NEW TRICKS FOR BISCUIT JOINERS p.48

ISSUE 261 JULY 2019

Better Homes & Gardens.

WOOD®

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Stunning Poured-Epoxy Table

p.24

Great Plans

- Dead-on Crosscut Sled p.62
- Modular Garden Fence p.52
- Super-easy Shop Cabinets p.30

Shop Test: Air-filtration Units

p.58

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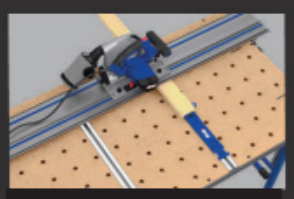

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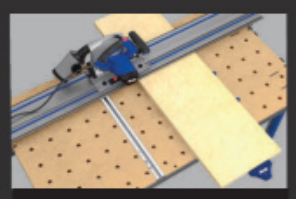

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Road-trippin'

My *other* favorite pastime is camping, and I often tell people that one of the best things Annette and I ever did for our family was buy a travel trailer when the kids were little. We pulled that little Roo hybrid—a short, full-height camper with canvas-topped beds that popped out each end—all over the country: Colorado Springs, St. Louis, Duluth, Orlando, Lake of the Ozarks, and many more.

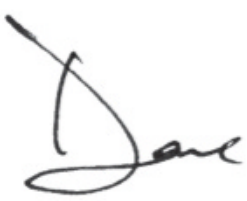
My favorite campsite, without question, was at Four Mile Creek State Park in New York, shown *above*. That spacious site backed up directly to Lake Ontario and every evening we, and people from all over the campground, gathered to watch the sun set spectacularly over the lake.

Besides the money we would have spent on hotels, we also saved by making meals back at the camper rather than eating in restaurants. More important than the savings was the windshield time we spent together. The four of us, all sardined into the SUV, would talk, laugh, read Harry Potter books aloud, and solve "60-second Mysteries" while the miles rolled away beneath us. If we'd just hopped on a plane, we would have missed those great shared experiences. Even weekend trips to local campgrounds strengthened our family bonds.

Speaking of weekend getaways, every May hundreds of woodworkers hit the road to share experiences and bond with other woodworkers at our annual *Weekend With WOOD* conference in Des Moines. I can't tell you how many attendees have told me how much they enjoyed seeing the shop and offices where their favorite woodworking magazine is put together, not to mention the actual projects that appeared on the pages. For some first-time attendees, I get the feeling that was more of a reason to come than the event itself. ("*Weekend With WOOD*: Come for the tour. Stay for the education.")

Truth is, you don't need a major event to get a tour of the *WOOD* shop. If your vacation plans bring you anywhere near Des Moines, please don't hesitate to drop me an email to let me know when you'll be here. You're always welcome. And let me know if you're looking for a good campground in the area—I've camped in most of them!

See you in the shop!



Dave Campbell
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Better Homes & Gardens®

WOOD®

July 2019

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In This Issue of WOOD®

JULY 2019 · ISSUE 261

PLANS

TOOLS & TECHNIQUES

DEPARTMENTS

Wood-Wide Web

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Lies, damn lies, and statistics

Mark Twain popularized this phrase in his autobiography, bemoaning the beguiling power of misapplied numbers to sway people, including himself, to support an otherwise weak argument. Well, we come armed with some freshly handpicked statistics of our own and we think you'll come around to our point of view.

The **FBI's Uniform Crime Reporting** (UCR) program estimates a **7.6% decrease in burglaries** in 2017 compared with the previous year. This was also the year *WOOD* introduced the plans for this concealed-storage mirror. **Coincidence?** We estimate that **nearly 100%** of the stolen property was not hidden behind a mirror. Find the potentially crime-resistant plans at woodmagazine.com/mirrorstorage.

The **World Health Organization's** (WHO) 2010 statistics estimate that **the United States ranks 48th** in annual alcohol consumption at **9.2 liters per capita**. Build this wine rack with free plans found at woodmagazine.com/winerack to limit your collection to nine 750-milliliter bottles—a **Trinidad-and-Tobago** level of indulgence. Put the **26% in savings** toward a visit to the slightly-less-sloshed island nation.

Centers for Disease Control and Prevention (CDC) data show that **most babies are born in the late summer**—a statistic which leads to obvious conclusions about the "snuggle weather" nine months prior. Two **alarming** words from 2019 lead us to believe that this will be a memorable summer: **Polar. Vortex.** **Get a jump on baby-shower season with free** plans for this Nanny Rocker at woodmagazine.com/nannyrocker.

The **Consumer Product Safety Commission** (CPSC) estimates that there were **1.37 million sports injuries** treated in the emergency room in 2001. At the same time, fewer than 32,000 tablesaw injuries were treated in the ER. The **obvious conclusion**: Woodworking is **43 times safer** than exercise. To encourage safer hobbies, we offer this free tablesaw-concealing workbench plan at woodmagazine.com/doubleduty.

Cat Pen Kit

Dog Pen Kit

Baseball Pen Kit

DuraClick EDC Pen Kit

Aromatherapy Necklace Kit

Measuring Spoon Kits

Discover the joy of making stunning lathe turned projects. From pens to crochet hooks to seam rippers to measuring spoons, the creative possibilities are endless. These small projects are easy to make on a woodturning lathe and are great to sell at craft shows or give them to friends and family as one of a kind gifts. We supply all the metal kit components and you make the project kit with any wood or plastic material and in any color you want.

"Wow! You Made Those?"

Cat Twist Pen Kit

A great gift for cat lovers! Features a tail clip, sleeping cat on top, cat silhouettes on the center band and paws on the tip.

3 Cat Twist Pen Kit Starter Set

You get one of each Cat pen kit in Chrome (shown above), 24kt Gold and Antique Pewter. Plus, you get the bushings and drill bit you need to make the pens.

#PKCATSS SAVE $13 **Only $58.50**

Dog Click Pen Kit

Create a dog themed pen that features a casted dog bowl on top, biscuit clip, engraved paw prints on the top and tip as well as "I LOVE MY DOG" engraved below the tip's paw prints.

3 Dog Click Pen Kit Starter Set

You get one of each Dog pen kit in Chrome (shown above), 24kt Gold and Antique Pewter. Plus, you get the bushing and drill bit you need to make the pens.

#PKDOGSS SAVE $12 **Only $47.75**

Baseball Pen Kit

Features a batter casted into the pen end, baseball bat pen clip, baseball stadium and field casted on the pen top, baseball on the pen tip and a "Curveball" Bolt Action mechanism.

3 Baseball Pen Kit Starter Set

You get one of each pen kit in Antique Pewter (shown above), Antique Brass and Chrome. Plus, you get the bushing and drill bit you need to make the pens.

#PKBASESS SAVE $14 **Only $59.95**

DuraClick EDC Pen Kit

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5 DuraClick EDC Pen Kit Starter Set

You get one of each DuraClick EDC Pen Kit in Black Anodized Aluminum (shown above), Aluminum, Burnt Bronze Anodized Aluminum, Stainless Steel and Brass. Plus, you get the drill bit and bushings you need to make the pens.

#PKEDCSS SAVE $18 **Only $69.95**

Aromatherapy Necklace Kit

Enjoy the benefits of Aromatherapy everywhere you go. Just add a few drops of your favorite essential oil to the cotton wick to absorb the oil. Unscrew the top of the kit and add the wick inside. Each kit Includes 5 wicks, a 28" chain, gift pouch and an empty 2ml sample jar (essential oil not included).

5 Aromatherapy Necklace Kit Starter Set

You get one of each Aromatherapy Necklace Kit in Satin Chrome (shown above), Chrome, 24kt gold, Rose Gold and Raw Brass. Plus, the bushings and drill bit to make the kits.

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Measuring Spoon Kits - Set of 4

Create these must-have kitchen essentials for a fun and useful gift. Spoon set includes four of the most common measuring spoon sizes; 1/4-tsp, 1/2-tsp, 1-tsp and 1-Tbs. They sit on a handy chrome ring and you can detach them for individual use. Plated with durable, food safe chrome.

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Mission accomplished

Issue 258 (Dec/Jan 2018/2019) arrived at a perfect time for me. I had been searching for just the right project for some white oak I had milled the previous year. When I saw the plans for the Limbert-style Rocking Chair, I knew I had found what I needed. The plans were easy to follow, and the mortising jigs worked great. My wife made the cushions, and the chair is now in my living room. Thanks for the inspiration!

—Dan Leatherman
Muskegon, Mich.

The woodworker's equivalent of an old Corvette in a barn

Awhile back, I went to a yard sale, where I bought 680 bd. ft. of gorgeous walnut boards, mostly 6/4 and 8/4, for—wait for it—$270. When I asked why he was getting rid of it, the owner said the wood had been air-drying for about 40 years, and he was selling it because he liked cherry, and this was, well, not cherry. With my windfall, I made five sculptural rockers, like the one shown, and four more low-back chairs.

Why am I telling you this? I'm telling EVERYBODY.

—John Graham
Vernal, Utah

Sounding Board

YOUR VOICE

3D printer solves puzzle-ball puzzler

I really enjoyed Richard Munson's Puzzle Ball project in issue 258—a fun, quick project that makes good use of end cuts and scraps, and it makes a great gift! I wasn't looking forward to making the sled's carrier, though, with its three different angles.

Then I realized that it was a great application for my low-cost 3D printer (Monoprice Maker Select, monoprice.com). My version of the carrier, shown here, worked great. For less than the price of a good cordless drill kit, the printer's relative precision is excellent for many workshop jigs and accessories.

—Joe Gustainis
Lake Wylie, S.C.

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continued on page 8

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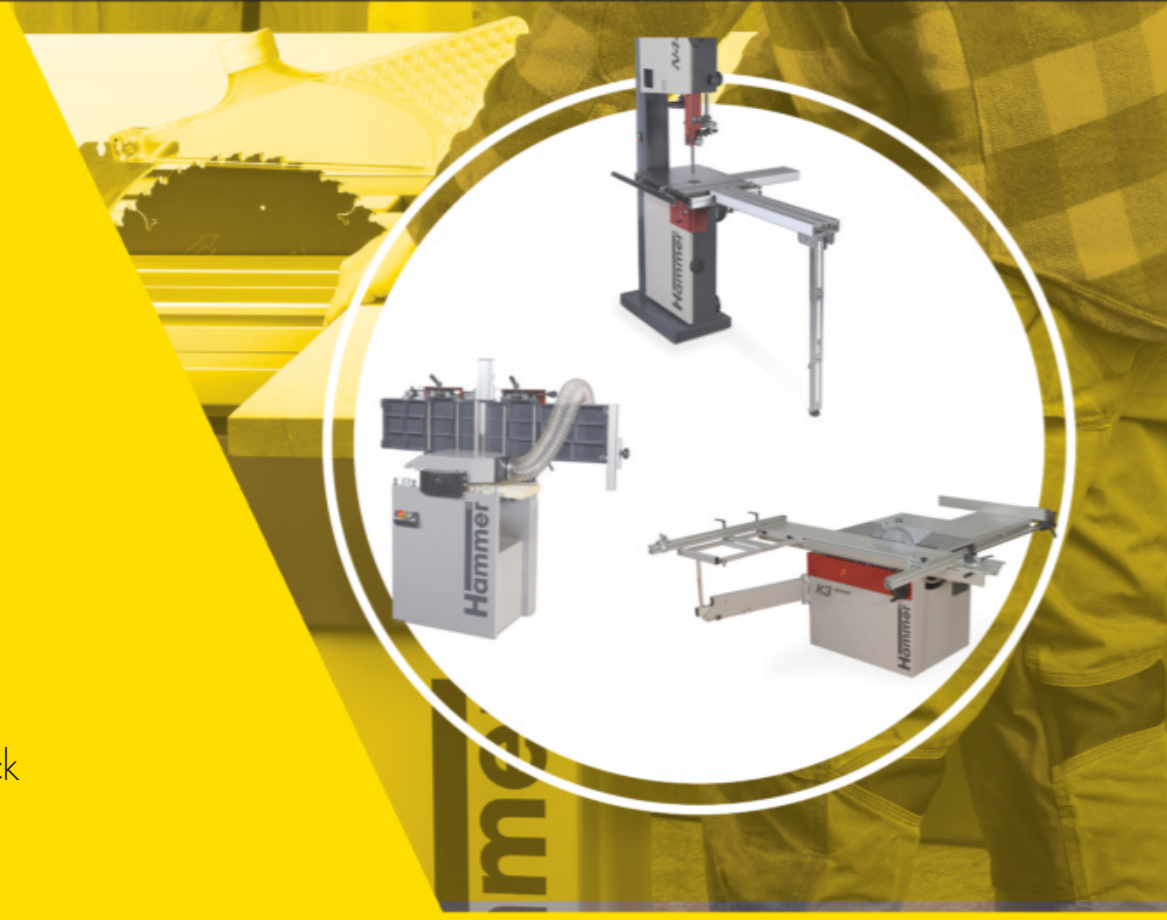

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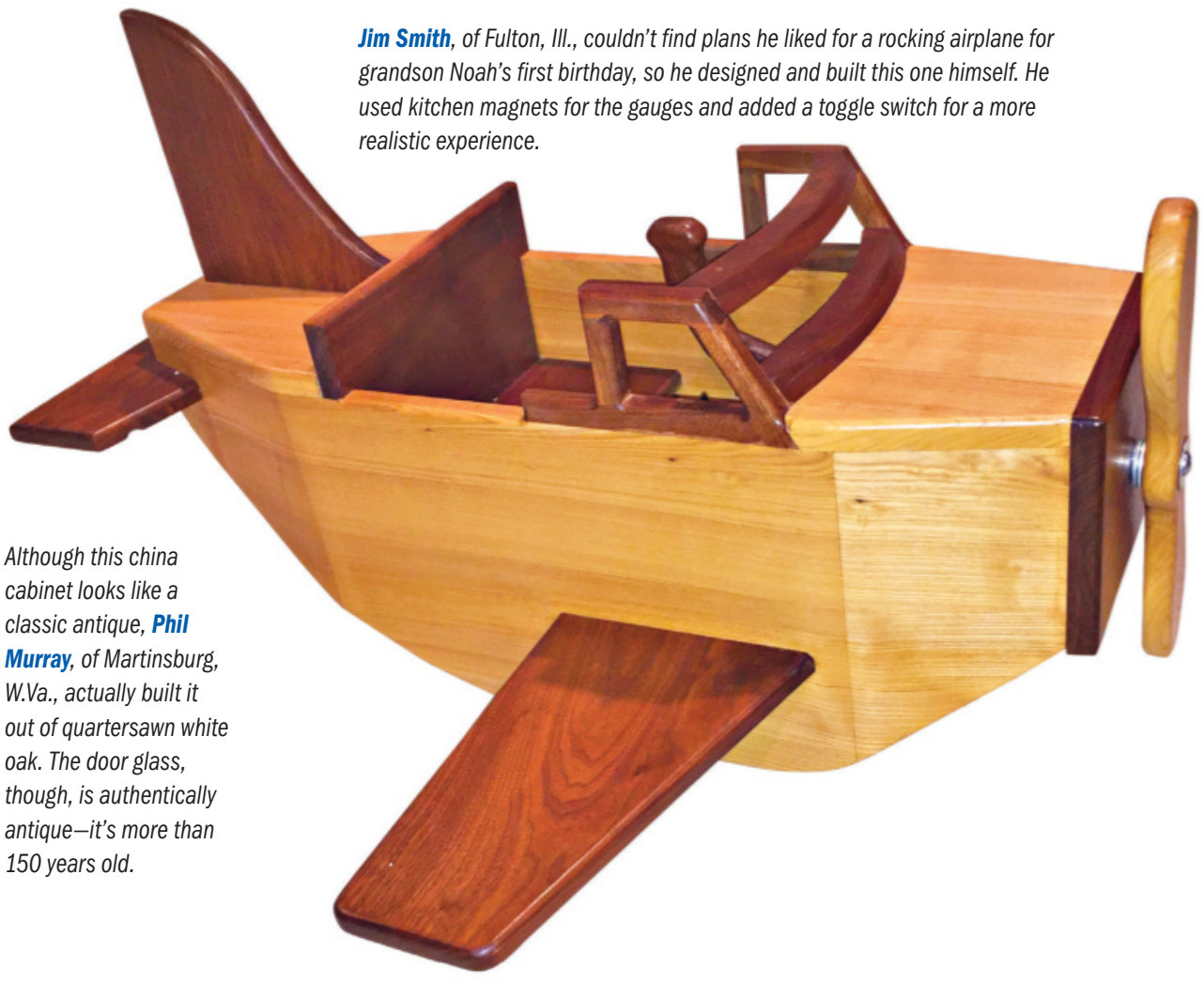
Sounding Board

YOUR PROJECTS

*As if the view of the Adirondacks wasn't spectacular enough from the deck of the house of his son, Geoff, and daughter-in-law, Emily, **Ron Day**, of Heuvelton, N.Y., enhanced it further with these bar-height Addy chairs and table from issue 254 (July 2018). Find plans at woodstore.net.*

*Although this china cabinet looks like a classic antique, **Phil Murray**, of Martinsburg, W.Va., actually built it out of quartersawn white oak. The door glass, though, is authentically antique—it's more than 150 years old.*

__Jim Smith__, of Fulton, Ill., couldn't find plans he liked for a rocking airplane for grandson Noah's first birthday, so he designed and built this one himself. He used kitchen magnets for the gauges and added a toggle switch for a more realistic experience.



Sounding Board

YOUR PROJECTS

*When his wife was disappointed with a jewelry cabinet she bought online, **Tom Smith**, of Cypress, Texas, headed to the shop and built this beauty of his own design (and to her specs). Finished with walnut stain, it stands 45" tall, 27" wide, and 14" deep.*

*After **Dale Watkins**, of Stonelick, Ohio, completed the Tapered-seat Bench in issue 227 (September 2014), a matching end table seemed in order. So he built one. It stands 23½" tall and 19¾" square; he did not taper the tabletop parts.*

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.

A Whole Other Level

A wall-to-wall shelf platform creates mezzanine storage. Its support structure ties into the ceiling joists for supporting heavy loads.

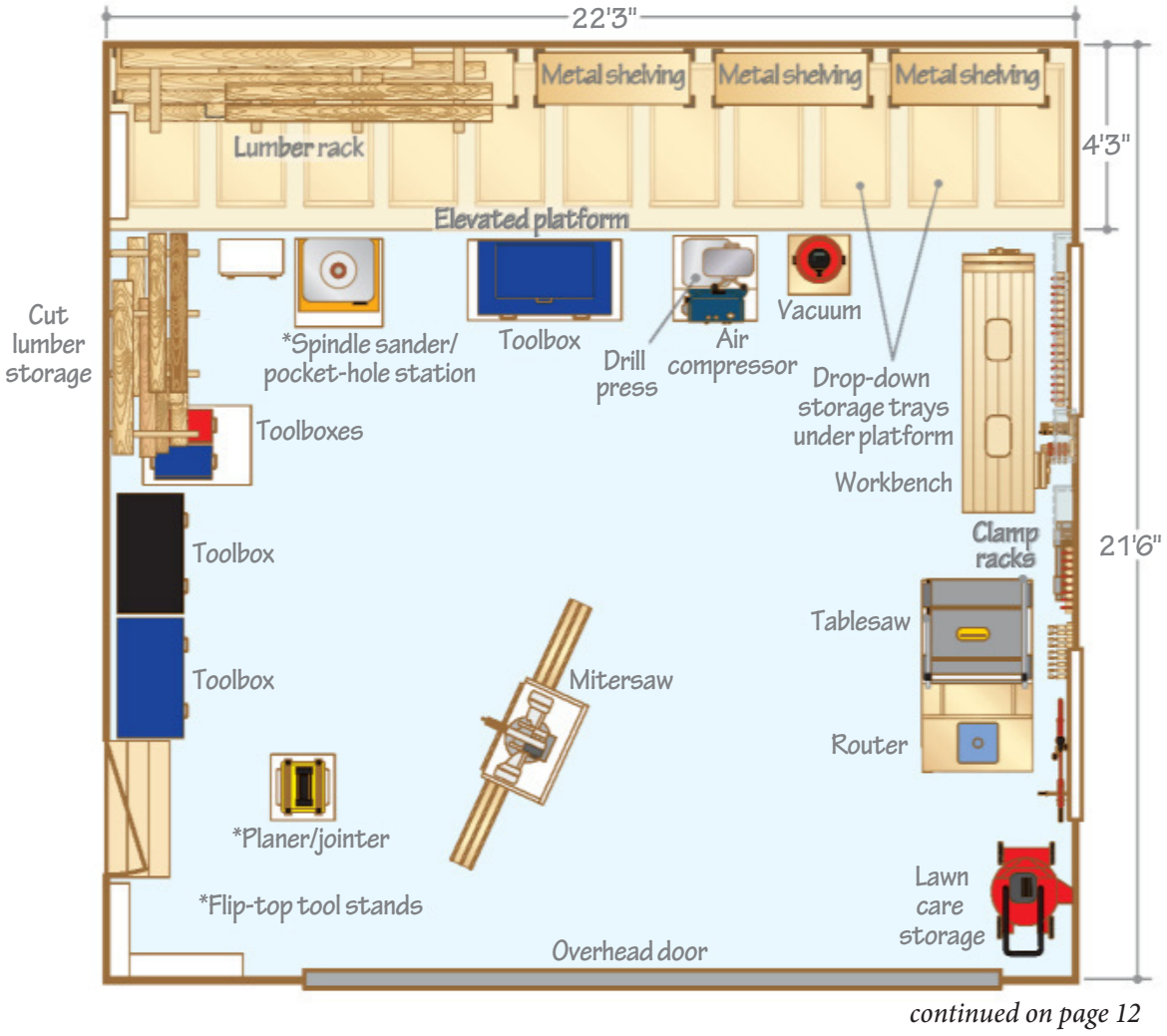
Almost every tool cabinet or base rests on casters because Timothy has to share his garage space with vehicles. Several of the bases feature two tools on a rotating top.

Utilizing every nook and cranny allows Timothy to maintain a shop full of tools and accessories without taking up valuable floor space.

To make the most of the floor space in his 480-sq.-ft. garage shop, Timothy England went up. That started with a heavy-duty platform he built along the back wall that provides storage on top, and drop-down trays utilizing the space underneath. With the trays closed at the end of the day, he can tuck many of his tools underneath and still have room for two cars.

A series of French cleats lines one wall almost to the ceiling, holding dozens of custom racks and shelves for shop clamps and other accessories. Each rack can be removed as needed, and Timothy can rearrange the system as his storage needs change.

Casters under every tool base and the workbench make moving them easy. Timothy also saved space by doubling up tools whereever practical. For example, his portable air compressor shares a stand with his benchtop drill press. The compressor lowers the center of gravity of the stand, making it less prone to tipping. His shop-



continued on page 12

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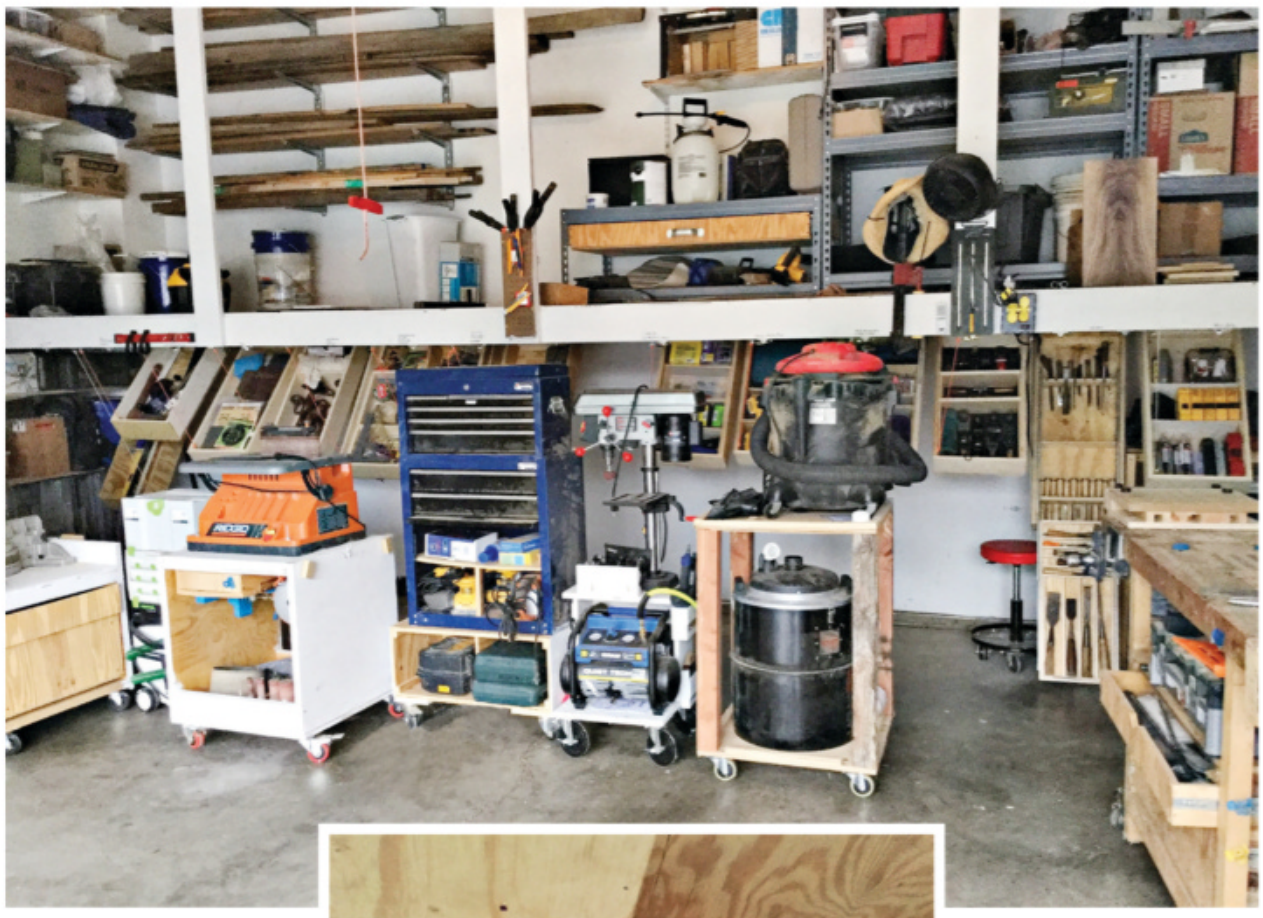
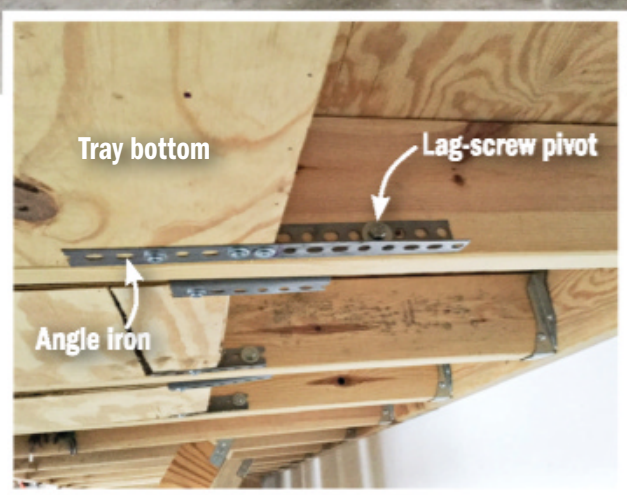
Timothy created double-decker chisel storage in one of the drop-drown trays. The upper tray slides out on full-extension drawer slides, exposing the tools underneath.



Drop-down storage trays fit below an elevated platform along the back wall of the shop (*above*). The trays hinge on perforated angle iron and lag screws (*right*). A cord tied to screw eyes in the platform and tray limits travel. Window-sash locks from the hardware store keep the trays closed.



built router table nests in the wing of his tablesaw. Several tool bases sport flip tops, allowing them to house two tools rather than just one.

Decades of woodworking have taught Timothy how to use every scrap of plywood and hardwood to build fixtures for his shop. For example, he fashioned the top of his main workbench out of hardwood cutoffs

Lining one wall are rows of French cleats upon which hang custom storage racks. Timothy uses a step stool to access the highest bins.

Timothy cut a pair of rabbeted openings in the benchtop and fitted each with an insert. Removing an insert allows him to slip the head of a clamp in place for additional options when assembling a project.

from trees on his family farm. Drawers and a shelf maximize storage within the bench's footprint. He's concerned more about the function of those items than their looks.

"The main thing is, I've got enough stuff to occupy a 2,000-sq.-ft. shop and it tucks away well enough for two cars to pull in. I kinda like it," he says.

Timothy England retired from the Kentucky National Guard after 37 years. He's been woodworking most of his life and has built commercial restaurant and museum fixtures, as well as furniture for his home.

Show us your shop

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

Q Reach new heights with benchtop tools

My shop has numerous benchtop tools, and most of them sit on any available surface. Some seem awkward or uncomfortable to use, and I suspect they may not be at the ideal height. I'm ready to build custom bases but need help determining the right height.

—Ben Novack, Jonesboro, Ark.

A The ideal tabletop height for a benchtop tool, Bengenerally ranges from 30" to 50", depending on the tool, how it's used, and operator height. A correctly positioned tool will help you work effectively, safely, and with minimal fatigue. Here's how to get there.

First, consider that each tool generally fits into one of three zones from low to high, as shown at *right*. Keep in mind that depending on how you work, a tool might be best in the zone above or below the zone cited here. Heavy workpieces could require shifting one zone lower, and light workpieces may allow you to move up a zone. For example, if you use a tablesaw primarily to make model or small-box parts from small blanks, or a lathe only to make pens, move the machine up a zone. But, if you prefer a bird's-eye view of operations at tools used for short periods, and don't mind a bit of bending over, go down a zone.

If the table of one machine could potentially double as an outfeed or support table for another machine, consider compromising the height of one or both to achieve a shared height. Just don't compromise more than an inch or two on the ideal height of your most frequently used tools.

And finally, keep in mind that anatomies differ drastically, even for people of the same height. One person will have longer arms or legs than another, even though one is no taller than the other. So remember: These are only guidelines, and listen to what your body says about the comfort of working at one height versus another.

Finesse Zone
(Elbow high) These tools require lots of control over operations you need to see well, generally using lighter workpieces. A drill press, belt/disc sander, spindle sander, mortiser, grinder, and scrollsaw fit into this zone.

Power/Finesse Zone
(Waist high) Tools such as a bandsaw, mitersaw, router table, and lathe require ample dexterity and control over the operation, but with some power for handling larger workpieces.

Power Zone
(About the height of your thumb's knuckle with arm hanging straight down) Machines in this zone, such as a tablesaw, jointer, and thickness planer, require pushing, lifting, or bearing down on heavy workpieces.

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-Jon, Restaurant Lighting & Fixtures

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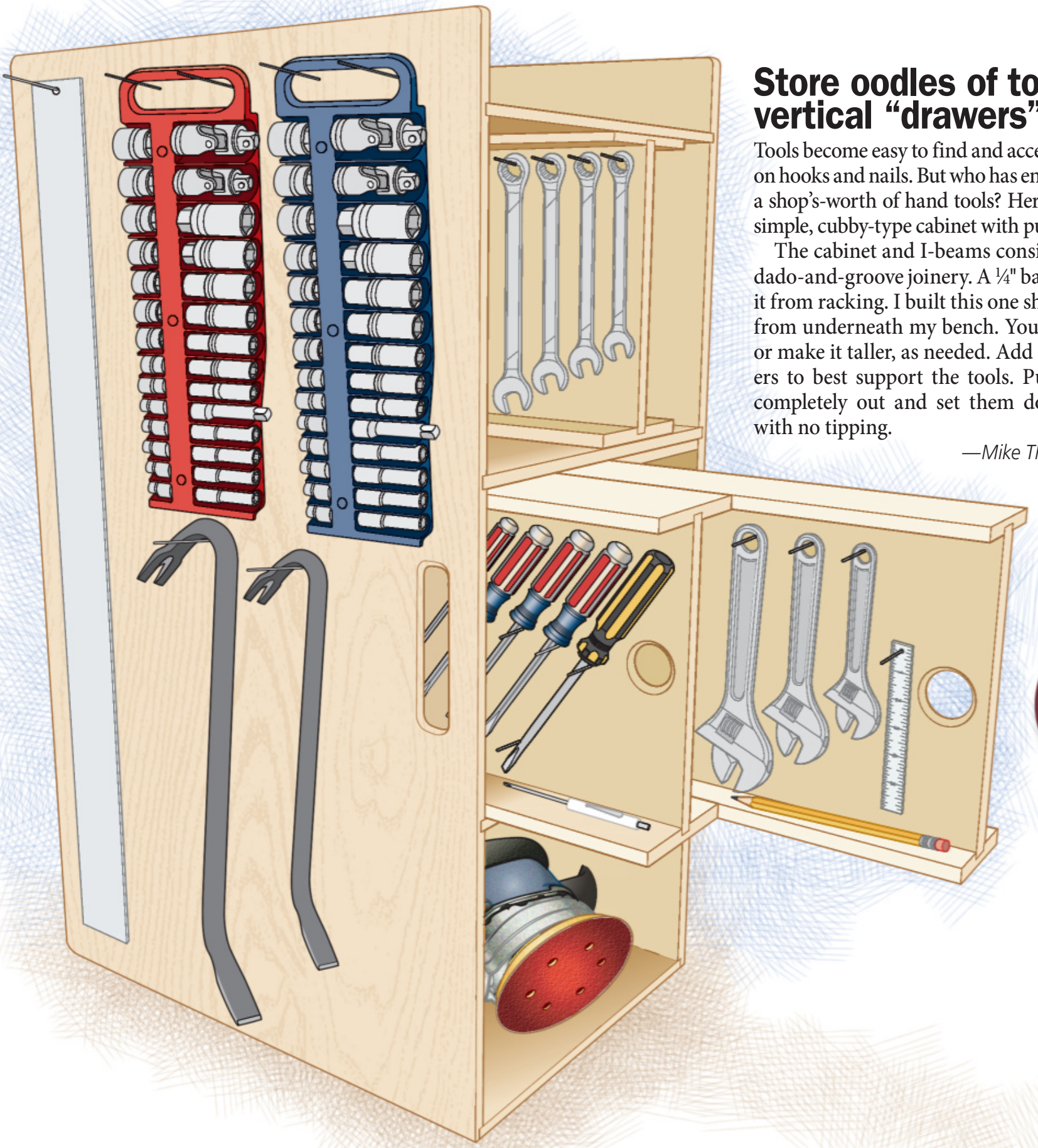


Store oodles of tools on vertical “drawers”

Tools become easy to find and access when you hang them on hooks and nails. But who has enough wall space to hang a shop’s-worth of hand tools? Here’s one good solution: a simple, cubby-type cabinet with pullout I-beam drawers.

The cabinet and I-beams consist of ½" plywood, with dado-and-groove joinery. A ¼" back on the cabinet keeps it from racking. I built this one short enough to slide out from underneath my bench. You could put it on wheels or make it taller, as needed. Add nails and custom holders to best support the tools. Pull the I-beam holders completely out and set them down wherever needed, with no tipping.

—Mike Thompson, Edmond, Okla.

TOP SHOP TIP

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.

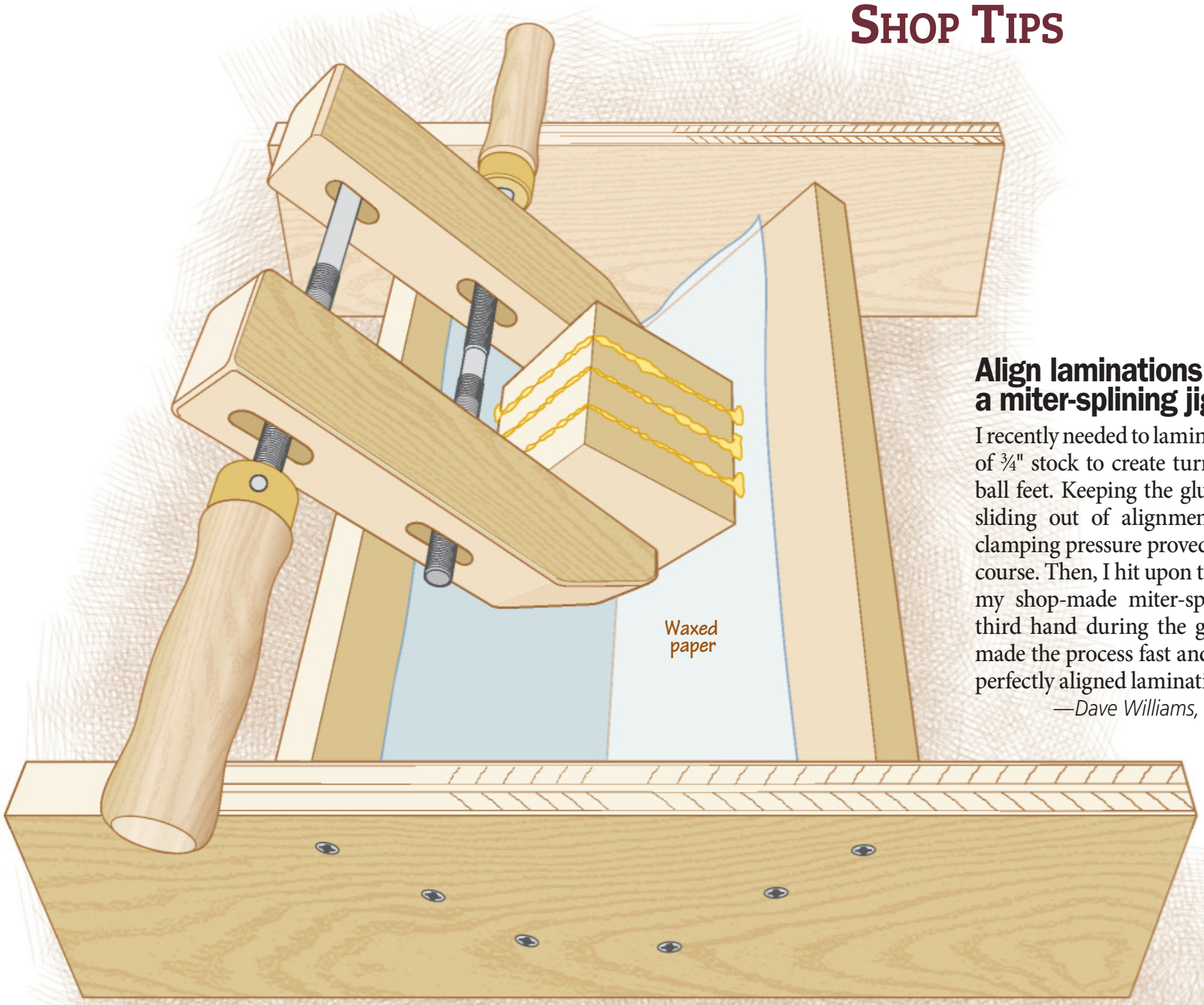
For sending this issue’s Top Shop Tip, Mike receives an Orion model 950 smart pinless wood moisture meter from Wagner Meters, worth $480.

continued on page 18

Align laminations with a miter-splining jig

I recently needed to laminate small pieces of ¾" stock to create turning blanks for ball feet. Keeping the glued pieces from sliding out of alignment as I applied clamping pressure proved a challenge, of course. Then, I hit upon the idea of using my shop-made miter-splining jig as a third hand during the glue-up. The jig made the process fast and effective, with perfectly aligned laminations.

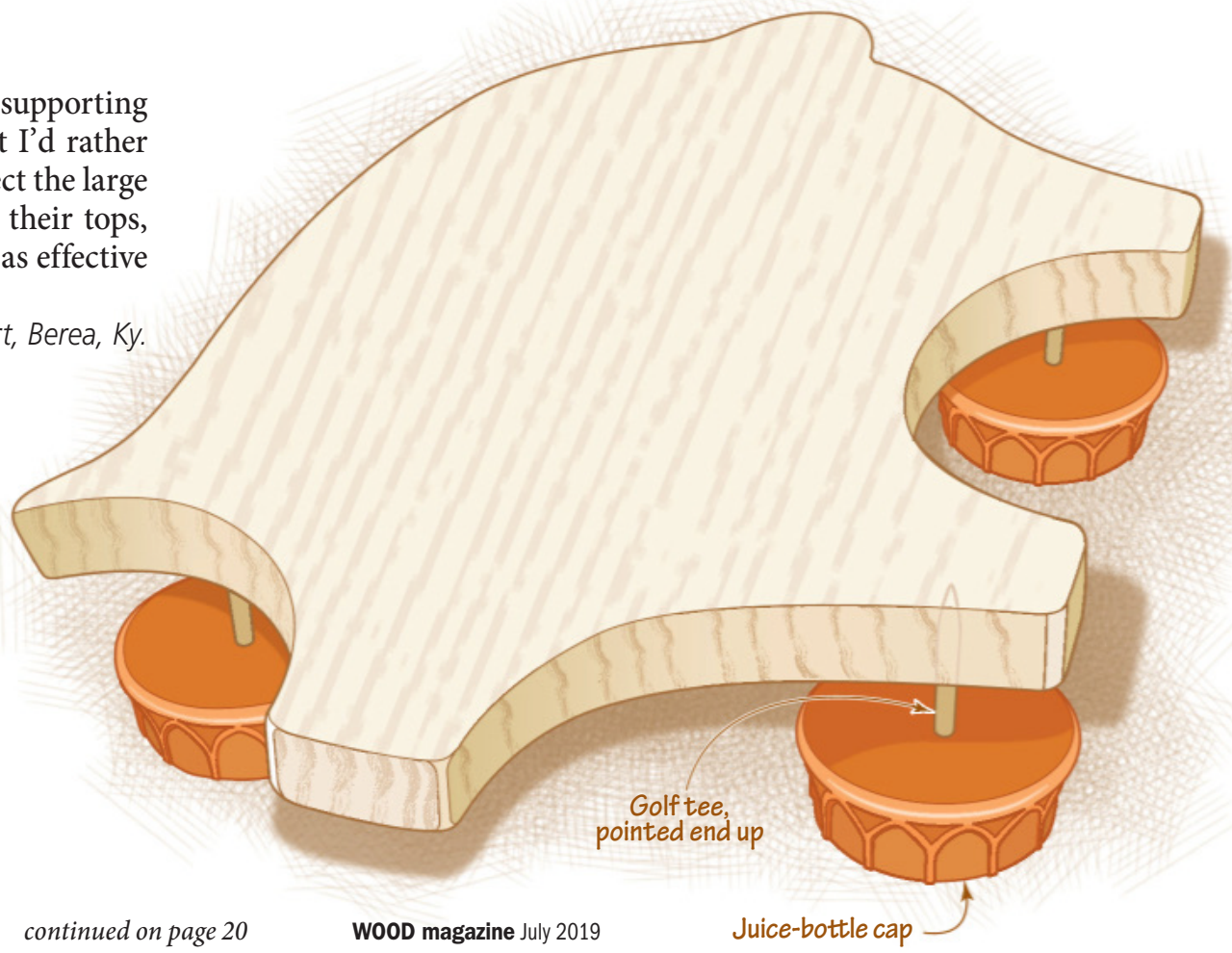
—Dave Williams, St. Cloud, Minn.



Tee up projects for finishing

Sure, you can buy plastic painter pyramids for supporting workpieces while finish dries on both sides, but I'd rather save that money and spend it on wood. So, I collect the large caps from juice bottles, drill a centered hole in their tops, and insert golf tees to make workpiece supports as effective as any commercial version.

—Lou Robert, Berea, Ky.



continued on page 20

WOOD® Father's Day Giveaway

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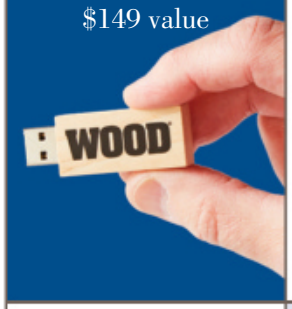
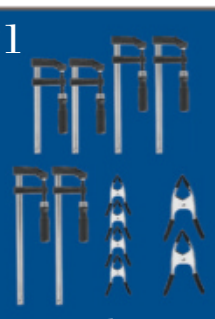
5 WOOD $149 value 	6 Castle $475 value 	7  Walrus Oil $90 value	8 Pony Jorgensen $80 value 	9  Craftsman Gallery $179 value	10 Bora Portamate $158 value 	11 Penn State $350 value 
12  Delta $50 value	13  System Three $200 value	14 BriWax $99 value 	15 Peachtree $80 value 	16  Triton Tools $150 value	17 Castle $475 value 	18  Walrus Oil $90 value
19 WOOD $149 value 	20 Kreg Tool $175 value 	21  Peachtree $55 value	22 Penn State $125 value 	23 WOODWORKERS GUILD OF AMERICA GOLD MEMBERSHIP TN Marketing $104 value	24 Woodpeckers $269 value 	25  Craftsman Gallery $58 value
26 WOOD $149 value 	27 Kreg Tool $160 value 	28 Pony Jorgensen $150 value 	29  BriWax $99 value	30 Affinity Tools $174 value 	31 System Three $700 value 	Enter for your chance to win a different prize each day in May!

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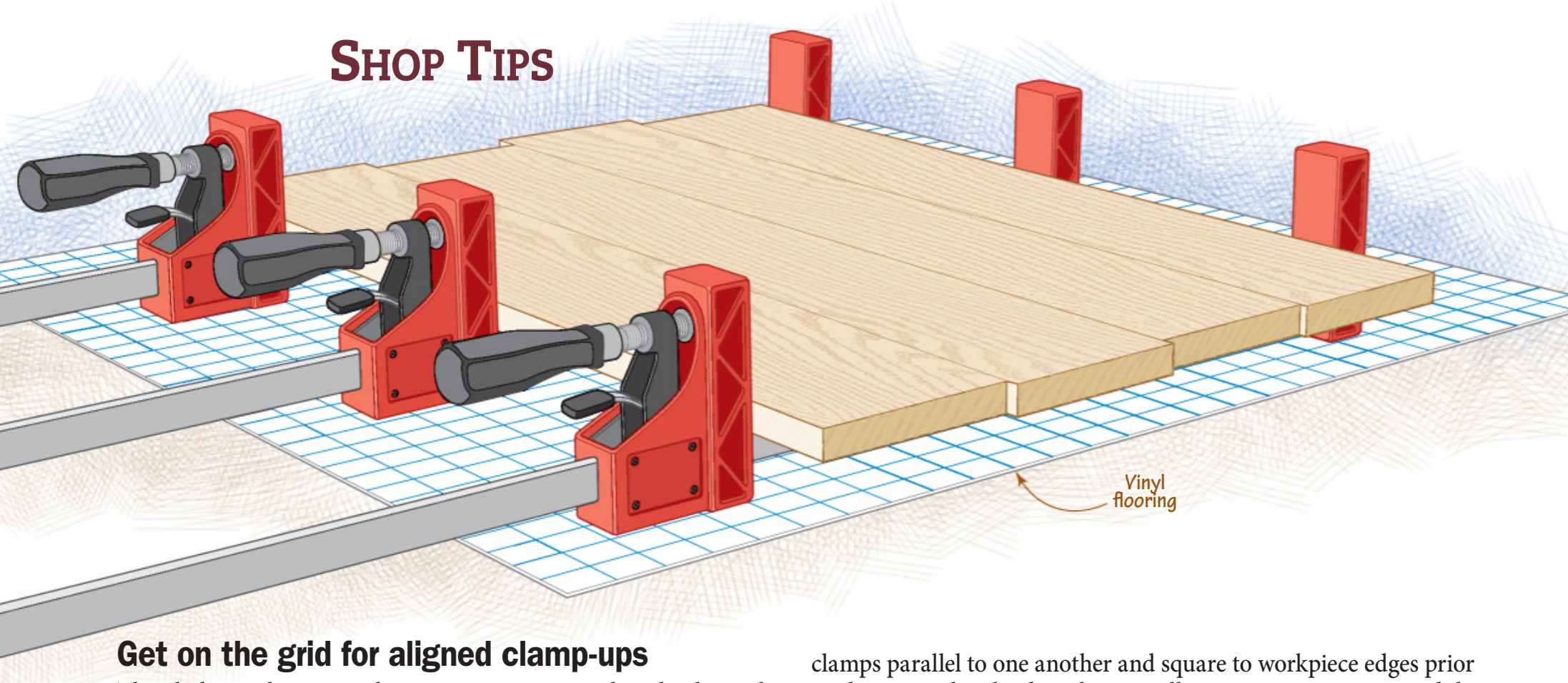


Get on the grid for aligned clamp-ups

The slightest clamp misalignments can cause edge-glued panels, such as cabinet doors, tabletops, and cutting boards, to shift during glue-up. To ensure perfect clamp alignment, I marked a grid on the back side of a scrap of vinyl flooring. Now, by using the grid to align clamps parallel to one another and square to workpiece edges prior to clamping, the glued workpieces all receive even pressure and do not move, as clamping pressure increases. I routinely apply paste wax to the grid to keep glue drips from sticking.

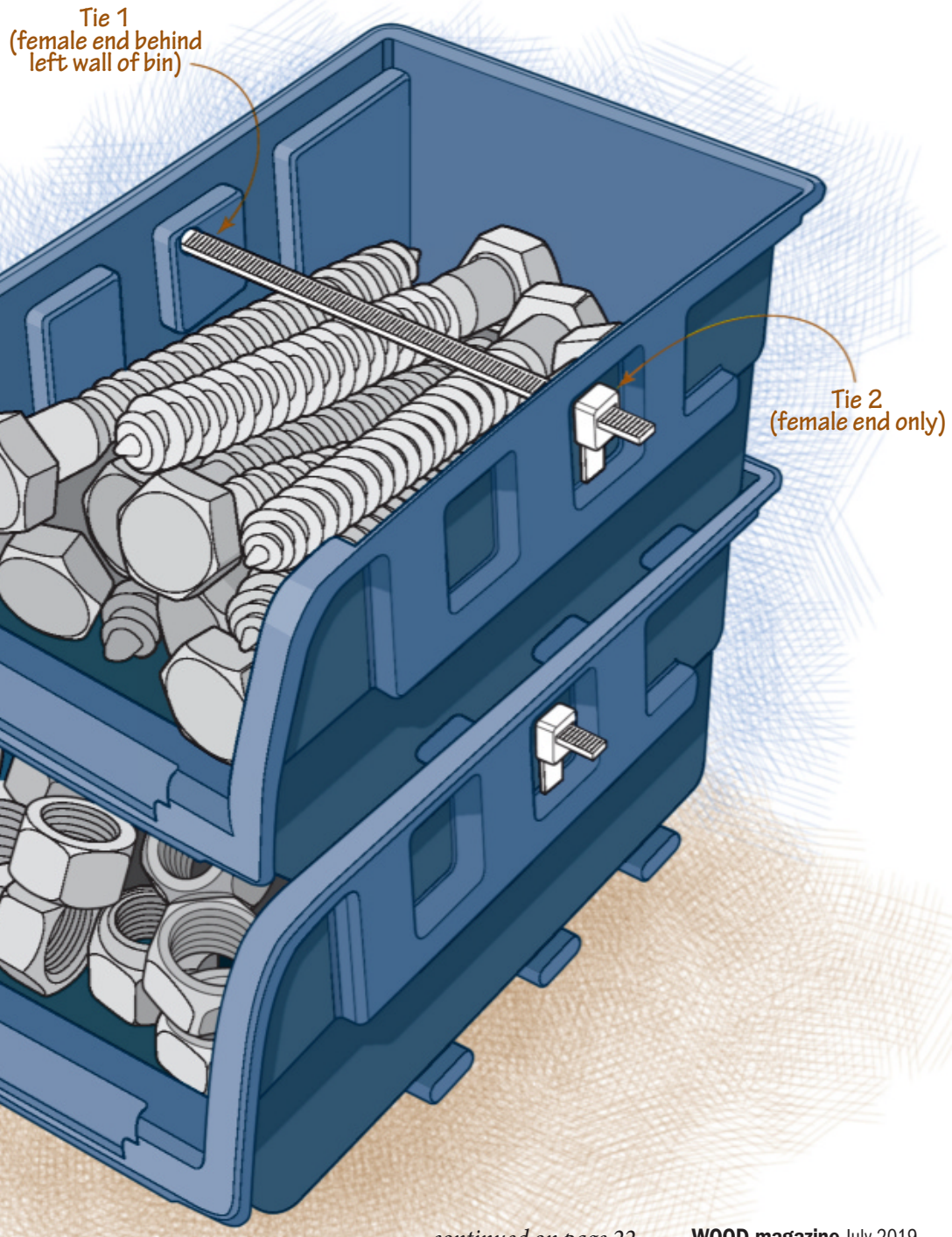
—Dan Neyens, Bonney Lake, Wash.

Win the battle of bulging bins

I have a lot of fasteners and other hardware stashed in low-cost plastic bins. They work fine, until you stack them three or four high, when they tend to collapse on each other, as the lower-bin sides begin to bulge out from the weight of upper bins.

To prevent that, empty a bin, drill two holes opposite each other, where shown, and insert a plastic cable tie (also known as a zip tie). Then, snip the female end off another tie (Tie 2 in the drawing) and fit it onto Tie 1. Tighten up Tie 2 just enough to keep the bin wall from bulging outward. Snip off the excess material on Tie 1.

—Ken Wiggs, Selma, N.C.



continued on page 22

Hold it square!

If you want to build square drawers and cabinets as quickly as possible, check out our new Clamp-It Clips. They work with our popular Clamp-It Assembly Squares and Clamp-It Corner Clamping Jig to hold the pieces at 90° while you drive fasteners. They're like another set of hands ... to help you *create with confidence*.

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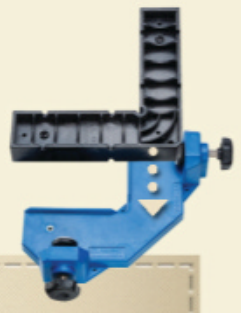

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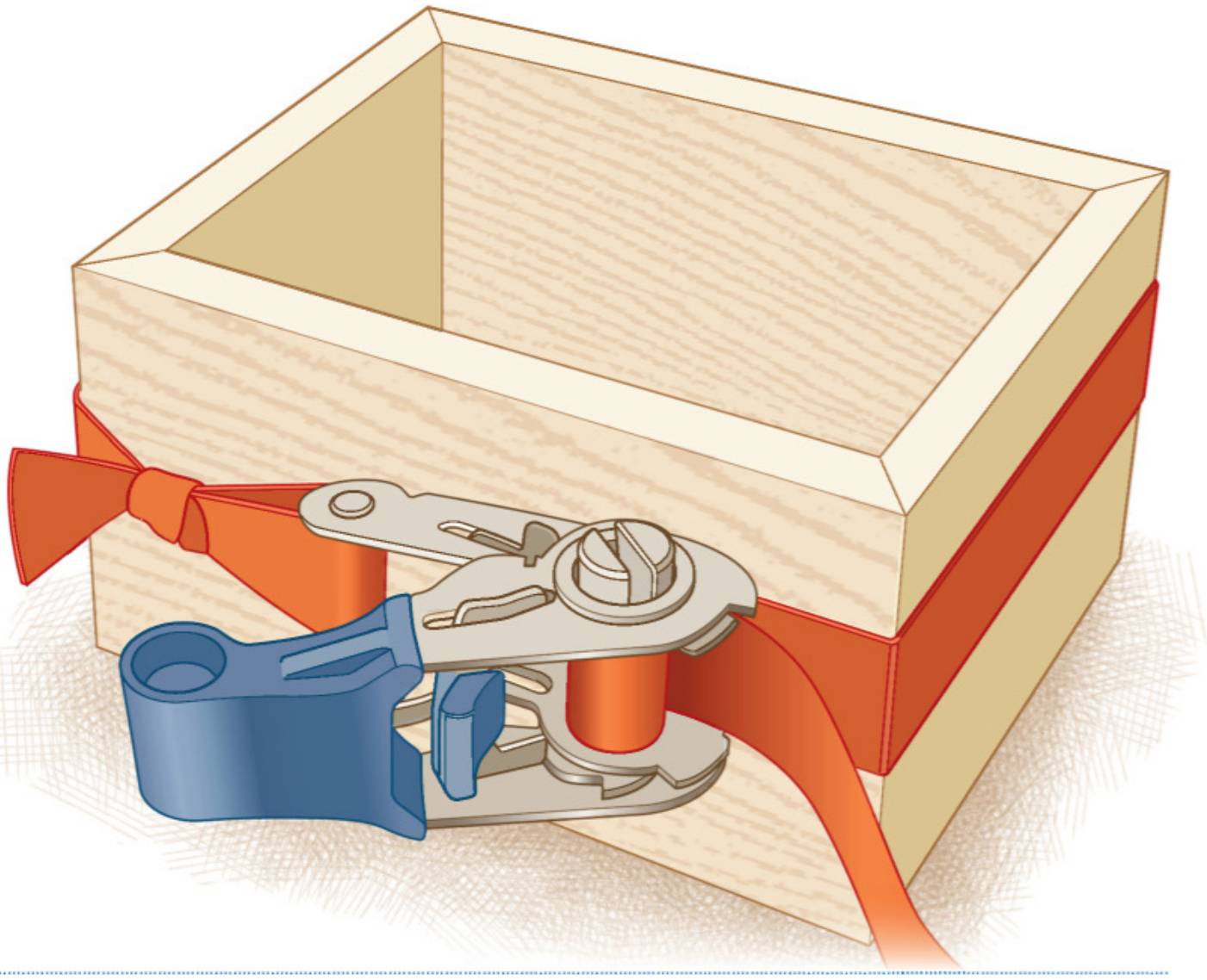
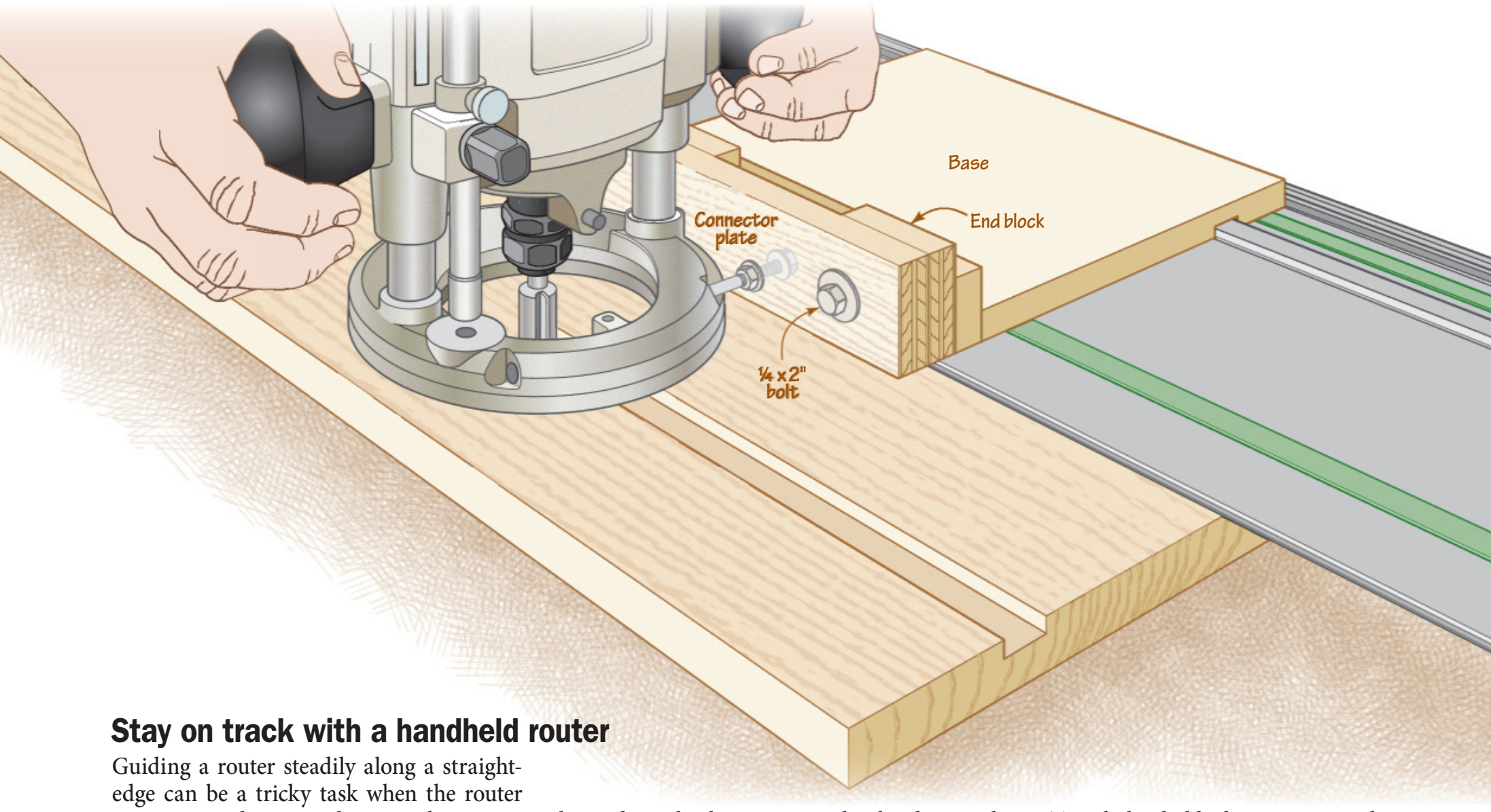
Low-cost band clamps from ratchet straps

I teach shop to nearly 200 middle-school students; favorite projects include small mitered jewelry boxes and picture frames. Buying enough band clamps to get that many projects glued up just wasn't in the budget, so I bought a bunch of inexpensive ratchet straps and made those work. To make the conversion, simply cut off and discard the hook and short strap. Then, cut off and discard the hook from the longer strap, singe that end with a lighter and tie the strap onto the ratcheting mechanism.

—Shane Burk, Lubbock, Texas





Stay on track with a handheld router

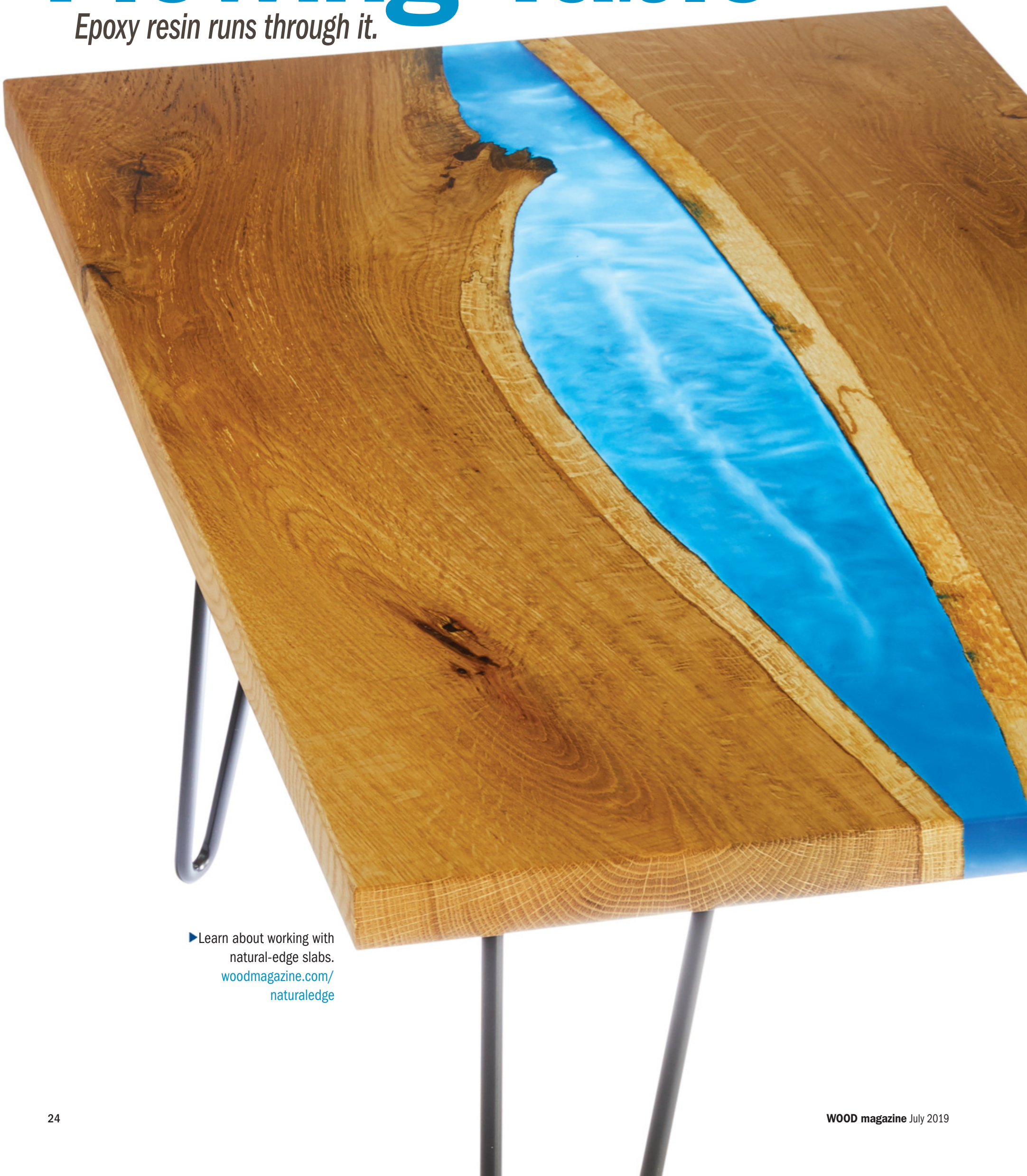
Guiding a router steadily along a straightedge can be a tricky task when the router wants to wander away. Eliminate that source of error by guiding the router along a track-saw guide.

To build the jig, first rout into the base a groove that fits snugly over the raised rail on the guide. Make the connector plate by gluing two end blocks to a strip of plywood as long as the base. Attach the router to the connector plate with bolts or all-thread rod that fits the edge-guide mounting holes in your router base. Two bolts hold the connector-plate assembly to the base, allowing you to make custom connector plates for different routers and use them on the same base.

—Dan Martin, Galena, Ohio

Flowing Table

Epoxy resin runs through it.



▶Learn about working with natural-edge slabs. woodmagazine.com/naturaledge

Translucent epoxy resin appears to move like a river between two natural-edge slabs, creating a unique, mesmerizing table. Pigments mixed with the epoxy tint it blue and add shimmer. (Find a link to purchase the resin and pigments in **Sources**, *page 28*.) Construction couldn't be simpler: only a circ saw, router, and sander required. Follow along to create your own one-of-a-kind natural wonder.

Position the slabs in the tray and secure them temporarily with clamps.

▶Watch a video of preparing the slab, and mixing and pouring the epoxy for our table. woodmagazine.com/epoxytable

Flip the tray over and countersink 1¼" screws through the bottom into the slabs, staying inside the outlines drawn earlier.

▶Leave all edges natural if you prefer; simply fill the voids between the slab and forms with more epoxy if desired.

Tip! *To prevent leaks under the slabs, apply a bead of silicone caulk along the slab edges before placing them in the form.*

1 Prepare your natural-edge slabs by removing any bark and loose or decayed material using a putty knife, wire brush, or 80-grit sandpaper.

2 Mill the slabs slightly thicker, wider, and longer than finished dimensions to allow for cleanup after the epoxy cures.

3 From ¾" sheet goods, build a tray to contain the slabs and ⅛" deeper than the slab thickness. Fully line the tray interior with house-wrap tape (available at home centers), overlapping each strip about ⅛".

4 Flip the tray over, place the slabs on the bottom face of the bottom as they will be positioned in the tray, and trace their facing edges to provide a guide for driving screws. Clamp the slabs in the tray [**Photo A**], then screw them in place [**Photo B**].

C

D

To simulate water, we added about a tablespoon of turquoise pigment to the full batch, then poured off about one-third into a smaller bucket and added about a teaspoon of macropearl pigment to that batch. Pigment amounts aren't critical; color to suit your taste.


E

Pour the blue epoxy first, working the full length of the form. Stop when the epoxy reaches about ⅛" from the top face of the slabs.

▶No need to hurry this process. The epoxy has an open time of hours.

5 Place the form on your bench and level it in all directions. Mix the epoxy according to the manufacturer's instructions, and add any desired colorants [**Photos C, D**]. Then pour the epoxy [**Photos E–H**]. After it cures, remove the forms, and clean up the slab [**Photos I–K**].

How much epoxy do you need?

The irregular shapes of natural-edge slabs give them interest, but complicate calculating the amount of epoxy needed to fill the space between them. To make it easy, break the area into smaller rectangles and calculate the volume of each one, rounding up for all increments. It's better to have epoxy left over than to come up short.

F

Pour in the smaller batch of epoxy, moving the bucket in swirling motions to create waves of lighter color through the blue.

G

If you want to create more swirls, move a dowel in curlicues through the epoxy. The pattern will change on its own as the epoxy cures, so don't worry about creating fine details.

H

To remove bubbles, quickly move a small torch back and forth just above the surface. *The flame should not touch the epoxy.* Check for more bubbles over the next four hours and repeat as needed. During the first few hours, the epoxy level may fall if some leaks below the slab. Top off with any remaining epoxy. Allow the epoxy to cure for at least 72 hours.

I

J

Carefully remove the forms from the ends and edges, then unscrew the bottom and remove it. Note the epoxy that seeped over the low side on the top, and leaked below the slabs on the bottom.

K

Slowly plane away any spilled epoxy on each face using a router with a straight bit and a planing sled. Patch any holes on the top with clear epoxy before routing.

Final details

Note: *Epoxy resin works easily with regular woodworking blades and bits.*

After any epoxy patches have cured, sand the table from 80 grit through 220 grit. Then carefully sand the colored epoxy with 400 and 600 grit.

Apply a finish. We brushed on four coats of Armor Seal from General Finishes. Attach the hairpin legs [**Sources**], and enjoy your new table.

Sources: 16" hairpin legs (set of 4), no. 48624, $35, Rockler, 800-279-4441, rockler.com.
Purchase Ecopoxy and Pearl Ex turquoise and macropearl pigments. woodmagazine.com/ecopoxy

Produced by **Craig Ruegsegger** with **Kevin Boyle**
Project design: **Kevin Boyle**

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One-Wall Workshop

Tool Cabinets

Keeping tools off your workbench but within easy reach helps you focus on your projects. Organize your One-Wall Workshop—or any shop—with easy storage for hand tools, power tools, and cordless tool chargers.

BASIC CABINET

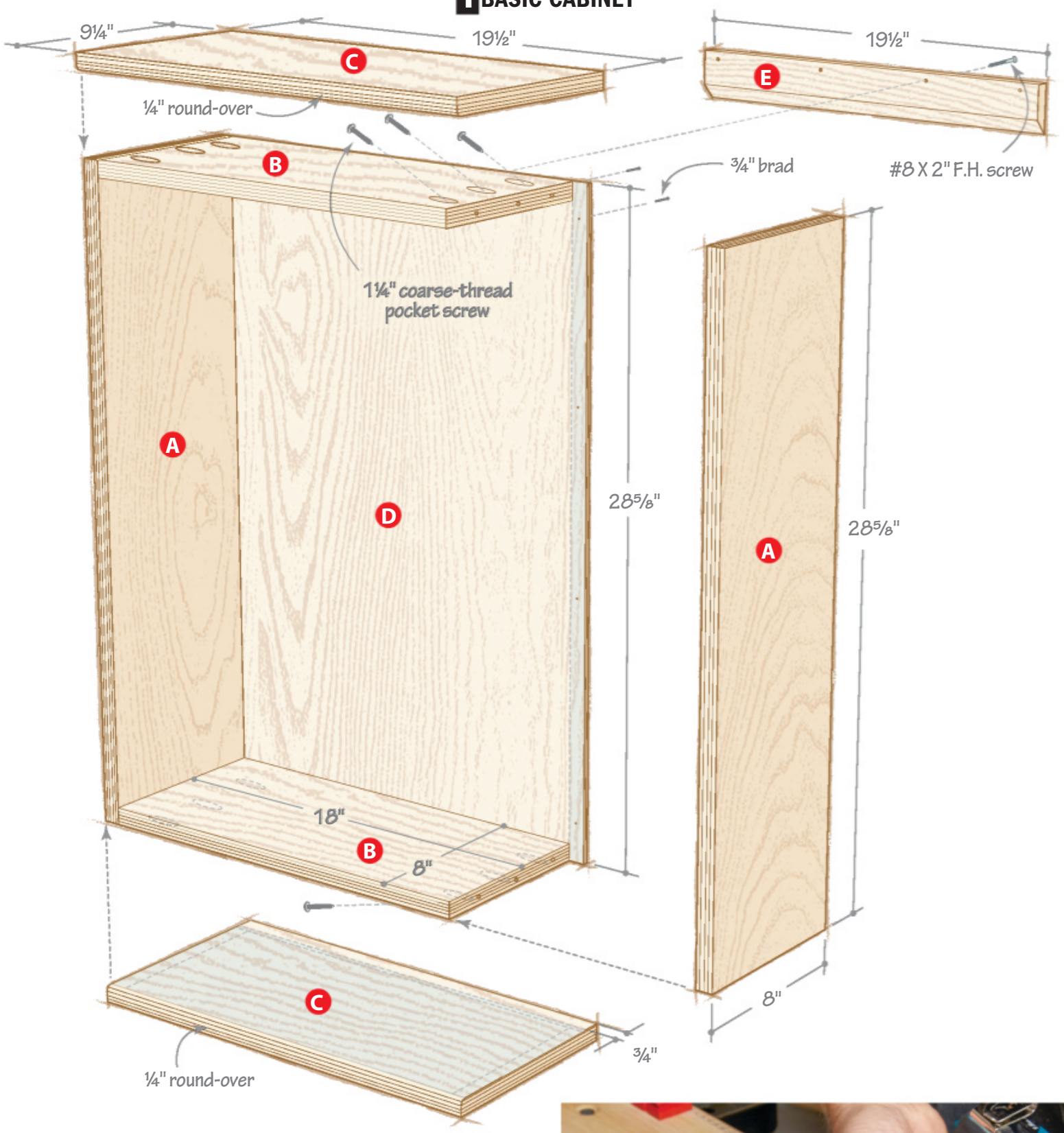
DIMENSIONS: 19½" W × 9¼" D × 30⅛" H

Approximate materials cost:

$40

for one cabinet as shown

Turn plywood scraps into racks and holders.



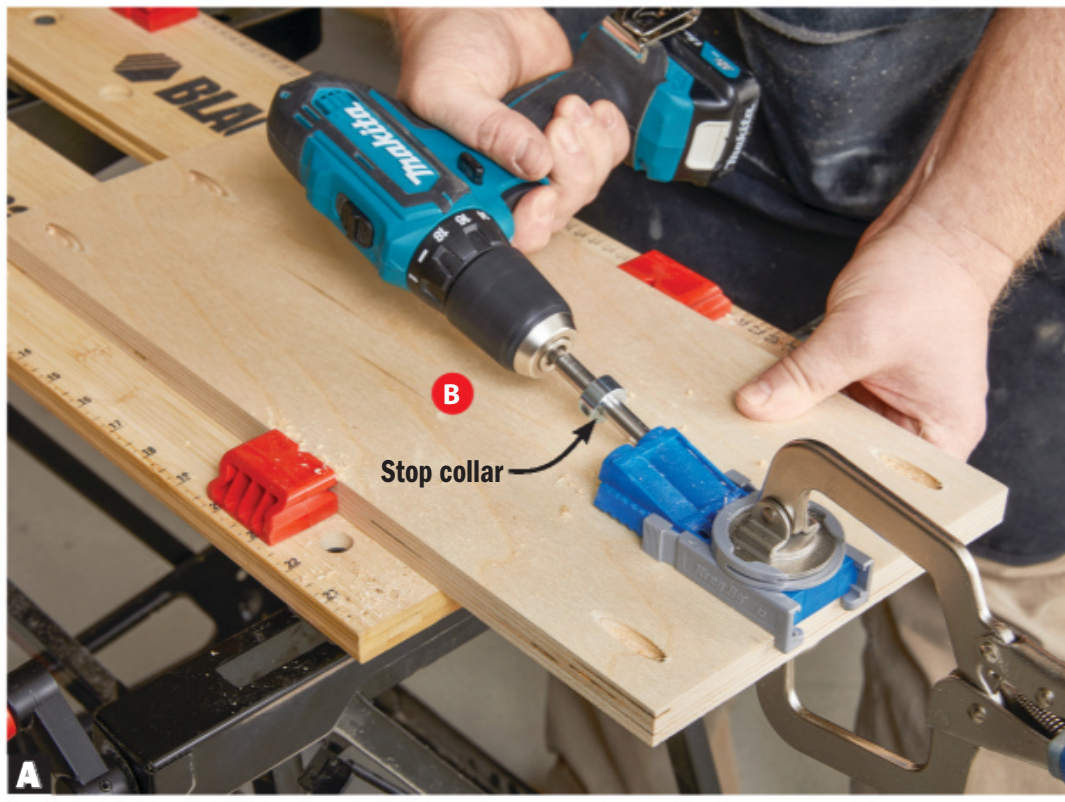
Begin with a simple cabinet

Note: *The top and bottom (C) conceal the pocket holes and add strength.*

Short enough to hang above a workbench, this wall cabinet can store frequently used tools, especially when you customize it as shown in **Build custom tool racks** *on page 33*.

1 Cut parts A–E to size [**Materials List, Drawing 1**]. Drill pocket holes in the carcase top and bottom (B) [**Photo A**].

▶Build the wall cleats, workbench, and mitersaw table from plans in issue 260 (May 2019).



Adjust the pocket-hole-bit stop collar to drill ¾"-thick material before drilling the outside faces of the carcase top and bottom (B).

Clamp the sides (A) to the carcase top and bottom (B) to prevent the parts from sliding out of position as you drive the screws.

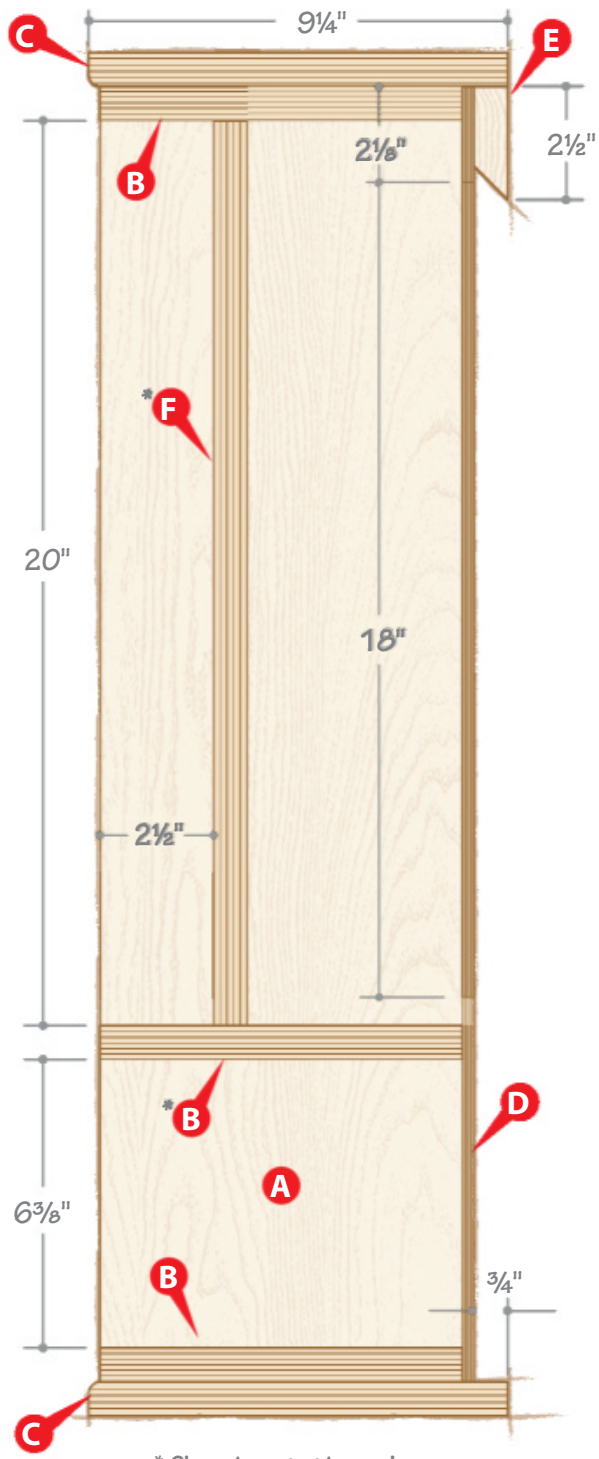
2 Glue and pocket-screw the carcase top and bottom (B) to a side (A). Then add the other side and check for square [**Photo B**].

3 Glue and nail the back (D) to the carcase [**Photo C**].

4 Round over one edge of the top and bottom (C). Glue them to the carcase top and bottom (B) [**Drawing 2**].

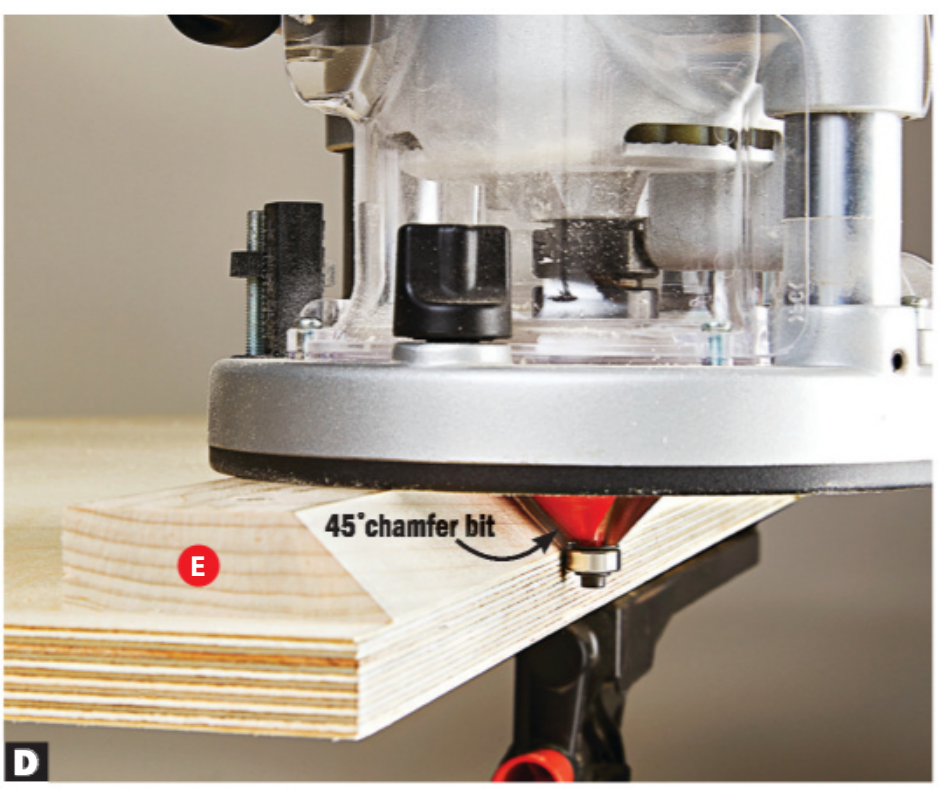
5 Using double-faced tape, secure the hanging cleat (E) to a sheet of Baltic birch plywood with the edges flush. Chamfer the cleat edge at 45° [**Photo D**], then glue and screw the cleat to the back (D). Finish with three coats of wipe-on polyurethane. For tool storage tips, see **Build custom tool racks**.

2 CABINET SIDE VIEW



* Charging station only

Use the back (D) to square the assembly. Nail one edge of the back to a side (A), check for square, and then nail it to the carcase top, bottom (B), and remaining side.



Ride the bit bearing along the plywood edge to chamfer the hanging cleat (E) edge.

Build custom tool racks

Use plywood or maple scraps ½–¾" thick to make custom tool holders and racks.

DOWEL PEG RACK

E

Hang combination wrenches, sockets, or tools with a hole in the handle on dowels glued into an 18"-long board screwed to the cabinet sides and back.

SLOTTED RACKS

F

Cut tool shelves deep enough to hold what you'll store. Group tools in the order you'll hang them and mark the shelf edge to fit the tool.

G

Lay each tool on the shelf face and mark its notch depth. Jigsaw the notches and sand the cut edges.

H

Cut shelf side supports for the desired shelf height. Screw the shelves to the supports and screw the assembly to the cabinet.

Note: *By screwing racks in place without glue, you can substitute updated racks later as storage needs change.*

SWINGING SCREWDRIVER RACK

I

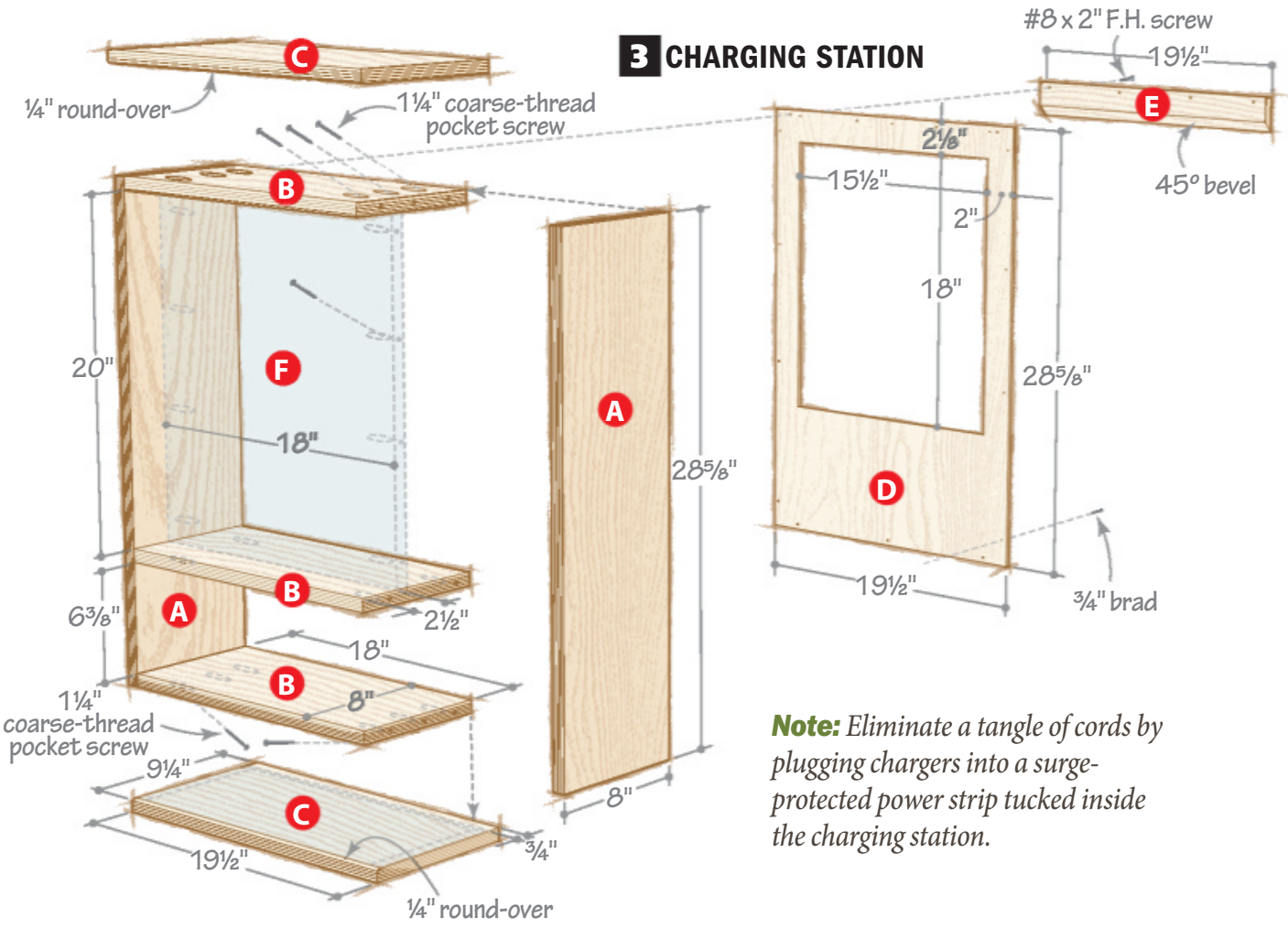
Build a screwdriver rack from two ¾×4" parts. Mark the width of the screwdriver blades on both halves of the rack.

J

Clamp a square to the rack as a routing guide. Rout notches half the depth of the notch width and glue the halves with the notches aligned. Cut the rack to 3½" wide.

K

To make a swinging rack, cut it to 17⅜" long. Screw a hinge to the rack with the barrel facing out. Screw the other leaf and a spacer to the cabinet side (A).



Note: *Eliminate a tangle of cords by plugging chargers into a surge-protected power strip tucked inside the charging station.*

Build a charging station

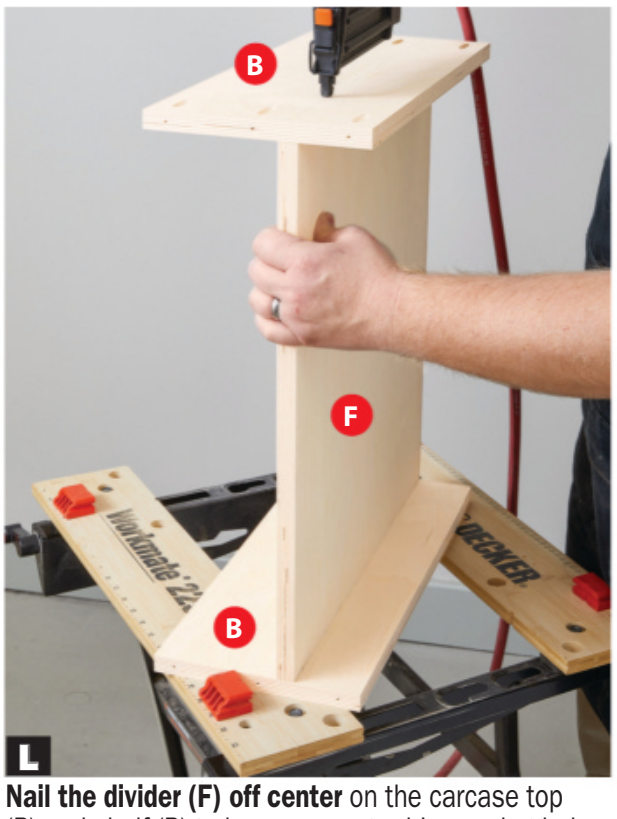
The charging station goes together just like the basic cabinet but with a shelf and cord-hiding divider [**Drawing 3**].

1 Cut the cabinet parts (A–F) plus a third part B for the shelf [**Materials List, Drawing 3**]. Jigsaw the opening in the back (D).

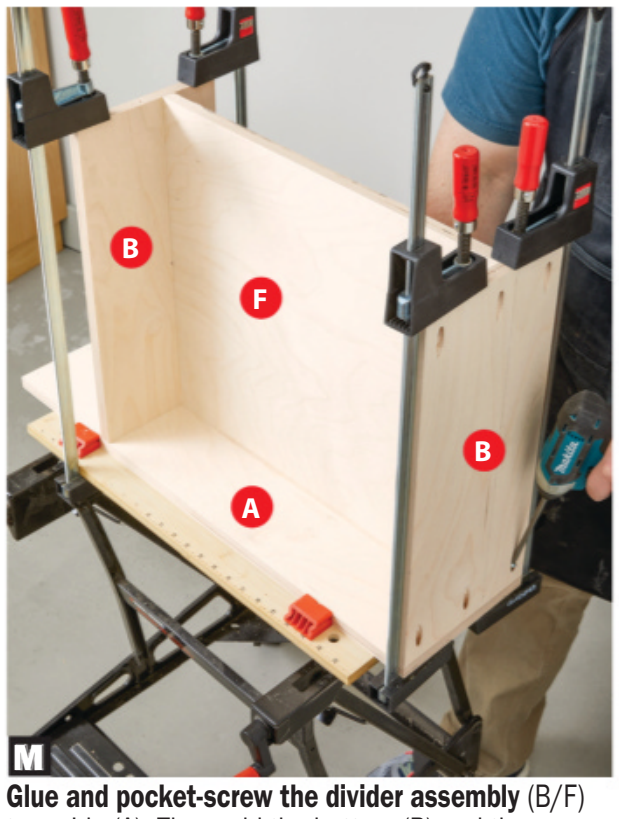
2 Drill pocket holes on the underside of the shelf (B). Then assemble the cabinet [**Photos L, M**].

3 Glue and nail on the back (D). Round over one edge of the top and bottom (C), then glue them to the carcase.

4 Arrange tool chargers on the divider, then mark mounting-screw locations and electrical-cord holes for each charger. Drive #8×1" roundhead mounting screws, and drill a 1¼" hole for each plug and cord. Finish with three coats of wipe-on polyurethane and hang the chargers.



Nail the divider (F) off center on the carcase top (B) and shelf (B) to leave space to drive pocket-hole screws.



Glue and pocket-screw the divider assembly (B/F) to a side (A). Then add the bottom (B) and the remaining side.

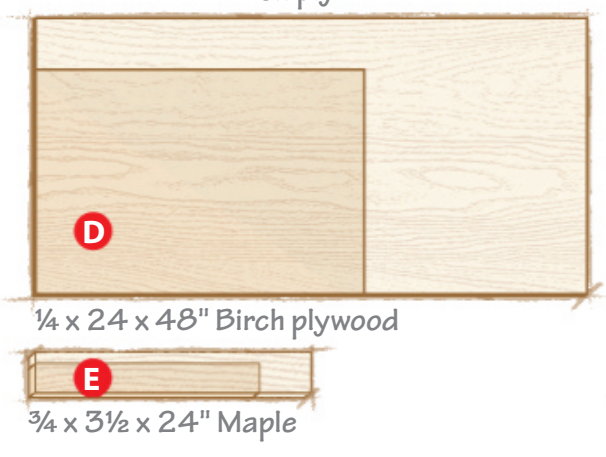
Materials List

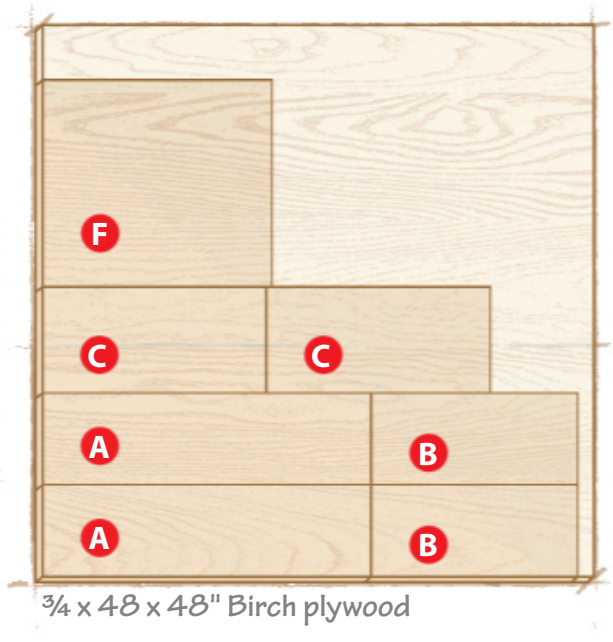
Part		FINISHED SIZE T	W	L	Matl.	Qty.
Basic cabinet/Charging station						
A	sides	¾"	8"	28⅝"	BP	2
B	carcase top/bottom	¾"	8"	18"	BP	2*
C	top/bottom	¾"	9¼"	19½"	BP	2
D	back	¼"	19½"	28⅝"	BP	1
E	hanging cleat	¾"	2½"	19½"	M	1
F**	center divider	¾"	18"	20"	BP	1

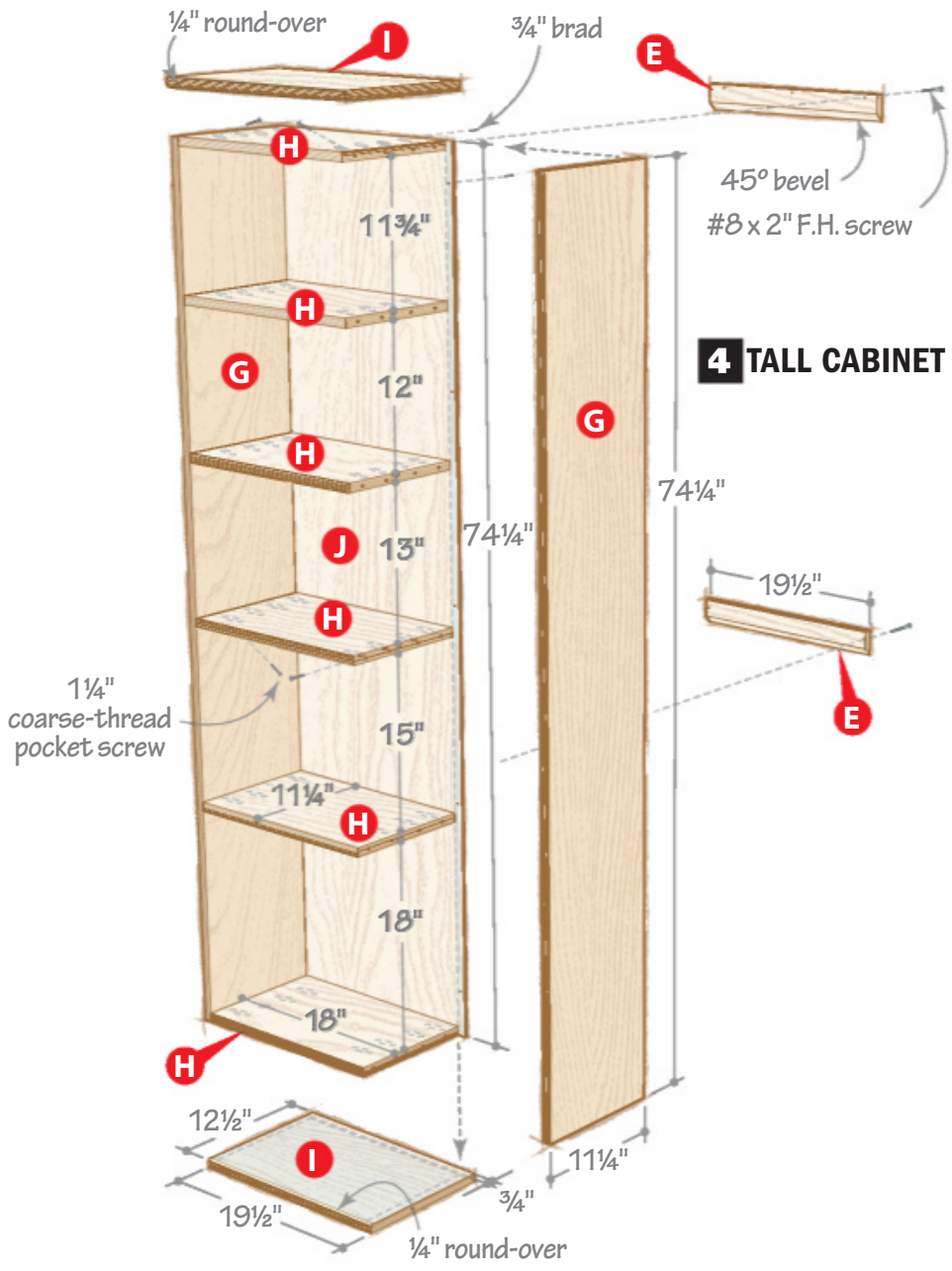
* Cut a third part for the charging-station shelf.
** Charging station only

Materials key: BP–Baltic-birch plywood, M–maple.
Supplies: 3½" butt hinge, 1¼" coarse-thread pocket-hole screws, #8×2" flathead screws, #8×1" roundhead screws, ¾" brads.
Blade and bits: 45° chamfer, ¼" straight, and ¼" round-over router bits; 1¼" drill bit.

Cutting Diagram







Coming in issue 262 (September 2019)

Put the fast in fastening with this pair of organizers. The tool rack keeps cordless drills, drivers, and air nailers in arm's reach of your workbench. Keep your top 10 boxes of project screws and nails equally handy in the fastener rack.

Expand your cabinet options

This tall cabinet goes together like the basic cabinet. Follow the shelf spacing shown, or adapt it to your tools.

1 Cut parts G–J to size [**Materials List, Drawing 4**]. Glue and pocket-screw the top, bottom, and shelves to a side (G), then attach the second side and check for square.

2 Glue and nail the back (J) to the carcase. Round over one edge of the top and bottom (I) and glue them to the carcase.

3 Cut and chamfer two hanging cleats (E). Glue and screw the top cleat to the back (J) and hang the cabinet from the top wall cleat. Mark the bottom cleat location, remove the cabinet, and glue and screw the bottom cleat to the back.

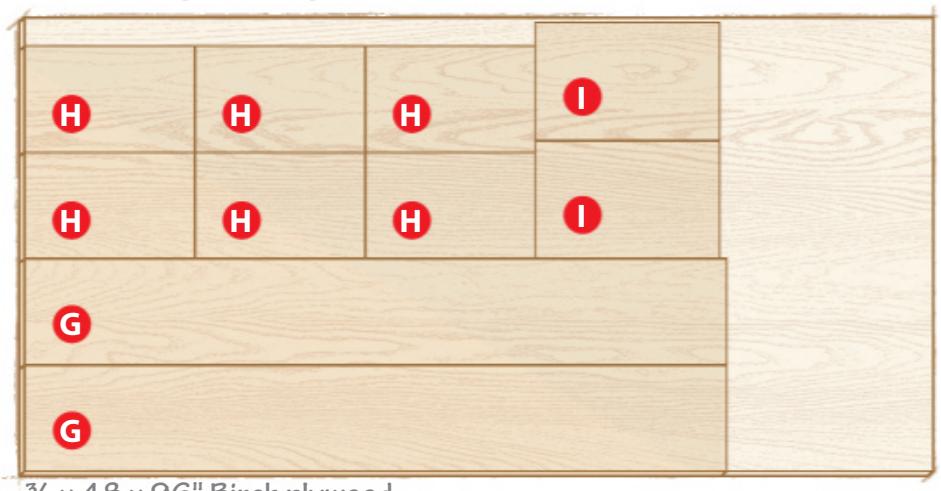
4 Add any desired racks or accessories to the cabinet. Then sand and finish with three coats of wipe-on polyurethane.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Tall cabinet						
G	tall sides	¾"	11¼"	74¼"	BP	2
H	carcase top/ bottom/shelves	¾"	11¼"	18"	BP	6
I	top/bottom	¾"	12½"	19½"	BP	2
J	tall back	¼"	19½"	74¼"	BP	1

Materials key: BP–Baltic-birch plywood.
Supplies: 1¼" coarse-thread pocket-hole screws, #8×2" flathead screws, ¾" brads.
Bits: 45° chamfer and ¼" round-over router bits.

Cutting Diagram



¾ x 48 x 96" Birch plywood

¼ x 48 x 96" Birch plywood

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

Buying a Workbench

A workbench anchors your woodworking shop by providing a flat, durable surface dedicated to making parts and assembling projects. Building your own requires substantial labor and material, so some woodworkers choose to buy ready-made.

Priced from around a hundred to several thousand dollars, factory-made benches offer a variety of sizes and features to meet most home woodworkers' needs.

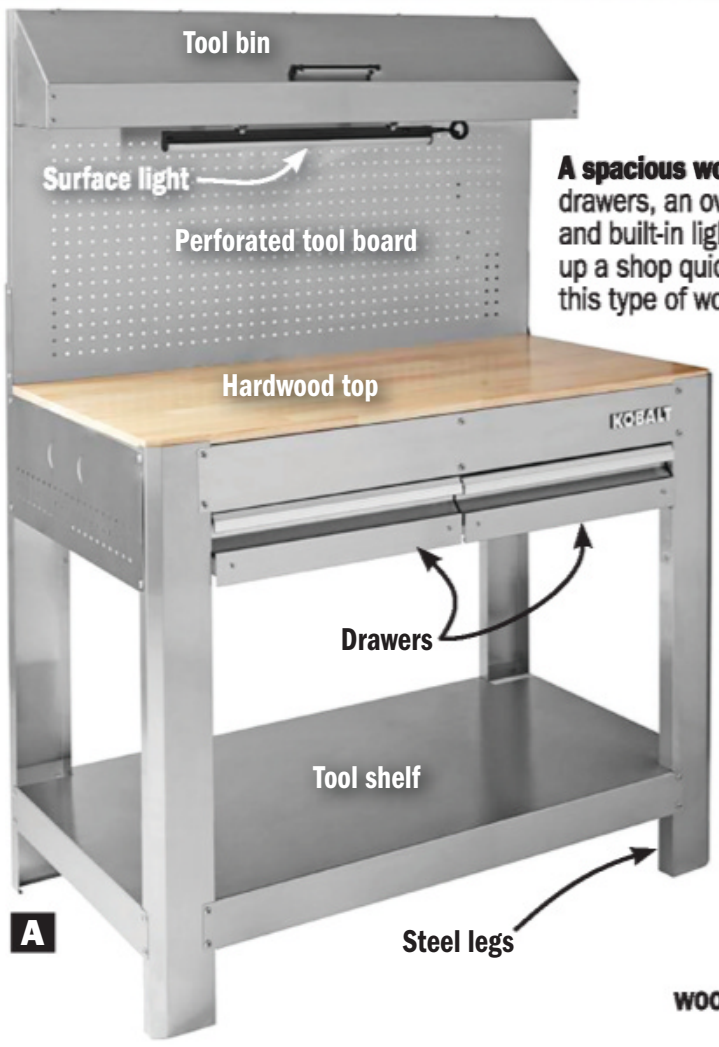
Going bench shopping

The kinds of projects you build should drive your workbench selection. Large furniture projects, for example, require a different bench than small boxes, toys, or craft items.

Consider, too, the way you work. Hand-planing stock, chiseling mortises, or cutting dovetails by hand demands a stout bench that won't scoot around while you work. Assembling machined parts doesn't stress a bench the way handwork does.

Pick the type that best fits your needs from the choices in three categories.

DIYer/hobbyist work centers. These steel units, topped with a hardwood or MDF worksurface [**Photo A**], let you set up shop quickly. They're ideal for home improvers and woodworkers who build small- or medium-size projects with machine-made parts.



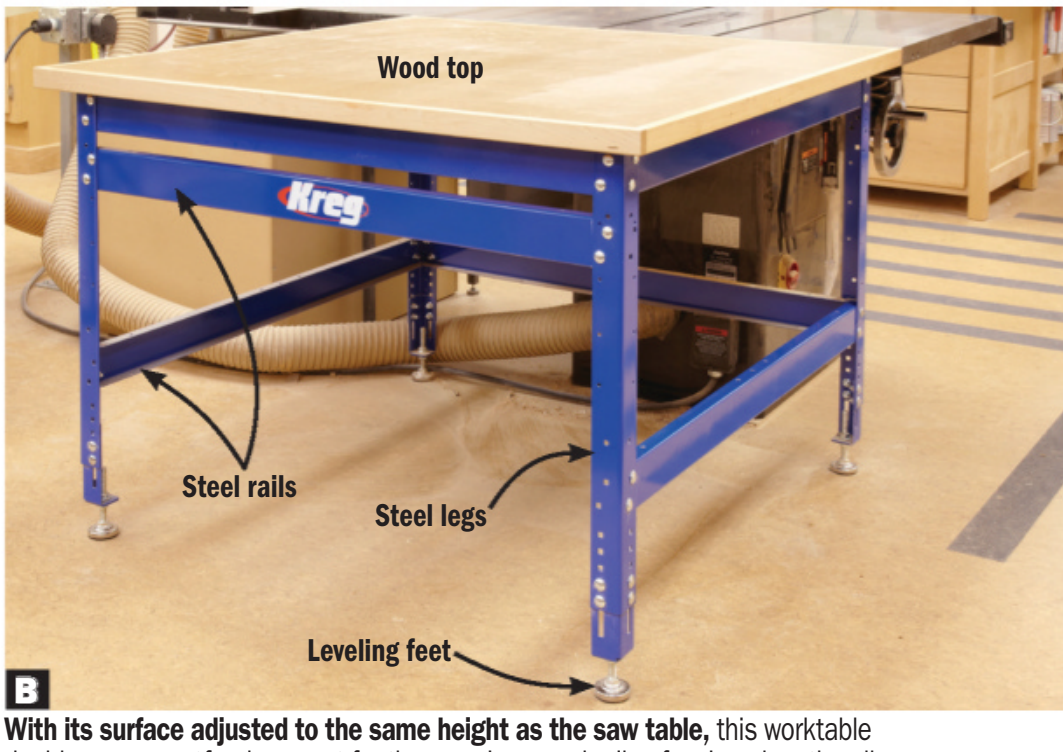
A spacious worksurface, drawers, an overhead tool bin, and built-in lighting make setting up a shop quick and easy with this type of work center.

A

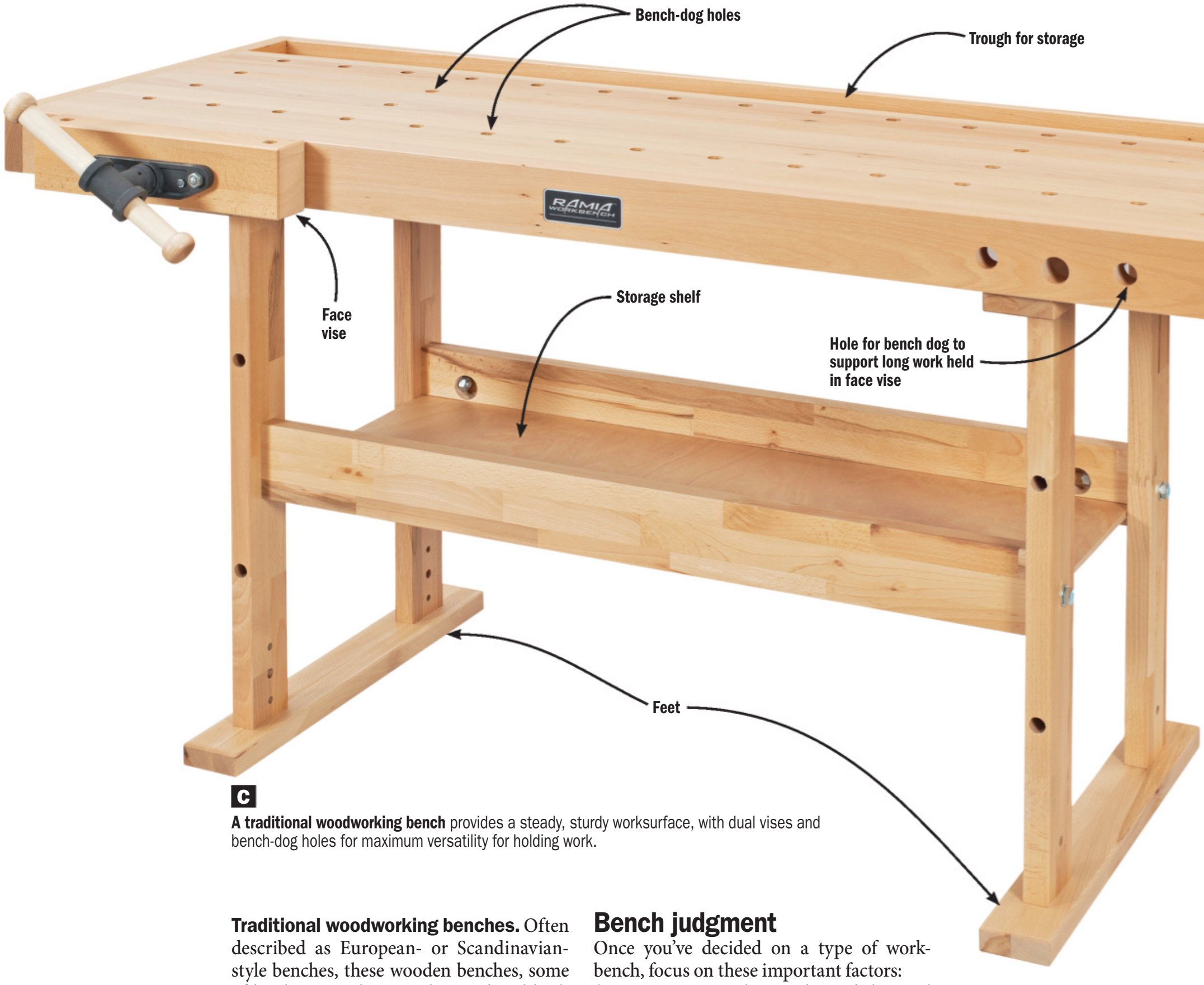
A built-in perforated tool board, drawers, and shelves offer storage, and many work centers feature lighting and electrical power strips. Most measure about 4' long, with prices from $100 to $500 or so at big-box home centers, tool dealers, and online.

Industrial worktables. Essentially heavy-duty tables with steel legs and a steel or wooden top, these benches range up to 12' long. Some manufacturers sell legs and rails that bolt together into a custom-size base to support your worksurface (or a manufactured one) [**Photo B**].

A large surface and a rigid base provide space and strength for big projects. Add backboards, shelves, and drawers, as needed. Buy these from big-box stores, industrial supply houses, tool dealers, or online. Prices start around $100 and head into the thousands as size, sturdiness, and features increase.



With its surface adjusted to the same height as the saw table, this worktable doubles as an outfeed support for the saw. Legs and rails of various lengths allow custom sizing.



C

A traditional woodworking bench provides a steady, sturdy worksurface, with dual vises and bench-dog holes for maximum versatility for holding work.

Traditional woodworking benches. Often described as European- or Scandinavian-style benches, these wooden benches, some of heirloom quality, are designed and built with woodworking in mind. Integral woodworking vises [**Photo C**] distinguish these benches from other styles. Such vises grip boards securely for sawing, planing, and other jobs and, for most woodworking processes, serve better than machinist-type vises mounted on the benchtop.

This bench style suits furniture builders well. Larger ones equipped with storage cabinets weigh 300 lbs. or more, making them steady and resistant to sliding when machining or shaping parts on them.

For many woodworkers, having a traditional bench, made or bought, is a source of pride. Prices start around $200 and go into the thousands. Find them at woodworking specialty dealers, tool stores, industrial suppliers, and online retailers.

▶Rather build your own bench? Find plans at woodmagazine.com/workbenches.

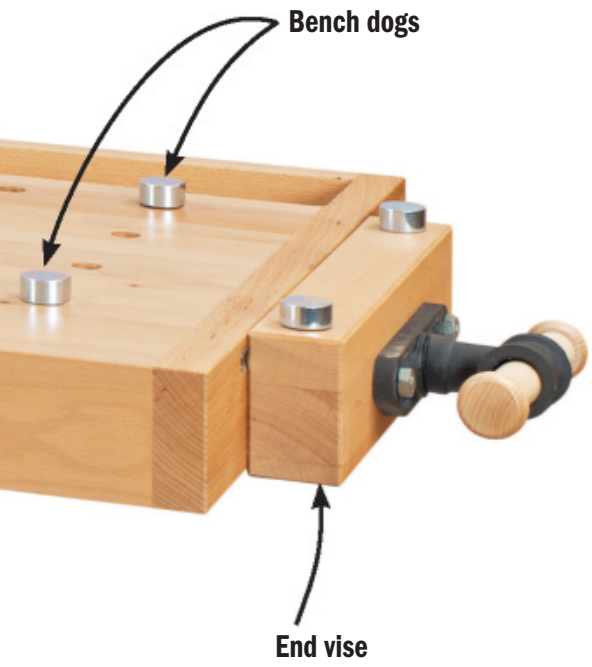
Bench judgment

Once you've decided on a type of workbench, focus on these important factors:

Strong support. A base with sturdy legs and stout stretchers resists swaying and provides a solid worksurface. Through-bolted joints offer superior strength [**Photo D**]. Feet that span both legs on each end enhance sway resistance and make leveling the bench easier.

Top-notch worksurface. Laminated hardwood makes the toughest worksurface, suited to the largest projects and hand-tool use. A top built up from plywood or MDF may prove durable enough for many projects. A steel worksurface poses problems for woodworking, as it's likely to damage cutting edges on tools and might prove too slick to work on safely.

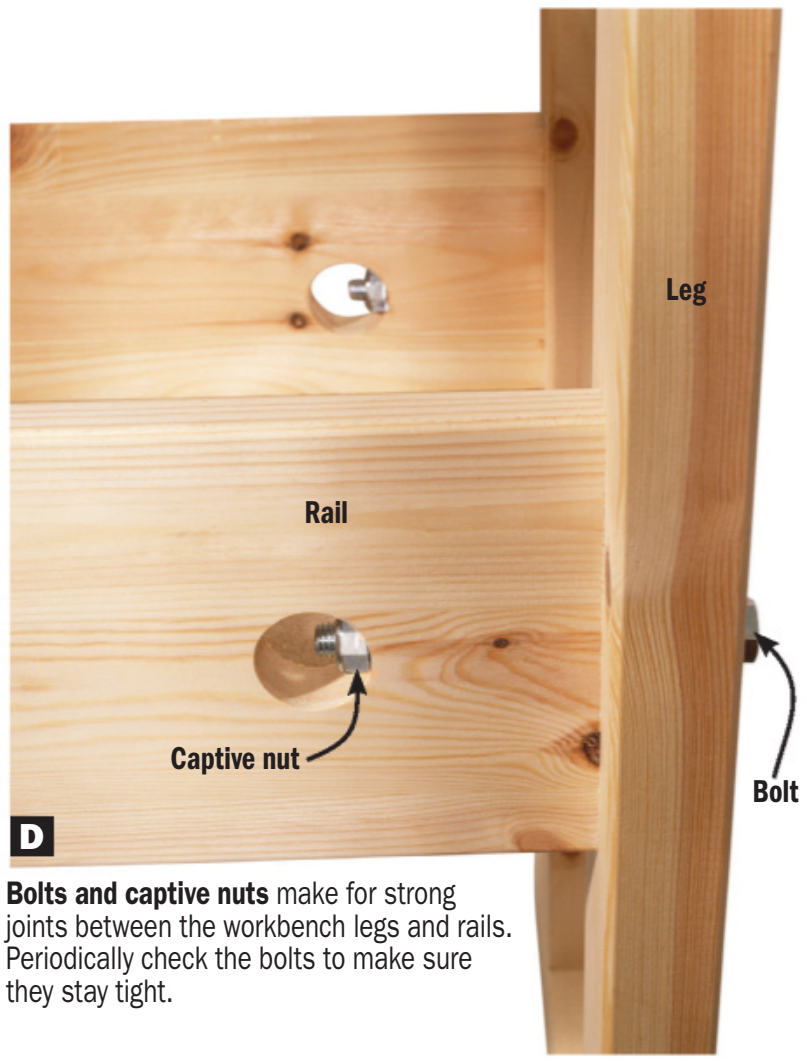
Vise virtues. Adding woodworking vises to an already-built bench can prove difficult, so consider buying a bench that comes with them. A pair of vises—a face vise on the left



Make it mobile?

A movable bench offers advantages. In a small shop, you could keep the bench against a wall or in a corner until you need working space on all sides for a larger project. One solution is simply to set a workbench on a mobile tool base, but the workbench won't be rock-steady when positioned, even with locking casters. For the greatest solidity, install workbench casters that retract or fold up, so the bench can stand on its legs when placed in working position [**Source**].

Source: Workbench casters, four-pack, item no. 43501, $80, Rockler, 800-279-4441, rockler.com.



D

Bolts and captive nuts make for strong joints between the workbench legs and rails. Periodically check the bolts to make sure they stay tight.

E

The massive jaw of the tail vise clamps tightly against a workpiece without racking out of position. The vise can hold work against the front or end of the bench.

▶Learn about vises. woodmagazine.com/bench-vises.

front edge (for right-handers) and an end vise on the opposite end—offer greatest versatility [**Photo C**]. Bench dogs and hold-downs that fit into benchtop holes offer added ways to grip a workpiece [**Holding things**, *next page*].

Sometimes installed instead of an end vise, a tail vise [**Photo E**] holds a long, wide workpiece vertically. The guide rods and screw in a face or end vise force you to grip such a piece at one end of the jaw, racking it out of alignment so it holds less firmly.

Storage space. A traditional workbench usually has a bottom shelf between the legs to hold tools and materials and prevent benchtop clutter. The shelf stiffens the bench base to increase rigidity, too.

To increase storage, some manufacturers offer additional shelves, drawers, or cabinets for their workbenches. A European-style bench often features a trough near the back edge of the top to keep chisels, mallets, and so forth handy but out of the way [**Photo C**].

Tip! *A wall-mounted bench (or one placed against a wall) saves space but limits your ability to work from all sides or to accommodate an oversize workpiece. Decide whether this would be a serious drawback for you.*

Note: *Hand-tool woodworkers often prefer a lower bench for hand-plane and chisel use. But a taller bench might make power-sanding and assembly more comfortable.*

Make sure it fits you and your shop

Measure the overall benchtop length and width, including vises. Then, add another 3' in front of and, unless placed against a wall, behind the bench, plus, ideally, at each end for working space. Determine how that footprint fits within your shop.

Benches vary from about 33" to 36" tall. A few inches may seem insignificant but can make a big difference in working comfort. Generally, you'll like a benchtop as high as the distance from the floor to your first thumb knuckle with your arms hanging relaxed at your sides.

Some benches, especially those designed for kids, have height-adjustable legs [**Photo F**]. If a fixed-leg bench seems too short, place it on risers. A too-tall bench will be harder to deal with.

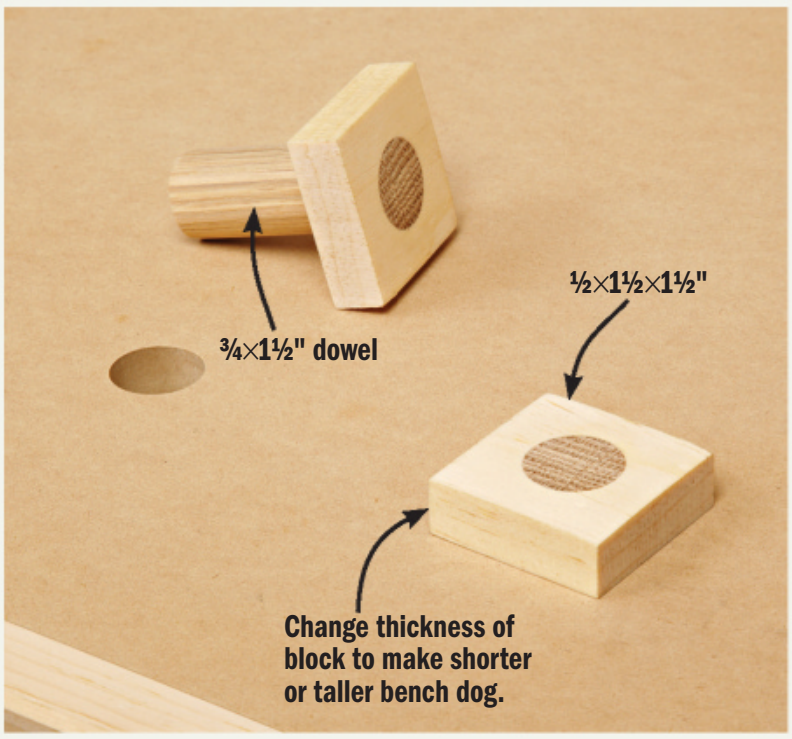
F **Adjustable legs on this bench** accommodate shorter woodworkers. The bench can also be raised as a child grows.

Holding things

Bench dogs are stops that fit into holes drilled into the benchtop. Woodworking stores sell many varieties (*right*), or you can make your own (*below*). Used in conjunction with a vise, they let you grip a workpiece securely [**opening photo**] without interfering with tools. Metal dogs have springs in the sides (*upper inset*), so you can insert the stop to different depths to accommodate workpiece thickness. Other dogs sit flat on the benchtop (*lower inset*).

Holdfasts and hold-downs fit into benchtop holes to secure large or irregular workpieces. To set a traditional fixed holdfast (*lower right*), drop it into the hole, let it contact your workpiece, then tap the curved top with a mallet to wedge the shaft into the hole. (Tap the back side to release it.) Adjustable hold-downs, such as the one shown *right*, drop into holes and tighten by turning a knob.

Produced by **Larry Johnston**



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Supercharged End Table

Wirelessly charge your phone by simply setting it near one corner of the top.

Clean design, cool joinery, and generous drawer space make this contemporary piece shine as an end table or night stand. And it hides a secret: a recess below the top holds an inductive charger (see *next page*) for keeping your phone topped off.

DIMENSIONS: 24" W × 18" D × 24" H

Approximate materials cost:

$175

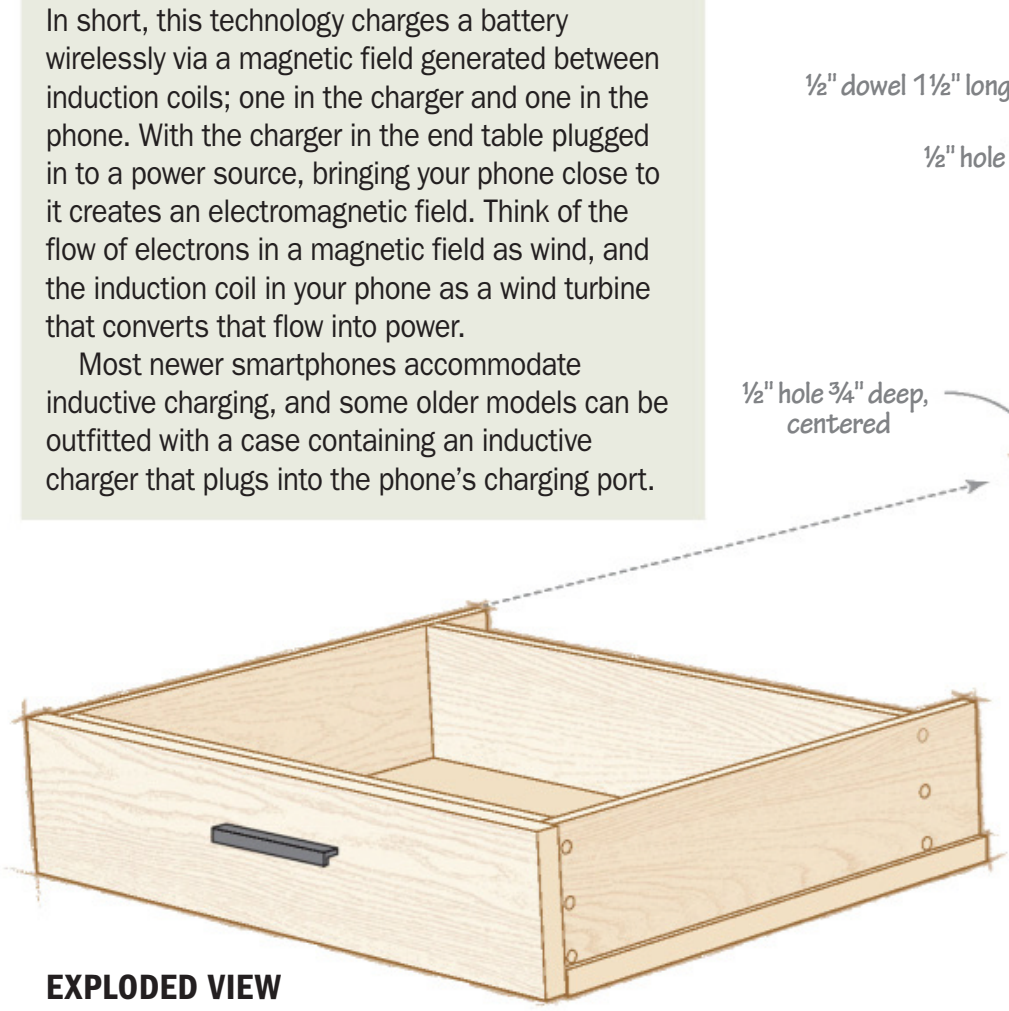
without the charger

A pegged, modified lap joint secures the top to the legs.

What is inductive charging?

In short, this technology charges a battery wirelessly via a magnetic field generated between induction coils; one in the charger and one in the phone. With the charger in the end table plugged in to a power source, bringing your phone close to it creates an electromagnetic field. Think of the flow of electrons in a magnetic field as wind, and the induction coil in your phone as a wind turbine that converts that flow into power.

Most newer smartphones accommodate inductive charging, and some older models can be outfitted with a case containing an inductive charger that plugs into the phone's charging port.



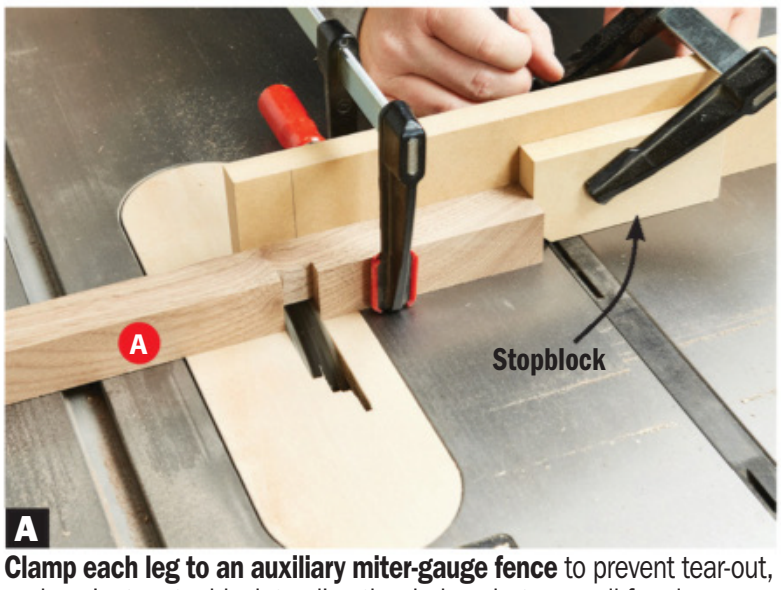
EXPLODED VIEW

__Tip!__ Carefully select stock for the feet so the grain blends well at the joint lines.

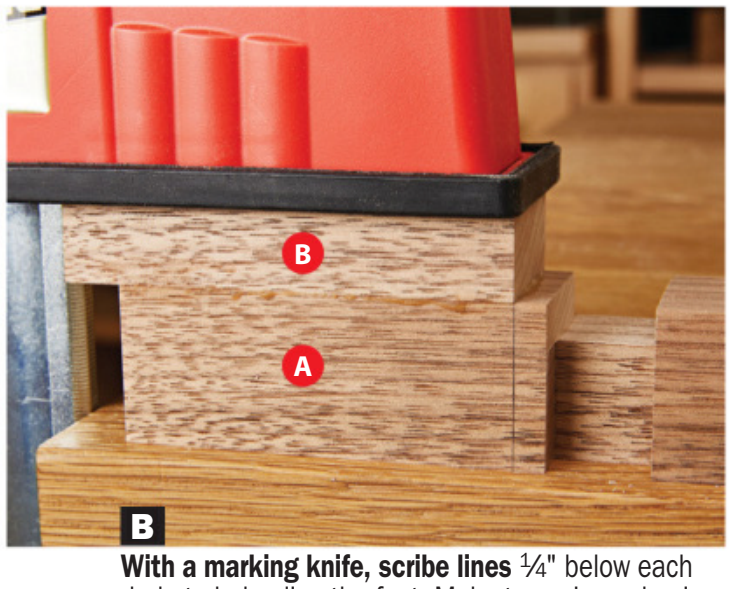
Start with the legs

1 Cut the legs (A) to size [**Materials List**, *page 47*]. Dado the inside faces of each leg [**Drawing 1, Photo A**].

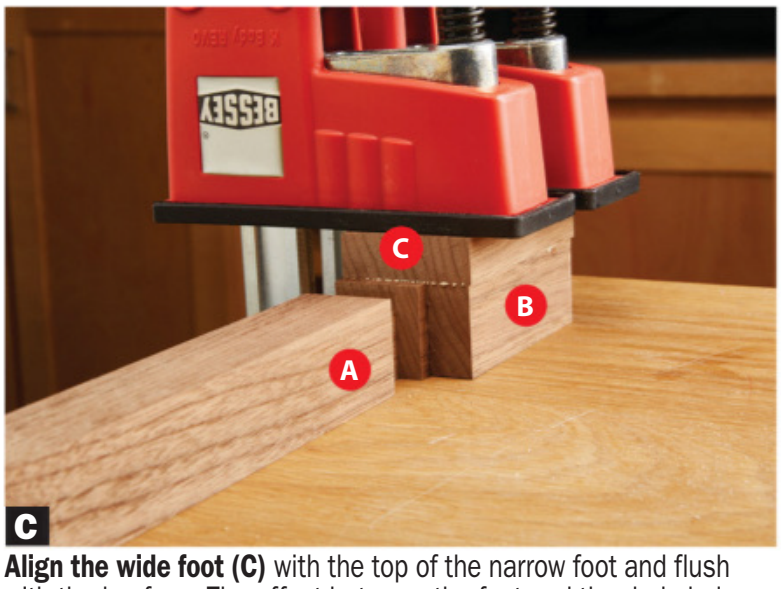
2 Cut the narrow and wide feet (B, C) ½" longer than listed. Glue a narrow foot (B) ¼" below a dado on each leg [**Photo B**]. After the glue dries, scrape away glue squeeze-out and plane the edges of the leg and foot flush. Glue the wide feet (C) in place [**Photo C**].



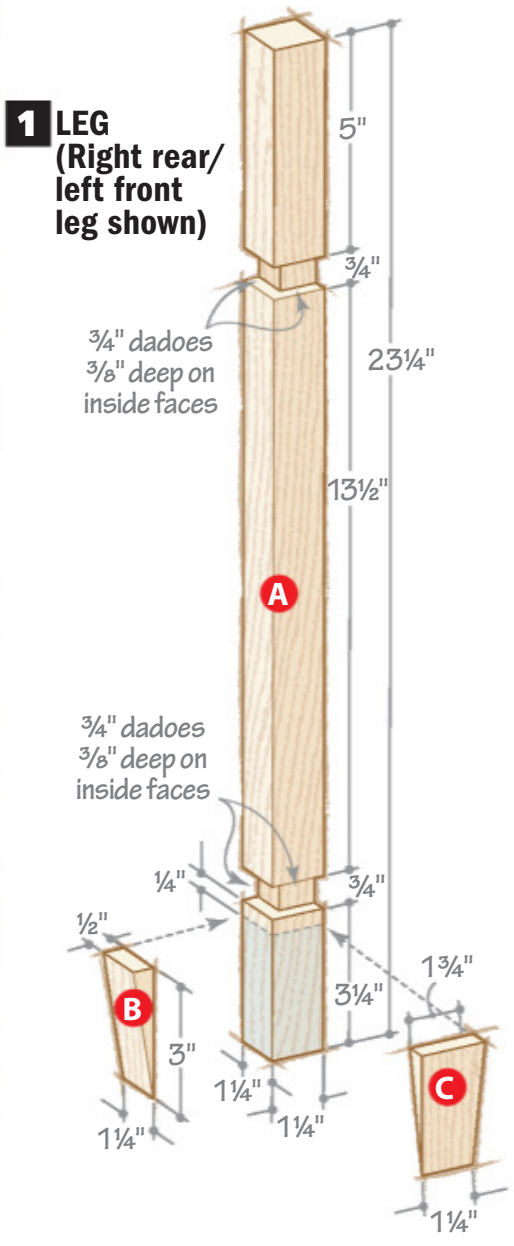
Clamp each leg to an auxiliary miter-gauge fence to prevent tear-out, and against a stopblock to align the dadoes between all four legs.

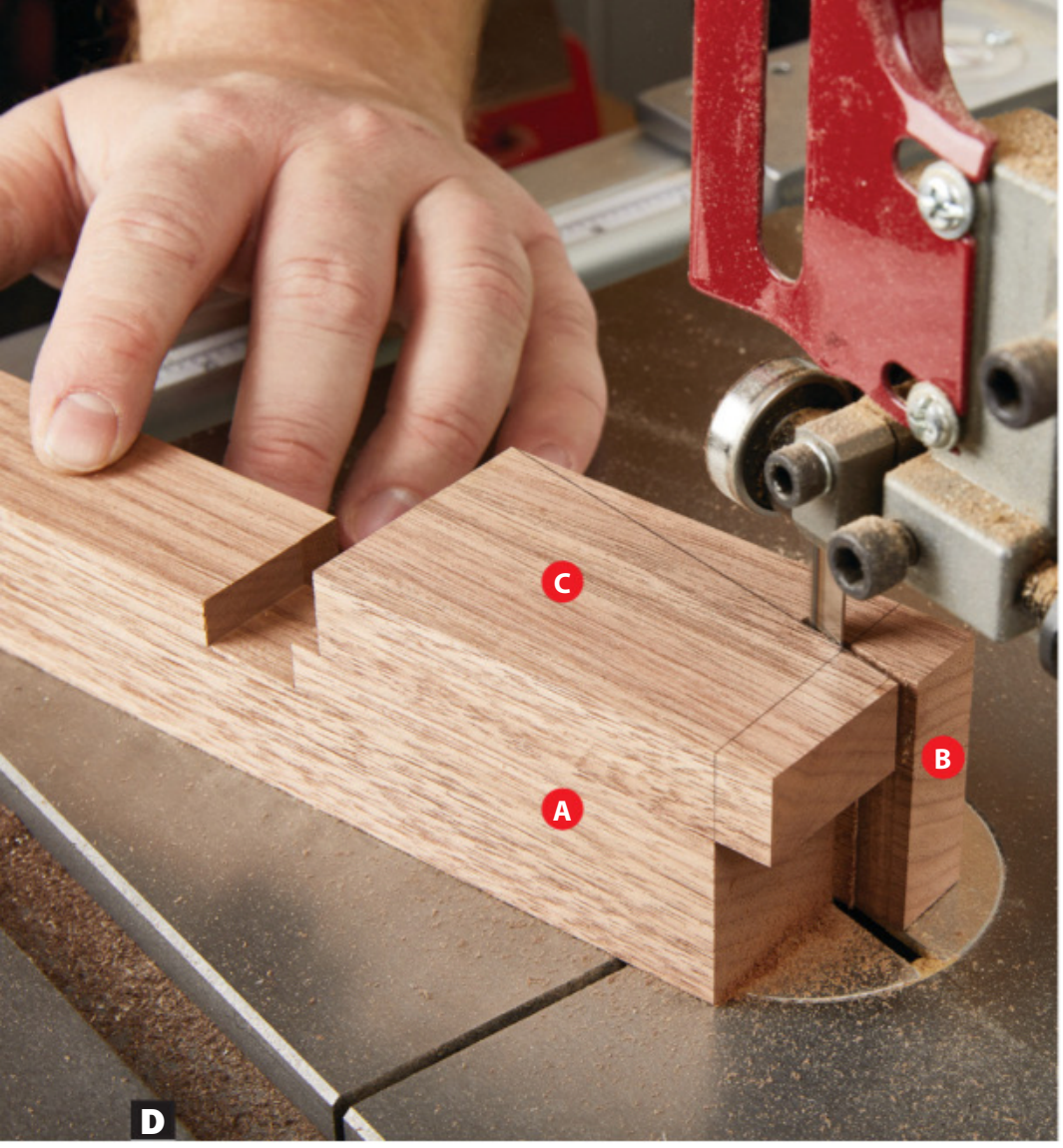


With a marking knife, scribe lines ¼" below each dado to help align the feet. Make two mirrored pairs of legs.

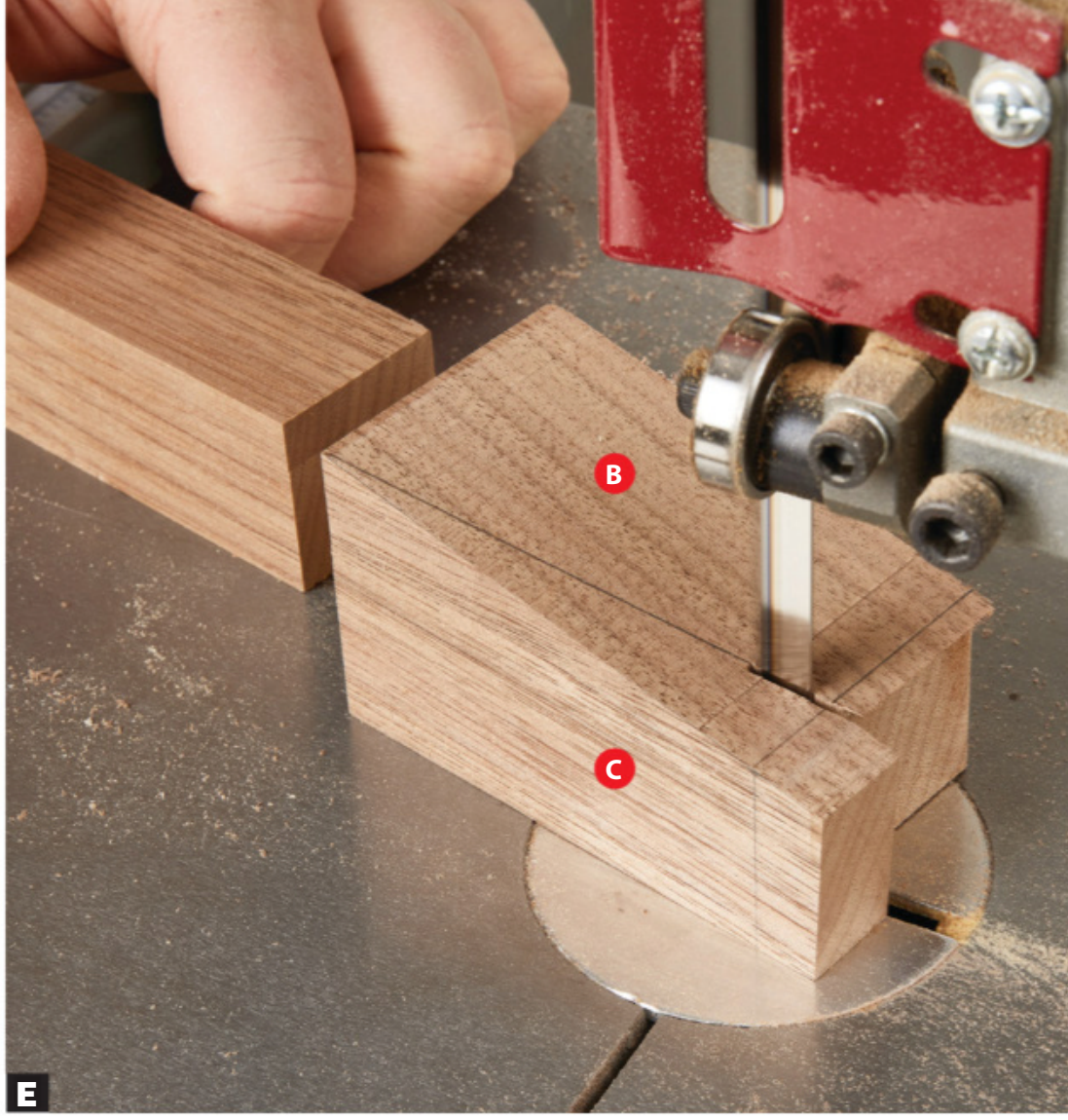


Align the wide foot (C) with the top of the narrow foot and flush with the leg face. The offset between the feet and the dado helps support the lower shelf.





Scribe the bottom of the leg onto the edges and faces of the feet (B, C). Then mark and cut the taper on the wide foot.



Mark the taper on the just-sawn face and bandsaw it. Sand both tapers smooth.

3 Mark the taper on each wide foot (C) and bandsaw to the mark [**Drawing 1, Photo D**]. Repeat for the second taper [**Photo E**]. Cut the feet flush with the end of the legs; then set the legs aside.

Next, the shelves

1 Cut the rails (D, E) to size, along with a few test pieces of the same thickness and width [**Drawing 2**]. Cut the rail joints [**Skill Builder**].

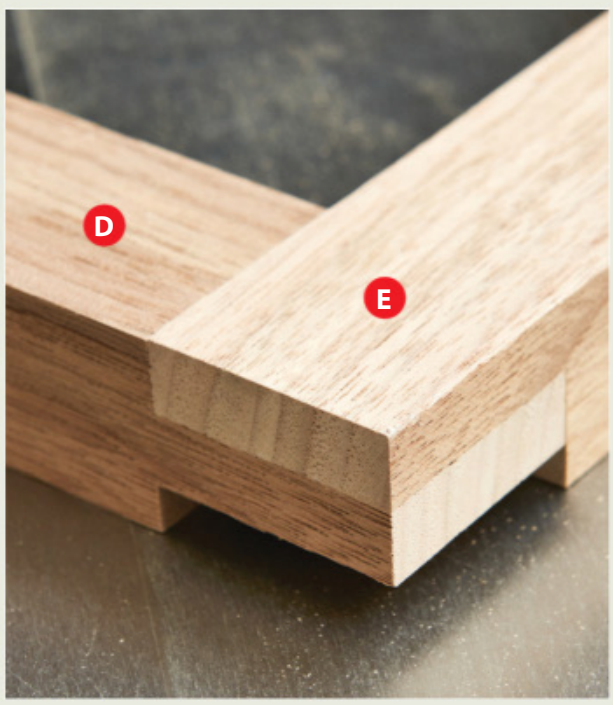
2 Dry-fit a set of rails (D, E), measure for the top and shelf panels (F), and cut them to size. Glue the rails around the panels [**Drawing 2**].

3 Use a marking gauge to scribe the rails of the two shelves to fit into the leg dadoes [**Photos F, G, Drawing 2a**]. Cut the notches. Test the fit of the shelves in the leg dadoes.

SKILL BUILDER

Cut a "Swedish lap joint"

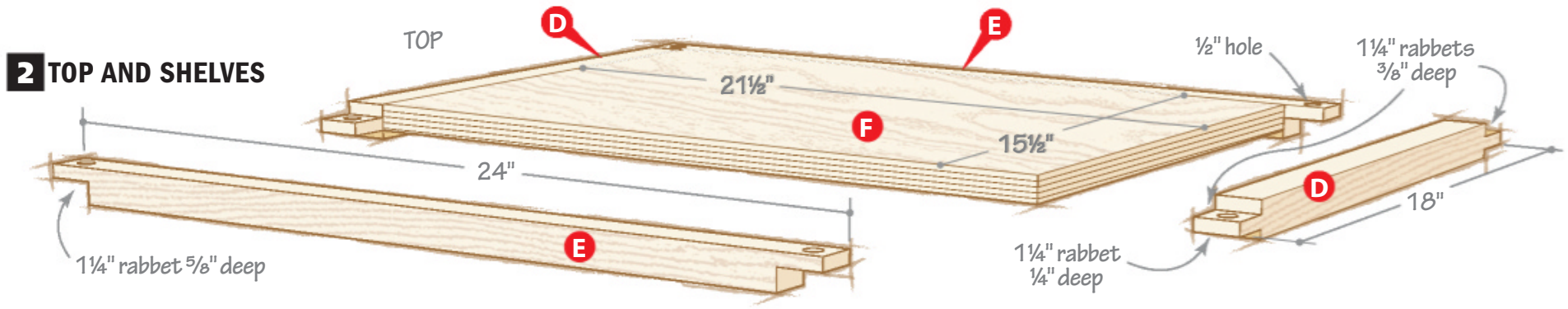
Not a true half-lap, but cut in a similar fashion, this joint is actually a bridle joint missing half the bridle. A dowel through the overlapped area pins the pieces to the table legs, *below*. We couldn't decide what to call it, so we dubbed it the Swedish lap joint in honor of Design Editor John Olson's heritage. Cut test joints first, and when one comes together properly, use those pieces to help reset the blade height as you cut the rails.

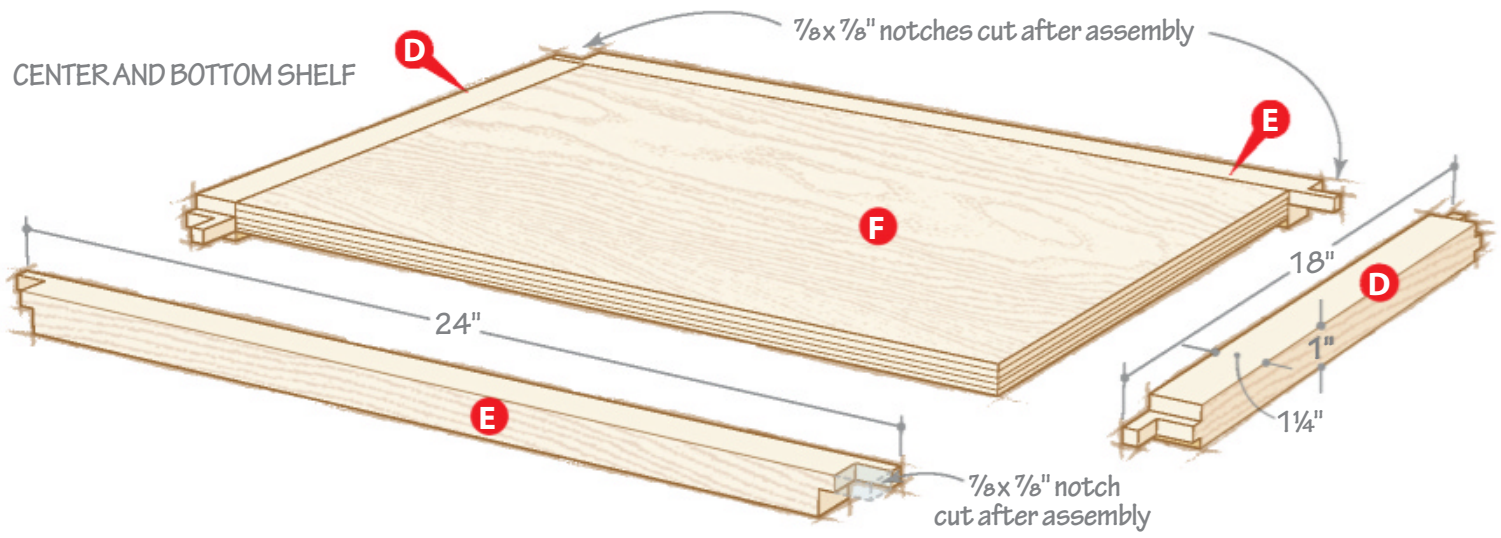


With the pieces on a flat surface, the top faces should be flush, with the mating faces of the lap touching and the ends and edges flush.

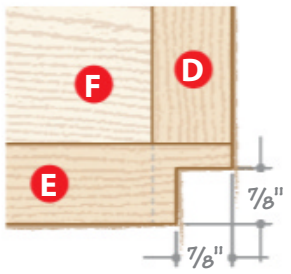
Use one of the test pieces to set your rip fence so the outside edge of the piece is flush with the outside tooth of the blade.

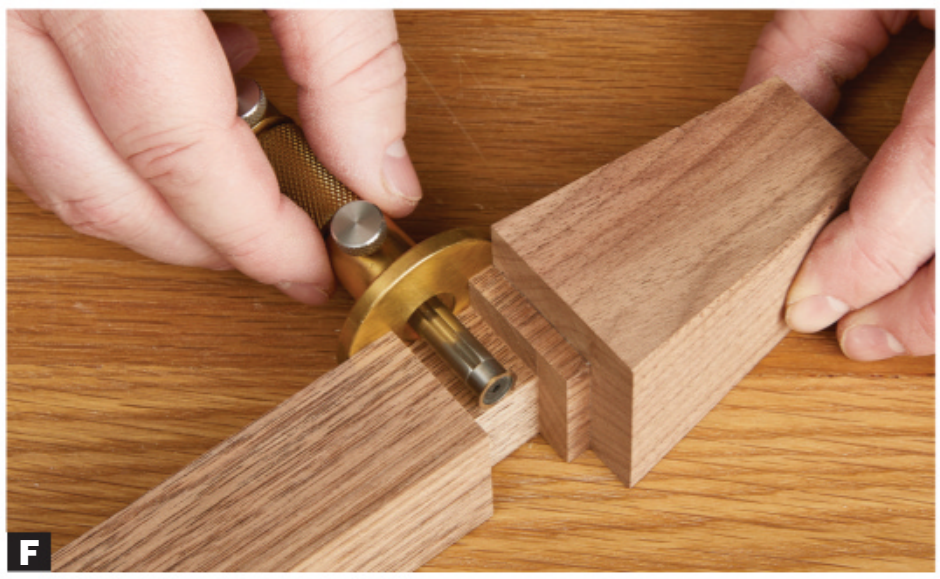
2 TOP AND SHELVES



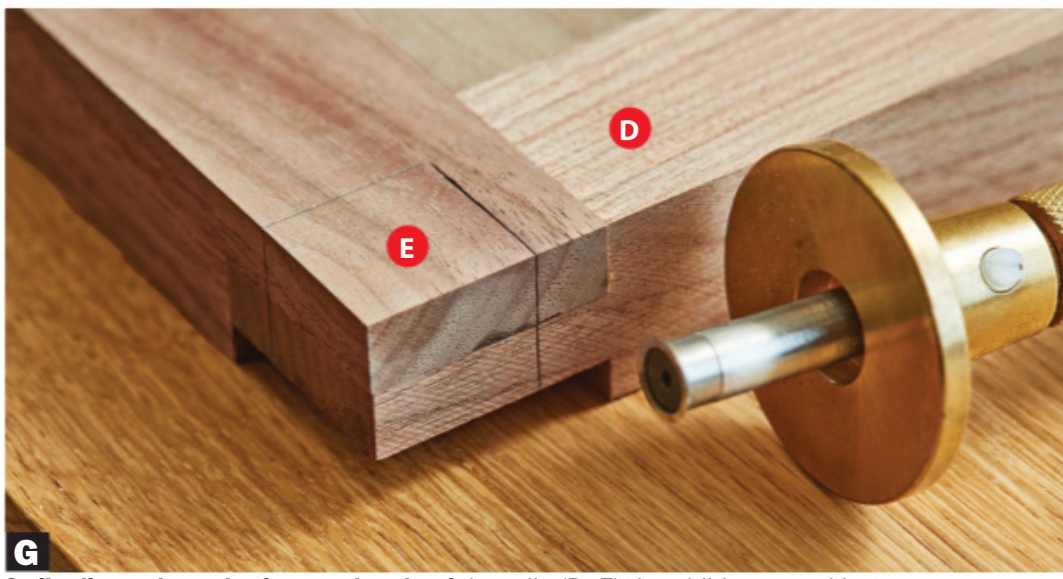


2a CENTER AND BOTTOM SHELF DETAIL





Set a marking gauge to match the remaining width of the leg.

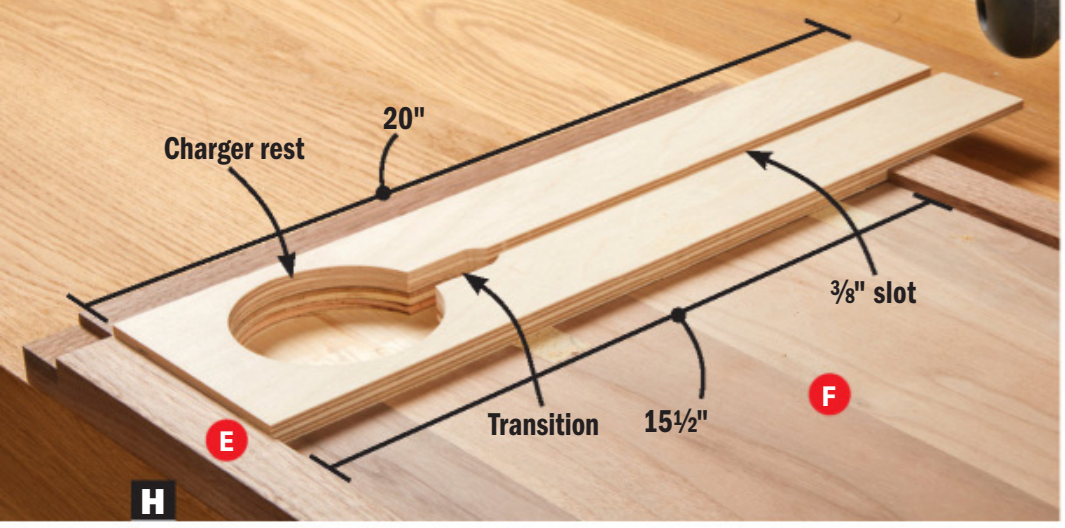


Strike lines along the face and ends of the rails (D, E). In addition to making precise marks, the gauge severs the fibers, reducing chip-out.

Attach an auxiliary fence to your miter gauge to prevent chip-out. Set the blade ¼" above the table, and rabbet the *bottom* face of each side rail (D).

Raise the blade to ⅜" above the table and rabbet the *top* face of each side rail (D).

Raise the blade to ⅝" and rabbet the bottom face of the front and back rails (E).



The bottom piece of plywood fits snug between the front and back rails. The top piece extends past the back rail. Make both pieces as wide as your router base.

Hide the charger

1 To rout the recess for the charger, make a template by laminating two pieces of ¼" plywood with the edges and one end flush [**Photo H**]. Set the template on the underside of the top (D/E/F). Place the charger [**Sources**] on the template in the desired location and trace around the charger. Jigsaw and sand the template opening to the line. To make a path for the cord, cut a ⅜"-wide slot from the charger opening along the length of the template. Shape a transition between the cord slot and charger opening wide enough to allow access to plug the power cord into the charger.

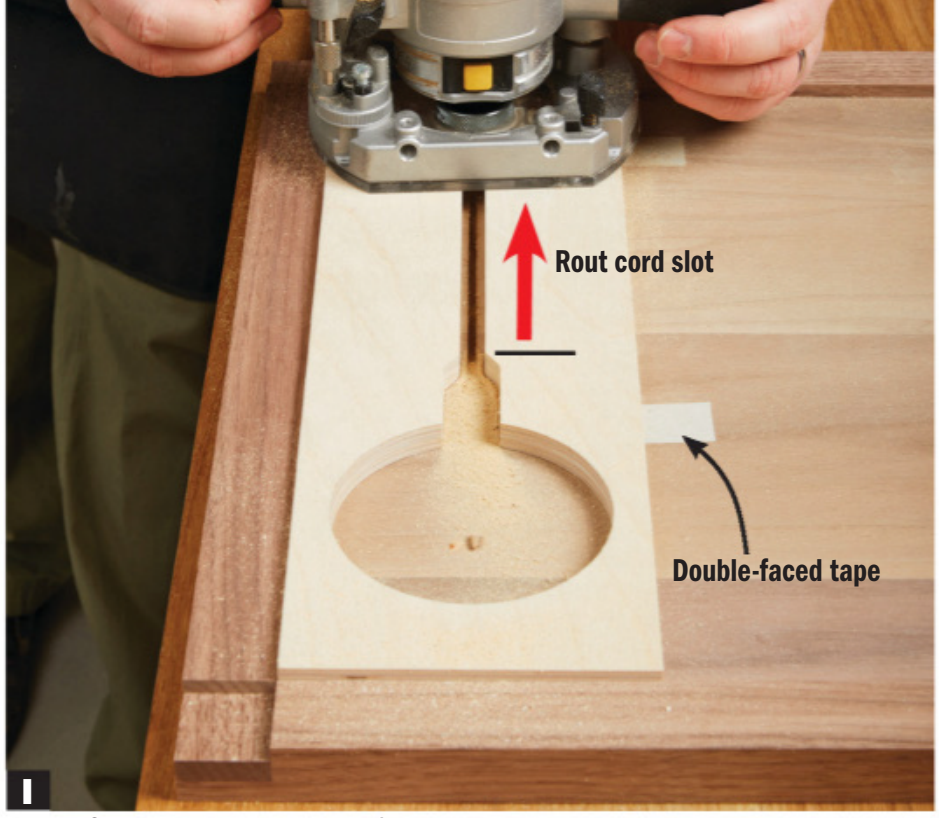
2 Secure the template to the underside of the top with double-faced tape, then rout the slot and recess [**Photos I, J**]. Chisel a slot in the back rail wide enough to allow the port (small) end of the cord to pass through.

Put things together

1 Glue the legs to the shelves [**Exploded View**]. Cut the side and back panels (G, H) to fit between the legs. Dry-fit the side and back panels, check the fit of the top, then glue the three panels in place [**Photo K**].

2 Rip the spacers (I) to size and glue them between the legs [**Exploded View**]. Glue the top (F) to the side and back panels (G, H).

3 Make a drilling guide [**Photo L**] to help bore holes into each leg. To do this, at the drill press, drill a ½" hole in a thick scrap, centered ⅝" from an end and edge. Tack on fences to register the jig. After drilling the holes in the legs, glue in lengths of walnut dowel. Cut and sand the dowels flush after the glue dries.

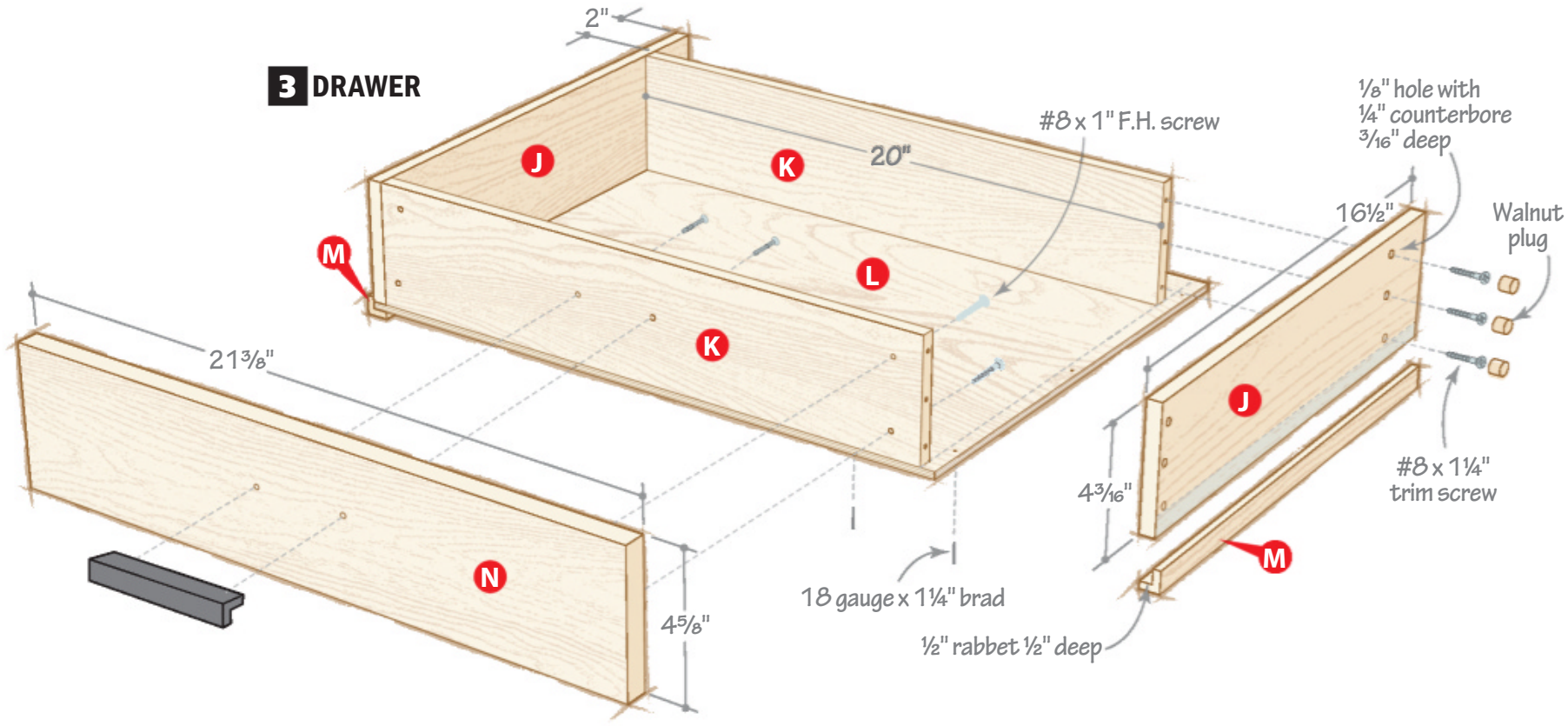


With a ⅜" guide bushing and a ⅛" straight bit, rout the channel for the cord. Rout slightly deeper than the cord thickness.

Remove the bushing and install a ¾" pattern bit. Rout the charger recess ⅝"-deep in the tabletop. Leave the template in place while you temporarily place the charger and test its fit and function. Rout deeper if necessary.

Glue and clamp the side and back panels to the legs and to the top shelf.

Clamp the drilling guide at each corner with the fences pressed against the table front and side. Drill with a brad-point bit for clean, straight holes.



Add the drawer

1 Cut drawer parts J–L to size [**Materials List**]. Glue the sides (J) to the front and back (K) [**Drawing 3**], then drill counterbored pilot holes, and drive trim screws. Glue and brad the bottom (L) to this assembly. Fill the counterbores with walnut plugs.

2 To make the runners (M) [**Drawing 3**], rabbet each edge of a 3"-wide blank, then rip a runner from each edge. Glue a runner to each side of the drawer.

3 Cut the false front (N) ⅛" narrower and shorter then the drawer opening. Slide the drawer into the table, and position the false front [**Photo M**]. Remove the drawer and secure the false front with the pull [**Sources**] and screws [**Drawing 3**].

4 Apply a finish. (We sprayed on a satin-finish lacquer.) Secure the charger and cord with hot-melt glue so they can be removed if needed.

Apply double-sided tape to the drawer front (K). Use 1/16"-thick spacers to position the false front (N) with an even reveal all around. Press the false front against the drawer, then pull out the assembly.

Cutting Diagram

This project requires 7½ board feet of 8/4 walnut, 2 board feet of 4/4 walnut, 1 square foot of ½" walnut, and 4 square feet of ½" maple.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Carcase						
A	legs	1¼"	1¼"	23¼"	W	4
B*	narrow feet	½"	1¼"	3"	W	4
C*	wide feet	½"	1¾"	3"	W	4
D	side rails	1"	1¼"	18"	W	6
E	front/back rails	1"	1¼"	24"	W	6
F	top/shelf panels	¾"	15½"	21½"	WP	3
G	side panels	¾"	4¾"	15½"	WP	2
H	back panel	¾"	4¾"	21½"	WP	1
I	spacers	½"	¾"	15½"	W	2
Drawers						
J	sides	½"	4³/16"	16½"	M	2
K	front/back	½"	4³/16"	20"	M	2
L	bottom	¼"	16½"	21"	BP	1
M	runners	¾"	¾"	16½"	W	2
N	false front	¾"	4⅝"	21⅜"	W	1

*Parts initially cut oversize. See the instructions.

Materials key: W-walnut, WP-walnut plywood, M-maple, BP-birch plywood.

Supplies: #8×1¼" trim screws, #8×1" flathead screws, #18×1¼" brads, ½×12" walnut dowel.

Blade and bits: Dado set; ¾" top-bearing pattern, ⅛", ¼" straight router bits; ⅜" guide bushing, ¼" plug cutter.

Sources: SurgeDisc wireless charger, no. SD180, $25, 5-volt, 2-amp power adapter with microplug, $7, woodmagazine.com/surgedisc; Hickory Hardware 96mm pull in Flat Onyx, no. 4883068, $5.79, menards.com.

Produced by **Craig Ruegsegger** with **John Olson**
Project design: **John Olson**
Illustrations: **Roxanne LeMoine, Lorna Johnson**

Get More Bang From Your Biscuit Joiner

Try these tips to make this handy tool even more valuable in your shop.

Improve joints and find new uses

1 Use a biscuit joiner to cut slots for Z-shape tabletop fasteners. You can do this before or after assembly in most cases. Limit the cutting depth to no more than two-thirds of the apron's thickness.

A

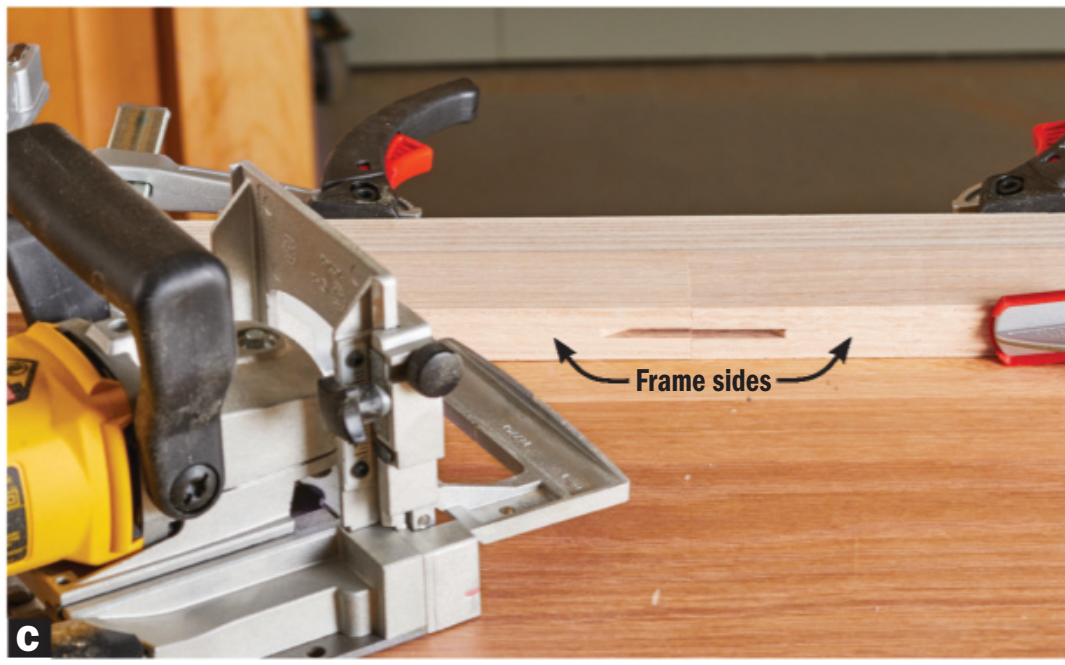

B

2 Biscuiting joints in narrow stock risks blowing the blade out the stock's edges, exposing the slot and biscuit. To avoid this, choose one of these methods of using half-biscuits where they won't be seen or can be covered with trim.

Reinforce miter [**Photo A**] and butt [**Photo B**] joints across the back with half-width biscuits (trimmed flush after the glue dries). You'll need to cut a slot narrow enough (most likely the 0 or 10 setting) to span across the joint without reaching the edges.

Or, create a joint with a half-length biscuit reinforcement. To do this on a frame, clamp opposing sides to the bench end to end, and cut a slot centered on the seam [**Photo C**]. Rotate the pieces and repeat for the other ends. Next, clamp the top and bottom rails side by side, and cut slots in the ends across the seam [**Photo D**]. Repeat for the other ends. Then, glue the frame together with a biscuit in each slot [**Photo E**]. Trim flush when dry.

▶Learn to make perfectly aligned biscuit joints. woodmagazine.com/biscuitbasics



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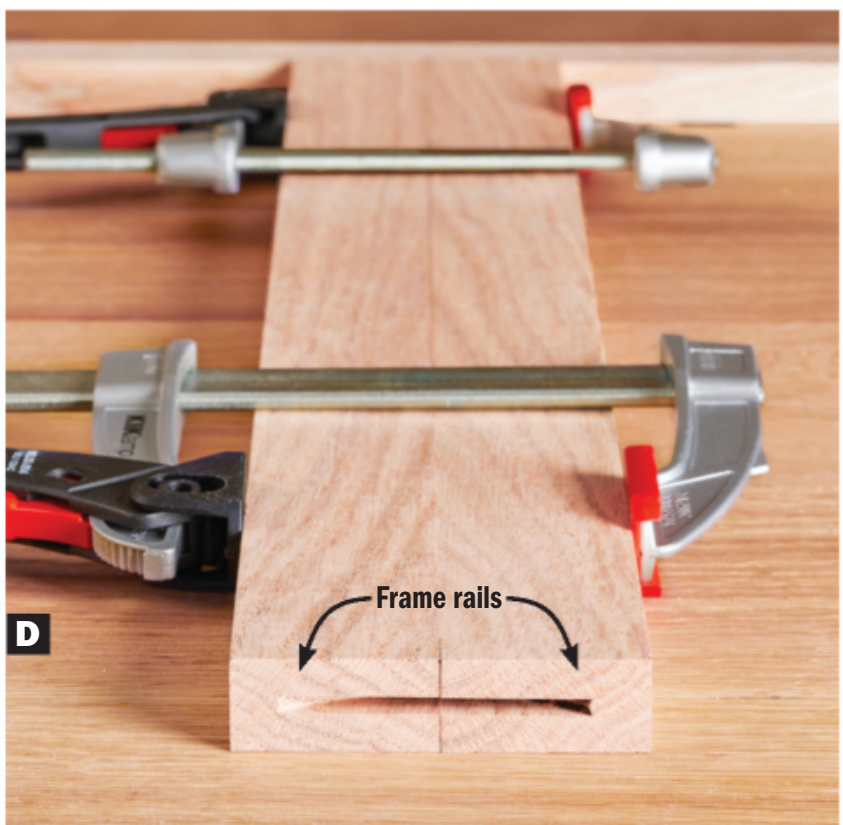

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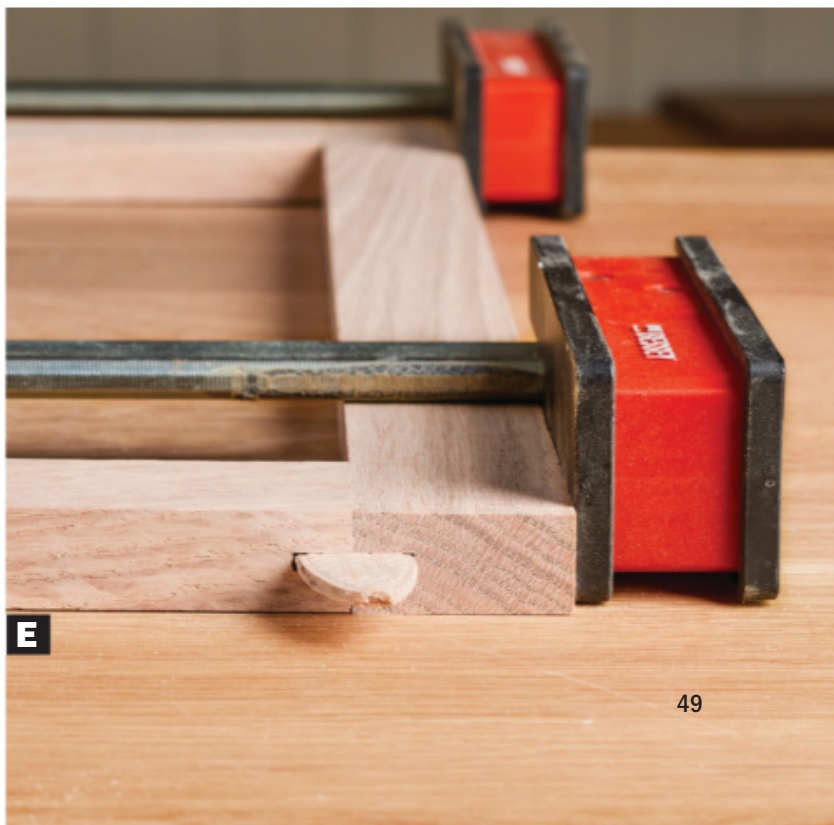

E


F


G

3 When planing panels glued up with biscuits, cut a reference slot on an end or edge that will be cut away later, at the same depth as the joinery slots [**Photo F**]. This shows the biscuits' location in the board's thickness, keeping the biscuits centered as you avoid planing too deep on one face. Or if you used two rows of biscuits, it prevents exposing them.

4 Create finger holds on cutting boards [**Photo G**], or finger pulls on the bottom edges of drawers and doors, by making stacked cuts of equal depth. Sand inside the cutout to remove blade marks.

5 When joining MDF or particleboard—products notorious for not joining well with screws—use biscuits for stronger glue joints.

▶Avoid common biscuit-joiner mistakes.
woodmagazine.com/biscuitgoofs

Help the tool perform better

▶Read reviews of biscuit joiners.
woodmagazine.com/review

6 Attach a shop vacuum to your tool's dust port [**Photo H**] for better dust collection than possible with just the included bag. Many biscuit joiner dust ports plug easily when using the dust bag.

7 Highlight broad alignment marks with a high-visibility marker. Or, add a fine black line to existing wide lines or notches that might not be easy to align in use [**Photo I**].

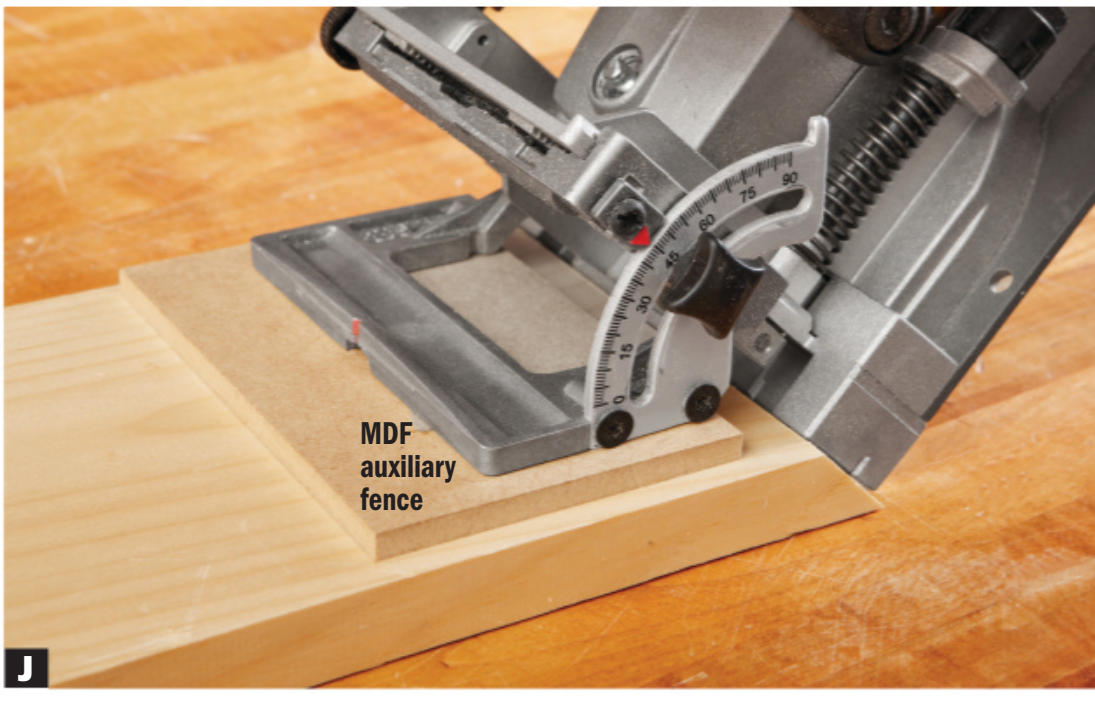
8 Sharpen the blade in your joiner, or upgrade to a new blade when plunging becomes difficult. Keep in mind that sharpening can potentially narrow the slot, making for a tighter fit. So don't count on more than a couple of sharpenings per blade.

Source: Freud FI102B biscuit-joiner blade, $20.56.
woodmagazine.com/biscuitblade

9 With many biscuit joiners, the narrow fence will not effectively support the tool, particularly when cutting angled slots. For more stability, attach a piece of thin plywood, MDF, or hardboard to the fence with double-faced tape [**Photo J**].


H

I



J

▶Lamello's Hermann Steiner invented the biscuit/plate joiner in Switzerland in 1955. Lamello continues to manufacture a line of premium biscuit joiners.

Think outside the (biscuit) box

In addition to standard wood biscuits, Lamello offers plastic and metal versions (*above*) for special purposes that work with slots cut by any biscuit joiner. We think these have a place in a home workshop.

10 For hard-to-clamp assemblies, K20 plastic biscuits have barbed faces that lock the biscuit into a joint. Used in conjunction with glued wood biscuits, unglued K20 biscuits "clamp" two workpieces together while the glue on the wood biscuits dries.

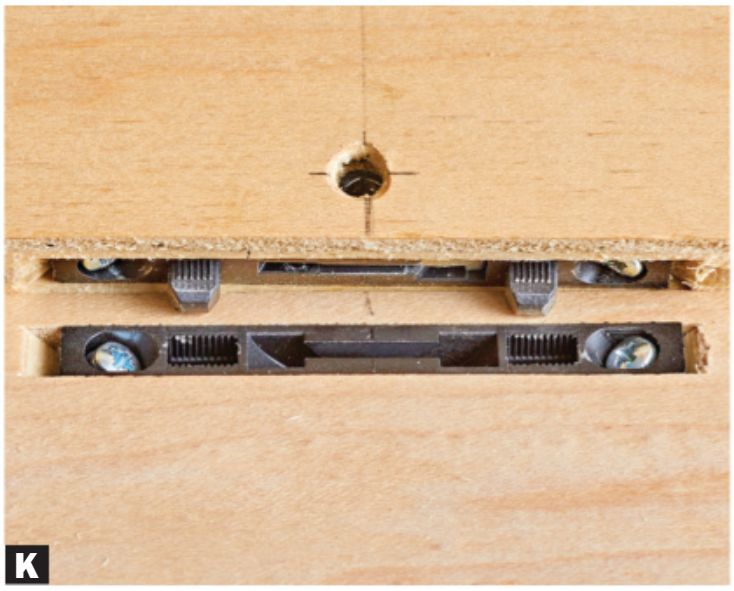
11 Plastic E20 half-biscuits work as self-clamping fasteners in slots cut across a joint, such as those shown in **Tip 2**. The splayed pattern of barbs draw components together without glue as they are tapped into place.

12 Simplex metal knockdown connectors work well in applications that require quick or frequent disassembly, such as adjustable shelves or access covers. Adhere one in each slot with polyurethane glue or two-part epoxy, making sure the opposing fastener is reversed. When you assemble the project, the fasteners hook together for a strong joint that's easily taken apart.

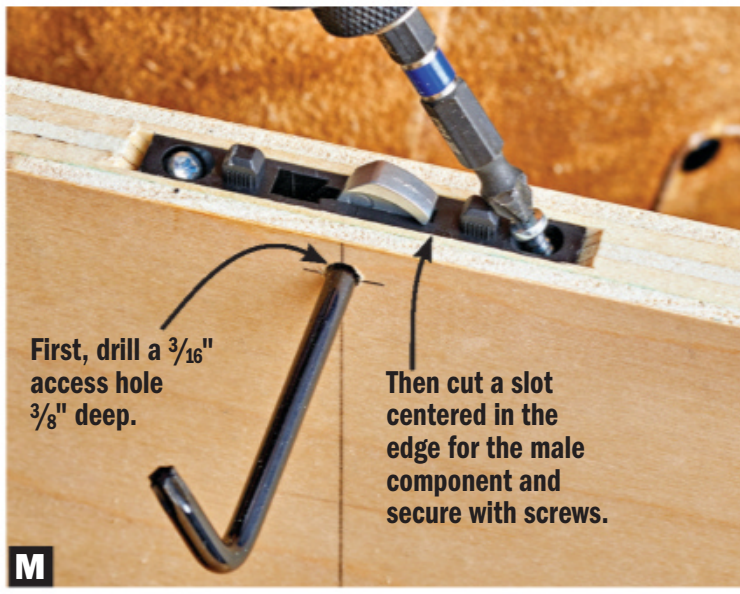
13 For knockdown joinery in more semi-permanent installations, use Clamex S cam-lock half-biscuits [**Photo K**]. These require a bit more setup than Simplex fasteners, and fit in double-thick slots that house mating fasteners [**Photos M–O**]. Create the slots by making two cuts with a standard blade, or buy an optional blade that cuts a ¼" slot [**Photo L**].

Source: Clamex S carbide reversing blades cutter, no. 132108, $185; 18 pairs Clamex S connectors with screws, no. 145231, $55; 781-585-4364, csaw.com.

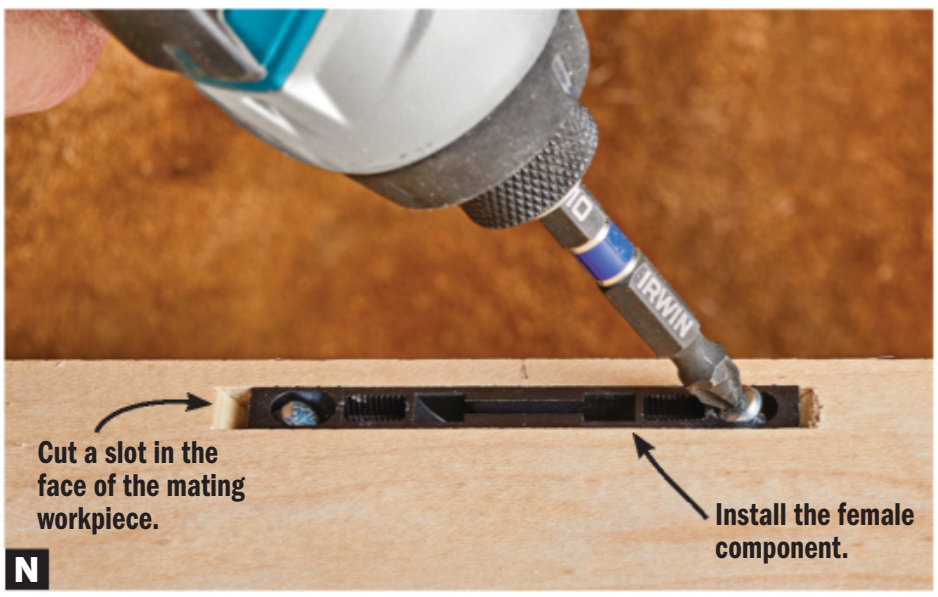
Produced by **Bob Hunter**


K

L



M



N

O

Simply stylish Garden Fence and Gate

Protect your flower bed or vegetable patch from pets, children, or careless adults without fully screening it from view. Modular design makes it easy to adapt the fence to any location.

Lay out your fence on paper before you start. Determine the overall length needed to enclose the area, and draw the fence sections and post locations to scale. Adjust the length of the fence sections to fit your space or add more gates/arbors. Shorter sections reduce gaps under the fence on a slope (see **Drawing 5**). Dimensions shown [**Materials List**] make fence sections 70" long with posts set 73½" on center.

DIMENSIONS:

Fence Section
70" W × 3½" D × 39" H

Arbor
55" W × 6½" D × 109½" H

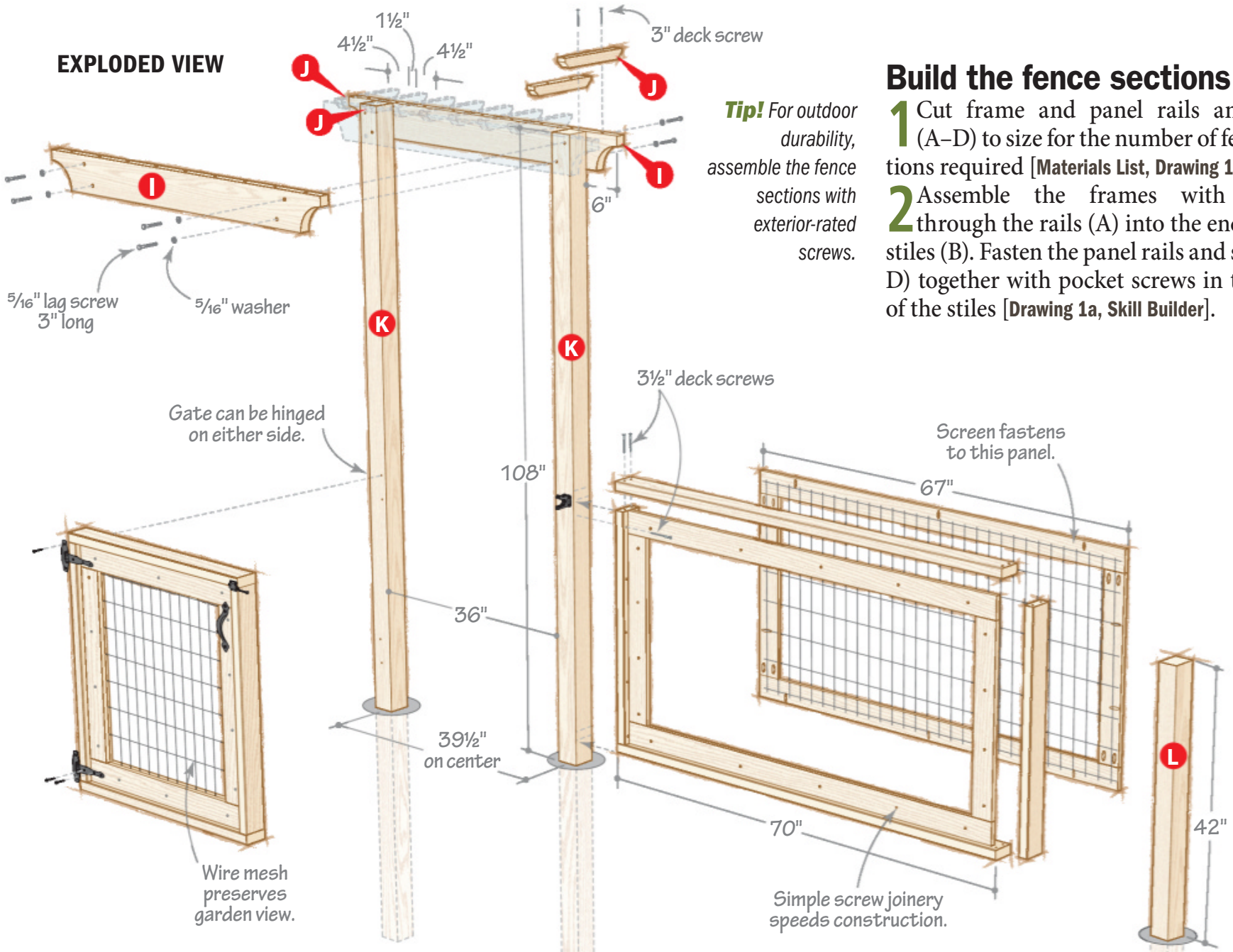
Approximate materials cost:

$175

for one fence section, gate, and arbor

Prebuild fence sections for fast installation

Note: *Check with local building authorities; your fence may require a building permit. Easements and setback requirements may affect placement.*



Tip! *For outdoor durability, assemble the fence sections with exterior-rated screws.*

Build the fence sections

1 Cut frame and panel rails and stiles (A–D) to size for the number of fence sections required [**Materials List, Drawing 1**].

2 Assemble the frames with screws through the rails (A) into the ends of the stiles (B). Fasten the panel rails and stiles (C, D) together with pocket screws in the ends of the stiles [**Drawing 1a, Skill Builder**].

SKILL BUILDER

Problem-solving pocket-hole joinery

Butt joints go together quickly and easily, but driving screws through one piece into the end grain of another creates a weak joint. And when building face frames, such as the panels for this fence, one or both parts may be too wide to join conveniently by driving screws through the edge.

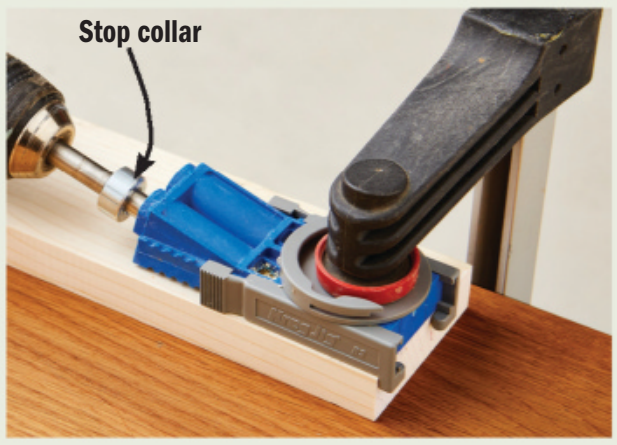
In such situations, pocket-hole screws create a strong joint that's easy to prepare and assemble. The key to successful pocket-hole joinery is a simple jig [*below left*, **Source**].

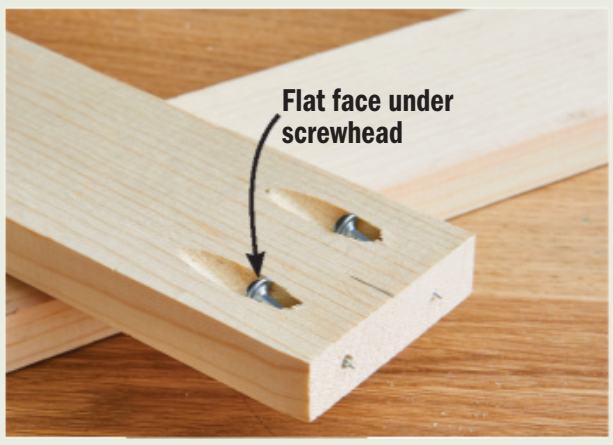
To make a joint, adjust the jig for the thickness of your material and clamp it to one joint part. Position the stop collar on the special stepped drill bit (which drills a pilot hole in a flat-bottomed counterbore [*above right*]), as specified in the jig instructions.

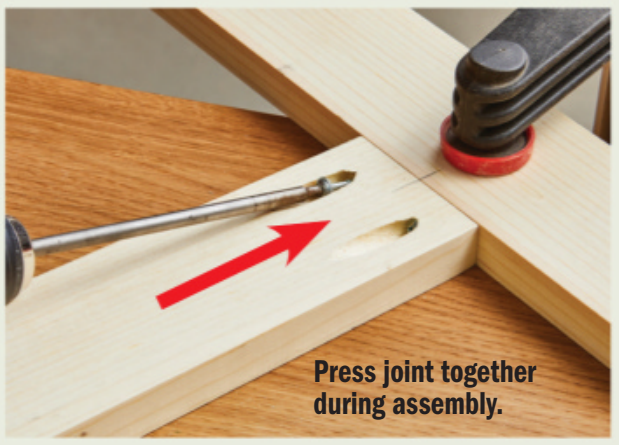
The jig geometry brings the screw point out at or near the middle of the board's thickness [*below*]. Assemble the joint with panhead or washer-head pocket-hole screws [*below right*]. The flat face on the screwhead bears against the flat counterbore to pull the joint parts together.

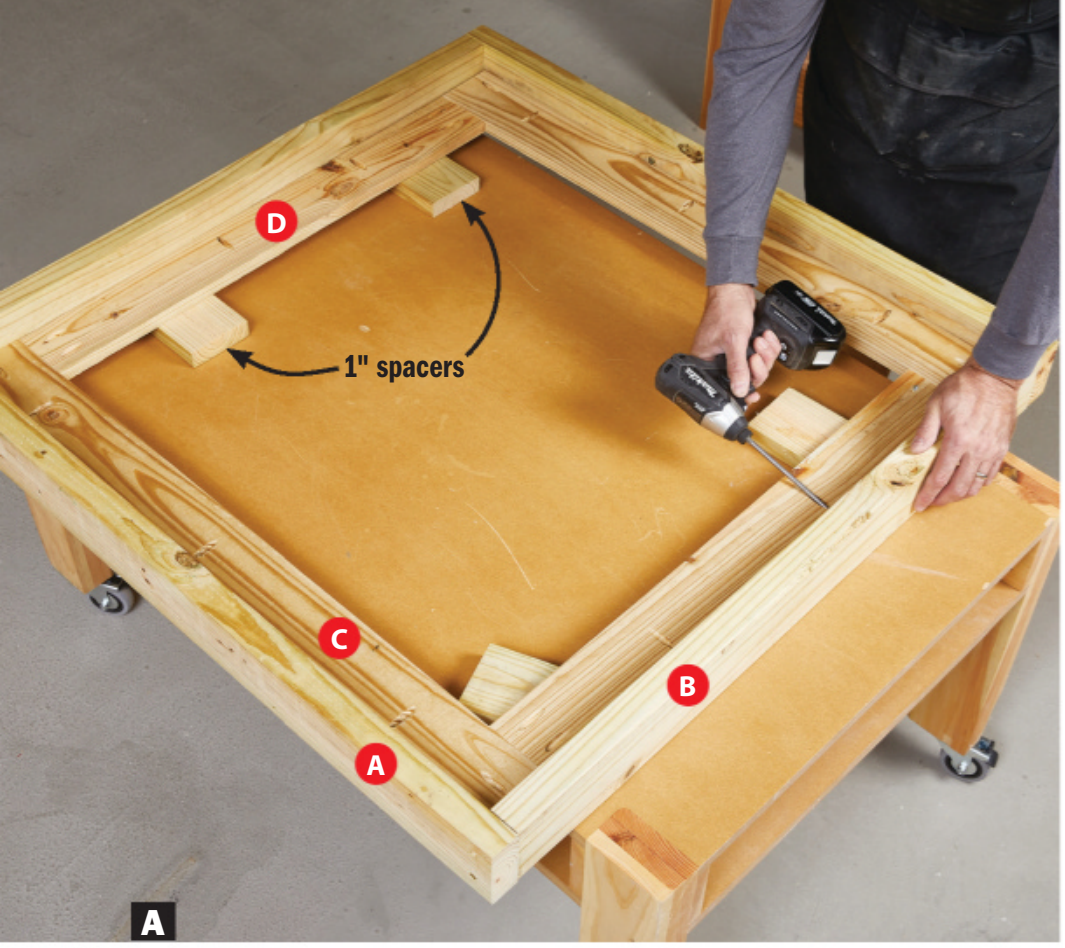
Screw length depends on material thickness; follow the jig instructions. Screws come in two pitches, fine threads for hardwoods and coarse threads for softwood, plywood, and MDF.

Source Kreg R3 Jr. Pocket Hole Jig System, $39, woodmagazine.com/kregr3

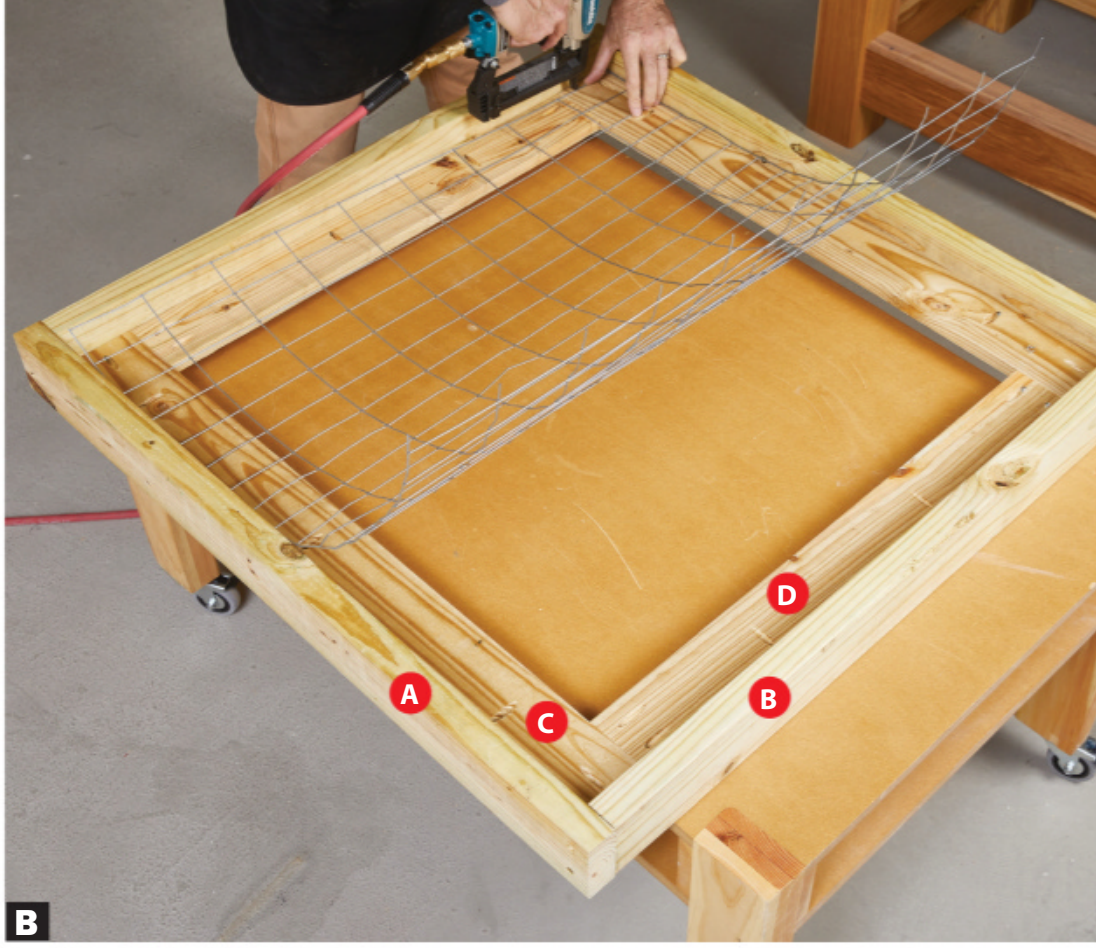








With the pocket-holed face up, attach the panel (C/D) to the frame (A/B) with pocket-hole screws. The panel strengthens the frame.



A pneumatic stapler eases installation of the wire mesh. Stretch the wire as tight as possible for a neat job, and keep the grid square to the opening.

Note: *The how-to photos show construction of a short fence section because its proportions provide better views.*

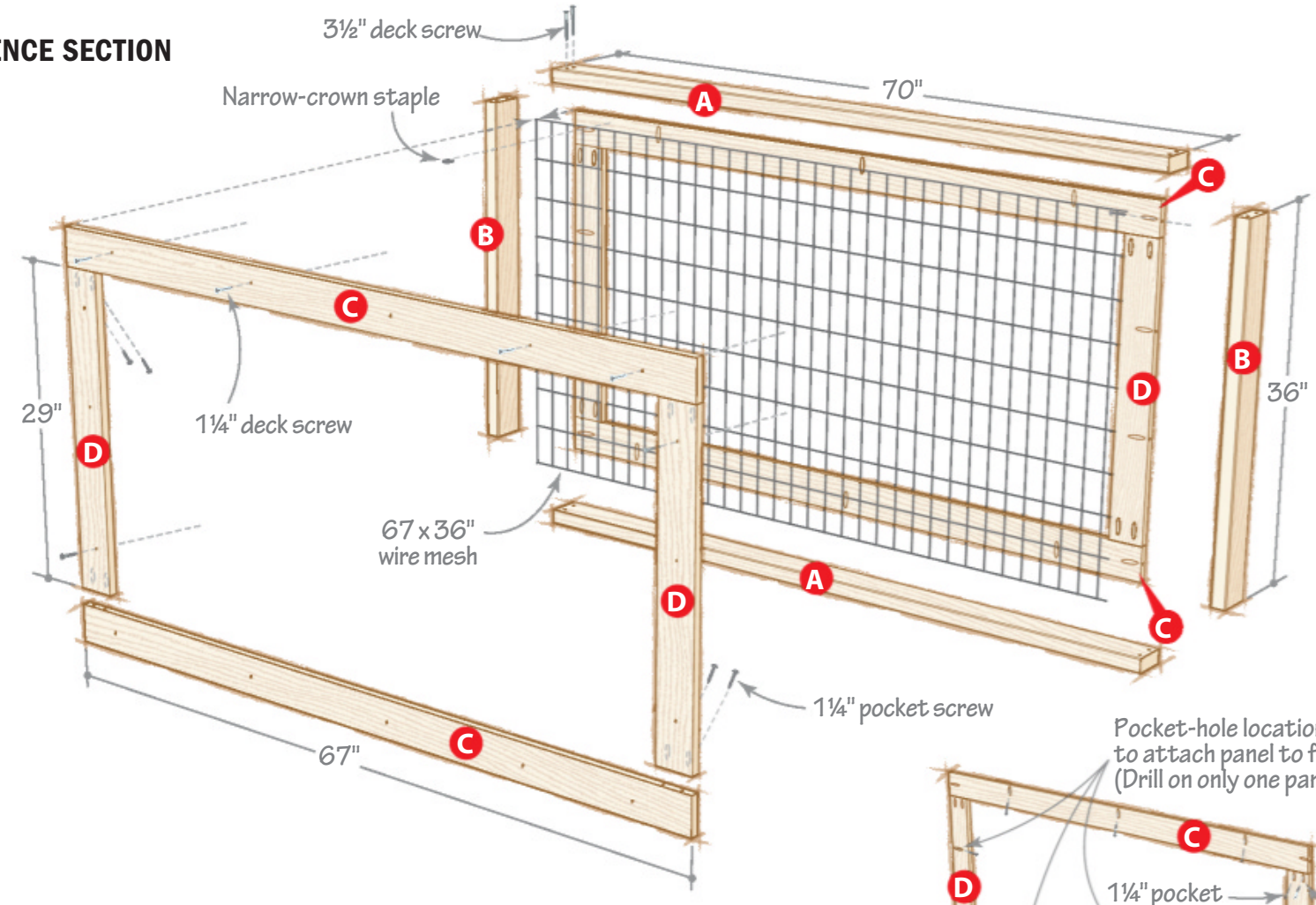
3 Lay one panel (C/D) for each fence section with the pocket holes facing up, and drill pocket holes in the stiles and rails to attach the panels to the frames (A/B) [**Drawing 1a**].

4 Lay a frame (A/B) on your workbench. Fit the panel (C/D) you just drilled inside the frame, raising it with 1"-thick spacers, and screw the panel to the frame [**Photo A**].

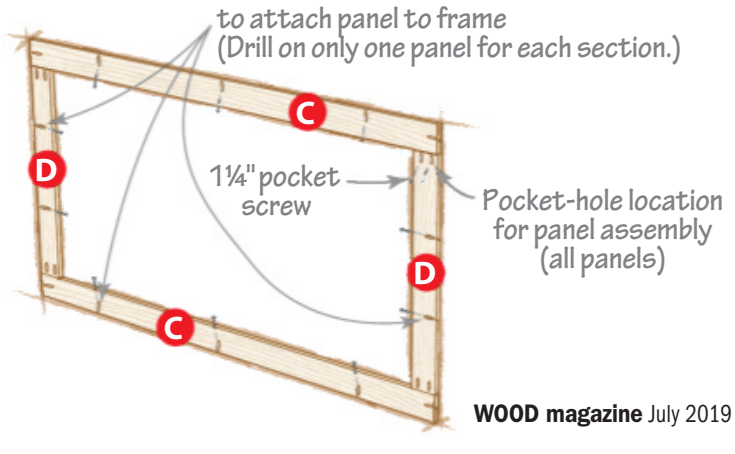
5 Staple wire mesh to the panel inside the frame [**Photo B**]. (We used ¼" narrow-crown staples.) Screw the other panel in place with the pocket holes facing in to com-

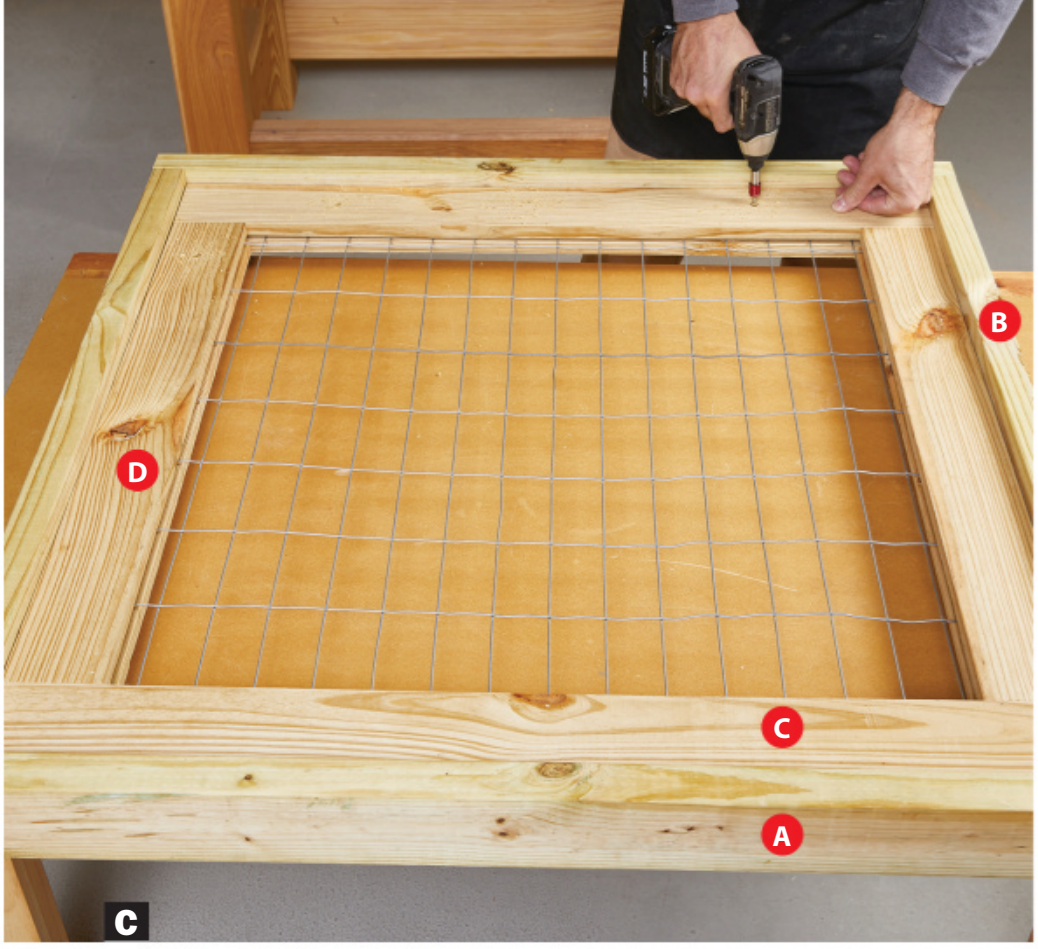
Note: *We installed wire mesh with 2×4" openings. Use any size that meets your needs.*

1 FENCE SECTION



1a POCKET-HOLE LOCATIONS (Inside face)





The outer panel (C/D) hides the staples and pocket-hole screws to provide attractive faces on both sides of the fence section.

plete the section [**Photo C**]. Following the same procedures, build the remaining sections for your fence and set them aside.

Swing over to the gate

1 Cut the gate parts (E–H) to size [**Drawing 2**]. Assemble the frame (E/F) and panels (G/H) the same way you built the fence sections.

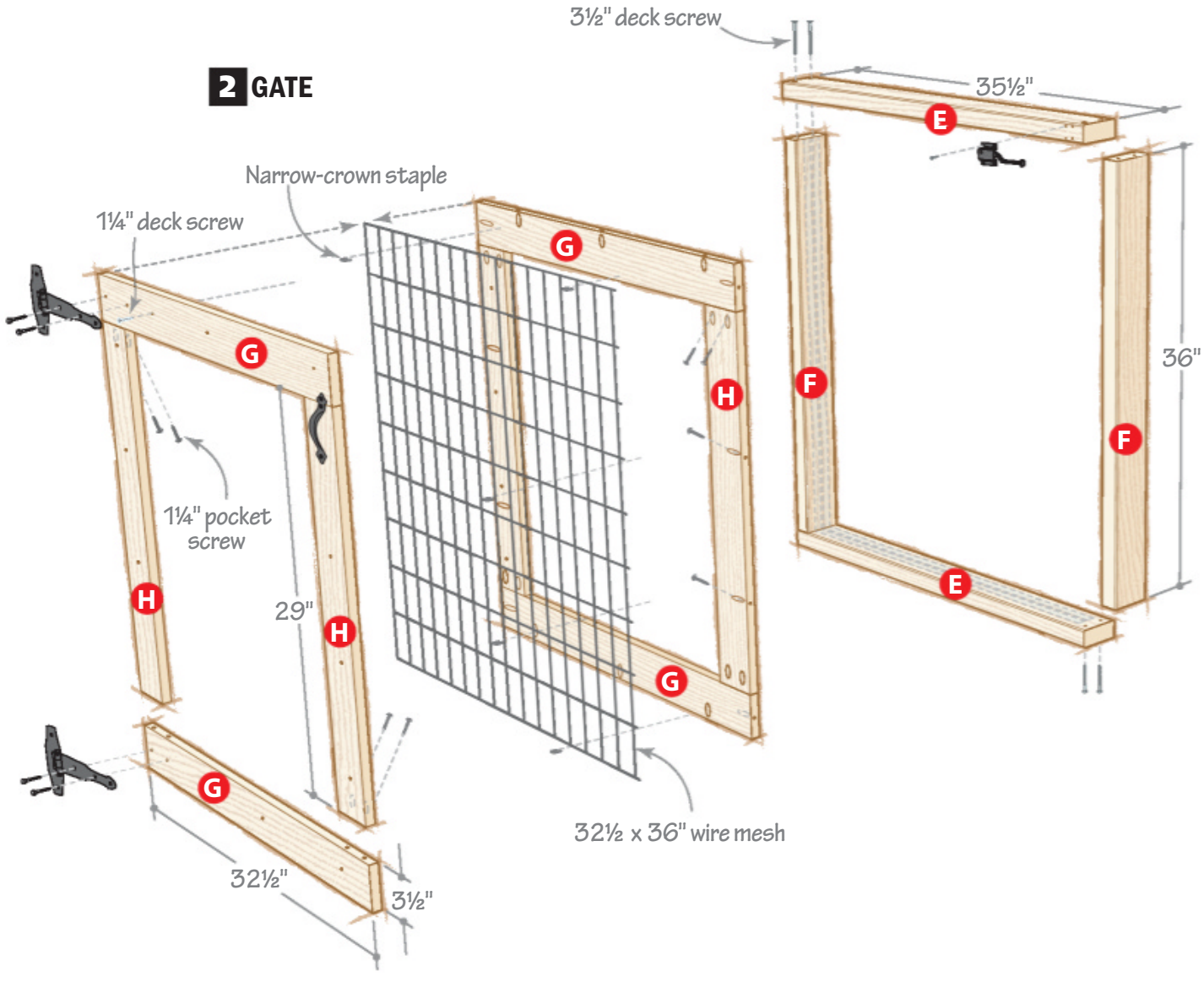
2 Attach the hinges and latch strike to the gate frame. Set the gate aside.

3 Cut the arbor crossbars and battens (I, J) to size and shape [**Drawing 3**]. Set the parts aside.

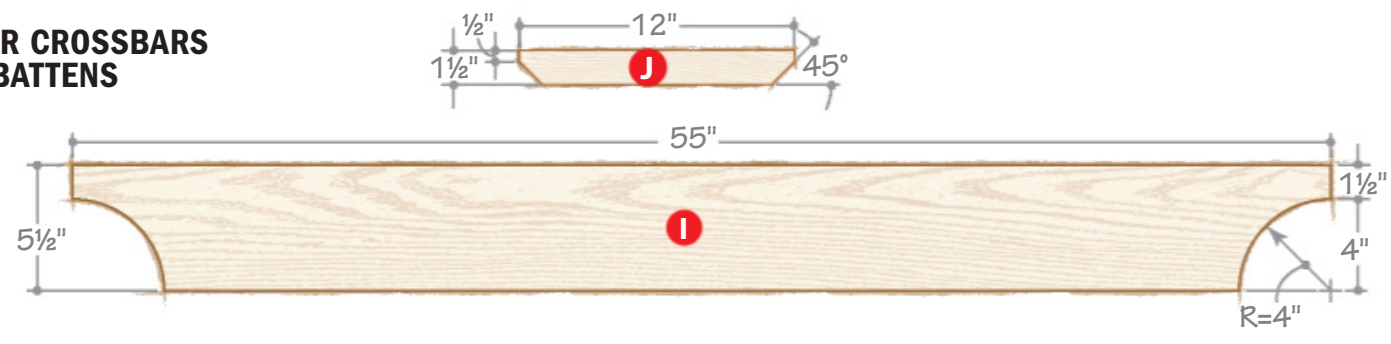
Putting a gate and arbor near a wall

Build a short section of fence to space a gate and arbor away from an adjoining wall. The short fence could attach to a post as shown or to the wall itself.

2 GATE



3 ARBOR CROSSBARS AND BATTENS



▶See how to lay out post locations and set posts. woodmagazine.com/postmaster

Put it in the ground

At least 48 hours before you dig any postholes, make a free call to 811 to have underground utilities marked where the fence will be installed. Also, ask your local building permit office how deep you must dig the postholes.

1 Cut the posts to size. The two arbor posts (K) should be 108" long plus the required length in the ground, at least 36" [**Drawing 4**]. Make line posts (L) 42" long plus the required length in the ground. On sloping ground, keep the posts plumb and the fence sections level by stairstepping the fence up or down the slope [**Drawing 5**].

2 Dig the first posthole (a corner or one end makes a good starting point). Set the post, plumb it, brace it, and pour in concrete. Allow the concrete to set.

3 Gauge the location of the next post with a fence section, and dig the hole. Attach a fence section to the first post and set the next post in its hole. Attach the post to the fence section, plumb and brace the second post, and pour in concrete.

4 Continue installing fence sections and setting posts to complete the run. Place the arbor posts (K) 36" apart to allow for gate hardware and swing [**Exploded View**]. Leave temporary bracing in place until the concrete sets.

A few details finish the fence

1 Attach the arbor crossbars (I) to the tops of the arbor posts (K) [**Exploded View**]. Screw the battens (J) to the tops of the crossbars, equalizing the overhang.

2 Install the gate hinges and attach the handle and latch. Close the gate and let your garden plants grow in safety.

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

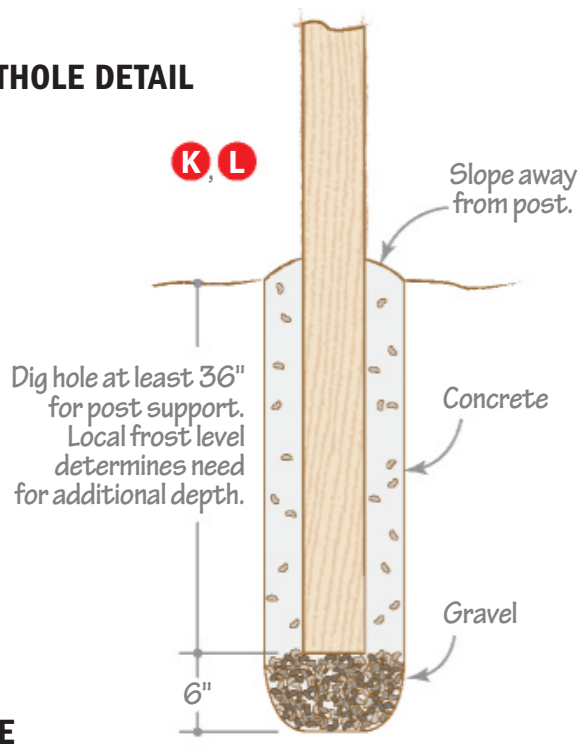
Dress up the post tops with decorative finials such as these, available at home centers. Drill a centered pilot hole into the top of the post for the finial screw.

Materials List

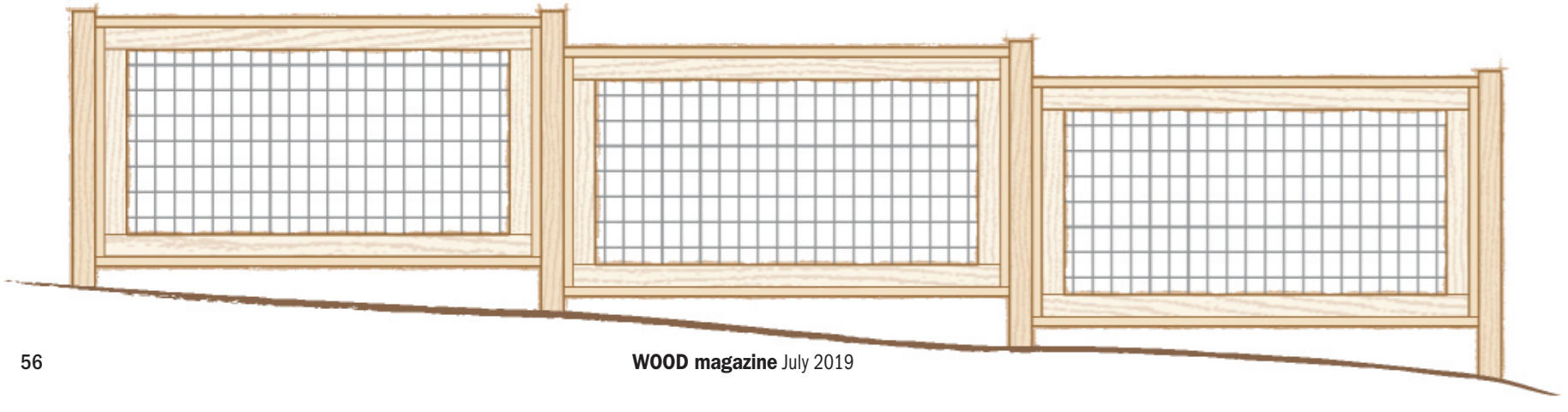
Part		FINISHED SIZE T	W	L	Matl.	Qty.
Fence section (quantities to make one section)						
A	frame rails	1½"	3½"	70"	P	2
B	frame stiles	1½"	3½"	36"	P	2
C	panel rails	¾"	3½"	67"	P	4
D	panel stiles	¾"	3½"	29"	P	4
Gate						
E	frame rails	1½"	3½"	35½"	P	2
F	frame stiles	1½"	3½"	36"	P	2
G	panel rails	¾"	3½"	32½"	P	4
H	panel stiles	¾"	3½"	29"	P	4
Arbor top						
I	crossbars	1½"	5½"	55"	P	2
J	battens	1½"	1½"	12"	P	9
Posts						
K	arbor posts	3½"	3½"	144"*	PC	2
L	line posts	3½"	3½"	78"*	PC	**

*Length depends on local requirements. See the instructions.
**Lay out fence run to determine number of posts. See the instructions.
Materials key: P-pressure-treated lumber, PC-pressure-treated lumber rated for ground contact.
Supplies: 1¼" pocket-hole screws, 3½", 3", and 1¼" deck screws, 5/16 × 3" lag screws, 5/16" washers, wire mesh, staples, gravel, concrete mix, gate hinges, gate latch, gate handle.

4 POSTHOLE DETAIL



5 BUILDING FENCE ON A SLOPE



SHOP TEST

Air-Filtration Systems

Scrub your shop air of the superfine dust left behind by a dust collector or shop vacuum. Then breathe a healthy sigh of relief.

▶Use an air-filtration system as a *supplement* to a dust collector and shop vacuum that collect debris directly from the machines and tools that create the mess. Do *not* rely on one of these units as your primary source of dust collection.

You can't help but create airborne dust when cutting or sanding wood. It's the pesky side of woodworking, the fly at the picnic. And that's where an air-filtration system comes to the rescue. This machine, typically suspended from the ceiling, draws dust-laden air into the front of the unit and through one or two filters, exhausting (hopefully) clean air out the back. To help you find one that works well, we tested nine models head-to-head. We also threw in a common shop hack: a $20 box fan with a $20 furnace filter. The results might surprise you.

Airflow starts the process

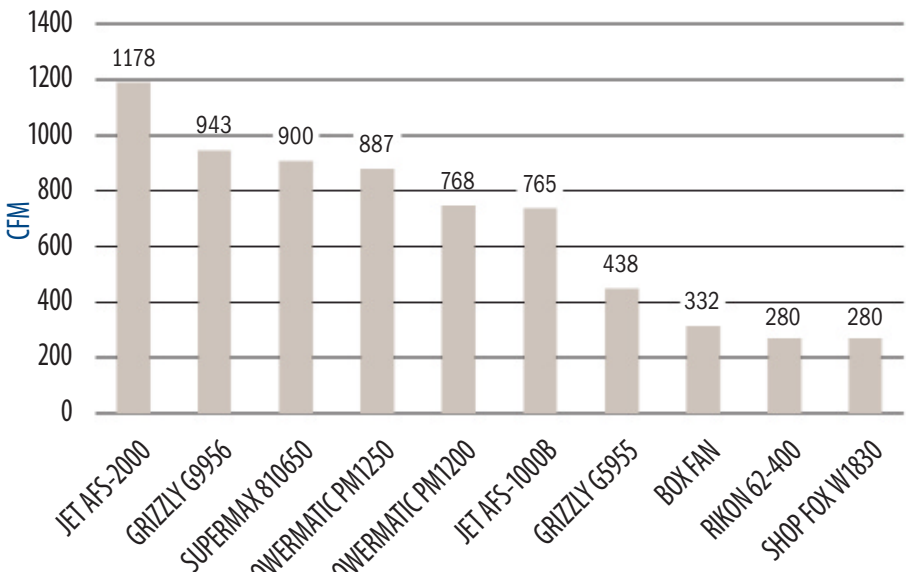
Before one of these machines can filter the air, it must first *suck in* the air. Lots of it. To measure airflow, we took readings at the intake filter in 12 spots using a digital vane anemometer, and then averaged the results. We measured each machine's airflow at all of its multiple speeds; the Grizzly G5955 has only one speed. We tested all models with brand-new filters, and then again after each dust-collecting trial, cleaning the filter each time with compressed air.

As you can see in the chart (*next page*), the two larger units, the Jet AFS-2000 and Grizzly G9956, created the highest airflow. (Generally, the larger the unit, the higher the airflow.) Naturally, all models moved the most air at their highest speed, and that's where we recommend you run most of these models, unless you find yours too noisy. None were loud enough to require hearing protection. And the Powermatic PM1250 was so quiet we almost didn't believe it.

With each unit, airflow dropped off as dust built up in the filters—especially the prefilter—but three (Shop Fox, Supermax

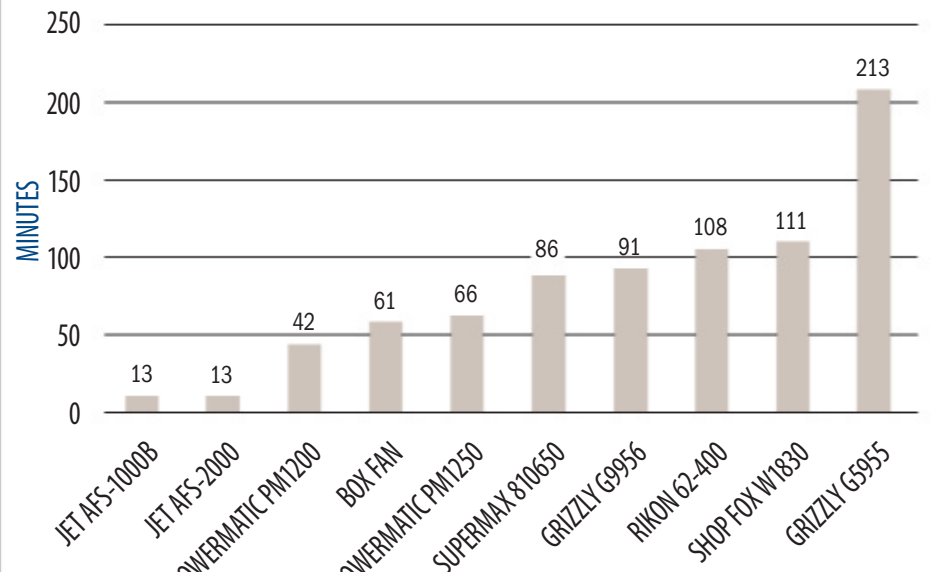
▶We tested these systems in an 850-cubic-foot shop space walled off with plastic floor to ceiling. Then we sanded MDF with a drum sander using 120-grit sandpaper, and no dust collection. When the air was saturated at 6 million dust particles per cubic foot, we ran each air cleaner until it cleaned the air to the "control" level.

Airflow gets the dusty air moving...



Airflow calculated in cubic feet per minute (cfm), measured at each machine's fastest speed, with seasoned filters.

...and filters trap the dust



Time required to clean the air to <10,000 particles per cubic foot (<.5 micron) at highest speed setting.

▶The air-handling industry recognizes air changes per hour (ACH) as a standard of how often a machine can move all the air in a fixed space. Manufacturers suggest you need 6–8 ACH for acceptable ventilation.

810650, and Powermatic PM1250) fell off less than 10 percent. The box fan dropped off the most, eventually stabilizing at 30 percent, followed by the Rikon (28 percent) and Powermatic PM1200 (23 percent).

To determine the ACH a machine will provide for your shop, multiply a machine's airflow (in cfm, from the chart *above*) by 60, and then divide by the cubic feet of the room (length × width × height). For example, in a 24×24' shop with a 9' ceiling (5,184 cubic feet), the Jet AFS-2000, pulling 1,178 cfm, will achieve 13 ACH. But, for this same shop, you'd need two units if using the Grizzly G5955, Rikon, Shop Fox, or box fan, to hit the minimum 6 ACH.

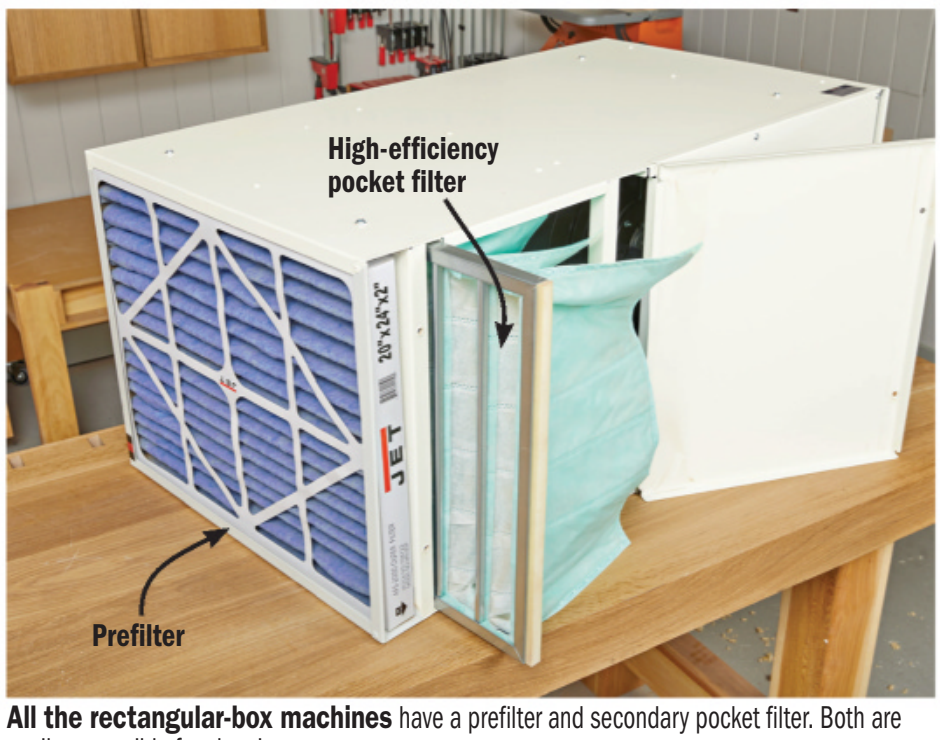
Filtration clears the air

All that airflow means nothing if the unit doesn't capture the particles in the air. The chart *above* shows how well each machine filtered dust in our trials. Both Jet units scrubbed the air in 13 minutes at high speed. Curiously, both Powermatic models cleaned the air about 60 percent faster at their slowest speeds. Powermatic's Tobias Bridges said he did not know why this would happen, adding that both machines typically clean the air faster at the faster speeds. The good news: Each machine was able to return the air to the control level. Obviously, the larger the shop space, the more time each machine will likely need to clean the air.

Eight of nine tested air-filtration systems have two sets of filters, as shown *below left*. The prefilter, made of spun nylon or pleated fabric, captures larger dust particles (5 microns or larger), and can be cleaned with compressed air or a shop vacuum. Most prefilters will eventually need to be replaced after cleaning no longer improves their performance. (The Powermatic PM1250, *below*, has a screen rather than a traditional prefilter.)

▶The smallest dust particles we can see without magnification measure about 10 microns. (Human hair typically measures about 40–60 microns in diameter.) Particles smaller than 10 microns can stay suspended in the air for 30 minutes or longer—ripe for you to breathe in.

▶Want to test the air quality in your shop? Get the particulate meter we used: Dylos DC1100 Pro, $260, woodmagazine.com/dylos



All the rectangular-box machines have a prefilter and secondary pocket filter. Both are easily accessible for cleaning.

Powermatic's PM1250 looks similar to a box fan, but has a high-efficiency spiral electrostatic filter behind a fine outer mesh screen that serves as a prefilter.

Don't be the filter—scrub the dust with an air-filtration system

MODEL	PERFORMANCE RATINGS (1)				FILTERS				FAN CONTROLS				NOISE LEVEL DECIBELS	
	PRIMARY		SECONDARY		PREFILTER		FINE FILTER							
	AIRFLOW	FILTRATION EFFECTIVENESS	EASE OF CLEANING/CHANGING FILTERS	EASE OF USING CONTROLS	SURFACE AREA, SQ. INCHES	RATING, MICRONS	SURFACE AREA, SQ. INCHES	RATING, MICRONS	NUMBER OF SPEEDS	TYPE OF REMOTE CONTROL (2)	OFF-TIMER SETTINGS, HOURS	OVERALL DIMENSIONS, INCHES (H x W x L)	HIGH SPEED	LOW SPEED
GRIZZLY G5955	C+	D	A-	B	220	5	1,944	1	1	N/A	N/A	12 × 24 × 30	71	N/A
GRIZZLY G9956	A	C+	A-	A	472	5	2,205	1	5	RF	2,4,6,8	16½ × 20 × 30½	75	71
JET AFS-1000B	B	A	A-	A-	523	5	1,575	1	3	IR	2,4,8	12 × 24 × 30	78	65
JET AFS-2000	A	A	A-	A-	1,553	5	3,964	1	3	IR	2,4,8	20 × 24 × 44½	76	70
POWERMATIC PM1200	B	A-	A-	A	523	5	1,650	1	3	RF	1–9	13 × 25 × 35	71	79
POWERMATIC PM1250	B+	B+	A	A-	N/A	N/A	10,610	0.1	3	RF	1,2,4,8	27 × 25⅝ × 15	59	50
RIKON 62-400	C-	C-	A-	A-	407	5	534	1	3	IR	1,2,4	10¼ × 17 × 20½	65	62
SHOP FOX W1830	C-	C	A-	A-	276	5	488	1	3	IR	1,2,4	10 × 17 × 20	69	68
SUPERMAX 810650	B+	C+	A-	A-	220	5	1,854	1	3	IR	0.5,1,2,4	27½ × 24½ × 12	79	72
20" BOX FAN W/FURNACE FILTER	C+	B	B	B	883	1-3	N/A	N/A	3	N/A	N/A	21¾ × 4¼ × 20½	60	70

1. A Excellent
   B Good
   C Fair
   D Poor
2. (IR) Infrared
   (RF) Radio frequency
3. (A) Airflow gauge/filter monitor
   (B) Cleaning brush
   (C) Hanging chains
   (D) Charcoal diffusion filter
   (E) Hanging eyebolts
   (H) Carry handles
   (M) Wall/ceiling mounting brackets
   (P) Rubber foot pads
   (R) Remote control
   (S) Hanging screws
   (W) Washable electrostatic outer filter
4. (C) China
   (T) Taiwan
5. Prices current at time of article production and do not include shipping, where applicable.
   (*) Price includes filter; prices may vary by location

▶When cleaning a filter with a vacuum, make sure its filter traps the fine dust you remove, rather than simply returning it to the shop air. If your vacuum can't pull this off—or when using compressed air—clean the filter outside where dust can vent into open air.

The inner high-efficiency filter consists of large "pockets" of dense fabric to trap particles that get past the prefilter. You also can clean these with compressed air; read the owner's manual before cleaning. Because replacements for these filters cost 4–5 times more than the prefilters, be sure to keep the prefilter clean or replace it often to preserve the inner filter.

As dust particles build up on the filters, airflow drops off, but filtration improves. So you'll have to find a good balance between adequate airflow and filtration. We suggest erring on the side of caution and cleaning the prefilter about every 7–10 days of working in the shop.

Details add convenience

Remote control. With a couple of exceptions, you can turn the unit on or off, control the fan speed, and even set a timer that turns it off automatically via a panel on the unit, or by remote control. (Grizzly doesn't provide a remote control for the G5955, although you can buy a radio-frequency [RF] model as an accessory. The Grizzly G9956 provides the functions on its remote control only.) We prefer the RF remotes on the G9956 and both Powermatic units, which control the system from anywhere in the room, to the others' infrared (IR) remotes that require line of sight to the control panel.

ACCESSORIES (3)		CORD LENGTH, FEET	WARRANTY, YEARS	COUNTRY OF ASSEMBLY (4)	SELLING PRICE (5)	CONTACT INFORMATION
STANDARD	OPTIONAL					
M	R	6	1	T	$225	800-523-4777, grizzly.com
E,H,R	NONE	6	1	T	$355	
E,H,R	W	6	5	T	$400	800-274-6848, jettools.com
E,P,R	W	6	5	T	$700	
A,E,H,P,R	D,W	6	5	T	$500	800-274-6848, powermatic.com
B,H,M,P,R	NONE	6	5	C	$700	
C,E,H,P,R,S	NONE	6	5	C	$230	877-884-5167, rikontools.com
E,H,R	NONE	6	2	C	$244	800-840-8420, shopfox.biz
A,E,H,P,R,W	NONE	8	2	T	$389	800-234-1976, supermaxtools.com; lagunatools.com
NONE	NONE	6	1	N/A	$40*	N/A

Filter upgrades can save an air cleaner

Curious to see if an upgraded filter would improve performance on these air cleaners, we tested two units with aftermarket prefilters (MERV 7) and high-efficiency pocket filters (MERV 15) from American Fabric Filter (877-742-3653, americanfabricfilter.com). The Jet AFS-1000B actually performed better with its original filters, requiring nearly twice as much time to clean the air with the AFF filters. However, the Grizzly G5955 improved vastly from 213 minutes using its original filters to just 33 minutes with the AFF filters. Our advice: If your air cleaner's performance falls below expectation, consider upgrading to these aftermarket filters. The aftermarket prefilters costs $3 each, and the high-efficiency pocket filters cost $35 apiece.

▶Furnace filters are rated in terms of a Minimum Efficiency Reporting Value (MERV) number. The higher the number (from 1 to 16), the better its filtration effectiveness. Woodworking machinery filters might not always specify a MERV rating, but will typically rate the finest size of particle, in microns, they can effectively trap.

■ **Airflow indicator.** The Supermax has a gauge that indicates when the filters become too clogged to clean the air effectively. The Powermatic PM1200's indicator light warns you of the same thing. No other units have this feature.

Produced by **Bob Hunter** with **Tom Brumback**

Let's clear the air

Our Top Tool recommendations come in two sizes. First, the Jet AFS-2000 proved best overall with the top airflow, fast filtration, and the largest filters (fewer cleanings). But its large size could make it unrealistic in some shops, particularly those with a low ceiling. So we also grant Top Tool status to the Jet AFS-1000B as best among the midsize units.

Our Top Value: the box fan. With no frills, and equipped with a MERV 12 filter, this fan outperformed or equaled several of the dedicated air cleaners, and at a significantly lower price (about $40 with a filter). Don't skimp on the filter! Get one rated at MERV 10 at a minimum. A filter rated higher than MERV 12 will increase dust pickup, but likely lessen airflow.

2019 WOOD Magazine TOP TOOL Air-Filtration System

2019 WOOD Magazine TOP TOOL Air-Filtration System

2019 WOOD Magazine TOP VALUE Air-Filtration System

Build Your Best Crosscut Sled EVER!

By William Ng

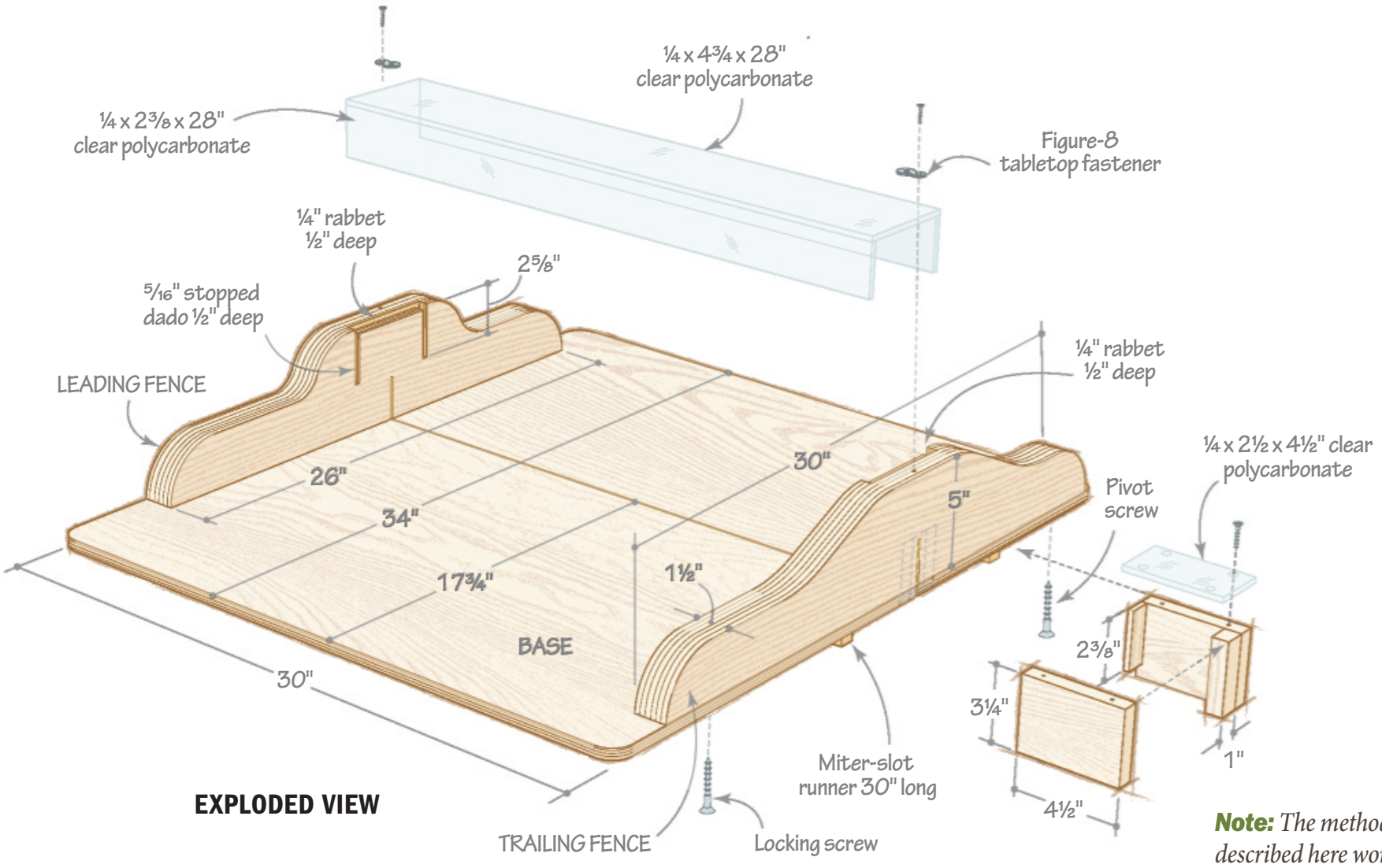
Simple tips ensure pinpoint precision from a shop's most important jig.

In my shop, virtually every piece of wood gets cut at some point using a crosscut sled. I rely on it for dead-on square cuts in large panels and small workpieces alike. So imagine my frustration from the guesswork and poor results that came with using typical tools and methods for squaring the sled's fence to the saw blade. Now I've developed new methods for building a sled, ones that ensure perfect cuts after the fence's first adjustment.

Choose the right materials

Like your furniture, cabinetry, and other projects, a good sled starts with proper material selection. For the miter-slot runners choose a hard, durable, kiln-dried wood, such as hard maple. The board should be slightly thicker than ¾" because of the way you cut the runners from it (more on that in the next section). Give the wood a couple weeks to equalize to the moisture content of your shop's air before working with it.

Choose ½" Baltic birch plywood for the base, and laminate the same material to make the fences. It's flatter and more stable than other plywoods or solid woods because of its many void-free plies.



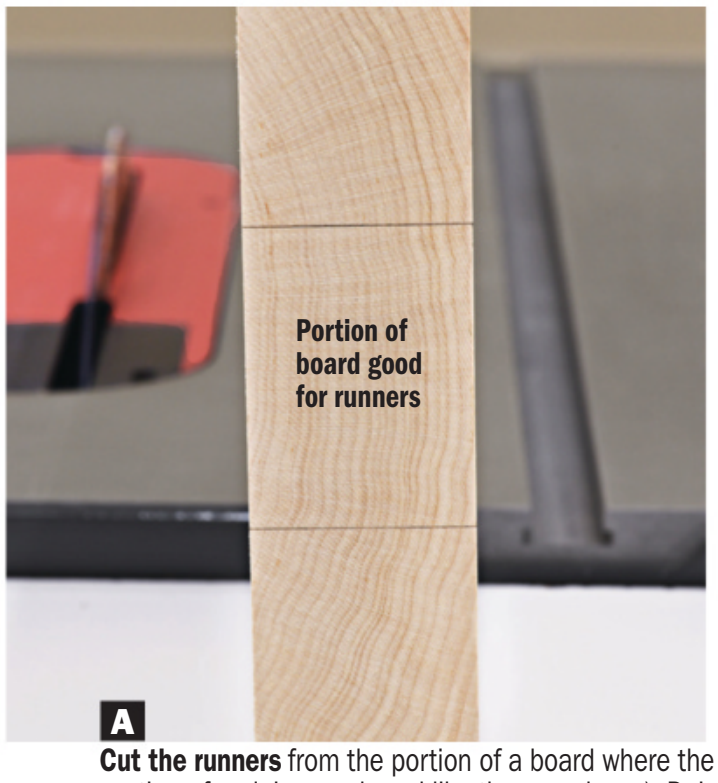
EXPLODED VIEW

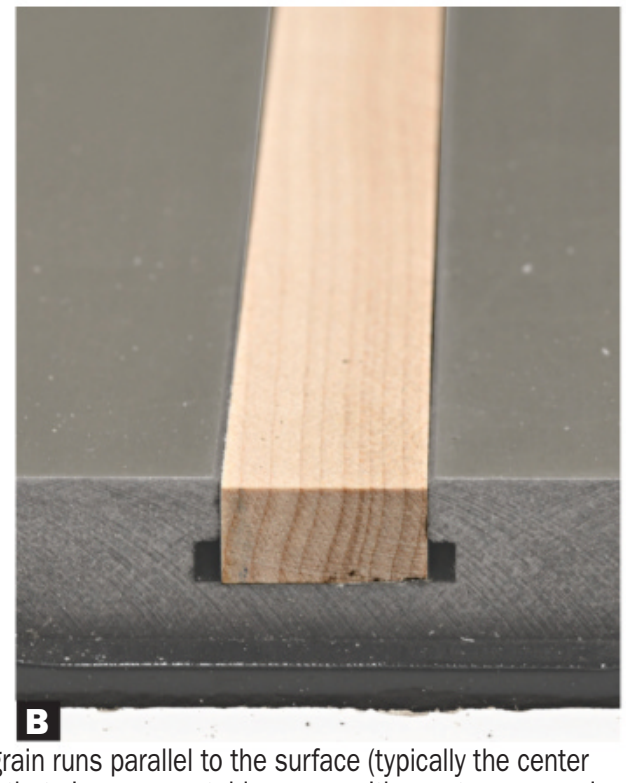
Properly make the parts

The runners need to be stable, with minimal contraction or expansion across their width, to maintain a good fit in the miter-gauge slots. For maximum stability, cut runners with end-grain growth rings running perpendicular to the face. To do that, cut the runners from the portion of a board shown in **Photo A**, yielding a runner like the one in **Photo B**. Make the runners as long as the depth of your tablesaw and the length of your sled: 30" for my Sawstop machine [**Exploded View**].

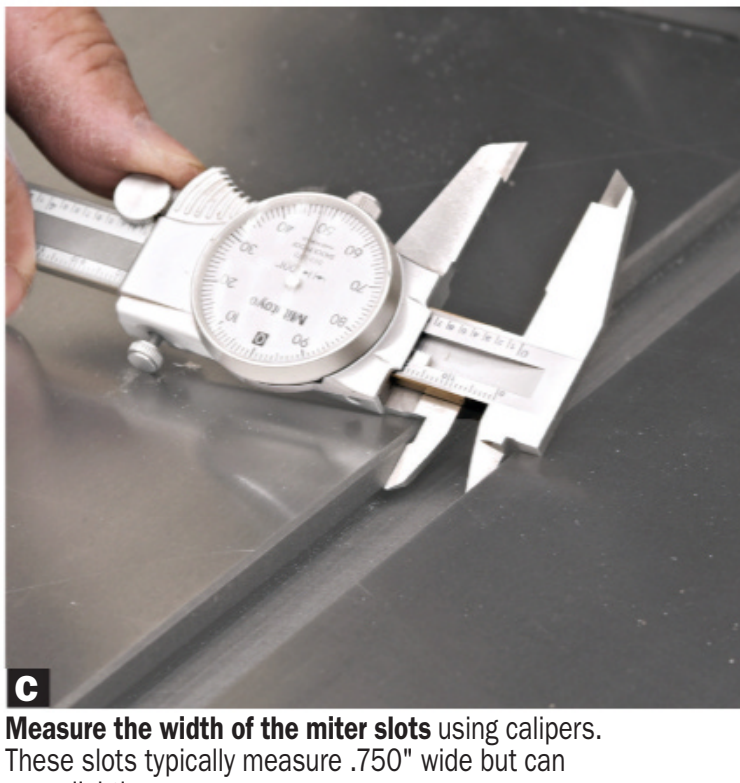
To cut the runners, first measure the depth of your saw's miter slots and rip the runner stock 1/16" narrower than the depth of the slots. Then, measure the slot width with calipers [**Photo C**]. Cut the runner stock just a hair wider than the slot width. Measure the runner width with a calipers. From that dimension subtract the miter-slot width to determine your fence adjustment for the next cut. For example, if the runner stock measures .762" wide, and the slot measures

Note: *The methods described here work for any typical tablesaw crosscut sled. You don't have to build one just like mine—yours can be bigger or smaller to suit your saw or work requirements, and its fences can be shaped entirely differently. But you do need to follow the setup procedures described here to make your sled a precision cutting accessory.*





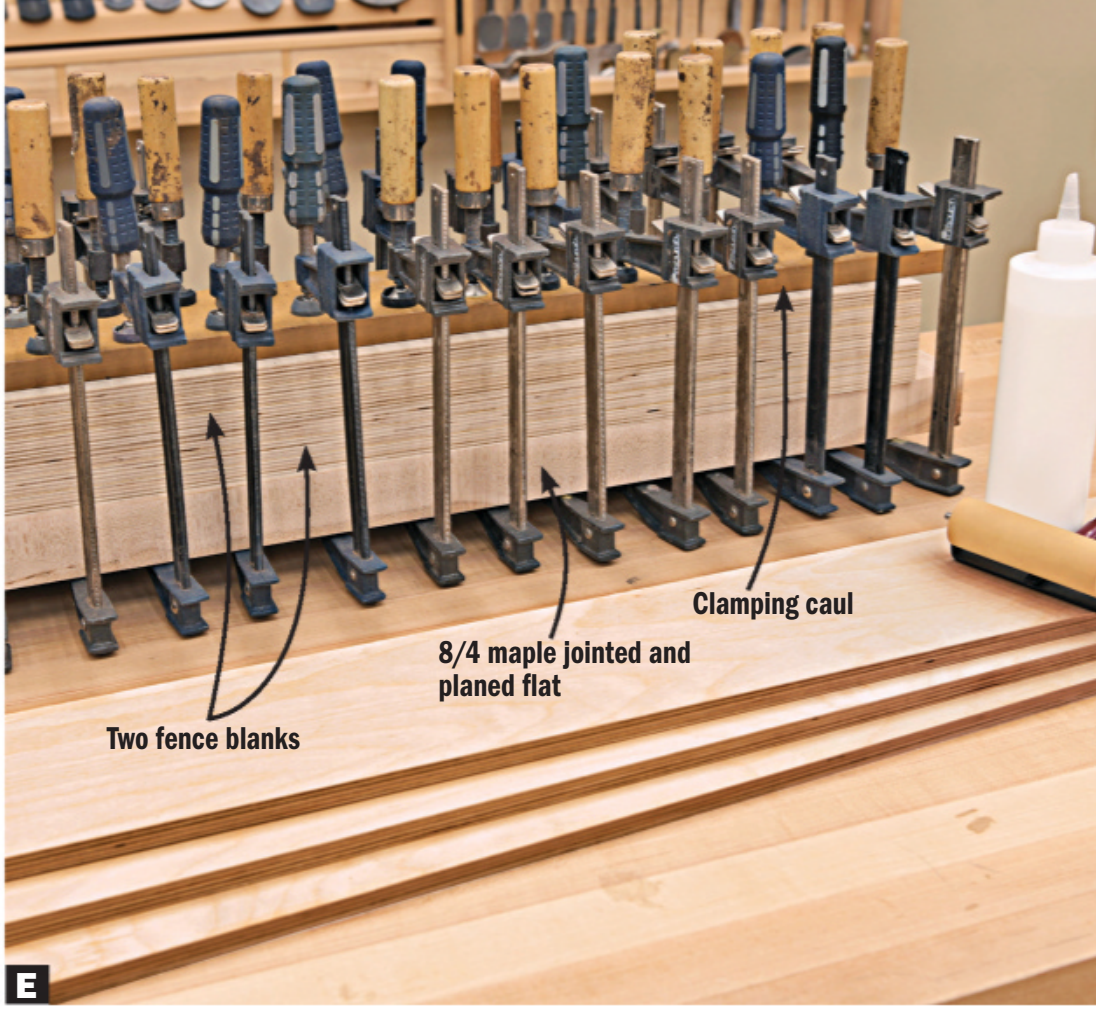
Cut the runners from the portion of a board where the grain runs parallel to the surface (typically the center portion of a plainsawn board like the one shown). Doing that gives you a stable runner with quartersawn grain.



Measure the width of the miter slots using calipers. These slots typically measure .750" wide but can vary slightly.

D

Adjust the fence for the runner's second ripcut using calipers positioned between the fence and a stop (in this case, a magnetic featherboard). Zero the calipers, then nudge over the fence until the dial shows the difference between the runner and slot.

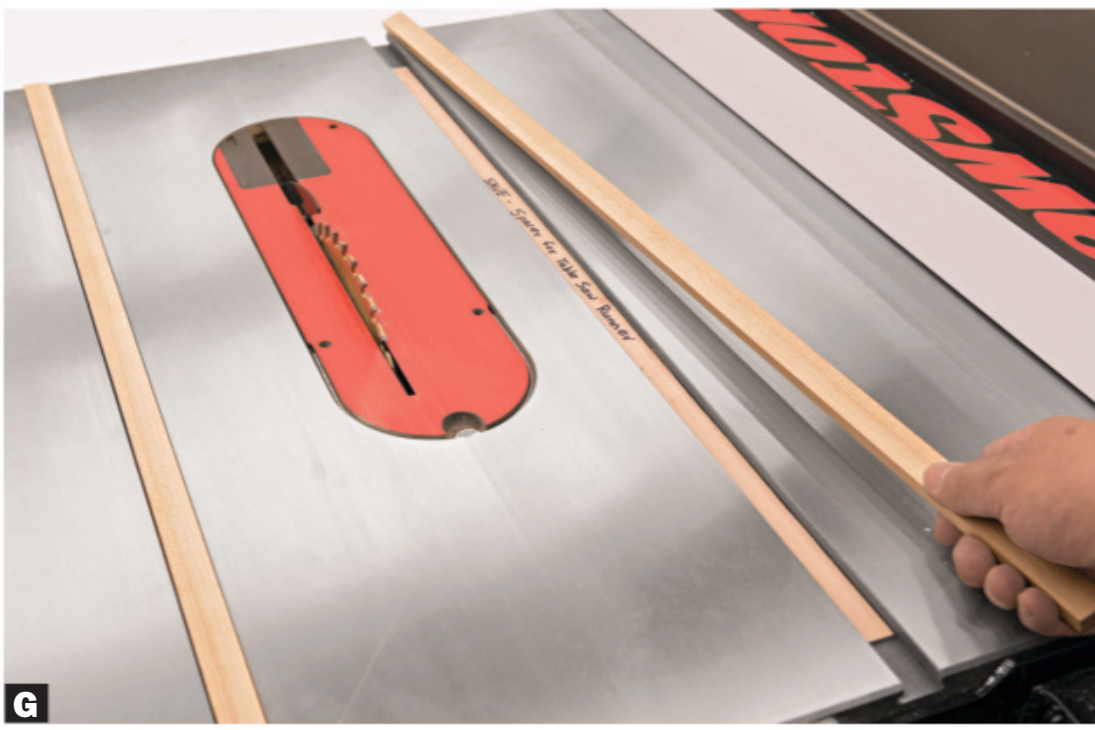


E

Glue and clamp the fence blanks using a known flat clamping surface and an ample number of clamps to evenly distribute the pressure.

F

Incorporate dust relief into the trailing fence by cutting a ⅛" rabbet ⅛" deep at the bottom of the inward face.



G

Prop up each runner with a strip of wood or several coins so the runners sit just proud of the tabletop.

.750" wide, you will need to adjust the fence .012" closer to the blade [**Photo D**].

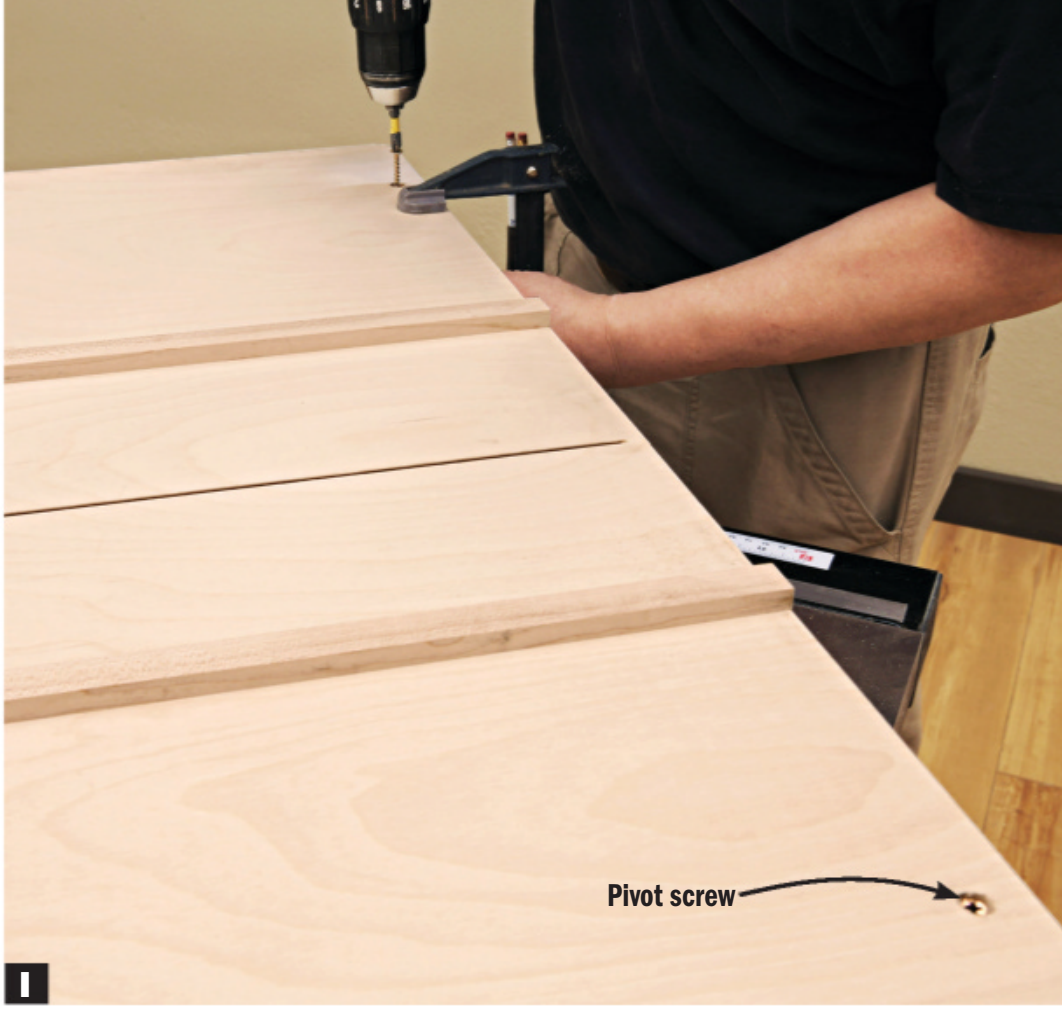
Your sled fences need to be dead straight and flat, so clamp the laminations to a trusted flat surface. I use a piece of 8/4 maple jointed and planed flat [**Photo E**]. After removing the fences from the clamps, bandsaw them to shape [**Exploded View**] and set aside the leading fence (the one furthest from the operator). On the trailing fence, mark pencil lines across the width of the face that will contact workpieces. Adhere sheets of 150-grit sandpaper to a flat surface (such as a tablesaw table). Sand the fence until the pencil marks disappear, telling you it's absolutely flat. At the bottom of that same face cut a rabbet [**Photo F**].

Round the corners of the sled base and fences for comfort and durability. Then cut the rabbets and slots in the fences for holding the polycarbonate top guard.

Do an initial assembly

Place spacers in the saw slots so the runners jut about 1/32" above the saw surface [**Photo G**]. Now, place the sled base atop the runners, aligned flush with the front edge of the saw tabletop. Shift the base sideways so the blade will come up through it 17¾" from the left edge. Offsetting the base on the blade

Square the fence to the saw kerf using a square placed between the fence and a tight-fitting strip of wood inserted in the saw kerf.



Mount the fence by flipping the sled over and driving a screw into the clamped end. Position the screw an even inch increment from the pivot screw (measured center to center) to simplify squaring the fence as outlined in the next section.

Cut 1: On the longest edge of the scrap piece make a mark at least 1½" long, then cut the entire length of the edge.

Cut 2: With the first cut edge against the left side of the trailing fence, make a full-length cut on the adjoining edge.

Note: *When using a rip fence as a stop, always attach a stand-off block to the fence to prevent the offcut from binding.*

enables you to set a stop on the fence for cuts up to 17" long. For cuts longer than 17", mount the stop on the tablesaw fence.

Mark the center of each runner's width from front to back on the base. Fasten the base to the runners with countersunk screws. Glue and screw the leading fence flush with the edge of the base.

Raise the saw blade fully, place the sled runners in the slots, and cut through the jig, stopping 1½" from the trailing edge.

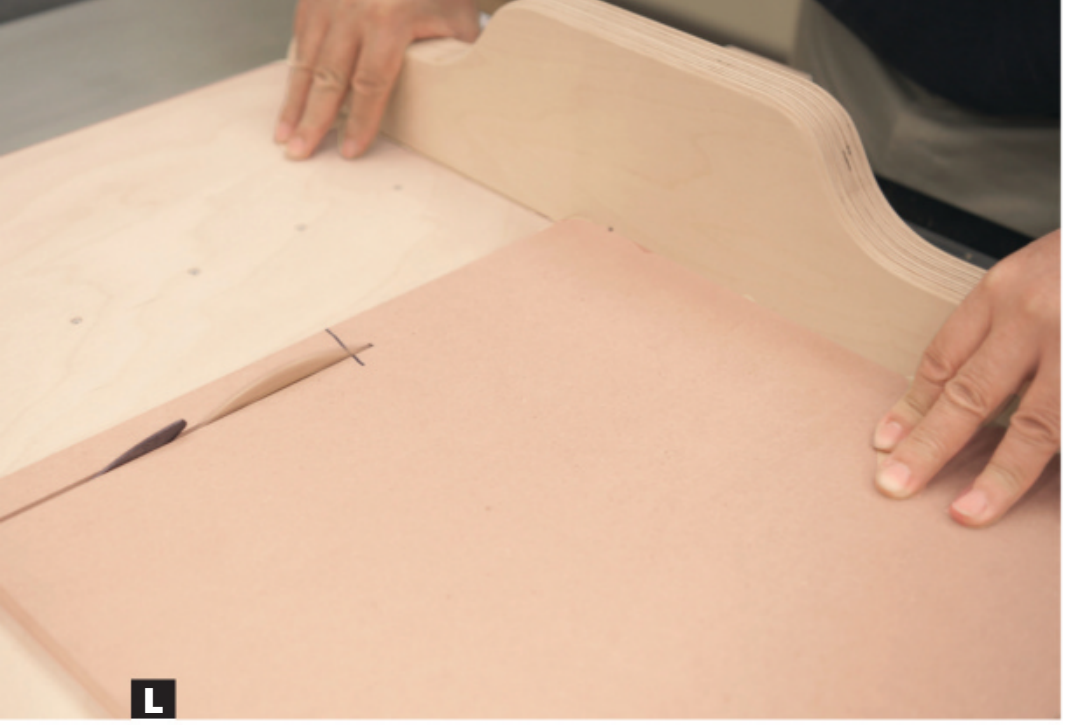
Install the trailing fence with one "pivot" screw placed about 1" from the right end of the fence [**Exploded View**]. Adjust the fence roughly square to the saw kerf [**Photo H**]. Clamp the fence in place and drive a "locking" screw near the left end of the fence [**Photo I**].

5 cuts to perfect square

For the following cuts you'll need a scrap of sheet good at least 16" long and wide. It doesn't have to be square, and can be any size that fits on the sled. So long as it has four sides you're good to go.

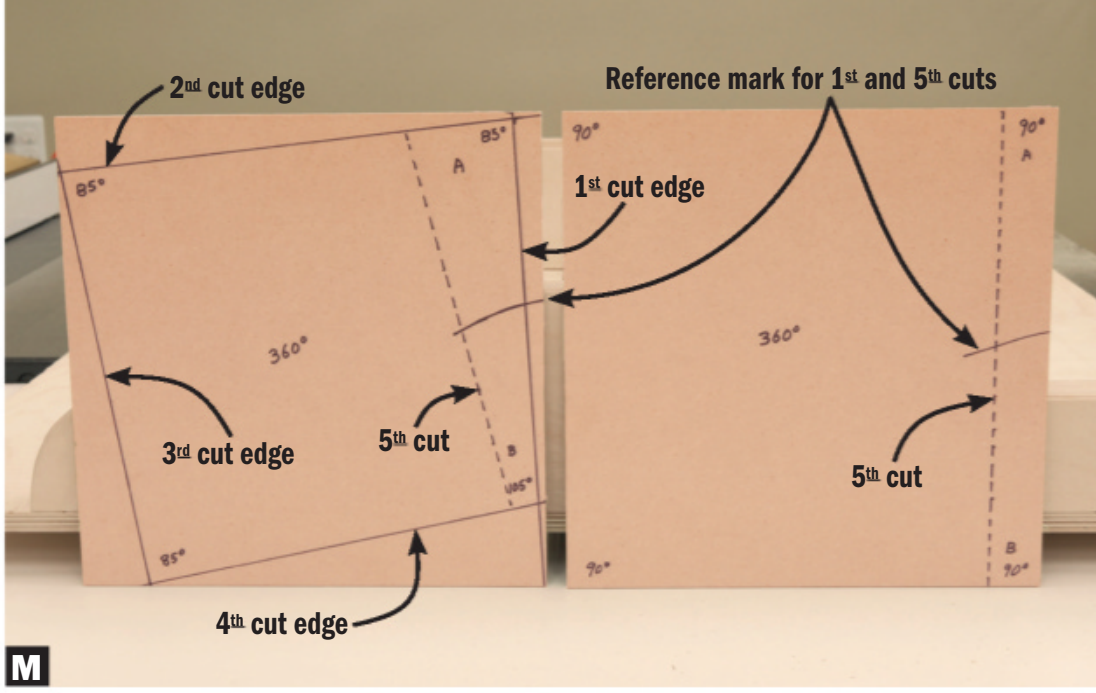
Mark one edge of the scrap (on rectangular scraps, mark the longest edge), and make a cut along that edge [**Photo J**]. Rotate the workpiece clockwise to place the just-cut edge against the fence. Cut that edge [**Photo K**], rotate again, and repeat until you cut all four edges. Rotate the scrap again for a fifth

▶See my video demonstrating how to make the five cuts for setting a perfectly square sled fence. woodmagazine.com/ng5cuts



L

Cut 5: After cutting all four edges, make an offcut about 1" wide on the marked edge. Mark the far end of the offcut "A" and the near end "B" before lifting the offcut from the sled.

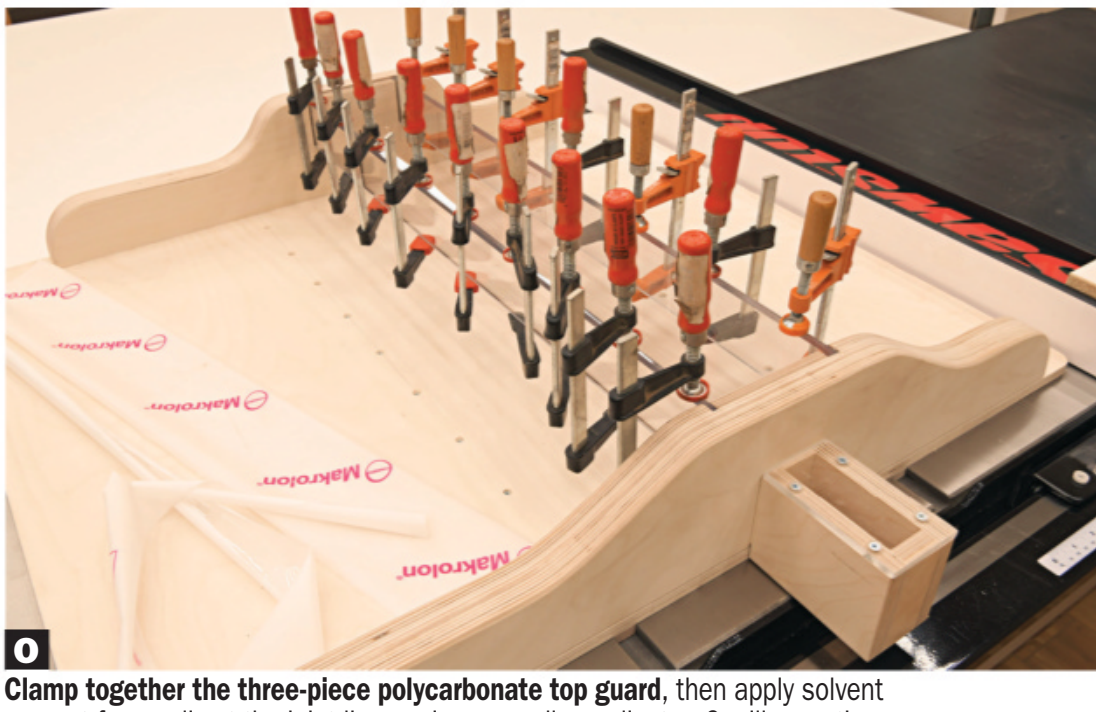


M

The fifth cut tells the tale. These two examples show how a fence that's out of square will yield an offcut that varies in width from the "A" end to the "B" end (left). A fence set perfectly square to the blade, producing 90° corners with each cut, will yield an offcut equal in width along its entire length (right).

N

For a negative error result, use a feeler gauge that matches the error to space a stopblock from the fence. Clamp down the stopblock, remove the locking screw, reposition the fence against the stopblock, clamp down the fence, and reinstall the locking screw in a new hole.



O

Clamp together the three-piece polycarbonate top guard, then apply solvent cement for acrylic at the joint lines using a needle applicator. Capillary action draws the solvent cement into the joint, where it welds together the pieces.

cut, but this time make the offcut about 1" wide [**Photo L**]. Each of the five cuts multiplies the degree of error [**Photo M**], ultimately yielding an offcut you can measure to determine the error.

To calculate the error, use a calipers to measure the width of the offcut at the A and B ends. Then, enter those measurements into this formula: (A-B) ÷ 4 ÷ length of the fifth cut × length between the pivot screw and the locking screw (measured center to center). For example, for a recently made sled the numbers worked out this way: (.974" – 1.002") ÷ 4 ÷ 24 × 28 = -.008". A negative error like the one in this example means the fence is too close to the operator on its left side. Conversely, if your equation results in a positive number, the left side of the fence is too far from the operator.

To reposition the fence, clamp a pointed stopblock centered on the locking screw and use a feeler gauge to make the adjustment [**Photo N**].

To check the placement of the fence, repeat the five-cut process, and adjust if necessary. Once adjusted precisely, secure the fence with additional screws.

Add two safety guards

With your sled dialed in, keep fingers safely away from the blade by adding a blade-exit guard and a top guard spanning the fences. Make the blade-exit guard from scraps of wood and a piece of polycarbonate. Glue and clamp the guard to the trailing fence.

Cut ¼" polycarbonate to make the three parts of the top guard [**Exploded View**]. Clamp the parts [**Photo O**] and apply solvent cement for acrylic into the joints using a needle applicator (both available from amazon.com). Install figure-8 fasteners tight enough to hold down the guard, but loose enough so you can pivot them to remove the guard.

Photos: **William Ng**
Illustration: **Roxanne LeMoine, Lorna Johnson**

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

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Flattening sled

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Good vibes and gorgeous veneer

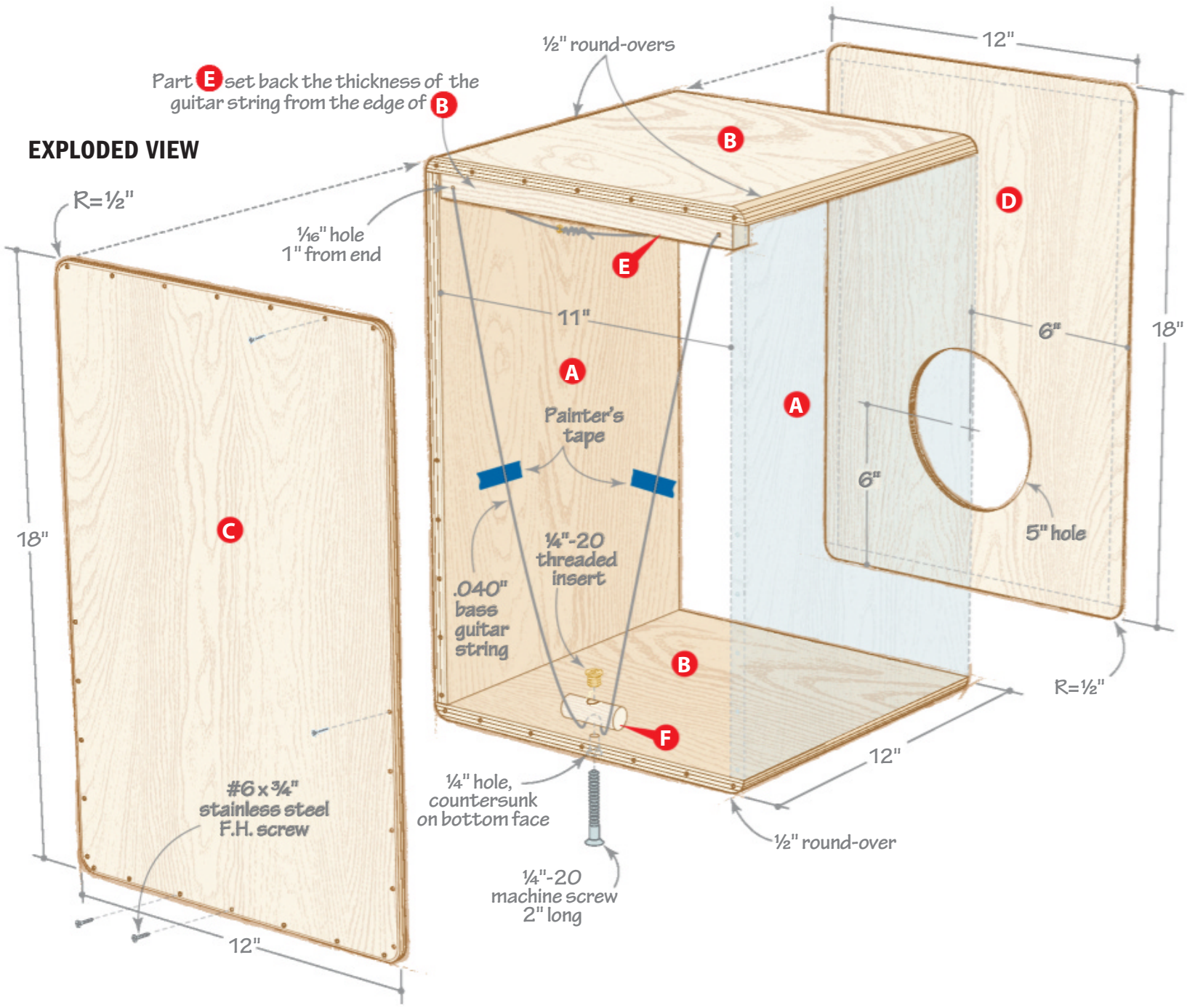
Cajón

DIMENSIONS:
12" W × 12⅜" D × 18" H

Approximate materials cost:

$140

Including nearly $100 for bubinga veneer. Build one from scrap plywood for a few bucks!



Even the least musically inclined among us will greatly enjoy busting a basic beat on this super-simple cajón. Its name (pronounced ku-HONE) comes from the Spanish word for "box." Slapping its front face produces an amplified and distinctive Afro-Peruvian sound.

In making this version, you'll learn how to add beautiful veneer to any smaller project. Or, for a simpler build, skip the veneer—your cajón will sound just as good. This cajón includes an internal bass guitar string, but you could leave that off, too—original cajons were simply boxes with a sound hole opposite the striking surface.

1 Cut the panels (A–D) 1" wider and longer than shown [**Materials List, Exploded View**]. Veneer each panel [**Skill Builder,** *next page*]. We chose bubinga veneer [**Source**]. Then trim the sides (A) and top/bottom (B) panels to finished size.

2 Glue the sides (A) between the top and bottom (B), checking for a square assembly as you tighten the clamps. Using that assembly as a guide, cut the front (C) and back (D) panels for an exact fit. Jigsaw the hole in the back and glue it in place [**Photo A**].

Glue on the back (D) using clamps around the edges to evenly disperse the pressure. The back's edges should align flush with the sides, top, and bottom.

Basic veneering

Nothing dresses up a box like veneer showcasing an exotic species or dramatic figure. It's easy to apply and will hold up for decades when you follow this super-simple method.

First, make a pair of clamping platens sized 1" wider and longer than the plywood project panel. For each platen laminate two layers of ¾" particleboard—the 1½" resulting thickness helps distribute clamping pressure. Cover one side of each platen with waxed paper taped in place.

Cut veneer pieces to cover both sides of the panel [**Photo B**]. (Veneering only one side can cause the panel to warp; you could save money by applying a lower-cost veneer to the inside surface.) Use painter's tape on the *face* side of the veneer to hold together cracks or to keep the ends from splintering.

Apply woodworker's glue to one side of the panel [**Photo C**]. Position a piece of veneer on the glued side of the panel, flip the panel over, and apply glue and veneer to the other side. Prepare the assembly for clamping [**Photo D**].

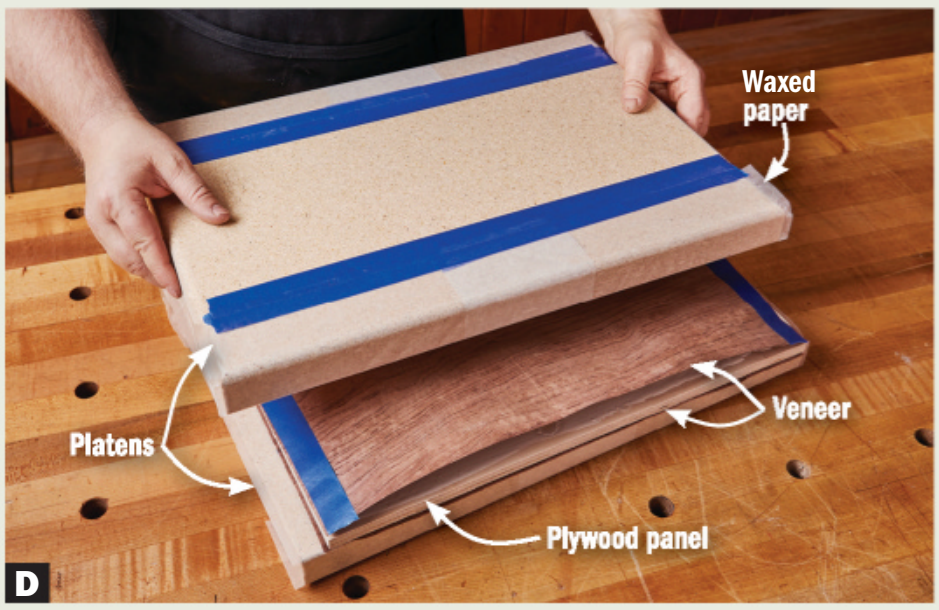
Position clamps for even pressure [**Photo E**], and leave them in place for at least 1 hour. Let the panels dry for at least eight hours before trimming to size.

B

A veneer saw helps you make splinter-free cuts. Use a straightedge to guide the saw and hold the veneer flat.

C

Spread the glue evenly using either a silicone glue spreader or small paint roller.



D

Make a sandwich with the panel and veneer pieces between the platens. Double-check the layers to ensure they don't slip out of alignment as you work.

E

Thick platens help spread clamping pressure evenly, but for panels exceeding 15" in width and length you may want to add deep-jaw clamps for exerting pressure closer to the sandwich center.

Tip! *When cutting the front and back to fit the A/B assembly, err on trimming them just a hair too large. You can trim off the excess when rounding the box corners later.*

3 Place the front (C) onto the A/B/D assembly. Drill countersunk screw holes through the front and into the box edges [**Exploded View**]. Set aside the front for now.

4 Cut the string support (E), drill its holes, and glue it to the top (B).

5 Drill a ⅜" hole ⅜" deep located 1" from the end of a short length of ¾" dowel (F) [**Photo F**]. Without moving the dowel, drill a ¼" hole, centered in the ⅜" hole, through the dowel. Install a ¼"-20 threaded insert in the hole [**Photo G**].

6 Attach the tuning dowel to the bottom (B) so a bass guitar string wrapped around the dowel will contact the front (C). To do that, measure as shown in **Photo H**. Use that measurement to position and drill a hole centered along the width of the bottom.

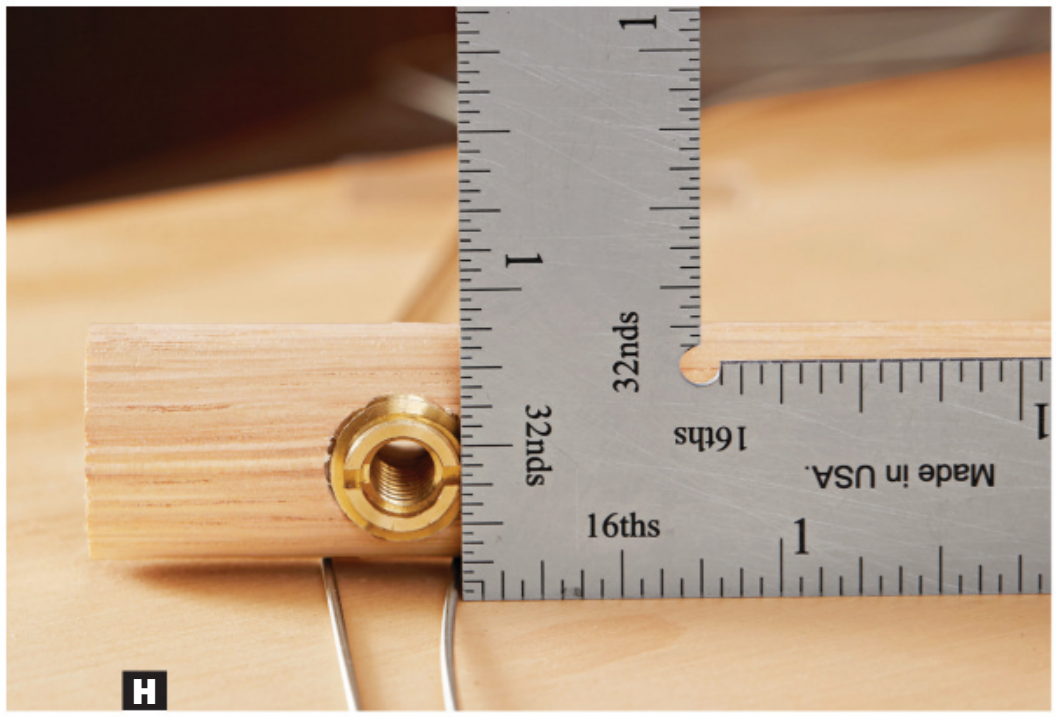
7 Cut the dowel to length and lightly chamfer its ends. Thread the guitar string through the holes in the string support (E), tie the ends, and loop its middle section over the tuning dowel [**Photo I**]. Make the guitar string hand tight, then back off the tension slightly so the string rattles a bit. Fine-tune the tension as you play the cajón to suit your ear.

8 Screw the front (C) to the assembly (no glue). Test the sound of the cajón; we found it necessary to tape the bass string to

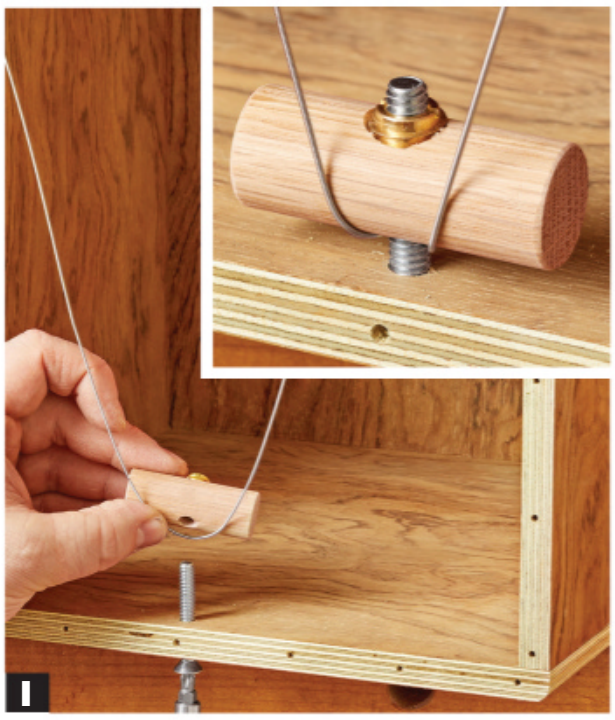
Tip! *To accurately position the string support (E) the thickness of your guitar string from the edge of the box, first set a combination square to the string thickness. Then, use the square to mark the position of the string support.*

Drill through the center of a dowel using a V-jig made from two chamfered blocks glued edge to edge. Mark a centerline on the dowel and align it with jig's glue line. Clamp the dowel and jig securely to the drill-press table.

Install a threaded insert with the assistance of a cordless drill/driver and a ¼"-20 machine screw 2" long.



Determine the tuning dowel's setback from the box bottom's edge by placing two lengths of guitar string under the dowel. Measure from the worksurface to the center of the threaded insert.



Secure the tuning dowel using the same screw used to drive the threaded insert.

▶The tuning dowel gives you a way to tension the guitar string for the sound you desire.

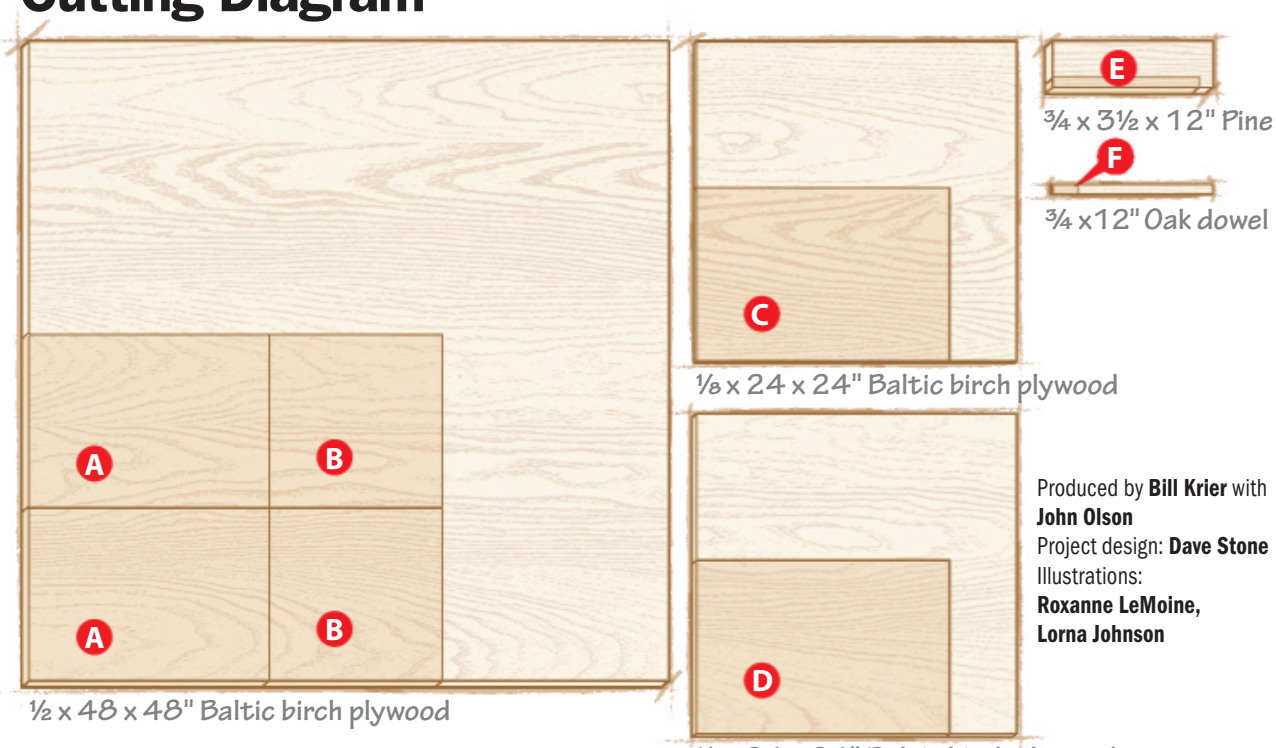
the front about midway up to get the sound we wanted. Rout round-overs on all edges except the front edges. Lightly round those with sandpaper.

9 Finish-sand all surfaces and apply a durable clear finish. We sprayed on three coats of satin polyurethane, sanding with 400-grit abrasive between coats.

▶Cajón players often lean the instrument on its back bottom edge while sitting on its top. Varying sounds result from striking either hands or fingertips on the "tapa," the instrument's front surface. Percussionists sometimes strike the sides, too, for additional sounds.

▶Hear the incredible beats produced on cajons, and watch different playing styles, at youtube.com

Cutting Diagram



Produced by **Bill Krier** with **John Olson**
Project design: **Dave Stone**
Illustrations: **Roxanne LeMoine, Lorna Johnson**

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	sides	½"	12"	17"	BP	2
B*	top/bottom	½"	12"	12"	BP	2
C*	front	⅛"	12"	18"	BP	1
D*	back	¼"	12"	18"	BP	1
E	string support	¾"	¾"	11"	P	1
F	tuning dowel	¾"	diam.	2"	O	1

*Parts initially cut oversize. See the instructions.

Materials key: BP-Baltic birch plywood, P-pine, O-oak.
Supplies: #6x¾" stainless steel flathead screws (24), ¼"-20 machine screw 2" long (1), ¼"-20 threaded insert (1), .040" bass guitar string (1).
Bits: ½" round-over router bit; countersink.
Source: Veneer: Certainly Wood, 716-655-0206, certainlywood.com. Many species and cuts available; call or go to the website for more information.

Choosing Jigsaw Blades

by Jim Heavey

Blade selection makes a big difference in the performance and cut quality of any jigsaw. Follow these tips for selecting the right blade for any job.

A setscrew presses against the side of, or extends into a hole in, a universal blade. T-shanks hold securely and provide a much wider selection of blades.

Some blade types cut more than one type of material, and some materials can be cut by more than one type of blade.

▶To determine the minimum blade length, add 1" to the workpiece thickness. This keeps the blade in the cut at the top of the upstroke.

Is it T or U for you?

First, consider how the blade mounts in your saw. In older jigsaws—and some current bargain-priced tools—a setscrew secures a U-shaped (universal) blade tang [**Photo A**]. Most newer jigsaws use T-shaped tangs that slide in and lock in place, no tools required. Some saws accept both types.

Metal shows its mettle

Manufacturers produce blades in four primary metal compositions for slicing through all types of material [**Photo B**], so consider what you'll cut.

Choose *high-carbon steel* (HCS) blades for cutting wood, MDF, or plastic. Though it may dull quicker, this softer, less expensive steel has more flexibility, making it well suited for scroll cutting.

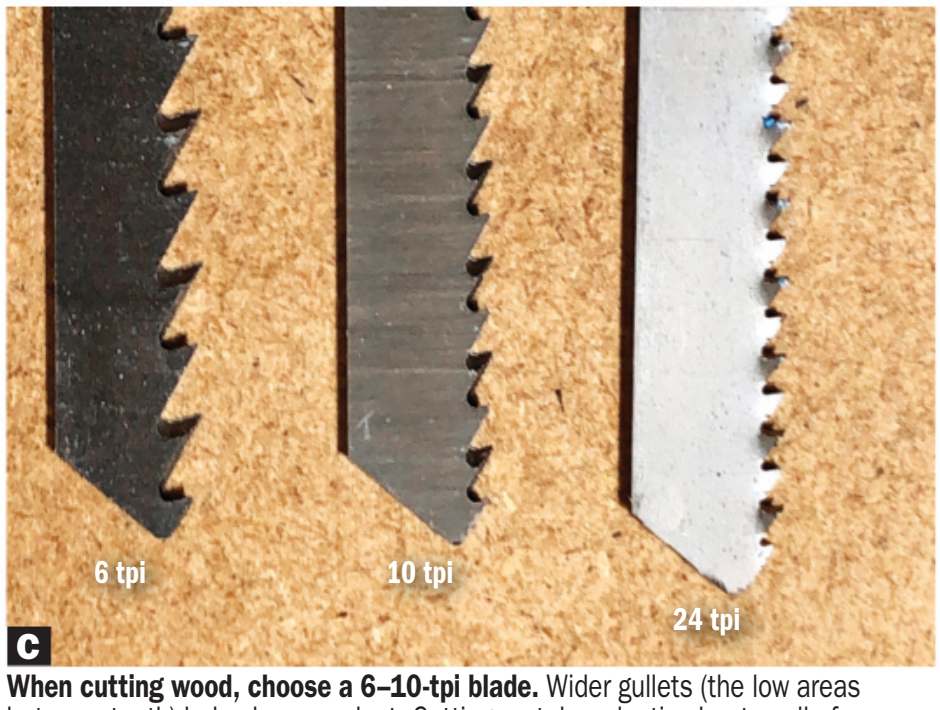
High-speed steel (HSS) blades excel at cutting nonferrous metal, as well as acrylics. They have a more durable cutting edge than HCS blades, but additional rigidity can lead to more blade breaks.

Select *bimetal* (BIM) blades for cutting wood, metal, and laminates. These blades combine the flexibility of HCS with the durability of HSS, making them less likely to break. Though more costly, they will typically outlast both HCS and HSS blades.

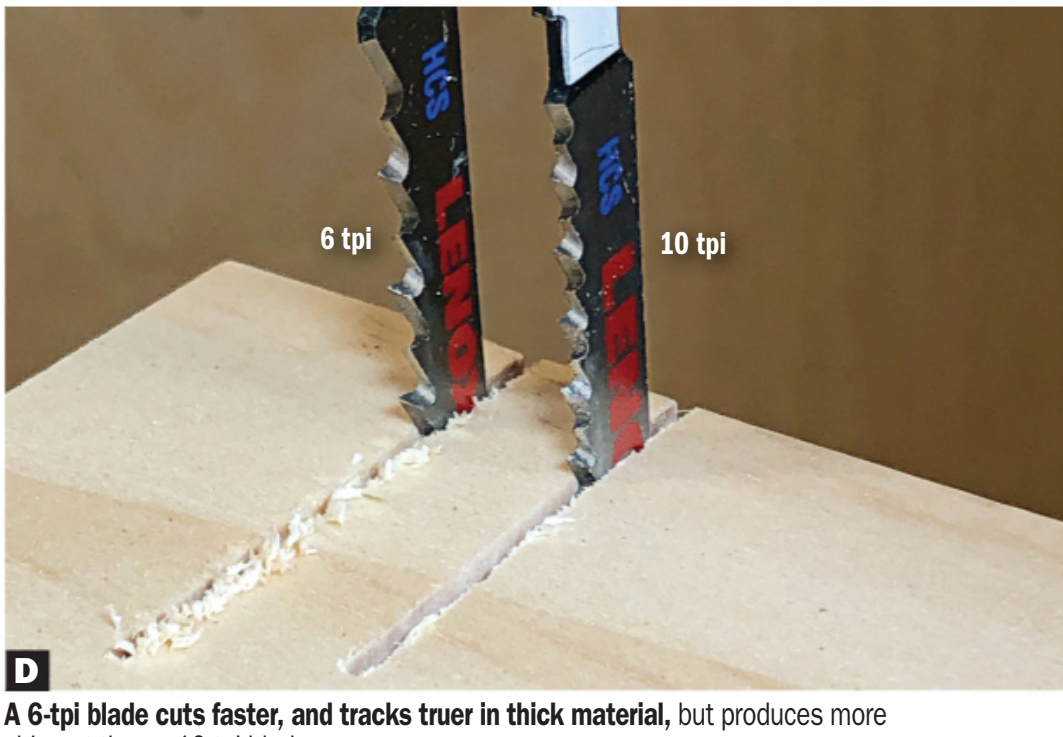
For really tough jobs, such as cutting through embedded nails or metal, use a blade with tungsten-carbide edged teeth. Toothless blades with tungsten-carbide grit on the edge cut glass, concrete board, brick, and tile.

The truth about the teeth

The number of teeth per inch (tpi) determines the speed at which the blade cuts efficiently [**Photo C**]. A lower tpi cuts aggressively, leaving a rougher edge [**Photo D**]; blades with 10–24 tpi produce markedly smoother cuts but at a slower pace.



When cutting wood, choose a 6–10-tpi blade. Wider gullets (the low areas between teeth) help clear sawdust. Cutting metal or plastic sheets calls for a higher tooth count and slower cut speed.



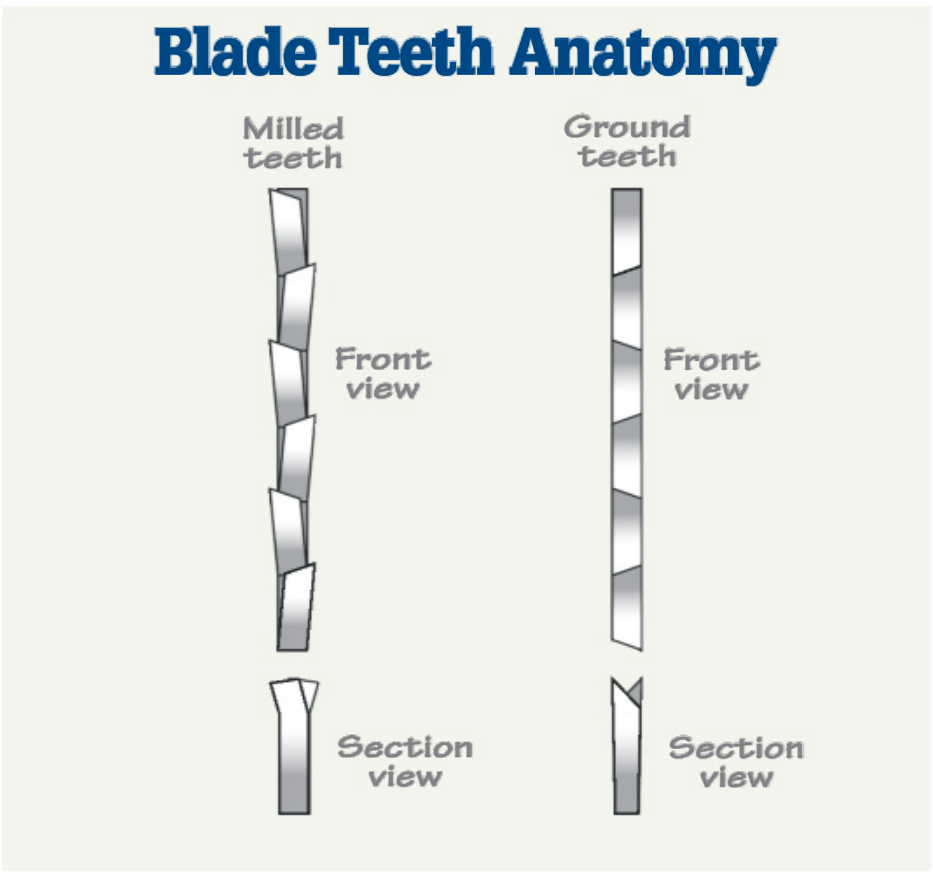
A 6-tpi blade cuts faster, and tracks truer in thick material, but produces more chip-out than a 10-tpi blade.

▶**Set:** Teeth bent to alternating sides to cut a wider kerf, helping remove waste and reduce binding and heat buildup.

The *set* of the blade's teeth can also impact cut quality, and manufacturers set them in one of two ways.

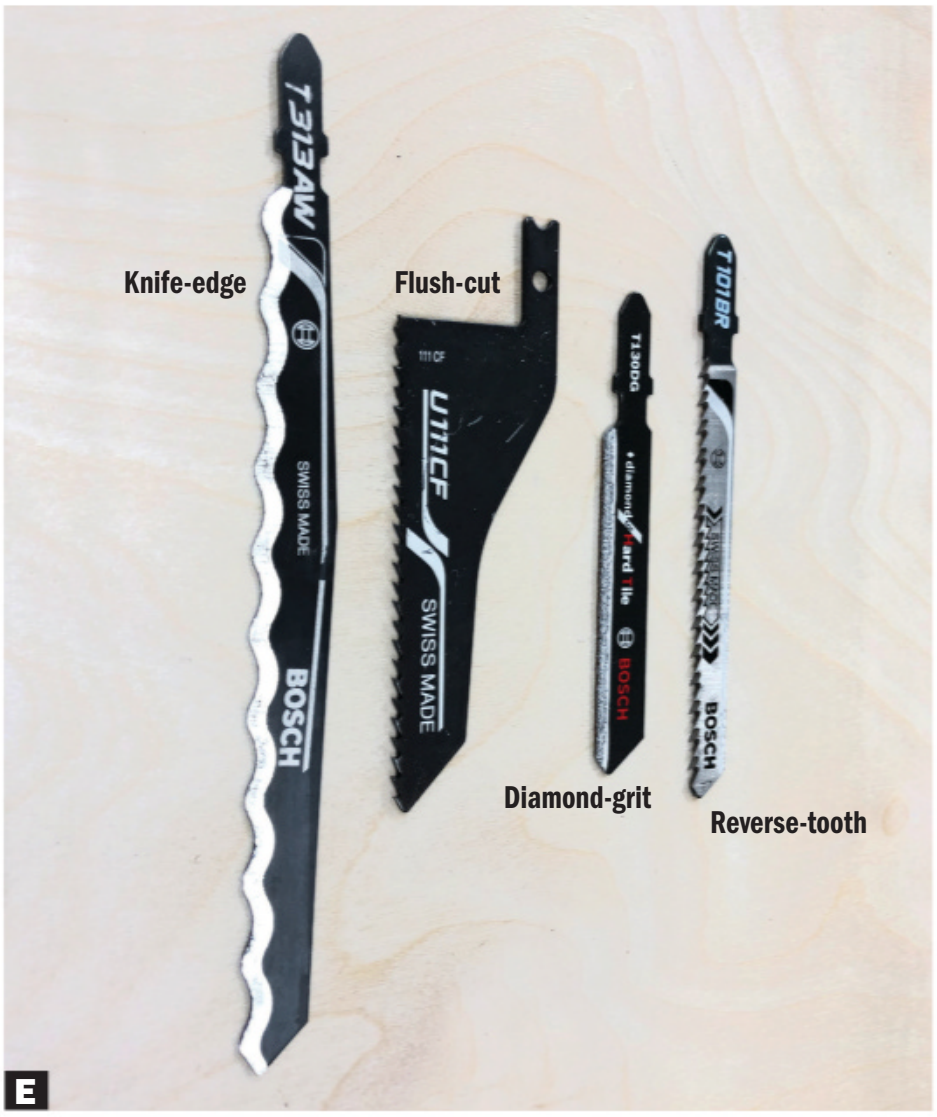
Milled teeth have a pronounced tooth set [**Blade Teeth Anatomy**] created by pressing each tooth shape from a blade blank. This set helps the blade cut faster, and the wider kerf reduces blade wear. As a result, milled teeth last longer in dense material. However, the set leaves a rougher cut surface.

Ground teeth have no set. Grinding produces sharper edges, but because the teeth align with the blade body, these blades cut slower and hotter. Ground teeth produce a smoother cutline.



Specialty blades

No matter the material, there's likely a jigsaw blade designed specifically for cutting it [**Photo E**].



E

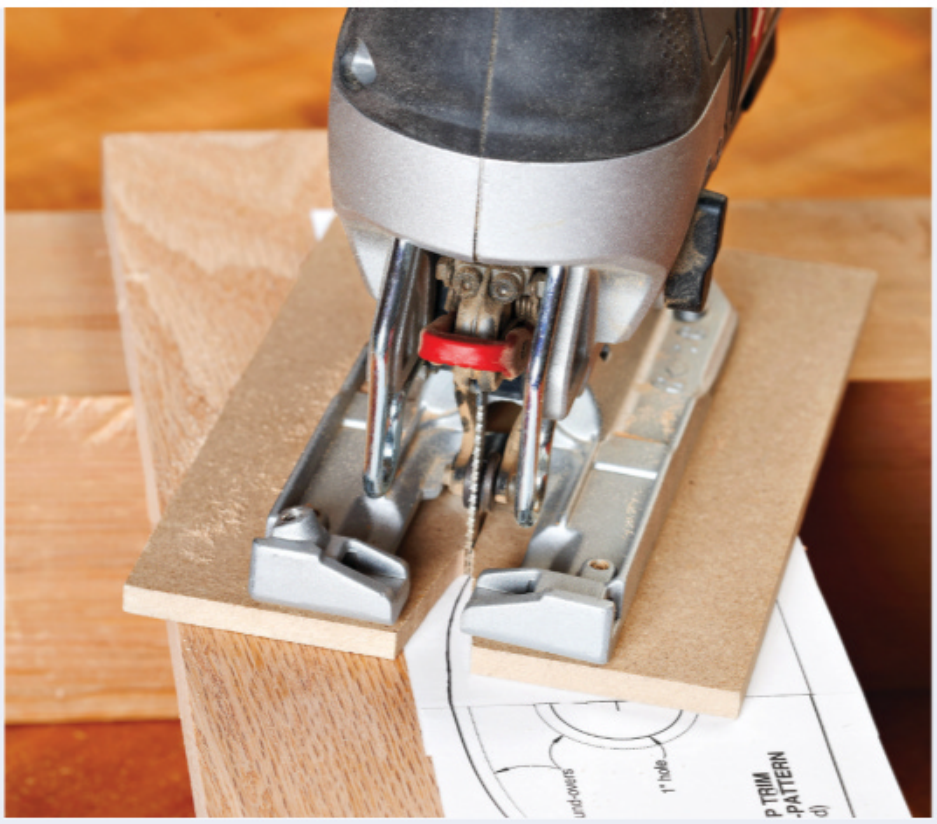
Knife-edge blades cut soft materials, such as leather, cork, and foam insulation sheets. Flush-cut blades, if your saw accommodates them, allow cutting right up to the leading edge of the jigsaw's foot plate. Diamond-grit blades cut through tough materials such as glass, granite, slate, and more. The downward-pointing teeth of a reverse-tooth blade cut on the downstroke, resulting in a splinter-free cut on the top face of veneered plywood and laminates.

SKILL BUILDER

A few more tips for clean cuts

Armed with the right blade, follow these pointers to make your work go (and cut) even smoother.

- Make a zero-clearance base, *right*, for use on splinter-prone materials, such as plywood.
- The forward and backward blade movement of orbital action (an option on some saws) helps the saw cut more quickly, but at the cost of cut quality. Switch off orbital action when scrolling delicate parts and cutting tight curves.
- On variable-speed jigsaws, use a slower speed for harder woods and materials, such as metal or fiberglass. Increase the speed for cutting soft woods and plywood.
- If equipped, use the blower to keep the cutline visible, and dust extraction to keep you and the workspace cleaner.



In a scrap of ¼" hardboard, cut a kerf about 2" long, then notch the front portion to provide a view of the cutline. Fasten the scrap to the saw with double-faced tape, aligning the tip of the notch with the front of the blade.

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Stauer brings back the "Noire", a design based on an elegant timepiece built in 1936. Black dialed, complex automatics from the 1930s have recently hit new heights at auction. One was sold for in excess of $600,000. We thought that you might like to have an affordable version that will be much more accurate than the original.

Basic black with a twist. Not only are the dial, hands and face vintage, but we used a 27-jeweled automatic movement. This is the kind of engineering desired by fine watch collectors worldwide.

But since we design this classic movement on state of the art computer-controlled Swiss built machines, the accuracy is excellent.

The movement of the Stauer ***Noire*** wrist watch carries an extended two year warranty. But first enjoy this handsome timepiece risk-free for 30 days for the extraordinary price of only 3 payments of $33. If you are not thrilled with the quality and rare design, simply send it back for a full refund of the item price. But once you strap on the ***Noire*** you'll want to stay in the black.

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Charged-up chainsaws

If you cut firewood for heat, a gas-powered chainsaw proves indispensable. But if you only occasionally use a chainsaw—for roughing out a turning blank, cutting tree limbs, or lopping off deck posts—a battery-powered model makes a lot of sense. They cut with respectable power, and you never have to fuss with a gas/oil mix. Plus, no exhaust fumes and low noise levels mean you can use one in your shop. We tested more than a dozen saws, and we recommend those shown here.

Saws that share batteries with your drill

Milwaukee 2727-21HD, 18 volts, $450

(Includes one 12.0-Ah battery and charger)

- Bar length: 16"
- Avg. time to cut 10×10 green timber: 14.0 seconds
- Avg. number of crosscuts in 5×5 timber per charge: 120

Why buy: Uses only one (large) battery pack; fast cutting; metal bucking spikes; blade and bar tool stores on the saw.

800-729-3878, milwaukeetool.com

Makita XCU04Z, 36 volts, $300 (bare)

(Two 5.0-Ah batteries and charger, no. BL1850B2DC2, $270)

- Bar length: 16"
- Avg. time to cut 10×10 green timber: 18.5 seconds
- Avg. number of crosscuts in 5×5 timber per charge: 107

Why buy: Tool-free chain and bar adjustments; great balance; metal bucking spikes; and it draws from both battery packs evenly.

800-462-5482, makitatools.com

Ryobi P549, 18 volts, $200

(Includes one-4.0 Ah battery and charger)

- Bar length: 12"
- Avg. time to cut 10×10 green timber: 46.9 seconds
- Avg. number of crosscuts in 5×5 timber per charge: 21

Why buy: It's not on the level of bigger saws, but it's ideal for cutting up the occasional tree limb or other light-duty work.

800-525-2579, ryobitools.com

Saws using higher-voltage batteries

Stihl MSA 200 C-BQ, 36 volts, $300 (bare)

(6.0-Ah battery, no. AP 300, $180; charger, no. AL 300, $90)

- Bar length: 14"
- Avg. time to cut 10×10 green timber: 16.3 seconds
- Avg. number of crosscuts in 5×5 timber per charge: 144

Why buy: Small, lightweight, tool-free, with the thinnest bar and chain (¼" compared with ⅜" for the others); our favorite saw overall.

800-467-8445, stihlusa.com

Husqvarna 120i, 36 volts, $260

(Includes one 4.0-Ah battery and charger)

- Bar length: 14"
- Avg. time to cut 10×10 green timber: 27.4 seconds
- Avg. number of crosscuts in 5×5 timber per charge: 85

Why buy: Compact, light, and well-balanced for a great price; tool-free adjustments; excellent electronic monitoring system protects battery packs.

800-487-5951, husqvarna.com

Ego CS1600, 56 volts, $300

(Includes one 5.0-Ah battery and charger)

- Bar length: 16"
- Avg. time to cut 10×10 green timber: 11.6 seconds
- Avg. number of crosscuts in 5×5 timber per charge: 170

Why buy: Produced the fastest cut times and second-longest battery run times in our test; tool-free adjustments; soft-start motor.

855-346-5656, egopowerplus.com

DeWalt DCCS690X1, 40 volt, $400

(Includes one 6.0-Ah battery and charger)

- Bar length: 16"
- Avg. time to cut 10×10 green timber: 18.4 seconds
- Avg. number of crosscuts in 5×5 timber per charge: 168

Why buy: Tool-free adjustments; second-longest run time; low vibration; heavy, but well balanced; has the heft and feel of a gas-powered saw.

800-433-9258, dewalt.com

▶Read reviews of other battery-powered chainsaws. woodmagazine.com/review

continued on page 81

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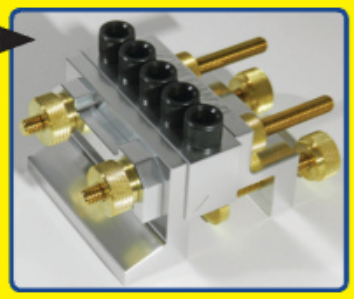

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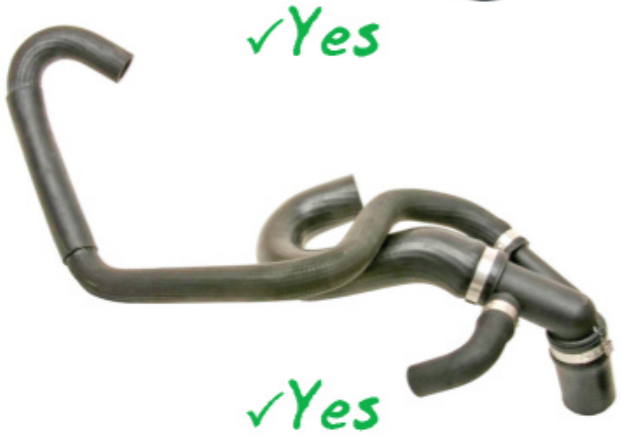

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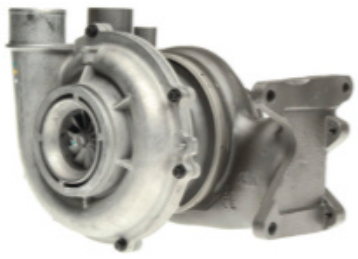

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Economy-priced saw turns in pro-priced performance

Hercules 12" dual-compound sliding mitersaw, no. 63978, $350

I was skeptical of how well a sliding mitersaw in the DIY-tool price range ($275–$350) could perform. (Professional-level sliders cost $500 and up.) But now, I'm a believer. This robust Hercules saw cuts accurately, with plenty of power and capacity, and it slides, rotates, and tilts smoothly.

It has 10 detents on the adjustable miter scale, including a whopping 60° to the right, and there's a detent override that lets you dial in an angle without it dropping into a detent. The Hercules tilts up to 49° right and left. And it crosscuts up to 14" at 90°. Granted, I'd prefer a larger table surface, but that's the trade-off for the wide miter-cutting range.

—Tested by John Olson, Design Editor

Harbor Freight
800-423-2567, harborfreight.com

Drill, countersink, and impact-drive screws quickly

Zack Rabbit Fully Loaded Holster countersinking drill/driver set, $99.95

I've used a lot of countersinking bits in two decades here at *WOOD*® magazine, and this has become my new favorite because it's built to withstand the high torque of impact drivers. Like its predecessor, the Jack Rabbit, the Zack Rabbit uses a quick-change chuck with a ball-bearing catch to firmly hold driver bits, even double-tipped ones. The three lengths of ⅜"-diameter countersinks cut cleanly and precisely, with twist bits for the pilot holes, and a replacement bit for each. You also get a ⅜" plug cutter, a magnetic ring to prevent screws from falling off the driver bits, and a handy holster to hold it all.

—Tested by Kevin Boyle, Senior Design Editor

Giffin Tec, Inc.
360-758-7008, zackrabbit.com

continued on page 84

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L:50° R:60°	MAX MITER CAPACITY (LEFT/RIGHT)	L:50° R:60°
YES	ADJUSTABLE STAINLESS STEEL DETENT PLATE W/10 POSITIVE STOPS	YES
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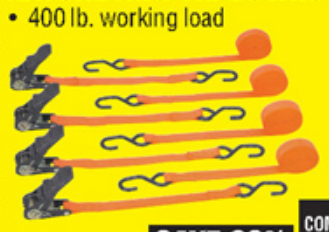

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72" x 80" MOVING BLANKET

Customer Rating ★★★★★

NOW $5.99

COMPARE TO BLUE HAWK $19.99 MODEL: 77280

SAVE 70%

~~$8.99~~

ITEM 69505/62418/66537 shown

32690106

LIMIT 4 - Coupon valid through 9/3/19*

Bauer — SUPER COUPON

15 AMP, 12-1/2" PORTABLE THICKNESS PLANER

Customer Rating ★★★★½

NOW $259.99

~~$319.99~~

SAVE $189

COMPARE TO DEWALT $449 MODEL: DW734

ITEM 63445

32698852

LIMIT 1 - Coupon valid through 9/3/19*

GOOD — SUPER COUPON — BETTER

	21 GALLON OIL-LUBE AIR COMPRESSOR	20 GALLON OIL-LUBE AIR COMPRESSOR
	125 PSI	135 PSI
	STANDARD LIFE	2X LIFE
	STANDARD, 90 dBA	25% QUIETER
	STANDARD RUN TIME	27% MORE RUN TIME
	STANDARD OIL-LUBE MOTOR	SUPERIOR CONSTRUCTION OIL-LUBE MOTOR

Not available in Arizona and Virginia.

Customer Rating ★★★★★ ITEM 61454/69091 62803/63635/67847 shown

$159.99 ~~$174.99~~ SAVE $79 COMPARE TO HUSKY $239

Customer Rating ★★★★★ ITEM 56241/64857 shown

$169.99 ~~$199.99~~ SAVE $80 COMPARE TO PORTER-CABLE $249.99

32699962

LIMIT 1 - Coupon valid through 9/3/19*

32882493

LIMIT 1 - Coupon valid through 9/3/19*

BRAUN — SUPER COUPON

5000 LUMENS LED HANGING SHOP LIGHT

NEW

Customer Rating ★★★★★

NOW $19.99

~~$29.99~~

SAVE 57%

COMPARE TO INOLED $47 MODEL: SNT28B-12

ITEM 64410

32884170

LIMIT 4 - Coupon valid through 9/3/19*

PITTSBURGH AUTOMOTIVE — SUPER COUPON

PNEUMATIC ADJUSTABLE ROLLER SEAT

- 300 lb. capacity

Customer Rating ★★★★½

NOW $19.99

SAVE 71%

~~$26.99~~

COMPARE TO DURALAST $69.99 MODEL: TR6201C

ITEM 61160/61896/63456/46319 shown

32884986

LIMIT 3 - Coupon valid through 9/3/19*

U.S. GENERAL — SUPER COUPON

30", 4 DRAWER TECH CART

- 12,600 cu. in. of storage
- 580 lb. capacity
- Heavy duty gas struts hold lid open at 90 degrees

Customer Rating ★★★★★

~~$159.99~~

NOW $107.99

COMPARE TO SNAP-ON $880 MODEL: KRBC10TBPC

SAVE $772

Side tray sold separately.

ITEM 64818 64096 shown

32892522

LIMIT 1 - Coupon valid through 9/3/19*

CHICAGO ELECTRIC POWER TOOLS — SUPER COUPON

MULTIFUNCTION POWER TOOL

Customer Rating ★★★★½

- Powerful 1.6 amp motor delivers 0 - 21,000 oscillations per minute

SAVE 59%

COMPARE TO GENESIS $36.79 MODEL: GMT15A

~~$19.99~~

NOW $14.99

ITEM 62866/60428/62279/62302/68861 shown

32893015

LIMIT 3 - Coupon valid through 9/3/19*

CENTRAL PNEUMATIC — SUPER COUPON

18 GAUGE, 2-IN-1 NAILER/STAPLER

WE CARRY A FULL LINE OF NAILS

NOW $15.99

Customer Rating ★★★★½

COMPARE TO PORTER-CABLE $49.97 MODEL: BN200C

SAVE 68%

~~$22.99~~

ITEM 63156/64269/68019 shown

32894161

LIMIT 3 - Coupon valid through 9/3/19*

PORTLAND — SUPER COUPON

7 AMP ELECTRIC POLE SAW 9.5" BAR

Customer Rating ★★★★★

NOW $59.99

~~$79.99~~

COMPARE TO WORX $99.98 MODEL: WG309

SAVE $39

ITEM 68862/63190/62896 shown

32897224

LIMIT 2 - Coupon valid through 9/3/19*

WARRIOR — SUPER COUPON

11 PIECE, 1" - 2-1/2" CARBON STEEL HOLE SAW SET

- Cuts to a depth of 1"

Customer Rating ★★★★½

NOW $5.99

COMPARE TO MASTERFORCE $24.99 MODEL: 3475

SAVE 76%

~~$9.99~~

ITEM 69070/68114 shown

32897609

LIMIT 4 - Coupon valid through 9/3/19*

PREDATOR — SUPER COUPON

2000 WATT SUPER QUIET INVERTER GENERATOR

Customer Rating ★★★★★

- 12 hour run time

NOW $449.99

~~$499.99~~

SAVE $560

ITEM 62523

COMPARE TO HONDA $1,009.99 MODEL: EU2000i

32900471

LIMIT 1 - Coupon valid through 9/3/19*

CHICAGO ELECTRIC POWER TOOLS — SUPER COUPON

BENCHTOP ROUTER TABLE WITH 1-3/4 HP ROUTER

Customer Rating ★★★½☆

NOW $94.99

~~$109.99~~

SAVE $44

COMPARE TO SKIL $139 MODEL: RAS900

ITEM 95380

32900813

LIMIT 1 - Coupon valid through 9/3/19*

HaulMaster — SUPER COUPON

18" WORKING PLATFORM STEP STOOL

Customer Rating ★★★★★

- 350 lb. capacity

NOW $19.99

~~$29.99~~

COMPARE TO GPL $51.45 MODEL: H-21

SAVE 61%

ITEM 62515/66911 shown

32924923

LIMIT 4 - Coupon valid through 9/3/19*

CENTRAL MACHINERY — SUPER COUPON

4" x 36" BELT/ 6" DISC SANDER

Customer Rating ★★★★☆

NOW $64.79

~~$74.99~~

SAVE $84

COMPARE TO RYOBI $149 MODEL: BD4601G

ITEM 5154/64778/97181 shown

32933094

LIMIT 1 - Coupon valid through 9/3/19*

drill master — SUPER COUPON

4-1/2" ANGLE GRINDER

Customer Rating ★★★★½

SAVE 44%

COMPARE TO PERFORMAX $17.99 MODEL: 2411-1

~~$14.99~~

NOW $9.99

ITEM 69645/95578/60625 shown

32937545

LIMIT 5 - Coupon valid through 9/3/19*

Apache — MODEL 1800 — SUPER COUPON

ULTRA-LIGHT, CRUSH PROOF WEATHER-RESISTANT LOCKABLE CASE

Customer Rating ★★★★★

- 8-1/8" L
- 5-5/8" W
- 3-3/4" H

NOW $9.99

SAVE 74%

~~$14.99~~

COMPARE TO PELICAN $39.95 MODEL: 1150

ITEM 64550 63518 shown

Case contents and locks not included.

32937553

LIMIT 4 - Coupon valid through 9/3/19*

HYDROSTAR — SUPER COUPON

50 FT. ELECTRIC DRAIN CLEANER

NOW $199.99

~~$249.99~~

COMPARE TO COBRA PRO $429 MODEL: CP3020

SAVE $229

Customer Rating ★★★★½

ITEM 61856/68285 shown

32938584

LIMIT 1 - Coupon valid through 9/3/19*

WARRIOR — SUPER COUPON

29 PIECE TITANIUM DRILL BIT SET

Customer Rating ★★★★½

COMPARE TO DEWALT $68.14 MODEL: DW1369

SAVE 85%

~~$17.99~~

NOW $9.99

ITEM 5889/62281/61637 shown

32941742

LIMIT 5 - Coupon valid through 9/3/19*

CHICAGO ELECTRIC WELDING — SUPER COUPON

170 AMP MIG/FLUX CORED WELDER

Customer Rating ★★★★½

EVERYTHING YOU NEED TO WELD

NOW $159.99

~~$189.99~~

COMPARE TO KLUTCH $494.99 MODEL: 55729

SAVE $335

ITEM 6271/97503/61888/68885 shown

32944810

LIMIT 1 - Coupon valid through 9/3/19*

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*Original coupon only. No use on prior purchases after 30 days from original purchase or without original receipt. Valid through 9/3/19.

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Jig strengthens miters and adds pizzazz

Corner-Key Doweling Jig, no. 59517, $36

This adjustable jig lets you reinforce miter joints with dowels. You can use dowels of the same species as the workpieces, or add visual appeal by using contrasting wood species. The jig comes with drill-guide blocks in ⅛", ¼", and ⅜" diameters, but does not include drill bits.

Rockler Woodworking and Hardware
800-279-4441, rockler.com

Give wood a charred look without lighting a flame

Varathane Charred Wood Accelerator, $11 per quart

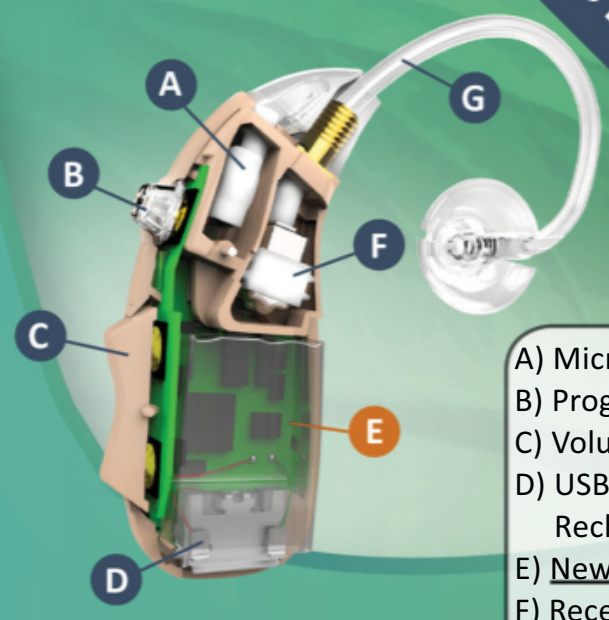
Wood finished with fire has become an increasingly popular look, and this new water-based stain reacts with the tannins in the wood to create a finish that mimics scorched wood. Rust-Oleum recommends testing it on scrap pieces to get the look you want before applying it to a finished project.

Varathane/Rust-Oleum
877-385-8155, varathanemasters.com

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!

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1-877-887-1223

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Visit and Save: **www.AdvancedHearing.com/WD97**

What's Ahead

A GLIMPSE INSIDE THE SEPTEMBER ISSUE (ON SALE JULY 5)

Blanket chest
Beautifully proportioned, it boasts raised-panel style but goes together easily with straightforward joinery.

One-wall workshop: Fastening center
Keep drivers, screws, and nails handy and organized with these simple storage projects.

Spray finish like a pro
Improved finishes and low-cost HVLP systems have put spray-finishing within the reach of any woodworker. Here's what you need to know.

Shop test: Battery-powered bradders
Skip the unwieldy air hose and stinky fuel cells with this new breed of 18-gauge brad nailers.

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