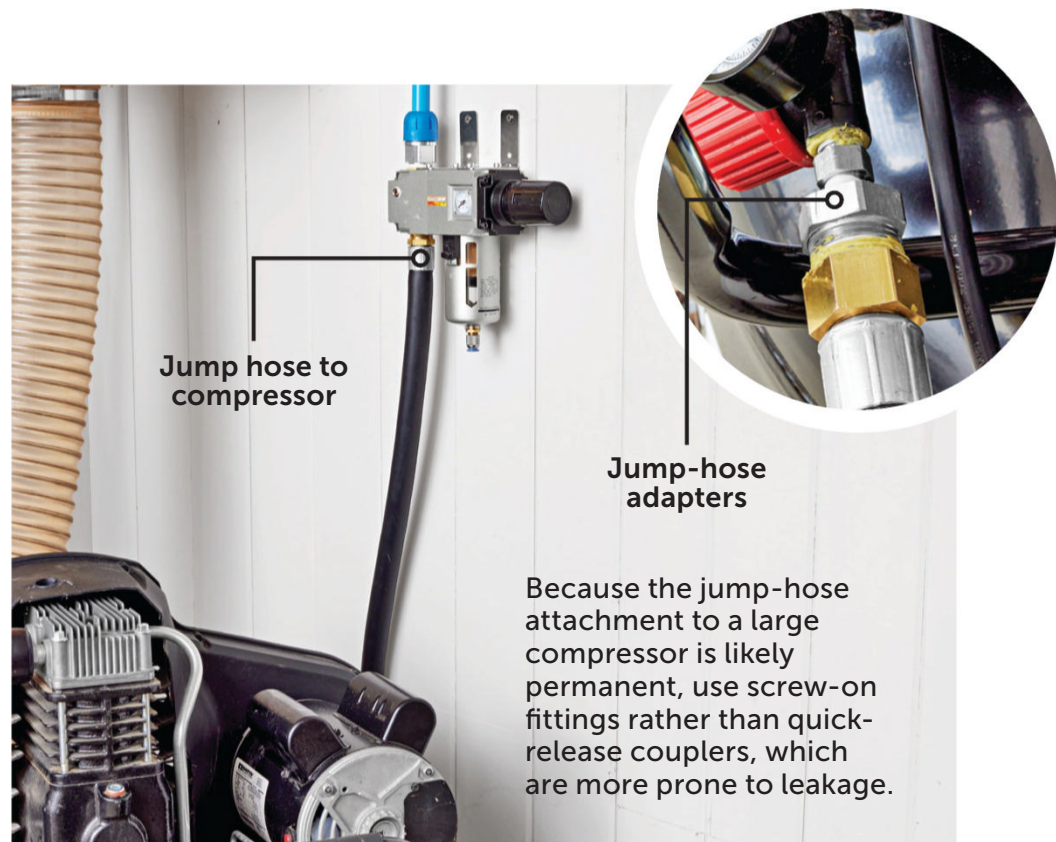
FITTINGS DO YOUR BIDDING

After determining what type of pipe you want, measure for the amount needed and the number of elbows to route it around corners or obstructions, including tees or elbows for adding drops, and if using rigid pipe, fittings to join lengths end to end.

Next, determine the needed components for your system. (We'll cover the most common in this article.) Buying a kit with flexible pipe typically provides all the parts needed to install three outlets as well as the tools for cutting and preparing the pipe. To add more or different types of outlets and accessories, use the sketch you made earlier and follow these steps: Start from the compressor and work your way

TIP!

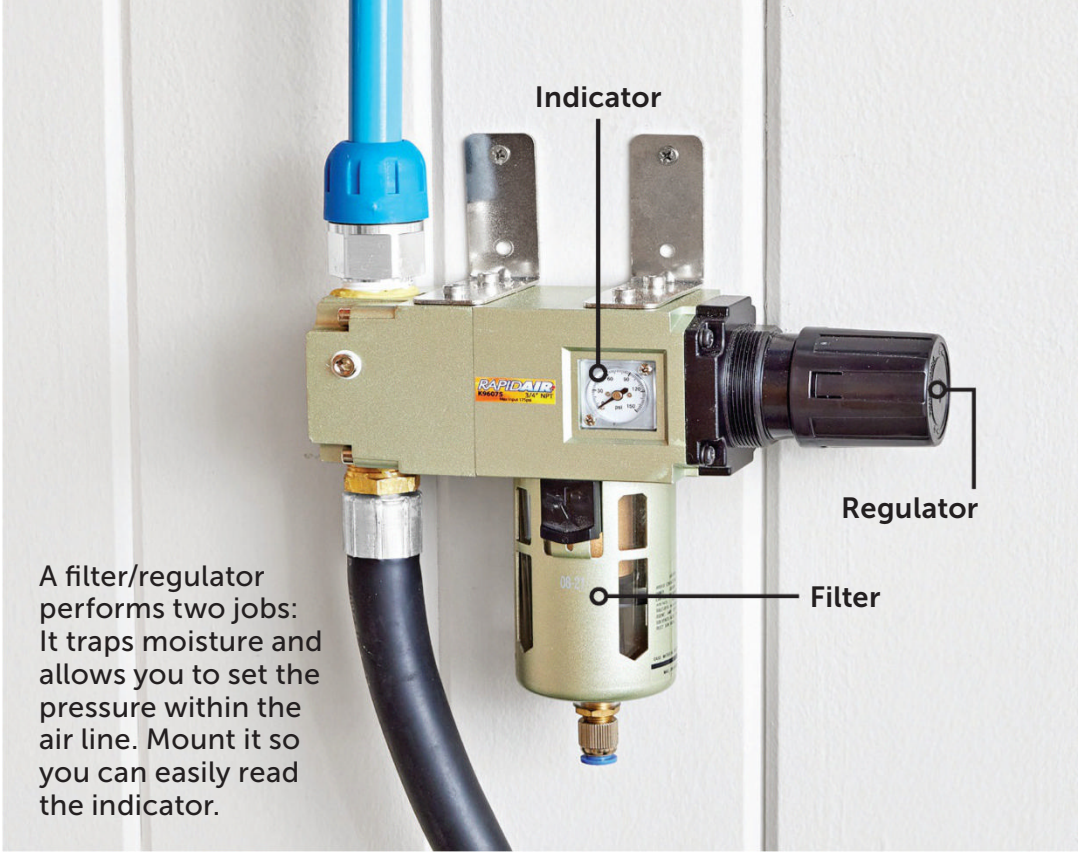
Keeping track of all these parts can be confusing. RapidAir Products offers an online design tool that automatically generates a parts list.



around the shop, identifying and recording what fittings you need and where. Pencil in part numbers or descriptions along each air line and at each corner, junction, and outlet to make sure you've covered everything.

Even if you buy a kit, you'll need a **jump hose**—a short, flexible section that joins your compressor to the air lines, *previous page, bottom*. This hose isolates the compressor vibrations from the fixed pipes, reducing noise and potential damage. Remember to include any adapters needed to fit the hose to your compressor.

The initial connection from the jump hose to your pipes will likely be through a **filter** or a **filter/regulator**, *right*. Air gets hot



A filter/regulator performs two jobs: It traps moisture and allows you to set the pressure within the air line. Mount it so you can easily read the indicator.

A COMPRESSED GUIDE TO COMPRESSORS

A whole-shop air system will use air faster than a small compressor can provide it. To determine the proper size of an air compressor tank and motor, you need to know what tools you'll be powering. The chart *below* shows the air-use requirements of common tools in cubic feet per minute (cfm). Yours may differ, so refer to the manufacturer's specs. A rule of thumb is to choose your highest-cfm tool and calculate 1 hp per 3.5 cfm, rounding up. For our setup, the most air-hungry tool is a 10-cfm orbital sander. Dividing 10 by 3.5 yields about 2.85, which rounds up to 3 hp.

In use, the sander runs almost constantly, so it needs a compressor that can recharge the tank with air faster than the sander consumes it. In the 3-hp class, tanks range from 20 to 60 gallons. A good rule of thumb is at least 2 gallons of storage for each cfm required. We chose a 30-gallon tank to provide the needed volume and some headroom. This model also allowed us to power it on a 110-volt circuit.

TYPICAL TOOL CFM REQUIREMENTS AT 90 PSI

TOOL	CUBIC FEET PER MINUTE
TIRE INFLATOR	1-2
BRAD NAILER	1-2
FINISH NAILER	1-3
DIE GRINDER (1/4")	4-7
CARVING PENCIL	4-7
IMPACT WRENCH (3/8", 1/2")	5-8
FINISH SPRAYER	7-12
ORBITAL SANDER	5-15



This 1-hp, 4.6-gallon compressor provides plenty of air for small jobs such as driving a finish nailer or blowing dust off items.



The 3-hp, 30-gallon compressor we chose occupies less space than a 60-gallon model but still powers a sander or sprayer.



The 60-gallon tank of this 3-hp compressor provides air to spare. It stands 67" tall and requires 220-volt power.

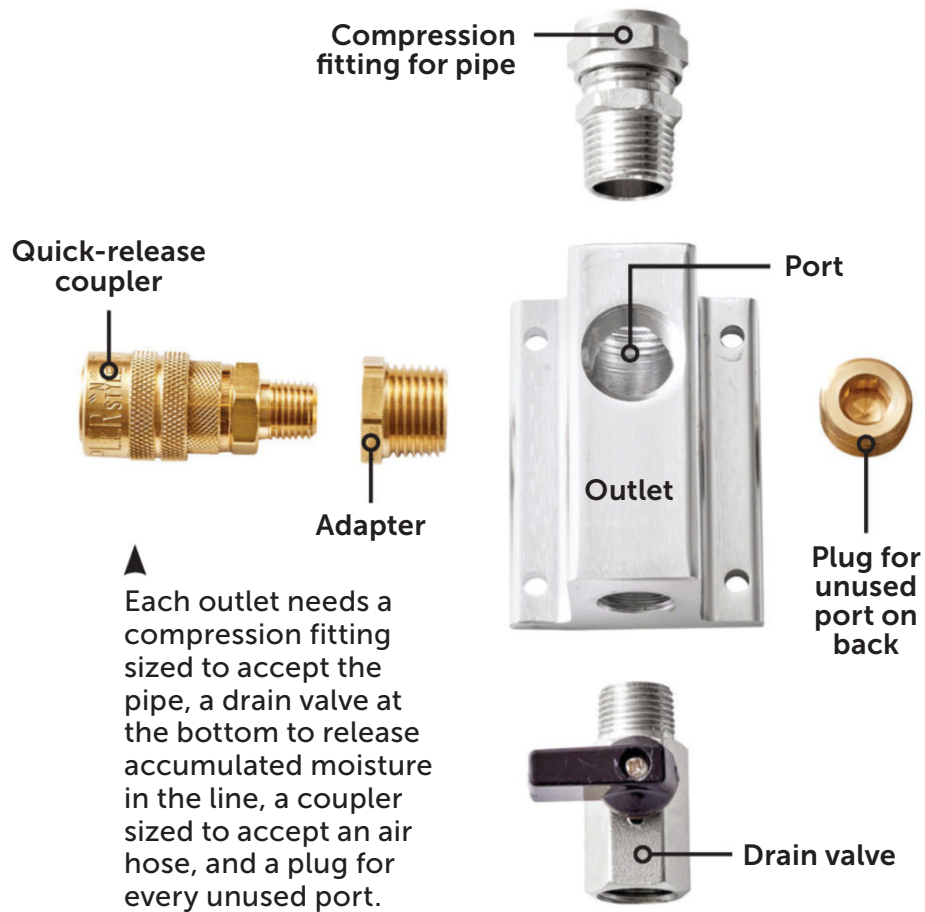
TIP!

Water collects in the air compressor tank, too. Drain it regularly to avoid rust in the tank and air lines.

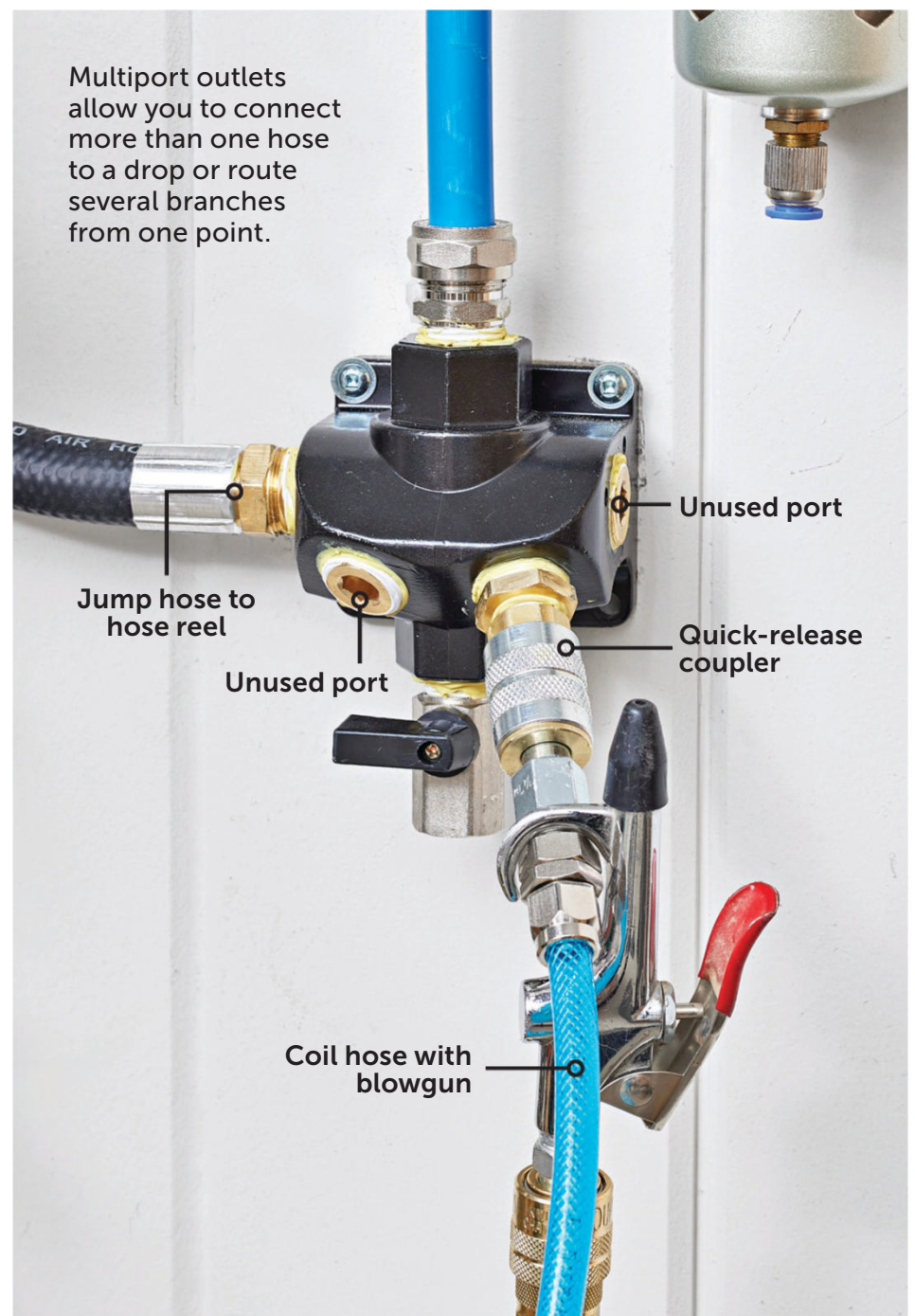
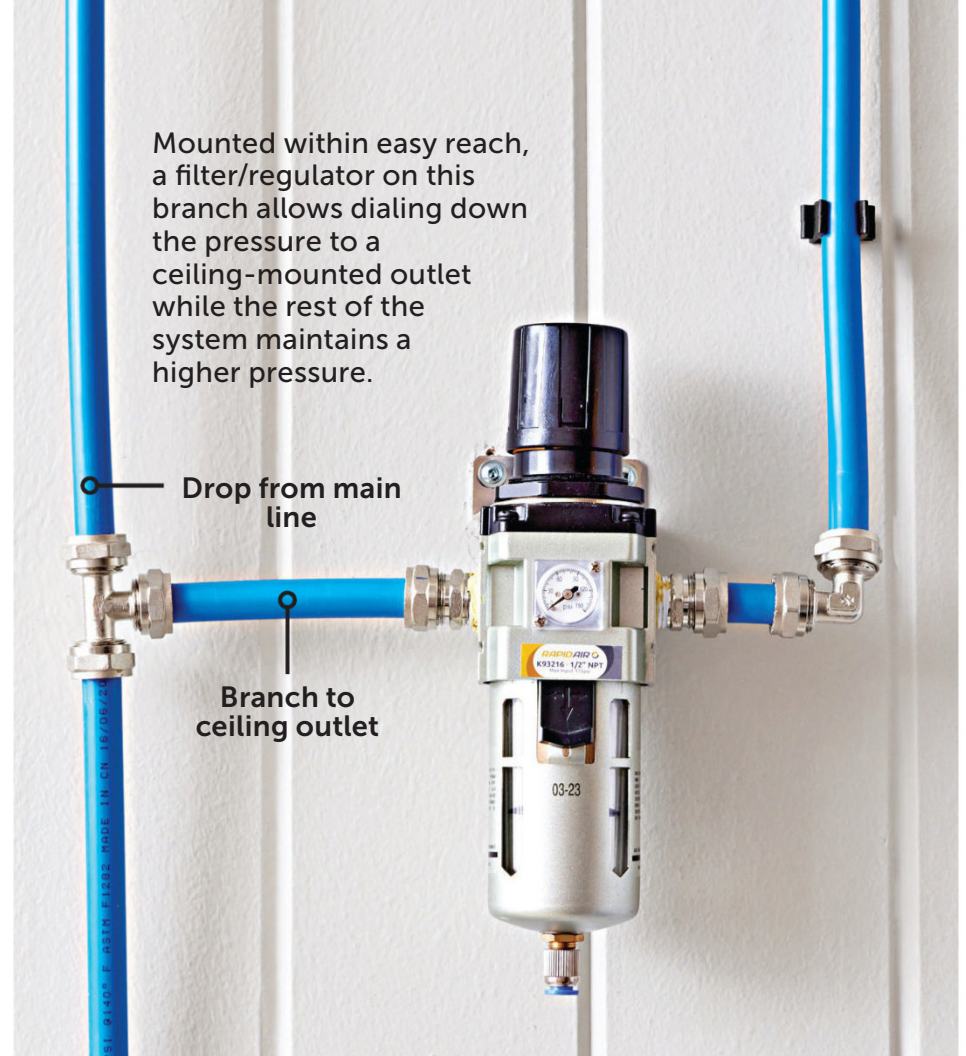
as it's compressed, and hot air holds water vapor. As the air cools, the vapor becomes liquid and can be carried into the air lines. The filter captures that water and any bits of debris before they reach your air tools.

If you want to provide lower pressure than the rest of the system along a branch line or at an outlet, or you want to provide an additional safeguard against moisture (such as on a line used to power a spray gun), add another filter/regulator near that location, *right*.

Each drop requires an **outlet** that accepts several types of **fittings**, *below*. Look for manufacturers that include these items with the outlet, as purchasing them separately can cost more. In our shop, each drop gets a single-port outlet, except the one by the door, which gets a multiport to feed a hose reel, a short coil hose, and a couple of unused ports for future expansion, *bottom right*.



Shutoff valves allow you to stop airflow to all or portions of the system. For instance, you may want to close off just one drop if it should develop a leak. Common locations for shutoffs are just after the compressor for a full-system shutoff and before each outlet. Because our system hosts only one user, shutting down the system to repair a leak doesn't inconvenience anyone else, so we opted not to include shutoffs.



Hoses can be permanently installed to an outlet by screwing them into an **adapter** in the port, but we like the versatility of having a **quick-release coupler**. (See *Fitting Fittings*, right.) This allows moving hoses around the shop, or removing one quickly should it develop a leak.

Next, determine the type and length of the hose you need. Standard $\frac{3}{8}$ " rubber air hose up to 50' long rolls onto a reel to store out of the way while unfurling easily to reach the job. Include a jump hose to reach from the outlet to the reel, if one isn't included with the reel. For work done near an air outlet, a **coil hose**, below, stretches out, then self-retracts when you let go. Dedicate shorter coil hoses to outlets near work areas. We outfitted our coil hoses with a plug on one end to fit into the quick-release coupler on an outlet, and on the opposite end, a quick-release coupler for connecting tools. This also allows chaining hoses together for a longer reach.



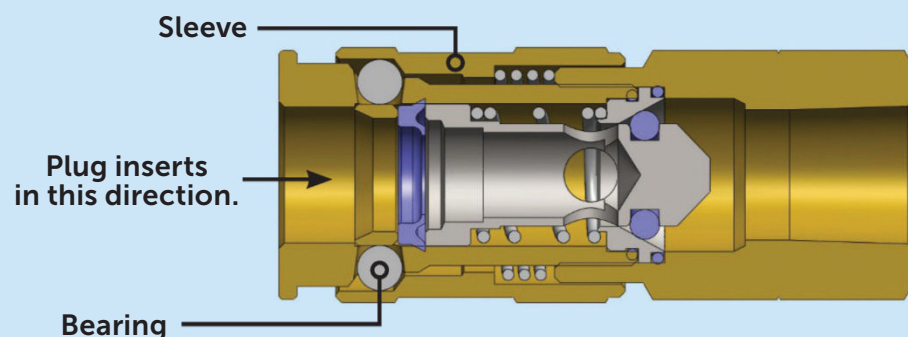
This coil hose stretches to 6', then recoils on itself to store in about 1' of space.

FITTING FITTINGS

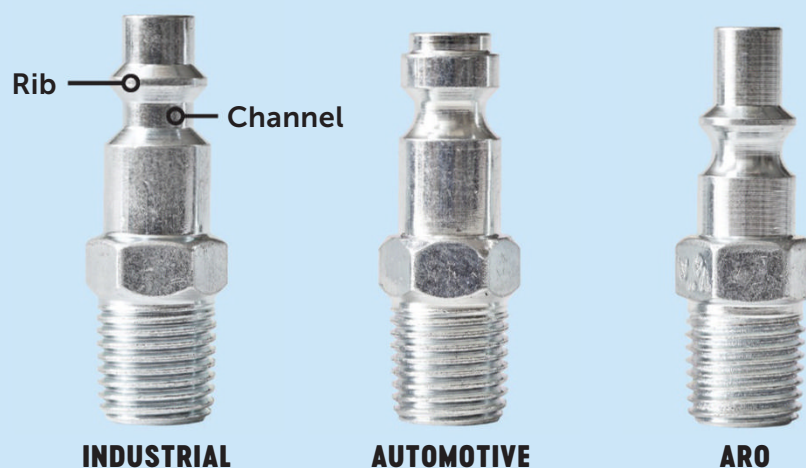
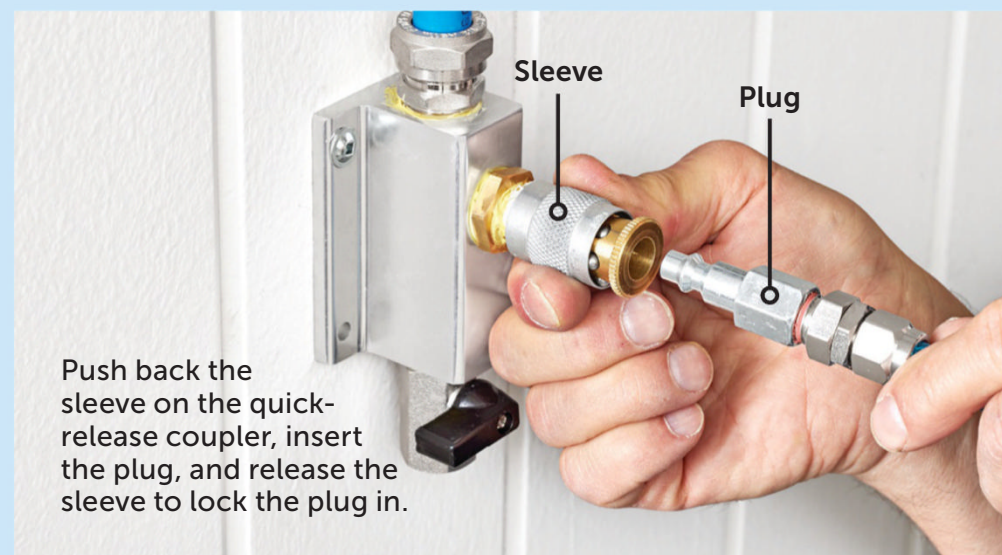
Connecting tools and hoses to your air system requires fitting a plug into a quick-release coupler, shown in the cutaway drawing below. Simple enough—until you realize not all plugs fit all couplers. Here's how to make the right connection.

The two most widely used and available air connectors are industrial (also called Milton or M-style) and automotive (also called Tru-flate, Type T, or C-style), bottom. Auto stores and some hardware stores also carry a third type called Aro fittings.

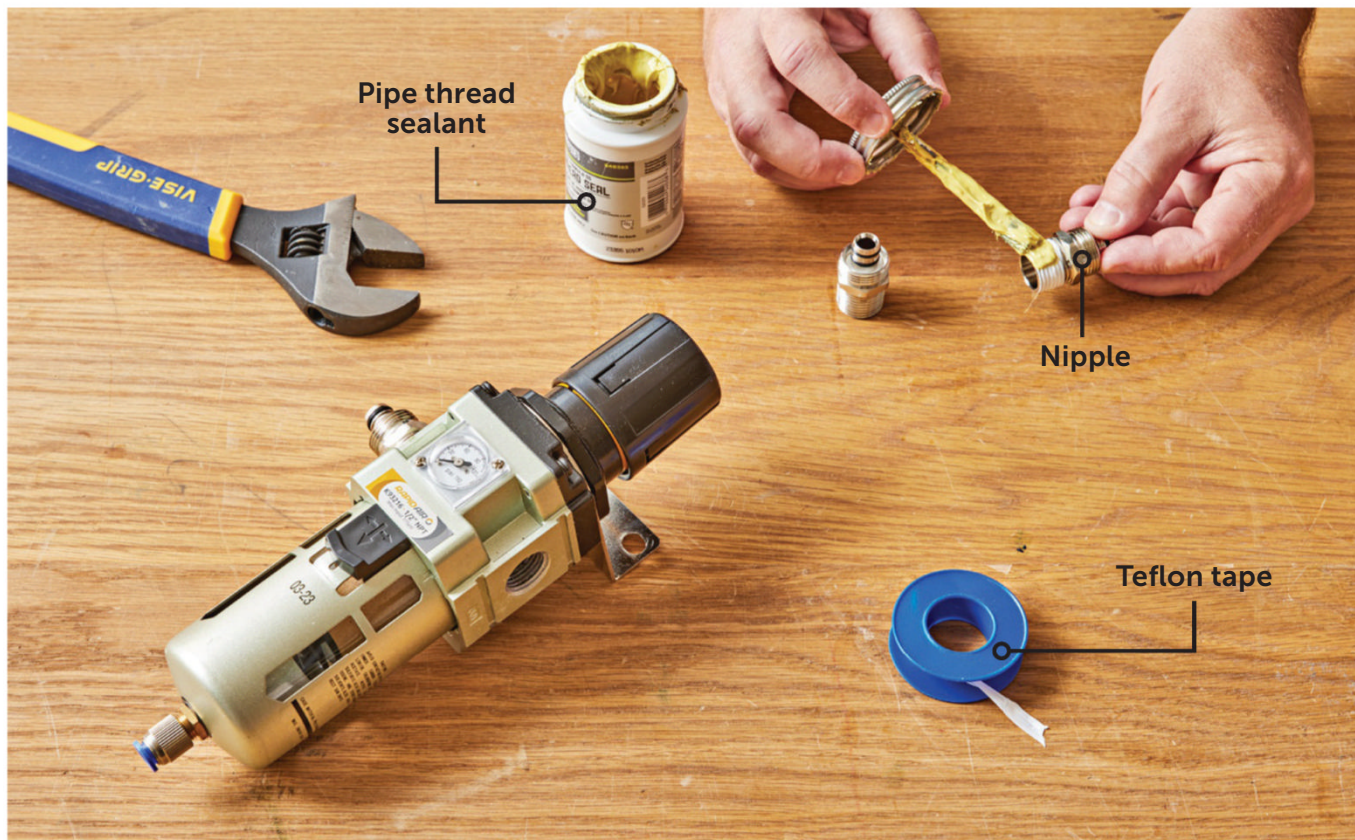
All styles work equally well, so the best advice is to choose one type and stick with it. If you have a mix of plugs or couplers currently, switch to one type so all tools, hoses, and connectors work together. Avoid universal couplers. They claim to work with both industrial and automotive plugs, but you'll get a better fit with a coupler that matches the plug.



Bearings inside the coupler snap into a channel behind a raised rib on the plug. The positions of the bearings, channel, and rib create the main differences in plug and coupler types.



The rib on an industrial plug slopes on both sides, and the tip is longer than automotive but shorter than Aro. Automotive plugs have a flat rib. The Aro profile is similar to industrial, but the longer tip moves the channel closer to the threads.



Wrap threaded unions with two layers of Teflon tape, then coat with pipe sealant. Screw the fixture in place and tighten with wrenches. Wipe away excess sealant.

SHARE AIR EVERYWHERE

When all of your parts arrive, take inventory and, referring to your original sketch, determine which parts go where.

Next, position your compressor to help you mark the location of the filter/regulator. Place the filter within easy reach and ahead of any branches of the air line.

Before mounting the filter/regulator to the wall, add a nipple to the outlet side to accept the vertical pipe to the main horizontal line, *above*. Temporarily secure the filter/regulator to the wall with a single screw, then measure for the vertical pipe and cut it

to length (*Slice Each Pipe Type, next page*). Add the tee or elbow that will connect to the horizontal line(s), then install the pipe in the nipple, *below left* and *below right*, and hand-tighten. (We hand-tightened all compression fittings initially to allow disassembly for adjusting pipe length or placement of a fitting as we worked.)

TIP!

Using a single screw simplifies fine-tuning component placement as the system comes together.



Wet the end of the pipe with soapy water so it slips easily into the fitting until the pipe bottoms out. The lubrication also helps the fitting turn smoothly as you tighten it.



For our layout, a tee fitting at the top of the pipe from the filter/regulator feeds the main-line runs that extend to the left and right.



Secure pipes to the wall or ceiling. The hangers supplied with our RapidAir pipes suggested a #10 screw inserted through a $\frac{5}{16}$ " hex nut. We found pocket screws worked just as well.



Pipe wrenches supplied with rigid pipe and fittings latch into notches and knurls on the compression fitting to tighten the collars.

Continue around your shop, adding pipe with pipe hangers, *top photo*, and drops according to your plan. Before adding outlets, shutoffs, and filter/regulators to the system, install any threaded fittings to them, such as hose nipples, plugs, and drain valves, while you can still easily access the needed openings. Tighten these connections securely.

After installation is complete, add any additional pipe hangers needed and secure all outlets and regulators to the wall with additional screws. Tighten all fittings per the manufacturer's instructions, *above*. Connect the jump hose to the inlet side of the filter/regulator, and then to the compressor. Bring the system pressure up to 50 psi, shut off the compressor, and walk around listening for leaks. Let the system sit like this for at least a couple of hours, then check the regulators. If the pressure has dropped, spray soapy water on each connection to locate the leaks. If the pressure remained steady, you are ready to have a blast. 🌳

SLICE EACH PIPE TYPE

Whether it's rigid aluminum or flexible tubing, cutting it to length and prepping the ends is as easy as pipe.

CUTTING RIGID PIPE



When measuring and cutting rigid pipe, allow for the 2" (1" at each end) that fits into the compression fittings, as well as the length of the fittings. Use a pipe cutter to cut the end square, *above*. Deburr the inside and outside of the cut ends, *inset*, to prevent damage to the fitting. Carefully wipe away any shavings.

CUTTING FLEXIBLE PIPE



Cut flexible pipe with the provided scissor-type tool, spinning it around the pipe as you close the jaws, *above*. Allow $\frac{3}{4}$ " extra at each end to fit into the compression fitting. Clean and square up the cut ends with a flaring tool, *inset*, to provide a good seal with the compression fitting.

ECHOES OF ART DECO FLIP-TOP BOX

Wrapped in cherry strips that elevate and provide handles, this box draws the eye with sleek lines that invite you to peek inside.

WRITER: CRAIG RUEGSEGER

DESIGNER: JOHN OLSON

BUILDER: BRIAN BERGSTROM

Streamlining was often a defining feature of art deco designs. Long lines with rounded or tapered ends extended along the surfaces of everything from locomotives to radio cabinets and teapots, evoking motion.

On this box, strips of cherry with rounded ends wrap walnut cladding, lifting the box and providing a subtle contrast to the walnut. The walnut, in turn, frames the striking grain of curly maple on the front and back faces. Lift the lid to reveal even more beautiful maple inside.



OVERALL DIMENSIONS

11½"W x 5"D x 3"H

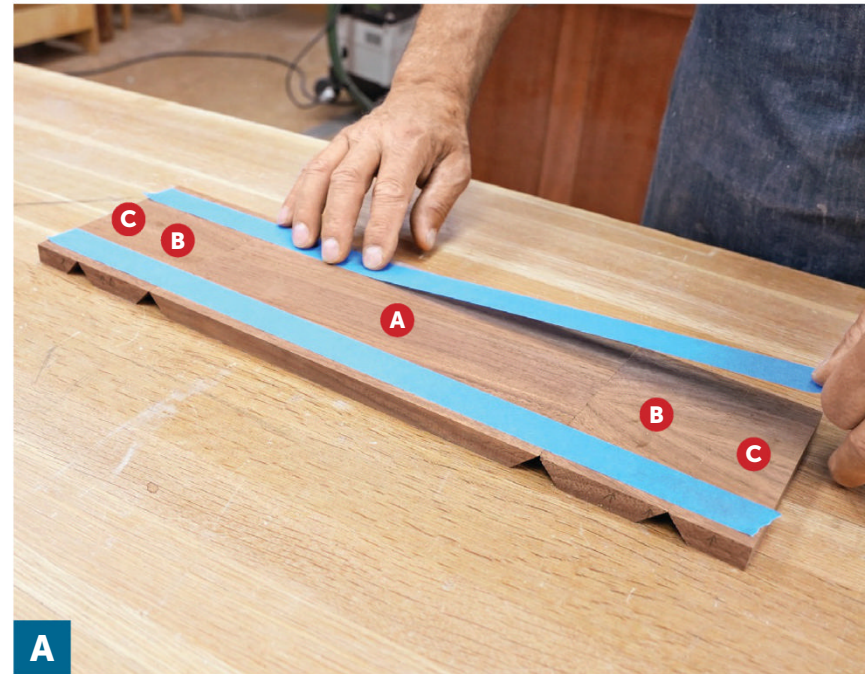
WORK FROM THE OUTSIDE IN

A small project such as this box is the perfect place to use those special scraps with an eye-catching section of grain. Careful crosscutting and bevel-cutting of the cladding and lid from a single blank provide a continuous grain pattern around the top and sides of the box. See *Getting Gorgeous Grain*, page 57, for details on how we prepared a walnut blank for our box.

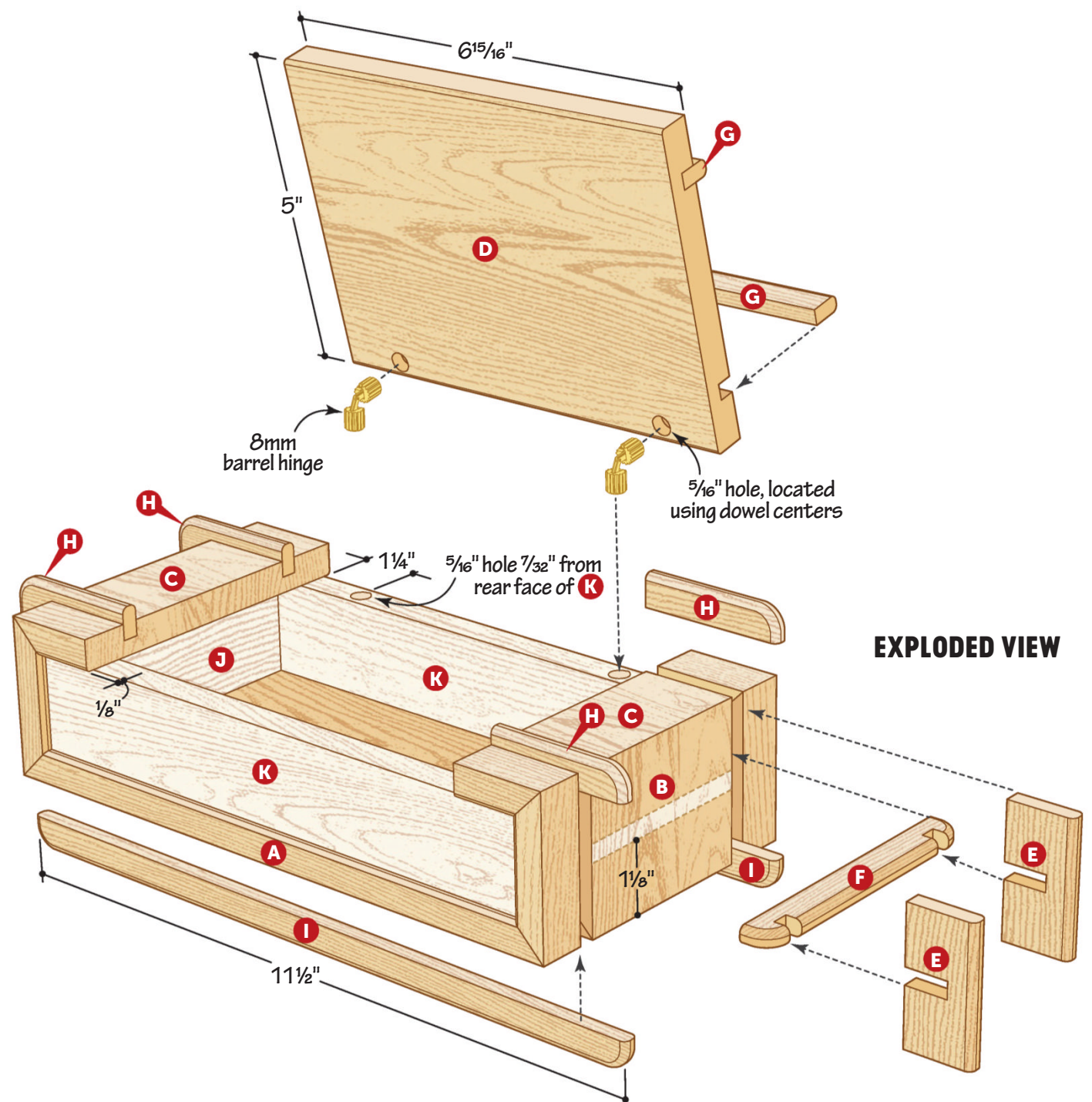
1 Start by cutting the bottom (A), end and top cladding (B, C), and lid (D) to size. Set the lid aside for now.

2 Bevel-cut both ends of the bottom (A) and end cladding (B), and one end of the top cladding (C) [Drawing 1].

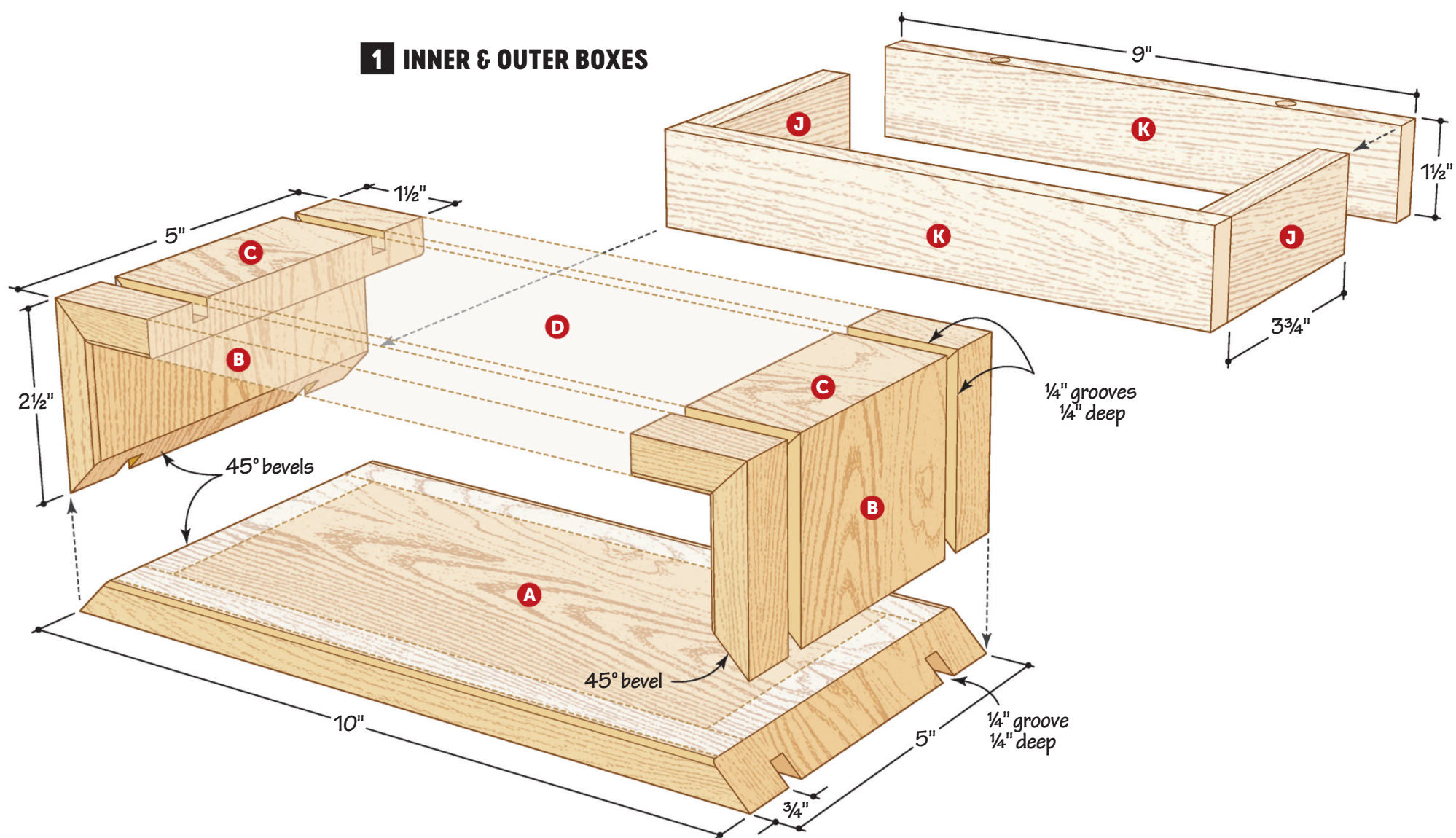
3 Place the bottom, end cladding, and top cladding inside-face down on your bench and stretch painter's tape across them [Photo A]. Fold up this



A Butt the tips of the bevels against each other, keeping the edges of the pieces aligned as you apply the tape. Stretch the tape slightly as you go so it pulls the joints together.

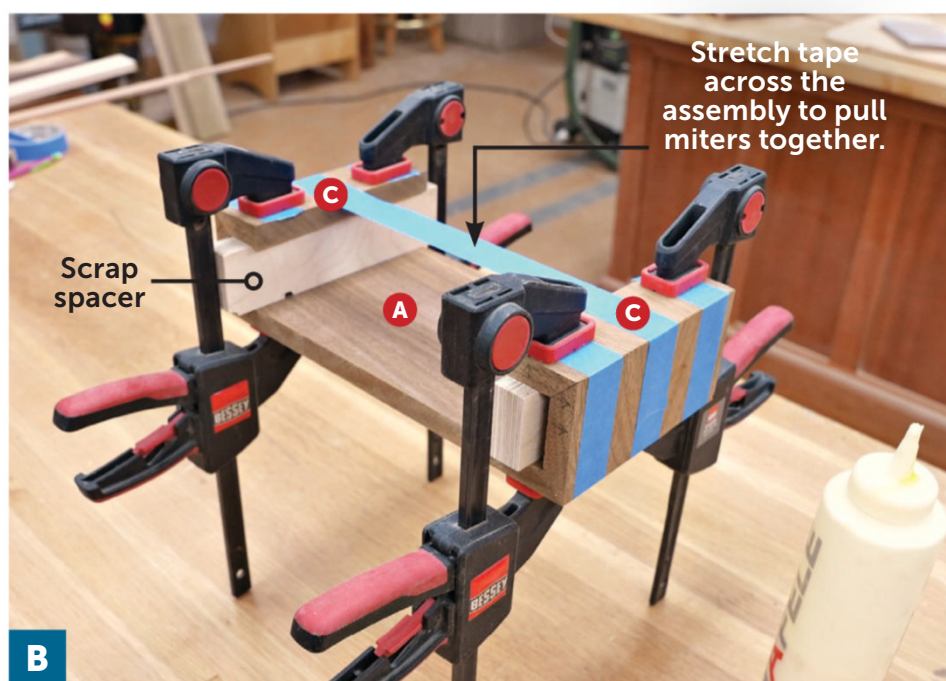


1 INNER & OUTER BOXES

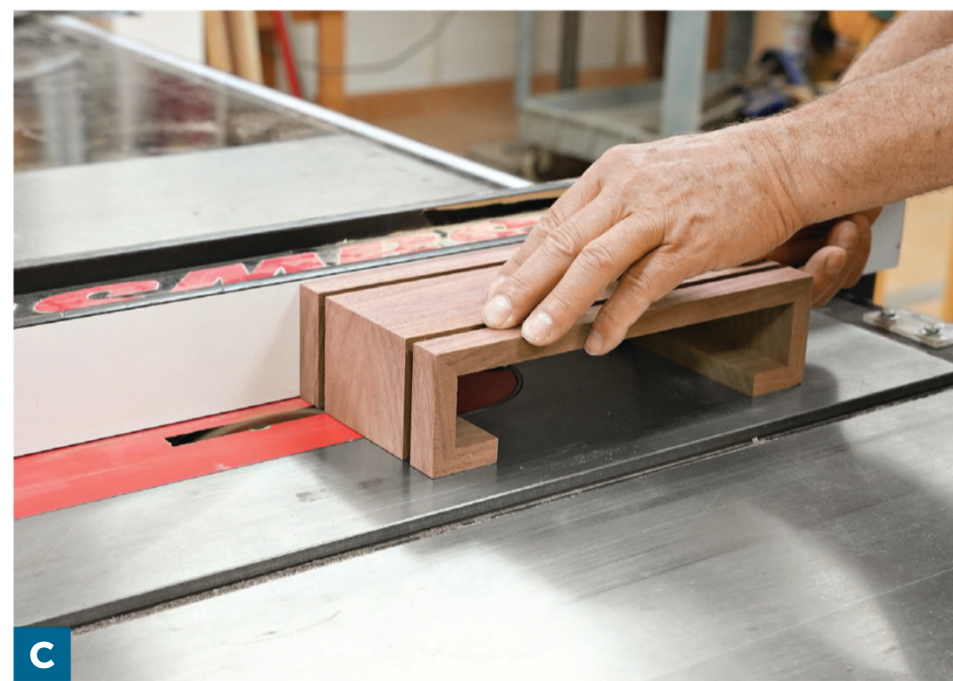


assembly and cut scrapwood spacers to fit between the bottom and top cladding. Check the fit of the lid (D), then set the lid aside once again. Unroll the assembly, leaving the tape attached, apply glue to the bevels, then clamp and tape the assembly [Photo B]. After the glue dries, remove any squeeze-out.

4 Set up a $\frac{1}{4}$ " dado blade in your tablesaw and position the rip fence $\frac{3}{4}$ " from the blade. Cut grooves around the cladding assembly (A-C) [Photo C], as well as the outer face of the lid (D), to accept the keys. Finish-sand the cladding assembly, rounding the interior edges slightly.



Slip the spacers in to support the top cladding (C), allowing you to apply light clamping pressure. Position the spacers away from the miter joints so they don't get glued in place.



Cut $\frac{1}{4}$ "-deep grooves around the cladding assembly (A-C) and the top face of the lid (D). When standing the assembly on end, guide it using the miter gauge with an auxiliary fence.

GETTING GORGEOUS GRAIN

Resawing takes grain from random to remarkable.
Wrapping the grain around corners adds even more “wow.”

A small box such as this one provides a perfect opportunity to showcase special grain. We had a piece of walnut with wavy grain that was long enough to yield the end and top cladding (B, C) and lid (D), but wasn't wide enough, *right*. But because the board was more than 1" thick, we could resaw and book-match it to create a wider board with a grain pattern that mirrors along the joint line. Careful crosscutting and bevel-cutting create parts where the grain flows around the corners of the box. Here's how to do it.



Watch a video
with great tips on
resawing at the
bandsaw.
[woodmagazine.com/
resaw](http://woodmagazine.com/resaw)



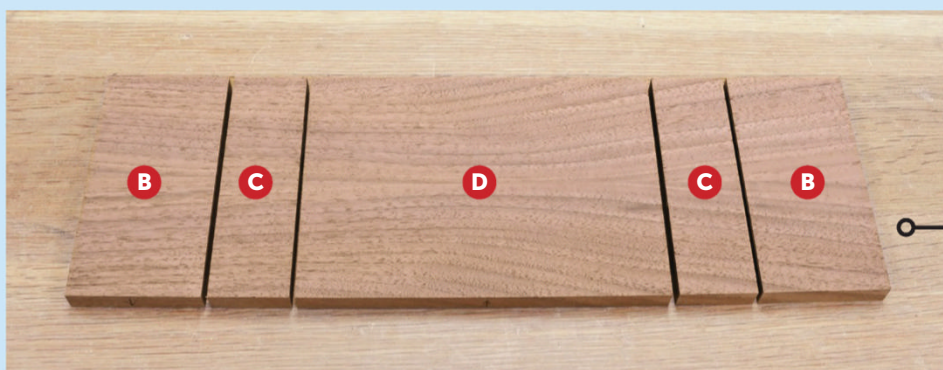
This walnut board was just over half as wide as we needed for the box cladding.



Resawing the board into thinner pieces and gluing the jointed edges together creates a symmetrical pattern.



Rip each resawn board to one-half the width of the finished blank—in this case, 2½" for a 5" blank. Glue the jointed edges together, aligning the grain pattern as closely as possible for a mirror match.



Starting from one end, and flipping the blank end for end after the first cut, crosscut the end cladding (B) to finished length. Repeat for the top cladding (C).

First, flatten one face of the board and joint one edge square to this face. The jointed edge becomes the centerline of the blank.

Resaw the board in half. Then rip each board to one-half the finished width of the desired blank, *left*. Glue these boards together to create the blank and plane it to final thickness. Crosscut each end of the blank to bring it to 15½" in length.

To keep the grain pattern flowing from one end cladding (B), across the top cladding (C) and lid (D), and onto the other top and end cladding, crosscut the blank as shown *below left*. To do this, clamp a stopblock to an auxiliary fence on your miter gauge. Cut an end cladding (B) from each end, then reset the stopblock and cut the top cladding (C). The remaining piece becomes the lid (D). Label the pieces to help you keep them in order as you cut them from the blank and to identify the top faces and mating ends. Note that this may yield a lid that differs in length from the Materials List. If so, adjust the length of the bottom (A) to account for this.

TIP!

A thin-kerf blade removes less material, improving the grain flow around the corners.



D Set the router-table fence flush with the bearing of the bit. Rout both faces of the key and handle blanks along one edge to create a bullnose profile.



E With a 1/4" dado blade in the tablesaw, test the rip-fence position by notching test pieces the same length as an end key (E) to center the notch on the workpiece. Then notch each end key.



F Lower the dado blade and reposition the rip fence to cut the notches in the handles (F) 3/8" from each end. Notch one end, flip the workpiece end for end, and notch the other end.

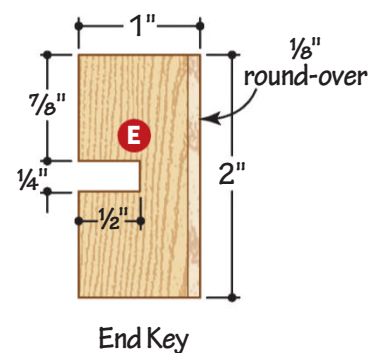
TIP!

Cut a lid key (G) and two top keys (H) from the same blank for a continuous grain match.

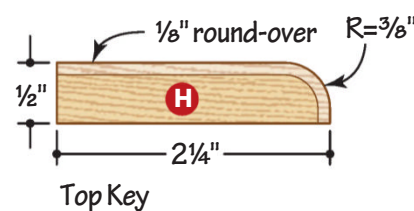
THE KEY TO MAKING KEYS

- 1 Plane cherry stock at least 12" long for the keys and handles (E-I) to fit the grooves in the cladding. From this stock, rip five 1/2"-wide blanks and one 1"-wide blank to make these parts plus a few more for testing tablesaw and router-table setups. Designate two 1/2" blanks for the lid keys (G) and top keys (H).
- 2 Rout 1/8" round-overs on both faces of the blanks [Photo D]. Save this router-table setup for later.
- 3 Crosscut the end keys (E) and handles (F) to length. Attach an auxiliary fence to your miter gauge and notch these parts [Drawing 2, Photos E and F].
- 4 Using 150-grit sandpaper, sand the 3/8" radius on each end of the handles (F) [Drawing 2]. Using your saved router-table setup, extend the bullnose profile around these rounded ends. Finish-sand the end keys and handles.

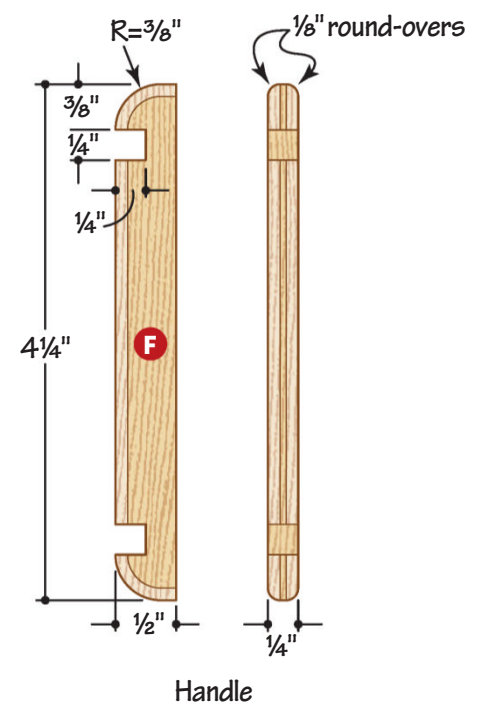
2 KEYS & HANDLES



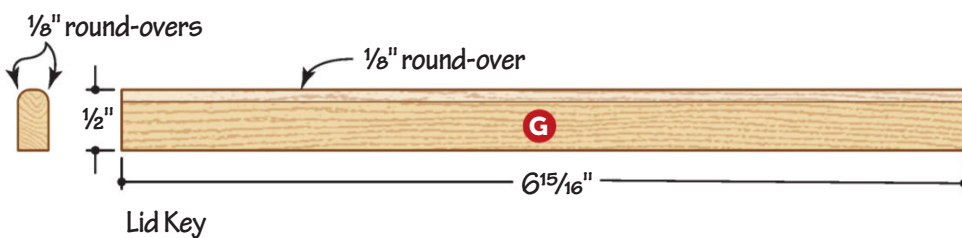
End Key



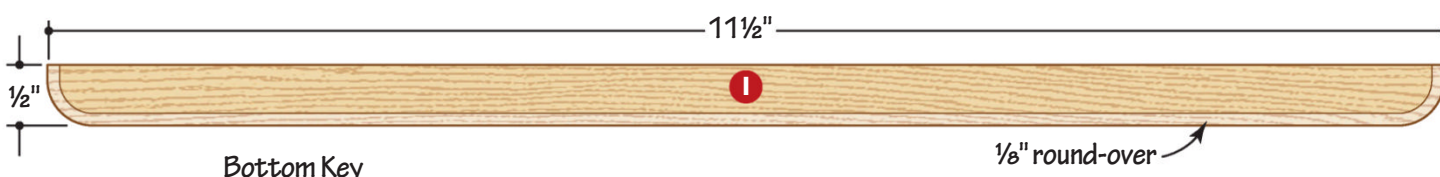
Top Key



Handle



Lid Key



Bottom Key

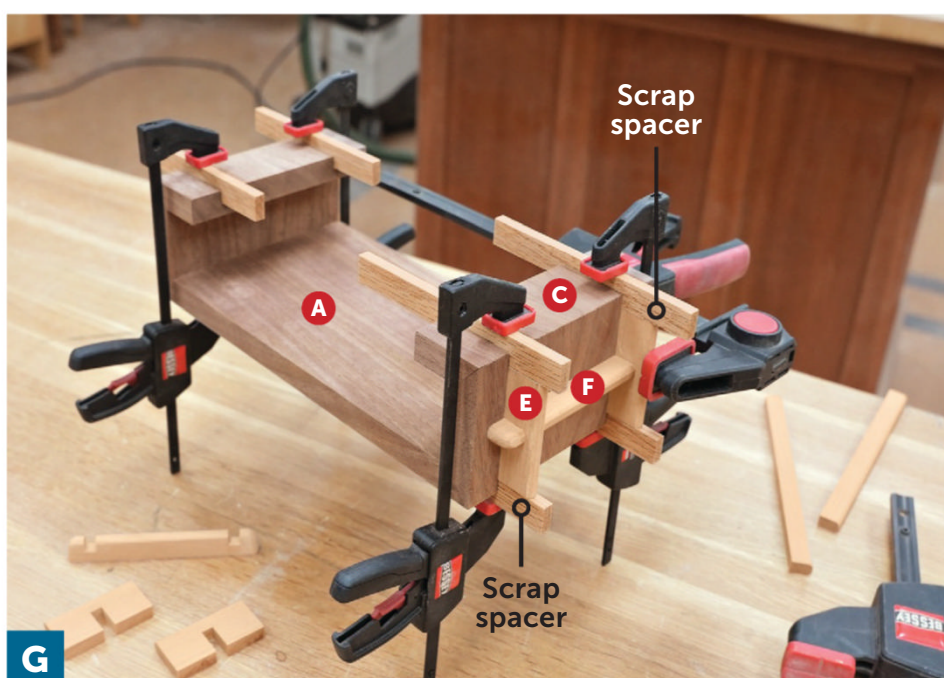
TIP!

Glue the end keys to the handles using cyanoacrylate (CA) glue to avoid squeeze-out that would be likely with conventional wood glue.

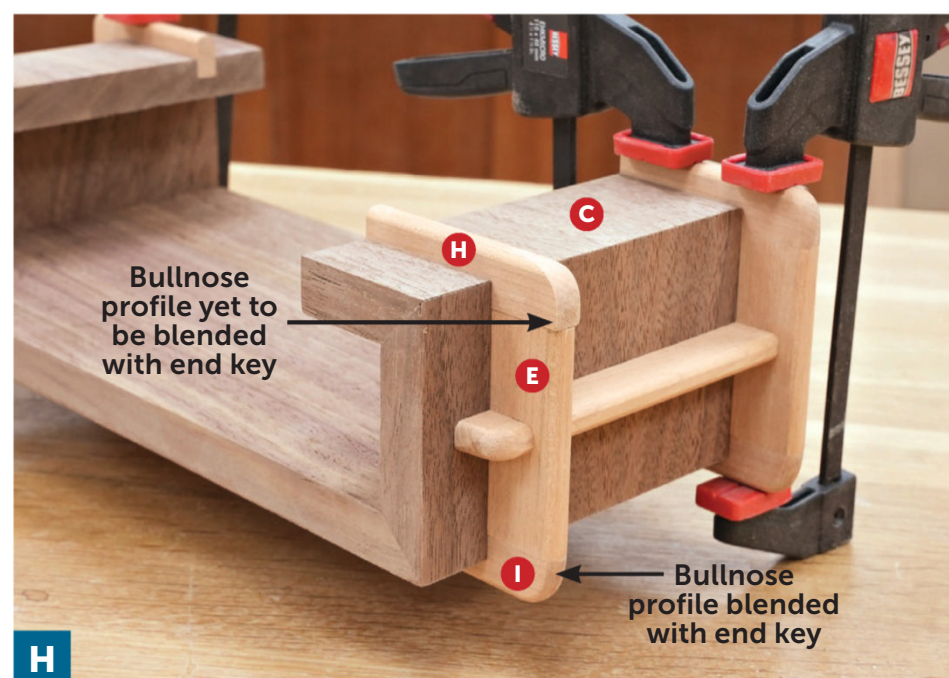
5 Glue the end keys (E) and handles (F) together. Then glue these assemblies to the cladding assembly (A-C) [Photo G]. Go easy on the glue to avoid squeeze-out.

6 Crosscut the lid keys (G) to match the length of the lid (D) [Exploded View, Drawing 2]. Finish-sand the lid keys and the lid, then glue and clamp the keys to the lid, using glue sparingly to avoid squeeze-out.

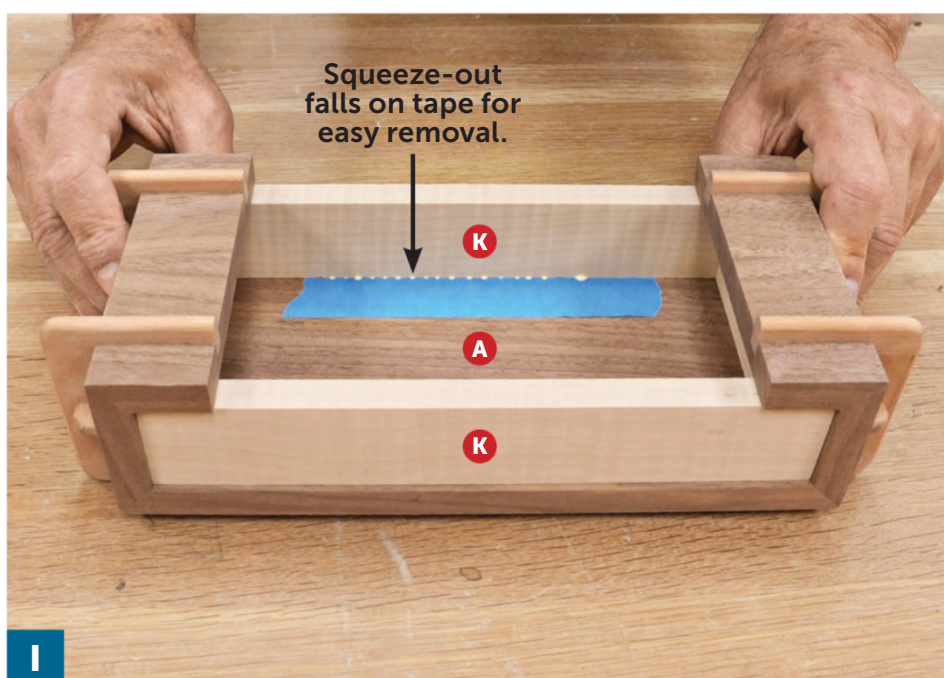
7 Crosscut the top and bottom keys (H, I) $\frac{1}{8}$ " overlength [Drawing 2]. Dry-fit these keys to the cladding, mark them, and cut them to final length. Sand $\frac{3}{8}$ " radiuses on one end of each top key (H) and both ends of the bottom keys (I). Rout round-overs to blend with the bullnosed edge and sand as needed to match those on the end keys (E) [Photo H]. Finish-sand the keys, and glue them in place.



Use a drop of glue in the notch to secure the end keys (E) to the handles (F). Then clamp scrap spacers in the grooves of the top cladding (C) and bottom (A) to help align each handle and key assembly.



Dry-fit and clamp each top key (H) flush with the edge of the end key (E). Sand the top key to blend its profile to the side key. Do the same with the bottom keys (I).



To prevent glue squeeze-out on the bottom (A), align a strip of painter's tape where the inside edge of the front and back (K) will rest. Remove the tape after about 20 minutes when the glue begins to set.

LET'S LOOK INSIDE

The inner box consists of curly maple ends and a front and back that fit inside the cladding assembly.

1 From $\frac{1}{2}$ " curly maple, cut the inner box ends (J) and front and back (K) to fit within the cladding assembly [Drawing 1]. Finish-sand the pieces.

2 Apply glue to the middle third of the face of each inner box end (J), leaving the ends unglued, and press them into place in the cladding assembly. Then glue the front and back (K) in place [Photo I].

TIP!

When the inner box pieces are dry-fit in the cladding, the front and back (K) should sit $\frac{1}{8}$ " inside the edges of the cladding.

IT ALL HINGES ON THIS

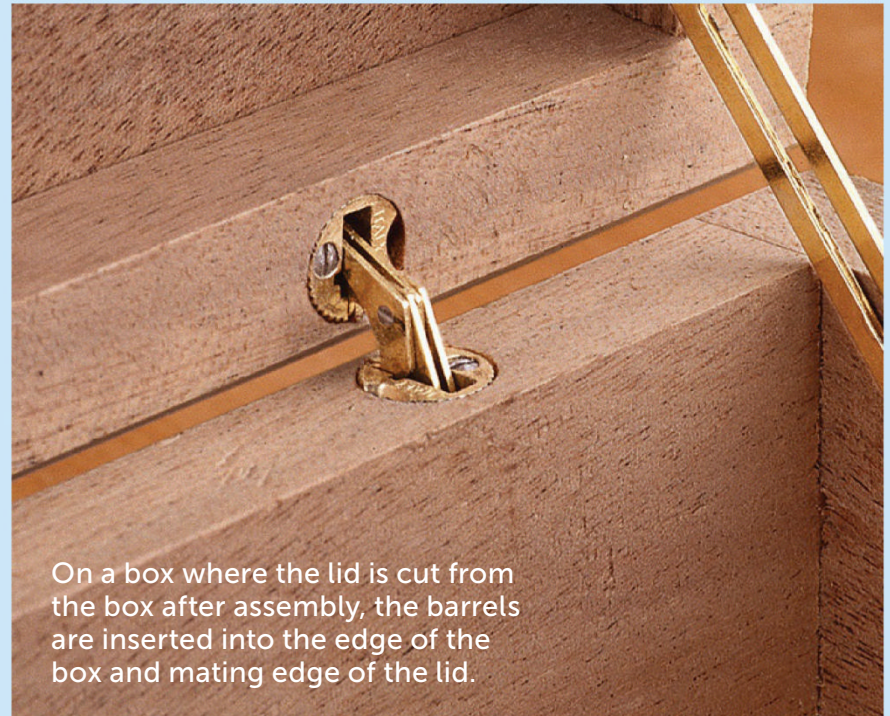
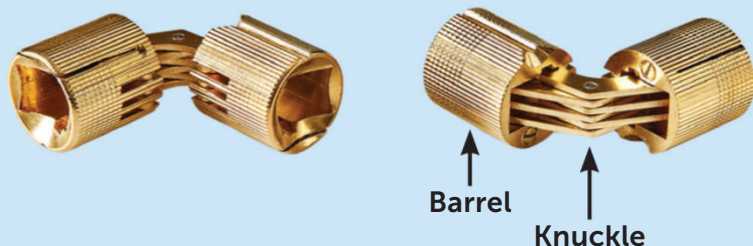
For a super-clean exterior with no visible hardware, barrel hinges hide inside.

With no visible hinges, it's not readily apparent how this box opens, adding a bit of mystery to the project. The barrel hinges that make this possible, *below*, mount in holes drilled in the box and lid. A knuckle ties the two barrels of each hinge together and folds into the barrels when closed. When you open the lid, the hinges provide an attractive touch of brass.

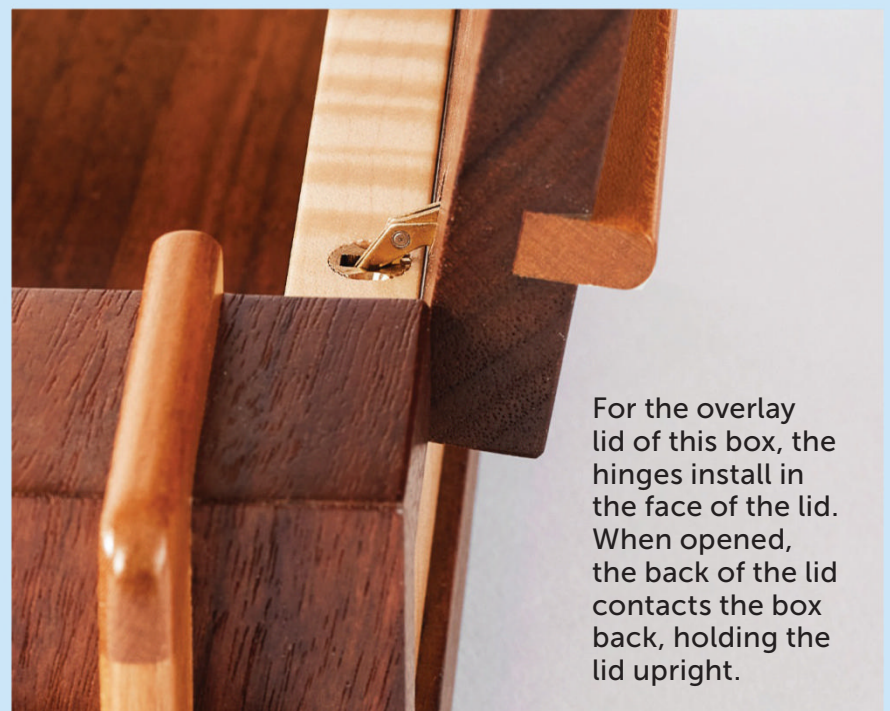
Installation requires precise layout of the holes and positioning of the hinge in the hole because, once the hinges are inserted, attempting to rotate them can damage the knuckle. In most applications, the barrels are installed in the edges of mating pieces, such as in a lid cut from the box itself, *right*. This allows the faces of the lid and box to align flush and with almost no gap. For this box, however, one half of the hinge installs in the *edge* of the box back, but the opposing half installs in the bottom *face* of the lid.

Barrel hinges come in metric diameters from 8mm–24mm (about $\frac{5}{16}$ "– $\frac{15}{16}$ ") for doors and lids with thicknesses from $\frac{7}{16}$ "– $1\frac{1}{4}$ ". Drill holes using a metric bit that matches the barrel. (The $\frac{5}{16}$ " bit we used for our 8mm hinges is within $\frac{1}{100}$ " of the 8.2mm bit spec'd by the manufacturer.) Use a drill press and fence to precisely position the holes and make them perpendicular to the workpiece surface. Match the hole depth to the length of the barrel so that, when installed, the top of the barrel rests flush with the surface of the workpiece.

On all but the smallest hinge, tightening a screw in the barrel expands the barrel, wedging the hinge in the hole. For additional security, drive a screw adjacent to the barrel so the screwhead overlaps and traps the hinge. On this box, we opted to use cyanoacrylate (CA) glue to help anchor the barrels.



On a box where the lid is cut from the box after assembly, the barrels are inserted into the edge of the box and mating edge of the lid.



For the overlay lid of this box, the hinges install in the face of the lid. When opened, the back of the lid contacts the box back, holding the lid upright.

“

I LOVE THAT BOXES ALLOW ME TO MIX SEVERAL TYPES OF WOOD THAT, IN A LARGER PROJECT, MIGHT BE TOO MUCH. MY SCRAP BIN HOLDS A LOT OF BOXES WAITING TO BE BUILT.

-KEVIN BOYLE, DESIGN EDITOR

”

PIVOT TO THE HINGES

We chose barrel hinges for the box because they hide inside, keeping the outside of the box free of hardware and adding to its visual appeal. Learn more about choosing and installing these in *It All Hinges on This, previous page*.

Note: The placement of the hinge-barrel holes differs from those in the manufacturer's hinge instructions to allow clearance for the lid overhang at the back of the box.

- 1 At the drill press, use a 5/16" Forstner bit to drill the holes in the box back (K) to accept the barrel hinges [Exploded View].
- 2 Use dowel centers [Sources] to transfer the hole locations from the box to the lid (D/G) [Photo J]. At the drill press, drill the holes at the marked locations [Exploded View], but don't install the hinges yet.
- 3 With 220-grit sandpaper, touch up any areas needing finish-sanding and ease any remaining sharp edges. Apply a finish. (We sprayed on four coats of aerosol spray lacquer, buffing lightly between coats with 0000 steel wool.)
- 4 Apply a couple of drops of CA glue to the walls in one hinge hole in the box back (K). Position a hinge with the knuckle square to the face of the back and press the hinge barrel into the hole. Repeat for the other hinge. Apply CA glue to the holes in the lid (D/G), and press the lid onto the exposed hinge barrels. Your new box with vintage appeal is ready for you to admire for years to come.

TIP! Place the lid upside down on your bench and lower the box onto it to prevent the glue from dripping out.



Place a dowel center in each hole in the box back (K). Position the lid (D/G) flush with the front of the top cladding (C), then pivot the lid down and press it firmly against the dowel centers.

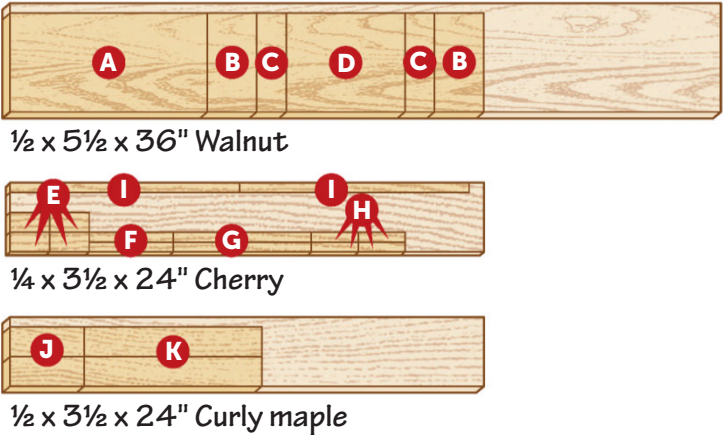
MATERIALS LIST

PART		FINISHED SIZE			Matl.	Qty.
		T	W	L		
A	BOTTOM	1/2"	5"	10"	W	1
B	END CLADDING	1/2"	5"	2 1/2"	W	2
C	TOP CLADDING	1/2"	5"	1 1/2"	W	2
D	LID	1/2"	5"	6 15/16"	W	1
E	END KEYS	1/4"	1"	2"	C	4
F	HANDLES	1/4"	1/2"	4 1/4"	C	2
G*	LID KEYS	1/4"	1/2"	6 15/16"	C	2
H*	TOP KEYS	1/4"	1/2"	2 1/4"	C	4
I*	BOTTOM KEYS	1/4"	1/2"	11 1/2"	C	2
J	BOX ENDS	1/2"	1 1/2"	3 3/4"	M	2
K	BOX FRONT/BACK	1/2"	1 1/2"	9"	M	2

*Parts initially cut oversize. See the instructions.
MATERIALS KEY: W—walnut, C—cherry, M—curly maple.
BLADE AND BITS: 5/16" Forstner bit, dado blade, 1/8" round-over bit.
SOURCES: 8mm barrel hinges (2) no. 00H3608, \$6 each, leevalley.com; dowel center set no. 217179, \$13, rockler.com.
PROJECT COST: Building from scrapwood, it cost us about \$25 to build this project. Your cost will vary by region and source.

CUTTING DIAGRAM

We started with 1 1/2 square feet of 1/2" walnut, 1 square foot of 1/2" cherry, and 1 square foot of 1/2" curly maple.



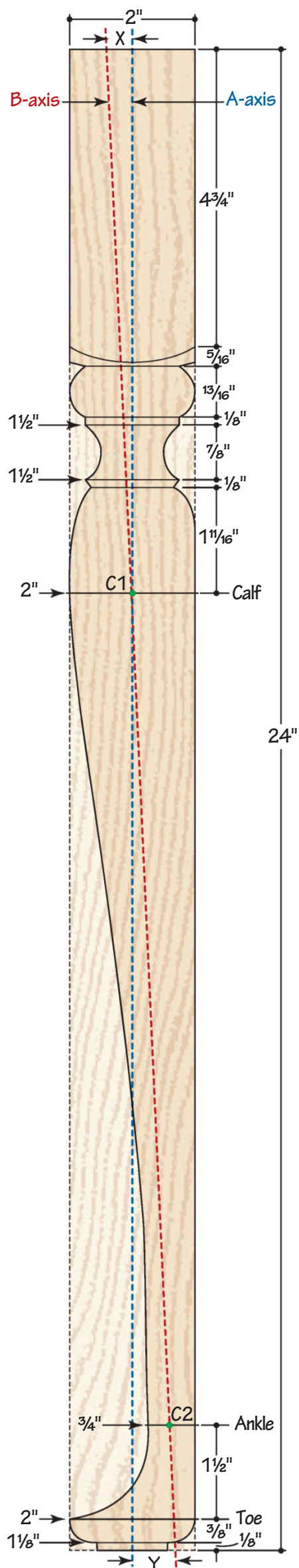
CREATE SHAPELY LEGS WITH TWO-AXIS TURNING

Turning a workpiece on two offset axes lets you form one set of details on one axis, and a second set on the other. It's easy once you know how.

WRITER: BRIAN SIMMONS with CRAIG RUEGSEGGER

PHOTOGRAPHER: KELSEY HANSEN; ILLUSTRATORS: ROXANNE LEMOINE, LORNA JOHNSON

1 LEG LAYOUT



Spindle turning usually involves simply marking the centers on the ends of your blank and then mounting it to the lathe to create a single axis that the blank rotates around. By adding a second axis that's slightly askew from the first, though, you can take your turnings to new levels by adding a variety of complex shapes.

A classic cabriole leg provides a great way to try multi-axis turning. Mount your leg on the standard centerline axis to shape the beads and coves, and then switch to the second axis to create the elegant off-center taper and foot. It's easier than you might think.

GET A LITTLE CENTERED

Mini centers, *top right*, work the same as standard centers, *below right*, but they provide several advantages in multi-axis turning. First, the smaller diameter allows additional room for working near the end of a workpiece, especially useful near the foot of a cabriole leg. These mini centers also have more teeth for better bite than a standard center. This provides more points of contact when turning on the B-axis, where a standard center might engage only one of its four teeth. Plus, the smaller teeth penetrate a workpiece more easily.

SOURCES: Oneway live center #2 Morse taper no. 112622BO, \$110; 1/2" stebcenter, #2 Morse taper, no. 110602, \$90, packardwoodworks.com.



DESIGN PRINCIPLES

Turning a cabriole leg starts at the bench. Using a pencil, ruler, circle templates, and French curves, draw your leg at full size on paper to work out a profile you like and the details you'll need while turning. The leg shown in this article is detailed in [Drawing 1](#).

After drawing the leg, mark the centerline of the blank along its length. This becomes the A-axis. Next, mark the location of the calf (the thickest point of the taper) and the ankle (the thinnest point) and their centers (C1 and C2). Draw a line that intersects C1 and C2 and extend it to both ends of the leg. This becomes the B-axis. Ensure both endpoints of the B-axis fall on the ends of the blank. Measure and write down the distance between the A-axis and B-axis on the top of the blank (dimension X) and the bottom of the blank (dimension Y).

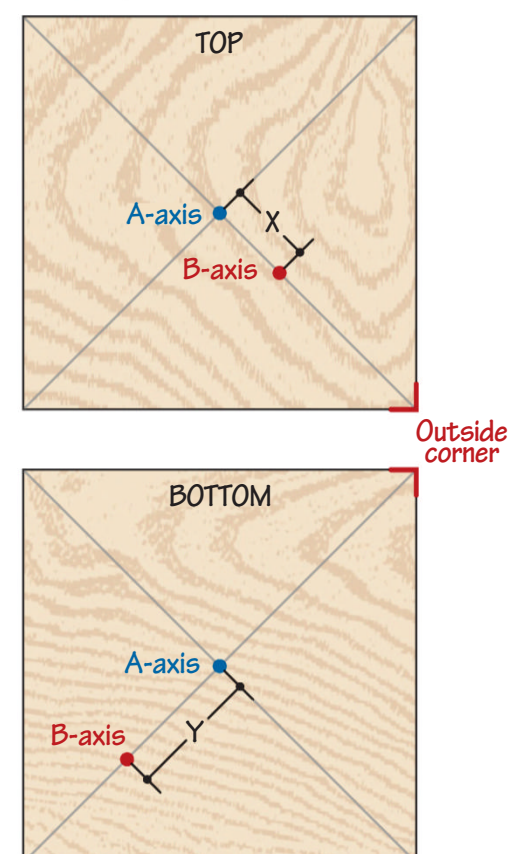
Before turning, prepare your blanks as you would for most spindles: Mill the blank square to final dimension, then draw diagonal lines from corner to corner on each end to find the centers of the A-axis.

Decide which corner of the blank will face toward the outside of the project and mark this on both ends [\[Drawing 2\]](#). To locate the centers for the B-axis, measure on the top of the blank from the center point diagonally (dimension X) *toward* the outside corner. On

the bottom of the blank, measure from the center point (dimension Y) *away* from the outside corner.

Referencing your drawing for dimensions, mark the location of the pommel (transition from square to round) on all four sides.

2 END LAYOUTS



NOW TO THE LATHE

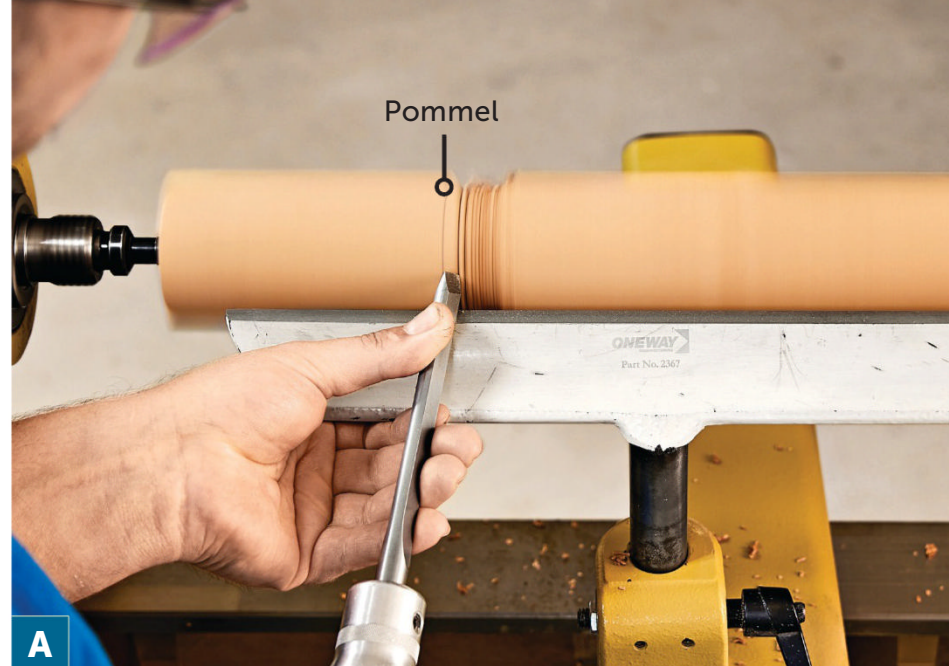
Mount the leg between centers on the A-axis. For multi-axis work, mini centers often prove easier to position, and they provide a better drive than traditional centers. See *Get a Little Centered*, page 63.

Use the toe of your skew to cut the pommel. Beginning to the right of the pommel lines, where the leg will be round, make small cuts by lifting the handle. Make successive cuts closer to the pommel line until you reach the line and cut all the way around the blank [Photo A]. Then switch to a spindle roughing gouge to round the rest of the blank to the toe. Use bevel rubbing cuts to prevent torn grain. To prevent gouging the pommel as you work closer to it, roll the gouge to the left and work next to the pommel with the wing. Stop when you've removed all the flats from the turned portion of the leg. Additional shaping at this point may inadvertently affect your turning on the B-axis. Mark the calf, ankle, and toe locations [Photo B].

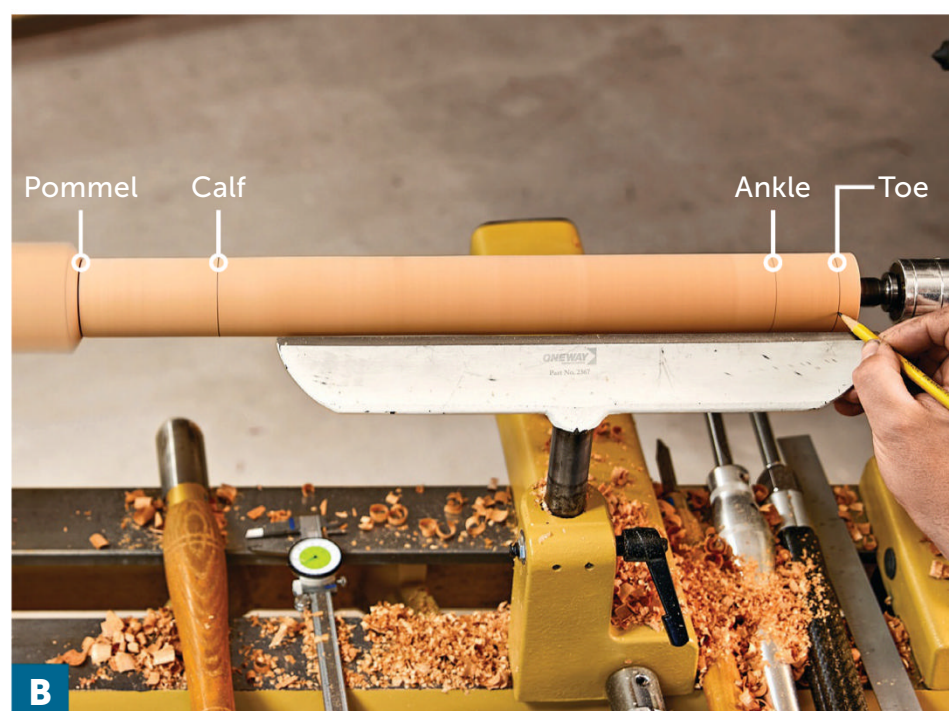
Note: Adjust the tool rest and rotate the leg by hand to ensure clearance between them before starting the lathe.

Remount the leg between centers on the B-axis. Reduce the lathe speed to account for the imbalance. Using your spindle detail gouge, begin cutting a cove at the ankle [Photo C]. "Scoop" both sides of the cove, centered on the ankle [Photo D]. The final cut should almost remove all of the ankle line.

With the ankle complete, switch to a spindle roughing gouge to cut the taper between the calf and ankle [Photo E]. For the final cut connecting the calf to the ankle, skew the wing of the gouge against the taper [Photo F]. Make sure to work only between the calf and toe on the B-axis. Sand the taper and foot.



A Make each successive pass a bit deeper and farther to the left until you reach round at the pommel layout line. Tilt the skew slightly to the left as you cut the pommel to shape between the layout lines.



B After turning the blank round, and with the leg still on the A-axis, mark the locations of the calf, ankle, and toe on the blank. The profiles between these points are shaped on the B-axis.



C Start with the gouge flute closed and facing the direction of the cut. Lift the handle to engage the cutting edge, then roll the flute open and raise the handle farther until you reach the center of the cove.



D Work from one side of the cove to the center, then from the other side to the center. Make each successive cut deeper and wider until the final cut reaches from the toe to the ankle (inset).



E Start the taper near the ankle where there is more material to remove. Begin each successive cut closer to the calf and make longer cuts to the ankle.



F For a clean final cut along the taper that needs minimal sanding, skew the gouge to face the direction of the cut. Move at a slow and steady pace.

Return the leg to the A-axis and mark the remaining details [Drawing 1]. Begin with your parting tool to cut the pad below the foot. Then shape the half-bead on the underside of the toe using a spindle detail gouge. Start at the toe layout line and roll the gouge during each pass until the half-bead meets the fillet of the pad.

At the other end of the leg, dimension the upper fillet with your parting tool and calipers, then cut the V with the skew. Use your spindle detail gouge to shape the half bead from the calf up to the V. Then, scoop the cove [Photo G] before forming the upper bead [Photo H]. Complete your work at the lathe by sanding the areas turned on the A-axis [Photo I].

Feel free to copy our design or modify it to suit your project. With a little planning and basic woodturning skills, multi-axis legs could elevate your next piece of furniture. 🌳



G As when cutting the cove for the ankle, begin on one side and work down to the center, then work from the opposite side. Increase the width and depth of cut until you reach the final dimensions.



H Forming a bead is the opposite action of cutting a cove. Begin with an open flute just off the centerline, then roll the tool closed as you lift the handle and cut away from the line.



I The completed leg needs only light sanding. Remove the tool rest and hold long strips of sandpaper taut and avoid contact with areas turned on a different axis.

KITTY-CAT CONSOLE

Binge-watch live cat videos (starring your favorite fur baby) on this retro telly bed.

WRITER: VINCE ANCONA

DESIGNER: JOHN OLSON

BUILDER: BRIAN BERGSTROM

CAT MODEL: PEANUT

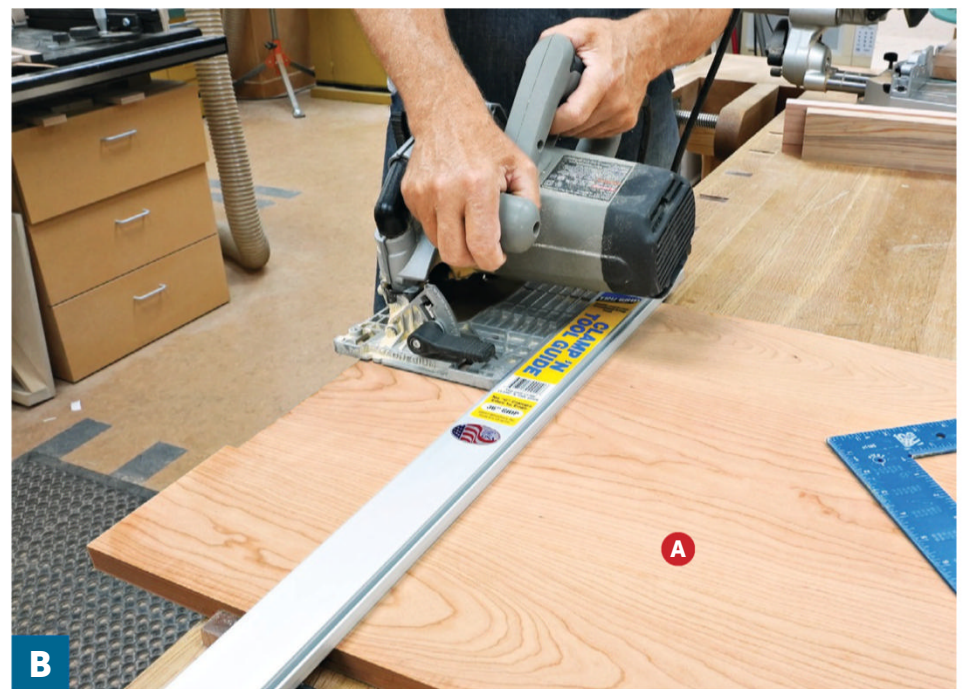
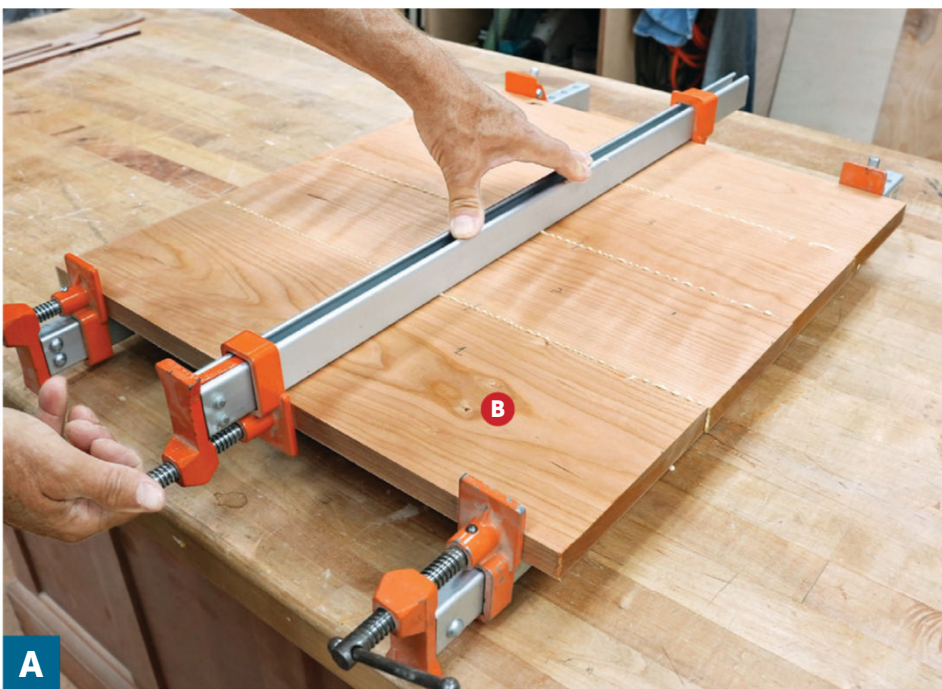
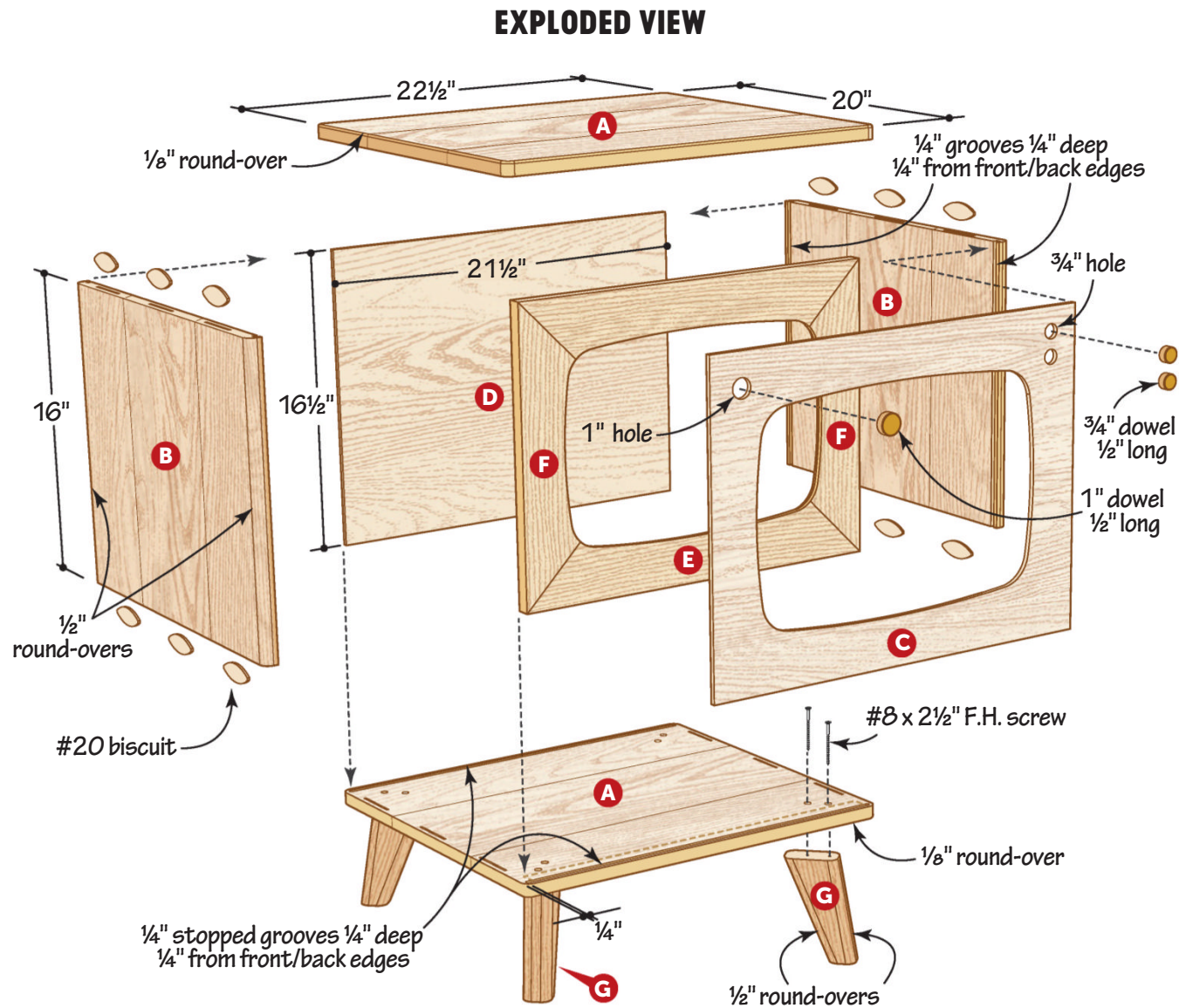


OVERALL DIMENSIONS
22½"W × 20"D × 23½"H

Over the years, we've featured a number of dog-related projects in *WOOD*® magazine so it seems only fair to offer up something for our feline friends. This cozy cat hangout takes its design inspiration from early television sets. We built ours out of maple plywood and cherry, but you can use any wood you like (except dogwood).

SOLID-STATE PANELS

1 From $\frac{3}{4}$ " cherry, glue up oversized panels for the console top and bottom (A) and sides (B) [Materials List, Exploded View, Photo A]. After the glue dries, cut the panels to size [Photo B].



Glue up panels for the console top, bottom, and sides from solid wood. Alternate the clamps, placing some below the panel and some above, to prevent cupping.

After the glue dries, remove the clamps and square up one end of each panel using a circular saw and a straightedge guide. Square up the opposite end while cutting the panel to final length.

STAY AHEAD OF THE CURVE

Much of the emphasis in woodworking falls on making straight cuts at right angles. But creating the picture tube opening in the front panel of the console requires laying out, cutting, and smoothing a series of curves. Start by using a compass to lay out four circles to establish the rounded corners of the opening **[Drawing 1]**. Then use a thin strip of scrap as a fairing stick to lay out the curves at the top, bottom, and sides of the opening (*left photo*). Rough-cut the opening with a jigsaw (*center photo*), then sand the edges smooth (*right photo*).



Lay out four circles on front panel (C). Then, using a clamp, apply pressure to bow a fairing stick to the correct arc to lay out the top and bottom curves on the panel. Repeat for the side curves.

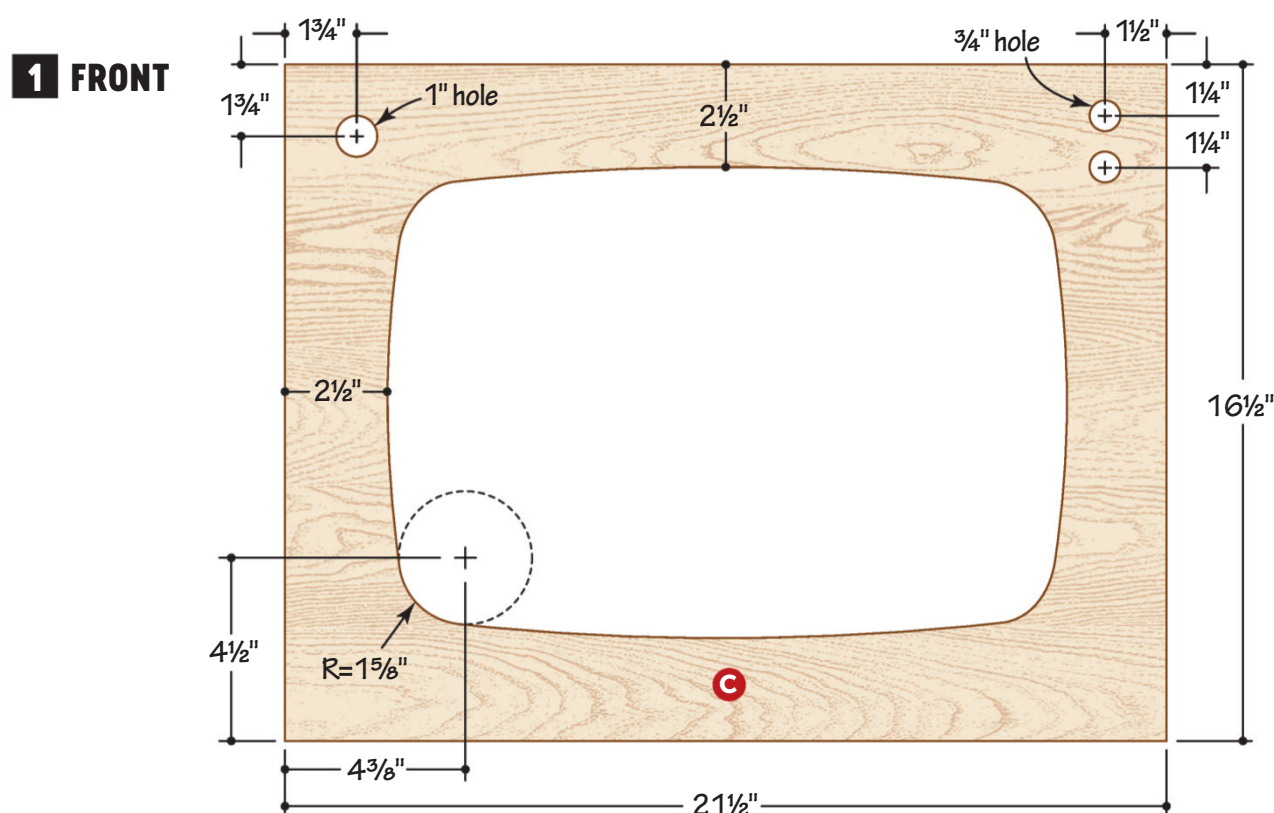
- 2** Lay out and cut biscuit slots to align and reinforce the panels **[Photo C]**.
- 3** Rout grooves in the panels for the case front and back **[Photo D]**.

ADD A PICTURE TUBE

- 1** Cut the plywood front (C) and back (D) panels to size **[Materials List]**. Set the back panel aside for now.
- 2** Lay out the picture tube opening in the front panel (C) **[Drawing 1]**, then cut and sand the opening smooth (see *Stay Ahead of the Curve*, above).
- 3** Lay out and drill the holes in the front panel for the knobs. Finish-sand the front and back panels.



To cut the biscuit slots in the console top and bottom (A), clamp the workpiece vertically to the front of your workbench. Pivot the fence forward to register the biscuit joiner as you cut the slots.





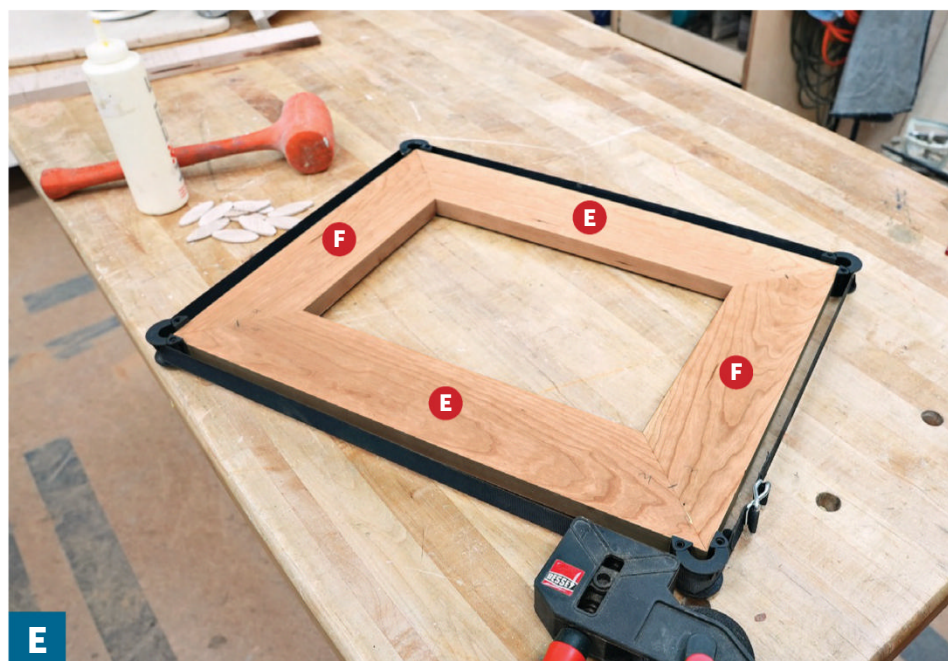
After drilling a starter hole inside the opening at one corner, cut away the waste using a jigsaw, remaining approximately $\frac{1}{16}$ " inside the layout line.



Smooth the edges of the opening, sanding to the layout lines. Keep the panel moving continuously to avoid creating divots in the edge. If you don't own a stationary sander, use a flexible sanding block.



Using a plunge router with an edge guide and a $\frac{1}{4}$ " spiral upcut bit, rout stopped grooves in the console top and bottom (A) for the front and back panels. Then rout through grooves in the console sides (B).



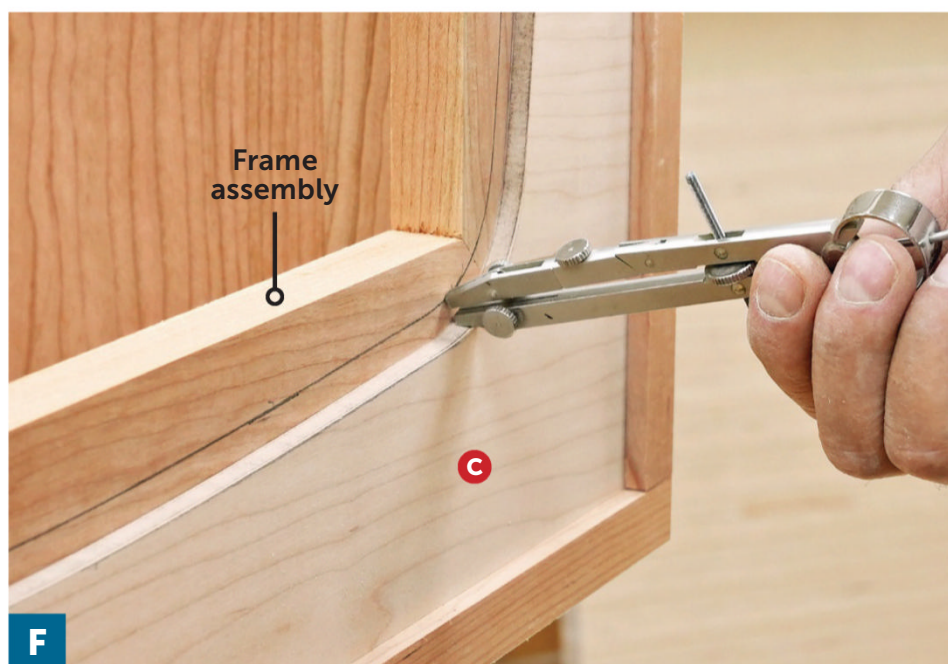
After cutting biscuit slots in the mitered corners of the frame rails and stiles (E, F), glue the frame together using a band clamp to hold the pieces in place while the glue dries.

ON TO THE SMALL SCREEN

1 From $3\frac{1}{2}$ "-wide stock, miter-cut the frame rails (E) and stiles (F) to length [Materials List]. Cut biscuit slots in the mitered ends and glue the frame together [Photo E].

2 Dry-assemble the case sides (B) and bottom (A), using biscuits to align the lower corners. Slide the front and back panels (C, D) into the grooves.

3 Check the fit of the frame (E/F) in the case and trim it if necessary. Clamp the frame to the back face of the front panel (C) and scribe the opening on the frame [Photo F].



Place the frame (E/F) in the console behind the front panel (C). Then, with the legs of your compass set $\frac{1}{2}$ " apart, scribe the front panel opening onto the frame.

4 Cut and sand the frame opening to finished shape. Rout a round-over on the inside face of the frame assembly [\[Photo G\]](#).

5 Finish-sand the frame assembly and glue it to the rear face of the front panel (C), ensuring the openings are centered [\[Photo H\]](#).

ASSEMBLE THE CONSOLE

1 Disassemble the dry-fitted console and finish-sand the inside faces of the top, bottom, and sides (A, B).

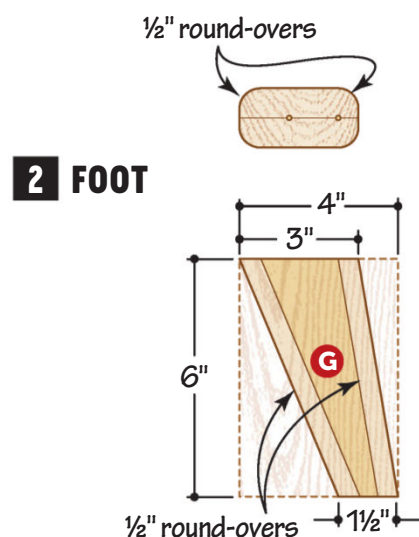
2 Glue the bottom to the console sides, using the front and back panels to square up the assembly. Glue the top in place.

3 Round over the vertical edges of the console [\[Exploded View\]](#). Rout or sand a smaller round-over on the top and bottom edges.

4 Finish-sand the console assembly. Cut the knobs to length from dowel stock and finish-sand them before gluing them in place.

TIP!

Place a drop of glue on each edge of the front and back panels to prevent them from rattling in their openings.



ALWAYS LAND ON YOUR FEET

1 From 3/4"-thick stock, cut four 4x18" blanks. Glue the blanks together face to face in pairs for the feet (G).

2 Lay out a foot at each end of both laminated blanks [\[Drawing 2\]](#). Using a jigsaw, cut the feet to rough shape, leaving them attached to the blank. Plane or sand the edges smooth up to the layout lines.

3 Round over the edges of the feet [\[Photo I\]](#), then cut the feet to finished length.

4 Lay out the location of the feet on the underside of the console, tracing around each foot [\[Drawing 3\]](#). Drill two mounting holes for each foot.

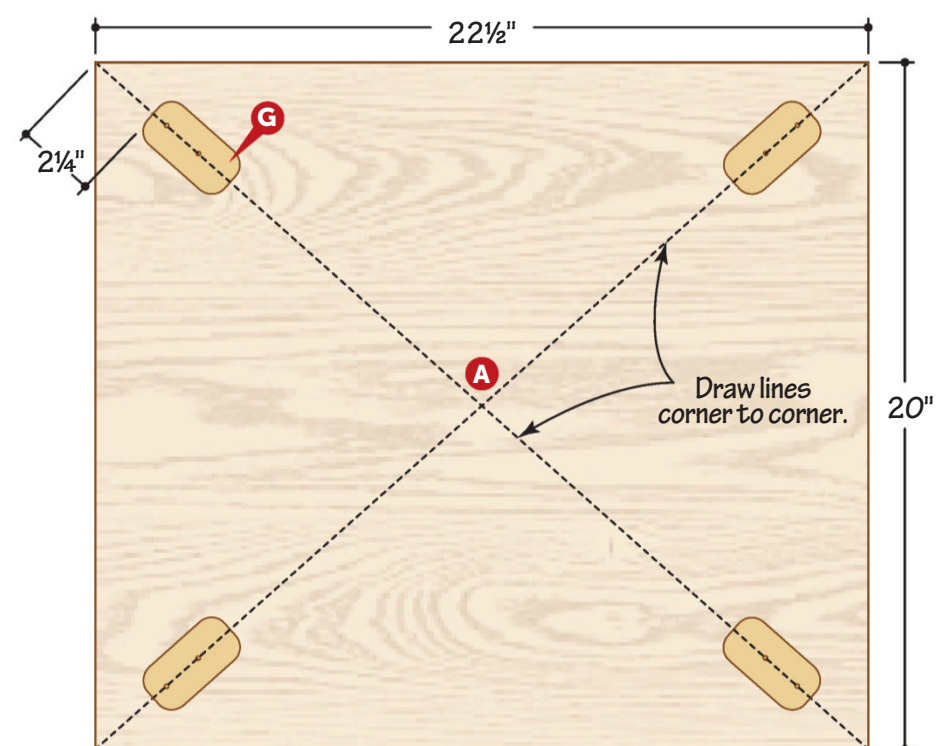


Using a jigsaw, cut the frame opening to shape, then sand the edges smooth. Ease the edge by routing a 1/2" round-over around the opening on the inside face of the frame.



Use the dry-assembled console to align the frame assembly to the front panel when gluing the two together. Apply clamps all around the opening as the glue sets up.

3 MOUNTING FEET (bottom view)





The extra-long foot blanks allow you to safely clamp the workpiece while sawing and routing the feet (G) to shape. Cut the feet to length after completing all the shaping and sanding.

A PURR-FECT FINISH

- 1 Apply a clear finish to the console and feet. We applied three coats of water-based polyurethane, sanding lightly between coats with a fine sanding sponge.
- 2 With the finish dried, attach the feet with screws through the bottom of the case [\[Exploded View\]](#).
- 3 Add a blanket or pet bed and sit back and watch as your kitty climbs inside for a catnap. 🐾

TIP!

Let the finish cure thoroughly (30 days) to allow any fumes or odor to dissipate before your cat moves in.

MATERIALS LIST

PART		FINISHED SIZE			Matl.	Qty.
		T	W	L		
A*	CONSOLE TOP/BOTTOM	3/4"	20"	22 1/2"	C	2
B*	CONSOLE SIDES	3/4"	20"	16"	C	2
C	FRONT PANEL	1/4"	16 1/2"	21 1/2"	MP	1
D	BACK PANEL	1/4"	16 1/2"	21 1/2"	MP	1
E*	FRAME RAILS	3/4"	3 1/2"	21"	C	2
F*	FRAME STILES	3/4"	3 1/2"	16"	C	2
G*	FEET	1 1/2"	4"	6"	LC	4

*Parts initially cut oversize. See the instructions.

MATERIALS KEY: C—cherry, MP—maple plywood, LC—laminated cherry.
SUPPLIES: #20 biscuits, 3/4" maple dowel, 1" maple dowel, #8x2 1/2" flathead screws.
BITS: 1/4" spiral upcut router bit, 1/2" round-over router bit, 1/8" round-over router bit, 3/4" and 1" Forstner bits.
PROJECT COST: It cost us about \$140 to build this project. Your cost will vary by region and source.

CUTTING DIAGRAM

We purchased 20 board feet of 4/4 cherry. Before cutting parts to size, we planed them to the thicknesses shown in these example boards.



3/4 x 7 1/4 x 96" Cherry (2 needed)



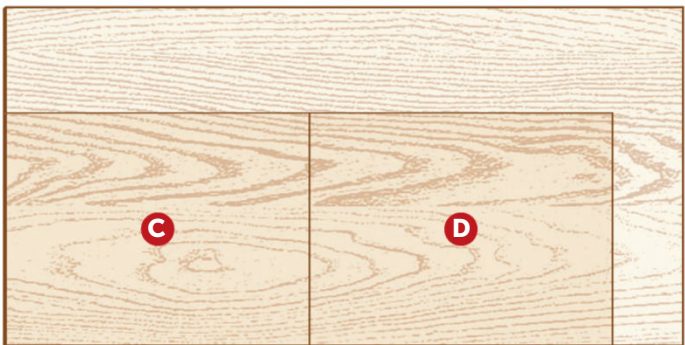
3/4 x 7 1/4 x 72" Cherry



3/4 x 3 1/2 x 72" Cherry



3/4 x 5 1/2 x 84" Cherry



1/4 x 24 x 48" Maple plywood

HOLD DOWN & HANG ON

Increase the holding capabilities of your workbench by outfitting it with these specialized accessories. They keep your workpieces where you want them, making your woodworking easier, safer, and more precise.

PHOTOGRAPHERS: JASON DONNELLY,
JACOB FOX, BRIE GOLDMAN



Set up a simple planing stop

A planing stop prevents your workpiece from moving without clamps that can get in the way. This one measures less than 1/4" thick, is made from anodized aluminum to minimize damage if your plane iron strikes it accidentally, and is equipped with dogs on the underside that adjust to fit your bench-hole spacing.

Lee Valley, leevalley.com
17 1/2" Veritas planing stop no. 05G2305, \$35

Add a dog-hole hold-down

To clamp materials thick or thin, the 7 1/2"-long post on this hold-down slips into any 3/4" dog hole, where its serrated surface holds the post in place at any height. The clamp is equipped with auto-adjust clamping pressure. An optional post for 20mm dog holes is available.

Armor Tool, armor-tool.com
Auto-adjust horizontal dog clamp no. P7-HH, \$50

Twist in tool-friendly nylon clamps

This pair of inexpensive hold-downs drops into dog holes in tops up to 1 1/2" thick, and stays put when you thread on the nuts from underneath. That makes these clamps perfect for portable benches that often lack built-in clamping capabilities. Made from glass-filled nylon, the clamps are strong yet friendly to sharp tools.

Lee Valley, leevalley.com
Hold-down clamps no. 16F0210, \$15 per pair

Tap in a traditional holdfast

Holdfasts have served woodworkers for centuries because they're so simple. Drop one in a dog hole and tap the top with a mallet to jam it in the hole and clamp your workpiece in place. Then tap its side to pop it loose. Holdfasts work best with 1½" and thicker benchtops. They're available individually, or as part of a kit (*below*).

Rockler, rockler.com

4¼"-reach holdfast no. 90407, \$20

Use toggles of many types

Toggle clamps are available in varieties that exert horizontal or vertical clamping pressure, making them handy for jigs and for use on a benchtop. These models offer automatic clamping-pressure adjustment to reduce fiddling when moving from one workpiece size to another.

Bessey, besseytools.com

Horizontal toggle clamp no. STC-IHH25, \$31;
In-line toggle clamp no. STC-HH70, \$30

Put it on a plate

This steel plate features multiple holes that allow you to mount almost any toggle clamp using included hardware. A long bench dog on the underside drops into any ¾" dog hole and has a knurled surface that maintains a tight grip whether you're clamping vertically or horizontally.

Rockler, rockler.com

Dog-hole clamp plate no. 69610, \$13

Call in the bench dogs

Bench dogs drop into the holes in your benchtop and often work in opposition to your vise to act as clamping stops. You can choose from a variety of styles, including these plastic dogs with low-profile flat faces. They're part of a bench accessory kit that also includes holdfasts (*above*) and a nonslip mat.

Rockler, rockler.com

Bench accessory kit no. 29817, \$30

A mini dog-hole vise is nice

Clamp horizontally with this simple setup that drops into any ¾" dog hole. Slide the steel rod to position the clamping head against your workpiece, then throw a small lever to lock it in place. The head sits below the surface of ¾" workpieces, and is made from soft brass so it won't damage chisels or plane irons in the event of contact.

Lee Valley, leevalley.com

Quick-release Wonder Dog no. 05G1030, \$70

Lock in in-line clamping

In-line clamps that drop into dog holes have a tendency to move around, but this one stays put thanks to a split dog that wedges it into the hole when you turn the knob. Then simply slide the clamping head against your workpiece and depress the lever. Auto-adjust clamping eliminates fussing with pressure, so you get a solid grip.

Armor Tool, armor-tool.com

Auto-adjust in-line dog clamp no. P7-IL, \$40



SHOP-TESTED PORTABLE BENCH PROVES HANDY FOR SITE WORK

Tester: Dave Stone

Kreg's portable work surface came in handy recently while I helped a neighbor who didn't have a bench. The $\frac{3}{4}$ "x18x29" MDF top sits on legs with built-in levelers and rubber feet that gripped my truck's tailgate well. Included bench dogs and clamps drop into $\frac{3}{4}$ " holes, while embedded strips of grippy rubber provide extra holding power on the slick MDF surface. I like the rabbeted recess that accepts Kreg's screw containers and works as a carrying handle. Like many Kreg products, it's geared toward pocket-hole joinery, but it proves handy as a lightweight, compact alternative to the folding bench I often use when working away from my shop.

Kreg, kregtool.com

Portable work surface, no. KWSJAWS100, \$100

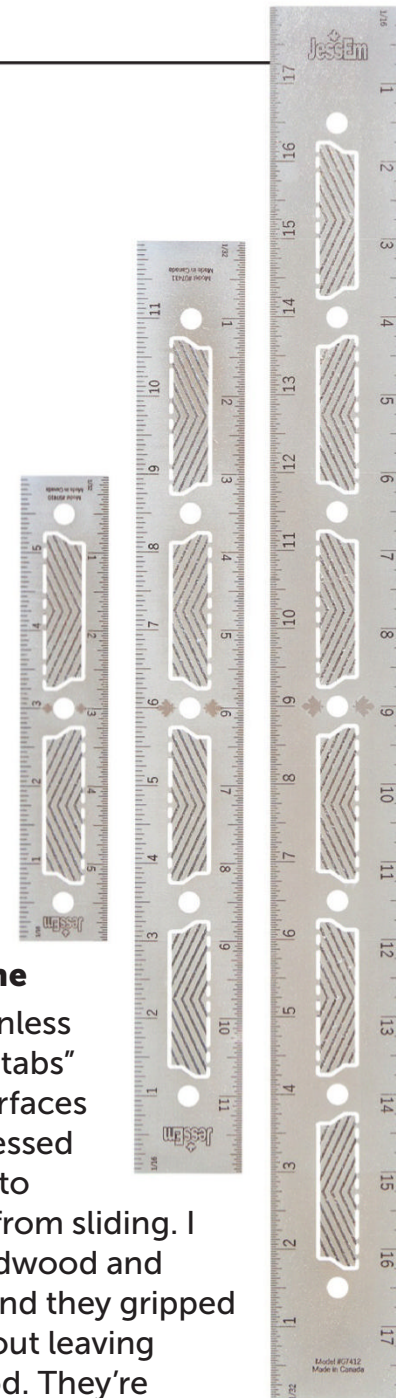
SHOP-TESTED NONSLIP PRECISION RULES

Tester: Dave Stone

JessEm's new stainless steel rules feature "flex tabs" with machined surfaces that grip when pressed against the wood to prevent the rules from sliding. I tried them on hardwood and softwood and found they gripped impressively without leaving marks on the wood. They're available in four lengths with engraved imperial or metric scales.

JessEm, jessem.com

Stainless steel precision rules, \$25-70



SHOP-TESTED BIT MAINTENANCE KIT

Tester: Vince Ancona

Cleaning and honing router bits gets easier with Rockler's compact kit. Fill it with bit cleaner of your choice, press the bits into recesses in the lid, and screw it on to suspend the bits for an extended soak. You can remove bearings first using included hex wrenches. Then pop the bits into the holder that comes with $\frac{1}{4}$ ", $\frac{1}{2}$ ", and 8mm collets while you scrub them with the kit's brass brush or touch up the cutting edges with the 300/600-grit diamond hone. All the components store onboard and you can leave it filled with cleaner. 🌿

Rockler, rockler.com

Router bit maintenance kit, no. 68994, \$35



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— Robert F., Richardson, TX

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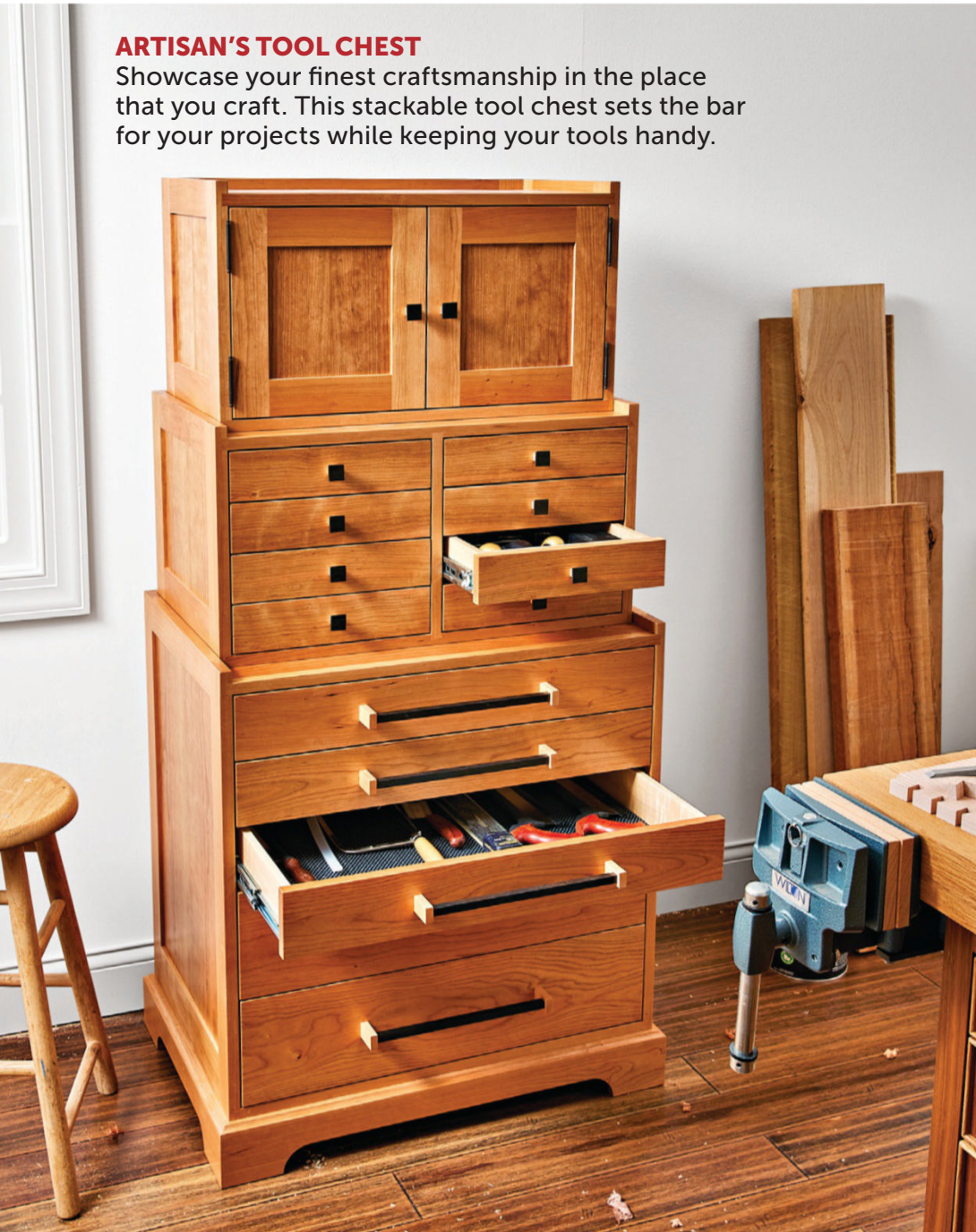


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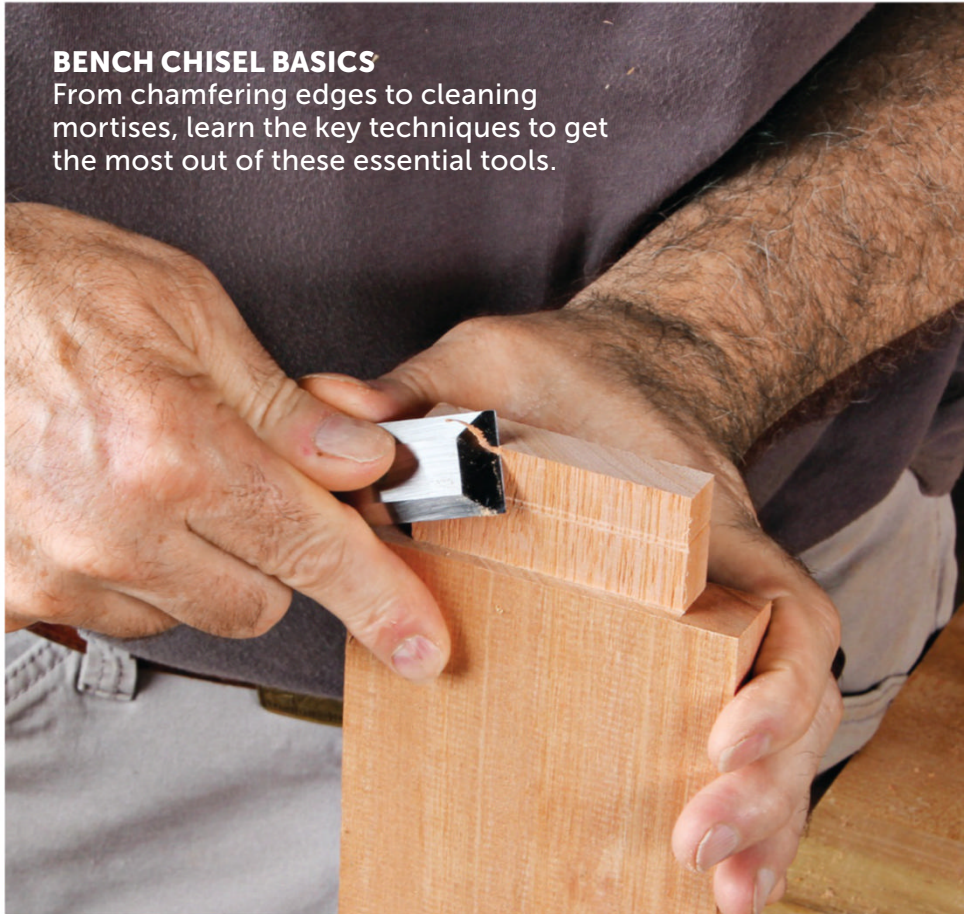
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LOAD-HAULING HOPPER CAR

Time to put the Timber Line Express to work hauling bulk goods. A sliding dump gate makes it offload just like the big boys.

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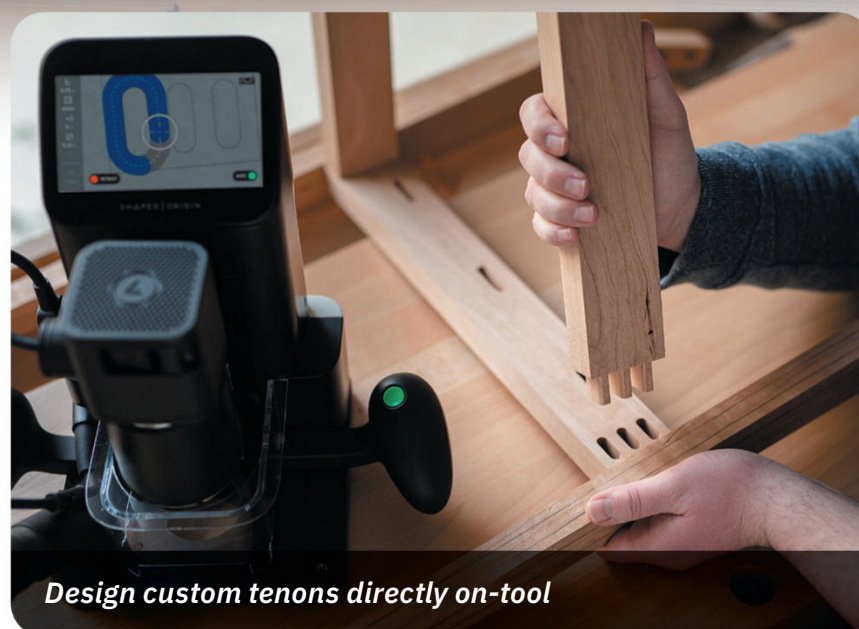


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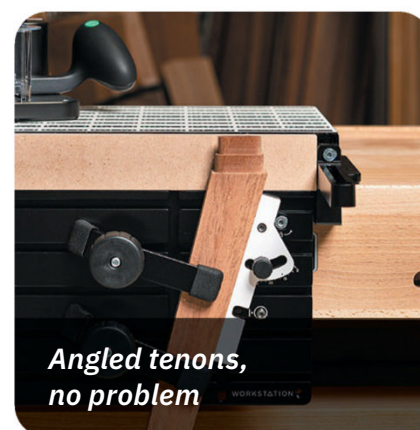
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