ISSUE 224 MARCH 2014

Better Homes and Gardens®

WOOD®

The World's Leading Woodworking Resource

Home-center Lumber Made Gorgeous

TV Table

p.26

47 Shop Tips Inside

Plus More Great Plans

We Dish the Dirt on Low-cost Shop Vacuums

p.52

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- Table tilt: 45° R, 10° L
- Cutting capacity/throat: 13½"
- Max. cutting height: 6"
- Blade size: 92½"–93½" L (⅛"–¾" W)
- Blade speeds: 1800 & 3100 FPM
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- Max. cutting height: 6"
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- Motor: 2 HP, 110V/220V, single-phase, TEFC
- Precision-ground cast iron table size: 17" sq.
- Table tilt: 45° R, 10° L
- Cutting capacity/throat: 16¼"
- Max. cutting height: 12½"
- Blade size: 131½" L (¼"–1" W)
- Blade speeds: 1700 & 3500 FPM
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- Motor: 1½ HP, 110V/220V, single-phase
- Precision-ground cast iron table with wings
- Table size: 25¼" x 40" • Arbor: ⅝"
- Arbor speed: 4000 RPM
- Capacity: 3¼" @ 90°, 2¼" @ 45°
- Rip capacity: 30" R, 12" L
- Approx. shipping weight: 208 lbs.

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- Precision-ground cast iron table with wings measures: 27" x 40"
- Arbor: ⅝" • Arbor speed: 3850 RPM
- Capacity: 3⅛" @ 90°, 2⅛" @ 45° • Rip capacity: 30" R, 12" L
- Quick change riving knife • Cast iron trunnions
- Approx. shipping weight: 404 lbs.

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- 7" inlet has removable "Y" fitting with three 4" openings
- Impeller: 12¾" cast aluminum
- Bag capacity: 11.4 cubic feet
- Standard bag filtration: 2.5 micron
- Portable base size: 21½" x 49½"
- Bag size (dia. x depth): 19½" x 33" (2)
- Lower bags: Plastic
- Powder coated paint
- Height with bags inflated: 78"
- Approximate shipping weight: 170 lbs.

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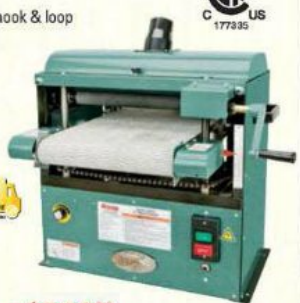
- Sanding motor: 1½ HP, 115V, single-phase
- Conveyor motor: ½ HP, 115V, single-phase, variable speed 5-55 RPM
- Drum surface speed: 2127 FPM
- Maximum stock dimensions: 12" wide x 3½" thick
- Minimum stock length: 8"
- Sanding drum size: 4"
- Sanding belt size: 3" x 70" hook & loop
- Dust collection port: 2½"
- Feed rate: 2.5-17.3 FPM
- Approx. shipping weight: 166 lbs.



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- Motor: 3 HP, 220V, single-phase, TEFC
- Precision-ground cast iron table size: 9" x 72½"
- Max. depth of cut: ⅛" • Max. rabbeting depth: ½"
- Cutterhead dia.: 3" • Cutterhead speed: 4800 RPM
- Cuts per minute: 20,000 (G0656P), 21,400 (G0656PX)
- Approx. shipping weight: 500 lbs.

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$150 shipping

15" PLANERS

- Motor: 3 HP, 220V, single-phase
- Precision-ground cast iron table size: 15" x 20"
- Min. stock thickness: 3/16"
- Min. stock length: 8"
- Max. cutting depth: ⅛"
- Feed rate: 16 & 30 FPM
- Cutterhead speed: 4800 RPM
- Approx. shipping weight: 666 lbs.

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March 2014 Issue 224

In this issue

PLANS

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TOOLS & MATERIALS

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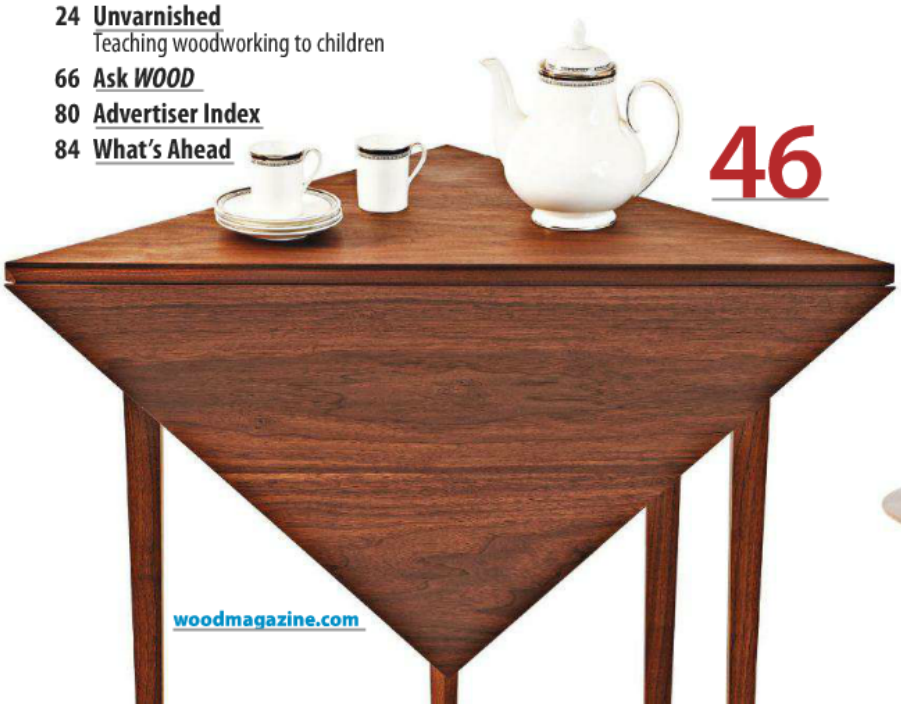
The *WOOD*® magazine difference: We build every project, verify every fact, and test every reviewed tool in our workshop to guarantee your success and complete satisfaction.

DEPARTMENTS



On our website

woodmagazine.com

WIN $10,000 TO TOOL-UP YOUR SHOP

Enter daily to win the "$10,000 Over-the-Top Shop Sweepstakes" from *WOOD* magazine and Woodworkers Guild of America. Get entry details on *page 18* or visit woodmagazine.com/10Kshop.

FIND ANY ARTICLE FAST WITH THE *WOOD*® MAG ONLINE INDEX

No need to wade through stacks of old issues of *WOOD* to find that project article you vaguely remember. Instead, let your computer do the searching at woodmagazine.com/index.

GOT A WOODWORKING QUESTION? YOU'RE NOT ALONE

Woodworking Forums

Title	Posts	New	Latest
General Woodworking Latest Post - Re: Veterans: Sound off!	72455	69580	13m by h
Tools and Tool Buying Latest Post - Re: Router for table	29878	28649	5m a by M
Info Sharing Latest Post - Re: Got a new issue of Wood in the mail last night, or at least I thought I did.....	856	634	2 we by C
Finishing and Refinishing Latest Post - Re: Before we get to your countertops ...	11114	11008	an h by yr
Shop Setup and Design Latest Post - Re: Shelves or cabinets?	1459	1371	Satu by jo
Wood Turning Latest Post - Re: Craft Sale Giveaways	11560	11462	yeste by B
Home Improvements Latest Post - Re: MIND BENDER for 11 NOV 13 "a learning tool"	20721	20679	23m by R
Woodworking Software Latest Post - Re: SketchUp File Attachments	1225	1175	2 we by L
Top Shop Tips Latest Post - Rejuvenate jigs and cross-cut sleds	1461	1259	Wed by to
Free Classifieds Latest Post - Re: Jet 1442vs Lathe	1153	1148	Satu by C
Off Topic			54m

Stumped by a problem in your shop? Help is as close as your computer when you post your question at woodmagazine.com/forums. You can also help a brother—or sister—out by answering other woodworkers' questions.

Better Homes and Gardens®
WOOD®

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HOW TO REACH US

- **For woodworking advice:** Post your woodworking questions (joinery, finishing, tools, turning, dust collection, etc.) on one of our online forums at woodmagazine.com/forums. Or e-mail askwood@woodmagazine.com.
- **To contact our editors:** E-mail woodmail@woodmagazine.com; post on our Facebook at facebook.com/woodmagazine; write to *WOOD* magazine, 1716 Locust St., LS-221, Des Moines, IA 50309; or call **800-374-9663**, option 2.
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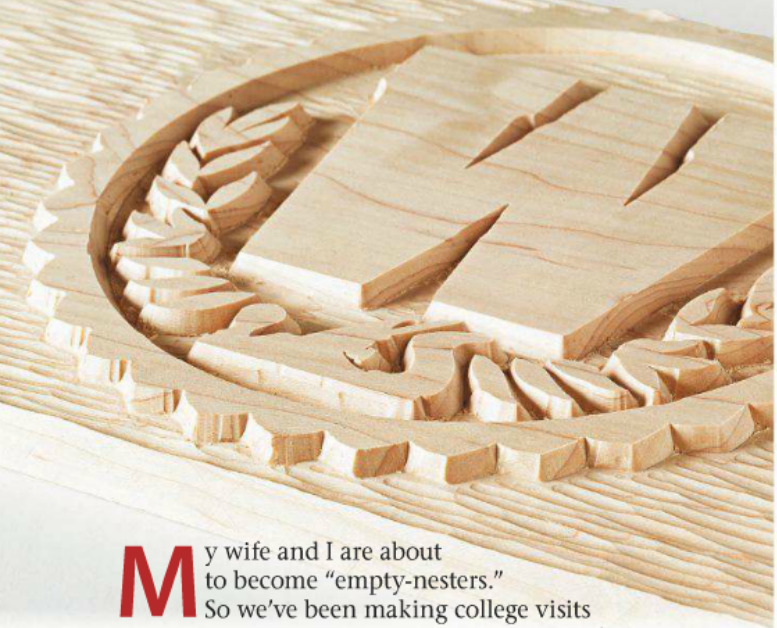
- **Updates to previously published projects:** For an up-to-date listing of changes in dimensions and buying-guide sources from issue 1 through today, go to woodmagazine.com/editorial.

Editor's Angle

Shopping for education



My wife and I are about to become "empty-nesters." So we've been making college visits with our youngest, checking out the vigor of her intended major programs, the quality of campus life, distance to the mall.... Ultimately, she chose a college with a low student-to-teacher ratio, where her major classes are small and taught by full-time, tenured professors. It's a few hours from home, but the personalized attention she'll get from top-notch teachers gives her the best possible chance for success.

You'll get that same experience at *Weekend With WOOD*. Learn basic woodworking skills, such as joinery and finishing, or more advanced techniques, such as sculptural furnituremaking (*a la* Sam Maloof), all taught in small classes by world-class woodworking greats. And it all takes place in the *WOOD*® magazine shops in Des Moines, Iowa. Get more details on *page 23*, and find a complete list of classes and teachers at weekendwithwood.com.

Could you use $10,000?

Silly question. *WOOD* and Woodworkers Guild of America are teaming up to give away a wad of cash to take your shop to the next level. Enter the "$10,000 Over-the-Top Shop" sweepstakes—every day, if you like—for a chance to win at woodmagazine.com/10Kshop. See entry details on *page 18*.

See you in the shop!

Dave Campbell
dave.campbell@meredith.com

Sounding Board

Our bulletin board for letters, comments, and timely updates

Hutch survives Hurricane Sandy

After reading the *WOOD*® cover story about turning stock cabinetry into furniture in issue 209 (Dec/Jan 2011/2012), I set about building a hutch using a stock cabinet base and two wall units.

However, Hurricane Sandy interrupted my build and forced the evacuation of our house in Long Beach Island, New Jersey. When we were able to return to the house five weeks later, I found my Delta Unisaw drowned, and the unfinished hutch doors floating.

Not to be undone by this setback, I returned to the house and completed the project using my benchtop tablesaw. After sanding down and finishing the water-damaged doors, I shipped the project to my son in Pennsylvania where it stands proudly in his kitchen.

—Robert Kirkpatrick, Beach Haven, N.J.

Modified mailbox post brings neighbors together

My neighbor and I were intrigued by the Timber-frame Mailbox Post project in issue 218 (May 2013), but only wanted to build one post for our side-by-side mailboxes. By simply modifying the post's box arm with four mailbox platform supports, we achieved a design that didn't stray too far from the original, but still accomplished our goal. And, true to the original design, we built the post entirely fastener-free with the exception of the screws we used to attach the mailbox platforms. To finish off our post, we topped it with a solar light. We both loved the way it turned out, and I "had" to add a new bandsaw in the process. A win/win!

—Paul Johnson, Westminster, Colo.

Mineral oil a slick tip for checking suction

In the Top Shop Tip featured on page 6 of *WOOD* issue 221 (October 2013), rather than using water in his shopmade manometer, may I suggest using mineral oil, instead? It won't evaporate, corrode, or leave deposits on the device, and as a result will give more accurate readings over long periods of time without the need to refill the fluid.

—Pete Menconi, Sun Lakes, Ariz.

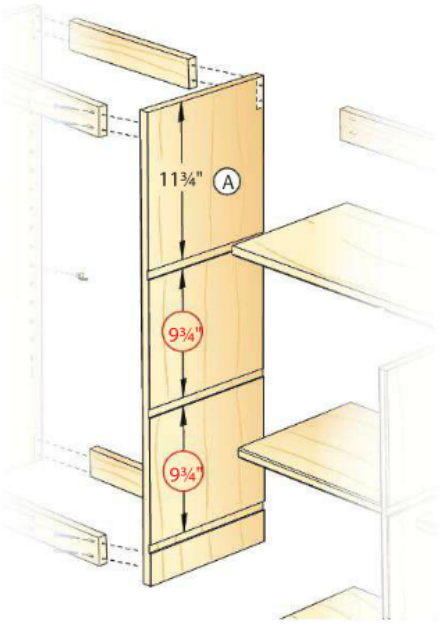
High humidity? Skip this bit tip

A cautionary note in regards to Joe Osfar's shop tip "Think pink to insulate router bits from damage" on page 8 of issue 220 (September 2013): Here in Florida, due to extreme humidity, rigid foam used for holding router bits also holds moisture, which will cause the shanks to rust. I learned this the hard way, and then switched to using a fluorescent light diffuser to hold my router bits.

—Ed Amsbury, Gainesville, Fla.

Country Sideboard

In issue 222 (November 2013), Drawing 1 on page 24, the distance between dadoes on the sides (A) should measure 9¾".



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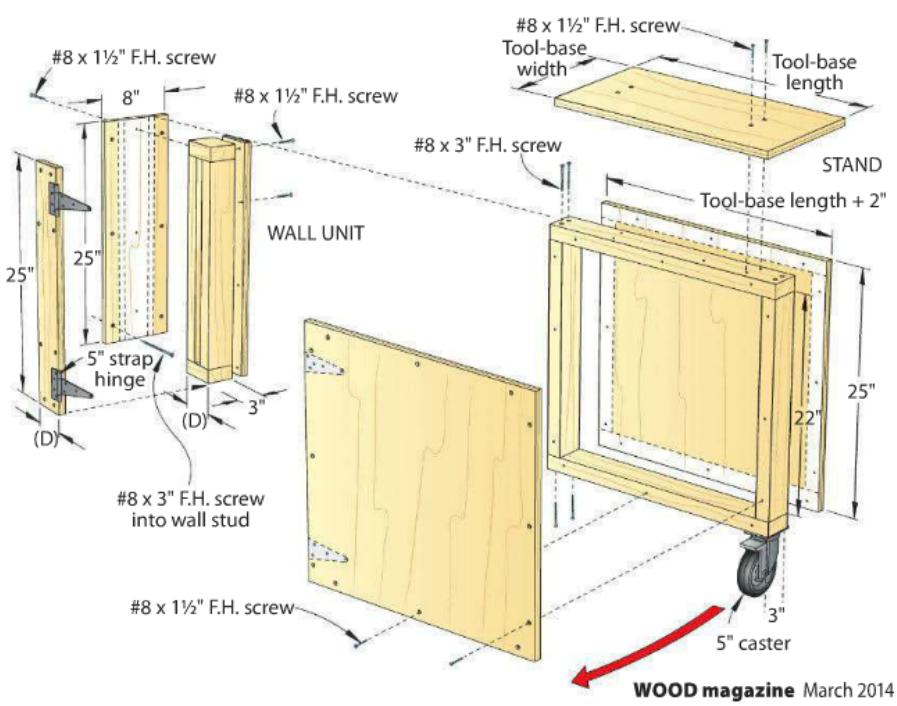
Great Ideas
For Your Shop

Swing-out, Fold-flat Tool Stand

When *WOOD*® reader Dan Christen of Boise, Idaho put together his garage shop, he wanted permanent mounts for benchtop tools that could easily move out of the way when it came time to park the cars. His swing-out tool stand accomplishes both tasks.

To make one, first measure the width of the tool base you want to mount, divide in half, and subtract 2" to find the depth (D) of the wall unit. Then, build the frame of the stand and wall unit using 2×4 stock ripped to 3" wide. Glue and screw ¾" plywood to the faces of the tool stand and wall unit, sanding or flush-trimming any overhanging edges. Connect the wall unit and the tool stand with strap hinges, attach the locking caster, and mount the assembly to the wall by screwing it into a stud. (If you're concerned about the tool stand holding up to a heavier tool's weight, cut a wider wall-mounting plate to reach two studs.) Finish the stand by screwing a plywood platform—sized to support the tool you'll use with it—to the stand's top. Bolt the tool to the platform, and you're set.



More Resources

Check out these other projects from the Fold-flat series:

- Fold-flat sheet-goods mover: woodmagazine.com/FFsheetgoods
- Fold-flat sawhorses: woodmagazine.com/FFsawhorse
- Fold-flat work table: woodmagazine.com/FFworktable

Develop Your
Shop Skills

4 Steps to a Perfect Polyurethane Finish

You can achieve a lustrous, smooth surface without using specialized tools or spray equipment. Just follow these easy steps.

Prepare your workpiece

A glass-smooth finish begins with a level, even surface. To achieve this on open-grain woods (oak, ash, walnut, or mahogany, for instance), first fill the pores with a wood-grain filler [**Photo 1**].

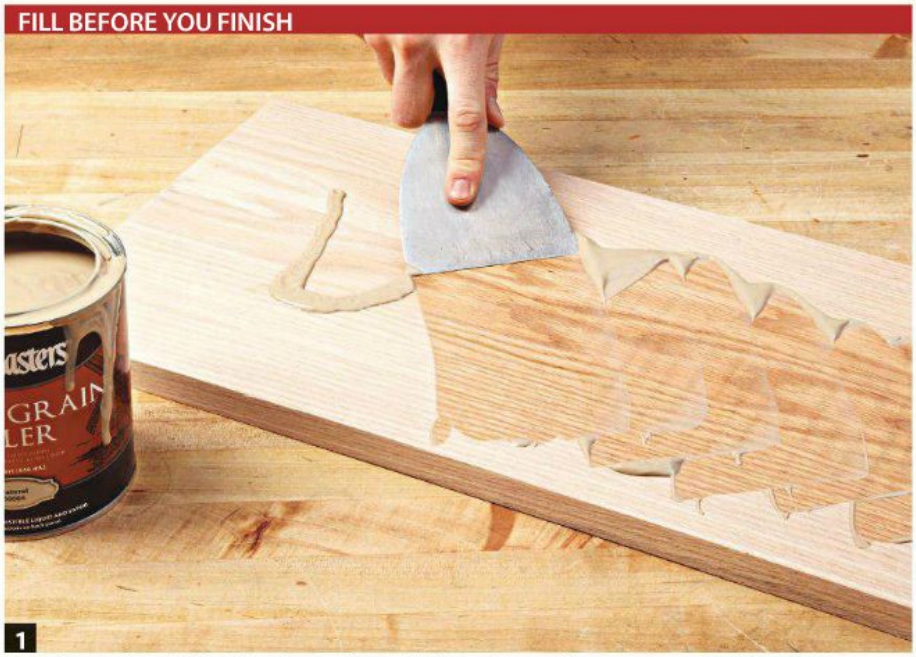
***Quick Tip!** Wood-grain fillers come in different colors; you can choose one to blend with the color of the workpiece for an even appearance, or select one that contrasts for more pronounced grain.*

Scrape off the excess and let dry. Sand the workpiece to 220 grit.

Apply stain and poly

Move to a low-dust setting: somewhere without lots of foot traffic and with dust-free surfaces. You can create such an area by hanging an inexpensive vinyl shower curtain in a corner of your shop. With your workpiece wiped clean, apply stain [**Photo 2,** *next page*]. (Skip the stain if you intend to leave your workpiece natural-color.) Let dry.

FILL BEFORE YOU FINISH

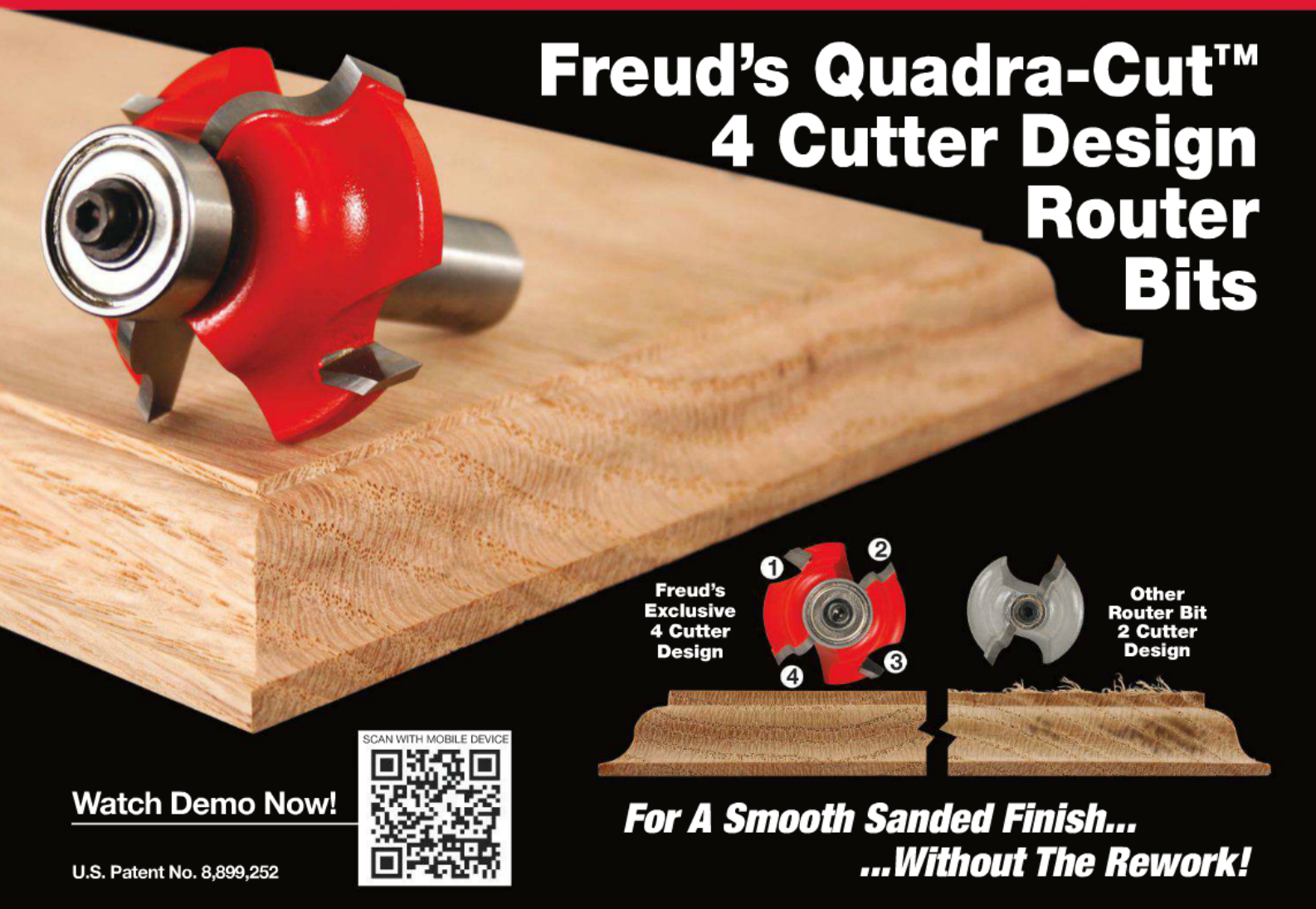


1

Pour the wood-grain filler directly onto the workpiece and spread it across the grain with a plastic putty knife or plastic scraper to force it into the pores.

continued on page 10

What's The Secret To Flawless Edge Profiles With NO REWORK?



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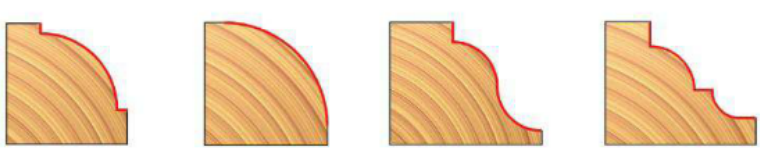

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Prepare the polyurethane by reducing it about 10 percent with mineral spirits, unless you're using water-based polyurethane, which doesn't need thinning. Thinning the polyurethane makes it flow on more smoothly and reduces brush marks.

***Quick Tip!** To reveal flaws (bubbles, brush marks, etc.) as you work, shine a light at a low angle across the surface.*

Brush on three thin coats with a foam brush *(previous page)*. (You can use a natural bristle brush with oil-based poly, but keep an eye out for loose brush hairs.) Coat the entirety of your workpiece, but don't brush excessively or you'll create areas with too little polyurethane. Allow each coat to dry fully. To give the subsequent poly layers something to bond to, sand lightly between coats with 320-grit sandpaper wrapped around a hard block. ***Note:** The first coat needs the most sanding to appear smooth; don't worry if it doesn't look as flawless as you'd like at first.*

After the third coat, sand with 320-grit, then 400-, and finally 600-grit sandpaper. Sand in alternating directions with each abrasive to make it easier to see whether you've removed the scratches from the previous grit. Sand with the grain on the final pass. Then, wipe off the dust with a rag dipped in mineral spirits.

Put on the polish

The final coat gives your workpiece its smooth feel and flawless appearance, so give it extra attention. Spray on this coat using an aerosol polyurethane and let it cure overnight [**Photo 3**]. Then, remove any dust nibs with 1,500-grit sandpaper or a piece of brown paper bag. Finally, using a soft cotton rag or polishing pad, buff the finish to a high shine using automotive paste wax [**Photo 4**], which has fine abrasives that polish the finish even further.

More Resources

- Choose your finishing brush wisely: **woodmagazine.com/brushwithgreatness**.
- Watch a filled-pore finish in progress: **woodmagazine.com/filledporevid**.
- Find more finishing tricks here: **woodmagazine.com/finishingtricks**.

ADD A DOSE OF COLOR

2

Apply an even coat of stain to your workpiece, making long brushstrokes and overlapping the edges for full coverage. Wipe off any excess stain.

SPRAY ON THE FINAL COAT

3

Hold the spray nozzle 12–16" from the workpiece and sweep the can across the surface without stopping. Apply only one thin coat.

WAX ON, WAX OFF

4

Apply a small amount of automotive paste wax, working in the grain direction to hide fine scratches. Buff off the excess with a clean, soft rag.

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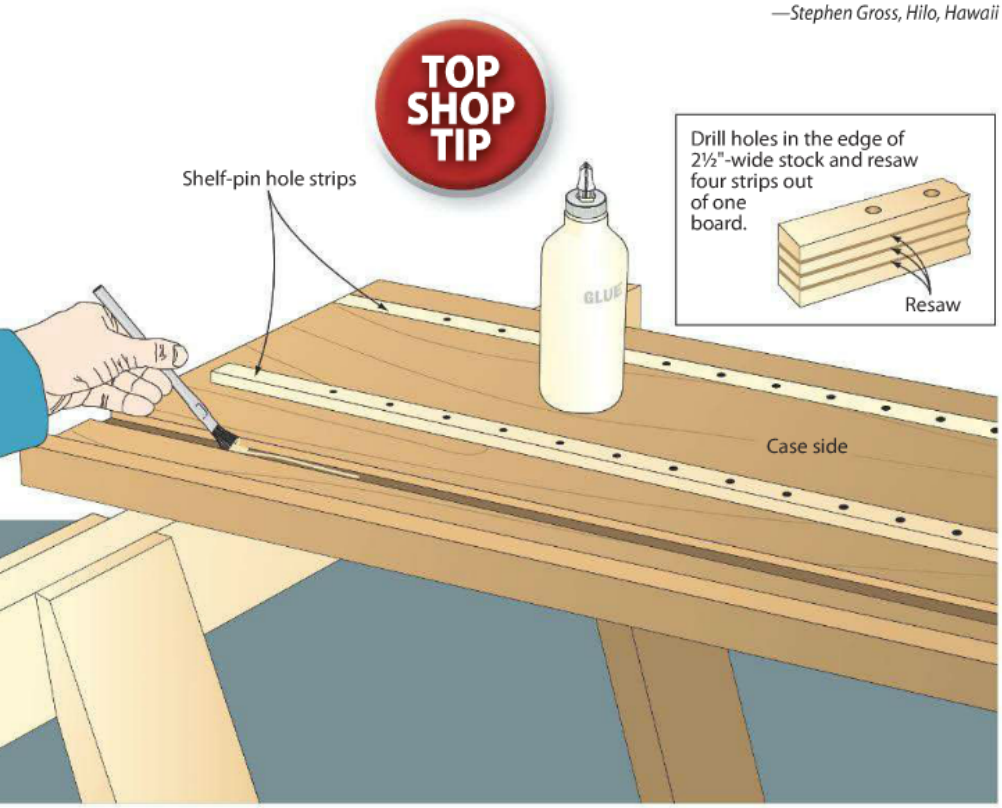
Drill precise pin holes four times faster

My large bookcase project would have required drilling dozens of shelf-pin holes and a jig to ensure those holes matched up. To save time and improve accuracy, I came up with this handy technique that creates perfectly aligned pin holes.

First, machine ½"-deep, parallel grooves in the case sides where you want the shelf-pin holes. Then, cut 2½"-wide stock (you can laminate thinner pieces for this) thick enough to fit in the grooves. Lay out the shelf-pin holes on the edge of this stock, drill through-holes on the marks, and then resaw the stock to make four strips of equal thickness. Using a full-kerf blade will yield shelf-pin hole strips that stand just 1/32" proud of the grooves—just enough for sanding flush. Glue all the strips in the same orientation and each set of holes will match up perfectly.

—*Stephen Gross, Hilo, Hawaii*



For sending this issue's Top Shop Tip, Stephen receives a JET 8" Bench Grinder with Norton Wheels worth $330.

HAVE A WOOD-WORTHY TIP?

Tell us how you've solved a workshop stumper. If we print your tip, you'll receive up to $150. And, if the idea garners Top Shop Tip honors, we'll also reward you with a tool prize from Jet Tools worth at least $300! Send your best ideas, along with photos or drawings and contact info, to shoptips@woodmagazine.com or **Shop Tips, WOOD magazine, 1716 Locust St., LS-221, Des Moines, IA 50309-3023.** Because we try to publish original tips, please send yours only to WOOD® magazine. Sorry, submitted materials can't be returned.

 continued on page 14

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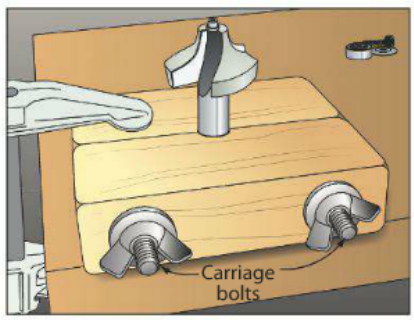
Shop Tips

Scrapwood holder puts the pinch on router bits

When sharpening a router bit or removing its bearing, I used to grip the shank with locking pliers to hold it tightly. But this scrapwood fixture does that without damaging the shank.

To make one, drill a center hole (either ¼" or ½" depending upon the bit shank's diameter) through a scrap of 2×4 stock. Drill two bolt holes through the scrap's width, and then rip the scrap through the center hole. Bolt the two halves back together loosely, insert your router bit into the center hole, and tighten the wing nuts. Clamp the holder to your benchtop and you're set.

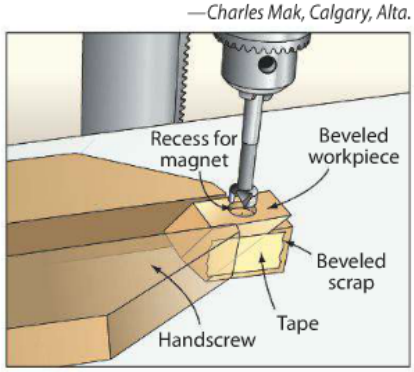
—Joe Wernicke, Indianapolis



Drill down on angled faces

One of my projects required drilling a recess for a magnet on an angled face, so I came up with this little trick to do it without tilting my drill-press table. Just cut a complementary angle in a piece of scrap to raise the workpiece surface parallel with the drill-press table. Tape that scrap beneath your workpiece and clamp both pieces between the jaws of a handscrew for better control.

—Charles Mak, Calgary, Alta.



continued on page 16

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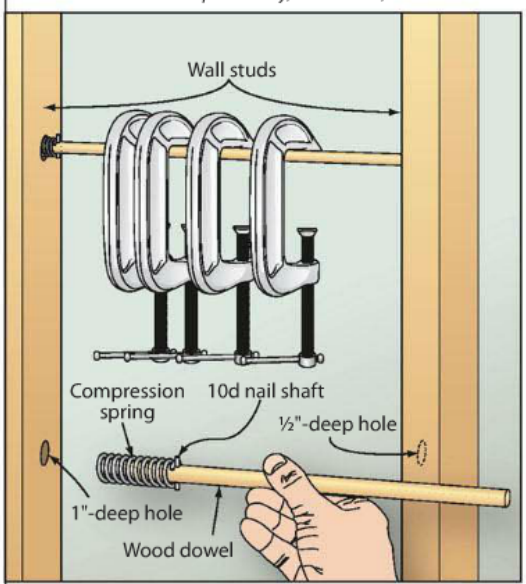
Shop Tips

Spring-in clamp rack hangs between studs

In need of a place to hang clamps, I suddenly had an idea: Use the space between my shop's exposed wall studs. Begin by cutting a dowel 1" longer than the space between the wall studs. Mark 1" from the dowel's end and drill a hole through the dowel to fit a 10d nail (with the head trimmed off). Epoxy the nail into the hole, and then place a compression spring over the end, abutting the nail. Drill holes in mirrored faces of the studs, slip the dowel's spring-covered end into a hole, and let the spring push the dowel tight into the opposite hole.

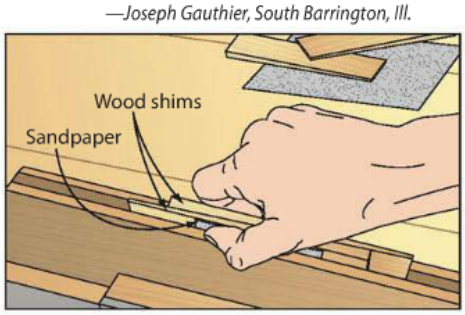
—Ralph Mullally, La Crescent, Minn.



Shims make slim slot sanders

For a quick, customizable sanding block that perfectly fits inside a groove or dado, just wrap a pair of wood shims with a piece of sandpaper. To widen the block, simply slide the thicker ends of the shims closer together.

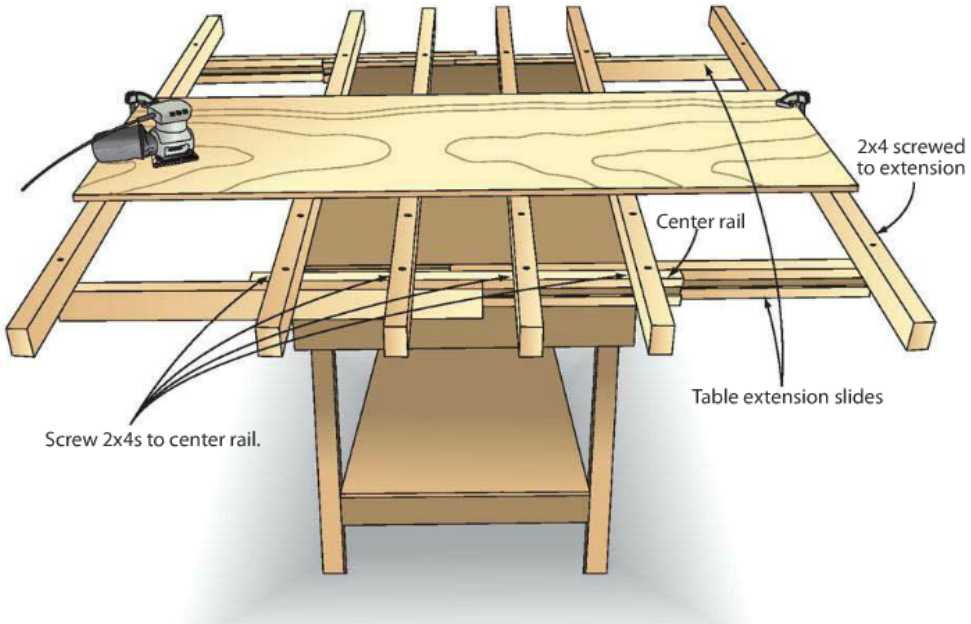
—Joseph Gauthier, South Barrington, Ill.



Widen a workbench with extension slides

Though my old workbench worked well enough for most ordinary tasks, it just wasn't large enough to accommodate large sheet goods. At least it wasn't until I mounted a salvaged set of 24" table extension slides to each end. The 2×4s screwed on edge, as shown, provide a worksurface with gaps wide enough to cut between without damage. With the extensions in the closed position, I simply lay a sheet of plywood atop the 2×4s to make a solid, gap-free worksurface.

—Dennis Kozian, Sterling Heights, Mich.



continued on page 18

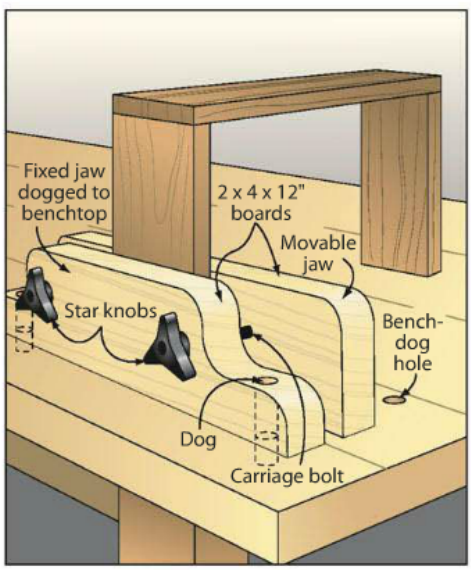
Shop Tips

Bench-mounted clamp holds up its end of the deal

Having worked for years as a draftsman and woodworker, I often wish for an extra hand during project assembly, especially when working with large vertical pieces. I've found it a big help to mount a shop-made clamp like this one to my workbench. (I used bench dogs, but screws will work if your bench lacks dog holes.)

Unlike a typical bench vise, project parts held in this clamp still rest on the benchtop, making it easy to keep parts parallel during assembly. And you can build it using only 2×4 stock, a couple of carriage bolts, and a pair of star knobs.

—Tony LoRusso, Wolcott, Conn.



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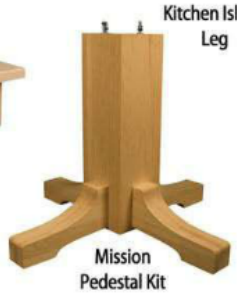

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Fixing
Workshop Goofs

Repairing Dowel-Jig Mistakes

Don't throw away that workpiece just because of a little accident. Get back on track with these quick fixes.

GOOF: You've drilled too deep and blown through.

Okay, you forgot to set a depth stop, and your drill bit popped through the workpiece leaving an unsightly error, like the mitered frame piece shown *above*. If you're working with small or inexpensive stock, no sweat: just make a new workpiece. But if your wood is expensive, or the last of a great set of matched boards, and you really want to save it, you can repair it so the goof will never be seen.

How to fix it: Cut away the damaged portion of your workpiece and replace it with new stock. Do this by rabbeting away the goof and then gluing in a filler strip. Or, as with the bloodwood frame shown at *right*, rip off the damaged section and glue on a matching piece.

FIX: PULL THE OL' SWITCHEROO

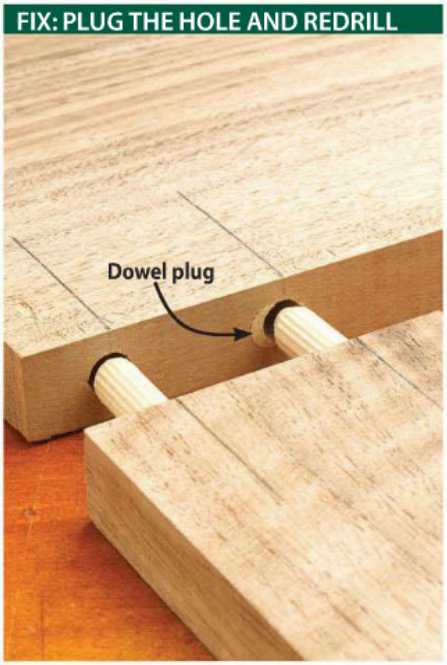
When cutting away a section, make the splice along a profile line or contour, if possible, to help mask the repair glue line.

GOOF: Your holes are off the mark or too large.

It can happen to anyone: You've misaligned the dowel jig, and now your dowel holes on one workpiece don't match up with those on the mating piece. Or maybe you used the wrong drill guide bushing and bored holes too large for the dowels you want to use.

How to fix it: Simply glue in a hardwood dowel that fits the errant hole, let it dry, and then trim and sand it flush. Now, line up your dowel jig to the correct mark, using the right size drill bit and matching guide on the jig, and drill a new hole.

FIX: PLUG THE HOLE AND REDRILL

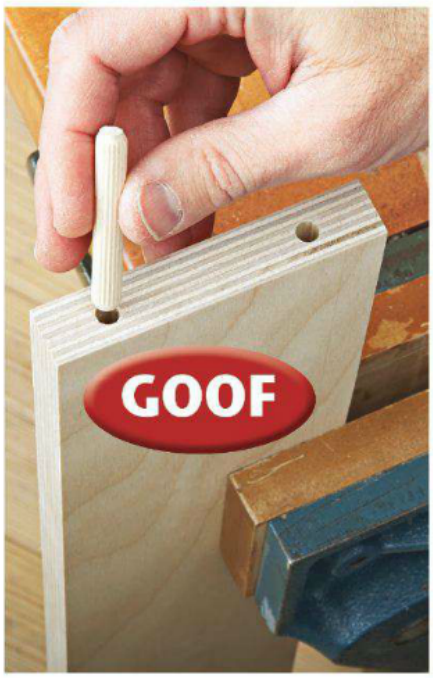


The crescent-shaped section of the plugged dowel proves as solid as the workpiece, and it will be hidden within the joint.

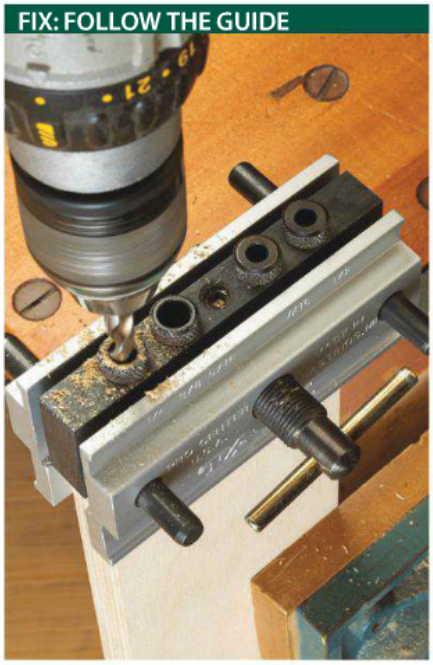
GOOF: Your dowel is too big for the drilled hole.

In any other drilling application, trying to redrill a too-small hole larger would be a problem, because the bit will not center itself on the hole. But not here.

How to fix it: Find the correct size guide and line it up with your mark over the too-small holes. Chuck the appropriate bit into your drill and bore new holes.



FIX: FOLLOW THE GUIDE



The dowel jig's sleeve will keep your bit on target, allowing you to enlarge the hole and still keep it centered on the mark.

Birch Basics

Solid, and usually understated, birch has been a standard in furniture production across continents and generations.

While America's native northern tribes preferred the white, or paper, birch (*Betula papyrifera*) for their extraordinarily engineered, lightweight canoes, it was *Betula alleghaniensis*, the yellow birch tree, that greeted colonial settlers and quickly became a staple for furnituremaking. The hard, close-grained wood found its way into Windsor chairs, tables, and any other furniture that was destined to see hard, daily use.

With a nearly white sapwood and cream-to-tan heartwood, yellow birch is nearly as dense as hard maple, but can prove brittle. So take care to back up cross-grain cuts, routed profiles, and drilled holes. Because birch can be prone to blotchiness when dyed or stained, test your finish on scrap before you start your project.

The use of solid yellow-birch in North America has slowly succumbed to hard maple's superior hardness and soft maple's superior workability. Reduced availability outside of birch's northeastern region has subsequently raised its price to a point on par with hard maple. Although you'll still find it regularly stocked at hardwood retailers and lumberyards, it is not always commercially milled to sizes other than the most-profitable 4/4 thickness. But because birch is rarely sorted, you can sometimes score highly figured wood, *right center*, on the cheap just by picking through the bin.

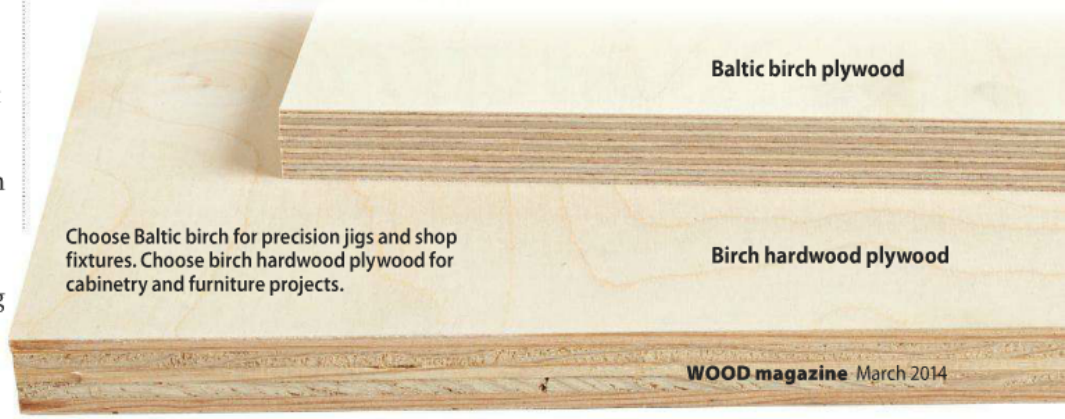
Baltic blurs the birch lines

In modern woodworking circles, birch's standing has seen a boost from the good reputation of Baltic birch plywood. Named after its region of origin (near the Baltic Sea) rather than any specific species of birch, the premium plywood is created from ultrathin, void-free birch layers. Sporting a nearly white, even tone, the plywood provides consistent quality and has become a mainstay in shop jigs, drawer boxes, and utility projects.

Don't confuse Baltic birch plywood with birch hardwood plywood. The domestic version, usually made from yellow birch, saw a popular resurgence in the 1920s when European varieties gained prominence through Scandinavian designers and their modernist designs. At about 60 percent of the cost of the premium Baltic birch plywood, it remains a low-cost favorite for cabinets.

As with other plywoods, a flood of Far-East imports has lowered the cost and quality of both of these plywoods. If possible, ask your hardwood retailer to steer you away from those. Can't find birch locally? Search for "birch" at woodworkerssource.com.

Flame, birch's prized figure, often finds its way into high-end veneered furniture, cabinetry, and musical instruments.



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Straight talk from the WOOD-wide web

Passing Along the Craft

Steve Schuler intentionally turned his shop into a kid-friendly environment. All hand-tool work happens at this shared bench inside the house, while the machines are in a separate location.

Like most woodworkers, I love escaping to the quiet solitude of my shop. I consider it my sacred space. But I also want to pass on my skills to the next generation of woodworkers. Over the last six years of fatherhood, I have discovered some ways to share my passion for woodworking with my children.

Let them watch

Children learn by imitation. Seat them on chairs or stools where they have a clear view of your hands. Allow them to rummage through your toolbox. Let them play in the sawdust and shavings, and give them the freedom to explore your shop while you work in it. Children learn far more from what we do than from what we say. Even so...

Talk as you work

Name the tools you are using, and explain what they do. Children who are willing to watch you work will ask questions naturally, so be willing to pause your work to answer questions in detail. While they may not understand everything you say, they will understand more than you expect.

Let them putter

Build a small toolchest and fill it with kid-friendly hand tools. Then encourage children to try out the tools on pieces of scrap. Demonstrate the rules of correct use, and observe the child using the tool. Gently correct technique when necessary, but as much as you can, just stand back and watch.

Emphasize practice over projects

Be content to let children fill a board with holes or whittle a stick down to dust. They are not building projects; they are building skill.

When a child does suggest a project, go along with it. Dimension the stock ahead of time for a first project, but leave simple joinery and assembly for both of you to do. Seeing a project come together is as exciting for the child as it is for you.

Build relationships

It can be inconvenient to let a child into your shop. My kids mess up my workspace, and have even broken a few tools. But it is easier to repair a tool than a family tie.

Even if your children never pick up a tool again, they will forever know that they were honored guests in your sacred space, and that you took time to share what was valuable to you. The most important thing you will ever build in your shop is a relationship.

Steve Schuler is an amateur woodworker who lives with his wife and four children in Mobile, Alabama. He blogs about hand tools, books, and kids at literaryworkshop.wordpress.com.

With your supervision, small children can handle eggbeater drills, braces, spokeshaves, and small hammers. Older children can use small hand planes, screwdrivers, carving gouges, and handsaws.

It seems counterintuitive, but never give a child a dull or shoddy tool. It frustrates them as much as it does you. And, increased danger results from the increased pressure required to make a cut.

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Bold, Beautiful TV Table

A sleek and modern flat-screen deserves a sleek and modern stand. Make it in a weekend with these easy plans.

Eliminate the lower shelf (B/G) and shorten the legs and stiles (A, C, and F) by 10" to create a bench instead.

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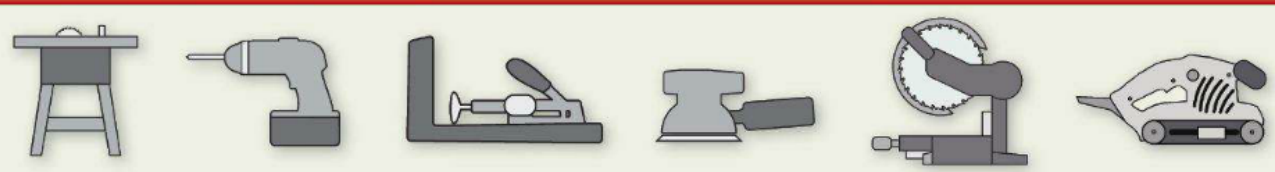
TOOLS NEEDED



No fancy joinery here — only screws and a little glue secure this sturdy and stylish stand. And check out its wood; did you know Douglas fir could look this good? The **Shop Tip** *below* shows how to accomplish this.

All the cutting, all at once

1 Rip the rounded edges off the boards and edge-glue panels for the inner legs (A), shelves (B), outer legs (C), top (D), rails (E), and stiles (F) [**Materials List,** *page 29*].

***Quick Tip!** Once the glue is dry, a belt sander with a 150-grit belt makes short work of smoothing any uneven joint lines.*

2 Rip parts A–D to 13½" wide and then crosscut them to length [**Drawings 1** and **2**]. Choose the best faces to be shown in the finished project and sand those to 220 grit.

3 Cut the rail (E), stiles (F), and shelf edge (G) to size [**Drawing 2**]. ***Note:** Cut the rail and stiles a little long and miter them to final lengths.*

Craft inner and outer shells

1 Using a 90° clamping brace (see **Shop Tip**, *below right*) to help position the parts, drill pilot holes and screw the inner legs (A) to the shelves (B) [**Drawing 1, Photo A**].

2 Drill four pocket-screw holes in the bottom face of the top (D) [**Photo B, Drawing 2**]. (See **Pocket screws make tight joints,** on *page 28*, to learn more about pocket-hole joinery.) Glue and clamp the outer legs (C) to the top and attach them with 2½" coarse-thread pocket-hole screws [**Photo C**].

SHOP TIP

Get the great look you want

You'll find the 2-by lumber for this project at your home center. While all the parts could be cut from 8' 2×6 boards, to get the straight-grained look you see here, I shopped in the 2×12 bins of Douglas fir floor joists.

Here's why: Longer and wider boards come from larger trees that produce more straight-grained material than the smaller-diameter trees chosen for smaller boards. Check the end grain and choose boards that include the pith (the tree's center), *below*. Once you get home, use your tablesaw to rip the boards, eliminating the unstable pith.

With careful board selection, it took me seven 8' 2×12s to harvest enough width to glue up the panels. (Buy a little extra to account for grain variations, and shop in the longer bins if it means better grain.) You pay a bit of a premium for the wider lumber, but it's worth it for the clean, modern lines and stable wood.

Kevin Boyle,
Senior Design Editor

Kevin

The wood to either side of the pith yields long, straight, quartersawn grain. Selectively rip and edge-glue this wood for the panels used in this project.

ATTACH THE SHELVES

A

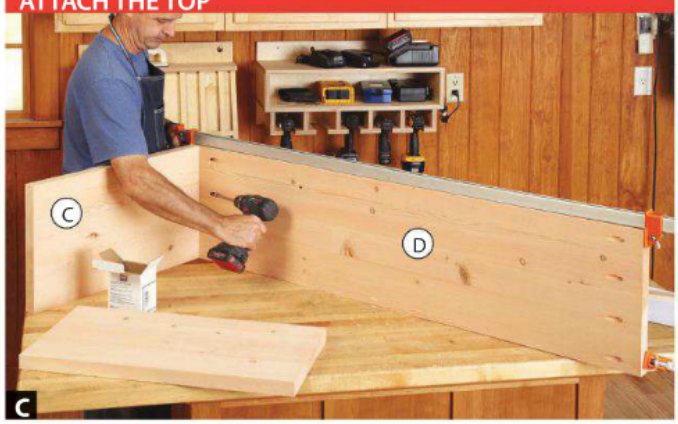
Drill ⅛" countersunk pilot holes to prevent the fir from splitting. Then, use #8×3" flathead screws to attach the inner legs (A) to the shelves (B).

DRILL THE POCKET HOLES

B

When drilling pocket holes, follow the directions that came with your pocket-hole jig to properly set the drill bit's depth collar for 2½" screws.

ATTACH THE TOP



C

To prevent the parts from shifting while driving the pocket screws, use a long pipe or bar clamp to securely hold the top (D) against the outer leg (C).

SHOP TIP

Clamp perfect corners every time

Shop-made 90° clamping braces are a must for squarely assembling parts. Make yours from scrap ¾" sheet-good material. Cut flat surfaces near their ends for clamping pads to grip, nip off the 90° corners so they don't get stuck in glue squeeze-out, and add a hole for easy handling during assembly (as well as to hang them out of the way on the wall). Find a free pattern for our clamping brace at woodmagazine.com/brace.

3 Drill two pocket-screw holes on the back face at each mitered end of the rail (E), and two on the back face of each end of the shelf edge (G) [**Drawing 2**]; then, glue and screw the face frame (E/F/G) together [**Photo D**] so the top edge of the shelf edge aligns with the top face of the shelf (B).

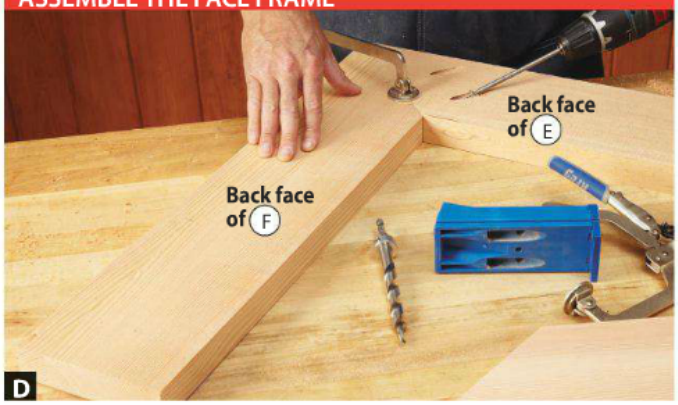
Assemble and finish

1 Apply glue to the front edges of the inner legs (A) and the shelves (B), and clamp the face frame in place [**Photo E**].

2 Apply glue to the front edges of the outer legs (C) and top (D); then, glue and clamp the outer shell (C/D) to the back of the face frame (E/F/G) [**Photo F**].

3 Allow the glue to dry, sand surfaces that need it to 220 grit, and apply finish. We applied three coats of Old Masters satin polyurethane.

ASSEMBLE THE FACE FRAME

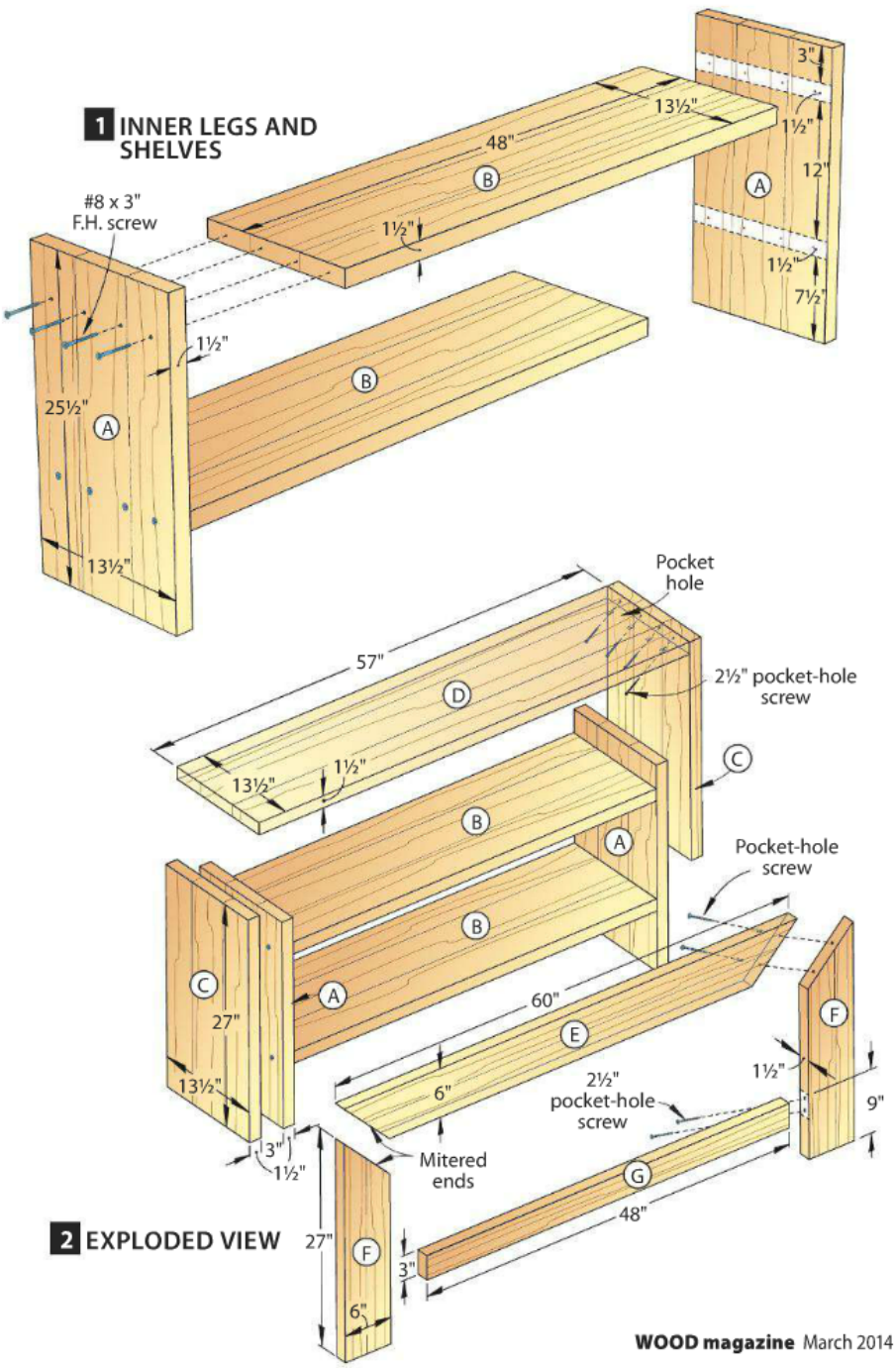


To prevent the miters from slipping when driving the pocket screws, clamp the rail (E) and the stile (F) tightly to your bench and to each other.

Pocket screws make tight joints

Thanks to pocket-screw systems, even a novice can create tight-fitting furniture-quality joints. Consisting of a jig for drilling angled holes, and a stepped drill bit with a stop collar for simultaneously drilling a shank hole and counterbore, these kits require little setup and work with many wood thicknesses. (See **More Resources** for advice on buying and using these jigs.) For this project, we used the Kreg Jig HD (kregtool.com, no. KJHD, $60) that is made to accommodate large screws in 1½" material.

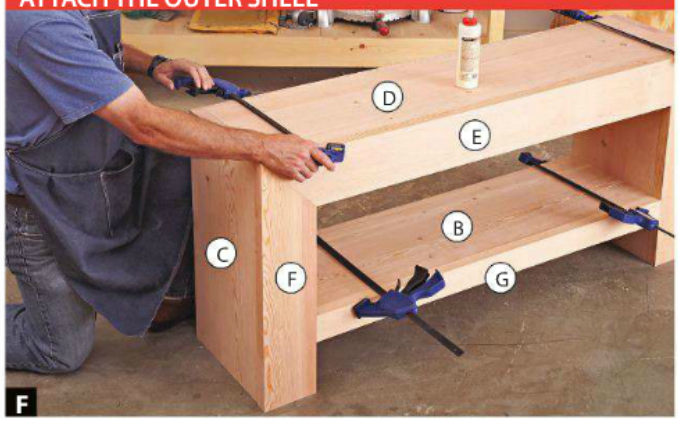
Pocket-hole joinery requires specialized screws: Self-drilling tips easily penetrate the hardest of woods, flat-bottomed heads distribute pressure to pull the parts together, and square-drive head recesses grip driver bits tenaciously. Purchase fine-thread screws for use in a hardwood, and coarse-thread screws when working with fir or pine.



GLUE ON THE FACE FRAME

When attaching the face frame (E/F/G), make sure the stiles (F) and the shelf edge (G) are flush to the inside faces of the inner legs (A) and the shelves (B).

ATTACH THE OUTER SHELL



As you did for the inner legs and shelves, align the outer legs (C) and top (D) with the face frame (E/F/G) and glue and clamp the outer shell in place.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A	inner legs	1½"	13½"	25½"	EDF	2
B	shelves	1½"	13½"	48"	EDF	2
C	outer legs	1½"	13½"	27"	EDF	2
D	top	1½"	13½"	57"	EDF	1
E*	rail	1½"	6"	60"	EDF	1
F*	stiles	1½"	6"	27"	EDF	2
G	shelf edge	1½"	3"	48"	DF	1

*Parts initially cut oversize. See the instructions.

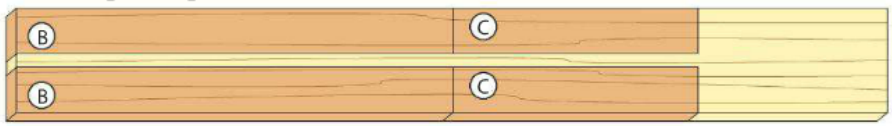
Material key: EDF–Edge-glued Douglas fir, DF–Douglas fir.

Supplies: #8x3" flathead screws (16), 2½" coarse-thread pocket-hole screws (16).

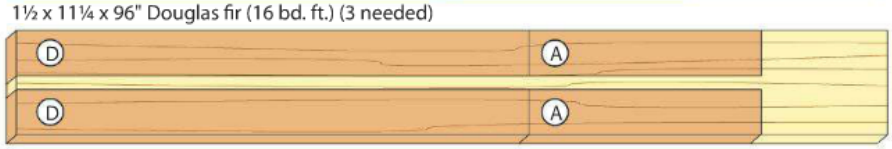
Bits: ⅛" countersink drill bit, pocket-hole drill bit.

Written by **Mike Berger**
Produced by **Lucas Peters** with **Kevin Boyle**
Project design: **John Olson**
Illustrations: **Lorna Johnson**

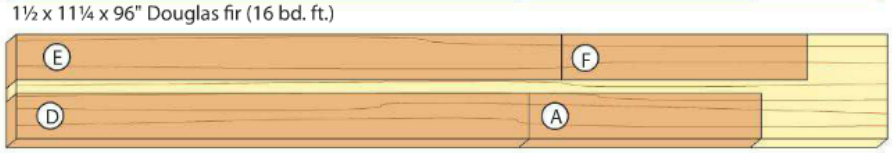
Cutting Diagram



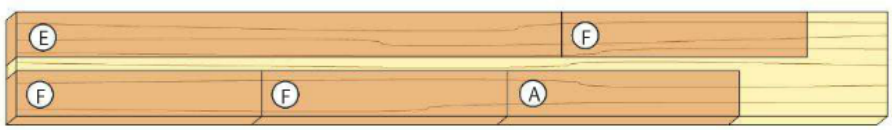
1½ x 11¼ x 96" Douglas fir (16 bd. ft.) (3 needed)



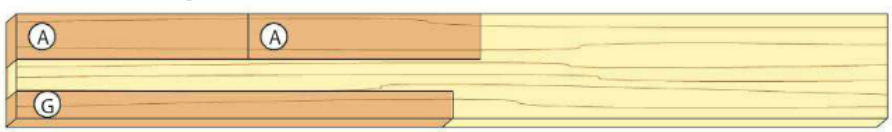
1½ x 11¼ x 96" Douglas fir (16 bd. ft.)



1½ x 11¼ x 96" Douglas fir (16 bd. ft.)



1½ x 11¼ x 96" Douglas fir (16 bd. ft.)



1½ x 11¼ x 96" Douglas fir (16 bd. ft.)

More Resources

- Learn how to use a pocket-hole jig to create tight face frame joints: woodmagazine.com/fastfaceframe.

- See our reviews of pocket-hole jigs at woodmagazine.com/pocketholereviews.

Get Perfect Edge-to-Edge Glue-ups with the WOOD® Design Team

Kevin Boyle

John Olson

John makes a case for tablesaw-edge prep and parallel-jaw clamps so he can stand his panels up while they dry.

Kevin prefers a "lie-flat" method, using lightweight aluminum bar clamps and one-handed bar clamps across the joint line.

Kevin Boyle and **John Olson** design and build nearly every project you see in *WOOD*®. Though both of them have decades of experience in woodworking, they approach even the most fundamental woodworking jobs, such as the edge-to-edge glue-up, differently.

Despite their contrasting styles, Kevin and John agree on some truths for achieving a perfect edge-to-edge glue-up. First, let your lumber dry thoroughly and acclimate to the humidity in your shop before machining it. They prefer to work with lumber that has from 6 to 8 percent moisture content. A moisture meter [**Sources**] helps you quickly determine moisture levels.

GO FACE FIRST

A

Face-joint your stock, plane the opposite face flat, and then edge-joint. A flat face riding against the jointer fence ensures a square edge.

Then, spend the time getting your workpieces perfectly square and flat [**Photo A**]: If you don't, and instead try to force together untrue edges using your clamps, the excessive pressure starves the joints of glue and may cause the glue-up to cup. To further help prevent cupping, they encourage alternating sides as you add each clamp [**Photo B**].

Both builders also agree: It's easier to glue up panels in small sections—two boards at a time. This way, there's only one joint line to watch while clamping. They also leave pieces as thick as possible, which gives added material to work with in case the panel warps.

GET THE OVER/UNDER ON CLAMPING

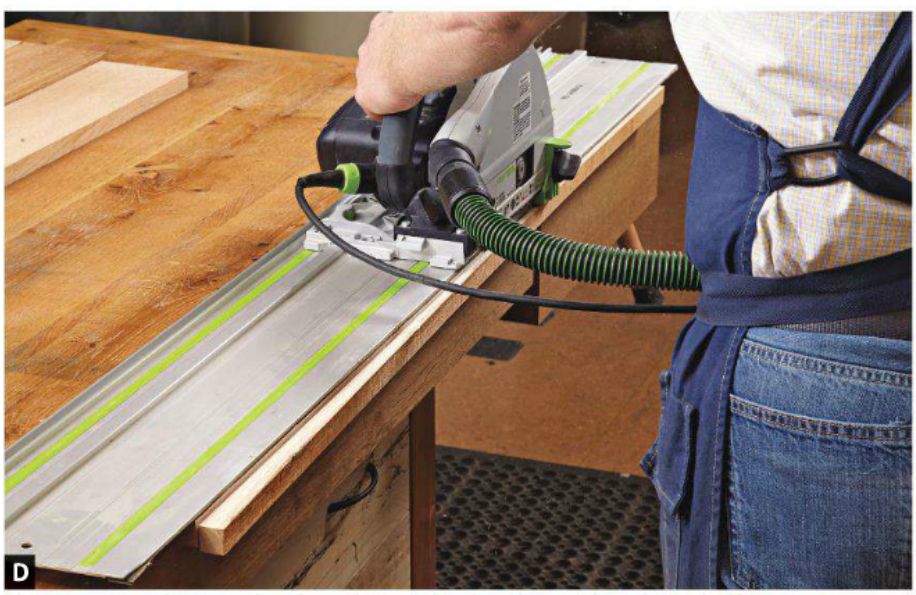
B

By alternating clamps above and below the glue-up, Kevin and John ensure that any cupping is neutralized by the opposing clamping pressure.

STRAIGHTEN UP THE GRAIN FOR BETTER LOOKS

C

John marks lines on the board faces parallel to the edge to remove sapwood and other imperfections.



D

Then, using a circular saw and guide, track saw, or bandsaw, he cuts along the marked line.

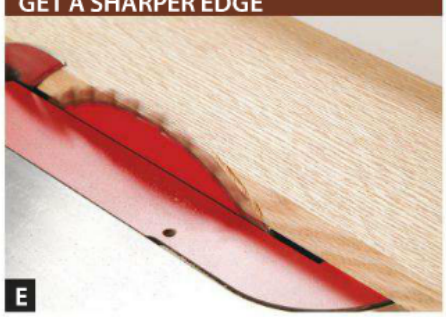
John: Living on the edge

Before joining the *WOOD* staff, John spent 11 years as an apprentice for his woodworking grandfather, and, following college, spent nearly a decade in the 1875-era cabinetmaker shop at Living History Farms—an open-air history museum in Urbandale, Iowa. When asked how his glue-up methods differ from Kevin's, John jumps at the chance to needle his coworker: "My approach differs from Kevin's in that it's based on logic and common sense."

Stock prep and machining

With his boards face-jointed and planed to thickness, John lays them out as he would for the edge-to-edge glue-up and looks for areas he can cut from the boards to make the grain lines parallel to the edges [**Photos C** and **D**]. With those cuts made, he returns to the jointer and edge-joints each board, and then returns to his tablesaw—removing only a paper-thin amount of material to get a glue-ready edge [**Photo E**].

GET A SHARPER EDGE



E

With a sharp, full-kerf, 50-tooth combination blade, John removes chatter marks, snipe, grain tear-out, and other imperfections left by the jointer.

SPREAD GLUE ADHERES BETTER

F

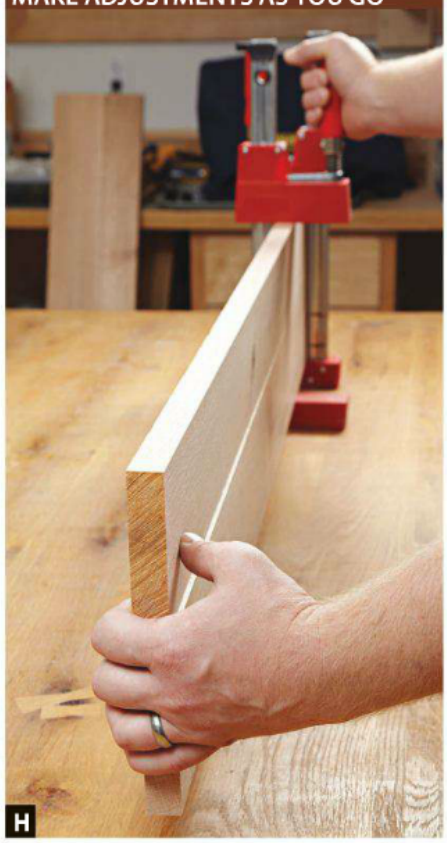
To keep fingers clean while spreading glue on mating edges of his boards, John wipes across the edge repeatedly with a silicone brush [**Sources**].

QUICK TIP FOR GLUE CHECK

G

With the joint assembled, grip the upper board and lift the glue-up. If the boards stick together without clamps, you've applied enough glue.

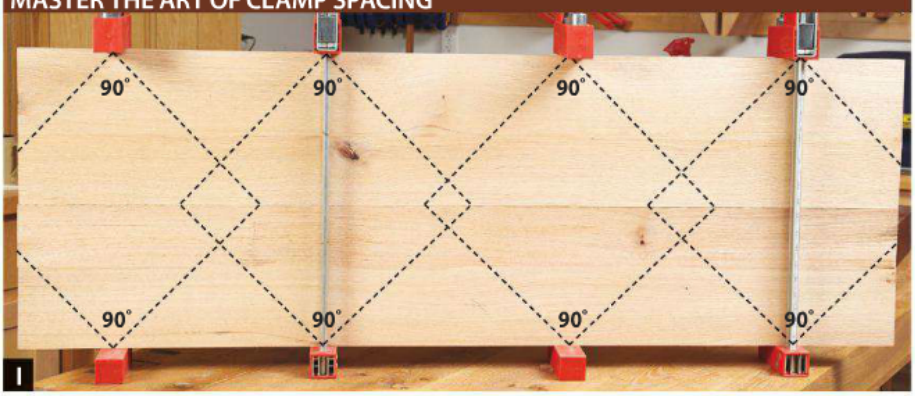
MAKE ADJUSTMENTS AS YOU GO



H

With one end of the panel clamped, John checks for flush at the joint line, adding clamps as he goes from one end to the other.

MASTER THE ART OF CLAMP SPACING



I

Pressure emanates from clamp jaws at 45° angles and should cover the entire joint line. If you're unsure about proper clamp placement, you can pencil in the pressure lines using a framing square.

Pro glue-up accessories

Having the right tools can help make even the trickiest edge-to-edge glue-ups go together more easily. Here are a few accessories John and Kevin keep close at hand when it comes time to glue up their panels.

John: "In addition to a silicone brush for spreading glue, I decant my glue from the factory bottle into smaller ones for ease of handling and more precise application. GluBot glue bottles [**Sources**] are my personal favorites; they have replaceable nozzles that enable me to precisely place glue in tight areas."

Kevin: "A crank-neck paring chisel works well for scraping off glue squeeze-out. Unlike a straight chisel, the blade of a crank-neck chisel lies flat against the workpiece even while you keep your grip on the handle. A chisel plane [**Sources**] also works great for removing glue squeeze-out without digging into the wood."

Putting it all together

John's technique for vertically stacked edge-to-edge glue-ups may seem unorthodox, but it has a couple of advantages over conventional methods. In this configuration, glue squeezes out evenly instead of dripping toward one face, doesn't drip on the workbench (any squeeze-out stays on a board you were planning to sand anyway), and he's able to keep an eye on both faces of the glue-up while clamping—ensuring better alignment.

When gluing his boards together, John applies an even bead of glue down the middle of the mating edges and spreads it with a brush [**Photo F**]. To create a better glue bond, he then rubs the boards together along the joint line. After checking the bond [**Photo G**], he clamps from one end of the glue-up to the other, keeping the boards' faces flush against the clamps' bars [**Photo H**].

Quick Tip! *Not sure how many clamps you need to keep even pressure across the length of your edge-to-edge glue-up? Use a pencil to draw in lines of clamp pressure to guide you, as shown in* ***Photo I.***

Kevin: the traditionalist

With more than 30 years of woodworking experience—much of it spent designing and building projects for woodworking magazines—Kevin knows just how to mix efficiency with precision to meet deadlines and produce eye-catching work. When asked how his style differs from John's, Kevin smiles and says, "There's a right way, and then there's John's way."

Stock prep and machining

Kevin rips and crosscuts workpieces to approximate size for a project to determine how much material he needs, but waits until the day he plans to glue up the panel to machine the pieces to final size. This allows any movement and warping to occur before he begins jointing and planing.

After face-jointing and planing the boards, Kevin marks the boards' top faces and edge-joints them in pairs [**Photo J**].

Putting it all together

When gluing up large panels, Kevin waits until the end of the day—a large edge-to-edge glue-up takes up lots of bench space and can be hard to work around. This also leaves time for the glue to dry completely before he continues machining.

After applying glue to just one board's edge [**Photo K**] and rubbing the two boards together along the joint line to spread the glue, he adds aluminum bar clamps, working from one end of the panel to the next as he makes minor adjustments. Finally, he clamps both ends of the clamp-up along the joint line using one-handed bar clamps.

After letting the assembly dry just until the glue is on the verge of hardening completely, he removes the clamps and cleans up any squeeze-out with a chisel or chisel plane [**Photo L**]. If his glue-up warps or he discovers high spots, Kevin uses a No. 7 jointer plane to even out the surface [**Photo M**].

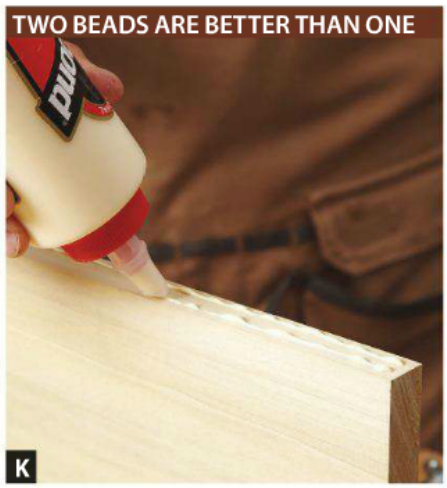
Sources

Moisture meter: $89.99, no. 413431, Woodcraft, 800-225-1153, woodcraft.com.
Silicone glue brush: $4.99, no. 45624, Rockler, 800-279-4441, rockler.com.
GluBot bottles: $7.99, no. 62979, Rockler.
Chisel plane: $62.99, no. 151301, Woodcraft.

JOINTED BOARDS MEET FACE TO FACE

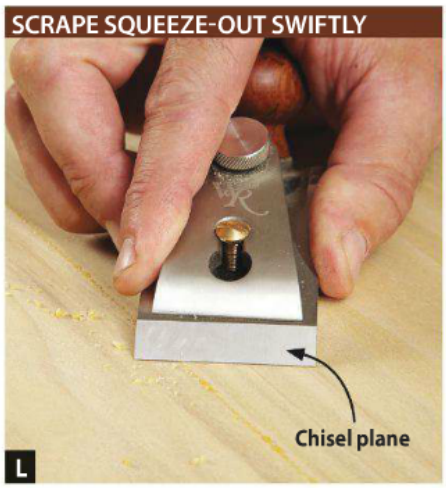
Placing adjoining boards face-to-face ensures complementary angles even if the jointer fence isn't perfectly square to the tables.

TWO BEADS ARE BETTER THAN ONE



Kevin applies two thin, parallel beads of glue to only one board's edge in order to minimize squeeze-out without starving the joint.

SCRAPE SQUEEZE-OUT SWIFTLY



Dried glue can damage tools. Kevin jokes, "If I accidentally let it get too dry, I just wait until John leaves the shop and use one of his chisel planes."

PLANE HIGH SPOTS BY HAND

Unlike sanding, where a high spot can quickly turn into a divot if you're not careful, a hand plane helps you evenly flatten high points.

Votive Stand

This tabletopper requires a meager amount of wood—and shop time—but makes a big statement about your craftsmanship.

Follow these enlightening instructions

Note: *This project fits votive candleholders up to 2¼" square. (Find a selection of votive holders at woodmagazine.com/votive.) Have your holders on hand before beginning so that you can modify any part and notch dimensions to fit them.*

1 From ½" walnut, cut the base center (A) to size [**Materials List**]. Cut the base top (B) to size from ¼" quilted maple. Glue and clamp the base top to the base center, centered.

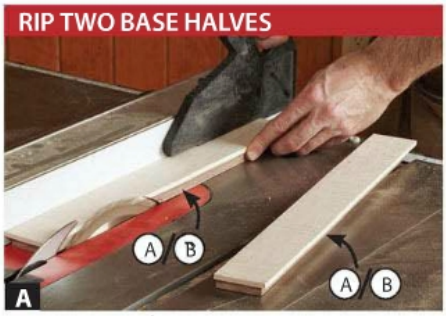
Quick Tip! ***To prevent the parts from sliding around, apply only a thin coat of glue and only to the base center.***

2 After the glue dries, rip two 2⅛"-wide blanks from the A/B blank [**Photo A**].

3 To cut the two outermost notches in the edges of the A/B blanks, mount a ¾" dado blade in your tablesaw and raise it 1⅛" above the table. Glue up a 1⅝"-wide stopblock like the one shown in **Photo B**. Set the saw's rip fence 3⅜" from the far face of the blade and clamp the stopblock in place. Cut the notches in each A/B blank [**Photos B** and **C**]. Then reposition the fence 6¾" from the outside of the blade and repeat the process to cut the next two notches in each piece. Finally, set the fence 10⅛" from the outside of the blade and cut the center notch. Finish-sand the A/B blanks to 220 grit.

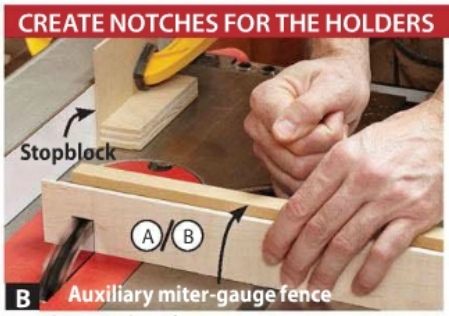
4 From ¼"-thick walnut, cut the base bottom (C) to size [**Materials List**] and finish-sand it. Glue one A/B blank to

RIP TWO BASE HALVES



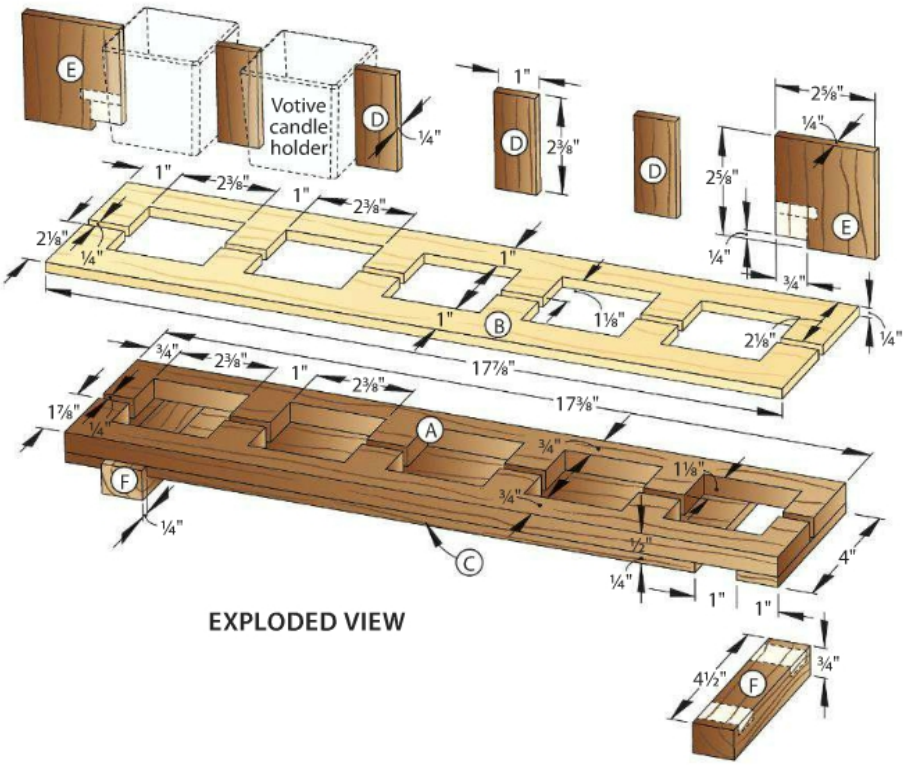
Run each edge of the A/B blank against the tablesaw rip fence to create two mirror-image blanks, each 2⅛" wide.

CREATE NOTCHES FOR THE HOLDERS

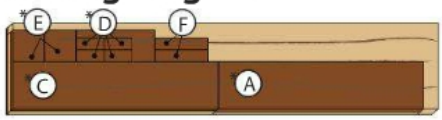


Attach an auxiliary fence to your miter gauge to back up the blank. Butt the blank against the stopblock and make a pass across each end.

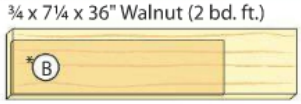
Butt the blank against the rip fence and make another pass across each end; then clean up the waste in the middle with additional cuts.



Cutting Diagram



¾ x 7¼ x 36" Walnut (2 bd. ft.)



¾ x 5½ x 24" Quilted maple (1 bd. ft.)

*Plane or resaw to the thickness listed in the Materials List.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A	base center	½"	4"	17⅜"	W	1
B	base top	¼"	4½"	17⅞"	QM	1
C	base bottom	¼"	4"	17⅜"	W	1
D*	center fins	¼"	1"	2⅜"	W	4
E*	end fins	¼"	2⅝"	2⅝"	W	2
F	feet	¾"	1"	4½"	W	2

*Parts initially cut oversize. See the instructions.

Materials key: W–walnut, QM–quilted maple.
Blade: Dado blade.

the base bottom with the ends and one edge flush [**Photo D**]. Glue and clamp the remaining A/B blank in the same fashion. Remove any glue squeeze-out before it dries fully.

5 Plane or sand a 2⅝×12" walnut blank to fit the gap between the A/B blanks. Cut the center fins (D) and end fins (E) to size from the blank [**Drawing**], and finish-sand them.

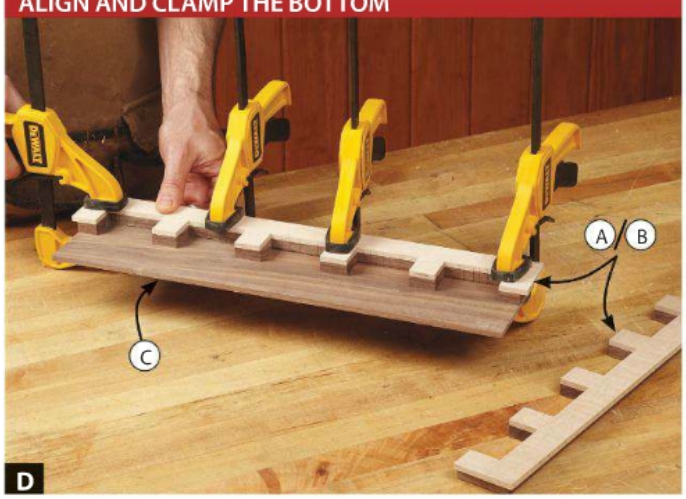
6 Lay out on the base bottom (C) the locations of the 1"-wide dadoes for the feet (F). Reinstall a ¾" dado blade in your tablesaw, attach an auxiliary fence to your miter gauge to back up the cut, and cut the dadoes [**Photo E**]. Clamp each lower fin (E) to the auxiliary fence and notch the lower corner [**Drawing**].

7 Cut the feet (F) to size to fit in the dadoes you just cut, finish-sand them, then set them aside. Glue the fins (D, E) in place, holding them until the glue grabs. After the glue dries, glue and clamp the feet in place, so they extend ¼" past the edges of the base bottom (C) [**Drawing**].

8 Finish-sand any areas needing it and apply a clear finish. (We sprayed on three coats of aerosol lacquer, buffing lightly between coats with a 320-grit sanding sponge to remove any nibs.) Place your candles and holders in the base, and relax by their calming glow.

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

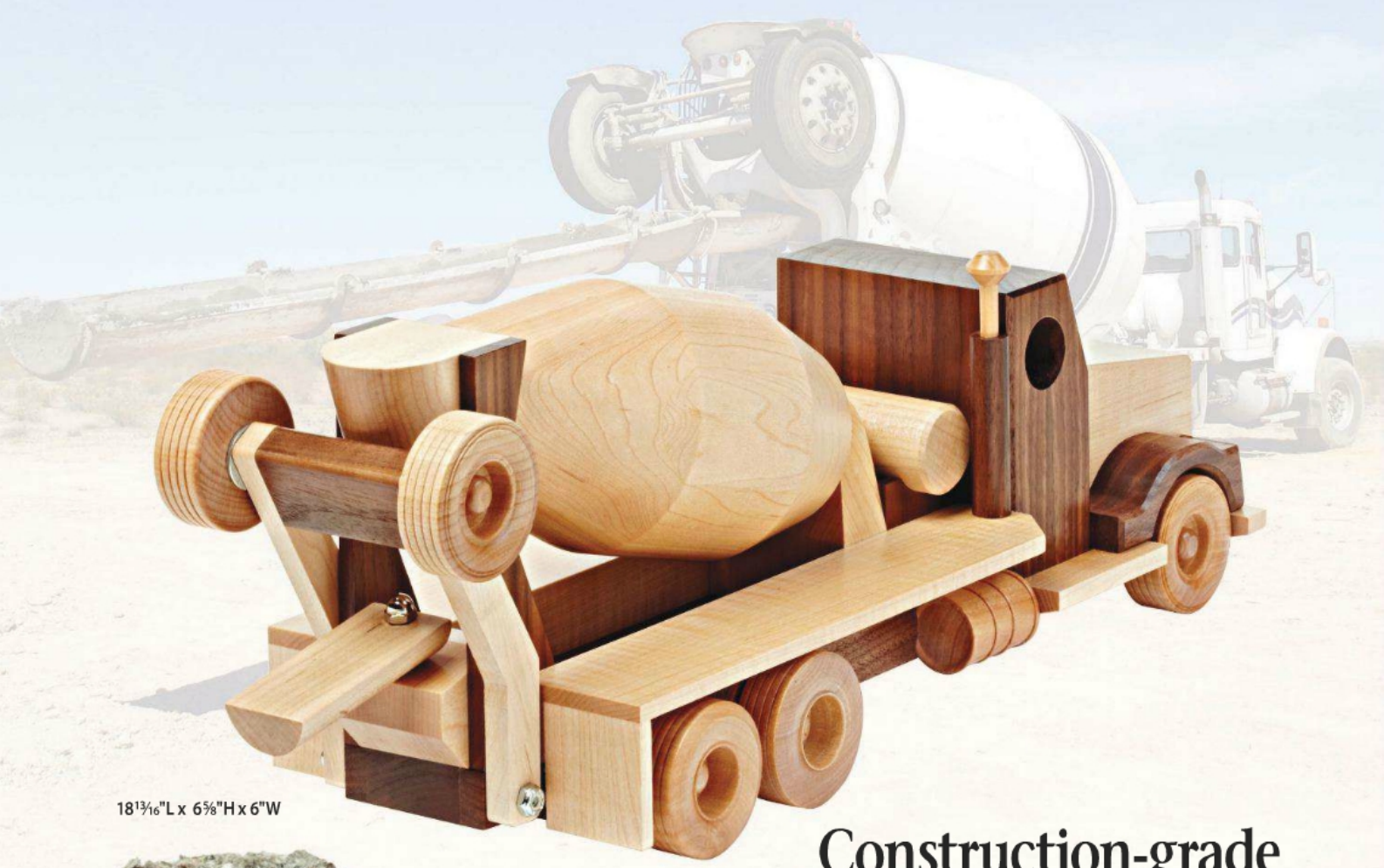
ALIGN AND CLAMP THE BOTTOM



Glue only one A/B blank to the base bottom (C) to begin. The ends and one edge of the base center (A) and the bottom (C) should be flush.

CUT DADOES FOR THE FEET

With the dado blade set ¼" above the table, make cuts between the layout marks to form the dadoes for the feet (F).



18 13/16"L x 6 5/8"H x 6"W

Construction-grade Concrete Truck

When the digging and grading wrap up, the pour can begin. And this truck hauls the goods. The solid-wood drum adds a good bit of heft to the truck and gives you a chance to try some basic turning.

Start with a rock-solid chassis

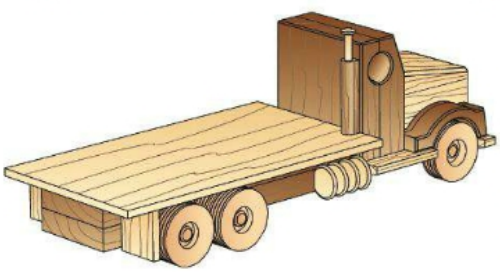
1 Cut the chassis (A) to size [**Materials List**]. Notch the back end where shown in **Drawing 1**, then drill the 11/32" and 3/16" holes in the edges [**Drawing 2**].

2 Laminate and cut to size a 2½"-thick maple blank for the hood (B) [**Drawing 1**]. Spray-adhere photocopies of the **Hood Side-view** and **Top-view Patterns** to the blank. Install a rip blade in your tablesaw, and cut the grooves in the hood to create the grill. Bandsaw and sand the bevel where shown; then, rout the chamfers. ***Note:*** *Throughout the build, after cutting a patterned part to shape, apply mineral spirits to the pattern, scrape it away, and finish-sand the part to 220 grit.*

3 Glue the hood (B) to the chassis (A) with their front ends and edges flush [**Photo A**].

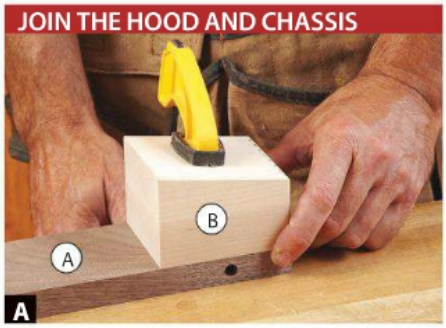
4 Laminate a 2"-thick walnut blank for the cab (C) and cut it to size. Adhere a copy of the **Cab Pattern** to one side of

BUILD IT AS A FLATBED



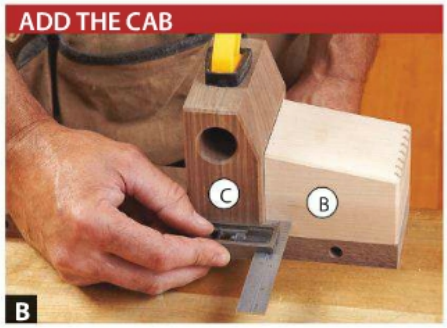
A simple modification converts the concrete truck to a straight truck. Find the free plans at woodmagazine.com/straighttruck.

JOIN THE HOOD AND CHASSIS



A Resting the chassis (A) on your bench and clamping the hood (B) to it makes it easier to align the ends and edges of the parts as you apply pressure.

ADD THE CAB



B Glue the cab (C) to the chassis (A) and hood (B). After centering the cab on the width of the chassis, clamp across the cab and hood.

the blank, drill and chamfer the hole where indicated, then cut the bevel for the windshield. Finish-sand the cab; then, glue it behind the hood [**Photo B**].

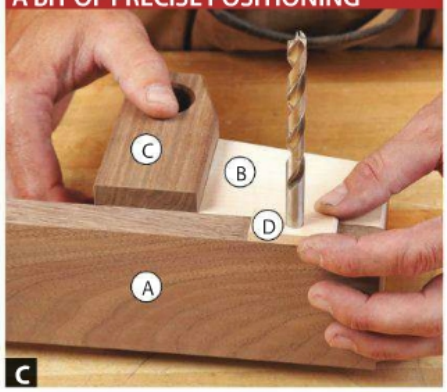
5 Cut the wheel spacers (D) to size from ¼" maple [**Drawing 1**]. Rout ⅛" chamfers on the ends and drill the hole where shown. Glue the wheel spacers to the chassis [**Photo C**].

Add the details

1 To the edge of a 1×1¼×12" walnut blank, apply two copies of the **Fender Pattern**. Bandsaw and sand the fenders (E) to shape; then, rout 1/16" chamfers where shown, making sure you end up with a mirrored pair of fenders. Glue the fenders to the hood (B) [**Photo D**].

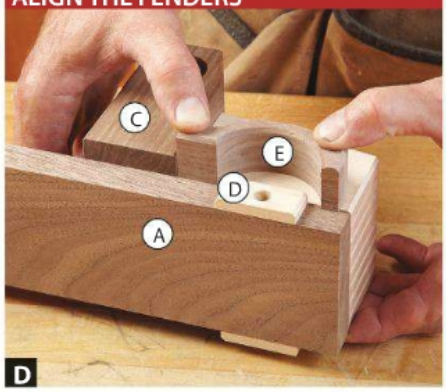
2 Bevel-rip the edge of a ½×1¼×12" maple blank as shown in **Drawing 1a**. Crosscut the steps (F) and bumpers (G) to length from the blank [**Drawing 1**]. Set the bumpers aside. Glue and clamp the steps to the chassis (A) against the bottom of the fenders (E) and cab (C) [**Drawing 2**].

A BIT OF PRECISE POSITIONING



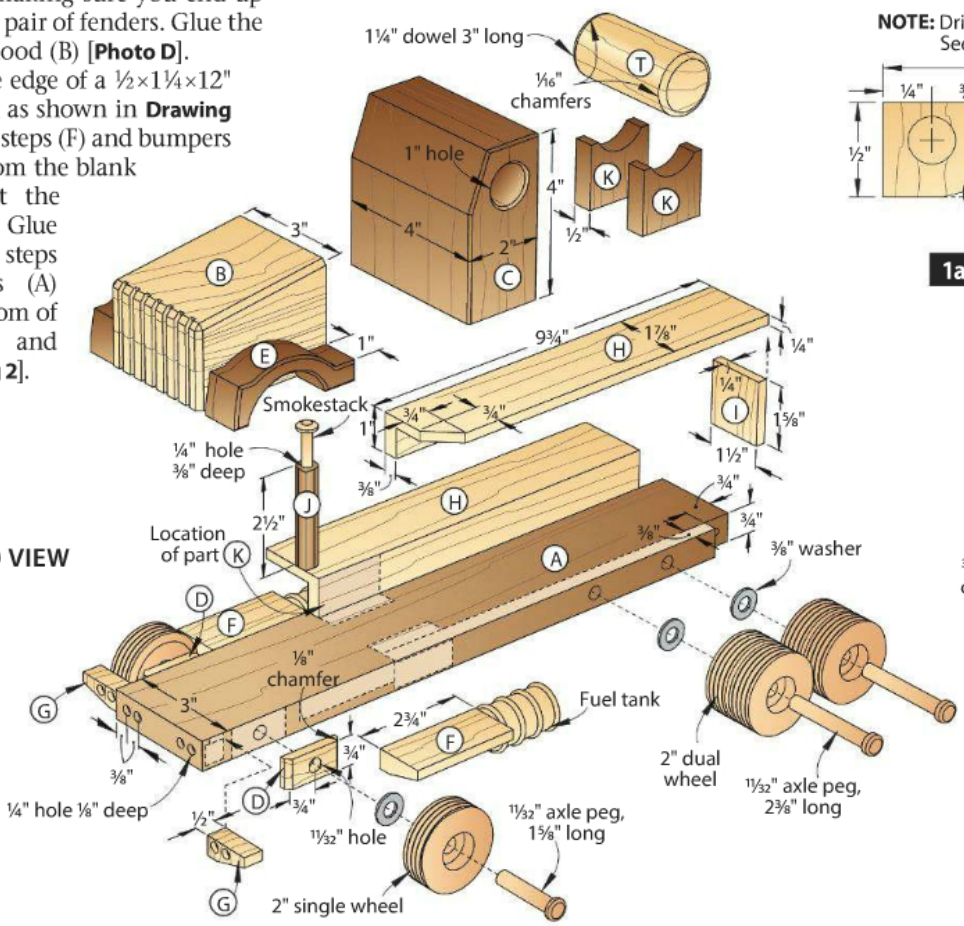
C When gluing the wheel spacers (D) to the chassis (A), use an 11/32" drill bit to perfectly align the holes in the two parts.

ALIGN THE FENDERS

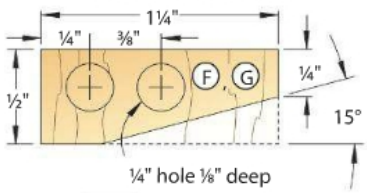


D Press the rear of the fender (E) against the cab (C) and flush with the top of the chassis (A). The front end of the fender extends 1/16" onto the chassis.

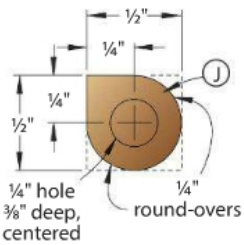
1 EXPLODED VIEW



NOTE: Drill holes in (G) only. See the instructions.

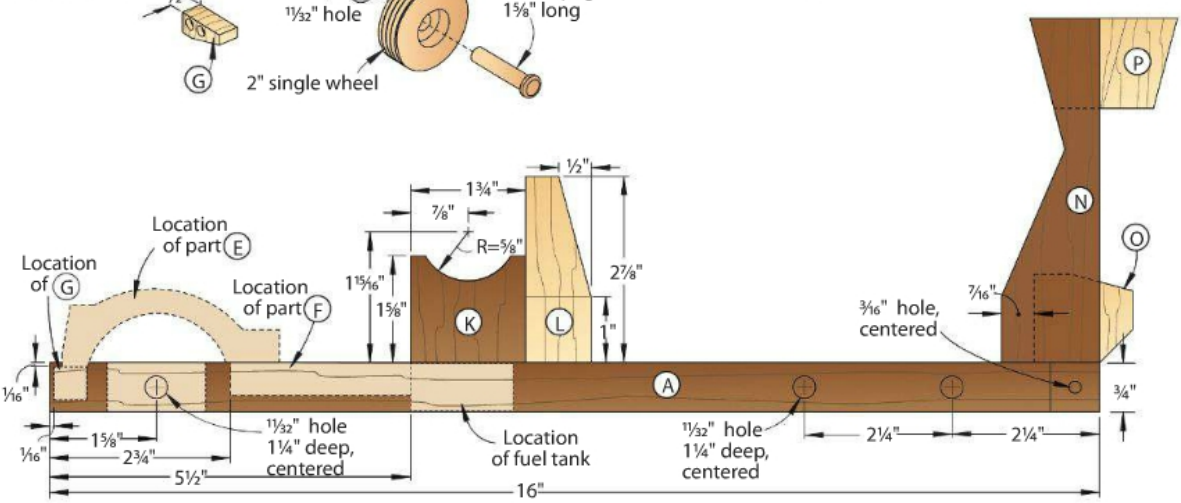


1a STEPS/BUMPERS (End view)



1b STACK (Top view)

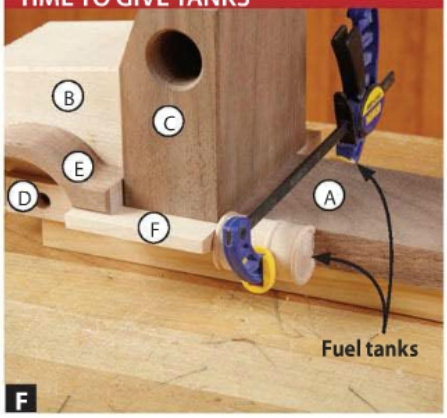
2 CHASSIS



CUT YOUR FUEL TANK

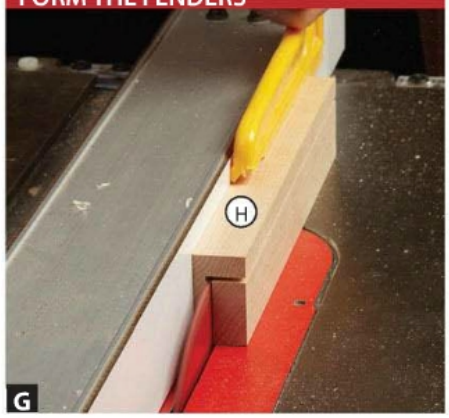
Grip the fuel tank in a handscrew, then double-faced-tape a straight-edged scrap to serve as a visual guide as you cut away one edge.

TIME TO GIVE TANKS



Glue and clamp each fuel tank to the chassis (A) and against a step (F), aligning the top of the tank's cut edge with the top of the chassis.

FORM THE FENDERS



Make the ¾"-deep cut first. Then, adjust the blade and rip fence to intersect the first kerf. Use a zero-clearance insert [**More Resources**] during this cut.

AFFIX THE REAR FENDERS

Glue and clamp the rear fender/mud flap assembly (H/I) so the inside edge of the fenders rests flush with the edge of the chassis (A).

SQUARE ENDS STEADY THE BLANK

Leave 2" at each end of the stack (J) blank unrouted. This provides flat surfaces for guiding the blank past the round-over bit.

CREATE THE CRUX OF THE CRADLE

After drilling the 1¼" hole, cut away the waste area between the tank cradles (K) and cut the remaining cradle from the blank.

3 Bandsaw a flat edge on each of the fuel tanks [**Source,** *page 40;* **Photo E**]. Sand the cut edges smooth and glue the fuel tanks to the chassis (A) [**Photo F**].

4 Retrieve the bumpers (G), grip them in a handscrew, and drill ¼" holes ⅛" deep to form the headlights [**Drawing 1a**], creating a mirrored pair.

***Quick Tip!** Use a brad-point or Forstner bit to drill flat-bottomed holes.*

Glue the bumpers to the fenders and chassis [**Drawing 2**].

5 Prepare two 1×1⅞×10" maple blanks for the rear fenders (H). Cut intersecting kerfs in each blank [**Photo G, Drawing 1**]; then, crosscut the fenders to length to match the distance between the rear of the cab (C) and the notch in the chassis (A). Bevel-cut the front end of each fender. Finish-sand the pieces.

6 Cut the mud flaps (I) to size, finish-sand them, and glue one to each rear fender (H), flush with the rear end. After the glue dries, glue this assembly to the chassis (A) [**Photo H**].

7 Prepare a ½×½×12" walnut blank for the stack (J). Set up a ¼" round-over bit in your table-mounted router and round over three edges of the blank [**Photo I, Drawing 1b**]. Cut away one square end of the blank, then cut the stack to final length. Clamp the stack in a handscrew and drill a ¼" hole centered on its diameter. Glue the flat face of the stack to the passenger side of the cab (C) so the square corner of the stack faces the middle of the cab. Glue the smokestack [**Source**] in the hole in the stack.

8 To make the tank cradles (K), start with a ½×1¾×5" blank. Lay out and mark two blocks 1⅝" long and ⅝" apart. Mark the centerpoint between the two blocks and drill a 1¼" hole centered on the mark [**Photo J**]. Cut the tank cradles

Build the whole crew

Purchase plans and kits for these companion projects at woodmagazine.com/cgtoys.

Give the crane (issue 185, September 2008) a spin on its base, and raise and lower its bucket with a crank.

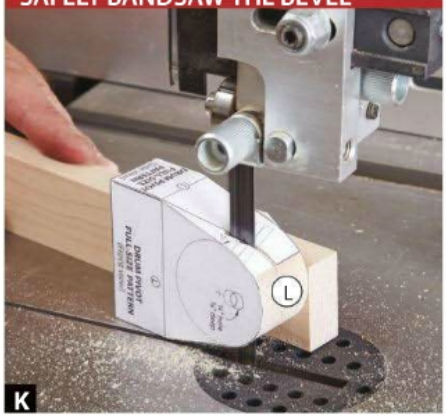
Load and spin with the skid loader (issue 211, May 2012).

Reach out and scoop with the excavator (issue 194, November 2009).

For heavy hauling, fill the dump truck (issue 215, November 2012).

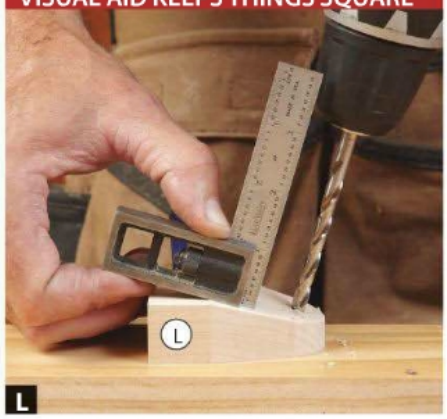
Move earth with the bulldozer (issue 199, September 2010).

SAFELY BANDSAW THE BEVEL



Adhere the drum pivot (L) to a scrap with double-faced tape so you can cut the bevel while keeping your hands well away from the blade.

VISUAL AID KEEPS THINGS SQUARE

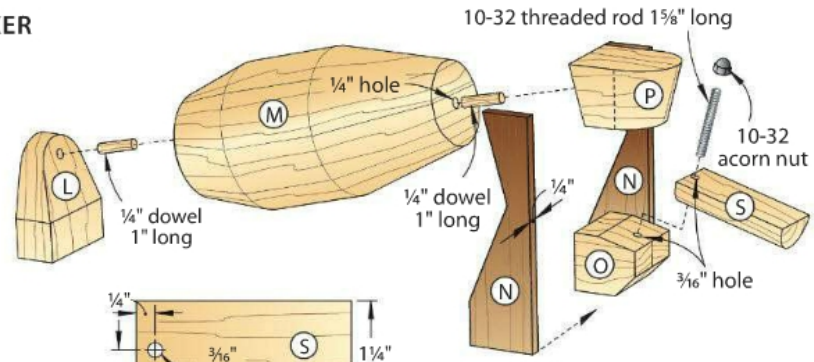


Set a small square on the beveled face of the drum pivot (L). Keep your drill bit parallel to the square as you drill the ¼" hole ½" deep.

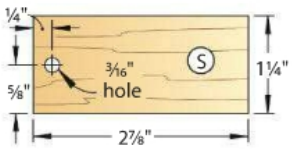
SHAPE THE HOPPER

Use the line on the Side-view Pattern to set the tilt of the bandsaw table. Then round off the rear of the hopper (P).

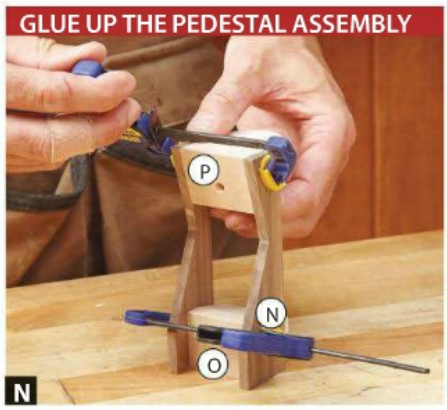
3 MIXER



3a TROUGH (Top view)



GLUE UP THE PEDESTAL ASSEMBLY



The front face of the hopper (P) aligns with the front edges of the pedestals (N). The face of the trough pivot block (O) rests 7⁄16" from the front pedestal edge.

to length, finish-sand them, and glue them inside the rear fenders (H), snug against the cab (C) [**Drawing 1**].

Get a fix on the mixer

1 Cut a 1×2¼×2⅞" blank for the drum pivot (L). Spray-adhere the **Drum Pivot Front-view Pattern** to the blank and bandsaw and sand the curve. Apply the **Drum Pivot Side-view Pattern** to an edge of the blank and bandsaw and sand the bevel [**Photo K**]. Drill the hole as shown in **Photo L**, finish-sand the pivot, then glue it to the chassis (A) and tank cradles (K) [**Drawing 2**].

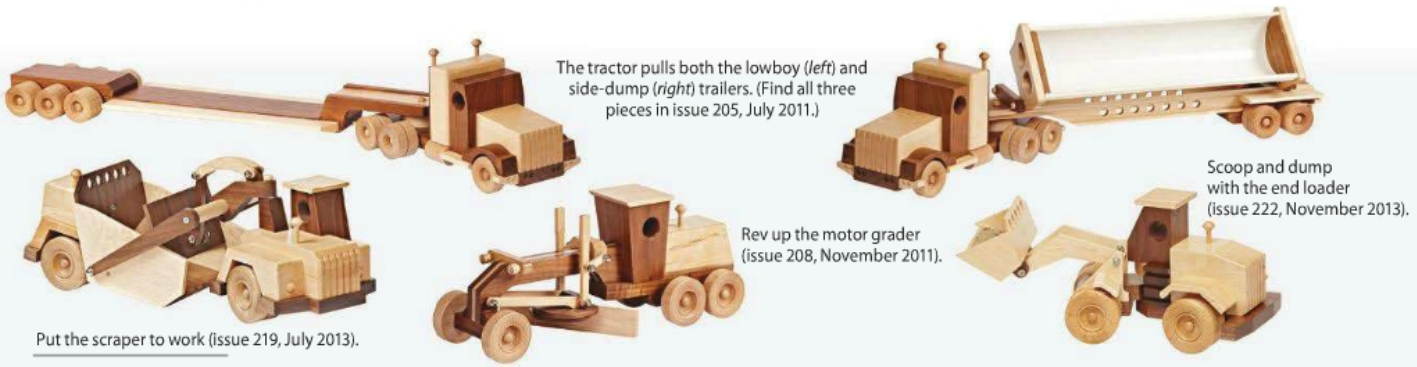
2 ***Note:*** *Turn the drum on your lathe or, if you'd rather, order a ready-made drum.* *See* **Source** *on page xx.* Spray-adhere a copy of the **Drum Template** to a piece of poster board and cut along the lines. Using this to check your progress, turn the drum (M) [**Materials List**] to shape. Drill into each end of the drum a ¼" hole ½" deep, centered on the diameter of the end. Cut and glue a 1" length of dowel into each hole.

3 Cut two ¼×1½×5¼" walnut blanks for the pedestals (N), double-faced-tape them together with their ends and edges flush, and apply a copy of the **Pedestal Pattern**. Cut the pedestals to shape, then separate them.

4 Prepare a 1¾×1⅜×1½" maple blank for the trough pivot block (O), spray-adhere the **Trough Pivot Block Pattern** to its edge, and cut and sand it to shape. Drill the 3⁄16" hole centered on the block's width.

5 Apply the **Top Hopper Side- and Top-view Patterns** to a 1¾×1⅜×2¼" maple blank. Tilt your drill-press table to 15° and drill the ¼" hole where shown. Then, tilt your bandsaw table to 15° and cut the curve on the **Top-view Pattern** [**Photo M**]. Reset the table square to the blade and cut the remaining line on the **Side-view Pattern**.

6 Dry-fit the pedestals (N), trough pivot block (O), and hopper (P) and check for a snug fit between the rear fenders (H). Glue up the pedestal assem-



The tractor pulls both the lowboy (*left*) and side-dump (*right*) trailers. (Find all three pieces in issue 205, July 2011.)

Scoop and dump with the end loader (issue 222, November 2013).

Rev up the motor grader (issue 208, November 2011).

Put the scraper to work (issue 219, July 2013).

bly [**Photo N**, **Drawing 2**]. After the glue dries, glue the pedestal assembly in place, trapping the drum (M) [**Photo O**].

7 Prepare two ⅜×2¼×5" maple blanks for the booster axle arms (Q) and double-faced-tape them together. Following the **Booster Axle Arm Pattern**, cut the arms to shape, and drill the holes.

8 Cut the booster axle brace (R) to size [**Materials List**] and round over the long edges [**Drawing 4**]. Drill the holes in the ends ¾" deep.

***Quick Tip!** To locate the holes precisely, dry-fit the brace between the booster axle arms (Q) [**Drawing 4**] and drill through the existing holes in the axle arms.*

Glue the brace between the axle arms, using axle pegs to align the holes between the parts. Remove the axle pegs after clamping so they don't get glued in place.

Now the finishing touches

1 Cut two 3" lengths of 1¼" dowel for the trough (S) and water tank (T). Glue one between two scraps [**Photo P**], and resaw the assembly in half to create the trough (S). Cut away the blocks and crosscut the trough to 2⅞" long. Drill a 3/16" hole centered on the trough's width [**Drawing 3a**]. Rout 1/16" chamfers around the ends of the water tank and glue it to the tank cradles (K), centered.

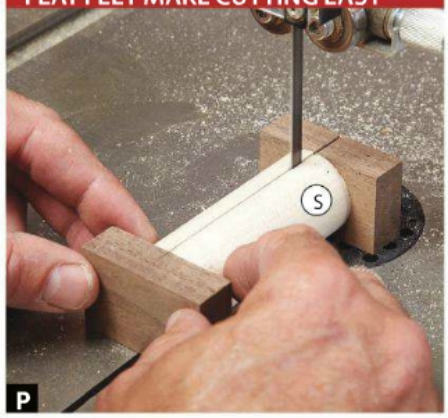
2 Apply a finish to all pieces. (We sprayed on three coats of aerosol lacquer.) Then attach the wheels with axle pegs and washers [**Drawings 1** and **4**]. Epoxy a 1⅝" length of 10-32 threaded rod into the trough pivot block (O) and mount the trough (S) [**Drawing 3**].

3 Cut a 3¼" length of 10-32 threaded rod and use it to attach the booster axle assembly (Q/R) to the chassis [**Drawing 4**]. Snug the lock nuts enough to hold the assembly up when desired.

ASSEMBLE THE DRUM ASSEMBLY

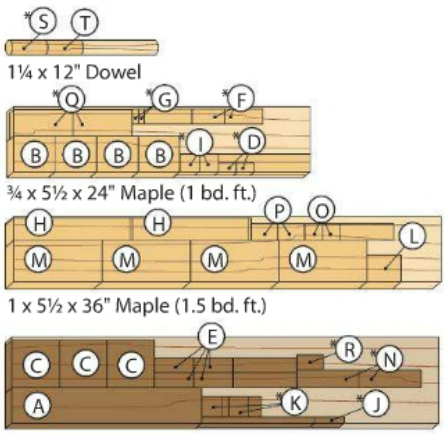
Glue the pedestal assembly (N/O/P) to the rear fenders (H), trapping the drum between the drum pivot (L) and hopper (P). Make sure the drum turns freely.

FLAT FEET MAKE CUTTING EASY



By gluing two equal-sized scraps to the ends of the dowel, you can cut a straight line through the dowel to create the trough (S).

Cutting Diagram



*Plane or resaw to the thicknesses listed in the Materials List.

More Resources

- Find plans for a zero-clearance insert for your tablesaw at **woodmagazine.com/zeroinsert**.
- Prefer slightly larger big-boy toys? Check out some ½-scale versions at **woodmagazine.com/bigmodels**.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A	chassis	¾"	3"	16"	W	1
B	hood	2½"	3"	3½"	LM	1
C	cab	2"	4"	4"	LW	1
D	wheel spacers	¼"	¾"	1½"	M	2
E*	fenders	1"	1¼"	3 5/16"	LW	2
F*	steps	½"	1¼"	2¾"	M	2
G*	bumpers	½"	1¼"	½"	M	2
H*	rear fenders	1"	1⅞"	9¾"	M	2
I	mud flaps	¼"	1½"	1⅝"	M	2
J*	stack	½"	½"	2½"	W	1
K*	tank cradles	½"	1¾"	1⅝"	W	2
L	drum pivot	1"	2¼"	2⅞"	M	1
M	drum	3½" diam.		7 1/16"	LM	1
N	pedestals	¼"	1½"	5¼"	W	2
O	trough pivot block	1⅜"	1¾"	1½"	LM	1
P	top hopper	1¾"	1⅜"	2¼"	LM	1
Q	booster axle arm	⅜"	2¼"	5"	M	2
R	booster axle brace	⅝"	1¼"	2¼"	W	1
S	trough	⅝"	1¼"	2⅞"	M	1
T	water tank	1¼" diam.		3"	M	1

*Parts initially cut oversize. See the instructions.

Materials key: W–walnut, LM–laminated maple, LW–laminated walnut, M–maple.

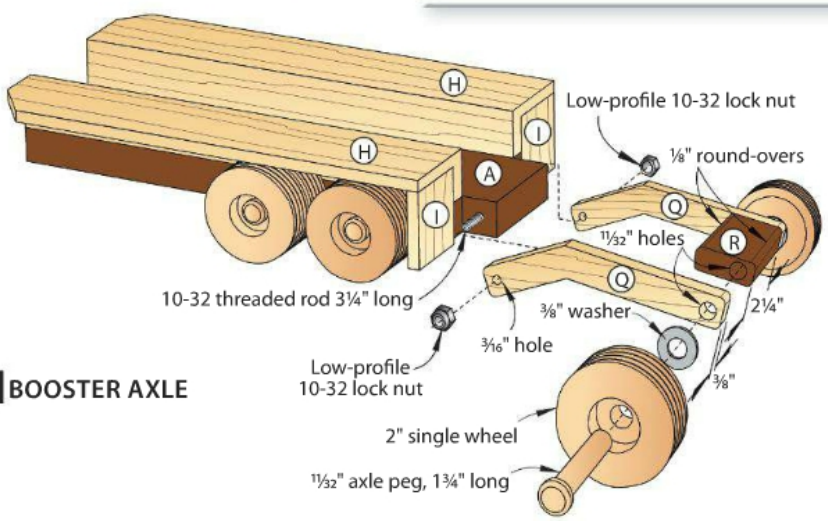
Supplies: 1¼" maple dowel 12" long, ¼" dowel 6" long

Bits: 1¼", 1", 11/32", ¼", 3/16" drill bits; 45° chamfer, ¼" and ⅛" round-over router bits.

Source

Kits: Two kits are available, one with a ready-made drum (part M), and one without. Kit no. RS-01003a contains all the specialty parts (wheels, axle pegs, smokestack, fuel tanks) and hardware (no lumber) needed to build one concrete truck; $21.95+shipping. Kit no. RS-01003a-t is identical, and also includes the drum (M); $54.95+ shipping, 888-636-4478, woodmagazine.com/concrete.

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



4 BOOSTER AXLE

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Better Homes and Gardens®
WOOD®
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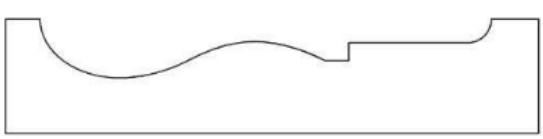
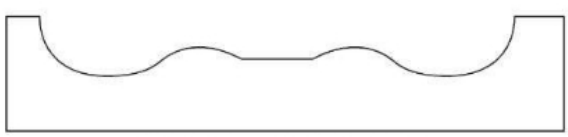
March 2014 *Issue 224*

Dear Reader: As a service to you, we've included full-size patterns on this insert for irregular-shaped and intricate project parts. You can machine all other project parts using the Materials List and the drawings accompanying the project you're building.

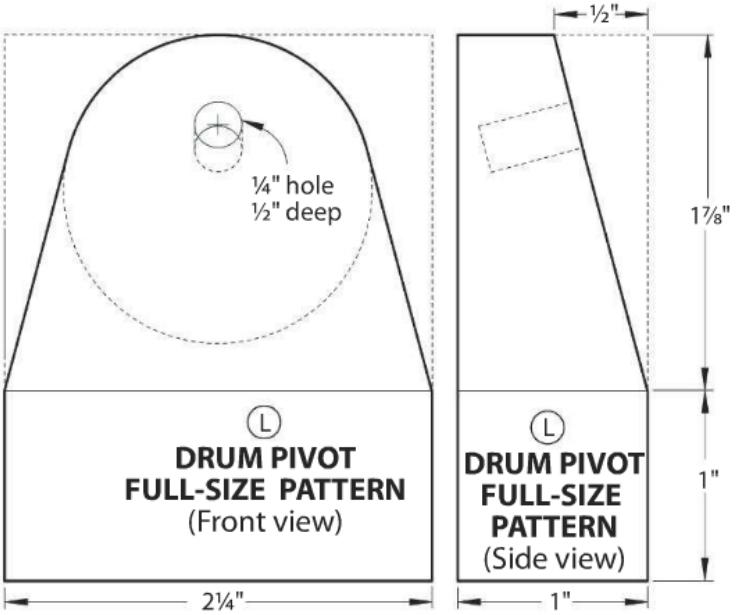
Turned Top
Page 56

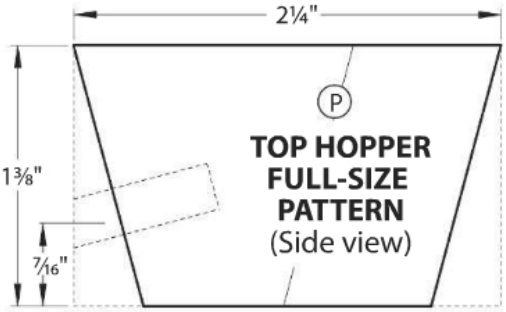


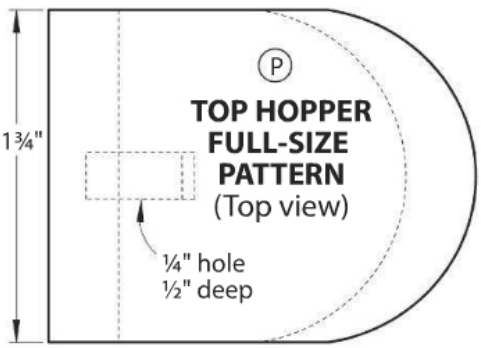
TURNED TOP SPINDLE FULL-SIZE TEMPLATE

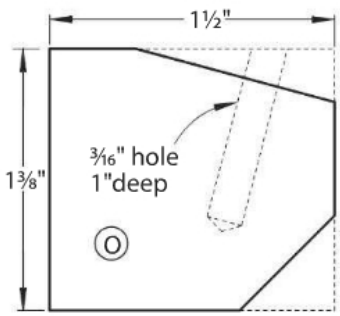


TURNED TOP HANDLE FULL-SIZE TEMPLATE









**TROUGH PIVOT BLOCK
FULL-SIZE PATTERN**

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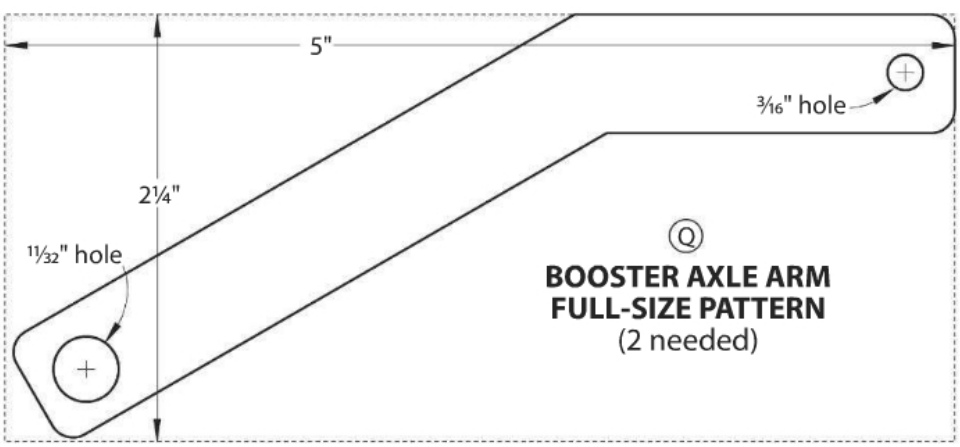
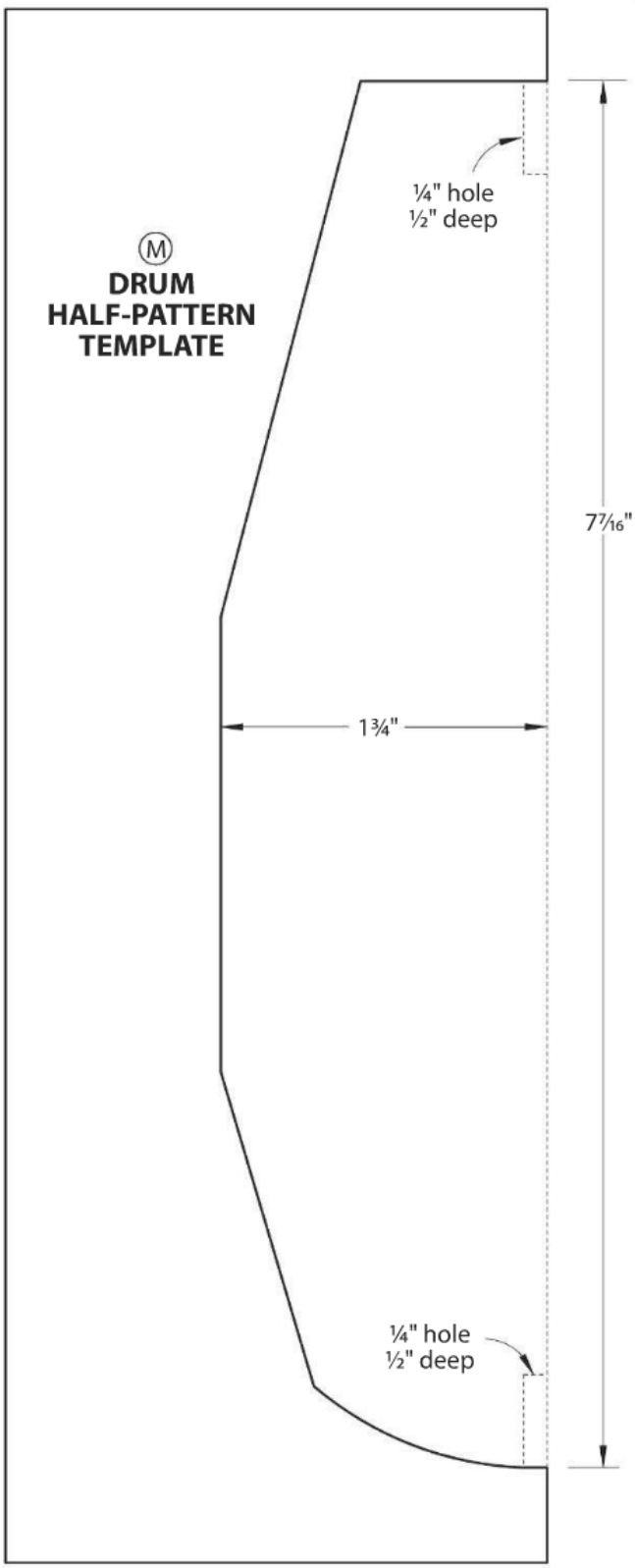
Construction-grade Concrete Truck

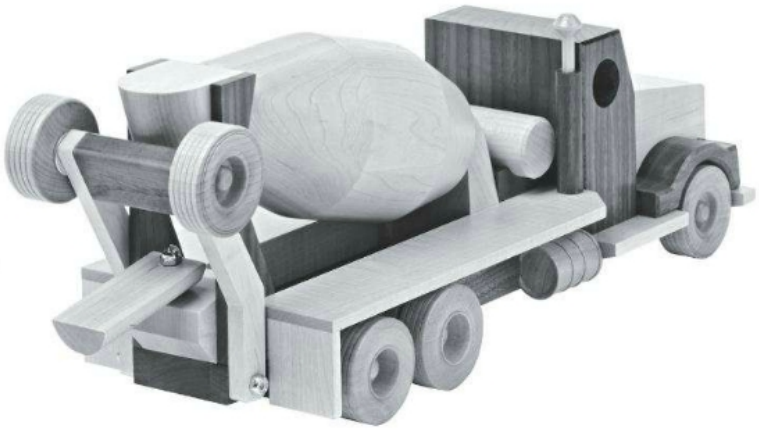
Page 36

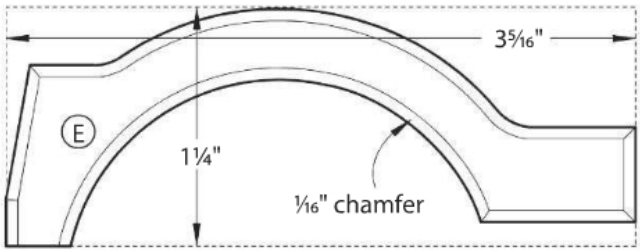


Construction-grade Concrete Truck

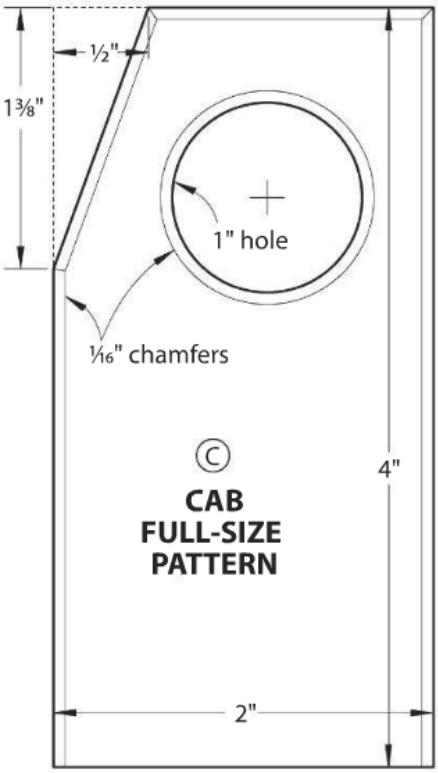
Page 36



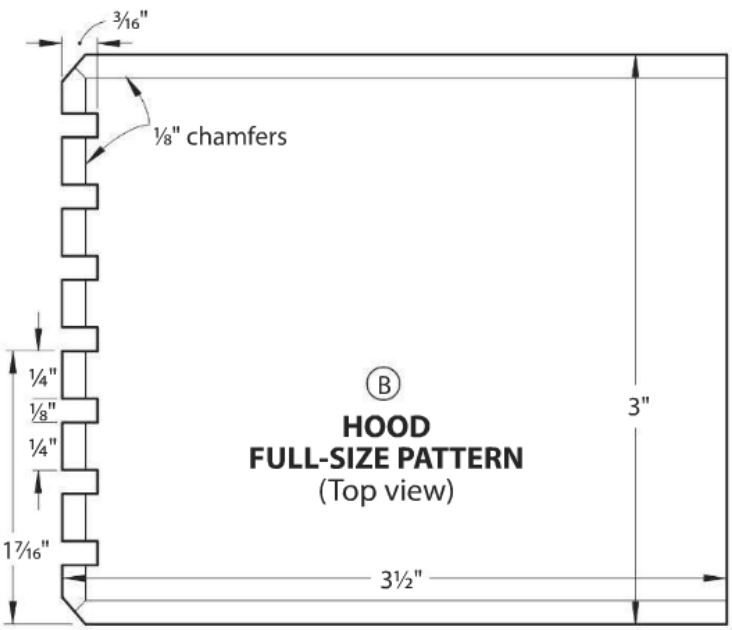




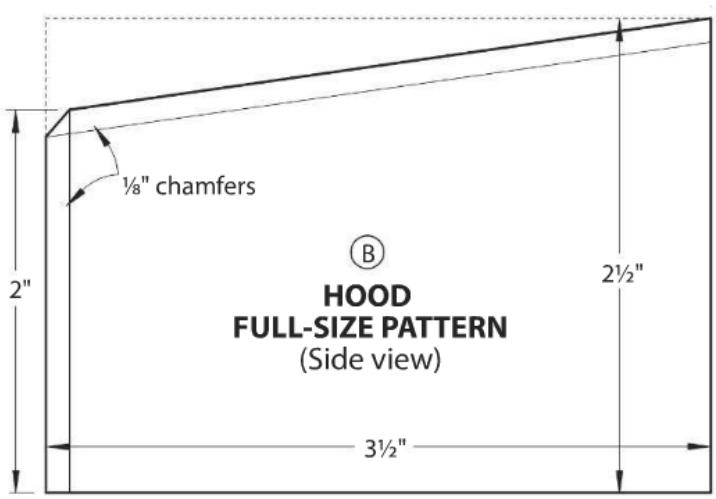
FENDER
FULL-SIZE PATTERN
(2 needed)



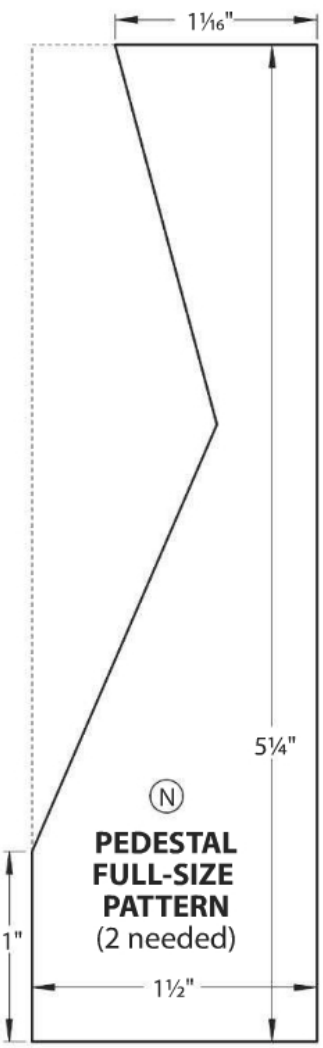
CAB
FULL-SIZE
PATTERN



HOOD
FULL-SIZE PATTERN
(Top view)



HOOD
FULL-SIZE PATTERN
(Side view)



PEDESTAL
FULL-SIZE
PATTERN
(2 needed)

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Construction-grade Concrete Truck
Page 36

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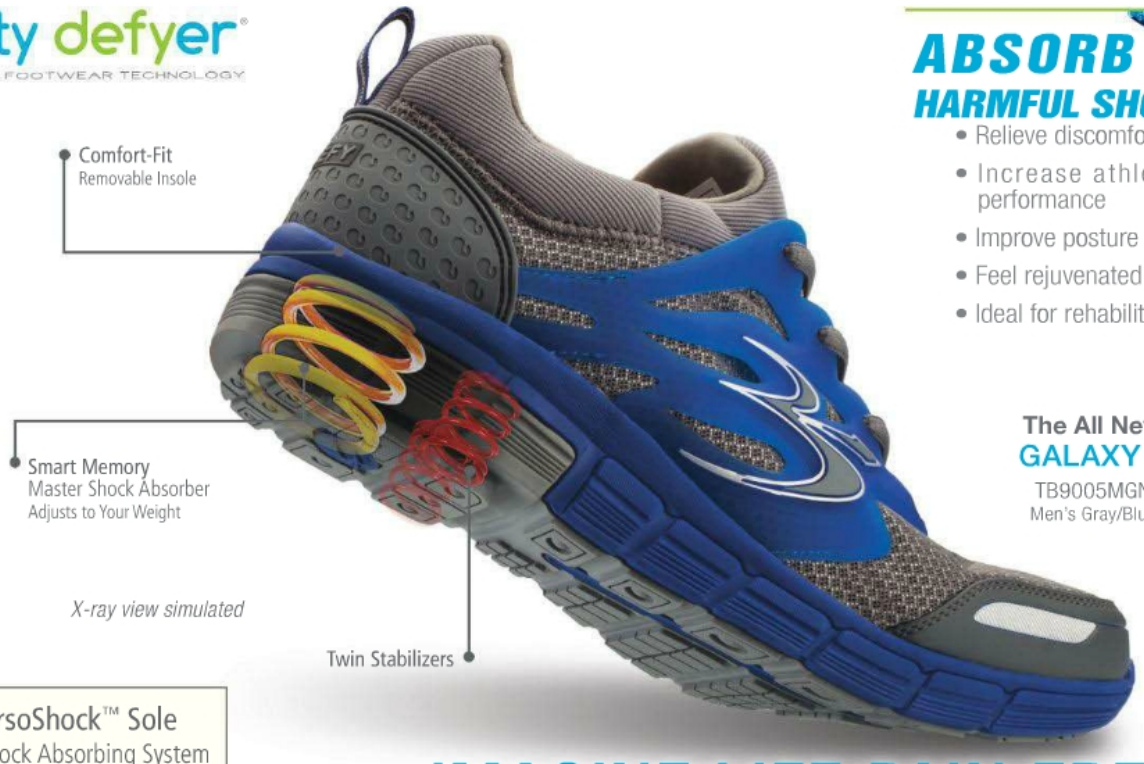

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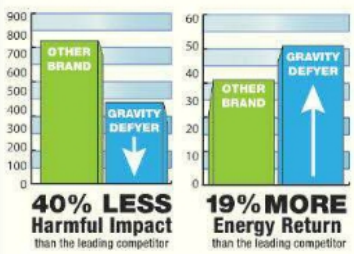

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SHOCK ABSORPTION STUDY HPW Biomechanics, 2012
*Shock absorption: Measurement of maximim pressure (KPI). Energy return: Measurement of energy returned (Joules).

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It's got that swing Handkerchief Table

Classic design and versatility never go out of style. No wonder variations on this table have remained popular since the 1700s.

Dimensions: 34⅜" W × 18" D × 27¾" H (Depth is 36" with top lifted.)
Approximate materials cost: $90

I discovered the inspiration for this drop-leaf corner table—sometimes called a handkerchief table—at the Wilton House Museum in Richmond, Va., (inset) more than a decade ago. I've been longing to design one like it for WOOD®, and this is it. We dropped the turned, pad-foot legs in favor of a simpler tapered version, but the rest of the project rings pretty true to the 1750 original. With its hinged leaf dropped, this accent table takes up little space as it sits in a corner, making it a perfect fit for any room in the house. But lifting the leaf—supported by a swing-out "gateleg"—turns it into a practical, attractive square table perfect for a game of cards or even as a quick food server. Though the triangular-base joinery and hinged apron might look tricky, our straightforward procedures will see you through without worry.

Kevin Boyle,
Senior Design Editor

Kevin

Swing right into the hinge

1 Cut a ¾×4×16" blank for the hinge block (A) and apron block (B) [**Drawing 1**]. Cut a ¾×4×24" blank for the hinge apron (C).

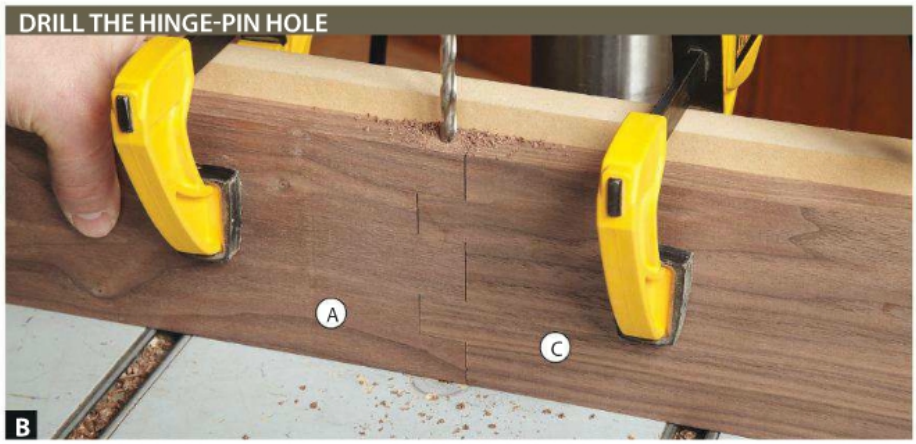
2 Lay out the hinge knuckles [**Drawing 2**] on one end of the A/B blank. Cut the knuckles at your tablesaw with a ¾" stacked dado set. Transfer the knuckle locations onto the hinge apron (C) blank [**Photo A**] and cut with the same setup.

3 Dry-fit parts A and C; they should fit together easily, without gaps. At your drill press, drill the hinge-pin hole 3½" deep [**Drawing 2, Photo B**].

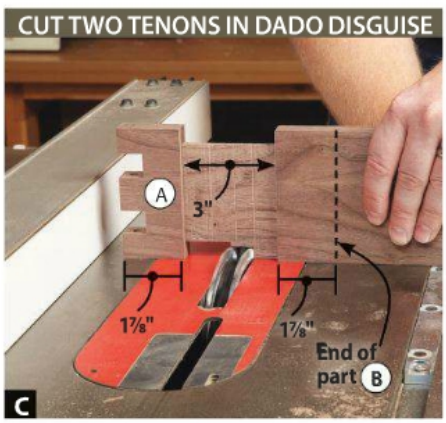
Note: *The hinge-pin hole must run dead-center through both parts of the hinge for it to work smoothly, so adjust the table and fence perpendicular to the chucked bit before drilling the hole.*

4 Because the completed hinge block (A) and apron block (B) are both 2¾" long, form the tenons for each while they are part of the longer blank as shown in **Photo C**. Find the tenon dimensions in **Drawing 2**.

For maximum precision, lay out the mating knuckles on the hinge apron (C) with a marking knife. Mark all four contact points.



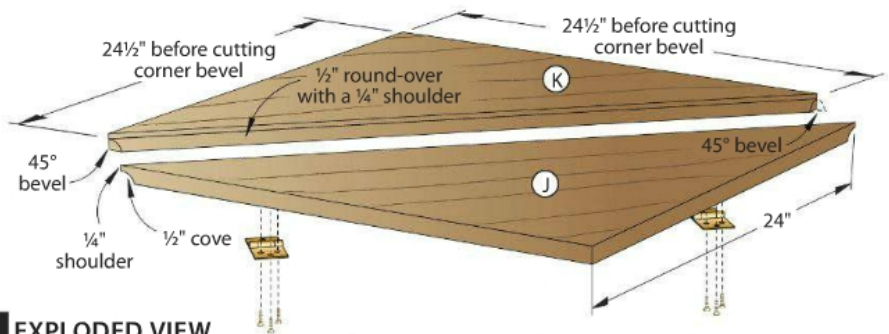
Clamp the dry-assembled hinge parts to the drill-press fence, set the depth stop for 3½", and drill a centered ¼" hole through the knuckles.



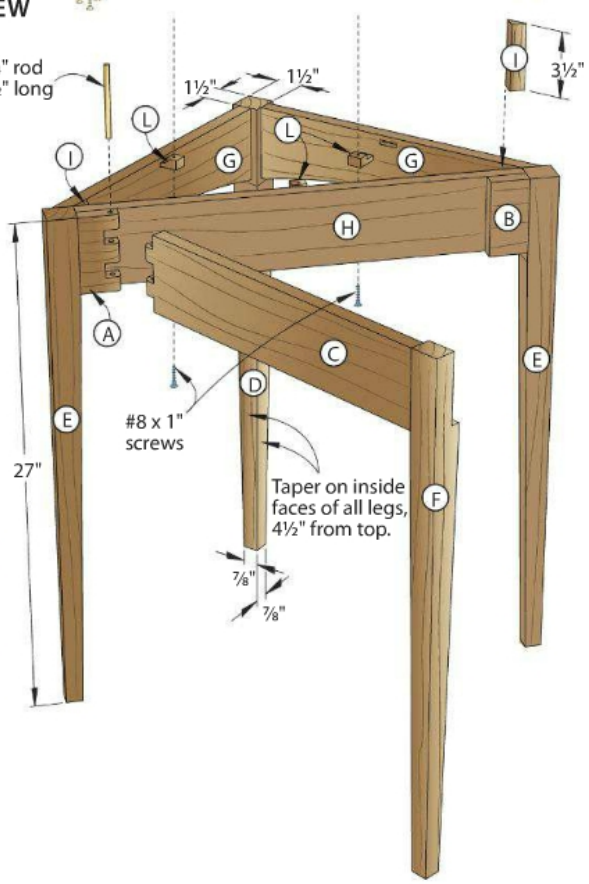
Make 3"-wide dadoes between the hinge block (A) and the apron block (B) on the A/B blank. You'll separate them and trim the tenons to length later.

5 Bandsaw and sand the knuckle ends round on the hinge apron (C) and the outer face of the hinge block (A) [**Drawing 2**]. Dry-assemble the hinge components with a ¼" rod about 5" long and test for smooth operation and fit. (You'll cut the pin to final length after finishing the project.)

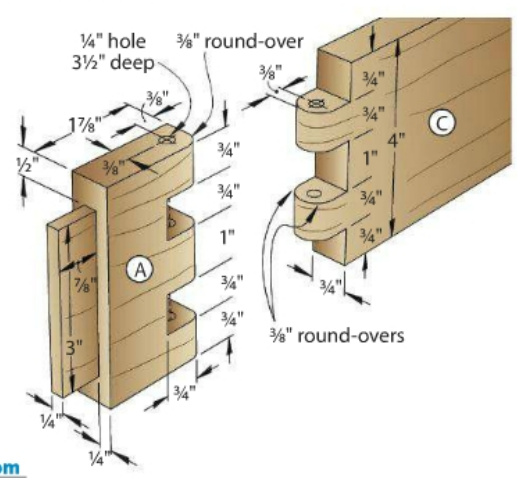
6 Cut the hinge block (A) and apron block (B) to final length with a ⅞"-long tenon on one end of each.



1 EXPLODED VIEW



2 HINGE JOINT



Cut the mortises and tenons

1 Cut the four legs (D, E, F) to size [**Materials List**], but don't cut the tapers yet.

2 Mark the mortise locations on each leg [**Drawings 3** and **4**], and then cut them. See the **Shop Tip**, *right*, for an easy way to make the angled mortises.

3 Cut the side aprons (G) and inner apron (H) to size, but a few inches longer than listed [**Materials List**]. Set the inner apron aside.

4 Lay out the angled tenons on the side aprons (G) [**Drawings 4** and **5**], and then follow the steps in **Photos D–I** *below* to cut them.

5 Cut the side aprons (G) and hinge apron (C) to length, and form a tenon on each straight end [**Drawing 5**].

SHOP TIP

Cut angled mortises easily with a quick-made jig

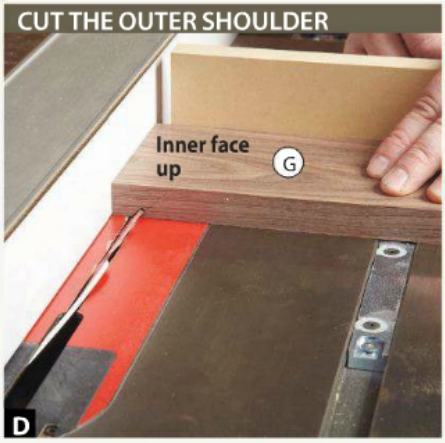
A V-block simplifies cutting the 45° angled mortises in the side legs (E). To fashion this block, make intersecting 45° ripcuts at your tablesaw in a scrap of 2× stock about 12" long. Place the V-block on your mortiser table and place the leg in the groove, as shown. Set the depth stop to cut ⅞" deep after the full width of the chisel has contacted the face of the leg. Save this block to use later during assembly.

6 Plane chamfers on the inner edges of the side aprons' (G) straight tenons [**Drawings 4** and **5**] to help them seat where they intersect in the back-leg (D) mortise. Test-fit the tenons in the leg and adjust as needed.

Angled tenons made easy

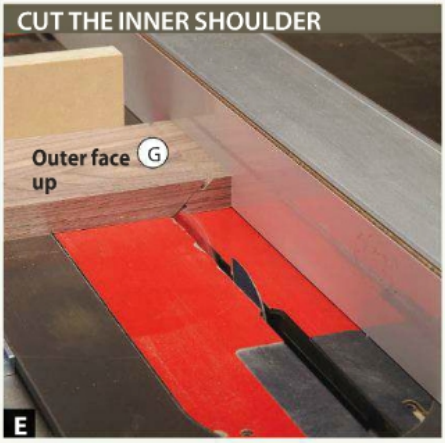
NOTE: These photos show a tablesaw with a left-tilting blade. For a right-tilting saw, the fence and miter gauge would be opposite of those shown. Repeat each step for the second side apron before changing setups, being careful to make mirrored parts.

CUT THE OUTER SHOULDER



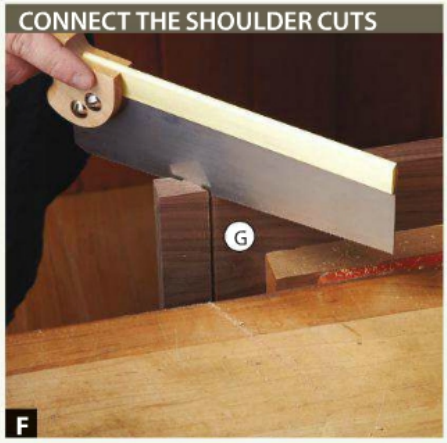
With the blade tilted 45°, the fence to the right of the blade, and the miter gauge in the left slot, saw the outer-face shoulder to the layout mark.

CUT THE INNER SHOULDER



Without changing the blade, move the fence to the left side and the miter gauge to the right slot. Flip the workpiece and saw the inner shoulder.

CONNECT THE SHOULDER CUTS



With a backsaw, cut ½" deep on each edge to connect the inner and outer shoulder cuts. This establishes the edge shoulders for a neat fit.

FORM ONE TENON CHEEK

With a ¾" dado set raised for a ¼" cut, and using the fence as a stop to prevent cutting the shoulder, remove the bulk of the waste from the tenon cheeks.

CLEAN UP THE INSIDE CORNER

Use a backsaw to continue the outer-shoulder cut to tenon depth. Follow that with a bevel-edge chisel to pare away the last nibs for a clean tenon.

COMPLETE THE TENON

Cut the tenon's edge cheeks to bring the tenon to width. Test the tenon's fit in its corresponding leg mortise; refine the fit as needed.

Complete the legs and aprons

1 Taper the inside faces of all four legs [**Drawing 1, More Resources**]. The inside faces are those with mortises cut in them plus the back of the hinge leg (F).

2 Lay out and cut the curve along the bottom of each side apron (G) [**Drawing 5**]. Sand the curves smooth.

3 Dry-assemble the back leg (D), side legs (E), and side aprons (G). Clamp the assembly and hold the inner apron (H) in position to mark its length [**Photo J**]. Cut the apron—which has no tenons—to length.

Quick Tip! *Crosscut in half the V-block you made earlier for cutting the angled mortises to serve as clamping cauls for the corners.*

4 Rout centered slots for the tabletop fasteners on the inside faces of both side aprons (G) and the inner apron (H) [**Drawing 5**].

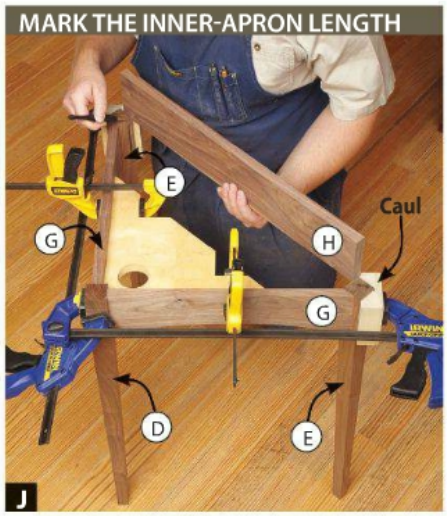
5 Finish-sand all parts to 220 grit. Glue the hinge block (A) and apron block (B) to the inner apron (H) with the tenon shoulders flush with the apron ends [**Drawings 1** and **4**].

Assemble the base

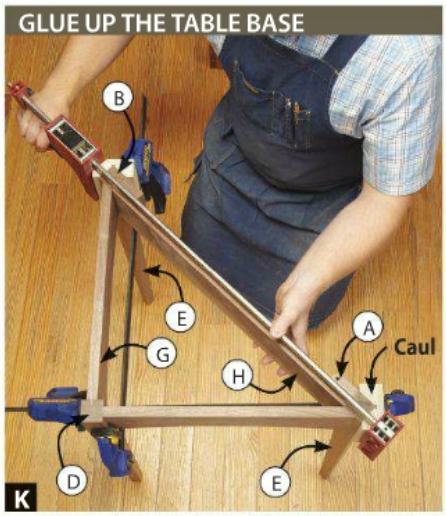
1 Glue each side apron (G) into its side leg (E). Clamp each subassembly, using a V-block caul on the leg.

Quick Tip! *After you unclamp the E/G assemblies and before you start the next step, bevel-rip one outer edge of each V-block caul at 45° to make clamping the glued-up base easier [Photo K].*

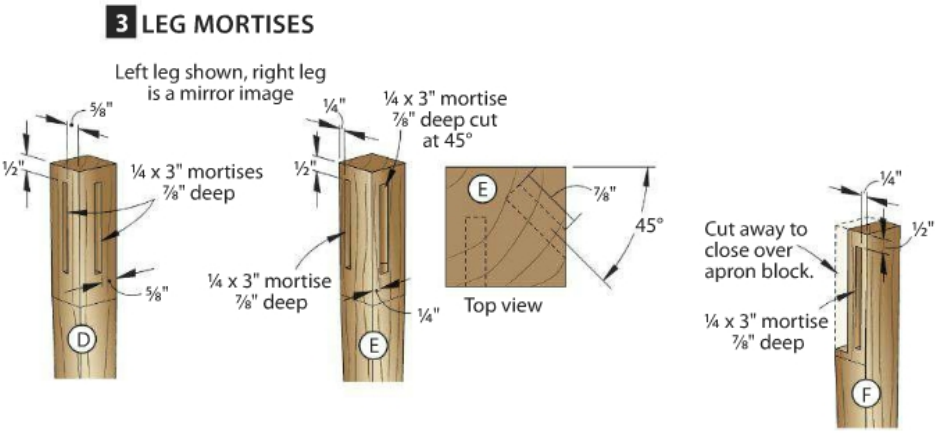
2 Cut the corner braces (I) to fit where shown in **Drawings 1** and **4**. Dry-

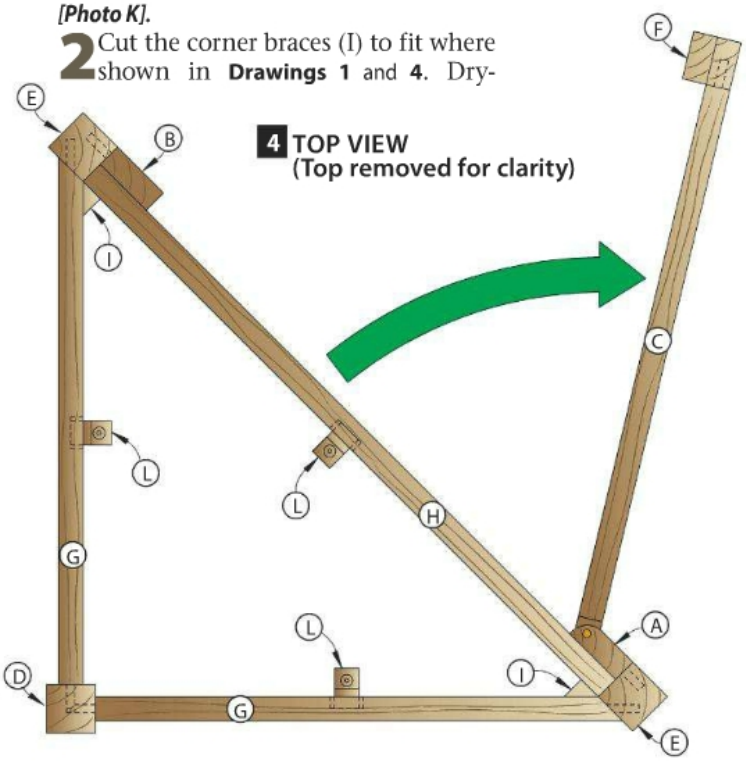


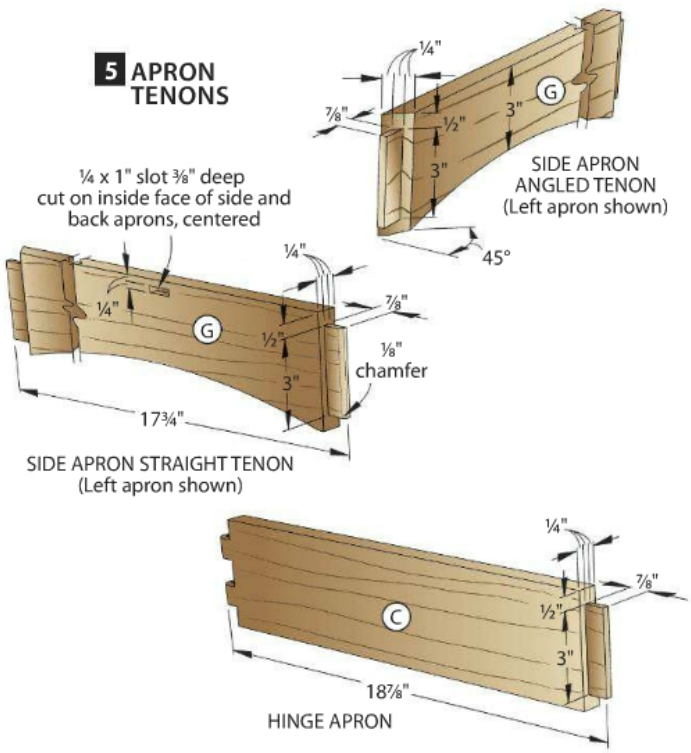
Clamp a squaring brace between the side aprons (G) to establish the distance between the side legs (E) and mark the inner apron's (H) length.



Clamp across each pair of legs to pull the aprons together for a solid frame. Bevel-ripped edges on the V-block cauls provide flat clamp surfaces.







assemble the side leg/apron assemblies (E/G) to the back leg (D) and the inner apron assembly (A/B/H) to determine the assembly sequence that works best for you. Disassemble, then glue and clamp the base [**Photo K**]. Glue the corner braces in place once clamped.

3 Temporarily place the hinge apron (C) and hinge leg (F) in position against the inner apron (H). Mark and cut the clearance notch [**Drawing 3**] so the leg will close over the inner apron. Glue the hinge apron to the hinge leg. Finish-sand as needed.

Turn to the top

1 For best appearance, orient the top's grain parallel to the inner apron (H). Glue up two blanks for the tops.

2 Cut the fold-down top (J) to size [**Drawing 1**] with a circular saw and straightedge. Lay out the fixed top (K) as shown in **Photo L**, and then cut it to size.

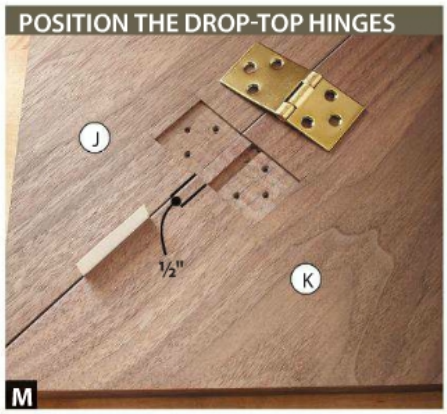
3 To form the rule joint that allows the fold-down top (J) to swing down, rout a ½" cove along the bottom of the fold-down top's long edge [**Drawing 1**]. Complete the rule joint by routing a ½" round-over along the top of the fixed top's (K) long edge.

4 Slide the top pieces (J, K) together, bottom surfaces facing up, with a 1/16" gap between them and centering the fold-down top (J) on the fixed top (K). Locate a hinge [**Sources**] 10¼" to each side of the centerpoint, with the hinge barrel centered ½" from the edge of the fixed top. Scribe around each hinge, and then cut mortises to match the thickness of the hinge leaves. Rout a ¼" groove ¼" deep for the hinge barrel [**Photo M**]. Screw the hinges to the tops.

5 Hand-saw 45° bevels on the corners of the fixed top (K) to continue the edge lines of the fold-down top (J) [**Drawing 1**].

6 Remove the hinges and finish-sand the top. Apply a finish to the project. We used Danish Oil, followed with three coats of a one-pound cut of dewaxed garnet shellac [**More Resources**], sanding between coats with a 320-grit sponge.

Place the fold-down top (J) on the fixed-top blank (K), ½" in from the long edge. Trace along the sides of J, extending the lines to the blank's long edge.



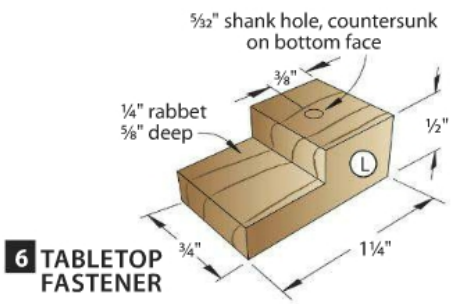
Use a 1/16" spacer to maintain the gap between the top panels (J, K). Create mortises and barrel grooves so the hinges mount flush to both parts.

Put the table together

1 Cut the gateleg hinge pin to length, and use it to attach the hinge leg assembly (C/F) to the hinge block (A).

2 Cut a ½×2½×10" blank for the tabletop fasteners (L) [**Drawing 6**]. Rabbet along one end of the stock to create the tongues for the apron slots. Rip and crosscut three fasteners from the blank, and drill screw holes where shown.

3 With the fold-down and fixed tops (J, K) hinged together, invert the base (A–I) on the bottom of the fixed top. Lift the fold-down top upward, and center the base side to side while also allowing clearance for the hinges to work. Center the tongue of a tabletop fastener in each apron slot [**Drawing 4**], and secure it to the top with a screw.



6 TABLETOP FASTENER

Written by **Larry Johnston**
Produced by **Bob Hunter** with **John Olson**
Project design: **Kevin Boyle**
Illustrations: **Lorna Johnson**

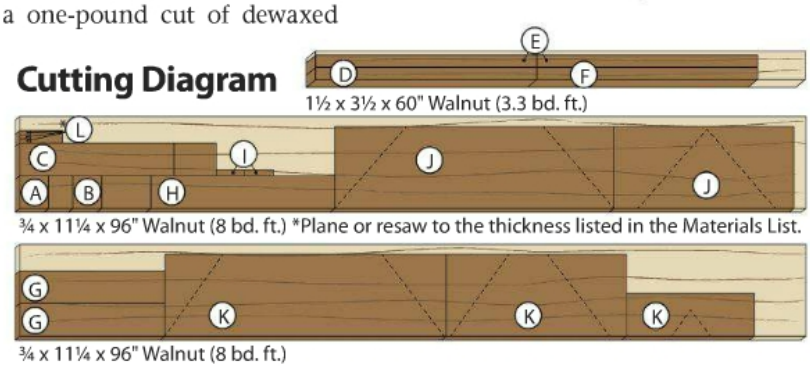
Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	hinge block	¾"	4"	2¾"	W	1
B*	apron block	¾"	4"	2¾"	W	1
C*	hinge apron	¾"	4"	18⅞"	W	1
D	back leg	1½"	1½"	27"	W	1
E	side legs	1½"	1½"	27"	W	2
F	hinge leg	1½"	1½"	27"	W	1
G*	side aprons	¾"	4"	17¾"	W	2
H*	inner apron	¾"	4"	22½"	W	1
I	corner braces	¾"	¾"	3½"	W	2
J*	fold-down top	¾"	17¼"	34⅛"	EW	1
K*	fixed top	¾"	17¾"	34⅜"	EW	1
L*	tabletop fasteners	½"	¾"	1¼"	W	3

*Parts initially cut oversize. See the instructions.

Materials key: W–walnut, EW–edge-glued walnut.
Supplies: ¼" brass rod, #8×1" flathead screws (3).
Blade and bits: Stacked dado set; ¼" hollow-mortise chisel; ¼" spiral, ½" round-over, and ½" cove router bits; 5/32" and ¼" drill bits.
Sources: Drop-leaf hinges, Rockler, no. 29256, $11.59 per pair, 800-279-4441, rockler.com; garnet shellac flakes, no. 195881, $35 per lb, Highland Woodworking, 800-241-6748, highlandwoodworking.com.

Cutting Diagram



More Resources

- Find plans for a tablesaw tapering jig and instructions at woodmagazine.com/taperjig1. See a free video about tapering legs with the jig at woodmagazine.com/taperjig2.
- For a free right-angle brace plan, see woodmagazine.com/clampingbrace.
- For a free fairing-stick plan, go to woodmagazine.com/fairing.
- Learn how to mix and apply shellac at woodmagazine.com/shellac.

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SHOP TESTED

Shop Vacuums under $150

Here's the "dirt" on the most utilitarian tool in any home, garage, or workshop.

Criteria for choosing the shop vacuums in this review:

- Sells for less than $150
- Widely available (online and in stores)
- 2½"-diameter hose for easy connection to common machine ports
- Sufficient tank capacity for woodworking debris; we chose 12- and 16-gallon models
- Swiveling casters for easy mobility

A shop vacuum is like the bass player in a band: seldom featured but always performing a crucial job. For a good shop vacuum, the gig includes more than cleaning up the floor; it should also effectively capture dust and chips at the source before that debris gets into the air or onto the floor.

We tested 10 shop vacuums in multiple woodworking, garage, and basement applications. Here's what you need to know before you buy.

The three most important attributes of a shop vacuum

1. Dry suction. If you're looking for a vacuum to use in your shop, then how well it sucks up dust and chips should be the top concern. Two factors determine a vacuum's ability to pick up dry debris: suction and airflow. *Suction* gives a vacuum the power to pick up debris, while *airflow* moves it through the hose and into the tub. Airflow is a direct result of suction when the hose end is open. You can have suction without airflow—see our water lift test, *next page*—but never airflow without suction. We measured each model's suction and airflow using instruments and methods similar to those used by testing labs.

For dry debris, airflow (measured in cubic feet per minute, or cfm) proves most critical. Fine dust, such as that generated by sanders, moves easily through hoses and requires little airflow. However, sucking chips from a router table or planer requires high airflow to prevent

this larger debris—especially in the volume these tools create—from hanging up in the hose. We measured airflow in these vacs in multiple situations, sucking up debris of varying size with clean and dirty filters to replicate new and used equipment.

In both suction and airflow, Craftsman's XSP vacuums consistently bested the other models. (See the airflow results for each vacuum in the chart on *page 55*.) And both Craftsman's high performance continued when we hooked up a chip separator between a planer and each vacuum. The separator—which sifts out the heavier debris before passing fine dust on to the vacuum tub—robbed each model of about a quarter of its airflow, and all of the Ridgid and Shop-Vac units left some chips inside the planer and hose. Craftsman's did not.

The Shop-Vac Pro 965-12-00, Shop-Vac Lowe's 931-17-11, Shop-Vac Lowe's Contractor 966-16-11, and Shop-Vac Ultra Pro 955-16-00 have exhaust mufflers or diffusers that cut down on noise—they're the quietest units in the test—but also reduced airflow.

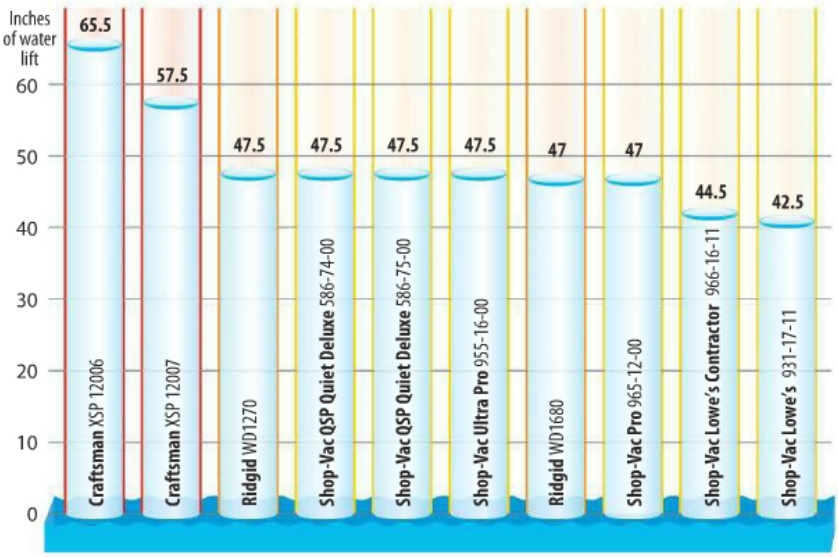
2. Wet suction. Hopefully, you'll never have to suck up water in your shop, but these are all wet/dry vacs capable of cleaning up unexpected spills or backed-up drain overflows. We tested each vacuum's maximum suction by connecting its hose to a clear vertical tube and measuring how high the vacuum could lift the water from a bucket. See the results in the chart *above right*.

We also removed the filters and timed each vacuum's ability to suck five gallons of water from a bucket. The Ridgid vacuums and Shop-Vac Ultra Pro 955-16-00 did this fastest, with the Craftsman vacs and Shop-Vac Pro 965-12-00 right behind. All the vacs have a float mounted under the lid that rises as the tub fills with water and cuts off suction to protect the motor from water exposure. Because the float extends into the tub, it cuts off suction after the vac has reached only about 60–75 percent of its maximum-rated capacity. For example, the low-profile lid of the 16-gallon Shop-Vac Lowe's 931-17-11 reaches lower into its tub than any of the other test vacuums, so it cut off after collecting only slightly more water than the 12-gallon models. See the chart on *page 55* for the liquid capacities you can expect with each unit.

3. Filtration. A filter (or filters) inside the vac trap the fine dust while letting clean air pass through, but better filtration often comes at the expense of airflow. We tested each vacuum with dust and chips you'd expect to find in a woodworking shop, and also with chalkline chalk (its uniform-size particles are easy to see), and found that, as a dust cake builds up on the filter's pleats, filtration actually improves. So while it's a good idea to occasionally clean the loose dust from the filter, don't feel the need to blow out every nook and cranny with an air compressor.

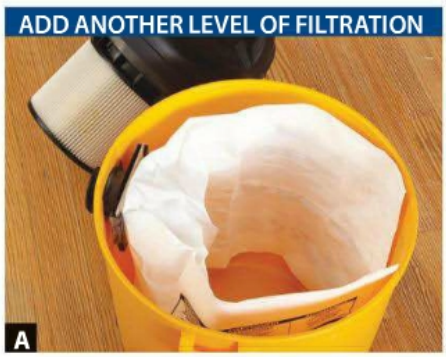
The Shop-Vac models filtered best because they come with a disposable collection/filtration bag [**Photo A**], as well as

SUCTION: THE ACID TEST FOR A SHOP VACUUM



Sucking water up into a clear tube lets you quickly gauge each vacuum's capability.

ADD ANOTHER LEVEL OF FILTRATION



A collection bag, shown on the Shop-Vac Pro, mounts directly to the intake port and wraps around the filter to trap most of the debris.

Craftsman XSP 12006, $90

800-549-4505, craftsman.com

Craftsman XSP 12007, $110

Ridgid WD1270, $80

800-474-3443, ridgid.com

Ridgid WD1680, $120

a pleated cartridge filter. Using these together greatly reduced the amount of dust particles returning to the air, compared to using the cartridge alone on any of the test vacs. Shop-Vac's fine-filtering bags—standard on the Lowe's Contractor 966-16-11, but optional on any Shop-Vac—trapped more fine dust without reducing airflow as much as the medium-filtering bags provided with the other Shop-Vac models.

The Craftsman and Ridgid cartridge filters have about twice as much surface area as those on the Shop-Vacs, allowing them to go longer between cleanings (when used without the collection bags). For an extra $30–50, you can upgrade any of these vacs with an ultrafine cartridge filter for better performance.

Other factors to help you buy the right vacuum

■ **Hose.** The 2½"-diameter hoses on these vacuums work well for general cleanup and hooking to benchtop and stationary machines with matching dust ports. But because of their awkward stiffness, you won't be happy using them connected to a portable tool, such as a random-orbit sander or router.

The Craftsman [**Photo B**] and Ridgid hoses felt stiffer than the Shop-Vac hoses, but better withstood crushes and collapses. In addition, many of the Shop-Vac hoses leaked around their swivel connectors. All but two vacuums (the Shop-Vac Quiet Deluxe 586-74-00 and 586-75-00) have hoses that lock or clip to the intake port, a nice feature that prevents disconnection when tugging on the hose.

■ **Dumping.** Whatever goes in the tub must, at some point, come out. To empty liquids, simply remove the drain plug and let gravity do its thing. For dry debris, a smooth-rimmed tub empties easiest [**Photo C**]. All but the Ridgid and Shop-Vac 16-gallon vacs have smooth rims. The added bulk of the accessory bin on the Shop-Vac Lowe's Contractor 966-16-11 makes dumping dry debris more difficult.

■ **Accessories.** All the tested vacuums come with a pair of extension tubes and a 14"-wide floor sweep. Most also include an 8" sweep, crevice nozzle, and rubber squeegee sweep insert for sucking up water from a floor. The Craftsman and Ridgid models store these best, but the Shop-Vac Ultra-Pro 955-16-00 (a hang-on mesh bag) and Lowe's Contractor 966-16-11 (rear bin) also keep accessories contained nicely.

■ **Noise.** The vacuums surprised us with noise levels lower than we expected, ranging from 80 to 87 decibels. That's not piercing or irritating, but still loud enough to warrant hearing protection. Ironically, the Shop-Vac Quiet Deluxe vacuums (586-74-00 and 586-75-00) measured among the loudest in the test.

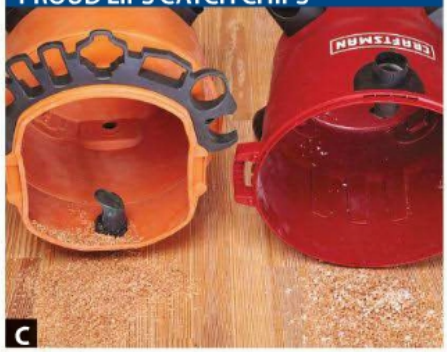
■ **Cord storage.** With power cords up to 21' long, you need a convenient method for stowing them. We like the molded

A MUCH-APPRECIATED HOSE CORRAL

B

The effective wire hose holders on top of the Craftsman models solve the age-old problem of how to wrap the hose when not in use.

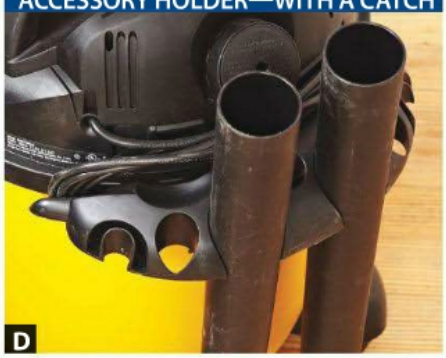
PROUD LIPS CATCH CHIPS



C

Lipped tub rims that flare inward (Ridgid WD1680, *left*) catch debris when dumping. Smooth-rimmed vacs (Craftsman XSP 12007) dump cleanly.

ACCESSORY HOLDER—WITH A CATCH



D

Six Shop-Vac models have friction-fit accessory hangers that interfere with the cord wrap and allow extensions to slip to the floor.

VAC AND BLOWER IN ONE

E

The motor of the Shop-Vac Lowe's 931-17-11 lifts off to make a handy blower. But it pops off so easily that you must lift this vacuum by its tub rim.

Shop-Vac Pro 965-12-00, $100
570-326-3557, shopvac.com

Shop-Vac QSP Quiet Deluxe 586-74-00, $110

Shop-Vac Lowe's 931-17-11, $125

Shop-Vac Lowe's Contractor 966-16-11, $120

MAKING A CLEAN SWEEP WITH 10 VALUE-PRICED SHOP VACUUMS

MANUFACTURER	MODEL	PERFORMANCE RATINGS (1)									ACTUAL TANK CAPACITY, GALLONS (2)	FILTER SURFACE AREA, SQUARE INCHES	HOSE LENGTH	DETACHABLE BLOWER? (YES, NO)	ACCESSORIES (3)		NOISE LEVEL, DECIBELS	CORD LENGTH	WARRANTY, YEARS (4)	COUNTRY OF ASSEMBLY (5)	SELLING PRICE (6)
		PRIMARY		SECONDARY																	
		DRY SUCTION: AIRFLOW MEASURED IN CUBIC FEET PER MINUTE	WET SUCTION: TIME REQUIRED TO SUCK UP 5 GALLONS OF WATER, SECONDS	FILTER EFFECTIVENESS	EASE OF REMOVING/REPLACING FILTER	PORTABILITY	HOSE QUALITY	EASE OF DUMPING DRY DEBRIS	EASE OF DRAINING LIQUIDS	EASE OF STORING ACCESSORIES					STANDARD	OPTIONAL					
12-GALLON MODELS																					
CRAFTSMAN	XSP 12006	207	7.6	C	B	A	A	A	A	A	8.8	1,033	7'6"	N	C,E,F,S,U,W	D,H,M,N,R	84	20'	1	C	$90
RIDGID	WD1270	165	7	C+	A	A	A-	A	B-	A-	9.4	1,386	7'	N	E,F,N,S,U	D,H,M,R	86	15'6"	L	M	80
SHOP-VAC PRO	965-12-00	144	8.7	B	B	A-	B	A	B	B-	8.2	582	8'	N	D,E,F,L,M,U	C,H,R,W	80	12'6"	3	U	100
SHOP-VAC QSP QUIET DELUXE	586-74-00	192	9.3	B	B	B	B	A	B	B-	7.9	582	8'	N	C,D,E,F,S	H,N,R,U,W	86	12'	3	U	110
16-GALLON MODELS																					
CRAFTSMAN	XSP 12007	209	8.8	C	B	A	A	A	A	A	11.1	1,033	7'6"	N	C,E,F,S,U,W	D,H,M,N,R	84	20'	1	C	110
RIDGID	WD1680	181	7.4	C+	A	A-	A-	B	B-	A	12.4	1,386	7'	Y	B,E,F,N,S,U	D,H,M,R	83	20'6"	L	M	120
SHOP-VAC LOWE'S	931-17-11	144	9.8	B	B	B-	B	B	B	B-	9.6	582	8'	Y	B,C,D,E,F,M,N,U	H,R,W	82	21'	5	U	125
SHOP-VAC LOWE'S CONTRACTOR	966-16-11	169	11.1	B+	B	B	B	B-	B	A	10.3	582	8'	N	C,D,E,F,M,N,U	H,R,W	82	20'	5	U	120
SHOP-VAC QSP QUIET DELUXE	586-75-00	193	11.9	B	B	B-	B	B	B	B-	10.3	582	8'	N	C,D,E,F,S	H,N,R,U,W	87	12'	3	U	130
SHOP-VAC ULTRA PRO	955-16-00	174	7	B	B	B+	B	B	B	A-	11	582	8'	N	A,C,D,E,F,L,M,U	H,N,R,W	80	18'	4	U	140

1. A Excellent; B Good; C Fair
2. Measured by drawing in water until float triggers vacuum shutdown.
3. (A) Accessory storage bag; (B) Blower nozzle; (C) Crevice nozzle; (D) Disposable collection bag; (E) 2 extension tubes; (F) 14" dry floor sweep; (H) HEPA cartridge filter; (L) 45° extension elbow; (M) Muffler/diffuser; (N) 2½" angled nozzle; (R) Round dust brush; (S) Squeegee wet sweep; (U) 8" dry utility sweep; (W) Wet-suction foam filter
4. (L) Limited lifetime
5. (C) China; (M) Mexico; (U) United States
6. Prices current at time of article production and do not include shipping, where applicable.

cord wraps on the Ridgid vacs best. It's hard to wrap the cords on the Shop-Vac units [**Photo D**] without removing stored accessories, and difficult to replace the lid on the tub with the cord wrapped. Craftsman has only a hook-and-loop strap to keep the cord coiled.

■ **Detachable blowers.** Two vacuums have blowers that lift free from the lid for handheld use. Both worked well at moving leaves and dust. The Ridgid WD1680 blower secures nicely to its lid, letting you lift the whole vacuum by its handles; not so with the other [**Photo E**].

Shop-Vac QSP Quiet Deluxe 586-75-00, $130

Shop-Vac Ultra Pro 955-16-00, $140

Seeing red at the top

Although all of these vacuums will perform adequately in a workshop, garage, or basement, the two Craftsman models earned top marks in almost every test. We like the high suction and airflow of the XSP 12006, but its 12-gallon tub fills quicker than the 16-gallon XSP 12007.

Produced by **Bob Hunter** with **Tom Brumback**
Illustration: **Tim Cahill**

Turn, turn, turn a top

Tops fascinate young and old alike with their hypnotic spinning. With a good tug on the string, this 3"-diameter top spins for more than a minute and a half.

Prepare your blanks

For the top itself, prepare a 1¼"-thick×3⅛"-diameter maple blank. Glue a ¼×2"-diameter waste block to one face of the maple blank, centered. While the glue dries, cut two ¾×¾×4" blanks for the spindle and the handle. (We used cherry and dyed it black [**Supplies on Demand,** *page 58*] after shaping.) To accept the string, drill a 1/16" hole in the handle blank centered on the blank's thickness and 1¼" from one end. Set the handle and spindle blanks aside.

Turn the top's tenon

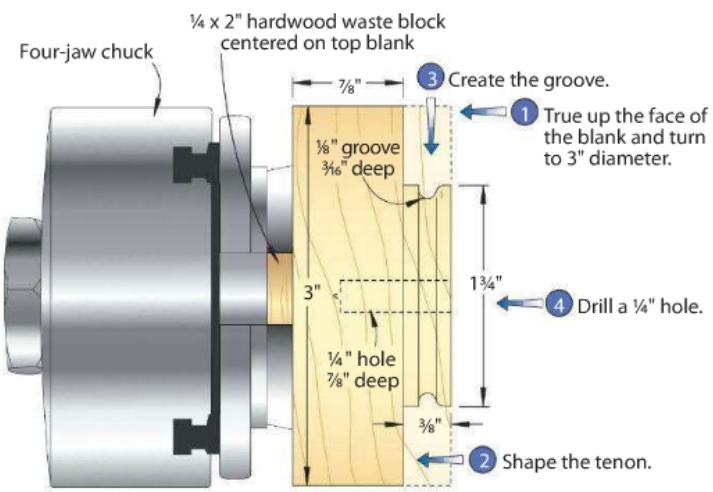
Tools: ⅜" bowl gouge, squarenose scraper, 1/16" parting tool, detail scraper **Speed:** 1,200 rpm

Secure in your four-jaw chuck the 2" waste block. Using a bowl gouge, turn the blank to 3" in diameter. Then, flatten its face.

Using a pencil, mark a 1¾" circle on the face of the blank; then, make a mark around the edge ⅜" from the outer face, *top right*. With a squarenose scraper, turn between the marks to create a tenon, *middle right*.

With a 1/16" parting tool, create a 3/16"-deep groove centered on the tenon's length. Widen the groove to ⅛" with a detail scraper, rounding the right shoulder slightly, *bottom right*.

Secure a ¼" drill bit in a drill chuck mounted in the tailstock, and drill a ⅞"-deep hole. Finish-sand the face of the top and the face and edge of the tenon to 220 grit.

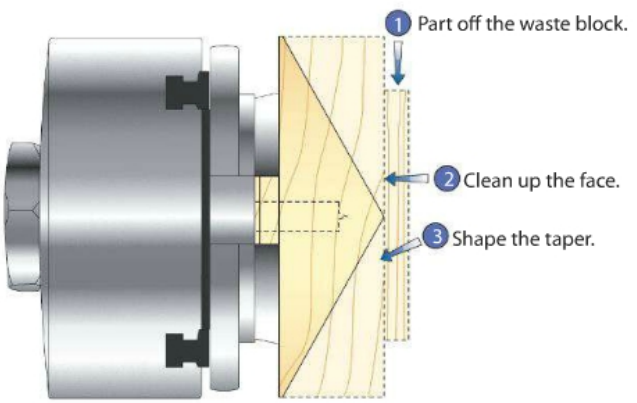


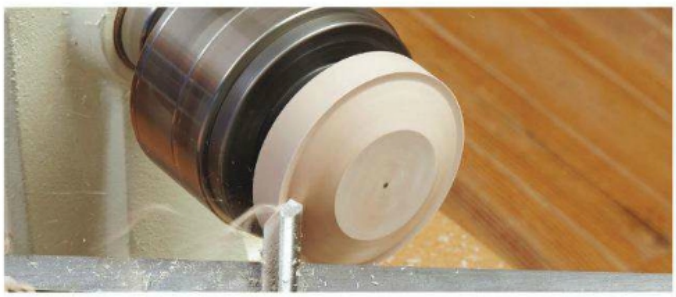
Time to make a point

Tools: Parting tool, ⅜" bowl gouge **Speed:** 1,200 rpm

Remount the top, gripping the grooved tenon you just turned in the four-jaw chuck. Part off the waste block from the exposed face, *right*.

With a pencil, mark a dot in the center of the face. Working from the center outward with the bowl gouge, create a taper between the dot and the edge of the blank. Sand the taper to 220 grit. Remove the top from the chuck.





Give the spindle a spin

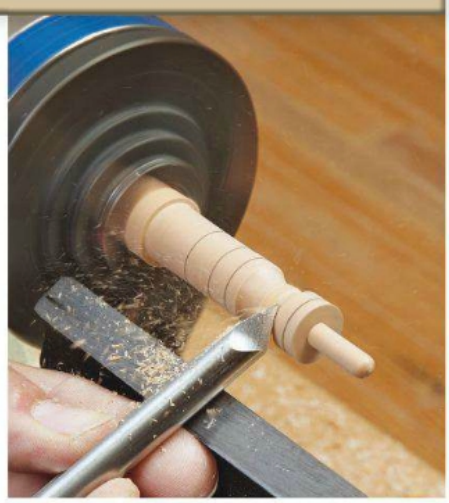
Tools: Spindle roughing gouge, spindle detail gouge, parting tool **Speed:** 1,200 rpm

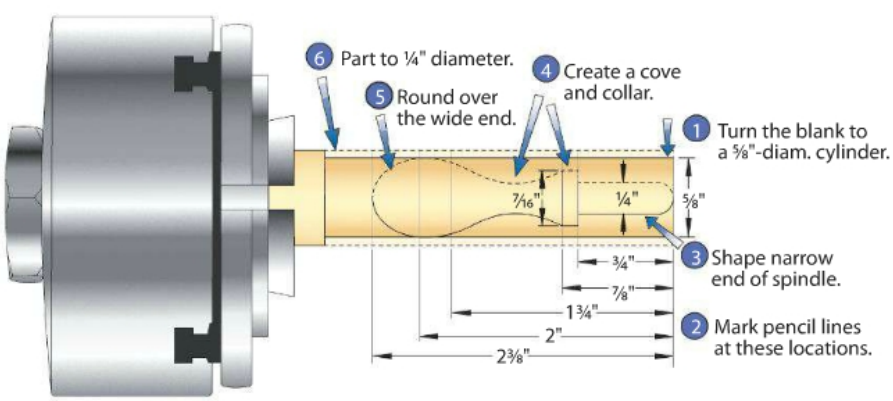
Photocopy the **Spindle** and **Handle Templates** from the *WOOD Patterns*® insert on *page 41* and spray-adhere them to a piece of poster board. Cut out the templates along the lines.

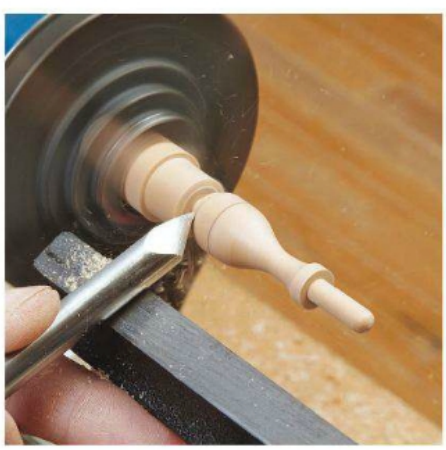
Install #1 jaws on your four-jaw chuck. Retrieve the spindle blank and secure it in the chuck. With your spindle roughing gouge, turn the blank round. Then, reverse the spindle, gripping the newly rounded end and leaving 3" of the blank's length exposed. Turn the blank to ⅝" in diameter.

Mark the five segments shown in the drawing, and extend the marks around the blank. Using the parting tool, turn the rightmost segment to ¼" diameter. Switching to the detail gouge, round over the end and shape the cove, *right*. Return to the parting tool and turn the collar between the cove and the right end to 7/16".

Round over the left end with the detail gouge, *bottom right*, checking your progress with the template. Switch to a parting tool and reduce the diameter at the top (left end) of the spindle to ¼". Touch up the profile until it matches the template. Sand the spindle to 220 grit; then, part the spindle from the blank.







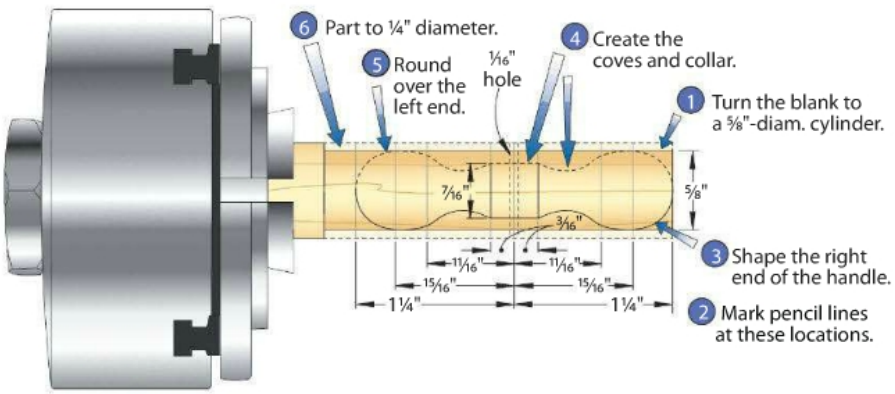
Craft a handle that resembles the spindle

Tools: Spindle roughing gouge, spindle detail gouge, parting tool **Speed:** 1,200 rpm

Mount the handle blank in the four-jaw chuck with the hole in the blank closest to the chuck. As you did with the spindle, turn the blank round, then reverse it in the chuck and turn it to ⅝" in diameter. Measuring out from the center of the hole, mark the eight segments shown in the drawing.

With the detail gouge, round over the right end of the blank first, then create the coves. With your parting tool, reduce the diameter on either side of the hole to 7/16". Round over the far edges of each cove with the detail gouge to blend the cove to the outermost segments of the handle.

As with the spindle, use your parting tool to define the left end of the handle, reducing the diameter to ¼". With the detail gouge, round over the left end of the handle. Sand the handle to 220 grit; then, part it off.



Finish it up, then give it a whirl

Sand to 320 grit any areas needing it, then apply a finish. (After dyeing the handle and spindle, we sprayed on 3 coats of a satin-finish aerosol lacquer, sanding lightly between coats with 320-grit sandpaper.) Feed a 36" length of waxed cotton string [**Supplies on Demand**] through the hole in the handle and tie a couple of knots in the end to keep it from pulling back through. Wind the string around the groove in the tenon, insert the spindle, and give a good tug, removing the spindle as the top takes off.

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

Supplies on Demand

You can quickly and easily order the black aniline dye and waxed cotton string needed for this project at woodmagazine.com/224top. Simply delete any supplies you already have on hand before checkout.

More Resources

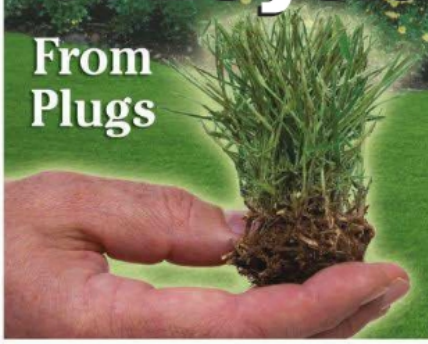
- Find more turning projects at: **woodmagazine.com/turnedprojects.**
- Watch FREE video turning tips and techniques at: **woodmagazine.com/turningvideos.**
- Read reviews of lathes and turning tools at: **woodmagazine.com/lathereviews.**

Top this!

Don't limit your top to 3" in diameter. Just for fun, *WOOD*® turning expert Brian Simmons glued up a maple blank with mahogany accent strips, then turned this 7"-diameter super-size top with a 3"-diameter tenon. The spindle, handle, and thickness of the top and tenon are identical to those of its little brother; however, use a string at least 48" long. The only limit to the size of a top will be the capacity of your lathe.

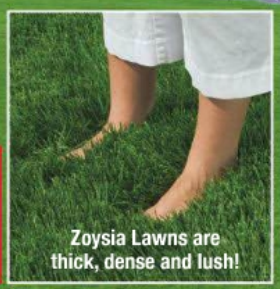
On this larger version, the mahogany strips disappear in the blur while the top spins quickly, gradually revealing themselves as the rotation slows. Try gluing up blanks with your own patterns. Then, give 'em a good spin and show us the results in a video. Post them for free at woodmagazine.com/woodtube.

SAVE When You Grow A Zoysia Lawn From Plugs!



To A Fabulous Lawn

ZOYSIA FARM NURSERIES
Improving America's Lawns Since 1953

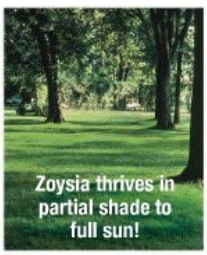


GRASS SEED WILL *NEVER* GROW A LAWN LIKE THIS!

Save Water! Save Time! Save Work! Save Money!

Grass Seed Is For The Birds!

Stop wasting money, time and work sowing new grass seed each spring, only to see birds eat the seed – or rain wash it away – before it can root. Plant a genuine Amazoy™ Zoysia lawn from our living Plugs only once... and never plant a new lawn again!



Zoysia Grows Where Other Grass Doesn't!

Zoysia is the perfect choice for hard-to-cover spots, areas that are play-worn or have partial shade, and for stopping erosion on slopes. North, South, East, West – Zoysia will grow in *any* soil, no ifs, ands or buts!

Each Zoysia Plug You Plant In Your Soil Is GUARANTEED TO GROW Within 45 Days Or We'll Replace It FREE!

To ensure best results, we ship you living sheets of genuine Amazoy™ Zoysia Grass, harvested direct from our farms. Plugs are not cut all the way through. Before planting, simply finish the separation by cutting 1"-sq. Plugs with shears or knife. Then follow the included easy instructions to plant Plugs into small plug holes about a foot apart. Our guarantee and planting method are your assurance of lawn success backed by more than 6 decades of specialized lawn experience.

Eliminates Endless Weeds And Weeding!

No more pulling out weeds by hand or weeds sprouting up all over your lawn. Zoysia Plugs spread into a dense, plush, deep-rooted, established lawn that drives out unwanted growth and stops crabgrass and summer weeds from germinating.

Environmentally Friendly, No Chemicals Needed!

No weeding means no chemicals. You'll never have to spray poisonous pesticides and weed killers again! Zoysia lawns are safer for the environment, as well as for family and pets!

Cuts Watering & Mowing By As Much As 2/3!

Many established Zoysia lawns only need to be mowed once or twice a season. Watering is rarely, if ever, needed – even in summer!

Meyer Zoysia Grass was perfected by the U.S. Gov't, released in cooperation with the U.S. Golf Association as a superior grass.

www.ZoysiaFarms.com/mag

Stays Green In Summer Through Heat & Drought!

When ordinary lawns brown up in summer heat and drought, your Zoysia lawn stays green and beautiful. The hotter it gets, the better it grows. *Zoysia thrives in blistering heat (120°)*, yet it won't winter-kill to 30° below zero. It only goes off its green color after killing frosts, but color returns with consistent spring warmth. Zoysia is the perfect choice for water restrictions and drought areas!

Our Customers Love Their Zoysia Lawns!

One of our typical customers, Mrs. M.R. Mitter of PA, wrote how "I've never watered it, only when I put the Plugs in... Last summer we had it mowed 2 times... When everybody's lawns here are brown from drought, ours just stays as green as ever!"

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The more Amazoy™ Zoysia Plugs you order, the more you SAVE! And remember, once your Zoysia lawn is established, you'll have an endless supply of new Plugs for planting wherever you need them. Order now!

FREE! PLANTING TOOL With Order of 500 Plugs or More!
Saves time, work and effort when making holes for Plugs!

Order Now and Save Over 50% – Harvested Daily From Our Farms And Shipped To You Direct!

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Please send me guaranteed Amazoy plug packs as marked:

QTY	# PLUGS	+ FREE Plugs	+FREE Planting Tool	Retail Value	Your Price	+ Shipping	Save
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	500	+ 100	+ Free Step-on Plugger	$84.00	$45.60	$ 7.00	38%
	750	+ 150	+ Free Step-on Plugger	$128.00	$74.50	~~$10.00~~ FREE	42%
	1100	+ 400	+ Free Amazoy Power Auger	$220.00	$99.10	~~$15.00~~ FREE	52%
	1500	+ 900	+ Free Amazoy Power Auger AND Step-on Plugger	$355.00	$147.50	~~$25.00~~ FREE	59%

❑ Extra Step-on Plugger **$8.95** + $3 Shipping ❑ Extra Amazoy Power Auger™ for 3/8" Drill **$24.95** + $5 Shipping

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We ship all orders the same day plugs are packed at earliest correct planting time in your area.

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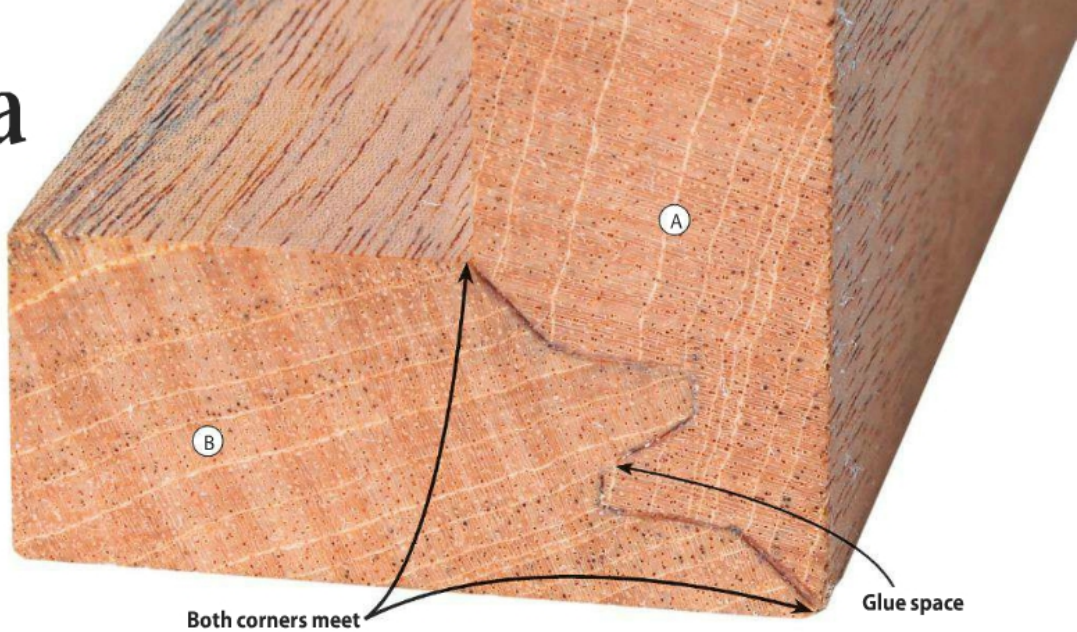
Setting up a Lock-Miter Bit



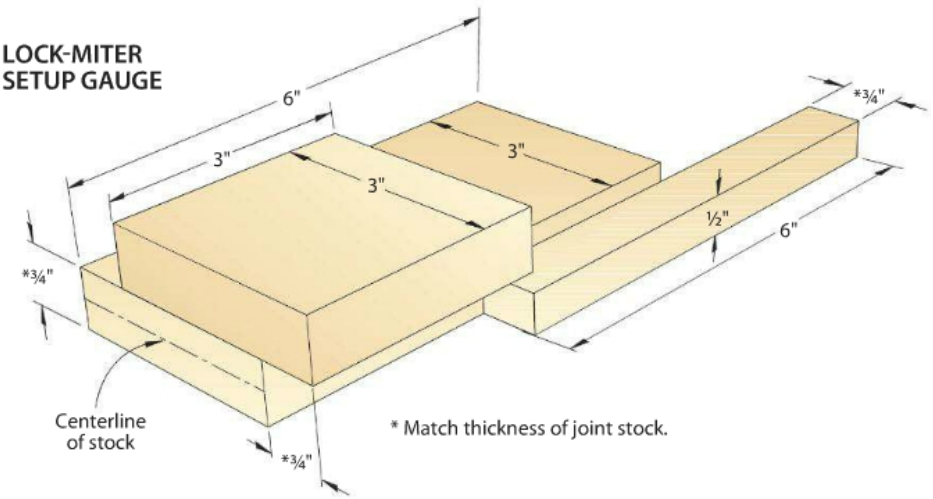
Lock-miter joints have a lot going for them: appearance, self-alignment for easy assembly and clamping, and ample gluing surfaces for strength. They're ideal for right-angle corners of boxes, columns, cabinets, frames, and the like. Plus, you can cut both parts of the joint with a single router-table setup.

But getting the correct router-table setup—both the bit height and fence position have to be just right—can be a challenge. Here's a sure-fire method for setting up this bit.

Install the bit

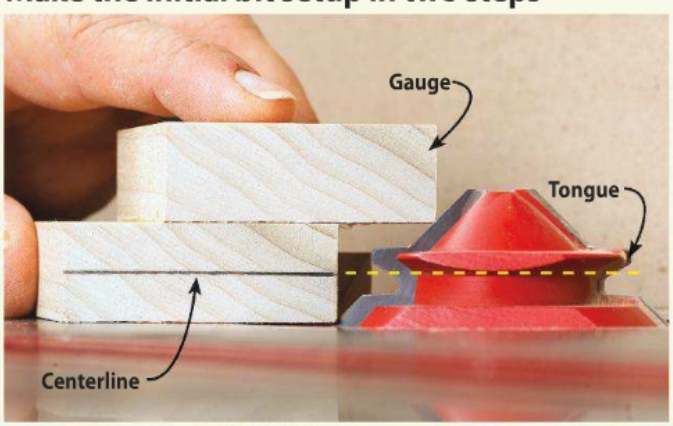
Lock-miter bits come in different sizes, covering different material-thickness ranges; choose one that works for the thickness of your stock. Install the bit in a table-mounted router, and set the router speed to 16,000 rpm for bits 1¼–2¼" in diameter or 12,000 rpm for bits 2¼–3½" in diameter. (Follow the bit manufacturer's recommendation if it is different.) When routing workpieces 2" or more wider than the height of your router-table fence, attach a tall auxiliary

LOCK-MITER SETUP GAUGE

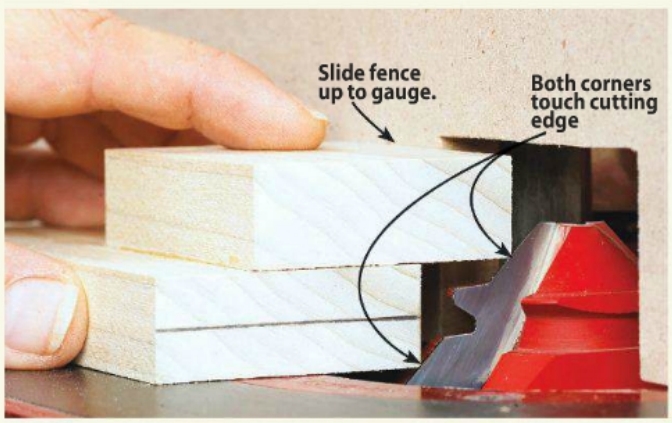


* Match thickness of joint stock.

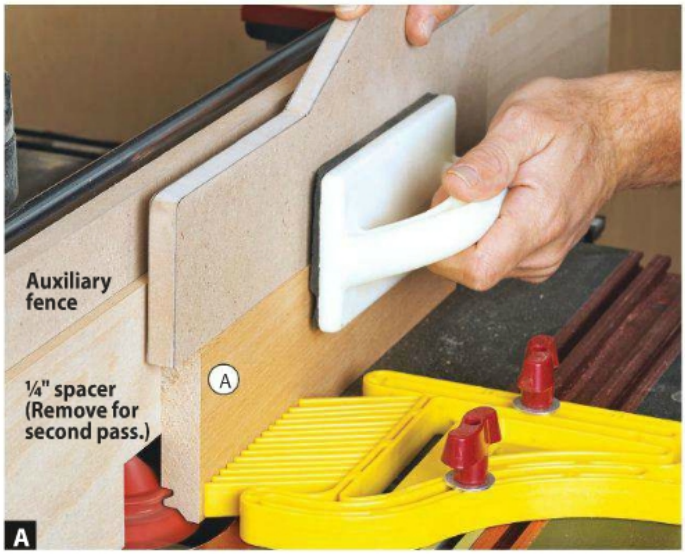
Make the initial bit setup in two steps



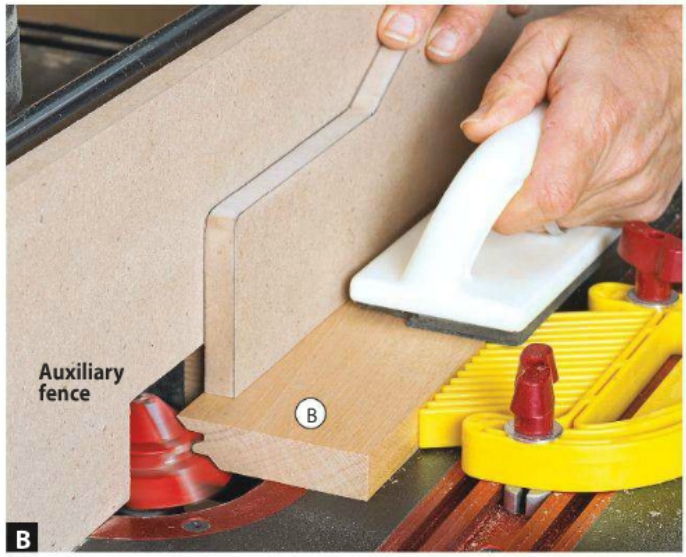
SET THE BIT HEIGHT FIRST
Place the gauge beside the bit and align the center of the bit with the centerline on the gauge. The center of the bit lies at the midpoint of the sloped face of the tongue.



THEN, POSITION THE FENCE
With the height set, position the gauge so the top and bottom corners contact the bit's cutting edge. Then slide the fence up against the jig and lock it in place.



A spacer makes the first cut shallow; remove it for the second pass. Use a featherboard and pushblocks for safe, accurate routing.



Hold the workpiece firmly against the table and fence and feed it at a steady rate as you form the complex profile on the joint parts.

fence to ensure adequate support. (We mounted ours with double-faced tape.)

Now, make a simple gauge

From scrap stock the same thickness as the joint parts (both parts of the joint must be the same thickness), construct the lock-miter setup gauge [**Drawing**]. Draw a centerline across the end of the bottom piece, and mark the material thickness on the gauge. Use it as shown as shown on the *previous page*.

Cut a test joint

Rout both parts of the joint on scrap stock the same thickness as the workpieces. For easier routing, make shallow cuts by starting with a spacer attached to the face of the router-table fence. (We clamped a ¼" plywood spacer in place to rout the joints in ¾" material). Make one pass with the spacer in place, and then remove it for the final pass.

Rout one part of the joint (call it Part A) vertically [**Photo A**], with its *inside* face against the fence. Without changing the setup, rout the other part of the joint (Part B) flat on the table [**Photo B**] in two passes, with its *inside* face down.

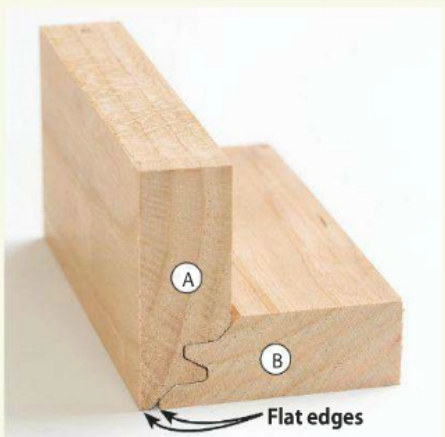
More Resources

▶ Learn more about special-duty bits:
Rabbeting bits with bearing sets:
woodmagazine.com/rabbetingbit
Clean-cutting spiral bits:
woodmagazine.com/spiralbit
Perfect angles with bird's-mouth bits:
woodmagazine.com/birdsmouthbit

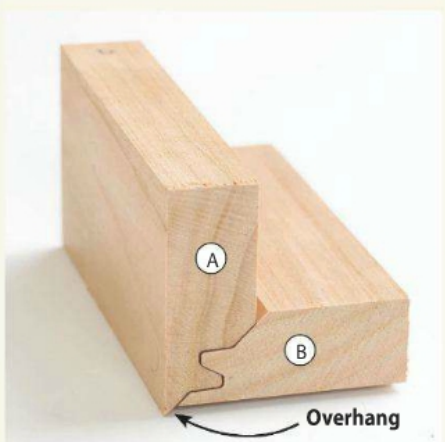
Check the resulting joint against these examples

After you cut the test pieces, assemble the test joint and compare it with the images *below*. Adjust the fence position or bit height, as indicated, in small increments. Cut additional test joints and make adjustments until the parts meet precisely, like the joint at the top of the *previous page*.

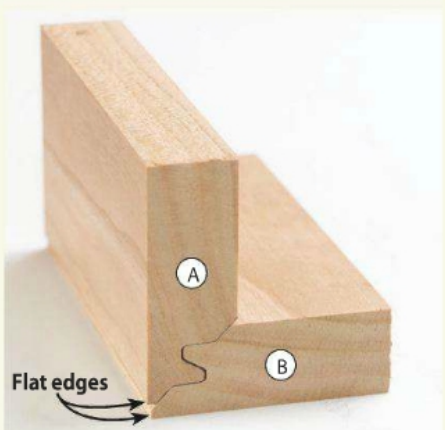
CORRECTION: MOVE FENCE FORWARD SLIGHTLY.



CORRECTION: MOVE FENCE BACKWARD SLIGHTLY.



CORRECTION: LOWER THE BIT SLIGHTLY.



CORRECTION: RAISE THE BIT SLIGHTLY.

Random-Orbit Sanders VS. Orbital Finishing Sanders

What's the difference? One saves you time, the other saves you money.

Orbital finishing sanders use either a quarter, third, or half of a full 9×11" sandpaper sheet, and random-orbit sanders take either 5"- or 6"-diameter discs. For this article, we'll focus on the most popular classes of both types: 5" random-orbit and quarter-sheet orbital finishing sanders. Both styles of sander smooth, and occasionally flatten, wood in preparation for a stain or other finish, and you can easily control these smaller, affordable tools with just one hand.

The pad of a typical orbital finishing sander moves in a 1/16" elliptical orbit at 12,000–14,000 orbits per minute. As you move the tool across a workpiece, the orbiting motion of the abrasive creates a consistent swirl pattern on the wood surface. And by working through a series of finer abrasives, the swirl patterns eventually blend together so well they disappear.

On the other hand, a random-orbit sander pad orbits about 1/8" while *at the same time* spinning up to 12,000 times a minute. This dual-mode action makes these sanders more efficient, blending swirl marks quickly as you work through the abrasive sequence.

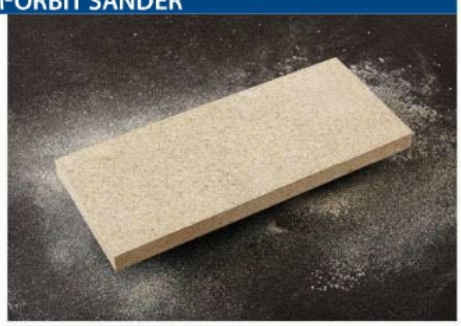
In our experience, both types of sander can produce flawless surfaces when sanding through a sequential series of abrasives, but the random-orbit sanders do so quicker. So what else should you consider before buying? Check out the pros and cons of each type on the *next page*.

PUNCH THE PAPER TO MATCH THE PAD

Most orbital finishing sanders come with a punch pad, for poking dust-collection holes in your own sheet abrasives to match the sander's pad.

COLLECT MORE DUST WITH A RANDOM-ORBIT SANDER

A random-orbit sander sucked up nearly all the dust into its dust bag when sanding away the melamine coating from this particleboard.



Few orbital finishing sanders collect dust well, as evidenced by this test board when we sanded away the melamine coating.

Random-Orbit Sander

Pros:

- Prepunched hook-and-loop abrasive discs are widely available and make for quick, easy changes [**Photo A**].
- When using equal abrasives, a random-orbit sander removes material about one-third faster than an orbiter.
- With eight ⅜" holes in most pads and abrasive discs, these tools collect dust better than orbital finishing sanders. The dust ports on most prove easier to connect to a vacuum hose [**Photos C** and **D**].
- Variable-speed motors (on models so equipped) let you adjust the aggressiveness for different materials, either to avoid clogging the abrasive or to better control the sanding action.

Con:

- The hook-and-loop pads wear out over time and will need to be replaced, a cost about one-quarter to one-third of the sander's cost.

Orbital Finishing Sander

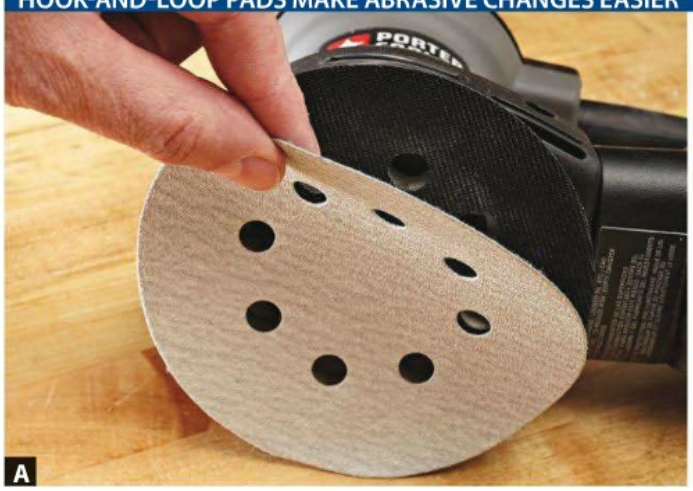
Pros:

- Low cost, typically about 20 percent less than a comparable 5" random-orbit sander.
- Whether you buy presized sheets or cut your own from full sheets, abrasives generally cost 20–30 percent less than manufactured random-orbit sander discs.
- With firm, rubbery sanding pads, these sanders contour to curved shapes better than random-orbit sanders without damaging the pads or leaving unusual scratch patterns.

Cons:

- More vibration and a single orbit speed lead to greater hand and arm tingling and fatigue.
- The clamping mechanisms on most of these sanders prove clumsy to use [**Photo B**].

HOOK-AND-LOOP PADS MAKE ABRASIVE CHANGES EASIER



A

With random-orbit sanders, you quickly and easily apply hook-and-loop discs to the pad. This makes sequential-grit sanding a breeze.

B

Orbital finishing sanders use cam-action clamps to hold sanding sheets in place, but the sheets can be awkward to install.

CONNECTING TO A SHOP VACUUM? SOME ADAPT BETTER THAN OTHERS

C

Although sized differently from brand to brand, round dust ports on most random-orbit sanders adapt relatively easily to a shop-vacuum hose.

D

The square or rectangular ports on most orbital sanders fit their provided collection bags or canisters, but are tricky to adapt to shop vacuums.

More Resources

▶ Read *WOOD*® editor and reader reviews of random-orbit sanders and orbital finishing sanders, as well as other types of sanders and other tools, at toolreviews.woodmagazine.com.

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70 GALLON CAPACITY

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YOUR CHOICE! $3.49 REG. PRICE $5.99

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- 3 Drawer Roller Cabinet

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CENTRALPNEUMATIC

3 GALLON, 100 PSI OILLESS PANCAKE AIR COMPRESSOR

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LOT NO. 95275/ 60637/69486/61615

SAVE 50%

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90877133

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NEW!

12" SLIDING COMPOUND DOUBLE-BEVEL MITER SAW WITH LASER GUIDE

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87913687

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SUPER COUPON!

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PITTSBURGH

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LOT NO. 47257/61585

SAVE 66%

Includes two 1.5v SR44 button cell batteries

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WINDSOR DESIGN

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SAVE 20%

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90 AMP FLUX WIRE WELDER

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SAVE $50

NO GAS REQUIRED!

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8" x 12" BENCH TOP WOOD LATHE

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SAVE $50

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Item 46163 shown

SAVE 43%

$8.99 REG. PRICE $15.99

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14" FOUR SPEED WOODWORKING BAND SAW

LOT NO. 60564/ 67595/68835

Item 60564 shown

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SAVE 46%

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CENTRAL MACHINERY

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LOT NO. 60237/44836

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Item 60237 shown

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29 PIECE TITANIUM NITRIDE COATED DRILL BIT SET

Item 5889 shown

drillmaster

LOT NO. 5889/61637

SAVE 60%

$9.99 REG. PRICE $24.99

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

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LOT NO. 69234/ 46104/69266

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2.5 HP 12" PLANER

CENTRAL MACHINERY

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SAVE $80

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LOT NO. 68527/69675/69728 CALIFORNIA ONLY

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SUPER COUPON!

EIGHT DRAWER WOOD TOOL CHEST

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SUPER COUPON!

4 PIECE 1" x 15 FT. RATCHETING TIE DOWN SET

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LOT NO. 90984/60405/61524

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

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$2.79 REG. PRICE $8.99

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HFT

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500 LB. CAPACITY ALUMINUM CARGO CARRIER

Haul Master

LOT NO. 92655/ 69688/60771

SAVE $60

Item 92655 shown

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51561200

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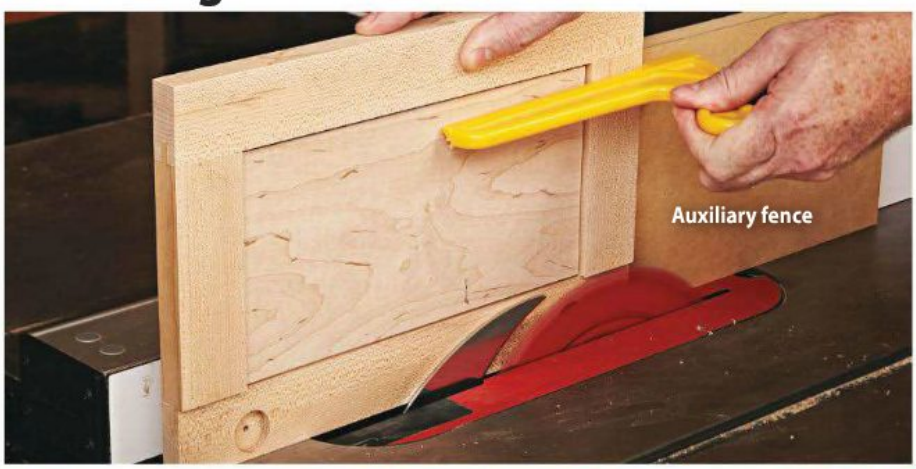
Thin skin hides misplaced hinge holes

Q Recently, I built a set of book-matched doors with cherry-crotch panels for a small cabinet. While drilling the mounting holes for European-style cup hinges, I mistakenly drilled the wrong stile of one door. Obviously, mounting them in that fashion would ruin the book-match. How can I fix this?

—Fred Davis, Kansas City, Mo.



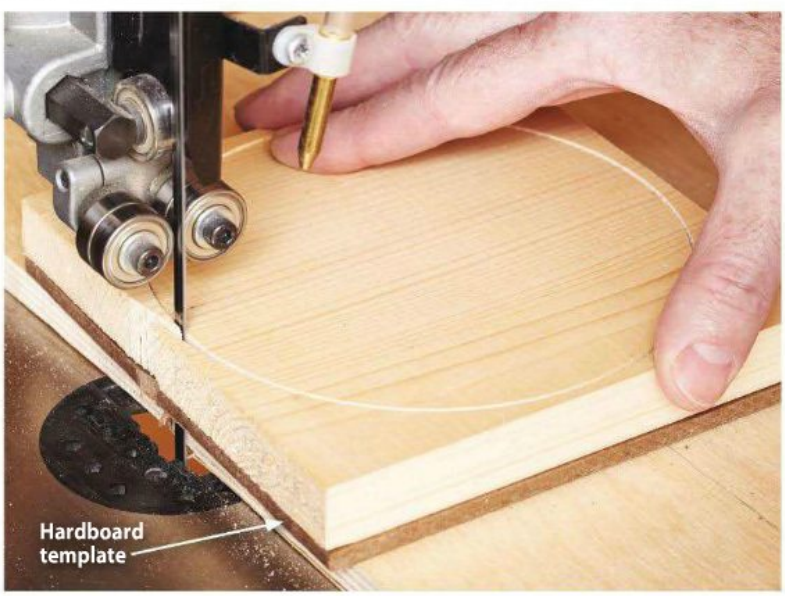
A You can plug the holes, Fred, but that would leave visible patches on the inside of your door. So try this fix that will be barely noticeable on the ends and edge of the stile.

First, on the errant stile, rip a ⅛"-deep rabbet the full width of the stile, as shown *top right*. (A tall auxiliary fence secured to the rip fence helps stabilize the door as you cut.) Next, from a piece of stock the same size and color as the stile, cut a ⅛"-thick strip to fit the rabbet. Glue and clamp the patch in place. When dry, sand the ends and edges smooth, filling any tiny voids with a mixture of glue and wood dust. Finally, now that you've hidden the goof, drill the hinge-cup holes in the correct stile and mount your doors.

Pointless way to cut perfect discs

Q I need to make a half-dozen 8"-diameter wood discs for an upcoming project. However, the discs cannot have center marks on either side, and my router trammel and bandsaw circle-cutting jig each require a hole for a pivot point. How can I cut these discs and leave both faces clean?

—David Vass, Mitchell, S.D.



A You can use that bandsaw circle-cutting jig, David, but you'll need to supplement it with a scrap of ¼" hardboard the size of your disc blanks. First, drill a hole in the center of the hardboard scrap, sized to fit the pin on your bandsaw jig. Attach it to your workpiece using double-faced tape. Place the template onto the pivot point and cut the disc to shape. Remove the template, and reuse it to cut the remaining discs. Sand each one smooth, and you're good to go.

continued on page 68

Last time a band played this well, Ringo was at the drums!

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Ask WOOD

Coming to grips with router-bit slippage

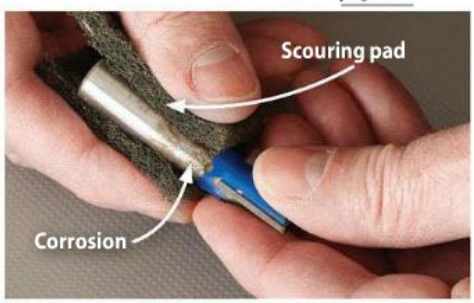
Q While table-routing ¼" grooves in drawer sides, my bit changed depth during the cut. That, of course, created uneven grooves. I retightened the bit into the collet as much as I could, but it slipped again. What am I doing wrong?

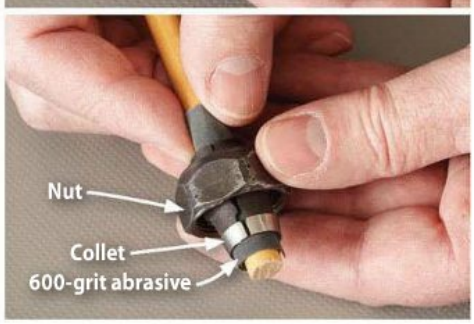
—*Greg Summers, Erlanger, Ky.*

A Router-bit slippage is both frustrating and dangerous, Greg, and usually results from dirt, damage, or both. Built-up dust, pitch, or other debris on the bit shank or router collet compromises the collet's grip. Give your bit's shank a quick cleaning with mineral spirits or lacquer thinner and a nonscratch scouring pad, as shown *below*. Next, clean the collet by blowing it out with compressed air, and then lightly sand its interior with a dowel wrapped in 600-grit abrasive. Inspect both the bit and collet for any damage. If you find any, invest in a replacement rather than using the faulty one.

Even a clean, well-maintained bit can slip if installed improperly. Never bottom out a bit in the collet; instead, raise it about ⅛" from full depth before tightening the collet nut. And no need for white-knuckle tightening; you only need to snug the collet nut firmly.

continued on page 70





Chicago Doctor Invents Affordable Hearing Aid

Outperforms Many Higher Priced Hearing Aids

Reported by J. Page

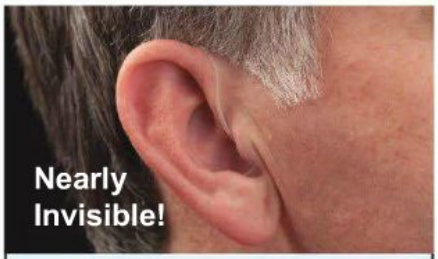
Chicago: Board-certified physician Dr. S. Cherukuri has done it once again with his newest invention of a medical grade **ALL DIGITAL affordable hearing aid.**

This new digital hearing aid is packed with all the features of $3,000 competitors at a mere fraction of the cost. **Now, most people with hearing loss are able to enjoy crystal clear, natural sound—in a crowd, on the phone, in the wind—without suffering through "whistling" and annoying background noise.**

New Digital Hearing Aid Outperforms Expensive Competitors

This sleek, lightweight, fully programmed hearing aid is the outgrowth of the digital revolution that is changing our world. While demand for "all things digital" caused most prices to plunge (consider DVD players and computers, which originally sold for thousands of dollars and today can be purchased for less then $100), yet the cost of a digital medical hearing aid remained out of reach.

Dr. Cherukuri knew that many of his patients would benefit but couldn't afford the expense of these new digital hearing aids. Generally they are *not* covered by Medicare and most private health insurance.



SAME FEATURES AS EXPENSIVE HEARING AID COMPETITORS

- ✓ **Mini Behind-The-Ear hearing aid with thin tubing for a nearly invisible profile**
- ✓ **Advanced noise reduction to make speech clearer**
- ✓ **Feedback Cancellation eliminates whistling**
- ✓ **Wide dynamic range compression makes soft sounds audible and loud sounds comfortable**
- ✓ **Telecoil setting for use with compatible phones, and looped environments like churches**
- ✓ **3 programs and volume dial to accommodate most common types of hearing loss even in challenging listening environments**

The doctor evaluated all the high priced digital hearing aids on the market, broke them down to their base components, and then created his own affordable version—called the MDHearingAid® AIR for its virtually invisible, lightweight appearance.

Affordable Digital Technology

Using advanced digital technology, the **MDHearingAid®AIR** automatically adjusts to your listening environment—prioritizing speech and de-emphasizing background noise. Experience all of the sounds you've been missing at a price you can afford. **This doctor designed and approved hearing aid comes with a full year's supply of long-life batteries. It delivers crisp, clear sound all day long and the soft flexible ear buds are so comfortable you won't realize you're wearing them.**

Try It Yourself At Home With Our 45 Day Risk-Free Trial

Of course, hearing is believing and we invite you to try it for yourself with our RISK-FREE 45-day home trial. If you are not completely satisfied, simply return it within that time period for a full refund of your purchase price.

Can a hearing aid delay or prevent dementia?

A study by Johns Hopkins and National Institute on Aging researchers suggests older individuals with hearing loss are significantly more likely to develop dementia over time than those who retain their hearing. They suggest that an intervention—such as a hearing aid—could delay or prevent dementia by improving hearing!

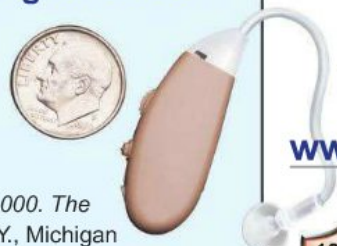
"Satisfied Buyers Agree AIR Is Best Digital Value!"

"I am hearing things I didn't know I was missing. Really amazing. I'm wearing them all the time" —Linda Irving, Indiana

"Almost work too well. I am a teacher and hearing much better now" —Lillian Barden, California

"I have used many expensive hearing aids, some over $5,000. The Airs have greatly improved my enjoyment of life" —Som Y., Michigan

"I would definitely recommend them to my patients with hearing loss" —Amy S., Audiologist, Munster, Indiana



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BBB RATING A

Ask WOOD

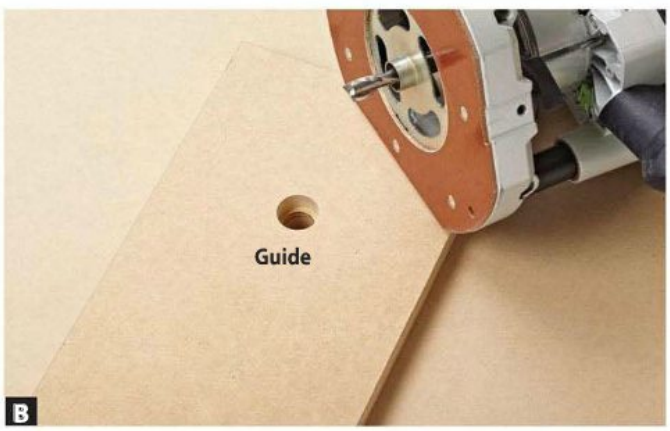
How to tame dogs that won't sit

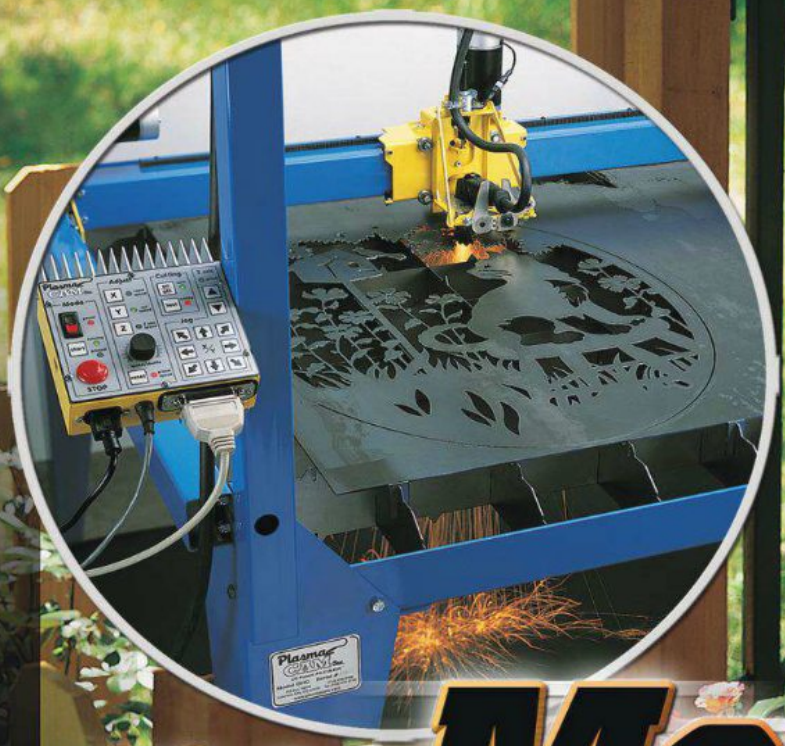
I drilled ¾" holes for bench dogs in my workbench that, unfortunately, aren't spot-on perpendicular to the top. As a result, my shopmade dogs—made with ¾" dowels—don't sit flat [**Photo A**]. How can I fix this?

—Manny Rivera, Austin, Texas

That's tricky, Manny, because redrilling the holes to correct the angle might help the bench dogs sit flat, but could create a sloppy fit. Try this before plugging the holes and drilling new ones, or starting over with a new top.

First, you'll need to make a jig from scrap MDF or plywood, long enough to reach from the edge of your workbench to the holes. At your drill press, bore a 1" hole in the jig to ensure it's perpendicular to the face. Install a ¾" guide bushing and ½" straight or spiral bit in your plunge router. Center the jig's hole over a dog hole [**Photo B**] and clamp it in place. Then, slip the router's guide bushing into the jig hole, and plunge the bit in ¼" increments as you rout around the hole [**Photo C**]. You'll likely rout away so little material that the dogs will still fit snugly and finally rest flat on the surface.





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Ask WOOD

Tame tear-out with a high-angled cut

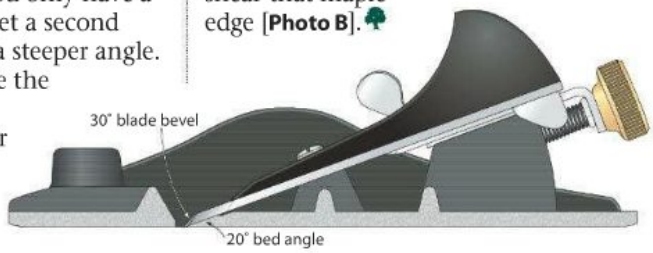
Q My low-angle block plane keeps pulling up chunks of grain on quilted maple rather than cutting cleanly, even with a sharp blade. How can I avoid this tear-out?

—*Matt Hoskins, Danville, Ky.*

A Figured wood can be tricky to work, Matt, as you've discovered. In your situation, the low-angle block plane "digs" under the interlocking grain, lifting it instead of shearing it cleanly.

To best prevent this, you need two things. First, use a plane with an adjustable mouth, so you can close it down close to the blade [**Photo A**] to limit the thickness of the shavings you'll make. Second, you want a steeper cutting angle of 50–55°.

To achieve this, first determine the blade's bed angle for your plane. For example, a standard angle block plane typically has a 20° bed angle. Subtract that amount from 50°. In this case, you'd then sharpen a 30° bevel onto your plane blade, as shown in the illustration at *right*. (If you only have a low-angle block plane, get a second blade and sharpen it to a steeper angle. That way you don't erase the benefits of the original low-angle blade for other tasks.) With a freshly sharpened blade and the mouth closed as tightly as you can without clogging the shaving, you should be able to cleanly shear that maple edge [**Photo B**].



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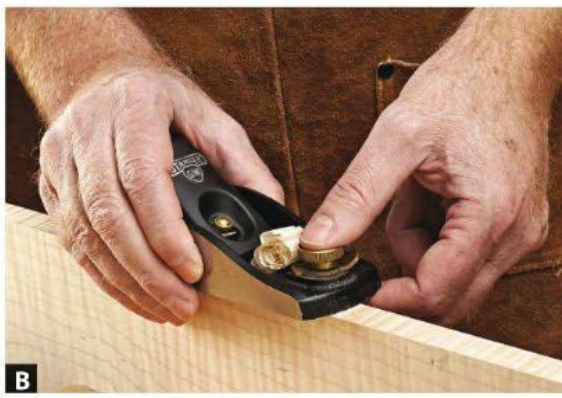
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About our product tests

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. The products shown here, and those that don't make the cut, are also reviewed at toolreviews.woodmagazine.com. Prices shown are current at the time of article production and do not include shipping, where applicable.

See-through cyclone delivers so-so performance

After our test of nine 220-volt dust collectors in issue 218 (May 2013), many readers asked how a Clear Vue Cyclone stacked up against those machines. So we ordered the company's CV1800LH unit and put it through the same tests.

Clear Vue collectors sell as kits comprised of sturdy plastic and medium-density fiberboard (MDF) components, a heavy-duty steel fan, and a 5-hp Leeson motor. During assembly, we needed a couple tubes of silicone sealant for all the joints. Nevertheless, in use we discovered a half-dozen air leaks that required more silicone. It's cool to watch the dust rotate in the clear-plastic cone and find its way to the tub and filter, but that novelty soon wears off.

As you can see in the top chart at *right*, the CV1800LH posted airflow readings that place it in the middle of the earlier test group. At 1,100 cubic feet per minute (cfm) of airflow, this unit could overcome 4" of static-pressure loss, and at 800 cfm—the minimum airflow needed for planers—it overcomes a respectable 7" of resistance.

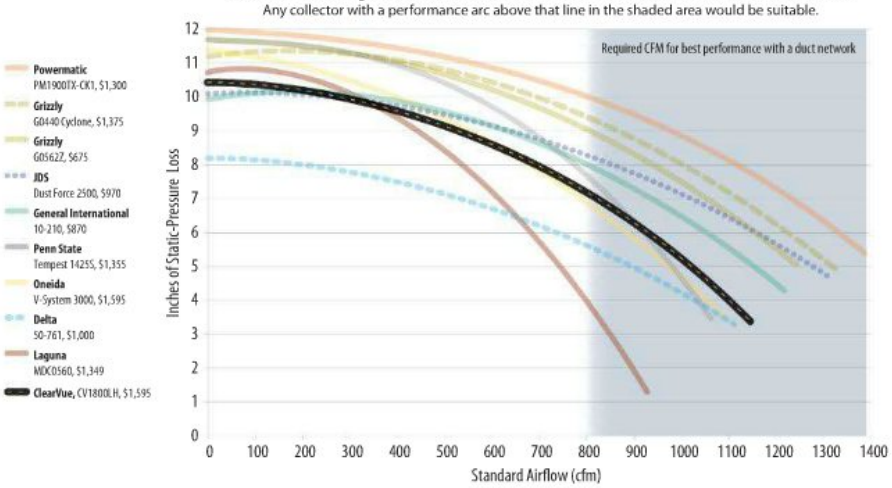
But the Clear Vue falls behind the other collectors in dust filtration. Based on our measurements of air particles per cubic foot, the CV1800LH returned more than 20 times as much fine dust to the shop air as the Oneida cyclone that topped our filtration testing a year ago. And, despite its ability to cyclonically separate larger debris, the Clear Vue returned more dust particles to the air than five single-stage collectors with bag and canister filters.

Bottom line: $1,595 is a lot of money for a kit collector that performs at a level below many lower-cost machines.

—Tested by Tom Brumback and Doug Ley

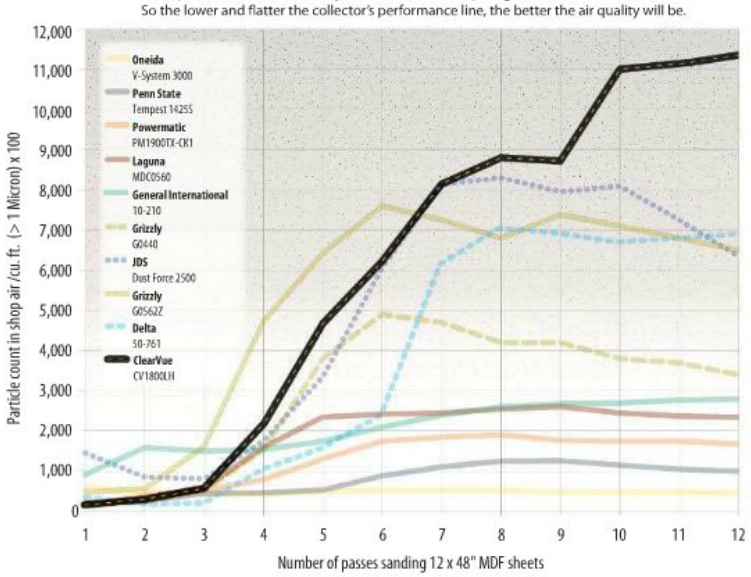
Airflow Measurements

To see which collectors provide enough airflow for your system, calculate the total static-pressure loss of your ductwork, find that figure on the left-hand column, and then draw a line across the chart at that level. Any collector with a performance arc above that line in the shaded area would be suitable.



Filter Effectiveness

Although all of the filters meet industrial regulatory air-quality standards, those that keep airborne particle counts low allow you to work in the shop longer without discomfort. So the lower and flatter the collector's performance line, the better the air quality will be.



5-hp cyclone dust collector (CV1800LH)

Performance	★★★☆☆
Price	$1,595

Clear Vue Cyclones
888-299-0221; clearvuecyclones.com

continued on page 76

Shop-Proven Products

Respectable heat for a shop, or on the go

The Mr. Heater Hero portable propane heater works great in a two-car-garage shop like mine, providing heat where I need it most. With a 35,000-Btu output, the Hero raised the temperature of my shop 20° in 15 minutes, reaching a workable warmth that suited me. Because this heater draws combustion air from within the shop and does not vent the carbon monoxide to the outside, I burn it only for short intervals every couple of hours.

The Hero lights easily, thanks to a push-button start that you hold for 15 seconds or so until the thermocouple heats up. An internal fan directs the heat nicely, and runs on either 110-volt current or a built-in rechargeable battery that powers the unit for up to eight hours, according to the manufacturer. The battery power makes it ideal for providing heat in chilly outdoor settings, such as a football-game tailgate, a fall-festival craft show, or an ice-fishing hut, where electricity might not be available.

Bottom line: The Hero won't maintain a balmy T-shirt temperature in a typical cold-weather garage shop, but it keeps the temperature at sweatshirt level, and the battery power gives you a nice option for heat away from home.

—Tested by Bob Hunter, Tools Editor

Hero portable propane heater (MH35CLP)

Performance	★★★★☆
Price	$180

Mr. Heater
800-251-0001; mrheater.com

Gmaxx blades cut everything but your wallet

After about a year of regular use in the *WOOD*® shop, we've found that Guhdo Gmaxx saw blades deliver quality performance for a value price. These German-made blades cut well in multiple materials, from hardwoods and softwoods to veneered plywood and melamine-coated particleboard. And the best part: Most of them cost $40–$80 per blade, although some go up to $100.

We tested a number of 10" and 12" blades on tablesaws, mitersaws, and the radial-arm saw in the *WOOD* shop, and each delivered a performance worthy of its price. However, sometimes they slightly chipped out workpieces on the surface and exit edge. (To get perfect cuts you typically have to spend $80 or more for a premium blade.) Our only other issue with a Gmaxx blade was the loud, distracting noise created by the deep gullets on the 50-tooth combination blade, shown *below center.*

—Tested by the WOOD staff

Circular saw blades

Performance	★★★★☆

Prices vary by size and type of blade

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continued on page 80

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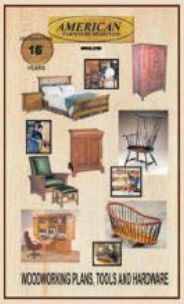

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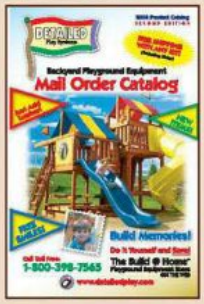

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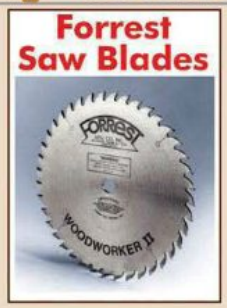

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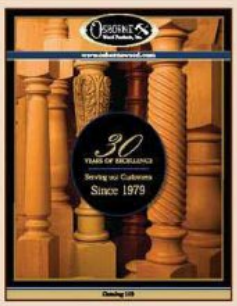

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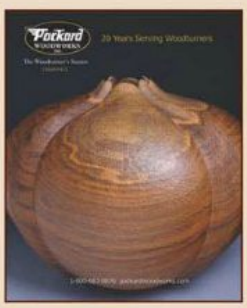

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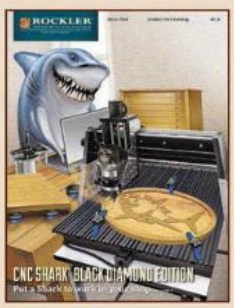

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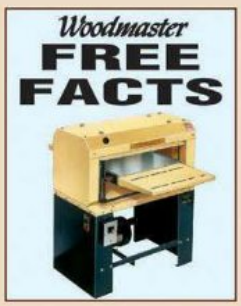

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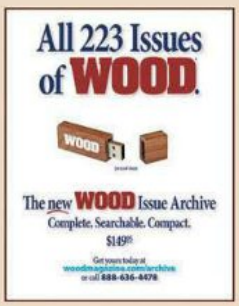

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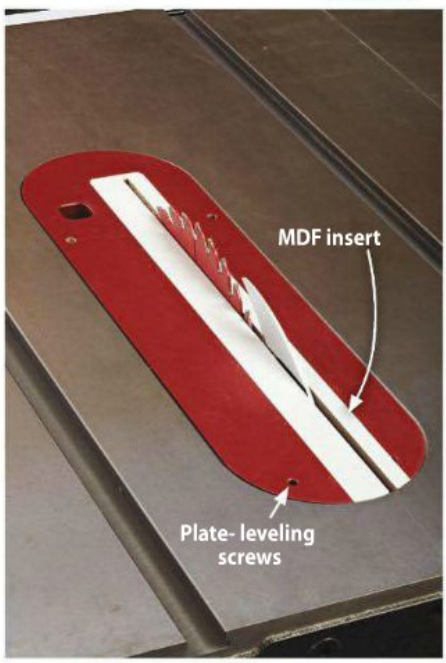
Shop-Proven Products

Get zero clearance with replaceable inserts

I try to always use a zero-clearance throat insert on my tablesaw to guard against tear-out. But new phenolic inserts for my SawStop tablesaw cost $30–$40 each; that adds up when you use a half-dozen or more inserts like I do. With Infinity's insert system (made specifically to fit SawStop tablesaws), you buy the sturdy aluminum plate once, and replace the disposable ¼" melamine-coated MDF inserts as needed.

You get two inserts with the initial unit, but you can buy a four-pack of replacements for $14 (part no. 100-337). Or, simply make your own to fit. The inserts have beveled edges for a secure, dovetailed fit in the plate. You can use them with or without a riving knife or blade guard; simply slot the rear portion to fit your saw's setup.

—Tested by John Olson, Design Editor



Zero-clearance throat insert (100-335)

Performance	★★★★★
Price	$110

Infinity Cutting Tools
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Mill your own lumber with minimal effort

Logosol's M8 mill takes most of the labor out of using a chainsaw mill. In fact, I found the M8 as easy to use as a bandsaw mill, but with price and portability advantages.

The aluminum-frame M8 has an 18' beam, yet, when assembled, it's still light enough (about 150 lbs without the saw) for two people to easily pick up and carry. I managed to carry the mostly assembled mill into the woods by myself, set it up, and cut the tree where it fell. That sure beats dragging a log to the mill through blade-dulling mud and dirt.

You can cut logs up to about 16' long, and their maximum diameter depends on the length of your chainsaw's bar; I cut up logs that were nearly 2' in diameter with my 24" bar. You'll need a chainsaw (not included) with at least an 80cc motor; lesser-powered saws will struggle. I outfitted a Husqvarna 395XP with ripping chain, and it cut with ease, though slower than a typical bandsaw mill.

Rolling the log up the 20"-high stepped platform (you raise the platform and log together to the saw from there) proves the most challenging aspect, but a friend and two cant hooks make it go quickly. Once you mount the saw into the mill's carriage, you feed it through the log via a crank and nylon cord. It couldn't be any simpler. The ratcheting depth-of-cut adjustments lock solidly in place for accurate rips. But know that you'll lose about ⅜" from the thickness with each cut.

The M8 and appropriate chainsaw will cost you about $3,200, admittedly a hefty investment. But if you spend a lot of money on precut dried lumber, and have a space to dry wood, you'll recoup your investment over time.

—Tested by John Olson, Design Editor

Portable chainsaw mill (M8)

Performance	★★★★★
Price	$2,199

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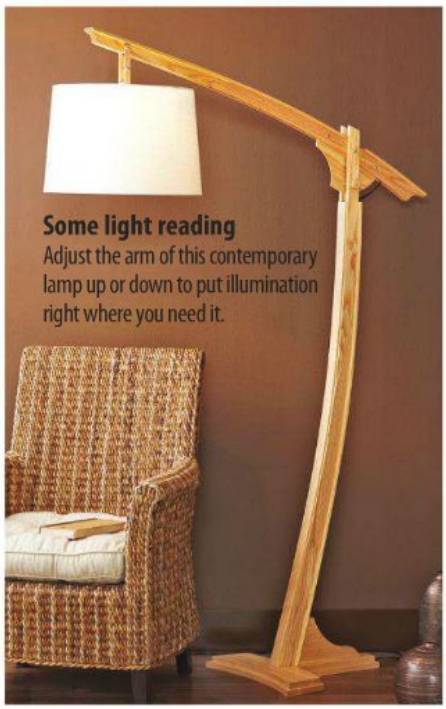
877-564-6765, logosol.us

What's Ahead

A glimpse inside the May issue (on sale March 11)

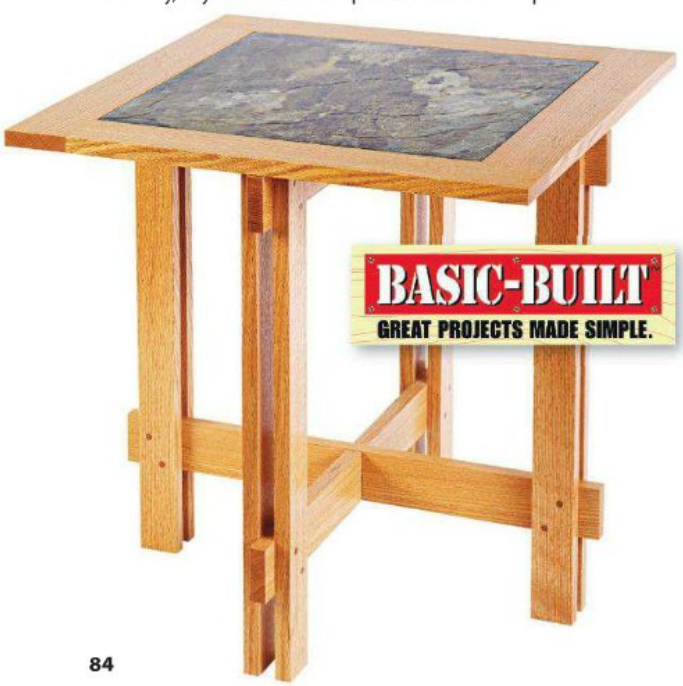
Uptown outdoor bench
Easy joinery and elegant style combine in seating as relaxing to build as it is to sit on.

Sound design
Craft a classy passive amplifier for your mobile phone or MP3 player.



Some light reading
Adjust the arm of this contemporary lamp up or down to put illumination right where you need it.

Tile-topped table
This sturdy, airy table teaches shop skills and resists tea spills.



A ripping-good saw review
Looking to upgrade or buy your first stationary tablesaw? We test six models priced from $795 to $1,200.

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Java Gel Stain

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826978	Pint
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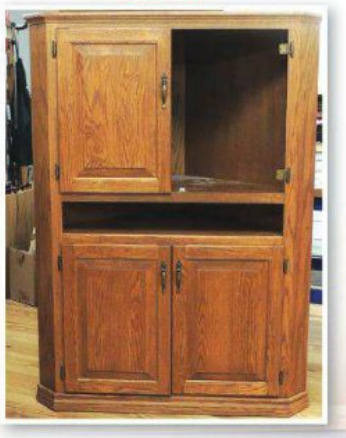
Before



After

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