

WOOD®

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Super-simple

Wine Rack

p.26

Or build it as a display stand

Plus more great projects:

- ▶ Media-storage End Table p.32
- ▶ Multiple-picture Frame p.58
- ▶ Magnetic Marble Run p.64
- ▶ Shelf-pin Jig p.18

Cut Airtight Miters p.62

3 Secrets to Choosing
GREAT Lumber p.14

Fit Inset Drawers Perfectly
the First Time p.20

65
Shop Tips
Inside!

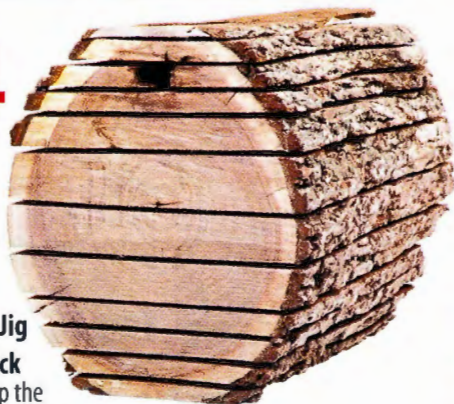
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In this issue

14



PROJECTS

- 18 Quick & Easy Shelf-pin Jig
- 26 **Cover Project: Wine Rack**
Build it to store *vino*, or drop the stops and make it a handsome display stand.
- 32 Graceful End Table
The easy-to-make drawers perfectly fit your collection of CDs and DVDs.
- 58 Last-minute Gift: Multi-photo Frame
- 62 Bench Hook for Dead-on Miters
- 64 Great Kid's Gift: Marble Run

SKILL BUILDERS

- 20 Goofproof Flush-fit Drawers
- 22 Get What You *Really* Want for Christmas
- 46 Prevent Kickback on 5 Power Tools
- 70 How to Use a Keyhole Router Bit

TOOLS & MATERIALS

- 14 Three Tricks to Get the Best Lumber
- 24 Wise Buys: Combination Squares
- 38 Most Innovative New Tools of 2013
- 52 SHOP TEST: Bench Chisels
- 78 Shop-Proven Products
Super-quiet compressor, and more.

DEPARTMENTS

- 4 Editor's Angle
- 6 Sounding Board
- 8 Shop Tips
- 41 2012 Index of WOOD® Articles
- 72 Ask WOOD
- 84 What's Ahead



The WOOD® magazine difference:
We build every project, verify every fact,
and test every reviewed tool in our workshop to
guarantee your success and complete satisfaction.

32



58



52



46



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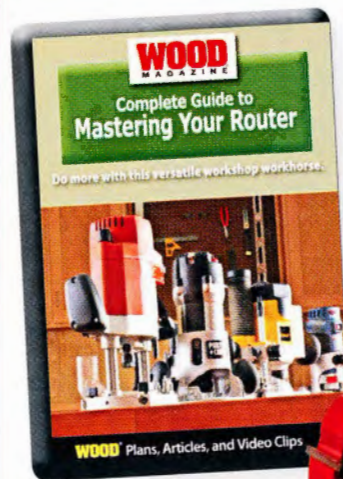
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NEW YEAR'S RESOLUTION #1: ORGANIZE THE SHOP

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- 5 Great Clamp Organizers woodmagazine.com/clampracks
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Long sold-out early issues, including the rare-as-hen's-teeth first year of WOOD magazine (above) are now available as downloadable PDFs.

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Editor's Angle

The greatest gift you can give

Christmas 1971 was the best. *Ever.* That year, Mom and Dad gave me my first power tool: a circular saw from Kmart. Were they nuts handing over that orange 24-tooth monster to a kid whose age hadn't even hit double digits yet? And it gets better: A few weeks later, on my 10th birthday, I got a matching jigsaw.

Dad—an avid woodworker and DIYer—recognized my early interest in building things, and I suspect it wasn't easy to convince Mom that power saws were good gifts for a preteen. But she apparently relented, and Dad and I spent many hours together in his tiny 12x12' basement shop; he working on projects, and me peppering him with questions, all patiently answered.

Those tools were like tinder on the gently glowing coals of wood-working, and my parents fanned and fed those flames enough to make it a lifelong passion for me. I literally would not be where I am today without that nurturing.

So whose fire have you fanned lately? Have your kids expressed a smoldering interest in what you do in the shop? Do you dismiss them because you're busy, or take the time to teach? Is there a neighbor who stops by the shop to chat and watch you work?

With a new year comes new goals. Let's make 2013 the Year of the Mentor. Volunteer to be a woodworking merit-badge counselor for a Boy or Girl Scout, or help a 4-H Club member build his or her first project. You may be lighting a fire that burns for a lifetime.

Here's a match

Because you can't be there to answer every question, get your "student" started right with a free subscription to **WOOD** magazine. Just give us his or her name and address the next time you renew your own subscription, and we'll fire off to them a complimentary year's worth of **WOOD** magazine. No strings attached. Learn more at woodmagazine.com/giftoffer.

See you in the shop!

Dave Campbell
dave.campbell@meredith.com



The saw that started it all: My 7 1/4" Kmart circ saw, circa 1971, still in use (occasionally) today.

What is the most memorable Christmas gift you've made?

A pair of mission-style end tables that my wife topped with colored-glass mosaics.

When I was 10, I made a scrollsawn horse for my Mom. It looks a little crude now.

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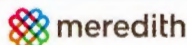
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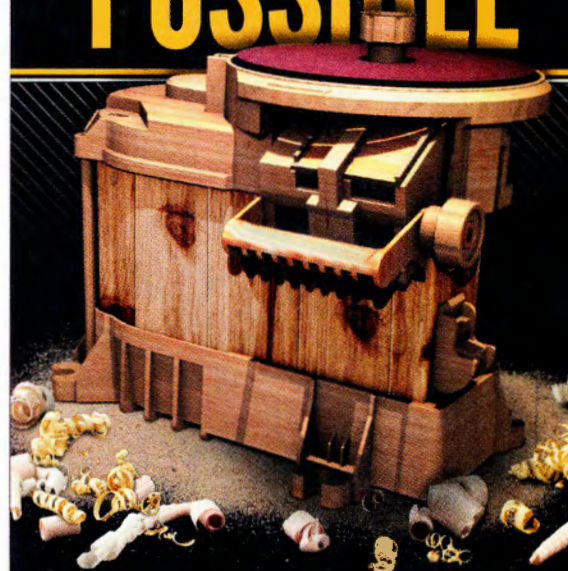
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A table fit for a king

I've always enjoyed marquetry work (forming decorative patterns with pieces of veneer), and recently decided to put my skills to the test in a large way—about 41 square feet large, in fact. After more than 500 hours of shop time, I



Stephen says cutting and installing the center and corner designs (above) were the most difficult parts of his table's construction.

finally completed a dining room table with more than 700 pieces of hand-cut veneer—of five different wood species—on its top and pedestal legs. I applied 15 coats of polyurethane, rubbing out each coat with 2,000 grit sandpaper.

The table now sits in my dining room and can comfortably seat 12 people. The project took more than a year to complete, but judging by the reactions from friends, I think it was time well spent.

—Stephen Julian, Southlake, Texas



Because the finished table weighs close to 250 pounds, Stephen added four casters under each pedestal to facilitate movement.

Article Update

► Issue 213 (September 2012)

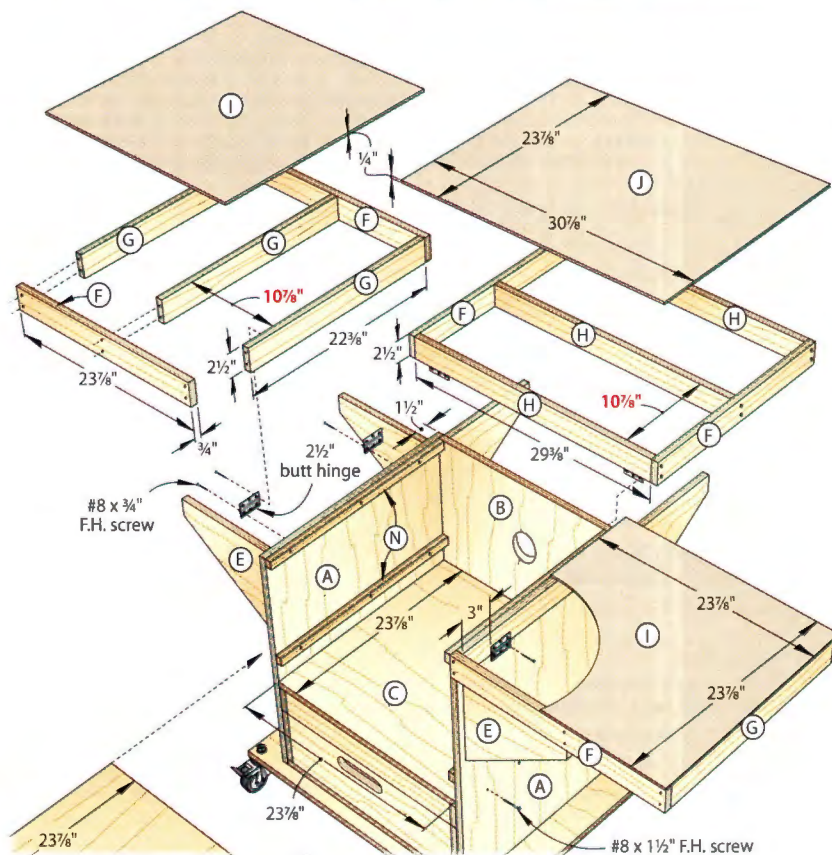
In the Shop Tip titled "Get a grip on clamp handles in tight quarters" on page 8, the hole drilled for the lagscrew should be $\frac{5}{16}$ " diameter.

► Issue 213 (September 2012)

In the drawing of the "Quick-convert Tablesaw/Router Station" on page 30, the 10" dimension shown between the wing bracings (G) and the outfeed bracings (H) should be $10\frac{1}{8}$ " to allow clearance for the wing supports (E).

Show off your shop

During the past few years, *WOOD*® magazine has published several newsstand specials about home shops, decked-out garages, and man caves. Now, we'd like to showcase the way you used our ideas—or your own—to create or upgrade your shop, garage, or man cave. We're on the lookout for all types of spaces, including basements, garages, outbuildings, small spaces, and even garden sheds. To submit your ideas, go to woodmagazine.com/garageshops.



How Do You Create Unlimited Frame & Panel Possibilities?



New Shaker
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(#99-762)



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Five profiles are available; Round Over (#99-760), Ogee (#99-761), Round Over Bead (#99-763), Bevel (#99-764) and the NEW Shaker (#99-762).

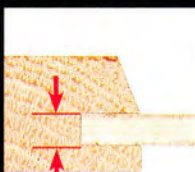


Freud's innovative feature enables the top section of the rail bit to be removed allowing you to cut an extended tenon cut in the rail.

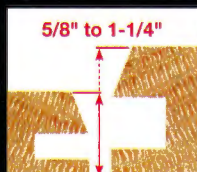
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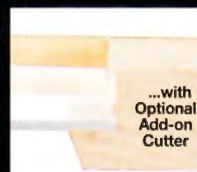
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Rotating insert takes a drilling but stays fresh

To reduce tear-out at the bottom of holes drilled at my drill press, I added a sacrificial insert to my drill-press table. Nothing new about that idea, but I put a new “spin” on my version, so I could drill into the insert many times before

having to replace it. By making the insert circular and offset from the bit, I simply rotate the insert whenever one spot becomes too worn, and then resume drilling into a fresh area.

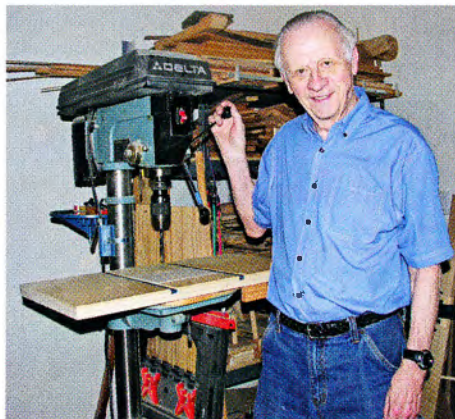
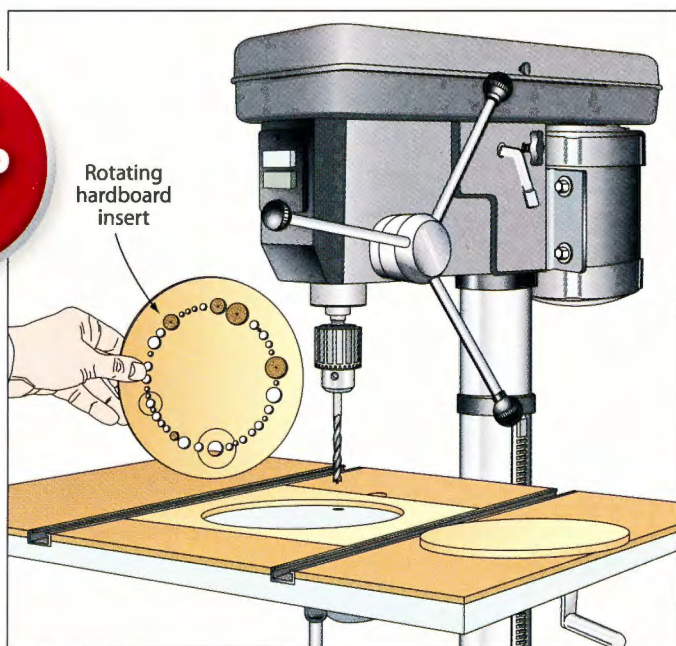
—Len Urban, Rancho Mirage, Calif.

Stick-anywhere worklight illuminates dark spots

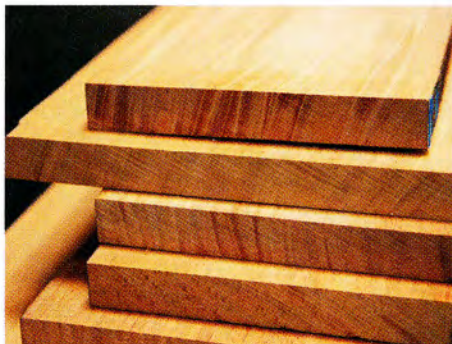
Though I long ago equipped my drill press and bandsaw with clamp-on task lighting, I’ve always found it difficult to place those accessories in locations where they light up my work without getting in the way. Keeping the lights’ cords out of the way and plugged in was a whole other dilemma. I solved all these problems with an inexpensive LED flashlight.

Simply mount one to a hardwood arm (the holes reduce weight) using $\frac{3}{4}$ " metal pipe strap and a bolt and nut. Then, epoxy a rare-earth magnet to the opposite end of the arm, and you have a cordless, stick-anywhere solution.

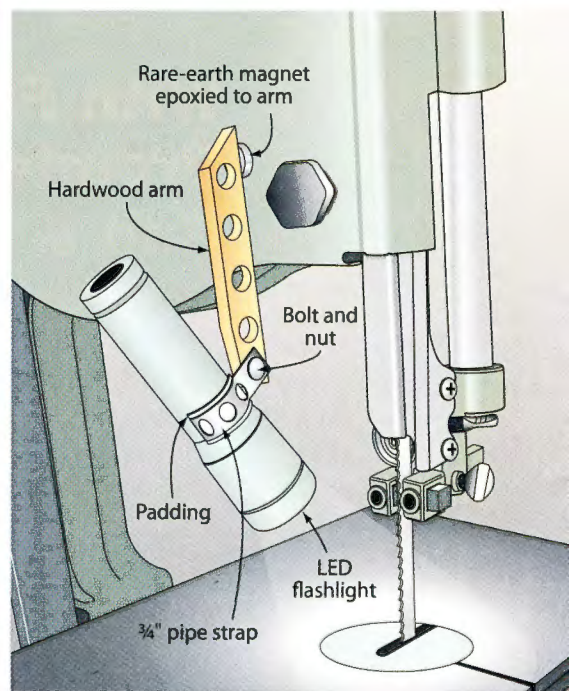
—Scott Warnecke, Brighton, Mich.



Schindler's Studio



For sending this issue's Top Shop Tip, Len receives 25 board feet of genuine mahogany lumber from Woodworker's Source, worth about \$300.



continued on page 10

YOUR TIPS EARN CA\$H, TOOLS!

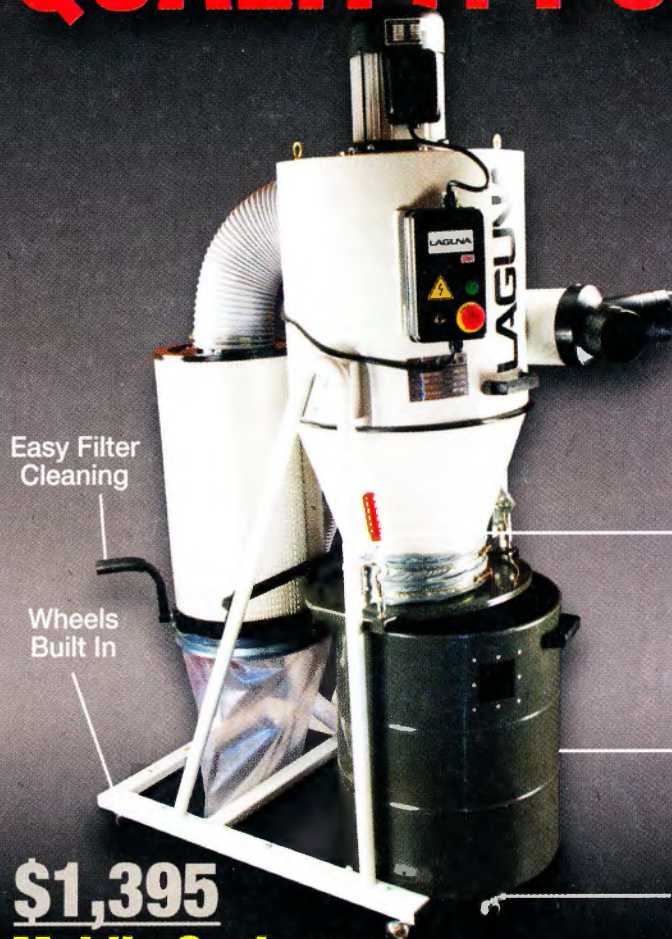
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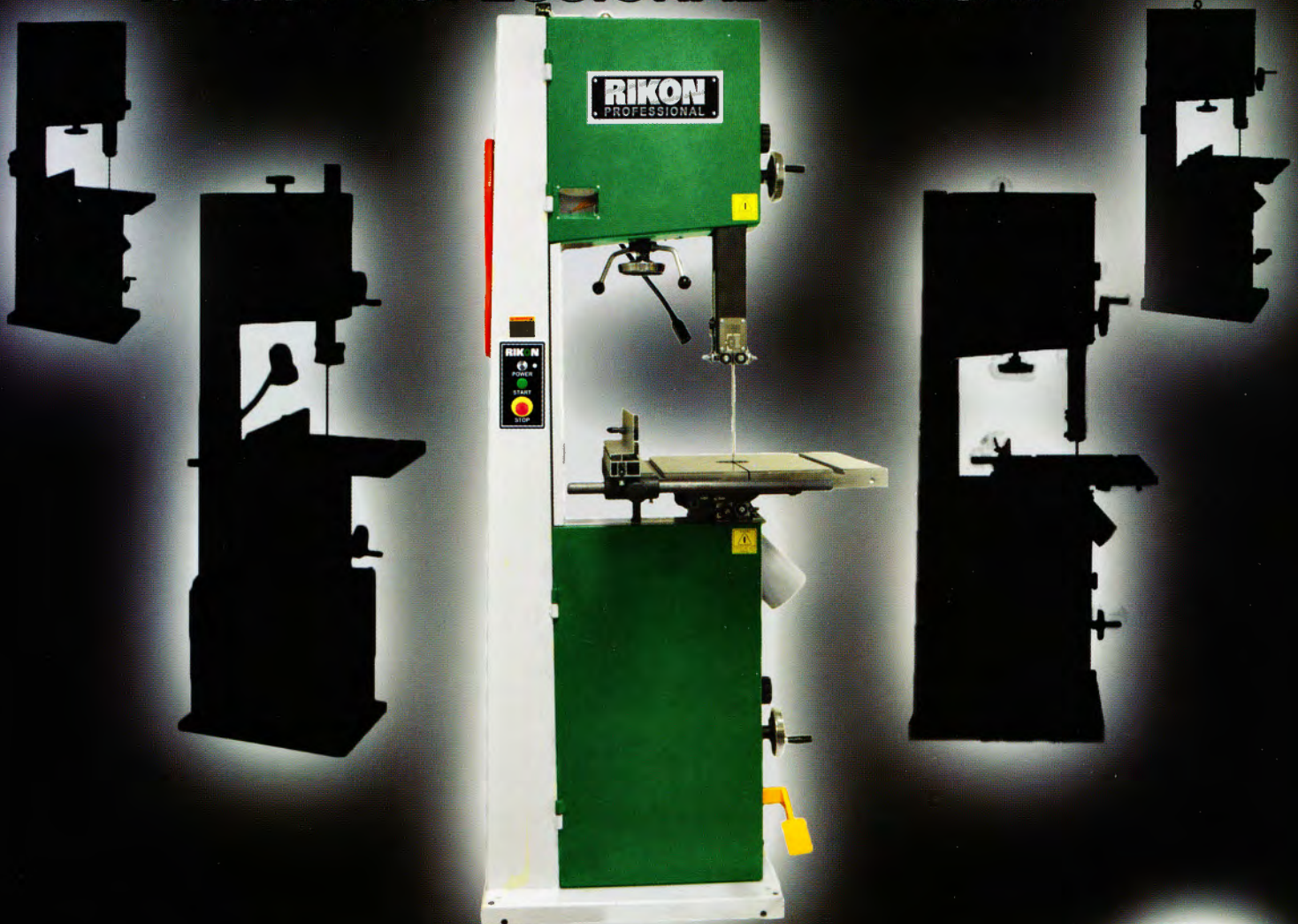
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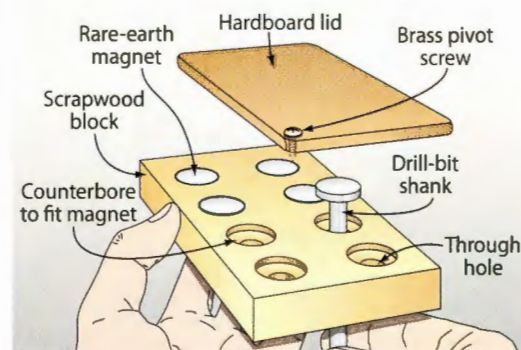
Shop Tips

Really unattractive storage for rare-earth magnets

After completing a recent project requiring rare-earth magnets, I tossed the remaining magnets in a drawer for storage. Big mistake. Later, I discovered them stubbornly stuck to each other and just about every metal object in the drawer.

To keep that from happening again, I built this simple holder. The pivoting hardboard lid keeps the magnets in place until I need one. Then, I simply insert the shank end of a drill bit through the bottom of the holder and easily pluck the magnet off the end.

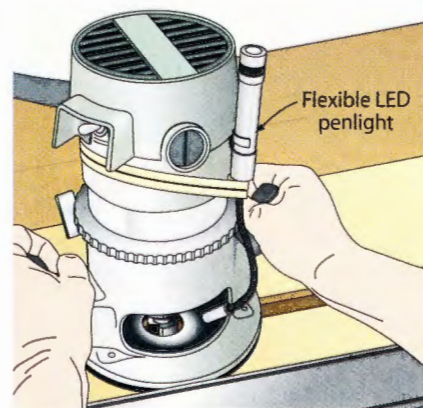
—Leonard Roselle, Angola, Ind.



Shed some LED on your old router

The built-in LED lights on some new routers really light up the action during cuts. But I can't justify buying a new router just for the pretty lights. Instead I added light to my old router by mounting an inexpensive flexible-neck LED penlight from an auto parts store with a rubber band. It works great! Just make certain the light is fastened securely and won't fall into the bit when running the router.

—Serge Duclos, Delson, Que.



Spent sanding discs see new life on turning tool

While turning a burl bowl on my lathe, I went to grab my sanding tool and realized I was out of sanding pads. Not wanting to wait for mail-ordered ones or risk toasting my fingertips by holding the sandpaper, I came upon an easy replacement: used random-orbit sander discs. Though worn around the edge, their centers were nearly fresh. So I cut them out with a scissors and had my sanding tool back up and running in seconds.

—Gary Van Hulle, Rochester Hills, Mich.



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continued on page 12

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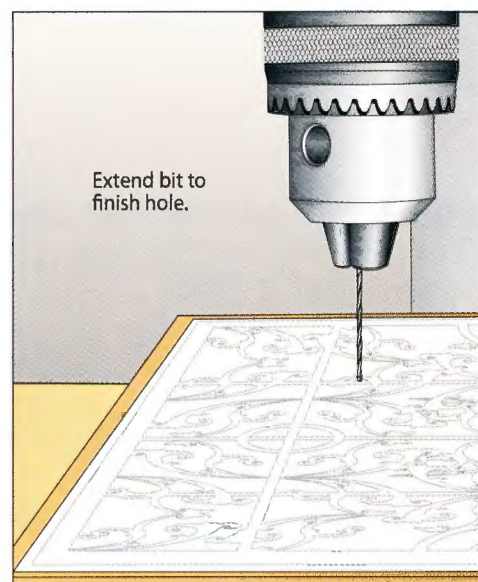
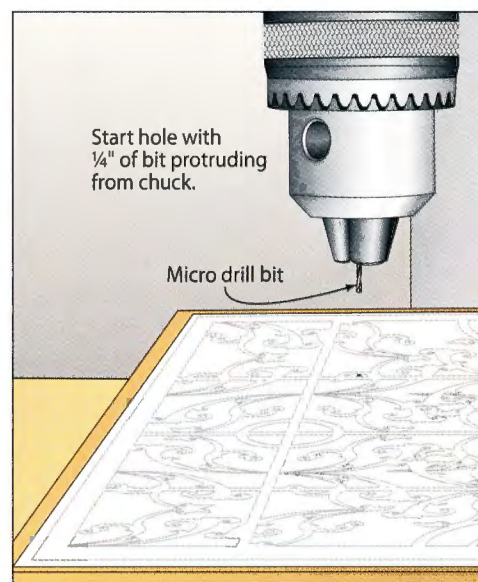
Shop Tips

Chuck trick stops skinny drill bit deflection

When making detailed scrollsawn patterns, I often use drill bits $\frac{1}{16}$ " or smaller in tight areas. But those tiny bits want to deflect—moving off target—no matter how slowly I feed the bit.

To stop that deflection, insert the drill bit into the chuck so only $\frac{1}{4}$ " of the bit shows. Drill the holes about $\frac{1}{8}$ " deep, and then extend the bit from the chuck at full length and drill the holes again. The first hole acts as a guide to keep the bit perfectly on track.

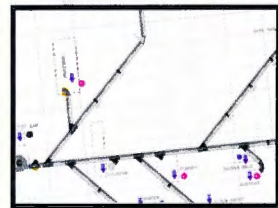
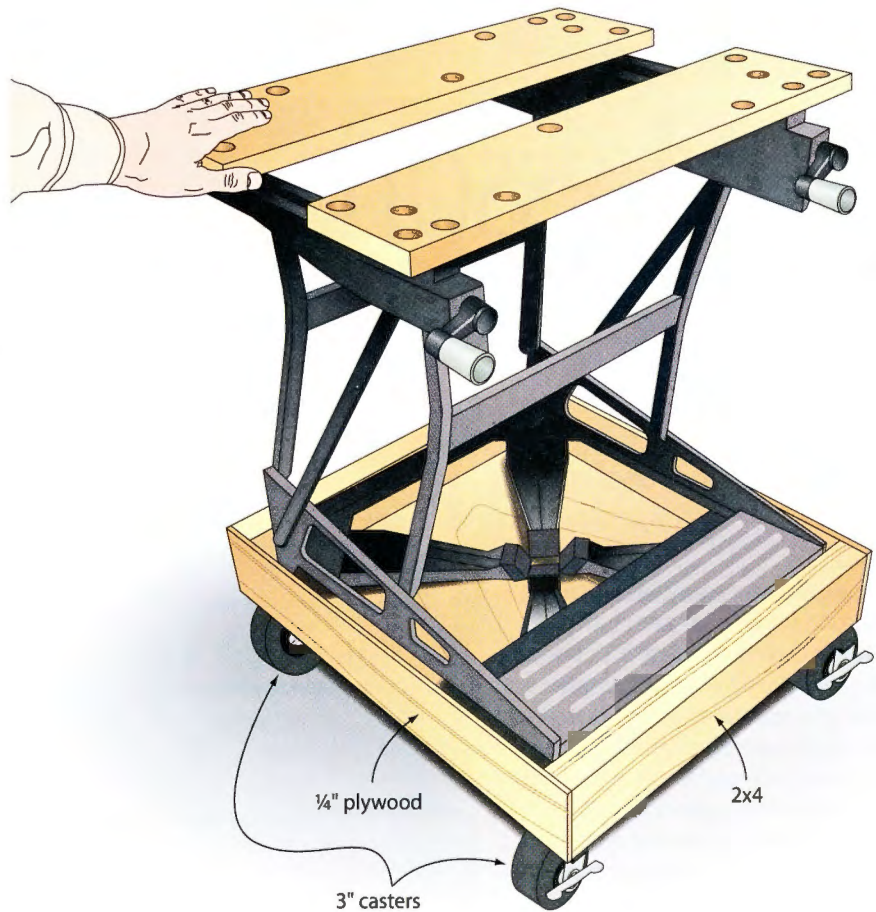
—Scott Miller, Littleton, N.C.



Knockdown workstation rolls to stow low

In my small shop, any tool that doesn't fit on a shelf gets casters added to help me make the most of the space I do have. But in the case of my collapsible workstation, there wasn't a good place to mount casters without interfering with the bench's folding function. So I built this base from 2x4s and 1/4" plywood, mounting 3" locking casters under it. Now, after collapsing the bench, I simply roll it beneath other machines for storage. 🌲

—Cory Hoehn, Jeffersonville, Ind.



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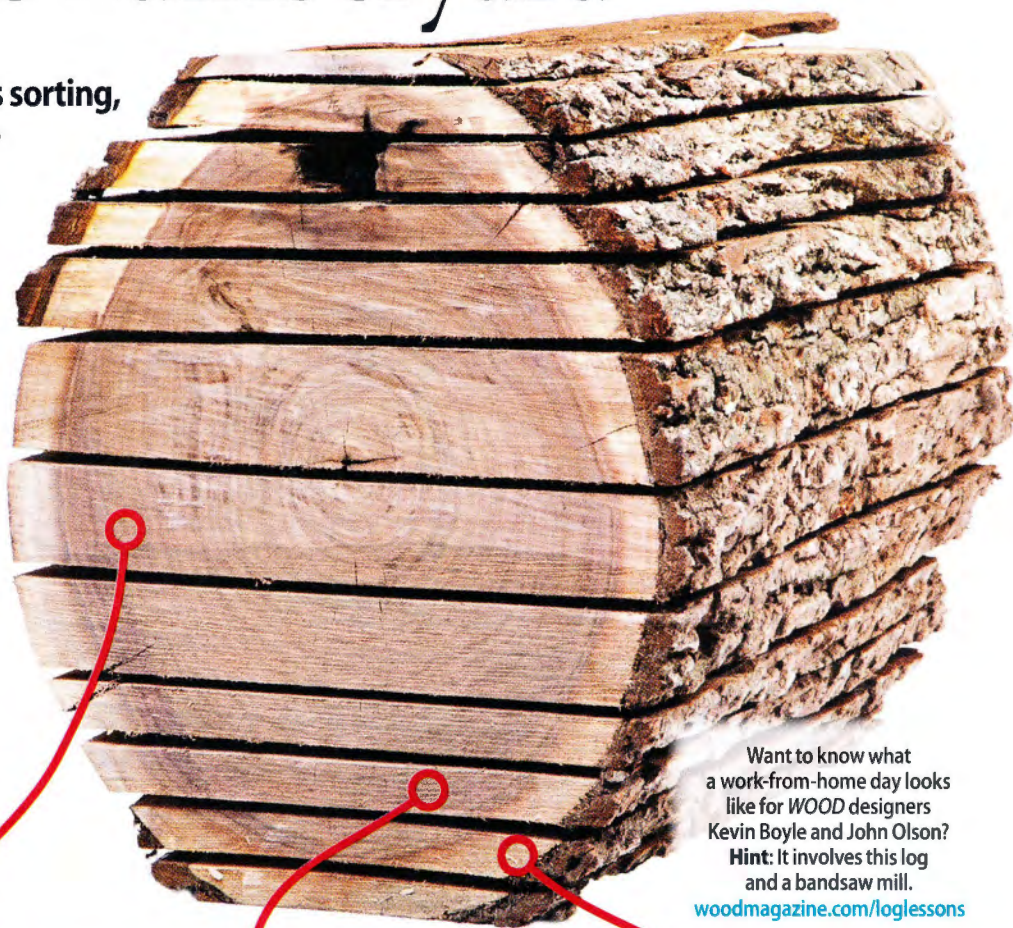
Log Lessons You Can Use at the Lumberyard

Pick your wood quicker with less sorting, stacking, squinting, or straining.

The deep, often-dark bins of a hardwood retailer aren't always the best environment for choosing the perfect board for your project. Without unstacking and restacking hundreds of pounds of lumber, your best view of the wood is often a small cross-section of end grain. How much can you really tell about the wood with just that glimpse? We sliced into a walnut log to get some answers.

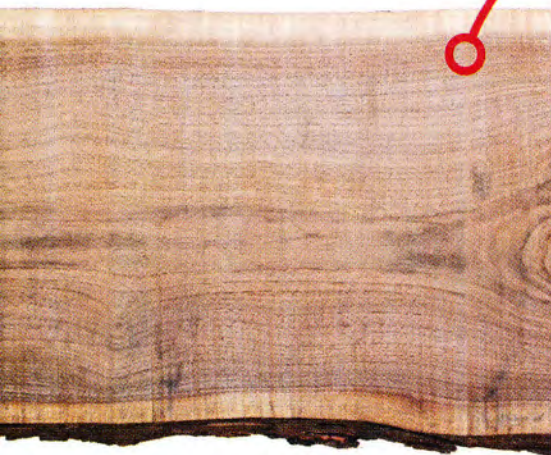
End grain at a glance

Like a palm reader who can tell your whole life story by looking at the lines in your hand, you can learn the story of the board from the end-grain lines. As you can see *below*, reading the curvature of the growth rings lets you estimate the size of the tree, where the



Want to know what a work-from-home day looks like for *WOOD* designers Kevin Boyle and John Olson? **Hint:** It involves this log and a bandsaw mill.

woodmagazine.com/loglessons



Parts taken from the nearly vertical (quartersawn) or slanted (riftsawn) end grain will be stable with relatively straight face grain. But be aware, boards with tightly curved rings may come from the center (pith) or from a small, knot-prone tree—both of which will prove unstable.



Moving away from the pith, boards begin to display shallowly arched end grain and are relatively stable. Wide, swooping cathedral grain results where these flattened curves intersect the face of the board.



Nearly flat end-end grain rings indicate a board that came from near the tree's bark. In walnut and cherry, sapwood can dominate these boards. Given just a glimpse of the end grain, you can visualize the rest of the ring to estimate the log's size. Boards from larger logs tend to be less prone to warp.

continued on page 16



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24kt Gold shown with refill retracted



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Lumber Aisle

board came from in the tree, as well as letting you predict what that means for the grain appearance and stability of the board.

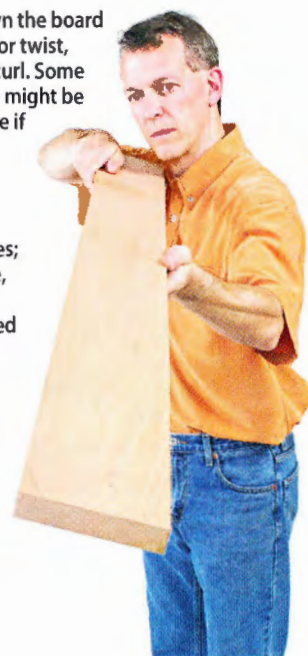
Look for layered logs

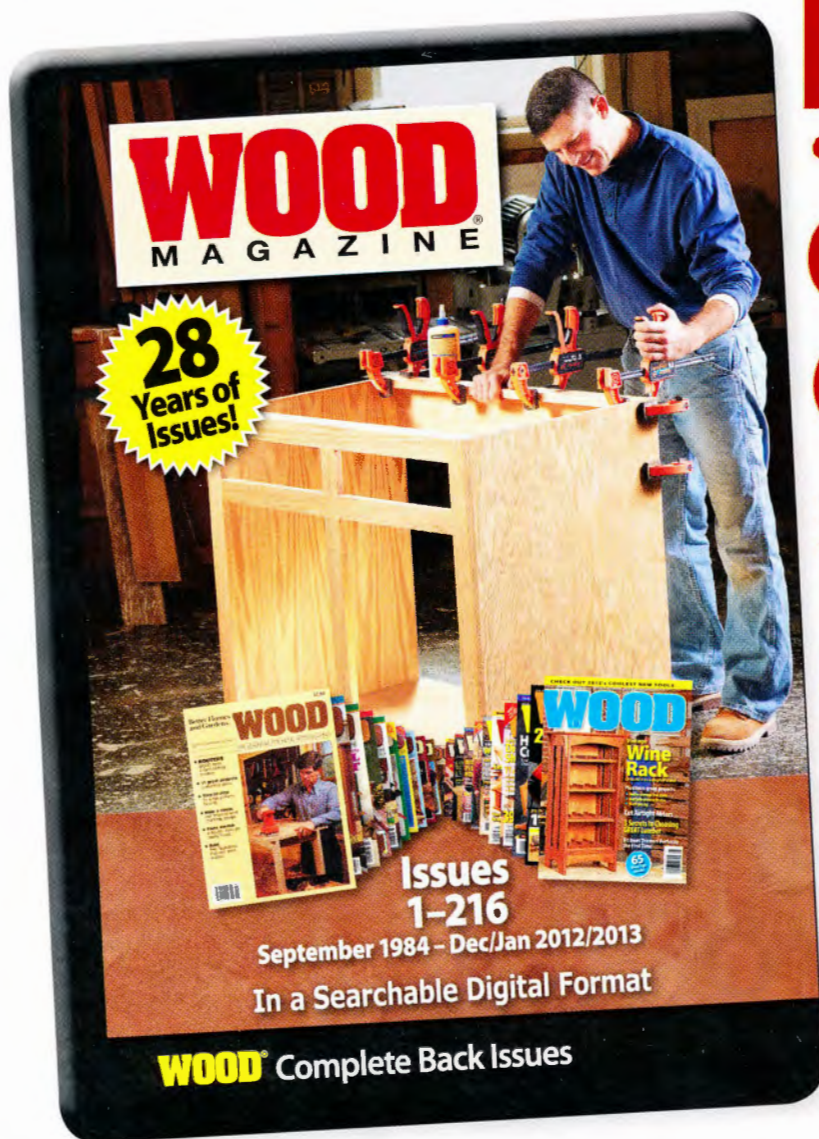
While examining a bin of boards, pay special attention to any boards in which the end grain aligns as if the boards came from the same log, because they probably did. Mills often bundle boards as they come off the saw, and a sequence—the sliced-up boards making up a complete log—will often end up in the same bin. It's your opportunity to snag boards with consistent color and complementary grain patterns. Confirm your find by pulling the boards and comparing their lengths; lumber from the same log will be the same length.

Final checks

After you zero in on a few likely candidates for project stock, pull those boards into the light for a final check. Does the grain match your expectations? Is the color consistent between boards? (If not, a stain or dye job might be in your future.) Sight down the edge to check for defects, *below*. And when you're done, proper lumberyard etiquette dictates that you neatly restack any rejects back in the bin. 🌲

Sight down the board to check for twist, cup, and curl. Some distortion might be acceptable if your cut list calls for short, narrow workpieces; otherwise, set aside any warped boards.





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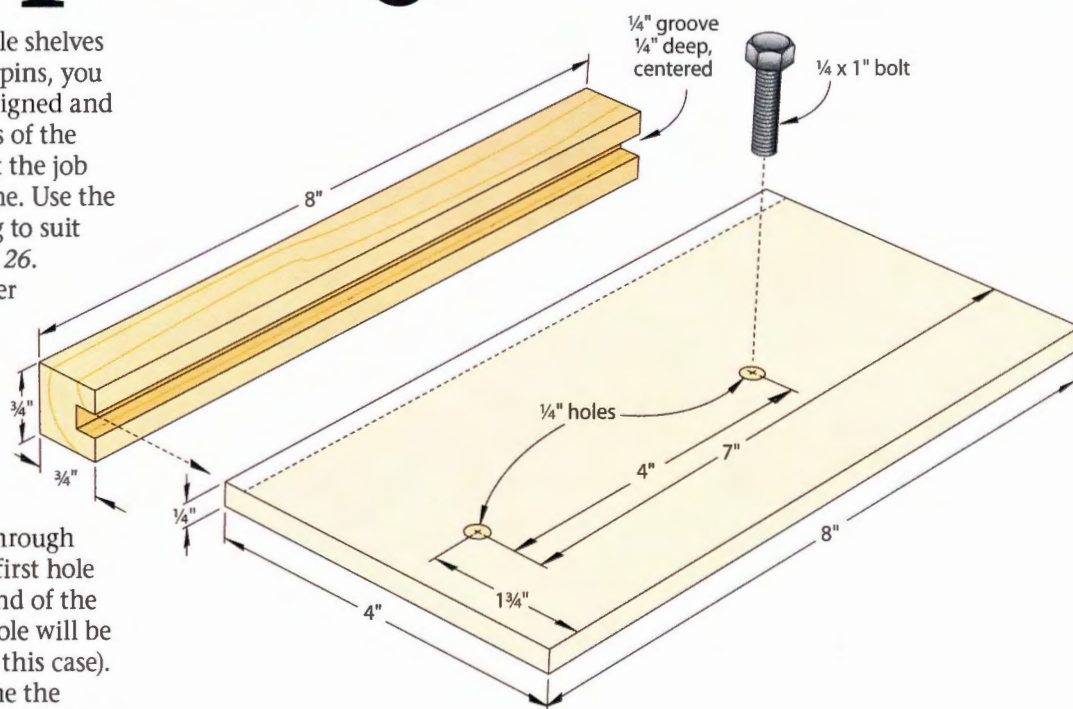
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Dead-on Accurate Shelf-pin Jig

To install height-adjustable shelves that don't rock on their pins, you need to drill perfectly aligned and spaced pinholes on both sides of the cabinet. This jig helps you get the job done with precision every time. Use the drawing (right) to build the jig to suit the wine-rack project on *page 26*. Vary the hole spacing for other projects, if necessary.

First, cut a centered, $\frac{1}{4}$ " groove in an 8"-long piece of $\frac{3}{4} \times \frac{3}{4}$ " hardwood scrap. Then, cut a piece of $\frac{1}{4} \times 4 \times 8$ " MDF. Mark a line on the MDF $1\frac{3}{4}$ " from one edge and drill two $\frac{1}{4}$ " holes through the jig on that line: Drill the first hole the same distance from the end of the jig as the topmost shelf-pin hole will be from your project's top (7" in this case). For the second hole, determine the distance between your project's shelf pins—4" for the wine rack—and drill that distance from the first hole.

To use the jig, clamp its end flush with the top edge of the project's inside face before project assembly. Drill the topmost shelf-pin hole through the



7"-spaced hole in the jig and into the project side. Use a brad-point bit and a stop-collar or tape flag to mark the depth. Unclamp the jig, place a $\frac{1}{4} \times 1$ " bolt through the jig's second hole, and

reposition the jig so the bolt goes into the just-drilled shelf-pin hole. Drill through the first hole again as shown *above* to make the second shelf-pin hole. Repeat. 🌲

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No-sweat, Flush-fit, Inset Drawers

Clean, modern drawers with precision reveals are just a few steps away.

Inset drawers give a modern, clean look to your furniture projects while speaking volumes about your craftsmanship. But the “reveals” (the gaps around the drawers) tend to highlight minor alignment discrepancies. (The fronts of *overlay* drawers overlap the cabinet face frame to hide those misalignments.) But here’s a little secret: It’s easy to make precise-fitting inset drawers with or without drawer slide hardware. Regardless of the mounting method you choose—slides or slideless—drawer fitting goes much easier if you start with drawer openings that are square. So take extra care when building the case.

Let’s start with slides

For easy alignment, nothing beats the combination of side-mount slides and a false-front drawer—one where the visible front attaches to and hides an assembled drawer box—because of adjustments built into the slides.

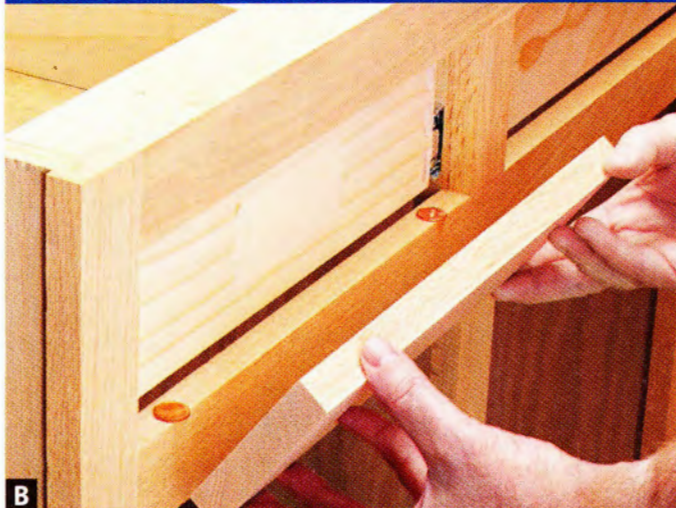
First, measure the drawer opening, and cut the false front $\frac{1}{8}$ " shorter in width and length. Next, construct the drawer box to fit the case, shortening its length to account for the thickness of the false front. Then, before attaching the false front to the drawer box, install the slides according to the manufacturer’s instructions, attaching the case-side components using only the vertical-adjustment slots [Photo A] and setting them back from the cabinet face the thickness of the false front.

GO VERTICAL FIRST



Start the drawer-slide installation by driving screws into the vertical adjustment slots, one at the front and one at the back of each slide.

2¢ BUYS A PERFECT REVEAL



B Pennies make great spacers, providing a reveal of about $\frac{1}{16}$ ", perfect for matching the top reveal of false fronts sized $\frac{1}{8}$ " narrower than the opening.

Using double-faced tape, attach the false front to the drawer box for an initial test fit. Center the front horizontally in the drawer opening and use spacers [Photo B] to help center it vertically.

Check to ensure the false front rests parallel (though not necessarily flush) with the face frame [Photo C]. If not, loosen the rear case-side screws in their vertical adjustment slots, and adjust the slides up or down slightly until the top and bottom of the drawer front is evenly recessed or evenly protrudes (or is perfectly coplanar, if you're lucky).

Once you have the drawer front parallel with the face frame, remove the drawer and drive centered screws in the horizontal adjustment slots and remove the screws from the vertical adjustment slots. Loosen the new screws enough to shift the components forward or back as needed to align the drawer front flush with the cabinet when closed. Once there, drive centered screws into the fixed mounting holes of the slides to secure them in place.

After all that adjustment, chances are the reveal needs tweaking. If so, remove the false front from the drawer and re-tape it in the proper position. Then, screw the false front to the box from the rear [Photo D]. Check the fit and install knobs or pulls.

SCREW IT IN FROM THE BACK



D With the drawer front taped into position with a perfect reveal, provide firm support while you predrill and screw it in place.

CHECK FOR PARALLEL



C A steel rule and back light help you quickly check the alignment of the drawer front. Unequal gaps or protrusions require slide adjustments.

Now let's try slideless

For slideless drawers you'll once again size false fronts $\frac{1}{8}$ " shorter horizontally, *but only* $\frac{1}{16}$ " narrower vertically than the drawer opening. Place

the completed drawer box in the opening; then, use double-faced tape to attach the false front to the drawer with the bottom edge resting on the case and an even reveal on the sides and top. When you're satisfied with the fit, remove the drawer to predrill and screw the face to the drawer box.

To create the bottom reveal, plane or rout a $\frac{1}{16}$ " chamfer along the bottom edge of the false front [Photo E]. The shadow created by this chamfer creates the bottom reveal.

Finally, to ensure that the drawer stops at the point where the face is flush with the case front, glue stopblocks in the backs of the drawer openings [Photo F].

For slideless drawers with integral (rather than false) fronts, the techniques for achieving a flush fit are the same, except that the front should be cut to precise size before completing any drawer joinery. 🌲

FAKE THE BOTTOM REVEAL



E Plane a small chamfer along the bottom edge of the false front, test fitting the drawer frequently to ensure an even reveal.

STOPS ENSURE A FLUSH FACE



F Clamp a scrap on the case front and press the drawer against it. Glue in stopblocks; avoid gluing the drawer to the case.

Get what you *really* want this holiday!

The twinkling lights of the tree danced in my eyes as I eagerly grabbed the largest present. "Go ahead, open it," my wife said. "You'll love it!" I tore into the bright wrapping paper. What could it be? A new miter-saw? A nice set of clamps?

Nope. It was a back-massager pad for my chair at work. "I hope you like it," she said. "I waited in line with two screaming kids for an hour to buy it." Of course I showed my appreciation, but deep down, I was hoping for something woodworking-related.

It was after that Christmas a few years ago that I vowed to make it less stressful for my family to get the right gift for me—a "win" all the way around. To ensure domestic tranquility in your home, try the following:

🎁 Just ask for it. I really appreciate when my wife provides a list of gift ideas—the more specific the better—because I know she'll get something she actually wants. Unlike the thermal underwear I bought for her in college. (True story. What was I thinking?!?) Wouldn't the gift givers in your life appreciate that help just as much? Many online woodworking retailers,

such as amazon.com, rockler.com, and woodcraft.com, let you create a "wish list" to share with those you love.

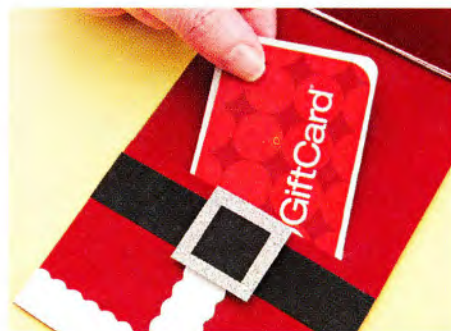
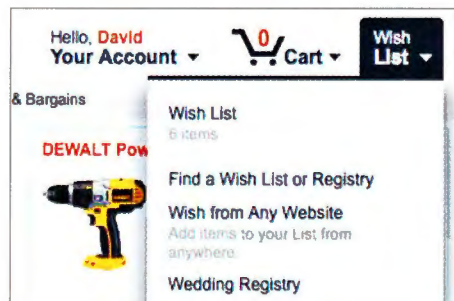
🎁 Take a tiered approach. Not everyone can afford to drop the cash on a major tool gift, so be sure to suggest items at different price tiers. That way, the kids can pool their allowance to get you that new marking knife, and your rich Uncle Ernie can spring for that cabinet saw. (By the way, tell Ernie he's always welcome in my shop!)

🎁 Go for the gift cards. Although some people see them as impersonal, a gift card from your favorite woodworking haunt—brick-and-mortar or virtual—allows gift givers to contribute to a more expensive tool. And, who doesn't love leisurely shopping for themselves after the holiday season is over, when deep discounts and clearance prices save you even more money?

And if what you really want this year is the warm, fuzzy feeling that comes from giving freely of your talents, build something for your favorite charity or a disadvantaged child. While you're at it, build projects for those who will be gifting tools to your shop. They will know their generosity is appreciated—and being put to good use! 🌲

—The Shop Monkey

(aka Tom Iovino of Tampa, Florida) blogs prolifically at woodmagazine.com/shopmonkey.



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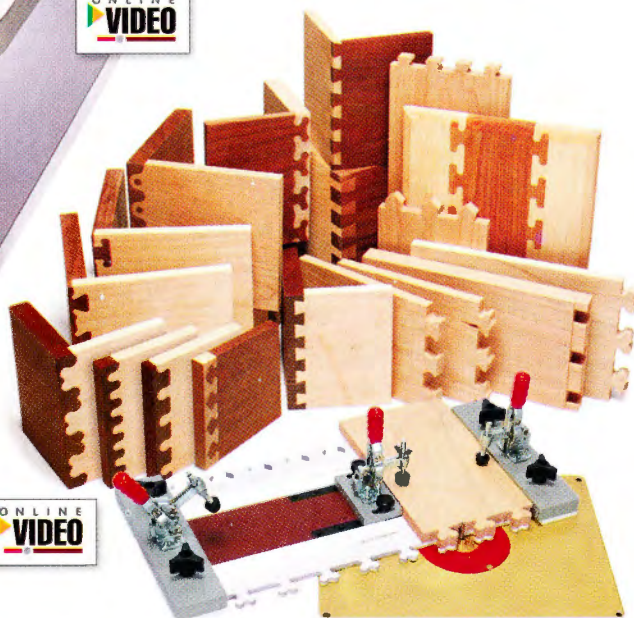
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Wise Buys

Our Tools Editor Tests Combination Squares

Why Buy?

A combination square, with a sliding head featuring 45° and 90° angles, ensures precise measurements, layout, and assembly. Look for one with a flex-free, non-glossy stainless-steel rule marked with laser-etched increments. (Stamped markings tend to be thick, hard to read, and unreliable.) The head should lock tightly on the rule without wiggle, yet still be easy to slide on and off. Most 12" combo squares fall into two price ranges: \$75 to \$120 for machinist-quality squares, usually sold by specialty retailers; and \$30 or less for those typically found in home centers and hardware stores. Tools Editor Bob Hunter tested a dozen squares in both price ranges and recommends these two.



L.S. STARRETT CO.,
#C11H-12-4R, \$95
978-249-3551, starrett.com

I've trusted Starrett squares and rules for years, as they've proved themselves time and again to be accurate and dependable. This model's stainless-steel rule—thickest in the test at .088"—has a glare-free matte finish that makes it easy to read even under bright lights. With $\frac{1}{8}$ " and $\frac{1}{16}$ " markings on one side and $\frac{1}{32}$ " and $\frac{1}{64}$ " on the other, the increments are marked in proportional lengths that make for quick, easy reference: In between inch marks $\frac{1}{2}$ " is longest, $\frac{1}{4}$ " and $\frac{3}{4}$ " are next longest, and so on.

The beefy cast-iron head grips the rule snugly, yet slides easily and locks securely, and it was dead-on at 90° and 45°. Its locking bolt has an indexing collar that makes it easy to align the bolt with the groove in the rule.

Starrett buries its spirit-level tube in the protective cast iron of the head, making it harder to see than most. But the white background and clear fluid help offset that some. The scribe measures $1\frac{3}{8}$ " long—helpful for large fingers—but was difficult to remove from its friction-fit home.

You can buy combination squares (or rules to fit the same head) in 6", 18", and 24" lengths.

Starrett also sells accessory heads for these rules that help you find the center of round workpieces, as well as a protractor head for measuring and marking angles from zero to 180°.

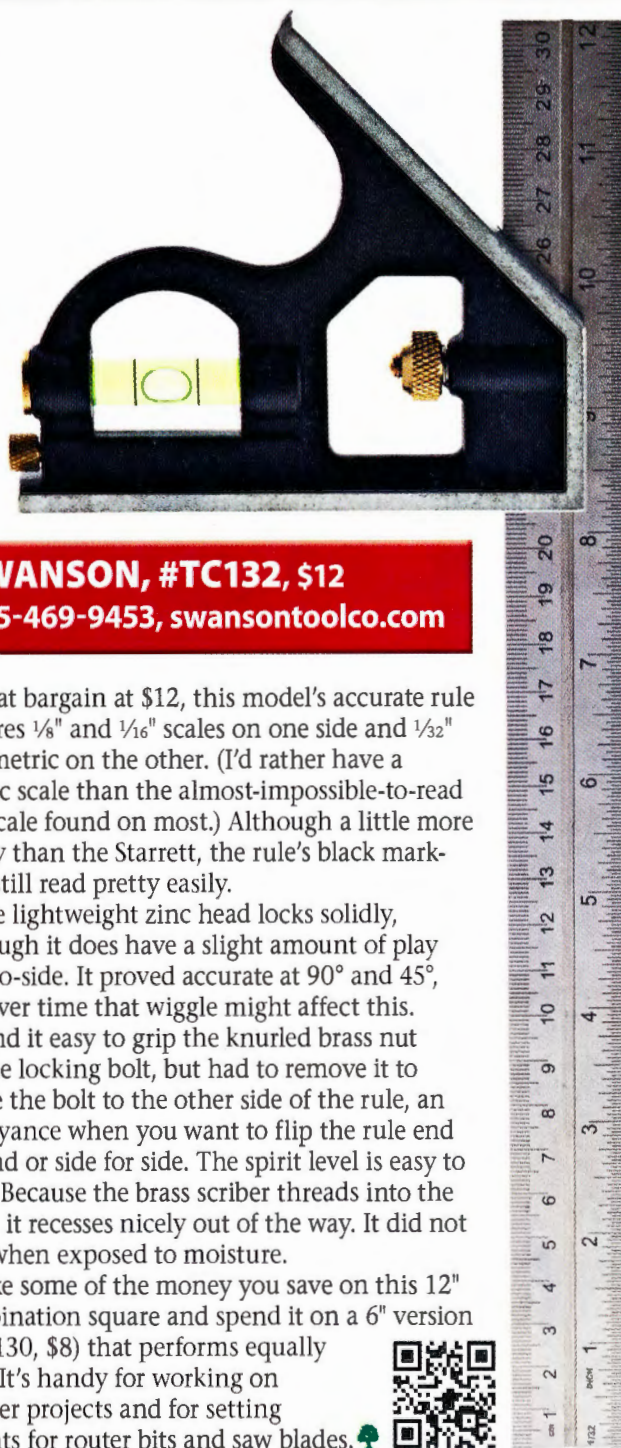
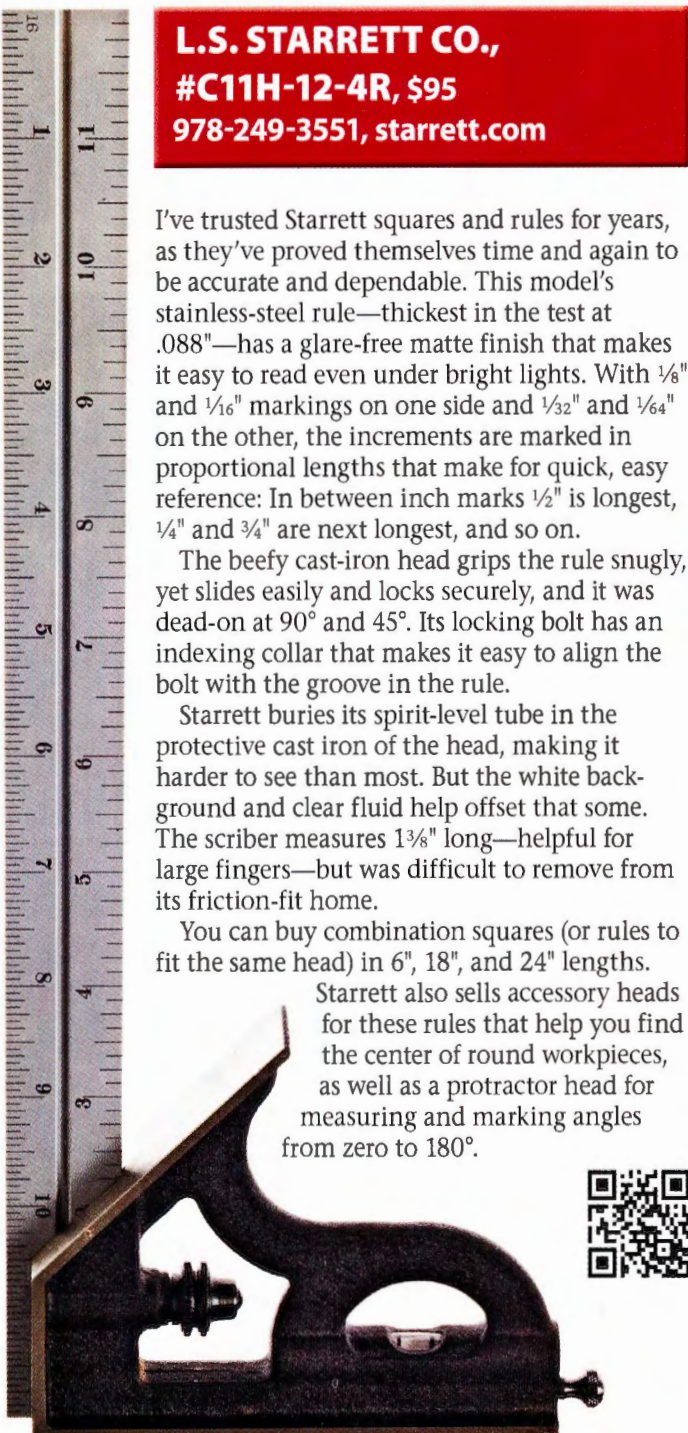


SWANSON, #TC132, \$12
815-469-9453, swansontoolco.com

A great bargain at \$12, this model's accurate rule features $\frac{1}{8}$ " and $\frac{1}{16}$ " scales on one side and $\frac{1}{32}$ " and metric on the other. (I'd rather have a metric scale than the almost-impossible-to-read $\frac{1}{64}$ " scale found on most.) Although a little more glossy than the Starrett, the rule's black markings still read pretty easily.

The lightweight zinc head locks solidly, although it does have a slight amount of play side-to-side. It proved accurate at 90° and 45°, but over time that wiggle might affect this. I found it easy to grip the knurled brass nut on the locking bolt, but had to remove it to rotate the bolt to the other side of the rule, an annoyance when you want to flip the rule end for end or side for side. The spirit level is easy to read. Because the brass scribe threads into the head, it recesses nicely out of the way. It did not rust when exposed to moisture.

Take some of the money you save on this 12" combination square and spend it on a 6" version (#TC130, \$8) that performs equally well. It's handy for working on smaller projects and for setting heights for router bits and saw blades.



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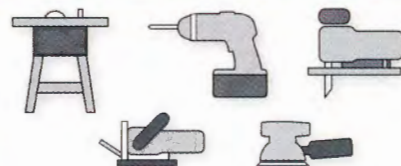
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TOOLS NEEDED



Approximate materials cost: \$62

Arts & Crafts stylings and wine country go together like—well, like braised veal shanks and a full-bodied Cabernet Sauvignon. Build this project as a wine rack or a display stand (page 29) to bring a little of the vineyard to your own home. Either way, the construction is simple, consisting of biscuit and butt joinery.

It has great legs

1 From $\frac{3}{4}$ " stock rip the legs (A) to the width listed [Materials List, page 30]. To ensure all legs are the same length, crosscut them as shown in Photo A.

2 Construct the Quick-and-Easy Shelf-pin Jig on page 20. Align the jig with

Project Highlights

- ▶ Overall dimensions: 18 $\frac{3}{4}$ " wide x 14" deep x 37 $\frac{1}{2}$ " high.
- ▶ Materials needed: solid oak and $\frac{3}{4}$ " oak plywood.

Skill Builders

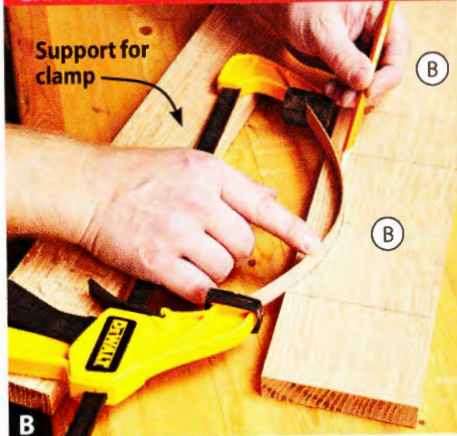
- ▶ Finish-sand as you build to eliminate awkward sanding in tight spaces.
- ▶ Learn a simple trick for attaching a tabletop that foils movement issues.

CUT FOUR LEGS EXACTLY THE SAME



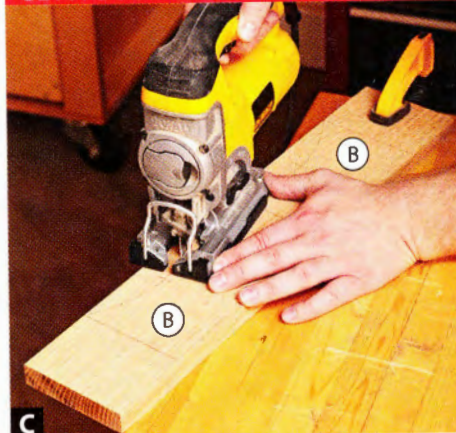
Attach a long miter-gauge extension to your table saw's miter gauge. Clamp a stopblock 36 $\frac{3}{4}$ " from the blade and cut the legs (A) to length.

CRAFT A CURVE



A thin scrap of wood, clamped to intersect the curve's top and ends, makes a quick fairing stick to complete the curve's layout.

GET A GOOD GRIP



Use the excess blank material to clamp the side bottom rail blank firmly in place while jigsawing the curve using a 10-tpi-or-greater blade.

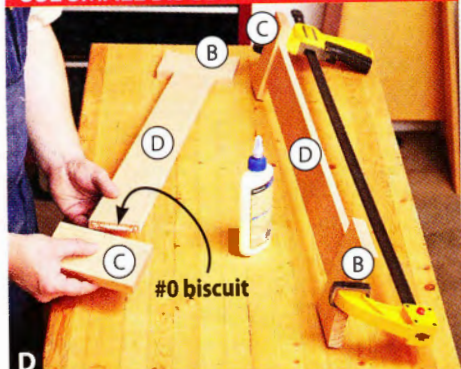
the top end of the inside face of one leg (A), with the jig's guide fence against the front-facing edge, and drill holes where shown [Drawing 1]. (You'll have to flip the jig for the legs on the opposite side.) Mark the legs with an L or R for left or right and set them aside.

3 Lay out the side bottom rails (B) on a $\frac{3}{4}$ ×4×18" blank, separating the two rails by 2". Then lay out the curves as shown [Drawing 1, Photo B]. Cut the curves with a jigsaw [Photo C] and sand smooth. Cut the excess from each end.

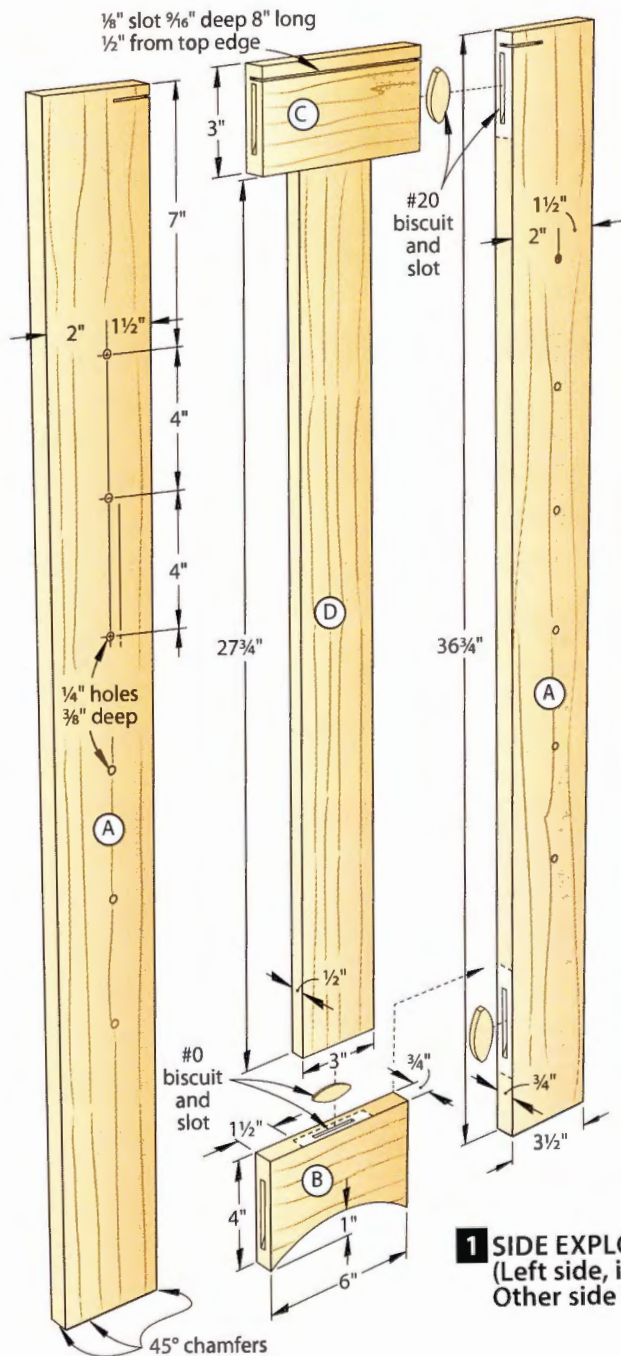
4 From $\frac{3}{4}$ " stock, cut a 3×12 $\frac{1}{2}$ " blank for the side top rails (C). Use a stop-block and miter-gauge extension to cut the side bottom rails (B) and side top rails to length.

5 From $\frac{1}{2}$ " stock, cut the side slats (D) to size, and finish-sand to 220 grit. Set up your biscuit joiner to center slots for a #0 biscuit in the ends of the side slats [Drawing 1]. Without changing the biscuit-joiner setup, cut the mating slots in the side rails (B, C), referencing from the inside face. Assemble parts B–D as shown [Photo D].

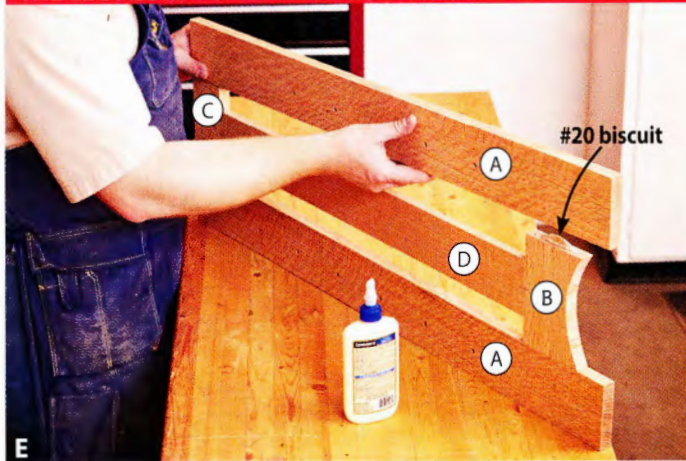
USE SMALL BISCUITS FOR SLIM SLATS



Add glue to the end grain of the side slats (D) and the biscuit slots. Insert #0 biscuits, position the side rails (B and C), and clamp.



THE LEG ASSEMBLY COMES TOGETHER

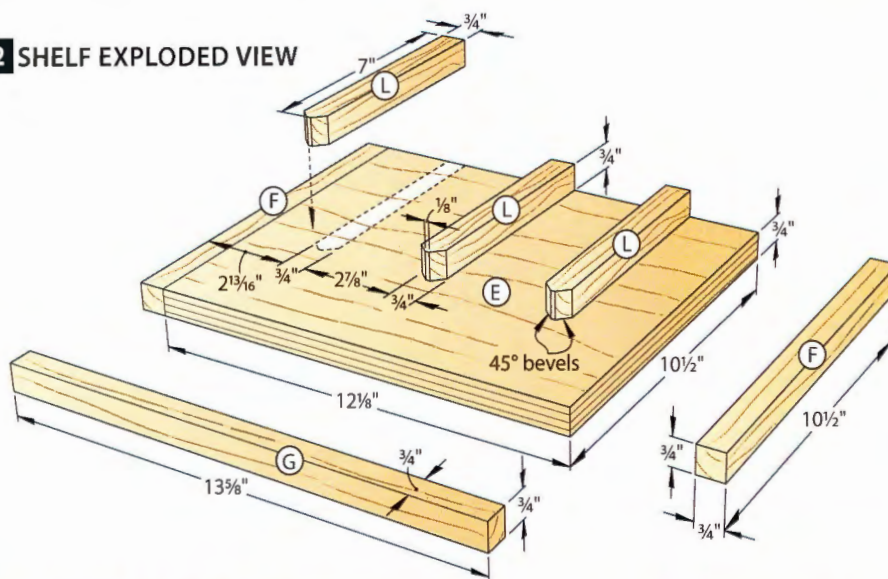


E Add glue to the end grain of the side rails (B-D) and the biscuit slots. Insert biscuits, assemble, and clamp the legs (A) to rails.

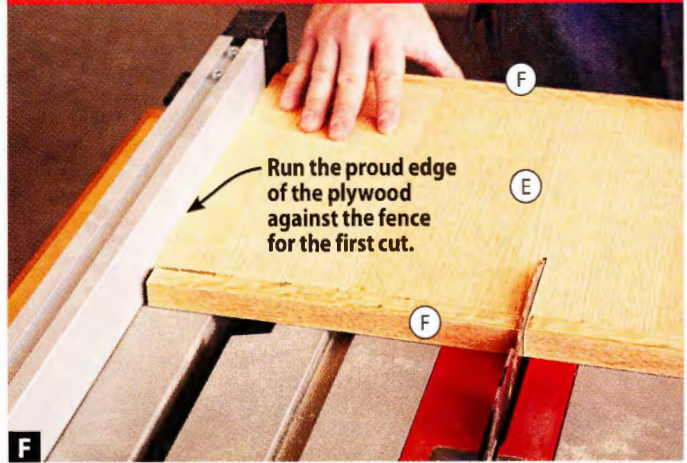
6 After the glue sets on the slat/rail assemblies (B/C/D), retrieve the legs (A), cut slots for #20 biscuits where shown [Drawing 1], and glue up the side assemblies (A-D) [Photo E].

Quick Tip: Allow the glue to dry overnight before finish-sanding the side assemblies. Sanding when the biscuits are still swollen with wet glue can leave divots after the glue dries and the biscuits shrink.

2 SHELF EXPLODED VIEW



FASHION TWO DEAD-ON SHELVES PER BLANK



F First cut the shelf blanks (E/F) in half (about 10 1/16 inches). Then, cut each shelf to final width, running the freshly cut edge against the fence.

Shelves sans complexity

Note: Because multiple parts require 3/4x3/4 inch stock, save setup time by cutting blanks for them all at once. From 3/4 inch stock, rip and crosscut four 3/4x21 1/4 inch blanks for the shelf side edging (F), two 3/4x28 inch blanks for the shelf front edging (G), and four 3/4x32 inch blanks for the bottom edging (I) and bottle stops (L), to be used as needed.

1 From 3/4 inch plywood, cut two 21 1/2x12 1/8 inch blanks for the shelves (E). Retrieve the 3/4x3/4x21 1/4 inch shelf side edging (F) blanks you cut earlier. Glue the side edging to the shelf blanks with one end of each edging flush with the blank end. (The opposite end of the blank remains proud, serving as a straightedge for cutting.) After the glue dries, cut two shelves from each blank [Photo F, Drawing 2].

2 Retrieve two 3/4x3/4x28 inch blanks and cut the shelf front edging (G) to length [Drawing 2]. Glue and clamp the edging to the shelves (E/F) and set them aside to dry.

REACH FOR A RAIL, NOT A RULER



G To ensure a square case, use the length of the top rail (J) to position the fence before cutting the back (K) and bottom (H/I) to final width (about 13 3/4 inches).

ASSEMBLE THE CASE



H Glue the remaining edges of the back/bottom (H-K), rails (J) and biscuit slots. Carefully position the leg assembly (A-D) and clamp the case.

BEVEL, FLIP, REPEAT, REPEAT, REPEAT...



Use the blade kerf in the miter-gauge extension to line up the bottle stop (L) for a $\frac{1}{16}$ " bevel. Clamp a stopblock in place and make both cuts.

3 From $\frac{3}{4}$ " plywood, cut a $12\frac{3}{8} \times 14$ " blank for the bottom (H) [Drawing 3]. Retrieve one $\frac{3}{4} \times \frac{3}{4} \times 32$ " blank and cut the bottom edging (I) blank to 14". Glue and clamp the edging to the bottom. When the glue has dried, finish-sand the shelves and bottom to 220 grit and set them aside.

A caseful of easy joinery

1 From $\frac{3}{4}$ " stock, cut the front rails (J) to size [Drawing 3]. Lay out and jigsaw the curves. Then sand away any blade marks.

2 From $\frac{3}{4}$ " plywood, cut a 14×31 " blank for the back (K). Determine the precise final width as shown [Photo G] and cut the back and bottom (H/I) to width. Finish-sand both parts.

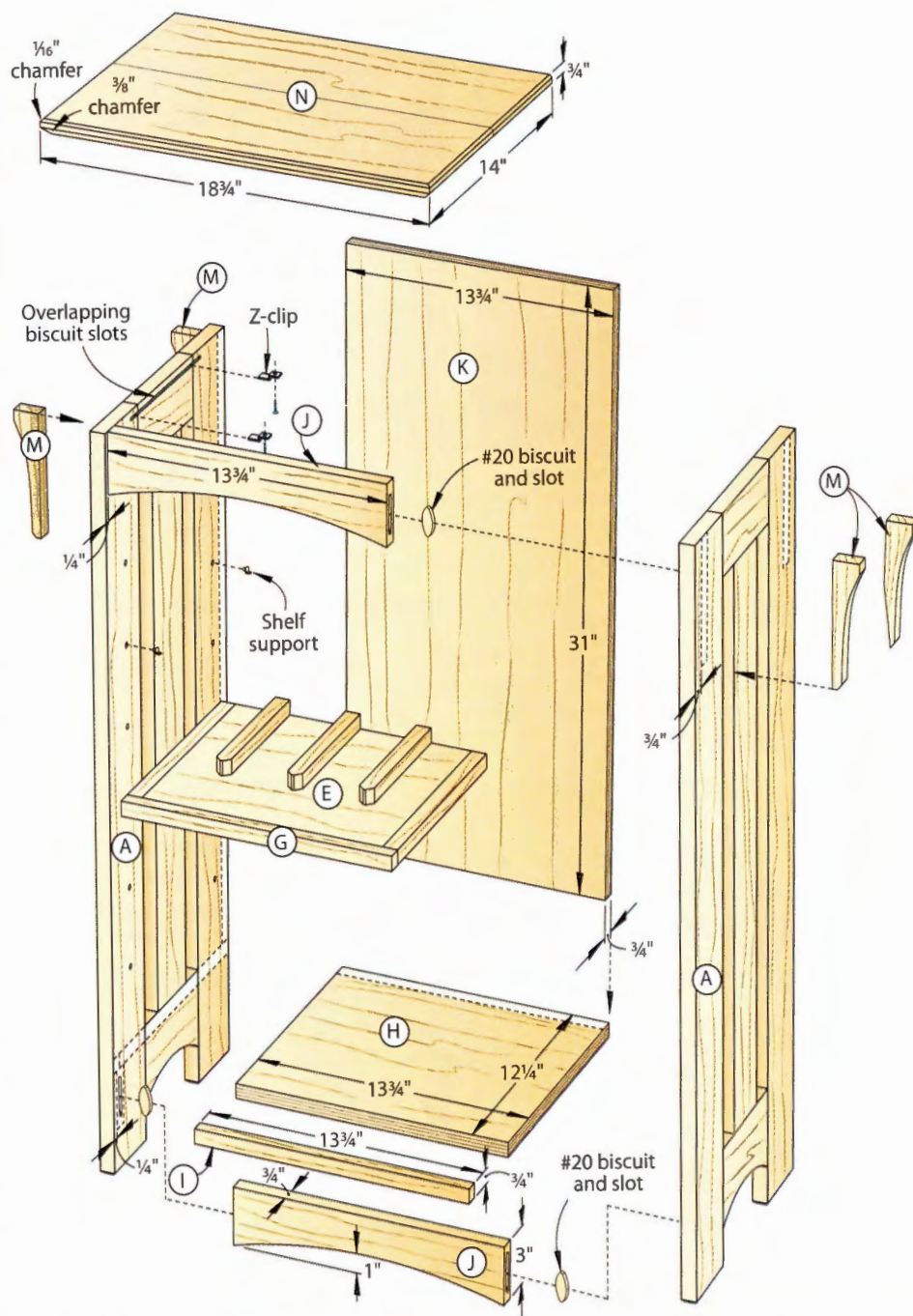
3 Glue and clamp the bottom (H/I) to the back (K) [Drawing 3] and allow the glue to dry.

4 Cut slots for #20 biscuits in the ends of the front rails (J). In order to create a $\frac{1}{4}$ " setback for the front rails, reposition the biscuit-joiner fence $\frac{1}{4}$ " deeper before cutting the corresponding biscuit slots in the side assembly (A-D).

5 Apply glue to the edges of one side of the back/bottom assembly (H/I/K) and carefully position it on the corresponding side assembly (A-D). Glue and biscuit the front rails (J) in place, gluing and clamping the top edge of the bottom rail (J) to the bottom (H/I). Complete the assembly [Photo H] and allow the glue to dry.

Bottle stops, corbel props, and table top

Note: To build the project as a display stand, right, rather than a wine rack, skip Step 1 at right.



3 EXPLODED VIEW

1 From the remaining $\frac{3}{4} \times \frac{3}{4} \times 32$ " blanks, cut 12 bottle stops (L) to length [Drawing 1]. Tilt your tablesaw blade to 45° and make an initial cut through a miter-gauge extension to mark the blade location. Then bevel the ends of each bottle stop [Drawing 2, Photo I], finish-sand the stops, and glue them in place on the shelves (E/F/G).

2 From $\frac{3}{4}$ " stock, cut two $2\frac{1}{16} \times 9$ " blanks for the corbels (M). Make four copies of the full-size Corbel Pattern on page 30. Cut out and spray-adhere two patterns to each blank, and jigsaw to

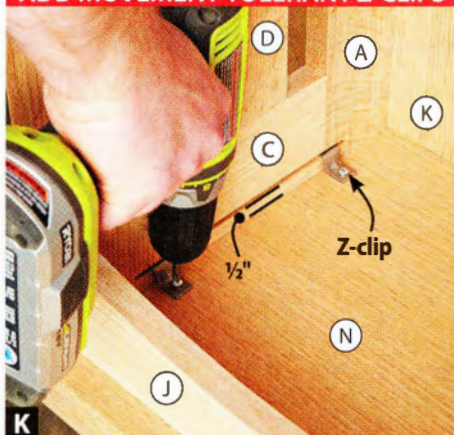


DOUBLE UP ON CORBELS



Clamp the corbel (M) blank by the excess material. Cut the waste from between the patterns before cutting the corbels free.

ADD MOVEMENT-TOLERANT Z-CLIPS



With the top (N) facedown, position the case, centered, with the backs flush. Insert the Z-clips in their slots and attach with screws.

Materials List

Part	FINISHED SIZE			Matl.	Qty.	
	T	W	L			
A	legs	¾"	3½"	36¾"	O	4
B	side bottom rails	¾"	4"	6"	O	2
C	side top rails	¾"	3"	6"	O	2
D	side slats	½"	3"	27¾"	O	2
E*	shelves	¾"	10½"	12½"	OP	4
F*	shelf side edging	¾"	¾"	10½"	O	8
G	shelf front edging	¾"	¾"	13½"	O	4
H*	bottom	¾"	12½"	13¾"	OP	1
I*	bottom edging	¾"	¾"	13¾"	O	1
J	front rails	¾"	3"	13¾"	O	2
K*	back	¾"	13¾"	31"	OP	1
L	bottle stops	¾"	¾"	7"	O	12
M*	corbels	¾"	1¼"	6"	O	4
N	top	¾"	14"	18¾"	EO	1

*Parts initially cut oversize. See the instructions.

Materials key: O—oak, EO—edge-joined oak, OP—oak plywood.

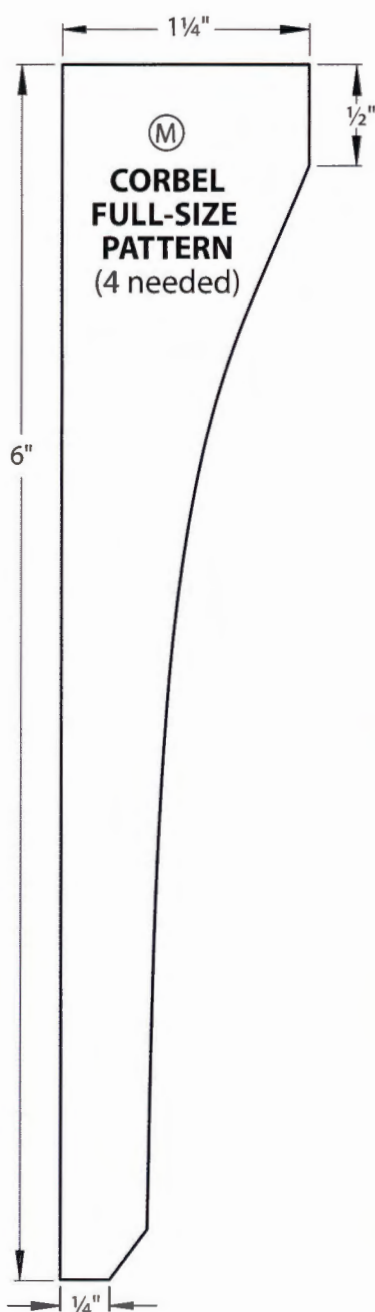
Supplies: #0 and #20 biscuits, Z-clips (4), ¼" shelf supports (16), #8x¾" roundhead screws (4).

Supplies on Demand: You can quickly order supplies for this project at woodmagazine.com/216winerack. Simply delete any supplies you already have on hand before checkout.

Produced by **Lucas Peters** with **John Olson**

Project design: **Kevin Boyle**

Illustrations: **Lorna Johnson**



shape [Photo J]. Finish-sand the corbels, sanding away any saw marks in the process. Now, glue and clamp the corbels to the case [Drawing 3].

3 From ¾" stock, glue up and cut the top (N) to size. Use your tablesaw to cut ¾" chamfers on the front and sides of the bottom face [Drawing 3]. Use a sanding block to ease the corners (about ¼" chamfer) on the remaining edges, and finish-sand the top.

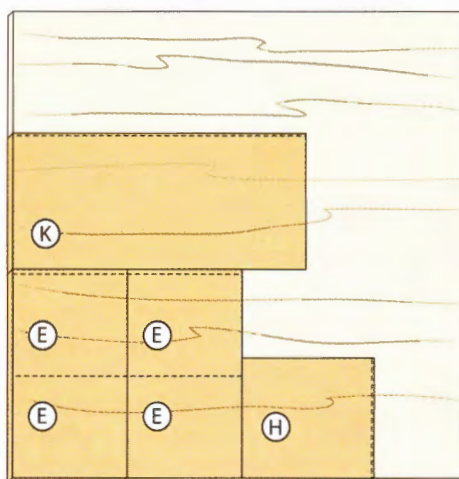
4 With your biscuit joiner set to a depth of ⅛", cut overlapping slots along the top inside face of the side assemblies (A–D) [Drawings 1 and 3]. Attach the top (N) to the case [Photo K].

5 Apply stain and a clearcoat. (We used Varathane wood stain #263, Gunstock, and three coats of General Finishes Enduro-Var water-based satin polyurethane.) Install the shelf pins and shelves (one shelf can rest on the bottom), stock the stand with your favorite vintage, and toast a job well done! 🍷

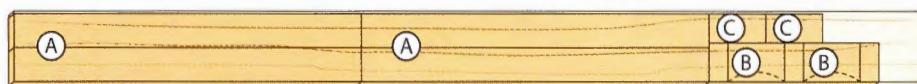
More Resources

- ▶ Learn the basics of biscuit joinery at woodmagazine.com/biscuitbasics
- ▶ For a limited time watch a free video on biscuit joinery at woodmagazine.com/biscuitvid

Cutting Diagram



¾ x 48 x 48" Oak plywood



¾ x 7¼ x 96" Oak (5.3 bd. ft.)



¾ x 5½ x 96" Oak (4 bd. ft.) *Plane or resaw to the thickness listed in the Materials List.



¾ x 5½ x 72" Oak (3 bd. ft.)

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Sitting next to your favorite chair, this beautiful table puts entertainment options at your fingertips. The golden Douglas fir frames and sets off the maple drawer fronts and sides. While Douglas fir may not be top-of-mind when you choose wood for a fine furniture project, as shown here, turning the straight-grained edges to the front makes great-looking stock.

Kick it off with the legs

1 From 8/4 Douglas fir, cut the legs (A) to size [Materials List, page 37; Drawing 1]. Arrange the legs to put the straightest grain to the front, and label the position of each one [Drawing 1a]. Lay out the tapers on the outside face of each leg and the front edges of the front legs and back edges of the back legs.

Quick Tip! Lay out the tapers so the grain runs parallel to the untapered faces.

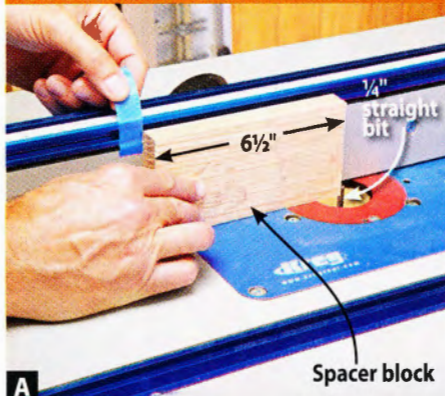
1 BACK LEGS (Inside face, left leg shown)

1/4" stopped groove
1/4" deep
(Back legs only)



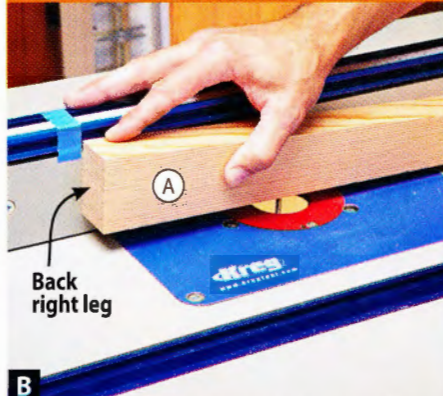
Dimensions: 27"W x 21"D x 27 3/4"H
Approximate materials cost: \$200

TAPE MARKS THE SPOT



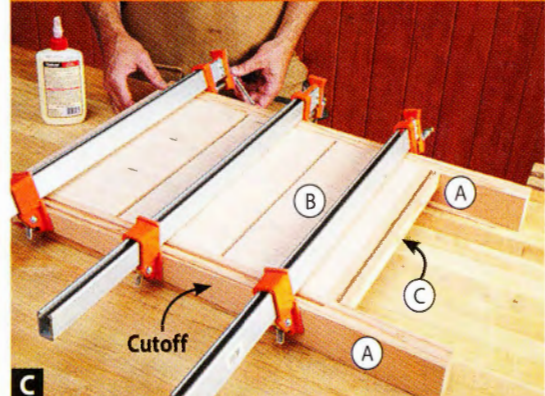
A To get identical start and stop marks on both sides of the bit, use a spacer block against the bit to help position the tape before each cut.

PLUNGE TO BEGIN THE CUT



B Align the bottom of the back right leg (A) with the inside tape edge, plunge the leg onto the spinning bit, and rout to the top of the leg.

GLUE UP THE SIDE ASSEMBLIES



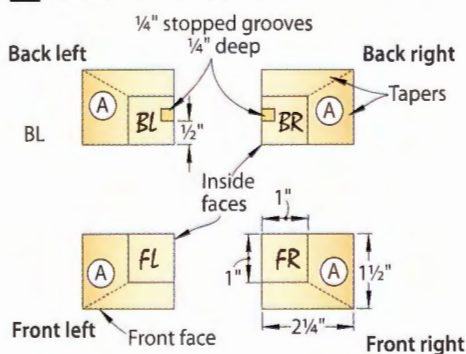
C To create parallel clamping surfaces and protect the soft fir from damage, put the tapered cutoffs from the legs alongside the legs (A).

Bandsaw and sand the tapers, or cut them with a taper jig on the tablesaw [More Resources]. Save the cutoffs for use later during assembly.

2 Set up a 1/4" straight bit in your table-mounted router, adjust it to 1/8" above the table, and set the fence 1/2" from the rear edge of the bit. Use a 6 1/2"-long scrap to help you position a piece of painter's tape to the left of the bit [Photo A]. Rout a 1/4"-deep groove in the inside face of the back right leg (A), plunging the leg onto the bit to begin [Photo B], and raising the bit between passes. For the back left leg, use the spacer block again to help position tape to the right of the bit. When routing, stop the leg when the top reaches the edge of the tape nearest the bit. Save this router table setup for later. Finish-sand the legs to 220 grit.

3 Cut the sides (B) to size [Drawing 2]. Then cut the side edging (C) to size, finish-sand it, and glue a length of side edging to the bottom of each side, flush on the inside faces. After the glue dries, rout a 1/4"x1/4" groove on the inside face of the side edging, and a dado near the top of the sides. Readjust the router-table fence to 7 1/4" from the bit and rout the remaining dados in the sides.

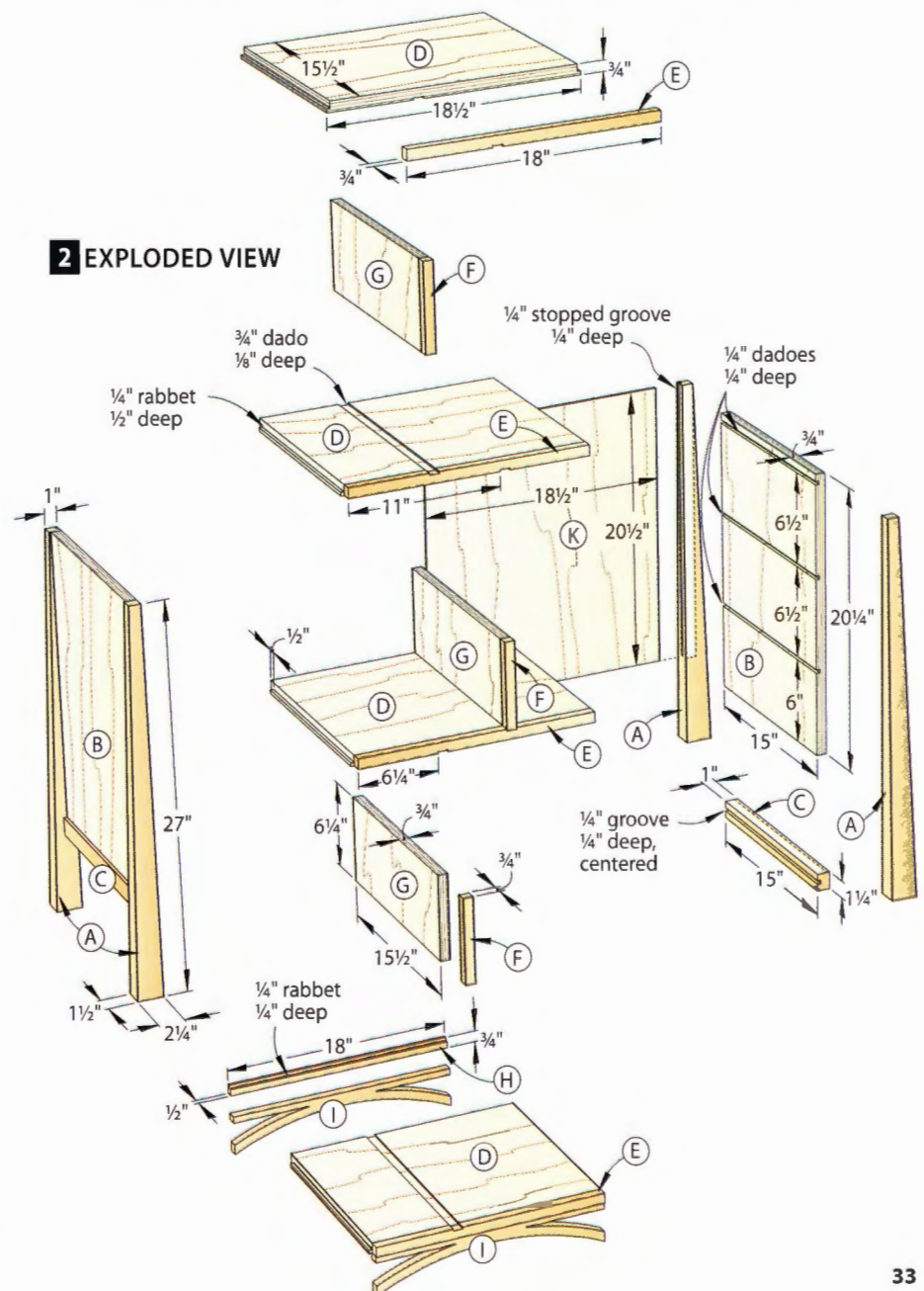
1a LEG DETAIL TOP VIEW



4 Retrieve the legs (A) and the cutoffs and glue the right legs to one side assembly (B/C) and the left legs to the

other, keeping the inside faces flush [Drawing 2, Photo C]. After the glue dries, remove the clamps. Keep the cutoffs for use later.

2 EXPLODED VIEW

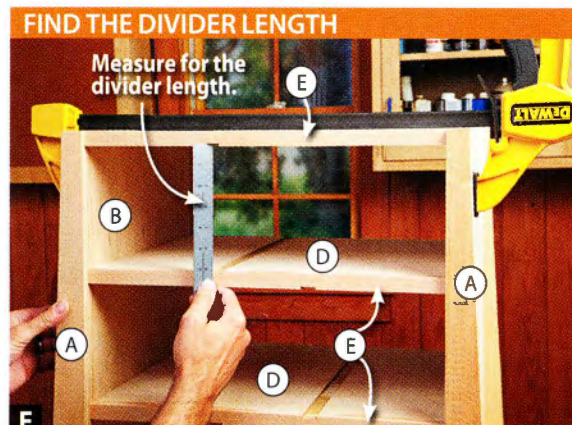




D Align the end of one shelf edging (E) blank with the shoulder of the rabbet and mark the edging's final length with a chisel.



E To allow the shelves (D) to extend past the sides (B) at the rear of the table, use a handsaw to cut $\frac{1}{2}$ " from the rear of each tongue.



F Measure between the bottoms of opposite dadoes to find the length of each divider (G). Sneak up on the final length for a snug fit.

Work away at the middle

1 Cut the four shelves (D) to size [Drawing 2]. Rout a $\frac{1}{4}$ " rabbet on each end, raising the bit slightly between passes to create tongues that fit snug in the dadoes in the sides (B).

Quick Tip! Back up the shelves with a piece of scrap to prevent chip-out as the bit exits the cut.

2 For the shelf edging (E) and divider edging (F), prepare five $\frac{3}{4}$ "x20" blanks to match the thickness of the plywood used for the shelves (D) and dividers (G). Set one of the blanks aside. Mark the shelf edging's final length [Photo D], set up a stopblock on a miter-gauge extension, and crosscut four pieces of shelf edging to length. Glue the shelf edging to the front of each shelf, keeping the faces flush on the top and bottom.

3 At the rear of each shelf (D/E), notch each tongue [Photo E]. Set up a dado blade in your tablesaw to match the thickness of the dividers (G), and cut $\frac{1}{8}$ "-deep dadoes where shown [Drawing 2].

Quick Tip! To make sure the dadoes align properly, stack the shelves as they will be in the finished table, and then mark the dado locations on the rear of each shelf.

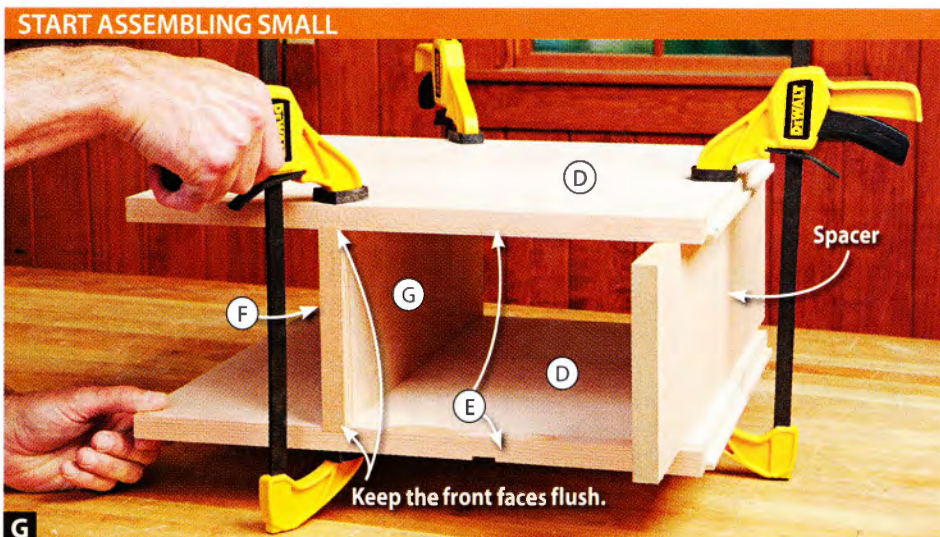
Finish-sand the shelves and edging to 220 grit.

4 Retrieve the side assemblies (A-C) and dry-fit the shelves (D/E) between them [Photo F]. Measure between the dadoes to determine the length of each divider (G). Crosscut each divider $\frac{1}{8}$ " longer than these measurements.

5 Retrieve the last edging blank and crosscut three $6\frac{1}{2}$ "-long divider edging (F) pieces from it. Glue the edging to each divider (G), flush on one end and

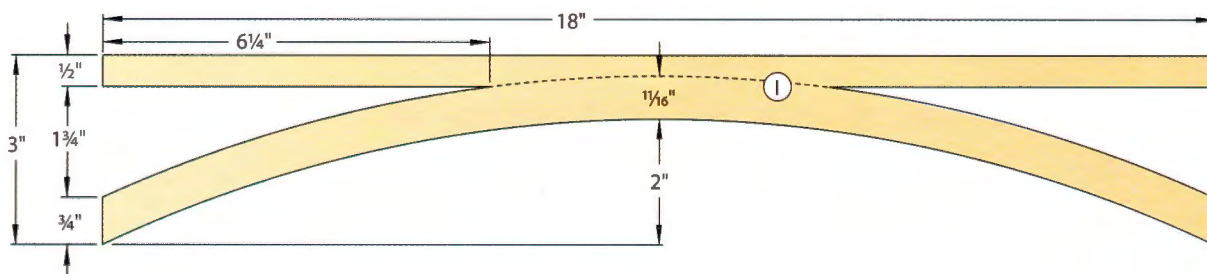
long on the other. Then crosscut the dividers and edging to final length to fit between the dadoes in the shelves.

6 Disassemble the case. Glue a divider (F/G) between two shelves (D/E) [Photo G], keeping the front faces flush. Repeat this process, making two subassemblies. Allow these assemblies to dry, then join them with the remaining divider [Photo H].



G Cut a spacer from scrap and use it to keep the shelves (D/E) parallel as you clamp a divider (F/G) between them. Check the assembly for square.

3 APRON



Make it look like a table

1 Retrieve the leg cutoffs and tape them to the legs (A) to make the outside faces parallel [Photo I].

Quick Tip! Use painter's tape for this because double-faced tape might tear out fibers.

Glue the shelf assembly (D–G) to each side. Align the rear edges of the shelves with the front edges of the grooves in the back legs.

2 Cut the back edging (H) to size [Drawing 2], and cut a $\frac{1}{4}$ " rabbet $\frac{1}{4}$ " deep along one edge. Glue the back edging

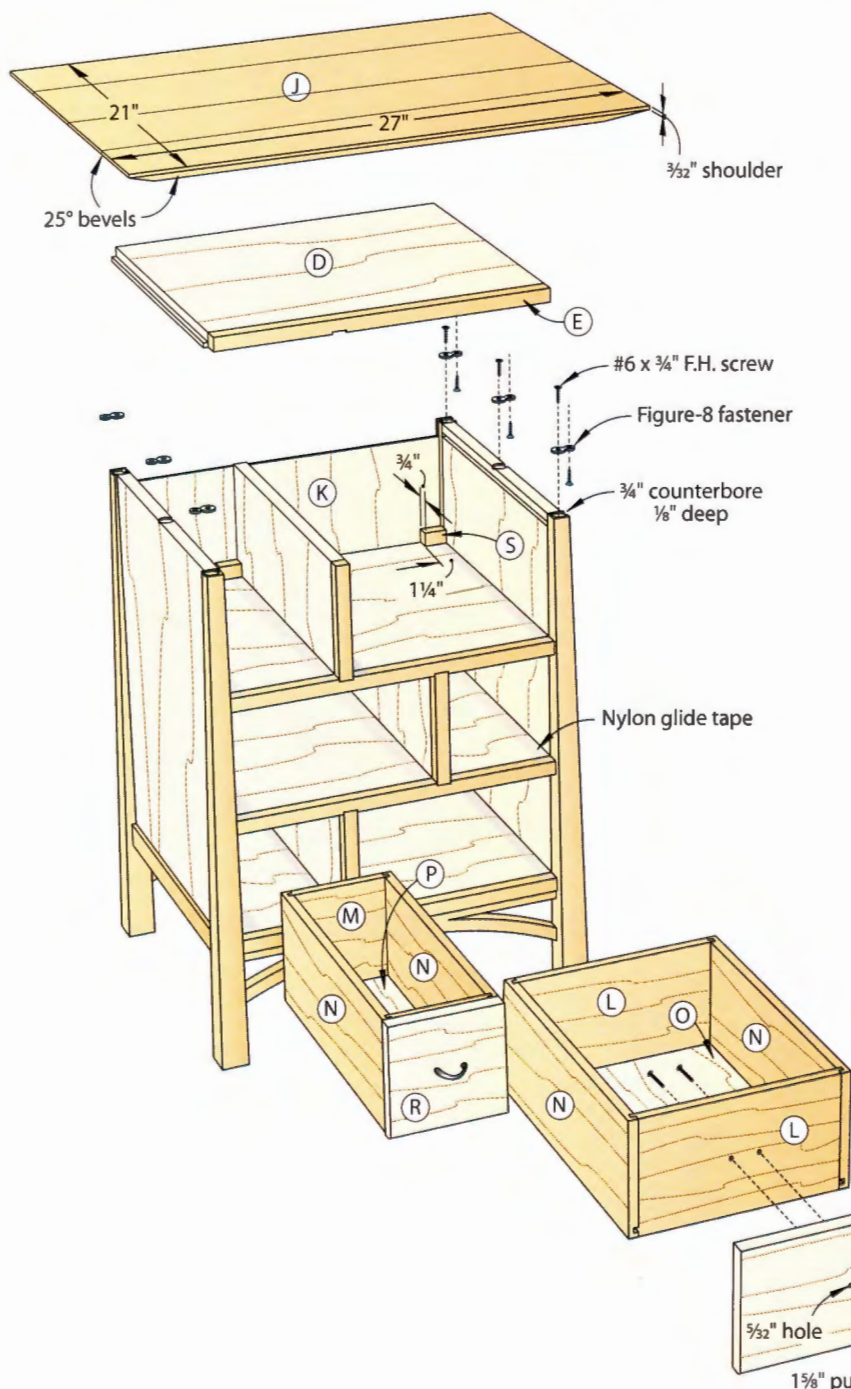
to the bottom shelf (D) flush along the bottom edge.

3 From Douglas fir, cut the aprons (I) to size.

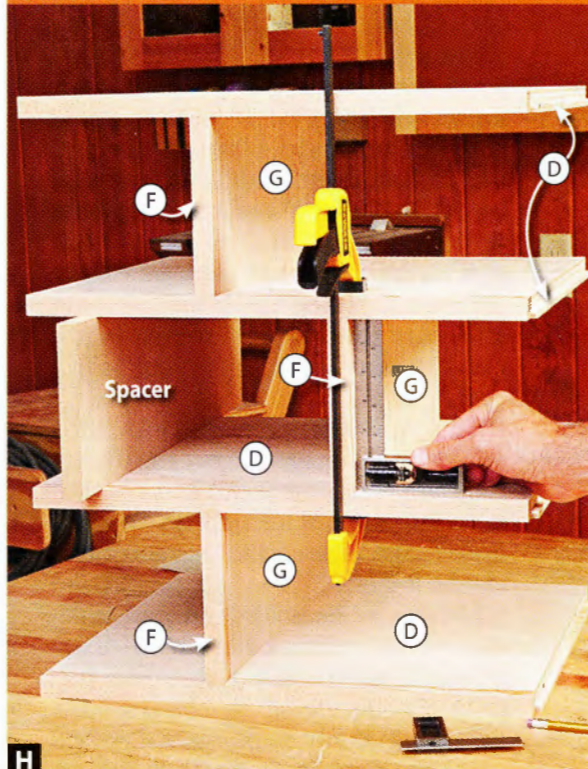
Quick Tip! Select straight-grained stock to hide the joint line between the aprons and the bottom shelf edging (E).

Using a fairing stick [More Resources], lay out the arches [Drawing 3]; then bandsaw and sand them to shape. Finish-sand the aprons, then glue them in place flush with the outside faces of the edging.

4 EXPLODED VIEW



STACK THE SHELVES AND DIVIDERS



Clamp across the divider (F/G) at the front and back after checking the assembly for square.

CUTOFFS MAKE CLAMP-UP EASY



Glue and clamp the shelf assembly (D–G) between the side assemblies (A–C). The cutoffs create parallel clamping faces.

4 Glue up a $\frac{3}{4}$ "-thick panel for the top (J) and cut it to size [Drawing 4]. Bevel the bottom face [Photo J]; then finish-sand both faces, and the edges and ends of the top. With a $\frac{3}{4}$ " Forstner bit, drill $\frac{1}{8}$ "-deep counterbores in the legs (A) and sides (B) where shown. Set the top aside for now.

5 Cut the back (K) to size from $\frac{1}{4}$ " plywood [Drawing 2]. Slide it into the grooves in the back legs (A), but do not glue it in place.

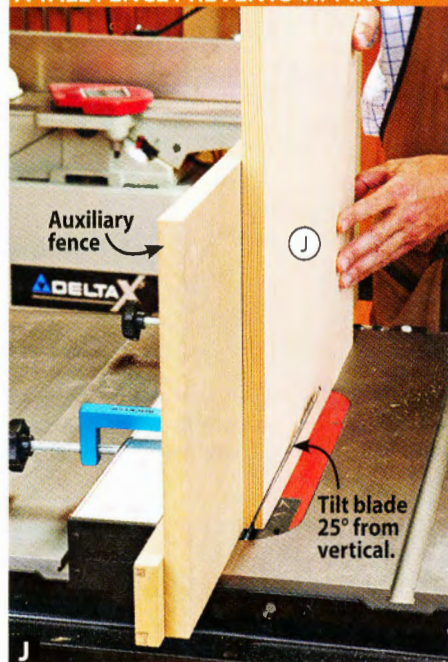
Add drawers

1 From $\frac{1}{2}$ "-thick stock, cut the drawer fronts and backs (L, M) and sides (N) to size [Drawing 5], along with an extra front to use when setting up the table-saw for joinery.

2 With a $\frac{1}{4}$ " dado blade in your table-saw, cut the dados in each end of the drawer sides (N) [Step 1 in Drawing 6]. Using the same setup, cut the groove in the sides, and fronts and backs (L, M) to accept the drawer bottoms (O, P). Add an auxiliary fence to the rip fence, and position it next to the blade. Make test cuts on the extra drawer front, adjusting the blade height to leave a tongue that fits snug in the dado in a drawer side. Rabbet the ends of the drawer fronts and backs [Step 2 in Drawing 6].

3 Cut the bottoms (O, P) to size; then finish-sand the inside faces of the drawer parts (L–P). Dry-fit the drawers and check their fit in the carcass (A–I/K).

A TALL FENCE PREVENTS TIPPING



To steady the top (J) when cutting the bevels, attach a tall auxiliary fence to the tablesaw rip fence.

Glue up the drawers, checking them for square. After the glue dries, finish-sand the outside surfaces.

4 To provide a continuous grain pattern across each row of drawers, cut three $\frac{3}{4} \times 5\frac{1}{16} \times 18$ " maple blanks. Cross-cut the false fronts (Q, R) to length from the blanks, and mark on the back to keep mating pieces together. Rout a $\frac{1}{16}$ " chamfer along the bottom edge of each false front to create a shadow line.

Now the finishing touches

1 Remove the back (K) and apply a finish to all pieces. (We applied a clear

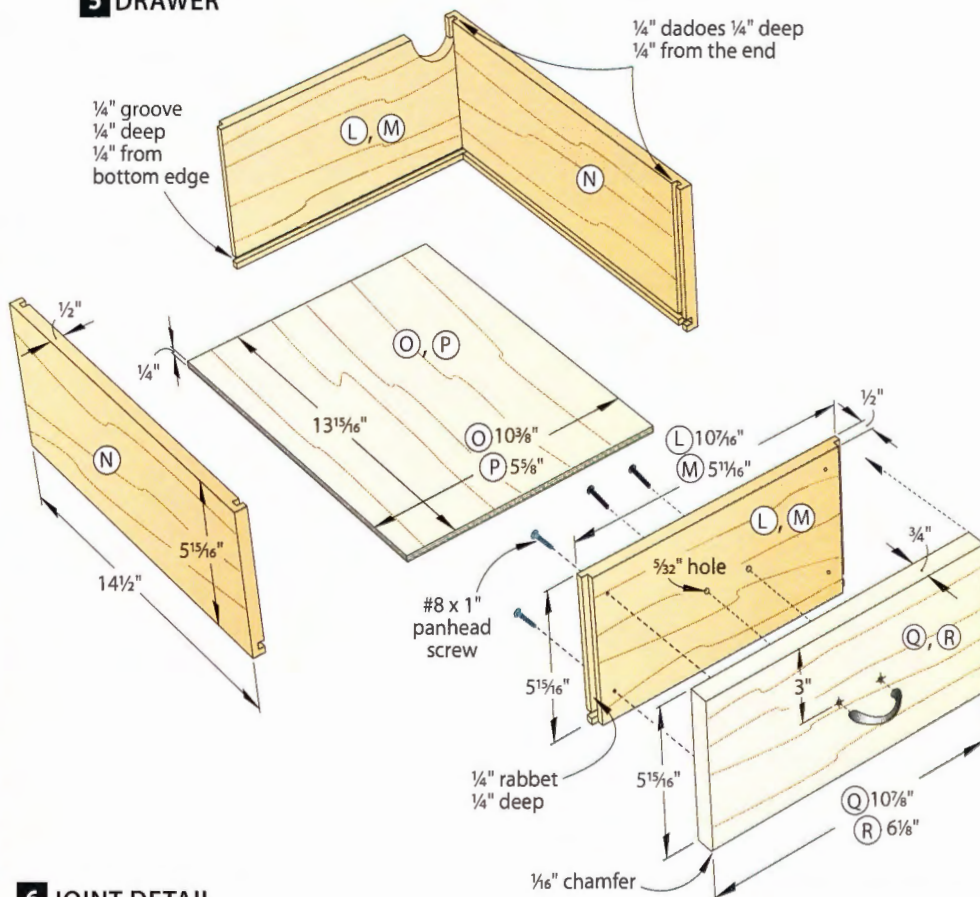
oil sealer to add some golden tones, then wiped on three coats of water-based polyurethane, sanding lightly between coats with a 320-grit sanding sponge.)

2 After the finish dries, apply nylon glide tape on each side of each drawer opening [Drawing 4].

Quick Tip! Save 2' of tape by starting the tape 2" from the front face of the back legs (A).

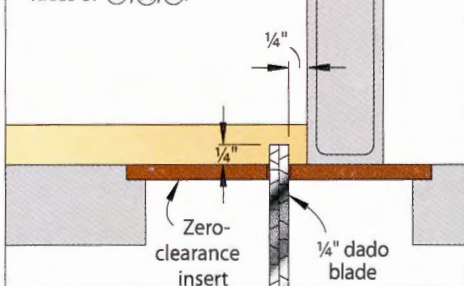
3 Slide the drawers (L–P) into the carcass. Place a piece of double-faced tape on the back face of each false front (Q, R), and place them in the openings resting on the shelves (D) and centered side-to-side. Press the false fronts firmly

5 DRAWER

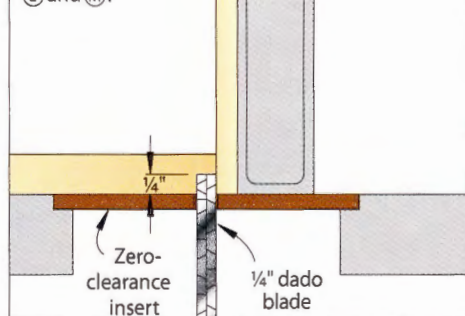


6 JOINT DETAIL

STEP 1
Cut dado along both ends of part (N), and groove on inside faces of (L, M, N).



STEP 2
Rabbet both ends of parts (L) and (M).



against the drawers. Remove the drawers with the false fronts attached and drill the holes for the pulls, centered on the false fronts [Drawing 4]. Install the pulls; then drive panhead screws to secure the false fronts [Drawing 5].

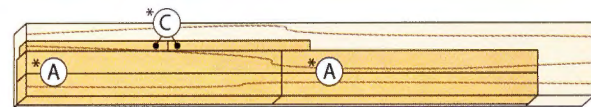
4 Slide the drawers back in place. Cut the drawer stops (S) to size and glue them to the shelves (D) to position the false fronts (Q, R) flush with the shelf edging (E) [Drawing 4].

5 Glue the back (K) into the grooves in the back legs (A). Screw the figure-8 fasteners into the counterbores in the legs and sides (B). Center the top (J) on the carcass, beveled face down, and screw up through the figure-8 fasteners to secure it.

Note: When lifting the table to move it, grip under the side edging (C); don't lift on the top (J) or the aprons (I).

Produced by **Craig Ruegsegger** with **Kevin Boyle**
Project design: **John Olson**
Illustrations: **Lorna Johnson**

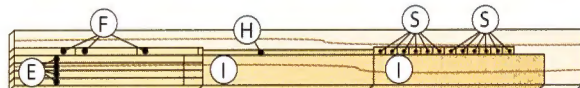
Cutting Diagram



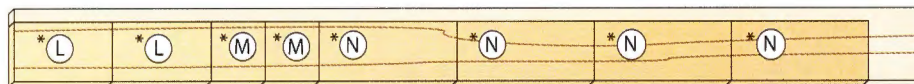
2 x 7 1/4 x 60" Douglas fir (6.7 bd. ft.) *Plane or resaw to the thicknesses listed in the Materials List.



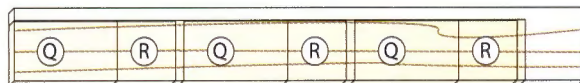
3/4 x 5 1/2 x 60" Douglas fir (2.5 bd. ft.) (2 needed)



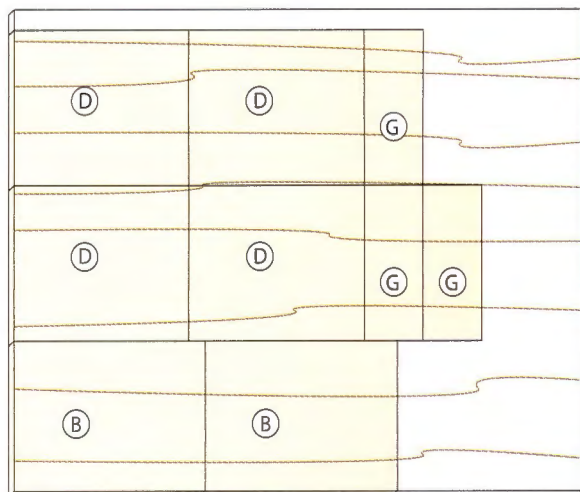
3/4 x 5 1/2 x 60" Douglas fir (2.5 bd. ft.)



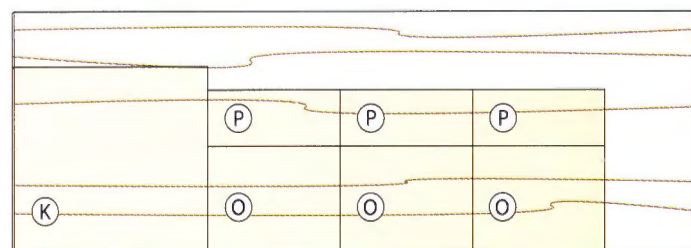
3/4 x 7 1/4 x 96" Douglas fir (5.3 bd. ft.) (3 needed)



3/4 x 7 1/4 x 60" Maple (3.3 bd. ft.)



3/4 x 48 x 60" Maple plywood



1/4 x 24 x 72" Maple plywood

Materials List

Part	FINISHED SIZE			Matl.	Qty.	
	T	W	L			
Carcase						
A	legs	1½"	2¼"	27"	DF	4
B	sides	¾"	15"	20¼"	MP	2
C	side edging	1¼"	1"	15"	DF	2
D	shelves	¾"	15½"	18½"	MP	4
E*	shelf edging	¾"	¾"	18"	DF	4
F*	divider edging	¾"	¾"	6¼"	DF	3
G*	dividers	¾"	15½"	6¼"	MP	3
H	back edging	¾"	½"	18"	DF	1
I	aprons	¾"	3"	18"	DF	2
J	top	¾"	21"	27"	EDF	1
K	back	¼"	18½"	20½"	MP	1
Drawers						
L	large fronts/ backs	½"	5¹⁵⁄₁₆"	10⁷⁄₁₆"	DF	6
M	small fronts/ backs	½"	5¹⁵⁄₁₆"	5¹¹⁄₁₆"	DF	6
N	sides	½"	5¹⁵⁄₁₆"	14½"	DF	12
O	large bottoms	¼"	10³⁄₈"	13¹⁵⁄₁₆"	MP	3
P	small bottoms	¼"	5⁵⁄₈"	13¹⁵⁄₁₆"	MP	3
Q*	large false fronts	¾"	5¹⁵⁄₁₆"	10⁷⁄₈"	M	3
R*	small false fronts	¾"	5¹⁵⁄₁₆"	6⅞"	M	3
S	stops	¾"	¾"	1¼"	DF	12

*Parts initially cut oversize. See the instructions.

Materials key: DF—Douglas fir, MP—maple plywood, EDF—edge-glued Douglas fir, M—maple.

Supplies: Double-faced tape, #8x1" panhead screws (24).

Blade and bits: Dado blade; 1/4" straight, 45° chamfer router bits; 5/32" drill bit; 3/4" Forstner bit.

Sources

Pulls: 1 3/8" oil-rubbed bronze pulls (6), no. 01W83.60, \$2.20, Lee Valley, 800-871-8158, leevalley.com.

Nylon glide tape: 1/2"x10", no. 70615 (2), \$13.69, Rockler, 800-279-4441, rockler.com.

Figure-8 fasteners: No. 21650 (pk. of 8), \$5.49, Rockler.

More Resources

- Watch a free video on easily handling sheet goods by yourself at woodmagazine.com/sheetgoods.
- For free articles and videos on making and using a simple taper jig and a fairing stick, go to woodmagazine.com/taperjig1 and woodmagazine.com/fairing.





Manufacturers of woodworking products live and die by the innovations they bring to market. Here are the eight new products we judge most innovative for the coming year.



Mix and pour without spilling a drop

IHOP would be proud—and maybe even a little jealous. Rockler's Mixing Mate attaches to a quart- or gallon-sized can of finish or paint, letting you stir up the contents and then pour it—like a restaurant syrup dispenser—into a spray cup or smaller cup for brushing. Tool-free cam clamps hold the Mixing Mate to the can, and a rubber gasket prevents drips. When you're done, remove it from the can and the rim remains clean, ready for you to reseal the lid. However, you'll still have to clean up the paddle and spout. Rockler has quart sizes available now, but the gallon Mixing Mate won't arrive until February.

Mixing Mate, 44360 (quart), \$15; 44170 (gallon) \$20
Rockler Woodworking and Hardware
800-279-4441, rockler.com



Watch free demonstration videos of the **Mixing Mate**, **Smart-Point** brad nailer, and **Gyro** screwdriver at woodmagazine.com/2013innov8



DC servo motor serves up greater low-speed torque

Woodturning requires torque just as much as it does speed, but with most lathes you lose torque at low speeds. Laguna's Revo lathes use brushless DC servo motors, providing greater torque in the lower speed range than typical AC- or DC-motor lathes. The tailstocks on these lathes swing away for turning large chuck-mounted pieces without having to remove the heavy tailstock. You can get a Revo lathe with either a 20" or 24" swing and 36" between centers.

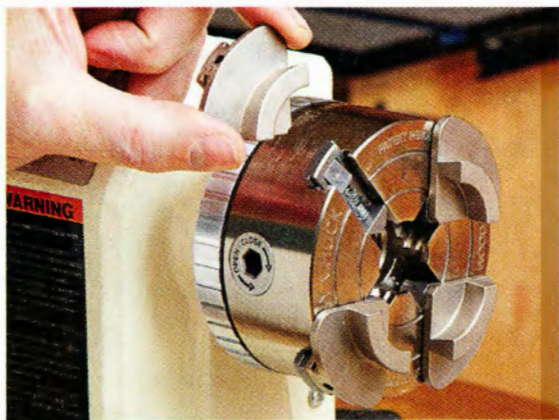
Revo Wood Lathes, 20-36 (MLA REVO 20-0180), \$3,300;
24-36 (MLA REVO 24-0180), \$3,900
Laguna Tools
800-234-1976, lagunatools.com



Triggerless tool drives screws—with only a twist of the wrist

This palm-sized, cordless screwdriver has no forward/reverse switch. Instead, when you grip the handle, squeezing the activation switch, you simply rotate the tool clockwise to drive a screw. An internal gyroscope senses the motion and will even increase or decrease drive speed based on how far you twist. The 4-volt Gyro works great for light-duty driving, but don't expect it to replace your 12-volt or larger drill/drivers. We're anxious to see where Black & Decker takes this gyro technology next.

Gyro screwdriver, BDCS40G, \$40
Black & Decker
800-544-6986, blackanddecker.com/gyro



Swap jaws with a snap and zoom to size

Changing accessory jaws on a 4-jaw chuck can be a tedious job because of all those screws. But the Easy Wood Chuck's rounded jaws simply snap in and lock without screws, so you can change jaws in seconds rather than minutes. And this chuck's "zoom ring" makes coarse jaw adjustments quickly by hand; then use the included T-wrench to tighten. Six jaw sizes will be available in early 2013.

Easy Wood Chuck, \$499
Easy Wood Tools
866-963-0294, easywoodtools.com



Narrow nose makes pinpoint precision possible for brads

Wouldn't you like to have a brad nailer with the skinny nose of a micro-pinner? Done. Bostitch's Smart-Point 18-gauge brad nailer eliminates the broad safety tip common to bradders, leaving only a slim nose that serves as its own safety. As long as the nose makes contact with your workpiece, you can fire a nail. And it still has all the features you'd expect from a brad nailer: fastener length up to 2", oil-free use, rear air exhaust, swiveling hose coupler with internal filter, and a belt hook. This tool is expected to hit the market in March.

Smart-Point brad nailer, BTFP12233, \$120
Bostitch
800-556-6696, bostitch.com



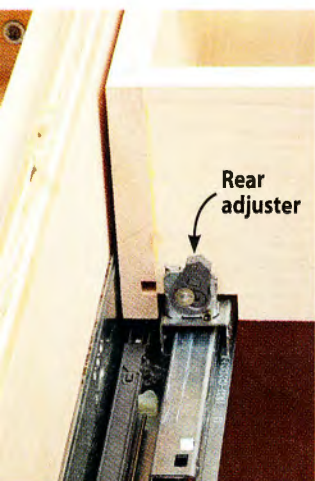


These are the slides that bind no more

Ball-bearing drawer slides have always been adjustable for perfect top-to-bottom and front-to-back fit, but if you missed the side-to-side spacing in your cabinet by a tiny bit, the slides would bind. Now Blum has added side-to-side adjustability to our favorite bottom-mount slides.

Install the slides on the drawer and cabinet, and then tweak the front and back slightly as needed—without tools—to remove any binding. They're available in full-extension versions from 100 lbs to 150 lbs and 9" to 30" drawer lengths.

Tandem Plus Blumotion drawer slides,
\$24–\$44 per pair
Blum
704-827-1345, blum.com

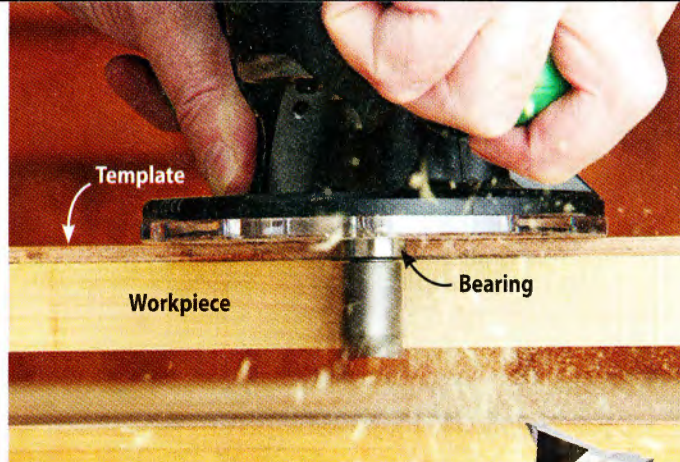


Rear adjuster



Front side-to-side adjuster

Drawer bottom



Template

Workpiece

Bearing



Clean, high-tech trimming with a bigger bit

Bearing-guided spiral carbide router bits cut cleanly when template routing because they shear-cut the workpiece from either the top or bottom. Compression bits, with both upshear and downshear cutters, slice from both the top and bottom faces at the same time for a clean cut on all surfaces. Whiteside's Ultimate Trim Bits take that action a step further. The larger, $\frac{7}{8}$ " diameter provides more shear angle for even cleaner cuts. And these are the first top-bearing compression bits we've seen with a sturdy $\frac{1}{2}$ " shank. Whiteside sells these bits in the three configurations described below.

Ultimate Trim Bits, UDP9112 (top-bearing pattern) \$150; UDFT9112 (bottom-bearing flush trim) \$140; UDC9112 (double-bearing combination) \$150
Whiteside Machine Co.
800-225-3982, whitesiderouterbits.com

Downshear cutter



Upshear cutter



New steel alloy blends durability with ease of sharpening

The folks at Lee Valley/Veritas have brought to market a new variety of steel alloy with distinct advantages for hand-tool users. Known as PM-V11, the new alloy consists of particles smaller than those found in typical carbon steel or even the harder A2 variety. This finer structure helps chisels and plane blades hold a sharp edge longer than other alloys, yet it sharpens quicker than A2. In addition to a set of five PM-V11 bench chisels (reviewed with other chisels on page 52), Lee Valley offers this alloy as an option for most of its hand plane blades, and eventually for older Stanley planes.

PM-V11-steel hand tools:

5-piece bench chisel set, 05521.50, \$359; individual chisels \$74–\$89 each; plane blades, \$10–\$15 upcharge over O1 or A2 blades

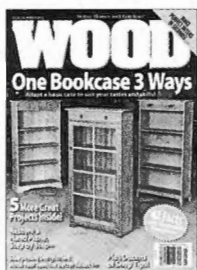
Lee Valley/Veritas

800-871-8158, leevalley.com

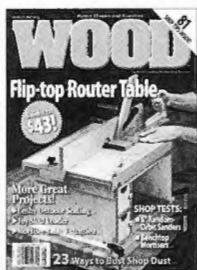




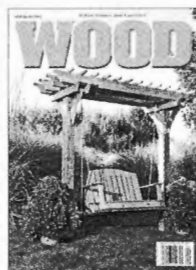
209



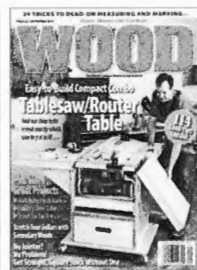
210



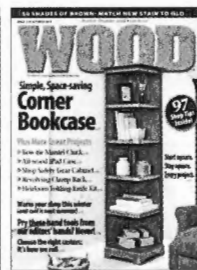
211



212



213



214



215

PROJECTS

Article, Issue: Page

Arbor, with swing, 212:28-33; update, 213:6
Backgammon board, 209:50-54
Bagel slicer, 213:42-44
Bandsaw:
 Fence, drift-correcting, 213:12
 Circle jig for, 209:65
Bench, seating, 212:38-40
Bevel-ripping sled, 212:16
Blanket chest, 210:66-70
Bookcases:
 Corner, 214:32-35
 Country, classic, and traditional, 210:30-37
Box-joint jig, 209:55-57; update, 212:6
Buffet, using stock cabinets, 209:32-37
Business card holder, 215:38-40
Cabinet, furniture using stock cabinets, 209:32-37
Cabinet, safety-gear, 214:44-47
Circle-cutting jig, 209:65
Circle-grooving jig, 214:14
Clamp rack, revolving, 214:22
Clock, bow-tie mantel, 214:26-30
Construction-grade toys:
 Dump truck, 215:58-62
 Side-dump, update, 209:8
 Skid loader, 211:58-61
 Tractor, update, 209:8
 Trailer/lowboy, update, 209:8
Dado jig for routers, 215:31
Diagonal-measuring gauge, 210:13
Display shelves, cantilevered 215:30-33
Drill press:
 Bit shelf, 215:24
 Stand, 209:15
 Tables, stackable, 213:8
Game table with storage, 213:48-53
Gears, scrollsawn toy, 215:26-28
Hors d'oeuvre server, turned, 210:47-49
iPad holder, 214:60-62
Jewelry box, cantilevered, 209:38-40
Jigs:
 Bevel-ripping sled, 212:16

Article, Issue: Page

Box-joint, 209:55-57; update, 212:6
Circle-cutting, on bandsaw, 209:65
Circle-cutting, on router table, 215:12
Circle-grooving, 214:14
Dado jig for routers, 215:31
Diagonal-measuring gauge, 210:13
End-grain shooting board, 209:14
Jointer knife sharpening jig, 215:10
Router edge guide, 213:14-16
Router subbase for radiused corners on door panels, 211:15
Slot-cutting for splines, 211:69
Tablesaw saddle for tall parts, 214:16
Tablesaw sled for thin strips, 214:8
Tapering sled for large panels, 215:13
Tapering sled for small parts, 209:18
Tenon-cutting saddle jig, 215:20
Thickening jig for small parts, 215:14
Workbench stop, adjustable, 214:11
Jointer knife sharpening jig, 215:10
Knife kit, folding, 214:41-43
Media center update, 213:6
Miter-gauge extension, 209:28-30; update 213:6
Miter-gauge holders, 209:24
Morris chair and ottoman, 212:52-59
Mortising-table extensions, 211:20, 23
Music-box carousel, 209:45-47
Potpourri box, scrollsawn, update, 209:8
Pub table and chairs, 215:50-56
Pushstick, 210:44
Puzzle boxes, bandsawn, 215:34-37

Article, Issue: Page

Quilt rack, wall-mounted, 213:61-63
Router table:
 Auxiliary fence, 210:15
 Benchtop, 211:36-40
 Circle jig for, 215:12
Router edge guide, 213:14-16
Settee, outdoor, 211:52-57
Sheet-goods mover, fold-flat, 210:38-42; update, 211:8
Shooting board, 209:14; adjustable, 210:26-28
Sideboard, using stock cabinets, 209:32-37
Silverware caddy, 211:68-70
Swing with arbor, 212:28-33; update, 213:6
Tablesaw fence adjuster, 214:10
Tablesaw saddle for tall parts, 214:16
Tablesaw sled for ripping thin strips, 214:8
Tablesaw/router stand, mobile, 213:28-32
Tapering sled for large panels, 215:13
Tapering sled for small parts, 209:18
Tenon-cutting saddle jig, 215:20
Thickening jig for small parts, 215:14
Tic-tac-toe game, 213:58-60
Track light for finishing, 210:8
Truck, rocking, child's, 209:63-67
Toys, construction-grade (see "Construction-grade toys")
Vase, bud, 212:64-66
Workbench, fold-flat, update, 209:8
Workbench stop, adjustable, 214:11; end stop, 209:11

Morris chair and ottoman, 212:52-59



Skid loader, 211:58-61

continued on page 42

TOOLS & MATERIALS

Article, Issue: Page

Air compressor, Campbell Hausfeld, test, 211:80
 Bandsaw:
 Fence setup, 212:62
 Tires, changing, 210:22
 Tuneup, 212:61
 Battery charger, QuickBoost, Craftsman, test, 210:80
 Box-joint jig, I-Box, Incra, test, 215:77
 Casters, choosing, 214:58-59
 Chisels, proper bevel angle, 215:73
 CNC routers, 212:46-51
 Countersinks, Cleanstop, test, 209:76
 Drilling/driving bit kits, test, 209:26
 Drills/drivers:
 18-volt, test 209:58-62
 20-volt Max, DeWalt, test, 215:74
 Filters, HEPA and MERV, 211:63
 Hand plane, restoring, 210:56-59
 Handsaw nib, 209:71; update 213:6
 Hand tools, editor favorites, 214:38-40
 Hollow turning system, Carter, test, 212:76
 HVLP turbine and gun, Apollo, test, 215:74
 Jointer:
 Flattening wide boards, 211:65
 Tables, truing, 212:20-22

Article, Issue: Page

Magnetic cord clip, Rockler, test, 215:80
 Marking gauge, dual, Veritas/Lee Valley, test, 212:76
 Miter saw, gliding, Bosch, test, 209:74
 Mortiser:
 4 helpful tips, 211:18-19
 Benchtop, test, 211:47-51
 Mortising chisel, sharpening, 211:49
 Multihead tool system, 12-volt, Ridgid Jobmax, test, 214:72
 Nailer, 21-gauge, Cadex, test, 214:74
 Nail puller, Nail Jack Tools, test, 209:78
 Pin nailers, 23-gauge, test, update, 212:6
 Planer, cutterhead lock, 213:68
 Plate vise, Tri-Vise, test, 214:73
 Pneumatic nailing tips, 209:48-49
 Pocket drill guide, Micro, Kreg, test, 212:77
 Pocket-hole joinery system, Quick Jig, Porter-Cable, test, 209:78
 Push block, Ultra Push-Bloc, Bench Dog, test, 212:78
 Random-orbit sander:
 Choose the right size, 211:66
 Test, 211:24
 Review-a-Tool website, 211:3, 6

Article, Issue: Page

Router:
 Bits:
 Bearing-guided, choosing, 215:70
 Rail-and-stile, chip-free, Sommerfeld, test, 215:76
 Compact, test, 215:64-67
 Two-base kit, Skil, test, 213:78
 Screw, spiral-point funnel-head, test, 211:82
 Separators, shop vacuum, test, 214:68
 Shelf-pin drilling jig:
 Kreg, test, 215:78
 Pro Shelf, Rockler, test, 213:74
 Solvents, 212:70
 Square, precision, Veritas, test, 209:74
 Tablesaw:
 Arbor nut, 213:72
 Benchtop, Bosch, test, 211:80
 Blade:
 In miter saw, 211:75
 Micro-Kerf 40, Total Saw Solutions, test, 213:77
 Mid-priced, test, 213:34-39
 Tail vise, Quick-release, Lee Valley/Veritas, test, 213:74
 Toggle clamps, auto-adjust, Bessey, test, 210:80
 Woodworking project kits, Red Toolbox, test, 212:79

TECHNIQUES AND FEATURES

Article, Issue: Page

Abrasives, extending life, 215:22
 Arts & Crafts, history, 213:73
 Basement shop dust, controlling, 211:62-64
 Box joints, made with router-table jig, 209:56-57
 Burn marks, removing, 212:73
 Cabinets, stock, turned into furniture, 209:32-37
 Casket construction, Kosher guidelines, 211:77
 Ceramic stones, for sharpening, 210:65
 Clock-face Roman numerals, 210:78
 Cooling and heating your shop, 214:52-56
 Curved piece, how to flatten edges, 212:74
 Diamond stones, for sharpening, 210:65
 Drawers, fixes for loose bottoms, 212:15
 Dust collection, basement shop, 211:62-64
 Dyes, choosing and applying, 213:18-20
 Finishing:
 Black finish, how to, 211:72
 Clear coats, fast-drying, 209:20-22
 Dyes, choosing and applying, 213:18-20
 Finish, keep it fresh with zipper bag, 211:12
 Hand buffing on lathe, 214:13
 Spraying small parts, 215:12
 Stains, matching color, 213:18-20
 Worn finish, how to revive, 211:30-34
 Glue questions answered by an expert, 212:45
 Glue storage in cold temperatures, 212:72
 Hand plane restoration, 210:56-59
 Heating and cooling your shop, 214:52-56
 Index 2011, issues 202 through 208, 209:41-44

Article, Issue: Page

Joinery:
 Biscuit joiner, outrigger for 45° cuts, 209:12
 Butterfly keys, 212:37
 Corner splines, 211:69
 Box joints in 12 easy steps, 209:56-57
 Dovetails:
 in 12 minutes, 212:24-25
 sliding, 210:16-18
 Dowel joints, 213:24-25
 End-to-end joints, 212:6
 Gluing questions answered, 212:45
 Magnetic fence for mortise, 214:12
 Miter, using shooting board, 210:26-28
 Mortise-and-tenon joints, double, 215:18-20
 Mortising, helpful tips, 211:18-19
 Tenons, enlarging, 213:68
 Tenon-cutting tablesaw saddle, 214:16
 Tongue-and-screw rails, 213:9
 Joining:
 Wide boards, 211:65
 Without a jointer, 213:64-65
 Laminates, plastic, 213:54-57
 Measuring and marking accuracy, 213:45-47
 Metric system, switching to, 212:70
 Resawing on the bandsaw, 212:60-63
 Safety rules, 214:36-37
 Sandpaper, for sharpening, 210:62
 Scrollsaw patterns, do-it-yourself, 211:74

Article, Issue: Page

Sharpening:
 Ceramic stone method, 210:64
 Chisels and plane irons, 210:60-65; response, 212:6
 Diamond stone method, 210:65
 Jointer knives, 215:10
 Mortising chisels, 210:76
 Sandpaper method, 210:62
 Storing sharpening discs, 211:12
 Waterstone method, 210:63
 Shop tips from one-man pro shops, 215:45-49
 Shop Monkey:
 Punch out before you hit the shop, 211:28
 Hey you! Get back into the shop!, 214:24
 Spindle-turning tips, 214:48-51
 Squaring tools and workpieces, 214:64-67
 Table legs, beveled, 212:16-18
 Techniques every woodworker should know, 210:50-55
 Walking sticks for veterans, 211:8
 Waterstones, for sharpening, 210:63
 Wobbly leg prevention, 215:16-17
 Woods:
 Red alder, 211:26
 Hickory, 211:26
 Mahogany, 212:68-69
 Natural-edge slabs, working with, 212:34-37
 Secondary, 213:22
 Sycamore, 211:26
 Veneer, buying online, 209:16-17
 Wood weight, 211:72

Article, Issue: Page

Adhesive tubes, storage, 212:13
 Arcs, drawing large, 213:10
 Bandsaw fence, adjusts for drift, 213:12
 Beam compass with sight, 215:51
 Benchtop drill press:
 Portable stand, 209:15
 Table, stackable, 213:8
 Benchtop tools mounted to plywood base, 209:13
 Bevel joints, repairing gaps, 212:18
 Biscuit joiner auxiliary fence, 209:12
 Bolt cutting, restoring threads, 210:42
 Buffed finish on the lathe, 214:13
 Centerlines, marking with painter's tape, 212:65
 Check for square without a tape measure, 210:13
 Clamps:
 As workbench vise, 213:13
 Caddy, 214:13
 Cauls, supported by C-clamps, 215:47
 Handle, leverage, 213:8
 Markers, 215:48
 Parallel, supports, 211:16
 Rack, doubled-up, 215:48
 Removing bite marks on pipes, 214:70
 Cove molding, sanding using lathe, 211:10
 Cutlines, parallel, using a pencil, 209:12
 Cutting thin material on tablesaw, 210:10
 Dado-routing jig, 215:31
 Dimensional lumber prep, 210:72
 Dog-hole spacing, 210:72
 Dowels, make your own, 211:70
 Drawers:
 Fixing binds, 213:70
 Stop, from a hasp, 212:12
 Drilling:
 Centered holes in dowels, 215:72
 Deep holes, 215:60
 Perpendicular holes, 213:11; 214:33; 215:55
 Drill press:
 Adjusting chuck perpendicular to table, 214:65
 Base turned backwards, 215:46
 Bit shelf, 215:24
 Loosening a tight chuck, 214:70
 Stackable tables, 213:8
 Stand for benchtop models, 209:15
 Face-frame rails, securing narrow, 213:9
 Finish can labeling system, 215:47
 Flush-trimming overhangs, 210:68
 Glass, cutting curves in, 209:70
 Glue:
 Answers to 5 sticky questions, 212:45
 Recycled bleach pen dispenser, 210:12
 Squeeze bottle with clamp, 212:8
 Squeeze-out, capturing, 209:35
 Hand plane:
 Fence, 212:14

Article, Issue: Page

Storage, 214:71
 Workbench stop, 209:11
 Hinge installation with a self-centering bit, 214:47
 Holesaw boring without burning, 215:70
 Identical parts, stack-cut, 211:59
 Jigsawing tight curves, 211:39
 Jig storage, 215:48
 Jointer:
 Adjustment tips, 214:65
 Blade sharpening, 215:10
 Truing tables, 212:20-22
 Lathe:
 For quick cove cleanup, 21:10
 Tool rest, easy adjustment, 212:10
 Tools, stowable stand, 211:13
 Magnetic tool holders, 210:11
 Mallet, from recycled baseball bat, 212:10
 Marking tool, brad-point bit, 210:42
 Melamine doors serve as marker boards, 215:47
 Micro-adjuster:
 Tablesaw, 214:10
 Vibration proof, 213:10
 Miter saw:
 Blade guard grips, 212:11
 Hold-downs, 213:13
 Moisture content, measuring, 210:10
 Mortise walls, truing, 212:53
 Mortiser fence, magnetic, 214:12
 Mortising chisels, sharpening, 210:76
 Need-to-know woodworking tips, 42, 210:50-55
 Notches, tablesawn, 211:37
 No-measure marking, 210:74
 Paint, keep fresh, 211:12
 Paneled doors, radiused corner jig, 211:15
 Panels, gluing flat, 213:49
 Plugs, sanding flush, 212:40
 Project part labeling system, 215:48
 Rabbeted half-laps, cutting, 210:33
 Router table:
 Adjustment tips, 214:65
 Auxiliary fence, 210:15
 Mounting holes, marking, 213:31
 Tablesaw extension, 215:48
 Routing:
 Circles:
 Grooves in, 214:14
 Non-through, 214:29
 Smoothing edges, 215:12
 Small parts safely, 212:8
 Sanding:
 Small parts, with electric toothbrush, 212:11
 Vibration dampener, 215:14
 Belt repair, 215:15
 Sawhorse, stepladder, 211:10
 Scraps, salvaging, 209:10

Article, Issue: Page

Screws:
 Fix for snapped, 210:69
 Thread-count advice, 215:52
 Scrollsaw vibration dampening, 212:13
 Sharpening discs, storage, 211:12
 Sheet-goods hauler, 214:12
 Shelf-pin drilling guide, 214:45
 Shooting board for hand plane, 209:14
 Shop light, mobile, 210:8
 Small-part thicknessing, 215:14
 Spindle sander, portable, 210:11
 Spray-finishing small parts, 215:12
 Storage:
 Finishes, 211:12
 Lathe tools, 211:13
 Miter gauges, 209:24
 Safety gear, 214:44
 Tablesaw sleds, 212:12
 Straightedge for miter gauge, magnetic, 211:16
 Table legs, choosing straight grain, 212:58
 Tablesaw:
 Crosscutting tips, 215:39
 Cutting thin material, 210:10
 Magnetic straightedge for lining up cuts, 211:16
 Outfeed beneath riser blocks, 215:45-46
 Saddle jig,
 Adjustment, 209:10
 For tall parts, 214:16
 Sled storage, 212:12
 Tapering with adjustable sled, 215:13
 Tapering with guide panel, 214:14
 Thin-strip ripper, adjustable, 214:8
 Tuning tips, 214:65
 Tenons, fixing loose, 213:68
 Thin-strip ripping sled, 214:8
 Tool stand stability, 210:12
 Turning:
 End grain blow-out prevention, 209:70
 Using shape-reference photos, 213:11
 Tools, color-coded, 209:14
 Unstable woods, securing with plastic film, 211:17
 Veneer, gap-free joints, 209:52
 Vise:
 Cork lining, 215:46
 Dog, sliding, 209:11
 Parallel-jaw clamp as vise, 213:13
 Secure tools with vise, 209:13
 Washers, from plastic lids, 211:14
 Woods, acidic, 213:72
 Workbench:
 From sawhorses, 209:33
 Protector, hardboard, 215:47
 Workpiece holder for dogless bench, 214:11

HOW TO USE THIS INDEX

This annual index includes every article and Shop Tip that appeared in *WOOD*® magazine from the December/January 2011/2012 issue through the November 2012 issue. To quickly find the article you're looking for, first identify the major index category most likely to contain the article:

- Projects (plans with step-by-step instructions)
- Tools & Materials (product reviews and guidance on using tools, accessories, hardware, and wood products)
- Techniques and Features (specific skills and articles of general interest, such as safety tips)

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- Then look for the one word that best describes the project, technique, tool, or shop tip. Articles with two strong descriptors, such as a mission table, may be found under both descriptors—"mission" and "table."

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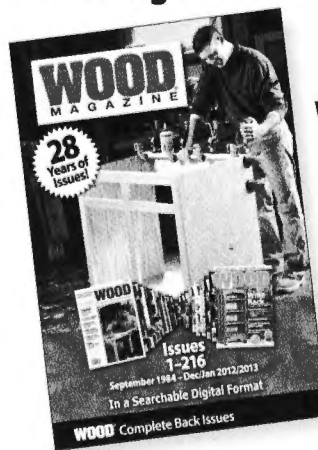
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Kicking Kickback

Startling at the least, injury-causing at worst, kickback can happen on a variety of tools when a fast-spinning cutter grabs the workpiece and throws it back at the operator. Understanding why it happens is the first step in preventing damage to your tools, project parts, and body parts. Then by tuning and using your tools properly, you can prevent it.

In this article, we'll look at four tools prone to kickback: tablesaw, router, mittersaw, and jointer. Regardless of the tool, always keep blades and bits sharp and clean to reduce friction. That keeps the cutter moving easily through the wood instead of grabbing at it, and contributing to kickback.

Tame the tablesaw

When mentioning kickback, woodworkers often think of the tablesaw first because it can turn small or large workpieces into powerful projectiles.

How it happens: At the rear of the blade, the spinning teeth trace an upward arc as they emerge from below the table. A warped board, a misaligned rip fence, operator error, or internal stresses in a workpiece can push the workpiece into the path of these teeth. This action lifts and pulls the workpiece further into the teeth, accelerating the workpiece up and back toward the operator.

How to prevent it: Use a riving knife or splitter to prevent boards from contacting the teeth at the rear of the blade [Photo A]. With crosscuts, the riving

knife or splitter prevents both the cutoff and the keeper from wandering into the blade's rear teeth. During a ripcut, these devices keep the kerf open as the board passes the rear of the blade.

The blade you choose can also make a difference. See **Give kickback the cold shoulder** at right for details.

If you hear a telltale "zing" at the completion of a cut, that indicates a misaligned blade. Adjust both the blade and the rip fence parallel to the miter-gauge slot. (Refer to your owner's manual and **More Resources** on page 50 for help with this process.) With these three parallel, boards won't pinch between the fence and blade during ripcuts, and when crosscutting, the material contacts teeth only at the front of the blade.

Even with a well-tuned saw, much still rests on your technique. During ripcuts, use featherboards or hold-downs whenever possible to press pieces against the fence and table just ahead of the blade. Choose a pushblock that provides stable downward pressure while gripping the workpiece firmly to provide the greatest control [Photo B].

When crosscutting, never use the rip fence as a stop; the offcut, trapped between the blade and fence, will be thrown back at you. Instead, make an L-shaped standoff block and clamp it to the rip fence in front of the blade [Photo C]. This allows you to cut multiple pieces to the same length and creates space so the cutoffs stay safely away from the back of the blade.

Give kickback the cold shoulder

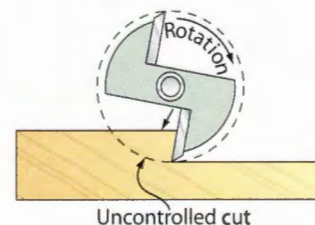
Some saw blades and router bits have a built-in shoulder in front of each cutting edge to reduce kickback. The shoulder limits the depth of the cut, as shown in the photo and drawings below.

On tablesaw blades with more than 50 teeth, the close spacing of the teeth precludes the need for shoulders.



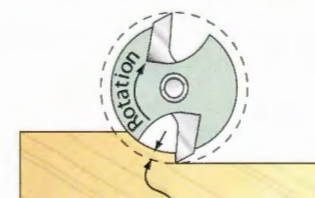
The shoulder behind each tooth on this 24-tooth rip blade limits how deeply the next tooth will cut.

STANDARD BIT



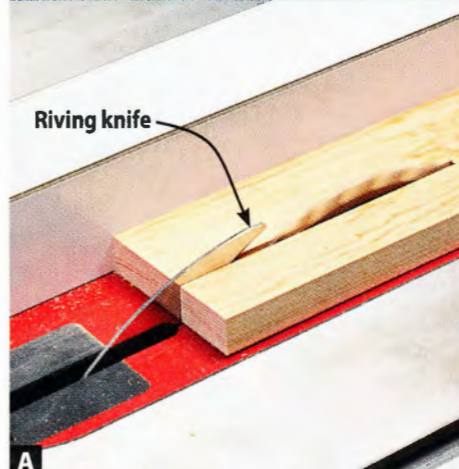
Uncontrolled cut

ANTIKICKBACK BIT



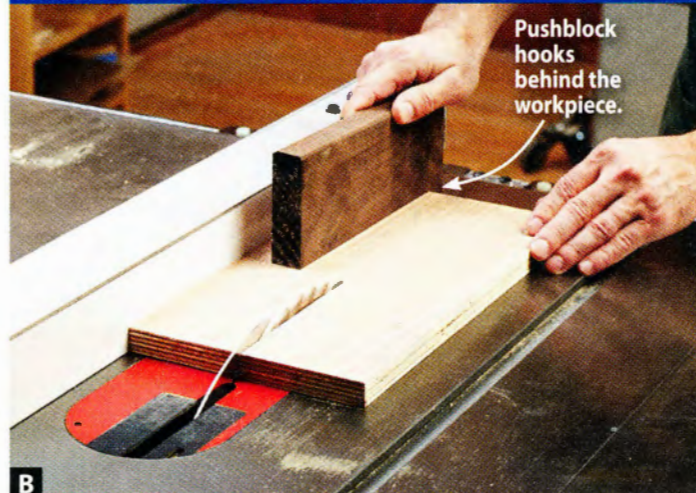
Depth of cut limited to 1.1 mm (.043")

COVER YOUR BLADE'S BACKSIDE



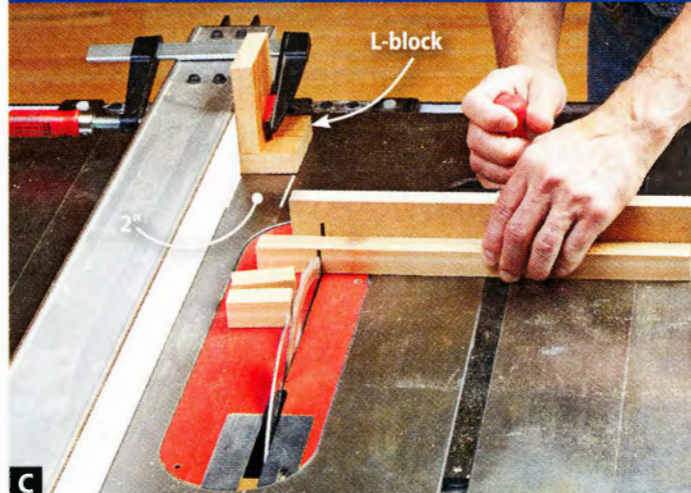
A During ripcuts, a riving knife prevents the workpiece from moving away from the fence and contacting the rising teeth that cause kickback.

MAKE A PUSHBLOCK FROM SCRAP



B A long notch in one edge of a scrap creates a hook that helps you push the workpiece down, forward, and against the fence.

GIVE ME WIDE OPEN SPACES



C Clamp a 2"-long L-block to the rip fence; then set the fence to account for the 2". Butt the workpiece end against the L-block before starting the cut.

Don't wrestle your router

Ever feel like you've gone three rounds with your handheld or table-mounted router? That unruly behavior results primarily from poor operator technique—and that's an easy fix.

How it happens with a handheld router: Trying to remove too much material bogs down the router, slowing the bit. With reduced momentum, the cutter hammers rather than slices the wood, and kicks the router away from the material. The same thing can occur when the bit encounters a knot or a foreign object, such as a screw or nail.

How to prevent it: As shown on the previous page, antikickback bits greatly reduce the problem by controlling the amount of bite the bit can take. To further reduce kickback, run bits at the

fastest safe speed (**Router-Bit Speed Chart**, below) that provides good results on your workpiece. Also, rout large profiles or deep cuts in several passes, increasing the bit's exposure by $\frac{1}{8}$ " with each pass.

How it happens on the router table: Starting a freehand cut with a bearing-guided bit [**Photo D**] is a surefire recipe for kickback. As the cutters bite into the wood, the bearing doesn't yet contact the edge. Because the workpiece lacks any support, the bit can dig in deeper than intended and kick the workpiece back. The greater the area of the exposed cutters, the greater the potential force of the kickback.

How to prevent it: Install a starter pin [**Photo E**] or, if your table insert doesn't accept one, clamp a narrow scrap about 2"

from the bit. Rest the workpiece against the starter pin or the end of the scrap and slowly pivot the board into the spinning bit, so the depth of the cut increases gradually and controllably. After the workpiece contacts the bearing, you can pivot the piece away from the starter pin and continue routing.

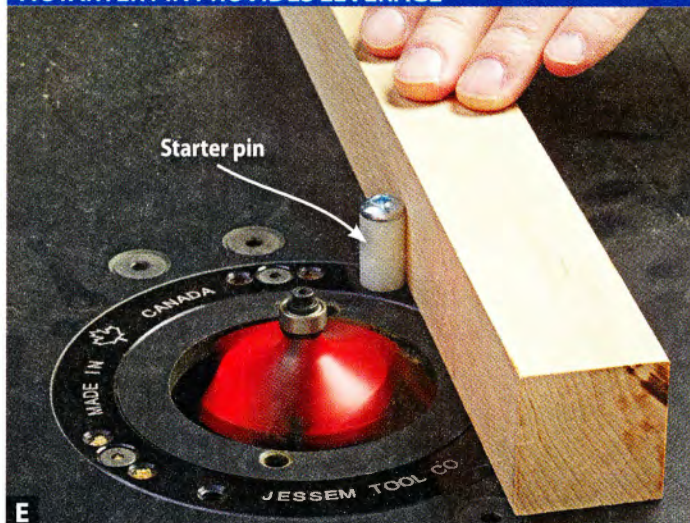
As with a handheld router, foreign objects, knots, or spots where the grain changes direction can also cause kickback. In addition to using antikickback bits at their fastest safe speed, and routing deep cuts in several passes, mount featherboards as hold-ins and hold-downs [**Photo F**]. These minimize the chances and effects of kickback, giving you more control and a better routed surface on the workpiece.

DON'T DO THIS! FINGERS AND WORKPIECE IN DANGER



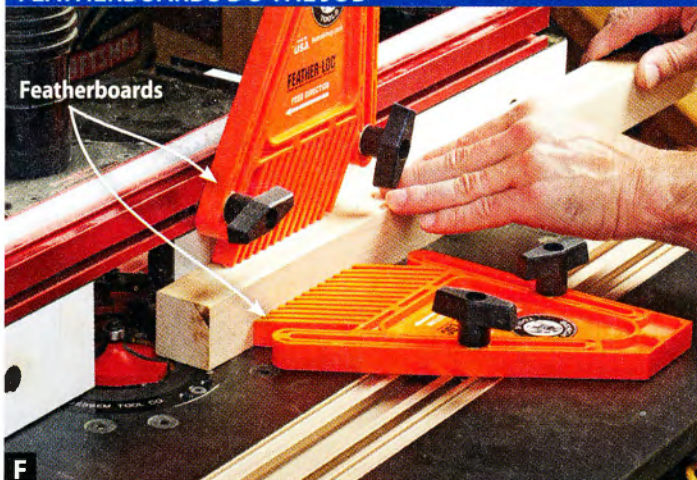
With no way to control the workpiece or cutting depth once the wood contacts the cutters, the rotation of the bit will jerk the workpiece violently.

A STARTER PIN PROVIDES LEVERAGE



Until the workpiece contacts the bearing on the bit, the starter pin serves as a fulcrum, allowing you to control how quickly the depth of cut increases.

FEATHERBOARDS DO THE JOB



A featherboard's slanted fingers resist any backward forces, helping you maintain control of a workpiece even if kickback occurs.

ROUTER-BIT SPEED CHART

Bit diameter	Maximum speed* (in rpm)
up to 1"	24,000
1 $\frac{1}{8}$ –2 $\frac{1}{2}$ "	16,000–18,000
2 $\frac{5}{8}$ –3"	12,000–14,000
3 $\frac{1}{8}$ " or larger	10,000–12,000

*Manufacturer's recommendations take precedence over these guidelines.

Master the mittersaw

Prevent kickback on your mittersaw by equipping it properly and polishing your technique.

How it happens: Internal stresses released during a cut, or a workpiece not held firmly against the fence or table during the cut, can cause a kerf to close around the blade, pinching the blade. Because the blade rotates toward the fence and the head of the saw pivots up and down, kickback throws the head upward. The board may also bounce back at you. Short cutoffs can jam between the blade and fence, or be thrown through the gap in the fence.

How to prevent it: First, support the workpiece so it remains flat on the table and the cut ends don't pivot up unexpectedly when completing the cut. Secure the workpiece so no gaps appear between it and the fence near the blade [Photo G]. Simply flipping a crooked workpiece removes any gap behind the cutline [Photo H]. When possible, use a hold-down on the keeper side to prevent

it from shifting. Because the cutoff has no hold-down, it will move safely away from the blade if it twists or bows. When using a stopblock to help cut pieces to consistent length, hold on to the piece between the blade and stopblock, or secure it with a hold-down.

Using the right type of blade also lowers kickback chances. Choose a blade with 60 or more teeth to reduce the bite each tooth takes. Specialized mittersaw blades also have a near vertical, or even negative, tooth-hook angle to prevent the teeth from grabbing the work like a claw [Drawing]. Allow the blade to come up to full speed before lowering it into the board and, to maintain the blade's speed throughout cuts, especially on low-powered saws, use a thin-kerf blade. Because it removes less material, it requires less power.

Know too that sliding compound mittersaws operate differently from standard mittersaws. Before starting the cut with a "slider," pull the motor/blade

housing fully forward, above and in front of the workpiece. Start the saw; then push the blade down and back to make the cut. This pushes the blade into the workpiece against the rotation of the blade. Don't pull the blade forward during a cut; it will want to accelerate across the workpiece back toward you, like a lugged tire digging into dirt.

Sliders can also make simple plunge cuts, like a regular mittersaw, without the blade traveling along the bars. Before making a plunge cut, push the head back fully, and lock it in position on the bars to prevent any forward motion during the cut.

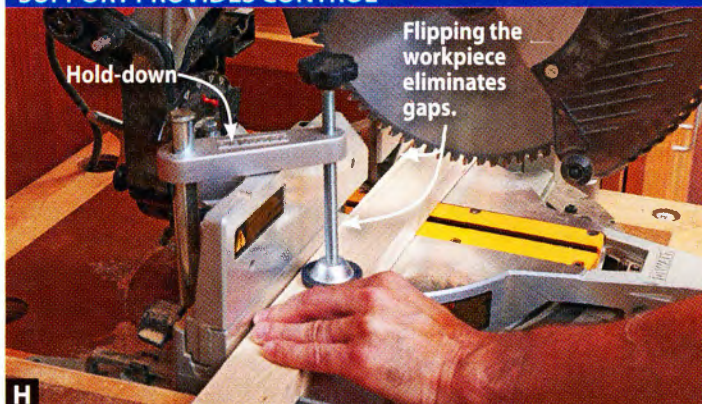
When leaving a cutoff of 2" or less, attach a simple zero-clearance insert to both the table and the fence [Photo I]. This closes the gaps, preventing a cutoff from wedging into a gap and jamming against the blade, or from being flung behind the fence where it can strike other parts of the saw or the wall and ricochet back at you.

DON'T DO THIS! A GAP INVITES KICKBACK



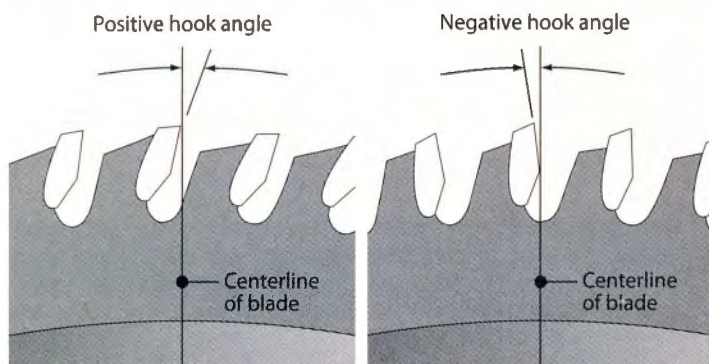
G With gaps behind the cutline, the rotation of the blade can shift the workpiece backward, pinching the blade.

SUPPORT PROVIDES CONTROL



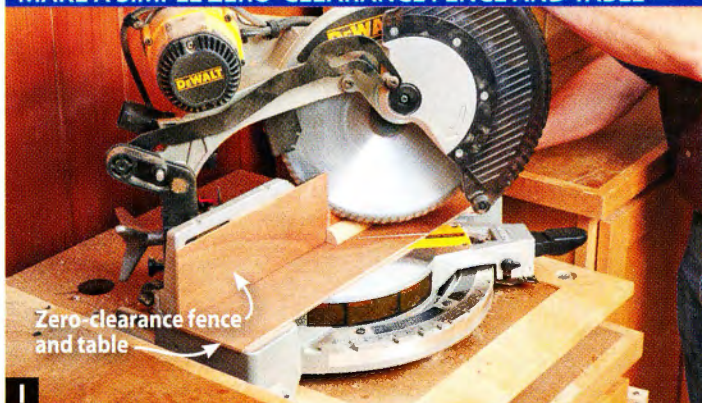
H The fence supports the workpiece near the blade, and a hold-down prevents the workpiece from shifting or lifting during or after the cut.

HOOK ANGLES



On blades with a positive hook angle, left, the tip of the tooth contacts the workpiece first. With a negative hook angle, right, the tip makes contact last.

MAKE A SIMPLE ZERO-CLEARANCE FENCE AND TABLE



I Fill gaps in the table and fence by attaching 1/4" material using double-faced tape. Make the fence short enough to allow the blade to pivot down fully.

Stop jumps on the jointer

With fast-spinning knives removing stock from the full width of a board's edge or face, the jointer can kick a workpiece back if you don't follow some simple safeguards.

How it happens: The rotation of the cutterhead wants to lift and push the workpiece backward. A too-deep cut presents more material than the knives can remove, so they instead propel the board back. A too-deep cut can occur suddenly if the leading edge of a workpiece tips down as you begin jointing.

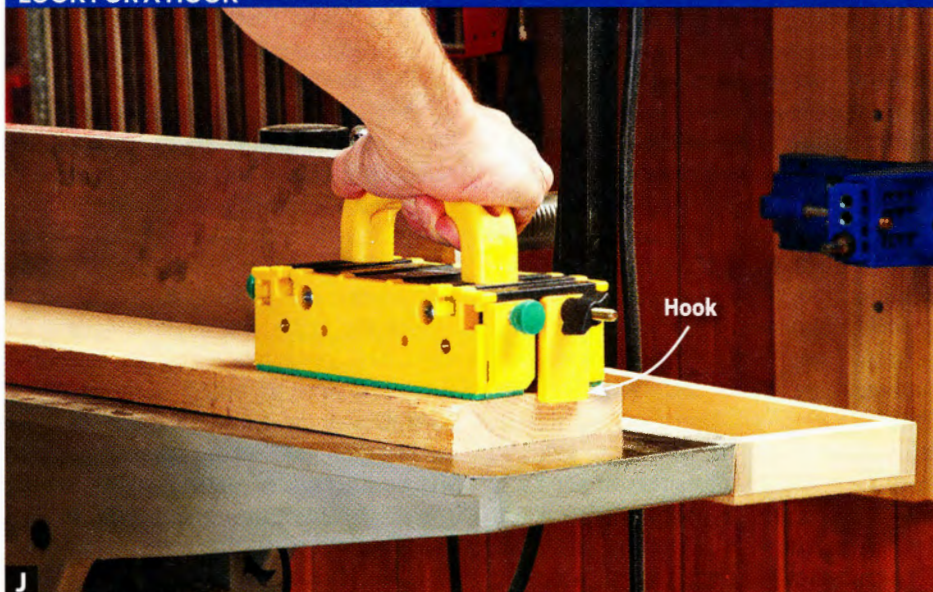
How to prevent it: Set the tool's depth of cut to $\frac{1}{8}$ " or less when jointing stock up to 3" wide, and $\frac{1}{16}$ " or less for material wider than 3" so the knives don't bite off more than they can chew. Pay extra attention when jointing pieces 12" or shorter so that they don't tip into the cutterhead, and don't joint pieces less than 8" long.

Be aware that the front edge or corner of a piece with a pronounced crook or twist can drop into the gap between the infeed table and knives, causing kickback. To prevent this, begin the cut by dropping the leading edge onto the outfeed table and joint only the trailing edge [Drawing]. Repeat this process until you have enough flat surface to support the board as you joint the leading edge.

Once you begin jointing, never reverse your direction; moving the workpiece in the same direction the knives spin invites a kickback. To help you keep the workpiece moving, use a pushblock that hooks over the end of the board [Photo J]. It provides the most control and keeps your hands out of harm's way if a kickback occurs.

Don't force a board through a cut. The jointer should slice through the wood

LOOK FOR A HOOK



Whether it's purchased or shop-made, a pushblock that hooks the rear end of the workpiece helps you keep the board moving forward across the jointer while also keeping it firmly against the table.

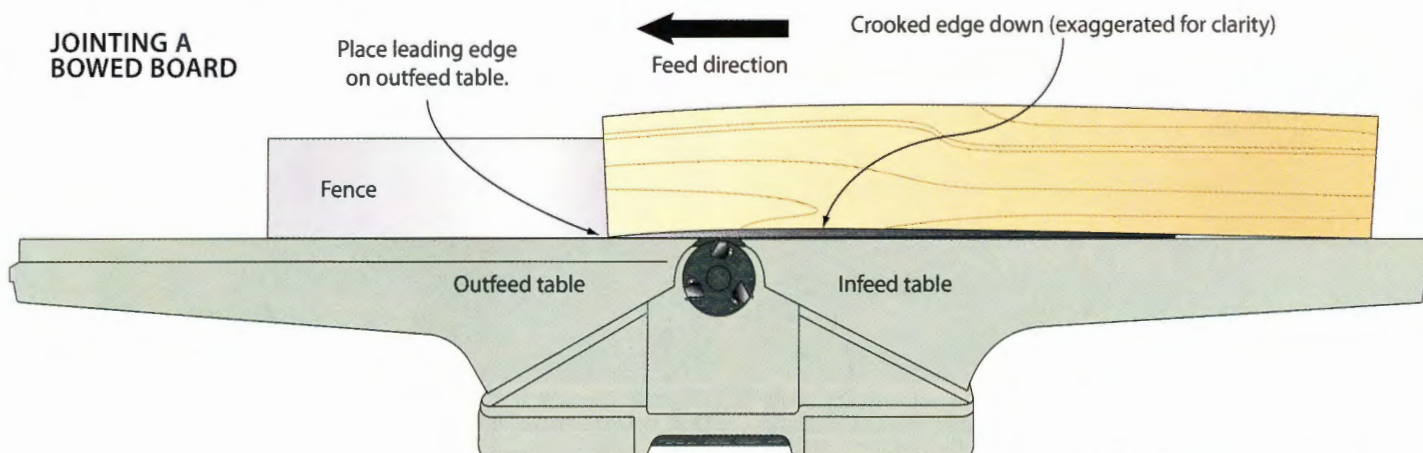
without excessive effort from you to move it forward. If you find yourself pushing ahead too hard, ease up on your feed rate, and complete the cut before shutting off the machine. Inspect each of the knives for sharpness, and replace them if needed. If they check out, reduce the depth of your cut.

Jointing end grain increases chances for kickback—and frankly, we can't think of a reason to do it. Run your hand over the ends of a broom's bristles and you get an idea of what the jointer knives face with end grain. To true up the ends of a board or panel, take it to the table saw, use a hand plane, or mount a straight bit in your router and guide the router along a straightedge. 🌲

Produced by Craig Rueggeger

More Resources

- ▶ Get a free article that walks you through a comprehensive tablesaw tune-up at: woodmagazine.com/tstune
- ▶ Read free articles with more about setting up and properly using the jointer and the miter saw at: woodmagazine.com/jointertips and woodmagazine.com/mitersawtips
- ▶ Purchase videos about using the tablesaw and miter saw at woodmagazine.com/mitersawvideo woodmagazine.com/tsbasics



Rotating insert takes a drilling but stays fresh

To reduce tear-out at the bottom of holes drilled at my drill press, I added a sacrificial insert to my drill-press table. Nothing new about that idea, but I put a new "spin" on my version, so I could drill into the insert many times before

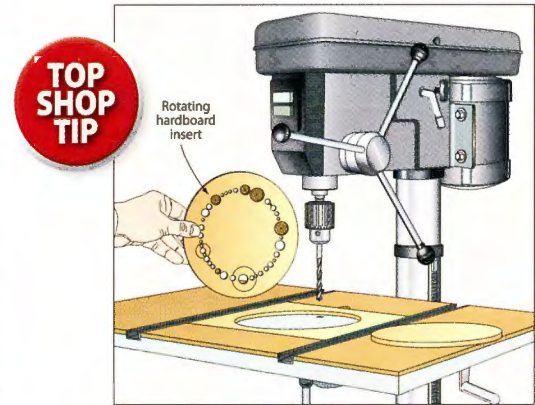
having to replace it. By making the insert circular and offset from the bit, I simply rotate the insert whenever one spot becomes too worn, and then resume drilling into a fresh area.

—Len Urban, Rancho Mirage, Calif.

Stick-anywhere worklight illuminates dark spots

Though I long ago equipped my drill press and bandsaw with clamp-on task lighting, I've always found it difficult to place those accessories in locations

where they were getting in the way. I found a cordless LED flashlight that was a perfect fit. I simply arm (the metal pin) the flashlight. Then, eyeing the spot, I stick the cordless flashlight in place.



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Bench Chisels

Every woodworker needs these classic hand tools for chopping, paring, and finessing joints.

WOOD® editors tested 17 multi-chisel sets and found winners for any budget.

What do session musicians and wood chisels have in common? Neither will grab the spotlight or carry a

project on their own, but just try getting the job done without them. You can buy different types of chisels, but bevel-edge

bench chisels are the most versatile, affordable, and easy to use. Here's what you need to know before you buy.

What is a bench chisel?

These tools typically have a steel blade measuring 5–6" long, in widths from 1/8" to 2", with bevel-ground side edges for reaching into tight areas. (See photos at *right*.) Most bench chisels use a 25° beveled cutting tip, although some 1/8"-wide versions have a 30° bevel to better prevent chipping and breaking down that narrow tip during use.

By comparison, a *paring chisel*, shown *below right*, has a longer blade, a delicate 20° cutting tip to better shave away wood, and handles made exclusively for hand-guided use. (Never strike this tool with a mallet.) *Butt chisels* look similar to bench chisels, but their shorter blades and handles make them ideal for maneuvering in confined spaces.

Three factors to help you decide between brands

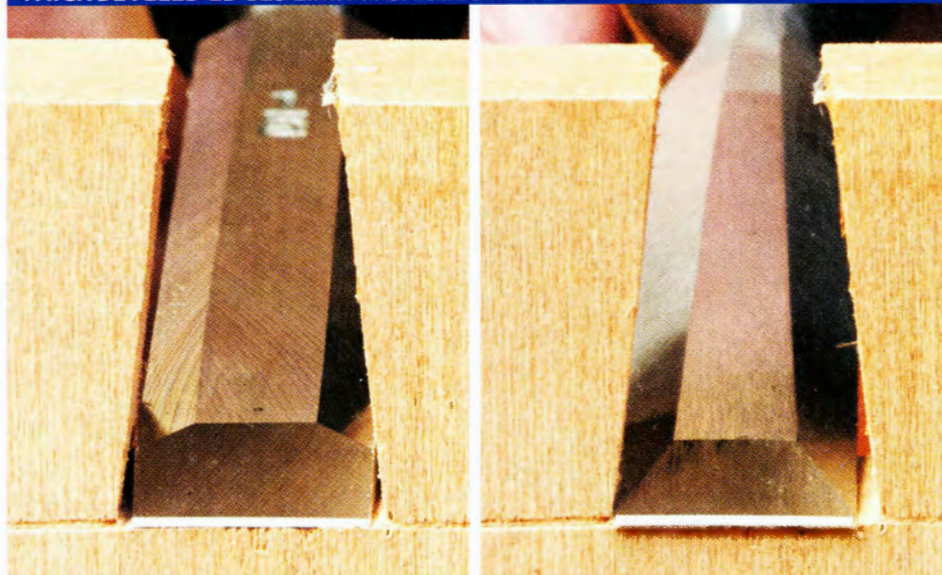
► **Blade.** Quick lesson in metallurgy for tool steel: Hard alloys, such as A2 or high-speed steel, hold a sharp edge longer (and cost more) than soft alloys, such as O1 carbon steel. But softer alloys sharpen easier, so you spend less time each time. Nearly all of the tested chisels use O1 blades, and of these, the Two Cherries, Pfeil, Stanley Sweetheart, Ashley Iles, and Veritas stayed sharp longest.

Both A2 sets (Blue Spruce and Lie-Nielsen) held their edges about three times longer than the best O1 chisels—at a significant price upcharge. However, a new alloy, the proprietary PM-V11 used in one of the Veritas sets, defies the traditional harder-steel-sharpens-harder rule common with hand tools. These tools held a sharp edge slightly longer than the A2 chisels, but surprised us with sharpening times that fell in between the A2 and O1 models. **TIP:** Get longer edge life from the harder-but-brittle A2 and PM-V11 chisels by sharpening 30° bevels on the cutting tip rather than 25°.

Exact blade width seldom matters with a chisel unless you're cleaning up a mortise—you need a 1/4" chisel to trim the ends of a 1/4" mortise, after all. Each tested set comes with 1/4", 1/2", and 3/4" chisels (or the metric equivalent), and all but the Bailey set include a 3/8" or equivalent—another common mortise size. Those sizes alone would handle most tasks, but it's nice to have a 1/8" chisel at times, as well as a 1" or wider chisel for trimming a wide tenon or long mortise.

A flat chisel back guides the cutting edge and keeps it on target, and we gave

THICK BEVELED EDGES LIMIT A CHISEL'S REACH



Both of these chisels measure 1/2" wide, but the thick beveled side edges of the Lee Valley chisel (*left*) prevent it from reaching into the corners of this dovetail pin socket. But the thinner side edges on the Ashley Iles chisel (*right*) get into such tight spaces better.



credit to those chisels that arrived with dead-flat backs: Lie-Nielsen, Blue Spruce, Pfeil, and both Veritas sets. With the other sets, it took from a few minutes to more than a half hour per chisel to flatten the backs, using a variety of hand and motorized sharpening media.

► **Handle.** Because a quality set of chisels can last for decades, get one that feels good in *your* hands. If possible, try before you buy. If you have large or arthritic hands, you'll likely prefer larger diameter handles, such as those on the Stanley

Bailey, Narex, Irwin Marples, Pfeil, Two Cherries, and Robert Sorby Sheaf River models. Users with smaller hands might prefer the Blue Spruce, Lie-Nielsen, Stanley Sweetheart, Traditional Woodworker, and Veritas chisels. (With about half the sets, the narrowest chisels have handles slightly thinner and shorter than those on the wider blades, giving you more control for intricate work.)

And the shape of the handle—as well as how you hold it for different uses—proves just as important, as shown in



When chopping dovetails or mortises, we grab a fistful of handle to maintain the best control. Try the tool first by holding it in this manner.



And for light-duty paring, such as trimming dovetail pins, we like to use one hand to guide the blade and the other to push. Test the feel this way, too.

the photos *above*. (See the handle shapes in the photo on *page 52*.)

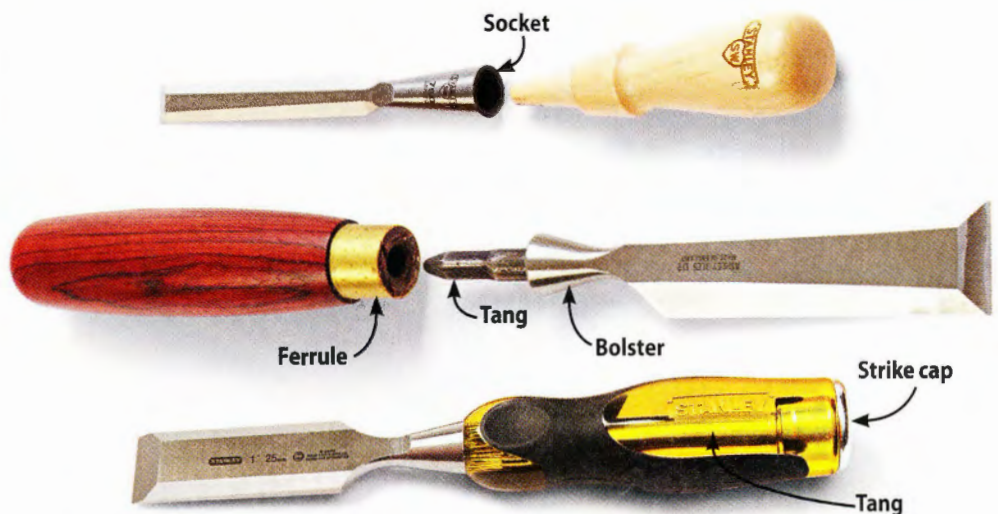
Also, consider how the handle mounts to the blade, using either a *tang* or *socket* fit, as shown at *right*. Two sets we tested (Lie-Nielsen and Stanley Sweetheart) use socket handles. These handles seat firmly in their sockets after being struck with a mallet, and provide better leverage than tang-style chisels. But this style costs more to manufacture, so expect to pay a premium.

Tang chisels tend to cost less and have more ergonomic handles, but the handles can split more easily than sockets because the tang acts as a wedge inside the handle; the metal ferrule helps prevent splitting, but it's not foolproof.

For best results building projects in a woodworking shop, steer clear of inexpensive, general-use chisels, such as the Stanley Fat Max, shown at *right*. They have plastic handles with metal strike caps made to withstand hammer blows, and their shorter, less-durable blades dull quickly compared to even the O1-steel bench chisels we tested. These work best for construction, DIY tasks, and glue-scrapping.

Although none of the synthetic handles failed during testing, we can't help but prefer wooden chisel handles for feel and aesthetics, especially those made of hard, dense wood species, such as maple, bubinga, elm, hornbeam, boxwood, or

TO WHACK OR NOT? DEPENDS ON THE JOINT



The blades of bench chisels (top and middle) mount simply, so you can hand-power them or strike them with a mallet, but a hammer could damage the handle. The tang of a general-use chisel (bottom) typically extends through the handle to a metal strike cap, ready for use with a hammer or mallet.

ash. Chisels made with softer beech handles (Bailey and Narex) typically come with metal hoops at the ends to discourage splitting when struck with a mallet.

► **Price.** You can buy bench chisels individually as needed, but you'll save money by buying sets comprised of the

most common widths. The 17 sets we tested group into three categories: less than \$90, \$130 to \$230, and \$275 or higher. You can sharpen a keen edge on any of them. But expect to resharpen less-expensive chisels more often than the premium ones made of more durable steel alloys.

Cutting to the quick on bench chisel sets



Ashley Iles 6-piece set ($\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1"), \$155
800-426-4613, toolsforworkingwood.com

These chisels were sharp out of the box, have a thin bevel-edge profile, and held an edge well during testing. We like the feel of the bubinga handles—well, the guys with small hands do—but wish the brass ferrules were tapered to eliminate the abrupt, crisp edges where they join the blade bolster. Also available in 4- and 11-piece sets. This set does not include a box or roll.



Blue Spruce 5-piece set ($\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ "), \$445
503-631-7485, bluesprucetoolworks.com

Handmade in Oregon, these chisels performed exceptionally well. The acrylic-impregnated curly maple handles won't mushroom when mallet-struck, but they're slim and somewhat slick. The blade side bevels taper to such a sharp edge—great for dovetailing—that we had to blunt them slightly to avoid cutting our hands. These premium-priced A2 chisels are so well-made and attractive it almost feels wrong to touch them to a grinder or strike them with a mallet. For this price we'd expect a box or leather roll, but got neither.



Irwin Marples 6-piece set ($\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1"), \$70
800-464-7946, irwin.com

The newest generation of this venerable chisel, these Irwins have a three-stepped handle that's comfortable for mallet work, but not as easy to manipulate for hand-guided use. The blades sharpen easily and cut nicely, but dull quickly—about what you'd expect from a value-priced set. Also available in 3-piece sets with a mallet.



Lee Valley 7-piece set ($\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1 $\frac{1}{4}$, 1 $\frac{1}{2}$ "), \$130
800-871-8158, leevalley.com

Despite blades that sharpened easily and held an edge reasonably well, several chisels required 30-plus minutes each to flatten the backs. Plus, they had the thickest beveled edges in our test. And we just can't find a comfortable way to hold the oblong grooved handles. Still, you get a nice selection of widths for the money. Also available in a 5-piece set (\$93); both sets available without the wood box for \$20 less.



Lie-Nielsen 5-piece set ($\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ "), \$275
800-327-2520, lie-nielsen.com

One of two socket-chisel sets we tested, the handles arrived loose in the blades, not uncommon for socket chisels. You can adjust their fit, if needed (ours did not), by removing material from the wood tenon, then firming them up with mallet blows. Like the Blue Spruce chisels, these are handmade (in Maine) and perform superbly—the lowest-priced option for A2 steel. Also available in 7- and 9-piece sets; add a leather roll to store the chisels for \$65–\$75.



Narex 7-piece set ($\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1"), \$69
800-871-8158, leevalley.com

This set didn't dazzle us, but it does offer a solid-performing collection for a reasonable price. The dark-stained beech handles felt chunky in small hands and unevenly balanced. Flats on the front and back faces prevent narrow chisels from rolling off a workbench. The blades needed work to flatten the backs, but they sharpened quickly. Also available in 3-, 4-, and 10-piece sets; these sets lack a box or roll for storage.



Pfeil 6-piece set (6, 10, 12, 16, 19, 26 mm), \$205
800-535-4482, woodcraft.com

These Swiss-made chisels were sharpest out of the box, with a mirror-polished finish and microbevel. They sharpened easily and held an edge longer than most of the O1 carbon-steel chisels in the test. We like the grippability of the eight-sided elm handles, but would prefer a smoother transition where the octagonal facets taper to meet the ferrule.



Robert Sorby (octagonal handles) 5-piece set ($\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1"), \$175
robert-sorby.co.uk

These hard boxwood handles held up well against mallet blows, but we just don't like the feel of the partial-length octagonal shape, and the metal hoops on the ends of three chisels came loose during use. The blades ranked among the softest in our test, dulling faster than most others.

Cutting to the quick on bench chisel sets (continued)



Tapered handle

Traditional handle

Robert Sorby Sheaf River 5-piece set ($\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1"), traditional \$150; tapered \$200
robert-sorby.co.uk

With blades made of the same steel as Sorby's octagonal-handled models (*previous page*), we observed the same longevity-between-sharpenings issues. We like these ash handles better than the boxwood, but our editors split about equally as to which shape we prefer. The tapered handles have a smooth transition to the ferrule and bolster, but the traditional handle measures $1\frac{1}{4}$ " longer, a plus for hand-guided use.



Stanley Sweetheart

8-piece set ($\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$ "), \$230
800-262-2161, stanleytools.com

Based on the original Sweetheart chisels from the early 20th century, we found these similar to the Lie-Nielsen chisels in size and shape and with hornbeam socket handles. The Sweethearts, however, have O1-steel blades, so they dull quicker than the Lie-Nielsens. Still, we like their overall performance, broad selection of widths, and the leather storage roll.



Stanley Bailey

5-piece set ($\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$ "), \$80
800-262-2161, stanleytools.com

Like the Narex chisels, the Baileys have large beech handles—making them not well-balanced—with flats on the front and back, but with a larger-diameter end and metal hoop. The blades sharpen easily, but dull quicker than most. This set comes with a nice leather roll.



Traditional Woodworker

6-piece set ($\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1"), \$137
800-509-0081, traditionalwoodworker.com

With comfortable, sculpted hornbeam handles, these German-made chisels performed nicely when sharp. The blades had nearly flat backs and shined with a high polish out of the box, but with average edge retention, you'll sharpen them frequently. Also available in an 11-piece set.



Two Cherries

6-piece set (6, 10, 12, 16, 20, 26 mm), \$175
800-356-2195, twocherriesusa.com

Similar to the Traditional Woodworker chisels, these have sculpted (though not as comfortable) hornbeam handles and polished blades. The blades held an edge longer than any of the other carbon-steel models. But the backs were not flat out of the box and not easy to flatten, and the handles were coated with thick, globby finish that affected grip. Our set came in a wood box, or you can opt for a leather roll. Also available in a 4-piece set.



Veritas

5-piece set ($\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1"), O1 blades, \$295; PM-V11 blades, \$360
800-871-8158, leevalley.com

These chisel sets are identical to each other in every way except one: the blade material. We like the PM-V11 best—it gets our Top Tool award—but if the premium price proves daunting, go for the O1 blades that outlasted most other O1 blades in the test. The crisp bevel-edge profiles on both sets let you slip these chisels into the tightest places for trimming. Veritas heat-treats the maple handles—crystallizing the sugars to make them even harder—turning them varying shades of brown, so don't be alarmed if your chisels don't match.



WoodRiver

6-piece set ($\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1"), \$84
800-535-4482, woodcraft.com

This was our favorite economy set. The bubinga handles felt comfortable for both hand-guided and mallet use. We also like that the ferrules taper to form a smooth transition between the handle and blade. After we flattened the blade backs and sharpened each edge, these chisels outperformed several pricier brands.

Where to spend your money

With the most durable blades that sharpened faster than comparable A2 chisels, the Veritas PM-V11 earned the Top Tool award. And we liked the overall feel of the tools no matter how we gripped them. This high level of craftsmanship comes at a price, of course: \$360 for five chisels.

If that's more than you want to spend, among the mid-priced chisel sets we recommend the Pfeil and Stanley Sweetheart sets. The \$205 Pfeils were sharp and flat out of the box and held an edge well. But the Sweethearts give you two extra chisels, including a 1/8", for just \$25 more.

On a tighter budget? Get the WoodRiver 6-piece set for \$84. Once you flatten the backs on these chisels—a one-time job—you'll have a solid, comfortable set in the most common sizes. 🌲

Produced by **Bob Hunter** and the **WOOD®** magazine staff

BENCH CHISELS: EVERY WOODWORKER'S BEST FRIEND

BRAND	MODEL (1)	BLADE		HANDLE		PERFORMANCE RATINGS (4)					STORAGE DEVICE (5)	BLADE WIDTHS, INCHES		COUNTRY OF MANUFACTURE (6)	SELLING PRICE (7)	
		BLADE-STEEL ALLOY	EDGE-GRIND PROFILE (2)	HANDLE MATERIAL (3)	HANDLE DIAMETER, INCHES (MEASURED AT WIDEST POINT)	HANDLE COMFORT	EASE OF SHARPENING	EDGE RETENTION	FLATNESS OF BACKS	OVERALL FIT AND FINISH		INCLUDED IN SET	ADDITIONAL WIDTHS AVAILABLE			
LESS THAN \$90																
IRWIN MARPLES	DDS181-02	01	B	P	1¼	B-	A	B-	B	B	B	¼, ⅜, ½, ⅝, ¾, 1	⅛, 1¼, 1½, 2	CH	\$70	
NAREX	10S09.77 *	01	B	B	1⅜	B-	A	B	B	B	N/A	¼, ⅜, ½, ⅝, ¾, ⅞, 1	1¼, 1½, 2	CZ	69	
STANLEY BAILEY	16-401	01	C	B	1⅜	B-	A	B	B	B	L	¼, ½, ¾, 1, 1¼	None	E	80	
WOODRIVER	151268 #	01	B	G	1⅜	A-	A	B	C+	B	N/A	¼, ⅜, ½, ⅝, ¾, 1	None	CH	84	
\$130-\$230																
ASHLEY ILES	IL-100-40 ^	01	A	G	1	B+	A-	A-	B	B	N/A	⅛, ¼, ⅜, ½, ¾, 1	⅝, ⅞, 1¼, 1½, 2	E	155	
LEE VALLEY	44S01.23 *	01	C	P	1⅜	C-	A	B+	C	B	B	¼, ⅜, ½, ¾, 1, 1¼, 1½	None	J	130	
PFEIL	05B54 #	01	B	E	1¼	A-	A-	A-	A	A-	F	6, 10, 12, 16, 19, 26 mm	4, 8, 32, 35, 40 mm	S	205	
ROBERT SORBY (OCTAGONAL HANDLES)	167	01	B	X	1⅜	C	A	B-	B	C	C	¼, ⅜, ½, ¾, 1	⅛, 1¼, 1½, 2	E	175	
ROBERT SORBY SHEAF RIVER (TRADITIONAL HANDLES)	1695ST	01	B	A	1¼	B+	A	B-	B	B	C	¼, ⅜, ½, ¾, 1	None	E	150	
ROBERT SORBY SHEAF RIVER (TAPERED HANDLES)	5305ST	01	B	A	1⅜	A	A	B-	B	B+	C	¼, ⅜, ½, ¾, 1	None	E	200	
STANLEY SWEETHEART	16-793	01	B	H	1⅞	A-	A-	A-	B+	A-	L	⅛, ¼, ⅜, ½, ⅝, ¾, 1, 1¼	None	E	230	
TRADITIONAL WOODWORKER	101-1012	01	C	H	1¼	B	A	B+	B+	B	B	¼, ⅜, ½, ⅝, ¾, 1	⅛, ⅜, ⅞, 1¼, 1½	G	137	
TWO CHERRIES	500-1562	01	C	H	1¼	B-	A-	A-	C+	C-	B/L*	6, 10, 12, 16, 20, 26 mm	2, 3, 4, 8, 14, 18, 22, 24, 28, 30, 32, 35, 40, 45, 50 mm	G	175	
\$275 OR HIGHER																
BLUE SPRUCE		A2	A	M	1	A	B	A	A	A	N/A	¼, ⅜, ½, ⅝, ¾	⅛, ⅞, 1, 1¼	U	445	
LIE-NIELSEN		C-BS-NR	A2	A	H	1⅞	A	B	A	A	A	L*	⅛, ¼, ⅜, ½, ¾	⅜, ⅝, ⅞, ⅞, 1	U	275
VERITAS		05S20.50 *	01	A	M	1⅞	A	A	A-	A	A	N/A	¼, ⅜, ½, ¾, 1	None	CA	295
		05S21.50 *	PM-V11	A	M	1⅞	A	A-	A	A	A	N/A	¼, ⅜, ½, ¾, 1	None	CA	360

1. Noted sets identified by retailer's model number

(*) Lee Valley
(#) Woodcraft
(^) Tools for Working Wood

2. (A) Thin profile for length of blade
(B) Thin at tip tapering to thick
(C) Thick at tip tapering to thicker

3. (A) Ash
(B) Beech
(E) Elm
(G) Bubinga
(H) Hornbeam
(M) Hard maple
(P) Plastic
(X) Boxwood

4. **A** Excellent
B Good
C Fair

5. (B) Wood box
(C) Cardboard box
(F) Fabric roll
(L) Leather roll
(N/A) None
(*) Optional

6. (CA) Canada
(CH) China
(CZ) Czech Republic
(E) England
(G) Germany
(J) Japan
(S) Switzerland
(U) United States

7. Prices current at time of article production and do not include shipping, where applicable.

Picture-perfect Multi-frame

Coordinate with your color scheme, pull together your pictures, and showcase your shop skills. All in a single frame.



This photo frame's not only fetching, it's flexible. Need more photo spaces? Add a few parts and stretch a couple measurements. See details on *page 60*.

Start with a frame job

1 From $\frac{3}{4}$ " stock (we used cherry), cut one $3\frac{1}{4}\times 54$ " blank for the large frame top and bottom (A) and sides (B) [Drawing 1]. Cut two $2\frac{1}{4}\times 32$ " blanks for the small frame tops and bottoms (C) and sides (D).

2 Attach an auxiliary face to your tablesaw's fence and install a $\frac{1}{2}$ " stacked dado blade. Cut $\frac{1}{2}$ " rabbets $\frac{3}{8}$ " deep along both edges of one face of the $3\frac{1}{4}\times 54$ " blank [Drawing 1a]. Lower the blade and adjust the fence (burying $\frac{1}{8}$ " of the dado blade in the auxiliary fence) to cut $\frac{3}{8}$ " rabbets $\frac{1}{4}$ " deep along both edges of one face of the $2\frac{1}{4}\times 32$ " blanks. Then, cut $\frac{1}{4}$ " rabbets $\frac{1}{4}$ " deep along both edges of the opposite face.

3 Replace the dado stack with a rip blade and remove the auxiliary fence. Rip the blanks, splitting them to cut the

large and small frame parts (A–D) to their final widths [Materials List, *page 60*, Drawing 1a].

4 To keep track of the orientation when mitering the small frame parts (C, D), mark a line down the length of the outside edge (the one with the $\frac{1}{4}$ " rabbet, $\frac{1}{4}$ " deep) of the small frame blanks. Attach an extension to your miter gauge and tilt the tablesaw blade to 45° . Use a stopblock clamped to the extension for repeatable cuts (or use the "Small-Parts Miter Maker" on *page 62*) as you miter-cut the frame parts (A–D) to length from the blanks you cut previously.

5 Assemble the large and small frames (A/B, C/D) by first taping the frame members together [Photo A]. Flip each frame assembly and spread glue on the miters. Fold up the frame and tape the final joint. Allow the glue to dry.

About the designer

WOOD* magazine reader Jeremy Cranfill, of Connersville, Ind., is a graphic designer who likes to work in multiple mediums. He originally designed this easy and elegant picture frame to display sand dollars collected on a vacation. Have a design you think would be perfect for **WOOD**? Drop us a line at woodmail@woodmagazine.com



PAINTER'S TAPE: A SMALL-PARTS CLAMP



A Use a straightedge to align the frame parts as you butt them end to end and join them with painter's tape. The tape acts as both hinge and clamp.

Sawtooth picture
hanger

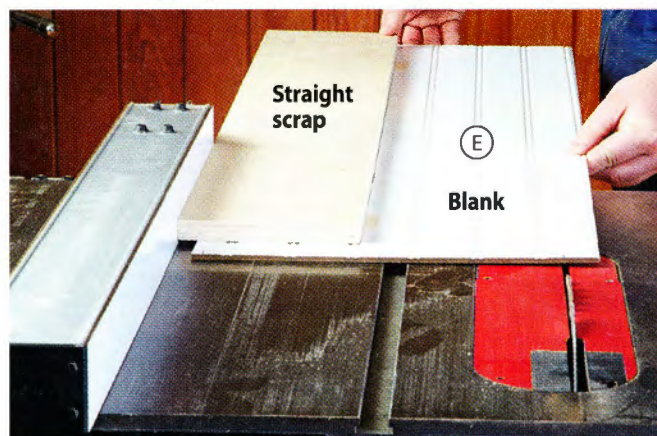


2 Mark the locations for the small frame openings in the beadboard back (E) [**Drawing 1, Photo B**]. Drill blade-start holes, then cut the openings with a jigsaw. Paint the face of the beadboard back to coordinate with your decor. (We used Krylon Hosta Leaf interior-exterior spray paint.)

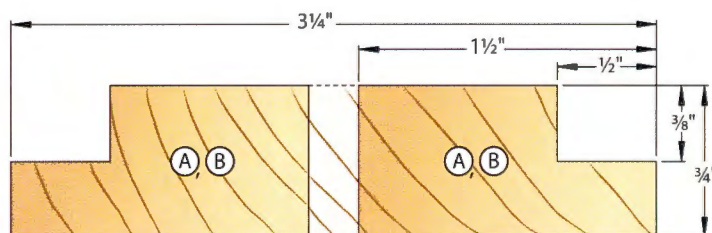
SHOP TIP

True up a crooked edge

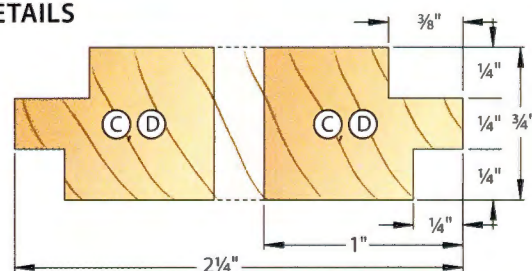
The beaded lines in the beadboard paneling we purchased at the home center did not run parallel to the factory edge. If yours are out of parallel, cut an oversize blank and true one edge as shown *below* before flipping the blank and cutting it to final width.



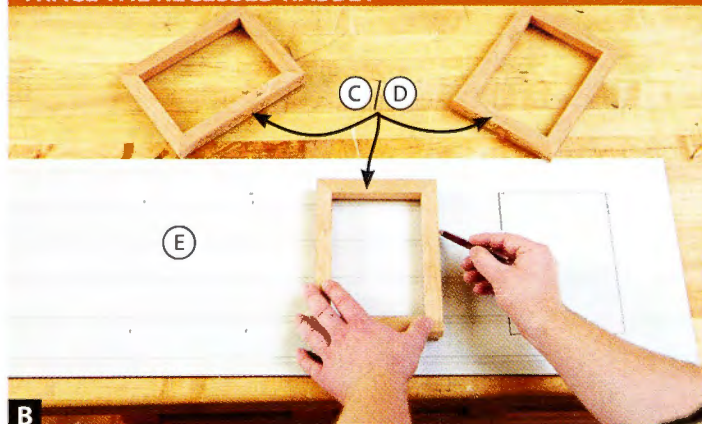
Tape a straight scrap to the blank, aligning one edge with a bead line and overhanging the other. With the scrap against the fence true the first edge.



1a FRAME DETAILS



TRACE THE RECESSED RABBIT



B Measure and mark the corners of the frame openings. Set each frame (C/D) in place to carefully trace the rabbet onto the beadboard back (E).

2 SMALL FRAME EXPLODED VIEW
(Viewed from the back)

3/4"

1/4" rabbet
1/4" deep

3/8" rabbet
1/4" deep

1"

3/4"

8"

Turnbutton

1/8 x 5 x 7" glass

5"

7"

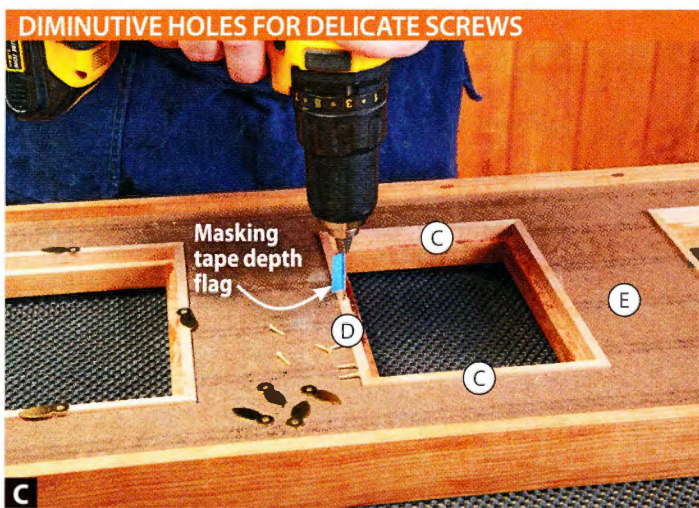
6"

Mitered ends

1/4"

Part		FINISHED SIZE			Matl.	Qty
		T	W	L		
A*	large frame top & bottom	¾"	1½"	39¾"	C	2
B*	large frame sides	¾"	1½"	12¼"	C	2
C*	small frame tops & bottoms	¾"	1"	6"	C	8
D*	small frame sides	¾"	1"	8"	C	8
E	beadboard back	¼"	11½"	39"	BB	1
F	small frame backs	¼"	5"	7"	MDF	4

Blade and bits: Stacked dado blade, 1/2", 5/64", and 1/16" drill bits.



4 Install photo-frame turnbuttons as shown [Drawing 2, Photo C]. Then install sawtooth hangers on the back of the frame assembly (A–E). To hang the frame vertically, attach one hanger centered on one of the sides (B). For a horizontal orientation as shown on *page 58*, attach two hangers 32" apart centered on the top (A).

5 Measure the opening in the backs of the small frames (C/D) and cut the small frame backs (F) to fit from ¼" medium-density fiberboard (MDF). Install photos sandwiched between 5x7" frame glass (we got ours at a hobby store) and the small frame backs. Now hang the frame on a wall for everyone to enjoy your art. Oh, and your photos, too. 🌳

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A close-up photograph showing a person's hand using a hand saw to cut a piece of wood. The wood is held in a wooden miter box that is clamped to a workbench. The saw is positioned to make a 45-degree cut. The workbench is made of light-colored wood.

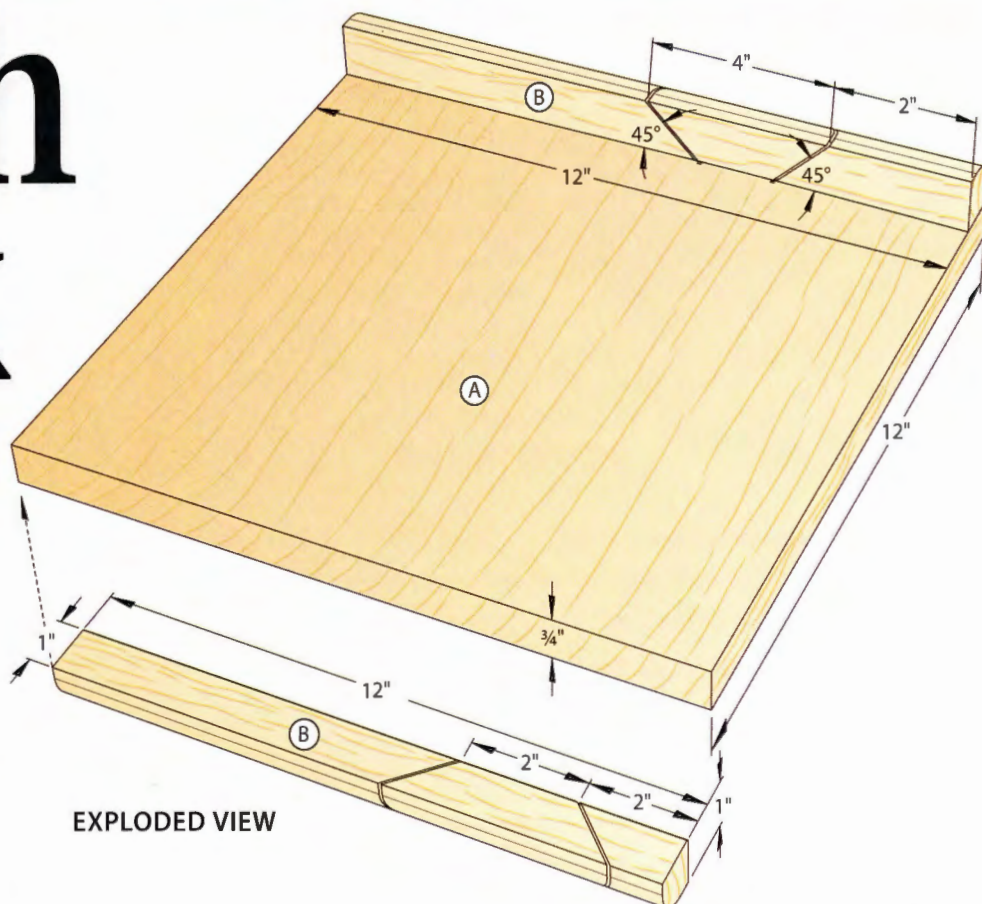
Small Parts Miter-Maker

Bench Hook

Cutting perfect miters in small project parts using a tablesaw or mitersaw can be dicey. But with a handsaw and this bench-hook miter box, you'll cut those angles with ease.

As its name implies, this jig hooks over the edge of your workbench. You apply forward pressure with your non-cutting hand during the cut to keep it locked in place.

1 Edge-glue a $\frac{3}{4}$ "-thick hardwood blank to 12" wide. Cut it to length for the bench hook's body (A) [**Exploded View**]. Cut two 12"-long 1x1" strips for the fences (B). Glue them to opposite

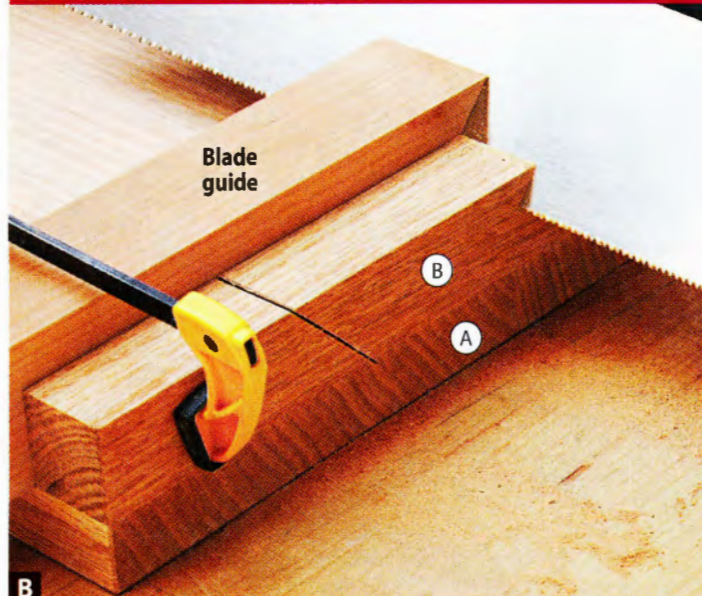


SANDWICH THE BLADE; THEN CUT THE FIRST GUIDE SLOT



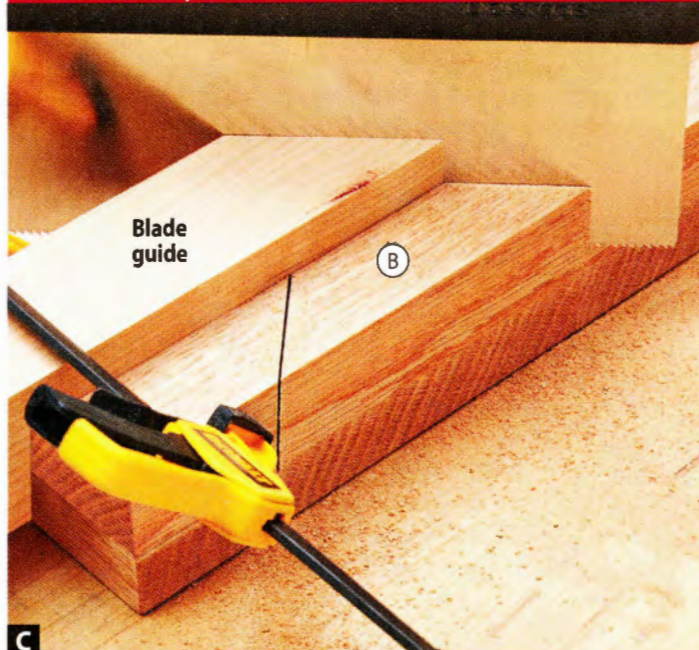
Clamp one blade guide in line with a guide-slot location, then the other, surrounding, but not pinching, your saw's blade. Cut through the fence.

CUT THROUGH THE FENCE AGAIN



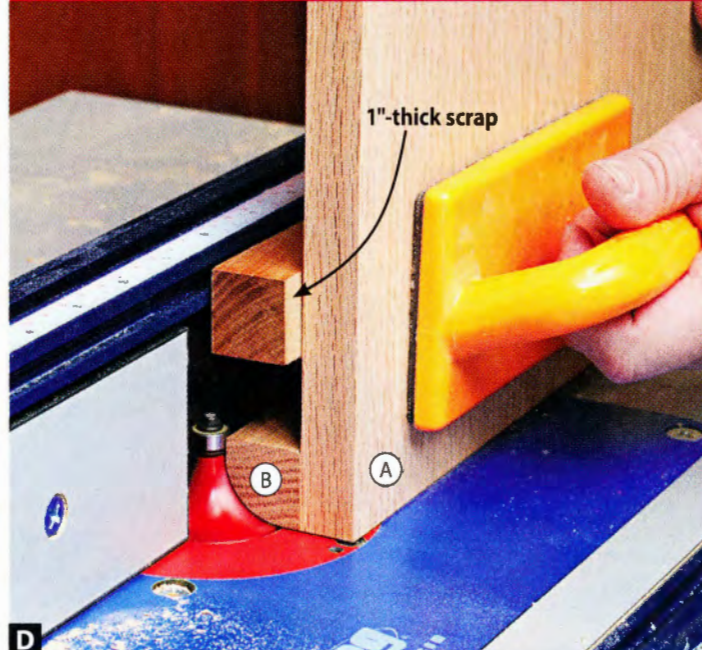
Reposition the blade guides to the next marked guide slot and repeat, stopping before cutting into the body (A). Check to make sure the cut stays in line.

FLIP THE BASE; CUT THE OTHER FENCE



Flip the bench hook over, turn the blade guide on its side, and clamp it to the uncut fence (B)—capturing the saw blade as before and making the cuts.

ROUND OVER FOR A RACIER LOOK



Attach a piece of 1"-thick square scrap to the body (A) with double-faced tape to keep the bench hook parallel to the router table fence.

ends and opposite faces of the body.

2 To cut precise guide slots (which capture your saw blade for accurate cuts) in the fences (B), first make a set of blade guides. To do this, use your table-saw or miter saw to make a 45° miter cut in the center of a 1½×1½×10" piece of scrap. Keep both pieces.

3 Mark the guide-slot locations on the fences (B). If you're right-handed, make the marks toward the right end of the fence; if you're left-handed, mark toward the left. This leaves room to grip

the workpiece and fence during the cut.

4 You should make this bench hook to perfectly fit a specific saw, so first select a short backsaw (a handsaw with a stiff rib on the edge opposite the blade's teeth) with 14–22 teeth per inch. Follow the steps in **Photos A, B, and C** to cut the guide slots.

5 After cutting all four guide slots in the fences, install a ¾" round-over bit in your router table and rout the outside edges of the fences (B) using a scrap spacer [**Photo D**] to give the bench hook a pol-

ished appearance. Be sure to note which saw the bench hook fits. 🌲

Produced by **Nate Granzow** with **John Olson**
Project design: **John Olson**
Illustration: **Lorna Johnson**

More Resources

- ▶ For free help in learning the basics of choosing and using a handsaw, see woodmagazine.com/helpfulhandsaws.
- ▶ For free handsaw reviews, visit woodmagazine.com/handsawreview.

Get the ball rolling Magnetic Marble Run



With limitless possible configurations, this project will provide hours of simple entertainment. In fact, you'll find yourself mesmerized—following the marble as it rolls and drops from one channel to another. Stick it to any ferrous metal surface, such as a refrigerator door or washing machine, using rare-earth magnets.

1 EXPLODED VIEW
(Viewed from the back)

Diagram illustrating the exploded view of a wooden magnetic storage device, showing various components and their dimensions:

- Component A:** A long wooden strip, 12" long, with a 1 1/2" wide section and a 3/8" counterbore 7/64" deep.
- Component B:** A long wooden strip, 15" long, with a 1 1/2" wide section and a 3/4" hole, centered.
- Component C:** A long wooden strip, 12" long, with a 1 1/2" wide section.
- Component D:** A curved wooden piece, 5 1/2" long, with a 1 1/2" wide section and a 3/4" cove 1/4" deep.
- Component E:** A small wooden piece, 1 1/2" long, with a 3/8" hole.
- Component F:** A small wooden piece, 1 1/2" long, with a 3/8" hole.
- Component G:** A small wooden piece, 1 1/2" long, with a 3/8" hole.
- Component H:** A small wooden piece, 1 1/2" long, with a 3/8" hole.
- Component I:** A small wooden piece, 1 1/2" long, with a 3/8" hole.
- Component J:** A small wooden piece, 1 1/2" long, with a 3/8" hole.
- Component K:** A small wooden piece, 1 1/2" long, with a 3/8" hole.
- Other Labels:** Rare-earth magnets, 3/4" hole, centered, 1 1/2", 12", 15", 5 1/2", 1 1/2", 3/8", 3/4", 1 1/2", 3/8" counterbore 7/64" deep, 3/4" cove 1/4" deep.

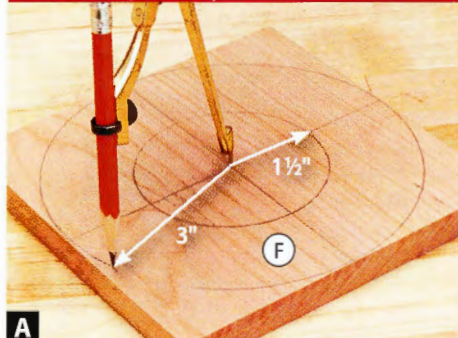
2 CURVED-RUN PARTS VIEW

Technical drawing of a circular part. The top view shows a circle with an outer diameter of 6" and a central hole of 1/4" diameter. The part features a chamfer with radii $R=3"$ and $R=1\frac{1}{2}"$. The chamfer is defined by a 36° angle. The drawing includes a side view showing the 36° angle and a top view showing the circular geometry with 54° segments.

1 Cut a $\frac{1}{2} \times 6 \times 6$ " blank for each curved run (F) **[Drawing 2]**. Then, lay out the 6" square into quarters and mark two circles centered on the blank: one with a $1\frac{1}{2}$ " radius and one with a 3" radius **[Photo A]**.

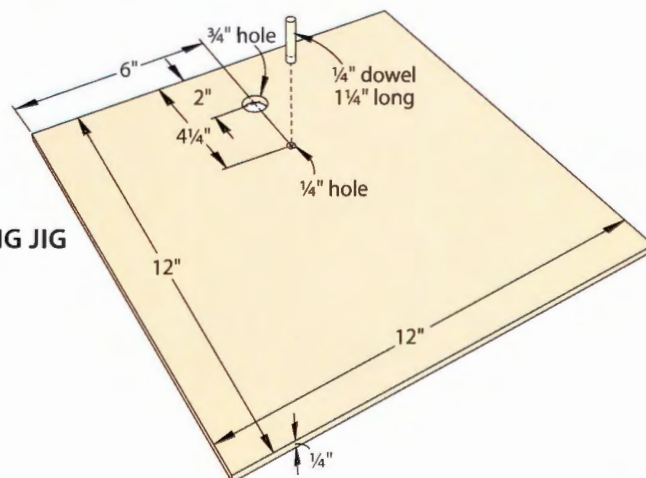
2 Drill a 1/4" hole in the center of the curved run (F) blank. Make the circle-routing jig [Drawing 3] and center its 3/4" hole over the 3/4" core-box bit in your router table. Use your router fence and double-faced tape to keep the jig from rotating.

DRAW SQUARES, THEN CIRCLES

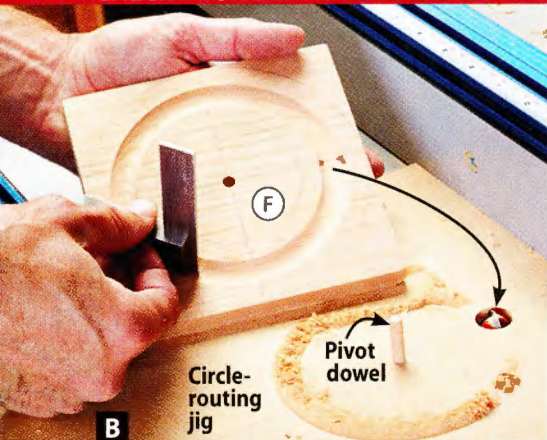


Draw intersecting centerlines on the square to both divide it into quadrants and mark where to place the compass point.

3 CIRCLE-ROUTING JIG



CHECK YOUR DEPTH

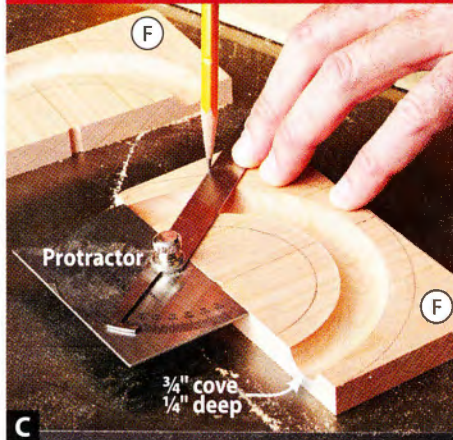


Raise the bit gradually ($\frac{1}{16}$ " per revolution), testing the depth as you go. Stop when the groove reaches $\frac{1}{4}$ " deep.

3 With the bit set to cut $\frac{1}{16}$ " deep, place the curved-run (F) blank over the circle-routing jig's $\frac{1}{4}$ " dowel and start the router. Slowly lower the blank onto the dowel and bit while turning it. Keep the blank rotating to avoid burning. After completing a pass, remove the blank, raise the bit and repeat the process [Photo B].

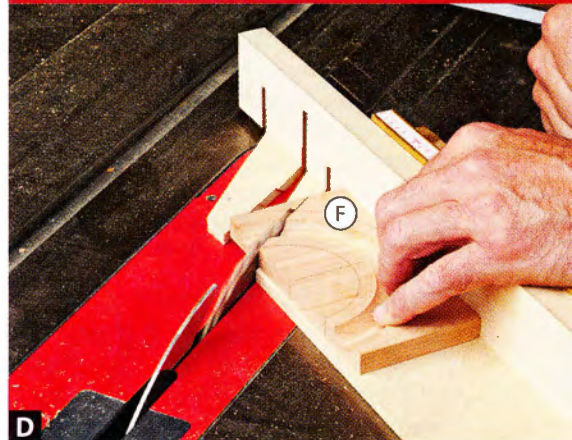
4 Crosscut the curved-run (F) blank along the centerline. With a protractor,

LAY OUT THE MITERS



Mark 54° miters starting on the inside edge of the curved run (F) blank. Mark the line for the second cut on the back side of the blank.

CUT IT AND FLIP IT

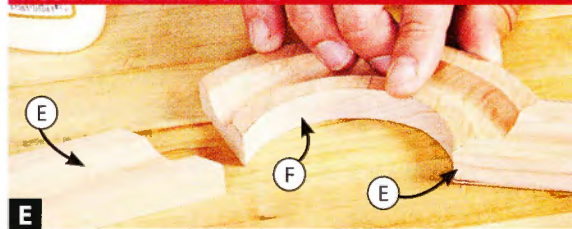


Cut the first miter to 54°. Flip the curved-run (F) blank over and cut the other miter. A miter-gauge extension steadies the piece and prevents chip-out.

tor, lay out the miters where shown [Photo C, Drawing 2]. Then, miter-cut the curved run [Photo D]. Bandsaw the curve to shape and sand away any resulting machining marks.

5 From the curve infeed/outfeed (E) blanks, cut two $5\frac{1}{2}$ " lengths with a 36° miter at one end of each [Drawing 2]. Glue each curve infeed/outfeed to the curved-run (F) [Photo E]. Let the glue dry for at least an hour.

ASSEMBLE THE CURVE



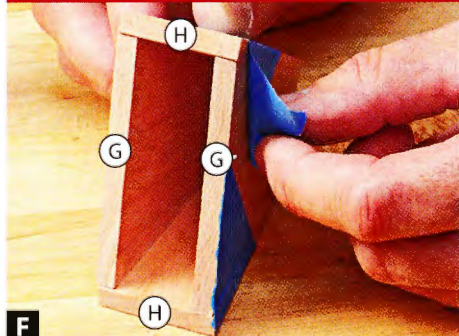
Apply glue to the miter and rub the mating pieces along the joint line to evenly spread the glue. Hold it in place until it stays put.

Build the bucket

1 From $\frac{1}{4}$ " stock, cut the bucket front, back (G) and sides (H) to size [Drawing 4]. Drill counterbores for magnets on the bucket back, where shown. Apply glue along the ends of the bucket front and back; then assemble the bucket [Photo F]. When the glue has dried completely, sand the sides flush.

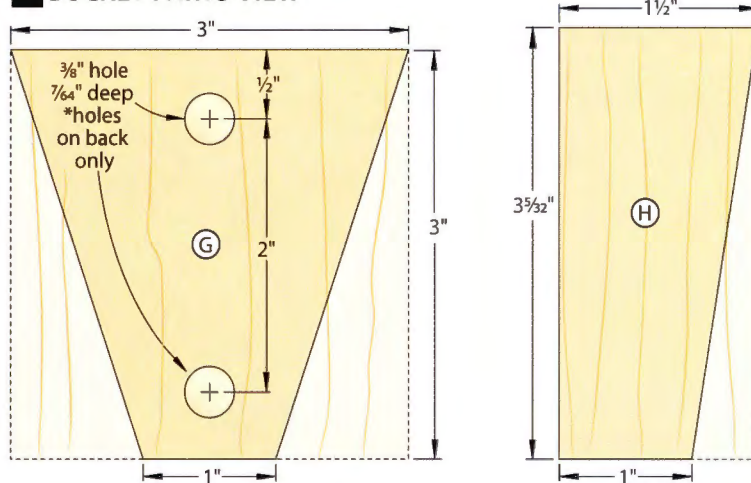
2 Finish-sand all the components to 220 grit, and then glue the magnets into place with cyanoacrylate glue. Apply a clear finish. We sprayed three coats of aerosol polyurethane, sanding between coats with a 320-grit sponge.

TAPE CLAMPS SMALL PARTS



To clamp the bucket assembly together, simply wrap it with painter's tape. Remove the tape only after the glue has dried fully.

4 BUCKET PARTS VIEW



Make your run, run better

After much hands-on testing, we came up with a few tips to make your run more fun.

Avoid steep runs. After losing several marbles that rocketed off a run, we opted for a shallower approach.

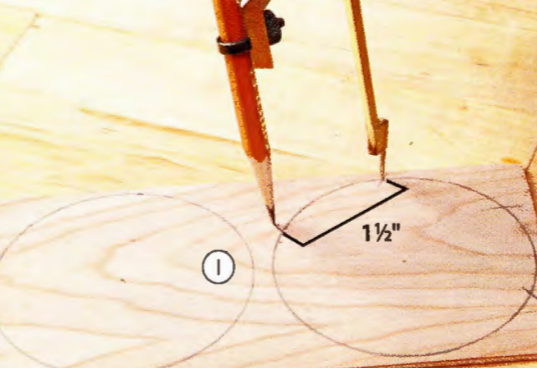
Plane to fit. The contoured doors on some new appliances may prevent the runs from fitting flush. If necessary, sand the back of the runs with a drum sander to conform.

Find the lucky marble. Marbles that

inexplicably jump the track may have inconsistencies in their surface. Try different marbles until you find one that works every time. But avoid ball bearings—the runs' magnets tend to grab them as they pass!



SEGMENT CIRCLES SIMPLY



A close-up photograph showing a person's hand using a compass to draw a segment circle on a piece of plywood. The compass is positioned over a previously drawn circle, and a line segment is being drawn from the center of the circle to the edge. The segment is labeled "1 1/2\"

G

H

1 Using a compass, lay out a pair of 3"-diameter circles on 1/8" plywood for the wheel faces (I). With the compass legs still set 1 1/2" apart, segment the circles with six equally spaced marks [Photo G]. Drill a 1 7/64" hole in the center of the circle, and then cut out the wheel faces.

2

4 From $\frac{1}{4}$ " stock, cut the wheel-nut (L) blank to $\frac{3}{8} \times 5"$. (The oversize blank allows you to safely cut the wheel nut to its final dimensions.) Drill a centered $\frac{1}{4}"$ hole $\frac{1}{8}"$ deep in the blank, $\frac{3}{16}"$ from one end. Cut the wheel nut to final size [**Drawing 5**] using a handsaw. Glue the wheel nut to the dowel only to complete the wheel assembly (I-L). 🌲

4 From $\frac{1}{4}$ " stock, cut the wheel-nut (L) blank to $\frac{3}{8} \times 5"$. (The oversize blank allows you to safely cut the wheel nut to its final dimensions.) Drill a centered $\frac{1}{4}"$ hole $\frac{1}{8}"$ deep in the blank, $\frac{3}{16}"$ from one end. Cut the wheel nut to final size [**Drawing 5**] using a handsaw. Glue the wheel nut to the dowel only to complete the wheel assembly (I-L). 🌲

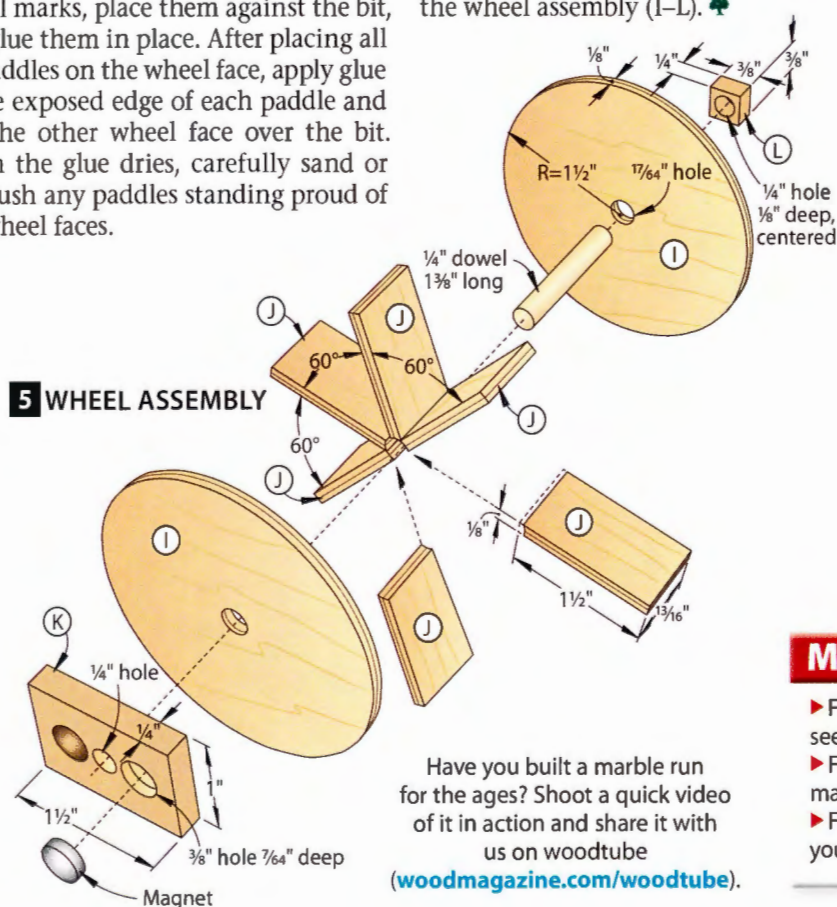
Produced by **Nate Granzow** with **Kevin Boyle**
Project design: **John Olson**
Illustrations: **Lorna Johnson**

Part	FINISHED SIZE			Matl.	Qty.
	T	W	L		
A stopped run	½"	1½"	12"	C	1
B drop run	½"	1½"	15"	C	1
C open-end run	½"	1½"	12"	C	1
D backstop	½"	1½"	1½"	C	1
E* curve infeed/ outfeed	½"	1½"	5½"	C	2
F* curved run	½"	3"	6"	C	1
G bucket front/ back	¼"	3"	3"	C	2
H bucket sides	¼"	1½"	3⅝"	C	2
I wheel faces	⅞"	3" diam.		P	2
J paddles	⅞"	1⅜"	1½"	P	6
K wheel block	¼"	1"	1½"	C	1
L* wheel nut	¼"	⅜"	⅜"	C	1

Materials key: C—choice of material, P—plywood.
Supplies: Double-faced tape, $\frac{3}{8}$ " rare-earth magnets (2 per component), $\frac{1}{4}$ " hardwood dowel.
Bits: $\frac{3}{4}$ " core-box router bit; $\frac{1}{4}$ ", $\frac{1}{64}$ ", $\frac{3}{8}$ " brad-point drill bits.

You can quickly and easily order supplies needed for this project at woodmagazine.com/216marblerun. Simply delete any supplies you already have on hand before checkout.

- ▶ For free tips on making spot-on tablesaw crosscuts, see woodmagazine.com/perfectcrosscut.
- ▶ For a free video on how to eliminate router-burn marks, visit woodmagazine.com/removeburn.
- ▶ For a small fee, get a complete guide to mastering your router at: woodmagazine.com/masterrouter.



Have you built a marble run for the ages? Shoot a quick video of it in action and share it with us on woodtube (woodmagazine.com/woodtube).

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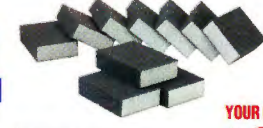
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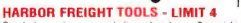


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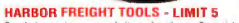
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How to
set up and use

Keyhole Bits

These handy cutters let you hide the fasteners for wall-hung projects.

When you want to hang a shelf, picture frame, clock, or candle sconce on a wall but don't want the mounting screws to show, use an inexpensive keyhole router bit (they cost about \$8–\$25 each) to cut screw slots instead. Then, when you hang the piece, it will appear to float on the wall. And, with keyhole slots you don't need special hardware. Once you've got the tools set up, you can cut multiple slots quickly and easily. Here's how.

Table-rout for precise slots

First, choose a keyhole bit with an entry-hole cutter slightly larger in diameter and thickness than the head of your screws. The slot cutter should be slightly larger

than the screw's shank. (Doing all this allows the screw to drop in and slide along the slot easily.)

These slots demand precision—especially when using more than one—because if they're off by a little, your project could hang crooked. So we like to rout them on a router table; a handheld router could veer off course while cutting, compromising the slot.

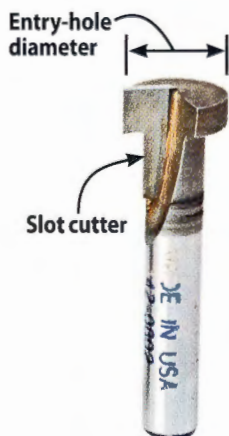
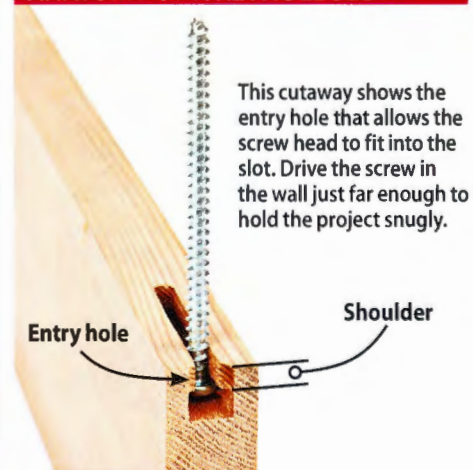
One or two slots should hold most projects sufficiently. To make keyhole slots, first lay out their locations. For projects with a single horizontal keyhole slot, locate the centerpoint of the project in the middle of the slot to allow you to adjust it for level. For a single vertical slot, make sure it's centered side-to-side and located on the upper half of the project.

Next, decide where to plunge the entry hole for each slot. For a keyhole slot that will be on a vertical element of your project, make sure to locate the entry hole at the *bottom* of the slot. For horizontal slots, it doesn't matter which

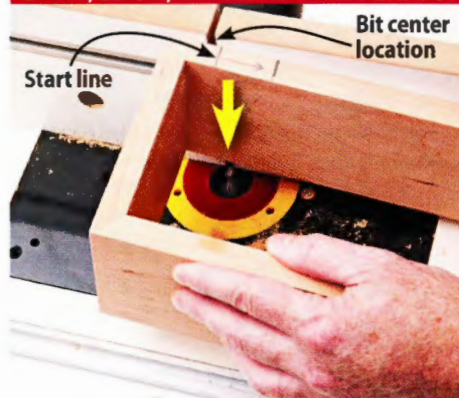
direction you plunge and cut as long as you do all slots the same. Mark the center of the entry hole and transfer that "start line" to the front of the workpiece.

Install the bit in your router table, and set its height to leave at least a $\frac{3}{16}$ "-thick shoulder. (See the keyhole slot *below*.) Position the fence to center the

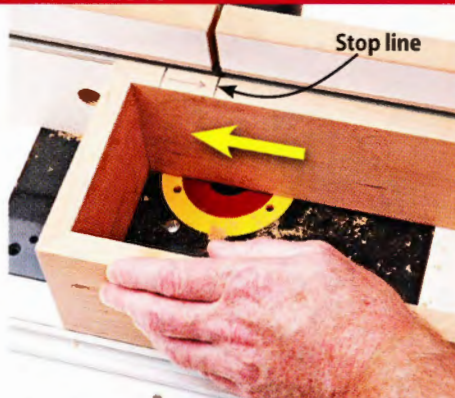
ANATOMY OF A KEYHOLE SLOT



DROP, SLIDE, AND STOP FOR PERFECT KEYHOLE SLOTS



With one end resting on the table and against the fence, lower the project onto the bit, keeping the "start" line aligned with the bit center.



With the project back flat on the tabletop, slide it along the fence—always from right to left—until the "stop" line meets the bit centerline.

AIM FOR A SNUG FIT



Drive screws into the wall to align with the plunge holes. Screw heads should stick out from the wall slightly more than the shoulder thickness.

bit on your workpiece's thickness. Mark a "stop line" across your workpiece's top edge to indicate where you'll stop routing the slot. In most cases, 1-1½" proves sufficient for slot length. Now mark a line on your fence that aligns with the center of the bit, such as the one shown *above*.

Now rout the slots

With the router running at maximum speed, place the workpiece above the bit and against the fence with the start line and bit centerline aligned. Gripping it tightly, slowly pivot the project down onto the bit, as shown *top left*. Once the project rests on the tabletop, slide it to

route the slot, stopping when the stop line reaches the bit centerline (*center*). Without moving the project, use one hand to shut off the router. Wait for the bit to stop spinning before backing the board off the bit. Failure to do so could damage the slot and project. Repeat for the remaining slots. 🌲

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71

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As American as...plywood?

My buddy was talking about building a project from something called ApplePly. Is this an actual product, or am I being hoodwinked?

—Lenny Bostic, Grayling, Mich.

ApplePly is legit, Lenny. Similar to imported Baltic-birch plywood, ApplePly is a premium plywood made from thin layers of birch and faced with various species of veneers. Made by States Industries in Oregon (thus the play on apple pie), it has few voids between layers and comes in thicknesses from 1/4" to 1 1/2". Since its debut in 1984, ApplePly has been used mostly for large-scale, high-end professional and industrial purposes (retail displays, architectural interiors, etc.). But in recent years it's become a popular



Photos courtesy of States Industries

choice for professional craftsmen and hobbyists making studio and contemporary furniture, often with the edges highlighted, as shown at right, rather than covered with edge banding.

Although you can buy 4x8' sheets through distributors around the U.S. (find one at statesind.com), you can also order it in smaller sizes online at buyappleply.com.

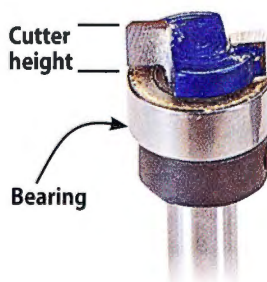


Dado cleanup on aisle 4!

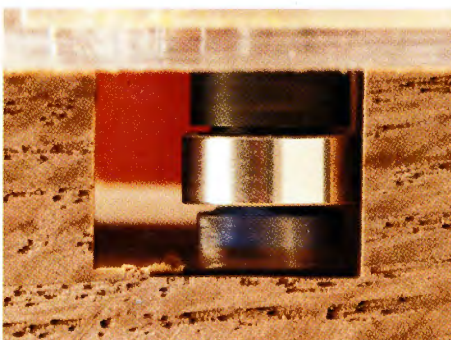
How can I cut dados with smooth, even bottoms using my tablesaw dado set? My set leaves ridges even though I just had it sharpened.

—Walter McCoy, Salina, Kan.

Unfortunately, Walter, very few stacked dado sets leave a perfectly smooth, flat channel, even when brand new. In most cases, it's not a big deal because you'll never see the joint after you've assembled the project. But when you need it dead flat, use a dado cleanout bit, shown above, in your handheld router. These bits have a shallow cutter, 1/8" to 1/4" in thickness, leaving room on the dado's shoulder for the bearing to register against. If your dado needs to be a specific depth upon completion, be sure to deduct the to-be-routed depth when setting the height of your stacked dado set.



The stacked dado set that cut this channel left ridges in the bottom caused by slight height variances between chippers and blades.



To remove the ridges, set a cleanout bit to shave 1/32" or so from the dado bottom. Holding the bearing against the shoulder, rout down and back.

Will my finishing solvents go bad over time?

Do solvents, such as denatured alcohol, mineral spirits, acetone, or lacquer thinner, ever go bad or have a "best-if-used-by" shelf-life?

—Mark Thomas, Galveston, Texas

Mark, we posed your question to Bob Flexner, a leading authority on all things finishing, and he says that solvents—if stored in their closed containers—never lose their ability to thin or clean up finishes. However, if left open, solvents do evaporate.



Ask WOOD

Make quick work of painted signs

I'm making signs with my handheld router, and I plan to paint the recessed numbers and letters but leave the top bare with a clear finish. How can I speed up the time-consuming process of painting each character individually with a small brush?

—Fred Johnson, Couer d'Alene, Idaho

If you have a surface planer, drum sander, or even a portable sander, Fred, then you have a simple, quick method within your grasp. First, spray-paint the characters, as shown *below*, preferably a color that will contrast with the finished wood tone. Be sure to spray from several angles to coat the sidewalls—it might take several coats.

When the paint has fully dried, plane or sand the sign to remove only enough material to reveal clean wood, as shown at *bottom*. Take light passes ($\frac{1}{64}$ " or less) to avoid tearing out the grain, especially around the characters.



continued on page 74

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Ask WOOD

Bring the heat to clean up clamps

How can I remove dried-on glue from my bar clamps?

—Michael Washburn, Irvine, Calif.

When you can't just pop glue off with a putty knife, Michael, throw in a little heat or moisture. We get the best results using a heat gun, as shown *below*, to soften the glue; it peels off easily once warm enough. If you don't have a heat gun—they sell for about \$40 to \$70—try a common hair dryer. It might take longer, though, depending on its heat output.

You can also soften most wood glues by wrapping a hot, wet towel around the affected area. You'll likely need to repeat the application a few times until the glue softens sufficiently, then scrape it off. Afterward, dry the clamp thoroughly to avoid rust and corrosion.



Start the heat gun at its medium heat setting and blow hot air on the glue for a couple of minutes; then scrape it off with a putty knife.



Saturate a washcloth with hot water, wring out most of the water, and then wrap it around the clamp bar. Repeat when the cloth cools.

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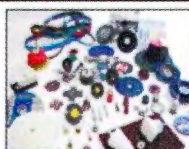
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What's up with this unusual dovetail joint?

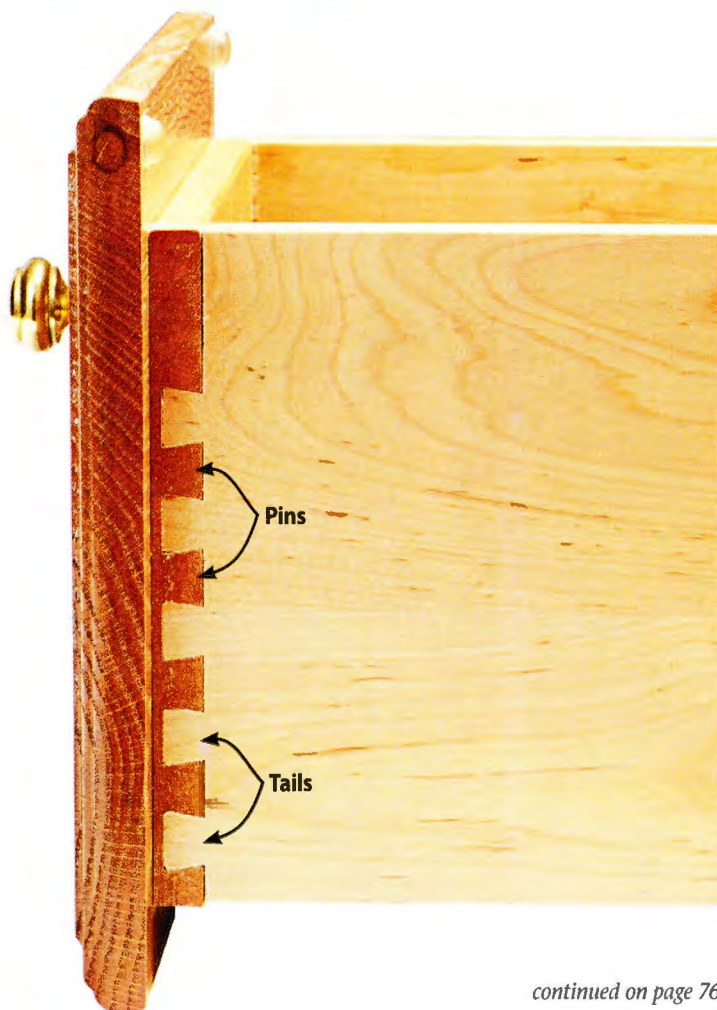
I bought a bathroom vanity with dovetailed drawers, as shown *below*. Why do the drawer joints have such a wide pin at the top?

—Herb Miller, Chandler, Ariz.

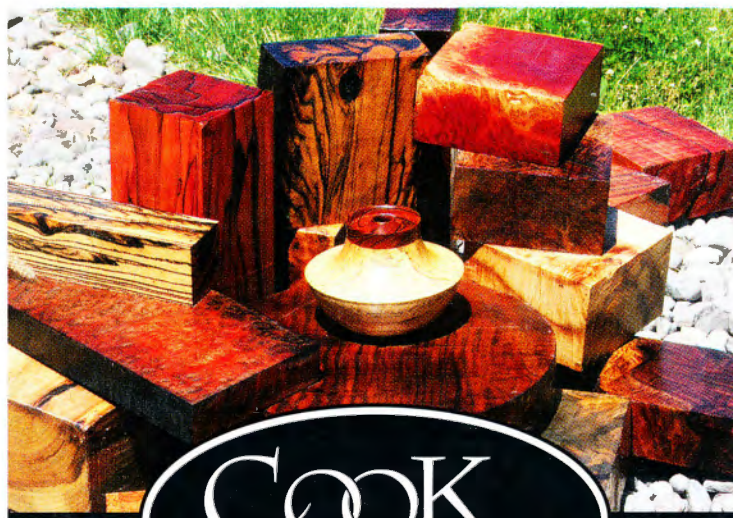
We haven't seen that look before, Herb, but the joint appears to be machine-cut using a jig or production cutter. Without knowing the maker of the drawer or vanity, we can only speculate why it was made that way. So here are a few possibilities:

- ▶ Those drawer joints were cut on a machine that typically spaces the tails 1" apart. To avoid leaving a too-narrow pin at the top that might split or break off, the manufacturer opted instead to skip the last tail, leaving the wide pin.
- ▶ The builder had a dovetail jig set up for a drawer size shallower than your drawer, and either was unable to, or did not want to, alter it for this deeper drawer. Instead, he simply cut the tails and pins for the jig as it was set up, and assembled the drawer with the top inch or so as a simple butt joint.
- ▶ The builder chose that pattern simply for aesthetic purposes.

Regardless of the reason, the joint should prove strong enough to hold the drawer together for decades (as long as the original glue bond was solid). Readers, any further ideas? Let us know by sending your best ideas to askwood@woodmagazine.com.



continued on page 76



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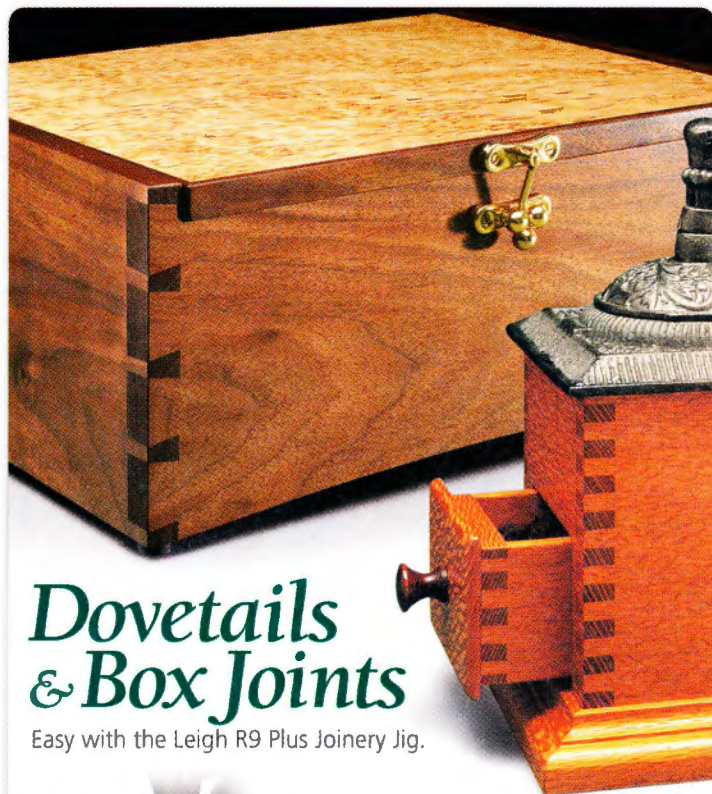


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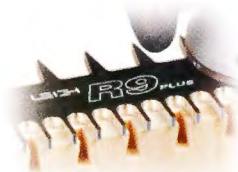
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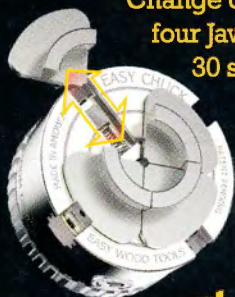
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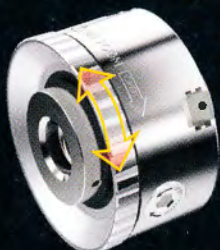
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Here's to the screw, Mr. Robertson!

Your article "Choose the Right Screw for Today's Job" (July 2009, Issue 191) praised the square-drive screw as a modern replacement for slip-prone, slotted- and Phillips-head screws. But aren't those the same Robertson screws that we Canucks have been using for more than a century?

—Jay Owens, Edmonton, Alta.

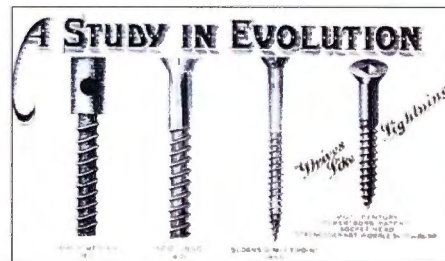
You're correct, Jay. The Robertson, or square-drive screw, which only recently gained acceptance in the United States, has been favored in Canada for decades. Inventor Peter Lyburner Robertson came up with the idea in 1908 after cutting his hand with a slotted screwdriver.

The head features a slightly tapered square socket making it self-centering, easier to drive one-handed, and slip-resistant. Because it sped up production with less chance of product damage, the manufacturing sector loved it, making Robertson's screw an instant hit.

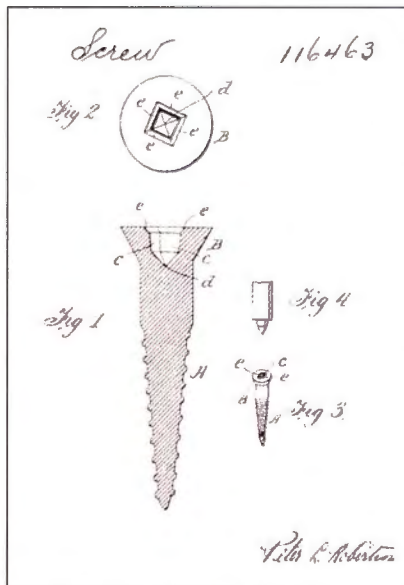
Most historians attribute its lack of popularity in the United States to Henry Ford. Having been nearly bankrupted by shady European licensees, Robertson refused to license his invention to Ford. Without a guaranteed supply, Ford turned to the Phillips-head screw, cementing its reign in American industry.

The company that Robertson created to produce the screws and screwdrivers (Robertson Inc., robertsonsscrew.com) remains in business today, with its headquarters in Milton, Ontario, where it was founded.

In 2007, the Canadian Broadcasting Company placed the Robertson as #7 on its list of the 50 greatest Canadian inventions, directly behind #6, the pacemaker, and #5, the Wonderbra. Oh, Canada! 🍁



A vintage brochure for the Robertson screw boasts its lineage from and improvements upon the Archimedian screw.



A drawing from the original patent form for the Robertson screw illustrates the slight taper of the square head and the proposed mating screwdriver.



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The feed-belt speed control has a built-in sensor to automatically slow

the belt if your workpiece bogs down the drum. And a contoured drum hood with 4" port makes dust collection better than any drum sander I've used.

The 19-38 comes with the open-leg stand shown, but the infeed/outfeed tables (\$90) and casters (\$40) are optional. Three-packs of replacement sanding belts sell for \$25.

—Tested by Bob Hunter,
Tools Editor



19-38 drum sander

Performance	★★★★★
Price	\$1,400

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About our product tests

We test hundreds of tools and accessories, but only those that earn at least three stars for performance make the final cut and appear in this section. Prices are current at the time of article production and do not include shipping, where applicable.

The quietest air compressor you'll never hear

Oil-free air compressors typically make some of the loudest noise in the shop, peppering the air in the 85–95-decibel range. By comparison, oil-lubricated compressors hum along at a much-quieter 70–80 dB. But this Rolair oil-free compressor sounds more like a bass-boat trolling motor than an air compressor, whispering along at a mere 62 dB.

The secret? Rolair uses a two-cylinder pump running at 1,725 rpm—half as fast as single-cylinder units. Still, the JC10 refills quickly, and has a sophisticated two-valve pressure system—a check valve to seal the tank pressure once full, and a solenoid valve to release the pressure from the pump—so the motor starts under no load. This prevents tripped breakers and should prolong the life of the motor and pump.

Even though the JC10 has a 2½ gallon tank—the compressor in my shop holds 6 gallons—it kept my finish, brad, and pin nailers working without me waiting for it to refill the tank. It cycled on and off more frequently than my regular compressor, but I barely noticed because it's so quiet.

The JC10's robust features build the unit up to weigh 40 lbs, a little heavier than other oil-free compressors of this capacity. And if I could change one thing, I'd tilt the pressure gauges up to make them readable from a standing position. 🌱

—Tested by Bob Hunter, Tools Editor

2½-gallon air compressor, #JC10

Performance ★★★★★
Price \$239

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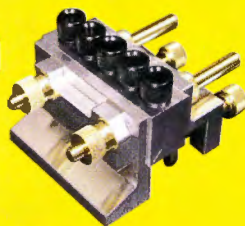
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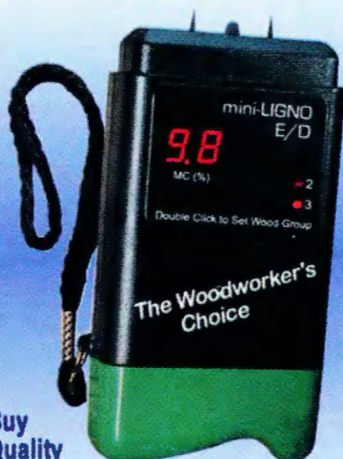
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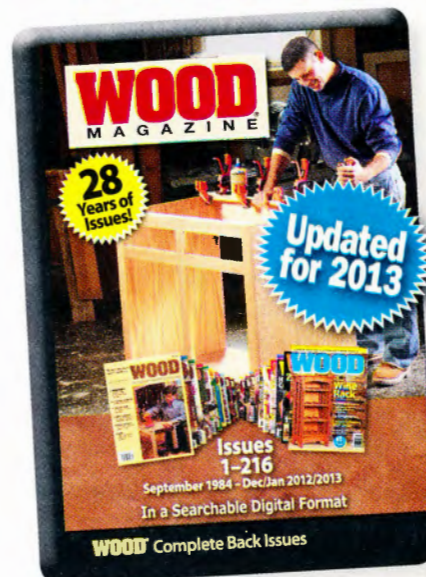


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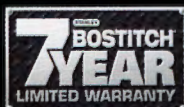
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