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ISSUE 265 DEC/JAN 2019/2020

Better Homes & Gardens.

WOOD

**2020's Most Innovative
New Tools** p.38

Great Plans

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**SHOP TEST: Tool-triggered
Supervacs** p.56

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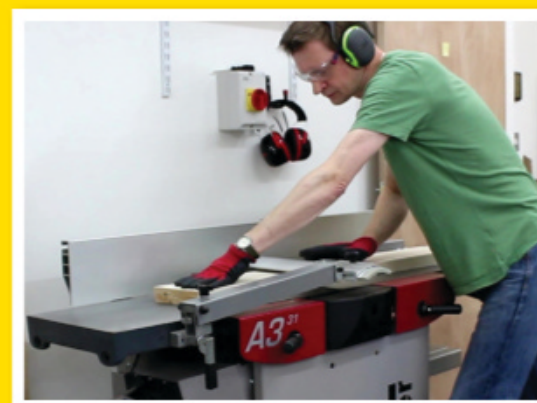
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Got brass in pocket

Over the past 20 years, Christmas-gift giving in our house has evolved from the toys and electronics of their youth to things our now-adult children can use for their own homes. As they get older and wiser, Colby and Katie also seem to appreciate more the work that goes into any handmade project, as well as the beauty of well-chosen materials.

In their elementary-school years, I could have made for them the “Pegs and Jokers” game in this issue out of spray-painted pine and golf tees, and they would have enjoyed it. But with now grown-up tastes, I’m certain they would “oooh” and “aaah” over the curly maple figure in the game boards on *page 52*. Last Christmas, I made a set of these game boards for each of them, using a chunk of mahogany shelving salvaged while remodeling their childhood home, making the game an instant heirloom.

I also made a set that included brass inlay, and found that I really liked the visual interplay between the warm wood tones and the bright metal. Since then, I’ve been watching for opportunities to incorporate more metal highlights in my woodworking.

So when design editor John Olson came to me with an idea for installing metal inlay in the Arts & Crafts Cabinet on *page 42*, I was all ears. And when I saw the eye-popping finished product, *above*, my jaw hit the floor.

We’ll show you how to make John’s inlay out of commonly available rods, pipes, and bars on *page 46*, and even provide a source for all the materials we used. But just think of that as the launching point for your own designs. Check out the selection of conduit, pipe, rods, and bar stock at the hardware store or home center, think about how they might fit together, then go for it! (I’m now playing with making metal medallions to “sign” pieces I build.)

The common lengths these materials come in provide plenty of stock for experimentation. And, as long as you stick with the soft metals—aluminum, copper, and brass—you can cut and machine them with the same blades and cutters you use for wood, albeit slower.

So as you head back out in the shop to complete (start?) those great gifts, consider not only proving your craftsmanship, but also showing your metal.

Merry Christmas!

Dave Campbell

dave.campbell@meredith.com

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PLANS

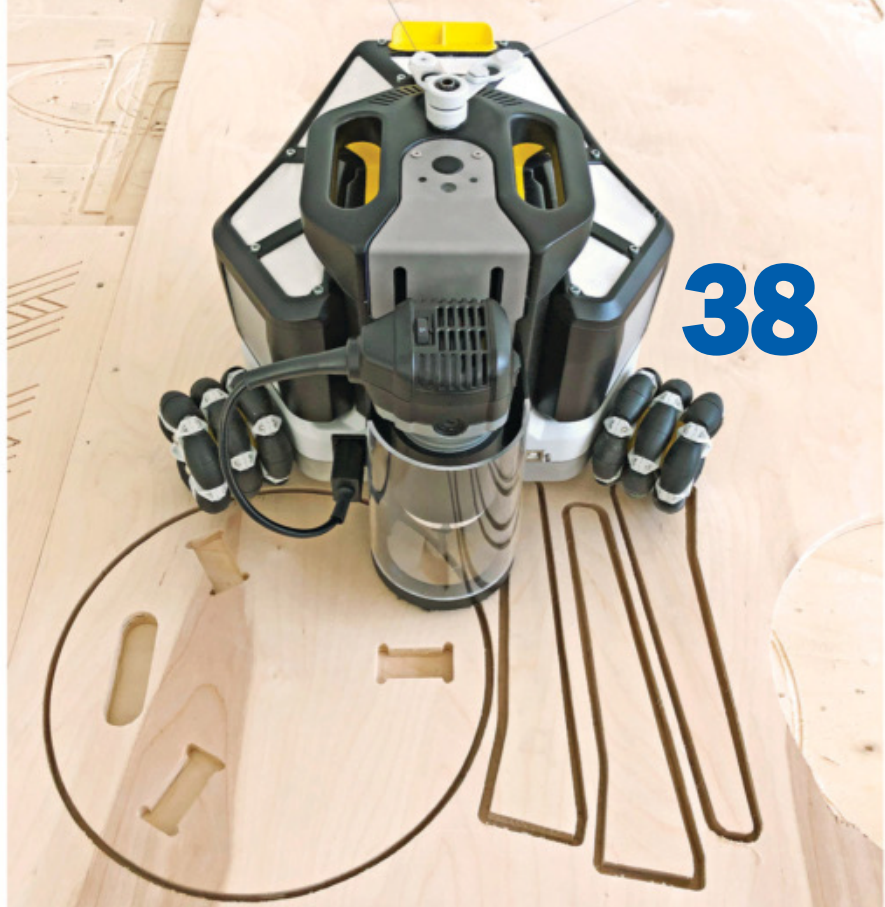
- 24 Ultimate Quilting Center**
Cut, stow, stitch, and sew. It's all here. Designed by quilters for quilters.
- 42 Arts & Crafts Occasional Cabinet**
This tall, trim beauty works in any room, with storage suitable for vintage vinyl.
- 52 Pegs and Jokers Game**
This classic family game makes a great gift. You—and they—won't be sorry!
- 62 Shaker-inspired Woven Bench**
Simple style gives this slender settee timeless appeal.
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Create this graceful gifttable in an evening, thanks to our full-size patterns.

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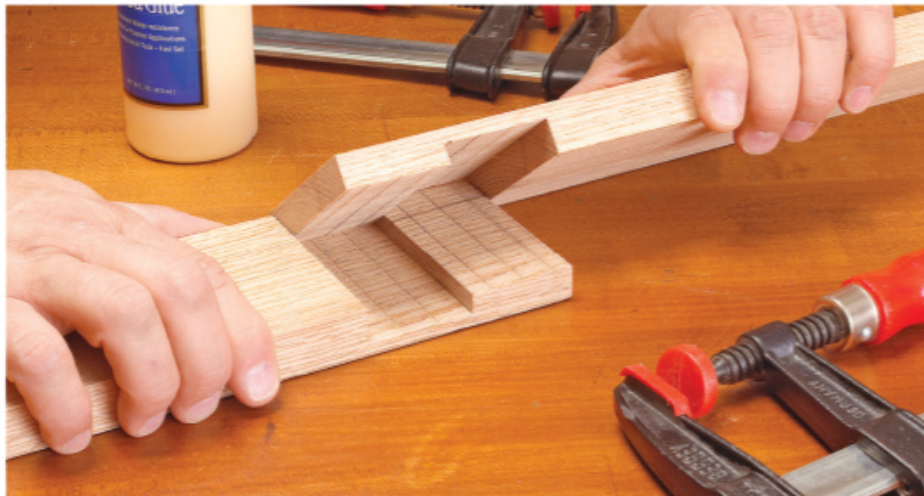
C'mon! Everyone's doing it!

You know what they say: Peer pressure makes diamonds. Or something like that. Anyway, tens of thousands of woodworkers can't be wrong! Follow their lead and check out the most popular articles at woodmagazine.com.

#5 What's the best workbench height?

Short answer: It depends. But we'll give you a rule of thumb to get you started.

woodmagazine.com/ruleofthumb



#4 Working with natural-edge slabs

We show you how to pick 'em, prep 'em, flatten 'em, and finish 'em. woodmagazine.com/naturaledge

#3 Eight strong end-to-end joints

For every apprentice who's been sent off to find the board stretcher. Show the foreman this article and tell him to Google it himself next time. woodmagazine.com/endtoend

#2 Four steps to a perfect poly finish

If you're tired of sloppy results from the old slap-and-slather, this article shows you how to take your polyurethane finish to the next level. woodmagazine.com/perfectpoly



#1 Make cabinets the easy way

And the winner is... cabinetmaking. This article shrinks the intimidation factor of a large project down to piddling proportions. woodmagazine.com/easycabinets



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Half-track adds to a full set

I have built all of the Mil-spec toys you guys have published over the years (woodmagazine.com/milspectoys), and my grandson loves them all. Inspired by those projects, I designed an M5 half-track and a 75mm tow-behind gun, shown above. Please keep up all the great projects. I have been a subscriber since the first issue and look forward to each and every new issue.

—Harry Parfitt, Jr.
Philadelphia

What the “Next 35” list missed

I liked Dave Campbell’s wish list for future woodworkers (“The Next 35”) in issue 263 (October 2019). Please add to the list a dust collector that compresses dust into pellets or cakes to use in a furnace to heat my shop! Shouldn’t be hard to do, right?

—Michael Gaule
New Orleans

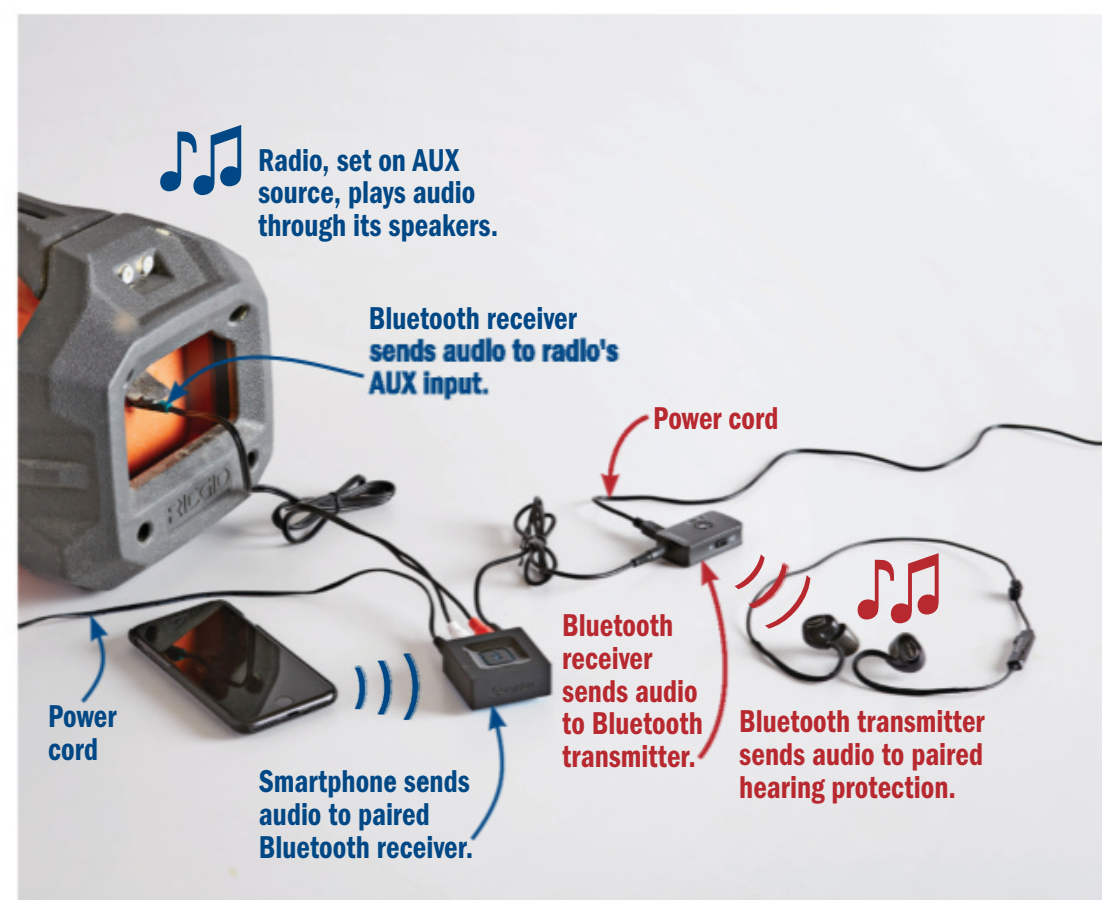
I was amused by many of the items on Dave’s “Next 35” list, but the last item—that shop classes be taught in every high school—really struck home with me. That’s because I was a shop teacher at both the high school and community college levels until I retired in 2001 after 35 years. The community college still offers those courses (albeit at reduced depth and frequency), but they are long gone from the high school. It simply seems that no one wants to get their hands dirty anymore.

—Greg Habas
Georgetown, Texas

One of your wishes for the next 35 years was for smartphones that play music through both the shop stereo and Bluetooth hearing protection at the same time for seamless audio. This is very doable; in fact, I’ve been doing it for quite some time.

I connected an inexpensive Bluetooth receiver to my stereo’s “aux” input, and a Bluetooth transmitter to its “tape out” output. My smartphone pairs to the receiver, and my WorkTunes hearing protection to the transmitter. Music from my smartphone (or any other source connected to the stereo, such as my shop TV) plays through both the hearing protection and from the speakers in my shop.

—Dale Theisen
Wichita, Kansas



Based on your suggestion, Dale, we put together the simple system, shown above, for about \$50. It works well, although there can be a slight audio delay between the speakers and the hearing protection. The Bluetooth receiver we chose eliminates the need for the “tape out” output, so it will work with any shop radio with a standard 3.5mm “aux” input.

To purchase the components we used, visit woodmagazine.com/bluetoothshop or hover your phone’s camera over this smart code (no app required). And if you haven’t yet made the leap to Bluetooth hearing protection, you owe it to yourself check out our top picks, also found on that web page.



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SOUNDING BOARD

YOUR VOICE

Flat spin?

I read with much interest your shop test of jointer/planer combo machines in issue 263 (October 2019). In that article, you seem to be relying on conventional wisdom when you say that “a planer cannot flatten a board without the use of a jig or sled, and a jointer cannot reliably make parallel faces.”

As a fairly advanced woodworker who has created many fine pieces of furniture, I have often successfully produced flat, parallel boards using only a thickness planer. To do that, I always begin by carefully determining which side should be planed first to create a flat surface and remove any imperfections, then turn the board over and plane it to the desired final thickness. What am I missing here?

—Jim Hanna
Franklin, Pa.

We'll give you that one, Jim, as long as the board you're planing has one flat face already. But for anything less, you'll need to face-joint it first. Here's why: When you run a workpiece through a thickness planer, the infeed and outfeed rollers press it down tightly against the machine's bed. So tightly, in fact, that they can press a cupped board flat while it runs under the cutterhead. Once freed of the feed-roller pressure, though, the board relaxes to its cupped state. So, you end up with a thinner cupped board.

Absent that feed-roller pressure, a jointer removes only the “high” spots on a board until repeated passes have removed them all to make a fully flat face on the workpiece. That face may or may not be parallel to its opposite, so running that board (freshly flattened face down) through the planer ensures parallel faces. Learn more at woodmagazine.com/jointplane.



Twisted up in torsion hinges

I am building the Family Treasure Blanket Chest in issue 262 (September 2019), and I have a question: The plan calls for two Lid-Stay torsion hinges, one 40 inch-pound and one 60 inch-pound, but the calculator on Rockler's website tells me I need two 60s and one 30. Per the instructions, I left only two slots in the trim to accommodate the hinges; do I need to cut a slot for a third hinge?

—Jim Lytle
Chambersburg, Pa.

Jim, that calculator is a great tool, and I suspect the manufacturer errs on the side of caution for safety reasons. (If this were a toy chest, we would have used higher-torsion hinges to prevent the lid from slamming down on little fingers.) For this blanket chest, we experimented with different combinations of hinges to get more of a soft-close effect, and we liked the 60/40 mix best. You could probably go with two 60s instead, if you want a little firmer closing action without having to modify the plans.

Kevin Boyle, Senior Design Editor

Sorry, wrong number

On page 70 of issue 264 (November 2019), the correct phone number for Milescraft is 224-227-6930.

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continued on page 8

7



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YOUR PROJECTS



Bill Leet, of Henderson, Nev., painstakingly built this table-tennis tabletop from laminated strips of $\frac{3}{4}$ " Baltic-birch plywood. Plywood ribs on the underside keep the tabletop flat in a torsion-box-like fashion. Bill made the edging and centerlines from black walnut, and the base from steel tubing and angle iron; the "net" he made from faux leather.



During a visit to the Taj Mahal in India, **Mark Abbott**, of Spring, Texas, bought a piece of marble inlaid with semiprecious stones in the same manner as the mausoleum. When he got back, he designed this mahogany table, complete with LED underlighting that shines through the marble and stones, creating a stained-glass effect.



Every time **Thad Edmonds**, of Dunlap, Ill., traveled for work, he bought his wife a piece of crystal, which eventually necessitated that he design and build this maple corner curio to store the collection and other family keepsakes.



The maple-slab top of this portable wine table, built by **Bobbie Ashton**, of East Haven, Conn., connects to its cedar base with a hinge for easy storage and transport.



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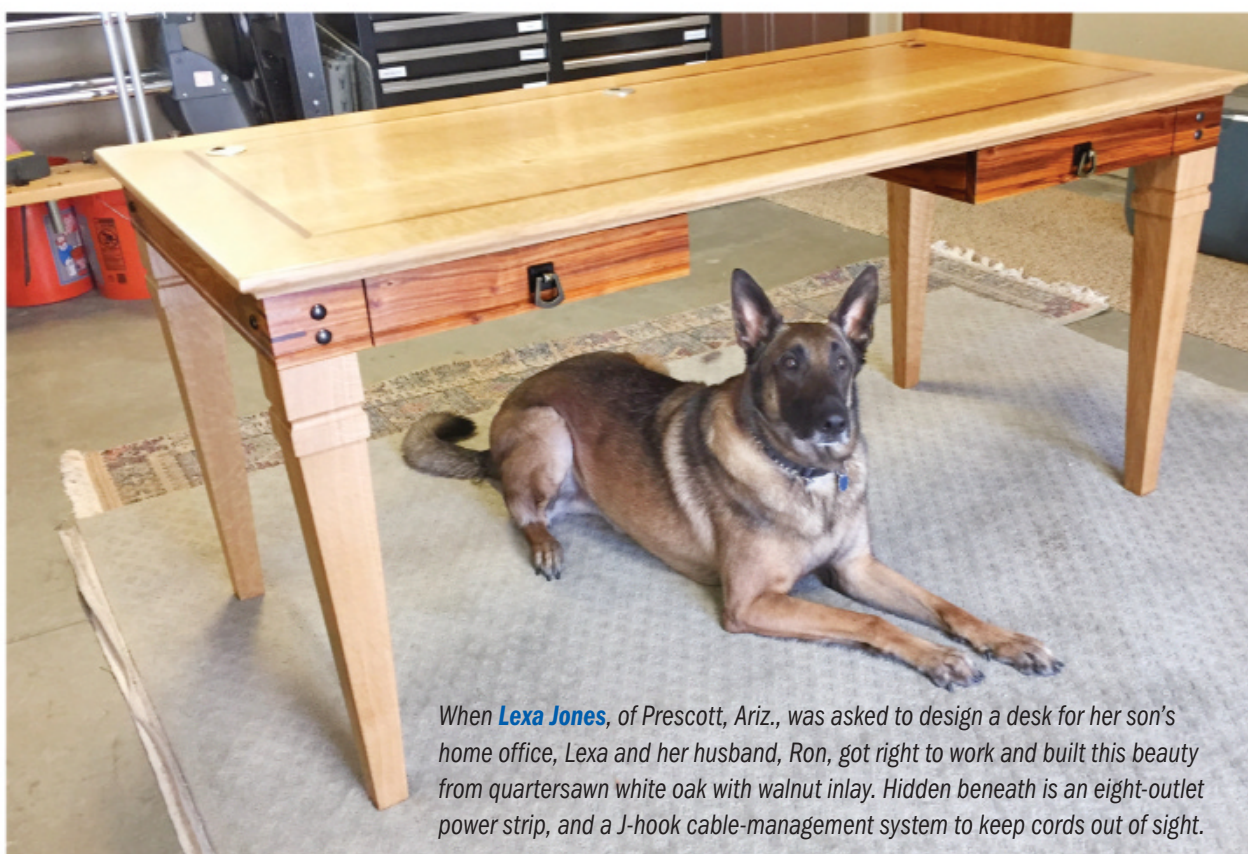
Ken Azevedo, of Reno, Nev., divided his spare time between building a street rod and crafting this nursery set for his grandson. He hopes to complete the car by the time his grandson is old enough to drive it.



This quartersawn-oak wall clock, built by **Jeff Vicenzi**, of Bloomington, Ind., features a clock face made of curly ash, mahogany, and rosewood veneers, and a curly-maple pendulum.

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.



When **Lexa Jones**, of Prescott, Ariz., was asked to design a desk for her son's home office, Lexa and her husband, Ron, got right to work and built this beauty from quartersawn white oak with walnut inlay. Hidden beneath is an eight-outlet power strip, and a J-hook cable-management system to keep cords out of sight.



This miniature 1932 Ford, built by **Bill Proctor**, of Chocowinity, N.C., is powered by a 48-volt electric motor. It sports rack-and-pinion steering and hydraulic disc brakes. And, of course, it's cherry. 🌳



Cat Pen Kit Steampump Pen Kit Bolt Action Pen Kit DuraClick EDC Pen Kit



Aromatherapy
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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

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3 Steampump Pen Kit Starter Set

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3 Bolt Action Pen Kit Starter Set

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5 Aromatherapy Necklace Kit Starter Set

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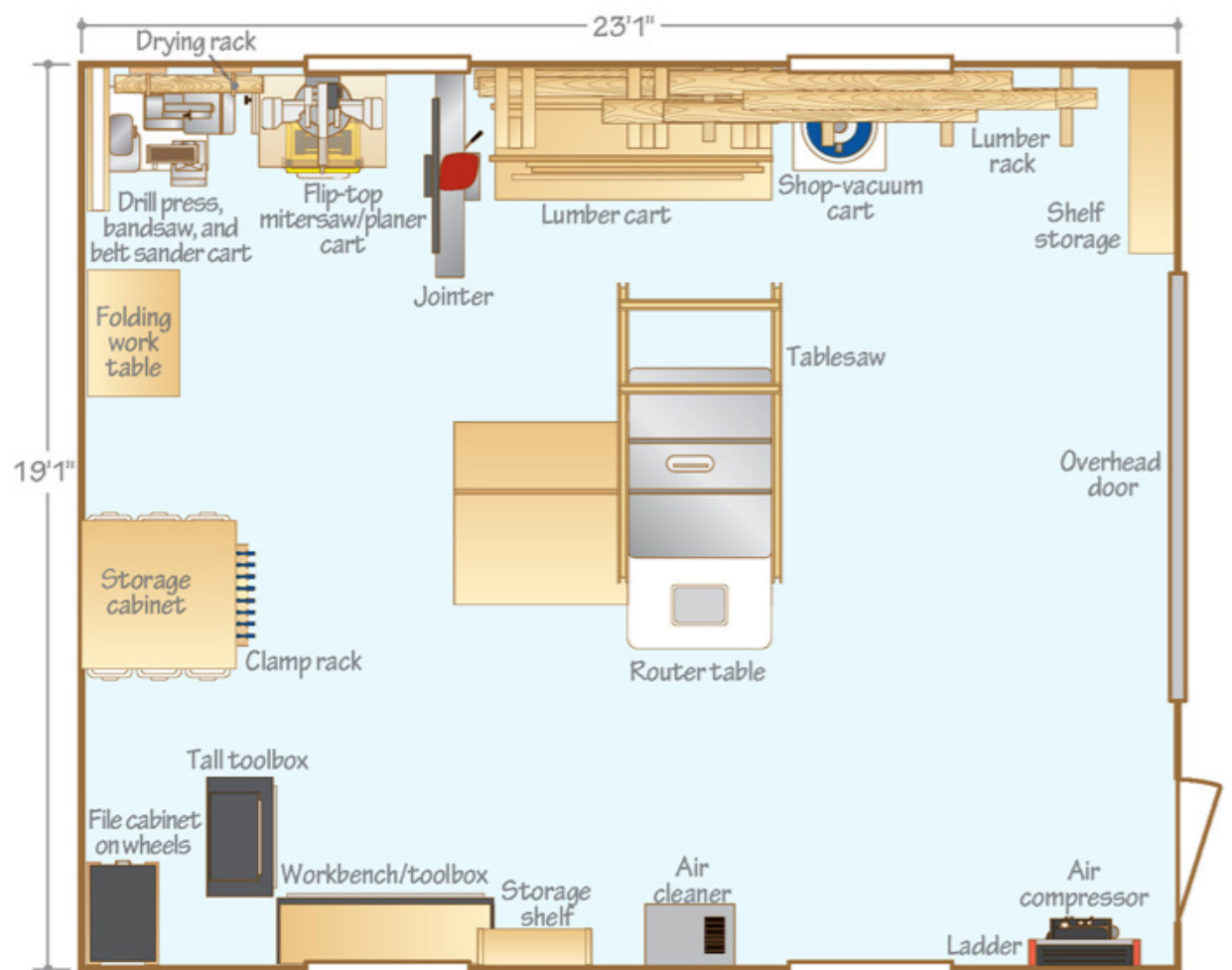
Winds of Change

Wall storage and mobile tool bases provide flexibility for working on projects and future storage needs. John says, "Mobile tools allow me to easily create room for awkward cuts or assembly."

When a tree fell and demolished John Gunter's detached-garage workshop, he viewed it as an opportunity to rebuild the shop to his specifications. He hired four Amish builders who had the new structure up and under a roof in eight hours. John insulated the walls and sheathed the interior with ½" oriented strand board (OSB) to provide solid anchoring for wall storage without having to hunt for wall studs.

Once the walls were in place, John says he got a little stressed coming up with a layout for his shop. He didn't want a fixed solution. "I took a page from lean manufacturing concepts and decided to put everything on wheels or on the wall," he says.

To save space, John consolidated tools on mobile stands. For example, his mitersaw and benchtop planer occupy opposite sides of a flip-top cart. Likewise, his drill press, 10" bandsaw, and belt/disc sander share a mobile cabinet. The jointer, and a metal file cabinet in which John stores his circular



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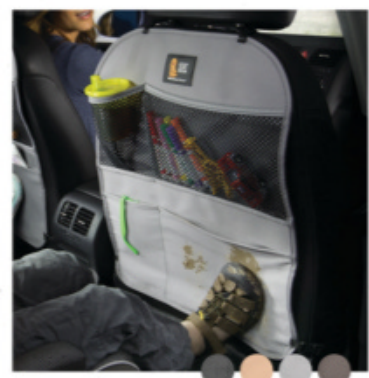


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YOUR SHOP



John Gunter's original detached garage workshop was destroyed by a tree during a wind storm (inset). He rebuilt on the existing foundation.



The centerpiece of the shop is this mobile tablesaw and router-table workstation. John designed it for plenty of support for large workpieces and lots of storage. The outfeed table is a torsion box assembly.



Consolidating tools on a mobile cart saves John a lot of floorspace. Plus, he can move the tools into the driveway when the weather is nice.

saw, drills, and routers, stand alone on plywood bases with locking swivel casters.

John designed and built a portable dust-collection cart that houses his shop vacuum and a Dust Deputy separator atop a 5-gallon bucket. To keep project lumber close at hand,



John designed this 6'-tall storage cabinet to fit a collection of plastic tubs and trays. A center divider allows for access to shelves on both sides.

he also built a rolling lumber rack. Compartments in a dual-sided storage cabinet hold plastic parts bins, trays, and tubs, while clamps and levels hang on the side of the cabinet. And, of course, it's on casters, too.

SOUNDING BOARD

YOUR SHOP



John designed this hinged 81x36" work table for sanding and project assembly. When folded for storage (below right), it occupies just a 36x30" area.

For final project assembly, John rigged up a folding work table on a mobile cabinet. A pair of strap hinges allow him to flip the top vertically for storage, maximizing floorspace.

Looking around John's shop, you can see he's already taken advantage of his new surroundings. And there's still plenty of wall and floor space to allow him flexibility and growth in his woodworking future. 🌱



John Gunter's first memorable woodworking experience nearly deafened his new bride and the neighbors when he fired up a router in a one-bedroom apartment. Retired after 39 years as a mechanical engineer, he enjoys building projects for family and friends.

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Q **Infested wood really bugs me**
I recently noticed small mounds of wood dust surrounding surface holes in a pile of air-dried lumber, telltale signs that insects have staked their claim. What can I do to get rid of the bugs and salvage the wood?

—Scott Hartung, Kennewick, Wash.

A You have three options to put the kibosh on those invaders, Scott. If you do nothing, the bugs will continue to bore holes and leave debris for years to come.

Option 1: Discard or burn the wood. That may seem like a waste, but after you consider the time/expense of the next two options, it might be your best choice. Just don't bring the wood into your home, where the bugs could spread to your trim, cabinets, and furniture!

Option 2: Kill the bugs with heat, known as sterilization in the lumber trade, by stacking the boards in a hot kiln. Your local kiln operator may not welcome buggy wood into his kiln, so you may have to build a heated enclosure with fans for air movement.

To kill all of the bugs, the center of the wood must heat to at least 133°F for 30 minutes. To achieve that with 1"-thick boards, the kiln would have to hold at 150–160° for about an hour, but two hours would be safer. Wood thickness greatly affects heating time: a 6×6 beam would require at least five hours in such a kiln. How you stack the wood, air circulation, and species also affect sterilization time, so err on the wood being in the kiln longer than necessary.

Option 3: Apply a borate chemical treatment such as Bora-Care (\$80–100 per gallon) that you dilute with water; or Tim-bor, a granular product that dissolves in water (\$15 for 1.5 pounds). Keep in mind those chemicals will reinfuse the wood with moisture, meaning you'll have to dry it again. And, once you've done that, the chemically treated wood must be handled as a hazardous material: Don't work with it indoors, wear a good respirator when machining it, wash your hands after touching it, and dispose of sawdust and other debris properly. Don't burn the scraps or use the sawdust as bedding, mulch, or compost.

Of course, prevention is the best medicine. Buying wood that has been heat sterilized in a kiln should preclude the possibility of bugs being present. If you mill and air-dry your own lumber, remember that bugs love damp wood. So avoid logs that have been sitting on moist ground for more than a few days, or any logs that show even the tiniest of bug holes. Stack the boards to dry immediately after they come off the sawmill. 🌲



Tiny holes and dust piles indicate the presence of wood-boring insects such as powder-post beetles. Saturating the wood with a borate treatment, such as Tim-bor or Bora-Care, should kill the bugs.



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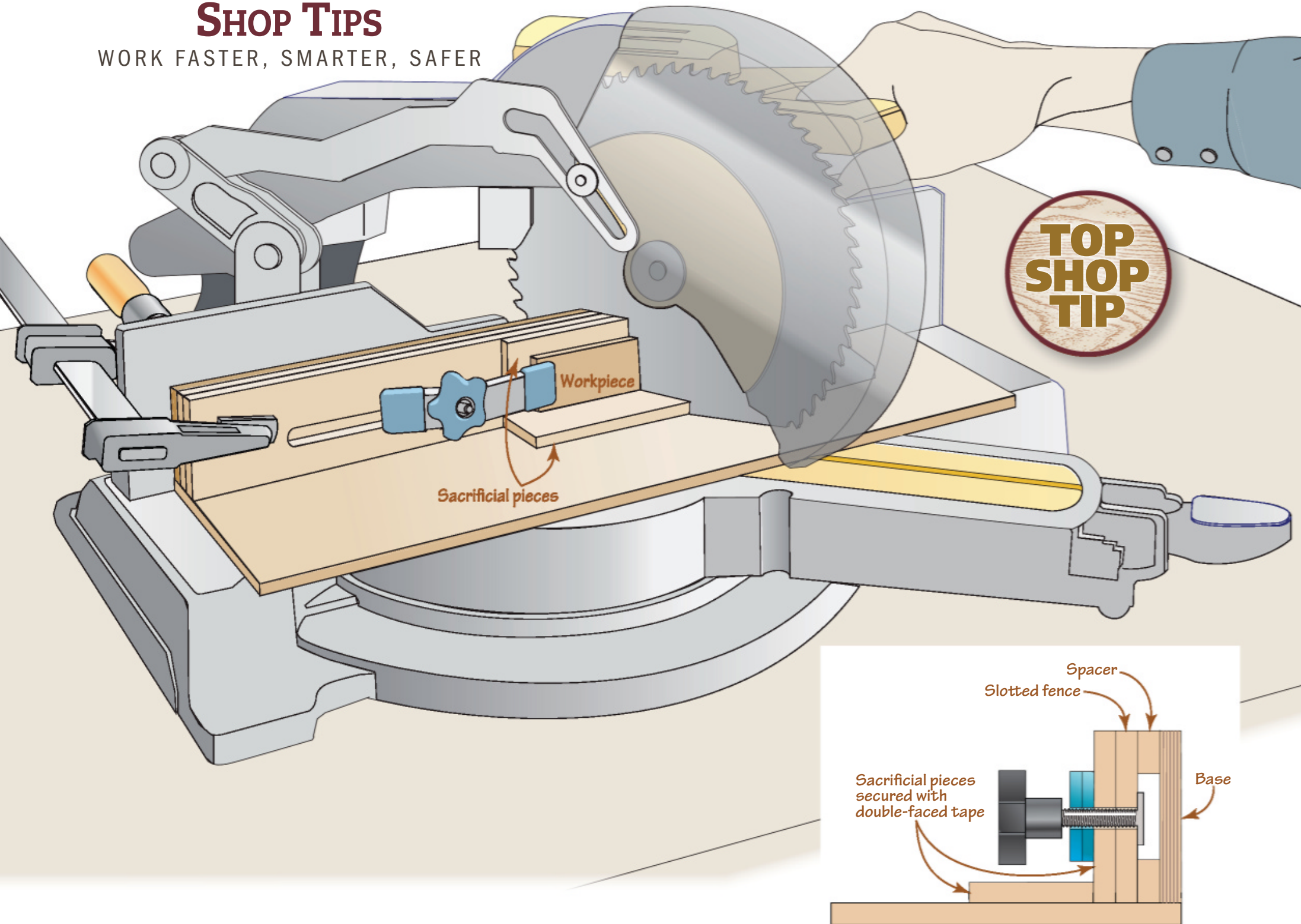


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SHOP TIPS

WORK FASTER, SMARTER, SAFER



Safely cut small pieces on your miter saw

Miter saw hold-downs keep your hand well away from the blade while holding the workpiece rock-steady for smooth cuts. But for pieces too short to reach the hold-down, I came up with this simple jig for securing pieces as short as 1/2".

Build your own using 1/4" MDF for everything except the 1/4" plywood back. Make the bottom piece wide enough that your saw

never cuts completely through it. Note that smaller jig pieces which the workpiece rests against are sacrificial scraps that provide a zero-clearance base and fence.

Hold the jig to the saw, using a clamp or the machine's hold-down. You can purchase a hold-down for the workpiece from a number of sources. I purchased a mini version from Rockler (item 45692, rockler.com).

—Fred Nowak, Liberty, S.C.

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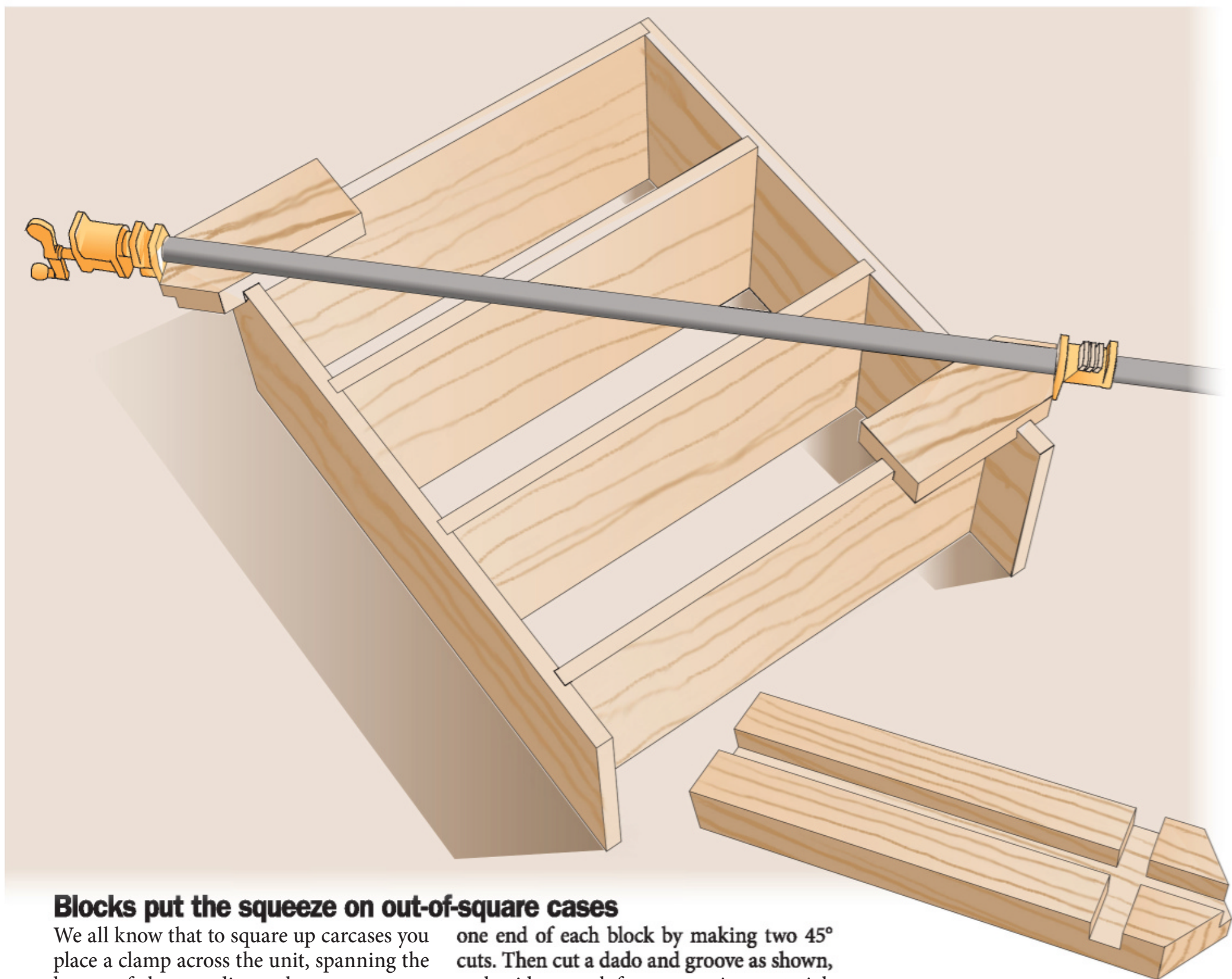
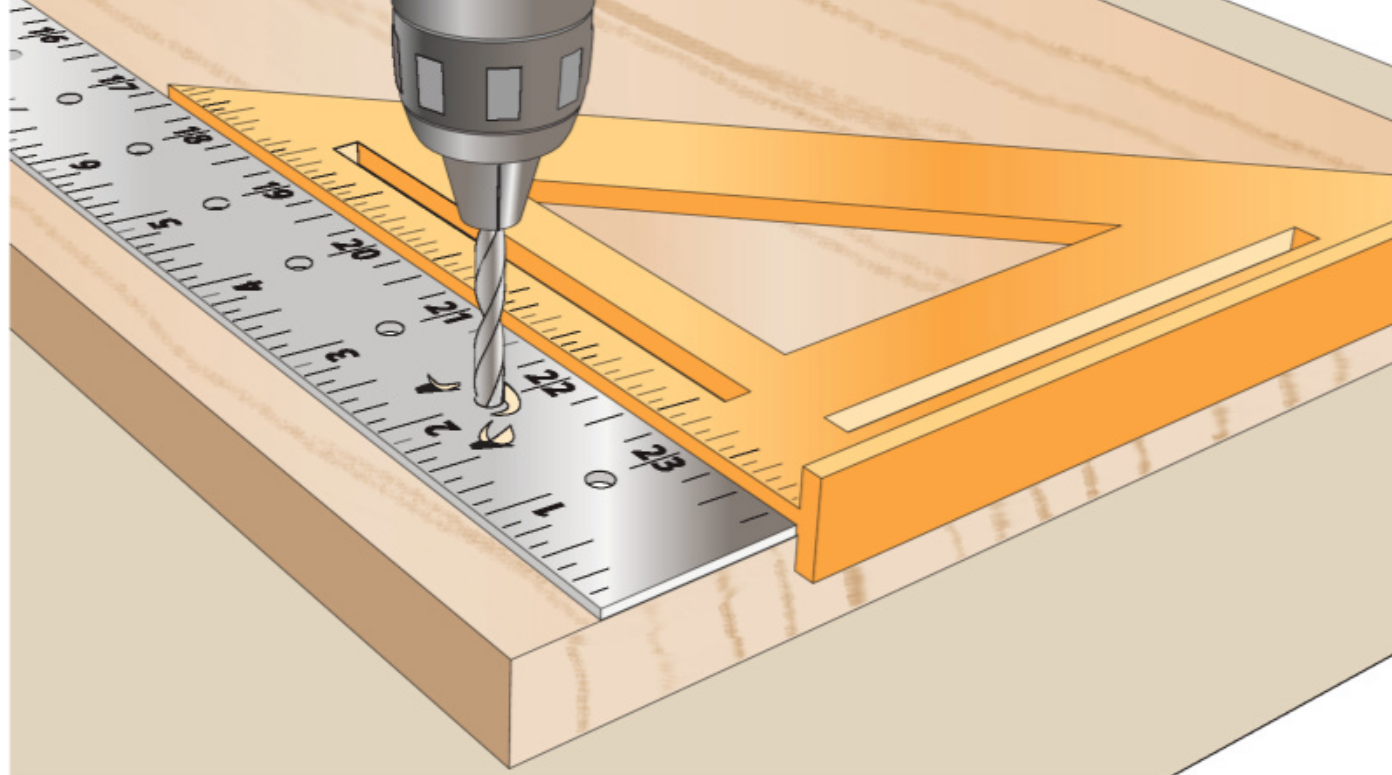
SHOP TIPS

This hole-spacing jig RULES

Like many others, I used to use pegboard to drill spaced holes in cabinet sides for shelf pins. But I never liked how the drill bit would wallow out the pegboard holes, so I made my own drilling jig from a durable aluminum rule. Using a fence at the drill press, make the jig by drilling a straight line of $\frac{1}{4}$ " holes at every inch mark on the rule.

To drill shelf-pin holes, simply tape the rule to the workpiece and have at it. The rule still works as well as ever at its usual tasks.

—Roger Mickelson, Mesa, Ariz.



Blocks put the squeeze on out-of-square cases

We all know that to square up carcasses you place a clamp across the unit, spanning the longer of the two diagonal measurements. Sometimes that's easier said than done because the clamp doesn't stay put.

To assist matters, make a pair of 2x4 clamping blocks. Form an arrowhead on

one end of each block by making two 45° cuts. Then cut a dado and groove as shown, each wide enough for your project material, and about $\frac{3}{4}$ " deep. Place the blocks and clamp as shown to controllably draw the carcass into square.

—Ed Swakon, West Linn, Ore.

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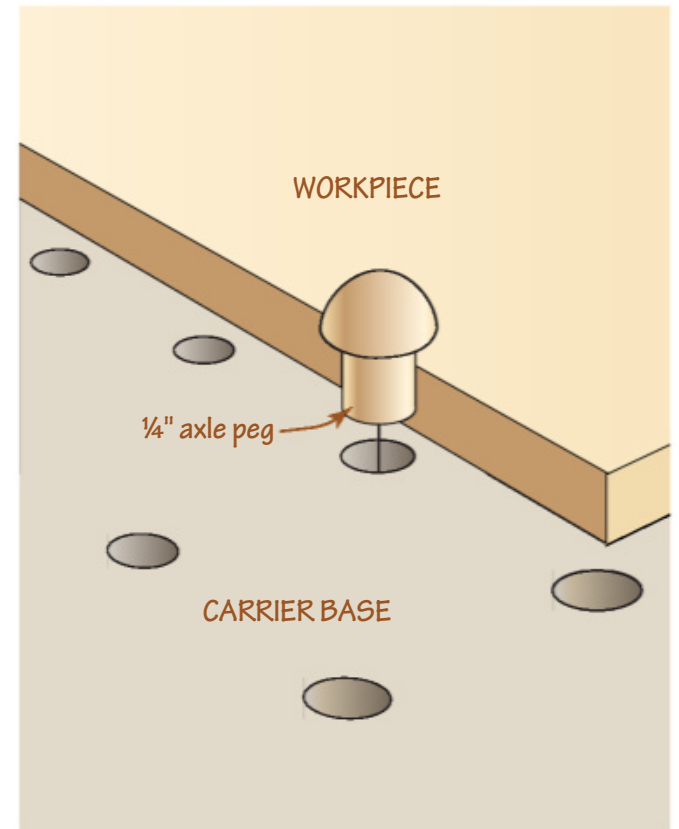
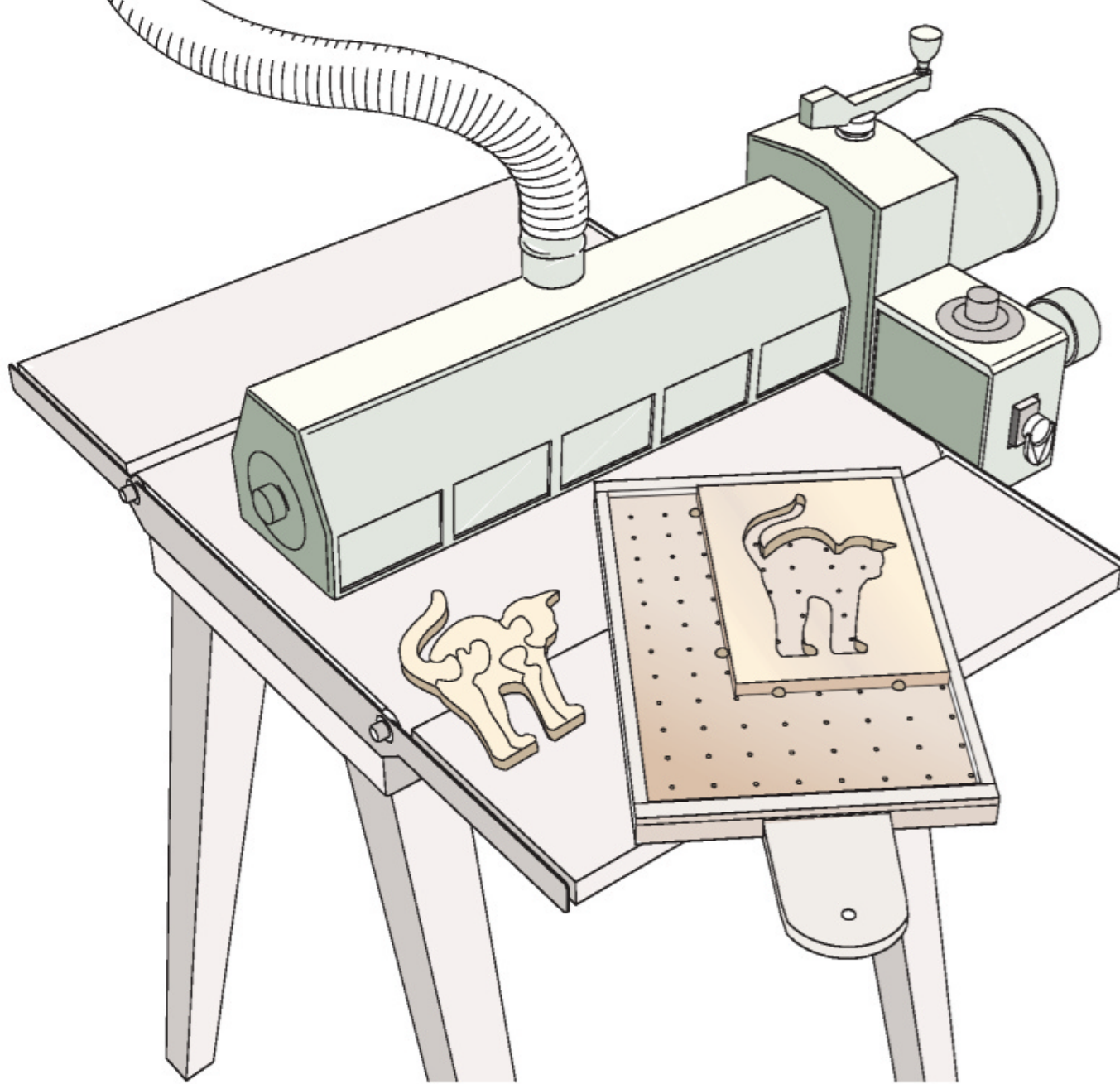
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Secure thin pieces for a trip through the planer or drum sander

My granddaughter and I make lots of scroll-sawn puzzles. To aid in thinning the frame surrounding the puzzle, I came up with a simple carrier board for safely sending it through the planer or sander.

Make the carrier base from $\frac{3}{4}$ " MDF as long and wide as you need (mine measures 13×34"). Edge the base with $\frac{1}{4}$ × $\frac{1}{2}$ " hardwood or MDF strips that serve as workpiece stops. In the base drill a grid of $\frac{1}{4}$ " holes as closely

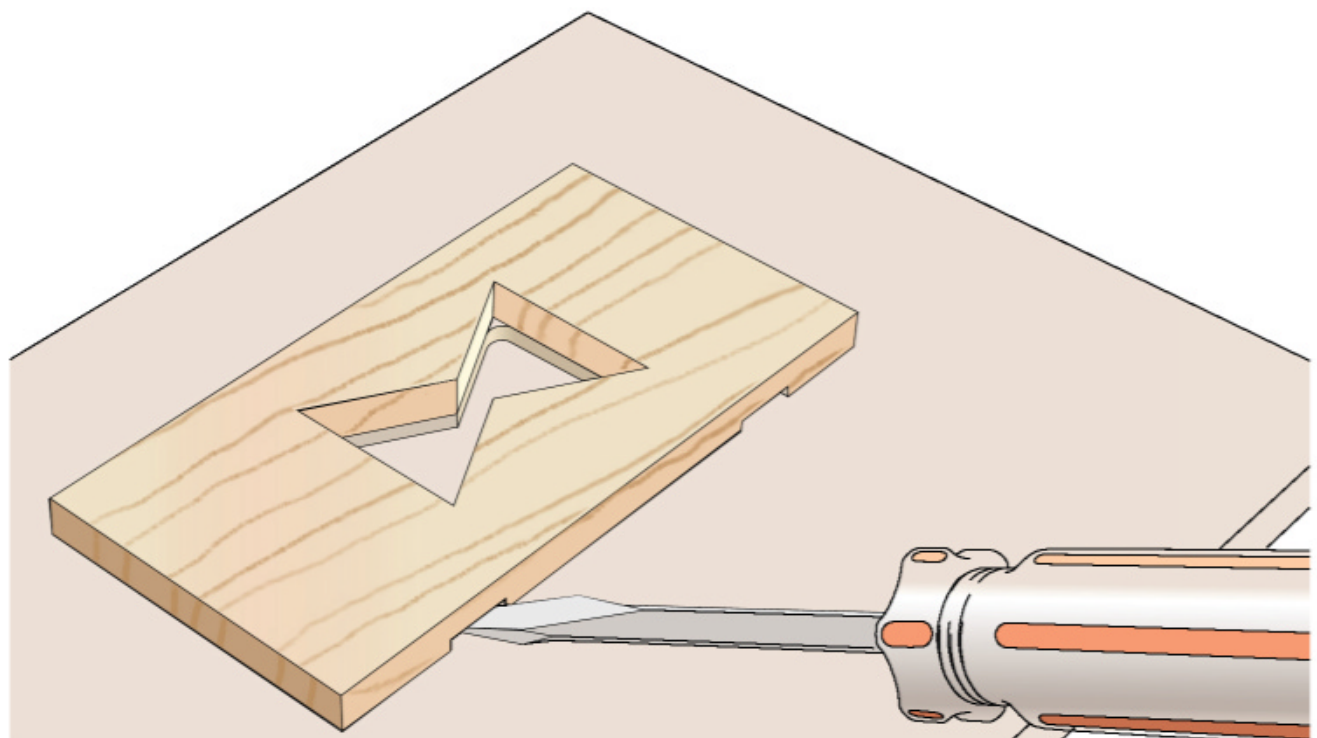
spaced as your project(s) require. Apply a clear glossy finish to the base to make it easier to release any workpieces you secure with double-faced tape. After applying the tape, I "pin" the workpiece in place using $\frac{1}{4}$ " wood wheel axle pegs cut to just under $\frac{3}{4}$ " long. Using this carrier I've never had a piece come loose in the planer or sander.

—Louis Goaziou, Taylor, Ariz.

Prepare for proper prying

I use a lot of templates and specialized fences for box-making, all of them secured with double-faced tape. I used to pry them up with a putty knife or chisel, until hitting upon a better idea. Now, I rout a small shallow recess or two along an edge of the fence or template for easy prying with a screwdriver. Just be careful not to damage any workpiece surfaces—it helps to use the screwdriver handle as a fulcrum instead of the screwdriver tip. Or place a thin wooden pad at the fulcrum point to provide protection.

—Bob Hunter, WOOD® Magazine



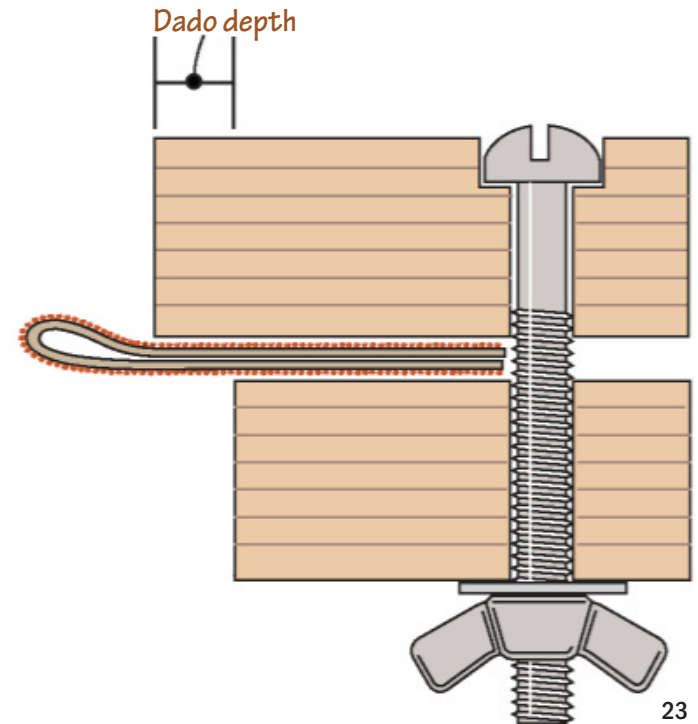
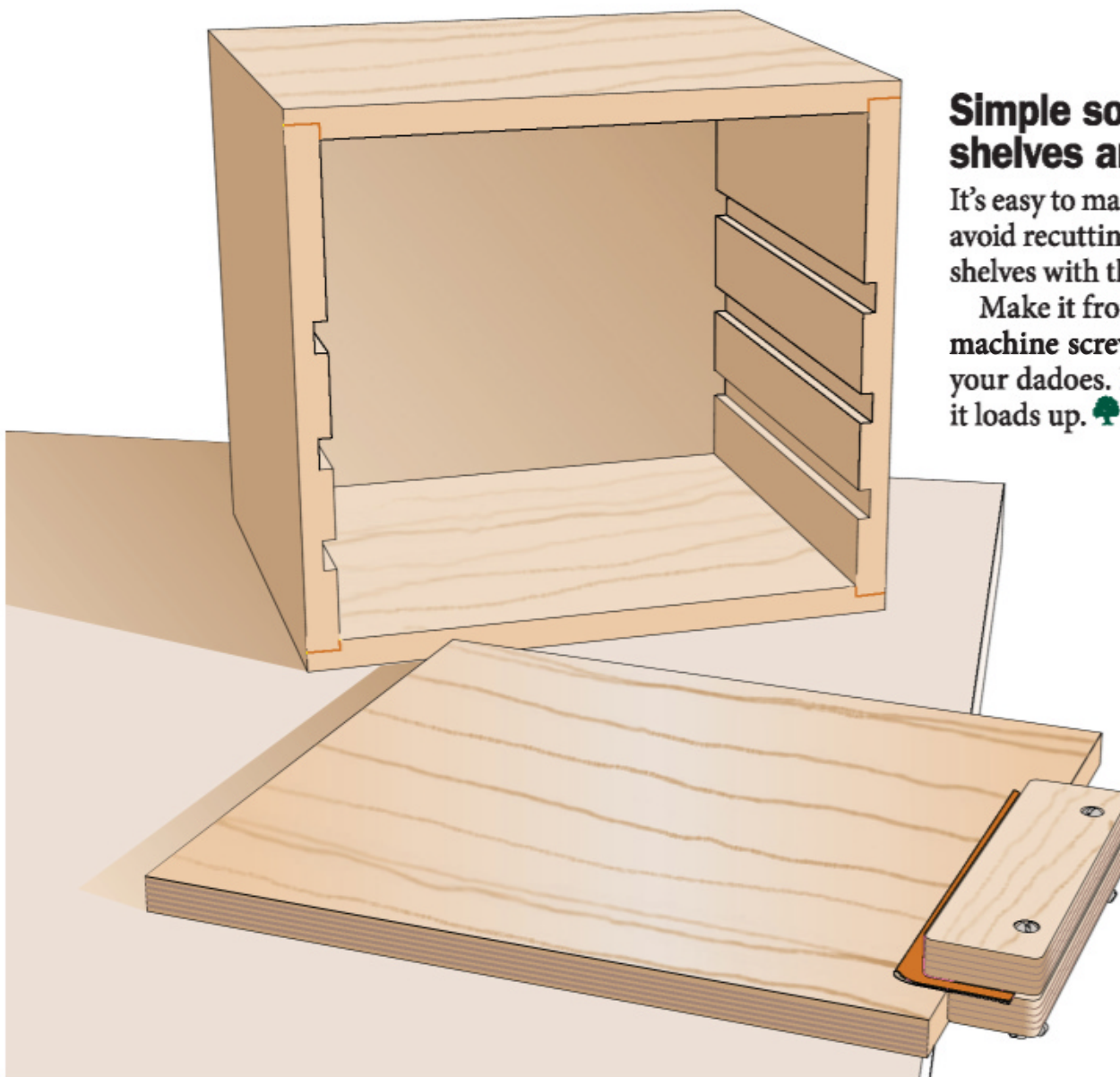
SHOP TIPS

Simple solution for well-fitted shelves and dados

It's easy to machine shelves and dados that fit just a bit too tight. To avoid recutting either part of the joint, I simply sand the ends of the shelves with this handy block.

Make it from two pieces of $\frac{3}{4}$ " hardwood held together with two machine screws and wing nuts. Offset the pieces by the depth of your dados. Loosen the wing nuts and flip over the sandpaper as it loads up. 🌲

—Merle Riesgaard, Conroe, Texas



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SEWING STATION DIMENSIONS:
60" W x 52 1/8" D x 28" H

Approximate
materials cost:
\$700

21.7
sq. ft. tabletop

6
full-extension
drawers

Edge-banded plywood panels, biscuits, and a handful of pocket screws make these sturdy and attractive workstations easy to build. Both projects share similarly constructed, though differently sized, pedestals and tabletops. The sewing-station pedestals have drawers, while the cutting-table pedestals have shelves. And though the steps that follow apply to both

projects and the pedestals share many of the same part letters, you'll find separate materials lists because of the varying sizes for parts with the same letters. Should you wish to build only the cutting table, check out **"Create the cutting table"** on *page 30* to learn how that project differs from the sewing station.



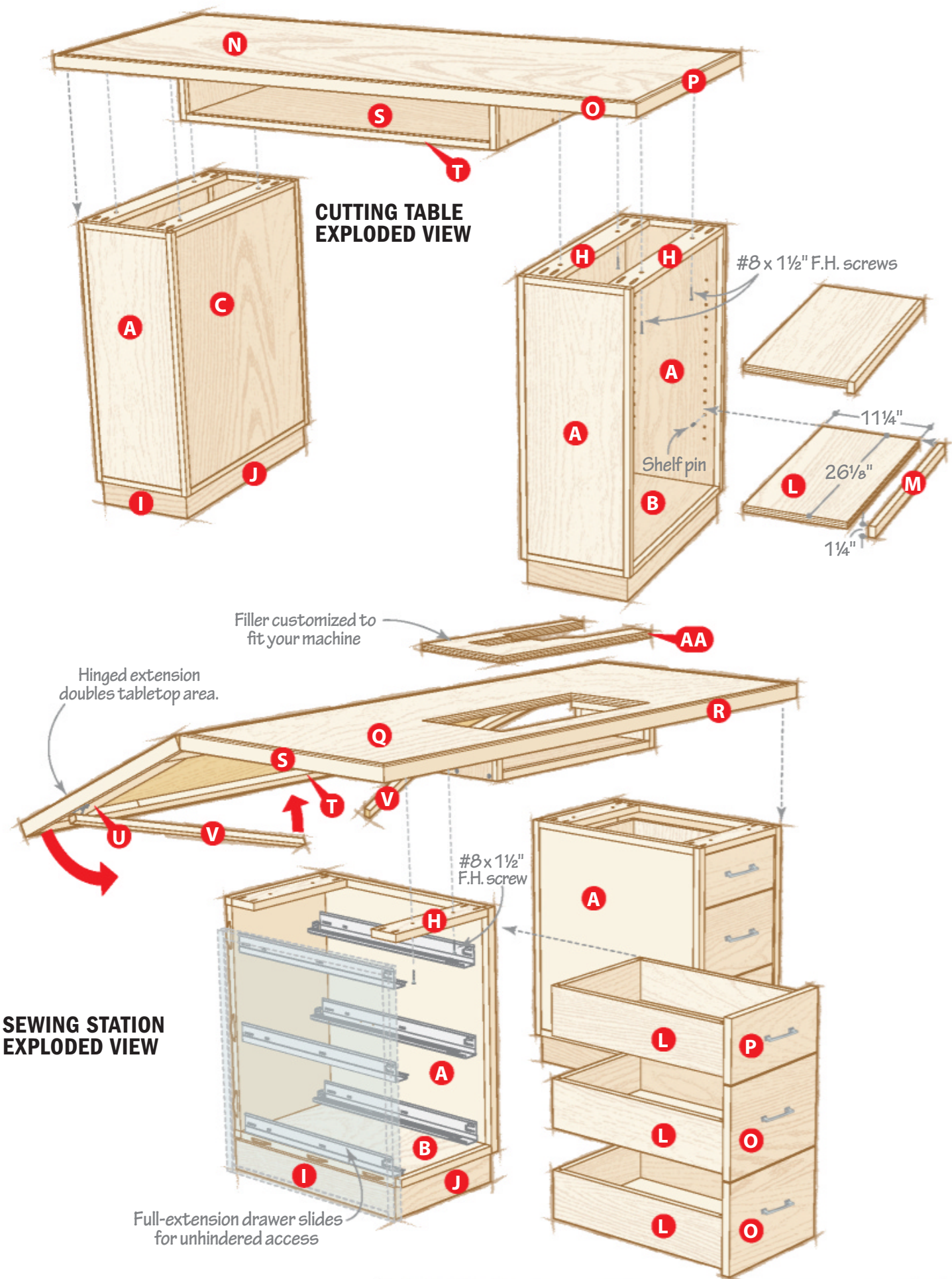
CUTTING TABLE DIMENSIONS:
72" W x 30" D x 37" H

Approximate materials cost:

\$440

15
sq. ft. tabletop

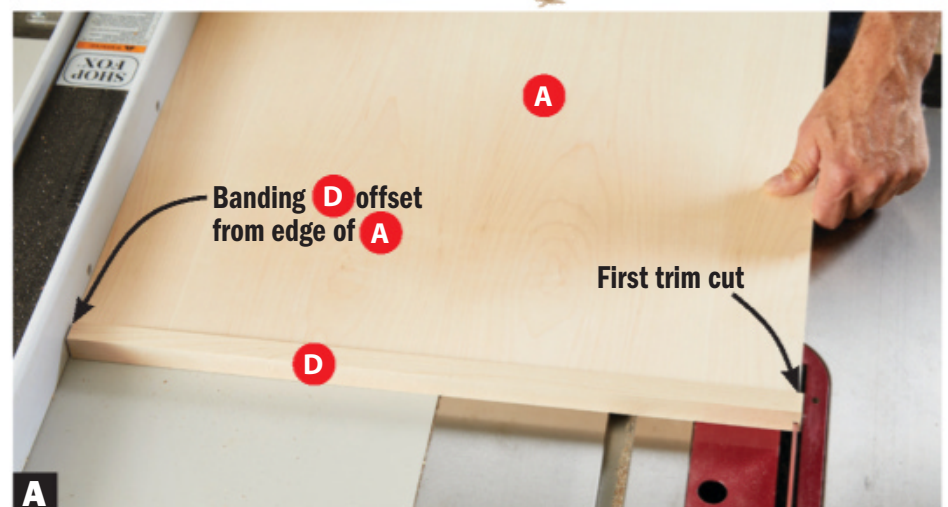
16
linear ft. shelf storage



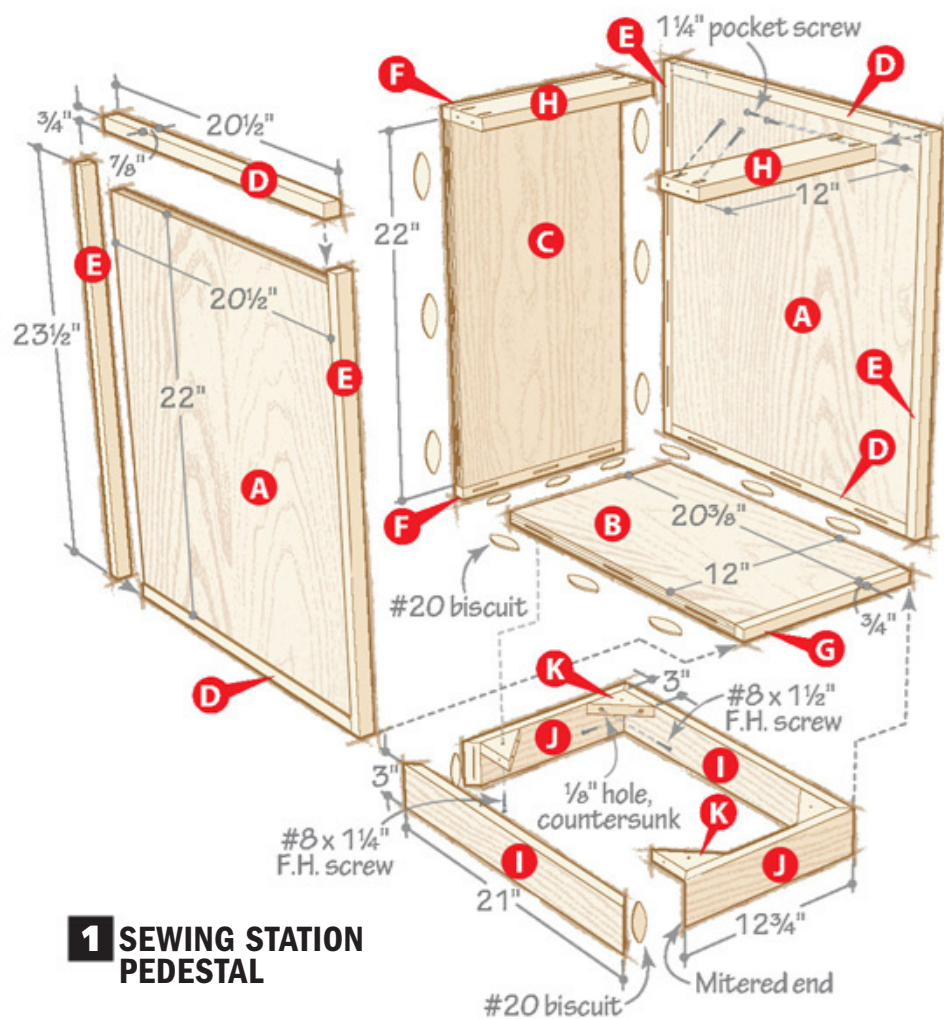
Let's start with two pedestals for the sewing station

1 Cut the side, bottom, and back panels (A-C) to the lengths and 1/2" wider than listed [Sewing Station Materials List, Drawing 1], and the banding (D-G) 1/2" longer than listed. Finish-sand the parts.

2 Glue the horizontal banding (D) to the side panels, flush with the inside faces and with the ends of both bands offset from one panel edge [Drawing 1, Photo A]. Trim the panels and bands to finished width. Glue the vertical banding (E) to the panels, flush at one end and overhanging the other. Trim the overhanging ends on the tablesaw.



Trim the overhanging end of the banding (D) and the panel (A) edge flush, then rotate the panel 180° and cut the panel and banding to finished width.



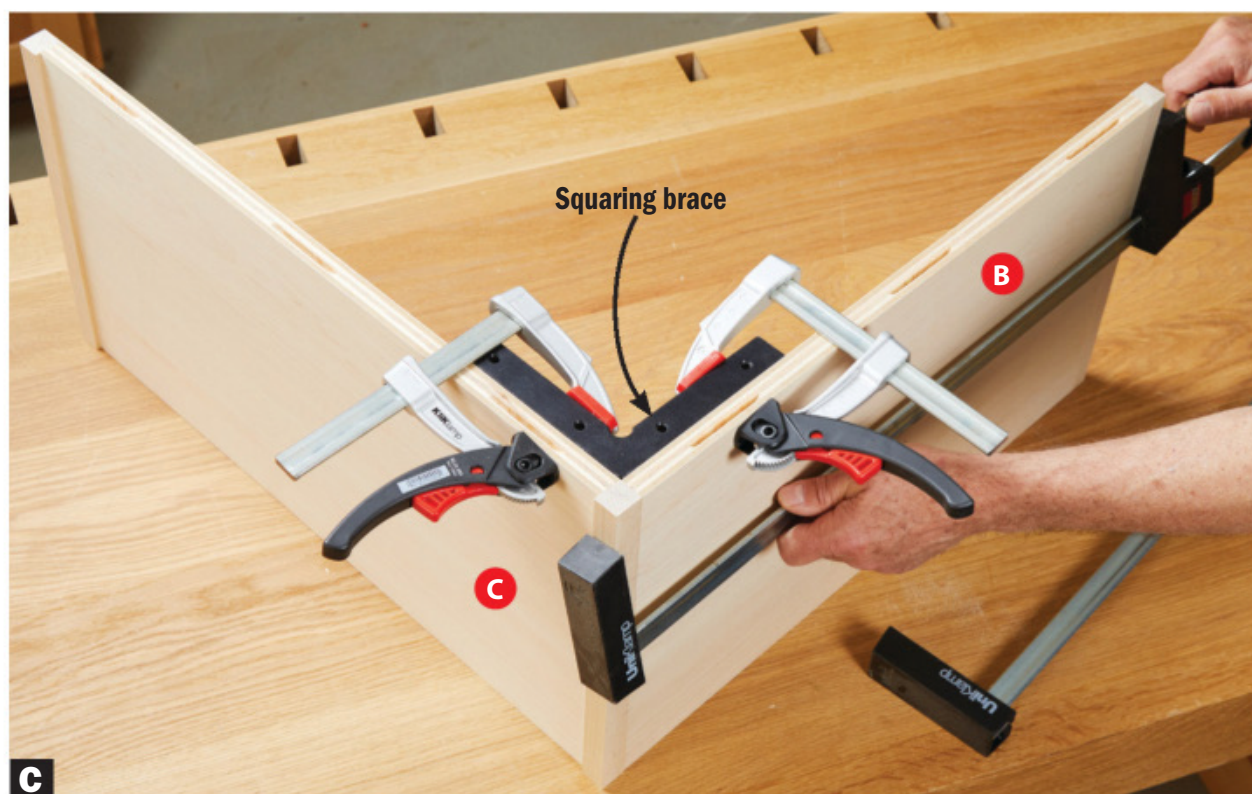
1 SEWING STATION PEDESTAL

3 Glue bandings F and G to the back and bottom panels just as you applied the horizontal bandings. Trim the backs and bottoms to finished size.

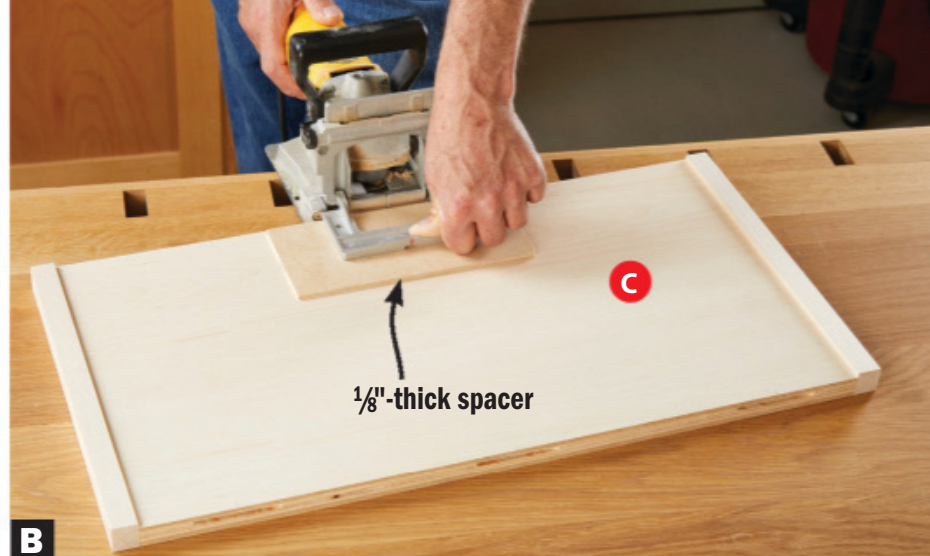
4 Adjust your biscuit joiner to center the blade $\frac{3}{8}$ " below the fence. Cut biscuit slots in the horizontal, vertical, and back banding (D, E, F), and edges and one end of each bottom panel (B) [Drawing 1]. With the same setting, offset the biscuit joiner and cut the slots in the edges of the backs (C) [Photo B].

5 Cut the stretchers (H) and drill pocket holes. Assemble the backs and bottoms [Photo C], add the sides, and then pocket-screw the stretchers in place.

► Make your own squaring braces.
woodmagazine.com/braces



C Glue and biscuit the bottoms to the backs, using a squaring brace to align the parts.



B Cut biscuit slots in the backs, placing a spacer under the biscuit joiner to maintain the $\frac{1}{8}$ " panel reveal.

6 Cut the base sides, fronts, and backs (I, J), miter the ends, and cut biscuit slots. Cut the corner blocks (K). Glue and clamp together the base frames. Glue and screw the corner blocks in place. Finish-sand the bases. Center the bases on the bottoms of the pedestals and screw them in place.

Delve into the drawers

1 Cut the drawer sides, fronts, and backs (L, M) [Drawing 2]. Cut the dados, rabbets, and grooves. Finish-sand the parts. Cut and finish-sand the drawer bottoms (N). Glue and clamp the drawers, making sure they dry square and flat.

2 Notch and drill the drawer backs for the drawer slides [Drawing 2a; Sources, page 29]. Attach the front mounting clips to the drawers, following the instructions provided with the drawer slides.

3 Cut a $16\frac{7}{8}$ "-tall spacer and install the upper drawer slides in the pedestals [Photo D]. Trim the spacer to $8\frac{3}{4}$ " and install



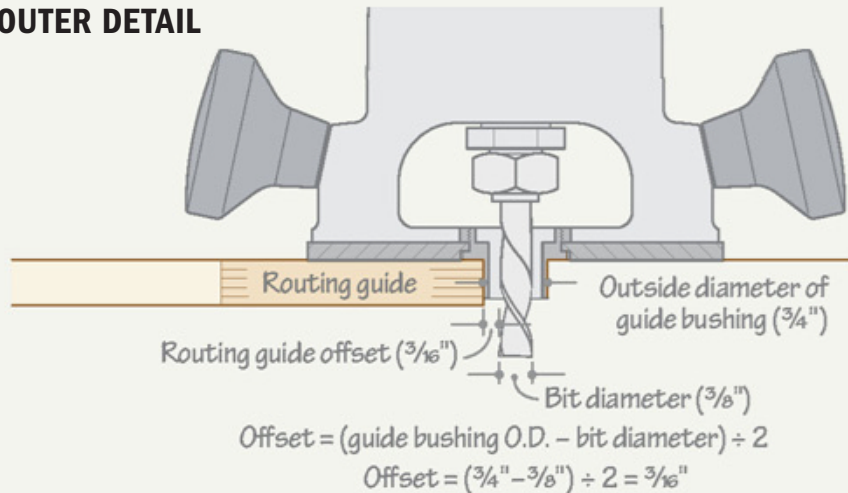
D Rest the upper slides on a spacer, position them 1" back from the pedestal front edge, and screw them in place.

SKILL BUILDER

Pattern-routing with guide bushings

Using pattern bits with top-mounted guide bearings, you can position a routing guide directly on a cutline. So why use a guide bushing that requires you to offset the routing guide from a cutline? Most pattern bits have straight cutters and fixed cutting lengths requiring coordination of routing-guide thickness and cutter length to achieve the desired depth of cut. You'll find that you need one bit for forming shallow mortises and

4 ROUTER DETAIL



6 Cut the platform and risers panel (W) and banding (X). Glue the banding to the panel edges and finish-sand the assembly. Crosscut a 26"-long platform from the assembly [Drawing 3]. Place the sewing machine on a flat surface and measure the height of the machine bed. From the platform cutoff, cut two risers to this dimension plus 3/4". Glue and screw the risers to the ends of the platform.

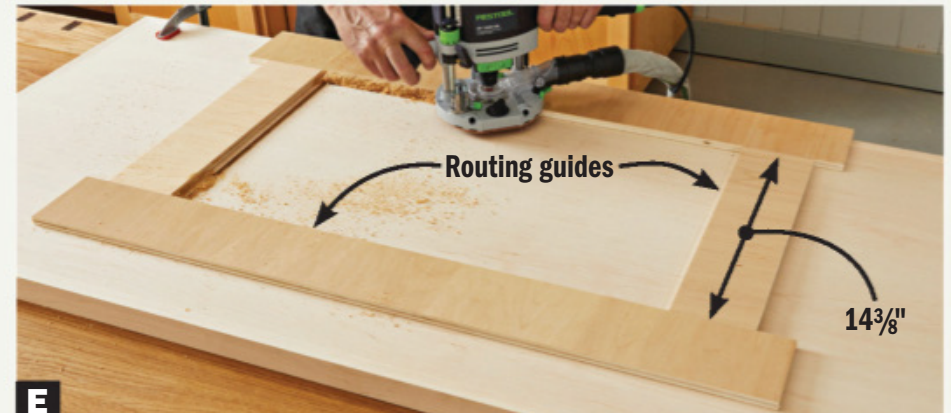
7 Cut the riser cleats (Y), and glue and screw them to the risers [Drawings 3, 3a]. Cut the filler supports (Z) and glue them to the risers. Set the platform assembly aside.

Form the filler

1 Cut a piece of cardboard to fit the tabletop opening. Position your sewing machine in the opening and use the card-

another for through-cutting. Using a guide bushing allows you to vary cutting depth simply by adjusting the router up or down. You'll also be able to select a spiral bit for smoother cutting and different diameter bits for larger or smaller inside-corner radii.

To form the sewing-machine opening in the tabletop, install a 3/4" guide bushing and a 3/8" upcut spiral bit in your router. From 1/2" plywood, cut two 4x34" and two 4x14 3/8" routing guides. Attach the guides to the tabletop with double-faced tape 3/16" outside the layout lines [Drawing 4] and form the opening [Photo E].



E Rout the machine opening in multiple 1/8"-deep passes using routing guides secured to the tabletop with double-faced-tape.

board to make a pattern for the filler (AA), custom-fit to your machine [Photos F and G].

2 Cut the filler opening in the cardboard pattern using a utility knife, increasing the size of the opening by 1/16" all around. Check the fit on the machine.

3 Cut the filler (AA) and round the corners to match the tabletop opening. The filler should fit in the opening without binding. Using the cardboard pattern, trace the opening onto the filler. Rout the opening with the guide bushing, spiral bit, and routing guides in the same manner as you formed the tabletop opening.

4 Retrieve the platform assembly, align it with the machine opening, and drive screws through the riser cleats and into the tabletop [Drawing 3a].



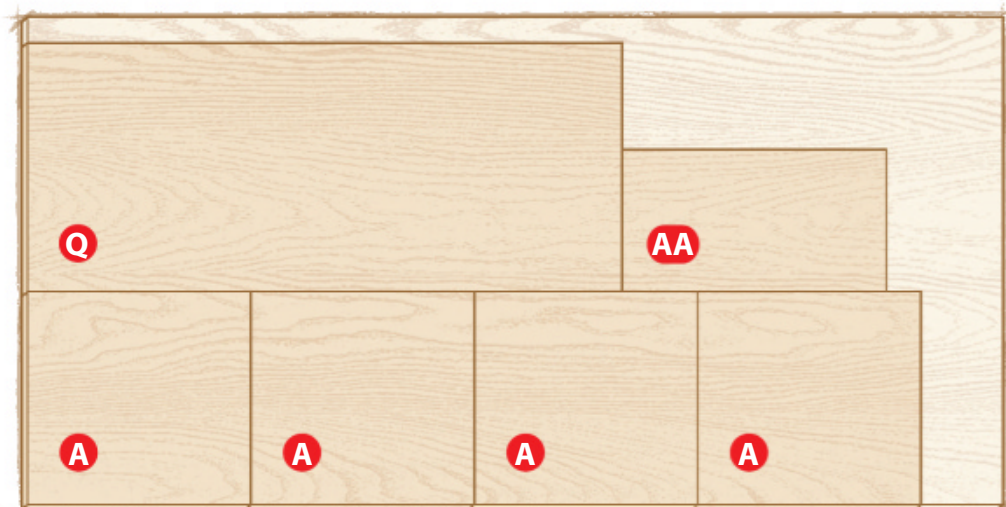
F Mark the front-to-back extents of the machine bed on the piece of cardboard aligned with the tabletop opening.



G Reposition the cardboard and mark the side-to-side extents of the machine. Extend both sets of lines to derive the outline of the filler opening.

Materials key: Ply-maple plywood, M-maple.
Blade and bits: Dado set, 1/8" round-over and 3/8" upcut spiral router bits, 7/64" self-centering drill bit.
Supplies: #20 biscuits, 1 1/4" pocket screws, #8 x 1 1/4" flathead screws, #8 x 1 1/2" flathead screws.
Sources: Drawer slides no. HT9134339, \$19 set (6 sets); front mounting clips no. HT9140416, \$2 set (6 sets). Woodworker's Hardware, 800-383-0130, www.hardware.com.
3 3/4" square bar pulls, brushed satin nickel no. 1010464, \$7.38 ea. (6); slotted continuous hinge, 72" L x 1 1/2" W, nickel no. 39170, \$25 plus \$7 special shipping; Posi-lock folding leg brackets with screws no. 32754, \$10 pr. Rockler, 800-279-4441, rockler.com.

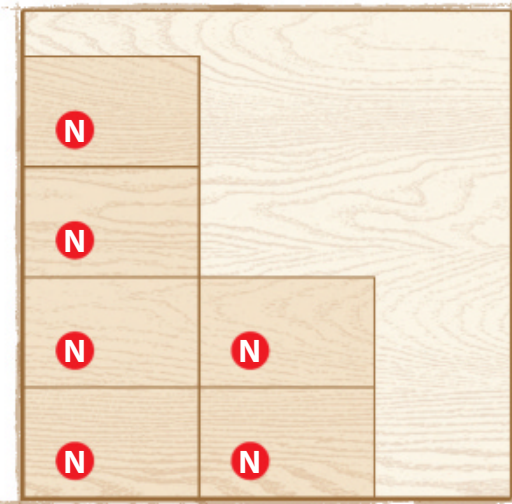
Cutting Diagram



3/4 x 48 x 96" Maple plywood



3/4 x 48 x 96" Maple plywood



1/4 x 48 x 48" Maple plywood

The sewing station requires 46 board feet of 4/4 hard maple and 2 board feet of 6/4 hard maple.



3/4 x 5 1/2 x 96" Maple



3/4 x 7 1/4 x 96" Maple



3/4 x 5 1/2 x 96" Maple (2 needed) *Plane or resaw to the thickness listed in the Materials List.



3/4 x 5 1/2 x 96" Maple (2 needed)



3/4 x 9 1/4 x 72" Maple



3/4 x 3 1/2 x 96" Maple (2 needed)



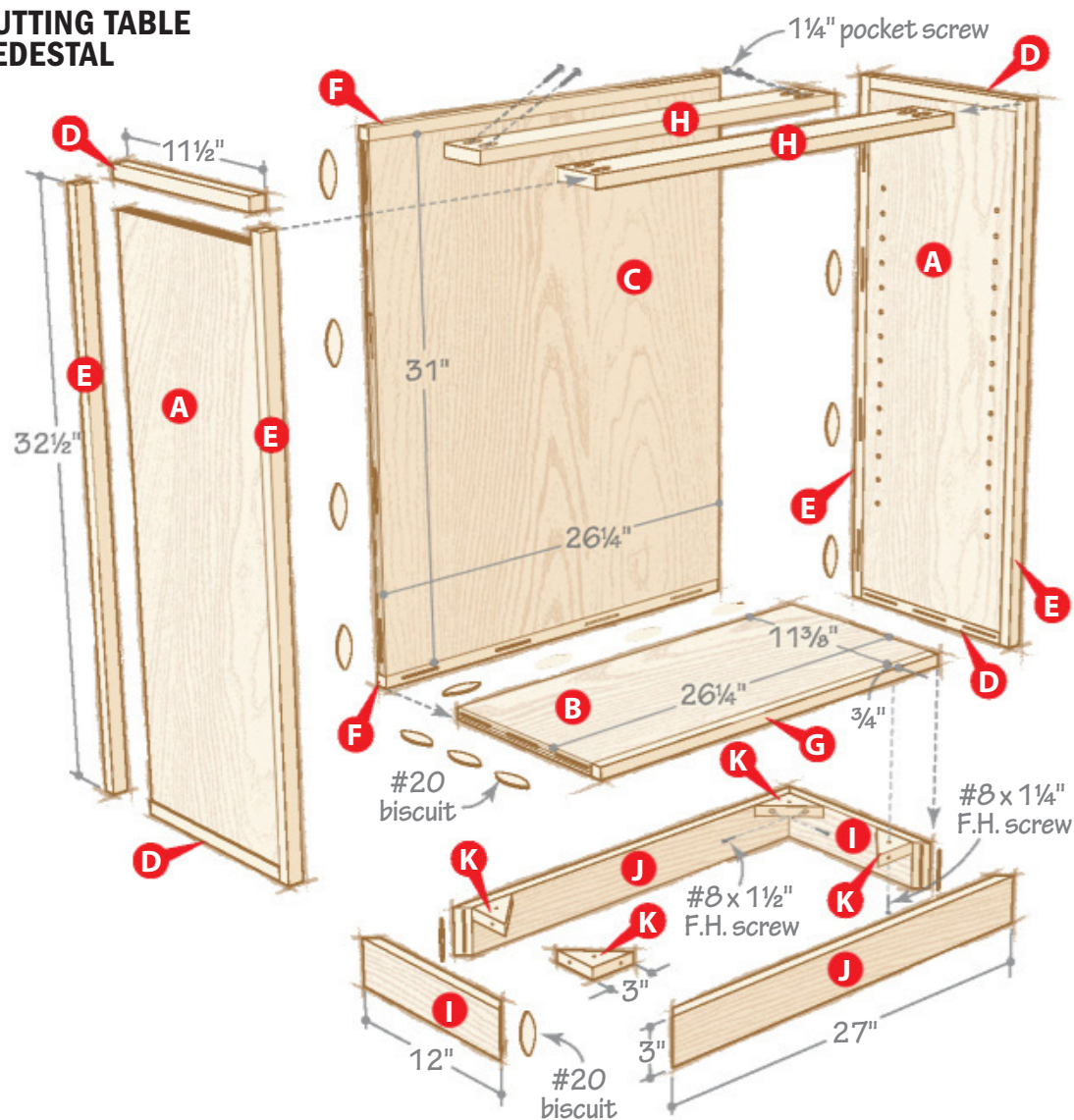
1 1/2 x 1 1/2 x 72" Maple

Sewing Station Materials List

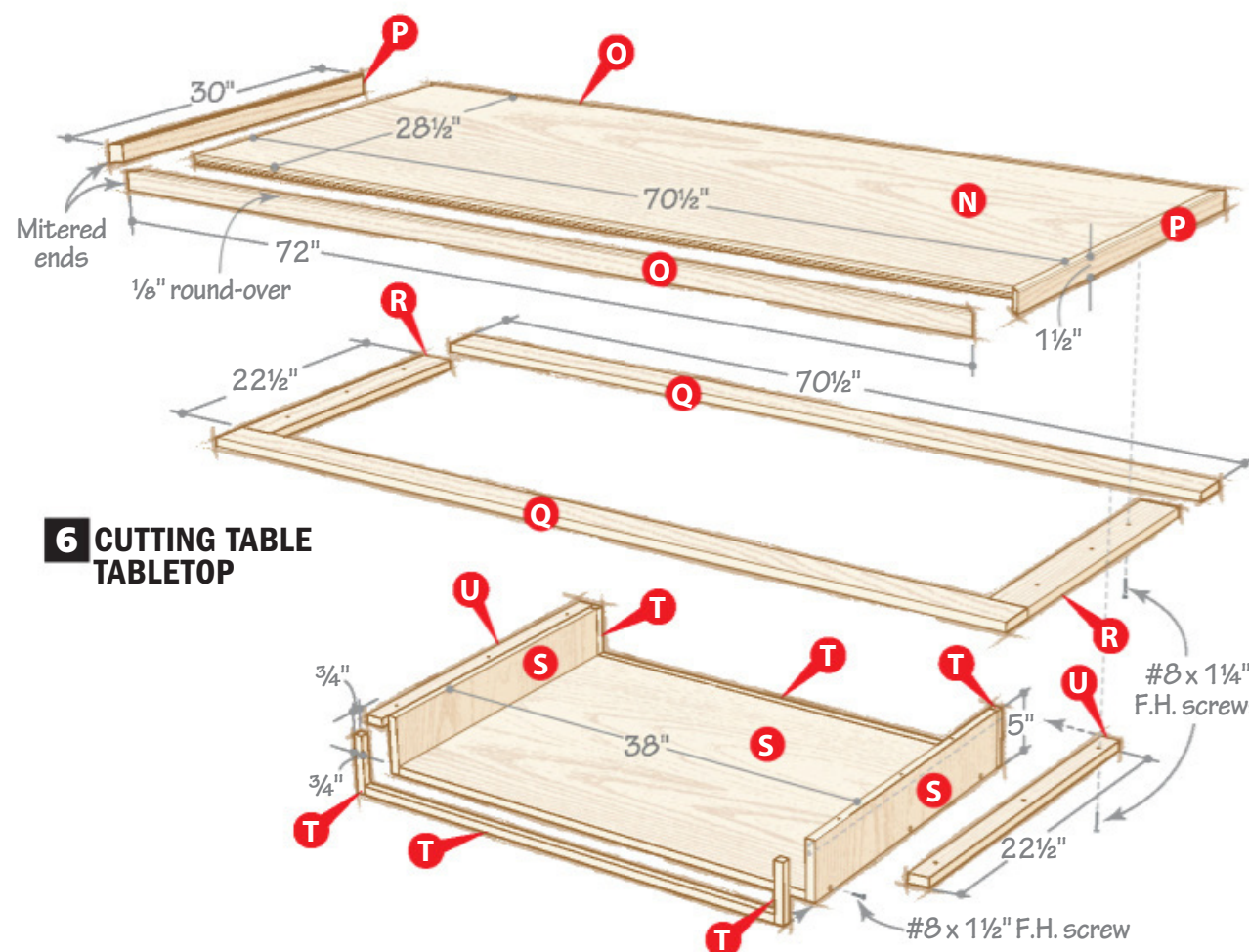
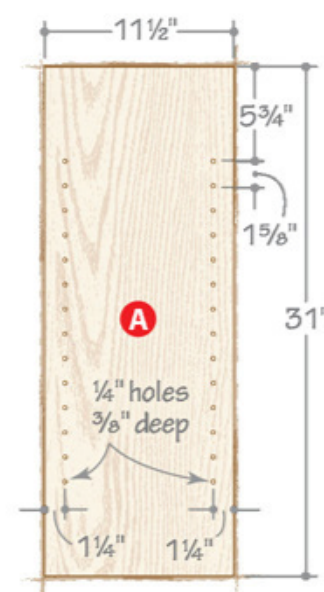
Part		FINISHED SIZE			Matl.	Qty.
		T	W	L		
Pedestals						
A*	side panels	¾"	20½"	22"	Ply	4
B*	bottom panels	¾"	12"	20⅜"	Ply	2
C*	back panels	¾"	12"	22"	Ply	2
D*	horizontal banding	¾"	⅞"	20½"	M	8
E*	vertical banding	¾"	⅞"	23½"	M	8
F*	back banding	¾"	⅞"	12"	M	4
G*	front banding	¾"	¾"	12"	M	2
H	stretchers	¾"	3"	12"	M	4
I	base sides	¾"	3"	21"	M	4
J	base fronts and backs	¾"	3"	12¾"	M	4
K	corner blocks	¾"	3"	3"	M	8
Drawers						
L	sides	⅝"	4⅜"	18"	M	12
M	fronts and backs	⅝"	4⅜"	10⅞"	M	12
N	bottoms	¼"	10⅞"	17¼"	Ply	6
O	lower faces	¾"	8"	11¾"	M	4
P	upper faces	¾"	5½"	11¾"	M	2
Tabletops						
Q	panels	¾"	24½"	58½"	Ply	2
R*	front and back edging	¾"	1½"	60"	M	4
S*	end edging	¾"	1½"	26"	M	4
T	long supports	¾"	3"	58½"	M	4
U	short supports	¾"	3"	18½"	M	4
V	legs	1¼"	1¼"	26½"	M	2
W	platform and risers panel	¾"	12½"	40"	Ply	1
X	platform and risers banding	¾"	¾"	40"	M	2
Y	riser cleats	¾"	1½"	14"	M	2
Z	filler supports	¾"	¾"	14"	M	2
AA	filler	¾"	14"	26"	Ply	1

*Parts initially cut oversize. See the instructions.

5 CUTTING TABLE PEDESTAL



5a PEDESTAL SIDE PANEL



6 CUTTING TABLE TABLETOP

Create the cutting table

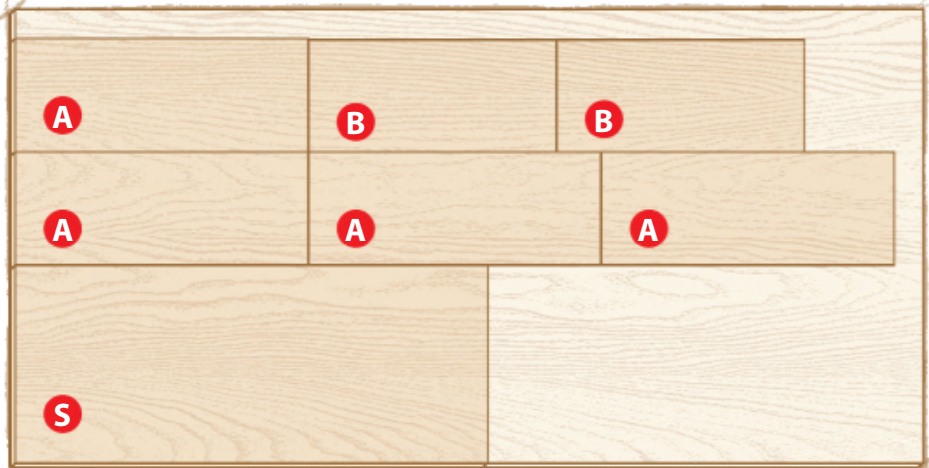
The cutting table employs the same construction methods as the sewing table but with different part dimensions [Cutting Table Materials List] and several changes that make it easier to build. The pedestals open to the ends of the table [Cutting Table Exploded View] and you'll drill shelf-pin [Sources, next page]

holes in the pedestal sides [Drawings 5 and 5a] for simple adjustable shelves instead of drawers. The tabletop has no opening or filler. The platform and risers of the sewing table become a larger hanging shelf in the cutting table [Drawing 6], built in the same manner, minus the pair of filler supports.

Finish up

1 Remove the drawers from the pedestals and the drawer faces from the drawer boxes. Remove the double-faced tape. As you remove them, mark the drawer-box and drawer-face locations on their backs. Remove all hardware. Inspect all parts and assemblies and finish-sand where needed. Apply finish. (We sprayed on M. L. Campbell MagnaMax precatalyzed lacquer, dull sheen.)

Cutting Diagram



3/4 x 48 x 96" Maple plywood



3/4 x 48 x 96" Maple plywood



3/4 x 48 x 96" Maple plywood



3/4 x 9 1/4 x 96" Maple



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



3/4 x 7 1/4 x 96" Maple



3/4 x 7 1/4 x 96" Maple

2 Position the machine top on the drawer pedestals with equal overhangs at front, back, and ends. Drill pilot holes and drive screws through the stretchers (H) and into the supports (T) [Sewing Table Exploded View]. Repeat with the cutting top and shelf pedestals, driving screws through the stretchers (H) and into the supports (Q, R) [Cutting Table Exploded View].

3 Screw the folding leg brackets [Sources] to the legs (V) and the extension top supports (T). Attach the extension to the machine top with the continuous hinge.

4 Reinstall the remaining hardware and the drawers and shelves. Position the sewing machine on the platform and drop in the filler. Stand back while your favorite quilter stocks drawers and shelves and goes to work.

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

Cutting Table Materials List

Part	FINISHED SIZE			Matl.	Qty.	
	T	W	L			
Pedestals						
A* side panels	¾"	11½"	31"	Ply	4	
B* bottom panels	¾"	11⅜"	26¼"	Ply	2	
C* back panels	¾"	26¼"	31"	Ply	2	
D* horizontal banding	¾"	⅞"	11½"	M	8	
E* vertical banding	¾"	⅞"	32½"	M	8	
F* back banding	¾"	⅞"	26¼"	M	4	
G* front banding	¾"	¾"	26¼"	M	2	
H stretchers	¾"	3"	26¼"	M	4	
I base sides	¾"	3"	12"	M	4	
J base fronts and backs	¾"	3"	27"	M	4	
K corner blocks	¾"	3"	3"	M	8	
L shelf panels	¾"	11¼"	26⅝"	Ply	4	
M shelf banding	¾"	1¼"	26⅝"	M	4	
Tabletop						
N panel	¾"	28½"	70½"	Ply	1	
O* front and back edging	¾"	1½"	72"	M	2	
P* end edging	¾"	1½"	30"	M	2	
Q long supports	¾"	3"	70½"	M	2	
R short supports	¾"	3"	22½"	M	2	
S hanging shelf and risers panel	¾"	21"	50"	Ply	1	
T hanging shelf and risers banding	¾"	¾"	50"	M	2	
U riser cleats	¾"	1½"	22½"	M	2	

*Parts initially cut oversize. See the instructions.

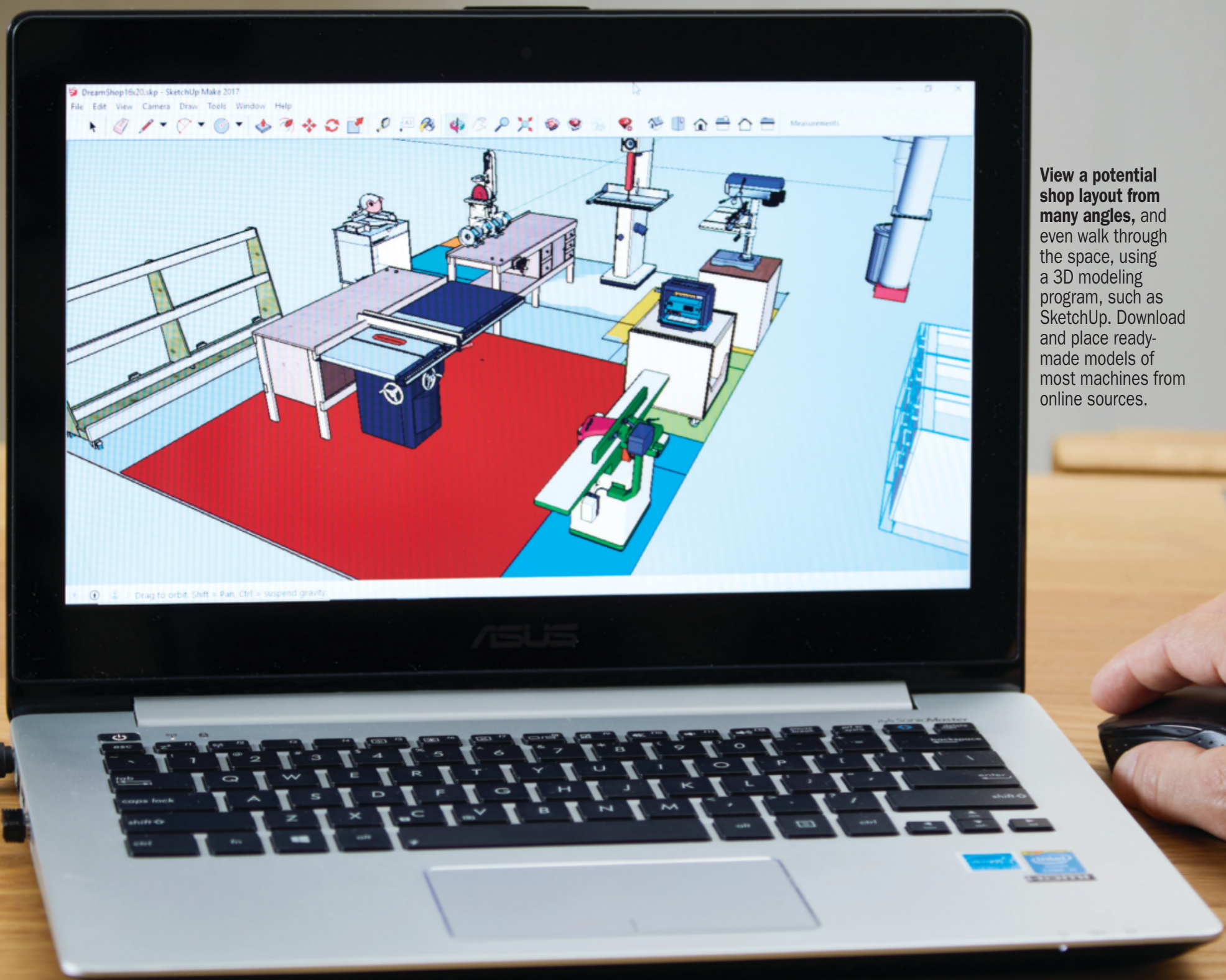
Materials key: Ply-maple plywood, M-maple.

Bits: 1/4" brad-point drill bit, 1/8" round-over router bit.

Supplies: #20 biscuits, 1 1/4" pocket screws, #8 x 1 1/4" flathead screws, #8 x 1 1/2" flathead screws.

Sources: 1/4" shelf-pin supports, nickel no. 22773, \$5 pack of 16. Rockler, 800-279-4441, rockler.com. Honey Strand hardwood floor, page 24, Lumber Liquidators, lumberliquidators.com.

The cutting table requires 27 board feet of 4/4 hard maple.



View a potential shop layout from many angles, and even walk through the space, using a 3D modeling program, such as SketchUp. Download and place ready-made models of most machines from online sources.

Set Up Your Best Shop Ever

Determined woodworkers have created shop space in spare bedrooms, closets, and bathrooms. Regardless of how much square footage you have, every shop layout involves compromises on space, tool choices and locations, climate control, and more. Here's how to lay out a new shop—or improve your current one.

Location, location, location

If you're setting up a shop, you probably already have an idea of where it will be. In an existing space, you know exactly how much room you have, and maximizing that foot-

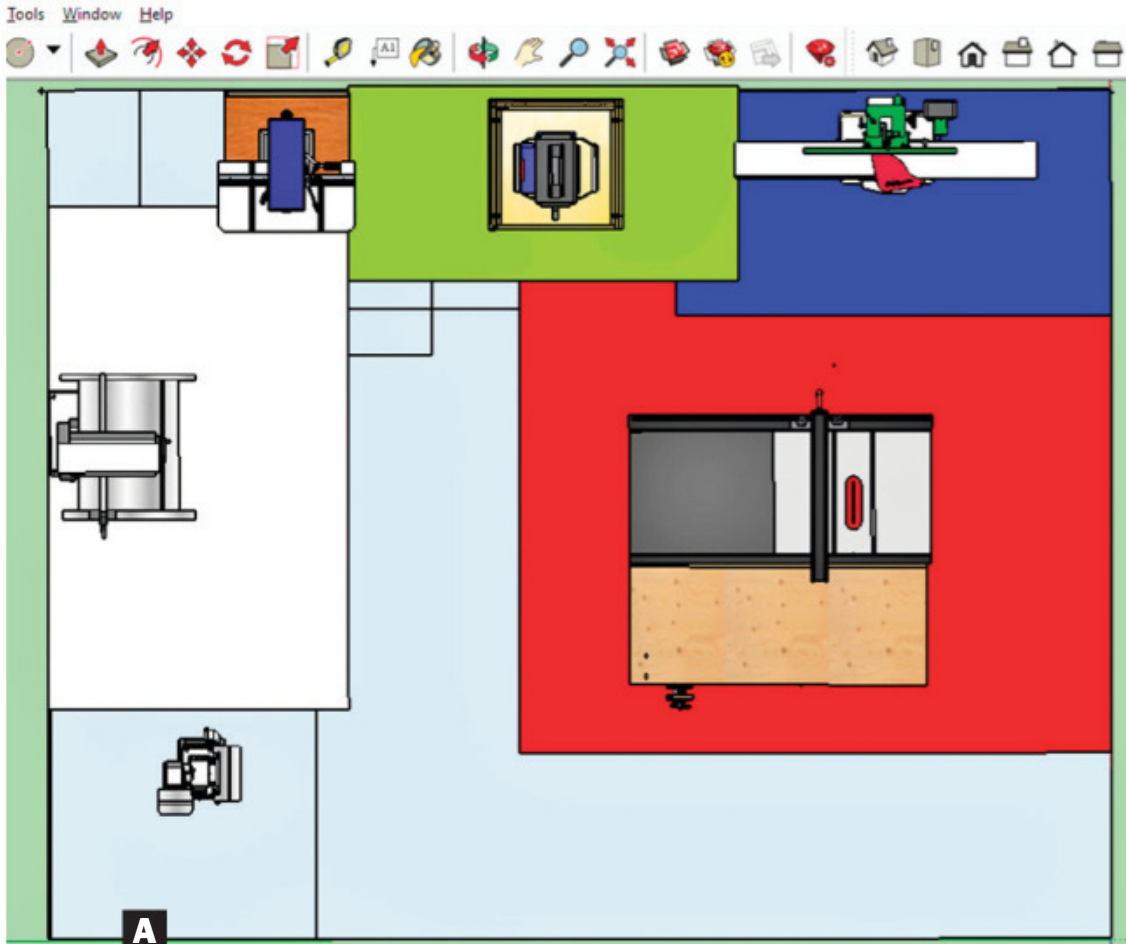
print becomes a priority. If you plan to build, you may have a little more freedom to adjust the size of the shop and outfit and arrange it to match your dreams.

Define the work you do...

...and the work you'd like to do. If you build mainly gift boxes now, but want to get into furniture construction, allot more square footage to accommodate larger parts and assemblies and more raw materials.

Consider other potential shop activities. Will it double as car storage or an entertainment spot? Does lawn equipment need to fit

► Seal a basement shop to contain dust.
woodmagazine.com/dustseal



A In the overhead view of this SketchUp model, colored rectangles show how much working space each tool requires. Overlapping the spaces fits in tools efficiently.



B Spanning two or more cabinets with a countertop creates a well-supported worksurface with lots of easy-to-reach storage below.

in? And how often will it be used? Daily use benefits from a permanent setup where tools have fixed locations; occasional evening or weekend use may dictate a convertible space where mobile tools get stored out of the way until needed.

Now, consider in order the items that follow, knowing that decisions made for one category can affect decisions in other areas. So stay flexible. Adjust plans as new options and considerations present themselves.

Determine tool floor spaces

Calculate the footprints of the largest items in the shop, likely your bench, stationary tools, and cabinets. Include sufficient infeed and outfeed room for materials and 24" on any side that you need to walk past. For example, your jointer may measure 16×48", but jointing a 5' board requires an additional 36" at each end of the infeed and outfeed tables. And allowing 24" in front of it for standing room makes the total footprint 40×120" [Photo A].

► Use SketchUp for free. sketchup.com

Estimate how much enclosed storage you'll need for hand tools, accessories, and supplies. This will determine cabinet needs. Base cabinets often double as stands for benchtop tools, such as a drill press or miter-saw, and provide worksurfaces [Photo B]. Don't worry about being exact; just get a general idea of what will accommodate the current and future inventory of these items, then add a couple more cabinets.

Lumber takes up significant space. Storing it on wall racks preserves floor space for tools. If possible, store wood elsewhere, such as in an outbuilding, basement, or covered

porch. Then, you can move only what you need to the shop to give it time to acclimate prior to working with it.

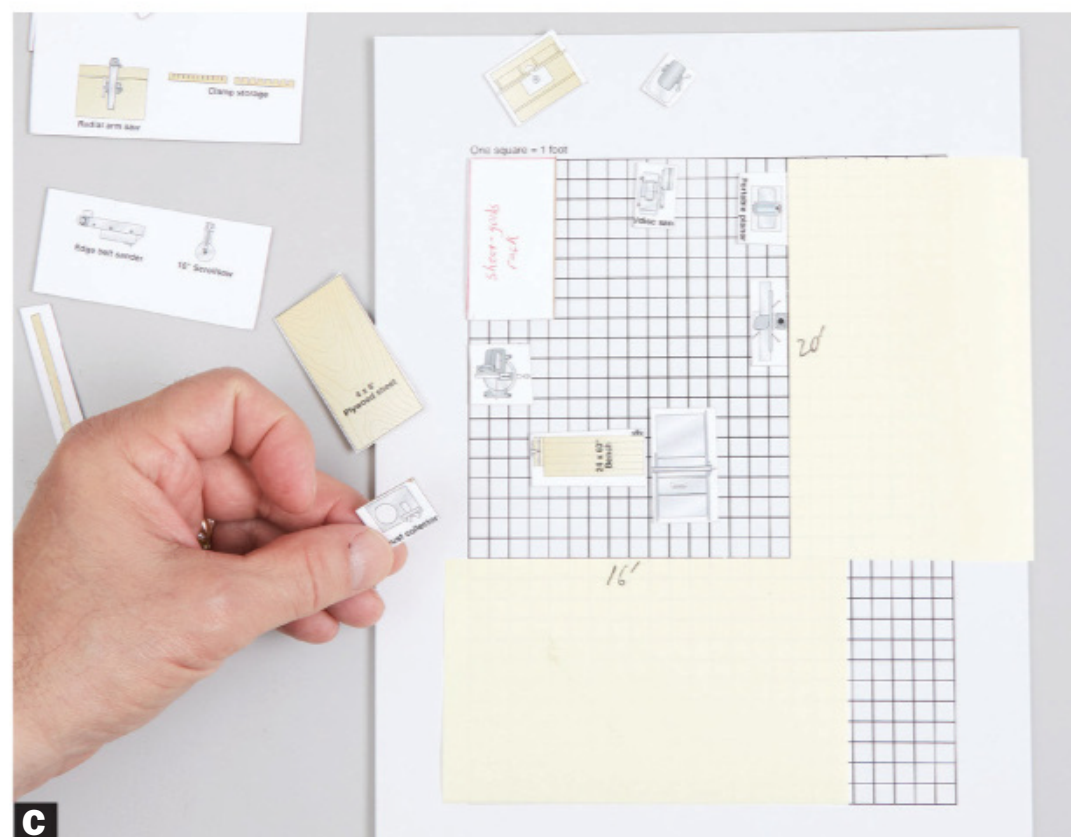
Place the big stuff

Now that you know how much space the biggest items need, start working out how they fit into the space. Whether you choose an analog approach [Photo C] or digital [Opening photo], keep these concepts in mind:

■ **Move materials in a logical workflow.** Place raw materials near the door where they come in. Then arrange tools for material breakdown (mitersaw), sizing/shaping (tablesaw, bandsaw, jointer, planer), joinery

► Download and print a template to help position your tools. woodmagazine.com/shoplayout

Tip! Glue paper printouts to cardboard to make them more durable and easy to handle.



C Moving paper cutouts on a scaled floor plan goes easy and fast, but provides only a flat, top-down view.



D A workbench placed behind the table saw doubles as outfeed support.

Tip! Try different layouts, and preserve each one by taking a photo, or saving different versions of the file.

► Get more ideas for shop layout and plans for shop fixtures. woodmagazine.com/ideashops

► Find dozens of mobile-base and tool-stand plans. woodmagazine.com/mobile

(drill press, mortiser, router table), assembly (workbench and open area for the largest projects), and finishing. In a long shop, the flow may be a straight line from front to back. In a squarish shop, work may move around the perimeter. A narrow space may dictate moving back and forth from one side to the other.

■ **Group tools efficiently.** Infeed and outfeed spaces can overlap on adjacent surfaces of the same height [Photo D]. For example, the infeed zone for your jointer may extend into the work zone for your router table, as you won't use both tools at the same time. Flip-top stands put two tools into the space of one [Photo E].

■ **Allow assembly space.** It can be tempting to cram in as many tools, worksurfaces, and storage spaces as possible. Don't. Instead, provide open space for subassemblies, such as drawers, to sit while you work on the carcass. And allow room to extend clamps and walk around a project during assembly.

■ **Consider dust collection.** We'll cover dust collection in more detail later, but for top performance, place the dust collector or shop vacuum(s) as close as possible to the largest chip producers. The planer and jointer create the largest chips, and the table saw, mitersaw, and router table throw the most dust into the air.

■ **Mobility provides flexibility.** Moving tools to a working position, then rolling them away for storage, maximizes floor space

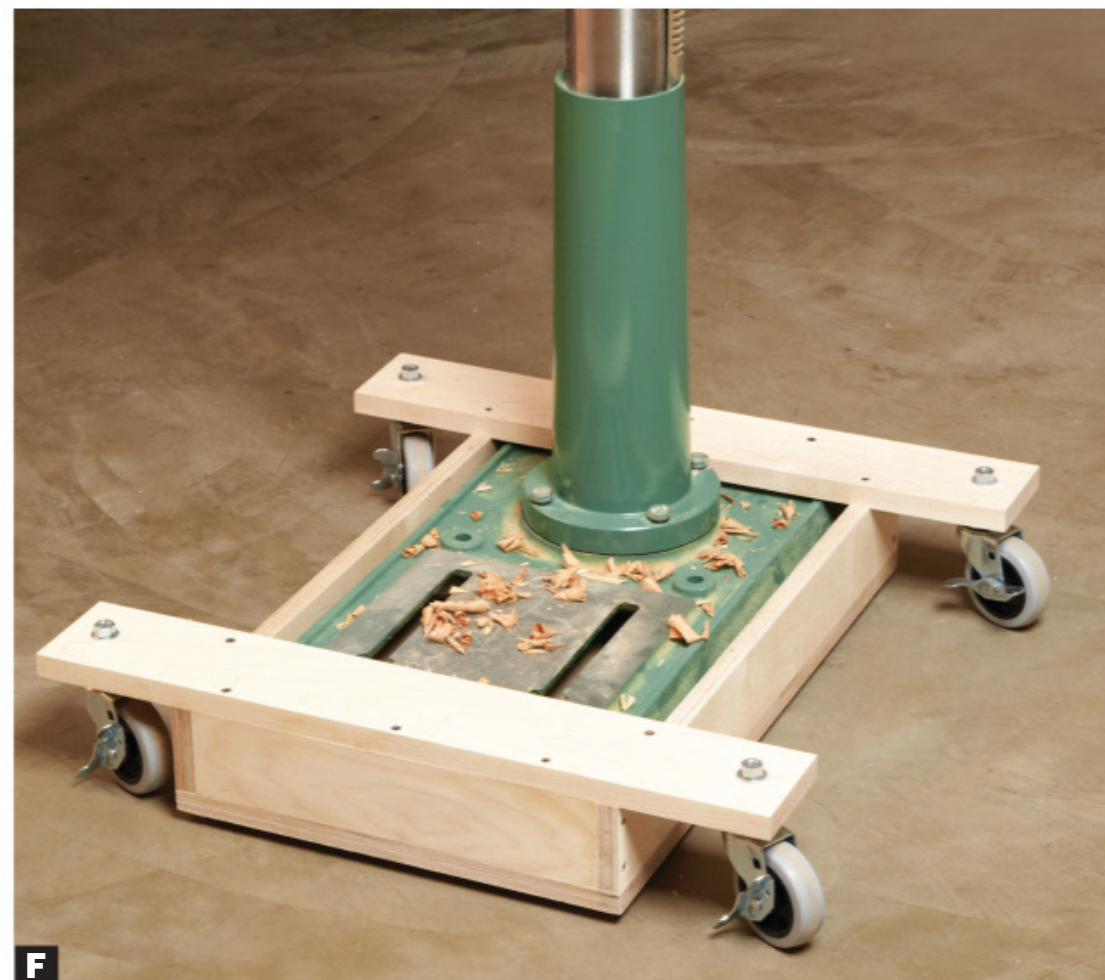
[Photo F]. A table saw can rest against a wall for most cuts, then roll away from it when you need a bit more space on that side.

■ **Give it a rest.** After settling on an arrangement, walk away from it for a few days. Then, come back and review it with a fresh eye, rethinking each of the points above.



E Pair tools not used at the same time, such as a planer and drill press, on a flip-top stand.

► Get plans for flip-top tool stands. woodmagazine.com/flipstands



F Buy or build mobile bases and tool stands, then move tools aside when not being used to make additional working area.

Assess your power needs

You can operate a perfectly serviceable shop with just two 15-amp 110-volt circuits [Today's Reality: The (Nearly) Cordless Workshop, below]. But you will be well-served by more or beefier circuits. Handheld and benchtop tools up to 1½ hp will operate on 15-amp circuits. The larger motors of stationary tools may need 20-amp circuits—check the owner's manual or the label on the motor. Larger stationary tools may not require 220 volts, but may operate better at that voltage. If you have the option of adding circuits, consider at least a couple of 220s.

The location of tools and workspaces helps determine receptacle placement. Place plug-ins near stationary tools to eliminate extension cords, and make them accessible above workspaces, unobscured by cabinets, lumber storage, or other items [Photo G].

► Assess how much power you'll need. woodmagazine.com/shopwiring



G Overhead reels provide power over a large area while keeping a cord out from underfoot, and stored neatly when not in use. Don't get an unnecessarily long cord, as this causes current loss, and when coiled, heats up in heavy use.

Today's Reality: The (Nearly) Cordless Workshop

Every shop needs wall receptacles, but the expanding selection of capable battery-powered tools reduces the need. Cordless miter saws, routers, circular saws, sanders, nailers, shop vacuums, and even tablesaws can serve well in a home shop. Because no manufacturer yet offers a complete lineup, you may need several brands of tools and battery platforms to cut the cord on a full range of tools.

Our tests show that many battery-powered tools handle much of the work their corded cousins do. Runtime isn't an issue, especially if you have an extra battery pack or two on the charger. Read our reviews at woodmagazine.com/reviews to find out what's available, and to gauge performance of these tools.





H The low power requirements of LED fixtures mean you may be able to light your entire shop with just one dedicated circuit. The power used by a 60-watt incandescent bulb will light seven of these LED bulbs (inset).

Light it up

When you see well, you work safer, and better enjoy shop time. So make sure to account for lighting in the layout.

► Get tips on choosing quality shop lighting. woodmagazine.com/let-there-be-better-light

Shop lights should be on a separate circuit from tools, to avoid plunging into darkness when a tool trips a breaker. Plan for sufficient overall lighting from overhead fixtures [Photo H], supplemented by task lighting for close-up work [Photo I]. Battery-powered LED task lights reduce the number of cords draped around.

When installing overhead fixtures, hang them as high as possible to maintain overhead clearance for moving materials. If you have high ceilings, a 9–10' light-fixture height provides adequate clearance without a drop-off in light level. Although LED fixtures don't have bulbs that can shatter, guards will prevent accidentally damaging one while moving a long workpiece.

Where will you finish?

Applying finish requires enough space for the project, and perhaps subassemblies such as drawers, doors, and panels, with room between them for access with a brush, rag, or spray can/gun [Photo J]. Existing flat surfaces including your bench and tablesaw will do, provided you cover them to protect from drips.

To spray finish you must contain and exhaust the fumes and overspray [Photo K]. Even water-base finishes, with fewer vapor concerns, require an exhaust system.

If you want to apply finish on your schedule, not Mother Nature's, you must control the temperature and humidity while minimizing dust in the finish area. This leads to the two final considerations in shop design, dust and climate control.

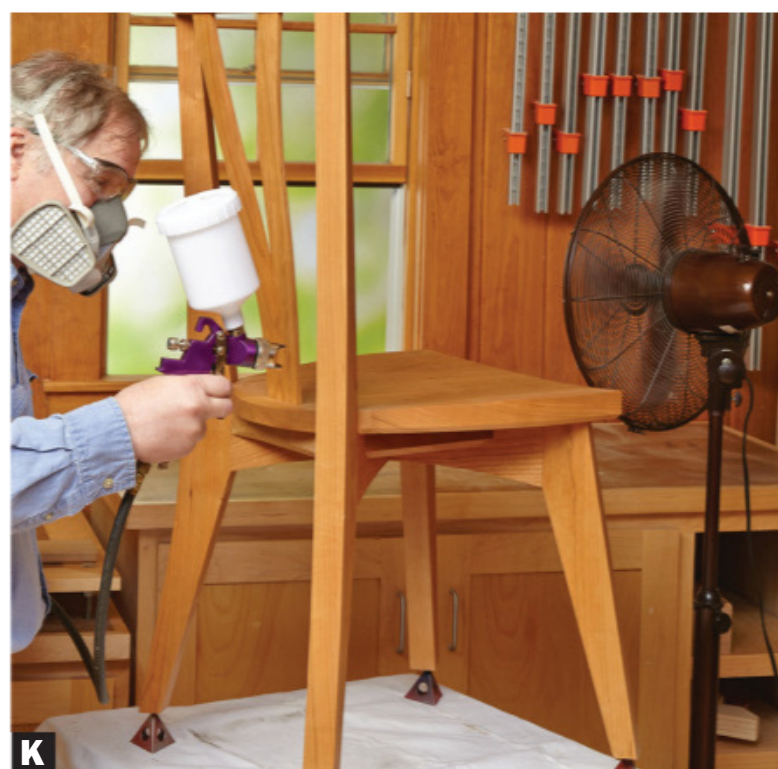
► Get more info about spray finishing. woodmagazine.com/sprayingfinish



I A magnetic gooseneck lamp eliminates shadows below a bandsaw blade guard, clearly illuminating the cutline. Buy this LED one at woodmagazine.com/tasklight.



J A pair of collapsible sawhorses support a carcass, then store out of the way.



K At a minimum, open a shop window and place a fan to move fumes out of the work area. Don't draw combustible fumes through a fan motor that's not rated explosion-proof.



L

A shop vacuum provides enough air speed to capture fast-moving chips thrown off by a router. The smaller hose also connects to many portable tools, such as sanders. In this arrangement, a separator collects most of the debris, keeping the vacuum's filter cleaner.



M

The 4" inlet of a single-bag collector matches ports on many stationary tools, and extracts chip quantities that would overwhelm a shop vacuum. You'll need to move the hose from tool to tool, and empty the bag more frequently.

Figure dust-collection needs

Capturing dust at its source not only keeps your shop tidier, it reduces potentially harmful particles floating in the air. And if you go with a central system, placements of machinery and the dust collector affect each other.

Dust collection can be pieced together with shop vacuums, small dust collectors for individual tools, a dedicated central unit that serves all machines, or a combination of these strategies [Photos L-O].

When designing a central system, provide a ductwork path from the collector to each machine. The straighter and shorter the path, the more efficient the system. Smooth duct walls allow air to flow easily, maximizing system efficiency. The ribbed surface of flex hose disrupts airflow, so minimize its use. Plumb fixed smooth-wall duct up to tool locations, then connect the tool to the ductwork with a short section of flex hose. Placing ductwork overhead with "drops" to each tool prevents tripping over ducts or hoses strung along the floor. Running a line lower along a wall eliminates the up-then-down path to the ceiling, reducing the length, but dictates machines sitting close to that wall so flex-hose connections don't run underfoot.

Keep it comfortable

Heating and cooling a shop provides more than a comfortable space for you. Temperature and humidity control also allows for storing and applying finish and glue. Choose a system that tolerates a dusty shop space. If heating or cooling proves impractical, find somewhere else to store temperature-sensitive supplies, and to apply finish when it's too cold or too humid. 🌱

- Determine which collector suits your needs.

woodmagazine.com/choosedc

- Learn the basics of installing a central dust-collection system.

woodmagazine.com/dc-upgrade



N

A properly sized cyclone collector moves enough air to capture chips from any machine. Many units can be wall-mounted, freeing up floor space.



O

A two-bag collector frequently serves as the heart of a small central system, with ductwork connecting to each tool.

Produced by **Craig Ruegsegger**

The logo for the Wood Magazine Innovate Awards 2020 is set against a dark, swirling wood grain background. The word "WOOD" is in white, bold, sans-serif font with a registered trademark symbol. "Magazine" is in a smaller, white, sans-serif font. "innovate" is in a large, blue, sans-serif font, with the letter "o" replaced by a circular saw blade icon. Below it, "AWARDS 2020" is in a white, sans-serif font.

WOOD[®] Magazine innovate AWARDS 2020

These new woodworking tools and accessories impressed us with their ingenuity and usefulness.

Capture that pesky dust

For most router-table work, you can capture dust and chips either through the fence or beneath the table. But for some tasks, such as routing dadoes or grooves, that debris shoots out ahead of the workpiece. Rockler's Dado Dust Chute mounts on the outfeed side of a router table to help capture much of that debris. Bristles along the edges stand up to stop chips and drop them into the funnel-shaped port, but bend flat as a workpiece glides over them.

Dust Right Dado Dust Chute

Rockler Woodworking & Hardware
no. 57495, \$24.99 (available late December 2019)
800-279-4441, rockler.com



Corded or cordless: Let 'er rip

Metabo HPT's new benchtop/job-site 10" tablesaw delivers two key innovations. First, it's the first tablesaw that runs on either a lithium-ion battery pack or an AC adapter (each sold separately). Second, its 35" rip capacity provides 10" more than other battery-powered tablesaws, and 2½" more than the next best benchtop/job-site model. Its MultiVolt battery pack also works with any Metabo HPT or Hitachi 18-volt lithium-ion tool.

10" 36-volt MultiVolt benchtop/job-site tablesaw

Metabo HPT, no. C3610DRJQ4, \$600 (bare tool)
 36-volt MultiVolt 4-amp-hour battery pack and charger kit, no. UC18YSL3B1, \$170
 MultiVolt AC adapter, no. ET36A, \$170
 800-706-7337, metabo-hpt.com



A CNC machine with (almost) no boundaries

The Goliath portable CNC machine routs without the constraints of a frame, supported instead by a trio of multi-caster "feet" that drive it across your workpiece as it carves. You load CAD files wirelessly. Goliath then operates within a maximum 9½×8½' work area, with a maximum cutting depth of 1⅜". The unit is tethered by thin wires to a pair of sensor posts that communicate Goliath's location continuously and keep it from driving off the workpiece. An onboard vacuum sucks up debris and stores it in a bin to maintain a clean surface and not compromise the casters' grip.

Portable CNC machine
 \$2,900 (Available in mid-2020)
 goliathcnc.com



► To see Goliath in action, hover your smartphone over this code (no app required) or visit woodmagazine.com/goliathcnc.



One jig, multiple perfect-fitting inlays

With ready-made, laser-cut inlays and a template system that lets you create exact-fit mortises, you can't go wrong with Slab Stitcher's inlay system. The starter kit (11 to choose from) comes with a master template holder, one inlay template, an assortment of inlays, spiral router bit, guide bushing, and centering pin. You can then purchase additional templates (dozens of designs), and inlays made from multiple wood species, as well as brass and aluminum.

Wood and metal inlay system

Slab Stitcher
Bow tie master starter kit, \$80 (other kits range from \$64 to \$115); extra inlays and templates \$2 and up
717-371-6543, slabstitcher.net

Remove bit bearings easily

Removing router-bit bearings can be vexing: You risk cutting your hands on the sharp carbide edges, or mangling the shank by holding it with pliers. These self-tightening router-bit vises solve this issue. Each model has self-tightening holders for 1/4"- and 1/2"-shank bits (the Infinity also has one for 8mm shanks) with single-directional needle bearings in each socket. These firmly hold the bit without slipping while you loosen the screw. (Flip the vise over to tighten the screw.)

Router-bit vise

Infinity Cutting Tools
no. RBV-001, \$30
877-872-2487, infinitytools.com

MLCS Woodworking
no. 297, \$25
800-533-9298, mlcswoodworking.com





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Homemade jams



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If you're looking to whip up a great holiday gift, Rockler's Wireless Speaker Kit has the key ingredients. It includes all the electronic components needed to build a small speaker that connects to any Bluetooth® device. You add a personal touch by crafting the case in the shape and material of your choice. Put it together, and you've got one sweet gift.

Rockler Wireless Speaker Kit with Playback/Volume Controls (57033) \$29.99



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Arts & Crafts Occasional Cabinet

*This versatile piece will add
a practical touch of classic
American style anywhere
in your home.*

D I M E N S I O N S :
24" W x 13½" D x 50¼" H

Approximate
materials cost:

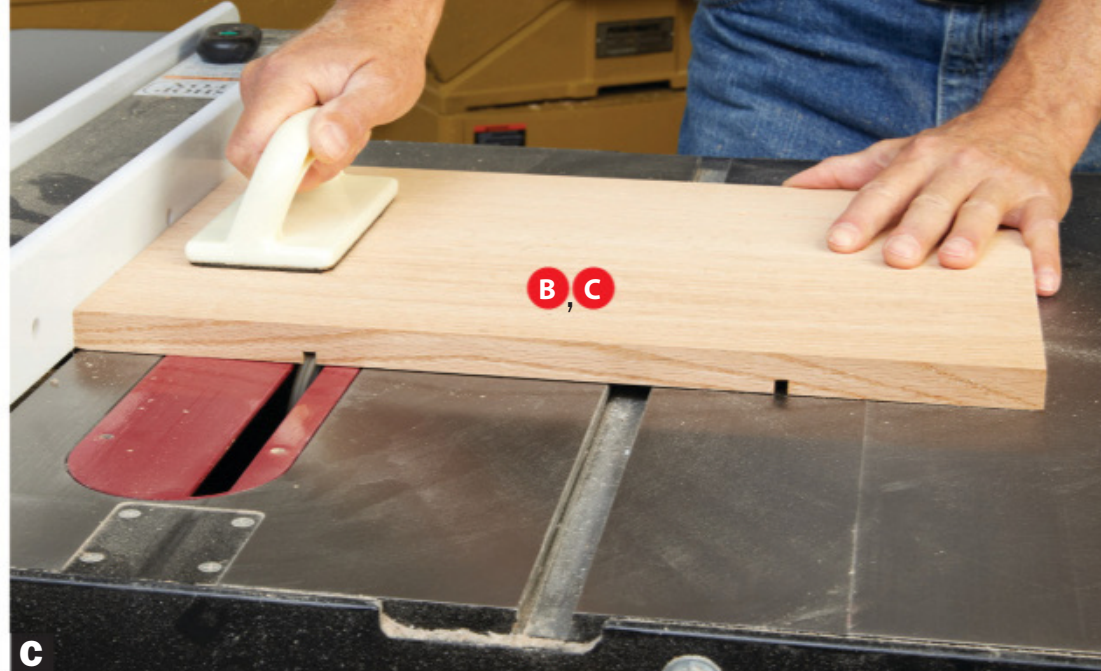
\$550

Shop-made
decorative
door inlays
enhance
vintage
look.





B Rip the shelf (B) and bottom (C) to 11½". Mark the orientation of the ½" strips as you rip them so you can reattach them in the same positions.



C Dado the bottom face on B, the top on C. Cut the outer dadoes on both parts, followed by the center ones to ensure the facing parts will be the same.



D Form stopped dadoes by gluing the ripped strips back onto the shelf and bottom. Keep the faces and ends flush as you clamp them.



E To rabbet the top face of the shelf and the bottom, work with the dadoed side of the shelf (B) and the plain face of the bottom (C) facing up.

4 Rip a ½" strip from the front edge of the shelf (B) and the bottom (C) [Photo B]. Retain the strips to glue back on later.

► Saw dadoes and rabbets using a regular blade.

woodmagazine.com/ripgrooves

5 Dado the shelf and bottom [Drawing 2, Photo C]. Glue the ripped strips back onto the front edges [Photo D].

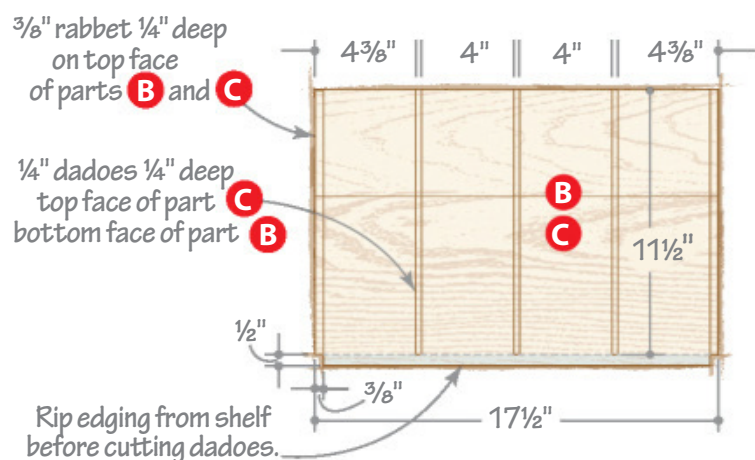
6 Rabbet the top ends of the sides (A) and both ends and front corners of the shelf (B) and bottom (C) [Photo E, Drawings 1 and 2].

7 Rabbet both ends of the arched front rail (D) [Drawing 3]. Bandsaw the arch on the bottom and sand it smooth. Notch the lower front corner and angle the front edge of each divider (E) [Drawing 4].

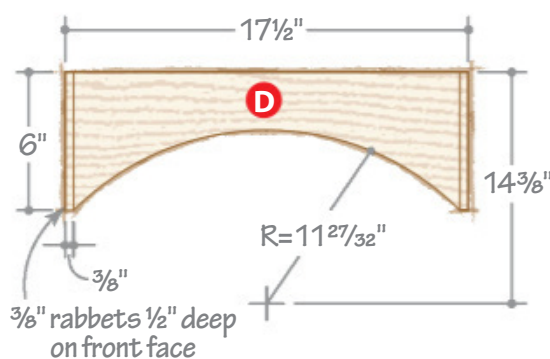
Tip! Test your rabbet setup on scrap material to verify the resulting tenons fit the mating dadoes correctly.

► Cut rabbets quickly and accurately with your tablesaw and dado head. woodmagazine.com/rabbets

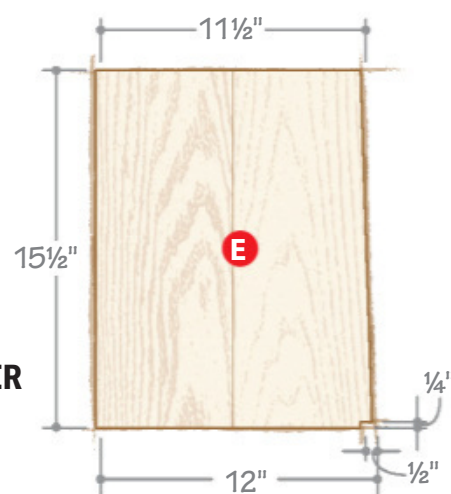
2 SHELF/BOTTOM (Mid shelf shown)



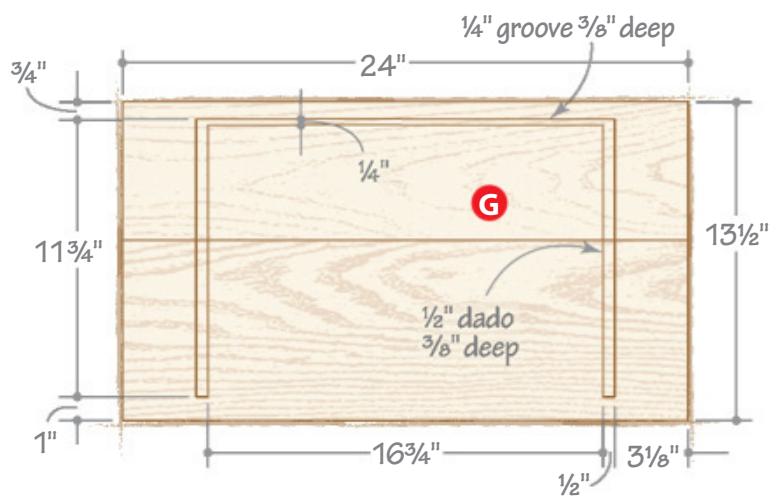
3 RAIL (Front face shown)



4 DIVIDER

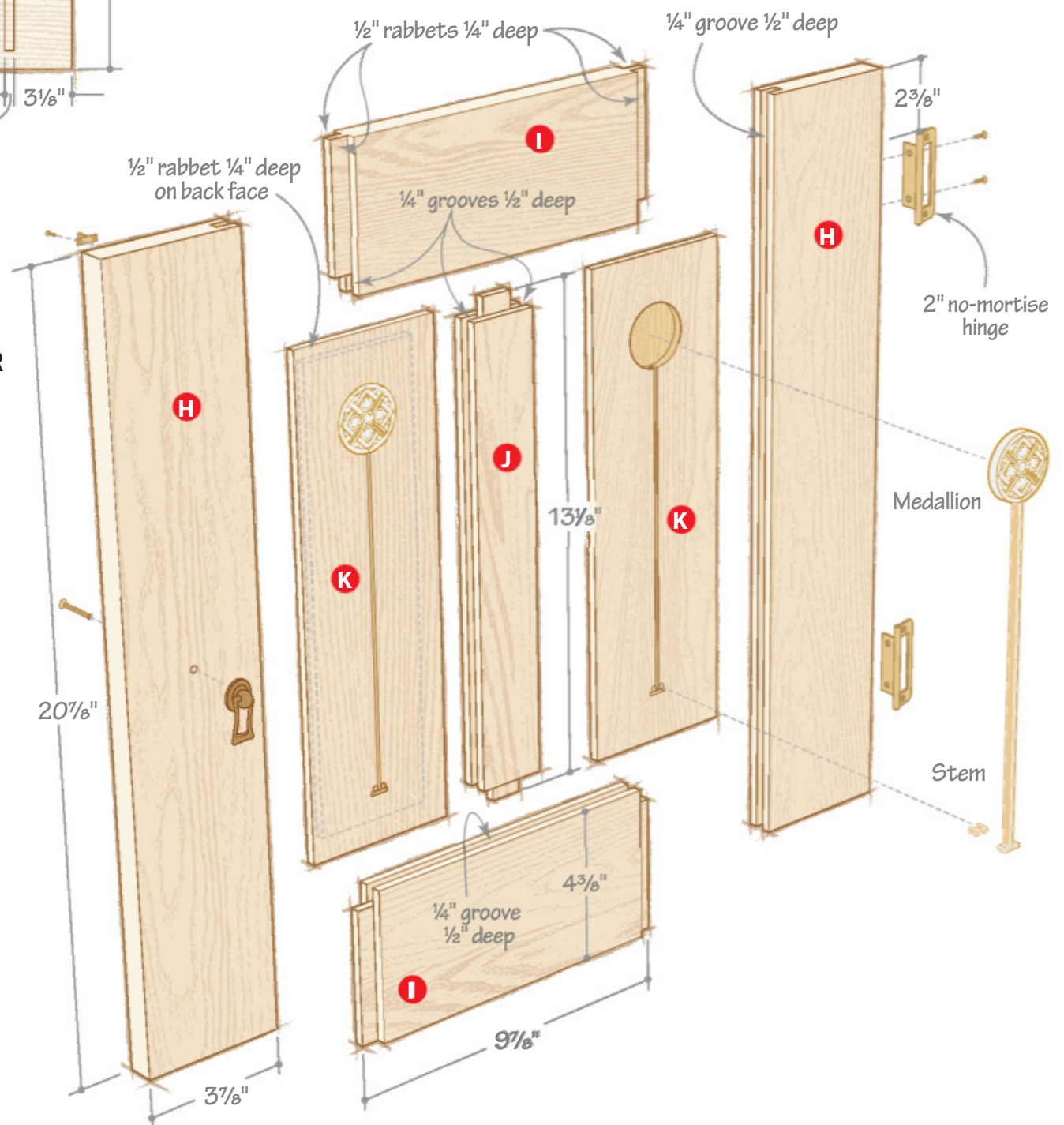
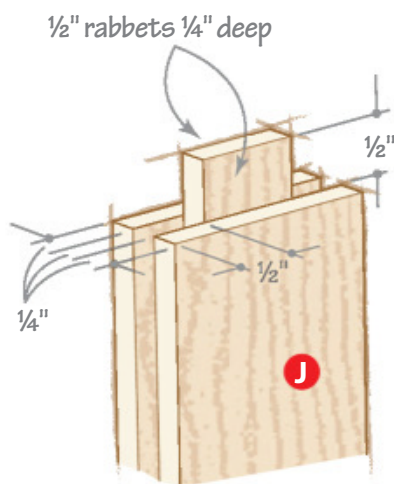


5 TOP (Bottom face shown)



6 DOOR

6a CENTER STILE DETAIL



Put the case together

1 Dry-assemble and clamp parts A–F. Verify measurements for the top (G) dados and groove [Drawing 5]. Then rout them and test-fit the top.

2 Disassemble, finish-sand all parts, and tape off the joints. Stain and finish the case parts.

3 Glue and assemble the shelf (B), bottom (C), and dividers (E).

4 Glue together the sides (A), B/C/E assembly, and front rail (D).

5 Slide the back (F) into place. Glue the top (G) to the sides and back.

Note: We finished the cabinet with Varathane ebony stain topcoated with water-based satin polyurethane.

Build the door

1 Cut the door parts H–K to size. Cut centered grooves along the inside edges of the stiles (H) and rails (I) and along both edges of the center stile (J) [Drawing 6].

2 Rabbet the ends of the rails (I) and center stile (J) [Drawings 6 and 6a] to form tenons that fit the grooves in H and I. Rabbet the door panels (K).

3 Finish-sand all parts. Mask the gluing areas, and stain the panel (K) and inside edges of the stiles and rails.

4 Assemble the door (H–K), but do not glue in the panels. Stain and finish the door.



F File each angle in turn in small, equal increments. Test the fit frequently to keep the design centered in the tube.



G Run the drill at a medium speed as you file the rod. Hold the file at a slight angle to the rod. The surface needs to be straight, but not supersmooth.



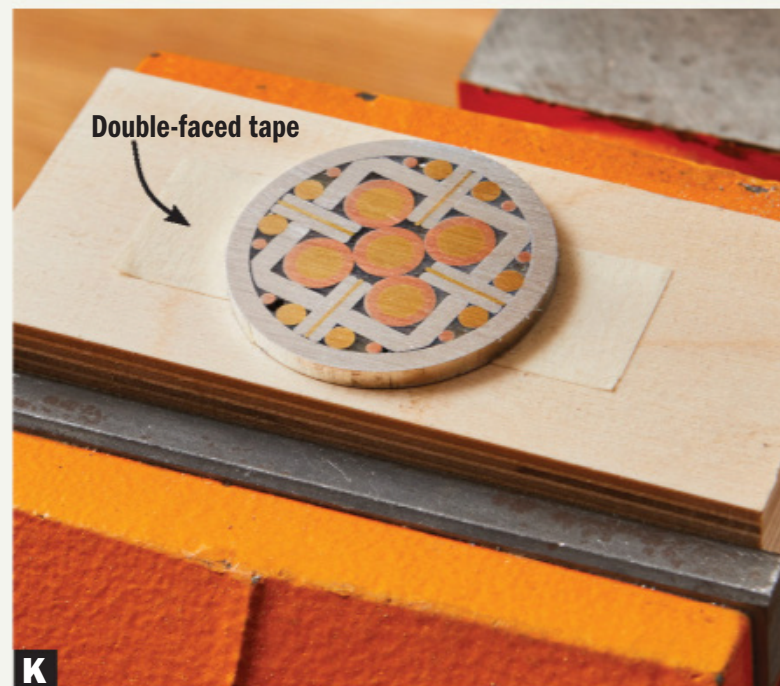
H The brass rod should fit snugly inside the copper tube. A force fit is better than too loose. Cut the rods to the length of the tubes after assembly.



I Pour the epoxy slowly to let it flow into the spaces. Rap the sides of the cylinder frequently as you pour to release bubbles.



J Clamp the cylinder to a V-block for stability when bandsawing the medallions. A fine-toothed woodcutting blade easily slices the soft metals and epoxy.



K Double-faced tape holds the medallion for polishing with progressively finer grits of wet sandpaper from 180 to 600. Fill any voids with additional epoxy.

SKILL BUILDER

Make the medallions

Tip! For smooth cuts, install a fresh, 32 tpi blade in your hacksaw.

Stock shapes of aluminum, brass, and copper [Sources] embedded in epoxy within an aluminum tube make up the medallions. The soft metals cut and file easily.

1 Cut all parts [Drawing 7] 2½" long except the ¼" brass rod; cut it into 3½" lengths.

2 Laminate each brass strip between two aluminum bars using cyanoacrylate (CA) glue. Slightly scuff the mating faces for best adhesion.

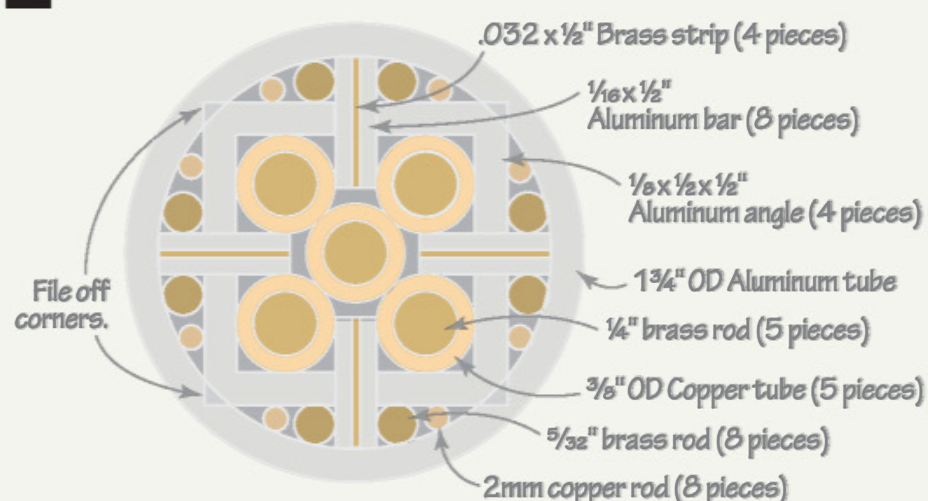
3 File the outside corners off the aluminum angles to fit inside the aluminum tube with the brass/aluminum laminations [Photo F, Drawing 7].

4 Chuck each ¼" brass rod in a drill and file it to fit snugly inside the copper tube [Photos G and H].

5 Slide the angles, brass/aluminum laminations, and copper tubes/brass rods into the aluminum tube [Drawing 7]. Insert

Tip! Hold the angles and brass/aluminum laminations together with a heavy rubber band. Then center the tube on top of the assembly to mark the angle corners for filing.

7 MEDALLION FULL-SIZE PATTERN



the 5/32" brass rods—they may need to be driven in—and the 2mm copper rods.

6 Tape the bottom of the tube. Mix epoxy and pour it into the assembly until full [Photo I]. Let the epoxy cure fully.

7 Bandsaw the top of the cylinder perpendicular to the edge of the tube. Then, saw off two ¼"-thick medallions [Photo J]. Polish the outside face of each medallion [Photo K].

Note: Choose a long-curing epoxy (30 minutes or longer, not 5-minute epoxy) to fill the medallion.

8 DOOR INLAY ROUTING TEMPLATE

Complete the cabinet

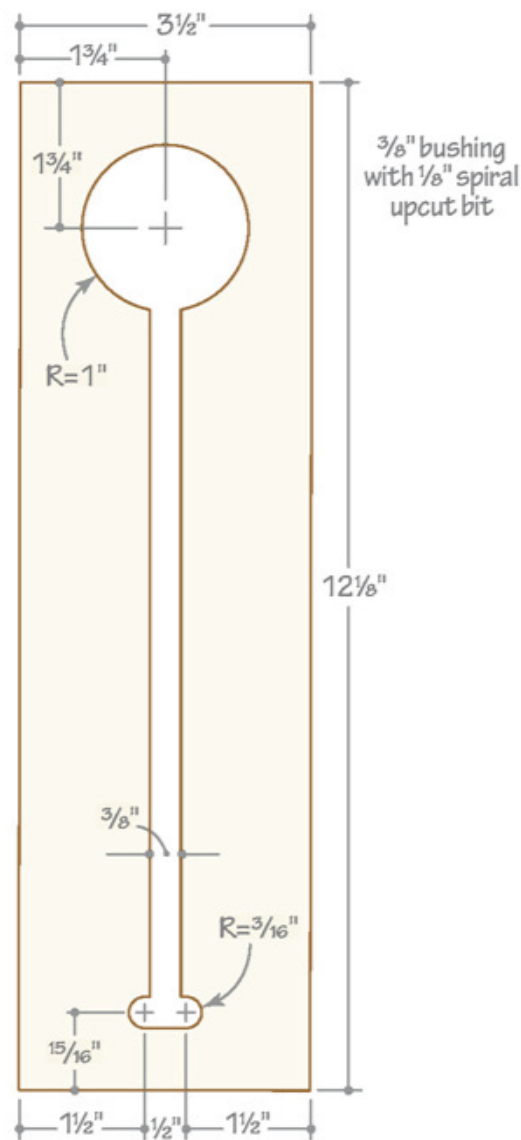
1 Craft a pair of medallions for the door [Skill Builder, previous page]. Make the inlay routing template [Drawing 8]. Adhere it with double-faced tape to the outside face of a door panel inside the frame. Fit your plunge router with a $\frac{3}{8}$ " guide bushing and a $\frac{1}{8}$ " spiral upcut straight bit, and rout the inlay channel [Drawing 8]. Rout both panels.

2 Drill $\frac{1}{8}$ " holes at the bottoms of the channels [Drawing 9]. Cut lengths of aluminum rod to fit flush with the surface and polish one end on each piece.

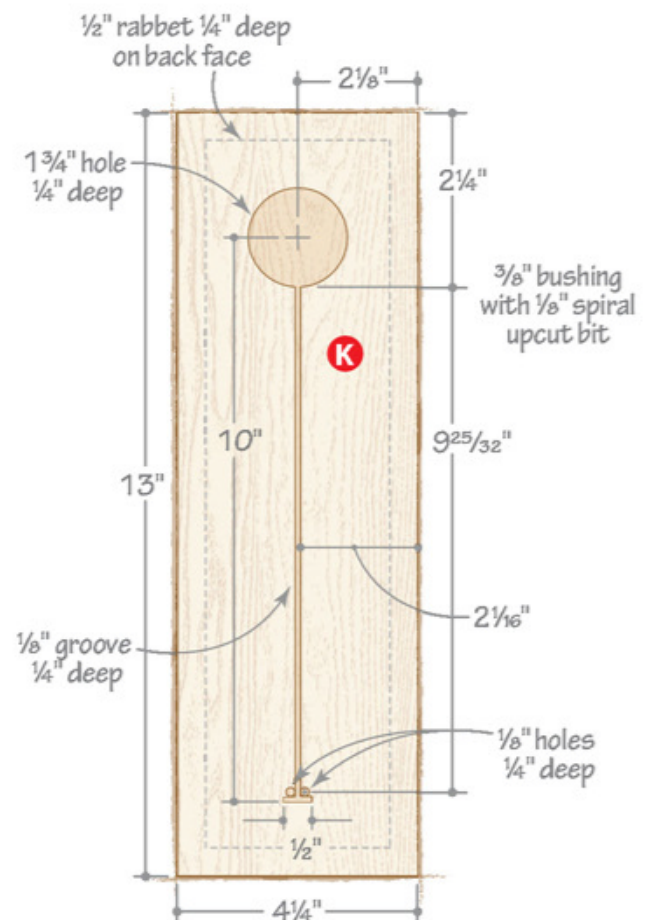
3 Cut two lengths of brass bar stock to fit the channels, polish the exposed edges, and install the medallions, bar stock stems, and aluminum rods with CA glue. Wax the face lightly.

4 Drill screw pilot holes and attach the hinges, pull, and catch. Install the door. Then, pick a prominent spot to display your handcrafted masterpiece. 🌲

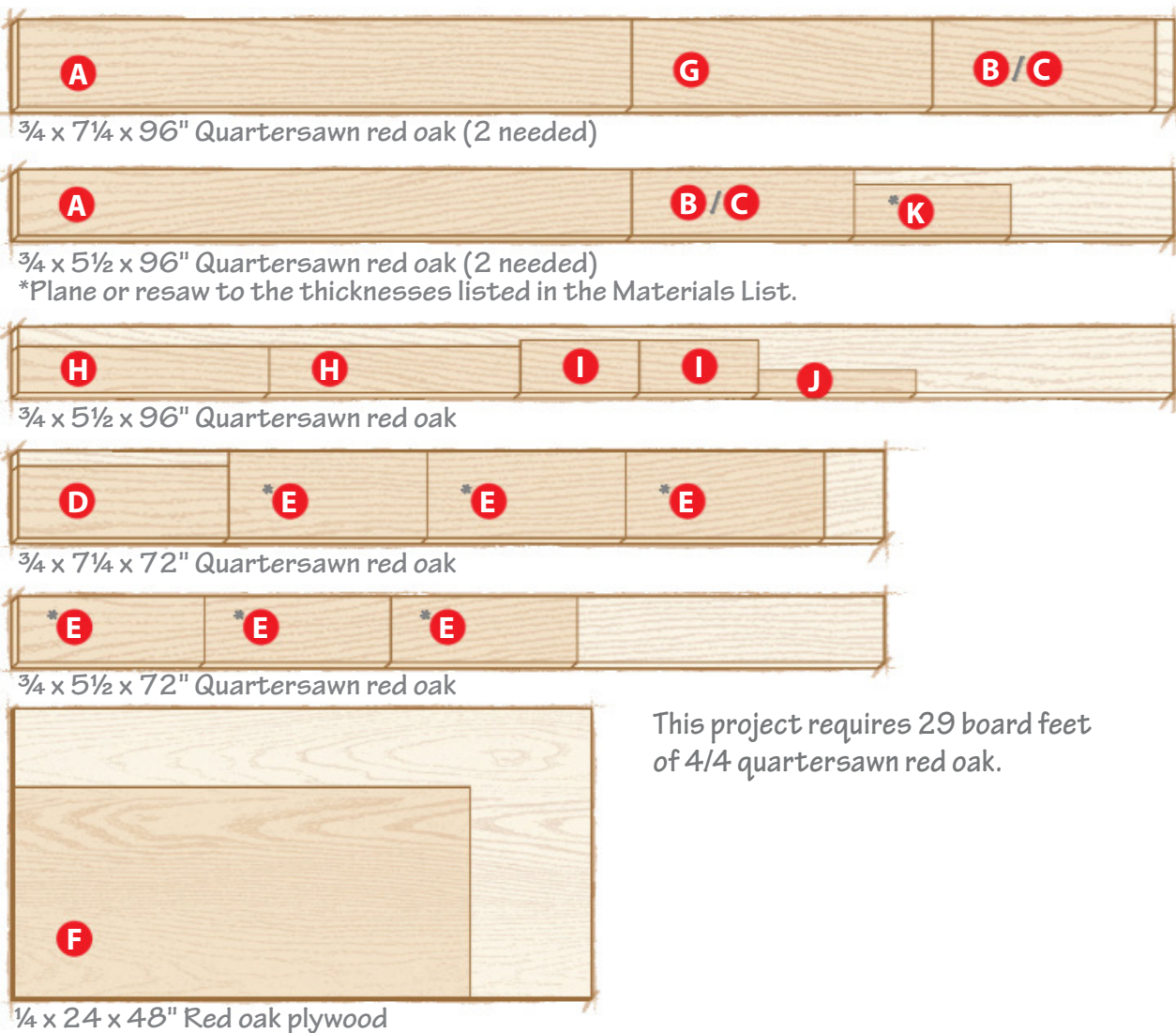
Produced by **Larry Johnston** with **Brian Bergstrom**
Project design: **John Olson**
Illustrations: **Roxanne LeMoine**, **Lorna Johnson**



9 DOOR PANEL



Cutting Diagram



This project requires 29 board feet of 4/4 quartersawn red oak.

Materials List

Part		FINISHED SIZE			Matl.	Qty.
		T	W	L		
A	sides	3/4"	12 1/2"	49 7/8"	QRO	2
B*	shelf	3/4"	12"	17 1/2"	QRO	1
C*	bottom	3/4"	12"	17 1/2"	QRO	1
D	front rail	3/4"	6"	17 1/2"	QRO	1
E	dividers	1/4"	12"	15 1/2"	QRO	3
F	back	1/4"	17 1/2"	37 7/8"	ROP	1
G	top	3/4"	13 1/2"	24"	QRO	1
H	door stiles	3/4"	3 7/8"	20 7/8"	QRO	2
I	door rails	3/4"	4 3/8"	9 7/8"	QRO	2
J	door center stile	3/4"	1 7/8"	13 1/8"	QRO	1
K	door panels	1/2"	4 1/4"	13"	QRO	2

*Parts initially cut oversize. See the instructions.

Materials key: QRO-quartersawn red oak, ROP-red oak plywood.

Blade and bits: Dado set; $\frac{1}{8}$ " spiral upcut straight and $\frac{1}{4}$ " top-bearing pattern router bit.

Supplies: Thin, slow-set epoxy.

Sources: **Medallion** 6061 aluminum tube, $\frac{1}{8}$ " wall, $1\frac{3}{4}$ " OD, 1', no. 9056K39, \$16; 6063 aluminum 90° angle, $\frac{1}{8}$ " wall, $\frac{1}{2}\times\frac{1}{2}\times 4'$, no. 88805K74, \$7, 6061 aluminum bar, $\frac{1}{16}\times\frac{1}{2}\times 3'$, no. 8975K111, \$2, 360 brass rod, $\frac{1}{4}$ ", 3', no. 8953K124, \$9, 360 brass rod, $\frac{5}{32}$ ", 3', no. 8953K106, \$6, 260 brass strip, $.032\times\frac{1}{2}\times 12'$, no. 8859K83, \$2, $\frac{1}{4}$ " copper tubing, $\frac{3}{8}$ " OD, $.065$ " wall, 3', no. 8967K93, \$14, 110 copper rod, 2mm, 1m, no. 8966K91, \$10, McMaster-Carr, 630-833-0300, mcmaster.com.

Stem 360 brass bar, $\frac{1}{8}\times\frac{1}{4}\times 3'$, no. 8951K09, \$5, 6061 aluminum rod, $\frac{1}{8}\times 3'$, no. 8974K19, \$2, McMaster-Carr.

Door hardware antique brass no-mortise hinges, 2", pair, no. 00H51.02, \$3, double ball catch, 38×7 mm, no. 00W12.00, \$2, antique brass ring pull, $1\frac{5}{8}\times 1\frac{1}{16}$ ", no. 01A22.81, \$4, Lee Valley, 800-871-8158, leevalley.com.



Arts & Crafts Style by the Numbers

It's no wonder Arts & Crafts furniture appeals to so many of today's woodworkers: When it flourished from 1880 to 1920, the style emphasized a return to traditional craftsmanship, a reaction to the growing industrialization of the period. Pioneers of the Arts & Crafts (A&C) movement rejected low-quality, mass-produced goods, and favored simple forms with less ornamentation reminiscent of medieval times when common people possessed the skills to design and build structures and furnishings.

In the heyday of the A&C movement, various designers and craftsmen including William Morris, Gustav Stickley, the Greene brothers, and others put their own twists and spins on the style. What we collectively call Arts & Crafts today encompasses all of their contributions to the genre, often mashed up with elements of similar and ensuing styles such as art deco.

In this article we'll share with you some of the most common traits of A&C design—ones you can incorporate into your projects to

Note: Each number in the lettered photos refers to a specific element of A&C style. Some especially popular style elements appear in various forms in multiple locations.



A



B



C

give them the distinctive look that has made this style so endearing for nearly 150 years.

Quartersawn oak

① [Photos A, B, C]

The strength, stability, and straight grain of this lumber suits the A&C aesthetic perfectly. The wood was often darkened, and its characteristic medullary rays enhanced, through treatment with ammonia fumes.

► Discover a safe, modern alternative to fuming oak.
woodmagazine.com/nofumes



►Rekindle the A&C philosophy of personal craftsmanship by making your own hardware. woodmagazine.com/hardware

Sturdy, simple hardware

② [Photos D, E]

Knobs, pulls, and hinges, often made of dark-finished brass or steel, pair well with Arts & Crafts furnishings. You'll find A&C hardware in big-box stores and online. Some favorite suppliers include rockler.com, woodcraft.com, horton-brasses.com, and leevalley.com.

Straight lines

③ [Photos A, C, E]

Arts & Crafts furniture has few curves or molded edges. The straight lines lend a simple elegance in repeating patterns such as multiple square spindles or slats.

Delicate decoration

The preponderance of straight lines in Arts & Crafts design makes sparing ornamentation really stand out. So consider these eye-grabbing A&C touches, but avoid using too

many of them in combination—doing so could give your project a cluttered look.

◆**Corbels** ④ [Photos A, D, E]. Like the stone corbels of medieval architecture that supported overhanging structures, A&C corbels lend a look of strength and permanence. Build them short or long, and place them beneath overhanging tops, shelves, and lids.

◆**Cutouts** ⑤ [Photos B, F]. Make a bold statement with large square cutouts, or send a subtle message with long, narrow recesses reminiscent of flower stems.

◆**Inlay** ⑥ [Photo C]. Add some challenge to your A&C project with a floral inlay. You can even combine it with string inlay for a design element that seizes the attention of even the most casual observer.

◆**Gentle arcs** ⑦ [Photos A, B, E, G]. Use a compass or fairing stick to mark graceful arcs on the bottom edges of rails. Cut and sand carefully for a smooth, eye-pleasing curve.



►To learn how a simple kit can make perfect-fitting inlays, hover your smartphone's camera over this code (no app required) or visit woodmagazine.com/inlaykit.

►Make a low-tech fairing stick. woodmagazine.com/fairing



◆**Beveled ends** ⑧ [Photo G]. End grain can detract from a project's appeal, and flat-cut ends on tenons or leg tops can look unrefined. Make those ends more interesting by beveling them. You can bevel square ends to a "diamond" point with a low angle cut of about 20°—you don't want a sharp point on the end.

◆**Ebonized buttons** ⑨ [Photo B]. There's no shame in using screws to fasten your Arts & Crafts masterpiece, especially when you hide those fasteners with ebonized buttons meant to mimic through-tenons. Bevel-cut their exposed ends to a low point as already described, then blacken them with dye, stain, or India ink.

Exposed joinery

⑩ [Photos F, H]

A well-designed A&C piece tells the world it was built by a craftsman, not a machine.

Few construction details convey that message as well as through-tenons. To emphasize a through-tenon, add a wedge to hold it in place [Photo H]. The wedge can be functional or purely decorative (glued on like an ebonized button), depending on how difficult and true to traditional building methods you want the project to be.

Divided flat panels

⑪ [Photos A, E]

Like rows of square spindles, multiple stiles or rails add visual interest and symmetry to flat panels devoid of routed edges or other ornamentation. Float solid-wood panels between the stiles and rails, or simply make a plywood panel and divide it with glued-on rails and stiles. 🌲

► Find detailed project instructions for any of the pieces shown in this article, and many other Arts & Crafts projects. woodmagazine.com/artscraftsplans

Produced by **Bill Krier** with **Kevin Boyle** and **John Olson**

Pegs and Jokers Game



BOX DIMENSIONS:
13⁷/₈" W x 7¹/₈" D x 4³/₈" H

Approximate materials cost:

\$45

**2-8
Players**

Game boards,
pegs, and cards
store in a
handsome box.

Played similar to the board games Parcheesi and Sorry!, these interlocking game boards accommodate two to eight players. Everything you need to get the fun started packs up in a beautiful box you won't mind keeping on display. Get the rules of the game (and a full-size game board pattern) at woodmagazine.com/pegsjokers.

Start with the boards

1 Cut a $\frac{3}{4} \times 3 \times 14$ " blank for each of the game boards (A). (We laminated $\frac{1}{4}$ " cherry and $\frac{1}{2}$ " maple—use any stock you like. Or make each board from a different species.)

2 Enlarge the **Game Board Pattern** and use it to make a $\frac{1}{4}$ "-thick template. Trace the template onto each blank, then use the paper pattern to locate the peg holes [Photo A].

3 Drill the peg holes [Photo B]. Drill the 1" hole at the end of each board, then band-saw and sand the boards to shape, easing the sharp edges. Finish-sand to 220 grit.

4 Apply a finish. (We used aerosol lacquer.)
Drill a $\frac{1}{64}$ " hole $\frac{1}{2}$ " deep where shown on the pattern. Cut the top $\frac{1}{2}$ " off a peg [Source] of each color and glue the tops in the holes.

Pegs and Jokers Cheat Sheet

A – Start a peg or forward 1

2, 3, 4, 5, 6, 9, 10 – Forward face value

7 – Split forward between two pegs or one peg forward 7

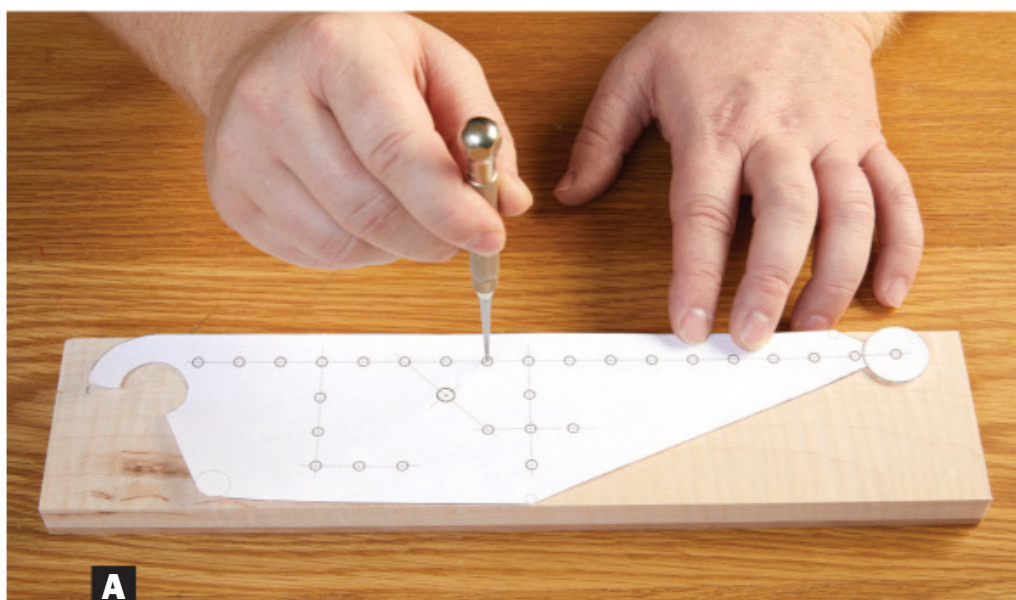
8 – Backward 8 only

Jack, Queen, King – Start a peg or forward 10

Joker – Send a partner's peg to In Spot, or send opponent's peg back to Home

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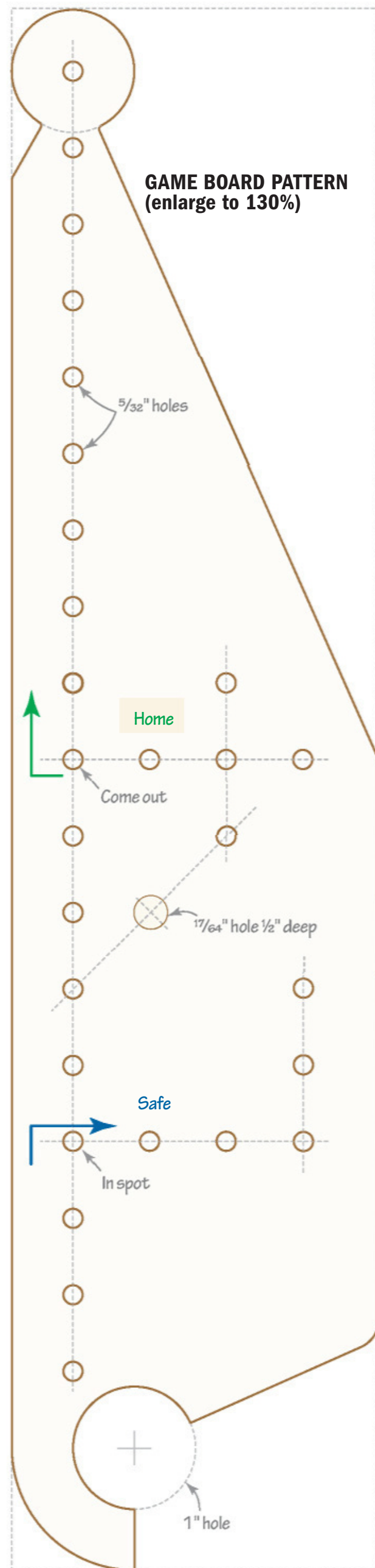
Copy and save this "Cheat Sheet" to remind players of peg movement.



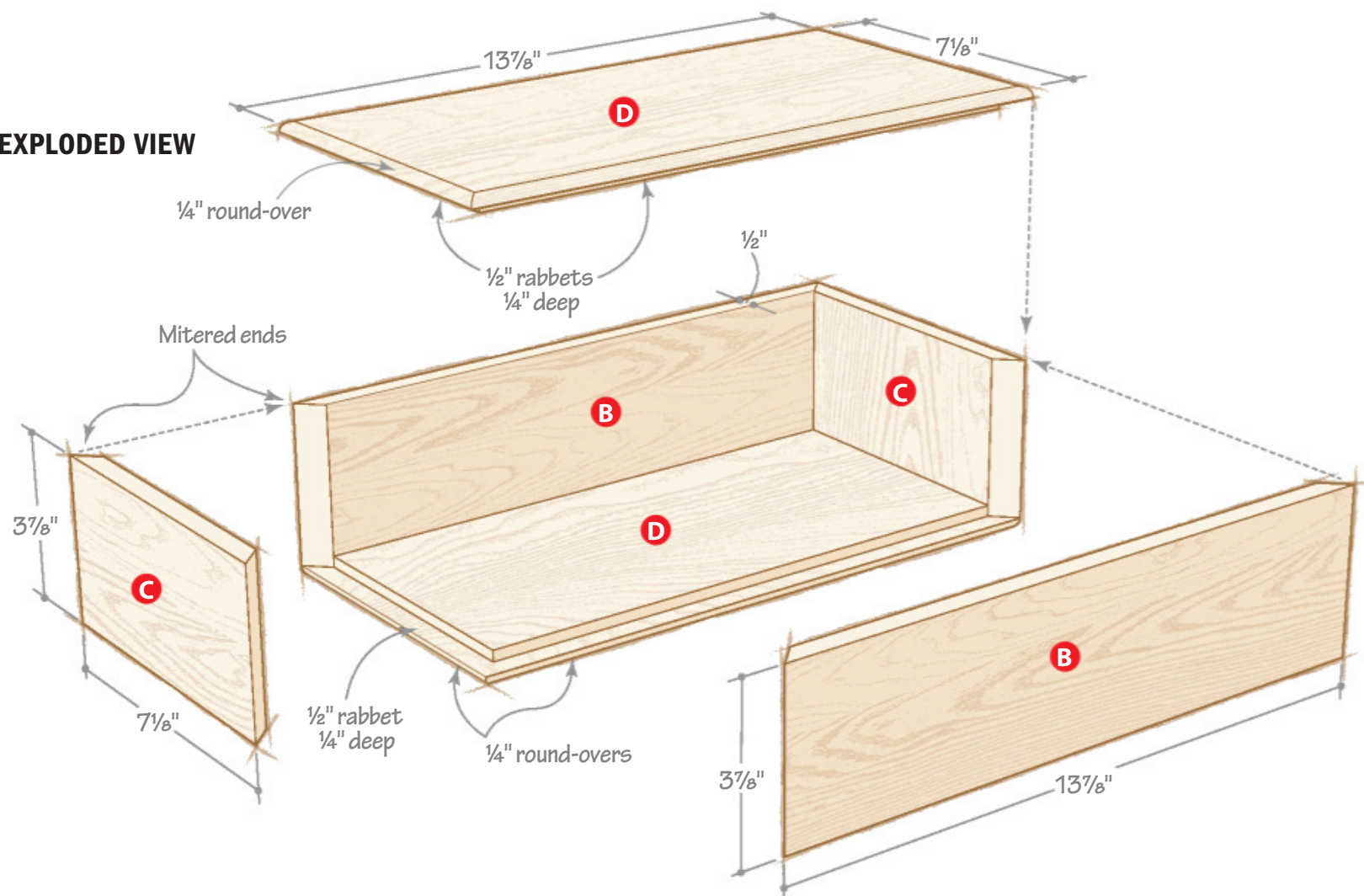
A Align the pattern with the traced outline. Press an awl in each hole location to mark the blank.



B Clamp a straight scrap to your drill-press table to align rows of holes.



EXPLODED VIEW



C

With the outside faces up, the edges aligned, and the tips of the miters touching, stretch painter's tape across the three joints. Flip the assembly and apply glue to the miters.



D

Fold the box together and apply a band clamp. If you don't have a band clamp, tape the fourth joint securely. Work on a flat surface.

Build the box

1 Cut to size the box sides (B) and ends (C) [Exploded View]. Miter-cut the ends and dry-assemble the box to check the fit of the game boards inside. Finish-sand the inside faces to 220 grit.

2 Align the box pieces along your bench, tape the joints [Photo C], and apply glue. Clamp the box [Photo D].

3 Cut the top and bottom (D) to match the dimensions of the box. Rabbet the interior faces and round over the exterior edges [Exploded View]. Finish-sand the pieces, then glue the bottom in place. Apply a finish to match the game boards. 🌲

Materials List

Part	FINISHED SIZE			Matl.	Qty.
	T	W	L		
A* game boards	3/4"	3"	12 1/16"	M/C	8
B box sides	1/2"	3 7/8"	13 7/8"	C	2
C box ends	1/2"	3 7/8"	7 1/8"	C	2
D box top/bottom	1/2"	7 1/8"	13 7/8"	C	2

*Parts initially cut oversize. See the instructions.

Materials key: M/C-laminated maple and cherry; C-cherry.

Bit: 1/4" round-over router bit.

Source: Pegs, no. 300PEGS. \$26.95 plus S/H, Schlabaugh and Sons, 888-346-9663, schsons.com.

Produced by **Craig Ruegsegger** with **John Olson**

Project design: **John Olson**

Illustrations: **Roxanne LeMoine, Lorna Johnson**

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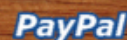
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SHOP TEST

Tool-Triggered Dust Extractors

These premium vacuums link up with tools to trap fine dust far better than an ordinary shop vacuum.



Tool-selection criteria

Each machine considered for this review has:

- an onboard tool power outlet;
- at least a 2-micron-rated dust filter.

Don't be the filter that removes the dust from your shop's air." That's a tool-industry axiom that makes a lot of sense these days. The more we learn about the health risks of airborne wood dust, the greater the need for devices that work in unison with tools to keep that dust out of our lungs. And that's where the 12 machines tested for this article really shine.

All of them represent a big step up from the typical wet/dry shop vacuum. For starters, each can automatically turn on when a power tool plugged into the vac's 110-volt outlet switches on. It makes using the vac a no-brainer. All of the test models, except for the Makita, come with a HEPA-rated filter (see note, *left*). The Makita instead comes with a filter capable of capturing particles down to 2 microns, though it will accept an optional HEPA filter (\$130).

Because replacement HEPA filters don't come cheap (\$35–\$255 per machine—some require two filters), 10 of the tested vacs come with a disposable bag prefilter that captures most of the dust before it reaches the HEPA filter. When the bag fills up, simply toss it out. The two units that don't come with a prefilter, the Metabo HPT and Fein Turbo II X AC, offer prefilter bags as an option (\$15 and \$10 each, respectively). A side benefit of the additional filtering: These machines run much quieter than a typical shop vacuum. Only one ran loud enough to

necessitate hearing protection (more on that later), although adding in the connected tool's noise might call for some protection.

We ran each of the extractors through extensive suction, airflow, and filtration testing. Here's what we learned.

Attributes of a dust extractor

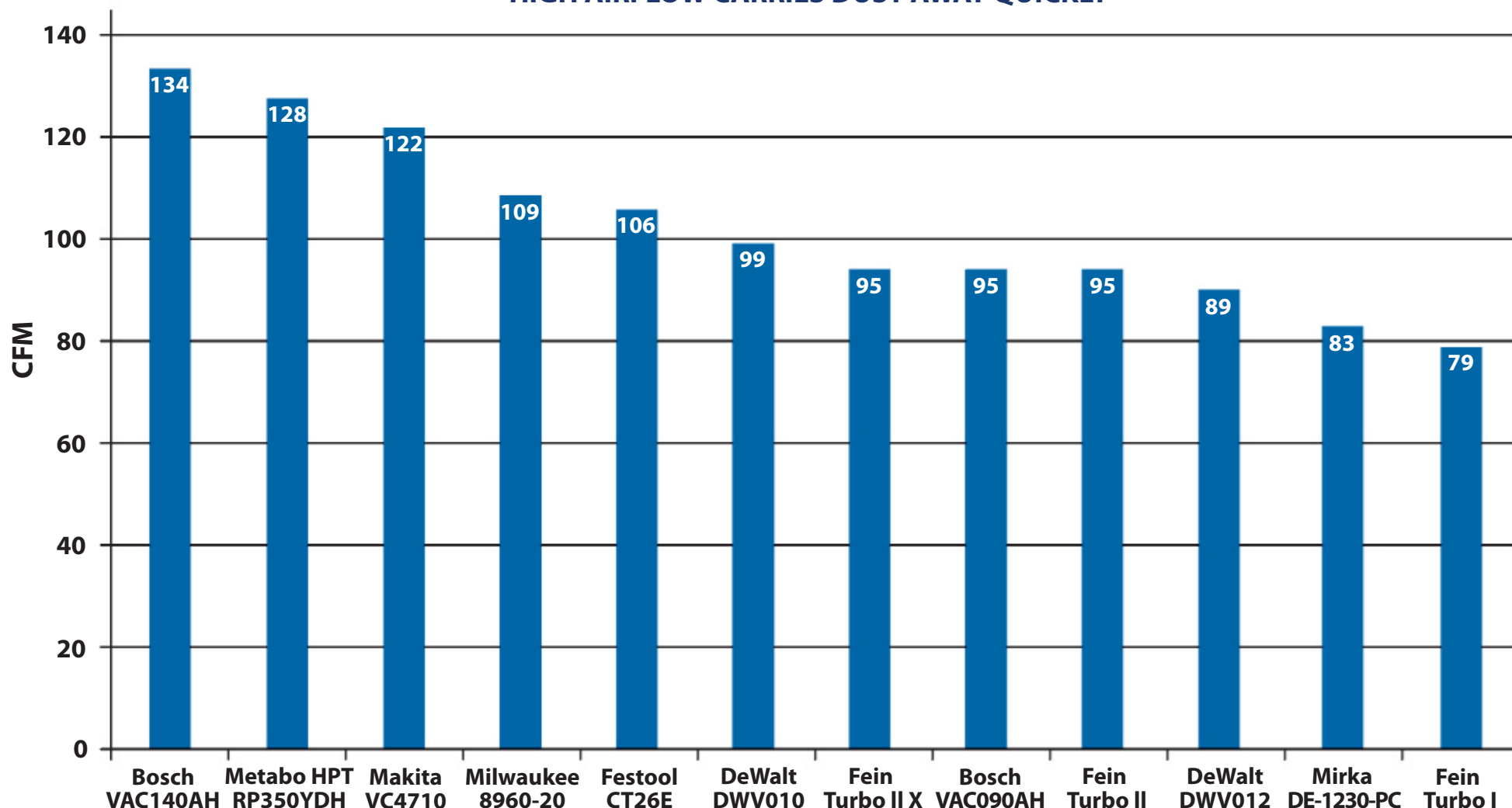
1. Suction/airflow. We measured each model's suction and airflow using instruments and methods similar to those used by testing labs. (The chart on *page 60* provides performance grades in these areas.) *Suction* describes the power to pick up debris, while *airflow* moves it through the hose and into the tub. Airflow results from suction when the hose end is open, so you can have suction without airflow, but never airflow without suction. For dry debris, such as sawdust, high airflow (measured in cubic feet per minute, or cfm) proves much more important than suction. Fine dust, such as that generated by sanders, moves easily through a hose and requires little airflow. However, chips from a router or circular saw require higher airflow to avoid hanging up in the hose.

To measure airflow in these models, we sucked up debris of varying sizes with clean and dirty filters to replicate new and used equipment, and then assigned them a composite score for airflow. The chart *below* shows the maximum airflow for each unit after all testing was complete and the filters

► The Occupational Safety and Health Administration (OSHA) now requires contractors and employees on job sites to use only tools, including vacuums, that all but eliminate workers' exposure to fine dust, particularly from cutting concrete. Tool companies complied by manufacturing dust extractors capable of this fine filtration. And we, as woodworkers, benefit from these efforts.

► High-efficiency particulate air (HEPA) filters capture 99.97 percent of airborne particles measuring .3 micron or larger in diameter. The smallest dust particles we can see without magnification measure about 10 microns. Particles smaller than that can stay suspended in the air for 30 minutes or longer—ripe for you to breathe in.

HIGH AIRFLOW CARRIES DUST AWAY QUICKLY



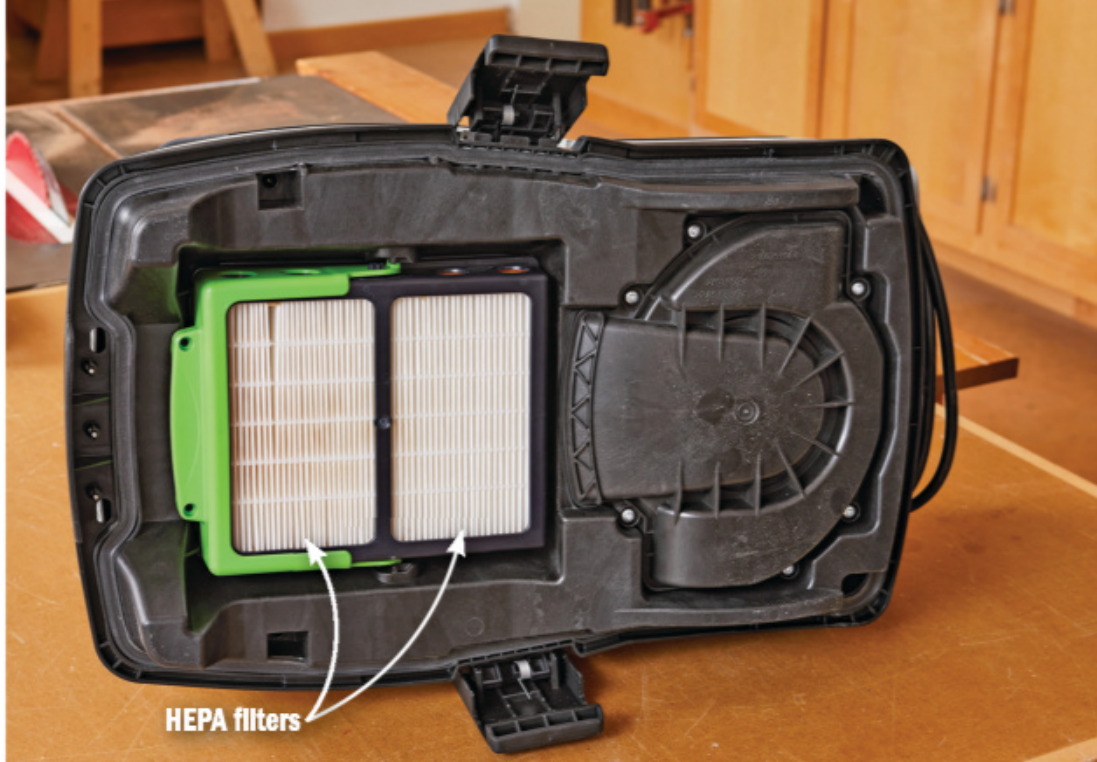
► Want to test the air quality in your shop? Get the particulate meter we used: Dylos DC1100 Pro, \$260. woodmagazine.com/dylos

Tip! Because these dust extractors prove so valuable—in performance and financial investment—avoid using them for wet suction (even though they're capable). Instead, buy a less-expensive tub-style wet/dry vac for those messy jobs.

were seasoned. The top performers delivered much greater airflow than the lowest airflow unit.

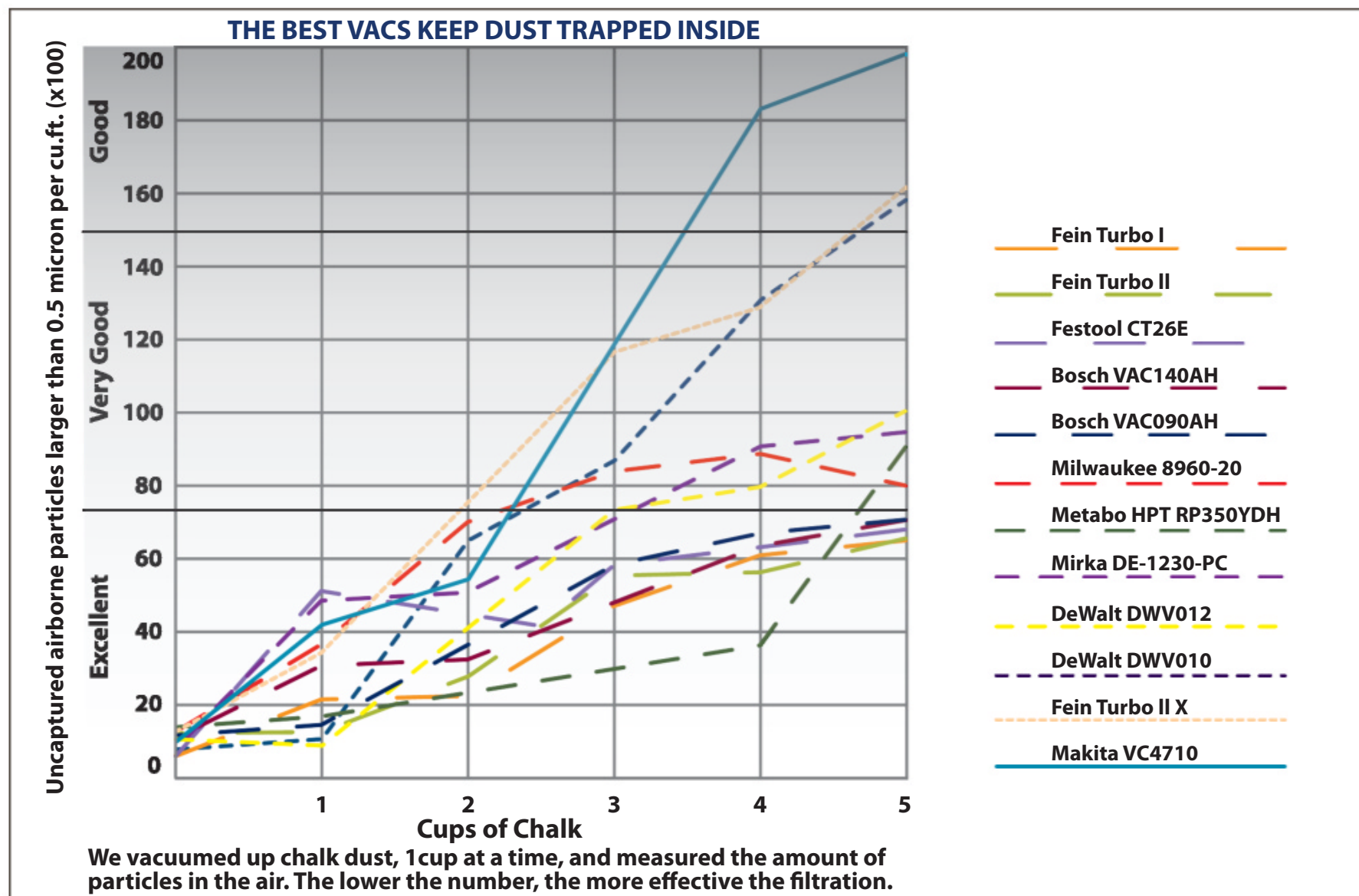
2. Filtration. Each model comes equipped with either one or two ultrafine (2 microns or finer) filters, shown at *right*. Think of these fine filters as a *last* line of defense against microparticles rather than serving as the only filter. That's why most models come with a prefilter/collection bag. With these, all debris enters the paper or fleece bag, while allowing the air (and some fine dust) to escape into the vac's chamber, where it gets drawn into the fine filter. We prefer the fleece bags because they trap more dust than the paper bags, and they're more resistant to accidental rips. These disposable filter bags cost \$5–\$15 apiece, but without one you'd quickly load up the fine filter with dust, compromising airflow and shortening the life of that more costly ultrafine filter.

To help maintain consistent airflow, many of the vacs automatically clean the fine filter, triggering 2–3 times per minute to knock or blow off dust. During testing, we found this cleaning action improved airflow each time, especially when not using a prefilter bag. The Mirka has a cleaner you must work manually—a step easily overlooked as you work; the Festool and Fein Turbo I and II vacs do not have a filter cleaner.



HEPA filters prevent fine dust from escaping a dust extractor's collection chamber.

We ran each vac through a series of tests to gauge its ability to filter large and small particles. Based on the air-quality chart provided with our particulate meter, all of the vacs tested in the “good” to “excellent” ranges. Wood dust seemed easy for these machines to filter well, but when we sucked up chalk dust—a product consisting of primarily tiny particles—a few models allowed more fine dust to escape than the majority. (See the chart *below*.) Bottom line, though: All of these vacuums perform well at filtering dust from shop air.



Three ways to bag up debris in a dust extractor



A drop-in bag liner collects debris so it's easier to lift out for disposal, but allows all dust access to the HEPA filters.



A paper filter bag captures all debris inside with only the finest dust getting through to the HEPA filter.

Power up the tool

To achieve tool actuation of the vac, plug the tool into the vac's outlet, attach the hose to the tool's dust port, set the selector switch to tool activation, and power up the tool. With each extractor you can also select manual power to operate it without a connected tool.

Each extractor has a maximum-amps rating for its own motor plus the outlet for the tethered tool. Most combined ratings do not exceed 15 amps, based on the likelihood you'll be using a 15-amp circuit. If you're using a 20-amp circuit, you'll probably never trip a breaker. But when we measured amp draw in our tests—all done on 20-amp circuits—we routinely exceeded the rated amperage without tripping a breaker. And when we used a 3-hp router and plunge-cutting tracksaw with each vac, we pulled more than 20 amps without issue.

Don't overlook the hose

A good hose proves nearly as important as the vacuum itself. The ideal hose would be large enough in diameter to allow any size debris to pass through without hanging up, but not so big as to be cumbersome. It should also be flexible but still resistant to crushing or kinking. Unfortunately, none of these hoses has all these qualities. Instead, the hose that comes with a vac usually is a com-



A fleece filter bag captures all debris and does the best job of filtering dust before it can reach the HEPA filter.

promise of one or more of those qualities.

All but one of the test vacs (Mirka) comes with a hose. Mirka's Julie Schilling says this allows you to choose the Mirka hose that best fits your needs. And that's a fair point, because hoses perform better at various tasks based on their size and qualities.

(However, it does add cost to this \$1,050 vac—highest in our test.) The other factory hoses measure between 1" and 1½" inside diameter, with nozzles generally slightly smaller. These work fine for attaching to portable tools, but are too small for bench-top tools and machines.

We like Festool's hose best because it's flexible and has a woven covering that prevents the hose's spiral ribs from catching on a workpiece edge. We'd prefer more crush resistance, but not at the trade-off of being less flexible.

More valuable vac facts

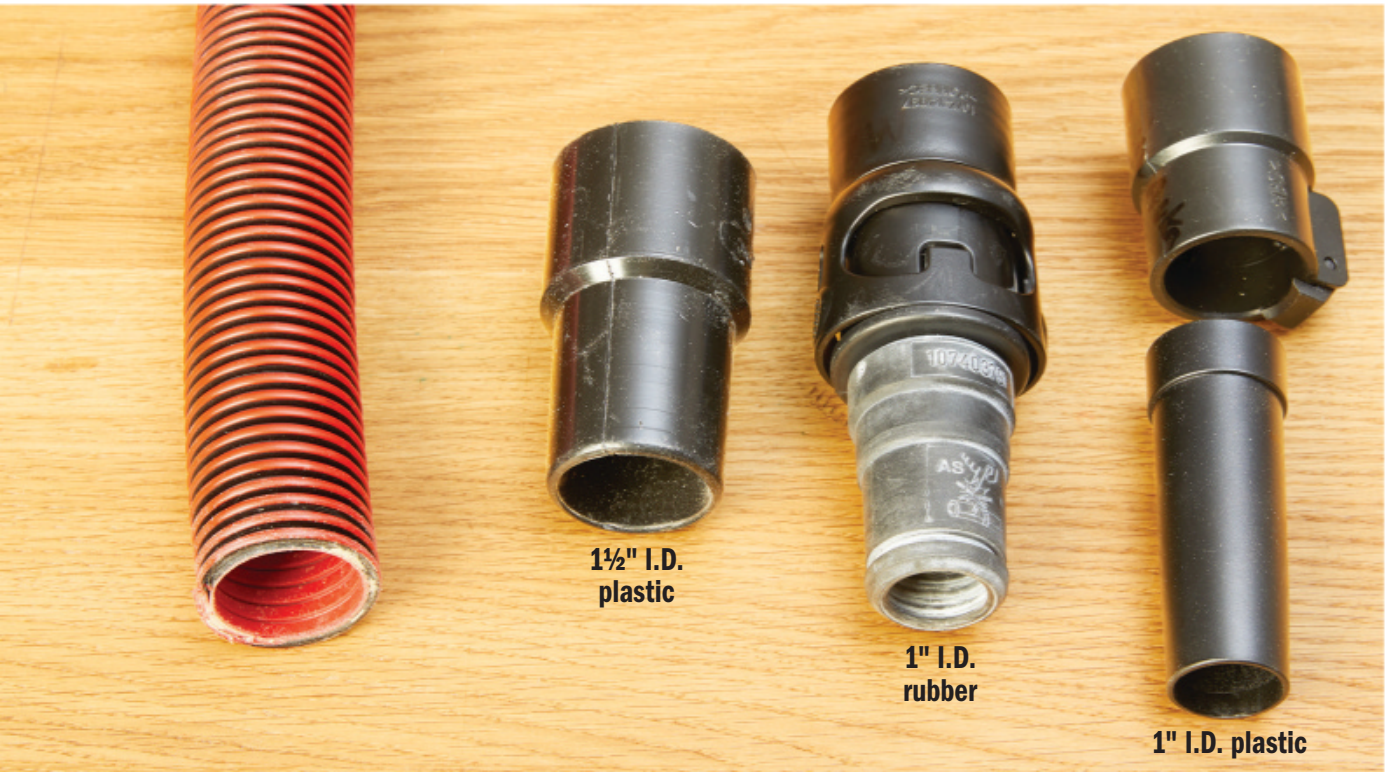
■ **Low noise.** These dust extractors run much quieter than general shop vacuums because of the extra layers of filtration. All but three models have variable-speed motors, allowing you to reduce the suction, airflow, and noise. And at their fastest (or single) speed, only one unit (the DeWalt DWV010) made noise above the 85-decibel threshold where you should wear hearing protection.

■ **Cord/hose wrap.** Most models have power cords longer than 13'. The DeWalt models have 7' and 8' cords, which required extension cords at times. You don't always need a lot of cord, but it's often helpful.

But, with a long cord comes a storage issue. So we appreciate dedicated cord wraps or bungee straps on each model. All but the Fein Turbo I and Turbo II and Mirka vacs provide a way to store the hose, too; these measure 10–17' feet long.

HEPA tool-triggered vacuums:

MODEL	PERFORMANCE RATINGS (1)									
	PRIMARY				SECONDARY					
	SUCTION	AIRFLOW	FILTRATION		EASE OF EMPTYING VACUUM (NO BAG)	EASE OF CHANGING VACUUM BAG	HOSE FLEXIBILITY (2)	HOSE CRUSH RESISTANCE (2)	ACCESSORY STORAGE	MOBILITY
BOSCH VAC090AH	A	B	A		A	A	B-	B	A-	A
BOSCH VAC140AH	A-	A	A		A	A	B-	B	A-	A
DEWALT DWV010	B-	B	C+		B	A	A	B	C+	B
DEWALT DWV012	B	B-	B-		A	A	A	B	B-	B+
FEIN TURBO I	A	C+	A		A	A	B	A-	B	A
FEIN TURBO II HEPA	A	B	A		A	A	B	A-	B	A
FEIN TURBO II X AC	A	B	C+		A-	A	B	A-	A	A
FESTOOL CT 26 E	A	B+	A-		A	A	A	B	A	A
MAKITA VC4710	A-	A	C		A-	A-	C+	A	A	A-
METABO HPT RP350YDH	A-	A	A-		A-	A	B+	A-	B-	A-
MILWAUKEE 8960-20	A-	B+	A-		A	A-	B+	A-	A	A-
MIRKA DE-1230-PC	A-	B-	B-		A	A-	B*	B*	A-	A-



Milwaukee's hose comes with three nozzles so you can use the best one to fit different tools. They simply thread onto the hose end.

In a great field, you can't miss

All of these dust extractors perform well enough to merit a spot in your shop. But if we had to pick just one, we'd take the Bosch VAC140AH, our Top Tool. Yes, it's an investment at \$650, but it scored top marks in suction, airflow, and filtration, has an excellent hose with a nozzle that fits the most common port sizes, and has a best-in-test 14½-gallon capacity. If you don't want to spend that much, opt for the \$290 Fein Turbo I. It's our Top Value. You get a smaller tank and less airflow, but it's more than adequate for collecting and filtering sanding, routing, and sawing debris.

Quiet performance with great filtration

RATED TANK CAPACITY, GALLONS	HOSE (2)			ELECTRICAL RATING, AMPS		NOISE LEVEL, DECIBELS (3)	CORD LENGTH, FEET	INCLUDED FILTER/COLLECTION BAG (4)	WARRANTY, YEARS	COUNTRY OF ASSEMBLY (5)	SELLING PRICE (6)	REPLACEMENT HEPA FILTER PRICE
	OVERALL LENGTH, FEET	INSIDE DIAMETER, INCHES	NOZZLE INSIDE DIAMETER, INCHES	VACUUM MOTOR	TOOL OUTLET							
9	10	1¼	1	9.5	7.5	82–84	13½	F	1	I	\$600	\$75
14½	10	1¼	1⅙	9.5	5.5	81–83	13½	F	1	I	\$650	\$75
8	15	1¼	1	11.8	3.2	88	8	F	3	C	\$400	\$70 (set of 2)
10	15	1¼	1	11.6	3.4	76–84	7	F	3	C	\$550	\$70 (set of 2)
5¾	14	1¼	1⅙	9	6	84	17½	P	3	R	\$290	\$140
8½	14	1¼	1⅙	9	6	83	17½	P	3	R	\$480	\$140
9¼	14	1¼	1⅙	9	6	79–82	22	P	3	R	\$580	\$140
7	12	1	1	8.3	3.7	75–82	24	F	3	G	\$730	\$100
12	16.5	1⅜	1½	7.3	5.2	59–81	24	F	1	H	\$500	\$130
9¼	10.5	1½	1¼	11	4	65–74	26	C	1	G	\$780	\$224 (set of 2)
8	13	1⅙	1	12	4.6	72–78	24	C, F	3	H	\$650	\$79
8	17.5*	1¼*	1*	8.7	4.8	66–74	23½	F	3	H	\$1,050*	\$150



1.

A

Excellent

B

Good

C

Fair

D

Poor
2.

(*) Using optional hose (no. MV-412HA, \$250) not included with vacuum
3.

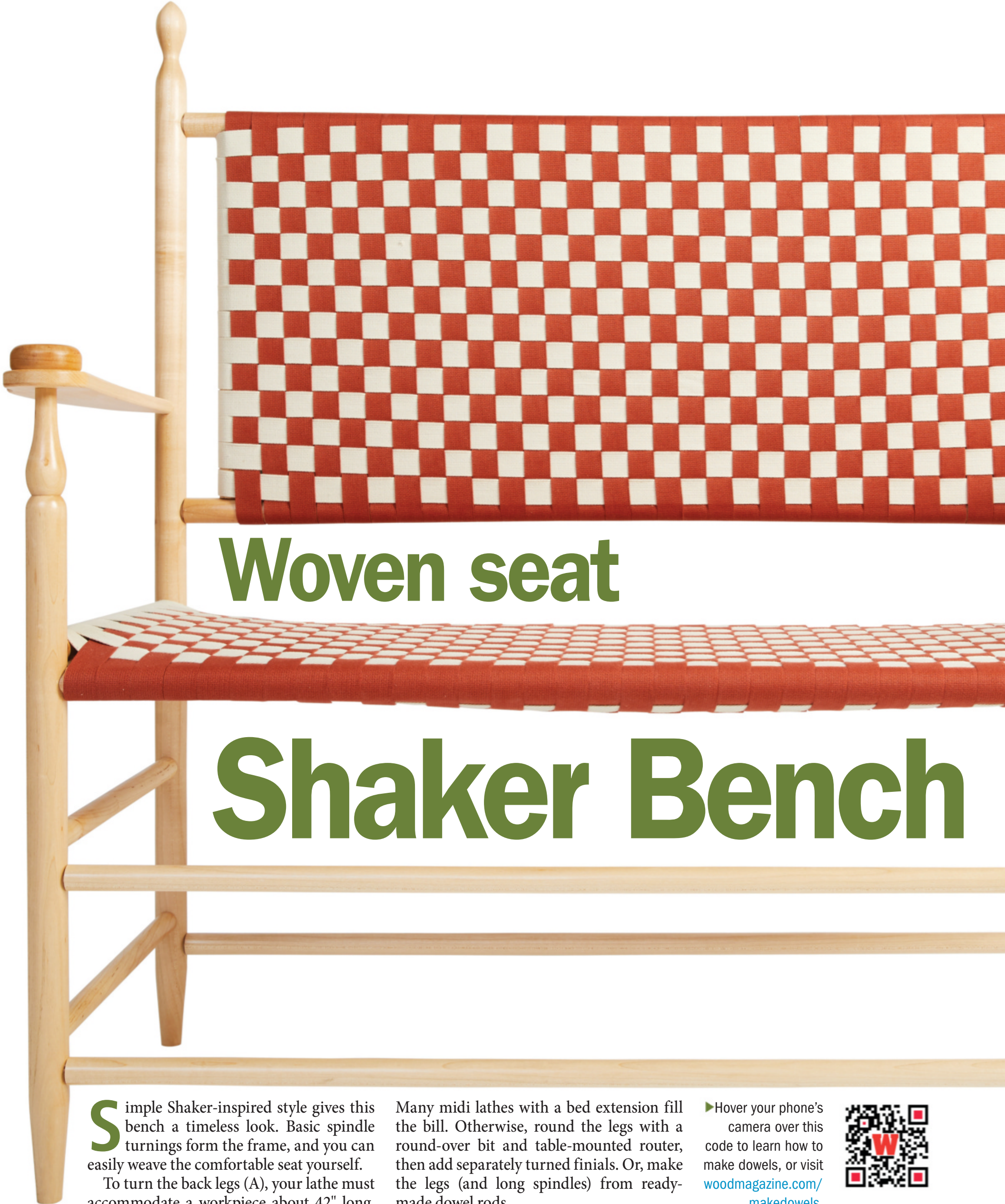
Variable-speed models show measurements at lowest and highest speeds.
4.

(C) Plastic collection bag
(F) Fleece filter bag
(P) Paper filter bag
5.

(C) China
(G) Germany
(H) Hungary
(I) Italy
(R) Romania
6.

Prices current at time of article production and do not include shipping, where applicable.
(*) Does not include hose

Produced by **Bob Hunter** with **Tom Brumback**
Illustrations by **Lorna Johnson**



Woven seat

Shaker Bench

Simple Shaker-inspired style gives this bench a timeless look. Basic spindle turnings form the frame, and you can easily weave the comfortable seat yourself.

To turn the back legs (A), your lathe must accommodate a workpiece about 42" long.

Many midi lathes with a bed extension fill the bill. Otherwise, round the legs with a round-over bit and table-mounted router, then add separately turned finials. Or, make the legs (and long spindles) from ready-made dowel rods.

► Hover your phone's camera over this code to learn how to make dowels, or visit woodmagazine.com/makedowels.





D I M E N S I O N S :
42½" W × 17¾" D × 41" H

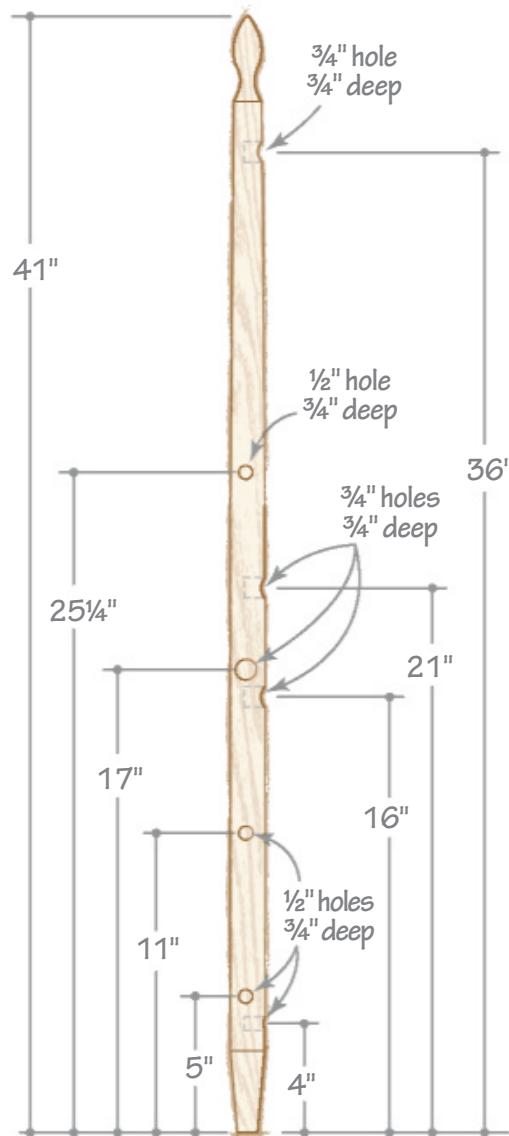
Approximate materials cost

\$350

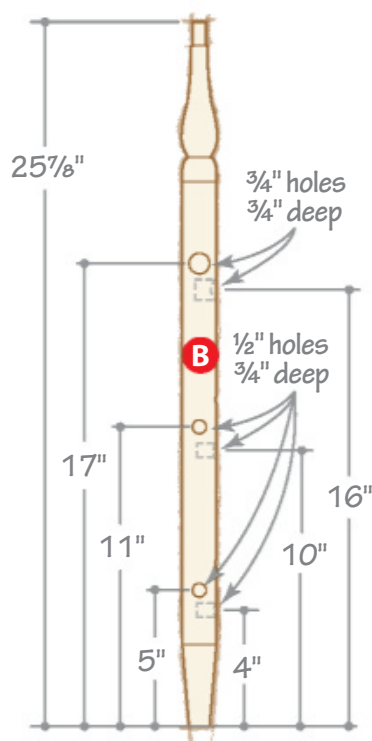
including webbing for seat and back

Turn some spindles, weave some webbing.

1 BACK LEG (Left rear leg shown, right leg is a mirror image)



2 FRONT LEG (Left front leg shown, right leg is a mirror image)

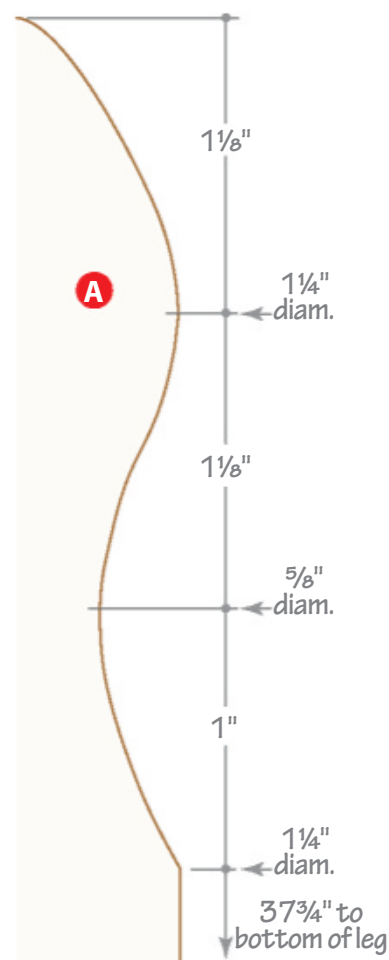


Note: Hole depths shown on Drawings 1 and 2 are after turning; drill about 3/16" deeper into the blanks.

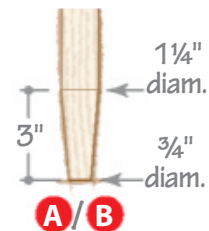
Begin with the legs

1 Cut 1½"-square stock for the back and front legs (A, B), allowing an inch or so extra length at the top end [Materials List, Exploded View]. Measuring from the bottom, drill holes in adjacent faces to make mirror-image legs [Drawings 1, 2].

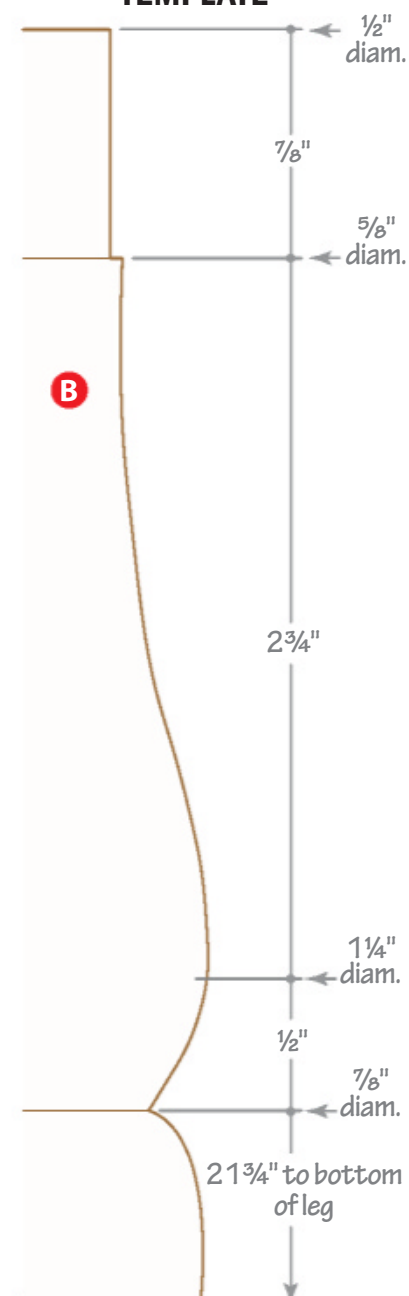
1a BACK LEG TOP PROFILE TEMPLATE



1b LEG TAPER

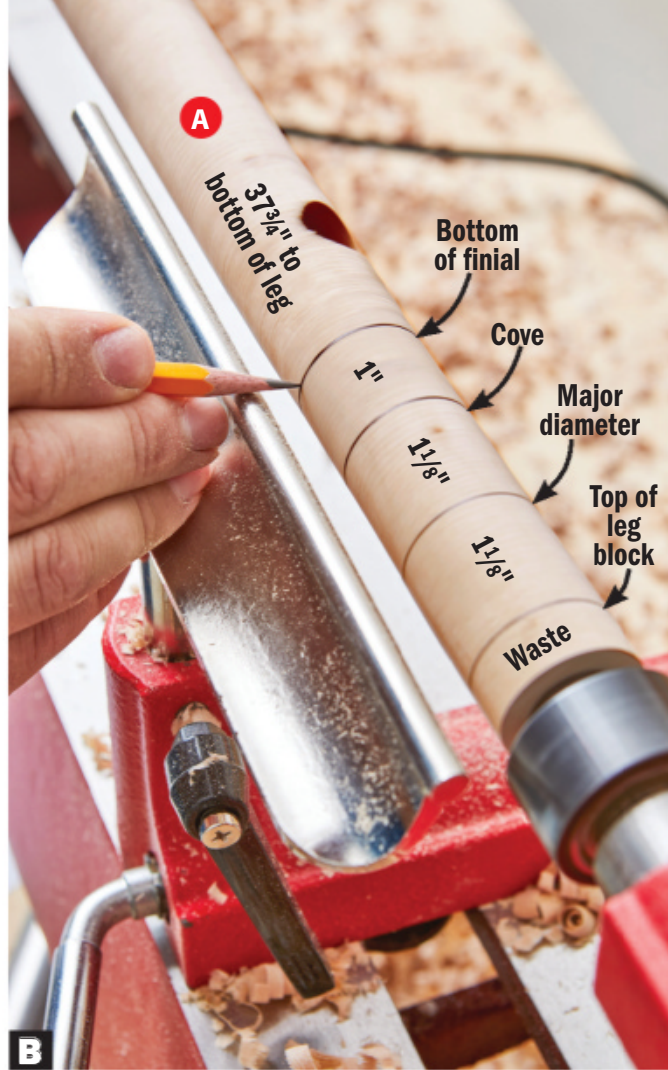


2a FRONT LEG TOP PROFILE TEMPLATE





A Use a roughing gouge to quickly round the square. Support the workpiece from behind with your hand to prevent flexing.

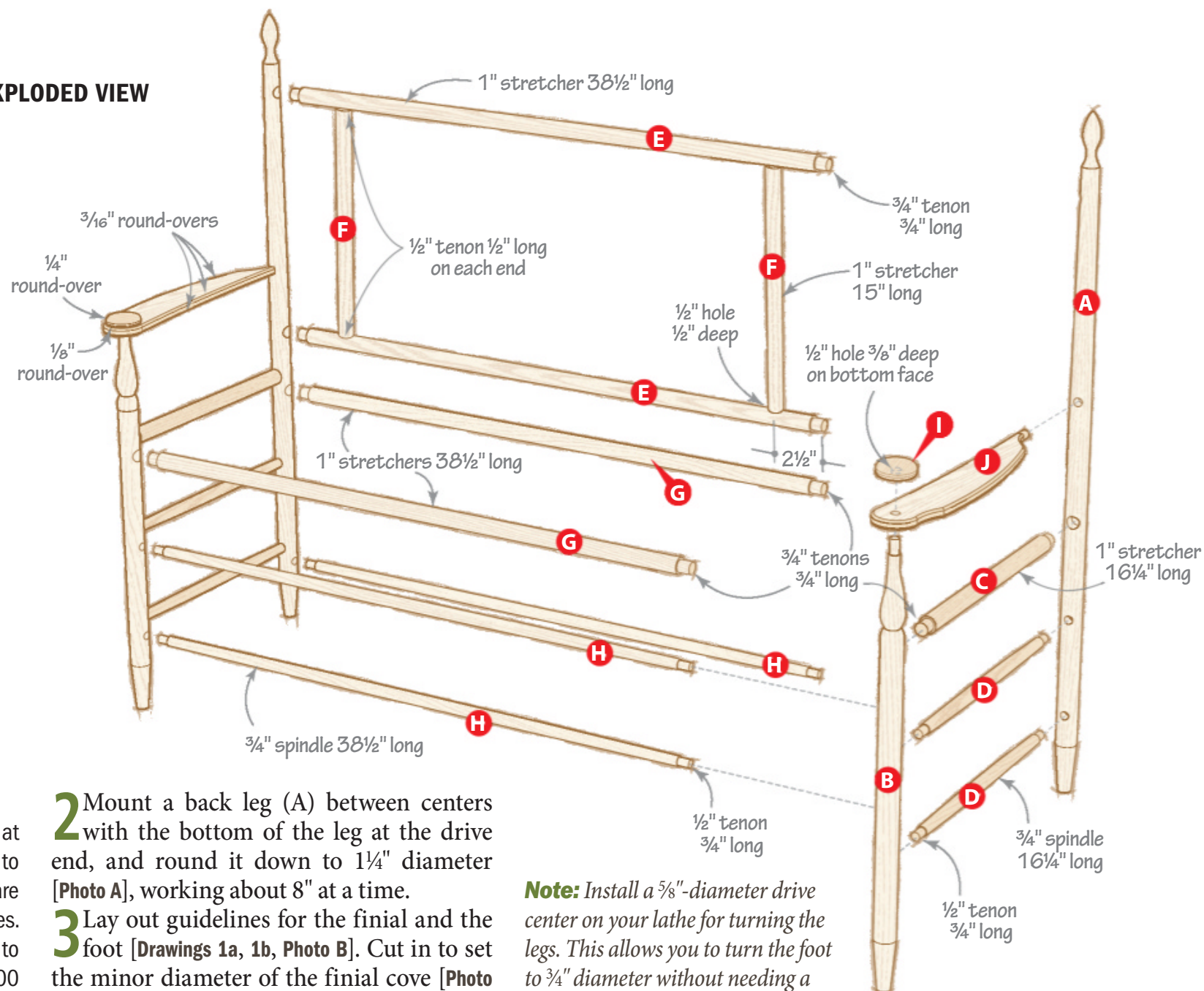


B Draw guidelines for the finial features, measuring from the bottom of the leg. Verify that the overall length between the top mark and the bottom is 41".



C Establish the diameter at the middle of the cove using a parting tool or a skew (shown). Center the cut on the guideline.

EXPLODED VIEW



► Run the lathe at about 1,500 rpm to round down square stock for the spindles. Then, speed up to about 2,000–3,000 rpm for finish-turning.

2 Mount a back leg (A) between centers with the bottom of the leg at the drive end, and round it down to 1 1/4" diameter [Photo A], working about 8" at a time.

3 Lay out guidelines for the finial and the foot [Drawings 1a, 1b, Photo B]. Cut in to set the minor diameter of the finial cove [Photo C] and define the leg top [Photo D].

Note: Install a 5/8"-diameter drive center on your lathe for turning the legs. This allows you to turn the foot to 3/4" diameter without needing a wasteblock.



D Cut in with a parting tool at the top of the finial. Leave about a 1/4" tenon connecting the top of the turning to the waste.



E Form the finial top with a spindle gouge. Move the gouge toward the top of the leg, and maintain the 1/4" connection to the waste.



F Work down to the minor diameter from the top and bottom of the cove. Check your work with a paper template to keep both finials the same.



G Form a straight taper for the foot. Establish the foot's bottom diameter with a parting cut, then work down from the guideline with the roughing gouge.



H Sand with cloth-backed abrasive in progressively finer grits from 80 to 220. Run the lathe at a slower speed (750 rpm or so) with coarse abrasive.



► Brush up on using a spindle gouge.
woodmagazine.com/spindlegouge

4 Cut out a copy of the finial pattern [Drawing 1a] for a template. Shape the finial [Photos E, F]. Taper the foot with the roughing gouge or a skew [Drawing 1b, Photo G].

5 Finish-sand the leg [Photo H]. Remove the turning from the lathe and cut off the

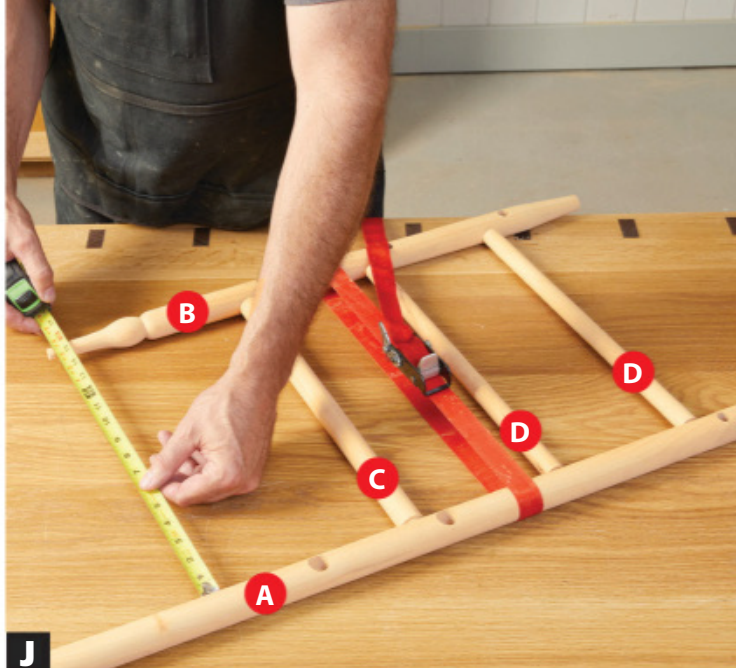
waste with a fine-toothed handsaw. File and sand the finial tips to shape.

6 Turn the other back leg (A) and both front legs (B) following the same procedure. Cut a template of Drawing 2a for the top of the front leg.

Tip! Form the tenons on top of the front legs with a parting tool to create sharp shoulders.



I Turn the arm cap to final diameter and round over the edge. Finish-sand the cap, remove it from the screw center, and drill the center hole to $\frac{3}{8}$ " deep.



J Hold the side assembly together with a band clamp to measure the arm attachment distance. Alter the arm pattern if the distance needs to be adjusted.



K Shape the arm tenon with a $\frac{1}{4}$ " round-over bit. Set the bit slightly low in the table to leave a flat surface for the bearing to ride on. Sand the tenon to shape.

Turn the spindles, add arms

1 Cut stock for the stretchers and spindles (C–H), adding a couple of inches extra to provide wasteblocks at both ends. Drill holes in the back stretcher (E) blanks [Exploded View].

2 Turn and finish-sand the stretchers and spindles, and form tenons on the ends [Exploded View].

3 Cut $2\frac{1}{2}$ "-square blanks for the arm caps (I) and scribe a $2\frac{1}{8}$ " circle on each blank. Drill a $\frac{1}{2}$ " hole $\frac{1}{8}$ " deep and a centered pilot hole for a screw center in each blank.

4 Bandsaw each blank just outside the line. Attach the screw center and grip it in your lathe chuck. Turn the cap to shape [Photo I].

5 Dry-assemble a bench side (A–D) and measure the distance from the tenon center on the front leg (B) to the face of the back leg (A) to determine arm (J) attachment distance [Photo J, Drawing 3].

Materials List

Part	FINISHED SIZE			Matl.	Qty.
	T	W	L		
A* back legs	$1\frac{1}{4}$ " diam.		41"	M	2
B* front legs	$1\frac{1}{4}$ " diam.		$25\frac{7}{8}$ "	M	2
C* side stretchers	1" diam.		$16\frac{1}{4}$ "	M	2
D* side spindles	$\frac{3}{4}$ " diam.		$16\frac{1}{4}$ "	M	4
E* back stretchers	1" diam.		$38\frac{1}{2}$ "	M	2
F* back vertical stretchers	1" diam.		15"	M	2
G* seat stretchers	1" diam.		$38\frac{1}{2}$ "	M	2
H* front/back spindles	$\frac{3}{4}$ " diam.		$38\frac{1}{2}$ "	M	3
I* arm caps	$\frac{3}{4}$ "	$2\frac{1}{8}$ " diam.		M	2
J* arms	$\frac{1}{2}$ "	3"	$17\frac{3}{8}$ "	M	2

*Parts initially cut oversize. See the instructions.

Materials key: M-maple.

Supplies: #4 upholstery tacks.

Bits: $\frac{3}{16}$ " and $\frac{1}{4}$ " round-over router bits.

Source: Shaker tape natural, 75-yard roll, no. 2613E, \$106; Shaker tape Indian red, 75-yard roll, no. 2621E, \$106; seat foam, $15 \times 15 \times 1$ " (5), no. 7009E, \$7.45; Basket Makers Catalog, 800-447-7008, basketmakerscatalog.com.

6 Cut blanks for the arms (J). Adhere enlarged copies of the arm pattern [Drawing 3] to the blanks.

7 Bandsaw the arms to shape, drill the holes, and round over the edges. Rout the tenons [Photo K], and finish-sand.

Assemble the frame

1 Glue and assemble the two sides (A–D), making sure the holes in the legs (A, B) face each other [Exploded View].

2 Dry-assemble (do not glue) the back stretchers (E) and vertical stretchers (F).

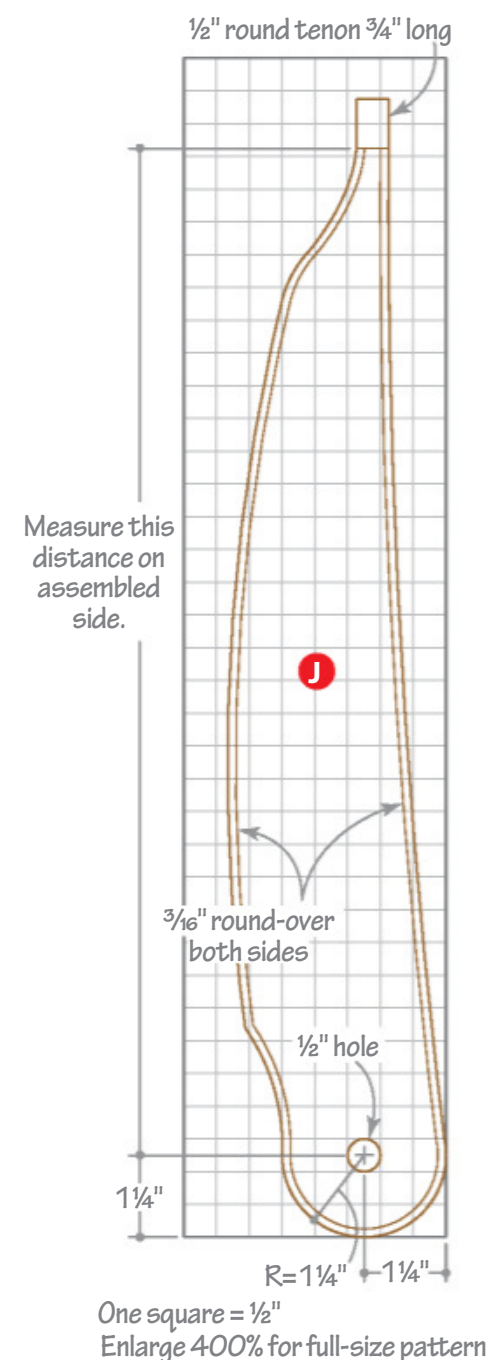
3 Glue the back (E/F), stretchers (G,) and spindles (H) into the holes in the sides (A–D) [Exploded View]. Install the arms (J) and arm caps (I). Make sure the frame sits solidly on all four feet.

4 Touch up sanding as needed, and apply a clear finish. We applied water-based satin-finish polyurethane.

5 Weave the seat and back as shown on the *next page*.

► See how to enlarge gridded patterns.
woodmagazine.com/enlargeplans

3 ARM GRIDDED PATTERN



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

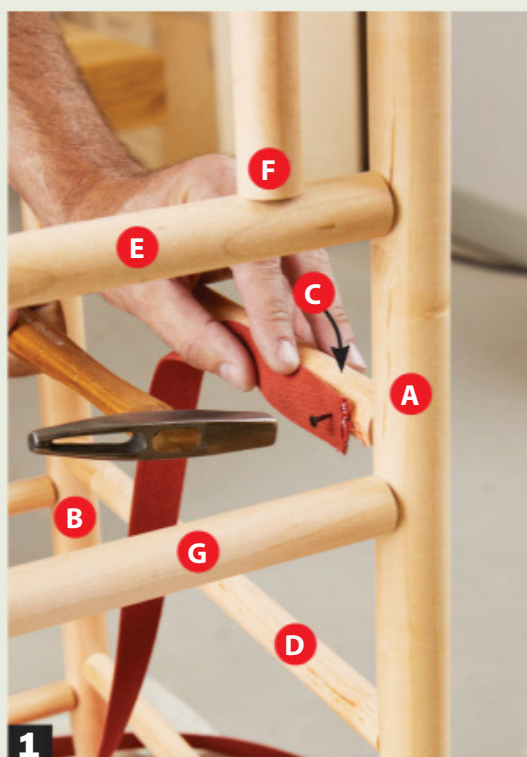
Note: If necessary, splice the tape by sewing the ends together. Plan joints to fall on the bottom or back, hidden under another warp or weft tape.

Weaving a seat

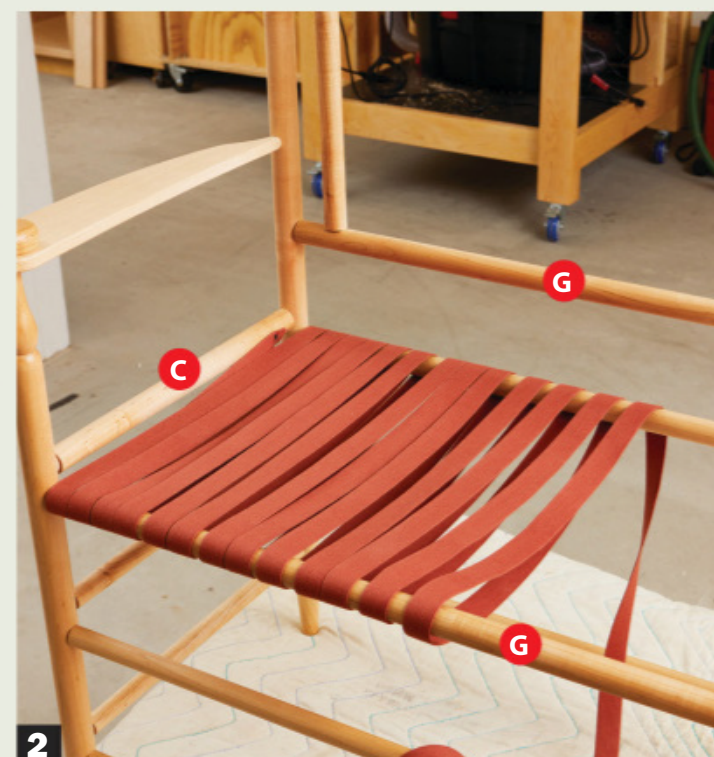
We wove Indian red and natural Shaker tape [Source] to make our seat and back; choose colors (or weave a single color) to match your decorating scheme. The warp runs front to back on the seat and vertically on the back. The weft, or woof, weaves through the warp strands along the length of the weaving.



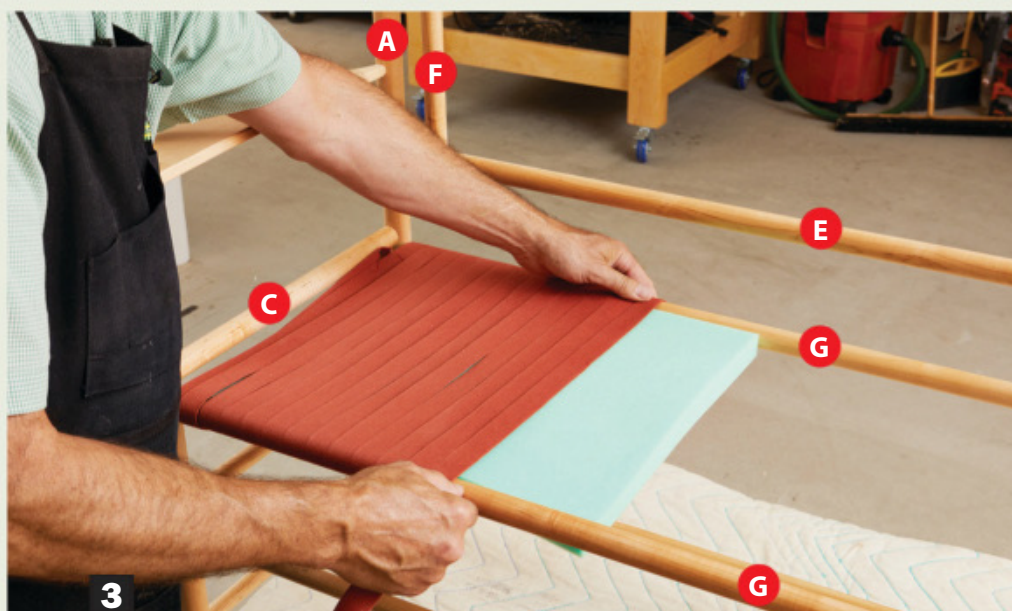
► Hover your phone's camera over this code (no app required) to watch a video of weaving the seat and back, or visit woodmagazine.com/benchweave.



1 Tack the warp tape to the inside face of the side stretcher (C) with #4 upholstery tacks. Start on the left side of the bench as you face it. Back the stretcher with a block of wood or another hammer to make tacking easier.



2 Bring the warp tape under the front stretcher, up around it, and over the back stretcher. Continue wrapping the tape around the stretchers.



3 Snug up the warp webbing and slide the edges together. About one-third of the way across the seat, insert 1"-thick foam [Source] between the top and bottom tape, then continue wrapping the seat and insert foam as you go.



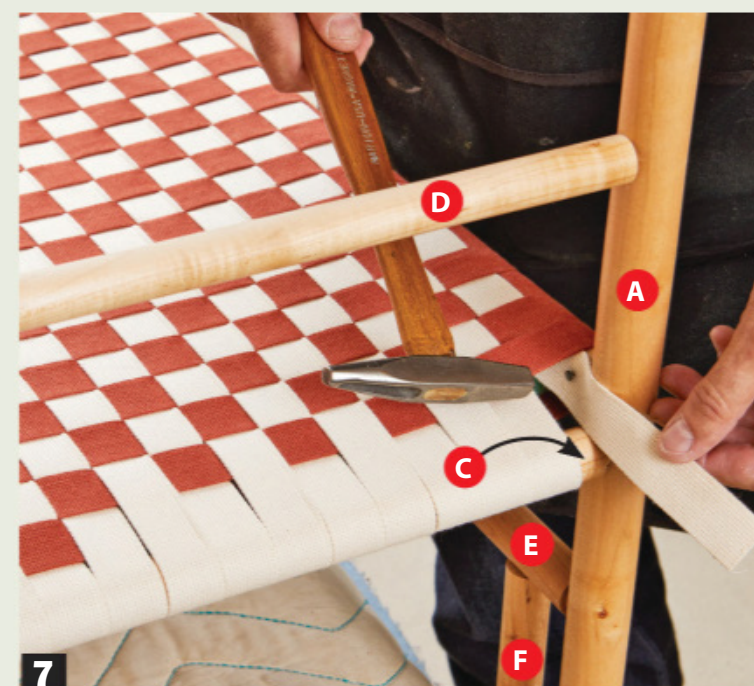
4 Tack the warp tape to the opposite side stretcher. The weft tape will hide the warp ends and tacks on the side stretchers.



5 Unwind enough tape to weave the weft plus an additional three passes for good measure. Tack the weft tape underneath the left side stretcher (C).



6 Wrap the tape around the stretcher and weave it under the first warp tape, over the next, and so forth. Wrap it around the opposite stretcher, flip the bench, and continue weaving on the bottom. Check that the weft isn't twisted before starting the return weave.



7 Tack the weft tape to the inside of the stretcher to complete the seat weaving. Leave enough tape to work with, and cut off the excess after tacking. Tuck the remaining excess into the seat.



Tealight Trio

Here's a project that's as simple as one afternoon, two parts, and three holes.

Note: The leg blank is oversize for added safety while cutting.

Make this project from a $1\frac{3}{4} \times 3 \times 8\frac{1}{8}$ " maple blank for the arch and a $1\frac{3}{4} \times 3 \times 5$ " cherry leg blank. Use the **Leg Top View Pattern** on page 70 to lay out the dovetail pins on one end of the leg blank. Then follow the instructions in **Photos A-E**.

Cut the leg $1\frac{3}{4}$ " long, then glue and clamp it to the arch. Adhere the **Arch Top View Pattern** to the arch, and drill the holes.

Apply the **Side-view Patterns** to the edges of the arch and leg, and cut and sand to the lines. Remove the patterns, finish-sand, apply a clear finish (we used Deft spray lacquer), and add the tea-light candles. 🌿

Blade and bit: Dado set; 40mm or $1\frac{5}{16}$ " Forstner bit.

Produced by **Robert Wilson** with **John Olson**

Project design: **John Olson**

Illustrations: **Roxanne LeMoine, Lorna Johnson**



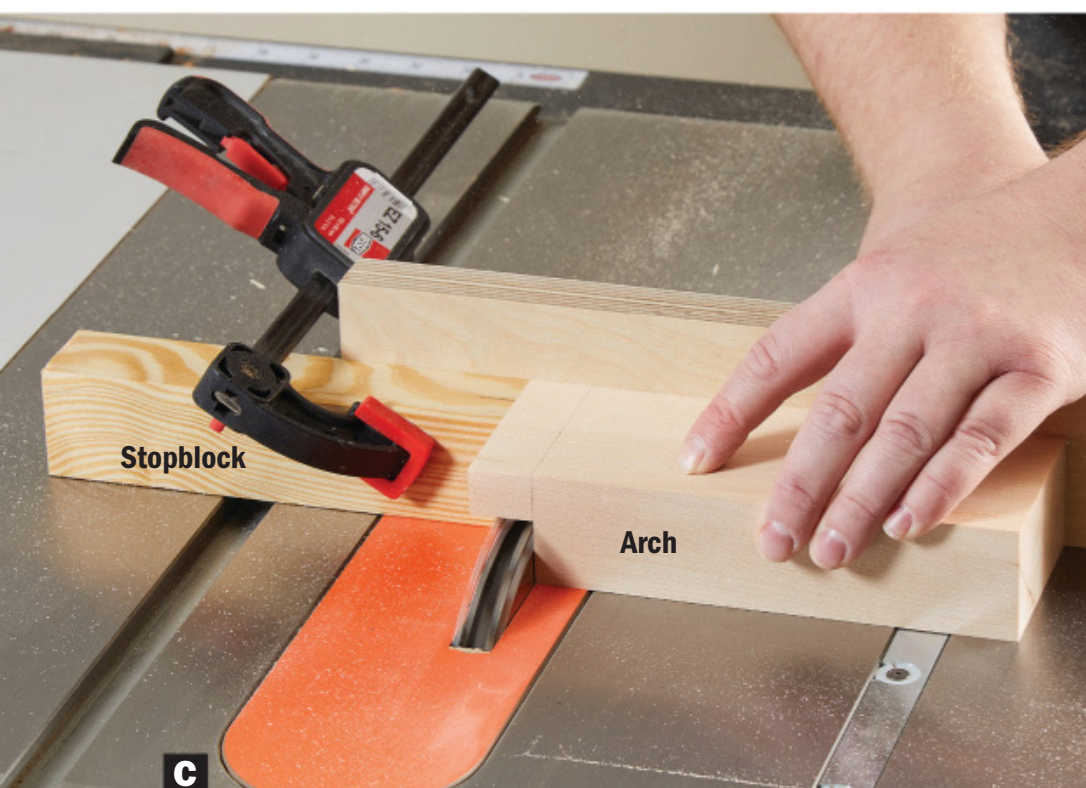
A

With a dado blade set $\frac{3}{4}$ " above the table, angle the miter gauge 10° , and cut one dovetail pin. Reposition the blank and saw away the center waste.



B

Set the miter gauge to the opposite 10° setting, and cut the second pin. Remove any remaining waste with additional passes.



C

Set the dado blade 1" high. Clamp a stopblock to the auxiliary miter fence $\frac{15}{16}$ " from the far edge of the dado blade, and rabbet the arch.



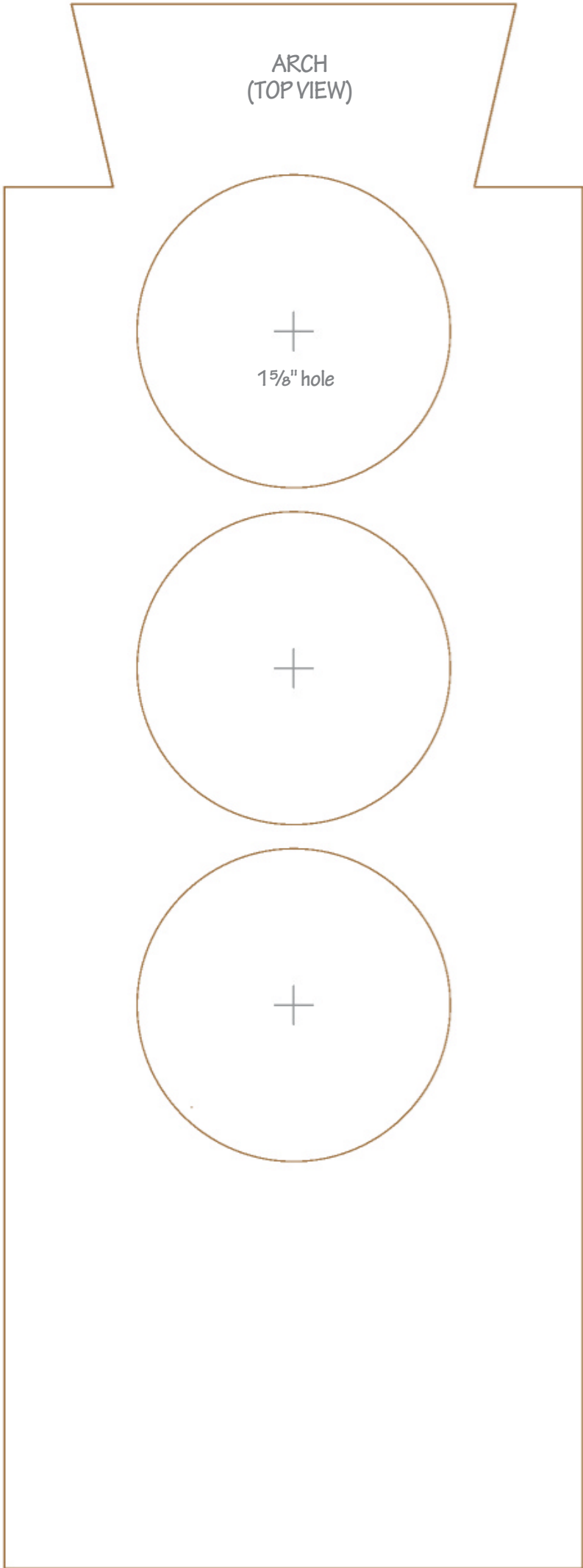
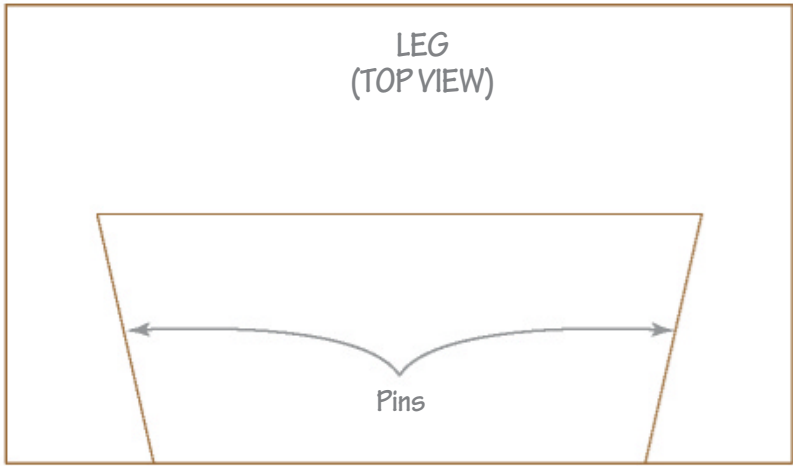
D

Rest the leg on the rabbet with the edges flush, and mark the pins onto the arch.

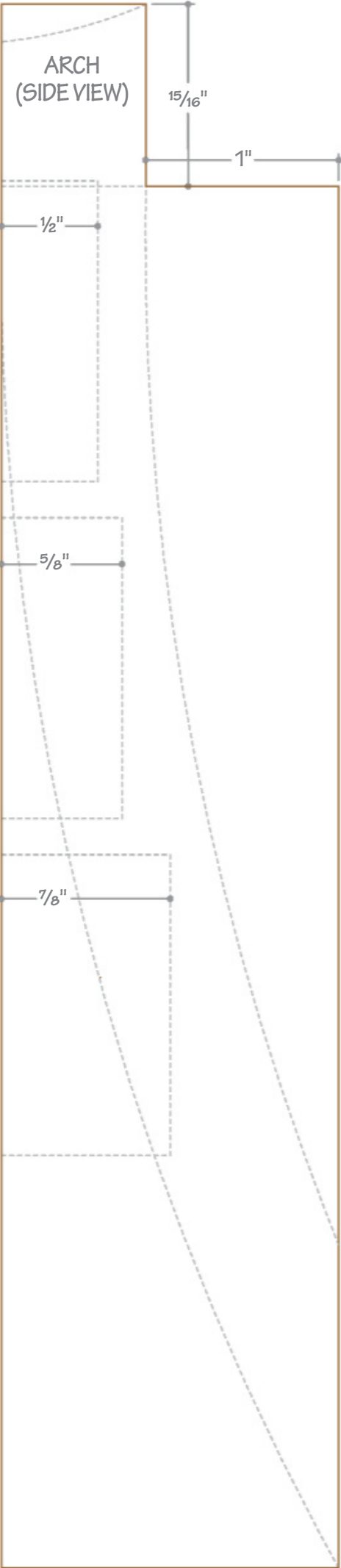
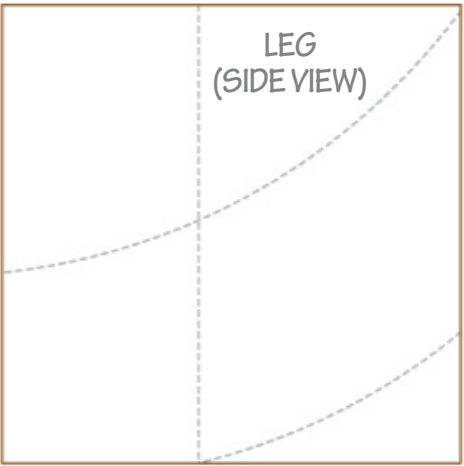


E

Cut the tail on the waste side of the scribe lines and use a chisel to fine-tune the fit of the leg to the arch.



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Take a stand for your mittersaw

While there is some value to having a dedicated mittersaw station in the shop—dust collection and workpiece support, for example—mounting your saw on a collapsible stand can save valuable floor space and allow you to take it on the road in less than a minute. We tested 10 universal mittersaw stands in the *WOOD*® shop, some with wheels and others without, all with extendable workpiece supports and adjustable length stops at each end. You can mount almost any mittersaw on each of them, so you don't necessarily need to match one to your saw's brand. Here are our favorites.

Wheeled stands

Just fold and go—no need to remove the saw.

Ridgid AC9946, \$199

► Height to top of saw-mounting brackets: 33¾"

► Workpiece support each side of blade (centered): 55"

At 10 pounds lighter than the Bosch T4B, this stand works similarly, though felt a little less, well, rigid in use. Its 12" wheels roll over objects and rough ground easily. The support extensions reach a little wider than the Bosch, but their locking levers worked loose and fell off a couple of times.



866-539-1710, ridgidpowertools.com

Bosch T4B, \$350

► Height to top of saw-mounting brackets: 34¾"

► Workpiece support each side of blade (centered): 50"

This is our favorite stand overall because it expands and collapses the smoothest and quickest (just two seconds!), and its heavy-duty mass holds everything steady during use, even when using a 12" sliding mittersaw. It might not be the easiest to load into a pickup truck with a saw mounted, but it's near-perfect in all other ways.

877-267-2499, boschtools.com

Folding-leg stands

Saw and stand store and transport separately.

DeWalt DWX723, \$199

► Height to top of saw-mounting brackets: 33¾"

► Workpiece support each side of blade (centered): 75½"

The lightest (at 29 pounds) and with the longest reach, this stand is best for long lumber. It lacks a leveler, but its longer stance makes one unnecessary.

800-433-9258, dewalt.com



Milwaukee 48-08-0551, \$239

► Height to top of saw-mounting brackets: 33½"

► Workpiece support each side of blade (centered): 49½"

The most compact in this class at 43½" folded, it's easiest to carry, and sets up just as easily. At 31 pounds, it's light, but heavy duty. A leveling foot on one leg proves handy.

800-729-3878, milwaukeetool.com



Ryobi A18MS01G, \$100

► Height to top of saw-mounting brackets: 34½"

► Workpiece support each side of blade (centered): 56½"

Inexpensive and easy to fold up, this stand is heavier than you'd expect (42 pounds). No leveler means you might have to shim a leg on an uneven surface.

800-525-2579, ryobitools.com

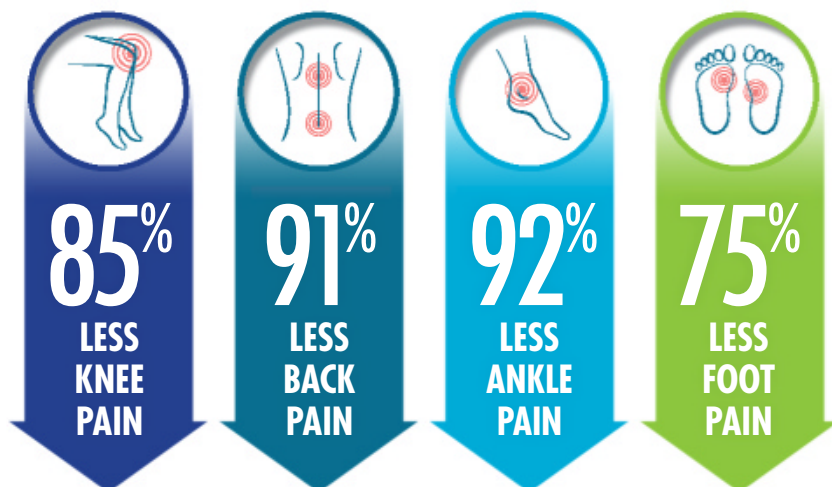


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SHOCK ABSORPTION SYSTEM**



*Results of a double-blind study conducted by Olive View UCLA Medical Center.

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– Bill F.

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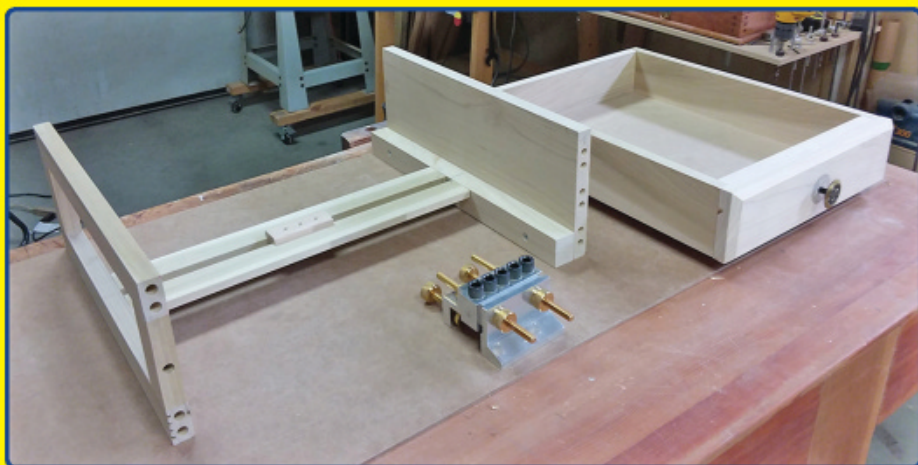


VersoShock® U.S Patent #US8,555,526 B2. May be eligible for Medicare reimbursement. This product is not intended to treat, cure or prevent any disease. \$30 off applies to orders of \$100 or more for a limited time. Cannot be combined with other offers. 9% CA sales tax applies to orders in California. Shoes must be returned within 30 days in like-new condition for full refund or exchange. Credit card authorization required. See website for complete details.

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PRECISION ENGINEERED JOINING SYSTEM

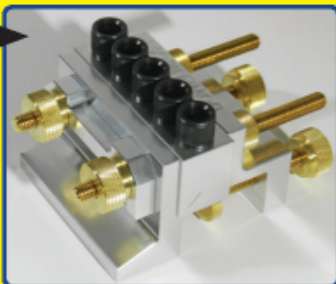
JOINT STRENGTH IS DIRECTLY PROPORTIONAL TO ACCURACY



Classic new drawer construction & drawer guide design by Dowelmax. Watch video of Cabriole Leg End Table & Drawer in "Gallery of Projects" on Dowelmax Website.

Full System Not Shown-Main Device Only

OUR UNCONDITIONAL GUARANTEE:
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- Pre-separates 99% of the dust & debris BEFORE it reaches your collector
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Design Pat.
D703401

Collector, hose and drum not included

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Call: 1-800-313-6359
Visit: CycloneRake.com



**Folds Up Flat
for Storage!**

TOOLS & MATERIALS

SHOP-TESTED

Who needs a cord?

36-volt 10" dual-compound sliding mitersaw, no. C3610DRAQ4, \$600 (bare tool);
36-volt 7¼" circular saw, no. C3607DAQ4, \$200 (bare tool);
36-volt 4.0-amp-hour battery and charger kit, no. UC18YSL3B1, \$170

While building a small house for my dad this past summer, the rural job site was seriously short on electrical outlets (only one at the service pole). So it seemed like a great opportunity to test the mettle of Metabo HPT's MultiVolt 7¼" circ saw and 10" sliding compound mitersaw. I have to say, I came away impressed with the power and runtime of these tools: We worked long days with both saws cutting joists, studs, rafters, siding, and sheathing without having to recharge the 36-volt battery on either tool. And I never felt like I was giving up cutting muscle for convenience.

The circ saw is powerful without being bulky and heavy (9½ pounds with a battery attached). It's comfortable to hold and use, with good sight lines for the 90° and 45° guides notched into the footplate. The mitersaw has all the capacities and capabilities you'd expect in a 10" slider. Both sell as bare tools, so you must buy batteries and charger separately. But the MultiVolt battery packs also work on my 18-volt Metabo HPT and Hitachi tools. You can also buy an AC adapter (no. ET36A, \$170) that plugs into the battery port.

When the house was done, I used each saw in my workshop, and both performed well, making accurate cuts for a furniture build. (I upgraded the factory blades for woodworking.)

—Tested by Bob Hunter, Tools Editor

Metabo HPT
800-706-7337, metabo-hpt.com



Click-to-fit slot cutters make accuracy easy

Precision Twist slot-cutting router bit set, no. 00-512, \$280

Infinity's Precision Twist adjustable slot cutters rout grooves so precise, I don't use my old dedicated-size slotting bits anymore. With this pair, I can rout a slot from ⅛" to ½", and with the adjuster on each changing the slot width .004" per click, I can dial it in to fit any workpiece. That's especially helpful for fitting panels of plywood, a product notoriously undersized and rarely the same with each project. The bits are sharp and durable, routing tear-out-free slots repeatedly in even the nastiest wood.

You can buy either bit separately if you don't want both. The small bit (no. 61-512, \$140) routs ⅛–¼" slots, and the other (no. 61-513, \$140) routs ¼–½" slots.

—Tested by Kevin Boyle, Senior Design Editor

Infinity Cutting Tools
877-872-2487, infinitytools.com



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Ideal for Impact Wrench, Finish & Brad Nailers, Stapling, Air Purpose Spray Gun & Blow Guns

20 GALLON OIL-LUBE AIR COMPRESSOR

NOW \$174.99

SAVE \$75

COMPARE TO PORTER-CABLE \$249.99

ITEM 56241/64857 shown

Handle and Protective Shroud

Powerful Induction Motor "Won't trip your breaker"

Easy Access Drain Valve



Customer Rating

★★★★★

135 MAX PSI
1.6 Running HP
4.0 SCFM
Oil Lube Pump

Large Rubber Wheels

Rubber Foot Stabilizers

11393074

LIMIT 1 - Coupon valid through 1/15/20*

SUPER COUPON

DUST AND PARTICLE MASKS PACK OF 5

NOW \$1.69

Customer Rating

★★★★★

COMPARE TO ACME UNITED \$9.27

MODEL: ACM13259

SAVE 81%

ITEM 63723
62606/50027 shown

11398953

LIMIT 4 - Coupon valid through 1/15/20*

CENTRAL MACHINERY

SUPER COUPON

70 GALLON, 2 HP HEAVY DUTY HIGH FLOW HIGH CAPACITY DUST COLLECTOR

Customer Rating

★★★★★

COMPARE TO SHOP FOX \$405.99

MODEL: W1685

NOW \$179.99

SAVE \$226

ITEM 61790/97869 shown

11400156

LIMIT 1 - Coupon valid through 1/15/20*

CENTRAL MACHINERY

SUPER COUPON

14" OSCILLATING SPINDLE SANDER

NOW \$109.99

SAVE \$60

Customer Rating

★★★★★

COMPARE TO TRITON TOOLS \$170.42

MODEL: TSP5450

ITEM 62146/69257 shown

12063255

LIMIT 1 - Coupon valid through 1/15/20*

Apache

SUPER COUPON

ULTRA-LIGHT, CRUSH PROOF WEATHER-RESISTANT LOCKABLE CASE • 11-7/8" L 9" W 5-5/16" H

NOW \$22.99

SAVE \$214

Customer Rating

★★★★★

COMPARE TO \$237.63

MODEL: 1400

ITEM 63926/64551 shown

12216007

LIMIT 2 - Coupon valid through 1/15/20*

CHICAGO ELECTRIC POWER TOOLS

SUPER COUPON

4" BISCUIT PLATE JOINER

Customer Rating

★★★★★

NOW \$44.99

COMPARE TO MAKITA \$179

MODEL: PJ7000

SAVE \$134

ITEM 38437/68987 shown

12228707

LIMIT 2 - Coupon valid through 1/15/20*

CHICAGO ELECTRIC POWER TOOLS

SUPER COUPON

BENCHTOP ROUTER TABLE WITH 1-3/4 HP ROUTER

Customer Rating

★★★★★

NOW \$94.99

COMPARE TO \$139

MODEL: RA5900

SAVE \$44

ITEM 95380

12333097

LIMIT 1 - Coupon valid through 1/15/20*

NEW US GENERAL

SUPER COUPON

30", 4 DRAWER TECH CARTS

• 12,600 cu. in. of storage

• 580 lb. capacity

Customer Rating

★★★★★

NOW \$179.99

COMPARE TO Snap-on \$880

MODEL: KRBC10TBCP

SAVE \$740

Item 56387, 64096, 56386, 56392, 56393, 56394

12334376

LIMIT 1 - Coupon valid through 1/15/20*

drillmaster

SUPER COUPON

80 PIECE ROTARY TOOL KIT

Customer Rating

★★★★★

NOW \$6.99

COMPARE TO PROFESSIONAL WOODWORKER \$22.76

MODEL: 51832

SAVE 69%

ITEM 63235/63292/97626 shown

12337408

LIMIT 6 - Coupon valid through 1/15/20*

SUPER COUPON

OVER 5,000 5 STAR REVIEWS

★★★★★

SUPER BRIGHT LED/SMD WORK LIGHT/FLASHLIGHT

- Super-Strong, Ultra-Lightweight Composite Plastic
- Magnetic Base & 360° Swivel Hook for Hands-Free Operation
- 3 - AAA Batteries (Included)
- 144 Lumens

ALL IN A SINGLE SUPER POWERFUL LIGHT

COMPARE TO PERFORMANCE TOOL \$135.2

MODEL: W2364

ITEM 63878/63991/64005

69567/60566/63601/67227 shown

11368844

Cannot be used with other discounts or prior purchases. Original coupon must be presented. Valid through 1/15/20 while supplies last. Limit 1 FREE GIFT per customer per day.

FREE

WITH ANY PURCHASE

ITEM 63878/63991/64005

69567/60566/63601/67227 shown

11368844

Cannot be used with other discounts or prior purchases. Original coupon must be presented. Valid through 1/15/20 while supplies last. Limit 1 FREE GIFT per customer per day.

SUPER COUPON

20% OFF

ANY SINGLE ITEM*

11371387

Limit 1 coupon per customer per day. Save 20% on any 1 item purchased. *Cannot be used with other discounts, coupons or any of the following items or brands: Inside Track Club membership, Extended Service Plan, gift card, open box item, 3 day Parking Lot Sale item, compressors, Rear jacks, safes, storage cabinets, chests or carts, trailers, welders, Admiral, Ames, Bauer, Central Machinery, Cobra, CoverPro, Dayton, Diamondback, Earthquake, Fitcher, Hercules, Ilex, Jagter, Lynx, Pexco, Predator, Tanglefoot, Viking, Vortex, Zentek. Not valid on prior purchases. Non-transferable. Original coupon must be presented. Valid through 1/15/20.

WARRIOR

SUPER COUPON



29 PIECE TITANIUM DRILL BIT SET

Customer Rating

★★★★★

NOW \$10.99

COMPARE TO DEWALT \$68.14

MODEL: DW1369

SAVE 83%

ITEM 5889

62281/61637 shown

11400269

LIMIT 2 - Coupon valid through 1/15/20*

Pierce

SUPER COUPON

18 GAUGE BRAD NAILER

Customer Rating

★★★★★

NOW \$39.99

COMPARE TO BOSTITCH \$119

MODEL: BTFF12233

SAVE \$79

ITEM 64255

11400791

LIMIT 3 - Coupon valid through 1/15/20*

CENTRAL PNEUMATIC

SUPER COUPON



3/8" x 25 FT. RETRACTABLE AIR HOSE REEL

Customer Rating

★★★★★

NOW \$39.99

COMPARE TO \$57.99

MODEL: 464125

SAVE \$110

ITEM 46104/69266

64682/69234 shown

12223040

LIMIT 2 - Coupon valid through 1/15/20*

BRAUN

SUPER COUPON

5000 LUMEN LED HANGING SHOP LIGHT

Customer Rating

★★★★★

NOW \$19.99

COMPARE TO INOLED \$29.99

MODEL: SMT28B-12

SAVE 57%

ITEM 64410

12233653

LIMIT 4 - Coupon valid through 1/15/20*

Grant's GARAGE

SUPER COUPON

14" x 13" SHOP TOWELS

Customer Rating

★★★★★

NOW \$9.99

COMPARE TO VIKING \$17.98

MODEL: 874900

SAVE 44%

ITEM 63365

64730/56119/63360 shown

12333197

LIMIT 4 - Coupon valid through 1/15/20*

PREDATOR

SUPER COUPON

2000 WATT SUPER QUIET INVERTER GENERATOR

Customer Rating

★★★★★

NOW \$449.99

COMPARE TO HONDA \$1,009

MODEL: EU2000i

SAVE \$559

ITEM 62523

12333001

LIMIT 1 - Coupon valid through 1/15/20*

PITTSBURGH

SUPER COUPON

24" CLAMP EDGE AND SAW GUIDE

Customer Rating

★★★★★

NOW \$7.99

COMPARE TO BORA \$13.99

MODEL: 543030K

SAVE 88%

ITEM 66126

12334565

LIMIT 4 - Coupon valid through 1/15/20*

FRANKLIN

SUPER COUPON

HEAVY DUTY PORTABLE SCAFFOLD

Customer Rating

★★★★★

NOW \$169.99

COMPARE TO \$260.40

MODEL: F-CSCNB

SAVE \$90

ITEM 69055/63051/63050 shown

12392406

LIMIT 1 - Coupon valid through 1/15/20*

HaulMaster **SUPER COUPON**

72" x 80" MOVING BLANKET

NOW \$5.99

~~\$8.99~~

Customer Rating **★★★★★**

COMPARE TO **\$19.99** **SAVE 70%**

BLUE HAWK MODEL: 77280

ITEM 69505/62418/66537 shown

12392706

LIMIT 4 - Coupon valid through 1/15/20*

CHICAGO ELECTRIC POWER TOOLS **GOOD**

SUPER COUPON

12" DUAL-BEVEL SLIDING COMPOUND MITER SAW

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

Customer Rating **★★★★★**

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

\$144.99 ~~\$189.99~~

SAVE \$73

COMPARE TO **\$218.99**

ITEM 56597 69684/56775 61970 61969 shown

BLADE SOLD SEPARATELY

12399275

LIMIT 1 - Coupon valid through 1/15/20*

ADMIRAL **BETTER**

SUPER COUPON

12" DUAL-BEVEL SLIDING COMPOUND MITER SAW WITH LED AND LASER GUIDE

Customer Rating **★★★★★**

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

\$179 ~~\$189.99~~

SAVE \$90

COMPARE TO **\$269**

ITEM 64686

FREE BLADE INCLUDED

12410336

LIMIT 1 - Coupon valid through 1/15/20*

BEST HERCULES

SUPER COUPON

PROFESSIONAL 12" DUAL-BEVEL SLIDING COMPOUND MITER SAW WITH LED SHADOW GUIDE

Customer Rating **★★★★★**

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

\$299 ~~\$349.99~~

SAVE \$300

COMPARE TO **\$599**

ITEM 56682/63978 shown

12428378

LIMIT 1 - Coupon valid through 1/15/20*

CHICAGO ELECTRIC WELDING **SUPER COUPON**

170 AMP MIG/FLUX CORED WELDER

Customer Rating **★★★★★**

EVERYTHING YOU NEED TO WELD

NOW \$159.99

~~\$494.99~~

SAVE \$335

COMPARE TO **\$494.99**

KLUTCH MODEL: 55729

ITEM 6271/61888/56835/68885 shown

12431403

LIMIT 1 - Coupon valid through 1/15/20*

PITTSBURGH **SUPER COUPON**

9 PIECE FULLY POLISHED COMBINATION WRENCH SETS

Customer Rating **★★★★★**

LIFETIME WARRANTY

NOW \$5.99

~~\$7.99~~

SAVE 66%

COMPARE TO **\$17.97**

HUSKY MODEL: HCW10PCSAE

ITEM 42305 shown

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

12432738

LIMIT 6 - Coupon valid through 1/15/20*

HARDY **SUPER COUPON**

MECHANIC'S GLOVES

AVAIL. IN SM, MED, LG, XL, XXL

Customer Rating **★★★★★**

NOW \$4.99

~~\$5.99~~

SAVE 66%

COMPARE TO **\$14.99**

VALEO MODEL: 25521

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

12435967

LIMIT 4 - Coupon valid through 1/15/20*

CHICAGO ELECTRIC POWER TOOLS **SUPER COUPON**

MOBILE MITER SAW STAND

Supports 16 ft.

Customer Rating **★★★★★**

NOW \$99.99

~~\$119.99~~

SAVE \$69

COMPARE TO **\$169**

ITEM 63409 62750 shown

HITACHI MODEL: UU240F

12436739

LIMIT 2 - Coupon valid through 1/15/20*

CHICAGO ELECTRIC POWER TOOLS **SUPER COUPON**

10", 15 AMP BENCHTOP TABLE SAW

Customer Rating **★★★★★**

NOW \$114.99

~~\$144.99~~

SAVE \$114

COMPARE TO **\$229**

RYOBI MODEL: RTS22

ITEM 45804 63117/64459 63118 shown

12441507

LIMIT 4 - Coupon valid through 1/15/20*

SUPER COUPON

YELLOW LENS SAFETY GLASSES

Customer Rating **★★★★★**

NOW \$2.99

~~\$3.99~~

SAVE 41%

COMPARE TO **\$51.27**

POWERTEC MODEL: UT1002

ITEM 46075/69805 shown

12452012

LIMIT 2 - Coupon valid through 1/15/20*

CENTRAL MACHINERY **SUPER COUPON**

UNIVERSAL TOOL STAND

500 lb. capacity

Customer Rating **★★★★★**

NOW \$29.99

~~\$39.99~~

SAVE 80%

COMPARE TO **\$49.99**

KOBALT MODEL: SBY-AIR88TZ

ITEM 67181/62300/47016 shown

12475988

LIMIT 4 - Coupon valid through 1/15/20*

Bauer **SUPER COUPON**

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

Customer Rating **★★★★★**

NOW \$269.99

~~\$329.99~~

SAVE \$179

COMPARE TO **\$449**

DEWALT MODEL: DW734

ITEM 63445

12467114

LIMIT 1 - Coupon valid through 1/15/20*

WARRIOR **SUPER COUPON**

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

Cuts to a depth of 1"

Customer Rating **★★★★★**

NOW \$5.99

~~\$9.99~~

SAVE 76%

COMPARE TO **\$24.99**

MASTERFORCE MODEL: 3475

ITEM 69070/68114 shown

12467994

LIMIT 4 - Coupon valid through 1/15/20*

CENTRAL MACHINERY **SUPER COUPON**

16" VARIABLE SPEED SCROLL SAW

Customer Rating **★★★★★**

NOW \$69.99

~~\$99.99~~

SAVE \$129

COMPARE TO **\$199**

PORTER-CABLE MODEL: PCB375SS

ITEM 62519/63283/93012 shown

12468098

LIMIT 2 - Coupon valid through 1/15/20*

CENTRAL PNEUMATIC **SUPER COUPON**

20 OZ. GRAVITY FEED AIR SPRAY GUN

1.4mm tip included

Customer Rating **★★★★★**

NOW \$9.99

~~\$15.99~~

SAVE 80%

COMPARE TO **\$49.99**

KOBALT MODEL: SBY-AIR88TZ

ITEM 67181/62300/47016 shown

12475988

LIMIT 4 - Coupon valid through 1/15/20*

WARRIOR **SUPER COUPON**

18V LITHIUM-ION 3/8" DRILL/DRIVER KIT

Customer Rating **★★★★★**

NOW \$27.99

~~\$37.99~~

SAVE 62%

COMPARE TO **\$74**

RYOBI MODEL: P1810

ITEM 64118

12483229

LIMIT 4 - Coupon valid through 1/15/20*

drillmaster **SUPER COUPON**

4-1/2" ANGLE GRINDER

Customer Rating **★★★★★**

NOW \$9.99

~~\$14.99~~

SAVE 44%

COMPARE TO **\$17.99**

PERFORMAX MODEL: 2411-1

ITEM 69645/60625 shown

13324811

LIMIT 4 - Coupon valid through 1/15/20*

CENTRAL MACHINERY **SUPER COUPON**

12" x 33-3/8" WOOD LATHE WITH REVERSIBLE HEAD

Customer Rating **★★★★★**

NOW \$299.99

~~\$399.99~~

SAVE \$620

COMPARE TO **\$919.99**

JET MODEL: 708352

ITEM 34706

12486541

LIMIT 1 - Coupon valid through 1/15/20*

PITTSBURGH **SUPER COUPON**

6" DIGITAL CALIPER

Includes two 1.5V SR44 button cell batteries.

Customer Rating **★★★★★**

NOW \$9.99

~~\$10.99~~

SAVE 66%

COMPARE TO **\$29.97**

HUSKY MODEL: 1467H

ITEM 63711/98563/61585/62387/47257 shown

12506297

LIMIT 6 - Coupon valid through 1/15/20*

VOYAGER **SUPER COUPON**

15" TOOL BAG WITH 14 POCKETS

Customer Rating **★★★★★**

NOW \$6.99

~~\$10.99~~

SAVE 46%

COMPARE TO **\$12.97**

HUSKY MODEL: 823035M12

ITEM 62348/62341/61469 shown

12520481

LIMIT 4 - Coupon valid through 1/15/20*

TOOLS & MATERIALS

NEW AND NEXT



General Tools launches three new moisture meters

Moisture meters, no. MM7, \$35; no. MM8, \$45; no. MM9, \$50

These meters share similar handle designs, have LCD screens, and are powered by single 9-volt alkaline batteries. The MM7 is a pin-type meter that General says will detect moisture from 1.5 to 50 percent; the pinless MM8 reads 0–35 percent in hardwoods and 0–53 percent in softwoods. The MM9 is a hybrid, with a pinless pad that flips open to expose pins, so you can use it either way. It reads moisture from 1.5 to 50 percent.

General Tools
800-697-8665, generaltools.com

Variable-pitch blades for resawing

Timber Wolf VPC resawing bandsaw blades, prices vary based on size. The design of Timber Wolf's new resaw blades incorporates a series of variable-size teeth within every inch. They say this reduces resonance throughout the blade to produce clean cuts. The VPC blades are available in ½", ¾", and 1" widths for bandsaws 10" and up.

Timber Wolf
800-234-7297, timberwolfblades.com



*Introducing
the future of personal
transportation.*



Also available in Black



The Zinger folds to a mere 10 inches.

It's not a Wheelchair...

It's not a Power Chair...

It's a Zinger Chair!

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

Years of work by innovative engineers have resulted in a personal electric vehicle that's truly unique. They created a battery that provides powerful energy at a fraction of the weight of most batteries. The **Zinger** features two steering levers, one on either side of the seat. The user pushes both levers down to go forward, pulls them both up to brake, and pushes one while pulling the other to turn to either side. This enables great mobility, the ability to turn on a dime and to pull right up to tables or desks. The controls are right on

the steering lever so it's simple to operate, and its exclusive footrest swings out of the way when you stand up or sit down. With its rugged yet lightweight aluminum frame, the **Zinger** is sturdy and durable yet convenient and comfortable! What's more, it easily folds up for storage in a car seat or trunk—you can even gate-check it at the airport like a stroller. Think about it, you can take your **Zinger** almost anywhere, so you don't have to let mobility issues rule your life. It folds in seconds without tools and is safe and reliable. It holds up to 275 pounds, and it goes up to 6 mph and operates for up to 8 miles on a single charge.

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

Zinger Chair®

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

1-888-658-0528

Please mention code 11165 when ordering.



Just think of the places you can go: • Shopping • Air Travel • Bus Tours

• Restaurants—ride right up to the table! • Around town or just around your house

The Zinger Chair is a personal electric vehicle and is not a medical device nor a wheelchair, and has not been submitted to the FDA for review or clearance. Zinger is not intended for medical purposes to provide mobility to persons restricted to a sitting position.

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misalignment**

**Create an elegant
low angle pocket**

*I have a
TSM22 and
two TSM-12's.
Our Company
is addicted.
This Castle
100 will live in
my garage!*



~ Jaimie Al-Shamma, Owner
Bay Construction Company



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Statement of Ownership, Management, and Circulation

(Requester Publications Only) **1.** Publication Title: Better Homes and Gardens WOOD **2.** Publication Number: 724-890 **3.** Filing date: 10/1/2019 **4.** Issue Frequency: March, May, July, September, October, November, December/January. **5.** Number of Issues Published Annually: 7 **6.** Annual Subscription Price: \$29.99 **7.** Complete Mailing Address of Known Office of Publication: 1716 Locust St., Des Moines, IA 50309 **8.** Complete Mailing Address of Headquarters or General Business Office of Publisher: 1716 Locust St., Des Moines, IA 50309 **9.** Full Name and Complete Mailing Address of the Publisher, Editor & Managing Editor: Publisher: Scott Mortimer, 1716 Locust St., Des Moines, Iowa 50309-3023; Editor: Dave Campbell, 1716 Locust St., Des Moines, Iowa 50309-3023; Managing Editor: Craig Ruegsegger, 1716 Locust St., Des Moines, Iowa 50309-3023. **10.** Owner: Meredith Corporation, 1716 Locust St., Des Moines, IA 50309-3023. The names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock: State Street Global Advisors (SSGA), Attn: Cyrus Taraporevala, 1 Lincoln St., Boston, MA 02111; BlackRock Fund Advisors, Attn: Larry Fink, 400 Howard St., San Francisco, CA 94105; The Vanguard Group Inc., Attn: Binbin Guo, 100 Vanguard Blvd., Malvern, PA 19355; Royce & Associates LP, Attn: Charlie Royce, 745 Fifth Ave., New York, NY 10151; Dimensional Fund Advisors LP, Attn: Dave Butler, 6300 Bee Cave Rd., Austin, TX 78746; Fairpointe Capital LLC, Attn: Thyra Zerhusen, 1 N. Franklin St., Chicago, IL 60606; Barrow, Hanley, Mewhinney & Strauss LLC, Attn: James Barrow, 2200 Ross Ave., Dallas, TX 75201; Ariel Investments LLC, Attn: John Rogers, 200 E. Randolph St., Chicago, IL 60601; Ceredex Value Advisors LLC, Attn: George Aylward, 301 E. Pine St., Orlando, FL 32801; Aberdeen Standard Investments Inc., Attn: Andrew Smith, 1735 Market St., Philadelphia, PA 19103; Northern Trust Investments Inc., Attn: William Hyatt, 50 LaSalle St., Chicago, IL 60603; Silvercrest Asset Management Group LLC, Attn: Richard Hough, 1330 Avenue of the Americas, New York, NY 10019; Channing Capital Management LLC, Attn: Timothy Kroll, 10 S. LaSalle St., Chicago, IL 60603; DePrince, Race & Zollo Inc., Attn: John Race, 250 Park Ave., S., Winter Park, FL 32789; Delaware Investment Management Business Trust, 2005 Market St., Philadelphia, PA 19103; River Road Asset Management LLC, Attn: Richard Beck, 462 S. Fourth St., Louisville, KY 40202; Norges Bank Investment Management, Bankplassen 2 Oslo, PS 0107 Norway; Bowen, Hanes & Co. Inc., Attn: Harold Bowen, 3290 Northside Pkwy., Atlanta, GA 30327; PPM America Inc., Attn: James Young, 225 W. Wacker Dr., Chicago, IL 60606; Raymond James & Associates Inc. (Inv. Mgmt), Attn: Dennis Zank, 880 Carillon Pkwy., St. Petersburg, FL 33716; Nuveen Asset Management LLC, Attn: Anthony Boase, 333 W. Wacker Dr., Chicago, IL 60606; Geode Capital Management LLC, Attn: Patrick Waddell, 1 Post Office Sq., Boston, MA 02109; Mellon Investments Corp., Attn: Caroline Higgins, BNY Mellon Center, One Boston Pl., Boston, MA 02108; William Blair Investment Management LLC, Attn: Mark Leslie, 150 N. Riverside Plaza, Chicago, IL 60606. Through some of the nominees listed above, the E.T. Meredith and Bohlen families and family foundations own, directly or beneficially, approximately 13% of the issued and outstanding stock of the corporation. Each nominee listed above holds stock for one or more stockholders. **11.** Known Bondholders, Mortgages, and Other Security Holders Owning or Holding 1 percent or more of Total amount of Bonds, Mortgages, or Securities: None. **12.** Tax Status (For completion by nonprofit organizations authorized to mail at nonprofit rates). Check one: The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes: ___ Has Not Changed During Preceding 12 Months ___ Has Changed During Preceding 12 Months (Publisher must submit explanation of change with this statement) Not applicable.

13. Publication Title: Better Homes and Gardens WOOD

14. Issue Date for Circulation Data Below: October 2019

15. Extent and Nature of Circulation

Average No. Copies Each Issue During Preceding 12 Months:

a. Total number of copies (Net press run): 344,243
b. Legitimate Paid and/or Requested Distribution (By Mail and Outside the Mail): (1) Outside-County Paid/Requested Mail Subscriptions Stated on PS Form 3541: 289,324

(2) In-County Paid/Requested Subscriptions Stated on PS Form 3541: 0
(3) Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid Distribution Outside USPS: 12,853

(4) Requested Copies Distributed by Other Mail Classes Through the USPS: 0

c. Total Paid and/or Requested Circulation: 302,177

d. Nonrequested Distribution (by Mail and Outside the Mail):

(1) Outside-County Nonrequested Copies Stated on PS Form 3541: 1,887

(2) In-County Nonrequested Copies included on PS Form 3541: 0

(3) Nonrequested Copies Distributed Through the USPS by Other Classes of Mail: 0

(4) Nonrequested Copies Distributed Outside the Mail: 923

e. Total Nonrequested Distribution: 2,810

f. Total Distribution: 304,987

g. Copies not Distributed: 39,256

h. Total: 344,243

i. Percent Paid and/or Requested Circulation: 99.08%

No. of Copies of Single Issue Published Nearest to Filing Date:

a. Total number of copies (Net press run): 333,331

b. Legitimate Paid and/or Requested Distribution (By Mail and Outside the Mail): (1) Outside-County Paid/Requested Mail Subscriptions Stated on PS Form 3541: 287,507

(2) In-County Paid/Requested Subscriptions Stated on PS Form 3541: 0

(3) Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid Distribution Outside USPS: 10,103

(4) Requested Copies Distributed by Other Mail Classes Through the USPS: 0

c. Total Paid and/or Requested Circulation: 297,610

d. Nonrequested Distribution (by Mail and Outside the Mail):

(1) Outside-County Nonrequested Copies Stated on PS Form 3541: 2,326

(2) In-County Nonrequested Copies included on PS Form 3541: 0

(3) Nonrequested Copies Distributed Through the USPS by Other Classes of Mail: 0

(4) Nonrequested Copies Distributed Outside the Mail: 923

e. Total Nonrequested Distribution: 3,249

f. Total Distribution: 300,859

g. Copies not Distributed: 32,742

h. Total: 333,601

i. Percent Paid and/or Requested Circulation: 98.92%

16. Not applicable

17. Publication of Statement of Ownership for a Requester Publication is required and will be printed in the December 2019/January 2020 issue of this publication.

18. Signature and title of editor, publisher, business manager, or owner Chris Susil, VP/Planning & Analysis. Date: 9/19/2019. I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

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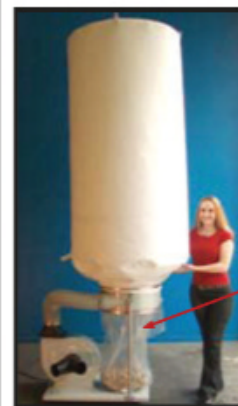
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WHAT'S AHEAD

A GLIMPSE INSIDE THE MARCH ISSUE (ON SALE JANUARY 10)



Demilune folding table

This lithe half-table hugs the wall and easily expands to full size for additional seating.



Contemporary display case

Common part sizes and super-simple construction make this an easy weekend project.



3-D cutting board

A simple step-and-repeat pattern produces this eye-popping gift.



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