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94610401

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MACHINERY
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5 MICRON
DUST COLLECTOR**

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97869/61790

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\$100**

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Item 97869 shown

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LOT NO.
34102

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28%**



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69684/
61776/98194

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30", 11 DRAWER
ROLLER CABINET**

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LOT NO. 66126

\$6.99

REG. PRICE \$12.99



**SAVE
46%**



64988499

SUPER COUPON!

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NITRIDE COATED
DRILL BIT SET**

drillmaster

LOT NO. 5889/61637

**SAVE
60%**

\$9.99 REG. PRICE \$24.99

Item 5889 shown



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88769519

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**27 LED PORTABLE
WORKLIGHT/
FLASHLIGHT**

LOT NO. 67227/
69567/60566

**SAVE
55%**

\$269 REG. PRICE \$5.99

Item 67227 shown



Requires three AAA batteries (included).



27138702

SUPER COUPON!

**CENTRAL
MACHINERY
10", 12 SPEED
BENCH MOUNT
DRILL PRESS**

LOT NO. 60237/44836

**SAVE
\$70**

\$99.99 REG. PRICE \$169.99

Item 60237 shown



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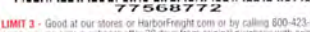
**SAVE
\$67**

\$152.99 REG. PRICE \$219.99

LOT NO. 67847/
61454/61693



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WITH 1-3/4 HP ROUTER**

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REG. PRICE \$129.99



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\$40**



16631380

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800 RUNNING WATTS
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60338/69381

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81428597

SUPER COUPON!

4" PLATE JOINER
CHICAGO ELECTRIC POWER TOOLS

LOT NO. 68987/38437

Item 68987 shown

SAVE 33% **\$39.99**

REG. PRICE \$59.99

89714653

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1000 LB. CAPACITY MOVER'S DOLLY
HaulMaster

LOT NO. 93888/60497/61899

Item 93888 shown

SAVE 46% **\$7.99**

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93299684

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CENTRAL MACHINERY

LOT NO. 69257/95088

Item 69257 shown

SAVE \$60 **\$89.99**

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18134837

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Item 93012 shown

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60684193

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EIGHT DRAWER WOOD TOOL CHEST
LOT NO. 94538
WINDSOR DESIGN

Item 94538 shown

SAVE \$40 **\$59.99**

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90172650

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ALUMINUM OXIDE SANDING SPONGES - PACK OF 10
Lifeline CARBIDE

LOT NO. 46751

Item 46751 shown

SAVE 41% **\$3.49**

REG. PRICE \$5.99

28926892

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SUPER COUPON!

500 LB. CAPACITY ALUMINUM CARGO CARRIER
HaulMaster

LOT NO. 92655/69688/60771

Item 92655 shown

SAVE \$60 **\$69.99**

REG. PRICE \$129.99

46780704

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12" x 33-3/8" WOOD LATHE WITH REVERSIBLE HEAD
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Item 34706 shown

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37722100

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LOT NO. 68068/69928

Item 69928 shown

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21215461

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CHICAGO ELECTRIC POWER TOOLS

LOT NO. 68861/68303/60428

Item 68861 shown

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14848844

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2.5 HP 12" PLANER
CENTRAL MACHINERY

LOT NO. 95082

Item 95082 shown

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61893847

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Bunker Hill Security

LOT NO. 93068/69590/61910

Item 93068 shown

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14085282

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Item 41005 shown

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90901590

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Item 68751 shown

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87405751

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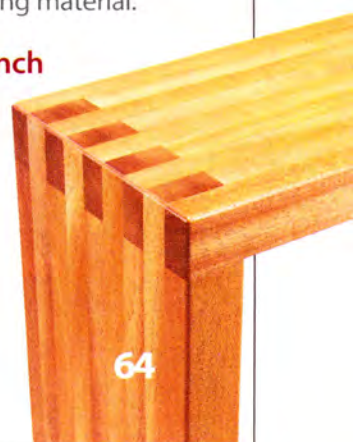
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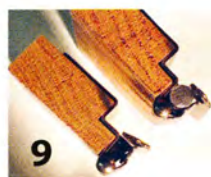
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AMERICAN WOODWORKER

#170, February/March 2014

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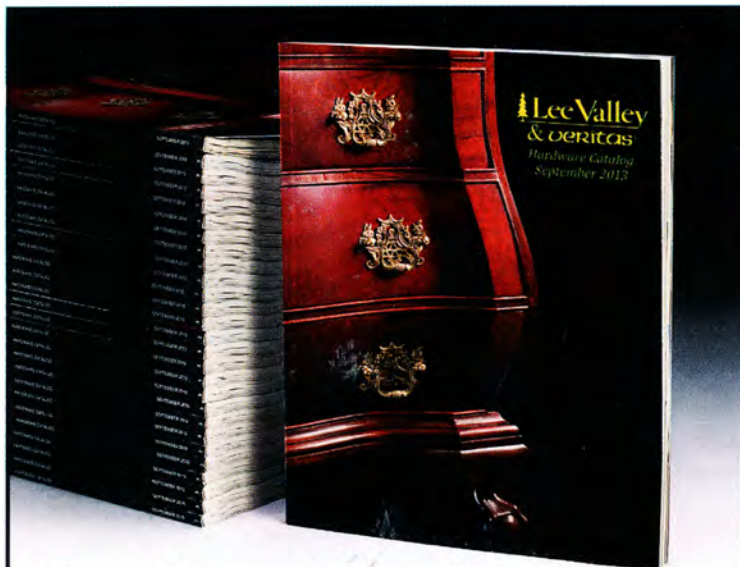
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Terrific Tip!

Measuring with a Clamp

ACCURATELY MEASURING the inside of a cabinet to fit a shelf isn't all that easy. Most people would solve this problem one of three ways, using a tape. I think I invented a fourth, using a clamp. Let me tell you about the shortcomings of the standard methods, then explain what I did with the clamp.

First, there's the quick and dirty method of bending the tape into the corner. As you know, this is a close guess at best.

Second, you could extend the tape without bending it and add the dimension noted on the tape's body to the reading at the tape's mouth. This strategy could backfire in a number of ways: You can forget to actually add the body dimension; you can make a mistake in the math; the body measurement may not be all that accurate.

Third, you could use the "pinch-stick" method. Here, you'd root around for two small sticks that are shorter than the inside measurement of the cabinet, clamp them together, remove the sticks and measure their total length. This method is very accurate, but it's time consuming and awkward.

Here's what I did: I switched one of my quick-



PHOTOS COURTESY OF CONTRIBUTOR

clamps to the spreader position, opened the jaws until they just touched the cabinet's sides, and then measured the jaws from outer face to outer face. Simple!

Alejandro Balbis

Clamp I.D.

THE ACTUAL OPENING CAPACITY of a clamp is valuable information going into a glue-up. Knowing this information avoids a lot of trial and error—especially if the dimensions of your workpiece are close to the full capacity of a clamp (which often seems to be the case). I've started measuring and marking the exact maximum opening of my clamps, with and without their work protecting pads, so I know just what they're capable of handling.

John Cusimano

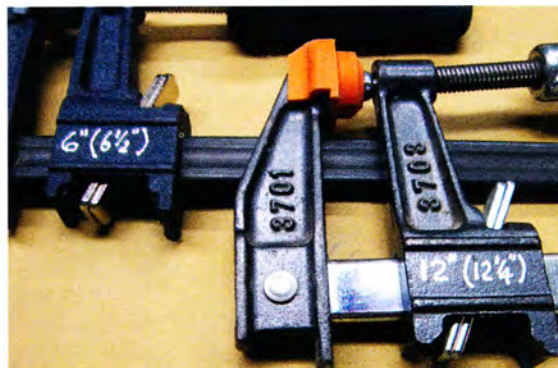


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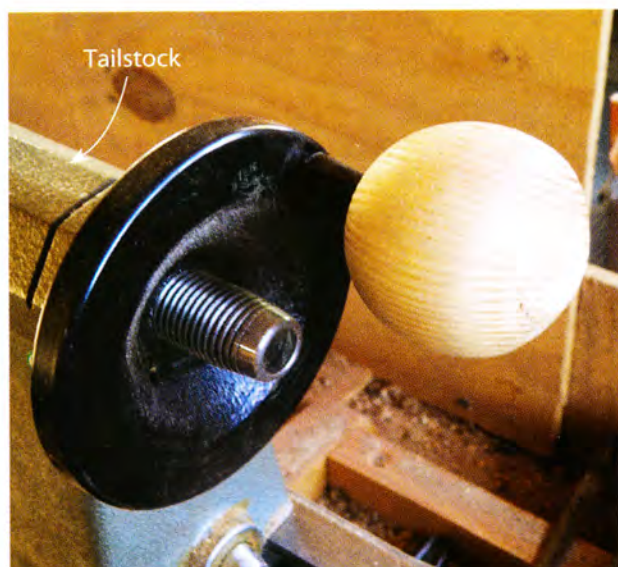


PHOTO COURTESY OF CONTRIBUTOR

Comfy Handle

I HAD A HARD TIME turning the handle on my lathe's tailstock when drilling into hard wood with a Forstner bit. The handle is small and uncomfortable, so I enlarged it by adding a wooden ball.

Using a chunk of scrap, I turned a 2-1/4" dia. ball, then drilled a hole into it slightly larger than the diameter of the handle. Now, when I need to drill on the lathe, I slip the ball over the handle. It fits nicely in my palm, giving me better leverage without tiring my hand. It works so well that I've made balls for all of my tools having this type of handle.

If you like this idea, you really don't have to turn any balls at all. Just buy them from a craft store.

Ken Sharrah



PHOTO COURTESY OF CONTRIBUTOR

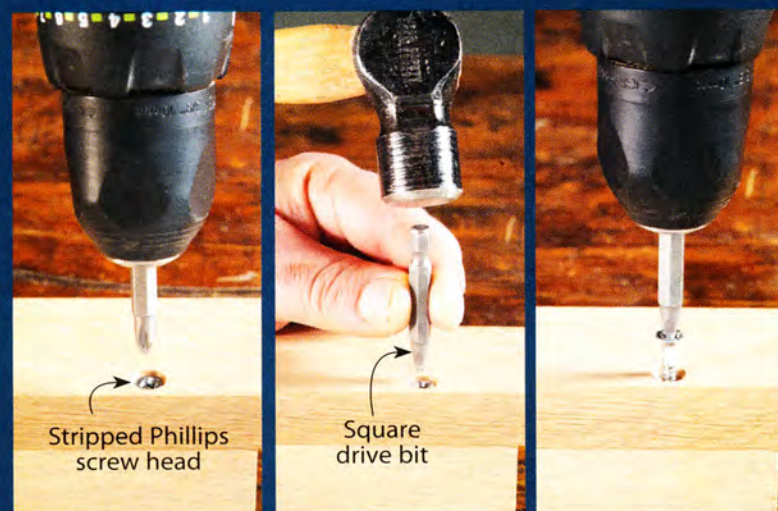
Flip Your Glue

ALL WOODWORKING GLUES contain a mixture of ingredients that are held in suspension. In order for these glues to perform as intended, this mixture needs to stay in suspension. If your glue stays in the bottle for a long time, these ingredients can settle to the bottom.

To safeguard against this, I've started the habit of flipping my glue bottles every time I come in the shop. If the bottle doesn't have a flat top, I put the bottle upside down in a can. When I asked one of the major glue manufacturers if this is a beneficial practice, I was told that frequent rotation does indeed prevent settling.

Of course, if you thought you'd go through your glue fast enough, you'd never have to flip it. But who can predict that?

Richard Helgeson



Stripped Phillips screw head

Square drive bit

Step 1

Step 2

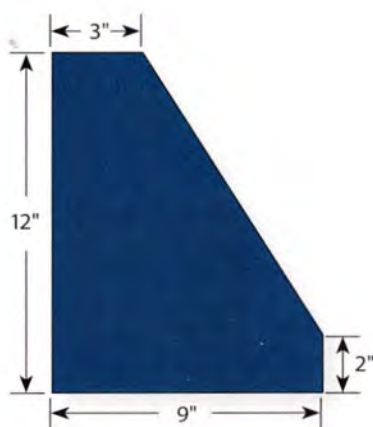
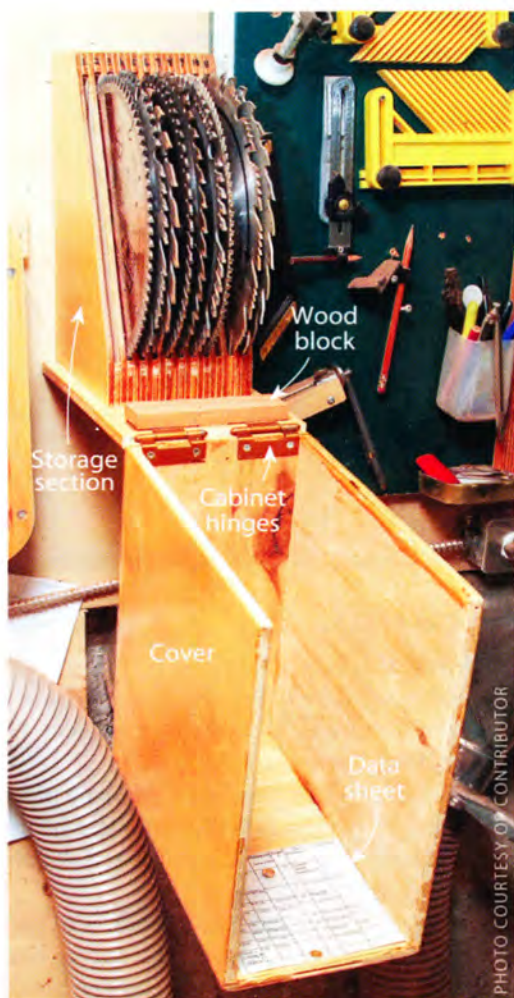
Step 3

Square Drive Extractor

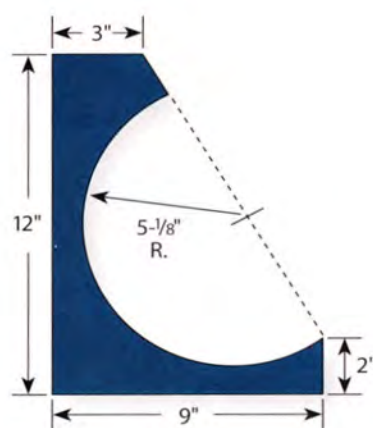
STRIPPED PHILLIPS HEAD screws aren't always easily removed using a screw extractor—especially if you can't recall where you last tucked it away.

Necessity being the mother of invention, I found another solution to this pesky problem using something that I always have lying around: a square-drive bit. Just pound the bit into the screw's head until you feel it bite. You can then install the bit in a driver and turn the screw out. This works great as long as the screw's head isn't harder than the bit.

Richard Tendick



Part A



Part B

Blade Box

PROPER SAW BLADE STORAGE not only keeps your blades organized, it also helps keep a blade's teeth from getting dinged. This project is a variation on one I found in an old issue of *American Woodworker*. It's simply a hinged plywood box with slots to separate and organize the blades.

The original box held six blades; mine has room for ten. To make the storage slots, you'll need a stack of thin plywood cut as shown in the illustrations. For storing ten blades, you need 11 A parts and 10 B parts. Starting with an A, glue all these parts together in a stack, alternating A's and B's.

The original box used butt hinges; I used cabinet hinges. This allows the lid to flip all the way down so it's much easier to access the blades. I covered the hinges with a piece of wood to protect the blades' teeth. I found that it was too easy to bump them against a hinge when putting in or taking out a blade.

I also numbered each blade and attached a "data sheet" with numbers corresponding to each blade inside the box's lid. The sheet tells me all the information I need about each blade, such as kerf width, purpose and when it was last sharpened.

Pierre Falzon



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AmericanWoodworker.com/WebExtras

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Contact Cement Cover

WHEN APPLYING CONTACT CEMENT, I prefer to roll it on instead of spraying it on. There's not as much clean-up, and I don't have to deal with overspray.

There are drawbacks to this method, however. Mainly, the glue needs to be covered to keep it from skinning over between applications. Also, if you're trimming laminate nearby, laminate chips in your glue spell disaster.

Here's my simple, low-tech solution. Since I use disposable roller tray liners to avoid clean-up, it occurred to me that I could also use an upside-down liner as a cover. I attached the liners with two pieces of masking tape on one end to act as hinges. I also made a small notch for the roller's handle on the other end. The matting liners seal up well enough to protect the glue from debris and keep it from skinning over.

Kelly Neumann

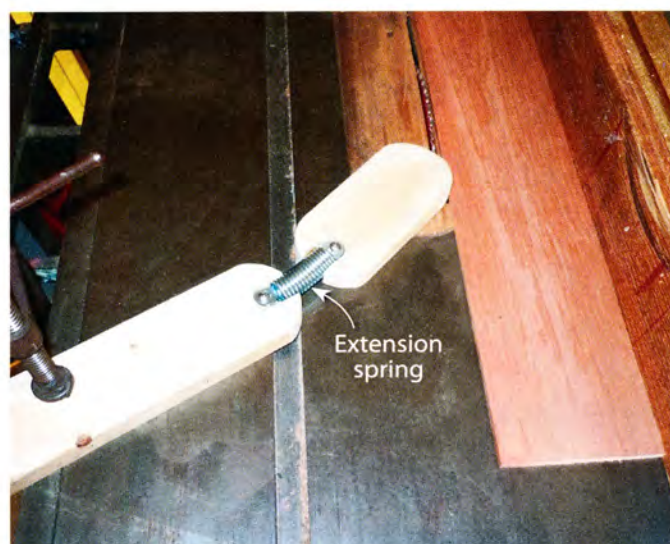


PHOTO COURTESY OF CONTRIBUTOR

Think Spring

A FEATHERBOARD is an important accessory for a table saw, providing both accuracy and a measure of safety. I often use one when ripping to keep a workpiece from wandering away from the fence.

Typically, a shop-made featherboard is just a piece of wood with thin fingers sawn into the end. The problem I've always had with this type of featherboard is adjusting it to provide the pressure I want.

I came up with this variation using a 3/4" x 3" extension spring from the hardware store. The spring makes adjustment less critical. I fastened the spring between one long and one short wooden block. The long block is for clamping the jig to my saw, and the short block flexes against the workpiece. Extension springs have a loop at one end and a hook at the other. I recessed these ends into the blocks and then screwed them in place.

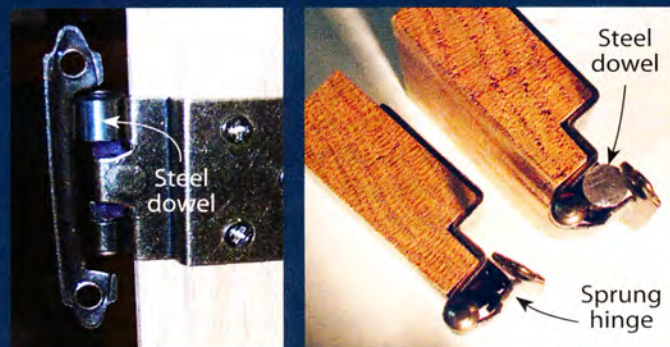
Mark Thiel

Hinge Flattener

MOUNTING DOORS using a common type of self-closing hinge is frustrating. When attached to the door only, these hinges don't lay flat. They're "sprung" (see right photo). This feature makes it next to impossible to hold the door in the proper position, apply pressure to straighten out the hinge and simultaneously drill pilot holes for the screws.

Here's a way to prop open the hinges while you mount the door: Cut short pieces of 3/8" dia. steel rod and insert one inside each hinge. When you're done mounting the door, open it. The props will drop right out. Wood dowels work OK for this, but metal ones are better.

Fred Burne



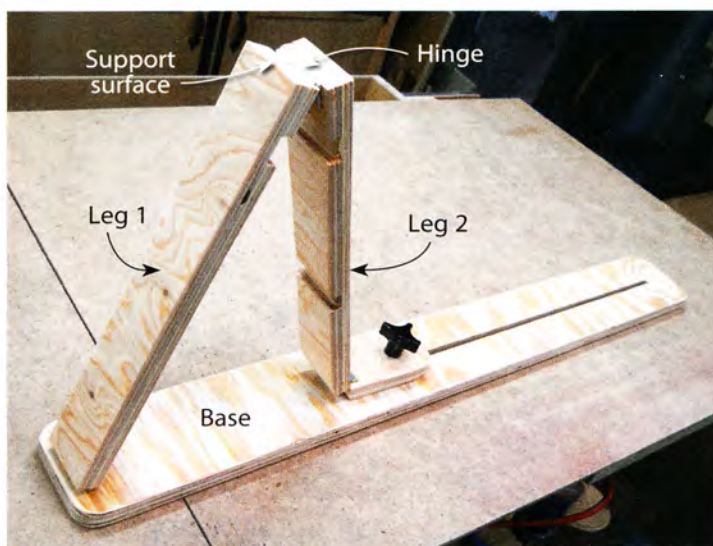
Helping Hand

"I NEED THREE HANDS!" I don't know how many times I've said this when working in the shop. It seems like I always need an aid to hold up the other end of something. I've often used stacked blocks of wood, but that was a hassle. Unless it was my lucky day, I'd rarely find pieces at hand to get the exact height I needed. This riser block solves that problem. It's infinitely adjustable anywhere between 1-1/2" and 13-1/2". A jig knob and T-bolt lock the jig at whatever height I need.

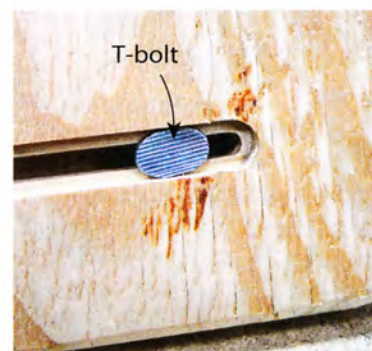
My riser block is 4" wide x 36" long, and made from 3/4" plywood. To build it, first mill a 1/8" x 1/2" recess centered in the base's bottom for the head of the T-bolt. Then rout a 1/4" through-slot for the T-bolt's body.

The two legs are 2" x 13". They're attached to the base using three butt hinges. In case you were wondering about the dadoes in the legs, they don't serve any purpose at all. Like many of my jigs, this one is built from scrap. I take whatever is handy!

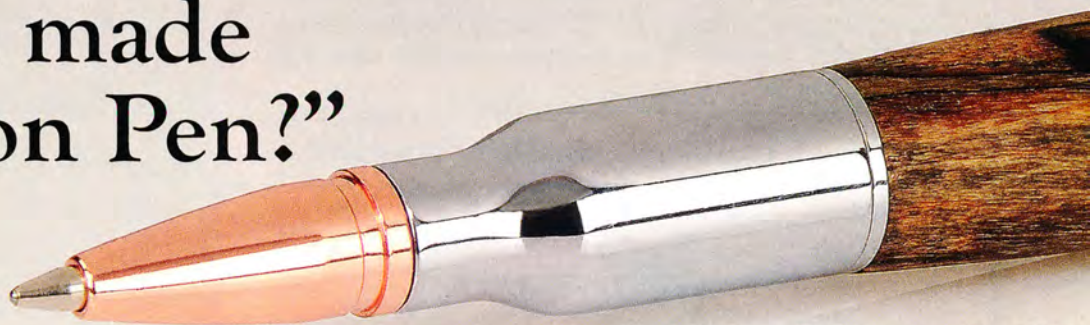
Serge Duclos



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Underside of vise mounting

Auxiliary Vise

A SINGLE FACE VISE is typical on most woodworking benches. Although that's usually enough, sometimes a second face vise is needed. I

bought an inexpensive vise just for those times.

This vise doesn't mount like a traditional face vise with a mounting flange that's milled to be fastened to the underside of the bench. This is a portable vise with a built-in clamp for attaching it to a bench. I mounted this one permanently to a piece of hardwood so I could more solidly clamp it to my bench.

Obviously, the auxiliary vise is very handy when you need support at both ends of a long workpiece. Also, an unforeseen benefit resulted: Because this vise is significantly higher than my permanent vise, it's perfect for those times when I need my work closer to my eyes, such as when I'm sawing dovetails.

Charles Mak

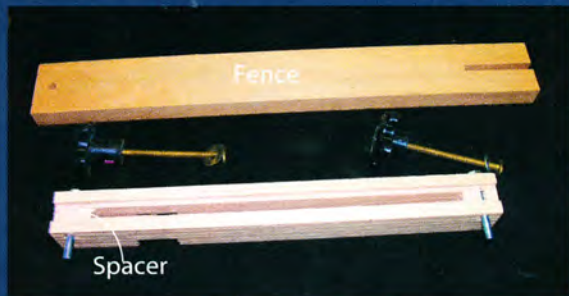
Bench Blob Detector



DROPPING GLUE BLOBS on a bench is inevitable. While they may seem innocuous, they can cause problems after they harden. An invisible blob can put a nasty dent in a workpiece placed or clamped on your bench.

As a precaution, every so often I run the edge of a straight piece of hard maple over my bench to find the blobs. Sometimes the board will actually pop off a blob, but its main purpose is to locate them, so I can remove the buggers with a scraper or chisel.

Tom Caspar



Shop-Made Bandsaw Fence

ARE YOU less than pleased with your bandsaw fence? This simple shop-made fence and track system could solve your problem. The tracks are formed by gluing up three pieces of hardwood. A slotted fence provides adjustment for blade drift. You can lock it in place at any angle using T-bolts and jig knobs.

To make the tracks, cut two pieces of hardwood 2" x 1-1/4" and the same length as your table's width. Cut a centered 3/4" wide by 1/4" deep groove in one 2" face of each piece. This creates the recess for the T-bolt's head to keep it from turning. Rip each of these pieces in half, down the center of the grooves, so you have four 7/8" wide strips, each with a rabbet along one edge. Make a notch through all of the strips in alignment with your saw's miter gauge slot. The notch needs to be dimensioned so that when the tracks are mounted to the table, your miter gauge's bar can pass through.

Glue 5/16" thick x 1-1/4" square spacers in between each pair of mounting strips. Drill mounting holes through the tracks' ends and spacers, and mating holes through the table's edges. Bolt the tracks in place.

The only downside—and I'm still looking for the best solution—is that each time I move the fence I need to re-square it to the blade.

Len Urban

PHOTOS COURTESY OF CONTRIBUTOR

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Festool Jigsaw

THE JIGSAW is a tool that folks are still striving to improve, which I'm glad to see. It's an indispensable shop staple as is, but most models come up a bit short. I've often been disappointed with a jigsaw's blade drift, tearout and inaccuracy.

With a handful of changes and options, Festool's new Carvox jigsaw addresses these problems with solid solutions. Festool's previous model, the Trion, is still available, but the Carvox is an upgrade. With its impeccable fit and finish, good ergonomics, solid build and great dust collection, the Carvox is unmistakably Festool: a tradesman's delight.

The Carvox is available in a corded or cordless version, each offering either a barrel grip or D-handle, depending on your preference. The cordless versions offer a tool-only option as well, if you already have 18v Festool batteries and want to save a little money. The D-handle version allows you to control the saw's variable speed either with the trigger or by using a separate dial. (Speed on the barrel-grip version is controlled only with the dial.) The trigger also locks in the full "on" position. Speed is variable, from 1500 – 3800 strokes per minute.

The standard baseplate on the Carvox comes with replaceable zero-clearance inserts to greatly reduce tearout. Also available are quickly interchangeable bases designed specifically for different tasks. They include a dimpled low-friction base for rough lumber, a hard fiber ultra-smooth low-friction base which doesn't pick up chips that could scratch a surface, and a hook-and-loop base with replaceable felts to prevent scratches on delicate materials. A steel baseplate is available for metal-cutting applications. A guide rail adapter base gives you the ability to use your jigsaw in conjunction with Festool guide rails for straight, accurate cuts. You can also attach a clever circle- and radius-cutting accessory to this base.

Saving my favorite for last, the bevel-cutting base (pictured) is undoubtedly the most ingenious. It's hinged lengthwise down its center, creating two feet to balance



on. This greatly increases stability and accuracy when making inside or outside bevel cuts. It's adjustable from 0° to 45° in either direction with the turn of a wheel.

Another notable feature on the Carvox is the LED lights; there are four of them surrounding the blade. You can have them on, off or in stroboscopic mode. In stroboscopic mode, the lights flash in synchronization with the blade's speed. Sound like a gimmick? That's what I thought too. Then I tried it. The blade appears to be standing still; you can literally see each tooth clearly while you're cutting, so you can see precisely when the tip of the tooth is touching your line. That makes for easy, accurate cutting, and it's pretty cool.

The folks at Festool have also made improvements to the blade guide system to help prevent deflection. I was able to make perpendicular cuts in 3" stock with the Carvox. That's pretty impressive.

All of the Carvox models have brushless motors, making them relatively compact and lightweight. According to the manufacturer, brushless technology also results in extended battery life, and longer service life for the tool.

SOURCE

Festool, festoolusa.com, 888-337-8600, Carvox PS or PSB 420 EBQ Corded Jigsaw, #561608, \$350; Carvox PSC or PSBC EBQ Cordless Lithium Ion 18V Jigsaw, #561668, \$550 (tool only, \$350).

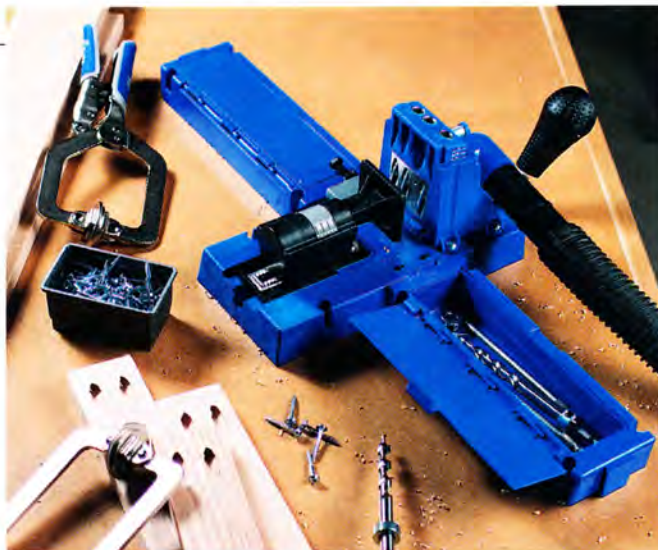
Improved Kreg Jig

POCKET HOLE JOINERY has been synonymous with the name Kreg for years—in a good way. Their jigs have always been affordable and easy to use. With the new K5 jig, the folks at Kreg have made their flagship kit even more user-friendly.

For starters, there's the almost-automatically adjusting clamping mechanism. It's a ratcheting, spring-loaded affair that's very simple to use. You still have to slide the clamping head up to your workpiece, but then you just hold the back of the clamping mechanism and raise the large paddle-style handle until you've heard two positive clicks. That's it. No trial and error. And there's no need to reset the clamping head until you change stock thickness.

The K5's drilling guide has also been upgraded in a couple important ways. Older models were equipped with a knurled knob-and-screw to change the height for different stock thicknesses. The K5 employs a spring-loaded knob, which makes height adjustments quicker. On older models, the graduations on the side of the drilling guide were hard-to-read indentations. On the K5, they're highlighted white and are much easier to read.

The folks at Kreg also changed the method for setting the bit's stop collar. On the previous version, you'd lay the bit in a recess and set the stop collar according to the stock sizes engraved next to the recess. The K5 uses a setting block in conjunction with the drilling guide instead. It's simple, positive and quick. Initially, I still preferred the old method, but have since come to like the K5 way.



The K5's support wings also serve as storage boxes for bits, screws and accessories. The dust port swivels for optimal vacuum hose positioning. A quick-attaching adjustable stop can be used on either side of the drilling guide for easily repeatable drilling.

Bottom line: The new K5 features lots of small improvements that make the jig faster and easier to use.

The K5 kit includes the base with ratcheting clamp, extension wings, dust port, drill guide block, spacer block, adjustable stop, drill bit setup block, hex-shank stepped drill bit with stop collar, 6" driver bit and a starter screw and plug pack.

SOURCE

Kreg, kregtool.com, 800-447-8638, Kreg Jig K5, #K5, \$140.

Tool-Free Dremel

Dremel's new EZ Change mechanism lets you quickly change bits and accessories in a completely different way. With the new 4200 High Performance Rotary Tool, you won't lose much valuable time changing attachments, nor will you lose the confounded wrench—there isn't one!

The 4200's EZ Change mechanism is a collet system that works by pulling back on two spring-loaded tabs on either side of the tool, releasing the collet's grip. Releasing the tabs re-engages the collet, securely gripping the accessory's shaft. The EZ Change mechanism is compatible with all Dremel accessories.

The 4200 is powered by a 1.6 amp motor with replaceable brushes. It features a variable-speed dial allowing infinite adjustment anywhere from 5000 – 35,000 RPM and a separate on/off switch.

The 4200 standard kit comes with a bevy of accessories including a circle cutter/straight edge guide, right angle attachment, detailer's grip attachment and sanding/grinding attachment, to name a few. A Platinum

Edition is also available. This kit includes all of the accessories in the standard kit as well as a flex shaft attachment and a deluxe case.

SOURCE

Dremel, dremel.com, 800-437-3635, 4200 High Performance Rotary Tool, standard kit, #4200-6/40, \$130; Platinum Edition, #4200-8/64, \$219.





Hose-Free Nailer

NO HOSE? No compressor? Now that's an idea I can get behind. The new Ryobi One+ 18 volt Brad Nailer with Ryobi's AirStrike technology is a pleasant surprise.

The One+ nailer shoots 18 gauge brad nails, 5/8" to 2" long, which cover most woodworking nailing tasks. The magazine holds 110 nails, and shoots up to 60 nails per minute and up to 700 nails per charge.

It's also got some serious features that you might not expect at this price point. You can set the firing mode to fire a single nail with each trigger pull, or set it to bump fire, where you hold the trigger and drive a nail every time you bump the nose against your workpiece. Other features include tool-free drive depth adjustment, dry fire lockout, LED work light, low nail indicator and a belt hook. The downside is that, largely because of the battery, you better have your belt snugged up an extra hole or two. This nailer weighs almost 7 lbs., about twice as much as its pneumatic cousins.

Clearly, this tool is aimed at the DIY market, but I think it could be a direct hit for woodworkers and finish carpenters as well. I know I wouldn't miss the noise of a compressor. I've also done enough finish carpentry to know that I wouldn't miss lugging a compressor around or inadvertently dragging a dirty air hose across someone's furniture.

SOURCE

Ryobi, ryobitools.com, 800-525-2579, 18V One+ Cordless 2" Brad Nailer, #P320, \$130.



Veritas Butt Chisels

BUTT CHISELS have shorter blades than bench chisels and are generally made in wider sizes. They're typically used for outlining and removing the waste from large areas, such as the mortises for butt hinges. These new butt chisels from Veritas are beautifully made and a pleasure to use.

Though butt chisels are technically a purpose-made tool, some woodworkers find that their shorter length offers improved control. I use them for chopping dovetails.

These chisels' blades are made from PM-V11. This is a powdered metal alloy chosen by the folks at Veritas after very thorough research to find the sweet spot between edge retention and ease of sharpening. In extensive blind testing by Veritas, PM-V11 outperformed both A2 and O1 tool steel in edge retention. As for ease of sharpening, PM-V11 sits between the two, with O1 tool steel taking an edge a little quicker and A2 being significantly more time-consuming.

The blades have beveled edges for clearance when working into a tight recess or an angled corner, like a dovetail. The bevel is full width and tapers to a point—a nice touch.

Each blade is lapped flat. I've come to realize through experience that when the folks at Veritas say flat, they mean flat. As trusting as I've become, however, I still swipe the blade's back across a fine stone a couple times just for the satisfying proof that I don't have to spend any time lapping.

The blade and handle are connected with a tang and socket-like stainless-steel ferrule that seats directly on the blade's shoulder, with flats on the tang to prevent the handle from rotating.

The hard maple handles have been treated by "torrefaction." This heating process stabilizes the wood and helps prevent swelling and shrinkage. The handles, albeit a little slippery, are nicely contoured and have a domed end to resist chipping from glancing mallet blows.

Overall chisel lengths range from 7-1/2" to 8", with the blades about 3" long. The 1/4" chisel has a 30° primary bevel, while the others are ground at 25°. All have 2° micro-bevels, and only require final honing before being ready for use.

SOURCE

Lee Valley & Veritas, leevalley.com, 800-871-8158, PM-V11 Butt Chisel, 1/4", #05S26.04, \$68; 1/2", #05S26.08, \$74; 3/4", #05S26.12, \$78; 1", #05S26.16, \$84; 1-1/2", #05S26.24, \$95; 2", #05S26.32, \$105; set of 3 (1/2", 1", & 1-1/2"), #05S26.40, \$219; set of 6 (all sizes), #05S26.60, \$439.

Multi-Function Router Base

A ROUTER BASE can be nothing more than just that: a base. Or, as in the case of the CRB7 MKIII kit from M.Power, it can be outfitted to help your router perform a multitude of other functions.

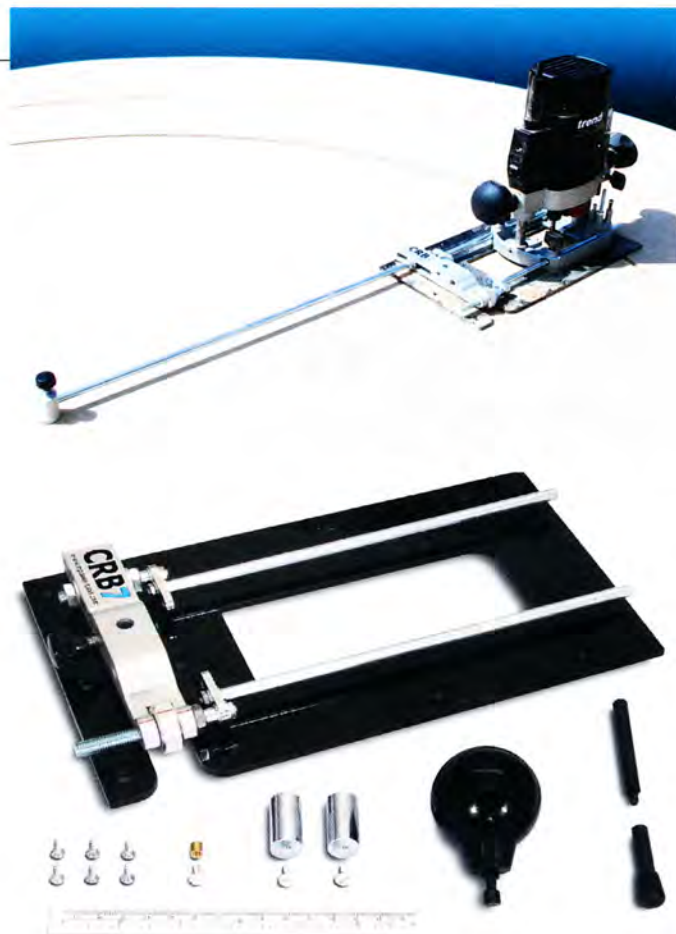
The CRB7 router base has been around a while, but the MKIII kit has a couple of important additions: two different-size guide rods to fit more routers, and the ability to cut larger circles. With the launch of the new accessories, I thought it'd be a good time to reintroduce the CRB7 for those who don't know the versatility it can add to your router. On its own, the CRB7 is a solid, well-built accessory. It attaches to your router via two rods that go in the slots where you'd attach a stock edge guide.

The most obvious benefits of the CRB7 are its large surface area and that it's offset. A large base increases stability when you're routing an edge. The offset amplifies that stability by putting about two-thirds of the base on your work surface, as opposed to just under half, as is the case with a centered base. For routing on the edge of a narrow workpiece, where the base size doesn't count, use the adjustable anti-tilt leg to provide stability.

With the MKIII kit, you'll be able to rout perfect circles with a diameter as small as 3/4" to as large as 50". Using the micro-adjust wheel, you can precisely dial right up to a line to adjust circle size.

This micro-adjust feature is also great for use with any clamp-on style edge guide for routing dadoes. A short edge guide that fastens to the base is also available. Using a shop-made guide attached to the base's underside, routing a series of parallel dadoes is a snap, as the guide slides in the previous dado.

Using a set of posts attached to the base's underside, you can cut centered or offset mortises. With the MKIII edge-trim kit, you're also set up for precise flush-trimming of edge banding or plugs.



Bottom line: This is a whole pile of jigs in one relatively affordable package. I'd like to see a kit that includes all of the available accessories.

SOURCE

MPower, m-powertools.com, CRB7 MKIII Combination Router Base, \$110; Edging/Dowel Trim Kit, \$30; Edge Guide/Side Fence Kit, \$20.

Briefcase Work Table

HERE'S A REALLY FRESH TAKE on an old idea. The Keter Folding Work Table is a boon for folks with limited work space who need an auxiliary bench from time to time. It's 29-3/4" tall—the perfect height for lots of benchtop tools.

The Folding Work Table has a unique pop-open design. You can set it up in no time. It only weighs 27 lbs. and according to the manufacturer, it'll support up to 1,000 lbs. There's a little bit of wobble, but less than you'd expect for a folding plastic table. Another cool feature is the two included quick clamps. They can be inserted into channels in the work surface for holding your work.

The Keter table has a generous 22" x 34" work area, as well as a storage shelf to keep the tools you're using close at hand. When you're done working, the table and all its parts fold up flat—just under 5" thick—in less than a minute for easy storage.

SOURCE

Keter, keter.com, 888-374-4262, Folding Work Table, #17182239, \$80.



The Trapped Reverse Chuck

How to build and use this must-have bowl-turning jig.

GOOD CRAFTSMANSHIP requires that the bottom of a turned bowl or vessel shows no evidence of how it was mounted. (In bowl turning, the “bottom” includes the lower outside portion of the piece as well as its underside.) Learning to keep the chuck from dictating key aspects of the design, such as the bottom’s shape, diameter and height, is another important skill.

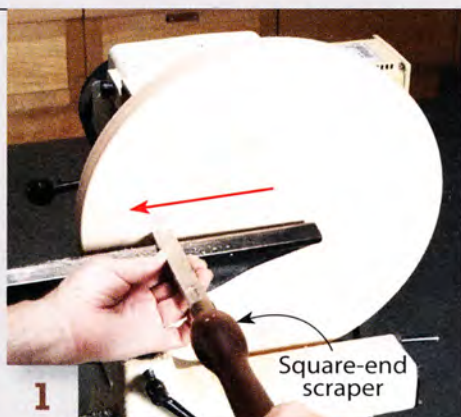
This shop-made trapping chuck will dramatically improve the quality of your work in both of these important areas. It allows full access to the bottom of a bowl or vessel and frees you from limitations caused by a faceplate or any other chuck. This chuck securely holds the work, so it can’t go flying across the shop—a benefit that’s absent from most other such chucks, both shop-made and commercial.

Make the chuck’s base

This chuck has two basic parts: a base on which the work is mounted and a ring to clamp the work to the base. Typically, rings of different diameters are used to clamp work of different sizes. Start by gluing together two thicknesses of 3/4" Baltic birch plywood to make the chuck’s base. Use yellow wood glue. Size the plywood to make a disc that’s slightly less than the maximum diameter your lathe allows. Let the glue cure for a day. Then bandsaw the disc.

Choose a faceplate to dedicate to the chuck (see Sources, page 23). I suggest at least 3" dia. for chucks up to 12", 4" dia. for chucks 14" to 16", 6" dia. for 18" to 24" and bigger still for lathes with larger capacities. Larger faceplates increase the

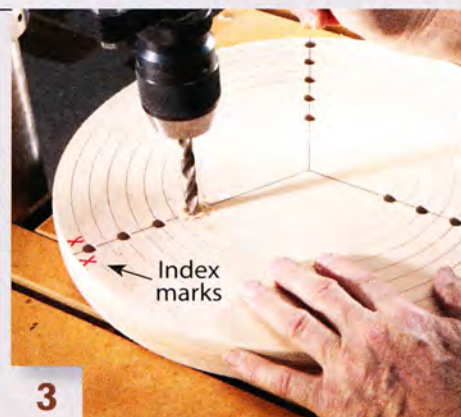




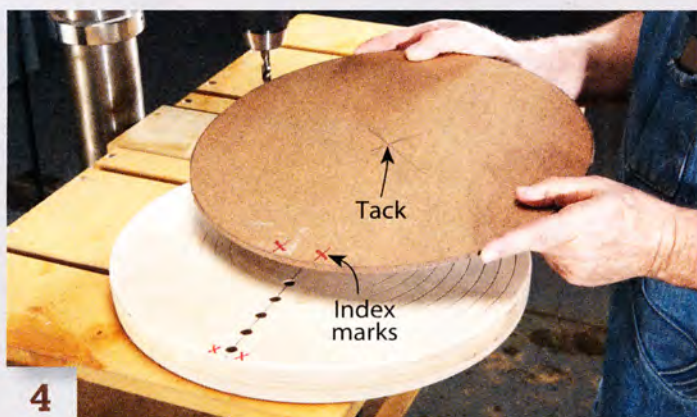
1 **Flatten** the face of a large plywood disc to create the chuck's base. Lightly scrape across the face to flatten it.



2 **Cut** shallow grooves to deepen scored lines made with dividers. Orient the skew with its long point down.



3 **Drill** holes through the disc on lines that divide it into three equal segments. Mark one line of holes to index the rings.



4 **Mount** a hardboard disc of the same diameter on top of the base, using a tack in the center and double-sided tape near the edges. Add marks to index this disc to the base.



5 **Drill** through the hardboard disc at every hole in the plywood base to create a template for drilling the chuck's rings.

stability of this chuck, so always err on the larger side.

Center the faceplate on the disc and mount it. Then turn the disc to a cylinder, using a bowl gouge. Plywood turns poorly and dulls tools quickly, so work slowly, make light cuts and keep your gouge sharp. Finish by power-sanding, using a sanding disc mounted in a drill to make sure the rim has no sharp corners or splinters.

In order to hold the work, the disc must have a flat surface that's perpendicular to the axis of the lathe. Use a square-end scraper to true the disc (**Photo 1**). Then lightly sand the surface.

With the lathe running at slow speed (less than 400 rpm), use a pair of solid dividers (see Sources) held flat on the tool rest to mark lines every 1/2", starting about 1/2" from the rim and stopping about 4" from the center. Then deepen these lines with the long point of a skew chisel (**Photo 2**).

Remove the faceplate and place the disc on a flat surface. Then draw lines that divide the disc's face into three pie-shaped sections that are (roughly) equal in size. Permanently mark one of these lines—this mark will be used to index the other parts when building and using the jig. Drill 3/8" dia. mounting holes along the three lines for the bolts that will hold the ring (**Photo 3**). Start at the outermost ring you cut earlier and space the holes 1" apart down to the 4" mark. Use a new or very sharp bit, make sure it's perpendicular to the drill press table and install a flat sacrificial board underneath to eliminate tearout.

Make the rings

Attach a hardboard disc to the base to create a template for making the rings (**Photo 4**). Mark this disc to index its "key" location, as well as its outside face (when mounted on the base). Then flip over the assembly and use the holes in

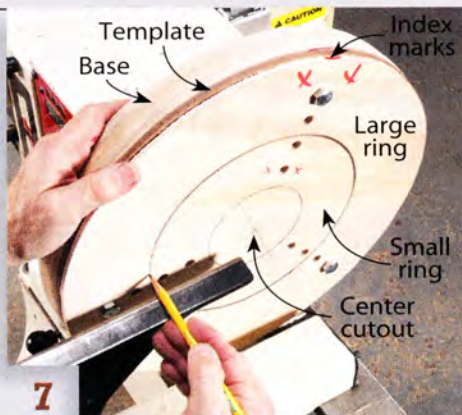
the base to drill through the hardboard (**Photo 5**).

Plan to cut between five and 10 rings at first. (Once you start using the chuck, you'll make many more.) Cut four rings the same diameter as the base, four two-thirds the diameter, and two half the diameter. The size of the center hole and where the drilled holes are located on the ring are the two variables, and they depend upon the piece you intend to hold. Cut the rings from 1/4" or 3/8" thick Baltic birch plywood. The 1/4" stock is fine for smaller chucks, but I tend to go to 3/8" or even 1/2" for larger rings and larger diameters.

Cut the plywood into discs the same diameter as the hardboard template. Then use the template to mark the bolt holes for drilling (**Photo 6**). For slightly more adjustability, I sometimes use a bit that's 1/64" larger than the bolts to drill these holes. As before, transfer the index marks to the plywood disc and



6 Index mark Plywood disc
Use the template and a brad-point bit to locate the holes on another plywood disc. Index this disc, too.



7
Mark the plywood disc for cutting into rings after bolting it and the template on the base and installing them on the lathe.



8
Cut through the disc to create the rings. Cut out the waste at the center. Then cut the small ring to create the large ring.



9
Line each plywood ring with clear plastic tubing that's been split with a utility knife.



10
To use the chuck, start by roughly centering a bowl on the appropriate groove cut in the base.



11
Install the ring and use it to clamp the bowl to the plywood base using bolts, washers and wing nuts.

mark its outside face.

Reinstall the faceplate on the chuck's base, making certain the base mounts flush. Lay the hardboard and one of the rings on top of the base, with all the index marks properly oriented. Then lash all three pieces together using 3/8" x 2-1/2" long coarse-thread bolts, washers and wing nuts.

Mark each disc for cutting into rings (Photo 7). Vary the center opening's size in each ring. Some discs will yield two rings. For the 14" chuck shown here, I made rings with openings from 3" to 12" in 1" increments. Rings between these sizes can be made as necessary.

Cut through the plywood disc to create each ring, using a thin-kerf parting tool (Photo 8). Run the lathe at 500 rpm or slower during this process. Wear a full-face shield and engage the tailstock (when possible) to hold the cut-through disc in place.

After all the rings are cut, lightly

sand all their edges and clearly mark the index points. Then line the center opening in each ring with 3/8" i.d. clear plastic tubing from the hardware store (Photo 9). You'll need about 20' of this tubing to line 10 rings. Note: The tubing's size will vary with the rings' thickness.

Cut the tubing about 1/8" shorter than the circumference of each hole. Observe how the hose curls. Then cut on the back of the curl, using a sharp knife or scissors. Lay the hose down and cut with the blade going away from you! Press the hose on—its natural curl will hold it in place.

Use the chuck

Set workpiece rim-down on the chuck and center it using the circular cut marks (Photo 10). Then decide which ring to use by placing each likely candidate on the work with the index marks and holes in alignment (Photo 11).

Does the center opening sufficiently grip the bowl while allowing full access to both its lower outside portion and its underside? Are the drilled holes positioned to allow the bolts to pass through without contacting the bowl?

Select the right bolts. As nearly every bowl is different, you'll need bolts of many different lengths to use with this chuck. I recommend buying sets of three 3/8" coarse-thread bolts, washers and wing nuts in 1/2" increments from 2" to 8". If having bolt heads whizzing past is unnerving, substitute carriage bolts.

With one washer on the ring under the bolt's head, make sure its threaded portion sufficiently protrudes through the base to install a washer and wing nut. If the bolt is slightly too long (so its unthreaded shaft appears), it's OK to use additional washers under the wing nut. Lightly tighten the wing nuts to secure the work.



12 Center the bowl with the chuck mounted. Mark the high spot. Gently tap it as necessary and then tighten the wing nuts.



13 Use this chuck to create a hollow base with a rim, add lines or beads, remove screw holes and chuck marks or fully round the bottom.

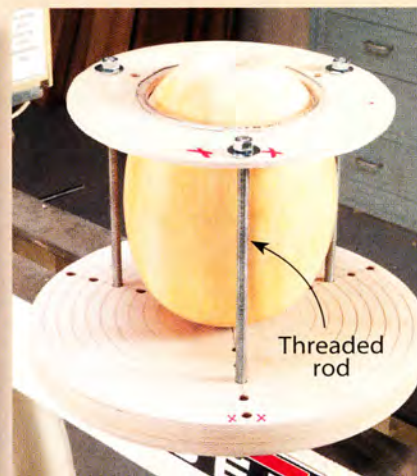
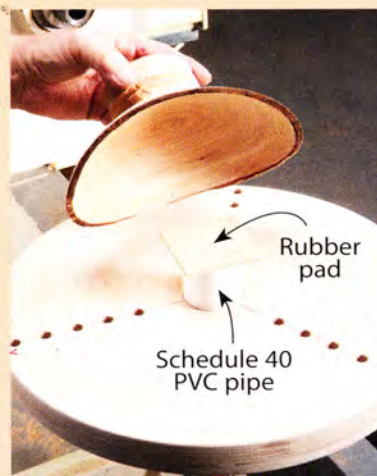
Screw the chuck and mounted work onto the lathe. Then center the work to the lathe. It's helpful to have already marked the center on the underside. One method is to use a simple center finder (see Sources). Then you can simply bring up the tailstock and move the work within the chuck to align the hole on its underside with the tailstock's center.

Fortunately, it's fairly easy to center the work even if it doesn't have a center mark (**Photo 12**). Rotate the chuck by hand. Place a pencil on the tool rest and slowly move it forward to mark the high spot on the rotating work. Then nudge the work slightly away from that high spot by pushing or tapping at the line's midpoint. Rotate the chuck and test again with the pencil. When the work is centered (or very nearly centered) the line will travel fully (or mostly) around the piece. When the work is centered (or very nearly), tighten the wing nuts

and bring up the tailstock center.

Finish turning the lower outside portion of the work and finalize its base diameter (**Photo 13**). If you cut in at the base to remove mounting holes on the underside, you'll also be changing the work's height. There's no need to run the lathe very fast during these operations, as you have a lot of mass on the machine. Finish-sand the newly turned portion of the work as necessary.

Pull back the tailstock and plan the look of the work's underside. I like a bowl or vessel to sit on a rim, whether footed or not, as opposed to a fully flat surface. With this chuck you can deep-hollow a foot, add details such as beads or lines or any other surprise you may wish to give the viewer. You can also fully round the underside. Finish-sand to complete the work. Remove the chuck with the work still attached and place it the bench. Then remove the wing nuts, bolts and ring.



Mount Unusual Shapes

This chuck can be used to mount work with natural edges, thin walls or delicate rims (above, left). Cut a groove in the face of the chuck's base to tightly house a short piece of Schedule 40 (thick-wall) PVC pipe—usually just long enough to raise the work's rim off the face. Use a scraper to lightly face off the protruding end of the pipe. Then glue on a 1/8" thick piece of textured rubber (such as a router mat) with CA glue. Position the work on the padded pipe, install a ring and you're ready to go.

You can also mount tall work by using threaded rod with washers and nuts on both ends (above, right). Most other reverse chucking systems don't have this capability.

Special Thanks

Eldon Rebhorn showed a version of this chuck in a book written in the 1960s. A few years later Hawaiian turner Jack Straka developed and refined this idea.

SOURCES

- Packard Woodworks, 800-683-8876, packardwoodworks.com, Dividers, 8", 135403, \$21.95; Thin-Kerf Parting Tool #10336, \$35.50; Center Finder #135510, \$5.95.
- Oneway Manufacturing, 800-565-7288, oneway.ca, Faceplate, 3" \$46.95, 4", \$52.95, 6", \$68.95, 8" \$114.95.
- Grizzly Imports, 800-523-4777, grizzly.com, Router Mat, #W1320, \$10.95.

Alan Lacer is a turner, writer, demonstrator and instructor living near River Falls, Wis. For more information, visit alanlacer.com.

Never Too Late



Fulfilling a childhood dream.



FOR MORE THAN 30 YEARS my workshop consisted of a workbench and my Shopsmith tucked into a corner of the garage. I either had to set up and tear down every time I worked in the shop or park the car in the driveway until a project was done.

In 2007 my husband said that if I'd give up my dream of buying a motorcycle for my 60th birthday, I could build my dream workshop next door to our house instead. This was certainly a great trade, as I spend time in the shop every day. In fact, some days my husband calls from the house to ask, "When are you coming home?"

My 1,000 sq. ft. shop includes a finishing room, a bathroom and an attached greenhouse with a covered patio (a wonderful place to sit while I'm hand sanding or carving). There's also a small alcove with room for a table and chairs. I trimmed its soffit with cutouts of girls enjoying woodworking, something that I dreamed about as a child. Un-

fortunately, I grew up in an era when girls weren't allowed to touch power tools.

My father and grandfather were both woodworkers and I used to sit in their shop for hours, watching as they built beautiful projects. I never had any woodworking classes, but what I learned by watching them was far better training than I could have gotten anywhere. Now I have a wonderful space where I'm able to teach classes for some of the ladies in the community. I've also set up a workbench and tool space for my grandson, who will carry on the tradition. A workbench that my father built from an ash tree he cut down on our yard is one of my favorite places to work.

My trusty Shopsmith—which I've upgraded by adding larger tables—is still one of my favorite tools. (A miniature version that I recently built as a project won ribbons at the county fair!) I use the Shopsmith's tablesaw, jointer, lathe,



disc and drum sander functions most often. Although I also use it for specialized drilling operations such as horizontal boring, its molder and shaper functions have been replaced by routing, for the most part.

I retrofitted the Shoptsmith's old tables with a custom-built stand to create a unique worktable that tilts, slides and raises up and down. It also doubles as a stand for my scroll saw. I've also built many other shop projects, including vertical lumber storage racks and a rolling rack for sheet goods, a pair of rolling work tables, a downdraft sanding table, the cabinet that houses the miter saw and a corner storage rack that holds branches I've collected for the walking sticks that I carve.

*Nancy Ballance
Hamilton, Montana*

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12 Tips for Working with Rough Lumber

by Tom Caspar

1 Safety First

Use your guard. Use your guard! Use your guard!! If you've ever traded shop horror stories with other woodworkers, you know how often people are injured by their tablesaws. The vast majority of those accidents would never have happened if a guard had been on the saw.

Old-style guards were truly a pain to install and remove, so I can understand why most woodworkers relegated them to a dusty shelf. I did, too. Modern guards are a different story. They're easy to deal with, just like a seatbelt, so I use mine whenever I can. I hope you will, too.



3 Paraffin Lube

Rubbing a small amount of paraffin wax on a jointer or planer's bed is the cheapest, most convenient and easiest-to-use method I know for reducing drag. I've tried sprays and powders as well, but I keep going back to paraffin. I always keep a small piece of it in my apron pocket.

Sold as canning wax, paraffin is available at most grocery stores. Unlike beeswax or carnauba wax, it won't contaminate your wood. Paraffin isn't a true wax—it's made from petroleum—so it's compatible with almost all finishes. Should any traces of it be left on your wood, you won't have a problem.



2 Beware of Checks

Cracks in a board's ends are a common flaw. Cut them off before you do any other crosscutting, so you know the true, usable length of your board.

These cracks are also called end checks. Large checks are easy to see and remove, but you may also find hairline cracks that aren't clearly visible on the board's surface or end.

I cut off the end of a board a little bit at a time, like slicing a loaf of bread. The slices are about 1/4" thick. As each slice falls off, I inspect it for checks. If the slice breaks very easily across the grain, it probably contains a hairline check.



4 Give a Rip

All you need is just one tablesaw blade, right? After all, a combination or general-purpose blade does a pretty good job of both ripping and crosscutting, and who wants to go through the hassle of changing blades all the time? Well, sometimes it's worth it.

If I'm working with boards that are more than 1-1/2" thick, I switch to a dedicated blade for ripping.

A rip blade requires less horsepower from your saw's motor and less manpower from your muscles. Pushing the wood is much easier. When you can maintain a reasonable feed rate, there's less chance of burning the wood or overheating the blade and dulling it.

If you have a contractor's saw, consider using a thin-kerf rip blade, such as the one shown here. Perfect for thick wood, it requires less power than a standard-kerf blade because it removes 25% less material.

SOURCE

Forrest Saw Blades, forrestblades.com, 800-733-7111, 10" Thin-Kerf Woodworker II 30-tooth rip blade, WW10307100, \$107.



Enlist Your Bandsaw

Rip wide rough lumber on the bandsaw—especially when the wood is cupped or twisted. This method is much safer than using a tablesaw, because a bandsaw can't kick back.

Ripping an uneven board on a tablesaw may cause an injury, and that's not a risk worth taking. If the cut binds, the blade will stall, the wood will burn, and if things are really bad, it may come shooting straight back at you. None of this will happen on a bandsaw.

Ripping thick stuff requires power, however. If you're thinking of upgrading to a larger bandsaw with a beefy motor, here's another reason to just do it.



Check Your Progress

Use the fence to make sure your edge is straight when you're done jointing. Running a board through a jointer doesn't automatically make it straight. You have to hold the board the right way, too, and where you put pressure depends on whether its original edge was concave or convex. It's better to check your progress, using the fence, than to just assume that everything is going well.

In fact, it's not a bad idea to place your board against the fence before you even start jointing. If you can tell whether its concave or convex right away, you'll know exactly how to handle it on the first pass.



Switch Throatplates

A **zero-clearance insert** will prevent thin offcuts from dropping down into your saw. Using a standard throatplate, a loose piece can get stuck between the blade and the plate, requiring you to stop and turn off the saw to remove the little offender. If it falls all the way through, a loose piece can also clog up your saw's dust collection—particularly if your blade has a shroud around it.

Standard throatplates are fine most of the time, but if your rip cuts will remove only a thin slice of wood, stop a minute and put in a zero-clearance insert, instead.



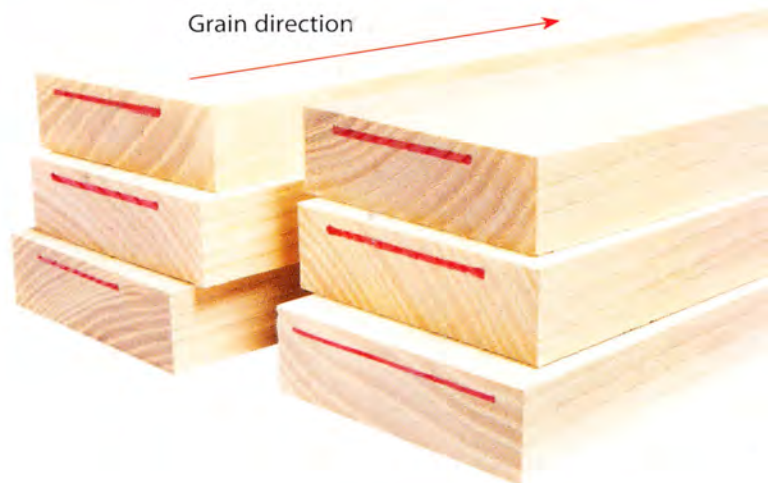
Save money by making your own zero-clearance inserts. Learn how at AmericanWoodworker.com/WebExtras

Mark the End Grain

When you're jointing, mark each board's grain direction by drawing a line on its end. The line means "Start here."

A mark on a board's face or edge can get erased by a planer or jointer, but a mark on its end grain won't be touched until you trim the piece shorter.

After jointing one face of each board, I mark it and stack it on a cart. Each time I add a board to the stack, I orient its mark the same way. When I wheel the cart over to the planer, the grain direction of each board is pointing the same way. Feeding the machine is easy!



9 Cut Big Boards into Small Pieces



You might think that the best strategy for milling rough lumber is to flatten as large a piece as possible, then cut it into smaller parts. Not true. It's better to cut a big rough-sawn board into individual pieces, one for each part on your cutting list, more or less, and then start milling.

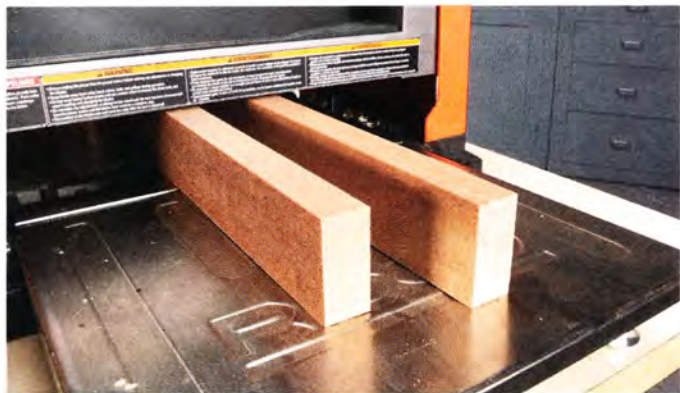
The problem with the big-board strategy is that the smaller pieces you cut from it may not remain flat or straight. Why? Some boards have a lot of stress built up inside them. When the board is whole, this stress is in balance. When you rip the board, you release some of that stress. Each half seeks a new balance and a new shape. It's hard to predict which boards will react this way, so I assume every board could present this problem.

I always cut my individual pieces slightly oversize, adding 1/2" extra in length and 1/4" extra in width. I don't cut any pieces less than 12" long, because it's unsafe to joint, plane or rip shorter stuff.

11 Planing on Edge

Run boards on edge through a planer when you have a stack that must be milled to a consistent width. Of course, the bottom edges of the boards must be sawn or jointed square and straight. This method won't fix a crooked piece! It's best to joint your pieces first, rip them about 1/16" extra-wide, then take them to the planer.

Won't they tip over? Yes and no. Tipping isn't a problem with boards that are 3/4" thick or more. Thinner boards, or boards that are over 4" wide, may not balance well. These pieces should not be planed on edge.



10 Measuring Thickness

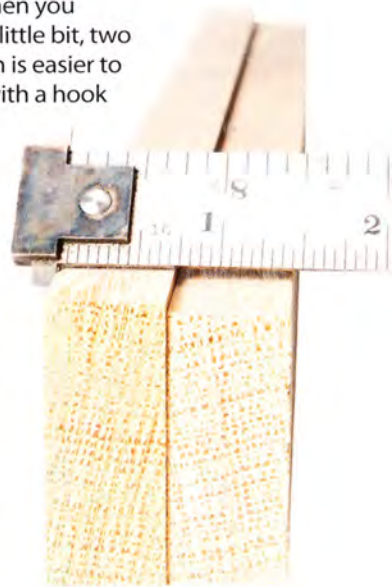
Two boards are better than one when you measure thickness. If one is off by a little bit, two will be off by twice as much—which is easier to read on a ruler. (I prefer using one with a hook on it. See Source, below.)

These boards are the same thickness—a bit less than 3/4". But how much less, exactly? Put together, they measure 1-7/16" on the nose. Which means the "bit less" is precisely 1/32", right?

Stacking four boards together gives you a measurement that's even more accurate, if you get the math right!

SOURCE

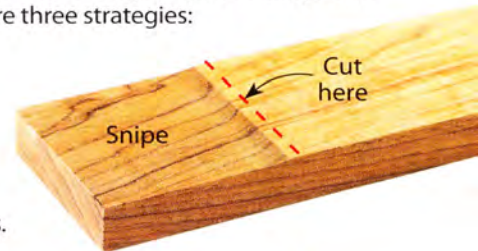
MSC Industrial Supply, mscdirect.com, 800-645-7270, 6" Starrett hook rule, \$30.91.



12 3 Ways to Beat Snipe

Planers create snipe by taking an extra-deep cut at the beginning or end of a board. Many machines do it, so it's natural to treat snipe as one of those problems—like the common cold—that can't be cured. We just have to adapt and learn to deal with it. Here are three strategies:

1. Start with boards that are 3" extra-long on both ends. Cut off the snipe when you're done planing. Sure, this wastes wood—but it always works.



2. Butt your boards end to end. This is an attempt to fool your planer into thinking it's just cutting one long board. (Planers don't snipe in the middle of a board, do they?) This method usually works, but not always. It requires you to move fast when feeding the beast.



3. Overlap your boards. This method also attempts to fool the machine. It won't work on the first pass, however, when your boards are different thicknesses. The feed rollers will only engage the thickest board, leaving the other one stranded. Once your boards are all the same thickness, from end to end, it's worth a try—although it's not a surefire cure. 



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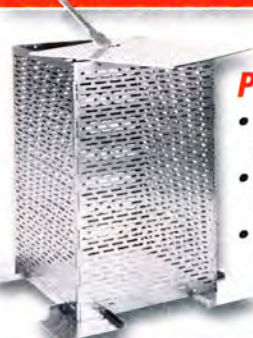
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The Abstract Chair

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WINTER 2013/14



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Curved-Lid Recipe Box

Update a kitchen icon with a contemporary design.

by
Richard Tendick



EVERY RECIPE my wife clips or copies goes in her “recipe drawer.” As she’s an inveterate recipe collector, this drawer is stuffed absolutely full. To get organized, she transferred the recipes onto 5x8 index cards. (Most recipes that are handwritten or clipped from magazines are too big to fit on 3x5 cards.) I designed this box to hold the cards in style.

An adjustable clip keeps the cards in place, whether the box holds only a few recipes or a drawerful. The lid works as a recipe holder when it’s open.

No cooks in your household? This box still warrants a place on your countertop. Use it to store coffee or tea, for example, or single-serving packets of oatmeal.

The curved lid may look challenging to make, but it’s actually pretty easy, because most of the work is done on

the tablesaw. The same goes for the through mortise-and-tenon joints: The mortises are template-routed and the tenons are cut on the tablesaw. Don’t worry about fitting the wedged tenons—the wedges are fake.



Shape the curved lid

Make the lid (A, Fig. A; Cutting List, page 32) from a 1" thick blank that’s 9" wide and roughly 13" long. The blank’s extra length provides a short test piece that will be used later, when you mount the lid. To shape the inside of the lid, you’ll pass the blank across the blade at a 90° angle. This may sound crazy, but it’s actually just a variation of the

traditional method for cutting coves on the tablesaw, in which a fence clamped at an angle to the blade is used to guide the work.

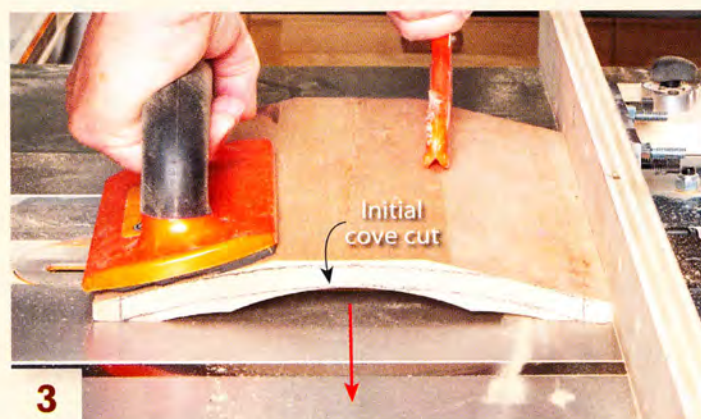
In this case, the fence is clamped perpendicular to the blade. (By the way, you can use this method to hollow a



1 **Start** shaping the curved lid by removing excess material from the top of the blank. This reduces the amount of planing you'll have to do later.



2 **Use** a 90° fence to hollow the bottom. Start by cutting a shallow cove at the center by pushing the blank across the blade. Then make additional passes, while incrementally raising the blade.



3 **Extend** the initial cove cut to complete the hollowing process. Reposition the fence, lower the blade and make additional passes. Turn the blank end-for-end to cut both sides.



4 **Shape** the lid's curved top surface with a block plane and then smooth the surface by sanding.

curved lid or door of almost any size, whether it's made from a single piece of wood or coopered.)

Draw the lid's profile on both ends of the blank (Fig. B). Leave 1/2" waste on each side to provide a stable surface for the blank to ride on as its coved shape nears completion. Then remove the waste on the top of the lid by making a pair of 15° cuts (**Photo 1**).

Build a fence to hollow the blank using a piece of 3/4" plywood that's 2" wide and slightly more than twice the length of the blank (**Photo 2**). Center this piece on the blade and attach it to two miter gauges set at 90°—this keeps the fence rigid and holds it perpendicular to the blade. Install Mag-switch magnets in a pair of blocks and attach them to the fence. These magnets switch on and off to provide both strong holding power while cutting and easy adjustability between cuts (see Source, page 35).

For the smoothest results—and the least sanding—use

Hollow the bottom of the lid by making coving cuts on the tablesaw.

a blade with flat-topped teeth to hollow the blank. A rip blade is best, but a combination blade with flat-topped teeth mounted between alternately beveled teeth will also work. Raise the blade to the height of the coved profile you've drawn on the end of the lid. Then mark the centerpoint of the exposed portion of the blade on the saw's table and place the center of the blank on that mark. Move the fence up to meet the blank and lock it in place. Lower the blade so that it extends only 1/8" above the table.

Make the first cut by sliding the blank slowly and deliberately across the blade while holding it firmly against the fence. Do not force the cut by moving too fast. Then make additional cuts, raising the blade in 1/8" increments, until you reach the profile line. Note: Adjust the fence as necessary to keep the cove centered.

To complete the hollowing, simply extend the cut to both edges. Reposition the fence and repeat the process

Fig. A
Exploded
View

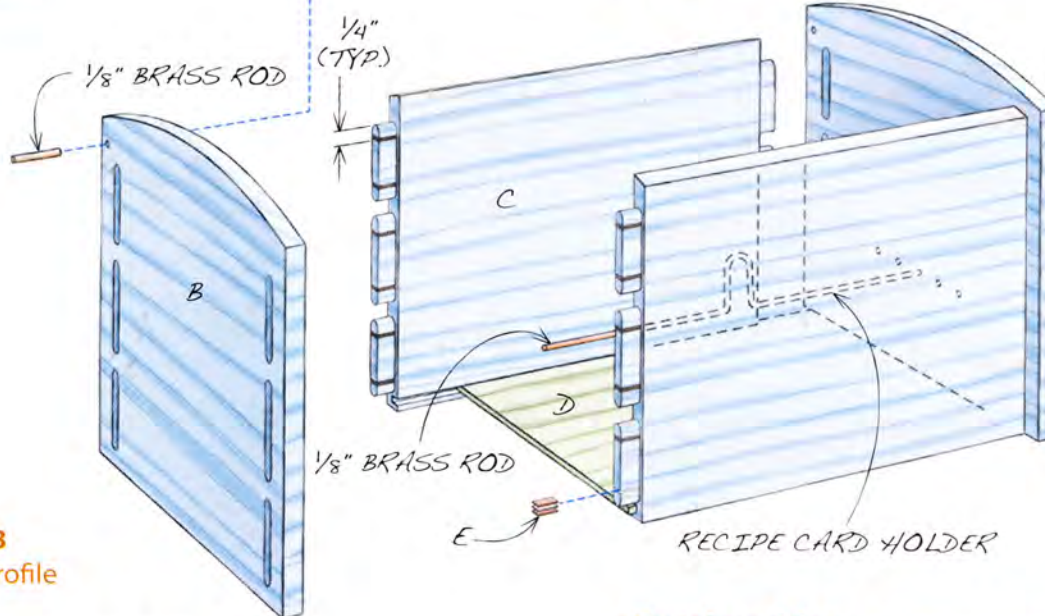


Fig. B
Lid Profile



Learn to make covered molding on the tablesaw at
AmericanWoodworker.com/WebExtras

Cutting List Overall Dimensions: 6-5/8" H x 9-1/4" W x 8" D

Part	Name	Qty.	Material	Th x W x L
A	Lid	1	Cherry	3/8" x 8" x 8" (a)
B	End	2	Cherry	3/8" x 6-5/8" x 8"
C	Side	2	Cherry	3/8" x 5-7/8" x 9-1/4" (b)
D	Bottom	1	Plywood	1/8" x 6-5/8" x 8-1/2"
E	Wedge	24	Verneer	3/69" x 1/2" x 3/4"

Notes:

a) Cut from a 1" Th x 9" W x 13" L blank.

b) Length includes 9/16" long tenons on both ends.

of making cuts while slowly raising the blade to match the coved profile (**Photo 3**). You'll have to make multiple setups to finish the job. Extend the cut on both sides of the blank from each setup by turning the blank end-for-end.

After shaping the inside of the lid, remove the saw marks and smooth the surface by sanding or by using a gooseneck scraper. Then cut off the waste on both sides so you can shape the top of the lid (**Photo 4**). Finish-sand the top and then cut the lid to final length. Save the curved offcut.

Rout mortises and slots

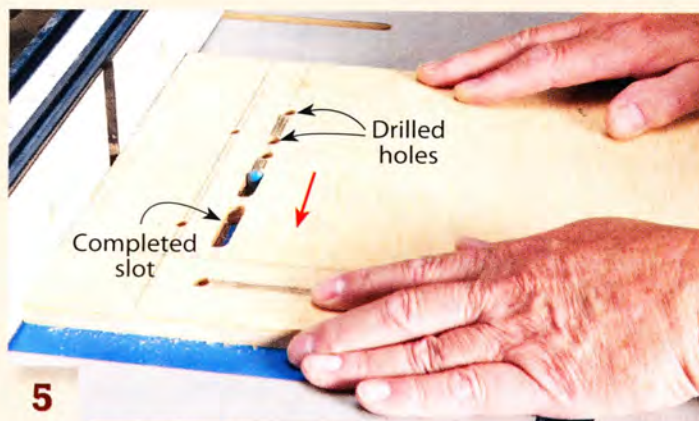
Make a template of 1/2" Baltic birch plywood so you can rout consistent mortises and slots in the box ends (**Photo 5**; Fig. E). This template has indexing pins that allow you to use it for both sides of the box. Carefully lay out and drill the four 1/4" dia. index pin holes on the template. Then cut three 13/16" long pins from 1/4" dowel stock and install them in the two holes on the left and the hole in the center. Place a try square (or a framing square) against the three dowels and use the two sides that touch the dowels to mark perpendicular lines that form an "L"

on the template. Use these two lines to locate the three mortise slots and the long slot for the box bottom. Install a fence on your drill press and drill 5/16" dia. holes at both ends of all four slots. Then use a 5/16" dia. straight bit and your router table to finish routing the slots.

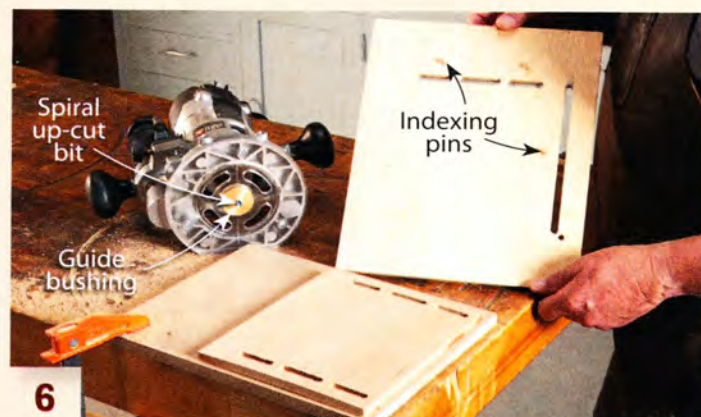
Outfit a plunge router with a 5/16" guide bushing and a 1/4" up-cut spiral bit to rout the mortises in the end pieces (B; Fig. C). Place each end piece on your bench, on top of a sacrificial board. Position the template on top of the end piece with its indexing pins firmly registered against the end's side and bottom. Then clamp the assembly to your bench. After clamping, check to make sure all three pins remain registered.

Plunge-route the first three mortises, using the guide bushing and the slots to guide the cuts. Then flip over the template and repeat the process to rout the remaining mortises (**Photo 6**). To rout the slot for the box bottom, move the template's bottom indexing pin to the fourth (lowest) hole and install a 1/8" up-cut spiral bit in your router. Then follow the same procedure as for routing the mortises.

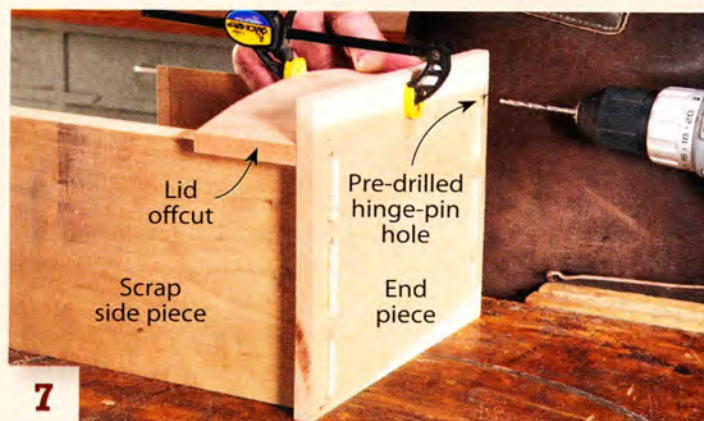
Locate and drill the five 3/16" deep stopped holes for



5 **Make** a template with slots to cut mortises in the box ends. Lay out the slots and drill holes at both ends. Then use a straight bit and a fence to finish the job.



6 **Rout** mortises in each end piece using both sides of the template. Rout the first three mortises. Then flip the template, push its indexing pins through to the opposite face, and go again.



7 **Drill** a hinge-pin hole in an offcut to test the lid's operation. Use scrap stock sides to hold the end piece. Install a pin and open the offcut. It should cant slightly back, so it will hold a recipe card.



8 **Mark** the lid's curved profile on each end piece, using the same setup. Then cut the profile on the outside edge of the line.

the recipe card retainer on each end piece, using the drill press. Stack the end pieces and use the fence and a stop to drill the hinge-pin holes, so they're identically located.

Locate the hinge pin

Cut a pair of side pieces (C) from scrap stock and use them along with the arched lid offcut you saved earlier to dial in the lid's hinge pin location (**Photo 7**). Cut rough tenons on one end of each scrap side; don't bother to round the ends of these tenons—just size them to fit through the mortises. Bevel the top edges of both side pieces with the blade tilted to 17°. Place the lid offcut on top of the scrap sides and flush with the end piece at the front and back. Then insert a 1/8" drill bit through the hinge hole and tap it to lightly mark the edge of the lid offcut. Drill a 1" deep hinge-pin hole at the mark. This hole must be perpendicular to the box end to ensure the lid offcut pivots easily, so use your drill press.

Fitting the wedged tenon joints is easy because the wedges are purely decorative.

Press a 3-1/8" length of 1/8" brass rod through the hole in the box end and into the lid. Lift the lid and see if it stays up and cants slightly back. If it does, you're good to go; if it doesn't, remove the lid and plane a little off its back inside corner, where it contacts the box. Then try again. When the lid stays up, remove the same amount from the inside corner of the real lid.

Use the same setup to mark the lid's curve on the box ends (**Photo 8**). Then bandsaw the curve.

Cut tenons

Cut the sides (C; Fig. D) to final length and width. Then rabbet both ends of each piece to establish the tenon cheeks. Make test cuts first, using scrap stock, to match the tenons' thickness with the mortises in the end pieces. As with the scrap sides, cut the bevel on the top of each side piece with the blade tilted to 17°. Then saw or rout the groove for the box bottom.

Clamp each side piece in a vise to mark its rounded



Technical drawing of a mechanical part, likely a bracket or plate, showing dimensions in inches. The drawing includes a top view and a side view.

Top View Dimensions:

- Overall width: $9\frac{1}{4}"$
- Distance from left edge to centerline: $8\frac{1}{8}"$
- Distance from centerline to right edge: $9\frac{1}{16}"$
- Distance from left edge to first vertical slot: $9\frac{1}{16}"$
- Distance between vertical slots: $1\frac{1}{2}"$
- Distance from last vertical slot to right edge: $1\frac{3}{4}"$
- Distance from bottom edge to first horizontal slot: $1\frac{1}{2}"$
- Distance between horizontal slots: $5\frac{1}{16}"$
- Distance from last horizontal slot to bottom edge: $5\frac{1}{16}"$

Side View Dimensions:

- Overall height: $5\frac{7}{8}"$
- Distance from top edge to first horizontal slot: $1\frac{1}{2}"$
- Distance between horizontal slots: $5\frac{1}{16}"$
- Distance from last horizontal slot to bottom edge: $5\frac{1}{16}"$
- Distance from bottom edge to first vertical slot: $1\frac{1}{2}"$
- Distance between vertical slots: $1\frac{3}{4}"$
- Distance from last vertical slot to right edge: $1\frac{3}{4}"$
- Distance from left edge to first vertical slot: $9\frac{1}{16}"$
- Distance between vertical slots: $1\frac{1}{2}"$
- Distance from last vertical slot to right edge: $1\frac{3}{4}"$
- Distance from bottom edge to first horizontal slot: $1\frac{1}{2}"$
- Distance between horizontal slots: $5\frac{1}{16}"$
- Distance from last horizontal slot to bottom edge: $5\frac{1}{16}"$

Other Dimensions:

- Distance from top edge to first horizontal slot: $1\frac{1}{2}"$
- Distance between horizontal slots: $5\frac{1}{16}"$
- Distance from last horizontal slot to bottom edge: $5\frac{1}{16}"$
- Distance from bottom edge to first vertical slot: $1\frac{1}{2}"$
- Distance between vertical slots: $1\frac{3}{4}"$
- Distance from last vertical slot to right edge: $1\frac{3}{4}"$
- Distance from left edge to first vertical slot: $9\frac{1}{16}"$
- Distance between vertical slots: $1\frac{1}{2}"$
- Distance from last vertical slot to right edge: $1\frac{3}{4}"$
- Distance from bottom edge to first horizontal slot: $1\frac{1}{2}"$
- Distance between horizontal slots: $5\frac{1}{16}"$
- Distance from last horizontal slot to bottom edge: $5\frac{1}{16}"$

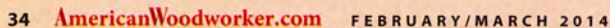
Hand-drawn technical drawing of a mechanical part, likely a bracket or plate, showing dimensions and features:

- Vertical Dimensions (Left Side):**
 - Top section: $11/16"$
 - Section between first and second holes: $1-1/4"$
 - Section between second and third holes: $9/16"$
 - Section between third and fourth holes: $1-1/2"$
 - Section between fourth and fifth holes: $9/16"$
 - Section between fifth and sixth holes: $1-1/4"$
 - Bottom section: $3"$
 - Total height: $3-5/8"$
- Horizontal Dimensions (Bottom):**
 - Leftmost section: $1-7/8"$
 - Section between first and second holes: $4"$
 - Section between second and third holes: $6-5/8"$
 - Section between third and fourth holes: $3-1/2"$
 - Total width: $11-1/2"$
- Features and Labels:**
 - 5/16" W. SLOT (TYP.):** Points to the top edge of the first hole.
 - 1/4" DIA. INDEX PIN HOLE (TYP.):** Points to a hole on the right side of the part.
 - 13/16":** Dimension from the bottom edge to the center of the index pin hole.
 - 1":** Dimension from the right edge to the center of the index pin hole.
 - 7/8":** Dimension from the bottom edge to the center of the index pin hole.
- Other Details:**
 - Five circular holes are arranged vertically on the left side.
 - Two circular holes are arranged horizontally on the right side.
 - Dimension lines are shown with arrows and circles at the ends.

Hold recipe cards upright inside the box by bending 1/8" brass rod around a form. The bent rod installs in the stopped holes drilled in the box ends. As more cards are added, you just move the rod forward to the next pair of holes.

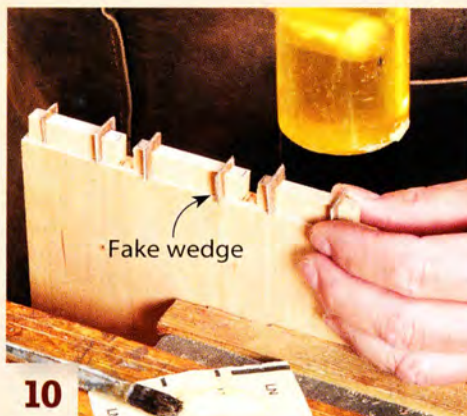
Make the form by attaching a stop and drilling holes for dowels in 3/4" plywood. Place the rod against the stop and bend it around a 1/4" dowel. Once the rod is at 90° and tangent to the 1/2" hole, insert a 1/2" dowel.

Bend the rod around the 1/2" dowel until it's tangent to the last 1/4" dowel hole. Install the last dowel and bend the rod until it's parallel. Complete the job by cutting the rod to length and filing a dull point on each end. To install the retainer, simply squeeze its U-shaped middle.





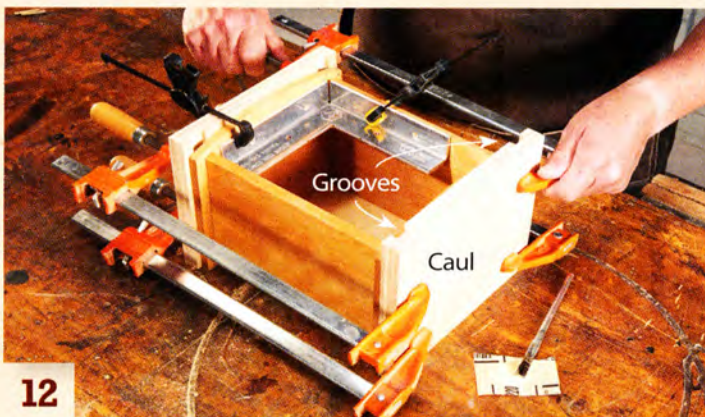
9 Use the mortises in an end piece to mark the rounded tenons on the adjacent side piece.



10 Glue fake wedges made from strips of veneer in slots cut in the tenons. Trim the wedges flush after the glue has dried.



11 Slightly round the ends after shaping the tenons to fit the mortises in the sides.



12 Glue the box together after pre-finishing all the parts. Use cauls with grooves cut to house the protruding tenons to tightly clamp the joints.



13 Install the lid by tapping home the hinge pins.

tenons (**Photo 9**). Make sure the bottom edges of both pieces are flush before you mark. Remove the waste between the tenons using a bandsaw and a chisel—leave the ends of the tenons square for now. Next, cut slots 1/4" from both ends of each tenon for the fake wedges (E). Make the wedges by gluing a strip of maple veneer between two strips of walnut veneer. (The kerf of a 1/2" bandsaw blade is just wide enough to hold three strips of veneer.) Cut the glued-up strip into short pieces and glue one piece in each kerf (**Photo 10**).



Use a chisel and a flat bastard file with a dead edge to round the ends of the tenons to fit the mortises. (A dead edge has no teeth, so it won't mar the tenon shoulders. To create a dead edge, simply grind off the teeth.)

File carefully and stop frequently to check the fit. Assemble the fitted joints and mark the tenons at the point where they protrude beyond the side. Then disassemble the joints and round the end of each tenon to the lines you've just marked (**Photo 11**).

Assemble the box

Cut the 1/8" thick plywood bottom (D) to size. Then dry-

assemble the box to make sure it fits.

Finish-sand the box and apply your favorite finish. (Do not sand or finish the mortises and tenons.) By pre-finishing, any squeeze-out that occurs during glue-up will be easy to remove. Make two scrap-wood cauls with grooves cut to house the protruding tenons. Then apply glue and clamp the box together (**Photo 12**).

Position the lid on the box, mark the hinge-pin locations and drill 1" deep hinge-pin holes, using the drill press. Cut two 1-7/16" long hinge pins from 1/8" brass rod. File a point on one end and smooth the other end flat. Then insert the pins in the holes in the box end and gently tap them into the lid (**Photo 13**). 

SOURCE

• Magswitch, magswitch.com.au, MagJig95, #8110004, \$24.99; MagJig150, #8110005, \$34.99.



Richard Tendick is a retired engineer who loves designing projects and working wood.

Bow Front Corner Cabinet

Learn how to
add a graceful curve
to a basic cabinet.

by Chad Stanton

THIS PROJECT LOOKS PRETTY SIMPLE, doesn't it? It's just a box with two sides and a few shelves. It's got a curved drawer, too—which isn't so simple—but let's skip that for the moment. As I started building a prototype, I thought, "This is no problem at all. It's just normal cabinetmaking."

Oops. As it turns out, this cabinet *isn't* normal: Some of its building steps are best done backwards. Normally you'd build a case first, then build a drawer to fit it. Not here—you make the drawer first, then build the case. Normally you'd make a face frame early on and fasten it to the case. Not here—there isn't any face frame. The stiles are added separately, after the shelves and drawer are installed.

After reversing course a few times, I realized that I had learned quite a few new tricks and skills while building the prototype. I gained experience dealing with irregular shapes, figured out how to build up 3/4" plywood to make it look thicker and perfected a way to make wide edging that's only 1/16" thick.

About that drawer—although it doesn't hold much, it anchors the whole design by adding visual weight to the bottom of the cabinet. It also anchors the whole building process, in a way. The success of the project depends on making a drawer front with a perfectly smooth, even curve. I enlisted some help to work out a foolproof method that doesn't require any special tools or equipment (see "Curved-Front Drawers," page 44). I'm very happy with the results. After struggling with the prototype, the actual cabinet went together without a hitch.

EDITOR: TOM CASPAR | PHOTOGRAPHY: JASON ZENTNER | ILLUSTRATION: FRANK ROHRBACH

Assemble the sides

Start by laying out all of the cabinet's plywood pieces on one sheet of plywood (Fig. B, page 38). Draw the two sides (A and B) as one unit. Make this large rectangle 1" wider than the two sides combined and 1" extra-long. Cut out two cardboard patterns for all of the triangular pieces (Fig. J). These patterns are slightly oversize, but be sure to create a 3/4" gap between the triangles when you lay them out—as shown in Fig. B—so you have room to turn a jigsaw.

Break down the plywood into three sections. Trim the section that contains the side pieces to final length. Using a straightedge as a guide, rout two dados in the plywood (**Photo 1**; Fig. C). These dados receive the cabinet's two fixed shelves (F1 and G1). Rout a rabbet on the top edge of the sides. The rabbet receives the cabinet's subtop (E1). Rip the plywood into two parts, separating the two side pieces. Both of them should be at least 3/8" extra-wide. (Note that side A is 3/4" narrower than side B.)

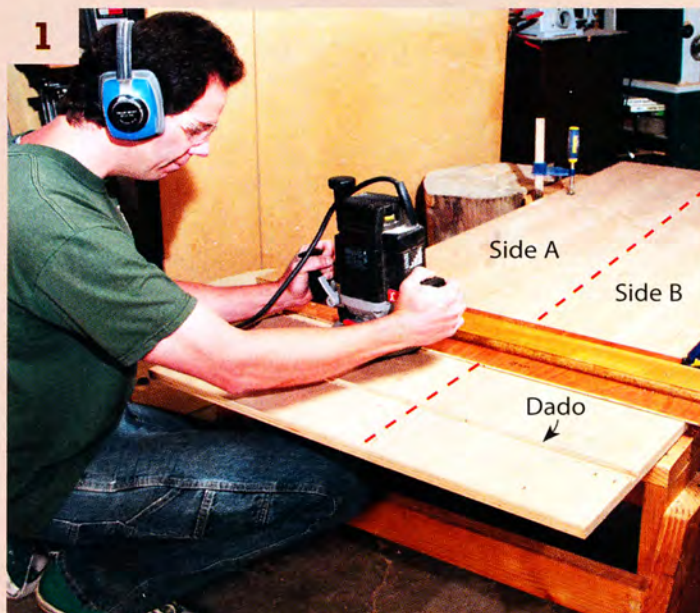
Mark what will be the front edge of each side, then rip these edges at 65° (**Photo 2**; Fig. E). Make sure these cuts are straight; the stiles will be glued to these edges later on. Rip the other edge of each side, at 90°, to final width. Using a jigsaw, cut out the feet on the bottom end of each side piece. Drill holes for the shelf pins.

Cut biscuit slots about 10" apart for joining the back corner of the sides. Assemble the pieces—without glue—then drill pilot holes for screws between the slots (**Photo 3**). Glue and screw the two sides together. You could use clamps instead of screws, but clamps might damage the sides' angled edges.

Make the subtop and shelves

This is where things start getting tricky. But don't worry—just follow the procedure below and everything will come out right. Start by making a precise wooden template for the shelves and subtop (Fig. E). You'll be cutting and

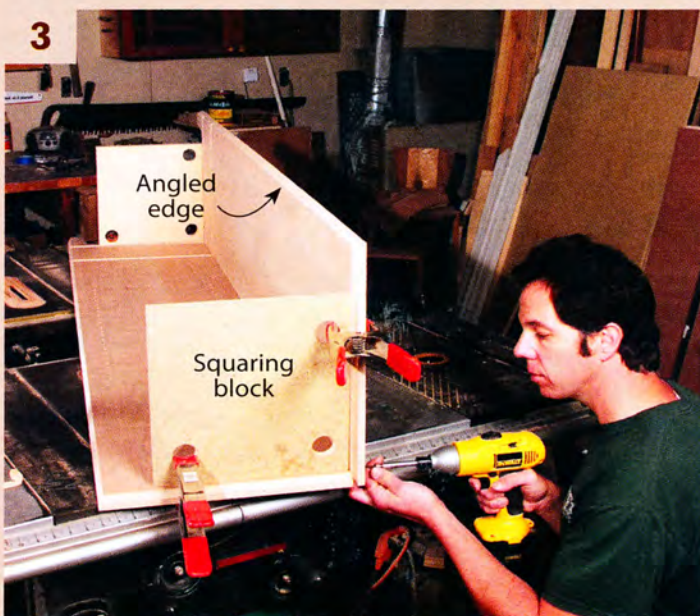
Begin by cutting one piece of plywood for both of the cabinet's sides. Rout two dados and a rabbet to receive the cabinet's shelves and subtop, then rip the piece into two sections, one for each side.



Cut a 65° angle on the front edges of both sides of the cabinet, then rip the pieces to final width.



Assemble the two sides with biscuits and screws, using plywood blocks to hold the cabinet square.



Watch Chad put his squaring blocks to use at AmericanWoodworker.com/WebExtras

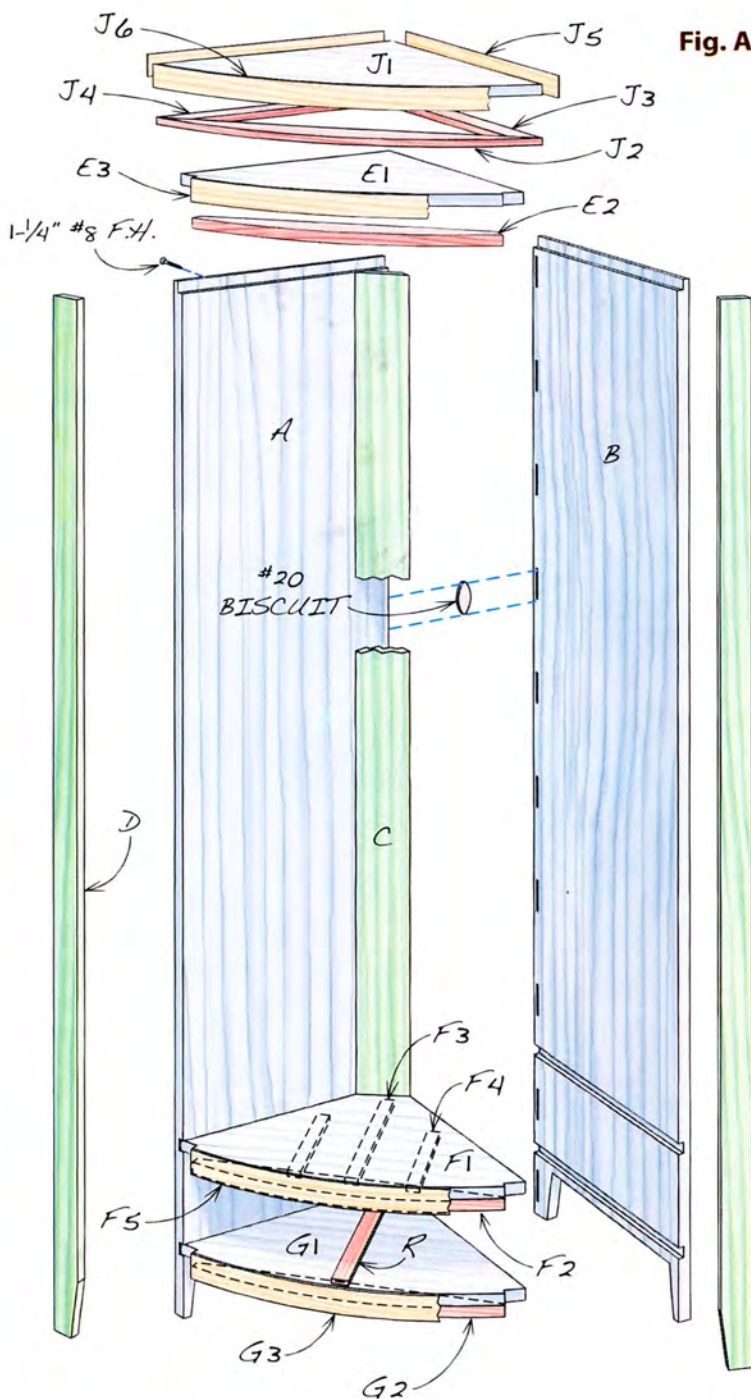


Fig. A Exploded View

Cutting List

Overall Dimensions: 72" H x 24-7/8" W x 15" D

Part	Name	Qty.	Material	Th x W x L
A	Case			
A	Side 1	1	Plywood	3/4" x 15-7/16" x 70-7/8"
B	Side 2	1	Plywood	3/4" x 16-3/16" x 70-7/8"
C	Back	1	Solid wood	3/4" x 3-1/2" x 58-1/4"
D	Stile	2	Solid wood	3/4" x 2-1/4" x 70-7/8"
E1	Subtop	1	Plywood	3/4" x 13-5/8" x 21-15/16"
E2	• Buildup	1	Solid wood	3/4" x 2-3/8" x 20"
E3	- Edging	1	Solid wood	1/16" x 1-1/2" x 20-3/8"
F1	Shelf 1	1	Plywood	3/4" x 13-5/8" x 21-15/16"
F2	• Buildup 1	1	Solid wood	3/8" x 2-3/8" x 20"
F3	• Buildup 2	1	Solid wood	3/8" x 3/4" x 11"
F4	• Buildup 3	2	Solid wood	3/8" x 3/4" x 6"
F5	- Edging	1	Solid wood	1/16" x 1-1/8" x 20-3/8"
G1	Shelf 2	1	Plywood	3/4" x 13-5/8" x 21-15/16"
G2	• Buildup	1	Solid wood	5/8" x 2-3/8" x 20"
G3	- Edging	1	Solid wood	1/16" x 1-3/8" x 20-3/8"
H1	Adjustable shelf	4	Plywood	3/4" x 11-1/2" x 21-3/8"
H2	- Edging	4	Solid wood	1/16" x 3/4" x 20-3/8"
J1	Top	1	Plywood	3/4" x 15" x 24-15/16"
J2	• Buildup 1	1	Solid wood	3/8" x 2-1/2" x 25"
J3	• Buildup 2	1	Solid wood	3/8" x 1-1/2" x 17-5/8"
J4	• Buildup 3	1	Solid wood	3/8" x 1-1/2" x 16-7/8"
J5	- Edging, side	2	Solid wood	1/16" x 1-1/8" x 17-5/8"
J6	- Edging, front	1	Solid wood	1/16" x 1-1/8" x 25-9/16"
	Drawer			
K	Front	1	Plywood	1" x 5-1/2" x 20-1/16" (a)
L	Edging	2	Solid wood	1/8" x 1" x 20-1/16"
M	Side 1	1	Solid wood	1/2" x 5-3/4" x 13-3/4"
N	Side 2	1	Solid wood	1/2" x 5-3/4" x 13-1/4"
P	Bottom	1	Plywood	1/4" x 10-1/2" x 18"
Q	Guide	1	Solid wood	1/2" x 2-1/2" x 10-3/4"
R	Guide strip	1	Solid wood	1/4" x 1" x 11-3/4"

Notes:

(a) Make substrate from five pieces of 1/4" plywood 6" wide by 27" long.

SketchUp
To download free plans for this project, go to
AmericanWoodworker.com/SketchUpPlans

Fig. B Plywood Cutting Diagram

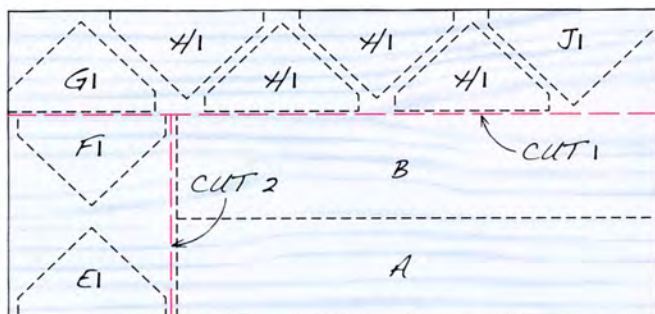
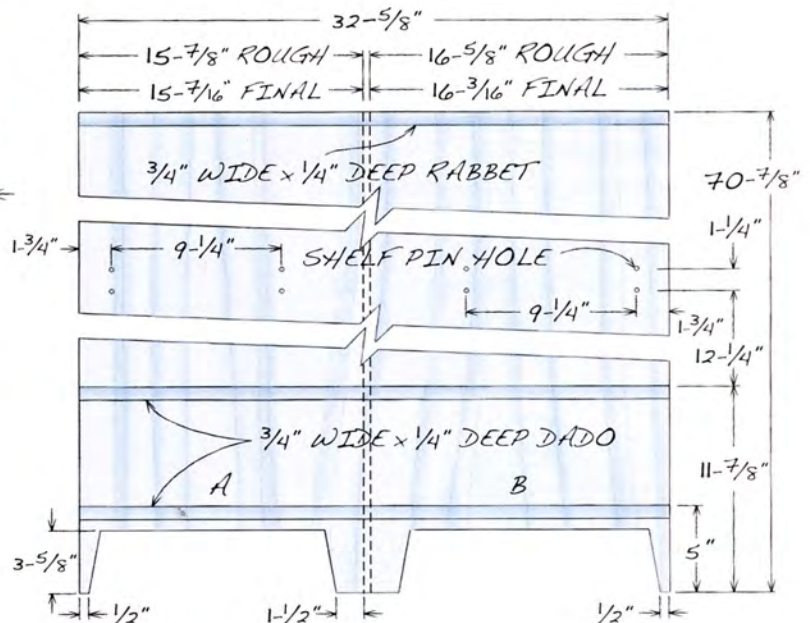


Fig. C Side Details



sanding a curve on the front edge of the template later on, so choose a material that shows pencil lines clearly and is easy to shape, such as 1/4" MDF. Place the template in the case, pressed tight to the bottom of both dadoes, and make two marks 11/16" beyond the edges of the case (**Photo 4**; Fig. E).

Now it's time to hit the pause button. Before you can go any further, you need to know the exact curvature of the drawer that fits between the shelves. (Fig. D shows an elegant geometric method for calculating this curve. It works for a cabinet of any size.) The drawer's front (K) sits flush with the shelves, so once you've nailed down the drawer's curve, you've also got the curve for the shelves.

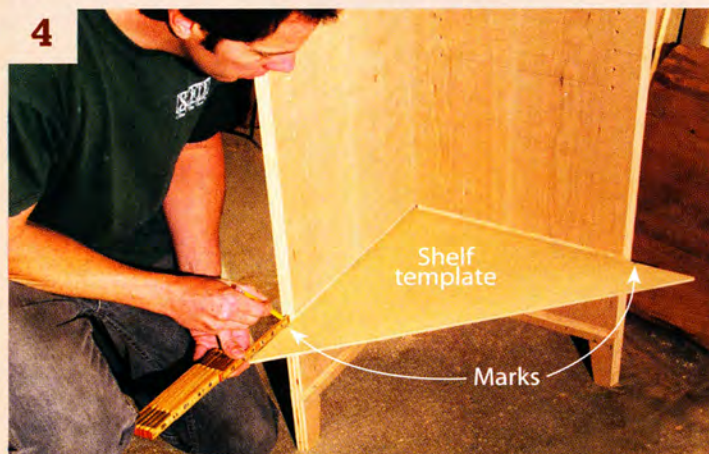
Knowing the drawer front's theoretical radius is a good start, but what you actually need now is the drawer front itself (see "Curved-Front Drawers," page 44). The front is laminated from 1/4" pieces of plywood, not sawn from a giant chunk of wood (**Photo 5**). When you make a bent lamination, the piece usually flattens out a small amount when it comes out of the clamps. Exactly how much "spring-back" you'll get is impossible to predict. Therefore, you must go through the process of making the drawer front in order to accurately determine its curvature—numbers alone won't work.

Thinking about this, I hope you'll see that it's risky to make the shelves first and then, later on, try to make a drawer front that matches their curve. Since the drawer front is veneered, there's no margin for error. Once the front is bent, it's impractical to change its shape to match something else. Making the drawer front before making the shelves is the prudent way to go.

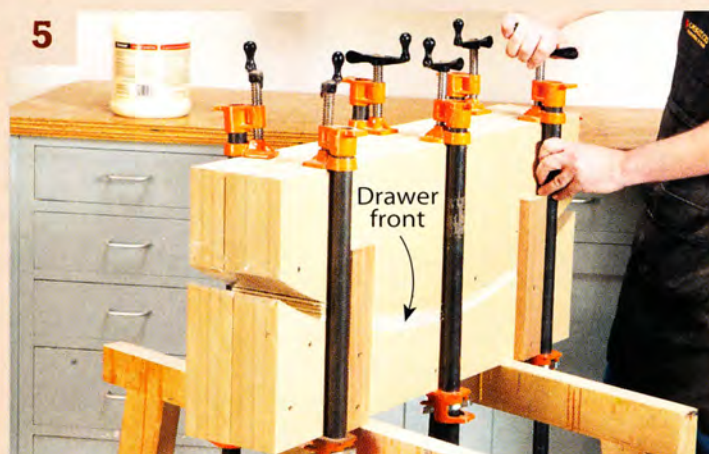
Make the front extra-long, using the dimensions given in the cutting list. Place the front on your template and connect the two marks you made (**Photo 6**). Trace the front's curve, then cut the template and sand to the line (**Photo 7**). Compare the template to the drawer front and adjust the template's curve, if necessary, so they match.

Rough-cut all the triangles from the sheet of plywood. Set aside the top piece (J1) for now. Place the MDF template on the remaining triangles, allowing a 1/16" margin on the straight

Make a template for the shelves and subtop from 1/4" MDF. Place the template in the dadoes and make two marks 11/16" beyond the edges of the cabinet's sides.



Make the front of the drawer before proceeding any further. You'll need to know its exact curvature before completing the shelf template.



Place the drawer front on the marks you drew on the template, then trace the outline of the drawer's curve.



Cut the curve on the bandsaw, then sand down to the line. The shelves and the drawer will be flush with each other, so their curves must match.



Fig. D Curve Layout

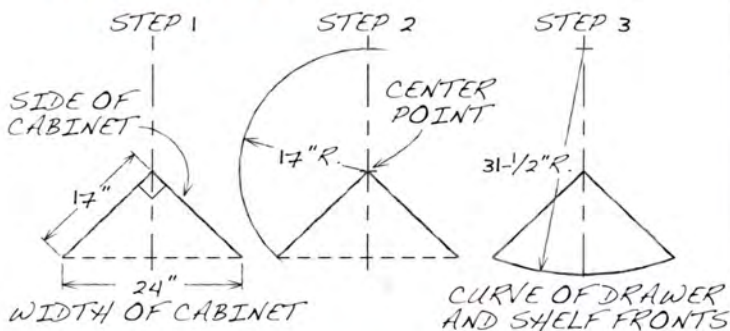


Fig. E Plan View of Shelf Template and Case

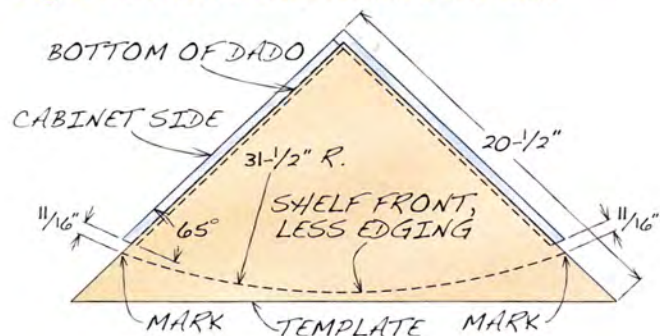


Fig. F
Subtop and Shelf Details

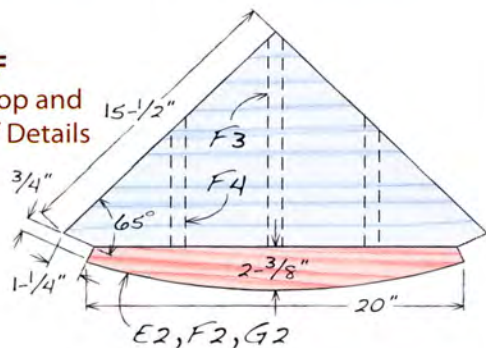


Fig. G Plan View of Drawer Inside Case

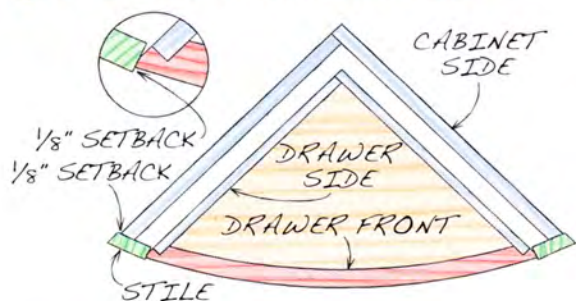


Fig. H
Top Details

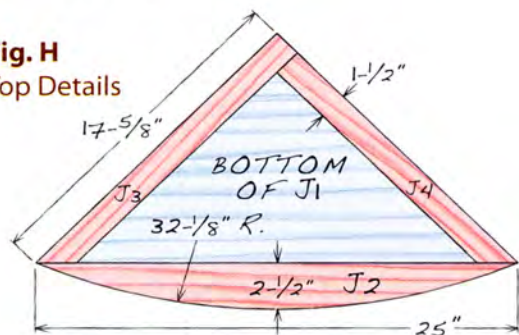


Fig. J Pattern Pieces for Roughing Out Top and Shelves

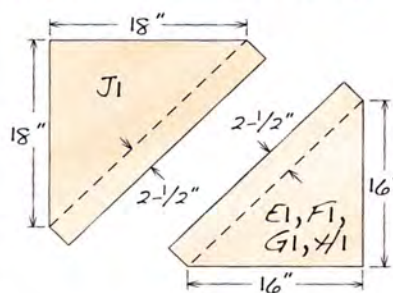


Fig. K Stile Marking Block

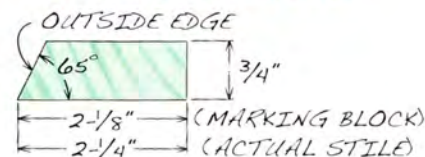


Fig. L
Exploded View of Drawer

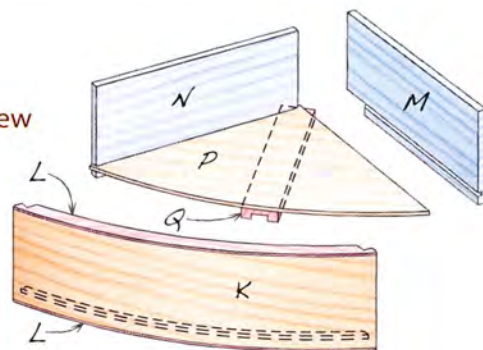


Fig. M
Drawer Details

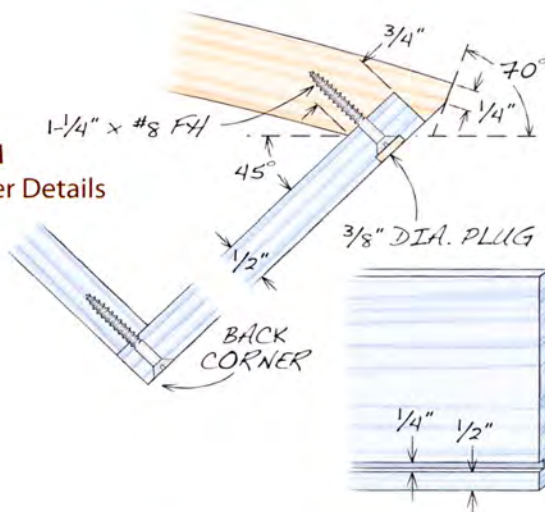


Fig. N
Drawer-Front Bending Form

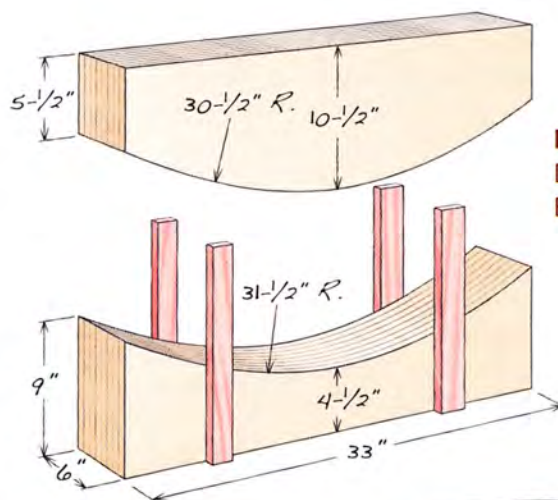
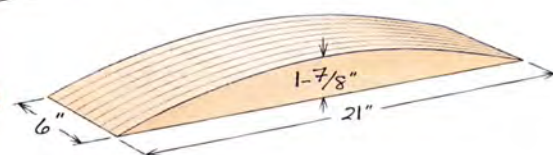


Fig. P
Drawer-Front Cutting Jig



sides. Trace the template's curve on each piece. Cut the curve at least 1/16" oversize, then use double-faced tape to fasten the template to each piece. On the router table, shape each piece of plywood all the way around to match the template (**Photo 8**).

The subtop (E1) and the two fixed shelves (F1 and G1) have front edges that are thicker than 3/4" (Fig. F). To achieve this look, glue "buildup" pieces (E2, F2, F3, F4 and G2) to each part. Trim the front buildups flush (**Photo 9**).

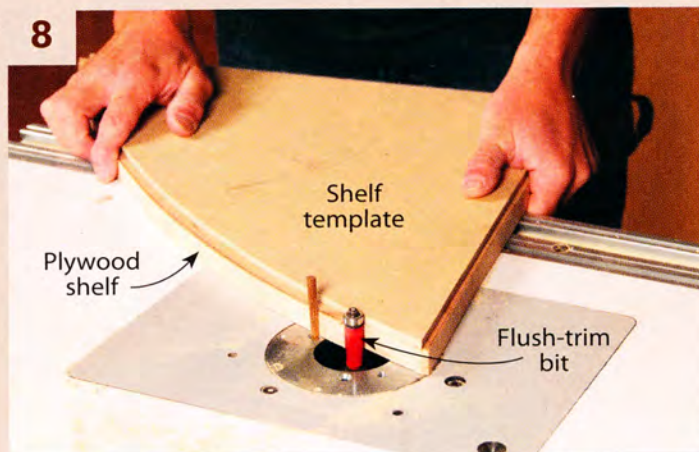
Resaw 1/16" thick edging for the subtop and fixed shelves (E3, F5 and G3). Also saw edging for the adjustable shelves (H2) and the cabinet's top (J5 and J6). I prefer using the tablesaw to make edging this thin (**Photo 10**), but you could also use a bandsaw. I glue the stock to a backer piece so there's plenty of support—and something to push with my push stick. Rip the edging about 1/8" wider than the front edges of the subtop and all of the shelves, then glue the edging to each piece (**Photo 11**). Trim it flush with a small router.

All of these triangular pieces must have notches cut in them to accommodate the cabinet's stiles (D). The best way to lay out the notches is to use a marking block that's similar in cross section to the stiles (Fig. K). Install the shelves and subtop, then mark around the block (**Photo 12**). When you do this, make sure the angled end of the block is flush with the cabinet's side. (The block is 1/8" narrower than the stiles. When you make the stiles and install them tight up against the notches, they'll automatically be proud of the cabinet's sides by 1/8".) Remove the shelves and subtop and carefully cut the notches with a bandsaw. True the cut surfaces with a file. Use the same block to mark the adjustable shelves. Cut these notches about 1/16" oversize, so the shelves are easier to tip into place.

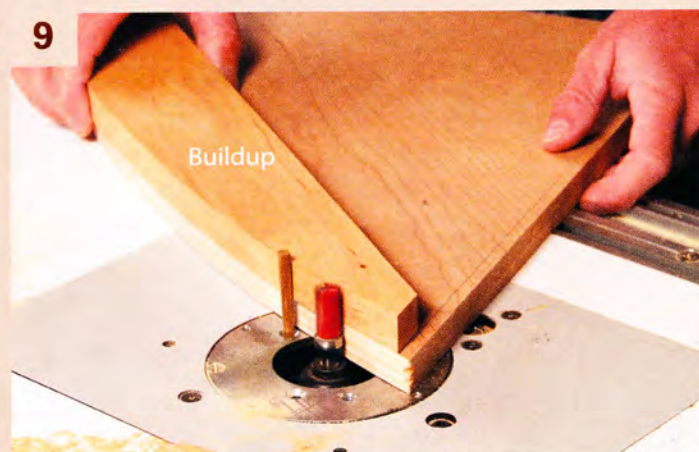


Watch Chad's thin-ripping jig
(Photo 10) in action at
AmericanWoodworker.com/WebExtras

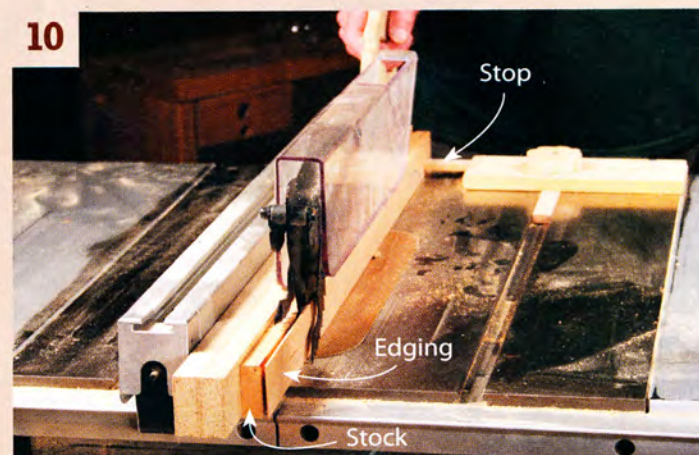
Shape an oversize piece of plywood so that it's an exact copy of the template. Make three pieces like this—two for the shelves, one for the subtop.



Add a solid-wood "buildup" piece to each of the three parts, then use a pattern bit to make the buildup flush with the plywood.

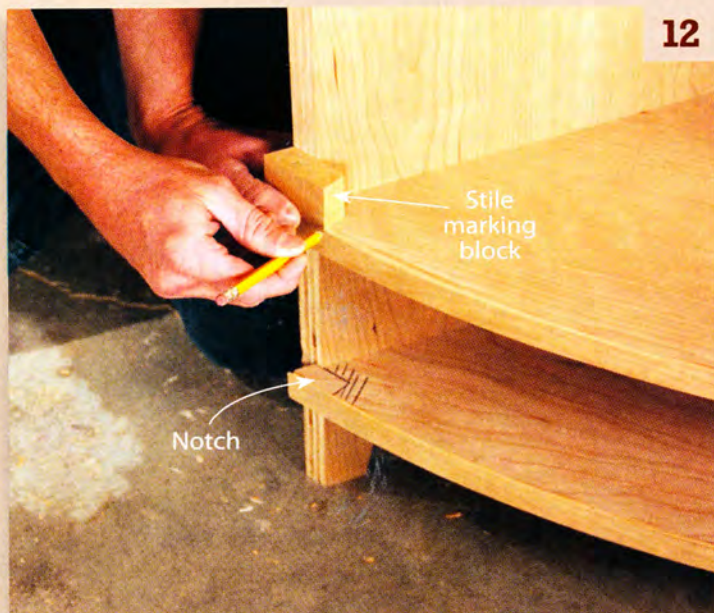


Saw 1/16" thick pieces of front edging for the shelves and subtop. This method, using a stop locked into a miter slot, allows you to easily cut multiple pieces—all the same thickness—from one piece of stock.



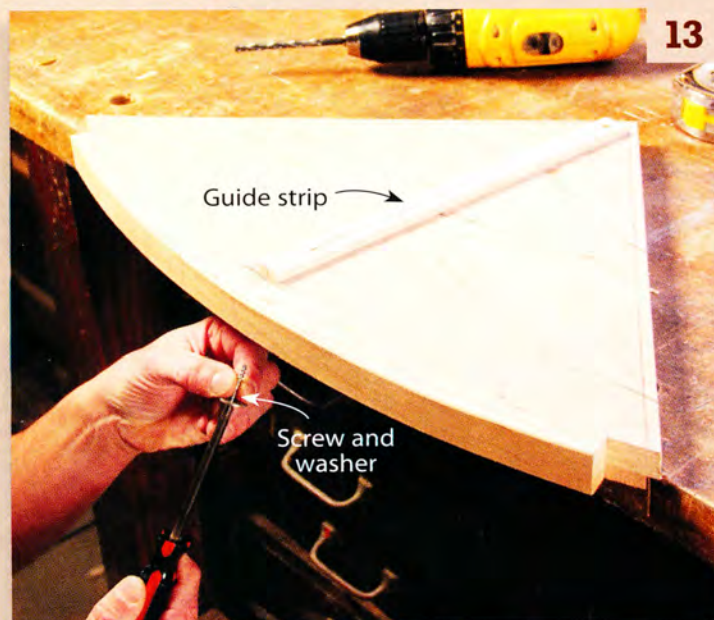
Glue the edging to the shelves and subtop, then trim it flush. Tape is adequate to hold the thin edging in place—you don't need clamps.





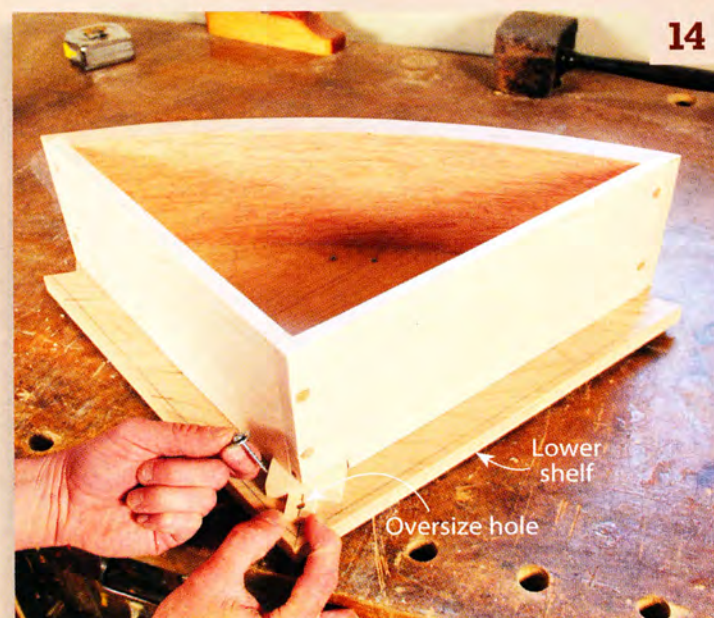
12

Slide the shelves and subtop in place, then trace around a block that has the same dimensions as the cabinet's stiles. Remove the pieces and notch them to receive the stiles.



13

Fasten a drawer-guide strip to the lower shelf. Run a screw from underneath to secure the strip's front end. The screw passes through an oversize hole, so you can adjust the strip's position.



14

Fasten the back end of the strip with another screw running through an oversize hole. Install the drawer and align its front edge with the shelf, then tighten the screws front and back.

Build the drawer

The entire procedure for building the drawer is given in "Curved-Front Drawers," page 44. On page 40, you'll find the exact dimensions for the drawer front's two-part bending form (Fig. N) and the dimensions for the support piece used to trim the drawer front and cut its joints (Fig. P). The dimensions of the joints and other drawer details are shown in Fig. M. Determine the exact length of the drawer's front by placing the front on top of one of the fixed shelves. Trace around the notches. When you trim the front, the ends of the drawer should be flush with the notches (Fig. G).

Before assembling the drawer's sides, make the guide (Q) and guide strip (R)—see Fig. L. Cut notches in the back corner of the drawer sides to receive the guide, then assemble the drawer. Install the guide with screws—be sure to center it front and back.

Remove the upper fixed shelf (F1) and add some additional buildup pieces (F3 and F4). These serve to prevent the drawer from tipping down when opened, so their precise location isn't important. Replace the shelf.

Next, you'll align the drawer as you install the guide strip on the lower fixed shelf (G1). The location of the strip must be very precise, so the best method is to make the strip adjustable. Here's how to do it: First, remove the lower fixed shelf from the cabinet. Draw a centerline, front to back, on its top face. Across the centerline, draw a perpendicular line 1" in from the shelf's front edge (this represents the inner edge of the drawer front when the drawer is closed). Drill a 1/4" hole about 2" back from the shelf's front edge, on the centerline.

Next, turn to the guide strip. Draw a centerline all the way around it, then drill a 1/4" hole through the strip about 1/2" in from one end. Clamp the strip to the shelf and drill pilot holes for the screws you'll use to adjust the strip. Use



Download free plans for a chest with center-guided drawers at
AmericanWoodworker.com/WebExtras

an extra-long screw in front, but cut it off even with the top of the guide strip before installing it—this gives you the maximum amount of holding power for a thin piece of wood.

Fasten the front end of the strip (Photo 13), but don't tighten the screw all the way. Place the drawer on the strip, then install the rear screw (Photo 14). Adjust the drawer until its front is flush with the shelf all the way across, then tighten the screws. Install the shelf in the cabinet and try out the drawer (Photo 15). Fortunately, both fixed shelves are still removable if you need to adjust anything, and you can still tweak the strip. Once everything is right, add some more screws to lock the strip in position, then glue and screw the shelves to the cabinet. In addition, glue and screw the subtop in place.

Add the stiles and top

Mill the stiles, cutting one side at an angle (Fig. G). Cut the bottom ends of the stiles to form tapered legs (Fig. A). Glue the stiles to the cabinet (Photo 16).

Make the top (Fig. H). You can lay out its front curve in a number of ways, but the best way to ensure that the curve will be smooth and true is to make a 1/4" MDF template first, as you did for the shelves. The rest of the procedure is similar to building the shelves, but here you'll need three buildup pieces (J2, J3 and J4) and edging on all three sides (J5 and J6). Fasten the top from underneath (Photo 17).

Make the back (C) and install it in the cabinet. Nail it from the front or screw it from behind. Finish the adjustable shelves by cutting off their back corners. 



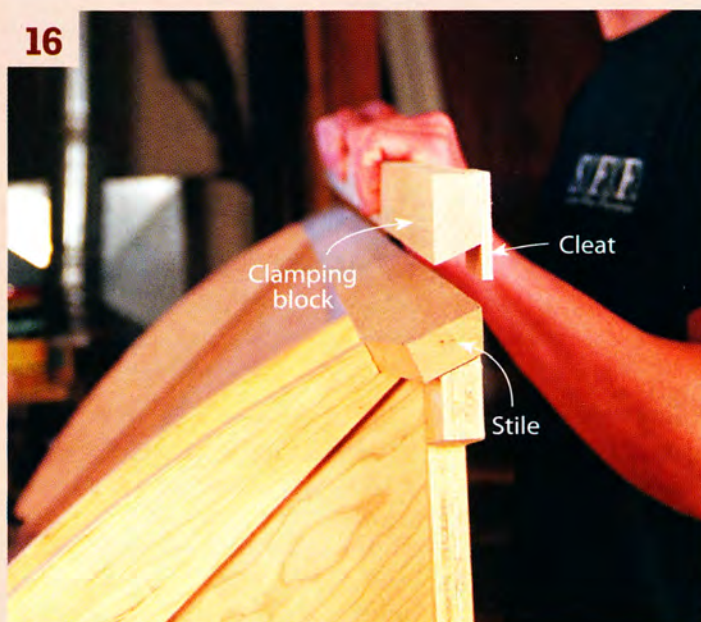
Chad Stanton is a licensed contractor and a professional furniture builder. He is also the host of the web show

Wood Choppin'Time.com, where serious woodworking and light comedy come together. "Watch, laugh and learn," says Chad.

Install the shelf and check the drawer's operation and alignment. When all is well, glue and screw the shelves in place.



Make the stiles and glue them to the cabinet. Use a long clamping block with an angled edge. Add cleats to the block so it doesn't slip.



Fasten the top through the subtop. Both of these pieces are made from 3/4" plywood built up to look extra-thick, like the shelves below.





Curved-Front Drawers

Create a perfect curve using ordinary plywood and a two-part bending form.

by Brad Holden

A DRAWER with a bowed front can add a touch of grace to any cabinet. Once you understand the process for making this kind of drawer, building the drawer is plain sailing. The method I'll be showing you is very low-tech—you don't need any special equipment at all. The joinery used is equally simple, too.

Before diving in to the nuts and bolts of my method, let's take a quick look at some other options for making a curved face.

Why use this method?

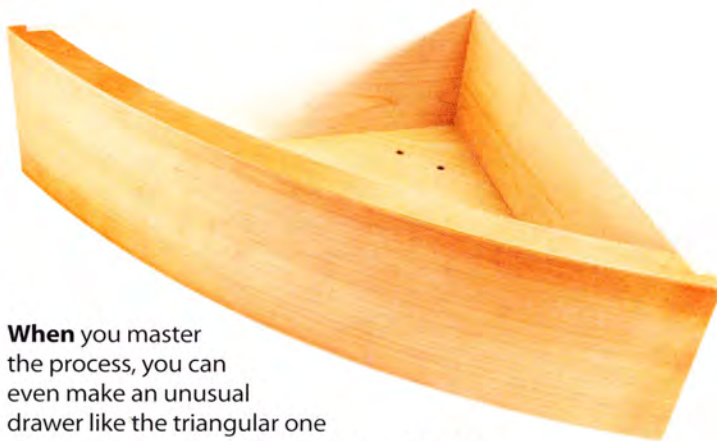
There are many ways to make a curved front. The simplest method is to cut it out of solid wood, but there are a number of problems with this approach. First, it often requires using a huge piece of wood—a lot of which will end up as waste. Second, the face of the drawer will have an unpredictable grain pattern, and could well turn into an ugly bull's-eye. Third, cleaning up the saw cuts will require a lot of work.

Generations ago, cabinetmakers addressed these problems by making the drawer front in two parts. They built a solid-wood substrate, laid up like bricks in a wall (see "Portsmouth Card Table," AW #161, Aug/Sep 2012), and veneered its front face. The method works well, but since you're shaping solid wood, making a perfectly smooth curve requires a lot of cleanup work.

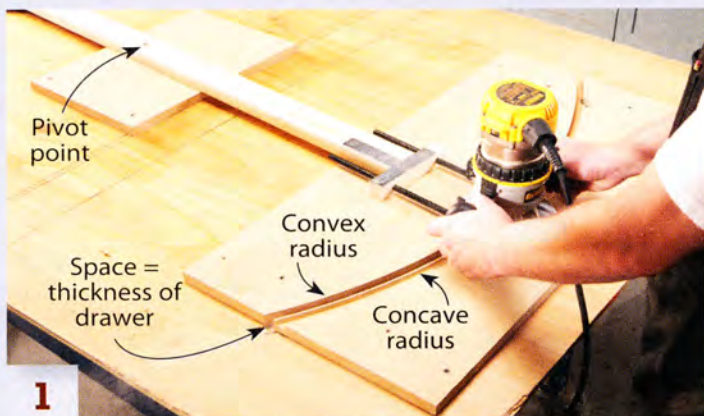
More recently, woodworkers have been using a vacuum bag to make curved pieces (see "Morris Chair and

Ottoman," AW #138, Oct/Nov 2008.) This method works extremely well. The substrate is composed of thin laminations, not thick solid wood, and making it requires only a one-part bending form. Cleanup work is minimal, and you can easily add veneer. However, you'll need to buy or make a vacuum bag and the equipment to create the vacuum.

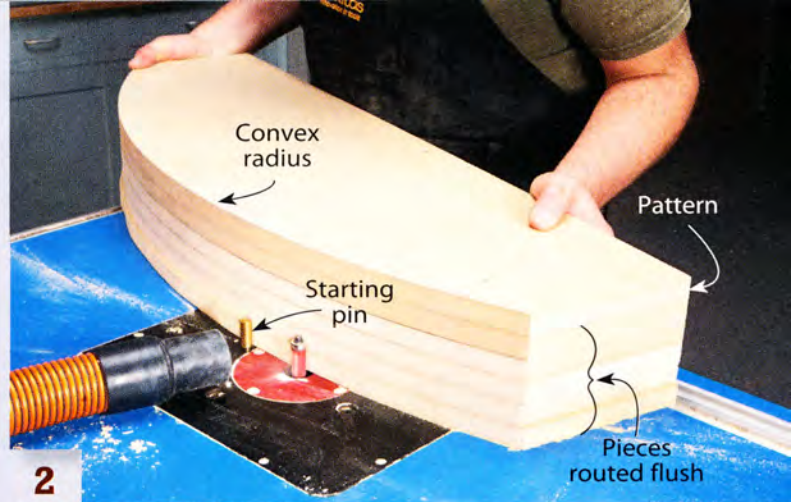
The method I'll be showing you isn't new, but it sure has a lot going for it. There's very little cleanup work, and you won't need a vacuum bag—just a bunch of pipe clamps. You'll be making a two-part bending form (rather than a one-part



When you master the process, you can even make an unusual drawer like the triangular one above (see "Bow Front Corner Cabinet," page 36). This article will show you how.



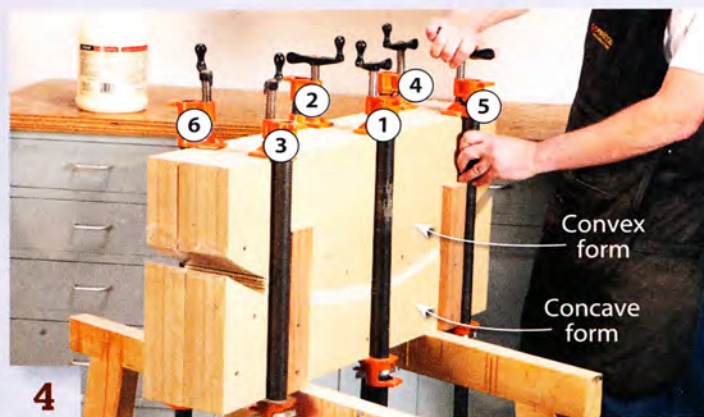
1 **Rout** two patterns to begin making a bending form. Each pattern must have a different radius to allow for the thickness of the drawer front. One pattern is convex; the other is concave.



2 **Build** up the forms one layer at a time. Start by screwing an oversize piece of MDF to the pattern, then rout it flush. Continue adding layers until the form is as wide as the drawer.



3 **Place** five layers of plywood in the form, with glue between each piece. Slide the other half of the form down between the battens. Its weight will bend the layers into an almost-complete curve.



4 **Clamp** the plywood in the form. Apply even, opposing pressure in the sequence shown to help prevent the stock from sliding end-for-end. Allow the lamination to cure for at least 24 hours.

form), but this only requires a router and a router table. Veneering is a cinch. If you're still on board, let's get going.

Build the drawer on paper

Before you make even one cut, draw a full-size plan of your drawer front, looking down from on top. First, draw the outside edge of the piece using a compass or trammel. Your front doesn't have to be circular—it could be any type of curve, such as an oval or ellipse—but it's easier to make patterns for a circular bending form than for other types of curves.

Next, calculate the exact thickness of your drawer front. This will be determined by the number of laminations you use and their precise thickness. I'll be laminating five layers of 1/4" plywood and one layer of veneer, which add up to make a front that's exactly 1" thick. (My plywood, like most, is actually less than 1/4" thick.)

Draw the inside edge of your drawer, using the same centerpoint you used to draw the outside edge. Your

drawing now basically consists of sections of two concentric circles; make a note of each radius. Mark off the ends of the drawer, and you're good to move on.

Make the bending form

The bending form will be composed of two major parts. One is concave; the other is convex. Their curves are taken directly from the drawing of your drawer front. The radius of the concave part is the same as the front's outside radius. The radius of the convex part is the same as the front's inside radius. Concave=outside; convex=inside.

Both halves of the form must be quite thick—as thick as your drawer front is wide, plus at least 1/2" more for trimming. The best way to make these thick pieces is to build them up from layers of a material that's easy to cut and shape, such as 3/4" MDF. This process starts with making a pattern for each half (**Photo 1**).

I've found that it's best to make both patterns at the same time, using one large piece of 3/4" MDF. Screw the MDF to a sacrificial board and then use a trammel to draw the two radii. After you've drawn the radii, make sure you won't hit any screws with the router and that both halves of the form are securely fastened to the sacrificial board.



Learn how to accurately rout a large arc at AmericanWoodworker.com/WebExtras



5

Glue veneer to the top of the laminations and place the assembly back in the form. Clamp the form together again. The result will be a piece that's stiff, strong and perfectly smooth.



6

Joint one edge of the drawer front until it's straight, square and smooth.



7

Rip the front to finished width, face up. This method ensures that the piece is adequately supported and avoids tearing out the veneer. Joint the ripped edge smooth.

Align the bit's edge with the waste side of the smaller radius line and then make the cut in several passes. Using the same pivot point, adjust the router to cut the larger radius, again aligning the bit's edge with the waste side of the line. After you've cut both radii, unscrew the patterns from the sacrificial board.

Next, cut rectangular pieces of MDF the same width and length as the two patterns. The number of pieces you'll need will depend, of course, on the width of your drawer. I cut seven rectangles for each pattern in order to create a form 6" thick. (Note: The total thickness includes the pattern.) Trace the patterns onto each rectangle. Rough-cut the curves on the bandsaw, staying about 1/8" outside the line.

Build up each half of the form one layer at a time. First, fasten the pattern piece to one of the additional pieces with screws, then trim the additional piece flush. (I didn't glue the layers together because I wanted to disassemble them later and save them for scrap.) Add another piece under the one you just trimmed, and trim again. Continue adding and trimming pieces (**Photo 2**). Because the parts are curved, you can't use a fence. For safety, start each cut by holding the workpiece against a starting pin, then rock the piece into the bit.

When the concave part of the form is built up to its full thickness, fasten battens to both sides. The battens will prevent the laminations from sliding out of the form during glue up; they'll also keep the form halves in alignment.

Glue and bend the laminations

Set up the form vertically, on sawhorses, with the concave half on the bottom. Sawhorses allow plenty of space for placing clamps all around. The convex half of the form is significantly heavier than the concave half. For a drawer front with a large radius, such as this one, just setting the convex half in place does most of the bending before you even start clamping.

I used five-ply, 1/4" home-center plywood to make the laminations. This material is sufficiently flexible for a drawer front with a large radius (about 30", in my case), but if you're bending a radius that's considerably smaller, I'd recommend using bendable plywood, which is even more flexible. It's sold under many trade names (see Source, page 48).

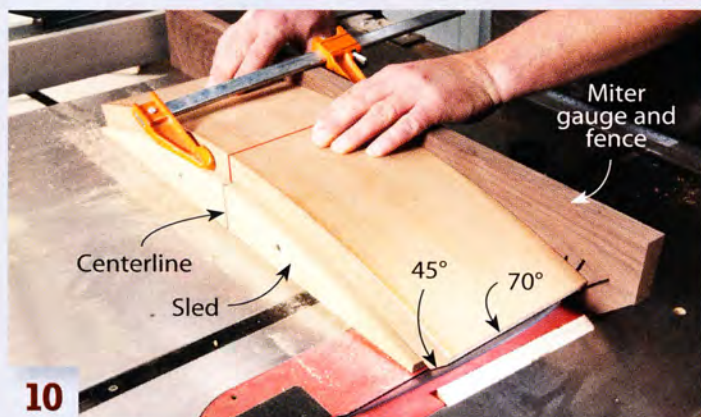
Cut your plywood pieces at least 2" longer than the finished front and 1/16" narrower than the form's thickness. Before gluing, cover the form's curved surfaces and battens with packing tape to prevent gluing the lamina-



8 Bandsaw 1/8" thick hardwood caps to cover the drawer front's laminations and to protect the veneer. Glue and clamp the caps to the top and bottom edges of the drawer front.



9 Trim the caps flush. Climb-cut half of each edge to keep the wood from splitting. (Climb-cutting means pushing the router in the same direction as the bit is spinning. Please be careful.)



10 Use an arched sled to support the drawer front when you trim its ends. I'm making this front for a triangular drawer (see page 42), which requires two angled cuts on each end.



11 Cut rabbets to receive the drawer's sides. This three-sided drawer required rabbets tilted at 45°. For a standard rectangular drawer, the rabbets would be cut at 90°.

tions to the form. Spread glue on all but one of the laminations and place them in the form, one on top of the other. The one without glue is the last to go into the form (**Photo 3**).

When the laminations are all in place, set the form's upper half in position. Make sure the laminations' ends are lined up, and then apply clamps. The glue will likely cause the laminations to slide. To minimize this, tighten the clamps as you would tighten lug nuts on a wheel (**Photo 4**). Finish tightening each clamp in the same order, a little at a time, until the laminations are completely pressed together. Wipe off any excess glue and leave the drawer front in the form for 24 hours.

When the glue is cured, remove the drawer front from the form. Spread an even coat of glue on the top of the front, and then apply the face veneer (**Photo 5**). Clamp the drawer front in the form again to apply even pressure until the glue dries.

Remove the front from the form and joint one edge (**Photo 6**). Continue jointing until the edge is straight, square with the face and all the laminations are flush. Bandsaw the front to finished height minus 1/4" (**Photo 7**). Smooth the ripped edge on the jointer.

The top and bottom edges of the drawer front should

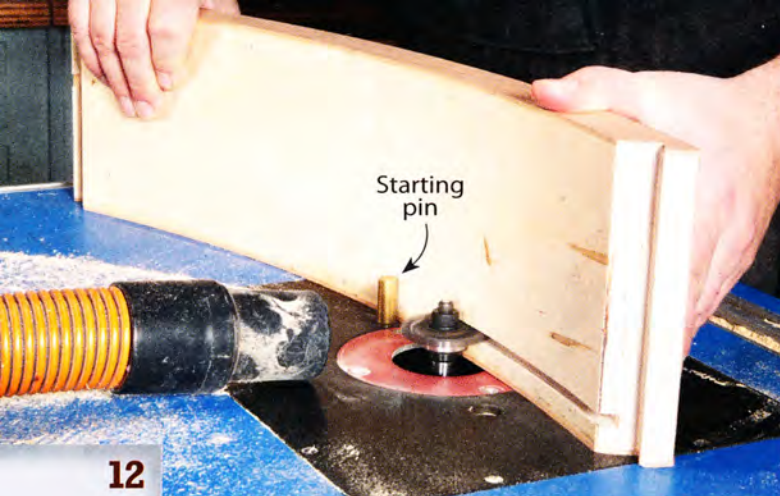
be capped with 1/8" thick solid wood. To make the caps, you'll need a board that's wide enough to accommodate the front's curve. Resaw and plane the board down to 1/8" thick. Trace the front's curve onto the stock and cut out the caps (**Photo 8**). Glue on the caps and then trim them flush (**Photo 9**).

Cut and rabbet the ends

Trimming the drawer front to final length and cutting its joints requires a convex sled (**Photo 10**). Use the sled in conjunction with an auxiliary wooden fence attached to your table saw's miter gauge.

You can make the sled by disassembling the convex half of the bending form, ripping all of its pieces to the right height and reassembling them. Or you can build it from scratch using the same technique you used to build the form. Make the sled just tall enough so that when you center the drawer front on it, the front's ends clear the saw's table by about 1/8". Don't fasten the sled to the fence; it needs to move back and forth to position the cuts.

I'm sure that there are many ways to join drawer sides to a curved front. I chose a relatively easy one, which only requires cutting rabbets in the drawer front. The



12

Rout a groove for the drawer's bottom using a slotting cutter with a bearing. Whenever you rout without a fence, place the workpiece against a starting pin, then rotate it to begin the cut.



13

Assemble the drawer using glue and screws. Add wooden plugs to cover the screwheads.



14

Trim the plugs and sand them flush. Even a flush-cut saw can leave marks, so use a shield to protect the drawer's sides. A playing card with a hole in it works well.

sides will be fastened to the front with screws, so the rabbets need to be sufficiently large to accommodate them. Use your drawing to lay out these rabbet cuts and the locations of the screws. Mark centerlines across the top of the sled and all around the drawer front, keeping the marks aligned as you make your cuts. Before you make the first cut, make a tick mark on the fence opposite the centerline on the top of the drawer front. If you need to move the sled side-to-side (to make overlapping cuts, for example), the distance between the lines will show you how far you've moved it.

All the cuts are 90° for a standard drawer with four sides. One of the drawers I made for this story is triangular, however, and it required cuts at different angles. The ends of the drawer are cut at 70°, to match the angle of the stiles next to the drawer (see "Bow Front Corner Cabinet," Figs. G and M, page 40). They're also cut at 45°, to accommodate the drawer sides. (The drawer is essentially a right triangle with two 45° corners.)

I made the 70° cuts first, trimming the front to exact length. I made the 45° cuts next, then installed a dado blade to cut the rabbets, which are also angled at 45° (Photo 11). Before cutting the first rabbet, I removed the fence from the miter gauge and flipped the fence around,

end-for-end, so I'd have a fresh surface to back up the next cut. Whenever you make any cuts, it's a good idea to clamp the drawer front to the fence.

Assemble the drawer

Cut the drawer's sides to finished length. Cut the drawer's bottom as a rectangle, then trace its front curve using the drawer front as a guide. Cut the curve on the bandsaw.

Cut a groove for the drawer's bottom in the front and sides using a slot cutter in your router table (Photo 12). Dry fit the parts and make any necessary adjustments.

Make or buy 3/8" dia. wooden plugs or a 3/8" dowel rod from which you can cut plugs. Drill 3/8" counterbores for all of the screws. Glue and screw one side in place and then install the bottom and the other side (Photo 13).

Glue in the plugs to cover the screwheads. When the glue is dry, trim the plugs and sand them flush (Photo 14). Even a flush-trim saw with no set to the teeth can leave marks, so use a shield to protect the workpiece. 

SOURCE

Packard Forest Products, packardforestproducts.com, 877-200-4213, various types of bendable plywood.

Modern Plate Rack

Keep your favorite china within easy reach.

By Laurie McKichan

ARTFUL DESIGN and Tinker-toy-style construction team up to make this eye-catching yet sophisticated dish rack. A great addition to any kitchen, it displays your favorite dishes in style while keeping them within easy reach for daily use. Store dinner plates, salad plates, cups, saucers, mugs or bowls. Need more space? Make your rack wider or taller. In fact, you can adjust the design to fit just about any dish—or space.

Make the side panels

Mill blanks for the side panels (A, Fig. A, page 50). Rip them slightly oversize in width and cut them to final length. Locate the large dowel holes and lay out the curved profile on the outside face of each side panel blank (Fig. B). Note: The holes must be identically located in both blanks for the rack to go together properly.

Drill $3/4$ " dia. holes for the six wedged dowels and a 1" dia. hole for the front dowel (**Photo 1**). Install a sacrificial board underneath to minimize tearout. Flip over each blank to locate and drill the $5/8$ " dia. stopped hole for the shelf dowel. Complete each side panel by shaping its curved profile. Bandsaw the curves and then sand to remove the saw marks.

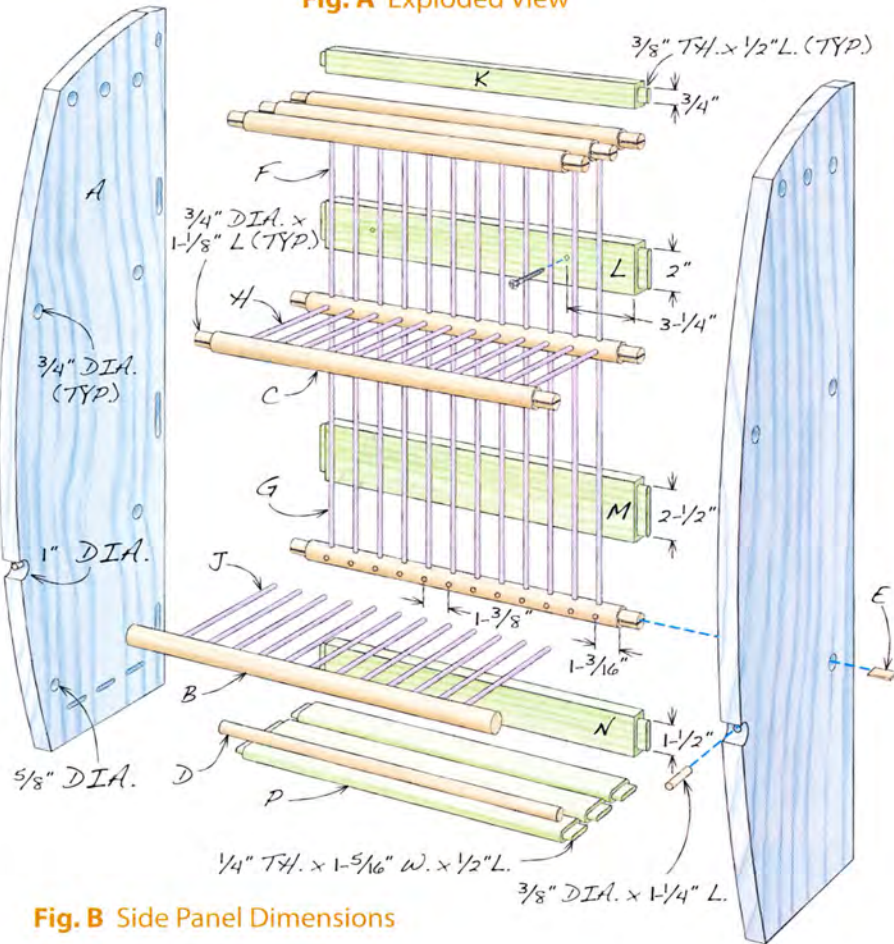


Build a classic Stickley-Style plate rack at AmericanWoodworker.com/WebExtras

Cutting List

Overall Dimensions: 37-1/4" H x 19-1/2" W x 12" D

Fig. A Exploded View

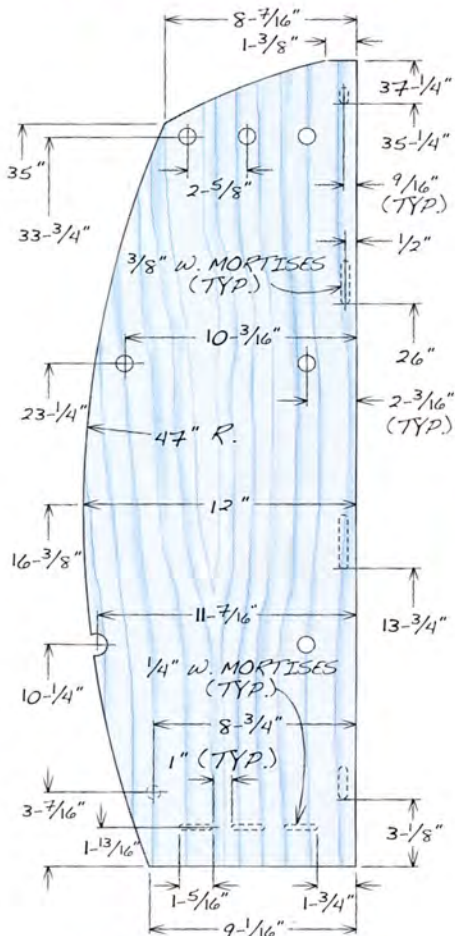


Part	Name	Qty.	Th x W x L
A	Side panel	2	1" x 12" x 37-1/4"
B	Front dowel	1	1" x 19-3/4" (a)
C	Wedged dowel	6	1" x 19-3/4" (a, b)
D	Shelf dowel	1	5/8" x 18-1/2"
E	Wedge	12	5/64" x 3/4" x 1-1/8" (d)
F	Small plate back dowel	12	3/8" x 10"
G	Large plate back dowel	12	3/8" x 12-1/2"
H	Small plate bottom dowel	12	3/8" x 7-1/2"
J	Large plate bottom dowel	12	3/8" x 8-3/4"
K	Top back rail	1	7/8" x 1-1/4" x 18-1/2" (c)
L	Small plate back rail	1	1" x 2-1/2" x 18-1/2" (c)
M	Large plate back rail	1	7/8" x 3" x 18-1/2" (c)
N	Shelf back rail	1	7/8" x 2" x 18-1/2" (c)
P	Shelf slat	3	5/8" x 1-13/16" x 18-1/2" (c)

Notes:

- a) Length is oversize. Cut flush after assembly.
- b) Length includes 1-1/8" long tenons on both ends.
- c) Length includes 1/2" long tenons on both ends.
- d) Taper one end to 3/64".

Fig. B Side Panel Dimensions



Cut round tenons

Cut 1" dowel stock to 19-3/4" lengths to create blanks for the wedged dowels and the front dowel (B, C; see Sources, page 53). Note: Dowel dimensions can vary from piece to piece. Make sure all your 1" dowel stock is the same diameter. Cut the 5/8" dia. shelf dowel (D) to final length. Set the front dowel and the shelf dowel aside. Then cut tenons on the wedged dowels.

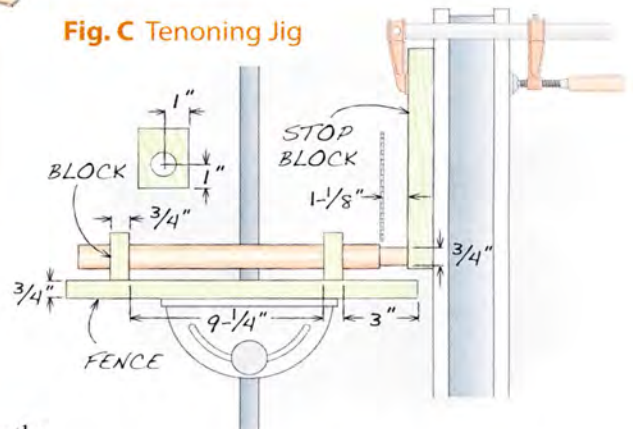


Build a simple tablesaw jig to cut round tenons on the ends of dowels (Fig. C).

The jig consists of a 2-1/2" W x 14" L fence with a pair of 2" W x 2-1/2" L attached blocks. Each block has a 1" dia. hole centered 1" from the bottom and the inside edge.

Setting up the jig takes a bit of trial and error, because the positions of the jig, dowel, rip fence and blade are all related. In a nutshell, you fasten the jig to the miter gauge so that it butts against

Fig. C Tenoning Jig

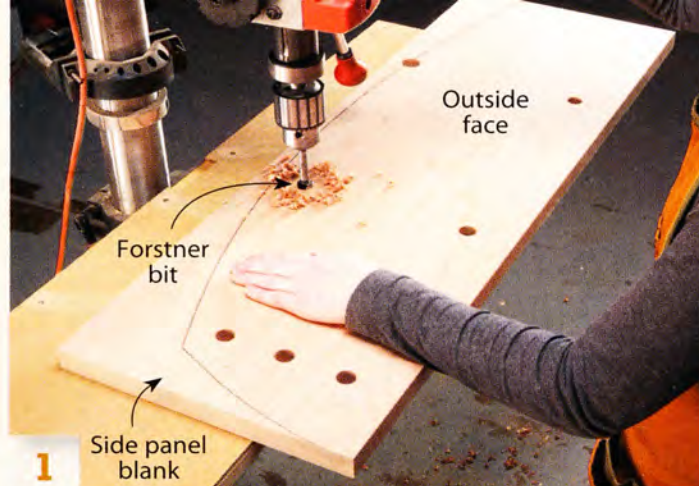


a stop clamped to the rip fence when the rip fence is set to cut a 1-1/8" long tenon on the dowel (Photo 2).

Hold the jig against the miter gauge and install a test dowel. Lower the blade, slide the miter gauge forward and position the jig so the dowel extends over the blade's leading edge. Clamp a stop block to the saw's rip fence so that the dowel will butt against the block's face and the jig will butt against its end.

Set the rip fence to cut the tenons by measuring from the face of the stop block to the blade's outside edge. Make sure the jig butts against the stop and slides freely without contacting the rip fence. Fasten the jig to the miter gauge at this position.

Slide the jig forward until it butts against the stop block. Then raise the blade incrementally and make test cuts on the end of the dowel to dial in a 3/4" dia. tenon. Use a go/no-go block to



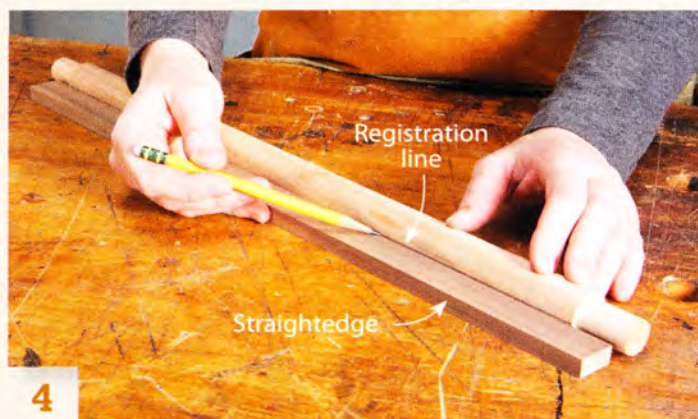
1 Drill holes for the rack's large dowels through the outside face of each side panel blank. Any tearout on the panel's inside face will be covered by the dowels.



2 Cut tenons on six of the large dowels using a shop-made jig and a stop block. To size the tenon, push the jig against the stop. Then raise the blade and rotate the dowel.



3 Test-fit each tenon using a go/no-go jig—a block with a hole that was drilled with the same bit used to drill the holes in the side panels.



4 Mark a registration line for drilling holes on five of the dowels. Two dowels have additional registration lines. Use the go/no-go jig's crosshairs to correctly orient these lines.

test-fit the tenon (**Photo 3**). The tenon should fit snugly and slide in and out without binding or wobbling. The best method is to cut the tenons a tiny bit oversize and sand them to fit.

Once you've established the tenon's length and diameter, back the jig away from the blade and slide the first dowel against the stop block. Cut the tenon's shoulder first: Turn on the saw, hold the dowel against the stop block and push the jig forward until it butts against the end of the stop. Then rotate the dowel. Next, rough out the tenon by rotating the dowel while slowly pulling it away from the stop block. Then smooth the tenon by sliding the dowel back and forth over the blade while incrementally rotating it.

Drill the dowels

Holes drilled in the 1" dowels house 3/8" dowels to form the structure that holds plates in the completed rack. In order to assemble this structure, the holes must

be accurately located and drilled.

The first step is to draw a registration line that runs the length of each dowel (**Photo 4**). This is easy as long as the dowels are straight and you have a flat piece of wood to use as a straightedge, a flat surface to work on and a sharp pencil. One dowel requires a second line drawn at 90° to the first and one dowel requires two additional lines, at 90° and 180° (Fig. A). Use the go/no-go jig's crosshairs to correctly orient these lines.

Mark the first hole on every registration line, centered 1-3/16" from one of the dowel's tenon shoulders. Mark that tenon, too, so you can keep the dowels correctly oriented for assembly. For example, always start with and mark the left tenon. Build a V-groove jig to hold the 1" dowels for drilling (**Photo 5**). To securely hold each dowel, line the groove with sandpaper and attach short lengths of vinyl plumber's strap across the jig. Care-

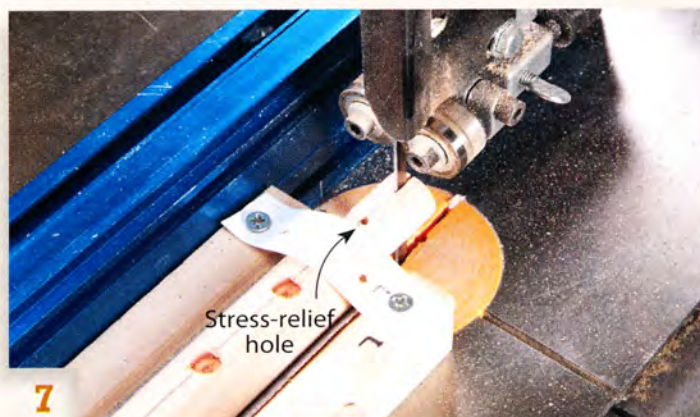
fully center the registration line when you install each dowel.

Build an indexing jig to accurately space the holes (**Photo 6**). Lay out 3/8" dia. holes precisely spaced 1-3/8" center-to-center on a 3/4" x 9" x 42" length of MDF or plywood. (Note: Test the dowel spacing with the bowls you plan to store in the rack. The deeper the bowls, the further apart the dowels must be spaced.) Complete the indexing jig by attaching a fence parallel to the holes you've drilled and installing the indexing pin.

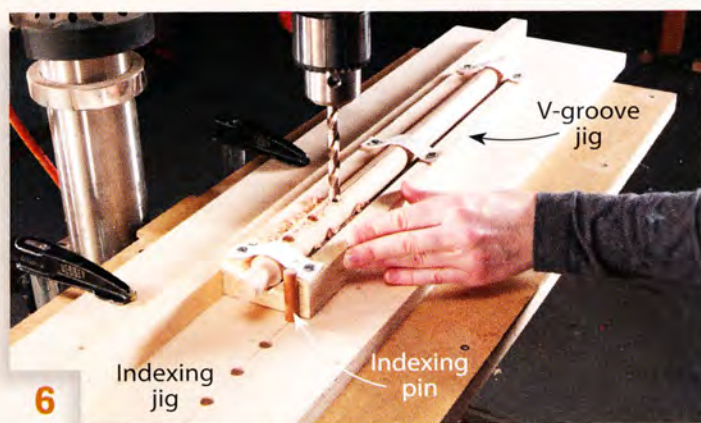
Place the indexing jig on the drill press, install a test dowel in the V-groove jig and butt the V-groove jig against both the indexing jig's fence and its pin. Center the drill bit on the mark you've drawn to locate the first hole on the dowel's registration line. Then clamp the indexing jig to the drill press at this position. Set the bit to drill 1/4" deep holes—drilling too deep will



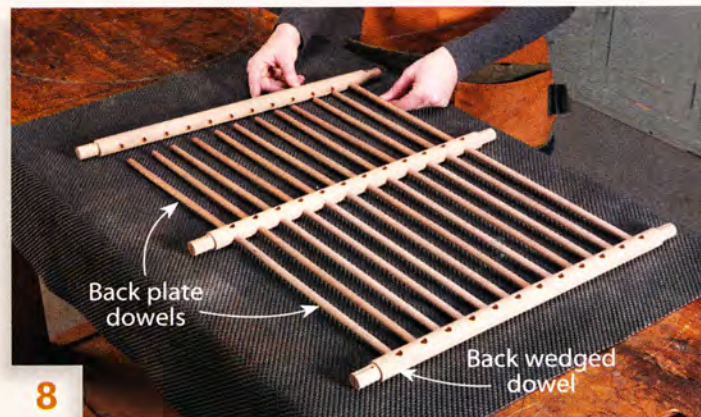
5 Center the registration line after installing each dowel in a V-groove jig. The dowel is correctly oriented for drilling when the measurement from both sides of the line is the same.



7 Cut a slot that ends in a stress-relief hole in each wedged tenon. Make sure to orient the slots correctly on the dowels that have drilled holes.



6 Use an indexing jig to accurately space the holes. Locate both jigs to drill the first hole. Then simply move the indexing pin and reposition the V-groove jig to drill each additional hole.



8 Press the back plate dowels into the back wedged dowels. Don't use glue.

cause problems on the dowels that have multiple registration lines. Then drill the holes.

The front dowel (B) attaches to the side panels with $3/8"$ dowels. So use the same setup to drill centered, $3/8"$ dia. x $1/2"$ deep holes in this dowel, located $5/8"$ from each end. Finally, use the setup to drill $1/8"$ stress-relief holes in all of the wedged dowels' tenons. Keep each wedged dowel in the V-groove jig to bandsaw a slot for each wedge (**Photo 7**). Make the wedges (E) from $5/64"$ thick stock. Then cut all the plate dowels (F–J) to final length.

Cut mortises and tenons

Locate and cut mortises in the side panels for the rails and slats. Using a drill press with a fence and a Forstner bit is an easy, old-school method for doing this. Install the bit, set the fence and drill a series of overlapping holes. Then use a chisel to square the cheeks. (Note that

the mortise for the small plate back rail is set in farther than the mortises for the other back rails.)

Mill the back rails (K–N) and shelf slats (P) to thickness. Note that the small plate back rail (L) is thicker than the other rails. This rail mounts flush with the back edges of the side panels because it's used to fasten the rack to the wall. Cut these parts to final width and length. Then cut all the tenons and round them to fit the mortises, using a file or chisel. Make sure the length between the tenon shoulders on these pieces matches the length between the tenon shoulders on the wedged dowels ($17\text{--}1/2"$ in a perfect shop). Round the edges of the shelf slats on a router table, using a fence and a $1/4"$ roundover bit.

Drill holes for the mounting screws in the small plate back rail. Make sure to locate the holes between the plate dowels. Countersinking the

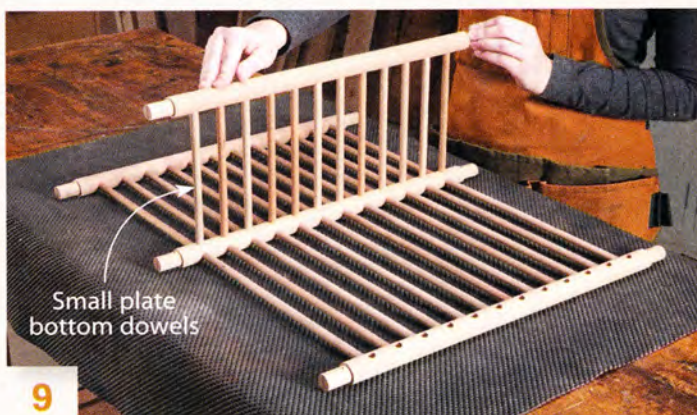
holes for buttons is optional.

Tinkertoy-style assembly

Start by assembling all the parts without glue to make sure everything fits properly. After making any necessary adjustments, disassemble the parts and prepare for gluing by finish-sanding all the dowels, rails, slats and the inside faces of both side panels.

Make sure to use glue with a long open time. I prefer Unibond 800, a two-part liquid urea resin glue that's perfect for complex assemblies like this one (see Sources). Unibond 800 is temperature sensitive, so if your shop is cool, just throw an electric blanket over the assembly to heat it up.

Working on a padded surface, install the back plate dowels in the three back wedged dowels without glue (**Photo 8**). Next, add the small plate bottom dowels and the front wedged dowel (**Photo 9**). As this assembly



9 Add the small plate bottom dowels and the front wedged dowel, also without glue.



10 Apply glue and press the dowel assembly into a side panel. Glue in the rails and slats, then glue on the remaining side panel and clamp the assembly together.



11 Glue the front dowel to the side panels after installing it on the large plate bottom dowels without glue.



12 Tap in the wedges along with a bit of glue. Let the glue dry and then trim the wedges and protruding tenons flush with the side panels.

isn't glued, you may want to tie it with string to hold it together.

Lay one of the side panels on risers to provide clearance for clamps. Apply glue to the holes for the wedged tenons in the dowel assembly. Then carefully lift the dowel assembly and install it (**Photo 10**). Similarly, glue in the remaining wedged tenons, the back rails, the shelf slats and the plate dowel. Glue on the remaining side panel and clamp the rack together.

Drill 3/8" dia. x 3/4" deep holes in the side panel cutouts and install without glue the 3/8" dowels that will fasten the front dowel. Then make adjustments as necessary to center the front dowel and fully seat it in both side panel cutouts. Unibond 800 is gap-filling, so it's okay to slightly widen the holes or shave the dowels. When you're happy with the fit, remove the front dowel and install the large plate bottom dowels without glue. Press the

front dowel onto the large plate bottom dowels. Then glue it to the side panels only (**Photo 11**).

Install wedges

Stand the rack up to install the wedges (**Photo 12**). Apply a bit of glue in each slot, insert the wedge and lightly tap it in. Leave the leftover Unibond in a plastic cup with a stick in it. When the glue is rigid and can be pulled out of the cup, you can remove the clamps from the rack.

Cut the wedged tenons and the front dowel flush with the sides, using a flush-cut saw (see Sources). The teeth on a flush-cut saw have no set, so they won't mar the side panel surfaces. Finish-sand the sides. Then choose a finish that will be easy to maintain, such as Velvit Oil, an oil-based wipe-on/rub-off finish that's easy to reapply as needed (see Sources). 

SOURCES

- Rockler Woodworking and Hardware, rockler.com, 800-279-4441, 36" Cherry Dowel Rod, 1" dia., #21105, \$8.59; 3/8" dia., #21063, \$3.49; 5/8" dia., #21089, \$5.59; Cherry 1/2" Screw Hole Button, #20560, \$4.59.
- VacuPress, vacupress.com, 800-382-4109, Unibond 800 resin with medium catalyst, 1/2 gallon, #UB-12 (M), \$23.36.
- Lee Valley & Veritas, leevalley.com, 800-871-8158, Veritas Flush-Cut Saw, Single Edge, #0K534.10, \$23.50.
- Velvit Products Company, velvitproducts.com, 920-722-8355, Velvit Oil, Natural, 1 Pint, \$15.96.



Laurie McKichan

designs furniture to be "simple, honest and direct." You can see more of her work at lauriemckichan.com.

Oogloo Eggcup

A fun introduction to the whacky world of oogloo, a homemade molding material.

by Richard Tandick



I OFTEN START a leisurely day in the shop with a breakfast of toast and a soft-boiled egg. Of course, as a hard-core woodworker, I've always wanted to make a simple set of eggcups of my own design, but experimenting soon revealed an awkward problem: Spilled egg is hard to clean up.

Oogloo is the solution. It's a homemade material that can be molded into any shape. (See "What Is Oogloo?" below.) Dried egg wipes right off this slippery stuff.

Incorporating oogloo into a wooden cup is easy. Here's how to do it:

Start with 3/4" thick cherry, cut into a 2-3/4" x 3-3/4" rectangle. Draw the outline of the eggcup on the wood and mark the centers of the two holes (Fig. A). Cut out the cup (**Photo 1**) and round over its edges (**Photo 2**; Fig. B). Drill the holes, then sand and apply three coats of poly.

Once the finish is cured, apply packing tape to the top of the cup and cut around the large hole (**Photo 3**). Make the oogloo (**Photos 4-6**) and spoon it into the cup (**Photo 7**). To mold the oogloo, coat a regulation 40 mm Ping-Pong ball with petroleum jelly and push it into the oogloo (**Photo 8**). If you're making a batch of eggcups, you can scrape away the excess and spoon it right away into another cup. Otherwise, let the oogloo cure for a few

hours, then slice off the excess and remove the tape (**Photo 9**).

After getting acquainted with oogloo, you'll probably think of dozens of uses for it. It sticks to both wood and metal. If you form it in a wooden mold, coat the mold with petroleum jelly first.

Now, can you say "oogloo eggcup" three times, fast? 

What Is Oogloo?

Oogloo is a mixture of 100% silicone caulk, a curing agent and paint. Normally, silicone caulk cures very slowly as it absorbs moisture from the air. But if you mix the silicone with an agent that contains a small amount of moisture, the curing process only takes a few hours.

The simplest agent to use is plain old cornstarch, which readily absorbs liquids. It's too dry to use directly from the box, however. To prepare the cornstarch, spread it on a cookie sheet

and leave it for a few days. If the air is very dry, lightly spritz the cornstarch with water, then let it sit.

You can thin oogloo with a small amount of mineral spirits if your project requires it to flow better.

Recipe for 1 eggcup

- 1/2 oz. 100% silicone caulk
- 3/4 tsp. corn starch
- 1/4 tsp. oil-based paint (optional)



1 Cut any shape you want on the bandsaw to outline the eggcup.



2 Round the cup's edges on a router table. For safety, make a handled plate to guide the piece.



3 Drill two holes in the cup, then apply tape around the large hole. Cut the tape to expose the hole.



4 Begin making the molding material, called oogloo, by squeezing a measured amount of silicone into a plastic cup.



5 Mix in a precise amount of slightly damp cornstarch.



6 Add a small amount of enamel paint to color the oogloo.



7 Pack the oogloo into the cup's hole.



8 Press a Ping-Pong ball into the oogloo, to simulate the shape of an egg. Coat the ball with petroleum jelly, first.



9 After the oogloo hardens, slice off the excess and remove the tape.

Fig. A
Plan View

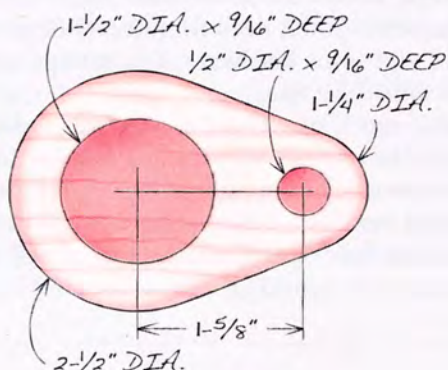
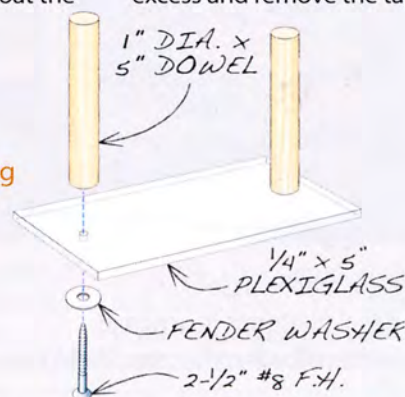


Fig. B
Router Jig



Power Tool-Friendly Bench

Store and use
key benchtop tools
on a single mobile unit

by Richard Tendick



INNOVATIVE FEATURES such as a lever-operated mobile base and dual-height pullout tool platforms give this bench a five-star rating, especially if you have to share your shop space with cars and other vehicles in a garage.

The mobile base works just like a floor jack, so you can easily move the bench from the middle of the shop to store it against the wall. The tool platforms allow you to pull out stored benchtop machines and raise them to operating position—flush with the top of the bench—in seconds.

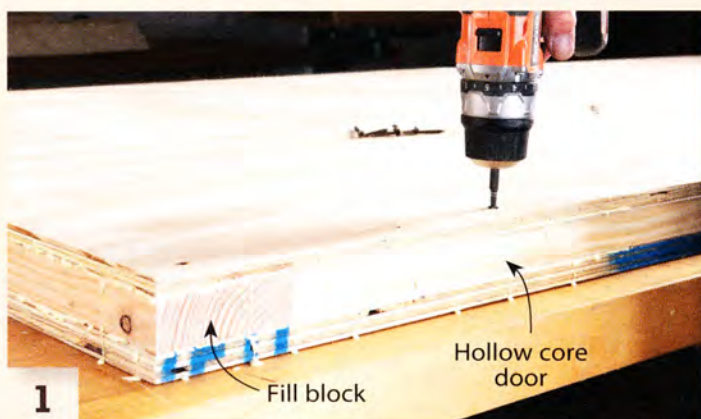
The benchtop houses a power strip (see Sources, page 63), so you don't have to fish for extension cords to plug in portable power tools. The top is long enough to mount a vise at one end and a router at the other.

Simple construction methods make this bench doable for most woodworkers. You'll need four sheets of plywood, a hollow core door and some hardware. You can get these materials at any home center (see Sources).

The bench's modular design is easy to modify to fit your space or tools. Shorten the top, for example, or install drawers or shelves on one side of the cabinet or forgo the tool platforms entirely and just build the bench. Whether you build the Cadillac version shown here or an economy model, this bench is sure to enhance your woodworking.



See the mobile base
and tool platforms in action at
AmericanWoodworker.com/WebExtras



1 Create a sturdy, flat bench top by fastening plywood sheets on both sides of a hollow core door. Adding a fill block makes this top long enough to house a router.



2 Assemble the cabinet's frames by stacking and gluing plywood stiles, rails and fill blocks. Use a 90° assembly jig to keep each frame square.



3 Install the lever in the middle frame after attaching the lever stiles. The lever raises the bench onto its casters by means of a cable and pulleys.



4 Prepare each pulley for mounting in blocks by driving an axle through its bearing. Make sure the bearing's inner race is supported on both sides by the vise.

Start with the top

The bench top consists of a 30" hollow core door sandwiched between sheets of plywood (A–C, Fig. A, page 58; Cutting List, page 58; **Photo 1**). This construction is both flat and sturdy. A 4" wide core spacer (D) makes the bench top long enough to mount a router at the end. Cut the 3/4" plywood top and 1/2" plywood bottom wider than the door to create a groove at the front for mounting a power strip.

Apply glue to one side of the door. (A paint roller works great for this job.) Lay the glued side of the door on the 1/2" plywood, flush at one end and at the back edge. Tack the door to the plywood by driving four 1-1/2" screws through the solid wood near the door's corners. Use screws designed for woodworking (see Sources). Attach the core spacer similarly.

Apply glue to the door and spacer. Place the 3/4" plywood on top and clamp it so you can flip over the assembly. Then fasten the plywood to both sides of the door by driving 2-1/2" screws all around the perimeter and through the center. These long screws may poke slightly through the 3/4" plywood, so it's a good idea to remove them after the glue dries. Glue on the vise fill strip (E) and install the vise (see Sources).

Build the cabinet

The cabinet consists of three stacked plywood frames that are

connected by stretchers and a back to create two 24" wide x 24" deep openings. Cut the stiles, rails and fill blocks (F, G, H; Fig. B) for the frames to final width and length—use a stop block so the lengths of similar pieces are identical. The frames must be square, so construct a squaring jig to assemble them (**Photo 2**). The jig is simply a piece of flat 3/4" sheet stock that has one square corner, with fences attached on both sides.

The middle frame includes two additional stiles (J). They house the lever (K) that operates the bench's mobile base. For accuracy, clamp these stiles together and use a drill press to drill the 3/8" hole that's used to mount the lever. Install a 3/8" x 3" bolt to keep these the holes aligned when you fasten the lever stiles to the middle frame.

Cut the 1/2" plywood lever to final dimensions (Fig. C) and drill the two 3/8" dia. holes. Use one hole to bolt the lever between the middle rails (**Photo 3**). The cable for the mobile base passes through the other hole. Install a 3/8" o.d. x 1/4" i.d. x 3/4" long steel bushing in this hole. This bushing will keep the cable from wearing the wooden lever.

On both sides of the lever, the cable passes through pulleys mounted in maple blocks that are bolted on the center frame's bottom rail (L; Fig D). The pulleys are steel screen door repair wheels with 5/32" x 1-1/2" roll pins driven through them to act as axles (**Photo 4**). The roll pin must be carefully ham-

Fig. A
Exploded View

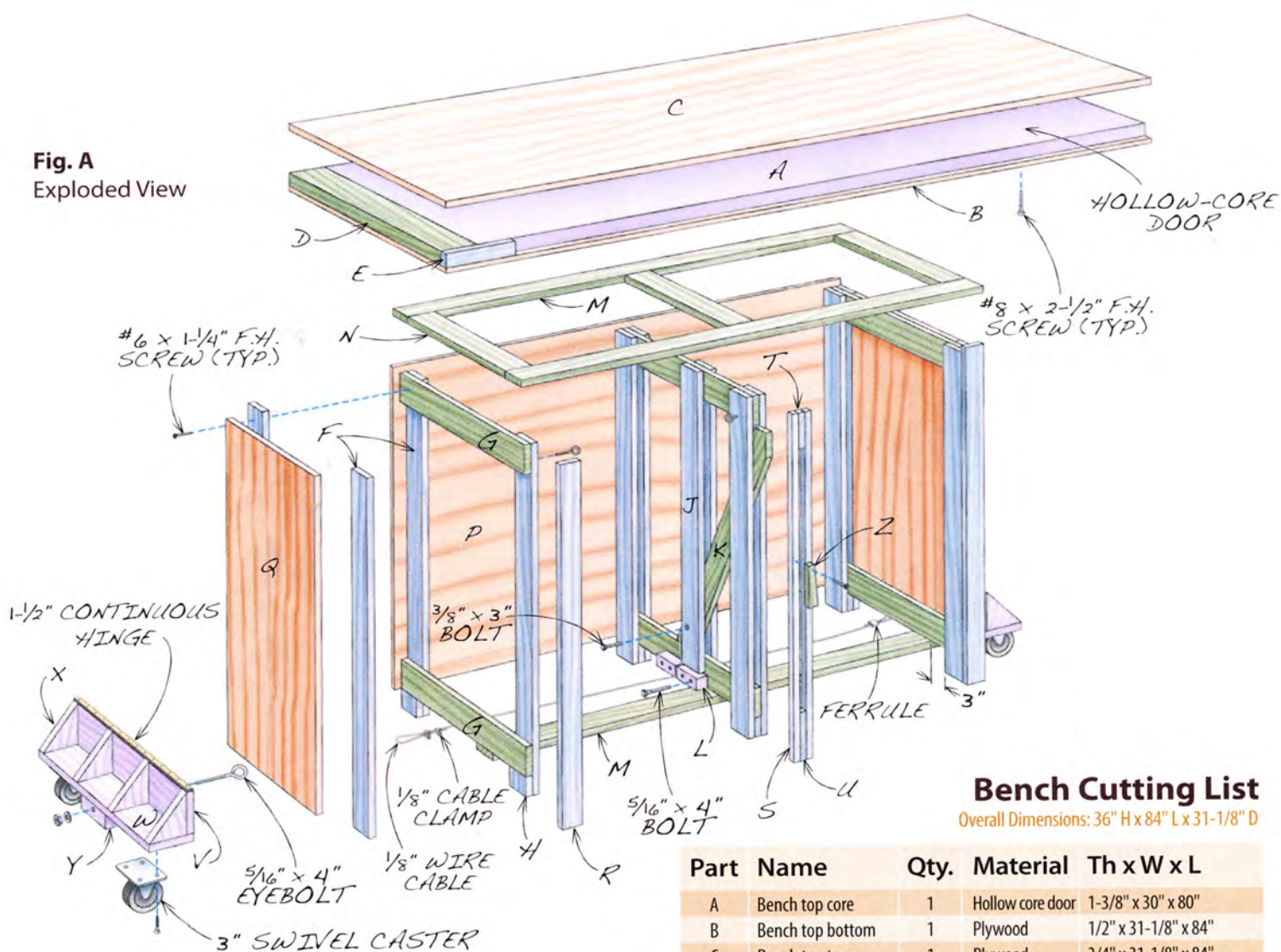


Fig. B Cabinet Frame Dimensions

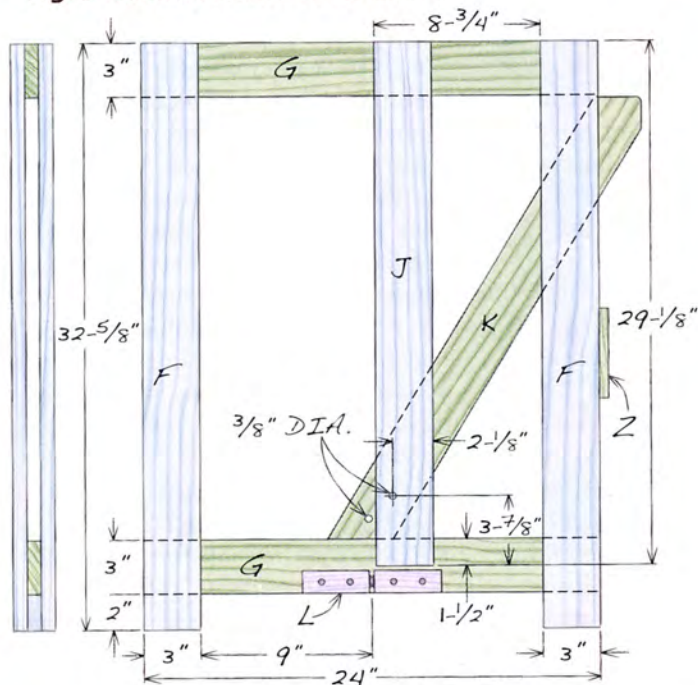
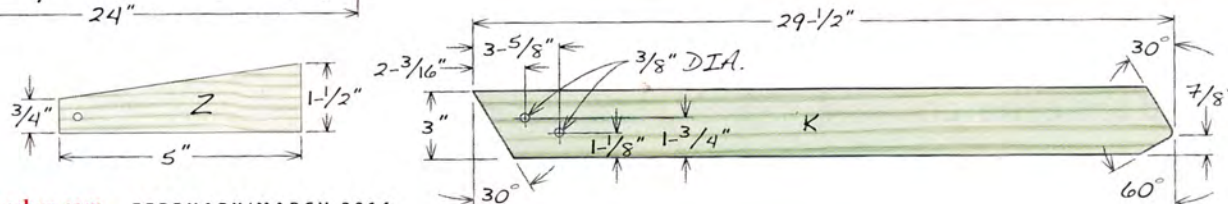


Fig. C
Lever and Stop
Dimensions

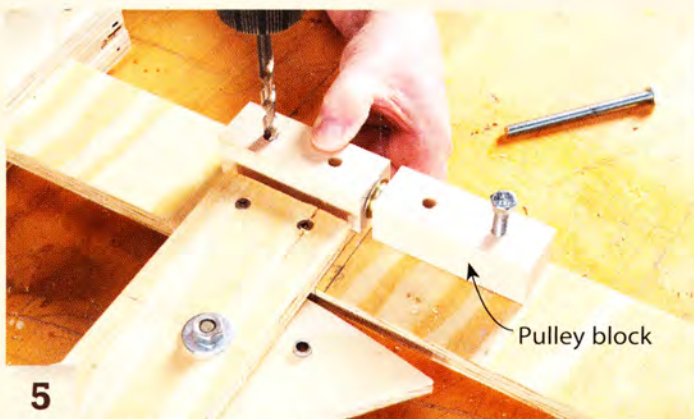


Bench Cutting List

Overall Dimensions: 36" H x 84" L x 31-1/8" D

Part	Name	Qty.	Material	Th x W x L
A	Bench top core	1	Hollow core door	1-3/8" x 30" x 80"
B	Bench top bottom	1	Plywood	1/2" x 31-1/8" x 84"
C	Bench top top	1	Plywood	3/4" x 31-1/8" x 84"
D	Bench top core spacer	1	Pine	1-3/8" x 4" x 30"
E	Vise fill strip	1	Pine	1-3/8" x 1-1/8" x 8"
F	Stile	12	Plywood	3/4" x 3" x 32-5/8"
G	Rail	6	Plywood	3/4" x 3" x 24"
H	Fill block	6	Plywood	3/4" x 3" x 2"
J	Middle stile	2	Plywood	3/4" x 3" x 29-1/8"
K	Lift lever	1	Plywood	1/2" x 3" x 29-1/2"
L	Pulley block	4	Maple	1-1/4" x 1-1/4" x 3-1/2"
M	Stretcher	3	Plywood	3/4" x 3" x 54-1/2"
N	Cleat	3	Plywood	3/4" x 3" x 18"
P	Back	1	Plywood	1/2" x 30-5/8" x 54-1/2"
Q	End panel	2	Plywood	3/4" x 18" x 30-5/8"
R	Frame face	2	Pine	3/4" x 2-1/4" x 33-3/8"
S	Center face	2	Pine	3/4" x 3/4" x 33-3/8"
T	Center top fill	1	Pine	3/4" x 3/4" x 3-3/4"
U	Center bottom fill	1	Pine	3/4" x 3/4" x 5"
V	Caster bracket back	2	Pine	3/4" x 4" x 24"
W	Caster bracket bottom	2	Plywood	3/4" x 4-3/4" x 24"
X	Caster bracket brace	4	Plywood	3/4" x 4" x 4" (a)
Y	Caster bracket block	2	Plywood	2-1/4" x 3" x 6" (b)
Z	Lever stop	1	Plywood	1/2" x 1-1/2" x 5"

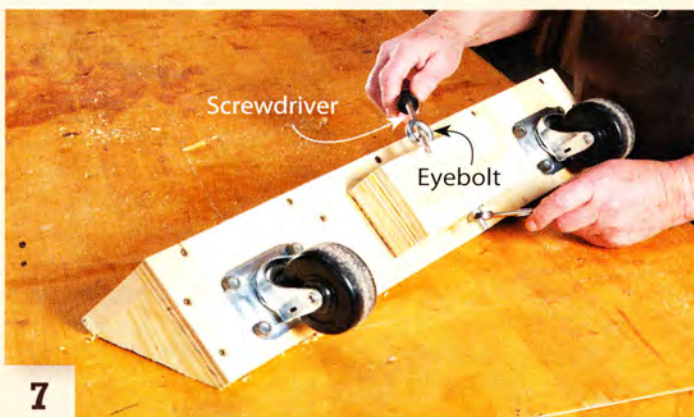
Notes: **a)** Cut diagonally. **b)** Stack three 3/4" pieces.



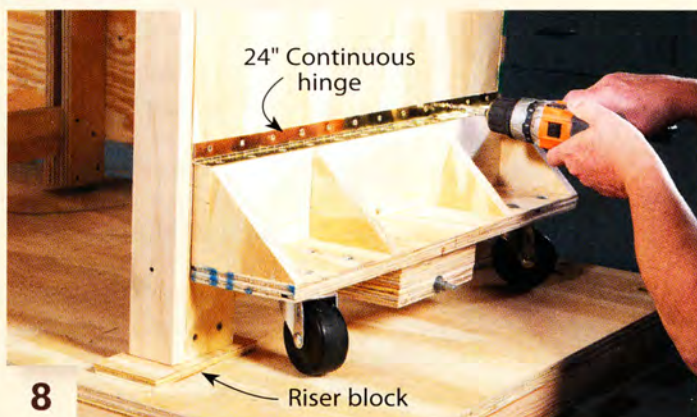
5
Bolt the pulley block assemblies on both sides of the middle frame's bottom rail. To properly align the holes in the rail, insert a bolt after drilling the first hole.



6
Assemble the bench cabinet by attaching stretchers and cleats after installing spacers to properly position the frames. Attach the back to complete the job.



7
Install a large eyebolt after building each castor bracket.



8
Attach the castor brackets with the cabinet raised on 1/2" plywood blocks.

Fig. D Pulley Blocks

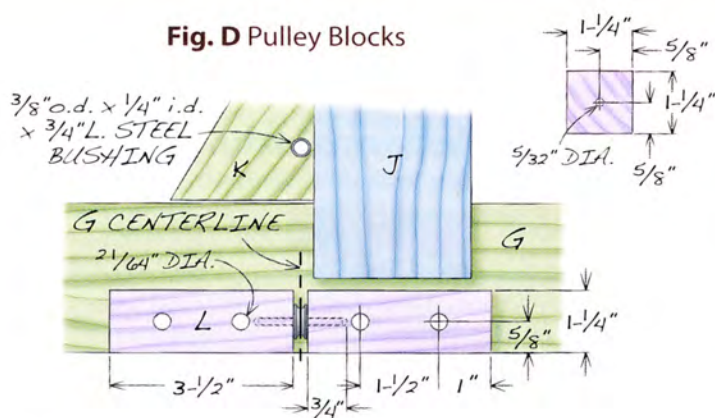
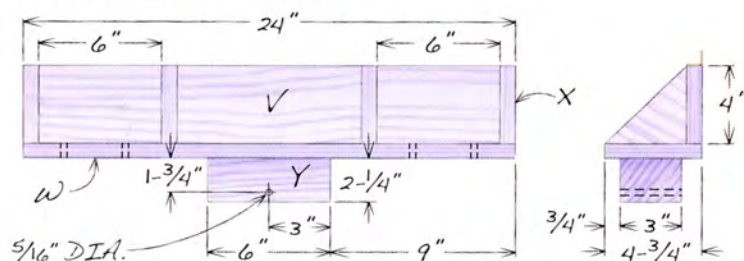


Fig. E Castor Brackets



mered through the pulley to prevent damaging its bearing.

Drill a centered 5/32" hole in one end of each pulley block and 5/16" holes for the mounting bolts. These 5/16" holes must line up, so stack the blocks in pairs (back blocks and front blocks) for drilling. After drilling the first hole in each pair, insert a bolt to keep those holes in alignment while drilling the second hole. Install a pulley between each front and rear block. Position one assembly with the pulley centered on the center frame's bottom rail and drill a hole through the rail (**Photo 5**). Install a bolt before drilling the remaining holes. Then bolt the pulley block assemblies on both sides of the bottom rail.

Assemble the cabinet on a flat surface—you can use the bench top you completed earlier (**Photo 6**). Space the frames 24" apart by using spacers that are rabbeted on both ends. Construct each spacer by fastening a 24" long piece of scrap plywood to a longer piece of plywood.

It's a good idea to recruit a helper to install the spacers. When the frames are properly spaced, screw the stretchers (M) to the top and bottom. Then screw on the cleats (N) and fasten the back (P) to square and stabilize the assembly. Attach the end panels (Q) and the decorative pine facing (R-U).

Install the mobile base

Build the castor brackets (V-Y; Fig. E) and install 5/16" x 4"

Fig. F
Tool Platform

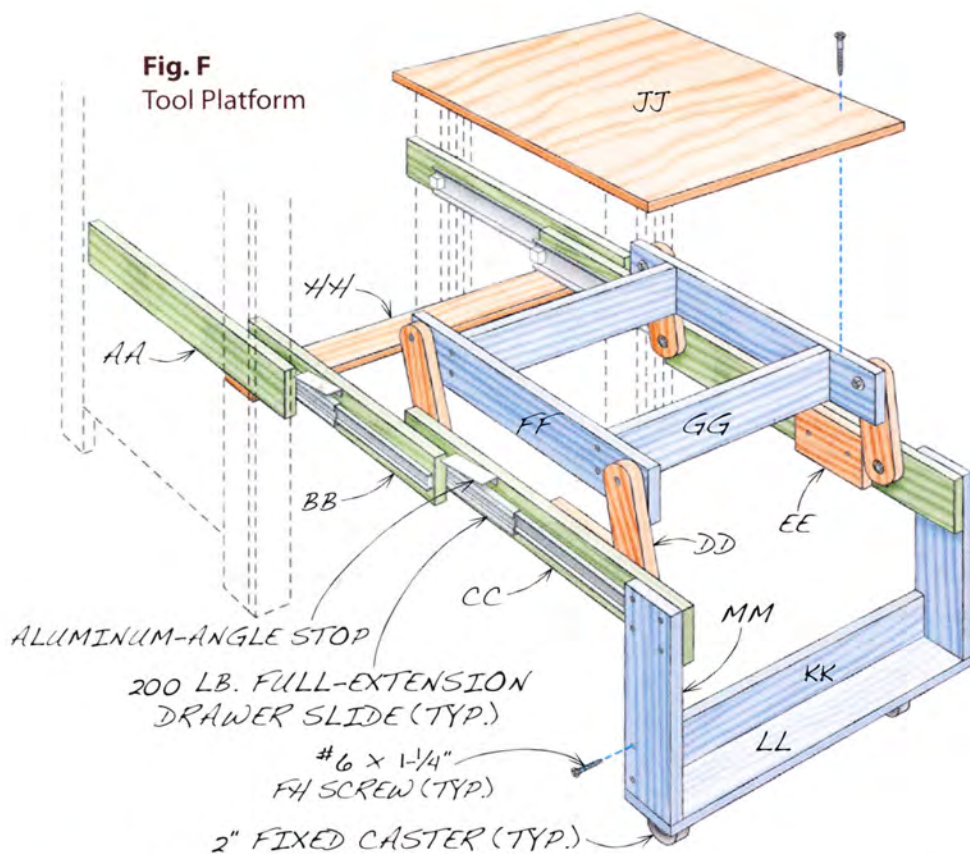


Fig. G Tool Platform Dimensions

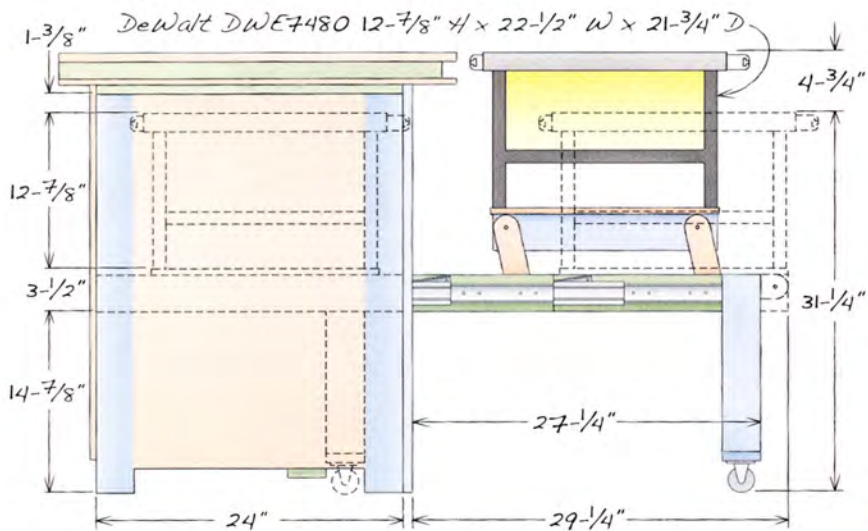


Fig. J Rotating Link Details

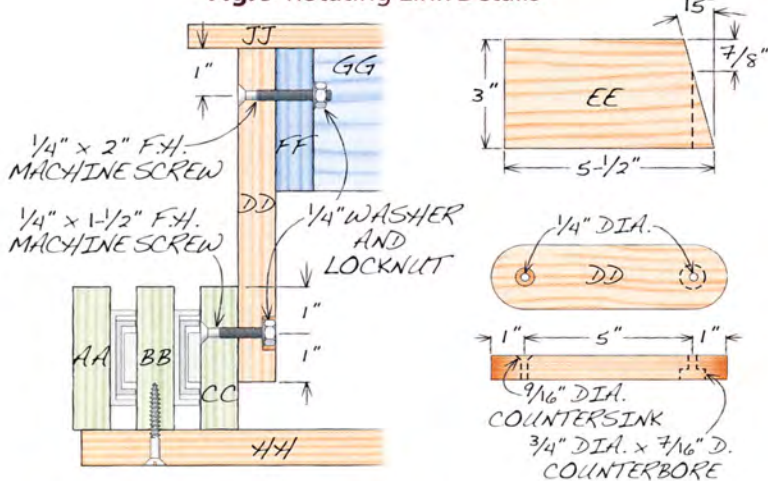
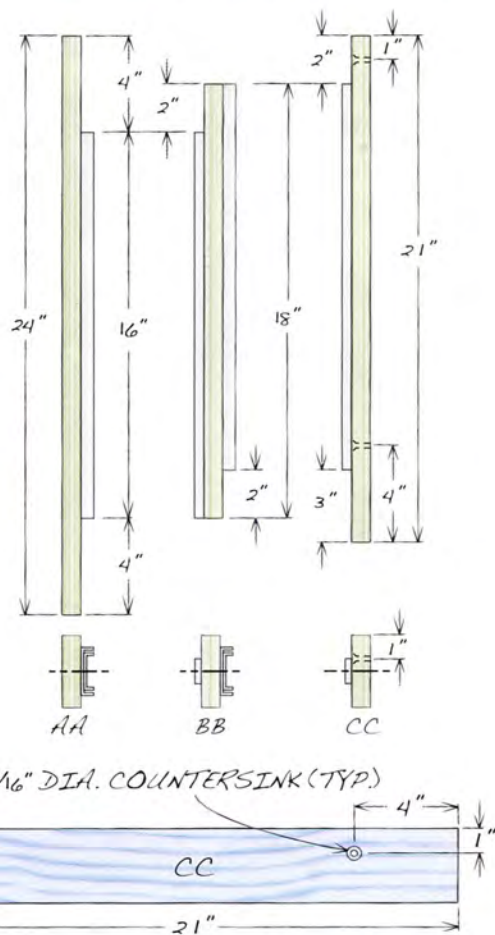


Fig. H Slide Support Dimensions



Build a fence to use
with the bench top's router at
AmericanWoodworker.com/WebExtras

Tool Platform Cutting List

Overall Dimensions: 18-3/8"–23-1/8" H x 24" W x 24"–54" D

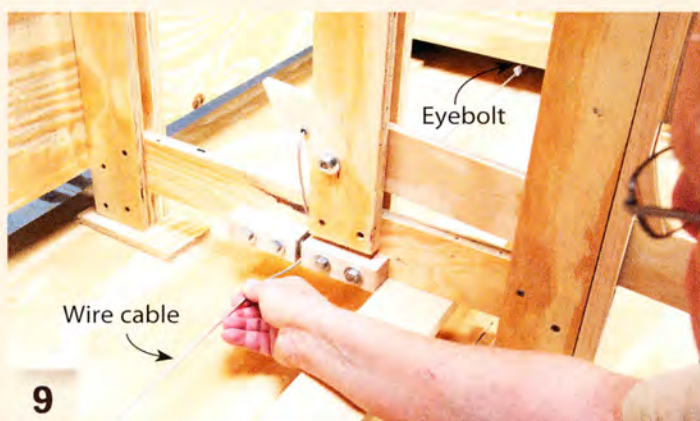
Part	Name	Qty.	Material	Th x W x L
AA	Outside slide support	4	Plywood	3/4" x 3" x 24"
BB	Middle slide support	4	Plywood	3/4" x 3" x 18"
CC	Inside slide support	4	Plywood	3/4" x 3" x 21"
DD	Link	8	Plywood	3/4" x 2" x 7" (aa)
EE	Stop block	4	Plywood	3/4" x 3" x 5-1/2" (bb)
FF	Platform side	4	Plywood	3/4" x 3" x 18"
GG	Platform brace	4	Plywood	3/4" x 3" x 13-3/4"
HH	Cross brace	1	Plywood	1/2" x 3" x 23-3/4"
JJ	Platform	1	Plywood	1/2" x 18" x 19-1/4" (cc)
KK	Support bracket brace	1	Plywood	3/4" x 3" x 18-1/4" (cc)
LL	Support bracket plate	2	Plywood	3/4" x 3" x 19-5/8"
MM	Support bracket leg	2	Plywood	3/4" x 3" x 14-1/2" (cc)

Notes:

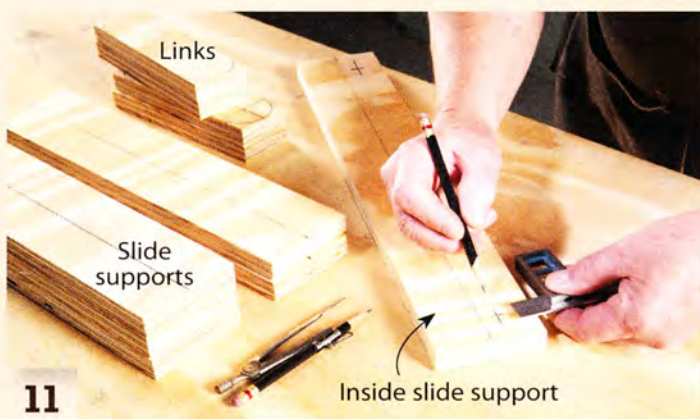
aa) Ends rounded at 1" radius.

bb) Cut front end at 15° angle.

cc) Dimensional changes to accommodate Delta 31-483 Oscillating Spindle Sander: Slide support mounting height: 9-5/8"; Platform: 15-1/4" W; Support bracket brace: 1-1/4" W; Support bracket leg: 9-1/4" L.



9 Feed the cable from the caster bracket's eyebolt through the first pulley, up and through the lever, and back down through the second pulley.



11 Lay out the platform assembly's support slides and links. Mark centerlines on all of the pieces and locate the bolt holes on the inside slide supports and on the links.

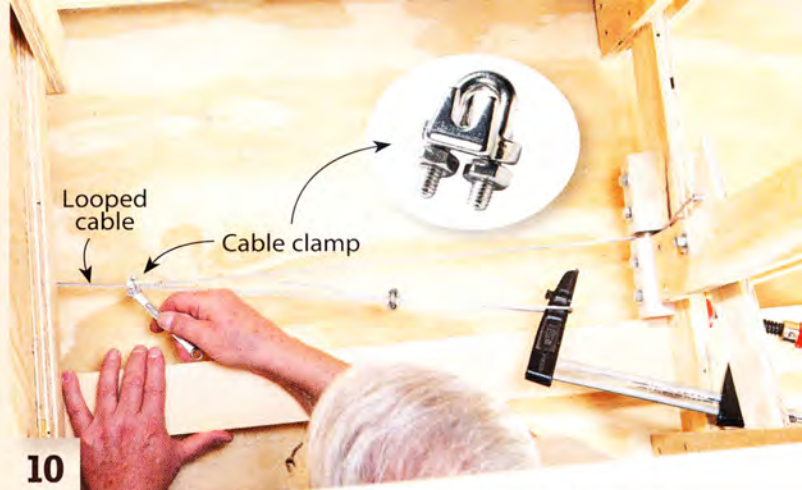
eyebolts (**Photo 7**). Loop one end of an 8' length of 1/8" wire cable through the eyebolt on one of the caster brackets. Secure this loop by hammering on an aluminum ferrule. Raise the base on 1/2" plywood blocks. Then attach the caster brackets (**Photo 8**).

Thread the free end of the cable through the nearest pulley (**Photo 9**). Feed the cable up to the bushed hole in the lever, through the bushing, down through the other pulley and over to the second caster bracket. Then thread the cable through the eyebolt, bring the end back into the bench and install a cable clamp to form a loop.

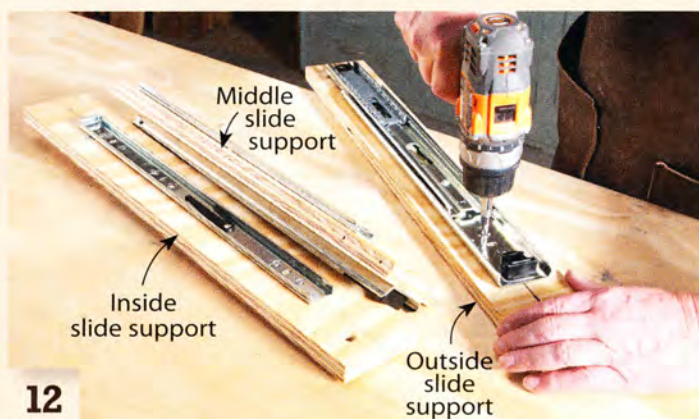
Use an F-style clamp with its head inside the loop and its screw bearing against the opposite side of the middle frame to tighten the cable (**Photo 10**). Then install two cable clamps to hold the tension. You have to use cable clamps because the cable will stretch like a guitar string and need to be re-tensioned. Install the lift lever stop (Z). Then test the lift mechanism and make any necessary adjustments. Move the cabinet to the floor and attach the bench top by driving screws through the cleats. Then follow the manufacturer's instructions to install the router plate.

Assemble the tool platform

The pullout tool platform extends by means of two 16" 200 lb.



10 Use a woodworking clamp to tighten the cable after looping it through the second eyebolt. Secure the tensioned cable using two cable clamps.



12 Screw the drawer slides to the slide supports. Mount slides on both sides of the middle slide supports.

capacity drawer slides on each side (see Sources) and rides on a support bracket with fixed casters. Rotating links raise and lower the platform between its storage and operating positions.

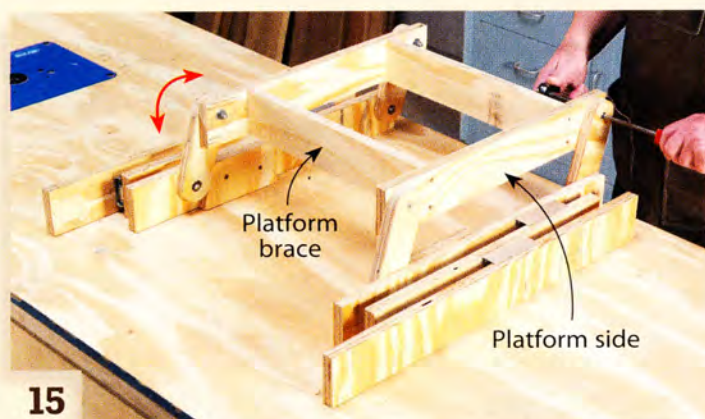
The platform shown here is designed for use with DeWalt's Compact Job Site Tablesaw (Fig. F; Fig G; Cutting List, page 60; see Sources). Note that the saw's blade must be lowered and its guard, fence and miter gauge must be removed in order to store the tool. We built simple brackets to conveniently store these must-have accessories on the left side of the cabinet.

To work with other similar saws you may have to make some alterations. For a shorter or taller saw, simply raise or lower the outside slide support's mounting position inside the cabinet and adjust the length of the support bracket's legs. For a wider saw, simply widen the cabinet's opening.

Cut the plywood slide supports (AA-CC, Fig. F) and the rotating links (DD) to length. Note that the slide supports are different lengths (Fig. H). Draw centerlines for mounting the slides on each support and mark the 1" radius ends on each link (Fig. J). Then locate the 1/4" dia. holes on the inside slide supports (CC; Fig. H) and on the links (**Photo 11**). Correctly locating these holes is critical for the platform's lift mechanism to work properly. The spacing between these holes must be the same on all similar pieces. Make sure to correctly



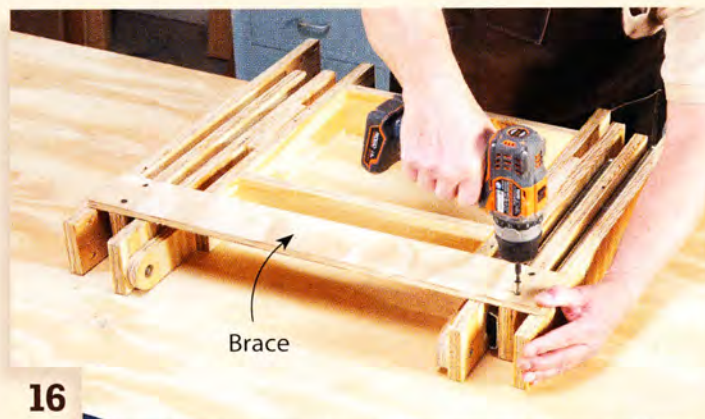
13 **Fasten** an angled stop block behind the link near the front end of each inside slide support. The links at the back end don't require stop blocks.



15 **Attach** the platform frame to the links. Tighten the bolts so the links rotate freely, without binding or wobbling.



14 **Install** shop-made stops to ride on top of the slide supports and automatically fall into place when the slide assembly is fully extended.



16 **Stabilize** the platform assembly by fastening a horizontal brace to the bottom, flush with the back ends of the middle slide supports.

countersink or counterbore the holes and drill deep enough to recess the screw head or locking nut and washer slightly below the surface. After all the holes are drilled, round the ends of the links to a 1" radius (or slightly less) so they won't rub and cause the mechanism to bind.

Start the assembly by attaching the drawer slides on the supports' centerlines (**Photo 12**). Note that the slides mount in different locations on each support. Fasten the links and their 15° stop blocks (EE) to the inside slide supports (**Photo 13**). Tighten the links so they rotate smoothly, without wobbling. Don't over-tighten. Attach each stop by rotating the front link up and over to match the stop's angle.

Assemble each set of slide supports and fully extend the slides. Then install stops made from 1" x 1" aluminum angle to stabilize the pullout assembly (**Photo 14**). These stops keep the slides from rolling back into the bench when you lift or lower the tool platform. Cut one leg of the angle down to 1/2" on the tablesaw. Set the blade height at 1/8", place the angle against the fence with a sacrificial piece of wood nested inside and run the assembly through the saw as if it were a piece of wood. Each slide assembly requires four 3-1/2" long stops. Drill mounting holes for screws and attach the stops. Make sure the stop is high enough to ride on the adjacent slide support when the assembly is pushed in. Fasten the stops just tight enough to

automatically fall into place when the assembly is pulled out.

Assemble the platform's frame (FF, GG) and attach it to the links mounted on the two slide assemblies (**Photo 15**). Flip over this assembly to attach the cross brace (HH, **Photo 16**). Then flip the assembly again to fasten the platform (JJ).

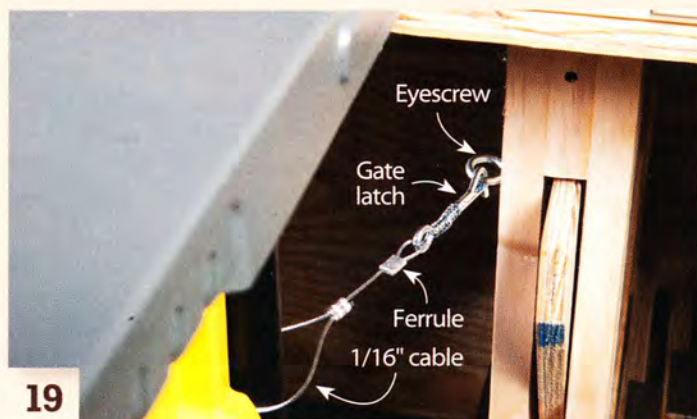
Install the tool platform

Remove the platform's outside slide supports and mount them in the cabinet. Remember, the mounting height shown in Figure G is for the DeWalt saw that's pictured. Make adjustments as necessary to find the correct mounting height for your saw, so the benchtop functions as an outfeed table. Cut a pair of spacers to the proper length and clamp them inside the cabinet. Place each outside slide support on top of these spacers. Then fasten it to the frame, flush at the back (**Photo 17**). After attaching both slide supports, install the rest of the platform assembly as if it were a drawer.

Install a support bracket with fixed casters to complete the tool platform (**Photo 18**). With the platform fully recessed inside the cabinet, measure the length between the outside faces of the inside slide supports. Cut the cross brace (KK) to the same length and the plate (LL) 1-1/2" longer. Cut the legs (MM) extra long. Assemble the bracket and mount the 2" casters. Pull the platform out of the cabinet just far enough



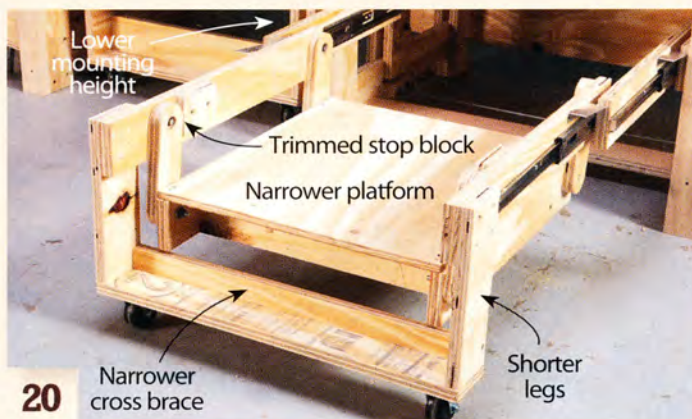
17 **Mount** the platform assembly's outside slide supports in the cabinet. Use spacers to level the supports and position them at the correct height.



19 **Anchor** the table saw to the cabinet with cable and fasten it to the tool platform with screws or brackets to secure it in the event of a kickback.



18 **Install** the support bracket to complete the tool platform.



20 **Modify** the tool platform to accept a taller tool by lowering its mounting height inside the cabinet and making other minor changes that allow the links to rotate all the way down.

to slide the bracket into position against the inside slide supports. Then mark the legs' exact height. Remove the bracket and cut the legs to length. Then fasten it to the platform.

Position the saw on the tool platform so it slides in and out without touching the cabinet and so the rip fence and miter gauge work properly when the platform is raised. (You may have to cut slots in the benchtop for the miter gauge's bar.) Fasten the saw to the platform (the base of the DeWalt saw has holes for screws). Then install restraints on both sides to anchor the saw to the cabinet during use (**Photo 19**). These restraints will help to keep the saw and platform from dropping to storage height in the case of a kickback.

Accommodate a tall tool

Minor modifications allow the tool platform to house a much taller tool (**Photo 20**). Mount the platform lower. Shorten the support bracket's legs and trim the width of its cross brace. Trim the platform's width so it fits between the links and cut the stop blocks to the dotted line (Fig. J). These alterations lower the platform's storage height by 5" while maintaining the same operating height. To accommodate the Delta 31-483 Heavy Duty Oscillating Spindle Sander shown on page 56 (see Sources), see Note "cc" on the Tool Platform Cutting List (page 60).

Richard Tendick is a retired engineer who loves designing projects and working wood.

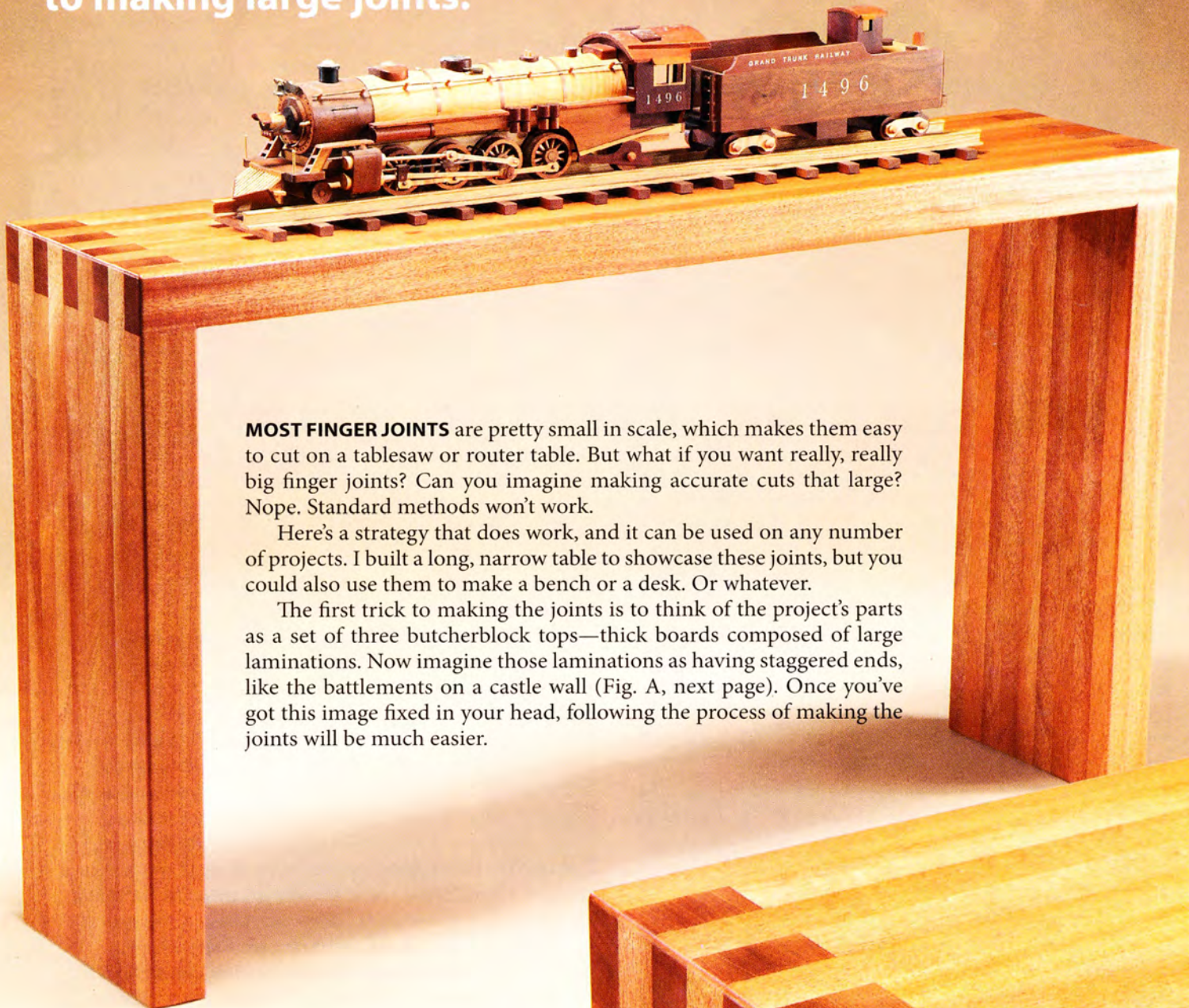
SOURCES

- Home Center, B-C Fir Plywood, 4x8, 1/2" and 3/4" thickness (2 sheets each); Hollow Core Door, 1-3/8" x 30" x 80"; Power Strip, 52"; Bolt, Washer and Nut, 3/8" x 3" (1 req.), 5/16" x 4" (4 req.); Screen Door Repair Wheel (2 req.); Roll pin, 5/32" x 1-1/2" (2 req.); Eyebolt, Washer and Nut, 5/16" x 4" (2 req.); Continuous Hinge, 1-1/2" x 24" (2 req.); Heavy-Duty Swivel Caster, 3" (4 req.); Stranded Wire Cable, 1/8" x 8', 1/16" x 2'; Cable Clamp, 1/8" (3 req.); Aluminum Ferrule, 1/8" (1 req.), 1/16" (8 req.); F.H. Machine Screw, 1/4" x 2", 1/4" x 1-1/2" (4 req. for each); Washer and Lock Nut, 1/4" (8 req.); Aluminum L-Angle, 1" x 1" x 36"; Fixed Casters, 2" (4 req.); Gate Hook, 3" (4 req.), Screw Eye, #8 (4 req.).
- Rockler Woodworking and Hardware, rockler.com, 800-279-4441, Woodworker's Bench Vise, #68888, \$89.99; Square-X Drive Lube Finished Screws, #6, #28647, #8, #29322, \$3.69 to \$6.59 per 100 screws; Heavy-duty Full-Extension Drawer Slide, 16", #46899, \$34 per pair (4 pair req.).
- DeWalt, dewalt.com, 800-433-9258, 10" Compact Job Site Tablesaw, #DWE7480, \$379.00.
- Delta Power Equipment Corporation, deltamachinery.com, 800-223-7278, Heavy Duty Oscillating Bench Spindle Sander, #31-483, \$519.99.

Finger-Joint Table

by Tom Caspar

Discover the small tricks
to making large joints.



MOST FINGER JOINTS are pretty small in scale, which makes them easy to cut on a tablesaw or router table. But what if you want really, really big finger joints? Can you imagine making accurate cuts that large? Nope. Standard methods won't work.

Here's a strategy that does work, and it can be used on any number of projects. I built a long, narrow table to showcase these joints, but you could also use them to make a bench or a desk. Or whatever.

The first trick to making the joints is to think of the project's parts as a set of three butcherblock tops—thick boards composed of large laminations. Now imagine those laminations as having staggered ends, like the battlements on a castle wall (Fig. A, next page). Once you've got this image fixed in your head, following the process of making the joints will be much easier.

Extra-large finger joints add a distinctive touch to any project. Every woodworker is going to ask, "How did you do that?"

EDITOR: TOM CASPAR | PHOTOGRAPHY: JASON ZENTNER | ILLUSTRATION: FRANK ROHRBACH

Fig. A Exploded View

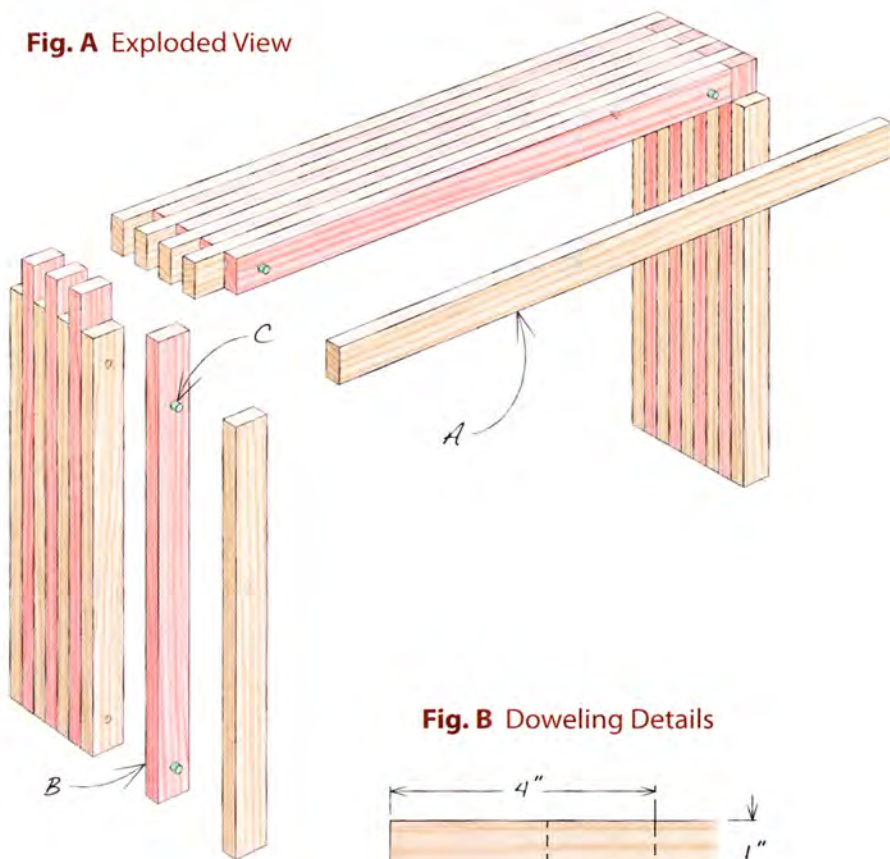
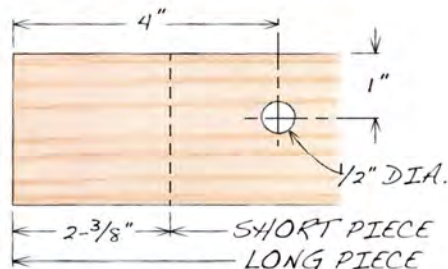


Fig. B Doweling Details



Cutting List

Overall Dimensions: 29-1/2" H x 48" L x 11-1/4" D

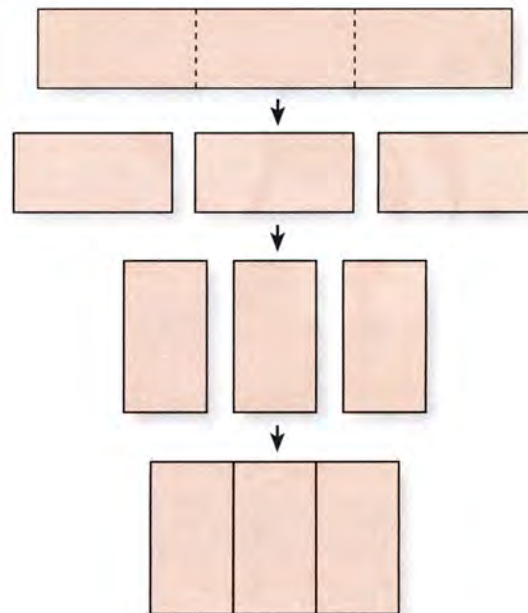
Part	Name	Qty.	Th x W x L
A	Top	9	1-1/4" x 2-3/8" x 48" (a)
B	Leg	18	1-1/4" x 2-3/8" x 29-1/2" (b)
C	Dowel	24	1/2" Dia. x 2-3/8"

Notes:

a) Rough size: 1-1/4" x 2-5/8" x 48-1/2"

b) Rough size: 1-1/4" x 2-5/8" x 30"

Fig. C Butcherblock Milling Steps



Snipe matters

Before we get going, let's take a detour into the ugly world of snipe. As you know, many planers tend to cut a slight depression at the beginning or end of a board, and that depression is called "snipe." Usually, a little snipe isn't a big deal. But in this project, snipe can be a real problem. Let me explain.

Say you're making a 3/4" thick top from several boards. After planing the boards to thickness, you joint their edges and glue them together. If your planer sniped, the problem only shows on the surface of the top. To fix the problem, you just plane, scrape or sand the ends of the sniped boards until they're even.

In this project, you'll be making a much thicker top (Fig. C). Some of the edges to be glued together will be jointed, while others will be planed—unlike the 3/4" top, where every edge to be glued is cut by the jointer. On the thicker top, if the planed edges are sniped you'll get small gaps between your glue joints. And in this particular project, you'll also get finger joints that are too loose. Clearly, you can't fix the snipe problem after the pieces are glued together. You have to address it earlier, when you're milling the wood.

The easiest solution to eliminating snipe works every

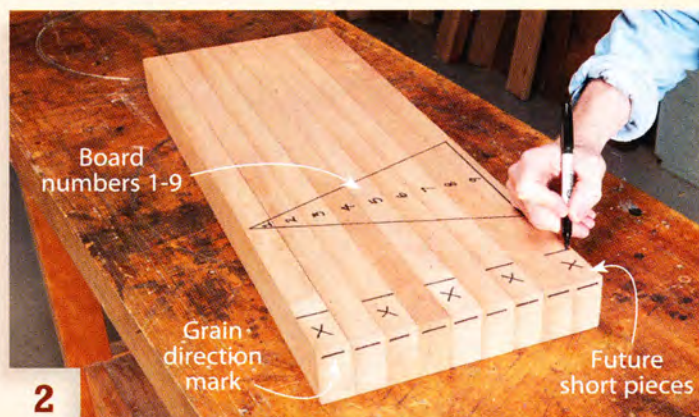
time, but it comes at a price. First, you must crosscut your rough lumber into pieces that are about 6" extra-long. If you see any snipe after jointing and planing, cut it off. (Snipe is usually no more than 3" long.) You may not be able to see the snipe, however. It can be very subtle, so the safest approach is to just whack off both ends of every board and have done with it. Frankly, I hate doing this, because it wastes a lot of wood. But, as I said, it works.

Alternate strategies for minimizing snipe don't waste as much wood. The most obvious, I suppose, is to simply joint every surface after it has been planed. (Assuming your jointer doesn't snipe!) On a regular butcherblock top, this method would work fine. But I'd hesitate to do it when building this table, because the finger joints require every piece to be exactly the same thickness from end to end. When you joint an edge, you may take off more wood at the beginning of the cut than at the end of the cut, or the other way around. You just can't be sure. The theory is good, but it may not work in practice.

There are yet more ways to deal with snipe (see "12 Tips for Working with Rough Lumber," page 26), but they're not 100% effective. I used the "butt the pieces end-to-end" method when building this table, and ran all my pieces through a drum sander as well. When all was done, I still



1
Begin by trimming all of the pieces for the legs and top about 1/4" extra-long.



2
Arrange the pieces in order. (This is one of the legs.) Number each piece, then mark every other one with an X. You'll cut the X pieces shorter later on, to form the table's finger joints.



3
Drill a 1/2" dia. hole near both ends of each piece. Use a fence and a stop block to make sure that all of the holes are in the same position.



4
Glue 1/2" dowels into the holes of the even-numbered pieces. Repeat the same process for the second table leg and the top.

had a small amount of snipe. In retrospect, I wish I had used the "whack off the ends" method instead, or tried the "joint every planed surface" solution. Oh well.

Milling and marking

Start with 6/4 (1-1/2" thick) rough lumber. (I used African mahogany.) Mill all the pieces for the top (A) and legs (B) at the same time, so they will be exactly the same width and the same thickness.

After crosscutting your rough lumber, rip the pieces 2-5/8" wide (1/4" wider than the final dimension, which is the thickness of the top and legs—2-3/8"). Joint one face of each piece, then plane the opposite sides until the pieces are 1-1/4" thick. These are the surfaces that will be glued together later on.

Next, joint one edge of each piece. Plane the opposite edge so the pieces are 2-1/2" thick (1/8" more than the final dimension). These surfaces will be the inside and outside faces of the table's top and legs.

As you plane, mark the grain direction of each piece on both of its ends (see "Mark The End Grain," page 27). Trim one end of each piece and redraw its grain direction mark. Set up a long-armed stop block for cutting all of the pieces 1/4" extra-long, then trim the other end of each one (**Photo 1**).

Arrange the pieces to form the table's top and legs (**Photo 2**). All of these pieces will be planed as a unit after they're glued up. To minimize tearout, position the pieces so that their grain all runs the same way. In addition, draw a large triangle across the assembly and number each piece, 1 through 9. Alternating pieces will get cut shorter later on, forming fingers—mark these pieces with a big X. On the table's top, mark both ends of the even-numbered pieces with an X. On the table's legs, mark only on one end of the odd-numbered pieces with an X.

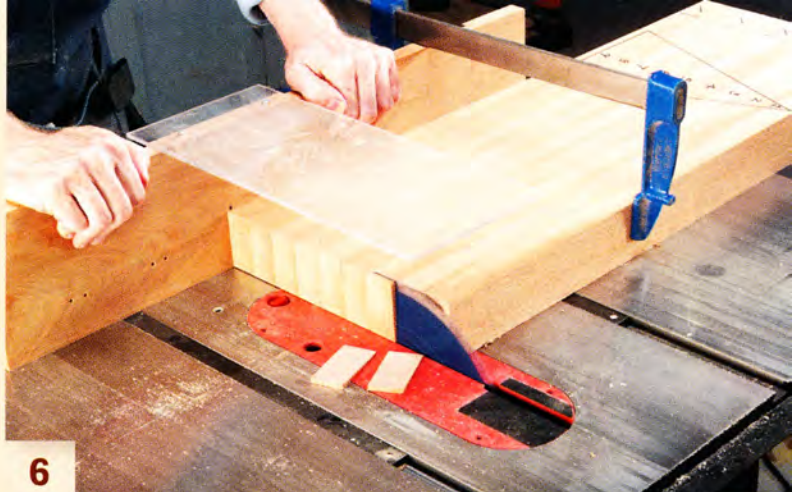
Register with dowels

Next, before making any cuts to form the fingers, you'll join the pieces with dowels (C). The dowels aren't intended to strengthen the joints—they're registration pins. From here on out, they'll keep everything in alignment, and that will be crucial to making tight joints.

Drill 1/2" dia. dowel holes through both ends of each piece of the top and legs using a Forstner bit (**Photo 3**; Fig. B). Note, however, that the holes don't go all the way through the outside pieces (#1 and #9)—just halfway. You'll be able to drill most of the holes using the setup shown in the photo. However, for two of the "halfway" holes, you'll need to reposition the stop block on the opposite side of the



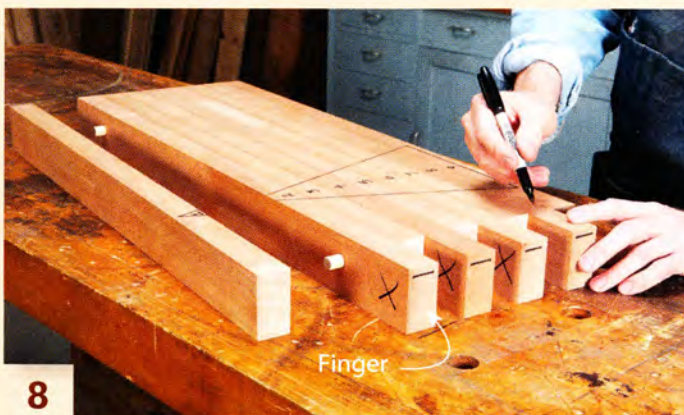
5 **Cut** the dowels so they only stick out 9/16" (less than half the stock's thickness). Guide the cut using a board with a slot cut into it. The slot is spaced 9/16" from the edge touching the stock.



6 **Assemble** each part of the table, without glue, and trim both ends. The dowels serve to register the pieces together; this step ensures they'll be flush. Take apart each assembly after cutting.



7 **Trim** one end of all the odd-numbered pieces from the table's legs. Trim both ends of all the even-numbered pieces from the table's top.



8 **Reassemble** both of the table's legs. Mark one face of each "finger" with an X.

drill bit. Countersink both sides of each hole.

Glue dowels through both ends of all the even-numbered pieces of the top and legs (**Photo 4**). The dowels should fit snug, but not too tight. For the best fit, use factory-made fluted dowels. (See Sources, page 69. Note: The dowels must be at least 2-1/2" long; many commercial dowels are shorter.) Position the dowels so they stick out approximately the same length on both sides of each piece, then wipe off all excess glue. Cut the dowels to final length on the bandsaw (**Photo 5**). They should stick out less than half the thickness of each piece—9/16" is about right.

Make the joints

Reassemble the top and both legs, then cut these parts to final length, trimming both ends (**Photo 6**). Make sure your blade is set at exactly 90°. This step ensures that all the ends of the top and legs are perfectly flush with each other.

Take apart the assemblies and trim the pieces marked with an X (**Photo 7**). Set up a stop so you remove exactly 2-3/8" (including the kerf cut by the blade)—the target thickness for the top and legs. It's best to put the stop at the far end of each piece, as shown in the photo, so the offcut won't be trapped.

Reassemble the top and legs (**Photo 8**). You'll see, of

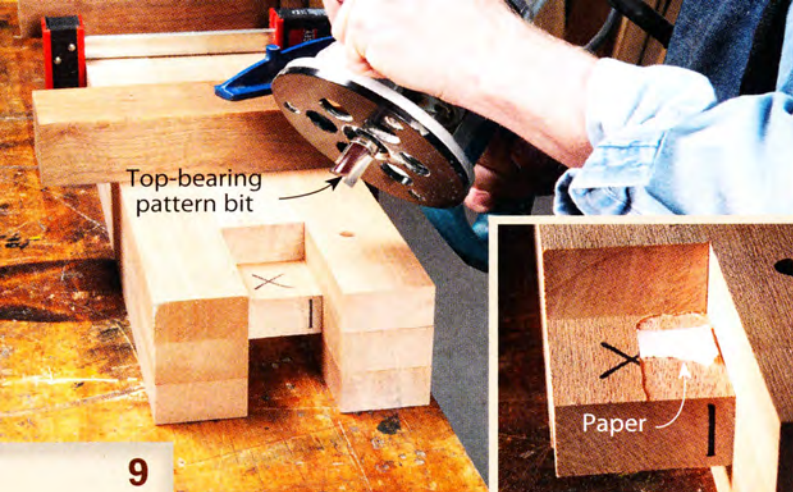
course, that trimming the X pieces has now created a series of fingers and notches. The fingers should fit nice and tight in the notches, right? Yes, they will—but nice and tight doesn't leave any room for glue. In fact, the joints may be so tight that you won't be able to assemble them. Not good!

I chose to head off this problem by making the leg fingers thinner by a few thousandths of an inch. Here's how to do it. On each leg assembly, mark one face of each finger with an X. Take apart the leg assemblies and rout the marked faces with a top-bearing pattern bit (**Photo 9**; see Sources). Stack other pieces around the finger to be routed in order to guide the bit. (The bit's bearing ensures that you won't cut into the surrounding wood.) Adjust the router's depth of cut to remove only about .003"—the thickness of a piece of notebook paper.

Reassemble the legs and clamp them together. Clamp the top assembly together, too, and try fitting the joints together. You should be able to push them home by hand or with light taps of a mallet. If you need to use more force, the joints are too tight. If that's the case, disassemble the legs and rout the leg fingers a little bit deeper.

Glue up each section

Let's start with the legs. If you've got everything planned



9

Rout the marked faces a paper-thickness deep (see inset). Make a flat bearing surface by stacking other pieces alongside. Reducing the thickness of these fingers will make it easier to glue the joints.



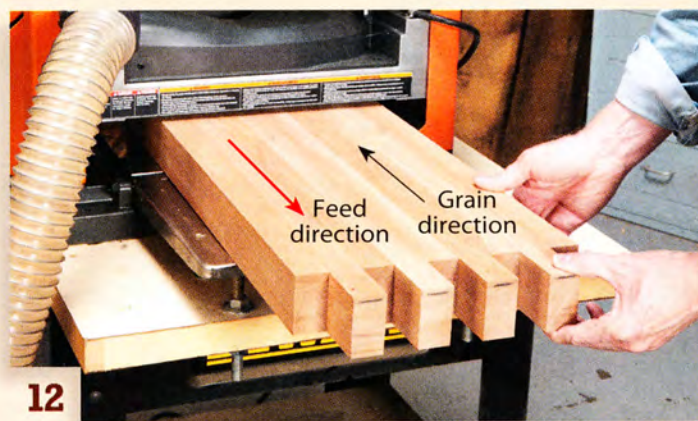
10

Glue all of the leg pieces in one shot. Apply the glue to one piece at a time, then stack them one on top of another, following the numbered order.



11

Clamp the leg pieces between stout cauls. Place the clamps above and below the cauls to apply even pressure. Repeat the procedure for the other leg and the top.



12

Plane both sides of each piece you've glued up. All the grain is oriented the same way, so the legs and top will come out smooth and even, with no tearout.

Sculpted Finger Joints

Large finger joints can be shaped in any number of ways after they've been glued together. This stool, for example, features a concave top and convex legs.

I roughed out both of these shapes on the tablesaw, using a series of angled cuts with a dado set. The secret to making the convex legs was to leave a 1/4" wide portion uncut at either side, so the stool wouldn't tip. Smoothing the surfaces required a fair amount of sanding, but it wasn't hard.

I made this stool from 6/4 yellow poplar, which is relatively inexpensive, as a dry run for making the larger table in this article. To finish the piece, I bleached the wood, applied Behlen's Medium Red Mahogany Non-Grain Raising Stain and brushed on a 1-lb. cut shellac seal coat. This was followed by a coat of Varathane Cabernet gel stain, which deepened the red color, and three coats of Varathane water-based poly.

—Tom Caspar



Find out how three types of bleach can transform wood at AmericanWoodworker.com/WebExtras





13

Prepare to glue the table together, one corner at a time. Glue paper-backed softwood blocks on each finger—wherever you may need to apply clamping pressure.



14

Apply glue and clamp in both directions.

out, you can glue all nine pieces at the same time (**Photo 10**). Stack the pieces in order. Remove piece #1, then use a small paint roller or equivalent to apply glue to its inside face. Place it nearby, outside face down, to start a new pile.

Stack piece #2 on top of piece #1. (You only have to apply glue to one side of the joint. And you don't have to put any glue in the dowel holes.) Pick up piece #3, apply glue to both sides and add it to the stack. Keep on going in this manner, then place the complete stack on a row of pipe clamps. Put cauls alongside the glue-up, then add more clamps across the top (**Photo 11**). Scrape off all the excess glue before it hardens.

The cauls should be as thick as the pieces you're gluing up. The wider they are, the better. Each of my cauls were composed of three pieces of 3/4" x 6" x 48" red oak glued together, then jointed. Boy, are they stiff!



Large cauls can really come in handy for gluing a large butcherblock-style top (Photo 11). Here's why:

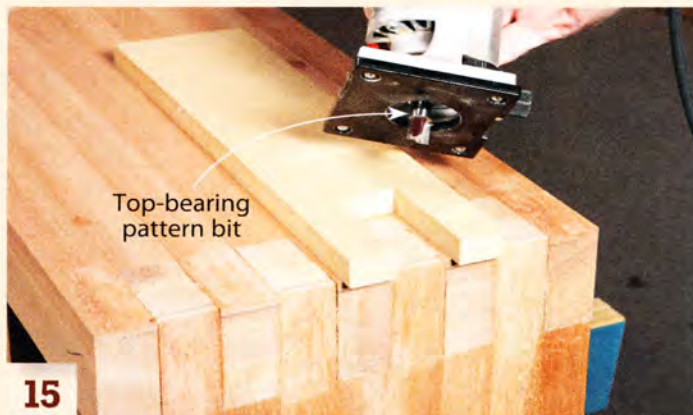
It's best to glue this type of top in stages, one half at a time. If you work really fast and have an assistant, you could glue the top all in one shot. But if you work alone, you may run out of time. The glue may start to set up before you get the assembly in the clamps. Big, stiff cauls ensure that the sides of each half remain absolutely straight, which is essential for the final glue-up.

Plane both sides of the legs and top (**Photo 12**). Reduce them from 2-1/2" thick to 2-3/8" thick (or better yet, 1/32" thinner than 2-3/8", so the fingers will stand 1/32" proud).

Glue the finger joints

To avoid denting the wood, prepare some softwood blocks that are slightly smaller than each finger (**Photo 13**). Glue a piece of notebook paper to one face of each block, then glue the blocks in position, paper face in. Rubbing them in place is sufficient; clamps aren't necessary.

Glue one corner of the table at a time (**Photo 14**). To make this easy, devise a method for holding the top and legs in position, so you can just slide them together. I taped



15

Level the fingers, if they're proud, with a router and top-bearing pattern bit. The bearing prevents the bit from chewing into the support piece.

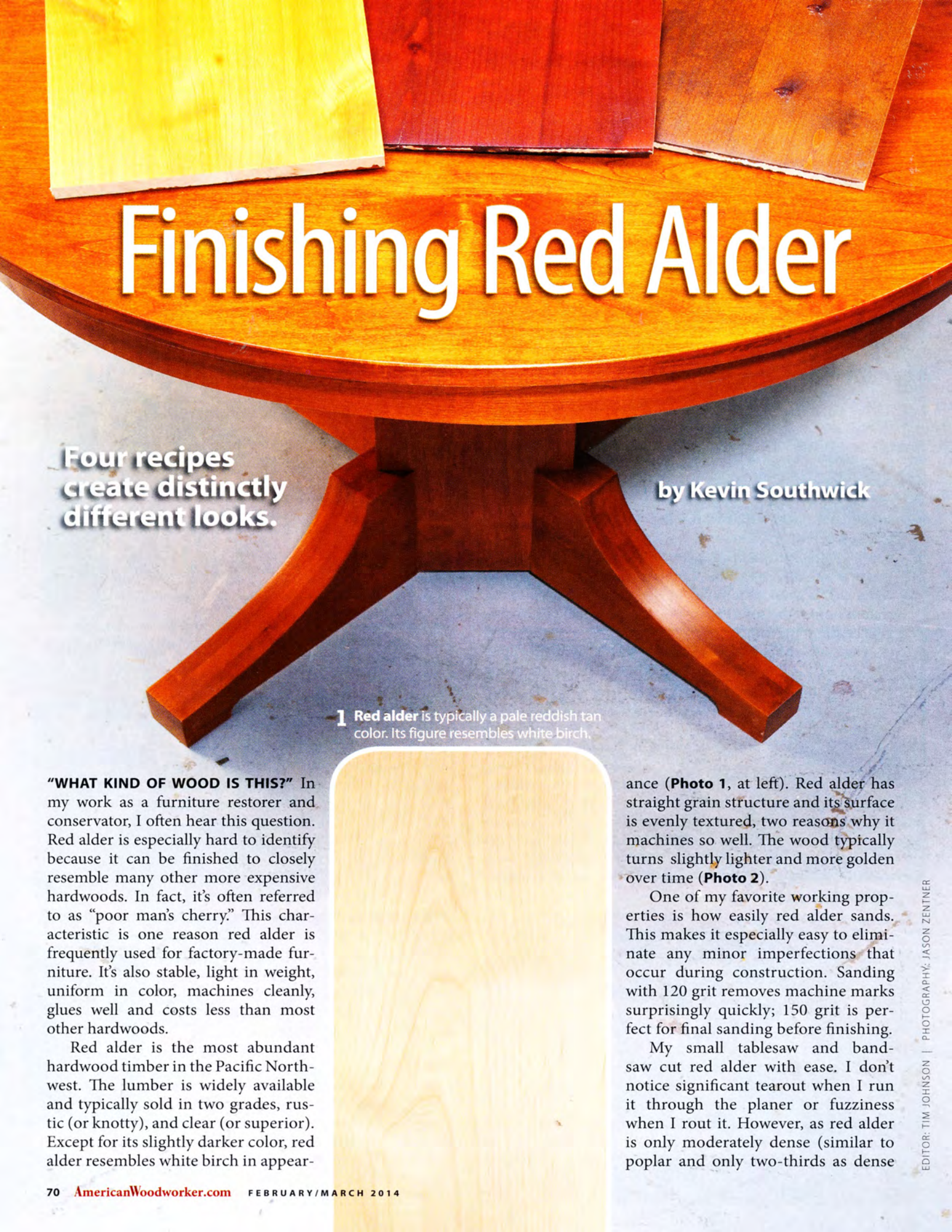
together some blocks to elevate the legs off the floor (allowing room for the ends of the pipe clamps), then supported the top with a box placed on sawhorses. After you apply the glue, smack the joint most of the way home with a mallet. Draw the joint tight with clamps.

After the glue dries, knock off the gluing blocks with a hammer. Some of the paper will be left behind, but it's easy to remove with hot water and a putty knife.

If the fingers are proud, level them with a router (**Photo 15**). Routing should leave them just a hair proud; finish the job with sandpaper. Level the areas where the legs meet the top, then rout every edge with a 3/16" round-over bit. I finished the table with Minwax Antique Oil, an oil/varnish mixture. It darkened the end grain of the finger joints, making a pleasing contrast with the rest of the wood. 

SOURCES

- California Dowel and Turnings, caldowel.com, 866-663-6935, 1/2" x 2-1/2" grooved and fluted dowels, \$5/100.
- MLCS, mlcswoodworking.com, 800-533-9298, Pattern Routing Bits, #16509, 1/2" dia., \$19; #18808, 3/4" dia., \$25.



Finishing Red Alder

Four recipes
create distinctly
different looks.

by Kevin Southwick

1 Red alder is typically a pale reddish tan color. Its figure resembles white birch.

“WHAT KIND OF WOOD IS THIS?” In my work as a furniture restorer and conservator, I often hear this question. Red alder is especially hard to identify because it can be finished to closely resemble many other more expensive hardwoods. In fact, it's often referred to as “poor man's cherry.” This characteristic is one reason red alder is frequently used for factory-made furniture. It's also stable, light in weight, uniform in color, machines cleanly, glues well and costs less than most other hardwoods.

Red alder is the most abundant hardwood timber in the Pacific Northwest. The lumber is widely available and typically sold in two grades, rustic (or knotty), and clear (or superior). Except for its slightly darker color, red alder resembles white birch in appear-

ance (**Photo 1**, at left). Red alder has straight grain structure and its surface is evenly textured, two reasons why it machines so well. The wood typically turns slightly lighter and more golden over time (**Photo 2**).

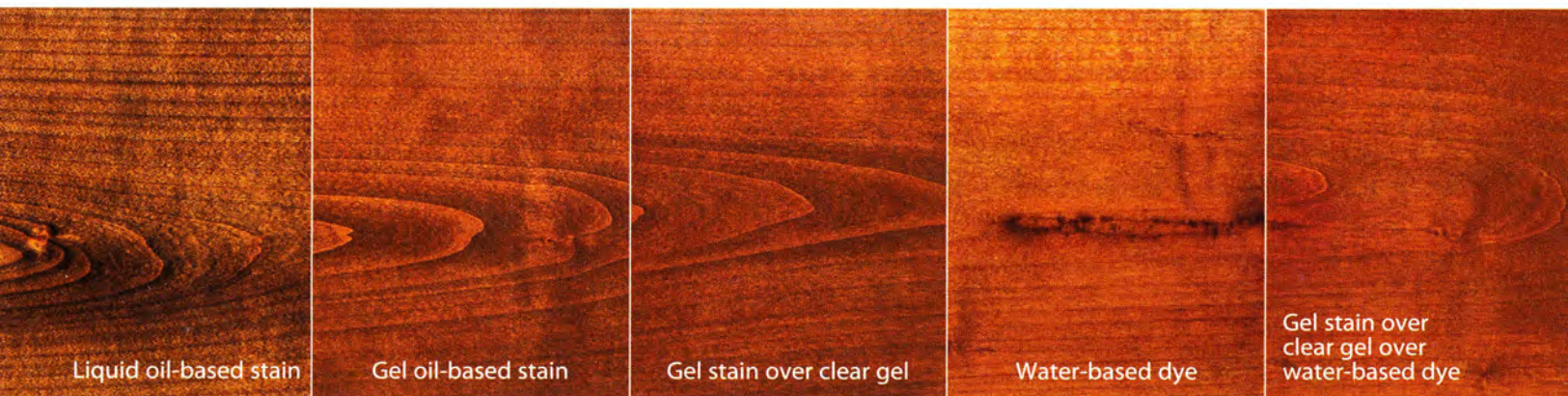
One of my favorite working properties is how easily red alder sands. This makes it especially easy to eliminate any minor imperfections that occur during construction. Sanding with 120 grit removes machine marks surprisingly quickly; 150 grit is perfect for final sanding before finishing.

My small tablesaw and bandsaw cut red alder with ease. I don't notice significant tearout when I run it through the planer or fuzziness when I rout it. However, as red alder is only moderately dense (similar to poplar and only two-thirds as dense



Exposure to light turns red alder a slightly lighter golden tone. It doesn't darken like cherry does.

Clear finishes can create very different looks. Linseed oil brings out red alder's natural color and grain, while water-based poly minimizes both.



4 Dramatically change red alder's appearance by using different types of stain, either alone or in combination.

as cherry), it dents relatively easily. It's best to drill pilot holes and turn the screws carefully when installing them, so as not to strip the holes. I've also learned that too much clamping pressure when gluing up a panel can actually bend the boards.

Chameleon wood

Surprisingly, even though red alder has many positive attributes and is very nice to work with, woodworkers seem to overlook it. Perhaps red alder is underappreciated because its indistinct figure, neutral color and medium texture make it rather nondescript. However, it's exactly these properties that make it possible to use red alder to imitate a wide variety of woods. With very little work, red alder can look a lot like natural cherry, dark walnut, or deep red mahogany. Even clear finishes allow you to alter its appearance (**Photo 3**).

In a nutshell, red alder is similar to a chameleon: Its natural color can be altered to match just about any wood tone because it readily accepts

all kinds of stains. More importantly, red alder's middle-of-the-road grain pattern can be minimized or exaggerated by the type of stain or the way it's applied (**Photo 4**).

Liquid pigment stains, for example, create two kinds of blotching on red alder: Coarse, grainy blotching on a small scale, because the pigments lodge in the tiny crevices that cover the wood's surface, and blotching on a large scale, because red alder's surface is not uniformly porous, so the stain soaks in unevenly.

Using gel stain limits both types of blotching, but leaves enough to result in a slightly muddy appearance.

Gel stain applied immediately after an application of clear gel used as a stain controller reduces both types of blotching even further. This adds a step to the process, but the result shows the wood's figure more clearly and is more lustrous than applying gel stain alone.

Water-based dyes work extremely well to provide intense, dark color with very little blotching, so no stain

controller is needed. Dyes work best when the goal is to minimize the wood's figure and grain in order to show a texture so uniformly smooth that it can actually shimmer. Water-based dyes also work very well to create lighter tones on red alder, with luster and shimmer that resemble the look of maple or birch.

Combining water-based dye with gelled pigment stain and clear gel as stain controller adds richness and depth that can make red alder look like an expensive hardwood. In this process the dye is applied first, followed by the clear gel as a stain controller and then the gel stain.

Recipes

Knowing how different stains and processes create different effects is the secret to making red alder look like other woods. The simple recipes on the following page use this information to quickly and easily give red alder four distinctive looks.

Red Alder Recipes

Knotty pine



Amber shellac creates a warm, rustic tone on knotty red alder, without unsightly blotching. A top coat of water-based finish leaves a pleasant satin sheen. The fast dry time of both products can make this finish a one-day process.

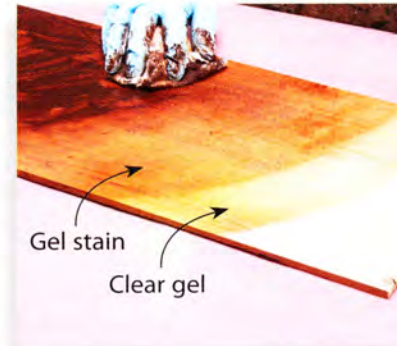
Step 1 Mix amber shellac at a 2 lb. cut.

Step 2 Apply the first coat and let dry 20 minutes.

Step 3 Apply the second coat and let dry 20 minutes.

Step 4 Lightly sand with 400 grit and remove the sanding dust. Then apply one coat of satin water-based finish.

Natural cherry



This is an easy method for imitating natural cherry. Using gel stain alone looks OK, but first using clear gel varnish as a stain controller reduces large-scale dark blotches and provides a more natural-looking and pleasing grain texture. Because the clear gel is used immediately before the gel stain is applied, this process doesn't require any extra drying time.

Step 1 Generously apply General Finishes Topcoat clear gel varnish, work it into the grain for a minute or two and then rub off the excess.

Step 2 Immediately wipe on General Finishes Candlelight Gel Stain and thoroughly rub off the excess. Let dry overnight.

Step 3 Apply your favorite top coat. For the "natural cherry" alder table on page 70, I chose two coats of Zinsser SealCoat and one coat of General Finishes High Performance Polyurethane Water Based Satin Top Coat.

Dark walnut

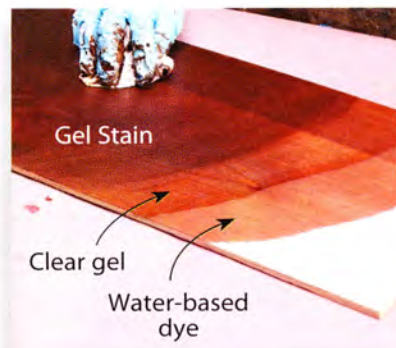


Water-based dyes work great to add dark, lustrous colors in one quick step to red alder without causing unsightly blotching. All the dye colors I've tested work well, and do not cause the grain pattern reversal that pigment stains do. It's also nice to work with a stain that dries as fast as water evaporates.

Step 1 Generously apply TransTint Dark Mission Brown Dye (mixed in water to the standard strength, as directed on the label). Continue to work in the dye with a damp rag for at least a minute to allow for thorough and consistent saturation of the surface. Rub off the excess with dry rags or paper towels. Let dry for an hour.

Step 2 Apply your favorite top coat. A wipe-on/rub-off finish, such as Sam Maloof's Poly/Oil Finish, will enhance the look.

Dark red mahogany



This three-step coloring process provides deep, rich color. It uses dye for most of the dark reddish color intensity and then brings out the grain pattern with pigment to imitate a dark red mahogany look.

Step 1 Generously apply TransTint Reddish Brown Dye (mixed in water to the standard strength, as directed on the label). Continue to work in the dye with a damp rag for at least one minute to allow for thorough and consistent saturation of the surface. Remove excess with dry rags or paper towels. Let dry for an hour.

Step 2 Generously apply General Finishes Topcoat clear gel varnish, work it into the grain for a minute or two and then rub off the excess.

Step 3 Immediately apply General Finishes Candlelight Gel Stain and thoroughly remove the excess.

Step 4 Apply your favorite top coat. A semi-gloss sheen will help create richness and depth. 

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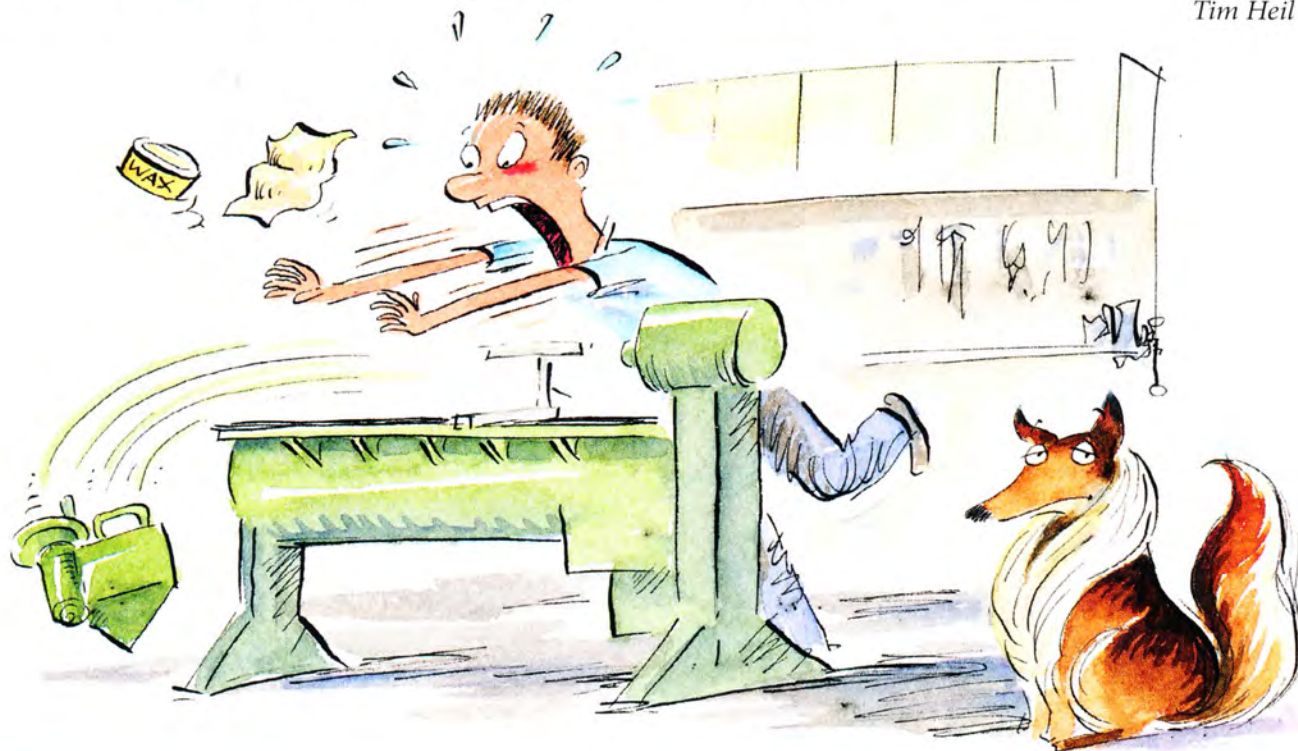
Kamikaze Tailstock

I OFTEN WAX finished projects as they spin on my lathe, so it's natural to wax the lathe's bed at the same time. (Waxing the bed prevents rust and makes the lathe's tool-rest banjo and tailstock glide effortlessly.)

Unfortunately, after waxing the bed the other day, I gave the 70 lb. tailstock a shove to get it out

of the way—and watched helplessly as it glided effortlessly down the bed, sailed off the end and crashed to the concrete floor. Fortunately, only its spindle wheel shattered; nothing else was damaged. Now the Vise-Grip pliers that substitute for the broken wheel constantly remind me to handle the tailstock carefully.

Tim Heil



Too Tall

I RECENTLY PURCHASED a pocket-hole jig. A book that came with it included plans and instructions for building kitchen cabinets, so I decided that new upper cabinets would be my next project. My shop space at home is limited, so I built the cabinets in my father's garage shop (he's an avid woodworker). Over several trips, I built a corner cabinet and two others, one to go on each side. I was so excited, I decided to mount these three cabinets as soon as they were stained and finished.

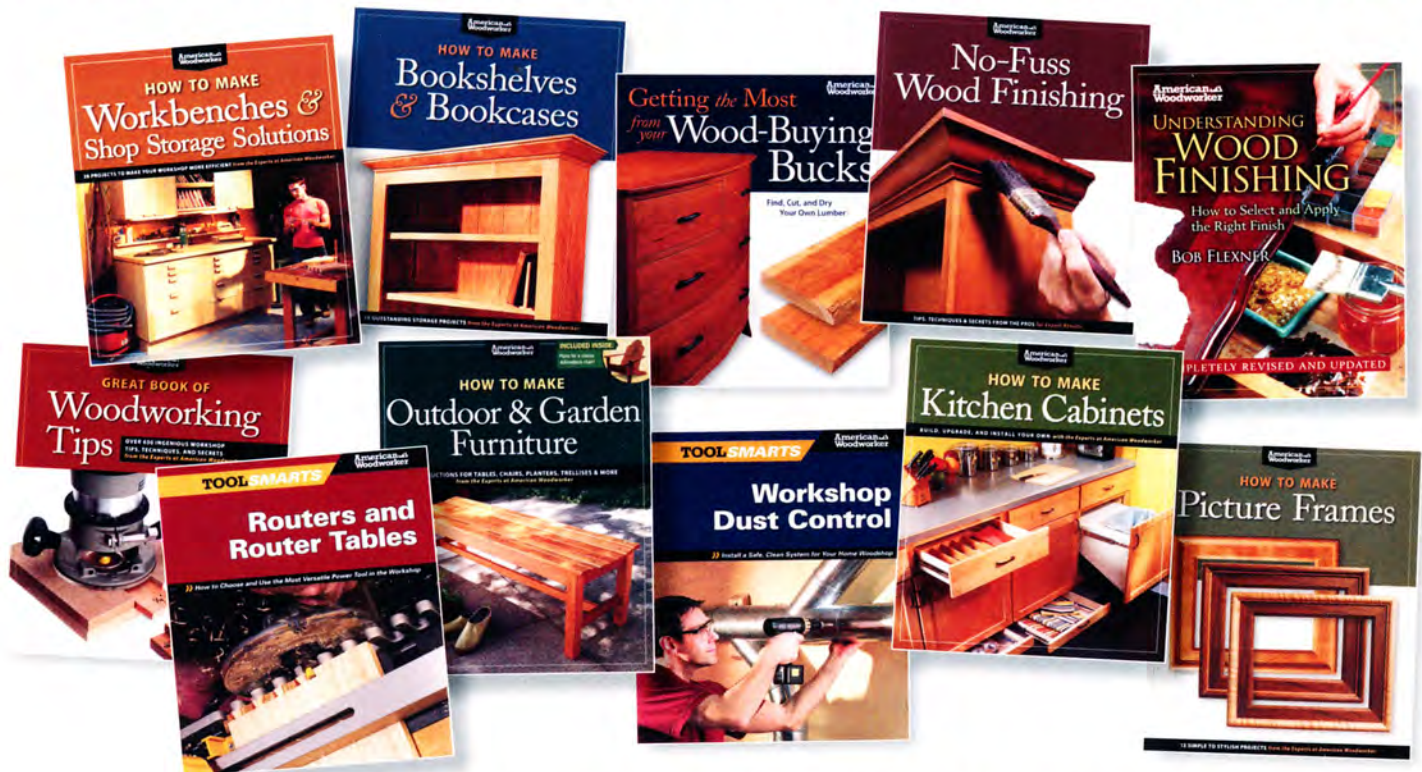
After removing the old cabinets and installing the new ones, I stepped back to admire my handiwork. Meanwhile, my wife began moving the countertop appliances back into place. Unfortunately, none of them would fit under the new cabinets. I couldn't figure out what had happened, because I'd followed the directions and used the dimensions given in the book. Then I measured the cabinets I'd removed. They were 2" shorter than my new ones.

Jonathan Lipscomb

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