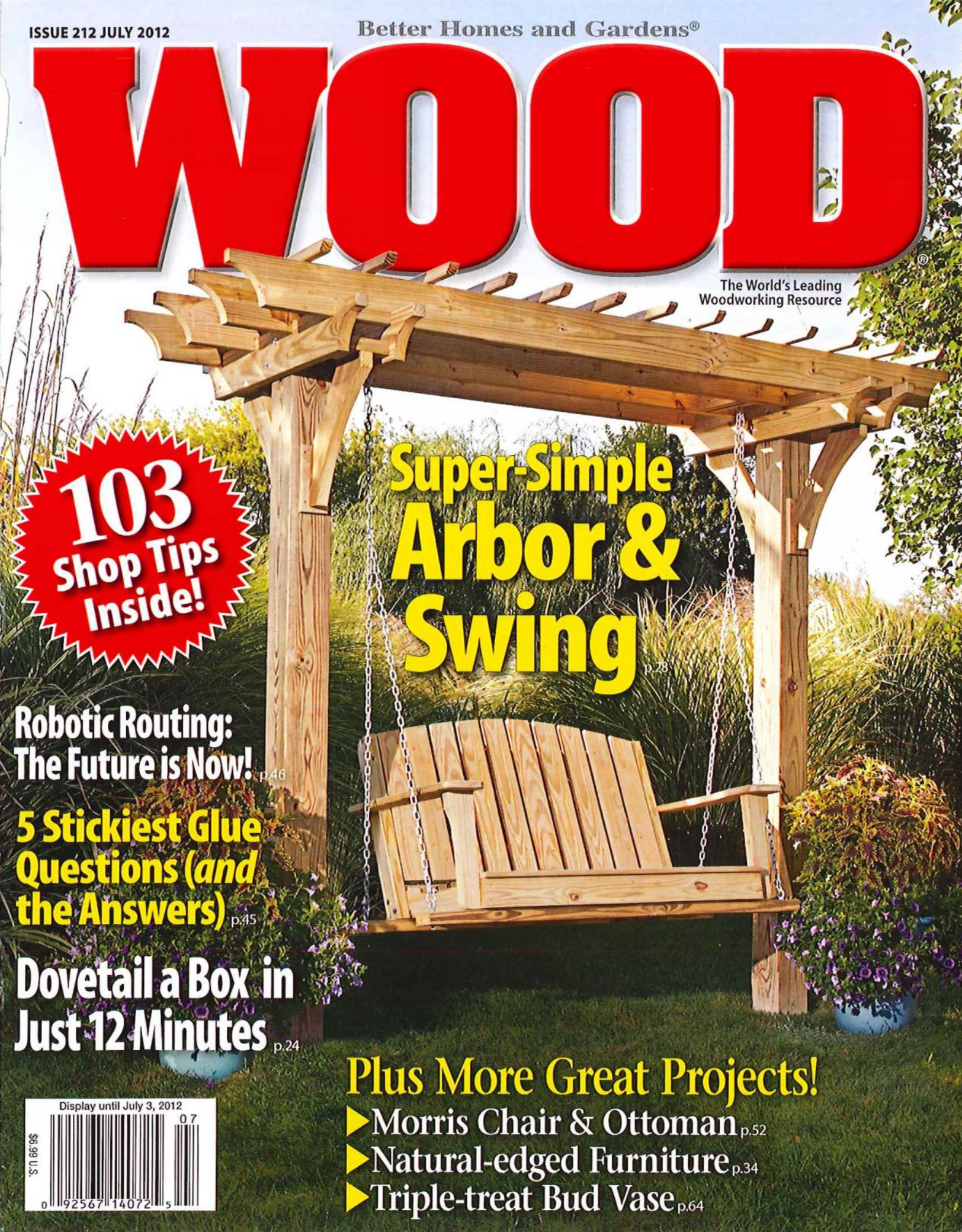
ISSUE 212 JULY 2012

Better Homes and Gardens®

WOOD®

The World's Leading Woodworking Resource



103 Shop Tips Inside!

Super-Simple Arbor & Swing

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Robotic Routing: The Future is Now!

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5 Stickiest Glue Questions (*and* the Answers)

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Dovetail a Box in Just 12 Minutes

p.24

Plus More Great Projects!

- Morris Chair & Ottoman p.52
- Natural-edged Furniture p.34
- Triple-treat Bud Vase p.64

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12" JOINTER/PLANER COMBINATION MACHINES

MADE IN TAIWAN

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!

G0634XP ~~$2195.00~~ SALE $2150.00

ALSO AVAILABLE

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

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

$150 shipping

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.

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PLEATED FILTER IS PROTECTED BY A STEEL CAGE

FULLY MOBILE WITH BUILT-IN CASTERS

$79 shipping

ONLY 65½" TALL!

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
G0656P ~~$795.00~~ SALE $750.00

$150 shipping

SPIRAL CUTTERHEAD
G0656PX ~~$1195.00~~ SALE $1150.00

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

CSA C US 208624

BUILT-IN MOBILE BASE

4 KNIFE CUTTERHEAD
G0490 ~~$945.00~~ SALE $895.00

$150 shipping

SPIRAL CUTTERHEAD
G0490X ~~$1250.00~~ SALE $1195.00

15" PLANERS

CHOOSE EITHER 3 KNIFE OR SPIRAL CUTTERHEAD MODEL

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

$150 shipping

BUILT-IN MOBILE BASE

3 KNIFE CUTTERHEAD
G0453P ~~$1050.00~~ SALE $1025.00

SPIRAL CUTTERHEAD
G0453PX ONLY $1650.00

7" SERIES 20" PLANERS

CSA C US 208624

- 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

$179 shipping

SPIRAL CUTTERHEAD
G0454Z ~~$2495.00~~ SALE $2450.00

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

$79 shipping

G0716 ~~$415.00~~ SALE $395.00

1 HP WALL MOUNT DUST COLLECTOR

MADE IN TAIWAN

- 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.

SPECIAL WALL MOUNT DESIGN!

EASY MOUNTING WALL BRACKET & LOCKING THUMB SCREW SECURES DUST COLLECTOR IN PLACE!

G0710
~~$174.95~~
SALE $165.00

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10" HYBRID TABLE SAW

BEAUTIFUL WHITE COLOR!

- Motor: 2 HP, 110V/220V, single-phase
- Precision-ground cast iron table with wings measures: 27" x 40"
- Arbor: 5/8" • Arbor speed: 3850 RPM
- Capacity: 3 1/8" @ 90°, 2 3/16" @ 45°
- Rip capacity: 30" R, 12" L
- Quick release riving knife
- Cast iron trunnions
- Approx. shipping weight: 354 lbs.

CSA C US 232857

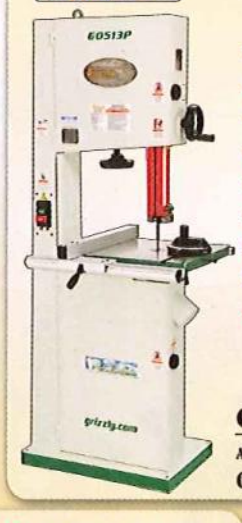
INCLUDES BOTH REGULAR & DADO BLADE INSERTS

$99 shipping

G0715P ONLY $795.00

17" HEAVY-DUTY BANDSAWS

BEAUTIFUL WHITE COLOR!



- Motor: 2 HP, 110V/220V, single-phase, TEFC
- Precision-ground cast iron table size: 17" sq.
- Table tilt: 10° L, 45° R
- Cutting capacity/throat: 16 1/4"
- Max. cutting height: 12 1/8"
- Blade size: 131 1/2" L (1/8"–1" W)
- Blade speeds: 1700 & 3500 FPM
- Quick release blade tension lever
- Approx. shipping weight: 342 lbs.

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INCLUDES DELUXE EXTRUDED ALUMINUM FENCE, MITER GAUGE & 1/2" BLADE

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G0513P ~~$895.00~~ **SALE $875.00**

ALSO AVAILABLE ~~$950.00~~

G0513 HEAVY-DUTY 17" BANDSAW **SALE $895.00**

10" LEFT-TILTING CONTRACTOR-STYLE TABLE SAW with Riving Knife

- 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.

MADE IN ISO 9001 FACTORY!

New!

MADE IN TAIWAN

FREE 10" CARBIDE-TIPPED BLADE

$99 shipping

G0732 INTRODUCTORY PRICE $795.00

10" LEFT-TILTING TABLE SAWS with Riving Knife & Cast Iron Router Table

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

FREE 10" CARBIDE-TIPPED BLADE

MADE IN TAIWAN

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$150 shipping

CSA C US 177335

G1023RLW 3 HP ~~$1350.00~~ **SALE $1225.00**

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!

CSA C US 232857

G0690

~~$1325.00~~

SALE $1295.00

FREE 10" CARBIDE-TIPPED BLADE

$150 shipping

10" CABINET TABLE SAW with Riving Knife & Extension Rails

- Motor: 3 HP, 220V, single-phase
- 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.

TOP VALUE

CSA C US 232857

FREE 10" CARBIDE-TIPPED BLADE

$150 shipping

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G0691 ~~$1425.00~~ **SALE $1395.00**

ULTIMATE 14" BANDSAW

- Motor: 1 HP, 110V/220V, single-phase, TEFC
- Precision-ground cast iron table size: 14" sq.
- 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.

CSA C US 252923

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MADE IN TAIWAN

MADE IN ISO 9001 FACTORY!

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G0555P ONLY $495.00

19" HEAVY-DUTY BANDSAW

MADE IN TAIWAN

- 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.

MADE IN ISO 9001 FACTORY!

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G0514X2 ~~$1495.00~~ **SALE $1450.00**

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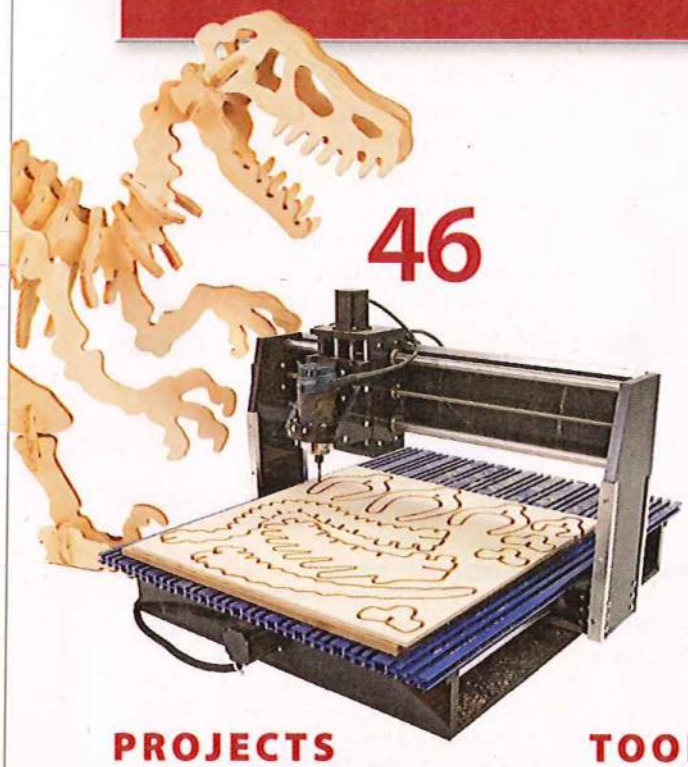

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PROJECTS

SKILL BUILDERS

DEPARTMENTS

TOOLS & MATERIALS

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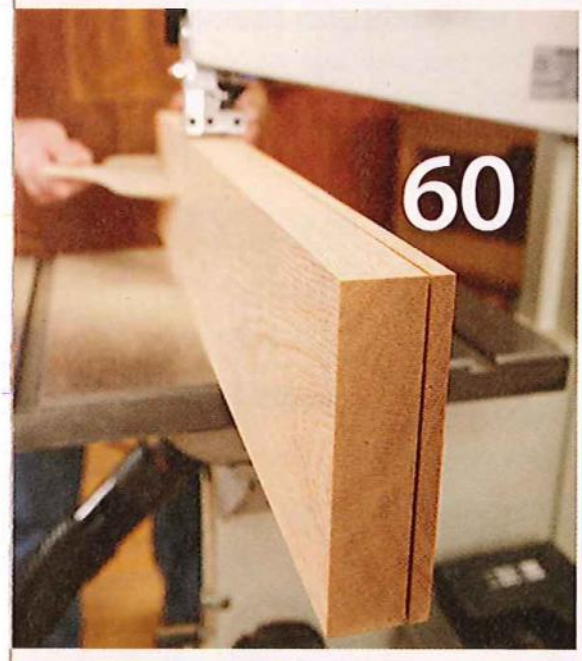
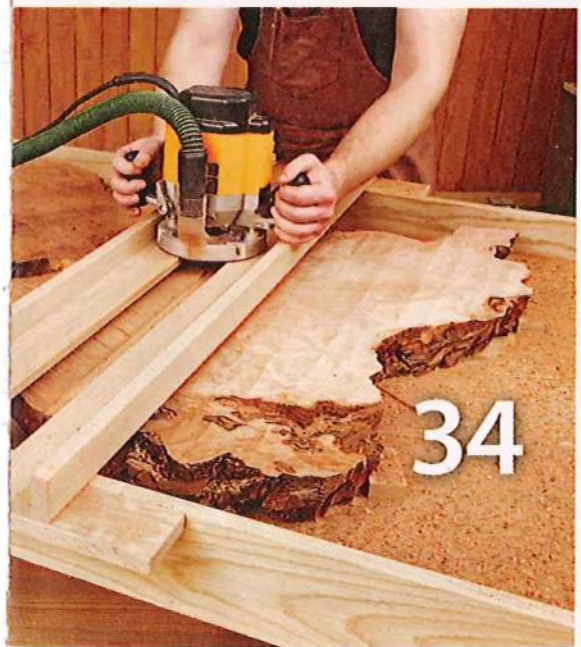
July 2012 Issue 211

This seal is your assurance that we build every project, verify every fact, and test every reviewed tool in our workshop to guarantee your success and complete satisfaction.

WOOD MAGAZINE SHOP TESTED APPROVED





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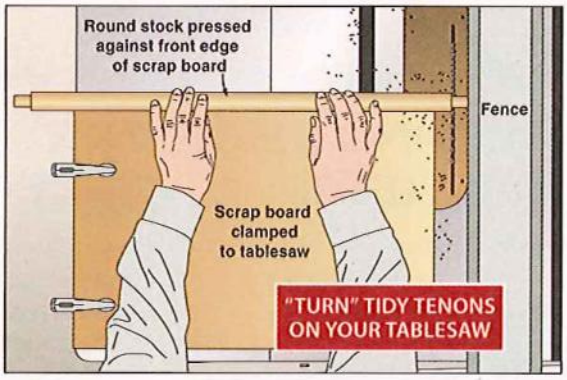
From May 15 to 23, 2012, download a free plan for this traditional workbench.

"TIP OF THE DAY" BETTER THAN EVER



Work smarter in the shop with a new FREE Shop Tip every weekday at tips.woodmagazine.com. We've upgraded so you can now search the entire archive of tips by category or keyword, and share great tips with your woodworking buddies on Twitter and Facebook with a single click.

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SHOP FOX® machines are backed by a 2 Year Warranty!

10" TABLE SAWS with Riving Knife

- 3 HP, 220V, single-phase motor
- Cast iron table size: 27" x 40¼"
- Max. rip capacity: (W1819) 29½", (W1820) 50"

Free 10" Carbide-Tipped Blade

W1819 10" Table Saw
W1820 10" Table Saw w/ Long Ext. Table

SLIDING TABLE and ROUTER TABLE ATTACHMENTS for W1819 & W1820

SAW NOT INCLUDED

W1821
SLIDING TABLE ATTACHMENT
- Industrial grade anodized aluminum table size: 47" x 9"
- Max. cross cut: 48"

W1822
ROUTER TABLE ATTACHMENT
- Precision-ground cast iron table size: 27" x 20"
- Universal router mount

3 HP LOW PROFILE CYCLONE DUST COLLECTOR

- Motor: 3 HP, 220V, single-phase, TEFC class "F", 3450 RPM
- Air suction capacity: 1489 CFM
- Filter: 0.2–2 microns
- 55 gal. steel collection drum with casters

Only 80" Tall!

W1816 Cyclone Dust Collector

VARIABLE SPEED PLANER/MOULDER with Stand

- Motor: 2 HP, 220V, single-phase
- Precision ground cast iron table with wings: 36¼" L x 10" W
- Max. cutting width: 7"
- Max. planing height: 7½"
- Max. moulding depth: ¾"

We also carry an extensive selection of moulding knives for this machine!

W1812 Planer/Moulder

10" HYBRID TABLE SAW with Extension Table

New

Free 10" Carbide-Tipped Blade

- 2 HP, 110V/220V, single-phase motor
- Precision ground cast iron table measures 27" x 55" with phenolic extension
- Rip capacity 30" right, 12" left

W1824 10" Table Saw w/Extension Table

8" JOINTER with Parallelogram Adjustable Beds

- 3 HP, 220V, single-phase, TEFC motor
- Precision ground cast iron parallelogram design table measures 8" x 76⅝"
- Cutterheads: (W1741) 4 HSS knives (W1741S) spiral

Built-in Mobile Base

W1741 8" Jointer
W1741S with Spiral Cutterhead

OUTSTANDING SHOP FOX® ACCESSORIES

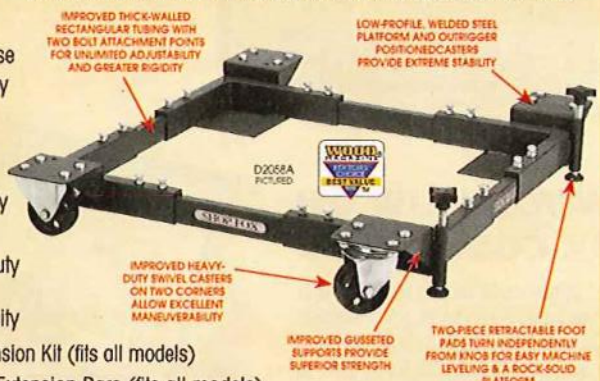
ADJUSTABLE MOBILE BASES

STRONGER FRAME WITH IMPROVED WHEELS AND GUSSETED SUPPORTS!

D2260A
Mini Mobile Base
600 lb. capacity

D2057A
Heavy-Duty Mobile Base
700 lb. capacity

D2058A
Super Heavy-Duty Mobile Base
1300 lb. capacity



D2259A Extension Kit (fits all models)
D2246A 36" Extension Bars (fits all models)

TENONING JIG

- Heavy cast iron construction
- Precision adjustment points
- Adjusts for angled tenon cutting set-ups
- Standard ⅜" x ¾" miter bar fits all miter gauge slots including T-slots

Produces perfect tenons for mortise and tenon joinery.

D3246 Tenoning Jig

Aluma-Classic® FENCE

Extruded Aluminum & Steel Contruction
Precision Right Angle Design

W1716 Aluma-Classic® Fence w/ standard 57" rails
W1720 Aluma-Classic® Fence w/ long 79" rails & legs (50" cutting capacity)
W1721 79" rails & legs (fence not included)
W1722 Set of 3 powder coated sheet metal wings

Self-adhesive measuring tape & adjustable magnified cursor for quick positioning.

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July 2012 | Vol. 29, No. 3 | Issue No. 212

Lucas made a herd of rocking horses (issue 193) and donated them to a local women's center.

Nate designed and built this guitar-amp pedal box out of bloodwood, zebrawood, and maple.

Kevin collaborated with Iowa House Speaker Kraig Paulsen on a conference table featuring a walnut veneer top with an inlaid ash motif of a wreath and gavel symbolic of the speaker's office. The table will be donated to the Iowa Capitol furniture collection.

Sounding Board

Our bulletin board for letters, comments, and timely updates

Manufacturer Responds to Sharpening Showdown

In the article "Sharpening Showdown" in issue 210 (March 2012), your recommendation to buy a DMT diamond stone appears to be based largely on speed of cut and price. However, while you tested the Trend Classic Pro double-sided stone (300/1,000 grit), you did not test the Trend extra-coarse 220-grit stone that has a speed of cut comparable to the DMT 220-grit stone in that article.

There are other considerations besides speed and price. For example, you never commented on the flatness of the diamond stones, which is critical to sharpening flat tooling. Trend diamond stones are factory-ground to +/- 0.0005". We've also found that our products' continuous diamond surface proves superior to "matrix" products, where small tools can catch in the gaps between the diamond surfaces.

You dismissed the need for our lapping fluid when utilizing our stone. Trend lapping fluid prevents rusting, clogging, and keeps the stone's surface clean. Your advice to use water instead refutes Trend's instructions and voids the product's warranty. If you found the lapping fluid "difficult to clean up," you may have been using too much—a few drops are all you need. At that rate, a typical woodworker will use no more than a 100 ml bottle in a year, or about a $15 investment.

Finally, Trend's Classic Pro diamond stone costs a little more than the DMT stones, but comes with a padded tool holder, cleaning block, and nonslip mat; accessories that cost extra with the other diamond stones.

Jamie LaMuraglia
Trend Routing Technology

Our editors respond:

For that article, we tested each of the products extensively with plane irons and wood chisels—the tools most commonly sharpened by our readers—as well as carving tools, marking knives, and jointer and planer knives. During those trials, all of the diamond stones were sufficiently flat for sharpening the tested tools.

Over the course of dozens of hours of sharpening those tools, we did not experience a tool-edge catch in the open areas of any diamond stone. Also, several other members of our staff have used diamond stones extensively over the past 20 years, and none experienced such catches in their own work.

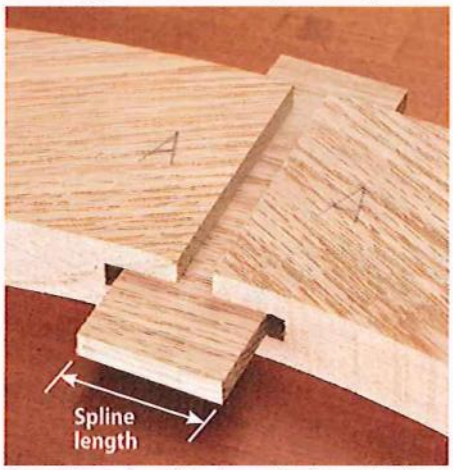
In our discussions with a Trend spokesman prior to publication, we shared our concerns about the lapping fluid and asked specifically if water could be used instead. Although he still recommended using the lapping fluid, he agreed that water would suffice as a lubricant, adding that it would cause rust if not properly dried afterward.

—Bob Hunter and John Olson

Article Updates

Issue 207 (October 2011)

In the article "8 ways to make end-to-end joints that hold," the photo caption on pg. 65 should read: "This spline measures a third the thickness of the pieces to be joined, with the grain running *parallel* to the spline length."



On cut pieces, length is always the dimension that runs with the grain. In the case of this spline, its length is actually shorter than the width.

Issue 208 (November 2011)

In the chart on pg. 66, the range of fastener lengths for the Bostitch HP118K pinner is ½"-1 3/16".

Issue 209 (Dec/Jan 2011/2012)

In the drawing of the "Fuss-free, Router-table, Box-joint Jig" on pg. 55, the length of the guide should be 11½".

— PLEASE WORK SAFELY —

In order to show you precise details in photos, we frequently remove safety guards. In your work, be sure to use all safety devices, as well as wearing vision, breathing, and hearing protection.

—WOOD *editors*

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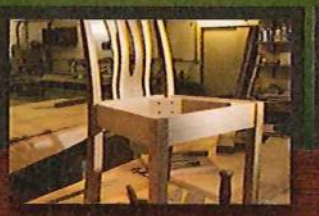
Think *Fast!*



When your woodworking calls for speed...Think Instant Bond!

Although our core Titebond® Wood Glue product line is ideal for a vast majority of woodworking applications, we realize there is a growing need for faster, and in some cases, "instant" adhesion capabilities. For this reason, we now offer the Titebond Instant Bond line of ethyl-cyanoacrylate-based wood adhesives (a.k.a. super glues), complete with an adhesive activator that accelerates the bonding process.

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Build a bridge to rout small parts safely

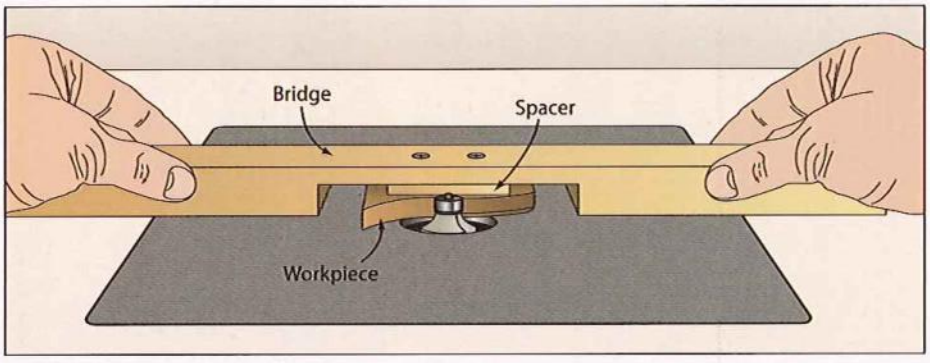
TOP SHOP TIP

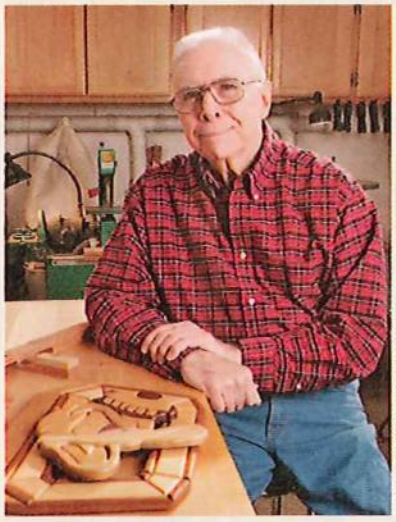
To safely round over small parts, say intarsia pieces, you can hold the workpiece against your router table with a wooden handscrew clamp (restricting you to routing only one area of the workpiece at a time), or use an inflatable or flex-drum sander. (Few of us own one.) Instead, I fashioned this "bridge" holder to keep my fingers away from the bit while routing around the entirety of the workpiece.

Build the bridge from a piece of scrap at least double the thickness of your workpiece. In the center of the scrap, form a slot wide and deep enough to house the workpiece plus clearance for the router bit to move around the edges, as shown. To accommodate a variety of workpieces, make the slot as deep as you think you'll ever need, and then mount a spacer between the jig and the workpiece that's just thick enough to keep the face of the workpiece flush with the bottom of the jig.

Fasten the workpiece in the slot with double-faced tape. Or, if the back of the piece won't show in the finished product, use screws. Now rout the edges, keeping the bridge and workpiece in contact with the router table.

—Frank Ryan, Eugene, Ore.





Vernon T. Williams Photography

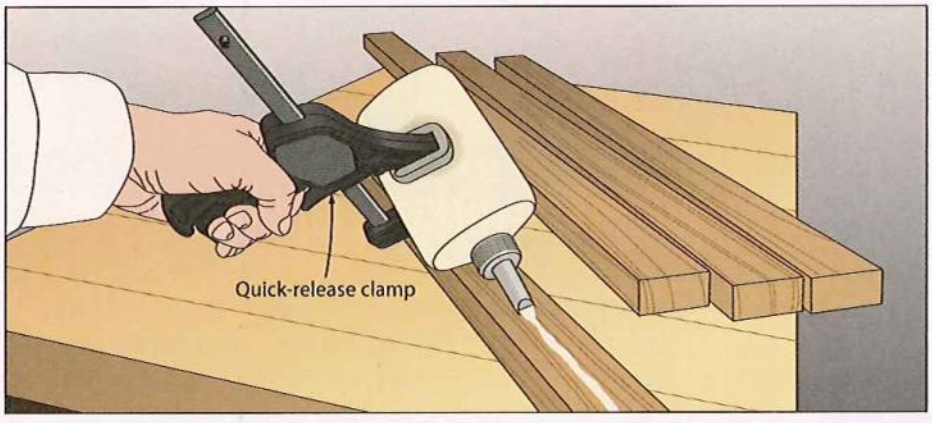
For sending this issue's Top Shop Tip, Frank receives a Kreg Jig Master System and Benchtop Router Table worth $370.

Quick clamp puts the squeeze on glue bottles

Laminating two pieces of wood together, particularly large ones, requires plenty of glue. But getting all that glue out of the bottle requires squeezing the bottle for a long time—difficult for someone with limited hand strength.

Fortunately, a handy "squeezing" tool can be found in most woodworking shops: a quick-release clamp.

—Serge Duclos, Delson, Que.



YOUR TIPS EARN CA$H, TOOLS!

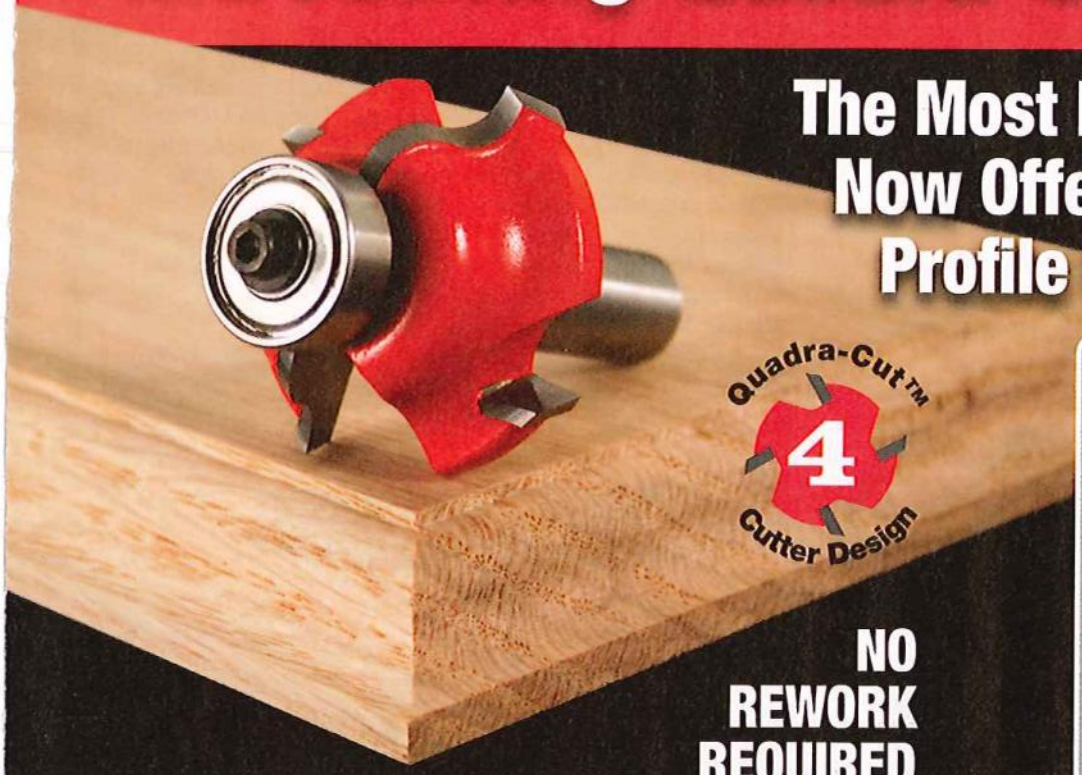
Tell us how you've solved a workshop stumper. If we print it, you'll get $100 and a DVD copy of Woodworking Secrets: Tips & Techniques (woodmagazine.com/tipsdvd). And, if your idea garners Top Shop Tip honors, we'll also reward you with a tool prize worth at least $300.

Send your best ideas, along with photos or drawings and your daytime phone number, to **Shop Tips, *WOOD* Magazine, 1716 Locust St., LS-221, Des Moines, IA 50309-3023.** Or, by e-mail: shoptips@woodmagazine.com. Include your contact info in the e-mail.

Because we try to publish original tips, please send your tips only to *WOOD*® magazine. Sorry, submitted materials can't be returned.

continued on page 10

Introducing Quadra-Cut™ Sets



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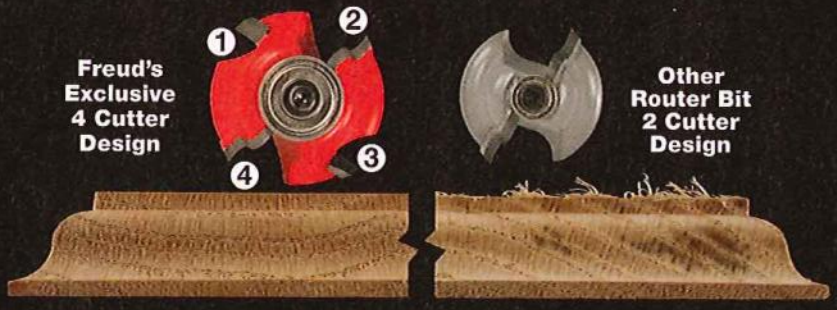

How It Works!

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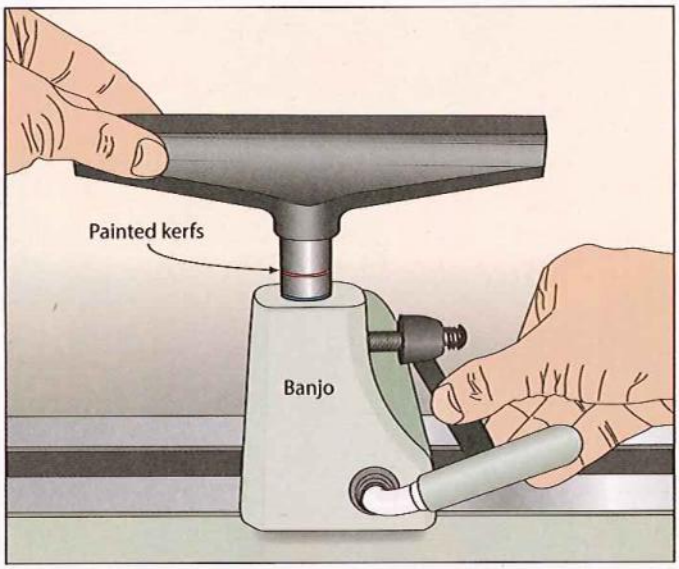
Shop Tips

Cut kerfs for easy tool-rest adjustment

When turning, almost every tool change requires resetting a lathe's tool-rest height. To make switching between common heights simpler, lock the tool rest to the desired height, and then cut a shallow kerf around the tool post, resting your hacksaw on the lathe's banjo to keep the cut straight. De-burr the kerf, mask it off with tape, and paint the kerf. Apply a different color paint or nail polish for each ring to make coordinating tools with their corresponding heights a breeze.

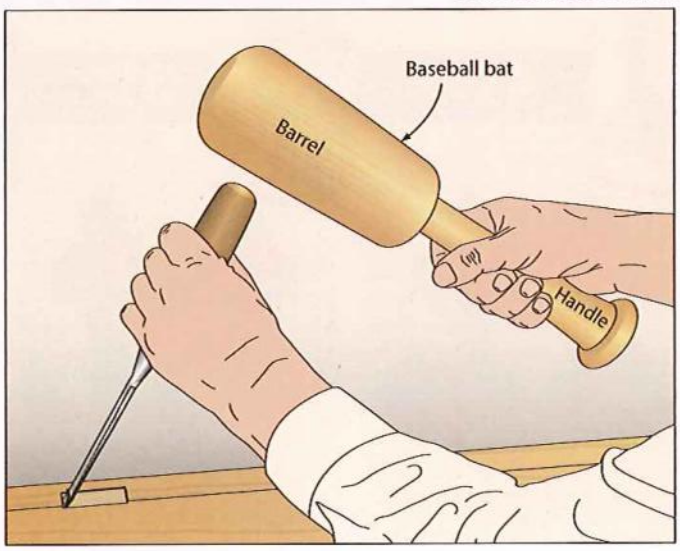
—Michael Cyr, Westport, Mass.



Baseball bat makes a striking mallet

Widely available at garage and junk sales, wooden baseball bats don't cost much and make excellent carving mallets. Even broken ones work! Cut the bat about 12" above the base of the handle and about the same distance from the bat's tip. Bore a centered hole the same diameter as the handle 2–3" deep into the barrel, and then glue the handle into the barrel.

—John Albrand, Glen Mills, Pa.

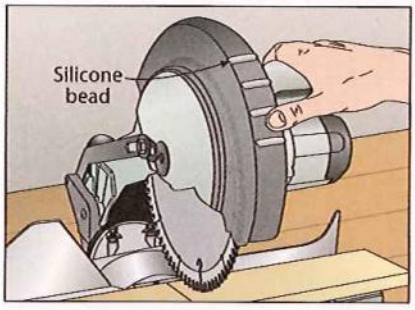


Silicone beads provide no-slip surface

I can't see through the blade guard on my mitersaw, so to get accurate cuts, I have to lift it up, pull the blade down to the workpiece, and nudge the workpiece until the cut mark aligns with the blade.

To simplify this process, apply beads of silicone an inch apart on the front of the blade guard, as shown. This gives your thumb enough traction on the slick surface to lift the guard while pulling the blade down with your right hand—freeing up your left hand to make precise adjustments.

—Serge Duclos, Delson, Que.

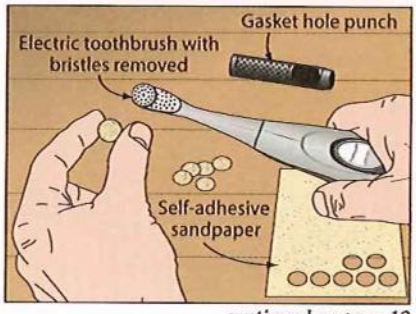


4 out of 5 dentists recommend this detail sander

Building wooden toys requires sanding small pieces, often in hard-to-reach places. To speed up the process, I bought an inexpensive battery-powered toothbrush from the drugstore and turned it into a miniature detail sander.

To make one, first pluck out the bristles of the toothbrush with pliers. Then use a gasket hole punch (Grizzly G9845, $5.50/set of 6, 800-523-4777, grizzly.com) the same size as the toothbrush's head to make tiny sanding disks out of adhesive-backed sandpaper. Apply the sandpaper disk to the head and show off your smile as you brush away your project's rough edges.

—Doug Vanmansart, Rancho Santa Margarita, Calif.



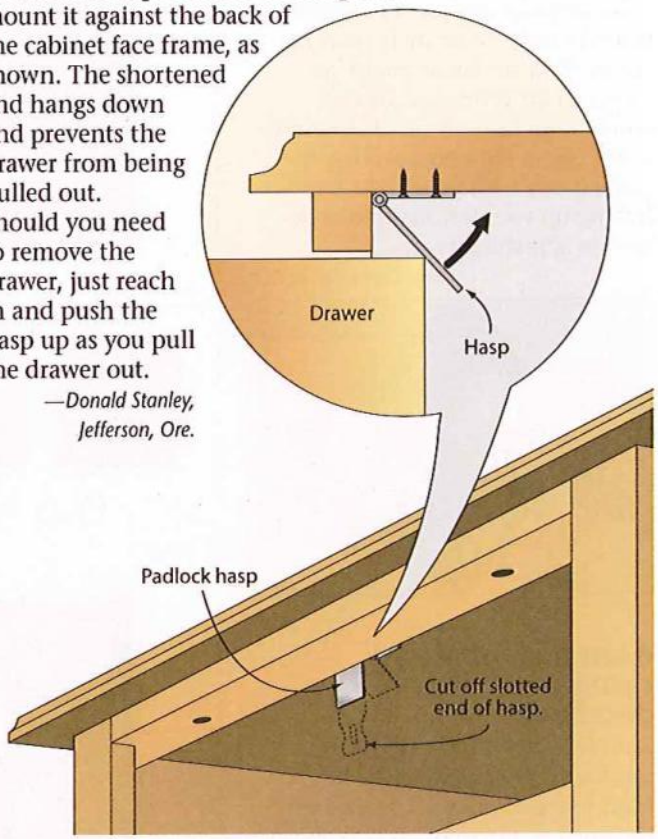
continued on page 12

Shop Tips

Drop-down drawer stop

To keep drawers from pulling completely out and dropping on the floor, use a common padlock hasp. Just cut off the slotted portion of the hasp and mount it against the back of the cabinet face frame, as shown. The shortened end hangs down and prevents the drawer from being pulled out. Should you need to remove the drawer, just reach in and push the hasp up as you pull the drawer out.

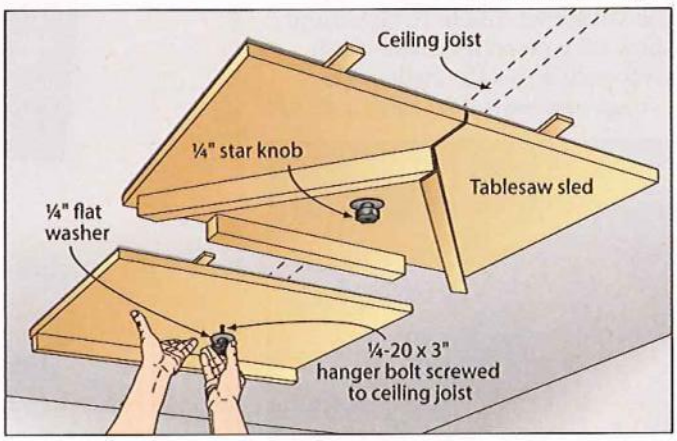
—Donald Stanley, Jefferson, Ore.



Things are looking up for shop storage

I had a problem storing three tablesaw sleds that seemed to be in the way a lot more often than I needed to use them. There was no space on the walls and they are too big for a cabinet. Then, I realized the ceiling was pretty empty, so I located a ceiling joist and installed some ¼" hanger bolts (headless bolts with wood-screw threads on one end and bolt threads on the other). With a single hole in each sled, I can quickly mount them to the ceiling, as shown.

—Carl Mascia, Greensburg, Pa.

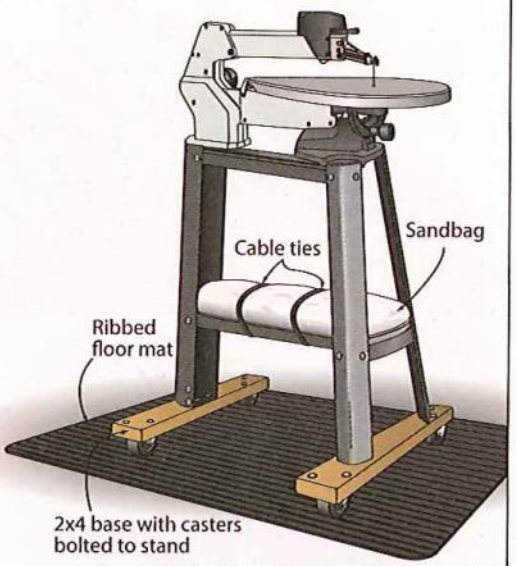


Small-shop solution for scrollsaw shakes

I put my scrollsaw on casters to make it mobile, but then it seemed to vibrate more. It also had a tendency to roll away from me while pushing a workpiece through.

To dampen the vibrations, I strapped a sandbag onto the saw, as shown, using cable ties. When I need to use the saw, I roll it onto a floor mat. This further reduces vibration. Plus, the additional weight sinks the wheels into the mat so the saw doesn't wander during use. It works so well that it passes the "nickel test"—a nickel standing on edge on the tabletop doesn't fall over with the motor running!

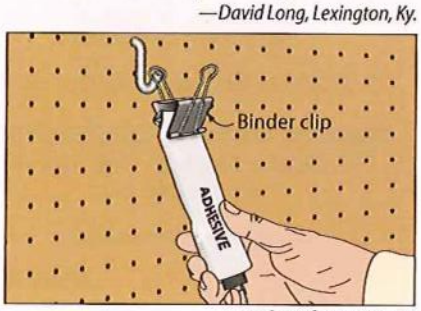
—Dean Fiene, Runnells, Iowa



Binder clips keep a firm hold on adhesive

You can move your adhesive tubes into plain view for easier access with an inexpensive package of binder clips, available at an office-supply store. Just clip them to the ends of your adhesive tubes and hang the clips on perforated hardboard. With the nozzle down, gravity keeps the adhesive at the tip—ready for use.

—David Long, Lexington, Ky.



continued on page 14

Shop Tips

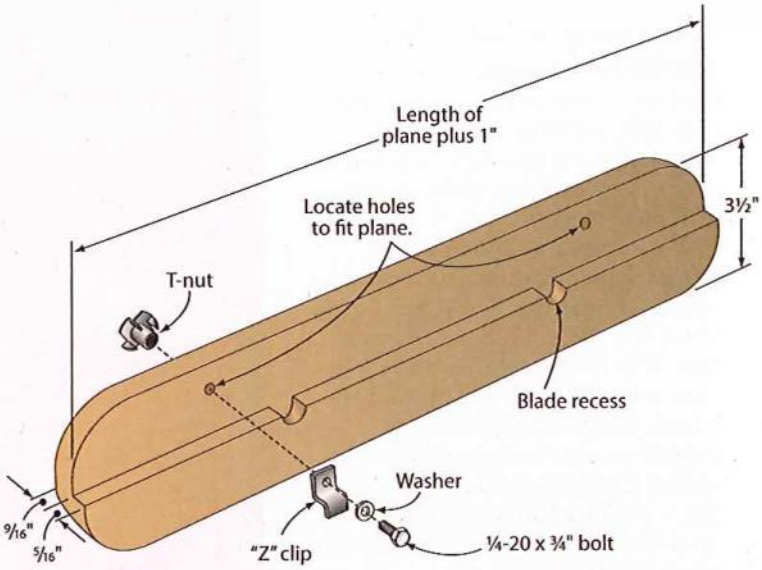
Easy-on/easy-off fence keeps plane square

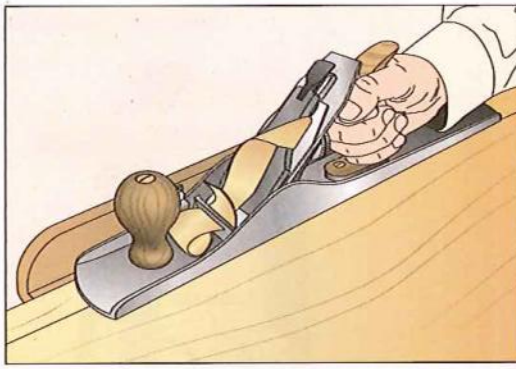
A hand plane makes quick work of edge-jointing a board, but it's difficult to keep the plane perched parallel on the edge, square to the adjacent board face. To prevent plane tippiness, add on this plane fence.

Because it mounts to the plane with bolts and tabletop fasteners (also called "Z" clips), the fence can be installed and removed quickly and easily, and it works on either side of the plane.

Just remember to cut recesses in the fence for the protruding plane blade. This allows the full width of the blade to act on the edge of the workpiece.

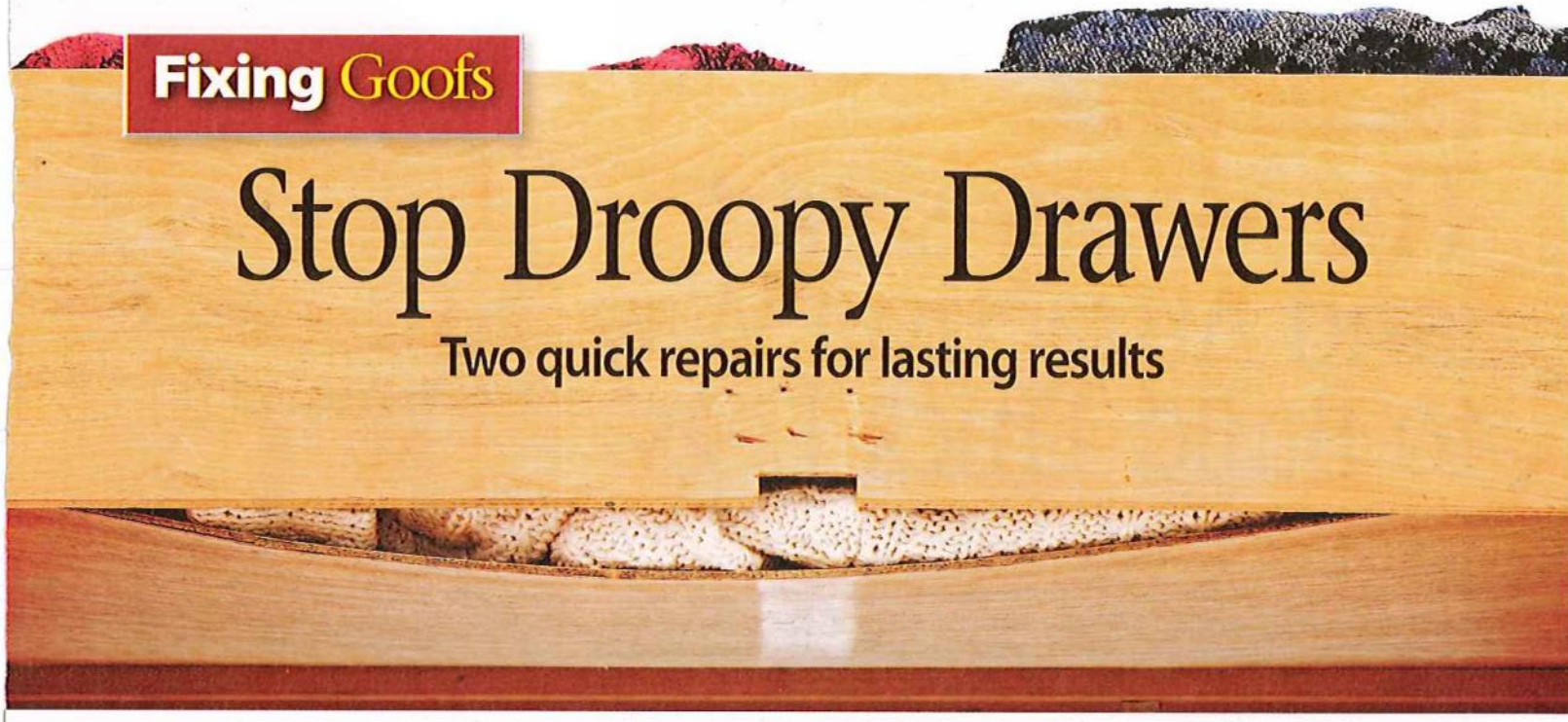
—Larry LaBeau, Temperance, Mich.





Stop Droopy Drawers

Two quick repairs for lasting results



Overfilling drawers can cause their bottoms to sag or even pop loose, as shown *above*, especially when the panel is a thin material, such as ¼" plywood. Fortunately, you don't need to rebuild the drawer—just make a quick fix. Here's how.

Fix #1: Support strips

Begin by popping the bottom panel back into its grooves. Then add a clamp or two to hold it securely. Measure the distance from the back of the drawer front to the back of the drawer, and cut scrapwood strips to length and 2–3" wide—one for each end and two or three in the middle, spaced no more than 6" apart, as shown at *right*. Thickness-plane them to fit flush with the drawer sides and front so they won't catch. Glue and fasten the strips to the bottom panel, along the sides, and to the front and back with brads or screws.

SOLID-WOOD STIFFENERS

If the bottom seats in a groove in the drawer front, toenail the support strips with brads short enough so they won't pierce the front face.

Fix #2: Secondary bottom

If the bottom won't stay in the grooves, or if they're broken away and you need added strength and rigidity, reinforce the bottom panel with a plywood panel cut to fit perfectly between the drawer front, sides, and back, as shown *below*.

Use the thickest plywood you can that won't protrude below the drawer's sides. With the original panel back in its grooves, glue the new panel to it and secure it on all four sides with screws.

QUICK-AND-EASY PLYWOOD SOLUTION

We attached this ½" plywood panel to the sides and back with #4×1" F.H. wood screws, and to the front with pocket screws.

To reduce the weight but retain the strength, cut out sections from the middle of the plywood panel and attach with glue and screws.

Challenge Skill

The Money-smart (and Attractive) Way to Build Thick Legs

Making 2¼"-square legs with straight grain on each face, such as those on the Morris chair on *page 52*, traditionally requires thick and expensive riftsawn lumber. However, you can save money and get the same appearance by bevel-ripping plainsawn ¾" stock and gluing up a leg.

Start with attractive stock

When choosing boards for the leg faces (A) [**Drawing 2**], look for clear material of similar color. This makes each leg look like one piece of solid wood. If you find a straight-grained board more than twice as wide as one face, cut adjacent faces from it, and wrap the grain pattern around the corner.

After choosing your boards, rip them ¼" over finished width, then cut them to length. Be sure to label each piece so you can identify parts for each leg and assemble them as intended.

Build a sled for accuracy

The sled shown *below* carries the leg stock through the tablesaw blade safely while ripping each piece to identical width. Build it from dead-flat plywood or MDF. Bevel-rip the base, and then attach the fence 1½" from the beveled edge. Use a leg piece to help position the cleats at each end.

Position the toggle clamp so it applies pressure ¾" from the edge of the fence. This prevents the leg face from tipping when beveling the second edge.

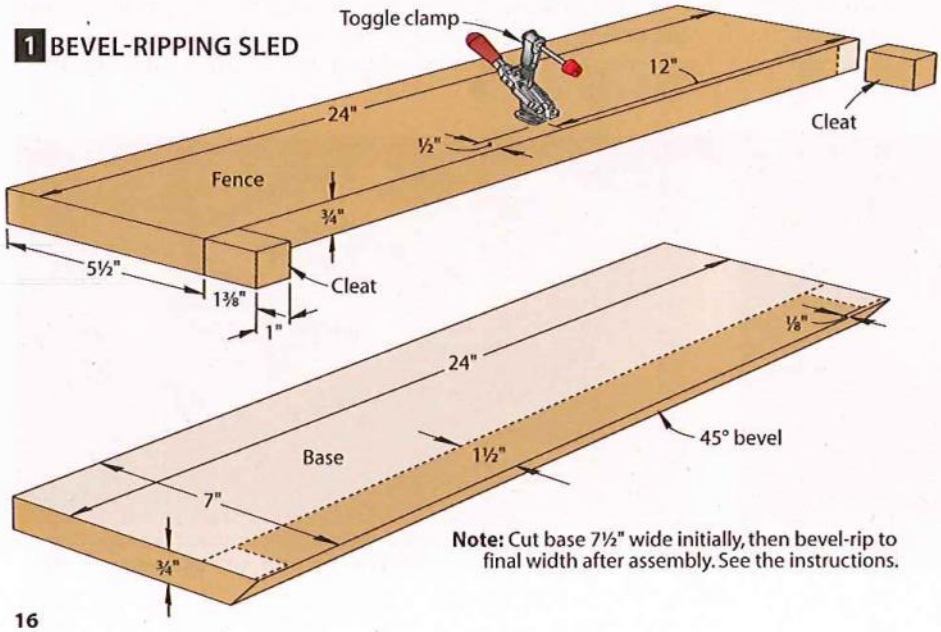
Next, test (and tweak) the tilt

Before cutting into your good stock, adjust your tablesaw bevel angle to exactly 45° by making bevel-rips in four identical-width pieces. Assemble the test pieces, and, if all four corners close tightly, you're ready to begin. Lock the blade-tilt mechanism on your saw to prevent the blade from shifting.

Set up the sled; then rip

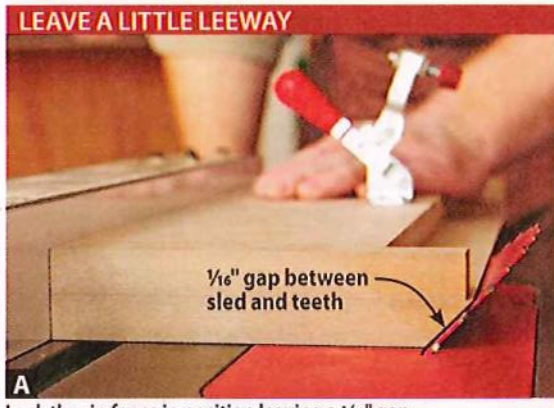
Position the tablesaw rip fence and sled as shown in **Photo A**. Bevel-rip one edge of each leg face at this setting [**Photo B**]. Then lightly nudge the rip fence so the edge of the sled just brushes the blade's

1 BEVEL-RIPPING SLED



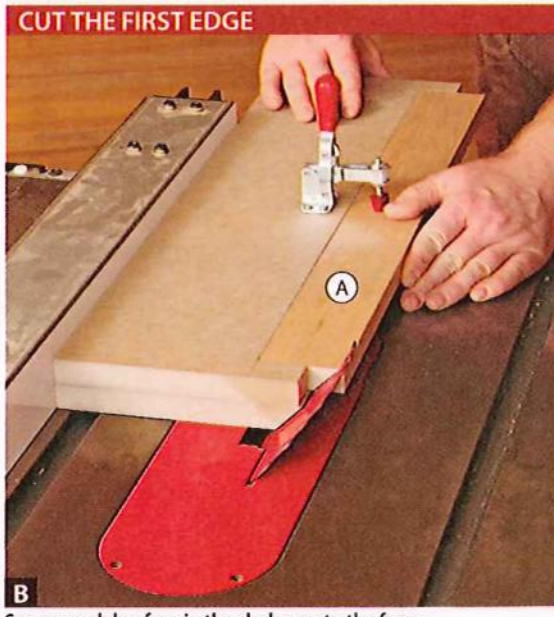
Note: Cut base 7½" wide initially, then bevel-rip to final width after assembly. See the instructions.

LEAVE A LITTLE LEEWAY



Lock the rip fence in position leaving a 1/16" gap between the teeth of the blade and the beveled edge of the sled.

CUT THE FIRST EDGE

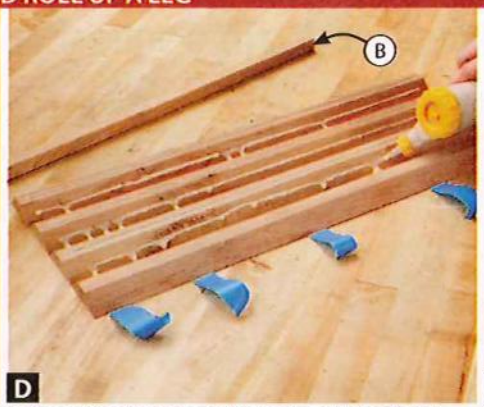


Secure each leg face in the sled snug to the fence and bevel-rip an edge. The cut must leave a sharp corner along the front face.

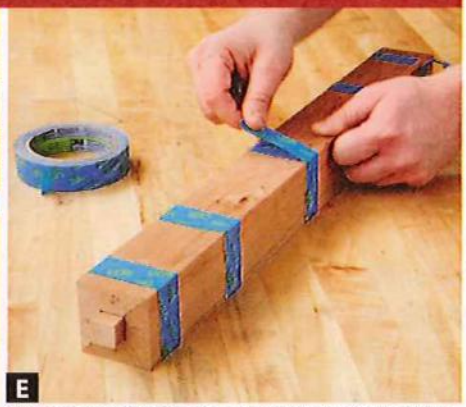
continued on page 18

TAPE THE FACES, GLUE THE BEVELS, AND ROLL UP A LEG

C Place the leg faces (A) edge to edge, outside-face up, with their ends flush, and apply several strips of painter's tape across all four faces.



D To speed the glue-up, apply glue to only one bevel and the flat center of each piece, then roll the faces up around a core (B).

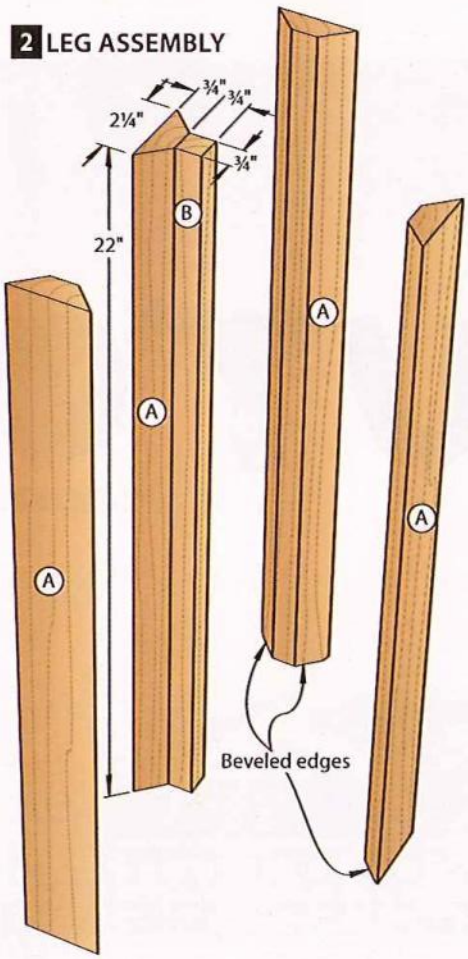


E Wrap more painter's tape around the leg to hold the joints closed. Trim and sand the core flush after the glue dries.

teeth, and bevel-rip the opposite edge of each piece.

Dry-fit four leg faces and cut a core (B) slightly longer than the leg so it slides easily, but not loosely, into the center of each leg. ***Quick Tip!*** *Sanding or planing 1/32" chamfers on the edges of the core allows the leg faces to fit tightly at the inside corners.* Then glue up each leg as shown in **Photos C, D,** and **E.**

2 LEG ASSEMBLY



SHOP TIP

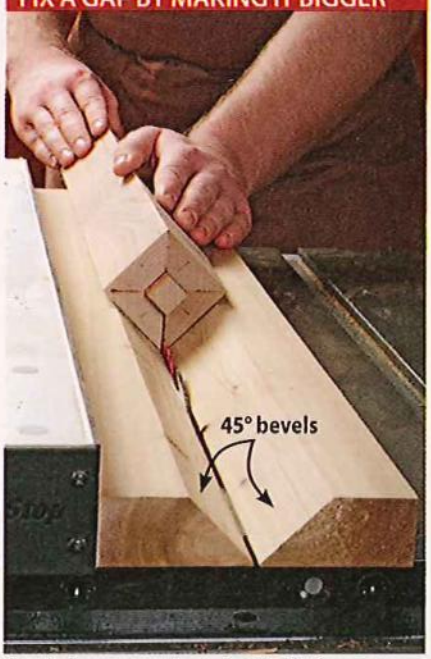
Oops, a gap! Now what?

Even with careful planning, cutting, and assembly, you may end up with a gap in a joint. Don't panic; the fix is simple. First, bevel-rip two straight 1½×3×24" scraps at 45°. Use the rip fence and a leg to position them on either side of the blade (but not touching it), so the scraps support the leg, *below.* (You may need to trim back the pointed edges of the bevels on the scraps.) Secure the scraps with double-faced tape, then cut a ¼"-deep kerf through the open joint on the leg.

Remove the scraps, tilt the blade to 3°, and rip a ⅛"-wide filler strip from a scrap of wood the same species and color as the leg. Glue the filler strip in place, allowing it to stand proud of the leg faces. (The slight bevel wedges the filler tightly in the kerf.)

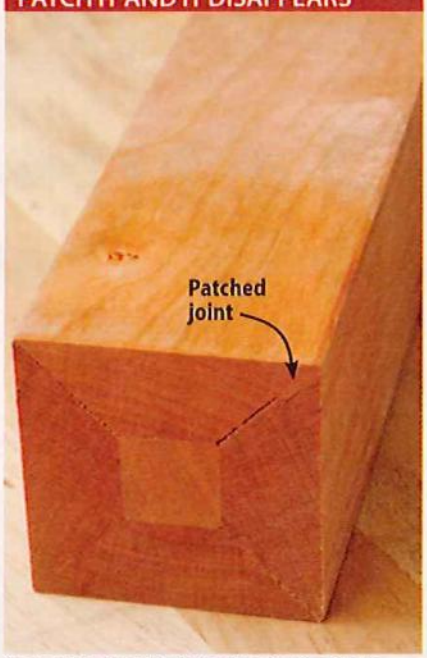
After the glue dries, trim the filler and sand it flush for a nearly invisible patch, *below.* When cutting the mortise joints in the leg, place the patched corner to the back and inside to hide it further.

FIX A GAP BY MAKING IT BIGGER



Beveled scraps cradle and guide the leg as you cut a ¼"-deep kerf the length of the leg through the open joint.

PATCH IT AND IT DISAPPEARS



Even with mineral spirits wiped on to mimic a finish, the patch blends in nicely with the surrounding wood.

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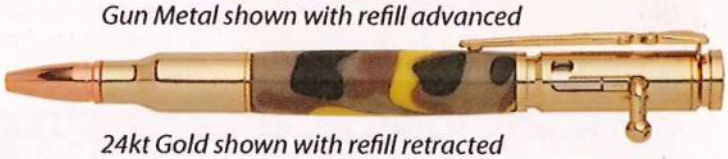
The more bolt action pen kits you buy, the more you SAVE! Choose from 3 finishes: Chrome (shown above), Gun Metal or 24kt Gold. Patent pending.

Gun Metal shown with refill advanced



24kt Gold shown with refill retracted

	Item #	1-4	5-24	25-49	50+
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True Up Your Jointer Tables

If, despite your best efforts, your jointed edges and faces aren't truly flat or joints in panel glue-ups show gaps, it's time to check the alignment of your jointer tables. The end of one or both tables may sag, or the tables might be twisted relative to each other. Here's how to diagnose the problem and then correct it.

***Note:** The fixes described here apply to jointers with dovetailed ways. That covers most floor-standing, sub-$1,000 jointers. For jointers with parallelogram beds, refer to the owner's manual.*

Check for twist and dips

To find if the tables are parallel across their widths, make winding sticks by ripping two scraps to equal width and crosscuting them just longer than the width of the jointer tables. Wrap blue tape around the long edge of one; then stand it on the far end of the outfeed table. Place the other stick on the opposite end of the infeed table as shown *above*. Squat down about 3' from the end of the infeed table until you see a sliver of blue from the far stick above the edge of the near stick. If the blue line tapers, the tables aren't parallel; adjust them as described in the next paragraph. If the blue line is even, skip to **See if it sags** on *page 22*.

Now check to see if the outfeed table sits parallel to the cutterhead. Remove the cutterhead guard and push the fence back fully. Set the outfeed table flush with the cutterhead body (not the knives) as shown *below*. Check the table edge at its front and back. A gap below the straightedge reveals a need to raise that side of the table. Follow the steps in the photos at the top of *page 22* to level

FIRST, CHECK THE OUTFEED TABLE 'S ALIGNMENT WITH THE CUTTERHEAD

Set the outfeed table flush with the cutterhead, then check for gaps between the straightedge and table.

continued on page 22

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CLEAN AND LUBE THE WAYS AND GIBS, THEN SHIM AS NEEDED TO MAKE THE TABLES PARALLEL

Loosen the gib bolts and table lock. Direct WD-40 or a similar solvent between the dovetail ways on both sides to dissolve the old grease.

Lift the end of the table to allow the solvent to reach all areas. Force out any remaining grease and grime with compressed air.

Slide the gibs (metal bars between the dovetail ways) out partially and apply a liberal coat of lithium soap grease; then reinsert them.

Cut .005 brass shim stock (**Source**) as long and wide as the gib, grease the shim, and slide it behind the gib. Add additional shims if needed.

level the table to the cutterhead. This can be a tedious trial-and-error process; you'll make an adjustment, retighten screws, recheck the table alignment, and then repeat the process if needed.

With the outfeed table now parallel to the cutterhead, repeat the winding-stick test. If twist still exists, make the same adjustments on the infeed table.

See if it sags

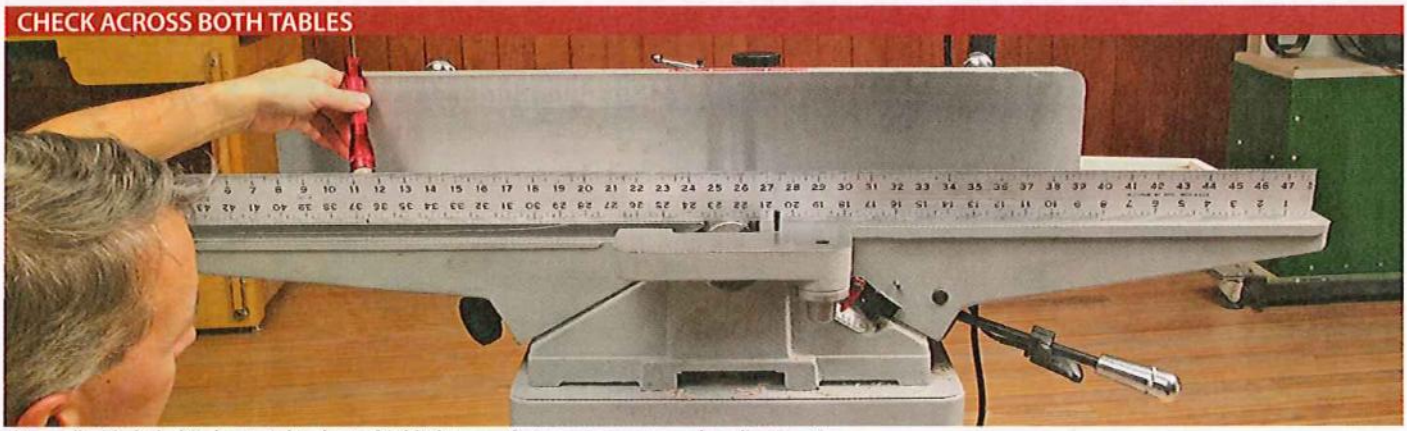
Now that the tables rest parallel with each other and the cutterhead, check them for sag along their length. Raise the tables so they align just above the cutterhead. Span both tables with a long straightedge, checking at the front and back edges of the table, *below*. Gaps below the straightedge indicate that one end of a table rests too low.

To correct this, place shim stock under the dovetail ways, beginning with the outfeed table. Shim the infeed table only if needed. Place ⅜"-long shims toward the upper end of the ways to raise the end of the table nearest the cutterhead; or toward the lower end to raise the outer end of the table. Shim the front and rear ways the same amount. After shimming, repeat the tests to check that the tables rest parallel in both planes.

Lastly, check that each end of each knife rests parallel to the outfeed table. Set the table even with a knife at its highest point. Rest a straightedge across the knife and the outfeed table as when checking the table to the cutterhead. Adjust each knife as needed.

Source: .005 brass sheets no. 106237, $3.49, shophobbylobby.com

CHECK ACROSS BOTH TABLES



Shine a flashlight behind a straightedge to highlight gaps that require you to make adjustments.

Just-Right Joinery

12-Minute Dovetails

Cut through-dovetail joints on your router table in about the time it takes to boil an egg!

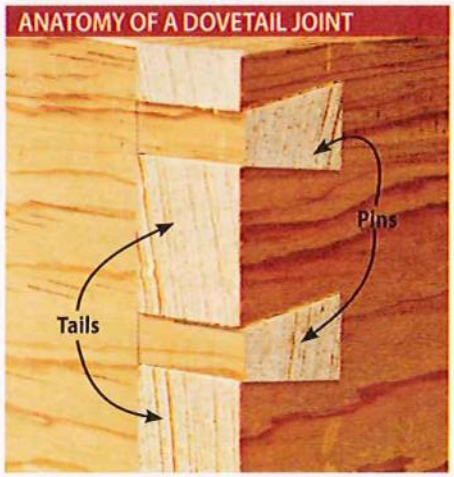
Dovetail joints bear the hallmark of quality craftsmanship and add loads of visual appeal to almost any project. Now, by using a basic dovetail jig on a router table—rather than with a handheld router—you can turn out four perfect-fitting joints in about 12 minutes. It's easy!

Start with the right jig

Over the years, we've used four jigs to cut through-dovetails on a router table. [See **Sources**, *page 26*.] They all work essentially the same and come with everything you need, including bits. The Leigh and MLCS jigs use guide bushings to steer the bit between the template's guide fingers. But we prefer the jigs that use bearing-guided bits—Katie Jig and Keller—because they're easier to set up and change bits.

With all but the Katie Jig, which comes ready to use, you'll first need to mount the finger template onto a backer board and make a one-time calibration for tight-fitting joints. (Each jig's instructions explain how to do this.) The backer board not only secures the jig and registers your workpiece properly, but also provides support on the back side against grain tear-out.

Scribe a centerline on the top side of a finger in the middle of the jig **[Photo 1]** on both the pins and tails side. This will be used to center boards for symmetrical joints.



Rout the pins with a straight bit and the tapered fingers. Rout the tails with a dovetail bit on the straight-finger side.

Now, rout the joints

Cut your project parts to size with square ends—and a couple of extra pieces for testing setups. When cutting dovetails with these jigs, tailboards and pinboards don't have to be the same thickness, but opposing boards in a drawer or other box do need to be of equal thickness. Arrange the boards to form the project, with the best faces out. Mark the outer faces—this proves critical when routing the pins—as well as the joints with sequential numbers or letters so you can match them up after machining. Now you're ready to begin cutting, tails first.

continued on page 26

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Just-Right Joinery

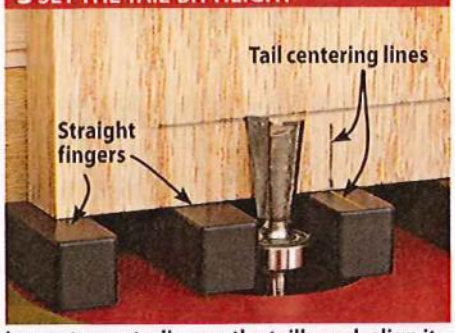
1 SCRIBE A CENTERLINE

Use a small square and craft knife to scribe a line down the length of a center guide finger on each side of the jig.

2 MARK FOR THICKNESS

Mark the tailboard thickness on one pinboard; then use the pinboard to mark its thickness on the tailboard.

3 SET THE TAIL-BIT HEIGHT



Lay out a centerline on the tailboard, align it with the jig's centerline, and clamp in place. Raise the bit 1/32" above the thickness line.

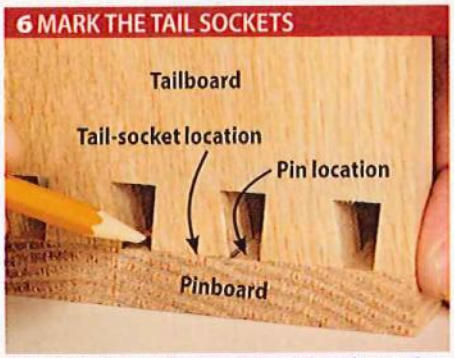
4 ADD A STOPBLOCK

Clamp a stopblock next to the tailboard to make repeatable dovetail cuts on this and other tailboards.

5 ROUT THE TAILS

Cut the tails by guiding the jig into the bit, so that it slides between the straight guide fingers. Repeat for each tailboard end.

6 MARK THE TAIL SOCKETS

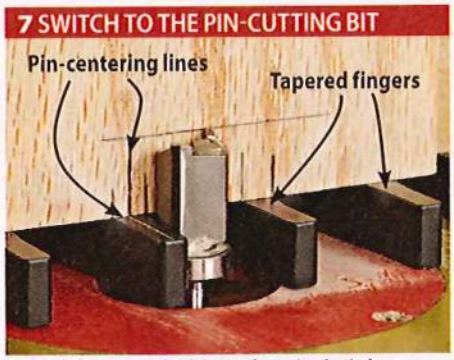


Stand a tailboard on a pinboard and transfer the tail locations. Wood visible between the tails will be pins; you'll rout away the sockets.

Follow this step-by-step procedure for flawless dovetails. (By aligning boards to the scribed centerlines on your jig's template, you should get perfect-fitting joints every time.)

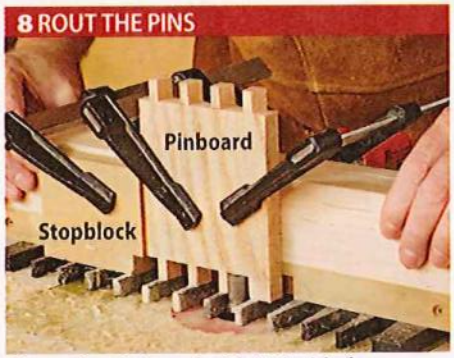
Watch a video on cutting all the dovetail joints for a typical small box at woodmagazine.com/12mintails (FREE for a limited time.)

7 SWITCH TO THE PIN-CUTTING BIT



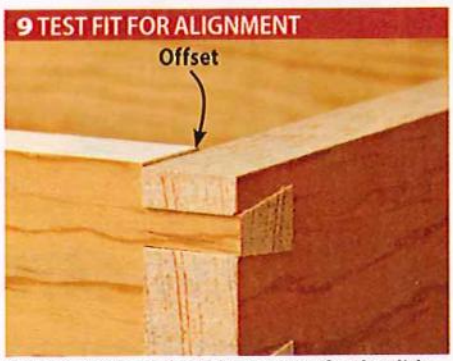
Install the straight bit and set its height as before. Lay out a centerline of one marked pin and align that to the scribed finger.

8 ROUT THE PINS



Clamp the pinboard with its inside face against the jig, set the stopblock against the board, and rout the tail sockets to make pins.

9 TEST FIT FOR ALIGNMENT



If the test joints don't line up perfectly, slide the pinboard half the difference left or right, readjust the stopblock, and rout new pins.

10 TAP TOGETHER FOR A PERFECT FIT

With all tails and pins cut, dry-fit the box; tap parts together lightly with a mallet to avoid any damage to the joints.

Sources

Keller jig: #1500 Journeyman (¼"-shank bits only), $159, Keller Dovetail, 800-995-2456, kellerdovetail.com.
MLCS jig: #6412 (¼"-shank bits), $49.95; #8712 (½"-shank bits), $49.95, MLCS, 800-533-9298, mlcswoodworking.com.
Leigh Jig: #R9 Plus (8mm-shank bits, collet reducer included), $169, Leigh Industries, 800-663-8932, leighjigs.com.
Katie Jig: #KJ1-12000001 (⅜"-shank bits, collet reducer included), $270, Katie Jig, 317-787-1965, katiejig.com.

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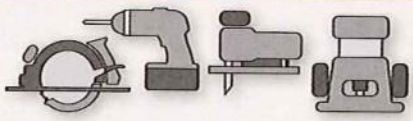
Easy Swingin' Arbor

Project Highlights

- Overall dimensions: 111" wide × 42" deep × 91½" high.
- Lumber cost: $155; cost of hardware and concrete: $70.
- Simple joinery—screws and a few notches—makes construction quick.
- Decorative battens and beams strengthen the arbor while providing partial shade.

BASIC-BUILT
GREAT PROJECTS MADE SIMPLE.

TOOLS NEEDED



With only two posts to set and nothing to rip, you'll be relaxing in your new swing in no time.

Punch holes; plant posts

1 Start by routing ⅜" round-overs on all edges of both posts (A) [**Drawing 1**]. Choose a relatively flat and level site and lay out the positions of the postholes [**Drawing 2**]. Dig the 12"-diameter postholes to a depth of 42" and add 6" of gravel to the bottom [**Drawing 1a**]. Drop the posts into the holes and secure them as shown [**Photo A**]. Use a string to check that the post faces lie in the same plane. Mix concrete and add it to both holes. Allow the concrete to cure before removing the bracing. (For a free article on accurately locating posts, see **More Resources**, *page 33*.)

2 Cut the cross beams (B), top blocking (C), brackets (D), beams (E), and chain blocking (F) to length [**Drawings 1** and **2**]. Lay out the arcs on the ends of the cross beams and beams as well as the shape of the brackets [**Drawings 1, 1b,** and **2**].

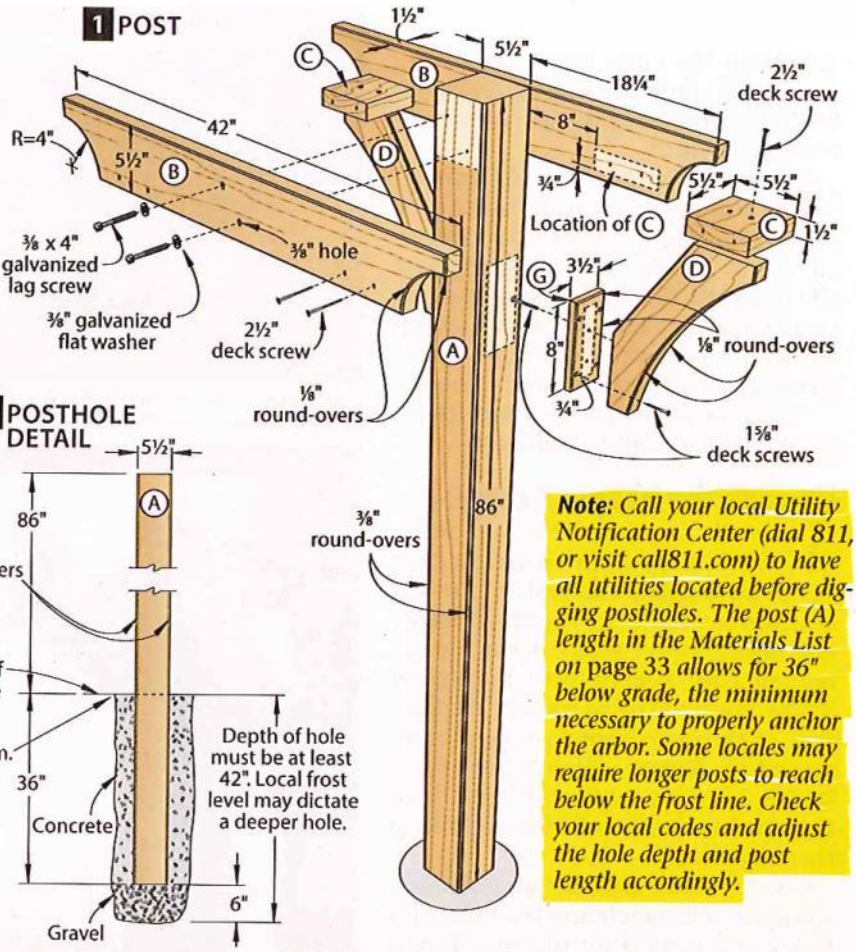
Quick tip: ***For large curves, mark the known dimensions, and then bend a thin strip of scrap wood (known as a fairing stick), clamping the ends so the curve intersects your layout lines. Then trace the curve.***

Cut the parts to shape, jigsawing all curves. Then rout ⅛" round-overs on the freshly cut ends and curves. Set the beams and brackets aside.

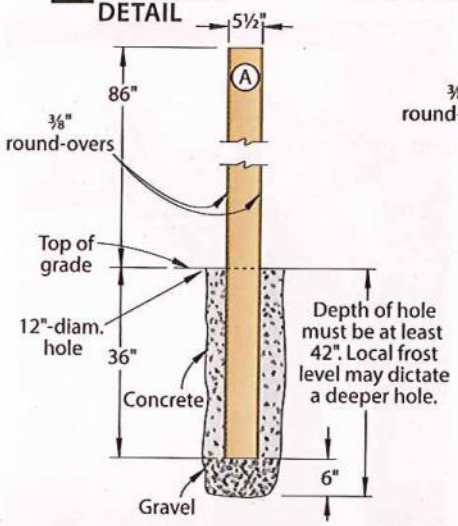
3 Now, cut the bottom blocking (G) to length and rout ⅛" round-overs on one face of each. Screw the blocking, centered, to the brackets [**Drawing 1**].

4 Retrieve one beam (E) (and a helper, if possible) and clamp it to the posts (A), leveling it 75" above the ground. Retrieve one of the cross beams (B) and place it on top of the beam [**Photo B**]. Level it and mark the post along the top of the cross beam. Repeat with the opposite post before removing the beam. Transfer the lines around all four sides of the post. Then use your circular saw to cut the post on all four sides, finishing the cut with a handsaw.

1 POST

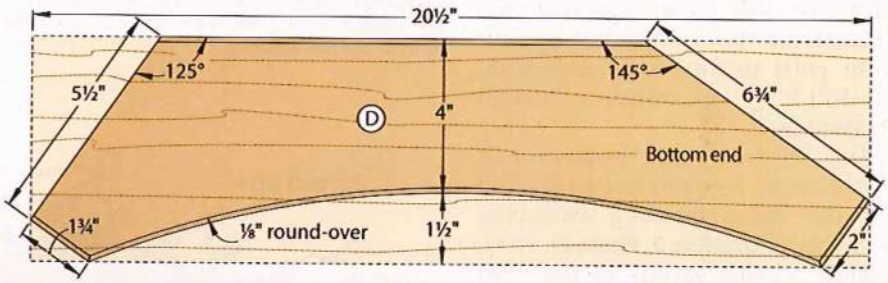


1a POSTHOLE DETAIL



Note: *Call your local Utility Notification Center (dial 811, or visit call811.com) to have all utilities located before digging postholes. The post (A) length in the Materials List on page 33 allows for 36" below grade, the minimum necessary to properly anchor the arbor. Some locales may require longer posts to reach below the frost line. Check your local codes and adjust the hole depth and post length accordingly.*

1b BRACKET



STAND 'EM STRAIGHT & TALL

Use stakes and bracers to secure the posts (A). Ensure they are plumb in both directions before and after filling the postholes with concrete.

PREP THE POSTS FOR CUTTING

First create a level reference using a beam (E) as a straightedge. Then use a cross beam (B) to establish the final post height.

5 Clamp the cross beams (B) to the posts (A) flush with the top and level. Predrill; then attach using lag screws and washers [**Photo C**].

6 Secure the top blocking (C) between the two cross beams (B) using deck screws [**Drawing 1**] on both post assemblies. Now, center a bracket assembly (D/G) against the top blocking and the post, screwing down through the top blocking to secure it in place before screwing the bottom blocking (G) to the post. Repeat with the remaining bracket assemblies to complete both posts.

Up with the beams, Scotty!

1 Mark the location of the four beams (E) on the top of the outermost cross beams (B) [**Drawing 2** and **2a**]. Set the first beam on top of the cross beams, centered end to end, with the face down and the bottom edge aligned with one set of marks. Use a square to transfer the location of the cross beams [**Photo D**] onto the beam. Repeat with the remaining beams, aligning them with their location marks. Number the beams to keep them in order.

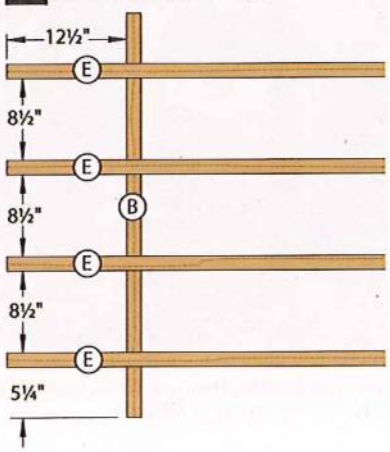
2 Back on the ground, on sawhorses, jigsaw 1½" notches in the beams (E) where you marked for the cross beams (B) [**Drawing 2**].

3 Retrieve the chain blocking (F). Screw the blocks together face-to-face in pairs to form two assemblies. Then drill a ⅜" hole, centered, through each assembly.

4 Place the two center beams (E) in position on the cross beams (B), and screw the chain blocking assemblies (F/F) in place [**Drawing 2, Photo E**]. Next, toe-screw all four beams to the cross beams. Install the eyebolts in the chain blocking as shown.

5 Cut 13 battens (H), chamfering the ends with your mitersaw or jigsaw,

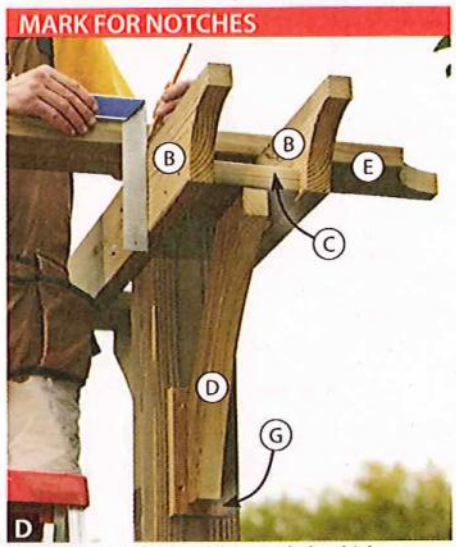
2a BEAM LOCATIONS



LEVEL AND ATTACH THE CROSS BEAM

Clamp a cross beam (B) flush with the top of the post (A). Drive one lag screw. Level the cross beam, and drive the second screw. Repeat with the second cross beam; then add the cross beams to the other post.

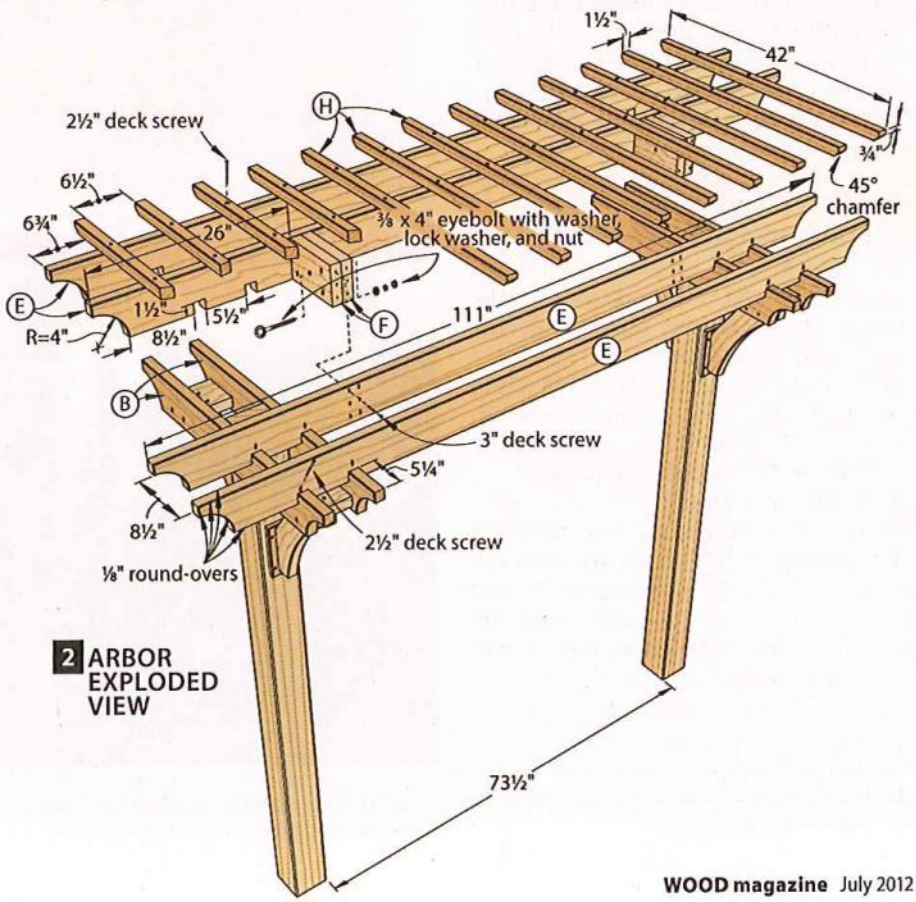
MARK FOR NOTCHES



Using the cross beams (B) to mark the thickness and location of the notches ensures that the beams (E) fit on the first attempt.

SCREW-STRENGTHENED SUPPORT

Drive six 3" deck screws into each end of the chain blocking (F/F), offsetting them to avoid the screws within the blocking.

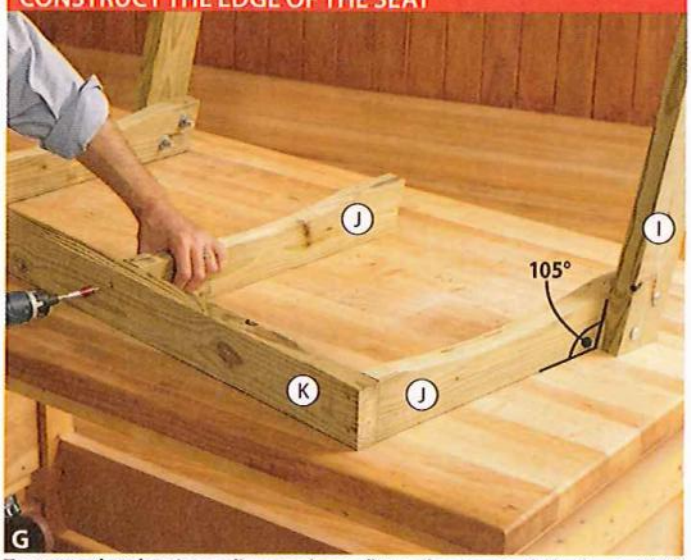


2 ARBOR EXPLODED VIEW

SPACE OUT THE SHADE-PROVIDING BATTENS

Use 2½" deck screws to attach the first batten (H) to the beam (E). Then use a 6½" spacer to position and attach subsequent battens.

CONSTRUCT THE EDGE OF THE SEAT



To ensure that the pieces align, work on a flat surface to attach the front rail (K) to the seat supports (J) using 3" deck screws.

and screw them to the tops of the beams (E) **[Drawing 2, Photo F]**.

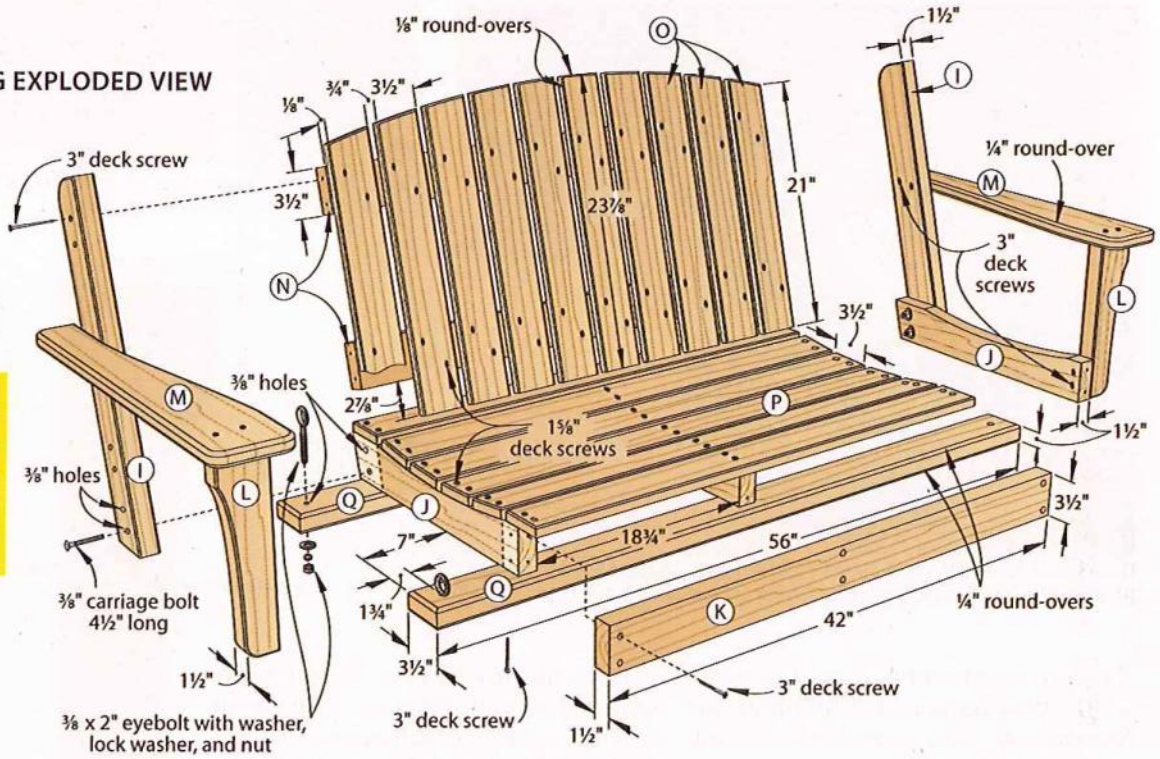
Quick tip: *Many home centers carry deck-rail balusters already chamfered and cut to the perfect size for this project. Purchase these as a speedy substitute for the battens.*

Frame up the swing

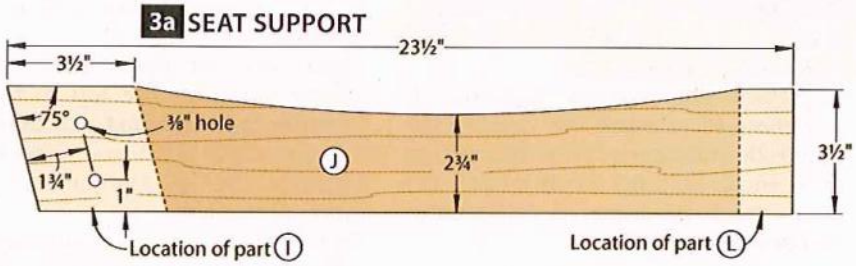
1 Cut the back upright (I) and seat support (J) blanks to length. Then use **Drawings 3a** and **3b** to lay out and cut them to shape before routing ⅛" round-overs on the back uprights where shown. Attach the back uprights to two of the seat supports, matching the angles at the back of the joint and making sure that you construct a left and right assembly **[Drawing 3]**.

2 Cut the front rail (K) to length and screw it to the front edges of the two side assemblies (I/J). Screw the remaining seat support (J), centered, to the front rail **[Photo G]**.

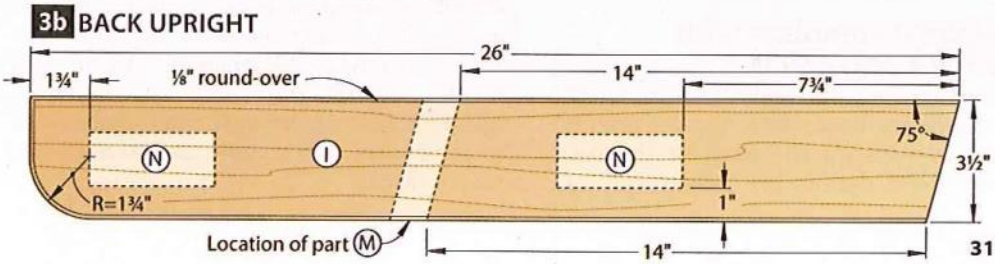
3 SWING EXPLODED VIEW

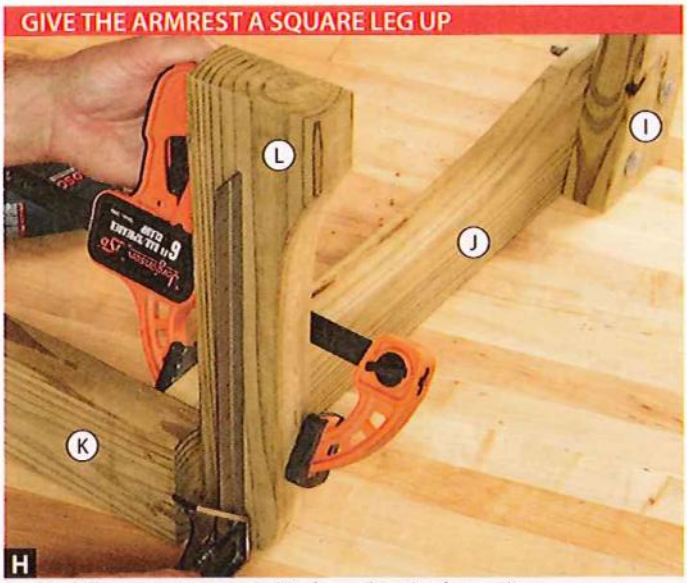


3a SEAT SUPPORT



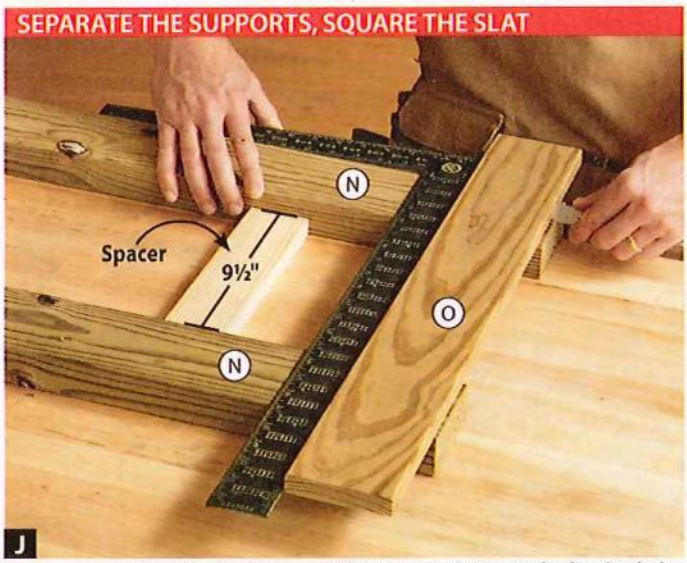
3b BACK UPRIGHT



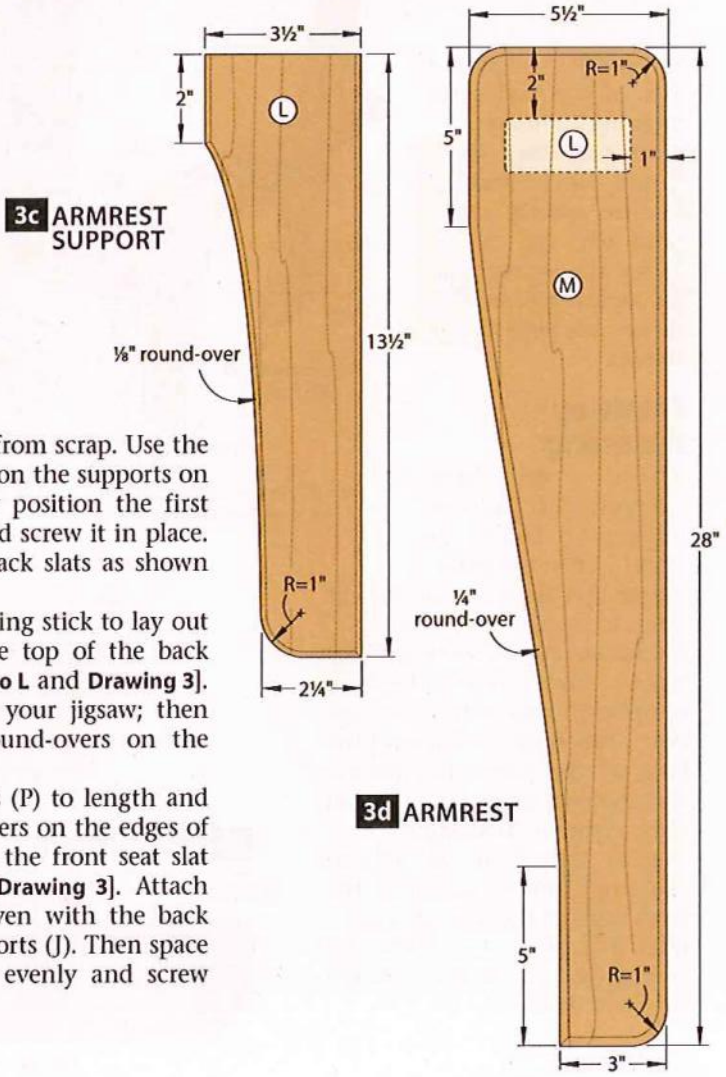


To attach the armrest supports (L), clamp them in place, using a square to ensure that they are vertical before driving the screws.

Center the front of the armrest (M) on the support (L) with a 2" overhang, clamping the back in place. Secure the front first, then the back, with screws.



Use a spacer to keep the back supports (N) separated. Square the first back slat (O) on the back supports, spacing it ⅛" from the end of both of the supports.



3 Lay out and cut the armrest supports (L) **[Drawing 3c]** and the armrests (M) **[Drawing 3d]**. Rout round-overs on the parts where shown.

***Quick tip:** Find the 1" pressure-treated material for the armrest (M), sold as 5/4 deck boards, in your home center.*

4 Attach the armrest supports (L) **[Photo H]**, driving the screws from the inside and taking care to offset them from those holding the front rail (K). Then attach the armrests (M) **[Photo I** and **Drawing 3d]**.

Make it complete with a back and a seat

1 Cut the back supports (N) to length and the back slats (O) to 24". Rout ⅛" round-overs on the front of the back slats. Next, cut two 9½"-long spacers and two ¾"-wide spacers from scrap. Use the long spacers to position the supports on a flat surface. Now position the first back slat **[Photo J]** and screw it in place. Attach subsequent back slats as shown **[Photo K]**.

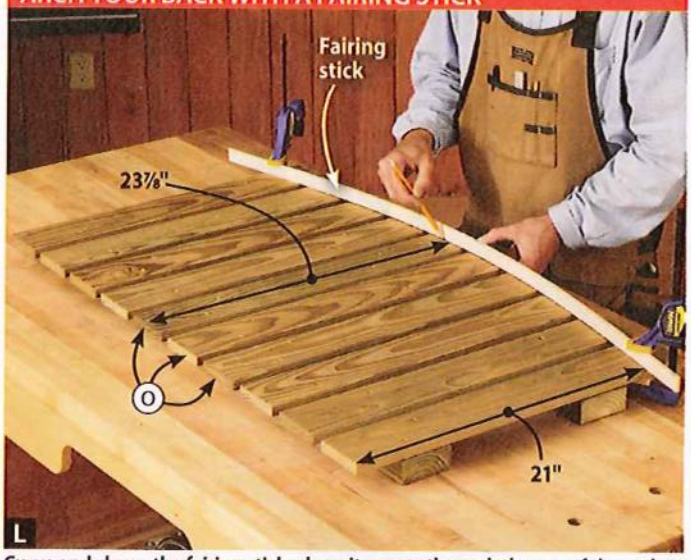
2 Retrieve your fairing stick to lay out the curve on the top of the back assembly (N/O) **[Photo L** and **Drawing 3]**. Cut the curve with your jigsaw; then complete the ⅛" round-overs on the front of the curve.

3 Cut the seat slats (P) to length and rout ⅛" round-overs on the edges of the top face. Attach the front seat slat with ½" overhang **[Drawing 3]**. Attach the back seat slat even with the back edge of the seat supports (J). Then space the remaining slats evenly and screw them in place.

SPACERS SIMPLIFY BACK SLATS SPACING

Set ¾" spacers on the back supports (N) to position and attach subsequent back slats (O). Use 1⅝" deck screws to attach the back slats.

ARCH YOUR BACK WITH A FAIRING STICK



Curve and clamp the fairing stick where it passes through the top of the arch at 23⅞" and 21" at the ends before tracing the curve.

4 Place the back assembly (N/O) between the back uprights (I) with the tops and back edges flush, and screw into place.

5 Cut the swing supports (Q) to length and drill ⅜" holes centered 1¾" from the ends [**Drawing 3**]. Rout ¼" roundovers where shown. Then flip the bench over and attach the supports even with the ends of the seat supports (J) and centered side-to-side.

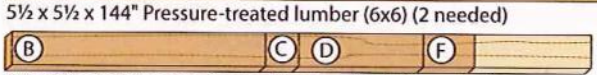
6 Attach the eyebolts to the swing supports (Q). Recruit a friend to help you hang the swing with some chain. We used quick links to make the connections between the eyebolts and chains which let us fine-tune the height and the hang of the swing. Treated lumber will turn gray in time. To protect it, allow a month or two for the wood to dry. Then brush on an exterior stain.

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

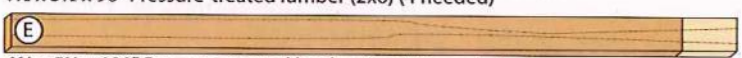
Cutting Diagram

ARBOR

5½ x 5½ x 144" Pressure-treated lumber (6x6) (2 needed)

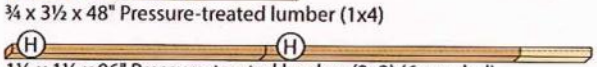


1½ x 5½ x 96" Pressure-treated lumber (2x6) (4 needed)

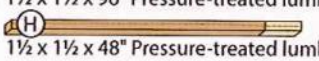


1½ x 5½ x 120" Pressure-treated lumber (2x6) (4 needed)

¾ x 3½ x 48" Pressure-treated lumber (1x4)



1½ x 1½ x 96" Pressure-treated lumber (2x2) (6 needed)

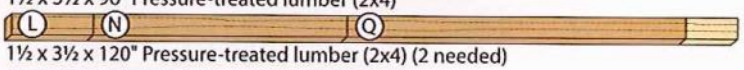


1½ x 1½ x 48" Pressure-treated lumber (2x2)

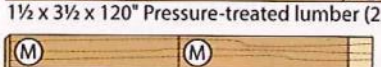
SWING

1½ x 3½ x 96" Pressure-treated lumber (2x4)

1½ x 3½ x 96" Pressure-treated lumber (2x4)

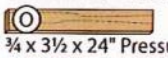


1½ x 3½ x 120" Pressure-treated lumber (2x4) (2 needed)

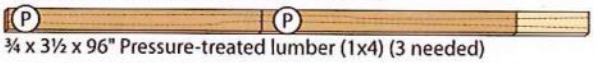


1 x 5½ x 60" Pressure-treated lumber (5/4 deck board)

¾ x 3½ x 96" Pressure-treated lumber (1x4) (3 needed)



¾ x 3½ x 24" Pressure-treated lumber (1x4)



¾ x 3½ x 96" Pressure-treated lumber (1x4) (3 needed)

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Arbor						
A*	posts	5½"	5½"	144"	T	2
B	cross beams	1½"	5½"	42"	T	4
C	top blocking	1½"	5½"	5½"	T	4
D	brackets	1½"	5½"	20½"	T	4
E	beams	1½"	5½"	111"	T	4
F	chain blocking	1½"	5½"	8½"	T	4
G	bottom blocking	¾"	3½"	8"	T	4
H	battens	1½"	1½"	42"	T	13
Swing						
I	back uprights	1½"	3½"	26"	T	2
J	seat supports	1½"	3½"	23½"	T	3
K	front rail	1½"	3½"	42"	T	1
L	armrest supports	1½"	3½"	13½"	T	2
M	armrests	1"	5½"	28"	T	2
N	back supports	1½"	3½"	42"	T	2
O*	back slats	¾"	3½"	23⅞"	T	10
P	seat slats	¾"	3½"	42"	T	6
Q	swing supports	1½"	3½"	56"	T	2

*Parts initially cut oversize. See the instructions.

Materials key: T–Pressure-treated lumber.
Supplies: ⅜x4" galvanized lag screws (8); ⅜x4" eyebolts (2); ⅜x2" eyebolts (4); ⅜x4½" galvanized lag bolts (4); ⅜" flat washers (18); ⅜" lock washers (10); and ⅜" nuts (10); 1⅝", 2½", and 3" F.H. deck screws; porch-swing chain (26'); quick links (8); gravel (2 bags); 80-lb. bags concrete mix (4).
Bits: ⅛", ¼", and ⅜" round-over router bits.

More Resources

- To purchase an article on positioning postholes, visit woodmagazine.com/postmaster.
- Find a video on circular saw joinery, free for a limited time, at woodmagazine.com/circsawjoinery.
- Upgrade your fairing stick with a free article at woodmagazine.com/fairing.

How to Work With Natural-Edge Slabs

Let Mother Nature be your co-designer as you build dazzling projects with wavy edges, bristly burrs, bark inclusions, and other "flaws" that give wood a look of unrefined beauty.

The rich contours of natural wood edges give tables, benches, and other projects a sculptural quality, almost as much art as furniture. Thankfully, anyone can build such stunning projects because doing so requires only basic techniques and tools.

Another great thing about building these types of organic projects: There's really no right or wrong way to do it. No two slabs will be exactly alike, making each project unique. Simply let the natural shapes, and the tips here, lead you through design and building.

First, grab a slab

You can obtain slabs in several ways; here's a list, beginning with your most affordable options:

- **Saw 'em yourself.** For details on this rewarding but labor-intensive option, see "Tips for sawing your own natural-edge slabs" on the *next page*.
- **Have a local mill saw 'em for you.** A lot of sawyers won't mind a custom-cutting job. Just bring them your log or have a

HALL TABLE
52"W x 14"D x 30"H
Mulberry top (from Ohio Woodlands)
Black-walnut base, stained with dark-walnut aniline dye
Wenge butterfly keys

COFFEE TABLE
42"W x 34"D x 16"H
Redwood burl and planks (redwoodburl.com)
Black-walnut butterfly keys

Tips for sawing your own natural-edge slabs

What to look for

- Logs felled during spring and summer give up their bark easier once dry, and have more unusual coloring due to higher moisture content.
- Search out logs with multiple knots, burls, limbs, and other unique characteristics.
- To create even more character in your wood, allow the logs to lie on the ground or in a stack for a year or two uncovered. Exposure to weather increases the chances of getting spalted streaks and color variations. (Cherry, soft maple, birch, box elder, and most softwoods break down quicker, so limit their exposure to a year.)

Cutting the logs

- Bark contains grit that dulls blades quickly, so remove as much as possible before firing up the mill. Start with a sharp blade, and keep extras on hand.
- Cut slabs a minimum of 2" thick to minimize warping. Saw thicker slabs for specific purposes or projects. If you want to use the warp-prone pith (the log's center), cut it as a 4–5"-thick slab, as shown at *right*. If the slab warps or splits later, remove the pith and make two slabs with single natural edges—great for shelves and mantels—or glue them together to form a wider slab with two natural edges.

Drying the slabs

- Air-drying maintains the best color of your wood; kiln-drying, although quicker, tends to even out subtle differences in wood tones.
- After cutting, don't leave the slabs stacked for more than a day or two without stickering (adding spacers to promote air circulation).
- Place slow-drying thicker slabs at the bottom of the stack so down the road you can access the thinner, drier slabs without dismantling the whole stack.

mobile mill come to you. (For operators of Wood-Mizer brand portable bandsaw mills in your area, call 800-553-0182; or go to forestryforum.com to locate a local sawyer.) Just remember, you'll need to air-dry the slabs about one year per inch of thickness or have them kiln-dried.

- **Buy 'em cut and dried.** You might be hard-pressed to find a local retailer selling slabs with two natural edges, so look to the Internet. In **Sources** on *page 37* you'll find sites selling natural-edge slabs, even in table-size planks; exotic wood species; and highly figured grain patterns, such as burls. When your wood arrives, let it acclimate to your shop's humidity for a week or two before doing any machining.

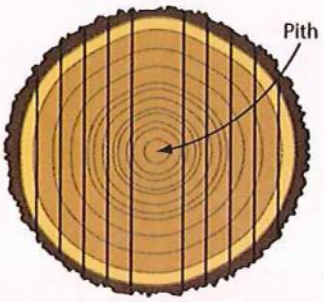
Let the slab drive the design

With the slab in hand, you probably have a general idea of what you want to build (large table, small table, long bench, short bench, for example). Now consider the following in order to match the unique characteristics of the slab to your personal tastes:

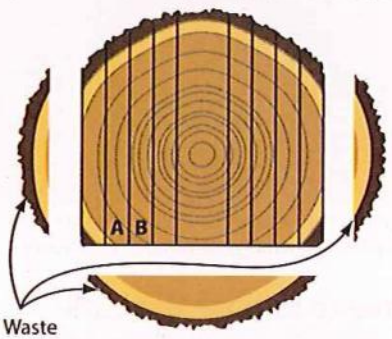
- The face of a table, bench, or headboard might look good with a little waviness; but a desktop must be flat. (We'll show you how to flatten a slab later in this article.)
- Unless you're working with a full cross-section burl, most slabs will have been cut off at the ends by a chainsaw. Those ends usually look best when sawn smooth and perpendicular to the face. If you want to sculpt the ends similar to the natural edges, use carving tools or an angle grinder (using coarse, beveled abrasive wheels) followed by sanding flap wheels.
- Determine parts that must be certain dimensions—such as table height or seat width—and design the other parts in proportion to those dimensions. For example, on the coffee-table *below left*, we had to cut down the 5½'-long slab to 4' to make it proportional to the natural shape and dimensions of our apple base.

2 Sawmilling Strategies to Maximize Natural Edges

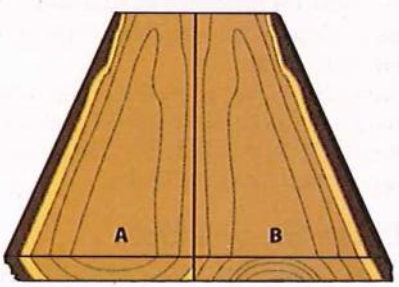
1. This method yields two natural edges and requires minimal joinery.



2. With this method you can bookmatch planks as shown to glue up wide tabletops.



"Open" adjacent slabs like a book ...

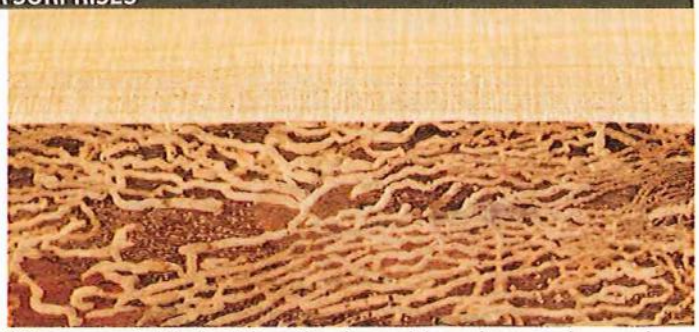


... joint the sawn edges and glue together for a wide bookmatched slab.

COFFEE TABLE
48"W × 30"D × 14"H
Claro walnut top (from Berkshire Products)
Apple base (local orchard)
Apple butterfly keys

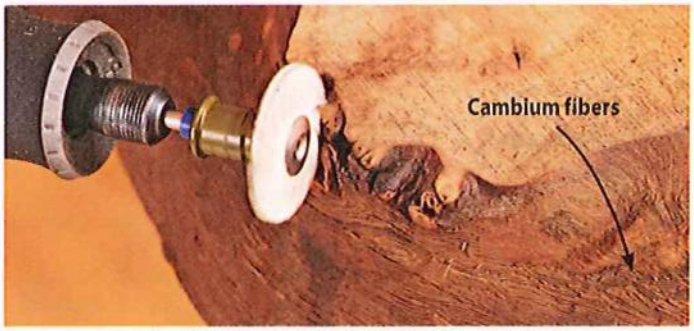
BENCH
49"W × 14"D × 18"H
Mulberry top (Ohio Woodlands)
Red-oak base; plans available on *page 38*
Black-walnut butterfly keys

To dislodge the bulk of the bark, gently push a rounded chisel beneath the bark. To prevent gouges, work along the slab edge rather than across it.



When we peeled the bark from this cherry slab we discovered a complex network of worm tracks, a feature worth highlighting.

With the bark removed, use a small nylon or wire brush to gently scrub away loose or stringy cambium-layer fibers.



Use a rotary tool and tiny sanding flap wheels (found at the **Sources** listed on the next page) to clean and smooth intricate details.

Time to remove the bark

Even though you might like the look of the bark, it tends to fall off later. Besides, there could be eye-catching surprises lurking below the bark, such as the worm tracks shown at *top right*. Begin by removing a 6–8" section of bark, starting at an end. The cambium layer, the fibrous "glue" that connects the bark to the wood, can add depth and character to the edge if you leave it. (It won't come loose later.) Scraping away that layer creates a slippery-smooth edge with more rounded features.

You don't need to sand the edges smooth at this point. And if you leave the cambium, you'll do little to no sanding to maintain the texture.

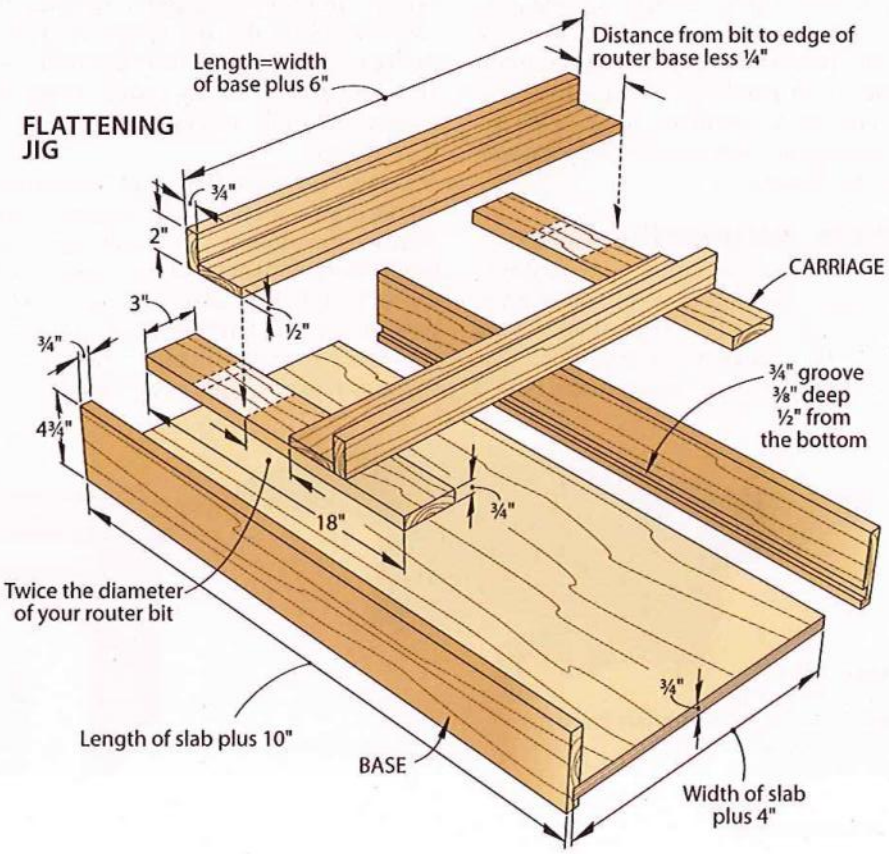
Flatten the slab faces

If you bought the slab precut, it might come with the faces already planed or sanded. Otherwise, flatten both faces with a plunge router and jig. Begin by building the jig at *right*, sized to fit your slab. We built ours 42" wide to accommodate a redwood burl, as well as most future slabs.

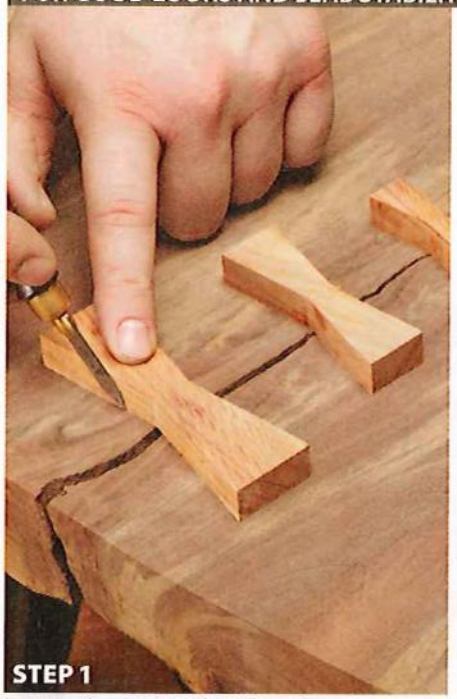
Cut natural-edge project parts to rough finished length so you're not flattening more stock than necessary. With the jig resting on sawhorses, place the slab where it will be easiest for you to reach with the router. Level the slab with wedges and "trap" it with screw-on cleats, as shown on *page 34*.

Install a wide, flat-cutting bit, such as Freud's 1½"-wide mortising bit (#16-128), in your router. With the router resting on the carriage, find the highest spot on the slab and set the cutting depth to remove ⅛" at that spot. Now plunge and rout across the slab, alternately holding the router against the carriage sides. Slide the carriage along the rails and repeat the length of the slab. Continue in ⅛"-deeper increments until flat.

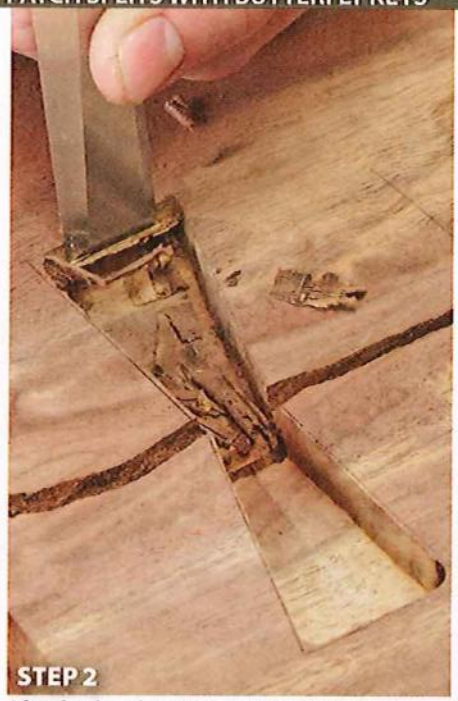
Turn the slab over, secure it with the cleats—no wedges this time—and flatten the other face as you did the first. Leave the slab as thick as possible to prevent warping. Power-sand both faces with 60- or 80-grit abrasive until the router marks disappear, but don't finish-sand yet.



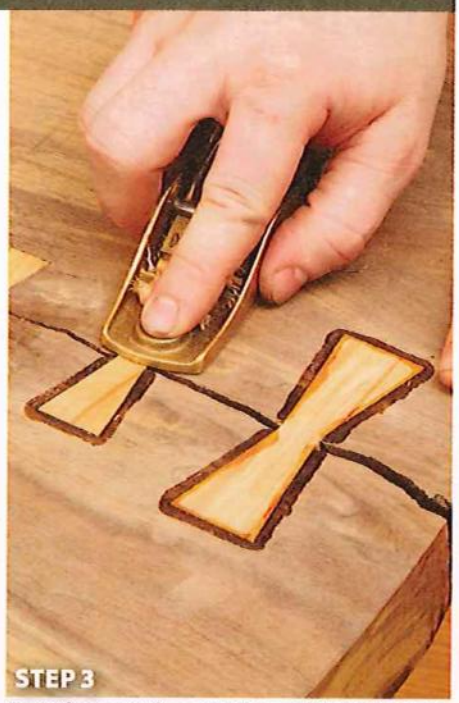
FOR GOOD LOOKS AND SLAB STABILITY PATCH SPLITS WITH BUTTERFLY KEYS



Lay your keys across the split and trace around them firmly onto the slab with a craft knife or marking knife.



After freehand routing close to the scribed lines, use a sharp chisel to clean up the sidewalls and corners. Epoxy the keys in place.



Once the epoxy has cured, use a block plane or power sander to trim the keys flush to the slab surface. Then sand smooth.

Focus on the flaws

Now you begin to see what the slab will look like when finished. Evaluate it for splits or other defects and decide how you want to treat them. Because splits could continue to open up, deal with them first to stabilize the slab, using butterfly keys as shown *above*.

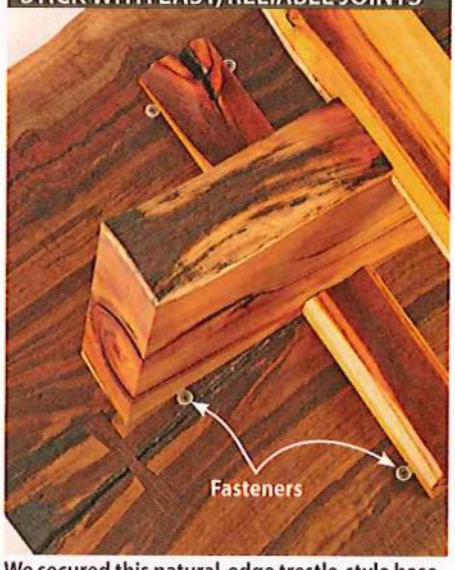
Space keys along the crack's length in proportion to the slab size. Install keys on both faces to further protect against future splits; they don't need to align with each other. Typically, make your keys from ½"-thick stock—we like species that contrast with the slab, but there's no right or wrong choice. Rout mortises and glue them in place with two-part epoxy, which fills in tiny voids better than yellow glue.

Next, clean out loose bark inclusions (small pockets of bark within the wood's interior) and either fill them with epoxy (colored or clear, but avoid epoxy that dries to a milky color) or leave them empty. Tight bark inclusions will likely remain intact. Glue torn or loose fibers or splinters back in place and sand the repair to blend in.

Now for the joinery

To connect the slab to its base, we recommend figure-8 fasteners, shown at *right*, over integral joinery (mortise and tenon or dovetails, for example) because they're easy to install, they allow the wood to shrink and expand without splitting, and they work with almost any project. They also allow you to apply finish to all or most project parts before assembling. You should make shallow mortises (the thickness of the fasteners) in either the slab or the base so the fasteners sit flush with that piece. (Use longer screws than those that come with the fasteners—ideally, you want to use at least 1"-long screws.) If you prefer to cut integral joints, such as mortises-and-tenons or dovetails, be sure to allow for seasonal wood movement.

STICK WITH EASY, RELIABLE JOINTS



We secured this natural-edge trestle-style base to the coffee table top with figure-8 fasteners and #8×1¼" FH screws.

Sanding and finishing

Before assembly, ease sharp edges with a rasp, file, or sandpaper. Hand-plane or sand smooth the slab's top face; if sanding only, start with 120 grit and continue with 150, 180, 220, and 320, if needed. Sand the natural edges with 120, 180, and 220-grit flap wheels until you're satisfied.

Apply your finish of choice. We like clear-oil finishes because they accentuate the wood's figure and grain. Follow up with several protective top coats of polyurethane, lacquer, or shellac.

Produced by **Bob Hunter** with **Kevin Boyle** and **John Olson**

Sources

Natural-edge wood slabs:

- Berkshire Products, Massachusetts, (domestic, exotic, and figured species), 413-229-7919, berkshireproducts.com.
- Hearne Hardwoods, Pennsylvania, (domestic and exotic species), 888-814-0007, hearnehardwoods.com.
- Ohio Woodlands, Ohio, (primarily domestic species), 330-506-9012, ohiowoodlands.com.
- Primo Wood Slabs, Tennessee, (primarily domestic species), 423-272-6003, primowoodslabs.com.
- Redwood.burl.com, California, (redwood slabs and burls), 707-826-9663, redwoodburl.com.

Sanding flap wheels:

- Klingspor's Woodworking Shop, 800-228-0000, woodworkingshop.com.
- Lee Valley, 800-871-8158, leevalley.com.
- Dremel, 800-437-3635, dremel.com.

Figure-8 fasteners:

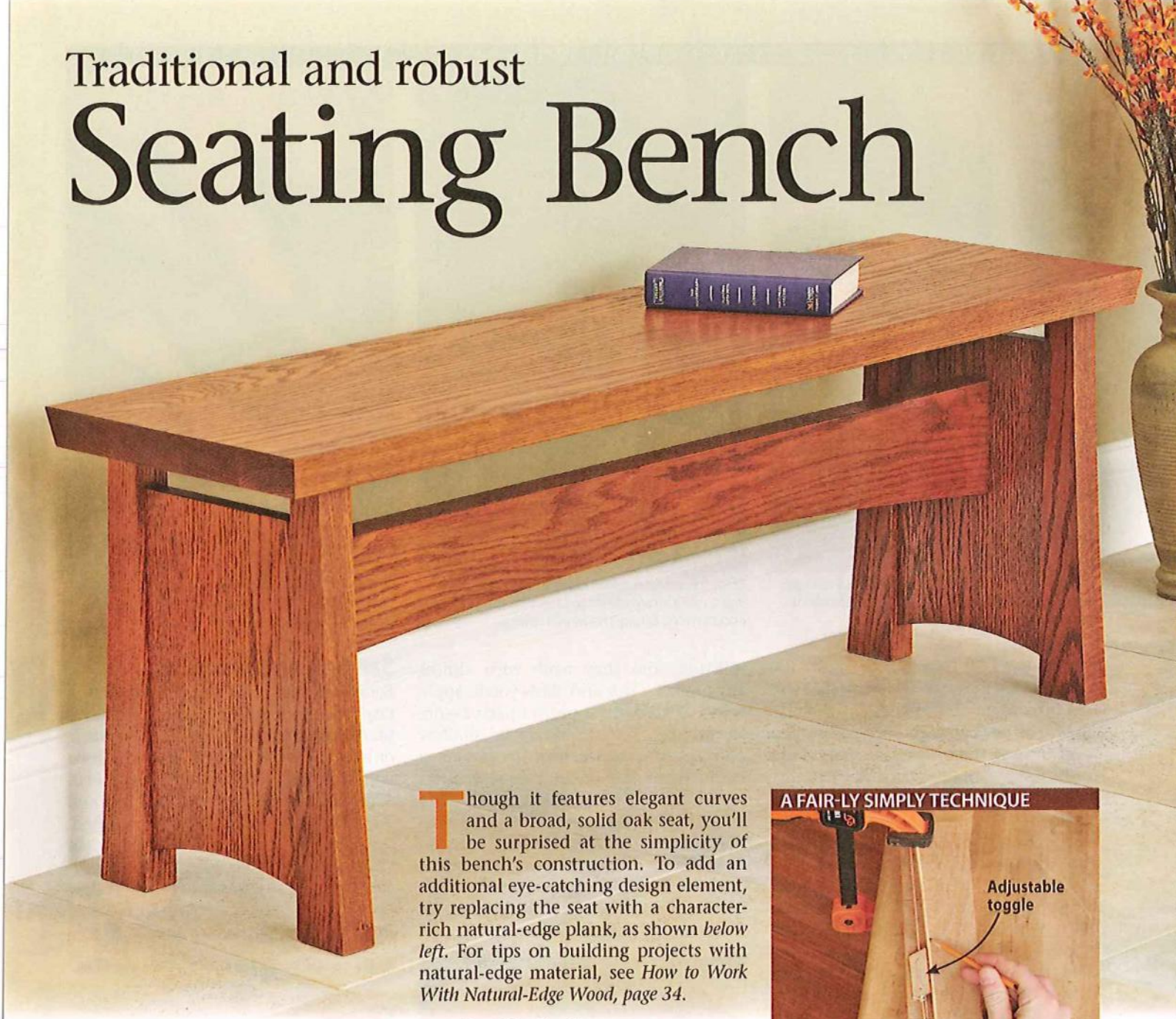
- Part #21650, $4.59/8-pack, Rockler Woodworking & Hardware, 800-279-4441, rockler. com.

Freud mortising router bit (#16-128):

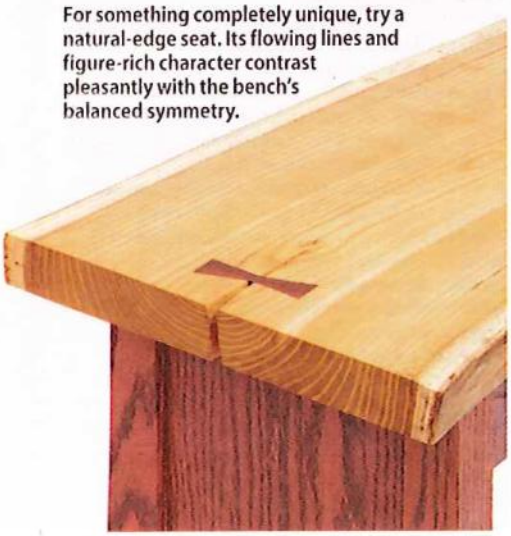
- Part #837557, $31.99, Woodcraft, 800-225-1153, woodcraft.com.

Traditional and robust

Seating Bench



Though it features elegant curves and a broad, solid oak seat, you'll be surprised at the simplicity of this bench's construction. To add an additional eye-catching design element, try replacing the seat with a character-rich natural-edge plank, as shown *below left*. For tips on building projects with natural-edge material, see *How to Work With Natural-Edge Wood, page 34*.



For something completely unique, try a natural-edge seat. Its flowing lines and figure-rich character contrast pleasantly with the bench's balanced symmetry.

Lead with the legs

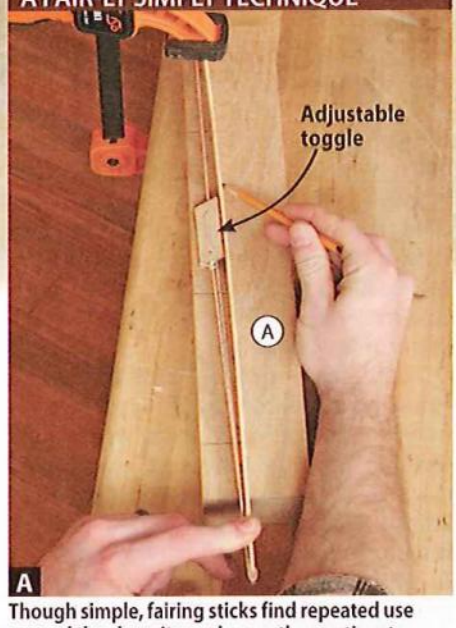
1 From 1½"-thick stock (or laminated ¾" stock), cut 3"-wide leg blanks (A). Cut the legs to length [**Materials List, Drawing 1**]. Lay out and mark the curve on a leg with a fairing stick [**Photo A**], a simple jig for drawing smooth arcs and curves [**Drawing 2**]. (See **More Resources** for a free video on making fairing sticks.) Bandsaw just outside the line and sand the curve smooth. Keep the offcuts.

***Quick Tip!** For closely matching legs, transfer the layout line from the first leg to the other legs. After bandsawing all the legs (keep the offcuts), clamp them together and gang-sand with a belt sander.*

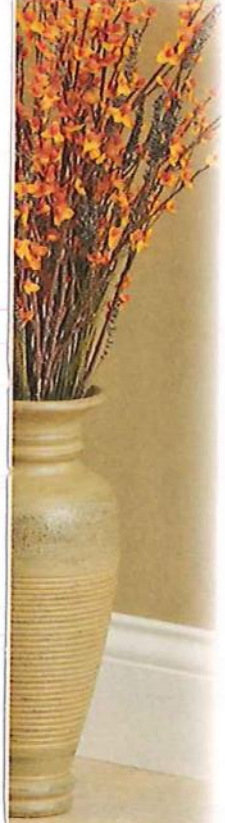
2 Edge-glue ¾"-thick stock to make an 8"-wide, 28"-long piece, and from it, crosscut two end-panel blanks (B). Use a fairing stick to lay out and mark the curve on the bottom of each panel [**Drawing 3**]. Cut and sand to the line. Save the resulting offcut.

3 Finish-sand the end panels (B) and the inside faces of the legs (A) to 220

A FAIR-LY SIMPLY TECHNIQUE

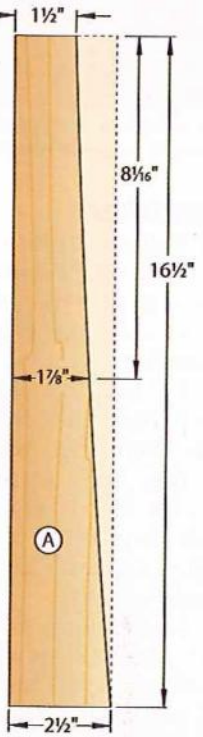


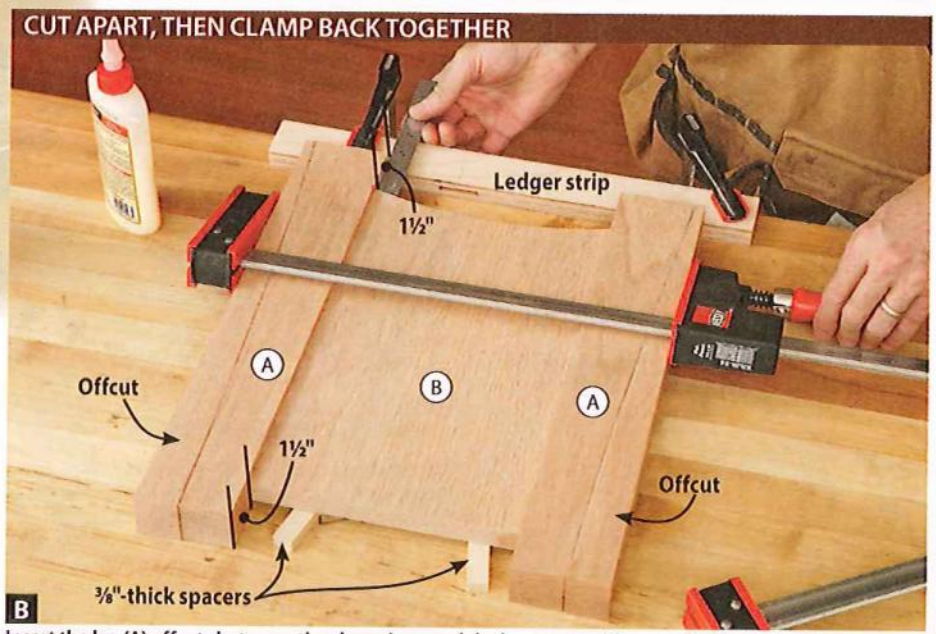
Though simple, fairing sticks find repeated use around the shop. It may be worth your time to make an adjustable one.



1 EXPLODED VIEW

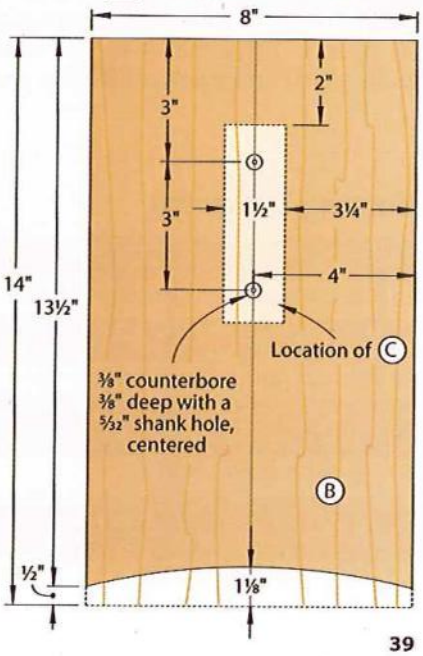
2 SIDE VIEW OF LEG





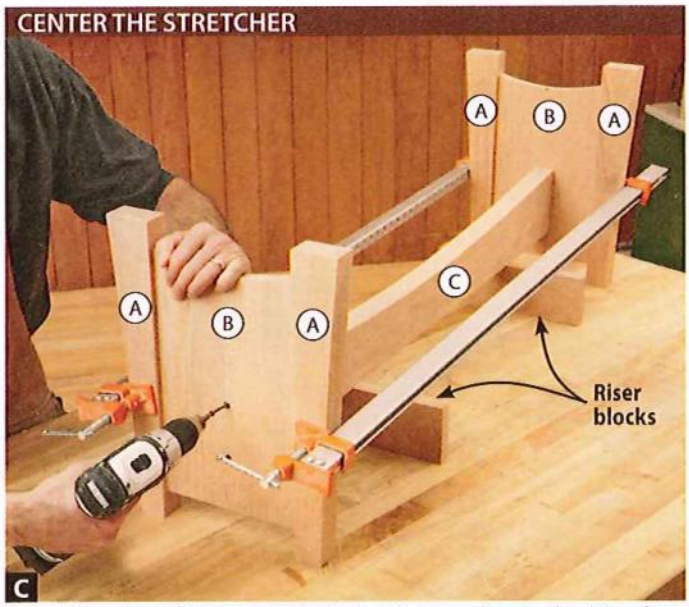
Insert the leg (A) offcuts between the clamp jaws and the legs to provide a parallel clamping surface.

3 END VIEW OF PANEL



grit. Sand 1/16" round-overs on the ends where shown **[Drawing 1]**.

4 To assemble the ends, cut four ⅜"-thick spacers, and a 16"-long scrap to use as a ledger. Clamp the ledger strip along the edge of the bench. Apply glue to the edges of the end panel (B) and place atop the spacers. Clamp two legs (A) with their offcuts to the panel **[Photo B]**, making sure the bottoms of the legs rest against the ledger, and the panel is 1½" from the top and bottom of the legs. Repeat for the other end. Finish-sand the ends (A/B) to 220 grit.



Even if the end panels (B) aren't exactly 8" wide, screw the stretcher (C) to the panels' exact center. It's essential to maintain the bench's balance and rigidity.

SHOP TIP

Don't toss those old sanding discs

By starting with ¾"-thick stock for plug material, a ⅜" counterbore will leave your plug ⅜" proud—a lot to sand flush. Instead, try this: After gluing the plug into the counterbore, slip a worn-out random-orbit sander disc over the plug, abrasive side down. Then use a flexible flush-cutting saw to trim the plug within 1/16" of the surrounding surface. Finally, sand the plug flush with a sanding block or random-orbit sander.

Size the stretcher

1 From 1½"-thick stock, cut the stretcher (C) to size **[Drawing 1]**. Lay out, bandsaw, and sand the curve; then sand round-overs on the edges where shown **[Drawing 1]**.

2 Cut two 3½"-tall riser blocks from scrapwood. Place the stretcher (C) upside down atop the riser blocks. Clamp the two ends (A/B) to the stretcher. Have a friend help you with this, as both ends need to be held upright and clamped against the stretcher simultaneously.

3 Drill ⅜" counterbores ⅜" deep in each end panel (B) where shown **[Drawing 3]**. Center a 5/32" hole in each counterbore, and then drive screws to secure the ends (A/B) to the stretcher (C) **[Photo C]**.

4 Use a plug cutter in your drill press to cut ⅜" plugs from the end-panel (B) offcuts: These match the color and grain of the end panels. Glue the plugs over the screws. Trim and sand the plugs flush with the surface. (See the Shop Tip *above right*.)

Top it off

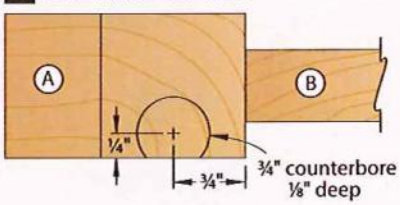
1 With a ¾" Forstner bit, drill ⅛"-deep counterbores in the tops of the legs (A) for figure-8 fasteners, where shown **[Drawing 4]**.

2 From 1½"-thick stock, glue up a blank for the seat (D) **[Materials List, Drawing 1]**. Tilt your tablesaw blade to 10° and bevel the bottom edges and ends. Sand round-overs along the tops of the edges and ends where shown; then finish-sand to 220 grit.

3 Apply a finish. For ours, we used a coat of United Gilsonite Natural Teak Stain (#SPM2382408802, $4.49/pt, 800-349-4358, sears.com), followed by two coats of General Finishes Enduro-Var Satin Urethane (#25451, $18.49/pt, 800-279-4441, rockler.com).

4 Mount the seat (D) to the bottom assembly (A/B/C) with figure-8 fasteners.

4 TOP VIEW OF LEG



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

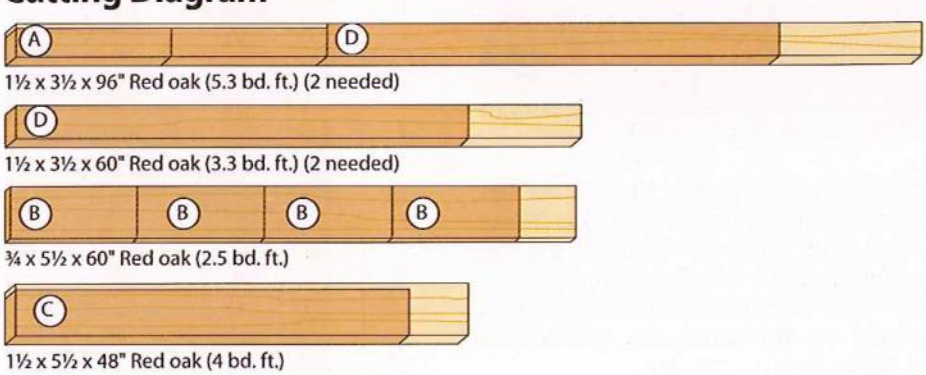
Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	legs	1½"	2½"	16½"	O	4
B*	end panels	¾"	8"	13½"	EO	2
C	stretcher	1½"	4⅞"	41¾"	O	1
D*	seat	1½"	13"	48"	EO	1

*Parts initially cut oversize. See the instructions.

Materials key: O–red oak, EO–edge-joined oak.
Supplies: #8x2" flathead wood screws (4), figure-eight fasteners (4), #8x1" flathead wood screws (8).
Blade and bits: ¾" Forstner bit, ⅜" and 5/32" drill bit, ⅜" plug cutter.

Cutting Diagram



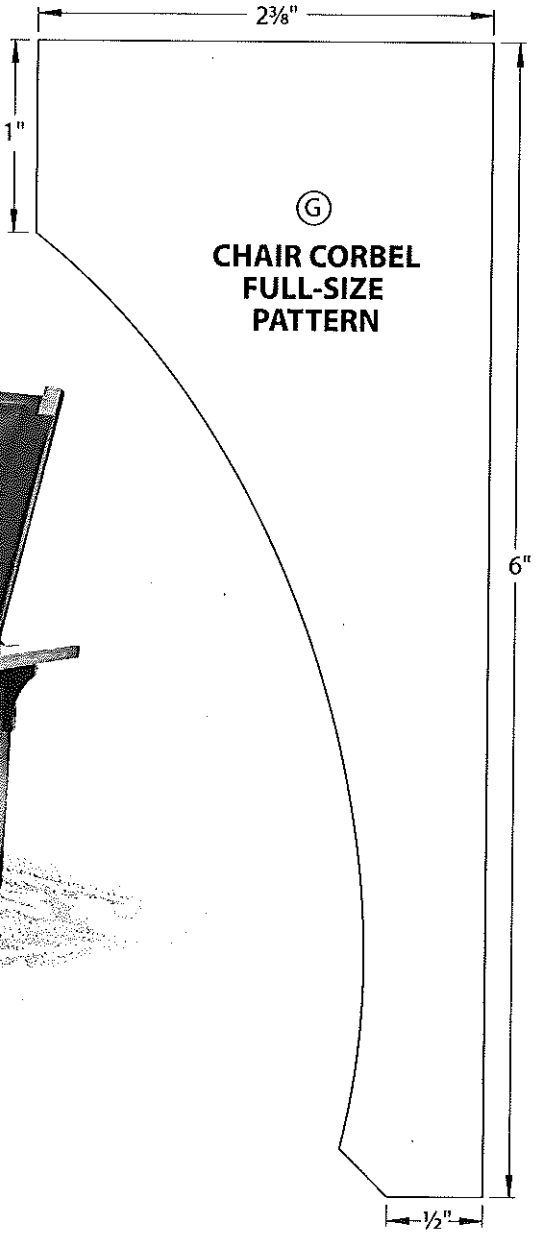
More Resources

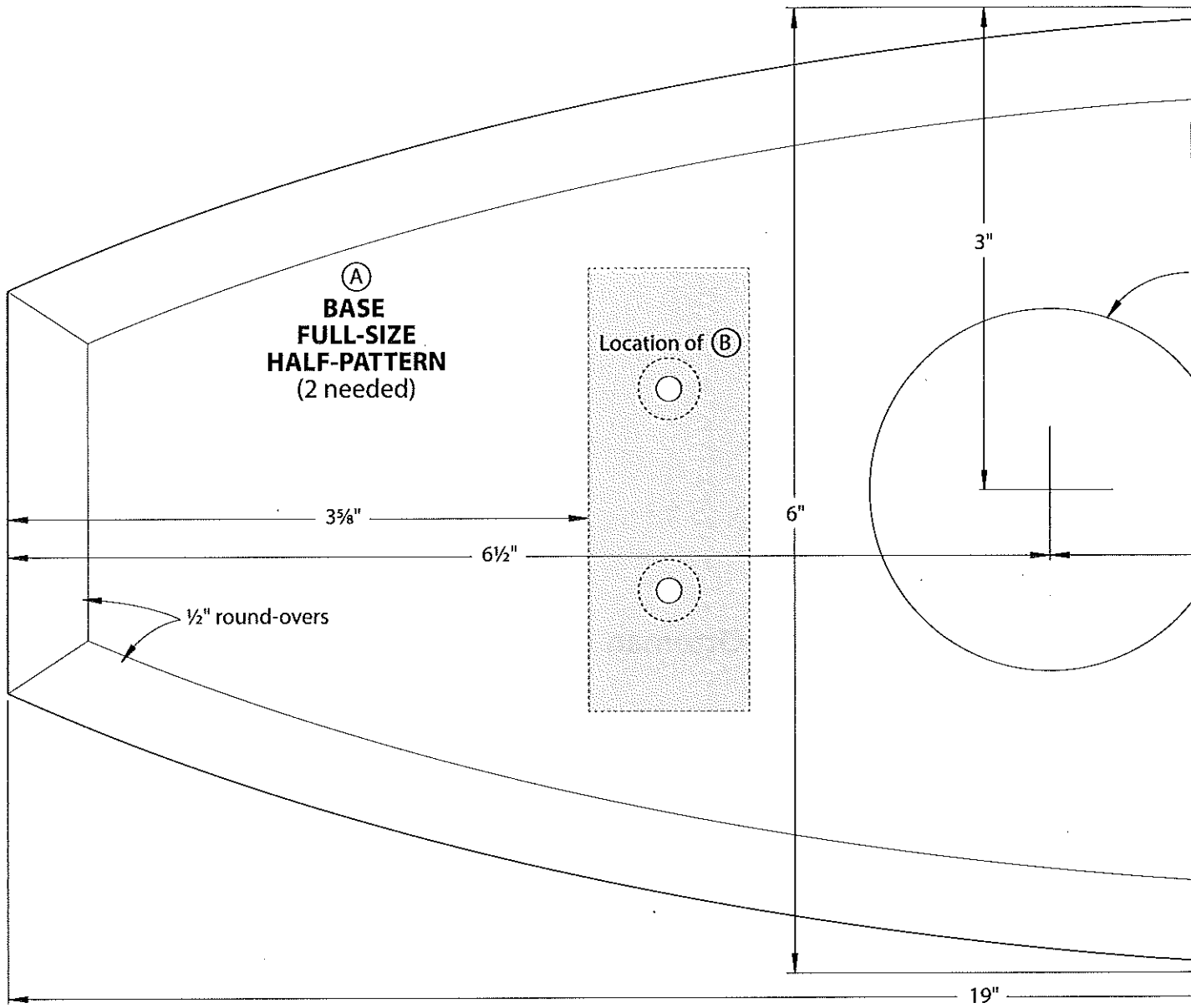
- For a video on using a shopmade fairing stick, see woodmagazine.com/fairingvideo.
- For tips on making perfect plugs, go to woodmagazine.com/perfectplugs.

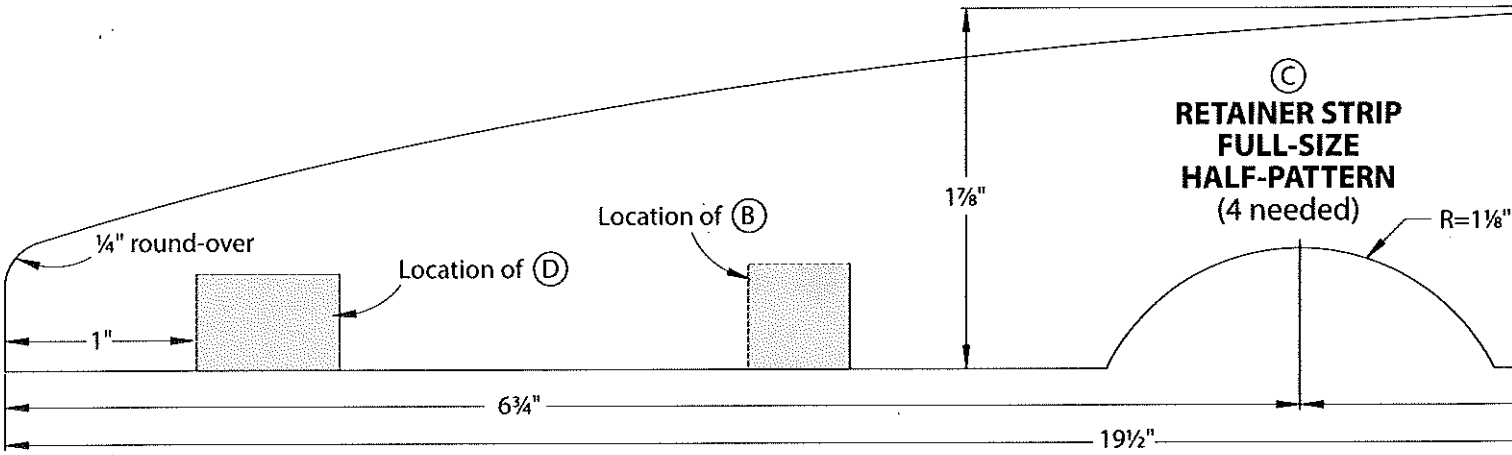
Better Homes and Gardens®
WOOD® PATTERNS®
July 2012 Issue 212

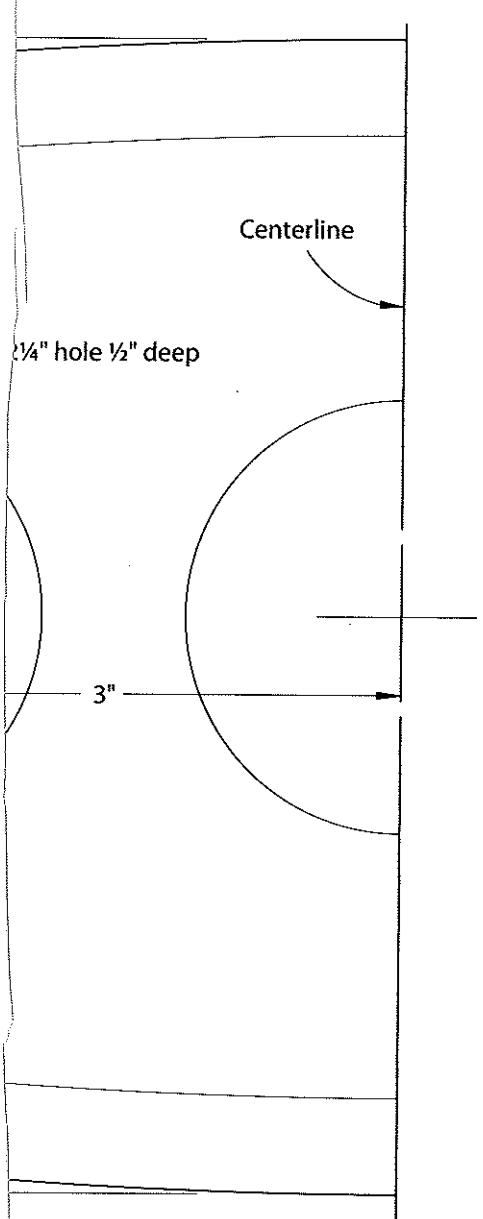
Dear Reader: As a service to you, we've included full-size patterns on this insert for irregular-shaped and intricate project parts. You can machine all other project parts using the Materials List and the drawings accompanying the project you're building.

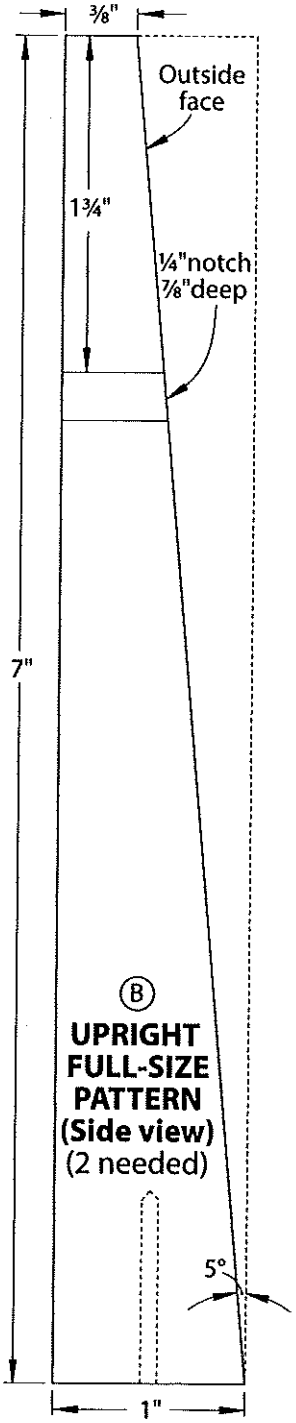
Morris Chair and Ottoman
Page 52




Ⓐ
BASE
FULL-SIZE
HALF-PATTERN
(2 needed)
Location of Ⓑ
3"
3⅝"
6½"
6"
½" round-overs
19"

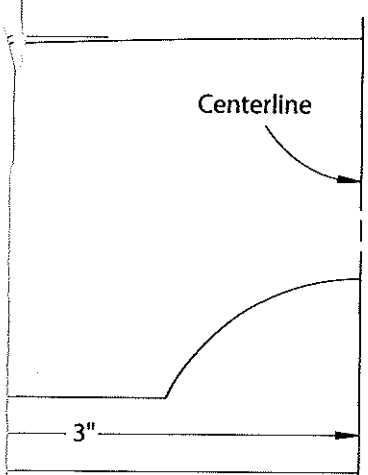

Ⓒ
RETAINER STRIP
FULL-SIZE
HALF-PATTERN
(4 needed)
R=1⅛"
1⅞"
¼" round-over
Location of Ⓑ
Location of Ⓓ
1"
6¾"
19½"



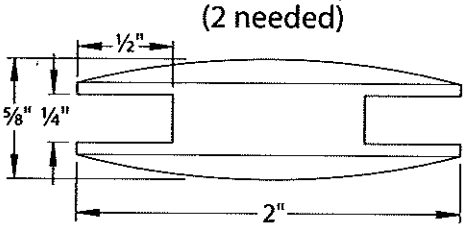


Ⓑ
UPRIGHT FULL-SIZE PATTERN (Side view)
(2 needed)

Bud Vase
Page 64



Ⓓ
CLIP FULL-SIZE (End view)
(2 needed)



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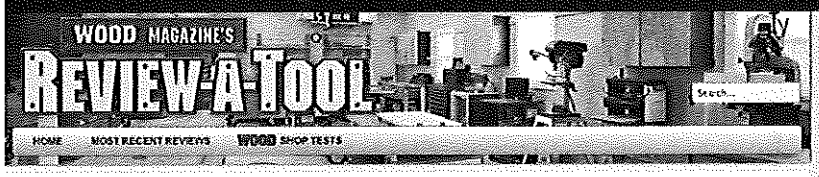

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The 5 Stickiest Wood Glue Questions *with expert answers*

After 36 years as a chemist and customer service representative for Franklin International (maker of Titebond wood glues), Dale Zimmerman has heard just about every question relating to wood glue. These are the five most common ones, and his simple answer to each.

1. How can I tell if my glue is still good?

A wood glue will bond strongly as long as its consistency remains fluid. If the glue becomes stringy or rubbery and cannot be restored to a normal viscosity by stirring or mild agitation, discard it.

2. Will freezing destroy my glue?

White and yellow wood glues contain water and will freeze at temperatures below 32°F, but when returned to room temperature, they'll be unaffected by the process. If the glue appears grainy and thicker after it's warmed, the creamy consistency usually can be restored by kneading the bottle. As long as the glue flows out smoothly *(below)* when applied, it will bond well.

PILE OR PUDDLE?

When glue no longer flows out evenly, like the dab on the left, it won't bond properly.

3. How much clamp pressure is needed?

Wood glue develops its best strength in thin, consistent glue lines. A carefully machined, square glue-up should only require a thin bead of glue *(near right)* and enough clamping pressure to produce a small amount of squeeze-out, like that shown at *far right*.

4. How long should I leave clamps on?

For well-matched pieces glued under ideal conditions (the moisture content of the wood from 6 to 8 percent, temperature from 70° to 80°F, and humidity from 40 to 60 percent), leave the clamps on for at least an hour.

For assemblies that require extraordinary clamping pressure, such as bent laminations, leave the clamps on for 24 hours. This allows the glue to achieve nearly full strength.

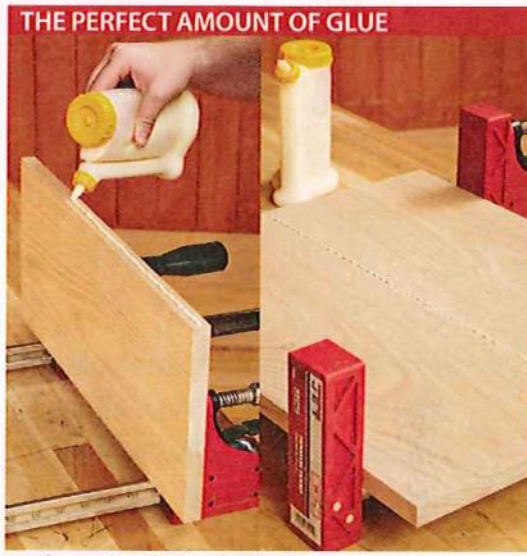
Quick Tip! *Mark the time you glued up each assembly with chalk* (top photo) *to know when it's safe to remove the clamps. You can then reuse those clamps in another glue-up.*

Higher temperature, drier wood, and lower humidity speed drying time; while lower temperature, wetter wood, and higher humidity slow it.

5. Can I take a dry glued joint apart?

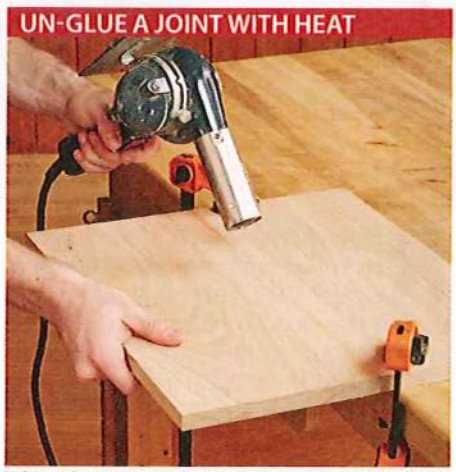
Joints made using white and yellow wood glues are most easily taken apart by applying heat. Use a heat gun (photo at *right*) on the joint line to soften the glue, and the joint will open with slow, steady pressure. Wood has good insulative properties, and it may take awhile, so be careful not to damage projects with the intense heat.

THE PERFECT AMOUNT OF GLUE



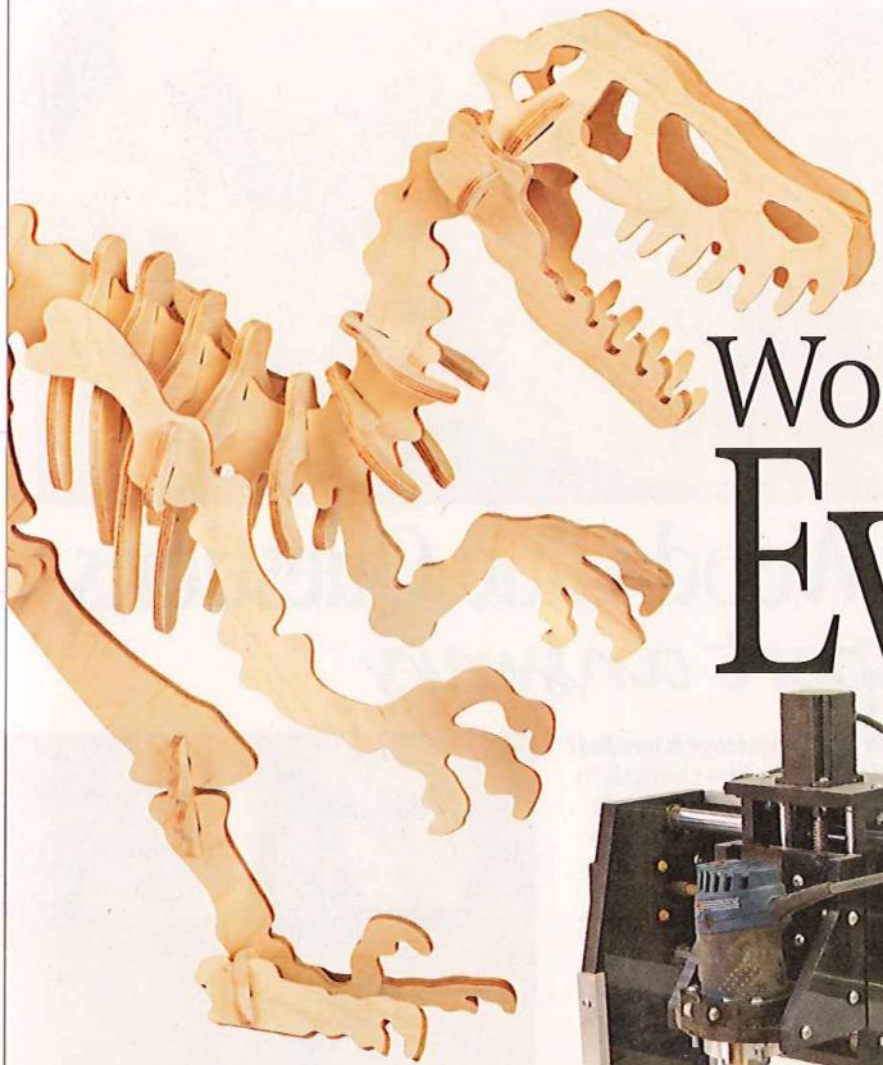
An aftermarket glue bottle, like the one shown *above* (Glu-Bot, #62979, $7.49, 800-279-4441, rockler.com) provides more control over glue flow.

UN-GLUE A JOINT WITH HEAT

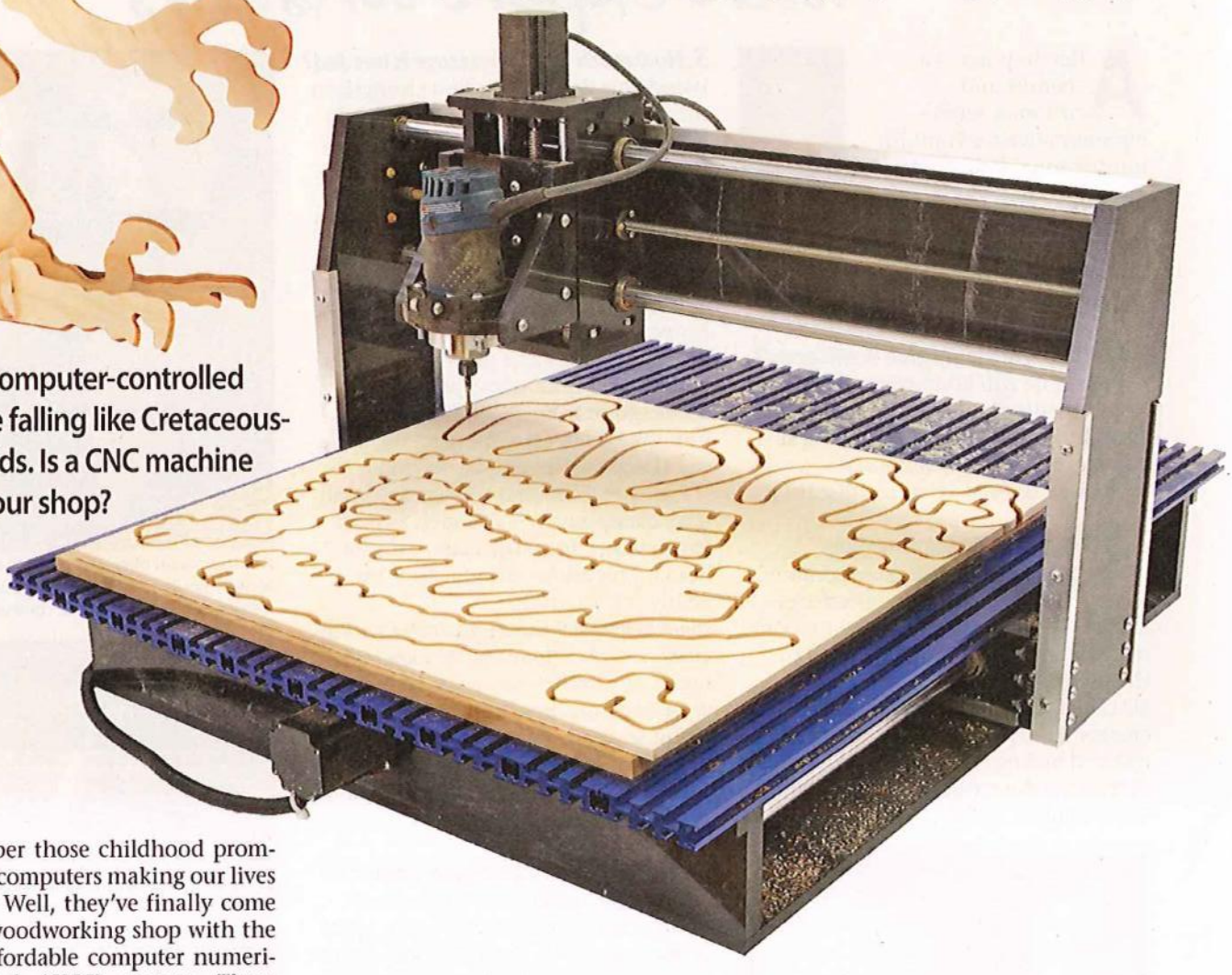


White glues react to heat more readily than yellow, but a heat gun set to a low, 150°F heat still reduces the strength of the latter by half.

Woodworking Evolved



Prices on computer-controlled routers are falling like Cretaceous-era asteroids. Is a CNC machine right for your shop?



Remember those childhood promises of computers making our lives easier? Well, they've finally come true in the woodworking shop with the advent of affordable computer numerical controlled (CNC) routers. These machines automatically move a router bit left to right, front to back, and up and down—all at the same time—to cut, shape, or carve with amazing precision. Think of them as 3D printers for wood.

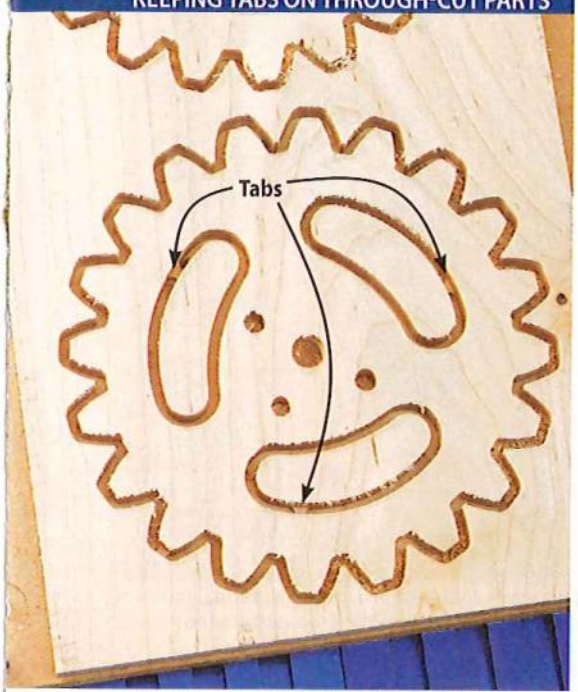
What a CNC machine will do for you

Factories have long used huge CNC routers that pull sheet goods in one end and spit completed cabinet parts out the other. While you can't expect that kind of speed or capacity from the new generation of machines designed for home shops, you will find these machines a godsend for such tasks as:

▶**Cutting curved or complex parts.** CNC routers precisely and repeatedly carve out intricate pieces such as the velociraptor bones shown, *previous page*, that would take many hours with a scrollsaw.

One limitation to keep in mind: A CNC machine acts on the face of the board with a spinning bit, which can't make square interior cuts. So complex joinery, such as dovetails and box joints, must still be done elsewhere.

KEEPING TABS ON THROUGH-CUT PARTS



Tabs programmed into the cutting path keep project parts secure during cutting. Separate them later with a knife and sand smooth.

▶**Sign making.** Most of the large-capacity machines—the Carvewright, the i-Carver 40-915X, the intelliCarve 1015 Pro, the Sharks, and the ShopBot Desktop—come with software that allows you to add text in your favorite font as well as create, import, and manipulate shapes. More important, most employ "vector" graphics. (The Carvewright requires a $100 software upgrade for this.) Where vector graphics are used, the machine's cutting bit follows lines and curves from start to finish—a process significantly faster than the back-and-forth carving used when engraving a three-dimensional image. (See **Relief carving**, *next page*.)

V-carving is the most common method for carving signs and text. Much as a calligrapher controls the thickness of the stroke using pen angle and pressure, V-carving employs the angle of a V-bit and the depth to control the thickness of the line.

Coming to terms with CNC

As with anything associated with computers, CNC has its own jargon:

(0, 0, 0) point: The starting point for the bit. In order to position the carving correctly, you must "zero" the bit at three axis points to match the location you indicated in your design.

CAD: Computer-aided design. CAD software provides a graphics interface and tools for designing your project before sending it to the CNC machine for cutting or carving.

Controller: The electronics that talk to the machine, translating the G-code into three-dimensional motion. Some controllers must be plugged directly into the computer; some accept files via USB drives.

CNC: Stands for computer numerical control. The term can be used to describe routing, laser-cutting, 3D printing, plotting, etc.

Envelope: The volume that defines a CNC machine's capacity. This will be similar to the manufacturer's specifications for XYZ travel (see chart on *page 50*), but could be limited by bit length and other factors.

Gantry: The moving structure that supports the router or spindle.

G-code: The most common type of instructions understood by CNC controllers. This file is output by the CAD software.

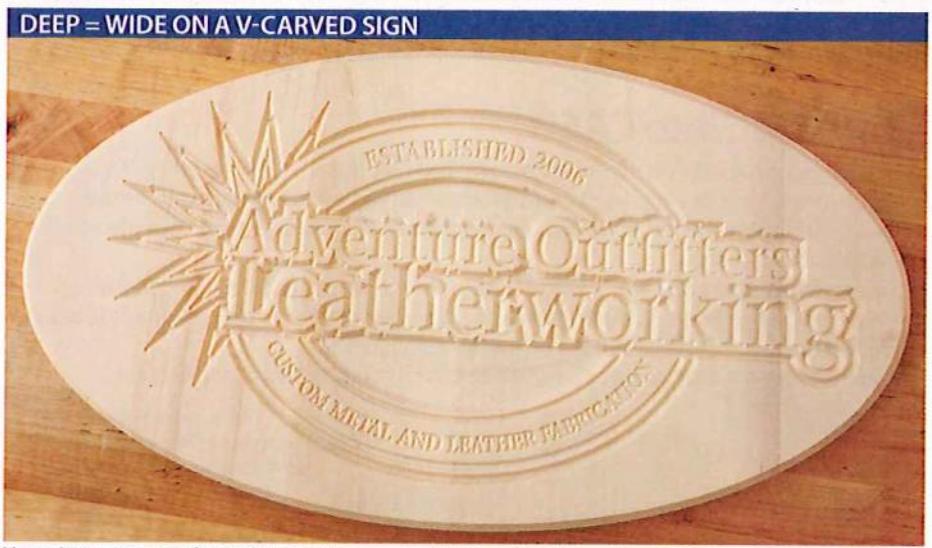
Raster images: Computer graphics, such as digital photos, in which individual colored pixels in a grid create an image. Often used in relief carving.

Spoil board: The sacrificial board placed beneath the workpiece for through cuts to protect the CNC table surface.

Vector graphics: Computer graphics in which lines and curves connect defined points to create an image. Often used in V-carving.

X-, Y-, and Z-axes: These are the three directions along which the gantry travels. The X-axis represents width; the Y-axis, depth; the Z-axis, thickness.

DEEP = WIDE ON A V-CARVED SIGN



V-carving, a common form of sign making, uses a V-bit to follow the paths of letters and shapes, routing deeply where lines are thickest and shallowly where delicate.

THREE LETTERING STYLES SUPPLY SIGN-MAKING VERSATILITY

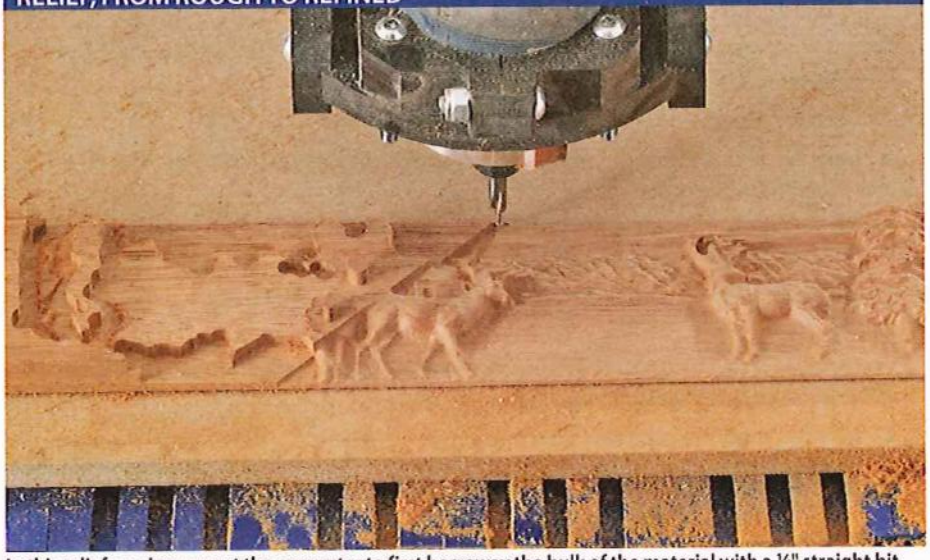
Carving capabilities vary by the software used. Here are three of the more common lettering styles. From left to right: V-carving, prism-relief carving, and pocket-and-inlay carving.

▶**Relief carving.** Unlike V-carving, 3D relief carving uses a depth map or a digital photo to create detailed carvings. Sweeping across the material in repeated rows, a tiny router bit, like the one *below*, carves deeper in darker areas of the image. Many of the small machines—the Carvewright, both Click-N-Carves, the IntelliCarve 1013, and the i-Carver 40-913—specialize in relief carving.

Images with clean backgrounds and high contrast tend to work best. And even then, you may still need to manipulate the photo using either the provided software or a third-party photo-editing package to achieve good results. Or, you can guarantee great carvings using premade patterns. Companies, such as Vector Art 3D (vectorart3d.com) and Vector Clip 3D (vectorclip3d.com), sell downloadable depth-map patterns optimized for CNC relief carving. And Carvewright (carvewright.com) offers an extensive collection in its Pattern Depot.

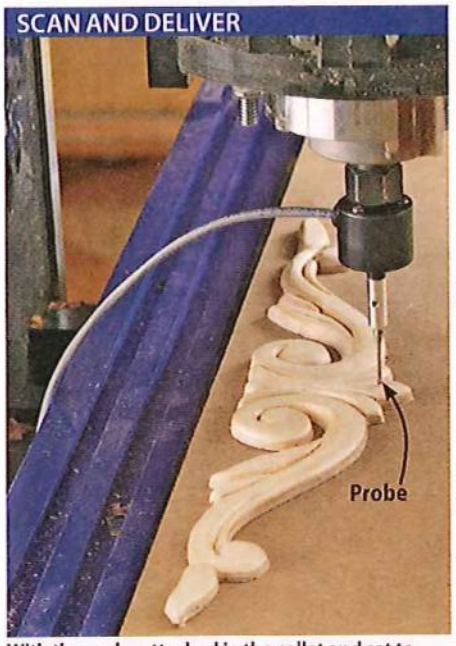
▶**Scanning and duplicating.** Rockler, Carvewright, and ShopBot sell accessory probes used to scan, and then duplicate, 3D objects. The CNC machine methodically drags the needle-thin probe, shown *below*, across a secured object to create a terrain map of the object. Replace the probe with a small round-nose bit, and the machine uses that to duplicate the object in wood.

RELIEF, FROM ROUGH TO REFINED



In this relief carving, we set the computer to first hog away the bulk of the material with a ¼" straight bit before cleaning up the image with a ⅛" roundnose bit in subsequent passes. The 3×24" carving took six hours and ten minutes to complete, not including time spent changing the bit.

SCAN AND DELIVER



With the probe attached in the collet and set to move in 0.01" increments, it took about seven hours to scan this appliqué.

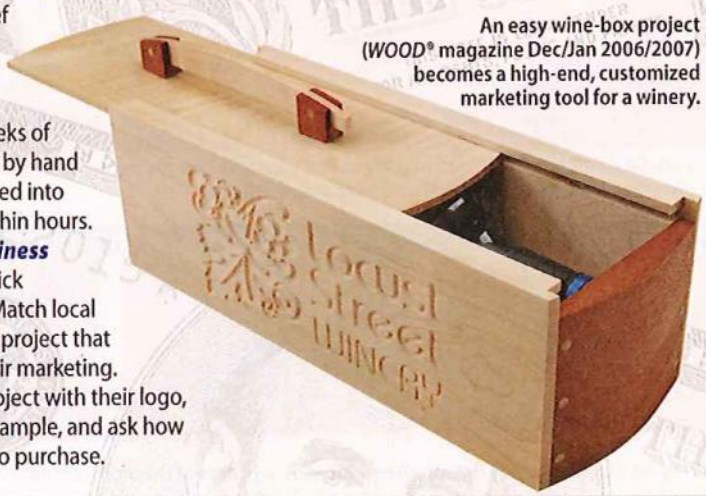
Turn CNC into CA$H

Need a reason to justify the expense of a small-shop CNC router? Consider turning it into supplementary income. You won't churn out cabinets like the big boys, but you can use a CNC router to set your work apart from the competition. Here are a few ways to make a buck from your investment:

Sell signage. Use the software's estimated carving time as a starting point for calculating your rates. Charge for any custom design work you provide. And don't forget to include costs for materials, as well as wear and tear on the machine and bits.

Enhance your product (and your profits) with carved flourishes, flutes, and textures. Fretwork and relief carvings that could take years of practice to master and weeks of work to complete by hand can be incorporated into your products within hours.

Business-to-business sales can be a quick infusion of cash. Match local businesses with a project that complements their marketing. Customize the project with their logo, take them a free sample, and ask how many they'd like to purchase.



An easy wine-box project (*WOOD*® magazine Dec/Jan 2006/2007) becomes a high-end, customized marketing tool for a winery.

Before you buy, consider the following

Motor-driven lead screws pushing a gantry in three axes to precisely move a spinning bit—mechanically, that's about all there is to these benchtop machines. All proved accurate enough that their precision can be measured in the 1/1000" scale or less—plenty for wood. So how do you choose between a machine costing $1,200 and another that costs nearly five times that? In short, these features:

▶***Bundled software.*** It's the software that provides the intelligence to create a variety of projects. Machines like the iCarver 40-915X, the intelliCarve 1015 Pro, the Sharks, and the ShopBot Desktop, that include third-party applications from Vectric or ArtCam take advantage of mature software with many options for design and output.

The Carvewright requires proprietary software, but after years on the market, it holds its own with these applications; many of the features require paid add-ons ranging from $50 to $200.

The add-ons add up

Between unboxing your new CNC machine and creating your first carving exists many options in accessories and bits. So consider these when figuring your total investment.

1. Computer. Don't forget that you'll need a computer. Some CNC machines must be connected to the computer while they carve. Others allow you to transfer the program via thumb drive, freeing up the computer for the next design.

2. Dust collection. Sadly lacking on most of the machines—only the ShopBot features a shroud with a built-in dust port—dust collection is a must on these mess makers. We added a dust shroud along with overhead support for hoses to prevent torque on the gantry.

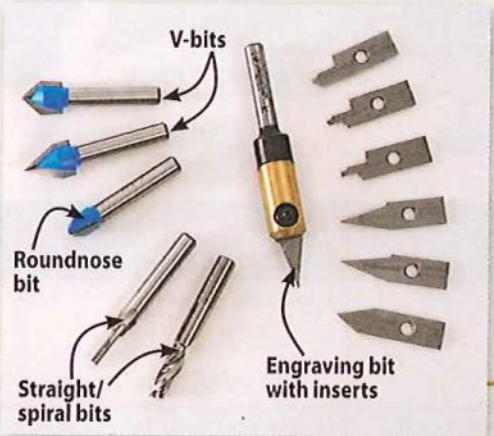
3. Stand. Even the midsize machines have large footprints. To preserve valuable bench space, we built the mobile cart at *right*, with room for the computer and accessories. The laptop we used tucked neatly in a drawer; for larger computers, consider building filtered containment to protect the electronics from dust.

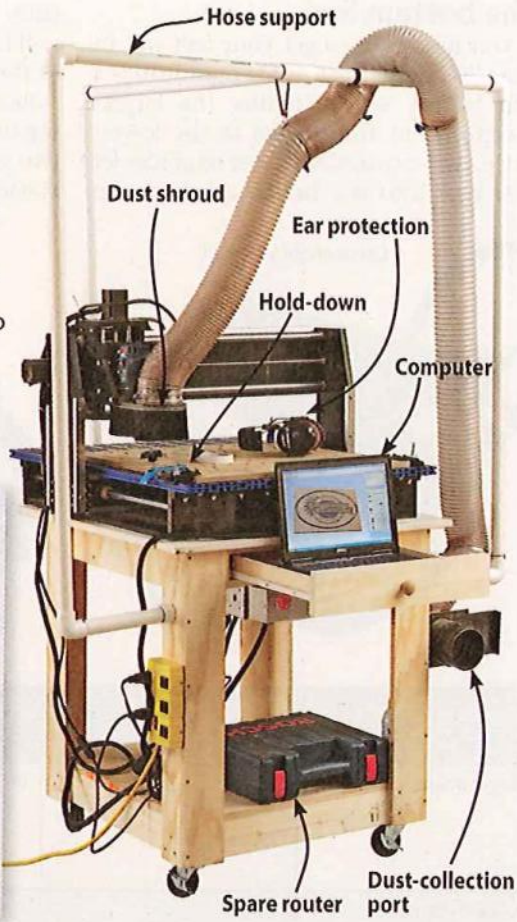
4. Spare router. Owners of machines that require router motors often keep spares on hand. Long running times ensure that you'll eventually have to change the carbon brushes.

5. Hearing protection. Auditory damage results both from decibel level and length of exposure. If you're going to work on other things in the shop while the CNC machine carves a project, wear sufficient hearing protection.

6. Other supplies, such as hold-downs, sacrificial spoil board, and double-faced tape, support your materials squarely and securely.

7. Bits. You'll quickly accumulate a large collection of bits for the various types of carving: V-bits for V-carving, roundnose bits for relief carving, straight bits for profile and pocket cuts. *At right*: Amana's In-Groove replaceable blade system for detailed engraving. Complex designs often require multiple bit changes for a single carving.





The included software for the engravers from Click-N-Carve, as well as the IntelliCarve 1013 and i-Carver 40-913, proved a little frustrating. They worked well for patterns and pictures optimized for the software; for other images, their limited design tools had us turning to third-party software for tweaks. The Laguna CNC IQ doesn't come bundled with any software, but works with many third-party packages.

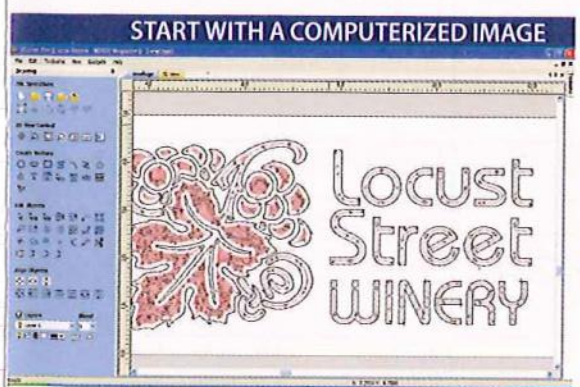
Our advice: Before you lay down any money, download a free demo of any or all of the bundled software. Spend plenty of time putting them through their paces. If you're comfortable with the capabilities of the software, you'll be happy with the CNC machine that uses it.

▶***Support and training.*** Not surprisingly, manufacturers with longer track records offer more robust educational options. ShopBot offers several training programs, including online and on-site training. Carvewright provides regular tips-and-tricks newsletters and other online resources. And both companies, along with Rockler, feature extensive online forums for user-to-user interaction.

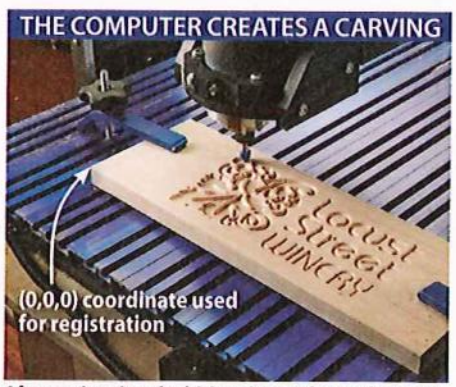
▶***Capacity.*** There's a limit to the size of workpiece that will fit in each machine. Choose a capacity—see the chart on *page 50*—that suits your needs.

▶***Router or spindle.*** All four Rockler Sharks and one of the ShopBot packages employ off-the-shelf routers to drive the bit; the rest use brushless spindles. Because routers aren't designed to run continuously for hours, as might be required when carving, they tend to have shorter life spans—150 to 250 hours—before needing repair. They are also significantly louder, and are often sold separately. Their saving grace: affordability. For example, choose the ShopBot Desktop's router model for an additional $359 versus the spindle model for an additional $1,595.

After capacity, the addition of a high-quality spindle affects machine price the most. We appreciated the low-noise spindles after a long session of router-powered CNCing. Kudos to the Laguna CNC IQ, which features the beefiest spindle in the category—a liquid-cooled, 2-hp, 220-volt, 30-amp beast.



First, import a design or create one in the design software. Then, output the file to your CNC machine's controller.



After registering the bit's point on the workpiece's corner to set the (0, 0, 0) point, start the carving, sit back, and watch.

The bottom line

If you just want to get your feet wet in the CNC pool, the Carvewright brings a full feature set (including the largest Y-capacity in this group) at the lowest price. Add-ons and software upgrades let you ease into the hobby at your own pace. Sure, you'll pay for them, but it will take quite a few to add up to the cost of the next-cheapest model.

Ready to dive off the deep end? At the top of the capacity range sit three attractive options: The Laguna CNC IQ outclasses the other benchtop machines in capacity and power, and the decibel level of the spindle won't drive you out of the shop. But you'll have to buy CAD software separately. On the other hand, the router-based Rockler CNC Shark Pro Plus HD comes in at $2,000 less, and includes two nice CAD programs that

Carvewright Version C

Laguna CNC IQ

Rockler CNC Shark Pro Plus HD

Company	Model	XYZ Travel	Router/Spindle	Bundled Software	Included Accessories
Carvewright	Version C	14.5x144x5"	1-hp spindle, 110 volts	Carvewright Project Designer software and patterns	1/16" carving bit, memory card, USB Programmer, and instructional DVD
Click-N-Carve	84015	12.8x5.9x2.36"	30-watt spindle, 110 volts	Click-N-Carve Edit & CNC	Two carving bits, acrylic workpieces, USB handheld controller, hold-down clamps, and how-to videos included
	84030	17.7x17.3x3.94"	80-watt spindle, 110 volts	Click-N-Carve Edit & CNC	
General International	iCarver 40-913	13x18x3"	150-watt spindle, 110 volts	i-Picture and image library	Two starter bits, USB flash drive, and hold-down clamps included.
	iCarver 40-915X	15x20x4"	500-watt spindle, 110 volts	ArtCam Express	
Laguna Tools	CNC IQ	23.5x35.5x4"	2-hp spindle, 220 volts	None	None
Oliver Machinery Co.	intelliCarve 1013	13x18x3"	150-watt spindle, 110 volts	i-Picture and image library	Two starter bits, USB flash drive, and hold-down clamps included
	intelliCarve 1015 Pro	15.3x20.5x4.13"	500-watt spindle, 110 volts	ArtCam Express	
Rockler	CNC Shark	13x24x4.5"	Accepts the Bosch Colt palm router, sold separately	VCarve Pro from Vectric	V-bit and hold-downs
	CNC Shark Pro	24x24x4.25"			
	CNC Shark Pro Plus	25x25x5"		VCarve Pro and Cut3D from Vectric	
	CNC Shark Pro Plus HD		Accepts Bosch 1617 & 1618, Porter-Cable 690 & 890, and DeWalt 610, 616, & 618 routers, sold separately		
ShopBot	Desktop	24x18x4"	Choose either a Porter-Cable router (an additional $359) or a 1-hp spindle package (an additional $1595)	Partworks from Vectric (a customized version of VCarve Pro)	Ready-to-cut sample projects

would cost you $900 separately. Finally, for futuristic features, the ShopBot Desktop is hard to beat, with add-ons that include a fourth rotary axis, plotter pen, and engraver, not to mention the soon-to-be-released laser-cutter and 3D extruded printing attachments.

ShopBot Desktop

DIY CNC

If you have more time than money, try building your own CNC machine. Joe Cantrill of San Antonio, Texas, built a machine that uses skateboard bearings riding on black pipe. After sharing his plan on the Web, thousands of the machines were built by eager enthusiasts. Joe now sells plans for a larger, more-refined version called the Hybrid 4x4, shown *below*, on his Web site, joescnc.com. "It's actually easy to build. All the parts are readily available in the U.S.," he says. "When people build it themselves, they know every nut and bolt of the machine. They can fix it themselves, so there's little downtime."


Joe's do-it-yourself CNC machine has a 48x48" envelope—nearly three times the area of the largest-capacity commercial benchtop machine—but costs less than half as much to build.

	Notes	Machine excels at:	Machine limitations:	Price	Contact Info:
	Carvewright's unique pass-through Y-travel gives it the ability to handle long boards. Carvewright offers à la carte pricing on software and hardware upgrades, patterns, bits—even extended warranties beyond the included 30-day warranty.	• Sign making • Relief carving	• Though Y-travel is not a limitation on this machine, its X-capacity is similar to other machines of its size.	$1,200	carvewright.com 713-473-6572
	Including workpieces and a quick-start guide, the Click-N-Carve machines let you start carving on your first project quickly. The table, rather than the spindle, moves forward and backward to carve in the Y-axis. The cover on the 84015 completely contains dust, but it has the smallest capacity of this group.	• Relief carving • Photoengraving	• Capacity • Limited relief-carving speed • Software options	$1,599 $2,499	800-266-9079
	A USB flash drive transfers files to the controller; no connected PC is required. On the iCarver 40-913, the table, rather than the spindle, moves to carve in the Y-axis. Optional steel stands and safety enclosures available.	• Relief carving • Photoengraving	• Capacity • Limited relief-carving speed • Software options	$2,300	general.ca 888-949-1161
		• Sign making • Relief carving • Small project parts		$4,500	
	The CNC IQ is the beefiest in its price range, but you'll have to supply your own CAD software, such as VCarve Pro ($599).	• Sign making • Relief carving • Project parts	• Software not included	$5,995	lagunatools.com 800-234-1976
	A USB flash drive transfers files to the controller; no connected PC is required. On the 1013, the table, rather than the spindle, moves to carve in the Y-axis.	• Relief carving • Photoengraving	• Capacity • Limited relief-carving speed • Software options	$2,099	olivermachinery.net 800-559-5065
		• Sign making • Relief carving • Small project parts		$4,500	
	The Shark Pro Plus and Shark Pro Plus HD feature upgraded extruded aluminum tops and controllers with auto on/off for the attached routers. The Shark Pro Plus HD has a reinforced design that allows for higher cutting speed than the other Rockler models.	• Sign making • Relief carving • Project parts	• Router lifetime and high decibel level	$2,600 $3,400 $3,800 $4,000	rockler.com 800-279-4441
	ShopBot has several optional accessories that convert the Desktop for other uses—a plotter bit for drawing, a drag knife for cutting sign vinyl, and a diamond drag bit for engraving. They recently released a rotary 4th axis attachment for carving spindles, and are planning a laser cutter attachment and a 3D-extruded printing attachment.	• Sign making • Relief carving • Project parts • Dust collection	• Router lifetime and high decibel level (on the router package)	$4,995	shopbottools.com 888-680-4466

Morris chair & Ottoman

Perhaps the most comfortable chair and footrest you'll ever build

Project Highlights

- **Dimensions:** Chair–34½"W x 41⅛"H (back in highest position) x 38"D Ottoman–23"W x 15½"H x 18"D (without cushion)
- **Materials cost:** $180 for lumber, webbing, and clips; $325 for imitation-leather upholstery, including labor. (Upholstery costs will vary widely with choices of materials and finish details.)

Our version of this Arts & Crafts classic features straightforward construction with wide rails between the front and rear legs instead of numerous spindles, minimizing the amount of mortising. And it's easy to create the gentle curve of the wide arms by laminating 3/16"-thick strips on a simple shop-made form.

First up: Legs and stretchers

1 We built up 2¼"-thick chair legs from beveled faces (A) glued around a core (B) [**Materials List**, *page 59*] as described on *page 16*. Alternatively, you could laminate three pieces of ¾"-thick material for each leg. If you choose this method, orient the legs so the glue lines end up on the front and back faces of each leg.

2 Choose the best adjacent faces of each leg (A/B) for the front and outside faces. Label the top of each leg and the inside and rear faces to help orient them during construction. Lay out the mortises [**Drawing 1**]. Drill out the bulk of the waste from each mortise using a ¼" Forstner bit in your drill press, then chisel the mortise walls square

SHOP TIP

Use a scrapwood fence for true walls

Clamp a straight piece of ¾"-thick scrap along the mortise layout lines and use the scrap to guide your chisel straight down to pare the mortise walls.

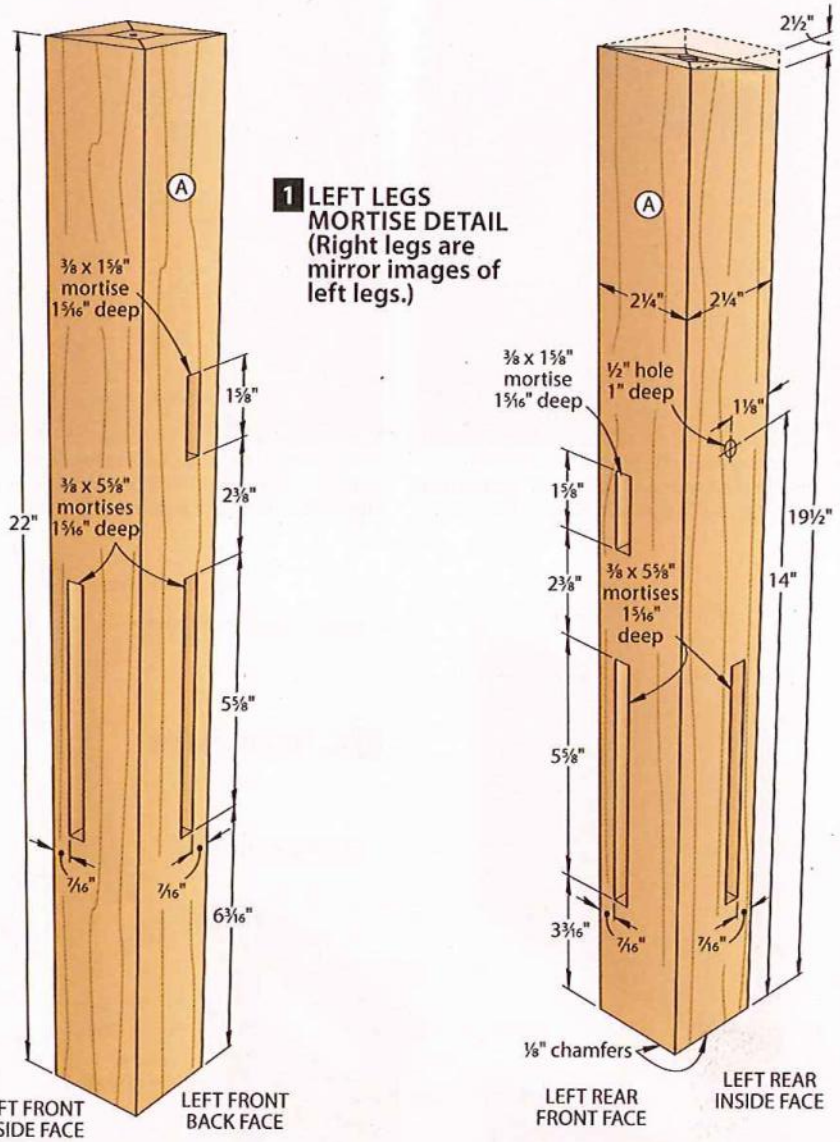
MATCH MITER ANGLES PERFECTLY

Place the end of a bottom side stretcher (C) against the rip fence, and position the miter-gauge fence against it to match the angle.

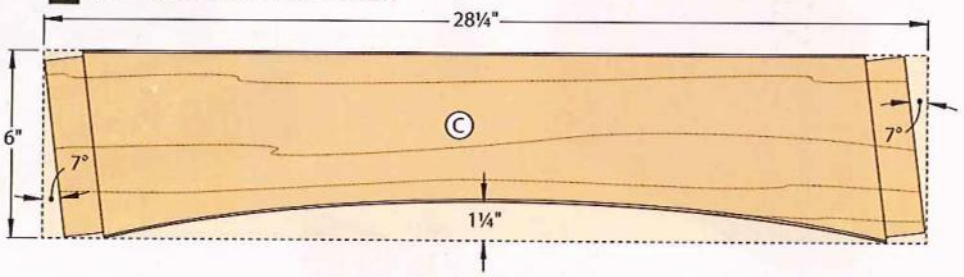
MARK THE TENON SHOULDERS

Using an adjustable square, mark the top and bottom shoulders square to the ends of each tenon on the top and bottom side stretchers (C, D).

1 LEFT LEGS MORTISE DETAIL (Right legs are mirror images of left legs.)



2 BOTTOM SIDE STRETCHER



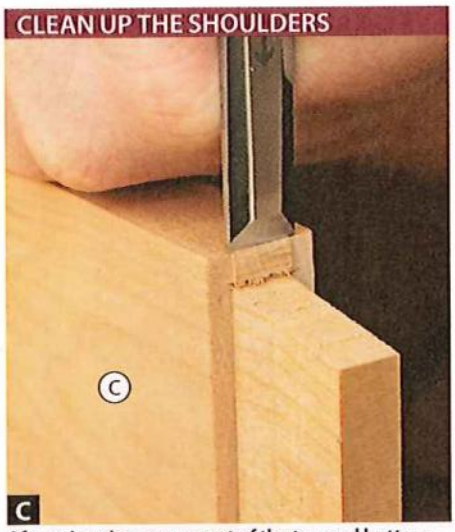
[Shop Tip, *top*]. Locate and drill the ½" hole in the inside face of each rear leg.

3 Cut the bottom side stretchers (C), top side stretchers (D), and front and back stretchers (E) to size **[Materials List]**. Cut a scrap at least 12" long the same thickness as the stretchers to test tablesaw setups later. Set your miter gauge to 7° and miter each end of the top and bottom side stretchers, keeping the ends parallel **[Drawing 2]**.

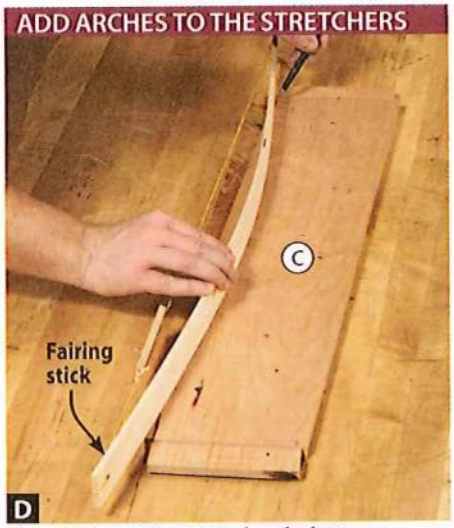
4 Set up a ¾" dado blade in your tablesaw and raise it just less than 3/16" above the table. Set your miter gauge back to 90° and make a pass on each face of one end of the test piece to cut a ¼"-long stub tenon. Check the fit of the tenon in a leg mortise. Adjust the blade height as needed and recut the tenon for a snug fit. Position the rip fence as a stop and cut 1¼"-long tenons on each end of the front and back stretchers (E) **[Drawing 3]**.

5 Use a bottom side stretcher (C) to reset the miter gauge angle **[Photo A]**, then cut the tenon cheeks on one face of the top and bottom side stretchers (C, D) **[Drawing 2]**. Reset the miter gauge for the opposite 7° setting and cut the cheeks on the opposite faces.

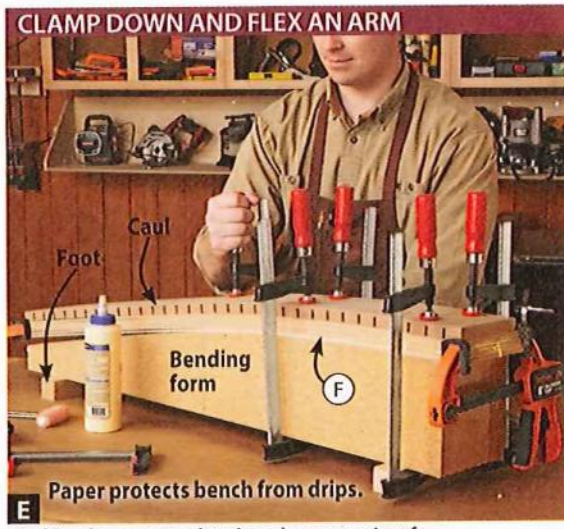
6 On the top and bottom side stretchers (C, D), mark the tenon shoulders **[Drawing 3, Photo B]**, bandsaw away most of the waste, and then trim



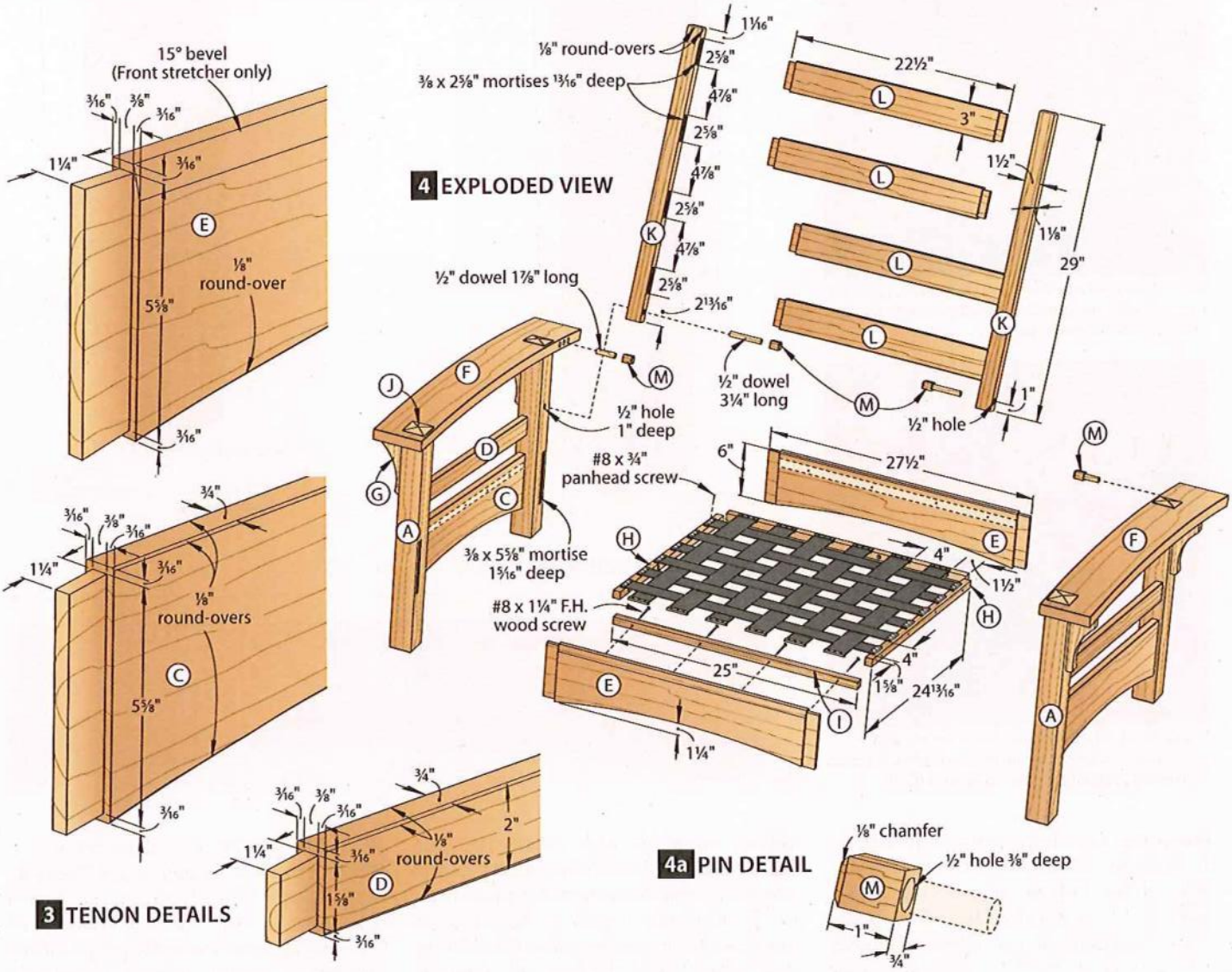
After trimming away most of the top and bottom shoulders at the bandsaw, use a chisel to pare them flush with the shoulders on the sides of the tenon.



Flex a fairing stick so it touches the bottom shoulders and a point 1¼" from the edge and equidistant from each end. Mark the arch.



Working from one end to the other, use pairs of clamps to apply even pressure across the full width of the caul and arm (F).

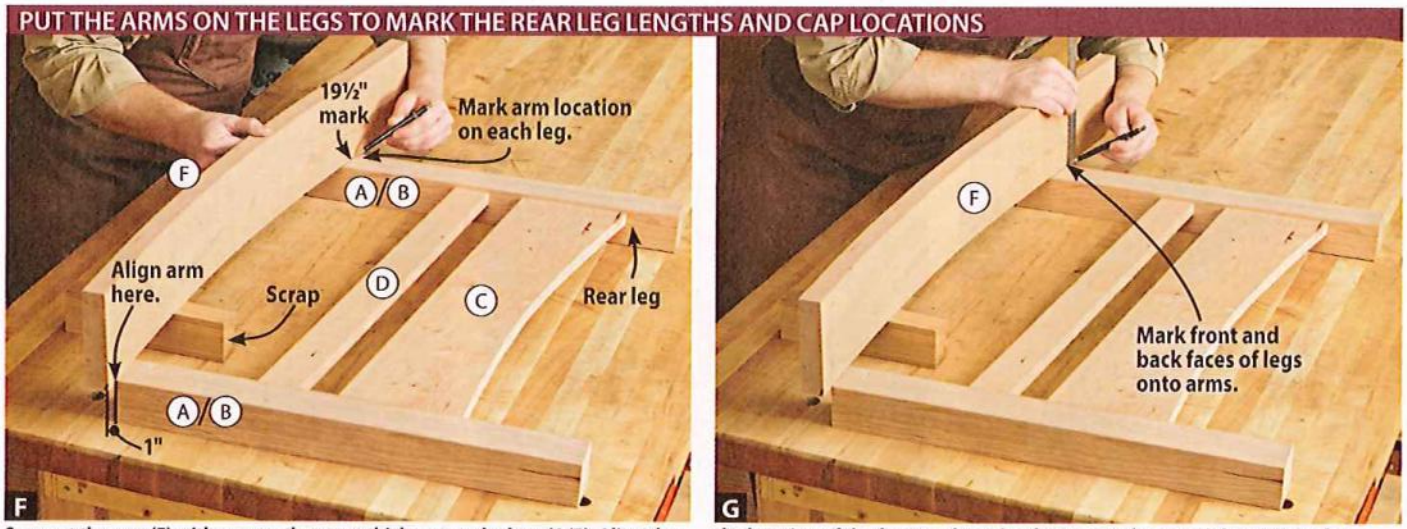


the tenon shoulders flush with a chisel **[Photo C]**.

7 Dry-fit the legs (A/B) and the stretchers (C, D, E), and fine-tune the fit of any joints needing it.

8 Using a fairing stick (see **More Resources** for a free plan), lay out the curve on the bottom side stretchers (C) and front and back stretchers (E) **[Photo D, Drawings 2** and **4]**. Bandsaw and sand to the lines. Tilt your tablesaw blade to 15° and bevel-rip the top front edge of the front stretcher only **[Drawing 3]**.

9 Rout ⅛" round-overs on the edges of the side stretchers (C, D) and front



Support the arm (F) with a scrap the same thickness as the legs (A/B). Align the bottom face of the arm with the top front of the front leg and with the 19½" mark on the rear leg. Mark along the arm onto the legs (*above*), then transfer the location of the front and rear leg faces onto the arms (*above*). Transfer the lines around the edge and onto the top face of each arm to help position the caps (J) later. Repeat this for the other arm and side assembly.

and back stretchers (E) **[Drawing 3]**. Finish-sand the legs (A/B) and stretchers to 220 grit, then set them aside.

Build up those arms

1 Laminate eight layers of ¾" MDF or particleboard for the bending form **[Drawing 5]**. Transfer the curve from **Drawing 5** onto the form, and bandsaw and sand the curve smooth. Glue on the feet where shown so they extend 1" on either side. Make a flexible clamping caul from a ¾×6×40" piece of MDF by cutting ⅝"-deep kerfs across the caul's width, spacing them 1⅛" apart.

2 For each arm (F) prepare a 2×5½×42" blank from solid stock.

Quick Tip! *To maintain the grain pattern after resawing, draw a line on one edge of each blank, then realign the line during glue-up.*

Resaw six 7/32"-thick strips from each blank (see *page 60* for more on resawing), jointing the face flat between passes. Then plane the strips to 3/16" thick.

3 Dry-clamp one set of six arm (F) strips and the caul on the bending form so you get a feel for the procedure and to determine how many clamps you'll need.

Quick Tip! *There will likely be drips during glue-up. Protect your bench with a piece of scrap plywood, a drop cloth, or paper.*

Remove the strips and caul. Place the bottom strip on your bench and apply glue to its top face, using a small roller to spread the glue quickly and evenly. Add the next strip and repeat the process until all six strips are stacked. Clamp across the edges at both ends to even them up, transfer the assembly to the bending form, place the caul over it, and clamp the caul to the form **[Photo E]**. Allow the glue to dry for 24 hours before removing the clamps. Repeat for the other arm.

4 Joint one edge of each arm (F) square to the top face. Rip the arms 1/16" over final width on the bandsaw, then plane or sand the edges smooth. Crosscut each end of one arm to bring it to a finished length of 38". Place this arm on the second, matching their curves as closely as possible; mark the length of the second arm; and cut it to length.

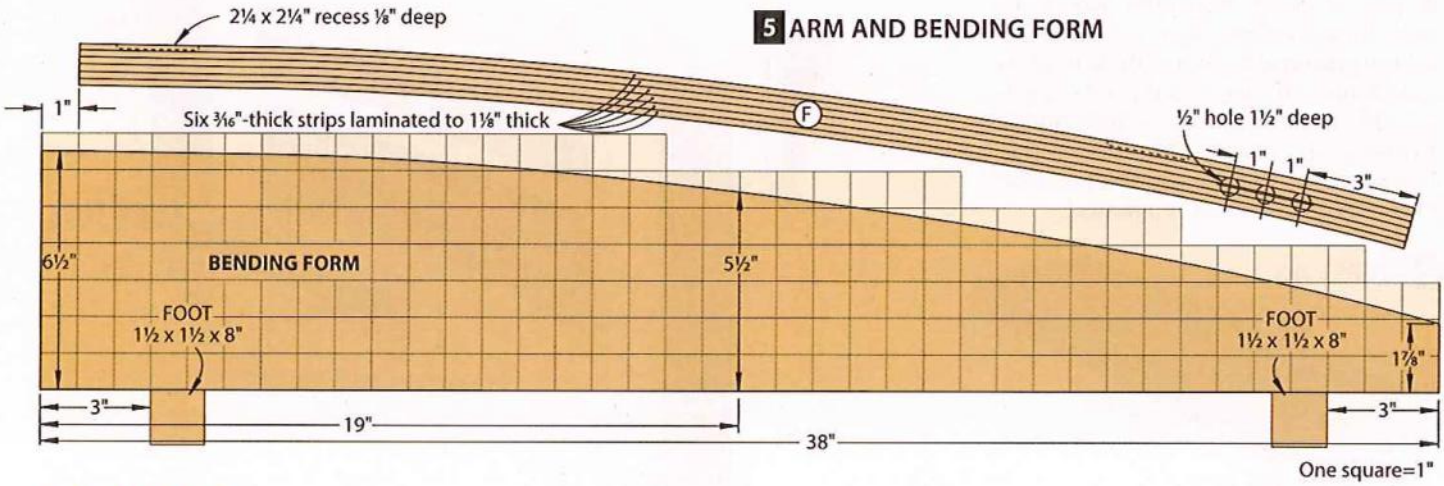
Assemble the base

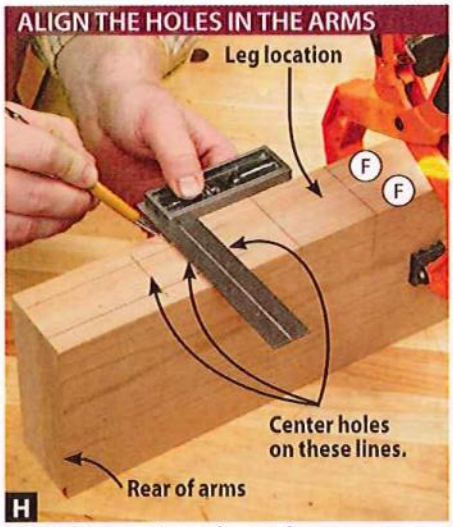
1 Dry-fit the legs (A/B) with the side stretchers (C, D) and lay the assemblies on your bench, outside face up. Make a mark on each rear leg 19½" from the bottom. Position an arm (F) on the legs flush with the top of the front leg and overhanging 1" at the front, and aligned with the mark on the rear leg. Scribe the location of the arms onto the rear legs **[Photo F]** and the leg locations onto the arms **[Photo G]**.

2 Mark the centerpoints for the three ½" holes on the inside face of each arm **[Drawing 5, Photo H]**, then drill the holes 1½" deep at the drill press.

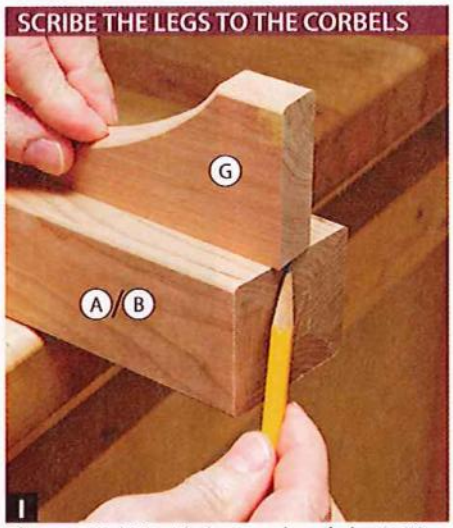
3 Disassemble the side assemblies and bandsaw and sand the tops of the legs (A/B) to shape.

4 Make a photocopy of the **Corbel Pattern** from the *WOOD Patterns®* insert and spray-adhere it to a ¾×2¾×6¼" blank. Cut and sand the corbel (G) to





Clamp the arms (F) together top face to top face, flush at the rear. Lay out the hole locations, marking across both arms at once.



Align a corbel (G) with the top edge of a leg (A/B), centered on its width and parallel to the edges. Trace the leg top onto the corbel.

The clamp heads don't align with both ends of the stretchers (C, D), so to avoid flexing the legs, apply only enough pressure to close the joints.

shape and use it as a pattern to shape the three remaining corbels. Center each corbel on the outside face of a leg (A/B), transfer the curve to the corbel **[Photo I]**, and sand the corbel to the line. Finish-sand the corbels and glue them to the legs.

5 Cut the side cleats (H) and front and back cleats (I) to size **[Drawings 4, 6]**. Drill countersunk pilot holes in each one, and glue and screw the cleats in place.

6 Tape off the tenons on the stretchers (C, D, E) and apply a stain to the stretchers, cleats (H, I), and legs (A/B/G). (We used General Finishes Antique Cherry oil-based stain.) After the finish dries, remove the tape and glue up each side assembly **[Photo J]**. Then join the two side assemblies with the front and back stretchers (E), resting the leg bottoms on a flat surface to ensure the base isn't twisted. After the glue dries, remove the clamps and apply a clear finish. (We applied two coats of General Finishes Satin Enduro-Var water-based polyurethane.)

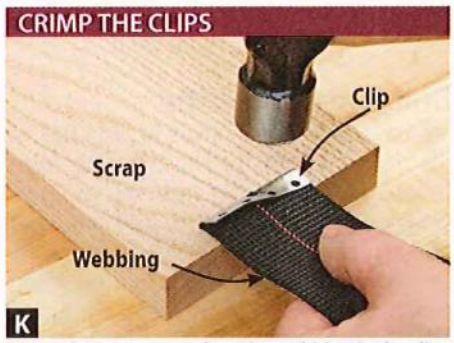
7 Measure the distance between each pair of cleats (H, I) and add ⅝" to each measurement. Cut six strips of webbing **[Source]** to each of these lengths and crimp web clips to each end of each strip **[Photo K]**. Lay out the strip locations **[Drawing 4]**, install the side-to-side webbing first, then weave the front-to-back webbing between it **[Photo L]**.

Make recesses and caps

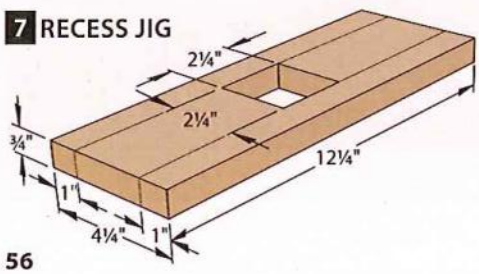
1 Retrieve the arms (F) and lay out the locations of the recesses for the caps (J) **[Drawing 6]**. Make the recess jig shown in **Drawing 7** from MDF. Position the jig over a recess location on an arm and secure it with double-faced tape and a clamp.

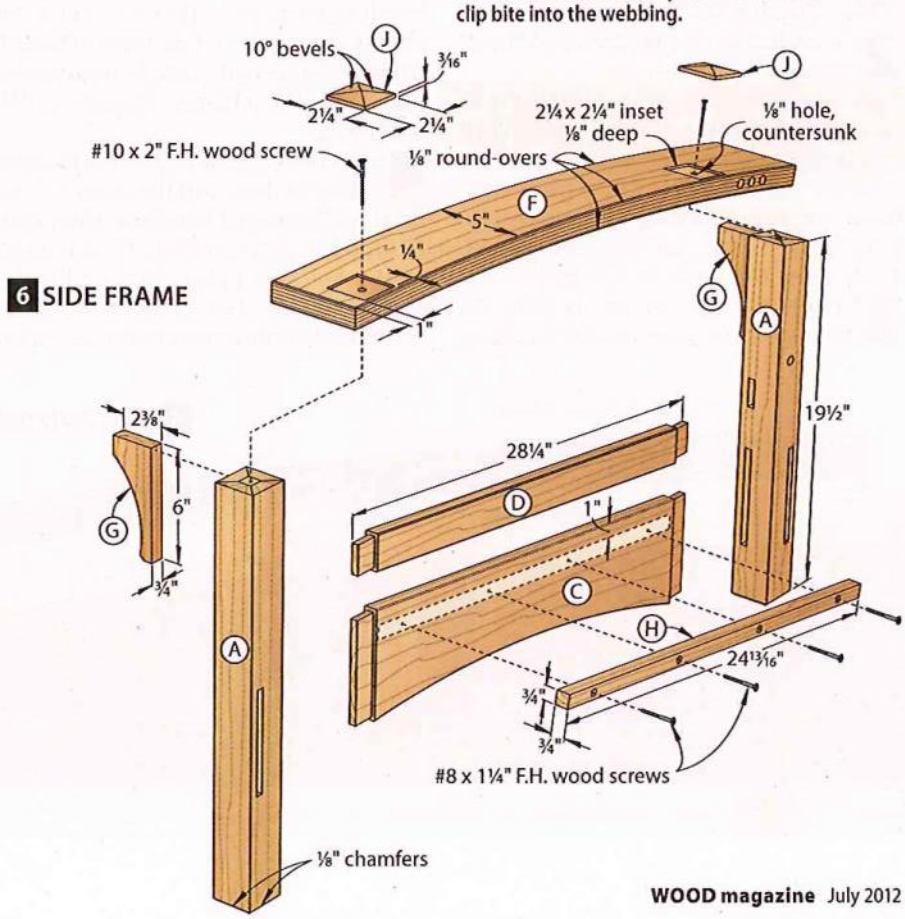
Note: *Place a wedge under one end of the jig to compensate for the curve of the arm.*

Mount a pattern bit in your router, set it for a ⅞"-deep cut, and rout the ⅛"-deep

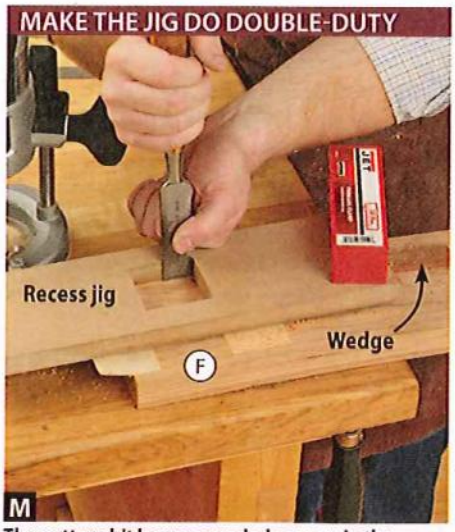


Rest a clip on a scrap, place the webbing in the clip, and then hammer the clip closed. Teeth inside each clip bite into the webbing.

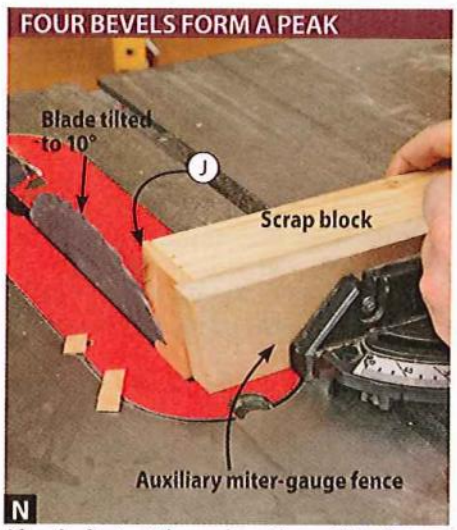




Screw the side-to-side web clips to the cleats (H) first. Then weave the front-to-back webs through them and screw the clips in place.



The pattern bit leaves rounded corners in the recess. Chisel them square, guiding the chisel against the jig.



After the first cut, the angle on the auxiliary fence helps you position the cap (J) as you sneak up on the bevels until they intersect in the center.

recess. Leave the jig in place and use it as a chisel guide when squaring up the corners [**Photo M**]. Repeat this process for the three remaining recesses.

2 Using the marks made earlier, position the arms (F) on the legs (A/B) and drill and countersink ⅛" pilot holes through each recess into the legs [**Drawing 6**]. Rout ⅛" round-overs along the top and bottom faces of the arms, and finish-sand them to 220 grit. Apply a stain and finish to the arms, keeping the recesses clean.

3 Cut the caps (J) to size [**Drawing 6**]. To make the peak on each cap, tilt your tablesaw blade 10° from vertical and attach an auxiliary fence to your miter gauge. Prepare a 2¼×2¼×8" scrap and double-faced-tape a cap to its end. Clamp a stopblock to the auxiliary miter-gauge fence so the blade cuts just below the center of the cap. Make a pass on all four sides [**Photo N**], then adjust the stopblock closer to the blade and repeat this process until the cuts intersect at the middle of the cap. Then cut the peak on the other three caps. Finish-sand the caps, maintaining the crisp edges, then stain and finish them.

4 Screw the arms (F) to the legs (A/B). Add a dab of glue to each recess and glue the caps (J) in place.

Back up your work

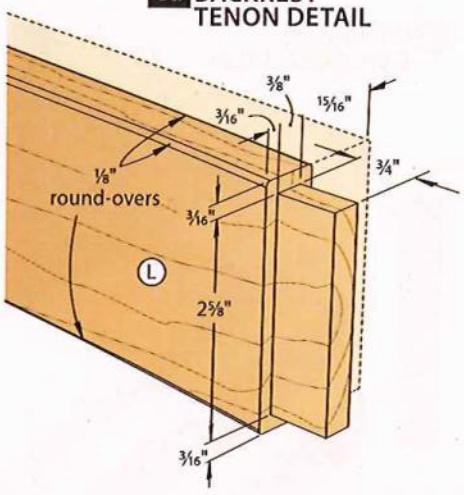
1 Cut the backrest stiles (K) to size [**Drawing 4**]. Drill and chisel out the mortises as you did with the legs; then drill the ½" hole toward the bottom of each stile.

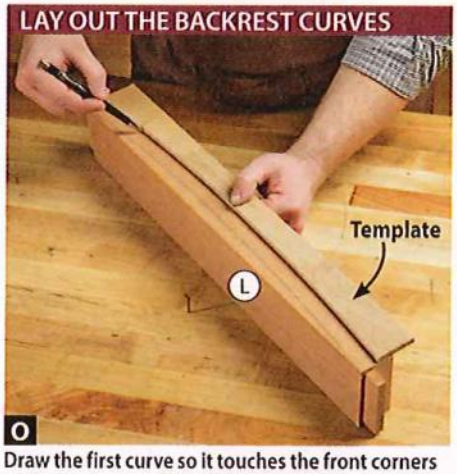
2 Prepare four 1½×3×22½" blanks for the backrest rails (L). Cut the tenons using a dado blade in the tablesaw [**Drawing 8a**]. Cut the top and bottom shoulders and front cheeks, and then raise the blade to cut the back cheeks.

3 Using a fairing stick, lay out the curve for the backrest rails (L) on a piece of hardboard [**Drawing 8**]. Cut and sand the template to shape, then use the template to draw the curves on each backrest rail [**Photo O**]. Bandsaw and sand the backrest rails to shape. Rout ⅛" round-overs along the long edges of the rails and backrest stiles (K) and the ends of the stiles [**Drawings 4, 8a**].

4 Prepare a ¾×¾×8" blank for the pin knobs (M). Rout ⅛" chamfers along one end [**Drawing 4a**], then crosscut a 1"-long pin knob from the blank. Repeat the process to make four pin knobs. Drill a ½" hole ⅜" deep centered in the

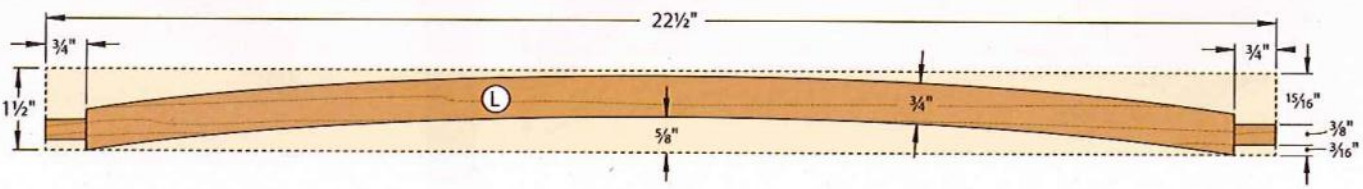
8a BACKREST TENON DETAIL





Draw the first curve so it touches the front corners of the backrest rail (L). Slide the template back ¾" and trace it again.

8 BACKREST RAIL



unchamfered end of each pin knob. Glue a 1⅞"-long dowel in two of the knobs **[Drawing 4]** and 3¼"-long dowels in the other two.

5 Finish-sand the backrest stiles (K), rails (L), and pin knobs (M) and dowels. Stain and finish these parts, then glue the rails between the stiles.

***Quick Tip!** Place the stiles front face down on your bench while clamping to ensure the assembly stays flat.*

After the glue dries, install the back assembly by inserting the long pins through the stiles and into the holes in the legs. Place the short pins in the holes in the arms (F) behind the stiles to set the back angle.

On to the ottoman

1 Cut the ottoman legs (N) to size **[Drawing 9; Shop Tip,** *right***]**. As you did with the caps (J), set up an auxiliary fence with a stopblock on your miter gauge and bevel the top of each leg to create peaks. Then drill and chisel the mortises where shown.

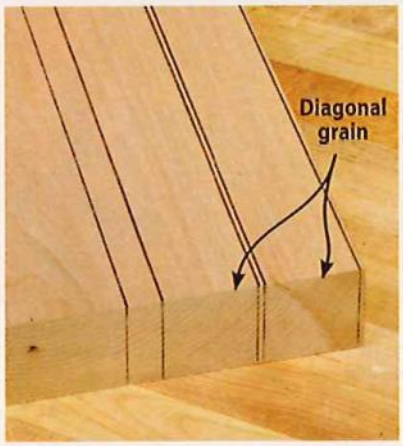
2 Cut the rails (O, P, Q, R) to size and cut the tenons **[Drawings 10** and **11]**. Lay out and cut the arches in the bottom front and back rails (P) and bottom side rails (R). Then rout ⅛" round-overs **[Drawing 11]**.

3 Cut the front and back cleats (S) and the side cleats (T) to size, then drill and countersink ⅛" pilot holes in their inside and bottom faces **[Drawing 10]** and screw them in place. Tape off the tenons on the rails (O, P, Q, R) and apply a stain to all pieces. After the stain dries, glue the top side rails (Q) and bottom side rails (R) between two legs (N). Let the glue dry, then join the end assemblies with the top front and back rails (O) and the bottom front and back rails (P).

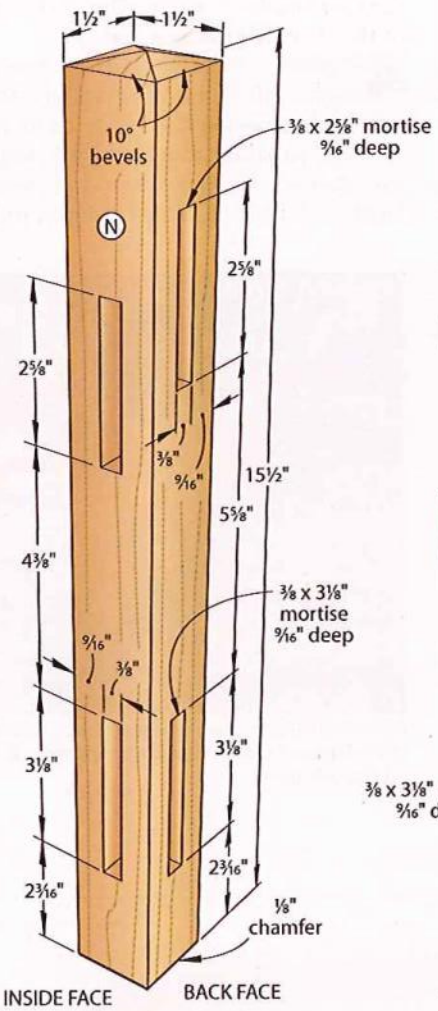
SHOP TIP

Go straight to the diagonal grain

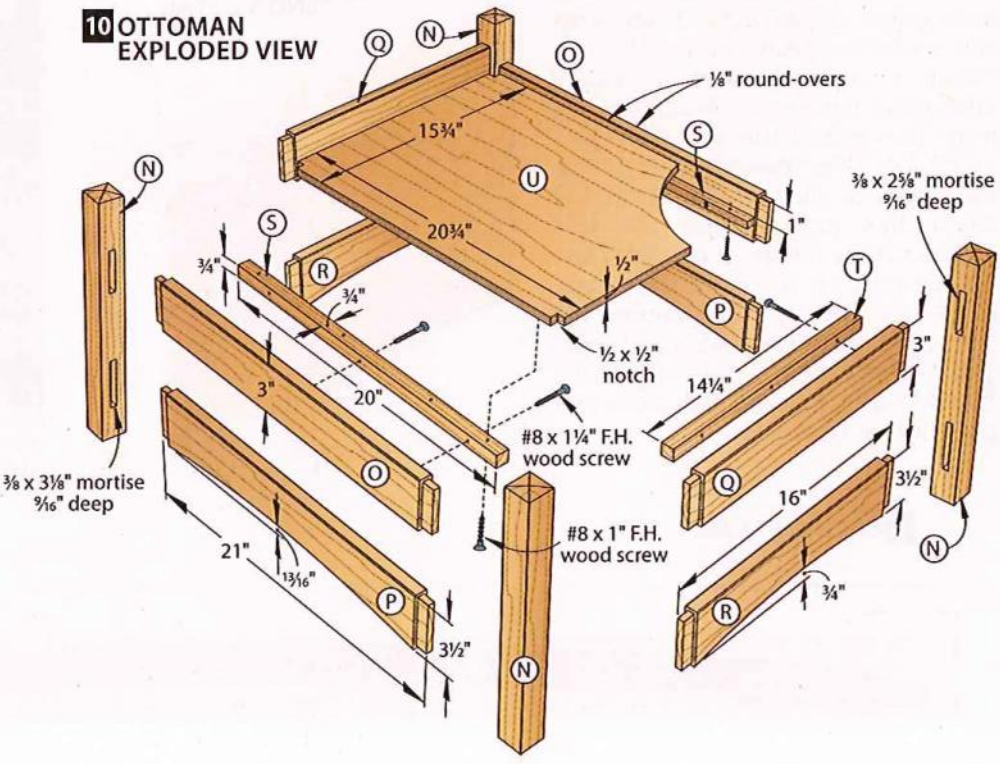
Cut the ottoman legs (N) from solid stock. For legs with straight grain on each face, choose boards where the end grain runs from corner to corner of the leg.



9 OTTOMAN LEG



10 OTTOMAN EXPLODED VIEW

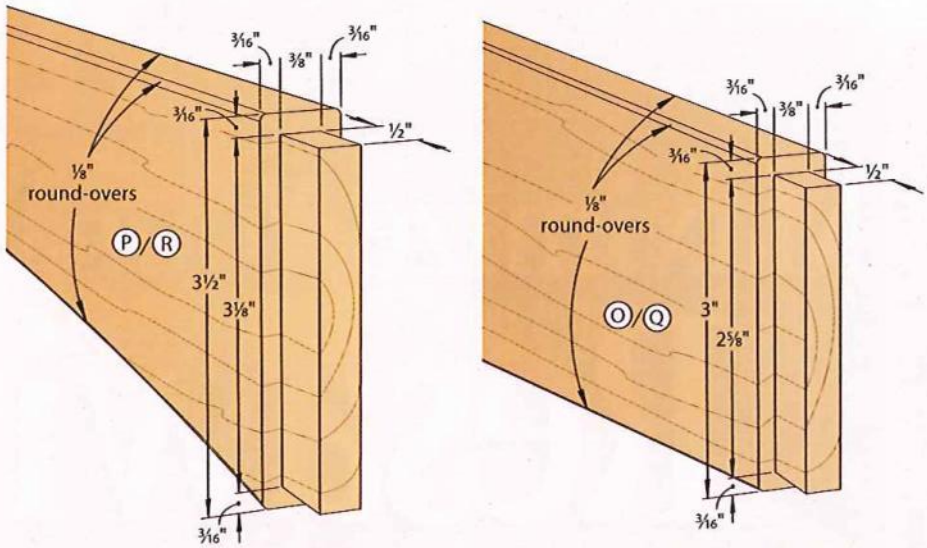


4 From ½" plywood, cut the cushion base (U) to fit between the top rails (O, Q) **[Drawing 10]**. Notch the corners to fit around the legs (N), and then secure the base by driving screws through the front and back cleats (S).

5 Send the chair and ottoman out for upholstery. We provided a 5×27×84" piece of foam, a 50' roll of 1" batting, and imitation leather to our upholsterer. Real leather is nice, but could triple your upholstery costs.

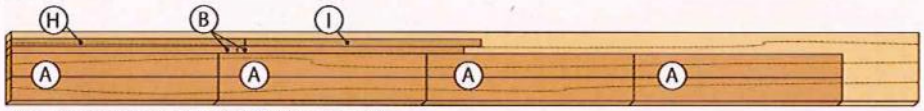
Produced by **Craig Ruegsegger** with **John Olson**
Project design: **Kevin Boyle**
Illustrations: **Lorna Johnson**

11 OTTOMAN TENON DETAIL

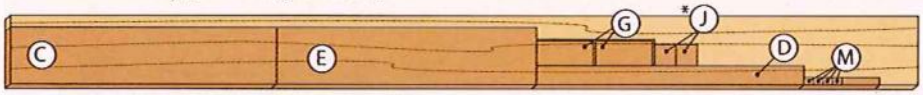


Cutting Diagram

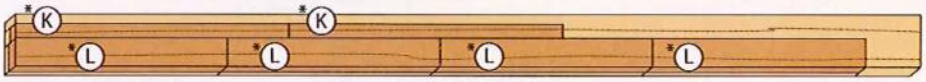
CHAIR



¾ x 7¼ x 96" Cherry (5.3 bd. ft.) (2 needed)



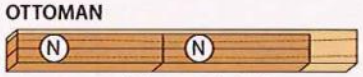
¾ x 7¼ x 96" Cherry (5.3 bd. ft.) (2 needed) *Plane or resaw to thicknesses listed in the Materials List.



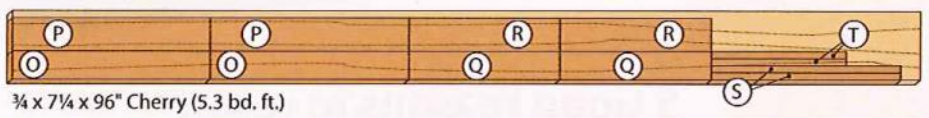
1½ x 5½ x 96" Cherry (8 bd. ft.)

2 x 5½ x 96" Cherry (8 bd. ft.)

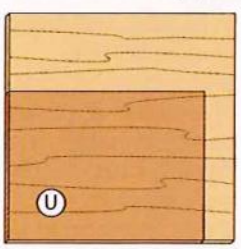
OTTOMAN



1½ x 3½ x 36" Cherry (2 bd. ft.)



¾ x 7¼ x 96" Cherry (5.3 bd. ft.)



½ x 24 x 24" Birch plywood

More Resources

- Get a free plan for a fairing stick and watch a free video on how to use it at **woodmagazine.com/fairing**.
- Download more mission-style furniture plans for a small fee at **woodmagazine.com/mission**.

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Chair						
A*	leg faces	¾"	2¼"	22"	C	16
B*	leg cores	¾"	¾"	22"	C	4
C	bottom side stretchers	¾"	6"	28¼"	C	2
D	top side stretchers	¾"	2"	28¼"	C	2
E	front/back stretchers	¾"	6"	27½"	C	2
F*	arms	1⅛"	5"	38"	LC	2
G*	corbels	¾"	2⅜"	6"	C	4
H	side cleats	¾"	¾"	24 13/16"	C	2
I	front/back cleats	¾"	¾"	25"	C	2
J	caps	⅜"	2¼"	2¼"	C	4
K	backrest stiles	1⅛"	1½"	29"	C	2
L*	backrest rails	1⅜"	3"	22½"	C	4
M*	pin knobs	¾"	¾"	1"	C	4
Ottoman						
N	legs	1½"	1½"	15½"	C	4
O	top front/ back rails	¾"	3"	21"	C	2
P	bottom front/ back rails	¾"	3½"	21"	C	2
Q	top side rails	¾"	3"	16"	C	2
R	bottom side rails	¾"	3½"	16"	C	2
S	front/back cleats	¾"	¾"	20"	C	2
T	side cleats	¾"	¾"	14¼"	C	2
U	cushion base	½"	15¾"	20¾"	BP	1

*Parts initially cut oversize. See the instructions.

Materials key: C–cherry, LC–laminated cherry, BP–birch plywood.
Supplies: Double-faced tape, spray adhesive, #8×1" flathead wood screws (8), #8×1¼" flathead wood screws (28), #10×2" flathead wood screws (4), #8×¾" panhead screws (24), ½×12" oak dowel.
Blade and bits: Dado blade; ¼" Forstner bit; ⅛", ½", drill bits; ⅛" round-over, pattern, 45° chamfer router bits.

Source

Elasbelt webbing: 2"x10 yd. roll $9.99
Web clips: $2.66/box of 12 (2 boxes), diyupholserysupply.com.

Maximize Your Wood By Resawing

Ripping boards into thinner slabs is a snap with a bandsaw and these easy-to-follow techniques.

5 Good reasons to resaw

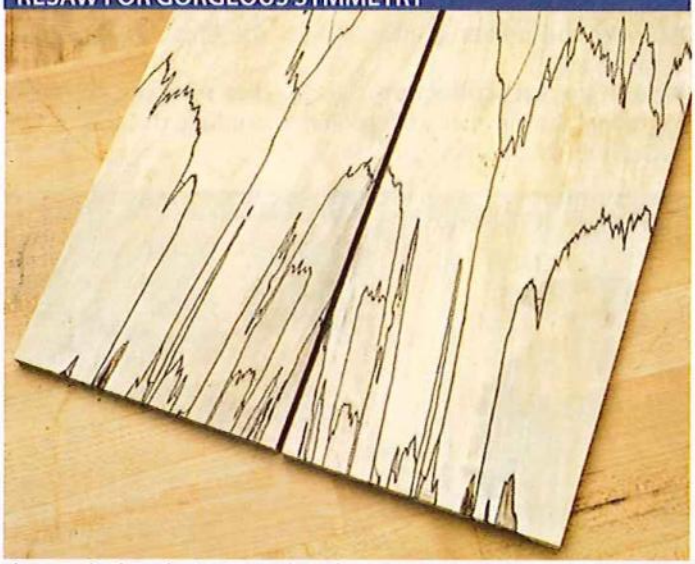
Resawing means ripping a board standing on its edge; and doing so opens up your woodworking to a lot of new possibilities.

1 Maximize exotic or pricey boards. You can make multiple matching project parts from a single piece of costly or prized wood. For example, if you want to make door panels from bubinga or bird's-eye maple, rather than using full-thickness boards, simply resaw several veneers from one board and laminate them to a less-expensive substrate, such as plywood or MDF. Once they're captured in a framed door, no one will be the wiser.

2 Waste less wood at the planer. Let's say your project calls for ¼"-thick wood—which can be hard to find—and all you have is ¾" stock. Rather than turn two-thirds of that ¾" board's thickness into planer chips, simply resaw it in half and then plane those slabs to ¼".

3 Extend the lives of planer knives. Because changing or sharpening dull or nicked planer knives proves more time-consuming than changing out a worn bandsaw blade, it's wise to limit the amount of wear on those costly knives when you have other options. So resaw slabs to approximate thickness, and then make only a pass or two through the planer.

RESAW FOR GORGEOUS SYMMETRY



These spalted maple pieces match perfectly because they were face-to-face in the board before being resawn.

YES, DRY WOOD BENDS TO SHAPE

These thin resawn strips flex enough to bend and take on the shape of the clamping form. They'll retain that shape after the glue or epoxy cures.

4 Bookmatch stock for stunning panels. On almost any project with a trapped panel, from side-by-side cabinet doors to a box top, resawing a board and then matching the two pieces in a mirror-image fashion, as shown *above*, adds eye-catching pizazz. You can resaw boards in this manner and then edge-glue them together for a bookmatched case side or top.

5 Create low-hassle curved workpieces. Rather than steam-bending wood, you can get tighter, multiple curves that won't spring back as much by resawing thin strips (usually ⅛" thick), planing or sanding them smooth, and then gluing them back together, clamped to a form. See how this was done to create the arms for the Morris Chair project on *page 52*.

Resawing relies on a tightly tuned bandsaw

To make resawing fast, safe, easy, and repeatable, adjust your bandsaw for peak performance. Here's how:

▶**Start squeaky-clean.** Remove the blade (and the table, if necessary), and clean all dust and buildup from the tires, belts, pulleys, and blade guides. Such buildup lessens the effectiveness of these components.

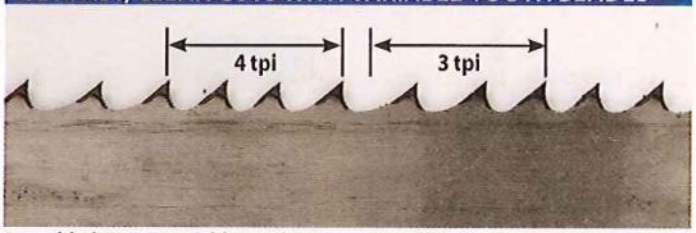
▶**Install the correct, sharp blade.** In general, the fewer teeth per inch, the faster a blade removes waste. It also runs cooler, extending its sharpness. For best results, choose the widest blade with 3 or 4 teeth per inch (tpi) that fits your saw. These blades cut quicker but leave rougher surfaces than 6-tpi blades.

Our favorite resawing blade, Highland Hardware's Wood Slicer [see **Source**, *page 63*], has a variable-tooth pattern, *below*, and leaves a kerf thinner than most bandsaw blades. You'll do less sanding or planing on boards resawn with this blade because it leaves a smoother wood surface. The downside? It dulls more quickly than other blades we've used, and costs nearly double a standard blade. Save it for resawing only.

▶**Adjust the blade tracking.** With the blade guides pulled back and the blade tensioned just enough to hold it in place, spin the top wheel. The blade should track centered or slightly in front of the tire's crown, the peak across its width. If it does not, tilt the wheels as described in your saw's owner's manual.

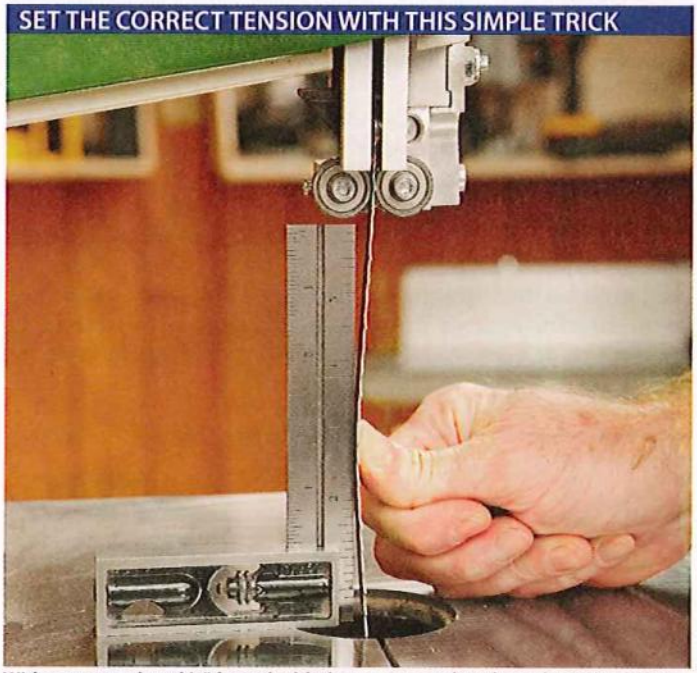
▶**Tension the blade.** Tighten the saw's spring-loaded blade tensioner, as shown *below*. Undertensioning a blade results in deflection during the cut—and more work and waste to flatten resawn boards. Overtensioning adds stress to the wheel bearings and blade.

GET FAST, CLEAN CUTS WITH VARIABLE-TOOTH BLADES



Some blades use a variable-tooth pattern that alternates from 3 to 4 teeth per inch, providing fast cuts and a cleaner surface than a typical 3-tpi blade.

SET THE CORRECT TENSION WITH THIS SIMPLE TRICK



With a square placed ¼" from the blade, press your thumb moderately against the blade. It should just touch the square but not move it.

▶**Square the table to the blade.** To make the faces of your resawn slabs parallel, adjust the table exactly 90° to the blade.

▶**Adjust the blade guides.** No matter the type of guides on your saw, set them just behind the teeth, as shown *below*. Adjust the thrust bearings with the same gap behind the blades.

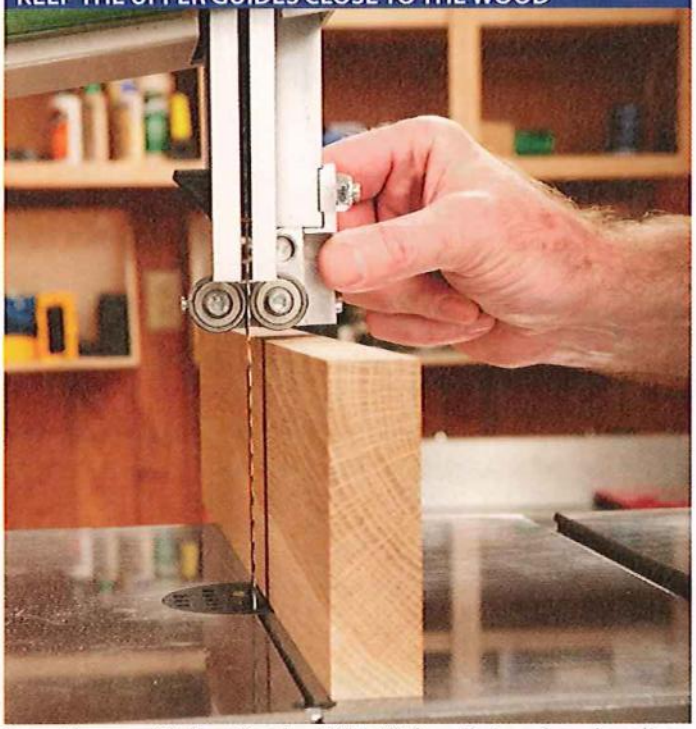
▶**Lower the upper guides.** Adjust the upper guidepost as shown *below*.

▶**Hook up dust collection.** Sucking dust from the saw helps the blade run cleaner and cooler, extending the life of the blade, tires, and guides.

PAPER-THIN GAPS WILL GUIDE YOU

To set the proper blade-to-guide clearance, insert a double-thickness of paper between the blade and each guide.

KEEP THE UPPER GUIDES CLOSE TO THE WOOD



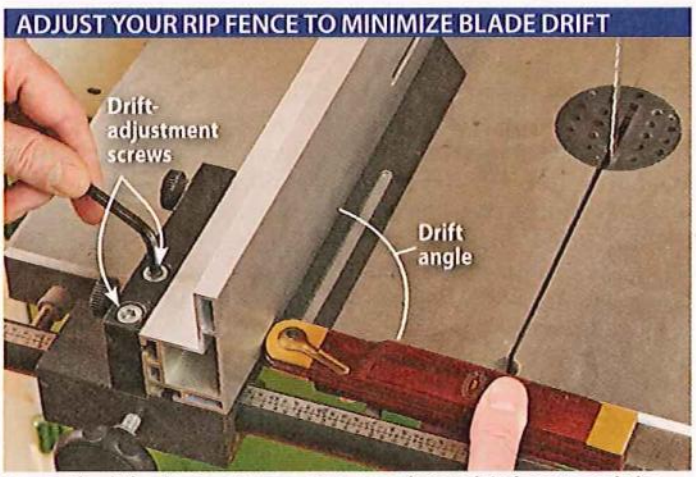
Secure the upper blade guides about ⅛" to ¼" above the top of your board to minimize blade deflection.

Set up the fence

We like to resaw using a rip fence to guide the board through the blade because it enables you to make repeatable rips of equal thickness. If your saw didn't come with a fence, you can buy an aftermarket model, build one from plans [**More Resources**, *next page*], or simply clamp on a straight board at least 3" tall.

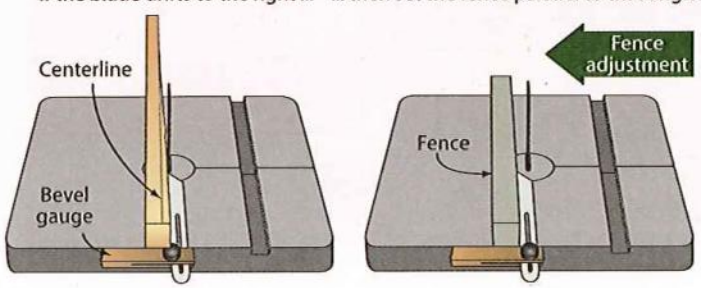
With the fence set parallel to the blade and 90° to the table edge, test for blade drift—when the blade cuts at an angle not perpendicular to the table's front edge. To do this, mark a line down the length of a scrap board, parallel to the left edge. Running the left edge against the fence, rip the full length starting at the marked line. If the cut strays from the line, you need to adjust the fence angle to match the blade's drift, as shown *below*, ensuring accurate rips. Once you calibrate a manufactured fence for blade drift, you shouldn't need to do it again until the next blade change.

ADJUST YOUR RIP FENCE TO MINIMIZE BLADE DRIFT

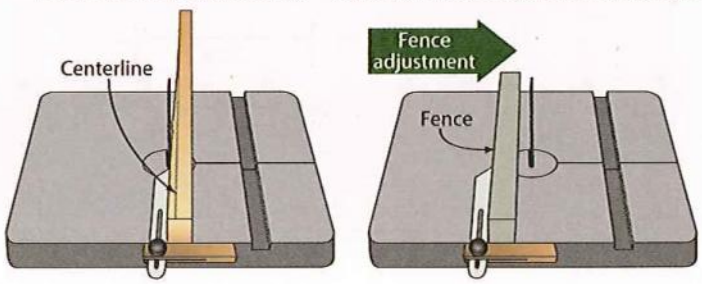


Loosen the drift-adjustment screws on a manufactured rip fence to cock the fence to the correct angle, as described *below*, and then retighten.

If the blade drifts to the right ... ... then set the fence parallel to that angle.



If the blade drifts to the left ... ... then set the fence parallel to that angle.

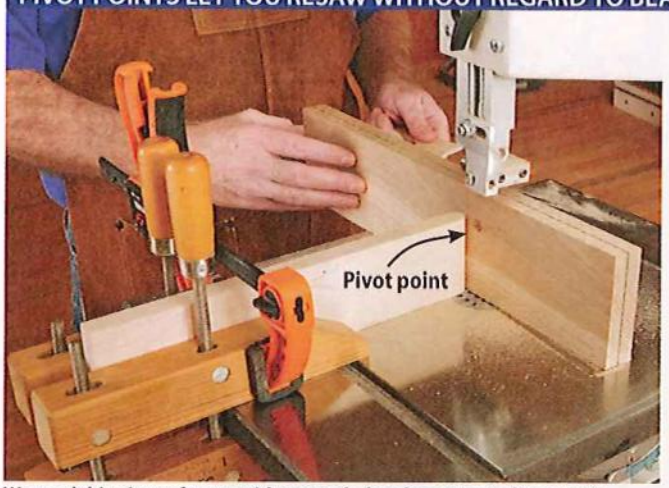


You might prefer a pivot point

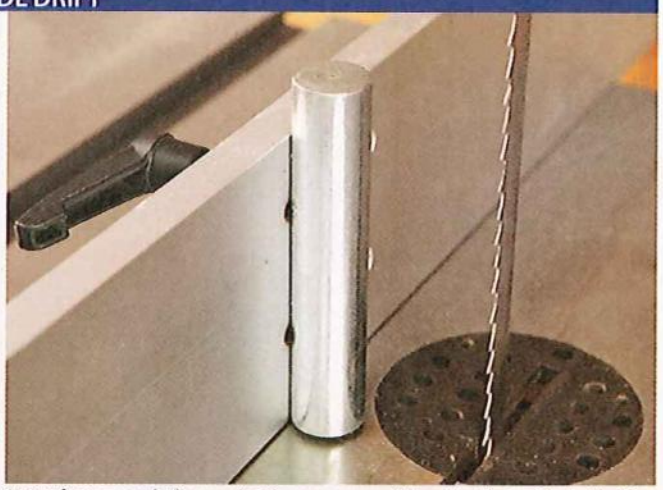
Instead of messing with adjusting a fence for blade drift, some woodworkers like to guide the board freehand using a single pivot point, as shown *below*. This technique saves time compared to manually setting a clamp-on fence every time, especially if you need to make just one or two cuts. It also typically leaves slightly rougher board faces that require more planer or jointer passes to flatten and smooth.

Some fences come with a pivot bar, shown *below*, or rounded fence attachment, but you can make your own easily. To use a pivot point, space it from the blade the thickness of your desired slabs, plus 1/16" or so. Mark a cutline the length of your blank. With the blank pressed against the pivot, feed the board while steering it to keep the blade cutting on the line.

PIVOT POINTS LET YOU RESAW WITHOUT REGARD TO BLADE DRIFT



We used this piece of scrap with a rounded end as a pivot, clamping it between handscrews to prevent it from moving.



Some factory and aftermarket fences come with a pivot bar, which attaches to the fence face with a bolts and threaded handle.

Now you're ready to saw

Plane both faces of your blank parallel and joint one edge square. When calculating how many slabs you can cut from the blank, allow an extra 1/16" to 1/8" for blade-mark waste that will be planed or sanded away later and another 1/16" for the blade kerf. So, for example, you can only get two 1/4"-thick boards from a 3/4" workpiece.

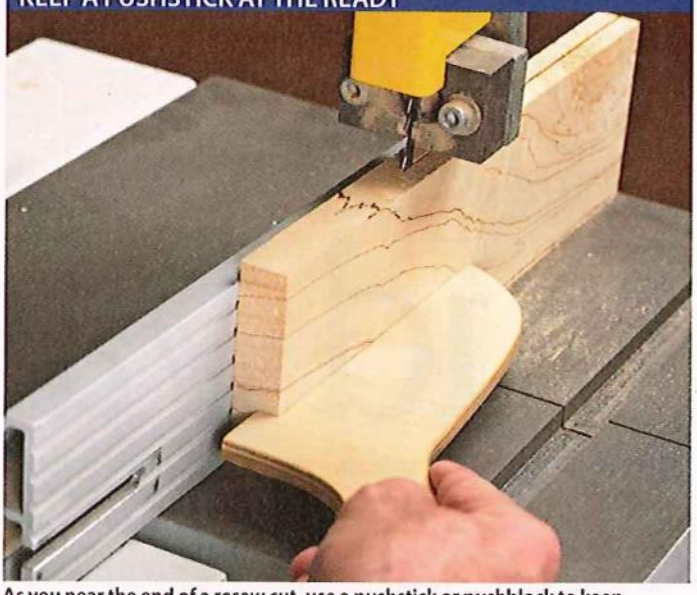
To cut, hold the board tightly against the fence and table as you feed the wood into the blade at a comfortable rate. Slow your rate if the saw bogs down or the blade wanders from the cutline. For workpieces that you're resawing into three or more pieces, after resawing one piece go back and plane or joint the blank's bandsawn face again. This way, every resawn piece has a flat face to reference on the planer table during final thicknessing later. Finally, remove any remaining saw marks with a planer or sander, taking the pieces to a uniform thickness.

Produced by **Bob Hunter** with **John Olson** and **Kevin Boyle**

Source

Wood Slicer bandsaw blades: 1/2" and 3/4" widths in various lengths, $30–50, Highland Woodworking, 800-241-6748, highlandwoodworking.com.

KEEP A PUSHSTICK AT THE READY



As you near the end of a resaw cut, use a pushstick or pushblock to keep your fingers a safe distance from the blade.

More Resources

- For more bandsaw tips, guides, tool reviews, and project plans, go to woodmagazine.com/bandsaw.
- Download plans for a bandsaw table and fence for a small fee at woodmagazine.com/bandsawfence.
- Watch a video on resawing at woodmagazine.com/resawvid, free for a limited time. To view more bandsaw-related videos for a small fee, go to woodstore.net and search for **"bandsaw video."**

Three-space Bud Vase

Sort through those precious scraps you have squirreled away and find just the right pieces to create this simple cradle for three cylindrical vases. (Our scrap bin yielded spalted maple, walnut, and bits of wenge.) Before starting, have the vases in hand (see **Source**). You'll use them when assembling the project and, if you choose vases larger or smaller than the 2"-diameter ones we used, you'll need to adjust the diameters of the holes in the base (A) and the cutouts in the retainer strips (C).

Just nine steps to a blooming success

1 Laminate a ¾×6½×19½" blank and a contrasting ¼×6½×19½" blank for the base (A) [**Drawing 1**]. Make two photocopies of the **Base Half-Pattern** from the *WOOD Patterns®* insert, and tape them together along the centerlines. Spray-adhere the pattern to the blank and bandsaw and sand the base to shape.

2 Using a 2¼" Forstner bit, drill the three ½"-deep holes where shown on the pattern, then rout the ½" round-over around the top of the base (A).

3 Prepare a 1×2¾×15" walnut blank for the uprights (B). Make two photocopies of the **Upright Pattern** and spray-adhere them to an edge of the blank. Mount a ¼" dado blade in your tablesaw and cut the ⅞"-deep notches on each edge where shown [**Drawing 2**]. Crosscut the blank in half.

4 Cutting 1/16" outside the pattern line, bandsaw the bevel on the outside face of each upright (B), then sand to the line. Lay out the tapers on the faces of the uprights [**Drawing 2**]. Bandsaw 1/16" outside these lines, then sand up to the lines. Finish-sand the uprights to 220 grit.

5 Using double-faced tape, adhere the uprights (B) to the base (A) where shown on the pattern. (See the **Shop Tip,** *next page,* for an alternate method for aligning the uprights.) Turn the assembly upside down, clamp each upright in a vise in turn, and drill two countersunk pilot holes through the base and into each upright [**Drawing 1**]. Apply mineral spirits to dissolve the adhesive, and scrape away the pattern. Sand the base

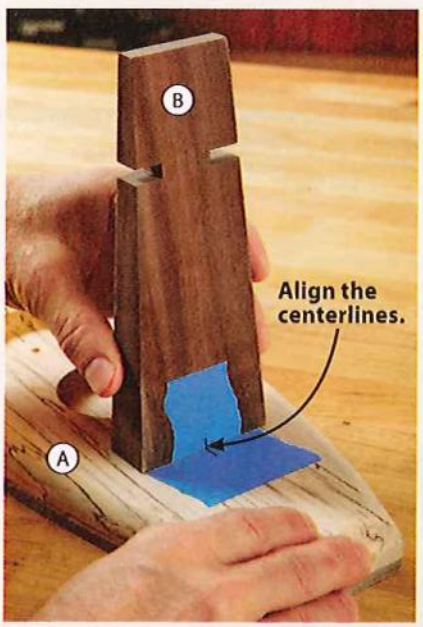
Position the rip fence to center a notch on the clip (D). Make a pass to cut a notch on each edge of the clip.

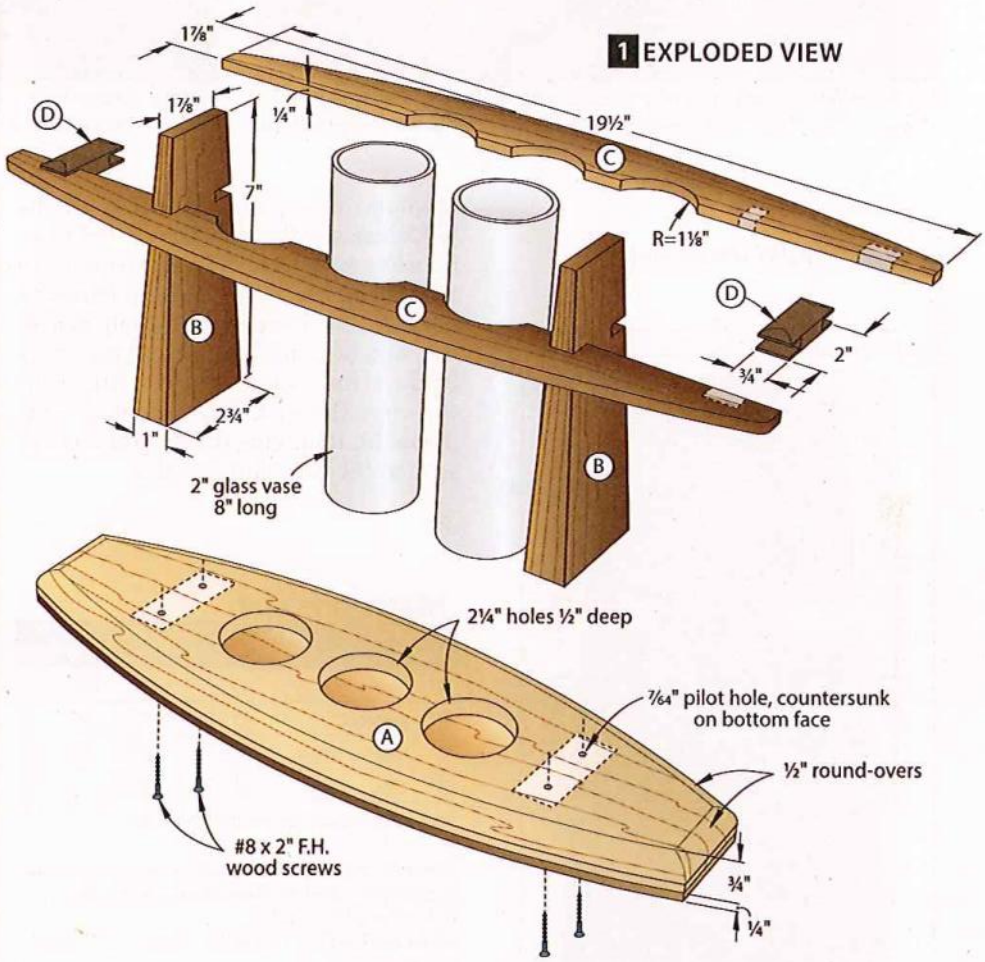
Grip the clip (D) in a handscrew while sanding the clip up to the pattern lines. Finish-sand the piece by hand.

SHOP TIP

Let's go to the tape

If the pattern gets damaged while shaping the base (A), use the dimensions printed on the pattern in the *WOOD Patterns* insert to position the uprights (B). Apply painter's tape to the uprights and base, mark centerlines on the pieces, and align the marks, positioning the uprights 3⅜" from the end of the base.

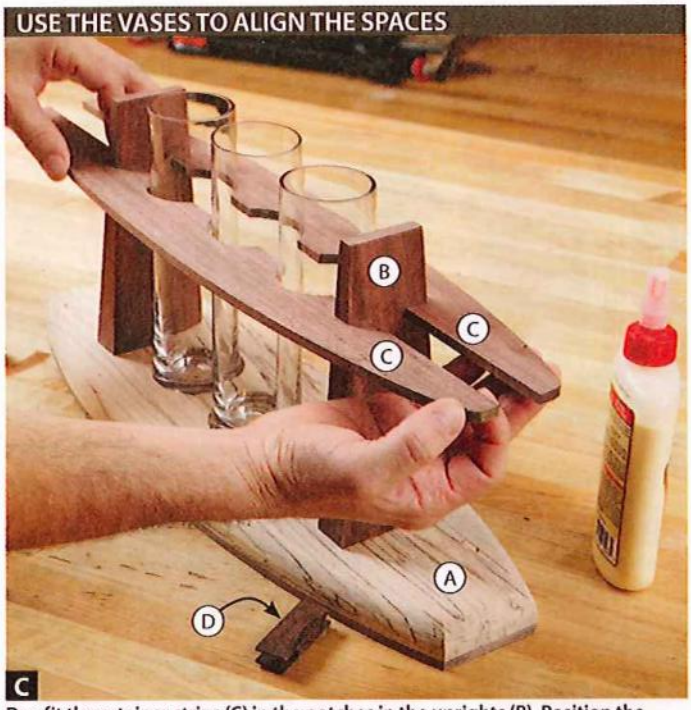




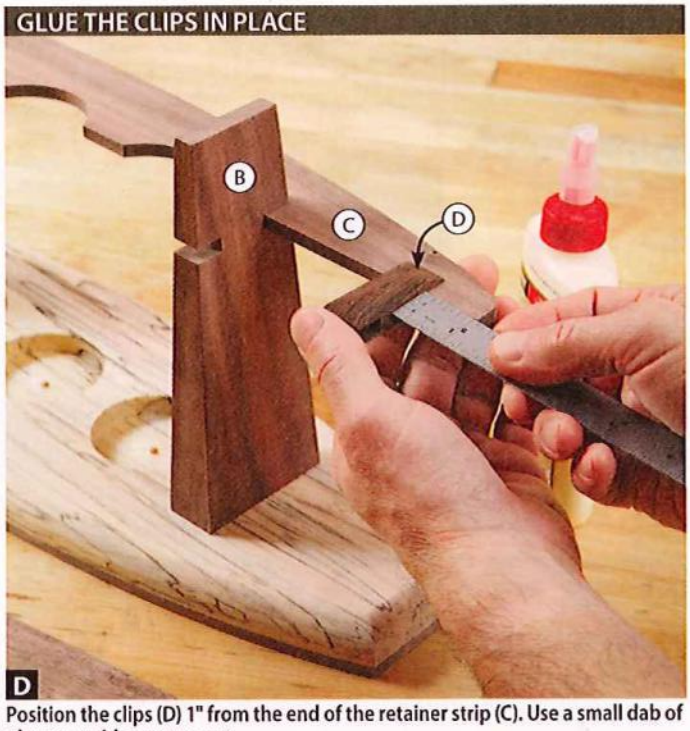
to 220 grit, then glue and screw the uprights in place. Apply the glue sparingly to avoid squeeze-out.

6 Mill two 2×20" blanks for the retainer strips (C) and plane them to fit the notches in the uprights (B). Make a photocopy of the **Retainer Strip Half-Pattern** and spray-adhere it to a piece of ¼" hardboard. Scrollsaw and sand the hardboard to shape, then use this as a template to lay out the full retainer-strip profile on a retainer-strip blank. Stack the blanks together with double-faced tape, and scrollsaw and sand both retainer strips to shape at the same time. Dribble some mineral spirits along the joint to dissolve the tape adhesive, and separate the retainer strips.

7 Cut the clips (D) to size [**Drawing 1, Materials List**]. Using double-faced tape, secure each one to the end of a ⅝×2×12" piece of scrap. Using a dado blade in your tablesaw, cut the notch in each edge [**Photo A**]. Make two photocopies of the **Clip Pattern** and cut them out along the lines. Spray-adhere the patterns to an end of each clip, then sand the clips to shape on a disc sander [**Photo B**], or with a sanding drum in your drill press.

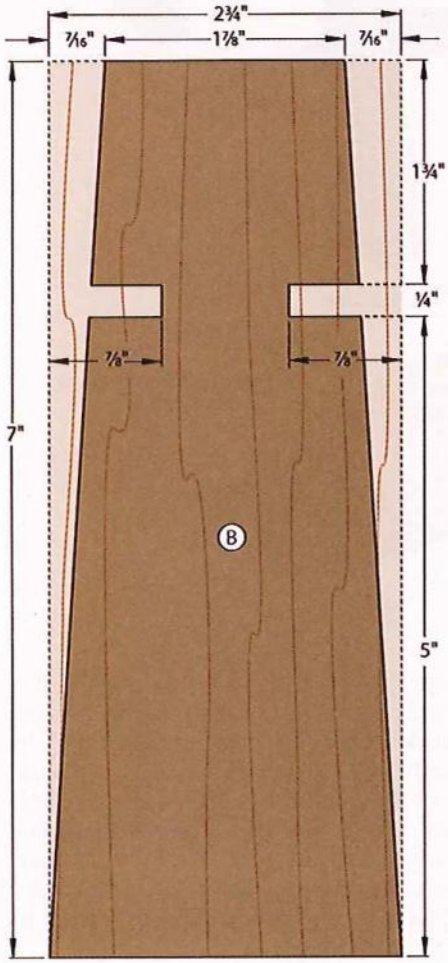


Dry-fit the retainer strips (C) in the notches in the uprights (B). Position the strips to center the vases in the openings without the vases touching the strips.



Position the clips (D) 1" from the end of the retainer strip (C). Use a small dab of glue to avoid squeeze-out.

2 UPRIGHT (Front view)



8 Stand and center the vases in the recesses in the base (A). Use the vases to help position the retainer strips (C) in the notches in the uprights (B) **[Photo C]**. Remove one retainer strip, apply glue in the notches, and reposition the strip. Remove the second retainer strip, glue the clips (D) to the first retainer strip **[Photo D]**, then glue the second retainer strip to the clips and uprights.

9 Finish-sand any areas needing it, then apply a finish. (We sprayed on two coats of satin polyurethane from an aerosol can.) Position the vases, and fill them with sand, pebbles, marbles, or flowers to brighten any room.

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

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	base	1"	6"	19"	SM/W	1
B*	uprights	1"	2¾"	7"	W	2
C*	retainer strips	¼"	1⅞"	19½"	W	2
D*	clips	⅝"	¾"	2"	G	2

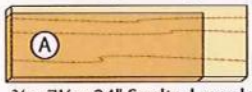
*Parts initially cut oversize. See the instructions.

Materials key: SM–spalted maple, W–walnut, G–wenge.
Supplies: Double-faced tape, spray adhesive, #8×2" flathead wood screws (4).
Blade and bits: Dado blade; 2¼" Forstner bit; ½" round-over router bit.

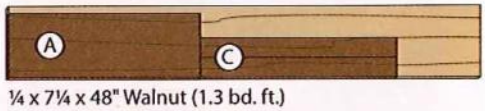
Source

Vases: Cylinder glass bud vase 2×8", no. GLWD208, $2.49, wholesalefloral.com, 877-569-4583.

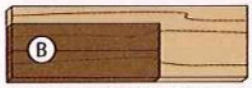
Cutting Diagram



¾ x 7¼ x 24" Spalted maple (1.3 bd. ft.)



¼ x 7¼ x 48" Walnut (1.3 bd. ft.)



1 x 7¼ x 24" Walnut (1.3 bd. ft.)

¾ x 3½ x 12" Wenge (.3 bd. ft.)

More Resources

- For a free article showing how to rout large holes, go to: woodmagazine.com/largehole.

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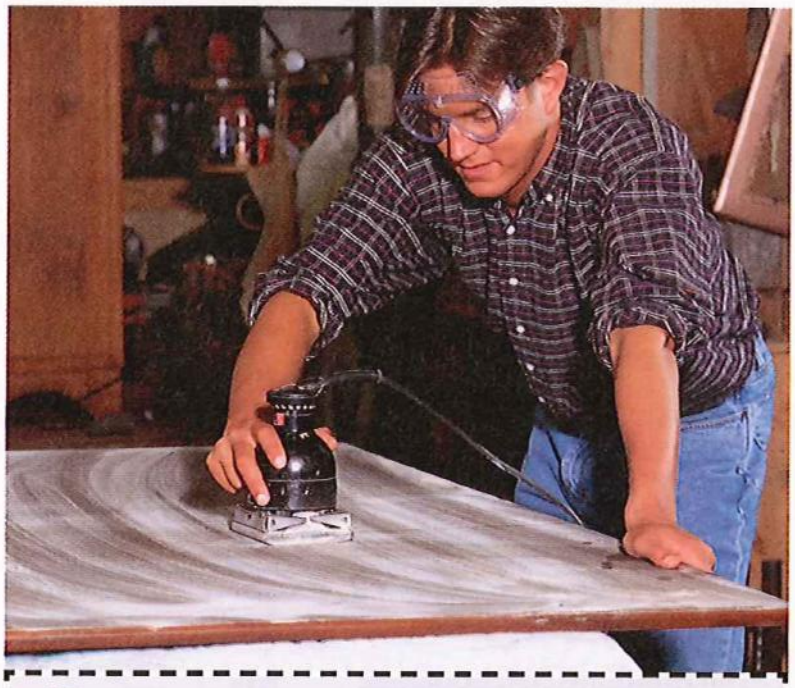

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Mahogany: *Wood of Kings*

Will the real mahogany please stand up?

Dwindling supply, distant-cousin substitutes, and marketing mischief have managed to muddle the mahogany moniker. Honduran? Genuine? African? Philippine? True? Santos? Here's a rundown of some of the various claimants to the mahogany throne.

The Cuban king

Mahogany has been synonymous with luxury since English furnituremakers Chippendale, Hepplewhite, and Sheraton made it their wood of choice in the late 1700s. Its easy workability made it ideal for the hand tools of the day, and perfect for the ornate carvings adorning their high-end furniture. And its rich, pink-tinged tan color that darkened to a deep, lustrous red secured its dominion as the "Wood of Kings."

Those classic cabinetmakers preferred Cuban mahogany *(Swietenia mahagoni), above,* for good reason: It proved superior in nearly all areas that matter to woodworkers. Boatbuilders loved the wide, rot-resistant and dimensionally stable planks. Furnituremakers appreciated the tight grain that readily accepted any finish. And the world's consumers loved the rich color. But its popularity proved to be its demise because by the mid-1800s, it had been harvested to commercial extinction. For all intents and purposes, the king is dead.

Modern sources are scarce, limited to salvage operations and centuries-old groves transplanted to South Pacific islands by Spanish missionaries. But because mahogany's old-world mystique lingers, replacements were desperately sought, and marketers quickly advanced alternatives.

Pros:
- ♥ Extremely stable
- ♥ Rot-resistant
- ♥ Easy to carve and shape with hand tools or power tools
- ♥ Stains and finishes easily and beautifully

Cons:
- ♠ Scarce and expensive

Price: $20–25/bdft

The Honduras heir apparent

The logical heir to the mahogany throne was, and is, Honduran mahogany *(Swietenia macrophylla), right.* Also in the *Swietenia* genus, Honduran mahogany, like Cuban, is entitled to the "genuine mahogany" honorific—and not just by family right. Honduran mahogany shares all of the prized characteristics of its cousin, differing in hardness (it's a bit softer), texture (it has slightly larger pores) and color (it's lighter and redder).

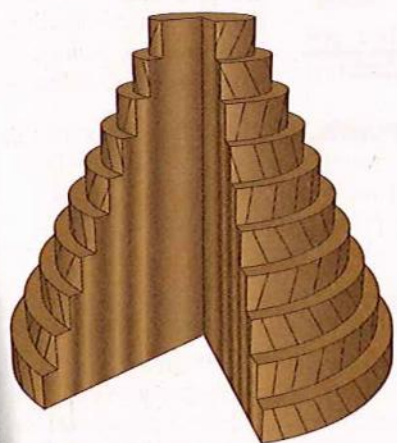
Unfortunately, overuse has started Honduran mahogany down the path of scarce supply and export restrictions, too. However, Keith Stephens, owner of hardwood retailer Woodworkers Source (800-423-2450, woodworkerssource.com), says Honduran mahogany has recently seen a glut in supply due to the slumping high-end housing market. "If you want to make something out of genuine mahogany, now is the time to do it," Stephens says. "Prices are as low as they've been for years."

Pros:
- ♥ Extremely stable
- ♥ Rot-resistant
- ♥ Easy to carve and shape with hand tools or power tools

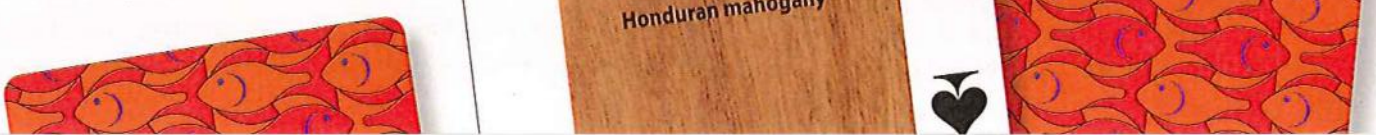
Cons:
- ♠ Sporadic availability

Price: $10–15/bdft

INTERLOCKED GRAIN
A mahogany family trait



The spiraling grain of mahogany switches direction between growing seasons, causing distinctive stripes on quartersawn faces but unpredictability when planing.



Out of Africa: Rival claims to the throne

With its supply and price issues, Honduras mahogany's rule is a shaky one. So, several African upstarts are making a name for themselves as genuine mahogany substitutes. Like the *Swietenia* varieties, these three woods hail from the *Meliaceae* family, earning them the regal distinction of "true mahogany" and due consideration as successors.

Khaya ivorensis, below, the species most-often marketed under the African mahogany moniker, has snagged much of the genuine-mahogany replacement market. While its coloring appears similar to genuine mahogany, its working characteristics differ distinctly. *Khaya's* tendency toward interlocked grain (see illustration, *opposite page*) manifests itself prominently. For jointing, planing, and hand-tool work, this makes it nearly impossible to read the grain direction.

Pros:
- Similar in appearance to genuine mahoganies
- Low cost and wide availability

Cons:
- Fuzzy, stringy grain
- Larger pores don't carve or finish as well as genuine mahoganies
- Interlocking makes the grain difficult to read for jointing and planing

Price: $6–8/bdft

Sapele (suh-PEE-lee), *Entandrophragma cylindricum,* uses its family tendency toward interlocked grain to display a characteristic ribbon-striped pattern, shown *below.* Often found in the same African mahogany bin as its cousins, Sapele's dark red tone and dramatic appearance set it apart. Use Sapele to draw attention to the grain in projects, and machine it as you would other figured woods: with shallow cuts, and reduced cutting angles to avoid tear-out.

Pros:
- Ribbon-striped grain patterns are common
- Lustrous, three-dimensional appearance

Cons:
- Prone to tear-out
- Difficult to match to genuine mahoganies

Price: $7–9/bdft

Sipo (SEE-poh), *Entandrophragma utile, below,* often sold as *utile* (YOO-tih-lee), has a more subdued grain pattern than its African counterparts. Because of this, it tends to share the easier workability of its American cousins. Sipo's darker tone makes it a closer match for age-darkened genuine mahogany furniture pieces. This, combined with its lower price, makes Sipo a strong contender as the mahogany substitute of choice, especially for period reproduction work.

Pros:
- Easy to carve and shape with hand tools or power tools
- Instant aged mahogany look
- Low cost

Cons:
- Less availability than other African varieties

Price: $6–8/bdft

Written by: **Lucas Peters**

Pretenders to the crown

Mahogany's lofty status has led marketers to slap the label "mahogany" on many nonrelated species.

Philippine mahogany—actually several species of the *Shorea* genus—is sometimes marketed under the name lauan. The designation is allowed by the Federal Trade Commission due to long-standing usage of the term. The Asian hardwood has found its way into low-cost plywood veneer, door skins, and house trim. But its nickname doesn't mask its lack of stability and rot resistance, nor its coarser texture.

Santos Mahogany (*Myroxylon balsamum)* and Royal Mahogany (*Pithecellobium arboreum)* have the hardwood flooring industry to thank for their artful appellations. Though prized in that capacity for their hardness, they bear only passing color similarities to the genuine stuff, and closer comparison easily gives them away as imposters.

Ask WOOD

Answers to your questions from letters, e-mails, and WOOD Online®

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Solving solvent uncertainty

Q: What is the difference between mineral spirits, paint thinner, and turpentine? Can they be used interchangeably for cleaning brushes or thinning oil-based finishes?

—Ty Evans, Shepherdstown, W. Va.

A: The least expensive of the three, paint thinner is often made from reclaimed mineral spirits, Ty, so trace impurities prevent the manufacturer from labeling it purely as mineral spirits. But you'll notice little difference in the way they perform. Because of the strong odor of both, you may prefer to pay a little extra for odorless mineral spirits, which has had some of the smellier parts chemically extracted. This weakens it slightly as a solvent.

Derived from the sap of pine trees, turpentine has a noticeably stronger "piney" smell than mineral spirits or paint thinner and is the stronger solvent for cleaning brushes. It also evaporates faster in thinned finishes, leaving less "open" time before the finish turns tacky. But it can be used in place of mineral spirits or paint thinner with no other noticeable difference.

Varying slightly in cleaning power, drying time, and price, the most dramatic difference you'll notice in these common solvent/thinners is the strength of their odor.

Make mine metric

Q: After fumbling with fractions on a recent project, I'm ready to make the leap to the metric system. My planer and tablesaw have dual scales and I already own small metric rules and calipers. What challenges will I need to overcome to make the switch?

—Charles Jackson, Montgomery, Ala.

A: It sounds like you nearly have the tools covered, Charles. For those remaining stationary tools that aren't metric-ready, buy and apply metric- or dual-scale stick-on tapes. Benchtop and portable tools may still require a conversion calculation, but the blades and bits you already own are probably close enough to a metric standard to make little difference.

The rest depends on your woodworking style. Do you design and build projects on the fly? If so, then you'll have few problems using metric through the entire process. The most difficult challenge will be your own long-ingrained sense of measurement: A ceiling is about 8' high, a desk is about 30" tall, but how high is that in centimeters?

On the other hand, if you're the type of woodworker who works from someone else's plans, you could be in for a lot of time with a calculator converting imperial to metric then double-checking part and sub-assembly dimensions to eliminate the possibility of cumulative errors. It might not be worth the hassle.

Of course you can avoid much of the hassle of conversion by using a method older than either system: Measure as little as possible. Instead use one part to mark another, building your project piece by piece.

For a free, printable imperial-to-metric conversion chart visit **woodmagazine.com/metric.**

Some European manufacturers, such as Festool, sell tools scaled for metric woodworking. For those that don't, gear up with a construction calculator, digital calipers, and a dual-scale tape measure.

continued on page 72

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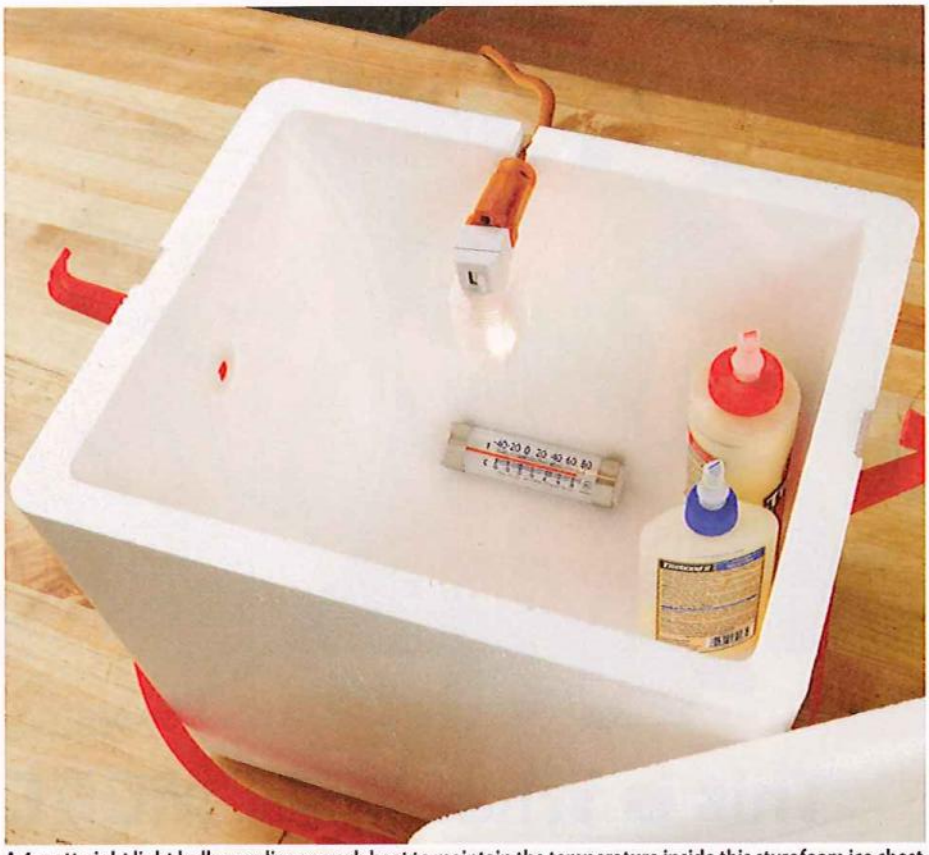
Ask WOOD

A cooler way to keep glue warm

Because I heat my shop with a wood stove, the temperature drops quickly when I'm not woodworking. How can I keep my glue from freezing during these times?

—John Griffin, Brighton, Ont.

John, we slapped together a glue warmer for less than 15 bucks with parts from a hardware store. Our shopping list: One styrofoam ice chest (or bait bucket), one night light, one thermometer. Cut a slot in the ice chest to accommodate an extension cord, plug the night light in so it dangles near the lid, and set the thermometer inside. Before trusting it with your glues, let the chest sit for a few hours in the cold shop, noting the temperature at regular intervals. If the temperature exceeds 70° F, punch holes in the lid until the temp stays between 55° and 70°. Then store your glue bottles in the ice chest.



A 4-watt night light bulb supplies enough heat to maintain the temperature inside this styrofoam ice chest at about 70° F in 36° F weather. Upgrade to a 7-watt bulb if more heat is requred.

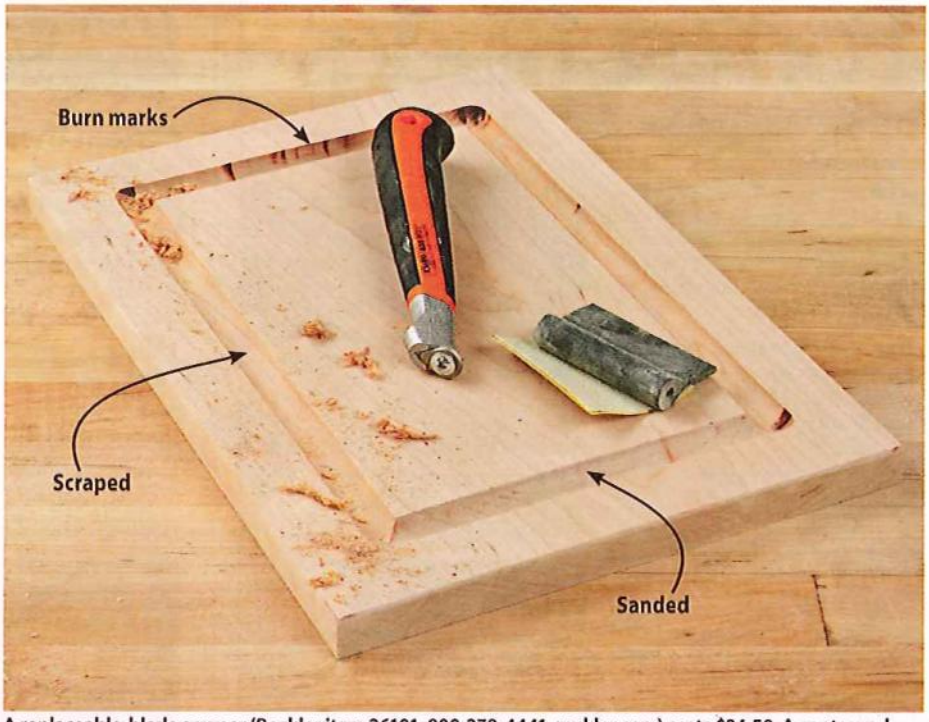
Groovy burn-mark removal

Q **While routing a juice groove into a cutting board with a core-box bit, I made some serious burn marks. Without fouling up the half-round shape of the groove, how can I fix it, and how do I prevent burning in the future?**

—Henry Whitbeck, Chicago

A The first and fastest method, Henry, is to set the bit a hair deeper and re-rout the contours. Because it doesn't have to hog away as much material, the second pass has less tendency to burn. If you still see burn marks, sand or scrape them away using a contoured scraper or sanding pad like the ones shown at right. The scraper comes with interchangeable blades that fit into contours and corners and remove material quickly for serious burn marks. Depending on the wood, end grain may require a follow-up with some sandpaper.

For a contoured sanding pad, wrap sandpaper around the contour and grip it while you sand. Sand with 120 grit until the marks mostly fade; then follow up with 180 and 220 grit.



A replaceable-blade scraper (Rockler item 26101, 800-279-4441, rockler.com) costs $24.50. A contoured sanding pad set (Woodcraft item 145961, 800-225-1153, woodcraft.com) will set you back $11.

To avoid future burn marks, make sure you use clean, sharp bits. If you have a variable-speed router, decrease the revolutions per minute (rpm) and increase your feed rate slightly. Finally, practice the cut on scrap first, working to eliminate any pauses.

continued on page 74

Ask WOOD

Flatten the edge of a curved piece

I'm just getting started in cold-bent lamination, and I may have bitten off more than I can chew. After epoxying a curved part nearly 8' long, I'm stuck wondering how to straighten the messy sides.

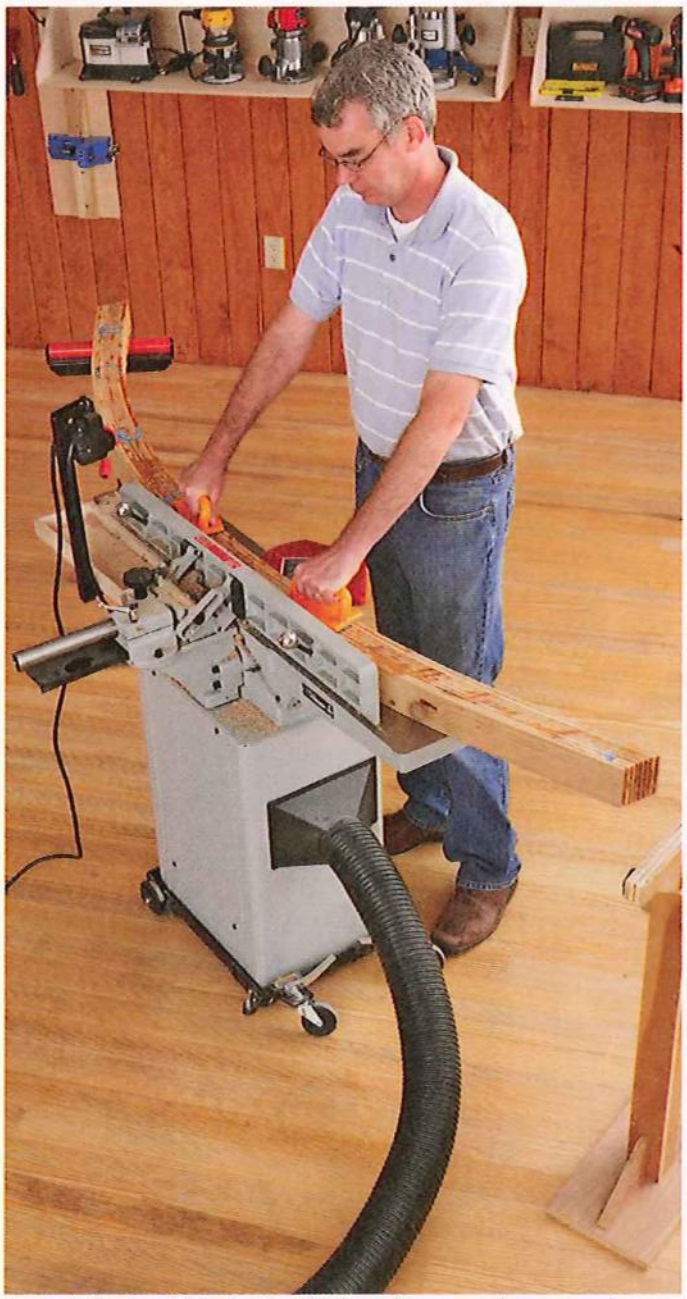
—Jacob Copley, Fort Lauderdale, Fla.

Q

A

You can flatten the edges of bent laminations much like you would straight pieces, Jacob: on your jointer. First, chisel away as much of the excess epoxy as possible. Set up infeed and outfeed supports if necessary. Then, use push pads, held firmly, to guide the piece across the jointer knives.

Once you've flattened one edge, simply run the piece through the planer to parallel the opposite edge.



Strategically placed infeed and outfeed stands support a large, curved workpiece with an awkwardly located center of gravity.

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84577652

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4 PIECE WOOD CHISEL SET

LOT NO. 42429/69471

1/4" 1/2" 3/4" 1"

SAVE 43% $4.49

REG. PRICE $7.99

Item 42429 shown

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PITTSBURGH

12" RATCHET BAR CLAMP/SPREADER

LOT NO. 46807/68975/69221

Item 46807 shown

SAVE 63% $1.99

REG. PRICE $5.49

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68159846

SUPER COUPON!

PITTSBURGH

24" CLAMP AND CUT EDGE GUIDE

LOT NO. 66126

SAVE 46% $6.99

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57949216

SUPER COUPON!

29 PIECE TITANIUM NITRIDE COATED DRILL BIT SET

LOT NO. 5889

drill master

SAVE 60% $9.99 REG. PRICE $24.99

HARBOR FREIGHT TOOLS - LIMIT 7 This valuable coupon is good anywhere you shop Harbor Freight Tools (retail stores, online, or 800 number). Cannot be used with any other discount or coupon. Coupon not valid on prior purchases after 30 days from original purchase date with receipt. Offer good while supplies last. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in-store, or with your order form, or entered online in order to receive the coupon discount. Valid through 9/9/12. Limit one coupon per customer and one coupon per day.

60165766

SUPER COUPON!

ALUMINUM OXIDE SANDING SPONGES - PACK OF 10

Lifetime CARBIDE

COARSE LOT NO. 46751

MEDIUM LOT NO. 46752

FINE LOT NO. 46753

YOUR CHOICE! $2.49 REG. PRICE $5.99

SAVE 58%

HARBOR FREIGHT TOOLS - LIMIT 6 This valuable coupon is good anywhere you shop Harbor Freight Tools (retail stores, online, or 800 number). Cannot be used with any other discount or coupon. Coupon not valid on prior purchases after 30 days from original purchase date with receipt. Offer good while supplies last. Coupon cannot be bought, sold, or transferred. Original coupon must be presented in-store, or with your order form, or entered online in order to receive the coupon discount. Valid through 9/9/12. Limit one coupon per customer and one coupon per day.

82008676

SUPER COUPON!

CENTRALPNEUMATIC

18 GAUGE 2-IN-1 NAILER/STAPLER

LOT NO. 68019

SAVE 46% $15.99 REG. PRICE $29.99

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83622462

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CHICAGO ELECTRIC POWER TOOLS

OSCILLATING MULTIFUNCTION POWER TOOL

LOT NO. 68861/68303

8 Functions: Sanding, Cut Flooring, Cut Metal, Scrape Concrete, Remove Grout, Cut Plastic, Scrape Flooring, Plunge Cut

Item 68861 shown

SAVE 68% $18.99 REG. PRICE $59.99

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86737102

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CENTRALPNEUMATIC

3 GALLON, 100 PSI OILLESS PANCAKE AIR COMPRESSOR

LOT NO. 95275

SAVE 50% $39.99 REG. PRICE $79.99

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83675536

SUPER COUPON!

CENTRAL MACHINERY

LOT NO. 97869

2 HP INDUSTRIAL, 5 MICRON DUST COLLECTOR

$149.99 REG. PRICE $249.99

SAVE $100

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65749597

SUPER COUPON!

12" SLIDING COMPOUND MITER SAW WITH LASER GUIDE

CHICAGO ELECTRIC POWER TOOLS

LOT NO. 98194

SAVE $80

SAW BLADE INCLUDED

$119.99 REG. PRICE $199.99

Laser requires two AAA batteries (included).

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76805027

SUPER COUPON!

EIGHT DRAWER WOOD TOOL CHEST

WINDSOR DESIGN

LOT NO. 94538

SAVE $40

Tools sold separately.

$59.99 REG. PRICE $99.99

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Shop-Proven Products

These woodworking wares passed our shop trials

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.

Hollow victory: Turning without twisting

Turning hollow vessels typically requires a lot of brute strength to prevent the round-shank tools from twisting as the tip digs into the spinning wood. Carter's Hollow Roller System prevents that by trapping the included flat-bottom tool bar between steel rollers. As a result, I can better focus on shaping the vessel, not fighting the tool.

The Hollow Roller unit consists of the three basic components shown in the photo at *right*: tool rest, torque arrestor, and the tool bar with cutting tip. The tool bar comes with a replaceable high-speed-steel fingernail cutting tip, but you can buy an optional round carbide tip for $70. Carter also plans to add an S-shaped tool bar to this system, allowing you to make smaller access holes and wider, deeper vessels.

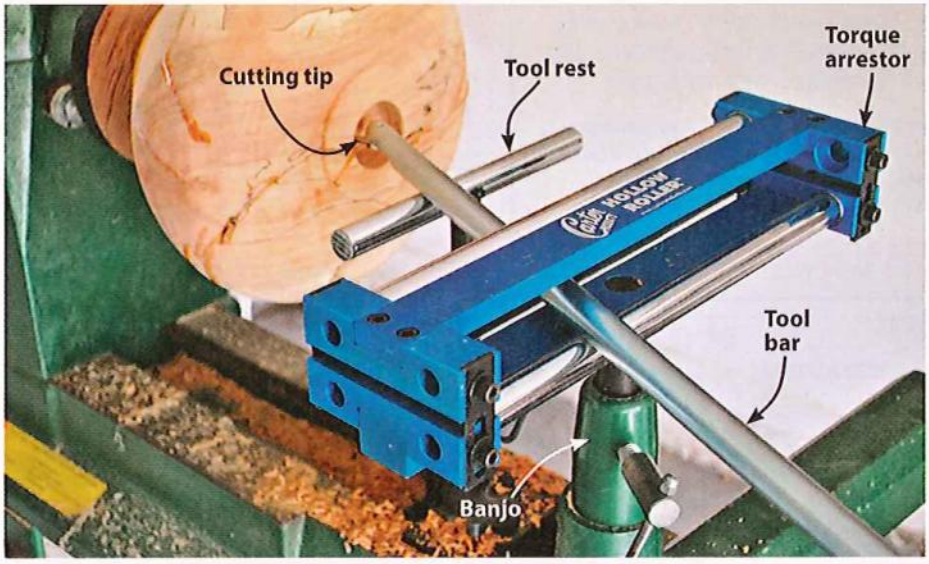
To test the system, I shaped the outside of the vessel with my normal tool rest and lathe tools, then installed the Hollow Roller. I inserted the tool bar between the rollers so it slid forward and back smoothly, and then secured it. I repositioned the banjo as needed to get the best cutting angle. It works great!

—Tested by Marlen Kemmet, Managing Editor

Hollow Roller Vessel Turning System, #HR1000

Performance	★★★★★
Price	$359

Carter Products Co.
888-622-7837;
carterproducts.com



Two-wheeler marks layout lines twice as fast

I often use a marking gauge to lay out joints on stock, so it had better be accurate and cut cleanly. The Veritas Dual Marking Gauge does that with a bonus: It marks two dimensions at the same time.

With a pair of solid steel rods that glide smoothly and lock securely to the gauge head, I quickly and easily mark both edges of a mortise or tenon with one pass. And the cutting-wheel bevels point in opposite directions, so you can set each to cut its bevel on the waste side of the workpiece. Another feature I like: The cutters retract into the head to protect them in storage and for times when I need to mark with just one wheel.

—Tested by John Olson, an expert on hand tools and a contributing project designer and builder

Dual Marking Gauge, #05N70.01

Performance	★★★★★
Price	$59

Veritas/Lee Valley
800-871-8158; leevalley.com

Kreg broadens pocket-hole capability by narrowing it

I've been using a Kreg pocket-hole jig in my shop for years and love it for making quick-and-easy joints. But for face frames less than 1¼"-wide, I could fit only one pocket hole and screw into each joint—not stable enough for my liking. Kreg's Micro Pocket Drill Guide solves that problem by replacing the standard drilling guide with a removable guide for drilling smaller holes.

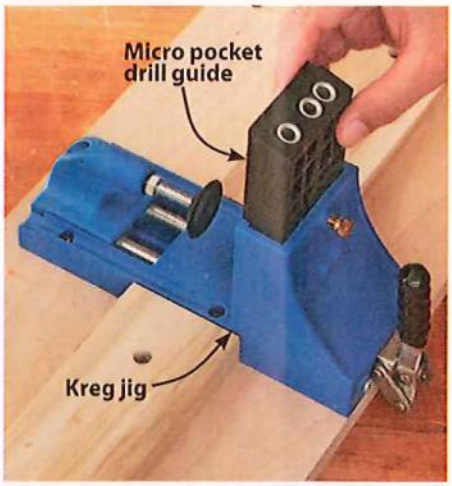
The Micro's stepped drill bit bores holes 25 percent smaller than standard pocket holes. This guide won't replace your standard Kreg pocket-hole guide, but it does complement it nicely. Because it requires smaller screws—available from Kreg—I found it best suited for ½"-thick stock. These small screws just don't hold a joint in thicker stock as well as the standard screws.

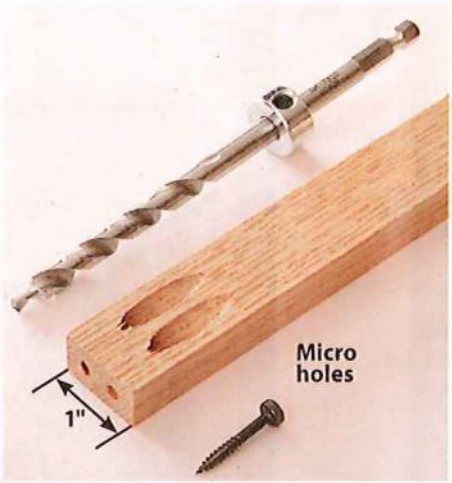
—Tested by Randy Zimmerman, a cabinet- and furnituremaker

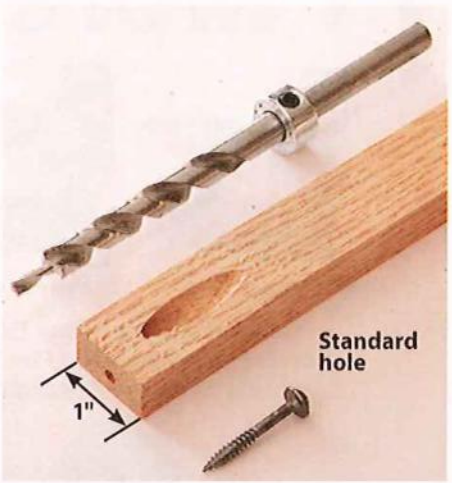
Micro Pocket Drill Guide, #KJMICRODGB

Performance	★★★★☆
Price	$50

Kreg Tool Co.
800-447-8638; kregtool.com







continued on page 78

Shop Proven Products

Push pads that don't slip

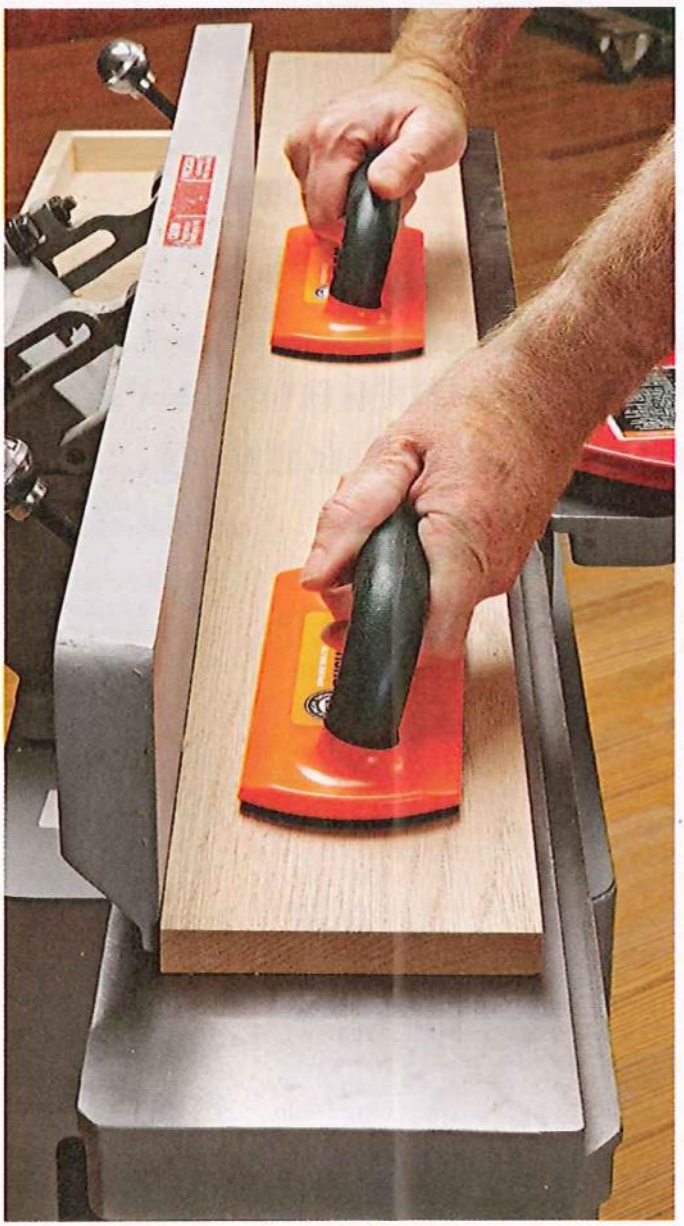
The rubber gripping surface of jointer and router-table push pads inevitably gathers dust and loses its grip. But the rubber pads on Bench Dog Push-Blocs somehow defy dust and don't lose their traction. And I like the thick handles, canted at an angle for a sure and comfortable hold.

—Tested by Bob Hunter, Tools Editor

Bench Dog Ultra Push-Bloc, #42790

Performance	★★★★★
Price	$10 each

Rockler Woodworking & Hardware
800-279-4441;
rockler.com



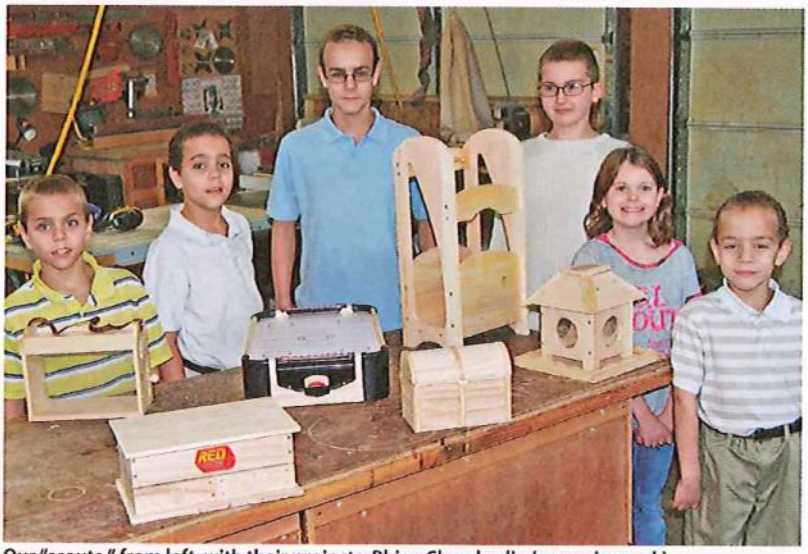
Kits for kids build interest in woodworking

Where will future woodworkers come from? Hopefully, ready-to-build project kits from Red Toolbox will spark a woodworking passion in adolescents. These kits come with wood parts milled to thickness and width, with some pieces needing to be cut to length. The kits also include all hardware.

To test them, I lined up six kids, each an active member of a local Scout troop, and worked with them to build age-appropriate projects. (The more than three dozen project kits are rated at two levels of difficulty.) They also used the Red Toolbox tools (hammer, coping saw, cordless drill, file, screwdrivers)—sold separately. Compared to the tools in my shop, these seem toyish, but are just right for young woodworkers.

As for the projects, most of my "testers" completed their kit in a few hours; a couple needed a second day to allow glue to dry before moving to the next step. With a few exceptions for crosscutting and shaping, the parts are ready to assemble. The youngsters had to drill screw holes where marked, an easy task using the included bit. However, some kits come with screws too small for the included bit, so I had to substitute larger screws; do a test fit in scrap. And some of the directions proved difficult for them to follow, so be sure to work closely with your young craftsmen.

—Tested by Steve Feeney, a woodworker with 26 years experience and a WOOD® magazine tester for 6 years



Our "scouts," from left, with their projects: Rhian Chamberlin (magazine rack), Ethan Chamberlin (keepsake box), Damian Chamberlin (air-hockey table), Carl Carr (bird feeder), Katie Carr (treasure chest), and Anakin Chamberlin (bug barn).

Woodworking project kits

Performance	★★★★☆
Price	$7–25 each Tool kits $20–30 each

Red Toolbox
red-toolbox.com
(Available at Lowe's)

WOODWorkersCenter.com

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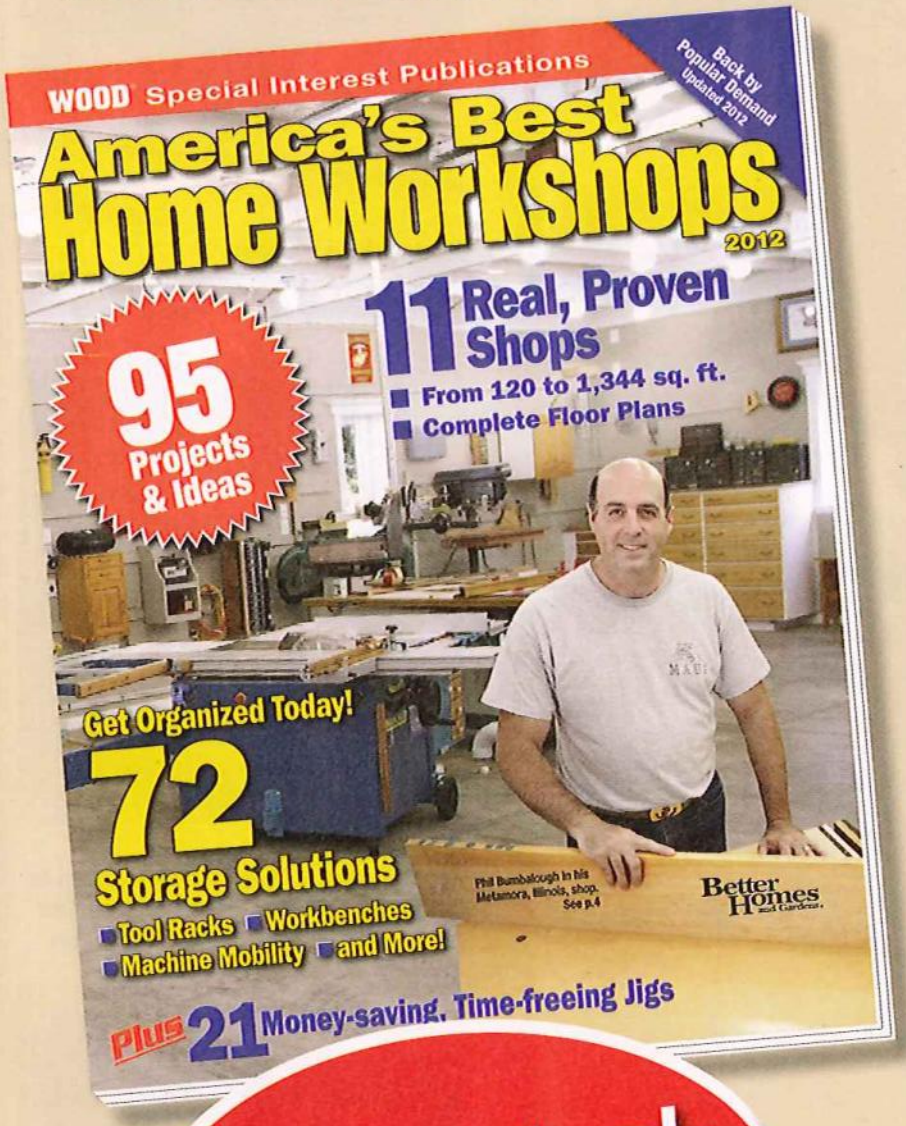


On newsstands May 22nd!

112 pages of shop-proven projects, tips, and organizers.

AD#WD0712

What's Ahead

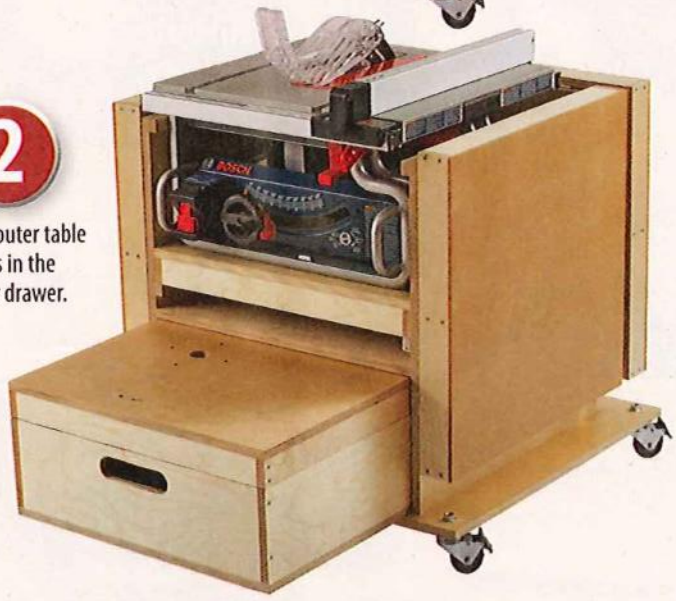
A sneak peek inside the September issue (on sale July 3)

Space-saving work station

Switch between a tablesaw and router table in no time using this mobile stand. It's a piece of cake to make.

1

Flip up all three wings for full workpiece support.

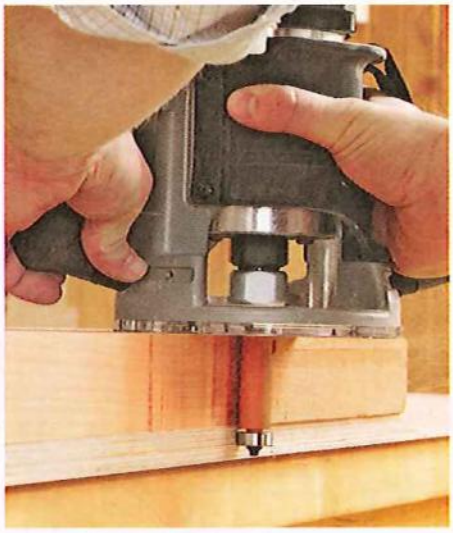


2

The router table stores in the lower drawer.

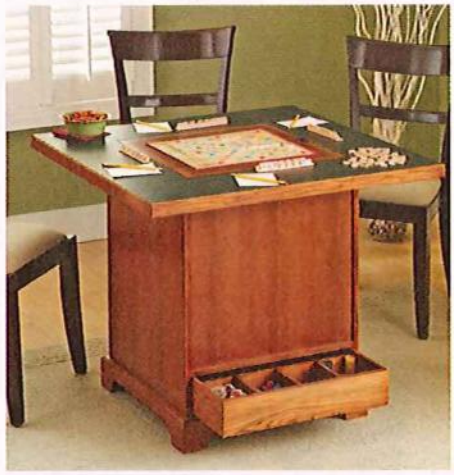
3

Voilà!
A router table with fence.



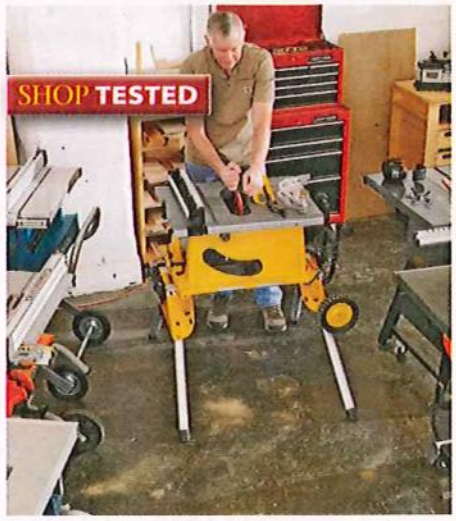
Joint without a jointer

Use these five tricks to get flat boards and straight, square edges using tools other than a jointer.



Ultimate game table

With self-storing, interchangeable tabletop inserts for various playing boards and drawers that corral game pieces, you'll never lack for at-the-ready family fun.



Tablesaws from $500 to $650

Looking for your first can-do-anything workshop tablesaw? We test seven models that'll do the job.

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