

Popular Woodworking

READERS PICK

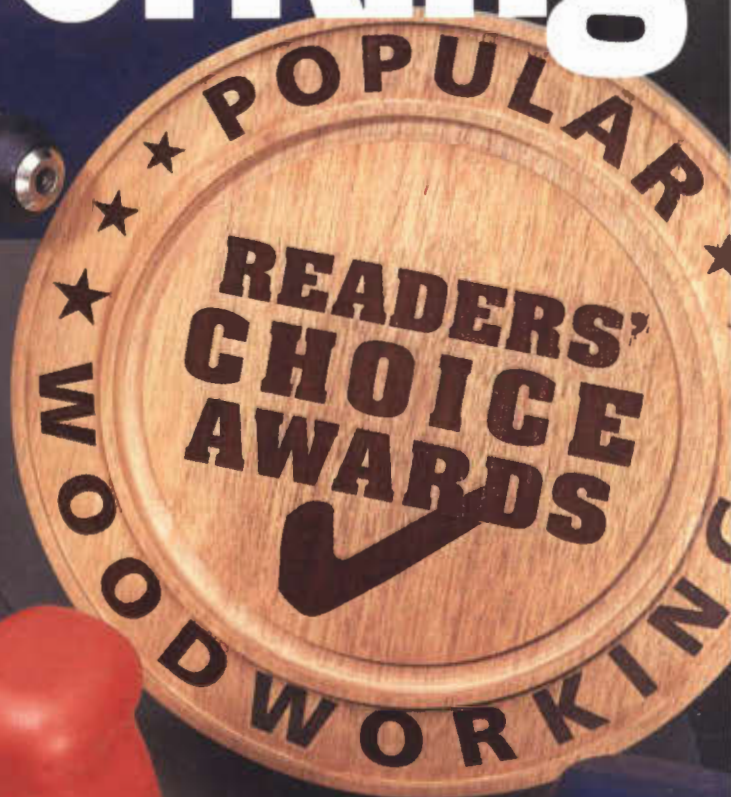
60 TOP TOOLS!

PLUS: TOOL REVIEWS

- Ryobi's Drill Press for wood!
- 47 Pneumatic Nailers/Staplers

14 SUPER PROJECTS!

- Gentleman's Armoire
- \$10 Wind Chimes
- Wall Cupboard
- Awesome Briefcase!



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Used for cutting dadoes, rabbets, circles and other general purpose routing. Can be used in solid wood, plywood, certain plastics and laminated material. Use shortest length (B) for work to be done. For use in hand-held routers only.



1/4" SHANK				
MODEL	CUTTER DIA. A	CUT. LENGTH B	REG. PRICE	SALE PRICE
C1001	1/4"	3/4"	5.95	4.95
C1002	5/16"	3/4"	6.95	4.95
C1003	3/8"	3/4"	5.95	4.95
C1004	1/2"	3/4"	7.95	6.95
C1005	5/8"	3/4"	9.95	8.95
C1006	3/4"	3/4"	9.95	8.95
C1007	1"	3/4"	11.95	10.95
C1037	23/32"	3/4"	11.95	10.95

1/2" SHANK									
MODEL	DIA. A	LGTH B	REG.	SALE	MODEL	DIA. A	LGTH B	REG.	SALE
C1008	1/4"	3/4"	5.95	4.95	C1038	23/32"	1-1/8"	11.95	10.95
C1009	5/16"	3/4"	5.95	4.95	C1015	3/4"	1-1/8"	11.95	10.95
C1010	3/8"	3/4"	5.95	4.95	C1016	3/4"	1-7/8"	14.95	13.95
C1059	7/16"	1"	7.95	6.95	C1017	1"	1-1/8"	11.95	10.95
C1011	1/2"	1-3/16"	7.95	6.95	C1061	1-3/16"	2"	21.95	20.95
C1012	1/2"	2"	14.95	13.95	C1018	1-1/4"	1-3/16"	11.95	10.95
C1013	5/8"	1-1/8"	9.95	8.95	C1019	1-3/8"	1-3/16"	14.95	13.95
C1014	5/8"	2-3/8"	14.95	13.95	C1021	1-5/8"	1-3/16"	17.95	16.95
C1060	11/16"	1-1/8"	9.95	8.95					

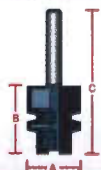


CORNER LOCK MITER BIT

Used for making 90° corner joints in wood for 3/16" to 1" material. Instructions for use provided.



MODEL	SHANK	CUTTER DIA. A	CUT. LENGTH B	REG. PRICE	SALE PRICE
C1331	1/2"	3"	1"	44.95	39.95



GLUE JOINT BITS

This bit is ideal for laminating and jointing stock together for use in table tops, panels and where extra-wide stock is needed. For 3/4" to 1" material.



MODEL	SHANK	CUTTER DIA. A	CUT. LENGTH B	REG. PRICE	SALE PRICE
C1328	1/4"	1"	1-1/4"	29.95	27.95
C1329	1/2"	1-1/8"	1-1/4"	29.95	27.95

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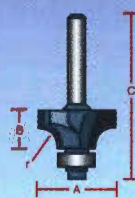
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Roundover bits are used to make quarter rounds of various radii. Also used to soften edges, especially if making anything a child would use. Everyone needs a drawer full of these. So many uses we can't list them all.



1/4" SHANK					
MODEL	CUTTER DIA. A	CUT. LENGTH B	RADIUS F	REG. PRICE	SALE PRICE
C1174	5/8"	3/8"	1/16"	\$9.95	\$8.95
C1175	7/8"	3/8"	1/8"	\$9.95	\$8.95
C1176	7/8"	3/8"	3/16"	\$9.95	\$8.95
C1177	1"	1/2"	1/4"	\$10.95	\$9.95
C1178	1-1/8"	1/2"	5/16"	\$11.95	\$10.95
C1179	1-1/4"	5/8"	3/8"	\$12.95	\$12.95
C1180	1-1/2"	5/8"	1/2"	\$14.95	\$13.95

1/2" SHANK					
MODEL	CUTTER DIA. A	CUT. LENGTH B	RADIUS F	REG. PRICE	SALE PRICE
C1182	3/4"	3/8"	1/8"	\$9.95	\$8.95
C1183	7/8"	3/8"	3/16"	\$9.95	\$8.95
C1184	1"	1/2"	1/4"	\$10.95	\$9.95
C1185	1-1/8"	1/2"	5/16"	\$11.95	\$10.95
C1186	1-1/4"	5/8"	3/8"	\$12.95	\$12.95
C1187	1-1/2"	3/4"	1/2"	\$14.95	\$13.95
C1188	1-3/4"	7/8"	5/8"	\$17.95	\$16.95
C1189	2"	1"	3/4"	\$18.95	\$17.95
C1190	2-1/4"	1-1/8"	7/8"	\$20.95	\$20.95
C1191	2-1/2"	1-1/4"	1"	\$20.95	\$20.95
C1192	3"	1-1/2"	1-1/4"	\$34.95	\$33.95



REVERSIBLE STILE & RAIL - ROMAN OGEE with Guide Bearing

MODEL	SHANK	CUTTER DIA. A	CUTTER LGTH B	REG. PRICE	SALE
C1392	1/2"	1-5/8"	13/16"	49.95	47.95



REVERSIBLE STILE & RAIL - OGEE with Guide Bearing

MODEL	SHANK	CUTTER DIA. A	CUTTER LGTH B	REG. PRICE	SALE
C1652	1/2"	1-5/8"	13/16"	49.95	47.95



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MODEL	SHANK	CUTTER DIA. A	CUTTER LGTH B	REG. PRICE	SALE
C1653	1/2"	1-5/8"	13/16"	49.95	47.95



REVERSIBLE STILE & RAIL - CLASSICAL with Guide Bearing

MODEL	SHANK	CUTTER DIA. A	CUTTER LGTH B	REG. PRICE	SALE
C1654	1/2"	1-5/8"	13/16"	49.95	47.95

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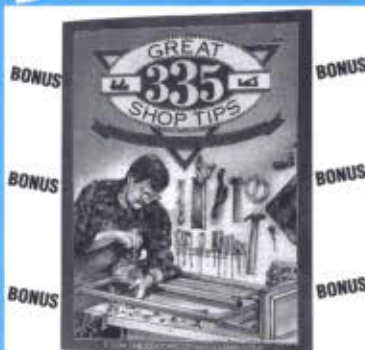
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8-1/4"x40TX 3/32"	\$136	\$99	\$89	\$79
8"x40T 3/32"	\$136	\$99	\$89	\$79
7-1/4"x30T	\$112	\$69	\$62	\$55

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Fine Woodworking Magazine test Oct. 96 page 43

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For TABLE AND RADIAL SAW — **10% to 20%**

	LIST	SALE
14"x60Tx1"	\$224	\$159
12"x60Tx1" or 5/8" 1/8"K	\$198	\$139
10"x60Tx5/8" 3/32"K	\$162	\$129
8-1/4"x60T	\$150	\$109
8"x60T	\$150	\$109
7-1/4"x60T	\$150	\$109

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Sears 8-1/4" & Delta 8-1/4"x60Tx5/8"	\$170	\$99
Hitachi 8-1/2"x60Tx5/8"	\$179	\$109
DeWalt 8-1/2" & Ryobi 8-1/2"x60Tx5/8"	\$179	\$109
Delta 9"x80Tx5/8"	\$204	\$119
Ryobi-Makita & all 10"x80Tx5/8"	\$207	\$129
DeWalt, Makita, B&D, Hitachi 12"x80Tx1"	\$229	\$139
Ryobi-Makita 14"x100Tx1"	\$266	\$179
Hitachi 15"x100Tx1"	\$277	\$189

For good general purpose cuts use Woodworker II 30T &
40T or Woodworker I. Use small stiffener where possible.



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5/8" HOLES. Boring up to 1-1/4" \$7.50 extra.
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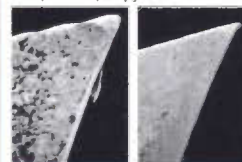
SIZES AVAILABLE	LIST	SALE
7-1/4"x60Tx3/32" K	\$149	\$129
8"x80Tx1/8" & 3/32" K	\$202	\$169
9"x80Tx1/8" & 3/32" K	\$207	\$179
10"x80Tx1/8" & 3/32" K	\$207	\$159
Other sizes available	\$212	\$181

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10" D. 5/8" & 1" Bore	\$389	\$349	\$314	\$297
12" D. 1" Bore	\$499	\$449	\$404	\$382

(Bore up to 1-1/4" Add \$25 — Plus \$5.50 S&H)

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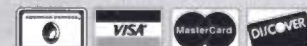
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by Ken Textor

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We put nine 14.4 volt drills to the test in our shop to find the good, the cheap and the heavy duty.

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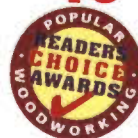
Create more closet space in your home with this improvement on the traditional armoire.

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Safety Note

Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason. In many photos you see in *Popular Woodworking*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Don't copy us. Think about each procedure you're going to perform beforehand. Think ahead. **Safety First!**



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Popular Woodworking®

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Editor: **Steve Shanesy**

Managing Editor: **Cristine Antolik**

Associate Editors: **Jim Stuard, David Thiel**

Designer: **Amy Schneider**

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Ruth Preston, Art Production Manager

ADVERTISING

National Sales Representative

Bill Warren, Buchmayr Associates

137 Rowayton Ave., Rowayton, CT 06853

Tel. (203) 855-8834; Fax (203) 855-9138

Advertising Sales

Joe Wood - Tel. (513) 531-2690, ext. 314

Classified Advertising Sales

Tiffany Gray - Tel. (513) 531-2690, ext. 311

Advertising Production Coordinator

Debbie Thomas - Tel. (513) 531-2690, ext. 219

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Tel. (515) 280-1721

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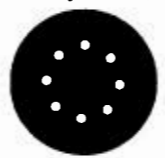
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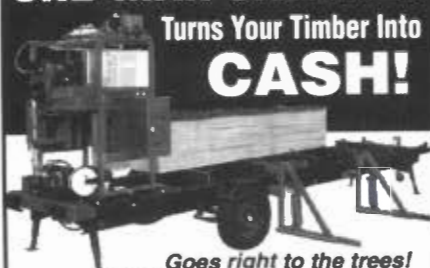
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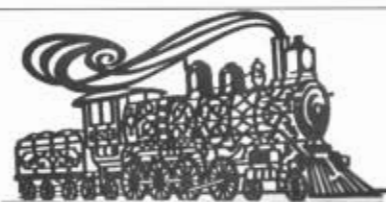
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TURNINGS

Dream Shop, Dream Team



Because *Popular Woodworking* is focused on getting you into the shop to build fun and useful projects, we haven't told you much about ourselves. It's time to clear this up.

After all, as *your* project magazine, you should know where the projects are built and who's doing the building. Well, most projects are made in our shop by woodworkers with real world know-how. The kind of experience you can count on for quality woodworking — without a lot of fuss.

The Dream Shop

Two years ago we set up our 1,800 square foot shop. It is organized and equipped much like a small custom woodworking shop. Machining operations are arranged in the centrally dust-collected area, with assembly and tool benches in another.

We equipped our shop with light-to medium-duty industrial quality tools and machinery. It was a happy "chore" to cherry pick equipment from manufacturers of our choice.

Once the equipment was hooked up, we made our benches, cabinets and worktables. It was a joy. So much so that while working on a cabinet, I turned to Associate Editor David Thiel and said, "Can you believe they're actually paying us to do this?" We were both working in a dream shop. There'll be more details about the shop in an upcoming issue.

The Dream Team

David started in his father Klaus' cabinet shop when he was old enough to push a broom. He learned the traditional ways from Klaus, who immigrated after his apprenticeship in Germany. There David learned the importance of quality and efficiency. Before joining the magazine a couple years ago, David logged 10 years at his dad's shop and a couple more on

his own, not counting his broom-pushing days.

A newer addition to the staff is Associate Editor Jim Stuard. I first met Jim years ago when I was managing a shop and was looking for some good "hands." Jim told me he had spent a number of years working for this German cabinetmaker I might have heard of. You guessed it, Klaus. I hired Jim on the spot. For several years we worked on everything from executive boardrooms to antique reproductions. In all, Jim brings 15 years of experience to *Popular Woodworking*.

As for your editor, I got the sawdust bug in the late 70s. After some wood school and years "on the job" I hooked up with a first class custom furniture shop in Los Angeles. That's where my graduate education commenced. I later moved my family back to the Midwest where I continued managing custom shops. A couple years ago I signed on with *Popular Woodworking*.

I suppose that among David, Jim and I we'd tally about 45 years of full-time woodworking experience. This is why I call the staff "The Dream Team."

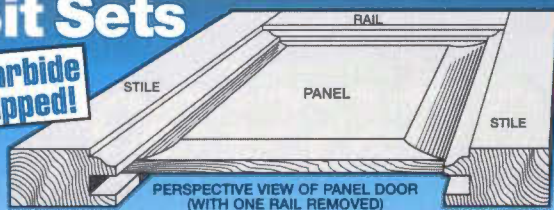
Another team member, Managing Editor Cristine Antolik, has moved on to another magazine. We'll miss her help getting your magazine to you on time, every time. So long, Cris, and good luck. Cris' replacement is Christopher Schwarz, who brings with him sound journalism experience and some wood shop know-how, too.

Well, enough about us. It's time to get busy on another round of projects. Oh boy, back to the dream shop. **PW**

Steve Shanesy

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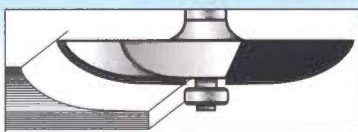
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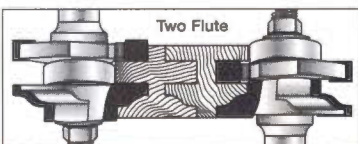
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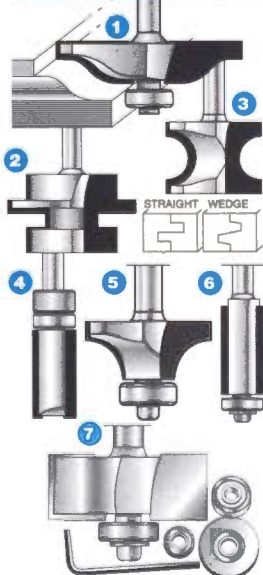
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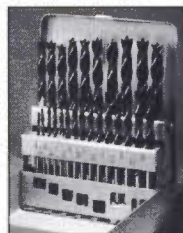
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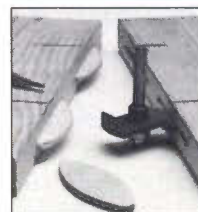
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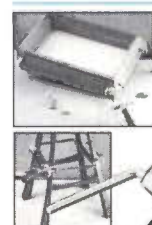
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From the Popular Woodworking mailbag...

We welcome your comments about *PW* or anything related to woodworking. We'd also like to see color pictures of what you're building. Send your input to: Infeed/Outfeed, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207. Send e-mail to: Wudworker@aol.com. Letters may be edited for publication. — **Steve Shanesy**, editor, *Popular Woodworking*

Purchasing Acrylic Plastics

Your November '96 issue of *Popular Woodworking* contains information on "Working With Acrylic Plastics" and using acrylic plastic with the "Flag Case" project. Where can I purchase large sheets of acrylic plastic and acrylic cement? And what type of store would sell these items locally? Thank you.

Bob Rogers
Tahlequah, OK

Bob, try Cadillac Plastics, 3938 Memorial Drive, Tulsa, OK 74145; (918) 665-8000. The company has 97 branches throughout the United States. Other readers looking for plastic materials may find a branch in their Yellow Pages under "Plastics." — **Steve**

Entertainment Showcase

My father, Cleo Larson, subscribes to *Popular Woodworking*. After browsing through and reading the "Infeed/Outfeed" column, I couldn't resist the opportunity to share my father's recent project. He built an oak surround entertainment system for our 52" TV. It's beautiful! The six top drawers hold VCR tapes, CD's and cassettes. The components are ready to be put in. Isn't it great?

Lorrie Ufkin
Sherburn, MN

Lorrie, you're very fortunate to have such a talented woodworking father. Having constructed a few such built-in EC's myself, I know there's a year's worth of weekends in a project of this scope. Congratulations, Cleo! — **Steve**



Continued on page 10.

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Continued from page 8.

The Next Generation of Woodworkers

I have been a subscriber to *Popular Woodworking* for many years and have enjoyed it very much. However, in the beginning I was a single parent with custody of my two young daughters, so you can imagine how little time I had for projects.

Your editorial, "Turnings," in the November issue prompted me to write. It had to do with passing on our love for woodworking to our children.

I have recently remarried and now have a household of six children: five girls and a boy, ages four through nine. All of them have been begging me to do projects — from building doll dressers or birdhouses for the older girls, to gluing scrap together for the youngest ones.

So, rest assured that some of us are already starting on the next generation of woodworkers. And keep those projects coming. I know a few people who will be interested in them!

David B. Wright
Simsbury, CT

Correction:

In our Dec./Jan. edition we mistakenly referred to a reader as Richard Fiedler, who sent us a photo of his custom-made door. We apologize to Michael Fiedler, who built the very attractive door to his home in Philadelphia.



Hand Crafted Stagecoach

I built this 9 1/2" x 6 1/2" stagecoach from some scrap wood, a dowel rod, scrap leather, four rubber bands and 52 kitchen matches. The coach is simple and easy to build. Although it was time consuming, it produced a model stagecoach that I'm proud to display for all to see. Please publish my address to welcome others to obtain more information.

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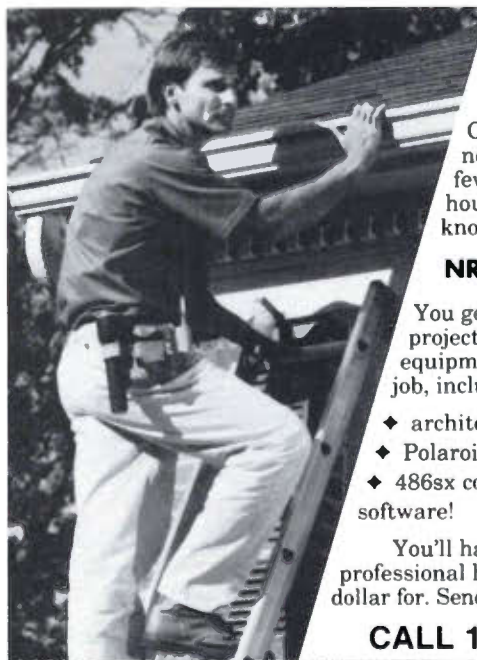


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CAPTION the CARTOON

PORTER-CABLE

illustrated by Bob Rech

Submit your caption(s) for this issue's cartoon on a postcard to **Popular Woodworking, Cartoon Caption #23**, 1507 Dana Ave., Cincinnati, OH 45207 by February 18, 1997. Winning entries

will be chosen by the editorial staff.

The winner will receive a Porter-Cable Limited Edition, 90th Anniversary router. The model 90690 is a 1½ hp, 23,000 rpm router featuring 100 percent sealed ball bearing construction. The fixed base router accepts both ¼" and ½" collets with an auto-release system to prevent bits from freezing in the collet. This limited edition also has a special anniversary finish and logo, and includes an all-metal carrying case.

The two runners-up will each win a one-year subscription to **Popular Woodworking**.



The winner of our "Caption the Cartoon Contest #21" from the November issue and recipient of the Porter-Cable Profile Sander kit is:

Dan Jones, from Victor, NY.

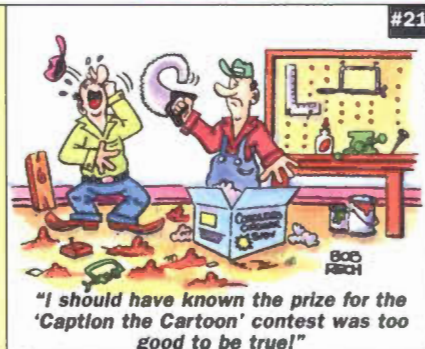
The runners-up receive a one-year subscription to **Popular Woodworking**:

Bob Boston, from Campbell, CA, for:

"How many box tops did you say it took to get that?"

Jim Carr, from La Verne, CA, for:

"This is even better than that 'Easy Bake Biscuit Joiner' that you bought last week!"



"I should have known the prize for the 'Caption the Cartoon' contest was too good to be true!"

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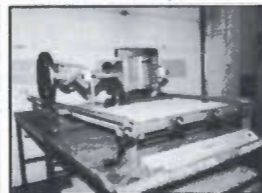
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Finally, a Woodworker's Drill Press

Ryobi rethinks the drill press, and woodworkers are the winners.

THE CONVENTIONAL DRILL PRESS was designed for metalworking, but that hasn't prevented it from becoming a valuable accessory in most woodworking shops. Wouldn't it be nice if a drill press was *specifically designed* for the woodworker, with features like an oversized tilting table that also rotates, easily adjustable speeds, a built-in work light, a special hold-down clamp and a stout table saw-type adjustable fence?

I've become acquainted with the new Ryobi drill press during the last few weeks and found that it provides these extras and more. It's a husky, 120 pound benchtop machine, rotating a 1/2" chuck at infinitely variable speeds between 500 and 3,000 rpm that you adjust by merely turning a top-side crank. No more belts and pulleys to fool with.

The column to spindle-center distance allows drilling to the center of an 18 1/2" board. Chuck-to-table capacity is about 12", but it can be expanded by removing the table and using the machine's base as the work support. Also, since the head/column assembly can be rotated a full circle, it's possible to position the machine on the edge of a bench so the drilling capacity is chuck-to-floor.

For stability on all possible operational setups, it's important that the tool be secured to a sturdy surface (workbench or optional workstand) with nuts, bolts and lock washers. Not, as the manual cautions, with self-tapping fasteners or lag screws.

One great feature is the table, which has a removable wood insert. It can be replaced when necessary; but more importantly, you can substitute homemade ones designed

Ryobi's new drilling machine is truly designed for woodworkers. Some of the convenient features include crank-adjustable head position, built-in hold-down clamp, work light, adjustable fence with built-in stops and easy-to-set variable speeds. Crank and lock handles are large enough for convenient handling.



for special jobs, such as drum sanding or V-block applications. Since the inserts are secured with self-tapping screws that pass through front and rear rails, the inserts you make don't even have to be full-size. (See



1 The adjustable fence with its built-in scales and stops makes it easy to set up for accurate drilling when the same hole arrangement is required in multiple components. It's like having ready-to-use jigs.



2 The table tilts through a 45-degree range for angular drilling. It can be tilted away from or toward the column. The fence can be locked to support and to position workpieces for accurate drilling.

"Interchangeable Tables" below.)

The table is equipped with an adjustable fence that looks and functions like those on table saws, except that this one has built-in scales and adjustable stops. So, for example, setting up to drill similar holes in multiple pieces (**photo 1**) is accomplished quickly. Drilling equally spaced holes on a common centerline is done as easily.

Also, the table can be tilted through a 45-degree range for angular drilling (**photo 2**).

All in all, this is a drilling "station" that can be appreciated by any woodworker. **PW**

R. J. DeCristoforo is a member of Popular Woodworking's editorial advisory board.

Source of Supply
Ryobi America Corporation
5201 Pearman Dairy Road
Anderson, SC 29625-8905
(800) 525-2579

Specifications for Ryobi Drill Press (WDP1850)

Motor:	Induction — 1/3 hp
Speeds:	500 to 3,000 rpm
Chuck:	1/2" capacity
Capacity:	Drills to center of 18 1/2" board
Spindle Travel:	3 5/16"
Drill Bit Capacity:	In Wood, up to 3" with a Forstner bit In Steel — 1/2"
Table:	13" x 25"
Catalog Price:	About \$450
Capacity Under Chuck:	To table 12" To base 18"

Interchangeable Tables



A It's easy to custom-make an insert for any sized sanding drum that can be raised or lowered for full use of the drum's abrasive sleeve.



B A V-block, secured to its own insert, will always be ready for use. Special inserts, like the standard table, are secured with self-tapping screws that pass through front and rear rails. The extra inserts do not have to be full-size.



C Having features that are great for woodworking doesn't negate metal drilling. Here, a drill press vise is secured to the machine's base. Drilling capacity in steel is 1/2".

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Circle #126 on Resource Directory Coupon

NEW PRODUCTS

Popular Woodworking wants to provide our readers with accurate, useful information on the newest tools available, so we've tested many of the products presented here in the *Popular Woodworking* workshop. Taking into consideration cost, design and benefit, we've added our comments about each of the tools tested to help you make decisions about your future tool purchases.

"Solid workhorse with many well-made and well-designed features. It's a very good saw for the price." — PW

Bosch 3915 10" Slide Compound Miter Saw

Contact: S-B Power Tool Co.,
(312) 794-7495

Retail Price: \$599

Now available at home center stores.

Features:

- 13 amp motor and all ball-bearing construction
- Includes a Bosch Platinum Series 10" thin kerf carbide blade
- Positive crown moulding miter detents and crown moulding bevel stop
- 3 7/8" tall fence and 25" wide base supports 2x and 4x dimensional lumber, and 3 3/4" crown moulding
- Sliding base/fence extension offers extra 3 1/2" of support
- Extended miter range for 52 degrees left/62 degrees right
- Includes quick-action workpiece clamp, dual guide rail, wrench storage and cast-in miter and bevel scales

For more information, circle #152 on the Resource Directory Coupon.



"An efficient professional tool providing excellent performance. Its price may make you carefully consider the value of the cordless feature for your needs." — PW

Milwaukee 6267-21 Cordless Jigsaw

Contact: Milwaukee Electric Tool Corp., (414) 783-8311

Price: \$530 with battery charger
Now available at local home center stores.

Features:

- 12-volt, 2 amp-hour battery pack offers 1,700 strokes per minute
- Keyless Quik-Lok™ blade change system for T-shank blades
- Four orbit levels to adjust blade motion
- Anti-splintering device for cleaner cuts

For more information, circle #153 on the Resource Directory Coupon.



Sjoberg Carving Bulldog

Contact: Woodcraft Supply Corp.,
(800) 225-1153

Retail Price: \$79.99 (part #124631)
Available through Woodcraft Supply.

Features:

- Adjusts with simple foot pressure while seated
- Offers max. jaw capacity of 8 3/4"
- Unit is fully portable and clamps into any woodworking vise, or can be screwed onto the surface of a workbench
- Footrest adjusts to height of chair
- Made of hard Nordic birch

For more information, circle #154 on the Resource Directory Coupon.



NEW PRODUCTS

"Stanley's entire ergonomic line provides reliable, comfortable tools for home or work." — PW

Stanley Ergonomic Tool Line

Contact: Stanley Tools, (860) 225-5111

Retail Prices: Hammer - \$28, Tape - \$27, Saw - \$21

Available in early 1997 at local home centers.

Features:

- 55 new tools with ergonomic features and benefits to maximize job performance, enhance work quality and minimize physical stress and fatigue
- Tools available include a 20-oz. jacketed graphite hammer, a 27', 1" wide Powerlock® tape rule, and a 15" tool box saw with cushioned wood handle and 9-pt. induction hardened teeth

For more information, circle #155 on the Resource Directory Coupon.



"Unbelievable performance. While these blades are almost twice the price of standard blades, their performance will more than pay back your investment." — PW

Low Tension Band Saw Blades

Contact: PS Wood Machines, (800) 939-4414

Retail Price: \$24 per blade
Available through distributor.

Features:

- Guaranteed straight cuts during resawing, or your money back
- The milled Swedish silicon steel band saw blades require only low tensioning, and will cut straight and perpendicular without guide blocks
- Will not break or jump the wheel no matter the abuse or radius cut
- Available in 1/8", 3/16", 1/4", 3/8" and 1/2" widths in any length

For more information, circle #156 on the Resource Directory Coupon.



"More than a good quality adhesive product. We especially liked the well-designed cap and pour spout that makes dispensing and refilling a breeze. A real improvement." — PW

Industrial Strength ProBond™ Wood Glue

Contact: Elmer's Products Inc., (800) 848-9400

Retail Price: 12-oz bottle - \$6, gal. refill - \$13

Now available at local home center stores.

Features:

- Strong, wet tack, with setup time of 15 to 25 minutes, requiring minimal clamping
- After curing, glue is sandable and paintable
- Offset spout delivers glue easily, even in tight corners, and the cap keeps the spout clear
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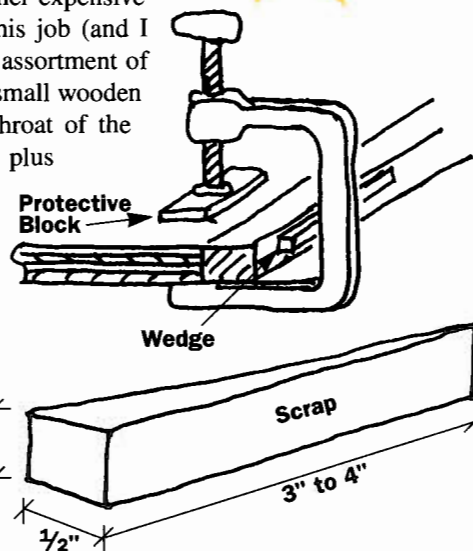


WINNER

Wedge That Edge

I wanted to glue a solid wood edge on a plywood table top so that I could shape the wood edge with a router. Instead of buying the rather expensive special three screw clamps made for this job (and I needed many of the clamps), I used an assortment of clamps that are in most every shop and small wooden wedges made from scrap wood. The throat of the clamp should be the width of the edge plus about an inch so that the clamp and protective block will clear the glue line. If you worry about gluing the protective block to the panel, use wax paper under it. Leave about 1/4" clearance between the edge strip and the clamp frame, and gently tap in a wedge. It will hold nicely. The method will work with most any type of clamp.

J.B. Marshall
Silver Spring, MD



Go Anywhere Magnifier

I'm enclosing a picture of a magnifying light that I find very helpful. I can get right on top of the work area and also protect my eyes.

I use this light all over the shop with the band saw, drill press, vise, etc. The light cost less than \$20, and the stand is from a discarded floor fan.

John D. Reinhold
Desert Hot Springs, CA

TRICKS OF THE TRADE

Gripping Concept

Newly available rare earth magnets [Lee Valley Tools, (800) 871-8158] offer unlimited opportunities for decorative box lid closures. The box shown uses four .25" x .10" magnets (\$.48 each) installed flush in the box lid and body using five-minute epoxy glue. Of course, opposing magnets must be oriented to attract, not repel. You won't believe how powerful these little magnets are!



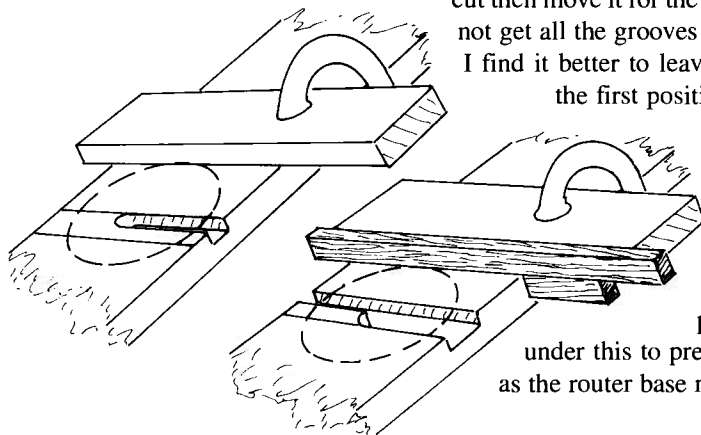
Paul Stotler
Leonardtown, MD

Accurate Two-Stepping Grooves

Grooving across a board with a router, as when making a series of dado joints for bookcase shelves, usually has to be done in two stages with a cutter narrower than the final groove. If you clamp on a guide piece and make a first router cut then move it for the second cut, you may not get all the grooves the same width.

I find it better to leave the guide piece in the first position, then use a spacing strip of suitable thickness to control the second cut to make the groove the absolutely perfect width. I put a stop block under this to prevent it from moving as the router base rubs against it.

Paul Bartlett
Philadelphia, PA



I Hate Dust

I hate dust (OK, I just hate breathing and cleaning up dust), so when I needed to do a lot of edge work on my router table, I came up with this combination router fence/dust collector/ hollow box solution. It attaches to my permanently mounted rip fence on the router table, so I collect the dust from the end of the box instead of the middle, like most of the conventional router fence ports.

Ron Tye
Yorba Linda, CA



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March 1997 **19**

Genuine Shaker

Resurrecting the traditional ways of woodworking proved to be a challenge

THE DISTINGUISHED woodworking of the Shakers developed in much the same way as today's home woodworker starts on the road to professional craftsmanship. At first, most projects are done for close friends and family. Then a stranger takes an interest and wants to buy a piece or two. This time a little more work is put into perfecting the piece and, when it's finished, the customer is thrilled. The process repeats itself. The business grows, and soon the woodworker almost forgets how it started.

And therein lies the peril, to both Shakers and home woodworkers. "We were in danger of losing how this was done," says Michael Graham, curator and woodworker at the Shaker Museum and farm in Sabbathday Lake, Maine. "And we're still refining how we do this."

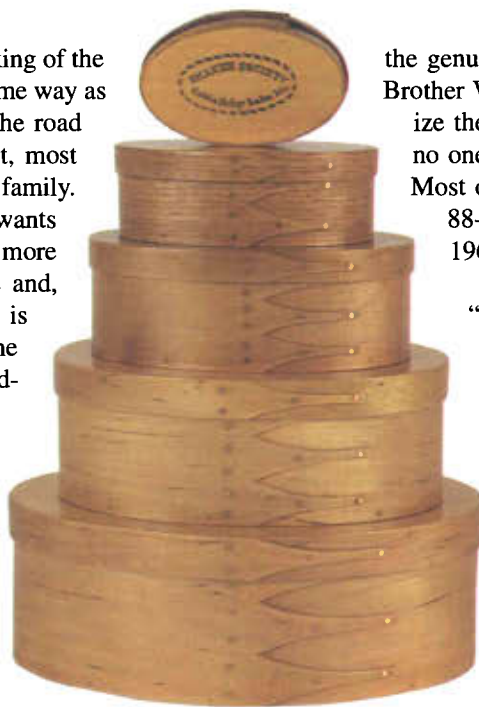
The "this" Graham refers to is the celebrated oval Shaker box, a project that appears deceptively simple.

Strictly speaking, "Shaker woodworking" refers to a piece produced by the 250-year-old, communal religious sect that came to be known as the Shakers. At its peak in the early 19th century, there were nearly 10,000 affirmed Shakers, with scores of active communities all over the youthful United States.

Today, however, only one active Shaker community remains. This means whatever comes out of the Sabbathday Lake shop is the only authentic Shaker woodworking still being produced. Anything else is just reproduction woodworking in the Shaker style. To collectors and sellers of fine woodworking, this difference is critical.

When asked about the methods many of today's woodworkers use to limit reproductions of their work, Brother Wayne laughs. "No, I don't think we need a copyright or a patent. But we do have a trademark stamp now that we use on all the boxes," he says.

Making those oval boxes in



the genuine Shaker style became crucial when Brother Wayne and Graham decided to revitalize the tradition. But it wasn't easy because no one had made the boxes since the 1950s. Most of the secrets of the process died with 88-year-old Brother Delmer Wilson in 1961.

"He did beautiful work," Graham says. "If we could aspire to even half the skill of Brother Delmer, we'd be very happy."

It helped that Brother Delmer kept records of his work.

"He wrote things down, but in no particular order and in no special place. He wrote on whatever was handy — the back of a board, a scrap of paper, parts of another project," Graham explains.

Fortunately, though, the 25-year-old Graham was learning to be methodical in his researching techniques since the Shaker puzzle started to intrigue him. As a biochemistry major at nearby Bates College, he was accustomed to following painstaking procedures to gain a result — and painstaking the box-making process was.

For instance, most of the boxes had to follow the tradition of hardwood sides and softwood tops and bottoms.

Brother Delmer used any woods that were readily available at the Shakers' self-sufficient farm — apple, cherry, elm, oak, pine, cedar and so forth. In fact, he left piles of these woods carefully stacked and drying under a barn. Trouble was, the wood had all turned gray, and deciding what was what became a baffling chore. Moreover, few contemporary woodworkers could give advice on how to best handle old-fashioned woods like elm and apple. Brother Wayne and Graham had to ad-lib.

Then there were the tools for making the boxes. Brother Delmer used some standard 19th century water-driven machinery and worked in a large shop, all of which have long since disap-



Michael Graham begins the process of fitting the cover to the oval box that Shakers are well known for. Each cover is fitted after the box has dried.

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July '93	Loft a duck; a simple cabinet; making pine burl tables; colonial handkerchief table; puzzle chair; fairy tale birdhouse; making bow saws; toddler's toybox.
September '92	Carved nut bowl and cracker; knock down couch; oak burl jewelry box; shop caddy; peter putter; old mill wheel; roll top desk II; desktop dolphin.
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March '91	Dust bench; benchdrop clamp; sailor's work; compact disk storage; spiral lamp bases; dinosaur bank; kitchen storage rack; occasional table; turned and carved bowl.
September '90	Roadrunner whirligig; log turning; serving cart; country mailbox; piano music box; toy carousel; cube and canister drum sanding system.

July '90	Victorian mailbox post; plate shelf; bee hive jewelry box; sliding miter table; writing desk; bentwood Indian boxes.
May '90	Captain's bed; centering tools; child's toybox/chair; computer security cabinet; cutlery box; candlestick.
January '90	Coffee table; Folding candelabra; ladle; firewood box; butterfly figures; cedar-lined chest; extension cord reel; pole lamp.
November '89	Panel doors; silver chest; corner pewter hutch; country sconce; Massachusetts lowboy.
January '88	Preparing stock by hand; bentwood boxes; heather's desk; medieval bookbinding; inlaid dice; build a box of dominoes; box joints on the table saw.
November '87	Antique wall cupboard; relief carving; wooden buttons; couch and chairs; handscrew clamps.
September '87	Dovetail joinery; half-bind dovetails; joiner's toolbox; nightstand; Connecticut River Valley desk; utility bench.
July '87	An interview with James Krenov; bed; crotch wood table dish; dinner table; carving an Arabian stallion part II.
March '87	Building a butcher block work table; ladder-back rocker; amazing folding stool; making knives.
January '87	Universal table saw; veneered vertical tambours; backgammon board.

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PBA7

SHAKERS



1 This clever bandsaw jig is used to rough out the hardwood sides of the Shaker oval boxes. The spring-loaded guide on the outside edge of the bandsaw table is key. It's used because one side of the resawn plank is left rough, which saves a little on wood.



2 Steam rises from the copper boiler that Brother Wayne immerses the oak in prior to bending.

peared. So his notes on how to use that machinery were nearly useless, especially when Graham and Brother Wayne began working on donated, multi-task Shopsmith™ machinery.

Another challenge Brother Wayne and Graham had to face in building the oval boxes was to acquire skills that can only be gained by experience. For instance, the sides of the boxes are best if cut from quarter-sawn stock. They are cut, planed and sanded to about 1/8" thick (**photo 1**) before they're immersed in a hot water bath in a specially made copper boiler (**photo 2**).

Brother Wayne and Graham keep iron out of the process because the natural tannins in oak react with iron to produce staining. Even the hammers used to drive the tiny #1 copper tacks in the finger joints must be of a non-ferrous metal. Otherwise, an oak-sided box will quickly turn blue or bluish-black wherever the iron touches it.

This no-iron policy forced the two woodworkers to make some of their own tools, including brass hammers and aluminum nail anvils for fastening the finger joints of the boxes' sides. It also means the water used in the boiler is distilled rather than tap water.

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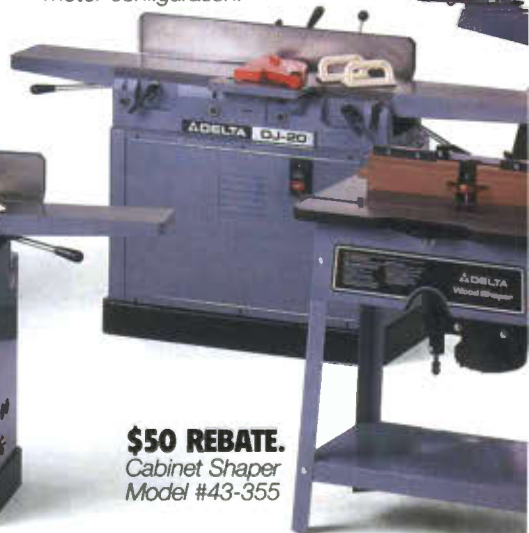
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And the process gets even more labor-intensive. Because the boxes' sides don't quite bend in precisely the same manner each time, the box top and bottom are made only after the sides have been finished and dried. This makes a more exacting fit, one that works well independent of glues and fastenings.

The only mechanical fastener between the tops, bottoms and sides are tiny square wooden matchsticks that are forced into undersized round holes, drilled through the hardwood sides and into the bottom or top.

This fastening method is quite secure, particularly after the box is finished with shellac. Some of the shellac inevitably gets into any microscopic spaces between the hole and the matchstick. The connection will then last for generations, without any glue.

"This whole process is a lot of finesse. . .and paying attention to each box," Graham says. "We try to be better than the reproduction (boxes), which are generally pretty good as far as they go." He also notes they have a strong incentive to keep their reject rate under five percent: There is a limited amount of Brother Delmer's wood. It will probably run out in another year and won't be easy to replace.

With all the extra steps in the process, plus the demands of running a thriving farm, Graham and Brother Wayne consider themselves lucky to produce a hundred boxes a year. Five sizes are available, costing from \$35 to \$75.

They also range in size from 3½" to 8½" long. And the market is always hungry for all the two men can make, with many buyers insisting on a full set of the boxes to keep in the family. Eventually, the two would like to produce 300 per year.

But as many woodworkers have found, improving production may not be as easy as simply working harder. Finding wood to replace Brother Delmer's supply will be difficult because most retail hardwood these days is kiln-dried, flat-sawn hardwood.

The difference between bending kiln-dried, flat-sawn wood and air-dried, quarter-sawn wood like Brother Delmer's often means the difference between wood that bends and wood that breaks. Flat-sawn, kiln-dried wood is more prone to break than wood that has been quarter-sawn and air-dried.

Graham and Brother Wayne also worry about their copper tacks supplier, evidently the only one left in the United States. And the number of Shakers to actually do the work continues to drop. Currently, seven confirmed Shakers live at Sabbathday Lake.

"It's a big commitment to take on," Brother Wayne says of the Shaker way of life. **PW**

Ken Textor got his start in woodworking as a boat builder. Now he writes and works wood from his home in Arrowsic, Maine.

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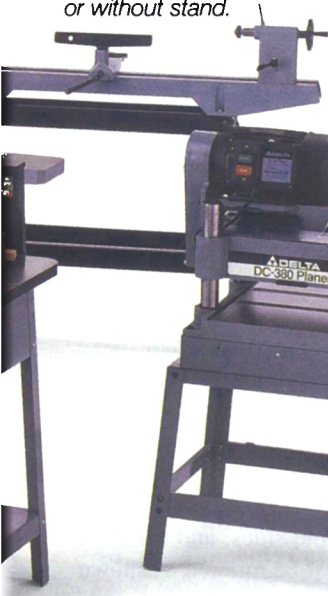
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The Family Organizer

This easy project is like having a butler at your back door.

By Steve Shanesy

MOST FAMILIES need a central place to organize comings and goings. This project has a place for your keys, supplies and a calendar. You can jot notes on the handy sloped writing surface then tack them on the corkboard front. It also features a mirror for last-minute grooming checks as you scurry out the door. This cupboard will see a lot of use if you hang it near the phone.

Like all the projects from our "Little Shop That Could" series, construction is simple, requiring a minimum of tools, and joinery is honest and straightforward — what some call *good* woodworking, not fine woodworking. Best of all, you can complete it in a weekend or two.

Getting Started

Before undertaking this project familiarize yourself with the diagrams and Schedule of Materials. It's like taking a trip; it's always best to know where you're going before leaving home.

I used red oak, mostly half-inch thick, which I found at my local lumber yard already surfaced to this dimension, and some leftover 1/4" oak plywood. All the hardware came from

the hardware store.

To make it easy to build, I broke the unit into separate upper and lower sections that were assembled independently, then screwed together. You can see the separation point in photo 7. First cut out the pieces for both upper and lower units. All the pieces are narrow

Editor's Note

In issue #91, I built this workshop on wheels, which folds in half for storage. Then I outfitted it with \$498 in tools and equipment. Reckoning many of you work in small shops with limited tools, I wanted you to know that we can work that way, too. "Little Shop" projects are designed to be built simply.

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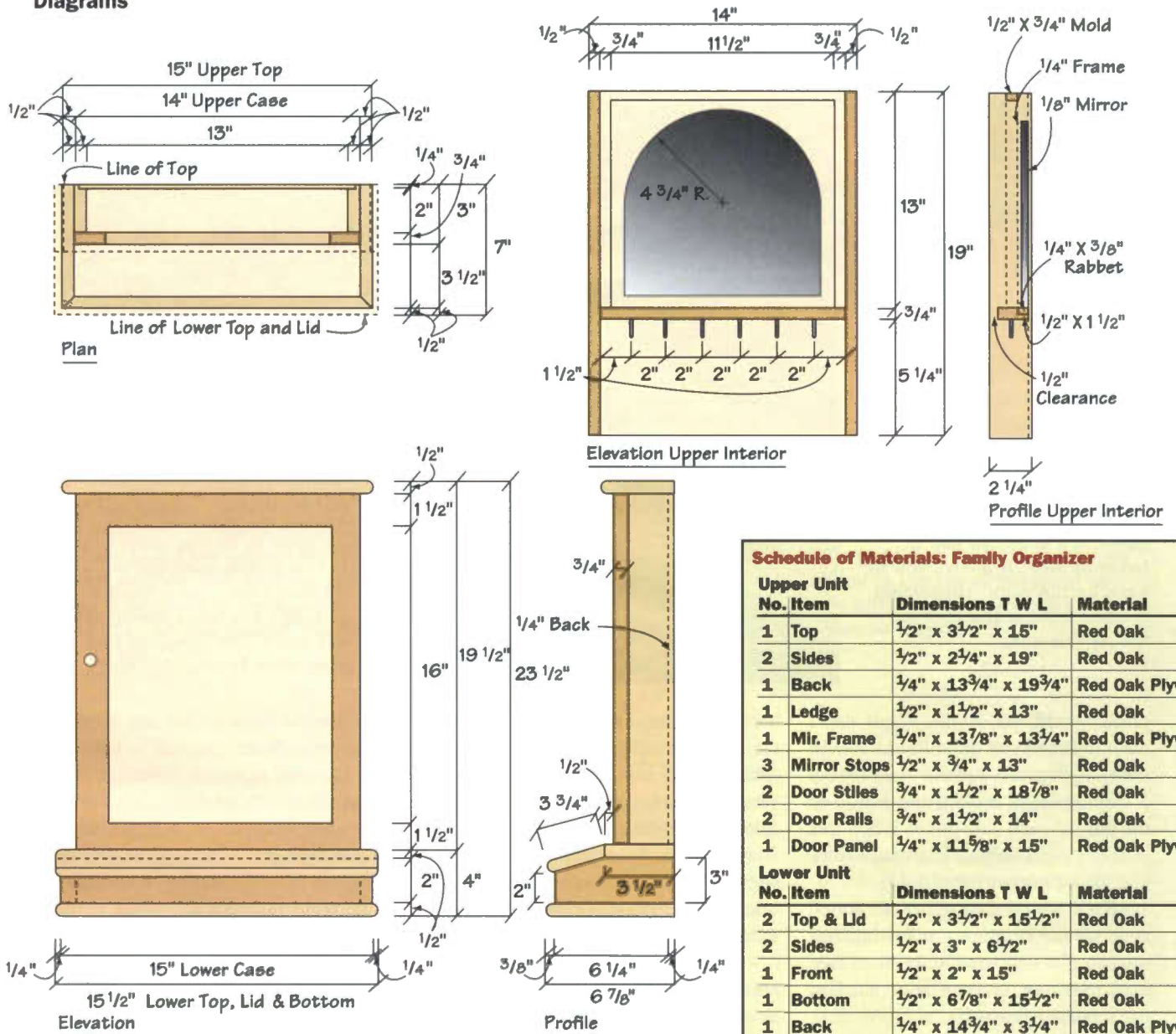


and probably won't need to be glued-up, except perhaps the bottom.

Before you can begin assembly, you must rabbet a number of parts to receive the upper and lower backs. Rabbet the back edge of the upper top, then rabbet the sides and bottom of the lower unit (**photo 1**). I think it's easier to cut through rabbets than make stopped ones on the tops and bottom, even though I have to go back and glue in small filler pieces.

A sloped angle is required on the top edges of the sides (**photo 2**). The front edges of the sides, and the ends of the front must be mitered as shown on the diagram (**photo 3**). The angle of the sloped sides need an extra bit of work before assembly. When you set your pieces together with the front

Diagrams



Schedule of Materials: Family Organizer

Upper Unit			
No.	Item	Dimensions T W L	Material
1	Top	1/2" x 3 1/2" x 15"	Red Oak
2	Sides	1/2" x 2 1/4" x 19"	Red Oak
1	Back	1/4" x 13 3/4" x 19 3/4"	Red Oak Plywd
1	Ledge	1/2" x 1 1/2" x 13"	Red Oak
1	Mir. Frame	1/4" x 13 7/8" x 13 1/4"	Red Oak Plywd
3	Mirror Stops	1/2" x 3/4" x 13"	Red Oak
2	Door Stiles	3/4" x 1 1/2" x 18 7/8"	Red Oak
2	Door Rails	3/4" x 1 1/2" x 14"	Red Oak
1	Door Panel	1/4" x 11 5/8" x 15"	Red Oak Plywd
Lower Unit			
No.	Item	Dimensions T W L	Material
2	Top & Lid	1/2" x 3 1/2" x 15 1/2"	Red Oak
2	Sides	1/2" x 3" x 6 1/2"	Red Oak
1	Front	1/2" x 2" x 15"	Red Oak
1	Bottom	1/2" x 6 7/8" x 15 1/2"	Red Oak
1	Back	1/4" x 14 3/4" x 3 1/4"	Red Oak Plywd

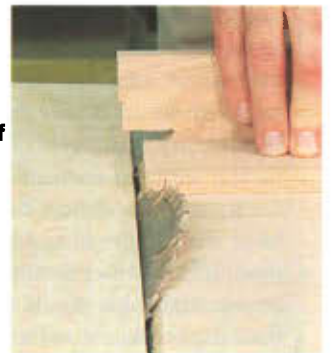


1 The backs of the upper and lower units are housed in a 1/4" deep x 3/8" wide rabbet. Cut these on the table saw in two passes running the stock first on the flat side, then on edge. To do this, however, you must have a "zero" clearance insert for your table saw.



2 Cut the sloping sides of the lower section on the table saw. Use your slot miter gauge equipped with an easily nailed together sled attached directly to it. Simply nail a small piece of 1/4" plywood to an auxiliary back fence. Set the miter gauge to 10 1/2 degrees. For added safety, nail a support/stop block to the sled to prevent the work from being pulled into the blade.

3 Next cut the 45 degree miters for the front of the lower box. Again use the sled attached to the miter gauge.



Just tack on a new bottom piece for it. Since you must remove your "zero" clearance insert to tilt the blade, tape a piece of 1/4" plywood close to the falloff side of the blade. This not only closes the throat opening but prevents the fall off piece from shooting back at you.

ORGANIZER

4 Glue the lower section's mitered corners and use a spacer block between the sides to keep it square. The unreinforced miter joint is amply strong for this project.



5 A router with a 1/4" roundover bit set in a router table cuts the radius profile of several parts. Do this before assembly. Although the router bit may have a bearing guide, it's smart to use a fence as well. It allows you to back up the work, supporting it when making the cuts on the narrow ends.



6 Use through dowel joints to connect the tops to their sides. Lay out the location of the sides on the corresponding top pieces (each side is 1/2" thick, the upper unit sides are set back 1/2" from the top and the lower sides are set back 3/8"). Make the holes align by drilling them at the same time. Do this by clamping the top to a surface, then clamp the side in position directly below it. Drill the holes through the top and into the sides. The "flag" on the drill bit indicates when to stop drilling.

piece, you'll notice the edges don't meet uniformly at the miter joints. To clean this up, use a plane to easily cut a sloping angle toward the inside of the box on each side piece. When this is done, you can glue the lower sides and front together (**photo 4**).

Use a router next to cut the round edge profile on the tops, bottom and lid using a 1/4" roundover bit. Place your router in a router table and also use a fence (**photo 5**).

Use a simple dowel joint to connect the tops to their sides on both the upper and lower sections. To make it even easier, make the joint in the tops exposed by drilling through them (**photo 6**). Use two 1/4" diameter dowels for each connection point.

Before presanding the parts, you must also cut the front edge of the top piece for the lower section. This 10 1/2 degree angle also should be cut on the back edge of the lid so these pieces will hinge and mate uniformly.

Putting Them Together

The upper section is easy to assemble. Just use a bit of glue then drive the short dowel pieces in place. When the glue has set, saw or sand off any part of the dowel that's standing proud.

Although the joinery is exactly the same for the top of the lower unit, first lay out then drill and countersink the clearance holes for the screws that later secure the upper section to the lower. When done, glue the lower top to its sides. Now the separate upper and lower sections begin to take shape (**photo 7**).

After the glue has dried, you should fasten the lower and upper sections together. As mentioned above, they are simply screwed together through the top of the lower unit into the sides of the upper part. Before screwing, however, you should mark and drill pilot holes in the sides so as not to risk splitting (**photo 8**). Then place the units upside down in their proper positions and clamp them together so they can't move while being screwed together.

Now nail the backs in place (**photo 9**). It's a good idea to run a small bead of glue down the rabbet before inserting and nailing the back since the project will be hung on the wall.

Before installing the ledge that runs between the sides in the upper section, cut a rabbet in its upper back edge that's 3/8" wide and 1/4" deep. It

holds the 1/8" thick mirror and its plywood frame. Since it would be hard to do later, drill the pilot holes for the cup hooks on the underside of this piece now. When done, nail the ledge in place through the sides so that it sits 13" down from the inside edge of the top. Countersink the nails then putty holes on each side.

Make and Hang the Door and Lid

The 3/4" thick door frame houses a panel that is made up of 1/4" thick oak plywood laminated on one side with 1/8" thick cork. The cork is easy to glue down using a spray adhesive. When done, cut the channel in the door frame parts and cut the decorative profile of the frame parts using the table saw (**photo 10**). This is best done if you cut the corner miters last.

To complete making the door, check the fit of the panel in the frame parts. When satisfied, glue the frame. As usual, apply glue at the miters, but you should add a bead of glue down the long parts of the door frame to give the door some added strength.

Cut mortises for the door hinges only on the sides of the case. Mortises for the lower lid should be cut only on



7 The top and bottom section sub-assemblies prior to installing the backs. Leave the bottom off the lower section until after the top section is screwed to the lower since you need access through the bottom to do this.



8 Use a nail set placed through the pre-drilled clearance screw holes in the top of the lower section to mark the location in the ends of the sides for the pilot holes. The clamp keeps the two sections from moving while marking the holes.



9 The 1/4" plywood back is nailed into the upper section. The back is long enough that it can later be nailed to the top of the lower section after the two sections are screwed together.

the lid. For the lid I had to cut an extra notch in the top of the mortise to accommodate the hinge barrel. Here's a case where I hadn't quite thought of everything in advance. With the hinge barrel sticking up normally, the door above wouldn't clear the hinge unless I left a larger gap at the door bottom.

Complete the Mirror Section

I purchased an inexpensive mirror at the hardware store and cut it myself.

Cut the plywood "frame" to size and lay out the 4 3/4" radius interior cut that produces the arch (**photo 11**). This piece merely lies over the mirror.

Cut the three moulding pieces that hold the mirror and frame in place. These have a beveled edge and mitered corners (in the top corners only). Don't install these until after finishing, however, because it will save you the trouble of having to clean any finish material off the mirror.

After finishing, just lay the unit on its back, set the mirror and frame in place, then use hot melt glue to stick the three frame stops in place.

Finish and Hardware

To finish, go back over the whole project with 120 grit, then 150 grit sandpaper. I left the wood its natural color and brushed on two coats of satin varnish, lightly sanding between coats with 360 grit paper.

To complete, I rehung the door and lid and installed the doorknob plus the hasp that keeps it closed. Then I screwed in the cup hooks. To hang on the wall, I used two screws inserted out of sight below the cup hook ledge and through the back.

Now that the cupboard is installed, I don't lose my keys so often. And because it's near the phone, I don't get in trouble for forgetting to relay phone messages. As for the mirror, I can't decide who uses it more, my wife or teen-age son. He forgets to leave notes letting us know where he is, though. I couldn't quite figure out how to build this feature into the project! **PW**

Steve Shanesy is editor of Popular Woodworking.



10 A piece that makes up the door frame. Cut the channel for the cork panel in the door frame on the table saw using multiple passes with the part run on edge. The decorative profile was made using the table saw. Make two 45 degree chamfer cuts and two shallow kerf cuts on the face adjacent to the chamfer.



11 Cut the arch for the mirror "frame" using a compass saw. Make the straight cuts on the table saw. Set the fence 1" from the blade. Then lower it below the table. Position the piece against the fence so that when the blade is raised it will be inside the layout line. Carefully raise the blade and push the work, stopping before the next layout line.

14.4 POWER—At A Price

We tested the newest cordless drill/drivers to see what was available, and what was worth the price.

We approached this review of 14.4 volt cordless drill/drivers excited by the prospect of testing all that power. We did stop for a moment to ask why we needed all that power. We assure you, however, it was a fleeting thought.

The tools we tested fall into two categories — industrial and home shop use. While there are some crossover models, it's obvious that some of the tools were designed with the home shop in mind. Indeed, many readers will be satisfied with the performance and price of the home shop models, while others will opt for the extra performance (and cost) of the profession-



al models.

Just to have a little fun, we also threw in DeWalt's 18 volt technology, as well as Milwaukee's 12 volt (2 amp hour) model as "controls." Though we haven't discussed them at length, their specifications are included in the accompanying charts.

In general we found that while price differences and certain features lead us to favor one brand or another, there are no tools tested that wouldn't be welcome in our own shops.

So let's look at what that power can do for you in your shop, or wherever you put it to work.

Black & Decker PS3600-Home Shop

Fit, Finish and Balance	●●●●●
Battery Release/Engagement	●●●○○
Switch Location/Function	●●●●○
Clutch Sleeve Movement	●●●○○



Discounting the off-brand competition to the right for a moment, Black & Decker offers the least expensive 14.4 volt tool tested. It operates in only one speed range, but includes a good shaft brake, is well designed and made, and it performs pretty darn well. The tool feels good in the hand and is sized well. The two-sleeve keyless chuck adjusts easily to a zero clearance opening, and the tool includes an on-board level and storage for a screwdriver bit. Though it takes three hours to fully recharge, for a home shop tool, this is an excellent choice and value.

Great Tools Direct-Home Shop

Fit, Finish and Balance	●○○○○
Battery Release/Engagement	●●○○○
Switch Location/Function	●●●○○
Clutch Sleeve Movement	●○○○○

The 14.4 volt cordless drill from Great Tools Direct was advertised in *Popular Woodworking* for an incredible \$69.95! The ad promised a money-back guarantee, so we had to try it out. Though the tool under performed the other drills in this test, it did a decent job considering its cost.

The tool features a two-sleeve keyless chuck that adjusts to a zero-clearance opening and includes a set of drill bits, nut drivers and screwdriver bits, two of which can be stored on the drill. On a full charge, this single speed, brakeless tool drilled 27 holes and drove 35 lag screws *most* of the way into a board, lacking the torque to completely seat the 3" screws. While not a stellar performance, this may be a fine tool for most once-a-month home projects.



Ryobi CTH1442K Home Shop

Fit, Finish and Balance	●●●○○
Battery Release/Engagement	●●●○○
Switch Location/Function	●●●●○
Clutch Sleeve Movement	●●●○○



The first thing we noticed when we picked up the Ryobi was the soft surface of the drill. Not only pleasant to grip, the finish provides a good non-skid surface.

The Ryobi comes standard with a two-sleeve keyless chuck that adjusts to a zero-clearance opening; and screwdriver bits are housed on the drill. Performance was fine for home use, though we did notice the battery and tool heated up quite a bit with continued use.

All in all, a good tool to recommend as an economy option to the more pricey industrial models. While not at the same performance level, it's a reliable tool.

Bosch 3610K Industrial

Fit, Finish and Balance	●●●●○
Battery Release/Engagement	●●○○○
Switch Location/Function	●●●●○
Clutch Sleeve Movement	●●●●○



The Bosch was one of our favorite tools. It performed and handled well during use, though we noticed the motor got hot during continued use. Its single sleeve chuck is a unique feature that feels friendly after some use. The size of the unit is not overly large as in some of the other industrial tools, but the battery seemed chunky and difficult to remove when gripped from below.

Bosch's charger does provide a maintenance mode, but they don't recommend storing the battery in the charger for extended periods of time. With everything considered, the performance of this tool makes it a companion tool for any workbench.

Wagner PG144DK-2 Home Shop

Fit, Finish and Balance	●●●○○
Battery Release/Engagement	●●●○○
Switch Location/Function	●●●●○
Clutch Sleeve Movement	●●●○○



We'd recommend the Wagner as a home shop tool, even though it's billed as a professional tool. While the performance was very good for a home tool, it falls short of an industrial rating. Our first impression was that the drill was somewhat large and chunky, but when we started using it, the performance and feel were good.

The drill's features include a two-sleeve keyless chuck that adjusts to a 1/16" clearance, as well as a unique feature – an on-board battery tester. By pressing the button on the rear of the battery we could gauge the charge left. This unit also offers a maintenance mode on the charger, which is frequently found only with industrial drill/drivers. Though a little pricey, it's a nice tool.

Real World Testing

To do our testing, we didn't use any fancy equipment, and we didn't dissect the motor. We also didn't care how many pounds of torque were produced on each speed setting. We wanted to know how the tool felt and how it performed. To that end, we first evaluated each tool for fit, finish, comfort and features. Next we conditioned the batteries by discharging each one under load three times, then recharged. We then drilled as many

holes possible on a single charge through 1 1/2" pine with a 1/2" spade bit, (using brand new, identical spade bits for each test), and finally we drove as many 1/4" x 3" lag screws into pine as possible on a single charge.

We thought these tests would reflect the drills' ability to make holes and drive screws, whether on the job site or in your garage. We won't claim scientific accuracy as lots of variables can't be controlled, but in all, we thought the testing reflected a realistic and fair performance of these tools.

Craftsman 27194 - Industrial

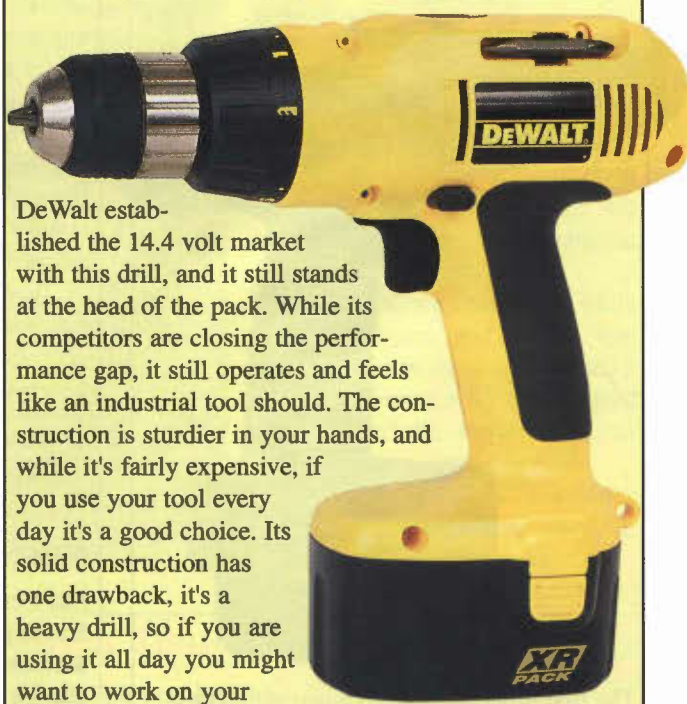
Fit, Finish and Balance	●●●○○
Battery Release/Engagement	●●●○○
Switch Location/Function	●●●○○
Clutch Sleeve Movement	●●●○○



Craftsman's entry in the 14.4 game lived up to its power tool reputation. Reliable power plus extras including a built-in level, storage for screwdriver bits on the housing and an oversized user-friendly trigger. Performance was very good, but as with the Wagner, the drill is pretty large. The chuck is chunky, and while the size doesn't hinder the performance, it's a lot of tool to hold. To sum up, the 27194 isn't a Mercedes, but it's a real nice Chevy Impala.

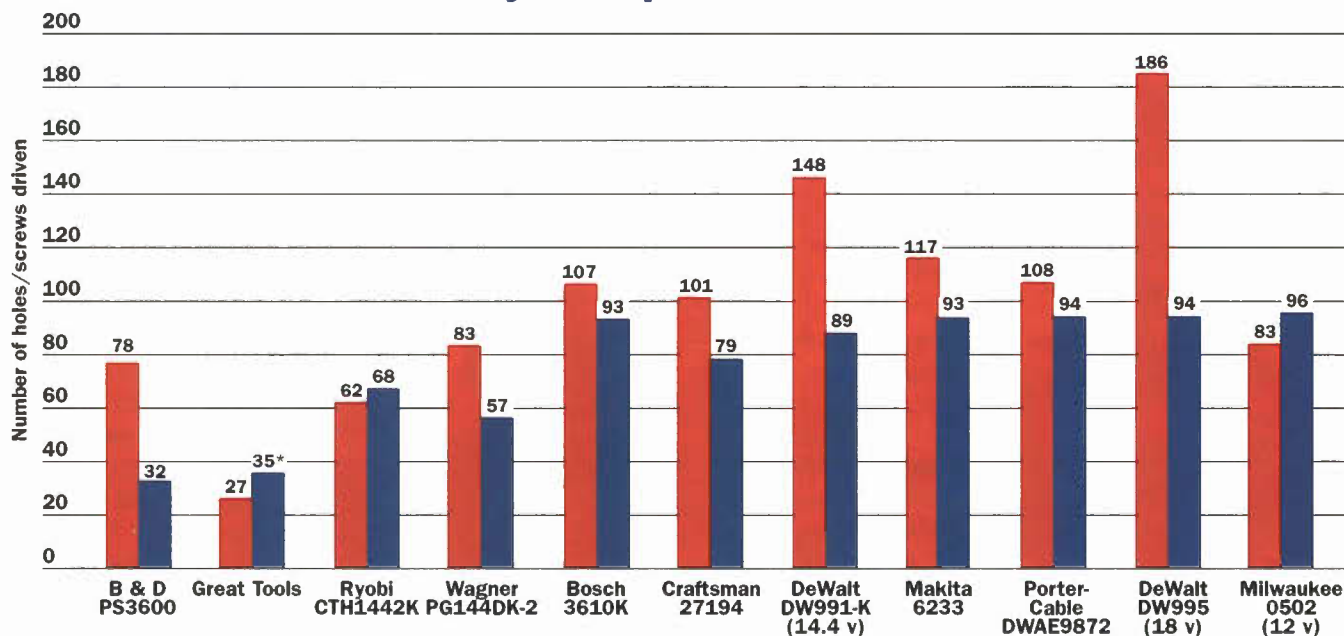
DeWalt DW991-K-2 - Industrial

Fit, Finish and Balance	●●●●○
Battery Release/Engagement	●●●●○
Switch Location/Function	●●●●○
Clutch Sleeve Movement	●●●●○



DeWalt established the 14.4 volt market with this drill, and it still stands at the head of the pack. While its competitors are closing the performance gap, it still operates and feels like an industrial tool should. The construction is sturdier in your hands, and while it's fairly expensive, if you use your tool every day it's a good choice. Its solid construction has one drawback, it's a heavy drill, so if you are using it all day you might want to work on your forearms.

14.4 Volts – How They Compare



■ Number of 1/2" spade bit holes per charge

■ Number of 1/4" x 3" lag screws per charge

* During the screw testing, the tool was unable to completely seat any of the screws into the board, always stopping a fraction of an inch short.

Makita 6233DWAE - Industrial

Fit, Finish and Balance	●●●●○
Battery Release/Engagement	●●●●○
Switch Location/Function	●●●●○
Clutch Sleeve Movement	●●●●○

For many of us the first cordless drill we ever used was a Makita. We're happy to continue using a tool such as the 6233DWAE. It edged out Bosch, Porter-Cable and Craftsman in performance and proved equal (but lighter) than the DeWalt model in comfort and use. Makita offers the unique feature of replaceable brushes for the motor. This would suggest Makita expects the tool to be functioning long enough to need replacement brushes. Because we didn't have the chance to test it that long we can't say for sure, but Makita's reputation would make us think it's a good possibility.



Porter-Cable 9872 - Industrial

Fit, Finish and Balance	●●●●○
Battery Release/Engagement	●●●●●
Switch Location/Function	●●●○●
Clutch Sleeve Movement	●●○●○

We tested one of the first 9872s in the country, and we're impressed. Porter-Cable's 14.4 performed as well as the Bosch and Craftsman models and is smaller than the Craftsman. The drill handled well, though we noticed some clunkiness in the switches and clutch. This was a pre-production model, so a little roughness was expected. The drill features a two-sleeve chuck that adjusts to zero clearance and has a nice non-skid grip. This drill is the most expensive tested and second heaviest, so you'll have to weigh that against the performance and reputation. **PW**



Manufacturer/Model	RPM (Low/High)	Weight w/batt.	Charge Time	Maint. Phase*	Batteries Included	Clutch Settings	Retail Price
B & D PS3600	800/NA	3.12 lbs	3 hrs	No	1	6	\$130
Bosch 3610K	450/1300	4.6 lbs	1 hr	No	2	16	\$199
Craftsman 27194	400/1400	4.8 lbs	1 hr	No	2	24	\$190
DeWalt DW991K-2	450/1400	4.13 lbs	1 hr	Yes	2	16	\$229
Great Tools Direct	600/NA	3.8 lbs	3 hrs	No	1	6	\$70
Makita 6233DWAE	400/1300	4.9 lbs	1 hr	No	2	6	\$199
Porter-Cable 9872	400/1450	4.11 lbs	1 hr	Yes	2	21	\$250
Ryobi CTH1442K	320/1150	4.3 lbs	1 hr	Yes	2	6	\$165
Wagner PG144DK-2	300/1100	4.6 lbs	1 hr	Yes	2	6	\$199
DeWalt DW995	450/1400	5.10 lbs	1 hr	Yes	1	16	\$239
Milwaukee 0502	400/1100	3.11 lbs	20 min	Yes	2	20	\$199

*Maintenance Phase - This feature allows the battery to remain in the charger after charging, receiving a minimal current to keep the battery fully charged without causing any harm to the battery.

A Gentlemen's Armoire

This redesign of the traditional armoire optimizes space efficiency to better fit your home. By Sal Maccarone

I'VE BUILT hundreds of armoires for clients. Each one has a little different height or width, but they've always been more than two feet deep to hang clothes on a rod running from one side to the other.

Often it was impossible to fit an armoire of this depth in the available space. I solved this problem by running the rod front to back to provide more space since men don't really require that much hanging room.

Begin Basic Construction

I chose Philippine mahogany for this project, but virtually any wood can be used. Start by milling four legs to the size given in the Schedule of Materials. Arrange them on the bench in the order they'll be assembled, best faces out (**photo 1**).

After marking the parts, separate them into what will become the two sides. Mill the $\frac{5}{16}$ " x $\frac{5}{16}$ " rabbets into the two back legs on the inside back edges, stopping 10" up from the bottom. After cutting, position the three side rails.

I like to use a biscuit joint for the rails and legs (**photo 2**). Once the joints have been cut, glue the sides together.



1 It can be easy to confuse these typical sized pieces, so mark not only the fronts and sides, but also the rabbets, for the back panel to be added later.



2 If you don't have a biscuit joiner, use a dowel joint. Remember that you're joining $\frac{3}{4}$ " rails to $1\frac{5}{8}$ " legs, and the rails should be flush with the outside face of the legs.



After the glue dries, install the front top and bottom rails. Make the top rail flush to the top of the legs. Position the bottom scrolled rail. (Use the scroll pattern provided as shown in the **diagram & photo 3**.)

Next, cut the back top rail which holds the closet pole cups (**photo 4**). Install the top rail with screws. It adds strength and the screwheads will ultimately be covered by the crown skirt.

The bottom back rail strengthens the cabinet and supports the bottom panel to add necessary sheer strength. Situate this part inside the bottom legs at $12\frac{1}{2}$ " up from the bottom of the legs, then install with glue and screws. Strength here is very important since this is a hidden area.

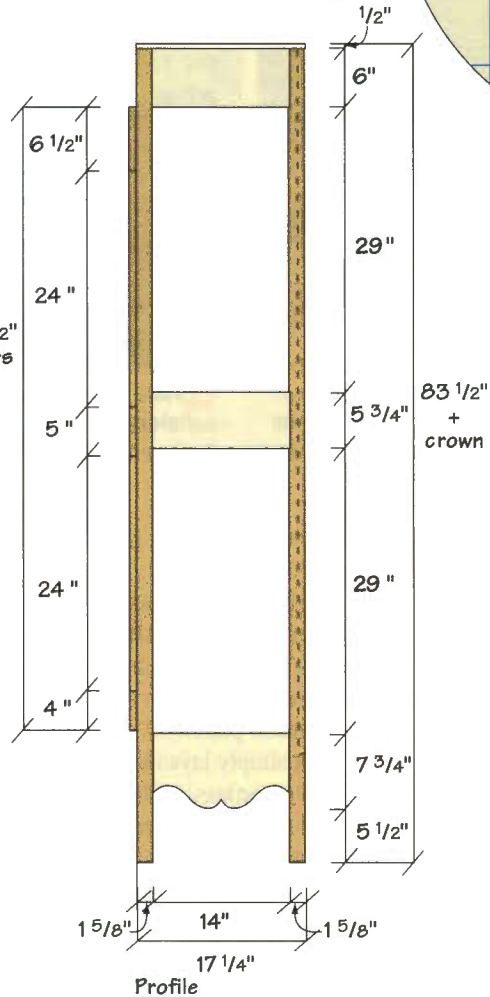
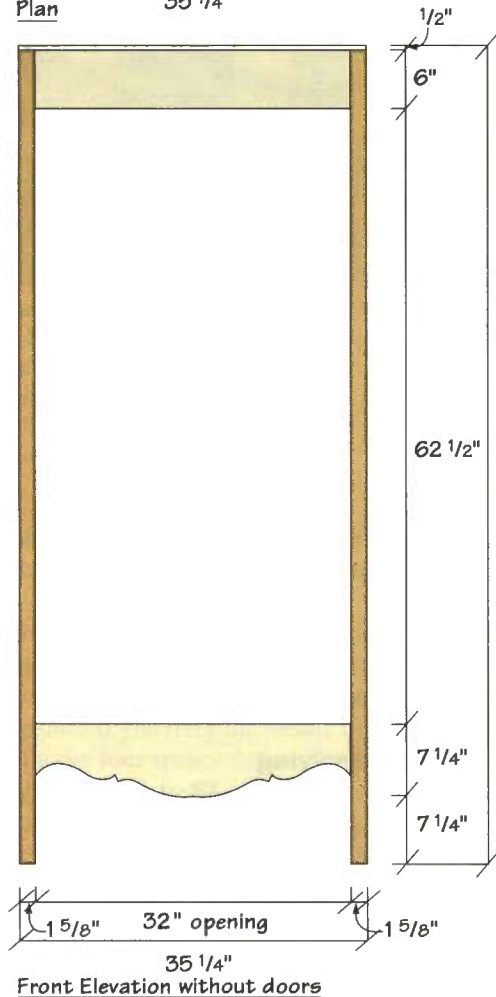
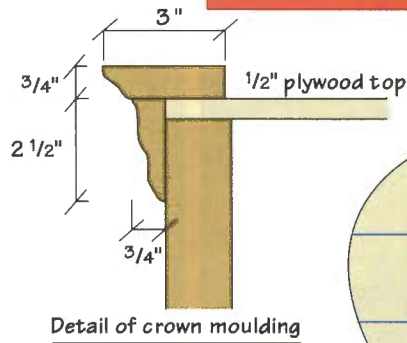
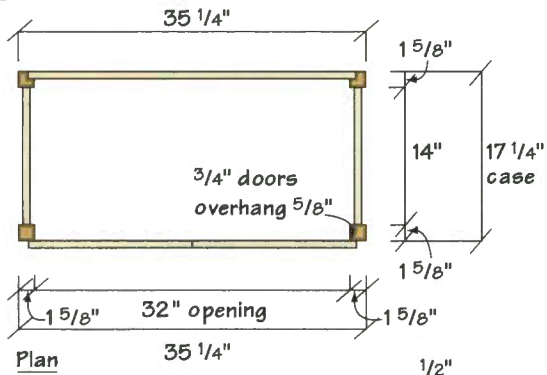
Now add $\frac{3}{4}$ " x $\frac{3}{4}$ " support cleats to the inside perimeter of the scrolled side rails and front rail (**photo 5**).

Install the Interior Panels

Next, begin installing the plywood parts. I used $\frac{1}{2}$ " mahogany hardwood veneer plywood since they're seen on the cabinet interior. Pre-sand before

Diagrams

ARMOIRE



Bottom Side Rails
Enlarge 220%
1 square = 1"

Schedule of Materials: Gentlemen's Armoire

No.	Item	Dimensions T W L	Material
4	Legs	1 5/8" x 1 5/8" x 83"	Mahogany
2	Top side rails	3/4" x 6" x 14"	Mahogany
2	Center side rails	3/4" x 5 3/4" x 14"	Mahogany
2	Bottom side rails	3/4" x 7 3/4" x 14"	Mahogany
1	Front top rail	3/4" x 6" x 32"	Mahogany
1	Front bottom rail	3/4" x 7 1/4" x 32"	Mahogany
1	Back top rail	3/4" x 7" x 32"	Mahogany
1	Back bottom rail	3/4" x 2 1/2" x 33 5/8"	Mahogany
1	Top crown	3/4" x 3" x 7'	Mahogany
1	Crown skirt	3/4" x 2 1/2" x 7'	Mahogany
1	Support cleats	3/4" x 3/4" x 6'	Mahogany
1	Panel moulding	3/4" x 3/4" x 26'	Mahogany
1	Back	1/4" x 32 5/8" x 70 3/4"	Plywood

No.	Item	Dimensions T W L	Material
1	Bottom	1/2" x 16 x 33 5/8"	Plywood
1	Top	1/2" x 17 1/4" x 35 1/4"	Plywood
2	Sides	1/2" x 14" x 70 1/4"	Plywood
4	Door stiles	3/4" x 2" x 65"	Mahogany
2	Door top rails	3/4" x 6 1/2" x 12 1/2"	Mahogany
2	Door center rails	3/4" x 5" x 12 1/2"	Mahogany
2	Door bottom rails	3/4" x 4" x 12 1/2"	Mahogany

10 sq. ft. of 1/4" plywood or solid stock (for beveled panels)
Pair of closet pole sockets
About 16" of 1 1/2" closet pole
3/4" plywood for dividers to builder's preferences

ARMOIRE



3 Again using a biscuit joiner or dowel joint, glue and clamp these parts in place and allow them to dry. Now your cabinet is beginning to take shape.



4 I favor a symmetrical curve to 6" wide at the center. Install this piece at the upper back of the cabinet, flush to the top of the legs and to the inside of the rabbet cut for the back.



5 Nail or screw these cleats in place so the bottom panel will be flush with the top of the back rail.



6 Since they're in full view when the doors are open, the plywood's best face should show on the inside of the cabinet. The back of the panel isn't as important since it will be covered with another decorative or finished panel between the side rails.

installation because they'll be difficult to sand later.

Install the bottom panel first. It extends beyond the back rail, so the corners must be notched to fit the bottom flush to the inside of the rabbet on the rear legs. This bottom panel also serves as the attachment point for the back panel.

Now install the back. It simply lays inside of the rabbets already pre-cut in the legs. It also rests on the back top rail and the 1/2" bottom.

Next, cut the top panel to the cabinet's exact outside dimensions since it lays on top. Glue and nail it all around. The plywood edge will be covered by the crown skirt. The cabinet should now be rigid and square.

Finally, lay the interior plywood side panels on the inside of the cabinet between the top and bottom panels and against the side rails (photo 6).

Shape the Legs

After gluing and nailing the interior plywood panels to the inside of the rails, rout the legs' outside front edges, rout the legs' outside front edges using any traditional router bit profile.

Stop the profile at the inside front rail lines. In other words, the shape won't go completely from the top to the bottom of the

legs. This will leave square corners at the top for the crown skirt, and about a foot of square edge at the bottoms for the sake of continuity.

Be careful not to use a profile wider than 1/2" so that it doesn't interfere with the overlay doors and hinges. Now sand the cabinet case on the outside.

Install Interior Shelving

The interior shelves and their divisions are a matter of preference. You will need a space that's 48" high x 23" wide in the top section for a standard suit to hang. Install the closet pole cups on the centers of the back cleat and the inside of the front top rail now.

Attach the interior shelves with screws through the plywood sides (photo 7). I also installed narrow shelves to the left and right of the suit compartment to use for accessories. The upright for these is dadoed and attached to the top shelves with screws from below.

Attach the Crown

The crown is a three-piece mitered frame which attaches to the top of the cabinet. The dimensions given in the Schedule of Materials allow for a 1 1/2" overhang on both sides and the front.

After cutting a traditional router profile on the underneath edges of this three-sided frame, add 1" of flat surface in the crown skirt. The crown should be pre-made, shaped and sanded before attaching it to the cabinet top.

Now shape and miter the 2 1/2" crown skirt, and apply it under the crown. This skirt not only adds dimension to the

Front
Bottom Rail
(scrolled)
Enlarge 312%
1 square = 1"



7 The piece I made has three shelves with two divisions each, thereby creating nine pigeon holes at the bottom under the upper hanging suit compartment.



8 The panels lay within the spaces and against the plywood sides. Use whatever type of decorative panels you choose to glue the backs and nail them as close to the edges as possible.



9 I favor 2" wide stiles, 4" wide bottom rails and 5" wide center rails. Line these up with the cabinet's center rails and scrolled top rails which are 6½" at their widest part.

cabinet, but also covers the rough plywood top edge. Use the same screws as earlier to install the top back cleat.

Add Decorative Side Panels

The decorative side panels are a matter of preference. You can use a flat ¼" veneered plywood of the same species, or raised panels if you have the means to produce them. They fit within the four spaces defined by the rails on each side of the cabinet (**photo 8**).

After attaching the panels, install the ¾" x ¾" edge moulding around the perimeters of all four panels. This moulding fits in the corners around the panels' perimeter. This size also allows for a little overhang beyond the cabinet faces and adds a nice detail to the cabinet sides.

Construct the Doors

A pair of overlay doors are best suited for this piece. Depending on the hinges used, a ⅜" to ⅝" overhang around the opening of the cabinet works best.

Once the overhang has been decided (the type of hinge you use may dictate the overhang), calculate the total size, then divide it in half to get each door's width. It's very important to use straight material for the door stiles because of the 5' plus length needed (**photo 9**).

You have a couple of options for the door construction. If you have the means to create a "cope & stick" type of door, then do so. You can also use a biscuit or dowel jointed assembly with similar results. If you use a cope and stick, adjust your stile and rail sizes accordingly.

Once the doors are assembled, use a simple router profile

to create a traditional profile edge on the outside perimeter. (Be careful not to shape the centers where the doors come together.) Then turn the doors over and make a rabbeted edge on the inside of the openings for the panels to fit into.

The final step to these door frames is adding a traditional router profile on the panel opening faces. Cut the door panels to fit within the rabbets created on the back side of the doors. If you have a hard time making the panels fit perfectly, add a thin moulding to cover any gaps.

Finish the Piece and Select the Hardware

To finish, sand as needed up to 150 grit, then stain and clear coat with your preferred finish material.

This piece looks good no matter what type of hinges and door handles are chosen. I used antique, two-piece barrel hinges, which can often be found in antique or secondhand stores. **PW**

Sal Maccarone welcomes feedback on this project. Write to P.O. Box 1651, Port Townsend, WA 98368. His Web page is at 222.daka.com/maccarone/woodwork.htm.

Door Top Rail Pattern
Enlarge 255%
1 square = 1"

Antique Chessboard

To construct this "antique" chessboard, begin by cutting the bottom as given below. Then cut the four side pieces, rabbeting the top inside edge of each $\frac{3}{4}$ " deep x $\frac{5}{8}$ " wide. Miter the ends of the sides to fit around the bottom.

Before assembly, cut out the drawer opening on one of the sides (**diagram**). Sand all the pieces and assemble the four sides around the bottom using nails and glue. Set the nails, but you don't need to fill the holes.

Cut out the $\frac{3}{4}$ " top, then cut a $\frac{1}{4}$ " x 1" rabbet on the top of all four edges. The rabbet is not functional, so cut deep enough to reveal a cross-grain layer. Then, using a router mounted in a table and a V-groove bit, define the $1\frac{3}{4}$ " x $1\frac{3}{4}$ " squares on the top. The grooves should only be about $\frac{1}{64}$ " deep. The top will be nailed in place after painting.

Next, cut the pieces for the drawer box. The simple construction uses butt joints and a $\frac{1}{4}$ " x $\frac{1}{4}$ " rabbet on the inside bottom edge of each piece to receive the bottom. Sand, then glue and nail the drawer together. Leave out the divider for now.

Two runners tacked to the box's bottom guide the drawer. Decide their locations, then glue and nail them to the bottom, $\frac{1}{16}$ " away from either side of the drawer. Glue and nail the drawer stop so it touches the drawer back when closed. Attach the drawer front with glue and nails, then attach the drawer divider $1\frac{1}{4}$ " from the front for storage. Hand-cut the handle as shown



in the **diagram**, then glue in place.

For an antiqued look, finish the entire piece using a warm brown glaze or stain, then wipe most of it from the gameboard. Next, lightly apply spray lacquer or varnish, and sand lightly. Now cover the board's squares with masking tape, then trim and remove it from the dark squares. Mask a $\frac{3}{8}$ " border on all corners of the case, and apply blue/gray latex paint to the entire board.

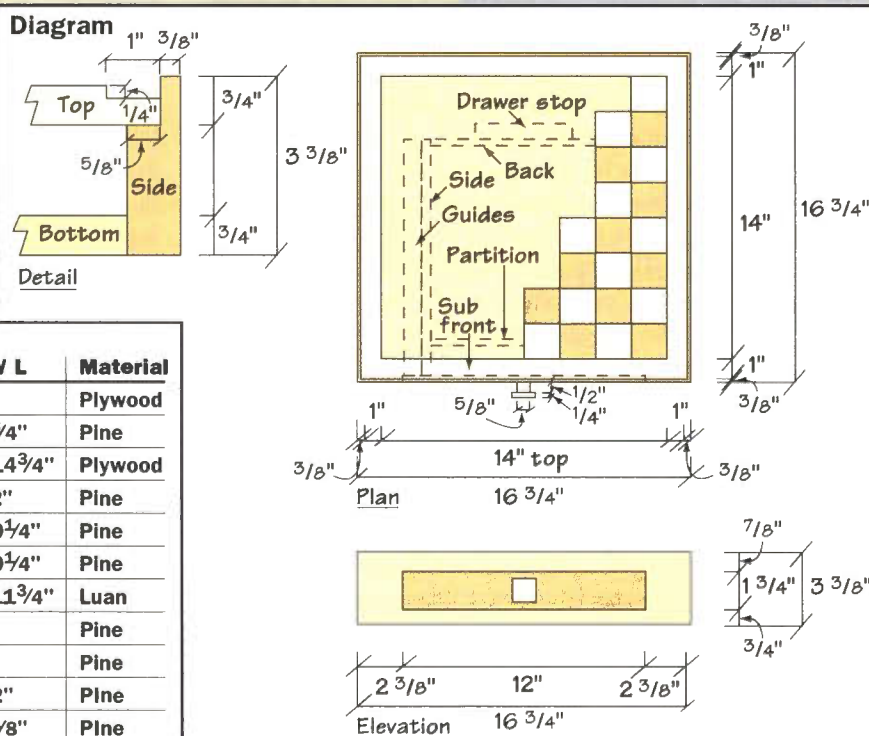
Once dry, remove the tape, and rough up the paint using a 3M abrasive pad, keys, a screwdriver or other items

to produce a worn look. Add more distressing to areas that normally would receive more wear. Don't hesitate to bang up the corners with a hammer, just don't break through the glaze.

Apply a second thin coat (6 parts thinner to 1 part lacquer or varnish) to the entire piece. Once dry, apply a light coat of glaze and wipe off almost entirely. Then add another thin coat of lacquer or varnish to seal. Checkmate!

Source List

Chess pieces: **U.S. Chess Federation**, (800) 388-5464



Schedule of Materials: Chessboard

No.	Item	Dimensions T W L	Material
1	Top	$\frac{3}{4}$ " x 16" x 16"	Plywood
4	Sides	1" x $3\frac{3}{8}$ " x $16\frac{3}{4}$ "	Pine
1	Bottom	$\frac{3}{4}$ " x $14\frac{3}{4}$ " x $14\frac{3}{4}$ "	Plywood
2	Drawer sides	$\frac{3}{8}$ " x $1\frac{1}{2}$ " x 12"	Pine
2	Drawer front & back	$\frac{3}{8}$ " x $1\frac{1}{2}$ " x $10\frac{1}{4}$ "	Pine
1	Drawer partition	$\frac{3}{8}$ " x $1\frac{1}{4}$ " x $10\frac{1}{4}$ "	Pine
1	Drawer bottom	$\frac{1}{4}$ " x $10\frac{3}{4}$ " x $11\frac{3}{4}$ "	Luan
2	Drawer runners	$\frac{3}{4}$ " x $\frac{3}{4}$ " x 12"	Pine
1	Drawer stop	$\frac{3}{4}$ " x $\frac{3}{4}$ " x 6"	Pine
1	Drawer front	$\frac{1}{2}$ " x $1\frac{3}{4}$ " x 12"	Pine
1	Handle	$\frac{3}{4}$ " x $1\frac{1}{8}$ " x $1\frac{1}{8}$ "	Pine

Hearthside Firewood Rack

A pair of frames, two bottom stretchers and a couple chunks of scrap walnut shaped like saddle horns are all it takes to make this rack for hanging a firewood tote.

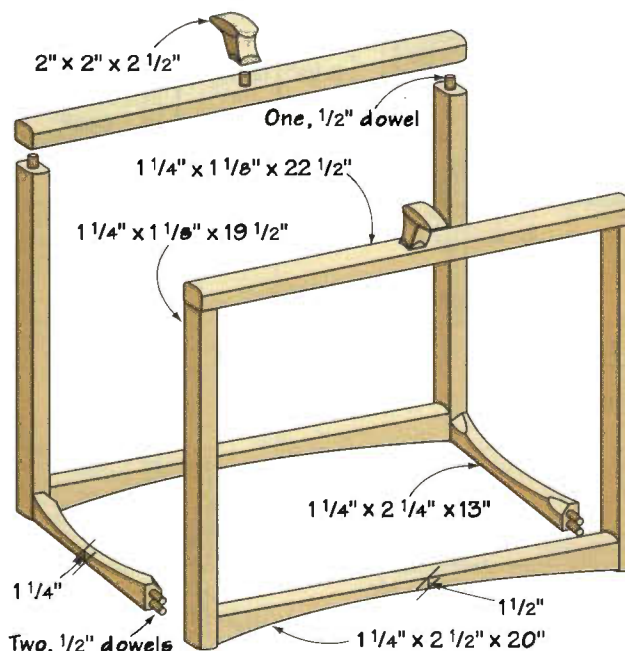
Cut out the parts given in the Schedule of Materials, then make the two side frames. For strength, use one $\frac{1}{2}$ " x 2" dowel pin for each frame joint. Center the dowel for the bottom rail so two dowel pins can be used for the stretcher joint. These two pins straddle the single pin in the outer frame and give needed strength to this joint.

After gluing the frames, cut the arch in the bottom rail, then rout a $\frac{3}{8}$ " roundover profile on all long edges. It's best to do this using a router table. Now cut the curve on the top of the lower stretchers, sand, and rout the same profile. Locate the stretchers so each outside edge sets inside the rounded profile on the legs and up $\frac{1}{4}$ " from the bottom. Glue and clamp these pieces to the two frames. Use a gouge to chisel away the top inside corners of the stretches so they meet the opposing parts inside their rounded profile.

If you don't want to go through the trouble of carving the saddle horns, simply glue a length of $\frac{5}{8}$ " dowel rod in the same location, sinking it into the top rail about $\frac{3}{4}$ ". Not being a carver, I used a coping saw, a rasp, files and a sanding drum to shape mine. Secure them to the top rail using a $\frac{1}{2}$ " dowel pin for each. A tung oil finish completes the project.



Diagram



Schedule of Materials: Firewood Rack

No.	Item	Dimensions T W L	Material
2	Top rails	1 1/4" x 1 1/8" x 22 1/2"	Red oak
4	Frame sides	1 1/4" x 1 1/8" x 19 1/2"	Red oak
2	Bottom rails	1 1/4" x 2 1/2" x 20"	Red oak
2	Stretchers	1 1/4" x 2 1/4" x 13"	Red oak
2	Saddle horn	2" x 2" x 2 1/2"	Walnut

Sandpaper Press

In the shop, you're likely to have the problem of sheets of sandpaper curling up like an enchilada. This easy project offers a simple solution made from scraps. I listed the scraps I used, but feel free to substitute.

Start construction by cutting the sides and ends as given in the Schedule of Materials, then cut the bottom. The joinery holding the box together can be as simple as screwed or nailed butt joints. If you're feeling frisky, try some hand-cut dovetails. I opted for the happy medium of pegged butt joints. By drilling the peg holes at opposing angles, you will get an especially strong joint.

Sand the interior faces of the sides, ends and the bottom. Then glue and clamp the sides and ends in place around the bottom. Don't glue the bot-

tom in place at this time, just use it as a guide. With a $\frac{3}{16}$ " bit, drill to a $1\frac{1}{4}$ " depth about $\frac{3}{4}$ " from each corner, angling the bit toward the center. Now apply a small amount of glue to the tip of a $\frac{3}{16}$ " diameter dowel (cut to about $1\frac{1}{2}$ " long) and tap it into the hole. Repeat this process on the other three corners.

After the glue has set, remove the clamps and the bottom. Apply a small

amount of glue to the edges of the bottom (except for the exposed front) and place it back within the box frame flush to the bottom. Clamp the sides to the bottom, then repeat the pegging process around the perimeter of the base. Use two pegs per side and back, and one per front piece. Once the glue is dry, cut the dowels flush to the surface of the sides and sand the outside of the box.

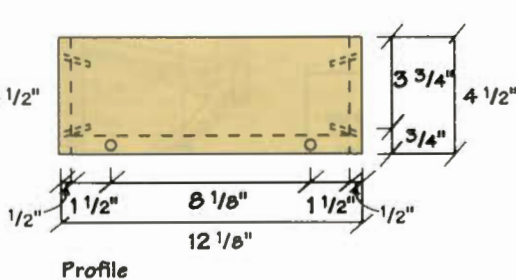
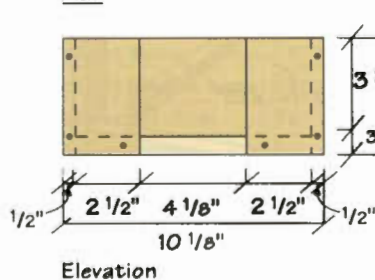
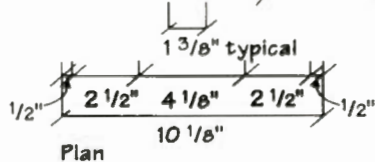
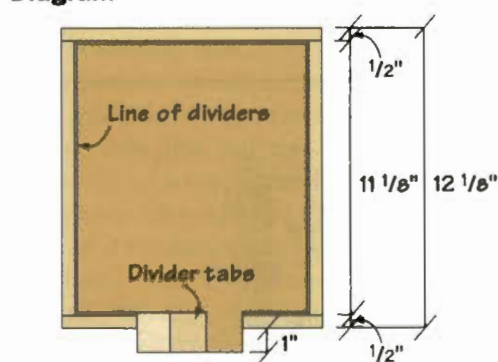
The lid is very simple, and depends a great deal on your scrap pile. The one I used was cut from a small cherry door that was damaged. Use whatever material you like (including particle board or plywood), as long as it has enough

weight to keep the sandpaper pressed flat. The masonite dividers are cut to fit within the box, each with a tab to extend through the front opening. The number of dividers depends on the variety of sandpaper used.

Find an extra handle laying around the shop and attach, then apply a quick coat of finish (optional). Now your curling days are over.



Diagram



Schedule of Materials: Sandpaper Press

No.	Item	Dimensions T W L	Material
1	Bottom	$\frac{3}{4}$ " x $9\frac{1}{8}$ " x $11\frac{1}{8}$ "	Plywood
2	Sides	$\frac{1}{2}$ " x $4\frac{1}{2}$ " x $11\frac{1}{8}$ "	Alder
1	Back	$\frac{1}{2}$ " x $4\frac{1}{2}$ " x $10\frac{1}{8}$ "	Alder
2	Fronts	$\frac{1}{2}$ " x $4\frac{1}{2}$ " x 3"	Alder
1	Lid	$\frac{3}{4}$ " x 9" x 11"	Cherry
3	Dividers	$\frac{1}{4}$ " x 9" x $12\frac{1}{2}$ "	Masonite

Shadow Box

Start construction by ripping some $\frac{3}{4}$ " maple boards to $2\frac{1}{4}$ " widths. Since finish sanding can round over the edges on narrow pieces this small, this width allows an extra $\frac{1}{4}$ " to trim these edges after sanding, leaving 2" wide strips.

Resaw the pieces to about $\frac{1}{32}$ " thick—rather than the width of the saw blade you'll use later to dado the parts. These are the divider strips. Next, finish sand both sides of the $\frac{1}{8}$ " strips, and finish the pieces with a coat of clear finish.

Now cut out the $\frac{3}{16}$ " strips for the inner frame and sand the inner surface. I used hand-cut dovetails to join the parts, but finger joints will also provide the needed support for the inner framed pieces.

Lay out and cut the dados for the inner structure. Start from the outside and work toward the inside, fitting the $\frac{1}{8}$ " divider pieces. Note that the interior diamond-shaped box is also held together with dovetailed corners.

After cutting the outer frame to size, add a beveled profile to the front of the outer frame, leaving enough depth for the rabbet that receives the back and the groove to house the Plexiglas® front. Cut the grooves, dados and rabbets on all pieces as shown in the diagram.

Three sides (one short and two long) of the outer frame are then miter cut across their width, and joined using biscuits and glue. Next, glue the assem-

bled inner frame to the inside of the three-piece outer frame.

Apply finish to the remainder of the box, then use epoxy to affix the Plexiglas into the groove in the loose side of the outer frame. This assembled piece makes up the glass front sliding door that allows access to the interior.

Next, cut the back to fit, apply finish, and tack the back in place. Finally, install picture hanging wire in the back edge of the outer frame. Your shadow box is now ready to load with collectibles and to hang on the wall.

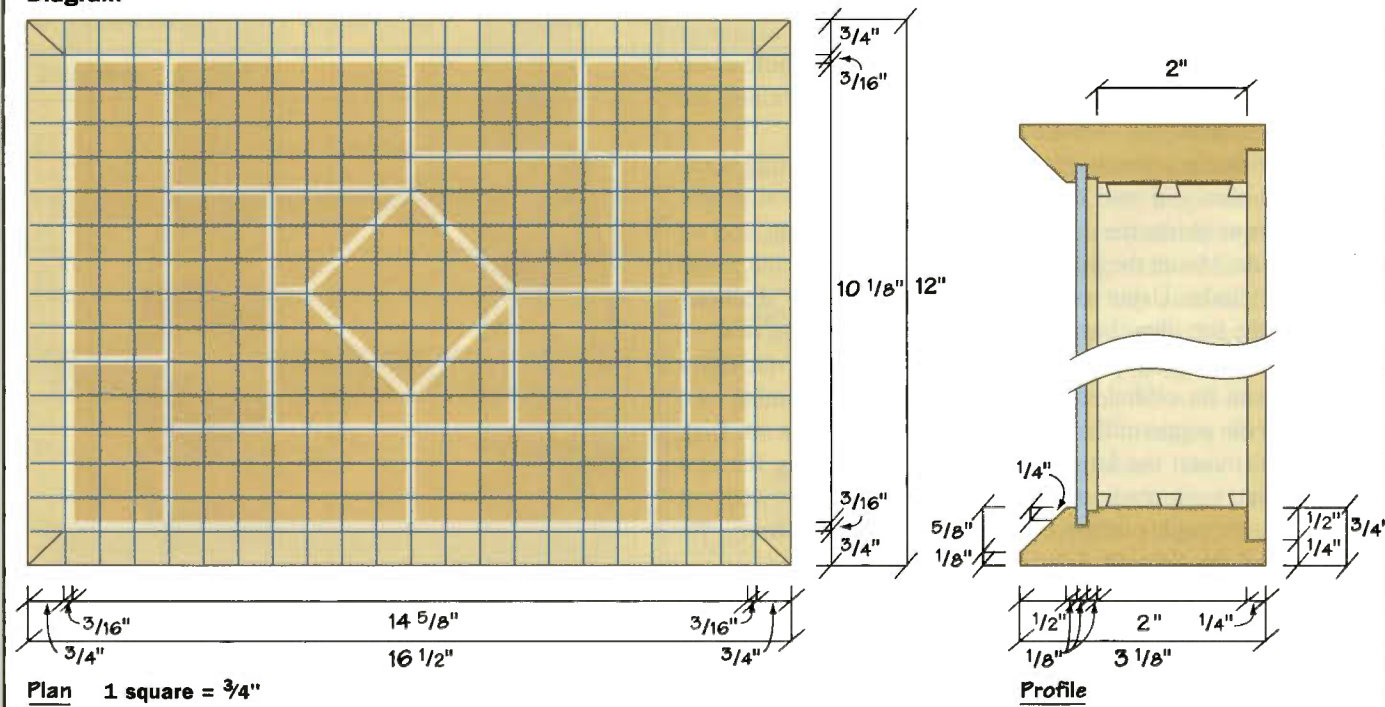


Schedule of Materials: Shadow Box

No.	Item	Dimensions T W L	Material
2	Inner frame top & bottom	$\frac{3}{16}$ " x 2" x 15"	Maple
2	Inner frame sides	$\frac{3}{16}$ " x 2" x $10\frac{1}{2}$ "	Maple
2	Outer frame top & bottom	$\frac{3}{4}$ " x $3\frac{1}{8}$ " x $16\frac{1}{2}$ "	Cherry
2	Outer frame ends	$\frac{3}{4}$ " x $3\frac{1}{8}$ " x 12"	Cherry
1	Back	$\frac{1}{4}$ " x $11\frac{1}{2}$ " x 16"	Cherry plywood

About 10 linear feet of $\frac{1}{8}$ " stock for divider strips

Diagram



Peppermill



To start the peppermill, dimension a blank to about $2\frac{3}{8}$ " x $2\frac{3}{8}$ " x 14". Square the ends and cut off a $7\frac{3}{4}$ " piece for the body. The other small section is for the top. Make sure that you keep track of the joint where the top and bottom sections meet so the grain will match up. Mark centers on both ends of the lower section. Using a drill press and spade bits ground to the appropriate diameters, drill the $1\frac{15}{32}$ " diameter hole in the bottom (**diagram**). Then drill the $1\frac{1}{16}$ " hole as far as the bit will reach. Turn the blank over and continue the $1\frac{1}{16}$ " hole until you've hollowed out the blank.

Now attach a screw chuck to your lathe and, using scrap material, turn out two cylinders with appropriate diameter shoulders to fit into the ends of the large turning blank, and set them aside. Mount the lid blank on the screw chuck and rough out the cylinder. Using a scraper, hollow out the $1\frac{1}{2}$ " diameter hole in the top, then begin turning the lid. After you're done turning and sanding, part the lid off and sand any scratches or marks with an orbital sander. Then drill the remaining two holes for the peppermill mechanism (**diagram**), large one first.

Next, mount the large blank in the lathe, using the two plugs that were made earlier to support the hollowed out blank, and rough out the cylinder. Now begin turning. Be careful of the lid's fit, leaving about $\frac{1}{32}$ " clearance.

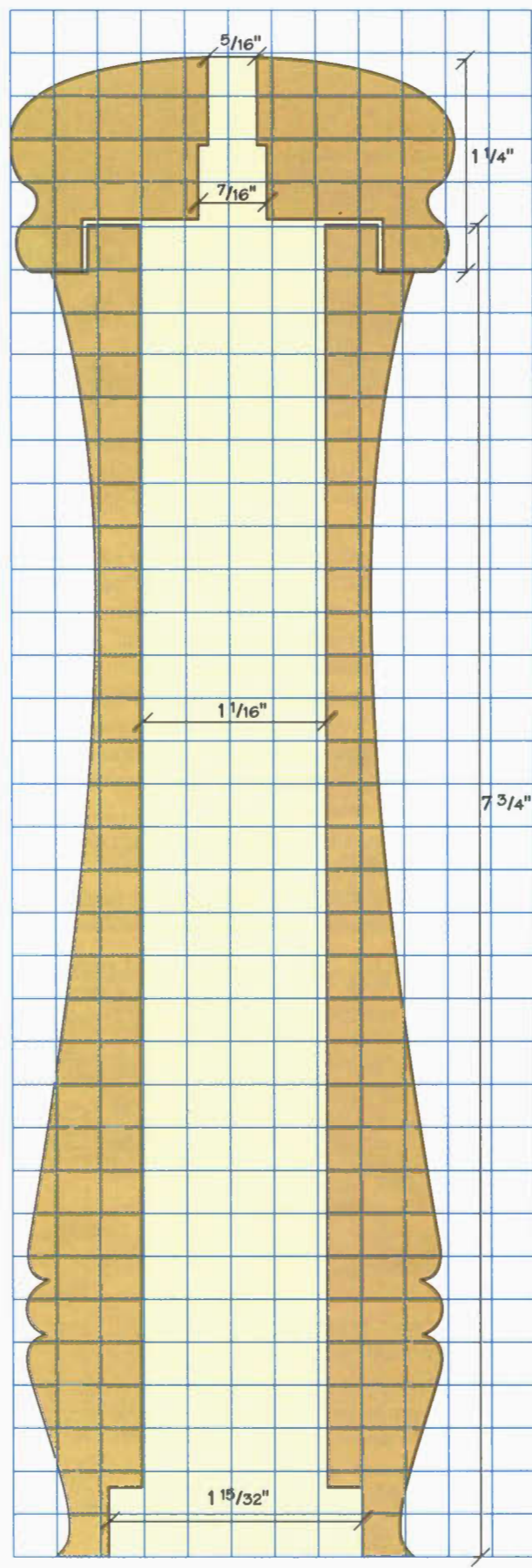
Finally, sand, finish and insert the mill parts. Now you're ready to start grinding your fresh pepper.

Source List

Mill parts, #43166:

Woodworkers' Store
(800) 279-4441

Diagram
Full-size pattern
1 square = $\frac{1}{4}$ "



Shaker Hanging Shelf

First prepare your stock according to the sizes given in the Schedule of Materials. Then lay out and cut the $\frac{1}{2}$ " x $\frac{1}{4}$ " deep dadoes in the end pieces. Also make the $\frac{1}{2}$ " x $1\frac{1}{2}$ " notches in the ends to receive the cross braces below each shelf.

Lay out one end piece and cut the shape, then sand the edges. Use this end as a template for cutting the other end. Then clamp the two pieces together and sand both front edges so they match perfectly.

The dimensions given for the shelves are a little oversize in width to allow for fitting. Cut them, then make an 8 degree saw cut on the front edge of the shelves to match the angle of the end. Reset the saw

blade to square, and cut the shelves to finished width. When this is done, sand all of the parts. Now set up a router with a $\frac{1}{4}$ " round nose bit. Rout the plate grooves on the shelves at the locations given in the diagram.

Using 6d nails and a $\frac{1}{16}$ " pilot bit, nail the shelves and cross braces into the ends. Apply wood glue to the inside of the dadoes and notches, as well as the top edge of the cross brace support. Then clamp the cross brace to the shelf until the glue dries. For a more traditional look, take an old nail set and grind the tip to a slightly rectangular point.

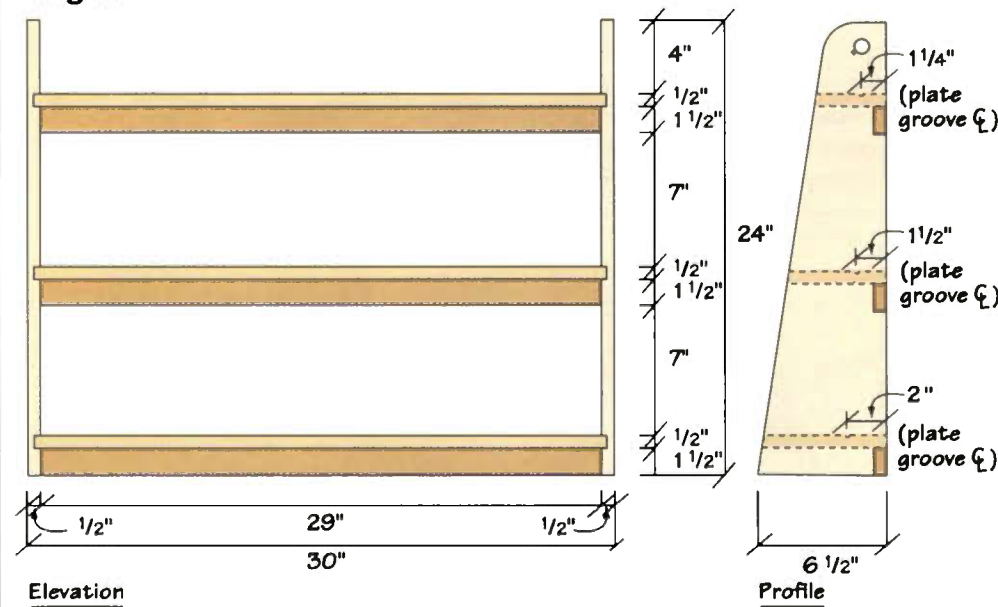
When you set the nails, there will be the impression that cut nails were used for assembly.

Finally, putty the holes and touch-up sand. Finish with a dark cherry gel stain along with three coats of a clear top coat such as varnish, shellac, lacquer or oil. If you hang a Shaker peg rail on the wall and use 10" or 15" centers for the peg locations, the shelf will hang nicely. Use equal length pieces of rawhide tied through the holes near the top of the ends to hang the shelf on the pegs.

Schedule of Materials: Shaker Hanging Shelf

No.	Item	Dimensions T W L	Material
2	Ends	$\frac{1}{2}$ " x $6\frac{1}{2}$ " x 24"	Poplar
1	Shelf	$\frac{1}{2}$ " x $4\frac{1}{4}$ " x $29\frac{1}{2}$ "	Poplar
1	Shelf	$\frac{1}{2}$ " x $5\frac{1}{4}$ " x $29\frac{1}{2}$ "	Poplar
1	Shelf	$\frac{1}{2}$ " x $6\frac{1}{2}$ " x $29\frac{1}{2}$ "	Poplar
3	Cross braces	$\frac{1}{2}$ " x $1\frac{1}{2}$ " x 30"	Poplar

Diagram



Adjustable Sawhorses

A level worktable will help you assemble your projects, both plumb and square. The adjustable height mechanism shown in the **diagram** easily levels at four points using simple T-nuts and cap screws.

To begin, cut the sawhorse and riser parts. We used $\frac{3}{4}$ " poplar for the legs and cross brace and $\frac{3}{4}$ " Birch veneer MDF for the risers. The height of the horses alone is good for working on cabinets. The addition of the riser provides a good height for routing, sanding and other flat work.

A band saw is the safest tool for making angle cuts (**diagram**) on the legs. A table saw can be used, but great care is needed for safety.

Using a 1" spade bit, drill and countersink for the heads, nuts and washers of the $\frac{3}{8}$ " machine bolts which secure the legs to the cross brace. Now lay two legs on edge on two $1\frac{1}{2}$ " strips to locate the legs the appropriate distance in from the end of the cross brace. Stand the cross brace vertically and place it into the notches of the two legs, then clamp the assembly together and check for square.

Next, drill a $\frac{1}{4}$ " pilot hole through the center of the previously made clearance hole. Then redrill using a $\frac{7}{16}$ " bit and bolt the assembly together. Repeat the process with the other end. Lastly, attach the leg brace support plates with screws and glue.

Lay out, cut and radius the hand holds on the sides of the riser boxes, then assemble using butt joints, screws and glue. Attach the top piece, then cut the notches in the bottom of the riser and set the unit on the horse.

Next, drill a $\frac{3}{4}$ " hole through the overhang on the riser and the center of the cross brace for the dowel indexing pin.

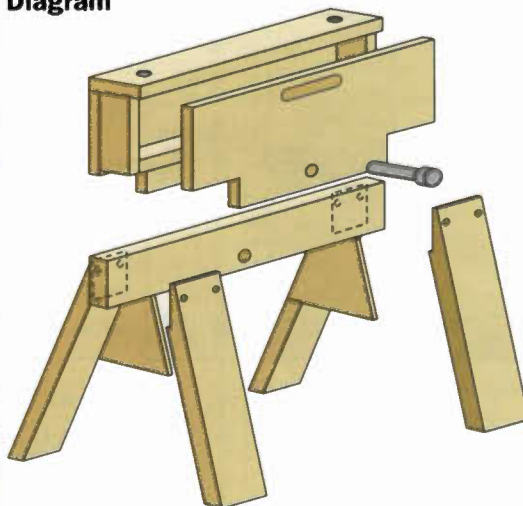
On the top edge of the cross brace and the top of the riser box, mark 24" centers in the middle of each piece. Drill two $\frac{7}{8}$ " x $\frac{1}{8}$ " deep holes with a Forstner or spade bit. Then place a punch out from a metal electrical box into each hole. The disk has about a $\frac{7}{8}$ " diameter and will allow the cap screws in the worktop to rest on a hard surface. Now install T-nuts and cap screws into the top (a $1\frac{3}{4}$ " solid core door cut to size works well) on 24" centers so the screws line up with the inserts.



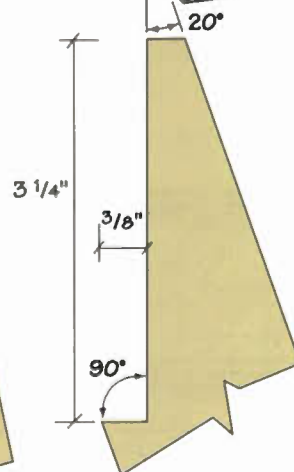
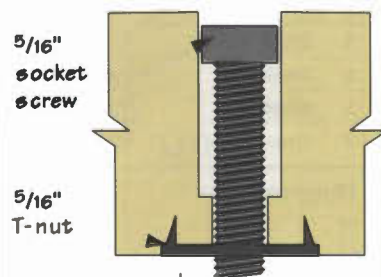
Schedule of Materials: Sawhorses

No.	Item	Dimensions T W L	Material
8	Legs	$1\frac{3}{4}$ " x $3\frac{1}{2}$ " x $21\frac{5}{8}$ "	Poplar
2	Cross braces	$1\frac{3}{4}$ " x $3\frac{1}{2}$ " x 30"	Poplar
4	Brace plates	$\frac{1}{2}$ " x 8" x 10"	Plywood
4	Riser sides	$\frac{3}{4}$ " x 29" x 11"	Birch veneer MDF
4	Ends	$\frac{3}{4}$ " x $1\frac{3}{4}$ " x 8"	Birch veneer MDF
2	Bottom	$\frac{3}{4}$ " x $1\frac{3}{4}$ " x $27\frac{1}{2}$ "	Birch veneer MDF
2	Riser top	$\frac{3}{4}$ " x $3\frac{1}{4}$ " x 29"	Birch veneer MDF
2	Index pins	$\frac{3}{4}$ " dia. x 4"	Oak dowel

Diagram



Detail - table top leveler



Detail - notch, top of leg

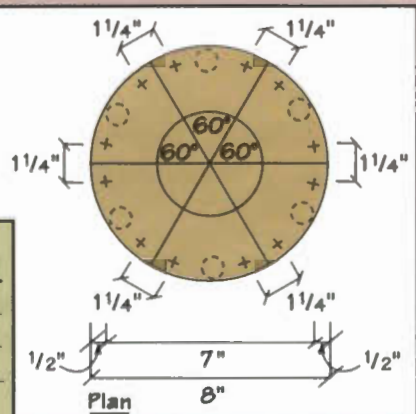
THE PROJECT FILE WIND CHIMES

The hardest part of creating these chimes is cutting the tubing to the correct lengths. Much like a church organ, different lengths of pipe produce different tones. Starting with a 10' section of 1" diameter copper sup-

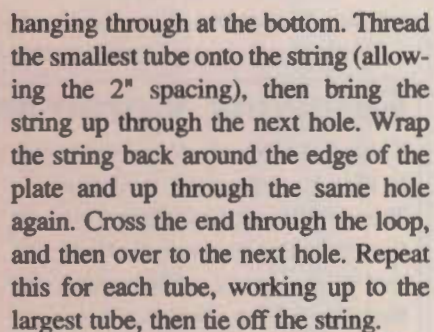
The tubes are suspended by nylon cord threaded through $\frac{1}{8}$ " holes drilled through the walls of the tubes. Where you drill these holes also is important to the tone of the wind chimes. Working from longest to shortest tube, the holes are drilled at the following locations from the top: 5", $4\frac{1}{2}$ ", $4\frac{1}{4}$ ", 4", $3\frac{3}{4}$ " and $3\frac{1}{2}$ ".

The wooden pieces of this project are made from three chunks of whatever lumber you have lying around. The discs are self-explanatory. The tail piece can be any shape, as long as it catches a breeze.

We rounded over the edges of the top plate and clapper with a $\frac{3}{8}$ radius bit. Then we applied a coat of exterior-grade polyurethane to the wood. We used simple eye bolts, nuts and washers to hang the wood pieces as shown in the diagram. Start by tying off the string in one hole with the string



No.	Item	Dimensions T W L	Material
1	Chimes	1" ID x 120"	Copper
1	Top plate	3/4" x 8"	Oak
1	Clapper	3/4" x 3 1/2"	Oak
1	Tail	1/2" x 3" x 6"	Oak



We used a product called Patina Green (available at most arts and crafts supply stores or by mail from Constantine's (800) 223-8087) to speed up the aging process of the copper, then used a coat of clear finish to protect the patina.

Utility Desk

This desk has the look and durability of a plastic laminated piece of furniture, but it doesn't have the hassles associated with gluing laminate. That's because the plastic is fused to the particleboard at the factory, ready to go.

Start by cutting the pieces for the desk out of a 4' x 8' piece of two-sided melamine (plastic-coated particleboard) (see **cutting layout**). To cut the melamine, we used a Forrest Woodworker II blade in the table saw, which made a nearly chip-free cut, even on the bottom side of the panel.

Next cut the oak pieces that will trim the desk. Then use a square-toothed rip blade in your table saw to mill the $\frac{1}{8}$ " x $\frac{1}{8}$ " decorative groove, called a "quirk," in the oak trim that will wrap around the table's top. Miter the oak pieces to fit. Before you glue the edging to the top, create a small v-groove where the wood meets the laminate top. (See sidebar)

To get the desk top ready for the oak trim, you need to double the thickness of the top by fastening buildup strips to the bottom of the desk top. I used another layer of melamine board, but any material will do. Attach the trim to the desk top, table leg and drawer fronts using biscuits and glue. Clamp and allow the glue to set for several hours.

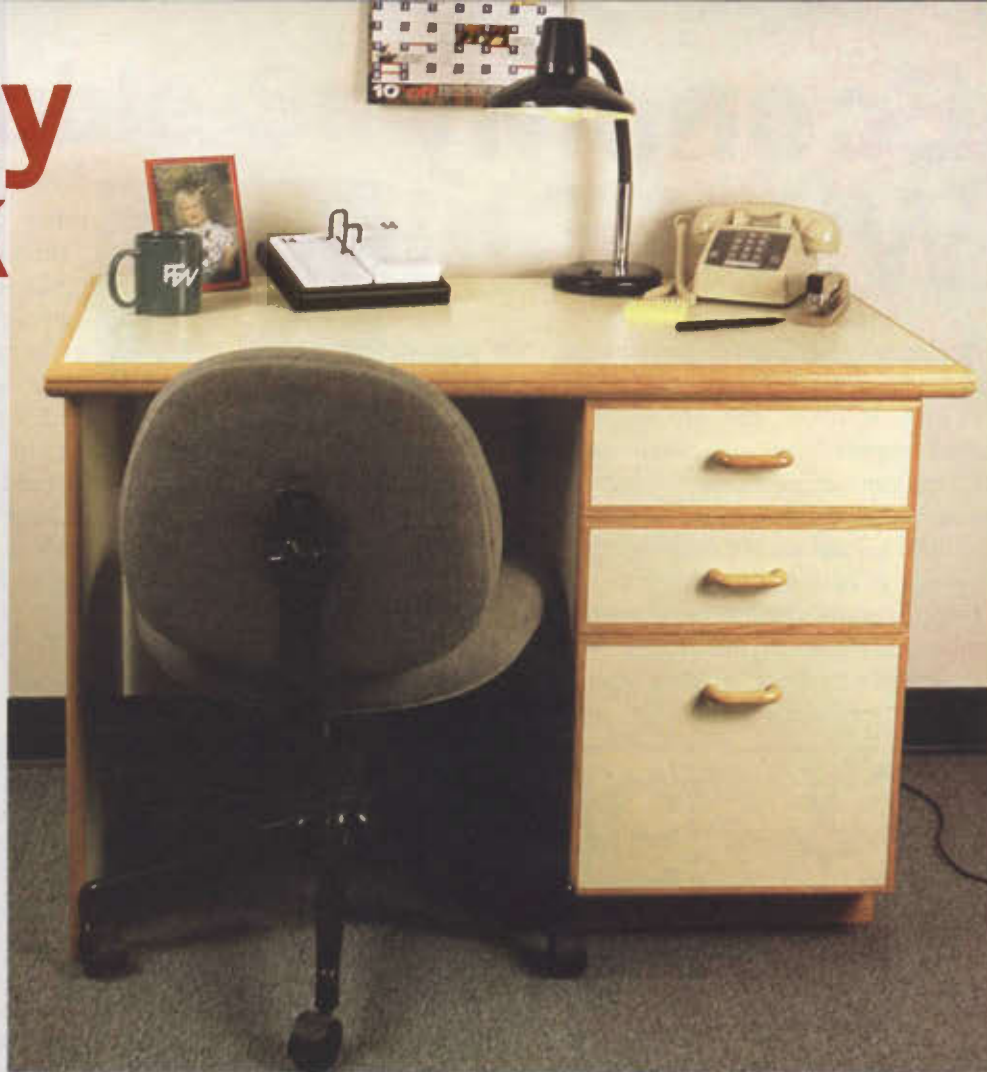
While that's drying, assemble the desk's base. First iron

on hot-melt, adhesive-backed vinyl edge tape on the bare edges to cover the particleboard that's showing. Then assemble the drawer base with biscuits. Clamp and allow to dry.

Once everything is dry, you need to rout the round profile on the desk top. Use a $\frac{3}{4}$ " roundover bit and run it on the top and bottom sides of the trim. For the drawer fronts, arrange them flat on your workbench in the order they will stack in the desk cabinet. Clamp the three drawer fronts together and then radius only the outside front edge with a $\frac{3}{8}$ " roundover bit. Use that same bit to radius the oak edge of the leg support panel, the toekick and the three cleats that attach the modesty panel. Hand sand the oak edges with 120 grit sandpaper and finish sand with 150 grit.

Begin the finishing process by taping off the melamine. First put a strip of masking tape around all the edges where the melamine meets the oak. Then tape newspaper over that tape. Apply three coats of clear finish. When dry, remove the tape and clean any adhesive from the desk.

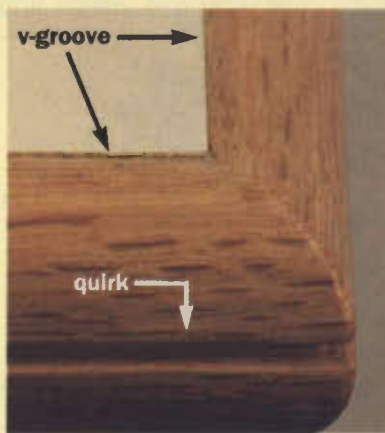
While the finish is drying, cut the drawers from $\frac{1}{2}$ " Baltic birch plywood. Cut $\frac{1}{4}$ " x $\frac{1}{2}$ " rabbet joints on the front and back of the drawer sides. Then cut a $\frac{1}{4}$ " x $\frac{1}{4}$ " groove in the



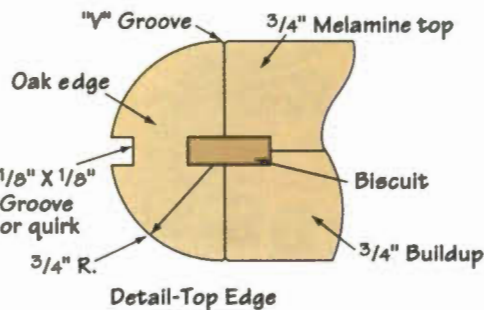
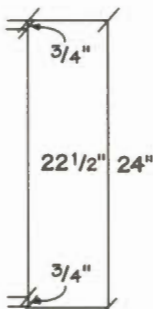
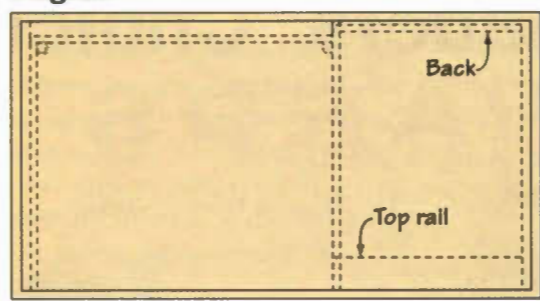
Forgiving v-grooves

Cabinetmakers often use v-grooves to hide imperfections in furniture.

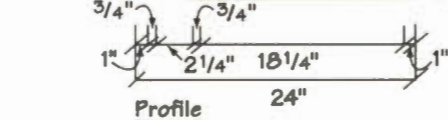
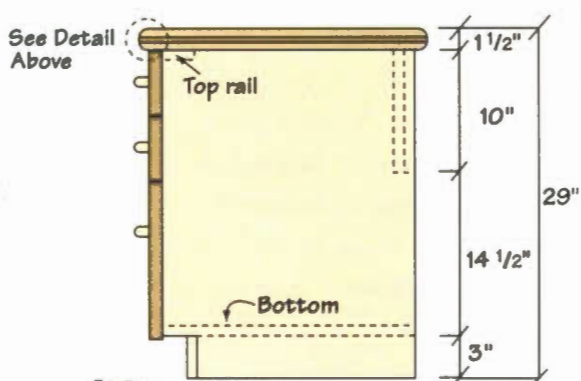
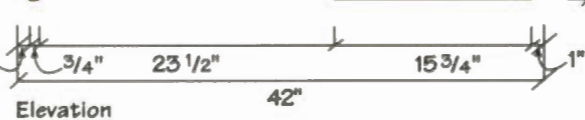
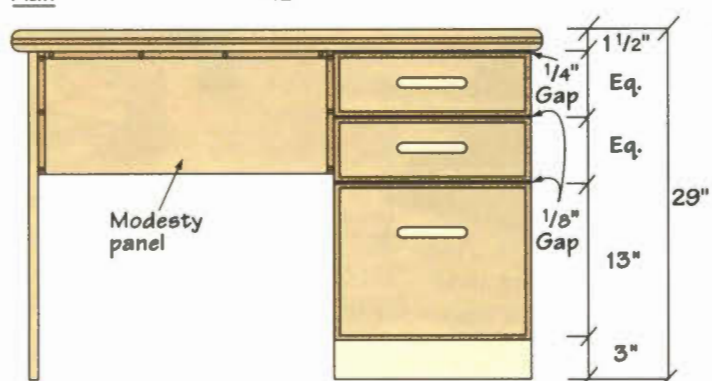
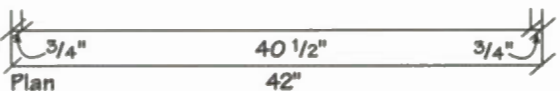
The v-groove makes a gap between the melamine and oak that you can feel — disguising places where the two aren't flush. To make a v-groove, use 150 grit sandpaper and a sanding block to make a small bevel on the edge where the melamine and oak meet. Sand both the melamine and the oak on the table top and drawer fronts.



Diagram



Detail-Top Edge



Schedule of Materials: Utility Desk

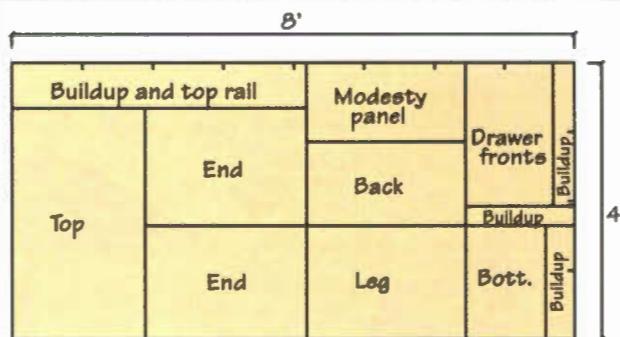
No.	Item	Dimensions T W L	Material
1	Top	3/4" x 22 1/2" x 40 1/2"	Melamine
1	Mod. panel	3/4" x 10" x 23 1/2"	Melamine
2	End leg	3/4" x 21 1/2" x 27 1/2"	Melamine
2	Drawer base	3/4" x 21 1/4" x 27 1/2"	Melamine
1	Bottom	3/4" x 14 1/4" x 20 1/2"	Melamine
1	Top rail	3/4" x 3" x 15 1/4"	Melamine
1	Back	3/4" x 14 1/4" x 27 1/2"	Melamine
2	Build up	3/4" x 3" x 8"	Melamine
2	Drawer front	3/4" x 4 1/2" x 14 3/4"	Melamine

1	File front	3/4" x 12" x 14 3/4"	Melamine
2	File sides	1/2" x 10 1/2" x 20"	Birch
4	Box sides	1/2" x 5" x 20"	Birch
1	File front	1/2" x 10 1/2" x 12 3/4"	Birch
2	Box fronts	1/2" x 5" x 12 3/4"	Birch
1	File back	1/2" x 10" x 12 3/4"	Birch
2	Box backs	1/2" x 4 1/2" x 12 3/4"	Birch
2	Top edging	3/4" x 1 1/2" x 8"	Oak
2	Drawer edge	3/4" x 1/2" x 8"	Oak
1	Toekick	3/4" x 3" x 15 3/4"	Oak
2	Cleating	3/4" x 3/4" x 8"	Oak

sides and front (1/4" up from the bottom edge) to accept the drawer bottom. Assemble the sides, front and back using nails and glue. Now slip the drawer bottoms in and make sure your drawers are square by measuring from corner to corner across the drawer. The measurements should be identical. When square, nail the drawer bottom into the bottom edge of the back. Sand the drawers; then finish with three coats of a clear finish.

We purchased 20" full extension drawer slides from a cabinetmakers' supply store, though home centers and mail-order catalogs sell them. For the file drawer, we bought slides rated at 150-pound capacity. For the other drawers, we bought 100-pound slides. Install the slides and the drawers. Now you're ready for the final assembly.

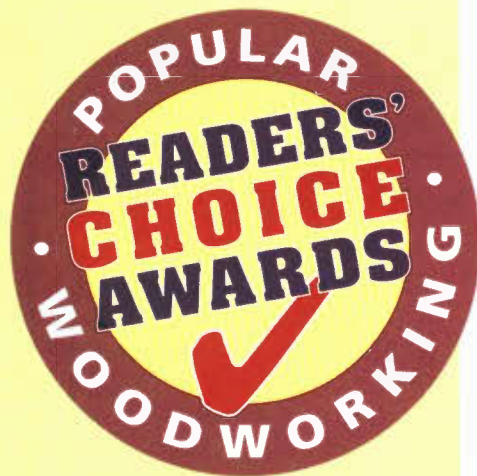
Attach the melamine modesty panel to the outer support leg using the oak cleats and 1 1/4" flathead screws. Then attach the other side of the panel to the drawer cabi-



Cutting layout for melamine panel

net, also using oak cleats and screws. Attach the toekick using cleats behind it that attach to the sides of the cabinet.

Finally, attach the desk top to the assembled base using oak cleats and screws. Attach the drawer fronts with 1" screws and the hardware.



In our shop here at *Popular Woodworking*, we enjoy having the luxury of putting a number of manufacturers' tools to the test. Our pages regularly feature many "shop-tested" tools, and we tell you our picks. Our **Readers' Choice Awards**, however, asks for *your* picks.

The tools that made the list are presented here with our heartfelt support. There's not a bad tool in the lot! But we couldn't publish this without noting there are a number of high-value brands whose names weren't selected as often as one might imagine—Jet, Ryobi, Fein, Makita, Milwaukee, General, Powermatic and Bridgewood—to name just a few. In the interest of educating, as well as instructing, we urge you to take a look at the enormous selection of quality tools available today. We are truly woodworking during the best of tool times!

1997 Readers' Choice AWARDS

This year, Popular Woodworking's readers help "a friend" outfit a shop.

THIS YEAR WE CHALLENGED a random sampling of *Popular Woodworking's* readers to give advice on tool purchases to a friend who wanted to set up a home woodshop. The only real guideline was that the friend's budget had a \$5,000 limit.*

A number of forms were returned with the first tool choice scratched off in favor of a less expensive one. This indicates to us that our readers have provided a realistic, thought-out shopping list.

Two schools of thought on outfitting a shop quickly became apparent. Many felt that money should be spent to buy the best available stationary tools first, and then the smaller tools could be filled in later. Others worked diligently to find a balance between cost and a good selection of tools.

Two tools frequently left for later purchase were a lathe and scroll saw. There was also a running debate about the need for a radial arm saw if you had a good miter saw (or vice-versa).

One category that drew comments about expense was the thickness planer. In a number of cases, the reader decided to purchase surfaced lumber rather than expend precious tool dollars on a potentially costly item.

The majority of respondents spent their money on a compressor and at least one fastening tool, and most purchased a dust collector that could handle at least one stationary machine at a time.



**Bosch 1613EVS,
2 hp plunge
router**

Though most readers managed to bring the total to within \$50 of the maximum (five actually came up with exactly \$5,000), a number of readers "left" \$150 to \$500 unspent. One comment recommended spending the extra \$100 to "take your wife out to dinner, because if you don't, the first thing you make is probably going to be a doghouse." Good idea.

We've listed the three most frequently requested choices in each category, and their approximate retail price. Some of the categories forced the reader to choose between corded or cordless, and benchtop versus stationary. There are no right or wrong answers here, and besides, the friend was only looking for advice — he'll have to make his own decisions.



**Delta 36-630,
1.5 hp contractor's
saw**

*Surveys were mailed randomly to PW readers, listing 19 tool categories ranging from table saws to jigsaws. Hand tools such as hammers and chisels were not included, assuming that "the friend" already owns those assorted tools.

Each category included a wide sampling of tools from all the major manufacturers.

Table Saws

One respondent pinpointed this tool's usefulness as the "anchor of the shop, all quality work starts here." Offered choices in benchtop, contractor and cabinet saw categories, our readers' decisions were driven by trying to get the most saw for the least amount of money.

Most Requested

Delta 36-630, 1.5 hp contractor's saw, \$595

2nd Requested

Delta 36-820, 3hp Unisaw, \$1,599

3rd Requested

Grizzly G1023, 3hp cabinet saw, \$795

Router

Plunge routers were frequently chosen over fixed base routers, with their versatility cited as a plus. One exception was the venerable Porter-Cable 690.

Most Requested

Bosch 1613EVS, 2 hp plunge router, \$195

2nd Requested

DeWalt DW621, 2 hp plunge router, \$210

3rd Requested

Porter-Cable 690, 1 1/2 hp fixed base router, \$165



Delta 37-190,
6" jointer

Jointer

Though a number of votes were received for stationary 8" jointers, the 6" stationary tools swept the category. One reader said, "If you own a 6", you wish you had an 8"."

Most Requested

Delta 37-190, 6" jointer, \$469

2nd Requested

Grizzly G1182, 6" jointer, \$375

3rd Requested

Craftsman 23221N 6" jointer, \$450



Delta 22-540, 12"
thickness planer

Thickness Planer

Readers who were trying to buy the most tools for their money frequently commented that buying surfaced lumber eliminates the need for a planer. Plenty of other readers wouldn't do without one.

Most Requested

Delta 22-540, 12" benchtop, \$385

2nd Requested

Grizzly G1021, 15" floor model, \$765

3rd Requested

Makita 2012, 12" benchtop, \$499

Lathe

While often left off the list for economical reasons, comments on the requested lathes showed an interest in quality, rugged and affordable tools.

Most Requested

Craftsman 22816 benchtop lathe, \$350

2nd Requested

Delta 46-700 benchtop lathe, \$479

3rd Requested

Grizzly G1495 floor model, \$695



Craftsman
22816 lathe

Drill Press

While most readers requested a drill press, many chose to use it as a spindle sander and save a few more bucks. "I like the extra capacity of a floor model."

Most Requested

Craftsman 21315, 7 1/2" floor model, \$300

2nd Requested

Delta 17-900, 8 1/4" floor model, \$425

3rd Requested

Delta 11-990, 6" benchtop model, \$219



Craftsman
21315, 7 1/2"
drill press

Band Saw

Readers heavily favored floor model band saws, with many of the benchtop requests made after a more expensive floor model had been scratched out.

Most Requested

Delta 28-275, 14" floor model, \$609

2nd Requested

Grizzly G1073, 16" floor model, \$575

3rd Requested

Craftsman 24835, 12" floor model, \$350



Delta
28-275,
14" band
saw



Delta 40-540,
16" scroll saw



Craftsman
27149, 3/8" corded
drill/driver



Makita
6211DWHE,
12-volt cord-
less drill/driver



Porter-Cable
333, 5" random
orbit sander

Scroll Saw

While most readers recognized the convenience and benefit of the scroll saw, many opted to spend the money elsewhere. When they did choose a scroll saw, the comments indicated choosing a reliable, sensible tool.

Most Requested

Delta 40-540, 16" benchtop model, \$190

2nd Requested

Craftsman 23558, 16" benchtop, \$120

3rd Requested

Delta 40-650 Q3, 18" floor model, \$479

Drill/Driver

Most of the readers wanted both a corded and a cordless drill/driver.

Pretty sensible, and the prices didn't keep them from making that choice. The top three choices from each sub-category are listed.

Most Requested Corded

Craftsman 27149, 3/8", \$60

2nd Requested

Porter-Cable 2620, 3/8", \$101

3rd Requested

Milwaukee 0232-1, 3/8", \$129

Most Requested Cordless

Makita 6211DWHE, 12-volt, \$180

2nd Requested

DeWalt DW972K-2, 12-volt, \$189

3rd Requested

Bosch 3610K, 14.4-volt, \$199

Random Orbit

Random orbit selections were all over the board, covering right-angle, in-line and palm grip categories. The three listed managed to pull ahead of the pack.

Most Requested

Porter-Cable 333, 5" palm grip, \$79

2nd Requested

Porter-Cable 97335 (5") right-angle, \$145

Craftsman 11712
belt sander



3rd Requested

DeWalt DW421 (5") palm grip, \$75

Dust Collector

Dust collectors did well, but one comment sums up a lot of sentiment, "If you've got a planer and jointer, a big vacuum is great to have."

Most Requested

Grizzly G1029, 2 hp, 1 stage, 4.5 cubic ft., \$275

2nd Requested

Delta 50-180, 1 hp, 2 stage, 4.5 cubic ft., \$489

3rd Requested

Craftsman 29978, 1 hp, 1 stage, 1.5 cubic ft., \$299

Belt Sander

A couple of readers commented that they didn't think a belt sander belongs in a small home shop, but plenty of others felt the money was well spent.

Most Requested

Craftsman 11712 (3" x 21"), \$60

2nd Requested

Craftsman 11792 (4" x 24"), \$110

3rd Requested

Porter-Cable 352VS (3" x 21"), \$179

Air Compressor

The number of readers interested in an air compressor was a breath of fresh air. Many were interested in starting a shop with pneumatic capabilities.

Most Requested

Craftsman 15561, 1½ hp, 12 gallon compressor, \$199

2nd Requested

Camp Hausfeld WL6041, 4 hp, 11 gallon compressor, \$269

3rd Requested

Craftsman 15293, 6 hp, 33 gallon compressor, \$399

Craftsman 15561,
1½ hp air
compressor



Grizzly
G1029,
2hp dust
collector



Air Nailers/ Staplers

While there wasn't an overwhelming clamor for air powered fasteners, many readers opted to buy one and build from there. The obvious winner was the brad nailer.

Most Requested

Porter-Cable BN125 brad nailer, \$185

2nd Requested

Porter-Cable DA250 finish nailer, \$220

3rd Requested

Senco SLP20 brad nailer, \$278

Miter Saw

We know how important the radial arm saw is to many of our readers, so this often repeated comment was very interesting, "The sliding compound miter saw will replace the need for a radial arm saw."

Most Requested

Delta 36-250, 10" sliding compound miter, \$509

2nd Requested

Craftsman 23520, 10" compound miter, \$219

3rd Requested

Delta 36-220, 10" compound miter, \$249

Biscuit Joiner

Again, a few folks figured that they could handle joints without a biscuit joiner, but plenty of others opted to spend the money.

Most Requested

DeWalt DW682K, \$219

2nd Requested

Porter-Cable 556, \$142

3rd Requested

Freud JS102, \$144



Porter-Cable
BN125 brad nailer

Jigsaw

A tool considered as essential by many seemed even more economical to one reader, "A good jigsaw can take the place of a band saw."

Most Requested

Bosch 1587VS, \$149

2nd Requested

Porter-Cable 7649, \$151

3rd Requested

Craftsman 27251, \$140

Spindle Sander

Not a lot of readers opted for a spindle sander, and those who did gave us one slim leader and a tie for second.

Most Requested

Ryobi OSS450, \$160

2nd Requested (tie)

Craftsman 22590, \$160 & Delta B.O.S.S., \$195

Radial Arm Saw

It's almost not fair to say that the Craftsman was the most requested in this category. It was almost the only requested radial arm saw. Garnering 75 percent of the requests out of the five offered, our respondents know what they want.

Most Requested

Craftsman 19642, 10", \$650

2nd Requested

Delta 33-990, 10", \$735

3rd Requested

Ryobi FA202, 8 1/2", \$279

If you've been paying attention to the price tags attached to the winners throughout the article, you might assume that adding all of the number one choices would go beyond the \$5,000 cap. It does, but only by \$818. And if you were to drop out a couple of the "wait until later" choices, you'd end up darn close to the limit. Looks like our readers have a pretty good head for tools, and for staying within a budget. **PW**

READERS' CHOICE

DeWalt DW682K
biscuit joiner



Bosch
1587VS
jigsaw



Ryobi OSS450
spindle sander



Craftsman 19642,
10" radial arm saw



Delta
36-250,
10" miter
saw

Long-handled Step Stool

THIS STEP STOOL is well suited for those of us who are encountering the physical limitations of advanced age. The giraffe-like design provides a handle for both carrying and steadying oneself while using. It's also lightweight (about six pounds), and its rugged construction proves useful for portly folks, as well as small children.

Start Construction

Almost any tight grained hardwood can be used to construct the stool. After selecting your stock, cut the parts to size. You'll need about 7 linear feet of 1 x 10 lumber (a little less than six board feet). Lay out the parts on the stock and cut them to size using a band saw or jigsaw. Note the grain direction required for the leg braces. To facilitate matching the curved outlines, cut outside the layout lines to allow sanding to the lines (**photo 1**).

Now cut the openings in the handle and the step. Make the 2½" diameter hole in the handle using a jigsaw or scroll saw. Use a backup block to avoid tear-out through the bottom of the work.

Next, cut the rectangular hole in the step for the handle tenon. Take care to make the cutout a snug fit to the portion of the handle that protrudes through it.

Round over the edges of the parts using a router and a ¼" roundover bit (**photo 2**).

Next, lay out the screw hole locations on the legs, leg braces, bridge and handle according to the **diagram**. Then drill the holes and counterbore to a depth of ¼" so some of the holes can be plugged.

Sand the Surfaces

Now sand all of the parts using several grit sizes, finishing with 150 or 220 grit. Then sand the hole in the handle using narrow strips of emery cloth and a "shoe shining" motion.

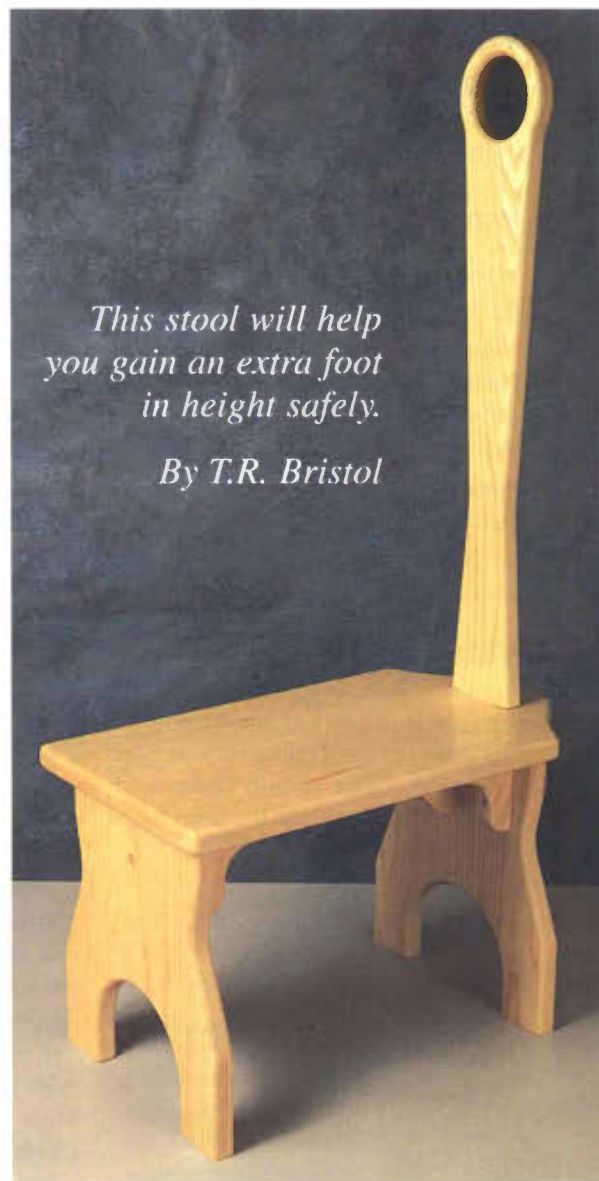
Assemble the Parts

For the leg/bridge subassembly, arrange the bridge and two legs on a flat surface with the step side of the parts resting on the flat surface. Carefully align one leg against one end of the bridge so the screw holes in the leg lie on the vertical centerline on the end of the bridge. Make sure the leg is perpendicular to the bridge when viewed from above.

Now clamp the parts in place and drill pilot holes for the screws in the

This stool will help you gain an extra foot in height safely.

By T.R. Bristol



end of the bridge. Attach the leg to the bridge using two #8 x 1½" flathead wood screws and glue (**photo 3**). Then attach the other leg to the opposite end of the bridge as above.

Remove any excess glue with a wet sponge or rag. Then repeat the opera-



1 A 2" diameter sanding drum mounted in a drill press or a spindle sander proves to be very helpful.



2 When radiusing the edges, take care to round over only those not mating to another piece.



3 The end screws are countersunk so that a plug can be used to hide the screw head.

tion on the other end of the bridge.

After the glue dries, assemble the step to the bridge. First insert the lower portion of the handle through the rectangular opening in the step. Make sure you insert the handle into the step's top surface, then clamp the step (top surface down) to your workbench. The handle should hang over the side of the workbench so you can measure it perpendicularly to the step's top surface.

Now position the leg/bridge subassembly on the step's bottom surface so that the leg adjacent to the handle is butted against it. Align the screw holes in the bridge with the step's centerline. Maintain the handle perpendicular to the other step. Clamp the leg/bridge subassembly to the step and drill the two pilot holes for the screws that attach the subassembly to the step.

Now install the two #8 x 1 3/4" flat-head wood screws and check the alignment. If the positioning is correct, remove the screws and coat the top of the subassembly with glue before re-assembling. Don't glue the handle to the leg. Before proceeding, remove any excess glue and allow the glue to set.

For the leg brace assembly, position the leg braces as indicated and drill pilot holes for the attachment screws (**photo 4**).

For the handle assembly, check the handle alignment with the step surface and drill a pilot hole for its attachment screw. Fasten the handle to the leg using a #8 x 1 1/2" screw and glue.

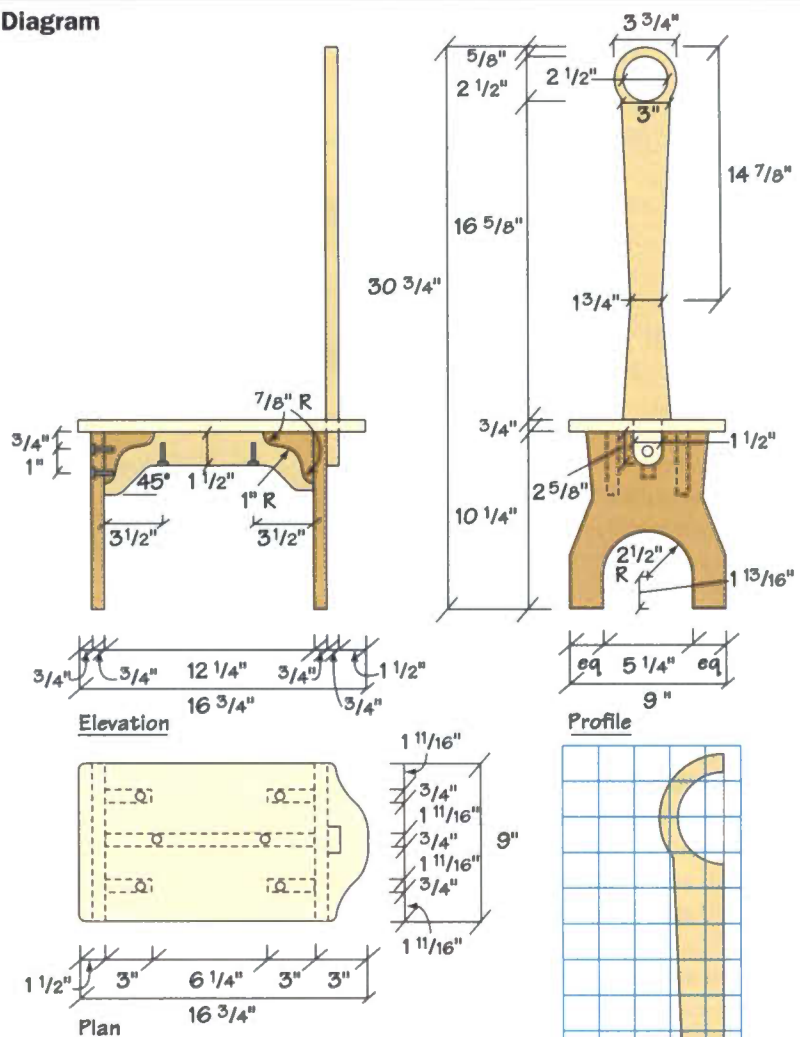
Finish the Stool

If desired, the screw hole in the handle and the two screw holes in the leg on the stool's opposite side may be



4 Use a gauge block to space the braces from the bridge, then attach with glue and two #8 x 1 1/2" screws.

Diagram



Schedule of Materials: Step Stool

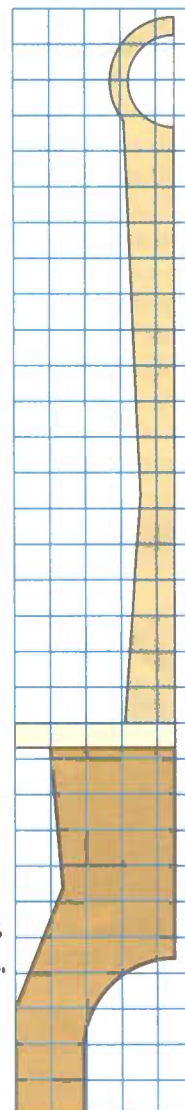
No.	Item	Dimensions T W L	Material
1	Step	3/4" x 9" x 16 3/4"	Ash
2	Legs	3/4" x 9" x 10 1/4"	Ash
1	Handle	3/4" x 3 3/4" x 23 1/8"	Ash
1	Bridge	3/4" x 3" x 12 1/4"	Ash
4	Leg braces	3/4" x 3" x 3"	Ash

plugged to hide these most visible attachment points.

Do any necessary touch-up sanding, then wipe the entire stool with a tack cloth before finishing. I used three coats of clear satin polyurethane. After the finish has dried, you may choose to glue rubber step tread to the top surface for added safety. Many adhesives will provide an adequate bond for this pad, though I recommend using 3M's Super 77 Spray Adhesive. **PW**

T.R. Bristol has a workshop in Grants Pass, Oregon.

Enlarge pattern 540%
1 square = 1"



African Landscape

Learn a pure form of the ancient art of intarsia.

By Clyde Lee

INTARSIA is an ancient art form employing various woods and other exotic materials to form decorative mosaics. The materials are either applied as inlays or glued to the surface of a wooden base to form a three-dimensional image using multicolored woods. In early times, some wood was tinted using the color dyes available.

In this project, "Late gathering" is used. Late gathering is an example of pure intarsia — no paints nor stains are used — except in this piece, a wood burning tool or paintbrush is needed to apply zebra stripes.

Prepare the Pieces

You'll need a scroll saw (or a band saw with a 1/4" blade), a variable speed drill, and a rotary carbide rasp of about 80 grit to contour the zebra.

The Schedule of Materials gives the wood sizes required to accommodate the various element patterns. At first they may seem to be a little extensive, but just six woods are involved, and four of them are veneers. The Tupelo gum is a wood carver's delight, and its light color and lack of pronounced grain make it ideal for this project. Other dark woods could be substituted for the Brazilian rosewood, such as zircote, Eastern Indian rosewood or Bolivian ironwood.



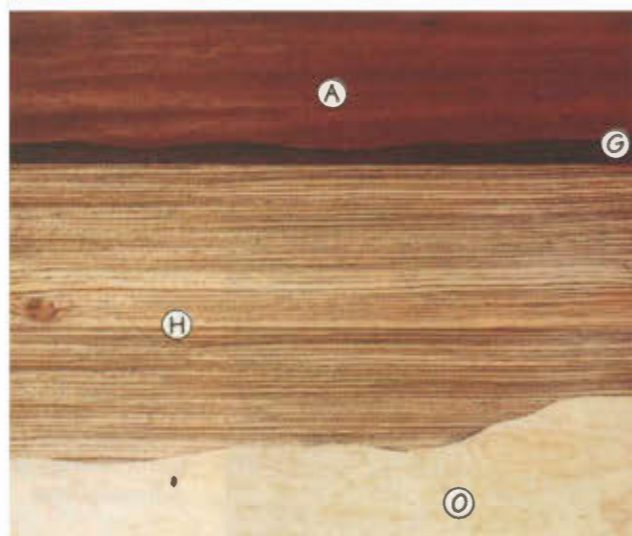
Using the patterns provided, enlarge them to full scale and cut out the rough shapes. Lightly sand by hand as needed, then affix the cutouts to the wood pieces with spray adhesive.

For the zebra detailing, use the rotary tool to contour the shapes (**photo 1**). Lightly sketch in the stripes on each animal with a pencil, then apply the patterns with a wood burning tool (**photo 2**). You also could apply the stripes with paint. An excellent paint used in wood carving is Jo



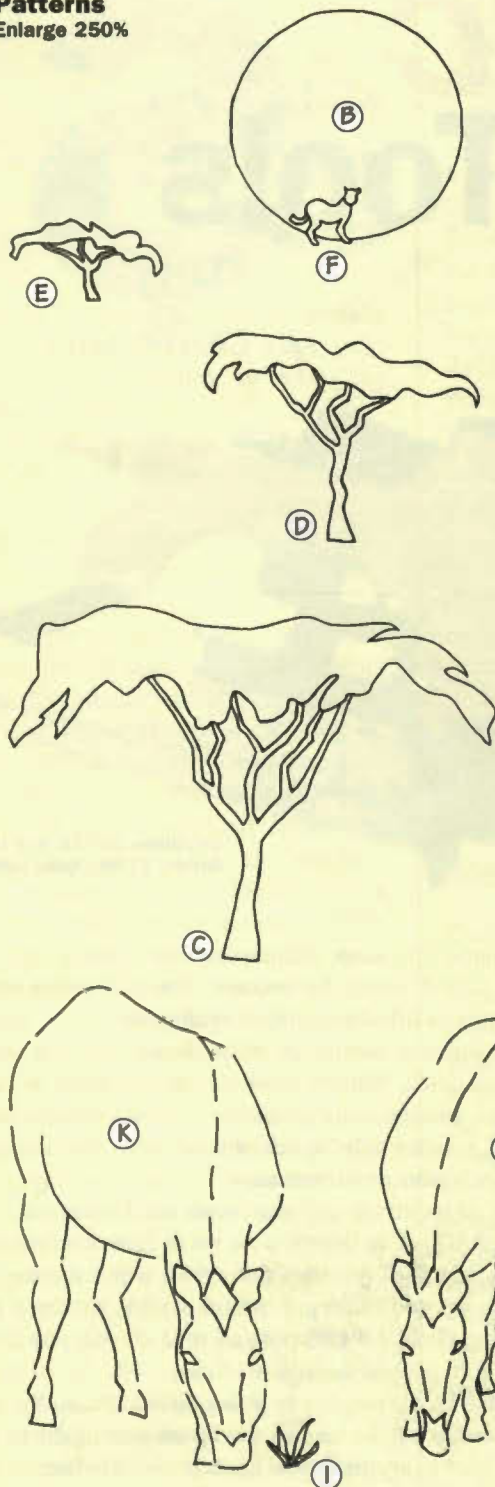
1 Cut the zebra elements from 3/4" tupelo gum stock, then shape them using a rotary carver.

2 Use a wood burning tool to apply stripes over the lightly pencilled guide lines.



3 Cut out the large elements — sky (padauk), distant hills (Brazilian rosewood), foreground (zebrawood) and water area (curly maple) — then glue them to the plywood base.

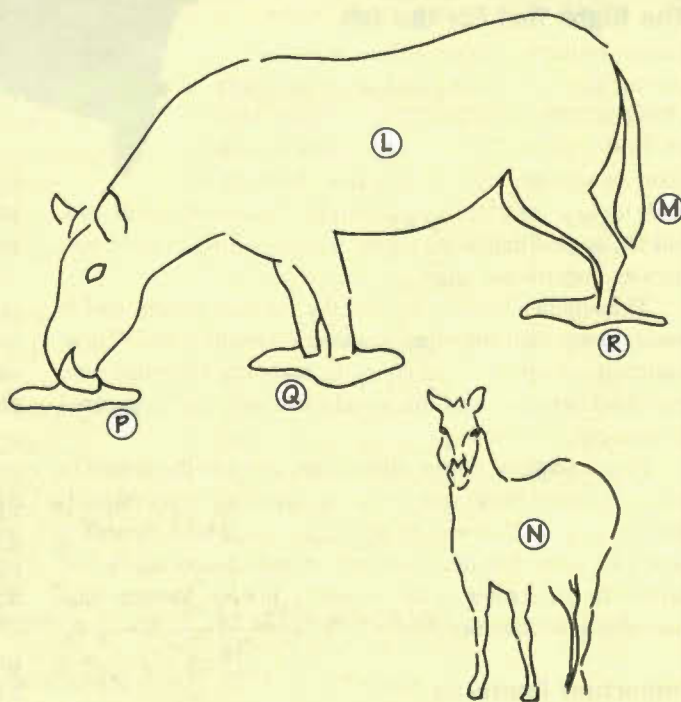
Patterns Enlarge 250%



AFRICAN LANDSCAPE

Schedule of Materials: Intarsia

No.	Letter	Item	Dimensions T W L	Material
1	A	Sky	1/16" x 6" x 24"	Padauk
1	B	Setting sun	1/16" x 3"	Cherry
1	C	Tree	1/8" x 3 3/4" x 5"	Brazilian rosewood
1	D	Tree	1/8" x 2 1/4" x 4"	Brazilian rosewood
1	E	Tree	1/8" x 1 1/4" x 2 1/8"	Brazilian rosewood
1	F	Stalker	1/8" x 7/8" x 1 1/8"	Brazilian rosewood
1	G	Distant Hills	1/8" x 1 1/8" x 24"	Brazilian rosewood
1	H	Foreground	1/16" x 11" x 24"	Zebrawood
3	I	Vegetation	1/16" x 1 1/4" x 1 1/2"	Cherry
1	J	Zebra	3/4" x 3 3/4" x 6 1/4"	Tupelo gum
1	K	Zebra	1 1/4" x 2 1/2" x 5 3/4"	Tupelo gum
1	L	Zebra	7/8" x 4" x 7 3/4"	Tupelo gum
1	M	Zebra tall	3/16" x 1/2" x 2 1/4"	Tupelo gum
1	N	Zebra	3/4" x 2 1/2" x 4 1/4"	Tupelo gum
1	O	Water area	1/16" x 5 1/4" x 24"	Curly maple
1	P	Water area	1/16" x 3/4" x 1 1/2"	Cherry
1	Q	Water area	1/16" x 7/8" x 2"	Cherry
1	R	Water area	1/16" x 1/2" x 2 1/4"	Cherry
1	S	Plywood base	1/4" x 20" x 24"	Outdoor
2	T	Frame moulding	2" x 23 1/2"	Dark gray "driftwood"
2	U	Frame moulding	2" x 27 1/2"	or "barnwood"



Sonjas, carbon black. It's a water-based acrylic gouache with a velvet matte finish.

Assemble the Elements

First attach the larger elements — the sky, distant hills, foreground and water area — to the plywood base using contact cement (**photo 3**).

Next, use wood glue to secure the zebra and remaining smaller elements to the larger elements. It's that simple. Then give the entire piece a coat of flat urethane to protect and seal.

Frame Your Masterpiece

To set off the intarsia work, I suggest a simple dark gray frame with a pronounced grain. (A more ornate moulding would likely detract from the intarsia work.) **PW**

Clyde B. Lee has devoted himself to a wide range of art mediums, from painting and pastels to wood carving, since his retirement in 1973.



PNEUMATIC Fastening Tools

The selection and price ranges of pinners, nailers and staplers get wider all of the time.

By Charles Self

FOR THE WOODWORKING SHOP, pneumatic nailers, pinners and staplers answer almost every mechanical fastening task. More and more, this makes them the tools of choice. And with a growing price range, it may be time for you to consider adding these workmates to your shop if you haven't already done so.

The Right Tool For the Job

Large projects, those using material more than $\frac{3}{4}$ " thick, and projects using crown or other large mouldings, require larger finish nailers. These are available in either slant or straight magazine styles. Both drive nails up to 2" or 2½" long. Straight finish nailers cost less, but the angled magazine allows closer nailing in tight corners and obstructed edges.

The smaller brad nailer has the lightest weight and is easier to use than any other pneumatic fastening tool. These nailers drive up to 1¾" long nails, and their 18-gauge wire nail thickness prevents the wood from splitting, compared to conventional nailing.

Finish staplers, on the other hand, provide the means to securely fasten backs onto projects, install shingles on doll-houses and birdhouses, or generally use where fastening won't be seen. For the most part, woodworkers use a ¼" crown finish stapler, with an easily hidden fastener that provides good holding power.

Important Features

An important feature of any pneumatic fastening tool is its type of firing mechanism. There are two basic kinds.

The most common type is contact trip. When the trigger is pulled and the tip of the tool contacts the work, the safety releases and the nailer fires. The trigger doesn't need to be released between firings.

The second type, sequential trip, sounds fancier, and does work better than contact trip for accurate nail placement. With sequential trip, there's less chance of an unwanted second fastener being popped into the work (usually part way in, to make matters worse). The tool's nose is

placed against the work (depressing the safety), and the trigger is pulled, firing the fastener. The tool won't refire until the nose is lifted and placed against the work again.

A convenience feature in all air fasteners is a quick release nose latch. Nailers use long, slender nails of malleable steel, and jamming problems sometimes occur for a variety of reasons. The quick release nose latch makes clearing such jams quick and easy.

As for air requirements, most tools need a sustained air pressure of 90 psi to drive 10 or more fasteners quickly. Campbell-Hausfeld specifies 0.8 CFM when driving 10 nails a minute, and it doesn't hurt to exceed that by a few points, up to about 1.5 CFM. At no time should you allow air pressure to exceed the 100 psi limit.

Pneumatic tools are slowly going oilless. Basically, that means you don't have to add a drop or two of oil to the tool's air inlet every time you hook it up. Whether or not the oilless tools will prove as durable over time, no one knows, but they've tested well for the manufacturers.

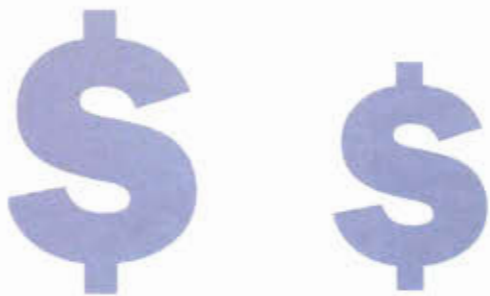
The chart on the next page shows some of the various manufacturer's models, their fastener lengths and their average retail prices. This provides much of the information you'll need to choose the right tool for you, especially when combined with the other features covered here.

Finish Nailers

The large finish nailer market changes almost daily, and is the most pricey category. Large finish nailers, whether



Devilbiss SD115 and the Grizzly G1861 brad nailers



straight or slant magazine, drive nails from $\frac{3}{4}$ " to $2\frac{1}{2}$ ". Prices range from \$140 for a Woodtek to \$390 for Senco's model.

Straight magazine finish nailers provide a relatively low-cost entry into the world of long finishing nailers. A wide range of minimum and maximum nail lengths are available, depending on the manufacturer.

All the straight nailers I tested felt heavy, though they handled reasonably well. Campbell-Hausfeld's NB0065 is compact and worked smoothly with all size nails, as did the DeVilbiss SD7 and the Porter-Cable model. These tools all have a textured finish that makes them easy to hold and handle.

Craftsman's 18314 doesn't have a textured finish, which makes it a little slicker. However, to my relatively small hand, it felt the most comfortable of any of the straight nailers. It has a quick release nosepiece for rapid freeing of jammed nails, as does the Porter-Cable model.

Grizzly's Magnum nailer is the heavyweight champ at more than five pounds, though its \$170 price is the low-cost champ. It handles well, but has a tendency to fire two nails at once (an extra on recoil) until you get the hang of using it. This has the slickest finish of all, and could be improved by adding some rubber tape on the grip.

The big bazookas of the finish nailers are the slant nailers. They're primarily designed for heavier moulding and casing assembly jobs. Many also shoot nails as short as 1", making them suitable for a lot of moderate and mid-range jobs as well. Be warned, though, they're twice the weight of smaller brad nailers, and can be tiring when used repetitively.

The Senco SFN comes in two models with varied nail sizes. Either is close to ideal for cabinet work, finish

PNEUMATICS At A Glance

STRAIGHT FINISH NAILERS

Brand & Model	Lengths accepted	Price
Airy ATF-0350K	$\frac{3}{4}$ " - 2", 16-gauge	\$185
Cam.-Hausfeld NB0065	$1\frac{1}{4}$ " - $2\frac{1}{2}$ ", 16-gauge	\$209
Craftsman 18314	$\frac{3}{4}$ " - 2", 16-gauge	\$190
DeVilbiss SD7	$\frac{3}{4}$ " - 2", 16-gauge	\$170
Duo-Fast LFN-764	1" - 2", 16-gauge	\$339
Jet JDPN 1850	$\frac{5}{8}$ " - 2", 18-gauge	\$130
Grizzly Magnum G2413	$1\frac{1}{4}$ " - $2\frac{1}{2}$ ", 16-gauge	\$170
Porter-Cable FN200	$\frac{3}{4}$ " - 2", 16-gauge	\$155
Reliant DD211	$\frac{3}{4}$ " - $2\frac{1}{2}$ ", 16-gauge	\$200
WoodTek 832-385	1" - $2\frac{1}{2}$ ", 16-gauge	\$225

SLANT FINISH NAILERS

Brand & Model	Lengths accepted	Price
Airy ATH-0565T	1" - 2", 14- & 15-gauge	\$220
Cam.-Hausfeld NB3565	$1\frac{1}{2}$ " - $2\frac{1}{2}$ ", 15-gauge	\$279
Craftsman 18329	1" - 2", 15-gauge	\$320
DeVilbiss SD55	1" - $2\frac{1}{2}$ ", 15-gauge	\$250
Grizzly G3690	1" - 2", 15-gauge	\$195
Porter-Cable DA250	$1\frac{1}{4}$ " - $2\frac{1}{2}$ ", 15-gauge	\$230
Reliant DD244	$1\frac{1}{2}$ " - $2\frac{1}{2}$ ", 15-gauge	\$230
Senco SFN40	$1\frac{1}{2}$ " - $2\frac{1}{2}$ ", 14- & 15-gauge	\$390
Stanley-Bostich N60FN	$1\frac{1}{4}$ " - $2\frac{1}{2}$ ", 15-gauge	\$349
WoodTek 832-392	1" - $2\frac{1}{2}$ ", 15-gauge	\$140

BRAD NAILERS

Brand & Model	Lengths accepted	Price
Airy ATK-0250SK	$\frac{3}{4}$ " - 2", 16-gauge	\$169
Cam.-Hausfeld NB00300	$\frac{3}{8}$ " - 1", 18-gauge	\$105
Craftsman 18309	$\frac{3}{8}$ " - $1\frac{1}{4}$ ", 18-gauge	\$100
DeVilbiss SD115	$\frac{5}{8}$ " - $1\frac{1}{4}$ ", 18-gauge	\$90
Duo-Fast BB-04440	$\frac{1}{2}$ " - $1\frac{1}{4}$ ", 18-gauge	\$199
Grizzly G1861	$\frac{5}{8}$ " - $1\frac{9}{16}$ ", 18-gauge	\$80
Hitachi NT50AD	1" - 2", 18-gauge	\$220
Jet JDPN 671.4	1" - $2\frac{1}{2}$ ", 16-gauge	\$220
Makita AF501	$\frac{3}{8}$ " - $1\frac{1}{4}$ ", 18-gauge	\$285
Porter-Cable BN200	$\frac{3}{4}$ " - 2", 18-gauge	\$135
Reliant DD 243	$\frac{3}{8}$ " - $1\frac{5}{8}$ ", 18-gauge	\$120
Senco SLP20	$\frac{5}{8}$ " - $1\frac{5}{8}$ ", 18-gauge	\$280
Stanley-Bostich BT35B	$\frac{5}{8}$ " - $1\frac{3}{8}$ ", 18-gauge	\$180
WoodTek 832-371	$\frac{5}{8}$ " - $1\frac{1}{2}$ ", 18-gauge	\$140

STAPLERS

Brand & Model	Lengths accepted	Price
Airy 0645	$\frac{3}{4}$ " - $1\frac{9}{16}$ ", 18-gauge	\$179
Cam.-Haus. SN258K00	$\frac{3}{8}$ " - 1", 18-gauge	\$95
Craftsman 18308	$\frac{3}{8}$ " - $\frac{7}{8}$ ", 18-gauge	\$90
DeVilbiss NCS2	$\frac{1}{2}$ " - 1", 18-gauge	\$99
Duo-Fast KB-1836	$\frac{3}{4}$ " - $1\frac{1}{8}$ ", 18-gauge	\$285
Grizzly G3811	$\frac{5}{8}$ " - $1\frac{3}{16}$ ", 18-gauge	\$80
Hitachi N3804AB	$\frac{1}{2}$ " - $1\frac{1}{2}$ ", 18-gauge	\$260
Jet JDPN-6013.2A	$\frac{3}{8}$ " - 1", 18-gauge	\$120
Porter-Cable NS100	$\frac{1}{2}$ " - 1", 18-gauge	\$89
Reliant DD320	$\frac{3}{8}$ " - $1\frac{9}{16}$ ", 18-gauge	\$180
Senco PowerPlus SKS	$\frac{7}{8}$ " - $1\frac{1}{2}$ ", 18-gauge	\$270
Stanley-Bostich S32X	$\frac{1}{2}$ " - $1\frac{3}{8}$ ", 18-gauge	\$180
WoodTek 884-082	$\frac{5}{8}$ " - $1\frac{1}{2}$ ", 18-gauge	\$185



Woodtek 832-392
slant finish nailer

Stanley-Bostitch N60FN
slant finish nailer



Campbell-Hausfeld NB3565
slant finish nailer



these tools present so little information, they're close to useless.

carpentry and similar woodworking. The SFN-40 is a lightweight unit at 4.7 pounds that's nicely balanced. It's a deluxe tool in every sense of the word, including the removable real leather hand grip and the easy-to-use quick clear gate at its front. A dial depth setting, the ability to accept both 14- and 15-gauge nails, and its reputation for durability make this tool excellent, but it's a little pricey for the home workshop.

The Stanley-Bostitch N60FN is a very lightweight 15-gauge finish nailer that also has a dial depth setting. It's easy to use, fast loading and a delight to handle. The N60FN comes with a long-term quality reputation of both parent firms. It has no quick release latch, which is unusual, but we had no trouble with jamming. The N60FN feels lighter than it is at 4.6 pounds, since most of the weight is concentrated in the magazine area. This is a sequential trip nailer that's durable enough for contractors, but light enough for home workshops, though pricey for hobbyists.

Porter-Cable's DA250 slant finish nailer comes as a kit with a plastic case, a pack of 1,000 nails and goggles. It weighs a mid-range 5 pounds, and comes in a sequential or contact, or, as Porter-Cable calls it, bump-fire models.

Airy's ATH-0565T is a streamlined, top-of-the-middleweight contender at more than five pounds that fires both 14- and 15-gauge nails. The tool balances and handles nicely, but I think its grip is too smooth. It has a side feed with a nose clearing latch, and is a nice handling tool. It comes with an instruction manual which ties for worst with two others — Grizzly and WoodTek. These manuals are little more than parts lists and a blown-up, poor illustration printed on cheap paper. The manuals for

Of the tools I handled, quality is reasonably good, though some of the castings on some import tools from smaller companies seem rough, with some cosmetic flaws. The finish on the models made in this country are top of the line, but they're the most costly by far. You'll have to decide if the Made in America tag and the superb fit and finish are worth the extra dollars.

Brad Nailers

The range starts with the Grizzly G1861, the lowest cost brad nailer listed. Near the top of the price scale is Senco's SLP20, a superb tool, second only in cost to the Makita AF501. While Makita's design may limit you in working on lightweight projects, the tool operates quite nicely.

DeVilbiss and Campbell-Hausfeld also offer nice, moderate cost brad nailers, as do Craftsman and Reliant (house brand of Trend-Lines).

Hitachi's NT50AD, driving 150 nails per load, has a longer minimum rail length, which may limit its usefulness in the home workshop.

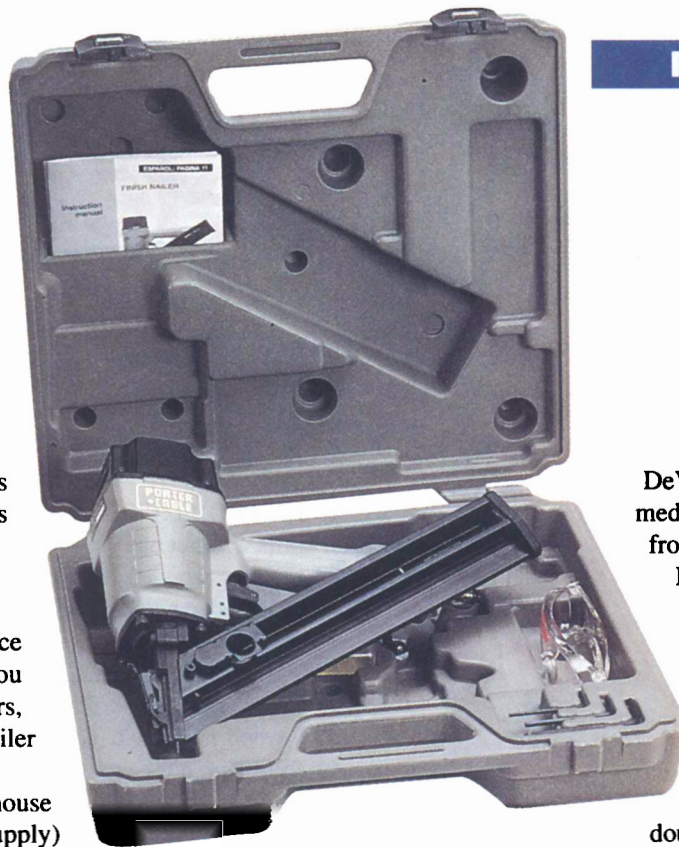


Stanley-Bostitch BT35B
brad nailer

Grizzly G2413
finish nailer

Senco SFN40 slant finish nailer

**Porter-Cable DA250
slant finish nailer**



WoodTek air nailer tools often use a double trigger as a safety mechanism: There is no contact nose-piece that must be pressed down to allow firing. Place the tool's nose where you want it and pull the triggers, one at a time, to fire the nailer or stapler.

WoodTek's 832-371 (house brand for Woodworker's Supply) fires $\frac{5}{8}$ " to $1\frac{1}{2}$ " nails and comes with an extra piston (except for O-rings, the pistons are usually the first parts to wear out on any of these tools, though magazine loading springs are also vulnerable). It also comes with wrenches, an assortment of fasteners and a case, all for about \$140.

To sum up, the brad nailers operated well, with all of them doing what they're intended to do. As might be expected, the more costly models worked better than the less expensive ones, were lighter in weight, felt better in the hand and generally had a more positive action. For modest use, the lowest cost tools do fine, but for any sustained use, or as tools you intend to leave to your kids, brad and finish nailers deserve the kind of thought and consideration you'd put into any major tool purchase.

Remember, if you pay good money for the tool, you should have an air compressor of at least $\frac{3}{4}$ horse capacity to drive it, and that's going to cost another \$200 or more. Overall, cost for even the lowest priced models of these tools is not insignificant.

Finish Staplers

Finish staplers give you the means of securely fastening backs, and quickly assembling joints where the means of fastening is not seen or important. For the most part, woodshop needs for a stapler are best served with a $\frac{1}{4}$ ", narrow crown stapler.

At the top of the list is the oilless Senco PowerPlus SKS stapler, shooting $\frac{7}{8}$ " to $1\frac{1}{2}$ " long staples, at a cost of about \$270. Stanley has its S32X, with a choice of contact or sequential trip models; while Campbell Hausfeld offers the SN258K00 finish stapler (holding 100 staples), and uses a sequential trip mechanism.

DeVilbiss lists their NCS2 as a medium duty unit, firing staples from $\frac{1}{2}$ " to 1" long. Hitachi's N3804AB uses 70 to 120 psi of air, and has a magazine capacity of 125. WoodTek's 884-082 comes complete with a bright orange case and a selection of staples. WoodTek staplers, like their air nailers, often use a double trigger as a safety mechanism, rather than a contact nosepiece that must be pressed down to allow firing.

At \$80, Grizzly's G3811 Super Stapler is a pleasant surprise. Compared to most other staplers, it's fairly heavy (3.8 pounds), but worked well when I tried it. Grizzly tools also come with quick disconnect nipples in place. For light to moderate woodshop use, this tool may be the sleeper we all hope for.

At \$80, Grizzly's G3811 Super Stapler is a pleasant surprise. Compared to most other staplers, it's fairly heavy (3.8 pounds), but worked well when I tried it. Grizzly tools also come with quick disconnect nipples in place. For light to moderate woodshop use, this tool may be the sleeper we all hope for.

Which One(s) Should I Buy?

In summary, don't expect the lower end models to withstand the sort of day in, day out use that you'll get from a top end, higher cost tool. For most woodshops, though, the middle range is more than enough. Those doing one small project a week or less will find aiming at the lower cost styles can get you time saving, energy saving and easier overall project assembly in quick order.

If you want a clean-cut recommendation of any one brand, model or style, I'm going to disappoint you. You'll need to sit back and evaluate the kinds of projects you build, what you plan to build in the future, and how you wish to fasten them. For most home woodshops, a small brad nailer is the best bet, immediately followed by a narrow crown stapler. You can, by shopping sales and doing without top cost brands, buy both of these tools for just over \$200. By the same token, one tool may cost you \$200, and even more if you buy top of the line.

Good luck and tight joints. **PW**

Charles Self is an author of magazine articles and books related to woodworking. One of his latest books is The Woodworker's Source Book, 2nd Edition, available from Betterway Books.



Handcrafted Briefcase

Show off your woodworking skills with this portable masterpiece.

By Jim Stuard

HERE'S A PROJECT for woodworkers who want to show off their skills without carrying an entertainment center around on their backs. This wooden briefcase will display your joinery, veneering and finishing skills everywhere you go.

Lay Up Your Veneer Panels

If you're unsure about performing veneering tasks, use 1/2" veneered plywood instead. If you have veneer experience, or want to learn by following our easy steps, start by laying up the veneered panels. I used 1/2" Baltic birch for the veneer substrate.

First, make sure the substrate panels are square and flat. The panels must be veneered on both sides to prevent them from warping. The second side need not match the good side because it will be covered by a leather insert.

Because you need a piece of veneer wide enough to cover the panel, it's likely you'll have to edge join two veneer leaves, making what's called a face. A common method of arranging the veneer leaves is called book matching, which I used for the project. To book match, you must first have leaves of veneer that were sliced from the flitch in sequence. Book matching produces a mirror image of each leaf. The veneer used for the briefcase is mahogany with a particular grain figure called Sapele Pommelle. An unattractive walnut veneer was used for the second, interior side.

Start working the veneer by rough cutting the leaves to length (**photo 1**). At this stage, leave about an extra inch of both width and length. When figuring the width it's important to calculate the total from the center seam to the outside as the required width.

Before the leaves are joined, the edges must be a perfect fit, much as solid lumber must be straight before it can be properly edge glued. An easy way to do this is by using a router and a flush cutting bit (**photo 2**). Once cut, set the two pieces edge to edge to make sure you have a flawless seam.

Joining the edges together is simply done using tape (**photo 3**). Veneer tape is available in mail order catalogs, but unless you plan to use it often,



1 Veneer is cut easily with a utility knife. Handle the veneer carefully because it can easily tear or split. To keep this from happening, I like to tape the ends of the veneer while I'm handling it.

WOOD WORDS (wood'wurds) n.

book matching: A method of matching veneer leaves side by side. The leaves are cut in sequence and every other leaf is turned over, just like the pages of a book, with the back edge of one veneer leaf joining to the front edge of the next.

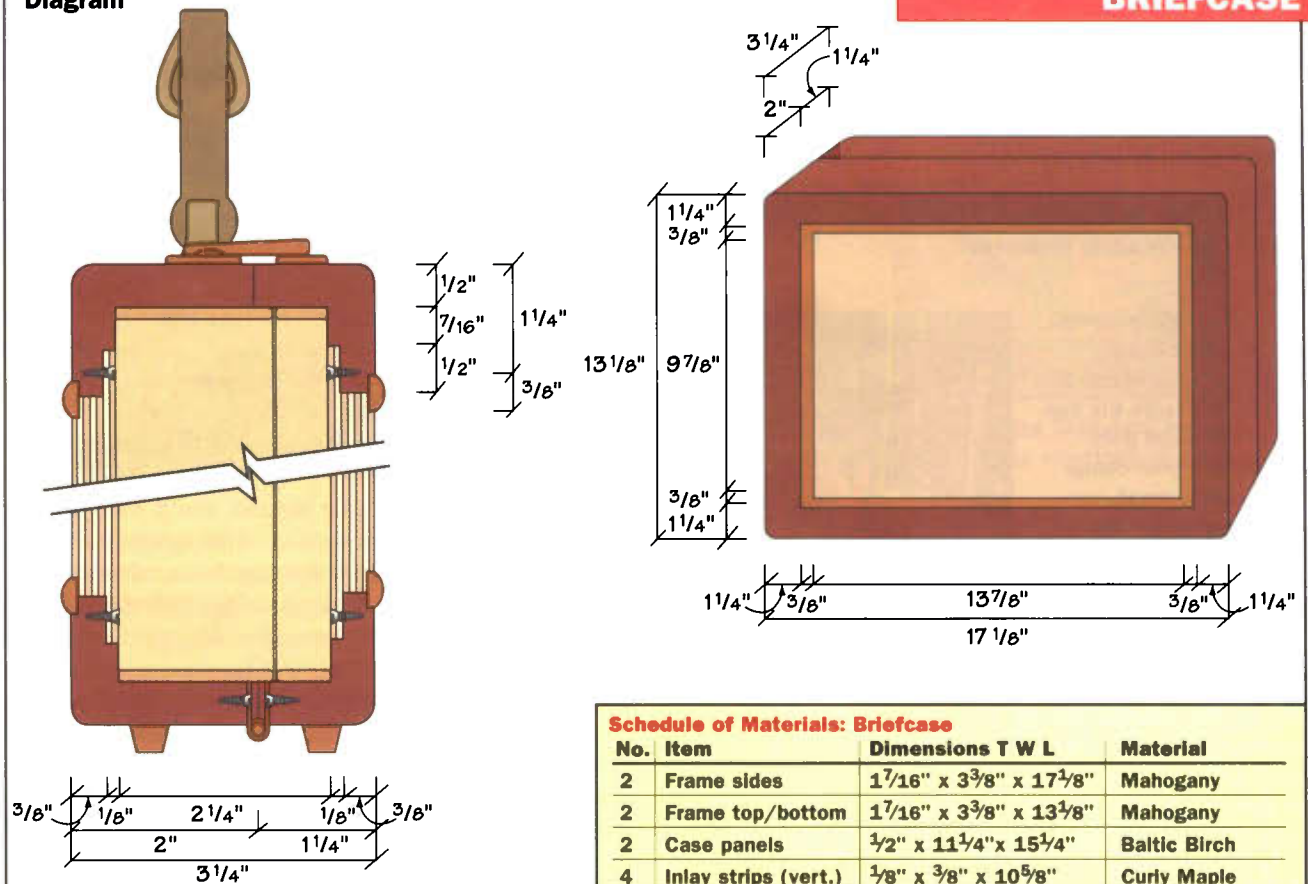
substrate: The core material between the face material, such as plywood or particleboard, between veneer or plastic laminate.

veneer face: The result of matching and taping veneer leaves together to form a larger sheet.

caul: A device used in clamping that helps direct the clamp pressure in the desired direction.

flash: The point at which a finishing material of any type changes in appearance from looking wet to dry.

flitch: The log or part of a log from which thin slices of veneer are cut.



masking tape will work just fine. Once taped, the veneer can be cut to about 1/4" over the size of the substrate all around (**photo 4**).

Prior to gluing, or pressing, the veneer to the substrate, make sure you have a clear area to work and everything you'll need at hand. In addition to regular white or yellow wood glue and a brush, you'll also need



2 The edges of the veneer leaf that form the seam must have a flawless fit. Here's how to do that: Clamp the veneer leaves between two 3/4" panels of plywood that have straight edges. Joint the edges of the veneer using a router with a flush-cutting bearing bit. To help prevent the veneer's edge from tearing out, trim only 1/8" to 1/4". Also, run the router backwards — that is, in the opposite direction of the rotation of the cutter, known as climb cutting.

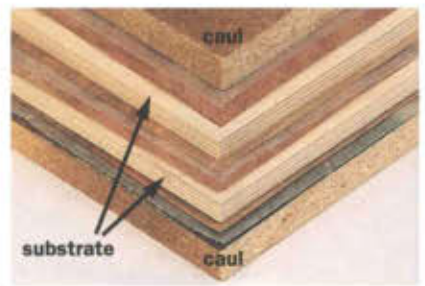


3 Just before gluing, tape the matched sheets together. Place a piece of tape every two or three inches across the joint. When applying the tape, first press down one side of the tape against the first piece of veneer. Then slightly pull the tape out to stretch it a bit as you press it down against the second piece of veneer. This will keep the joint tight. After taping across the joint, tape the entire length of the joint.



4 Trim the excess veneer but leave about 1/4" all around. Before trimming, make sure you mark the horizontal center of the substrate panel on the top and bottom panel edges. Align these center marks with the center seam of the taped veneer leaves. This will ensure your veneer face can be centered on your substrate.

5 Glue the two veneered panels onto each piece of the substrate and press down. The photo shows how the pieces should be arranged between the clamping cauls. First put down a layer of wax paper to prevent the veneer from gluing to the cauls. Then put down one of the veneered panels and cover it with wax paper; put down the second panel and cover that with wax paper. Add the top caul and clamp. The photo shows the panels fanned out so you can see the sequence. When you clamp them, stack them straight up. Also, make sure the center seam of the veneer panels is aligned with the center marks on your substrate, particularly while clamping, because they can shift slightly as you apply pressure.



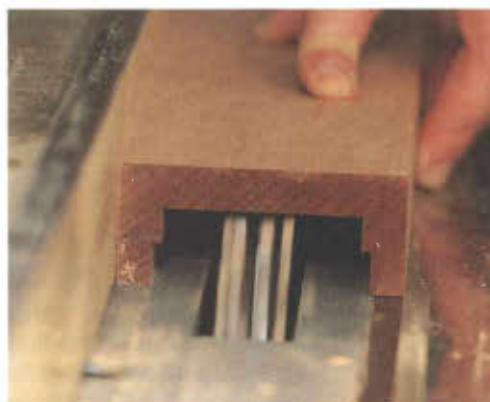
6 Use as many clamps as possible and make sure you clamp the middle to ensure the center of the panel gets pressure. If your clamp collection is small, you can make up for that by clamping a couple of cross rails onto the panels. The cross rails should be slightly bowed (you can do that with a jointer). Place the bowed side against the caul and clamp the ends — this will give you pressure along the entire rail.



7 After the glue is dry, unclamp the panels and peel off the wax paper. Carefully remove the tape and adhesive from the veneer using a scraper. Then trim the excess veneer overhang using a file, block plane or flush trimming router bit.



8 Cutting out the edges of the briefcase is a two-step process. First you need to cut out the $\frac{1}{8}$ " rabbet, which is where the veneered panel will be attached later. To do this, measure the thickness of the veneer panel, then subtract $\frac{1}{8}$ ". Set your rip fence for this measurement. Use a $\frac{3}{4}$ " dado set in your table saw and set the height of the blade to $\frac{1}{2}$ ". Run the mahogany through on the left and right sides. Then raise the saw's blades to cut all but $\frac{1}{2}$ " out of the mahogany. That $\frac{1}{2}$ " is the exterior wall of the case's edge.



two more panels, or cauls, which are cut a little larger than the veneer panels. These are placed on the top and bottom of the glued-up panels to spread out the clamp pressure and prevent damaging the veneer being pressed. You'll also need wax paper, a number of clamps, and a bucket of water and rag to clean up any messes.

As with the entire gluing process, you'll want to work quickly. When the glue is applied to the side of the veneer opposite the tape, the veneer will start to curl after a minute or two. For that reason, it's a good idea to first brush glue on the substrate, then the veneer face, then lay the substrate on the veneer so that its weight helps prevent the curling. (When you set the substrate on the veneer, make sure that the veneer seam aligns with the center marks on the panel.) Proceed with gluing the second side of the substrate, then the veneer face. Then place the veneer on top of the substrate. Since you're making two panels, go ahead and repeat the process for the second panel.

When done, prepare to clamp all the pieces together (**photo 5**). The bottom caul should be sitting on two saw horses (which allows you to clamp all around the assembly). The more clamps the better (**photo 6**).

Let the assembly dry overnight, and when you take the panels out of the clamps, the wax paper should peel right off. Use a scraper (**photo 7**) to clean the tape from the panels.

Make the Frame

Plane enough $\frac{8}{4}$ mahogany to yield the outer frame —



9 Use a miter saw to cut the mahogany to the sizes specified in the Schedule of Materials. Now you are ready to glue the frame together.

Tips on Taping Miters

When gluing two mitered corners together, it's necessary to have a tight glue joint along the entire surface of the miter. Using the elastic properties of



masking tape, you will be able to line up the miters and pull the corners together. As shown (left), lay the pieces to be mitered end to end with the mitered joint face down. Next, put a piece of masking tape on one piece. Then stretch the tape across the joint and press firmly down on the other piece. Repeat this for all the joints. After glue is applied (right), simply fold up the mitered and taped assembly and stretch tape across the final joint before clamping. The miters are literally pulled together by the elasticity of the tape!

BRIEFCASE



about 60" in length will do. The object is to make the frame as a box and to leave enough thickness for a saw cut that will separate the briefcase's lid from the bottom. This will give you a grain match all around the case, and have a continuous long grain match on three corners.

With a $\frac{3}{4}$ " dado set in your table saw, begin cutting out the frame's interior. Start with the rabbet that will receive the $\frac{1}{8}$ " lip of the veneer panel (See diagram cross section). Next, set up the saw for the dado cut that will leave the $\frac{1}{2}$ " wall of the case (diagram and photo 8). Use a miter saw to cut the frame parts to size (photo 9).

Coupled with the panel being screwed and glued into the frame, I found that wood glue provided sufficient strength on the frame corners (See Taping Miters). It takes only four clamps to glue the frame together (photo 10). Using a wet and then wrung-out rag, clean as much wet glue from the frame as you can.

Separating the Frame

When the glue has dried for several hours, remove the clamps and clean any remaining dried glue. Now set the

table saw to rip the width of the wider (bottom) part of the case (photo 11). Keep a wedge handy to insert into the saw kerf so it doesn't pinch the blade.

Install the Veneer Panels

Lay out the size of the frame opening on the panels, working from the center of the panel. Now mark a line $\frac{1}{2}$ " larger than the first line to establish your panel's actual size. Next, cut the $\frac{1}{2}$ " wide by $\frac{3}{8}$ " deep rabbet on the front of the panel. It's OK if the panel doesn't fit perfectly, but it must be flush with the outside surface of the frame. The $\frac{1}{2}$ " lip will leave plenty of room to attach the panel and later rout the inlay directly over the center of the joint between the frame and panel. When satisfied with the fit of the panel and frame, glue and screw the panel into the frame with $\frac{3}{8}$ " x #4 flathead screws (photo 12).

Rout the Inlay

First make a template jig to rout the $\frac{3}{8}$ " wide x $\frac{1}{8}$ " deep inlay groove into the top and bottom of the case. The inlay serves two functions besides being decorative. One, it cov-



10 Only four clamps are needed to hold the frame together. For a clever way to keep the frame from sliding around during clamping, see the tip above on taping miter joints. After clamping, clean any excess glue, then check the box for squareness by measuring diagonally across the corners.

11 When the glue dries, it's time to cut along the edges to separate the top of the briefcase from the bottom. Set your table saw's blade to no more than $\frac{1}{16}$ " higher than the thickness of the frame. Start the cut on one of the short sides of the frame so you finish on a long side.



12 Fit the panels to the frame by first cutting them to size, then rabbet the edges to get a good fit. To determine the panel size, place the frame opening on top of the panel (making sure the center of the veneer is in the center of the opening). Pencil a line around the edge of the opening and remove the frame. Measure out $\frac{1}{2}$ " all around that line and cut along the outside line. Then cut a rabbet into the face of the panel, $\frac{1}{2}$ " wide x $\frac{3}{8}$ " deep. Glue and screw the panel in place.





13 To hide any gaps between the frame and panel, cut a groove into the seam where they meet. Then inlay strips of curly maple into that groove. Make a template routing jig to cut a groove $\frac{3}{8}$ " wide and $\frac{1}{8}$ " deep into the frame and panel.



14 Next shape the maple to produce a radiused edge. Using a $\frac{3}{8}$ " roundover bit in your router table, radius one edge. Then flip the maple over and radius the edge's other side. Finish sand this profile.



15 With the inlay profile prepared, use your table saw to rip the edge off. While ripping, be sure to have the radiused portion falling to the waste side of the blade.

Finish Your Briefcase

A good looking briefcase deserves a first class finish. Every project has three essential elements to be a complete success; good design, good construction and a good finish. We've pulled out the stops in finishing this project, and although there are several steps in the process, each one is simple. Or if you prefer, simply stain then apply a clear top coat, or, just a top coat.

The key to good finishing is proper sanding. It prepares the surface to receive the finish. A random orbit sander gives the best results. Start sanding using 120 grit paper, then switch to 150 and resand. Clean up any glue squeeze-out before sanding by wetting it until it softens, then scrape with a single-edge razor blade.

The end result of our finish is a grain-filled traditional red mahogany finish. Other variations are orange, yellow and even purple or violet mahogany finishes. Color is determined by the initial coloring process usually involving aniline dye (photo A). For our red mahogany finish we first applied red aniline dye using a spray gun. Let it dry for a couple hours and don't be alarmed when the wood looks very red. If you have raised grain from a water based dye, lightly hand sand using 220 grit paper.

Next, fill the grain and stain the wood in the same step. We used a traditional walnut color stain, adding it to a neutral, oil-based grain filler. The stain not only imparts the desired color, but thins the filler to a more workable consistency (pea soup). Wipe on the filler, and after it flashes, wipe off the excess (photo B). This action drives the filler into the wood's open pores. Now, lightly wipe again, this time following the grain direction. Then check to make sure all excess filler has been removed, especially streaks running across the grain. Handle the case from the bottom making sure not to leave fingerprints or smudges on the freshly filled surfaces. Set the grain filled pieces aside to dry overnight.

Next, apply one coat of clear top coat. We used a spray lacquer, though you could also brush varnish. At this point, we concluded that the color difference between the solid wood and the veneer was too great. The solid mahogany was lighter in color, so we darkened it using a warm brown glaze (photo C). All that remained was to remove the masking tape, glue in the pre-cut curly maple inlay, then add two more coats of clear finish. Be sure to include the internal curly maple wood lining in the final clear coating step.



A If you don't have a spray system, you can apply the dye with a rag or sponge. If you use this method, select a water-based dye and dampen the wood before applying the dye. When using these dyes, always follow the manufacturer's recommendations for diluting it because it's usually very concentrated.



B Make up the stain filler by adding $\frac{1}{4}$ pint of stain to $\frac{3}{4}$ pint of filler. After mixing well, brush or rag on the filler to the exterior of the briefcase and on the inside edges and slides. Work on half the case at a time. After a few minutes, the filler will "flash," the signal to start wiping off the excess filler with a rag (wipe across the grain).



C The glaze was easily applied using a rag and allowed to dry until it flashed, then the excess was wiped off to a uniform color. The glaze was allowed to dry for several hours, then another coat of clear finish was applied.



16 Use a small miter box to cut the inlay to size. Once the pieces are fit into the grooves, remove the inlay, number the pieces and get ready to finish the mahogany portion of the briefcase.



17 To attach the hardware, mark the hinge locations. Then use a router to cut away half the hinge leaf's thickness from the side. Repeat this for each hinge on both the top and bottom of the frame.



18 I created this jig to mortise out the holes for the catches using a plunge router. The other option is to drill out the mortise using a drill press and then chisel out the waste.

ers any gaps between the veneer panel and the frame. Two, because it sets proud of the frame and panel, it will provide a raised edge to protect the surface when laid flat.

After routing the inlay groove (**photo 13**), plane a 60" long piece of curly maple to a thickness that will fit snugly in the $\frac{3}{8}$ " groove. For the slight radius, I used the part of the roundover bit that's closest to the bearing (**photo 14**). Then take the strip to the table saw and rip the radius inlay off the strip (**photo 15**).

I used a small shopmade miter box to handcut the inlay strips (**photo 16**). The miter box also made a passable shooting board for fitting the miters' ends.

Now take some masking tape and press a strip into the inlay groove. This prevents the finish from filling the groove. Use your fingernail or the corner of a small wood strip to press the tape into the groove's corners, then trim the excess tape with a sharp knife.

Install the Hardware

Start the hardware installation with the hinges. First lay out each hinge's location and rout the frame (**photo 17**). Install the hinge by laying it open and hanging it down the side of the frame. Use an awl to locate the centers of the mounting holes and install the hinge screws. Remove the hinge and repeat the process on the opposite notch. Repeat for the other hinge. Then attach the hinges to the case; it should open and close without binding.

The case's interior sides are trimmed with $\frac{1}{8}$ " thick curly maple that's installed after the case has a finish. The maple trim will project about $\frac{1}{8}$ " above the edge of the case bottom's sides and keeps the case from flexing when closed. Therefore the lid's trim pieces must be recessed a little more than $\frac{1}{8}$ " to receive the lower trim edge.

With the trim pieces taped in place, install the rest of the hardware from the kit according to the manufacturer's instructions. When finished, remove the hardware, except for the hinges, and clamp the case into a vise.

Now lay out the mortises for the catches. I made a small jig to use with a plunge router and router template guide (**photo 18**). This makes mortising the holes for the catches easier. Check for a good fit on the catches, then lay out the locations for the rivet holes for the latches and catches.

See the sidebar to create a furniture-quality finish for your briefcase, then re-install the trim and hardware and glue in place. Then install the curly maple inserts that go inside the briefcase. Install the leather insert with some rubber cement, and you're ready to show off the best "calling card" a woodworker ever had. **PW**

Jim Stuard is an associate editor for Popular Woodworking.



Editor's Note: The briefcase kit, including the leather insert and brass hardware, is available from The Woodworkers' Store, 4365 Willow Drive, Medina, MN 55340-9701 • (800) 279-4441. Ask for #36708. The cost is \$85.95, including freight. Veneer is available from Certainly Wood, 11753 Big Tree Road, E. Aurora, N.Y. 14052 • (716) 655-0206. Another source is Constantine's, 2050 E. Chester Road, Bronx, N.Y. 10461 • (800) 223-8087. Sapele Pommelle is \$1.60 to \$2 a square foot.

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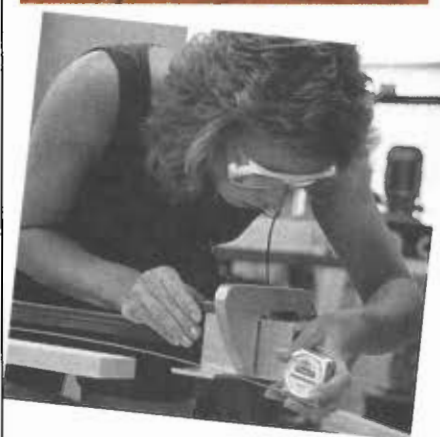
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DOVETALES



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Cabinetmakers Catalog, 1990

ly uninitiated to woodworking, and in this way we can train them in the style that best suits our furniture. So I just simply think that many women by and large are not drawn to woodworking, and I think the hiring practices of many other cabinet shops are tailored to skilled craftsmen...so we open up our labor pool to all applicants," he says. The company looks for patience, attention to detail and a strong commitment to teamwork in its candidates. He says, "I think women generally have a lot of these attributes, then they become, through tutelage, experience and training, skilled woodworkers."

Moser adds that men and women seek employment at Thos. Moser Cabinetmakers because of its good reputation in its community of Auburn, Maine.

This reputation, not an interest in woodworking, drew chairmaker Brenda Swett to apply for a job nine years ago. Her attitude toward the company hasn't changed, but it soon did toward her craft. "If you're on the

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outside looking in, and you've never done any woodworking, it seems much harder," she says. "But it's just a matter of learning. As long as you're trained well, you pick up on it. I can't imagine doing something else now."

To learn the skills required of a Thos. Moser cabinetmaker, good communication skills and teamwork are essential. This is because the training involves working directly with other cabinetmakers, rather than with manuals or procedures. Moser explains, "You have to be willing to communicate and (to) accept communication, which is another reason why we don't hire classically trained woodworkers. They come to us with preconceived notions, and then we have to untrain them, and untraining somebody is a lot more difficult than simply training them the first time around."

Cross-training is encouraged, so cabinetmakers may try different departments as open positions allow until they

find one that suits them best. Chairmaker Brenda Bowie says, "They like people to be flexible...the doors are basically always open for advancement. They really want you to learn as much as possible and move up."

And men and women are moving up with equal speed, says Customer Service Manager Gayla Fournier.

"Women (represent) 25 percent at the top level.

In middle management I think it's pretty close to 50-50."

Cindy Morin became the lead person (the company's title for department head) in the finishing department after three years at Thos. Moser Cabinetmakers. She

became interested in work-

ing for the company after a high school field trip to the shop. She enrolled in its co-op program, then became fully employed after graduation. Morin has wanted to work with wood ever since she began helping her grandfather, a carpenter, with small jobs. "My grandfather inspired me," she



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DOVETALES

says with vigor. "He's the one that put the love of woodworking into my life."

Morin is especially proud of the company's tradition of having cabinet-makers sign the finished work. "When we sign a piece, we're signing our pride," she says. Although she's worked in many departments, finishing is the most enjoyable for her. "The actual beauty of a piece is in the finish."

In the company's 1990 catalog, Thomas Moser himself credits the fine quality of the finished product to the cabinet-makers: "Whatever success we have achieved belongs ultimately to the men and women who build, sell, manage and install our work. They are Thos. Moser Cabinetmakers." **PW**



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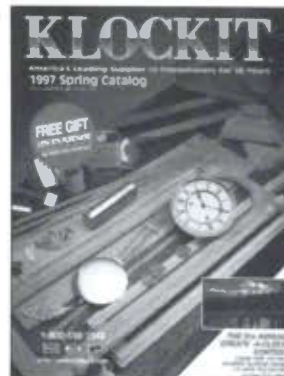
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What does our Orange mean to you? It stands for the highest quality products, it's a reminder of the orange color of our router bits (a registered trademark of CMT Tools) and it represents a solid commitment to service and customer satisfaction.

The CMT Tools Orange is also symbolic of our Florida home. Florida is where we started in 1991 and it's where our bits have been manufactured since early 1996.

We love to show the factory to our friends and customers, so please plan to visit. If you're in the Tampa Bay area just stop by the factory office at 10 am weekdays for a tour.

Be sure to enter our contest for a trip to Florida, I'll look forward to seeing you soon!

Best regards,

Carlo M. Venditto

Carlo M. Venditto, CEO

PS: If I can be of assistance please give me a call, and don't forget our famous guarantee: *If you aren't happy with your purchase, we'll take it back for immediate refund or exchange, period.*

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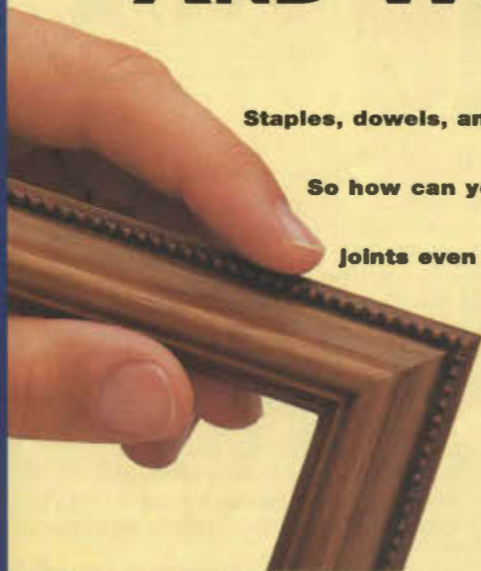
Staples, dowels, and glue won't do. Standard-size biscuits won't fit.

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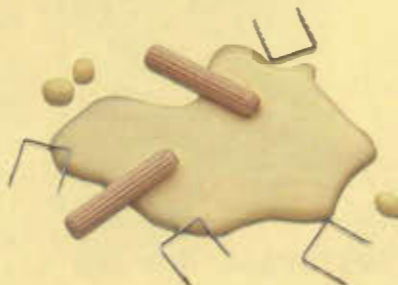
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