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May 1997 #96

Popular Woodworking

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C1005	5/8"	3/4"	~~9.95~~	8.95
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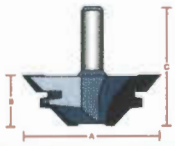
C1009	5/16"	3/4"	~~5.95~~	4.95	C1015	3/4"	1-1/8"	~~11.95~~	10.95
C1010	3/8"	3/4"	~~5.95~~	4.95	C1016	3/4"	1-7/8"	~~14.95~~	13.95
C1059	7/16"	1"	~~7.95~~	6.95	C1017	1"	1-1/8"	~~11.95~~	10.95
C1011	1/2"	1-3/16"	~~7.95~~	6.95	C1061	1-3/16"	2"	~~21.95~~	20.95
C1012	1/2"	2"	~~14.95~~	13.95	C1018	1-1/4"	1-3/16"	~~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					

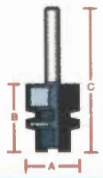
CORNER LOCK MITER BIT



Used for making 90° corner joints in wood for 9/16" 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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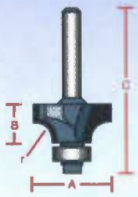

Roundover bits are used to make quarter rounds of various radii. Also used to soften edges, especially if making anything a child would use. Everyone needs a drawer full of these. So many uses we can't list them all.

1/4" SHANK					
MODEL	CUTTER DIA. A	CUT. LENGTH B	RADIUS r	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"	~~$13.95~~	$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 r	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"	~~$13.95~~	$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"	~~$19.95~~	$17.95
C1190	2-1/4"	1-1/8"	7/8"	~~$29.95~~	$28.95
C1191	2-1/2"	1-1/4"	1"	~~$29.95~~	$28.95
C1192	3"	1-1/2"	1-1/4"	~~$34.95~~	$33.95

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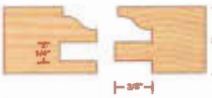
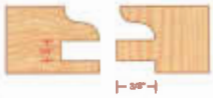


MODEL	SHANK	CUTTER DIA. A	CUTTER LGTH B	REG. PRICE	SALE
C1392	1/2"	1-5/8"	13/16"	~~49.95~~	47.95

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

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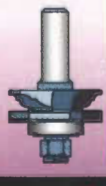
with Guide Bearing



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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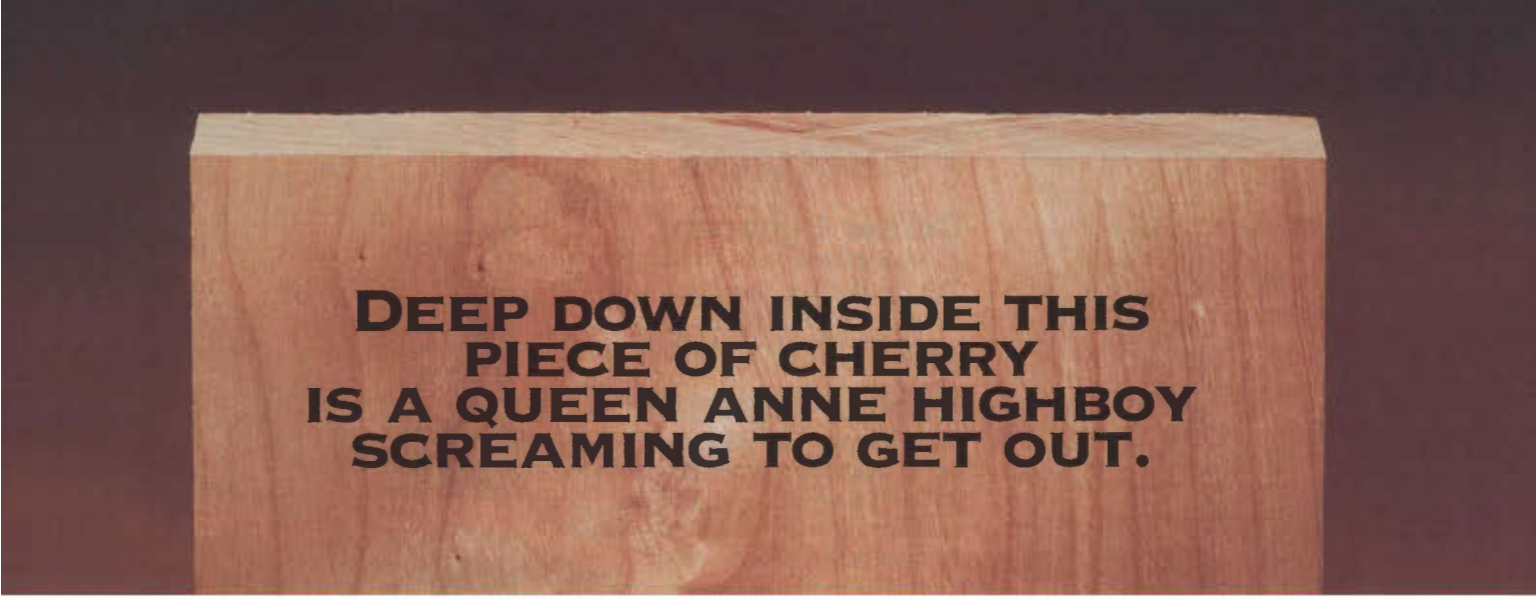

DEEP DOWN INSIDE THIS PIECE OF CHERRY IS A QUEEN ANNE HIGHBOY SCREAMING TO GET OUT.

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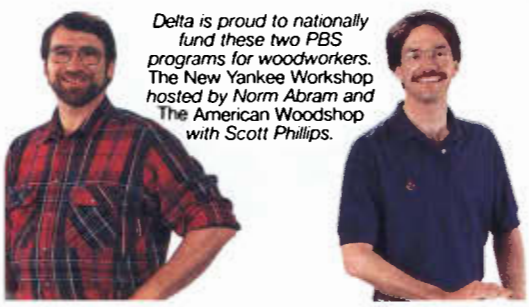

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Features

Corner Cupboard
by Steve Shanesy **24**
The "Little Shop That Could" builds a Canadian corner cupboard using only 12 pieces of pine.

Outdoor Materials
by Christopher Schwarz **28**
Save your deck chairs from decay by knowing what woods, fasteners, glue and finish can weather the weather.

Greene Brothers Garden Bench
by Jim Stuard **47**
This eye-catching bench is inspired by Arts & Crafts architects and will be the centerpiece of your garden.

Picnic Dining Set
by David Thiel **52**
Romantic yet practical, this unusual roll-up table and folding stool collapse to go anywhere.

Visitor's Nightstand
by David Camp **56**
Your overnight guests will appreciate the storage in this small chest of drawers.

Perfect Flattop
by Jeff Jewitt **60**
The secrets to making large glued-up slabs that are as flat as Kansas and as smooth as satin.

Recipe Cabinet
by Ralph Wilkes **64**
Give Aunt Erma's sponge cake recipe a special home with this antique cherry cabinet.

Chippendale Mirror
by Robert Treanor **68**
Hand tools and shop scraps are all you need to build a classic Chippendale looking glass.

Scrolled Coffee Table
by Ralph Wilkes **74**
Stylized fish from a classic English design swim around the apron of this coffee table.

45

Project File

This special section, exclusive to Popular Woodworking, *features building basics for seven projects.*

Flower Tower **30**
An afternoon in the shop is just enough time to build this amazing self-watering flower pot.

Pot Hangers **31**
These bandsawn brackets can be used to hang a potted plant almost anywhere — even on a mission-style stand.

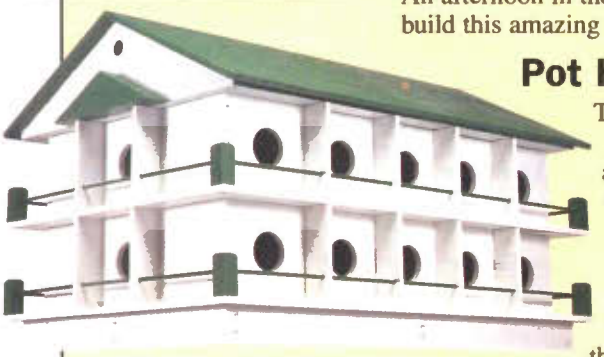
Martin Condo **32**
Host a whole neighborhood of these bug-chomping birds with this inexpensive and easy bird dwelling.

Potting Bench **34**
Garden enthusiasts will love this garden workbench; you'll love the simple joinery and quick assembly.

Planter Box **36**
Three or four of these "found wood" planters will give your deck or patio a Club Med atmosphere.

Love Spoon **45**
For 300 years the Celts have given these carved spoons as symbols of affection; carve one and carry on the tradition.

Shaker Shelves **46**
If you need extra storage, this classic flight of Shaker shelves will fit your budget and almost any space.



32

Columns

Turnings 6
"Have Your Cake and Eat it, Too!"

Infeed/Outfeed 8
Letters from readers

New Product Releases 12

Good Reading 16

Cris Cuts 18
"Another Way to Recycle"

Tricks of the Trade 22
Tech tips & techniques

Wood Types 73
American Alleewood

Resource Directory 71

Classifieds 77

Caption the Cartoon 79

Out of the Woodwork 80
"Dumpster Diving"

Cover photo: Hal Barkan/BKT Photography
Shot on location at Krohn Conservatory, Cincinnati.

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!

Popular Woodworking®

May 1997, Vol. 17, No. 2

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TURNINGS

Have Your Cake And Eat It, Too!

Last summer we made some changes to *Popular Woodworking* that put the major emphasis on projects — lots of projects for all sorts of woodworkers. We introduced the new Project File section, which gives you the building basics for eight or more projects in every issue. While most readers have given us a thumbs up on the new look and emphasis on projects, more than a few of you wrote to say you missed the PullOut™ Plans section that we eliminated.

Well, we listen when you write.

This issue brings back the trusty PullOut Plans. With the return of the pullout section, "America's Best Project Magazine" is better than ever. So in addition to the projects and practical woodworking advice, you'll get more plans to make your project building quicker and easier. Plans really do belong in *Popular Woodworking* because we were the first woodworking magazine to have such a section. And if imitation is the sincerest form of flattery, we're blushing like a bride.

Speaking of brides, we have a scroll saw/carving project for yours. The traditional love spoon (page 45) has been a woodworker's expression of affection for centuries. Our version, of Celtic inspiration, will have you sharpening both your knife and your carving skills.

And if in spring a young man's thoughts turn to love, a more mature woodworker might also start thinking of projects to enjoy outdoors.

This issue puts the spotlight on all sorts of projects for both your flower garden and post-gardening relaxation. One of the most clever and practical projects we've seen lately is our roll-up, go-anywhere picnic table and chairs (page 52). These will be sprouting in back yards everywhere this summer. And so will the handsome mission-style garden bench we feature on page 47.

And if the outdoors isn't for you, check out the Chippendale mirror (page 68), the corner cupboard (page 24), or perhaps the fretwork coffee table (page 74).

Hey, this issue's got it all, the projects, techniques (see "Perfect Flattop" on page 60) and once again the PullOut Plans.

Good Woodworking!

Steve Shanesy

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9"X40T	$146	$109	$ 98	$ 87
30T	$125	$ 99	$ 89	$ 79
*8-1/4"X40TX 3/32"	$136	$ 99	$ 89	$ 79
8"X40T 3/32"	$136	$ 99	$ 89	$ 79
30T	$115	$ 89	$ 80	$ 71
7-1/4"X30T 3/32"	$112	$ 69	$ 62	$ 55
**6"x40T 3/32"	$136	$ 89	$ 80	$ 71

*NEW for Sears & Makita Table Saws **New For Saw Boss

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FLASH NEWS!!

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Fine Woodworking Magazine test Oct. 96 page 43

After installing your blade and 5 in. stiffener the vibration in my saw went down another 20%. I ran several pieces of hardwood through the saw, both crosscut and ripping, and was amazed at the smoothness. It was like cutting butter, maybe smoother. I have never had a saw blade that cut this smooth.

Rick Price

CHOPMASTER FOR SLIDING COMPOUNDS & MITER SAWS

New specs, 5° Neg. Pts. & flat, runs out less than .002 for perfect, tight, smooth, splinter-free miter joints.

TAKE EXTRA 10% – 20% OFF COMBO SALE!

NEW SIZES AVAILABLE	LIST	SALE
Delta Sidekick 6-1/2"x40Tx5/8"	$149	$ 89
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.

THE ONE BLADE THAT LEAVES A SMOOTH-AS-SANDED SURFACE!

SAVE ANOTHER $45 to $90 AFTER USING SHARPENING COUPONS

WOODWORKER I – CROSSCUT — 7 1/4" – 14"
For TABLE and RADIAL SAW – 10% to 20%

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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

OTHER SIZES AVAILABLE – 7 1/4" – 14"

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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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10"x80Tx1/8" & 3/32" K	$207	$159
12"x80Tx1-1/8"K	$212	$181

Other sizes available

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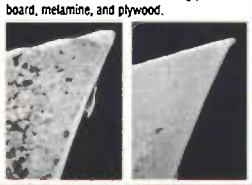

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From the Popular Woodworking *mailbag...*

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. Our e-mail address is: Wudworker@aol.com. Letters may be edited for publication. — *Steve Shanesy, editor,* PW

Holiday House-building

For Christmas decorations, the creche in your January 1997 issue was just the ticket. I built it pretty much to the instructions, with only minor differences. The plans were easy to follow, and with the help of a hot melt glue gun, assembly was a snap.

Folks who visited our house during the holidays all loved it and asked when I could build one for them. My thanks to your magazine and the project contributor, George Antolik.

Kerry Cravens
Frankfort, KY

Four 'Times' the Fun

For my best friend's wedding anniversary I decided to build the tall pine clock featured in the September 1996 issue of *PW*. After finishing it, I liked it so much that I decided to make three more for Christmas presents for family members. My wife wanted to participate, so she cut and painted little ducks that, when placed on top of the clock, appear to be checking the time.

For others who might want to build the clock, they should be aware that the dimensions shown for the front, back and sides of the bottom box must all be the same length. I made mine 10".

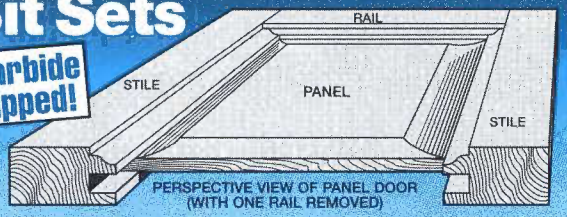
Thanks for a great project. Please keep them coming.

Duane Nightingale
Westlake Village, CA

*Parts I and J should have been 12" long, but the 10" scale worked for Duane — so don't be afraid to tinker — **Steve***

Save 55% on MLCS Raised Panel Door Bit Sets

Carbide Tipped!



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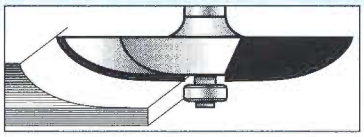
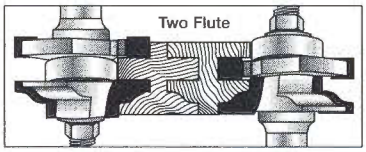


✶Raised Panel Router Bit



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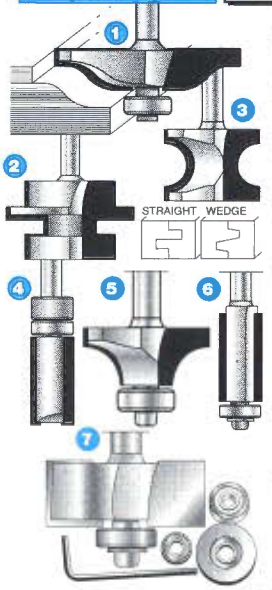

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#1341 3/4" Dia., 1" Cutting length $17.00

5 ROUND OVER
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#1315 (3/16" Radius) $11.00
#1394 (1/4" Radius) $13.00
#1316 (5/16" Radius) $14.00
#1369 (3/8" Radius) $15.00
#1370 (1/2" Radius) $17.00

6 FLUSH TRIM
#1337 3/8" Dia., 1" Cutting length. $8.50
#1338 1/2" Dia., 1" Cutting length..... $9.50

7 RABBETING KIT
Change ball bearing guides and select 4 depth of cuts: 3/8", 7/16", 5/16", 1/4". Set: 1/4" shank rabbeting bit, 4 bearings (3/8", 1/2", 5/8", 3/4") and hex key.
#1425 1-1/2" Large Diameter $25.00

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"Biscuit Joining with your Router", Instructional sheet included.

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For exceptional thread "Bite"!

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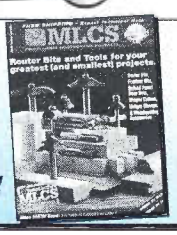

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Circle #120 on Resource Directory Coupon

INFEED/OUTFEED

One Big Wooden Hog

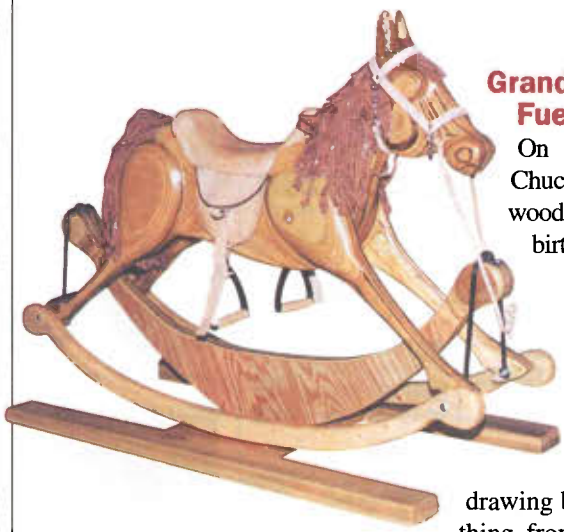
I was trying to get home through a thunderstorm on a motorcycle when I missed a turn and ended up with a broken hip and on crutches. But that wasn't enough to keep me out of my shop.

In my shop I have an old office chair on wheels and a 1965 Harley Davidson, my pride and joy.

I went from machine to machine on that chair. And using 90 percent scrap lumber I built this 1/2 scale replica of my bike out of 24 species of wood. This model of my Electra Glide has 17 movable pieces, including the saddlebag, which opens, and the rear shocks.

In all, I figure this took me more than 1,100 hours of work between July and October. I hope it's worthy to show your readers.

Virgil Huffman
Creston, Ohio



Grandkids and Horses Fuel His Hobby

On many occasions my husband, Chuck, had voiced an interest in woodworking; however, it was the birth of our first two grandchildren last year that spurred him to get started. We had seen various rocking horses in our weekend "antiquing" trips, and he wanted to do something special for the boys' first Christmas. These horses started as a freehand drawing by my husband. He did everything, from the carving, to the mane and tail (from old mops), to the leather saddles. One unusual feature of these horses is that they can be used on the gliders or removed from the base and used as rocking horses.

My husband is now taking a respite after his first attempt at woodworking. But from what I've seen so far, the bookcases I want for his home office should be a piece of cake for my in-house woodworker!

Helen Turner
Knoxville, Tenn.

Oil Rig Malfunction

While building the oil rig in the November 1996 issue, I had some trouble with the diagram. The derrick tower, according to the dimensions, is 7/8" x 6" x 7". When you put these dimensions to the diagram, the tower is about 6" x 4 1/2". I had the same problem with the beam. Please straighten me out.

Merwin G. Willman
Schertz, Texas

The Schedule of Materials is off on a couple pieces. The derrick tower should be 7/8" x 4 1/8" x 5 1/2", and the beam should be 7/8" x 1" x 6 3/4". Good catch! ***—Steve***

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by Kerry Pierce
Discover everything you need to create 30 elegant gifts from wood—for all skill levels—illustrated instructions, tips on hardware, and recipes for flawless finishes.
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by Pat Warner
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Making Wooden Mechanical Models
by Alan and Gill Bridgewater
Build 15 handsome and incredibly clever machines ranging from an oil pumping rig to a flywheel propeller machine, complete with step-by-step plans.
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All books are sturdy paperbacks unless noted otherwise.

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NEW PRODUCTS

Popular Woodworking wants to provide 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 purchases.

"The tightening handle, mar-proof corner pads and chalk line retraction system are a great improvement over older, (and some newer) strap clamp designs." — PW

Bessey Varlo Angle Strap Clamp

Contact: American Clamping Co.,
(800) 828-1004
Retail Price: $49.95
Available at local home center stores.

Features:
- Applies even pressure with fine-adjust tightening handle
- Twenty-three foot strap pulls evenly from both sides, avoiding distortion
- Clips with movable padded feet allow multi-angled clamping
- Strap rewinds easily onto spool

For more information, circle #175 on the Resource Directory Coupon.

"The new single-handle clamping feature adds even more versatility to this already useful tool." — PW

Workmate Celebrates its 25th Anniversary

Contact: Black & Decker
(800) 54-HOW-TO
Retail Price: $99
Available at home center stores.

Features:
- Model 425 offers one-handed system for opening and closing vise jaws
- Built-in clutch allows clamping of odd-shaped materials
- Supports up to 550 pounds
- Vise jaws open to 8⅝", while adjustable surface pegs hold material up to 18¾"
- Extra bench-top piece can be inserted in top to provide larger work surface

For more information, circle #176 on the Resource Directory Coupon.

Jorgensen Deep-Reach Aluminum Bar Clamps

Contact: Adjustable Clamp Co.,
(312) 666-0640
Retail Price: $29 - 12", $44 - 72"
Available at home center stores.

Features:
- Aluminum construction offers high strength-to-weight ratio
- Clamp faces of 1¾" x 3¾" provide deeper reach for larger project assembly
- Rectangular bar design allows stable clamping surface for edge gluing
- Available in 12", 24", 36", 48", 60" and 72" capacities

For more information, circle #177 on the Resource Directory Coupon.

"DeWalt's new machinery line offers a number of attractive options. The thickness planer's depth stop gauge, material removal scale and lock-down head system make it a user-friendly tool with quality results. The scroll saw's arm design offers one of the most vibration-free operations we've ever seen. The oversized table and easy blade replacement will please every scroller. Though pricey, the table saw's rack-and-pinion fence will add improved accuracy in the bench top arena. DeWalt's sliding compound miter saw will hold its own with the competition." — PW

DeWalt DW733 Portable Thickness Planer

Contact: DeWalt, (800) 433-9558

Retail Price: $435

Available at home center stores.

Features:

- 12½" cut width, with min. finished thickness of ⅛"
- 12" long steel infeed and outfeed tables for extra material support
- Stock removal scale indicates accurate depth of cut
- Two resharpenable M2 high speed steel knives
- Turret depth-stop for quick, accurate return to preset depths
- Four-post head locking system prevents movement during cut
- Magnetic knife setting system and tools stored on the machine

DeWalt DW788 Variable Speed Scroll Saw

Retail Price: $450

Features:

- Double-parallel-link arm reduces vibration
- Simple, tool-free blade-changing system
- Variable speeds of 300 to 1,750 strokes per minute
- Top-front mounted controls for easy access
- Oversized teardrop-shaped cast iron table bevels to 45 degrees in either direction
- Available accessories include a heavy-duty stand, foot pedal and light

DeWalt DW744 10" Heavy Duty Table Saw

Retail Price: $550

Available in July.

Features:

- High torque universal motor
- Telescoping rack-and-pinion rip fence provides 24½" capacity to right of blade and 16" capacity to left, without extension bars
- 10" thin kerf carbide blade
- Fence also offers fine adjustment knob for "tapless" accuracy
- Smooth cast aluminum tabletop surface with marproof coating
- Blade cover to channel dust away from machine, or hook directly into a shop vacuum or dust collection system
- Storage on-machine for tools, blades or a dado stack
- Optional accessories include a heavy duty collapsible stand and retractable outfeed and side supports

DeWalt DW708 Sliding Compound Miter Saw

Retail Price: $675

Features:

- 12" sliding double-bevel capability to 48 degrees
- Extra height fence allows cutting of most trim material vertically, or slides out of the way to accommodate bevel cuts
- Miters 50 degrees to left, and 60 degrees to right
- Vertical dual-rail design for increased accuracy and smoothness
- Cam-action miter-locking system offers 11 positive lock stops, or an infinite variety of "between stop" positions

For more information, circle #178 (planer), 179 (table saw), 180 (scroll saw), or 181 (miter saw) on the Resource Directory Coupon.

Continued on page 14.

NEW PRODUCTS

"Every woodworker will appreciate the quality construction of these marking tools, and their projects will benefit from the accuracy and ease of use they provide." — PW

Veritas Wheel Marking Gauge

Contact: Lee Valley Tools Ltd. (800) 871-8158
Retail Price: $19
Available through Lee Valley.

Features:
- Hardened-steel cutter wheel makes accurate marks, even on cross-grain
- Because cuts are made with a wheel instead of a pin, you avoid "chatter"
- Aluminum head has thick brass face and thumbscrew
- "O" ring makes setting the gauge simple

For more information, circle #184 on the Resource Directory Coupon.

Veritas Sliding Square

Contact: Lee Valley Tools Ltd. (800) 871-8158
Retail Price: $22
Available through Lee Valley.

Features:
- Provides constant reference face to work without having to flip-flop tool
- Offers two-axes scaling at same time
- Stainless steel 3" x 6" blade
- Hardened steel locking mechanism housed in hefty anodized aluminum

For more information, circle #182 on the Resource Directory Coupon.

Skil Folding Contractor's Saw Stand

Contact: S-B Power Tool Co., (773) 286-7330
Retail Price: $159
Available at home center stores.

Model 80092 Features:
- Converts Skil 3400 Table Saw and other similar benchtop models to 34½" stationary saw height
- Increases saw's ripping capacity from 12" to almost 27"
- Self-aligning steel rip fence improves accuracy for larger jobs
- Sturdy construction weighs in at 50 pounds

For more information, circle #105 on the Resource Directory Coupon.

"Adds a handy workbench vise to any saw horse at a great price." — PW

HorsePower™ Handy Clamp

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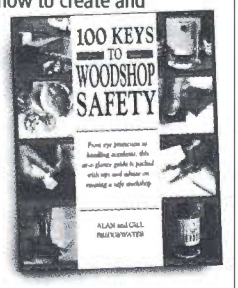

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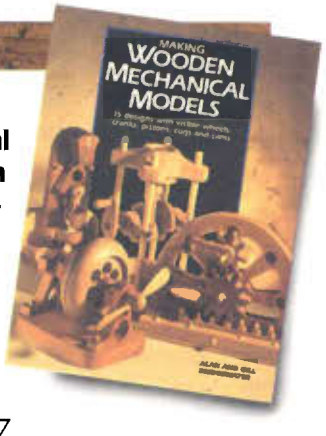
GOOD READING



Making Wooden Mechanical Models: 15 designs with visible wheels, cranks, pistons, cogs, and cams, *by Alan and Gill Bridgewater. 138 pages, paperback, $21.99; available from Betterway Books, F & W Publications, 1507 Dana Avenue, Cincinnati, OH 45207.*

The Bridgewaters' book is the third or fourth title I've seen relating to mechanical models, but it has real advantages over competing titles: For starters, there are excellent gridded drawings of all the parts; woodworkers with access to a reducing/enlarging photocopier can make these projects as large or small as they want without having to redraw them, but the gridding makes the redrawing easy enough for those who don't have access to a photocopier.

The instructions are comprehensive. Rather than just telling us to "make the thingamajig," they detail the operations, stepwise. Children and novice woodworkers will be able to follow along nicely. A quick perusal of the index reveals that many of the projects can be built using a lathe, scroll saw, gouge and skew chisel. So most of us can build these small projects without breaking the bank on either tools or materials. These projects are exemplary of what one might call pastime woodworking. And the projects look fun to build and then to play with after completion.

The introduction tells us how the Bridgewaters became interested in projects like this. Their personal notes read more like letters to each individual reader rather than a general introduction. I like that a lot. Each project begins with a background section that tells the "why" of the project — why it is included, why it is interesting to the author, why it should be interesting to the reader, and a bit of rationale for the building. Then follows an overview that spells out the pitfalls you might encounter when building the project, as well as what expertise you might come away with when you complete the project. Then, before the actual instructions begin, you're instructed about wood choices — which commonly available woods will work in North America, and which will work in Great Britain. Each project concludes with a short section called "Problem Solving." If you're having trouble with the design, this may help, but it's equally good for those who want to make the projects more challenging and interesting.

The Bridgewaters are projects writers. I've never seen a bad book under their name. But this, their debut volume for Betterway, is exemplary. All things considered, I'd call this volume indispensable to the libraries of woodworkers. **PW**

Hugh Foster *is a woodworking author and high school English teacher who lives in Manitowoc, Wisconsin.*

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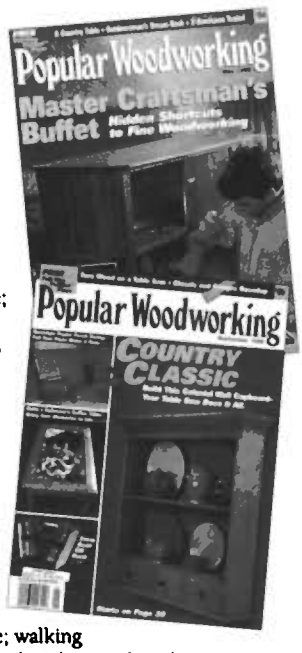

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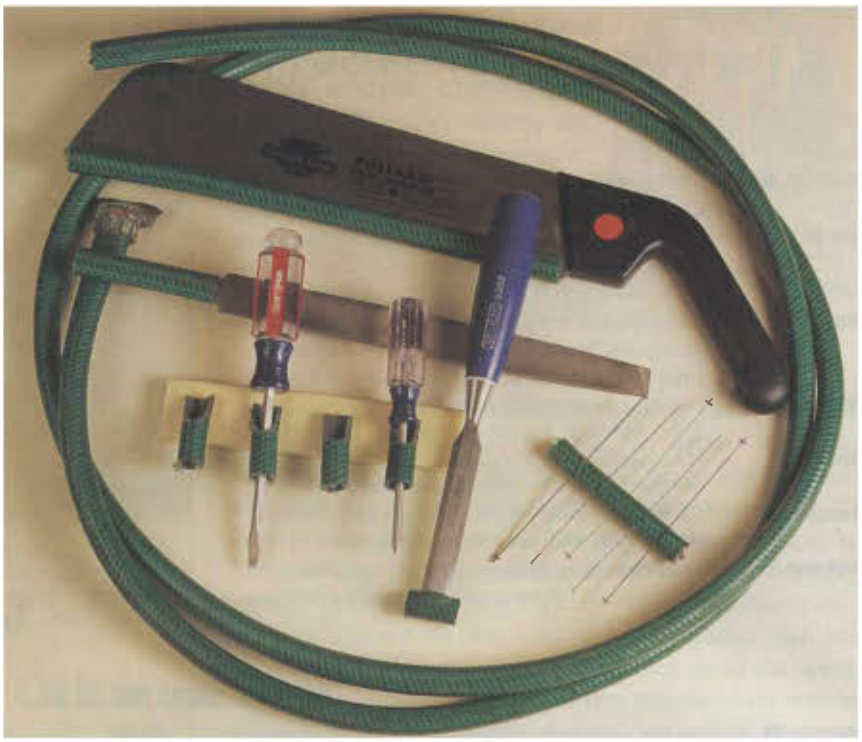
PBA7

Another Way to Recycle

Clever ways to use old garden hose in your shop.



Anyone visiting the "Golden State" during the last winter would regard the title as so much public relations rhetoric. We do have our rainy season and the water is always appreciated, but last year it was a bit much, especially because the welcome water was frequently accompanied by unwelcome winds. By now you are asking, "So? What does this have to do with the home workshop?"

Well, when you live in an all-electric environment, as I do, the result of rain and high winds is power outages. And that means, no heat, no light, no power, no workshopping. So during a prolonged electric-less period, I came across a bundle of unsalvageable garden hose and, thinking shop, as always, I reasoned that recycling the material in shop-wise ways was a good project.

The thoughts I had are shown on the accompanying pages. I'm sure that *Popular Woodworking* readers will envision many others.

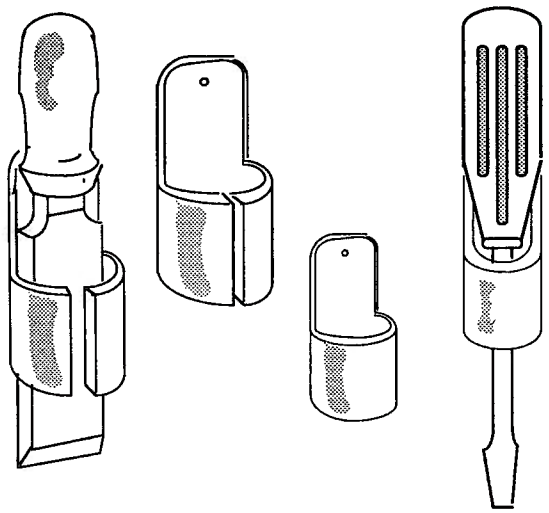
I used a utility knife to separate sections and to form slits or slots. To shape ends for "ties" I used a coping saw with a fine blade. This leaves rough edges that can be smoothed with the knife or with sandpaper.

To make handles, say for a file, I filled a suitable length of hose with a product called "Durham's Water Putty." The product comes as a powder that can be mixed to various consistencies with water. After filling the hose with putty, I pressed it onto the tang of the file and then left it alone until the putty hardened.

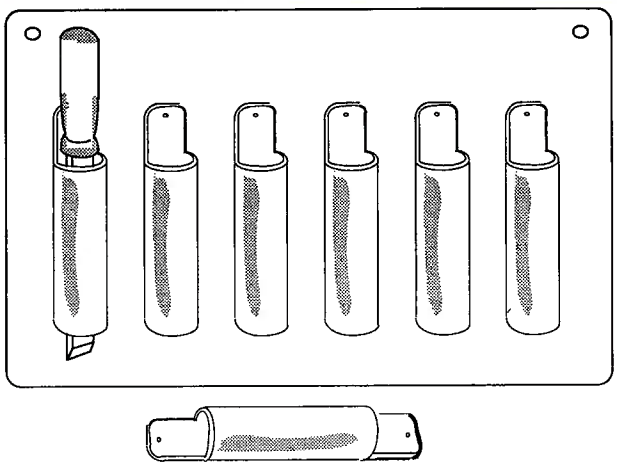
Necessity is not alone the mother of invention. Sometimes, power outages serve the same purpose! **PW**

R.J. DeCristoforo *has written more than 30 how-to books, including* Jigs, Fixtures and Shop Accessories *(McGraw-Hill).*

STORAGE FOR SCREWDRIVERS, CHISELS, AWLS AND OTHER TOOLS



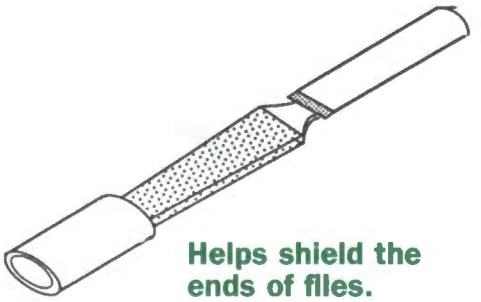
A RACK FOR LATHE TOOLS • The hose can have a "tie" at each end that can be used to attach the hose to a piece of wood.



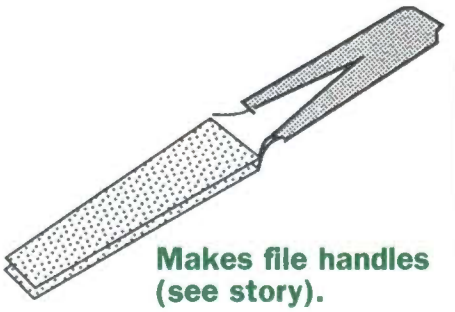
CRIS CUTS

PROTECT YOUR HANDS

Hose helps start nails and brads.

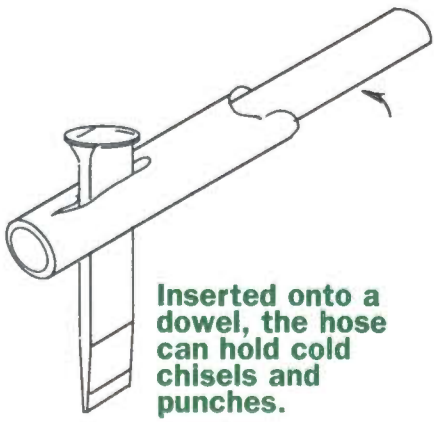


Helps shield the ends of files.



Makes file handles (see story).

Wrap it around a hacksaw blade to make a "frameless" hacksaw.

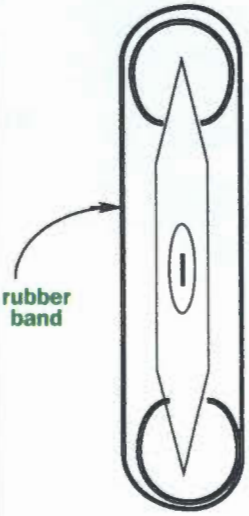


Inserted onto a dowel, the hose can hold cold chisels and punches.

CRIS CUTS

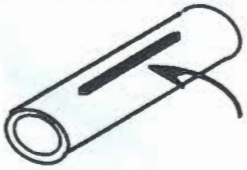
PROTECT THE CUTTING EDGES OF YOUR TOOLS.

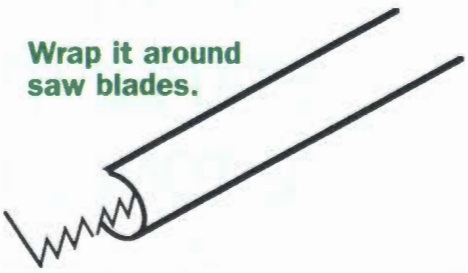
One small section of hose can protect the edge of your ax.



For double-edged axes, put hose on both ends and then secure them with a rubber band.

A small slit in a hose will keep flat blades, such as the one on this chisel, from getting knocked around.

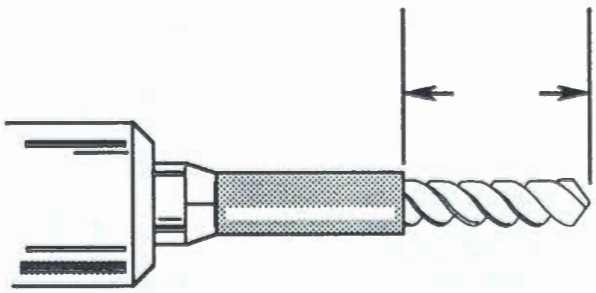




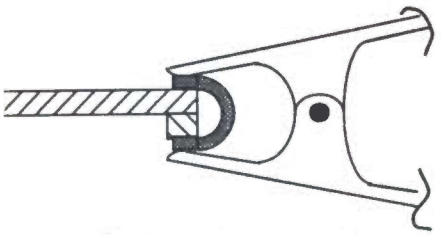
Wrap it around saw blades.

It also works to store large drill bits, knives and jointer blades.

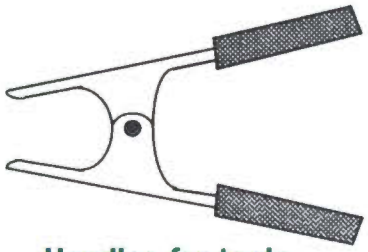
A SMALL SECTION OF HOSE CAN BE INSERTED ON A DRILL BIT TO MARK THE DEPTH OF A HOLE, INSTEAD OF USING TAPE.



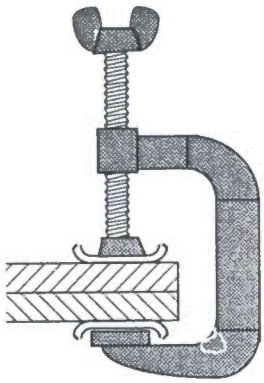
A FEW OTHER WAYS THE HOSE MIGHT BE USED.



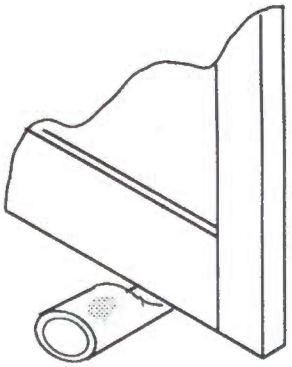
Spring clamp pads.



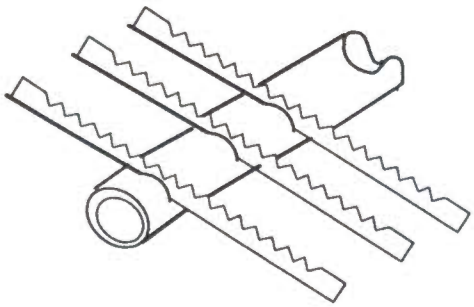
Handles for tools.



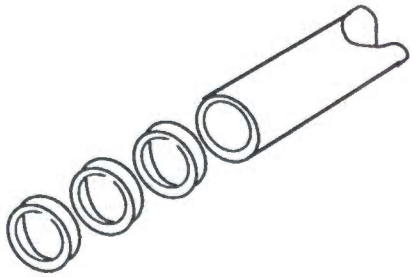
C-clamp pads.



Door stop.



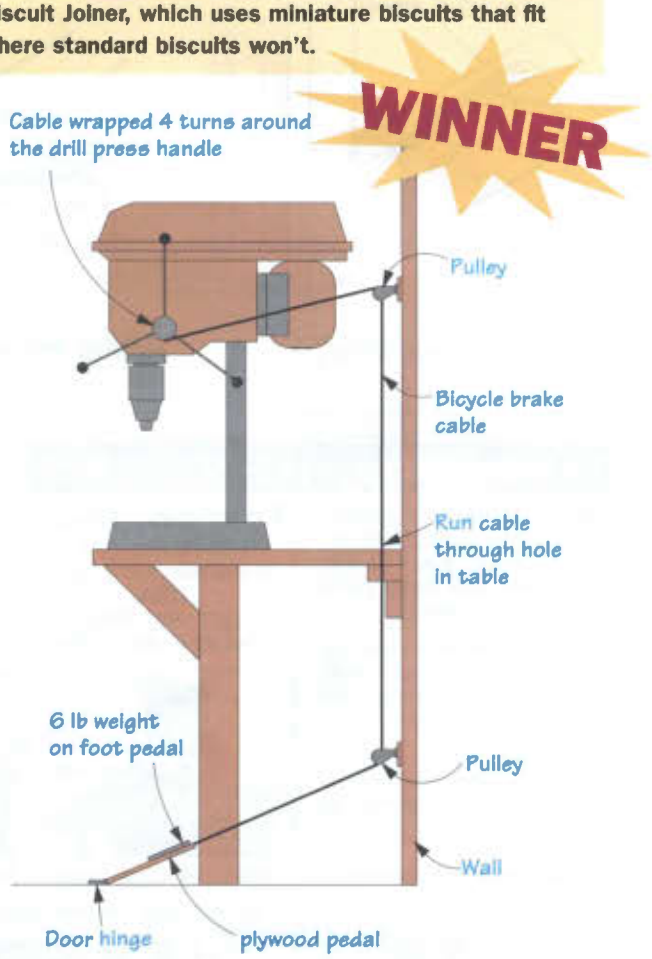
Holder for scroll saw blades.



Rubber washers.

TRICKS OF THE TRADE

Tricks of the Trade shares readers' ideas for making woodworking tasks easier and safer. Send your original, unpublished ideas to Tricks of the Trade, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207. If needed, please illustrate with a color photo or diagram. We pay $35 for each trick published; the best tip wins Ryobi's new Detail Biscuit Joiner, which uses miniature biscuits that fit where standard biscuits won't.



Hands-Free Drilling

I like to have my hands free to hold boards when drilling holes on the drill press, so I used bicycle brake cable and pulleys to rig a foot pedal for my bench top drill press. It works well for me, and with an 8" space between the pedal and floor I get about 4" of throw.

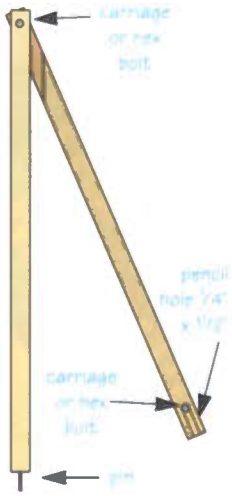
David Taylor
Dunville, Newfoundland

Sanding 'Glove' Fights Fatigue

When I use power tools that vibrate for long periods of time, my hands tend to swell, itch and tingle. One evening while working on a project and dreading another case of "sander hand," I noticed my bicycle gloves. The gel and padding in the palm of the glove insulated my hand from the vibration. And because the gloves have no fingers, they didn't affect my dexterity.

Norm Stewart
Lacey, WA

Scribe Huge Circles



From time to time in the workshop, the need arises to cut large arcs or circles out of wood. This can cause a problem as most compasses available to scribe these shapes are small. This compass can be made large enough to scribe any circle you want.

A jigsaw cut 2½" on the edge of the pencil side allows the end to compress and hold the pencil in place when you tighten the wing nut. Then glue a large pin from a craft store in place with epoxy or super glue on the opposite leg.

At the joint, make a cut 2½" long into the middle of each end, then clean out the waste on one side of each piece. This will give you an angle that allows the legs to close within 6" of each other.

Ron Watts
Kaysville, UT

Belt-Sand Small Pieces

Several years ago I purchased a Porter-Cable 3" x 21" belt sander. It wasn't long before I learned it was difficult to sand small items with it. Clamping the work was awkward (clamps had to be repositioned). So I made this jig to hold the sander upside down.

This proved satisfactory, so I also made a small jig for my ½ sheet sander. I've used these jigs for years and hope this information is useful for other readers.

Stan Lech
Bradford, TN

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. For a copy of issue #91, send $4.50 to Popular Woodworking • Back Issues • 1507 Dana Ave. • Cincinnati, OH 45207 • Ask for #58066.

THE LITTLE SHOP #5 THAT COULD

Corner Cupboard

This primitive design will look good in even the most modern homes.

I was charmed by the simple, naive design of this "primitive" corner cupboard when I first came across it in a book, *The Heritage of Upper Canadian Furniture*, which presents a wonderful collection of antique furniture authored by Howard Pain. The scalloped sides of the upper part make it special in my opinion.

And it's a safe bet the builder of the original wasn't a woodworker by trade and didn't have a shop full of tools. His limited tools give his project something in common with my version, produced in *Popular Woodworking's* "Little Shop That Could" (see editor's note below). But even my limited power tools would have seemed a miracle to the fellow who built the first one in the mid-1800s.

To construct this pine corner cupboard, I gave my circular hand saw a workout cutting the different angles required, finding this easier to use in conjunction with a straight-edge cutting jig instead of my small, benchtop table saw. To cut the curves, I used a compass saw, which left me with a bit of a sore hand before it was all over.

For materials, I bought seven 1 x 12 #2 Ponderosa pine boards that were eight feet long. For this project, I figured the knots were part of the overall look.

Begin by reviewing the project plans and Schedule of Materials. When you're ready to head for the shop, the first chore is gluing up three slabs made up of two eight-foot boards each. Two of the slabs are for the sides. The third is for the triangular-shaped tops, bottom and shelves. I found the "factory" edges on my lumber were fine for edge gluing. Although gluing wide stock together is contrary to sound woodworking principles because of the high potential for cupping and warping, I chose not to worry about it. Again, because of the primitive nature of the piece, this just lends a little more character to the finished piece.

STEP 1 Cut the Sides • Trim to square one end of the two glue ups. Then lay out the cut line for the angle of the upper sides. From the back edge, measure and mark out a line 21¾" to represent the width of this side (the other side is ¾" less wide because the first side overlays it in the back corner when assembled). Next, measure up 30" from the bottom at what will be the front edge. Now measure up from the bottom 76½" at the back edge, and in 12" (11¼" on the other piece) to establish the width at the top. Connect those lines and you've laid out the angle from the countertop to the top of the side.

STEP 2 Cut an Angle on the Lower Sides • At this point you need to

1 ANGLE THE SIDES • Use your circular saw and the straight-edge jig to first crosscut for the length of the side. Then reposition the jig to cut the angle. Use stop cuts where the angle and crosscut intersect.

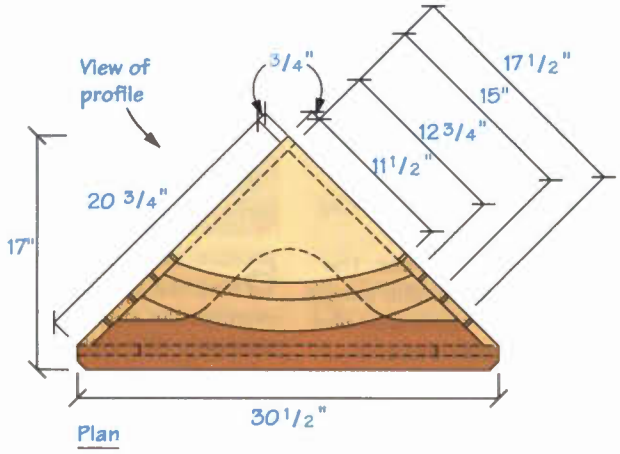
2 AN ANGLE ON THE FRONT EDGES • Use your table saw and clamp an auxiliary fence to your benchtop work table so that you can make the 45 degree cut on the front part of the sides.

CUPBOARD

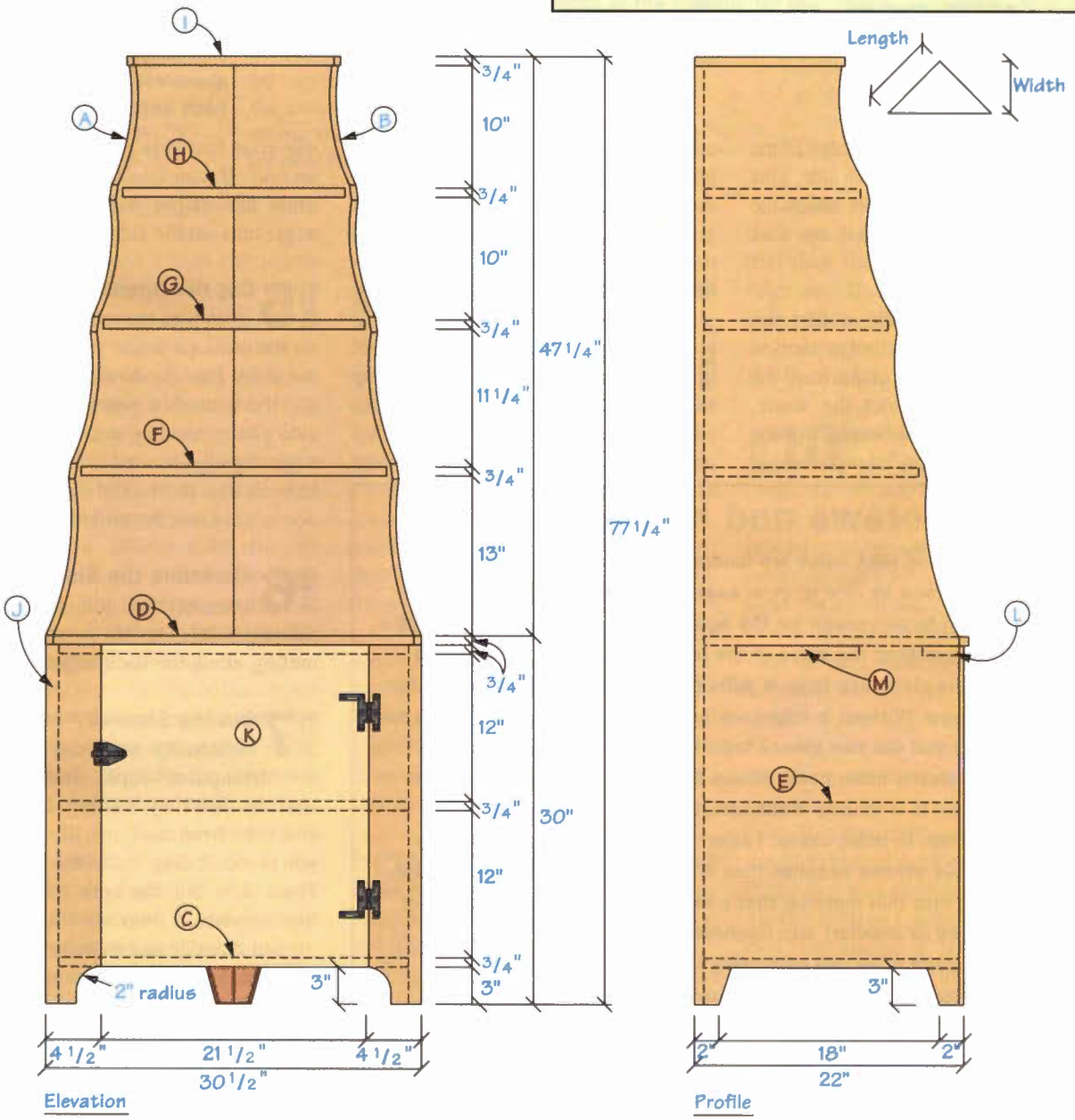
Schedule of Materials: Corner Cupboard

No.	Letter	Item	Dimensions T W L	Material
1	A	Side	3/4" x 21 1/2" x 76 1/2"	Pine
1	B	Side	3/4" x 20 3/4" x 76 1/2"	Pine
1	C	Bottom*	3/4" x 20" x 28 1/2"	Pine
1	D	Lower Top*	3/4" x 24" x 34 1/4"	Pine
1	E	Lower Shelf*	3/4" x 19 7/8" x 28 3/8"	Pine
1	F	Upper Shelf*	3/4" x 17 3/8" x 12 1/4"	Pine
1	G	Upper Shelf*	3/4" x 14 7/8" x 13"	Pine
1	H	Upper Shelf*	3/4" x 12 3/4" x 10 7/8"	Pine
1	I	Upper Top*	3/4" x 12 1/2" x 10 5/8"	Pine
2	J	Front Stiles	3/4" x 4 1/2" x 29 1/4"	Pine
1	K	Door	3/4" x 21 1/4" x 26 3/8"	Pine
1	L	Stretcher	3/4" x 3 1/4" x 28 1/2"	Pine
2	M	Cleats	3/4" x 3/4" x 8"	Pine

* Thickness x width x length of the side of the triangle.



Plan



Elevation

Profile

3 CUT THE FEET • Here's how to lay out the feet: First draw a line 3" up that's parallel to the bottom edge. On that parallel line, mark a point that's 4" in from the back edge of the side and mark another point that's 3¼" from the front edge. On the bottom edge of the board, mark a pencil line that's 3" from the back of the side and 2¼" in from the front. Connect the pencil marks.

4 MAKE THE SCALLOPS • Draw the shapes of the scallops using a piece of scrap that's thin, straight grained and bendable. Drive a nail at the beginning and ending point of the curve, place the piece of scrap between the nails, then bend it ⅞" back to the mid-point between the two nails. Strike the pencil line and your curve is drawn.

5 ROUNDOVER • Rout only the curves, leaving the short flat spaces between them square. The ⅜" roundover profile should be routed on the inside and outside of both sides, again, only on the curved scalloped shapes.

6 JOIN THE SIDES • Make sure the wider side overlays the side that's ¾" narrower. This will give you sides of equal width when put together. If you screw them together, first drill clearance holes and countersink. I used #8 x 2" drywall screws and placed one about every 18" along the back edge.

cut a 45 degree angle on the edge of the lower part of the front of each side. This angle will allow you to later attach the two front pieces that establish the door opening and the front feet.

STEP 3 Side Feet • These feet are made by cutting out a section from the bottom edge of each of the sides. Before cutting out the waste, drill a hole in the inside corners of the cut lines so that you can start your compass saw cut in these corners. Now cut away the waste. Keep your compass saw handy because you are going to need it to cut the scallops on the upper front edges before assembling the sides.

STEP 4 Cut the Scallops • Lay out the saw cuts for the scallop shapes following the diagram. You can either make a pattern, as I did, or lay out the shapes on one side only and use your first side as a pattern for the second. If you don't make a pattern, draw the shapes before making the angle cuts on the sides in step one.

STEP 5 Cut the Roundover • It's easier to rout the roundover profile on the scallops while you can still lay the sides flat. So do that before starting the assembly process. Clamp the side you're routing to a table with the edge slightly elevated or hung over the side so that the router's pilot bearing doesn't contact the table top.

STEP 6 Assemble the Sides • Begin assembly by joining together the two sides. Do this by screwing or nailing along the back edge.

STEP 7 Cut the Shelves • Most of the remaining assembly involves the triangular tops, bottom and shelves. Start by cutting the pieces you need from the third, glued-up slab you made. A diagram in the PullOut™ Plans lays out the cuts for the best lumber yield. I used my straight-edge jig and circular saw to make the angle cuts. In laying out the cuts on the board, be sure you account for the extra depth on the upper shelves and top that have a radiused front edge.

Also carefully lay out the countertop for the lower section, taking into account the extra width required for

Tips on screws and screwing

Clearance holes and pilot holes are fundamental techniques, but they're often not understood by new or even experienced woodworkers. A clearance hole is just large enough for the screw to pass through without the screw threads grabbing the sides of the hole. By allowing the screw to pass through the clearance hole, it pulls the opposing part to it when the screw seats down. Without a clearance hole, the threads are bound in each piece and can't pull the two pieces together when the screw tightens.

A pilot hole, on the other hand, allows the screw threads to grab the sides of the hole. It is usually made about the same size as the screw minus the threads. In most cases, I take the trouble to drill pilot holes when using brass screws because they are soft and prone to break. Also when screwing into thin material that's likely to split, or when screwing small screws (#6 or smaller) into hardwoods.

One reason I don't often use pilot holes is because I never use wood screws, opting instead for self-tapping screws, also called sheet metal screws. Wood screws are tapered, and act as a wedge when inserted in wood. Without constantly drilling pilot holes, the tapered design leads to splitting, especially in hardwoods. Because the self-tapping screw isn't tapered, and its threads are more course (further apart) splitting is much less likely. Screw sizes #8 and #10 suit 90 percent of wood shop applications.

7 MAKE THE PLATE GROOVE • Set the blade angle to 30 degrees, set the fence to 7/8" and make the first pass with the part face down and the side of the shelf running against the fence. Run both sides of the shelves. Next, reset the fence to the other side of the blade and position it so the next cut intersects the first at the point of the "V." The depth of the "V" should be about 3/8".

8 SUPPORT FOR THE COUNTERTOP • Cut the two 45 degree angles on the ends of the stretcher at the length given in the Schedule of Materials. Screw it in place so that when the 3/4" countertop is in place on it, the top is 30" up from the bottom of the sides. Place the two cleats the same distance up near the back corner.

9 ATTACH THE FRONT FEET • Nail and glue the two feet after checking the squareness and consistency of the opening for the door that these two front pieces will create.

10 FINISH • After stirring thoroughly, brush on the shellac/color mixture. I applied three coats to achieve the color and protection I wanted. Sand lightly between coats with 360 grit paper. You can sand and apply your next coat after 45 minutes.

the "ears" that lap over the sides at the front. To form the "ears," use your table saw and make a stop cut on one side. On the other side, you must locate the piece over the lowered blade so that when the machine is turned on and the blade raised, it starts the cut at the desired location near the front edge. Make these table saw cuts first, then make the short cut with the grain 3/4" deep and 1 3/4" in and parallel to the front edge using a hand saw.

If I had a 3/8" cove bit for my router, I would have made the plate grooves in the shelves using it. Instead, I cut them using the table saw.

To complete making the upper shelves, you must cut the radius on the front of two of them and the top, and cut the shape of the lowest shelf in the upper section. To make the curves on the upper shelves and top, use the bendable stick and nails method described earlier. Place a nail at the proscribed side length of the shelf, then bend the stick out 2" and draw the pencil line. Cut the curve with a compass saw or jig saw.

To make the lowest upper shelf that curves inward, draw lines that are parallel to each side 4" in from the edges. Then draw a 3" diameter circle at the back where the two lines interest and at the front where shelf's front edge and the 4" line returns back. Now cut away the inside shape.

STEP 8 Attach the Countertop and Bottom • The next step is to attach the bottom and the stretcher and cleats that support the countertop. To attach the bottom, drill clearance holes for the bottom that allow it to set up 3" on the sides, then screw it in place. Attach the stretcher and cleats that will support the countertop. Once done, presand the countertop with 120 grit then screw the countertop in place up through the stretcher and cleats.

The upper shelves are simply screwed in place through the sides at the locations given in the diagram. The top is placed on top of the sides and screwed down. Once in place, I cut the front corners of the top back about 5/8" so they didn't stick out so far.

STEP 9 Make the Door and Front Feet • The front feet have a 2" radius that starts 1" up from the bottom edge and 2 1/4" in from the outside edge.

The flush inset door is then cut to size and mounted in the opening. I found a nice pair of H-L hinges which, because they install on the outside surface, were a breeze to install. The latch/pull combination matched the style of the hinges perfectly.

Before sanding and finishing, cut the corners of the lower countertop so that they first are square to the front edge and flush to the outside of the side. Then clip the corner at a 45 degree angle that starts 3/4" back from the front edge.

STEP 10 Sand and Finish • To sand and finish, unscrew all the upper shelves and top, remove the door and door hardware as well. This takes a few minutes but makes the job so much easier that it's well worth the trouble. Give the entire piece a thorough going over with 120 grit paper using a random orbit sander. Ease or break all edges, softening them generously.

For a finish, I wanted to add a bit of color without worrying about stain blotching on the pine. That meant a penetrating stain was out of the question. To achieve the color without risking blotching, I used orange shellac by Parks that was already mixed in a can. To the shellac I added brown aniline dye. The recipe is 16 oz. (two cups) shellac and 8 tsp. Tru-Tone brown dye by Dayco. The liquid aniline color is available in many paint stores.

If you try my finish, send me a picture. I'd like to see how your cupboard turned out! **PW**

—Steve Shanesy, PW staff

Outdoor Materials

Informed choices make a lasting difference between a deck chair and a chunk of rotting lumber.

Choosing materials for outdoor projects is a bit of a balancing act. Sure, you can use inexpensive pine. But unless you paint it every couple years, it will rot. Or you can use durable teak — as long as you get a loan approved from the bank first.

Besides choosing the wood, you also have to consider what type of fasteners to use. Some metals react to the tannins in the wood and make ugly black stains on your project. Other fasteners will simply rust away to nothing.

There's a wide selection of outdoor adhesives, too. These can be complicated to use, messy or both.

And finally, you have to decide what type of finish to use. Some woods can go *au naturel* on your deck. Others must be painted. And some can be stained and protected with a spar varnish or urethane.

Because this issue emphasizes outdoor projects, we thought it might be helpful to share our experience with exterior-grade materials so your outdoor projects can be enjoyed for years to come.

Wood

If expense is an issue, douglas fir is one wood to consider. This reddish-brown wood is widely used in building construction and is relatively knot-free. However, it will rot faster than other outdoor woods and probably should be painted if it's headed outside.

A popular wood for building decks is pressure-treated southern yellow pine. It resists rot and decay thanks to chemicals that have been forced into the wood, which make the wood a not-so-tasty lunch for fungus and insects. However, because of these chemicals, we think it's unwise to use this lumber with any of the projects in this issue.

Western red cedar, cypress and redwood are a little more costly, but they are all hardy woods that can be left on the back deck for several seasons without a protective coat. They finish nicely and will last even longer outside with a protective coat of varnish.

White oak is another fine wood for exterior use. Left untreated outside, it will turn grey or silver, like most woods. When choosing materials, avoid white oak's cousin, red oak. Unlike white oak, red oak has an open cellular structure. This means the vessels in red oak that run the length of the board act like drinking straws, sucking moisture into the wood that will ultimately rot your project.

And finally, the expensive but nice woods for outdoors are mahogany, teak and even walnut. These durable woods

finish beautifully with oil and an exterior-grade varnish or urethane, or they can be left natural. However, in the Midwest, expect to pay about $5.50 a board foot for mahogany and $15 a board foot for teak. White oak, by comparison, costs about $4 a board foot. Cedar, about $2.

Some of the adhesives, fasteners and woods that are available for outdoor use.

Adhesives

There are basically five common types of adhesives for outdoor projects, according to Dale Zimmerman, a technical specialist with Franklin International, which makes Titebond glue and other adhesives. These five types fit into two broad categories: Type I and Type II. Type I adhesives resist heat, cold and moisture. Type II adhesives resist mostly moisture.

Resorcinols: These Type I adhesives are probably the best choice for outdoor wood joints, says Zimmerman, a member of *PW*'s editorial advisory board. However, they are inconvenient to work with because they come in two parts that must be mixed together. They also are reddish or purple, which means your glue line is going to be dark in color. (This dark glue line is a giveaway when inspecting layered laminated plywood for use outdoors.)

Polyurethanes: Another adhesive from the Type I family, polyurethanes can be used for bonding woods, plastics and metals. They are not as temperature resistant as resorcinols, but they are easier to use because there's no mixing involved. After they dry, the squeeze out is foamy and hard, much like aerosol foam insulation you can purchase at the hardware store.

Cross-link vinyl aliphatics: This Type II glue, marketed under the name Titebond II™, is user-friendly because it has only one part and holds up outside well, Zimmerman says.

Urea-formaldehydes: Another Type II adhesive, urea-formaldehydes, such as DAP's Weldwood Plastic Resin Glue™, make a nice water-resistant bond. However, the adhesive comes in a powder form that has to be mixed with water.

Epoxys: These Type II glues come in two parts that must be mixed together, but they have one distinct advantage over many other types of adhesives: They fill gaps. Other glues must have a cabinet-quality fit to make a solid joint because the adhesive shrinks during drying. Epoxys have little or no shrinkage when they dry. (One notable exception to this is the polyurethane glues, which actually expand as they dry.)

Mechanical fasteners

Many woodworkers prefer not to use adhesives on their outdoor projects and opt for screws or nails instead. Avoid nails and screws made from iron. Tannins in the wood will react to ferrous materials and stain the wood.

Instead, use brass, zinc-plated steel, galvanized steel or — better yet — stainless steel. Also worth noting is that except for decking nails, regular nails will rust away to nothing when left outside. A good rule of thumb here is to read the box that your screws and nails came in to make sure they're intended for outdoor use.

Finishes

If you're using an inexpensive wood such as pine or fir, you probably should use an exterior paint and add a fresh coat every couple years to prevent rot.

On the hardier woods, you can leave them outside without a finish, though this will shorten the life of your outdoor projects by several years.

Your best option is to coat the project with a finish. Varnish made with a high percentage of oils is commonly called "spar" or "marine" varnish and is a good choice for outdoor use. The most popular type of varnish is polyurethane. Regular urethane will peel off in the sun, however, so make sure you purchase urethane that is resistant to ultraviolet radiation. It costs a bit more, but it's worth it. Finally, don't forget that all varnishes will give your projects a yellow cast.

Also keep in mind that standard interior urethane just isn't strong enough to keep Mother Nature away — and that's the single biggest goal when building outdoor furniture. **PW**

—Christopher Schwarz, PW staff

Plastic Myth

Though polyurethane is overkill for many finishing projects (Are you really going to bowl on that coffee table?), it is often disparaged as being a "plastic" finish. What might surprise you is that almost all film finishes — with the exception of shellac — are made from plastic. (Shellac, if you must know, is a natural resin that is secreted by the lac bug in northern India.)

Phenolic-resin varnishes — the first synthetic varnishes — are made of the same stuff used to make the first plastic radio cases. Conversion finishes are made from amino resins, which are used to make plastic laminate. And acrylic resins, used in water-based finishes, are used to make plexiglass.

Another common myth about polyurethane is the name you read on the label. Pure polyurethane finishes come in two parts that must be mixed together. What you usually buy at the hardware store is an alkyd varnish that is modified with polyurethane resin.

— Understanding Wood Finishing *by Bob Flexner*

Magic Flower Tower

Here's a homemade hanging flower pot project that will make your porch or patio the envy of the neighborhood. And while you don't need one stick of wood to make the project, a few of your woodworking tools are necessary.

Begin with a length of 6" ID PVC sewer pipe and another length of 1" ID PVC pipe. Cut them to the lengths provided in the Schedule of Materials. The rest of the project requires only a little bit of layout and hole drilling. In all, you'll be done in an hour or two.

You will need to drill six rows of 7/8" diameter holes along the length of the sewer pipe with alternating rows of three and four holes. First lay out the lines along which you'll be drilling. Take the total circumference of the pipe and divide by six. It should be about 3½" between lines. Use your combination square to project the line up the pipe once you've arrived at the dividing points.

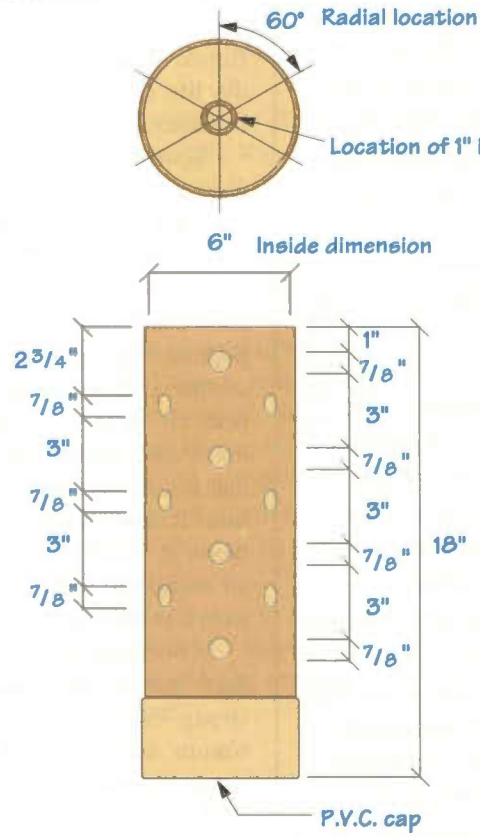
Now lay out the hole drilling locations following the diagram. Drill your holes using an ordinary spade bit chucked in a drill press if you have one. Otherwise, just use a drill. It's best to use a simple "V" block to hold the pipe while drilling to prevent it from turning. A vise would also work. When finished, drill two more 1/8" holes near the top for the wire that will hang the pot. Your work on this part is done as soon as you glue the end cap on the bottom end of the pipe. Use regular PVC adhesive and follow the manufacturer's instructions.

The purpose of the 1" pipe is to water the plants deeply and evenly throughout the length of the hanging pot. Drill a series of 3/16" holes spaced every 2" up and down four rows on the sides of the pipe.

When planting time comes, place the 1" pipe in the center of the sewer pipe and add potting soil around it. When you reach the first 7/8" holes, place a young flowering nursery plant through the holes, add more potting soil, tamp down, then proceed to the next level of holes. Repeat the process until you reach the top. If you like, add a couple plants on top. To water, fill the center pipe with water. Occasionally use liquid fertilizer during the growing season. Soon you'll have a bloomin' hanging pot the likes of which you've never seen!

—Steve Shanesy, PW staff

Diagram



Schedule of Materials: Hanging Flower Tower

No.	Item	Dimensions	Material
1	Pot	18" long x 6" dia.	6" PVC
1	Water Pipe	18" long x 1" dia.	1" PVC
1	Bottom	6" dia.	6" PVC cap

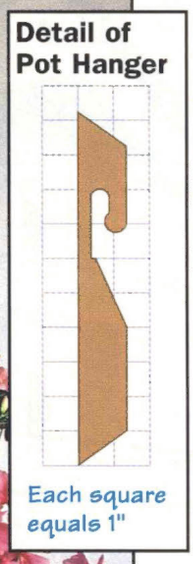
Flower Pot Hanger

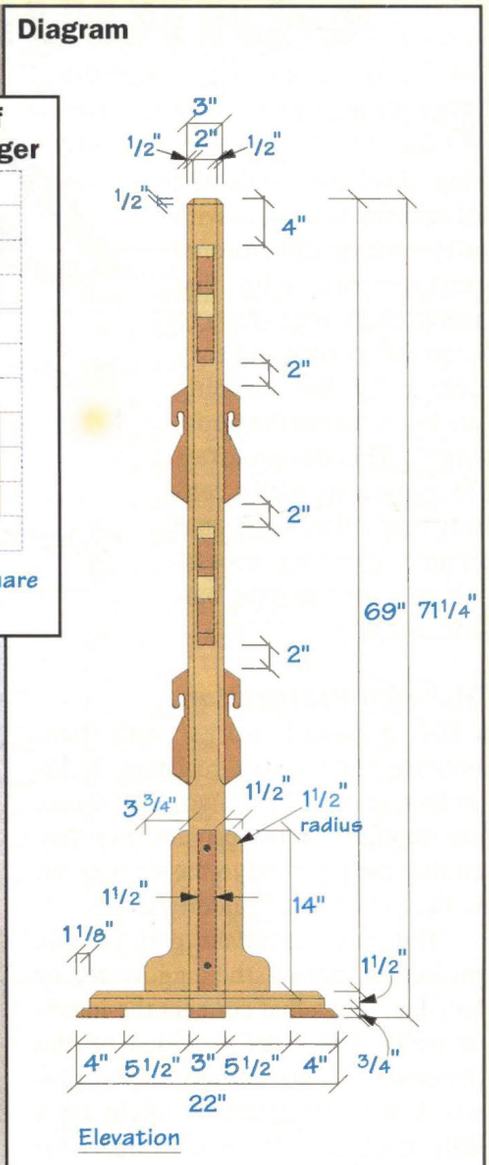
The Arts and Crafts style stand shown here is just one of the places you can attach this simple band-sawn pot hanger. Use it to hang 6" terra-cotta flower pots on all sorts of surfaces, such as fence posts, deck supports, trees or even the sides of your house or garage.

This stand was built with construction grade western red cedar for less than $20. For other suitable outdoor woods, see the Outdoor Materials article.

The hangers are made from 1 x 2 stock, 10" long and cut to the full-size pattern in the PullOut™ Plans. Crosscut the 60 degree angle on eight of them using the same saw setup. Do this by turning the stock 180 degrees after each end cut.

To build the free standing post, cut the parts given in the Schedule of Materials. The only joinery used is a lap joint for the cross pieces that make up the base. Use a dado set to cut notches centered on each piece that are exactly the width of your stock and half the thickness. Before gluing the base together, route the chamfers on the ends of these pieces and return the detail back along the sides, stopping short of the notch for the lap joint. Also chamfer one end of the block or foot that goes below them. When done, glue the base pieces together with an outdoor glue.





Schedule of Materials: Flower Pot Post & Hanger Stand

No.	Item	Dimensions T W L	Material
1	Post	3" x 3" x 69"	Cedar
4	Corbels	1½" x 3¾" x 14"	Cedar
2	Base supports	1½" x 3" x 22"	Cedar
4	Base blocks	¾" x 3" x 4"	Cedar
8	Pot Hangers	1½" x 1½" x 10"	Cedar

While this subassembly dries, route the chamfer profile on the post's long edges from the top to a mark 18" from the bottom. When this is done, chamfer the top of the post.

Now cut out the shapes of the four lower corbels that support the post. The shape is such that you can nest them together and yield all four 14" long pieces from a three-foot length. When done, chuck a ¼" cove bit in your router and shape this profile on the curved sides of the corbels, stopping two inches from the top and bottom.

Now drill and countersink holes to attach the corbels. These should be the appropriate length for the screws you are using. Drill holes through the width of the corbels to attach them to the post. Then drill through the underside of the base to secure it to the corbels. For good measure, drill a clearance and pilot hole for a ¼" x 3" lag screw through the center of the base and post.

To assemble, first screw the base to the post using the lag screw and a fender washer. Now screw each corbel to the post and then through the base into the bottom of the corbel. This will give you a stout connection.

To complete, screw the pot holders to the post as shown in the diagram.

—Steve Shanesy, PW staff

Purple Martin Condominium

Purple martins are very sociable birds, preferring dwellings with lots of apartments, each with very specific dimensional requirements. With that many birds, ventilation to keep things cool and easy access for fall cleaning are important to the birds' health. This design offers 24 apartments with a central ventilation shaft, and simple cleaning access. All this and private balconies too!

Material Preparation

CDX plywood works well here because it's weather resistant, lightweight and strong. Two $10 sheets are enough for the project. Start by cutting the plywood to the sizes given in the Schedule of Materials.

The most involved part of this project is cutting the egg crate, or half-lap, joints that connect the interior walls. The sizes provided on the Schedule of Materials are for 3/8" plywood, but your material might be a little thicker or thinner. Either way, the exterior dimensions are the same, but consider the material thickness and adjust the half-lap joint cut locations accordingly.

Use a dado set to make the cuts with the piece flat on the saw and backed by a miter gauge. Clamp a stop block on your rip fence to limit the cut to the needed 3". Allow the radius of the kerf to go slightly beyond 3".

The 2 1/2" entry holes are cut into the exterior walls, centered on each apartment space. An adjustable circle cutter works well for this step.

Next, use a 3/8" drill bit to make a ventilation hole through the back wall of each apartment, as close to the top of the wall as possible.

Then switch to a 9/32" bit and drill the railing clearance holes in the outer edge of the "porch" dividers, 1 1/2" up from the floor and 1/2" in from the outside edge of the wall.

To form the roof peak, rip one long edge of each roof piece on the table saw with the blade set for a 27 degree angle.

Lay out the triangular gables as shown and cut them out. Each gable gets a 1" vent hole centered about 1/2" down from the top peak. Before assembling the roof, staple a piece of screen over these holes to keep out unwanted guests (such as wasps).

Next, cut out 10" x 22" rectangular holes centered in both the upper level floor and the roof floor. These, in conjunction with the vent holes, allow hot air to escape.

Assembly

Begin by dry assembling the egg crate wall sections, then use a waterproof glue such as Titebond II on the seams. Next fasten the corners of each level. I used 1/4" x 1 1/4" staples in an air gun to staple all the plywood pieces. The exterior-grade paint job will protect the staples from rusting.

Now, turn the egg crate sections over and, using glue and staples, fasten each of the floors to the wall sections.

The roof is assembled by first gluing and stapling the gables to the roof sides, one at a time, paying special attention to the peak joint. I used a bead of weatherproof caulk at the joint to help seal the roof. Now flip the roof

Make Purple Martins Feel Welcome

One of the delightful things about insect-eating purple martins is that they return to the same nest year after year. The trick then is to attract them and keep them happy.

Your martin house should be at least 40 to 60 feet away from trees that are taller than it is. Erect the house away from shrubs or wires that could hide or be used by predators. Mount your martin house on a pole keeping it at least eight feet above the ground. A telescoping pole is best to make it easy to maintain the house. If other species of birds take up residence before purple martins arrive, evict them, otherwise your martins will go elsewhere. While the martins are away for the season, keep the holes plugged (paper cups work nicely) until about four or five weeks before they are scheduled to arrive.

over and glue and attach the roof floor.

Assemble the support frame as shown in the diagram, using a half-lap joint at the center. Then screw the finished frame to the bottom of the first floor, screwing through the floor into the frame.

Next, cut out and shape the railing corner posts, drilling a 3/8" deep x 9/32" hole on two adjoining faces to accept the railings.

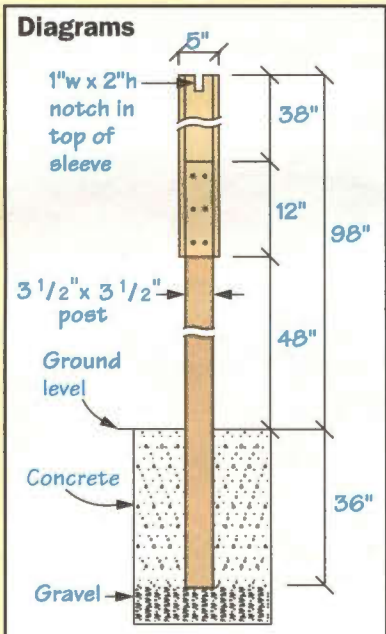
Cut out the eight indexing blocks and the two gable overhangs. The blocks are screwed to the floors' bottom just to the inside of where the corners of the walls below meet. These blocks connect the levels so they won't shift in a strong wind. They also allow the roof and second story to be easily removed for cleaning (or for evicting unwanted species from your bird house).

Leave the railings, railing posts and gable overhangs loose until after painting. Though spray paint might seem like a time-saving idea, I found it doesn't cover well, even with multiple coats. Use exterior-grade brush-on enamel instead. After the paint is dry, attach the gable overhangs using finish nails, and screw the railing posts in place through the floor. Attach the railings as you go.

The support post is made of a hollow sleeve and a section of 4 x 4 **(see diagram below)**. The sleeve fits around the center joint of the support frame and screwed in place. Then screw the sleeve to the top of the 4 x 4, overlapping the two as shown. The screws can be removed to lower the martin house for periodic maintenance or cleaning.

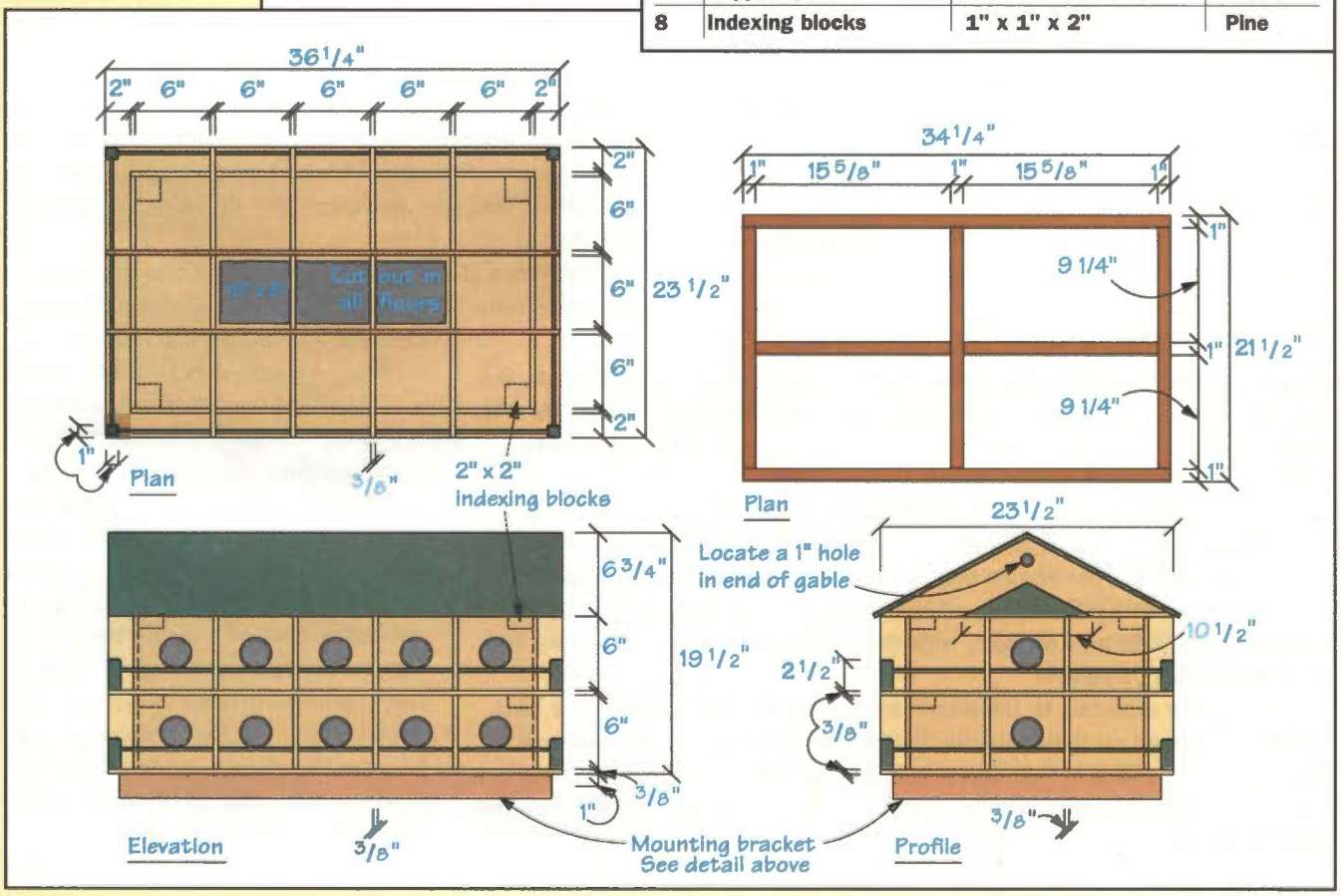
— David Thiel, PW staff

Diagrams



Schedule of Materials: Martin Condo

No.	Item	Dimensions T W L	Material
2	Floors	3/8" x 23 1/2" x 36 1/4"	Plywood
1	Roof floor	3/8" x 23 1/2" x 34 1/4"	Plywood
4	Walls	3/8" x 6" x 36 1/4"	Plywood
4	Walls	3/8" x 6" x 32 1/4"	Plywood
8	Walls	3/8" x 6" x 23 1/2"	Plywood
4	Walls	3/8" x 6" x 18 3/4 "	Plywood
2	Roofs	3/8" x 14" x 36 1/4"	Plywood
4	Gables	3/8" x 6" x 23"	Plywood
2	Gable overhangs	1 1/2" x 2 3/4" x 10 1/2"	Pine
8	Railing posts	1" x 1" x 2 1/2"	Pine
4	Railings	1/4" x 35"	Dowels
4	Railings	1/4" x 22 1/4"	Dowels
2	Support frame pieces	1" x 2" x 34 1/4"	Pine
3	Support frame pieces	1" x 2" x 19 1/2"	Pine
1	Support frame piece	1" x 2" x 32 1/4"	Pine
2	Support sleeve sides	3/4" x 5" x 50"	Pine
2	Support sleeve sides	3/4" x 3 1/2" x 50"	Pine
1	Support pole	3 1/2" x 3 1/2" x 96"	Pine
8	Indexing blocks	1" x 1" x 2"	Pine



Potting Bench

I don't think I've ever made a piece of furniture faster or more easily than this potting bench. Within half a day you can turn four frames, four legs and a bunch of slats and screws into a great gardening workbench.

Material Preparation

Cedar works great for this bench because it's weather resistant, lightweight, looks good unfinished and comes pre-cut in handy sizes. I used 10 eight-foot 1 x 8s and a small piece of plywood scrap for the entire project. Materials cost about $65, including a box of stainless steel #6 x 1¼" decking screws.

The 1 x 8s give an efficient yield of 7" widths after ripping off the rounded and chipped factory edges. I didn't bother to plane the framework pieces, opting to leave the ¾" rough finished thickness, but I planed the bench top and shelf slats to ⅝" to create a smooth working surface.

The next step was to rip and cross-cut the piece to the sizes listed in the Schedule of Materials.

Assembly

If you've ever framed a stud wall, this bench is a snap. Start by marking layout lines on all eight front and rear frame pieces dividing the 45¾" (minus 3" for the four cross pieces) into three sections as shown. Next screw the eight 19¼" cross pieces between four of the front and rear frame pieces to form the work surface and lower shelf. Use two screws per joint, and pilot drill the holes to avoid the splits that cedar is known for.

Next screw the remaining two sets of four cross pieces between their front and rear frames to form the top and middle shelves.

When I made this bench I waited until after the frames were assembled to the legs to mount the slats, but to avoid crawling around and drilling at odd angles, I'd suggest that you attach the slats to the frames before assembly.

Start with the shallow 6" top frame and screw two of the shorter slats to the frame, leaving no gap between them. While all other horizontal surfaces on the potting bench has gaps between the slats, it's sometimes nice to know you can set a small object down and not have to chase it across the floor.

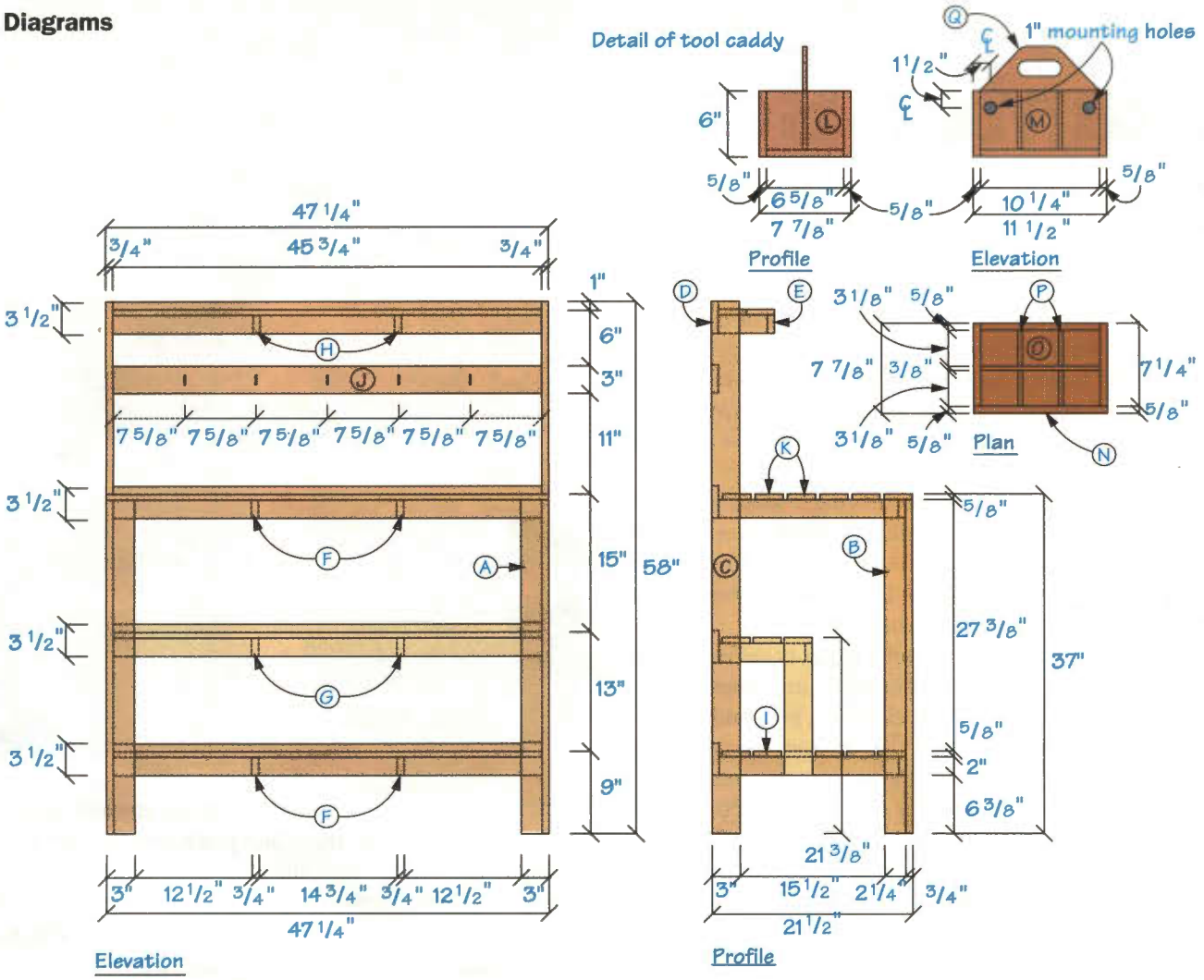
Tool Caddy an Extra Touch

To jazz up the bench, I added a tool caddy that attaches to the bench. You can use it while working at the bench and then slide it off the dowels and take it with you to the garden. In fact, the caddy can easily be built to attach to an existing garden bench.

The caddy assembles as a simple box with the back and bottom captured between the sides, and the front applied to the sides and bottom. The handle and divider pieces pieces are cut to size and then notched to form half-lap joints offering six compartments. The handle is shaped as shown in the diagrams at right, with the handle formed by connecting two 1⅜" holes with a jigsaw.

The caddy attaches to the bench by drilling two ¾" holes in the back of the caddy and on two matching holes in the end of the work surface frame. A 2½" piece of ¾" dowel is then glued into the holes in the bench side, and the caddy slips over the dowels with the top edge just below the slat overhang.

Diagrams



The work surface and middle shelf each get a short slat at the back edge, and then the rest of the depth is filled out with the longer slats (two on the middle and five on the work surface shelf). Leave a 1/2" gap between each slat, and a 3/4" overhang on both sides of the frames. Leave the front slat off the work surface shelf until the bench is assembled because this slat is flush to the front edge of the legs.

Attach the slats to the bottom shelf in the same manner, making sure the ends of those slats are flush to the edges of the frame, unlike the slats on the work surface.

With the shelves assembled, lay the two rear legs and the two 2 1/4" legs together and mark layout lines to indicate the location of the four shelves, (as given on the diagrams), across the four legs. Then screw the two 2 1/4" front legs to the two 3" front legs to form two 3" x 3" legs.

Screw the four legs to the four frames where marked, then screw the tool support between the two rear legs as shown in the diagram.

Screw the last slat into place on the work surface and add the hooks for hanging tools, spacing them evenly (or as desired) across the tool support.

And that's it. The simple frame and leg construction not only works well for gardening, but it makes a handy bench for the shop as well.

— David Thiel, PW staff

Schedule of Materials: Potting Bench

No.	Item	Description	Dimensions T W L	Material
2	A	Front legs	3/4" x 3" x 36 3/8"	Cedar
2	B	Front legs	3/4" x 2 1/4" x 36 3/8"	Cedar
2	C	Rear legs	3/4" x 3" x 58"	Cedar
4	D	Rear frame pieces	3/4" x 3 1/2" x 45 3/4"	Cedar
4	E	Front frame pieces	3/4" x 2" x 45 3/4"	Cedar
8	F	Frame cross-pieces	3/4" x 2" x 19 1/4 "	Cedar
4	G	Frame cross-pieces	3/4" x 2" x 9 1/4"	Cedar
4	H	Frame cross-pieces	3/4" x 2" x 5 1/4"	Cedar
10	I	Slats	5/8" x 3" x 45 3/4"	Cedar
1	J	Tool support	5/8" x 3" x 45 3/4"	Cedar
7	K	Slats	5/8" x 3" x 47 1/4"	Cedar
2	L	Tool caddy sides	3/4" x 6" x 7 1/4"	Cedar
1	M	Tool caddy back	3/4" x 6" x 10 1/4"	Cedar
1	N	Tool caddy front	3/4" x 6" x 11 1/2"	Cedar
1	O	Tool caddy bottom	3/4" x 6 5/8" x 10 1/4"	Cedar
2	P	Caddy dividers	3/8" x 5" x 6 5/8"	Plywood
1	Q	Caddy handle	3/8" x 9" x 9 1/4"	Plywood

Five Gallon Planter Box

Classing up your deck can be inexpensive and easy by making a few of these simple planter boxes designed to hold five gallon buckets.

Wood selection is a two-fold process for this project. First, the wood should hold up to the forces of nature (see Outdoor Materials elsewhere in this issue for guidelines). Second, the lumber needs to be inexpensive, so we used the featured Wood Type for this issue: American alleewood. We found alleewood in cypress and white oak, both excellent for outdoor use.

First, mill your lumber to the sizes specified in the Schedule of Materials. Next, glue up the frames using #0 biscuits at the joints. We used outdoor safe polyurethane glue. While the glue dries, cut the shiplap rabbets for the frame panels as shown in the diagram detail.

Now use a hand plane to put a slight bevel on the outside long edges of the slats. The slats are fastened to the frames with screws, so drill a clearance hole and countersink on the inside of the slats 3/8" in from the edges, one hole on each end, and two on the sides of the outside slats.

After removing the squeeze out, attach the slats to the frames. On the backside of each frame, mark a line parallel to the top of the opening that's 3/4" in from the frame opening. This is your guide for mounting the slats. Start on one side and use a 1/16" spacer in the joint between the slats as you attach each piece with brass #6 x 3/4" screws.

While you're attaching things to the frames, fasten the cleats. First cut a 45 degree miter on both ends of each cleat, and screw one flush to the top of each frame, centering in the case of the wider frames. Repeat this process flush to the bottom of the two wider frames, but leave the bottom cleats off the two narrower frames for now.

The four bottom slats are screwed to the two bottom cleats as shown in the diagram. This makes the bottom removable. Screw the bottom assembly onto the two shorter sides, then edge glue the four frame assemblies and clamp together.

If you clamp away from the top edge, you can miter the caps and glue and nail them into place (flush to the interior edge of the cleat) while the glue is drying. All that's left is a little sanding, some stain and a coat of outdoor finish.

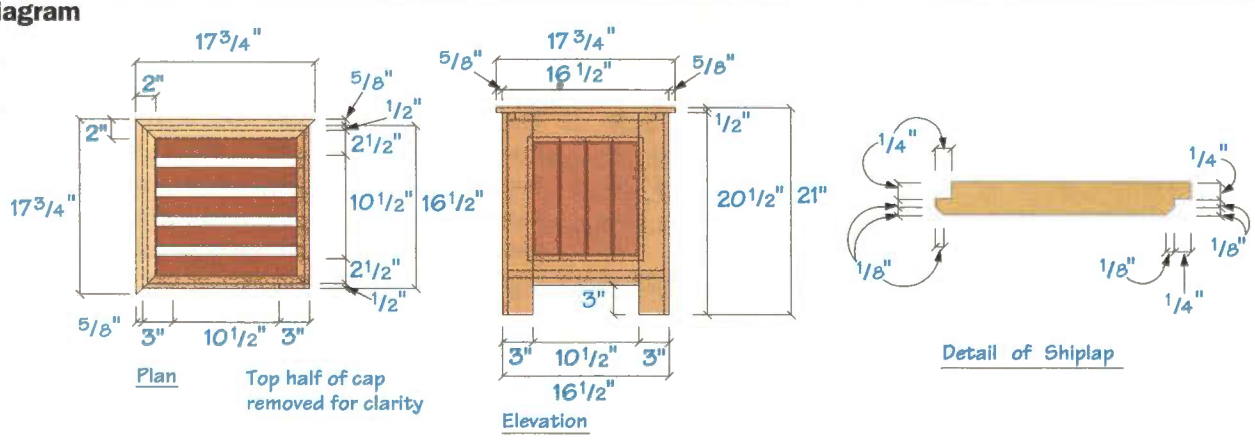
—David Thiel, PW staff

Schedule of Materials: Planter Box

No.	Item	Dimensions T W L	Material
4	Legs	1/2" x 3" x 20 1/2"	Cypress*
4	Legs	1/2" x 2 1/2" x 20 1/2"	Cypress
8	Rails	1/2" x 3"x 10 1/2"	Cypress
4	Caps	1/2" x 2" x 17 3/4"	Cypress
4	Bott.	1/2" x 3" x 15 1/2"	Cypress
8	Slats	1/2" x 2 15/16" x 13 1/2"	White Oak*
4	Slats	1/2" x 3 5/16" x 13 1/2"	White Oak
4	Slats	1/2" x 3 13/16" x 13 1/2"	White Oak
8	Cleats	3/4" x 3/4" x 15 1/2"	White Oak

*Both materials were from discarded pallets.

Diagram



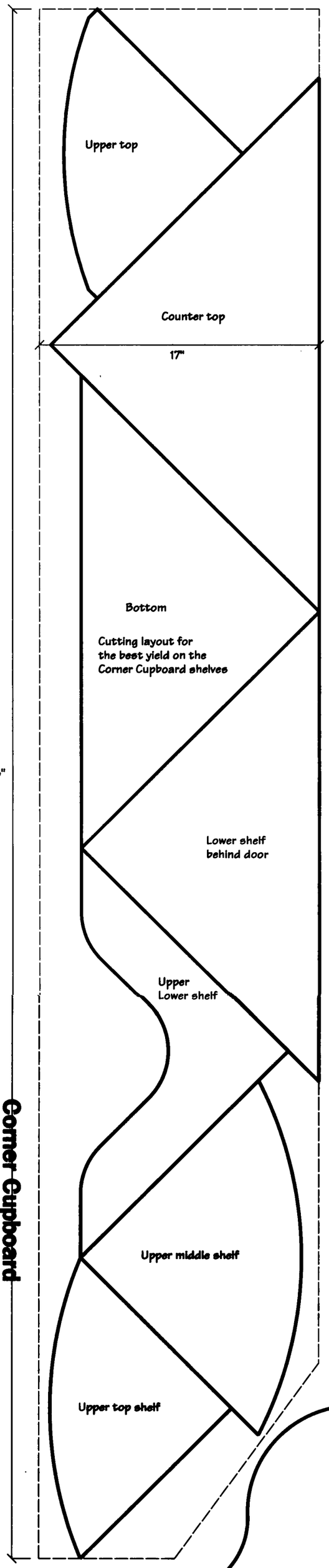
PullOut™ Plans **#96**

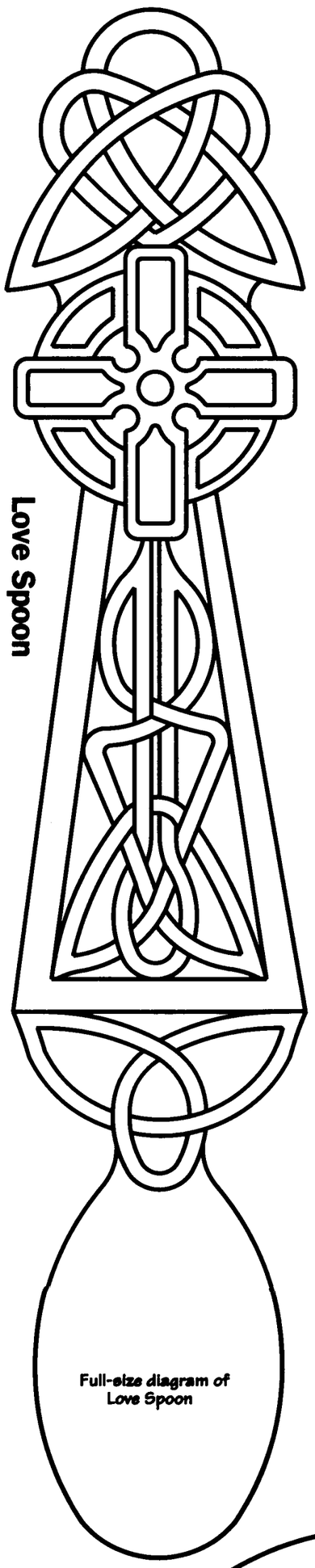
Popular Woodworking

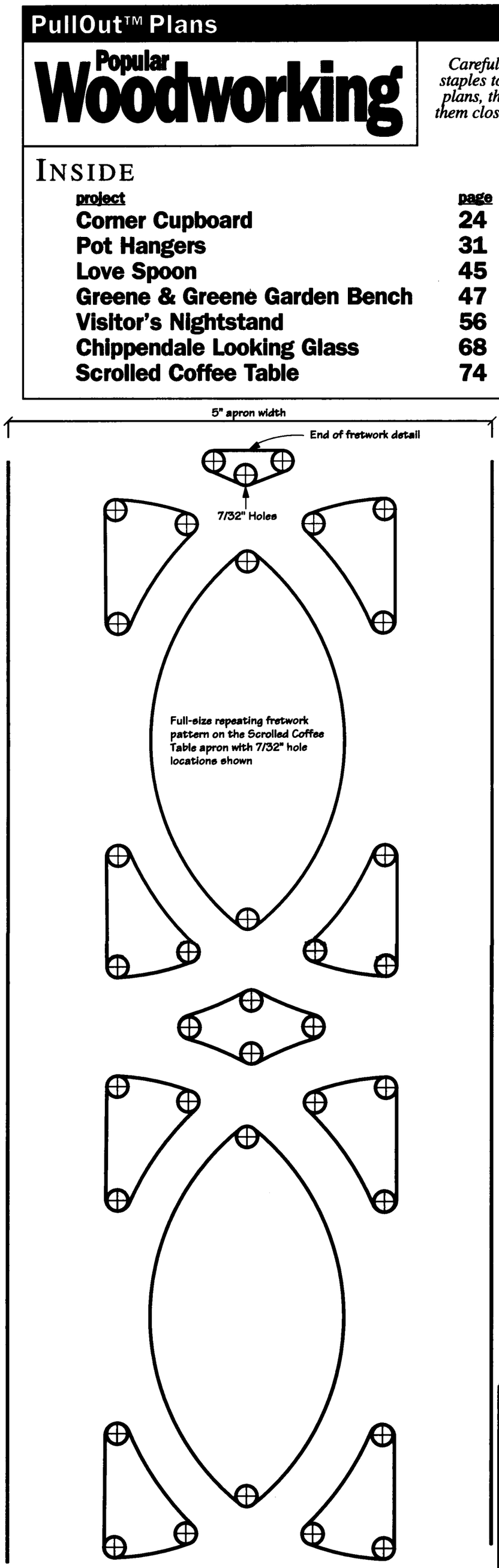
Carefully open staples to remove plans, then bend them closed again.

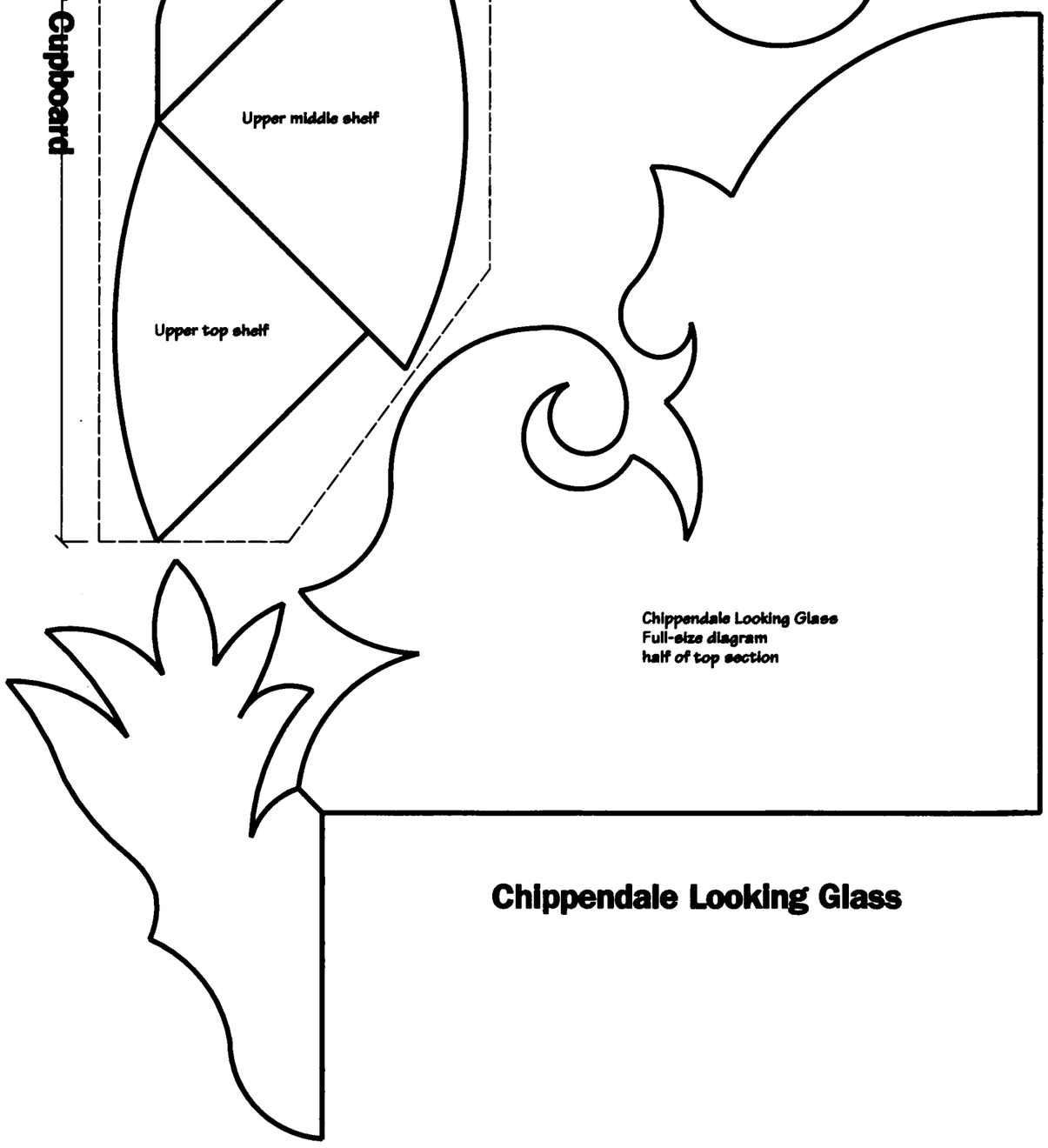
INSIDE

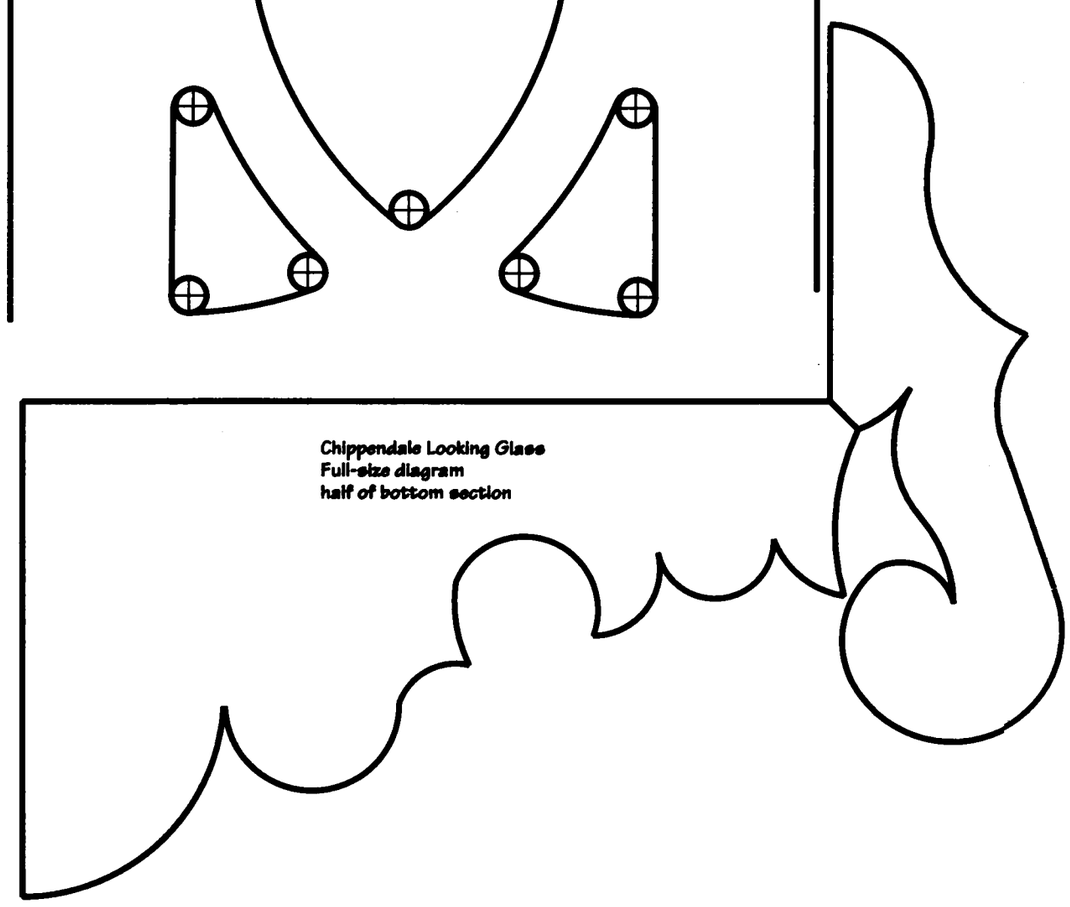
project	page
Corner Cupboard	24
Pot Hangers	31
Love Spoon	45
Greene & Greene Garden Bench	47
Visitor's Nightstand	56
Chippendale Looking Glass	68
Scrolled Coffee Table	74





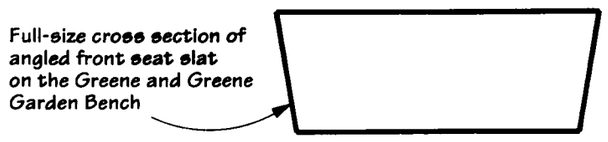




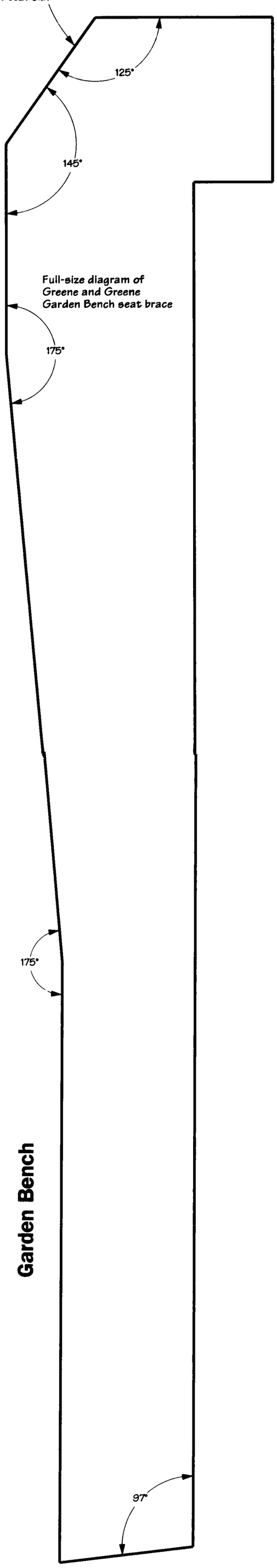


Garden Bench

Full-size cross section of angled front seat slat on the Greene and Greene Garden Bench



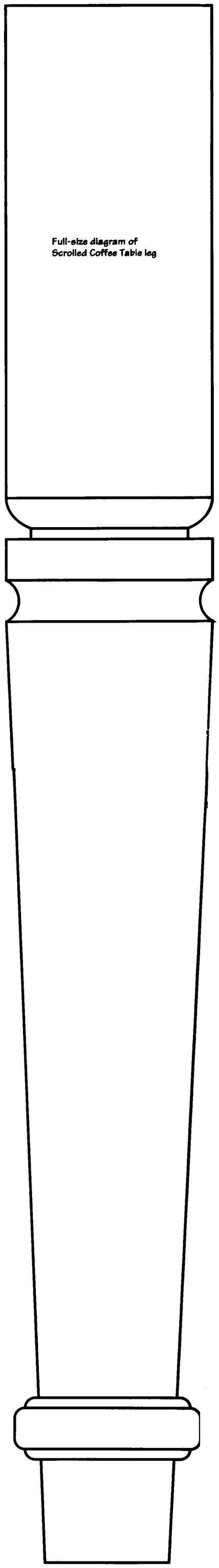
Location of angled front seat slat



Full-size diagram of Greene and Greene Garden Bench seat brace

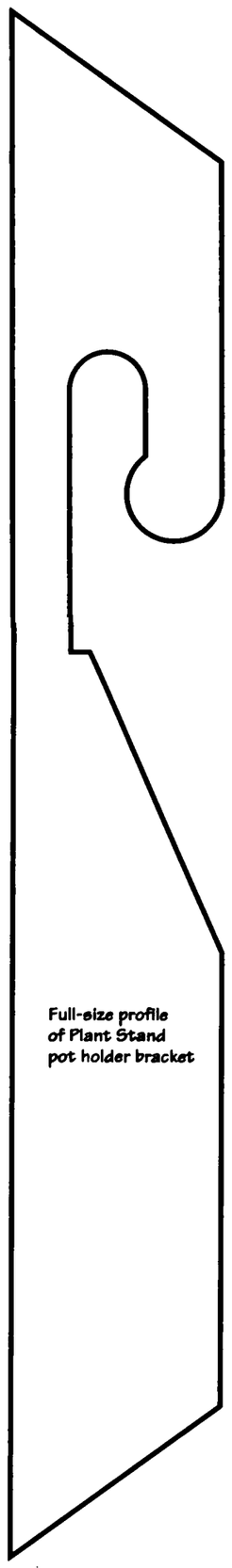
Scrolled Coffee Table

Full-size diagram of Scrolled Coffee Table leg



Pot Hanger

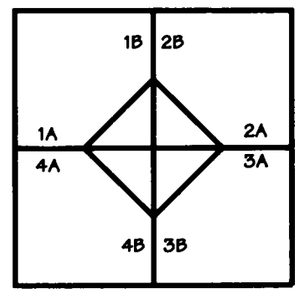
Full-size profile of Plant Stand pot holder bracket



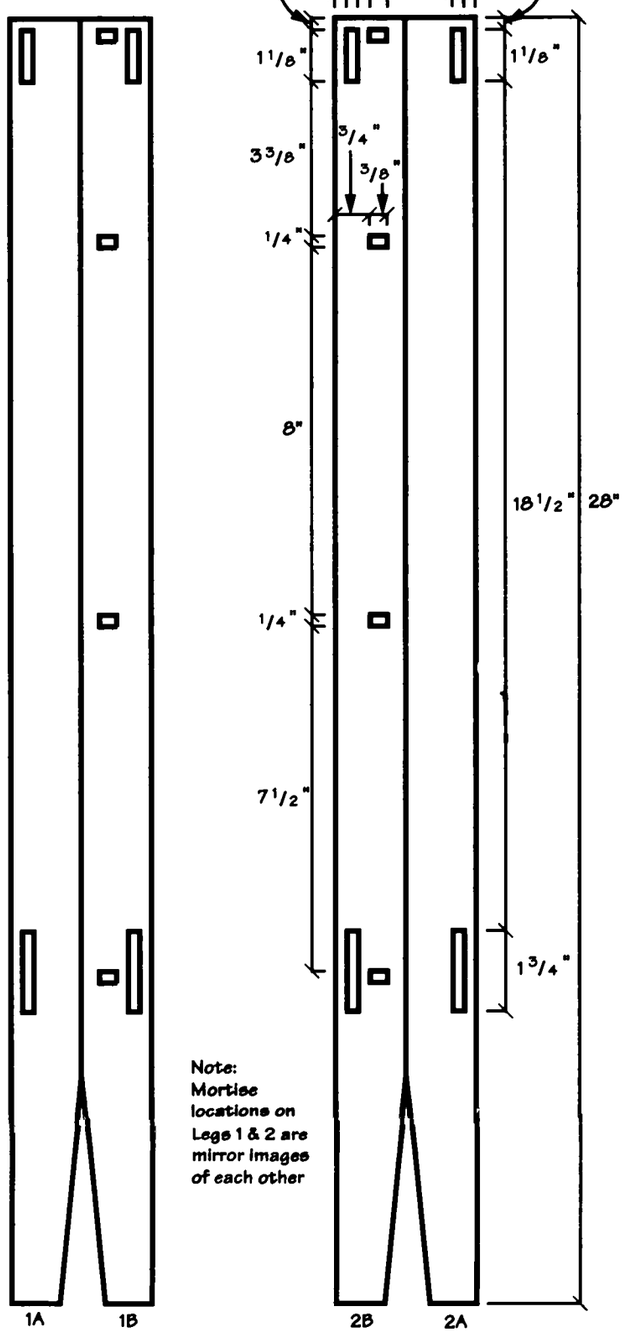
Visitor's Nightstand

Visitor's Night Stand

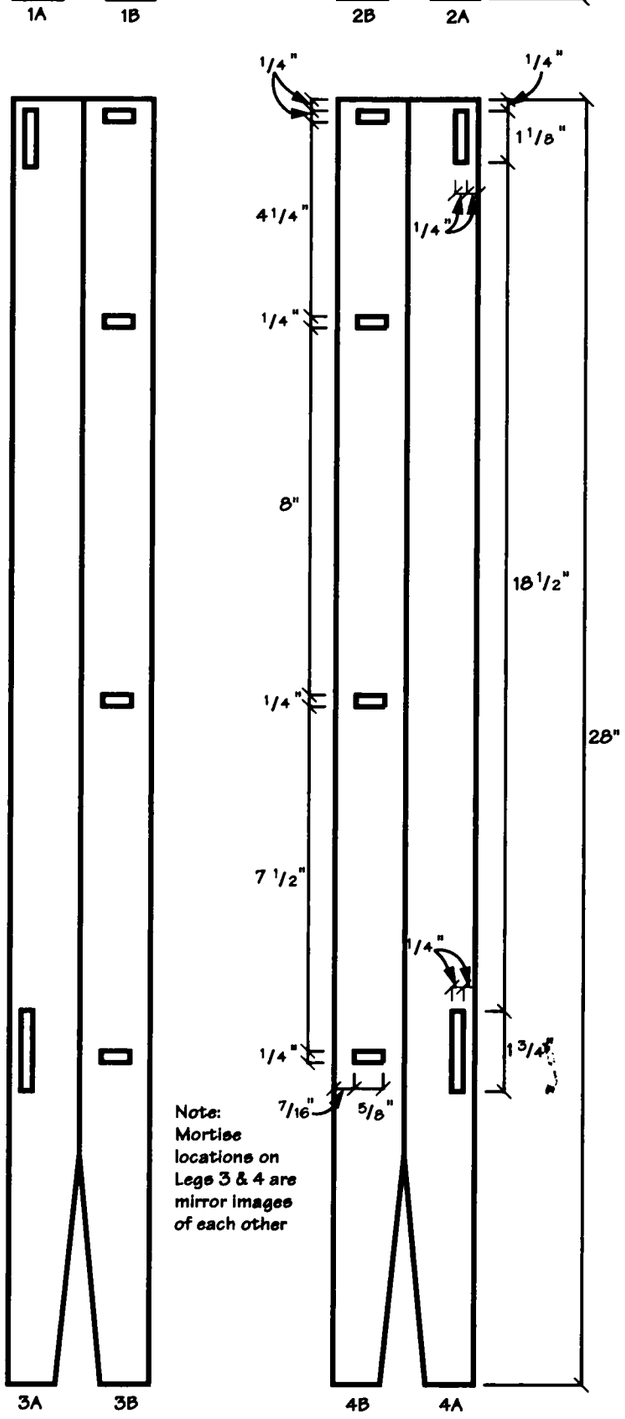
Mark top of legs to reference their orientation using Cabinetmaker's Pyramid method shown at right



Visitor's Night Stand Mortise layout plan (not to scale)



Note: Mortise locations on Legs 1 & 2 are mirror images of each other



Note: Mortise locations on Legs 3 & 4 are mirror images of each other

Celtic Love Spoon

This traditional token of affection can be made with a few carving tools, and it definitely will give your carving skills a weekend workout.

Start with a piece of 3/4" mahogany and cut it to 9 1/2" long by 2 1/2" wide. Our design includes a heart at the top, a Celtic cross in the middle and a knot near the base. Photocopy the design and put the original aside. You can use the full-size pattern in the PullOut™ Plans or the slightly smaller version at right.

Cut out the outside edges of the paper pattern and glue it to the mahogany blank with spray adhesive. Next, chuck a 1/16" bit into your drill press. Pierce holes on the corners of the patterns to make room for the saw blade that will cut out the waste. Use a larger bit to drill out the pattern around the center of the cross because this part is too tight for a saw. Then use a scroll saw or coping saw to remove the wood from the interior of the pattern throughout the spoon.

Now use your band saw to cut the piece of wood along its thickness. This will give you two identical, but thinner, blanks to carve. Then cut the outside edge of the handle of the spoon. Don't cut out the spoon part yet; this will give your workpiece strength while carving.

Now outline the pattern with a V-tool. Remove the paper pattern from the wood.

When making your cuts, pay attention to the different depths of carving in the spoon. Most of the curvy loops are merely rounded over. The cross, however, has two different levels. The rectangular interior of the arms is 1/16" deep with a v-shaped trench at the bottom. The area between the cross and heart is 1/8" deep.

To carve out the interiors, make a vertical stop cut with a skew or knife that is the depth of the hollow area. Once the outline has been clearly defined, you can start boasting the foreground by removing the waste with a deep gouge. Then smooth the surface with a shallow sweep.

A straight-edged knife can be used for rounding the loops. Be sure to cut with the grain or directly perpendicular to the grain to avoid tear out. The deeper cuts where the loops intersect can be shaped with stop cuts and a gouge. Then round over the edges with a straight knife.

The narrow trenches that frame the knot and cross (see photo at left) can be cut with a small gouge that has a tight sweep.

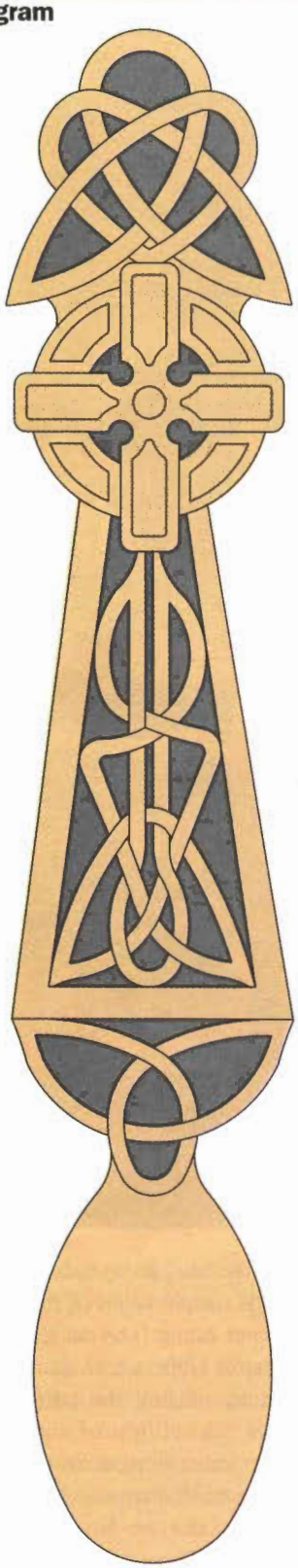
Use a gouge or a curved shank to hollow the spoon area. Then cut out the exterior edge of the spoon with a band saw.

Use sandpaper taped to popsicle sticks or emery boards to sand the rough edges. Finish with oil or a clear finish.

Now all that's left is finding a sweetheart worthy of all this work.

—Jim Stuard, PW staff

Diagram



You Don't Eat With Them

The giving of Celtic love spoons is a tradition common since the 17th century. The spoons, which are always made from one piece of wood, were hand carved for a loved one. The carver would put different symbols into the handle of the spoon to mean different things. Hearts represented love; keys symbolized home and security; ships stood for smooth passage through life; wheels represented work; crosses meant faith; and knots symbolized an everlasting bond. Sometimes a chain would be carved from the single piece of wood, which stood for either the linking of lives or a certain number of children.

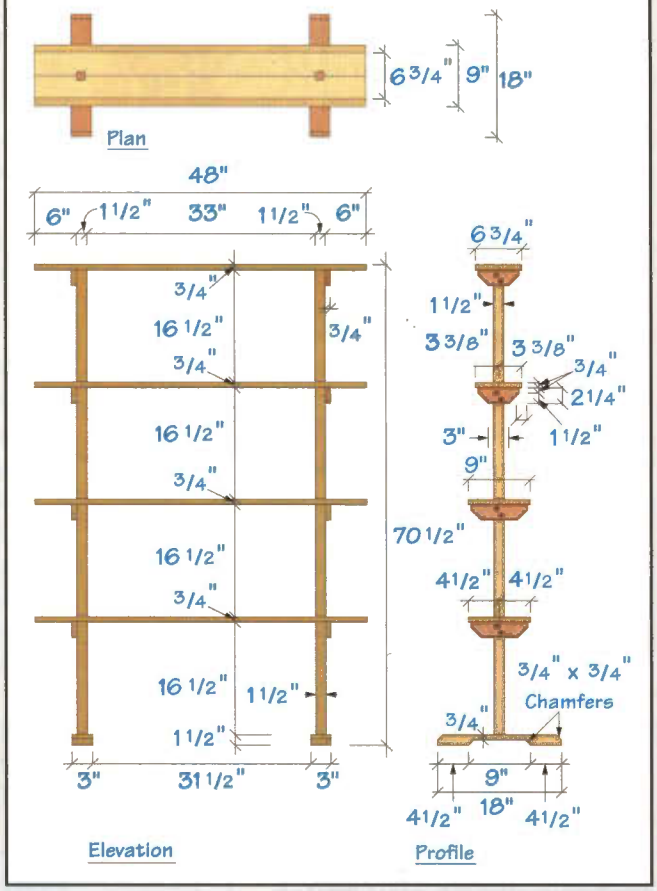
Love spoons are still around, though many people purchase them instead of carving them by hand. While this spoon can be made for a few dollars, hand-carved spoons cost between $10 for a simple, small spoon to $115 for a large intricate spoon.

Storage Shelves

Schedule of Materials: Shelves

No.	Item	Dimensions T W L	Material
2	Bases	1½" x 3" x 18"	Oak
2	Posts	1½" x 1½" x 69¾"	Oak
4	Braces	¾" x 2¼"x 8¼"	Oak
4	Braces	¾" x 2¼"x 6"	Oak
4	Shelves	¾" x 4½"x 48"	Oak
4	Shelves	¾" x 3⅜"x 48"	Oak
16	Pegs	¼" x 1¾"	Oak
2	Pegs	⅛" x 2¼"	Oak

Diagram



If you like Shaker-style furniture or need additional storage, this simple flight of shelves would make a nice addition to your home. The design comes from a four-shelf unit on display at Hancock Shaker Village in Hancock, Mass.

Start by cutting the parts following the Schedule of Materials. This flight of shelves is joined using mortise and tenon construction. So begin by cutting out the underside of the base, then cut 1¼" square through mortises in the center of the two base pieces. You can use a mortising jig on your drill press, or you can drill out most of the mortise with a standard bit and then square up the walls with a sharp chisel.

Next drill ⅛" holes into the sides of the base that are 2¼" deep and that intersect with the mortises you just made. Cut a 45 degree chamfer on the top side of each end of the base pieces. For the posts, cut tenons on one end of each post that are 1¼" square and ¾" deep.

Use a miter saw to cut 45 degree angles on each of the eight braces that support the shelves. Then drill two ¼" holes on each brace for the pegs.

Next, cut two 1 9/16" x 13/16" notches into the sides of each of the shelves 6" from each end. These notches wrap the shelves around the posts. Use a ⅜" roundover bit to radius the outside edges of both sides of each shelf.

To assemble, begin by gluing the posts into the bases. After the glue has set, redrill the holes for the pegs. Put a little glue in the hole and insert a ⅛" peg into the hole.

Glue and clamp the braces to the post. Be sure to glue the two smaller braces to the top of the posts and the longer braces to the bottom. I used a piece of 14¼" scrap lumber to evenly space the braces. After the glue has set, redrill the holes and glue the ¼" pegs into the holes.

Glue and clamp the shelves onto the braces, fitting them around the posts. A heavy piece of metal works nicely to hold the shelf against the brace during gluing. Additionally, you can screw or nail the shelves to the braces, though it's not necessary. Finally, cover with three coats of clear finish.

—Dana Batory

Greene & Greene Garden Bench

This Arts & Crafts settee can be the centerpiece of any garden.

Who Were the Greenes?

Charles Sumner Greene (1869-1957) and Henry Mather Greene (1870-1954) designed some of the most sought-after houses and custom furniture in the Pasadena, Calif., area. The brothers were born in Brighton, Ohio, and studied woodworking, metalworking and toolmaking at Washington University in St. Louis. After studying architecture at the Massachusetts Institute of Technology and a short stint as apprentices to other architects, Charles and Henry moved to Pasadena and set up their own architectural firm. On their trip West, the two stopped at the Columbian Exposition in Chicago and saw Japanese architecture for the first time, which greatly influenced both brothers.

Unlike many of their Arts & Crafts contemporaries, the Greene brothers' furniture and interiors were designed using teak and mahogany instead of quartersawn white oak. Their work also has a decidedly Japanese flavor not found in the works of Gustav Stickley and the Roycrofters.

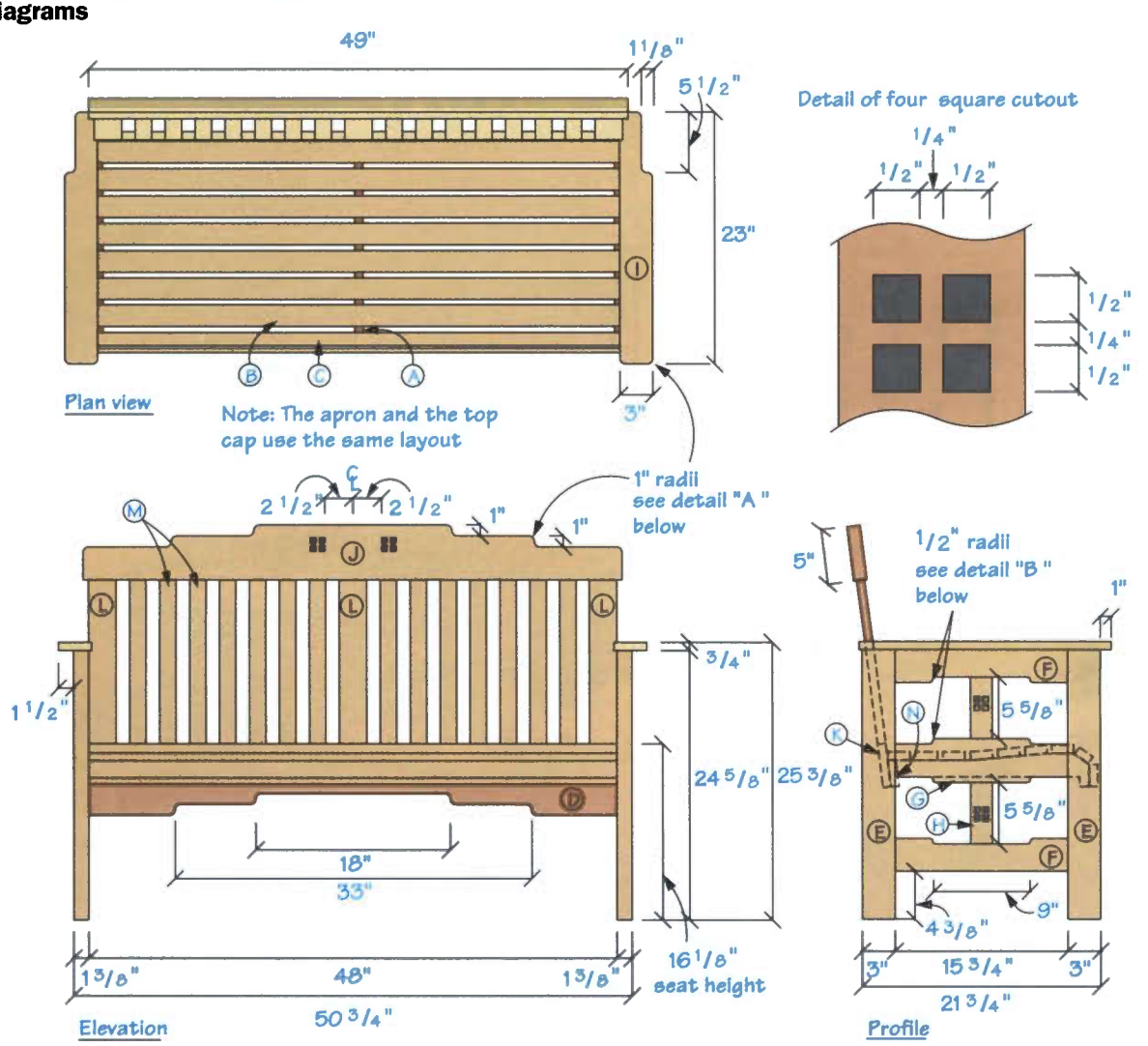
The Greene brothers' most famous design is the Gamble House in Pasadena. Commissioned in 1908 by David Berry Gamble (of Proctor & Gamble fame), the house was once in danger of being sold to a family that planned to paint the stunning mahogany and teak interiors white. The house is now operated as a museum.

This understated garden bench is like no other we've seen. The fluid lines of the top and sides are inspired by the architectural work of the Greene brothers, who built houses and furniture around the turn of the century that are fast becoming national treasures. Yet this bench is surprisingly simple to build and will quickly catch the eye of everyone who visits your garden or solarium.

We used genuine mahogany for the bench, though you could easily substitute oak, teak or any other wood suitable for outdoors. (If you plan to use teak, be prepared to open that checkbook wide.) We bought our lumber already planed and surfaced for about $180. Purchasing rough stock would knock 30 percent to 40 percent off that price.

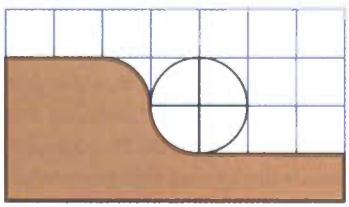
GARDEN BENCH

Diagrams

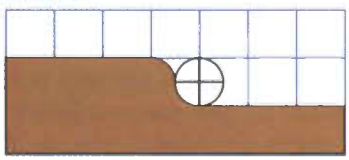


Details of Cloud Lift radii

Detail A



Detail B



Each square = 1/2"
Enlarge 200%

Schedule of Materials: Garden Bench

No.	Item	Description	Dimensions T W L	Material
3	A	Seat Braces	3/4" x 3" x 17 5/8"	Mahogany
8	B	Seat Slats	3/4" x 2" x 48"	Mahogany
1	C	Angled Slat for Seat	3/4" x 1 3/4" x 48"	Mahogany
1	D	Seat Front Apron	3/4" x 5" x 48"	Mahogany
4	E	Legs	1 3/8" x 3" x 24 5/8"	Mahogany
4	F	Upper & Lower Side Rails	3/4" x 3" x 15 3/4"	Mahogany
2	G	Middle Side Rails	3/4" x 4" x 15 3/4"	Mahogany
4	H	Center Side Stiles	3/4" x 2" x 5 5/8"	Mahogany
2	I	Armrests	3/4" x 3" x 23"	Mahogany
1	J	Top Cap	1 1/4" x 5" x 49"	Mahogany
2	K	Back Bottom Rail	3/4" x 4" x 48"	Mahogany
3	L	Wide Back Slats	3/4" x 2 1/2" x 15"	Mahogany
14	M	Narrow Back Slats	3/4" x 1 1/2" x 15"	Mahogany
1	N	Seat Back Rail	3/4" x 2 3/8" x 48"	Mahogany

1 LAY OUT CUTS • Using a rule with at least 1/32" increments, lay out the locations for the dowel and biscuit cuts. Then, using a self-centering doweling jig, drill the 1/4" dowel holes in the slats (two per slat end). Make sure the holes are just a shade deeper than the dowels you plan to use. This gives room for your glue to move.

2 DRILL RADIUS • First lay out the cloud lifts with a compass. Use a 1" forstner bit to cut the inside radius on the top, apron and armrests (use a 1/2" bit for the cloud lifts on the end pieces).

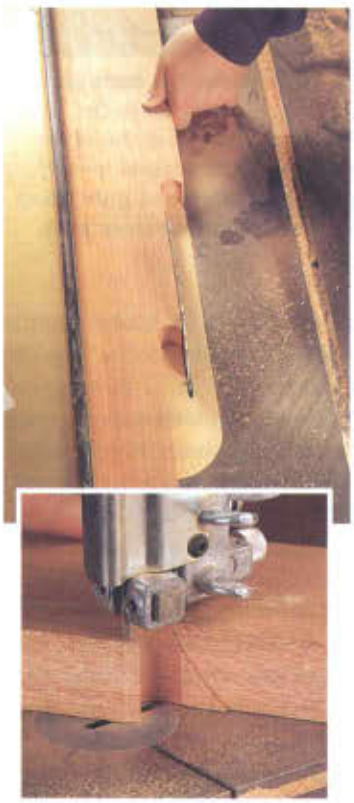
Start by laying out your crosscuts on the lumber. Because there are a lot of pieces to this bench, I marked each piece with a letter. Crosscut the lumber to rough length on a radial arm saw.

Take the wood to your jointer and edge joint one edge of each piece. This will give you a square, straight edge for ripping. Rip out the pieces at your table saw and then crosscut to the finished lengths in the Schedule of Materials.

STEP 1 Build the Back • Attaching the slats to the top cap and the bottom back rail requires a little math to get evenly spaced slats. You have 14 narrow slats that are 1 1/2" wide, and three wider slats that are 2 1/2" wide. The bottom back rail is 48" long. So subtract 21" from that 48" length to account for the small slats, and then subtract 7 1/2" to account for the wide slats. This should leave you with 19 1/2" for the spacing. Then divide this number by 16, which is the number of openings between the slats. This leaves 1 7/32" between each slat.

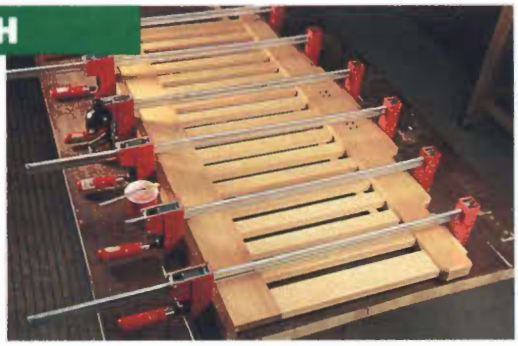
Next, you need to lay out the slat locations on the top cap and bottom back rail. Here's how: Start at one end of the back rail and measure in 2 1/2" in from the end for the wider slats. Then measure out 1 7/32" of space, then 1 1/2" for the slat, then 1 7/32" and so on until you've laid out seven narrow slats. Then start from the other side of the rail and lay out those seven narrow slats. The wider center slat is centered in what's left. The wider slats will be attached with biscuits; the narrow slats with dowels. To find the dowel centers on the back rail, measure in 1/4" from the marks you made for the ends of each narrow slat. Drill the holes for the dowels on the bottom back rail as shown in the photo. Then lay out the holes on the top cap, keeping in mind it is 1" longer than the bottom back rail.

STEP 2 Cloud Lifts • Cut the cloud lift pattern on the top cap using the pattern in the diagram and a band saw. (Cloud lifts are soft, stair-stepped details.) Then cut the reverse cloud lift pattern on the apron that attaches to the front of the seat, as shown in the photo.



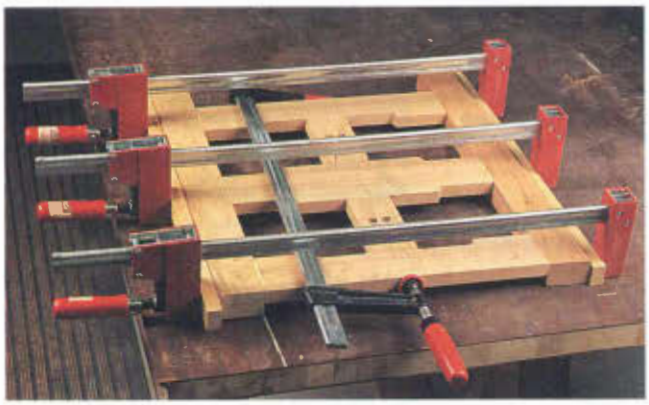
3 RIP CLOUD LIFTS • After you rough out the cloud lifts on a band saw, use a table saw to rip to the bottom of the inside radius cut on the drill press. (On the reverse cloud lifts for the apron, you need to set the ripping width with the table saw blade lowered below the table. With the saw running, hold the work firmly in place, making sure your hand is clear of the point where the blade will exit the piece. Then slowly raise the blade to make the interior cuts.) Then use your band saw to remove the waste on the outside radii. Clean up the cuts on a spindle sander.

STEP 3 Straighten the Pattern • After you rough-cut the cloud lift shape on the band saw, straighten up the cuts on the table saw. When you're cleaning up the reverse cloud lift pattern you need to be careful because you're going to have to raise and lower the table saw blade to get into the middle of the pattern. To finish the cloud lift pattern, use a 1/4" roundover bit to cut a profile on the edges.



4 GLUE THE BACK • Dry assemble the back to make sure everything lines up and that the back can be made square. Then, using clamping cauls, assemble the back with a waterproof glue (we used polyurethane glue). Check for square by measuring across the corners. The measurements should be identical. Then adjust the clamps accordingly.

5 MAKE THE CUT OUTS • Lay out and drill the four-square cut outs using a ½" forstner bit in a drill press. Square the corners using a jigsaw. Square the openings with a sharp chisel.



6 CLAMP THE ENDS • After laying out the ends and cutting the cloud lifts on these parts, mark the pieces for the biscuit jointer cuts. Assemble the stiles and the rails first. With this assembly clamped loosely, clamp the legs on and allow to dry (urethane glue takes about four hours to dry and has a foamy squeeze out).

7 ROUNDOVER • After the ends are dry, use a ¼" roundover bit to radius all of the edges — except the top where the armrest will be attached. Using a four-in-hand rasp and starting at a 45 degree angle to the corner, gently file out a mitered corner. Remove burn marks from the corners with the rasp and finish the corners with sandpaper.

STEP 4 Assemble the Back • Now you have to do a little sanding. Using 120 grit sandpaper and a random orbital sander, sand the flat surfaces and break the edges of the back's slats. This will, in the end, give the piece a more finished look. It also has a practical purpose. If your bench is going to sit outside, the first spring shower or two will raise the grain of the wood. Squared edges will likely splinter, making your bench a potentially painful place to sit.

Attach the wider slats with biscuits; the narrower ones with dowels. Make your cuts for the biscuits on the wider slats and the back rails. After dry assembling the back, start with the bottom rail. Paint your dowels with waterproof glue and insert them into the back rail. Then paint the other dowels' ends with glue and put a little glue on the end of the slat. Attach the slats. Then glue the dowels into the top back rail. Paint them with glue, put a little glue on the top end of each slat and attach the top rail. Clamp and let dry.

STEP 5 Cut Out the Square Patterns • The four-square pattern that goes on the back is repeated on the center stiles on the end. Mark the locations of the cut outs according to the diagram and lay out the location of the four squares.

Drill holes to make the pattern using a ½" forstner bit. Clean up the holes with a jigsaw and a chisel.

STEP 6 Build the Ends • Begin building the ends by cutting the cloud lift and reverse cloud lift patterns on the top, bottom and middle rails with a band saw. Use the ¼" roundover bit on all the edges except those on the inside of the sides; these will be radiused after assembly.

Next make the cuts for your biscuits. These will attach the center stiles to the rails, and attach the rails to the legs. Make sure the rails and the legs are flush on the inside edge where they will attach to the seat. Use waterproof glue with the biscuits; clamp and set aside to dry.

STEP 7 Rout the Edges • When dry, use your router to radius the edges of the ends. Then cut out the armrests to the pattern shown in the diagram. Attach them to the end assemblies with screws, leaving a ⅛" overhang on the inside edge and notch the arm to the back.

STEP 8 Seat Assembly • The first thing to do here is to cut out the three seat braces that support the seat's slats. Cutting the braces is a little tricky because there are several angles at work here. We've included a pattern in the PullOut™ Plans to make things easier.

Once you've got the seat braces cut, make the seat's back rail. This piece runs along the entire back of the bench and is the place where the bench's back and the seat are

8 ATTACH SEAT SLATS • The diagram in the PullOut™ Plans shows the shape of the three seat braces. Attach the tapered seat slat to the front angle on the seat brace. Then, using galvanized screws, attach the remaining seat slats, leaving about 7/16" between each slat.

9 NOTCH THE APRON • After the slats are screwed in, flip the seat over and lay the front apron against the front slat. Mark the locations of the seat braces onto the apron. Using a backsaw and chisel, cut 2" x 3/4" notches into the apron. Attach the apron to the back of the front slat with screws and glue. You also need to cut a 7/8" x 16" cut away into the ends of the seat braces. This starts at the back of the seat brace and keeps the seat brace from peeking below the cloud lift on the ends.

10 ASSEMBLY • Clamp the seat assembly to the back, making sure the back is flush to the bottom of the seat. Screw the two together with 1 1/4" galvanized screws and glue. Then, on the inside of the ends, lay out the location of the seat braces. The seat brace starts 13" up from the bottom of the leg to the inside of the cut away explained in Step 9's photo.

11 CUT BISCUITS • Clamp a straight piece of wood to the front line on the leg. Then using a biscuit jointer with the fence removed, make your biscuit cuts.

joined. To make the back tip at a comfortable angle, cut a bevel on both edges of this piece. Set the angle of your table saw's blade to 7 degrees. Run one edge through. Then flip the piece over lengthwise and run the other edge through, creating a parallel cut to the first one.

While you're at the table saw, set the blade's angle to 10 degrees. Take the 1 1/2" wide seat slat and run one edge through the saw to create a bevel. Then flip the piece onto its other face and run the other edge through. The result is one face that is narrower than the other. This seat slat goes on the highest part of the seat, and the bevel will make the seat more comfortable.

Then, using screws and waterproof glue, attach the three seat braces to the seat's back rail. Then take one of the 2" slats for the seat and attach it to the front of the three seat braces with screws and waterproof glue. Screw and glue the rest of the slats as shown in the photo, making sure to attach the beveled 1 1/2" slat to the highest point of the seat.

STEP 9 Notch the Apron • When I designed the front apron, I intended it to be merely decorative. However, after some experimentation, I decided it could help hold up the seat. To attach it to the seat, cut three 3/4" x 2" notches into the front rail and screw the front rail into the seat behind the front rail. Use a sharp chisel to cut a screw pocket on the back face of the apron near each end. This is where you will attach the apron to the legs.

STEP 10 Assembly • Screw the back bottom rail to the seat's back rail with eight screws. Place one of the bench's end assemblies flat on the floor. Using a square, measure where the seat brace attaches to the seat's side rail and mark a line. Then mark three biscuit cuts that will attach the back leg to the end of the back. Mark both sides of the back on the leg.

STEP 11 Attach the Ends • Attach the seat assembly to the back leg with biscuits. Then, from the inside of the bench, screw the seat brace to the seat's side rail using 1 1/4" screws. Be careful not to countersink too much, or the screw will go through both thicknesses of wood.

Then screw the apron to the leg in the screw pocket you cut earlier using a 1 5/8" galvanized screw. Repeat this procedure for the other side assembly. You can finish this bench with varnish or an outdoor-safe polyurethane. I chose to leave the wood bare so it will slowly turn a silvery gray.

This bench looks great in the garden or solarium and will last for years outdoors, but some of you might opt to keep yours in the front hall or near the back door. **PW**

—Jim Stuard, PW staff

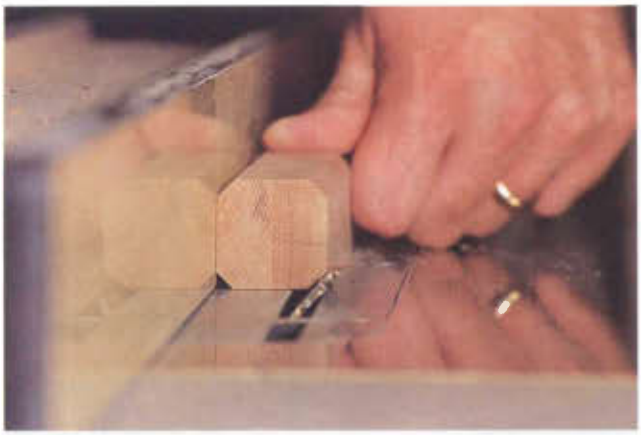
Portable Dining Set

Picnicking without the blanket (or the bugs).

Maybe I'm just getting older, but the idea of having a picnic while sitting on the ground isn't as attractive an idea as it used to be. If I'm going to eat a meal, I'd like to have a table in front of me and a chair that keeps me away from the inevitable ants.

Lugging around a folding table and chairs isn't much of an option either. They don't leave room for the cooler in the trunk. That's why I was intrigued when a friend told me about an unusual, go-anywhere roll-up table he'd seen at a party. He said it used cloth straps to hold the top together and the legs simply screwed in. After a little sketching, I came up with plans for my own portable picnic table. And by adding a couple of camp stools **(see accompanying story "Simple Picnic Stools")** I'd be dining with my honey in style.

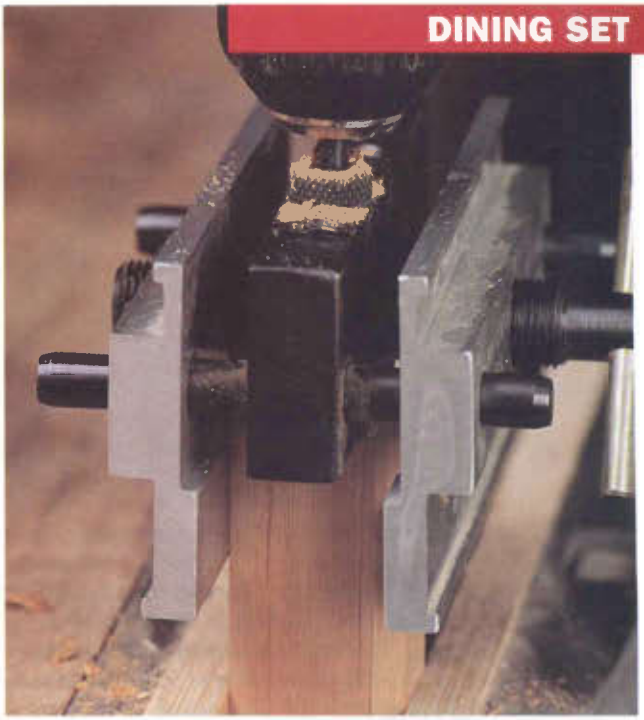
STEP 1 Cut Your Lumber • I used alder for the table and chairs because it's a lightweight wood that offers reli-



STEP 1 BEVEL THE LEGS • After the legs are squared up at 1½" x 1½", set your table saw's blade to 45 degrees. Then bevel all four corners to a 1" face.

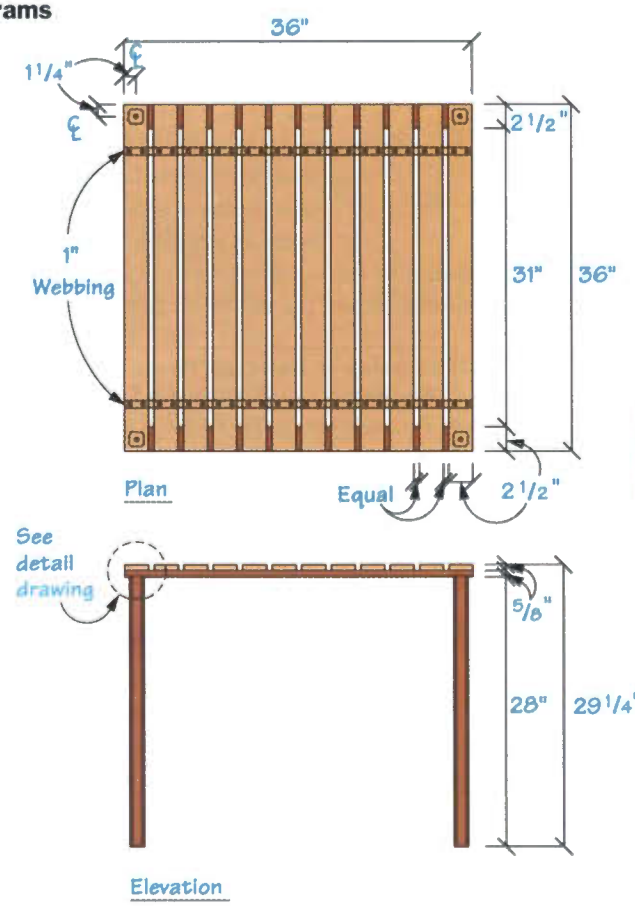
able strength. It does nick a little easier than I would prefer, but I'm willing to trade a few scratches for a few less pounds. Start by milling all the lumber as shown in the Schedule of Materials. The legs are next ripped on the saw to an octagonal shape.

STEP 2 Make Holes for the Bolts • It's important that the legs be attached squarely to the table, or your project can end up with legs headed in all directions. While you could try to freehand the pilot holes in the legs for the hang-



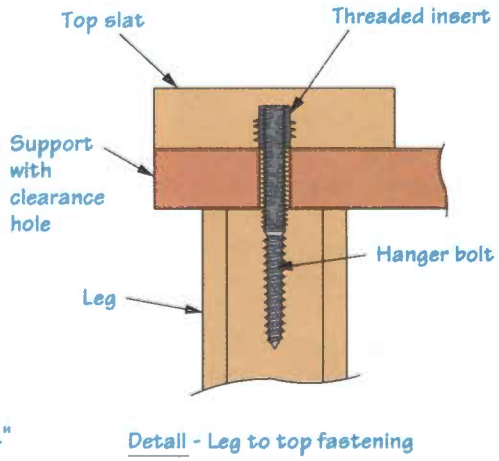
STEP 2 MAKE PILOT HOLES • An easy way to drill a straight pilot hole for the hanger bolts is to use a doweling jig to guide the drill bit. While you could use a drill press, you'd have to make a fairly complicated clamping jig to hold the 28" legs square to the bit.

Diagrams



Schedule of Materials: Portable Dining Set

No.	Item	Dimensions T W L	Material
12	Top Slats	⅝" x 2½" x 36"	Alder
2	Supports	⅝" x 2½" x 36"	Alder
4	Legs	1½" x 1½" x 28"	Alder



Detail - Leg to top fastening

STEP 3 **THE HARDWARE IS CRITICAL** • Four hanger bolts and threaded inserts fasten the entire table together. The wood screw thread end is screwed into the legs, while the threaded insert is installed in the outermost slat of the roll-up top. The machine-threaded end passes through the support and is then screwed into the threaded insert and tightened until the connection is snug.

STEP 4 **A TRICK FOR THE BOLTS** • A handy trick for inserting hanger bolts is to tighten two nuts against one another on the machined thread end of the bolt. This gives you a place to use a wrench, pliers or nut driver without damaging the threadings. Place a drop of glue in the hole before inserting the screw, and once the bolt is sunk to the required 1" depth, remove the nuts by first using two wrenches to loosen them.

Simple Picnic Stools

No portable table would be complete without a portable chair or two...as an added bonus, this stool makes a great ottoman for an outdoor chair or bench.

Make the stool or stools by first milling and and cutting to size the legs, (four per stool). Set your drill press up to make a single hole centered and 3/8" in (3/4" to the center) from one end of each leg. These holes should be made 5/8" deep and the same as the diameter of your dowel rod.

With the same drilling setup, make a second hole in two of the legs with the center 12 5/8" down from the top. On the other two legs drill a hole all the way through at the same location. Next, round the ends of all the legs to a 3/4" radius and sand all the sharp edges.

The dowels are then cut to the sizes indicated; but before assembling the stool, the seat should be cut and hemmed.

I used a double-folded hem on all sides of the seat, starting with the long edges first. Mark, then fold the material over once a half-inch, then another half-inch and pin. Now run a double hem line, for strength, on a sewing machine.

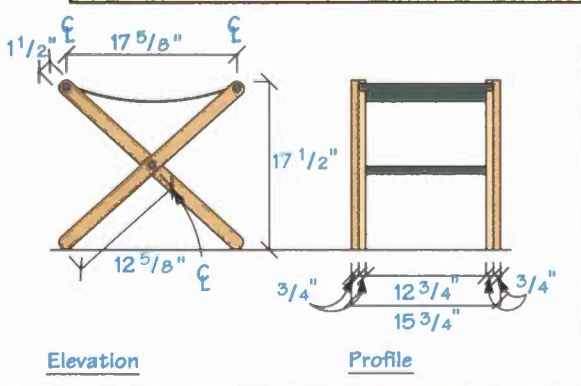
Next, fold the ends over a half-inch twice, as above, and then pin and stitch in place two inches in to form the pockets for the dowel rods.

Put a coat of finish on all the wood pieces, then attach the shorter stretcher between the ends of the two legs with through-holes in the center, slipping the dowel rod through the seat pocket first. I used #6 x 1" screws inserted through a clearance hole in the sides of the legs and a pilot hole in the dowel to fasten them together.

Next, attach the remaining two legs after running the center dowel through the two holes in the middle legs, and again slipping the top dowel through the other seat pocket. Attach the center dowel to the outer legs only, as the middle legs must rotate around the dowel for the stool to fold.

Schedule of Materials: Picnic Stools

No.	Item	Dimensions T W L	Material
4	Legs	3/4" x 1 1/2" x 25 1/4"	Oak
2	Stretchers	3/4" x 15 1/2"	Dowel
1	Stretcher	3/4" x 14"	Dowel
1	Seat	14 3/4" x 24"	Cloth



er bolts, I found a doweling jig was much more reliable for drilling straight holes square to the top of the legs. Make sure your pilot hole is exactly the width of the hanger bolt, minus the threads. It's important that the bolt bites well when started and holds.

STEP 3 Choose Your Hardware Carefully • I found that 1/4" x 2 1/2" hanger bolts and threaded inserts are a reliable way to attach the legs to the top. There are different types of threaded inserts, and you can spend a little extra and get brass if you like. Remember: This is the most important part of the table. The only thing holding the table together is these bolts and inserts, so be sure to take your time and install them correctly.

STEP 4 Insert the Hanger Bolts • Once the pilot holes are drilled, insert the hanger bolts, leaving 1" exposed. This can be tricky. There's no head on the bolt, so you can't use a screwdriver. And a pair of pliers would damage the machine threads. The photo shows a method using two nuts, as found on a drill press depth gauge.

STEP 5 Install the Inserts • While getting the hanger bolts in straight is a challenge, getting the threaded inserts in straight is even more difficult. Because of their design, one side of the thread wants to bite into the wood first, pulling the entire insert to one side. This time a drill press offers a good solution to the problem while once again using two nuts tightened together to assist.

STEP 6 Attach the Webbing • Once you've got the inserts in place, drill an ample clearance hole through both ends of the support bars. Then assemble the table without the top to make sure everything fits well.

At this time you should decide if your table gets a protective finish. While it's not going to be left outdoors, a urethane finish might be a good idea because red wine or potato salad could stain the wood. At any rate, the table is a lot easier to finish before it's assembled.

Once dry, lay out your top slats on the assembled table to double-check the spacing before you attach the webbing to the back of the slats. Pilot holes aren't necessary in the soft alder, but pay attention to the webbing. It wants to twist when the screw seats against the wood. The trick is to keep the webbing in the same location on each slat. As you continue down the table top, the strap wanders just enough to throw you off. Don't worry, it isn't critical, just compensate in the other direction.

Once the slats are attached, the table is complete. When disassembled, the legs and supports lie against the inside and the table can be rolled up around them, with the finished surface facing out. You might want to consider buying a duffel bag or making a rope sling to make carrying a little easier, but a piece of string to tie things together works just fine. **PW**

—David Thiel, PW staff

STEP 5 ANOTHER TRICK • To screw in the threaded insert straight and square, the best way I found is to again use the two-nut method on a 1/4" bolt with the head cut off. The nuts are tightened on the bolt leaving enough room to screw the threaded insert onto the bolt about two-thirds of the way. The bolt is then chucked in the drill, and the quill brought down to the surface of the wood, where a pilot hole has already been drilled and a little glue added. Without turning on the drill press, turn the chuck by hand as downward pressure is applied, until the threaded insert seats flush to the wood. Then, with the quill still lowered, release the chuck and allow the quill to retract. Loosen the nuts as before, and unscrew the bolt.

STEP 6 WEB THE TABLE • Finally, the webbing (available at fabric stores) is first doubled over at the ends and then attached to the bottom of each slat with two #6 x 1/2" plated sheet metal screws and finish washers. Be careful not to put the screws too close to the edges to avoid splitting. A 1/2" gap is allowed between slats. A little tension should be applied to the webbing throughout this process to make sure the top won't have too much slop in it when stretched across the supports and legs.

Visitor's NIGHTSTAND

Guests have plenty of room for their belongings in this nightstand/chest of drawers.

Photographs by Ed Taylor

This small chest of drawers presents a number of interesting challenges, not the least of which is keeping track of all the different mortises and working with frame and panel construction. Router-made wooden pulls and beaded drawer rails give the piece a subtle refinement and put your tools to use in unusual ways.

But First, Make Up the Panels

The nightstand uses a solid frame and panel carcass—including the back, which, because of its width, should be made of two panels separated by a center muntin. The frame and panel construction allows for seasonal movement due to changes in humidity. By dividing the expanse with a center muntin, and allowing the panels to "float" (i.e. rest in their grooves without glue) you prevent any possible expansion or contraction damage to the carcass.

However, because the back is likely to be against a wall, you could save time and material by replacing the two panels and center muntin with a single piece of 1/4" plywood measuring 20 1/4" x 17 1/4".

If you opt for the solid wood back, follow the Schedule of Materials to mill enough material for the two side and two back panels and one panel large enough for the top. Choose the material carefully for figure and color. I didn't have boards wide enough to give me the full drawer fronts, so I also glued up a 21" x 23" panel (carefully matching the grain), and then ripped the individual drawer fronts from this slab.

Mill the Legs and Frames

Rough cut the legs from 8/4 stock, then joint two perpendicular edges and use the planer to dress them to 1 1/2" square. Mill the rest of the material for the side rails, back rails and front rails from ash, but use a less expensive secondary wood such as poplar for the back, side and center pieces of the drawer support frames.

I used 1/8" cherry strips as an accent on the front drawer rails, shaping a bullnosed lip that sits proud of the front edge **(see diagram)**. The bullnose is cut either using a 1/16" roundover bit set in a router table with a guide fence, or by shaping by hand using a block plane and sandpaper. I used this detail above and below each drawer front. The topmost rail has cherry on its bottom surface, and the lowest rail has it only on its top surface, while the two center rails have it on both surfaces.

Laminate the front rails early in the process so you can run them through the same planer setup used to mill the rest of the parts; tenoning will be easier if the thickness of everything is consistent. Be sure to

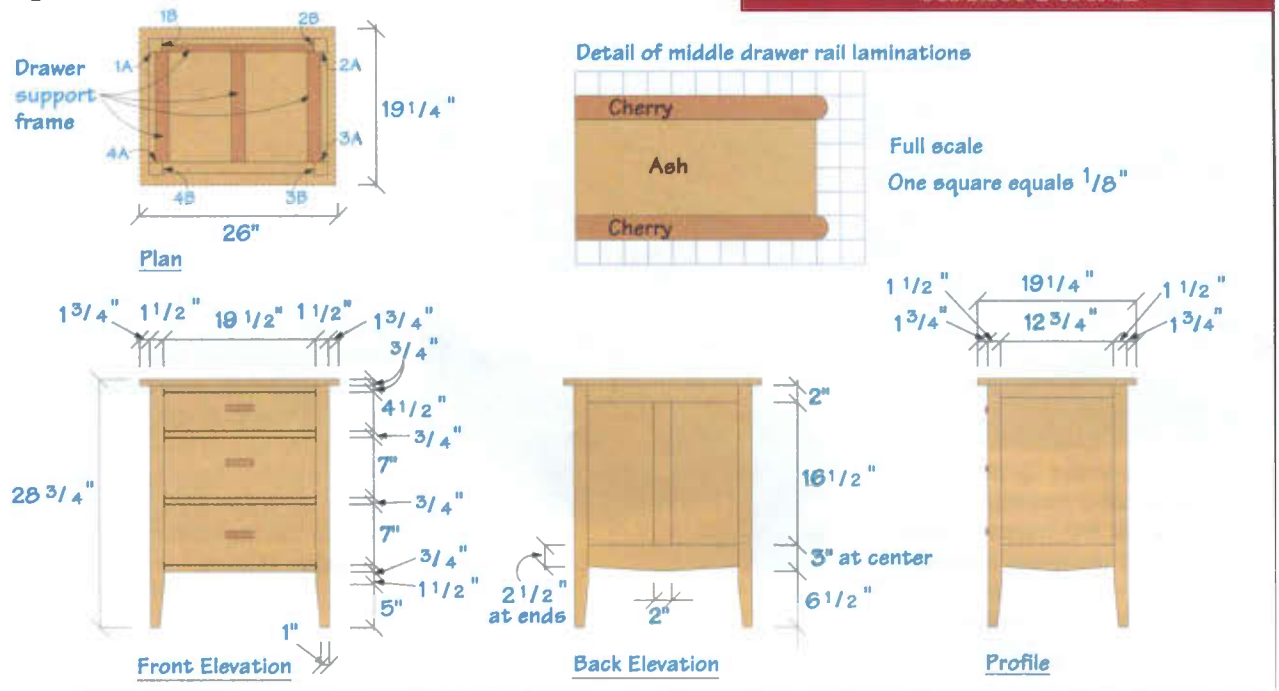
WOOD´WORDS
(wood´wurds) n.

cabinetmaker's pyramid: A method of marking furniture parts, especially legs, to organize them in terms of their orientation within the project: inside, outside, front, back etc.

muntin: A vertical division between rails (in making sashes or windows, the vertical division is called a mullion).

Diagram

NIGHTSTAND



Schedule of Materials: Nightstand

No.	Item	Dimensions T W L	Material
2	Side Panels	3/4" x 13 3/8" x 17 1/8"	Ash
2	Back Panels	3/4" x 9 3/8" x 17 1/8"	Ash
1	Center Muntin	3/4" x 2" x 18"	Ash
1	Top	3/4" x 19 1/4" x 26"	Ash
4	Legs	1 1/2" x 1 1/2" x 28"	Ash
2	Up. Side Rails	3/4" x 1 1/2" x 14 1/4"	Ash
2	Low. Side Rails	3/4" x 3" x 14 1/4"	Ash
1	Up. Back Rail	3/4" x 1 1/2" x 21"	Ash
1	Low. Back Rail	3/4" x 3" x 21"	Ash
2	Mid. Front Rails	1/2" x 1 1/4" x 21"	Ash
2	Tp. & Bt. Frt Rails	5/8" x 1 1/4" x 21"	Ash

No.	Item	Dimensions T W L	Material
4	Bk. Drawer Rails	3/4" x 3/4" x 21"	Poplar
12	Drawer Rails	3/4" x 1 1/2" x 13 1/2"	Poplar
2	Top Drawer Sides	1/2" x 4 1/2" x 14 1/8"	Poplar
4	Low. Drawer Sides	1/2" x 7" x 14 1/8"	Poplar
1	Top Drawer Front	3/4" x 4 1/2" x 19 1/2"	Ash
2	Lo. Drawer Fronts	3/4" x 7" x 19 1/2"	Ash
1	Top Drawer Back	1/2" x 4 1/2" x 19 1/2"	Poplar
2	Lo. Drawer Backs	1/2" x 7" x 19 1/2"	Poplar
3	Drawer Bottoms	1/4" x 13 7/8" x 19"	Poplar
6	Drawer Guides	1/2" x 1/2" x 12 3/4"	Poplar
6	Rail Accents	1/8" x 1 5/16" x 21"	Cherry

mill some scrap stock to the same thickness to help set up for the grooving operation that comes later.

STEP 1 Cut the Mortises • In a sense, the legs are parts of two different structures; they support the rails and panels that make up the outer carcass, and they also support the rails on which the drawers run. As you can see in the PullOut™ Plans, no two legs are mortised exactly alike, so mark everything carefully.

Start by selecting the two best perpendicular surfaces on each leg. These will be the outer faces of the legs. Orient and mark the legs as shown in the PullOut™ Plans, with the best surfaces out, and mark a "cabinetmaker's pyramid" on the top ends.

This triangular mark makes it easy to reposition the legs with the proper orientation every time. Now you can cut the mortises according to the plans. I used a 1/4" hollow chisel mortising attachment on my drill press to cut the mortises. In addition to the leg mortises, you'll need to cut mortises in the top and bottom back rails for the center muntin.

STEP 2 Grooves • Virtually every part of this carcass — except the panels and the side and center drawer support frame rails — gets a groove. While many of the grooves run the full length of the pieces and could easily be cut on the table saw, the grooves in the legs have to stop at the mortises, so the router table was my method of choice.

To check the fence position, clamp it in place and test the cut using the

1 MORTISES • To cut the horizontal mortises for the drawer rails, you'll need to shift the fence a few times for each mortise. Make each cut in each leg before re-adjusting the fence for the next cut.

2 GROOVES • Set up the router table to cut a 1/4" wide, 3/8" deep groove at 1/4" from the fence and groove all the frame members.

3 TENONS • I used a 3/8" wide dado set with an auxiliary rip fence on the table saw to shape the tenons. By setting the saw to cut flush against the auxiliary fence and with the height of the dado set for 1/4", I first ran all four sides of each tenoned piece. Then by repositioning the fence to cut 3/4", I took a second pass on the appropriate rails to form the longer tenons.

scrap you milled to the thickness of the rails. It will be dead center if you can make a cut with one surface against the fence and then turn the wood around and enter the cut with the other surface against the fence without removing any more wood.

When you get it just right, secure the fence and attach feather boards to apply pressure. Cut all the rails with their outer surface against the fence.

To groove the legs, carefully lower the rail mortises onto the spinning router bit. Push the leg along until you feel it reach the other rail mortise, then lift the leg off the bit.

STEP 3 Cut the Tenons • All of the tenons are 1/4" thick; I prefer to cut them a skosh fat and pare them to fit. The tenons on the drawer support frame sides and centers are 3/8" long and fit into the grooves in the front rails and back drawer support frame rails. All the tenons that enter the legs are 3/4" long.

Most of the pieces call for 1/4" shoulders on their ungrooved side, however, the lower back rail and lower side rails will need 3/4" shoulders on their bottom edge because of their chevron shape. Save these for last and just raise the dado blades to remove a bit more from the tenon.

Now it's time to check the fit of each tenon to its respective mortise. Use a sharp paring chisel to make any necessary adjustments. Once the fit is good you can shape the bottom rails by locating the center point and marking out the chevron to the appropriate height as shown in the diagrams. Use a band saw to make these cuts, then clean them up on the jointer taking the same number of passes on each surface.

Tapering the Legs

I tapered the two inside surfaces of each leg, leaving the outer surfaces

Wooden Drawer Pulls

1 Cut a 7/8" X 1 5/8" X 14" blank from hardwood. Round over one corner of the wood with a 3/16" radius bit in a router table.

2 Set the table saw blade to a height of 7/16" and position the fence 7/16" from it. Run the stock through with the rounded corner up and towards the fence.

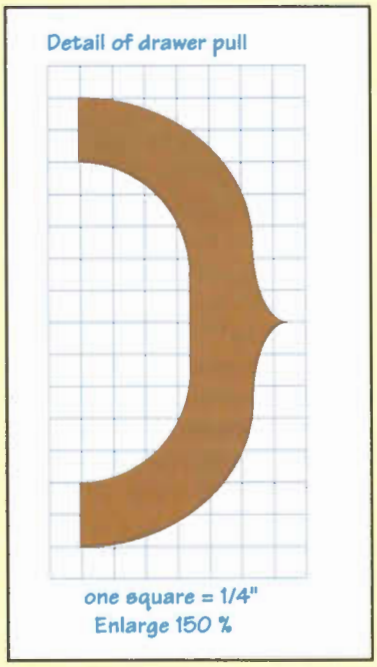
3 Turn the stock around and raise the blade to complete the rabbet. Be sure to use push sticks to make these cuts.

4 Mill some scrap to fill the rabbet so the workpiece will be supported as you cut out the pulls. Secure the filler strip in place with double-sided carpet tape. Enlarge the gridded drawing to make a pattern for the pulls and trace this onto cardboard or MDF. Then lay out as many pulls as your wood will allow, aligning the template with the top edge of the filler strip.

5 Extend the pattern lines to the top of the blank. Cut out the pulls on a scroll saw.

6 Carefully rout the front corners of the pulls with the 3/16" roundover bit. I glued some scrap wood "handles" to the pulls to keep my hands away from the cutter.

7 Use 80 grit sandpaper to finish shaping; then sand to 150 grit. Keep the scrap wood filler in place while you mount the pulls. Clamp the pulls to the drawer fronts, drill pilot holes for the screws, and then drive the screws then remove them, so you can remove the filler and apply finish.



4 PANELS • Tilt the table saw blade to 8 degrees and set to a depth slightly less than 1/4". Position the fence 3/8" from the outside of the blade. Run the panels flat against the table, cutting shoulders on all four edges of both sides.

5 TONGUES • To finish cutting the tongues, straighten the blade to 90 degrees and set the depth at 3/8". Attach a high auxiliary fence and position it a strong 1/2" from the inside of the blade. Run the panels through on edge, allowing the waste to fall to the left of the blade.

6 ASSEMBLY • You might need a pair of diagonal clamps to make the box square. After the glue dries, cut the top to its finished size and rout the edges with the profile of your choice. Lay the top upside down on your workbench and center the carcass. Secure the top with pan head screws and washers.

straight. The taper begins 5" up from the floor, trimming the 1 1/2" thickness down to 1" at the floor. I made a very simple jig from scrap plywood to cut this taper on the table saw. Cut the first taper with the second surface to be tapered facing down. Then rotate the leg and make the second cut. Otherwise you'll turn the first cut underneath, leaving no support for the second cut.

STEP 4 Raising the Panels • Cut the four carcass panels to the finished sizes given in the Schedule of Materials. Then cut shoulders on all four edges of both sides.

STEP 5 Cut the Tongues • Finish cutting the tongues by running the panels through on edge. Use a rabbet plane to fine tune the fit of the tongue into the grooves in the rails and legs.

STEP 6 Assembling the Carcass • Before assembly, you must first drill clearance holes in the top drawer support frame rails to secure the top. Use a 1" forstner bit to first drill a 1/4" counterbore for each screw. Then drill oversized through–holes elongated from back to front so the screws can move with the top as it expands.

Assembly is easiest when the process is broken into several subassemblies and, of course, dry assembled first. When you're sure everything fits, glue the center muntin between the two back rails. Next put the back panels in place, and glue the back legs onto the back rail tenons, gluing the back drawer support rails in place at the same time. Measure diagonals to check for square, clamp and allow to dry.

Next, glue the front rails to the front legs and check for square. When dry, you're ready to assemble the rest of the carcass. Fit the upper and lower side rails onto their panels so that they're ready to go. Then, with the back assembly lying flat on your workbench, put glue on one tenon of each center drawer support frame rail, and on one tenon of each top and bottom side rail. Fit theses pieces into their grooves and mortises. Now paint all eight front tenons with glue and apply the front assembly. Clamp and check for square.

I installed the side drawer support frame rails later. Like the center rail, these fit in the grooves between the front and back rails. You have to cut away part of the tenons on each to fit around the legs. Then to put them in, round one corner, then fit the back tenon in place and knock the front end in with a mallet.

Drawer construction is straightforward. I used poplar for the sides, and I cut half-blind dovetails at the front and through dovetails at the back. I made my own wooden pulls **(see "Wooden Drawer Pulls")**, but you may choose to purchase pulls.

For the drawers to run smoothly, you need to fit some drawer guides between the front and back legs. I used 1/2" x 1/2" strips of poplar and glued them directly to the drawer rails. Next, glue some 1/4" thick blocks to the back drawer rails so that when the drawers are closed they will all line up nicely in front.

Finally, screw a pivoting wooden tab to the back of each front rail so guests don't accidentally pull the drawer out all the way. When you do need to remove a drawer, just reach inside and push the tab up so the drawer can clear it.

It's easiest to finish this piece if you remove the top and coat it separately. I used a clear satin varnish. **PW**

David Mukamal Camp *is a former editor of* Popular Woodworking. *He's now a custom furniture maker and freelance writer in Santa Fe, N.M.*

The Perfect Flattop

How to get your glued up slabs stunningly smooth

By Jeff Jewitt

Editor's Note: Because two of the projects in this issue involve gluing up large panels (the coffee table and the nightstand), we thought it might be helpful to give you tips on how to make those panels flat and smooth.

The process of gluing up narrow boards to make wider panels is a process most woodworkers are familiar with. Not only is it hard to find wide boards, but panels made from narrower stock are more stable and stronger. Also, gluing up from narrower stock allows you to design patterns and symmetry into your panels that don't occur in natural wood.

The tops of large items like tables are one of the most challenging tasks in woodworking, even for the experienced craftsman. The visual impact of a large surface depends not only on sound joinery, but also on carefully matched grain and surfacing methods to ensure a flat surface and a striking appearance.

In this article I'll detail the steps necessary to properly plan, glue up and surface a large curly maple top (6' x 3') that I built for a kitchen table. The steps involved for large tops can also be applied to smaller panels.

Importance of Planning

The key to executing a large top is planning. Five minutes of gluing might take two days of preparation. If you work with rough milled stock, you'll spend more time planning than if your boards are already thicknessed and planed. Nevertheless, proper planning involves layout, edge preparation, dry-run clamping, leveling and smoothing.

Layout

Much has been written about orienting the annular rings so that they reverse every board. This results in an alternating "heart side up/bark side up" arrangement that will reduce

WOOD´WORDS (wood´wurds) n.

open time: Period after glue has been applied to surface and before it begins to dry.

tack: The sticky property of glue that intensifies as it begins to dry.

cabinet scraper: A sharpened piece of steel set in a body of a cast iron tool used to remove fine shavings of wood on the face of a board or panel.

warping. Though a sound practice, I always arrange the boards for my tops to maximize the best figure, grain and symmetry in the panel. Because the tops are fully secured to the base and finished on both sides, warping is minimized. If you look at the underside of the warped top of an old piece of furniture, you'll most likely find it unfinished.

To help visualize what the grain and figure will look like once the panel is finished you can squirt naphtha on the wood. Don't use water because it might distort the wood as it dries. After you determine the best layout, draw a large triangle on the panel so that you can assemble it in the same order later.

Cut the boards for the top at least 4" longer than you need. This will allow you to reposition each board slightly along its length for the best grain transition between boards. It also makes initial surfacing easier as you will see later. In addition, you'll have scrap pieces to test different finishes on.

STEP 1 Edge Preparation • After arranging the boards to produce the best design, mark the edges with a pencil to designate inside and outside edges. This compensates for any slight imperfections in the jointer's 90 degree fence alignment to the table.

If you don't have a jointer, you can use a razor sharp jointer plane and fold the boards like they were pages in a book so that you plane the two edges simultaneously. This accomplishes the same thing. If you have very long boards and lack a jointer, you might want to take them to a mill to have them done. Whatever method you choose, try to glue the panel up as quickly as possible after jointing the edges. Boards that have sat around will not only warp, but the edges can became dirty and might not accept glue well.

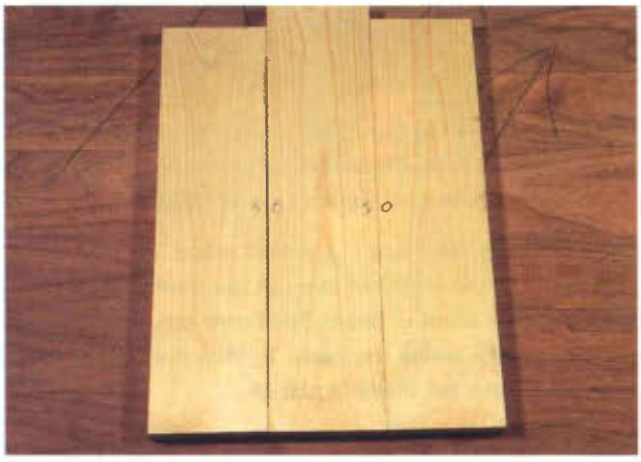
An edge-to-edge joint does not need any mechanical fasteners such as dowels or biscuits to add strength. The only time these are needed is when the individual boards for the panel do not lie flat. These devices can then be used to coax the individual boards into alignment. Very long panels might benefit from biscuits or splines if individual boards are curved over their length.

STEP 2 Dry-Run Clamping • It is imperative to clamp panels on a flat surface. Clamping a long panel on an uneven surface will transfer this to the panel. I use a large moveable table made from a thick slab of Formica-covered particleboard. Particleboard is a guaranteed flat surface and the Formica laminate makes glue clean up easily. To support the boards during gluing I rip some scrap boards of equal width so that they raise the boards above the table. This allows clamps to be placed underneath as well as on top of the panel. This equalizes pressure so that the panel does not cup when the clamps are tightened. I space the clamps approximately 12" to 18" apart.

Another useful tool is a glue roller applicator. These dispense a thin, even amount of glue so that glue squeeze out is minimized. It also prevents glue from getting on your hands, which invariably winds up on your stock. If you use iron pipe clamps, put wax paper under the clamps so that the iron doesn't discolor the wood where it contacts wet glue. Galvanized steel pipe clamps don't have this problem.

Glue choice is not critical, but you should pick a glue with a long open time if you're working with a lot of individual boards. Glues with a quick tack like Titebond can start to set on time-consuming assemblies, which creates glue lines in the finished panels. Using a glue with a longer open time, like white glue, allows you more time to apply the glue and position the boards for clamping. You might also want to have a rubber mallet on hand to coax boards into alignment.

After collecting all the materials and tools, get into the habit of dry-clamping the panel before gluing. This way



1 PREPARE THE EDGES • Run edges marked as "inside" edges on the jointer with the face of the board against the fence. And run edges marked as "outside" edges with the face of the board facing away from the fence.

2 MILK RUN • Place clamps about 12" to 18" apart. For very wide panels (over 36") avoid clamping all the boards at once. Instead, glue up two sections first, then clamp these together after several hours.

you can anticipate and correct any problems that would be hard to fix if the edges had glue on them. Look for gaps that don't close under moderate clamp pressure and adjust the boards to correct. Once satisfied with the dry assembly, remove the clamps and place all the materials you need close by so that you have ready access to them.

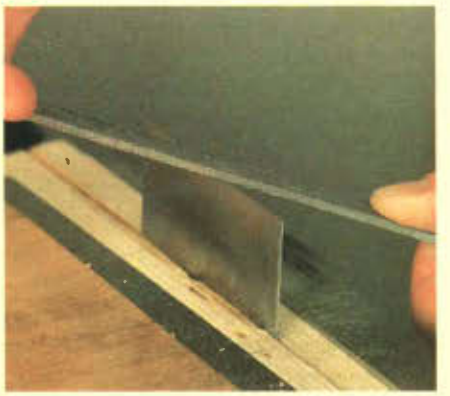
Glue-up

Glue-up is easy once you've gone through a dry run. Place your supports on the table and put a clamp between each support. Lay the boards on the supports and apply the glue to the edges. Align the boards in reference to the triangle you marked earlier. Try to work as quickly as possible. Then apply the clamps on top and slightly snug both top and bottom clamps. Make sure clamps are positioned 90 degrees to the joint lines, which applies pressure directly across the joint and prevents the boards from slipping along their length. Bang any raised boards into alignment with a rubber mallet. Wipe the squeeze-out off the top with a damp cloth, then tighten all the clamps. If you can, turn the panel over and wipe the excess glue off the bottom. Let the glue dry according the glue manufacturer's recommenda-

Sharpening a Cabinet Scraper

There are many ways to sharpen a cabinet scraper that will curl wood like a schoolgirl's ringlets. This method, passed down from an old cabinetmaker, is our favorite.

1 The object of sharpening the blade for a cabinet scraper is to file a gently sloping valley across the length of the cutting edge that is a couple thousandths of an inch deep. To do this, first place the blade in a vise with the beveled cutting edge facing away from you. (The bevel was put on the blade at the factory.) Take a ½" wide mill bastard file (the kind where the grooves go only one way) and start to shape this valley by pushing the file away from you against the cutting edge. After each stroke, brush the metal filings off the file.



2 The next step is to hone the blade to remove any burrs. Use a small, medium-grit to medium-fine-grit oil stone. Lay the scraper blade flat on the back side against the stone and rub it in a small figure-eight pattern.

3 Then flip the blade over and sharpen the valley, which is the tip of the beveled edge. Make sure you do this on a corner of the stone so that you can get into the slightly concave part.

4 Next, burnish the edge to make a burr that cuts the wood and curls the shavings. Put the blade back into the vise, cutting edge away from you. Place the tip of the burnisher on the left side of the cutting edge. Push the burnisher to the right and away from you. Repeat this motion several times.

Finally, install the blade in the cast metal body. To set the blade to the proper depth, put the front end of the housing on a sheet of paper. Then drop the blade in with the bevel facing the back. Tighten the clamping screws to lock the blade in place.

Now adjust the set screw in the front to set the curvature of the blade. Turn the scraper over and hold it under a strong light. Turn the set screw until you see an even amount of light reflecting off the cutting blade. Try out that setting on a piece of scrap wood and fine tune.

tions. Then remove the clamps (usually after several hours). Next place the panel against a wall so that air can circulate freely on both sides.

STEP 3 Leveling • Leveling and smoothing of the panel should not be done until the glue is fully cured. Leveling the panel flattens it so that it will attach to the frame of the table without gaps and will visually appear as a pleasing, flat surface.

The best tools for efficient leveling are the cabinet scraper and belt sander. The cabinet scraper **(see "Sharpening a Cabinet Scraper")** removes dried glue, high spots and ridges formed by two adjoining boards. The belt sander also removes high spots, but its main role is to establish a consistent surface ready for final smoothing.

The first side to work on is the bottom, or non-show side, of the panel. Using a cabinet scraper, remove dried glue and ridges from the panel. Then knock down any high spots on the table top.

Repeat the same process on the show side of the panel, removing dried glue and ridges with the cabinet scraper.

3 GET FLAT • Use a sharp cabinet scraper to remove dried glue and ridges. Then, working at a 45 degree angle, make several passes to knock down any high spots. Reverse direction and repeat. Turn the board over and make sure it doesn't rock. If it does, keep working the high spots on the back until it lays flat.

4 CROSSING THE LINES • As you work, you should see the lines disappear as you remove high spots. Keep sanding until the lines disappear, then reverse the angle, sanding at an opposite 45 degrees.

STEP 4 Crosshatch Sanding • With a pencil, draw some lines at a rough 45 degree angle on the surface of the panel. Then, using a belt sander equipped with an 80 grit belt, start sanding the surface, moving the sander constantly and maintaining the 45 degree angle. Hold the sander with the excess cord gathered up by the handle and the rest of it draped over your shoulder.

STEP 5 With the Grain • When these lines are gone, draw some lines with the grain of the wood and sand in this direction until the lines are gone.

The extra length left on your panel will help when working with a belt sander. That's because the tendency is to tip the sander and gouge the wood near the edges.

The scratches left by the 80 grit belt are pretty deep, so I continue beltsanding with the grain with 100 grit, then 120 grit belts. At this point I cut the panel to its final dimensions and mill any edge treatments with a router.

Final smoothing is tricky with a belt sander, so I usually use a random orbit sander. Start with 120 grit and work up to your final grit. If you want, flip the board over and finishsand the bottom the same way you did the top. This is a good idea at least around the overhang of table tops, where hands frequently contact the underside, and a rough surface would be undesirable. **PW**

Jeff Jewitt is the author of "Hand Applied Finishes" and two videos, "Coloring Wood" and "Topcoats." (The Taunton Press). Jewitt is a teacher and specializes in period finishing techniques.

5 FINAL BELTSANDING • When the lines disappear, you should have a flat surface, but work the surface until all the cross-grain sanding scratches are gone. You can wipe the surface periodically with naphtha to help highlight any errant scratches.

"Antique" Recipe Cabinet

Please the cook with a classic kitchen organizer. *By Ralph Wilkes*

I ADAPTED THE DESIGN for my cherry version of this recipe holder from an antique believed to be about 100 years old. Not only is the recipe cabinet charming, but it's also versatile. It can perch on the counter or hang from a wall if your kitchen has succumbed to clutter.

The width of the sides, back and shelf makes it necessary to glue-up these pieces. While a simple glued edge joint might be strong enough with only a ½"-thickness, I decided biscuit-joined edges would be stronger **(photo 1)**. To begin, lay out the pattern to place the biscuits where they won't show at an exposed edge. To guard against warping when joining two or more pieces, match the stock so the annual rings are reversed.

After enlarging the pattern provided at the end of this article, lay it out on the stock **(photo 2)**. Then cut one of the side pieces to shape **(photo 3)**. Sand the edges carefully **(photos 4 & 5)**, then use this side as a pattern for the other. Start with paper of about 100 grit, then finish all exposed flat surfaces and edges with 150 grit.

Next saw the back and the other pieces. Form the back corner joints with a straight bit in a router or shaper **(photo 6)**, or use a table saw to form the rabbets.

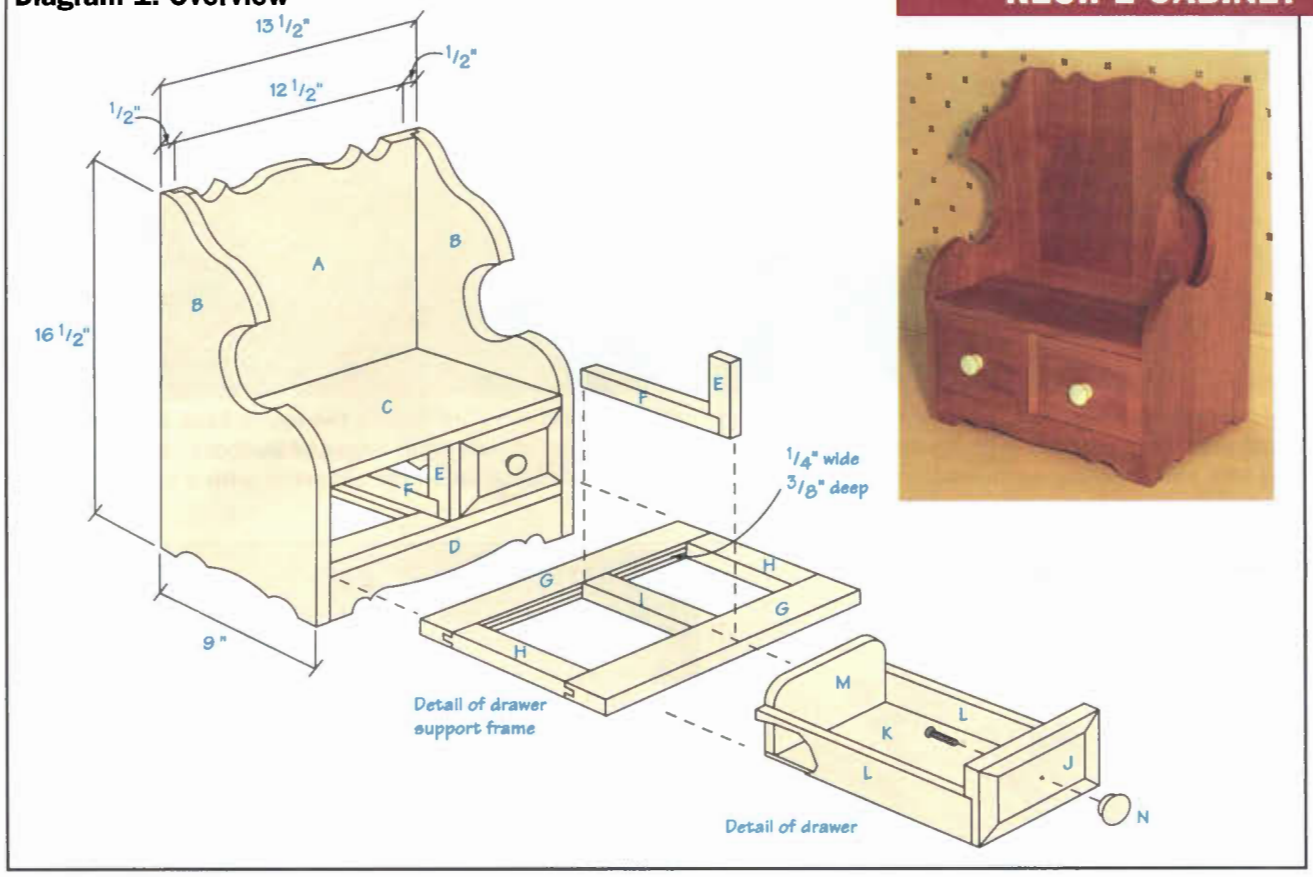
Now drill three or four 1/16" holes near each edge of the back piece, then glue and nail the rabbeted back corner joints with ¾" #18 wire brads. Remove any glue that squeezes out, then thoroughly wipe the surface with a wet cloth to eliminate any glue. This is important, particularly if you intend to apply stain, as any trace of glue prevents stain from penetrating the wood, causing splotches.

1 Edge-join stock to obtain the needed width using dowels or biscuits. Place them so they aren't exposed when cutting the scroll design.

2 After enlarging the pattern, use carbon paper to transfer it to the sides.

3 Cut the side scrollwork using a band, saber or scroll saw.

Diagram 1: Overview



Since the shelf doesn't support a heavy load, glued and nailed butt joints are strong enough. Fit the shelf between the sides. Then draw lines to mark the location of the shelf's lower edge on the inner surfaces of both sides. Use a try square to assure that these lines are perpendicular to the back and are even with each other. Drill two 1/16" holes for nails on each of the outsides, then glue and nail the shelf in place.

Make the support frame for the drawers as shown in **diagram 1.** The long grooves on the inner edge of the front and back pieces serve as a mortise for the tenons of the three drawer runners. Make these joints a snug fit. Check the assembly with a try square, then glue and clamp the frame.

Now make the two-piece divider, center it, and attach with glue and nails before securing the frame to the sides **(photo 7)**. Mark the sides first, making sure the frame will be exactly 4" below the shelf at all points. Then glue and nail it in place. Put one nail down through the shelf into the end of the upright divider.

4 Outside curves can be sanded using a disc or belt sander.

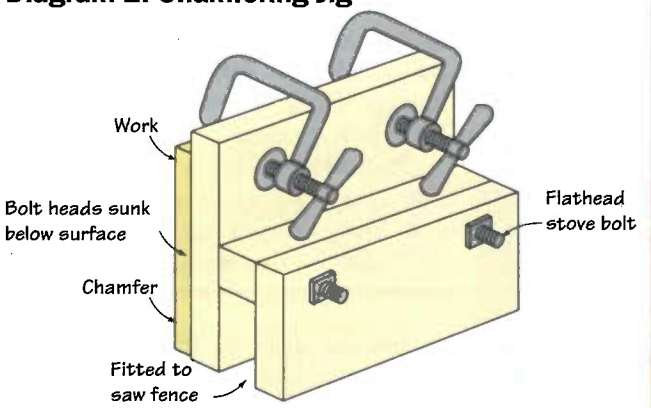
Schedule of Materials: Recipe Cabinet

No.	Letter	Item	Dimensions T W L	Material
1	A	Back	1/2" x 12 1/2" x 15"	Cherry
2	B	Sides	1/2" x 9" x 16 1/2"	Cherry
1	C	Shelf	1/2" x 8 1/2" x 12"	Cherry
1	D	Front decorative base	1/2" x 1 1/2" x 12"	Cherry
1	E	Partition (divider)	1/2" x 1 1/2" x 4"	Cherry
1	F	Drawer guide	1/2" x 1/2" x 6 1/2 "	Cherry
2	G	Frame front & back	1/2" x 1 1/2" x 12"	Cherry
2	H	Drawer runners	1/2" x 1" x 6 1/4"	Cherry
1	I	Center drawer runner	1/2" x 2" x 6 1/4"	Cherry
2	J	Drawer fronts	3/4" x 4" x 5 3/4"	Cherry
2	K	Drawer bottoms	1/4" x 5 1/4" x 8"	Plywood
4	L	Drawer sides	1/4" x 2 " x 8"	Plywood
2	M	Drawer backs	1/4" x 5 1/4" x 3 1/2"	Plywood
2	N	Drawer pulls	1" diameter	Porcelain or wood
Wire brads		5/8", 1" and 1 1/4" wire brads		
Glue				
Polyurethane finish				
1" white porcelain knobs (Amerock BP724-30, available at many hardware stores. Wood knobs may also be used.)				

5 **Inside curves are best sanded with a drum sander on a drill press or a portable drill. Follow all machine sanding with hand sanding as needed.**

6 **Cut a ¼" x ¼" rabbet on the inside back edges of the sides and at both front edges of the back. Do this with a straight mortising bit on the shaper or with a table saw.**

Diagram 2: Chamfering Jig



Chamfering Tip

When chamfering the drawer fronts, first clamp the front in place with one end level to the saw table. By always making the first cuts across the grain, the final cuts made with the grain will remove any tear-out created by the first passes.

8 **A homemade jig that's fitted to the rip fence of the table saw makes chamfering a simple process.**

Next you can glue and nail in place the decorative lower front piece. Turn the assembly upside down and lay the drawer support frame against a firm support. Then apply glue and drive nails through the decorative piece into the front section of the frame.

From ¾" stock, cut the drawer fronts to fit. They should measure approximately 4" x 5¾". While the drawers could be made with plain fronts, the raised panel effect adds styling to the recipe cabinet and is well worth the little extra time.

To cut the chamfers safely and accurately, you'll need a simple jig for your table saw **(photo 8 & diagram 2)**. The jig should fit over the fence tightly enough to assure identical cuts, but loosely enough so it will slide freely. The **diagram** shows the construction details. (The dimensions must be tailored to fit your saw fence.)

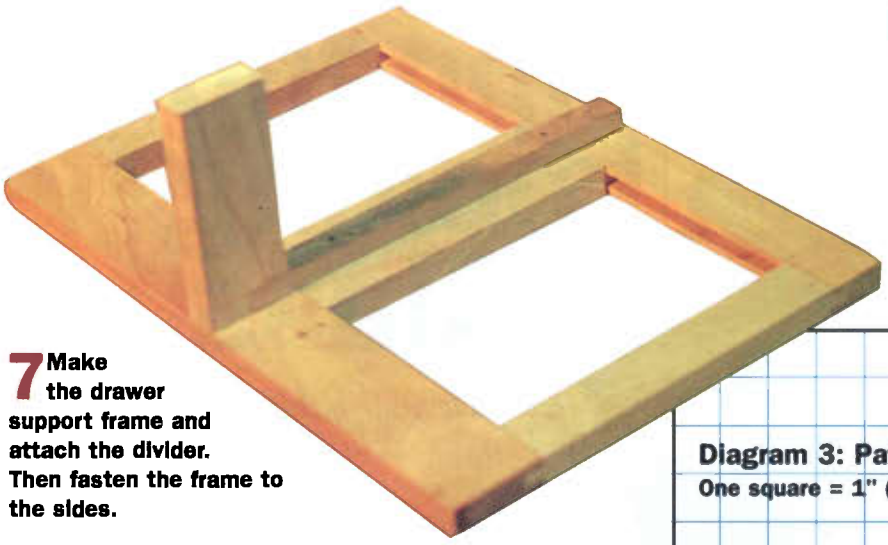
Before chamfering the drawer fronts, set the blade for a ¾"-deep cut and at a 10-degree angle. Then clamp a piece of ¾"-thick scrap stock to the jig and make trial cuts, adjusting the fence until you're satisfied with the result.

Next sand the chamfer cuts. Protect the raised panel by laying a piece of scrap stock of about the same size and shape over it. I found that sanding sponges worked well here. Complete the sanding using fine paper, such as 150 grit. Then locate the center and drill for the screw to attach the pull.

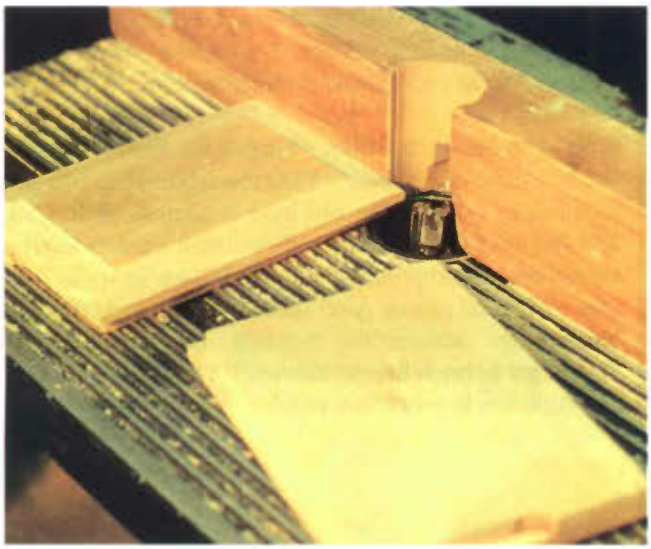
Now cut a ¼" x ¼" rabbet on the ends and bottom with the table saw or shaper **(photo 9)**. If you use a shaper, extend the end cut up only 2½" since the drawer sides are 2"-high.

Cut the ¼" plywood sides to shape and attach to the drawer fronts with glue and ⅝" x #18 wire brads. Fit the bottom to the front and sides, then glue and nail. Cut the back to fit, round the corners as shown, and attach in the same way.

After completing any necessary sanding, apply an oil stain if desired. I was pleased with the natural color and grain of the cherry wood, so I didn't use stain. I used a nail



7 Make the drawer support frame and attach the divider. Then fasten the frame to the sides.



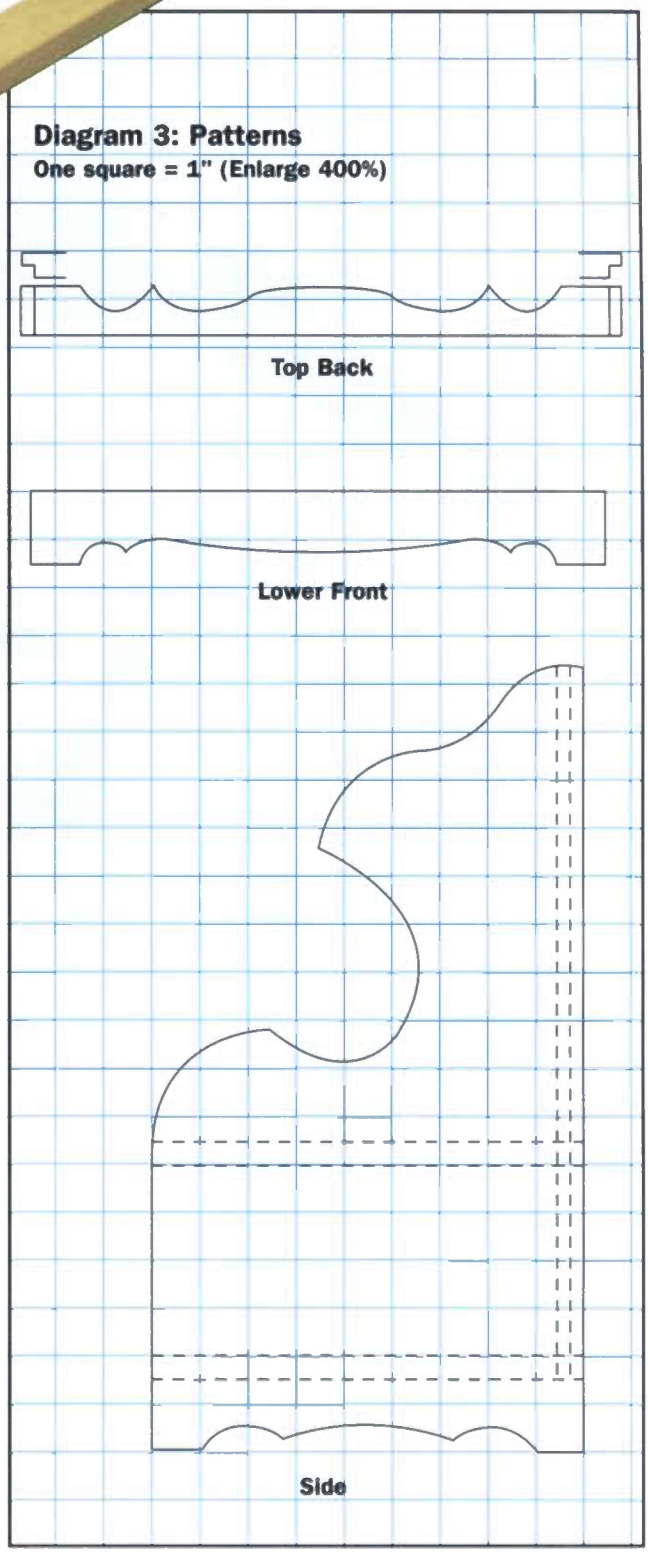
9 After chamfers are completed, cut rabbets in the back, sides and bottom of the drawer front, again using the shaper or table saw.

set to sink all nail heads about 1/8", then applied one coat of polyurethane finish after covering all surfaces to eliminate any possibility of moisture absorption. I then used a stick wood filler of matching color, applying it over all exposed nail heads. A pen knife works well for pressing the filler into place and smoothing it with the knife blade.

After each coat, sand lightly and remove dust with a tack cloth. I applied three coats, the last one being a satin sheer polyurethane. This will let you avoid rubbing down the finish with a powdered pumice stone and oil to eliminate the glossy surface.

Now attach the two white porcelain pulls (or wood ones if you prefer), and the newest "antique" in your house is ready to be placed in service. **PW**

Ralph Wilkes *has been a woodworker for more than 50 years. He also is a retired business manager/treasurer of Keuka College in New York.*



Chippendale Looking Glass

Exercise your hand tool skills and create a classic.

This attractive Chippendale-style mirror can be built with shop scraps and hand tools.

Some thin boards of leftover mahogany led me to the idea of making small mirrors or, in the parlance of the 18th century, looking glasses. They make wonderful gifts and require only scrap wood from around the shop.

STEP 1 The Scratch Stock • I began the mirror by milling a piece of mahogany wide enough to yield two strips of molding side-by-side and long enough to yield a long and short piece of molding end-to-end. It's easier to scrape the profile into this one piece rather than scraping it into four individual pieces. After securing the parts between the bench dogs, scratch the molding into the stock **(see "Making a Scratch Stock" below)**. If you don't want to use a scratch stock, you could purchase molding from a home

1 THE SCRATCH STOCK • Your left hand should hold the scratch stock firmly against the material being molded. Your right hand should hold the scratch stock down onto the frame stock. (Or vice-versa if you're left handed.) Push the scratch stock along the length of the board, trying not to take too much of a bite. By working slowly and forming the profile of the molding with several passes, you'll avoid chatter and be left with a molding with crisp arrises that will require little sanding.

Making a Scratch Stock

To make the scratch stock, you'll need a piece of hardwood about 1½" thick, 4" long and 2" wide. Cut one corner away to remove a piece about 1" x 2". The "L" shaped piece will have to be resawn; but before doing this, drill two holes for the bolts that will lock the blade into the stock. Resaw the stock in two and obtain a piece of an old scraper blade. Grind or file the profile of the molding, obtained from the diagram, into the blade. The blade can then be locked into the stock. Practice using the scratch stock on some scrap wood to get the feel of it before you use it on the frame stock.

Schedule of Materials: Looking Glass

No.	Item	Dimensions T W L
2	Frame sides	7/8" x 7/8" x 16"
2	Frame top & bottom	7/8" x 7/8" x 10"
1	Top scroll	1/4" x 5 3/4" x 10 1/2"
1	Bottom scroll	1/4" x 3" x 10 1/2"
2	Top ears	1/4" x 2 3/8" x 4 1/4"
2	Bottom ears	1/4" x 3" x 4 1/4 "
1	Mirror	1/8" x 9 1/4" x 15 1/4"
1	Back	1/8" x 9 1/4" x 15 1/4"

improvement center or hardware store instead.

When you're satisfied with the moldings, the frame can be ripped apart at the table saw. There's no need to crosscut the parts to length—they'll be mitered later. While you're at the table saw, a dado head can be fixed onto the arbor to plow the 1/2" x 9/16" rabbet along the back of the frame parts. Next, sand the molding profile before cutting the miters.

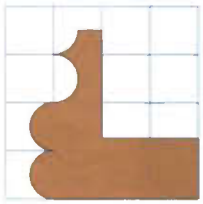
STEP 2 Miter the Corners • I made a small miter box to cut the frame parts to size. Another option is to make shooting boards to shoot the miters with a sharp plane. Whichever way you go about it, the object is to arrive at square frames.

I glued the frame together with a miter clamp at each corner, checking carefully for squareness before putting the part aside to dry.

STEP 3 The Spline • After the glue has set, reinforce the miter joints with a cross-grain spline. The thickness of the spline is dictated by the width of the chisel used to clean out the slot, in this case 1/8". To begin the slot, use a sharp backsaw to make parallel cuts across the joint down to a layout line scribed across the frame's edges. Make sure your cuts are parallel to make a uniformly wide slot.

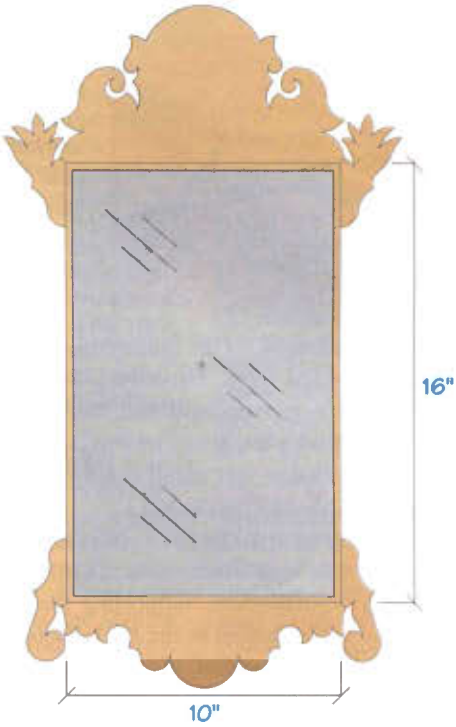
STEP 4 Glue the Splines • Cut, surface and glue the splines. Once the glue has dried, trim the splines close to the frame with a saw and clean up the ends with a sharp chisel.

Diagram **MIRROR**



One square equals 1/4"

Full scale detail of frame molding



Elevation

2 MITERS • A small miter box was made to cut the frame's corners, though there's no reason that a table saw fixed with a miter gauge or a mitering jig can't be used.

3 SPLINES • Cut the slot for the spline in the frame with a backsaw. Chisel from either end of the slot toward the middle of the slot to avoid tear-out.

4 GLUE • The splines are made from the same material as the frame. Surface the material down so the spline will have a press fit into the slot, and make sure the spline's grain is oriented across the miter.

5 SCROLLWORK • To cut the pieces, first set a very fine-toothed blade into the fret saw with the teeth pointing toward the handles of the saw. Try to plan your cuts to avoid getting stuck in a spot where there's no egress.

STEP 5 The Scrollwork • This rather ordinary frame could easily be used as-is. However, with a little extra effort, the mirror can be embellished with scrollwork. The scrollwork is cut with a coping, or fret, saw. (Of course a small, table-mounted power scroll saw or jigsaw could be used to saw out the scrollwork, too.)

I cut the scrollwork on top of a shop-made table with a "V" cut into its top, sometimes called a birdsmouth. I made the table from particleboard, supporting the work surface with some brackets fastened to the back. Before laying out the scroll cuts on the material, plane or scrape off the mill marks and sand the stock. You'll need to establish one reference edge on the scrollwork pieces. Use the patterns in the PullOut™ Plans to lay out the cuts on the parts.

STEP 6 Reinforce the Scrollwork • The thin edges of the scrollwork will need to be beefed up before they can be mounted on the frame. This is easily done with scraps glued to the backs of the pieces.

STEP 7 Glue and Finish • The scrollwork can now be glued to the frame, held in place with spring clamps. If you feel it necessary, a strip of wood could be screwed, not glued, across the grain of the cresting piece to keep the crest from warping.

I finished the frame with several coats of orange shellac, rubbing down each coat with fine sandpaper before applying the next. I applied a coat of wax after the shellac dried.

The mirror is held in place with glazier's points and backed with a piece of door skin. Glue a piece of brown butcher's paper to the back of the frame to protect against dust. This gives the mirror a more finished appearance. Finally, add screw eyes and picture hanging wire. **PW**

Robert Treanor *has a workshop in San Francisco. He specializes in Early American and Shaker furniture.*

6 REINFORCE • To reinforce the delicate parts, glue narrow strips made from scrap left from cutting the scrollwork to the back faces of the scrollwork. Once the glue has dried, use a plane to clean and true the edges that attach to the frame.

7 ASSEMBLY • Spring clamps hold the frame together as it dries. After the frame is finished to your liking, cut a ⅛" mirror 9¼" x 15¼" and insert it into the rabbet. Secure with glazier's points.

Bad luck, but valuable

Mirror stock wasn't always plentiful in the United States. In fact, the silvered glass was so precious that small hand-held or wall-hung mirrors often were made from the broken shards of larger mirrors — Colonial-style recycling, if you will. In the 18th century and up into the 19th century, almost all the glass for U.S. mirrors came from Europe. Frames for the glasses usually were manufactured by local craftsmen, and those made in the urban centers could be quite fancy. More often than not veneer was used to embellish the ears, cresting pieces and frames. Carving, often of eagles, could frequently be found on the crest.

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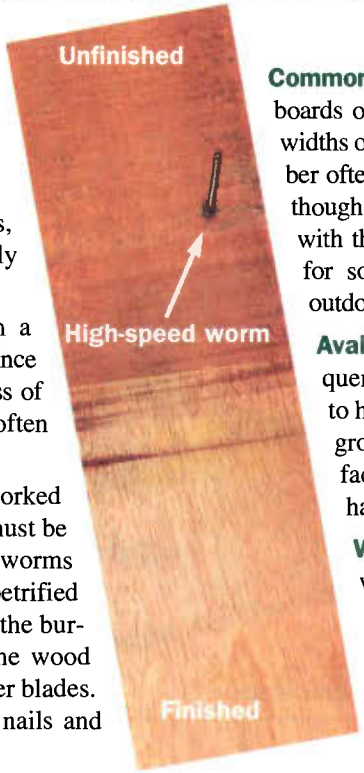
A/M 97

American Alleewood

(Foundus paletus)



Other Common Names: Sloof lirpa, common crate.

Growing Regions: Worldwide, particularly industrial areas.

Characteristics of Tree: A barkless, leafless, short scrub tree of varying height, but routinely small trunk diameter.

Characteristics of Wood: Wood varies from a bleached white to a dark and knurled appearance with a wide range of grain patterns. The hardness of alleewood varies greatly, as does density, often depending on growing region.

Workability: American alleewood can be worked with hand and machine tools, but special care must be taken during milling. Holes from high-speed worms are a frequent occurrence in the wood, and the petrified remains of the worms can be found in many of the burrows. Care should be taken when surfacing the wood because these remains can ruin jointer and planer blades. The wood is adequate for turning, and glues, nails and screws well.

Common Uses: Alleewood frequently yields boards of no greater usable length than 36" and widths over 6" are rare. The best selection of lumber often yields a thickness no greater than ¾", though 2" x 2" stock is not uncommon. Even with these limitations, alleewood is acceptable for some furniture, turnery, pattern making, outdoor furniture and painted projects.

Availability: Where is, as is. Found frequently in urban settings, alleewood is easy to harvest as it is often found already on the ground behind shopping establishments, factories and warehouses. Most common harvest date: April 1 (hint, hint).

Wood Movement: Varies. Most alleewood is speed air-dried, achieved by stickering on flatbed trucks, which are driven at high speeds on interstate highways.

Midwest Retail Price: 4/4 ungraded, often free for the asking. Select and better, recommend inquiring first. **PW**

Scrolled Coffee Table

A coffee table with a twist, a turn and a tail.

I WANTED to make a coffee table that was different, perhaps decorated with a cutout design. I finally stumbled on a design that I liked and later discovered that it has been around a long time. In the cabinetmaking field, this design is classified as English fretwork. It's also known as a Pisces design because it looks like a stylized fish. Whatever you call it, it simply consists of a row of intersecting semicircles.

Preparation

If you plan to use a clear finish or a stain and finish, choose a typical furniture wood, such as cherry, mahogany, oak or walnut. If you plan to enamel the base and finish the top to show the wood grain, consider poplar for the base. I used cherry for the entire project.

Start by planing the material to the finished thickness given in the Schedule of Materials. I planed the four side pieces to 1/2", which saved time because I could then drill and saw two sides at once. As for the legs, I produced the desired thickness of exactly 2 1/2" by gluing together two 1 1/4" thicknesses.

Basic Construction

It doesn't really matter whether you begin with the sides or the legs. I made the sides first. Plane and sand them until you have two pieces exactly 1/2" x 5" x 35 3/4" and 1/2" x 5" x 17 3/4". Pair these, best side up, and join each pair with a 1" x #7 roundhead screw through what will become the tenon at the end of each piece. Now you're ready to lay out the pattern as shown in the PullOut™ Plans on the top one of each pair. Transfer the pattern to the wood with carbon paper. Or, because the design is simple, you can draw the design directly on the wood, as I did. This requires only a compass and a ruler. It's advisable to begin at the center and work out.

STEP 1 Drill the Corners • Use an awl to mark the centers for drilling the cutouts. Drill holes tangent to the construction lines large enough to accommodate a scroll saw blade. There are different types of blades, so it's advisable to check, but a 7/32" bit is big enough for most blades.

STEP 2 Remove the Waste • Use a scroll saw to cut the pattern in the sides. After sawing is completed, sepa-

WOOD´WORDS (wood´wurds) n.

fretwork: Interlaced ornamental work, either perforated or cut in low relief on a solid ground, usually in geometric patterns.

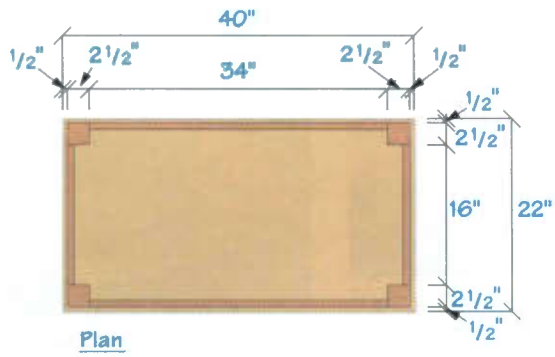
glue size: The sealing of a surface using glue. In woodworking, glue left behind, even after cleaning a surface, that has penetrated the wood fibers. This prevents the coloring of the sealed area.

chain drilling: A line of drilled holes that overlap one another, giving the appearance of being "linked" to each another.

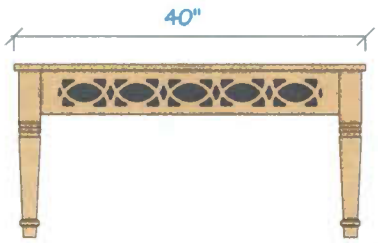
1 DRILL • As shown in the photo, drill two thicknesses at the same time. Place a piece of scrap wood beneath your work to prevent chipping as the drill breaks through the wood.

Diagram

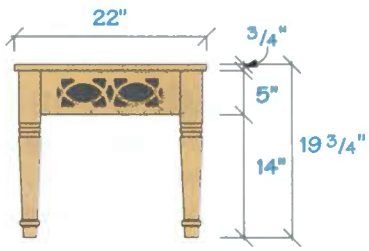
COFFEE TABLE



Plan



Elevation



Profile

Schedule of Materials: Coffee Table

No.	Item	Dimensions T W L	Material
1	Top	3/4" x 22" x 40"	Cherry
2	Sides	1/2" x 5" x 35 3/4"	Cherry
2	Ends	1/2" x 5" x 17 3/4"	Cherry
4	Legs	2 1/2" x 2 1/2" x 19"	Cherry
2	Cleats	3/4" x 3/4"x 32"	Cherry
2	Cleats	3/4" x 3/4"x 16"	Cherry

rate the pieces and smooth the rough edges with a fine-cut wood rasp and with sandpaper backed by a piece of flat wood about the shape of a ruler. Because it's easier to fit tenons to mortises than mortises to tenons, don't shape the tenons until you complete the legs.

Make the legs

If you need to glue together two or more pieces to make the legs, try to match grain types so the joints won't show. Make the legs at least an inch longer than the final measurement. Square the tailstock end with a lathe chisel and measure the pattern details (see PullOut™ Plans) from that end, leaving waste at the upper (headstock) end to be sawed off later.

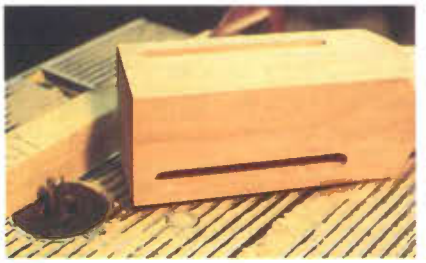
STEP 3 Turn the First Leg • Start the turning by rounding the stock up to the point where the turning design is left square. The turning now looks like a rolling pin with a square end at the left. This way it's easy to mark turning details, measuring up from the tailstock end. I designed this table to be higher than most, so if you want to make it lower, adjust your plan accordingly.

STEP 4 Turn the Other Legs • After completing the first leg, mount it behind the lathe for comparison while making the others. Use a two-by-four as a base and two wires from a coat hanger to make a suitable holder. Wait until all four legs are turned before sanding.

2 CUT THE DESIGN • As you cut the design to shape with a scroll saw, the drill holes simplify turning of the work while sawing.

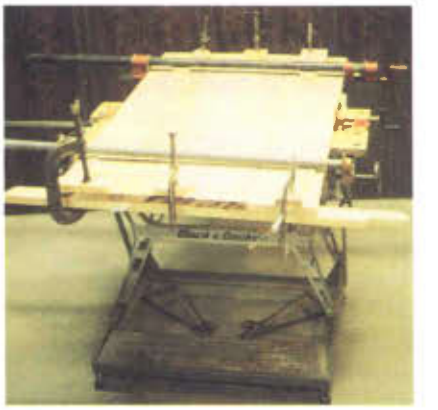
3 TURNING • Begin the turning by making the rounded part nearest the square section of the leg. Then work down the leg to the ball near the foot.

4 MORE TURNING • To ensure the legs are identical, mount the first leg behind your lathe. While turning the other legs, stop periodically to compare measurements using calipers.



5 MORTISES • The mortises can be made by drilling several holes and then cleaning out the waste with a chisel. Or you can use a 3/8" straight router bit, as shown here. Mark the beginning and ending points on your router table's fence and on the legs. Make three or four passes at increasing depth, up to 1".

6 ASSEMBLY • Before gluing, dry fit all the joints for complete assembly. There may be a slight variation, so try them for the best fit, then mark the joints AA, BB, etc.



7 GLUE UP • Use dowels or biscuit joints for edge-joining the top boards. After gluing, draw the boards together with clamps. To hold the top flat, use C-clamps to attach straight pieces at the ends. Finish all the pieces before final assembly.

Edge Gluing Tip

When edge-joining wood where long grain is glued to long grain, using dowels, biscuits or splines doesn't add strength to the joint. In fact, they weaken the joint somewhat. The use of joinery in edge-gluing is an assembly aid only, helping align the surfaces of adjacent boards. It is helpful with wood that might be slightly warped, or if you have a large glue-up where the time to level each board to mating boards is limited before the glue begins to set.

STEP 5 Mortise the Legs • Mark the legs for sawing and cut them on a table saw. Place the most attractive sides outward. Mark the mortises' locations for the side tenons. These are set back 3/8" from the outside edge of the legs and are centered top to bottom on the squared part of the legs. These may be formed by "chain" drilling a row of overlapping 3/8" holes 1" deep, then cleaning up the walls with a wood chisel until smooth slots are formed.

Now go back to the scroll sawed sides and cut the offside tenons to fit the mortises. The tenons are 7/8" long x 4" wide x 3/8" thick, so remove 1/2" of width from the top and bottom ends and 1/8" from the front surface. Textbook mortises and tenons are usually shown with square corners. The joints will be just as strong if you round the tenon corners with a wood rasp to fit the rounded ends of the mortises.

STEP 6 Build the Base • Assemble the legs and the short end sections first, gluing and clamping. Remove any glue that squeezes out of the joint with a wet cloth. This is important to prevent a light-colored spot in the finish, a result of glue size.

After the glue has set, remove the clamps and join the end sections to the sides in the same way. Check the assembly with a framing square, both horizontally and vertically.

Make the Top

Rip 3/4" x 3/4" cleats that go around the inside upper edge and attach the top. Drill these with slotted holes, and secure them to the sides with glue and 1" x #7 flathead wood screws set in countersunk holes. You won't need all of the holes you have drilled, as four screws will probably be plenty for attaching the top. However, if you discover a slight warp or twist in the top, you might want to use more.

Select the boards for the top, examining them for warp or twist. Cut the boards about an inch longer than final dimensions and allow a little extra for width. Run all edges on a jointer, or plane them until you get a perfect fit the entire length of each joint. Use at least three dowels or biscuits in each joint.

STEP 7 Glue the Top • Apply glue and draw the pieces together using bar or pipe clamps, two on one side, one on the other. Remove any glue that squeezes out on the upper surface.

Finishing

The top will need considerable sanding. If you start with a belt sander, use fine paper. This tool is easy to overuse, causing low spots or gouges. I recommend a straight line or orbital sander of the pad or palm type for most of the sanding. Sand under the best lighting conditions and view your work from all angles.

Break the sharpness of the corners with 120 grit sandpaper using a block for backing. For a fine finish, use paper as fine as 220 grit for all final work.

For finishing, work in a dust-free room and go over all parts with a tack cloth. I applied two coats of Minwax cherry stain. This was followed by three coats of polyurethane finish, the last being a satin finish. This removes the shine left by a glossy polyurethane finish. Coat all surfaces (including the underside of the top) with at least one coat of polyurethane to seal out moisture.

Finally, attach the top with washers and roundhead screws. After all this work, you've earned a rest. Sit on your sofa, have a cup of coffee and admire your new table. **PW**

***Ralph Wilkes** is a retired business manager/treasurer of Keuka College in New York. Woodworking is his hobby.*

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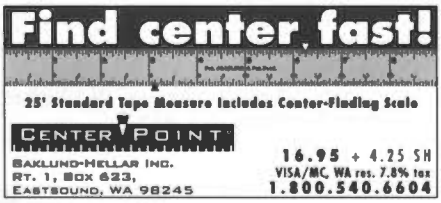

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Advertiser Index

Adams Wood	13
Airy Sales Corp	19
Alan Peters	12
Anderson Manufacturing	22
Arrow Fastener	15
Betterway Books	11, 15
Bonham's Woodworking Supply	6
CMT Tools	5
Constantine's	15
Delta	1
Decorative Artist's Workbook	73
Easyway Ventures	22
Econ Abrasives	12
Fein Power Tools	4
Forrest Manufacturing	7
Franklin International	8
Great Tools	14
Grizzly Imports	Cover 2, Cover 3
JIL Industries	10
Klockit	12
MLCS	9
Mobile Dimension Saw	6
NRI/McGraw Hill	19
Nyle Corporation	20
Popular Woodworking	17
RB Industries	13
Red Hill Corporation	13
Ryobi	Cover 4
Shopsmith, Inc.	23
Smithy	20
Systimatic	16
Terrco Inc.	21
Timberking	22
Van Dyke's	21
Wagner Electronic	21
Wood-Mizer	21

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 #24, 1507 Dana Ave., Cincinnati, OH 45207 by April 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 #22" from the January issue and recipient of the Porter-Cable router is:
David Grimberg, from Merrillville, Indiana.

The runners-up receive a one-year subscription to *Popular Woodworking*:
Bruce Costa, from Perkasie, Pennsylvania for:
"You picked the wrong 'hood for crack dealin', man!"

Ronald Estrada, from Oxford, Michigan, for:
"We fix our mistakes the old-fashioned way: on overtime!"

And finally, for dubious achievement, C.D. Ramsey, of Baytown, Texas, for:
"And you don't need to come back 'til Stephen Shanesy is a member here."
C.D., You'll receive a 55-gallon drum of wood dough, shipped COD and freight collect! — *Steve*

"Only gap needs fillin' here is the one between your lips!"

Dumpster Diving

Furniture for the inexpensive 'pallet.'

Someday I will build fine furniture. The joinery will be flawless, all wood movement will be compensated for, and the design will be a result of intent and function, not accident. Until that day, I read every magazine I can for ideas and inspiration.

The trouble is, in terms of experience, the distance from a gallery-quality piece of furniture to what is produced in my garage can be more accurately measured in parsecs rather than meters.

For practicing, my resources are scant. Though I've managed to scrounge my way to a useful hand tool collection, my "arsenal" of power tools includes only a sabre saw, a circular saw and a drill. Wood is most often from a much-watched dumpster in a downtown alley or from pallet giveaways at a local warehouse.

The reason for this frugality is that this year I have four (count 'em: four) kids in college. After they all graduate I'm planning to present each with an extensive Christmas "wish list" that will be to my advantage.

I like to think of my style of woodworking as the old "bootstrap method." For example, last winter when I left a bottle of carpenter's glue in the unheated garage for four months, the experience was more along the lines of, "Tell me and I might remember; show me and I'll never forget." My first spring project was a glue caddy to carry all that stuff back to the house when necessary.

When it got a little warmer, I decided to build a small end table, but my scrap pile of leftovers yielded only some construction-grade 2 x 4s and a rough piece of plywood pocked with knot holes on one side and splintering grain on the other. Wistfully remembering the beautiful black walnut table I'd been studying in photos the night before, I started the project with what was at hand.

I center-marked a long 2 x 4, ripping it on the pencil line with the sabre saw; then I crosscut it to give me four legs. I used a block plane to bevel each corner, which got to be so much fun I nearly ended up with wide elliptical dowels instead of neatly chamfered table legs.

It's nice crunching though curled tendrils of fresh wood on the floor, but hand-cutting mortises in construction-grade pine can dent a person's enthusiasm. The further I went on the project, the more I envied "good" wood.

Inspiration came unexpectedly, as it usually does. I had spent some time on a borrowed computer to view postings on a favorite newsgroup: rec:woodworking. This is an open forum on the Internet where professional woodworkers and "wanna-bees" ask questions, trade information and tout their expertise. Amongst the advice offered in this forum, the grain can quickly be separated from the chaff. One night a posting showed up from a neophyte who complained he would never be able to do quality woodworking until he could afford a fully equipped shop.

A professional woodworker from the Midwest known only as "The Heartbreak Kid," or "HBK," replied to this lament by saying it is never the tools that make the craftsman. "If you do the best you can with what you've got, you're the best there is," he wrote. "Because that's all anybody should ask of anybody."

From that exchange, I found a new determination for my scrap-project end table. Each mortise and tenon would be better than the one cut before. Instead of making all the joinery the same, I'd experiment with things I hadn't yet tried.

When I had to use inferior plywood, I'd "distress" it with burn marks or a nail punch, or jazz it up with marbleized paper and several coats of decoupage glue. I would hide rough edges by hand-chiseling grooves in the side railings for the lower shelf. In short, I was free to improvise to the best of my ability.

The end table is now complete, sanded down and stained a light golden oak with protective coats of interior spray varnish. It's square, solid and stable. It will hold magazines and coffee cups.

My college kids each want one, and thanks to rec:woodworking, I can now think of half a dozen ways I could do a similar table, only differently.

Maybe next time I'll find a more conventional source for table aprons than the stack of 1 x 4s used nearby to prop up the peach trees. The orchard came up a few props short this year. Fortunately, though, I was not a suspect. **PW**

Barb Siddiqui *runs Chapter Two Books in Wenatchee, Wash. You can visit her at* http://www.televar.com/~lbrown/barb.html

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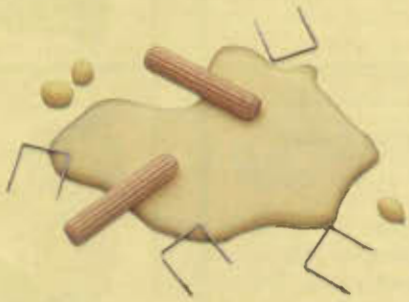

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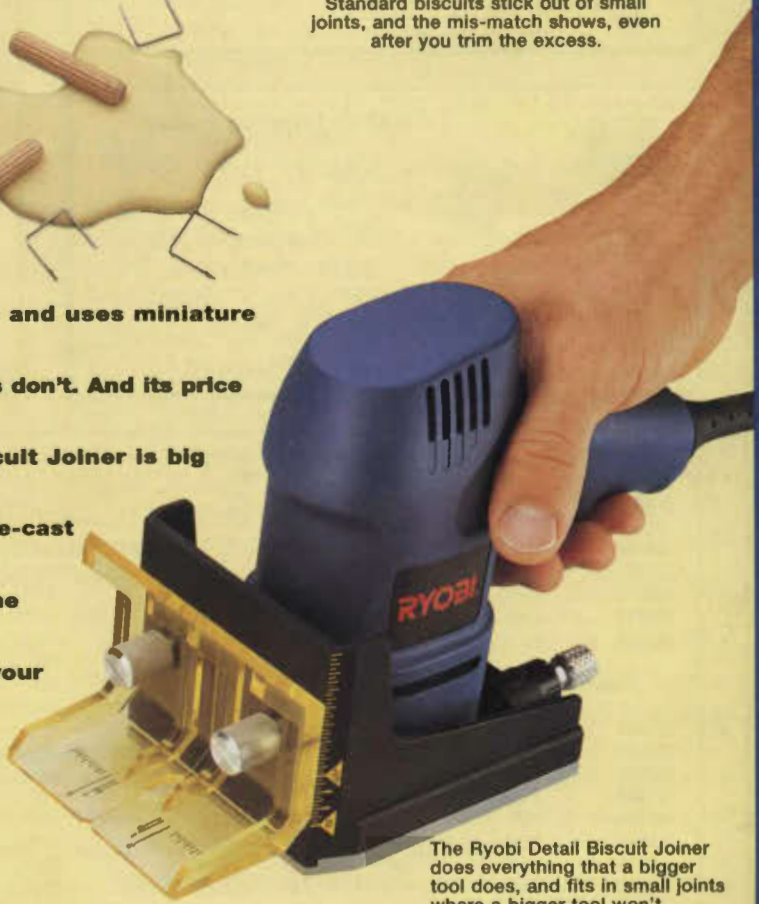

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