TOOL TESTS: JET MINI-LATHE; ROUTER BASES; GRIZZLY LATHE; JOINT A-BILI-T

Woodworker's Journal

Vol. 22, No. 2 March/April 1998

Baker's Bench

Build This Durable Kitchen Heirloom

Page 44

TECHNIQUES

- Hand-Cut Mortise and Tenon Page 18
- Turned Jewelry Page 62

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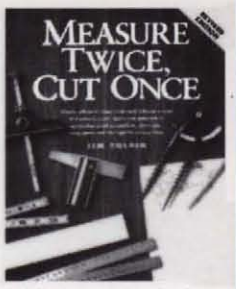

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Author – Jim Tolpin

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30T 1/8" or 3/32"	$135	$ 99	$ 89	$ 79
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30T	$125	$ 99	$ 89	$ 79
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8"X40T 3/32"	$136	$ 99	$ 89	$ 79
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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

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

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

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
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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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5/8" HOLES. Boring up to 1-1/4" $7.50 extra. Larger holes–time basis. Shipping $4.50.

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SIZES AVAILABLE	LIST	SALE	SIZES AVAILABLE	LIST	SALE
7-1/4" x 60T x 3/32" K	$149	$129	300mm x 100T x 1/8" x 30mm	---	$189
8" x 80T x 1/8" & 3/32" K	$202	$169	12" x 100T x 1-1/8"K	$253	$215
220mm x 80T x 1/8" x 30mm	---	$159	14" x 80T x 1"	$232	$197
9" x 80T x 1/8" & 3/32" K	$207	$179	14" x 80T x 1"	$266	$226
10" x 80T x 1/8" & 3/32" K	$207	$159	16" x 100T x 1"	$262	$243
12" x 80T x 1-1/8"K	$212	$181	16" x 100T x 1"	$294	$243

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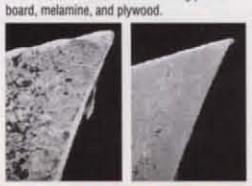
Above is bore standard.

CARBIDE IS THE HARDEST OF THE C-4 GRADES AND 40% STRONGER, NOT WEAKER! FOR 50% TO 300% LONGER LIFE.

Standard C-2 Carbide (below, left) and FORREST **still sharp** Oxidation and Corrosion Resistant Sub-Micron C-4 Carbide (below, right). Each shown after cutting 3,500 feet of MDF. Similar results obtained cutting particle board, melamine, and plywood.



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WOODWORKER'S JOURNAL

Vol. 22, No.2 March/April 1998

PROJECTS

TOOLS AND TECHNIQUES

DEPARTMENTS

Cover Photo: *Frank Pieroni*

FEATURES

SHOP TALK

This Project Didn't Make the Grade

We consider a lot of great projects when we select those that will appear in *Woodworker's Journal.* We believe we offer a good cross section of interesting, well-conceived, useful, and buildable projects, and we're proud of every one. I like to think that ours are the projects that get out of the shop and into use.

Unfortunately, for one reason or another, not all of them—even some of the great ones—make it into our magazine. For one, there are simply too many. We don't have enough pages to bring you all of them, so we have to pick and choose. Some are too costly, others too involved or difficult to present clearly. That doesn't mean you couldn't or wouldn't build them successfully, rather that we couldn't present thorough, step-by-step instructions and illustrations within our limitiations.

Take, for example, the nutcracker shown *above.* We've been meaning to offer such a project in our holiday issue for several years, but haven't yet found a design we considered worthy. We weren't sure of the feasibility either, so we asked contributing editor/woodworker Bob Colpetzer to make one. Thanks to Bob's efforts, we found out what it takes to make a nutcracker. This one didn't make the cut, but it set us searching for a design that will. If you have one, we'd like to hear from you.

Introducing Our Travelogue Series

We know from phone conversations and letters that many of you make special trips to visit a woodworker or shop that's of interest to you. Or, you stop off at points of woodworking interest while on vacation or business travel. The craft-rich regions around Berea, Kentucky and the Amana Colonies in Iowa, as well as numerous Shaker communities, get frequent mention.

When we travel around the country to interview and photograph woodworkers in their locations, we invariably turn up people and places of local woodworking fame that we'd never heard of. Rather than just file or (worse yet) forget this information, we've decided to share it with you in a series of Travelogues.

The "pilot" for this new series is based on a recent visit to the Holland, Michigan area *(page 16)*, where we photographed the Baker's Bench project that starts on *page 44.* It also includes a side trip to nearby Grand Rapids, a long-time furniture and woodworking mecca in its own right. Should you be visiting or just passing through the areas reported on, we hope you'll stop in.

For that matter, if you know of any locally celebrated woodworkers, galleries, museums, or sawmills in your area that you'd recommend to visitors, drop us a line or give us a call. We'd appreciate hearing about them and hopefully can pass them along to other readers.

Charles Sommers

Photograph: *Randall Sutter*

WOODWORKER'S JOURNAL

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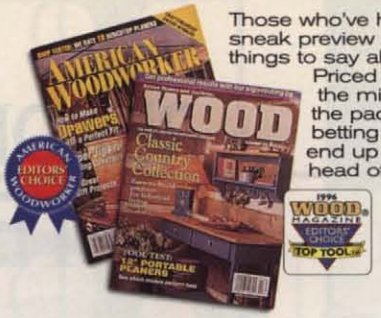

Those who've had a sneak preview have nice things to say about it. Priced in the middle of the pack–we're betting it'll end up at the head of its class.

Quick-change 2-knife system includes two high-speed steel, double-edged, reversible knives, a wrench and installation tool for quick and accurate knife changes.

Plane your own stock up to 12½" wide and 6" thick. All the way down to ⅛" thick.

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READER LETTERS

TOOL-PRIZE DRAWING WINNER!

Ever since I saw this desk in your Nov./Dec. '92 issue, I've wanted to build it. I finally got up enough nerve, and here it is. I made it from cherry with brass hardware from Horton Brasses. The finished piece was a birthday gift for my wife. This was my first attempt at a piece of furniture of this skill level, and I enjoyed the learning process immensely. Your instructions and drawings were superb. Keep up the excellent work.

Carl Heidegger
Battle Ground, Wash.

In searching for a gift item for this past Christmas, I selected the collapsible basket detailed in your May/June '94 issue. My first basket was a disaster because the glue didn't bond to the tropical woods I used. I went back to your article on gluing and clamping (Sept./Oct. '96) and followed your suggestions: cleaning the surfaces with acetone, reducing the clamp pressure, and lengthening the clamp time. The results were perfect. My thanks for a good project and, when I had a problem, for having already published a solution.

Carl Tillstrom
El Dorado, Ark.

Enclosed is a picture of the garden arbor from your March/April '97 issue. The article called for cedar, but I used pressure-treated pine. It turned out a lot heavier, but I think it will outlast me.

Robert MacNai
Dillard, Ga

Enclosed is a photo of my version o the ferryboat and cars featured in your Nov./Dec. '94 issue. I have since made several additional cars. They're a hit with the younger set, especially my three year-old grandson.

Allan Woo
Elkton, Md

Tool Prize

For being selected as the winner of the tool-prize drawing, Carl Heidegger will receive a Bosch 14.4 volt cordless drill/driver, model 3615K.

The names of readers whose project photos appear in Reader Letters are entered into a tool-prize drawing for each issue. To become eligible, send us a good photo and description of a project you've built from the pages of *Woodworker's Journal*. Send your submissions to: Reader Letters, *Woodworker's Journal*, P.O. Box 1790, Peoria, IL 61656.

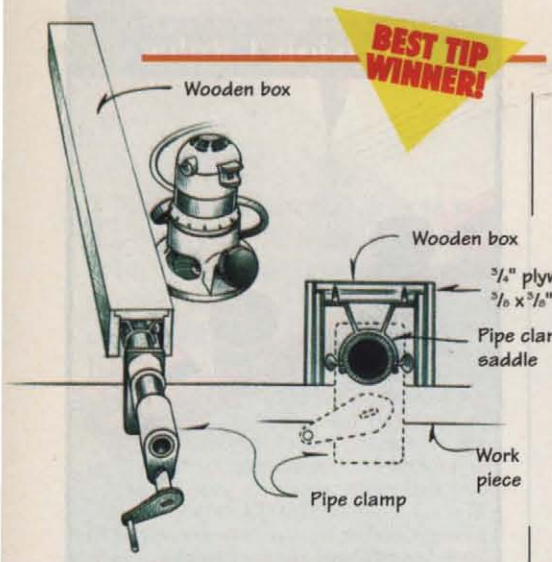
The table shown in the photo *(below)* was featured in your May/June '96 issue. The tupelo wood I built it from and the knowledge of how to make the joints came by way of my connection to the Woodworker's Guild of Georgia—which you also featured in your Nov./Dec. '97 issue. Last October, the guild held an open house for members, and I came away with a blue ribbon for my table entry. It drew considerable attention at the open house, and I (a beginner) was able to share the knowledge I gained from this project with others. I'm also enclosing a photo of an airplane rocking toy *(above)* I built from your Jan./Feb. '94 issue.

Roy Blackwell
Alpharetta, Ga.

I can't count the number of projects I've built from the issues I have of *Woodworker's Journal*, but I chose to send you a photograph of my version of the Memorabilia Case (March/April '96) because of the response I have had to it. I constructed the sides and arched top of this piece as one unit made up of steam-bent layers of ⅛"-thick mahogany. I thoroughly enjoyed building this project for my father, and it now sits proudly on his desk displaying my grandfather's war medals.

William Wicks
Charlottetown,
Prince Edward Island

SHOP TIPS



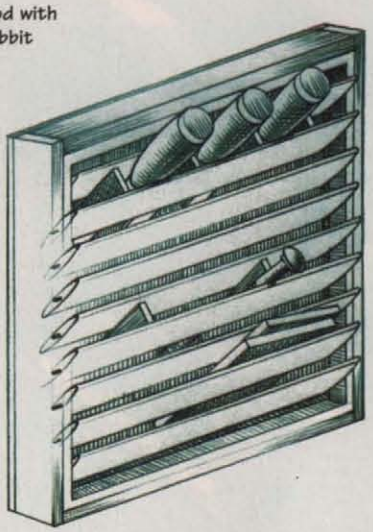
Saddles Turn Pipe Clamp Into Straightedge

When you need a straight-edged guide for routing or other purposes, you usually have to attach two clamps, one at each end, to secure the straightedge to the workpiece. I developed a less cumbersome system that uses a pipe clamp and pipe-clamp saddles.

The straightedge consists of a long, three-sided box made of ¾" plywood. The top of the box should be just wide enough so that the feet of the saddles fit snugly inside. Make the sides wide enough so that their edges touch the top of the workpiece when the components are assembled. Cut the length to suit your needs. On the edges of the plywood sides and top, cut mating ⅜x⅜" rabbets. Then, glue and screw the pieces together.

Next, screw the feet of the pipe saddles to the inside of the box as shown. A saddle every 18" or so works well. Then, simply drop a pipe clamp into the saddles, tighten the thumb screws that hold the saddles to the pipe, turn the assembly over, and clamp it to the workpiece.

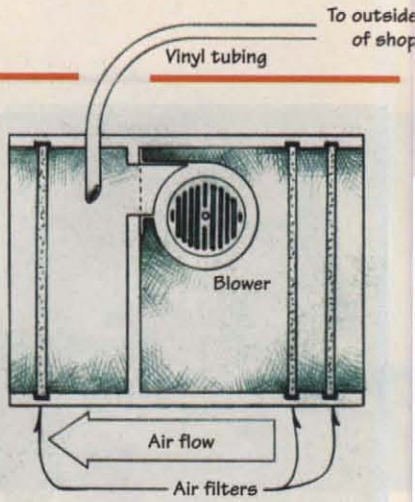
Yue Ma
Burnaby, British Columbia



Old Shutters Make Good Tool Racks

Recently, I salvaged some old wooden shutters and discovered a way to turn them into tool racks that hold a wide variety of chisels and hand tools. First, I built a wooden frame that goes around the perimeter of the shutter and extends its depth to about 2". Then, I tacked the louvers open at 15°. Finally, I added a ¼" plywood back to the frame and hung the shutters on my shop wall.

Lon Scott
Springfield, Ill.



Air Escape Tube Improves Efficiency Of Shop Air Cleaner

One of the drawbacks I found to shop air filters is that they increase the air pressure inside the shop. If your shop is connected to the house, the high-pressure shop air takes the path of least resistance and migrates toward the lower pressure air in the house. And where the air flows, the dust follows.

The solution I discovered was to vent the air filter to the outside. To do this, I installed a piece of ¾" vinyl tubing between the blower and the last air filter in the air cleaner. The other end of the tube extends through a small hole in the wall to the outside. Venting the air to the outside keeps the air pressure in the shop equal to or lower than that in the house.

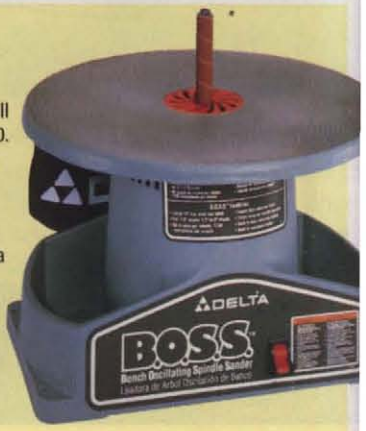
J.F. Witschey
Corolla, N.C.

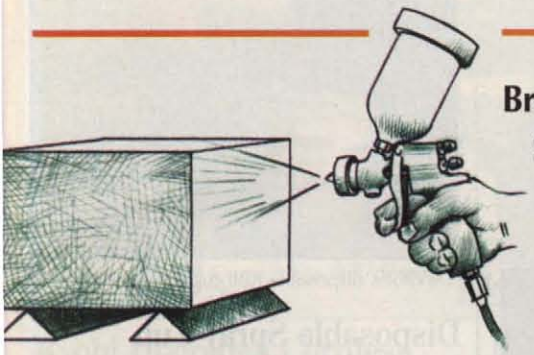
Get Paid For Your Advice

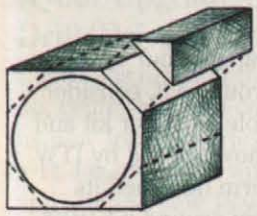
For submitting the best shop tip in this issue, Yue Ma will receive a Delta B.O.S.S. Oscillating Spindle Sander, model 31-780.

If you have a good shop tip, let us publish it. We pay $50 for every tip published, and you'll also get a shot at winning the tool prize for best tip.

To be considered, your submission must be original, unpublished, and not under consideration by other magazines. Send a description and photos or drawings that help explain the idea to: Shop Tips, *Woodworker's Journal*, PJS Publications, Inc., 2 News Plaza, P.O. Box 1790, Peoria, IL 61656. If you want the material returned, include a self-addressed, stamped envelope. You can also e-mail us at: wwjmag@aol.com







Bowl Blank Trimmings Prop Up Projects For Finishing

When roughing out my bowl blanks on the bandsaw, I save the triangular offcuts and use them to support workpieces that are still wet from finishing. The supports prevent the finish from wicking under the project, and the small contact area on the tips of the triangles won't leave marks on the still-soft finish.

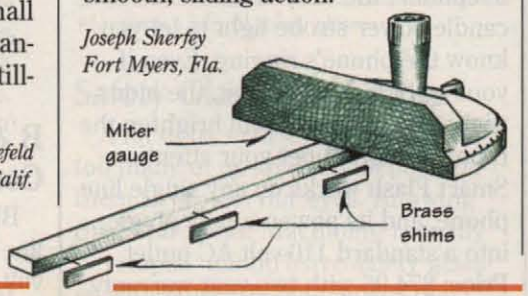
Joseph Denefeld
San Francisco, Calif.

Brass Shims Take the Shimmy Out Of Miter Gauge

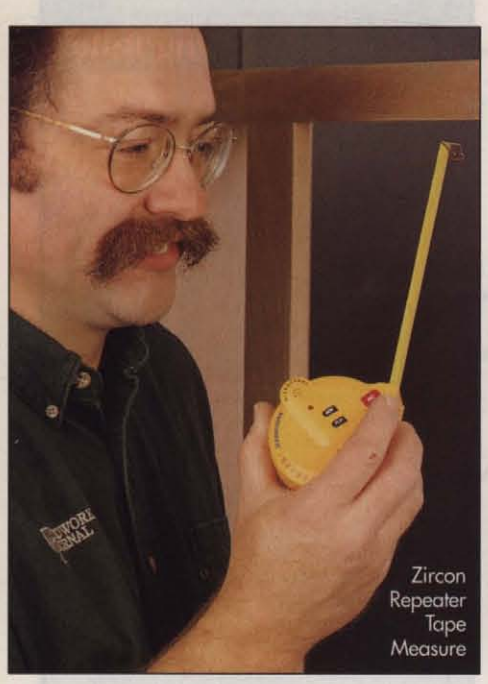
Over the years, I've seen several techniques published on how to make a miter-gauge bar fit tighter in its slot. Most of these work well for bars that are undersized by just a few thousandths of an inch. But here's a technique I discovered that creates a snug fit for a sloppier-fitting miter bar.

Buy a few pieces of sheet brass in various thicknesses at a hobby store, and test the fit of each in the gap between your bar and the slot in the table. When you find one that stops the bar from rattling but still allows it to slide smoothly, cut three pads approximately ¼x1" from it. Epoxy these to the side of the bar. After the epoxy has cured, sand or file a little of the brass off the face of the shims. This will compensate for the thickness of the epoxy and re-establish a smooth, sliding action.

Joseph Sherfey
Fort Myers, Fla.



PRODUCT NEWS


Zircon Repeater Tape Measure

Tape Measure Has Built-In Voice Recorder

That age-old problem of forgetting measurements will vex you no more with Zircon's new Repeater™ tape. Simply press a button, talk into the small integral mike, and record the dimension. You can then play back the recorded measurements or comments in sequential order whenever and wherever you need them.

Separate record and play buttons permit one-hand operation. The solid-state digital voice recorder will capture up to 20 seconds of information. Gain-control circuitry automatically adjusts volume to help ensure the recordings are audible even in noisy conditions.

The high-impact polystyrene case has a blade lock-and-release mechanism and built-in belt clip, and it fits in a standard tool-belt tape holder. The 1"-wide tape has easy-to-read markings, 16" stud locators, and a 7' stand-out. You can buy the Repeater tape measure in 10', 16', and 25' lengths for under $30.

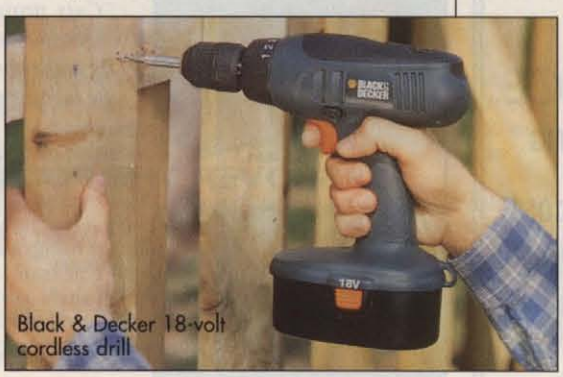
Zircon Corporation
800/245-9265


Smart Flash telephone alert

Smart Flash Overcomes Shop Noise

If you've ever missed an important call because shop noise drowned out the telephone's ring, you're a good candidate for the Smart Flash. Wired between your telephone jack and telephone, the unit flashes a 70,000-candle-power strobe light to let you know the phone's ringing. Even if you're not facing the unit, the industrial-rated flash tube will brighten the room enough to get your attention. Smart Flash works on any single line phone, and its power supply plugs into a standard 110-volt AC outlet. Price: $74.95 with two-year warranty.

Fernbrook
704/524-6125


Black & Decker 18-volt cordless drill


DeVilbiss disposable KBII cup liner system

Disposable Spray-Cup Liners Save Time

If you hate cleaning your sprayer cup every time you use it, consider the new disposable cup-liner kit and sprayer system now offered by ITW DeVilbiss. The firm designed its easy-to-use system around a KBII™ pressure cup and includes throw-away liners, lids, and ring. Installed, the liners and lids prevent the finishing product from contacting any part of the cup. The manufacturer says this permits much faster cleanup with less use of solvents and lower VOC emissions, and also improves compatibility of waterborne products with the spray equipment.

ITW DeVilbiss
800/338-4448

B & D Offers 18-Volt Cordless Drill

Black & Decker has bolstered its line of cordless drills with a new 18-volt, ⅜" keyless chuck, mid-handle model designed for heavy-duty drilling. The new unit incorporates variable speed control and a six-position clutch. You can purchase this drill with either one or two rechargeable batteries, and it comes in a hard-plastic box with a three-hour charger and two-year warranty.

Black & Decker
800/544-6986

Ryobi JobSite cordless drill/drivers

Ryobi Upgrades Cordless Drill/Drivers

Ryobi is offering three new beefed-up, center-handled cordless drills in its new JobSite Series—a 12-volt and a 14.4-volt version with ⅜" chucks, and a brand-new 18-volt ½" model. All drills feature variable-speed control, a Jacobs keyless chuck, a 24-position adjustable clutch, an electric brake, and a two-speed gear box that extends the tools operating-speed range from 0 to 1,300 rpm.

The 14.4- and 18-volt units have five planetary gears to handle the higher torque—275 inch-pounds on the 14.4, more than 300 on the 18-volt. All are covered with Ryobi's unique, no-slip Power-Grip surface. Each drill comes in a carrying case with two batteries, a one-hour diagnostic charger, and two driver bits. Prices will range from $130 to $230.

Ryobi North America
800/525-2579

Cordless With a New Twist

The S-B Power Tool Company has expanded its line of cordless Skil power tools with a couple of Twist cordless screwdrivers. Model 2106, a 2.4-volt unit, delivers 130 rpm (no load) to tackle a variety of screw-driving chores. A more powerful version (model 2207) delivers 3.6 volts.

Both drivers feature ergonomically designed linear housings and a ¼" hex collet that accepts most screwdriver bits. A reversing rocker switch provides one-thumb control, and a collet lock lets you operate the tool manually. Each model will be sold in a kit along with a tool box, battery charger, a driver-bit assortment, fasteners, and other tools. Either kit will sell for $32.99.

S-B Power Tool Company
800/301-8255

Skil 2207TB Twist cordless screwdriver and kit

Marquette's bifocal safety glasses

Safety Glasses and More

A lot of us wear eyeglasses, and too many of us unwisely depend on them to protect our eyes. Knowing this, Marquette Machining recently developed unobtrusive safety glasses with polycarbonate lenses that have bifocal magnifying diopters of +2.0 and +2.5 strength for woodworkers requiring eye protection and some vision enhancement. The frames incorporate side shields, the temple length can be adjusted, and the lenses can be angled to suit individual needs. Price: $35.

Marquette Machining & Fabricating
906/228-8242

CLUB SPOTLIGHT

Orange County Woodworkers Association

Acquiring basic woodworking skills can be a daunting task, but southern California's Orange County Woodworkers Association came up with a unique way to make this process easier for novices. According to club president Sam Migliazzo, newcomers are encouraged to sign up for the mentor program, which pairs them with an experienced-woodworking member. As a result of these efforts, many beginners advance quickly into the intermediate ranks. Member Jim Seiwert, the club's current official mentor, reports efforts are already underway to expand the roster of mentors this year.

OCWA member Fred Adams demonstrates segmented bowl turning at a recent club workshop.

This friendly, personalized approach to woodworker training is one of the hallmarks of this 150-member organization. Although the group started as a bunch of like-minded professional woodworkers during the early '80s, Migliazzo says the association has evolved and now serves the area's hobby and amateur woodworkers and a healthy contingent of turners. The turning group meets separately on a different night so association members can participate in both groups if they wish to.

One of the highlights on the Orange County Woodworker's annual calendar is their holiday-season toy drive. Members are encouraged to build toys of their own design in their own shops, but as the holidays draw near, they swing into production mode to crank out several thousand toys. To find room for all this, the association turned to "The Woodworking Club," a retail store that also rents shop space and equipment to woodworkers who don't own the necessary tools. The

Continued on page 15

Calling All Clubs

We want to find out more about your woodworking club for future articles in the magazine. To encourage you to tell us about your club and its activities, we teamed up with Jet Equipment & Tools. Jet will present a stationary power tool to each club featured in our 1998 Club Spotlight articles.

To be considered for publication and the tool prize, send us a copy of your newsletter, a brief description of your club and its activities, your goals for the future, and photos you have of club events or members' work. Address the correspondence to: *Woodworker's Journal*, Club Spotlight, P.O. Box 1790, Peoria, IL 61656. Include a self-addressed stamped envelope if you want us to return your photos.

For participating in the *Woodworker's Journal* Club Spotlight program, the Orange County Woodworker's Association will receive this Jet 14" Bandsaw, model JWBS14CS. This saw comes with a 1-hp motor, graphite-impregnated Jet Blocks for blade guides, an enclosed stand, and an extra large 15 x 15" cast-iron work table.

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- Same sizes as above
- M2 high speed steel

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- Gear driven, variable speed
- 3.6 amps
- 300 SPM to 2400 SPM
- 1-1/4" stroke
- All ball bearing
- Overall length: 17"
- 110V, 60 Hz, single phase
- 600 Watts
- Tool weight: 7-1/4 lbs.

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BI-METAL SAWZALL® BLADES

PACK OF 5

- 1/2" universal shank
- 18 teeth per inch, 6" length Milwaukee 48-01-1184

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- 5 metal cutting 18 TPI, 5 wood cutting 8 TPI
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5 SPEED BENCH DRILL PRESS W/ KEYLESS CHUCK

With a 1/2" chuck capacity, 5 speeds, and a 1/3 HP motor, this drill press is the choice of home craftsmen and small production shops.

- Five speeds: 620, 1100, 1720, 2340 and 3100 RPM
- 2" stroke, 8-1/4" swing
- Column diameter: 1-13/16"
- Table dimensions: 6-1/2" x 6-5/8"; tilts 45° left and right
- 22-1/2" high
- Base dimensions: 7-3/16" x 5-5/8"
- 49 lbs. shipping wt.

~~$69.99~~ $49.99
ITEM 34231-6KYA

DRILL PRESS WITH KEYED CHUCK

ITEM ~~$59.99~~ $48.99
05901-0KYA

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Compact high output leveler projects a round dot visible up to 600 feet away. Solid brass construction. Also includes a professional quality built-in spirit (bubble) level. Locking on/off switch.

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$49.99
ITEM 36535-2KYA

B. HI-OUTPUT LASER POINTER

Make sure people get your point. Perfect for supervisors, teachers, product demonstrators.

- Includes two AAA batteries
- 5-1/2" long

ITEM ~~$19.99~~ $14.99
37431-2KYA

CENTRAL MACHINERY

16" SCROLL SAW

- Precision milled 14-1/2" x 8" table tilts 0° to 45°
- Uses pin end blades, 5-1/2" long
- Heavy duty cast iron frame and base reduce vibration
- 1/8 HP, 110V, .83 amps
- 1750 SPM blade speed
- 7/8" blade stroke

~~$54.99~~ $49.99
ITEM 34618-7KYA

5 PC. 5-1/2" SAW BLADES

- Pin end type

$4.99
ITEM 35024-0KYA

CENTRAL MACHINERY

10", 2 HP, BENCH TABLE SAW

Die cast aluminum table 25-3/4" x 16", has adjustable 17-7/8" x 2" rip fence and inch/metric scale for precise cutting. Blade adjustments control angle and depth of cut.

- Maximum depth of cut at 90°: 3-1/8"; at 45°: 2-1/2"
- Shipping weight: 36 lbs.
- Miter gauge adjusts 0° - 60° left and right
- Motor: 2 HP, 115V, 60 Hz, 10 amp, 4500 RPM
- Blade capacity: 10" with 5/8" arbor
- Blade sold separately, below

ITEM 35715-2KYA $79.99

10" 40 TOOTH CARBIDE TIP SAW BLADE

- 5/8" arbor

ITEM 00529-4KYA $9.99

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TWO BATTERIES

3/8", 9.6V VSR CORDLESS DRILL KIT

- Dual range reversible 0-400/0-1100 RPM
- Adjustable clutch torque control
- Equipped with a keyless chuck and an electric brake
- Includes: 1 hour charger, TWO batteries, heavy duty carrying case, and a double ended screwdriver bit
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- Factory reconditioned, factory perfect

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- Four precision ground columns to effortlessly raise & lower cutter head
- Long lasting high speed steel, reversible, double edged knives
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- Includes removable table extensions, and fold away depth adjustment
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Motor: 15 amp, 120V; Capacities: 12" width,6" thick, 3/16" depth of cut; 26.2 FPM feed rate; 8000 RPM, 16,000 CPM; 27-1/4" x 20-1/2" x 15" overall dimensions;Table size with extensions: 12-1/8" x 26"68 lbs. tool wt.

~~$339.99~~ $289.99
ITEM 06177-2KYA

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2-1/2 HP, 15 amp motor. D-handle with trigger switch for positive control. Electric brake automatically stops blade in seconds. Includes dust collection bag, 10" blade with 5/8" arbor, and retractable blade guard.
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SANDING BELT CLEANER

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CENTRAL MACHINERY

33 GALLON CAPACITY, DUAL BAG, 1 HP, DUST COLLECTOR

This unit can develop over ten times the CFM of most shop vacuums to help make your work space dust-free. Take advantage of this units flexible PVC hose – they even pick up chips from joiners, saws, and planers. Includes heavy duty ball bearing castors for rapid mobility. Hoses sold separately.

- 1 HP, 110V, 3500 RPM, 6 amp, single phase motor
- 1 hose inlet
- 4" diameter suction hose
- 650 CFM
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- 5/8"-11 spindle with 7/8" arbor adapter
- Motor: 3/4 HP, 115V, 5.18 amps
- High powered 10,000 RPM
- Spindle lock
- 11-7/8" long

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4-1/2" x 1/4" GRINDING WHEELS

- 24 grit, 7/8" arbor

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CLUB SPOTLIGHT

Continued from page 12

woodworkers donate the toys they make to about a dozen area charitable organizations, and members can also give toys to individual families in need.

Greater Los Angeles may not be known as a premier hardwood-producing region, but OCWA members do reap a bounty of distinctive and unusual turning stock through the group's "greenwood sales" program. As part of this project, a club member harvests trees downed by the city and saws them into green lumber using a portable bandsaw mill. Club members can buy this green stock, primarily turning squares and bowl blanks, at a nominal price. Since the Los Angeles basin has a semi-arid climate, the harvest often includes such exotic species as olive, carob, and Brazilian pepper.

The club's annual calendar lists 12 monthly meetings. A typical meeting program will include demonstrations and guest lectures by both local talent and nationally known experts. Four Saturdays a year, the group also conducts an all-day workshop to provide hands-on experience with a specific technique or operation. The OCWA also sponsors and participates in several shows each year, including the Orange County Fair. And for the first time this year, the association will award a scholarship to a local high-school graduate who has demonstrated promising craftsmanship.

The regular woodworking club meets at 7:30 p.m. on the first Thursday of the month at the Tustin Senior Center, 200 South "C" St., in Tustin. The turners meet on the third Thursday, same time and place. These meetings are open and guests are always welcomed. To find out more about the OCWA, contact welcome/membership chairperson Dave Recupero at 714/846-2622. WJ

Grand Rapids and Holland, Michigan

Inside the Shaker Messenger you'll find work from some of the country's top craftsmen.

Located on the eastern shore of Lake Michigan, Holland is, as the name suggests, modeled after the cities of Europe. Downtown Holland, a 1997 Great American Main Street Award winner, exudes turn-of-the-century charm in every direction. In this pedestrian-friendly zone you'll find dozens of shops and galleries, many with original custom woodworking pieces.

Per square inch, you'll find the greatest concentration of custom furniture and accessories at the Shaker Messenger, 210 S. River Ave., phone 616/396-4588. This store and gallery specializes in authentic reproductions of Shaker furniture and contemporary interpretations of Shaker styles, such as our baker's bench project. Some of the country's top craftsmen sell their work here, and owner Diana Van Kolken and her staff are very friendly and quite knowledgeable about furniture, antiques, and woodworking. Spend an hour here and you'll come away both inspired and better educated.

Just outside the downtown area, the Holland Museum includes a completely restored and furnished Victorian-era house. To get to the museum take I-196 to 31 W. 10th St. The house is open Saturday and Sunday 1—4 p.m. The museum is open daily except Tuesday. Call 888/200-9123 for information.

You may also get a kick out of seeing Veldheer's Deklomp Wooden Shoe and Delftware Factory where artisans demonstrate wooden shoe carving and delftware pottery making. The factory is located at U.S. 31 and Quincy St. Call 616/399-1900 for hours and information. Tool collectors will want to check out the indoor Flea Market at the Hoffman Storage Buildings, 0-5970 136th St., Holland.

For more information on the area, contact the Holland Area Convention and Visitor's Bureau, 100 E. 8th St., Suite 120, Holland, MI 49423, or call 800/506-1219.

Grand Rapids Locations

One of the highlights of the Grand Rapids furniture scene is a store called the Design Quest, 4181 28th St. SE, phone: 800/9443232. Here they specialize in Scandinavian and contemporary furniture and gifts. Another interesting spot, Rethink, 1200 East Paris Ave., phone 616/940-2926, features rustic and unusual pieces of furniture and accessories with styles geared for cabins, lofts, and cottages. Also be sure to make some time to browse through Heartwood Antiques, 956 Cherry St., phone 454-1478. In this store you'll find early 20th Century furniture and decorative arts, with an emphasis on Mission, Deco, and Moderne styles.

Fans of the architect Frank Lloyd Wright will not want to miss an opportunity to see the Meyer-May House located at the intersection of Madison and Logan in Grand Rapids. The house is open for tours on Tuesdays and Thursdays from 10 a.m. to 2 p.m. and on Sundays from 1 to 5 p.m. The last tour of the day starts one hour before closing. For more information call 616/246-4821. WJ

Photographs: *Frank Pieroni, Tom Jackson*

Brick paved streets and Victorian-era store fronts make downtown Holland a stroller's delight.

With your choice of fences, 3 or 5 hp motor, single-phase or three-phase, with or without LVC switches. More options than you can shake a stick of cherry at. And now you can multiply everything by two. Two blade tilting options give you 26 different configurations of Unisaw.®

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Right Tilt Unisaw shown here with Unifence Saw Guide.

Choose your weapon.

Left Tilt Unisaw shown here with Biesemeyer Fence.

Yes, we're still making every Unisaw right here in the good ol' USA. And we're still covering them with a full 2-year warranty.

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A correctly fitted mortise-and-tenon joint has great shear strength and is as strong in compression as the wood itself. Pinned, wedged, or glued together, the joint will be virtually impossible to pull apart.

LAYING OUT AND CUTTING A MORTISE AND TENON

by Roger Holmes

The mortise and tenon—an essential woodworking joint. For centuries, virtually all wooden frames, from massive post-and-beam buildings to the delicate doors of glass-fronted display cases, have been held together by mortise-and-tenon joints. Cultures as diverse as those of Europe and the Far East developed remarkably similar joinery systems based on the mortise and tenon.

New materials, fasteners, and glues have decreased our dependence on the joint. But, anyone making quality woodwork still finds the mortise and tenon indispensable. We've included several projects in this issue that call for them.

Editor's note: A portion of this article was excerpted from Roger's newest book, *The Complete Woodworker's Companion*, published by Watson Guptill in 1996.

It's not hard to understand why woodworkers in such far-flung places would all arrive at the same method of joining a frame. A well-made mortise-and-tenon joint has great shear strength; it's as strong in compression as the wood itself; and, if pinned, wedged, or glued together, it is virtually impossible to pull apart.

Although inherently simple, the mortise and tenon can take highly complex forms. Some of the Japanese timber-framing joints for example, are wondrous affairs worth making just for the challenge. Beneath the complexity, however, lies the same basic concept. Learn to lay out and cut the simple version shown here, and you'll know much of what you need to make the elaborate variations.

You can use a range of tools to cut a mortise and tenon, from chisels and handsaws to high-speed horizontal boring machines and double-end tenoners. In between, there are bandsaws, tablesaws, routers, shapers, drill presses, and a world of ingenious (sometimes wacky) jigs and fixtures. Here, I'll show how to cut mortises by clearing most of the waste with an auger bit (powered by hand or drill press) then finishing the job with paring chisels. I cut and trim basic tenons with just a backsaw and shoulder plane, but I'll also show how to do it using a bandsaw and a tablesaw.

Mortise-and-Tenon Anatomy

Despite its simplicity, this joint can be a maddening thing to discuss because the terminology used to describe the parts is far from standard. *Photo A* shows the terms I'll use here. Most of us agree on "cheek" and "shoulder," but from there on, confusion surrounds the other terms. Note also that the tenon

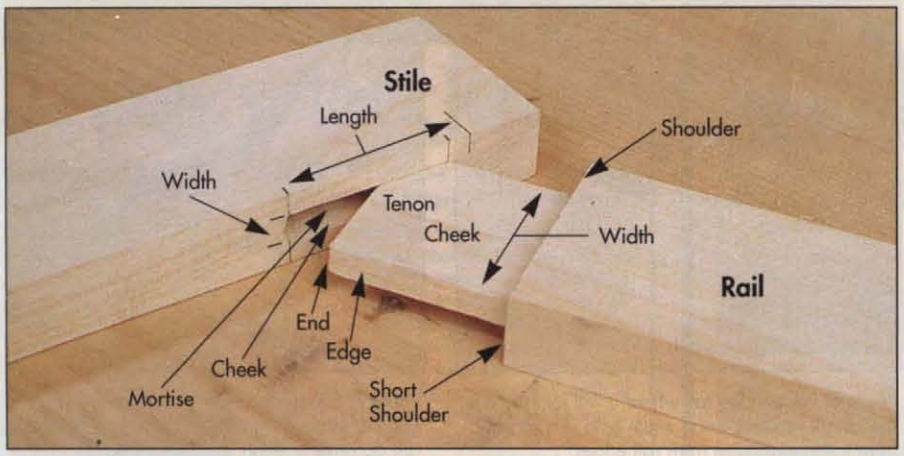

Photo A: Principle parts of a mortise-and-tenon joint. Note that tenon width, lengh and thickness correspond to mortise length, depth and width.

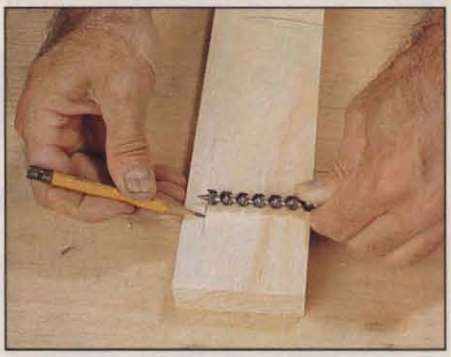

Photo B: When establishing mortise depth on the stile, make sure the waste-clearing bit's lead point won't penetrate the workpiece's opposite edge.

Photo C: Scribe the tenon's shoulder lines using a sharp knife and a square held against the rail's working edge. Make tenons 1/16" shorter than the mortise depth.

width, length, and thickness correspond to the length, depth, and width respectively of the mortise.

As a general rule, tenons should measure about one-third of the stock thickness with shoulders of equal width centering the tenon. Most tenons also have "short" shoulders. These make the joint more resistant to racking and also hide any bruises that result from chiseling the mortise ends.

The depth of the mortise, and therefore the length of the tenon, varies with the width of the mortised piece. The deeper the mortise, the stronger the joint, since this enlarges the glue surface and enhances the structural strength. The blind or stopped joint I'll make here isn't quite as strong as a through-wedged tenon, but it has more applications and is easier to cut.

For convenience, I'll call the tenoned piece the rail and the mortised piece the stile, terms commonly used for the horizontal (rail) and vertical (stile) parts of a frame construction.

Laying Out the Joint

To make the sample joint shown here, prepare two 1x3x15" pieces of stock. These dimensions can vary depending on the scrap you have on hand, but try for stock at least ¾" thick. Make sure that the faces are flat and the edges are square to them; the ends need not be perfectly square at this point. Mark a "working" face and edge on each piece, and remember to measure and mark only from them. If you want to try the machine techniques as well, prepare several additional pieces for use in setting up machines.

To lay out, you'll need a pencil, a thin-bladed marking knife, a double-pin mortise gauge, and an accurate square. A single-pin gauge will work, but you'll need to reset it for each cheek. Use two single-pin gauges if you have them.

Although I'll cut only one sample joint here, many projects require two or more identical or nearly identical joints. A cabinet door, for instance, has four. Whether you're making two identical joints or a dozen, you can save time and avoid errors by organizing your work. Scribe the shoulders of all tenons, then all the cheeks, and so on. And remember, always hold the gauge fence or square against the working face and edge.

Lay Out the Tenon

Mark the tenon shoulders first. To do this, measure in from the end of the rail a distance of 1/16" less than the mortise depth, and make a tick with a pencil. This 1/16" difference ensures that the tenon won't bottom out in the mortise and also provides room for excess glue that the tenon pushes ahead of it during assembly.

Keep in mind that the tenon's length depends on the depth of the mortise. Since we'll clear waste from the mortise with an auger bit, allow room for the bit's lead point to ensure that it won't penetrate the opposite edge of the stile. I mark the mortise depth on the stile directly from the bit *(photo B)*.

A pencil makes too thick a line to accurately lay out the tenon shoulders. Instead, scribe the actual shoulder lines (at the location of the pencil tick) with the knife *(photo C)*. Extend the knifed lines across both faces and edges, placing the square only against the working face and edge.

To lay out the tenon cheeks, set the double pins of the mortise gauge to the tenon thickness. Start with the one-third thickness proportion, but size the tenon slightly thicker than the diameter of one of your standard auger bits. For 1"-thick parts, I set the gauge to slightly less than 3/8" thick. I then clear waste from the mortise using a 5/16" bit and still have a shaving or so left on each cheek to pare away with a chisel.

With the pins set, position the mortise-gauge fence to center the tenon on the edge of the rail. Then, holding the gauge fence against the working face, start at the knifed shoulder line and scribe up the edge, across the end, and down the other edge *(photo D)*. Now, set the rail aside—you'll lay out the tenon width later.

Photo D: Set the mortise gauge's double pins to desired tenon thickness, then set the fence to center tenon on rail edge. Starting at the shoulder line, scribe the cheeks up one edge, across the end, and down opposite edge.

A single-pin gauge also works for scribing cheeks. However, if you use one, don't be tempted to scribe from both faces, even though the tenons and mortises are centered on the pieces. Even slight variations in part thickness will yield different-sized mortises and tenons, leaving you with some irritating trimming to do. Instead, scribe both cheeks from the working face, resetting the gauge for the second (or use two separate gauges).

Lay Out the Mortise

Position the mortise on the edge of the stile. While this sample mortise could go anywhere, I'd normally place a mortise so that the rail edges fall where I want them. So, square a pencil line across the stile's working edge 1" from an end, and assume that's where you want to locate the rail's outer edge.

Photo G: Scribe the mortise cheek lines using previously set mortise gauge, then add a centerline with single-pin gauge. This makes it easier to center the waste-clearing bit.

Photo E: Position the rail where it will join the stile, then mark mortise/tenon width onto stile directly from rail about ¼" in from rail edges.

Photo F: Square the mortise lines across stile edge to establish mortise ends. Sharp pencil lines are accurate enough for these marks.

Butt the rail against the stile, aligning its top edge with the pencil mark. The mortise width will equal the width of the rail minus the short shoulders. Make a pencil mark across the juncture of the stile and rail about ¼" in from each rail edge *(photo E)*. You can eyeball these dimensions—the exact distance isn't critical. Square the lines across the edge of the stile with a pencil to position the mortise *(photo F)*. Then, square the lines across the rail end to fix the tenon's width.

Next, scribe the mortise cheeks. Use the same gauge setting used for the tenon, and run the fence against the stile's working face. (On projects that require you to offset the rail face from that of the stile, you'll need to reset the fence, but not the two pins.) To make it easier to center the waste-clearing bit, I scribe a centerline down the mortise with a single-pin gauge *(photo G)*.

Cutting the Mortise

It's easier to fit a tenon to a mortise than the other way around, so I cut the mortises first. For a blind mortise, you need to stop the waste-clearing bit at the proper depth. With a drill press, simply adjust the depth stop on the quill. When boring with a brace and bit, I wrap a piece of tape around the bit at the correct length and watch for it to reach the wood. If you prefer a more positive stop, fix a block of wood to the bit or buy a commercially made stop.

To keep the bit parallel to the stile faces, place a square next to the workpiece and check your progress *(photo H)*. Bore the first holes near the mortise ends, then work on the waste between. Whether working with a drill press or by hand, I find it easier to leave a little wood between the holes. These "bridges" remove easily with a chisel.

Chisel away the remaining waste. To do this, deepen the scribe marks slightly with a wide, sharp chisel, then switch to a narrow chisel and break

Continued on Page 22

Photo H: To clear waste, use a bit slightly smaller in diameter than the mortise's width, boring at the mortise ends first. Note the square used to help the author keep the bit vertical.

Photo I: Remove the "bridge" waste, then pare the mortise cheeks using a wide, sharp chisel as shown in this cutaway view of a mortise.

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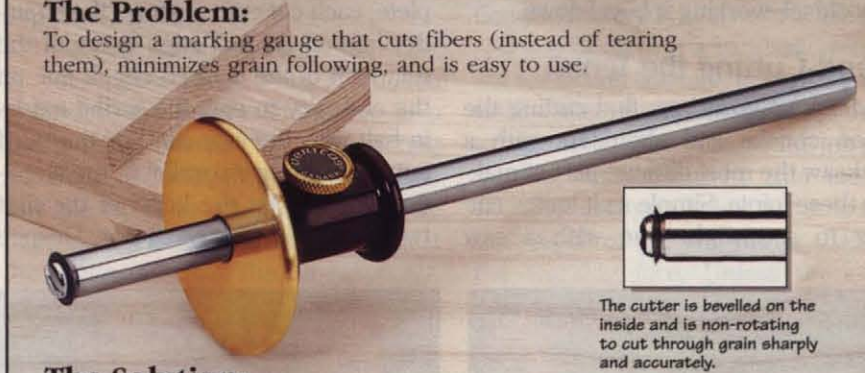

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Photo J: Use a narrow chisel to square the mortise ends. When end grain offers resistance, author uses a mallet.

Photo K: For the final paring, place the chisel edge in the scribed lines you deepened earlier and clear the last traces of the auger-bit holes.

Photo L: Start each tenon cheek by making angled cuts from both corners. When completed, each cut should extend from the shoulder line to the midpoint of the rail end.

out the bridge wood. Next, pare the cheeks, guiding the wide chisel with your left hand (if you're right-handed) and powering it with your right *(photo I)*. Make sure you create flat surfaces that are parallel to the faces. Using a chisel equal to or slightly narrower than the mortise width, square the ends *(photo J)*. If the end grain offers more resistance, a little persuasion with a mallet usually helps.

During this process, switch between the various chisels to deepen the mortise. For the final cheek-paring, rest the chisel's cutting edge in the deepened scribe line, then clear the last traces of the auger-bit holes *(photo K)*. Flatten the bottom of the mortise with a narrow chisel, working it bevel-down.

Hand-Cutting the Tenon

Many woodworkers find cutting the tenon cheeks and shoulders with a backsaw the most difficult part of making these joints. Simple as it looks, cutting to a straight line with a saw requires patient practice. For me, regular workouts with scrap wood repay the effort handsomely.

Use a sharp, correctly set saw; in fact, don't even attempt this operation with a dull saw. Most backsaws have crosscut teeth, which, if sharp, will cut satisfactory tenons. However, on the cheek cuts which go with the grain, I get better results using a backsaw sharpened as a rip saw. This tool will also produce clean shoulder cuts, even though these cross the grain, because the surface fibers have already been severed with a knife.

Cut the cheeks first. I start each cheek with two angled cuts, one from each corner *(photo L)*. When complete, each cut extends from the shoulder line on the rail edge to about the midpoint of the scribed cheek line on the end. Try to split the scribe marks in half with the saw cut. For the third cut, hold the saw parallel to the shoulder line and let the kerfs of the first two cuts guide it *(photo M)*. Despite having this little "jig" formed by the angled kerfs, you'll still need to exert pressure here and there to keep the saw on track.

Next, cut the shoulders on the knifed lines, holding the rail with a bench hook. Start the cut on the far edge and lower the saw gradually until you're cutting across the full width of the rail *(photo N)*. The fibers break cleanly at the knifed line, providing a good indicator for manipulating the saw as you lower it along the line. A raking light that sets off the knife line will also help you see what's going on. Apply even strokes, using as much of the blade as possible and keeping it perpendicular to the rail face.

Photo M: Using the angled saw kerfs as guides, cut both tenon cheeks to the shoulder line holding the saw perpendicular to the rail.

Photo N: Cut the shoulder to the knife line, starting at an angle on the far edge and gradually lowering the saw across the rail's full width. A bench hook steadies the rail.

Photo O: With the cheek waste cut away, mark the tenon width using a pencil marking gauge. Make the long-grain cuts, then cut along the knife lines on the edges to form the short shoulders.

Photo P: Bandsaw the far cheek first, then the one closer to the fence. Reset the fence for each cut so the working face always bears against the fence.

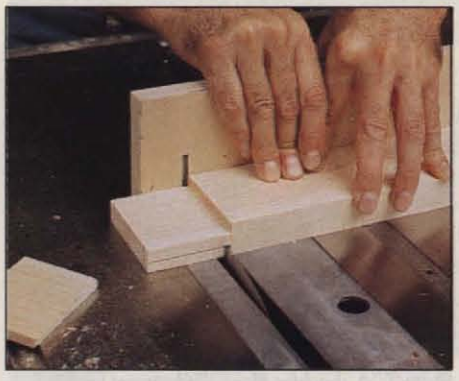


Photo Q: Cut the shoulders on the tablesaw using a miter gauge with a wooden extension. The extension provides extra support for accuracy and also backs the cut.

Photo R: After laying out and bandsawing the tenon to desired width, remove waste by cutting the short shoulders on the tablesaw.

With the cheek waste removed, lay out and cut the tenon to width. When you marked the mortise earlier, you also penciled lines across the tenon end to indicate its width. If you didn't do this, hold the tenon to the mortise and tick off the width with a pencil. Extend those lines down one cheek of the tenon using a pencil-point marking gauge, then secure the rail in a vise to cut along the lines. To make fitting and assembly easier, I cut away the line, making the tenon slightly narrower than its mortise—1/32" of clearance is plenty. (The cheeks, on the other hand, must fit the mortise snugly.) Free the waste by cutting the edges on the knife lines to create the short shoulders *(photo O)*.

Cutting Tenons By Machine

Of all the possible machine methods, I prefer the bandsaw for cutting the cheeks and the tablesaw for cutting the shoulders. Unless you have a special jig, tablesawing the cheeks is too dangerous. Holding a workpiece vertically against the rip fence provides too many opportunities for kickback and injury, especially if you're working with narrow parts or cutting long tenons.

The bandsaw, however, makes cheek cuts safely and quickly. You can easily control a horizontally fed workpiece, and the thin blade creates much less resistance than a tablesaw blade and much less risk of injury. I prefer a wide, sharp blade in a well-tuned bandsaw, although I've had success with 1/4"-wide blades. Avoid dull blades of any width—they can wander or otherwise make a mess of things.

The technique is simple. With the rail's working face against the rip fence, set the fence to cut the far (outer) cheek first *(photo P)*. Then, reset the fence for the second cheek. Again, because of possible variation in the thickness of rails and stiles, resist the temptation to flip the piece over and cut the second cheek using the same fence setting.

Make trial cuts on a piece of same-thickness scrap, then fine-tune the fence settings to make the tenon fit snugly in the mortise straight from the saw. If you're new at this, or simply don't like to gamble, cut the tenon slightly oversize in thickness. You can easily remove stock later but it's tough to put it back on.

To cut the shoulders on the tablesaw, fit your miter gauge with a wooden extension and square the gauge to a sharp blade. Double-check the setting for accuracy. Next, elevate the blade so that the top of its arc projects into the bandsaw kerf. Hold the material against the gauge and make the cut *(photo Q)*. With a little practice, you'll be able to cut right to the line, just as you would with a handsaw.

Because you're cutting on both faces, you can't place the working edge against the miter gauge for both cuts. If you've prepared the stock carefully, however, so that both edges are parallel, the shoulders should come out square. For longer pieces, which can be difficult to hold steady during these cuts, I'd recommend using an accurately set up radial-arm saw because the blade moves across the stationary work.

When you've removed the waste from the cheeks, mark the tenon width as described previously. Then, return to the bandsaw and cut the tenon edges, using two fence settings as before. Remember that undersizing the tenon width slightly makes the joint easier to fit. Now, cut the short shoulders on the tablesaw *(photo R)*.

Machines are well-suited to cutting identical parts. Once you've set the fences and gauges, the same cut can be made over and over. So, you need to lay out cheek lines and scribe shoulders on only one of each part. However, I usually lay out all of them anyway so I can check the cuts as I go along. The machines most of us use (not to mention their operators) are not infallible.

If you don't own a bandsaw, you can cut tenons on the tablesaw with a dado head *(photo S)*. A full dado set cuts a groove 3/4" or 13/16" wide, so the job goes quickly. Unfortunately, this method requires that you index the cuts from both faces of the rail, rather than just the working face. Unless the corresponding mortise has been perfectly centered, you'll have to fiddle with the cutting height for each cheek, or the tenon will end up too thick or too thin. Likewise, if you're tenoning several rails, any variation in stock thickness will affect the tenons. It helps to have several pieces of same-thickness scrap on hand for use in setting up each cheek cut.

Final-Fitting the Joint

If all of your saw and chisel work has been exact, the parts should now slip snugly together without forcing. The

Photo S: If you don't own a bandsaw, you can cut the tenon cheeks with a dado head, although this is less accurate because it prevents you from indexing the tenon from the working face.

Photo T: A shoulder plane works great for final-fitting the tenon cheeks and shoulders.

Photo U: To square tenon shoulders, work from bo edges inward to avoid splintering the rail edges.

cheeks of the mortise and tenon should make contact along their entire surfaces, the shoulders seating on the edges of the stile with no gaps showing. I've often approached this ideal but have seldom escaped having to trim a little something somewhere. When I was learning, I spent a lot of time fiddling. This can be frustrating, but keep at it—the job becomes easier as you gain experience.

If the tenon won't insert all the way, check the mortise first to see if the cheeks are parallel to each other and to the working face. You'll need to eyeball this. Look for little scalloped vestiges of the auger bit on the walls, and pare them away with a wide chisel.

Using a Shoulder Plane

Next, turn to the tenon. I find a shoulder plane indispensable for this job. This small tool fits comfortably in the palm of my hand. Its blade extends across the width of the narrow sole and aligns flush with the plane body's machined steel faces. You can use it both to trim cheeks and square shoulders *(photos T, U)*. For larger tenons, I use a block plane on the top part of the tenon cheek.

When setting up the shoulder plane, make sure the blade aligns flush with the faces, particularly for shoulder work. If the blade protrudes, it will dig into the cheek. If it's recessed, it won't get right into the juncture of cheek and shoulder, and the plane will move farther from the cheek with each pass. Grinding the blade flush with both faces allows you to cut on the push or the pull stroke. This way, you can turn the plane around before the end of the stroke and pull it toward the center, rather than planing off the edge and risking tearout.

As you fit the tenon cheeks to the mortise, check to see whether the working faces of the rail and stile align when you assemble the joint. If they do, take an equal number of shavings from both cheeks to keep them that way. If they don't, take shavings from the appropriate cheek to bring them into alignment.

Once you get the hang of cutting mortise-and-tenon joints, you probably won't need to adjust the cheeks much. But even a tiny gap in the shoulders is noticeable, so you'll regularly spend time fitting them. Fortunately, a shoulder plane makes the job easy.

If your knifed shoulder lines are still visible, plane down to them. Otherwise, check with a square to see if the shoulders measure 90° to the working edge and if both shoulders are level. Use the plane to correct any faults, then push the joint home. Mark any remaining high spots with a pencil, disassemble the joint, and plane them off. As you proceed, check matching parts, such as trestle uprights or paired rails and stiles in a door frame, to make sure that the shoulder-to-shoulder distance measures the same.

Trim Tenons Sparingly

Fitting is a process of trial and paring. Try the tenon in the mortise, then trim off any material that's causing it to hang up. It's not always easy to see where the problem lies, so work cautiously, taking only a shaving or two before you retry the tenon in its mortise.

Tenons that end up too thin cause the most problems. I've glued on veneers to fatten them up, but the process is tedious and not very satisfactory. If you end up with an emaciated tenon, the best solution usually is to make a new rail. Nobody likes to start over, but if you find yourself in this pickle to begin with, it may well be that you could use a little additional practice. WJ

Photographs: *Michael Farrell*

Editor's note: If you would like to learn more about the mortise-and-tenon joint, look no further than our back issues. In the Jan./Feb. '87 issue (Vol. 11 No. 1), we detailed the steps for making several variations of the basic joint including bridle-tenon joints, blind pinned tenons, through wedged tenons, haunched tenons, and keyed tenons.

If you're really ambitious and intend to do a production run of mortise-and-tenon joints, consider purchasing a benchtop mortising machine. These machines take a lot of the tedium out of having to drill and chisel out the mortises. For more information, see our review of benchtop mortising machines in the May/June '95 issue (Vol. 16, No. 5).

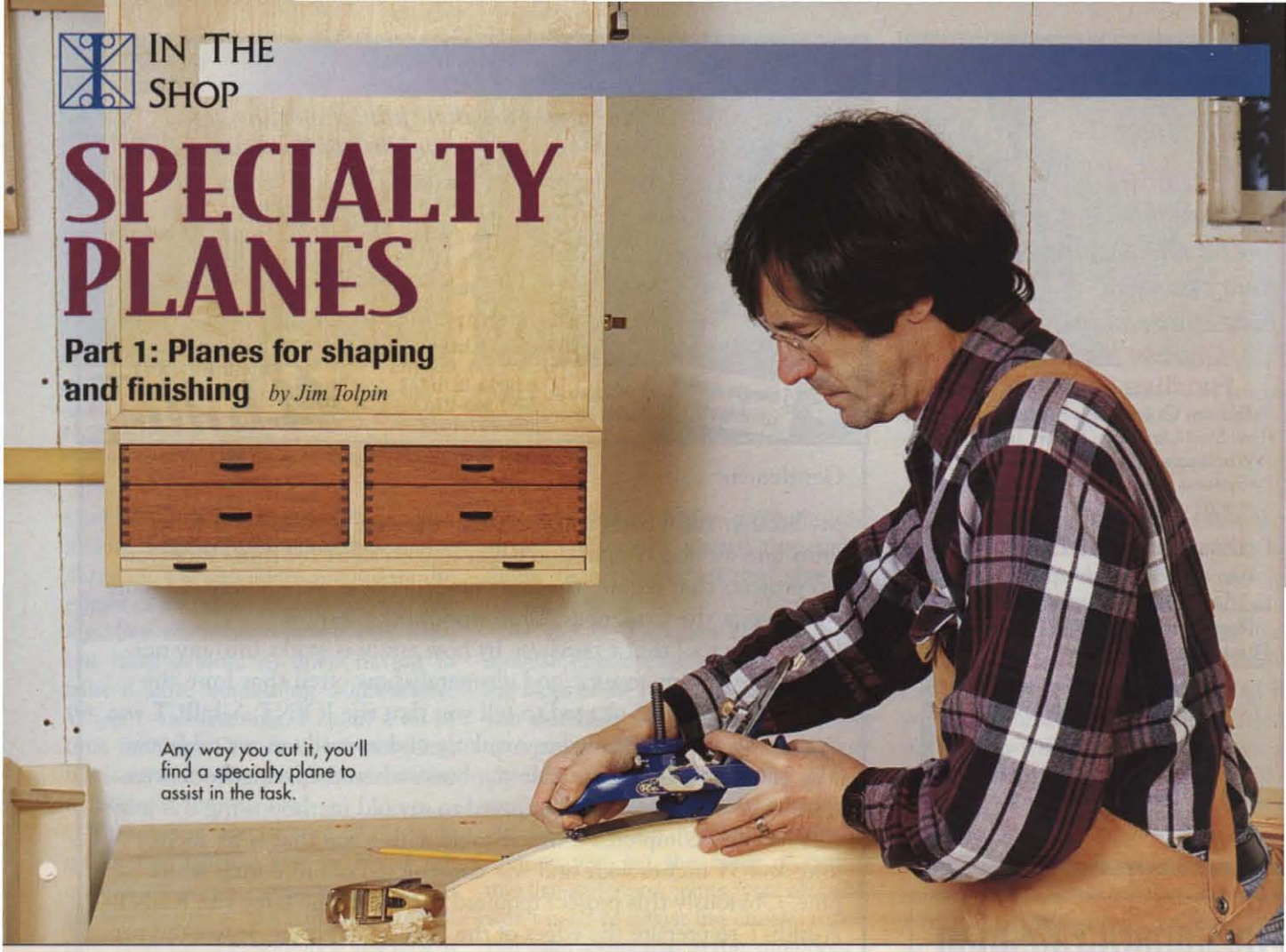
You can also buy a tenoning jig for your tablesaw (We like the Delta model no. 34-182. It sells for about $90 at Delta dealers, home centers, and in mail-order catalogs.) Or, consider building your own tablesaw tenoning jig such as the one we featured in the March/April '93 issue (Vol. 17, No 2).

To order a copy of these articles, call Sheryl Martin at 800/827-0374. The price is $4 per article and includes shipping and handling.

SPECIALTY PLANES

Part 1: Planes for shaping and finishing

by Jim Tolpin



Any way you cut it, you'll find a specialty plane to assist in the task.

What's so special about specialty planes? After all, most woodworkers find that they can take care of the great majority of planing tasks with a modest collection of standard bench planes. However, if you do a lot of hand woodworking (or would like to), you'll run into numerous situations where a specialized plane is the best tool—and sometimes the only tool—for the job.

Sure, you can use a bench plane to trim small joints to fit, but it makes for tedious and cumbersome work. A plane that fits in the palm of your hand, however, makes small-part planing almost effortless. You can shape an outside curve with a bench plane as well, but a plane whose sole bends to the curve—a compass plane—does the job faster and leaves a smoother and truer surface. If you want a hand tool that will shape a rabbet, trim a tenon shoulder, plow a groove, scrape a face, or cut a long, shallow mortise, you'll find that only a specialty plane will answer the call.

For a craftsman, few joys rival that of working wood with the appropriate tool—especially one that replaces a shrieking, dust-belching saw or router. However, you pay a price for this—literally. Specialty planes, new or used, don't come cheap. Besides that, their finicky nature requires that you develop skill in tuning them. This article will brief you on how to set up and use these unique tools.

I'll limit the discussion here to planes that are still being manufactured. Many more types can be found as antiques, particularly wooden varieties, but these tend to be highly specialized, very expensive, and often in need of restoration.

The Block Plane Family

These diminutive tools see action more frequently than any of their larger relations. Because they're easy to carry and handle, we tend to use them for nearly every planing task, switching to bench planes only for longer, wider boards. This group includes four basic types of block plane: the standard-angle, the low-angle, the edge trimmer, and the palm plane *(photo A)*.

Standard-angle: Its 20° bed incline, combined with the 25° bevel of the blade (in block planes the blade sits bevel-side up), yields the same 45° cutting angle of the typical bench plane—an angle that works well for most tasks. (See *figure 1.)* The standard block plane is used primarily for chamfering edges, trimming miter joints, flush-trimming edge-bandings, and jointing short lengths of stock and veneer.

Low-angle: With a bed inclined at 12°, this plane has a 37° cutting angle, which makes it well-suited for smoothing end grain on small parts (the low angle reduces tearout) and for making fine cuts in stock with well-behaved

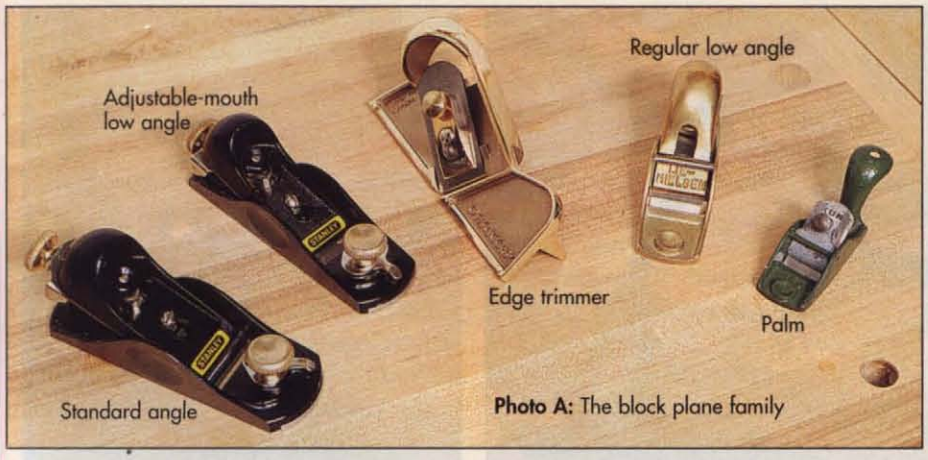


Photo A: The block plane family

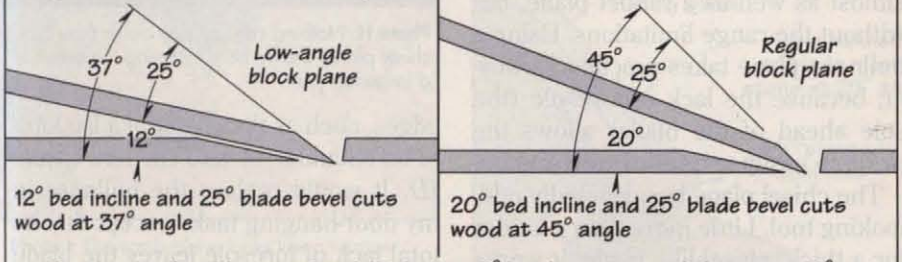
grain. Low-angle blocks often come with an adjustable mouth to improve performance on cross grain.

Edge-trimmer: This odd-looking tool features an integral fence set at 90° to a skewed blade and comes in a right- or left-hand version. The fence ensures a perpendicular cut, and the skew reduces the effective cutting angle to minimize tearout and splintering. Use the edge-trimmer to final-joint and square end-grain cuts or the edges of plywood.

Palm: This tiny plane measures barely 3" long but its rounded back handle fits comfortably in the palm of your hand. The blade sits at the typical 45°, bevel-side down. Model-makers enjoy using the palm plane for jointing and shaping tiny parts, and I know boat-builders who swear they use this plane more than any other tool in their ship's box. It's perfect for lightly chamfering the edge of any size board.

Photo B: Improvement points on a basic block plane.

Figure 1 Block plane blade angles



Caution: Don't add a microbevel. With extra 5° bevel, cutting angle becomes 42°, canceling out low-angle advantage.

Tuning and Sharpening Block Planes

To set up a block plane, I usually stick with the same procedures I described in earlier issues for bench planes. (See *Woodworker's Journal*, May/June and July/August '97.) As with the larger tools, you can improve a block plane's performance by flattening its sole, chamfering the sole's sharp edges, and adjusting the blade-support points. (See *photo B.*)

Sharpening also calls for the same techniques, with one exception: I would definitely not add a microbevel to the cutting edge of the low-angle block. Because the blade sits bevel-side up, a microbevel increases the cutting angle and thus cancels out the benefits of the low bed angle. (See *figure 1.*)

Using the Block Plane

Although the block plane is commonly regarded as a one-handed tool, I use both hands whenever possible to gain more control over the cutting action *(photo C)*. Two hands allow me to apply more downward pressure, which keeps the shaving's fulcrum—the edge of the mouth ahead of the blade—tight against the wood. This is especially important when planing cross or end grain.

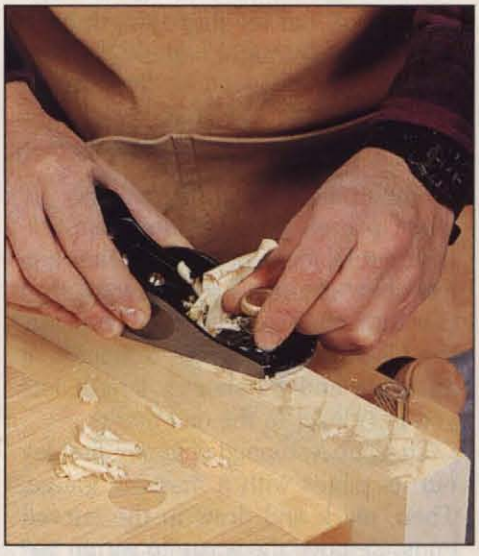


Photo C: Author demonstrates the proper block plane technique: two hands in control and the plane at a slight skew.

Photo D: The edge trimmer's fence guarantees a square edge.

Photo E: Author first removes chamfer waste with a drawknife.

Photo F: Final paring on the chamfer is done with the block plane.

I always start with as fine a cut and as narrow a mouth opening as possible if I suspect the grain will give me trouble. If the first cut looks smooth, I'll increase the cutting depth and open the mouth a little to allow more aggressive stock removal. As with the bench plane, I sometimes skew the block plane in the direction of sweep to lower the blade's effective cutting angle. This increases shearing action, reduces drag, and generally makes a smoother cut, especially across end grain. However, use this technique cautiously. If you plane over areas of reverse grain it will increase the risk of tearout.

On the end of a board, I often kill two birds—smoothing and squaring—with one stone by using the edge trimmer *(photo D)*. You can also use an edge trimmer along the edge of a board, but its short length does not ensure a straight edge.

Chamfering With a Block Plane

Smoothing end grain may be the block plane's most common application, but I'll focus here on another typical use: chamfering. Although you can cut a chamfer with a bench plane, the block plane is easier to handle at an angle and its shorter length lets you get closer to the end marks.

To plane a stopped chamfer, first lay out its edges with a marking gauge. Then, mark and draw in the curved ends. Remove the waste to within 1/16" of the line using a sharp drawknife *(photo E)*. Then, switch to the block plane and cut to the layout lines, making full-length sweeps on the final passes to ensure a straight, level chamfer *(photo F)*. (I like Lie-Nielsen's small block plane for chamfering.) Join the curved end stops to the chamfered surface using the drawknife or a paring chisel.

The Bullnose and Chisel Planes

Though similar in size to the block planes, these tools have a distinguishing feature. The blade is set close to, or even flush with, the front end of the body. This lets you work in close quarters, for instance, when planing a rabbet to its termination point against a stop or crosspiece.

In my finish carpentry days, I always kept a bullnose in my tool belt when hanging doors. If I had a warped door or misaligned jamb to deal with, I made a fast fix by trimming back the rabbeted stop *(photo G)*. This nearly always had to be done at the jamb's corner, and the stubby bullnose plane proved itself the tool of choice in this confined space. Unlike a chisel, it maintains the rabbet's straight line almost as well as a rabbet plane, but without the range limitations. Using a bullnose plane takes practice, however, because the lack of foresole (the sole ahead of the blade) allows the plane to easily veer off a straight line.

The chisel plane is a decidedly odd-looking tool. Little more than a holder for a thick, chisel-like blade, it works best for smoothing surfaces up to

Photo G: The bullnose plane is the perfect tool for trimming door jambs and other tight spots.

Photo H: Nothing can get you closer than a chisel plane, shown here trimming the cheek of a large lap joint.

edges, such as the cheek of a lap joint to its shoulder, or into corners *(photo H)*. It would replace the bullnose in my door-hanging tasks except that its total lack of foresole leaves the blade exposed. This would wreak havoc

with the pockets of my tool belt, and the tool itself would come out the loser after encountering the nails that always seem to lurk at the bottom of these pockets.

The chisel plane comes in handy for flush-trimming wooden plugs, through tenons, and dovetail pins; it also neatly removes glue residue. Piano makers use large chisel planes to surface-plane the spruce soundboard right up to the surrounding framework—an essential step in fine-tuning the board's resonance.

Setting up a chisel plane can be tricky. Since you can't easily view the blade's protrusion (with no foresole to reference to), you need to make test cuts on scrap material in order to set the depth. The blade gets no help from a mouth fulcrum, cap iron, or skewed cutting angle, so it must be razor-sharp.

To control this tool, hold it firmly under both hands and exert a fair amount of downward pressure. The plane has a mushroom-shaped handle that accommodates this grip. It takes practice to control the planing action, especially to prevent the blade from diving into the grain. In fact, it's safest to think of this tool more as a chisel than a plane—don't rely on the plane body to control the cut. Caution: If you use the chisel plane to remove glue residue, don't wait for the glue to get too hard, or it will dull the blade.

The Scrub Plane

The scrub plane resembles a jack plane, but it has a narrower body (1½" wide) and a large mouth opening to accommodate the thick shavings this tool can produce *(photo I)*. Its blade, which is usually thicker than a jack plane's (3/16"), has no cap iron and is sharpened to a slight arc.

An aggressive tool that could level a board's face much faster than a conventional bench plane, the scrub plane was the forerunner of the power surface planer. Today, the tool is used to remove stock quickly in sculptural work, to "back out" large moldings or planks to fit over uneven wall surfaces, and to apply a hand-hewn look to boards or timbers.

The blade's curved edge makes it a bit more difficult to sharpen than a standard blade. I built a fixture that lets me move the blade across the wet stone at an arc while maintaining the proper angle. (See *figure 2.*) You'll also want to add a microbevel to the edge, which makes sharpening easier and also adds a bit more thickness to the cutting edge. This helps keep the blade sharp longer under the impact of making deep cuts.

The scrub plane requires a slightly different action than the typical bench plane. Because I'm taking thicker shavings (up to 1/16" in soft woods), I find it easier to take quick, short strokes. This motion also produces the scalloped hand-hewn look.

Photo K: Set the depth of the blade on a butt mortise plane by gauging it against a leaf of the hinge.

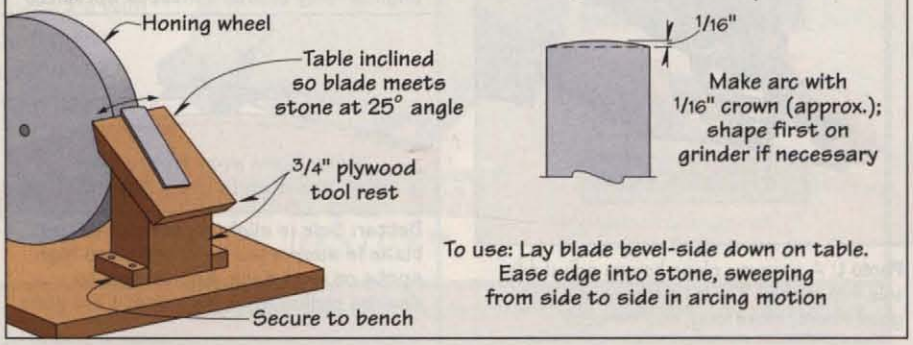
Photo J: The butt mortise plane can shape up hinge mortises faster than a router in many cases.

The Butt Mortise Plane

Similar in size and shape to the scrub plane (in fact it can do the same work if fitted with a scrub blade), the butt mortise plane is distinguished by several features. It has knobs at either end, which make it comfortable to pull as well as push the tool, and a huge mouth ahead of the blade. This generous opening provides a clear view of the blade's position and cutting action.

Photo I: The scrub plane looks like a narrow-bodied Jack plane with a large mouth opening but without a cap iron.

Figure 2 Fixture for honing arc on scrub plane blade



As the name implies, this plane is designed primarily to create shallow mortises for hinges and other flush-mounted hardware *(photo J)*. It not only can do the work of an electric router, but it does so quietly and probably as quickly if you're mortising only only two or three hinges. While you could also use a router plane to cut butt hinge mortises, you'll find that the mortise plane's long, narrow sole helps produce the cut with more speed and precision.

Because you plane in both directions when mortising (with and against the grain), you need to sharpen the blade to a razor edge. Also, this tool has no cap iron or mouth fulcrum to assist the blade. Mortising work requires that the blade edge be straight and set parallel to the sole.

Cutting a Hinge Mortise

To cut a typical ⅛"-deep butt hinge mortise, position the hardware and then knife its outline on the stock. Chisel the outline to depth, chop into the mortise area to divide the waste into segments, and then pare away the waste to within 1/32" of the bottom. Now, you're ready to plane.

Set the blade to the mortise's full depth by holding a leaf against the sole as a reference *(photo K)*. Start the cleanup cuts at the outside edge, reversing direction as you approach either end of the mortise. Take care to keep the blade perfectly square to the mortise ends. Work your way to the inside edge of the mortise, overlapping the cuts as you go.

The Compass Plane

The compass plane is another jack-sized bench plane that has one crucial difference—an adjustable curved sole made of thin steel. (See *photo L.*) On newer versions of this plane, the radius of the sole varies as it flexes around the frog (the blade support mechanism), while older styles flex at the ends to form the desired curve. Avoid the earlier type—the sole flexes too much under planing pressure to maintain a consistent curve.

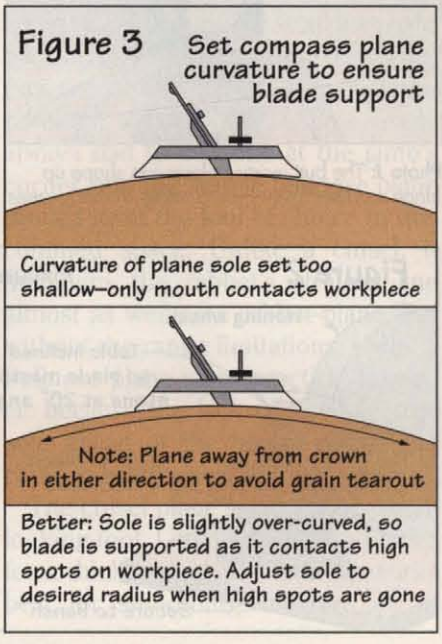
Photo L: A compass plane has an adjustable sole that enables it to cut a true radius. For good results, make long, shallow cuts.

You don't need a compass plane to smooth a curve. A standard bench plane or spokeshave works on convex and shallow concave surfaces. But if you need a curve that's true to the radius of a circle, these tools won't cut it. Only the compass plane will form a perfectly smooth and fair arc.

Using the Compass Plane

Begin by setting the blade's cutting depth and lateral orientation with the sole aligned and locked down flat. You'll find this plane's blade, blade support, and adjustment mechanisms to be the same as those on a standard bench plane. To adjust the sole to the radius, hold the plane in profile directly against a full-scale drawing, then loosen the lock nuts and turn the center-adjustment knob. After you lock in the curve, recheck the blade depth and adjust if necessary.

If the precut curve on the workpiece is rough, you may find that only the mouth of the plane bears on the wood. (See *figure 3.*) This can cause the blade to take too big a bite, clog with shavings, and bog down the planing action. To prevent this, you may have to under-adjust the curve of the sole to start. Then, as the workpiece arc becomes smooth, you can re-adjust the sole in increments until you reach the desired radius. Note where the grain changes direction, and reverse the direction of the plane as necessary. To ensure a smooth, fair curve, make long, shallow cuts on the finishing strokes.



The Scraper Plane

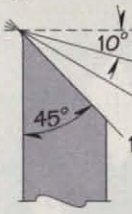
The scraper plane consists of a scraper holder that's configured like a bench plane. However, the blade-holding mechanism tilts the blade to adjust cutting depth and to fine-tune the cutting angle of the burr to achieve a smooth cut *(photo M)*.

Holding a scraper in a plane body offers several advantages. The long sole, relatively heavy weight, and handle locations help you keep the blade flat and firmly in contact with the work's face. This not only produces a

Photo M: When faced with wild or unruly grain, the scraper plane is the tool of choice to prevent tearout.

Photo N: Use a piece of paper to set the depth of the blade on a scraper plane.

Figure 4 Rolling the burr on a scraper-plane blade



Use moderate but steady pressure to stroke the burnisher along the bevel (1), then move it toward the horizontal (2, 3), stopping where shown

more uniform scrape, it also reduces fatigue. (If you've ever scraped for more than a couple of minutes at a stretch, you'll know that scraping offers considerably more resistance than planing.)

I use the scraper plane primarily to surface large faces and also to thickness wood with difficult grain that might tear out if planed. I've known woodworking fly fisherman who used this tool to size and smooth the facets of bamboo fly rods. You can also install a toothed scraper blade and scratch a substrate surface before gluing on veneer to improve adhesion.

Setting Up and Using The Scraper Plane

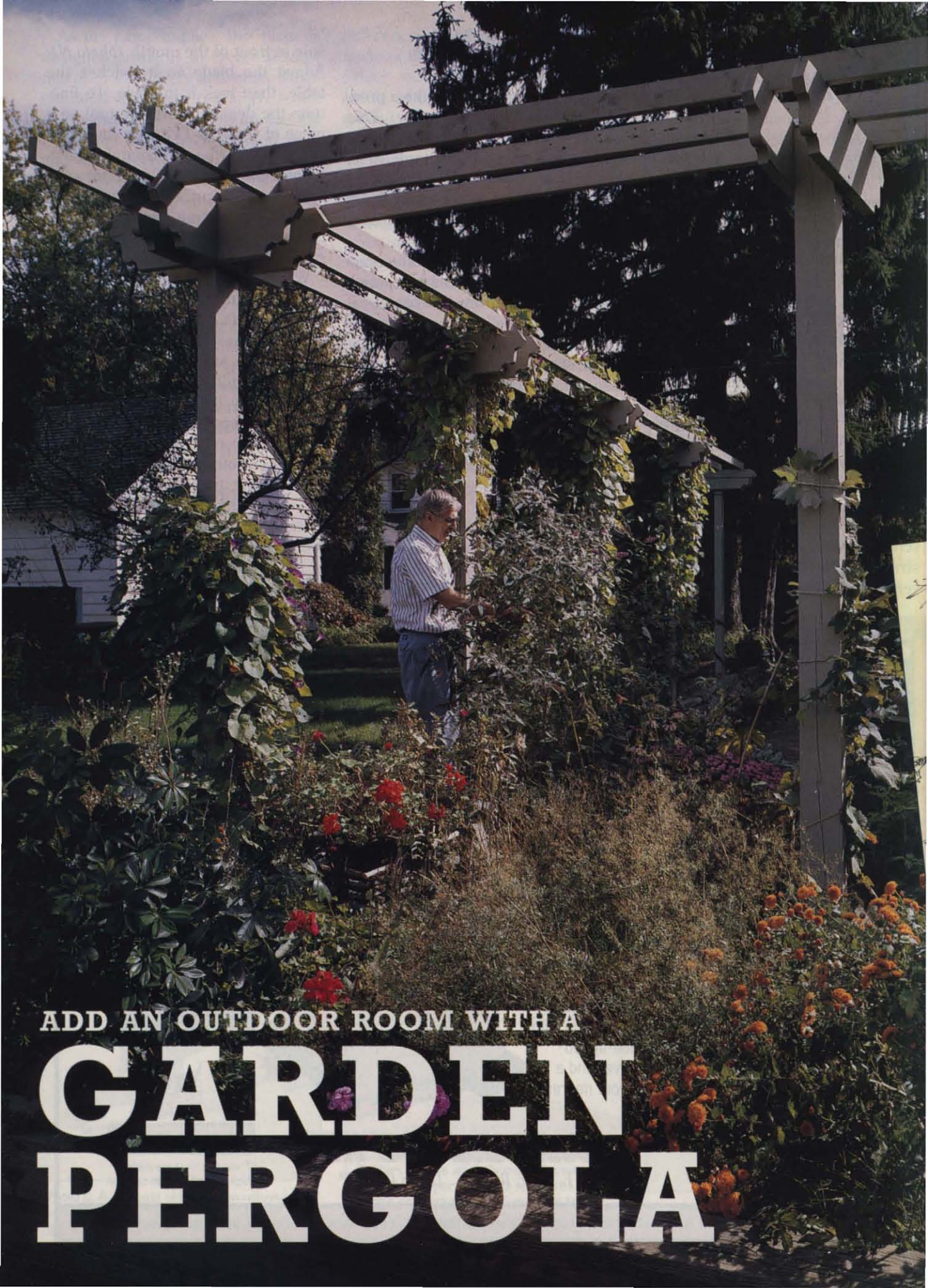
To use this tool, first make a proper burr on the blade edge. This involves honing the blade to a fine edge at its correct bevel angle (usually 45°) and then "rolling" the burr with a burnisher as shown in *figure 4*. It's the burr that actually scrapes the wood surface.

Making this burr takes some practice. If you roll it to too high an angle (more than 10° from horizontal), it will break off easily as it engages the wood. Roll it too low, however, and it won't scrape effectively. You must also make the burr smooth—a jagged edge produces a rough shaving. Once you've rolled the burr properly, file and hone a bevel at each edge to eliminate the sharp corners that tend to dig in and scratch the surface.

Next, set the blade to depth. To do this, place the plane on a flat surface such as your jointer table, and insert a sheet of typing paper under the sole in front of the mouth *(photo N)*. Adjust the blade so it touches the table, then lock it in place. To fine-tune the depth, I work the tool on a piece of scrap as I change the blade angle using the horizontal adjustment knobs. Tilt the blade forward to deepen the cut, back to reduce it. Look for a setting that allows the blade to cut easily into the wood rather than skim over it.

When the cuts from your scraper plane produce fine shavings, you'll be amazed at what this tool can do. Even the most highly figured grain will smooth without tearing. To get the best results, work the tool a little more slowly than you would a conventional plane. Scraping action generates more edge-dulling heat than slicing, so you want to give the blade a little more time to cool off. When the blade starts making sawdust instead of shavings, it's time to renew the burr.

Photographs: *Craig Wester*
Illustrations: *Dana Quiram*



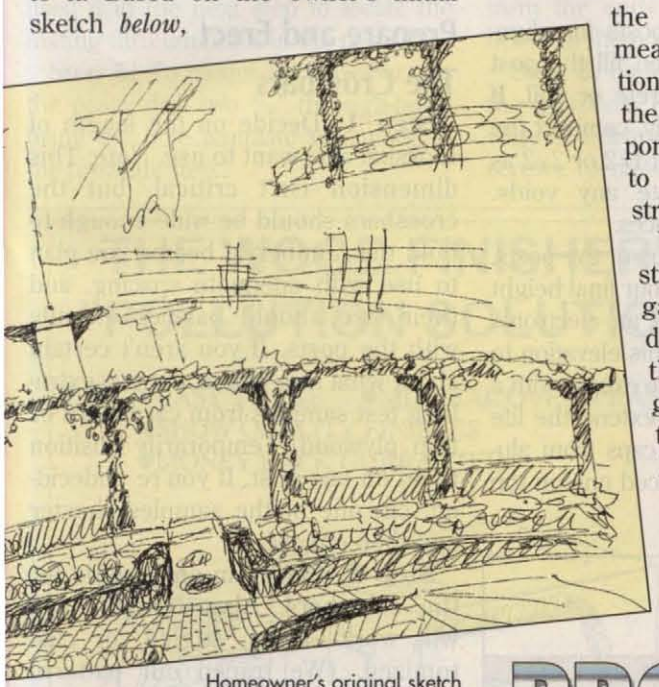
ADD AN OUTDOOR ROOM WITH A

GARDEN PERGOLA

Per'·go·la: (1) An open-work arch or covering for a walk or passageway on which climbing plants are trained to grow; (2) a structure, usually consisting of parallel colonnades, that supports an open roof.

Whichever meaning works for you, adding an open overhead structure to your garden can transform it into a totally new space, adding visual dimensions you haven't experienced before.

The owner of this pergola envisioned an outdoor "room" that would provide the garden with just a hint of separation without obstructing the view or access to it. Based on the owner's initial sketch *below*,



Homeowner's original sketch

we designed a simple but effective structure that uses 4x6 lumber for the posts, and 2x10s and 2x4s for the overhead parts.

Before You Start

To keep costs down, we used standard construction-grade lumber for the above-ground parts but picked through the stock at the lumber yard to find the straightest possible boards with the fewest possible knots. For the posts, we opted to use pressure-treated material.

We selected 4x6 posts for their massiveness and stability. Depending on how high a structure you prefer (ours stands 9' above the ground), 4x4s or doubled 2x4s reinforced with spacers between them would suffice. We went with fir 2x10s for the crossbars because they provided the mass we wanted and also sufficient width for the decorative profile we intended to cut on the ends.

Layout for a project like this need not be complicated. We simply staked the post locations and ran strings to align them. This also made it easier for the homeowner to visualize the structure's placement.

The shape of the garden called for an L-shaped pergola, so we started at the common corner and measured in both directions to locate the posts. At the same time, we temporarily erected two posts to help us decide on the structure's final height.

We wanted a rigid structure and, since the garden had adequate drainage, decided to set the posts 36" in the ground and anchor them with concrete. Even with the heavy overhead load, no additional supports or braces are required with this system.

MATERIALS

Parts	Dimensions	Lengths
Posts	4x6s	12'
Beams	2x4s	8'
Crossbars	2x10s	12'

SUPPLIES

¼"-20 threaded rod; ¼"-20 hex nuts and ¼" flat washers; #8x3" galvanized deck screws; stain, paint, or water sealant; concrete mix.

Before starting construction, check with local authorities to determine whether any codes or covenants govern the erection of structures like this. If you intend to build on or near the property line, it's also a good idea to involve your neighbors and let them know what you're planning. And before you dig, ask the utility companies to locate and mark any buried cables and pipelines.

Lay Out and Dig The Post Holes

Step 1. Starting at a corner or at one end, drive a stake to mark the centerpoint for that post.

Step 2. From this starter stake, string lines in the direction(s) of the colonnades and several feet beyond the ends. Secure the lines to stakes. Since our structure was L-shaped, we worked in both directions and checked the corner we were creating for square using the 6-8-10 triangulation method. (See the Pro Tip *below left* for an explanation of this squaring technique.)

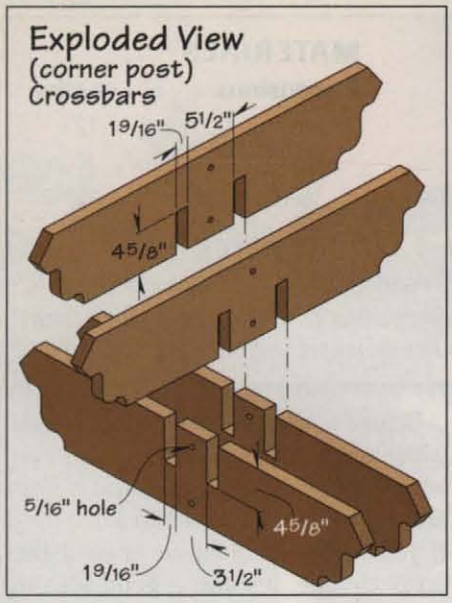
Step 3. Measure the length of the pergola. Determine the number of posts you need by dividing the distance by the post spacing you want. (We selected 7' between post centers so we could use standard 8' 2x4s for the beams with minimal trimming.)

Step 4. Arrange the posts temporarily according to your layout to determine whether your spacing is uniform. If not, change the dimensions to correct the problem, or make the last space one-half the normal distance. This will help to maintain a visually acceptable spacing.

Step 5. After you've established the post spacing, mark all post centerpoints. (We dropped a plumb bob from

PRO TIP

To square a structure using the triangulation method, start in the corner and measure outward along both legs of the structure. Measure one leg and mark it at 6'. Return to the corner and measure along the string of the second leg and mark it at 8'. Next, measure the diagonal distance between the two string marks. If the corner is square (90°), this diagonal will measure exactly 10'. If it measures less, you need to increase the corner angle; if more, decrease the corner angle.

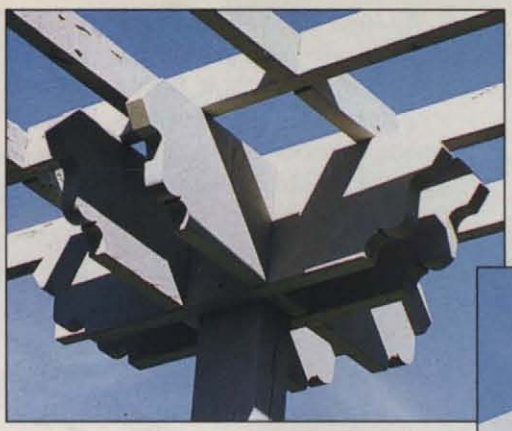


the line and marked the points with aerosol paint.)

Step 6. Dig the post holes. (We used a two-man power drill fitted with a 10"-diameter auger. The 4x6 posts require holes this large in order to have room for some alignment adjustment. We dug each hole 42" deep so we could back-fill with 6" of small stone for drainage and still have 36" of post set in the ground.)

Erect the Posts

Step 1. Clean out and then back-fill the holes to the desired depth. Stand a post in each hole. Attach two stabilizing braces at right angles to each post, and drive stakes into the ground to anchor the braces after you've plumbed each post.



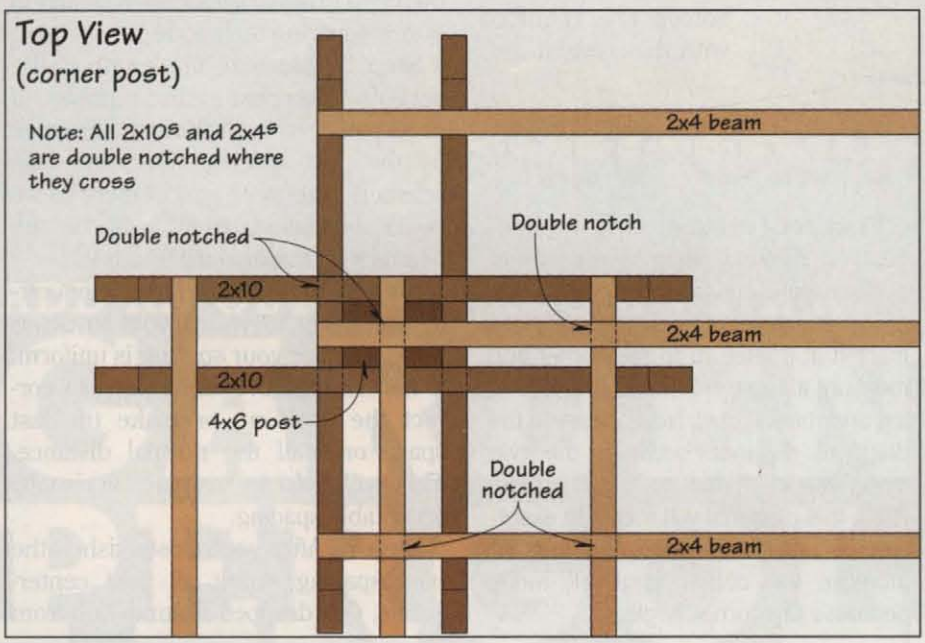
Overlapping corner crossbraces and beams were notched to permit flush joints. Cut notches generously.

Morning glory vines rapidly climbed to the post tops and crossbars and bloomed. Depending on climate, grapes and bougainvillea also make good choices.

Step 2. Stretch a string along the desired line at about eye level. Starting at one end, position the post so its face just touches the string. Using a carpenter's level, plumb the post, then have a helper screw the supporting braces to the stakes to hold the post in place. Align, plumb, and brace the remaining posts this way.

Step 3. Check all posts for alignment one last time, then fill the post holes with either concrete or soil. If back-filling with soil only, compact the dirt by tamping it with a 1x2 or 2x2 as you work to eliminate any voids. Remove the support braces.

Step 4. Level the tops of the posts. (To do this, we marked our final height on one post, then used an electronic water level to transfer this elevation to the others. We cut off the excess with a circular saw.) Note: To extend the life of the posts, we made caps from aluminum flashing and placed one on top of each post.

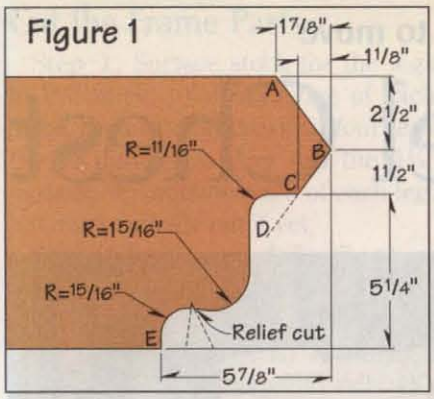


Prepare and Erect The Crossbars

Step 1. Decide on the length of crossbar you want to use. Note: This dimension isn't critical, but the crossbars should be wide enough to hold the number of beams you plan to use with adequate spacing, and their size should balance visually with the posts. If you aren't certain about what size to use, cut two extra-long test samples from cardboard or thin plywood. Temporarily position them on one post. If you're undecided, cut one of the samples shorter and then choose.

Step 2. Select an end profile for the crossbars. Almost any shape will work—blunt, angled, or customized. (We traced our pattern, shown in *figure 1*, from a structural part on the house.)

Step 3. Lay out and cut the crossbars to length. (We laid out the pattern on the 2x10s, then crosscut each piece to rough length. To shape the ends, we made a cut along line AB and then a stopped cut at BD using our sliding compound-miter saw. We switched to a portable jigsaw to cut the relief notch, then bandsawed the curved line CE. We then sanded the cut edges on an oscillating spindle sander. With a simple design, you could make a template of it, cut the end to rough shape



with a jigsaw, and then use the template and a pattern bit to rout the profile to finished shape.)

Step 4. Lay out and drill two 5/16" holes through each crossbar, spacing them about 6" apart vertically and centering them from end to end. (We made a drilling template and used it to ensure uniform hole spacing. We also used it in the next step to locate the mating through-holes in the posts.)

Step 5. To mount the crossbars on the posts, drill two 5/16" through-holes using the hole template you made in the previous step.

Step 6. Bolt the crossbars to the posts. (We used lengths of 1/4" threaded rod with hex nuts and washers.)

Note: If your pergola has a corner and you intend to cross the crossbars as we did, you'll need to notch them to a depth that equals half their width. To do this, we first clamped the crossbars around an off-cut length of post to space them correctly for layout. Next, we marked their points of crossing, laid out the notches, and then cut the notches with a jigsaw. We found it best to oversize the notches by at least 1/16" all around to compensate for structural and material inaccuracies.

Fit and Secure the Beams

Step 1. Mark the crossbars where you intend to position the 2x4 beams. We spaced two outside beams 4" in from the ends and centered a third between them.)

Step 2. Fit and attach the beams to the crossbars. We placed the beams on edge and drove #8x3" galvanized deck screws, toenail-fashion, to secure them to the crossbars. Note: Again, if your pergola has a corner, you'll need to notch the beams where they cross.

Apply the Finishing Touches

Step 1. If you haven't already done so, apply a protective paint, stain, or waterproofing material to all parts.

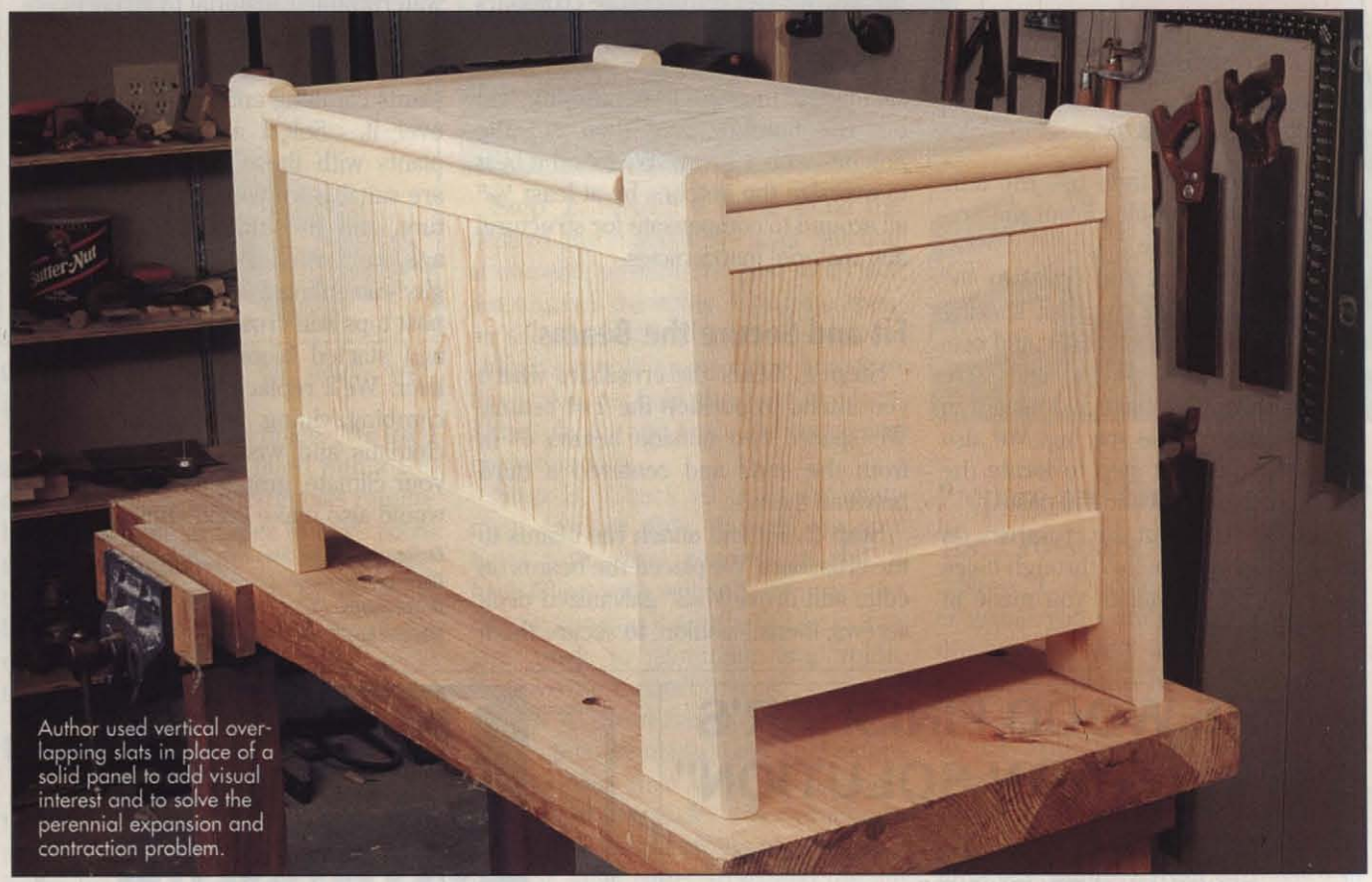
Step 2. Plant the garden stock. A pergola looks best with attractive plants climbing and vining around and over it. Select annual or perennial plants with these characteristics that are suitable for your garden soil, moisture, and sunshine. For quick coverage, we planted 4"-tall annual morning-glory seedlings. They climbed to the post tops and crossbars in eight weeks and started blooming several weeks later. We'll replace these with several climbing/vining perennials, such as clematis and wisteria. Depending on your climate, grapes and bougainvillea would also make good choices.

Design: *Darlene Sommers, Dick Coers*
Photograph: *StudioAlex*
Illustrations: *Dana Quiram*
Written by *Charles Sommers*

Panels made up of overlapping slats give the wood room to move

Frame-and-Panel Chest

by Roger Holmes



Author used vertical overlapping slats in place of a solid panel to add visual interest and to solve the perennial expansion and contraction problem.

A successful adaptation is one that creates the same effect as the original but does so in forms and materials that suit one's own tastes or circumstances. The inspiration for this design came from a chest built in the 1890s by Sidney Barnsley, a founder of the English Arts and Crafts movement. He in turn had adapted elements for his design from medieval pieces. Adapting (rather than copying) a design you admire can be a challenge, but I found it rewarding and encourage you to try it yourself.

Some of my design's distinctive features echo those of Barnsley's, particularly the legs, which present a wide tapering profile on the front and back of the chest. Like Barnsley, I also enlisted the play of light and shadow. Recessed surfaces, chamfers, and radiused edges catch the light in a variety of ways, adding considerable interest to an otherwise simple design.

To enhance these effects, I strayed from Barnsley's example, particularly inside the frames, where I replaced his single, large horizontally grained panels with a series of narrow, vertical slats. On the lid, I made the stiles the same width as the slats and carried the chamfers across the lid's rail-to-stile joints to reflect the front and back panel layout.

Editor's Note: We present here another project adapted from Roger Holmes' book *The Complete Woodworker's Companion*, published by Watson Guptill in 1996. We recommend Roger's chest especially to those of you interested in honing your hand skills, although nearly every operation can be completed using power tools if you prefer.

Before You Start

Mortise-and-tenon joints represent the traditional staple of frame-and-panel construction, and this project will give you plenty of practice cutting them—they number more than 20 in all. Before you cut the joints, see my Woodworking Basics article, "Laying Out and Cutting A Mortise-and-Tenon," on *page 18*.

A word of caution: Don't ignore the sequence of construction here. This isn't a project you can build successfully just by looking at the drawings. For example, you'll need to round some of the radiused edges before assembly, some of them afterwards. Because there are many parts in this piece, it pays to organize. I suggest you group the legs, rails, and stiles in assemblies (front, back, right side, left side, lid) as soon as you can and keep the parts together throughout the process.

Cut the Frame Parts

Step 1. Surface stock for the legs to 1½" thick. Joint one edge of each piece, then rip and crosscut four legs (A) to dimension. Lay out the 1¼" taper on the outside edge of each leg, but don't actually cut it yet.

Step 2. Surface stock for the chest and lid rails and the lid stiles to 1" thick. Rip stock for the bottom rails (B, C) and top rails (D, E) to finished width. Leave the horizontal rails (F) ½" wide for now, but rip the lid rails (G) and stiles (H) to finished width. Now, use a single setup to cut each set of same-length parts to finished length.

Step 3. Mark all parts for identification and indicate a "working" face and edge on each—in this case, the two sides that will form the interior surfaces of the assembled chest. To avoid confusion, group identical parts and keep them together as you work *(photo A)*.

Bill of Materials

	Part	T	W	L	Mtl.	Qty.
Chest	A Legs	1½"	5½"	21½"	P	4
	B Bottom rails—front/back	1"	4¼"	33"	P	2
	C Bottom rails—sides	1"	4¼"	18⅝"	P	2
	D Top rails—front/back	1"	2"	33"	P	2
	E Top rails—sides	1"	2"	18⅝"	P	2
	F Horizontal rails—sides	1"	3¾"	18⅝"	P	2
	G Rails—lid	1"	3"	29"	P	2
	H Stiles—lid	1"	4⅛"	17½"	P	2
	I Bottom* **	¾"	17⅜"	34¼"	P	1
Slats	J Chest—standard*	⅝"	4½"	11⅜"	P	14
	K Lid—standard*	⅝"	4½"	14⅛"	P	4
	L Chest—wide*	⅝"	4⅞"	11⅜"	P	4
	M Lid—wide*	⅝"	4⅞"	14⅛"	P	1
	N Chest—side center*	⅝"	8⅝"	11⅜"	P	2

*Parts cut to final size during construction. Please read all instructions before cutting.

Materials List

P–Ponderosa pine (or hardwood of your choice)

Supplies

3x1¾" extruded brass butt hinges (2).

Prepare the Frame Joints

Step 1. Lay out all of the mortises on one leg as dimensioned in *figure 1*. (For help, see "Laying Out and Cutting A Mortise-and-Tenon" on *page 18*.) Measure all leg mortises from the "working" face and edge of each part. Note: Lay out two small mortises for the horizontal rails (F) instead of one large one; this doubles the amount of long grain-to-long grain glue surface. Check your layouts for accuracy, then transfer them to the three remaining legs. Cut the mortises in each leg *(photo B)*.

Step 2. Cut the tenons on all 10 rails *(photo C)*. Make the tenons 1/16" shorter than the depth of their corresponding mortises. If you machine the tenons, use a single setup to make all cuts identical. Note: Since you oversized the horizontal rails (width), the double tenons will be off-centered as shown in the photo.

Step 3. Lay out and cut the two mortises in each lid rail. (For dimensions, see *figure 2*.) Next, cut mating tenons on the lid stiles, again making them 1/16" shorter than the mortise depth. After I finished cutting these joints, I regrouped and stacked the parts to keep them organized *(photo D)*.

Step 4. Dry-assemble the chest and lid frames to check the joints for fit. Adjust the fit as necessary. Then, disassemble the side-rail assemblies, but keep the front, back, and lid assemblies intact for now.

Groove the Frame Parts

Step 1. With the front, back, and lid frames still dry-assembled, plane the inside faces flush. This ensures that the grooves in the mating parts will align after you cut them.

Step 2. Cut a centered 5/16" groove 3/8" deep in the edge of each top and bottom chest rail (B, C, D, E) and each lid stile (H). These grooves will accept the slat tongues. (See figures 1 and 2 for locations.) For this procedure, you can use a tablesaw and dado head or a router table and fence with a straight bit or slotting cutter. Note: Index the groove from the working face of each part by placing this face against the fence. Keep this setup for the following two steps.

Step 3. Cut a stopped groove in the edge (not the face) of each leg between the two rail mortises. (See figure 1.) To

Photo A: Group the legs, rails, and stiles, and keep them together throughout the construction process to reduce confusion.

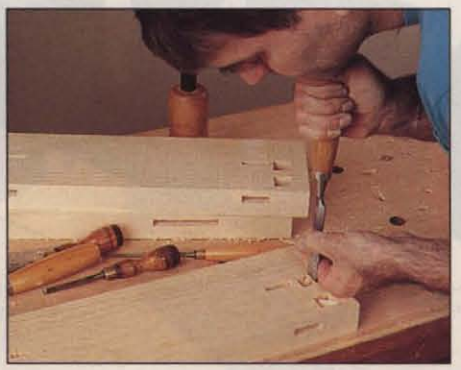


Photo B: For accuracy, index all mortises from the "working" face and edge of the leg. Lay out the mortises on one leg, then transfer the layouts to each of the remaining legs.

do this, first pencil the two mortise locations on the outside face of each leg. Again, make sure you place the inside (working) face of the leg against the fence. Center the left-hand mortise over the bit, using the pencil marks to guide you, then turn on the router. Carefully ease the leg onto the bit, rout as far as the other mortise, then lift the leg off the bit.

Step 4. Rout a stopped groove in the edge of both lid rails (G) between the two mortises. (See figure 2.) As with the stiles, index this groove from the bottom (inside) face of the rail.

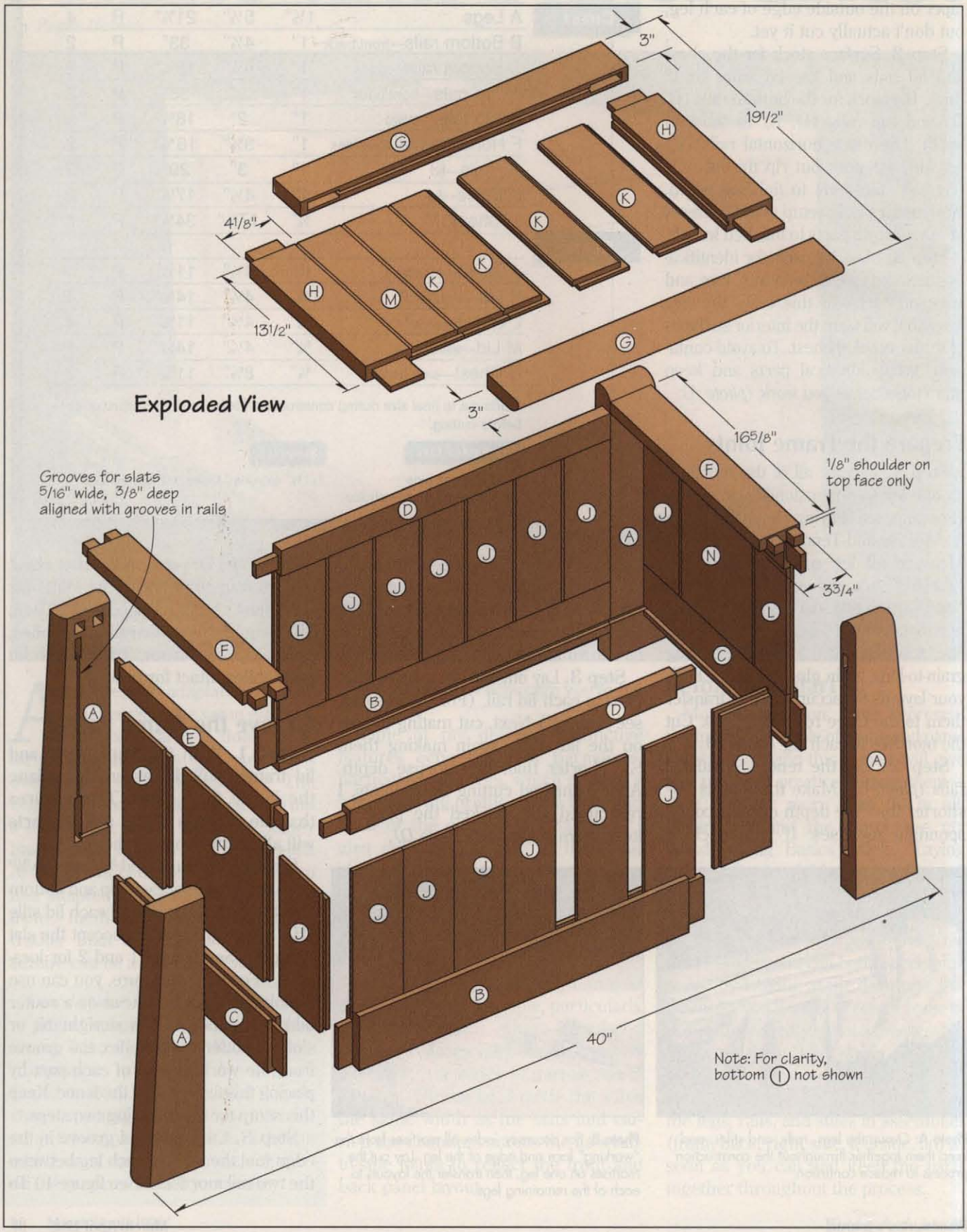


Photo C: Cut all mortises first, then size the tenons to fit them. Here, author trims the double tenon on the horizontal rail.

Photo D: When you've cut all joints, regroup the parts to keep them organized.

Photo E: Save the tapered waste pieces from the legs to use as clamp cauls during front/back assembly. Note that the leg end is rounded before assembly, the leg edge afterwards.

Step 5. To lay out the stopped grooves in the leg faces, dry-assemble two legs to one set of side rails (C, E) to form a side frame. Transfer the location of the rail groove to one leg face. Use this leg to set the router-table fence, indexing the distance from the inside (working) edge of the leg. With this same edge riding against the fence, rout the groove from one mortise to the other on each leg face.

Step 6. Cut a 5/16" groove 3/8" deep in the inside face of the four bottom chest rails (B, C) to accept the bottom. (For location, see figure 1 and the Exploded View.) You'll need to cut a short groove across each leg to connect the bottom-rail grooves, but it's best to do this later after gluing up the front and back.

Prepare the Bottom And Panel Slats

Step 1. Dry-assemble and clamp the chest and lid frames. Measure the width and length of the openings (including that for the bottom) and add the groove depths. Record these dimensions.

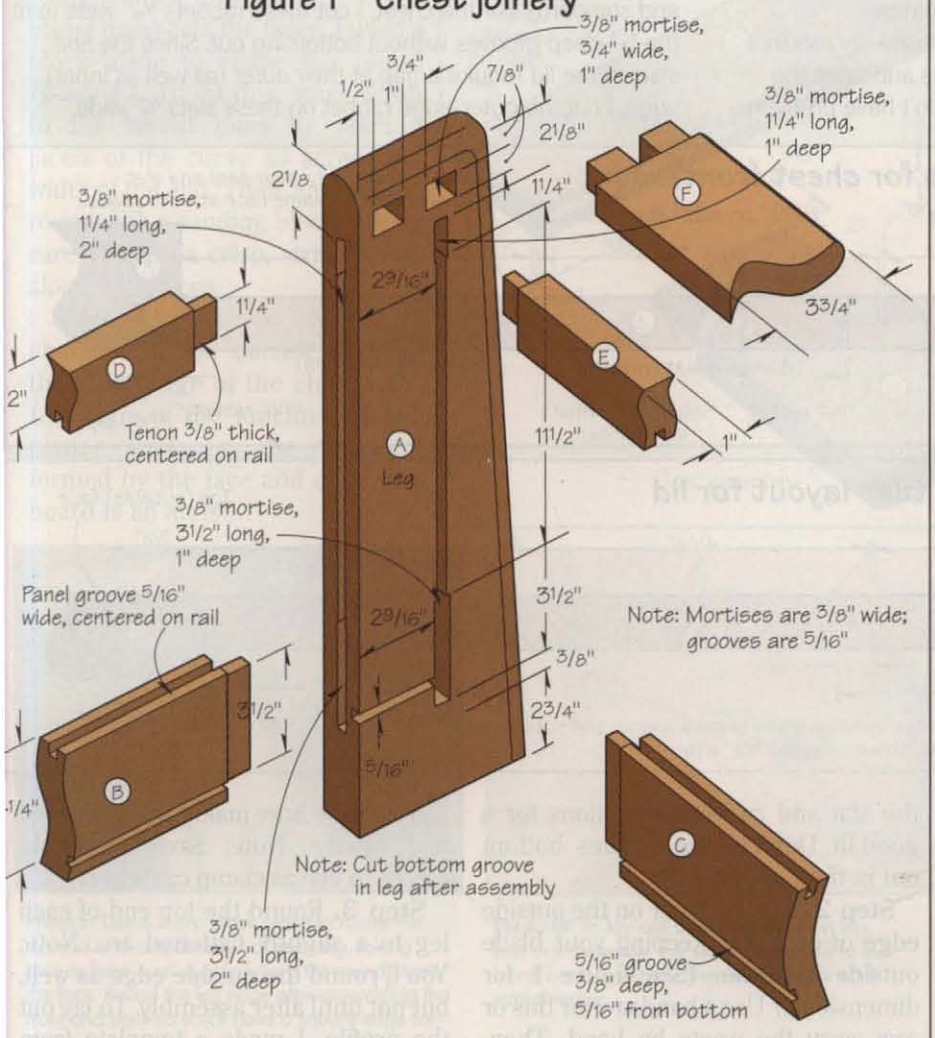
Step 2. To make the bottom panel (I), edge-glue and clamp 3/4"-thick solid stock. When the glue has cured, smooth the faces. To accommodate wood movement, rip the bottom about 3/16" narrower than the width (including the grooves) if you're working in humid conditions, 1/4" narrower if conditions are dry. Crosscut the bottom 1/8" shorter than the overall length.

Step 3. Rabbet the bottom edges and ends of the bottom panel to form a tongue that fits the 5/16" groove snugly. Make the rabbet 1/2" wide to accommodate expansion.

Step 4. Surface stock for the 25 slats to 5/8" thick and joint one edge of each board. Rip the stock for the 18 "standard" slats to 4 1/2" wide; for the five end slats to 4 7/8" wide; and for the two center side slats to 8 5/8" wide. I suggest you cut at least one extra slat of each size in case you make a mistake.

Step 5. To size the slat blanks for length, subtract 1/8" from the distance between the groove bottoms on both the chest and lid frames. (My chest and lid slats measured 11 3/8" and 14 1/8" long, respectively.) Crosscut the slats using the same setup for all identical-length parts.

Figure 1 Chest joinery



Making the Overlapping Slats

Combining a number of narrow, vertical slats to form the panels in the side, end, and top frames of the chest serves the design well but poses two construction problems. Like a single solid panel, each slat will expand and contract with changes in humidity, and this movement must be accommodated. Second, if the slats were just butted together edge to edge, shrinkage in dry weather would open gaps between them and allow dust to filter into the chest.

Rabbeting the slat edges and overlapping them solves both problems. I rabbeted the slat ends as well to form tongues that fit snugly in the rail grooves. Note that you'll rabbet the slat ends for the chest on the inside face, which recesses the outside faces of the slats in those frames. The rabbet on the lid slats, however, goes on the outside face, so you can position that face flush with the outside frame face. This gives the lid a different look and makes it more comfortable to sit on as well.

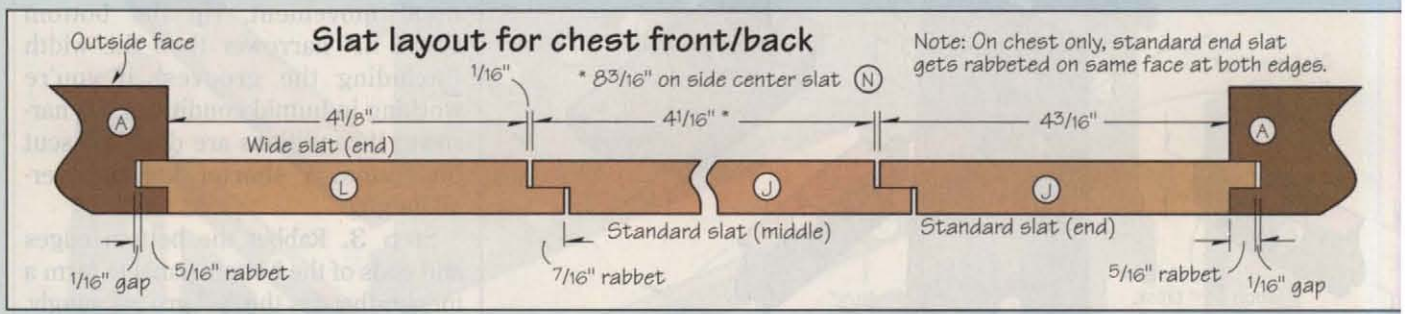
As shown in the two figures *below*, all frames (front/back, sides, and lid) require three different types of slat: a wide end slat, a middle slat, and a standard-width end slat. For the chest, the edges of the first two types are rabbeted along opposite faces, while those on the standard end slat must be rabbeted on the same face. For the lid, the wide end slat receives the same-face rabbets, but the standard end slat does not. By configuring them this way, you'll end up wih slats that appear uniform in width when assembled in the frames.

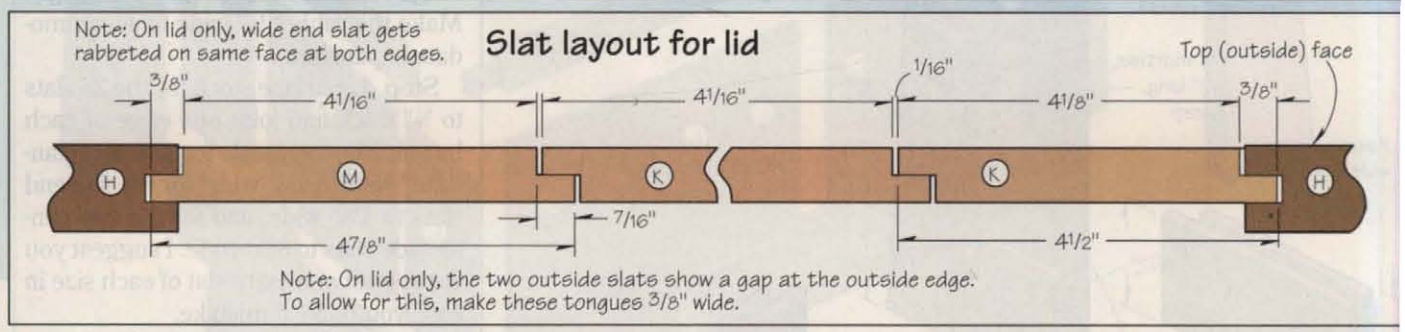
Note that laying out and cutting all slats correctly requires concentration, but if you study the drawings and keep the parts and operations organized, you shouldn't have problems. The slat and rabbet dimensions depend on the actual dimensions of your frame openings. Alter the measurements to fit your frames. To ensure correctly sized slats and rabbets, it would help to draw a full-scale section view of each set of assembled slats and take the measurements directly from those drawings.

To avoid errors, I marked all of the rabbets on each slat with a pencil marking gauge, then kept the slats arranged in sets throughout the subsequent machining. Cutting rabbets on the tablesaw is easy—either make the rabbet in two cuts with a single blade as I did, or use a dado head.

Rabbet the slat ends first to form tongues that fit snugly (but not tightly) in the rail grooves. On the front, back, and side slats, make the shoulder-to-shoulder length 1/8" less than the rail-to-rail distance on the frame. This keeps the shoulders from bottoming out on the rails, and the gap between the slat shoulders and rail will show only on the inside face. For the lid, however, the shoulder-to-shoulder length must match the width of the frame opening exactly, so no gaps show between the rails and slats on the outside face of the lid.

Next, rabbet the slat edges, taking care to cut opposite faces on all but the standard end slats (for the chest) and the wide end slat (for the lid). The edge rabbet on my slats measured 7/16" wide, except on the outer edge of the end slats (both wide and standard). For the chest, I cut these rabbets 5/16" wide to fit the 3/8"-deep grooves without bottoming out. Since the end slats in the lid require a gap at their outer (as well as inner) edge, I cut the outer-edge rabbet on these slats 3/8" wide.





Note: On lid only, the two outside slats show a gap at the outside edge. To allow for this, make these tongues 3/8" wide.

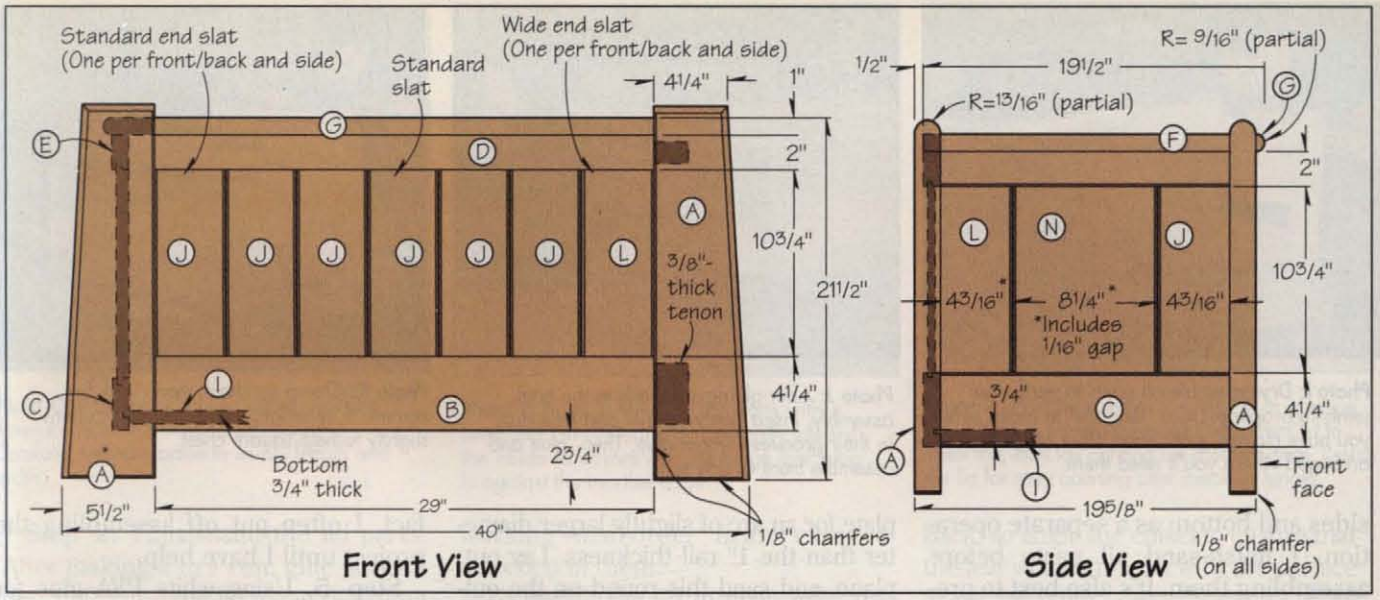
Step 6. Rabbet the ends and edges of all slats to form tongues as described in "Making the Overlapping Slats" in the box *above*.

Prepare For Assembly

Step 1. After rabbeting all slats, dry-assemble the frames and fine-tune the slat and rabbet dimensions for a good fit. Don't let the tongues bottom out in their grooves.

Step 2. Cut the taper on the outside edge of each leg, keeping your blade outside the line. (See figure 1 for dimensions.) Use a bandsaw for this or saw away the waste by hand. Then, plane to the line, making the edge flat and square. Note: Save the waste pieces to use as clamp cauls later.

Step 3. Round the top end of each leg to a slightly flattened arc. Note: You'll round the outside edge as well, but not until after assembly. To lay out the profile, I made a template from



heavy card stock, cutting an arc of slightly larger diameter than the 1½" leg thickness. (I used a 13/16" radius for a 1⅝" diameter.) Trace the sectional profile onto both leg edges, then connect the profiles with straight lines to show where the round intersects the faces. I used a block plane to shape the round *(photo E)*. To do this, work down to the layout lines by planing facets of the curve all across the width of the end. Then, smooth the round with a sanding block, taking care to keep a crisp, straight line along both faces.

Step 4. Plane or rout a ⅛" chamfer on the outside arris of the inner edge of the chest rails. (An arris is the juncture of two planar surfaces; the "corner" formed by the face and edge of a board is an arris.)

Assemble the Chest In Stages

Note: I find it easier to assemble a project of this size and complexity in stages. I glue up the chest front and back first, do some work on them after the glue cures, then add the

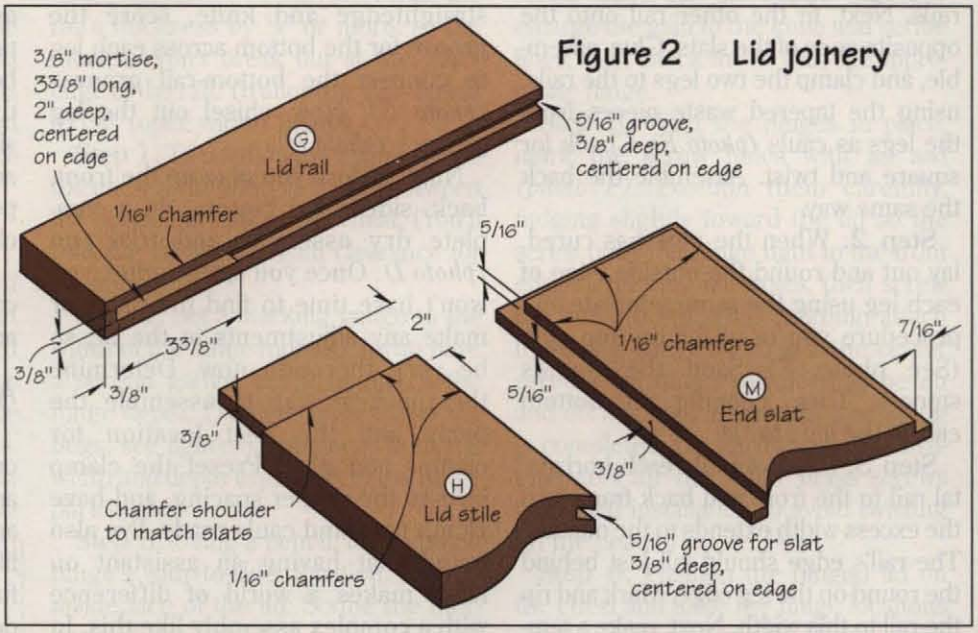


Figure 2 Lid joinery

Photo F: Use a sharp block plane to round the top end and outside edge of each leg, taking care to keep a crisp arris where the round meets the face. Round the leg edge after assembling the front and back so you'll have a square edge for clamping.

Photo G: To lay out bottom groove on leg, first dry-assemble the side bottom rail to the front/back assembly, then use a knife and straightedge.

Photo H: Author uses sharp chisels to cut cross-grain bottom groove on leg.

Photo I: Dry-assemble all parts to verify that joints fit properly. Do a "dry run" to make sure you have clamps, pads, and other supplies arranged where you'll need them.

Photo J: After gluing side rails to the back assembly, insert bottom panel and side slats in their grooves without glue. Then, glue and assemble front to side rails.

Photo K: Clamp up chest, then check for square. If necessary, adjust clamp positions slightly to help square chest.

sides and bottom as a separate operation. I finish-sand all parts before assembling them. It's also best to prefinish the slats and bottom.

Step 1. To assemble the front and back, first fit one set of slats (without glue) into the groove on one of the rails. Next, fit the other rail onto the opposite ends of the slats. Glue, assemble, and clamp the two legs to the rails, using the tapered waste pieces from the legs as cauls *(photo F)*. Check for square and twist. Assemble the back the same way.

Step 2. When the glue has cured, lay out and round the outside edge of each leg using the same template and procedure you used for the top end. (See photo F.) Sand the rounds smooth. Then, chamfer the bottom end of the legs to ⅛".

Step 3. Dry-assemble each horizontal rail to the front and back frames so the excess width extends to the outside. The rail's edge should fall just behind the round on the leg edge. Mark and rip the rail to this width. Next, make a template for an arc of slightly larger diameter than the 1" rail thickness. Lay out, plane, and sand this round on the outside edge of each horizontal rail.

Step 4. Dry-assemble each bottom side rail to the corresponding legs on the front and back frames. Using a straightedge and knife, score the groove for the bottom across each leg to connect the bottom-rail grooves *(photo G)*. Now, chisel out the leg grooves *(photo H)*.

Note: Before you glue up the front, back, sides, and bottom, do a complete dry assembly and trial run *(photo I)*. Once you spread glue, you won't have time to find the parts or make any adjustments to the fit, so be very thorough now. Determine the quickest way to assemble the parts and the best location for clamps and glue. Preset the clamp jaws to the proper spacing, and have clamp pads and cauls ready. I've also found that having an assistant on hand makes a world of difference with a complex assembly like this. In fact, I often put off assembling the project until I have help.

Step 5. Using white PVA glue for longer open time, glue and assemble the bottom side rails to the back, then insert the bottom into its groove without glue. Working quickly, glue and assemble the top side rails and horizontal rails to the back. Assemble the slats between the side rails (without glue), then glue and assemble the front to the sides *(photo J)*. Clamp the assembly and check for square. Adjust the clamp positions if necessary to square the chest *(photo K)*.

Step 6. When the glue has cured, carefully scrape off any squeeze-out and sand where necessary.

Assemble the Lid

Step 1. Chamfer the exposed arrises on the lid slats (edges and shoulders) and on the inner edges of the lid rails and stiles to 1/16". To make the stiles look like two additional slats, I chamfered the full length of the rails and the stile shoulders as well. (See figure 2.)

Photo L: To lay out hinge mortises, use two marking gauges if you have them—one for width (on face), one for depth (on edge).

Photo M: Since hinge leaves often are not cut perfectly square, use actual hinge to mark ends of mortise. Mark hinges and mortises to pair them.

Photo N: Score the waste to within 1/16" of mortise ends and edge, holding chisel at an angle so depth decreases toward inner edge. The leaf should align flush with rail face at this edge.

Photo O: Pare away scored waste, working down to depth line scribed on rail edge. Carefully extend mortise to its full length and width.

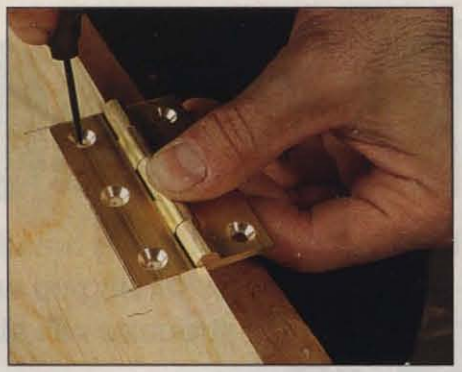


Photo P: Mark screw-hole locations with a brad awl, off-centering them slightly toward the inside so screws will pull hinge leaf snugly against the mortise edge.

Photo Q: With lid sized to fit snugly in its opening, use a knife to transfer hinge locations from lid to chest rail, then lay out and cut chest mortises. Resize the lid for easy opening after installing hinges.

Step 2. Finish-sand the lid parts. After making a dry run, glue, assemble, and clamp the lid using the same procedure you followed for the front and back. Remember to orient the slats so that their top faces align with the top face of the lid frame.

Step 3. Round the front edge of the front lid rail using the template you made for the horizontal rails. This rounded edge will protrude beyond the top chest rail, providing a handhold for opening the lid.

Hinge the Lid To the Chest

Note: I used extruded brass butt hinges, which are expensive but worth the extra money. Die-formed and crisply machined, these hinges have a pleasing heft and don't rattle around like stamped or pressed butts. If you can't find extruded hinges at your local hardware store, most woodworking mail-order firms carry a selection of them.

To permit the lid to open fully, the hinge barrel must protrude from the back of the chest. (See *figure 3.*) With the barrel positioned correctly, the hinge leaf should be narrower than the rail's thickness by ⅛" or more, so the mortise won't break out at the inner edge of the rail. To allow for this, I used 3x1¾" (open width) hinges.

Step 1. To position the hinges, plane the ends of the lid to fit snugly between the horizontal rails on the chest. (You'll refit the lid later to gain clearance for opening.)

Step 2. Set a marking gauge to the width of the hinge mortise. If you have a second gauge, set it to match the hinge depth. (To determine these settings, see figure 3.) Measure both the width and depth to just shy of the hinge pin's center.

Step 3. Using a pencil, lay out each hinge's side-to-side location on the inside face of the lid. Scribe the mortise's width on the face and their depth on the edge with the marking gauges *(photo L)*. Align the edge of each hinge leaf with the scribe mark for width, then knife a line against both ends of each leaf *(photo M)*. Note: Since hinge ends are seldom milled perfectly square to the edges, knifing the outline ensures tight-fitting hinges. Mark each hinge and mortise to keep them paired.

Step 4. With a sharp chisel, deepen the scribe marks, then score the waste *(photo N)*. Score both with the grain and across it. Stay about 1/16" from the scribe marks for now. The depth should taper slightly from front to back, so angle the chisel to ensure that the leaf will align flush with the surface along its edge. (See figure 3.) Pare away the scored waste with a wide, sharp chisel *(photo O)*. Start the final cuts by nestling the chisel's edge in the scribe mark for the depth. Carefully enlarge the gain to the knife and scribe lines, then check the fit with the appropriate hinge.

Step 5. With the hinges in place, mark the screw holes with an awl *(photo P)*. Position them carefully, fudging slightly toward the lid so the screw pulls the hinge tight to the front edge. Drill the pilot holes, then screw the hinge down. (When fitting, attach three-hole hinges with just the center screw—the hinge will need to be on and off a couple of times before fitting is completed. On hardwoods, I substitute steel for the softer brass screws until final installation to avoid twisting off the heads.)

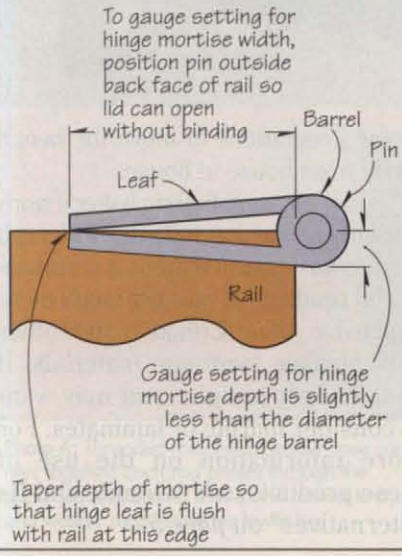
Step 6. Position the hinged lid on the chest and knife the hinge locations on the rail *(photo Q)*. Remove the hinges and use them to scribe the mortise ends. Then, cut and fit the mortises and drill pilot holes in the top rail as you did in the lid.

Step 7. Attach the hinges to both lid and chest and check the fit of the lid in its opening. Remove the lid and plane the ends to create clearance for easy opening. A small gap at both ends will allow for expansion in humid weather.

Step 8. Remove the hinges from the lid and chest. Apply finish to both parts and allow it to cure thoroughly. Reattach the hinges.

Photographs: *Michael Farrell*
Illustrations: *Roxanne LeMoine/CadArt*

Figure 3 Hinge mortise layout



Baker's Bench

by Andy Andresen

Whether you are baking bread, preparing a seven-course meal, or just serving up wine and cheese, this sturdy structure will stand at the center of action.

Several years ago I noticed a large, bench-like kitchen work table at a northern California winery. As a woodworker, I know that most cabinetmakers center their work around a large functional bench, and it struck me that the same surely holds true for bakers and cooks. I decided that such a baker's bench would serve a cook, or even a whole family of cooks, better than the built-in "islands" you find in some kitchens today. I didn't get a look at the table's inner structure at the winery, but decided to build my own and add a few enhancements I wanted.

I wanted my bench to last for at least several generations. This called for solid wood and traditional joinery—no shortcuts. It also had to be somewhat mobile, so I designed the bench to break down into three pieces—a top, an upper two-drawer section, and a lower three-drawer section with a shelf. This way we were able to haul it from the shop to the kitchen, and it will allow future generations to move the bench easily from house to house.

To make it an authentic baker's work station, I added a granite top. Although granite has a reputation as a premium-priced product, its not that much more expensive than Corian™ and other solid-surface synthetic materials. If your budget is tight, you may want to consider marble or laminates. For more information on the use of these products, see "Granite and Its Alternatives" on *page 52.*

Before You Start

I built my bench out of cherry and accented it with tiger-maple drawer fronts and walnut pulls, but any good hardwood can be used. Always try to lay out your stock so you use the best-looking materials for the most visible cabinet parts.

If you can, use solid 12/4 stock for the legs rather than laminating thinner pieces, especially if you use cherry. After it's finished, cherry refracts light in a way that gives laminations a striped appearance along the edge grain. If you can't find the 12/4 stock locally, or you don't have the means to turn the legs, we've lined up a supplier who will provide four legs turned to the profile shown in the drawings. See Source at the end of the article to order the legs.

Most of the bench's joinery is straightforward mortise and tenon. For help with cutting and fitting these joints accurately, see "Laying Out and Cutting the Mortise and Tenon" on *page 18*.

Begin With the Legs

Step 1. From 12/4 stock, machine four leg blanks to 2½" square and 36" long. Arrange the leg blanks as they will be positioned on the bench. Then, mark each leg with its location and the front faces on each so you can orient them correctly later.

Step 2. Crosscut a 10" length from the top of each leg blank to make the four upper legs (A).

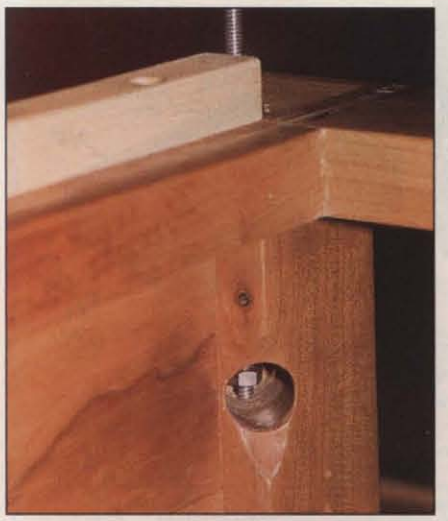


Photo A: Threaded rods hold the four case corners together. Each rod passes through the upper leg and divider frame and fastens to a nut and washer recessed in the lower leg.

Bill of Materials

	Part	T	W	L	Mtl.	Qty.
Case	A Upper legs*	2½"	2½"	10"	C	4
	B Lower legs*	2½"	2½"	23¾"	C	4
	C Side panels—upper	1"	10"	24⅞"	C	2
	D Side panels—lower	1"	7"	24⅞"	C	2
	E Back panel—upper	1"	10"	48⅞"	C	1
	F Back panel—lower	1"	7"	48⅞"	C	1
	G Front stretcher—upper	1½"	2"	48⅞"	C	1
	H Front stretcher—lower	1½"	2"	48⅞"	C	1
	I Drawer divider—upper*	15/16"	1½"	9"	C	1
	J Drawer divider—lower*	15/16"	1½"	6"	C	2
	K Shelf stretchers*	1"	2"	23"	C	2
Carcass	L Runners—lower middle*	¾"	3"	25⅜"	M	2
	M Runners—lower side*	¾"	1½"	24½"	M	2
	N Guides—lower middle*	¾"	1"	24½"	M	2
	O Guides—lower side*	¾"	¾"	23"	M	2
	P Divider frame—front/back*	1"	3"	52¾"	C	2
	Q Divider frame—sides*	1"	3⅞"	28¾"	C	2
	R Divider frame—stretchers*	1"	3"	23⅝"	M	3
	S Upper drawer kickers*	¾"	2"	25⅜"	M	2
	T Rear stanchion	15/16"	1½"	10"	C	1
Drawers	U Front/backs—upper*	¾"	7 15/16"	22 15/16"	M	4
	V Front/backs—lower*	¾"	4 15/16"	14 15/16"	M	6
	W Sides—upper*	¾"	7 15/16"	24"	M	4
	X Sides—lower*	¾"	4 15/16"	24"	M	6
	Y Bottoms—upper*	½"	23"	23¼"	BP	2
	Z Bottoms—lower*	½"	14"	23¼"	BP	3
	AA Guides—upper middle*	¾"	1"	24½"	M	1
	AB Guides—upper side*	¾"	¾"	23"	M	2
	AC Pulls*	1¼"	2¼"	5½"	W	5
Shelf	AD Shelf* **	¾"	23"	51½"	C	1
	AE Shelf backstop*	¾"	1¾"	48⅞"	C	1

*Parts cut to dimension during construction. Please read all instructions before cutting.

**Parts edge-glued from narrow stock.

Materials List

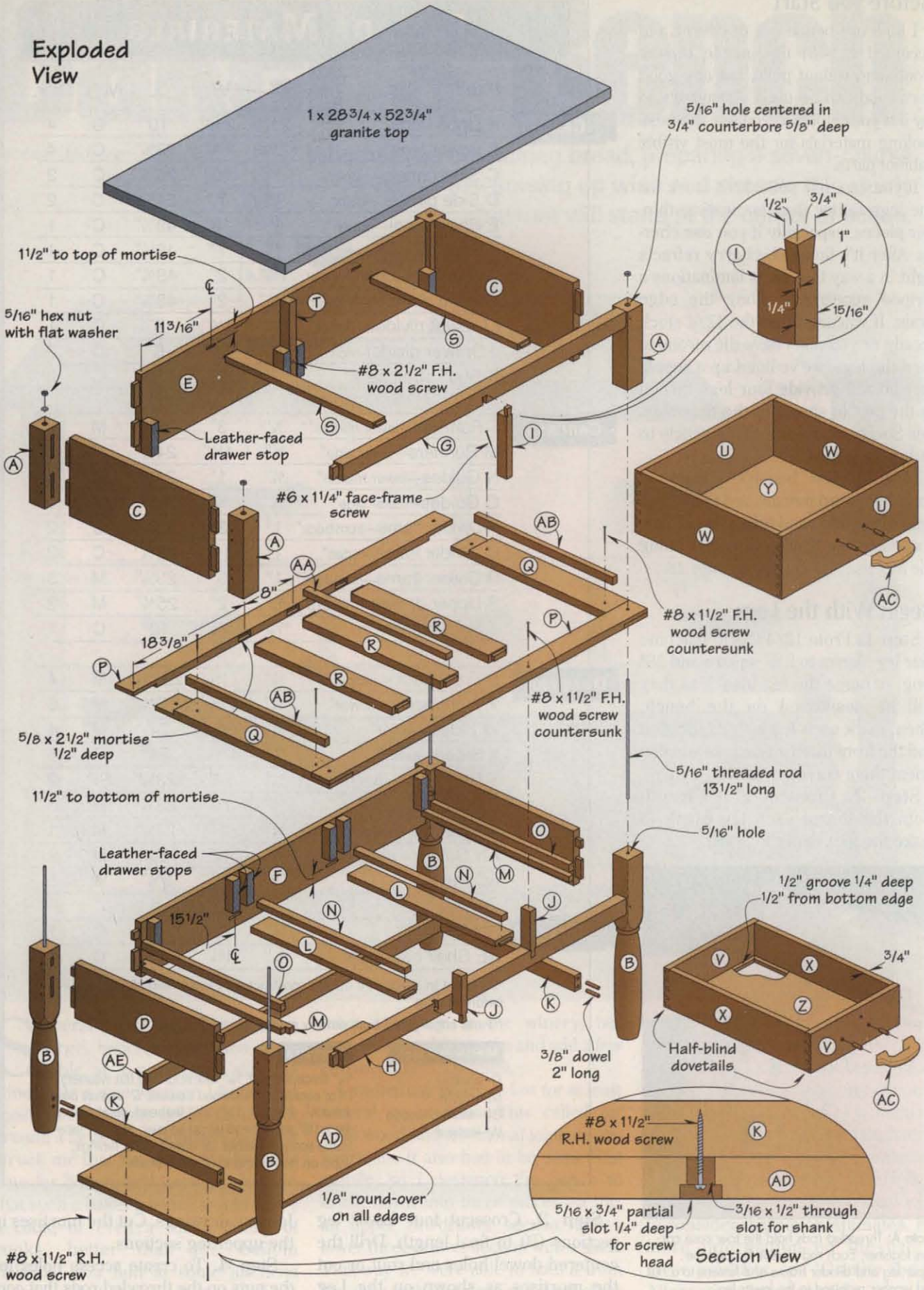
C–cherry
M–maple
BP–birch plywood
W–walnut

Supplies

5/16" threaded rod; 5/16" hex nuts and flat washers (8 of each); ⅜" hardwood dowels; ¼" walnut dowel; #6x1¼", #8x1¼", 1½", 2½" flathead wood screws; #8 x 1½" roundhead wood screws; #8x1¼" face-frame screws; leather for drawer-stop facings; wipe-on polyurethane or other finish.

Step 3. Crosscut four lower leg sections (B) to final length. Drill the centered dowel holes and rout or cut the mortises as shown on the Leg Joinery drawings. Cut the mortises in the upper leg sections.

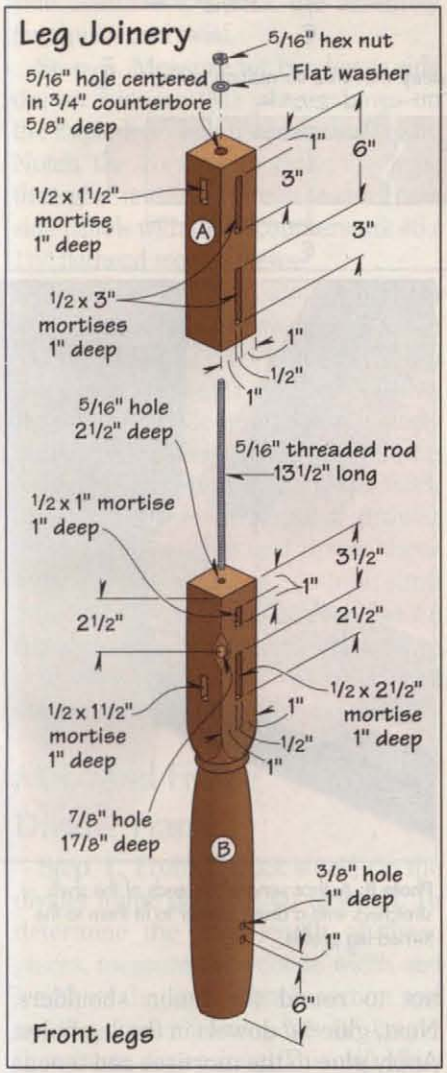
Step 4. To create access holes for the nuts on the threaded rods that con-

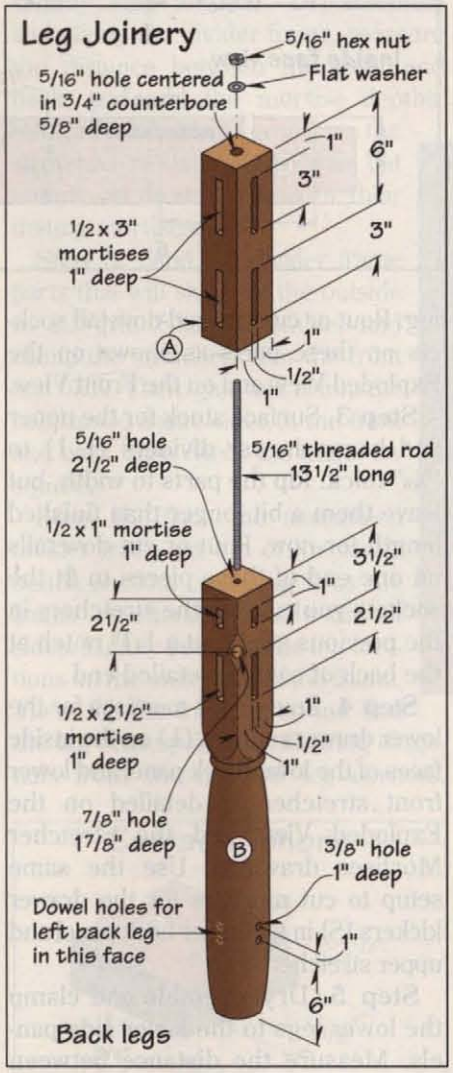

Exploded View
1 x 28 3/4 x 52 3/4" granite top
5/16" hole centered in 3/4" counterbore 5/8" deep
1/2"
3/4"
1"
1/4"
15/16"
11/2" to top of mortise
5/16" hex nut with flat washer
113/16"
#8 x 21/2" F.H. wood screw
Leather-faced drawer stop
#6 x 11/4" face-frame screw
#8 x 11/2" F.H. wood screw countersunk
8"
183/8"
5/8 x 21/2" mortise 1/2" deep
#8 x 11/2" F.H. wood screw countersunk
5/16" threaded rod 131/2" long
11/2" to bottom of mortise
5/16" hole
Leather-faced drawer stops
151/2"
1/2" groove 1/4" deep 1/2" from bottom edge
3/4"
Half-blind dovetails
3/8" dowel 2" long
#8 x 11/2" R.H. wood screw
1/8" round-over on all edges
5/16 x 3/4" partial slot 1/4" deep for screw head
3/16 x 1/2" through slot for shank
Section View
#8 x 11/2" R.H. wood screw

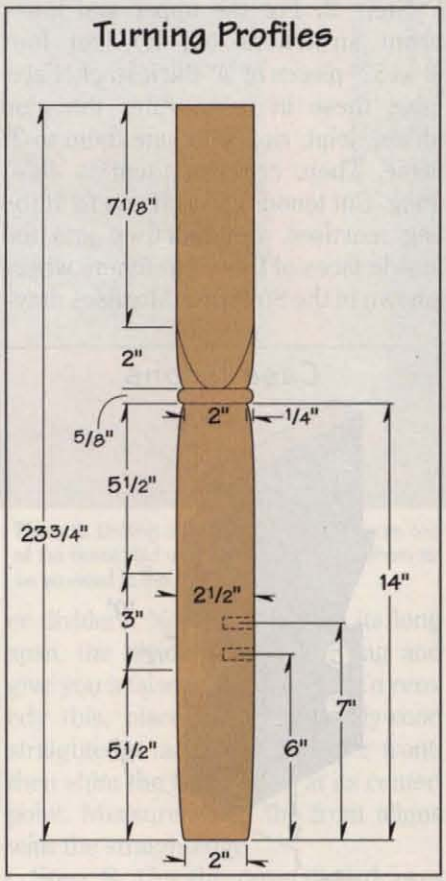
nect the upper and lower sections, rout a flat-bottomed notch ½" deep and 1¾" long on the inside corner of each lower leg where shown. (I used a large 45° chamfer bit. See *photo A.*) Next, position each lower leg in a V-block on the drill press, routed edge face up. Bore a ⅞" hole 1⅞" deep centered in the notch.

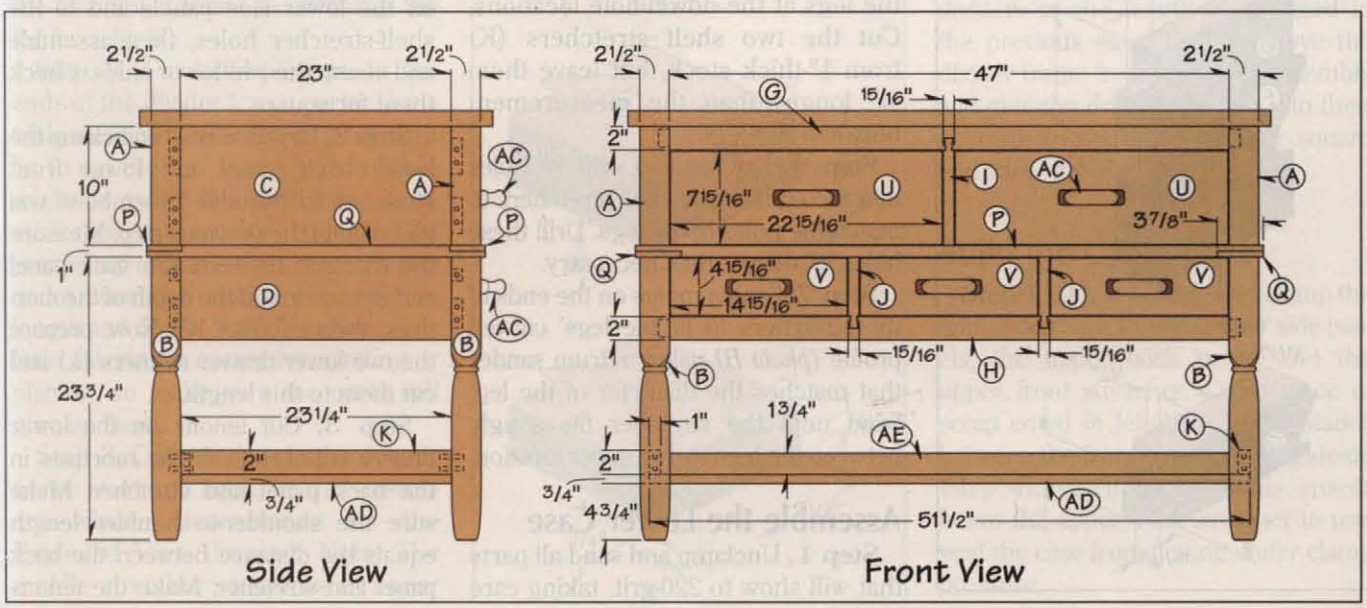
Step 5. Drill vertical 5/16" holes centered in the top of the lower legs that connect with the ⅞" nut-access holes where dimensioned. In each upper leg, drill a centered vertical ¾" hole ⅝" deep. Center a 5/16" hole in the ¾" hole and drill through each upper leg. Note: For these long vertical holes, use an extra-long bit or drill from both ends. On the lower leg, I found it easier to use a doweling jig than to try drilling them on the drill-press.

Step 6. After cutting all mortises and boring all holes, turn each lower leg to the profile shown on the Turning Profiles drawing.





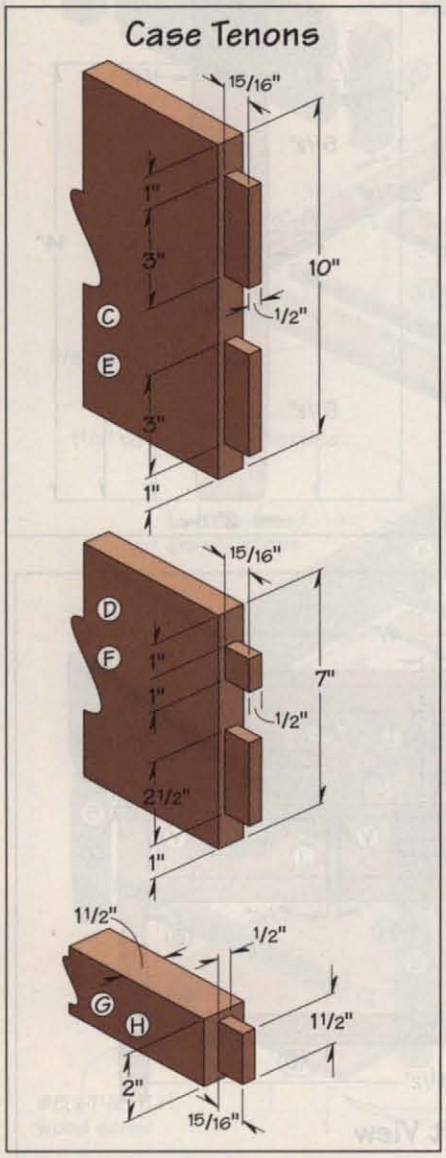


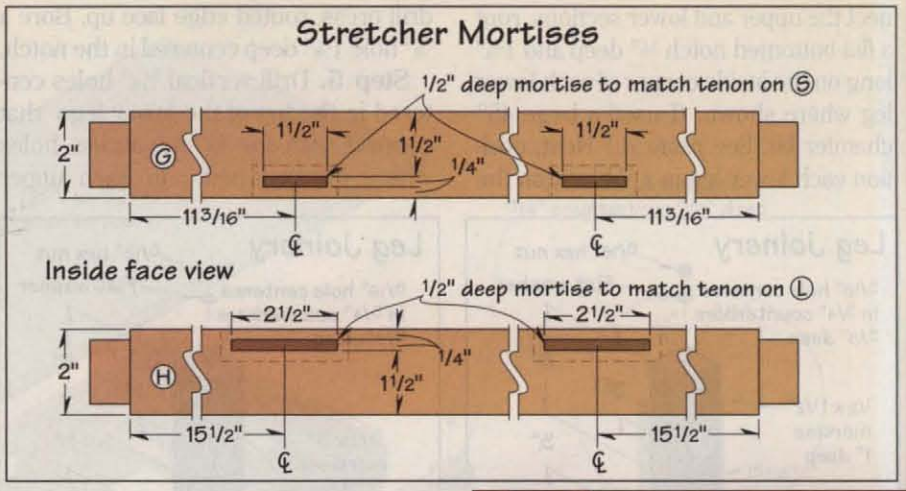


Cut Panels, Tenons, And Stretchers

Step 1. Edge-glue sufficient 5/4 stock for the two upper side panels (C), two lower side panels (D), upper back panel (E), and lower back panel (F). Surface these pieces to 1" thick, then cut the parts to the dimensions listed in the Bill of Materials. Lay out and cut the tenons on these parts, as shown *below,* to match the leg mortises.

Step 2. For the upper and lower front stretchers (G, H), cut four 2⅛x52" pieces of ¾"-thick stock. Face-glue these in pairs. After the glue dries, joint, rip, and plane them to 2" wide. Then, crosscut them to 48⅞" long. Cut tenons on each end to fit the leg mortises. Cut mortises into the inside faces of these stretchers where shown in the Stretcher Mortises drawing. Rout or cut stopped-dovetail sockets on these parts as shown on the Exploded View and on the Front View.





Step 3. Surface stock for the upper and lower drawer dividers (I, J) to 15/16" thick. Rip the parts to width, but leave them a bit longer than finished length for now. Rout or cut dovetails on one end of these pieces to fit the sockets you cut into the stretchers in the previous step. Cut a 1x1" notch at the back of each dovetailed end.

Step 4. Rout or cut mortises for the lower drawer runners (L) on the inside faces of the lower back panel and lower front stretcher as detailed on the Exploded View and the Stretcher Mortises drawings. Use the same setup to cut mortises for the drawer kickers (S) in the upper back panel and upper stretcher.

Step 5. Dry-assemble and clamp the lower legs to the lower side panels. Measure the distance between the legs at the dowel-hole locations. Cut the two shelf stretchers (K) from 1"-thick stock, but leave them ¼" longer than the measurement between the legs.

Step 6. Lay out and drill ⅜" holes into the ends of the shelf stretchers to match the holes in the legs. Drill these holes ¼" deeper than necessary.

Step 7. Sand a radius on the ends of the stretchers to fit the legs' curved profile *(photo B)* using a drum sander that matches the diameter of the leg. Sand until the stretcher fits snugly between the legs at the proper location.

Photo B: Author sanded the ends of the shelf stretchers with a drum sander to fit them to the turned-leg profile.

Assemble the Lower Case

Step 1. Unclamp and sand all parts that will show to 220-grit, taking care not to round the tenon shoulders. Next, glue ⅜" dowels in the leg holes. Apply glue to the mortises and tenons on the lower side panels and to the shelf-stretcher holes, then assemble and clamp the two lower sides. Check them for square.

Step 2. Dry-assemble and clamp the lower back panel and lower front stretcher to the side assemblies you glued up in the previous step. Measure the distance between the back panel and stretcher, add the depth of the mortises, then subtract ⅛". Now, prepare the two lower drawer runners (L) and cut them to this length.

Step 3. Cut tenons on the lower drawer runners to fit the mortises in the back panel and stretcher. Make sure the shoulder-to-shoulder length equals the distance between the back panel and stretcher. Make the tenons

1/16" shorter than the mortise depth so they don't bottom out.

Step 4. Glue and clamp the two lower middle runners to the back panel and the lower front stretcher. Then, glue and clamp this assembly to the side assemblies. Check the assembly for square and twist.

Step 5. Measure for two lower side drawer runners (M) where shown on the Exploded View, then cut them to fit. Notch the corners to clear the legs, then glue and screw them to the lower side panels with three countersunk #6 x 1¼" flathead wood screws.

Step 6. Surface stock for two lower middle and two lower side drawer guides (N, O) to ¾" thick. Rip these parts to their respective widths. Crosscut the side guides to fit snugly between the legs and the middle guides to fit between the lower back panel and the dovetailed drawer dividers. Now, glue and screw these where shown using countersunk #6x1¼" flathead wood screws. Before the glue dries, check to make sure that the guides are parallel and square to the front of the assembly.

Make and Fit the Divider Frame

Step 1. From 1"-thick stock, rip the divider frame parts (P, Q) to width. To determine the final length of these pieces, measure the outside width and length of the lower bench section and cut the divider frame parts ¾" longer than these dimensions. This will allow the assembled frame to overhang the leg faces by ⅜".

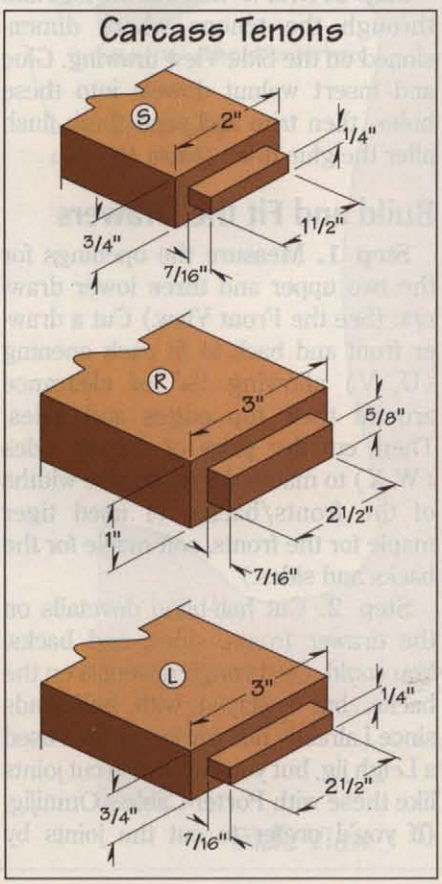
Step 2. Cut half-lap joints on the ends of the divider frame parts. Use a table-mounted router and a straight bit to cut the half laps. (A dado blade might be easier, but it will leave score marks on the outside edges.) Test your setup on same-thickness scrap to make sure the cuts are correct in length and depth. Note: You have very little margin for corrective sanding or planing, so make sure the parts will glue up flush.

Step 3. Cut mortises in the divider frame front and back for the stretchers where dimensioned on the Exploded View drawing. Note: The middle stretcher serves as a runner for the two upper drawers, and all three parts serve as kickers for the lower drawers.

Step 4. Surface stock for the three divider stretchers (R) to 1" thick. Rip the parts to width, but leave them slightly long for now. Dry-assemble and clamp the divider frame, measure the distance between the front and back, and add the mortise depths. Subtract ⅛", then crosscut the stretchers to this length. Now, cut tenons on these parts to fit their mating mortises.

Step 5. Sand the divider frame parts that will show on the outside to 220-grit. Glue, assemble, and clamp the stretchers into the front and back. Then, glue and clamp the half-lapped frame sides to the front and back. Also check the frame for square.

Step 6. Place the assembled divider frame on top of the lower bench section, centering it so the frame overhangs equally on all sides. Lightly pencil in the leg locations on the underside of the frame. Then, flip the frame over and find the leg centerpoints by drawing diagonals from the marked leg corners.



(You could also use dowel centers, if you have them, to mark the hole locations.) Drill 5/16" holes on these centerpoints to match the holes you drilled earlier in the top ends of the legs.

Step 7. Place the divider frame on top of the legs and measure the distance between the front frame piece and the lower front stretcher to determine the length of the dovetailed drawer dividers. Note: Because of its long span, the divider frame may sag and give you a false measurement. To remedy this, place an accurate plywood straightedge across the divider front, then shim the frame front at its centerpoint. Measure when the front aligns with the straightedge.

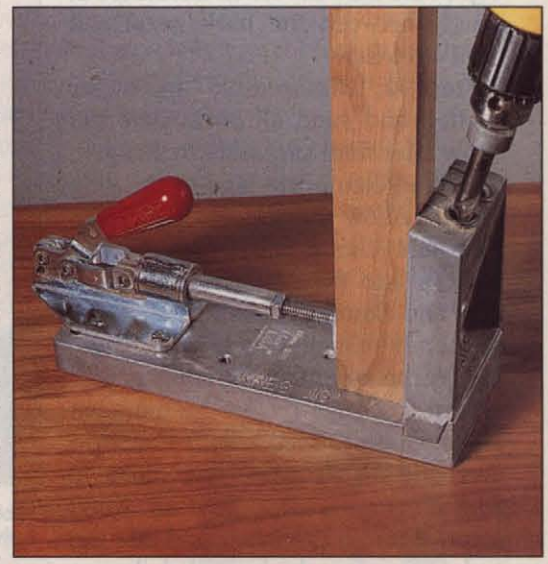


Photo C. Drilling a pocket hole in the square end of the dovetailed drawer dividers allows them to be screwed to the horizontal divider.

Step 8. Cut the dovetailed drawer dividers to the length determined in the previous step. Then, remove the divider frame from the lower assembly and glue the drawer dividers into their dovetail slots. Check them for square and allow the glue to cure.

Build the Upper Case

Step 1. Dry-assemble and clamp the four upper legs, the two upper side panels, the upper back panel, and the upper front stretcher. Cut a piece of scrap equal in length to the distance between the front legs. During glue-up (step 4), you'll position this spacer below the upper front stretcher to prevent the case from flexing under clamp pressure.

Step 2. Measure the distance between the back panel and front stretcher including the mortise depths. Subtract ⅛" for tenon clearance. Rip the two upper drawer kickers (S) to width from ¾"-thick stock, then cut them to the length you just measured.

Step 3. Cut tenons on both ends of the upper drawer kickers as dimensioned on the Carcase Tenons drawing. Make sure the tenon shoulders fit snugly between the back panel and front stretcher.

Step 4. Disassemble the upper section and sand all parts that will show after final assembly to 220-grit. Glue and clamp the legs to the side panels. Allow the glue to set. Then glue and clamp the upper drawer kickers into their mortises. Finally, glue and clamp the back panel/front stretcher assembly to the legs. Check the assembly for square.

Step 5. Center the divider frame on top of the lower section with a uniform overhang on all sides. Next, drive a #8x2½" countersunk flathead wood screw through the frame and into the end grain of each dovetailed drawer divider below it.

Step 6. Place the upper assembly on top of the divider frame and measure the length needed for the dovetailed upper drawer divider (I) you rough-cut earlier. Crosscut this part to fit. Next, drill a 15° pocket hole in the back edge of the part so you can screw it to the horizontal divider frame later *(photo C)*. Glue the divider in place and check it for square.

Step 7. Cut the rear stanchion (T) to fit where shown on the Exploded View. Note: This part provides support for the granite top should the back panel shrink during seasonal humidity changes. An unsupported granite top this long could crack. Screw (but do not glue) the stanchion to the inside face of the upper back panel where shown. To avoid wood-movement conflicts with the back panel, place only two #8x2½" flathead wood screws approximately 1" apart near the stanchion's lower end.

Step 8. Screw the upper dovetail divider to the horizontal divider frame. Next, cut four 13½" lengths of ⅝" threaded rod, and cut a screwdriver slot in one end of each. Insert a rod into each leg hole, then thread a washer and nut onto the bottom end through the lower leg access hole by rotating the rod with a screwdriver. Thread a washer and nut onto the top end and tighten the nut to pull the assembly together.

Photo D: Walnut dowels pin the side-panel tenons in the leg mortises.

Step 9. Drill ¼" holes in the legs and through the tenons where dimensioned on the Side View drawing. Glue and insert walnut dowels into these holes, then trim and sand them flush after the glue dries *(photo D)*.

Build and Fit the Drawers

Step 1. Measure the openings for the two upper and three lower drawers. (See the Front View.) Cut a drawer front and back to fit each opening (U, V) allowing 1/16" of clearance around their top edges and sides. Then, cut five pairs of drawer sides (W, X) to match the respective widths of the fronts/backs. (I used tiger maple for the fronts, soft maple for the backs and sides.)

Step 2. Cut half-blind dovetails on the drawer fronts, sides, and backs. You could use through dovetails on the backs, but I stayed with half-blinds since I already had my jig set up. I used a Leigh jig, but you could also cut joints like these with Porter-Cable's Omnijig. (If you'd prefer to cut the joints by hand, see "Making and Fitting a Dovetailed Drawer" in the Jan./Feb. '95 *Woodworker's Journal*.)

Step 3. Cut the grooves on the inside face of the drawer parts as dimensioned in the Exploded View. Dry-assemble the drawers, measure the interior (including the depth of the grooves) and subtract 1/16" from both width and length. Cut the drawer bottoms (Y, Z) to these dimensions from ½" plywood. Now, glue and clamp the drawer sides and backs with the bottoms.

Note: If you want to customize one drawer with a wire-mesh bottom (see *photo E*), omit the plywood bottom for it, and insert the wire mesh in a narrow groove cut ½" up from the bottom edge of the drawer. Then glue a ½x½" ledger strip on the bottom inside edges of the drawer to support the mesh. For more custom drawer details see *photo F*.

Step 4. Cut the middle and side drawer guides (AA, AB) for the upper section and install them where shown in the Exploded View using countersunk #8x1¼" flathead wood screws.

Step 5. To make drawer stops, cut a 48" length of ¾"- or 1"-thick scrap hardwood. Glue and clamp a leather facing (felt or cork would also work) on one edge using bottled hide glue. Apply even pressure across the facing with a clamped caul until the glue dries.

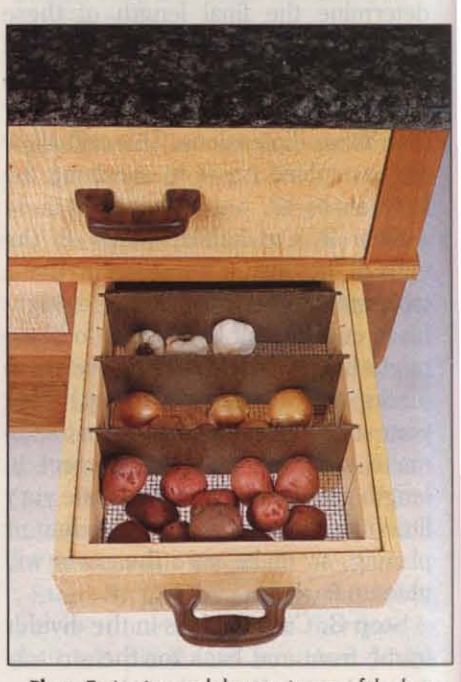


Photo E: A wire-mesh bottom in one of the lower drawers provides air circulation for potatoes, onions, and garlic.

Photo F: Customize the drawers with dividers or other fittings to suit the bench's purpose.

Step 6. Insert the drawers in their openings so their fronts align flush with the case front. Joint the wooden edge of the leather-edged stock until its width fits the gap between the drawer back and the back panel. Crosscut 10 stops to about 4" long, then drill and counterbore two shank holes through each. Screw the stops to the upper and lower back panels (without glue) where shown on the Exploded View and *photo G.*

Step 7. Test the fit of the drawers and adjust as necessary.

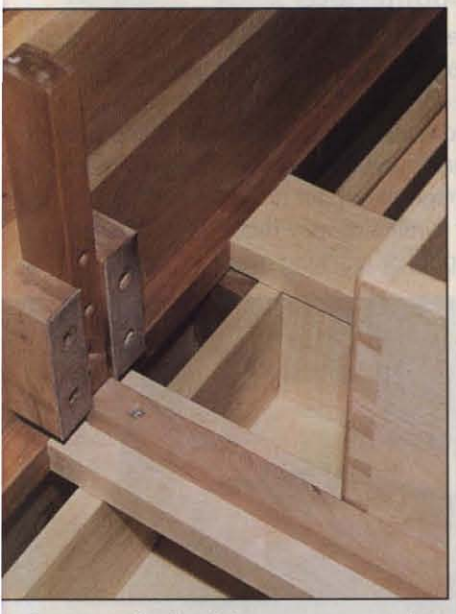


Photo G: Leather-faced drawer stops mounted on each side of the stanchion limit drawer movement.

Add the Drawer Pulls And Shelf

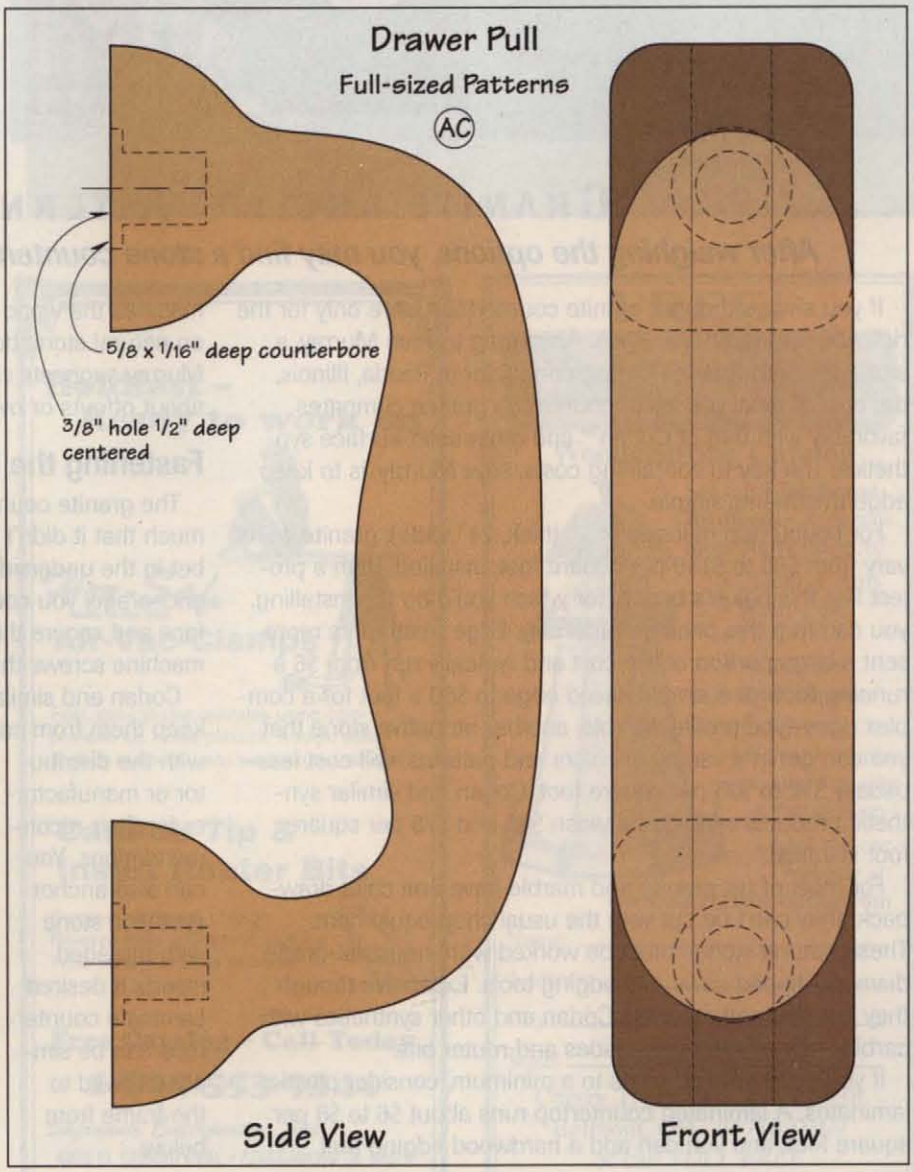
Step 1. To make the pulls (AC), prepare a 7/16x2½x32" and a 7/16x6x28" piece of walnut. Crosscut the narrow piece into ten 2½" lengths and the wide piece into five 6" lengths. This will give you enough material to laminate five drawer blanks with three thicknesses of walnut each.

Step 2. Glue and clamp the pieces so that the grain runs lengthwise on the two outside faces and widthwise on the inside piece. This cross-grain construction gives you a much stronger handle than a solid piece of stock.

Step 3. After the glue dries, square the edges of the pull blanks on the tablesaw. Transfer the profile pattern shown *below* onto each blank. Drill the counterbore and holes for the dowels where shown on the pattern. (The counterbore will give excess glue an escape route when you glue and dowel the pulls to the drawer front.) Next, bandsaw each handle to shape. Round the pull edges with a rasp and sandpaper to create a comfortable grip.

Step 4. Make a plywood drilling template for the drawer fronts that matches the dowel hole locations on the pulls. Then, use this template to drill matching dowel holes in the drawer fronts. Drill the dowel holes in the drawers ⅝" deep.

Step 5. Edge-glue enough ¾"-thick stock to make a 24x53" panel for the shelf (AD). Measure the distance between the front and back legs and rip the panel to this dimension. Note: Subtract an extra ¼" from the width if you are building in the winter or dry



months. This will allow for later expansion. Crosscut the shelf ¾" longer than the distance between the shelf stretchers to create a ⅜" overhang at both ends.

Step 6. Clean up any glue squeeze-out, then flatten and sand the shelf to 150-grit. Rout a ⅛" round-over on all edges, then finish-sand to 220-grit. Cut the shelf backstop (AE) to width, then crosscut it to fit snugly between the two leg stretchers. Screw the shelf to the bottom edge of the stretchers with #8x1½" roundhead wood screws. Note: Drill a slotted counterbored shank slot for the screws to allow the panel to expand and contract relative to the stretchers. Attach the backstop using standard countersunk shank holes.

Step 7. Remove the shelf from the bottom stretchers and disassemble the upper and lower case sections. Sand any parts that still need it to 220-grit. Mask the dowel holes on the handles and drawer fronts, then apply finish to all parts. (I chose a wipe-on polyurethane for its durability and ease of application.)

Step 8. After the finish has dried, glue the pulls to the drawer fronts. Go light on the glue to avoid contaminating the finished parts.

Step 9. Reinstall the shelf and reassemble the upper and lower case sections. Then, install your choice of countertop. (See "Granite and Its Alternatives" *below.*)

Photographs: *Frank Pieroni, Tom Jackson*
Illustrations: *Dana Quiram*

Meet the Designer

Andy Andresen, at *left*, is a member of the "Four Spies Woodworks," a group of (mostly) retired federal agents in the Grand Rapids, Michigan, area who have pooled their time and talents to form a custom furniture business. Fellow spy Bob Smit, at *right*, does most of the group's turnings, including the legs for the baker's bench.

Source

Baker's bench legs, set of four, 2½ x 2½ x 34" turned to the profile shown– cherry, $103.92; maple and oak, $97.40, $55.56; plus s/h. From:

Osborne Wood Products
800/849-8876

Granite and Its Alternatives

After weighing the options, you may find a stone countertop surprisingly affordable

If you always thought granite countertops were only for the rich and famous, think again. According to Rich Murray, a stone countertop and flooring contractor in Peoria, Illinois, the cost of most grades of countertop granite compares favorably with that of Corian™ and other solid-surface synthetics. The key to containing costs, says Murray, is to keep edge treatments simple.

For countertop material (1¼" thick, 24" wide), granite costs vary from $65 to $130 per square foot, installed. With a project like this baker's bench, for which you'd do the installing, you can trim this price considerably. Edge treatments represent a large portion of the cost and typically run from $6 a running foot for a simple eased edge to $60 a foot for a complex ogee-type profile. Marble, another attractive stone that you can get in a variety of colors and patterns, will cost less– usually $12 to $25 per square foot. Corian and similar synthetic products average between $45 and $75 per square foot installed.

For most of us, granite and marble have one chief drawback: they can't be cut with the usual shop equipment. These natural stones must be worked with industrial-grade diamond-tipped saws and edging tools. Expensive though they are, you can machine Corian and other synthetics with carbide-tipped tablesaw blades and router bits.

If you'd rather keep costs to a minimum, consider plastic laminates. A laminated countertop runs about $6 to $8 per square foot, and you can add a hardwood edging that matches the wood of your project. If you have your heart set on natural stone but still want to rein in the expenses, Murray suggests visiting a local stone fabricator and asking about offcuts or overage that they might sell at a discount.

Fastening the Countertops

The granite countertop on our baker's bench weighed so much that it didn't require any mechanical fasteners. A rabbet in the underside keeps it from shifting. For more positive anchorage, you could embed threaded inserts in the bottom face and secure these to the cabinet by driving countersunk machine screws through the upper drawer kickers.

Corian and similar synthetics may require some support to keep them from sagging or cracking over long spans. Check with the distributor or manufacturer for their recommendations. You can also anchor synthetic stone with threaded inserts if desired. Laminate countertops can be simply screwed to the frame from below.

Machining stone requires industrial equipment.

Versatile Shop Cart

Hefting large pieces of plywood or lumber by yourself can mean strained backs or wrenched shoulders. Our cart puts the weight on wheels and helps out with other chores as well.

From the truck to the shop or even around the shop, our small cart maneuvers plywood and lumber with ease.

With the base recessed in our shop cart, you can drop off heavy sheet goods using a plywood carrier and not trap the carrier under the plywood.

To use the angled supports as a drying rack, fit the brackets with ⅜" dowels to create single points of contact.

Those of you who remember the mobile plywood storage rack we featured in our March/April '96 issue will probably not be surprised to learn that it's now so heavily laden with sheet goods that we can barely move it. Such is the universal law of wood shops: Any and all storage space will be filled immediately to capacity and then some.

We reasoned that our chief storage rack needed an assistant, so we built this smaller, more maneuverable shop cart. Like the big rack, our cart has built-in mobility—its 2x3' dimensions enable it to turn tight corners and fit through most doorways.

Our main objective was to come up with an easy way to transport heavy sheet goods from the truck to the shop and from the big storage rack to the tablesaw or work area. Since we buzz through a lot of solid stock too, we added shelf standards and brackets to the uprights so that the cart would carry that material as well. Install a few additional brackets, and you can also use the shop cart as a drying rack. You could even add horizontal cleats to the frame and turn it into a mobile clamp rack. The basic design has a lot of possibilities, so use your imagination.

Before You Start

We used poplar for the frame parts of our cart, but any hardwood will do. Since we intended this cart to be a workhorse and not a beauty queen, you can also get by with a less expensive grade of plywood for the base.

For the shelf standards, we chose a heavy-duty twin-track system rated for loads of 165 to 187 pounds (depending on the bracket size). This gives you a good margin of safety in case you intend to load up the brackets with hardwood lumber. Note: Have the hardware on hand for measurements before cutting the grooves in the angled supports. (To mail-order the parts we used, see the Sources at the end of the article.)

Size the Stock and Cut the Joints

Step 1. Machine all of the 1½"-thick stock to the widths and thicknesses listed in the Bill of Materials. This includes the base frame ends (A), base frame

back (B), base frame front (C), vertical posts (D), upper rail (E), and angled supports (F). Crosscut these parts to dimension, except for the angled supports (F). Leave these at least 1" longer than finished length. Also, cut three 12" lengths of 1½"-thick scrap. Set these aside for testing setups later.

Step 2. To cut grooves for the shelf standards in the angled supports, mount a ⅝"-wide dado head on your tablesaw and set it to cut 9/16" deep. Set the fence just a hair more than 25/64" from the blade. Make a test cut on a scrap piece, rotate the piece end for end, and make another pass without moving the fence. These two cuts should give you a centered 13/64"-wide groove. Note: If you use shelf standards different from the ones we list in Sources, adjust the groove width to fit them. Test the fit of a standard in the groove. If it fits, use this setup to cut the grooves in the three angled supports. Keep the dado head for the following step.

Step 3. Cut a 7x12" (approx.) piece of ¾" scrap plywood, and check the corners for square. Hold it loosely to the face of your tablesaw miter gauge. This piece will support the parts (held vertically) when you cut slots for the bridle joints *(photo A)*. Reset the fence 11/16" from the dado head. Slide the plywood along the miter gauge until it contacts the fence, then attach it to the gauge.

Step 4. Raise the dado head to 1½". Clamp the base frame front vertically to the miter gauge, aligning its end flush with the end of the plywood extension. Cut the slot for each bridle joint where shown on the Side View. Repeat this procedure on the base frame back and the top ends of the vertical posts.

Step 5. Remove the plywood extension from the miter gauge and reset the fence 7/16" from the dado head. Reattach the extension with a fresh (uncut) corner flush against the fence. Raise the dado head to 2", then cut the bridle joint slot on the bottom end of each vertical post as dimensioned.

Photo A: Cutting the joints vertically requires an auxiliary face for your miter gauge.

Bill of Materials

Cart

Part	T	W	L	Mtl.	Qty.
A Base frame—ends	1½"	2"	24"	P	2
B Base frame—back	1½"	2"	36"	P	1
C Base frame—front	1½"	3"	36"	P	1
D Vertical posts	1½"	2"	48"	P	2
E Upper rail	1½"	2"	36"	P	1
F Angled supports*	1½"	2"	63 5/16"	P	3
G Back*	¼"	33 1/16"	47 3/16"	HP	1
H Base* **	¾"	24"	36"	HP	1
I Glue block*	½"	½"	33"	P	1

*Parts cut to fit during construction. Please read all instructions before cutting.
**Dimensions include ¼"-thick edge-banding.

Materials List

P—poplar
HP—hardwood plywood

Supplies

3" swivel casters (4); #14x1½", #12x1¾", #8x2½", #8x1½" flathead wood screws; ⅜" hardwood dowel stock; ¼x1" flathead bolts, washers, and nuts.

Assemble the Parts

Step 1. Install a 3/16" straight bit in a table-mounted router. Rout the stopped grooves in the vertical posts and upper rails for the plywood back as shown on the Exploded View. Make three passes: two to reach final depth and a third to widen the groove to fit the actual thickness of the back. (Nominal ¼" plywood usually measures about 7/32" thick.)

Step 2. Dry-assemble all parts. Measure the opening for the back (the area framed by parts D and E) including the groove depths. Subtract 1/16" from the width and add 5/16" to the length. (This extra length will fit in a groove cut in the base later.) Cut the back to these dimensions from ¼" hardwood plywood. (We used lauan ply.) Check the fit of the back in its groove to make sure it doesn't hold the joints open.

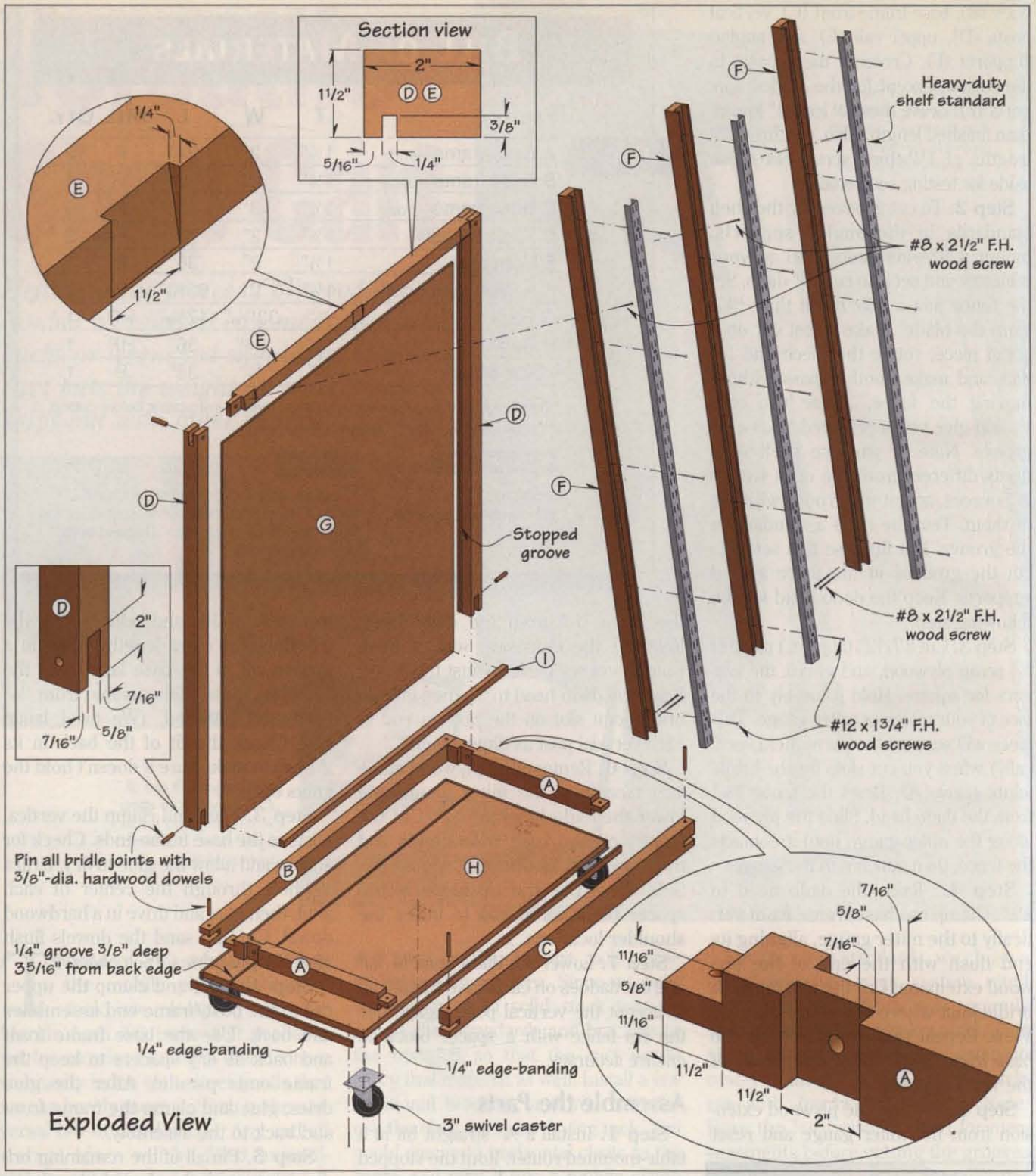
Step 3. Glue and clamp the vertical posts to the base frame ends. Check for square and allow the glue to dry. Drill a ⅜" hole through the center of each joint, then glue and drive in a hardwood dowel. Cut and sand the dowels flush after the glue dries. (See *photo A.*)

Step 4. Glue and clamp the upper rail to the post/frame end assemblies and back. Use the base frame front and back as dry spacers to keep the frame ends parallel. After the glue dries, glue and clamp the frame front and back to the assembly.

Step 5. Pin all of the remaining bridle joints with hardwood dowels as described in Step 2. Then, glue the ¼" plywood back into its grooves in the upper rail and vertical posts.

Make and Fit the Base

Step 1. To size the base (H), measure the outside dimensions of the base frame (parts A, B, C). Subtract ⅜" from the width and length to allow for edge-banding,



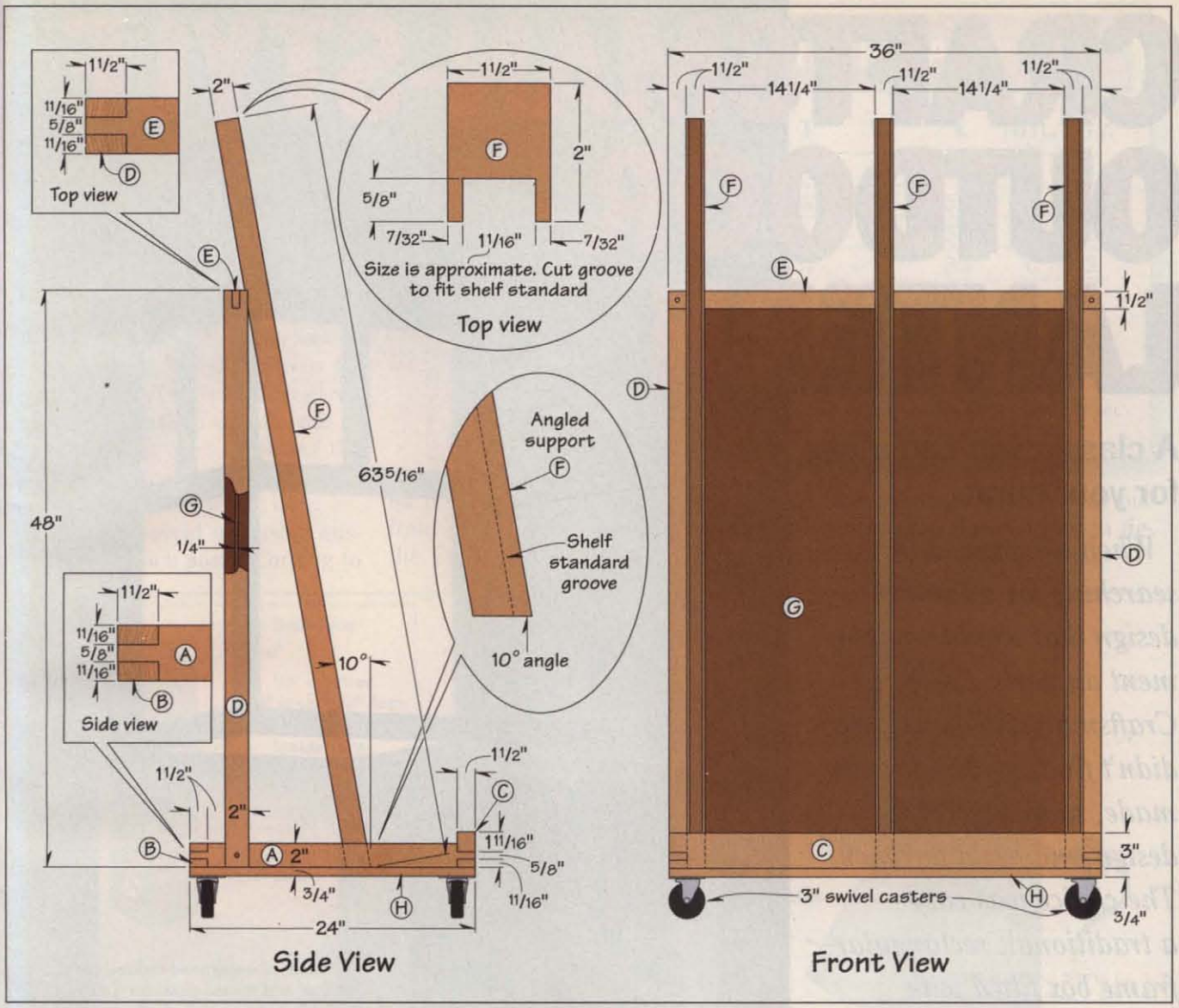
then cut the base to these dimensions from ¾" plywood.

Step 2. Cut or rout a full-length ⅜"-deep groove along the top face of the base to accept the back. (See the Exploded View for location.) Size the groove to match the actual thickness of the back.

Step 3. From hardwood stock, cut strips of ¼"-thick edge-banding that are slightly wider than the base's actual thickness. Band the ends of the base first, trim those to length, and then band the frame front and back. Flush-trim the banding along both faces.

Step 4. Position the plywood on the bottom edge of the base frame. The edge-banding should overhang the frame by 1/16" or so on all four sides. Glue and screw the base to the frame, but keep the screws away from the corners so as not to interfere with the casters. After the glue has dried, flush-trim the edge-banding to align with the frame faces.

Step 5. Machine the glue block (I) and glue it in place where shown on the Exploded View. You can tack it in place with an air nailer or brads, or wedge it against the back with some thin pieces



of scrap stock fitted between it and the base frame front.

Install the Angled Supports

Step 1. Cut one end of each angled support (F) to 10° from perpendicular as shown in the Side View. Then, square-cut the opposite end to finished length.

Step 2. Position the angled supports against the upper rail where shown on the Exploded View, then mark their locations on the upper support. Cut beveled slots at these locations as shown. Start the cuts with a fine-tooth handsaw, then rasp or chisel out the waste.

Step 3. Sand all parts to 150-grit and break all sharp edges. Glue and screw the lower ends of the two outside angled supports to the inside faces of the base frame ends and into the beveled slots in the upper rail. To keep the center support in the same plane as the outside supports as you fasten it, clamp a straight cleat horizontally across the faces of the two outside supports. Clamp the middle support to this cleat, then screw the lower end of the support through the underside of the plywood base. Now, glue and screw the upper end of the middle support into its slot in the upper rail.

Step 4. Clean up any remaining glue squeeze-out, then apply the finish of your choice. Note: If you anticipate hauling a lot of plywood with your cart, you may want to apply strips of plastic laminate to the top edges of the base frame ends before finishing. These will prevent a lot of wear and tear.

Step 5. Install the shelf standards using #12x1¾" flathead wood screws. Wax the screws to ease insertion.

Step 6. Screw the casters to the base using #14x1½" flathead wood screws. Note that each caster has one through-hole that does not align with the base frame. Since you'll have to attach it to the plywood at this location, use a ¼x1" flathead bolt with a washer and nut. WJ

Photographs: Randall Sutter
Illustrations: Dana Quiram
Written by Tom Jackson

SOURCE

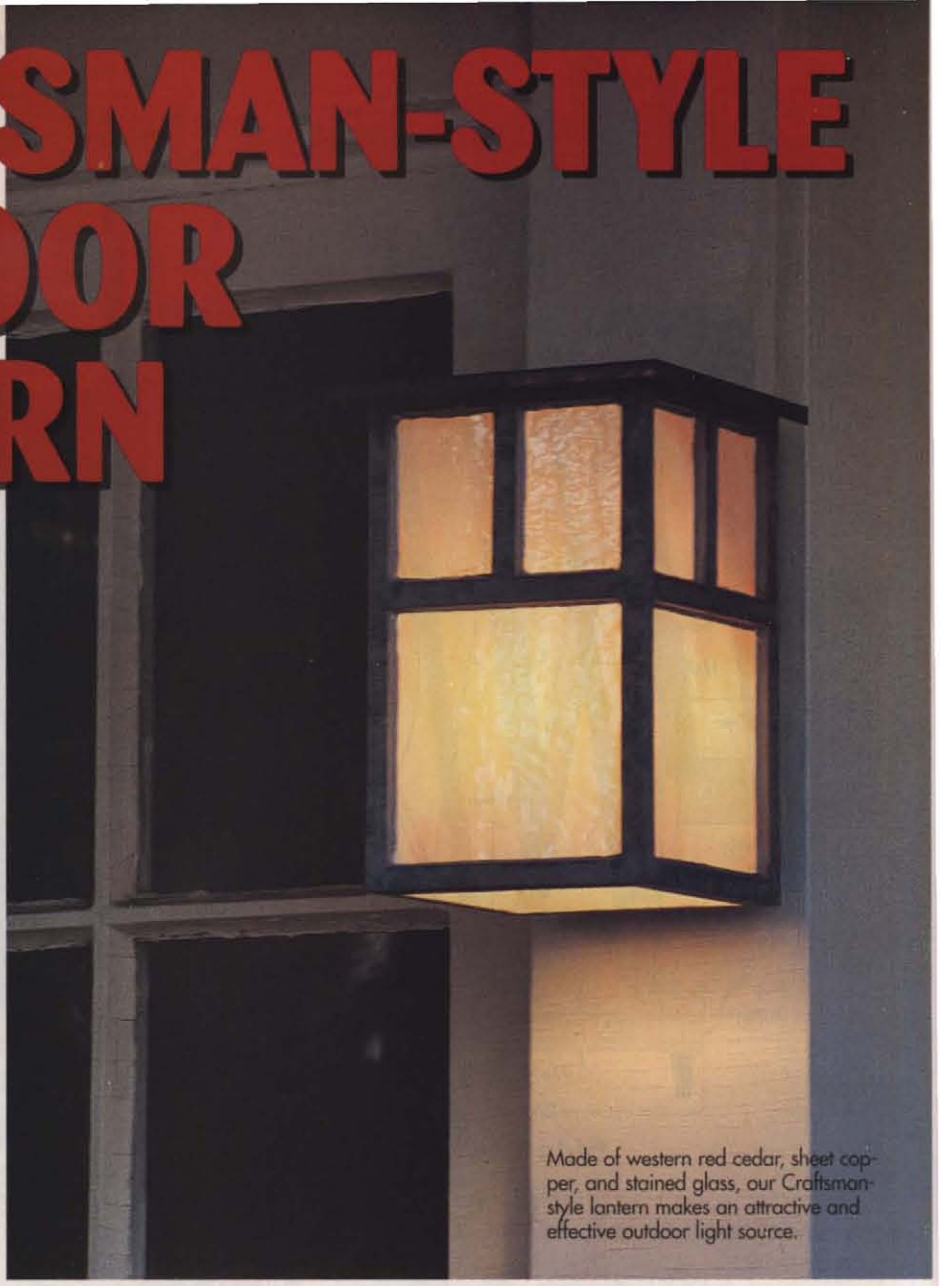
Heavy-duty shelf standards and brackets. Black, epoxy-coated, 48" long. Catalog no. 68114, $5.49 each. Matching shelf brackets, available in 8½" to 14½" lengths, priced at $2.59 to $4.99 each. For more information, contact:

The Woodworkers' Store
800/279-4441

CRAFTSMAN-STYLE OUTDOOR LANTERN

A classic you can make for your home

When we went searching for a lantern design that would complement an early 1930s Craftsman-style house, we didn't find anything ready-made, so we elected to design and build our own. The choice was easy—a traditional, rectangular-frame box fitted with colored glass lites.



Made of western red cedar, sheet copper, and stained glass, our Craftsman-style lantern makes an attractive and effective outdoor light source.

Before You Start

We decided to scale the lantern to two-thirds the size of the glass lites in the adjacent windows. A full-sized sketch helped us confirm our proportions, and we made only modest changes to our preliminary design.

Since the lanterns would have to withstand the Illinois climate, we selected durable western red cedar for the framework, used sheet copper for the roof and back, and chose a warm shade of colored glass for the three lites. Pine, basswood, mahogany, or redwood will also machine easily enough at this scale and will give reasonably long service if the lanterns are placed in a partially protected area or painted.

To comply with electrical codes, we used an outdoor-rated light socket in the lantern, hard-wired it to the electrical line, and then screwed the lantern to an electrical junction box. Check with local authorities for the codes governing exterior electrical installations in your area.

If you intend to construct more than one lantern, calculate the amount of stock needed, then prepare all of it at once and cut identical parts using a single setup before moving on to the next part. This will keep

Builder's Notes:

I found building these lanterns a lot like making doll-house furniture. The parts are small and a bit fragile, and cutting the ⅛"mortises and tenons calls for fine, delicate workmanship. You'll also discover that with so little glue area on these small parts, they must fit perfectly to ensure a strong frame. However, once it's assembled and glued to the copper roof/back and the glass installed, the frame makes a rigid lantern. Keep in mind as you work that western red cedar is very soft; handle your stock carefully to avoid dents and scratches.

Dick Cours
Designer/Craftsman

parts uniform and save considerable setup time.

Prepare the Frame Parts

Step 1. From clear, straight-grained stock, joint, plane, and rip enough ½x½" and ¼x½" material to make up the number of lanterns you intend to build. Note: Each lantern requires 90" (linear) of ½x½" stock and 30" (linear) of ¼x½" stock.

Step 2. From the ½"-square material, crosscut four 9¾"-long pieces for the corner posts (A). Note: This allows an extra ¼" of length at both ends to ensure that you don't break out the ends when cutting the mortises. You'll trim the posts to final length later.

Step 3. To avoid mortising mistakes, orient each post according to its position in the lantern, such as front left or back left and so on. (See the Exploded View for help.) Code the faces on each post, then lay out the mortises as dimensioned in *figure 1* and Exploded View detail.

Bill of Materials

Lantern

Part	T	W	L	Mtl.	Qty.
A Posts*	½"	½"	9¼"	C	4
B Rails	½"	½"	5¼"	C	8
C Muntins	¼"	½"	5½"	C	3
D Mullions	¼"	½"	3⅞"	C	3

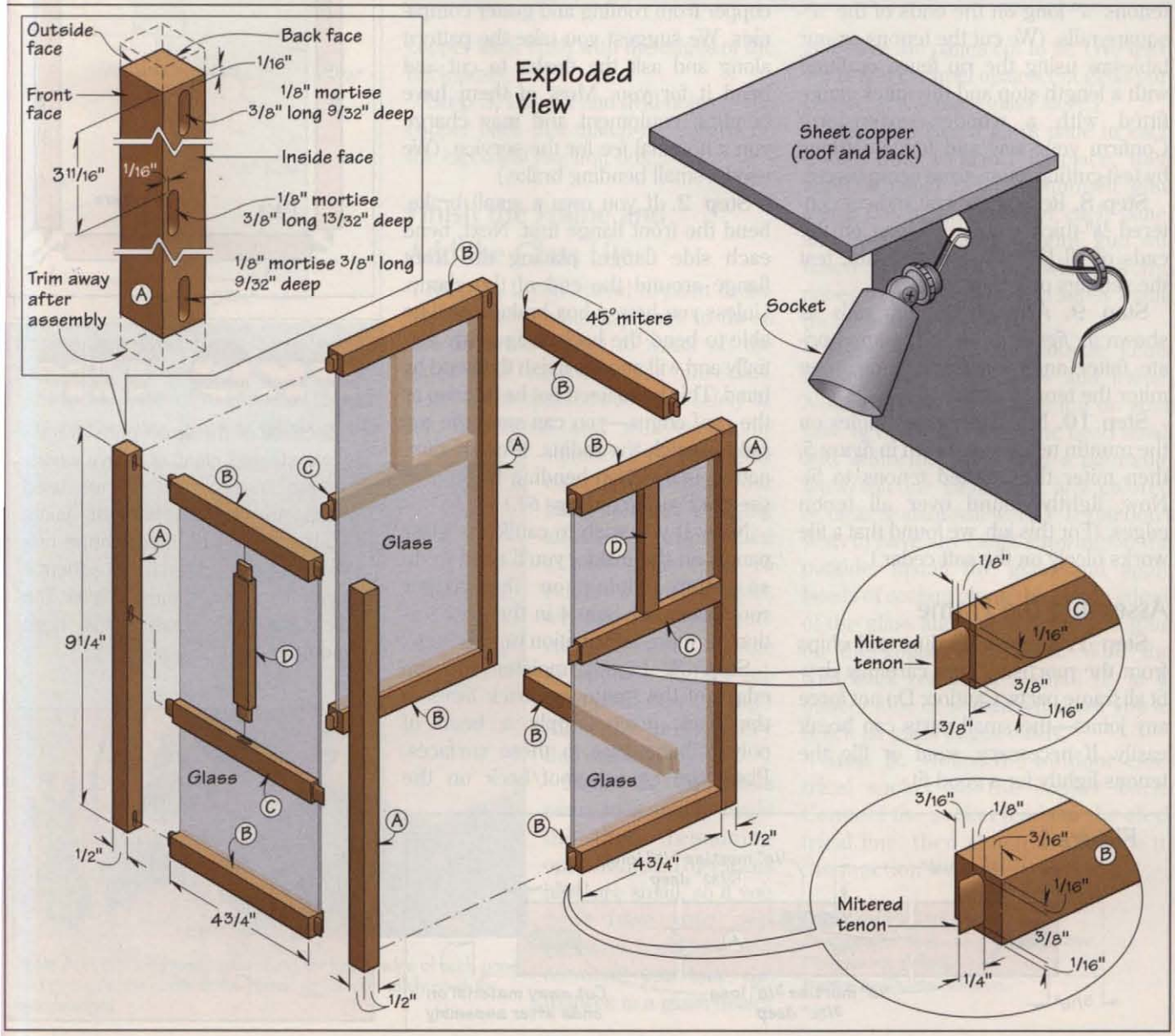
*Parts cut to final length after mortising. Please read all instructions before cutting.

Materials List

C–Western red cedar

Supplies

Outdoor-rated electrical socket and light bulb; stained glass panes (3); 24-gauge sheet copper; caulk or silicone sealant; finish.



Step 4. From the remaining ½"-square stock, crosscut eight top and bottom rails (B) to dimension. Next, lay out the mortises on three of the top rails as dimensioned in *figure 2*.

Step 5. From the ¼x½" stock, crosscut three muntins (C) to length. Lay out the mortises on one edge of each as dimensioned in *figure 3*. From the same stock, crosscut three mullions (D) to length.

Step 6. Cut the mortises where marked on all parts. (We used a ⅛" bit in a spindle mortiser. You could also cut the mortises using a ⅛" straight bit in a table-mounted router fitted with a good, solid fence and stops.) To ensure uniform mortise dimensions from piece to piece, always place the same face on the table.

Step 7. Cut centered ⅛"-thick tenons ¼" long on the ends of the ½"-square rails. (We cut the tenons on our tablesaw using the rip fence outfitted with a length stop and the miter gauge fitted with a wooden extension.) Confirm your saw and fence settings by test-cutting same-sized scrap pieces.

Step 8. Reset your saw and cut centered ⅛"-thick tenons ⅜" long on the ends of all ¼"-thick parts. Again, test the settings on scrap first.

Step 9. Arrange the top rails as shown in *figure 4*. Mark the appropriate miter angle on each tenon, then miter the tenons to fit.

Step 10. Mark the miter angles on the muntin tenons as shown in *figure 5*, then miter the marked tenons to fit. Now, lightly round over all tenon edges. (For this job, we found that a file works nicely on the soft cedar.)

Assemble the Frame

Step 1. Remove all dust and chips from the mortises, then carefully dry-fit all frame parts. Caution: Do not force any joints—the small parts can break easily. If necessary, sand or file the tenons lightly for a good fit.

Step 2. Assemble and glue the frame. (We glued up each top rail, mullion, and muntin first, then attached the posts.) Moisten the tenons slightly with water, then apply polyurethane glue with a small brush. For help on clamping the frame, see the Pro Tip *below*. Check the frame for square, then allow the glue to cure.

Step 3. Trim the post ends flush with the bottom and top rails. Then, lightly sand the frame and break all edges.

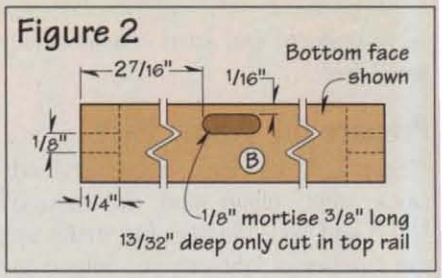
Shape the Copper Roof

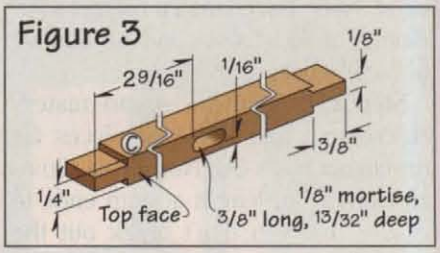
Step 1. On a piece of sheet copper, lay out the roof/back piece (including the hole centerpoint) as dimensioned in *figure 6*. (We used 24-gauge material, which measures .02" thick.) Cut out the part and bore the ⅞" hole. Note: You can buy small amounts of sheet copper from roofing and gutter companies. We suggest you take the pattern along and ask the dealer to cut and bend it for you. Most of them have bending equipment and may charge you a nominal fee for the service. (We used a small bending brake.)

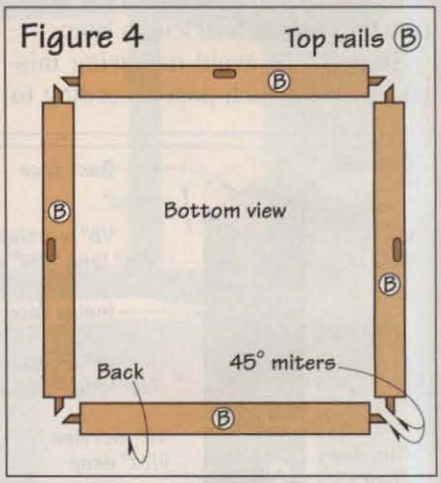
Step 2. If you own a small brake, bend the front flange first. Next, bend each side flange, placing the front flange around the end of the clamp. Unless you have a box brake, you'll be able to bend the back flange only partially and will need to finish the bend by hand. This bend need not be as crisp as the roof edges—you can sand the top rail to match the radius. (For an alternative, in-the-shop bending technique, see the Pro Tip on *page 61*.)

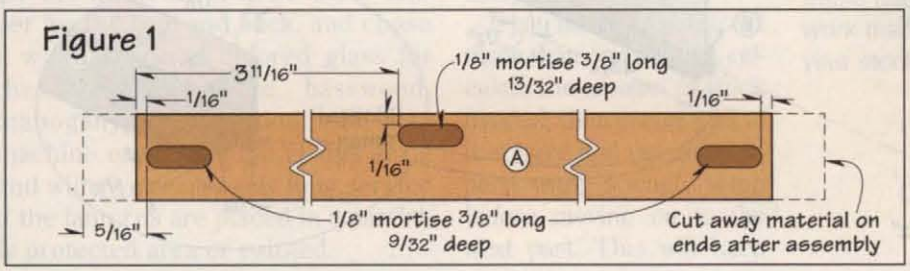
Note: If you wish to caulk the glass panels on the inside, you'll need to do so before gluing on the copper roof/back. See Step 4 in the next section for more information on this step.

Step 3. Lightly moisten the top edges of the frame and back faces of the back posts. Apply a bead of polyurethane glue to these surfaces. Place the copper roof/back on the









PRO TIP

Because of the small parts' fragility, we steered clear of heavy woodworking clamps. Instead, we used packaging tape to pull the joints together. Wrap the tape around one side, then lightly stretch and adhere it to the other side as shown *below*. The stretched tape applies the right amount of clamping pressure.

Figure 5 Muntins Ⓒ

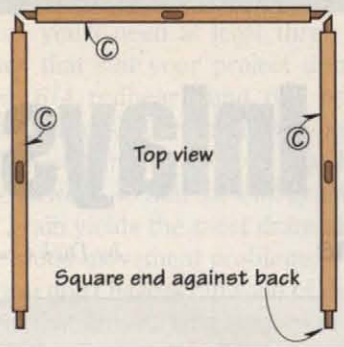
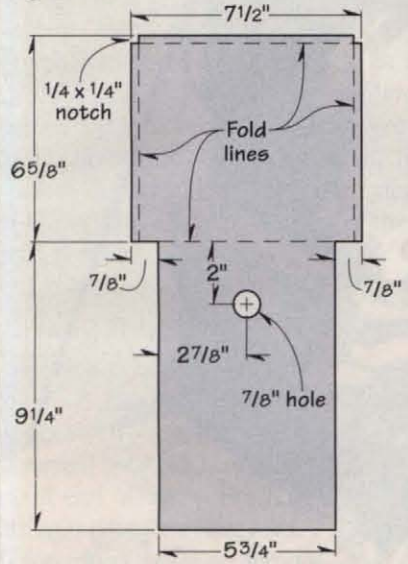


Figure 6



frame, then bind the assembly with packaging tape.

Step 4. After the glue has cured, remove the film. File the edges of the copper back flush with the edges of the back posts.

Step 5. Lay out and drill holes in the copper back that match the screws on the electrical junction box.

Finish the Frame and Add the Glass Lites

Step 1. If you intend to paint or finish the frame, you may want to do so now to avoid having to mask off the glass. Use exterior-grade materials. Note: Cedar and redwood can safely be left unpainted and will eventually weather to a light gray color. (We painted our lanterns, first applying an exterior primer, then a base color coat. To achieve a stippled effect, we used a medium-coarse textured sponge to apply a lighter-colored paint over the top.) Allow the finish to dry thoroughly.

Step 2. Cut glass panes to fit snugly inside the three remaining open frames. Tolerances here are small, so if you don't have your own glass on hand, we recommend you take the fixtures to a glass dealer and have the panes cut to fit. (We used white and caramel opalescent glass purchased at a stained-glass store.)

Step 3. Place a glass pane in each frame, hold it firmly in place, then apply a small bead of hotmelt glue along the inside edge of each panel and post as far as your glue gun will reach *(photo A)*. This will tack the panes in place so you can safely caulk them on the outside.

Step 4. Caulk all outside joints between the glass panes and frame. Note: Cut a small tip opening on your tube of caulk and keep the bead small and uniform. (We used a paintable latex/silicone caulk, but any colored or clear sealant will work.) If you don't wish to have any caulk showing on the outside, install the glass and apply beads of sealant along the inside edges of the glass and frame *before* you glue on the copper roof/back. With the roof/back removed, a small (2- to 4-ounce) tube of sealant will allow you to reach all glass edges easily.

Step 5. Mount the outdoor electrical socket on the copper back. Connect the socket leads to the electrical line, then attach the fixture to the junction box. WJ

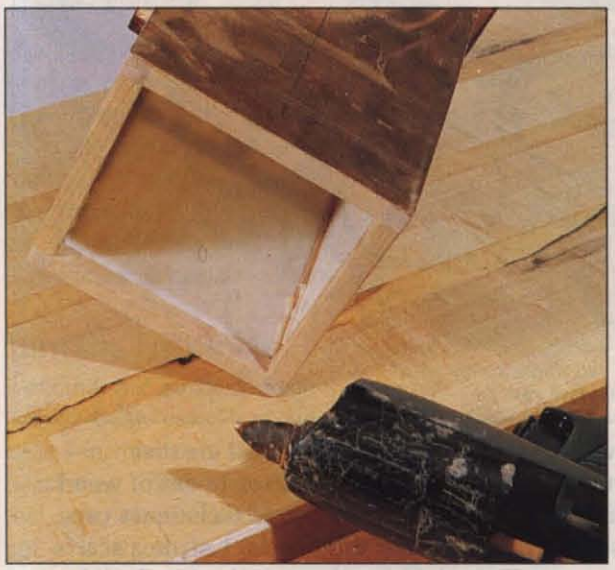
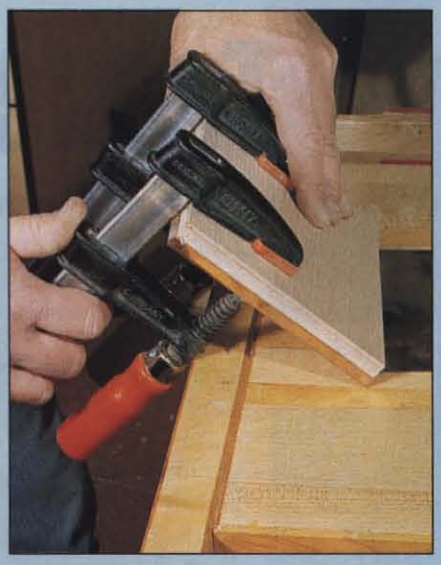


Photo A: A bead of hotmelt glue along the inside edge of each pane and post tacks the panes in the frames so you can safely caulk the outside edges.

PRO TIP



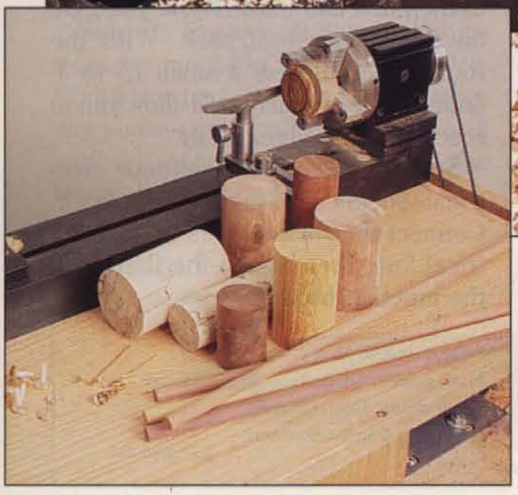
If you elect to bend the copper yourself, cut the sheet as dimensioned, including the two ¼x¼" corner notches. Use whichever technique you feel comfortable with to bend the copper, or consider this alternative. To get sharp, clean folds without hammering, first cut a piece of ¾" plywood or maple to roof size (minus the flanges). Clamp the copper sheet to the blank aligning the edges with the fold lines. Then, make the bends as shown at *left*. Fold the front first, then the two sides, and finally the back.

Project design: *Dick Coers*
Photographs: *StudioAlex, Randall Sutter*
Illustrations: *Dana Quiram*
Written by *Charles Sommers*

Decorative Turned Inlays

Creating fine jewelry and ornamental accessories on the lathe

by Dick Coers



Turning decorative inlays can bring out your most creative woodworking impulses. If you have an odd assortment of wood scraps stashed away in your shop, these simple techniques can turn that would-be trash into treasures. For this article, I made a scarf pin, but the possibilities are unlimited. Using the same basic principles, you can fashion a variety of gift projects such as earrings, brooches, and inlaid lids for turned boxes.

Select Your Materials

To turn a project with an inlaid ring that has a disc set in its center, you'll need at least three contrasting woods in thicknesses that suit your project dimensions. I used 8/4 canary wood, 6/4 redheart, and 6/4 osage orange for the project described here. For earrings, you may want to start with 5/4 stock. Use turning squares that have been turned round (or large dowels) so that the end grain will show on the inlay faces. End grain yields the most dramatic figure and also helps minimize wood movement problems.

If you don't have scrapwood of the right thicknesses, look for a source that sells turning squares or large-diameter dowels. (For a mail-order supplier, see Sources at the end of the article.)

You can also turn "found" wood. The spalted maple you see in the scarf pins (*opposite*) came from a log rescued from a wood-chipping machine. Keep an eye out for downed trees in your neighborhood. Fruit trees such as apple and pear and ornamentals such as holly make excellent turning woods. I cut my spalted log into sections of different thicknesses, then turned the sections into dowels. I sealed the end grain and set the stock aside to air-dry. After air-drying, I microwaved the stock on a low "defrost" setting to lower the moisture content to about eight percent.

Turning Tools Needed

Besides a lathe, you need only a parting tool and a spindle gouge. A four-jaw scroll chuck, such as the one shown here, makes the work easier, but it's not essential. The inlay pieces can be turned between centers, but you do need full access to the outboard end of the workpiece during the final turning step. If you don't have a scroll chuck, simply fasten the work to a faceplate.

A drawing of your project is not necessary, but I find one handy for checking and confirming part diameters. (See *figure 1.*) Initially, I turn all of my stock pieces round. This expedites the work, especially if you plan to turn multiple projects. Then, I turn the rounds to a diameter slightly larger than that of the finished inlays.

Turn the First Inlay

Mount the stock for the largest inlay piece on the lathe—in this case, the redheart ring. With a parting tool, score the stock to mark out a ⅛"-thick disc on the outboard end *(photo A)*.

Turn this disc to the outside diameter needed for

Photo A: With a parting tool, mark the thickness of the inlay ring.

Photo B: Check the diameter of the inlay ring with calipers.

Photo C: Mark the thickness of the inlay disc.

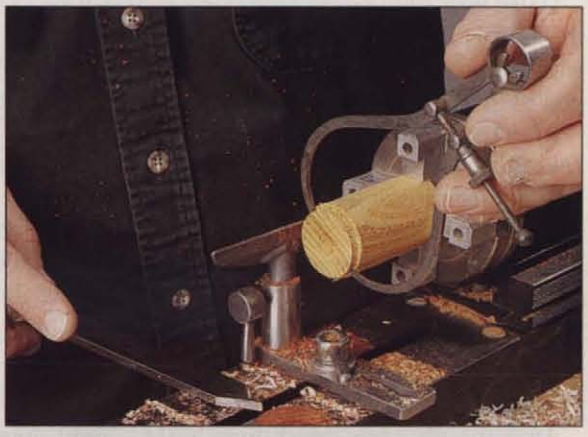
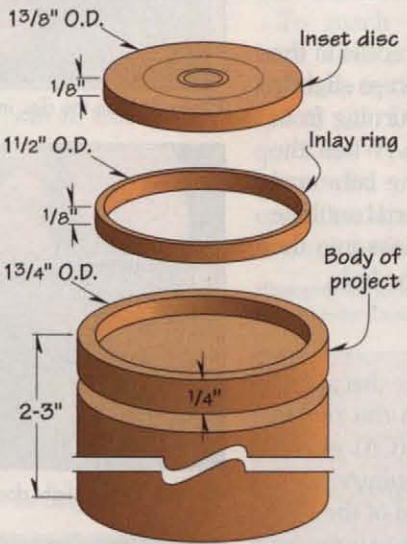


Photo D: Size the inlay disc using your calipers.

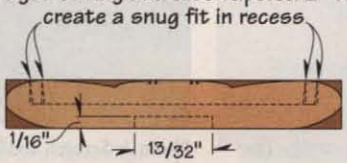
Figure 1



Note: Dimensions can be varied to suit project

Figure 2

Edges of ring and disc tapered 2° to create a snug fit in recess



◀ **Photo E:** Hollow out a shallow recess in the body stock.

▶ **Photo F:** Glue the inlay ring into the recess in the body.

the inlay ring and check it against your drawing with a pair of calipers *(photo B)*. Once you reach the correct diameter, angle the parting tool slightly to bevel the edge to about 2° from square as shown in *figure 2*. Then, part off the disc. Note: If you're turning the disc between centers, make it a little thicker than ⅛" so you can remove the marks left by the tailstock center. Also, don't part it off completely. Instead, remove the turning from the lathe and complete the cut with a handsaw.

Follow the same steps to make the second inlay that you completed for the first. Score the disc to the correct thickness, check it with the calipers, and turn the edge to a 2° bevel *(photos C, D)*. Then, part or saw off this disc.

Shape the Recess

Mount the body of the project on the lathe using a scroll chuck or faceplate. If you're turning earrings or other small, flat jewelry, use dowel stock long enough so you can maneuver the tools. Now, true up the sides and face of the piece. Note: After you've trued the body stock, keep it on the lathe until you're finished. If you remove and remount the stock, you'll have to retrue its surfaces, and that will change its dimensions.

Next, use a ¼" scraper or a parting tool to hollow a recess in the outboard end of the body stock *(photo E)*. Make the recess slightly shallower than the thickness of your large disc. Start turning from the centerpoint and work the tool toward the edges. When the recess gets close to the finished diameter, turn off the lathe and check the fit of the large disc. Continue to remove material until the disc fits snugly when inserted to about half its thickness into the recess. Check the fit frequently so you don't oversize the hole.

Glue Inlay Ring

Dab a little glue around the edge and back face of the disc, align the end grain of the two pieces, and seat the disc in the recess with a few mallet taps *(photo F)*. Use cyanoacrylate (CA) glue if you're in a hurry. If you use yellow glue, let it set 15 minutes.

After the glue has dried, turn a new recess in the end of the disc *(photo G)*. Again, cut carefully when the diameter of this new recess begins to approach the diameter of your inlay.

Check the fit of the disc as you work and stop when it fits about halfway down into the recess *(photo H)*. Once again, apply a bit of glue to the edge and back face, align the grain of the parts, and tap the disc into the recess.

True Up the Faces

After the glue has dried, turn a very slight dome on the front face of the workpiece using a gouge *(photo I)*. Then, with the

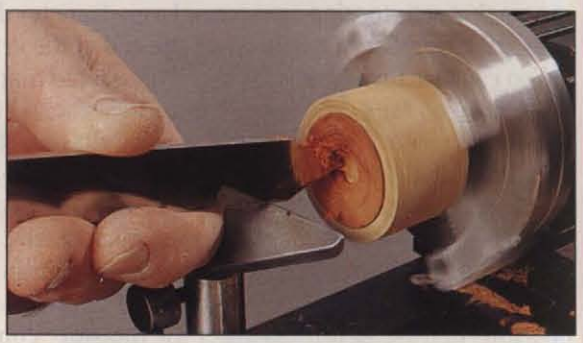


Photo G: Turn a recess in the inlay ring piece.

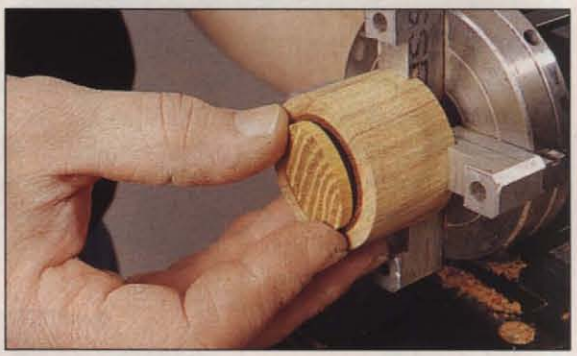


Photo H: Glue the disc into the recess you cut in the ring piece.

Photo I: Turn a slight dome on the workpiece face.

Photo J: Scratch shallow decorative grooves into the face.

▲ **Photo K:** Turn a ½"-deep groove at the point where you'll later part the piece from the stock.

◀ **Photo L:** Round over the workpiece edge.

Photo M: Sand all surfaces to 320-grit with the lathe spinning.

Photo N: Final-sand using Micro-Mesh sanding files.

Photo O: Apply finish to the piece with the lathe spinning.

corner of your parting tool or a small skew, scratch a few very shallow rings in the face of the inlaid disc *(photo J)*. Note: This step is optional, but it adds to the intricacy of the piece.

Using the parting tool, mark off the thickness of the finished piece *(photo K)*. Cut this groove to a depth of about ½", then switch to your gouge and round over the back face of the piece *(photo L)*.

Apply Finish and Attach Hardware

When you've finished shaping the workpiece, sand all surfaces lightly to 320-grit with the lathe spinning *(photo M)*. At this point, I continue sanding with Micro-Mesh sanding files *(photo N)*. After sanding, apply the finish of your choice using a small cotton pad *(photo O)*. I used Behlen Woodturner's Finish. Shellac or wipe-on polyurethane also works well. After the finish dries, part the piece from the dowel stock *(photo P)*. Then, sand and apply your finish to the parted area.

To attach the scarf-pin hardware, drill a 13/32"-diameter hole 1/16" deep in the back of the piece *(photo Q)*. Drop a small dot of quick-set epoxy into the hole, insert the pin flange into the epoxy, and hold until the adhesive sets *(photo R)*. WJ

Photographs: *Randall Sutter*
Illustrations: *Dana Quiram*

Photo P: Part the piece from the dowel.

Photo Q: Drill a shallow hole in the back to attach the hardware.

Photo R: Epoxy the hardware in place.

SOURCES

Micro-Mesh sanding files. Micro-Mesh abrasive bonded to a foam file. Package of five. Catalog no. 11L62, $9.99 plus s/h. Order from:

Woodcraft, 800/225-1153

Pin and earring hardware. Minimum order, $10. For information, contact:

Rio Grande Jewelry Findings, 800/545-6566

Hardwood turning stock. For information, contact:

Pekin Hardwood Lumber, 800/475-9663

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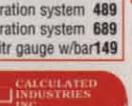

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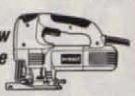

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What's New In Clamps

The lever on this single-handed Bessey PowerGrip can be operated from either the rail or handle side.

When it comes to clamping, rule number one for most of us is to have plenty of clamps in the shop. Rule number two should be to make sure we have the right kind of clamp for the job at hand.

Without question, a dozen or so traditional handscrew clamps and a similar number of bar or pipe clamps will handle the lion's share of our clamping operations. These days, however, clamp-makers are producing new, innovative tools, some with very specialized uses, that can do many clamping jobs better, safer, and/or faster.

Many of these innovations have appeared on the scene during the last four or five years, and this surge of clamp R&D, we're happy to report, doesn't appear to be tapering off. To help keep you up to date, we searched the two major tool and hardware shows last summer for clamps that you'll be tempted to buy in the near future. For a sampling of what we found, read on.

Spring Clamps With Adjustability

Here's a spring clamp with a difference—adjustable pressure. Adjustable Clamp Company has added a screw-adjustable spring to a new line of spring clamps that the firm calls the Pony Adjust-a-Clamp.

By simply turning an adjustment screw with a Phillips screwdriver, you set clamp pressure to match the needs of the project, from soft and delicate to firm and tight *(photo A)*. The manufacturer claims that clamping pressure can be set from 1 to 50 lbs. The new clamps will be sold in a range of sizes and all will incorporate soft, pivoting jaw pads to protect fragile work and hold odd shapes more securely.

A Quick-Action Pumper

This concept isn't brand-new—both Quick-Grip (American Tool Companies) and Jorgensen (Adjustable Clamp Company) already offer versions of hand-activated bar clamps. The new Bessey PowerGrip, distributed by American Clamping, (PG 4.012) offers similar rapid one-hand operation on a high-pressure clamp. (See the lead photo.)

The new clamp's hand lever can be operated from either the handle side or the rail side. On our test units, a single squeeze moved the jaw 3/16". Once the clamp closes on an object, you can apply additional pressure (up to 1,000 lbs.) by turning the wooden-handled screw.


Photo A: To adjust clamping pressure from 1 to 50 lbs. on a Pony Adjust-a-Clamp, simply turn the screw located inside the clamp.

This clamp also incorporates a convenient push-button quick-release which lets you open the clamp quickly or slide the jaw along the rail. It also has non-slip, glue-resistant pads to protect the workpiece. Bessey will offer this new clamp in 12" and 24" lengths, both with a 4" throat depth.

A Double-Duty Clamp

If you frequently face the challenge of clamping angled joints, Bessey's New Flex K clamp may be the solution. The clamp's flexible jaws handle conventional clamping duties like it's bigger cousins, the popular K body units. But when the angles change, the moveable jaws on the Flex K clamp quickly adapt—up to 10° in two different directions at once. We found the Flex K great for clamping miters and irregularly shaped parts as well as for edge-gluing panels *(photo B)*.

Photo B: Both jaws on the Bessey Flex K (catalog no. FJ4.016) angle up to 10° in two directions—ideal for holding miters and irregular-shaped parts.

The 1½"-wide, 5"-long jaw faces provide a lot of clamping surface to bear on. They're made of polyamid, a tough, glue-resistant composite material. You'll find the Flex K in 3" and 4" throat depths with nominal rail lengths of 6", 8", and 16".

Ratcheting Lever Clamps

For fast and easy one-hand clamping, it will be hard to beat the new ratcheting-lever clamps we found. The notched ratchet lets you set and hold the desired pressure. A floating pressure plate on the arm rotates, so its face always remains parallel to the clamp head. There's also an integral lever in the handle that you press to release the ratchet and free the clamp. On the units we tested, the hand-length handle provided more than enough leverage for any clamping application we could test.

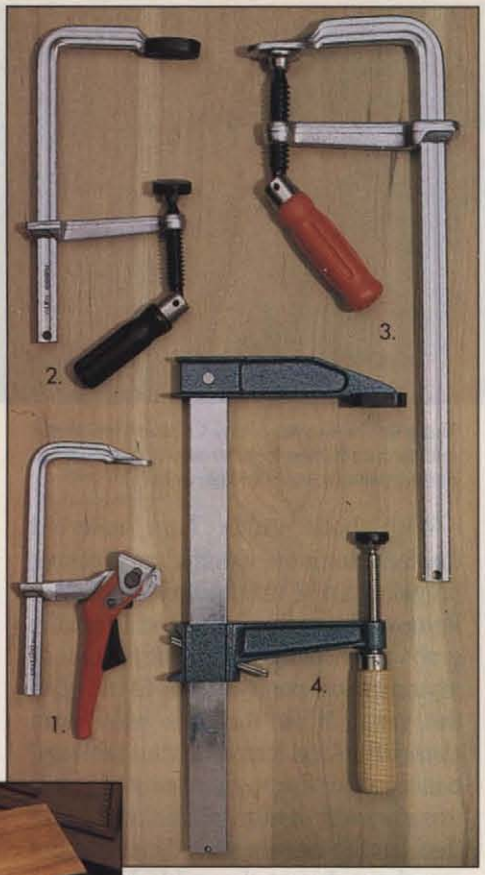

Photo C: A selection of new clamps: #1— Bessey all-steel lever clamp (catalog no. G16H); #2—Wilton pivot-handle L-clamp (catalog no. 6108PH); #3—Woodworker's Supply 19" heavy-duty pivot-handle clamp (catalog no. 915-464); #4—Wilton 5" throat heavy-duty bar clamp (catalog no. 3512).

American Clamping Company plans to market the Bessey standard all-steel lever clamp (clamp 1 in *photo C*) in throat depths of 2⅜" to 5½" and rail lengths of 5½" to 40".

The Wilton Corporation offers similar ratchet-action lever clamps in its 6600 series. Nominal lengths of 8" to 20" are available, with a choice of 4" or 5½" throat depth.

Both firms also have modified versions of the ratchet-action clamp for use in limited-space environments. On these models, either the arms or handles are bent to offset or clear the clamp body. The Wilton 6700 series offers offset lever clamps with 3" to 5½" throat depths in 6", 8", and 12" lengths. Bessey will offer the SGHS lever clamp with a 90° offset lever in four sizes.

Photo D: Wilton's T-slot speed clamp with its offset ratcheting lever (catalog no. 6906) adapts to tools with slotted tables or drilled bases.

Wilton also makes an offset ratchet action machine T-slot speed clamp *(photo D)*. This clamp has a special base that adapts to any tool or machine with a slotted table or drilled base that accepts a T-bolt. You'll be able to get it in either of two versions: one with a 3" throat depth and 6"-wide opening, the second with a 4" throat and 8" opening.

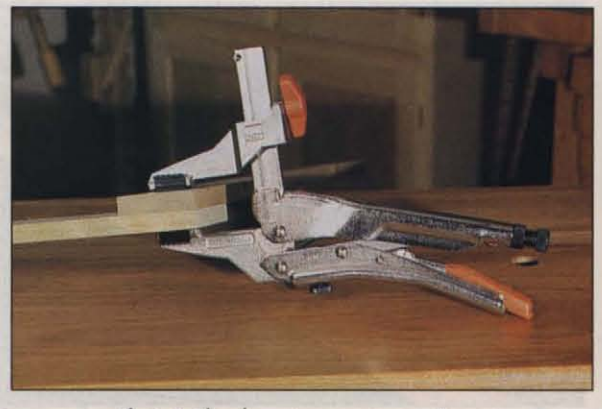

Photo E: The clamp jaw opening on Bessey's Multigrip can be adjusted up to 2½". It saves time on jobs calling for repetitive jaw settings.

The Ultimate In Clamp Specialization

At first, we wondered skeptically how many woodworking applications we might find for the Bessey Multigrip clamp *(photo E)*. Once we tried it, however, a number of uses became obvious. The tool's key benefit is its repeatability. If you're fabricating a lot of same-sized parts, for example, you simply secure the moveable jaw at the right position by tightening the wing nut. Once set, the jaw repeatedly operates at the same setting.

The adjustable upper jaw arm provides an opening of zero up to 2½". Plastic pressure caps fit over the jaws to protect delicate surfaces, then easily slip off for safekeeping in the handle when not needed.

Besides the adjustable jaw, the Multigrip offers two additional refinements. A knurled screw in the handle lets you widen the jaw if you're clamping distorted or bowed material. A second screw resets the lower jaw angle so both jaw faces can be kept parallel when they're closed at any depth setting.

A Clamp and Vise In One Tool

We found it a challenge even to count all the possible uses for this combination clamp and vise from Bessey *(photo F)*. It might well become the workhorse in many home shops.

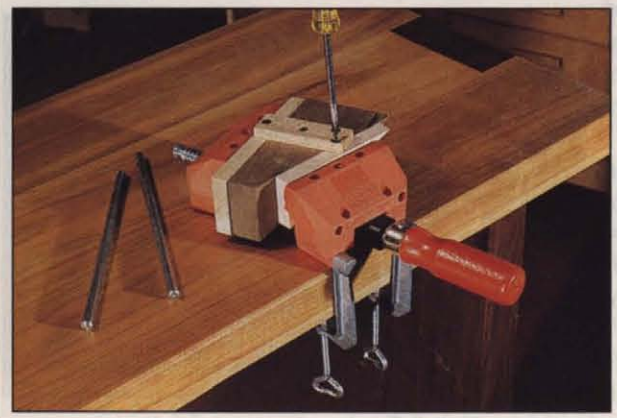

Photo F: The Bessey Vise Clamp may well be one of the most flexible clamping tools you can own—it's both clamp and vise.

Photo G: The two-way Pony Cabinet Claw draws cabinet face frames together and aligns them for accurate shank-and pilot-hole drilling.

With both guide bars inserted through the jaws, it works as a clamp, providing a 4¼" maximum jaw opening. Remove the guide bars, and it readily grabs and holds just about any round or asymmetrical part you can fit between the jaws. With the two hold-down clamps in place, it attaches to a tabletop, bench, chair back, or what have you, transforming it into a miniature vise that can be set up quickly just about anywhere. Insert the guide bars or a pair of dowels into holes in the top of each jaw, and it can grip items too large or odd-shaped to fit between the jaws.

Because of its construction, the clamp can not apply the high pressures you can get with all-metal clamps—it wasn't designed for such applications. It will, however, perform an amazing number of tasks that don't require a great clamping force.

The Cabinetmaker's Helper

The Pony Cabinet Claw from Adjustable Clamp Co. is really the first tool designed to align and clamp cabinet face frames in one operation *(photo G)*. We found its construction and operation so simple and straightforward, it prompted an immediate "Why didn't I think of that?" response.

Using the Claw could hardly be easier. You open the clamp, place it over the cabinet stiles to be joined, turn the secondary handle to close the side jaws, then adjust the main handle to bring the parts into alignment. Next, flip the drill guide attached to the clamp's side into horizontal position, and use it to pilot-drill through the first stile and halfway into the second stile. Then, flip the guide out of the way and, with the Claw still in place, drive a screw to join the parts.

The 1⅜"-deep jaws on the Cabinet Claw's cast-aluminum body open to 4⅜" wide, so they'll handle a range of cabinet sizes. Adhesive pads cover the three parts that contact cabinet surfaces to protect them from marring. The large handles allow a solid grasp for applying torque to the screws. We found the units sturdily built, so they should give long service.

Clamps With a New Twist

Bar clamps have been around for a long time, but they're getting a new twist—a pivoting handle. We found that this makes them much easier to crank on high clamp pressures, and it also makes it easier to use them in tight spaces or where straight handles may not fit.

With the pivoting handles, you can exert a lot more leverage on the clamp screw than is possible with straight handles. Depending on the size of the rail used, these clamps can easily produce 1,000 to 2,000 lbs. of pressure with not much effort from you.

Wilton offers pivot-handle clamps in four throat depths (3" to 5½") and in lengths of 6" to 40" in its regular L-clamp line (clamp 2 in the photo C). In addition, the firm also offers 16" and 24" lengths with an extra-deep 6⅞" throat, and in three sizes in its light-duty, pivot-handle L-clamp line.

Woodworker's Supply recently started selling a heavy-duty pivot-handle clamp (clamp 3 in photo C). It's available in five lengths (9" to 31") with a 4⅝" throat depth.

A number of firms have recently engineered extra-heavy-duty, deep-throated bar clamps, and those manufactured by Wilton are about as tough and strong as they come. The

12" unit (clamp 4 in photo C) weighs in at 4.76 lbs. and will exert up to 1,600 lbs. of pressure. You can get this 5"-throat clamp in lengths from 6" to 36".

Familiar Toggle Clamps in New Dress

We've all seen and possibly used at least one of the 500-plus special-duty clamps made by De-Sta-Co and other firms. These devices adapt especially well to jigs and fixtures where fast lock and release are desired. While De-Sta-Co continues to make carbon-steel, stainless-steel, and aluminum clamps, the firm recently announced the release of a new line of similar operating clamps made from fiberglass reinforced nylon polymers. According to the firm, this new composite material makes these clamps non-sparking, electrically non-conductive, highly resistant to most acids, gases, chemicals, and high temperatures, yet still rugged enough for the same applications as their metal counterparts.

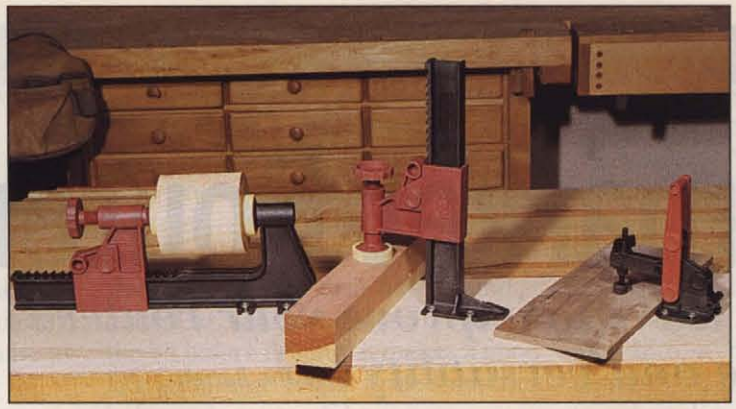

Photo H: De-Sta-Co uses a composite material to make its clamps non-sparking, electrically non-conductive, and resistant to most chemicals and high temperatures.

De-Sta-Co offers the new clamps in four basic versions: bar clamps, cantilever clamps, vertical-handle clamps, and straight-line clamps *(photo H)*. Although they have been designed to perform the same chores as conventional models, they look, feel, and operate differently from what we are used to. We have several samples in our shop and will be testing them over the next several months.

Photographs:
Randall Sutter
Written by
Charles Sommers

Sources

Adjustable Clamp Company
312/666-0640

American Clamping Corporation
800/828-1004

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248/594-5600

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Aftermarket Router Bases

Inexpensive ways to improve your router's performance and versatility

By Jim Barrett

Are you tired of putting a rock-crushing grip on your router just to keep it from tipping? With these simple and affordable products, you can expand your router's capabilities and relax your grip enough to concentrate on the quality of your work.

Top-heavy and small-based by design, routers are difficult to support in many applications, and their whirlwind torque works to twist the tool right out of your hands. If you edge-rout freehand, you know that even the slightest jostle can ruin an otherwise perfect cut. To make matters worse, the standard opaque phenolic bases found on most routers offer a very limited view of the cutting action beneath the tool.

Today, you can find a variety of aftermarket router bases in woodworking tool stores and catalogs. Many are oversized acrylic or polycarbonate attachments that provide better stability and control for edge-routing operations. The clear versions offer a better view of the work. They also glide across workpieces with less friction than most standard router bases, which can lessen the arm and wrist fatigue that often results from gripping handles too hard.

Aftermarket bases come in a variety of shapes and sizes which I will discuss at length below. Some offer specialized functions, such as the router trammels used to rout circles and arcs. One of the products I tested, the PowerPlate, performs eight different woodworking operations.

Extended bases give your router a smoother ride and prevent tipping. The Tear Drop Plate shown here is sold by Woodhaven. (See Sources.)

Bases With Offset Bit Openings

Unlike standard router bases that typically center on the bit, most of the aftermarket router bases employ an offset bit opening. This off-center configuration gives you more leverage on the inboard side to balance the weight of the router, and this reduces the chance of the router accidentally tipping.

The bases come in two basic shapes—rectangular and teardrop. The photos show a sample of the products currently being sold.

The rectangular bases provide good stability by presenting a larger surface to the workpiece. Teardrop-shaped bases enable you to rout closer to inside corners. I found this design generally less cumbersome and more versatile yet it still provided plenty of support. These models do have straight (although not parallel) sides, so you can run them against a straightedge. Teardrop bases come in 6" and 7" radii. Pick the size that best matches your router's base diameter.

The triangular-shaped base from Woodworker's Supply is a modified version of the conventional square

plates. Like the teardrop bases, it lets you rout closer to inside corners than square bases, and also provides a long straight edge.

Attaching a New Base

With the exception of the Trendlines base, you'll need to drill mounting holes in order to attach any of these bases to your router. Typically, you use your router's original base as a template.

In most cases, I found the aftermarket bases thicker than standard ⅜" bases, so you likely will need to buy longer screws to mount them. Many of these screws are metric sizes, but most well-stocked hardware stores should have them. Eagle America also carries a selection of metric screws to fit most routers. You will need a ⅜" countersink bit to recess the screw holes in the bottom surface of the base and accommodate the mounting screws.

The bases from Eagle America also require you to bore your own router-bit access holes—a plus or a pain, depending on your router-bit requirements and the availability of drill bits to do the job. The rectangular Eagle America base plate also requires a ⅜" hole with ¾" countersink to mount the auxiliary handle.

For a base material, I prefer polycarbonate. It drills and machines more easily than acrylic, and seems less likely to crack or craze. It is, however, less rigid than acrylic. If your polycarbonate base doubles as a router-table insert, it will sag more under the weight of the router than an acrylic base.

While you can use a portable electric drill for drilling and countersinking the plates, you'll get more accurate results using a drill press. In either case, use a slow speed, sharp bit, and light pressure. Both types of plastic will melt at relatively low temperatures, which can cause the plate to weld itself to the drill bit. I found it helpful to dab a bit of paraffin wax on the bit before drilling. It makes a good lubricant and helps drill smoother holes and countersinks.

Routing Circles With A Jig

Circle-cutting router-base extensions go by several names: router trammel, circle jig, or router compass. They all feature a router base connected to a long arm that provides an adjustable pivot point, typically a 1¼" round-head wood screw or some type of pin. By securing the pivot point at the center of your layout you can rout a perfect circle. Mate one of these jigs to a plunge router, and you can also rout perfectly curved inlay channels as shown in *photo A*.

Most companies offer small and large sizes. While you can use the larger models for cutting out circular tabletops, they're not as convenient as the smaller ones for cutting small circles. See the photos *below* and on the following two pages for the router bases I tested.

In using these bases, I've found that they work best with plunge routers. A plunge router is essential if you are cutting inlay channels. But you can also use the jigs on smaller fixed-base routers–the jigs come with instructions for both types. The circle jigs I tested proved accurate and easy to use.

The two jigs from Eagle America are made of ¼"-thick polycarbonate and come with stick-on measuring tapes and nail-type pivot pins. To mount the pins, you drill a small hole in the jig at the desired centerpoint, then tap the pin through that hole and into a matching hole in the stock. With the small jig, I was able to cut circles of 6" to 17" in diameter; with the large one, 8" to 48".

Both Eagle America jigs fit router bases up to 7" in diameter. Also, the large jig can be attached to a separate square mounting plate, which in turn mounts on the router. Slots in the square plate enable you to make fractional adjustments of the router position on the jig after you've attached the jig's pivot point to the work.

Woodhaven's Large Trammel Jig will cut circles 8" to 54" in diameter. The firm's Small Trammel Jig will cut diameters from 8" to 21". Made of ⅜" polycarbonate, both jigs have an adjustable pivot block. This white phenolic block is tapped to accept a #6x1¼" flathead wood screw for a pivot point. A separate clamp knob fits into a second hole in the block to lock it in place, or it can be placed separately in the slotted arm to serve as a stop when using a fixed-base router.

This setup lets you slide the router in from the edge of the workpiece until the stop contacts the pivot block at the desired point on the jig. This was a bit tricky to coordinate at first, but it proved easier than tilting the router into the work. The jigs

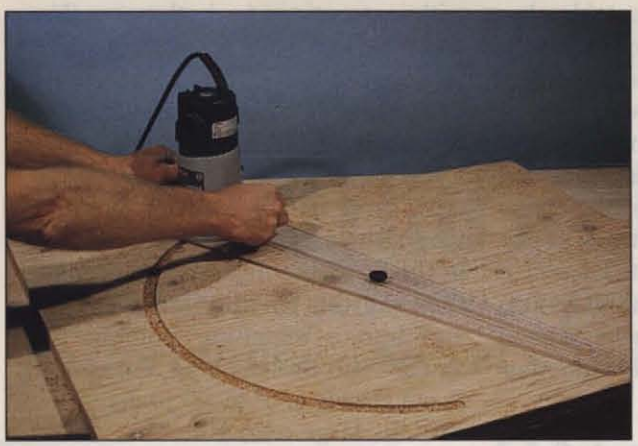


Photo A: Secure the pivot point and throw the switch; a circle-cutting jig will deliver a perfect arc or circle.

lack a scale, but I didn't find this to be a serious drawback since I check my measurements and setup anyway. Both jigs fit routers with bases up to 7" in diameter.

Sold by Woodworker's Supply, the Lewin Router Compass handles circles of 8" to 48" in diameter. Made of 3/16" thick polycarbonate, the jig has an accurate scale printed in 1/16" increments. A single locking pivot pin slides along a slot cut in the arm. This jig fits routers with bases up to 6" in diameter.

Trendlines Roller Edge and Guide Bushing Kit

If you've ever wanted to use a guide bushing but discovered that your router doesn't accept the locking collars that secure these bushings, or ever wanted to use your non-piloted bits for edge-routing, the Trendlines Roller Edge and Guide Bushing Kit *(photo B)* will solve both problems.

The system uses a "universal" router base with predrilled mounting holes in a variety of patterns that will fit just about any router of 2 hp or less. You can mount any of the four guide bushings supplied with the kit or the roller-edge device on this base. The adjustable roller edge guide lets you rout partial or full profiles, trim plastic laminates, and cut rabbets with non-piloted straight and profile bits.

In my tests, the edge guide took some trial-and-error fiddling to position it precisely underneath the bit, and the opaque phenolic base plate doesn't provide much of a clue as to what is going on underneath it. But you'll find the kit easy to install and center for accurate routing. The kit sells for $19.95 plus shipping. By comparison, an aftermarket adapter and bushing set for most routers can set you back $35 to $50, which makes this TrendLines kit a good value.

Photo B: Trendline's Roller Edge and Guide Bushing Kit can expand the usefulness of many routers and bits.

8-in-1 Router PowerPlate

As the name suggests, this multi-purpose base plate provides eight different woodworking functions. It sells for $69.95 plus shipping. With the router mounted over the center bit opening, the PowerPlate functions as a rectangular base extension (see *photo C*). Mount the router over the offset hole, and it functions as an offset base plate.

The two V-shaped rows of holes serve as compass points that turn the plate into a circle cutter (*photo D*). The holes are marked and spaced for cutting circles of 6" to 24" diameter in 1/16" increments. To use, you simply drive a #10 x 3/4" roundhead wood screw through the selected hole to serve as a pivot point.

To use the PowerPlate as a dado-cutting guide, mount your router over the offset bit opening, insert a straight bit, then guide the plate

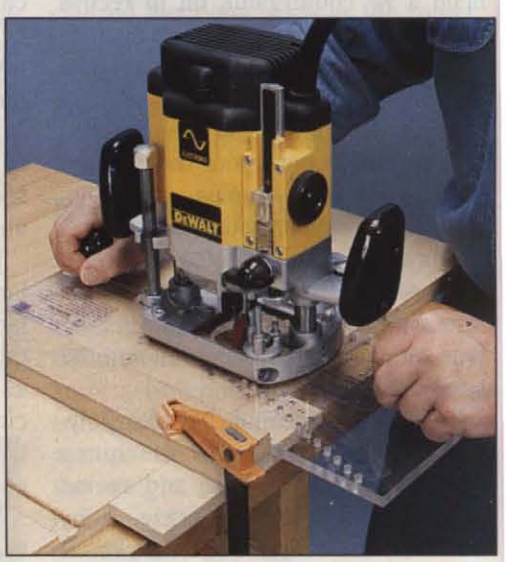
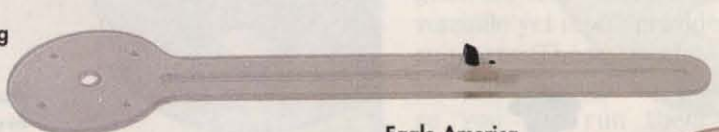


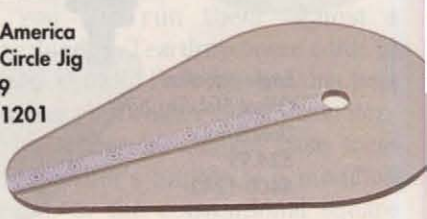
Photo C: The PowerPlate, used here as an extended base, enables a router to perform eight different routing tasks.

Eagle America
Large Circle Jig
$29.99
#400-1202



Woodhaven
Large Trammel Jig
$39.99
#512

Lewin Router Compass
(Woodworker's Supply)
$29.95
#897-070



Eagle America
Small Circle Jig
$25.99
#400-1201

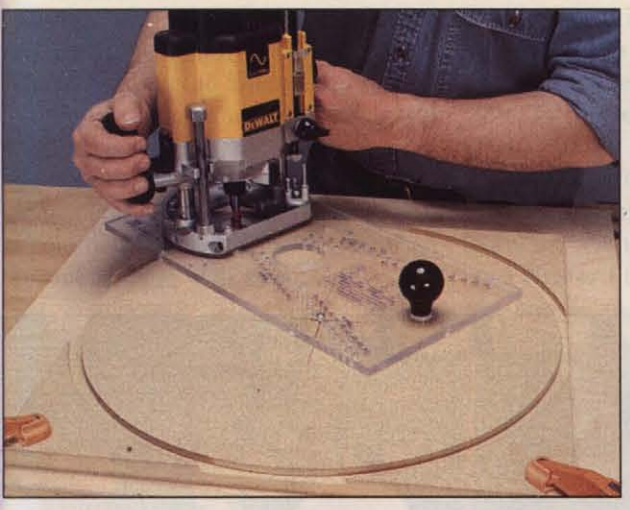


Photo D: PowerPlate used as a circle cutter. Note the offset mounting of the router on the base.

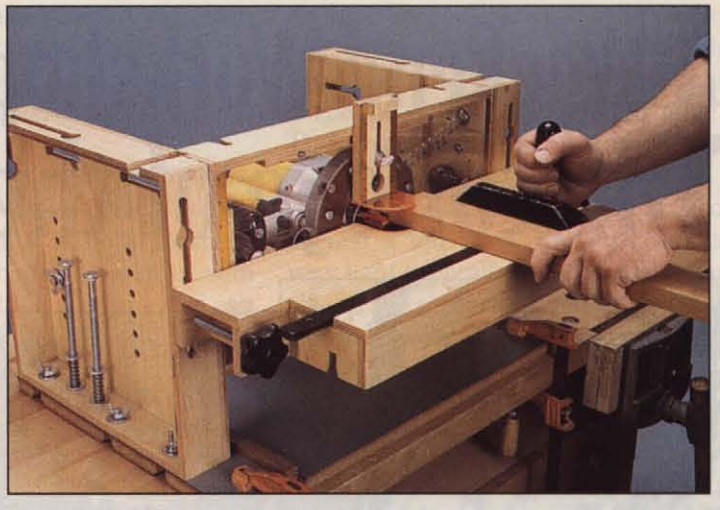


Photo F: Used with the PowerPlate, the modular-built Router PowerShop can be reconfigured seven different ways.

along a straightedge, much as you would do with any square base. However, the access hole was drilled slightly off center in the plate so a second pass, depending on which edge you place against the straightedge, will widen a previously cut dado by increments of 1/32", 1/16", or 3/32". For example, to widen a cut by 1/16", you make the first pass with the end of the plate marked "0" against the straightedge, then turn the base and make a second pass with the edge marked +1/16" against the straightedge. Simple but clever!

The PowerPlate's mortising guide consists of two nylon pins that screw into the underside of the plate on both sides of the center bit opening *(photo E)*.

To rout mortises, you straddle the workpiece with the pins, then twist the router until both pins contact the sides of the workpiece. This centers the bit. Turn on the router and plunge the bit into the stock.

For pattern-routing, the offset access hole has been counterbored to accept flush-mounted guide bushings that are readily available from router manufacturers, woodworking stores, and mail-order catalogs. Adding an auxiliary sole plate made from 1/2" stock converts the plate into a router plane for flattening wood.

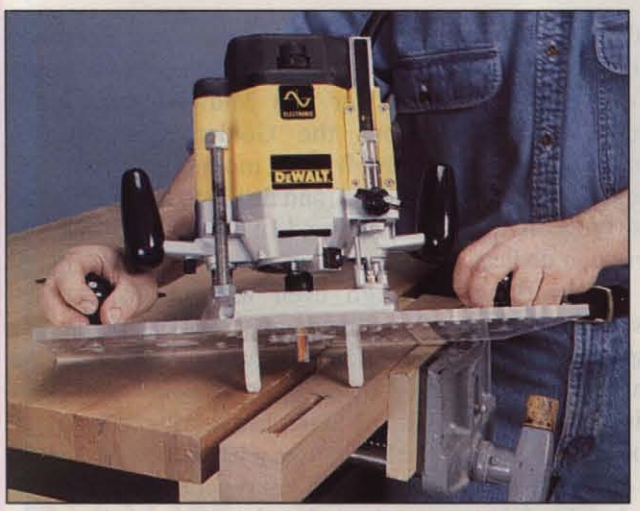


Photo E: The Power-Plate used as a mortising guide.

Eagle America
Offset Stability Jig
Rectangular
$22.99
#400-1243

Woodhaven
Square Base
$12.99
#121

The PowerPlate's instructions also show how to mount it upside down as a router-table insert in a shop-built router table. The pins used for the mortising attachment double as starting pins for freehand routing on the table.

While this tool does plenty by itself, it becomes even more versatile if you mount it on the company's Router PowerShop—a multipurpose build-it-yourself benchtop fixture (see *photo F*). Modular in design, the PowerShop sets up in seven different configurations to accomplish various tasks. The company supplies the hardware and parts in a kit for $39.95. (You furnish your own plywood.) For an additional $17.95, you can buy a more detailed 32-page manual. A video is also available for $12.95.

Photographs: *the author; Randall Sutter, America's Best Tool Co.*

Sources

America's Best Tool Company, Inc.
800/413-4400

Eagle America
800/872-2511

Trendlines
800/767-9999

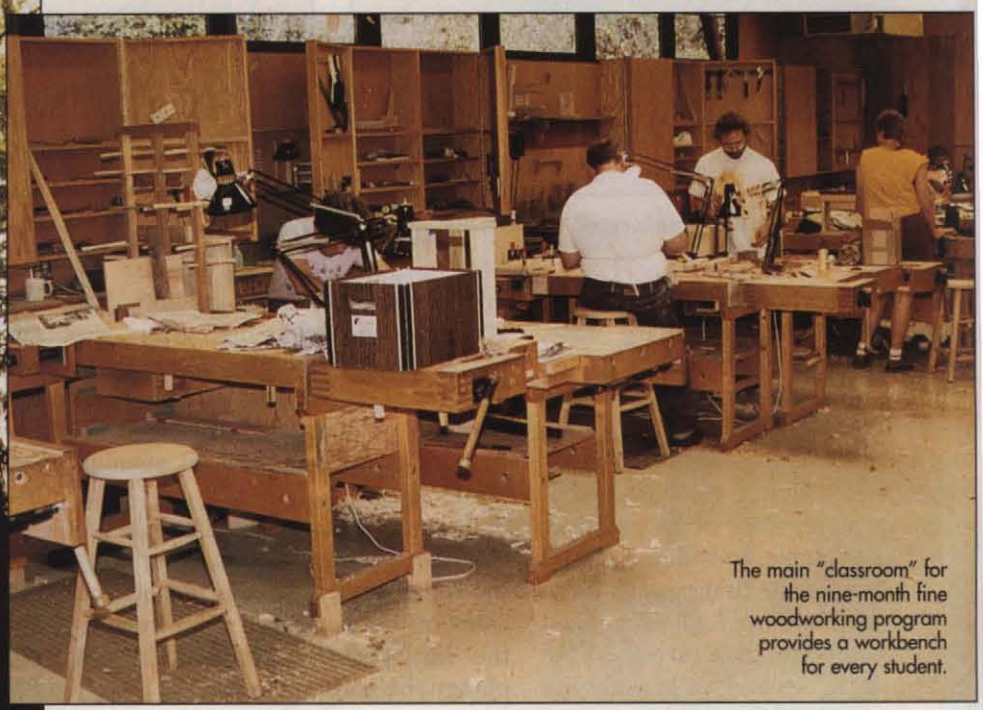
Woodhaven
800/344-6657

Woodworker's Supply
800/645-9292

A Weekend Workshop At The College of the Redwoods

by Dick Coers

Tall timber in a redwood forest.



The main "classroom" for the nine-month fine woodworking program provides a workbench for every student.

Last year, I attended one of the two-day summer workshops held at the College of the Redwoods in Fort Bragg, California. Located about four hours north of San Francisco, the college numbers among a handful of schools in this country that offer instruction dedicated to high-level fine woodworking. James Krenov works and teaches here, and the list of graduates from the school's nine-month fine woodworking program reads like a Who's Who of top-drawer woodworkers.

Fortunately for those of us who can't muster a nine-month stretch of free time, the college also offers a summer series of short workshops. These last from two days to two weeks and include topics such as plane-making, marquetry, and tools and techniques. The two-day course I took, the "Weekend Seminar with James Krenov," covered design and aesthetics in woodworking, attitudes toward tool and material selection, and joinery techniques that add personal touches to your work.

Driving north out of San Francisco toward the Mendocino coast was a treat for this Midwest farm kid—across the Golden Gate bridge, through the mountains, past the wineries, and finally to the ocean. The scenery made it hard to keep my eyes on the road, which was challenging enough even without distractions. One Mendocino resident put it this way: "If it was easy to get here, we'd have too many people." But as I neared Fort Bragg, the sun disappeared behind a bank of heavy coastal fog and did not reappear until I drove out three days later.

Just after I pulled into the college's parking lot, I met Krenov returning from lunch. Revered though he is by a great many woodworkers, I was pleasantly surprised to find him friendly and open. He put me at ease right off, introducing me to fellow instructors David Welter and Jim Budlong. They showed me around as the outgoing class of students, here for the Tools and Techniques workshop, finished

up some small poplar cabinets. A brief visit at the bench of student Emily de Aiaujo gave me an idea of the quality of this workshop and had me eagerly looking forward to the weekend.

It struck me that most of these students come to the college in pursuit of a common goal, which gives them an instant rapport with one another and the instructors. The small classes encourage a free flow of dialogue and provide the instructors with plenty of time for each student. But get your application in early—the one drawback with small class sizes is that they tend to fill up quickly.

Conversations With a Master

Krenov opened our seminar with an extended conversation and a slide show that surveyed his work and that of his students in the nine-month program. The instructor knew them and their work intimately, and it was a testament to the camaraderie that develops during the long course that he was able to share interesting anecdotes about each.

I particularly enjoyed Krenov's discussion of his hand planes, which combine elements of both Japanese and Western tools. He dispenses with the handle and builds a plane that can be pulled as well as pushed, laid on its side for shooting an edge, or set so fine that it can trim veneer. He showed us not only straight planes but also a variety of radius planes for smoothing coopered doors.

We were all a bit surprised when Krenov, in response to a question about sharpening handheld scrapers, replied "Don't ask me, I can't sharpen them worth a darn." He apparently said this tongue in cheek, because he then went on to demonstrate his preferred method. Krenov files a 45° bevel on the edge of the scraper (as you would with a cabinet scraper), then burnishes a single hook from the beveled edge. Thus sharpened, his scrapers pulled up some terrific curls.

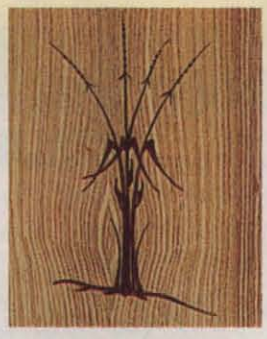
His discussion of finishes also opened a few eyes. Krenov favors a very light application of extremely thin shellac. He mixes it so thin, in fact, that a drop between your fingers dries without feeling sticky. This he calls polishing, not finishing. After several coats, he follows the shellac with Clapham's beeswax polish.

Friendly Furniture

A theme that runs consistently through Krenov's discussions is that furniture should be friendly. This he defines as "pleasing to the body and the mind." Soft edges, hand-worked surfaces, and a finish that doesn't smother

SAMPLES OF WORK FROM STUDENTS AT THE COLLEGE OF THE REDWOODS

Eric Owen
Troy, Montana
Sideboard in European ash with pau ferro inlay



Mark Edmondson
Sandpoint, Idaho
Mahogany chest of drawers

Jack Bogdanowicz
Freehold, N.J.
Display case in kwilla

Tom MacNamera
Davis, Calif.
Cherry linen cabinet with apricot panels

Tim Patterson
Ft. Bragg, Calif.
Sideboard in white oak and spalted maple

John Manning
Arcata, Calif.
Small mahogany desk

the wood make a piece pleasing to the body. An appropriate scale and features that "make music together" please the mind. Surfaces should constantly change with subtle edge treatments, and the different geometric planes and details of a piece should flow together gracefully to create the impression of an organic whole. As he worked through the slides, Krenov pointed out successful (and a few less-than-successful) examples of these precepts. He also led the group into his own workspace and showed us one of his signature cabinets in an apple mosaic veneer.

The atmosphere that permeates the school impressed me as one of serious fun, creativity, and friendship. Krenov talks often about artists who know how to inject whimsy into their work. His philosophy reminds me of a friend and fellow woodworker, Craig Moro, who worked for a while here at *Woodworker's Journal* as assistant editor. Both make a similar music with their woodwork, and both know the importance of slowing down and enjoying the journey.

Coming Down the Coast

After two days in these beautiful surroundings, it was tough to get in the car and drive south toward the big cities. To ease the transition, I stopped in at several inspiring points along the way. At the Highlight Gallery in Mendocino, I visited Clyde Jones, who helped start the fine woodworking program at the college. His gallery is filled with much of the current work coming out of the school and some of the most spectacular furniture I've seen.

On my way South, I drove through several redwood forest areas. Words fail to describe the impact these enormous trees have on a person seeing them for the first time—especially on a woodworker. Suffice it to say that everyone should see the redwoods at least once.

Next, I stopped off at Misugi Designs in Berkeley. If I hadn't seen enough awe-inspiring work already, this gallery nearly sent me into overload. Proprietor Kayoko Kuroiwa gave me a tour of the showroom, which again contained many pieces by College of the Redwoods students.

I savored this trip as a once-in-a-lifetime event, one that I'd urge every serious woodworker to make. It changed my perspective on my chosen profession, on the materials I use, and on the scale and design of the work I execute. Best of all, I had the opportunity to listen to and learn from one of the most highly respected woodworkers of our time, a craftsman who graciously shared his gifts and skills. WJ

Photographs: *College of the Redwoods, author*

To find out more about the nine-month fine woodworking program or the shorter workshops and seminars, contact:

The College Of the Redwoods
1211 Del Mar Drive
Fort Bragg, CA 95437
Telephone: 707/964-7056

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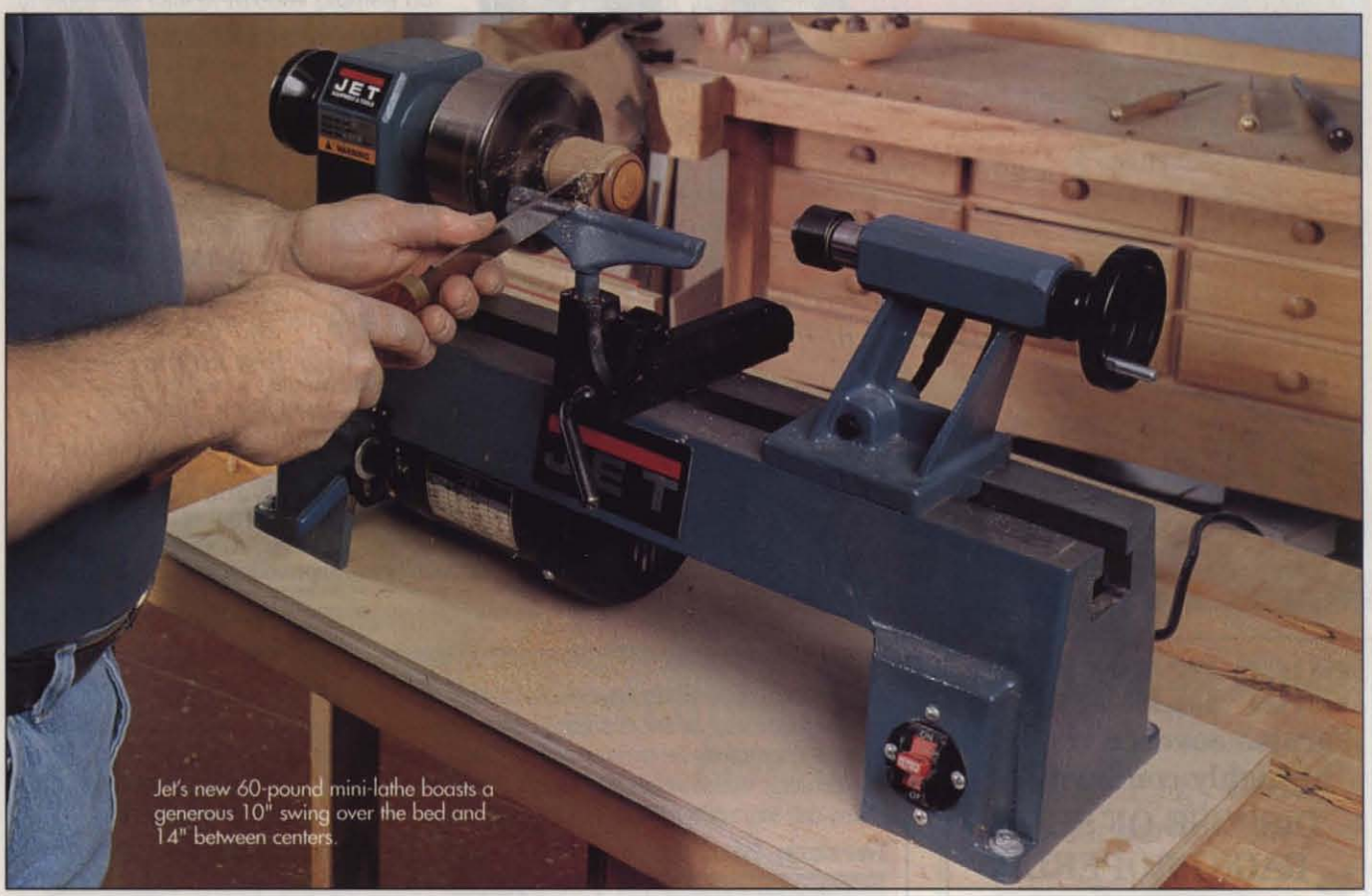
Jet Mini-Lathe

Add a set of mini-turning tools and you're in business

by Dick Coers



Jet's new 60-pound mini-lathe boasts a generous 10" swing over the bed and 14" between centers.

Although Jet calls this model a mini-lathe, it might better be described as a midi-lathe. Compared to several other mini-models I've used recently, this 60-pounder seems like quite a step up. You'll appreciate the mass of the cast iron built into this unit when you're turning a mid-sized bowl or scraping out the bottom of a box. The machine stays put and does the job.

The lathe arrived completely assembled, which was a welcome touch after the mechanics I've had to perform on some new arrivals. With a little degreasing, it was ready to go. The fit and finish impressed me, especially for a pre-production machine.

To simplify matters, I mounted the lathe on a piece of ¾" plywood, then attached four rubber feet to the plywood to help the machine "stick" to the benchtop. I was pleasantly surprised to find, after roughing out several 6" burl bowls, that the unit hadn't moved a fraction of an inch.

The smoothness of this machine's operation also surprised me. No matter what speed I selected, the lathe just stood there virtually motionless. Even with a large bowl blank on board, it hummed nicely and stayed in place.

Plenty Of Power And Capacity

One of the first things I check on any tool is its power. The Jet's ½-hp motor provided enough muscle to let me make some pretty aggressive cuts. The lowest speed, 500 rpm, felt just right on the 6" bowls I turned. This may be a bit fast if you go to the maximum 10" diameter with a badly out-of-balance blank, but that would seem like a far stretch

Editor's Note:

Jet unveiled the prototype of this new lathe at the International Woodworker's Fair in Anaheim last August. (See the preview on *page 14* of our Jan./Feb. '98 issue.) After watching a demo, we were eager to get our hands on one and try it for ourselves. That opportunity came in November, when the company sent us a pre-production unit to test.

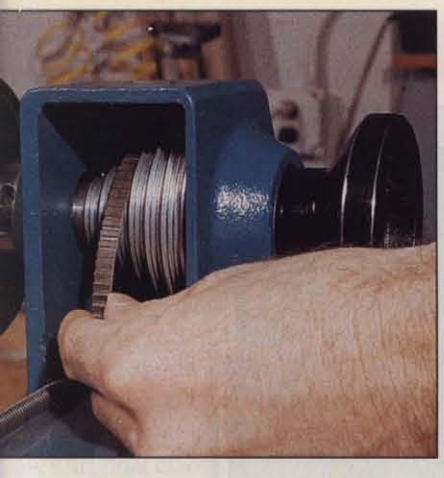


Photo A: To change operating speed, you loosen a single ratchet knob on the front of the machine to release belt tension, then move the belt on the paired stepped pulleys in the headstock.

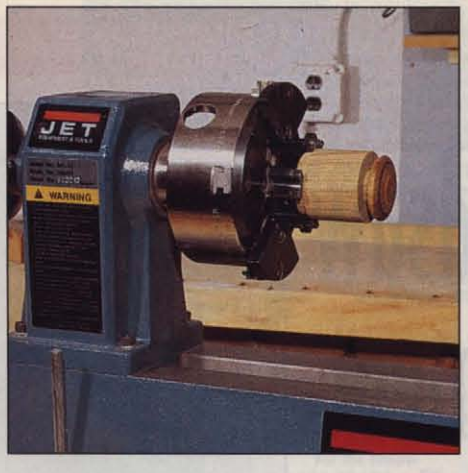


Photo B: The headstock has 1"x8 threads which accommodates a standard 3" faceplate and similar full-sized lathe accessories.

Photo C: Author's success with tiny turnings indicates this lathe operates smoothly enough to handle even the most delicate work.

for a lathe of this size anyway. The higher speeds were well-matched to the smaller turnings one reserves for this type of machine. The 14" distance between centers gives you enough capacity for a good-sized spindle and easily handles pen and pencil mandrels.

Two stepped pulleys provide six speeds: 500, 840, 1240, 1800, 2630, and 3975 rpm. To change speeds, you first loosen a single ratchet knob on the front of the machine. This takes the motor's weight off the belt. You access the belt and pulleys through two doors, one of them located behind the spindle at the rear of the casting *(photo A)*, the other on the end of the casting below the outboard handwheel. By taking the belt off the largest pulley first, then choosing a smaller pulley, I was able to make belt changes quickly and smoothly.

Tool Specifications

Manufacturer	Jet Equipment & Tools, Inc.
Telephone	800/274-6842
Model	JML-1014 Lathe
Stock no.	708351
Swing over bed	10"
Distance between centers	14"
Motor	1/2-hp, 115V
Number of speeds	6
Range of speeds	500-3975 rpm
Headstock spindle threads	1"x8
Headstock spindle taper	MT2
Tailstock spindle taper	MT2
Tailstock ram travel	2"
Weight	59 lbs.

Accepts Numerous Accessories

I also like the lathe's use of standard spindle sizes. This enables you to use a lot of the accessories made for full-sized lathes. If you already own these items, you'll save yourself a sizable chunk of money.

The headstock and tailstock, for example, both use no. 2 Morse tapers. The headstock has 1"x8 threads and accepts a standard 3" faceplate *(photo B)*. I was able to attach my Oneway Stronghold chuck and start turning immediately.

Three Days Of Continuous Turning

A few days after receiving the lathe, I participated in a three-day wood expo at a local hardwood dealer. I turned a variety of items during this show, and the lathe never once disappointed me. I flipped the switch on and off hundreds of times to test-fit lids and jam-fit boxes, but heard not a whimper from the electronics.

I turned quite a few tops and other very small items, all of which came out beautifully *(photo C)*. The smallest top measures 3/16" in the body, 1/64" in the stem! Granted, the choice of ipe wood helped, but it takes a well-balanced, smooth-running machine, an excellent chuck, and quality tools to turn something that small and fragile.

One of the raps we've heard against larger mini-lathes like this one is that they aren't small enough for miniature projects and can't compete with the smaller machines for smooth, vibration-free operation. This Jet machine has proved otherwise in my experience. I've routinely turned tiny objects with just as much accuracy and finesse as I get using either of the two "true" mini-lathes in our shop.

My Conclusions

I enjoy turning, especially on smoothly operating equipment, and this lathe performed nicely for me. I've had the opportunity to try a number of different machines in the past four months, including the Oneway 2036, and I've found the Jet Mini as pleasurable to use as any of the others.

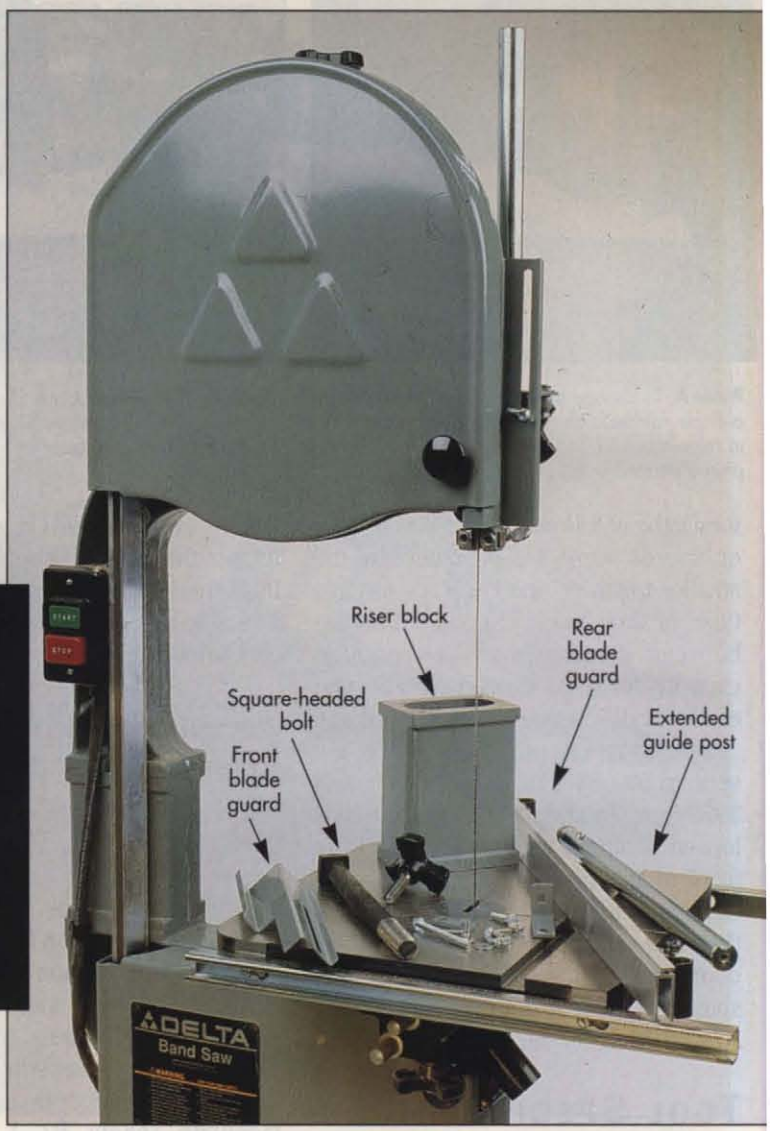
This lathe will meet your needs if you're looking to do a lot of small-scale work and maybe an occasional larger piece. If you already own a full-sized lathe, this machine will serve as a worthy companion to it and let you expand your work into miniatures. With an expected street price of $370, and standardized spindles that will accept a full range of accessories, the Jet Mini-lathe should offer exceptional value. It definitely warrants a good, close look.

Photos: *Randall Sutter*

The Delta Bandsaw Height Attachment

This aftermarket device gives many 14" bandsaws more than 12" of resaw capacity

by Dick Coers



With Delta's Height Attachment Kit, you can boost your bandsaw's resaw capacity to match those on saws costing thousands of dollars.

Once you start resawing stock on your bandsaw, you'll wonder how you ever got by without this technique. You can create book-matched panels, make veneers and inlay material, and get a lot more mileage out of your choicest woods.

Unfortunately, a conventional 14" bandsaw can only resaw stock up to 6" or maybe 6¼" wide—barely enough capacity to cut book-matched panels for an average-sized cabinet door. If you need to resaw wider stock, you're out of luck. Larger bandsaws (16", 18", or 20") will handle 10"– to 13"–wide material, but the price tags on these machines are steep—anywhere from $1,000 to $3,000.

Delta gets around this limitation on their 14" saw with an accessory called the Height Attachment Kit (#28-984). Installed, it boosts the resaw capability of the 14" model (and some other brands as well) to 12¼". Best of all, it costs just $100. In the *Woodworker's Journal* shop, we've relied on the services of a 14" Delta bandsaw for years, and recently decided to install one of these kits rather than upgrade to a larger bandsaw.

Installation Easy

The heart of the kit is the riser block, a 6"-tall chunk of cast iron that's rectangular in cross section and ground flat on both ends. (See the photo *above*.) To install it, unbolt the bandsaw's upper arm assembly from the lower arm assembly and insert the riser block between them. This requires a 1¼" wrench; an adjustable (Crescent-type) or socket wrench won't work because there's not enough clearance between the webbings in the castings for them.

Indexing pins cast into the ends of the riser block ensure alignment of the arms. A hefty square-headed bolt runs through the block to clamp the upper and lower arms back together. With the block in place, you then attach a new rear blade guard (supplied with the kit) to the upper and lower arms.

The next step requires removing the blade-guide assembly, installing the extra-long guide post that comes with the kit, and reattaching the blade-guide assembly to the new guide post. With these parts installed,

you then realign and re-tension the blade and install the new front blade guard. This whole process takes about an hour.

The instructions were well-written and clearly illustrated, making installation easy. After it was all assembled, the front blade guard bumped into the upper wheel cover when the blade guides were raised to the full-up position. So, we simply bent the sheet-metal guard enough to clear the obstruction.

With the riser block installed, the saw's original blades no longer fit so we replaced the originals with 105" blades. When you buy new blades for your bandsaw, we suggest you get at least one blade that's designed specifically for resawing. These blades typically measure ½" or wider and have a more aggressive tooth profile and fewer teeth than regular bandsaw blades.

The Height Attachment Kit can also be retrofitted to many similar Taiwanese-made 14" bandsaws, such as those sold by Jet and Grizzly. However, Delta product manager Scott Box cautions that these other brands may not have locator pins between the upper and lower arm castings. If yours doesn't, you'll need to accurately align the parts, then drill holes in the castings and insert hardened steel dowels for locator pins.

We Like the End Result

Retrofitted with the height attachment, our Delta bandsaw gives us excellent results. The machine runs as smoothly as ever, and we can now pare thin slices from 12"-wide hardwood stock with clean, controllable results.

You can purchase the Delta model 28-984 Height Attachment Kit from Delta tool dealers and many woodworking mail-order suppliers. WJ

Delta Height Attachment Kit
model no. 28-984

Delta International Machinery Corporation
800/438-2486

Photographs: Randall Sutter

Porter-Cable Introduces the Bammer

And Two Other New Tools

Porter-Cable Bammer model CAD250

The rechargeable battery freed the portable drill from its electrical cord and changed the tool forever. The Bammer may similarly change the way we drive nails. Whether Porter-Cable's new nailer will actually revolutionize the process remains to be seen, but it definitely makes a leap in that direction.

Powered by compressed liquefied gas fuel, this tool operates free of any air hose, compressor, battery, charger, or electrical outlet. To drive a nail with the Bammer, you simply press the tool against the target and pull the trigger. This activates a piezo igniter, which sparks a small volume of fuel released into the combustion chamber, which in turn drives the nail. The fuel is contained in a small replaceable gas cylinder. There are no batteries or other power sources involved.

In tests, the Bammer delivered over 3,000 shots per fuel cylinder when driving 2½" finish nails. Engineers have also equipped the nailer with an oil-free engine to eliminate oil-spotting on wood and to help minimize carbon deposits for longer maintenance-free operation.

Porter-Cable currently offers three versions of the Bammer. The CDA250 angle-nailer drives 15-gauge D-head angle finish nails ranging from 1¼" to 2½" long; model CFN250 fires 16-gauge finish nails of the same lengths; and the CMS200 medium crown-stapler drives 1¼"- to 2"-long 16-gauge crown staples. The firm promises new models to come in the future.

All Bammer nailers incorporate an adjustable depth guide, a toolless, quick-release hinged nose piece (for clearing jams), an anodized aluminum magazine with steel guides, a special alloy driver blade, and a non-marring safety tip. Look for current models to list at under $400, the non-aerosol fuel cylinders at less than $7 each.

Plate Joiner Upgrade

A simple plate joiner wouldn't seem to offer much room for improvement, but Porter-Cable's second-generation tool (model 557) includes several innovations worth checking out.

For instance, the fence and head have been redesigned to accept both 2"- and 4"-diameter cutters. With this flexibility, the unit can cut seven different slot sizes (#FF, 0, 10, 20, larger biscuits, knockdown fittings, and hinges) and also has a fine-adjustment depth stop. It can slot stock as narrow as 1½" wide. (The new FF biscuit, by the way, measures ½" wide by 1¼" long and fits a slot formed by the 2" cutter.)

The revamped fence incorporates micro-height adjustment for precise biscuit placement. It also tilts from 0° to 135°, stops positively at 90°, and

Porter-Cable Plate Joiner model 557

doesn't have to be removed for flush cuts. Engineers have added a 5/32"-thick plate to the fence to make it easier to center the cutter on your marks. This plate also serves as a spacer, which makes cutting double slots in thick stock fast and easy. But probably most critical of all, the front handle has been moved off the motor body and onto the fence, providing better leverage during cuts.

The new tool also has a more powerful 7.5-amp barrel-shaped motor, a lock-on trigger switch, an ergonomically designed rear handle grip, and a 1" chip-collection port that connects to a bag or vacuum. P-C officials expect to offer the new plate joiner in the low $200 range.

Porter-Cable Quicksand model 333VS

A Hopped-Up Sander

Random-orbit sanders continue to be upgraded, and the features in Porter-Cable's new variable-speed Quicksand 333VS typify these improvements. According to company tests, this new 2.4-amp unit offers a 43% greater removal rate that its predecessor.

The 333VS incorporates a patented SandTrap dust canister that swivels 360° to allow greater mobility in corners and other tight places. The canister also attaches to a vacuum for optimum dust control.

Engineers have also added a pad-control feature that prevents free-spinning. This lets you apply the rotating sander to the work surface without gouging or scratching it. Look for the new sander to sell for under $100.

For additional information, contact:
Porter-Cable
800/487-8665

Joint A-billi-T

An in-depth look at a matched-edge jointer

by Dick Coers

I have watched inventor Bill Gudeman demonstrate his Joint A-billi-T router fixture many times at woodworking shows and often thought about its possible applications. We eventually ordered one for the *Woodworker's Journal* shop. Since then I've used it numerous times over the past two years.

Bill calls this tool a "matched-edge jointer." As you can probably infer from its name, that's its major function—to cut matching edges on adjoining pieces of stock for a precision glue joint.

Setting Up the Fixture

Assembling the fixture was routine, and the four steps required no wrench or other tool. Initially, you choose a router and bit to use, then stick with that same equipment for future cuts. You do this because the router, on its first pass, trims the substrate base on both sides to match the diameter of its base.

If you change to a router with a different-sized base, the router's and fixture's bases will no longer match and you lose the locating feature. But all is not lost. If the new router has a smaller base than the previously installed unit, simply retrim both edges of the substrate base. If the new router's base happens to be larger, replace the substrate base with a new piece of melamine and trim it.

Bill recommends that you choose a router with a ½" collet so you can use ½"-shank bits. I'd also use a fixed-base router with at least 1½ hp. As for a cutter, he advises using a carbide-tipped straight bit. I chose a ¾"-diameter spiral cutter with a 1½" cutting length and a ½" shank. The spiral bit costs a bit more ($35), but its shearing action causes less splintering in hardwood, and it works well on manmade materials like melamine and MDF. It also requires less power than bits with straight cutters.

Brand-new, the fixture arrives with an oversized substrate base that accommodates any size of router base. The ¾"-thick melamine is tough to cut. If you have to trim away a lot of the base, I suggest that you first determine the approximate cut line and rip away most of the waste on the tablesaw (to within ¼" or less). Then, trim it with your router.

Using the Tool

To edge-join with the fixture, you simply slide the board under the substrate base and align the cut line

(or the width of material you want to remove) with the base's outside edge. Adjust the end clamps to the stock thickness and tighten them. Next, rout along the board's edge, holding the router base firmly against the tool's guide bar. To joint a second board for edge-gluing, place it in the fixture at the same location but on the opposite side, then rout its edge.

Because this system is designed to make matching edges, the guide bar need not be perfectly straight. If one board gets cut with a slight bow, the other will have a matching crown. The bar on our fixture has a .018" bow over the length of my 48" straightedge, yet it still made perfectly good edge joints.

As suggested in the operating instructions, I find it helpful to letter each side of the fixture (A and B) and also the edges of the boards I want to straight-line. This way, I know automatically which edge goes on what side of the fixture.

Other Uses, Too

I've used the Joint A-billi-T for other woodworking jobs as well. For example, I trimmed the ¼" panels used in the tapered pedestal we featured in the May/June '97 issue *(page 51)* with the Joint A-billi-T. You can also use it to cut dadoes, although this requires adding another substrate (or a piece of ¼" plywood under the substrate) to use for locating the cut.

As mentioned before, the fixture (used with a carbide-tipped bit) is a natural for trimming manmade materials. You can even trim veneer by sandwiching it between two backer boards. The unit also works well for removing the wane edge on stock that hasn't yet been straight-lined, and for odd jobs such as trimming interior doors when you install carpeting. The base measures 1½" high, so if I need to cut a large panel, I simply place a 2x4 close by on the bench to use as a material support.

The metal parts of the fixture are made of powder-coated, heavy-gauge steel. They'll last a long time without maintenance, though you may occasionally want to lubricate the rub points on the cam clamps. By boring small holes through the base, I can hang the fixture on the wall out of the way until the next time I have use for it.

I enjoy using the Joint A-billi-T. If you can operate a router, you can make a square, smooth edge with it. If you have trouble getting good edge cuts on your jointer, or don't own a jointer, this tool can remedy either problem. Don't expect it to totally supplant the jointer, however. You'll still need one to flatten cupped or twisted stock before thickness-planing.

The manufacturer currently offers three models: a 60" unit for $139, a 96" model for $189, and a 120" version for $289. WJ

For additional information, contact:
Gudeman Enterprises
P.O. Box 126, Dept. WJ
Goodfield, IL 61742

800/997-1918

Photographs: *Randall Sutter*

Fully Featured Lathe Offers Good Value

The new Grizzly lathe offers 40" between centers and lots of conveniences.

For outboard turning, the headstock swivels 180° and can be positioned at any point along the length of the bed.

Grizzly Imports recently added a new lathe, the G1067, to its line. While the unit doesn't offer any new technology, it does contain most all features one might ask for at a very decent price.

The owner's manual is well-written, and the instructions made assembly easy. It took me about an hour to unpack and assemble the entire machine, stand included. You will, however, need to recruit help to hoist the 160-lb. lathe onto its stand.

For outboard turning, the headstock swivels 180° and can be positioned anywhere along the length of the bed. Detents provide positive stopping points for every 45° of rotation. Being able to move the headstock, however, makes it easy to lock it out of parallel with the bed since there is some play until you engage the lock. To ensure perfect alignment, I found you must first locate the parallel point and then lock the headstock.

How It Worked

The lathe ran smoothly with no vibration at any of the six speeds (600 to 2,100 rpm). The ½-hp motor proved adequate for turning between centers, although I did stall it hogging out an 8"-diameter bowl. I'd prefer a ¾-hp motor for large bowl and faceplate turning. The G1067 provides a generous 13¾" of swing and 40" between centers. The headstock shaft can be indexed every 15° of rotation but on the unit I tested, the indexing pin fit loosely in the casting.

Grizzly incorporates a number of features in this machine that make turning easier and more efficient. For example: a locking spindle for removing faceplates, a knockout bar to remove the drive center, dial-adjusted speed controls, and a self-ejecting tail center. A live center, spur center, and faceplate also come standard on the new lathe.

A Good Starter Lathe

This machine offers all the basic features one needs to get started in bowl or spindle work and good value for beginning and intermediate turners. With a slightly larger motor, it would also satisfy the needs of many advanced turners. WJ

***Tested by** Dick Coers*
***Written by** Tom Jackson*

Grizzly G1067 Swivel-Head Wood Lathe, $449 plus freight. Grizzly Imports, 800/523-4777.

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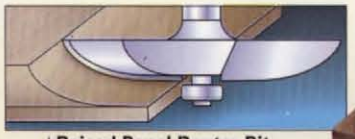

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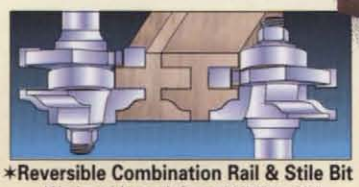

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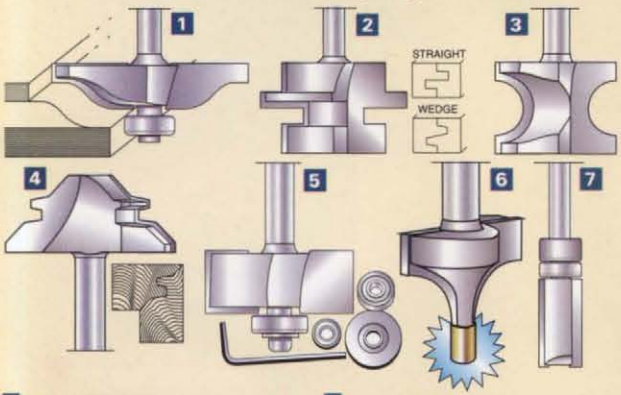

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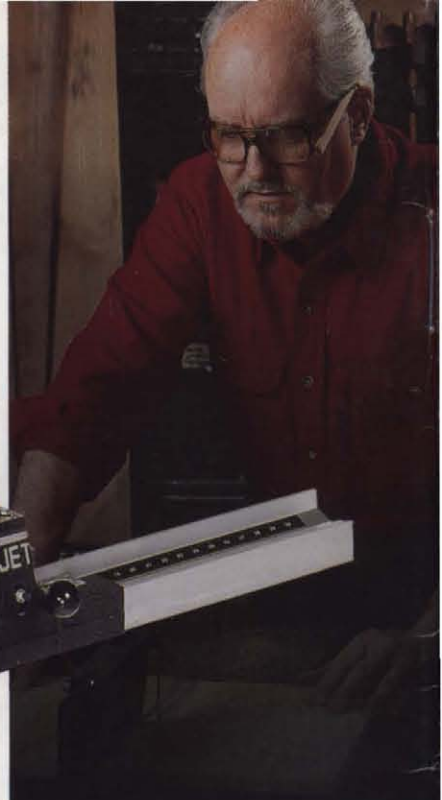

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