ISSUE 214 OCTOBER 2012

Better Homes and Gardens®

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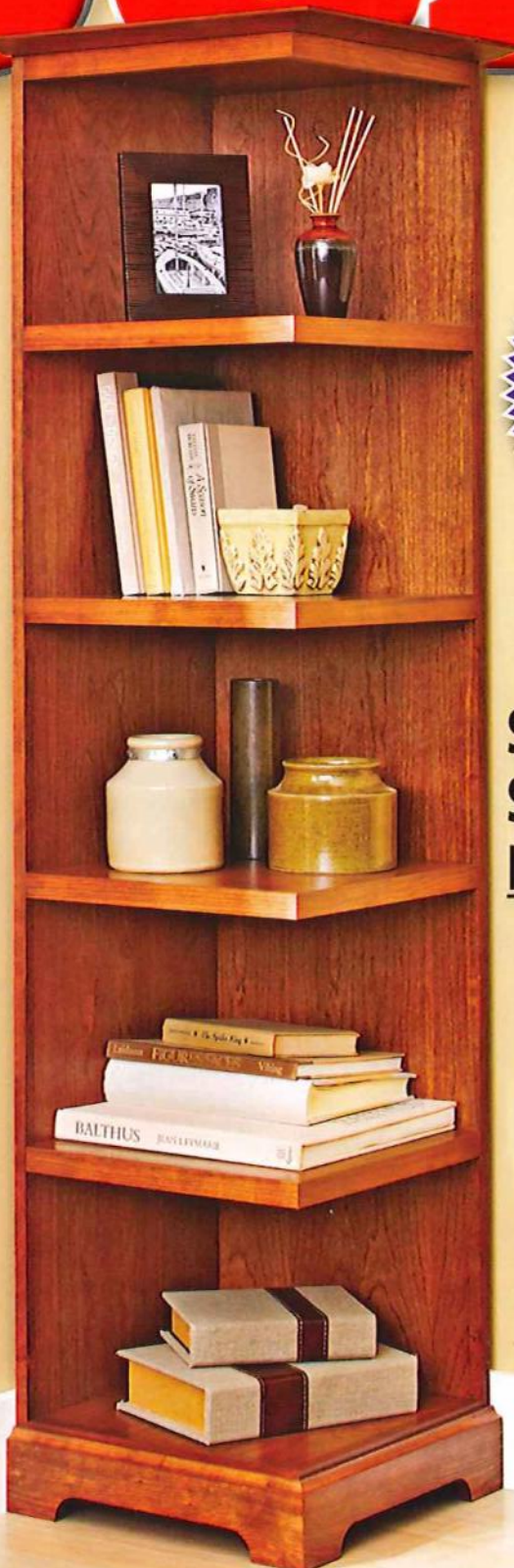
The World's Leading Woodworking Resource

50 SHADES OF BROWN: MATCH NEW STAIN TO OLD p.18

Simple, Space-saving Corner Bookcase p.32



97 Shop Tips Inside!

Plus More Great Projects

- Bow-tie Mantel Clock p.26
- All-wood iPad Case p.60
- Shop Safety Gear Cabinet p.44
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Start square. Stay square. Every project. p.64

Warm your shop this winter (and cool it next summer) p.52

Pry these hand tools from our editors' hands? Never! p.38

Choose the right casters: It's how we roll p.58

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- Motor: 1 1/2 HP, 110V/220V, single-phase
- Precision-ground cast iron table with wings
- Table size: 25 1/2" x 40" • Arbor: 5/8"
- Arbor speed: 4000 RPM
- Capacity: 3 1/8" @ 90°, 2 1/4" @ 45°
- Rip capacity: 30" R, 12" L
- Approx. shipping weight: 221 lbs.

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- Motor: 3 HP or 5 HP, 220V, single-phase
- Precision-ground cast iron table size with wings: 27" x 48"
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- Cutting capacity: 25 5/8" R, 8" L
- Max. depth of cut: 3" @ 90°, 2 1/8" @ 45°
- Approx. shipping weight: 546 lbs.

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G1023RLWX 5 HP ~~$1350.00~~ SALE $1295.00

10" CABINET TABLE SAW with Riving Knife

- Motor: 3 HP, 220V, single-phase
- Precision-ground cast iron table
- Table size with extension: 27" x 40"
- Arbor: 5/8" • Arbor speed: 4300 RPM
- Max. depth of cut: 3 1/8" @ 90°, 2 3/16" @ 45°
- Max. rip capacity: 29 1/2"
- Max. dado width: 13/16"
- Approx. shipping weight: 542 lbs.

3 HP LEESON® MOTOR!

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G0690

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10" CABINET TABLE SAW with Riving Knife & Extension Rails

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- Precision-ground cast iron table
- Table size with extension: 27" x 74 3/4"
- Arbor: 5/8" • Arbor speed: 4300 RPM
- Max. depth of cut: 3 1/8" @ 90°, 2 3/16" @ 45°
- Max. rip capacity: 50"
- Max. dado width: 13/16"
- Approx. shipping weight: 572 lbs.

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- Table tilt: 15° L, 45° R
- Cutting capacity/throat: 13 1/2"
- Max. cutting height: 6"
- Blade size: 92 1/2"–93 1/2" L (1/8"–3/4" W)
- Blade speeds: 1500 & 3200 FPM
- Approx. shipping weight: 196 lbs.

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- Motor: 3 HP, 220V, single-phase, TEFC, 60 Hz
- Precision-ground cast iron table size: 26 3/4" x 19"
- Table tilt: 5° L, 45° R
- Cutting capacity/throat: 18 1/4"
- Max. cutting height: 12"
- Blade size: 143" L (1/8"–1 1/4" W)
- Blade speeds: 1700 & 3500 FPM
- Approx. shipping weight: 480 lbs.

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BEAUTIFUL WHITE COLOR!

- Motor: 5 HP, 220V, single-phase
- Jointer table size: 14" x 59½"
- Cutterhead dia.: 3⅛"
- Cutterhead speed: 5034 RPM
- Max. jointer depth of cut: ⅛"
- Max. width of cut: 12"
- Planer feed rate: 22 FPM
- Max. planer depth of cut: ⅛"
- Max. planer cutting height: 8"
- Planer table size: 12¼" x 23⅛"
- Approx. shipping weight: 734 lbs.

NEW END-MOUNTED FENCE

CARBIDE INSERT SPIRAL CUTTERHEAD!

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G0634XP ~~$2195.00~~ SALE $2150.00

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G0633 3 KNIFE JOINTER/PLANER ~~$1995.00~~ SALE $1950.00

G0634Z SPIRAL CUTTERHEAD MODEL ~~$2450.00~~ SALE $2395.00

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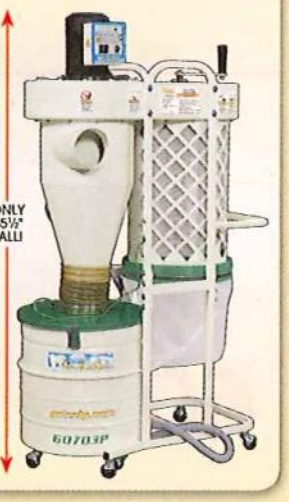
CYCLONE DUST COLLECTOR

BEAUTIFUL WHITE COLOR!

- Motor: 1½ HP, 110V/220V, single-phase, TEFC, 3450 RPM
- Air suction capacity: 775 CFM
- Static pressure at rated CFM: 1.08"
- Intake port: 6" with included 5" optional port
- Impeller: 13½"
- Height: 65½"
- Built-in remote control switch
- Approx. shipping weight: 210 lbs.

PLEATED FILTER IS PROTECTED BY A STEEL CAGE



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G0703P ONLY $725.00

8" JOINTERS

- Motor: 3 HP, 220V, single-phase, TEFC
- Precision-ground cast iron table size: 9" x 72½"
- Max. depth of cut: ⅛"
- Max. rabbeting depth: ½"
- Cutterhead dia.: 3"
- Cutterhead speed: 5000 RPM
- Cuts per minute: 20,000
- Approx. shipping weight: 500 lbs.

FREE SAFETY PUSH BLOCKS

BUILT-IN MOBILE BASE

CHOOSE EITHER 4 HSS KNIVES OR SPIRAL CUTTERHEAD MODEL

4 KNIFE CUTTERHEAD

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SPIRAL CUTTERHEAD

G0656PX ~~$1195.00~~ SALE $1150.00

$150 shipping

8" X 76" JOINTERS

- Motor: 3 HP, 220V, single-phase, TEFC, 3450 RPM
- Precision-ground cast iron table size: 8" x 76⅜"
- Infeed table size: 8" x 43⅜"
- Cutterhead knives (G0490): 4 HSS, 8" x ¾" x ⅛"
- Cutterhead speed: 5350 RPM
- Cutterhead dia.: 3⅛"
- Max. depth of cut: ⅛"
- Max. rabbeting depth: ½"
- Deluxe cast iron fence size: 36" L x 1¼" W x 5" H
- Approx. shipping weight: 597 lbs.

FREE SAFETY PUSH BLOCKS

BUILT-IN MOBILE BASE

$150 shipping

4 KNIFE CUTTERHEAD

G0490 ~~$945.00~~ SALE $895.00

SPIRAL CUTTERHEAD

G0490X ~~$1250.00~~ SALE $1225.00

15" PLANERS

- Motor: 3 HP, 220V, single-phase
- Precision-ground cast iron table size: 15" x 20"
- Min. stock thickness: 3/15"
- Min. stock length: 8"
- Max. cutting depth: ⅛"
- Feed rate: 16 FPM & 30 FPM
- Cutterhead speed: 5000 RPM
- Approx. shipping weight: 660 lbs.

CHOOSE EITHER 3 KNIFE OR SPIRAL CUTTERHEAD MODEL

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BUILT-IN MOBILE BASE

3 KNIFE CUTTERHEAD

G0453P ~~$1050.00~~ SALE $1025.00

SPIRAL CUTTERHEAD

G0453PX ONLY $1650.00

20" PLANERS

Z SERIES

- Motor: 5 HP, 220V, single-phase
- Precision-ground cast iron table size: 20" x 25¾" (20" x 55½" w/ extension)
- Max. cutting height: 8"
- Max. cutting depth: ⅛"
- Feed rate: 16 & 20 FPM
- Cutterhead dia.: 3⅛"
- Cutterhead knives: 4 HSS (G0454)
- Cutterhead speed: 5000 RPM
- Approx. shipping weight: 920 lbs.

2 SPEEDS!

BUILT-IN MOBILE BASE

4 KNIFE CUTTERHEAD

G0454 ~~$1575.00~~ SALE $1550.00

SPIRAL CUTTERHEAD

G0454Z ~~$2495.00~~ SALE $2450.00

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10" DRUM SANDER

- Motor: 1½ HP, 110V, single-phase
- Conveyor motor: 1/10 HP
- Drum speed: 2300 FPM
- Drum size: 5⅛" x 10"
- Max. sanding width: 10"
- Max. workpiece height: 3"
- Min. workpiece height: ¼"
- Variable feed speeds: 1–10 FPM
- 4" dust port
- Approx. shipping weight: 220 lbs.

WHEELS & STOWABLE TRANSPORT HANDLES FOR MOBILITY

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G0716 ~~$415.00~~ SALE $395.00

1 HP WALL MOUNT DUST COLLECTOR

- Motor: 1 HP, 110V/220V, single-phase
- Amps: 14/7 • Intake size: 4"
- Bag size (dia. x depth): 13½" x 24"
- Balanced steel, radial fin impeller
- Air suction capacity: 450 CFM
- Max. static pressure: 7.2"
- Approx. shipping weight: 51 lbs.

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G0710

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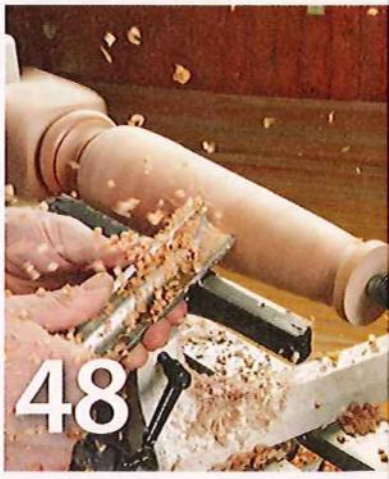

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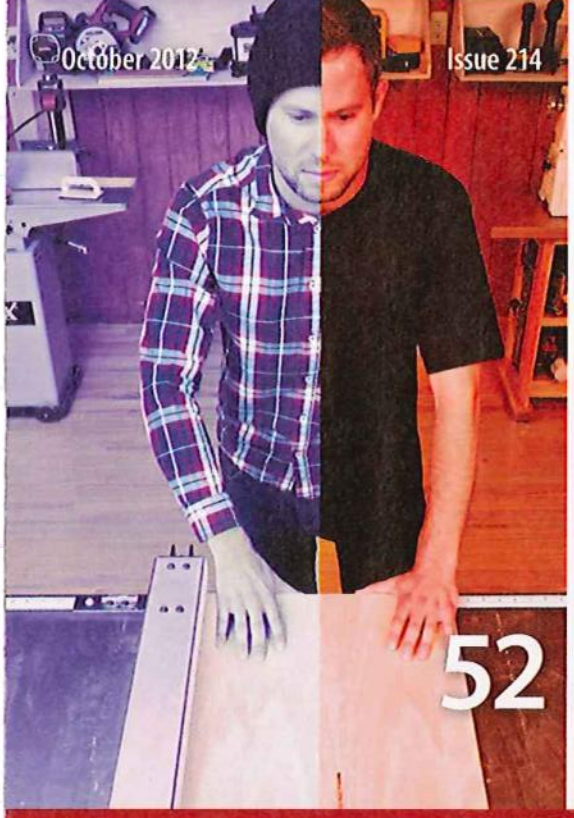

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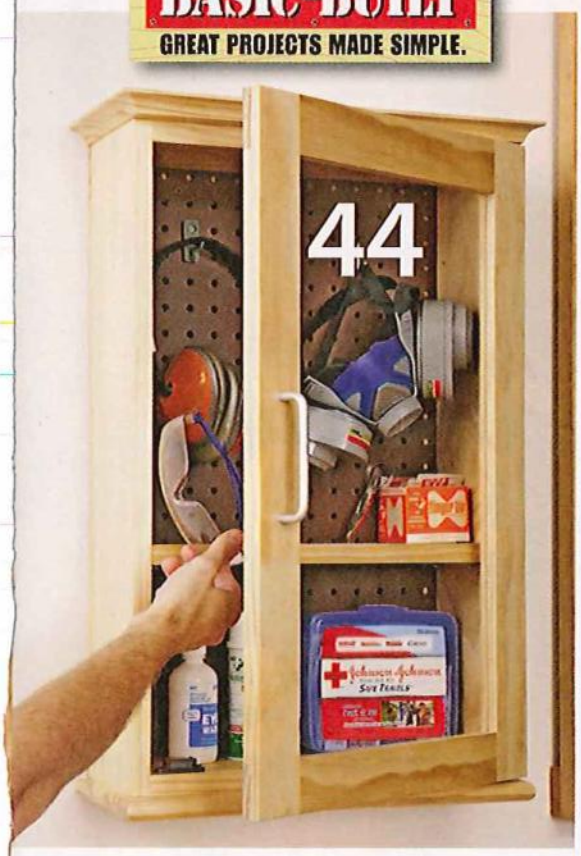

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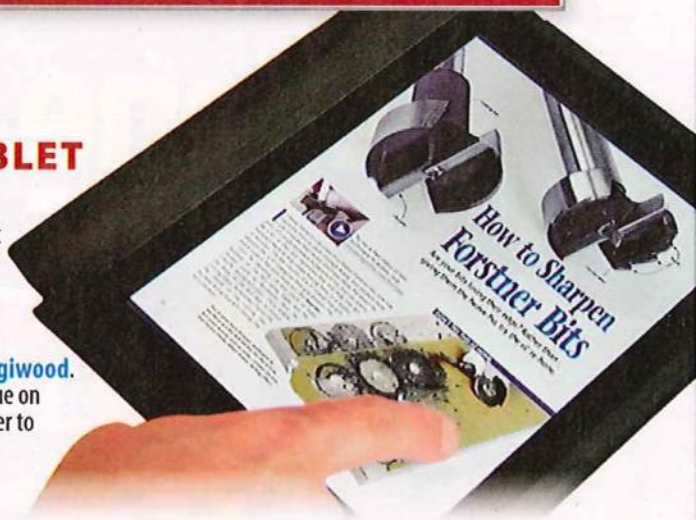

GEAR-UP FOR GIFT-MAKING AND GIVING

Before tackling the list of holiday to-do's, tune-up your shop with *WOOD*'s **Awesome Autumn Giveaway**. A new FREE shop project plan, tips, and more every week from Sept. 3–Oct. 10, 2012. Learn more at woodmagazine.com/awesomeautumn

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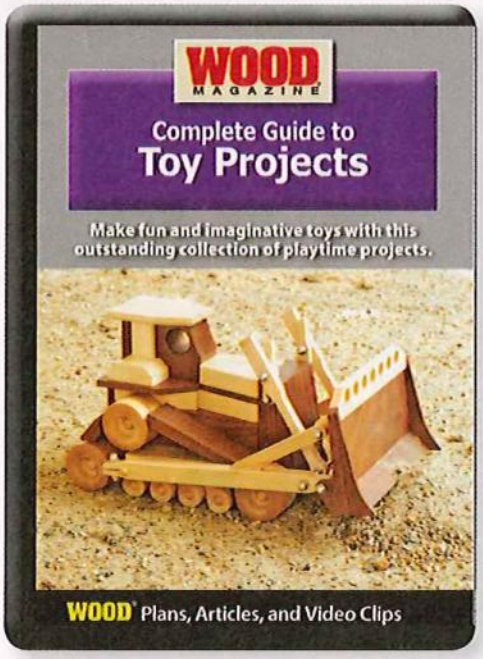

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Marlen designed and built this Greene and Greene-style TV stand out of African mahogany and ebony. He used smoked glass for the doors.

Lucas built three raised vegetable beds out of pressure-treated lumber lined with plastic. Each planter has a drip line for easy watering.

Bob made this wenge and spalted ash keepsake box for a gift.

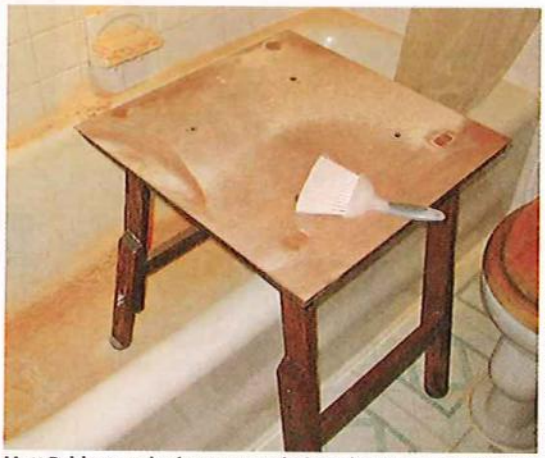
Sounding Board

Our bulletin board for letters, comments, and timely updates

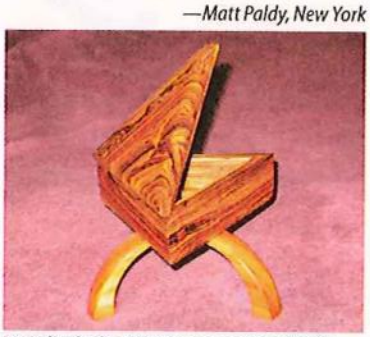
Commode "shop" far from commodious

Life in a New York City studio apartment can get a little cramped. But resourcefulness and woodworking go hand-in-hand, and I've found a way to pursue this rewarding hobby—in my bathroom. Using a "workbench" that straddles the tub (shown at *right*) and assorted benchtop tools I carry in and out as needed, such as the bandsaw shown *below right*, I've successfully built several projects. Obviously, cleanup is a big chore, but it makes me feel great that I can build something if I want to. Besides, woodworking makes a great antidote to the stress of living in a big city!

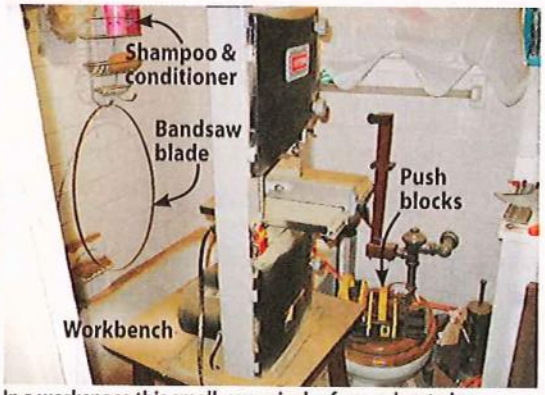
—Matt Paldy, New York



Matt Paldy spends about as much time cleaning as working in his tiny New York City studio apartment bathroom/workshop.



Matt built this Mexican rosewood and Brazilian cherry triangle jewelry box.



In a workspace this small, every inch of space has to be maximized. Benchtop tools, like this bandsaw, fit the bill.

A fellow woodworker on wheels

Thank you for the article "Woodworking on Wheels" in issue 206 (September 2011), showcasing wounded veteran Chuck Isaacson's entry into woodworking in a wheelchair. Three years ago, I underwent a surgery that left me paralyzed from the waist down. Unlike Chuck, I had been woodworking for years and now had to convert an existing shop to fit my needs. Your article reads like a bible for woodworkers with similar obstacles to overcome. Please include more articles like this one in the future.

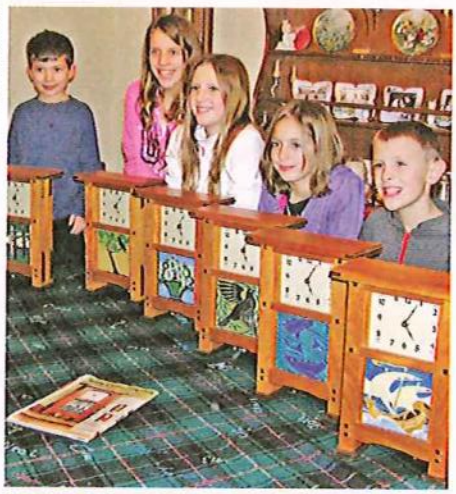
And a big 'thank you' to Chuck for his service to our country. I wish him well and encourage him to pursue his passion for woodworking.

—Charles Kroeger, Cincinnati

Super grandpa delivers!

I made six of the Greene & Greene clocks from issue 201 (November 2010) as gifts for my grandchildren. I invited the kids to choose their own Motawi tiles from the company's Web site (motawi.com). They picked different designs, so each clock looks unique.

—Mark Heatwole, Annandale, Va.



Article Update

▶ Issue 194 (November 2009)

In the article titled "Dovetailing Wide Panels" on page 38, the description of the clamping process should read "Clamp the test boards to opposite sides of the spacer block, *with their outside faces out*, and tighten to the underside of the template."

HOW TO REACH US

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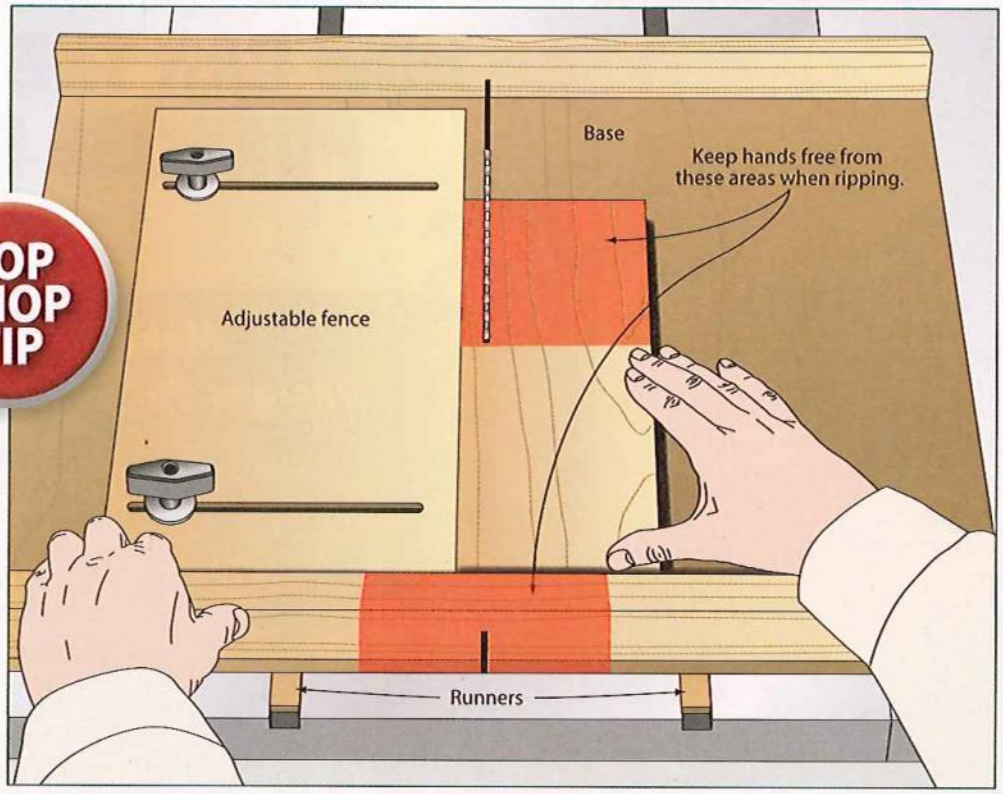
Sled slices skinny strips safely

Ripping thin strips on a tablesaw makes me nervous and sometimes the strip falls back into the blade, scarring the strip. Ironically, I found a ripping-good solution in my crosscut sled with the addition of an adjustable fence, as shown.

To rip strips, simply adjust the sled's fence to the width of the needed strip, butt the blank against the fence, and make a pass. Push the sled completely past the blade, remove the strip from the sled, and repeat for the next strip.

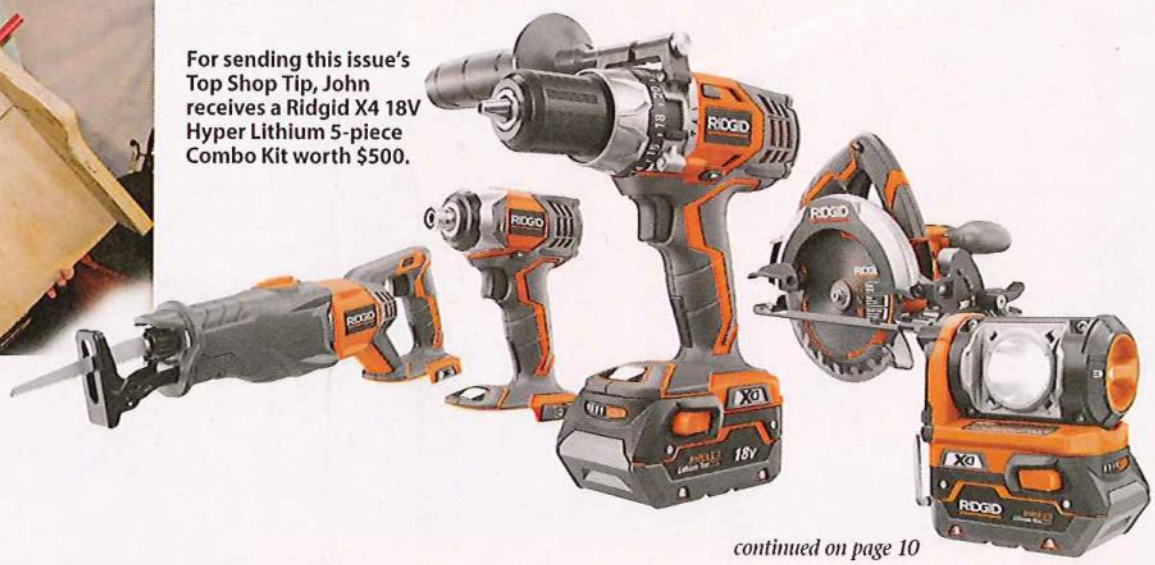
—John Powell, Houston

TOP SHOP TIP



Evin Thayer Studios Inc.

For sending this issue's Top Shop Tip, John receives a Ridgid X4 18V Hyper Lithium 5-piece Combo Kit worth $500.



continued on page 10

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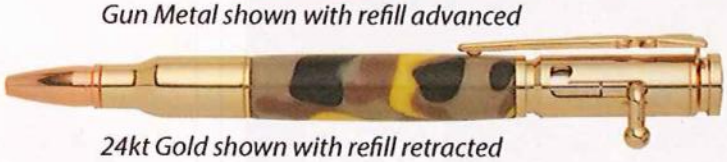
Gun Metal shown with refill advanced



24kt Gold shown with refill retracted

	Item #	1-4	5-24	25-49	50+
Chrome	#PKCP8010	$12.95	$12.05	$11.15	$10.25
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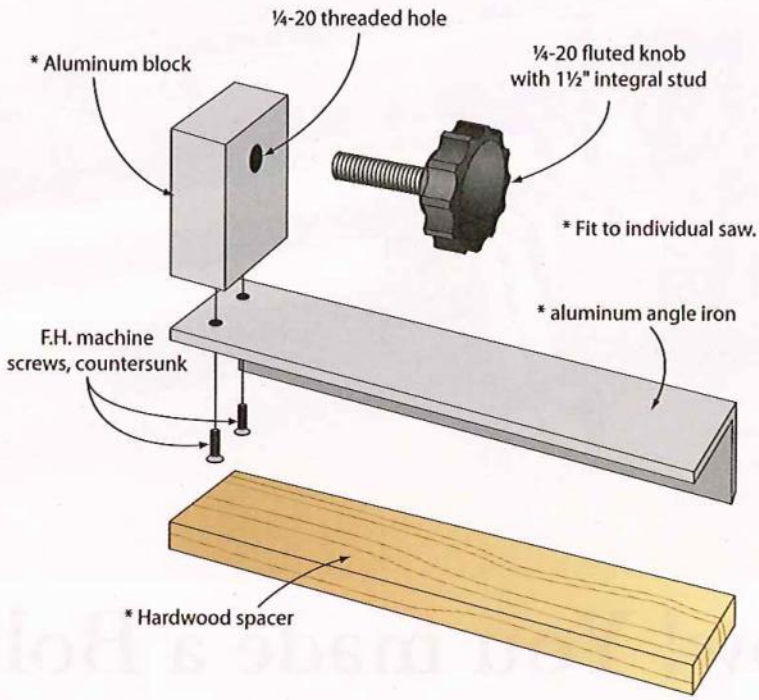
Shop Tips

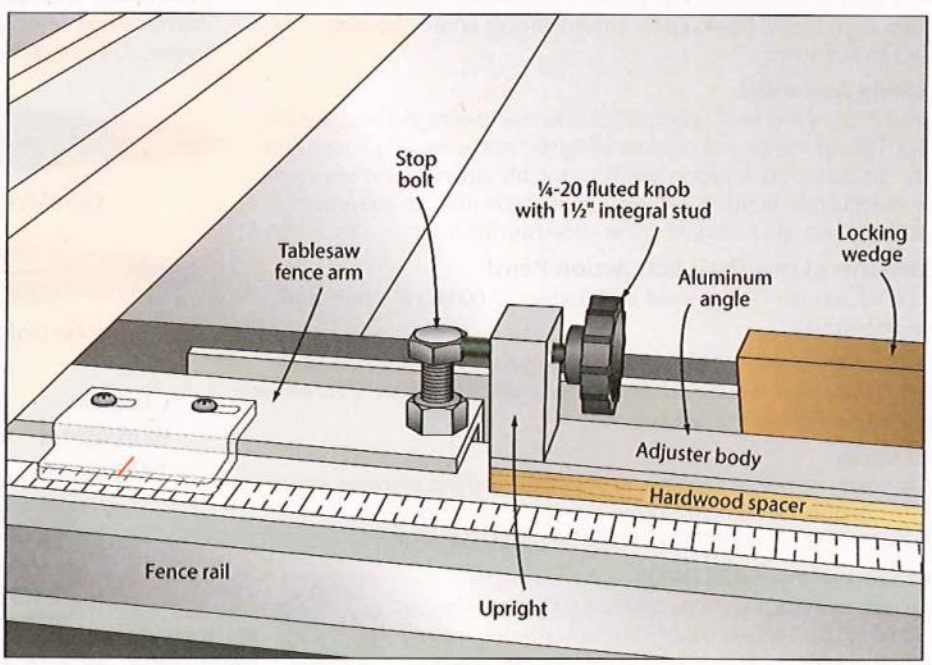
Adjuster nudges fence for dead-on cuts

I got tired of playing "taps" to make fine adjustments to my tablesaw's rip fence, so I built this adjuster to dial it in precisely. I first drilled and tapped a hole in the fence arm and installed a stop bolt in it to act as a bearing surface for the microadjuster. Then, I made the adjuster, shown *below*. I used a ¼"-20 stud (#3GDX3, $3.70, 800-323-0620, grainger.com) to give me finer control.

When I need to make a fine adjustment to the fence location, I drop the adjuster between the fence rail and table top, butt it against the stop bolt, and then secure it by tapping a wedge where shown. Now I unlock the fence and turn the knob clockwise to nudge it closer to the blade. A half-turn of the knob gives me 1/40" adjustment.

—Jim Anderson, Kalamazoo, Mich.



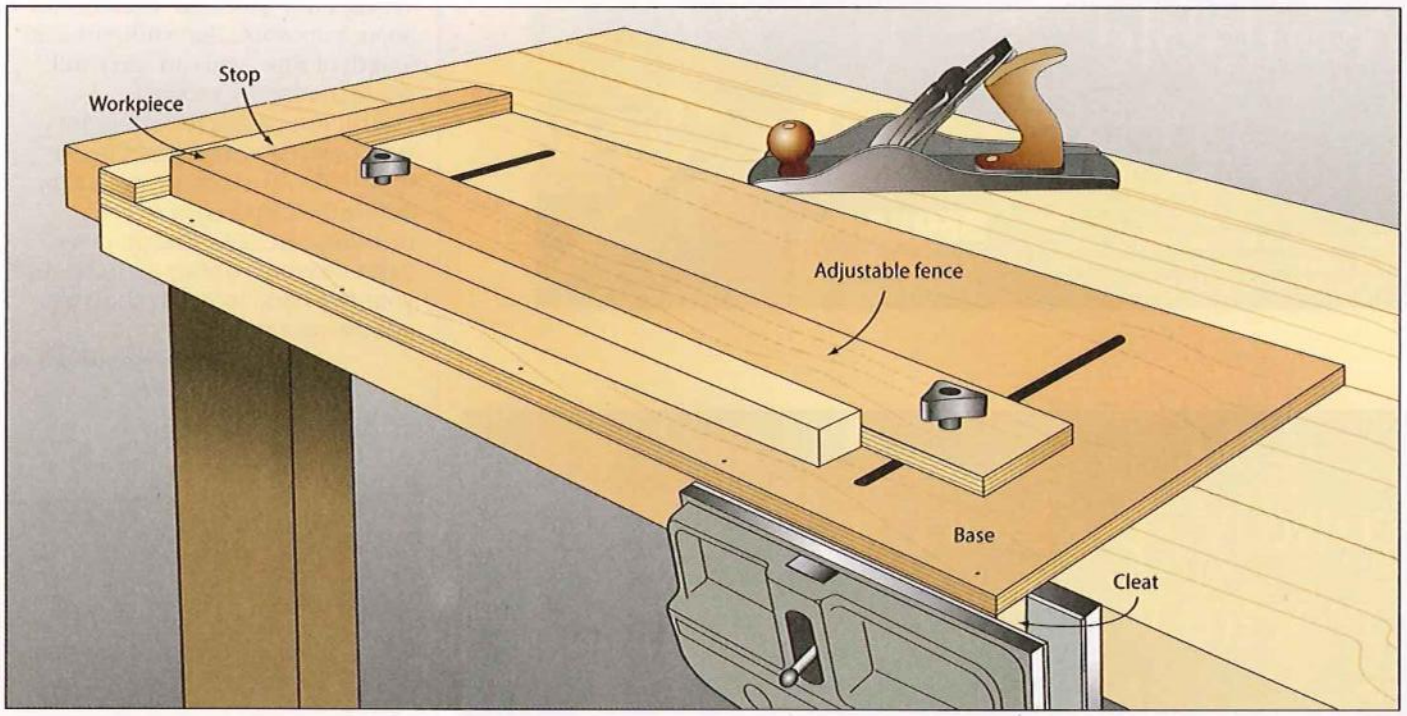


Benchtop catcher stops the slide

Because my workbench lacks dog holes, I always found myself needing to clamp a stop block to the edge of the bench while hand-planing boards. But long or wide pieces still shifted side to side while I worked them, so I made this adjustable benchtop holding jig to keep those pieces firmly in place—and it only requires a bench with a vise.

To use it, simply clamp the jig's base cleat in your bench's vise and adjust the fence to match the width of your workpiece.

—Charles Mak, Calgary, Alta.



continued on page 12

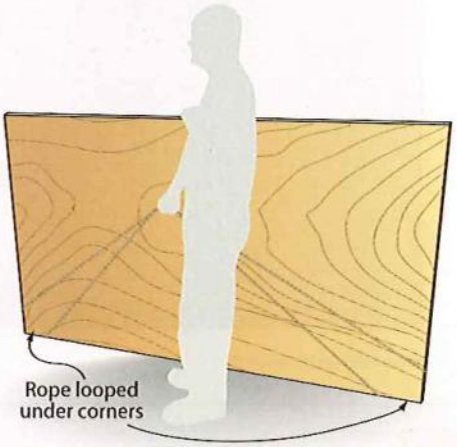
Shop Tips

Rope trick helps haul the goods

Without someone to help, maneuvering sheet goods can become just about impossible. But with just a 20' length of rope, you can carry full sheets around by yourself.

First, form a loop by tying the rope's two ends together. Slip the rope under two corners, as shown. Adjust the loop height so your carrying arm locks straight down (with no crook) during carrying. Use your free hand to steady the panel against your shoulder.

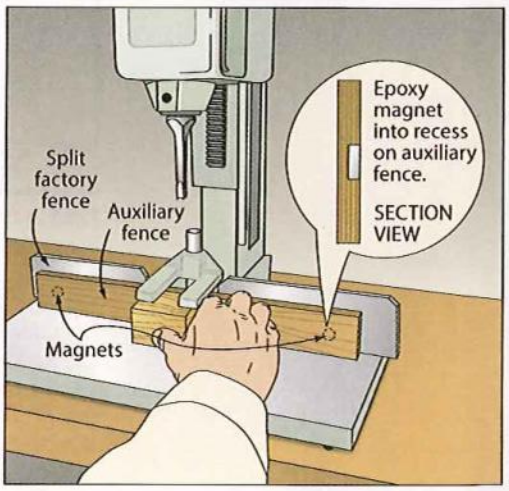
—John Cusimano, Lansdale, Pa.



Magnetic fence closes the gap

The split fence on many mortisers leaves a gap where small pieces aren't supported. This scrapwood auxiliary fence quickly attaches to the factory fence with recessed magnets, and, when not in use, sticks to the mortiser where you'll have no trouble finding it.

—Charles Mak, Calgary, Alta.

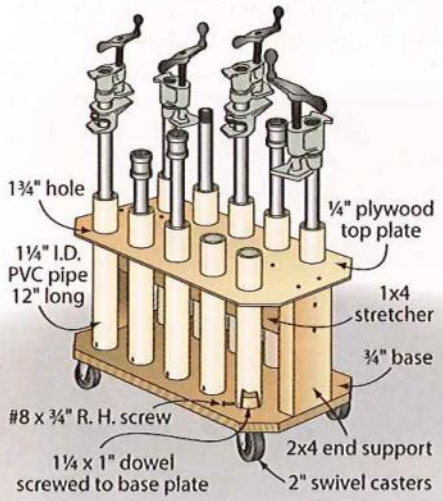


Come-along clamp caddy

I depend on my pipe clamps for most projects, which means I constantly have to move them around the shop (or trip over them). The simple caddy I built makes moving and storing those heavy clamps easy.

I built mine for 24" clamps, but you can resize all the parts to accommodate longer (or more) clamps. The lengths of 1¼" I.D. PVC pipe slide through the holes in the top and fit over 1¼×1" dowel attached to the base with screws. After securing the pipe to the dowel with screws and attaching casters, your pipe-clamp caddy will be ready to roll.

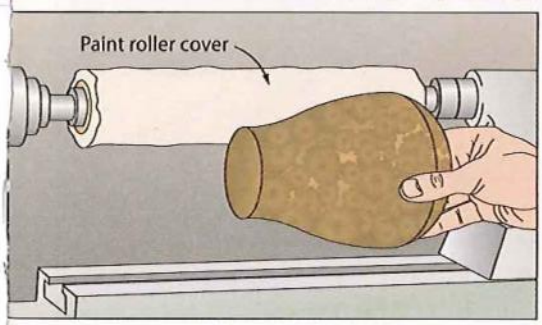
—John Fiorani, Winston-Salem, N.C.



Skip the workout, get projects buff at the lathe

I've discovered a quick and almost effortless alternative to hand-buffing a finish on my projects. Find or turn a dowel that matches the inside diameter of a lambswool paint roller cover, mount the dowel between centers on your lathe, and fire it up. Apply paste wax or buffing compound to the roller and give your project a high shine.

—Tony Finlay, South Penrith, New South Wales, Australia



continued on page 14

Shop Tips

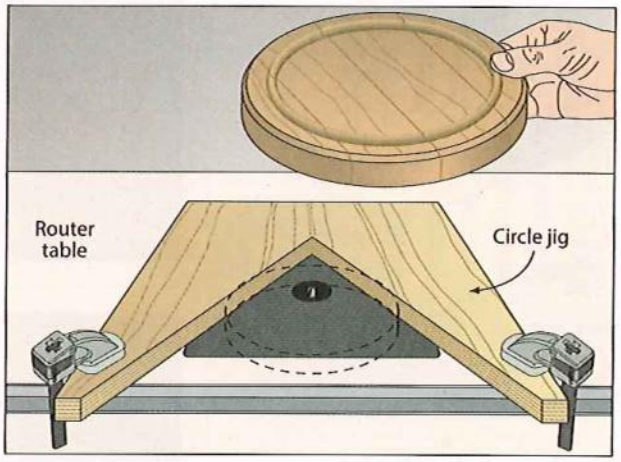
Come full circle with this groovy jig

After making a round cutting board, I decided to add a "juice" groove to keep juices from dripping onto the countertop. But making a consistent groove circling the workpiece had me stumped. This easy-to-build router table jig did the trick.

Install a round-nose bit in your router table. From a scrap of plywood, make a jig similar to the one shown. Place it on the router table so the distance between the bit and the edge of the triangular cutout equals the distance of the groove from the edge of the cutting board. With the jig located, clamp it to the router table.

To rout the groove, rest the cutting board over the bit and against both edges of the jig. Carefully lower the workpiece atop the spinning router bit and slowly turn the workpiece, keeping its edges in contact with the inside edges of the triangular cutout. The jig also works well for using non bearing-guided bits to edge-profile circular workpieces.

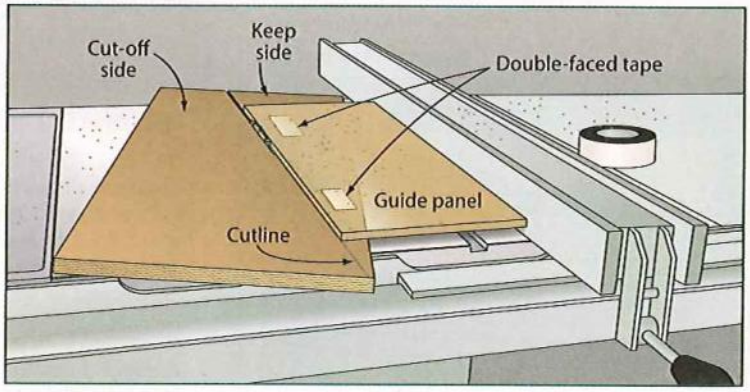
—Bob Galbraith, Tijeras, N.M.

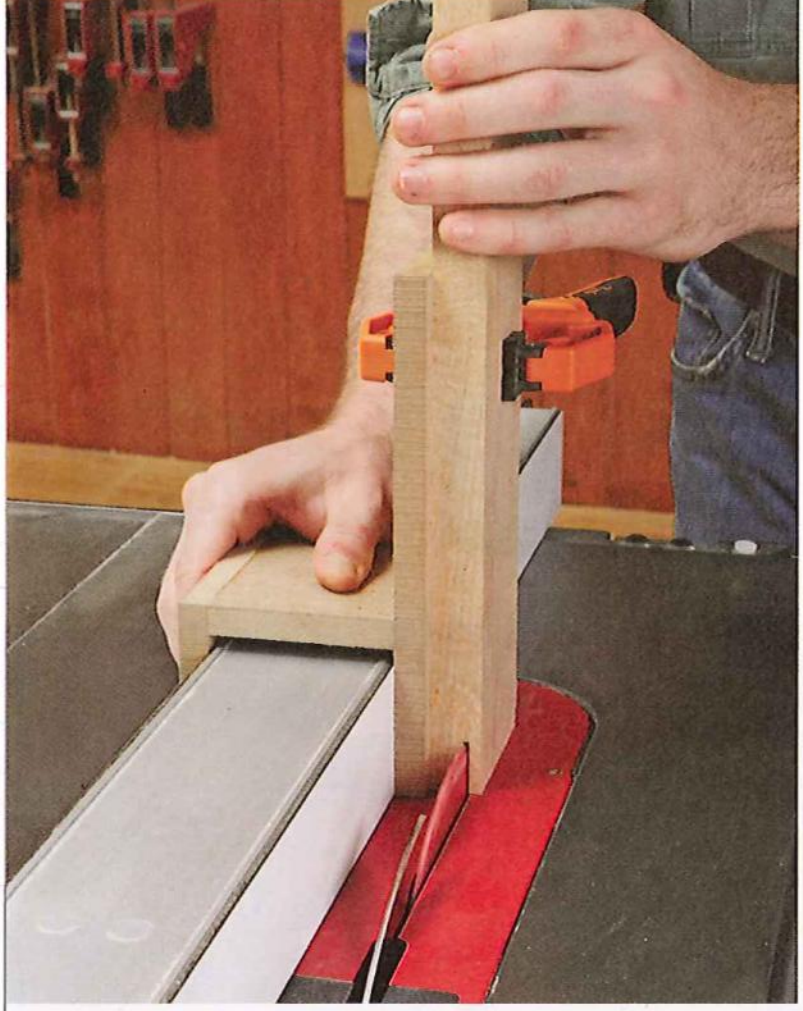


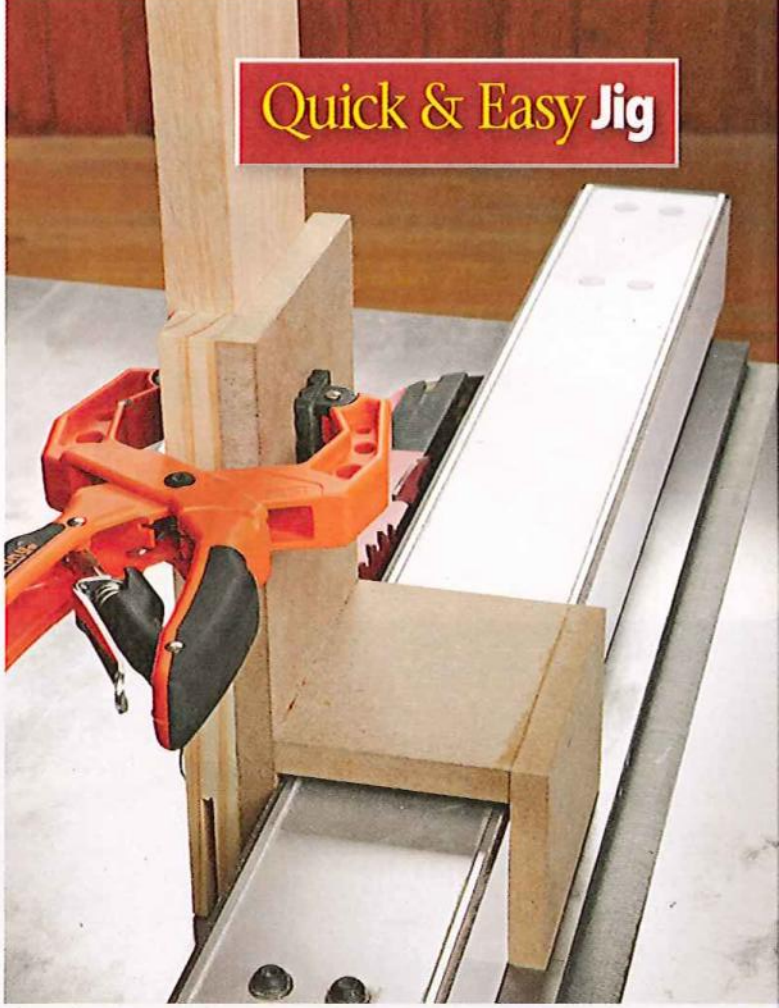
Guide panel makes for easy tablesaw tapers

Instead of reaching for a circular saw to taper a large workpiece, cut it on the tablesaw with this easy trick. After marking the cutline on your workpiece, cut a guide panel from MDF or plywood, making sure it's wide enough to overhang, as shown. Without moving the rip fence, adhere the guide panel to the workpiece along the cutline with double-faced tape. Then, run the panel along the fence to make the cut.

—Serge Duclos, Delson, Que.





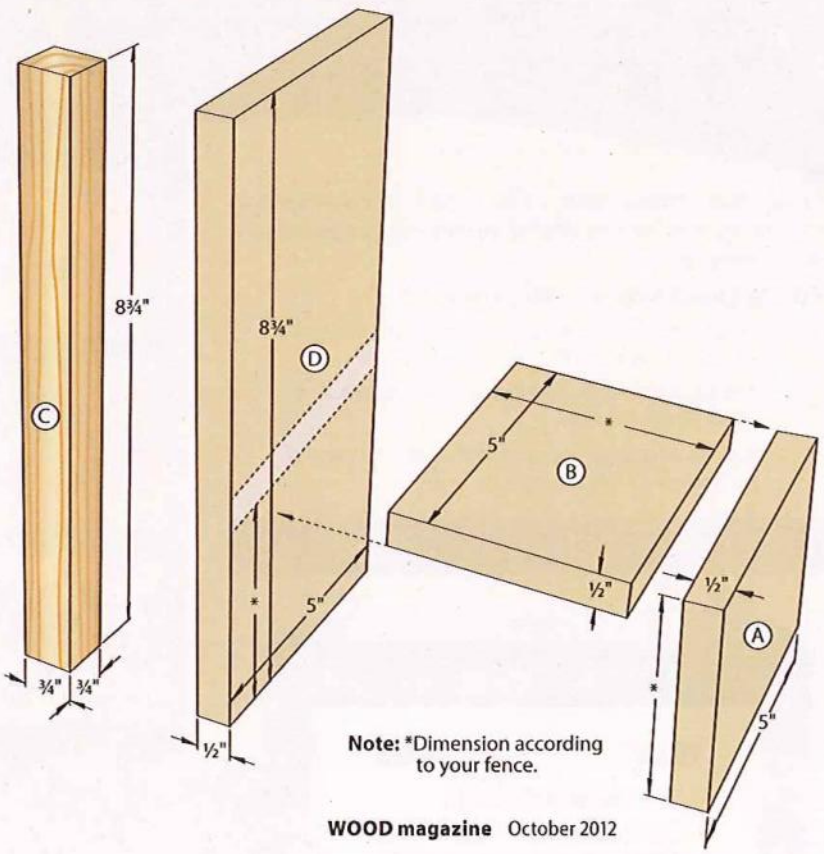


Tall-Parts Tablesaw Saddle

This simple fence-riding jig makes safe and accurate work of cutting upright project parts. You can use it to cut the beveled top of the Bow Tie Clock on *page 26*, the half-lap joints in the Safety-Gear Cabinet doors on *page 44*, and to machine tenons. We opted for MDF to minimize seasonal swelling and shrinking, which can make the jig pinch the rip fence or fit sloppily.

To build the jig, first size the outside face (A) to match your saw's fence height, plus ½"—the thickness of the top (B). (Add additional clearance if the top of your rip fence has bolt heads or other obstructions, as ours did.) Add 1/32" to the width of the rip fence to determine the width of the top. The scrapwood backer (C)—glued to the inside face (D)—keeps the workpiece standing square during machining and prevents blowout. Glue and screw MDF parts together.

To use, simply fit the saddle jig over your tablesaw's rip fence—backer to the rear. Clamp the workpiece snugly against the backer, adjust the fence location and blade height; then make the cut.



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- Max Torque: 800 in.-lbs. (Impact Mode)
- Charging time: 30 Minutes
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Porter-Cable 12V Max Compact Lithium 2-Tool Kit

- Voltage – 12V Max V
- Drill/Driver Specs:
  Torque – 200 in.-lbs.
  RPM – 1,200 RPM
  RPM (High Torque) – 315 RPM
- Battery Type – Lithium-Ion
- Impact Driver Specs:
  Torque – 950 in.-lbs.
  RPM – 2,500 RPM
  Blows/Min. – 2,600 BPM

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Match new stain to old wood

Blending oil stains to match a previously stained surface requires trial and error, but by learning some simple techniques, you can reduce the error part. Use these stain-matching tips to replace broken or missing parts, or to make new furniture match existing furniture or trimwork.

Spin the wheel of finish

Let's say you want to match a new oak table to an existing baseboard. You must first determine which colors went into the baseboard.

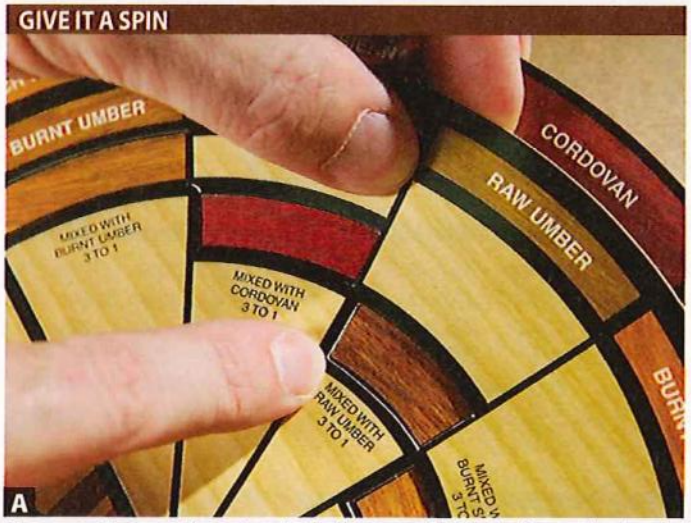
Start with a finisher's color wheel **[Photo A, Source]**. This handy tool represents common pigments such as umber, cordovan, sienna, and ochre—fancy names for brown, red, orange, and yellow. These colors are printed on the rim of the inner wheel, and again on the outer wheel. When you line up different pairings on the rims, small windows in the inner wheel show how the blend creates a third color.

The windows might reveal several blends that come close to your target. If one looks too light and the other too dark, choose the lighter one, because you can darken stain more easily than lighten it. For our example, cordovan and raw umber blend for a good start.

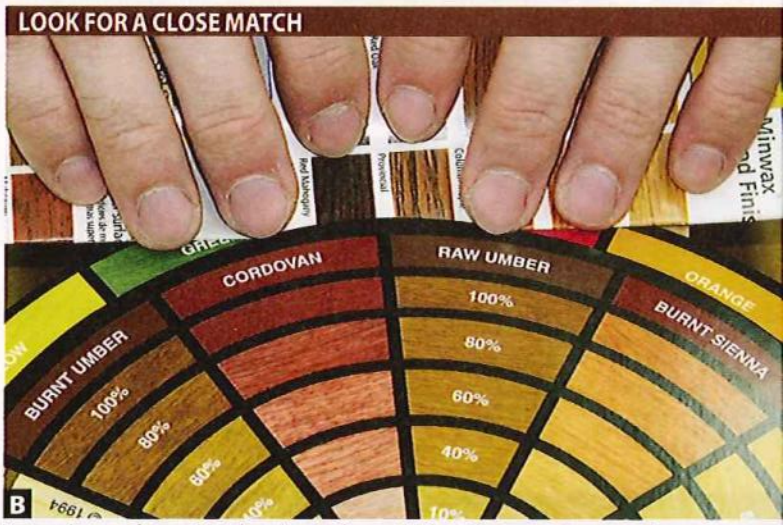
Now, decide which off-the-shelf stains come closest to the cordovan and umber. Pick up stain palettes **[Photo B]** at a home center to narrow the options, keeping in mind that the grain or color of your project wood may affect your results.

In this case, a stain named Red Mahogany is awash in cordovan, and Early American or Provincial might provide enough umber. If you're not sure which stain colors you need, you can save money by buying half-pint sizes rather than quarts.

Quick tip: *Some manufacturers sell inexpensive stain samples the size of ketchup packets perfect for experimenting.*



Line up cordovan on the outer wheel with raw umber on the inner wheel, and you'll see in the window approximately how they mix.



Test stain samples against the wheel colors to find similar tones. Be aware that manufacturers' palettes often show overly dark colors and small images.

continued on page 20

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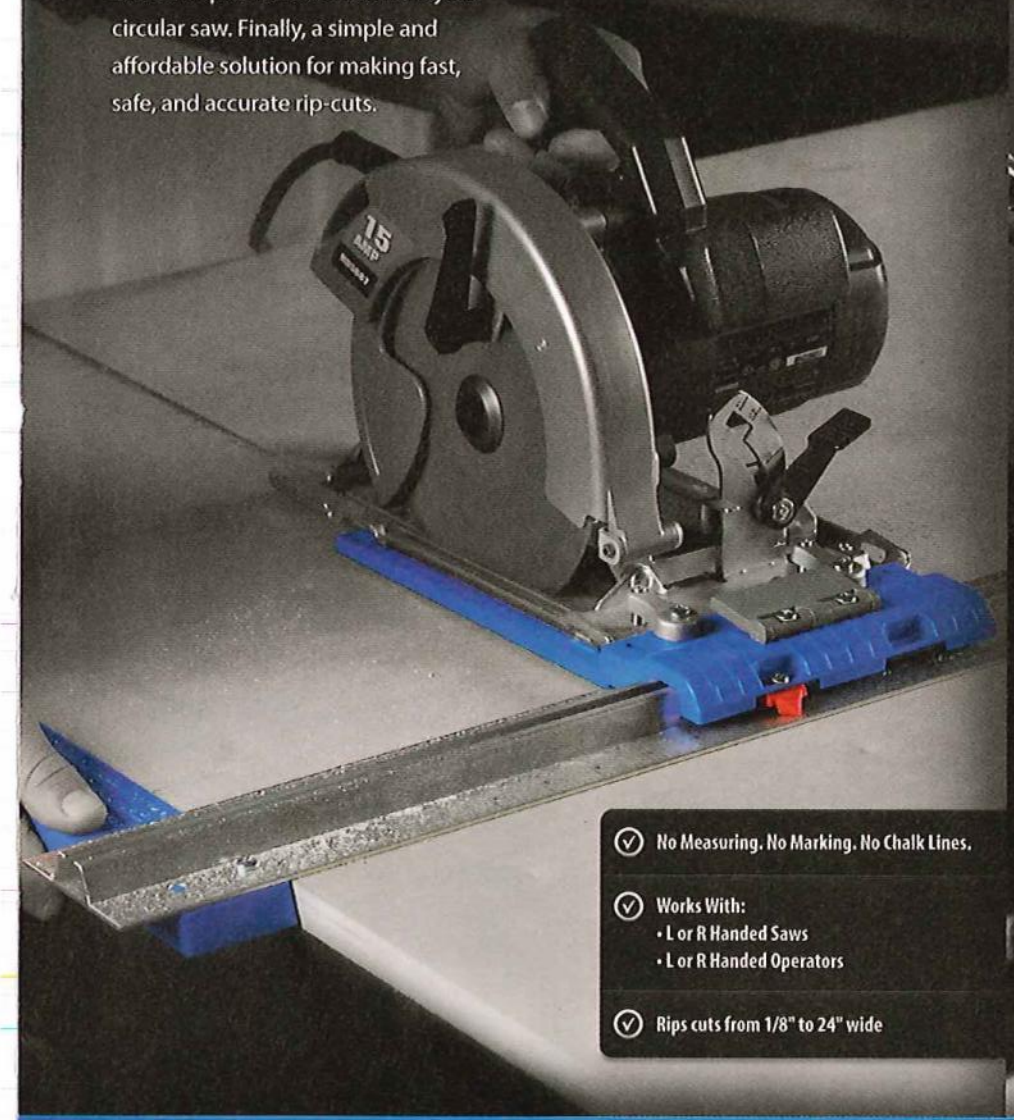

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Factor in the variables

As you prepare to mix and test, keep these tips in mind:

- For consistency, test on a scrap of the same wood—and sanded to the same grit—as your project.
- Before blending, stir each stain well to get all the pigment into suspension.
- Let your test samples dry fully. What initially looks spot-on can appear different a few hours later.
- Apply a topcoat to the test samples, keeping in mind that your choice of finish will affect your results. For example, adjust the stain color to allow for the ambering from shellac or oil-based polyurethane; even crystal-clear finishes will alter the stain's final color.

Measure, mix, repeat

1 Mix the stains in a clean container, starting with a 1:1 ratio. Begin with small amounts—a little stain goes a long way **[Photo C]**. Adding a spoonful at a time gives you repeatable ratios while minimizing waste, especially if you have to start over a time or two.

2 Record each addition so that you can duplicate it, whether in a larger batch now or another in the future.

3 Test the mix on a sample board, referring to the color wheel to see if a particular color is lacking **[Photo D]**.

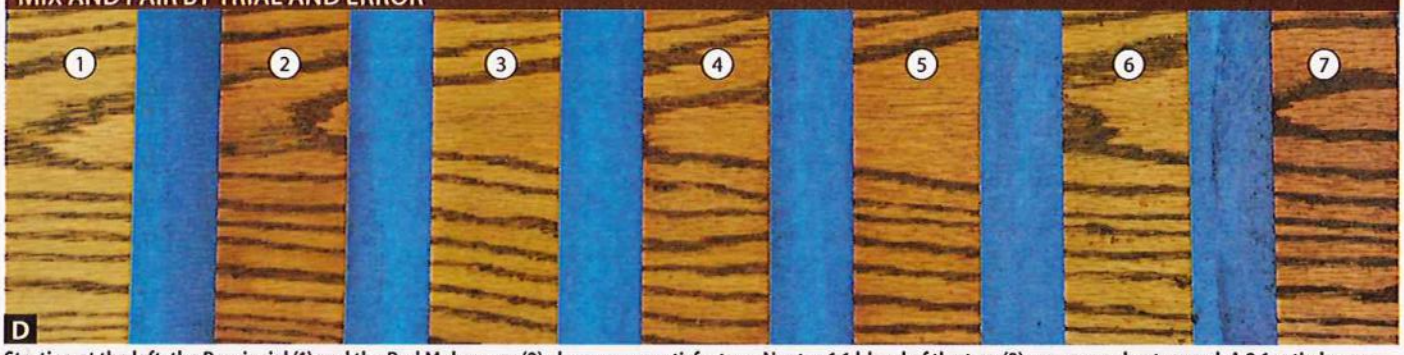
4 Add one unit of a color at a time, testing after each addition. Don't fret if you don't hit your target color right away—even the paint-store professionals who do this for a living expect a custom stain to require a dozen or more tries.

KEEP IT SIMPLE

C

Measure with whatever gives you easy, repeatable results: spoons, oral syringes, or eyedroppers for test batches, and bathroom cups for large batches.

MIX AND PAIR BY TRIAL AND ERROR



D

Starting at the left, the Provincial (1) and the Red Mahogany (2) alone are unsatisfactory. Next, a 1:1 blend of the two (3) comes up short on red. A 2:1 ratio heavy on Red Mahogany (4) still lacks saturation. Bumping it to 3:1 looks better (5), but overall the color looks weak. Adding a shot of black to darken the color (6) turns out to be a bad idea, because the black cancels out the red, leaving only brown. Finally, returning to the 3:1 ratio and selectively wiping off a heavy application after an hour (7) produces a close match.

Deeper, darker: Longer

To darken the color of the stain, try adding another coat of stain after the first has dried. Keep in mind that your results will vary, because the binders that help stain stick to wood form a mild seal coat, hindering the absorption of more stain. Or, you may darken the color by waiting to wipe off the excess. This delay deepens the color not because the color soaks in deeper (in truth, stain does its job almost immediately when you apply it), but because more of the stain's solvent evaporates, increasing the ratio of colorant to liquid.

So, if waiting darkens the color, can you go superdark by flooding stain onto the wood and letting it dry that way? Possibly. If your stain contains lots of pigment, brushing on a heavy coat and letting it dry about an hour will leave a layer of pigment solids on the wood's surface. With careful, selective blotting and wiping, you can remove some of the thickened stain while leaving more color where you want it **[Photo E]**. (If it's too dark, wipe with a rag dipped in stain. The solvents in the fresh stain soften the dried stain to more effectively remove the excess.)

Keep in mind two things, though: First, the heavy layer of pigment could obscure the wood grain. Second, be sure to spray on, not brush on, your first topcoat, because a brush and the solvents in the topcoat can redissolve the stain and muddy the finish.

Source

Finisher's color wheel: No. 17881, $19.99, Rockler, 800-279-4441, rockler.com.

Produced by **Mark Lane**
Photography: **Kent Sievers**

PATIENCE PAYS

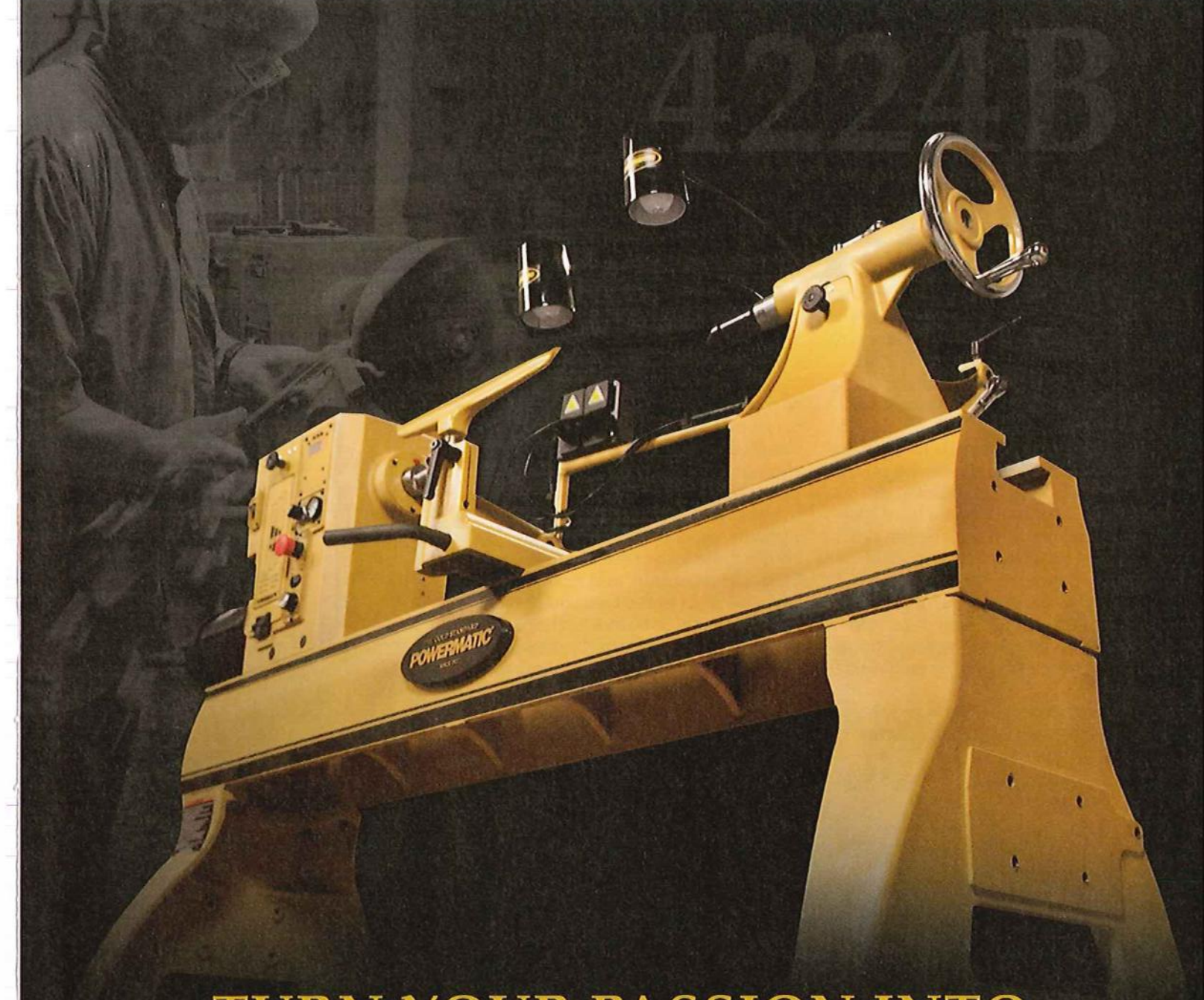
E

To darken the stain, leave it unwiped until most of the solvent evaporates. On this test board, selective wiping left more pigment in the lower left corner than in the top right corner.

Dyes vs. pigments

Oil-based stains get their colors from dyes or pigments—or both. To see the difference, brush on some stain from the top of a can that has rested undisturbed for a few days: Any coloration you see in the wood comes from dyes. But the muck you stir up from the bottom of that same can is the pigment. These heavier particles require frequent stirring to keep them from settling out of the liquid.

Dyes and pigments act differently on wood. Because dye stays dissolved in the liquid, it tends to soak into the wood. Pigment particles, though, are too large to get inside wood cells, so they sit on the wood's surface.



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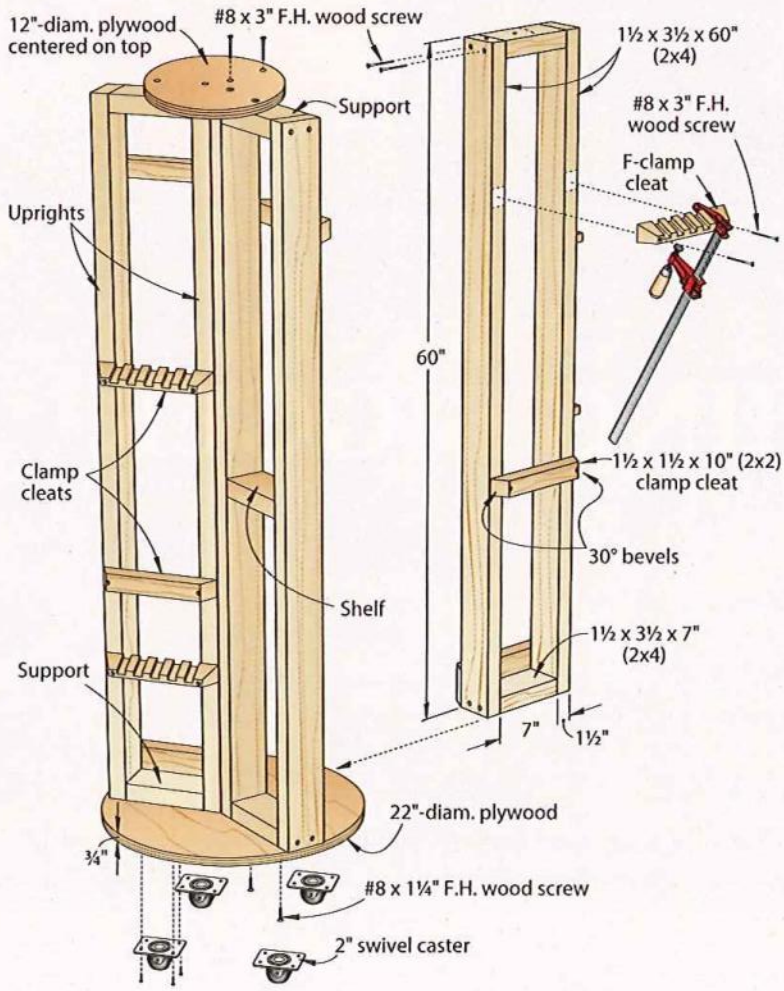
Carousel Clamp Rack

Instead of running back and forth to your clamp rack when assembling a project, bring the clamps to where you need them. This customizable mobile rack, constructed from 2x2s, 2x4s, and ¾" plywood, makes it easy.

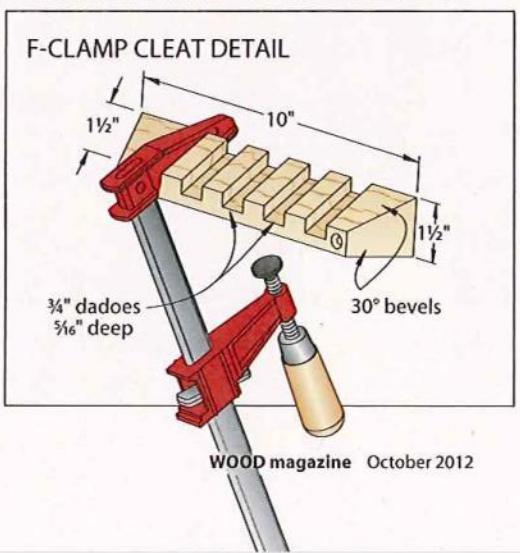
Before cutting the parts to the sizes noted on the drawing, you may want to modify the design to suit your needs. For example, if you have a lot of clamps, consider making the rack wider by lengthening the top and bottom horizontal supports, clamp cleats, shelves, and the diameter of the top and bottom plywood discs. Add about 2" in length for each additional clamp you want to add to each cleat or shelf.

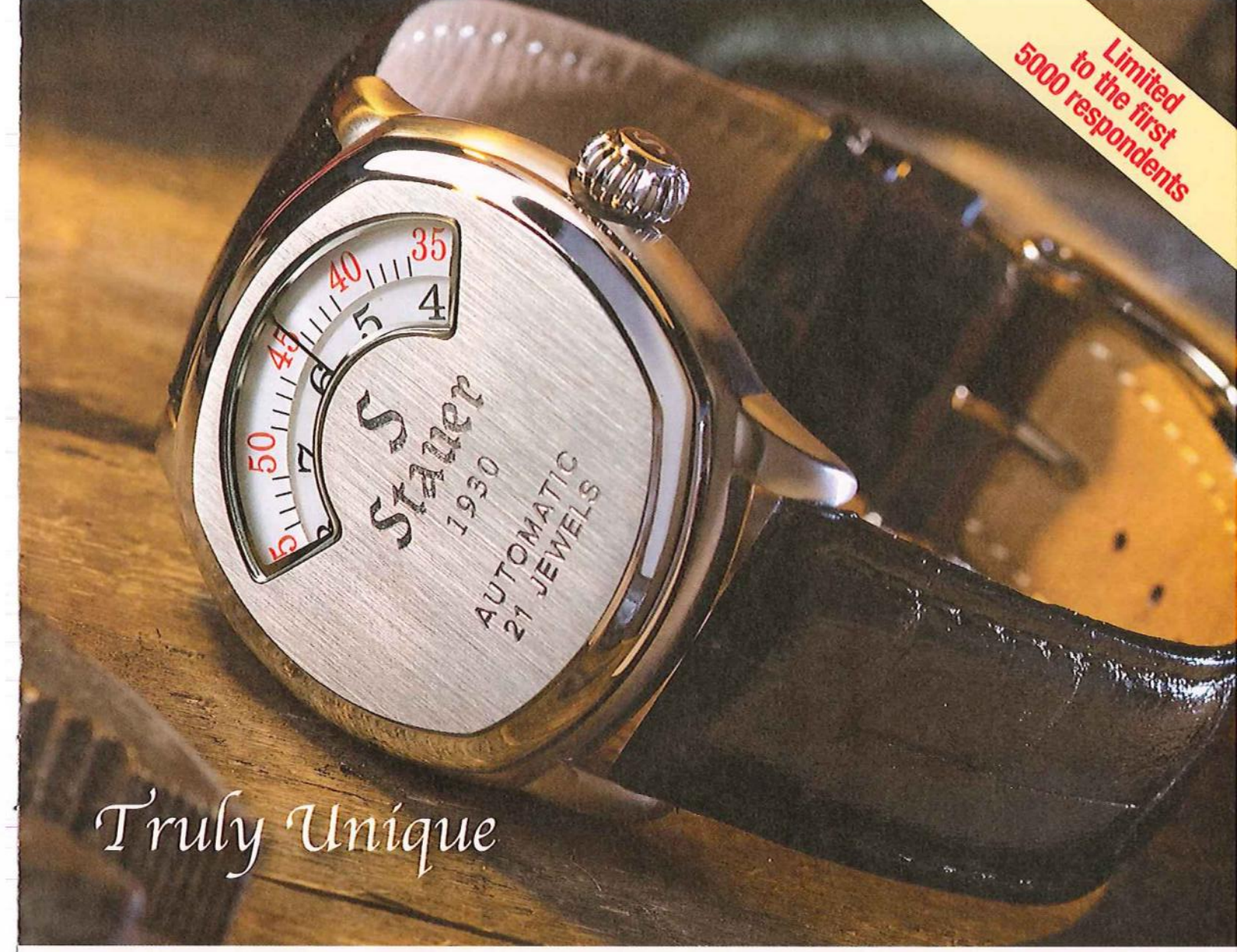
Before cutting the cleats and shelves to size, plan for which clamps will hang from each. The notched and angled cleats work great for F-style sliding-head clamps. If you own pipe clamps, simply drill 1" holes spaced 2" from center to center in the flat shelves. Protruding cleats work great for one-handed, spring, and hand-screw clamps. So the rack doesn't get tippy, build it no taller than the one shown here.

Next, cut all parts, and screw the uprights, supports, and shelves together to form the three main frames. Then, center, clamp, and screw the plywood discs to the tops and bottoms of the three frames in the configuration shown in the drawing. Finally, screw (not glue) the cleats in place; without glue you can move, remove, or add more cleats as your clamp inventory changes.



Project design: **Todd DiOrio**, Sipesville, PA
Illustrations: **Roxanne LeMoine; Lorna Johnson**





Time travel at the speed of a 1935 Speedster?

The 1930s brought unprecedented innovation in machine-age technology and materials. Industrial designers from the auto industry translated the principles of aerodynamics and streamlining into everyday objects like radios and toasters. It was also a decade when an unequaled variety of watch cases and movements came into being. In lieu of hands to tell time, one such complication, called a jumping mechanism, utilized numerals on a disc viewed through a window. With its striking resemblance to the dashboard gauges and radio dials of the decade, the jump hour watch was indeed "in tune" with the times!

The Stauer *1930s Dashtronic* deftly blends the modern functionality of a 21-jewel automatic movement and 3-ATM water resistance with the distinctive, retro look of a jumping display (not an actual jumping complication). The stainless steel 1 1/2" case is complemented with a black alligator-embossed leather band. The band is 9 1/2" long and will fit a 7–8 1/2" wrist.

True to Machine Art esthetics, the sleek brushed stainless steel case is clear on the back, allowing a peek at the inner workings.

Try the Stauer *1930s Dashtronic* Watch for 30 days and if you are not receiving compliments, please return the watch for a full refund of the purchase price. If you have an appreciation for classic design with precision accuracy, the *1930s Dashtronic* Watch is built for you. This watch is a limited edition, so please act quickly. Our last two limited edition watches are totally sold out!

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Shop Monkey
Don't be afraid... he's trained.

Hey, you! Get back into the shop!

Most days I can't wait to grab some shop time. Just me, the wood, and the tools. But sometimes I simply don't want to go there. Maybe the shop's a mess, or I'm wrung out after a day at my real job. Occasionally, I'd rather just lay in front of the TV with a good movie. No shame there; we all sometimes need a break from the things we love.

But spend too much time away from the shop—like many of us do when the weather turns nice and we'd rather be outside—and it may be difficult to rekindle your internal woodworking fire. Then, try these small motivators.

Lust for some lumber. A trip to the hardwood store can do the trick. Spend an hour or two reacquainting yourself with the beautiful grain, vivid figure, and rich textures and before long you'll rush home to the shop to dive into the next project.

Clean up—a little at a time. The most complex woodworking projects become easier when broken into smaller steps, so tidy-up a messy workspace the same way. Abide by the "rule of 5": Every time you head out to the shop, for *any* reason, put five things away. Before you know it, the shop will be back in fighting form.

Explore, enlighten. Every locale has a history, often with well-preserved homes and museums featuring furniture of a bygone era. Go. Take along a camera, notebook, and pen. Get on your hands and knees to discover (and record) how other woodworkers put their pieces together.

Nothing beats the doldrums like immersing yourself in board-dom. Shopping for wood without a specific project in mind stirs the imagination.

Choose quick and easy. If diving into a huge cabinetry or furniture project seems daunting, think smaller. Picture frames, desk organizers, and small boxes get you back in the groove in no time and will thrill a loved one as a surprise gift.

Challenge yourself. Try to build a project without using a single power tool. Or one without any metal fasteners or hardware. Break out of your woodworking comfort zone and try something crazy. Inlay. Bandsawn boxes. Veneering. Be surprised by your own capabilities.

Visit an historic village to discover the thrill of learning old-school woodworking techniques, such as coopering.

Of course, once you're back in the shop and hitting on all cylinders, remember to leave it at the end of the day! Pace yourself to keep that new-found enthusiasm burning steadily for a good long time.

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

Build this small ribbon clock from start to finish in about a day, and learn simple cold-bent lamination at the same time. (Buy the plan at woodmagazine.com/ribbonclock.)

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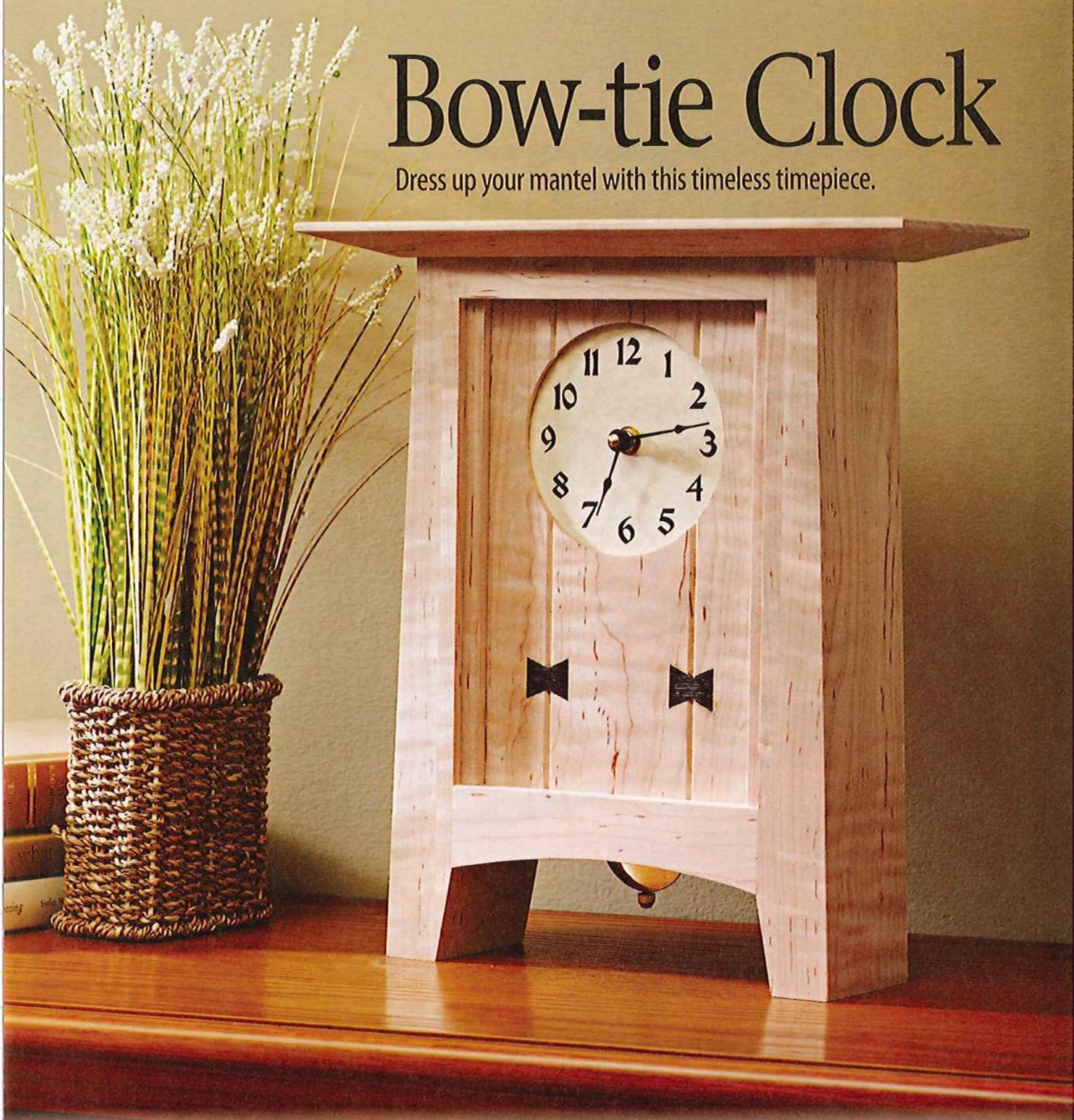
Bow-tie Clock

Dress up your mantel with this timeless timepiece.



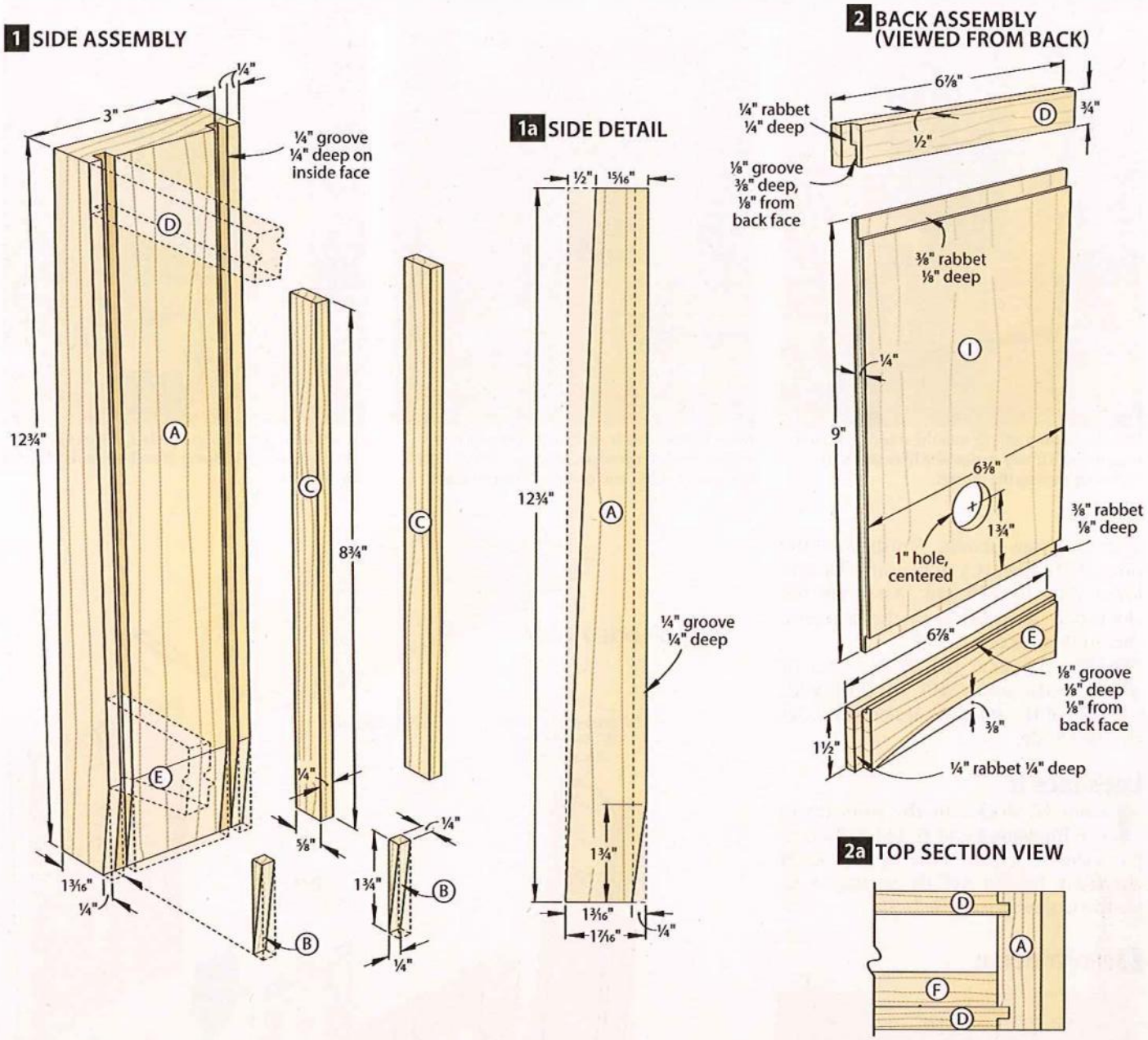
Make a case for the clock

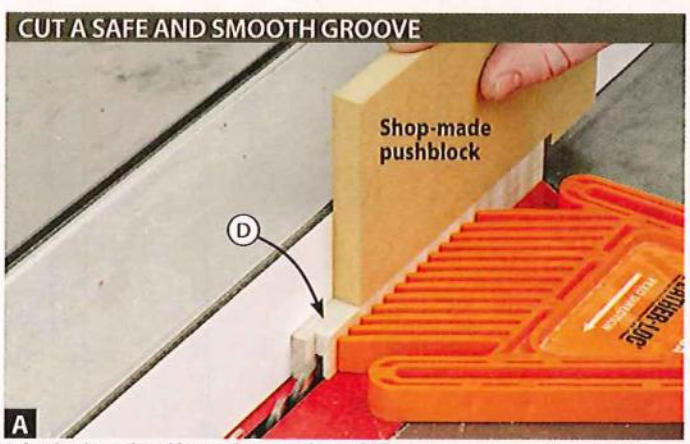
1 Plane or resaw 8/4 or laminated 4/4 stock to 1 7/16" and cut the sides (A) to the size listed **[Drawing 1, Materials List,** *page 30*]. Cut the filler strips (B), stiles (C), upper rails (D), and lower rails (E) to size. Set aside the stiles and rails for now.

2 Using a ¼" dado stack in your tablesaw, cut ¼" grooves ¼" from the edges on the inside faces of the sides (A) **[Drawing 1]**. Leave the dado height untouched for the stub tenons in **Step 4**. Glue and clamp the filler strips (B) into the grooves flush with the bottom ends of the sides.

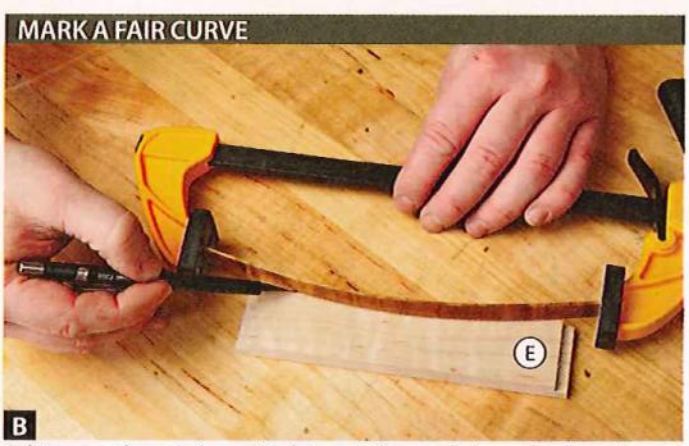
3 Use **Drawing 1a** to lay out the tapers on the edges of the sides (A). Then, bandsaw and sand the sides to shape.

4 With the dado stack still set up from **Step 2**, clamp a sacrificial auxiliary fence to the tablesaw fence and set it flush against the dado blade. With a sacrificial extension attached to your miter gauge, form stub tenons by cutting rabbets on both ends of the outside faces of the upper rails (D) and lower rails (E) **[Drawings 2, 2a, and 3]**.





A featherboard and long, shop-made pushblock ensure a smooth cut while keeping your fingers a safe distance from the blade.

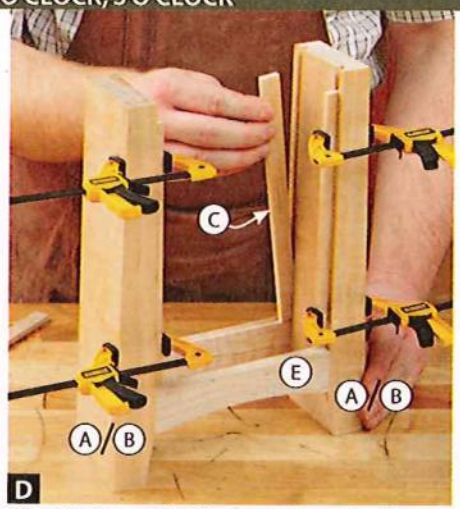


A thin scrap of wood, clamped to intersect the curve's top and ends, makes a quick fairing stick to complete the curve's layout.

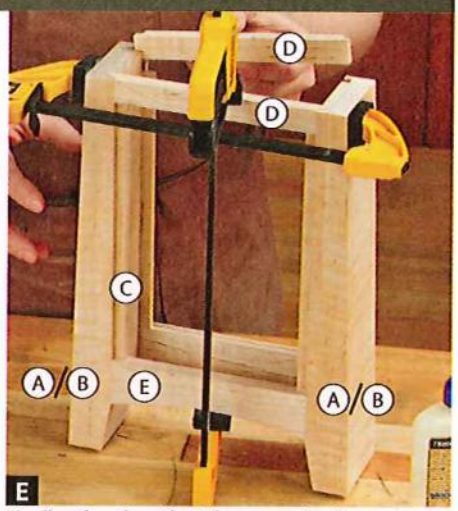
5 With a full-kerf blade in your tablesaw, cut a ⅛" groove ⅜" deep in the *back* upper rail (D) only and a ⅛" groove ⅛" deep in the *back* lower rail (E) only **[Drawing 2** and **Photo A]**. *Do not* cut the same grooves in the front rails.

6 Lay out the curves on both lower rails (E) **[Drawing 2** and **Photo B]**. Cut the curves at the bandsaw, then sand

Glue the bottom rails (E) into the sides' (A) grooves, seating them firmly against the filler strips (B) before tightening the clamps.



Allow the lower rails' glue to set; then, glue the stiles (C) into the grooves, seating them on top of the lower rails (E), and clamping them in place.



Finally, after the stiles' glue sets, glue the upper rails (D) in place, clamping them both vertically and horizontally.

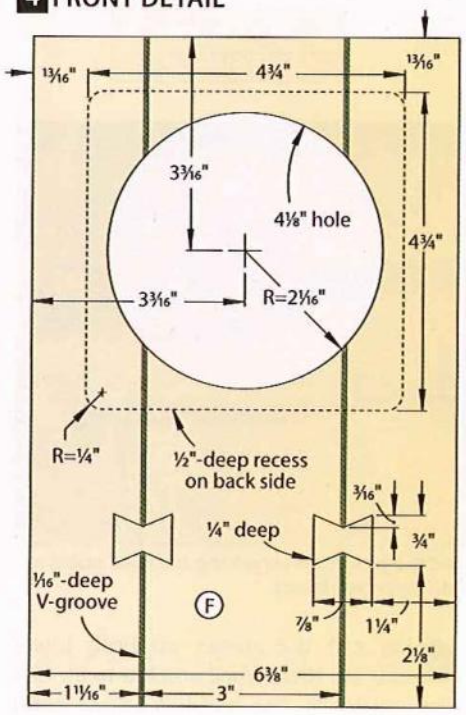
away any saw marks. Finish-sand the sides (A/B), stiles (C), upper rails (D), and lower rails to 220 grit. Assemble the clock case **[Drawing 3]** in the sequence shown **[Photos C, D,** and **E]**.

7 After the glue has dried, sand or plane the upper rails (D) flush with the tops of the sides (A), if necessary. Set the case aside.

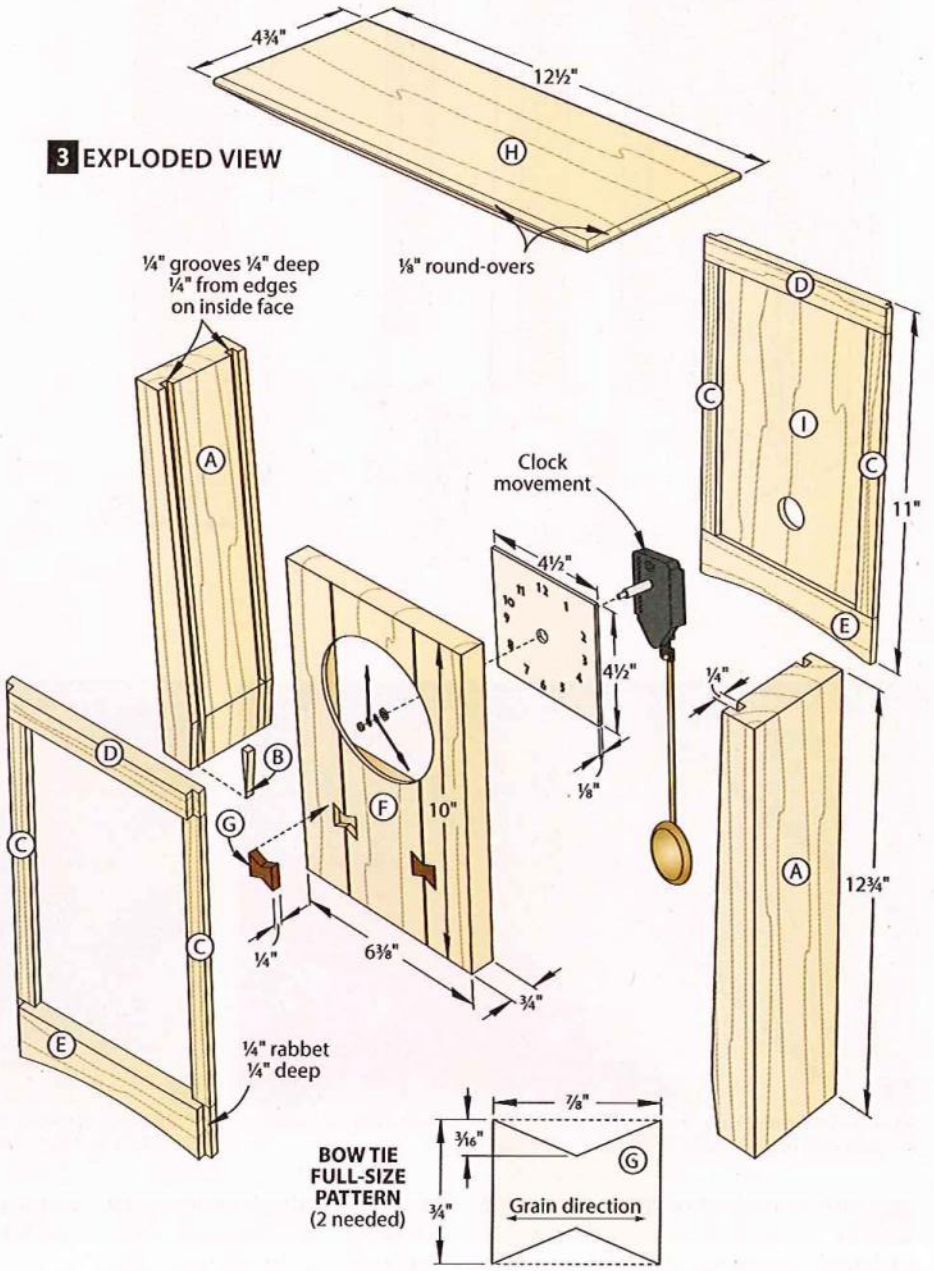
Let's face it

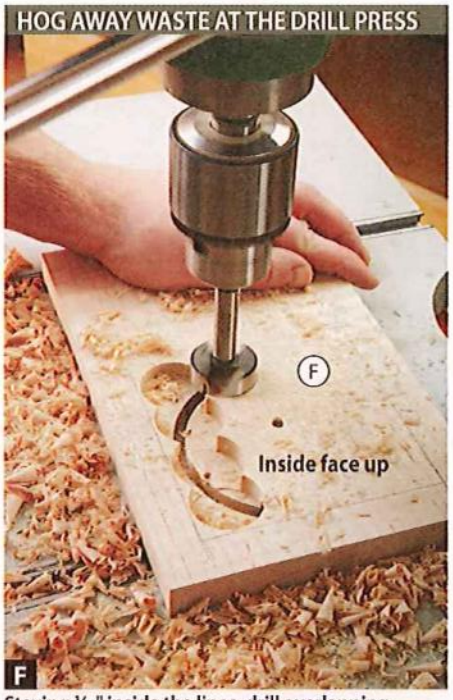
1 From ¾" stock, cut the front (F) to size **[Drawing 3** and **4]**. Mark the center of the clock face on the outside face of the front; lay out the 4¾"-square recess on the inside face of the front.

4 FRONT DETAIL

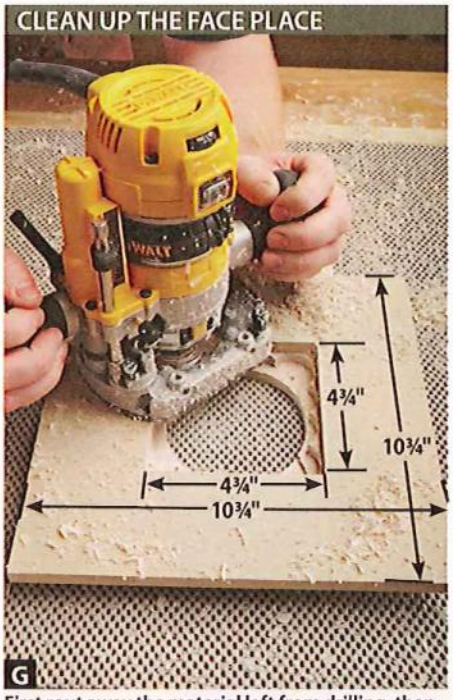


3 EXPLODED VIEW

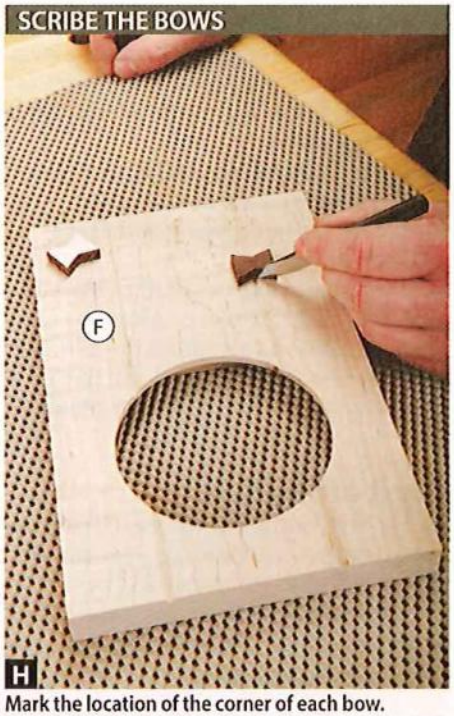




Staying 1/16" inside the lines, drill overlapping counterbores around the edges of the marked square. The circle cutout will detach.



First rout away the material left from drilling, then set the bit to rout the cutout to a depth of ½" for the final pass.



Mark the location of the corner of each bow. Double-faced-tape them in place. Then, scribe their outlines with a marking knife.

2 Create the circle-cutting jig shown in the **Shop Tip**, *below*, to rout the circle for the clock face in the front (F). Then, flip the front over. After chucking a large (1–1½") Forstner bit in your drill press, set the depth stop to halt the bit's centerpoint (rather than the cutting spurs) 5/16" above the table to avoid overdrilling. Hog away the bulk of the material in the square you marked earlier with the Forstner bit **[Photo F]**.

3 From MDF cut a ½×10¾×10¾" template blank. Lay out a 4¾" square, centered; drill a blade start hole; and jigsaw out the square. Double-faced-tape the template to the back face of the front (F), aligning the cutout with the layout lines. Use a dado clean-out bit to rout the rest of the waste **[Photo G]**.

4 Using a 45° V-groove bit in your router table, rout 1/16"-deep V-grooves in the front (F) where shown **[Drawing 4]**.

5 Make two copies of the **Bow Tie Full-size Pattern**, on *previous page*. Next, spray-adhere the patterns to ¼" stock of a contrasting species. (We used wenge.) Bandsaw and sand the bows (G) to shape. Mark the locations of the bows on the front (F) **[Drawing 4, Photo H]**.

6 Remove the bows and their tape. Install a ⅛" spiral upcut bit in your plunge router, using the thickness of the bows to set the plunge depth. Practice on

SHOP TIP

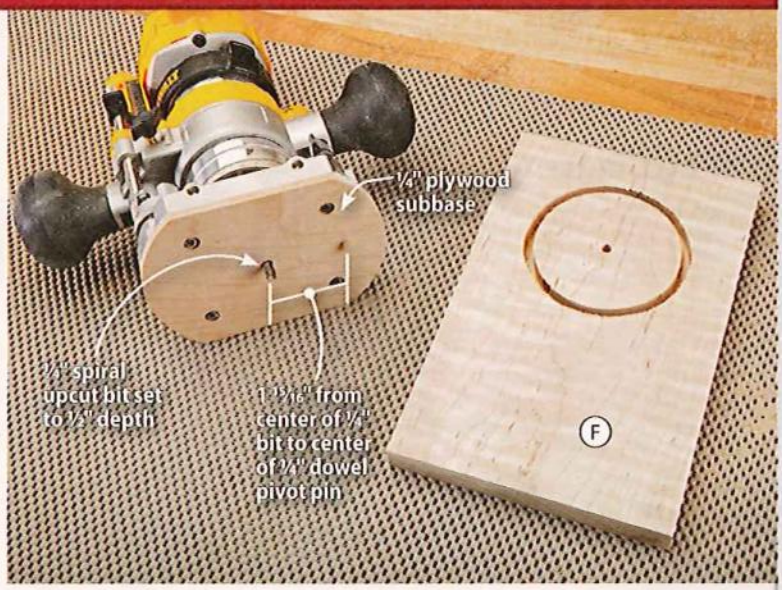
A simple solution for small circles

A jigsaw is out of the question for the non-through cut needed for the round clock face. And a large hole-saw could be unavailable or expensive. The solution: A shop-made circle-cutting jig for your plunge router.

To make the jig, first double-faced-tape your router's subbase to a blank of ¼" plywood. Use a flush-trim bit in your router table to duplicate the subbase. Mark the mounting-screw locations. Then, remove the subbase and drill and countersink the screw holes.

Next, insert a ¼" spiral upcut bit into your router, attach the jig to the router, and plunge the bit through the jig. Remove the jig and drill a ¼" hole centered 1 15/16" from the center of the bit hole. Glue in a ¼" dowel ½" long. When the glue has dried, reattach the jig to your router.

To make the circle in the clock's front (F), drill a ¼" hole through the front where marked earlier. Set the plunge depth of the router to ½". Insert the pivot pin in the center hole and plunge-cut the hole, rotating the router around the pivot pin to complete the circle.



scrapwood before freehand-routing away the waste from the recesses for the bows (G) within 1/16" of the inside of the layout lines [**Photo I**].

***Quick Tip:** Using a spiral upcut bit for freehand routing provides greater control than a straight bit, generating fewer catches and smoother travel.*

Clean up the recesses with a chisel and glue the bows in place. After the glue dries, finish-sand the front to 220 grit, sanding the bows flush with the face. Then glue the front (F) in place [**Photo J**].

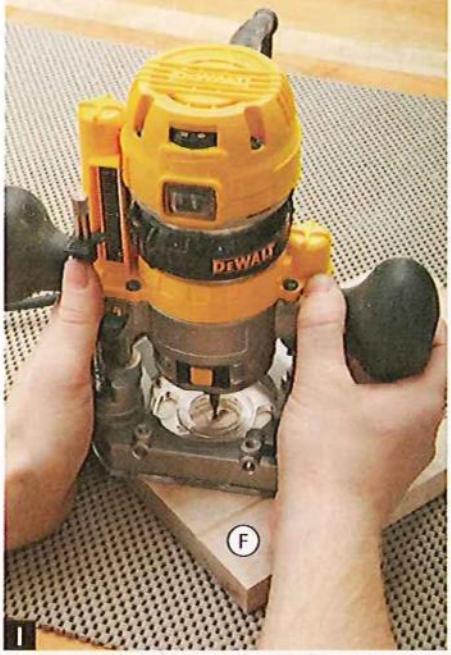
Top it off; back it up

1 From 5/8" stock, cut the top (H) to size. Construct a saddle jig, like the one shown on *page 16*, to cut 13° bevels on the ends [**Drawing 5**]. Remove the saddle jig to cut the 45° bevels along the front and back edges. Finish-sand the top to 220 grit, round over the top edges, and glue it to the case, centered.

2 From 1/4" plywood, cut the back (I) to size. Use a dado stack in your tablesaw to cut the rabbets in the outside face of the back [**Drawing 2**]. Locate and drill the 1" finger hole. Finish-sand the back.

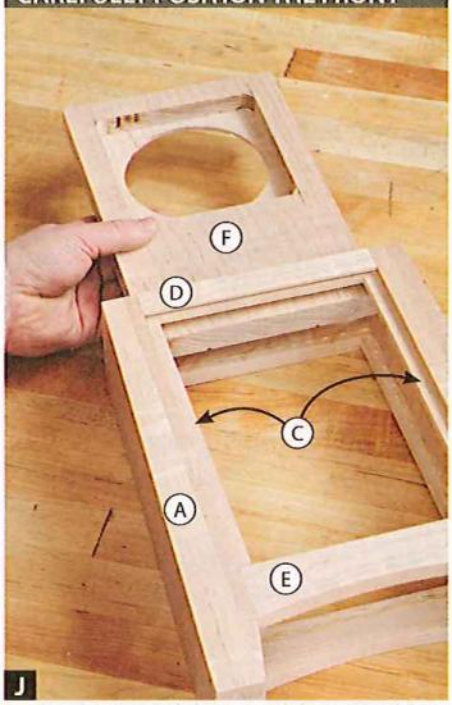
3 Apply a clear finish. (We used three coats of satin aerosol lacquer.) Glue the face into its recess, install the movement, and—Oh dear! Would you look at the time?!

STEADY YOUR HANDS FOR ROUTING



Plunge, gripping the router low and bracing your hands on the workpiece for maximum control when freehand routing the bow tie recess.

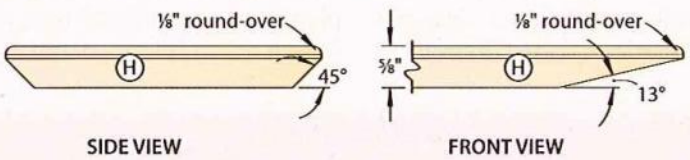
CAREFULLY POSITION THE FRONT



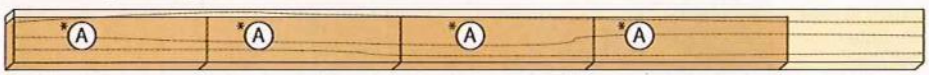
Apply a thin bead of glue around the inside of the front frame. Without smearing the glue, insert the front (F) flush with the top.

Produced by **Lucas Peters** with **John Olson**
Project design: **Schlabaugh & Sons**
Illustrations: **Lorna Johnson**

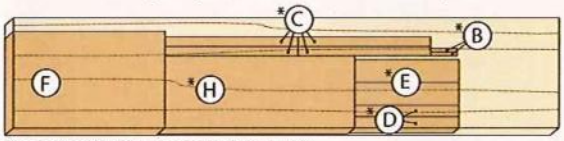
5 TOP



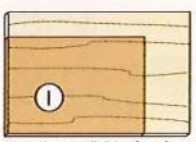
Cutting Diagram

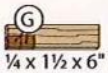


1 x 3½ x 60" Curly maple (1.7 bd. ft.) *Laminate or plane to the thicknesses listed in the Materials List.



¾ x 7¼ x 36" Curly maple (2 bd. ft.)





¼ x 1½ x 6" Wenge (.08 bd. ft.)

¼ x 8 x 12" Birch plywood

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A	sides	1 7/16"	3"	12¾"	M	2
B	filler strips	¼"	¼"	1¾"	M	2
C	stiles	¼"	5/8"	8¾"	M	4
D	upper rails	½"	¾"	6⅞"	M	2
E	lower rails	½"	1½"	6⅞"	M	2
F	front	¾"	6⅜"	10"	M	1
G	bows	¼"	¾"	⅞"	W	2
H	top	5/8"	4¾"	12½"	M	1
I	back	¼"	6⅜"	9"	BP	1

Materials key: M–curly maple; W–wenge; BP–birch plywood.
Supplies: Double-faced tape, spray adhesive, ¼" dowel.
Blade and bits: Dado stack; ¼" twist and 1" and 1½" Forstner drill bits; flush-trim, dado clean-out, ⅛" spiral upcut, ¼" spiral upcut, 45° V-groove, and ⅛" round-over router bits.

Sources

Wood kit: Each kit contains all of the needed stock to complete the project. Order kit no. W214, $35 including U.S. delivery (call for delivery outside the U.S.), from Woodworkers Source: 800-423-2450 or woodworkerssource.com/kitw214.
Clock movement kit: Each kit includes dial, quartz pendulum movement, and hands. Order item no. 200AC-DP, $20.90 plus shipping, from Schlabaugh & Sons: 319-656-2374 or schsons.com.

Corner bookcase

Open shelves create a display area visible from anywhere in the room.

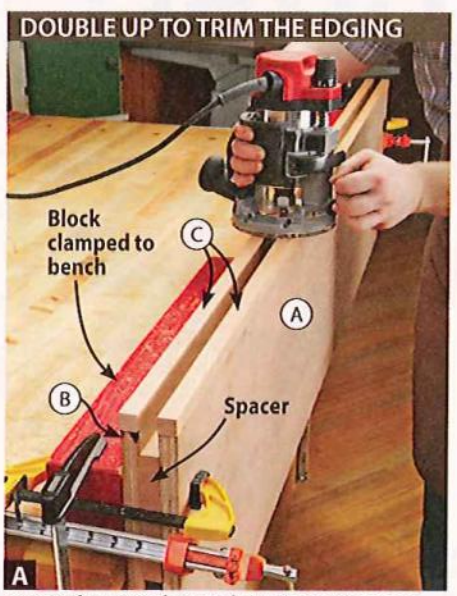
Approximate materials cost: $130
Dimensions:
71⅜" H × 19¼" D × 19¼" W

By eliminating one side, this bookcase tucks into a corner, allowing a clear view of everything on its shelves—seemingly without taking up any space.

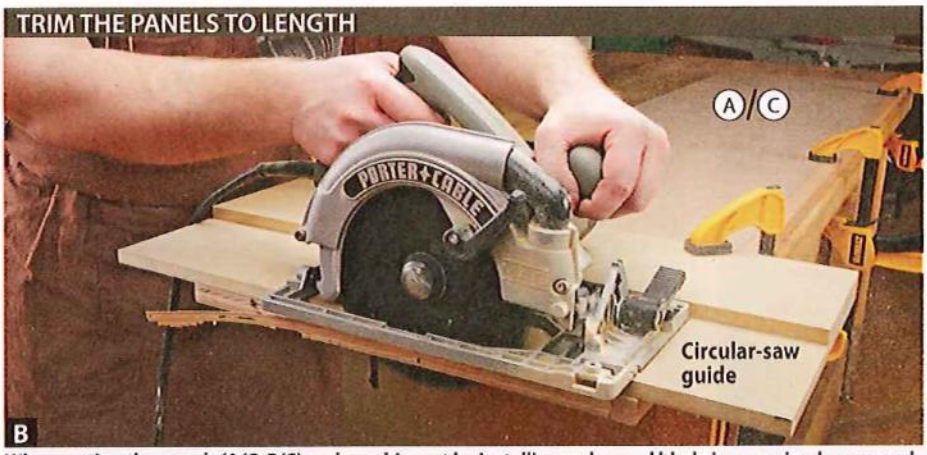
Start with the panels

1 Cut the left panel (A), right panel (B), and the panel edging (C) to finished width but ½" longer than listed **[Materials List, Drawing 1]**. Glue a length of panel edging to the outside edge of each panel. After the glue dries, mount a flush-trim bit in your router, clamp the panels to the front of your workbench as shown in **Photo A** with the faces of the edging even so the router sits level, and trim the edging flush to the panel faces.

2 Make a circular-saw guide by cutting an MDF base 24" long and 4" wider than the distance from your circular-saw blade to the left side of its shoe. Glue a 3×24" MDF fence to this base flush at one edge and both ends. After the glue dries, trim the base, running the left side of the saw shoe against the fence. This edge now shows exactly where your



A spacer between the panels (A, B) provides room for the router bit. Clamp one end of the assembly in a vise, and the other to a block clamped to the bench.



When cutting the panels (A/C, B/C), reduce chip-out by installing a plywood blade in your circular saw and by cutting the panel with the good face (the inside face) down.

A straight-edged scrap serves as an edge guide when routing the groove in the left panel (A).

blade will cut. Clamp the guide to each panel (A/C, B/C) and crosscut them to final length **[Photo B]**.

3 To help rout the groove in the left panel (A) **[Drawing 1]**, make an edge guide by clamping and double-faced-taping a scrap block to the base of your router **[Photo C]**. Rout the ¼" groove ⅜" deep where shown.

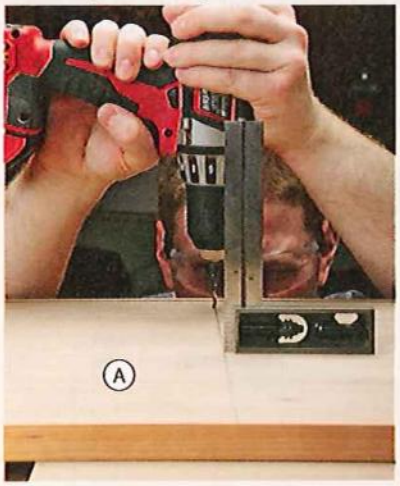
4 Remove the edge guide, switch to a ⅜" rabbeting bit, and rout a rabbet on the rear face of the right panel (B) to create a tongue that fits into the groove in the left panel (A) **[Drawing 2]**.

5 Lay out the centerlines of each shelf (D) on each panel (A/C, B/C) **[Drawing 1]**, then drill and countersink three 5/32" holes spaced evenly along each line **[Shop Tip, *below*]**.

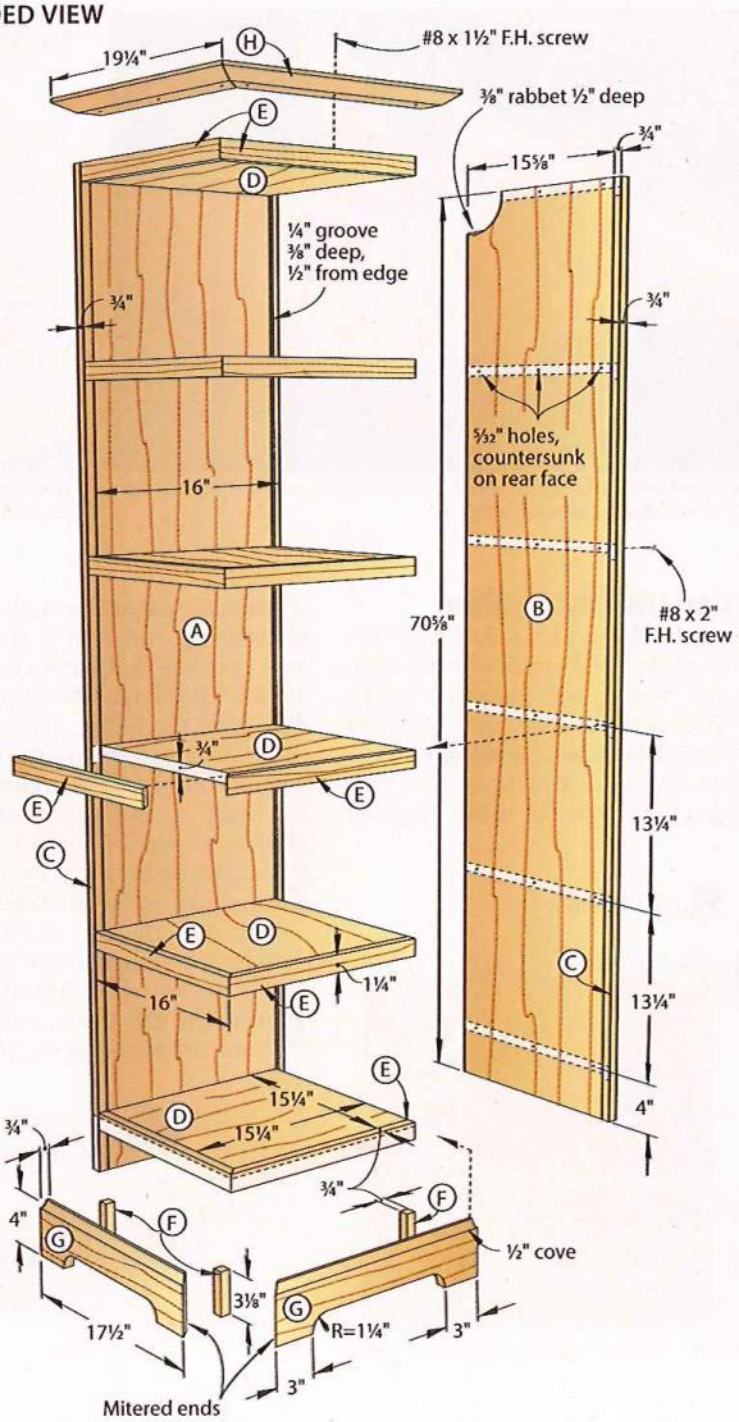
SHOP TIP

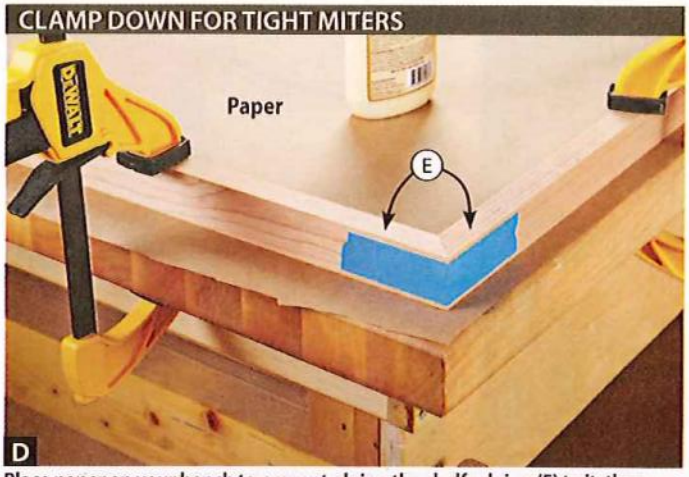
Drilling true

To drill perpendicular holes, stand a square on a panel (A, B) with the head parallel to the edges. Sight along the bit to the square, keeping the two parallel as you drill.

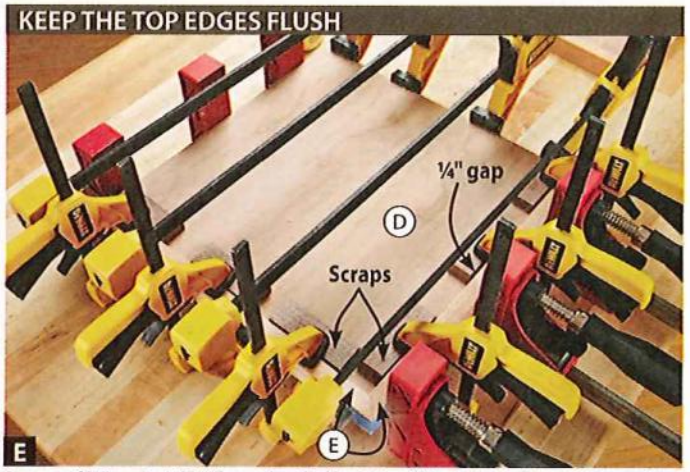


1 EXPLODED VIEW

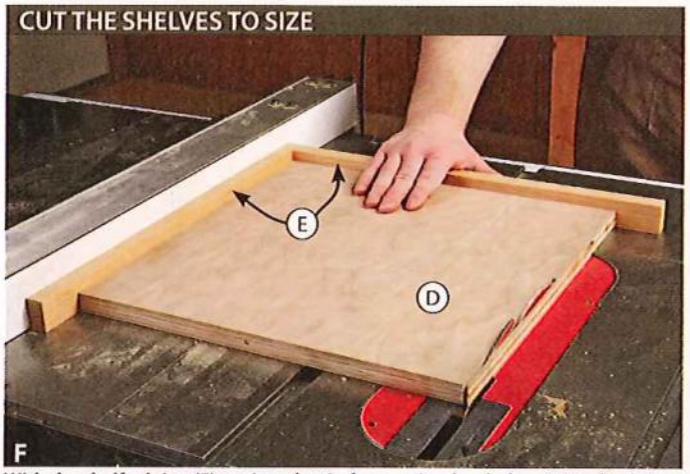




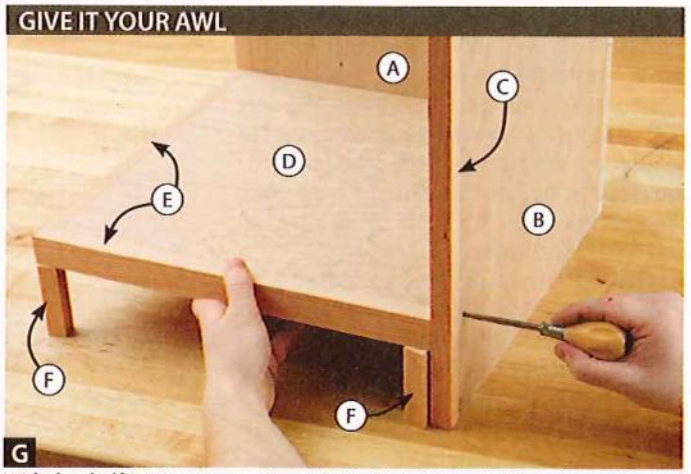
Place paper on your bench to prevent gluing the shelf edging (E) to it, then clamp each mitered-edging pair to the bench.



Scraps of ½" material ¼" from the shelf edging (E) help keep the top faces of the shelf (D) and edging flush as you clamp down.



With the shelf edging (E) against the rip fence, trim the shelves (D) to final size. This trims the edging perfectly flush, too.



With the shelf (D/E) resting on base blocks (F), hold the shelf against each panel (A, B) while pressing an awl through each screw hole.

Cut and trim the shelves

1 From ¾" plywood, cut six shelves (D) 15¾×15¾". (They will be trimmed to size after adding the edging.) Cut the shelf edging (E) to finished width and 1½" longer than listed **[Drawing 1]**.

2 Miter one end of each piece of shelf edging (E). Tape the miters together to make six pairs. Check the fit of each assembly against a shelf (D), then glue each pair together **[Photo D]** and clamp them to the bench while the glue dries.

3 Gather the shelves (D) and mark the two edges to receive the edging (E).

Note: *We alternated the grain direction on each shelf so that screws through either panel (A, B) would bite into primarily edge-grain layers on three of the plywood panels and end grain on the other three.*

Place the shelves upside down on clamps on your bench and glue the shelf edging to the shelves **[Photo E]**.

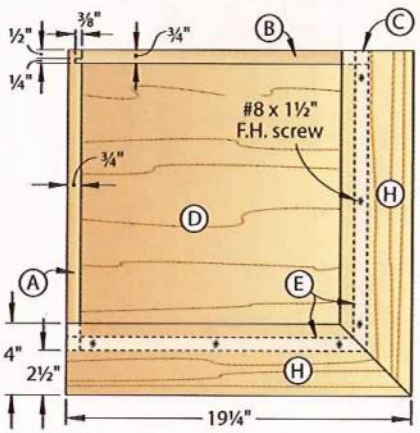
4 After the glue dries, remove the tape from the shelf edging (E), and trim each shelf (D/E) to finished size **[Drawing 1, Photo F]**. Check the fit of each shelf in the panel assembly (A–C). The faces of the shelf edging should be flush with the outer faces of the panel edging (C).

Dress it up with a base

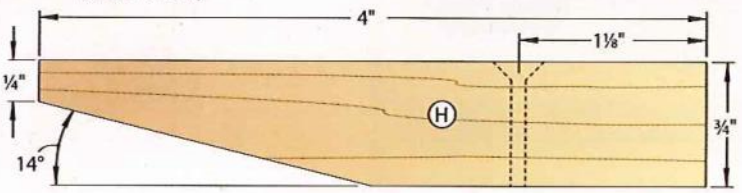
1 Cut the base blocks (F) to size **[Drawing 1]**. Position a shelf (D/E) next to the panels (A–C) and stand the blocks under the shelf **[Photo G]**. With an awl, mark through the holes in the panels to locate the screw holes in the shelf. Drill 3/32" holes 1¼" deep on the marks.

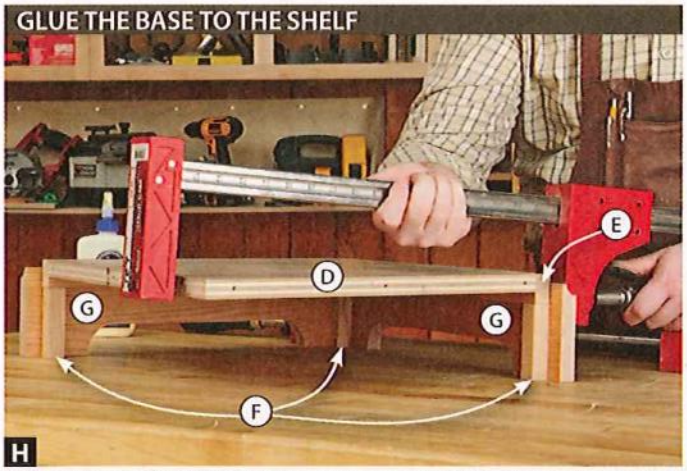
2 Cut the base (G) pieces to width but 1" longer than the width of each

2 TOP VIEW



2a TOP TRIM (Side view)





Support the shelf (D/E) with the two remaining base blocks (F), and clamp the shelf to the base assembly (F/G).

Two scrap spacers help hold the shelf (D/E) in position while you drive screws through the panels and into the shelf.

panel assembly (A/C, B/C). Rout a ½" cove along the top outside edge of each piece **[Drawing 1]**. As you did with the shelf edging (E), miter one end of each base piece, tape the miters together, and fit the assembly around the bottom shelf (D/E). Mark the final length of the base pieces and crosscut them on the marks.

3 Lay out the profile on the base pieces (G) **[Drawing 1]**, then jigsaw or bandsaw and sand the profile smooth. Glue the base pieces together, and glue a base block (F) in the corner.

4 After the glue dries, glue the base assembly (F/G) to the bottom shelf (D/E), making sure the screw holes face the rear **[Photo H]**. Glue the two remaining base blocks (F) in place flush with the back edges of the shelf.

Tackle the top

1 Cut the top trim (H) to finished width, but 1" longer than listed **[Drawing 2]**. Tilt your tablesaw blade to 14° and rip a bevel along the front edge, leaving a ¼"-thick edge **[Drawing 2a]**. Miter one end of each top trim and crosscut the opposite end to bring the trim to finished length. Glue the mitered ends of the trim together.

2 Apply a finish to all parts before beginning assembly. (We brushed on General Finishes oil-based Antique Cherry stain, then applied two coats of General Finishes water-based satin polyurethane.)

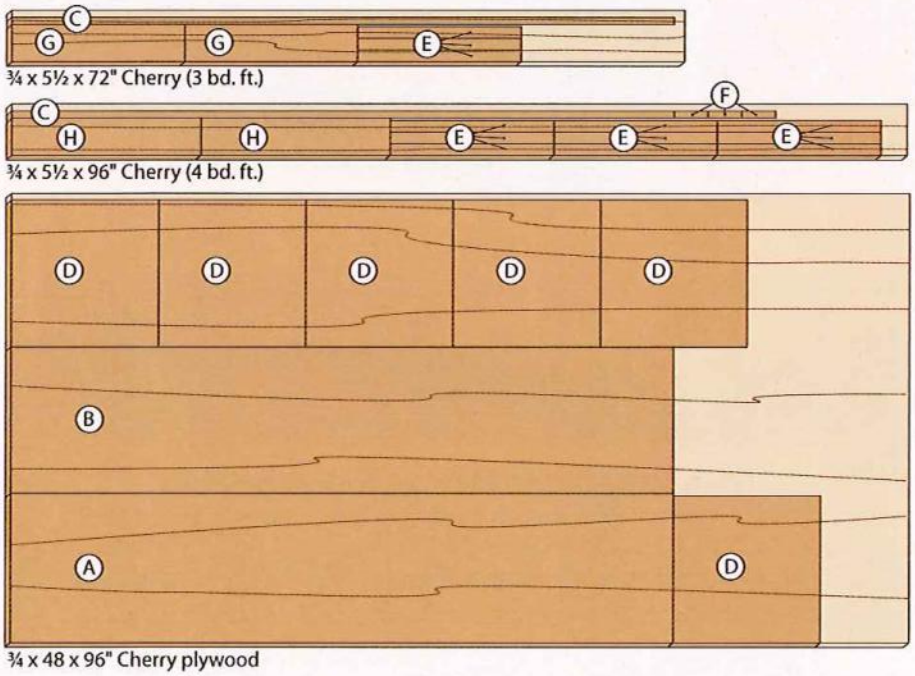
3 After the finish dries, screw the base assembly (D–G) to the panel assembly (A–C), driving the screws closest to the corner first, then working your way out. From ¾" MDF, cut two 12½"-long spacers. Use these to position the remaining shelves **[Photo I]**.

Quick Tip! *Press an awl through each shank hole to confirm that the screws will be centered on the shelf's thickness. If needed, shim the spacers to raise the shelf enough to center the marks.*

Drill pilot holes on the awl marks and drive the screws.

4 Center the top trim (H) on the top of the bookcase, with the ends flush with the back of the panels (A, B) **[Drawing 2]**. Drill 3/32" pilot holes through the top trim and into the shelf edging (E) and screw the trim in place.

Cutting Diagram



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

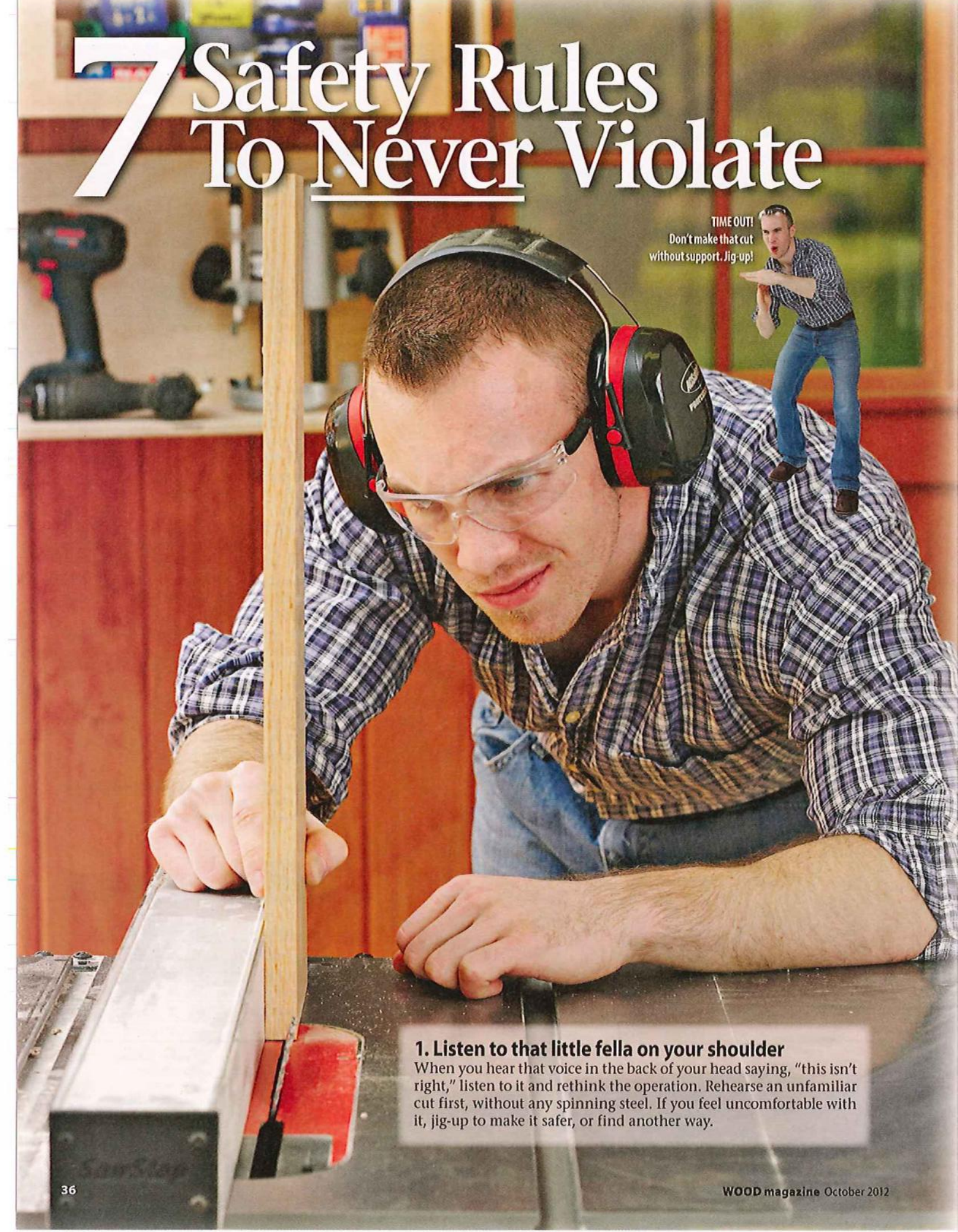
Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	left panel	¾"	16"	70⅝"	CP	1
B*	right panel	¾"	15⅝"	70⅝"	CP	1
C*	panel edging	¾"	¾"	70⅝"	C	2
D*	shelves	¾"	15¼"	15¼"	CP	6
E*	shelf edging	¾"	1¼"	16"	C	12
F	base blocks	¾"	¾"	3⅛"	C	3
G*	base	¾"	4"	17½"	C	2
H*	top trim	¾"	4"	19¼"	C	2

*Parts initially cut oversize. See the instructions.

Materials key: CP–cherry plywood, C–cherry.
Supplies: #8×2" flathead screws (36), #8×1½" flathead screws (6).
Blade and bits: ½" cove, flush-trim, ⅜" rabbeting router bits; ¼" or ⅜" bandsaw blade.

7 Safety Rules To Never Violate



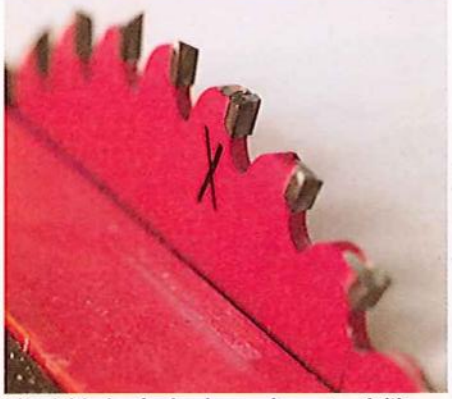
1. Listen to that little fella on your shoulder

When you hear that voice in the back of your head saying, "this isn't right," listen to it and rethink the operation. Rehearse an unfamiliar cut first, without any spinning steel. If you feel uncomfortable with it, jig-up to make it safer, or find another way.

2. Inspect your tools

Check every tool before use, even if you were the last to use it: Look for debris near the cutterhead or blade and any loose or misaligned parts that could become projectiles when you turn the tool on. Keep blades sharp and clean: Forcing a workpiece through a dull and dirty blade increases the risk of a hand slipping (and may cause burns and tearout on your workpiece, too).

WATCH FOR BROKEN PARTS, TOO

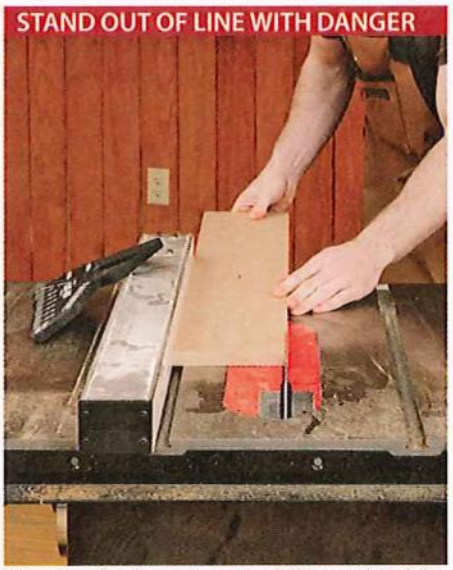


Check blades for broken or loose teeth like the one marked here. Such damage can create a dangerous imbalance in the blade.

3. Watch where you stand

Never put your body directly in line with the blade when making rip cuts at the tablesaw: If the board kicks back, it's coming straight at you. Also, never place your pushing hand in direct line with the cutting motion, regardless of the tool.

STAND OUT OF LINE WITH DANGER

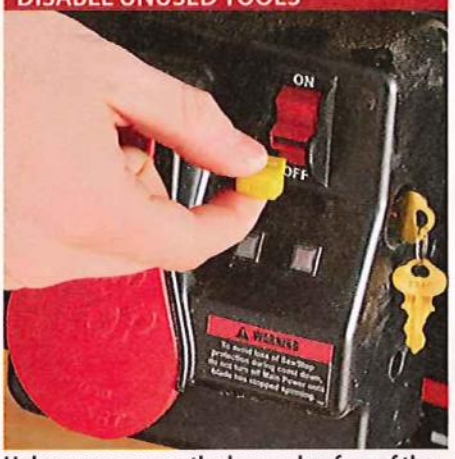


Whether the fence is on the left or right of the blade, stand to the side of the blade opposite the fence—body out of line with the cut.

4. Tug the plug

When not in use or during blade changes, unplug power tools or, if the tool has one, remove the safety tab from the on/off switch. This prevents both you and shop visitors (young and old) from accidentally turning on a tool. The same principle applies to pneumatic tools: When adding fasteners to a nailer, always disconnect the air hose first.

DISABLE UNUSED TOOLS

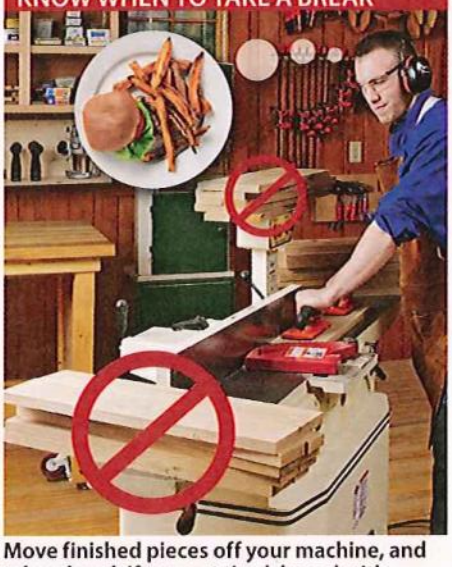


Unless you can see the loose plug free of the outlet or the yellow safety tab absent from the switch, assume the tool's ready to go.

5. Stay mentally sharp

Get comfortable, but not *too* comfortable, with your tools. When a project requires repeated cuts for identical parts—making the same cut 20 times—your mind can wander. Stay focused. Never walk away from a tool when it's running and always wait for the blade to come to a complete stop before reaching for cutoffs near the blade.

KNOW WHEN TO TAKE A BREAK



Move finished pieces off your machine, and take a break if you get tired, bored with repetitive cuts, or hungry.

6. Get pushy

Use pushsticks designed with plenty of surface area in contact with the workpiece; they hold the board down while keeping your hand several inches from the blade. A pushstick doesn't have to be pretty, complicated, or expensive—the shop-made one at *right* consists of just scrap 2×4 with an MDF heel. Keep a pushstick at each tool station and always within easy reach.

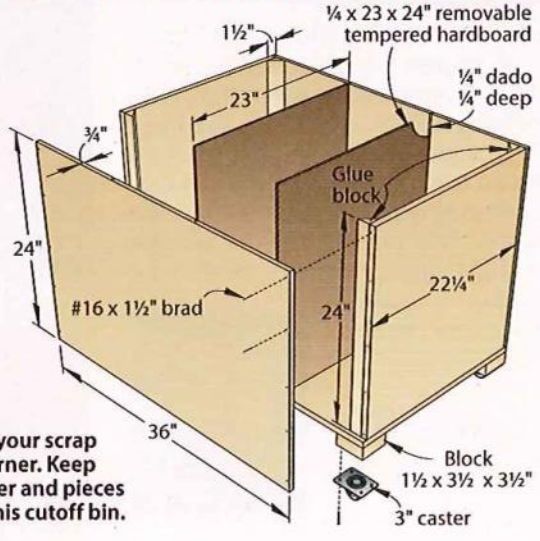
A SIMPLE STICK DOES THE TRICK

This pushstick can pass right over the blade and still support the cutoff. Replace the heel when it becomes too kerfed.

7. Keep it clean

If your shop has a layer of sawdust as thick as urethane on a gym floor, that dust presents a slipping hazard. Sweep it up. Also, dispose or store loose cutoffs and tools not in use. Clear off machines before use and make sure there's nothing that may shift into your cutting path or the blade during the machine's operation.

A CUTOFF BIN AIDS SHOP ORGANIZATION



Don't just chuck your scrap in a pile in the corner. Keep your floors cleaner and pieces separated with this cutoff bin.

Our Favorite Hand Tools

We love power tools; but many times a hand tool does the job better and quicker and always with less noise and dust. Here are eight "unplugged" tools that seldom leave our workbenches and where you can buy them.

5" Pocket Saw

Cady Tools, $125
cadytools.blogspot.com

I keep this mini handsaw nearby for cutting small project parts that would be impractical or even dangerous to cut with a power saw. In spite of its stubby length, the handmade Pocket Saw has a full-size, quartersawn hard-maple handle that feels comfortable in my hand. Its durable blade is thicker than most small saws, with 16 teeth per inch and a folded steel back for rigidity. It makes quick work of rips *and* crosscuts in small workpieces.

—John Olson, Design Editor

Starrett folding wood rule

(No longer in production)
Modern equivalent: Lufkin X46, $17
Amazon.com, part no. B00002N5KI

My favorite tool was also my kids' favorite: a 6' Starrett rule. It has seen as much action over the years in sword fights and light-saber battles as it has in the shop. (Okay, so they broke a few, but I quickly replaced them because I couldn't imagine working without one.) It's spot-on accurate, the brass extension reaches into tight spots, and it's perfect for checking carcase glue-ups for square.

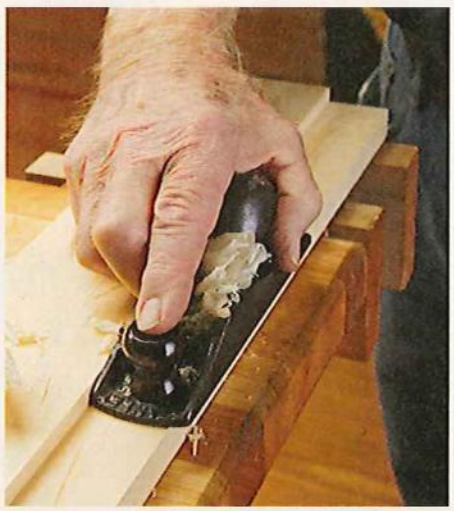
—Jim Heavey, contributing craftsman

1" crank-neck chisel

Traditional Woodworker, #225-2100, $63
800-509-0081, traditionalwoodworker.com

I find this paring chisel useful for flush-trimming wood plugs, shaving tenon cheeks, and—I'm sure this will make a few purists grumpy—slicing glue squeeze-out off a joint. Its bent neck lets you rest the back of the chisel on the workpiece while maintaining a good grip on the handle, and it reaches places that regular bench and paring chisels just can't.

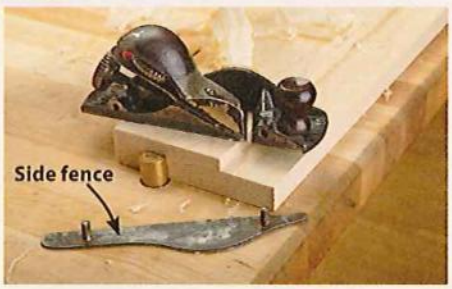
—Kevin Boyle, Senior Design Editor



Stanley #140 rabbeting block plane

(No longer in production; look for used models at auctions and online.)
Modern equivalent: Lie-Nielsen #140l, $195
800-327-2520, lie-nielsen.com

My grandfather bought this plane in the early 1900s, and I'm its third-generation user. That speaks volumes about its usefulness and durability. The Stanley #140 functions as two planes: a *low-angle block plane* (*far left* photo) that slices end grain as well as edge grain and, when you remove the side fence (*near left*), a *rabbeting plane* that cleans up tenons and rabbets. Its blade cuts at a skewed angle, greatly reducing tear-out.



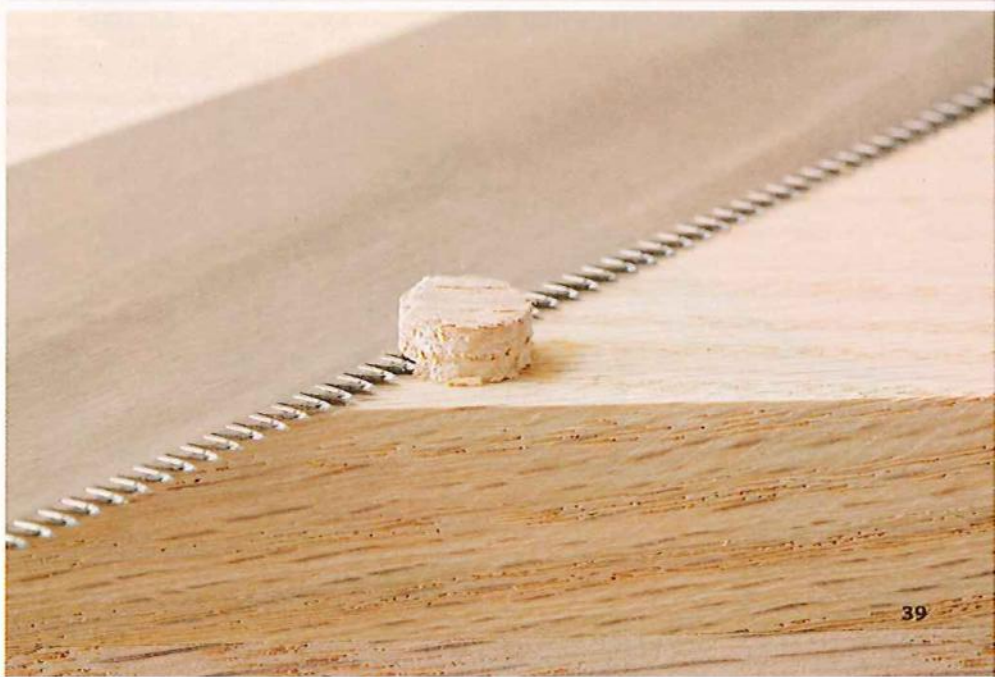
—Erv Roberts, a longtime woodworker and WOOD® magazine contributor for more than 15 years

Japanese hand saw

Tools For Working Wood, #MS-JCOMSAW, $26
800-426-4613, toolsforworkingwood.com

I grew up using Western-style saws for hand work. But the first time I tried a Japanese hand saw, I couldn't believe the difference. Like all Japanese saws, this general-purpose model cuts on the pull stroke rather than the Western-style push, so it's easier to start a cut and tracks straighter. Its thin blade flexes slightly for making flush cuts and leaves no errant scratches on the wood because the teeth have no set. Still, the blade is stiff enough to hold true for joinery cuts. I could probably never go back to the Western saws now gathering dust on my shelves.

—Lucas Peters, How-To Editor



#5½ Jack plane

Lie-Nielsen, #5.5, $375
800-327-2520, lie-nielsen.com

For years I used a #4 smoothing plane and #5 jack plane and got along fine. But then I tried a #5½ and was immediately hooked. Now it's my go-to bench plane, seeing action on almost every project I build. Although about the same length as a typical 5, this plane measures nearly ½" wider and weighs about a pound-and-a-half more. I like that extra heft because it provides momentum to power through cuts without feeling cumbersome—making less strain for me in the long run—especially in figured or knotty wood. And if you prefer to buy a used Stanley model (made until the late 1950s) online or at auction, rest comfortably knowing that you almost can't find a bad one (unless it's broken).

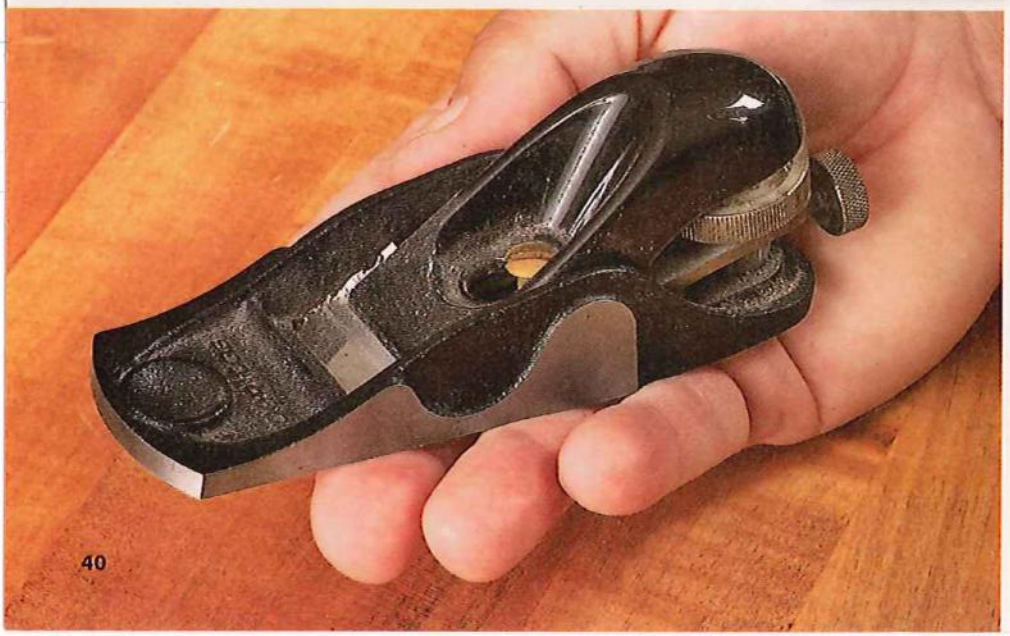
—Bob Hunter, Tools Editor

Veritas apron plane

Lee Valley, #05P27.01, $85
800-871-8158, leevalley.com

I have two standard-size block planes, in regular and low blade angles, but I always reach for this compact plane to do light trimming or shaping tasks. Veritas' apron plane perfectly combines size, weight, and nimbleness, especially when I need to get in tight on a small project part that needs fine-tuning. Its low angle shaves end grain as easily as edge grain, and the blade adjusts quickly and holds an edge for a long time.

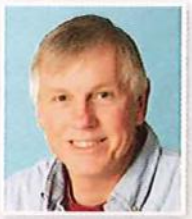
—Matt Seiler, a custom furnituremaker and WOOD Online® *forum host*



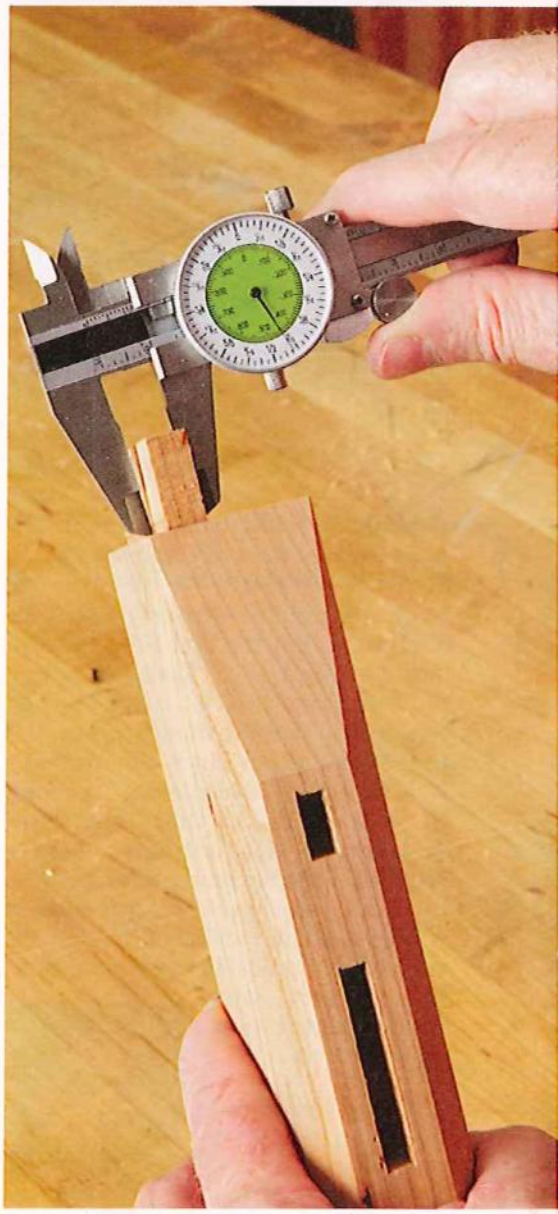
6" Dial caliper

Amazon.com, part #MTDCF-06, $30

Whether checking the thickness of a tenon, the depth of a mortise, the spacing of box joints, or the diameter of a counterbore, this handy caliper delivers precision like no measuring tape or rule can. The large dial's 1/64" graduations make it easy to read, and when I'm feeling *really* picky, the inner dial provides 1/100" increments. It also comes in handy for setting up machines, such as dialing in router bit and tablesaw blade heights.



—Bob Saunders, woodworking school owner and teacher and WOOD® *magazine contributor*



Folding Knife

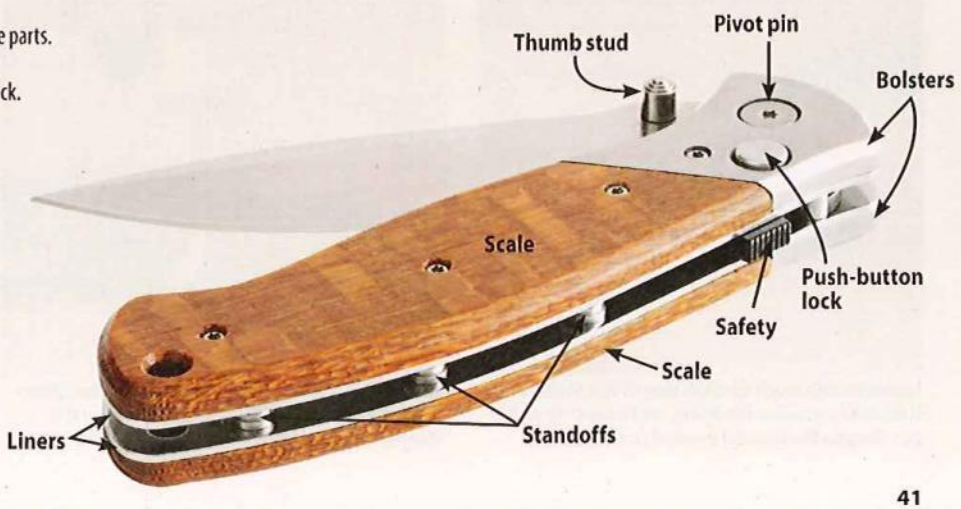
Even beginnners can craft this handsome cutting-edge heirloom.

Building a knife from a kit [Source] makes this personal item even more special. Scales (the wood portion of the handle) made from tight-grained woods, such as the ones shown at *right,* feel best in your hand. The kit we chose features stainless steel liners (see **Anatomy of a knife,** *below*) and a near-razor-sharp blade that offers durability and sharpenability.

Anatomy of a knife

Before assembling a knife, it helps to familiarize yourself with the parts.

- **Bolsters:** Metal parts that beef up one end of the liners for attaching and housing the blade pivot pin and push-button lock.
- **Liners:** The metal plates that surround the folded blade. The bolsters and scales attach to these.
- **Safety:** A sliding lock that, when pushed forward, prevents the blade from opening or closing.
- **Push-button lock:** After sliding the safety back, press this button to free the blade to pivot open or closed.
- **Scales:** The wood (or other material) shaped to cover the liners. They butt against and lie flush with the bolsters.
- **Standoffs:** Metal cylinders sandwiched between the liners to create space for the blade.
- **Thumb stud:** A knob or knobs attached to the blade. Press upward on a stud to pivot the blade open.

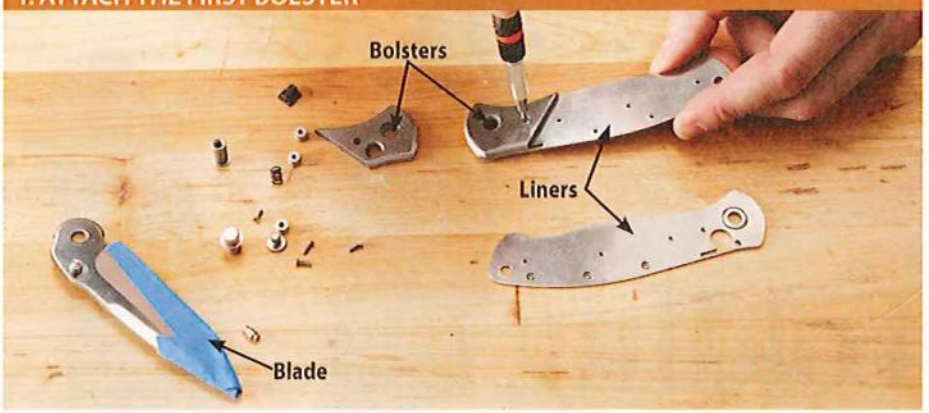


First, assemble the knife

The knife kit contains small parts, so before opening it, clean your worksurface to keep everything easily visible. Carefully unpack the kit and take inventory of the contents to verify you have all of the needed parts and to familiarize yourself with them. Wrap the sharp edge of the blade with painter's tape for safe handling.

The kit comes with minimal instructions, so follow our step-by-step photos to assemble the knife before beginning work on the scales.

1. ATTACH THE FIRST BOLSTER



Using one of the supplied Torx screws, fasten a bolster to the outside face of one liner. Leave the screw just loose enough to allow adjustment of the bolster later.

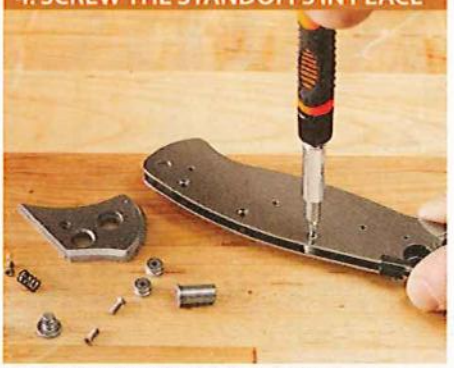
2. ADD THE SAFETY BUTTON

Place the safety into the slot and position the blade stop pin. Place the second liner over the pin and safety, but don't add the second bolster yet.

3. TWEEZER DOES IT

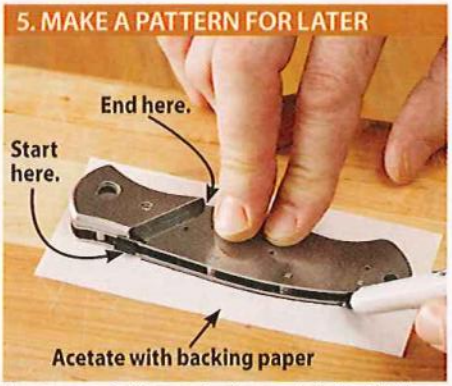
Using tweezers to grip it, position a standoff between the liners, aligning the standoff with the holes in the liners.

4. SCREW THE STANDOFFS IN PLACE



Join the two liners by driving a flathead screw through the top liner and standoff. Snug down the screw, and then install the remaining standoffs.

5. MAKE A PATTERN FOR LATER

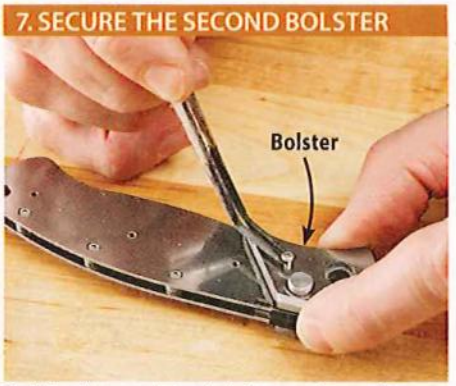


Trace around a liner onto clear acetate (available at office supply stores). Connect the start and stop points with a straight line. (See **Photo 1**, *next page*.)

6. INSTALL THE LOCK

Insert the push-button lock spring into the push-button lock and place this assembly in the liner so the spring rests on the opposite bolster.

7. SECURE THE SECOND BOLSTER



Position the remaining bolster over the push-button lock and loosely secure the bolster with a roundhead screw.

8. ADD THE BLADE; GIVE IT A PIVOT

Install thumb studs on each side of the blade, place the blade between the liners, and insert the pivot pin. Wiggle the blade if needed to seat the pin.

9. SECURE ALL OF THE SCREWS

Screw the pivot pin in place but don't overtighten the screw. Snug down the screws securing the standoffs and bolsters.

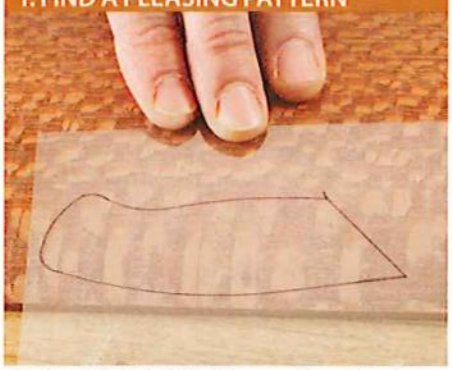
10. FILE THE LINERS SMOOTH

File down any screwheads standing proud of the liners. Pull the safety back and lightly file the plastic tabs protruding through the liner.

Create the scales

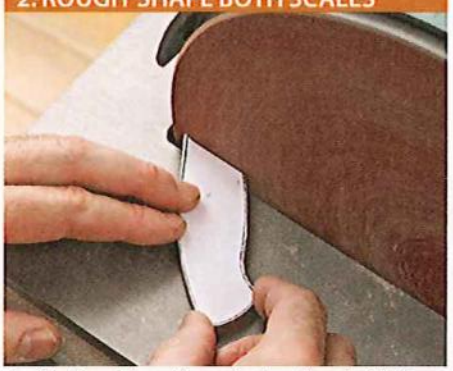
With the metal parts assembled, plane stock for the scales and some scrap for making test cuts, to 3/16" thick. After shaping the scales, you'll sand these pieces to final thickness to sit flush with the bolsters.

1. FIND A PLEASING PATTERN



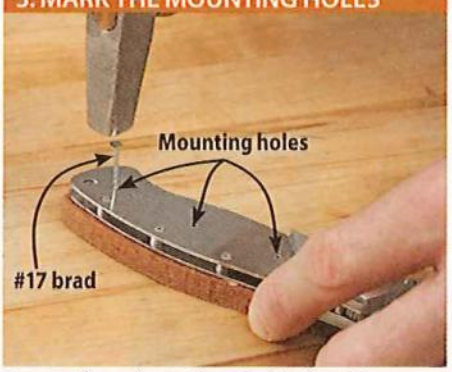
Use the acetate to find nice areas of wood grain, and mark them. Make two photocopies of the acetate pattern and spray-adhere the copies to these areas. Bandsaw 1/16" outside the lines.

2. ROUGH-SHAPE BOTH SCALES



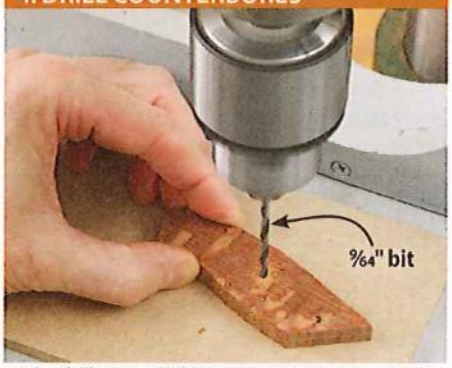
Double-faced-tape the scales together, inside face to inside face. Sand a straight edge at the front. Stop when you have a tight fit to the bolsters with material extending over the edges of the liners.

3. MARK THE MOUNTING HOLES



Remove the patterns, then double-faced-tape the scale "sandwich" to a liner. Mark through the mounting holes with a #17 brad. Repeat for the other liner and the other side of the sandwich.

4. DRILL COUNTERBORES



At the drill press, drill 9/64" counterbores centered on the dimples made with the brad. Drill just deep enough to accept the heads of the screws used to secure the scales.

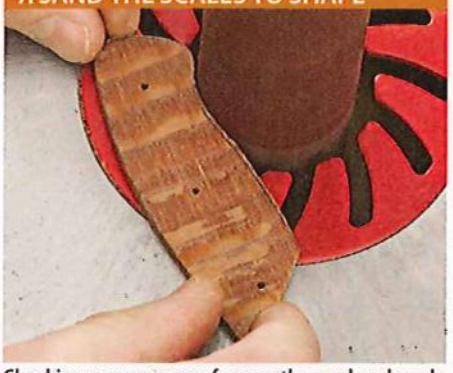
5. NOW THE SHANK HOLES

Dribble mineral spirits between the scales to dissolve the tape adhesive, and separate the scales. Drill a 5/64" shank hole centered in each counterbore. The scrap backer prevents chip-out.

6. OUTLINE THE SCALES

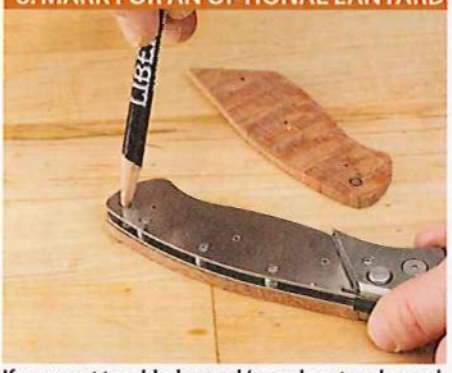
Temporarily screw each scale to a liner, tight to the bolster. If needed, enlarge the screw shank holes to allow adjusting the scale's position. Trace around the liner with a sharp pencil.

7. SAND THE SCALES TO SHAPE



Checking your progress frequently, sand each scale until it sits flush with the edges of the liner. Then sand or plane the scales and a scrap piece, used later, to match the thickness of the bolsters.

8. MARK FOR AN OPTIONAL LANYARD



If you want to add a lanyard (a cord or strap looped through the rear of the liners and scales), secure one scale at a time to a liner and mark through the lanyard hole. Drill 3/16" holes where marked.

9. CHAMFER THE SCALES

Set a chamfer bit to rout chamfers matching those on the bolsters, checking the setup on your scrap. Chamfer the edges of each scale, leaving square the straight edge that nests against the bolster.

Finish it up

Sand the scales to 320 grit and apply a finish. We wiped on two coats of General Finishes Arm-R-Seal, an oil and urethane finish, sanding lightly with 320-grit sandpaper between coats. For a higher sheen, buff on two coats of paste wax. Screw the scales to the liners and pocket one sharp-looking project.

Produced by **Craig Ruegsegger** with **Kevin Boyle**

Supplies: Clear acetate, double-faced tape, spray adhesive.
Bits: 45° chamfer router bit; 9/64", 5/64" drill bits.

Source: Our knife came from knifekits.com, kit no. DDR3-BL, $56.95, 877-255-6433. The kit contains small Torx or hexhead screws so you'll need jeweler's screwdrivers in these styles. Knifekits.com offers several driver sets that include these bits.

Safety-Gear Cabinet

Corral shop necessities in this high-style home.

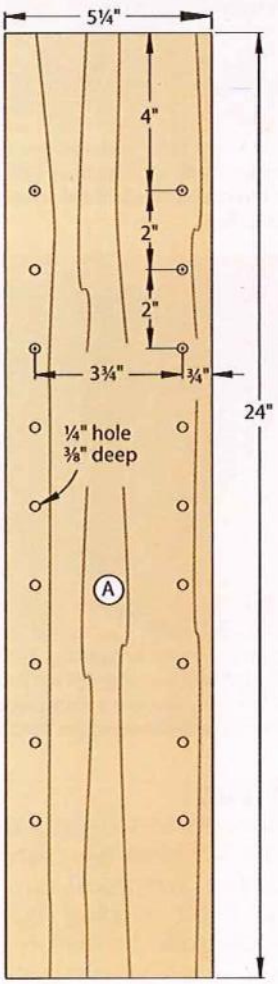
Dimensions: 25½"H x 16½"W x 7½"D
Approximate materials cost: $45

Your hearing muffs, safety glasses, and respirator never had it so good. This simple cabinet features handsome moldings above and below, making it attractive enough to hang in your house as a display or storage case. Our pine version keeps bandages, tweezers, and other first-aid supplies visible, dust-free, and instantly accessible. Choose oak, cherry, walnut, or another fine hardwood to dress it up for inside the house.

Create the carcase first

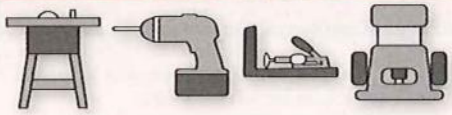
1 From ¾" stock, cut the sides (A) to size **[Drawing 1]**. Label the top end of each piece to help when drilling the shelf-pin holes as shown in the **Shop Tip**, on the *next page*.

1 SIDE (Inside face)



BASIC-BUILT
GREAT PROJECTS MADE SIMPLE.

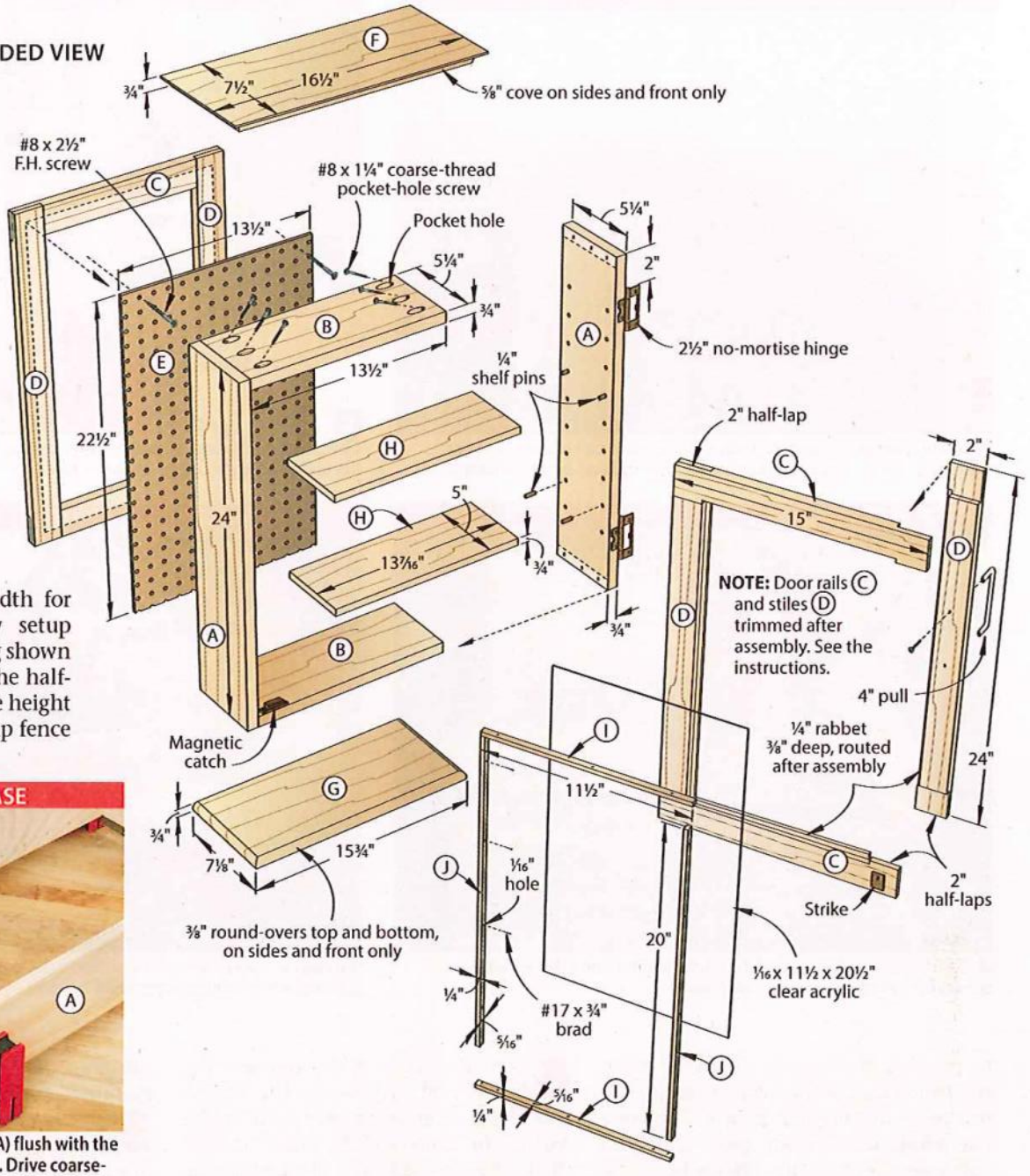
TOOLS NEEDED



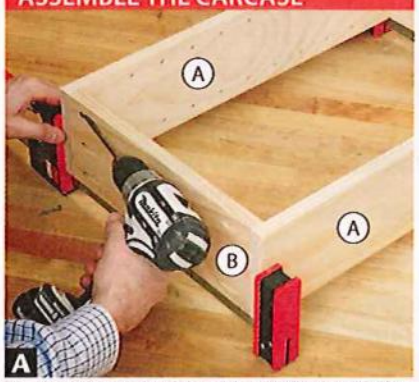
2 Cut the top and bottom (B) to size **[Drawing 2]**. Drill the pocket holes; then finish-sand the inside faces of the top (B), bottom (B), and sides (A). Clamp the pieces together and drive the screws **[Photo A]**.

3 Cut the rails (C) and stiles (D) to size **[Drawing 2]** along with two scraps the same thickness and width for checking the tablesaw setup later. Build the saddle jig shown on *page 16* for cutting the half-lap joinery. Set the blade height **[Photo B]**; then set the rip fence

2 EXPLODED VIEW



ASSEMBLE THE CARCASE



Position the ends of the sides (A) flush with the faces of the top and bottom (B). Drive coarse-thread pocket-hole screws.

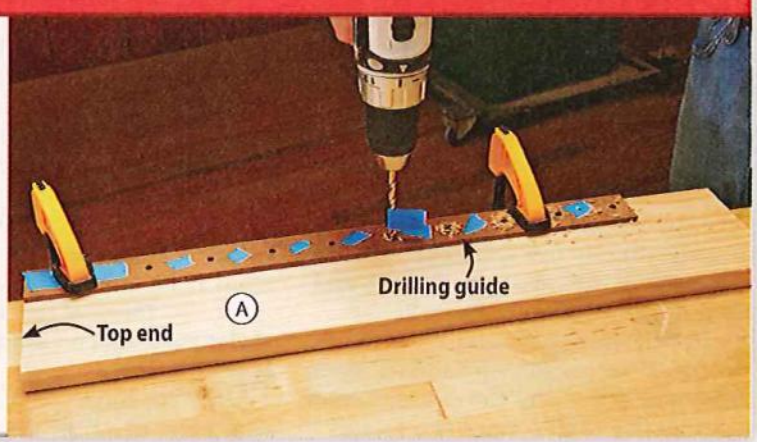
SHOP TIP

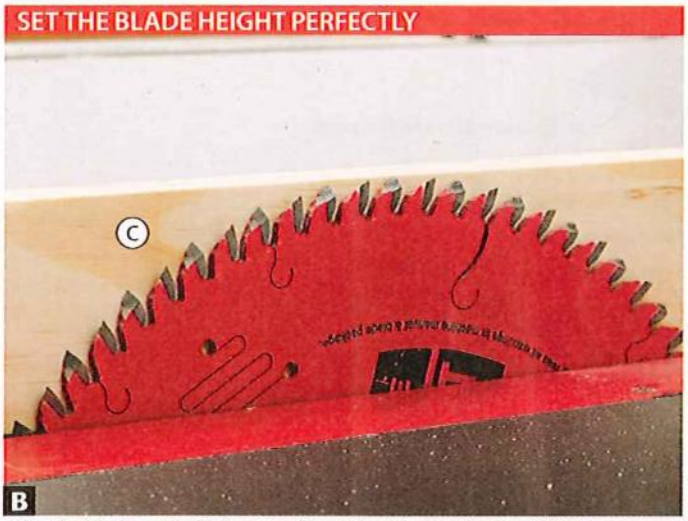
Superfast drilling guide

For a shelf to sit flat, all four shelf-pin holes must align perfectly. This guide makes that job simple.

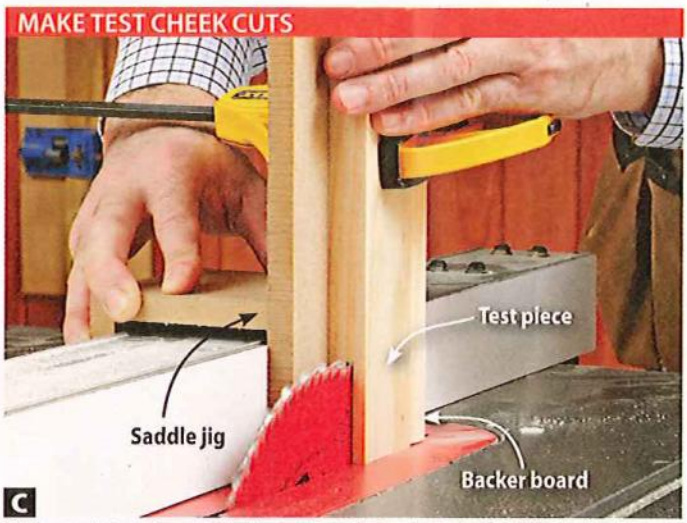
Cut a 1½×21" strip of ¼" perforated hardboard, positioning the center of a hole 4" from one end and ¾" from an edge. Label this end the top. Place tape over the first three holes at the top end and every other hole after that [photo at *right*].

Chuck a ¼" bit in your drill and wrap a strip of tape around it ⅝" from the tip to mark the hole depth. Align the drilling guide with the edge and top end of a side (A); then drill through the exposed holes. Flip the guide over, align the edge with the opposite edge of the side, and drill the rear column of holes. When drilling the front column of holes in the opposite side, start with the taped face down.

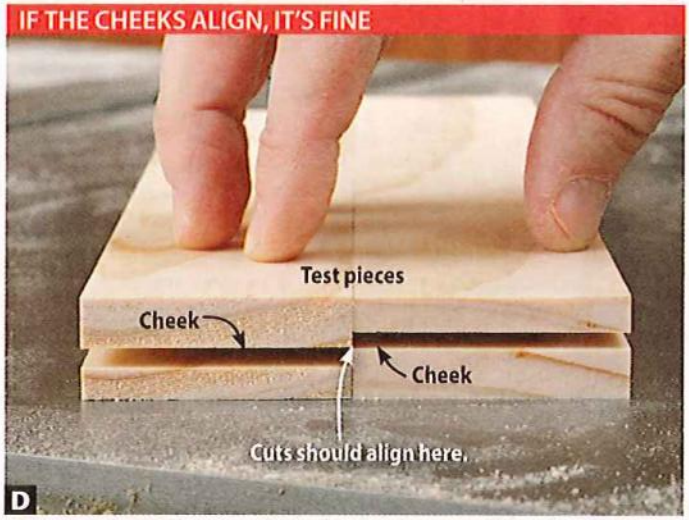




Raise the blade so the highest tooth matches the width of a rail (C). To get smooth cuts in pine, we used a crosscut blade; use a rip blade for hardwoods.



Clamp each test piece to the jig, against the backer board. Slide the jig along the rip fence. Make a cut on each test piece.



With one test piece faceup and the other facedown on a flat surface, the cheeks of the test cuts should match up.

Butting the workpiece against a stopblock creates clearance for the waste to fall away when completing the half-lap joint.

to position the face of the jig ⅜" from the inside face of the blade. Clamp each test piece in the jig in turn and make a cut **[Photo C]**. Flip one piece over and compare the two cuts **[Photo D]**. Make any needed adjustments to the rip-fence position; then cut the cheeks of the half-laps on each end of the rails and stiles.

4 Lower the saw blade to 5/16" above the table. Clamp a stopblock to the rip fence in front of the blade. Attach an extension to your miter gauge, place a rail (C) against it, and align the end of the cheek cut in the rail with the *outside* edge of the blade. Hold the rail against the extension, pull the miter gauge back, and lock the rip fence in place with the stopblock butted against the rail end. Complete the half-laps **[Photo E]**.

5 Dry-fit the rails (C) and stiles (D) and check the assembly for square. Then apply glue and clamp the rails and stiles together **[Photo F]** to make two frames.

6 After the glue dries, remove the clamps and finish-sand the frames to 220 grit. Glue one frame (C/D) to the rear of the carcase (A/B). Plane or sand the frame if needed so it fits flush to the carcase on all edges. Cut a back (E) to fit inside the carcase **[Drawing 2]** and glue it to the rear frame.

Add a door, cap, and base

1 Retrieve the remaining frame (C/D) (the door) and rout a ¼" rabbet ⅜" deep around the inside of the back face **[Drawing 2]**. Then, square up the corners with a chisel.

2 Clamp the door (C/D) to the carcase (A–E) **[Photo G]** and drill the hinge screw holes in a side (A) and a stile (D).

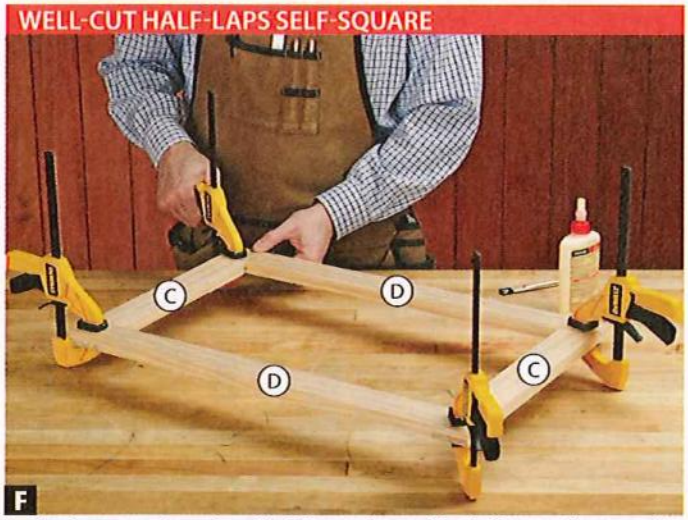
Quick Tip! ***The door can swing either way. Mount the hinges on whichever side works best in your shop.***

Screw the hinges in place and test the swing and fit of the door, then remove the door. Drill the holes for the door pull **[Drawing 2]**.

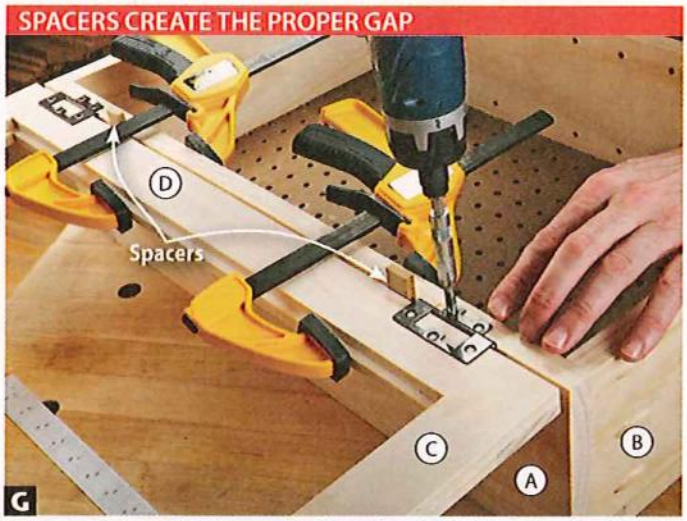
3 Cut the cap (F) and base (G) to size **[Drawing 2]**. Rout a ⅝" cove along the front and ends of the cap and ⅜" roundovers on both faces of the front and ends of the base. Finish-sand the cap and base to 220 grit; then glue them to the carcase (A–E), flush at the back and centered side-to-side. Retrieve the door (C/D) and trim the width of each rail (C) to create 1/16" clearance between the rails and the cap and base.

4 Cut the shelves (H) to size and finish-sand them. Cut the long and short glass stops (I, J) to size and sand them to 220 grit. Apply a finish to the shelves, glass stops, carcase (A–G), and door (C/D). (We wiped on three coats of satin-finish polyurethane.)

5 After the finish dries, cut a piece of 1/16"-thick acrylic to fit in the rabbet in the door. Place the acrylic in the door



Apply glue to one face of each half-lap and assemble the frames. Clamp each corner and check the assembly for square.



Cut scraps the same thickness as the hinge barrel to help position the door. Drill the holes with a self-centering bit, *below*.

frame and the glass stops over it. Drill 1/16" holes through the stops and drive #17x3/4" brads to secure them. Install the hinges and door pull, and then mount the door on the carcase.

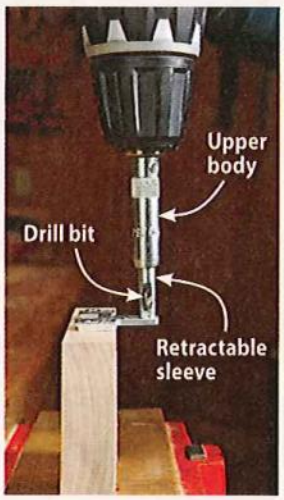
6 Install a magnetic catch on the bottom (B) and the strike on the lower door rail (C) [**Drawing 2**].

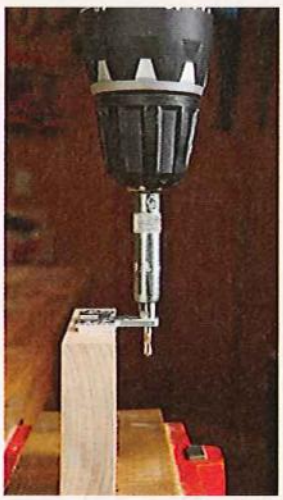
7 To hang the cabinet, position it on a wall and drive screws through the back (E) and top rear rail (C). Drive one screw into a wall stud, and use a hollow-wall hanger for the other screw.

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

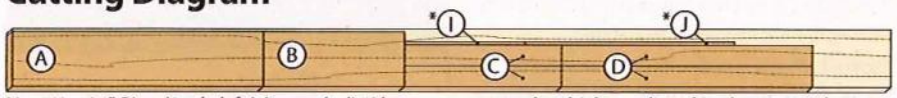
Center yourself

A self-centering drill bit makes it easy to install hinges without the worry of a misaligned screw hole forcing the hinge out of place. A retractable sleeve with a tapered tip surrounds the drill bit and automatically centers the bit in the hinge-leaf hole. A spring in the upper body holds the sleeve down until you press the bit down while drilling [*near right*]. This drives the bit forward while the sleeve slides up into the upper body [*far right*].

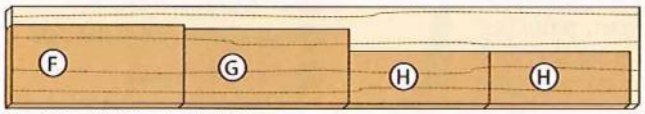




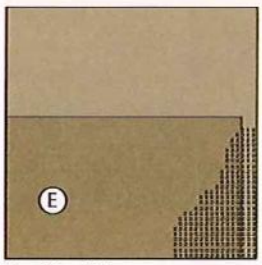
Cutting Diagram



¾ x 5½ x 84" Pine (3.5 bd. ft.) (2 needed) *Plane or resaw to the thickness listed in the Materials List.



¾ x 9¼ x 60" Pine (4.2 bd. ft.)



¼ x 24 x 24"
Perforated hardboard

More Resources

- Find FREE tips and techniques articles to sharpen your skills, plus more of our easy-to-build Basic-Built projects*, at woodmagazine.com/basicbuilt.

*Plans available for a small fee.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A	sides	¾"	5¼"	24"	P	2
B	top/bottom	¾"	5¼"	13½"	P	2
C	rails	¾"	2"	15"	P	4
D	stiles	¾"	2"	24"	P	4
E	back	¼"	13½"	22½"	PHB	1
F	cap	¾"	7½"	16½"	P	1
G	base	¾"	7⅛"	15¾"	P	1
H	shelves	¾"	5"	13⅞"	P	2
I	short glass stops	¼"	5/16"	11½"	P	2
J	long glass stops	¼"	5/16"	20"	P	2

Materials key: P–pine, PHB–perforated hardboard.

Supplies: #8x2½" flathead screws (2), #8x1¼" coarse-thread pocket-hole screws (12), ¼" shelf pins (8), #17x¾" brads (14), 1/16x11½x20½" clear acrylic, magnetic cabinet catch and strike plate, 4" satin-finish door pull, 2½" no-mortise hinges (2).
Bits: ¼" drill bit, 9/64" self-centering drill bit, ⅜" cove, ⅜" round-over router bits.

Supplies on Demand:
You can quickly and easily order the supplies and bits listed above at woodmagazine.com/214safety. Simply delete any supplies you already have on hand before checkout. Note: The acrylic sheet provided is 12x24".

Tips for Better Spindle Turning

Even if you use the lathe only occasionally, you can quickly and easily learn to turn out shapely spindles—anything turned between centers—with these essential guidelines to lead you.

Things to know before turning on the lathe

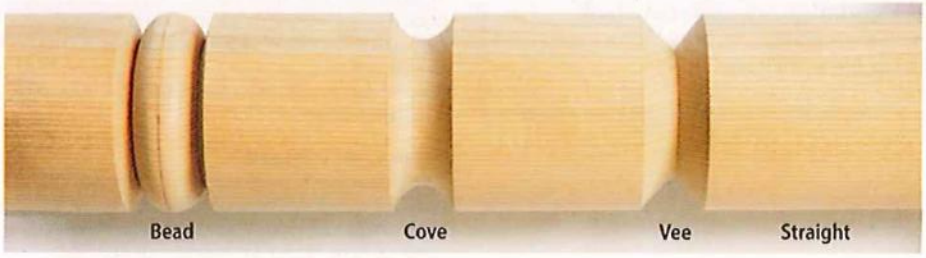
▶No matter how complex it might look, every turned spindle consists of four basic shapes, shown *below*—bead, cove, vee, and straight—used alone or in various combinations. In this article, you'll learn to make each shape individually; then you can begin blending them to create more complex profiles.

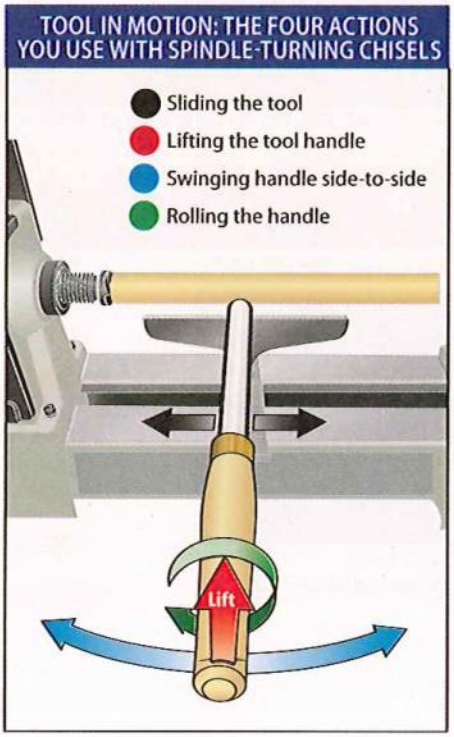
▶After roughing a blank round, define each shape's width with top and bottom limits (side-to-side when mounted on the lathe) by making pencil marks on the turned cylinder.

▶When shaping a profile, always work from the greater diameter to the smaller. So divide each shape in half, and cut each segment with a "downhill" motion to prevent catches and tear-out.

▶Regardless of the tool, you use one or more of four tool motions, shown *right*, for making shapes. *Lifting* the tool handle makes the tool cut deeper, reducing the spindle diameter; *swinging* the tool handle side-to-side creates curved profiles; *rolling* the tool in a circular motion optimizes the cutting edge to the task and fine-tunes shapes; and *sliding* the tool on the tool rest cuts shapes laterally.

▶And remember, practicing on scrap stock helps hone your skills, saves your good wood, and proves just as much fun as turning the final project.



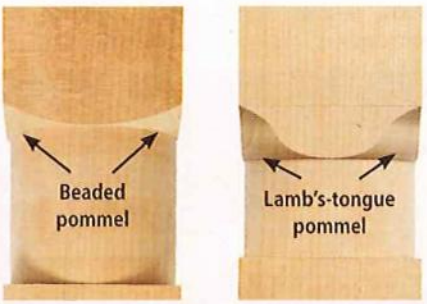


Starting from square one: Turning a pommel

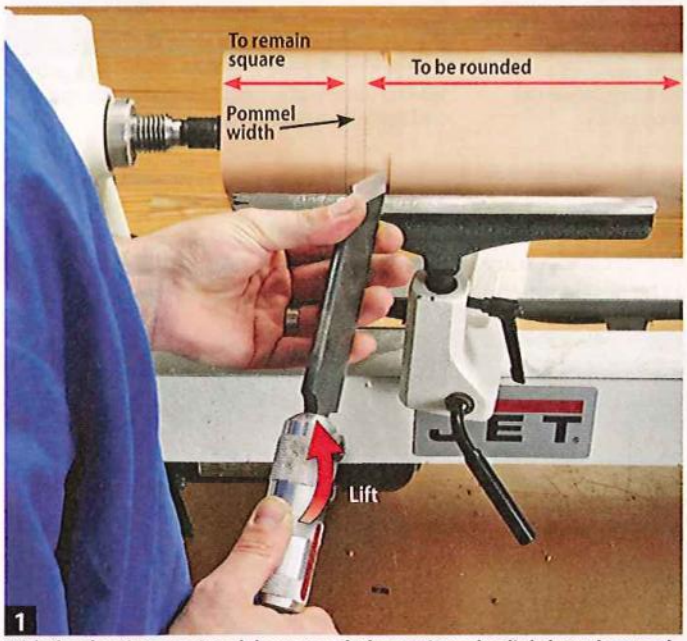
Most spindles start out as square blanks. To make the blank round, mount it on the lathe between the headstock and tailstock, and use the roughing gouge to reduce it to a cylinder.

If the finished spindle will retain a square segment, you'll need to first turn a *pommel*, the transition from square to round. Typically, pommels have either a beaded or lamb's-tongue (cove-and-bead combination) profile, shown at *right*. You can turn either profile with a spindle gouge, but we prefer a 1⅜" skew chisel for beaded pommels because, when used correctly, it cuts cleanly with no tear-out.

Cutting pommels first gives you a safety net: Should you have a catch that damages the square portion, you can stop and flip the spindle end for end and start fresh. The torn-out miscue will disappear when you later turn that end into a cylinder. Begin by marking the top and bottom of the pommel with a pencil and square on all four faces. With your lathe running at about 1,350 rpm for a 3"-square blank, cut the pommel (ours is a bead) as shown *below*.



With the pommel finished, use the roughing gouge to turn the remaining spindle to the largest profile diameter.



With the skew's toe pointed down, touch the cutting edge lightly to the wood ½" or so to the right of the bottom mark, and cut about 1/16" deep.

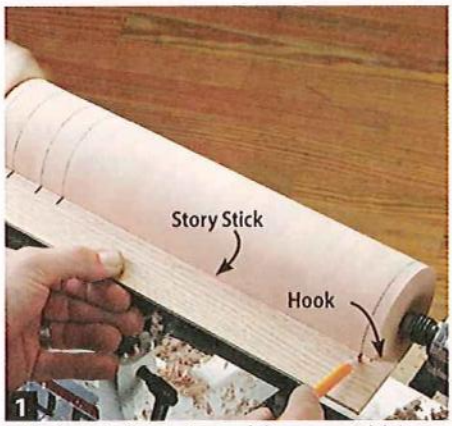
Make a series of gradually deeper cuts, repositioning the skew about 1/16" closer to the pommel's bottom mark each time.

When you reach the bottom mark, begin rolling the tool slightly as you cut, using a clockwise rotation, and ending with the tool at 90°.

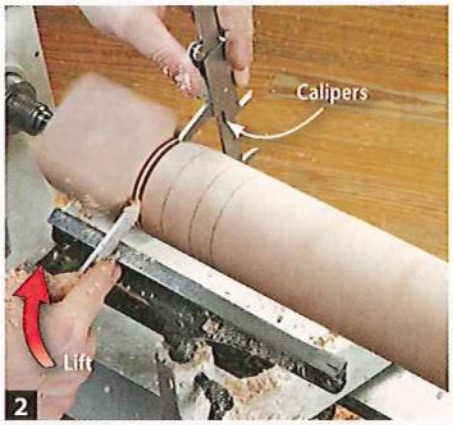
Make light shaving cuts until you've cut a bead that begins at the upper mark and ends in a complete circle at the bottom mark.

Now set critical diameters with a parting tool

Make a story stick with a hook at the bottom end, with dividing lines indicating the locations for different shapes. Transfer the lines to the spindle, as shown *below left*. Then use a parting tool and calipers to turn each diameter.



With the spindle turning and the story stick lying on the tool rest and hooked around the tailstock end, transfer the profile lines to the spindle.

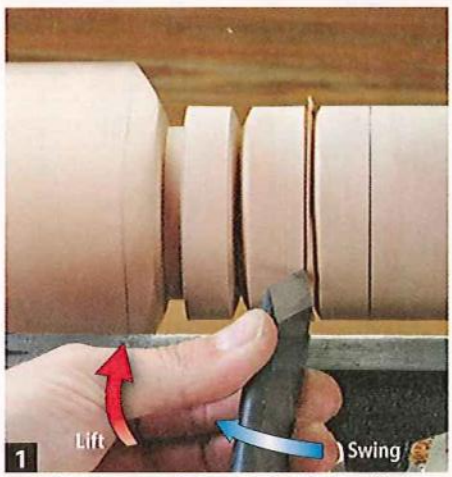


Rest calipers set to the desired diameter in a straight segment as you turn it down. When the calipers slip over the center, stop cutting.

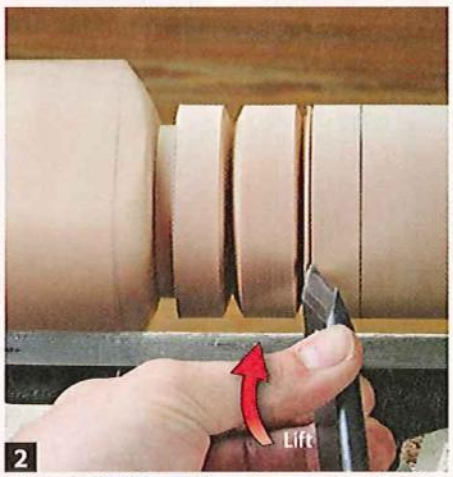
Establish the diameters of each shape, such as the top and bottom of a nonsymmetrical cove you'll cut later, with a parting tool.

Turn vees with a skew

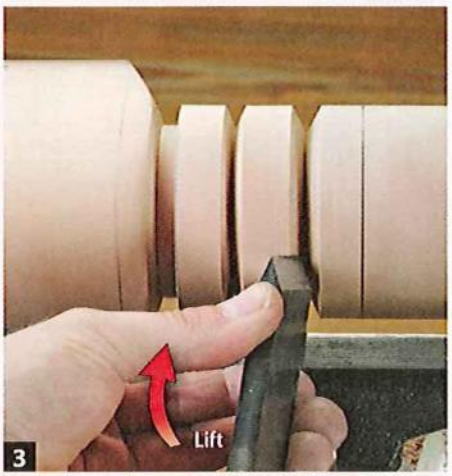
You create vees much like a beaded pommel, but without rolling the tool. Because the vee comes to a point, you cannot use a parting tool to establish the bottom diameter. Instead, alternate cutting each side of the vee with the skew, shown *below*.



With the toe pointed down, swing the handle while orienting the bevel with the vee angle. Then touch the toe to the workpiece and lift the handle.



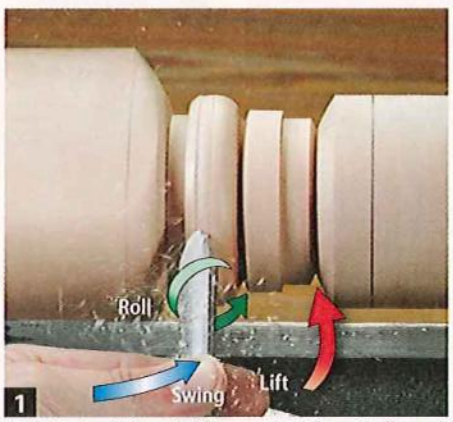
Take a similar light cut from the opposite side of the vee, chasing the shaved-away waste material toward the bottom.



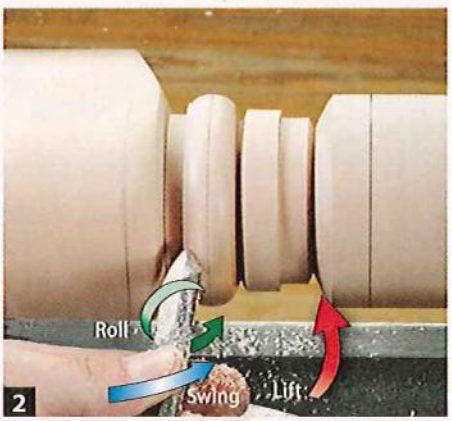
Make the vee deeper and wider by alternating cuts on both sides until you've reached the "bottom" diameter you want.

Make beads with a spindle gouge

Spindle gouges have rounded tips and shallow flutes (by comparison, bowl gouges have deep flutes), and work perfectly to make the rounded cuts that form beads. Begin by marking a dividing line in the center of the bead (defined in the earlier step with the story stick). Then, as you round off each side, start each pass closer to the pencil line and cut away from it, as shown at *right*. Ultimately, you should cut right up to the pencil mark on each side but not remove the line until the sanding stage. Reverse the tool actions for left and right halves.



With the tool's bevel riding against the spindle and the flute at 12 o'clock, start "pushing" a shallow cut away from the center mark, rolling a quarter-turn.

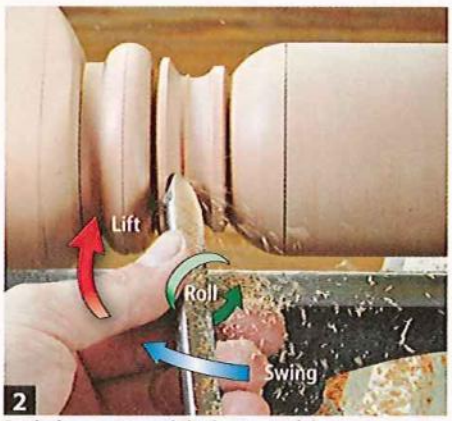


Continue making light cuts until you've rolled a continuous curve from the pencil line to the bottom diameter or connection to the next shape.

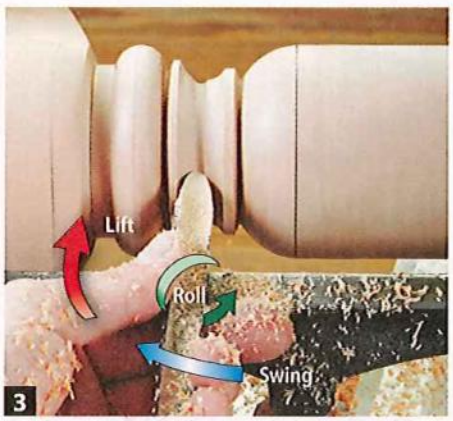
Shape coves similarly to forming beads

Use the same techniques to make coves as you did with beads. You roll the tool counterclockwise for left-side cuts while swinging the tool handle to the left. Do the opposite to shape the right side of a cove profile.

Start with the gouge's flute at about the 2 o'clock position. Lightly touch the tip into the spindle by lifting the tool's handle.



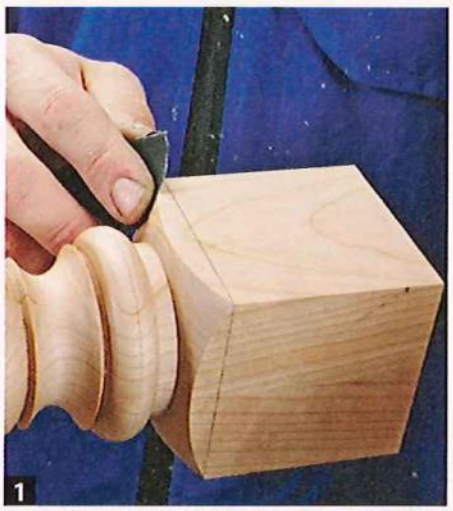
Push the cut toward the bottom of the cove by lifting the handle, pivoting, and rolling it counterclockwise simultaneously.



Continue cutting until you reach the center of the bottom. Do not cut past that point or you'll get tear-out or an uneven cove.

It's all over but the sanding

Once you've shaped the spindle's profile with your tools, sand away the tool marks. Start with 120 grit and follow with 150, 180, and 220 if needed.



To avoid rounding over the crisp corners and edges of the pommel, sand its turned profile by hand with the lathe *NOT* running.

Sand round profiles with paper-backed abrasive: It folds tighter to reach into crevices and tears easily if caught, protecting your fingers.

Sanding round profiles with the lathe spinning proves quicker than doing it by hand, but leaves radial scratches (Photo 3). With the lathe off, sand by hand in the grain direction to remove these scratches (Photo 4), following the same 120-, 150-, 180-, 220-grit pattern.

More Resources

- Watch these spindle-turning techniques in action in a video, free for a limited time, at woodmagazine.com/spindlevid.

- Buy more downloadable turning videos at woodstore.net. From the left-hand menu select "wood-working videos" and then "turning" for a full listing.

Produced by **Bob Hunter** with **Brian Simmons**
Illustration: **Tim Cahill**

Heat your shop. Cool your shop.

Double your woodworking enjoyment.

If your shop feels uncomfortably cold in the winter or unbearably hot in the summer (or both), your smartest "tool" purchase might be a shop heater or air conditioner. We take a look at some of the details to consider, and our quick-read chart on *page 56* speeds you to a decision.

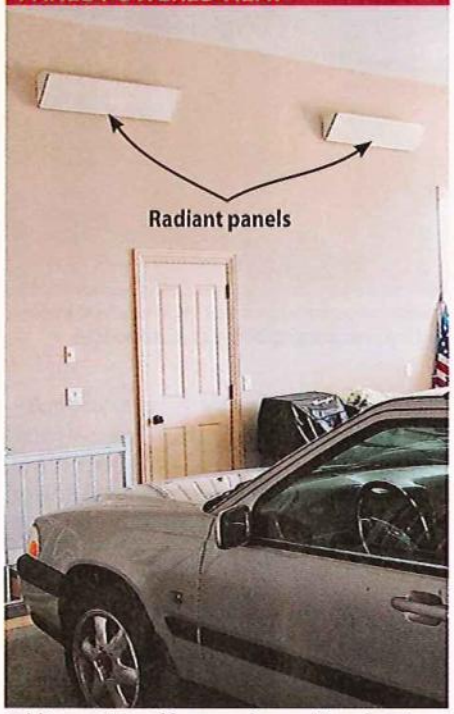
Radiant Systems

These work by directly heating the objects (and people) in the room via infrared rays—much as the sun warms you when you step out of the shade. The objects, in turn, pass that heat to the air. Because it warms a room's heat sinks, such as its concrete slab floor and cast-iron tool tops, a radiant heating system requires less energy to maintain a steady temperature and feels comfortable at a lower thermostat setting, making it more cost-effective than its forced-air counterparts. And radiant heating won't dry the air or stir up dust like forced-air systems.

You can find radiant heaters powered by either gas or electricity in several forms: electric panels *(below left)* in a variety of shapes that nestle into coves, baseboards, or even ceiling-tile grids; gas-fired, vented tubes in a variety of configurations to hang from your ceiling; and in-slab systems consisting of loops of hot-water lines *(below)*.

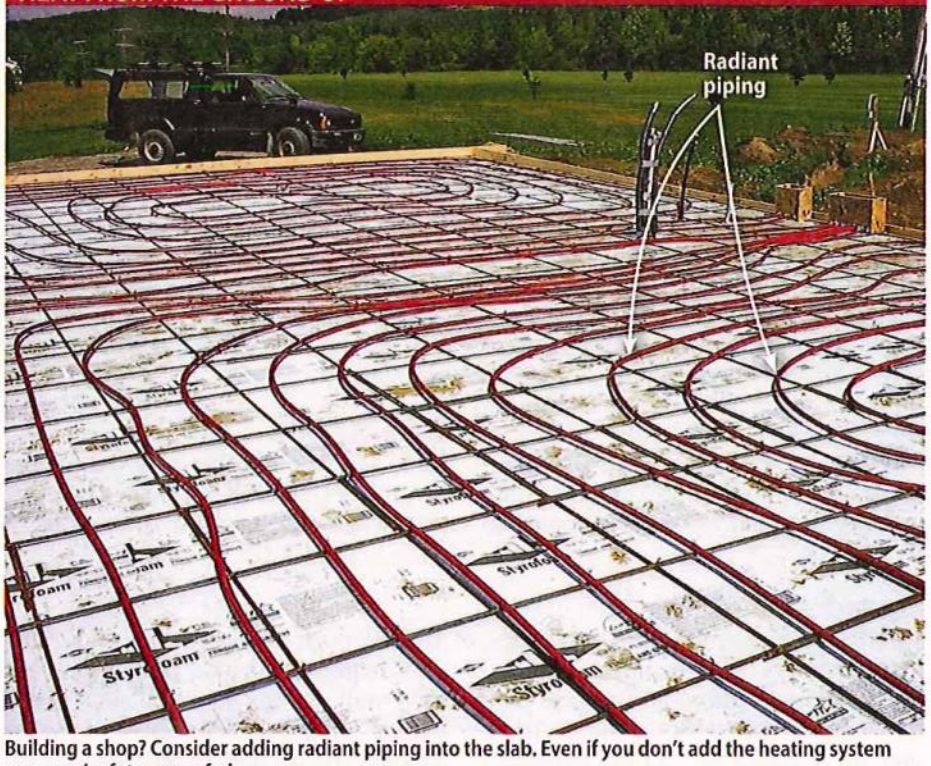
Radiant systems cost more to install than forced-air systems and often have to be special-ordered and installed by expert technicians. And they take a long time to heat things up—a consideration if you're in your shop for just a few hours at a time. However, if you require consistent, all-day heat, strongly consider a radiant system.

PANEL-POWERED HEAT



Sold in a variety of forms and capacities, electric radiant panels can be wired in series to match the needs of your shop space.

HEAT FROM THE GROUND UP



Building a shop? Consider adding radiant piping into the slab. Even if you don't add the heating system now, you're futureproofed.

Not-so-hot heating options

What about wood? Makes sense, right? You can burn your offcuts and mistakes for cozy heat. But wood heat has enough drawbacks to discourage it:

- Passing inspection may be difficult or even impossible in your community.
- Your insurance agent may balk at (or charge a fortune for) an open-flame appliance.
- Kiln-dried scraps burn hot and fast, so you'll soon be forced to switch to labor-intensive firewood. Even then, it will be difficult to maintain consistent heat.

Also be wary of vent-free propane- or kerosene-fired appliances. These low-cost heaters, sold as portable units or radiant panels, require plenty of fresh-air ventilation to prevent carbon-monoxide poisoning, causing you to waste energy warming cold outside air. And propane versions introduce moisture into the air—a bad mixture with wood and cast-iron tools. Although some models come with low-oxygen shut-off sensors for safer operation, the trade-off can be inconsistent heat as you wait for the fresh-air supply to replenish.

WOOD HEAT IN A WOODSHOP? MAYBE NOT

Sitting on concrete with clearance on all sides and fireproof tiles shielding the walls, a wood stove *might* pass inspection. But insuring a shop—especially one attached to a house—could prove the larger hurdle.

Heating Systems

For most of us, wintertime means woodworking. With the summer chores done, it's time to make sawdust. But if you live in a cold climate, toughing out a frigid shop can have a chilling effect on your hobby. Time to look into a shop heating system. But first, consider these four I's:

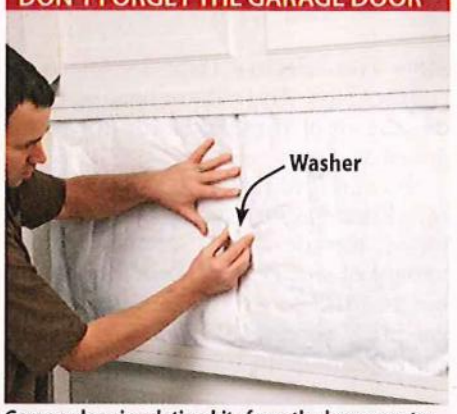
Insulation

Bare building materials, such as wood studs, sheathing, and siding, readily conduct heat and cold. To tame that transmission, add weather stripping to doors and windows, spot-fill holes and cracks with canned expanding-foam insulation, fortify the insulation of heat-loss-prone garage doors, and insulate walls and ceilings to a value of at least R-13. If you work out of a basement, add cut-to-fit rigid foam insulation to the rim joists, adhering it in place with expanding-foam insulation.

Installation

To choose an appropriate-size system for your climate, confer with a licensed HVAC installer. He will ask such questions as: How many walls does your shop share with a heated structure? What are the dimensions, and how high is the ceiling? Do you want to maintain a minimum temperature when you are not in the shop?

DON'T FORGET THE GARAGE DOOR



Garage-door insulation kits from the home center include adhesive-backed posts with washers that hold the insulation in place.

Inspection

Speak to your local housing code inspector to narrow the field of appliance choices. Eliminate systems restricted by your municipality and get the inspector's guidance on the legal installation of a system.

Insurance

Some heat sources that pass the inspector's muster may still be frowned upon by your insurance company. Choosing a system not covered by your insurance—such as a wood-burning stove—could leave you with denied claims after a fire, whether your heater was involved or not. So keep your insurance agent in the loop.

DEFEAT THE LOSS OF HEAT

Insulation pays for itself quickly in heat retention, cutting your heating bill by as much as 50%.

Forced-air Systems

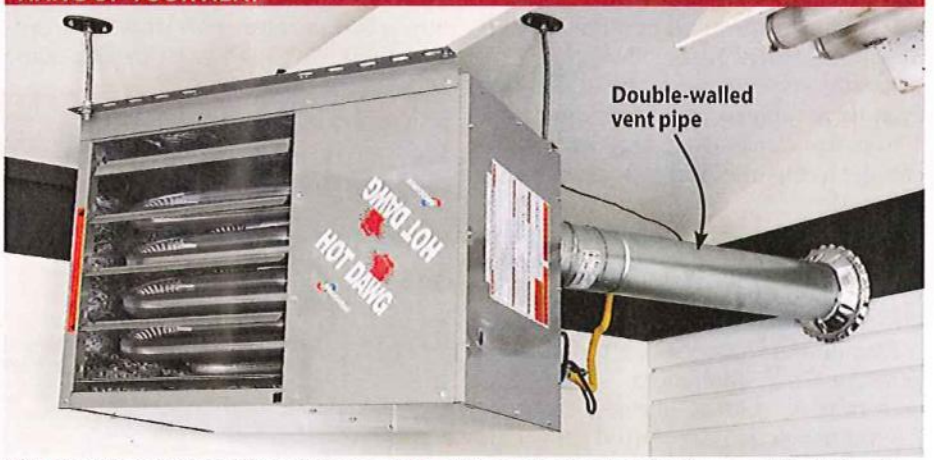
Specifically targeting home workshops, manufacturers have recently introduced more and more forced-air furnaces onto the market—both gas and electric—making it easier to find an affordable model for nearly any shop size. Fan-circulated, heated air raises a room's temperature quickly, making a forced-air unit an economical choice if you heat only intermittently.

In an electric forced-air furnace, all of the power sent through the element is converted to heat, making the appliance nearly 100 percent efficient. Electric furnaces sit on the low end of the price scale. Installation is inexpensive and simple—often little more than plugging or hard-wiring into your existing electrical service. However, in most of the country, electricity is the highest-cost utility, so an electric forced-air furnace may make the most sense for moderate climates calling for only occasional or supplemental heat. If your electric panel can handle it, opt for a more powerful 220-volt model.

A gas-fired, ceiling-mounted forced-air furnace requires venting and a gas line. And through-the-wall, direct-vent versions require some modifications to your shop wall, adding to installation costs. But natural gas remains one of the most inexpensive fuel sources, so it makes good long-term sense. For safety in a fume- and dust-filled shop, choose a furnace with a separated combustion chamber that draws outside air for combustion.

Their propane-fired cousins work the same, but propane prices approach electricity costs in some regions. If your only fuel options are electric or propane, enter your utility prices into a cost calculator like the one available from the U.S. Energy Information Administration (http://www.eia.gov/neic/experts/heatcalc.xls) to guide you to the lowest-cost option.

HANG UP YOUR HEAT



With a double-walled vent, this unit draws outside air for combustion, keeping fume- and dust-laden air away from its internal flame.

Cooling Systems

All air conditioners work basically in the same way: A cycle of evaporating and condensing refrigerant cools the air on the inside of the room and releases heat to the outside. As an added benefit, cooler air holds less moisture, so an air conditioner removes humidity naturally: great for your comfort and your cast iron.

The main differences in air conditioners are Btu capacity and shape. If you can't stand the heat in your shop, here are AC units to consider.

Portable units

Pint-size, rollaway, portable air conditioning units like the one shown *below* are low-dough options. But don't expect one to counter triple-digit heat, or cool large or uninsulated spaces. It's more useful in mild climates requiring only occasional cooling. And it needs only a 110-volt outlet and a door, window, or cut-out to accommodate its vent hose, which exhausts the hot air and humidity to the outside.

PINT-SIZE COOLING

If you're looking for a portable AC unit, consider an efficient dual-vented unit, which isolates hot outdoor air without venting the room's already cooled air.

Window and through-the-wall units

Today's window units aren't the rattle-and-roar contraptions you remember from decades ago. Quiet-running and efficient, modern window units often feature remote controls and can even heat on chilly days.

You'll recognize through-the-wall units (sometimes referred to as "packaged terminal air conditioners" or PTAC) from hotels. More readily available to consumers nowadays, these units sell in a variety of room-cooling capacities.

HAVE A WINDOW? MAKE IT COOL

With features rising and costs dropping, window units make appealing cooling options with low- or no-cost installation.

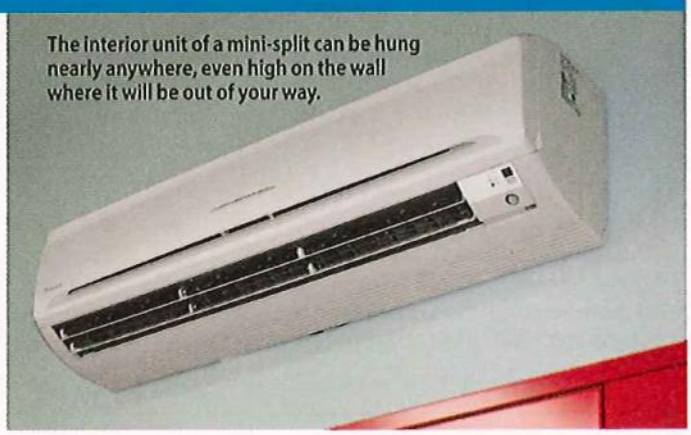
Mini-split

A favorite in Asia and Europe, mini-split systems have a long track record, but have only recently gained traction in North America. These cooling units work just like home central-air units: an outdoor compressor coupled with an indoor cooling coil, but in miniature. The lightweight, outdoor compressor takes up little room, the interior cooling unit can be hung anywhere (no ducting necessary), and the connecting refrigerant and electrical lines require only a 3" hole through the wall.

For an added cost, many mini-split units offer a heat pump upgrade, adding the capability of drawing heat from the outdoor air and depositing it inside. While capable of heating the air much more efficiently than a simple electric heating element (some use one-third the electricity of their element-equipped cousins), they can't overcome outdoor air temperatures lower than about 35°. To compensate for the coldest part of the season, many units add less-efficient supplemental resistance-style electrical heating elements.

MAKE MINE A MINI-SPLIT

The mini-split condenser unit from Friedrich (friedrich.com) measures only 33x36x13", mounts outside, and can power up to four interior cooling units. A licensed HVAC technician is required for installation and charging the system with refrigerant.



The interior unit of a mini-split can be hung nearly anywhere, even high on the wall where it will be out of your way.

HEATING AND COOLING SYSTEMS AT A GLANCE

	Type	Price Range*	Operating Cost**	Notes
Heating	Forced-air, electric furnace	$250–$750	High	• Low installation cost • No venting required • May require 240-volt service • May stir finish-marring dust
	Forced-air, gas furnace	$500–$1,500	Moderate	• Available in a wide range of sizes • Requires gas line, venting, and isolated combustion • May dry shop air and stir dust
	Direct-vent gas heater	$750–$1,500	Moderate	• Requires gas line and possible wall reconfiguration • Takes up valuable wall space
	Radiant panel, electric heater	$2,000–$3,000	Moderate	• No venting required • Does not stir dust • May require multiple units • Could leave cold spots
	Radiant tube, gas heater	$5,000–$7,000	Low	• Does not stir dust • Requires 8' or higher ceilings and clearance near garage doors • Requires gas line and venting • Not widely available • Not available in lower Btu sizes
	Radiant in-floor, hydronic heater	Depends on size of workshop	Low	• Low operating cost: can be powered by a small water heater • Provides even heat throughout space • Does not stir dust • Requires new construction or new floor
Cooling	Portable air conditioner	$300–$700	Moderate/High	• Can be moved for spot cooling • Requires venting via hose • Works best in small shops
	Window/wall air conditioner	$200–$800	Moderate/High	• Available in a variety of capacities • Requires window or wall opening • Some come configured with heating element or heat-pump options
	Mini-split air conditioner	$800–$2,000	Moderate/High	• Available in a variety of capacities • Cooling unit can be positioned almost anywhere • Some outdoor compressors can power multiple units • Some come configured with heating element or heat-pump options • Should be installed and charged by a licensed HVAC technician

*Prices based on systems with enough Btus to heat or cool a well-insulated one- or two-car garage shop in a moderate climate. Installation costs will vary by contractor. Operating costs will vary by region.
**Compared with other heating/cooling options in this chart.

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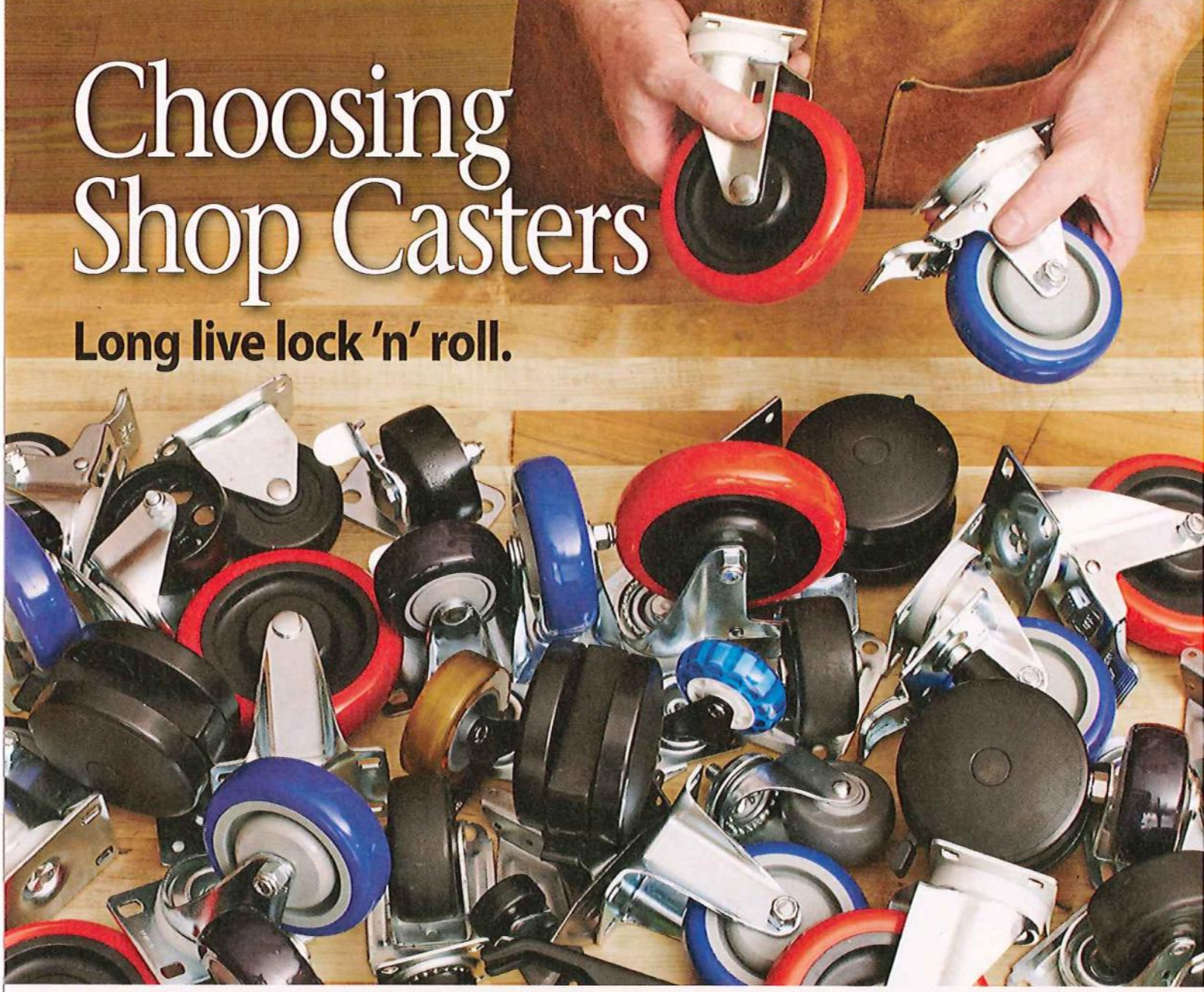
Choosing Shop Casters

Long live lock 'n' roll.



In any shop, putting machines, tool stands, clamp racks, assembly tables, and workbenches on casters gives you maximum flexibility in shop layout and usage. Roll it out when needed; then roll it back out of the way for storage. But with a mind-boggling assortment of casters available on websites and in catalogs and home centers, how do you pick the right ones for your projects? Read further to learn how.

Start with weight rating, then choose material

Each caster has a maximum weight limit it will support and still function properly. Begin by calculating the approximate weight of your project, using the chart at *right* as a basis for material weights. (For products or wood species not listed, compare them with a similar species from the list or weigh a sample of your own.) Divide the project's weight by the number of casters you'll use, and that figure tells you the minimum weight rating you should consider; buy casters that meet or exceed that number.

TYPICAL WOOD WEIGHTS (LBS)	
1x12x12" pine (1 board foot)	1½
1x12x12" red oak (1 board foot)	3
¼"x2x4' hardboard (¼ sheet)	7
½"x2x4' plywood (¼ sheet)	9
¾"x2x4' plywood (¼ sheet)	16
¾"x2x4' particleboard (¼ sheet)	18
¾"x2x4' MDF (¼ sheet)	20

Next, select a tire material:

▶ **Plastic or nylon** tires provide no "give" when passing over an extension cord or uneven crack in a concrete floor—sometimes hanging up rather than hopping over—and lack the durability of beefier casters.

Typical price: $4–8 each.

Best use: lightweight projects (under 200 lbs) on smooth, crack-free floors.

▶ **Rubber/PVC** tires conform to small obstructions, so they roll easily over power cords, debris, and floor cracks. But that softness creates extra drag when used on projects over 300 lbs, and the wheels can develop flat spots if not moved regularly. These can also come loose from their rims as they roll over

wide or uneven cracks.
Typical price: $3–7 each.
Best use: Light- to medium-weight projects (300 lbs and under).

▶ **Steel** tires are tough and durable, but unforgiving, so they hang up easily on small objects and cracks. They tend to scratch and dent wood floors.
Typical price: $7–10 each.
Best use: Heavyweight projects (500 lbs and up) that you don't move often or far, such as a big workbench, lumber storage rack, or cabinet tablesaw.

▶ **Polyurethane** tires, our favorite, provide the best of all worlds. They're firm enough to support projects up to nearly 1,200 lbs without flattening, yet pliable enough to easily pass over nearly anything in their path.
Typical price: $8–15 each.
Best use: Everywhere.

Now look at size and mounting options

In general, the larger the diameter of wheels you select—most types come in 2–5" sizes—the better your casters will maneuver over obstructions. But larger casters also raise the height of your project. So be sure to consider caster height when designing projects.

Next, choose between plate-mount casters and stem-mounted ones. Plate-mount casters attach with screws or lag bolts and require flat mounting surfaces typically at least 3" wide. These tend to be more durable than stem-mounts.

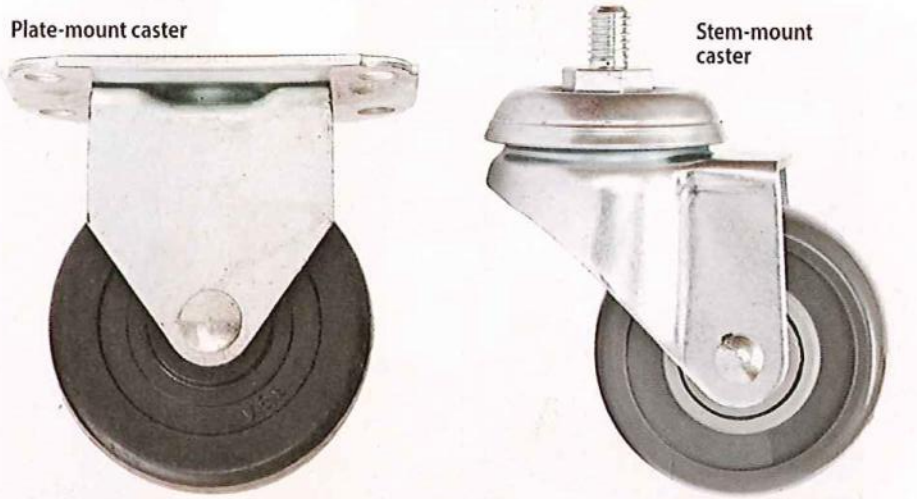
A stem-mount caster has a threaded stem you insert through a hole in your project and then secure with a nut. For these you need a horizontal surface, such as a stretcher or foot, but not as wide as for a plate-mount. You can also attach a stem-mount to a vertical leg or side panel using right-angle brackets.

Finally, choose between fixed, swiveling, or locking

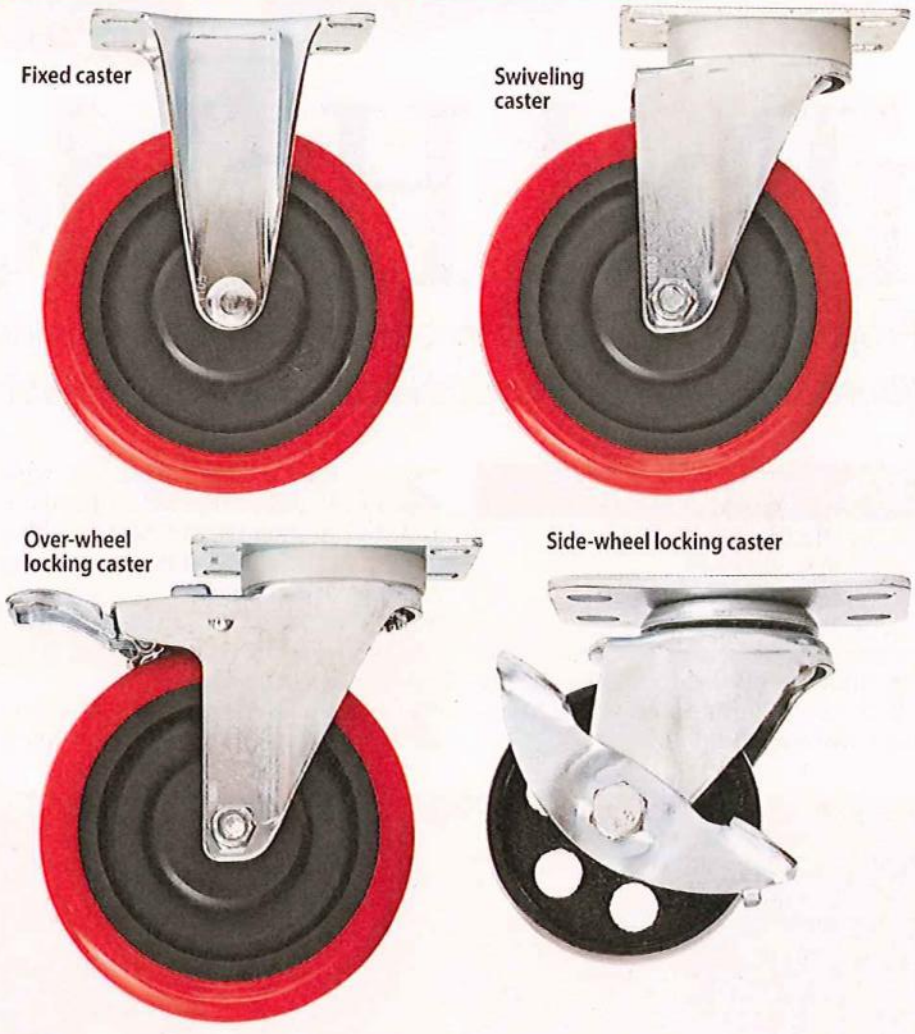
Casters typically come in all three styles for each size, and each has its advantages. On projects with four casters, at least two must swivel so you can steer them around the shop. For the other pair, it will depend on the situation: Fixed casters on the opposite end allow you to better control the direction you push the project, but you might have to "parallel park" it into spaces. Four swiveling casters maneuver easily in tight quarters, but make long projects, such as workbenches, harder to steer.

Each style of caster comes with or without a locking mechanism. As a rule, if you'll need your project to hold in place, get locks on the swiveling casters (but not on fixed ones). We prefer over-wheel locks you can step on with your foot and press into the wheel, and then lift with the toe of your shoe to unlock. Side-wheel locks prove more difficult to operate with your foot—you might have to stoop and use your hand.

FOR STURDINESS CHOOSE PLATE-MOUNT VERSUS STEM-MOUNT



MORE CHOICES: FIXED, SWIVELING, OR LOCKING



Produced by **Bob Hunter**

Source

Casters, assorted sizes and styles: Rockler Woodworking and Hardware, 800-279-4441 or rockler.com.

iPad Holder

Prop and protect your tablet computer with this handy, easy-to-make case. (Don't own an iPad? Adapt the dimensions to fit your tablet.)

Project Highlights

- Overall dimensions: ⅝" thick × 8⅞" wide × 11⅛" long.
- Materials needed: Cherry and cherry plywood. Approximate cost: $40.

1 From ⅛" plywood, cut the top (A) and bottom (B) panels to size **[Drawing 1, Materials List]**.

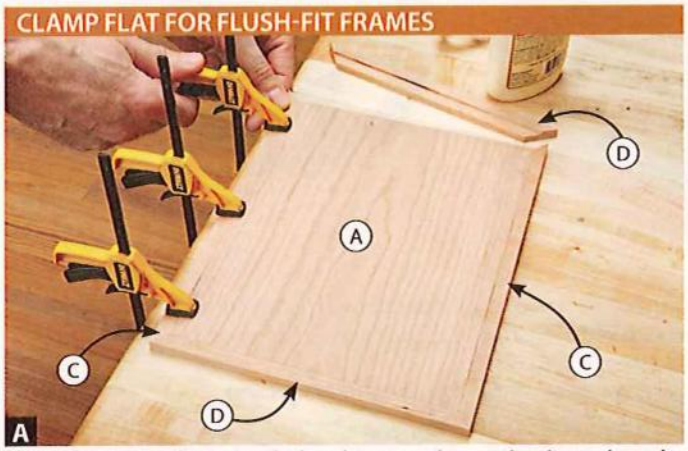
2 Make four 5/16"-thick blanks ¾" wide and 24" long for the rails (C) and top and bottom stiles (D, E). Cut a ⅜" rabbet as deep as the plywood thickness along one edge of each blank.

NOTE: *To ensure smooth, flush faces on the case, make test rabbets in scrap until they precisely match the plywood.*

3 Cut the rails (C) and top stiles (D) to length **[Materials List]** with 45° miters at each end. Glue and clamp together the mitered rails and stiles around the top panel (A) **[Photo A]**.

Now cut the bottom stiles (E) to length with only one end mitered, making sure one part mirrors the other. (You'll notch the square end in the next step.) Glue and clamp together the bottom panel (B), one rail, and the bottom stiles with the panel tight against each of the rabbets.

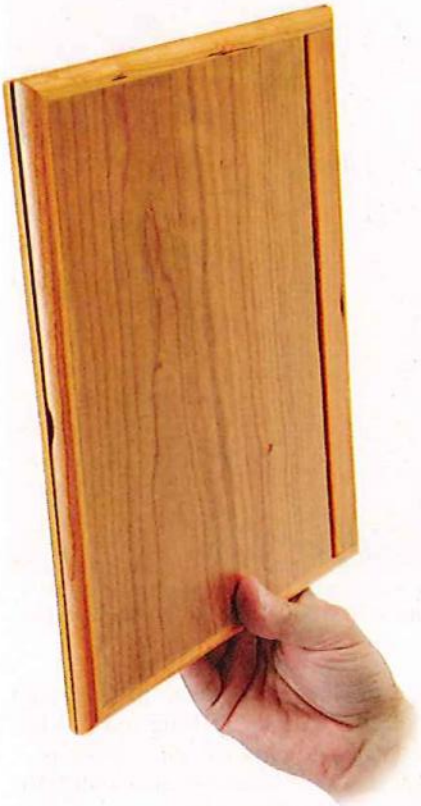
CLAMP FLAT FOR FLUSH-FIT FRAMES

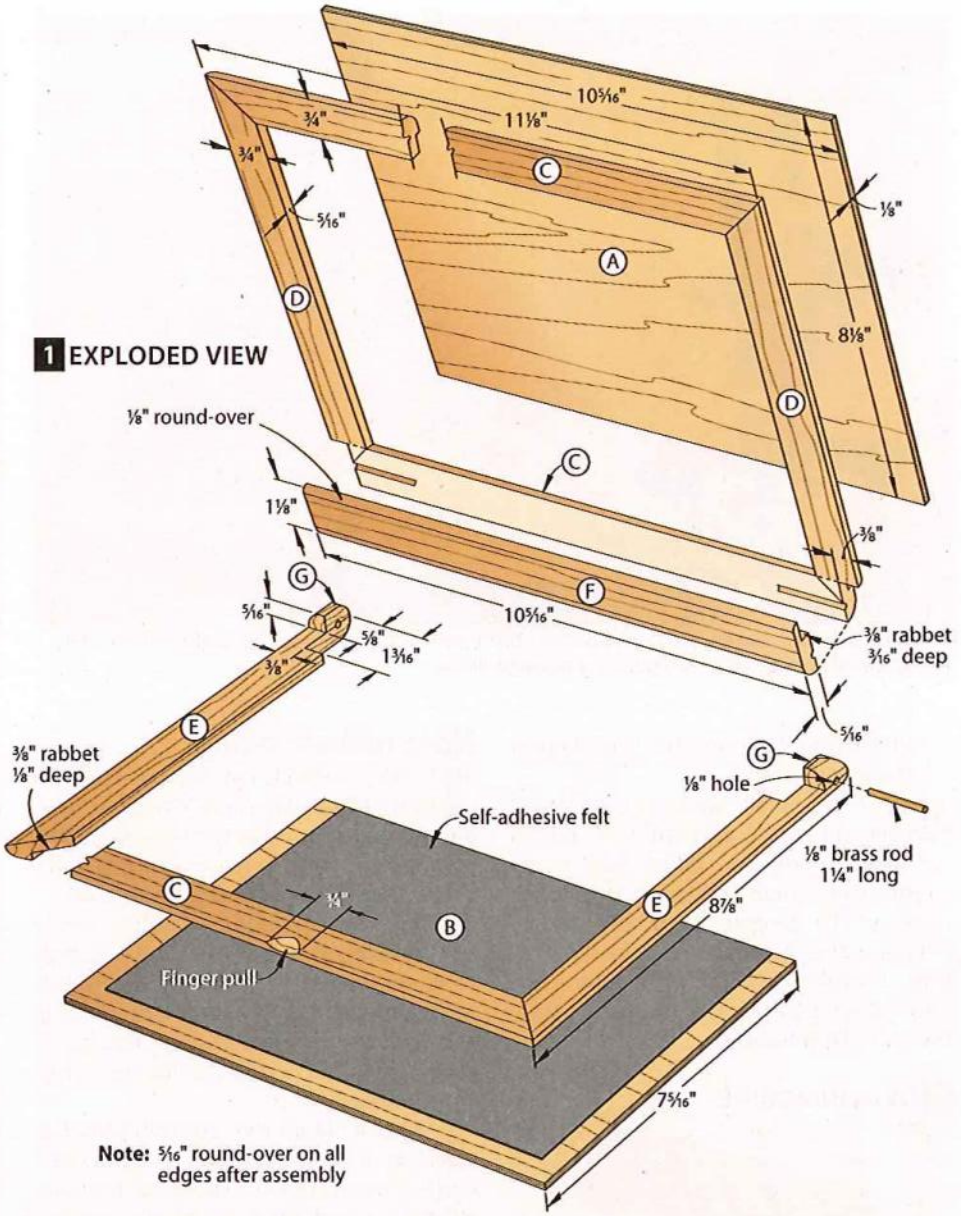


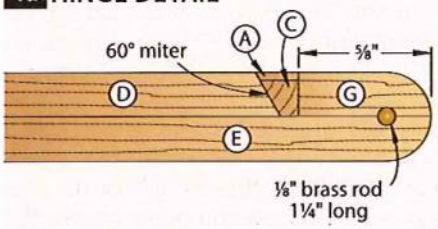
A Clamp the top together, using the benchtop to make sure the plywood panel seats flush with the rabbets in the rails (C) and stiles (D).

PERFECT THE HINGE SECTION

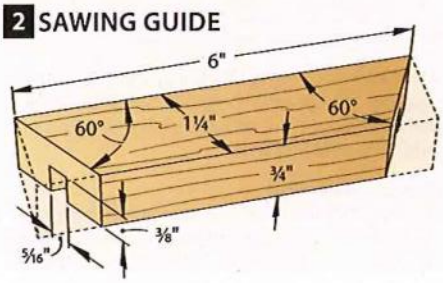
B Because this holder is so thin (⅝"), the hinge details prove critical to provide maximum support while also leaving clearance to open.



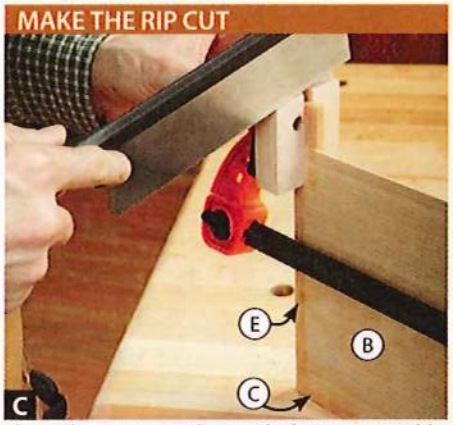




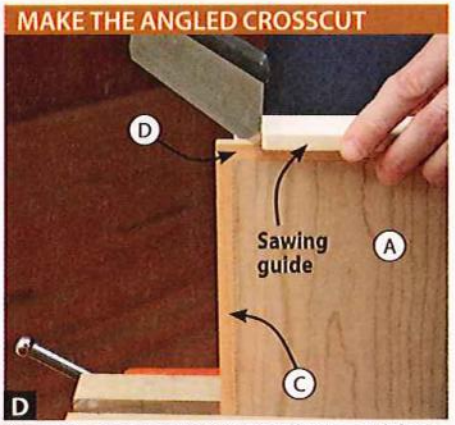
4 Lay out the ⅜×¾" hinge notches on the top assembly (A/C/D) and ⅜×1³⁄₁₆" notches on the bottom assembly (B/C/E) where shown in **Drawings 1** and **1a** and **Photo B**. Make a 1¼×6" sawing guide with a centered groove as shown in **Drawing 2**, *but don't miter-cut the ends yet.* Clamp the guide to align the blade with one of the bottom-assembly layout lines you just made, and make the rip cut 1³⁄₁₆" deep **[Photo C]**. Next, slide the sawing guide so one end lines up with the remaining mark, clamp it, and cross-cut to intersect the previous cut. Repeat for the other side.



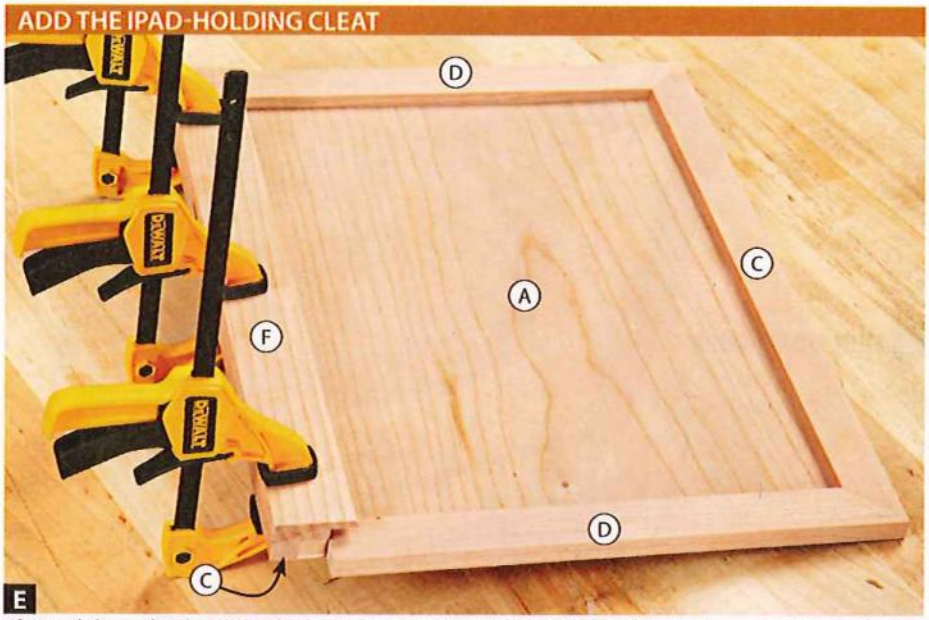
5 Next, cut 30° miters onto each end of the sawing guide. Position the guide on the top assembly (A/C/D) and miter-cut ⅜" deep at the layout line **[Photo D]**. Slide the sawing guide so 1–2" extends beyond the mitered frame, and rip-cut to complete the notch, tilting the saw 30° to match the crosscut angle and



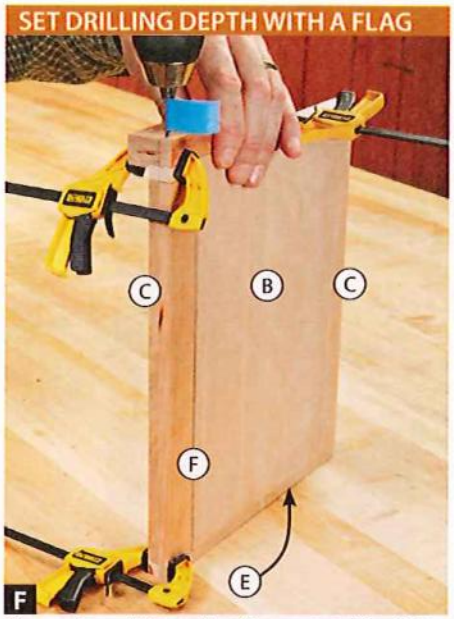
Clamp the sawing guide over the bottom assembly (B/C/E), and, holding the blade against the guide, saw to the intersecting line.



Secure the top assembly in a bench vise, and then hold the sawing guide at the crosscut mark to make the angled notch cut.



Glue and clamp the cleat (F) to the now-notched rail (C), flush with the bottom edge and with the rabbet facing inward (to support the computer in a raised position).

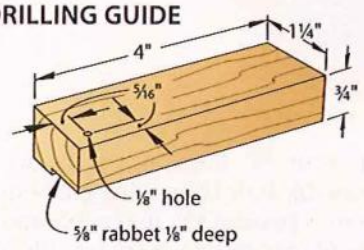


Wrap a piece of blue painter's tape around the bit to prevent drilling deeper than the 1¼"-long brass pins.

avoid cutting beyond the kerf. Repeat for the other stile.

6 From 5/16"-thick stock, cut a 1⅛×12" cleat (F) blank, and cut a ⅜" rabbet 3/16" deep along one edge. Rout a ⅛" round-over where shown in **Drawing 1**. Crosscut to length so it fits snugly between the notches cut into the bottom assembly (B/C/E) in **Step 4**. Glue and clamp it in place on the top assembly (A/C/D) **[Photo E]**.

3 DRILLING GUIDE



Now, make it swing

1 From 5/16"-thick cutoffs, cut the two hinge blocks (G) to size **[Drawings 1, 1a]**, and glue and clamp to the bottom assembly (B/C/E). After both assemblies have dried, sand all edges and faces smooth.

2 Make a hinge-pin drilling guide **[Drawing 3]**. Clamp the top and bottom assemblies together with all ends and edges flush. Clamp the drilling guide flush with the ends of the hinge blocks (G), and drill holes for the hinge pins **[Photo F]**.

3 From ⅛" brass rod, cut two pins 1¼" long and tap all but ¼" into the drilled holes. Open and close the case gently to check for catch points; sand or trim any areas that rub or bind. Remove the pins, apply a drop of super glue into the holes on the top assembly (A/C/D/F), reassemble the two halves, and tap the pins into place, leaving just enough exposed to trim flush. After the glue has dried, cut and sand the pins smooth.

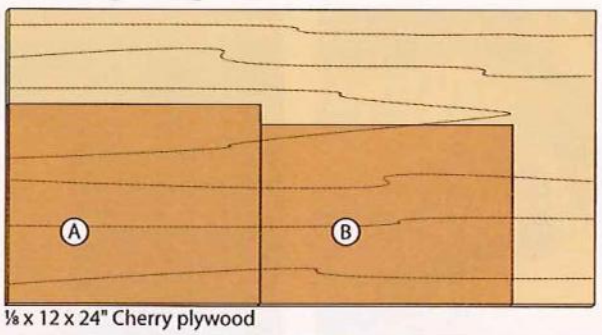
4 Rout a 5/16" round-over around the top and bottom edges.

5 Mark a centerline on the bottom front rail (C), and use a spindle sander (or sandpaper wrapped around a ¾"-diameter dowel) to shape an angled indentation about ⅛" deep. Relieve all sharp corners with 220-grit sandpaper.

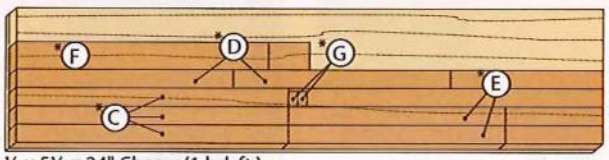
6 Apply finish. (We sprayed on two coats of Old Masters aerosol satin lacquer.) When the finish has dried, insert thin self-adhesive felt in the bottom to protect the computer screen.

Produced by **Bob Hunter** with **Kevin Boyle**
Project design: **Kevin Boyle**
Illustrations: **Lorna Johnson**

Cutting Diagram



⅛ x 12 x 24" Cherry plywood



½ x 5½ x 24" Cherry (1 bd. ft.)
*Plane or resaw to the thickness listed in the Materials List.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A	top panel	⅛"	8⅛"	10 5/16"	CP	1
B	bottom panel	⅛"	7 5/16"	10 5/16"	CP	1
C*	rails	5/16"	¾"	11⅛"	C	3
D*	top stiles	5/16"	¾"	8⅞"	C	2
E*	bottom stiles	5/16"	¾"	8⅞"	C	2
F*	cleat	5/16"	1⅛"	10 5/16"	C	1
G	hinge blocks	5/16"	⅜"	⅝"	C	2

*Parts initially cut oversize. See the instructions.

Materials key: C–cherry, CP–cherry plywood.
Supplies: ⅛" brass rod, 3" long; 9×12" self-adhesive felt.
Blade and bits: ⅛", 5/16" round-over router bits; stacked dado blade or rabbeting bit.

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

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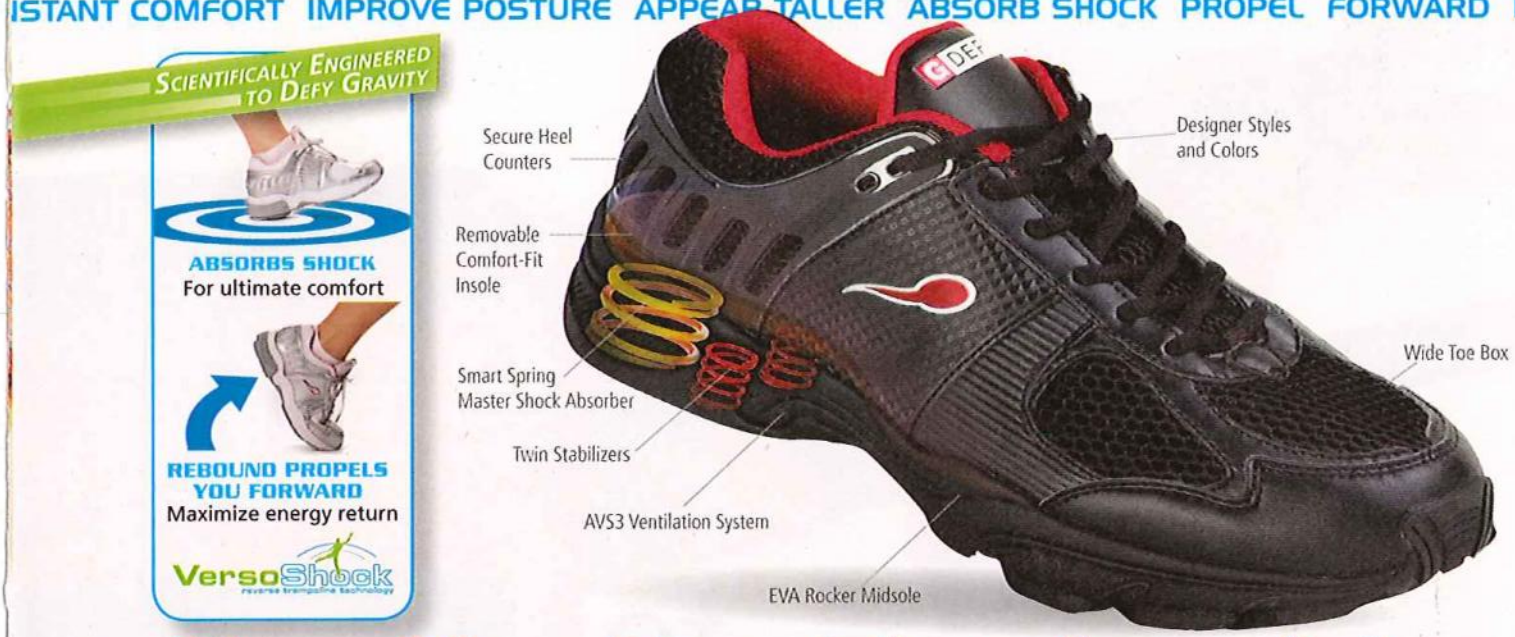
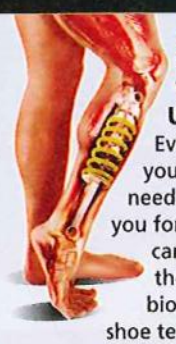


Now You Can Stop Imagining



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115

Start square...

...to finish square

From tuned-up tools 'til you tighten the clamps, it's hip to be square. Here's how to get there.

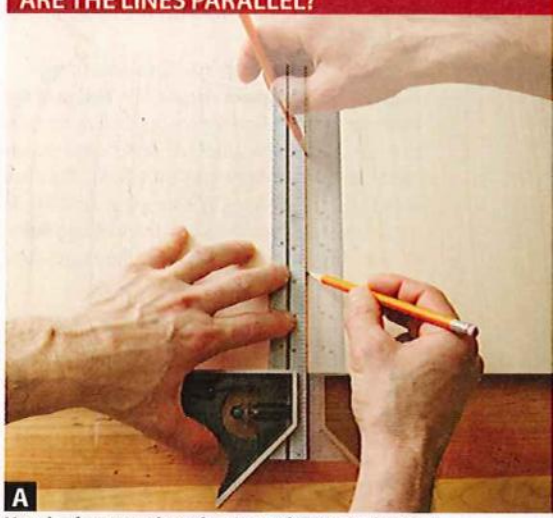
Whether you build a jewelry box or a dresser, square assemblies begin with square stock and properly cut joinery. Apply these top-notch techniques with properly tuned tools; then use our reliable methods for checking your work, and say goodbye to off-kilter corners.

Check your standards

Square machine setups, workpieces, and assemblies begin with an accurate square. A good combination square (see **More Resources,** *page 67,* to find reviews of squares) performs most checks, but keep a 4" engineer's square in an apron pocket to fit in small interior spaces.

But how do you know your square is... well, square? To find out, place the head against the straight edge of a scrap. Draw along the length of the blade, then flip the square over and draw a second line about 1/16" from the first **[Photo A]**. Parallel lines indicate a square you can trust.

ARE THE LINES PARALLEL?



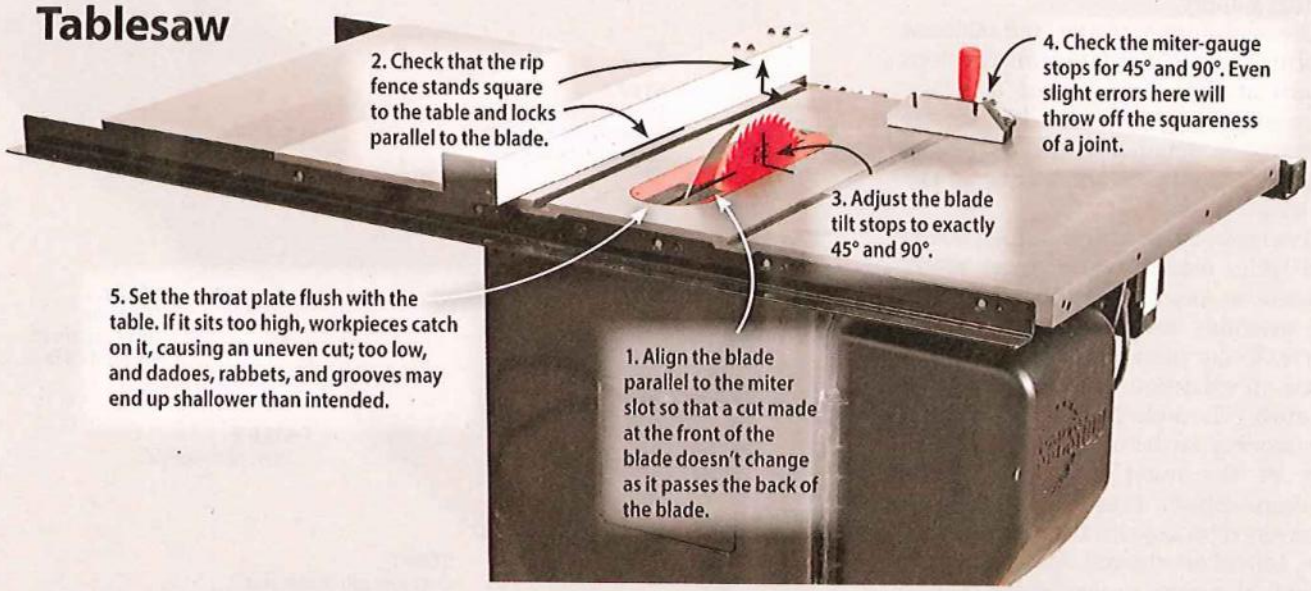
A

Use the factory edge of a piece of MDF or plywood to perform this test. Draw lines with a sharp pencil or marking knife.

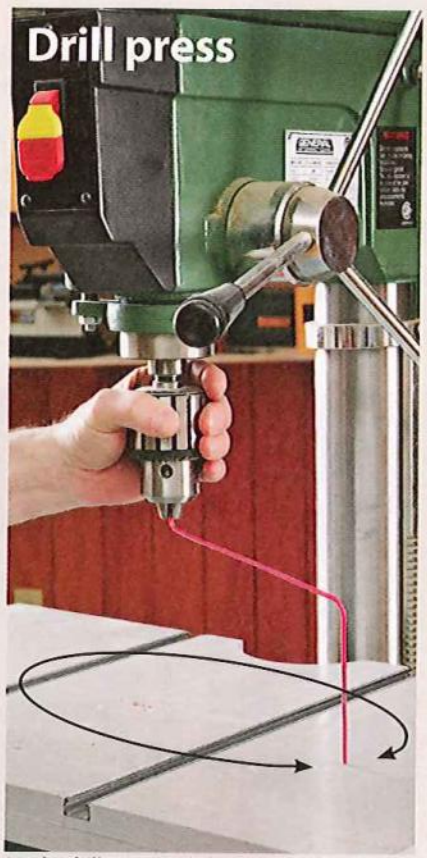
Take the time to tune the tools

Before milling lumber to size or cutting joints, tune your tools to cut true. The owner's manuals should have details on making most of the adjustments listed *below*. See **More Resources** on *page 67* for additional help.

Tablesaw

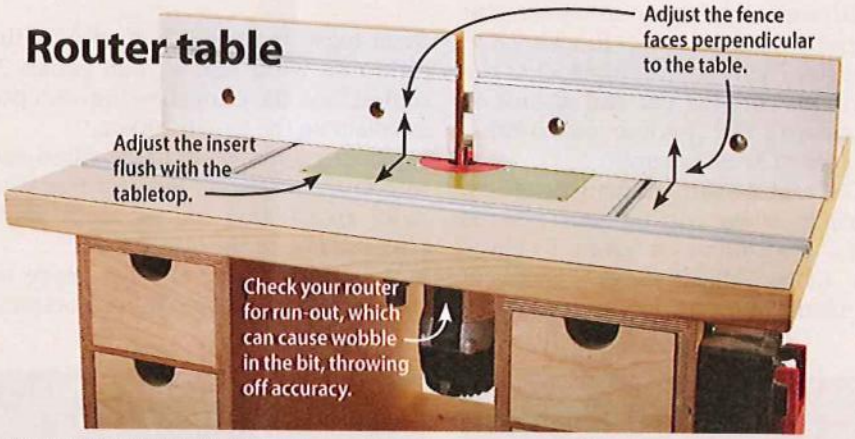


Drill press

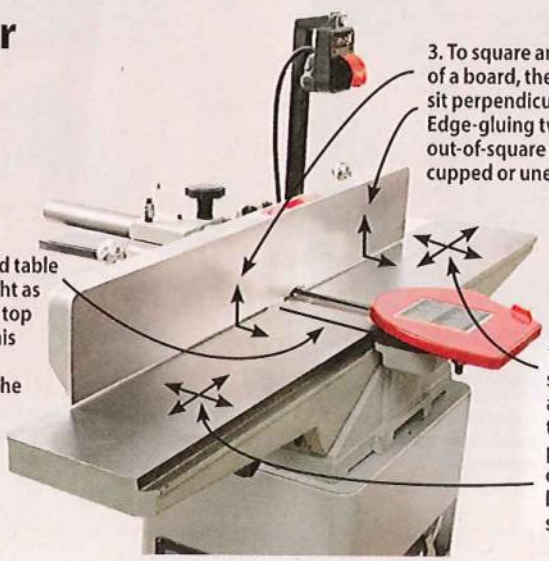


Set the drill-press table to bore dowel joints and mortises perpendicular to the surface of a workpiece. Check the table by mounting a Z-shape wire in the drill press and turning the chuck by hand. The wire should make even contact at all points around the table; then install the fence and ensure that its face sits perpendicular to the table.

Router table



Jointer



Cut parts and joints accurately

With your tools properly tuned, focus on producing the most accurate cuts possible when milling project parts and cutting joinery.

▶ Use your jointer, planer, and tablesaw to bring stock to size, following the steps shown at *right*. For greatest accuracy, crosscut pieces less than 40" long on the tablesaw, as detailed in the next paragraph. Use a mitersaw or radial-arm saw for longer pieces.

▶ Assemblies such as face frames, boxes, and tables require two or more pieces crosscut to identical length—otherwise the assembly ends up a trapezoid or worse. To cut pieces to identical length, screw an extension to your miter gauge **[Photo B]**. The additional surface steadies a workpiece far better than the narrow face of the miter gauge. We prefer medium-density fiberboard (MDF) for extensions because it's flat and inexpensive. Fences get chewed up with use; cut several at a time so you always have a fresh one on hand.

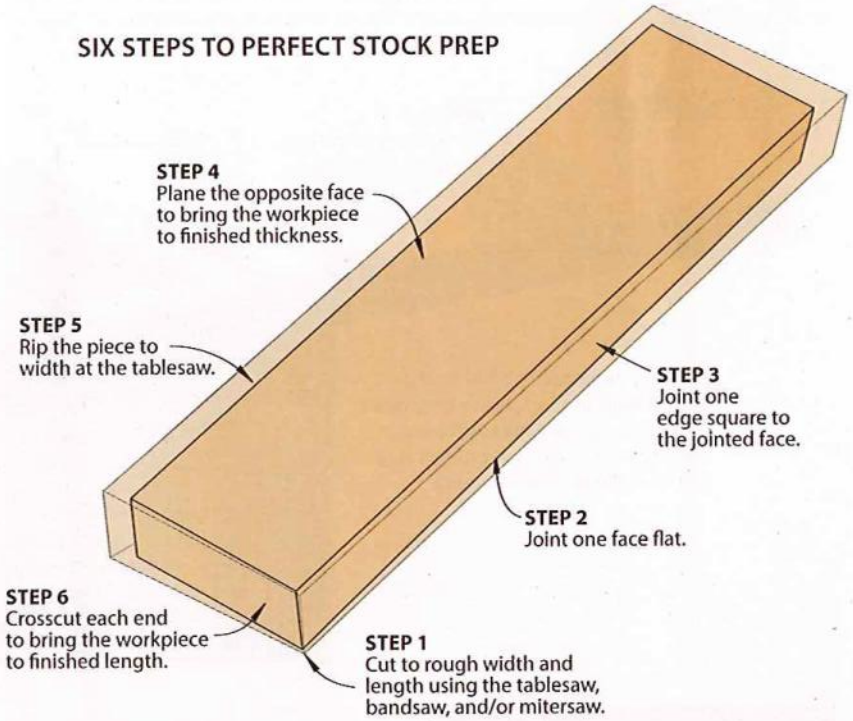
With the extension mounted, crosscut one end of each workpiece to square it to the edges. Then clamp a stopblock to the extension, butt the cut end against it, and crosscut the opposite end to bring the piece to finished length.

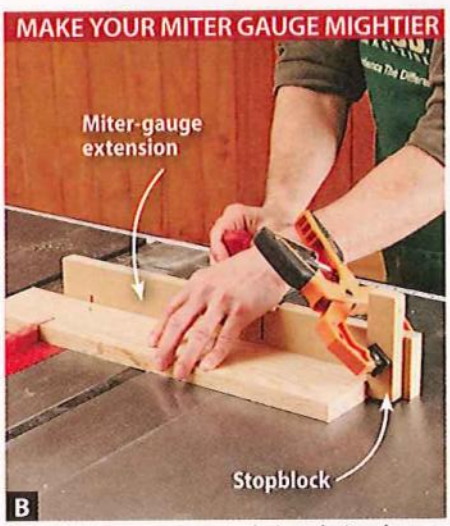
▶ Miter joints are particularly fussy, especially when cutting four mitered pieces, as for a box or frame. To check your tablesaw-blade angle, miter-cut four identical-length pieces and dry-fit them together **[Photo C]**. If each of the eight cuts is off just ¼°, that equals 2° overall, and the error shows up as a gap as you close the fourth corner.

▶ Jigs can improve accuracy when cutting joints **[Photo D]**. But just like your tools, ensure that the jig keeps workpieces square to the blade or bit.

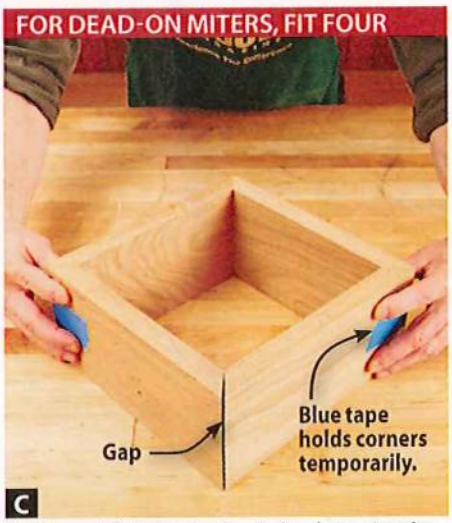
▶ When using a jig or miter gauge on the tablesaw, secure your workpiece with clamps or double-faced tape whenever possible to prevent the workpiece from shifting during the cut.

▶ After milling parts, check them for square. When checking the end of a workpiece, place the head of the square firmly against one edge and slide it down until the blade just touches the end **[Photo E]**. Sight against a light source or white surface to highlight any gap.

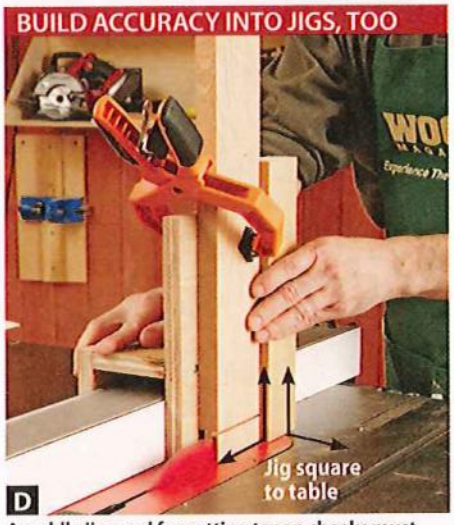




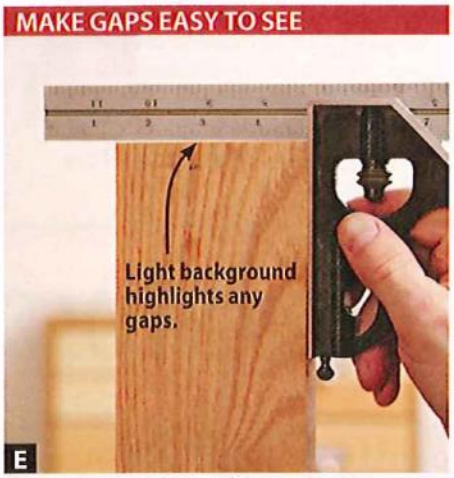
An extension supports a workpiece during the cut and provides a surface for attaching a stopblock for cutting pieces to identical length.



Cutting and fitting a test box helps determine the precision of your setup because any error will be multiplied by eight.

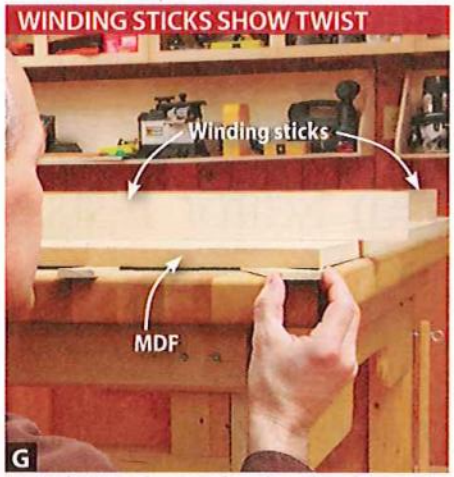


A saddle jig used for cutting tenon cheeks must rest square to the table and ride smoothly on the fence without wobble.

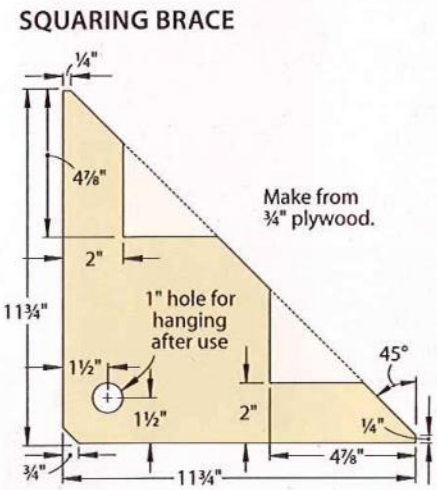


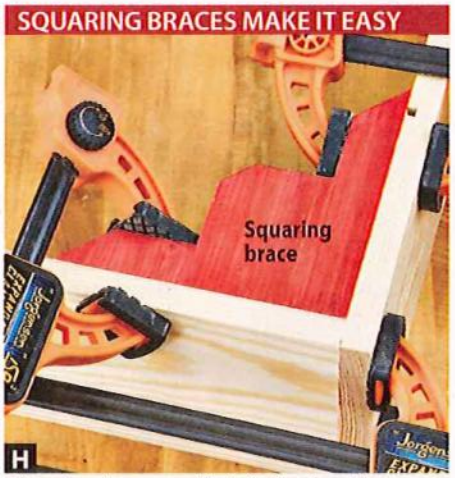
Register the broad base of the combination-square head against an edge and check for gaps under the blade, where they show most readily.

To check an edge, steady the head of the square against the wide face of the board. The square won't rock on a perfect 90° corner.

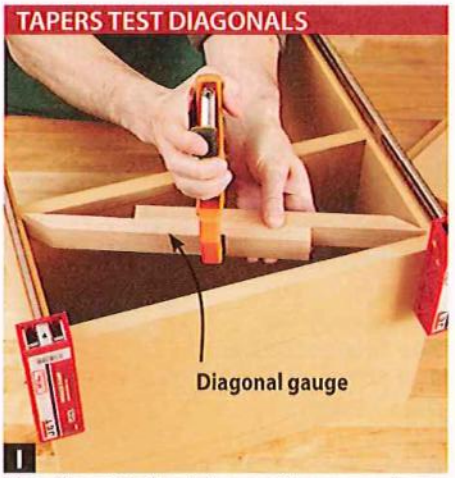


Squat down to view just the edge of the far board. Shim below the MDF to remove any taper in the revealed edge of the far board.





After clamping across the joints to close them tightly, clamp a brace to two adjacent pieces to hold the corner perpendicular.



Place the pointed ends in opposite corners, clamp the gauge together, then compare the fit in the opposite diagonal.

When checking square between the face and edge of a board, rest the head against the face, as the broad surface offers the most support **[Photo F]**.

Put it together right

If you follow the above procedures when machining, assembly should offer no surprises. A test fitting without glue ensures that and allows for correcting out-of-square corners.

▶ Assemble projects on a dead-flat surface. To determine if your workbench is flat, rip two boards to equal width and use them to reveal any twist **[Photo G]**. If needed, lay a sheet of MDF on your workbench or the floor, and then shim below the sheet to make it flat.

▶ When assembling carcases or boxes, you sometimes need three hands to hold the first piece while directing the second into place. Clamp one of the pieces to the bench to keep it stationary while you square the assembly. Squaring braces **[Drawing, Photo H]** serve as indispensable helpers in the *WOOD®* shop. Make several sets of various sizes.

▶ A time-tested technique for checking an assembly for square is comparing diagonal measurements. But instead of holding a floppy tape measure in one corner and trying to read it at the other, compare the dimensions using a more precise shop-made gauge **[Photo I]**.

▶ Especially on complex assemblies, use a glue with a long open time: polyurethane, liquid hide glue, or a glue labeled with an extended dry time. This gives you time to check for square and make adjustments. For the same reason, glue only what's needed and get those pieces square before adding the next piece to the assembly.

More Resources

- Find reviews of squares at woodmagazine.com/squares.
- For a free article on truing up jointer tables, go to woodmagazine.com/truetables.
- To buy a video on tuning up your tablesaw or drill press go to woodmagazine.com/tstuneup woodmagazine.com/drillpress.

Produced by **Craig Ruegsegger**

Wise Buys

Why Buy?

If you rely on a shop vacuum for dust collection, then you know how quickly its filter will clog with fine wood dust. Installing a dust separator between the vacuum and the tool largely solves that problem by trapping dust in a secondary container before it reaches the vac's filter. General-Interest Editor Nate Granzow tested several separators that accept standard 2¼" hoses and deemed these three the best buys. Although they reduced suction slightly, each unit let only a small fraction of the sawdust reach the vacuum.

Our Editor Tests
Shop Vacuum Dust Separators

ONEIDA DUST DEPUTY DELUXE, $79
800-732-4065, oneida-air.com

The Dust Deputy Deluxe proved itself a top performer: Run until the separator was filled to capacity, it captured all but a few ounces of fine dust and shavings. It comes with two 5-gallon buckets—one with casters and one without (the latter holds the dust and drops into the wheeled bucket)—and a kit for mounting it to the side of your shop vacuum. This requires drilling a hole in your vacuum's tub and mounting a bolt through it.

Once in place, this system makes emptying easy: Remove the lid from the topmost bucket and lift up on the handle. If you have no use for the mobility of the Dust Deputy Deluxe, save some money and get the DIY Cyclone version. Priced at $39, it includes the funnel only, which you can mount to your own bucket.

The Dust Deputy Deluxe's built-in static-reducing copper strips struck me as a clever addition because these separators generate a large amount of static electricity. However, the strips began to fray after connecting the vac hoses only a few times, and may not hold up over time.

DUST RIGHT VORTEX, $85
800-279-4441, rockler.com

Though lacking some of the Dust Deputy's features (no static-reducing strips or vacuum-mounting kit), the Vortex captured just as much dust—keeping the vacuum's filter clear and its tub nearly empty.

The 10-gallon capacity of the Vortex doubles that of the Dust Deputy and other 5-gallon separators—so I was able to go twice as long between emptying. The bucket's five casters make it stable yet easy-wheeling, and its distinctive translucent sides show when it needs to be emptied.

WOODSTOCK W2049, $25
800-840-8420, shopfox.biz

At about one-third the price of the other separators, I was pleasantly surprised at the W2049's performance—after a few workarounds. First, the W2049 fit loosely atop a standard 5-gallon bucket (not included), with no gasket or seal between the separator and bucket. So the stiff vacuum hose tended to pop the lid off. I fixed this by applying weatherstripping around the inside neck of the separator, then moving the bucket handle up to pinch the sides of the separator in place. Modifications made, the W2049's performance kept up with the Vortex and the Dust Deputy—preventing all but a handful of fine dust and chips from reaching the vacuum.

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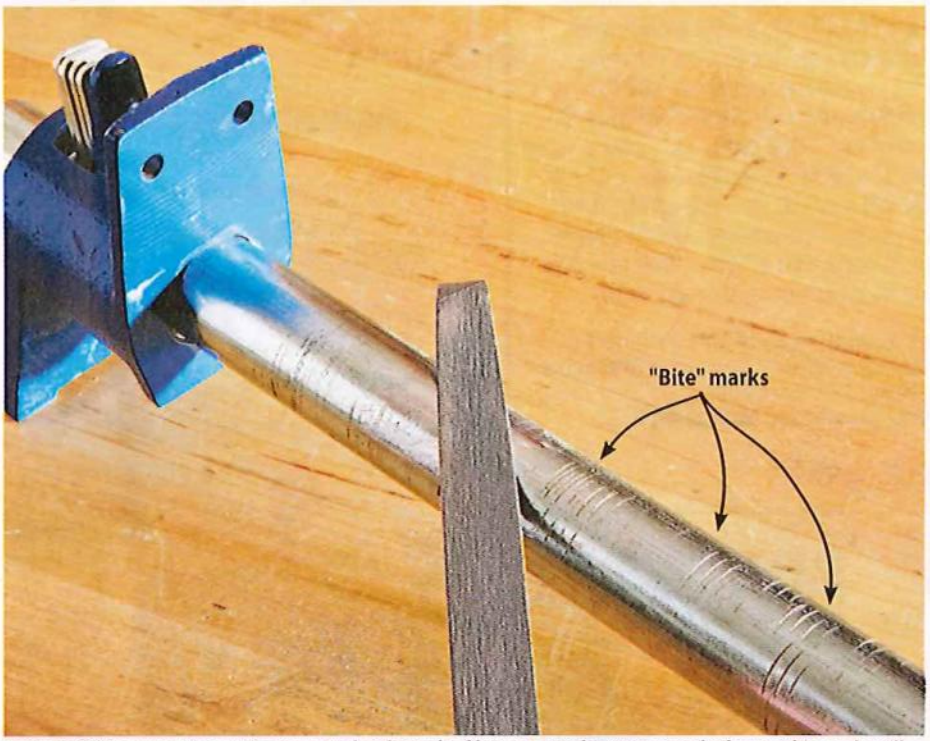
Help take a bite out of my clamps!

The more I use my pipe clamps, the more "bite marks" I get on the pipe from the tail jaw. Now the jaw catches as it slides. What can I do to fix this and prevent it from happening again?

—Fred Barnes, Seattle

The marks (or "burrs") result from the clutch rings inside the tail jaw biting into the bar as you clamp up a project, Fred. Overtightening can deepen those bite marks, so ease off a bit with future glue-ups. Tighten them until firm and your joints have pulled together, but not so much that you have to work hard at it.

Now for the fix: Use a mill file to remove the offending burrs. You don't need to dig in and make the shallow pits disappear—just knock off the high spots, making them flush with the pipe surface, working your way across and along the pipe. After filing, wrap the pipe with 220-grit sandpaper and work the abrasive back and forth to remove any subtle burrs.



Run a mill file across the marks at an angle where the file's grooves best remove the burrs. This angle will vary depending on your file. Roll the file over the contour of the pipe as you reshape it.

Gummed-up jaws need a good cleaning and lube job

Recently I bought a used drill press at an auction. Everything works great except the chuck—it's stiff and difficult to turn without using the chuck key, especially when cold. This really makes it tough when switching from small bits to large ones because I have to crank the chuck key repeatedly to open and close the jaws. Any ideas how to free this up?

—Arlen Byard, Adams, Ind.

Sounds like dust and grit have found their way inside the chuck, Arlen, and fouled the grease that lubricates the jaws and scroll mechanism. The cold temperatures in your shop stiffen the grease even more. Here's how to fix it.

After removing the chuck from your drill press, open the chuck jaws fully, and use compressed air to blow out as much debris as possible. Holding the chuck as shown, *above*, scrub inside the chuck with a toothbrush and mineral spirits, reaching in from the jaw end. Repeat several times until you get no more debris. Blow compressed air through the chuck from the top to clear out any solvent residue.

Hold the chuck jaws down to avoid getting solvent on the bearings; solvent could erode the bearing seals and lead to a bigger repair.

Spray on a couple of coats of a quick-drying lubricant, with jaws open and closed, before reinstalling your chuck onto the drill press.

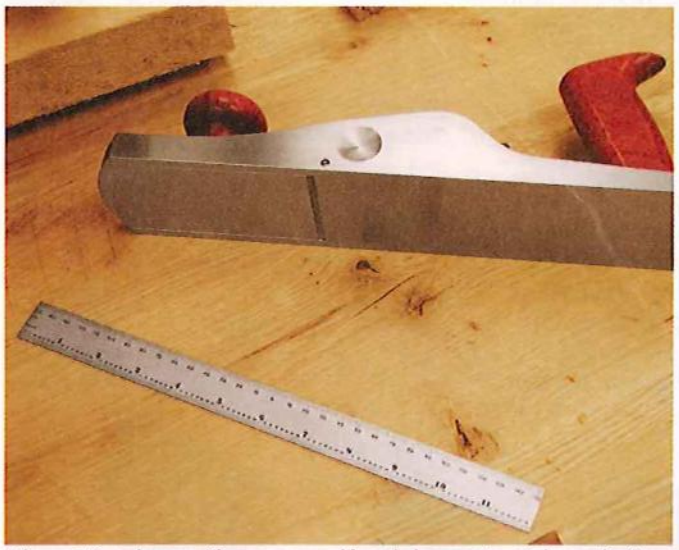
Now close the jaws and scrub the outside of the jaws. Blow them dry with the air hose. Finally, lubricate the jaws as shown *above*. We recommend Bostik DriCote because it dries quickly and penetrates the steel pores, so it won't attract more dust.

Sole or side: How to park your planes

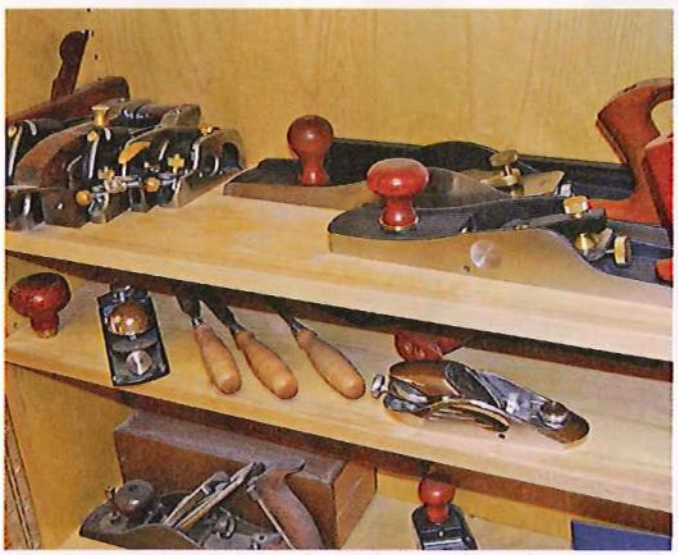
Q As my collection of hand planes grows, I find myself caught in the middle of the debate on how to best store them when not in use. Some folks lay planes on their sides to protect the blades' cutting edges, while others insist you should set them on their soles. Who's right?

—Cecil Cranston, Pine Bluff, Ark.

A Truth is, Cecil, you should use both methods, depending on your circumstances. For instance, setting your plane sole-down on a wooden benchtop won't ding or dull its cutting edge, but placing it on your cast-iron tablesaw top might. So if you're looking for a place to put it down between chores, laying the plane on its side will usually be your best bet. For long-term storage, though, a plane on its side leaves the blade exposed, where it could be damaged by an accidental, glancing blow from another tool. In this case, storing the plane sole-down on a wood surface, whether a shelf or drawer bottom, prevents accidental damage with no risk of dulling.



When setting planes aside on your workbench, be sure to watch you don't accidentally ding the blade with other tools.



This collection of shoulder planes, bench planes, and block planes stays well guarded and ready to use inside a tool cabinet.

Shop-Proven Products

These woodworking wares passed our shop trials

5-in-1 cordless tool does some tasks well

Ridgid's JobMax 12-volt tool system uses interchangeable heads on a single "stick" drive unit. The starter kit comes with an oscillating multifunction tool head (including two blades and a sanding attachment), one 12-volt lithium-ion battery, and a charger. You can buy optional drill, impact-driver, auto-hammer, jigsaw, and ⅜"-ratchet heads to fit the tool. I'd also suggest an extra battery ($40) so you don't wait for this one to charge.

It's a cinch to change heads: Just squeeze the release tabs, pop one head off, and snap on another. The drive unit handles awkwardly at times—especially working in tight spaces—and I kept finding myself choking up on the tool for greater leverage, placing my index finger above the trigger.

As you might expect, a tool designed to perform this many tasks excels at a few, while sometimes compromising performance for convenience. For example, the drill's top speed of 550 rpm is slower than I'd like, and the absence of a clutch left me on my own to know when to stop driving screws. I wish the multi-tool head had a faster speed as well. One nice thing, though: It readily accepts accessory attachments from most other brands without an adapter. And the auto-hammer (essentially an impact hammer), although helpful for driving nails in tight spots where you can't swing a hammer, proves loud and uncomfortable for more than a few nails. The tool's low speed actually helps the impact driver and ratcheting heads develop greater torque for driving bolts and screws.

—Tested by Doug Ley, a manufacturing engineer with 15 years of woodworking experience

JobMax 12-volt multihead tool system

Performance		★★★★☆
Price	Starter kit (#R82235)	$130
	Right-angle drill head (#R8223402)	$50
	Impact-driver head (#R8223401)	$50
	⅜" Ratcheting head (#R8223403)	$50
	Auto-hammer head (#R8223405)	$50

Ridgid
866-539-1710; ridgid.com

About our product tests

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

Tri-Vise gives you a "hand" to hold pieces for cutting

Many do-it-yourselfers and hobby woodworkers hold a board or pipe in an unsafe manner while cutting or drilling into it. Rather than setting up sawhorses to hold these products, consider using Tri-Vise's pair of handy workholders. I was skeptical of these aluminum devices at first because they seemed gimmicky, but after using them I appreciate their value, ease of use, and handy size. The Lumber Lok holds almost any size board, including 2×12s and 4×8s, for cutting or drilling. Acting similar to a fulcrum, the Lumber Lok leans into the board and holds it securely.

I also like the similarly built Plate Vise, which holds all sorts of metal and PVC pipe and conduit, angle iron, fence posts, and boards up to 2×6s and 4×4s.

If there's a downside to these products, it's the bending down or getting on your knees to work on the piece. But using the LumberLok or Plate Vise proves much safer than holding a board or pipe by hand or trapped against a leg to make a cut.

—Tested by Don Freisen, a general contractor

Lumber Lok & Plate Vise

Performance	★★★★★
Price	$20 each

Tri-Vise
805-370-5487; tri-vise.com

continued on page 74

Shop Proven Products

21-gauge nailer straddles the line between brads and pins

I like the holding power of 18-gauge brad nails and the nearly invisible holes left by 23-gauge headless pins. So I was glad to see Cadex has come out with a nailer that gives me both. This 21-gauge model shoots a nail that's essentially half the size of a brad, yet twice as large as a pin (see inset photo, *below*). And it fires both headless and headed fasteners.

I put the CPB21.50 to use in multiple applications, and as you'd expect, the headed pins demonstrated greater holding power than 23-gauge headless pins. But even the headless 21-gauge pins surprised me with their ability to grip moldings and onlays. And the holes they create become virtually invisible in the coarse grain of some wood species, such as oak, and proved easy to fill during sanding and finishing with other species.

The versatility of this nailer comes at a premium price, but if you depend on a variety of pneumatic fasteners for your work, you'll never regret buying it. It shoots pins from ⅝" to 2" long, and comes with a no-mar nose tip, swiveling air coupler, and a built-in blow gun for clearing away dust.

—Tested by Bob Saunders, owner and teacher, Prairie Rose Woodworking Studio, Indianola, Iowa

21-gauge pin nailer, #CPB21.50

Performance	★★★★★
Price	$330

Cadex Tools
604-876-9909; cadextools.com

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1.3 billion Chinese were only given the right to own silver a mere eight years ago. What does that mean for the 2012 Silver Panda? Demand is greater than ever. The time to collect is now.

Until recently, the majority of Panda coins were exported. But now, the Chinese have become the largest buyers of their own coins. In fact, hungry silver Panda collectors have created shortages almost overnight in Pandas available to the rest of the world. And when in-demand coins become hard to find, their values can soar! Consider what these past Silver Panda issues are currently selling for:

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2003 Silver Panda	$185.39
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What's Ahead

A glimpse inside the November issue (on sale October 9)

Pub Table and Chairs

A simple cutting trick eliminates complex angles in the comfy chairs, and makes this attractive set a snap to build.

Business Card Holder

Get started on holiday gift-building with this handsome holder, made from just a few exotic scraps and a marble.

Double-locked Puzzle Box

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23 Tips from One-man Shops

Learn how three professional woodworkers do great work in shops a lot like your own.

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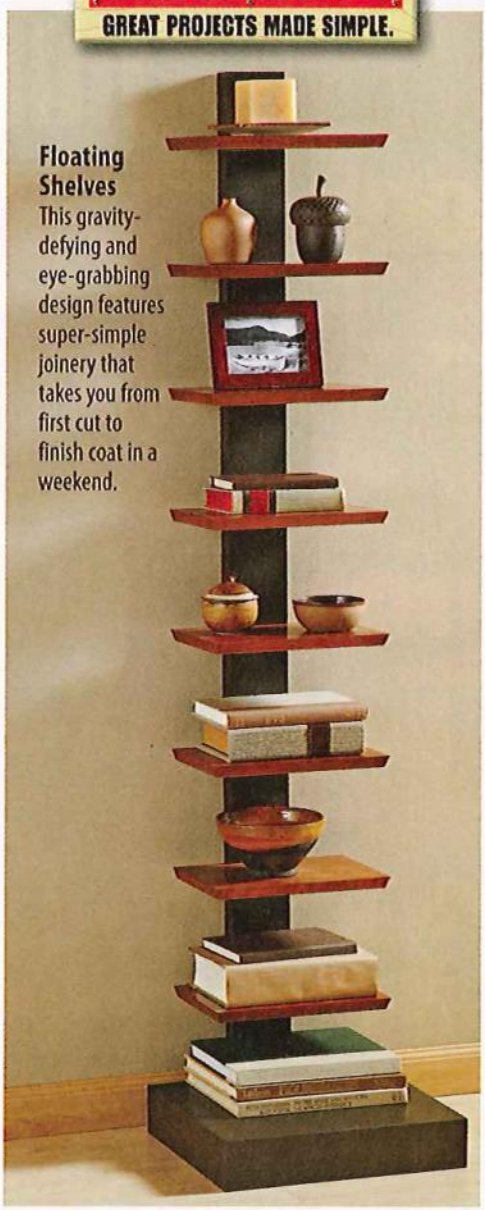

Floating Shelves

This gravity-defying and eye-grabbing design features super-simple joinery that takes you from first cut to finish coat in a weekend.

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