

WOODCRAFT

Projects, Techniques, and Products

magazine

Make A Grand Entrance

Garden Arbor & Gate

p.22

Full-sized patterns inside!

EASY SPRING PROJECTS



- *The One-Day Two-Part Chair*
- *Fisherman's Rod & Reel Stand*
- *Power-Carved Fish Plaque*

WORKSHOP PROJECTS

12 Jigs & Organizers

WOOD vs. WILD

p.36

Your guide for building outdoor projects that last!



Vol. 4 / No. 22

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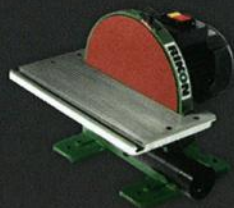
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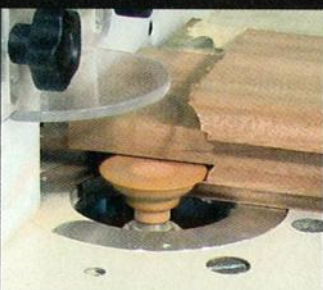
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Step 1. Cut the tenon in the rails.



Step 2. Cut the groove and door profile in all the pieces.



Step 3. Undercut the tenons to cope the ends of the rails.



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Alan Turner and Mario Rodriguez designed and built our arbor and gate using western red cedar, epoxy, and solid color stain. Photo by Mario Rodriguez.

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clamps

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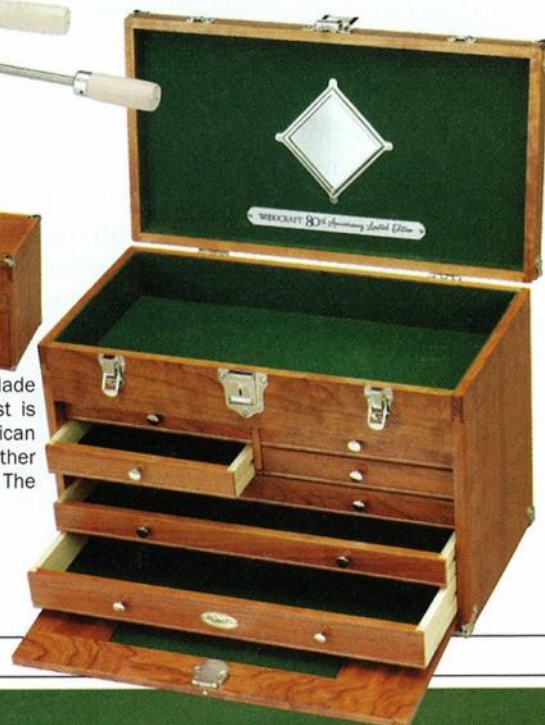
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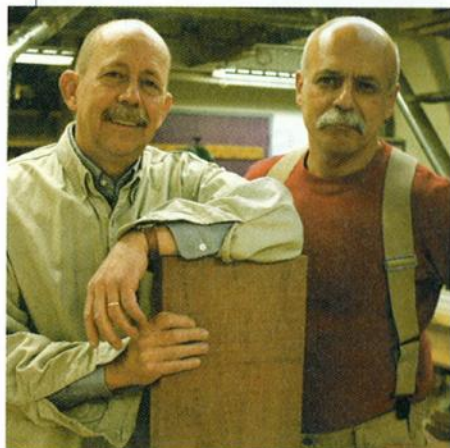
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CUTTING IN

THE STORY BEHIND OUR CRAFTSMEN DESIGNERS



You may have wondered how we come up with the top-notch project designs seen in every issue of the new and improved *Woodcraft Magazine*—designs like the arbor and gate on page 22, the step-back cupboard and heart music box (Feb/Mar issue), the mission coffee and end tables (Dec /Jan 2008 issue), and the quilt stand and flat-panel TV entertainment center (Oct/Nov 2007 issue). The short answer: “It ain’t easy.”



Alan Turner and Mario Rodriguez

The long answer: we span the globe (OK, just North America) seeking established craftsmen who have a strong design sense and know how to create projects that are buildable, affordable, and have the “it” factor—that all-important aesthetic quality that causes woodworkers to pause and say “cool” and “I like it.” And based on our positive reader feedback so far, something seems to be working ... big time!

Take, for example, seasoned craftsmen designers Alan Turner and Mario Rodriguez who team-designed and built the arbor and gate. The two men bring nearly 80 years of combined woodworking experience to the table.

Other seasoned woodworkers in our pages are established furniture makers Iowan Ben Svec (entertainment center) and West Virginian Jim Probst (the mission tables) whose combined woodworking experience exceeds 60 years. Then there’s Ohioan Steve Rigrish (step-back cupboard), a newcomer whose considerable talent was honed at several woodworking schools. Despite their differences, our contributors share a passion for woodworking and a desire to pass it on to you.

In short, we’ll go where we must to get the best project designs into your hands—tapping the vast, diverse reservoir of woodworkers whose shops sit among farm fields, in mountain hollows, or along city streets across America and reveal their special approaches to woodworking, their tips and tricks, and their contributions to a very rich tradition. So if you’ve enjoyed what we’ve offered so far, you’re going to love what’s down the road ... literally. I promise.

Jim Harrold

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April/May 2008
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NEWS & VIEWS

By Sharon Hambrick

Heirloom Quilt Stand Ends Reader's Search

FOR TWO YEARS Emlyn Jones, who works part-time at the Downingtown, Pennsylvania, Woodcraft store, searched for a quilt stand design that would meet the needs of his neighbor.

"I was unable to find one that she or I liked until I saw the 'Heirloom Quilt Stand' in the Oct/Nov 07 *Woodcraft Magazine*," Jones explained. "It was the perfect size; and, with the shorter base behind the rear legs, it would fit perfectly against the foot of the bed."

"The project was a joy to build, and the patterns, cut list and clear instructions made it easy to modify the project to meet my needs," Jones said. He modified the building process by using alternate joinery. "I decided to eliminate the lap joints and dowels in favor of using Festool's Domino to produce mortise-and-tenon joints."

To finish the stand so that it matched his neighbor's bedroom furniture, Jones used TransTint's Golden Brown Dye, General Finishes' American Oak Wipe-on Gel Stain, and five coats of Zinsser's Clear Shellac.



EMLYN JONES USED mortise-and-tenon joinery (see closeup right) for his version of Woodcraft Magazine's Heirloom Quilt Stand.



Project Updates

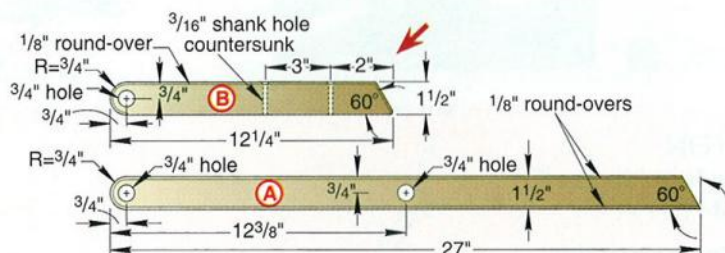
Arts & Crafts Shelf Clock

Feb/March 08 issue, page 62, "Make the back and trim the columns" section, Step 4: The revised instruction should read, "Cut the columns (A) to the exact length of the back (G) minus the tenons and the thickness of two 1/4" spacers. To do this, lay a column on the back as shown in **Photo D**, placing a couple of 1/4"-thick spacers to flush the end of the column to the shoulder cut of the tenon. Now you can accurately mark the opposite end. Use a stopblock setup at your mitersaw to ensure that all of the columns are identical in length. Finish-sand the columns and back."

Submit Your Ideas, Comments

The staff of *Woodcraft Magazine* is eager to hear about your experiences when making projects, trying techniques, and using products from our pages. Do you have a different spin on a project of ours you built or a better way to do a woodworking task? Or do you know of an event of interest to woodworkers? Let us know by writing or emailing:

News & Views
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Editor@WoodcraftMagazine.com



On-Demand Folding Table

Dec 07/Jan 08 issue, page 10: Note the revised locations of the 3/16" shank holes for the cleats (B) in **Figure 1**. The 2" measurement should be taken from the toe not the heel where shown at left.

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Shorter Open Time	✓	✓
Doesn't Stain Skin	✓	✓
Bonds Most Materials	✓	
Bonds Oily / Exotic Woods	✓	
Lower Cost – Better Value	✓	
Longer Usable Shelf Life	✓	

Woodworking Handbook 2007

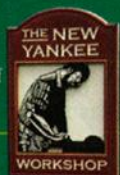


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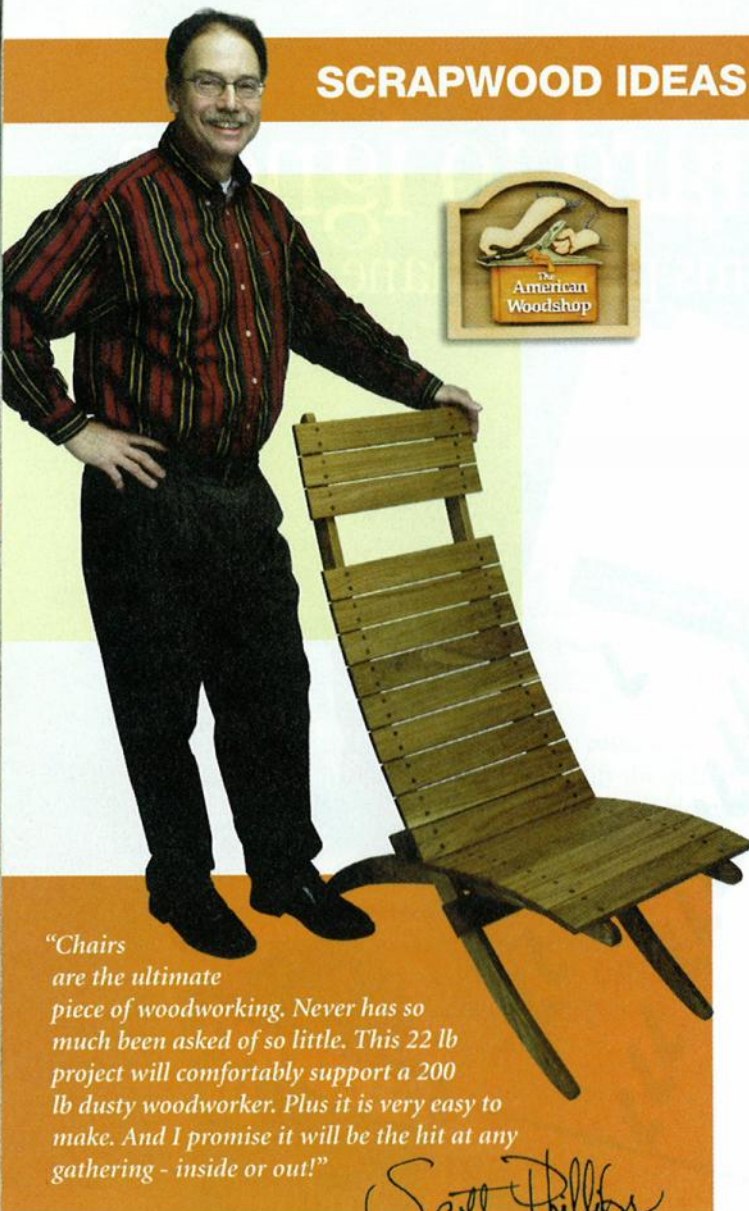
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"Chairs are the ultimate piece of woodworking. Never has so much been asked of so little. This 22 lb project will comfortably support a 200 lb dusty woodworker. Plus it is very easy to make. And I promise it will be the hit at any gathering - inside or out!"

Scott Phillips

Start with the seat/leg and back/leg rails

1 Make a $\frac{3}{4}$ x 1 x 66" trammel from scrap. Drill two $\frac{5}{32}$ " nail holes at one end, one at 60" from the opposite end, and the second at 62". Now, make copies of the **Top End** and **Bottom End** full-sized patterns on page 78 for the back/leg rail (A) and seat/leg rail (B) templates.

2 Next, use the trammel, nail, $\frac{1}{4}$ "-thick spacer, and pencil to scribe a pair of parallel arcs on $\frac{1}{4}$ " hardboard or plywood for the back/leg rail template. Mark the ends of the template using the dimensions in the **Figure 1**. Now, spray-adhere the appropriate patterns on the ends of the arc where shown in the **Figure 1**. Bandsaw or jigsaw just

Easy to build and store CROSS-BRACE CHAIR

By Scott Phillips and Jim Harrold

Two simple subassemblies, made from strong, rot-resistant white oak, add up to one comfortable seat that you can use indoors or out. For easy storage, simply slide out the seat/leg subassembly from the back/leg subassembly and slip it between the back rails of the back/leg subassembly. Make the two hardboard templates first, and employ them to build as many chairs as you like.

Scott Phillips of the PBS show *The American Woodshop* provided this clever design. He fastened the slats by drilling counterbored holes and driving #8 x $1\frac{1}{4}$ " self-tapping, washerhead outdoor screws by Kreg. (See the **Convenience-Plus Buying Guide**.)

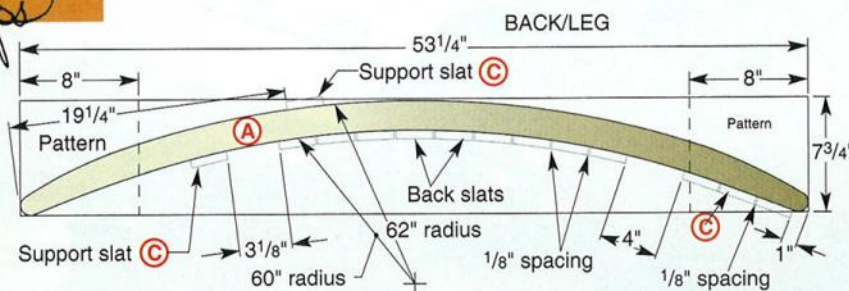
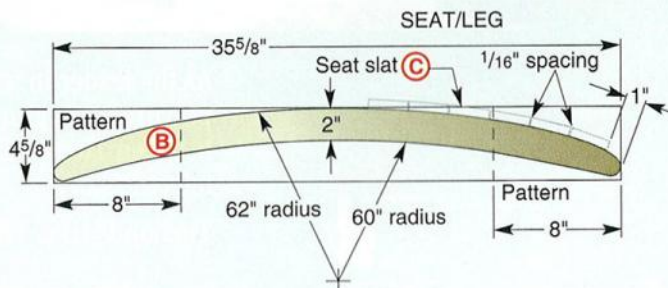
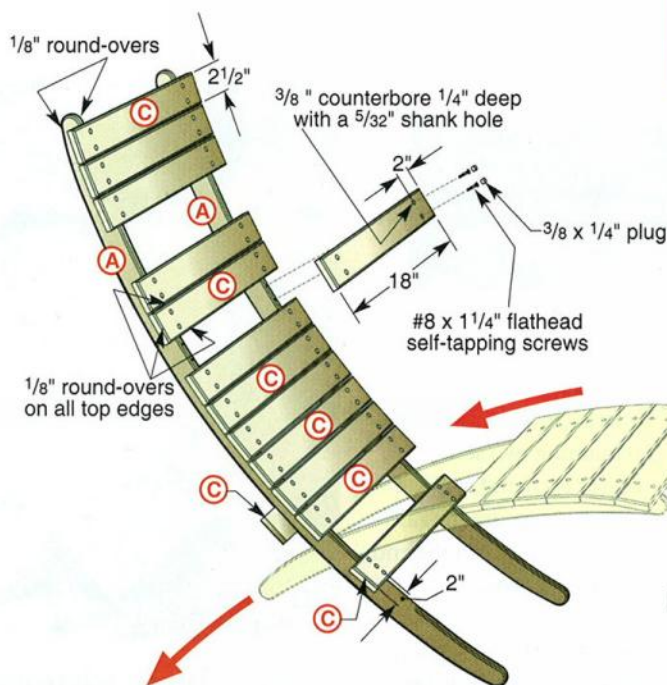


Fig. 1





Hole location detail

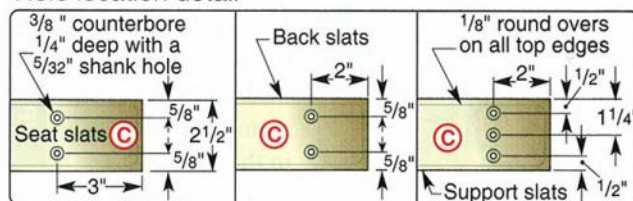


Fig. 2

outside the cut line to form the template for the back/leg rail parts (A). Follow the same process to scribe and cut out the shorter template for the seat/leg parts (B) as shown in **Photo**

A. Sand the two templates to the line using a spindle sander for the concave curves and a disk or belt sander for the convex curves.

3 Cut two pieces of 8"-wide 4/4 white oak to 60". Joint and plane the stock to 7/8" thick. Adhere the pieces together with double-faced tape. Apply the back/leg pattern along one edge of the stack and scribe around it with a pencil. Now, bandsaw (or jigsaw) the back/leg pieces to shape, cutting just outside the line. Apply the seat/leg pattern to the waste from the first cut, and bandsaw the seat/leg pieces to shape as shown in **Photo B.**

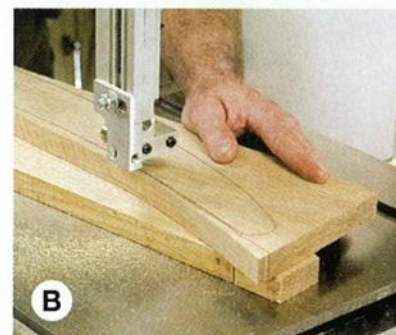
4 Using a spindle and stationary disc or belt sander, sand the

5 Rout a 1/8" round-over on the back/leg (A) and seat/leg (B) parts and set them aside.

Form the slats

1 Referring to the **Cutting Diagram** and **Cut List**, plane then rip enough stock to make at least 22 5/16"-thick slats. (If you have enough extra material, consider milling a few spare slats.)

2 Use a 1/8" roundover bit to break the sharp edges on the top faces of all 22 slats, as shown in **Photo C.**



By tacking the seat/leg to the back/leg with double-faced tape, you can bandsaw both parts at the same time.



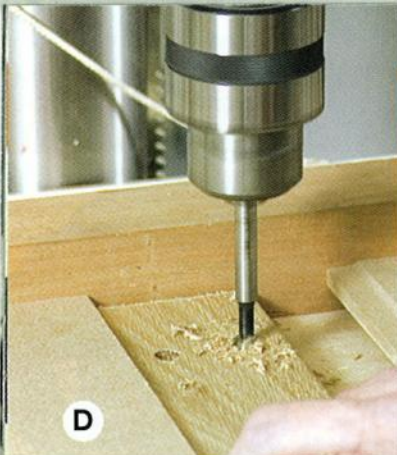
3 Chuck a 3/8" Forstner bit in your drill press, adjust the fence 3" from the bit's center, and set up a pair of stopblocks to locate the holes 5/8" in from each edge.

Use push pads when routing the top faces of the slats to keep your fingers clear of the bit. Rout the ends, then the edges, to control bit-caused splintering.

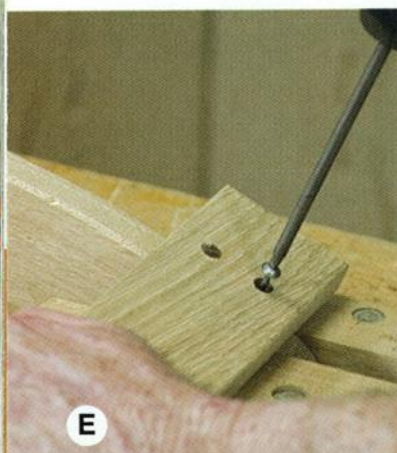
Secure the pivoting end of the trammel with a nail. Hold a pencil at the opposite end and scribe one of two arcs for the template. Use the second nail hole to scribe the remaining arc.

patterned parts to the line, removing saw marks and any unevenness. Separate the parts and label the bottom ends and top ends of each pair.

SCRAPWOOD IDEAS



D Set stop blocks against your drill press fence to speed through the drilling sequence for each slat set.



E Center the pilot holes in the seat rail and drive the first screw.



F Place the outside edge of the first slat on the 1" mark and use a square to ensure that it's perpendicular to the rail.

Lock in the $\frac{3}{8}$ " bit depth, and drill a pair of counterbored holes in the top face of slat as shown

in **Photo D**. Flip the slat around and drill a pair of counterbores at the opposite end. Drill the six seat slats in this manner. Change to a $\frac{5}{32}$ " bit and drill pilot holes in the center of the counterbores.

4 Adjust the fence depth to 2", and drill counterbores and pilot holes in the 12 back slats. Next, drill three counterbores and pilot holes at each end in the remaining two support slats, spacing them evenly.

Make a pair of subassemblies

1 From your slat scrap, rip $\frac{1}{16}$ "- and $\frac{1}{8}$ "-thick strips to help with slat spacing. Finish-sand all of the parts to 220 grit. Now mark 1" in from the top end of the seat/leg rails (B). Place the first seat slat (C) on the rails at the marks (see the **Tip Alert**), center the pilot holes of one end over the convex edge of a seat/leg rail ($2\frac{1}{16}$ " in from outside rail face to slat end), and drive a self-tapping screw (see the **Buying Guide**) through the slat and into the rail as shown in **Photo E**. (See **Figures 1** and **2** for additional spacing information.)

2 Square the unscrewed end of seat slat (C) on the opposite seat/leg rail 1" in from the rail's edge, centering the pilot

TIP ALERT

When working with curved parts on a benchtop, such as the rails in this project, secure and stabilize them with handscrews.

holes over the rail as shown in **Photo F**. Drive a screw in here. Drive the remaining two screws, one at each end, using a square to ensure the rails remain $2\frac{1}{16}$ " from the end of the seat slats.

3 Place the $\frac{1}{16}$ " spacer along the first seat slat as shown in **Photo G**, add the second seat slat, flushing the ends, and screw it in place. Add the remaining four seat slats the same way.

4 Mark 1" in from the top end of the back/leg rails (A). Center the pilot holes of one back slat on the *concave* edge one back/leg rail ($1\frac{1}{16}$ " from outside rail face to slat end) and drive the first screw. Locate and square the slat onto the other back/leg rail, driving the remaining screws. Using the $\frac{1}{8}$ "-thick spacer, and flushing the back slat ends, fasten two more slats in place for the headrest.

5 Measure 4" from the last headrest slat and mark on both back/leg rails. Fasten nine back slats beginning at this location, using the $\frac{1}{8}$ " spacer between slats, ensuring the ends remain flush.

6 Measure $3\frac{3}{8}$ " down from the last back slat, mark, and fasten a front support slat, using three evenly spaced screws at each end (see **Figure 2**). Measure $19\frac{1}{4}$ " up from the bottom end of the back/leg rails and mark the convex edge. Secure the back support slat with screws.

7 Dab an exterior grade woodworking glue (we used Titebond III) in the counterbore recesses. Then aligning their grain with the surrounding wood, use a mallet to drive in wooden plugs (we used walnut) to hide the screw heads. After the glue dries, sand the plugs flush with a random-orbit sander.



G Simplify slat assembly by using a $\frac{1}{16}$ " spacer strip for the seat/leg and a $\frac{1}{8}$ " strip for the back/leg.

TIP ALERT

Choose face-grain plugs for outdoor projects to reduce severe swelling and shrinking, which could cause the edge-grain plugs to pop loose.

8 Finish the cross-brace chair with three coats of oil (we used General Finishes Outdoor Oil), sanding lightly between coats. (If you feel the need to rejuvenate the finish a few

years from now, simply scuff sand the project with 220-grit sandpaper and apply a fresh coat of oil.) Once the finish dries, fit the two parts together and have a seat. 🌳

Cut List	Thickness	Width	Length	Qty.	Mat'l
A* Back/leg rail	7/8"	2"	53 1/4"	2	WO
B* Seat/leg rail	7/8"	2"	35 1/2"	2	WO
C Back, seat, and support slats	1/2"	2 1/2"	18"	20	WO

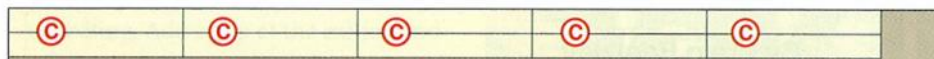
*Indicates the part was initially cut larger; see the instructions for further details.

WO = White Oak

Cutting Diagram



5/4 x 7 3/4 x 60" White oak (2 boards)



4/4 x 5 1/2 x 96" White oak (2 boards)

convenience**PLUS**

BUYING GUIDE

	WOODCRAFT #	PRICE
☐ 1. 3/8" Forstner Bit	12E32	\$12.50
☐ 2. Kreg #8 x 1 1/4" Coarse, Weather-Resistant, Self-tapping Screws	148478	\$6.99/box (100 screws)
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Rabbets, Dadoes, and Grooves

USE YOUR ROUTER TO MASTER THE BUILDING BLOCKS OF BASIC JOINERY

By Craig Bentzley

RABBETS, DADOES, AND GROOVES ARE ESSENTIAL JOINTS, used in most furniture and cabinet projects. They also rank among the easiest joints to make provided you have the right tools. So, if you're fairly new to woodworking, or you need to brush up on your skills, here's your chance to master these three "building block" joints and achieve cleaner, more accurate cuts every time.

Though other tools can fashion rabbets, dadoes, and grooves (see "Router or Table Saw: Which Is

Better?" on page 15), you'll discover that the router is the most efficient and least expensive way to get started. While a hand-held router excels in some cases, a table-mounted router may have the edge in others, providing more accuracy, stability, and safety. We'll cover both approaches. After the dust settles, you'll have the confidence you need to machine dead-on, snug-fitting joints for any number of project assignments.

RIGHT-ON RABBETS

A RABBIT IS A TWO-SIDED, OPEN-ENDED RECESS that runs along the edge or end of a board as shown in **Figure 1**. Typically, you'd size the rabbit to accommodate the thickness of mating shelves, cabinet backs, and glass in a picture frame or door. You'll also find them in shiplapped backboards and overlapping cabinet doors. Occasionally, you'll even see them in the construction of utility drawers.

In addition to speedy machining and assembly, a rabbit joint offers several advantages over a butt joint. First, it enables mating parts to align

easily and accurately. Second, it creates more gluing surface, providing greater load-bearing capability than a butt joint. That said, glued rabbit joints offer little in the way of strength and usually need to be reinforced with nails or screws. As a rule of thumb, never exceed two-thirds of the stock thickness when determining a rabbit's depth.

RABBETS WITH A HAND-HELD ROUTER

A hand-held router provides the most common way to cut rabbets. For

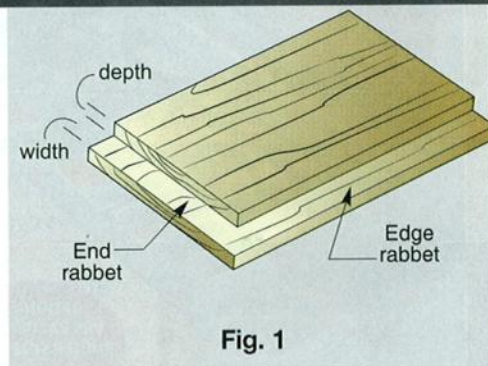
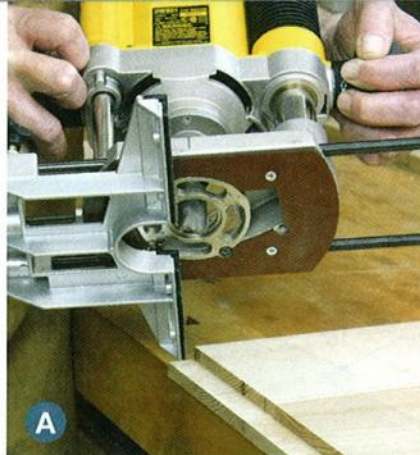


Fig. 1

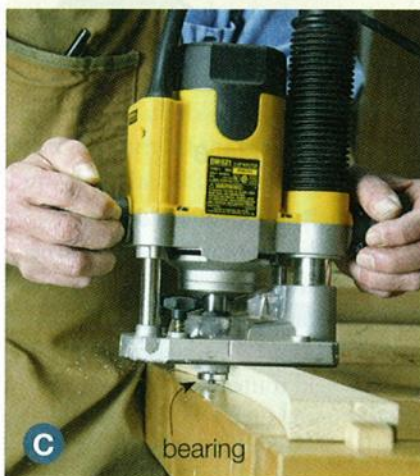
smaller rabbets having widths and depths that match up with a common rabbet bit set, setup is easy. (See "A Bigger Bit Bang for Your Buck," page 17). Just select the right bearing, set

your depth of cut, and go at it. Things get trickier when making wider or deeper rabbets. Here you'll need to use a larger straight bit and an edge guide accessory, or a straightedge clamped to your workpiece. Some manufacturers' edge guides have large openings that can't be adjusted (**Photo A**). This can hamper registration with the edge of the stock at the beginning of the cut. You can close this gap by attaching wood strips to the edge of the guide. If you don't have an edge guide, you can screw or clamp a piece of wood to your router's subbase.

Regardless of your setup, make sure your workpiece is secured with clamps, double-faced tape, or other means, so it doesn't move during the cut. Note, too, that the direction of feed is always left to right when doing hand-held rabbeting. Add scrap at the exiting end of the workpiece to eliminate tear-out as shown in **Photo B**. Rout end grain before edge grain; and, for the best cut quality, don't remove more than $\frac{1}{8}$ " of material in a pass. If you have a fixed-base router, you can place $\frac{1}{8}$ " hardboard strips under the router base and remove one after each pass until you achieve the desired depth. For rabbeting curved stock, see **Photo C**.



Make wide rabbets with a large straight bit and an edge guide.



A rabbet bit with a bearing is the best choice for cutting rabbets on curved edges.



Clamp boards side-by-side to create a longer bearing surface for the edge guide. Scrap placed where the bit exits the wood prevents tear-out.



When making end rabbets, a squared cutoff can provide backup and prevent tear-out at the end of the cut.

RABBETS ON THE ROUTER TABLE

Although you can do most rabbeting with a hand-held router, certain applications call for a table-mounted router. Some examples: small projects (like jewelry boxes), picture frames, and

when you need to make multiples. Here, with one setup, you can dispense with the large assignment in short order.

When working on the router table, remember that your feed direction

should always be from right to left, and for the best quality cuts, never remove more than $\frac{1}{8}$ " of material per pass. Follow your workpiece with sacrificial scrap as shown in **Photo D**.

Router or Table Saw: Which Is Better?

While a table saw can cut most of the joints featured here, several issues come into play. First is cost. A quality dado set is expensive (up to \$300). Also, some saws do not have arbors long enough to hold a complete dado set. To cut rabbets, you need to attach an auxiliary wood face to the fence to "bury" the unneeded portion of the dado set. You'll also need a dedicated zero-clearance insert for each setup you use whether you're cutting rabbets or dados. A dedicated sled is best for dadoing large parts, and stopped dados made on the table saw require a lot of handwork to clean them up. Also don't forget that dado sets take valuable shop time to set up.

If you have a lot of joints to make, setting up a table saw is probably worth the effort. One advantage: You can make wider and deeper cuts in one pass. This saves time in the long haul. Still, when you only have a few rabbets or dados to make, a router will get you to the finish line much faster.

TIP ALERT

Straight bits can cause tear-out at the edge of the cut. As an alternative to using a sacrificial piece of scrap as in Photo B, make a pass from right to left, taking $\frac{1}{16}$ " of the material off. After making this "climb-cutting" skim pass, rout from left to right to finish the rabbet.

CUTTING SHARP, CLEAN DADOES

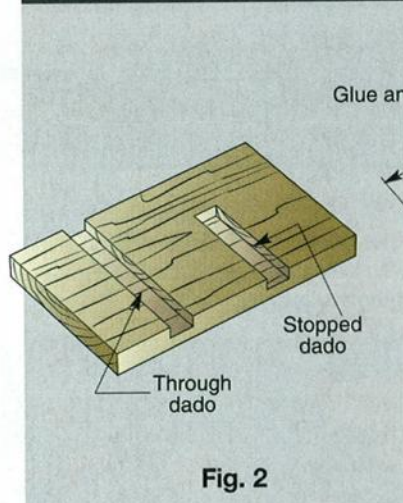


Fig. 2

A **DADO IS A SQUARE-SIDED, FLAT-BOTTOMED RECESS** that runs across the grain as shown in **Figure 2**. It's primarily used to house the ends of shelves and cabinet floors, as well as retain drawer runners. The most common type is a *through* dado, which runs the full width of a workpiece. For a cleaner look, a *stopped* dado, shown in **Figure 2**, may be substituted. As the name implies, the stopped dado stops short of one, or both edges. The mating piece must then be notched

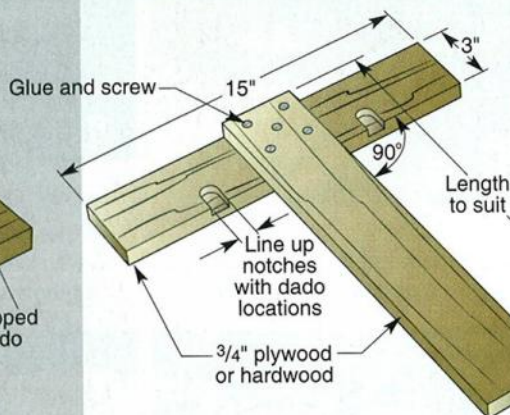


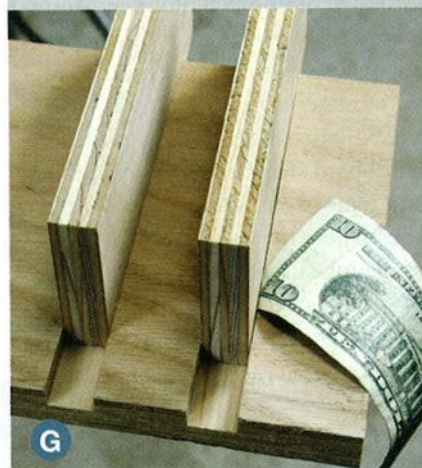
Fig. 3

accordingly. Normally, dados are made no deeper than one-half of the stock thickness.

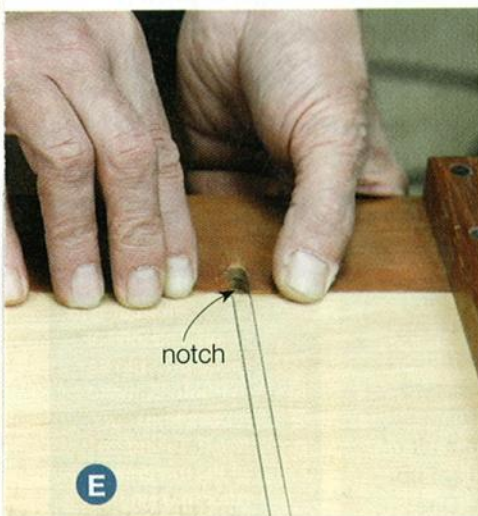
While dados on larger pieces are most easily and accurately made with a hand-held router, dados on small project parts, such as jewelry box dividers, often require a table-mounted router. You can clamp a straightedge to your workpiece as a guide, or use a shop-made "T-square jig" as shown in **Figure 3** and **Photos E** and **F**. The advantage to this jig is that it saves time

Dadoes For Plywood

As you may already know, $\frac{3}{4}$ " plywood does not typically measure $\frac{3}{4}$ " thick. The same holds true for $\frac{1}{2}$ " plywood. Although it might not seem like much, the difference can result in a sloppy fit in a case piece (**Photo G**). To make a snug dado or groove for undersized plywood, take two passes with a smaller bit, or rout a shallow rabbet along the edge of the mating piece on the hidden face. Perhaps the best option: Use an "undersized" router bit that manufacturers created to cure this problem.



The perfect dado on the left was made with a $\frac{23}{32}$ " router bit. The dado on the right was made with a standard $\frac{3}{4}$ " bit.



Align the notch in the head of the T-square jig with the layout lines, and then clamp the jig in place.



Start the router in the notch and maintain the position of the router to the straightedge through the whole cut.

by showing the location of the cut, and guarantees your cuts are square to your reference edge. The only disadvantage to this jig is that you'll need a dedicated one for each router/router bit combination. If you're routing dados that are wider than your bit, attach two fences to the head of the T-square and make your dado in two or more passes.

FORMING SNUG GROOVES

THE ONLY DIFFERENCE BETWEEN A GROOVE AND DADO IS GRAIN ORIENTATION. While a dado runs across the grain, a groove runs with the grain as shown in **Figure 4**. (This definition gets hazy when working with MDF, but "grain" generally runs along a panel's longest dimension.) Common uses for grooves are housing drawer bottoms, door panels, and cabinet backs. You can cut grooves with a straight bit and edge guide using a hand-held router, or a straight

bit in a router table. Like dados, grooves can run the full length of the workpiece, or be stopped.

A plunge router works best for stopped grooves on large panels, but for smaller pieces choose a router table. It's a lot easier to take the workpiece to the tool than clamping it in a manner that won't interfere with the router. To make the cut, butt the stock against the right hand stopblock and slowly lower it onto the spinning bit. Then feed to the left hand stopblock, as shown in **Photo H**. Turn off the router and lift it up when the bit comes to a stop. For deep grooves, make the cut in two or more passes.

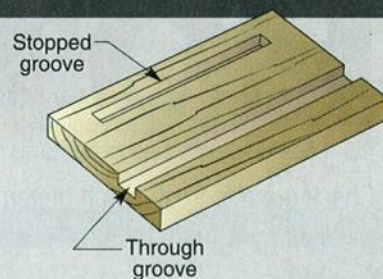


Fig. 4

If you need to cut narrow through grooves, consider slotting bits as shown in **Photo I**. Because they come with a guide bearing, these bits can be used in a hand-held router. Mounted in a router table, they can be used for all sorts of grooving chores, on edges, ends, and faces.



stopblock

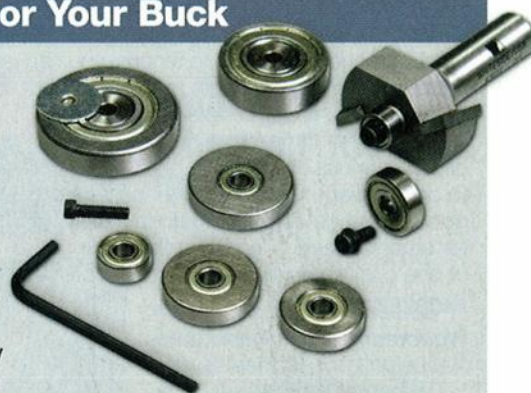
To rout a stopped groove cut on the router table, slowly lower the workpiece onto the spinning bit. Maintain inward pressure against the fence so you won't spoil the cut.



Slotting bits are great for making clean, square-bottom grooves on the router table.

A Bigger Bit Bang For Your Buck

Rabbet bit sets make for a worthwhile investment. They're especially useful in hand-held routers. The bearings allow for accurate, repeatable cuts, and you'll never have to fuss with an edge guide. They are also the best way to rabbet concave or convex edges (**Photo C**). Also, the cutting edge geometry creates a smoother, cleaner cut than a straight bit. The Whiteside set shown here includes eight bearings, which allow you to make seven different rabbets ($\frac{1}{8}$ ",



$\frac{3}{16}$ ", $\frac{1}{4}$ ", $\frac{5}{16}$ ", $\frac{3}{8}$ ", $\frac{7}{16}$ ", and $\frac{1}{2}$ "). As a bonus, a full-sized bearing enables the unit to pull double duty as a flush trim bit.

Convenience**PLUS**

BUYING GUIDE

		WOODCRAFT #	PRICE
☐ 1.	Pinnacle Premium Router Tabletop	#148487	\$199.99
☐ 2.	Pinnacle 36" Router Table Fence	#148488	\$179.99
☐ 3.	Rousseau Router Table Stand	#148646	\$119.97
☐ 4.	Whiteside Rabbet Set ($\frac{1}{2}$ " shank)	#143223	\$59.99
☐ 5.	Whiteside Straight $\frac{23}{32}$ " Plywood Bit ($\frac{1}{2}$ " SH)	#24K19	\$19.99
☐ 6.	Whiteside Straight $\frac{31}{64}$ " Plywood Bit ($\frac{1}{2}$ " SH)	#24K17	\$17.99
☐ 7.	CMT Three-Wing Slot Cutter $\frac{1}{4}$ " H, $\frac{17}{8}$ " D	#820305	\$23.99
☐ 8.	CMT Slot Cutter Arbor w/Bearing ($\frac{1}{2}$ " SH)	#820307	\$10.00

Above items available at Woodcraft stores, woodcraft.com or by calling (800) 225-1153.

HOT New Tools & Accessories

Check out this fresh batch of items recommended by the Woodcraft Product Development Team to make your woodworking the best it can be.

Items featured here are available at Woodcraft stores, woodcraft.com or by calling (800) 225-1153. We've included the Woodcraft product numbers for your convenience and quick reference.

Big bits for solid-wood doors (and more)

CMT Entry and Passage Door Router Bit Set

Thanks to CMT's entry and interior door bit set, you can now use a 2½ or 3 hp table-mounted router—instead of a heavy-duty shaper—to make a traditional mortise-and-tenon door.

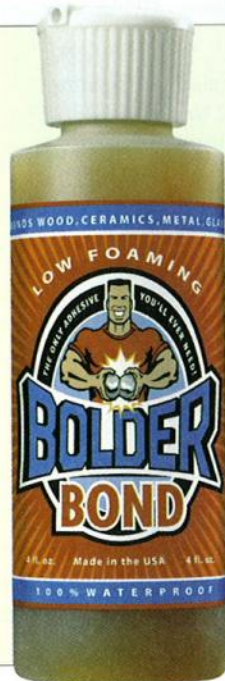
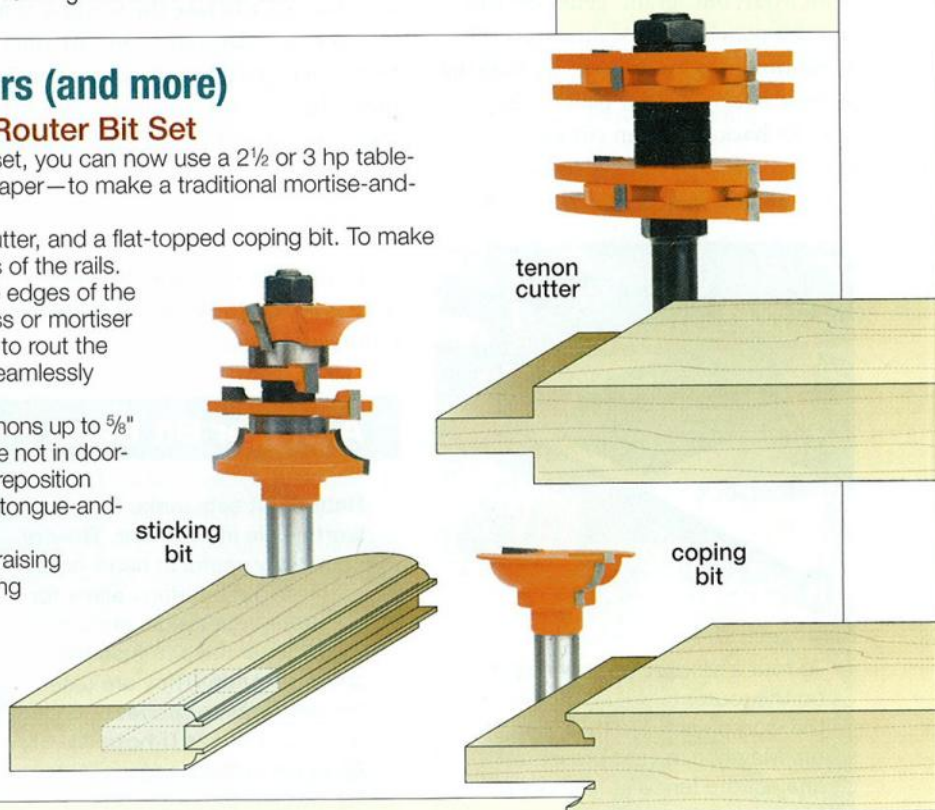
The set includes a sticking bit, a tenon cutter, and a flat-topped coping bit. To make a door, use the tenon bit first to mill the ends of the rails. Next, use the sticking bit to shape the inside edges of the rails and stiles. (You'll need to use a drill press or mortiser to mortise the stiles.) Use the coping bit last to rout the shoulders of the tenons so that the rails fit seamlessly against the stiles.

The tenon-cutting bit (capable of cutting tenons up to 5/8" thick and 1 1/16" long) is useful even when you're not in door-building mode. In addition to tenons, you can reposition the bit's cutters and spacers to rout ship laps, tongue-and-groove edges, or spline slots.

Buying the three-piece set, plus a panel-raising bit, is a serious investment, but if you're willing to do the work, you can mill a houseful of doors—and get a tenoning bit that's good for other projects—for about the price of one custom door.

#403757 \$299.99

Woodcraft Tester: Peter Collins



Lower foam, higher strength poly glue

Bolder Bond Polyurethane Glue

When polyurethane glues first appeared on the woodworking scene a decade ago, they were touted as the "ultimate" adhesive solution. Now that the foam's had time to fully harden, these one-part, waterproof adhesives have proven their usefulness for some projects, especially for outdoor use and for joining metals, plastics, or oily woods. I appreciate the fact that dried poly glue is easy to sand and doesn't chip chisel or plane blades. But polys aren't perfect. I find the foam more of a nuisance than gap filler and some don't seem as strong as good old yellow glue or epoxy.

The benefits of Bolder Bond are subtle, but significant enough to warrant a fresh look. For one, this glue isn't new. This industrial-grade adhesive has been used to repair and reinforce cellular phone towers and high-pressure gas pipes for 15 years. The low-foam blend designed to make less mess in the field also makes for cleaner shop experience. Most importantly, third-party testing has found that Bolder Bond has a 20-25% higher mechanical property (basically, "more grip") than its competition.

By giving more of what I really want from a poly glue and less of what I don't, this bottle has earned a spot on my shelf.

2 oz, #148530 \$4.99

4 oz, #148531 \$7.99

8 oz, #148532 \$12.99

Woodcraft Tester: Joe Hurst-Wajszczuk

Old tricks with a new stick

Pinnacle Story Sticks

Traditionally, a "story stick" is nothing more than a wooden stick with penciled ticks. As simple as it may sound, for transferring the exact location of parts or joints from one piece to another, it's worth its weight in gold. Unfortunately, a simple stick can't take measurements, plus it's sometimes easy to read the wrong pencil mark on a well-used stick.

Pinnacle's story stick takes the proven concept a couple of notches up. First, they've replaced the wood stick with a solid aluminum bar. Instead of relying on hard-to-read pencil marks, Pinnacle's version employs adjustable steel tabs that slide along the bar and lock in place. To position the tabs, you can simply align them to existing marks, or use the scales engraved on both sides of the main bar. Once set, the small marking slots in the tabs are perfect for a 0.7mm mechanical (or a freshly sharpened) pencil to transfer precise "story marks" to your workpiece. In addition, this stick comes with an adjustable stopblock to make it easier for you to register it against the edge of your stock.

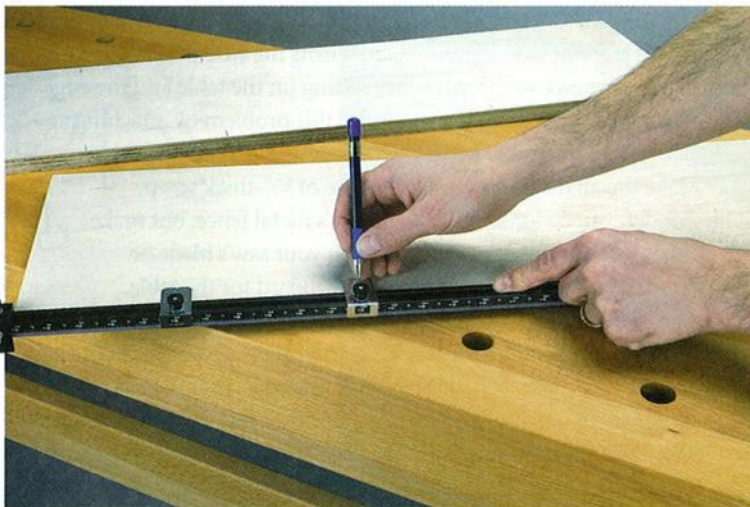
Adjustable for right or left hand use, the stick also works well as a center scale, such as when laying out symmetrical projects.

36" Story Stick, #148746 \$34.99

900mm Story Stick, #148747 \$34.99

Replacement Stops (pk of 4) #148748 \$12.99

Woodcraft Tester: Tim Rinehart



Longer-Lasting Folding Rule

Rhino 6' Folding Rule

I have always depended on a good folding rule for all my cabinet and finish carpentry work, but wooden ones have drawbacks: A good one can be fairly expensive, fragile, wears quickly, and water-stains easily. The Rhino folding rule has all the advantages of my wooden rule, but its fiberglass body is built to handle abuse in and outside of my workshop. The Swiss-made rule features engraved graduations in 1/16" increments, a graduated slide for taking precise inside measurements, and snap locks which secure each section in the closed and extended positions. The snap locks can also be used to lock the rule at almost a perfect 90° angle. In a pinch the rule could serve as a square for rough work. This tool might not be more accurate than my old rule, but I strongly suspect it will last a lot longer, even if it gets used for some extreme-condition jobs outside of my workshop.

#148596 \$19.99

Woodcraft Tester: Tim Rinehart



Holding Power Wherever You Need It

Magswitch Universal Magnetic Featherboard

Keeping workpieces secure while using my table saw is now as easy as twisting a knob with Magswitch's Universal Magnetic Featherboard. Two 20mm rare earth magnets featuring "on/off" switches let me locate the featherboard quickly on any steel or cast-iron surface. And the two contrasting feather orientations give me flexibility regardless of the feed direction. I also used the Universal Magnetic Featherboard on the outfeed table to edge-joint stock. Other applications include bandsaw and shaper work. A real plus for me is that the pressure can be pre-loaded against the workpiece by locking one magnet "on," and then

pivoting the featherboard toward the fence or table and locking the remaining magnet in place.

#148442 \$44.99

Woodcraft Tester: Peter Collins

TIPS&TRICKS

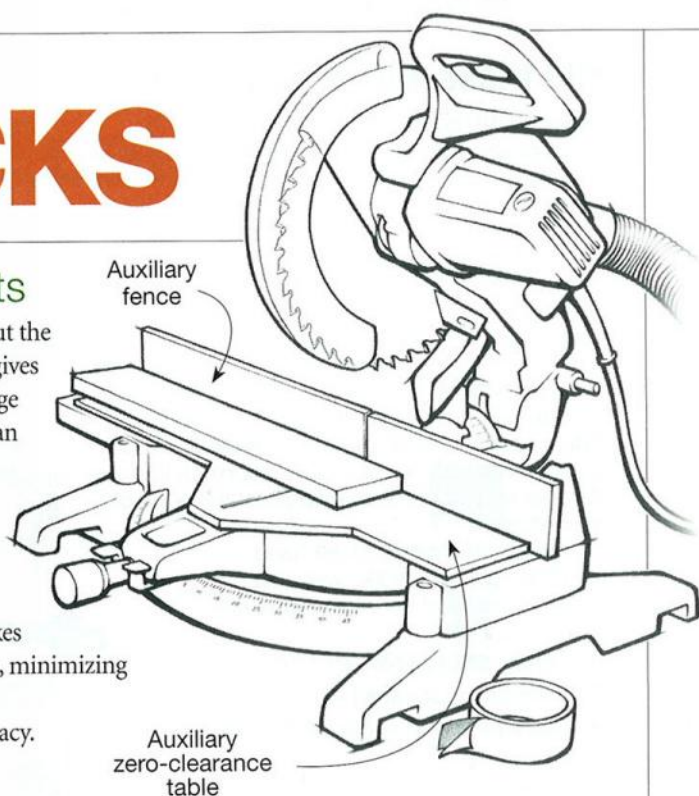
Equip your miter saw for “no fuzz” cuts

THE MITERSAW CAN DO A GREAT JOB OF PRECISION CUTTING, but the blade can tear out wood fibers where it exits the wood. This often gives a fuzzy appearance to the stock face resting on the table and the edge on the fence. Fortunately, you can solve this problem by attaching an auxiliary fence and table surface with double-sided tape.

Make the auxiliary fence from a piece of 1/2"-thick scrap plywood. It can be longer than your saw's metal fence, but make sure that its height doesn't interfere with your saw's blade or guard. Use a piece of 1/4" plywood or hardboard for the table.

After you've attached the fence and table, your first saw cut makes a kerf that keeps your workpiece supported right up to the cut line, minimizing tear-out. As an added benefit, the kerf shows the cut line exactly, enabling you to quickly position your stock for line-splitting accuracy.

—David Smithson, Syracuse, New York

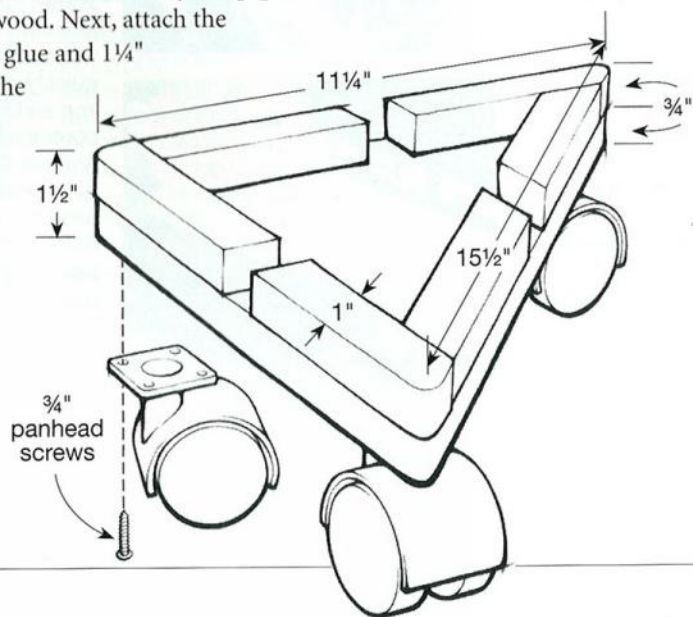


Anti-Gravity boots for your shop

OK, SO THEY AREN'T REALLY ANTI-GRAVITY, but these mini-carts come close.

According to Don Hamrick of the Woodcraft store in Parkersburg, West Virginia, this shop helper is the most-used jig in the store and shop. Made from scrap plywood and inexpensive twin-wheeled casters, these handy movers can be used individually for scooting heavy sheets of plywood or MDF, or as a set for moving machinery or cabinets. Larger objects can be placed on top, or set into the mitered notches in the top rail to ensure that the cart doesn't unexpectedly kick out in use. They're also good for schlepping furniture around the house.

Making a set of four is an easy afternoon production run. Start by cutting the $11\frac{1}{4}$ x $11\frac{1}{4}$ x $15\frac{1}{2}$ " triangular bases from any scrap-pile piece of $\frac{3}{4}$ "-thick plywood. Next, attach the 1"-wide top rails with glue and $1\frac{1}{4}$ " finish nails. To make the notches, attach one rail, insert a 1"-thick spacer, then tack on the second rail. (Trim the matching rail to match the base after assembly.) Ease the pointed corners with a sander, then attach the wheels with $\frac{3}{4}$ "-long screws.



Two ways to spread glue fast

IF YOU EVER BUILD PROJECTS WITH LAMINATED COMPONENTS, you know how difficult it can be to lay glue over a large surface quickly and evenly. Here are two strategies that will give you great results.

When you're spreading glue on really large surfaces, pour glue directly out of the bottle and spread it on the surface with a plastic trowel having $\frac{1}{8}$ " notches. Next, smooth out the application with a small-diameter foam paint roller. If you're working with narrow strips, squeeze most of the glue out of the roller. Wash out the remainder with soap and water, and you can re-use the cover on your next laminating job.

—Kate Logan, San Diego,
California

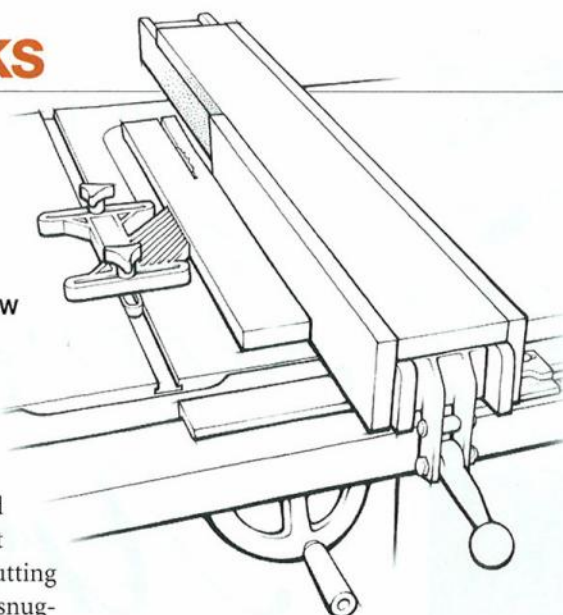
TIPS&TRICKS

Make a reversible, dual table saw fence

HALF-LENGTH TABLE SAW FENCES ARE COMMON

IN EUROPE; they allow room for the movement of stressed lumber when ripping. I tried one and really liked it for ripping lumber but didn't care for it when cutting sheet goods so I made a snug-fitting fence cover that I could reverse, thus presenting a choice of a half length or a full length sacrificial fence facing the blade. You'll need to adjust or modify the measuring pointer on the fence rail to compensate for the thickness of the new fence cover.

—Dick Ayers, Barron, Wisconsin

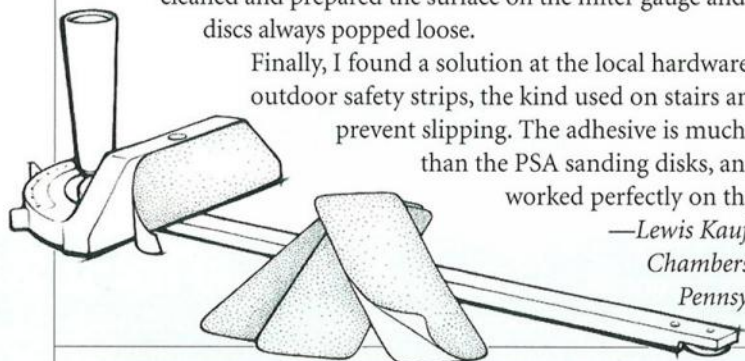


Outdoor safety strips prevent slips

I RECENTLY STARTED A PROJECT THAT REQUIRED MORTISE-AND-TENON JOINTS. I decided to make the tenons on the table saw using the miter gauge with an extension and a stopblock. To keep workpieces from slipping, I used PSA sanding disks on the miter gauge. However, no matter how well I cleaned and prepared the surface on the miter gauge and extension, the discs always popped loose.

Finally, I found a solution at the local hardware store: outdoor safety strips, the kind used on stairs and ladders to prevent slipping. The adhesive is much more robust than the PSA sanding disks, and their size worked perfectly on the miter gauge.

—Lewis Kauffman,
Chambersburg,
Pennsylvania



How To Submit Your Ideas:

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JOINERY COMBINE TO MAKE
THIS OUTDOOR
STRUCTURE THE ENVY OF
THE NEIGHBORHOOD.

By Alan Turner

Project Design by
Alan Turner and Mario Rodriguez

*W*hen spring blooms, many woodworkers turn their attention from the shop to the garden. This arbor—plus its matching gate on page 30—takes dead aim at both passions. Handsome but without excess adornment, this Arts and Crafts-inspired project provides an inviting entrance to a thoughtfully landscaped backyard or patio area. And with any of three complementary fence ideas on page 35, you can enclose a garden or

contain Fido's urge to romp and roam.

As a woodworking project, the arbor will teach you how to use your router with a few simple jigs to cut precise mortises and perfectly-shaped curves. Another surprising detail about this project is the shop-friendly subassemblies. Despite its impressive size, this arbor is designed so that you can build the parts when there's still snow on the ground and quickly install it outside as soon as the weather allows.

Note: Both the arbor and gate were made from grade "D and better" western red cedar. Cedar is a natural choice for large outdoor structures because it's lightweight, easy to work, and resistant to decay. To find suitable material, you may need to go to a specialty lumberyard. Pressure-treated pine, although less expensive and easier to find, isn't recommended for this project. Treated wood can be brutal on bits and blades. If you go with straight "select and knotty" cedar from your local home center, you can build the arbor for under \$300.

Overall dimensions: 51" d x 71" w x 93¼" h

Start with the arbor sides

Note: Begin this project by making the mortising templates explained in "Shop-Made Mortising Jigs" on page 24. Then follow the steps below.

1 CROSSCUT THE POSTS (A) AND STRETCHERS (D) TO LENGTH PLUS 4".

(Add the below-frost length if sinking the posts to provide better support for the gate. See the **Cut List** for dimensions and the sidebar below.) Now, thickness-plane these parts to square off the rounded corners. Working in 1/16"-deep increments, plane one post face, rotate the post 90°, and plane the adjacent edge. Plane all four post and two stretcher faces before lowering the cutting head. After removing the roundovers, the finished dimension should be 3 1/4" square.

TIP ALERT

Look for stock that's free of any pith (center of the tree), especially when picking corner posts. Pithy posts tend to twist over time.

face, rotate the post 90°, and plane the adjacent edge. Plane all four post and two stretcher faces before lowering the cutting head. After removing the roundovers, the finished dimension should be 3 1/4" square.

MATCH THE POST LENGTH TO YOUR NEEDS

The length of the post (A) given in the **Cut List** assumes that you're using a metal post base or post stake (refer to **Figure 8** on page 29) for post-footing options. If attaching the gate, setting the posts in concrete offers the most stable and permanent option. If you choose this method, buy posts that are long enough to be positioned below the frost line.

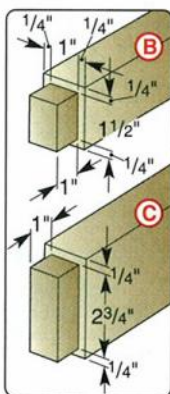
2 CROSSCUT THE FRESHLY-SQUARED POSTS (A) TO 83 1/2".

Include the frost-depth if appropriate.

3 STARTING AT 83 1/2" DOWN FROM THE TOP END OF POSTS (A), MARK THE MORTISE LOCATIONS SHOWN ON FIGURE 1. Next, clamp all four posts side-by-side, as shown in **Photo A**. Make sure that the ends are flush before transferring the mortise locations onto the remaining three posts.



Marking out all the mortises at once is faster than using a tape and eliminates the errors that can sneak in when making repetitive measurements.



4 MORTISE THE POSTS

(A) USING THE "LOWER RUNG" AND "UPPER RUNG" TEMPLATES in **Figure 2**. Begin by aligning the appropriate template with your mortise marks and clamping it in place. Chuck a 7/8" spade bit into a drill and remove the bulk of the waste as shown in **Photo B**.



Use a spade bit to hog out the waste material. Mark the mortise depth on the bit's shank to avoid drilling too deeply.

TIP ALERT

Make your mortises 1/8" deeper than the length of your tenons. The extra space gives excess glue a place to go—instead of oozing out the sides—when you insert the tenons

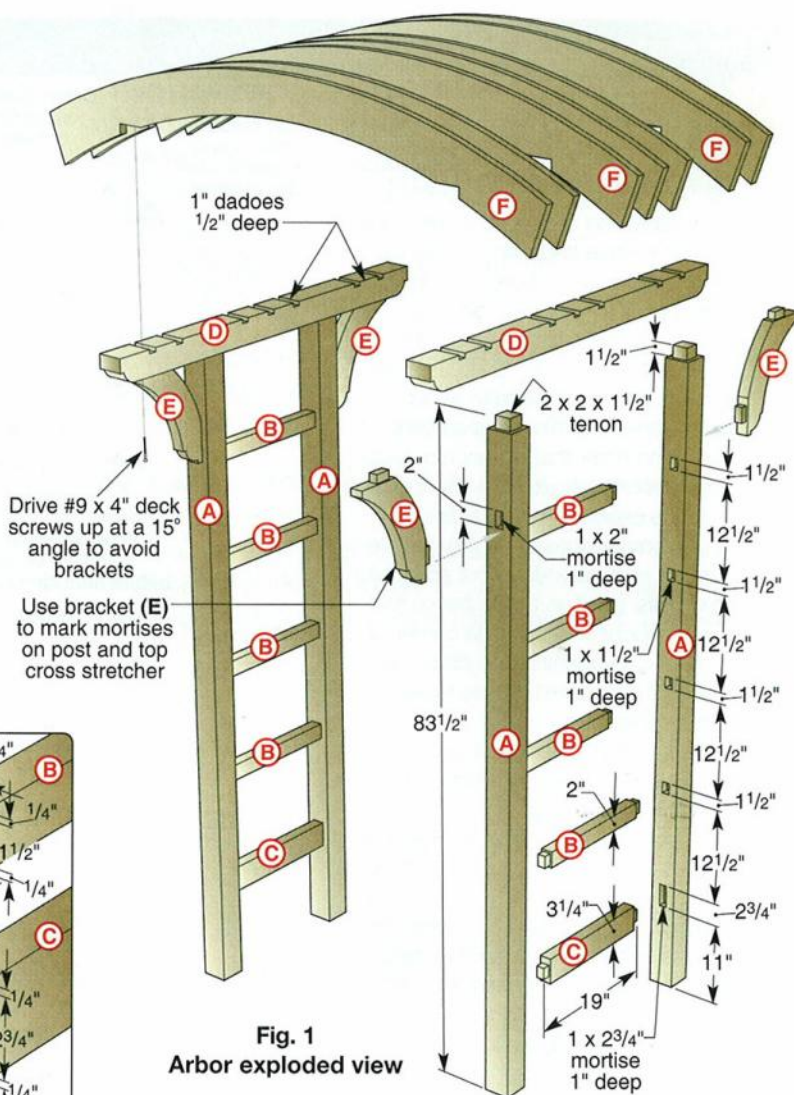
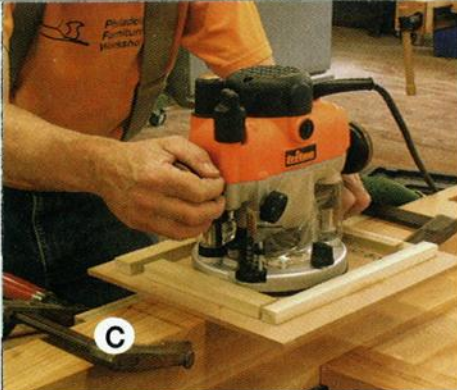


Fig. 1
Arbor exploded view



The jig keeps the router from cutting outside the lines. Vacuum out the cavity and inspect your work before unclamping the jig.

5 NEXT, CHUCK AN UPCUT SPIRAL BIT (SEE THE CONVENIENCE-PLUS BUYING GUIDE) INTO YOUR HAND-HELD ROUTER. Position the tool on the jig, turn it on, and

TIP ALERT

Filing a small notch in the top and bottom of the jigs' mortise openings will make the layout lines visible without affecting the accuracy of your jigs.

plunge the mortising bit to full depth at the corners of the mortise; then raise the bit and rout from side to side in 1/4"-deep increments to clean up the

mortise walls and bottom, as shown in **Photo C**.

After routing the four mortises for the lower rungs, use the upper rung template to rout the remaining 16 mortises.

6 REFERRING TO THE CUTTING DIAGRAM on page 29, rip enough 2x6 stock to make eight 19" long upper rungs (B) and two lower rungs (C). Saw off the rounded corners before ripping the rungs to final **Cut List** width. (Cut an extra upper and lower rung to fine-tune the tenon-cutting setups.)

7 CROSSCUT RUNGS (B AND C) TO FINAL LENGTH by clamping a stopblock to your mitersaw and making a test cut. Adjust as needed and make your cuts.

8 CUT THE UPPER (B) AND LOWER RUNG (C) TENON SHOULDERS ON THE TABLE SAW BY FIRST DRAWING A LINE 1" IN FROM THE END OF A TEST RUNG. Next, raise the blade height to 1/4" and adjust the rip fence so that your pencil line remains after you cut. Then, using your

miter gauge, test-cut a tenon and check your work. The shoulder-to-end dimension should be exactly 1". Now, cut the shoulders on all of the upper rungs (B) and lower rungs (C) as shown in **Photo D**.



Butt the ends to each rung against the fence to ensure even tenon shoulders. Use a miter gauge to guide the rungs over the saw blade.



Bandsaw the cheeks so the waste falls away from the fence. Use a stopblock to control the length of cut.

SHOP-MADE MORTISING JIGS

To make the jigs, we used four 10 x 11" pieces of 1/4"-thick hardboard, a combination square, glue and finishing nails or 3/4"-long screws. When in use, the scrapwood cleats guide the router while the fence and clamps hold the jig in place on your work. The arbor requires four router mortising jigs: "Lower Rung," "Upper Rung," "Post," and "Corner Bracket." Build as shown and label each template to avoid confusion. Determine your router's offset and mark that distance outside of your mortise lines. (The offset is the distance between the outside edge of your router's base and the outside edge of your installed upcut spiral bit.) To do this, position the router so that the bit touches each inside corner of your mortise opening and draw a box around the penciled arcs to reveal the offset distance.

Next, attach the cleats to the base along the outside edges of the penciled box with glue and screws or finish nails. (As shown in **Figure 2**, open corners enable chips to fall free instead of clogging the jig.)

Finally, lay out a mock mortise on a piece of test scrap that matches the workpiece. Clamp the jig to the scrap and check that the mortise aligns with your layout lines. Make a test cut, following the instructions in step 4 on page 23 and step 5 above.

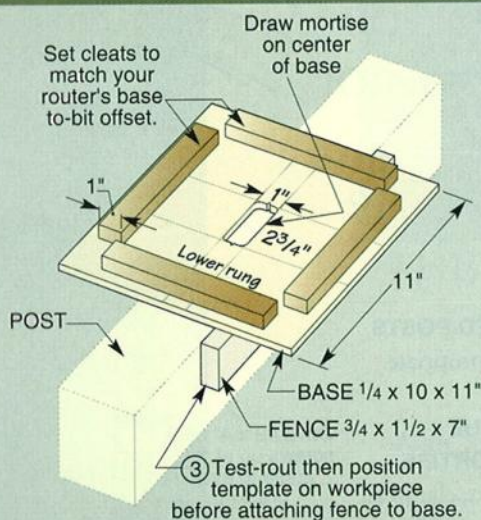
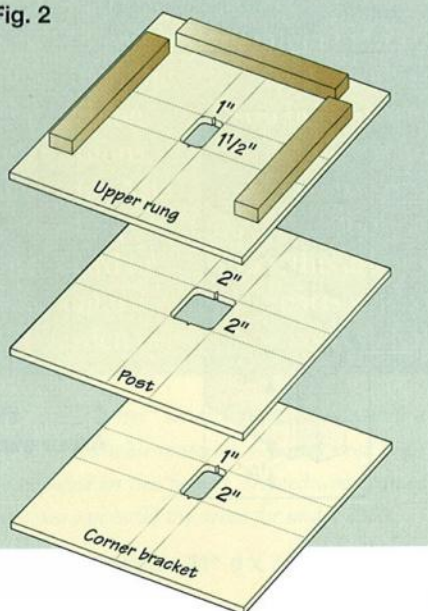


Fig. 2



9 CUT THE RUNG CHEEKS ON THE BANDSAW BY STARTING WITH YOUR TEST RUNG. Adjust the bandsaw's fence and attach a stopblock on it, as shown in **Photo E**, so that the blade cuts the cheek and the waste falls to the outside. Finally, round the edges of the tenons with a file (see the **Buying Guide**) so that they'll slide into the mortises.



Insert a spacer between the fence and your workpiece to cut the even tenon shoulders. Use a stopblock to set the tenon length.

10 CUT THE TENONS ON THE ENDS OF POSTS (A). The length of the posts makes them too awkward to maneuver on the table saw, so instead, clamp all four posts together side-by-side, with the ends flush. Mark your tenon locations, and use a circ saw and straightedge to make the $\frac{5}{8}$ " deep cut as shown in **Photo F**. Turn the posts 90° and repeat the cut. Do all four post sides the same way. Cut the cheeks as in Step 9 above.

11 CROSSCUT THE TOP CROSS STRETCHERS (D) TO 51". Refer to the dimensions given in **Figure 3** to make a pattern for the stretcher ends from $\frac{1}{4}$ "-thick hardboard. Trace the end pattern on both sides of each end. Next, cut out the curve using either a bandsaw or a jigsaw with a 6"-long blade. Finally, clean up your cut with rasps, files, and sandpaper. Work from the outside edges toward the center to avoid chipping on the back edges.

12 MARK (DON'T MEASURE) THE POST MORTISES. The locations of the post mortises in the top cross stretcher (D) depend on the side assemblies. For the best fit, dry-assemble each side assembly and pull it tightly together with

TIP ALERT Use the post mortising jigs to check the fit of the rungs before sticking them into the posts.

clamps. Center a top cross stretcher (D) between the two posts (A) and transfer the locations of the posts tenons onto the bottom face of the top cross stretcher (D). Repeat the assembly and marking process with the opposite side. Label each stretcher/side pairs so that they will be matched together later.

13 ROUT THE MORTISES IN THE TOP CROSS STRETCHER USING THE POST MORTISING JIGS.

Make the corner brackets

1 MAKE AN ENLARGED COPY OF THE CORNER BRACKET PATTERN ON PAGE 76. Adhere the pattern onto a $5\frac{1}{4}$ "-wide piece of $\frac{1}{4}$ "-thick hardboard and bandsaw and sand it to shape.

2 FROM 2X6 STOCK CUT TWO CORNER BRACKET BLANKS FOR PARTS (E) TO 18" LONG. Joint one

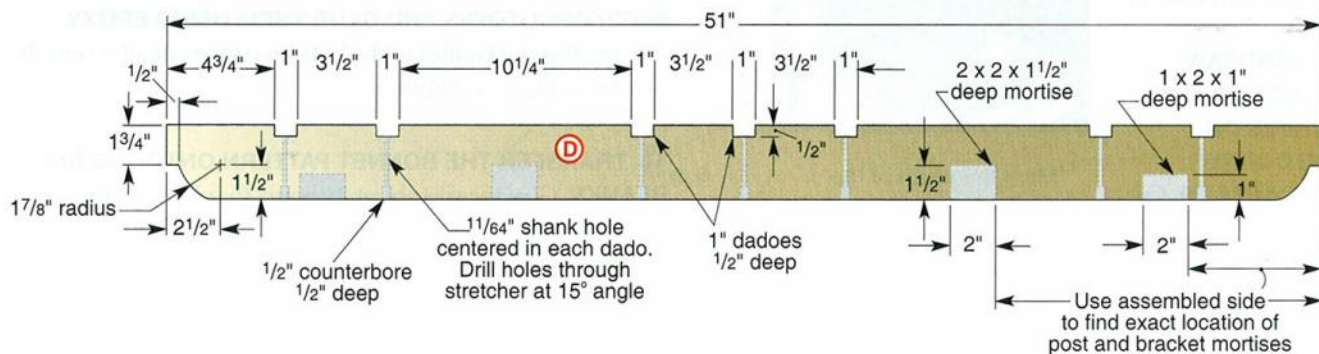
TIP ALERT When making curved parts, cut the joinery before cutting the curves. A straight edge provides a reliable reference for both marking and cutting.

edge of each piece to remove the round-overs and, using your mitersaw, cut one end of each blank at 35°.

3 NEXT, PLACE THE CORNER BRACKET PATTERN ON THE BRACKET BLANKS for parts (E), aligning the top tenon with the 35° line. Trace the bracket pattern onto both faces of each blank.

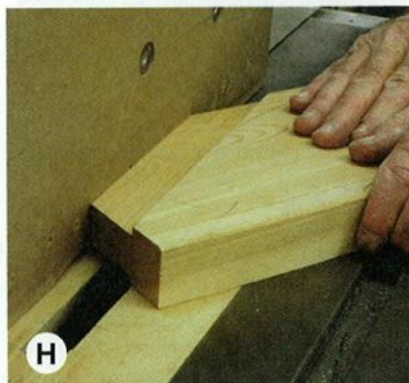
4 MAKE A STOP for cutting the bottom tenon angle on the bracket blanks on a mitersaw. Add a toggle clamp hold-down for securing the bracket blank during the cutting operation. Position the workpiece, clamp the brace to the mitersaw fence, lower the hold-down, and make the cut as shown in **Photo G**.

Fig. 3
Stretcher part view



5 TO CUT THE CORNER BRACKET (E) TENON CHEEKS, install a $\frac{5}{8}$ " dado cutter set into your table saw and a sacrificial fence on your saw's fence. Set the cutter height to $\frac{1}{4}$ ", and set the sacrificial fence 1" from the outside edge of the dado set. Now cut both ends of each corner bracket (E) to establish the tenon shoulders, as shown in **Photo H**.

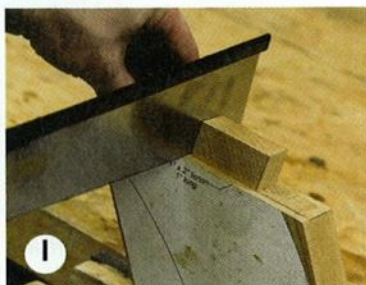
Reset the fence, burying the blade in a sacrificial fence, to complete the ends of the tenon cheeks.



Press the ends of the corner brackets against the fence to cut the angled tenons. The resulting tenon should be 1" thick.

6 LOCATE, MARK, AND CUT THE BRACKET TENONS TO 2" WIDE as shown in **Photo I**. Now make the shoulder cuts, cutting to the line. Clean up the cuts with a chisel.

7 BANDSAW OR JIGSAW THE CURVES ON THE CORNER BRACKETS (E). Cut as close to the line as possible, and smooth with rasps and files or a spindle sander.



Mark the width of the bracket tenons; then cut them to finished dimensions with a bandsaw or dovetail saw.



With the miter saw set for a 35° cut, clamp a brace to the fence, secure the workpiece to it, and angle-cut the end of the bottom tenon on the bracket blank at 55°

8 ASSEMBLE BOTH SIDE ASSEMBLIES TO LOCATE THE CORNER BRACKET MORTISES. Using the corner brackets, transfer the bracket mortise locations to the posts (A) and top cross stretchers (D). Disassemble the side assemblies and rout the mortises using the "Corner Bracket" mortising jig. After you've cut all eight mortises, reassemble the sides and test-fit the corner brackets. Label each bracket for later assembly.

Make the bonnet ribs

Note: There are seven identical bonnet ribs (F). If drawn inside a rectangle, each would be approximately 14 $\frac{3}{4}$ " wide by 71" long. Here you'll see how to create a wider board from a 2x12 by reattaching cutoffs onto the bottom of your stock.

1 MAKE THE TEMPLATE FOR THE FLARED BONNET RIBS (F) by attaching a 16 x 72" piece of $\frac{1}{4}$ "-thick hardboard to your floor with double-faced tape. Then follow the 3-step layout sequence as shown in **Figure 4**. (A pair of trammel points will help, but in a pinch, you can get by with a 2"-wide strip of plywood, pencil, and finish nails.) After laying out the top and bottom curves, measure and mark the ends of the bonnet rib pattern and the notches (**Figure 5**). Cut out the template on your bandsaw, then carefully sand up to your layout lines to create a smooth, or fair, curve.

2 THICKNESS 2x12 STOCK TO 1" FOR THE 1x12 BONNET RIBS (F) AND EDGE-JOINT ONE EDGE.

Position the bonnet rib template on top of your rib stock as shown in **Figure 6**, so that the jointed edge runs along the bottom of the rib. (At this point, the template is still wider than your stock.) Using a bandsaw or jigsaw, cut the bottom curve about $\frac{1}{8}$ " to the waste side of your line.

3 MAKE TWO RECTANGLES FROM THE JOINTED BOTTOM CUTOFFS AND GLUE THEM USING EPOXY (see the **Buying Guide**) to the bottom corners of all seven rib blanks as shown in **Figure 6**.

4 TRANSFER THE BONNET PATTERN ONTO THE RIB BLANKS. Give the ribs about 24 hours to fully cure; then remove the clamps and trace the rib pattern on your board. Cut the ends to finished length using a miter saw set at 20°. Cut the top arc and the remaining portions of the bottom arc about $\frac{1}{8}$ " outside of your pencil lines.

TIP ALERT To shape the gently curved rib pattern, glue 60-grit paper to a 2" wide by 11" long piece of $\frac{1}{8}$ " plywood using a quick-release contact cement, to make a flexible "file".

Fig. 4
Making the rib template

To establish a perpendicular line through the middle of your template, swing trammel from opposite corners. Snap a line connecting intersecting arc points.

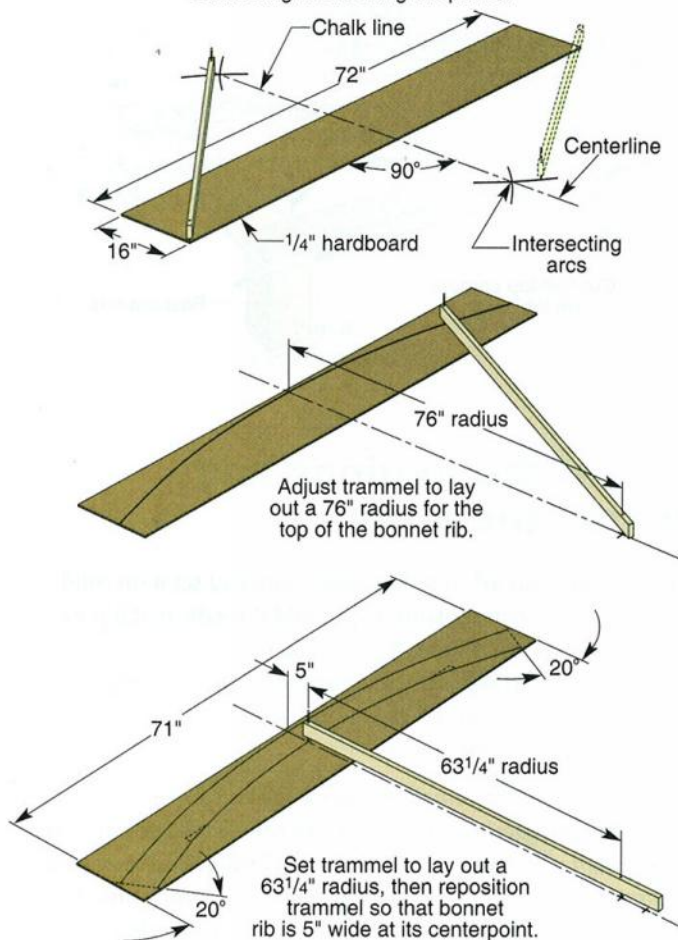


Fig. 5
Rib part view

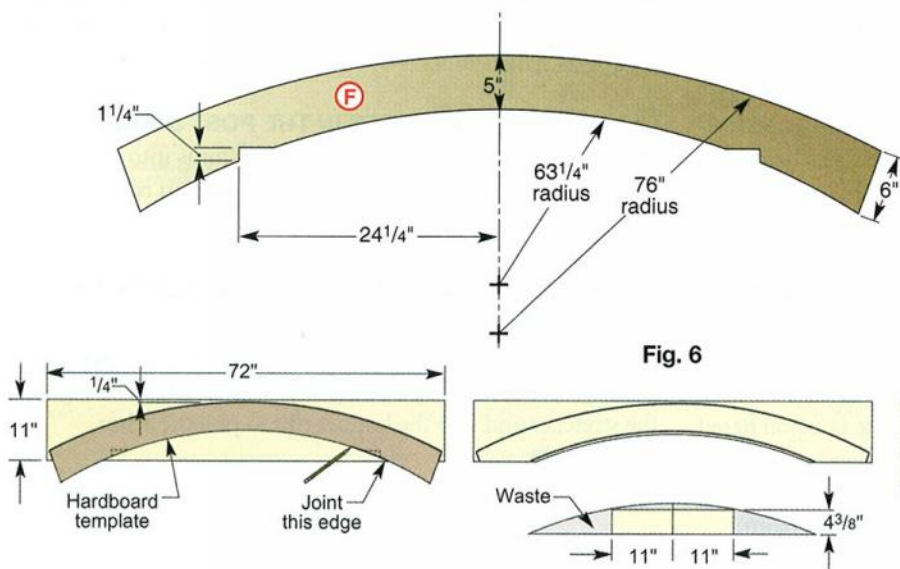


Fig. 6

5 ROUT HALF OF THE BONNET RIBS (F). To avoid tear-out, always rout “downhill” to the grain. To succeed, you’ll need two bearing-guided router bits: a pattern routing bit with a top bearing and a flush-trim bit with a bottom-mounted bearing (see the **Buying Guide**). Begin the process by sticking the pattern on top of the rib blank and orienting the blank so that the bottom ends are pointing toward you. Now with your router and a pattern-routing bit, guide the bearing against the left-hand half of the arch bottom; then reposition the router and shape the right-hand half of the top. (Try to start and stop your cuts at or near the rib’s centerpoint so that the bit’s rotation doesn’t lift or tear out opposing grain.)

6 FINISH ROUTING THE REST OF THE RIB WITH A FLUSH TRIM BIT. Flip the rib (F) so that that pattern sits under your stock. Chuck a bottom-bearing flush trim bit into your router and trim the remaining two edges.

7 USING THE PATTERN, MARK AND THEN BANDSAW OR JIGSAW THE NOTCH IN THE RIBS.

8 DADO THE TOP CROSS STRETCHER (D) TO FIT THE BONNET RIBS (F) by first placing two stretchers side-by-side. Referring to **Figure 3**, mark the location of the dados for both bonnet ribs at the same time with a square and pencil. Use a bonnet rib (F) to check that the dados are wide enough. Then use your table saw and dado cutter set, or router and straightedge guide, to cut the 1/2”-deep dados.

TIP ALERT

Fresh epoxy squeeze-out can be cleaned up with acetone or lacquer thinner. If you miss a spot, watch and wait for it to get to the green stage. This partially-cured point is the perfect time to remove excess with a block plane because it’s not sticky but softer than when fully cured.

TIP ALERT

Ball-bearing guided spiral bits are expensive, but the shearing cut can prevent tear-out, even when cutting against the grain.

Assemble the arbor sides

The glue-up proceeds in two stages. The first creates the “ladder” assembly; the second adds the corner brackets (E) and top cross stretcher (D). Choose an epoxy with a long open time so you can make adjustments and arrange your clamps where needed.

1 CLEAN UP YOUR PARTS BEFORE GLUE-UP. To lift dents, place a damp cloth over spot, then lightly run a hot iron over it. Lightly sand to 120 grit.

2 NEXT, GLUE THE UPPER AND LOWER RUNGS TO THE POSTS, placing the top cross stretcher (D) on the post tenons without glue to help maintain the squareness of the assembly. Center clamps across each rung and let the epoxy cure overnight.

TIP ALERT

A thin coat of epoxy on the end grain of a joint will seal the wood and prevent or reduce wicking, preserving the joint for a long period of time. Similarly coating the bottom of the posts is also recommended.

4 ASSEMBLE THE ARBOR IN YOUR SHOP. Stand the two sides on the floor. To keep the sides from tipping, clamp a pair of 42"-long 2x4 spacers between the sides. Insert the bonnet ribs into the dados.

5 SCREW THE TOP CROSS STRETCHER (D) TO THE BONNET RIBS (F). To do this, refer to **Figure 1**, and then drill a $1\frac{3}{64}$ " hole at a 15° angle up through the bottom of each stretcher (D). Aim for the center of each rib (F) about $\frac{3}{4}$ " in from the inside edge. After drilling the pilot hole, use a $\frac{3}{8}$ " twist drill to create a $\frac{1}{2}$ "-deep counterbore in the stretcher (D). This allows the screw to be countersunk well out of sight. Drill a $\frac{1}{8}$ " pilot hole about 2" into the bottom of each bonnet rib (F). Mark the ribs before disassembly so that they can be matched to their dados.

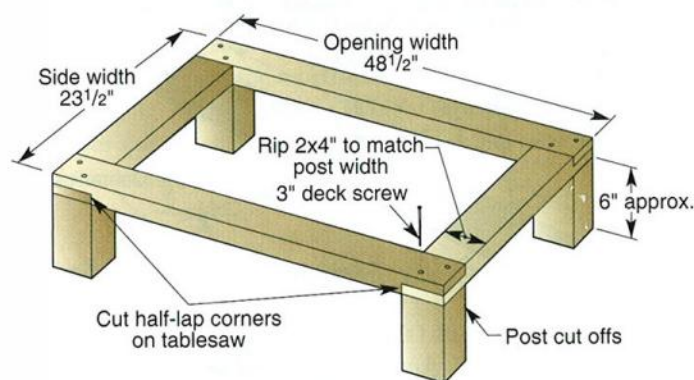


Position the clamps perpendicular to the top cross to prevent bending the ends or warping the assembly.

3 INSERT THE CORNER BRACKETS (E) IN THE POSTS (A), then clamp the top cross stretcher (D) in position as shown in **Photo J**. Repeat the process for the remaining side.

6 FINISH YOUR ARBOR. Stain or paint the arbor after final assembly and drilling, but before installation. A good defense is an oil based exterior primer, gray (see the **Buying Guide**), followed by an acrylic deck paint.

Fig. 7
Footing placement frame



Set in the footings and install the arbor

If you want your arbor to last, make sure you set it on solid footing. If you're not planning to build the gate, metal post stakes, as shown in **Figure 8**, are a quick and easy way to set the posts. A concrete footing would offer more support to the arbor frame, and is recommended if you intend to include a gate and/or fence.

Note: Digging even a small misplaced hole can disrupt service to an entire neighborhood, or kill you. An easy—and free—way to avoid such risks is by calling 811. This call will connect you with a professional utility locator who will mark out nearby utility lines so that you know where it's safe to locate your arbor.

1 REFERRING TO THE FOOTING PLACEMENT FRAME IN FIGURE 7, screw together a jig from scrap lumber and left over post stock, matching the dimensions of your arbor. Use the frame to level the tops, as shown in **Photo K**.

2 SET THE ARBOR SIDES IN THE POST STAKES, as shown in **Photo L**. You'll need to insert shims into the post stakes or standoffs to account for the wood you removed when squaring the posts (A).

3 SET THE BONNET RIBS (F) INTO THE TOP CROSS STRETCHERS (D), as shown in **Photo M**. To avoid chuck damage to the corner brackets, use 6" long drill bits, (see the **Buying Guide**). Drive a 4"-long #9-size deck screw through the stretcher and into the bonnet ribs to pull the arbor together. 🪛



Use a scrapwood positioning jig to mark the exact locations for the bolt-down standoffs or to adjust the height of the post stakes.

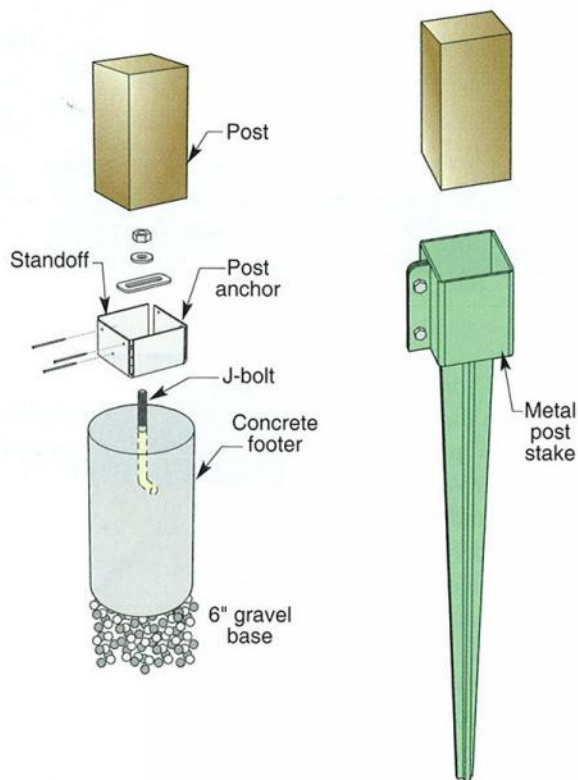


Tip the arbor sides in place. Use a helper or attach a scrapwood brace before attaching the bonnet ribs.

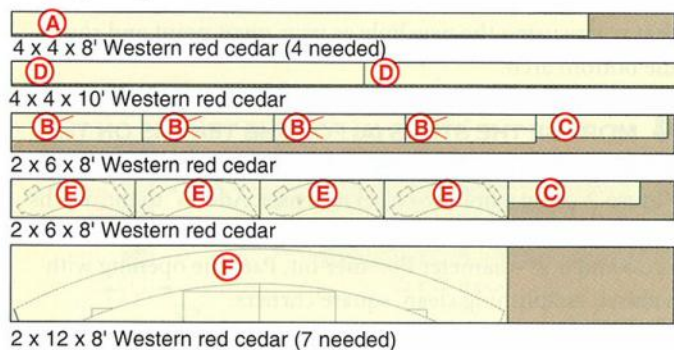


Set the bonnet ribs in the dadoes carefully to keep touch-up painting to a minimum. Screw them in place.

Fig. 8
Post footing options



Cutting Diagram



ConveniencePLUS

BUYING GUIDE

		WOODCRAFT #	PRICE
☐ 1.	Whiteside Carbide Spiral Upcut Bit 1/2" D, 1 1/2" CL (1/2" SH)	03K35	\$52.99
☐ 2.	Whiteside Pattern Cutting Bit 1/2" D, 1" CL (1/4" SH)	24A61	\$24.99
☐ 3.	Whiteside Pattern Cutting Bit 1 1/8" D, 1 1/2" CL (1/2" SH)	24A63	\$42.50
☐ 4.	Whiteside Spiral Upcut Flush Trim Bit 1/4" D, 1" CL (1/4" SH)	127465	\$39.99
☐ 5.	Nicholson #50 rasp	06B02	\$59.99
☐ 6.	10" Half Round File	06B06	\$24.50
☐ 7.	System Three Epoxy Resin, qt	124520	\$26.99
☐ 8.	System Three Hardener, pt	124526	\$21.50
☐ 9.	System Three Plunger Pump Set	124533	\$17.99
☐ 10.	Nitrile Gloves (12)	145280	\$5.99
☐ 11.	Disposable glue brushes 1/2" width, pack of 48	04Z51	\$10.50
Above items available at Woodcraft stores, woodcraft.com or by calling (800) 225-1153.			
☐ 12.	6" long 1/8" dia. drill bit	71000087	\$2.90
☐ 13.	6" long 1/16" dia. drill bit	71000111	\$3.83
Above items available at MSC Industrial Supply Co. Phone (800) 645-7270 or visit Mscdirect.com .			
☐ 14.	4" stainless steel screws, pkg/100	1240-SD6	\$52.42
Above items available at McFeely's. Phone (800) 443-7937 or visit mcfeelys.com .			
☐ 15.	Cabot Solid Color Acrylic Decking Stain, Medium Base #1808 (Color: Napa Vine)	Contact Cabot at (800) 877-8246 or visit cabotstain.com/cabot/info/dealer_locator.jsp to locate a dealer near you.	
☐ 16.	Cabot Problem-Solver Oil Primer, #8044 (Gray)		

Cut List	Thickness	Width	Length	Qty.	Mat'l
A Post	3 1/4"	3 1/4"	83 1/2"	4	WRC
B Upper rungs	1 1/2"	2"	19"	8	WRC
C Lower rungs	1 1/2"	3 1/4"	19"	2	WRC
D Top cross stretcher	3 1/4"	3 1/4"	51"	2	WRC
E Brackets	1 1/2"	5 1/4"	16 7/8"	4	WRC
F Bonnet ribs	1"	14 5/8"	71"	7	WRC

* Indicates that part is initially cut larger; please see the instructions for further details.

WRC= Western red cedar (See the Cutting Diagram.)

A Graceful Arbor Gate

By Alan Turner

Project Design by
Alan Turner and Mario Rodriguez



This curved-top gate is the perfect complement to your new arbor. As you can see, the top rail, the ends of the stiles, even the custom-made iron hinges (see the Convenience-Plus Buying Guide) were arched to match the arbor's ribbed bonnet. Like the arbor, the gate is built to last. The rails attach to the stiles using solid mortise-and-tenon joinery. Matching the curve of the top rail to the top of the center stile might appear daunting, but here you'll learn how to make a template and use your router for a seamless fit.

Begin with the gate frame

1 REFERRING TO THE CUT LIST, CROSSCUT THE STILES (A), BOTTOM RAIL (B) AND CENTER STILE (D) to length plus a few inches, from 2x6 stock. Make the top rail (C) from 2x10 stock. Surface-plane all five pieces to $1\frac{3}{8}$ " thick. Using your table saw, rip a square edge on all pieces, then rip the stiles (A), bottom rail (B) and center stile (D) to $4\frac{1}{4}$ " wide. (The top rail (C) will be sawn to width later.)

2 CUT THE FRAME TO FIT THE ARBOR. Referring to the **Cut List**, crosscut the stiles (A) and center stile (D) to final length. The center stile (D) is left long. It will be trimmed to fit later during assembly. See the note below before cutting the bottom rail (B) and top rail (C) to final length.

Note: Measure the width of your arbor opening before cutting the rails to final length. This gate is designed with $\frac{7}{8}$ " of clearance on the hinge side and an equal $\frac{7}{8}$ " gap on the latch side, for a post-to-post distance of 42". You may need to adjust the length of the rails to fit your arbor.

3 MAKE A TEMPLATE FOR THE TOP RAIL (C) BY FIRST CHUCKING A $\frac{1}{2}$ "-DIAMETER STRAIGHT BIT INTO YOUR HANDHELD ROUTER. Then attach the router's base to a 54"-long strip of plywood. Plunge the bit through the plywood base. Measure $46\frac{3}{4}$ " from the inside edge of the bit

and drill a $\frac{1}{8}$ "-diameter pilot hole through the plywood. Cut an 8 x 36" piece of $\frac{1}{2}$ "-thick MDF or $\frac{1}{4}$ " hardboard and place it under your router. Now drive a screw through the pilot hole so that it serves as a pivot point. Proceed to rout the top arch as shown in **Photo A**. Drill a $\frac{1}{8}$ "-diameter hole $42\frac{1}{4}$ " away from the outside edge of your bit on the plywood base. Reposition your jig so that you're using the new hole as your pivot point and rout the bottom arch.



Mounting a router to your trammel is an easy way to cleanly cut the curves for the top rail template.

4 MORTISE THE STILES (A) FOR THE TENONS ON THE BOTTOM RAIL (B) AND TOP RAIL (C) where shown in **Figure 3** using a hollow-chisel mortiser. Add $\frac{1}{8}$ " to the depths to allow for glue. If you don't own a mortiser, use your drill press and a $\frac{1}{2}$ "-diameter Forstner bit. Pare the opening with a chisel, establishing clean, square corners.

5 MORTISE THE BOTTOM RAIL (B) FOR THE CENTER STILE (D) referring to the dimensions given in **Figure 2**.

Fig. 1
Exploded view

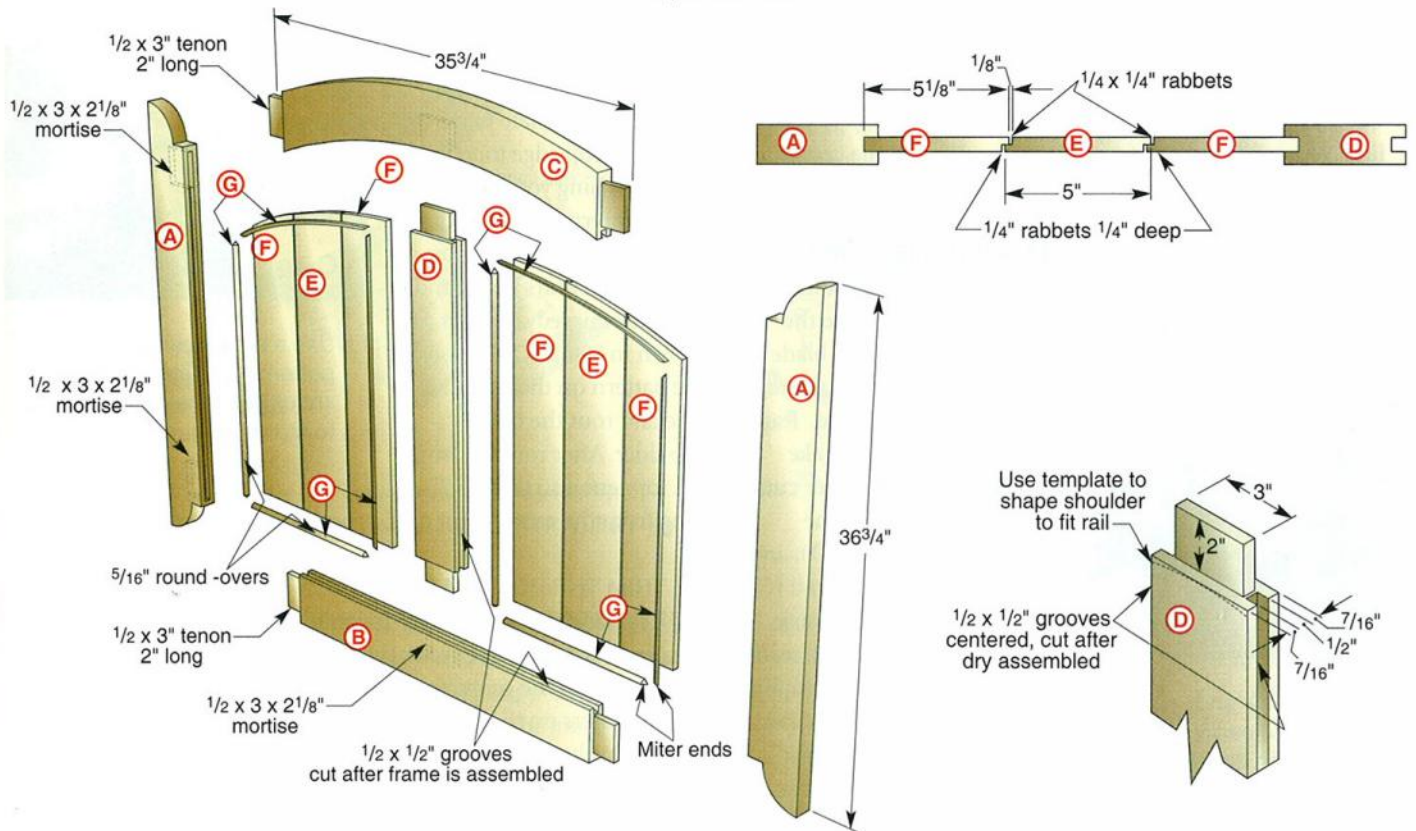
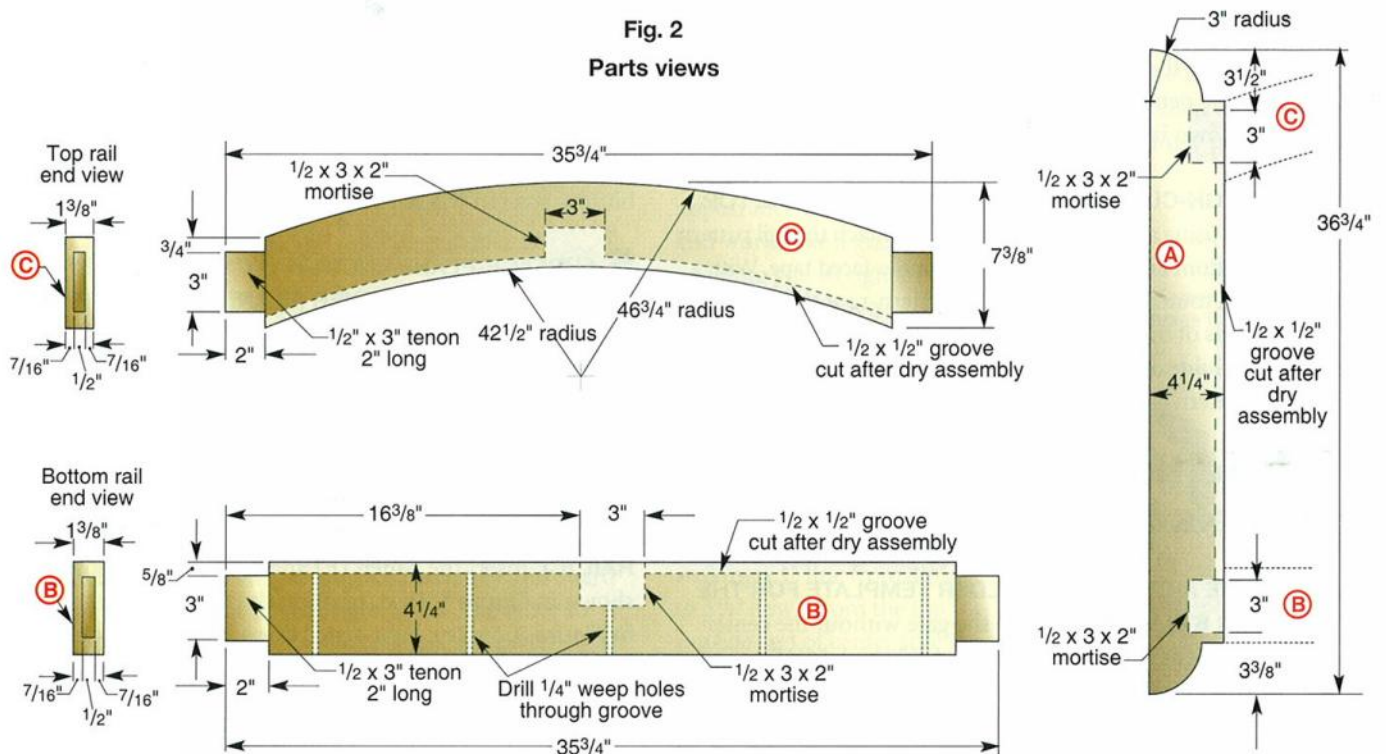
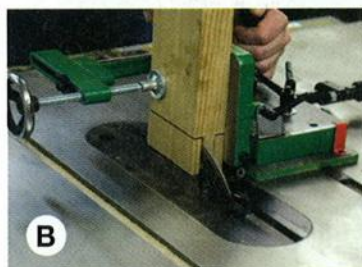


Fig. 2
Parts views



6 SPRAY-ADHERE A COPY OF THE PATTERN FOR THE STILES (A) FOUND ON PAGE 76 ONTO 1/4"-THICK HARDBOARD AND CUT IT OUT. Now trace the pattern onto both faces of each stile end. Use your table saw to cut the horizontal notches, then bandsaw or jigsaw the curves. Use a rasp and file to erase saw marks and work up to your line. When filing, work from the outer edges to the center to prevent chip-out.

7 SAW THE TENONS ON BOTTOM RAIL (B), TOP RAIL (C), AND CENTER STILE (D) by first cutting the shoulders on the faces of the three pieces with a table saw. Raise the blade to 7/16", adjust the fence to 2" from the outside blade teeth, and cut the shoulders, using your miter gauge. Raise the blade to 5/8" and make the connecting shoulder cuts through the edges of the bottom rail (B), stile (D), and in the bottom edge of rail (C). As shown in **Photo B**, raise the saw blade to 2", and, using a tenoning jig (see the **Buying Guide**), make the cheek cuts on all three pieces. Finish cutting the edge shoulders with a bandsaw or handsaw.



Use a table saw and tenoning jig to easily cut the wide tenon cheeks on the rails (B, C) and stile (D).

8 USE THE TOP RAIL TEMPLATE TO MARK THE CURVES ON THE TOP RAIL (C). Cut the bottom curve about 1/4" away from your pencil line. Before sawing the top curve, make the mortise for the center stile (D). Measuring against the pencil line, set your mortiser for a 2 1/8"-deep cut where shown in **Figure 2** and cut the 1/2" x 3" mortise.

9 ROUGH-CUT THE CURVED TOP EDGE OF THE TOP RAIL (C) using a bandsaw or jigsaw; then attach the rail pattern to the bottom face of the stock with double-faced tape. With a handheld router and flush-trim bit, pattern-route the "downhill" grain parts of the curve. Then, chuck a pattern-routing bit (see **Buying Guide** on page 29) into your router, flip the work over so the pattern is on the top, and finish the curve.

Make the center stile and panels to fit the frame

1 MAKE A CURVED SHOULDER TEMPLATE FOR THE CENTER STILE (D). Assemble the gate without the center stile (D). Center a 4 1/4"-wide strip of 1/2"-thick MDF under the top rail (C) and then trace the bottom curve onto the MDF. Cut to the line, smooth the curve and then test the template to make sure that it fits tightly against the bottom of the top rail (C).

2 SHAPE THE CENTER STILE (D) TO FIT THE TOP RAIL (C). To do this, use a combination square and make a pencil line across both faces of the center stile (D), 1/4" below the square-cut tenon shoulder. Clamp the template to the rail so that its top edge touches the line. Using your router and a pattern bit, adjust the bit height so that the cutter grazes the tenon's cheek and routs the curved shoulder as shown in **Photo C**. Remount the pattern on the opposite side and rout the other shoulder. After routing, trim the top tenon so that it's 2" long from the centerpoint of the curved shoulder to the end.



Use a shallow-cutting pattern bit to shape the top shoulder of the center stile to fit the top rail.

3 TRIM THE BOTTOM OF THE CENTER STILE (D) TO FIT THE GATE. Begin by dry-assembling the gate, without the center stile (D) and mark the new shoulder location on the bottom of the center stile with a knife. Recut the bottom rail shoulders on the table saw to the marked length and clean up the cheeks with a chisel. Trim the tenon to fit.

4 GROOVE THE GATE FRAME FOR THE PANELS. First, dry-assemble and clamp the gate with the center stile. Using your handheld router, install a 1/4" slot cutter (see the **Buying Guide**) then adjust the bit so that when routing from both sides of the gate you produce a 1/2"-wide centered groove. After routing the framed openings from both sides, disassemble the gate and use a chisel to square off the rounded corners that the bit couldn't reach. Finally, drill a series of 1/4"-diameter weep holes through the slot on the bottom rail (B) where shown in **Figure 2** for water drainage.

5 SURFACE-PLANE ENOUGH 1X6 STOCK TO 1/2" THICK TO MAKE THE INNER (E) AND OUTER (F) PANELS. (See the **Cutting Diagram**.) Rip the panels to the widths indicated in the **Cut List**. Using your table saw and dado cutter (or router table and straight bit) cut the 1/4 x 1/4" rabbets where shown in **Figure 1**.

6 CUT THE PANELS TO MATCH THE CURVED TOP BY ASSEMBLING THE GATE FRAME, MINUS THE TOP RAIL (C). Insert the panels (E) and (F) into the grooves as shown in **Figure 1**. Next, position the top rail (C) as shown in **Figure 3**. Make a light pencil line along the bottom edge of the top rail. Mark 3/8" up from that previous line and, aligning the top with these marks, scribe a second line parallel to the first. Now remove the rail

TIP ALERT Save the leftover (mixed) epoxy. Once cured, you'll know that it is properly cured.

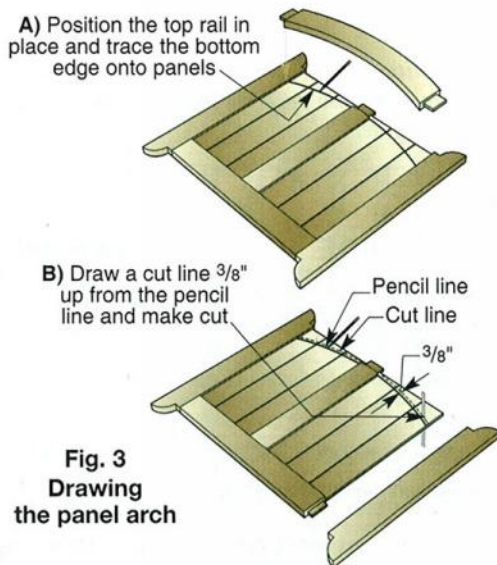


Fig. 3
Drawing
the panel arch

template and bandsaw or jigsaw along this outside line, allowing the panels to fit the frame. See the **TIP ALERT** on page 32 before applying epoxy.

7 CLAMP THE BOTTOM RAIL (B) TO THE BENCH. Then insert the center stile (C) and panel pieces as shown in **Photo D**. (Some $\frac{7}{16}$ "-thick strips of scrap can help support the free ends of the panel.) Slide the top rail (C) onto the inner panels (E), outer panels (F), and center stile (D).

8 MILL THE PANEL BEADING (G) BY MAKING THE RADIUS EDGE FIRST. For safety, the beading pieces are



Assemble the gate from the bottom up. Using spacer blocks to support the free ends of the panel.

Flex the bead along the top curve to fit it in place. Use clamps and nails to hold it to the top rail until the glue dries.

routed, then ripped, from leftover two-by stock. To do this, install a $\frac{1}{4}$ " radius round-over bit (see the **Buying Guide**) into your router table and rout each corner. Next, take the board to your table saw. Set the blade height to $\frac{5}{16}$ ", the fence to $\frac{5}{16}$ " and free each corner in two cuts using a sacrificial push pad. Joint the edge and repeat the routing and sawing process to make additional beading. Miter the bottom corners and cope the top corners to fit the beading to the frame. Attach the beading to the rail and stile edges using pin nails and

waterproof glue (see the **Buying Guide**). Clamp the beading in place, as shown in **Photo E**, to ensure that it doesn't pull away from the nails.

9 SAND THE GATE TO 180 GRIT IN PREPARATION FOR PAINTING. See step 6 in the arbor instructions on page 28 for advice on finishing. See also "Wood vs. Wild" on page 36 for finishing alternatives.

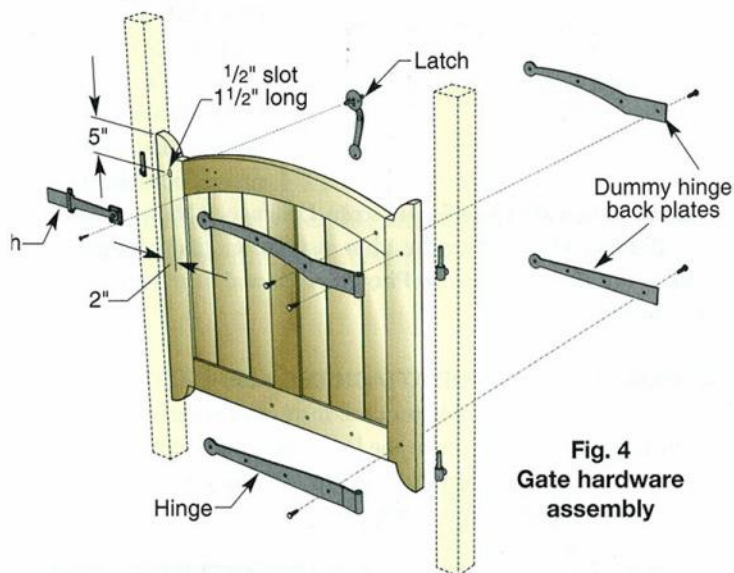


Fig. 4
Gate hardware
assembly

Install the hinges and hang the gate

1 TO INSTALL THE STRAP HINGES ON THE BOTTOM RAIL (B) AND TOP RAIL (C), strike a centerline for the bolt holes (the hinge does not have parallel sides), then drill and mount where shown in **Figure 4**. A dummy hinge plate on the gate's back face gives a similar appearance from both sides and works like a giant washer enabling you to tighten the hinge bolts to the gate.

2 INSTALL THE THUMB LATCH (see the **Buying Guide**) by measuring $1\frac{3}{4}$ " in from the edge of the door (opposite the hinges) with a combination square and striking a 1" line from $4\frac{1}{2}$ " to $5\frac{1}{2}$ " down from the top outside end of center stile (D). Strike a parallel line $2\frac{1}{4}$ " in from the edge. With 2" in as your center, mortise through the door with a $\frac{1}{2}$ "

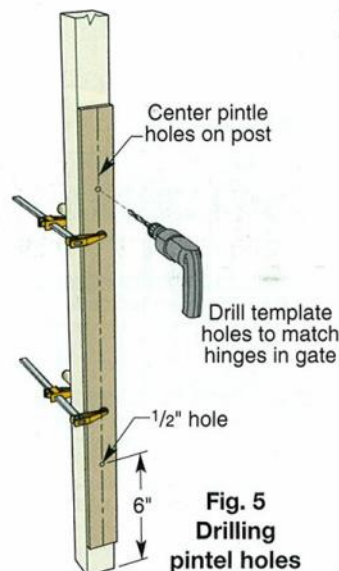


Fig. 5
Drilling
pintel holes



Make a boring jig, drill the holes in the arbor post, and install the threaded pintles by screwing them in place.

drill bit, creating a 1"-long slot for the latch lift. Clean the mortise with a chisel and install the latch door hardware.

3 TO INSTALL THE PINTLES, measure the distance from the bottom of the top hinge to the bottom of the bottom hinge and then make a post boring

template shown in **Figure 5** from scrap. Drill two 1/2" holes at this exact distance. On site, after the arbor installation, clamp the guide block to the arbor as shown in **Photo F**, drill, and turn them in. Hang the gate on the pintles.

4 HANG THE GATE AND ATTACH THE KEEPER. The keeper is the last step in the assembly process. Instead of measuring, close the installed gate and transfer the location of the catch onto the post to accurately position the keeper when the gate is shut. Now, fasten the keeper to the post. 🌿

About the Author and the Designer

Alan Turner and Mario Rodriguez operate the Philadelphia Furniture Workshop, a full-service woodworking school in Philadelphia, Pennsylvania. They combine over 60 years of furnituremaking and teaching experience and offer courses ranging from power- and hand-tool basics to project building. See PFW on the Web at philadelphiafurnitureworkshop.com.



Note: In addition to the items listed in the Buying Guide on page 29, you may also need the following products to build the garden arbor gate.

convenience**PLUS**

BUYING GUIDE

	WOODCRAFT #	PRICE
☐ 1. Tenoning Jig	144755	\$79.99
☐ 2. Whiteside Flush Trim Bit, 1/2" D, 1 1/2" CL (1/2" SH)	24A73	\$20.99
☐ 3. Whiteside 3-Wing Slotting Cutter 1/4" (requires arbor listed below to operate)	24D67	\$19.99
☐ 4. 1/2" SH x 4" Arbor	405748	\$16.99
☐ 5. Woodcraft Round Over, 1/4" R, 1/2" CL (1/4" SH)	129659	\$21.99
☐ 6. Waterproof Titebond III, 8 oz	145561	\$4.99
Above items available at Woodcraft stores, woodcraft.com or by calling (800) 225-1153.		
GATE HARDWARE		
☐ 7. Arch-top Pintle Hinges	8024	\$162.50
☐ 8. Dummy Hinge Back Plate (pair)	8524-D	\$45.50
☐ 9. Regular (Thumb) Latch, #9100, \$139.70	9100	\$139.70
Order the gate hardware from James Peters & Sons Hardware by calling (215) 739-9500 or visiting jamespetersandson.com .		

Cut List	Thickness	Width	Length	Qty.	Mat'l
A *Stiles	1 3/8"	4 1/4"	36 3/4"	2	WRC
B *Bottom Rail	1 3/8"	4 1/4"	35 3/4"	1	WRC
C Top Rail	1 3/8"	7 3/8"	35 3/4"	1	WRC
D *Center Stile	1 3/8"	4 1/4"	30"	1	WRC
E Panels (inner)	1/2"	5"	26"	2	WRC
F Panels (outer)	1/2"	5 1/8"	26"	4	WRC
G Beading	5/16"	5/16"	16" (top & bottom) 26" (side) (Cut pieces to fit)	8	WRC

* Indicates that piece is initially cut larger; please see the instructions for further details.

WRC= Western red cedar

Cutting diagram



2 x 6 x 8' Western red cedar



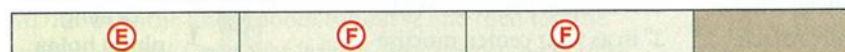
2 x 6 x 8' Western red cedar



2 x 10 x 4' Western red cedar



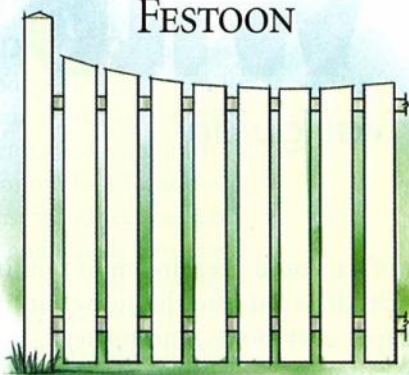
1 x 6 x 8' Western red cedar



1 x 6 x 8' Western red cedar



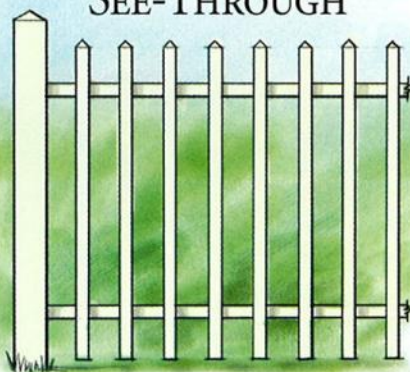
FESTOON



TRADITIONAL



SEE-THROUGH



A Trio of Fence Ideas

While the arbor and gate make a grand entrance into an attractively landscaped yard, you might want to enclose the area with a complementary fence. Here are three fence ideas to help you do just that. Consider making the 8' long fence sections, attaching picket assemblies to 4 x 4' posts and maintaining a height equal to or just above the gate's height. Sink the posts to below frost line for maximum durability.



WOOD vs. WILD

An Outdoor project survival guide

By Robert J. Settich

None of us would ever dream of sending our children out into the snow without a proper coat, boots, and mittens. Yet some people callously shove their woodworking creations out the door to face Arctic blasts, blistering heat, and torrential rain. And while cruelty to wood won't land you in prison, it will definitely peel years away from your project's life expectancy and serve a death sentence to its good looks.

To help save your outdoor projects from abuse, we developed a condensed survival guide covering wood and manufactured panels, fasteners, adhesives, and finishes.

Tough-Enough Wood Products

PRESSURE-TREATED LUMBER involves injection of a chemical. Chromated Copper Arsenate (CCA), a previous choice, has been replaced by Alkaline Copper Quaternary (ACQ), with slightly different formulations tailored to various wood species, the most common being pines. The end of each board should have a stapled tag that identifies the treating company, chemical, year and whether the amount of chemical retained in the wood makes it suitable for ground contact or only above-ground use. Be sure to select fasteners that can stand up to ACQ's corrosive properties.



EXTERIOR GRADE PLYWOOD

is excellent for many outdoor projects. If plywood qualifies for exterior use, it will have the word "exterior" as part of the stamp that also identifies the face veneer grades. This indicates that exterior-rated adhesive bonds the plies. Pressure-treated plywood is another great choice for outside projects.

OPENING PHOTO: DOUG HETHERINGTON

TROPICAL

HARDWOODS such as teak and ipe have high density and natural decay resistance, two factors that recommend them for outdoor furniture. But these woods can be hard to find and usually have eye-popping price tags. **Genuine mahogany** (not lauan) is another decay-resistant wood

that is lower in both density and price.

Mahogany

Teak

Ipe

DOMESTIC SOFTWOODS

with natural decay resistance include **western red cedar, cypress, and redwood**. Shipping costs usually dictate which species is available in your area. All are lightweight and easy to work. However, realize that these species are particularly soft softwoods and therefore are susceptible to surface damage by a stray hammer blow or collision with brick, concrete, and other unforgiving surfaces.

Western Red Cedar

Redwood

Cypress

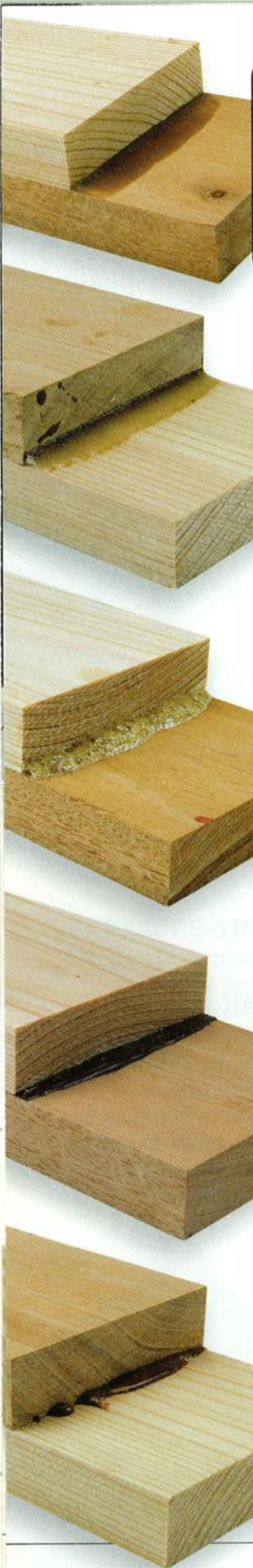
Choices For Outdoor Wood

Wood	Weight (lb/ft ³)	Hardness	Workability
Mahogany*	33	Medium hard	Easy to work. Moderate blunting effect on cutting edges.
Teak*	40	Hard	Silica content dulls cutting Edges. Glue fresh-cut edges or clean with naphtha to eliminate oil contamination.
Ipe*	67	Very hard	Moderate dulling effect. Glue fresh-cut edges or clean with naphtha to eliminate oil contamination.
Western Red Cedar*	20	Soft	Minimal dulling effect. Iron contact will create black stains.
Redwood*	26	Soft	Minimal dulling effect. Use sharp cutters to reduce splintering. Iron contact will create black staining. Predrill holes to avoid splitting.
Cypress*	29	Moderately hard	Minimal dulling effect. Works well with hand and power tools. Accepts finishes readily
White Oak*	47	Hard	Moderate dulling effect. Iron will create black stains.

WHITE OAK is an excellent domestic hardwood for exterior projects because its closed cell structure inhibits moisture absorption. That's why it works for everything from whiskey barrels to porch swings. (See the white oak cross-brace chair on page 10.)

White Oak

*Exposure to dust can cause an allergic reaction, such as nose and eye irritation, asthma, and dermatitis. Repeated exposure to dust can cause sensitivity. Future exposure can cause immediate allergic reaction.



Titebond III



System Three T-88



Bolder Bond



Weldwood Resorcinol



Weldwood Plastic Resin

Long-Lasting Exterior Adhesives

MODERN ADHESIVES routinely perform chores that would have been considered nearly miraculous a generation ago. In fact, Titebond III, which debuted just a few years ago, is the first one-part waterproof glue that offers water cleanup. It's suitable for many outdoor projects but inexpensive enough that many woodworkers also use it for their indoor projects.

The chart below gives you fast facts on the key types of adhesives suitable for outdoor projects ranging from birdhouses to boats. In addition, you'll find a wide range of products within the epoxy family to suit specialized applications. Epoxy putty, for example, is useful both as an adhesive as well as a gap filler that can plug a knothole.

TIP ALERT

Polyurethane glue fills gaps, but don't consider that an invitation to produce sloppy joinery. Work joints to the same tolerances as for your indoor work, aiming for surfaces that slide together with minimal pressure.

TIP ALERT

Quick-set epoxy allows you to unclamp your project sooner, but it has only about half the ultimate strength of the slower-setting formula. If you have a little patience up front, your project will be stronger in the long run.

Some other useful outdoor bonding products include construction adhesives: PL and Liquid Nails are two well-known and widely-available brands.

Choices For Outdoor Glue

Brand/Generic	Open Time*	Set Time**	Solvent	Notes
Titebond III / waterproof yellow	10 min.	1 hour	Water	Not for continuous submersion or structural applications
System Three T-88 Epoxy / two-part epoxy	10 min. Varies w/ hardner	6 hours	Lacquer thinner	Gap filler. You can add fillers such as sawdust.
Bolder Bond / polyurethane	20 min.	1 to 4 hours	Denatured alcohol	Wear gloves to protect your hands. Easy to sand or scrape when dry.
Weldwood Resorcinol / resorcinol formaldehyde	30 minutes	10 hours	Water	Suitable for even marine applications. Observe ventilation and safety warnings.
Weldwood Plastic Resin / powdered plastic resin	20-30 min.	12 hours	Water	Long open time is useful for complex assemblies. Bond has very good structural strength.

*Open time = maximum duration from initial mixing or spreading until project is clamped.

**Set time = minimum time that project is in clamps before gentle handling.

Weather-Tough Exterior Finishes

WITH EXTERIOR COATINGS, the term “finish” is somewhat of a misnomer because even the most durable types require periodic renewal. So, you’re never really finished. The two most punishing elements your outdoor projects face are ultraviolet (UV) radiation and water.

Invisible UV rays beam right through clear finishes, causing a layer of wood cells (and the finish attached to them) to fall away in the same way that your skin reacts to a sunburn. As you’ll see in the chart below, pigment is your best ally in combating UV rays, with an opaque paint enjoying up to 20 times the longevity of a clear spar urethane. Be sure to use a quality primer under paint.

Water protection is important because it helps limit checking (cracking) of the surface. This condition is not merely unsightly, it also permits further water penetration, which then accelerates the destructive cycle. End grain is very susceptible to water damage, so you’ll want to keep the ends of legs and posts away from soil and wet surfaces. Seal them with a preservative or epoxy as an extra precaution. Plastic glides are a great choice for elevating furniture projects, as shown in photo lower left. For larger-scale projects such as trellises, keep posts out of soil with anchors that you drive into the soil or attach to concrete piers. Both strategies keep vulnerable end grain dry.

Of course, there’s one more choice for outdoor projects: simply omit the finish and let the wood take on a natural weathered patina.

TIP ALERT

Your outdoor projects will last longer if you don’t store them outside. If you have adequate space, consider bringing your furniture inside a garage or shed for off-season storage.

Choices For Outdoor Finishes

Finish/Type	UV Protection	Recoat Frequency*	Appearance	Notes
General Finishes Urethane- modified acrylic varnish	UV absorbers deteriorate with exposure	2 years	Clear	Can recoat in 1 hour. Soap and water clean up.
Waterlox / Penetrating oil	Virtually none	1 to 2 years	Clear	Thin finish requires frequent renewal, but wipe-ons are easy to reapply.
System Three / Spar urethane/ spar varnish	UV absorbers deteriorate with exposure	6 months to 1 year	Clear	Boat-grade defense against abrasion and moisture. Scuff sand weather-worn surfaces before recoating.
Cabot / Alkyd stain / semi- transparent penetrating stain	Pigment and UV absorbers provide moderate protection	3 to 7 years	Grain partially obscured; degree is variable	Check compatibility if top coating with clear sealer.
Sherwin Williams / Exterior paint / latex alkyd	Pigment provides excellent protection	7 to 10 years	Wood texture may show; natural look hidden	Most durable exterior finish when used with a matching primer.

*Recoat frequency can vary greatly depending on wood and degree of exposure.

Urethane-modified
acrylic varnish



Penetrating oil



Spar urethane/
spar varnish

TIP ALERT

Choose exterior enamel for painting outdoor tables and chairs. Ordinary latex house paint is engineered to have to an elastic film—that’s great for wood siding, but it can feel rubbery on furniture surfaces.



Hard-wearing plastic glides elevate outdoor furniture legs above water so it can’t wick into the end grain.



Alkyd stain/
semi-transparent
penetrating stain



Exterior
paint/latex
alkyd

Outdoor-Rated Fasteners

THE CHEMICAL PROPERTIES that make certain woods naturally rot-resistant can also attack fasteners, causing corrosion that can weaken joints and cause unsightly staining. The powerful chemicals employed for pressure-treating lumber can be even more reactive with fasteners, making your choices even more critical.

There are two broad categories of outdoor-rated fasteners. One type uses a corrosion-resistant material for the fastener itself, and the other relies on a protective plating or coating to shield a steel body.

TIP ALERT Stainless steel is softer than ordinary steel, so maintaining identical strength in shear means that you need to buy screws with a larger diameter. As a rule of thumb, go up one or two gauges. For example, if you would ordinarily use a #6 steel screw, upsize it to #8 in stainless. The same upscale thinking applies to stainless steel bolts and lag screws.

TIP ALERT Drilling pilot and shank-clearance holes helps prevent screws from splitting your lumber. Splits aren't just unsightly; they also open the wood to water penetration.

Using a metal that resists corrosion, such as stainless steel or brass, offers more dependable performance than galvanizing and other surface treatments that can be easily damaged by abrasion or impact.

Stainless steel screws are generally suitable for outdoor projects, but not all alloys are truly stainless in every application. As a general guide, select the 316 stainless alloy for marine applications, but choose among the less-expensive 302, 304, or 305 screws for general exterior projects. Screws in the 200 series use alloys that cut back on the expensive metals, saving money but compromising corrosion resistance. To be on the safe side, choose screws that are clearly identified as compatible with your project's building material. **Stainless steel nails** are available but can be tough to find.

Silicon bronze screws have corrosion resistance that is tough enough for boat-building chores: the 651 alloy, for example. As with stainless steel, there are various alloys, so it pays to read carefully and ask questions before you buy.

Aluminum screws as well as those made from **solid brass** have excellent corrosion resistance but both of these materials are quite soft, so drilling pilot holes is an absolute necessity. You'll also need to carefully monitor your torque when driving to avoid snapping the screw in two.

Zinc-plated screws as well as **coated screws** offer good exterior performance at a budget-conscious price. **Kreg Blue-Coat Screws** claim a rust-resistant performance that's 400% better than their former zinc-coated screws. However, these screws are not recommended for use with ACQ-treated lumber.

Epoxy and ceramic coatings that resist corrosion are typically used for deck screws, and you'll often find a range of colors to help them blend into their surroundings. Read the box before you buy, especially if you're working with ACQ lumber.

Galvanized nails, bolts, and lag screws utilize a zinc coating to resist corrosion. Electro-galvanizing produces a smooth plated surface for air-driven nails as well as the manually-driven version. Hot-dip galvanizing produces a thicker but rougher surface coating on hand-driven nails. **Deck and siding nails** with a twisted or ringed shank offer excellent pull-out resistance.

Corrosion Resistant Metals

Stainless steel

Stainless steel

Silicon bronze

Brass

Aluminum

Weather Resistant Coatings

Zinc plated

Kreg blue coat

Epoxy

Ceramic

Stainless steel

Electro galvanized

Hot dip galvanized

Hot dip galvanized (spiral shank)

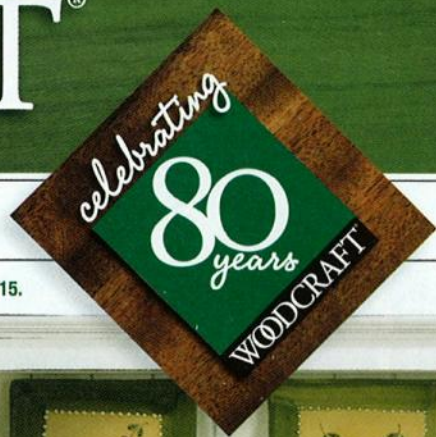
TIP ALERT

When you use fasteners that touch each other, such as bolts, washers, and nuts, make sure that all of the components are the same material. Mixing materials in the presence of moisture creates a tiny electrical current (galvanic reaction) that hastens corrosion.

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Dept: 08WD05P

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The His-and-Her Workshop

BY MICHAEL L. MAINE



Can a husband and wife share the same basement workshop and not drive each other up the wall? Buzz and Nelda Kelly of Indian Springs, Alabama, have been doing it for the past 10 years and couldn't be happier.

Ten years ago, when Buzz Kelly first gave serious thought to retiring, he decided to check out a class offered by the Alabama Woodworkers Guild. His wife, Nelda, offered to drive him. They arrived a little early and the doors were still locked, so Nelda hung around, just to make sure Buzz wasn't stranded. She ended up taking the class too, and together they discovered a hobby to last a lifetime.

"I don't think at that point I realized it would cause such a change," says Nelda about their newfound hobby.

Both in their 50s, Buzz and Nelda's routine days are vastly different.

Now retired from an information technology career at Birmingham Waterworks, Buzz spends much of his day in the shop. Nelda works as a technical planner for a local bank. "I am so jealous," Nelda says, referring to Buzz's shop time. "If I didn't have a really intense, busy job, I'd probably go crazy."

Both are avid students of woodworking. They frequently take classes sponsored by the local guild and elsewhere, learning new skills and then applying them to projects in their own shop.

"The good/bad thing about both marriage partners becoming



A pair of 7 x 9' garage doors provides easy access and plenty of fresh air to Buzz and Nelda Kelly's workshop. At the center of the shop is the table saw with outfeed table and a rolling auxiliary table built to the same height. That's Buzz in the foreground cutting wood; Nelda is in the background at the European-style workbench—a favorite work station. "We wish we had two," Nelda says. Colorful foam tiles provide an easy-on-the-feet insulated floor surface. Overhead a central duct attached to the HVAC ductwork carries dust to a central vacuum.

AMERICA'S TOP SHOPS



Conceding that they needed more workspace, Buzz and Nelda opted to close off one of the garage doors and use the space in front as a sliding compound mitersaw workstation. A plywood shell around one side captures dust. The back of the shell functions as a clamp rack, as does one side.

THE WORKSHOP *at a glance*

Size: 33 x 43' with separate space for wood storage.

Construction: Cinder block basement that includes two 3 x 6' windows, two standard 7 x 9' garage doors, and one 2' 8" x 7' exterior door.

Heating and cooling: Household HVAC system provides heating and cooling.

Lighting: Fluorescent lights; three 8' dual-tube fixtures; seven 4' quad-tube fixtures; two 4' dual-tube fixtures; plus task lighting and magnifying work lamps.

Electrical: All the Kellys' 220-volt tools draw from a shop-dedicated sub-panel.

Dust collection: Oneida Super Gorilla 3-hp cyclone; two jet 1/5-hp air cleaners rated at 1,044 cfm airflow.

Air compressor: Single-stage Porter-Cable rated at 6 hp.

woodworkers is that ALL of the money goes to the workshop," Nelda says with a laugh. "Another is that a week-long woodworking class becomes a very viable, even attractive, vacation opportunity."

"We're the other half of each other. We talk while we're working. It's pretty much togetherness time."

Buzz Kelly

They credit their rapid development as woodworkers to other guild members for willingly sharing their knowledge. The best payback, Buzz says, "is learning what they've done, and then coming home and using our tools to perform these skills on our projects. Sometimes we tweak what we've learned to make it our own."

Interjects Nelda, "What Buzz is trying to say is that we are incapable of following instructions."

Fortunately for the Kellys, at the same time their woodworking interests took off, a relative decided to part with his tools, so they bought them. That got them started with a minimal investment. First they built a simple workbench made of 2x4s. Next, they moved up to more finished-looking tables for the compound mitersaw and table saw outfeed table, and then graduated to the European-style workbench they both love.

"For three years or so, it seemed that all we built were shop projects," Nelda recalls. "It's hard at first. What they don't tell you is that to build a shop you need a shop."



Equipped with multiple vises and a tool tray, the European-style workbench serves as one of the shop's most versatile tools. Storage space is in high demand in a shop with two woodworkers. Screws, tacks, and saw blades occupy one area; various finishing materials sit on the shelves behind Buzz.

AMERICA'S TOP SHOPS

"The good thing is, he does a lot of the gruntwork things while I am at work. He's good at sizing and sanding, some of the things that are not the fun part of woodworking, and I really appreciate that."

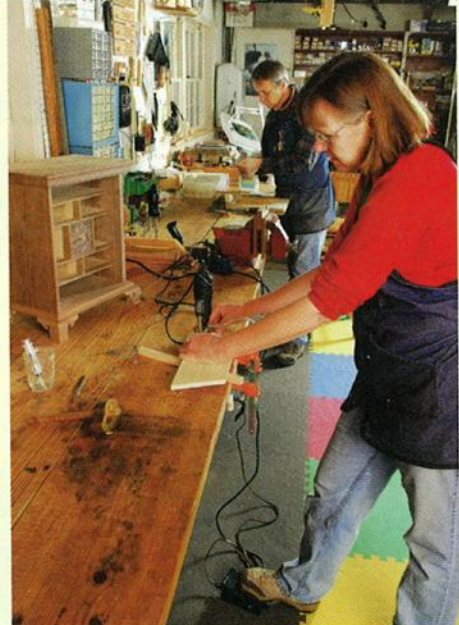
Nelda Kelly

Over the years, they have accumulated a full power-tool collection, including two lathes, two scrollsaws, a sliding compound mitersaw, a bandsaw, a table saw, two drill presses, an 8" jointer, several routers, a dedicated mortise machine, spindle sander, belt and drum sanders, two router tables, 15" planer, a couple of sharpening systems, and numerous hand tools.

"They say it takes about \$10,000 to get started, but \$10,000 is a drop in the bucket," Buzz says.

"Things we would change include buying bigger the first time around," adds Nelda. "We bought a 6" jointer and then a couple of years later replaced it with an 8". Our advice—buy the best equipment you can afford. You'll be glad you did."

The Kellys go through phases, in both the types of projects they make and the woods they use. They've made projects out of oak, maple, cherry, and walnut, but most of the projects—a blanket chest, a barrister bookcase, a lamp, and two card tables—used mahogany. That was followed by the "walnut phase," says Nelda, when they created such pieces as hunt boards and spice cabinets. Currently they are in an "ornamentation phase," which involves adding stringing and inlay into many of their projects. Recently their matched pair of Federal-style card tables earned blue ribbons at the guild's annual show. Their favorite finish is a hand-rubbed oil finish (see Buzz's "recipe" below.) All pieces remain in their home or go to friends or family.



One of Nelda's current projects is a walnut spice box with nine inlaid drawers. Here she's using a foot-controlled Dremel tool to groove a drawer for string inlay.

"Those card tables have some stringing on the tops that wasn't in the original," says Nelda. "That's the thing about making your own stuff. Each piece is uniquely yours...sometimes on purpose."



Buzz and Nelda won a blue ribbon for this pair of Federal-style card tables. Buzz's table is shown with the top open; Nelda's with the top closed. Both convert to full- or half-circle tables.

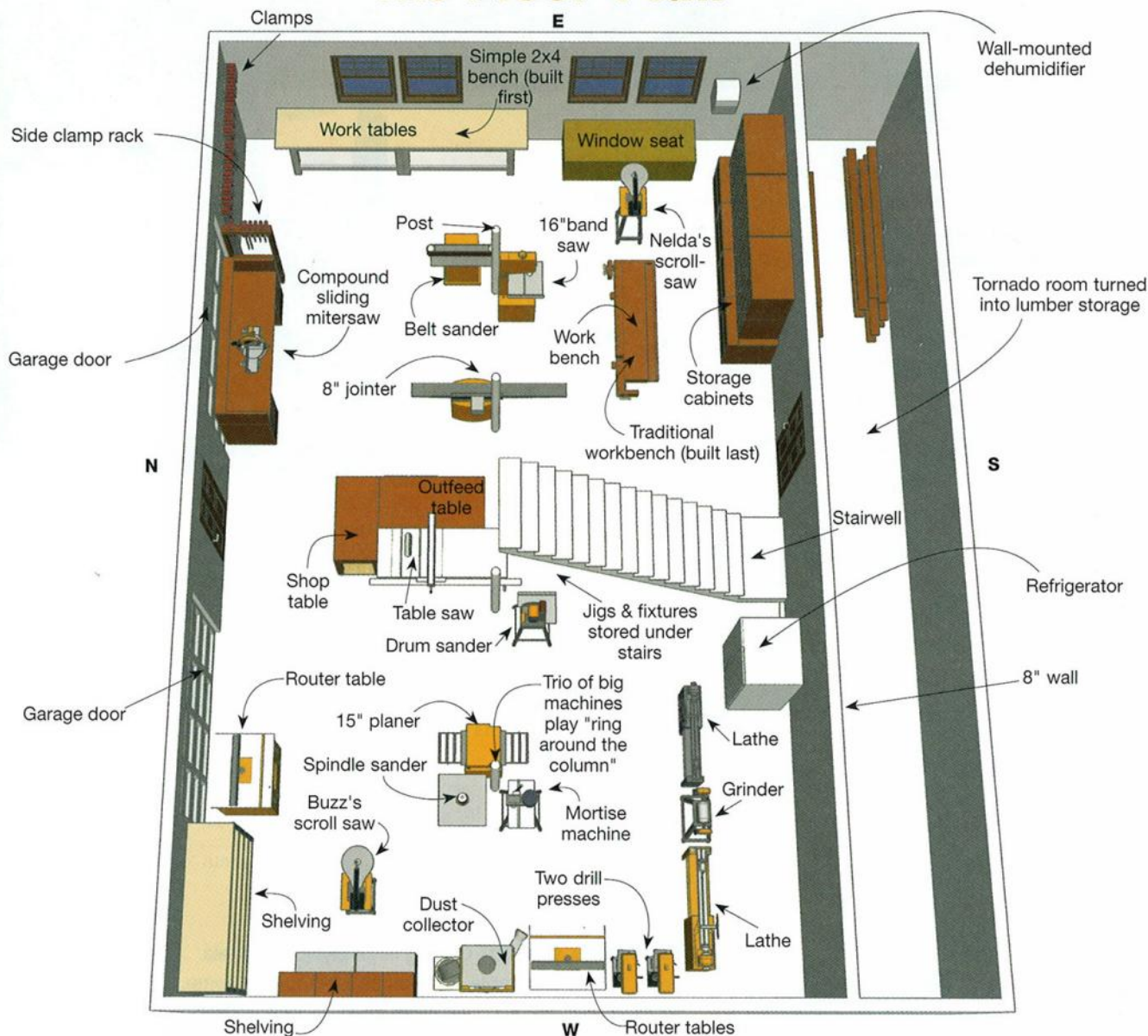
BUZZ KELLY'S SHOW-STOPPING FINISH

A patient and meticulous person, according to Nelda, Buzz gets the credit for the show-stopping finish on their projects—a hand-rubbed process that takes about a week.

1. Sand the bare wood to 220-300 grit.
2. Flood the wood with boiled linseed oil—HOT. (We use a small Crock-Pot to heat the oil.)
3. After drying overnight, sand with wet/dry 400-grit sandpaper using boiled linseed oil as a lubricant to create a slurry. (You can add rottenstone to highlight the grain and help fill open-grain woods.) Wipe the wood dry again.
4. After 4-5 days, scuff-sand with wet/dry 400-grit sandpaper; wipe down. Apply 1 lb cut shellac with smooth (Viva) paper towels (one or two coats).
5. Scuff-sand with wet/dry 600-grit sandpaper. Use mineral spirits for lubricant if desired. Wipe down and let dry overnight.
6. Apply Waterlox sealer with a paper towel. Let dry overnight. Scuff-sand with 600-grit wet/dry sandpaper using mineral spirits for lubricant. (Repeat this step three to four times.)
7. Scuff-sand with 800-grit wet/dry sandpaper, using mineral spirits as a lubricant.
8. Buff with buffing compounds 1 and 2 to medium gloss.
9. Wax and buff.



The Floor Plan



A COMMON SENSE LAYOUT

Buzz and Nelda's shop layout is constantly evolving. Initially confined to one bay of the attached basement-level garage (the other bay reserved for their car), they contemplated building a separate shop. They decided the basement shop was so convenient that, instead, they built another garage for the cars.

"This way we could take advantage of the heating and cooling from the house," says Nelda. "There is a bathroom at the top of the stairs, and it was pretty easy to put in a telephone and rig it with a light that flashes when the phone rings."

Now the shop occupies the entire former garage space.

The locations of major tools and workstations have changed as the Kellys invested more in their shop and refined their skills. However, the locations of the four posts lined up through the center of the shop have remained central to the workflow (see floor plan above).

"The posts can't be moved because they hold up the house," Buzz explains. "So we set the tools around those posts. I ran all the ductwork and wiring down the posts to try to save as much space as I could."

Metal ducts extend from the major power tools and up the posts where they connect to main duct wired to the overhead HVAC duct, leading to the Oneida 3-hp

dust collector. It is controlled at each piece of equipment by a blast gate that turns the system on and off. A recent acquisition, the dust collector prompted yet another reorganization of shop tools. "Before that we had two dust collectors that I put on each machine. It was awkward. The (new) dust collector freed up a lot of other stuff," says Buzz.

At the shop's core is the Powermatic 66 table saw and rolling side table along with the adjacent Performax drum sander. To the right is a 15" mobile planer; to the left, a stationary jointer. The bandsaw and belt sander are clustered around the end pole. Storage shelves, workbenches,

and other tools—including a pair of drill presses, router tables, compound sliding mitersaw, and a scrollsaw—are strategically distributed around the perimeter. Wood is stored in an attached room that also serves as a tornado shelter.

Colorful playroom tiles purchased at a local home center offer several advantages. They are comfortable to stand on, have prevented many a dropped tool from denting or breaking, and provide insulation by covering the bare concrete floor.

"In the winter, the temperature would fluctuate significantly," says Nelda. "With this flooring, we have a 65° constant temperature."

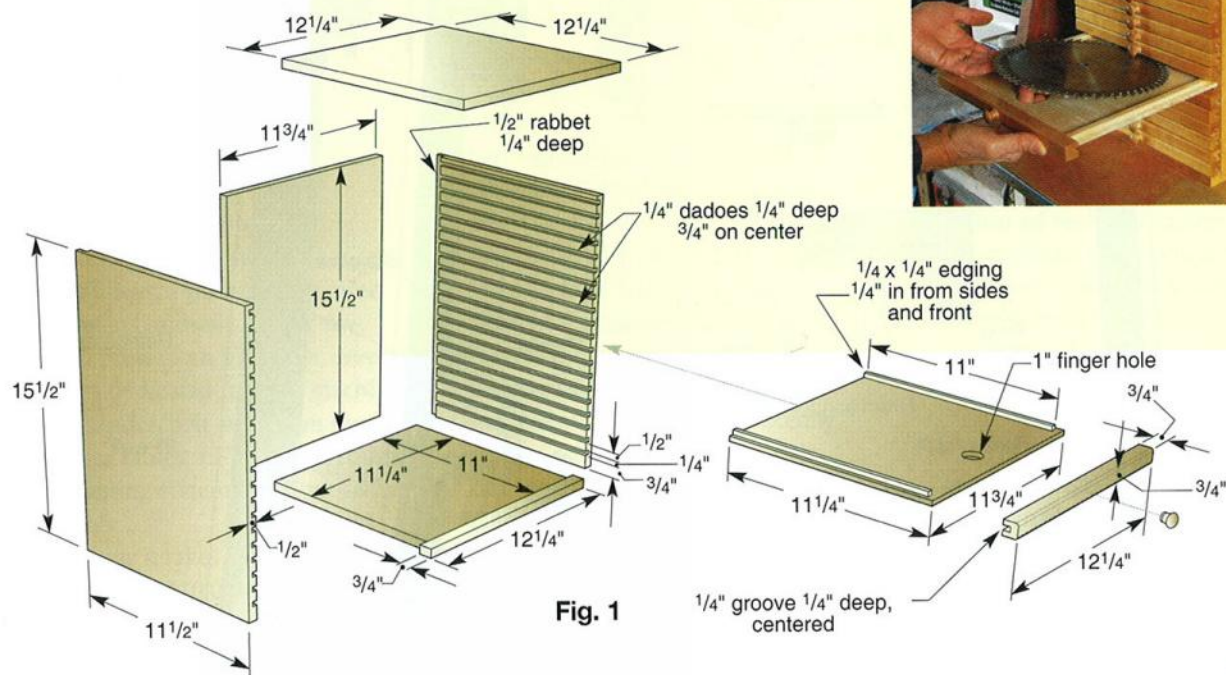


Fig. 1

Plywood guide: Cutting large plywood panels down to size on a table saw can be a bit cumbersome, so Buzz devised this plywood cutting jig. When down, the flip-up fence shows the exact location of his circular saw blade, eliminating a measuring step. “Now I just measure one time, flip the board and cut the line with my saw,” says Buzz. The jig is adaptable to other portable power tools, such as a router and jigsaw.

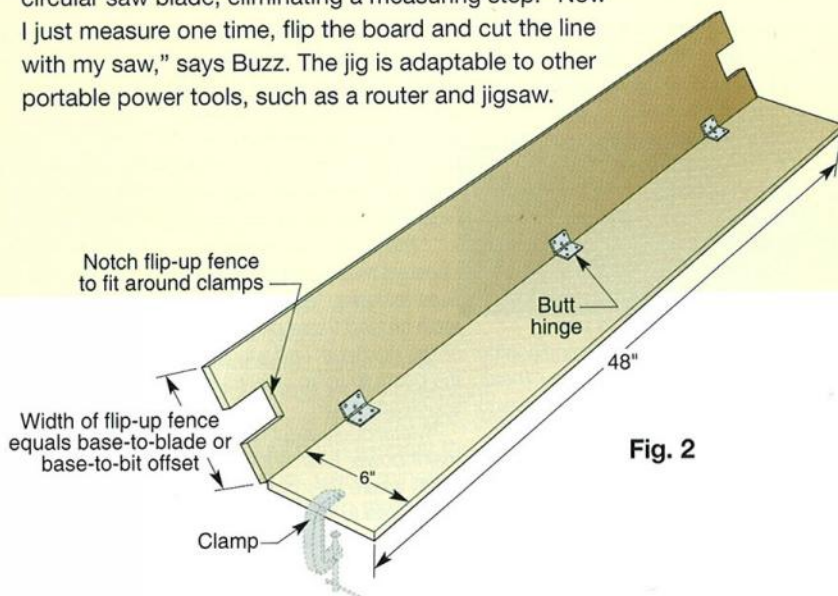
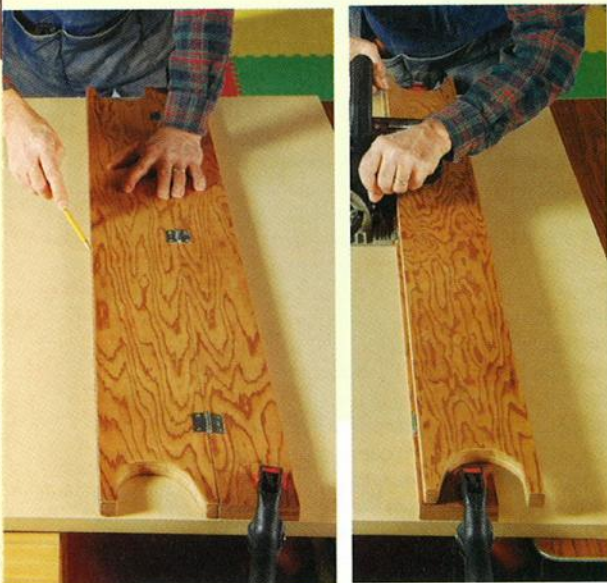


Fig. 2

3&4

Panel sled: Buzz built this panel sled years ago when he had to cut a large piece of countertop, and it has been a fixture in the shop ever since. Designed for safety, the sled is constructed of $\frac{1}{2}$ " plywood on the bottom and 2 x 6" risers. Wooden runners on the bottom fit into the table saw slots to guarantee smooth, square cuts.

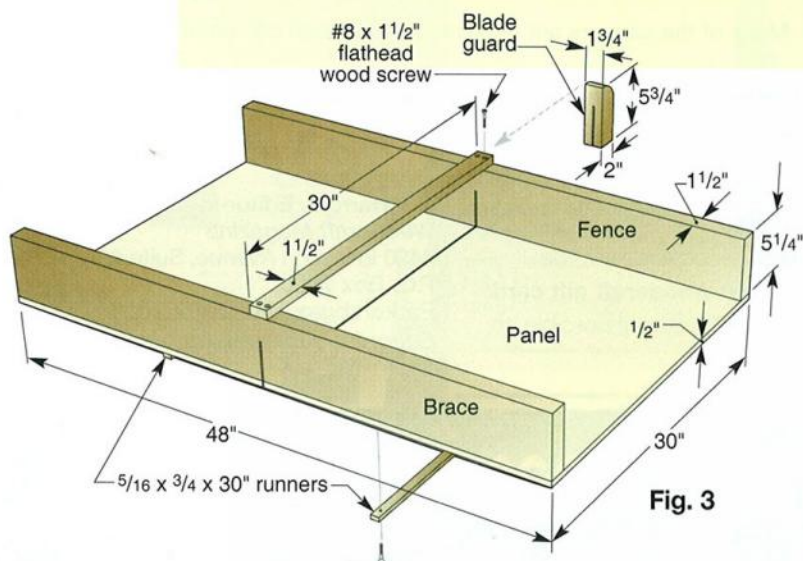


Fig. 3

Fence support: Another safety device is this simple sliding fence, ideal for cutting stock on edge. The workpiece is clamped to the sliding fence and the cut is made as shown here - fingers well out of harm's way. "It's much easier than trying to balance a board on edge, like when you are cutting a raised panel," Buzz says.

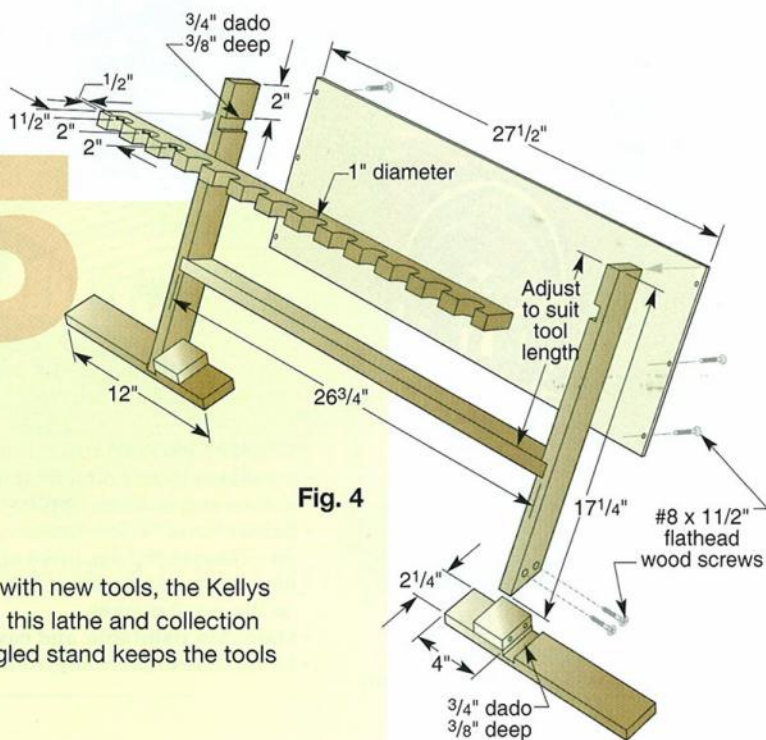


Fig. 4



Tool rack : Although they continue to outfit their shop with new tools, the Kellys occasionally put their old tools to good use. They acquired this lathe and collection of turning tools from Nelda's brother-in-law. The simple angled stand keeps the tools within easy reach.

AMERICA'S TOP SHOPS

Buzz and Nelda's Toy Build-A-Thon

In 2007 the Alabama Woodworkers Guild donated 7,400 toys to local organizations. Various guild members hold build-a-thons at their home workshops in the fall as the deadline for completing the projects nears. On Fridays, guild members meet at the local Woodcraft store and use the store's shop for build-a-thon projects. Cars, jewelry boxes, and game boards are the most common items.

Buzz and Nelda host one or two sessions at their home each September and October. On these days, a shop usually occupied by one or two woodworkers may see 27 guild members at work. In about four hours they can complete 300 cars and jewelry boxes. Many of the cars are left unpainted so children can paint them as part of their physical therapy.

Toys are distributed among several organizations, including the Children's Hospital in Birmingham, the Alabama Department of Human Resources, and the Alabama School for the Deaf and Blind. 🌞

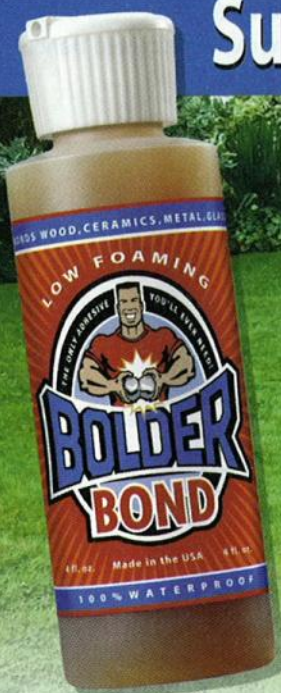


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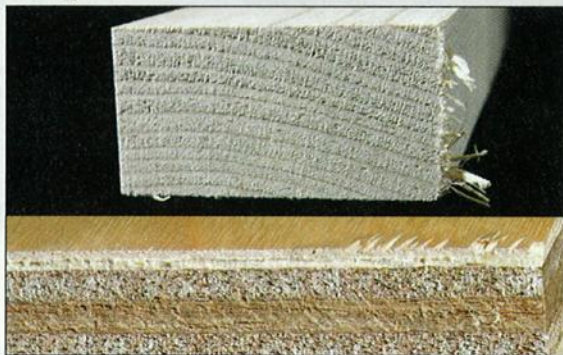
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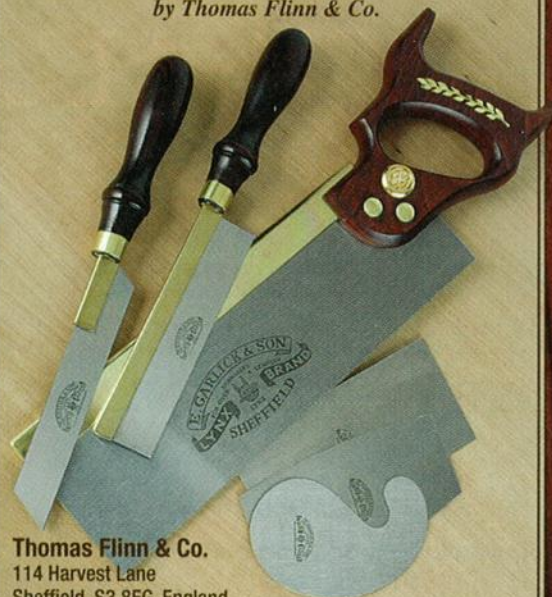
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FISHERMAN'S CATCH-ALL

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By Robert J. Settich

Project designed and built by
Bob Vincent

When you enjoy something as much as fishing, it's a shame to simply prop your favorite rods into a corner of the garage or basement. This accommodating stand lets you store up to 10 rods in style, and provides two generous drawers for reels, string spools, and other accessories. In fact, the two main drawers each hold three no. 3700 Plano boxes (a handy size for holding all your lures, hooks and weights), so that when the fish are biting you can grab the tackle you need and stash the stuff you don't. There's also a secret third drawer, but we can't say more than that right now. Otherwise, it wouldn't be much of a secret.

This medium-sized project provides a nice excuse to hone your joinery skills. It features router-cut half and full sliding dovetail dadoes (shelves and drawer backs) and hand-cut through dovetails for the front joints of the drawers. To ease construction, we developed a half-dovetail dado jig that you can use to assemble large case projects without clamps. For step-by-step help for hand-cut dovetails, see "Demystifying Hand-cut Dovetails" on page 60. And to really jazz up the stand, consider adding the power-carved trout on page 70.



Overall dimensions
10 $\frac{3}{4}$ " d x 34 $\frac{1}{4}$ " w x 50" h

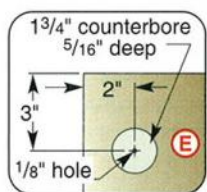


Fig. 1
Exploded view

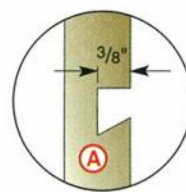
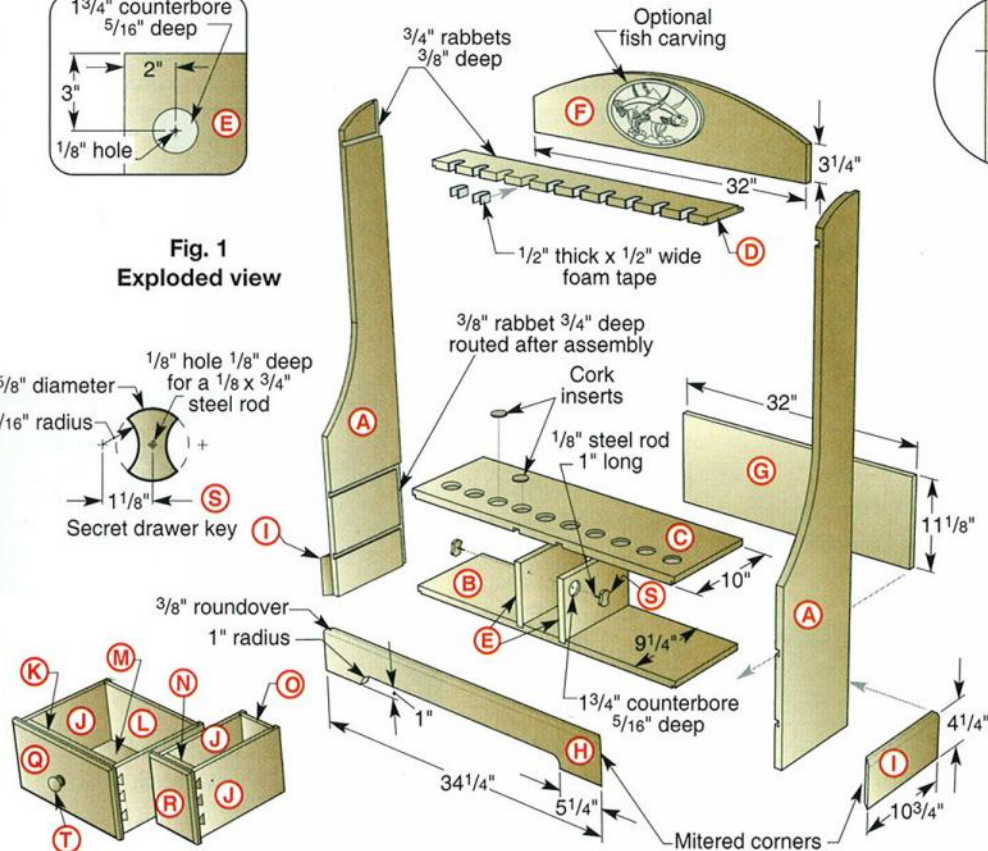
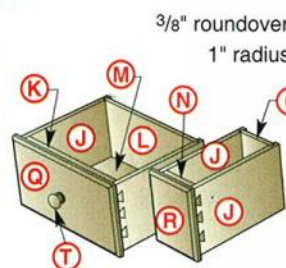
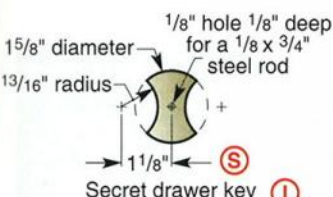
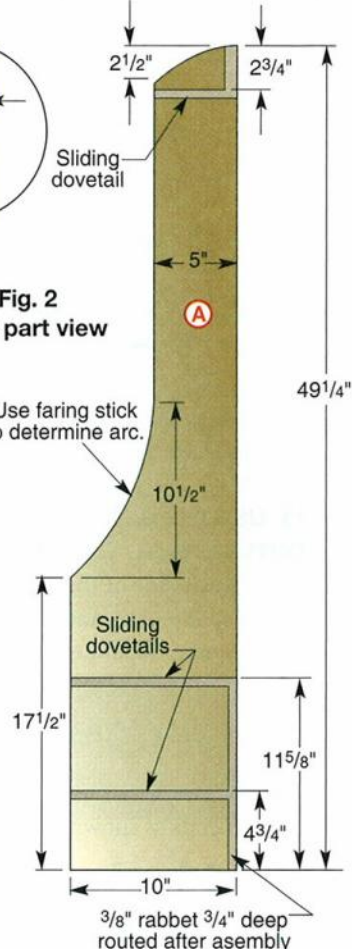


Fig. 2
Side part view

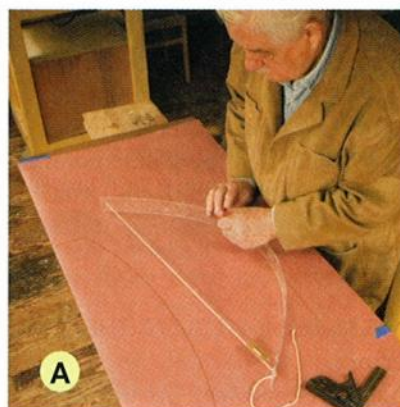


Use faring stick to determine arc.



Start with the sides

1 MAKE A FULL-SIZED PATTERN FOR THE SIDES (A) from 1/4" hardboard or plywood, referring to **Figures 1 and 2**. Use the stock's straight edge to establish the rear edge of the side, and then measure and mark the other straight portions of the perimeter.



Use a shop-made jig to draw a fair curve. Adjust the string to achieve the desired shape.

2 LAY OUT THE CURVES ON THE SIDES with a shop-made fairing stick. To make one, cut a 1/8"-thick strip of straight-grained hardwood or acrylic about 1" wide and 36" long and cut a 1/2"-long kerf in each end. Thread the string through one kerf to the other. Now pull on the

string to flex the stick. Wrap or knot the string to secure it. Bow the stick to mark the large curve as shown in **Photo A**.

TIP ALERT

Pencil marks can be difficult to see on dark hardboard. Work around this problem by taping rosin paper to the hardboard. Purchase this inexpensive layout paper in the flooring department of a home center.

making smooth, sweeping curves while keeping the straight edges straight.

4 EDGE-GLUE BOARDS TO MAKE BLANKS WIDE ENOUGH FOR THE SIDES (A), unless you have 10" or wider stock. Thickness-plane the sides to 3/4" thick. (To save time, consider thicknessing all of the stock now while you're planer is set up.)

When planing, work from thick to thin, stopping when each board is planed down to the desired thickness. Here, you'll finish planing the 7/8"-thick middle shelf (C) first, then the 3/4" thick parts (sides, back, and shelves) and finish with the 1/2"-thick drawer parts. (Use the **Cut List**, on p. 55 as a part check-off list.)

TIP ALERT

If your planer digs a little deeper at the beginning and end of each pass, cut the boards long. Trim away the divots as you cut the parts to final lengths.

5 RIP THE SIDES (A) TO WIDTH, AND CROSSCUT THE BOTTOM ENDS. Carefully align the bottom ends and edges

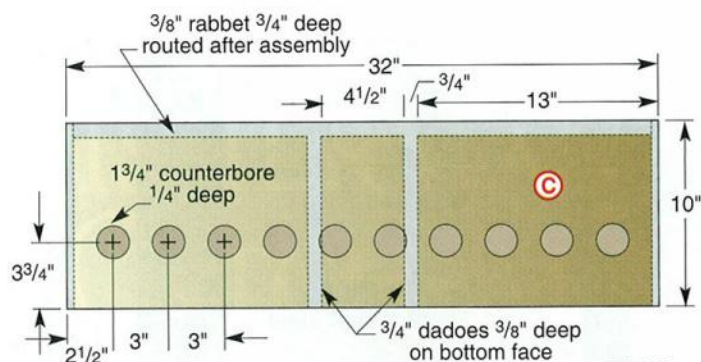


Fig.3

Middle and top shelves

as you stick the inner faces of the sides (A) together with double-faced tape.

6 USE THE PATTERN TO TRANSFER THE SIDE OUTLINE ONTO THE STACKED SIDES (A). Bandsaw just to the waste side of the line, then smooth the perimeter with a rasp, spokeshave, and sandpaper. Be careful to keep the edges square. Separate the sides from each other.

Lay out the dados

1 LAY THE SIDES (A) BACK TO BACK and flush at the bottom ends as shown in **Photo B**, and mark the locations of the sliding dovetail dados on one side where shown in **Figure 2**. When using the half-dovetail dado jig, you only need to mark the top face of each shelf.



Butt the bottom ends of the side against a straight piece of scrap, then use a combination square to mark the shelf locations on both sides at once.

2 RIP AND CROSSCUT THE SHELVES (B, C, D) to the dimensions in the **Cut List**. (Note that the middle shelf (C) is 7/8" thick. The bottom shelf (B) and top shelf (D) are 3/4" thick.) When cutting the shelves to length, use a stopblock to ensure that they're cut to the same exact length.

3 LAY OUT THE HANDLE COUNTERBORES IN THE MIDDLE SHELF (C) and the rod slots in the top shelf (D) by referring to **Figure 3**. Drill the 1 3/4" dia. counterbores in the middle shelf and 7/8"-dia. holes in the top shelf with Forstner bits (see the **Convenience Plus Buying Guide**). Use a backer board when drilling through the top shelf to prevent tear-out.

4 MARK TANGENTS TO THE HOLES IN THE TOP SHELF (D) to the front edge of the piece, with a square and pencil. Cut along these marks to complete the U-shaped slots shown in **Figure 3**.

(Since you'll line these slots with foam later, it's not necessary to sand them.)

5 PUT A 3/4" DADO SET INTO YOUR TABLE SAW, and cut the rabbet along the top rear edge of the top shelf (D) where shown in **Figure 3**. Refer to the same drawing to mark the location of the dados on the bottom face of the middle shelf (C). The top face of the bottom shelf (B) has matching dados, so you can cut both sets at the same time.

6 SET UP YOUR TABLE-MOUNTED ROUTER WITH A 3/4" STRAIGHT BIT (see the **Buying Guide**), and cut the stopped rabbet at the top of each side (A).

Cut the sliding half dovetails

1 Chuck a 1/2"-dia. straight bit into your hand-held router. Set the depth stops to make a 3/8"-deep dado in two passes. Clamp the jig to a practice board and rout through the outside edge of the fixed fence, your board, and into the counterbore on the adjustable end. (Use the counterbores as parking spots at the beginning and end of each cut.) Attach the depth stop so that its top edge is flush with the bottom of your full-depth dado.

2 AFTER ROUTING THE DADO, SWITCH TO THE DOVETAIL BIT. Don't remove the jig, just shift the aluminum spacer from one rail to the other. Use the depth stop to set the dovetail bit for a 3/8"-deep cut. Now rout from counterbore to counterbore, as shown in **Photo C**. By moving the spacer, you've shifted the guides so that the bit should rout a dovetailed notch on just one side.

3 REPEAT THE DADO/DOVETAIL ROUTING SEQUENCE ON THE SIDES. Position the jig so that the

TIP ALERT

When laying out a series of holes, tiny errors can add up at each mark, significantly shifting the position of the final hole. To minimize repetitive-measurement errors, lay out the locations from each end toward the center.

SLIDING HALF-DOVETAIL JIG

Routing a dovetail notch on one wall of the dado requires an extra step compared to cutting a regular dado, but this joint locks the shelf to the side so that you don't need to clamp it in place. Don't let the fancy-looking joinery spook you. The router's corralled between two rails, making this joint practically foolproof. A neat thing about this jig is that it's reversible so that you can always position the fixed end against a straight edge. The only thing you need to remember is to start the sequence with the aluminum spacer on the side where you want the dovetail notch.

Make the jig as shown. Adjust the jig so that your router's base and the aluminum spacer fit snugly between the two rails. Make sure that the fixed end is perpendicular to the jig rails.

After building the jig, try it out on some scrapwood. A practice joint will give you a chance to try the dado/dovetail routing sequence and set the jig's bit depth stopblock. The test parts can also help position the dovetail bit on the router table.

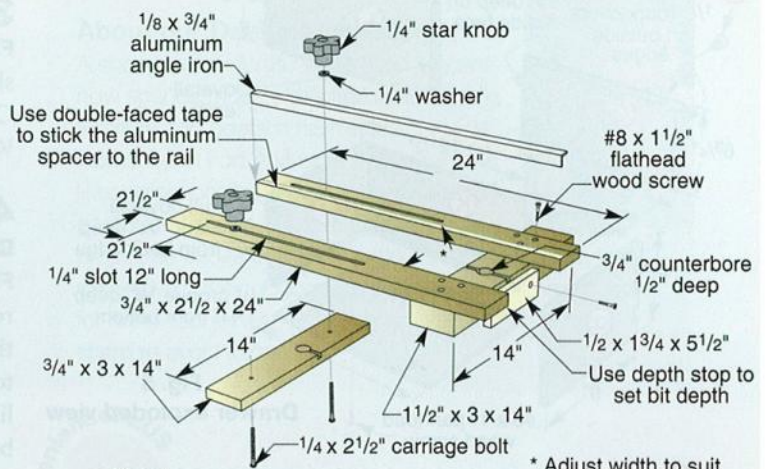
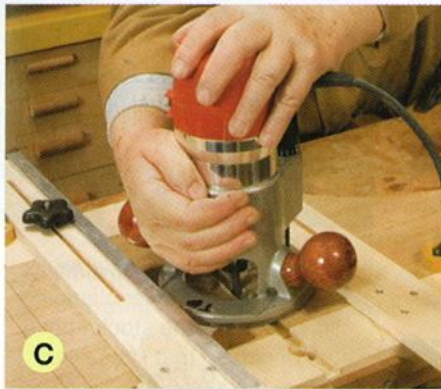


Fig. 4
Sliding dovetail jig



To rout the half-dovetail notch, run the router from one end of the jig to the other. Press the router down against your workpiece so that it can't lift in mid-cut.

fixed end rests against back edge of the side (A). Position the aluminum spacer on the rail closest to the bottom edge. As before, rout a 1/2"-wide by 3/8"-deep dado, shift the aluminum spacer to the opposite rail, then rout the half-dovetail notch.

4 INSTALL THE DOVETAIL BIT YOU USED TO ROUT THE SIDES (A) INTO YOUR TABLE-

MOUNTED ROUTER. Set the bit so that it's 3/8" above the table. To fine-tune the fence, rout a half-dovetail on a piece of scrap. Test it out on a side and adjust the fence until the

piece slides easily into a half-dovetailed groove. Once the fence is set, rout the bottom face of all three shelves as shown in **Photo D**.

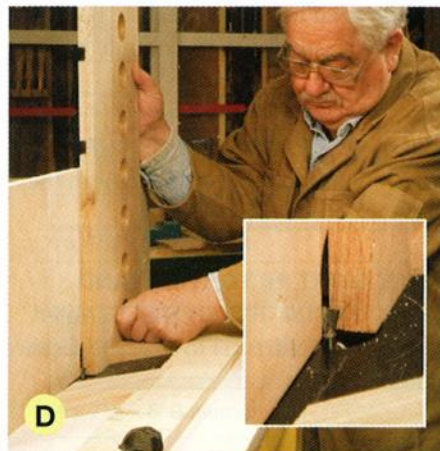
5 SLIDE THE SHELVES (B, C, D) INTO THE SIDES (A) FROM THE FRONT. (If you need to use a mallet, protect the shelf's edge with a scrap block of wood.) Note that the middle shelf (C) and top shelf (D) are flush to the front and back edge of the sides. The bottom shelf (B) stops 3/4" in from the back edge.

TIP ALERT

Too much glue can swell the shelf enough to make the sliding fit impossible. To avoid this potential problem, apply glue to the last couple of inches to lock the shelf in place.

Add the dividers, arched top, back, and skirts

1 RIP AND CROSSCUT THE DIVIDERS (E) that fit between the bottom shelf (B) and middle shelf (C). Note that the dividers are wider than they are long so that edge grain, not end grain, is visible at the front.



Attach a tall fence to help support the shelves when routing the half-dovetails on the ends. Rout the notch on each shelf's bottom face.

2 MAKE THE KEYHOLE FOR THE SECRET DRAWER.

Referring to the detail in **Figure 1**, drill a 1 3/4" counterbore on the outside faces of both dividers. Drill a 1/8" hole through each divider at the centerpoint of the counterbore. After making the keyhole, glue the dividers into the shelf

dadoes. Check that the front edges of the dividers are flush with the middle and bottom shelves.

TIP ALERT

Two routers with identical universal baseplates will save a ton of time. Instead of switching bits, chuck a 1/2" straight bit into one and the dovetail cutter into the other.

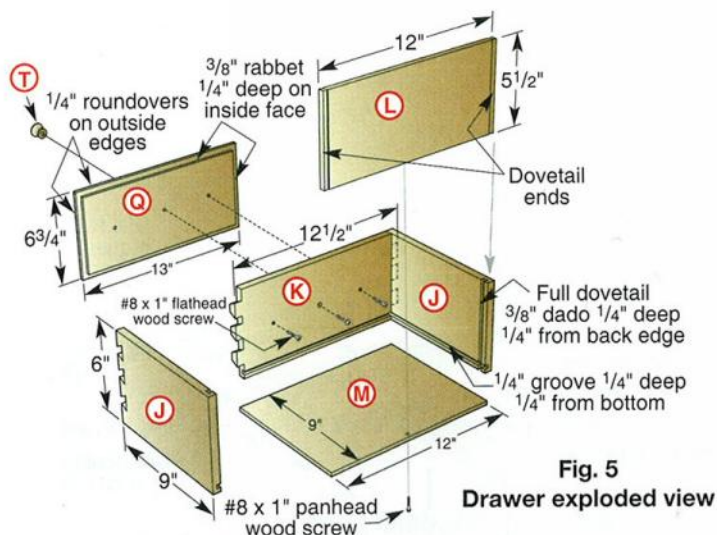


Fig. 5
Drawer exploded view

3 LAY OUT THE CURVE OF THE ARCHED TOP (F)

with a fairing stick, referring to the dimensions in **Figure 1**. Bandsaw along the waste side of the line, then sand to the line. Glue and clamp the top arch in place.

4 LAY THE CARCASE ASSEMBLY ON ITS FRONT SIDE.

Chuck a $\frac{3}{8}$ " rabbeting bit in a hand-held router and rout along the back edges and inside faces of sides (A) and middle shelf (C). Adjust the bit depth incrementally to achieve the $\frac{3}{8}$ " rabbet $\frac{3}{4}$ " deep. Square the corners with a chisel.

5 CUT THE BACK (G) TO SIZE AND GLUE IT INTO THE BACK RABBET.

6 MAKE THE BASE SKIRT PIECES (H, I) from one long board. Referring to **Figure 1** and the Cut List, rip the stock to width. Make miter cuts to create a blank for the front base trim that's about $\frac{1}{4}$ " longer than its finished length. Fit this piece to the front of the rod assembly. Then carefully mark and miter it to finished length.

7 MARK THE CUTOUT AT THE BOTTOM OF THE FRONT SKIRT (H), shown in **Figure 1**. Bandsaw just to the waste side of the line, and sand to the line.

8 ATTACH THE FRONT SKIRT (H) TO THE STAND ASSEMBLY WITH GLUE AND $\frac{1}{4}$ " FINISH NAILS. Miter and crosscut the ends of the side skirts (I) to size, and fasten them in place with glue and nails.

Make the drawers

1 GATHER STOCK FOR THE DRAWER COMPONENTS (parts J through S).

2 RIP THE DRAWER SIDES AND FRONTS (J, K, N) about $\frac{1}{16}$ " narrower than the height of the openings. Cut the fronts (K, N) about $\frac{1}{16}$ " less than the width of the openings. Crosscut the drawer parts to length.

3 ROUT $\frac{1}{4}$ " GROOVES IN THE DRAWER SIDES (J) AND FRONTS (K, N) as shown in **Figure 5**. Cut the dovetails as shown in **Photo E**. (For dovetail-cutting info, check out Rob Cosman's story on page 60. For a simpler alternative, rout a $\frac{1}{4}$ x $\frac{1}{4}$ " rabbet and assemble the drawer with glue and nails.)

4 ATTACH THE DRAWER BACKS (L, O) TO THE DRAWER SIDES (J). For the full-sliding dovetail shown in **Figure 5**, chuck a $\frac{1}{4}$ " dovetail bit into your table-mounted router. Set the bit for $\frac{1}{4}$ "-deep cut and rout a through dado through the inside faces of all six sides (J). Adjust the fence to rout the dovetailed ends of the backs. (This setup is just like shelves, except here you're routing both faces of the board.)

5 GLUE AND CLAMP THE DRAWERS, ensuring that the top edges are flush and that the assemblies are square.

6 RIP AND CROSSCUT THE DRAWER BOTTOMS (M, P) from $\frac{1}{4}$ "-thick plywood. Referring to **Figure 5**, glue the $\frac{1}{4}$ "-thick bottoms (M, P) into the drawer grooves and then drive screws into the bottom edges of the drawer backs (L, O).



The plywood square works as a convenient drawer clamping jig and raises the stock above the bench so that it's easier to see the saw cuts.

Add the false drawer fronts

1 DRILL SHANK HOLES THROUGH THE DRAWER FRONTS (K, N) for the screws that attach the false fronts.

2 RIP A BOARD TO WIDTH FOR THE DRAWER FALSE FRONTS (Q, R). Crosscut the parts sequentially so that the grain flows from one piece to the next. Mark the back of the boards to ensure that they're correctly positioned later.

3 CHUCK A $\frac{1}{4}$ " ROUND-OVER BIT INTO YOUR TABLE-MOUNTED ROUTER, and clamp a fence flush with the bit's bearing. Beginning with the end grain, rout along the front perimeter of each drawer false front (Q, R).

4 CHUCK A RABBETING OR STRAIGHT BIT INTO YOUR TABLE-MOUNTED ROUTER, and clamp a fence that allows a $\frac{1}{4}$ " bit projection. Rout a $\frac{1}{4}$ x $\frac{1}{4}$ " rabbet along the rear perimeter of each drawer false front (Q, R). Again, minimize chipout by routing the end grain first.

5 ATTACH THE FALSE FRONTS (Q, R) TO THE DRAWER BOXES by using double-faced tape. Center the false front in the drawer opening, and adjust the fit as necessary. Make the installation permanent by driving screws from inside the box, making sure that the false front doesn't shift off center.

6 MAKE THE KEYS (S) FOR THE SECRET DRAWER, as shown in **Figure 1**. Drive a 1"-long nail through the center of each key. To set the lock, insert the nail through the divider (E) and press it against this side of secret drawer. Use the dimple to drill holes in the sides of the drawers.

Finishing/Finishing Touches

1 FINISH-SAND ALL THE PARTS TO 180-GRIT. Lightly "break" any sharp corners or edges, but don't overdo it or your rack will lose its crisp lines.

For this project, we used a 3-part finish. First, we used a waterborne dye, followed by a gel stain, and finished with a clear topcoat. (For product and color suggestions, see the **Buying Guide**.)

2 SET THE CORK DISCS INTO THE COUNTERBORES ON THE MIDDLE SHELF (C) to cushion your rods. Adhere $\frac{3}{4}$ " wide x $\frac{1}{2}$ " thick foam insulating tape to the U-shaped slots in the top shelf (D). (Cork and foam insulating tape are common hardware-store items.)

3 ATTACH THE DRAWER PULLS (T)

TIP ALERT

If you plan to attach the fish carving described on page 70, glue it to the top arch after staining, but before applying the top coat. Otherwise it might not stick.

Cut List	Thickness	Width	Length	Qty.	Mat'l
A Sides	$\frac{3}{4}$ "	10"	49 $\frac{1}{4}$ "	2	B
B Bottom shelf	$\frac{3}{4}$ "	9 $\frac{1}{4}$ "	32"	1	B
C Middle shelf	$\frac{7}{8}$ "	10"	32"	1	B
D Top shelf	$\frac{3}{4}$ "	5"	32"	1	B
E Dividers	$\frac{3}{4}$ "	9 $\frac{1}{4}$ "	6 $\frac{3}{4}$ "	2	B
F Arched top	$\frac{3}{4}$ "	7 $\frac{1}{4}$ "	32"	1	B
G Back	$\frac{3}{4}$ "	11 $\frac{1}{8}$ "	32"	1	B
H Front skirt	$\frac{3}{4}$ "	4 $\frac{1}{4}$ "	34 $\frac{1}{4}$ "	1	B
I Side skirts	$\frac{3}{4}$ "	4 $\frac{1}{4}$ "	10 $\frac{3}{4}$ "	2	B
J Drawer sides	$\frac{1}{2}$ "	6"	9"	6	Po
K Large drawer front	$\frac{1}{2}$ "	6"	12 $\frac{1}{2}$ "	2	Po
L Large drawer back	$\frac{1}{2}$ "	5 $\frac{1}{2}$ "	12"	2	Po
M Large drawer bottom	$\frac{1}{4}$ "	9"	12"	2	P
N Secret drawer front	$\frac{1}{2}$ "	6"	4 $\frac{1}{2}$ "	1	Po
O Secret drawer back	$\frac{1}{2}$ "	5 $\frac{1}{2}$ "	4"	1	Po
P Secret drawer bottom	$\frac{1}{4}$ "	4"	8 $\frac{3}{4}$ "	1	P
Q Large drawer false front	$\frac{3}{4}$ "	6 $\frac{3}{4}$ "	13"	2	B
R Secret drawer false front	$\frac{3}{4}$ "	6 $\frac{3}{4}$ "	5"	1	B
S Secret drawer keys	$\frac{1}{4}$ "	1"	1 $\frac{5}{8}$ "	2	Po

B = Butternut Po=Poplar P=Plywood

About our Designer/Builder

A shop teacher for 30 years, Bob Vincent now spends much of his free time building furniture and boats in his modest 16 x 24' workshop in Fort Atkinson, Wisconsin. He likes using locally-harvested hardwoods, particularly cherry and butternut. For this project he chose butternut, walnut's lighter-colored, less-expensive cousin. Bob recommends this soft hardwood for hand-tool joinery, but suggests keeping tools razor sharp to avoid fuzzy cuts.



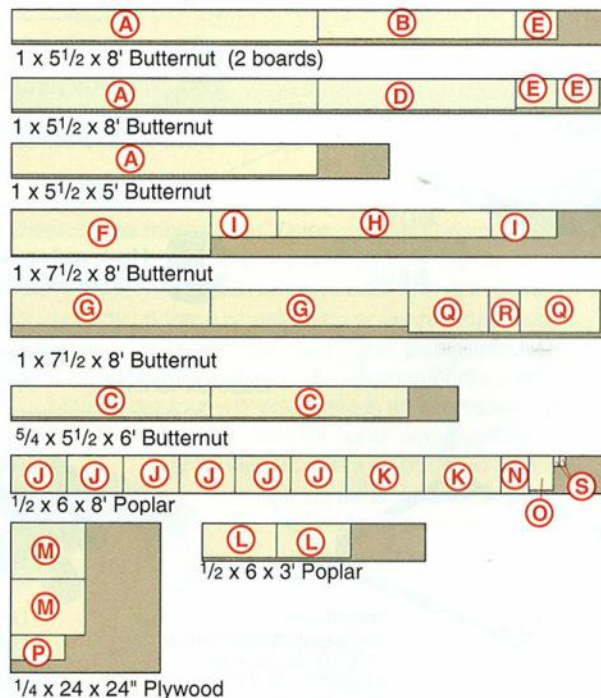
BUYING GUIDE

WOODCRAFT # PRICE

☐ 1.	Woodcraft Anti-Kick Dovetail Bit, 1/2" D, 14°, (1/4" SH)	129676	\$10.99
☐ 2.	Woodcraft Anti-Kick Straight Bit, 1/2" D, 1/4" CL (1/2" SH)	140797	\$14.99
☐ 3.	Woodcraft Anti-Kick Straight Bit, 3/4" D, 1/4" CL (1/2" SH)	140799	\$16.99
☐ 4.	7/8" Forstner Bit	125933	\$5.99
☐ 5.	1 1/4" Forstner Bit	125941	\$8.99
☐ 6.	Five-Star Knob with Through Hole, 1/4" x 20 insert	27R13	\$1.39/ea.
☐ 7.	TransTint Dye, Dark Vintage Maple	821825	\$16.99
☐ 8.	General Finishes Colonial Maple Gel Stain	826969	\$9.99
☐ 9.	Deft Spray Lacquer Satin	143198	\$6.50

Above items available at Woodcraft stores, woodcraft.com or by calling (800) 225-1153.

Cutting diagram



GO MOBILE

Your guide to the smartest shop space-makers

By Joe Hurst-Wajszczuk

Few of us ever admit to having “enough” tools and machinery, but sooner or later, we realize that it’s possible to own one too many. Finding parking spots for those most-needed machines, benches, stands, and materials in a crowded garage or basement can take the thrill out of making sawdust. All too often, we eat up shop time dragging heavy pieces across the floor, turning every project into a series of hassles.

Enter mobile bases—the next best thing to building a bigger shop. These affordable accessories maximize

available space by enabling you to roll in machinery when it’s needed and then roll it out of when it’s not. Mobility is the quintessential tight shop solution, but it can be equally valuable in larger workshops. Repositioning machinery improves workflow and, in some cases, creates extra assembly space for large projects.

Choosing the right mobile base—or deciding to make one yourself— isn’t as difficult as it seems. Here’s a list of options, plus a handy product-selection decision tree you can use to get your shop rolling.

CHOOSE A MOBILE BASE IN 3 STEPS

1

Tell me about your new machine

AS GOOD AS IT GETS

GOOD ENOUGH FOR NOW

2

What’s your reaction to “some assembly required”?

NO THANKS

NO PROBLEM

3

How universal should your universal base be?

BUY A DEDICATED BASE

BUILD A BASE

Basic buying factors

Base dimension

Weight capacity

Ease of mobility

WoodRiver Adjustable Mobile Base
12 x 12" to 18 x 50"
#148515 \$54.99
Max. Weight: 400 lbs

Universal Mobile Base Hardware
12 x 12" to 37 x 37"
#145488 \$59.99
Max. Weight: 600 lbs

Shop Fox Super HD Mobile Base
18 x 24½" to 28½ x 33½"
#816491 \$98.99
Max. Weight: 1200 lbs

There are dozens of different bases to choose from. This simple decision tree can help you pare down available choices and select the best base for the need at hand.

YOUR MOBILE OPTIONS

Dedicated or Universal Base

MOBILE BASES COME IN TWO BASIC FLAVORS: DEDICATED AND UNIVERSAL. A dedicated base, as shown in **Photo A**, is the simplest solution because it's engineered to match the size and weight of a given machine. However, custom bases are more expensive (on average \$50 to \$100 more than comparable universal bases), and they can cost you more later. Because these bases fit specific machinery, future shop upgrades, such as replacing your old 6" jointer with an 8" one, may also mean buying a brand-new base.

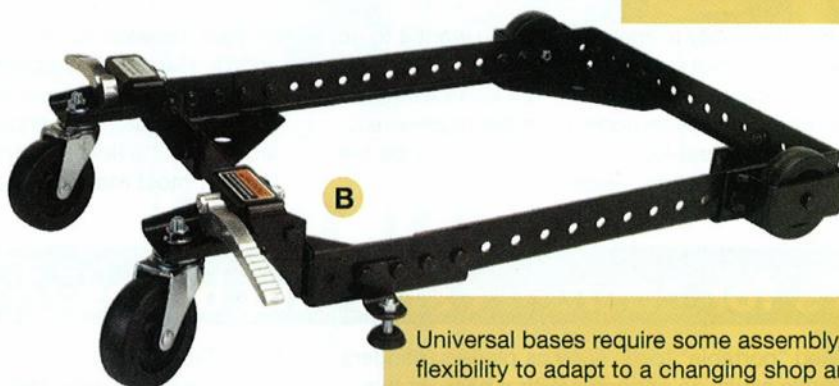
Universal bases, as shown in **Photo B**, are suitable for almost any machine that fits within the base's size and weight range (see "Average Machine Weights," below). Prices for universal bases generally fall in the \$50 to \$100 range. The downside to universal bases is the assembly process; however, even those bases that come with a bag of parts can be completed in less than two hours.

TIP ALERT

Buying an adjustable heavier-duty base makes sense if there's a chance that you might switch it to a different machine, or if you are planning future upgrades.



Dedicated bases are ready to go straight out of the box, but lack the flexibility to adjust to a changing shop.

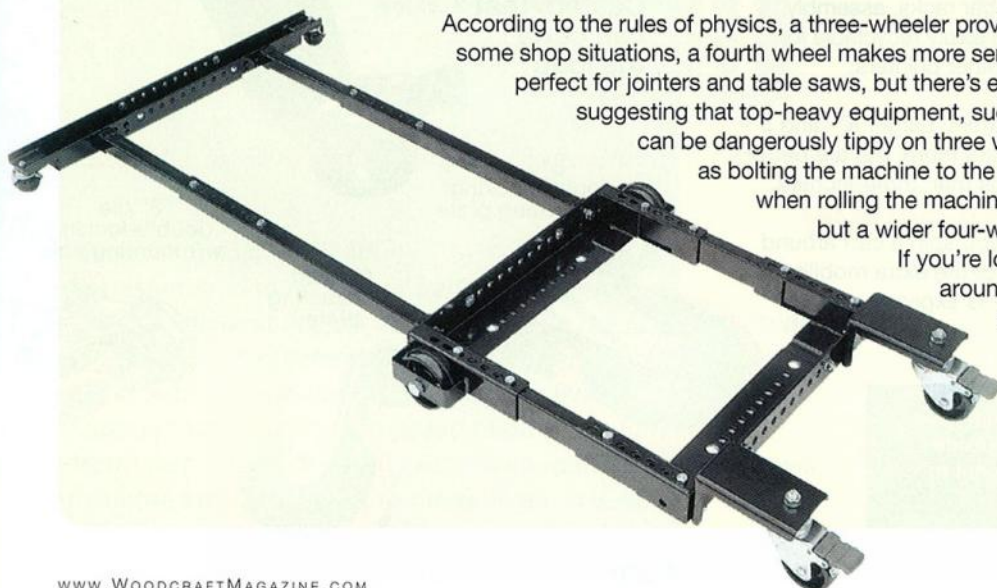


Universal bases require some assembly, but offer the flexibility to adapt to a changing shop and a variety of machines.

AVERAGE MACHINE WEIGHTS

TOOL	LBS
Bandsaw	250-500
Drill Press	100-200
6" Jointer	250-350
8" Jointer	400-500
10" Contractor Saw	200-300
10" Cabinet Saw	400-500

Caster count: 3, 4, or 6?



According to the rules of physics, a three-wheeler provides the most stability, but in some shop situations, a fourth wheel makes more sense. Three-wheeled bases are perfect for jointers and table saws, but there's enough anecdotal evidence suggesting that top-heavy equipment, such as bandsaws and drill presses, can be dangerously tipsy on three wheels. Proper precautions, such as bolting the machine to the base, and being extra careful when rolling the machine around, can prevent disaster, but a wider four-wheeled base is an even safer bet.

If you're looking for some way to wheel around a cabinet saw outfitted with an extension table, you might consider a six-wheeled base. An extra pair of wheels makes the large machines easier to roll and better distributes the weight across the frame.

Wheel locks: hand or foot-activated



Hand-tightened wheel locks (C) are good for machines that are moved infrequently, but foot-activated pedals (D) can be raised or locked in place without needing to bend over.

Besides having the ability to move where you want it to go, it's equally important that your base/machine combo stays firmly planted where you want it to sit. You don't want a table saw to roll or spin when ripping a sheet of plywood. For that reason, the wheel-locking mechanism may be the most important factor in base selection.

Your decision comes down to convenience (see photos C and D). Hand-tightened wheel locks are effective, but not as easy to use as foot-operated levers and plungers. The ability to quickly brake and release a base without having to crawl around on the floor is worth the few added bucks, especially for your most mobile big tools.

Casters for custom carts and bases

Some so-called "portable" tools, such as planers, sanders (even some table saws) do not come with a base. In this case, you'll need to build your own cabinet base and then equip it with casters.

A set of four casters can wind up costing more than a mobile base kit; however, casters are more suitable for larger and heavier applications such as lumber racks, assembly carts, and workbenches. They're also easily recyclable for future shop projects. Here are some other pointers:

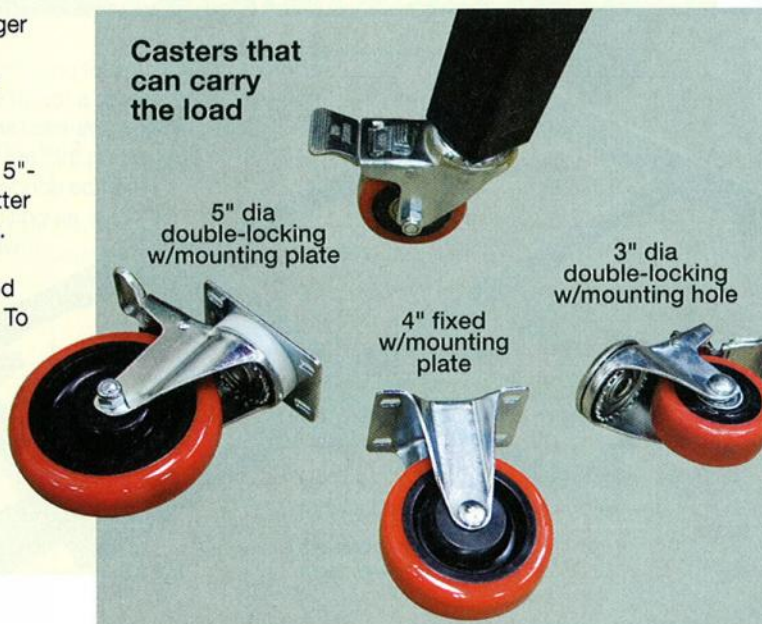
- When choosing casters size matters. Larger 4"- and 5"-diameter wheels cost a few dollars more, but are better able to roll over cracks and cords than three-inches.
- Swivel-based casters can help you spin a cart around on a dime, but you'll pay more for the extra mobility. To save money, position a pair of less expensive fixed casters on one end.

- For stability, at least two casters should be equipped with double-locking mechanisms. These brakes keep the wheel from turning and prevent the caster from swiveling.

TIP ALERT

When building a custom base, position the casters outside of the machine's footprint to maximize stability.

Casters that can carry the load



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LESSONS FROM A PRO

DEMYSTIFYING HAND-CUT DOVETAILS

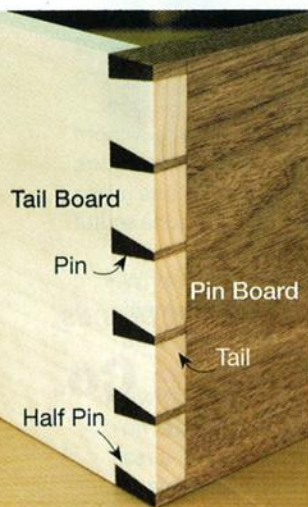
By Rob Cosman

An eight-step approach for getting a perfectly fitting joint, straight from the saw.

The dovetail joint is regarded as the paramount joint of fine woodworking because it blends form and function. But the reason it's been used for centuries is because of its simplicity and strength. Making accurate dovetails boils down to having a few good tools and developing the skill to saw and chisel to a line.

After teaching hundreds of students and cutting thousands of the joints myself, I've developed a straightforward sequence that can help anyone cut a through-dovetail joint that requires no after-the-fact fitting. My approach covers preparing, laying out, sawing, and chiseling out the *tails* and *pins* and addresses the most common problems woodworkers encounter.

So whether you're a beginner or advanced woodworker, I hope the next few pages encourage you to spend an hour or two at your workbench trying your hand at dovetailing—or refining the dovetailing skills you already possess. We'll create a test joint to give you hands-on experience. Of course, honing the technique takes time but after a few dozen corners, your speed will significantly increase. At some point you'll realize hand-cutting dovetails can take less time than setting up a dovetail router jig, especially when doing smaller projects. Speed aside, you'll also fall in love with the look of hand-cut dovetail joints. Now let's get started.



Elements of a hand-cut dovetail

The Hand-Cut Dovetailer's Tool Kit

To follow this joinery exercise, you'll need a basic set of hand tools: a dovetail saw (preferably one with a rip-tooth configuration and narrow set), a marking gauge, chisels, and a few hand planes. I also use a few special tools, including a fret saw, two sets of dividers, a dovetail marker, and a palette knife. (To see these tools and for some tool-buying suggestions, see the photo and **Convenience-Plus Buying Guide** on page 64.)

Using low-grade (or poorly tuned) tools will make this sequence a lot more difficult, if not impossible, but I don't want to discourage you from making sawdust. Start with the tools you own, just make sure they're sharpened and tuned to the best of your ability. When you're ready to step up, your experience will help you understand and appreciate the value of top-shelf hand tools.

Step 1: PREPARE YOUR STOCK

Your joint will only be as good as the material you start with. When dovetailing a drawer, I prepare all the pieces first to save time, but in this case there are just two pieces of 5½"-wide stock: a tail board and a pin board. Label each piece so that the best face will be on the "show side" of the finished joint. Hand-plane the inside face, edges, and ends to ensure that all the surfaces are flat, smooth and square. (Planing end grain is challenging for beginners; I use a shooting board, but for this exercise you may use a mitersaw with a fine-tooth blade.)

Step 2: LAY OUT THE SHOULDER LINE FOR TAILS

To lay out the baseline for tails, set your marking gauge to the thickness of your pin board, as shown in **Photo A**. Next, I use a skew angle block plane to create a shallow (1/32" to 1/64") rabbet on the inside face of your tail board up to the baseline, as in **Photo B**. This rabbet isn't absolutely necessary, but it helps align the tail board on the pin board when transferring the tails. Next, readjust your marking gauge so that it is 1/32" less than the thickness of the rabbetted end of the tail board and scribe a line on both faces of your pin board.

Step 3: LAY OUT THE TAILS

To lay out the tail board, I use two sets of dividers: one set to mark the half pins at the end, and a second set to space the tails across the end of the board. (I prefer the look of a dovetail joint with half pins on the outside edges rather than half tails. I think they offer a more finished look.) Having two sets of dividers—instead of setting and resetting one with each corner—makes the layout process faster and more accurate.

Mark the half pins first (see **Photo C**). The half pins shouldn't be too thick, but thick enough so that they don't break or splay during assembly. (On this 5½"-wide sample joint, I made the half pins about 1/4" wide.) After using your divider to make a shallow indent in from each edge, set it aside for use on the next corner.

Next, space out your tails. Dividers offer a no-math spacing solution; all you need to know is that the distance between the tool's legs equals the width of one tail and one pin. Starting at the

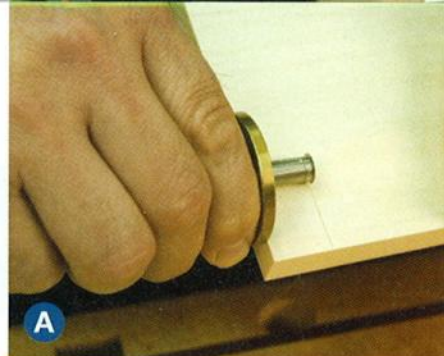
half pin mark, lightly walk the dividers across the end from one edge to the other. Adjust the divider's legs so that by the fifth step, the divider's point lands just past the opposing half pin mark. (That "extra" is equal to the width of the pin.)

Once you've found your setting, walk the dividers across the end of your tail board, as shown in **Photo D** but this time make deeper indents. Walk the divider from the left half-pin point across to the right, then repeat the process starting from the right half-pin to the left. When you're done, the end of your board should have four close-fitting indent pairs. These indents are the top points of your tails.

Mark the tails on the end and face side of your board using a dovetail marker. To position the marker, place the pen in an indent then slide the marker until it registers against the pen. Draw square lines across the end grain and angled lines from the scribe line up to the end of the board (**Photo E**). Repeat the marking process on the opposite face. Finally, take a minute to identify your waste.

Step 4: CUT SNUG-FITTING TAILS

Secure the tail board to your bench vise, as shown in the opening photo, so that it's plumb and a few inches above the bench. With your free hand, pinch the top of the board with your thumb and forefinger, as shown in **Photo F** to serve as your saw guide.



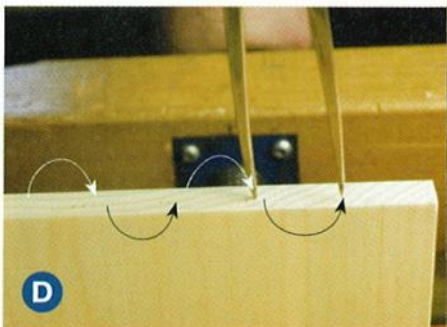
Using a wheel marking gauge, scribe a line on your tail board that is the thickness of your pin board.



Plane a shallow rabbet along the inside face of the tail board to establish an easily referenced lip for laying out the pin board.

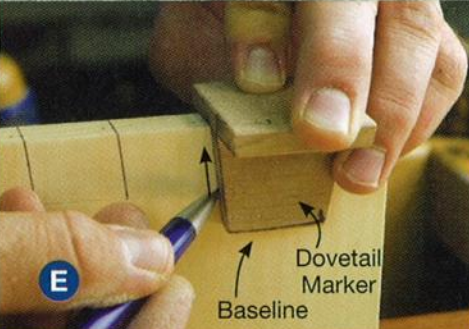


Make a small indent 1/4" in from each edge to mark the location of the half pins.



Walk the divider across the end of the tail board. Adjust the legs so that it crosses the half-pin mark by 1/8" on the fifth step.

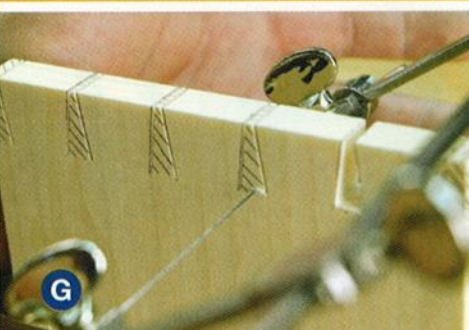
The tail count is more than just an aesthetic choice. Too many will weaken the joint at the baseline; too few leave an inadequate gluing surface. In the example on page 60, five tails make for a strong and good-looking joint.



Start your lines from the baseline and draw up along the dovetail marker. Saws have a habit of following pen lines.



Pinch the board to create an anchor point for the saw. This prevents the blade from skipping when you start the cut.



To remove the waste, slip the blade into the saw kerf. Then saw just above the scribe line. A close cut now means less chiseling later.



Set the saw on the waste side of the scribe line and cut the half pin opening. Try to split the line for a no-gap fit.

When starting each cut, lift your saw to take most of the weight off the wood. This prevents the saw from biting and grabbing. After the first few strokes, allow the weight of the saw to provide the downward pressure needed to make the cut. Once you've started the kerf, aim the saw to match your pen line and work down toward the baseline. It's OK if you're off your line slightly by a few degrees, just as long as you maintain a straight cut. Slow down as you approach the scribe line. To finish the cut, tilt the saw slightly forward until the teeth touch the scribe line on the opposite face. Make all of the same slope cuts before coming back to cut the other side of the tails. Repetitive angle cuts improve accuracy.

Now remove the waste. To avoid too much chiseling, I remove the bulk of the waste between the tails using a fret saw with a narrow 12.5 skip tooth blade, as shown in **Photo G**. Do not cut below the baseline on either face.

After removing the waste between the tails, reposition the tail board horizontally in the vise, about an inch above your bench, and saw out the half pins. Note that this is the first cut where you'll need to *split* a line. The half pin must meet exactly at the baseline to ensure there's no gap.

As shown in **Photo H**, focus on holding the saw vertically and stopping the saw before cutting into the side of the tail. The baseline helps ensure a clean, straight cut. If you've scribed the line deeply enough, the saw will practically guide itself against the edge of the line.

Step 5: CHOPPING THE TAILS

Position the tail board flat on your bench, on top of a piece of scrap. Start chopping on the inside face of the board and finish from the good face. That way, if a chop breaks through, the damage will be on the inside of the joint.

I try to chop the waste with two taps. The first strike seats the chisel in the scribe line, and the second drives the chisel halfway through the board (**Photo I**). Flip the board and repeat the process on the face side.

Some woodworkers undercut the baseline, I've found that keeping my chisel vertical and chopping straight down avoids two problems. First, a perpendicular cut eliminates the risk of exposing a gap should you need to plane off more wood than expected from the finished joint. Second, positioning the chisel against the scribe line and going straight down prevents it from pushing backwards and eating into the baseline.

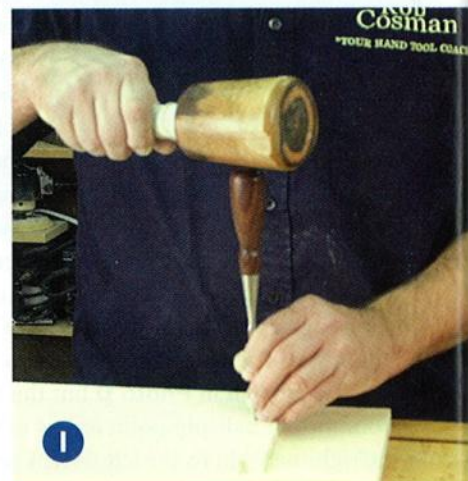
Inspect your tail board. Assuming you've sawn to the line on both sides of your tails, the corners should be sharp. If not, use the corner of a narrow chisel to clean out the corners.

Step 6: TRANSFER THE TAILS TO THE PIN BOARD

Regardless of your sawing and chiseling skills you'll wind up with a sloppy joint if your pins are not accurately laid out, so proceed carefully. To start, set your bench plane on its side, then clamp your pin board in your vise so that the tail board can bridge between both. If you've planed a rabbet on your tail board's inside face,

TIP ALERT

Use a ballpoint pen to lay out the tails. The lines are easier to see and the ink doesn't dull and disappear.



Position the tail board on a piece of scrap to protect your bench when chiseling. Two taps from each side should be enough to remove the waste.

reference it against the inside face of the pin board. Make sure that the long edges of the tail and pin boards are flush.

While keeping the boards in position with your left hand, transfer the tail locations onto the end of your pin board as shown in **Photo J**. Press the side of the scribe knife blade against the tail to ensure that your mark is accurate. Use 80% of your effort on keeping the knife against the side of the tail and 20% cutting the mark on the pin board. Like sawing, mark all your right sides before your lefts. Take a second to inspect your knife lines before unclamping.

Finally, chisel small chamfers on the tail board, starting $\frac{1}{16}$ " from the end to the baseline, as shown in **Photo K**. The chamfers allow the glue to squeeze up into the joint and to prevent the pins from being damaged during assembly.

Step 7: LAY OUT AND SAW THE PINS

When marking the pin lines on the face of your pin board, little details really count. For example, some students are so intent on splitting the line that they'll follow it straight through the baseline. To ensure that my lines don't run long, I tell students to strike from the baseline up to the knife marks. Don't forget to mark your waste. (This is cheap insurance against placing the sawblade on the wrong side of your line.)

Sawing pins takes some practice. Unlike the tails, you want to split the knife lines you made on the end of the pin board. ("Splitting" means removing half of the V-shaped knife cut with your saw, and leaving half attached to the pin.) To begin your cut, tilt your saw slightly forward and start a small kerf on the back side, as shown in

Photo L. Using this as an anchor point, steer your

saw along the knife line on the top edge so that the blade remains on the waste side of the line and make a shallow cut along the top edge. Once you've established the kerf, use the vertical pen mark as a guide and saw straight down to the scribe line.

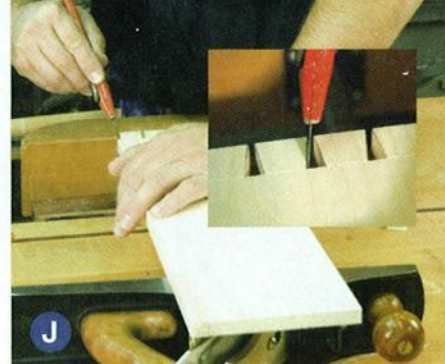
After making all the vertical cuts, remove the bulk of the waste with a fret saw and finish up with a chisel just as you did with the tail board. Starting from the inside face, set your chisel in the scribe line and tight against the side of the pin. Strike it to seat the chisel on the line, adjust the chisel angle to match the slope of the pin, then make your second strike. Again, try to complete your chisel work in two taps.

Reposition the board after chopping out the waste upright in your vise for a final inspection. Use a square, check that the sockets between the pins are clean and flat. If you need to do any paring, use a narrow chisel so that you can shave high spots with a minimum of forward pressure. Set the edge of the chisel about $\frac{1}{16}$ " in from the edge and slightly undercut the socket floor. Pinch the blade of the chisel with one hand while you're driving it with the other (**Photo M**). This back pressure prevents the chisel from jumping forward and blowing out the back of the joint.

Step 8: FINISHING THE JOINT

I don't suggest dry-fitting your joint. I find this step not only unnecessary, but it also has the potential to be damaging. Too often, pulling apart a partially assembled joint will crush or split perfectly fitting pins. Assuming you've accurately laid out and cut to your lines (it's easy to see whether or not you have any remaining knife marks) as described, you've already done all the required work.

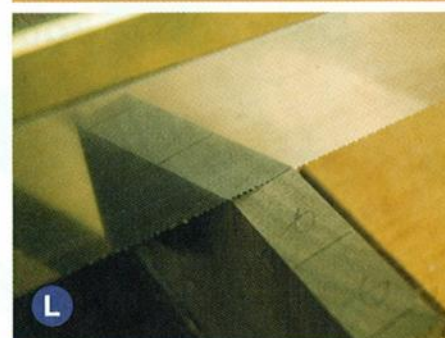
Before you start assembly, gather the tools needed to put your corner together: steel hammer, small square, pallet knife, glue, wiping rag, and pounding block. (To avoid splitting the joint during assembly, make this block as wide as the joint.) Next, secure the pin board in your vise about 6" above your benchtop and apply the glue (**Photo N**). Don't worry about the end grain; simply apply a light coating to all long grain edges.



A dull blade is better for marking pins because it leaves a thicker line and is less likely to follow the grain.



Chamfer the inside edge of the tails to help align the joint during assembly and facilitate gluing.



Push the saw lightly along the back edge to start the pin cut. Cut the kerf along the waste side of the knife line then saw straight down.



Pare the pin socket with a narrow chisel to maintain good control when cutting. Use a square to make sure the socket is flat.

TIP ALERT

With practice, you'll use gravity will help you steer vertical cuts, but for this to work the boards must be plumb to your bench. When clamping your pin board to your bench, use a square or torpedo level.



N Apply glue to both boards with a palette knife. The wet glue acts as a lubricant to help you slide the joint parts together.



O Seat the joint with a pouncing block and hammer. Keep your pouncing block clean of glue and debris so that you don't dent your work.



P Plane the boards until the joint is flush.

Start the joint with hand pressure, then use a pouncing block and hammer to completely seat the joint, as in **Photo O**. (If you set your marking gauge just shy of the tail board thickness, the joint should seat completely before your block hits the ends of the pins. If not, you'll need to pound around the pins to seat the joint.)

At this point, you can remove the piece from the vise and check for square. Make adjustments with a little hand pressure, then reseat your joint with your block and hammer.

If necessary, you can position a clamp across the joint to squeeze the half pins against the tails.

Now that the joint is assembled, wipe off any excess glue then plane the sides (**Photo P**) and inspect your work. Last but not least, date and save your dovetail work.

I've found that these sample corners are a great way to gauge your progress. 🪵

TIP ALERT

If you need to resize a pin, pare across the grain. If you chisel straight down, you may catch the grain and remove too much. Using a wide chisel pare across the grain from the front to back face.

TIP ALERT

Gaps are easier to fix when the glue is still soft. If you find a gap, repair it from the end grain side. Using offcuts, saw a small wedge, trim the leading edge with a chisel, apply glue then lightly tap it in place. Trim the wedge with a chisel after the glue has dried.

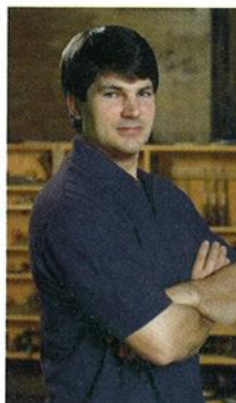
Dovetailer's Tool Kit



ConveniencePLUS

BUYING GUIDE

		WOODCRAFT #	PRICE
☐ 1.	8" Dividers	141597	\$17.99
☐ 2.	Dovetail Markers, Pair	01M10	\$12.99
☐ 3.	Maple Carvers Mallet	141342	\$23.99
☐ 4.	"Mastering the Dovetail Saw with Rob Cosman" DVD	835723	\$25.00
☐ 5.	"Hand-Cut Dovetails with Rob Cosman" DVD	833847	\$25.00
☐ 6.	"Advanced Hand-Cut Dovetails" DVD	830245	\$25.00
Above items available at Woodcraft stores, woodcraft.com or by calling (800) 225-1153.			
☐ 7.	Dick Blick Palette Knife, #03115-1003, \$2.99. To order call (800) 828-4548 or visit dickblick.com .		



MEET THE EXPERT

ROB COSMAN has been woodworking for most of his life. Through his book, 12 DVDs, demonstrations, and in-person hand tool workshops, Rob has helped hundreds of woodworkers discover how to achieve higher levels of craftsmanship by using hand tools. For more information about Rob and a list of his scheduled appearances, go to www.robcosman.com.

WOODCRAFT®



Woodcraft has been "Helping You Make Wood Work" for 80 years! Woodcraft – your source for quality tools, supplies and advice.

Pinnacle is defined by Webster's as *the highest point of development or achievement*. The latest offering of clamping, marking, and measuring tools that bear the Pinnacle™ name have certainly earned their logo. Every detail of these Pinnacle™ tools was engineered with one thing in mind; provide woodworkers with tools that empower them to craft higher quality, more professional cabinetry and furniture. Pinnacle™ tools are available exclusively at Woodcraft.



PINNACLE™
PROFESSIONAL QUALITY TOOLS

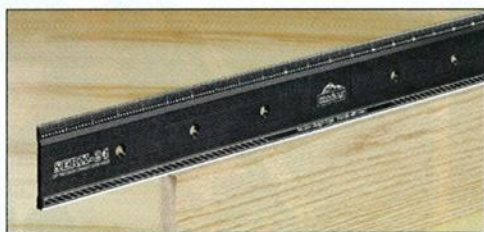
Pinnacle Clamping Square & Wedge

Maintain a perfect square while assembling frames, cabinets, or just about any box!

- 147530
Clamping Square (pr)
- 147531
Wedge (pr)
- 143936
Straight Line
Toggle Clamp

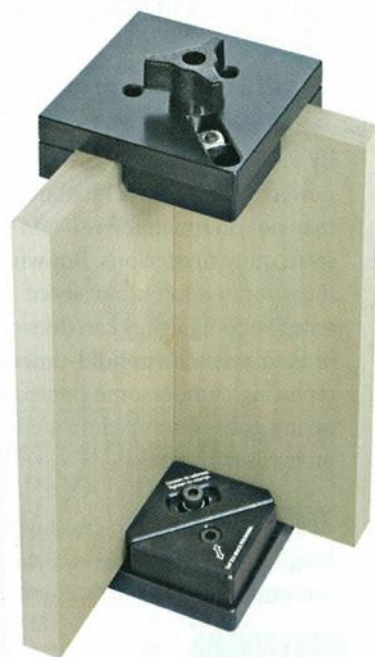
Pinnacle Precision Straight Edge Rule

Each inch and fractional marking is laser engraved to a positioning tolerance of .0002".
147624 24"



Pinnacle 4" Box Clamp

Quickly square up and secure the pieces of any box structure with a thickness between 1/4" to 1"!
147529 (1)



Pinnacle Precision Triangle Set

Both the 4 1/2" and 6 1/4" Triangles in this set are manufactured to extremely accurate standards and guarantee perpendicular accuracy to well within .001".
147623 Set of 2



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Dept: 08WD05P1

QUALITY WOODWORKING TOOLS • SUPPLIES • ADVICE®

VERSATILE HOLD-DOWNS WITH MAGNETIC PERSONALITIES

THE PRODUCT: MagJig

MADE BY: Magswitch

WHAT IT DOES: Powerful magnetic hold-down that works with jigs and that can be switched on and off for quick attachment and release.

AVAILABLE AT WOODCRAFT:

MagJig, 20mm, #147832; MagJig, 30mm, #147833

PRICE: #147832, \$24.99; #147833, \$29.99

TESTER: Jim Harrold

By themselves, one or two of these powerful, switch-operated devices may not do much for you and may seem quite mysterious. But when incorporated into a variety of scrapwood jigs, they can do wonders in their role as firm hold-downs, replacing cumbersome clamps and saving gobs of setup time while increasing safety.

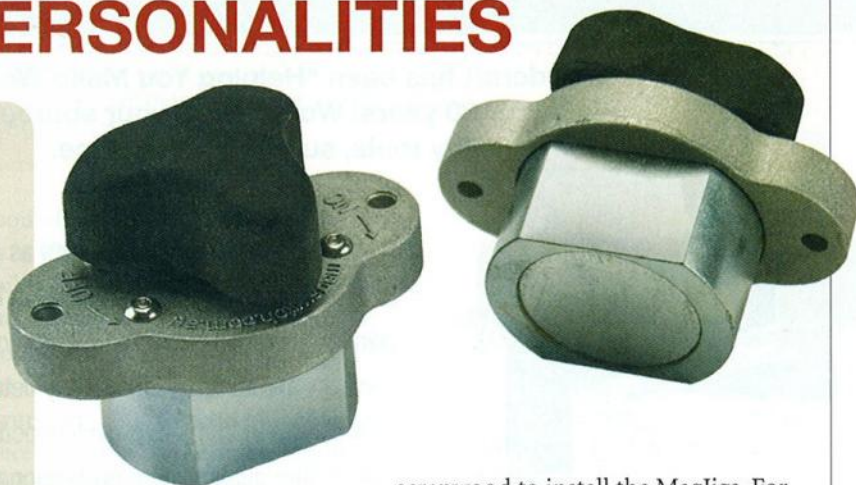
THE SETUP: To employ the MagJigs (we recommend having a minimum of two), first choose the

jig to use items with. In order for MagJigs to work, the selected jig needs to be something you intend to attach to a steel surface, such as a drill press or table saw table. The jig could serve as a guide, or a hold-down. It could contain other hardware parts to increase its functionality. Also keep in mind that whatever jig material you use for the MagJigs—Baltic birch plywood, MDF, or hardwood—it needs to be $\frac{1}{16}$ " to $\frac{3}{4}$ " thick so that the bottom of the MagJig is flush with the attaching scrapwood surface when in place. Now, drill sized holes in the

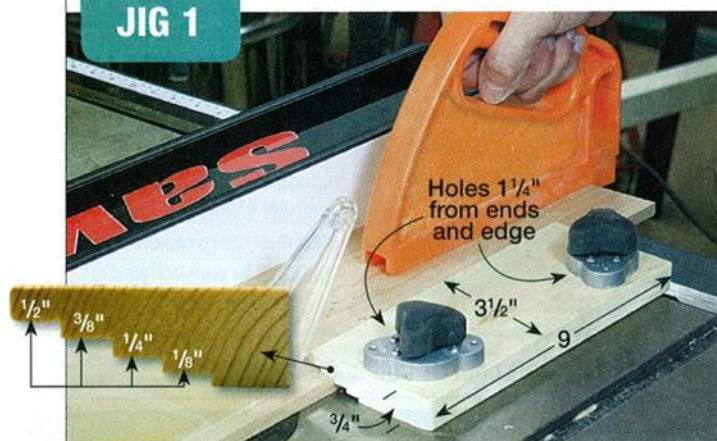
scrapwood to install the MagJigs. For the 20mm MagJig, bore a 30mm or $1\frac{1}{4}$ " hole; for the 30mm MagJig, a 40mm or a $1\frac{1}{16}$ " hole. Leave enough wood along the edges and ends of the scrapwood (from $\frac{3}{4}$ " to 1") to avoid breakage or weakness. Drop in the MagJigs (a friction-fit lets you quickly pull them out for use in another shop jig), or screw the devices to the jig for continued use.

Finally, adhere the scrapwood jig to the tool's steel surface by turning the MagJig knobs clockwise to activate the magnetic force in an instant.

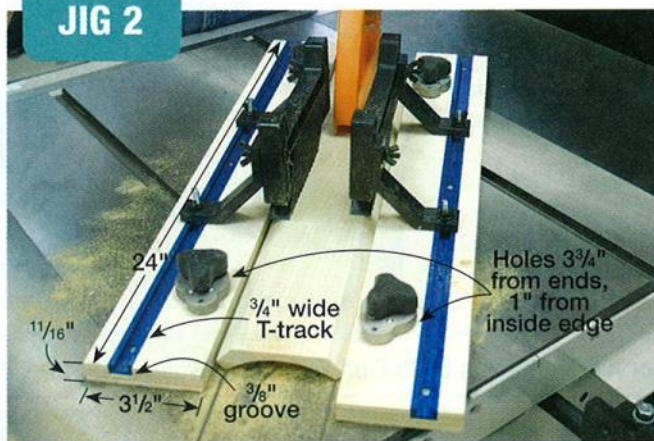
THE TEST: Using the four jigs featured here in actual shop applications, I was able to rip stock



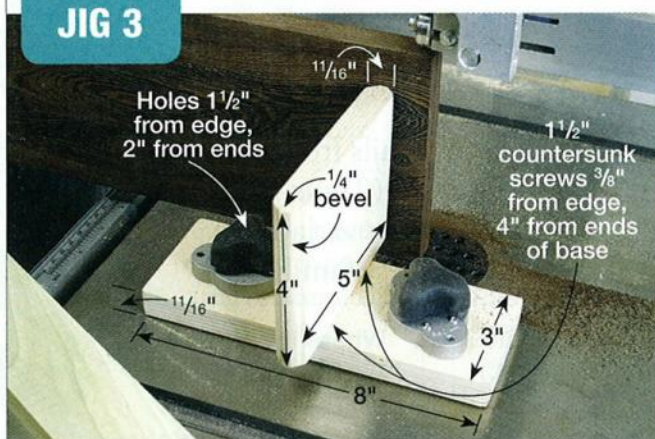
JIG 1



JIG 2



JIG 3



safely through our shop table saw, cut crown molding on a table saw, drill accurate holes in the slats for our cross-brace chair (see page 10), and resaw a 7"-wide piece of wenge on the bandsaw. I was amazed at how little time I needed to make the above setups. And the setup for cutting the crown on the table saw provided the needed safety for this somewhat intimidating cut. By simply locating jigs and locking them in place with a turn of the wrists, I was ready to go. Trying to clamp such jigs to the underside of a steel tool table can be trying at best, while forever seeking the perfect spot.

BEST APPLICATIONS:

Not knowing what to do with the MagJigs is likely the biggest challenge manufacturer Magswitch has in selling the items. Consequently, the company spent this past year developing jigs that are well suited for the MagJigs. We borrowed them to give you four practical shop applications. Complete with dimensions, they're yours for the taking.

JIG 1: THE THIN-STOCK HOLD-DOWN

This clever jig is made from one piece

of solid wood and consists of four graduated steps for holding down 1/8"-, 1/4"-, 3/8"-, and 1/2"-thick stock.

JIG 2: COVE MOLDING AND DADO GUIDE SYSTEM

Employing a pair of stock-containing scrapwood guides, this jig includes two MagJigs in each opposing guide strip, as well as a T-track, and a Magswitch vertical featherboard (#147528, \$11.99).

JIG 3: BANDSAW RESAW JIG

Consisting of just two pieces of scrapwood, this screwed together jig locks in place at the desired distance from the blade, allowing for an even cut from top to bottom.

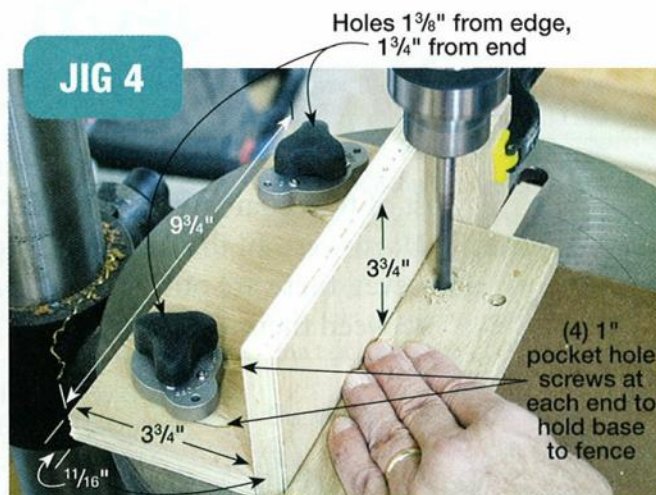
JIG 4: UNIVERSAL FENCE

Shown here in a drilling operation, this right-angle jig, held together with pocket screws, makes quick work of any number of fence-dependent tasks.

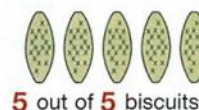
TESTER'S TAKE:

Though I'm not crazy about the price, I am a little nutty over the possibilities for using MagJigs. A good place to start is to own just two and make a bunch of jigs that they fit into. The holding power is impressive. I asked Magswitch

JIG 4



if they would supply a free pair to the reader who submitted the best original workshop application, and they seemed quite agreeable. Submit your idea to our "Tips and Tricks" address on page 21 and we'll make sure Magswitch gets it. We'll also publish the best idea in the magazine and award the originator a \$100 Woodcraft gift card.



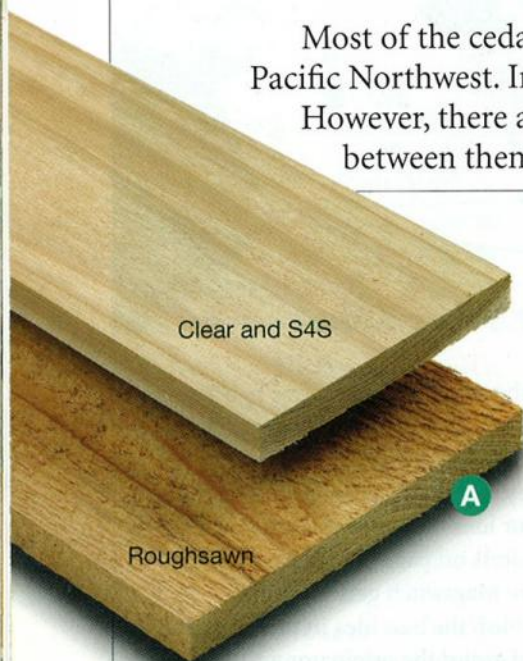
WHAT PRODUCTS PERPLEX YOU?

Have you ever looked in a woodworking catalog or browsed in a woodworking store and encountered a product that baffled you? You eyeball the item, read the promotional information, but still don't see the product's value? Hopefully, with this column in *Woodcraft Magazine*, those days are over. We'll select one or more "mystery products" for each issue and show how to use them beyond the manufacturer's take. We'll point out their pluses, problems, practical shop applications, and grade them. If you know of a few such products that need more explanation, email us at Editor@WoodcraftMagazine.com to let us know.

SPOTLIGHT ON WESTERN RED CEDAR

By Pete Stephano

Most of the cedar you'll encounter for woodworking hails from the Pacific Northwest. In the trade it's called western red cedar (*Thuja plicata*). However, there are other cedars available, too, with a few variations between them, and, yet, they're all in the same cypress family.



History in woodworking

Tribes of North America's Pacific Northwest were using western red cedar long before white explorers came across the tree on Vancouver Island in the late 1700s. Native carvers shaped it into masks, ceremonial boxes, and totem poles. Split into planks, the lightweight, decay-resistant wood formed their lodges. As hollowed-out trunks, it became ocean-going trade and whaling canoes (also see "It's a fact that...") Even the tree's tough, sinew-like bark provided the raw material for woven baskets, braided rope, and fishing lines.

When white settlers came on the scene, they, too, took advantage of western red cedar's attributes, making it into shakes, shingles, and siding for their frontier homes. Today, those uses still account for the largest commercial use of the wood, followed by outdoor structures such as decks, gazebos,

and fences, as well as patio furniture. (See the arbor and gate on page 22.)

Moving east, across the continent, the history was similar with northern white cedar (*Thuja occidentalis*). From the Great Lakes to Maine, Native American's put it to good everyday use, while white men employed it as home construction material. Its use today parallels that of its western cousin, but in far less volume. It's also more greatly appreciated by boat builders.

Atlantic white cedar (*Chamaecyparis thyoides*), which grows in fresh water swamps from New England to Louisiana's Gulf Coast, shares the same characteristics as northern white cedar and small amounts may be mixed with it at local lumberyards.

Note: Eastern red cedar (*Juniperus virginiana*), the aromatic wood used for chest and closet linings, isn't suitable for furniture and outdoor projects, so the information here doesn't pertain to it.

Where it comes from

Western red cedar flourishes in the moist coastal forests that stretch from northern California to southern Alaska, but also grows in commercial quantities in the mountains of Idaho and Montana. Under prime conditions it can attain heights greater than 100' and 10'-diameters.

Northern white cedar is logged from eastern Canada to Maine and along the northern Appalachians, then westward through the northernmost Great Lakes states. The greatest production of Atlantic white cedar centers in North Carolina and along the Gulf Coast to Louisiana.

What you'll pay

Lumber retailers sell western red cedar in board and timber form as well as shakes, shingles, and siding. The best board grade—kiln-dried clear heart—has no knots or sapwood, and can cost \$4 per board foot or more. Most outdoor projects don't require all-clear lumber, though, so lesser grades containing knots will do.

You'll find northern white cedar and Atlantic white cedar at small local mills and lumber outlets in its growth range. It sells for about \$1 per lineal foot in thicknesses up to 4" and surfaced four sides

Cedar Quick Take

	LOW	MEDIUM	HIGH
COST - Fairly moderate			
WEIGHT - Light			
HARDNESS - Low			
STABILITY - High			
DURABILITY - High			
STRENGTH - Fairly low			
TOXICITY - Low*			
WORKABILITY —hand and power tools			
COMMON USES —boat building, fences, outdoor furniture and structures, millwork, planters, shingles, and siding.			

*In rare cases a significant amount of contact can cause a respiratory reaction to those with an allergy to it.

(S4S). C Select and D Select grades work well for interior trim, cabinets, and outdoor furniture because they are graded for appearance from one side. You also can buy the wood in common and construction grades as well as roughsawn on one face (A).

Choose top-quality wood

Due to its variety of possible applications, western red cedar comes in a matching variety of grades, but you need remember only the following simplified guidelines:

The wood offers two basic “appearance” categories—*standard clear* and *standard knotty* (both kiln-dried). Standard clear grades, for furniture and cabinets, include *clear* (finest appearance and highest cost), *A-grade*, and *B-grade*. Some dealers may special-order these grades in vertical grain for specialized architectural use.

Non-appearance grades—for decks, fences, and planters—include Select merchantable, Construction, Standard, and Utility knotty grades. Select offers the fewest and tightest knots in the group.

Keep in mind that for projects that come in contact with the ground don’t use material that includes *sapwood*. Tight knots won’t hurt a thing.

Cedar Finishing Secrets

■ Cedar that’s been surfaced (S4S or S2S) should be gone over with 80-grit abrasive before applying a solid, pigmented finish (paint). This helps the finish adhere.

■ Extend the life of painted cedar by first applying a paintable water repellent to the bare wood.

It’s a fact that...

■ Northern white cedar splits easily by hand, a trait that made it the featured wood for the planking (as little as 1/8" thick), ribs, thwarts, and gunwales of traditional bark canoes.

■ Port-Orford cedar, a species that grows along a narrow coastal mountain strip from northern California to southern Oregon, has always furnished the favored wood for archery arrows.

■ The largest of the nation’s western red cedars grows in Olympic National Park, Washington. According to American Forests’ National Register of Big Trees, it stands 159’ tall and has a diameter of nearly 20’! In contrast, northern white cedar’s top tree, growing in Michigan, is only 113’ tall and about 6’ in diameter.

Working cedar in the shop

One of the lightest softwood species at about 20 pounds per cubic foot, western red cedar (and its relatives) also rates among the most stable, especially when kiln-dried. However, it tends to be brittle which demands attention in machining.

Planing, ripping, and routing.

Plane cedar in shallow passes, removing 1/16" or less. Do the same on the jointer.

Due to its straight grain (B), western red cedar rips easily. Crosscut it with a fine-toothed blade to avoid splintering.

Tear-out while routing across the grain is common. Eliminate it with a backing board along the edge where the bit exits.

Adhesives and fasteners.

Without sappy pitch to gum up the

works, you’ll have little problem joining cedar with the adhesive of your choice. When it comes to fasteners, though, you should use non-corrosive ones of aluminum, brass, or silicon bronze. Screws require pilot holes and should also be about one-third longer than you’d normally use. Rely on zinc-coated nails that are also extra long so they won’t pull out.

Deciding on the right finish

When fresh-cut, western red cedar looks bright, reddish-brown (other cedars appear light tan), but it soon becomes drab brown. Sapwood, by contrast, appears creamy white (C).

Without a finish, all cedars gradually change to a silver gray color (D). Although this aged color is pleasant, it can be uneven. Any type of clear protective finish that’s occasionally reapplied slows the graying process. Without a protective finish the wood also will literally weather away—not decay—over time (about 1/2" per century).

Cedar, because it contains no pitch or resins, takes paints, stains, and clear finishes well, with the best protection from damaging ultraviolet rays provided by a pigmented coating.



A Fisherman's Delight



POWER-CARVED TROUT

By Jim Harrold

with John Garton and Joe Adkins

Whether you own a low-dough handheld rotary carving tool or one that features an easy-to-manage flex shaft, you'll find this handsome plaque a joy to make, using our full-sized pattern and a few selected cutters. Go through the **Convenience-Plus Buying Guide** to check off the items you already own, and pick up those you don't. Or, you may have alternative burrs that will serve just as well.

While carving pro John Garton of Petersburg, West Virginia, designed the plaque as a stand-alone project,

we also made sure that it serves as the perfect, glue or screw-mount motif for the fisherman's (rod and reel) catch-all on page 50. Follow along now as John and his carving associate Joe Adkins (see "About Our Carvers") walk through the project steps from wood blank to finished fish.

Note: John and Joe selected a sassafras blank that measured $\frac{7}{8}$ x $7\frac{1}{2}$ x 12" for the fish carving, but many other woods can be substituted, among them basswood, walnut, mahogany, and butternut.



Cut the blank and transfer the pattern

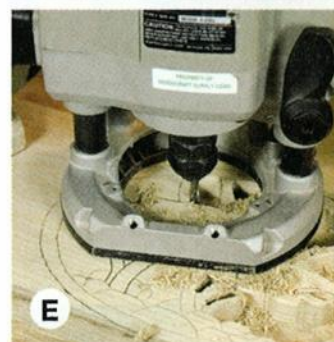
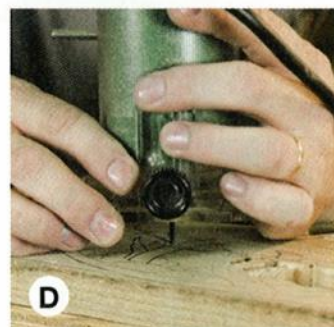
- 1 Cut and plane a blank from a wood of your choosing, using the dimensions found in the note on the opposite page.
- 2 Photocopy the full-sized fish pattern on page 74 and flip the copy over on your work surface. Using a graphite pencil, rub lead in the area of the pattern from the opposite side as shown in **Photo A**. (This saves buying carbon paper.)
- 3 Next, lay your blank on the work surface, good side up, and tape the copy onto the wood. Now, go over the pattern with pencil to transfer the lines onto the blank as shown in **Photo B**. Lift up the corner of the pattern to check on the transfer (**Photo C**).

Rout out the waste areas

- 1 Clamp the blank securely to your work surface, and then chuck a $\frac{1}{8}$ " upcut spiral cutter (see the **Buying Guide**) into your trim router. To rout out the background (see the **Relief Depth Guide**), position the bit away from the line, switch on your router and then lower the bit about $\frac{1}{4}$ " into your material. Run the bit up to and around the outer edges of the fish and grass as shown in **Photo D**. Rout out any small sections where a larger bit won't fit. Repeat this process two or three times until you've worked down to the $\frac{5}{8}$ " background depth.
- 2 Hog out the larger waste areas with a plunge router and a $\frac{1}{4}$ " upcut spiral cutter as shown in **Photo E**.

Power-carve the routed blank

- 1 Chuck a tungsten carbide coarse cylinder burr with a $\frac{1}{8}$ " shank in your power carver (see the **Buying Guide**) to round over and/or rough-out the fish, grass, and rocks as shown in **Photo F**. Refer to the **Relief Depth Guide** below, and the opening photo to help with tapering and dimensioning.
- 2 Redraw lost pattern lines from time to time, first after rough-shaping the parts as shown in **Photo G**, and then later as needed. Keep a copy of the full-sized pattern in close view.
- 3 Chuck in a ball-tipped diamond bit (from a 28-piece carving burr set like the one listed in the **Buying Guide**) and begin creating more

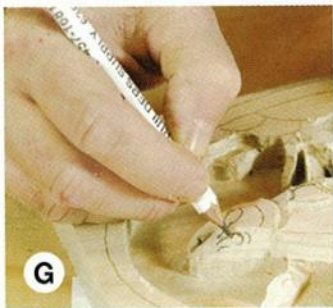


RELIEF DEPTH GUIDE

In relief carving, the general tendency is to not carve deeply enough. Use this guide to remind you how deep the various elements of the plaque should be for the maximum dimensional effect.

- The plaque's rim level is the same as the thickness of the original planed board.
- The body of the fish is the shallowest part of the carving, from $\frac{1}{8}$ " to $\frac{1}{4}$ " below the rim's surface.
- The fins and some of the plant matter are on the middle level, from $\frac{1}{4}$ " to $\frac{3}{8}$ " below the rim.
- Some of the rocks and plant matter are $\frac{3}{8}$ " to $\frac{1}{2}$ " below the rim.
- This is the deepest level at $\frac{5}{8}$ " and consists of the textured background.

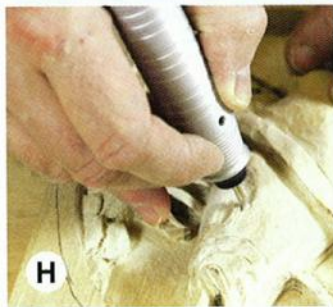




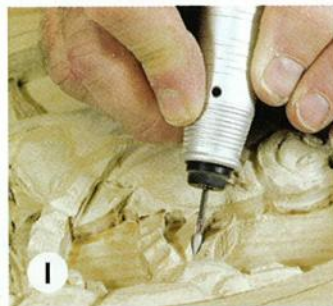
depth and detail around the fish parts—the fins, jaw, eye, for instance—as shown in **Photo H**. Further refine the grass and rocks as well.

TIP ALERT

To best control the power-carving action, always rest a part of your hand or hands on the workpiece as shown in the sequence photos here.



4 Switch to a cone-shaped ruby carving bit (see the **Buying Guide**) to clean up and refine the edges and crannies, get rid of coarse lines, remove burn marks, and create sharp edges on the grass blades as shown in **Photo I**. Also, use the ruby cutter to define the eye, gills, and other fish parts, as well as undercut the rocks and grass for a 3-D look.



5 Chuck a flat-headed bit from your diamond carving burrs into your power carver and then use it to define the sharp edges between the fish, grass blades, rocks and relief background.



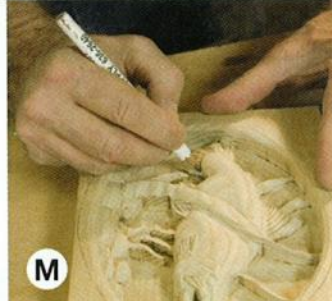
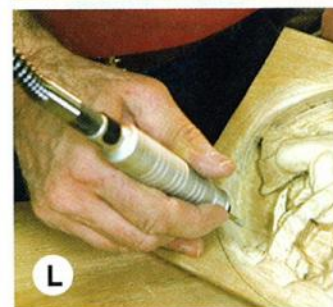
6 Return to your coarse cylinder burr and round over the inside perimeter of the plaque frame as shown in **Photo J**.



7 Install a 120-grit sanding star (see the **Buying Guide**) in a cordless drill to soften and clean up the surface of the carving as shown in **Photo K**.

TIP ALERT

Wear down some of the grit on a new sanding star by running it on scrap stock before using it on a carving. Otherwise, John and Joe warn, it could over-soften the details.



8 Chuck a diamond cylinder bit in your power carver to remove remaining burn marks and further clean up edges as shown in **Photo L**.

9 Pencil in the lateral line from the gill to the tail, as well as at the vertebrae lines for the fins as shown in **Photo M**. Now, select either a flat-headed or pointed diamond burr and carve the fin lines as shown in **Photo N**. Create branching vein lines in the grass blades as well. Smooth the carving with a 150-grit sanding star.



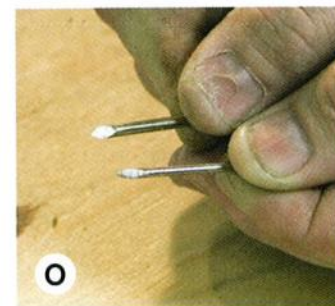
Removing wood with a power carver can raise a lot of fine dust close to your face. This can pose a health hazard, and, in some, lead to an allergic reaction. Therefore, always wear a dust mask. In addition to wearing dust masks, John and Joe have invested in a ceiling-mounted air-filtration system. A less pricey alternative is the power-carving dust collector shown here and found in the **Buying Guide**.

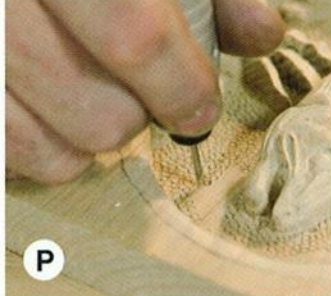
Add a textured background

1 Bevel-grind the shafts of worn-out and broken $\frac{1}{8}$ " and $\frac{3}{16}$ " drill bits as shown in **Photo O**.

2 Chuck the smaller $\frac{1}{8}$ " bit in your power carver and create the textured background surface between the fish, grass blades, and rocks as shown in **Photo P**, allowing the spinning tip to cut $\frac{1}{32}$ "-deep circles.

3 Use the same bit to dot the trout's eye as in **Photo Q**.





4 Switch to the larger $\frac{3}{16}$ " bit. Then break up the monotony of the texture by adding a few randomly located larger circles $\frac{1}{16}$ " deep as shown in **Photo R**.

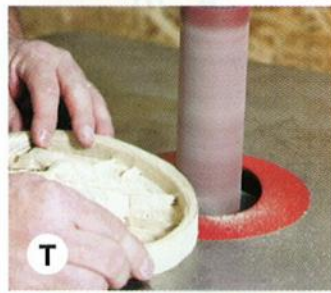
Cut out the plaque and apply a finish

1 Bandsaw the plaque to shape, cutting just outside the frame's cutline as shown in **Photo S**, using a $\frac{1}{4}$ " blade.

2 Disc- or spindle-sand the plaque to the line, creating a smooth, even frame all around as shown in **Photo T**.

3 Chuck a $\frac{1}{4}$ " round-over bit in your trim router and round over the outside edge of the plaque as shown in **Photo U**. Touch up the workpiece with a 180-grit sanding star and a little hand-sanding where needed to remove machining and burn marks.

4 Apply a stain and finish as desired. Joe and John applied a golden oak oil stain, and later, sprayed on three coats of clear satin lacquer, sanding with 400 grit sandpaper between the first two coats. 🌿



About Our Carvers

Having taken up carving two decades ago, retired veterinarian Dr. John R. Garton of Petersburg, West Virginia, right, transferred his love of animals from medicine to making full-sized carvings that often reflect his great sense of humor. John's full-sized subjects include wildlife, household pets, cigar-store Indians, and carousel horses. His carving cohort, Joe D. Adkins, provides the needed prep work, allowing John the time required to add the artist's touch. See John's gallery of work at gartonoriginals.com.



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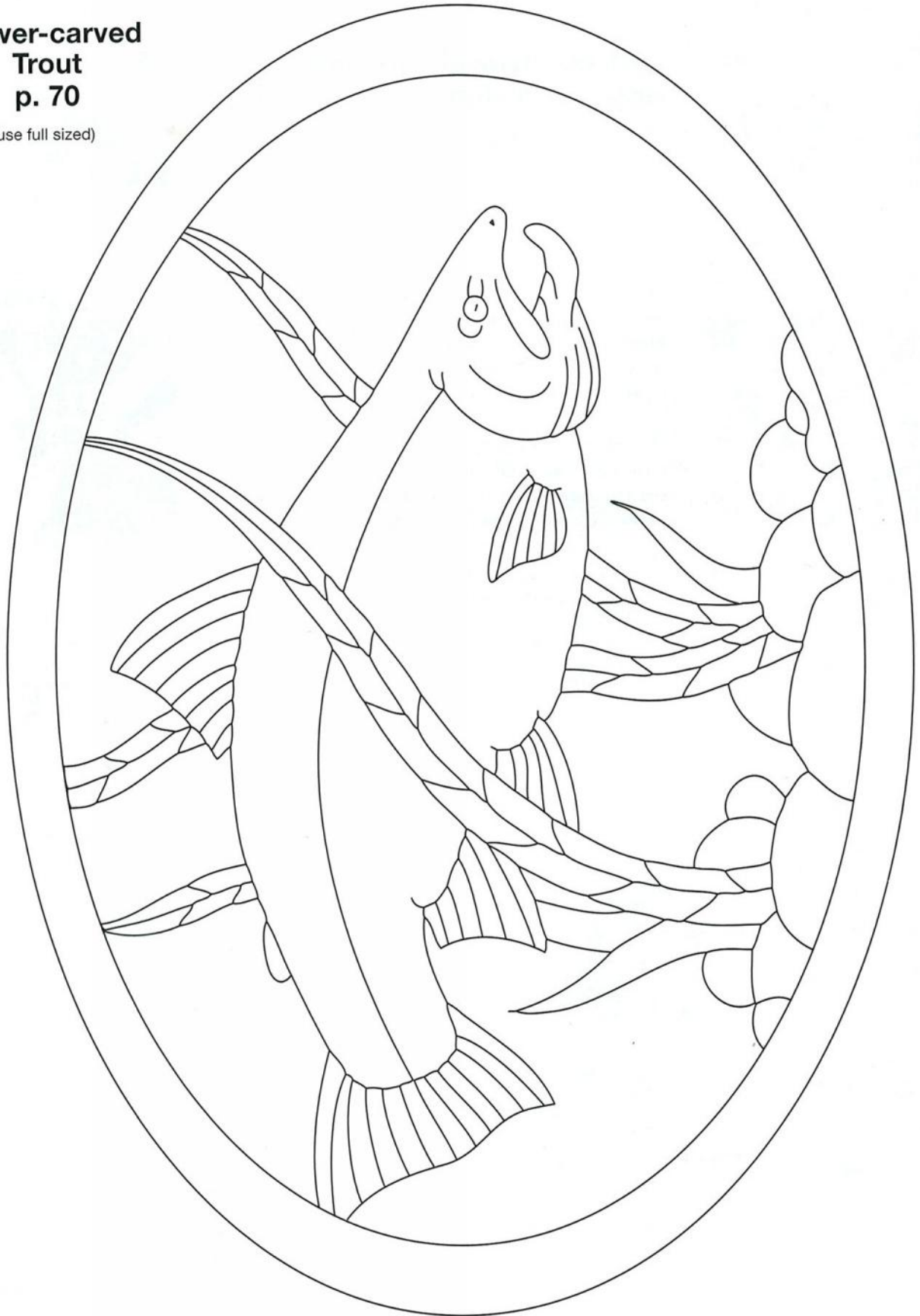
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☐ 6.	Onsrud HSS Upcut Spiral Bits $\frac{1}{8}$ " D, $\frac{3}{8}$ " CL ($\frac{1}{4}$ " SH)	12W52	\$9.50
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☐ 7.	Power Carving Dust Collector, 2 fans dual 115v outlets, Plexiglas shield, overall dim. 8 x 10 $\frac{1}{2}$ x 21"	140605	\$179.99

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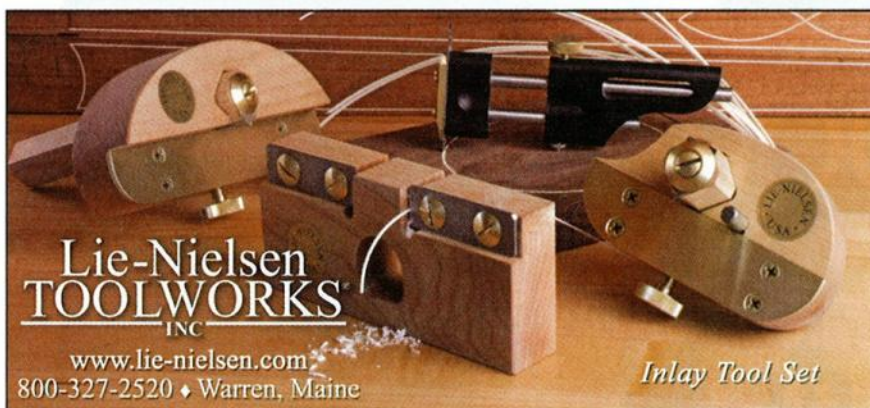
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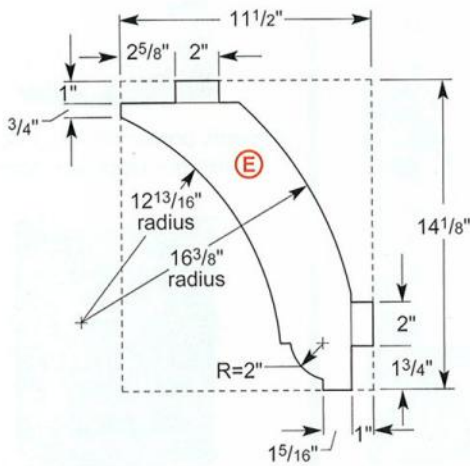
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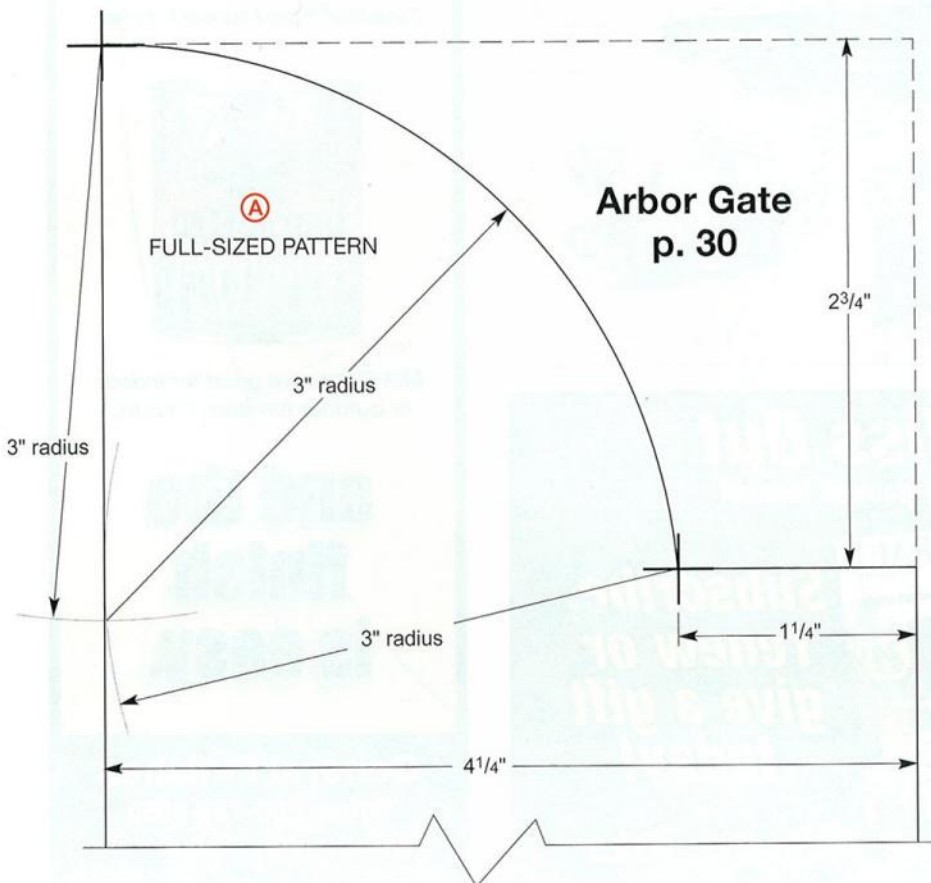
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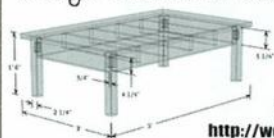
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Here's a sneak peek at the June/July 08 issue of Woodcraft® Magazine.

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Set designed by Scott Phillips of *The American Woodshop* on PBS.
- **Three Wagon Project** Plans for a Low-Dough Chassis Kit
- **Cutting Board** Featuring Breadboard Ends and Built-in Knife Storage
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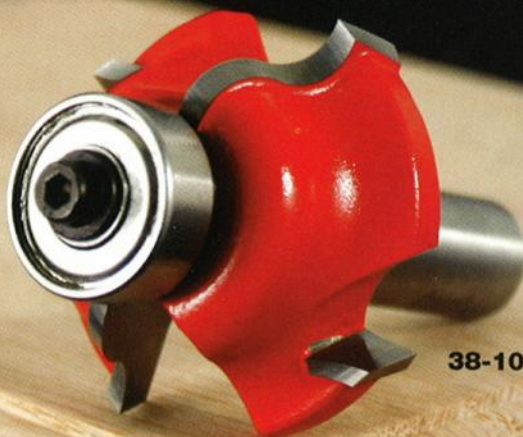
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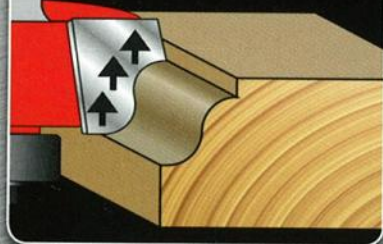
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Freud's New Quadra-Cut™ 4 Cutter Design

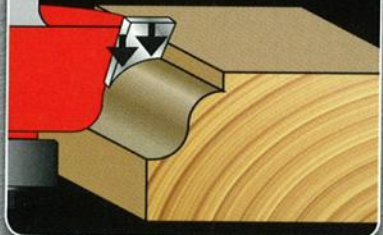


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