CUT PERFECT MITERS EVERY TIME p.38

ISSUE 262 SEPTEMBER 2019

Better Homes & Gardens.

WOOD®

The World's Leading Woodworking Resource

Family treasure
Blanket Chest
p.24

Great Plans
Bandsaw Fence System p.23
Slide-out Cabinet Storage p.54
Backyard Playhouse p.42

Spray Finishing Made Easy
p.58

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14" 1½ HP EXTREME SERIES BANDSAW

- Motor: 1½ HP, 110V/220V, single-phase, 1725 RPM, 15A/7.5A, prewired 110V
- Table size: 20½" x 14" x 1½"
- Table tilt: 45° R, 15° L
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- Cutting capacity/throat: 13½"
- Max. cutting height: 6"
- Blade size: 92½" to 93½" L (⅛" to ¾" W)
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- Overall size: 30" W x 26" D x 67¼" H
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- Motor: 2 HP, 110V/220V, prewired 220V, single-phase, TEFC capacitor start induction, 60 Hz, 1725 RPM
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- Precision-ground cast-iron table size: 17" x 17" x 1½"
- Table tilt: 10° left, 45° right • Floor-to-table height: 37½"
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10" 3HP 220V CABINET TABLE SAW
WITH RIVING KNIFE & EXTENSION RAILS

- Motor: 3 HP, 220V, single-phase, 12.8A
- Precision-ground cast iron table with extension measures: 27" x 74¾"
- Floor-to-table height: 34"
- Arbor: ⅝"
- Arbor speed: 4300 RPM
- Max. dado width: 13/16"
- Capacity @ 90°: 3⅛", @ 45°: 2⅜"
- Max. rip capacity: 50"
- Approx. shipping weight: 557 lbs.

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10" SLIDING TABLE SAW

- Motor: 5 HP, 230V, single-phase, 19A
- Main table size: 14⅜" x 27"
- Sliding table size: 12¼" x 63"
- Main blade arbor: ⅝"
- Main blade speed: 4000 RPM
- Scoring blade size: 3⅛"
- Scoring blade arbor: 22mm
- Depth of cut: 3⅛" @ 90°, 2¼" @ 45°
- Max. rip capacity: 33"
- Approx. shipping weight: 688 lbs.

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G0623X ~~$3375.00~~ Sale **$2995.00** $169 shipping

8" x 72" JOINTER WITH BUILT-IN MOBILE BASE

New!

- Motor: 3HP, 230V, single-phase, 12A
- Total table size: 8" x 72"
- Fence size: 4⅝" x 38"
- Max depth of cut: ⅛"
- Rabbeting capacity: ½"
- Cutterhead knives: 4
- Cuts per minute: 22,000
- Power transfer: V-belt drive
- Standard push-button type switch with large off paddle for safety
- Fence size: 4⅝" x 38"
- Fence system: positive stops
- Approx. shipping weight: 373 lbs.

C SA US 175370

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G0855 ~~$1150.00~~ Sale **$995.00** $169 shipping

20" 5 HP PLANER

- Motor: 5 HP, 220V, single-phase • Table size w/ wings: 20" x 55¾"
- Max. cutting width: 20"
- Max. cutting height: 8"
- Min. cutting height: ¼"
- Max. cutting depth: ⅛"
- Min. length of stock: 7"
- Feed rates: 16 FPM and 20 FPM
- Number of knives: 4 HSS
- Knife size: 20" x 1" x ⅛"
- Cutterhead diameter: 3¼", speed: 5,000 RPM
- Overall width: 39"
- Overall depth (w/ extensions): 58"
- Overall height: 41"
- Approx. shipping weight: 880 lbs.

1999 WOOD MAGAZINE EDITORS' CHOICE TOP VALUE

TOOL BUYING GUIDE Users' Choice

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G1033Z ~~$2050.00~~ Sale **$1750.00** $199 shipping

3 HP SHAPER

- Motor: 3 HP, 240V, single-phase, with reversing switch, 12A
- Table with extension wing attached: 30½" x 28¼"
- Floor to table height: 34"
- Spindle travel: 3"
- Spindle size: ½", ¾", 1"
- Table spindle openings: 1½", 3", 4", 7"
- Maximum cutter height: 2½"
- Spindle speeds: 7,000 and 10,000 RPM
- Overall size: 30½" L x 30" W x 39½" H
- Footprint: 20" L x 21" W
- Approx. shipping weight: 392 lbs.

C SA US 177335

G1026 ~~$1295.00~~ Sale **$995.00** $119 shipping

2 HP CANISTER DUST COLLECTOR

- Motor: 2 HP, 240V, single-phase, 9A
- Blower/impeller: 12¾" aluminum, radial fin
- Air suction capacity: 1700 CFM
- Static pressure: 10"
- Sound rating: 83–85 dB
- 6" inlet has removable "Y" fitting with three 4" inlets
- Canister filter size (dia. x depth): 19⅝" x 23⅝"
- Bag capacity: 4.5 cubic feet
- Overall dimensions: 31½" W x 37⅜" L x 71" H
- Approx. shipping weight: 150 lbs.

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Yup, that's frost on the plywood sheeting Kevin is cutting while building a playhouse in December.

Thank goodness every smartphone has a calendar in it, because I can hardly tell what time of year it is any more. Valentine's candy appears on shelves on New Year's Day, back-to-school sales begin July 4, and retailers deck the halls with Christmas decorations and merchandise starting in October. (Sorry, Thanksgiving!) Our business does its share of time shifting, too. Most subscribers received this September issue in June.

That out-of-whack sense of seasonality is amplified when you produce a how-to magazine like *WOOD*® because it takes literally months to design, build, photograph, illustrate, write, and edit the projects and articles between the covers. The playhouse project on *page 42*, first sketched out by Senior Design Editor Kevin Boyle nearly a year ago, is a great example.

Kevin and Design Editor John Olson are wearing jackets and gloves in the photos not because of a chilly spring day, but because they actually constructed the playhouse in late December. (Kudos, too, to photographer Brie Passano and assistant Emily Hemmingsen, who battled not only the cold, but also various scrims and shades on that breezy day.) Fortunately, although the grass had faded to straw, there was no snow on the ground; that would start a couple weeks later, and in record amounts. In April, the weather finally relented enough to paint and shoot the "beauty shot" of the playhouse, now surrounded by green grass.

Besdides a calendar, every smartphone has a built-in camera that also recognizes smart codes—those quilty-looking boxes that link directly to a web page—without having to download and launch another app. Just point the camera at the code and away you go.

I love them because, as a too-fat two-fingered typist, I never have to type (and backspace… and retype…) a web address. The one *below* links to my Instagram page if you'd like to try it. You'll find these helpful smart codes scattered throughout this issue—let me know what you think.

By the way, we first used smart codes in *WOOD* magazine way back in 2011, when only 35 percent of Americans had smart phones—half the number who have them now. Guess you could say we were ahead of our time back then, too.

Merry Christmas.

Dave Campbell
dave.campbell@meredith.com
Facebook and Twitter: @WOODeditor
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WOOD®
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In This Issue of WOOD®

SEPTEMBER 2019 · ISSUE 262

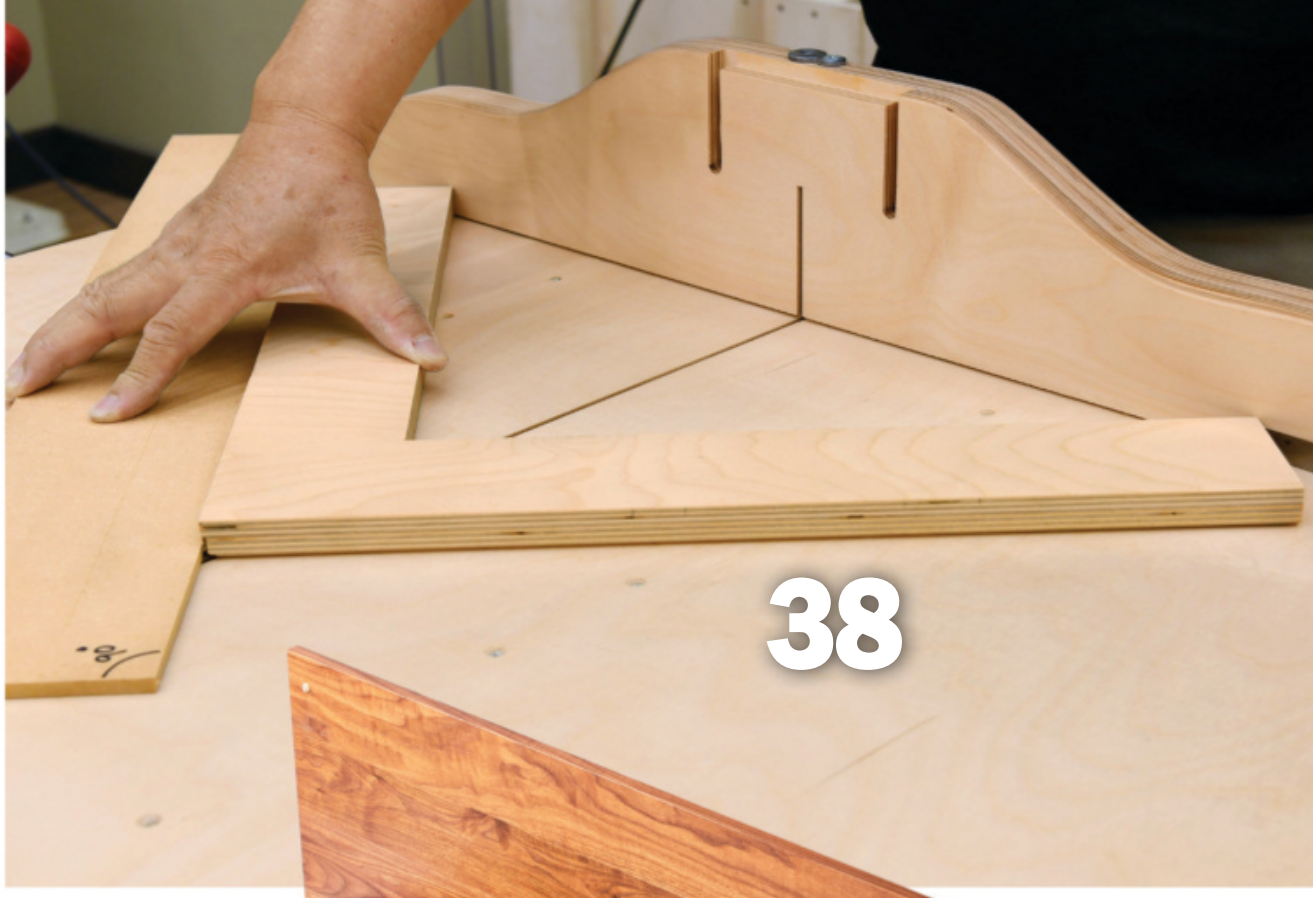
PLANS

TOOLS & TECHNIQUES

DEPARTMENTS


RIDGID
EXTERIOR SCREWS
1-5/8 in x 8
PrimeGuard PLUS
1-1/4 in x 8
ZINC
POLE BARN SCREWS
#10 x 1"
DECKMATE

28



38

24

58

42

A Bevy of Dovetails

Trying your hand at dovetails? Oh yeah? Which species? We've tamed a whole variety of them and show you how as well.

Hand-cut dovetails woodmagazine.com/handcutdovetails
Dovetails with a jig woodmagazine.com/jiggeddovetails
Jig-free dovetails woodmagazine.com/jigfreedovetails
Dovetails in wide panels woodmagazine.com/widepaneldovetails
Half-blind dovetails woodmagazine.com/halfblinddovetails
Double dovetails woodmagazine.com/doubledovetails
Fast dovetails woodmagazine.com/fastdovetails

Curse-word Prevention

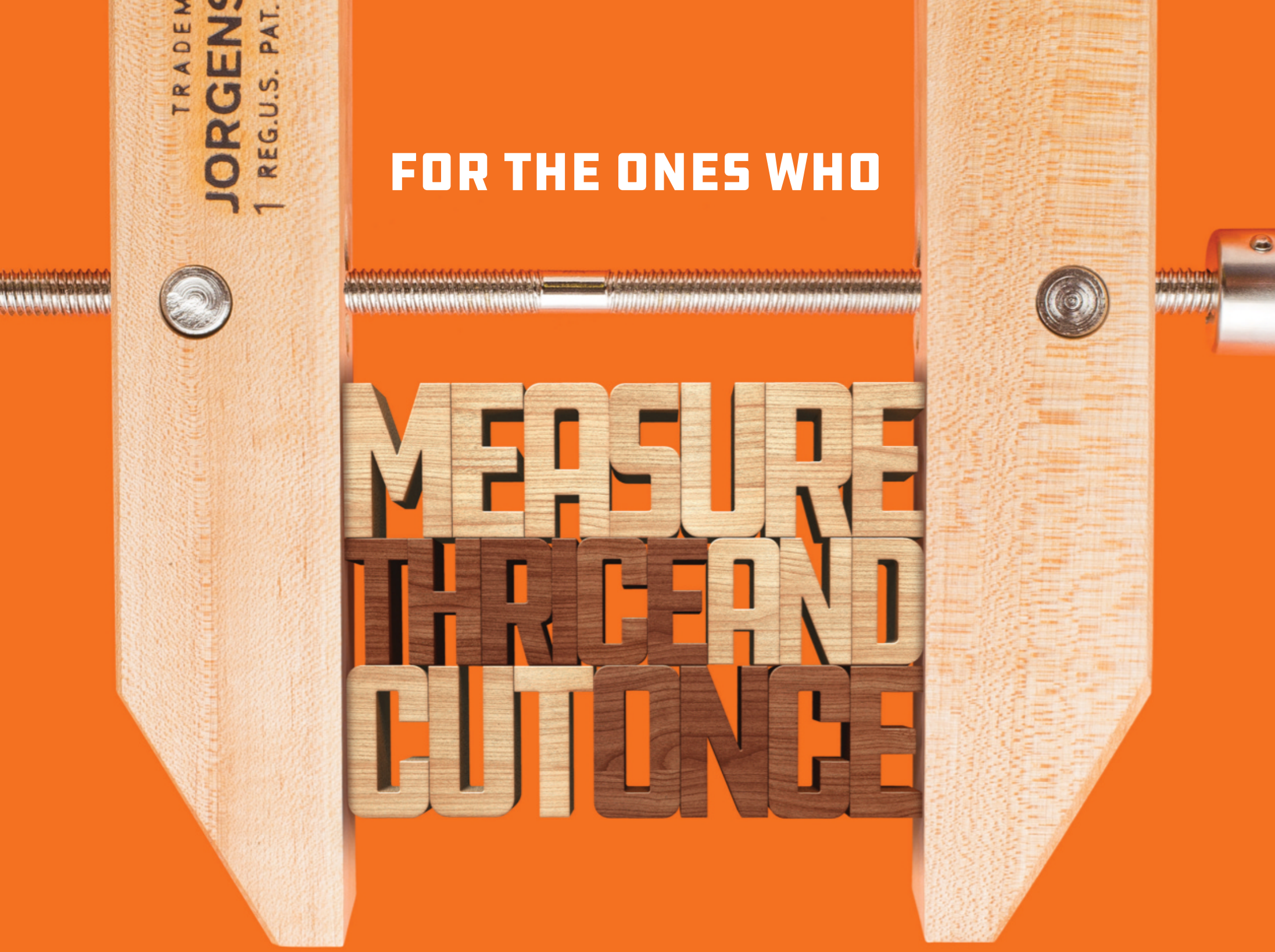
Shop mishaps happen. Instead of reaching for your extensive curse-word collection, try these fixes, instead. (Or, at least, after.)

Fix a d!%#&d edge. woodmagazine.com/dingededge
Fix a g#$!@d miter. woodmagazine.com/gappedmiter
Fix s#@&!y tenons. woodmagazine.com/sloppytenons
Fix finish f#@&s. woodmagazine.com/finishflaws
Fix s&%$#!@g drawers. woodmagazine.com/stickingdrawers

When Good Wood Goes Bad

Sometimes wood turns on you like a B-movie bad guy. But you can prevail like an award-winning A-lister with these tips.

Bullet-riddled lumber woodmagazine.com/bulletriddled
Naughty, knotty boards woodmagazine.com/naughtyknotty
Tricky, sticky sap woodmagazine.com/trickysticky
Criminally crooked wood woodmagazine.com/criminallycrooked
Invasion of the buggy kind woodmagazine.com/buggyinvasion
Acid-infused species woodmagazine.com/acidinfused



Clamps without compromise.

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Find your next clamp at ponyjorgensen.com.

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Sounding Board

YOUR VOICE

T. rex on the deck

As I was walking through a thrift store in Houston a few years ago, I stumbled across a 3D dinosaur puzzle. I turned to my wife and said, "I'm going to figure out a way to make this bigger." And I did. This all-wood Tyrannosaurus rex measures 26' long and took me two months to build using only a jigsaw. My next project: a 42'-long version.

—John Gordy
Houston

Cross story sticks with readers

I was pleasantly surprised to read Dave Campbell's "Story Sticks" in issue 259 (March 2019) because a year ago I was asked by my minister to provide a reasonably priced unity symbol for weddings at our church, so I came up with the one shown, at right. *I use walnut or cherry for the frame, with maple for the cross. To date, I have supplied about a half dozen and have orders for several more. I always look forward to the next issue of* WOOD® *magazine and have been a subscriber since the 1980s. Keep up the good work!*

—Dennis Kinkaid
Columbus, Neb.

My heart was warmed when I read "Story Sticks" in issue 259. Not only is the cross beautiful, but the story behind it is inspiring. Thank you, Dave, not only for the story, but for the plans to make something beautiful and meaningful.

—Larry Nicholas
Clio, Mich.

Like Dave, I made a cross out of meaningful woods for my son's wedding in 2010. The outside wood is 1,000-year-old sunken cypress, and the center is Texas Oak. (He's from Louisiana; she's from Texas.) It was made to slide together only one way, to remind them that there is only one way for a happy marriage.

—Larry Martin
via e-mail

Missed it by inches

I always look forward to seeing your magazine in my mailbox, but in the "No Tablesaw? No Problem" article in issue 260 (May 2019) I noticed what I am pretty sure is a mistake or oversight. On page 29 it says that you should use 24-tpi (teeth per inch), 40-tpi, and 60-tpi for 7¼" circular-saw blades. Unless the terminology has changed recently, this should be the total number of teeth for the blade, not the number of teeth per inch.

—Tom Hudson
Maryville, Tenn.

You're absolutely right, Tom. Seems someone secretly switched the coffee in the editors' lounge to decaf. We apologize for the error.

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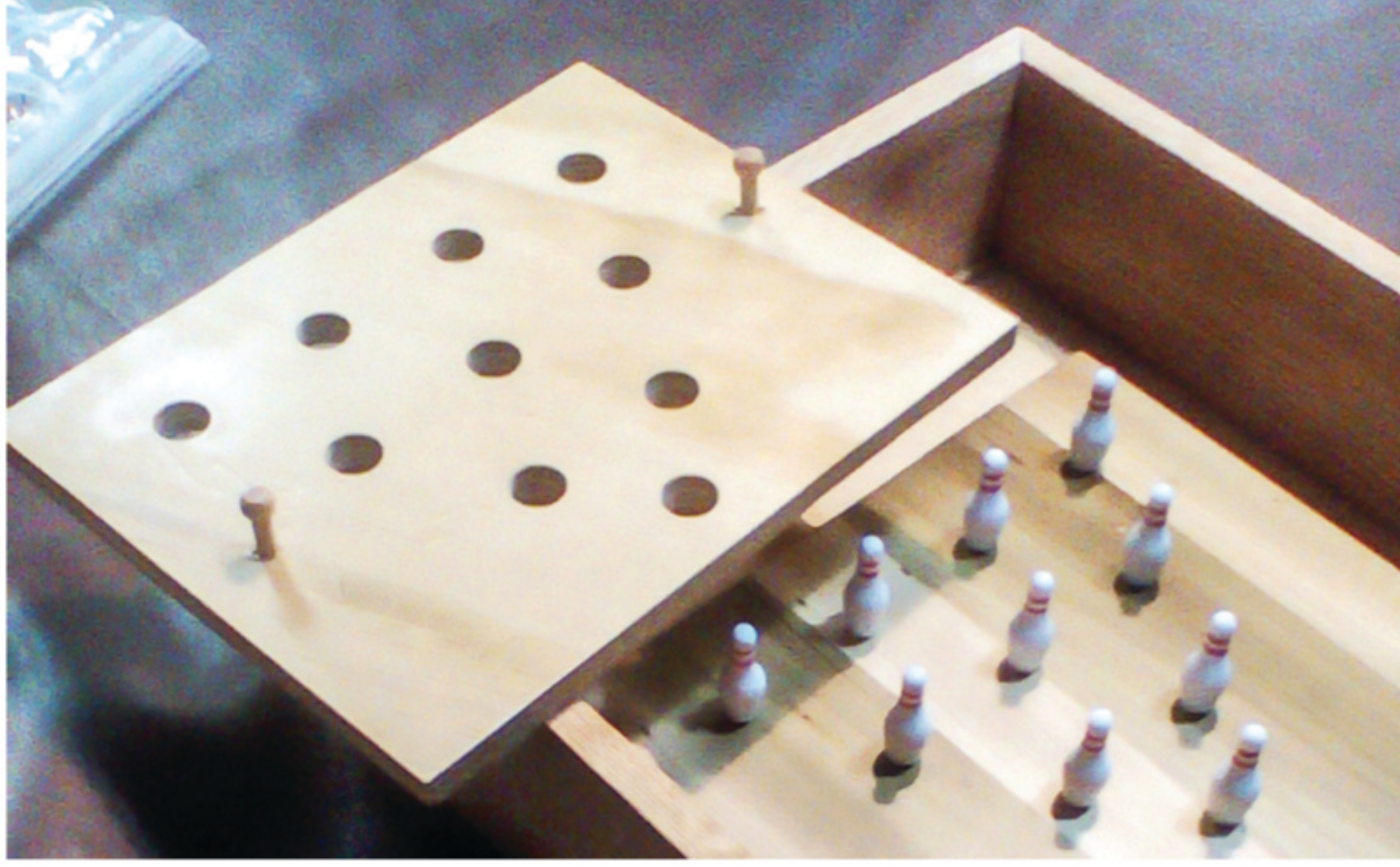
continued on page 8



Readers find bowling game right up their alley

I'm enjoying the Tabletop Bowling game I built from plans in issue 257 (November 2018) but found resetting the pins time-consuming. So, I made a pinsetter by cutting a piece of ½" plywood to match the pin area and drilling holes in it ⅛" larger than the widest part of the pin. I then added a couple of pegs, as shown. To use the setter, I rest it on the end of the lane, drop in each pin, and carefully lift it off. So much faster.

—Howard Peoples
Battle Ground, Ind.

The Tabletop Bowling project in issue 257 reminded me of one I made a couple of years ago that I call "Gauss Bowling." The firing mechanism uses ½" ball bearings and a ½" rare-earth magnet installed in a piece of PVC pipe. I have to admit, my alley is not nearly as nice as yours, nor are the pins, but it was a lot of fun to design and build, and we've had fun playing it.

—Jim Allen
Lakeside, Ore.

Hover your phone's camera over the smart code to see how it works, or visit woodmagazine.com/gaussbowling

The more, the merrier

Whenever I see beautiful and functional tool storage, such as the Heirloom Hand-Tool Cabinet in issue 258 (Dec/Jan 2018/2019), I think, "Boy, that's what I need!" And then I remember that tomorrow I will have at least two more of something and there is no room in the cabinet to add them.

—Matt Mattick
via e-mail

continued on page 10

Sounding Board

YOUR PROJECTS

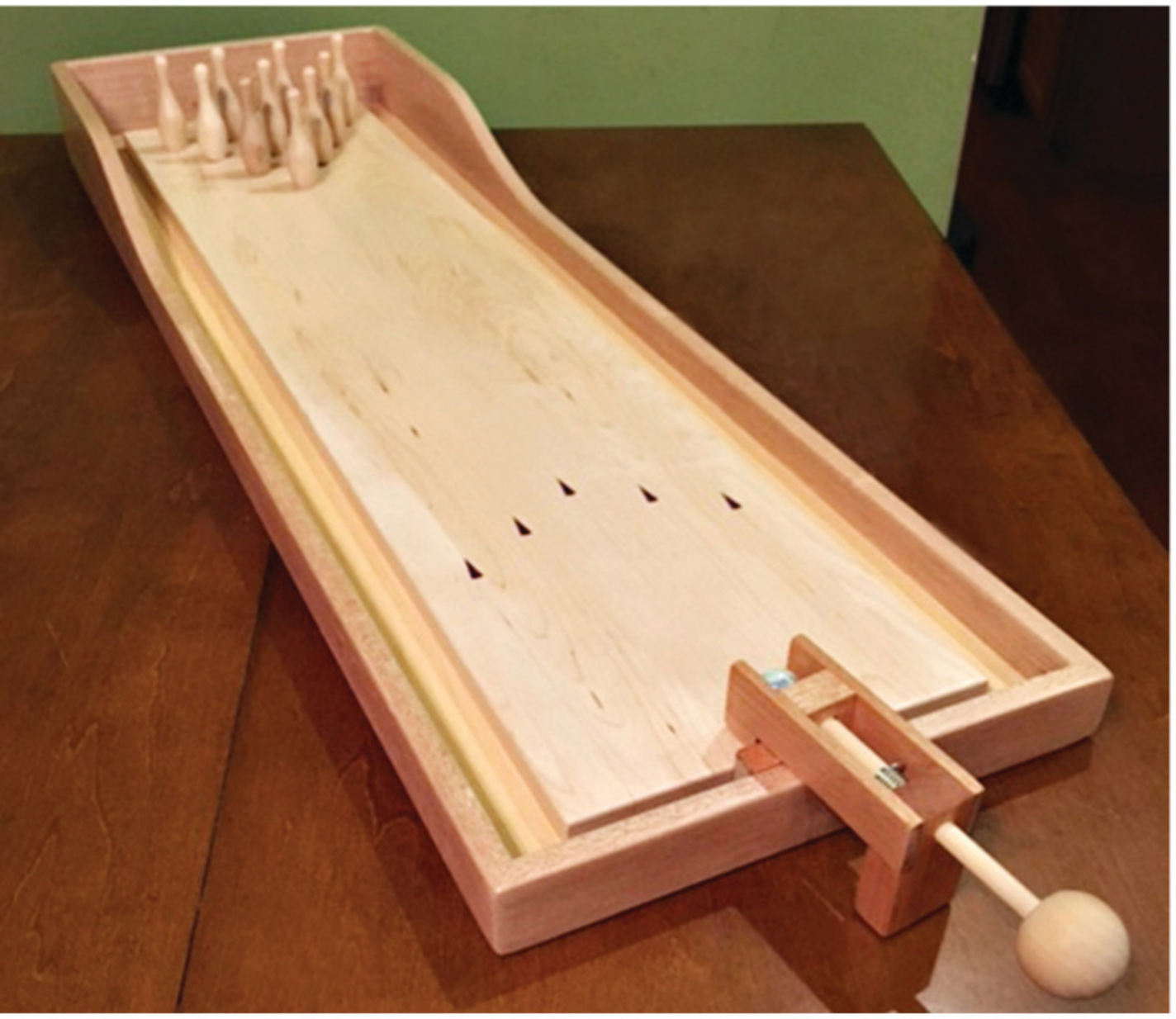
***Jeff Beeson**, of Collinsville, Okla., built this walnut 3-in-one Bed for All Ages and matching Double-duty Changing Table for his son's family. Find plans at woodmagazine.com/3in1bedroombundle, or hover your phone's camera over this smart code.*

***Joe Eide**, of Eau Claire, Wis., tricked out a Kreg Universal Bench (kregtool.com) with a tool-triggered vac and cyclonic separator to make a compact dust-free workstation. He adapted a shop-vacuum gutter-cleaning kit for the hose drop.*

Sounding Board
YOUR PROJECTS

Using the ancient Japanese art of kumiki, ***Jerry Oxborough***, *of Naples, Fla., created this plant stand from 14 pieces of dimensional lumber. Like the puzzles that inspired the piece, the table is put together without glue or fasteners, and you must figure out the secret to assemble or disassemble it.*

It took ***Bill Menkedick***, *of Maineville, Ohio, about six months to complete this roulette wheel and gaming table. The wheel alone consists of 365 pieces of walnut, maple, and oak; it spins on a bicycle-wheel ball bearing.*



Dave Millard, *of Zion, Ill., built two of these Tabletop Bowling games from issue 257 (November 2018) and donated one to a silent auction for Cory's Project (corysproject.com), an organization that assists families with children battling pediatric cancer. Find plans at woodstore.net.*

Send us a photo of your work

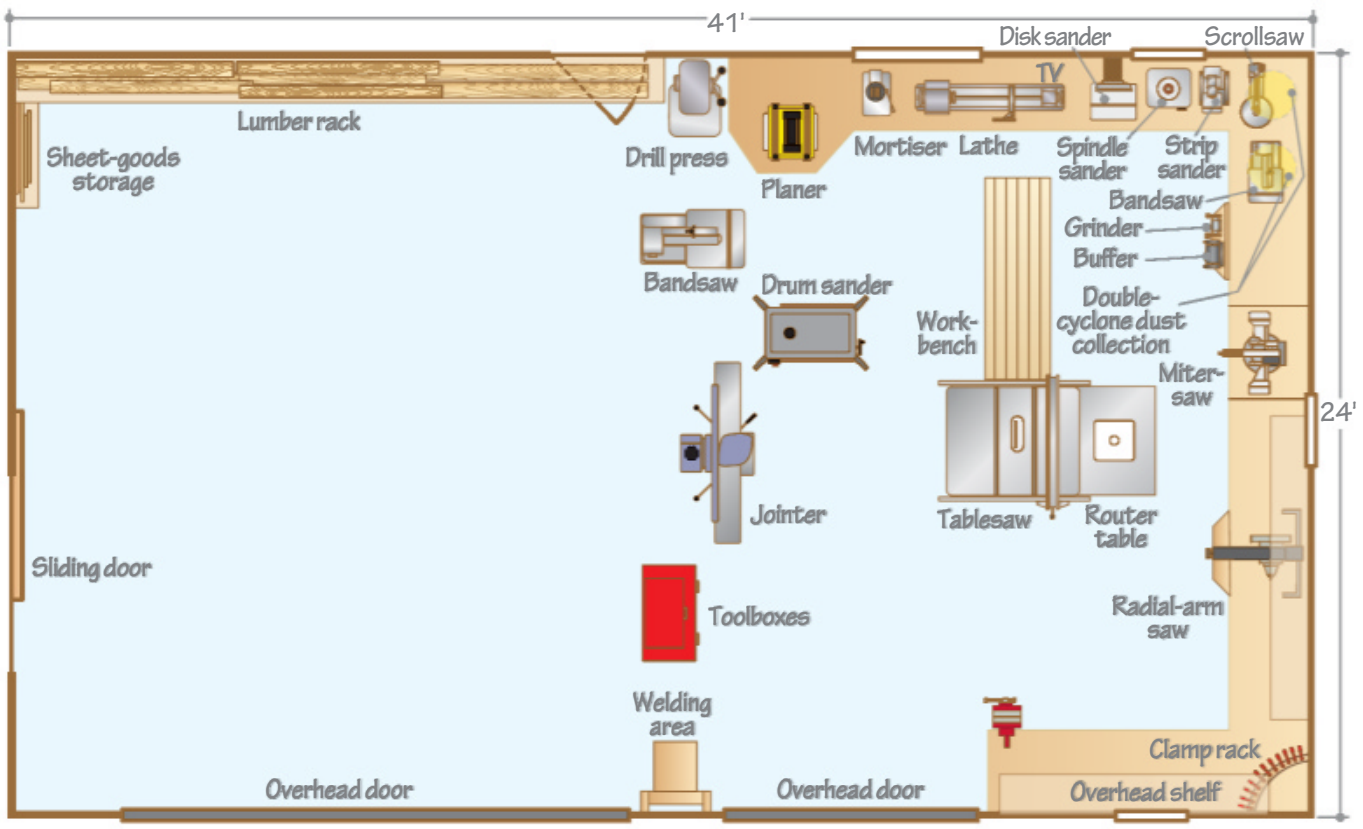
Want to see your work showcased in WOOD® *magazine? Send a high-resolution digital photo of your completed project to* woodmail@woodmagazine.com.

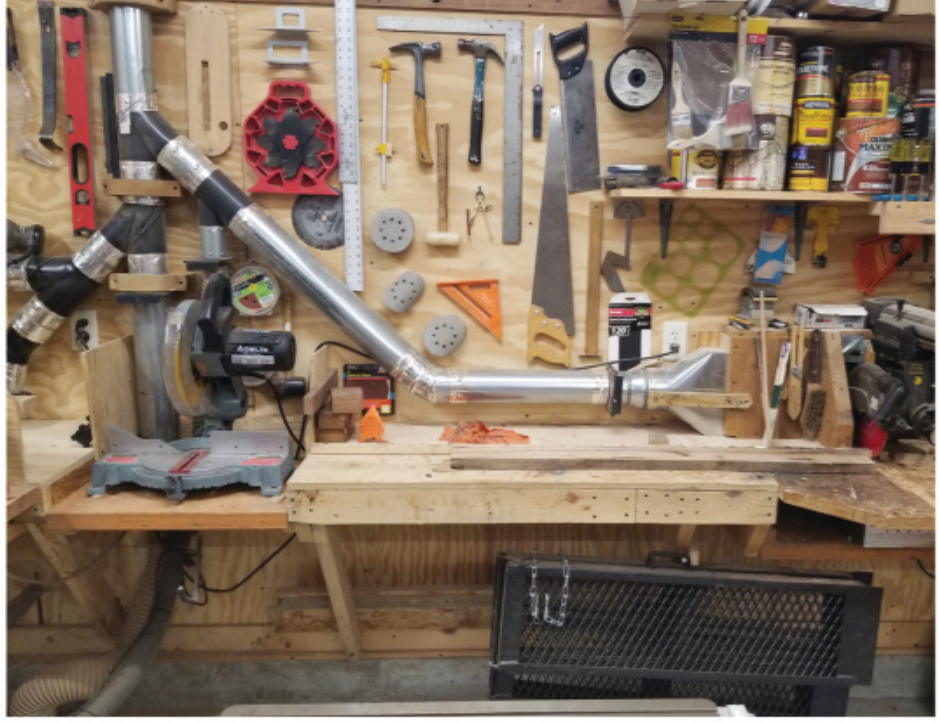
Doubling Down on Dust Collection

Joe dedicated a double-wide bay of his garage to woodworking. Lumber storage spills into the walls of the other two bays used for parking his vehicles.

After living with small, cramped woodshops in prior residences, Joe Sternberger finally built his ultimate: a 1,000-sq.-ft. garage addition with his shop occupying half of the floor space. The 12½' ceilings provide an airy feel and create additional storage. A 100-amp subpanel powers the workshop, supplying his welder, tablesaw, and other major tools on separate circuits.

Metal ductwork, including an underfloor run for the tablesaw, directs sawdust to a unique double-cyclone dust-collection system, adapted from a *WOOD*® magazine plan. The first cyclone removes large chips, and the second removes the larger particles that get past the first stage. Joe says that very little dust passes on to the exhaust pipe that exits through the roof. He says eliminating





Knee braces support the saw stations. The open space below provides storage for bulky items, and allows for quick sweep-up.

Lining the shop walls with ½"-thick plywood allows Joe to cluster custom storage racks, such as these drill-bit organizers, near his drill press.

With two cyclones hooked up in series, very little dust exhausts through the roof. A shop-made muffler dampens noise during operation.

Joe took advantage of unused corner space by installing racks to hold his clamps.

▶Build your own cyclone dust collector. woodmagazine.com/cyclone

the need for a filter maximizes his system's performance.

Joe partially covered the fully insulated shop walls with ½"-thick plywood, which provides a solid mounting surface for shelving, parts organizers, and custom racks for tools. A simple nail or screw can be used to hang a tool wherever space allows. The plywood also makes it easy to rearrange storage as needs change.

When Joe built the workbenches along adjacent walls, he made sure they were the same height. He incorporated a mitersaw station and his radial-arm saw on one wall. Custom dust hoods for each saw suck in the majority of sawdust.

A worksurface behind the tablesaw serves for project assembly and as outfeed support for the saw. "I'm still debating whether to build a separate assembly bench," Joe says.

A mechanical engineer by trade, Joe Sternberger has been woodworking since grade school. He enjoys building projects for friends and family.

Show us your shop

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

Ask Wood

YOUR QUESTIONS

What to do when warped plywood throws you a curve

Q I have a number of plywood sheets in my shop—some partial, some whole—that have warped, making them difficult to work with. How can I flatten them?

—Leroy Zahm, Laramie, Wyo.

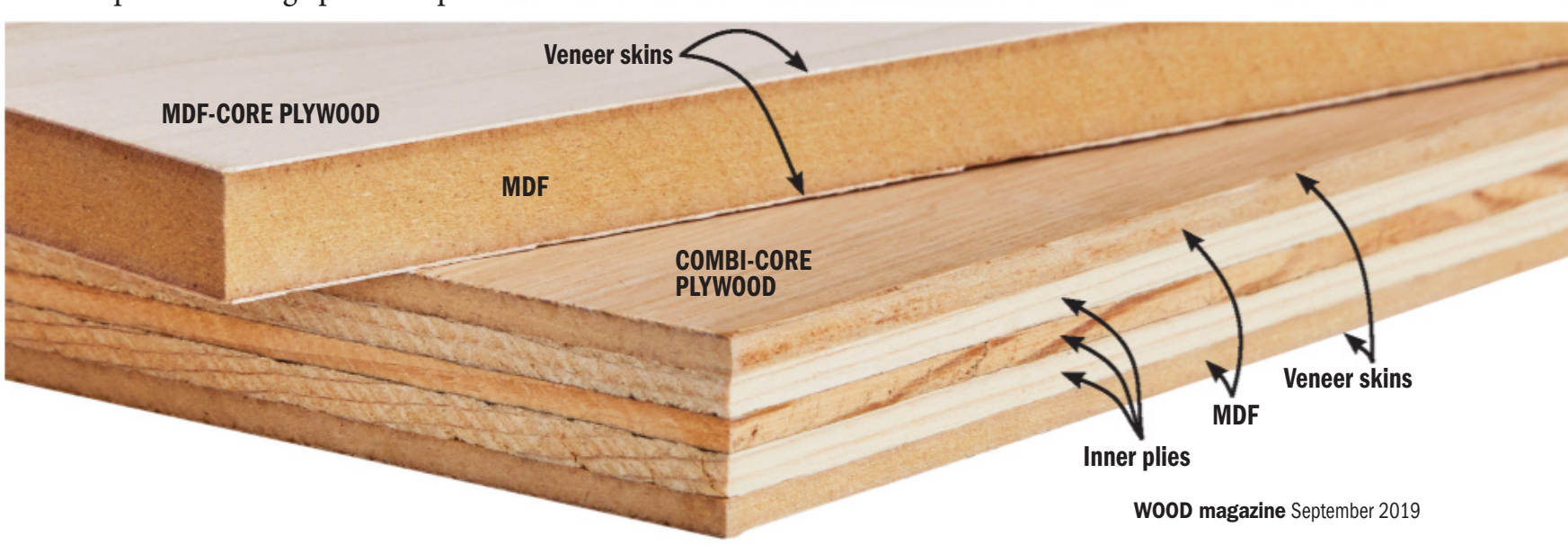
A You'll find it suggested far and wide, Leroy, that you can flatten plywood by restoring the moisture equilibrium between the top and bottom plies. That entails adding moisture to the concave side, removing it from the convex side, or both. One popular notion suggests doing both by laying the sheet on your lawn on a sunny day. We've tried those ideas and have found the results unpredictable, at best. Rarely does the sheet return to a flattened state. Our advice: Avoid warped plywood altogether by buying high-quality material, using the material before it has a chance to warp, and storing it correctly.

When shopping, stay away from bargain-basement plywood. It will often warp soon after you pull it from the stack of other sheets holding it down flat. If available, choose a combi-core product that has a plywood center, with MDF or particleboard layers on both sides of the center, and veneer skins. In our shop it tends to stay flatter longer than other plywoods. Products with cores of only MDF or particleboard also tend not to warp quickly, but weigh a lot and don't hold screws well.

After deciding on a plywood, buy it the same day you plan to cut it into project parts. Unlike solid wood that needs days to acclimate to your shop's environment, plywood should be cut up as soon as you get it home.

If you don't use all of the parts that day, clamp them together, sandwich-style, with other materials that tend to stay flat such as particleboard and MDF. Do the same with leftovers. Clamped this way, you can even store the pieces standing up to save space.

Have a question? Drop us an e-mail. askwood@woodmagazine.com

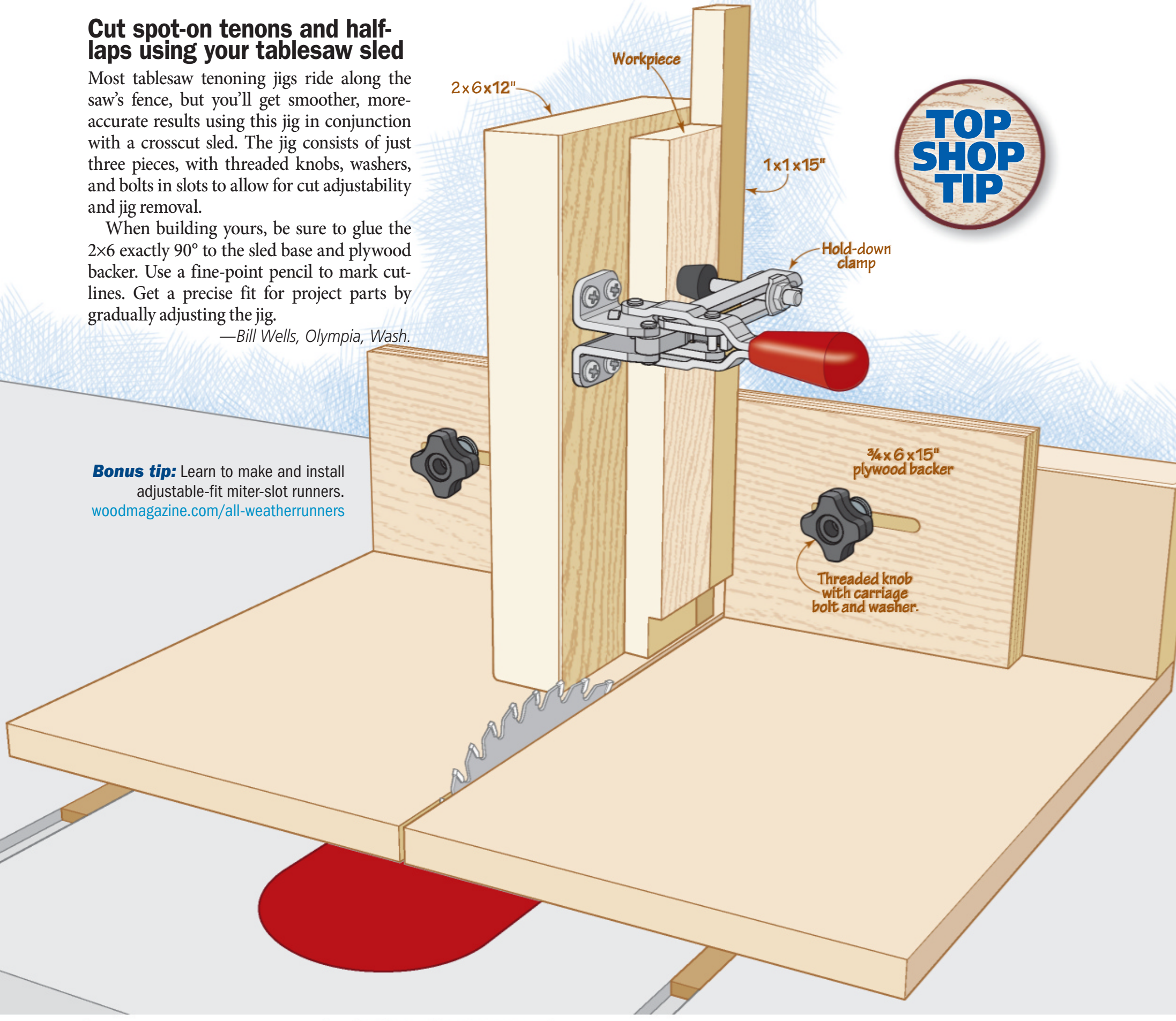


Cut spot-on tenons and half-laps using your tablesaw sled

Most tablesaw tenoning jigs ride along the saw's fence, but you'll get smoother, more-accurate results using this jig in conjunction with a crosscut sled. The jig consists of just three pieces, with threaded knobs, washers, and bolts in slots to allow for cut adjustability and jig removal.

When building yours, be sure to glue the 2×6 exactly 90° to the sled base and plywood backer. Use a fine-point pencil to mark cut-lines. Get a precise fit for project parts by gradually adjusting the jig.

—Bill Wells, Olympia, Wash.



TOP SHOP TIP

Bonus tip: Learn to make and install adjustable-fit miter-slot runners. woodmagazine.com/all-weatherrunners

Tips earn up to $150.

If your tip is the best of the issue, it wins **Top Shop Tip** honors, and you receive a **tool prize** worth at least **$300**.

Send your tip, photos or drawings, and contact info to **shoptips@woodmagazine.com**

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

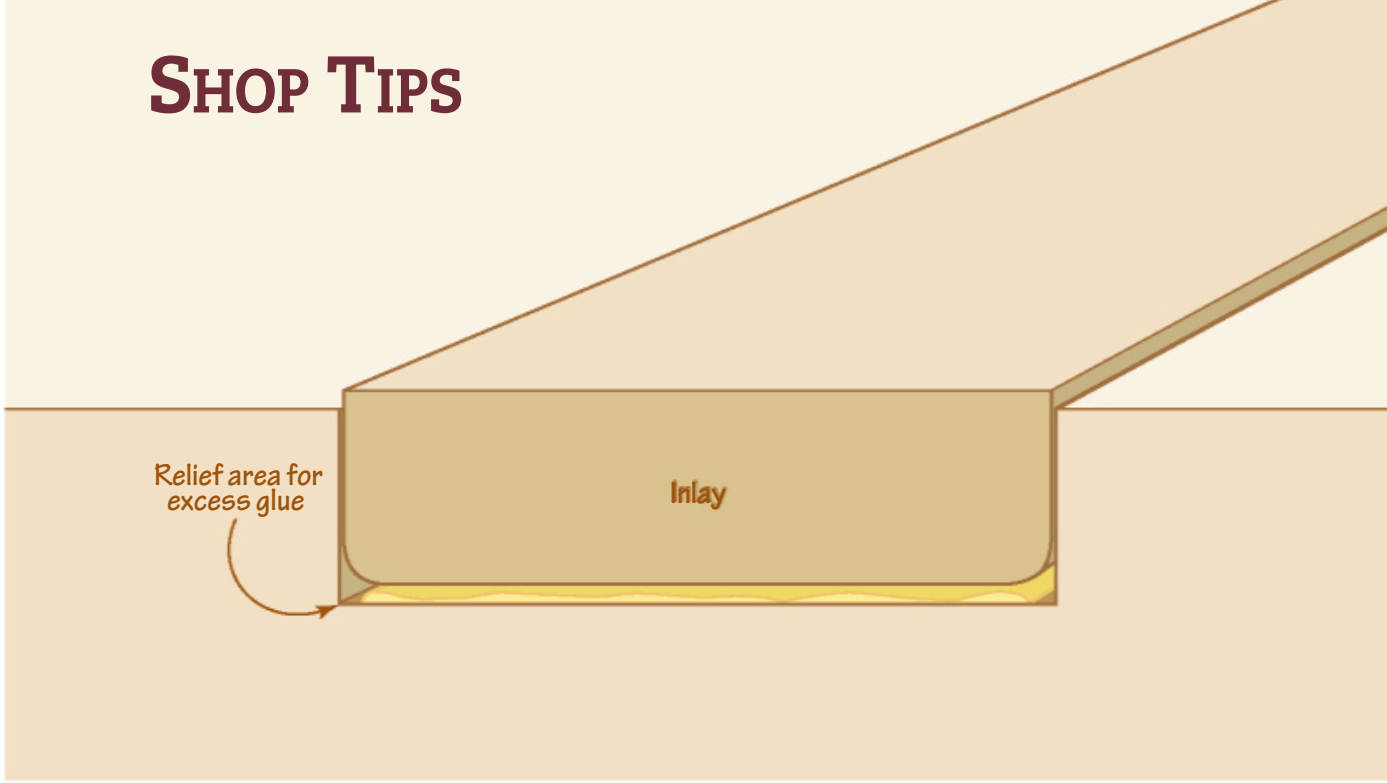
For sending this issue's Top Shop Tip, Bill receives an Adaptive Cutting System Saw + Guide Track Kit with Rip Guides and Parallel Guides from Kreg Tool worth $600.

continued on page 18

Well-rounded solution for glue squeeze-out

I build a lot of jewelry boxes and other items featuring ⅛"-thick inlays. After becoming frustrated with cleaning glue that oozed out from around the inlays, I solved the problem by making a slight modification to the inlays. Simply rounding the bottom corners with a block plane or sandpaper creates a place for excess glue to pool, cutting down significantly on glue squeeze-out. Those slight round-overs also make it easier to insert inlays into tight-fitting grooves.

—Tony Rush, Springfield, Ore.



Try some new facets on making bowls

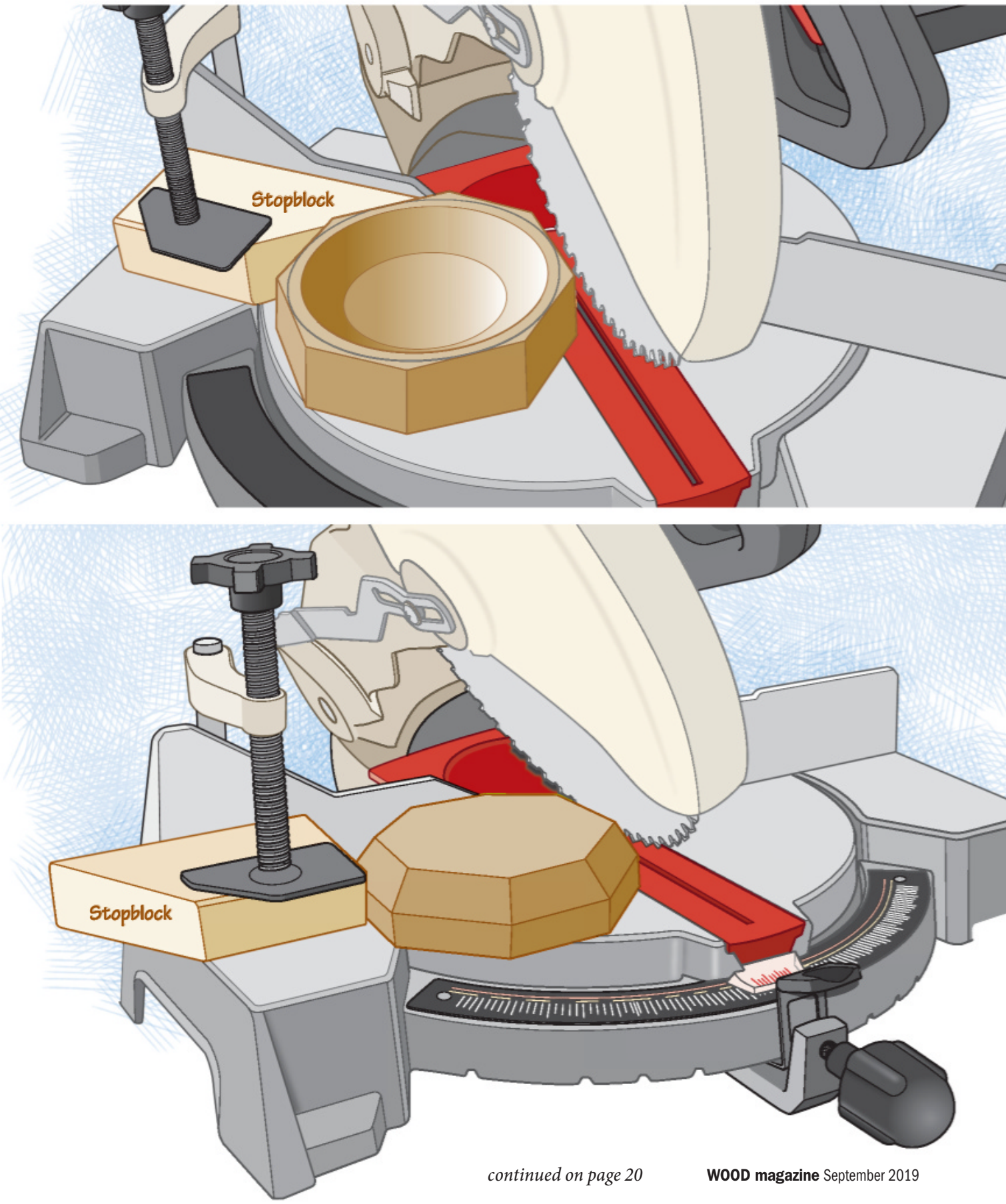
Turned vessels look interesting when they combine round, lathe-turned areas with sawn flat cuts. Here's one way to get that look.

First, hollow out the center of a square blank on the lathe, just as when shaping a typical bowl. Sand the hollow. With the blank spinning, mark a fine registration line on the face of the blank, just outside the rim of the dished area. Remove the blank from the lathe.

For the following steps you'll get the best results with an accurately adjusted mitersaw, sharp blade, and slow but steady blade feed. Set the mitersaw for a 45° miter, align the blade with the registration mark and cut the first facet. Clamp in place a stopblock, like the one in the drawing, to further support and align the blank. Rotate the blank and make another cut. Continue rotating and cutting until you create an octagon.

Next, adjust the saw for 0° miter and 25° bevel. Turn the bowl upside down and clamp in place a stopblock, as shown. Cut an additional set of facets. Final-sand and finish the bowl.

—Roy Carlson, Greensboro, N.C.

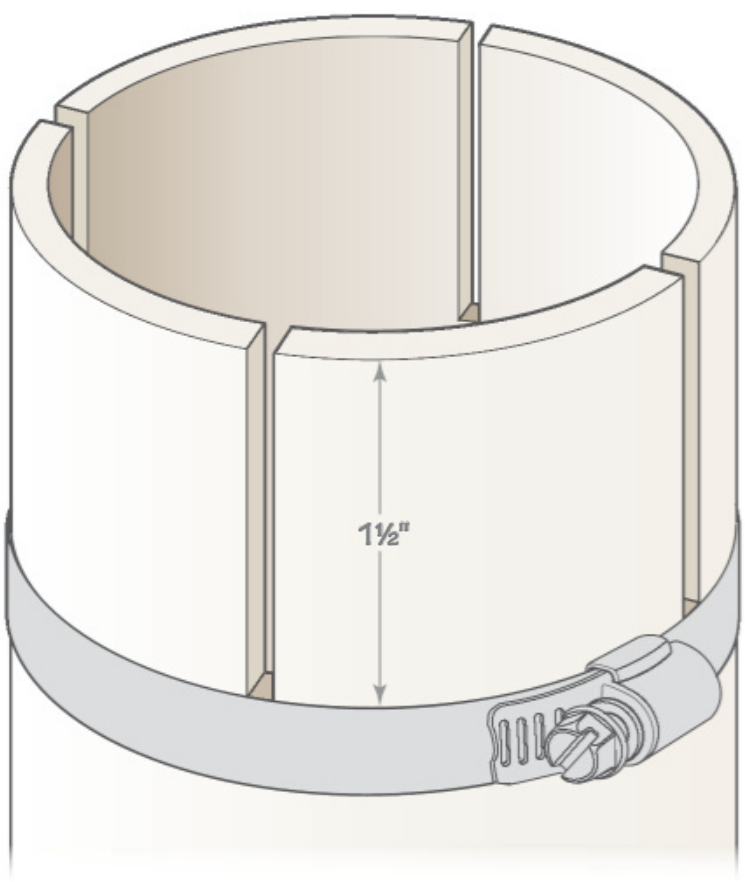


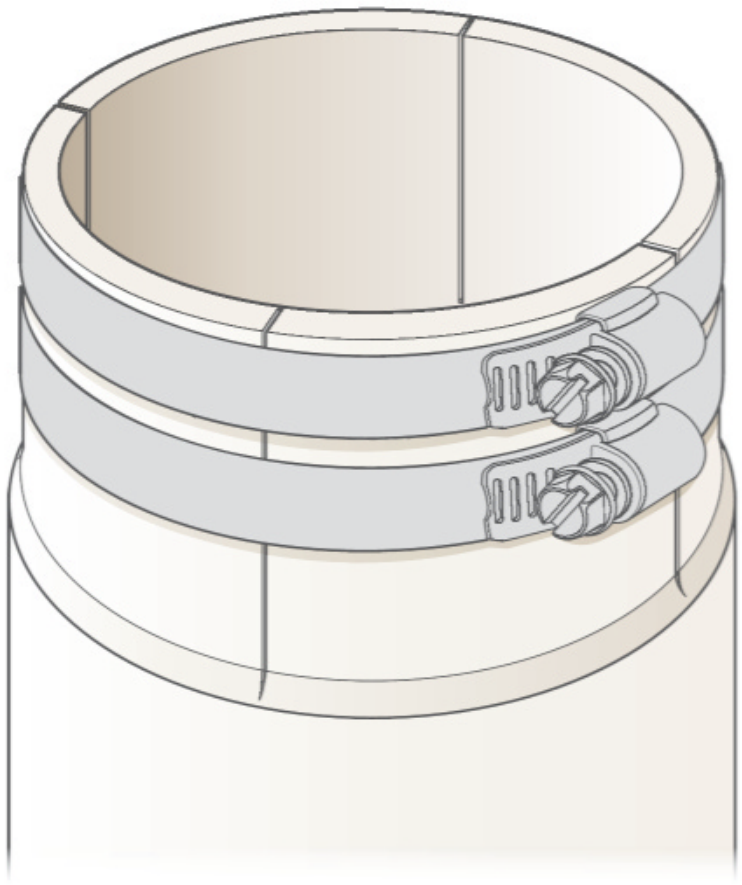
continued on page 20

Shrink PVC pipe to suit your needs

I recently needed to reduce the end of a 2" PVC pipe to fit into my vac's exhaust hole. This process worked like a charm: First, stand the pipe on end. Using a handsaw, make four 1½"-deep cuts at 3, 6, 9, and 12 o'clock. Slide two hose clamps onto the slit end and adjust them to the existing diameter. Remove one clamp and leave the other near the ends of the cuts (*below left*). Apply heat to the PVC with a heat gun until the PVC softens. Then, slide the other clamp onto the pipe and tighten both clamps to close the four cuts (*below right*). After the PVC cools, remove the clamps and check the fit. If the pipe is still a bit large, cut more slits and repeat. I used the same process to shrink a 1½" pipe to fit my vacuum-hose nozzle.

—Glen Perry, Greenville, Mich.

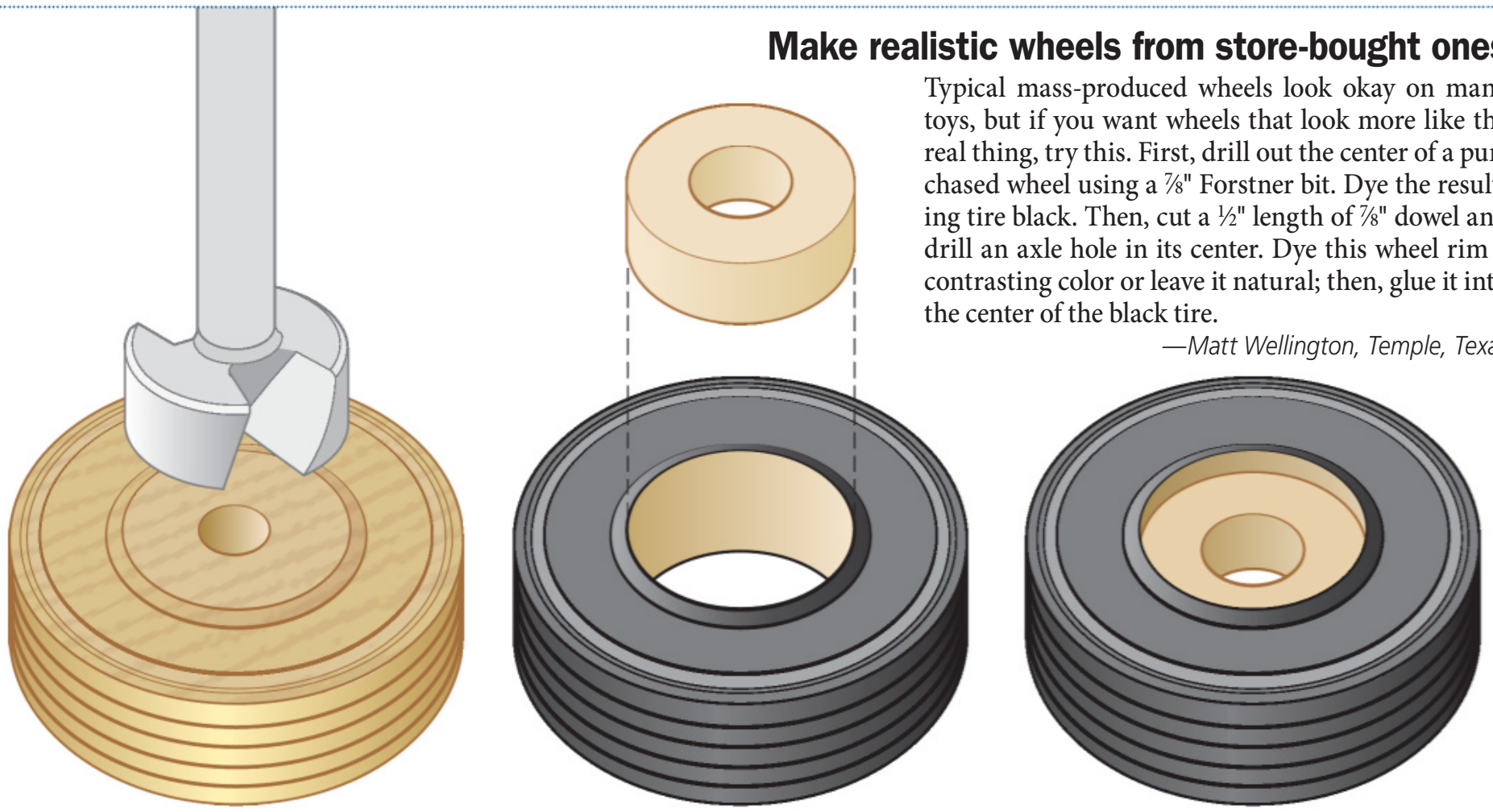


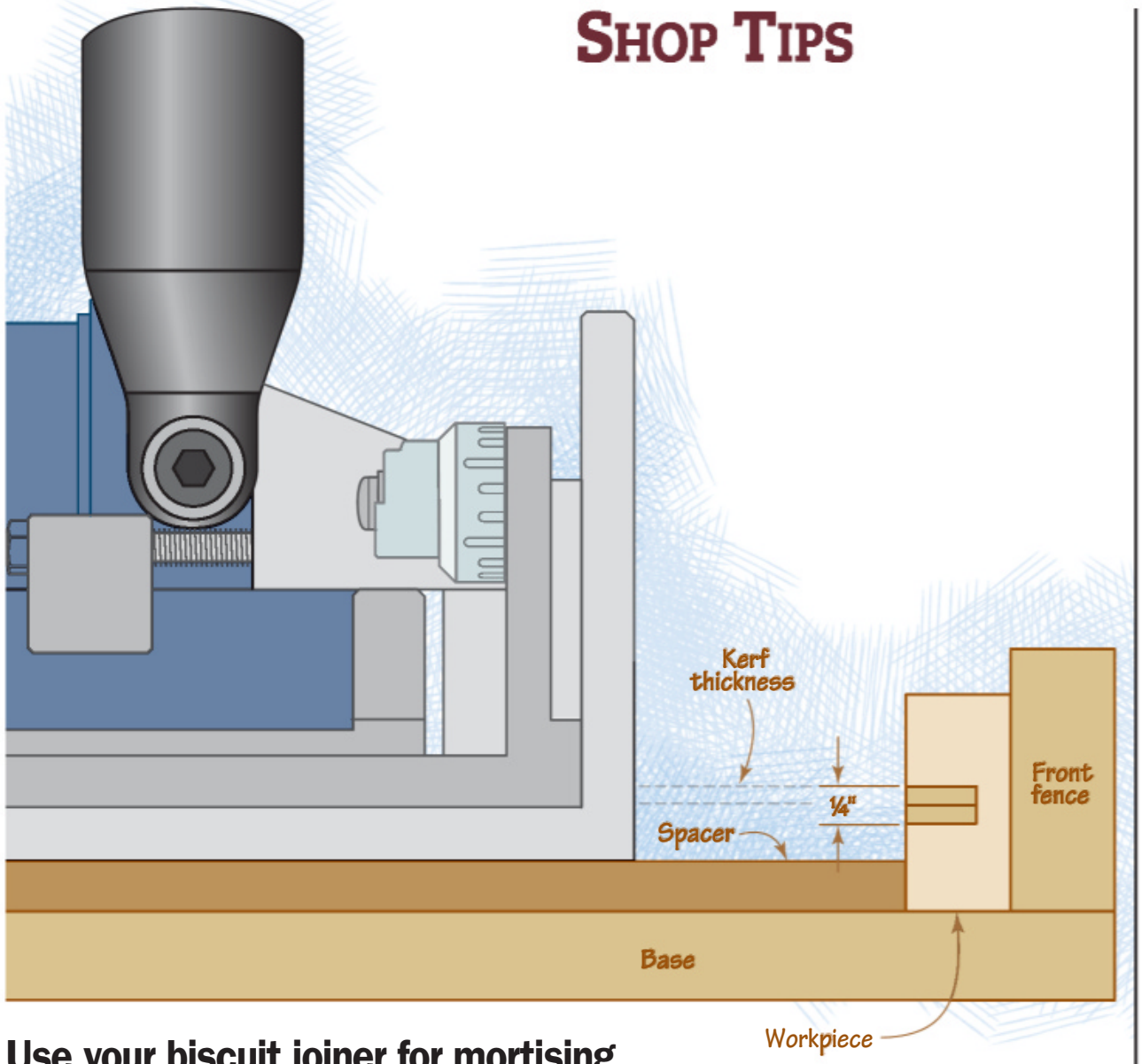


Make realistic wheels from store-bought ones

Typical mass-produced wheels look okay on many toys, but if you want wheels that look more like the real thing, try this. First, drill out the center of a purchased wheel using a ⅞" Forstner bit. Dye the resulting tire black. Then, cut a ½" length of ⅞" dowel and drill an axle hole in its center. Dye this wheel rim a contrasting color or leave it natural; then, glue it into the center of the black tire.

—Matt Wellington, Temple, Texas





Use your biscuit joiner for mortising

I've never had much success hand-chopping mortises, so I tried removing the bulk of the waste with a biscuit joiner. Then, I simply chop the slots square using a chisel. The slots' walls help guide the chisel cuts. Result: perfect mortises.

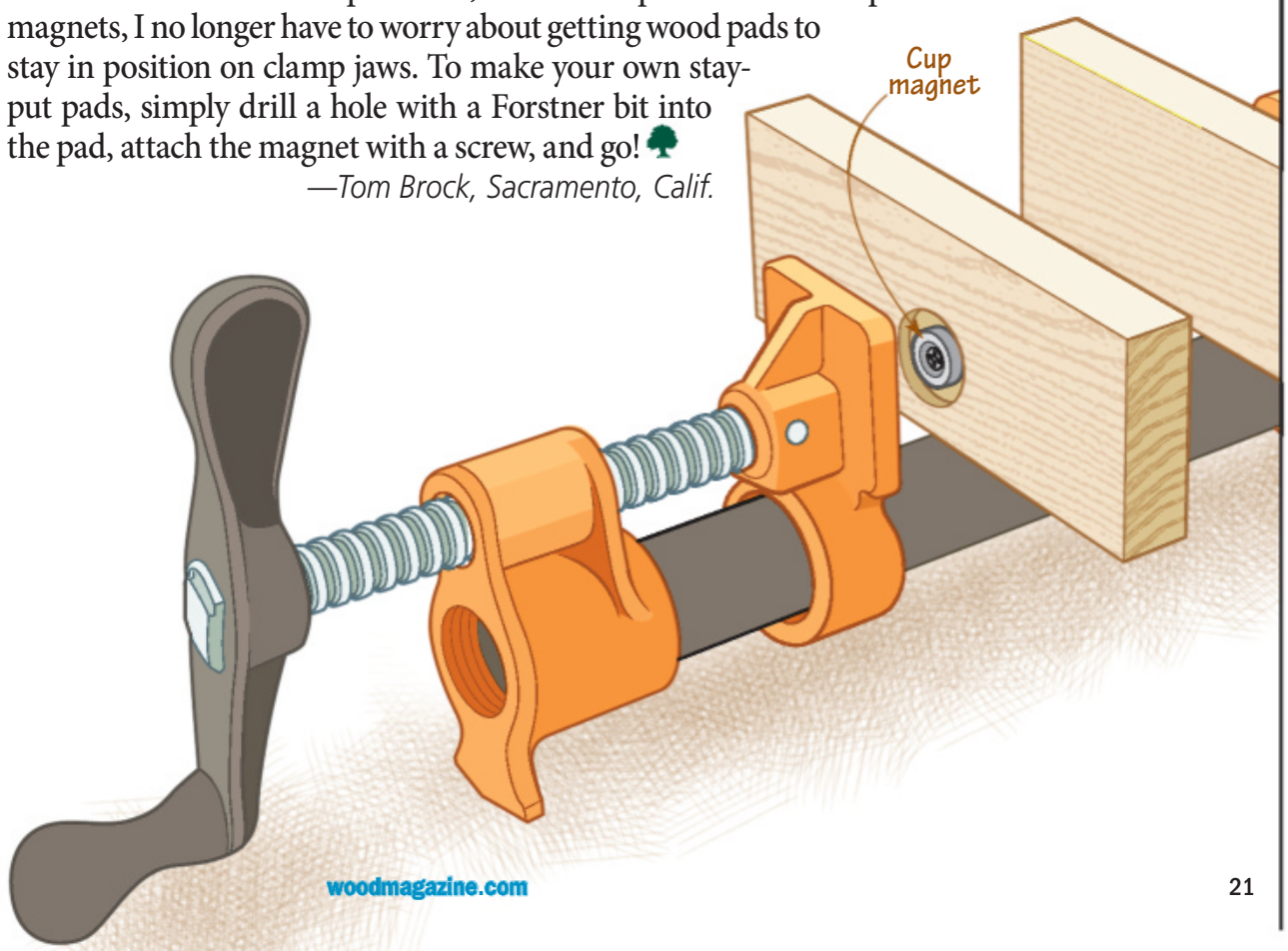
You will have to do some math to calculate the thickness of spacers placed under the biscuit joiner to achieve the correct mortise width and positioning. Most biscuit-joiner blades cut approximately a ⅛" kerf , so two plunges will yield a ¼"-wide mortise.

—Mark Buckley, Norwich, N.Y.

Tiny magnet provides big help when the going gets hectic

With so many things to hold in place during clamp-ups, I often feel like I need the arms of an octopus. Now, with the help of rare-earth cup magnets, I no longer have to worry about getting wood pads to stay in position on clamp jaws. To make your own stay-put pads, simply drill a hole with a Forstner bit into the pad, attach the magnet with a screw, and go!

—Tom Brock, Sacramento, Calif.



Bandsaw Fence System

Expand your machine's table size and cutting versatility.

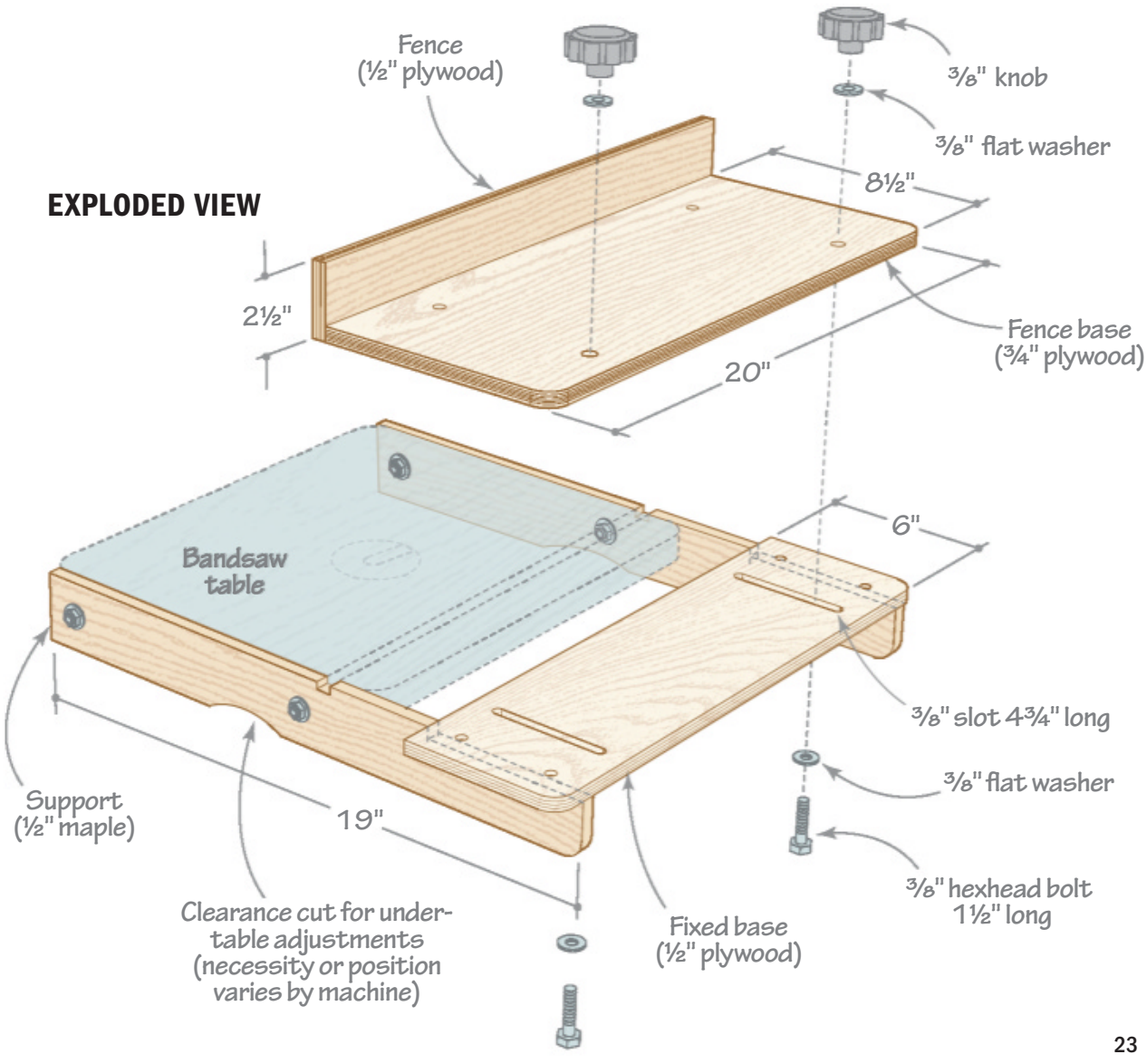
Get more work and better results from your bandsaw with this easy-to-build table extension and adjustable fence. Set the fence parallel with the saw's blade, or lock it securely at a slightly skewed angle to counter blade drift. Reference lines marked 1" apart [**Photo**] help you quickly set the fence's position. Insert the locking knobs in the holes farther from the fence for resawing and narrow cuts, or move them to the other holes for wide rips. When you don't need the fence, enjoy the added surface area provided by the fixed base [**Exploded View**].

Reader Jim Whetstone of New Cumberland, Pennsylvania, designed the fence system to fit his Delta 14" saw. You can change the dimensions of the system's various components to fit any bandsaw.

To resaw pieces wider than 6", make a separate fence and base with the fence at least 4" tall. Add 90° bracing where the fence meets the base.

To make tightening the knobs as easy as possible, Jim secured a 9/16" socket to the end of a piece of wood that fits comfortably in his hand [**Photo**]. "It comes in real handy for holding the boltheads while tightening the knobs," Jim says.

EXPLODED VIEW



Family treasure
Blanket Chest

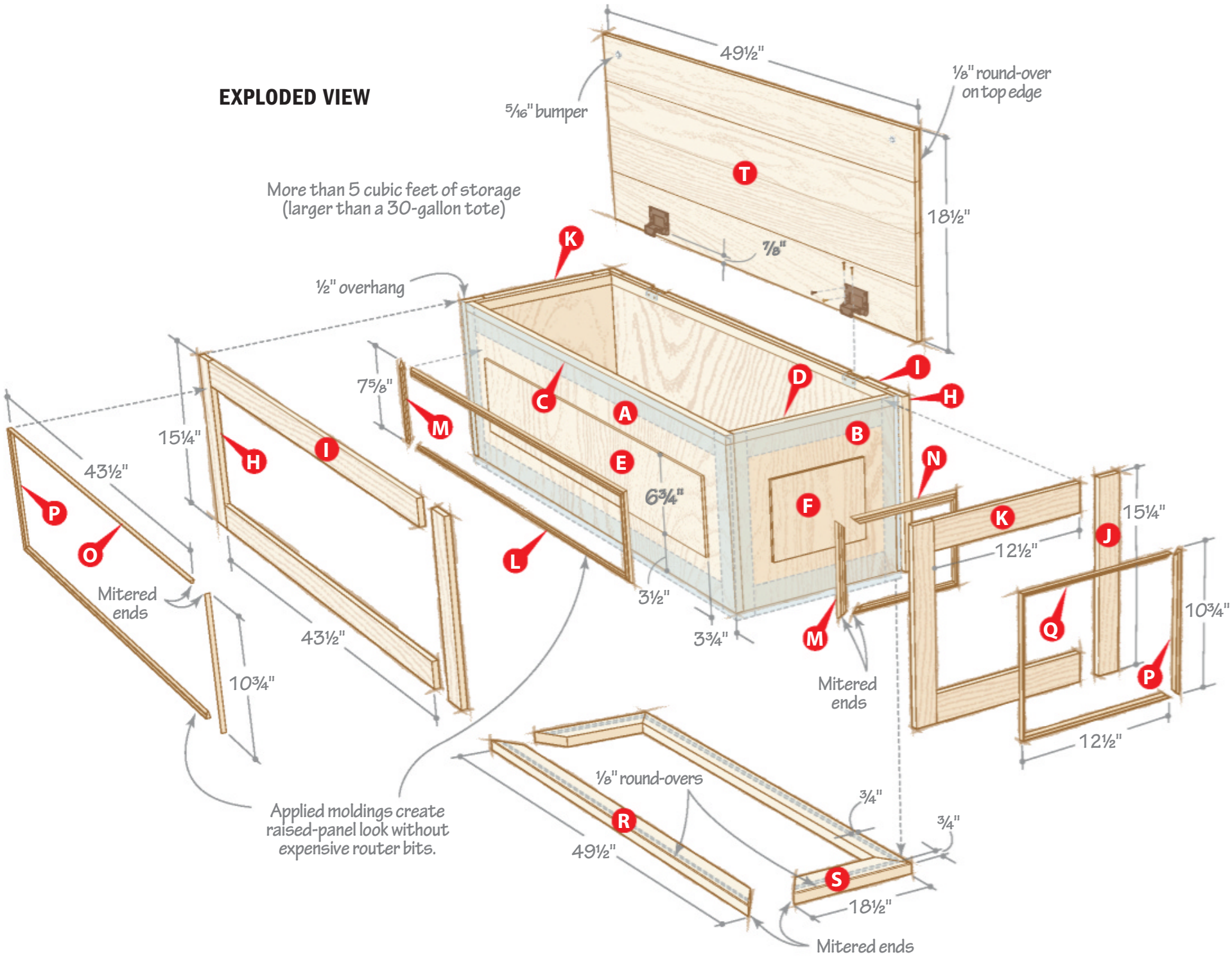
Fine-furniture elegance. . . with easy construction

DIMENSIONS:
49½" W × 18½" D × 17½" H

Approximate materials cost:
$550

Roomy enough to store heavy blankets and fluffy duvets.

Spacious and beautifully proportioned, this chest boasts raised-panel style but goes together easily with straightforward joinery and applied moldings.

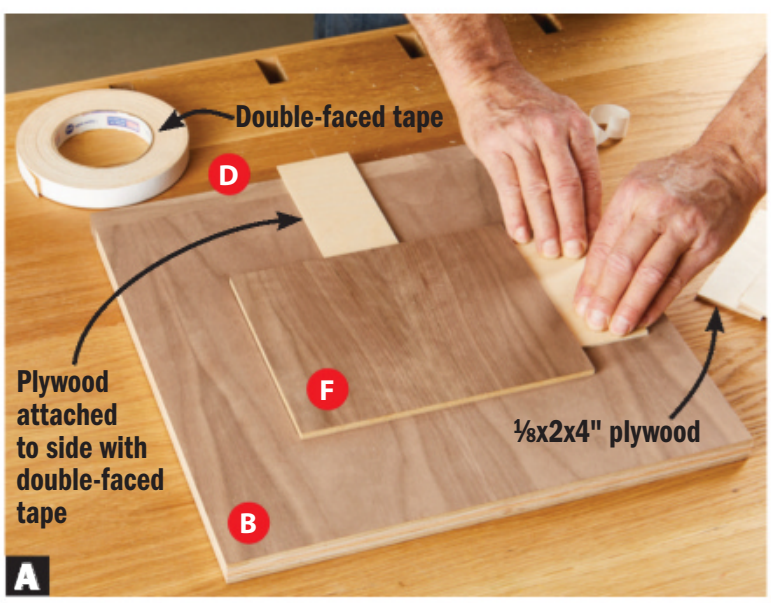


Build the carcase

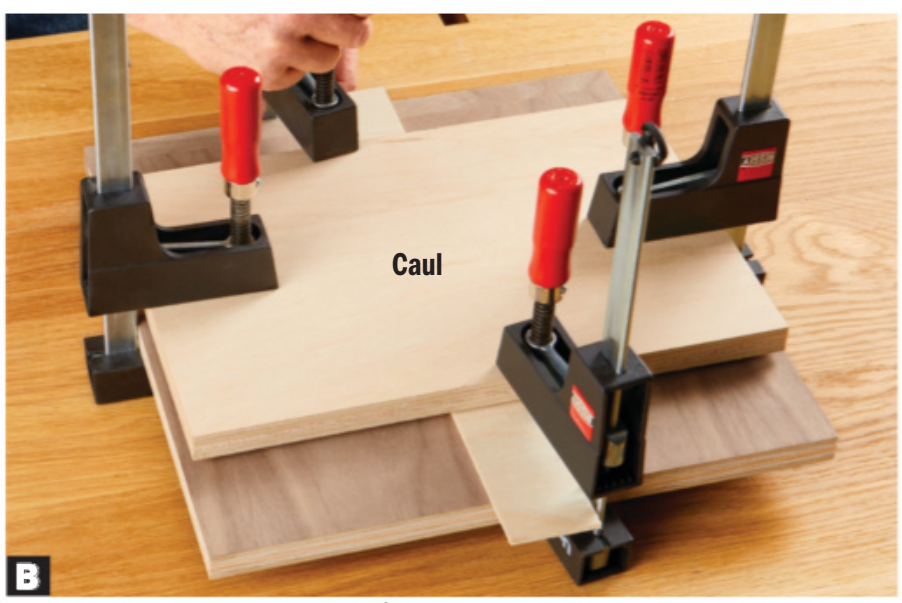
Note: *Plywood seldom measures ¾" thick, so make the width of the caps (C, D) to match it.*

1 Cut to size the front, back, sides, and caps A–D [**Materials List**]. Glue and clamp the caps (C, D) to the front, back, and sides (A, B).

2 Cut the face panels (E, F) to size. Center a face panel on the outside of each A/C and B/D [**Photo A**]. Then, lift off a panel, apply glue to the back, and clamp in place [**Photo B**]. After the glue dries, finish-sand each face panel with progressively finer sandpaper to 220 grit.



Temporary plywood guides placed against each edge of the face panels (E, F) prevent them slipping out of place when clamping.



Clamp the face panel with a ¾" plywood caul to ensure even pressure at the center. Apply clamps from the center out on the long front and back.

Align the end and the front carefully as you join them to keep the end of the front panel flush with the face of the end panel.

A pushblock keeps your hands clear of the blade while ripping the blanks.

Tip! *Right-angle clamping braces guarantee square corners. Make a set of your own.* *woodmagazine.com/clampingbrace*

3 Glue and screw together the front (A/C/E) and one end (B/D/F) [**Drawing 1, Photo C**]. Assemble the back and the other end; then, join the two A–F assemblies.

4 Cut the bottom (G), and glue and screw it to the carcase [**Drawing 1**].

Add character with trim

1 Cut the rails and stiles (H–K) to width and about 1" longer than shown.

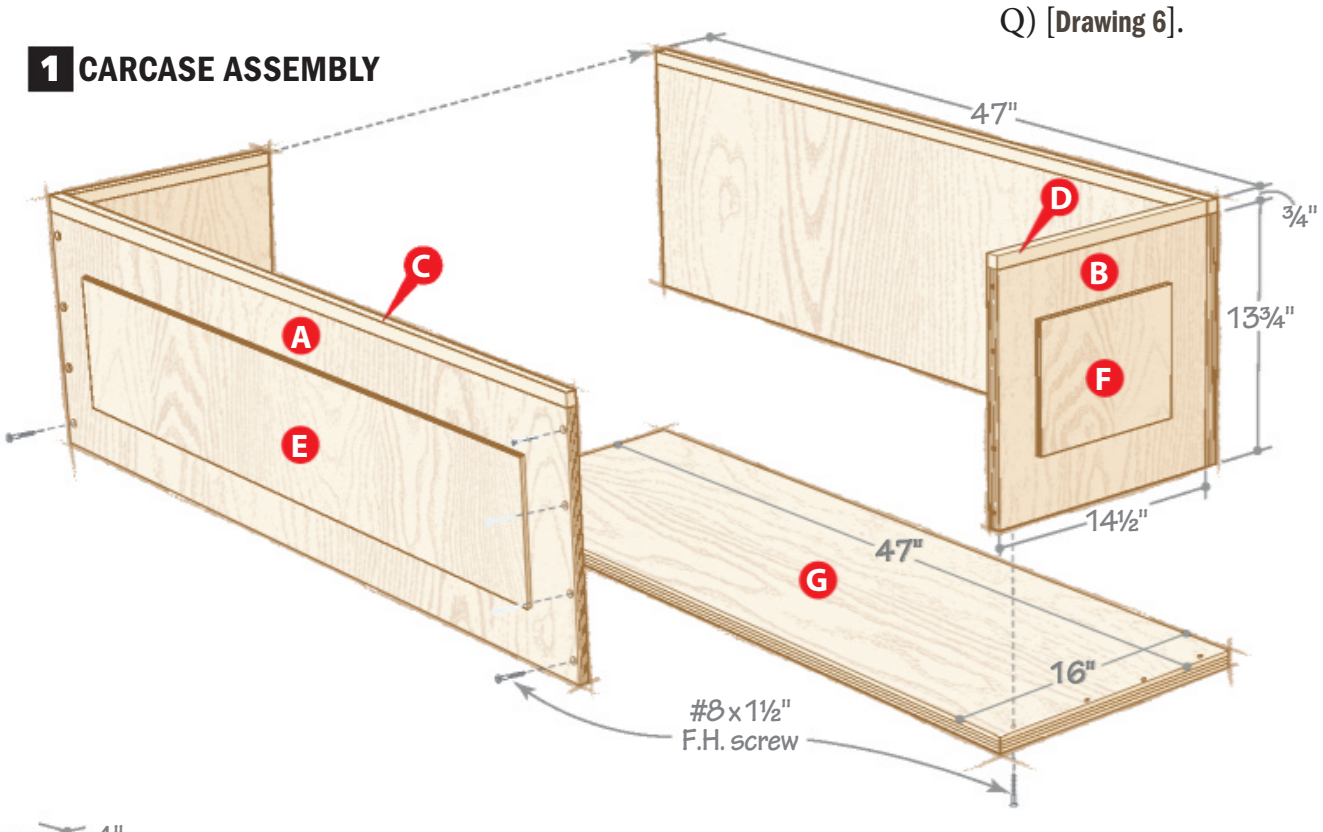
2 Trim the stiles (H, J) to the height of the carcase. Cut the rails (I, K) to fit between the stiles [**Exploded View**]. With a dado blade, notch the back top rail (I) for the hinges [**Drawing 2**]. Glue the stiles [**Drawing 3**] and rails in place. Finish-sand the carcase.

3 Cut seven blanks ⅜×1⅜×48" for the trim L–Q. Shape both edges of each blank with a classical cove and round bit [**Sources**] in your table-mounted router [**Drawing 4**]. Rout a centered groove in four blanks.

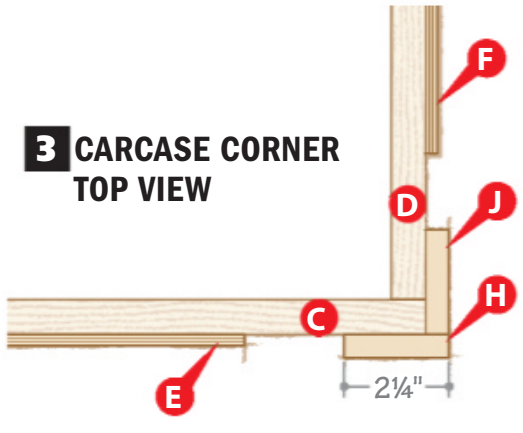
4 Rip the grooved blanks in half for the panel trim (L, M, N) [**Photo D**]. Rout a round-over on the inside edge [**Drawing 5, Photo E**]. Rip the edges of the remaining blanks to make the rail and stile trim (O, P, Q) [**Drawing 6**].

Note: *Groove depth must match the thickness of your face panels (E, F). Adjust as necessary.*

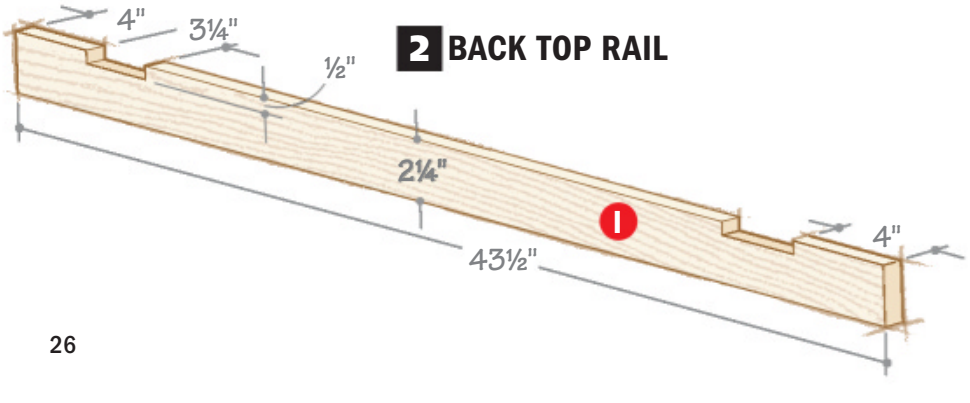
1 CARCASE ASSEMBLY



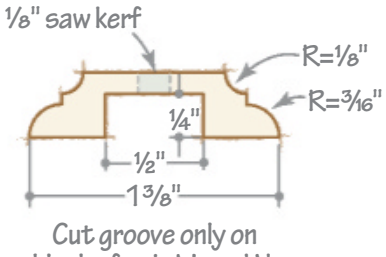
3 CARCASE CORNER TOP VIEW



2 BACK TOP RAIL

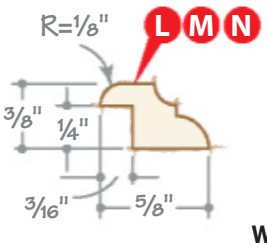


4 TRIM BLANK

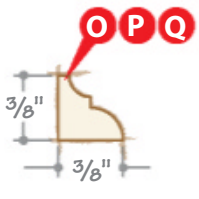


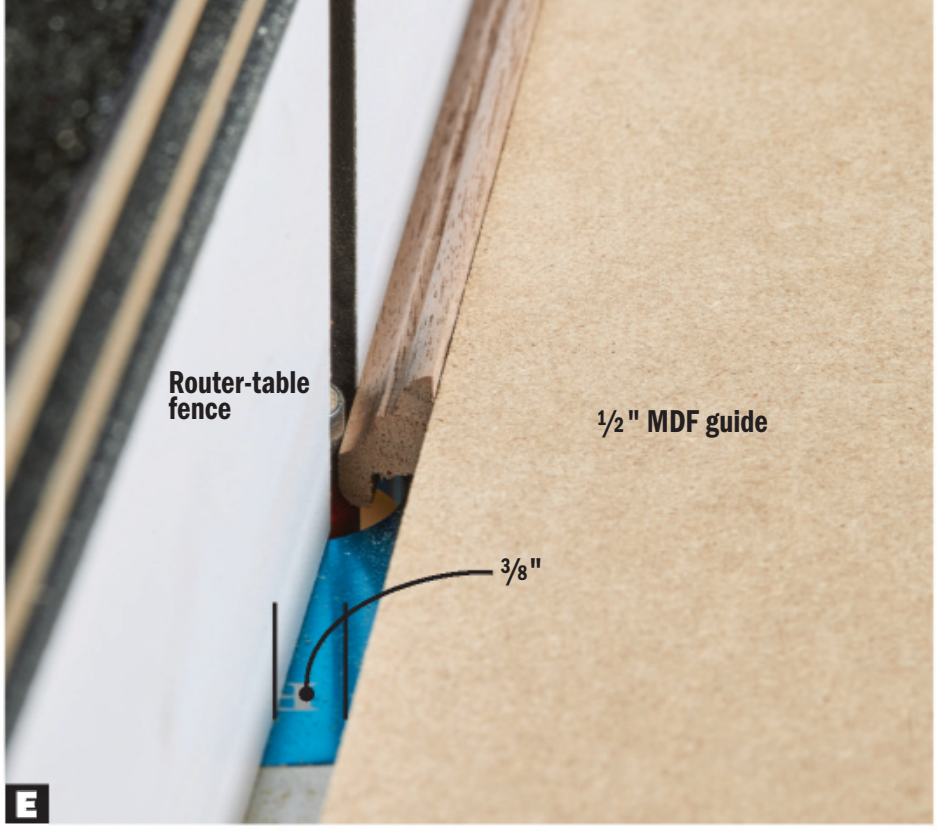
Cut groove only on blanks for L, M, and N.

5 FACE PANEL TRIM



6 STILE/RAIL TRIM





Clamp an MDF guide to the router table ⅜" from the fence to capture the trim when routing the round-over on the inside edge of L, M, and N.

Precisely fit the panel trim by marking the joint corners with a knife. A piece of scrap trim, or a good piece not yet miter-cut, aids accurate marking.

5 Miter-cut trim L, M, and N to fit around the face panels (E, F) [**Exploded View**, **Photo F**]. Affix the trim with glue and 23-gauge pins. Cut and install the rail and stile trim.

The base and lid finish the job

1 Cut the base front, back, and sides (R, S) to width and about 1" longer than shown [**Exploded View**]. Round over the outside top edges, and finish-sand. Miter-cut the pieces and glue them to the bottom of the carcase, centered.

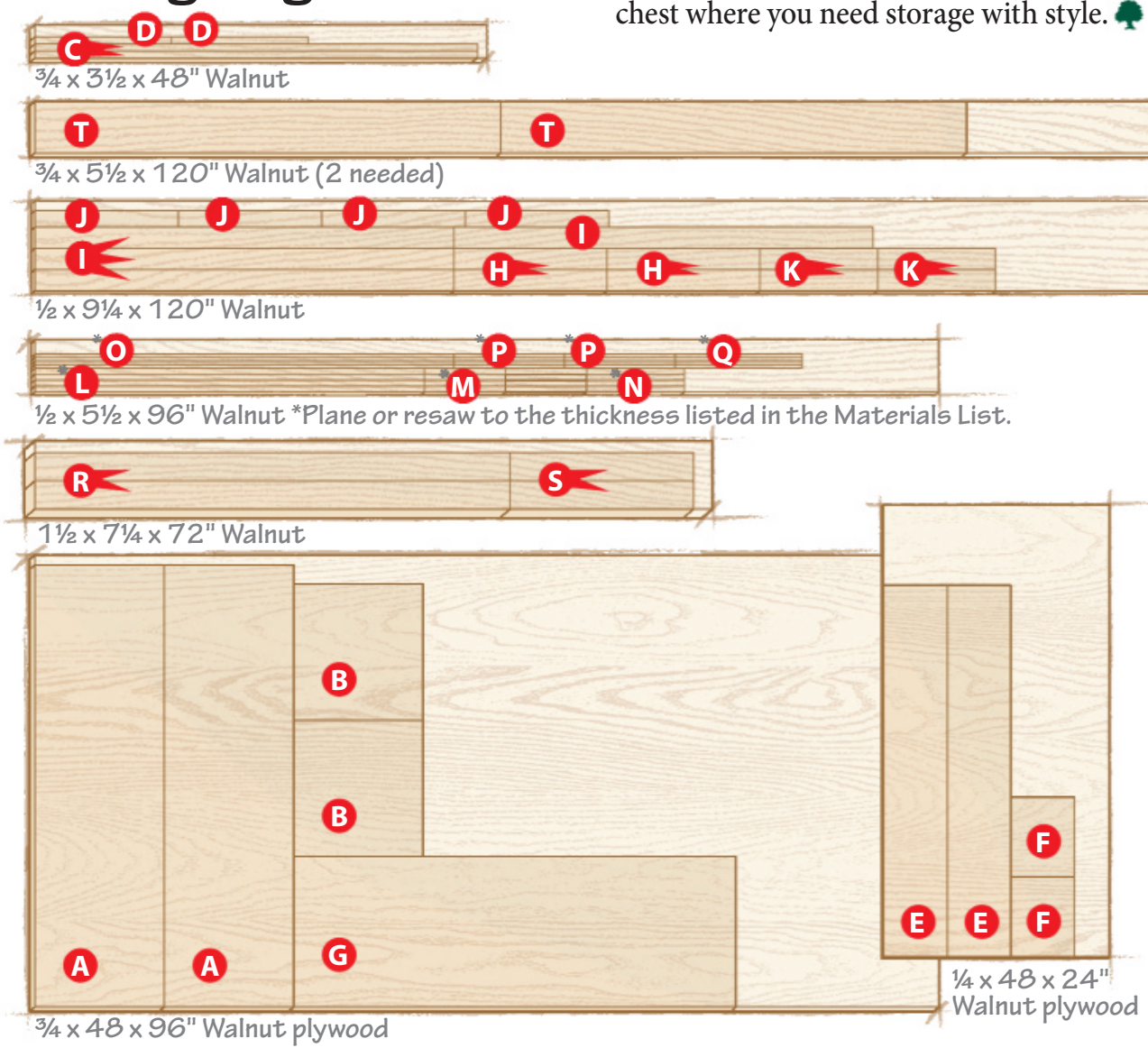
2 Edge-glue and cut to size a panel for the lid (T). Round over the top edge [**Exploded View**], and finish-sand the lid.

3 Drill pilot holes and temporarily attach the hinges to the carcase. Center the lid on the carcase, mark the hinge locations on the lid, drill pilot holes, and remove the hinges for finishing.

4 Touch up the sanding as necessary and apply a finish. (We sprayed on three coats of clear satin water-based polyurethane.)

5 After the finish dries, attach the hinges and install rubber bumpers where the lid contacts the front top rail. Then, place the chest where you need storage with style.

Cutting Diagram



Produced by **Larry Johnston** with **Kevin Boyle**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine, Lorna Johnson**

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Carcase						
A	front/back	¾"	47"	13¾"	WP	2
B	sides	¾"	14½"	13¾"	WP	2
C	front/back cap	¾"	¾"	47"	W	2
D	side cap	¾"	¾"	14½"	W	2
E	front/back face panels	¼"	39½"	6¾"	WP	2
F	side face panels	¼"	8½"	6¾"	WP	2
G	case bottom	¾"	16"	47"	WP	1
Panel trim						
H*	front/back stiles	½"	2¼"	15¼"	W	4
I*	front/back rails	½"	2¼"	43½"	W	4
J*	side stiles	½"	1¾"	15¼"	W	4
K*	side rails	½"	2¼"	12½"	W	4
L*	front/back panel trim rails	⅜"	⅝"	40⅜"	W	4
M*	panel trim stiles	⅜"	⅝"	7⅝"	W	8
N*	side panel trim rails	⅜"	⅝"	9⅜"	W	4
O*	front/back rail trim	⅜"	⅜"	43½"	W	4
P*	stile trim	⅜"	⅜"	10¾"	W	8
Q*	side rail trim	⅜"	⅜"	12½"	W	4
Base and lid						
R*	base front/back	1½"	3"	49½"	W	2
S*	base sides	1½"	3"	18½"	W	2
T*	lid	¾"	18½"	49½"	EW	1

*Parts initially cut oversize. See the instructions.

Materials key: WP–walnut plywood, W–walnut, EW–edge-glued walnut.
Supplies: #8×1½" flathead wood screws, 23-gauge pins, rubber lid bumpers.
Blade and bits: Dado set; classical cove and round, ½" straight, and ⅛" round-over router bits.
Sources: Lid-Stay torsion hinges, rustic bronze finish, one each 40 inch-pound (no. 34899) and 60 inch-pound (no. 34353), $35 each, rockler.com; Freud 38-612 1⅛" classical cove and round bit, $50, woodmagazine.com/coveandround. Opening photo, *page 24*, *Better Homes & Gardens* brand comforter and blankets, Grayson canopy bed in gray (shown) or oatmeal, walmart.com/bhg.

One-Wall Workshop
Drill Holder & Hardware Rack

Keep drills and fasteners handy with this pair of organizers.

DRILL HOLDER

DIMENSIONS: 10½" W × 9¼" D × 4¾" H

Approximate materials cost: **$14**

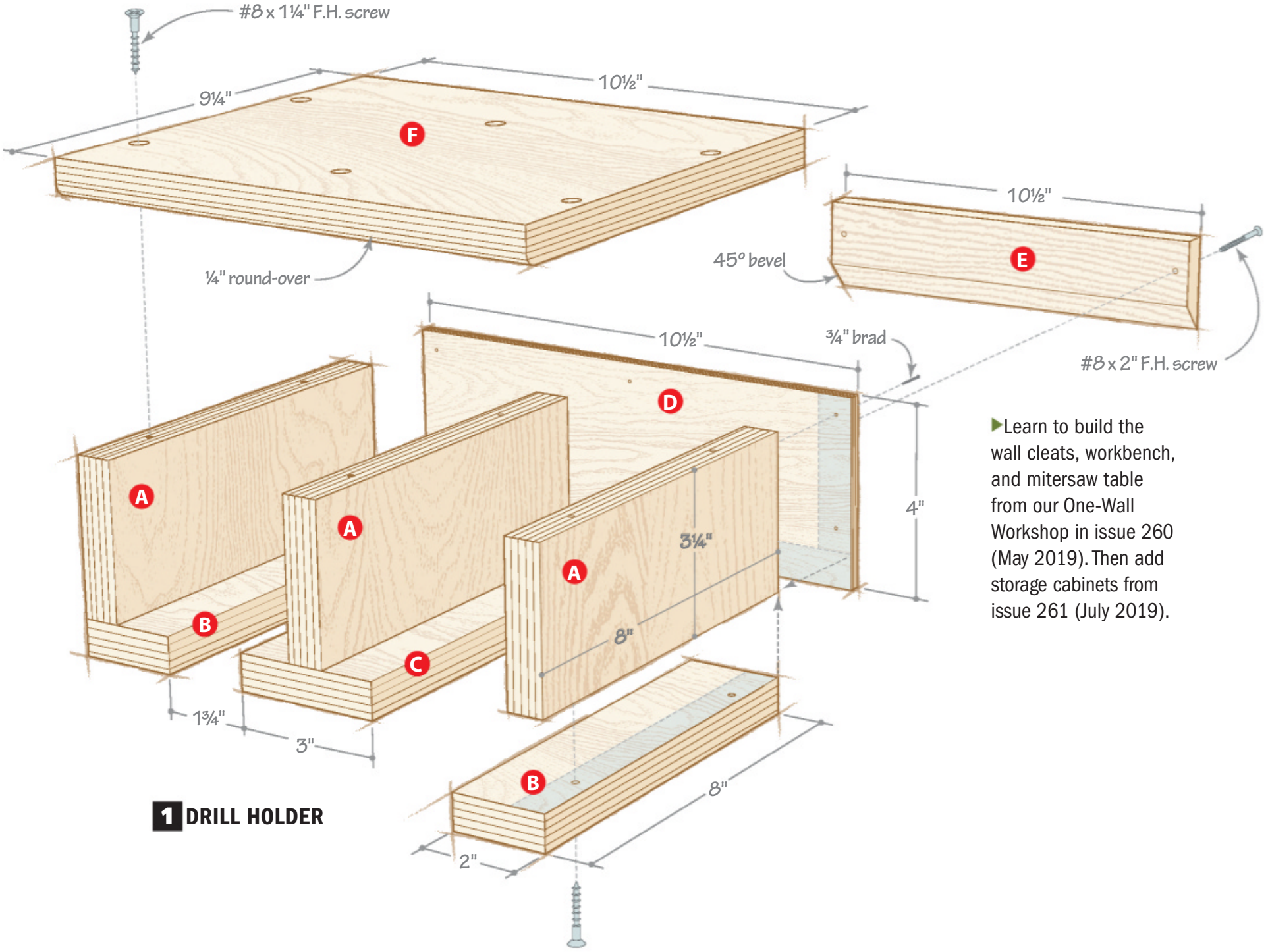
Build this rack with scraps from other One-Wall Workshop projects.

HARDWARE RACK

DIMENSIONS: 10½" W × 4¾" D × 15⅜" H

Approximate materials cost: **$20**

Store 10 boxes of the fasteners you use the most.



1 DRILL HOLDER

▶Learn to build the wall cleats, workbench, and mitersaw table from our One-Wall Workshop in issue 260 (May 2019). Then add storage cabinets from issue 261 (July 2019).

Begin with a drill holder

This rack holds most cordless drills, drivers, and pneumatic brad nailers. Check that the bodies and handles of your tools will fit before cutting parts to size [**Photo A**].

1 Cut the drill holder parts (A–F) to size [**Drill Holder Materials List**, *page 31*]. Glue and screw the end shelves (B) to the sides (A), and the center shelf (C) to the divider (A) [**Drawing 1**].

2 Glue and nail the back (D) to the A/B and A/C assemblies. Rout a 45˚chamfer along one edge of the hanging cleat (E). Glue and screw the cleat to the back and sides.

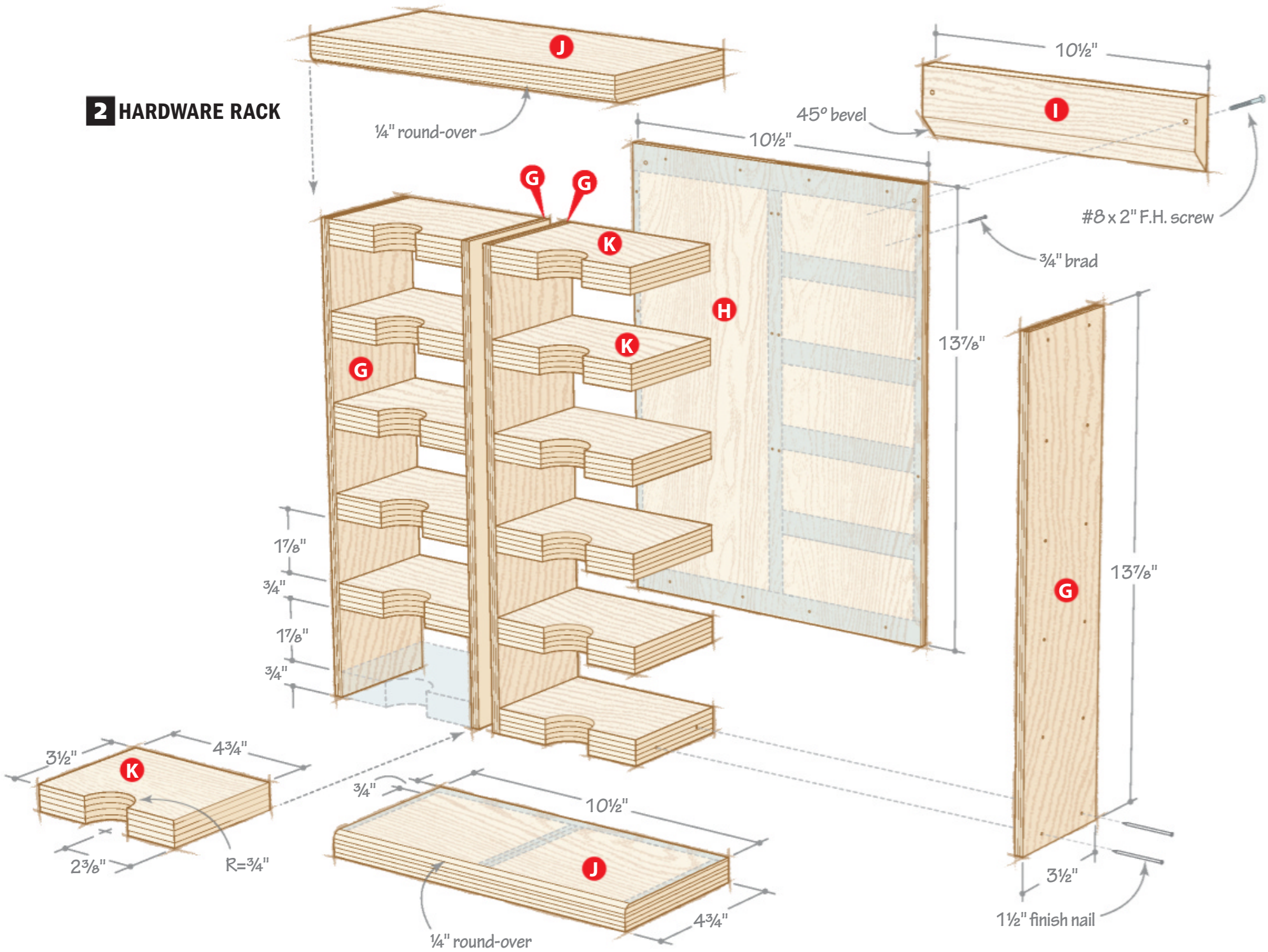
3 Round over one edge of the top (F). Glue and screw the top to the A–E assembly.

4 Apply three coats of wipe-on polyurethane and hang the holder on a wall cleat.

Note: *To install the rack in a shop without French cleats, omit the hanging cleat (E), cut the top (F) ¾" narrower, and fasten the rack to a wall using washer-head screws.*

Check the size of a side/divider (A) against your largest tool, and adjust the part sizes as needed.

2 HARDWARE RACK



Now organize those fasteners

Slots in this hardware rack hold 1⅞×3½×4⅝" nail and screw cartons. Check the dimensions of the fastener packages in your shop and adjust the part sizes and spacing as needed.

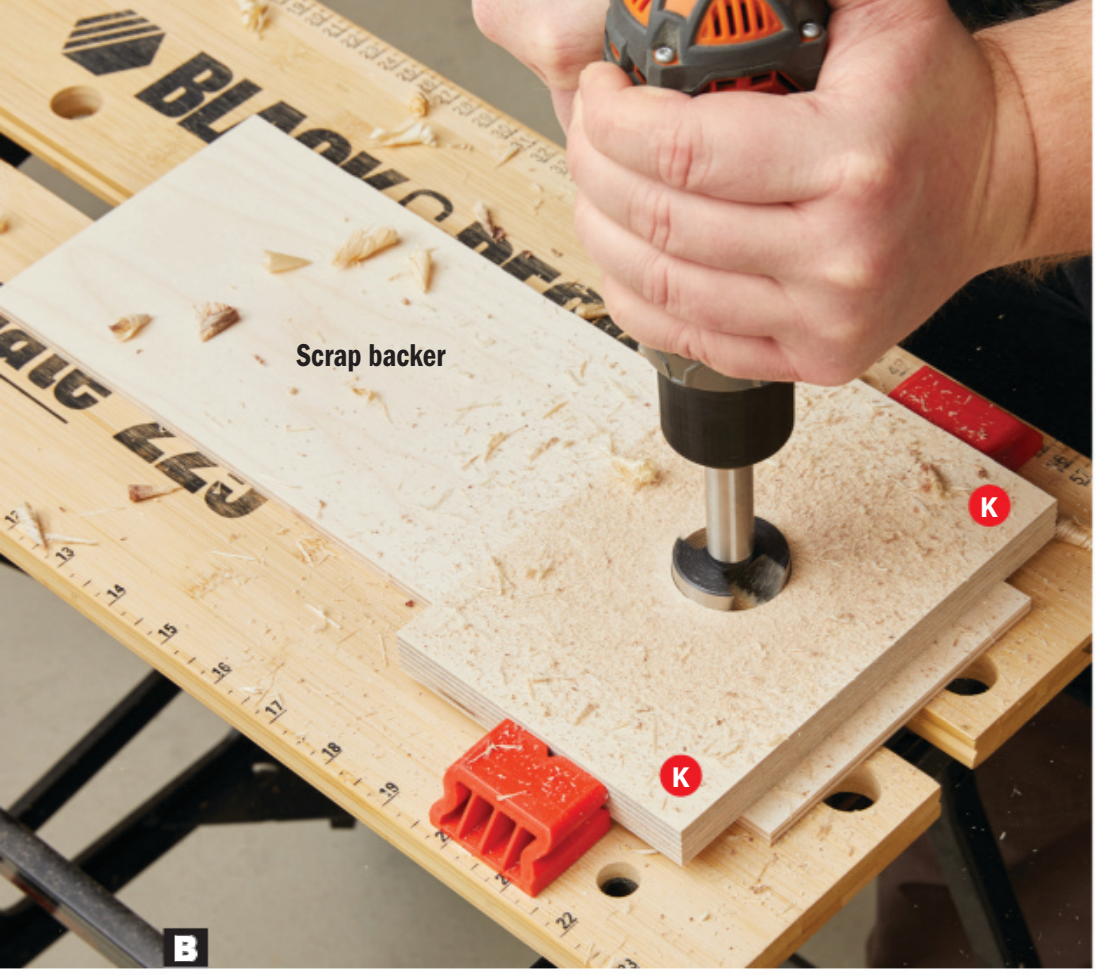
1 Cut parts G–J to size [**Hardware Rack Materials List**].

2 Cut six 7⅛×4¾" blanks for the shelves (K). Drill a centered 1½" hole in each blank [**Photo B**]. Then cut each shelf to size [**Photo C**].

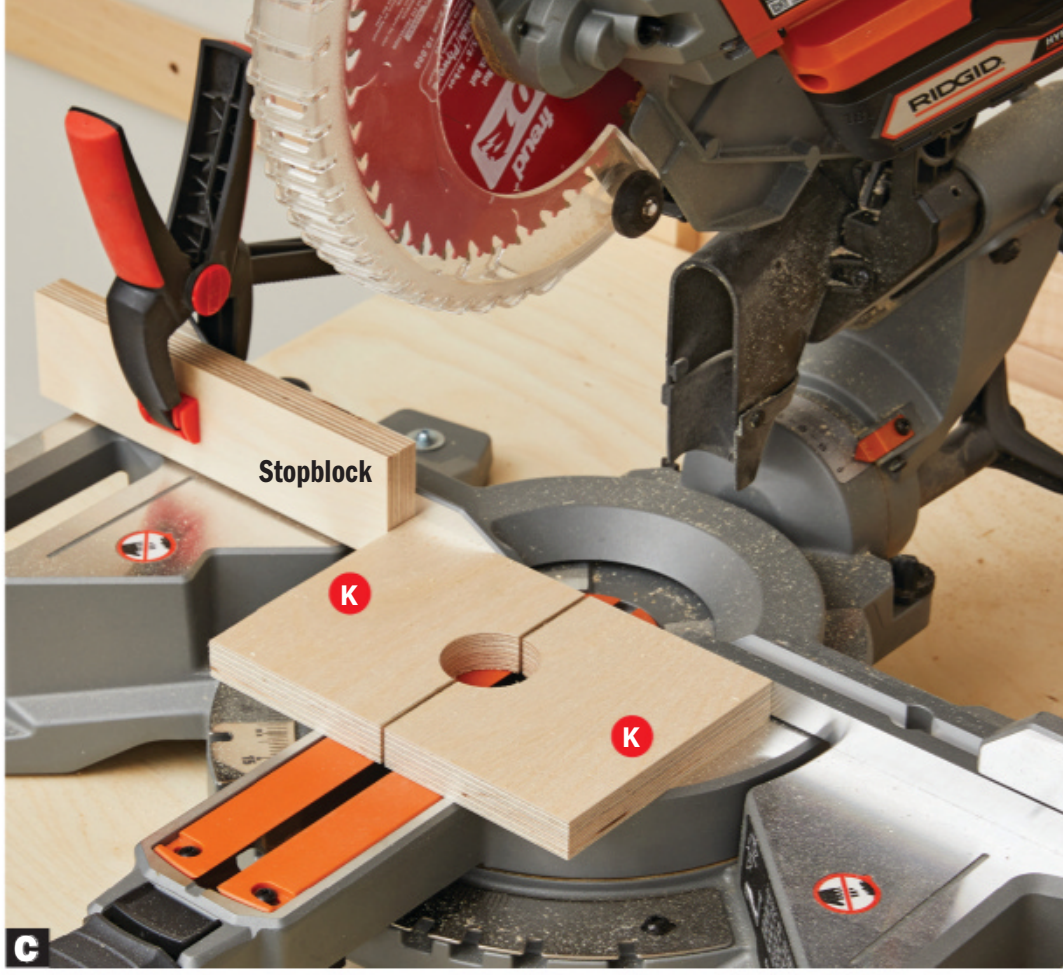
3 From scrapwood, cut a spacer 1⅞" long. Glue and nail the shelves (K) to the sides (G) [**Drawing 2, Photo D**]. Repeat for the second assembly and glue the assemblies together.

4 Glue and nail the back (H) to the rack assemblies (G/K). Chamfer one edge of the hanging cleat (I), then glue and screw it to the back.

▶The blank size assumes your saw cuts a ⅛" kerf. For a narrow-kerf blade, cut the shelf blanks 7⅛₁₆×4¾".



Clamp a shelf (K) blank firmly in place atop a scrap backer to safely drill a clean 1½" hole.

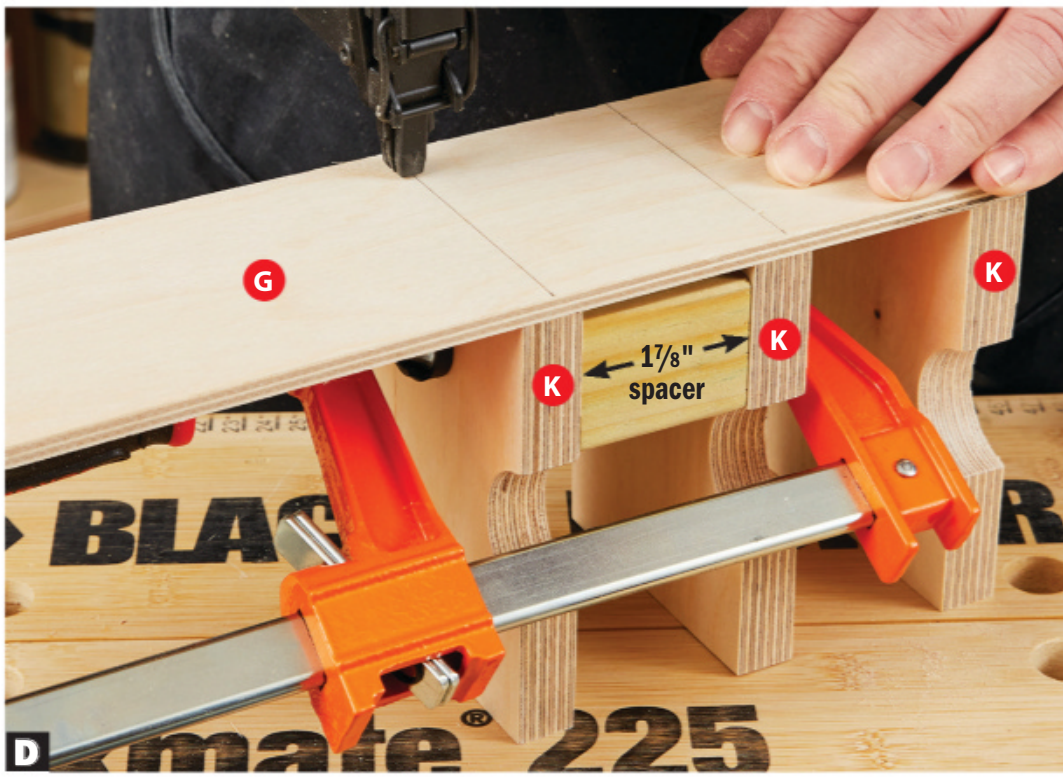


Install a stopblock to cut shelves (K) to a consistent width.

5 Round over one front edge of the top and bottom (J), then glue them in place.

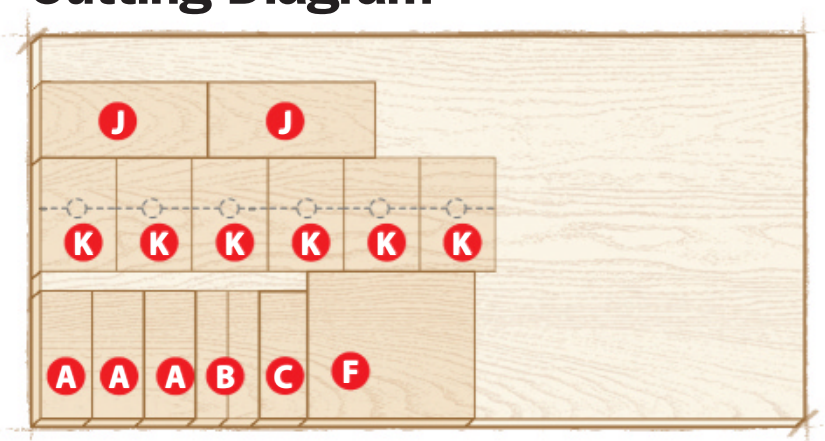
6 Apply three coats of wipe-on polyurethane and hang the rack.

Produced by **Robert Wilson** with **John Olson**
Project design: **John Olson**
Illustrations: **Roxanne LeMoine, Lorna Johnson**

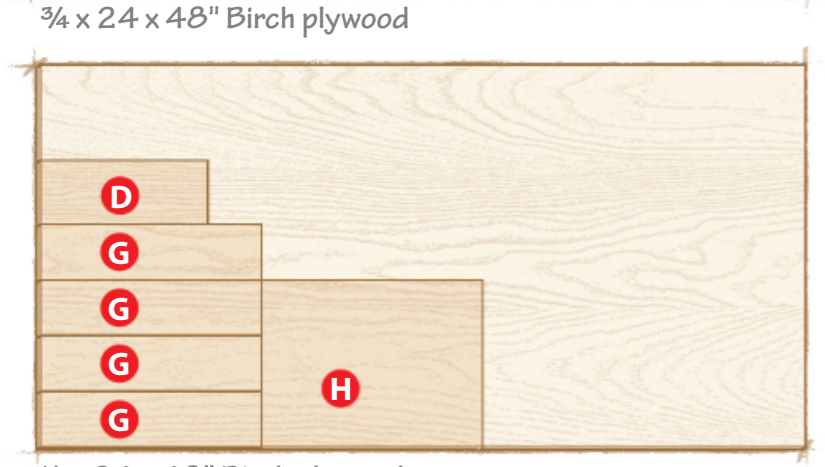


Apply glue to a shelf (K) edge, position it with the help of a spacer, then nail the shelf in place.

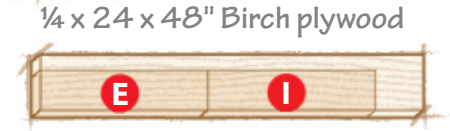
Cutting Diagram



¾ x 24 x 48" Birch plywood



¼ x 24 x 48" Birch plywood



¾ x 3½ x 24" Maple

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Drill holder						
A	sides/divider	¾"	8"	3¼"	BB	3
B	end shelves	¾"	8"	2"	BB	2
C	center shelf	¾"	8"	3"	BB	1
D	back	¼"	4"	10½"	BB	1
E	hanging cleat	¾"	2½"	10½"	M	1
F	top	¾"	9¼"	10½"	BB	1

Materials key: BB-Baltic birch plywood, M-maple.
Supplies: #8×2" flathead screws, #8×1¼" flathead screws, ¾" brads.
Bits: ¼" round-over and 45° chamfer router bits.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Hardware rack						
G	sides	¼"	3½"	13⅞"	BB	4
H	back	¼"	10½"	13⅞"	BB	1
I	hanging cleat	¾"	2½"	10½"	M	1
J	top/bottom	¾"	4¾"	10½"	BB	2
K*	shelves	¾"	3½"	4¾"	BB	12

* Parts initially cut oversize. See the instructions.

Materials key: BB-Baltic birch plywood, M-maple.
Supplies: #8×2" flathead screws, 1½" finish nails, ¾" brads.
Bits: ¼" round-over and 45° chamfer router bits; 1½" holesaw or Forstner bit.

Five ways to slice

Breadboard Ends

Enhance the look and stability of solid-wood tabletops, lids, and doors.

Capping the ends of a solid-wood panel with rails hides end grain and prevents the panel from cupping, all while allowing for seasonal expansion and contraction.

The basics

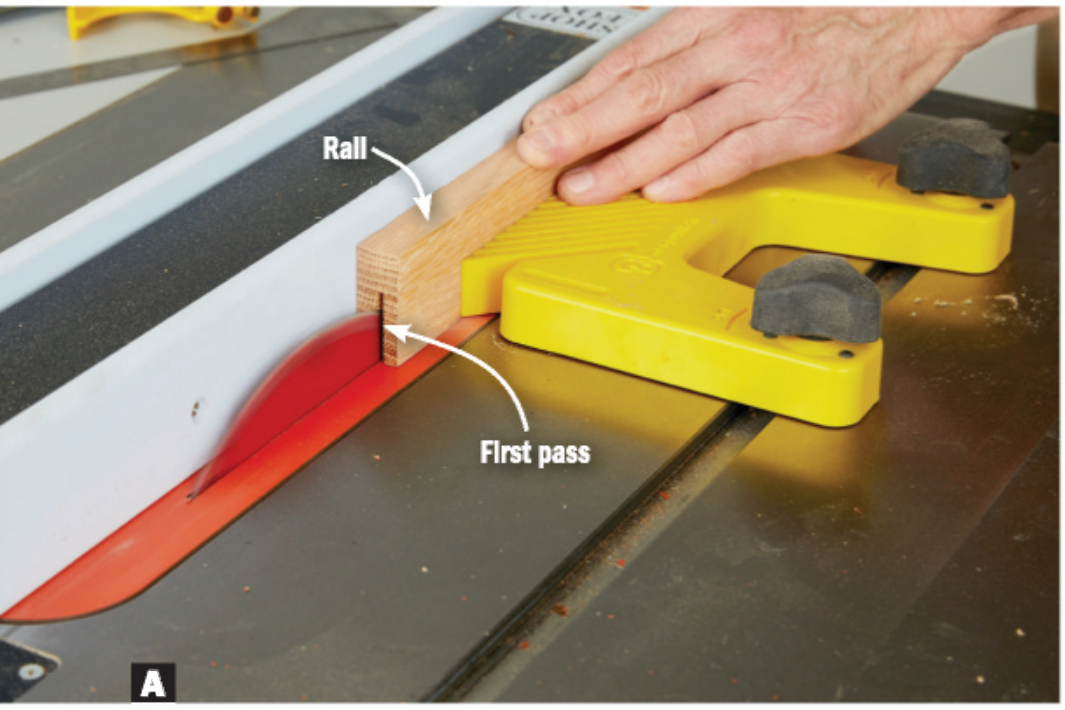
In this article you'll become familiar with five types of breadboard ends, each with its own purpose and level of complexity. But all breadboard ends share certain traits: Each comprises a grooved rail, typically 2–3" wide, mated to a tongue on the end of a panel. The groove width equals one-third the panel thickness; its depth measures two-thirds the rail width. The rail attaches to the panel tongue with dowels, fixing its center and allowing for wood movement toward the edges.

Plan for wood movement

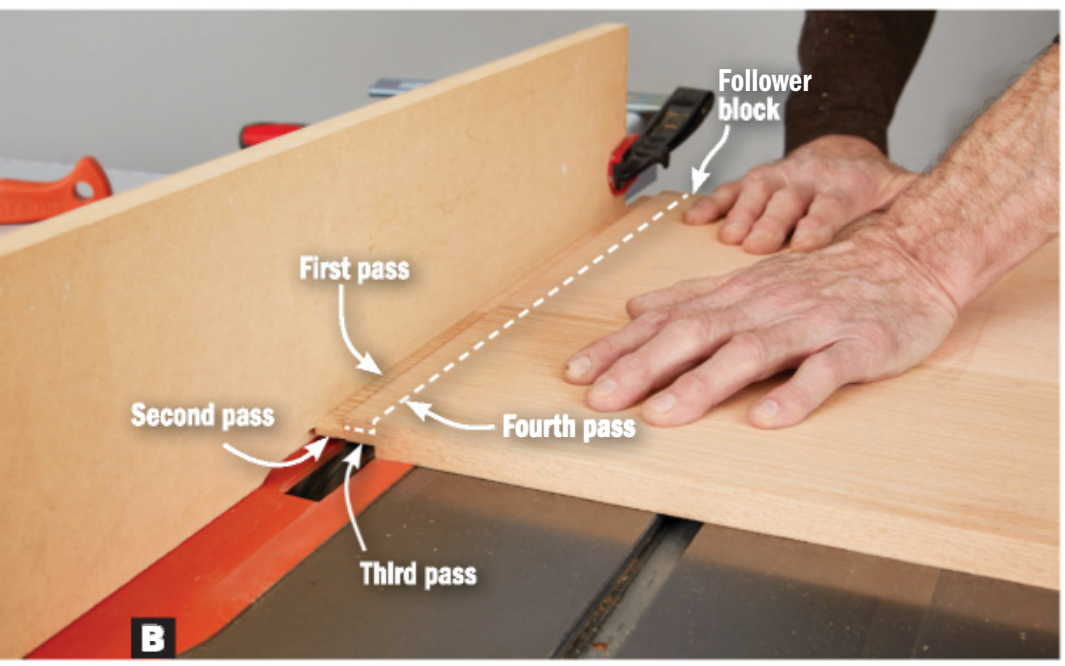
Wood expands and contracts most across its width but changes only slightly lengthwise. So, the breadboard rail should be long enough to prevent the panel edges from protruding beyond the rail ends at the most humid time of year. Flatsawn panels move about ¼" for every 12" of width; quartersawn, about ⅛". (This accommodates an annual change of 8 percent moisture content—plenty for most parts of the country.) So, for a 24"-wide flatsawn panel built in the dryness of winter (panel at maximum shrinkage), cut the rail ½" longer, so the ends protrude ¼" beyond each panel edge. For the same panel built in summer humidity (panel at maximum expansion), make the rail ends flush with the panel edges.

▶Learn more about flat-, rift-, and quartersawn boards. woodmagazine.com/logsawing

Full-length tongue and groove: Simple as possible



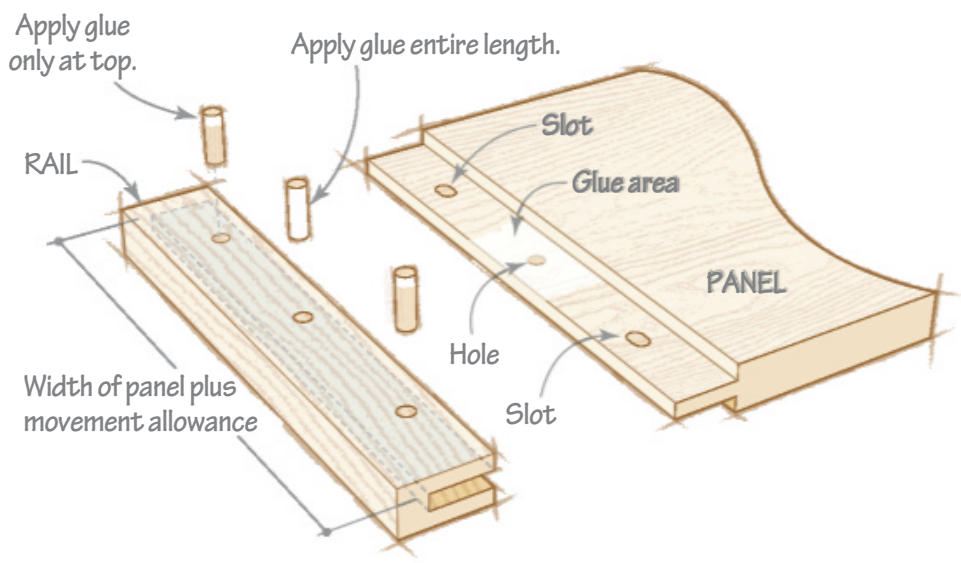
Plow a groove in the rail in two passes, making one pass with each face against the fence to ensure a centered groove.



Form a tongue on the panel, using a follower block to prevent chip-out. Use a dado set, start shallow, and make progressively deeper passes until the tongue fits snugly in the rail groove.

Drill ¼" holes for dowels, either all the way through to expose the dowels, or from the bottom, stopping ⅛" from the top surface, to conceal them.

Form a basic tongue-and-groove joint with open ends [**Photos A–D**]. Tap dowels into place, gluing the center dowel to the rail and panel tongue, and the outer dowels only to one groove cheek. With the glue dry, trim and sand the dowels flush.



Tip! *To ensure a tight-fitting rail, draw-bore the hole and slots in the panel tongue. First, drill only through the rail. Then, fit the rail on the panel tongue and mark the hole centers. Position the router guide to move the hole and slots 1/32" closer to the tongue shoulder; then, plunge the center hole and rout the outer slots. The resulting slight offset draws the rail against the panel as you drive the dowels.*

Elongate the outer holes in the tongue one-half of the total panel movement allowance in both directions with a plunge router and ¼" upcut spiral bit.

Sliding dovetail: A classic look

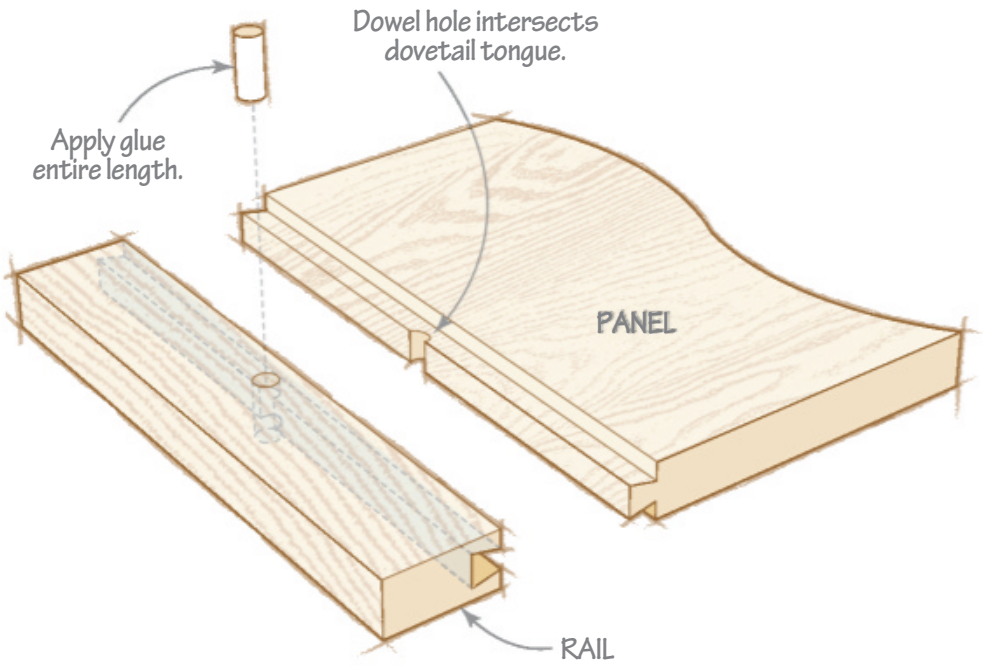
E

Set a dovetail bit at maximum cutting height, center it in the sawn groove, and make two passes over the bit, one with each face of the rail against the fence.

A decorative and structural sliding-dovetail joint requires pinning only at its center. Start by cutting a centered 3/16"-wide groove in the rail, slightly shallower than the height of the dovetail bit [**Photo A**]. Complete the dovetail groove [**Photo E**]. Leave the dovetail bit at the same height, move the fence to expose only a portion of the bit, and form a mating dovetail tongue on the panel [**Photo F**]. Install the rail on the panel [**Photo G**]. Drill a hole centered on the rail length that intersects the dovetail tongue, and glue in a dowel. Trim and sand the dowel flush.

Note: *Sawing a slot in the rail removes excess material, making it easier to rout the dovetail slot while also reducing burning.*

Tip! *Even a carefully constructed panel can cup when left to sit. To hold a cupped panel flat, clamp a jointed board to the panel* [**Photos F** *and* **G**].



F

Form a centered dovetail tongue on the panel, routing on both sides. Start shallow and move the fence back in small increments until the end rail slides on, snug but not tight.

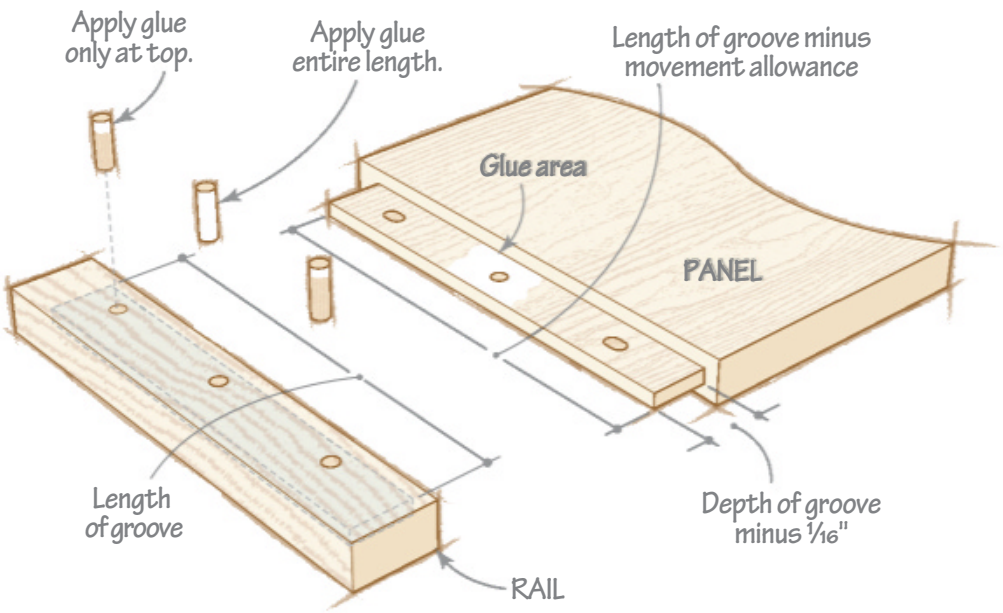
G

Draw the rail onto the panel using a bar clamp. Do not apply glue.

Stopped tongue and groove: A clean look

To draw as little attention as possible to the joint, conceal it. First, groove the rail [**Photo H**]. Form the panel tongue [**Photo B**] and notch the tongue ends [**Photo I**]. Pare the notch flush with the tongue shoulder, using a chisel [**Opening Photo**]. Drill holes, form slots, and install dowels as shown previously.

Form a stopped groove with a series of progressively deeper cuts, using an upcut spiral bit. Position stopblocks to control the cut length and make passes with each face against the fence to center the groove.

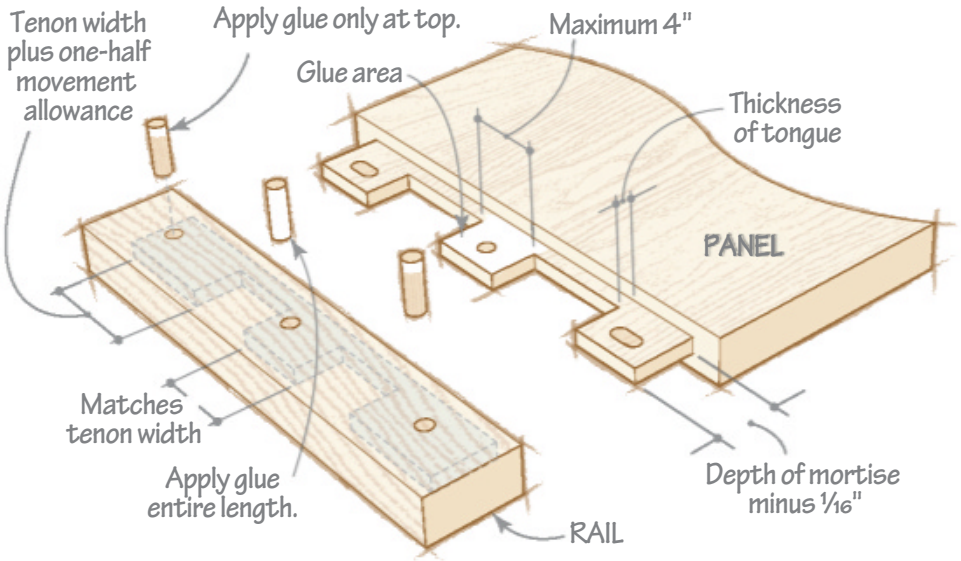


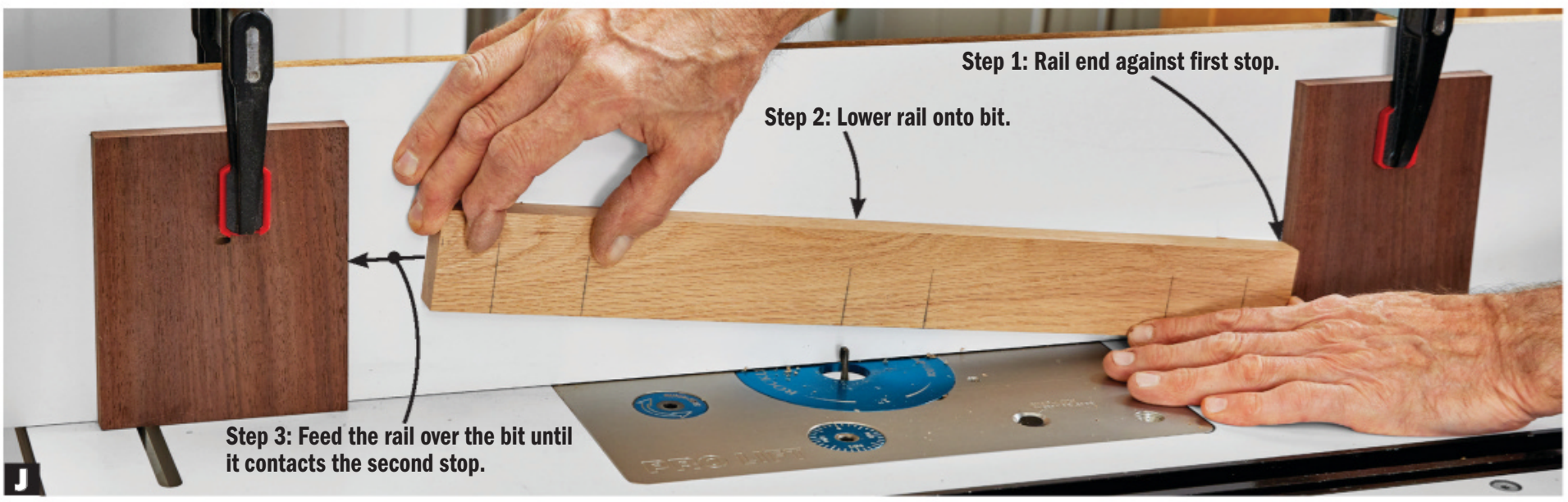
Cut back the tongue ends to fit the rail groove plus an allowance for panel expansion. Position the blade slightly away from the tongue shoulder to avoid nicks.

Mortises and tenons: For wide or thin panels

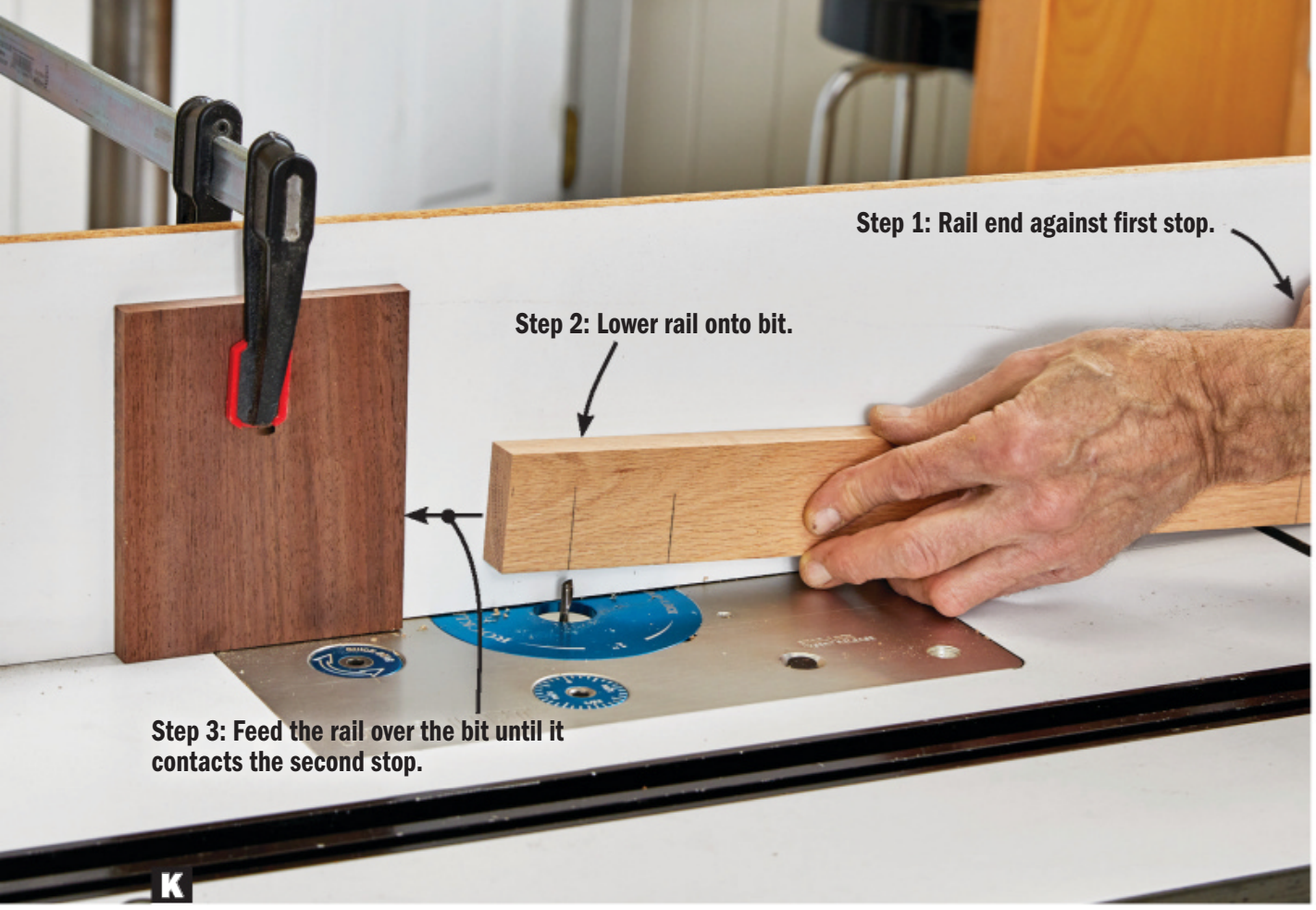
Tip! *Conceal the glue lines by bandsawing the laminations from a single piece of stock thicker than the panel. Then plane them to finished thickness. Add a decorative touch by making the center lamination from a contrasting wood.*

Haunched tenons and mating mortises reinforce the groove cheeks of rails on wide panels (over 24") or when a thin panel (under ¾") dictates thin groove cheeks. Start by forming a shallow stopped groove in the rail, using the method shown in **Photo H**. Without moving the fence, form the mortises [**Photos J** and **K**]. Next, form the panel tongue [**Photo B**]. Then, notch the tongue ends [**Photo I, Opening Photo**]. Cut the tongue to form haunched tenons [**Photo L**]. Drill holes, form slots, and install dowels as shown for a full-length tongue and groove.





Rout the center mortise, making progressively deeper cuts. Position stopblocks to control mortise length and make passes with each face against the fence to center the mortise.



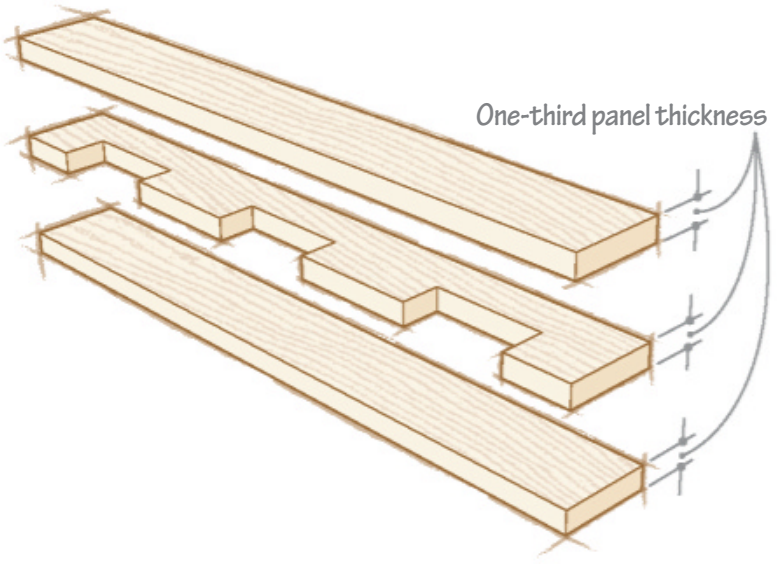
Position the stopblocks to rout the end mortises and make the first passes at each end. Reposition the stopblocks and make the second pass at each end.

Bandsaw the panel tongue to form haunched tenons.

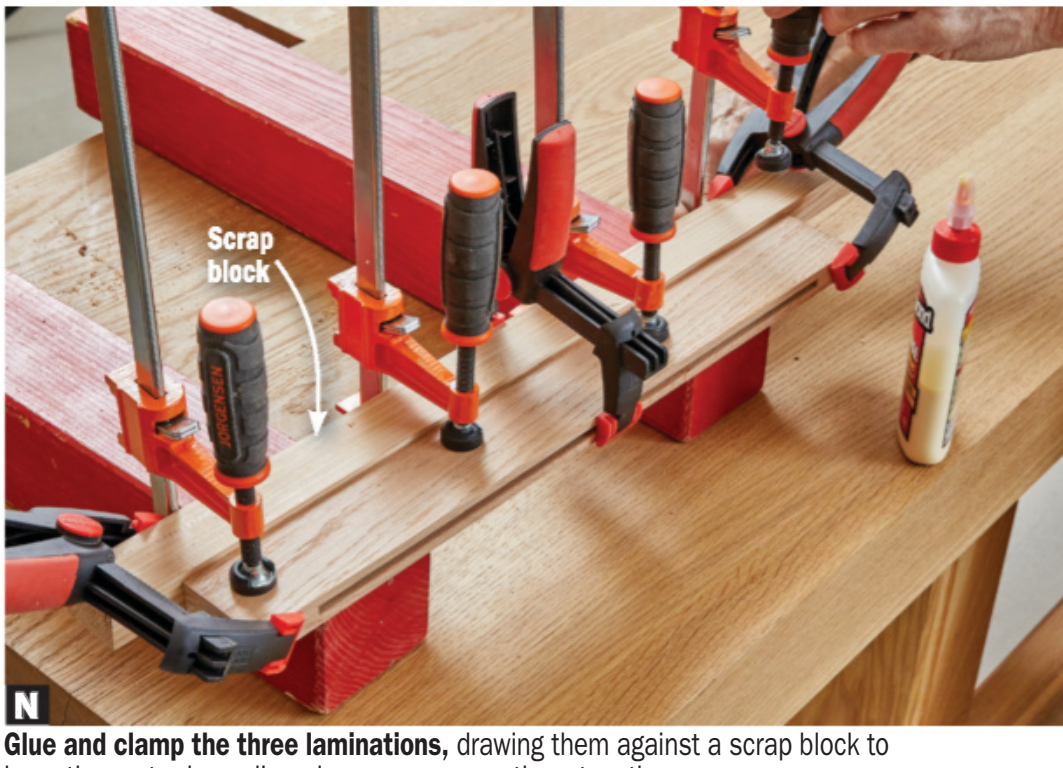
Laminated rail: A simpler route for the rail

Speed up making the rail for the previous two joints by planing three pieces of stock to one-third the thickness of the panel and slightly wider and longer than the finished rail. Then stack-laminate them [**Photos M** and **N**]. (We show laminating a tenoned rail; use the same process for a stopped tongue and groove.) Remove excess glue from the groove and mortises before the glue fully hardens. Joint the rail edges and trim the ends.

Produced by **Jan Svec**
Illustrations: **Lorna Johnson**



Bandsaw notches in the rail center lamination and trim material between them to form mortises and a shallow groove in the laminated rail.



Glue and clamp the three laminations, drawing them against a scrap block to keep the part edges aligned as you squeeze them together.

Perfect-miter Tablesaw Sled Attachment

By William Ng

Add 45° cutting capability to the hyper-precise tablesaw sled from the previous issue.

In *WOOD*® issue 261 (July 2019), I showed how to combine simple math with five quick test cuts to make a tablesaw sled capable of perfect 90° crosscuts. With the attachment shown here, you can use that same sled to cut miters with absolute precision. To make the mitering attachment, you will need the crosscut sled shown in that article, or another means of making a perfect 90° cut. The mitering attachment is easy to build, and you'll learn a two-cut test of its precision—along with a simple accuracy tweak if necessary.

First, cut a perfect L

I used ¾" Baltic birch plywood to build this attachment (and many other shop jigs) because it's flat, strong, and stable. The L-shaped mitering fence must be square at its point, with two straight legs exactly the same length. Here's how to do that.

1 Starting with an 18×18" piece of plywood, use the crosscut sled to cut adjoining edges straight and at precisely 90° [**Photo A**]. Then cut the workpiece to finished size on the tablesaw [**Photo B**].

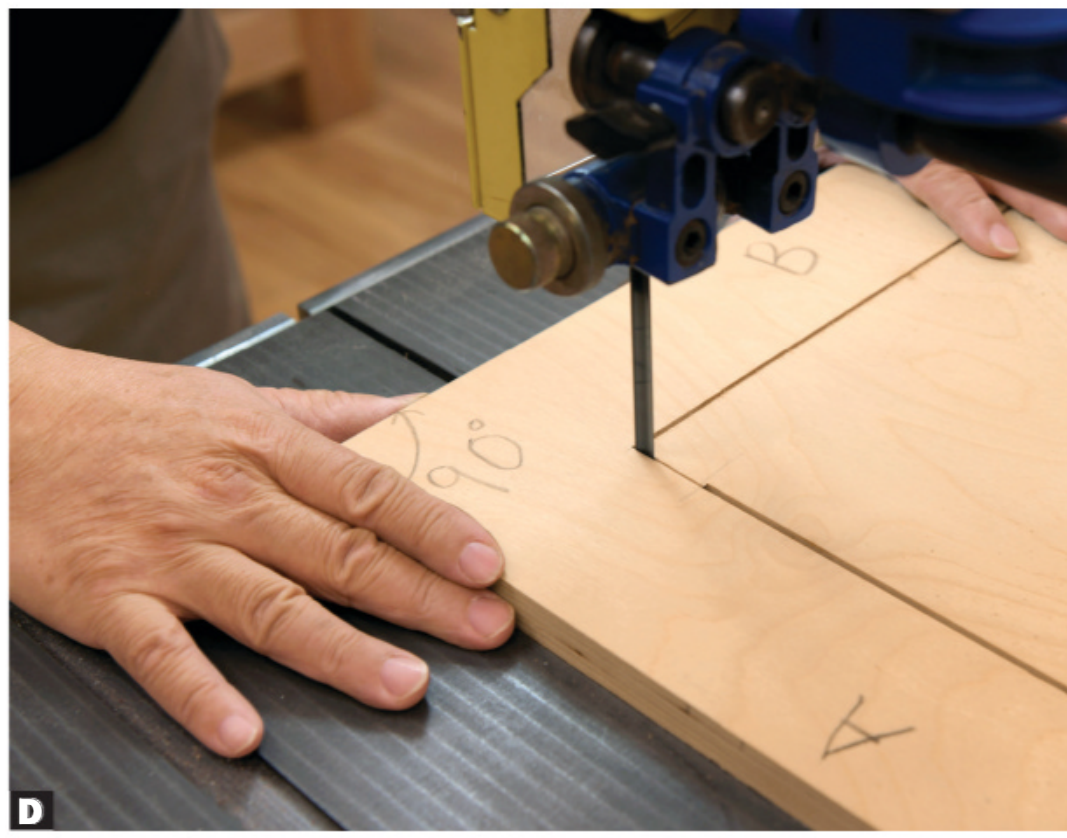
2 Make a stopped cut to form one leg of the L-shaped fence [**Photo C**]. Flip the piece over and cut the other ("B") leg. The cuts won't completely free the L—do that with another tool [**Photo D**].

▶ Hover your smartphone's camera over this code to watch William Ng demonstrate how to make the crosscut sled and this attachment or visit woodmagazine.com/

Cut a square corner, marking one edge “A” and the other “B.”

Make a 17" square by ripping the edges opposite the “A” and “B” edges. Don’t change the rip-fence position between cuts.

Cut the “A” leg 3" wide, stopping 3" short of the “B” edge, as measured on the bottom side of the panel.



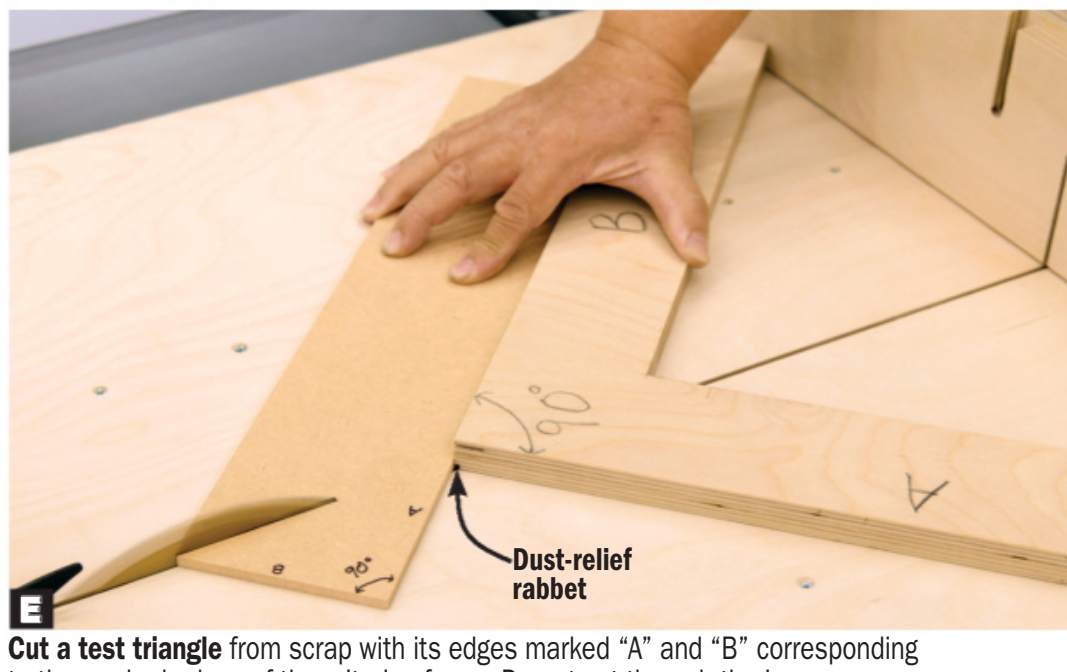
Complete the L cut with a bandsaw, jigsaw, or handsaw. These cuts don’t affect the fence’s accuracy, so their cleanness is only cosmetic.

3 Complete the mitering fence by cutting a ⅛×⅛" dust-relief rabbet along the bottom outside edges [**Photo E**].

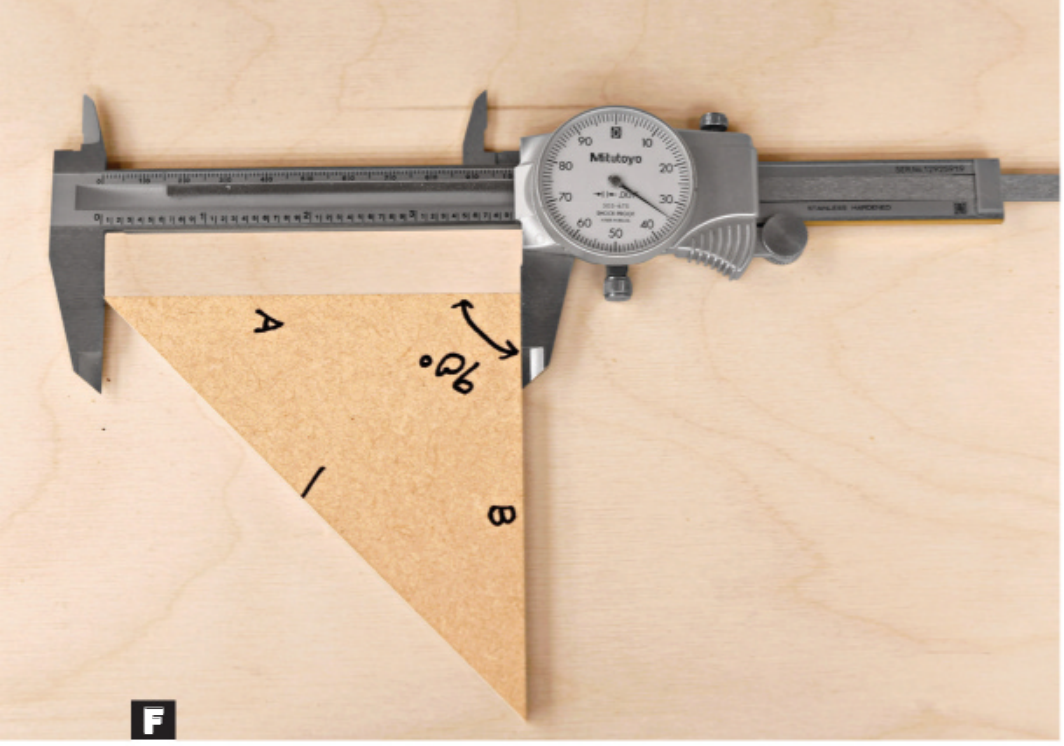
Test, adjust, and complete

If you made the initial squaring cuts with a dead-on-accurate crosscut sled, both legs of the mitering fence will be the same length. But test the setup as follows just to be sure.

1 Place the mitering fence on the sled, with its point centered on the saw kerf, being careful not to bruise its two points contacting the sled’s trailing fence. Use that arrangement to cut a triangle from a scrap about 4" wide and at least 12" long [**Photo E**].

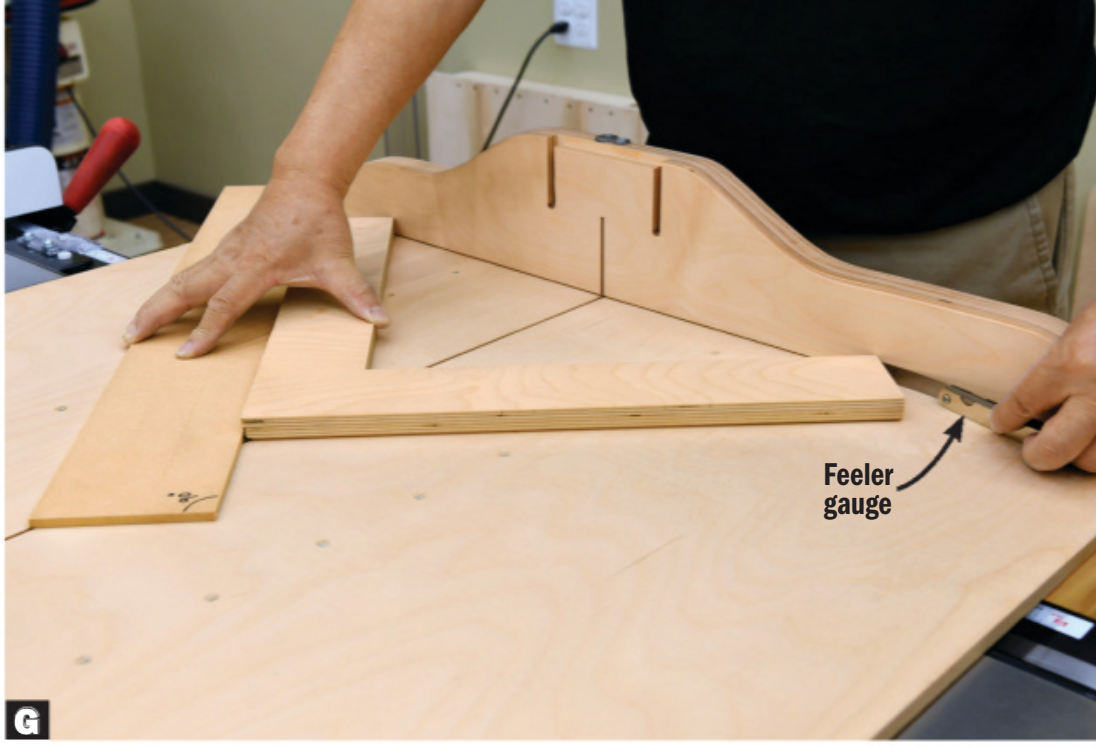


Cut a test triangle from scrap with its edges marked “A” and “B” corresponding to the marked edges of the mitering fence. Do not cut through the L.



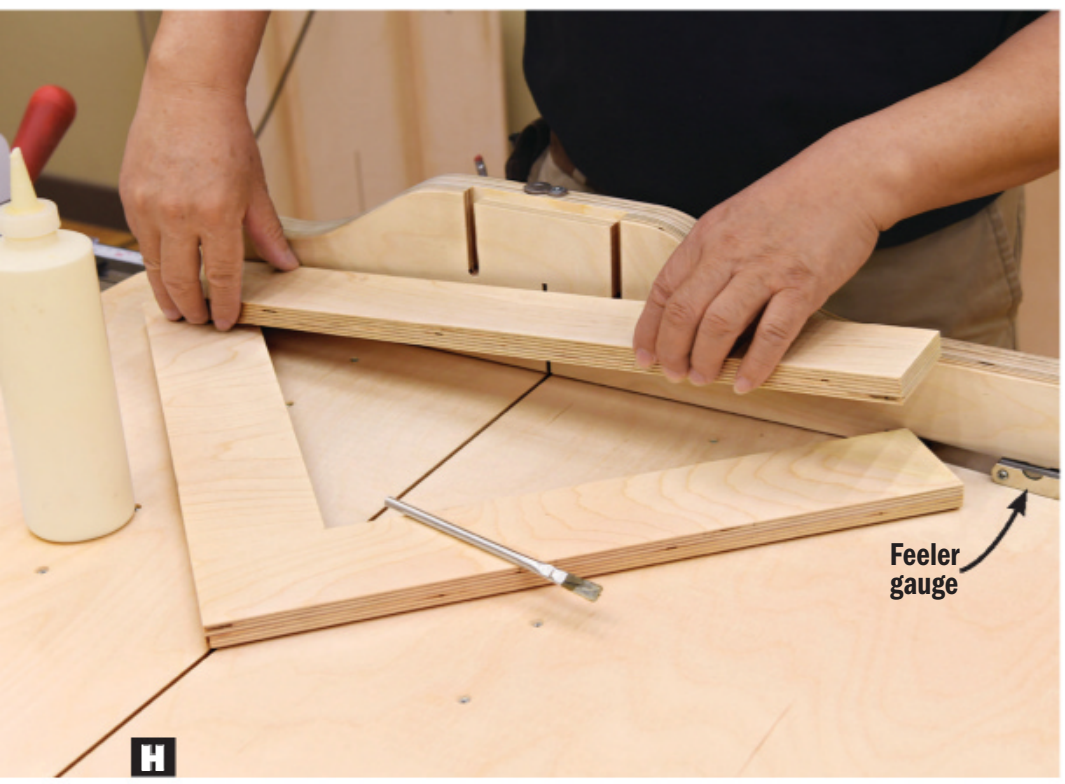
F

Measure for equal short edges on the test triangle using calipers. Be careful in handling the calipers to ensure an accurate reading.



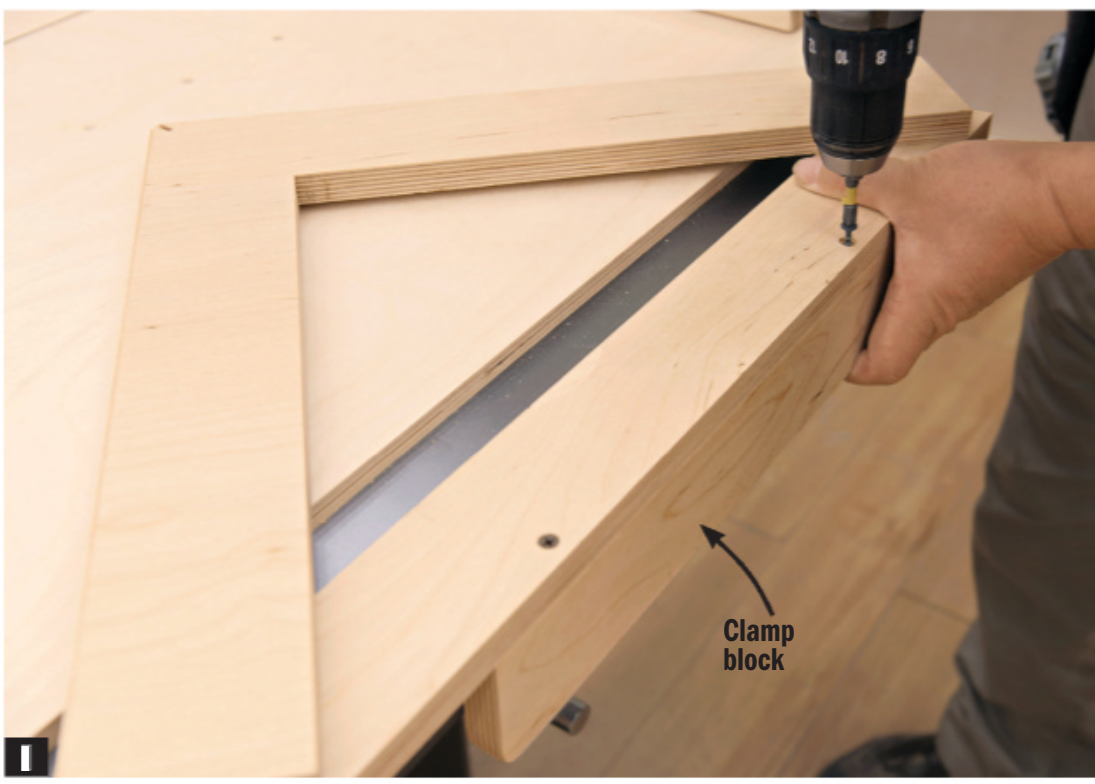
G

Space the short leg using a feeler gauge and cut another test triangle, measure the short edges, and, if needed, calculate any error as you did before.



H

Attach a spanner atop the mitering fence, being careful to maintain the spacing set by the feeler gauge.



I

Glue the clamp block in place, being careful to set it so the edge of the spanner will remain in full contact with the sled's trailing fence. Once the glue dries, add screws.

Note: *Because I offset the crosscut sled base on the saw kerf to provide better flexibility in setting stops, this mitering attachment will likewise be offset on the fence. That limits the length of workpieces you can cut on the left side to about 19". (On the right side you can cut pieces that extend past the sled.) If you must cut workpieces longer than 19" on both sides, build another crosscut sled with a centered kerf.*

2 Measure the "A" and "B" edges of the test triangle [**Photo F**]. They should be equal. If not, use this formula to determine how far to adjust one leg of the mitering fence: (A–B) ÷ 2 ÷ width of test piece × length of miter fence on outside edge. For example, a test triangle I recently cut measured 3.936" on the "A" edge and 3.946" on the "B" edge, yielding the following result: (3.936 – 3.946) ÷ 2 ÷ 4 × 17 = –.021.

This result means the "A" leg will have to be spaced .021" from the sled's trailing fence, essentially making that leg longer. Whether the result of the equation is a positive or negative number, you should space the leg that has the same letter designation as the shorter side of the test triangle. So, if the results of the test were reversed (A=3.946 and B=3.936), you would space the "B" leg instead of the "A" leg.

3 Use a feeler gauge to space one leg [**Photo G**], then cut another test triangle. The mitering fence should be spot-on, but respace it if necessary.

4 Once you're sure of the spacing, glue a 3"-wide plywood spanner to the ends of the mitering-fence legs so the spanner edge fully contacts the sled's trailing fence [**Photo H**]. Hold the spanner in place until the glue tacks up, or speed things up by adding a few brads.

5 After the glue dries, attach a clamp block atop the spanner for clamping the miter attachment to the crosscut sled [**Photo I**, **Opening photo**]. That's it—you're ready to make the most accurate miters of your life!

Photos: **William Ng**

William Ng brings an engineering background to his woodworking, emphasizing accuracy and efficiency (with a dash of humor added) in his classes at the William Ng School of Fine Woodworking in Anaheim, Calif. wnwoodworkingschool.com

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Kids' haven Playhouse

The big bad wolf won't blow down this tiny house.

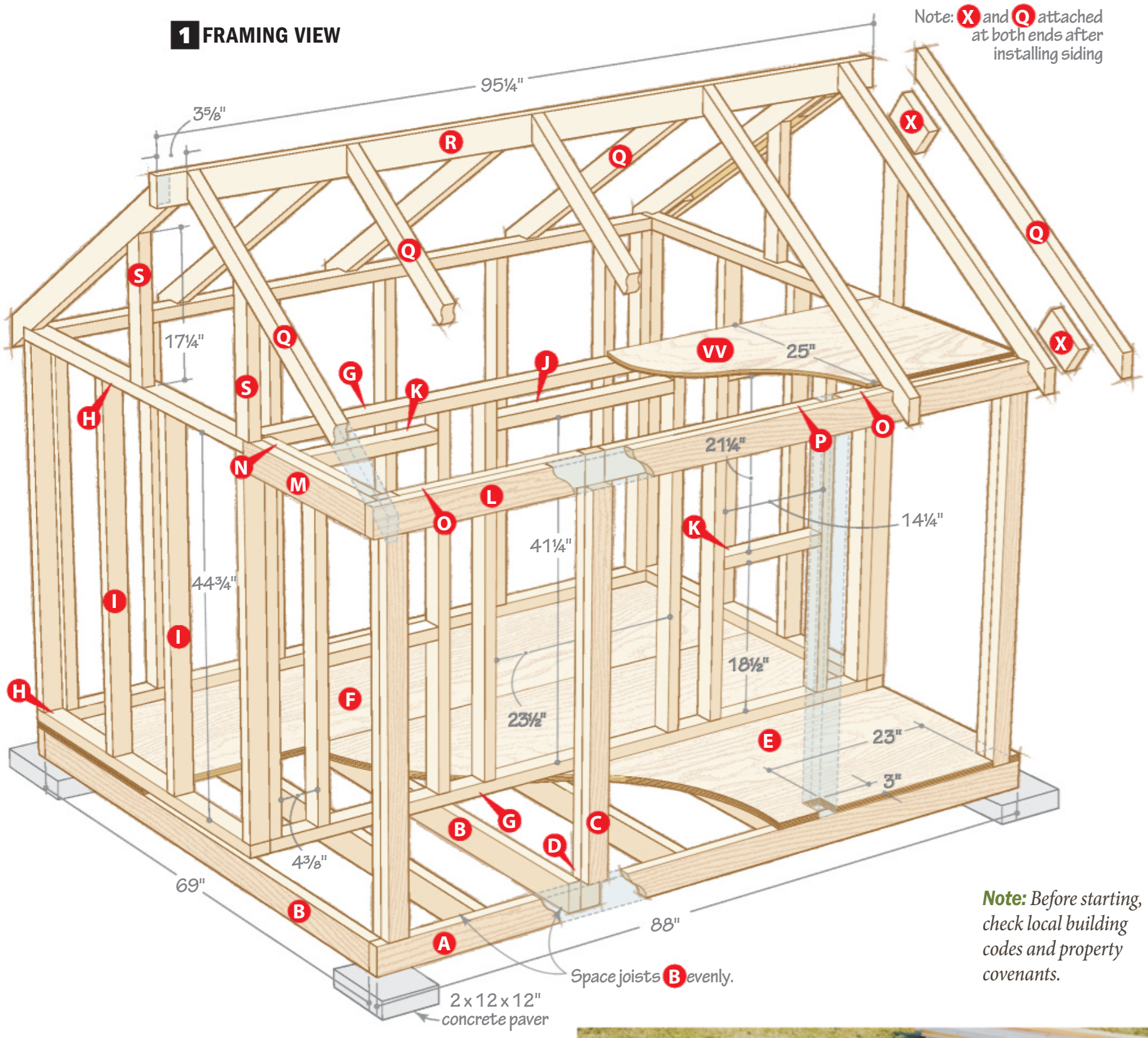
DIMENSIONS:
98¼" W × 77¾" D × 80" H

Approximate materials cost:
$770
including windows, shutters, and flower boxes

24
sq. ft. of floor space inside

Lumber List

9 - 8' 2×4 treated	1 sheet ¾"×4×8' plywood
4 - 8' 2×4	36 - 8' 2×3
2 sheets ¾"×4×8' treated plywood	6 - 8' 1×4
4 sheets ⅝"×4×8' T1-11 plywood	10 - 8' 1×6
3 sheets ½"×4×8' plywood	2 - 8' 2×2



Note: *Before starting, check local building codes and property covenants.*

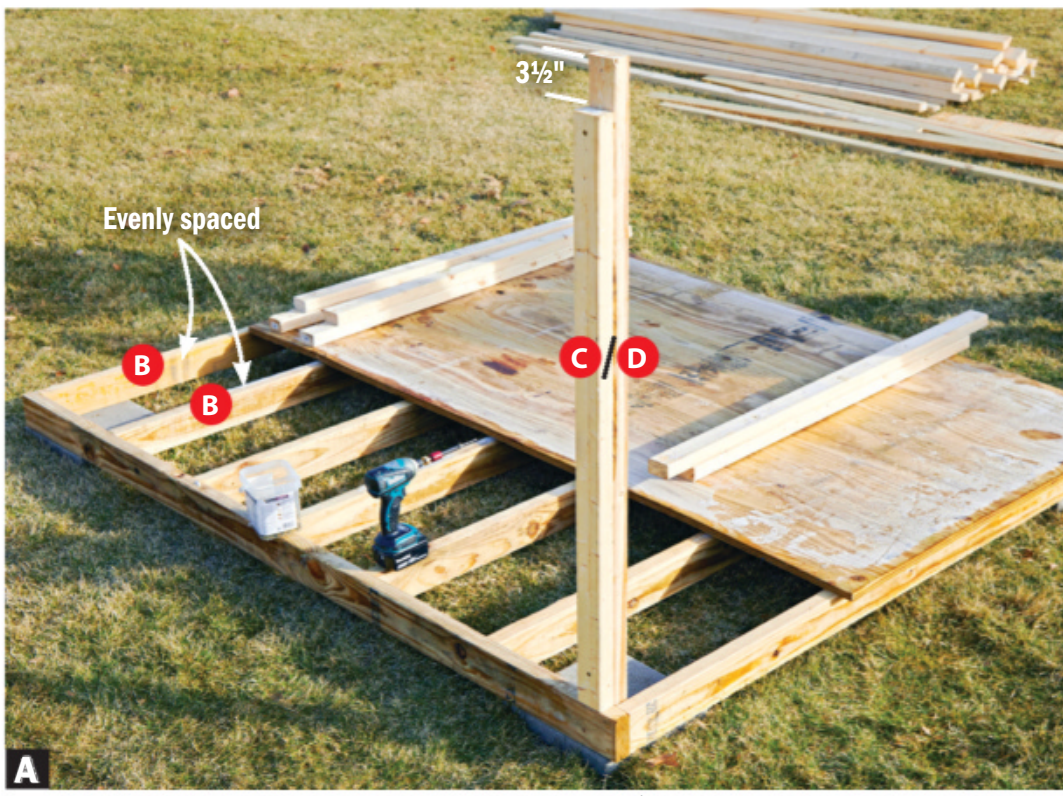
Give the children in your life the gift of a make-believe world in a scaled-down house of their own. You'll find just about everything you need at a home center, and we supply sources for hard-to-find items.

Frame it up

Tip! *When leveling your playhouse floor, remove dirt under a high paver instead of filling under a low one. Fill dirt can compact after placement, racking the playhouse.*

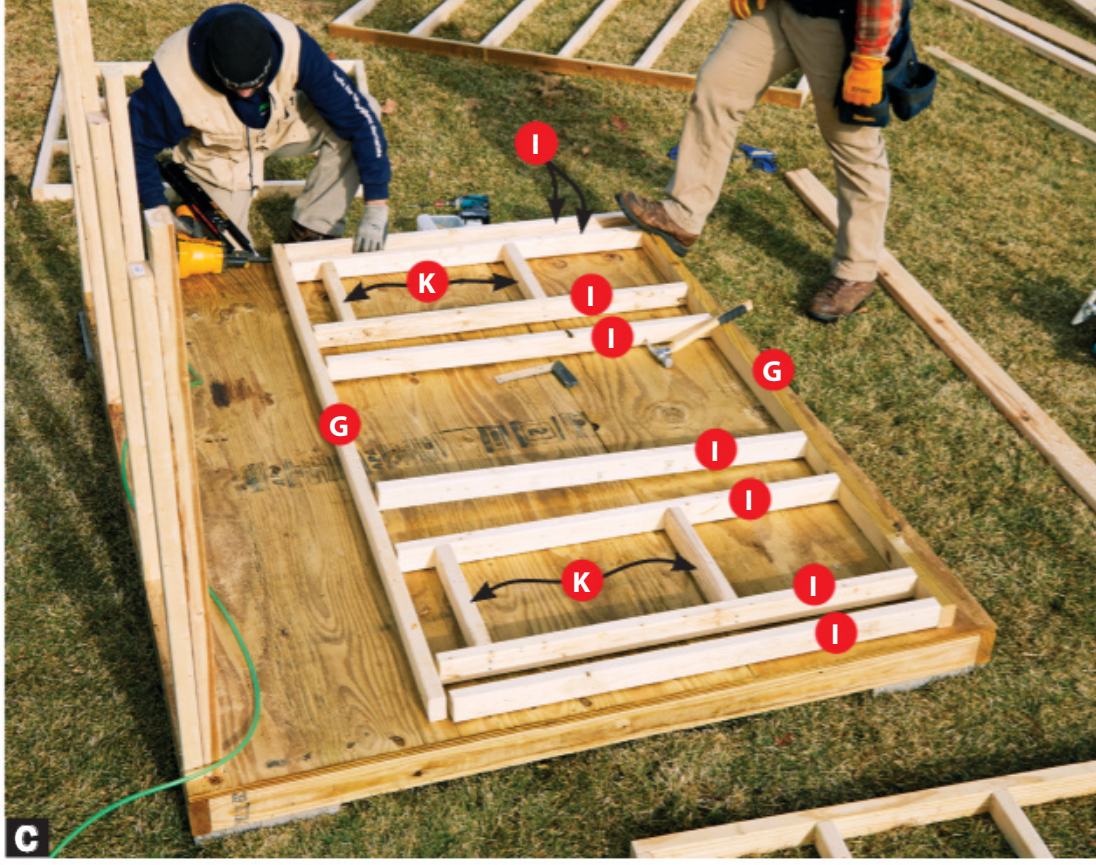
1 Cut the joists (A, B) [**Materials List, Drawing 1**]. Assemble the floor frame on flat ground with 3" deck screws [**Drawing 1**]. Rest each corner of the frame on a 12" paver and check the frame for square and level.

2 Cut the post halves (C, D). Assemble the posts and attach them to the floor frame [**Photo A**].



Fasten the posts (C/D) to the front rim joist (A) with 2½" deck screws, checking them for plumb.

Transfer the post (C/D) locations to the front floor panel (E) positioned on the floor frame flush at the ends.



Nail together the wall sections, using the playhouse floor as an assembly table. Center the door opening.

Tip! *To make assembly easier, nail the window headers and sills (K) between wall studs (I) and then nail these assemblies between the plates (G).*

Tip! *When fastening the rafters, drill pilot holes for the deck screws to prevent splitting.*

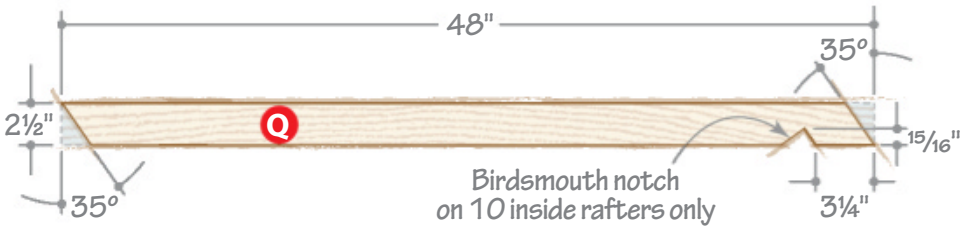
3 Cut the front floor panel (E) and lay out the post notches [**Photo B**]. Jigsaw 3"-deep notches and nail the panel to the floor frame. Cut the rear floor panel (F) and nail it in place.

4 Cut the framing members (G–K) and assemble the walls [**Photo C, Drawing 1**], evenly spacing the side- and rear-wall studs. Apply a bead of silicone caulk to the bottom plates to prevent water intrusion, and erect the walls. Check the entire assembly for plumb and square.

5 Cut the porch beam (L) and end ties (M). Screw the beam to the posts, checking the posts for plumb and equal distance between them top and bottom. Install the end ties, checking for equal distance top and bottom between the corner posts and front wall.

6 Cut the end blocking (N), outer blocking (O), and center blocking (P). Fasten the end blocking to the end ties (M). Position the outer and center blocking between the posts (C/D) and fasten them to the porch beam (L).

7 Cut 10 rafters (Q) [**Drawing 2**] and form the birdsmouth notches. Cut four more rafters without birdsmouth notches and set them aside. Cut the ridge beam (R) and gable studs (S) [**Drawing 1**]. Screw five notched rafters to one face of the ridge beam, insetting the end rafters 3⅝" from the ridge-beam ends. Have a helper support the Q/R assembly, or tack in place two gable studs (S), while you add the remaining notched rafters [**Photo D**] and position the gable studs.

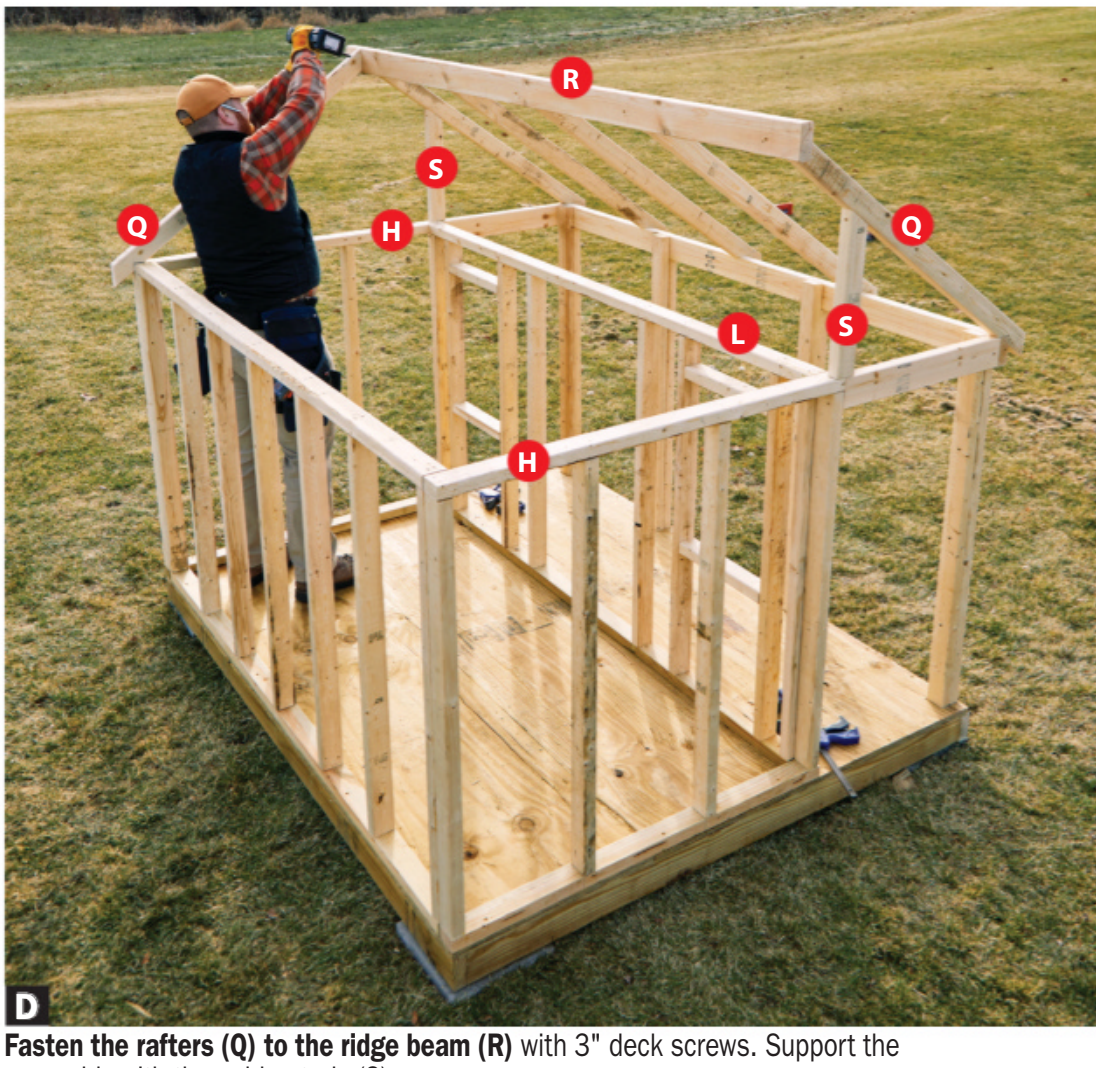


2 ROOF RAFTER

Close it in

1 Cut the end and overhang siding (T, U) [**Drawing 3**], making them mirror images with the tongues on the end siding facing front. Mark the end-siding angles [**Photos E** and **F**], make the cuts, and nail the siding to

Note: *Before cutting the back siding (V, W) to width, make sure the joint will fall on a stud. The soffit covers the gap at the top where the siding terminates below the top plate.*



Fasten the rafters (Q) to the ridge beam (R) with 3" deck screws. Support the assembly with the gable studs (S).

Stand the end siding (T) on a temporary ledger screwed to the end joist 1" below the floor.

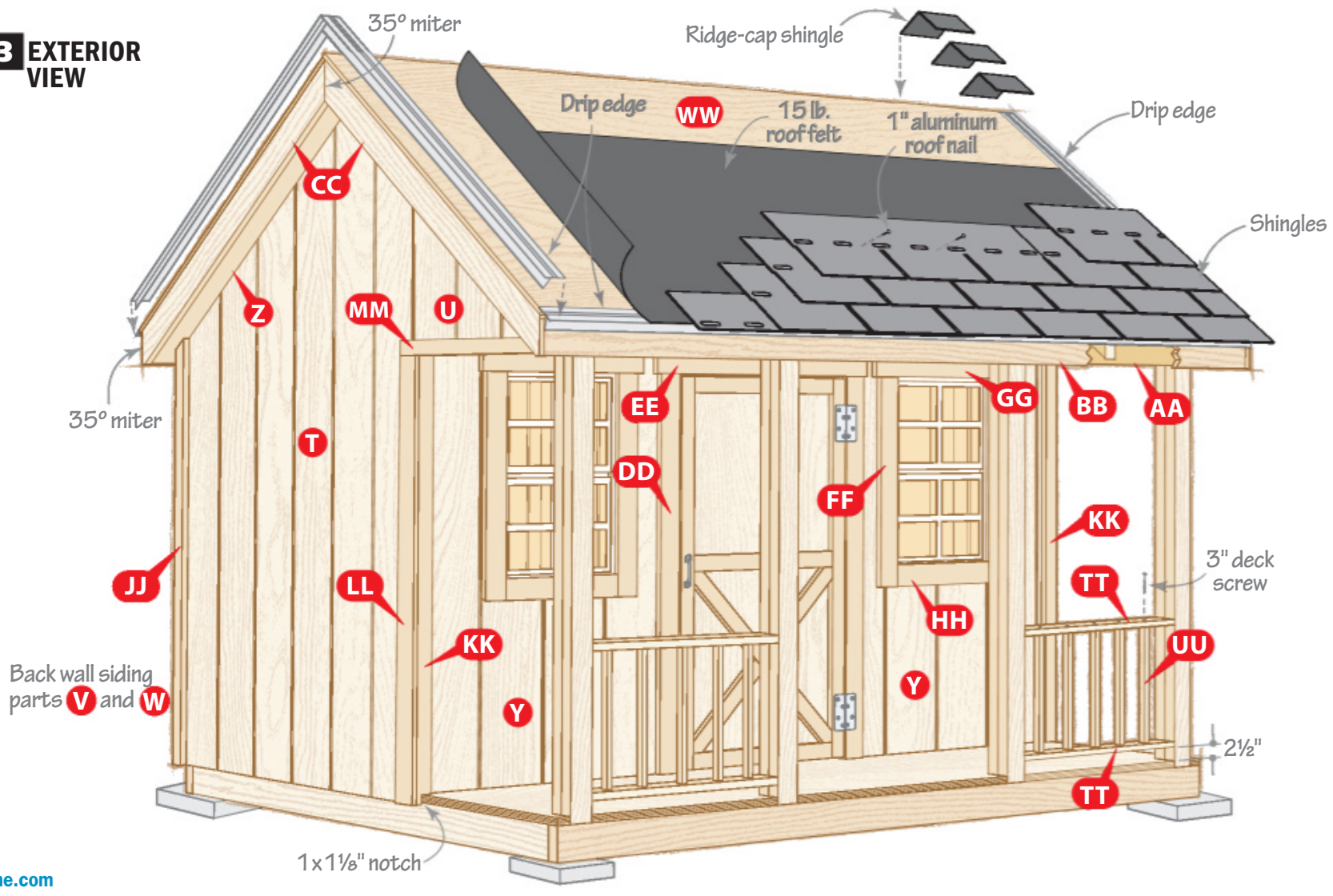
Clamp the siding in place and trace the upper edges of the front and rear rafters (Q) onto the back.

the framing. Clamp, mark, cut, and install the overhang siding. Cut and install the back siding (V, W).

2 Cut the rake blocking (X) and retrieve the four rake rafters (Q) [**Drawing 1**]. Install the blocking and rafters.

3 Cut the front siding (Y) and position them on the front wall. Trace the window and door openings onto the siding, cut the openings, and screw the siding in place.

3 EXTERIOR VIEW



Nail the rake soffits (Z) to the blocking (X) and the rake rafters (Q).

Project the roof plane with a scrap 2x3, push the fascia (BB) against the underside, and mark the top edge of the fascia on the rafter (Q) ends.

Nail the rake fascia (CC) to the rake rafter (Q). The rake fascia covers the ends of the front and back fascia (BB).

Nail the overhang trim (MM) in place, covering the upper end of the front corner side trim (LL).

Trim it out

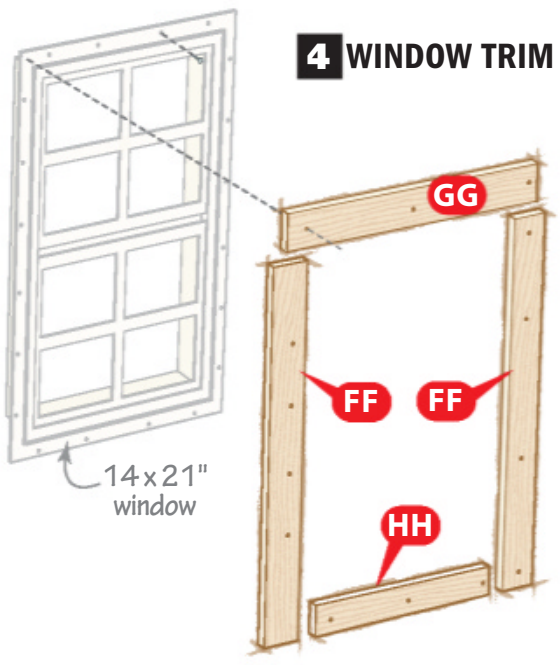
1 Cut the soffits (Z, AA) [**Drawing 3**]. Install the rake soffits [**Photo G**] and then the front and back soffits.

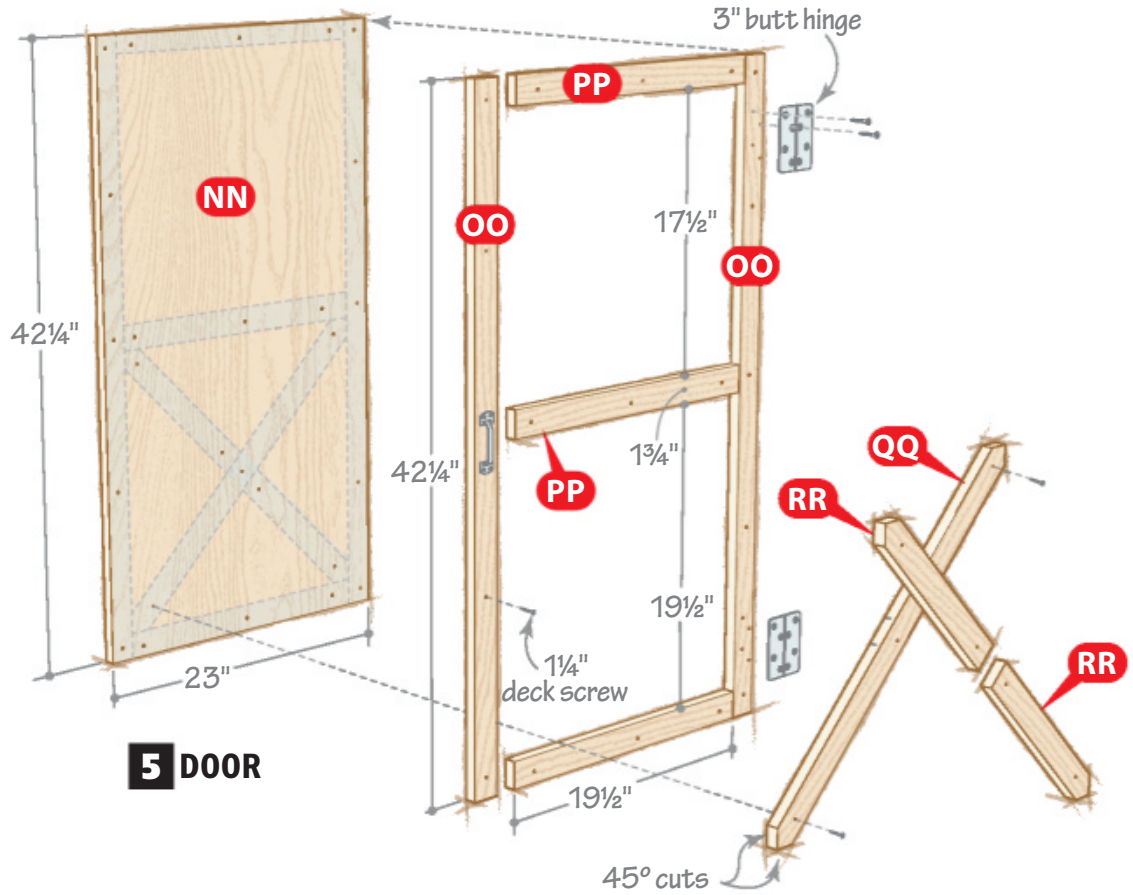
2 Cut the front and back fascia (BB). With a helper, mark the fascia position on the rafters [**Photo H**]. Nail the fascia in place. Cut and install the rake fascia (CC) [**Photo I**].

3 Install the windows [**Sources**] by driving the included screws through the frame flanges.

4 Cut and install the door and window trim (DD–HH) [**Drawings 3, 4**]. Center the door top trim (EE) and window top trim (GG) on the openings so the ends protrude evenly beyond the side trim (DD, FF).

5 Cut the corner trim and overhang trim (II–MM). Bevel the top ends of the rear corner back trim (II) and install them. Angle-cut the top ends of the rear corner side trim (JJ) [**Drawing 3**] and install them. Notch the bottoms of the front corner front trim pieces (KK) and install them. Install the front corner side trim (LL). Then, angle-cut the front ends of the overhang trim (MM) and install them [**Photo J**].





5 DOOR

Insert shims to leave uniform gaps at the door top and sides and screw the hinges to the door side trim (DD).

Build the door and railings

1 Cut the door panel (NN), stiles (OO), rails (PP), and cross trim (QQ, RR). Assemble the door with glue and screws [**Drawing 5**].

2 Cut and remove the lower front plate (G) between the door-opening studs. Cut the door stop (SS) and fasten it to the left-hand stud, 1½" from the face of the siding.

3 Screw hinges to the door and install it [**Photo K**]. Install the door pulls, catch, and strike.

4 Cut the top and bottom rails (TT) and balusters (UU). Assemble the railings [**Drawing 3**] and install them.

Top it off

1 Cut the porch ceiling (VV) [**Drawing 1**]. Slide it into place from the top and fasten it to the outer and center blocking (O, P), front wall upper plate (G), and end blocking (N).

2 Cut the roof sheathing (WW) and nail it to the rafters (Q). ***Note:*** *Center the roof sheathing on the width of the roof. Drip edge covers the gap between the end of the sheathing and the face of the rake fascia (CC).* Staple on roof felt and install drip edge along the perimeter with 1¼" roof nails. Apply shingles with 1" aluminum ring-shank roof nails [**Sources**]. Crawl inside and cut the protruding nails flush with the roof sheathing using end nippers or an oscillating multitool fitted with a metal-cutting blade.

3 Paint or stain the playhouse and install the shutters and flower boxes [**Opening photo, Sources**]. Now try to distract the kids until the finish dries.

Produced by **Jan Svec** with **Kevin Boyle**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine, Lorna Johnson**

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Floor, wall, and porch framing						
A	rim joists	1½"	3½"	88"	PT	2
B	floor joists	1½"	3½"	69"	PT	7
C	short post halves	1½"	2½"	45"	P	4
D	long post halves	1½"	2½"	52"	P	4
E	front floor panel	¾"	48"	88"	Ply	1
F	rear floor panel	¾"	24"	88"	Ply	1
G	front and back plates	1½"	2½"	83"	P	4
H	side plates	1½"	2½"	47"	P	4
I	wall studs	1½"	2½"	44¾"	P	23
J	door header	1½"	2½"	23½"	P	1
K	window headers and sills	1½"	2½"	14¼"	P	4
L	porch beam	1½"	3½"	88"	P	1
M	end ties	1½"	3½"	23½"	P	2
N	end blocking	1½"	2½"	21⅜"	P	2
O	outer blocking	1½"	3½"	23"	P	2
P	center blocking	1½"	3½"	29"	P	1
Roof framing						
Q	rafters	1½"	2½"	48"	P	14
R	ridge beam	1½"	3½"	95¼"	P	1
S	gable studs	1½"	2½"	17¼"	P	4
Siding						
T	end siding	⅝"	47"	75⅝16"	S	2
U	overhang siding	⅝"	25"	22⅞"	S	2
V	back right siding	⅝"	47⅞"	47"	S	1
W	back left siding	⅝"	41¾"	47"	S	1
X	rake blocking	1½"	2½"	6"	P	8
Y	front siding	⅝"	47⅞"	47¾"	S	2
Trim						
Z	rake soffits	½"	3"	46⅞"	P	4
AA	front and back soffits	½"	3½"	89¼"	P	2

Trim						
BB	front and back fascia	¾"	3½"	96¾"	P	2
CC	rake fascia	¾"	3½"	49⅞"	P	4
DD	door side trim	¾"	2½"	42¾"	P	2
EE	door top trim	¾"	2½"	29½"	P	1
FF	window side trim	¾"	2½"	23¾"	P	4
GG	window top trim	¾"	2½"	20½"	P	2
HH	window bottom trim	¾"	2½"	14¼"	P	2
II	rear corner back trim	¾"	2½"	46½"	P	2
JJ	rear corner side trim	¾"	1¾"	47¾"	P	2
KK	front corner front trim	¾"	1¾"	45¼"	P	2
LL	front corner side trim	¾"	2½"	44¼"	P	2
MM	overhang trim	¾"	2½"	34716"	P	2
Door and railings						
NN	door panel	¾"	23"	42¼"	Ply	1
OO	stiles	¾"	1¾"	42¼"	P	2
PP	rails	¾"	1¾"	19½"	P	3
QQ	long cross trim	¾"	1¾"	27916"	P	1
RR	short cross trim	¾"	1¾"	121516"	P	2
SS	door stop	¾"	1¾"	42¾"	P	1
TT	top and bottom rails	1½"	2½"	23"	P	4
UU	balusters	1½"	1½"	16½"	P	10
Ceiling and roof						
VV	porch ceiling	½"	25"	85"	Ply	1
WW	roof sheathing	½"	48"	96"	Ply	2

Materials key: PT-pressure-treated lumber, P-pine, Ply-exterior-grade plywood, S-reverse-board-and-batten plywood siding.

Supplies: 2×12×12" concrete pavers (4), silicone caulk, 2" and 3" common nails, 1¼", 2½", 3" deck screws, 3" butt hinges (2), sash pull (1), screen-door spring (1), 1¼" roof nails, 10' drip edge (4), 15 lb. roof felt (1 roll), 3-tab shingles (1 square).

Sources: 14×21" small shed windows, white, $22 ea. (2); 6×21" shed shutters, white, $12/pr. (2 pr.); 24" shed flower boxes, white, $22 ea. (2). Shed Windows, shed-windows.com.

1" aluminum ring-shank roof nails no. EGR100ARS-1, $6.85/1-lb. box (1 box). Best Materials, 800-474-7570, bestmaterials.com.

SHOP TEST


XR
DEWALT
20V MAX XR BRUSHLESS
18 GA
BRAD NAILER
BRUSHLESS MOTOR
LITHIUM ION
DEWALT
2 AH

Battery-powered Brad Nailers

Unleash your woodworking by ditching the compressor and hose.

Is a battery-powered brad nailer right for you?

Reasons to buy a battery nailer

- No hose-tripping hazard
- No loud compressor noise
- No need to drag along the compressor and hose for jobs outside the shop
- If you've already invested in a battery-powered tool system, such as a drill and circular saw, you can buy the nailer without a battery pack and charger, reducing the cost.
- No need to add oil to the nailer
- Built-in LEDs for better visibility around the nose

Reasons to buy a pneumatic nailer

- Lower cost (about ⅓ to ½ that of a comparable battery-powered model) if you already own an air compressor and hose
- Lighter weight
- Smaller tool can fit into tighter spaces.
- Typically smaller nose aids in precise nail placement.
- Faster driver reaction when pulling the trigger
- No reliance on a battery's charge level, and never have to buy a replacement battery pack
- You can adjust the nailer's driving force by increasing or decreasing the air pressure.
- Less recoil

In the 25 years or so since most of us saw our first pneumatic brad nailer while watching Norm Abram on TV, those tools have become almost as common as a cordless drill in home shops. And with good reason: 18-gauge brads secure glued assemblies without clamping and leave a negligible hole to fill.

In a world where everything is going cordless, it seems inevitable that hoseless brad nailers would become a thing. Before you scoff at the idea ("I already have an air compressor; this seems silly!"), we thought the same thing about our corded drill back in the day, and where is *that* tool today? Still, as we tested these nine battery-powered nailers, we found them quite capable, but with some compromises, as you'll learn.

Do they pack enough punch?

It's critical for a nailer to fully sink the fastener, because these wire nails are virtually impossible to pull out or finish off with a hammer. Three nailers routinely sank all fasteners without issue in the pine, Douglas fir, red oak, and maple we used in testing: the Bostitch, DeWalt, and Senco Fusion F-18. Two models, the Makita XNB01Z and Ryobi P320, had difficulty consistently seating fasteners fully in hardwoods. These nailers will work fine if you use primarily softwoods or

▶Collated strips of nail-gun wire fasteners sell by the gauge of the wire: the larger the number, the smaller the fastener's diameter. Currently, among finish nails, 23-gauge headless pins are the smallest and 15-gauge the largest.

▶Two pairs of nailers seemed identical, with only cosmetic differences, and performed the same in testing. Those are the Bostitch BCN680D1/DeWalt DCN680D1 and the Craftsman CMCN618C1/Porter-Cable PCC790LA.

attach up to ¾" hardwood to softwood. Ryobi's Jason Swanson says the Ryobi nailer was optimized to shoot fasteners in stock up to ¾", but thicker hardwood would be considered extreme; Makita's Wayne Hart says these results are not consistent with Makita's own testing.

With a pneumatic nailer, you can add or subtract "power" by adjusting the air pressure in the hose. And that's important because sinking a nail in oak typically requires more power than doing the same in pine. Only two of these nailers, the Ridgid R09890B and Ryobi, have adjustments to add or decrease the force of the driver, and this worked well when we changed from hardwoods to softwoods. Each nailer has a depth-of-drive adjustment for the nose, but this feature adds only about 1/16" to 3/32" of countersink. In most cases, this was enough to compensate for hardwood versus softwood. We found the adjusters on the Metabo HPT NT1850DE, Ridgid, and Senco nailers difficult to use; the others work fine.

Placing brads precisely

▶In all our testing, we used Grip-Rite electrogalvanized fasteners.

Sometimes you need to position a fastener precisely, and with all the test models, visibility improved with the plastic no-mar nose tip removed. But workpiece marring increased, so we rated each nailer's accuracy with its nose tip in place, as shown at *right*. The Makita gets top marks here, with the Bostitch and DeWalt next best. With some models, the tips prove too large or clumsy to work with effectively. The Metabo HPT best minimized workpiece marring.

Hardworking batteries

▶The Bostitch, Craftsman, DeWalt, and Porter-Cable nailers use 20-volt "max" battery packs. The others list as 18 volts. We found no discernible difference in testing that we could relate to battery voltage.

Because these tools are already bulkier and heavier than their pneumatic counterparts, we tested each nailer with a "slim" battery pack, rated from 1.5 to 3.0 amp-hours. (See the chart on *page 52*.) Larger amp-hour packs will also work with these tools.

To see how many brads each nailer could drive on a charge, we drove 1½" nails through ¾" red oak into fir. All but two nailers were able to drive 500 fasteners, at which point we stopped. All of the nailers outperformed our run-time expectations. We can't imagine a situation where you would drive enough brads to exhaust a battery before another is charged. And if you have only one battery, it should easily get you through a full day's work on a single charge.

Battery packs for all but two nailers have built-in charge-level indicators. The Metabo HPT has a gauge on the nailer that works with the battery installed; the Porter-Cable has no gauge on the battery pack or nailer.

FAIR: Porter-Cable's U-shaped no-mar nose tip makes it difficult to see the driver location and align the nose precisely.

BETTER: DeWalt's nose tip sits behind the nose, providing good visibility of the target.

BEST: Makita's tiny translucent nose tip makes for the easiest alignment of any of the test nailers.

Drive systems affect delay

These nailers use three different systems to power the piston and driver. The Metabo HPT and Senco pressurize a permanent, fixed amount of air or nitrogen, and both tools fire instantaneously, most like a pneumatic nailer. The Makita, Ridgid, and Ryobi nailers work similarly, but draw in outside air. This results in about a half-second delay between the trigger pull and driver activation. The Bostitch, Craftsman, DeWalt, and Porter-Cable nailers must spin up a flywheel to deliver the punch

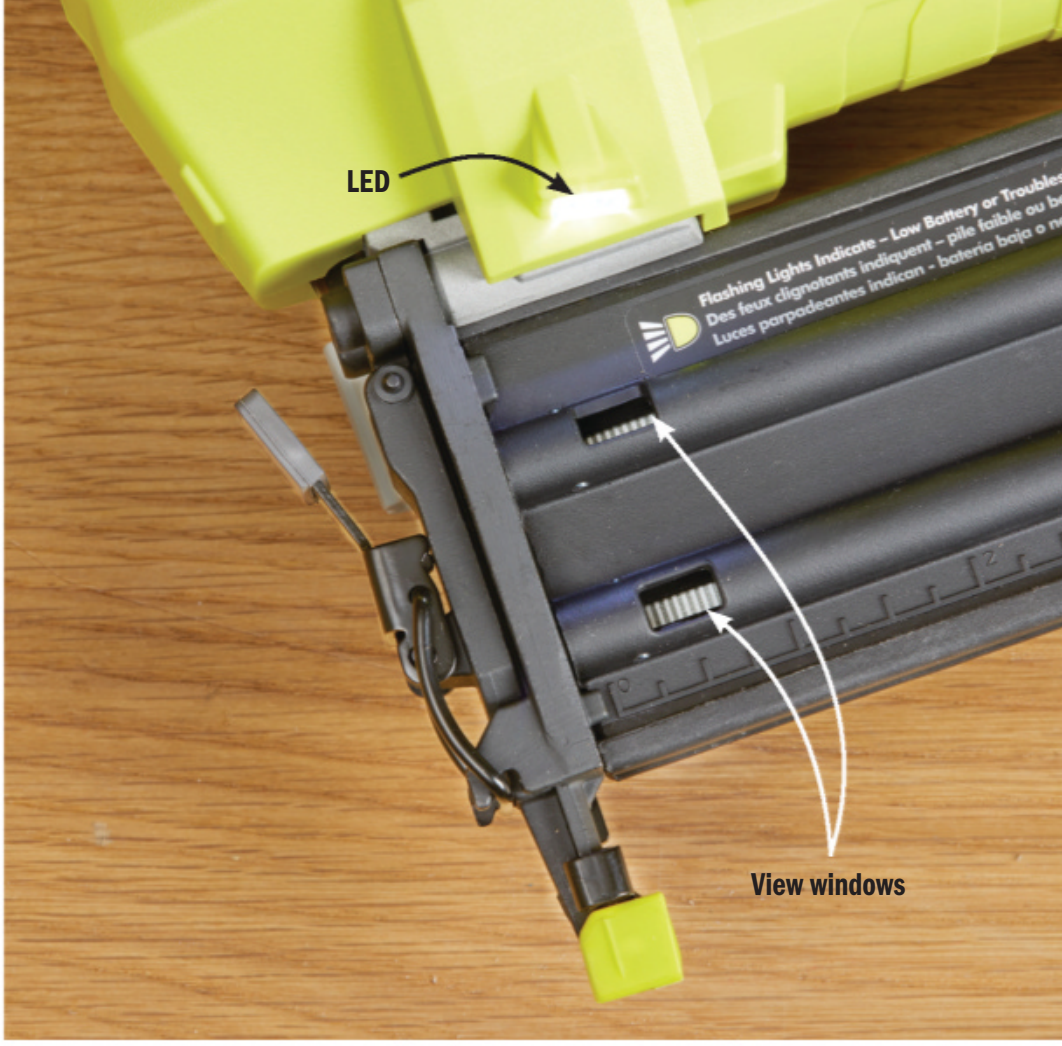
rather than using pressurized air. The Bostitch and DeWalt flywheels begin spinning when you touch the nose safety to the wood, and pulling the trigger activates the driver immediately. The Craftsman and Porter-Cable have nearly a one-second delay before firing.

Fastener facts

The Bostitch, DeWalt, Ridgid, and Senco nailers shoot fasteners ⅝–2⅛" long; the others shoot ⅝–2". Dry-fire lockouts on all but the Craftsman, Metabo HPT, and Porter-Cable prevent the tool from firing "blanks," so you'll know when it's out of fasteners.

Each tool has either a colored indicator or clear window to show when it's time to add more fasteners. Almost all of the nailers will accept a full strip of 100 brads as soon as you see the indicator, but with the Ridgid and Senco, you must shoot 5–7 additional nails before a full strip will fit.

▶Point your phone's camera at this code to read reviews of more nailers, or visit woodmagazine.com/reviews



Features such as LEDs and fastener-view windows make it easier to operate these battery-powered brad nailers effectively.

More hoseless nailer nuggets

■ **On/off switch.** All but the Ridgid and Ryobi nailers have a switch that either powers the tool or locks out the trigger to prevent accidental firing when a battery is installed.

■ **Time-out function.** If you wait too long between pushing down the safety nose and pulling the trigger in single-shot mode (vice versa in bump mode), all of the nailers will time out to conserve charge level and make you start the process again. Most time out in 5–10 seconds—a reasonable time. The Craftsman and Porter-Cable nailers time out in 25–30 seconds. But the Metabo HPT does so in just 2 seconds—too short, in our opinion.

■ **LEDs.** All models have at least one LED (some have two) to helpfully illuminate the area around the nose. A partial pull of the trigger activates the light.

■ **Recoil.** Battery-powered nailers tend to have greater recoil—the bounce-back after each strike—than pneumatic nailers. With most models, you'll get used to it. The Senco produced a jarring recoil worse than the others, although it did not affect its ability to seat nails.

■ **Belt hook.** Each nailer has a handy hook that can be installed on either the right or left side, or you can remove it if you prefer. We like the one on the Metabo HPT best because it can swivel out of the way when not needed.

■ **Nail jams.** We experienced only one jam during testing, so we can't evaluate jam likelihood. But all the tools except Makita have tool-free access to remove a jammed fastener should it happen. The Makita requires a hex wrench.

▶The Metabo HPT brand was formerly known as Hitachi Power Tools.

Bostitch BCN680D1, $300

Craftsman CMCN618C1, $200

DeWalt DCN680D1, $300

The Metabo HPT nailer has electronic controls for powering the tool on and off, switching between firing modes, and gauging the battery pack's charge level.

■ **Bump fire.** Only the Porter-Cable and Craftsman models lack this feature that lets you shoot fasteners rapidly by holding down the trigger and bumping the nailer's nose to the workpiece to release a fastener. But because we place more importance on the ability to place a nail precisely—even if it takes a few seconds—we don't see bump fire as a valuable feature on a brad nailer.

Here's where to "charge" your nailer budget

If you've already invested in a battery platform, in most cases it makes sense to buy the nailer that shares those battery packs. But if you're simply looking for the best battery-powered brad nailer, go for the Bostitch BCN680D1 or DeWalt DCN680D1. They share Top Tool honors.

Produced by **Bob Hunter** with **Michael Springer**

No hose, no problem for these nailers

MODEL	PERFORMANCE RATINGS (1)										
	PRIMARY			SECONDARY							
	POWER	ACCURACY OF FASTENER PLACEMENT (2)	FASTENERS DRIVEN PER BATTERY CHARGE	COUNTERSINK HOLE SIZE	EASE OF ADJUSTING FASTENER DEPTH	ERGONOMICS	ABSENCE OF WORKPIECE MARRING (WITH NOSE TIP)	EASE OF CLEARING FASTENER JAMS	EASE OF LOADING AND UNLOADING FASTENERS	FIRING SPEED (TRIGGER DELAY)	ABSENCE OF RECOIL
BOSTITCH BCN680D1	A	A–	500+	A	A	A–	B	B+	A	B+	B–
CRAFTSMAN CMCN618C1	B	C	384	A	A	B	C+	B	A	C–	B–
DEWALT DCN680D1	A	A–	500+	A	A	A–	B	B+	A	B+	B–
MAKITA XNB01Z	D	A	500+	A	B	C–	C	C	B	B–	B+
METABO HPT NT1850DE	B+	C+	500+	B	C–	B–	A	B–	A	A	A
PORTER-CABLE PCC790LA	B	C	397	A	A	B	C+	B	A	C–	B–
RIDGID R09890B	B+	B*	500+	C	C+	B–	B	B–	B	B–	B–
RYOBI P320	C	B*	500+	C	B	B	B	A	A	B–	B+
SENCO FUSION F-18	A	C–	500+	A	B–	B–	C–	A	A	A	C–

1. A Excellent; B Good; C Fair; D Poor

2. (*) Using flat no-mar tips, rather than C-shaped tips (also included)

3. (*) Battery pack not included with nailer

Makita XNB01Z, $250 (bare tool)

Metabo HPT NT1850DE, $340

Porter-Cable PCC790LA, $200

FASTENERS		NAILER						BATTERY						SELLING PRICE *(7)*			
LENGTH RANGE, INCHES	WILL A NEW STRIP OF FASTENERS FIT IN THE MAGAZINE WHEN INDICATOR SIGNALS? (YES, NO)	ON/OFF SWITCH? (YES, NO)	DRY-FIRE LOCKOUT? (YES, NO)	NUMBER OF NO-MAR TIPS INCLUDED	TOOL-FREE JAM CLEARING? (YES, NO)	TIME-OUT AFTER PULLING TRIGGER OR PUSHING NOSE, SECONDS	BUMP-FIRE SETTING? (YES, NO)	VOLTAGE	AMP-HOURS (AS TESTED) *(3)*	STORAGE CASE *(4)*	WEIGHT WITH BATTERY, POUNDS–OUNCES	WARRANTY, YEARS *(5)*	COUNTRY OF ASSEMBLY *(6)*	NAILER KIT WITH BATTERY & CHARGER	BARE TOOL	BATTERY & CHARGER KIT	CONTACT INFORMATION
⅝–2⅛	Y	Y	Y	3	Y	5	Y	20	2.0	B	6-4	3	M	$300	N/A		800-556-6696, bostitch.com
⅝–2	Y	Y	N	2	Y	30	N	20	1.5	N	6-4	3	C	$200	N/A		888-331-4569, craftsman.com
⅝–2⅛	Y	Y	Y	3	Y	5	Y	20	2.0	B	6-3	3	M	$300	$250		800-433-9258, dewalt.com
⅝–2	Y	Y	Y	2	N	6	Y	18	2.0*	N	7-4	3	J	N/A	$250	$130	800-462-5482, makitatools.com
⅝–2	Y	Y	N	1	Y	2	Y	18	3.0	B	7-8	L	C	$340	$290		800-829-4752, metabo-hpt.com
⅝–2	Y	Y	N	2	Y	30	N	20	1.5	N	6-0	3	C	$200	$150		888-848-5175, portercable.com
⅝–2⅛	N	N	Y	2	Y	5	Y	18	2.0*	N	7-3	3*	C	N/A	$220	$120	866-539-1710, ridgidpowertools.com
⅝–2	Y	N	Y	2	Y	5	Y	18	1.5*	N	6-5	3	C	N/A	$130	$80	800-525-2579, ryobitools.com
⅝–2⅛	N	Y	Y	2	Y	10	Y	18	1.5	B	6-4	2	T	$330	N/A		800-543-4596, senco.com

4. (B) Fabric bag
(N) No bag or case

5. (L) Lifetime for nailer only
(*) Lifetime Service Agreement upon online registration

6. (C) China (M) Mexico
(J) Japan (T) Taiwan

7. Prices current at time of article production and do not include shipping, where applicable.
(N/A) Not sold in this configuration

Ridgid R09890B, $220 (bare tool)

Ryobi P320, $130 (bare tool)

Senco Fusion F-18, $330

Accessible Under-Sink Storage

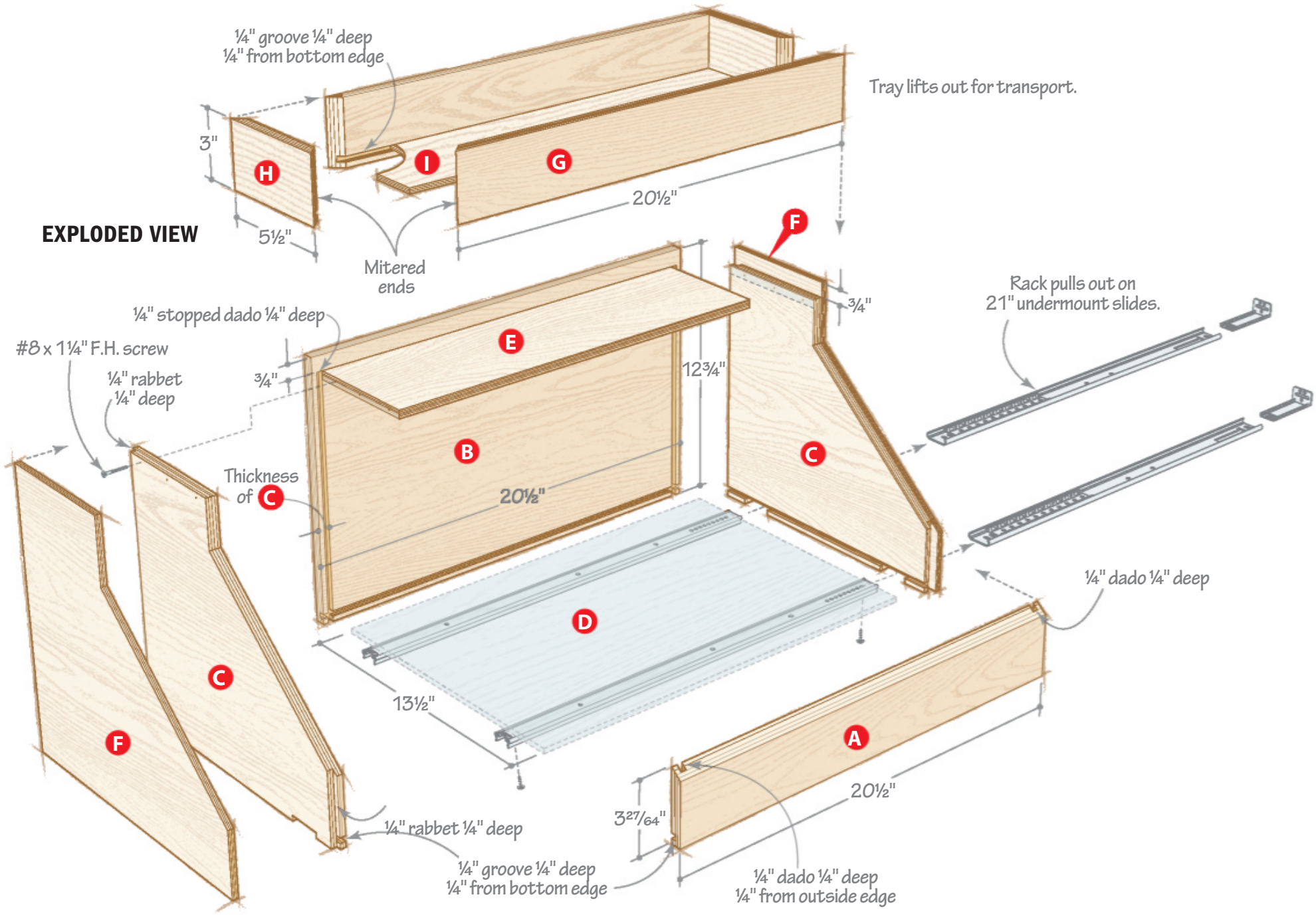
Give your kitchen organization a boost.

DIMENSIONS: 14" W × 21" D × 15" H

Approximate materials cost:

$80

Store cleaning supplies in the lift-out tray.



Note: The tall side (B) has stopped dados but the dadoes go through the short side (A).

This organizer fits common under-sink kitchen cabinets. Check that the project dimensions will clear the sink and plumbing, and adjust part dimensions as needed.

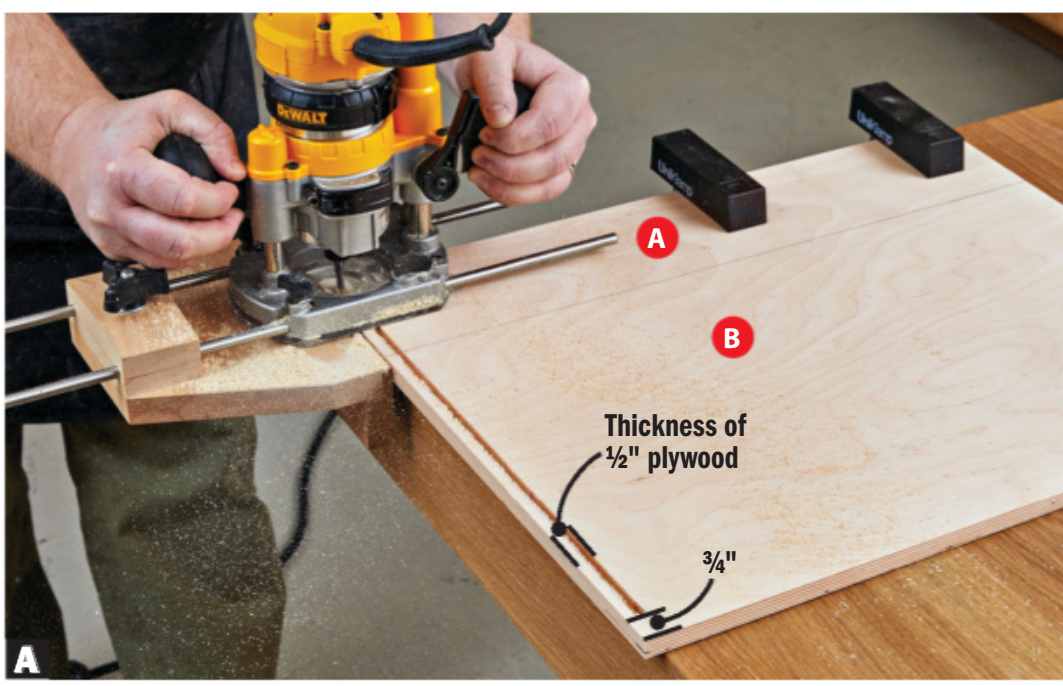
Rack up some parts

1 Cut a 17×20½" blank for the sides (A, B) [**Materials List**]. Draw a line the length of the blank 12¾" from one edge to identify the tall side (B). Mark the stopped-dado locations [**Exploded View**] and rout them [**Photo A**].

2 Square the stopped-dado ends with a chisel, then rip apart sides A and B, leaving the short side (A) oversize.

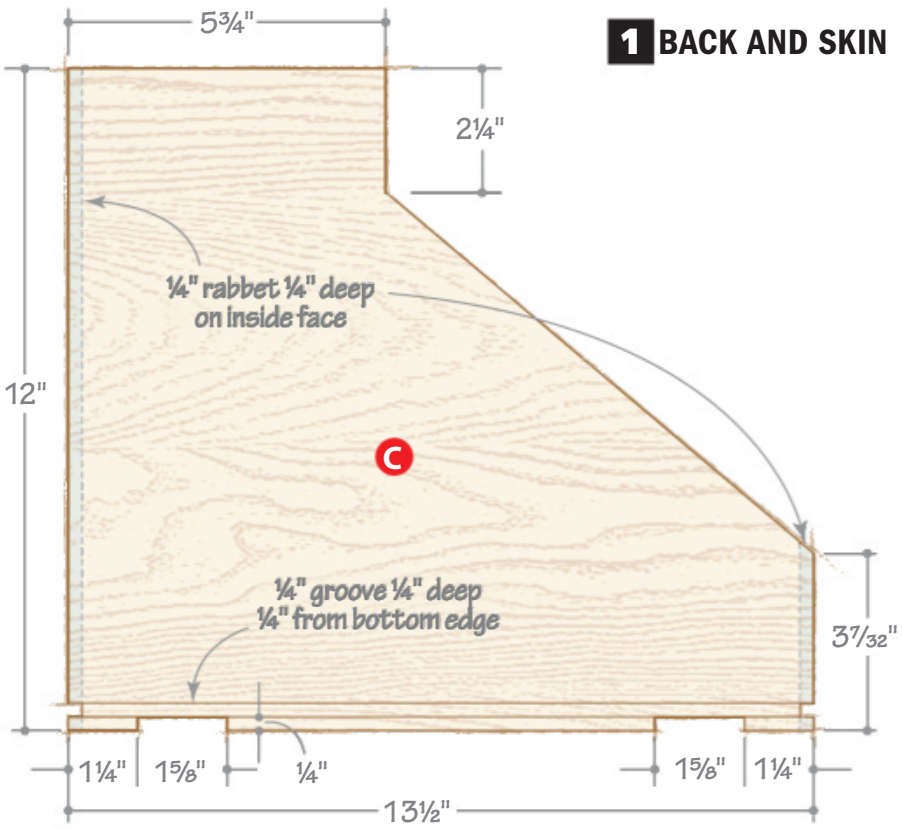
Tip! *A ¼" spiral upcut router bit pulls chips from the dado as you rout, letting you work faster.*

Store cleaning supplies in the lift-out tray to take them where they're needed.

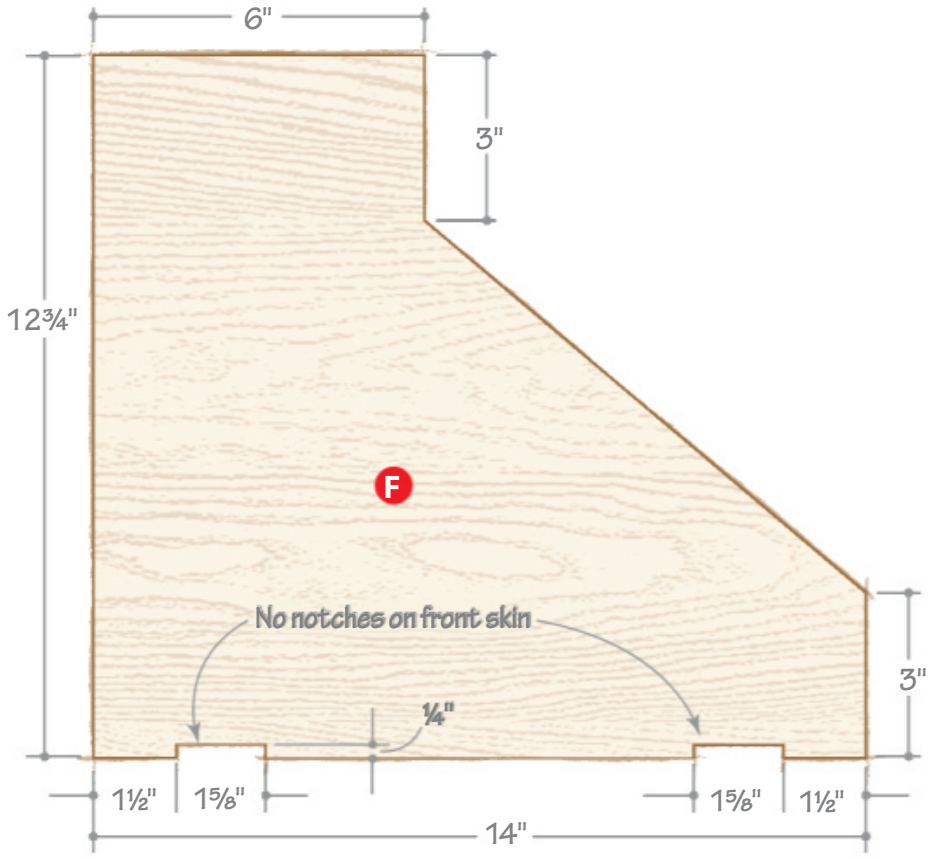


Routing the short and tall sides (A, B) as one blank ensures the ¼" dadoes align between the two parts.

1 BACK AND SKIN



FRONT / BACK
(Back shown, front is a mirror image)



FRONT / BACK SKIN
(Back skin shown)

Tip! *A combination saw blade with flat-topped raker teeth cuts clean rabbets.*

Note: *When cutting rabbets and grooves in the front and back (C), remember that they mirror each other.*

3 Cut two 12×13½" blanks for the front and back (C). Rabbet the ends to fit the dadoes in the sides (A, B) [**Drawing 1, Photo B**].

4 Cut the groove on the inside faces of the sides (A, B), front, and back (C) [**Exploded View, Photo C**].

5 Notch the front and back (C) for the slides [**Drawing 1, Photo D**], then bandsaw them to shape.

6 Dry-assemble the front, back (C), and sides (A, B) [**Exploded View**]. Mark the short side (A) top edge to match the mating parts, and bevel-cut the side to width.

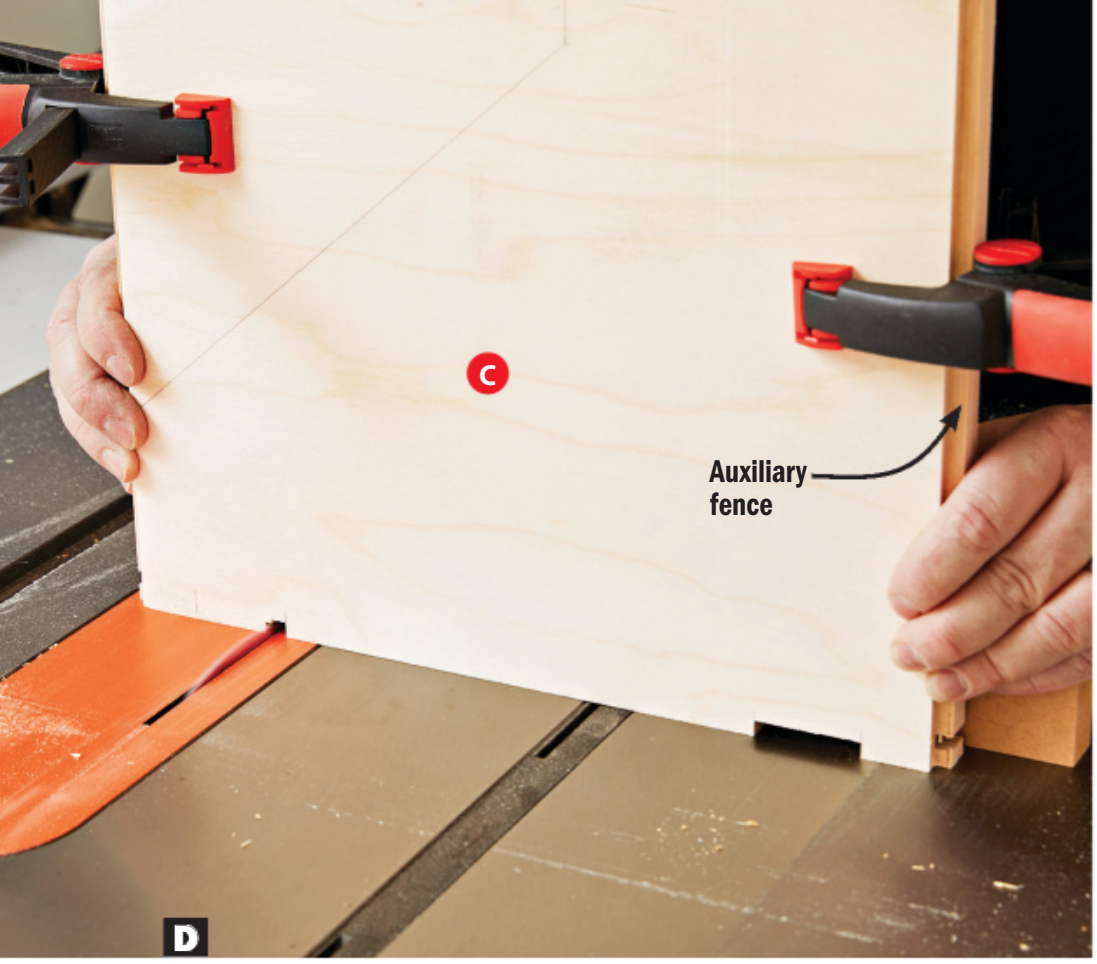
7 Cut the bottom (D) and top (E) to size. Finish-sand and glue all parts.

8 Cut the skins (F) to size and notch the back skin to match the back (C) [**Drawing 1**]. Glue the skins to the ends, then sand to 180 grit.

Note: *The version shown is for the left side of a two-door cabinet. If yours will go on the right side, remember to reverse the location of the notched skin (E).*

Position the fence ¼" from the outside edge of the blade. Use an auxiliary miter-gauge fence and adjust the blade height until the tongue fits the dadoes in the sides (A, B).

Cut the groove for the bottom (D) in two passes to match the thickness of the plywood.



Clamp the front and back (C) together against a tall miter-gauge auxiliary fence to cut clean notches.

Space centerlines 9⅜" apart for slides on both the organizer and cabinet.

Tip! Check that the length of the tray sides (G) will fit between the front and back (C) of the organizer.

Add a removable tray

1 Cut tray parts G–I to size. Miter the tray sides (G) and front and back (H), then cut the grooves [**Exploded View**] to match the thickness of the bottom (I).

2 Finish-sand and glue all parts. Then apply four coats of wipe-on polyurethane to the tray and organizer.

Slide the organizer into place

1 Screw the slides [**Source**] to the front and back (C). Position the organizer and tray inside a cabinet and check that it clears the sink, plumbing, and face frame.

2 Mark the slide locations on the cabinet floor [**Photo E**]. Screw the lower portion of the slide to the cabinet, then insert the organizer and check that it operates smoothly.

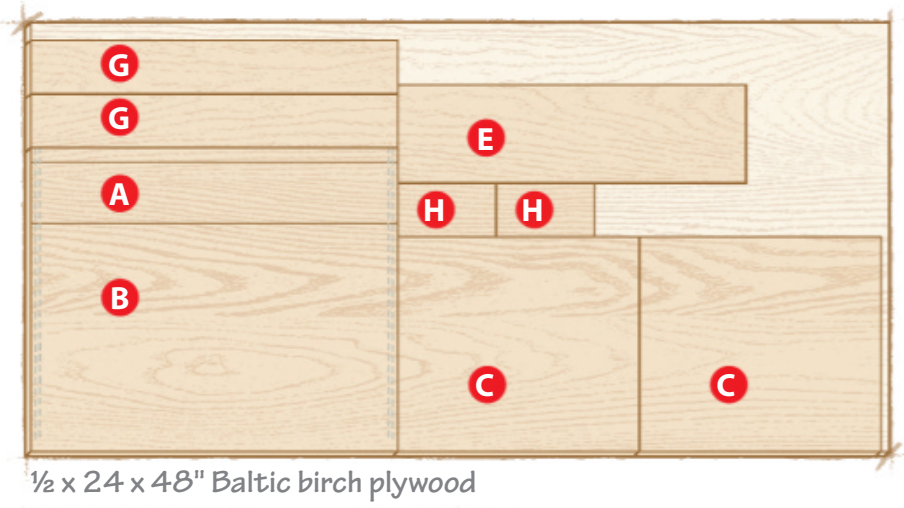
Materials List

Part		FINISHED SIZE T†	W	L	Matl.	Qty.
A*	short side	½"	3 27/64"	20½"	BP	1
B*	tall side	½"	12¾"	20½"	BP	1
C	front/back	½"	12"	13½"	BP	2
D	bottom	¼"	13½"	20"	BP	1
E	top	½"	5½"	19½"	BP	1
F	skins	¼"	12¾"	14"	BP	2
G	tray sides	½"	3"	20½"	BP	2
H	tray front/back	½"	3"	5½"	BP	2
I	tray bottom	¼"	5"	20"	BP	1

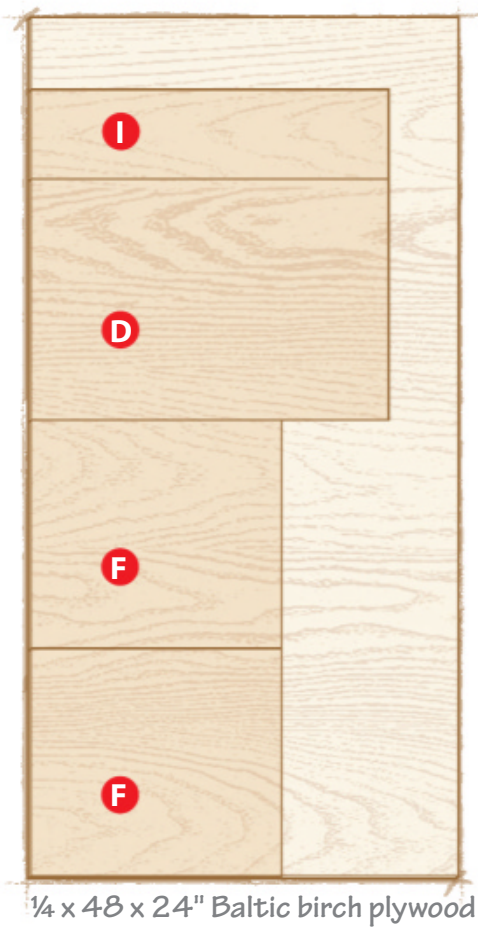
*Parts initially cut oversize. See the instructions.
†Plywood thicknesses will vary. See the instructions.

Materials key: BP–Baltic birch plywood.
Blade and bit: Combination saw blade with flat-topped raker teeth, ¼" spiral upcut router bit.
Sources: Accuride 1029 21" undermount slides (2), model no. CECOMINOD062688, $23.99, woodmagazine.com/accuride1029.

Cutting Diagram



½ x 24 x 48" Baltic birch plywood



¼ x 48 x 24" Baltic birch plywood

Produced by **Robert Wilson** with **John Olson**
Project design: **John Olson**
Illustrations: **Roxanne LeMoine, Lorna Johnson**

Spray Finishing Made Simple

Brush aside brushed-on and wiped-on finishes for super-smooth, sprayed-on topcoats.

You can't beat a sprayed finish for a smooth, even surface to enhance and protect a project. No worries about brush streaks or stray bristles embedded in the finish. Although spray finishing—done incorrectly—can result in drips or unevenness, with the right tools and finish, and a little practice, you'll soon be spraying like a pro.

Compressed air or HVLP?

A conventional compressor-fed spray gun operates at 40–60 pounds per square inch (psi) of air pressure, and does a great job atomizing finish and depositing a smooth, even film on a project. But that much air pressure causes blowback and produces clouds of overspray, lowering the quality of your finish and wasting about half of the finish. All that overspray must be contained, filtered, and exhausted from your work area. Air from a compressor inevitably contains water vapor and, for oil-lubricated compressors, fine drops of oil that can contaminate your finish. To prevent this, you'll need an inline filter or drip leg (shown *next page*) located far enough downstream from the compressor to allow the water vapor and oil drops to cool and condense so they don't reach the spray gun.

HVLP turbine system ($300–$2,000)

HVLP conversion gun ($50–$400)

▶**Atomize:** To break the stream of finish into a fine mist of uniform particles.

▶**Blowback:** Finish droplets that hit the surface at high velocity and bounce back, leaving an uneven finish and adding to overspray; the higher the pressure, the more blowback.

▶**Overspray:** Atomized finish that does not adhere to your project. If not sucked out the vent fan, it could settle onto the project or surrounding surfaces as dried particles.

That's why for small-shop spray finishing we recommend a high-volume, low-pressure (HVLP) system, shown *above*. An HVLP spray gun produces a more focused atomized mist, greatly reducing blowback and overspray, and depositing 60–80 percent of the finish on the project.

HVLP spray guns come in two varieties: turbine systems and conversion guns. A *turbine system* includes the gun, hose, and a turbine that generates dry, filtered air for the gun at 10 psi or less. The turbine output matches the requirements of the gun to ensure optimal atomization.

If you already have an air compressor and don't want to invest in a turbine system, a *conversion gun* may seem an economical solution—but with a hitch. A conversion gun looks similar to an HVLP turbine gun, but works at a slightly lower air pressure (20–30 psi) than standard air-pressure sprayers (40–60 psi). It also demands a large volume of air (5–12 cubic feet per minute [cfm]) well beyond the capacity of most home-shop compressors. So before going this route, check the gun's air requirements against your compressor's specifications. If you need to upgrade the compressor, doing so might cost more than buying an HVLP turbine system.

▶Download a review of HVLP spray systems. woodmagazine.com/hvlpreview

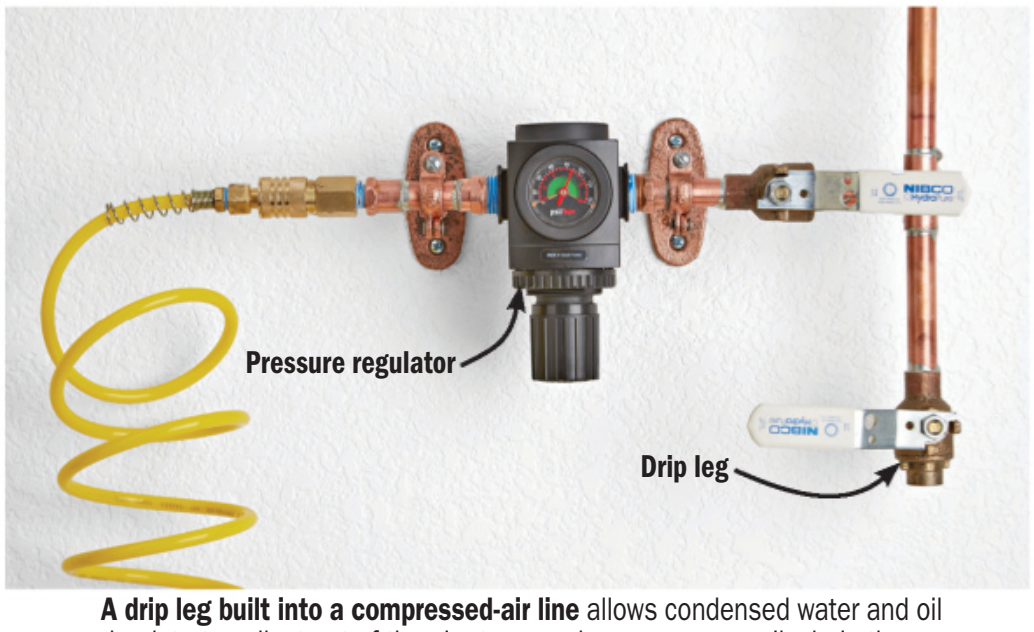
Spray user-friendly finishes

Water-borne clear finishes have come a long way since their introduction three decades ago, and we now prefer them to oil-based finishes, which require an organic-vapor respirator and a spray booth with an explosion-proof fan motor. Without them, spraying an oil-based finish can be dangerous to your health and pose an explosion hazard.

In a marketplace crowded with similar water-borne finishes, choosing one may prove daunting. (See the photo *below* for a few of our favorite finishes.) Don't be afraid to try out more than one product. When you find a finish that works for you, stick with it for best results.

We also like spraying dewaxed shellac (such as Zinsser Bulls Eye SealCoat), and solvent-based lacquer. Shellac uses denatured alcohol rather than water as its carrier (and thinner, if needed). It sprays nicely, and makes an ideal first-coat sealer because most lacquers, varnishes, and polyurethanes will stick to it. If you use it alone, or topcoat with regular shellac, you'll get a durable finish with a glossy sheen. Lacquer uses lacquer thinner as its base. It sprays beautifully, but has a strong odor. As with oil-based finishes, spray shellac and lacquer only in well ventilated areas using explosion-proof exhaust fans; these start at around $600.

▶**Water-borne or water-based finish:** Tiny spheres of resin (commonly acrylic and/or polyurethane) suspended in water along with a slow evaporating solvent, such as glycol ether. After the water and solvent evaporate, the resin spheres form a continuous film.



A drip leg built into a compressed-air line allows condensed water and oil droplets to collect out of the air stream, where you can easily drain them.

A few finishes we like to spray: Water-borne polyurethane and acrylic.

How to measure finish viscosity

- Stir the finish well, but don't create bubbles. If you do, wait until the bubbles dissipate before you measure.
- Submerge the cup into the finish with the rim just below the surface and keep it level.
- Start the stopwatch at the exact time you lift the cup straight up.
- Let the fluid flow out until you see the first break in the stream, then stop the timer.
- The number of seconds equals the viscosity measurement. Cross-reference this against the chart in your gun's owner's manual to determine which nozzle to use for that finish, or thin the finish until its viscosity matches your nozzle's specifications.

Source: Ford #4 viscosity cup, $6, woodmagazine.com/viscosity.

Tip! *Smartphones have a stopwatch you can use for timing fluid viscosity.*

Finish consistency is key

Some water-borne topcoats require thinning 5–10 percent (1–1½ oz. per quart) with distilled water for spray application. Establish a baseline measurement by checking the viscosity of the unthinned finish with a viscosity cup, shown *above*. This gives you a feel for how much water to add to any finish to make it sprayable. Start at low dilution and test for good material feed, gradually adding water until you obtain a consistent spray pattern and good coverage. Thin only the amount of finish you intend to spray in one session, and always thin your finish using the viscosity-cup time rather than the amount of water added in previous sessions.

Set up a spray space

Ideally, you'd have a dedicated spray booth to work in, but for most of us, that's unrealistic. Still, you can make a spraying setup in your shop or garage, even if a temporary one, for water-borne finishes. Start by placing a box fan in a window, with a pleated filter secured to the intake side (facing you). If possible, use two fans to maximize exhaust ventilation.

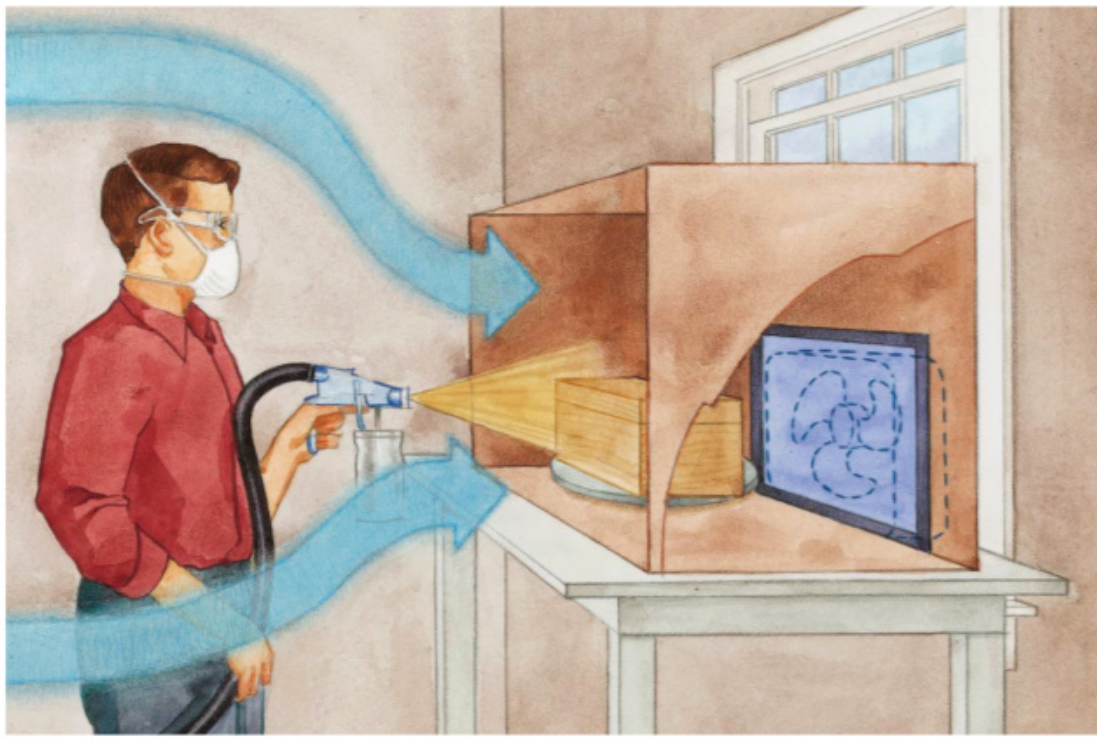
Note: *Spray only water-borne finishes using this temporary spray-booth setup.*

For small projects, place a work table in front of the window (shown *center, right*) and create a cardboard shroud to contain and funnel overspray and fumes to the fan.

For large projects, fashion a booth with white muslin drop cloths. Don't forget the ceiling: Dust and grit from overhead can land on a freshly finished project. Avoid using sheets of polyethylene, because static electricity can cause dust to cling to those sheets, and that dust may find its way onto your wet finish. The fan will draw air from beyond your spray space, over and around the project, and out the window, so clean the area outside the spray space, too.

Arrange good, bright lighting that reflects off project surfaces so you can see how the finish builds, *bottom right*. Wear a respirator made to filter organic vapors. HVLP turbines can be as loud as a noisy shop vacuum, so wear hearing protection when using one. Don't place a turbine under a box to muffle the sound; without proper ventilation, the turbine motor will overheat.

Tip! *Do not spray if the temperature in your shop is below 60° F. If possible, keep the humidity level close to 50 percent.*



A box fan can provide sufficient air draw for spraying small projects. Open a window or door on the opposite side of the shop to provide make-up air.

Using a low-angle raking light provides a good look at the wet finish on your workpiece, helping you see where to spray next.

Develop your technique

__Tip!__ Strain your finish with a paint filter every time you load your spray gun. Even a very small lump can clog the spray tip and cause spattering.

Before spraying a project, build your confidence by practicing on sheets of cardboard (*right*). Adjust the finish volume, size and pattern of spray, the speed at which you move the gun, and the distance from the workpiece (6-8") until you get good, even coverage without drips. Cardboard absorbs finish differently than wood, so once you get the hang of spraying on cardboard, try veneered plywood or finish-sanded scrapwood.

Seal coats. Water-borne finishes leave raised wood grain after drying. You can knock this down with fine sandpaper, or avoid it altogether by first spraying a seal coat of dewaxed shellac or lacquer. Start by finish-sanding to at least 180 grit, then remove all sanding dust with a clean rag or shop vacuum. Spray on one or two light coats, let the finish dry thoroughly, and then rub it out (buff smooth) with 320- or finer grit sandpaper. If you've stained the wood, spray two seal coats before rubbing out to avoid sanding through the stain. (A thinned finish builds less quickly than an unthinned one, requiring two seal coats and usually more than one finish coat.)

__Tip!__ You can remove finish drips and runs with a dry foam brush if done immediately while the finish is wet enough to flow out.

Stains. Water-borne stains raise grain more than water-borne polyurethane, and can't be easily rubbed out after application. In this case, raise the grain before applying the stain. First, sand to 180 grit, then wet the wood slightly with a clean sponge. Wait for the surface to dry, and finish-sand again. Apply the stain and let it dry. If any grain raises again, wipe it gently with very fine abrasive, and blow away the dust.

Rather than going to this much effort, we recommend wiping on an oil-base stain and letting it dry at least 12 hours (until you can sniff the surface and not smell the solvent) before spraying with a water-borne topcoat.

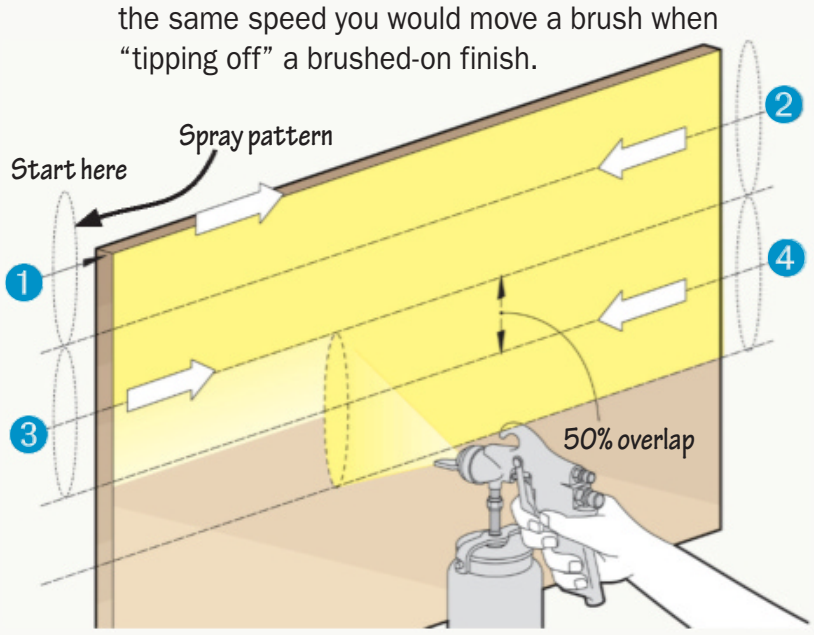
Spraying on cardboard lets you adjust the fan pattern and volume of finish as well as your technique without the worry of wasting wood.

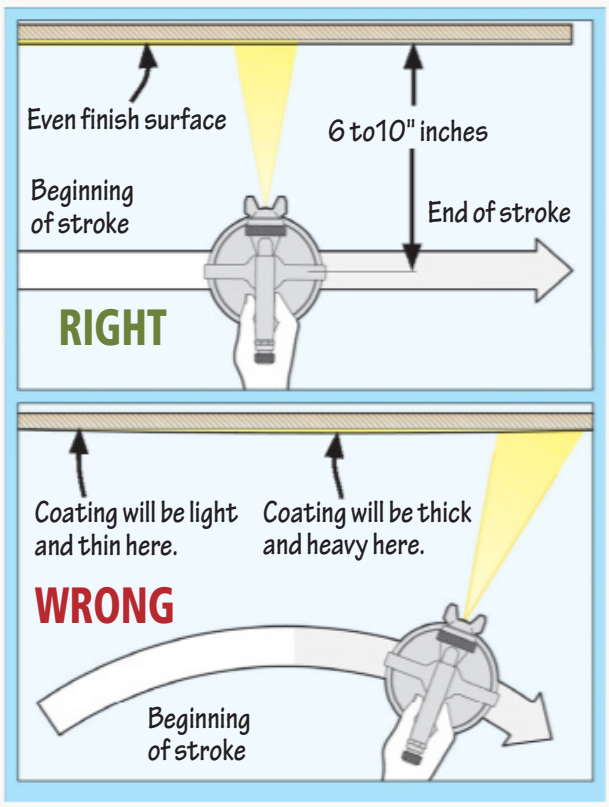
Topcoats. Spray on finish until it fully wets the wood and leaves a bit of stippling or orange-peel texture on the surface immediately after application. (It will soon level out.) Spraying until the wet surface is absolutely smooth means you've applied too much finish. If your finish has a milky color in the container, and you see this color building on the workpiece, once again, you've applied too much finish. In either case, quickly wipe off the finish with a wet rag, wipe the piece dry, and start over.

Spray finish with confidence

Hone your spray-finishing skills by practicing these tips until they become habits.

- Pull the sprayer's trigger before you reach the edge of the project, move across the project at an even pace, and release the trigger after spraying past the far edge. Starting the spray directly on the project can create uneven or blotchy finish, drips, or runs.
- Overlap the spray pattern about halfway onto the previously sprayed pass. Maintaining a wet edge in this manner helps you blend each swath.
- Keep the tip of the spray gun parallel to the surface as it moves across the project, and move it at a steady pace. Don't swing the gun in an arc.
- Apply just enough finish to a vertical surface to wet it without creating runs.
- Apply multiple thin coats rather than one or two thick coats.
- Move the spray gun across the surface at the same speed you would move a brush when "tipping off" a brushed-on finish.





With case-type projects, spray the interior upright elements first.

Then spray the interior horizontal elements.

For removable shelves, screw them to supports so you can spray the entire shelf.

For doors, spray the outer edges first, then spray the rail and stile faces and panel.

More spraying tips

When you're ready to spray your first project, do the following:

- Spray as many parts as possible in a horizontal orientation to reduce the likelihood of drips and runs.
- When spraying any type of casework, always spray the interior elements first, then the outer parts last.
- Leaving the backs off cabinets and case pieces provides easy access to the interior, especially tight corners. This also prevents finish from blowing back in your face.
- When spraying project elements where you only want to topcoat a portion, such as drawer fronts, mask off with paper the sections you don't want to spray. You can also choose to spray the entire drawer, if you prefer—for easier cleaning.
- Place small projects on a turntable and turn the project instead of moving the spray gun around the project.
- With almost any finish you spray, sanding between coats knocks down any dust nibs, making for smoother succeeding coats. And with polyurethane, the sanding marks help the new coat link to the previous one.
- Don't stand between the project and the exhaust fan, or you'll block the fan or get coated in overspray.

▶Point your phone's camera at this code to get a video lesson on spray finishing, or visit woodmagazine.com/sprayfinish

▶Learn how to maintain your spray gun on *page 70*.

Produced by **Bob Hunter** with **Jan Svec**, **Kevin Boyle**, and **John Olson**

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Mortar and Pestle

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Wood makes for a good mortar and pestle as it is hard enough to crush ingredients while having enough texture to help tear them apart. To hone the design of our mortar and pestle, we gathered opinions from the experts in the *Better Homes & Gardens®* Test Kitchen. They liked the feel of the pestle and that the mortar nestles in a base with nonskid feet to eliminate tip-overs while grinding ingredients. After several days of testing, Test Kitchen director Lynn Blanchard, *left*, pronounced it "very sturdy and useful for grinding herbs and crushing seeds such as cumin, fennel, and dill. Lifting the mortar from the base makes for easy transfer of herbs to what you are cooking."

Work from large diameter to small, lifting the handle and rolling the gouge.

Start away from the line that marks the equator of the hemisphere and work toward the parting cut. Start closer to the line with each cut.

Spindle-turn the pestle

1 Mark the centers on the ends of a 1¾×1¾×5½" maple blank. Mount the blank between centers and, with the lathe at 2500 rpm, turn it round using a spindle roughing gouge [**Drawing 1**]. Reduce the right half of the blank to 1¼" diameter.

2 Mark lines ½" and 1⅜" from the left end, at the midpoint, and ½" and 1⅛" from the right end. With a ⅛" parting tool, reduce from the outside marks to each end of the blank to about ½" diameter, and the midpoint to 1".

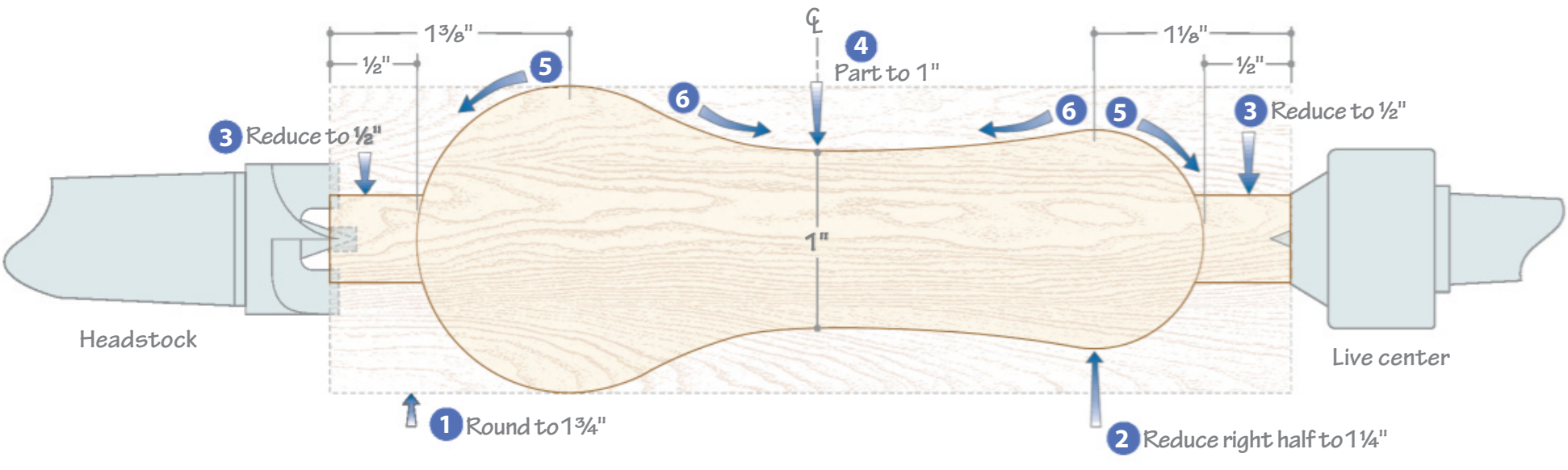
3 Using a spindle detail gouge, round a hemisphere on each end [**Photo A, Drawing 1**].

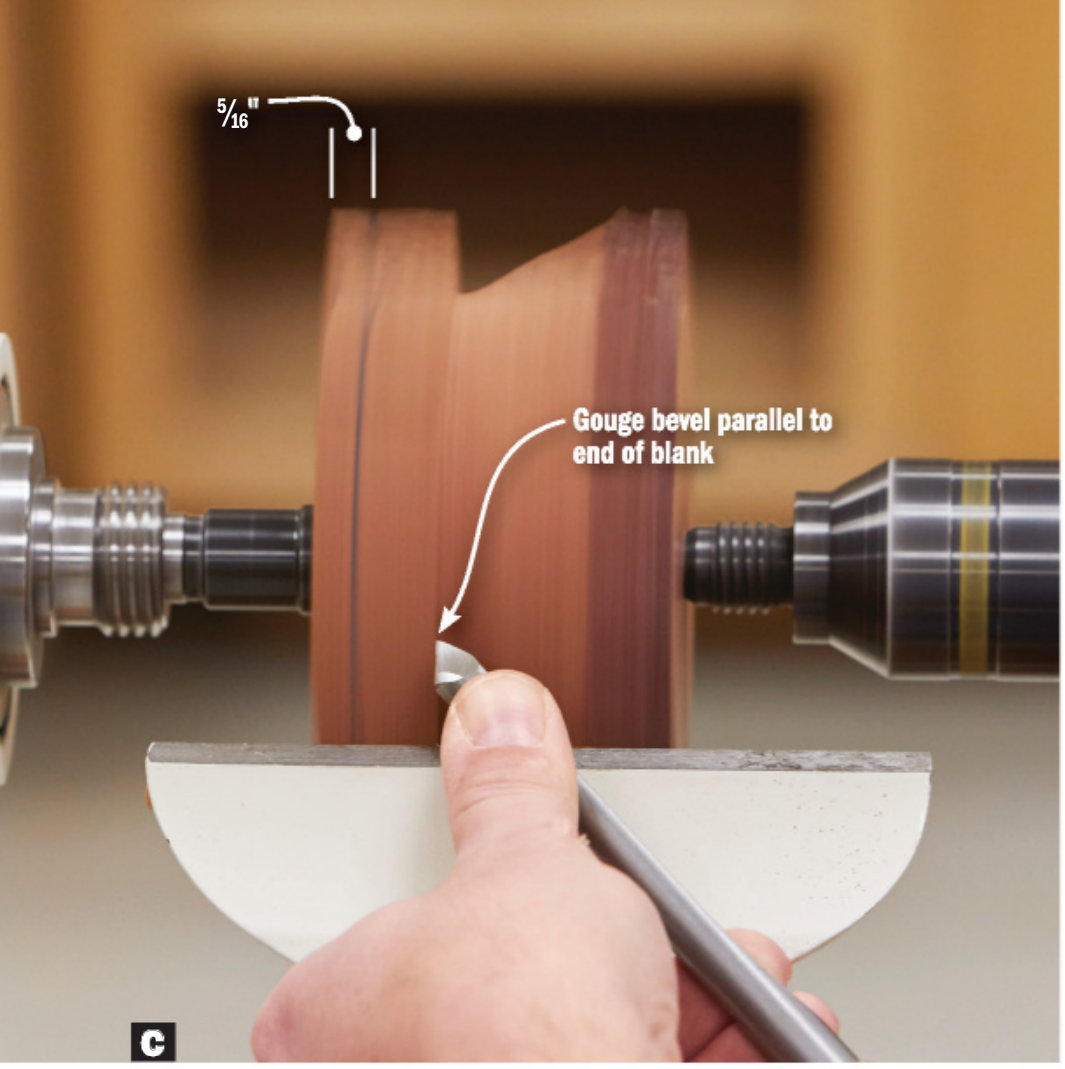
4 Starting with the roughing gouge and changing to the detail gouge, shape the cove to the depth of the middle parting cut, blending the cove to the hemisphere on each end [**Photo B**]. Check your progress with the **Pestle Pattern**, *page 69*.

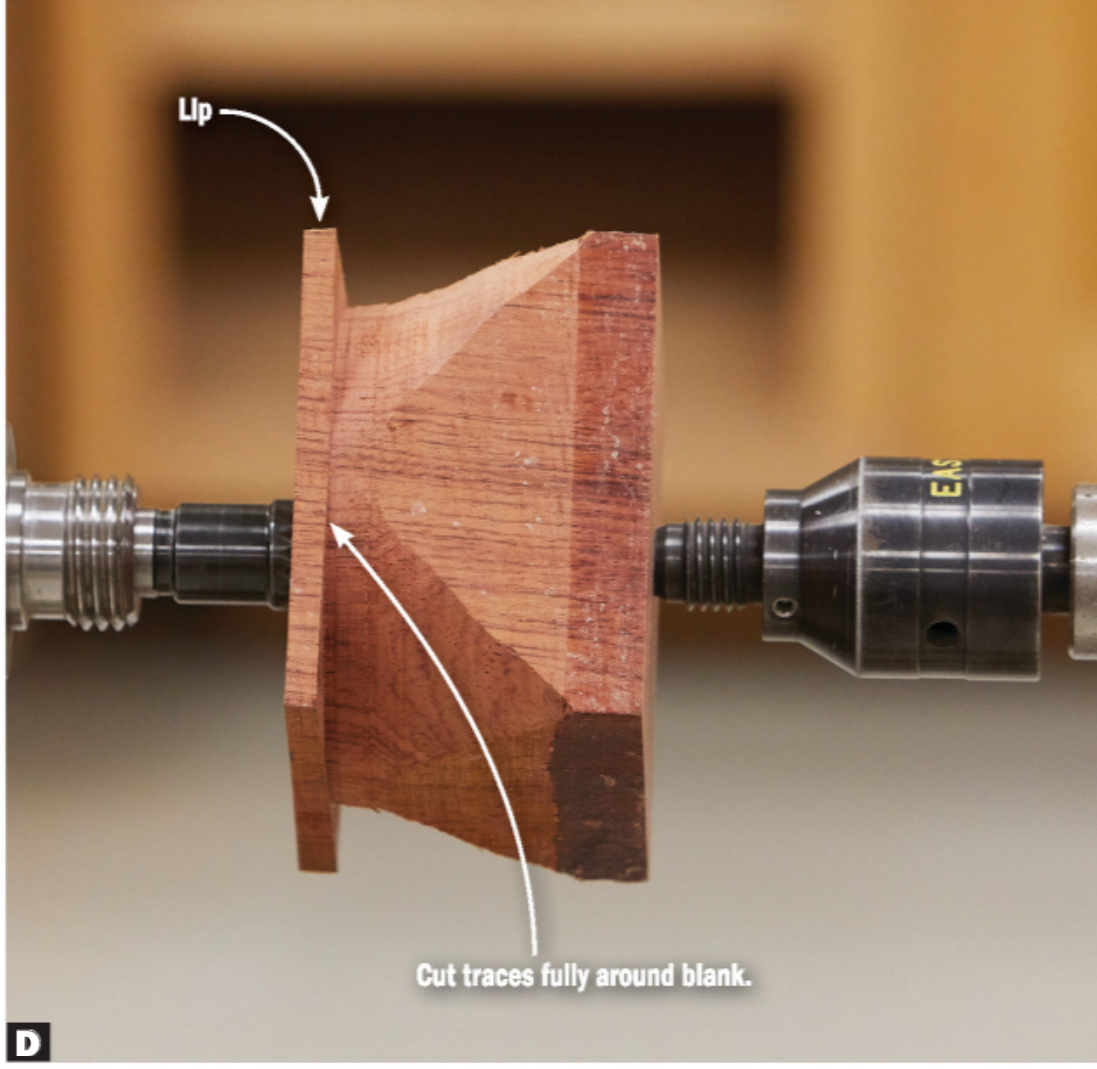
5 Sand the pestle to 220 grit. Then pare the ends down with a skew. Stop the lathe and use a handsaw to separate the pestle from the waste. Sand the ends smooth, blending them into the hemispheres.

▶Hover your smartphone's camera over this code to watch a video of turning the three pieces of this project, or visit woodmagazine.com/mortarpestle.

1 PESTLE







Begin with the flute of a spindle detail gouge closed and the bevel parallel to the end of the blank. Starting well to the right of the line, lift the handle until the gouge begins cutting. Stop at about ⅛" depth. With each subsequent cut, move a little closer to the line and cut slightly deeper than previously. Stop when the cut fully traces the blank circumference at the line.

Work from large diameter to small using the **Mortar Pattern** to gauge your progress. Shaping the mortar as closely as possible to the pattern simplifies forming the base later.

Align the centerline of the tab with a corner, then trace around the pattern.

Cut end grain on the mortar

▶We used bubinga for the mortar, but any dense, closed-pore wood will work.

▶**Pommel**: The transition in a turning from square to round.

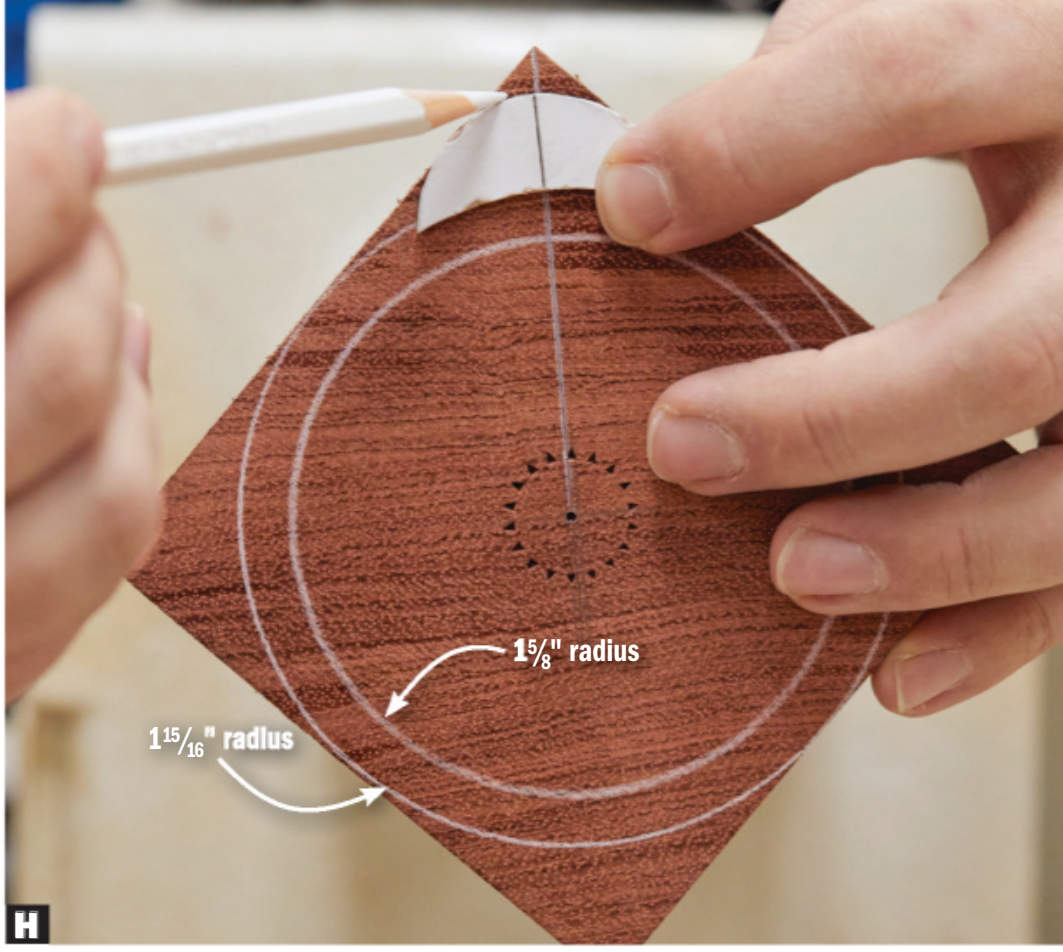
1 Mark the centers on each end of a 4×4×2¾" blank. Also mark a line around the blank 5/16" from the top end.

2 Mount the blank between centers with the marked end nearest the headstock. Set the lathe for 1000 rpm, and cut a pommel [**Photos C, D**]. Make sure that the only motion while cutting is lifting the handle.

3 Round the blank to the right of the lip with a roughing gouge. Mark 2" to the right of the lip, and part to a 2" diameter to the right of the mark. Form a tenon to the right of the parting cut to fit your four-jaw chuck. Switch to a spindle detail gouge and shape the outside of the mortar [**Photo E**].

4 Sand the outside of the mortar, being careful of the lip. Then trace the **Tab Pattern** onto one corner [**Photo F**].

Use a wide parting tool to form a tenon to fit your four-jaw chuck. Set this jam chuck aside for use later when completing the mortar.



Concentric circles outline the mortar rim. Align the **Tab Pattern** with the outside circle and trace it onto the top face of the same corner as before.

Align the gouge with the lathe axis. With the flute open, push the gouge into the center, then rotate the flute counterclockwise. Keep the handle level as you swing it to the right to cut toward the rim.

▶Although the mortar looks like a bowl, the grain runs *parallel* to the lathe bed, so it's really a short, fat spindle, and you hollow the end grain.

5 Before removing the drive center from the lathe, make a jam chuck for use later by turning a 3×3×2" scrap round and forming a tenon on one end [**Photo G**].

6 Mount the mortar in a four-jaw chuck by its tenon. Mark the rim thickness and tab [**Photo H**]. Hollow the interior to about 1⅝" deep using a spindle detail gouge [**Photos I, J**]. Finish the opening with a roundnose scraper, working to the line and maintaining a uniform wall thickness. Finish-sand the mortar interior.

7 Bandsaw the mortar rim round, cutting around the tab. Mount the mortar in the four-jaw chuck again, and smooth the rim [**Photo K**].

With the lathe switched off, the four-jaw chuck securely holds the mortar, allowing easy access for smoothing the rim with a rasp and sandpaper.

Place two layers of paper towel over the dome and press the mortar against it using a live center in the tailstock.

On a line from a corner to the blank centerpoint, mark a point 1¾" from the centerpoint. Drill ⅛" deep at the mark.

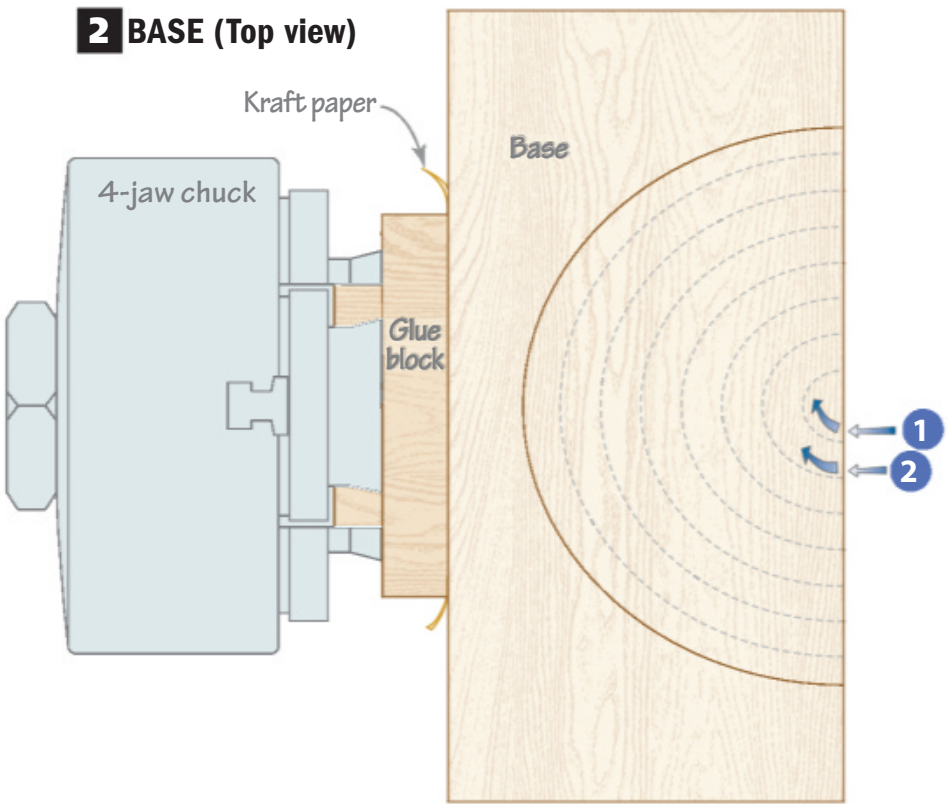
Tip! *The fit of the jam chuck to the mortar doesn't have to be perfect, just close.*

8 Grip in the four-jaw chuck the jam chuck turned earlier. Turn a dome on the end to fit inside the mortar. Mount the mortar [**Photo L**], and use a parting tool and spindle detail gouge to finish shaping the outside, checking the profile against the **Mortar Pattern**. Saw away the remaining waste and sand the bottom smooth. Flatten the rim by adhering sandpaper to a flat surface and rubbing the mortar on it.

Hollow face grain for the base

1 Mill a 2¾×5½×5½" hard maple blank. Mark the center on the top face and from it draw a 3⅞"-diameter circle. Then drill the tab recess [**Photo M**].

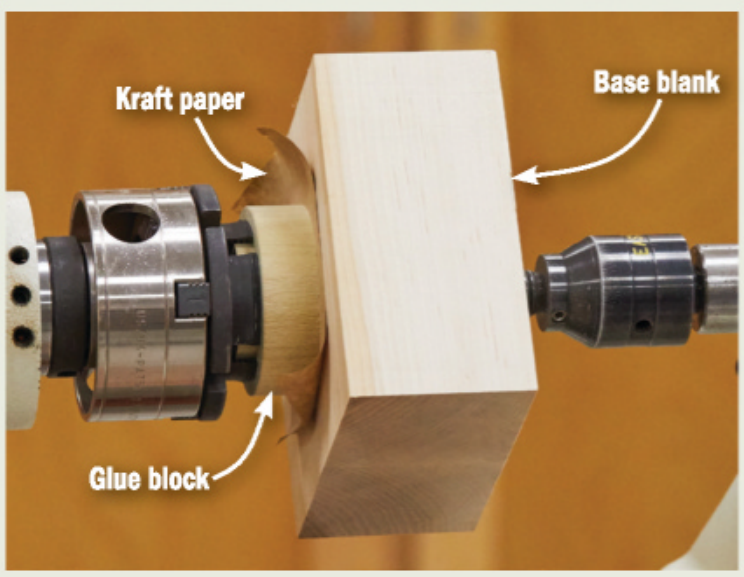
2 Grip the jam chuck in your four-jaw chuck, part off the dome, and flatten the exposed face with a skew chisel. Glue the newly made glue block to the base with a paper joint [**Skill Builder**].



SKILL BUILDER

The perfect joint to break up

Attach a glue block to a workpiece temporarily by gluing a piece of kraft paper between the two pieces of wood. The joint holds securely while you turn the workpiece to shape; a sharp rap from a chisel separates the pieces.



Apply a thin coat of glue to the glue block and the bottom of the base. Sandwich a piece of kraft paper between the two and advance the tailstock slightly to apply pressure until the glue dries.

Rest your widest chisel on the base and against the glue block. A couple sharp blows with a mallet should remove the glue block. Plane and sand away the remaining glue and paper.

▶The blank's grain runs perpendicular to the lathe bed length. Hollow the blank working toward the bottom center to cut with the grain and prevent tear-out.

3 Remove the tailstock, set the lathe for 700 rpm, and hollow the base with a bowl gouge, widening the opening with each subsequent cut [**Drawing 2**]. Compare your progress to the **Base Pattern,** and as the opening enlarges, to the mortar itself. You want a close fit so the mortar won't wobble while crushing ingredients.

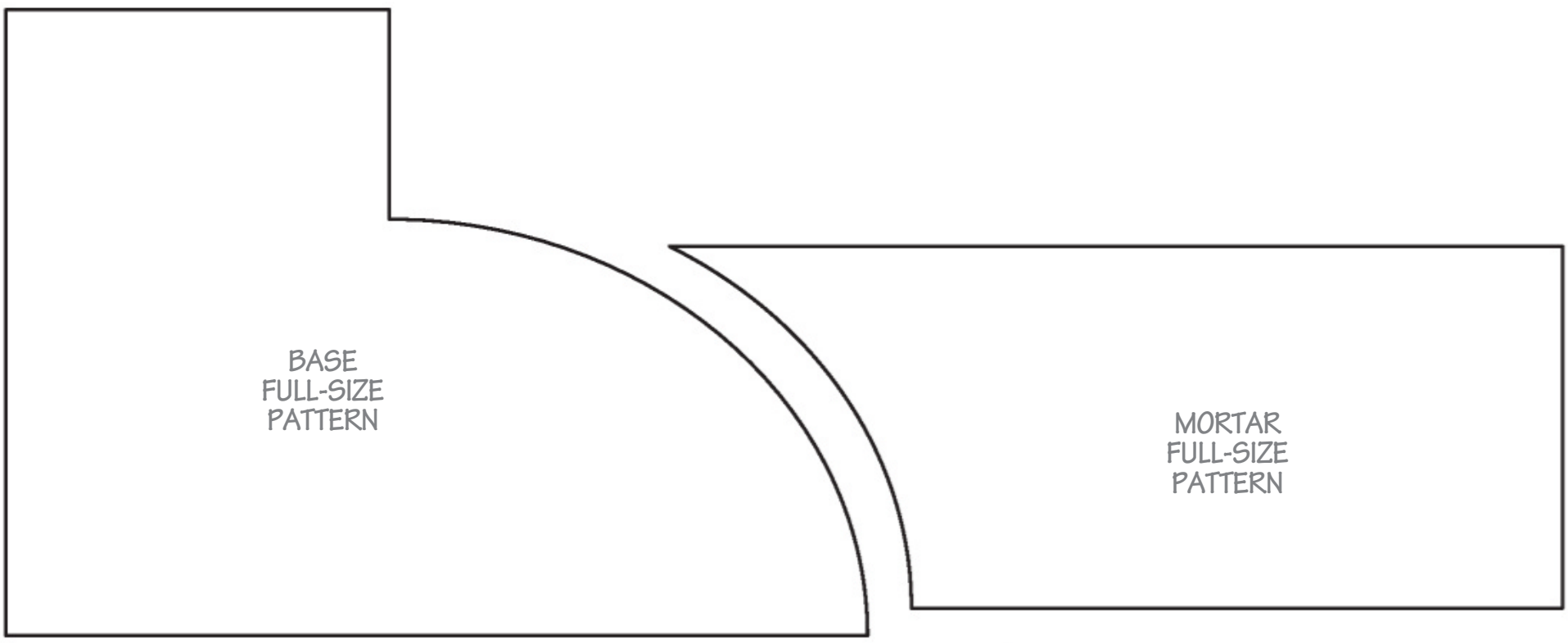
4 Sand the inside of the base, then remove it from the lathe and remove the glue block. Finish-sand the outside, easing the sharp edges. Drill holes for the feet [**Source**] ¾" from each corner, and apply a finish to all pieces. (We used Arm-R-Seal.) After the finish dries, install the feet, and admire your work. You crushed it!

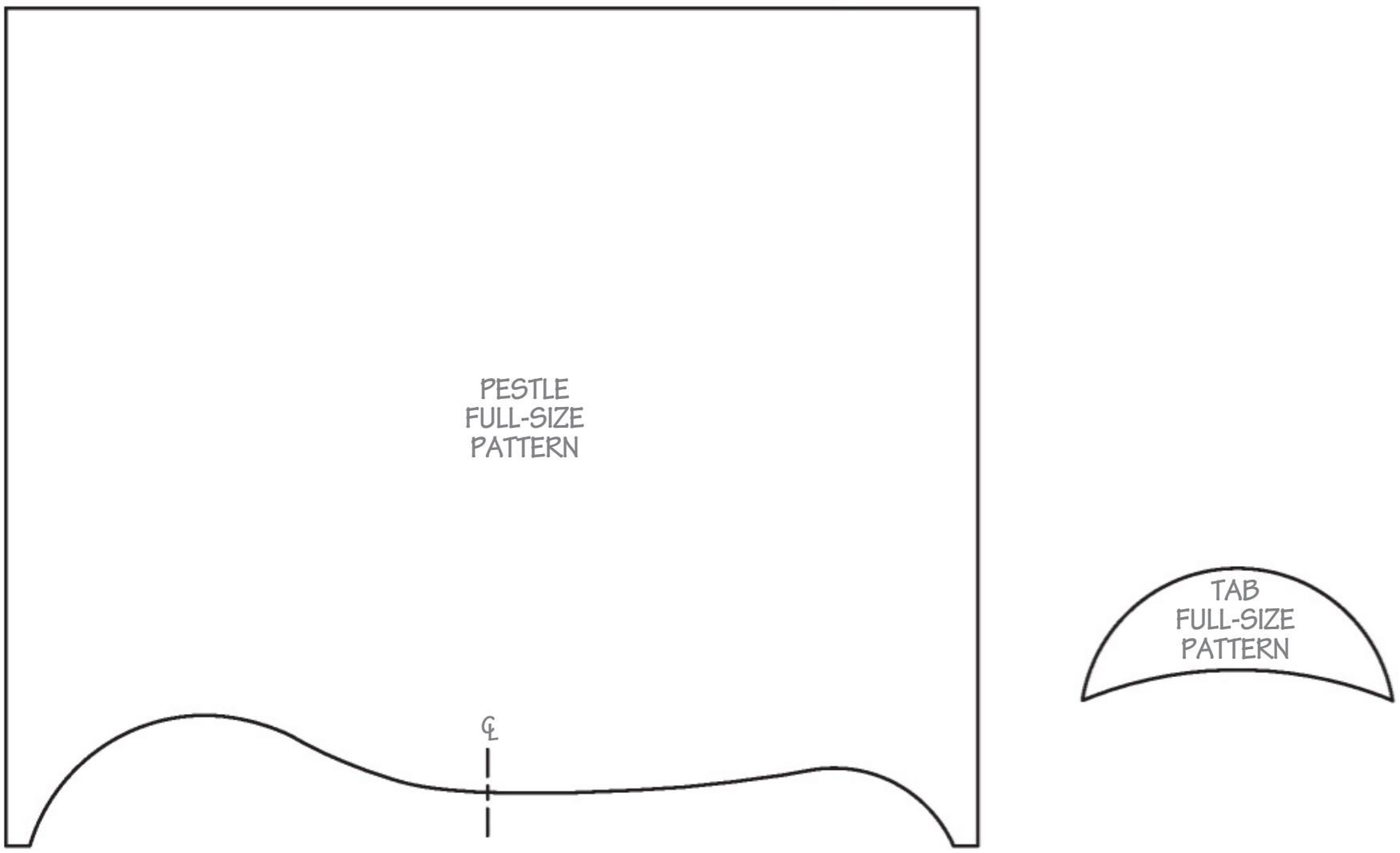
Source: Soft-stem bumpers, no. 32479, $3/8-pk, Rockler Woodworking and Hardware, 800-279-4441, rockler.com.

Note: *Clean the mortar, pestle , and base with warm water and mild soap, and dry them with a soft towel. Do not submerge or soak them, or run them through a dishwasher. If the finish dulls, buff with a soft cloth, reapplying finish if needed.*

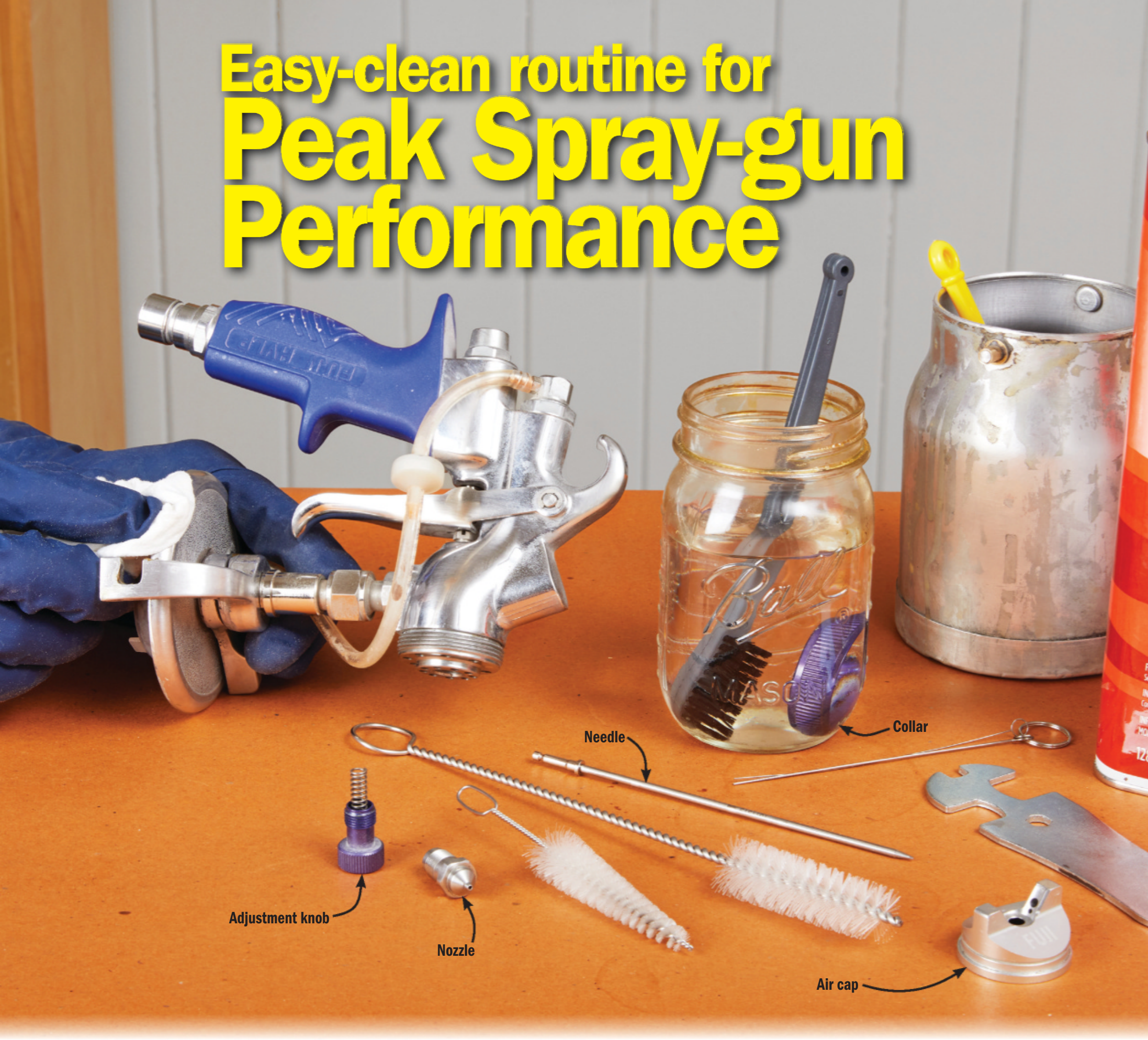
Note: *Any finish is food-safe after it dries thoroughly. But do not use a film-forming finish such as polyurethane—it could flake off and contaminate food.*

Produced by **Craig Ruegsegger** with **Brian Simmons**
Project design: **Brian Simmons**
Illustrations: **Lorna Johnson**





Easy-clean routine for Peak Spray-gun Performance



by Jim Heavey

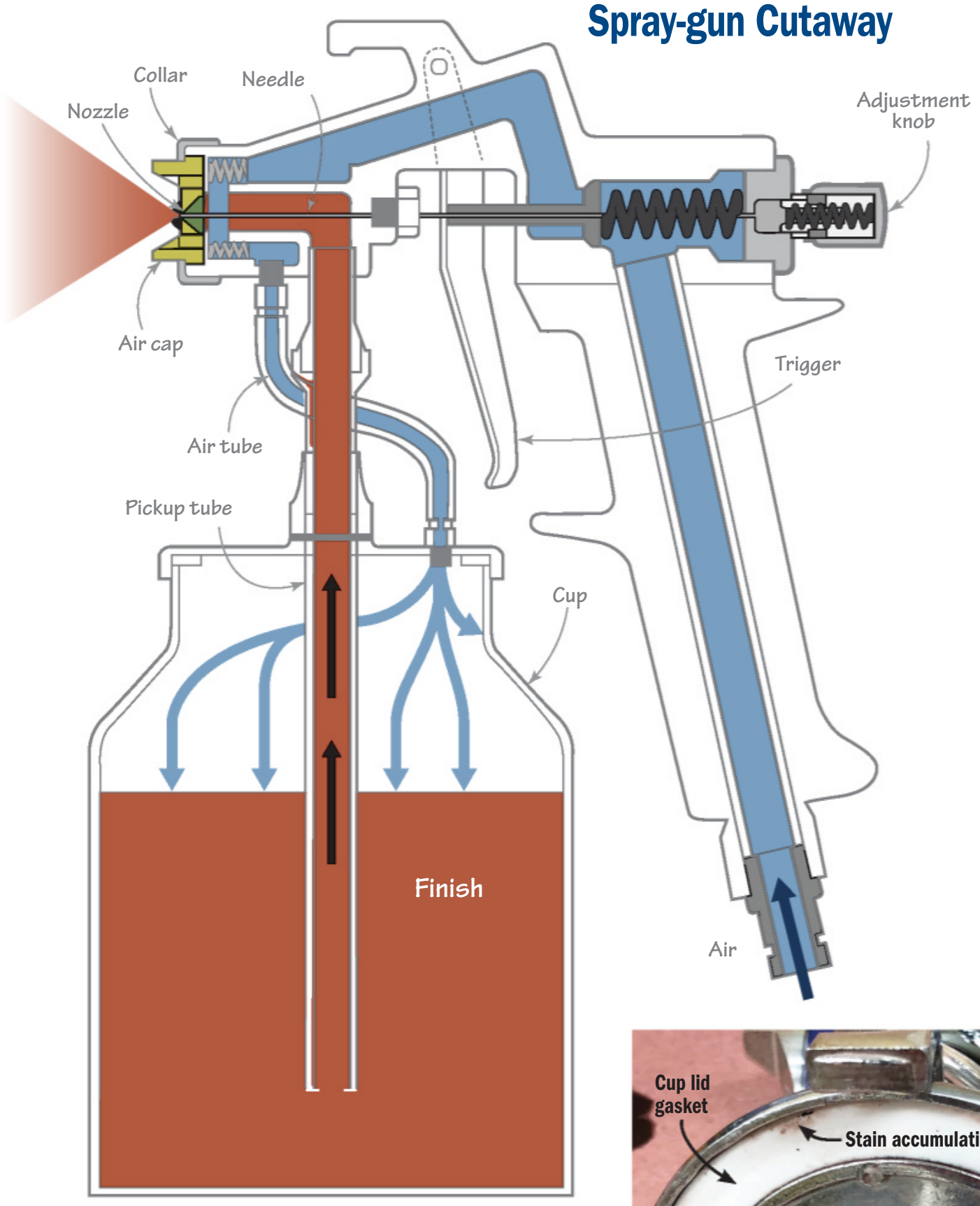
A high-volume, low-pressure (HVLP) spray gun makes applying a finish easier than ever. Follow these simple procedures and keep that gun performing like new for years to come.

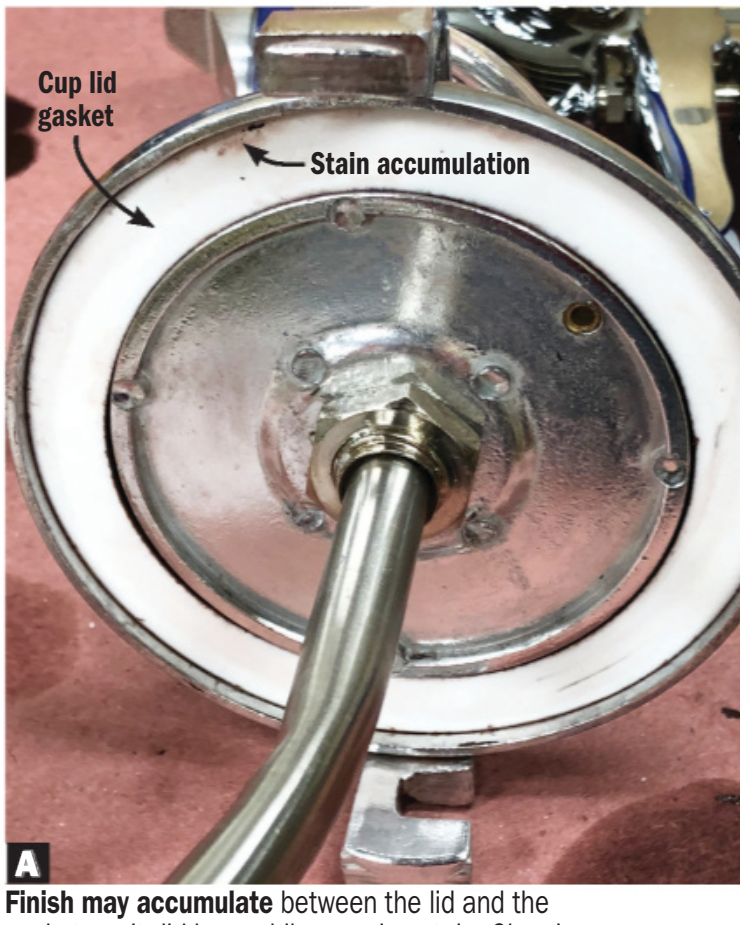
Spray a little, clean a little

On a typical project, you may apply several coats of finish separated by a drying time based on temperature and humidity. Here's how to minimize cleanup between coats, even when spraying a slow-drying polyurethane that might require eight hours between applications.

Spray the first coat, then unscrew the spray gun collar [**Spray-gun Cutaway**], remove the air cap, and soak these items in a sealed jar of the appropriate solvent. Wipe the tip of the nozzle with some of the solvent as well. If overspray has collected on the exterior of the cup or gun, wipe them with the rag and solvent. No need to completely clean the gun at this time because the liquid finish is sealed inside.

As you ready to spray each additional coat, swish the finish in the gun to stir the contents, place the air cap and collar back on the gun, and spray away. Repeat the mini-





Finish may accumulate between the lid and the gasket, as it did here while spraying stain. Cleaning this area keeps the gasket pliable and avoids contaminating the next finish.

Note: *With catalyzed finishes, clean the gun completely at the end of each day. Catalyzed finishes can harden in the gun, ruining it, if left for extended periods.*

Note: *Wear eye protection to guard against solvent splatters.*

cleanup routine and finish applications until you apply the final coat.

With finishing complete, the gun needs a thorough cleaning. First, pour any remaining finish in the cup back into the can. Pull the trigger to drain any finish from the pickup tube, then wipe out the cup with a paper towel. Now pour in about 1" of clean solvent and lock the cup back on the gun. While swirling the cup around to distribute the solvent, spray the contents into a rag until the mist runs clear. This cleans the pickup tube and fluid passageways inside the gun. Remove the cup and pour any remaining solvent into the sealed jar. If the pickup tube has a removable filter, drop this into the jar as well. Remove, clean, and reinstall the cup lid gasket [**Photo A**].

A wrench included with your spray gun should fit the nozzle for easy removal.

The air passageways in the air cap create a precise spray pattern. To prevent damaging them, use only cleaning kits designed to clean the airways. Purchase them wherever spray guns are sold.

Break down the gun

Next, remove the collar and air cap. With the trigger pulled, remove the nozzle [**Photo B**], and place all three pieces in the solvent-filled jar. Unscrew the adjustment knob and spring to remove the needle.

Using a paper towel, soft brush, and solvent, clean all exposed parts of the spray gun and wipe them dry. Use the same brush to clean the filter, collar, air cap, and nozzle, paying close attention to the openings in the air cap [**Photo C**]. Use a rag dampened with solvent to clean the needle.

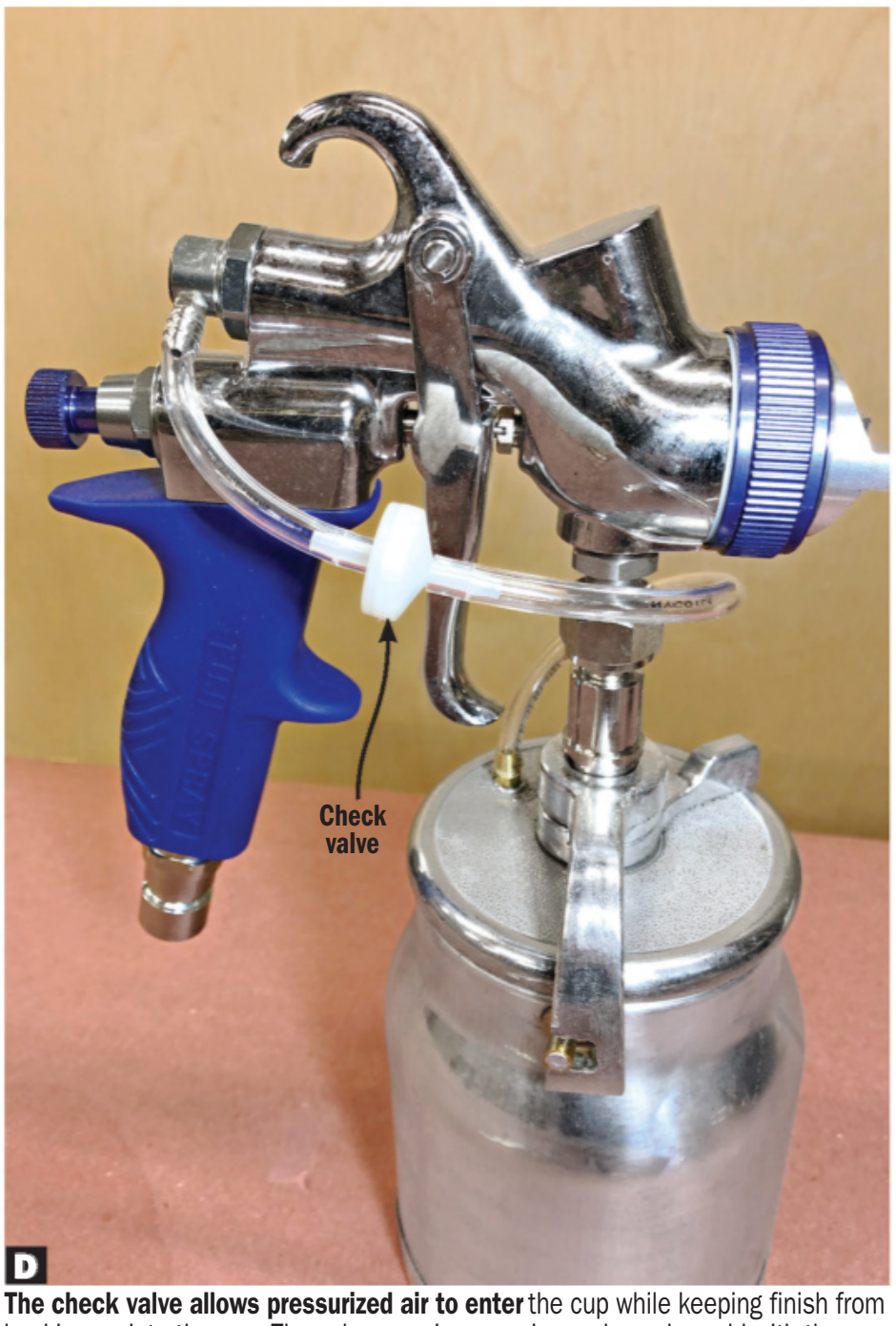
Tip! *Use a low-pressure stream of compressed air to dry parts quickly.*

To reassemble, begin by adding a drop of spray-gun oil to the back end of the needle and reinsert it into the gun, securing it with the spring and adjustment knob. While pulling the trigger to retract the needle, replace the nozzle and tighten carefully. Finally, add the air cap and the collar, and place the filter onto the pickup tube.

Reassemble the spray gun and cup. If the gun will sit unused for a long period of time, avoid overtightening the lid on the cup to prevent deforming the gasket. It's a good idea to keep a couple of replacement gaskets on hand.

Now, visually inspect the air tube and check-valve assembly [**Photo D**]. If finish has collected above and below the valve, the valve has failed. A clogged valve may prevent the gun from spraying at all, and the valve should be replaced.

This entire cleaning ritual takes less time than cleaning a brush, further reducing finish time. Pretty easy, huh?

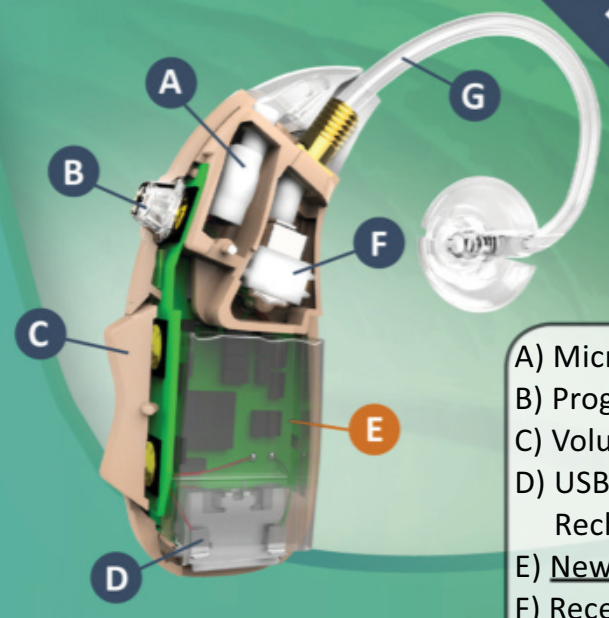


The check valve allows pressurized air to enter the cup while keeping finish from backing up into the gun. The valves are inexpensive and may be sold with the tubing or separately. Keep a couple of spares to avoid downtime.

NEW Rechargeable Digital Hearing Aid Technology Only $229!*

(*Each when you buy a pair)

The new more powerful HearClear™ **HCR3 rechargeable** hearing aid combines advanced technology with a low price to provide you with outstanding value.



New Improved R3 Digital Processor™!

A) Microphone
B) Program Button
C) Volume Control
D) USB Charging Port & Rechargeable Battery
E) New Digital Processor
F) Receiver (Speaker)
G) Sound Tube

5 Star Reviews! ★★★★★

Outstanding Product! "This product is outstanding. Dad loves it, my mom loves it, and I am grateful! Don't believe that you have to spend a lot of money to get a quality hearing aid"
- Gilmore B.

HCR3 Features!

- Digital sound processing chip provides **clear sound and makes speech easier to understand** with less feedback than old analog technology
- Don't worry about replacing batteries! **Full Charge Gives 16 Hours of Use! (Charger Included)**
- Easy **On / Off Button**
- Automatic Noise Reduction and Feedback Cancellation
- **100% Money Back Guarantee**
- **4 Programs** for different listening situations
- Helps most **moderate to significant hearing losses** (call us if you need more power)

Even Better In Pairs!

Your brain is designed to use both ears working together. In fact, studies show that you may be able to **hear up to 3 times better** in noisy situations when using two hearing aids. Buy a pair for the best results and maximum savings!

Simple. Affordable. Rechargeable Digital Hearing Aid - For Only $229!*

The new HearClear™ HCR3 Rechargeable Digital Hearing Aids are now available to you for an unbelievably affordable price! The HCR3 is packed with the same key technologies that all high end digital hearing aids share while leaving out the extra bells and whistles that increase cost and require expensive adjustments. This helps you **hear better, while saving you a lot of money.**

NOW ON SALE!
~~List Price: $849~~
Sale Price: $229*

Your new HearClear HCR3 hearing aids work at a fraction of the cost of name-brand hearing aids, and you won't have to keep changing the batteries! You will love the discreet, comfortable, lightweight Open-fit design. The HCR3 is pre-programmed for most moderate to significant hearing losses, so you won't need professional appointments to make costly adjustments. **It is shipped directly to you and will help you hear better right out of the box!**

You can spend thousands for an expensive hearing aid, or you can spend just **$249** for a hearing aid that is great for most hearing losses **(only $229 each when you buy a pair – hear up to 3 times better than wearing just one)**. We are so sure you will love your hearing aids that we offer a **100% Money Back Guarantee - Risk Free** if you are not satisfied for any reason.

MONEY SAVING OFFER!

Use Coupon Code: **WD99**

1-877-745-0944

***Only $229 Each When You Buy A Pair!**
(Coupon Code & Price Valid For A Limited Time Only)

Advanced Affordable Hearing™
Affordable Quality Since 1996!

A+ BBB ACCREDITED BUSINESS | MONEY BACK 100% GUARANTEE | RISK • FREE • Trial | US Company Owned And Operated | FDA REGISTERED

Visit and Save: **www.AdvancedHearing.com/WD99**

Backsaw Bonanza

Even if you're primarily a power-tool woodworker, you'll love a backsaw (or two) for those times when a handsaw proves the perfect and logical tool for the job. The spine along the top of the blade prevents flexing, ensuring straight, accurate cuts. We tested and recommend these saws.

Zona Tool fine-kerf razor saw and miter set

no. 161791, $31

This is a great first handsaw, especially if you need a more accurate way to cut miters than what you currently use. The superthin 6½" blade with 24 teeth-per-inch (tpi) doesn't deflect in cuts. The included aluminum miter box accommodates stock up to 2" wide and ⅞" thick, with precut guide slots for precise 90°, 45°, and 30° angles.

Available at Woodcraft
800-225-1153, woodcraft.com

Lie-Nielsen 9" dovetail saw

no. 1-SAW-DS, $125

This 15-tpi ripsaw works perfectly for cutting dovetails. With a brass spine and curly hardwood handle, it's as much a work of art as a functional tool. If you have large hands, though, you might feel a bit pinched by the small handle.

800-327-2520, lie-nielsen.com

Lee Valley Veritas 9" dovetail and crosscut saws

Small crosscut saw (shown), no. 05T06.01, $76; standard dovetail saw, no. 05T05.01, $76; fine-cut dovetail saw, no. 05T05.05, $76

These three saws have molded resin spines for rigidity, and comfortable maple handles. Get the 16-tpi crosscut saw (shown) for making cross-grain cuts. Both dovetail saws work great at ripping, with the standard saw (14 tpi) a little more aggressive than the fine-cut (20 tpi). Lee Valley sells all three in a set (no. 05T05.12) for $195.

800-871-8158, leevalley.com

Bad Axe Tool Works 14" precision carcase saw

$260

Also marketed as "The Bayonet," this saw can be customized to suit you, with options in six categories, from materials used, to the geometry of the teeth. We chose the large handle, and like it immensely. The hybrid tooth cut works well as a compromise between a ripsaw and crosscut saw. Buying this saw says you appreciate custom tooling created by an artisan; expect a 2–3 month wait for your saw to be made to your specifications.

888-489-9665, badaxetoolworks.com

continued on page 77

▶Our favorite router bit for flattening slabs: woodmagazine.com/megabit.

Flatten wide slabs with this smooth operator

Slab Flattening Mill with 38×56" capacity, no. SLBFLT, $800
Also available in 2×2' capacity, no. SLBFLT-2×2, $500; 2×4' capacity, no. SLBFLT-2×4, $550; and 38×128" or 62×104" capacity, no. SLBFLTXL, $1,000

I build a lot of projects using natural-edge slabs, and flattened them using several shop-made router sleds over the years. But this Woodpeckers flattening mill simply works better than any sled I've built. With aluminum rails and fixtures, and a carriage and router base that glide freely on slippery-smooth UHMW strips, this mill takes much of the work out of flattening boards.

This kit accommodates slabs up to 38" wide. The router plate comes predrilled for most midsize and larger routers, and includes mounting screws. You mount the long rails to a sheet of plywood or similar base, spaced up to 4' apart. If you can deal with its bulk, I recommend making it 4' wide, so you won't have to reposition one of the rails to match each slab.

If I could improve anything, it would be adding dust collection—admittedly a tough task because of so much open space beneath the router base. And the hold-down clamps work great except along edges that taper down and in. In those cases, you'll need to use a temporary wood cleat to secure the slab.

—Tested by Bob Hunter, Tools Editor

800-752-0725, woodpeck.com

FeatherPro delivers a firm grip with a soft touch

FeatherPro featherboard, $30

Whether ripping boards on a tablesaw or routing on a router table, you frequently need a featherboard or two to hold stock against a fence and on the table. This FeatherPro does that perfectly. The hardened foam fingers show surprising strength yet don't scratch workpieces the way some plastic featherboards can.

And because the fingers insert can be reversed, you don't need to buy left and right featherboards. If you should accidentally cut into the fingers, a replacement insert costs only $15. A double-stack FeatherPro sells for $60, good for working with thicker workpieces or ones oriented vertically.

—Tested by Bob Hunter

844-895-4488, bow-products.com

continued on page 80

HARBOR FREIGHT
QUALITY TOOLS AT RIDICULOUSLY LOW PRICES

1,000+ Stores Nationwide • HarborFreight.com

NEW U.S. GENERAL — SUPER COUPON
BIGGER • STRONGER • MORE STABLE SERIES 2

30", 5 DRAWER MECHANIC'S CARTS
- 15,000 cu. in. of storage
- 700 lb. capacity
- Weighs 139 lbs.

Customer Rating

NOW AVAILABLE IN WHITE

Item 56429, 64031, 64033, 64061, 64721, 64722, 64720

~~$229.99~~ YOUR CHOICE OF COLOR $189.99

SAVE $640

COMPARE TO Snap-on BLUE-POINT $830 MODEL: KRBC10TBPES

71603437

LIMIT 1 - Coupon valid through 11/5/19*

SUPER COUPON

OVER 5,000 5 STAR REVIEWS

FREE WITH ANY PURCHASE

SUPER BRIGHT LED /SMD WORK LIGHT/FLASHLIGHT
- Super-Strong, Ultra-Lightweight Composite Plastic
- Magnetic Base & 360° Swivel Hook for Hands-Free Operation
- 3-AAA Batteries (included)
- 144 Lumens

ALL IN A SINGLE SUPER POWERFUL LIGHT

COMPARE TO PERFORMANCE TOOL $13.52 MODEL: W2364

ITEM 63878/63991 64005/69567/60566 63601/67227 shown

71602407

Cannot be used with other discounts or prior purchases. Original coupon must be presented. Valid through 11/5/19 while supplies last. Limit 1 FREE GIFT per customer per day.

SUPER COUPON

20% OFF ANY SINGLE ITEM*

71602753

Limit 1 coupon per customer per day. Save 20% on any 1 item purchased. *Cannot be used with other discount, coupon or any of the following items or brands: Inside Track Club membership, Extended Service Plan, gift card, open box item, 3 day Parking Lot Sale item, compressors, floor jacks, safes, saw mills, storage cabinets, chests or carts, trailers, trencher/backhoe, welders, Admiral, Ames, Bauer, Cobra, CoverPro, Daytona, Diamondback, Earthquake, Fischer, Hercules, Icon, Jupiter, Lynxx, Poulan, Predator, Tailgator, Viking, Vulcan, Zurich. Not valid on prior purchases. Non-transferable. Original coupon must be presented. Valid through 11/5/19.

CENTRAL PNEUMATIC — SUPER COUPON

3 GALLON, 100 PSI OIL-FREE AIR COMPRESSORS

A. HOT DOG ITEM 69269/97080 shown

B. PANCAKE ITEM 61615/60637 95275 shown

Customer Rating

- Air delivery: 0.6 CFM @ 90 PSI

SAVE 59%

YOUR CHOICE $39.99

~~$57.99~~

COMPARE TO PORTER-CABLE $98.62 MODEL: PCFP02003

71603966

LIMIT 2 - Coupon valid through 11/5/19*

BRAUN — SUPER COUPON

5000 LUMENS LED HANGING SHOP LIGHT

NEW

Customer Rating

NOW $19.99

~~$29.99~~

ITEM 64410

SAVE 57%

COMPARE TO INOLED $47 MODEL: SNT28B-12

71604163

LIMIT 3 - Coupon valid through 11/5/19*

CHICAGO ELECTRIC POWER TOOLS — SUPER COUPON

10", 15 AMP BENCHTOP TABLE SAW

Customer Rating

NOW $109.99

~~$139.99~~

COMPARE TO RYOBI $229 MODEL: RTS22

Stand sold separately.

SAVE $119

ITEM 45804/68827/63117/64459/63118 shown

71604424

LIMIT 1 - Coupon valid through 11/5/19*

SUPER COUPON

7 FT. 4" x 9 FT. 6" ALL PURPOSE/WEATHER RESISTANT TARP

Customer Rating

NOW $2.99

~~$4.99~~

COMPARE TO BLUE HAWK $8.78 MODEL: BG8X10-Y

SAVE 65%

ITEM 69115/69121/69129/69137/69249/877 shown

71605142

LIMIT 6 - Coupon valid through 11/5/19*

SUPER COUPON

200 LUMENS LED SUPER BRIGHT FLIP LIGHT

- Wireless, tool-free and easy installation

Customer Rating

NOW $2.99

~~$4.49~~

COMPARE TO PROMIER $4.99 MODEL: SW-SWITCH-12/24

SAVE 40%

ITEM 64189/64723/63922 shown

71605714

LIMIT 4 - Coupon valid through 11/5/19*

HARDY — SUPER COUPON

MECHANIC'S GLOVES

Customer Rating

NOW $4.99

~~$5.99~~

COMPARE TO VALEO $14.99 MODEL: 25521

SAVE 66%

ITEM 62434, 62426, 62433, 62432, 62429, 64178, 64179, 62428 shown

71607208

LIMIT 6 - Coupon valid through 11/5/19*

PITTSBURGH — SUPER COUPON

9 PIECE FULLY POLISHED COMBINATION WRENCH SETS

Customer Rating

LIFETIME WARRANTY

YOUR CHOICE $5.99

~~$7.99~~

SAVE 66%

Item 42305 shown

TYPE	ITEM
SAE	69043/63282/42304
METRIC	69044/63171/42305

COMPARE TO HUSKY $17.97 MODEL: HCW10PCSAE

71607415

LIMIT 6 - Coupon valid through 11/5/19*

WINDSOR DESIGN — SUPER COUPON

60" HARDWOOD WORKBENCH WITH 4 DRAWERS

Customer Rating

NOW $119.99

~~$149.99~~

COMPARE TO GRIZZLY $399.95 MODEL: H7723

Tools sold separately.

SAVE $279

ITEM 63395/93454/69054/62603 shown

71608400

LIMIT 1 - Coupon valid through 11/5/19*

PITTSBURGH — SUPER COUPON

60" ALUMINUM F-STYLE BAR CLAMP

LIFETIME WARRANTY

Customer Rating

COMPARE TO SHOP FOX $35.95 MODEL: D2468

ITEM 92490/60673 shown

SAVE 69%

NOW $10.99

~~$16.99~~

71608611

LIMIT 3 - Coupon valid through 11/5/19*

Haul-Master — SUPER COUPON

1000 LB. CAPACITY SWING-BACK TRAILER JACK

- Height range: 12-1/2" to 24"

Customer Rating

NOW $17.99

~~$25.99~~

COMPARE TO REESE TOWPOWER $49.99 MODEL: 74410

SAVE 64%

ITEM 69780/41005 shown

71608832

LIMIT 4 - Coupon valid through 11/5/19*

CENTRAL MACHINERY — SUPER COUPON

16" VARIABLE SPEED SCROLL SAW

Customer Rating

NOW $69.99

~~$94.99~~

COMPARE TO PORTER-CABLE $199 MODEL: PCB375SS

SAVE $129

ITEM 62519/63283/93012 shown

71610090

LIMIT 2 - Coupon valid through 11/5/19*

VOYAGER — SUPER COUPON

15" TOOL BAG WITH 14 POCKETS

NOW $6.99

~~$10.99~~

COMPARE TO HUSKY $12.97 MODEL: 823035N12

SAVE 46%

Customer Rating

Tools sold separately.

ITEM 62348/62341/61469 shown

71611779

LIMIT 4 - Coupon valid through 11/5/19*

luminar OUTDOOR — SUPER COUPON

24 FT., 18 BULB, 12 SOCKET OUTDOOR STRING LIGHTS

~~$27.99~~ YOUR CHOICE OF COLOR $19.99

Customer Rating

NEW SAVE 50%

BLACK ITEM 64486 63483 shown

WHITE ITEM 64739

COMPARE TO PORTFOLIO $39.98 MODEL: SLC12BK

71613660

LIMIT 4 - Coupon valid through 11/5/19*

Lynxx — SUPER COUPON

40 VOLT LITHIUM CORDLESS 14" BRUSHLESS CHAIN SAW

Customer Rating

SAVE $25

~~$179.99~~ NOW $154.99

ITEM 64715/64478/63287 shown

71615351

LIMIT 1 - Coupon valid through 11/5/19*

SUPER COUPON

DUST AND PARTICLE MASKS PACK OF 5

Customer Rating

NOW 99¢

~~$1.99~~

COMPARE TO ACME UNITED $9.27 MODEL: ACM13259

SAVE 89%

ITEM 63723/50027/62606 shown

71616549

LIMIT 4 - Coupon valid through 11/5/19*

drill master — SUPER COUPON

1/4" TRIM ROUTER

Customer Rating

~~$29.99~~ NOW $19.99

COMPARE TO MAKITA $99 MODEL: RT0701C

SAVE $79

ITEM 44914/61626 64314/62659 shown

71617305

LIMIT 4 - Coupon valid through 11/5/19*

Apache — MODEL 2800 — SUPER COUPON

ULTRA-LIGHT, CRUSH PROOF WEATHER-RESISTANT LOCKABLE CASE

- 11-7/8" L 9" W 5-5/16" H

Customer Rating

NOW $22.99

$29.99

Case contents and locks not included.

COMPARE TO PELICAN MODEL: 1400 $237.63

SAVE $214

ITEM 64551
63926 shown

71617497

LIMIT 3 - Coupon valid through 11/5/19*

GOOD — CHICAGO ELECTRIC POWER TOOLS

SUPER COUPON

12" DUAL-BEVEL SLIDING COMPOUND MITER SAW

Not available in AZ, OH, OK, and VA.

BLADE SOLD SEPARATELY

Customer Rating

ITEM 56597/69684/61776
61970/61969 shown

- 3-1/2" VERTICAL CROWN MOLDING CAPACITY
- 2-5/8" TALL SLIDING FENCES
- LASER GUIDE LIGHT

$139.99 $199.99

SAVE $89 COMPARE TO PROFESSIONAL WOODWORKER MODEL: 9627 $229.80

71619069

LIMIT 1 - Coupon valid through 11/5/19*

BETTER — ADMIRAL

SUPER COUPON

12" DUAL-BEVEL SLIDING COMPOUND MITER SAW

FREE BLADE INCLUDED $19.99 VALUE

Customer Rating

ITEM 64686

- 6-1/2" VERTICAL CROWN MOLDING CAPACITY
- 4-1/2" TALL SLIDING FENCES
- LASER GUIDE LIGHT & LED WORK LIGHT

$179 $199.99

SAVE $90 COMPARE TO RYOBI MODEL: TSS120L $269

71619138

LIMIT 1 - Coupon valid through 11/5/19*

BEST — HERCULES

SUPER COUPON

PROFESSIONAL 12" DUAL-BEVEL SLIDING COMPOUND MITER SAW

Customer Rating

FREE BLADE INCLUDED $44.99 VALUE

ITEM 63978

- 7-1/2" VERTICAL CROWN MOLDING CAPACITY
- 4-3/4" TALL SLIDING FENCES
- LED PRECISION SHADOW GUIDE LIGHT

$299 $349.99

SAVE $300 COMPARE TO DEWALT MODEL: DW378 $599

71619167

LIMIT 1 - Coupon valid through 11/5/19*

FRANKLIN — SUPER COUPON

OSHA/ANSI COMPLIANT

17 FT. TYPE IA MULTI-TASK LADDER

- Versatile - 24 configurations
- Safe + Secure + Stable
- Super Strong - Holds 300 lbs.
- Weighs 34 lbs.

$139.99 NOW $109.99

COMPARE TO LITTLE GIANT MODEL: XE M17 $298.99

SAVE $189

Customer Rating

ITEM 67646/62514/63418/63419/63417 shown

71621852

LIMIT 1 - Coupon valid through 11/5/19*

CHICAGO ELECTRIC POWER TOOLS — SUPER COUPON

MOBILE MITER SAW STAND

Customer Rating

SAVE $69

COMPARE TO HITACHI MODEL: UU240F $169

$119.99 NOW $99.99

ITEM 63409/62750 shown

71621893

LIMIT 2 - Coupon valid through 11/5/19*

CEN-TECH — SUPER COUPON

2/10/50 AMP, 12 VOLT BATTERY CHARGER AND ENGINE STARTER

Customer Rating

NOW $29.99

ITEM 60581/3418/66783/60653 shown

COMPARE TO SCHUMACHER ELECTRIC MODEL: SE-1250 $59.77

SAVE 49%

$52.99

71622334

LIMIT 3 - Coupon valid through 11/5/19*

HaulMaster — SUPER COUPON

18" x 12" MOVER'S DOLLY

Customer Rating

- 1000 lb. capacity

NOW $7.99

COMPARE TO BUFFALO TOOLS MODEL: HDFDOLLY $22.99

SAVE 65%

$10.99

ITEM 60497/61899/63095/63096/63097/63098 shown

71622397

LIMIT 4 - Coupon valid through 11/5/19*

CENTRALPNEUMATIC — SUPER COUPON

3/8" x 50 FT. RETRACTABLE AIR HOSE REEL

Customer Rating

NOW $59.99

COMPARE TO KOBALT MODEL: SGY-AIR184 $99

SAVE $39

$79.99

ITEM 69265/62344/64685/93897 shown

71622604

LIMIT 1 - Coupon valid through 11/5/19*

KRAUSE&BECKER — SUPER COUPON

AIRLESS PAINT SPRAYER KIT

Customer Rating

NOW $169.99

$214.99

SAVE $129

COMPARE TO GRACO MODEL: 262800 $299

ITEM 68001
62915/60600 shown

71624463

LIMIT 1 - Coupon valid through 11/5/19*

drill master — SUPER COUPON

80 PIECE ROTARY TOOL KIT

SAVE 69%

Customer Rating

COMPARE TO PROFESSIONAL WOODWORKER MODEL: 51832 $22.76

$9.99

NOW $6.99

ITEM 63235/63292/97626 shown

71626015

LIMIT 4 - Coupon valid through 11/5/19*

CENTRAL MACHINERY — SUPER COUPON

Customer Rating

8", 5 SPEED BENCHTOP DRILL PRESS

NOW $54.99

SAVE $58

COMPARE TO BUFFALO BLACK BULL MODEL: DP5UL $113.35

$67.99

ITEM 38119/62520/60238 shown

71626929

LIMIT 2 - Coupon valid through 11/5/19*

Bauer — SUPER COUPON

Customer Rating

10 AMP DEEP CUT VARIABLE SPEED BAND SAW KIT

NOW $99.99

$139.99

COMPARE TO DEWALT MODEL: DWM120 $269.96

SAVE $169

Blade sold separately.

ITEM 64194/63763/63444 shown

71627120

LIMIT 2 - Coupon valid through 11/5/19*

PITTSBURGH #1 SELLING JACKS IN AMERICA — SUPER COUPON

Customer Rating

RAPID PUMP® 1.5 TON LIGHTWEIGHT ALUMINUM FLOOR JACK

- Weighs 34 lbs.

SAVE $91

NOW $59.99

COMPARE TO K TOOL MODEL: KTI63094 $151.42

$79.99

ITEM 64545/64552
64832/64980/62160/62516/60569 shown

71627638

LIMIT 1 - Coupon valid through 11/5/19*

CHICAGO ELECTRIC WELDING — SUPER COUPON

MIG/FLUX WELDING CART

Customer Rating

SAVE $70

NOW $29.99

COMPARE TO FORNEY MODEL: 117535099 $99.99

$39.99

Welders, tools & supplies sold separately.

ITEM 61316/90305/131/60790/69340 shown

71628889

LIMIT 2 - Coupon valid through 11/5/19*

PITTSBURGH — SUPER COUPON

Customer Rating

LIFETIME WARRANTY

50" CLAMP AND CUT EDGE GUIDE

NOW $14.99

$22.99

SAVE 62%

COMPARE TO BORA MODEL: 543050 $39.98

Tools sold separately.

ITEM 56363/66581 shown

71630152

LIMIT 4 - Coupon valid through 11/5/19*

CENTRAL MACHINERY — SUPER COUPON

Customer Rating

350 LB. CAPACITY FOLDABLE SAWHORSE

NOW $8.99

$12.99

COMPARE TO STANLEY MODEL: STST11200 $17.99

SAVE 50%

ITEM 61979/60710/69446 shown

71633316

LIMIT 5 - Coupon valid through 11/5/19*

BANKS — SUPER COUPON

Customer Rating

23 GAUGE PIN NAILER

NEW

NOW $24.99

COMPARE TO PORTER-CABLE MODEL: PIN138 $119

SAVE $94

$29.99

ITEM 64143

71633781

LIMIT 2 - Coupon valid through 11/5/19*

SUPER COUPON

4 PIECE ANTI-FATIGUE FOAM MAT SET

Customer Rating

- Each pad measures 25" x 25"

NOW $6.99

$8.99

COMPARE TO NORSK MODEL: 001119346 $19.99

ITEM 40187/61607
62389/94635 shown

SAVE 65%

71634620

LIMIT 5 - Coupon valid through 11/5/19*

CENTRALPNEUMATIC — SUPER COUPON

Customer Rating

3" HIGH SPEED AIR CUT-OFF TOOL

NOW $6.99

COMPARE TO SPEEDWAY MODEL: 7625 $16.38

SAVE 57%

$9.99

ITEM 60243/47077
69473/60374 shown

71640771

LIMIT 4 - Coupon valid through 11/5/19*

1,000+ Stores Nationwide • HarborFreight.com

*Original coupon only. No use on prior purchases after 30 days from original purchase or without original receipt. Valid through 11/5/19.

At Harbor Freight Tools, the "Compare to" price means that the specified comparison, which is an item with the same or similar function, was advertised for sale at or above the "Compare to" price by another national retailer in the U.S. within the past 90 days. Prices advertised by others may vary by location. No other meaning of "Compare to" should be implied. For more information, go to HarborFreight.com or see store associate.

DeWalt launches pneumatic pinner

23-gauge pin nailer, no. DWFP2350K, $150

This DeWalt pinner shoots ⅝–2" headless pins and weighs just 2½ lbs. It features a tool-free, quick-release mechanism for clearing jams, a low-nail lockout that prevents firing when it's time to reload, and an override that allows you to continue shooting until the magazine is empty.

800-433-9258, dewalt.com

Five modes, one sander

20-volt 5-in-1 Sandeck Multi Sander, no. WX820L, $120 (kit), $80 (bare tool, no. WX820L.9)

The Worx Sandeck combines multiple types of sander into one tool. By changing the sanding attachment, you can turn the tool into a ¼-sheet orbital finish sander, a 5" random-orbit sander, or a detail sander (with angled, finger, and contour attachments). The tool runs on a 20-volt 2.0-amp-hour battery pack (included).

855-279-0505, worx.com

Introducing
the future of personal transportation.

The Zinger folds to a mere 10 inches.

It’s not a Wheelchair…

It’s not a Power Chair…

It’s a Zinger Chair!

More and more Americans are reaching the age where mobility is an everyday concern. Whether from an injury or from the aches and pains that come from getting older– getting around isn’t as easy as it used to be. You may have tried a power chair or a scooter. The ***Zinger*** is NOT a power chair or a scooter! The ***Zinger*** is quick and nimble, yet it is not prone to tipping like many scooters. Best of all, it weighs only 47.2 pounds and folds and unfolds with ease. You can take it almost anywhere, providing you with independence and freedom.

Years of work by innovative engineers have resulted in a mobility device that’s truly unique. They created a battery that provides powerful energy at a fraction of the weight of most batteries. The ***Zinger*** features two steering levers, one on either side of the seat. The user pushes both levers down to go forward, pulls them both up to brake, and pushes one while pulling the other to turn to either side. This enables great mobility, the ability to turn on a dime and to pull right up to tables or desks. The controls are right on the steering lever so it’s simple to operate and its exclusive footrest swings out of the way when you stand up or sit down. With its rugged yet lightweight aluminum frame, the ***Zinger*** is sturdy and durable yet convenient and comfortable! What’s more, it easily folds up for storage in a car seat or trunk– you can even gate-check it at the airport like a stroller. Think about it, you can take your ***Zinger*** almost anywhere, so you don’t have to let mobility issues rule your life. It folds in seconds without tools and is safe and reliable. It holds up to 275 pounds, and it goes up to 6 mph and operates for up to 8 hours on a single charge.

Why spend another day letting mobility issues hamper your independence and quality of life?

Zinger Chair®

Call now and receive a utility basket absolutely FREE with your order.

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Please mention code 110875 when ordering.

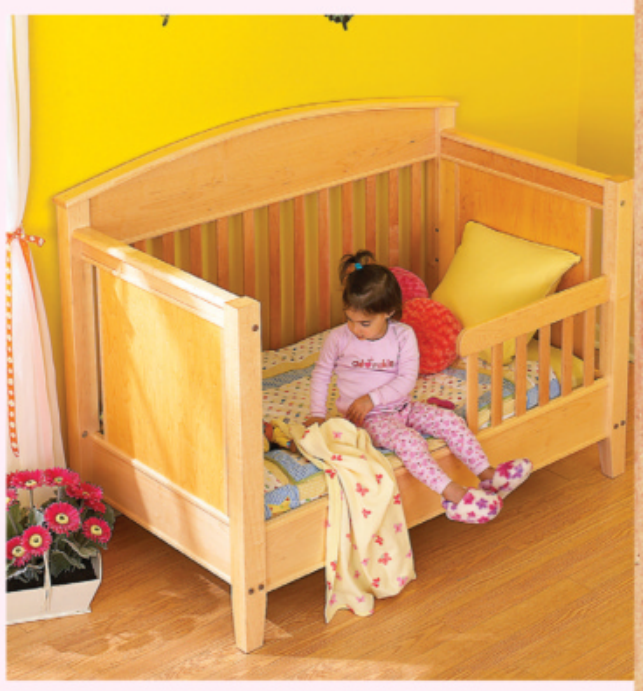
BBB ACCREDITED BUSINESS Rating of A+

Just think of the places you can go: • Shopping • Air Travel • Bus Tours • Restaurants– ride right up to the table! • Around town or just around your house

Zinger is not a wheelchair or medical device and is not covered by Medicare or Medicaid.

83952

3-in-1 Bed Plan



Build a bed that grows with your child. From crib, to toddler bed, to full bed, you'll be years ahead.

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High-style

Adirondack Pair Plan

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STEP 1: Relax in style.

STEP 2: Easily exit the chair without looking like a panicked inverted turtle.

STEP 3: Repeat

woodstore.net/highstylepair

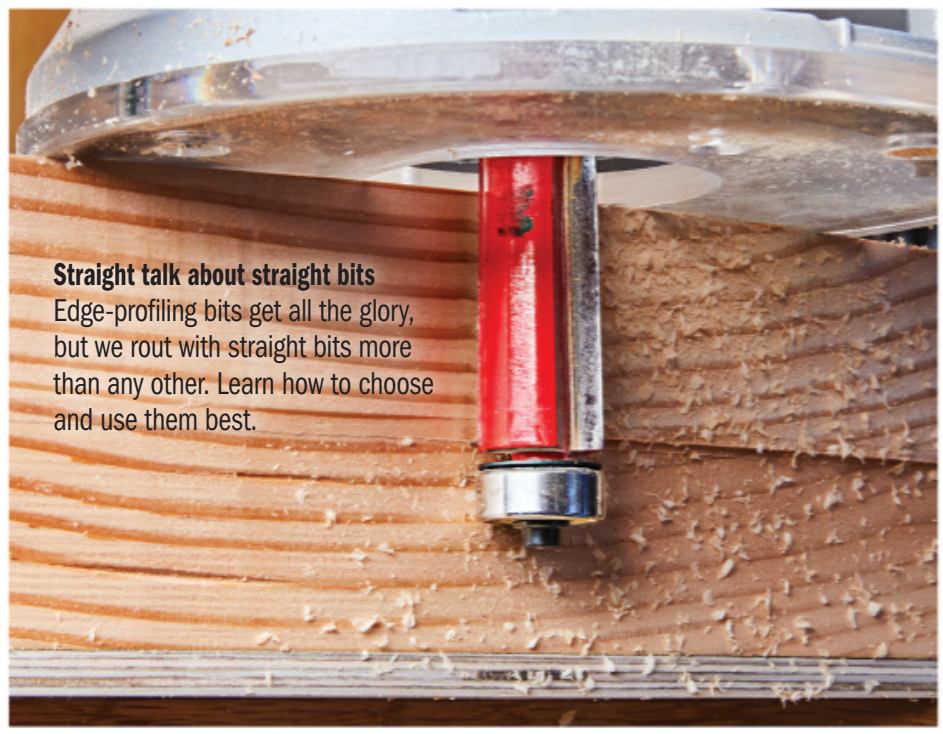
What's Ahead

A GLIMPSE INSIDE THE OCTOBER ISSUE (ON SALE AUGUST 9)

Bookcase with a secret
Sure, it holds books and knickknacks, but it also conceals a clever cache for your valuables.

Shop project: Mobile planer stand
This rolling, right-height cart will serve you in the shop through thick and thin.

Nesting tables
Space-saving and sturdy, these extra surfaces (or seats) are attractive, too, with matching grain wrapping around all ends and edges.



Straight talk about straight bits
Edge-profiling bits get all the glory, but we rout with straight bits more than any other. Learn how to choose and use them best.

Choosing the right router
Whether it's your first or your next, our handy guide will help you pick the best type of router.

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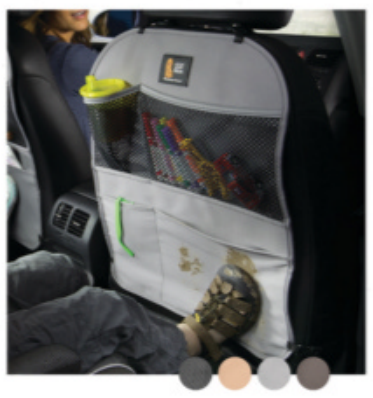

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