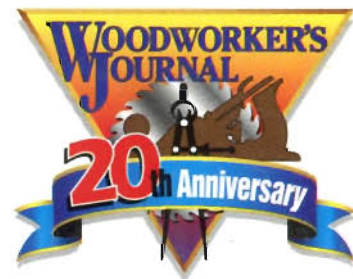


WOODWORKER'S JOURNAL

Vol. 20, No. 4 July/August 1996



**WIN THIS
TOOL CHEST!**
Page 80

Great Projects...

- **Breakfront Tool Chest**
- **Child's Book Rack**
- **English Pub Table**
- **Dovetailed Gift Box**

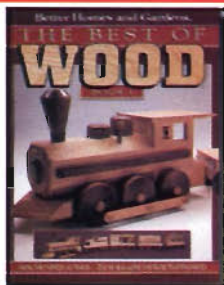


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Delta 9"x80Tx5/8"	\$204	\$119
Ryobi-Makita & all 10"x80Tx5/8"	\$207	\$129
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WOOD® Magazine test, Sept. '93, pg. 45

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P. Rose, PA

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.

I also am going to send you my old Craftsman blade to sharpen. I'm not satisfied with our local sharpening. Now, how to justify another one of your blades.... because I don't ever want to be without one.

Rick Price

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10"x80Tx1/8" & 3/32" K	\$207	\$159
Other sizes available	\$212	\$181

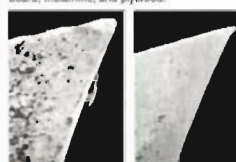
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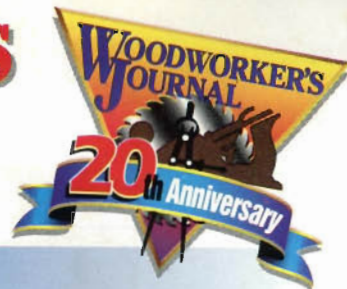
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WOODWORKER'S JOURNAL

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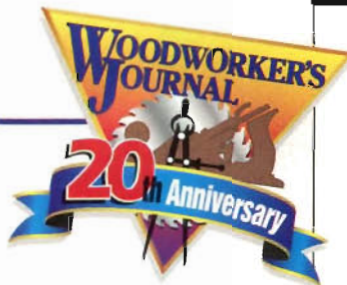
Register to win our 20th-anniversary cover project and help us respond to your woodworking interests



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Cover photograph: Lynxwiler Photography
Tools courtesy of Bridge City Tool Works

SHOP TALK



Register For the Tool Chest Giveaway

We have a special opportunity for you this issue—a chance to win our striking cover project, the *Woodworker's Journal* 20th-Anniversary Breakfront Tool Chest. Dick Coers, staff designer and craftsman, designed and built this unique furniture-quality piece. We'll be announcing the name of the lucky reader on this page in our November/December '96 issue. To enter the drawing, simply fill out the questionnaire and entry form on page 80. I hope you'll do it today before you forget—our deadline for accepting entries will be midnight, July 31, 1996.

Fortunately, you don't have to wait that long to have a tool chest just like it. For step-by-step instructions, turn to page 26. We've intentionally left the interior undeveloped so you can customize it to store your own tools. I think you'll agree that the chest will look right at home in your shop, whether you fill it with your precious antique collectibles, with your reliable, everyday workhorses, or with fancy tools like those from Bridge City Tool Works that you see in the photo.

Calling All Web Surfers

For you computer owners who surf the net and work in the woodshop, I'm happy to report that *Woodworker's Journal* has a new home page on the World Wide Web. Although still in the refinement stage, it's up and running, and we invite you to check it out. Log on at <http://www.woodworkersjrn.com>. Look it over, then let us know what you think and what additional features you'd like to see. You may E-mail us at wwjmag@aol.com.

Note: Woodworker's Journal ran the wrong ad for Jet Equipment in the May/June issue. The rebate program referred to in the ad had already expired. We are sorry for any inconvenience this may have caused.

Charles Summers

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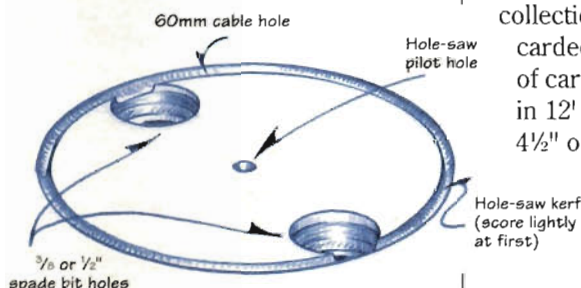
\$450⁰⁰



SHOP TIPS

Keep Cool When Hole-Sawing Laminates

I cut many 60mm holes in plastic laminate countertops for power cable grommets using a hole saw. Such laminates, and the industrial particleboard underneath, are very tough on steel blades. Even though I



worked carefully to avoid overheating the tool, I was only getting 10 or 15 holes between sharpenings until I discovered this solution.

Begin by sawing just enough to score the laminate. Next, drill two $\frac{3}{8}$ " holes through the top with a spade bit, positioning the bit so the holes just intersect the kerf of the large hole. Now, finish cutting the large hole. The small holes let the sawdust escape, so there is very little buildup in the kerf. This allows the hole saw to run much cooler and facilitates removal of the cut-out plug. Using this technique, I now get 40 to 50 holes before resharpening.

Robert Newbegin
DeForest, Wis.

Into the Gutter With It

I mounted a piece of rain gutter on the end of my work table and attached a short length of downspout to it. When I finish a job, I just sweep the debris off into the gutter and down into a trash can.

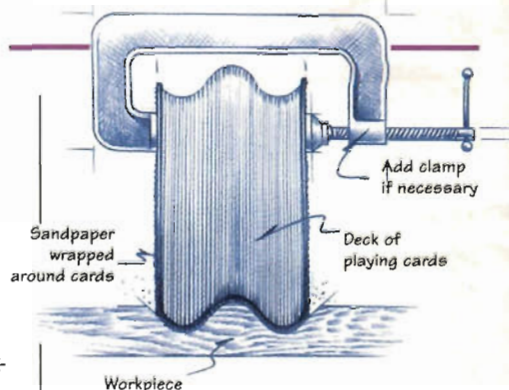
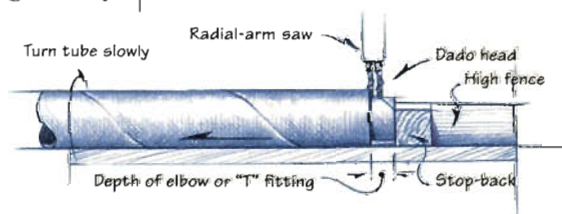
Tennis Deselle Jr.
Bunkie, La.

No Charge For Dust Collection

Want to save money on your dust-collection system? Try using discarded cardboard tubes from rolls of carpet or linoleum. They come in 12' lengths and usually have a $\frac{4}{2}$ " outside diameter and $\frac{1}{4}$ "-thick walls. Cut the tubes to length and join them together (and to your machines) using plastic T and elbow connectors.

To reduce the o.d. of the cardboard tube ends to fit inside the plastic parts, install a dado blade and set up a stopblock on the radial-arm saw as shown. Lower the blade until it barely touches the tube. Next, start the saw and rotate the tube by hand. Repeat, lowering the blade gradually and test-fitting until you achieve a snug fit in the plastic connectors.

Phil Williams
Port Elgin, Ontario



Deal Up a Custom Contour Sander

To sand an irregularly shaped edge, I wrap a piece of sandpaper around the edge of a deck of playing cards, then press them to fit the profile, just like a contour gauge. Use paper with a flexible backing and a small clamp to hold the shape if necessary. (Airlines and casinos are great sources for free cards.)

Forrest Bennett
Columbus, Ohio

Best Tip Tool Winner

For submitting his shop tip, Phil Williams of Port Elgin, Ontario, will receive a free Bosch dustless variable-speed orbital jigsaw. This new Bosch saw features a powerful 4.8-amp motor with a variable speed range of 300 to 3000 strokes per minute. Electronic feedback circuitry maintains optimal blade speed even under load, and Bosch's new "Clic" blade-change system allows quick, tool-less blade changes. Four-position orbit adjustment handles anything from fine detail work to aggressive rough-cutting of heavy stock.

To be eligible for a free tool or cash award, send your original shop tip ideas (and sketches if necessary) to: Woodworker's Journal, 2 News Plaza, P.O. Box 1790, Peoria, IL 61656. We redraw all sketches, so they need only be clear and complete. If you want the material returned, please include a self-addressed stamped envelope.



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Vol. 10 No. 4 July-Aug '86 (Item #8607)

Wall-Hung Display Cabinet, Latticework Planter, Country Bucket Bench, Adirondack Chair, Coffee Mill, Clamdigger's Basket, Box of Shapes Toy, Disk Clock, Tenon Jig, Dictionary Stand, Shaker Slat-Back Side Chair; *Articles*: Selecting a Production Project; More About Warped Boards; About Router Bits; Sliding Dovetail Joints.

Vol. 11 No. 3 May-June '87 (Item #8705)

Kitchen Canister Set, Riding Biplane, Contemporary Serving Cart, Napkin Holder, Decorative Planter, Country Vegetable Bin, Medicine Cabinet, Drum Sander, Vienna Regulator Clock, Display Pedestal; *Articles*: Penetrating Oils; The Jointer; Veneer, Part I; Dovetail Key Butt-Miter.

Vol. 13 No. 2 Mar-Apr '89 (Item #8903)

Adirondack Settee, Country Village, 18th-Century Tilt-Top Table, Toy Fishing Trawler, Two Trivets, Folk-Art Cow, Greek Revival Birdhouse, Pine Armoire, Oriental Mirror; *Articles*: Transferring and Enlarging Patterns; Making Tripod Legs; Three Easy Finishes for Pine; The Portable Circular Saw.

Vol. 13 No. 6 Nov-Dec '89 (Item #8911)

Mission Style Trestle Table, Jewelry Box, Kids' Bobsled, St. Nick Carving, Carousel Toy, Box Drum, Dancing Man Folk Toy, Towel Rack, Secretary Desk, Bed Tray; *Articles*: Mortising Butt Hinges; Dado Heads; Marquetry; The Empty Window Method; Aniline Dyes; Lynes Unlimited: Making Toys in a Kansas Chicken Coop.

Vol. 14 No. 5 Sep-Oct '90 (Item #9009)

TV/VCR Cabinet w/Pocket Doors, Shaker Woodbox, Cabinet with Punched Tin Doors, Sushi Set, Carved Pineapple, English Cutlery Tray, Toy Train Set, Workbench, Portable Tool Chest; *Articles*: Files and How to Use Them; Compound Angle Dovetails; Water-Based Finishes; Making the Slip Joint; Shop Test: 6 Dovetail Jigs.

TV and VCR Cabinet Sep/Oct '90



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Kids' Bobsled Nov/Dec '89



Vol. 16 No. 5 Sept-Oct '92 (Item #9209)

Early American Pine Hutch, Child's Windsor Chair, Universal Table Saw Jig, Convertible Step Stool/Chair, Finger-saving Plastic Bag Handle, Acrobatic Bear Folk Toy, Kids' Kitchen Playcenter, Easy-build Bookshelves; *Articles*: Amps vs. Horse-power; An Introduction to Chairbuilding; Vacuum Turning; Tool Review: Benchtop Table Saws.

Vol. 16 No. 6 Nov-Dec '92 (Item #9211)

Gov. Winthrop Slant-front Desk, Futon Bed/Couch, Low-cost Router Table, Toy Livestock Truck, Heirloom Jewelry Box, Scroll-sawn Nativity Scene, Early American Doll Bed, Router-built Wall Cabinet; *Articles*: Stick and Cope Doorbuilding; Linenfold Carving; Tool Review: High-end Scroll Saws.

Vol. 17 No. 3 May-June '93 (Item #9305)

Country Pie Safe, Collapsible Basket, Intarsia: Humpback Whale, Classic Jewelry Chest, Skittles Game, Porch/Yard Swing, Handsaw Caddy, Shaker Wall Cabinet; *Articles*: Doweling Jigs, Taming the Hand Scraper; Shoptest: Porter-Cable's Pocket Hole Cutter.

Vol. 17 No. 4 Jul-Aug '93 (Item #9307)

Early American Corner Cupboard, Gossip Bench, Band Saw Cutoff Table, Roaring 20's Sports Car, Pussycat Napkin Holder, Aerobic Step, Desktop Bookshelf, Cherry Letterbox w/Mountain Scene Relief Carving; *Articles*: How to Buy Wood; Incised Lettering: Choosing and Using Sharpening Stones; Shoptest: The Inca Jig System.

Vol. 17 No. 5 Sep-Oct '93 (Item #9309)

Intarsia: American Eagle, Blockfront Chest, Super Box Joint, Old Fashioned Farm Table, Sunset Rider Desk Set, Scroll-sawn Bunny Puzzle, Quilt Crane, Magazine Slipcases; *Articles*: Pennypincher's Clamp Organizer; How to Flatten Rough Stock; Faux Antique Cracked Finish; Tool Review: Benchtop and Mini Lathes; Shoptest: Safe-T Planer by Wagner.

Vol. 17 No. 6 Nov-Dec '93 (Item #9311)

Old-Time Icebox, Contemporary Jewelry Box, Windowpane Mirrors, Miter Gauge Fence, Toys (Boat, Helicopter & Truck), Noah's Ark & Scroll-sawn Animals, Victorian Wall Shelf, Kids' Modular Furniture Set, Santa Carving; *Articles*: How to Rip and Crosscut on the Table Saw; Getting Started in Carving; Turning Bricklaid Bowls; Shoptest: Laguna Tools Mortising Table; Tool Review: Random-Orbit Palm Sanders.

Vol. 18 No. 3 May-June '94 (Item #9405)

Through-Dovetail Jig, Woody Wagon Toy, Intarsia: Bad Puppy, Oval Collapsible Basket, Cherry Coffee Table, Salt & Pepper Shaker Set; *Articles*: Fine Tuning Your Band Saw; Tool Review: Benchtop Band Saws.

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Here's my version of the Shaker Tall Clock (May/June '90), made from wild cherry logs cut on my farm. I added the gingerbread on top and the molding on the bottom to make it more stable. (I also made a second clock with shelves and a glass door.)

*William Nichols
Ravenna, Ohio*

Just thought you might like to see Grampy's airport. The first plane came off the line on Christmas Eve, nine days after I got your issue with the Riding Biplane (Jan./Feb. '94). You would not believe the look on the face of the little pilot who received it. With nine grandsons, more planes had to follow. Needless to say, many miles have been flown! I look forward to every issue of your great journal.

*Paul P. Harasimowicz, D.D.S.
Gardner, Mass.*



READER LETTERS



I enjoy reading your magazine, as you have a variety of different projects, big and small. I've received your magazine since 1983. I'm enclosing photos of the Desk with Tambour Top (Sept./Oct. '86) that I made for my granddaughter. I enjoyed making it.

*Orlando Sprunger
Berne, Ind.*

Here's a picture of one of my first attempts at woodworking, the Apothecary Chest (Jul./Aug. '87). I used maple and finished it with Minwax Early American stain and three coats of polyurethane. I'm enclosing my versions of several of your other projects as well. I thoroughly enjoy your magazine, especially your method of teaching. I will be a subscriber for many, many years.

*George C. Simpson
Belleville, Ill.*

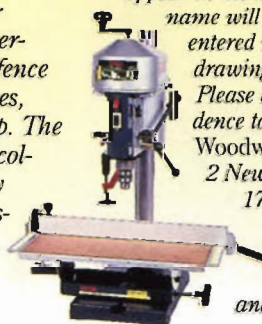


Tool Award

For sending a photograph of his project, Orlando Sprunger will receive a free Ryobi 18 1/2" wood-drilling system. Unlike most drill presses, which are designed for metal-working, this unit was designed by Ryobi engineers for woodworkers. It features an oversized tilting table, a scaled rip fence with flip stops for repetitive holes, and a built-in hold-down clamp. The head cranks up and down the column and swivels 180° to allow floor-drilling capability. The system requires no belt-switching; instead, you simply crank in the desired spindle speed.

Woodworker's Journal will award a free tool each issue to a reader whose letter and woodworking project appear on this page. To become eligible for future tool drawings, send us a good, clear photo and a description of a Woodworker's Journal project that you have made. If your letter and photo appear in the magazine, your name will automatically be entered into that issue's drawing.

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By Ron Bishop

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PRODUCT NEWS

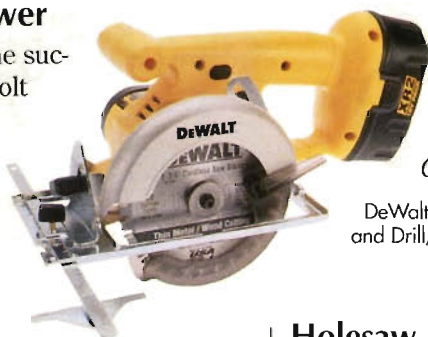


DeWalt Boosts Cordless Power

Building on the success of its 14.4-volt cordless tools, DeWalt just announced the development of a new 18-volt cordless power system. The first products to feature the new power will be a 5 $\frac{3}{8}$ " cordless circular saw (DK936K) and the $\frac{1}{2}$ " mid-handle drill/driver (DK995K), both to be released in June. Two drill/hammerdrill versions (DK997K, DK998K) will be available later this summer.

Powering the system will be the firm's new 18-volt XR Pack™ battery and matching charger. The batteries recharge in one hour and reportedly provide 70 percent more run-time than standard 12-volt batteries. Fully charged, the drill/drivers produce 330 in./lbs. of torque, enabling them to take care of many tasks that now require a $\frac{1}{2}$ " corded drill. The 18-volt saw reportedly can cut up to 125 2x4s on a single charge.

The drills feature dual speed ranges (0 to 450 rpm and 0 to 1400 rpm), an adjustable clutch torque control, fan-cooled motors with replaceable brushes, and soft comfort grips. They weigh in at 5.6 pounds each.



DeWalt's 18-volt Cordless Saw (left) and Drill/Driver (top left)

The new saw incorporates an adjustable (50° bevel) sole plate with built-in rip fence, a spindle lock, and a 3200-rpm fan-cooled motor with replaceable brushes.

The firm will offer both tools in kit form, which includes one battery, a 1-hour charger, a carrying case, and

a double-ended driver bit with the drill or 24-tooth blade with the saw.

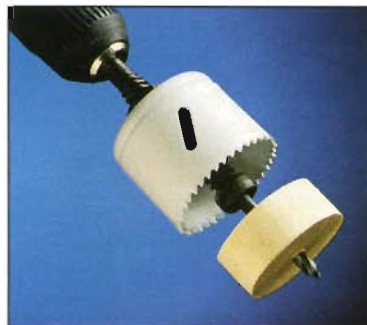
DeWalt Industrial Tool Co., 800/433-9258

Holesaw Automatically Ejects Plug

If you've used a holesaw very much, you know how frustrating it can be trying to remove the plug from the saw. Now, a new arbor system designed by Vermont American solves this problem—it automatically ejects the plug when you reverse the drill with the saw wedged in the hole. There's no need to knock or dig the plug out of the saw.

You can buy the universal Plug-out™ arbors individually or in kits. Arbor kits no. 18412 for small ($\frac{3}{4}$ to 1 $\frac{3}{16}$ ") saws and no. 18408 for large (1 $\frac{1}{4}$ to 6") saws retail for about \$18. A third kit, no. 18405, attaches to hole saw backs for high-torque sawing. It will sell for about \$28. Available at hardware stores, home-supply centers, and similar outlets.

Vermont American Tool Co., 704/736-8020



Vermont American's Plug-Out Holesaw Arbor

HVLP Spray Guns With A Light Trigger

The new Maximum Performer series of HVLP spray guns from ITW DeVilbiss will spray any finishing product from low-VOC enamels and polyurethanes to waterborne topcoats. Three of the four models shown—the standard-sized gun, a lighter-weight mid-sized model, and the detail/touch-up gun—will fit most wood-finishing applications. All guns



DeVilbiss Maximum Performer HVLP Spray Guns reportedly meet legislated VOC requirements for HVLP performance.

The new guns feature the firm's GoldMax™ air caps, special fluid tip, and needle and baffle combinations, which enable them to handle more than 90% of all available products. The guns have stainless steel fluid passages to resist corrosion, forged aluminum bodies for strength and less weight, feather-light trigger action, and knurled knobs for easy adjustment.

ITW DeVilbiss, 800/338-4448



QUIKWOOD by Polymeric Systems

Epoxy Putty Repairs Wood

Hand-mixable QUIKWOOD offers a new method for fast, convenient molding and repair of wooden parts. Available from Polymeric Systems, Inc., this polymer compound molds like clay and can be sculpted with a wet finger or tool. It also works as an adhesive for wood-to-wood or wood-to-metal bonding.

QUIKWOOD has an open working time of about 20 minutes, after which it cures to the hardness, density, and color of wood. It can then be drilled, sawed, sanded, carved, and painted without danger of chipping or shrinking.

You'll find the product sold in 7"-long sticks that contain pre-measured proportions of a curing agent (of contrasting color) molded within. To use, you cut or twist off a desired amount, then knead the material until it becomes uniform in color. Once cured, it is unaffected by weather, so it can be used indoors or out. The

firm claims the product to be safe, non-toxic, and solvent-free.

QUIKWOOD. For name of nearest dealer, telephone 800/228-5548

Dremel Power Engraver Fills Dual Role

Dremel's 290 engraver can be put to a multitude of uses—from adding decorative, personal touches to glass, stone, or ceramics to marking tools, cameras, appliances, computers, compact discs, furniture, and other valuables.

The 290 has a five-position calibrated stroke-adjustment dial for regulating engraving depth, providing a choice of fine lines or deep grooves. The hard carbide steel point moves at 7,200 strokes per minute and will engrave just about any surface,

including steel, wood, plastic, glass, leather, ceramics, and other hard materials.

Dremel sells the engraver with a two-year warranty for about \$20 in hardware stores, home centers, and other tool dealers. *Dremel, 414/554-1390*

Dremel 290 Engraver

continued on page 12



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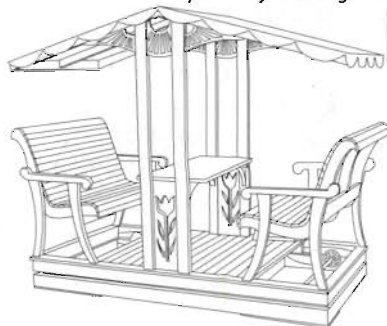
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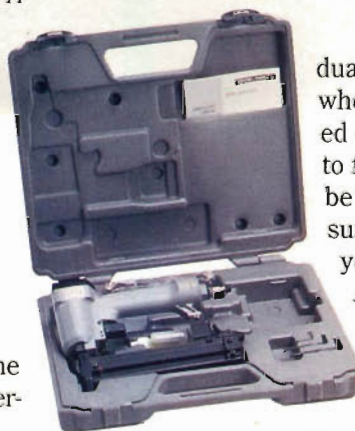
12 July/August 1995

Product News

Continued from page 11

New Air Nailers Open Fire

Woodworkers continue to find more wood-fastening jobs for lightweight air nailers around the woodshop. Porter-Cable recently introduced two new brad nailers that fit the bill quite nicely.



Porter-Cable's BN125 Air Nailer

Model BN125 fires 18-gauge brads, ranging from 5/8" to 1 1/4" long, and weighs only 2 lbs. 11 oz. Model BN200 accepts 3/4" to 2" 18-gauge brads and weighs 3 lbs. 6 oz. Both models feature die-cast aluminum bodies, anodized aluminum magazines that hold up to 100 brads, and a hinged quick-release lever for fast jam clearing. You'll also find a load indicator that shows when nails are low.

The firm offers 1,000- and 5,000-quantity packages of the most commonly used fasteners. Maintenance kits will also be available for servicing normal wear-and-tear parts.

The nailers come with carrying case, one pack of brad nails, a 1/4" NPT male quick coupler, a pair of safety glasses, air-tool oil, two wrenches, and an owner's manual.

Porter-Cable, 800/487-8665

Ryobi Offers 2HP Router

Expected to retail at less than \$130, Ryobi claims its new 2-hp router will be the least expensive full-featured 1/2"-collet router available.

The new model R180 features a built-in work light, a shaft lock for easy bit changing, a solid die-cast metal "D"-base, an operating speed of 25,000 rpm, and a



Ryobi Model R180 router comes with a 2-hp motor, 1/4" and 1/2" collets

dual scale that is clearly visible whether the unit is table-mounted or used freehand. According to firm officials, the router will be available in home centers this summer, probably by the time you read this.

Ryobi, 800/525-2579

Bosch Offering 15-Minute Charger

Bosch now offers a charger that will recharge the batteries of its 12-volt cordless T-handle drill/driver within 15 minutes without overcharge-



Fuzzy Logic Battery Charger for Bosch Cordless Drill/Drivers

ing. Dubbed the Fuzzy Logic Charger, the new unit comes packaged in a kit (model B2310K:10) along with a matching drill/driver.

According to the firm, the new charger's circuitry senses the battery voltage, temperature, and charge status, then selects the best charge current to safely charge the battery. It will not overcharge the battery or produce a "recharge memory" problem.

The Bosch 12-volt cordless drill/driver generates 225 in./lbs. of torque in two speed ranges—0 to 400 rpm and 0 to 1200 rpm. It also incorporates a 16-position clutch, a 3/8" keyless chuck, and brushes that never require replacement.

S-B Power Tool Company, 312/286-7330

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I've recently acquired a 36" Sears Dunlap wood lathe. I'd like to find an owner's manual and any other information on this tool.

James Roben

325 Russell

Mountain Home, AR 72653

501/425-6869

Anyone with plans for a wood-frame market/beach umbrella, please write or call:

Jim Natrass

1166 Phyllis Court

Mountain View, CA 94040

415/969-0639

I need a new pinion spring and case for a Duracraft drill press, model no. 40830. I wrote Gateway Resources, Inc., of Northridge, California, but my letter was returned. They seem to have moved or gone out of business.

Arthur Krier

223 N. 69th St.

Milwaukee, WI 53213-3825

I have a Duro 8" tablesaw, model FFG3013, serial no. 753081, made by Duro Metal Products, 2651 N. Kildare Ave., Chicago, Ill. I purchased

it in the mid-1950s. Now, I'm looking for a table insert (no. L-3012-5-2) as I had an accident and damaged mine. I've written to the company at that address, but my letter was returned. I would appreciate any information on getting a replacement as my saw is still like new.

Robert L. Nielsen

526 W. Main

Madelia, MN 56062

507/642-8557

I'm looking for small brass handles to use on serving trays. Does anyone know of a source for these?

Gary Brownson

150 Illinois Dr.

Jacksonville, AR 72076

501/988-1182

Help! I'm looking for a small-scale "velocipede" (pedal-powered scrollsaw). Desired size is 10-16" in height. It does not have to be workable. Please contact me with any information you might have.

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Shoptest Update: Exact Cuts Alignment Kit

In our review of Exact Cuts Tool Company's table- and radial-saw alignment kit (March/April '96), we pointed out a couple of changes that we felt would improve the "A"-Justable Square included in the kit. Company reps told us they were addressing our concerns and that a newly designed "A"-Justable Square would be available shortly.

We just received the redesigned square. The molds used to make the two sections of the square have been changed, creating a slightly beefier section on each leg. This should serve to hold the leg straight throughout its entire length.

The indicator on the top section of the tool is much easier to read and adjust precisely. Also, the degree markings on the bottom section have been improved. In addition, Exact Cuts has replaced the round pivot point on the two legs with a square insert. This should prevent any slop from developing in the joint due to use and wear.

We now feel that a useful tool just got better. The complete kit sells for \$59.95 and is now well worth the cost. You can order it from Exact Cuts Tool Co., Inc., P.O. Box 268, 5306 Boy Scout Rd., Florence, OR 97439. Telephone: 800/623-7411.

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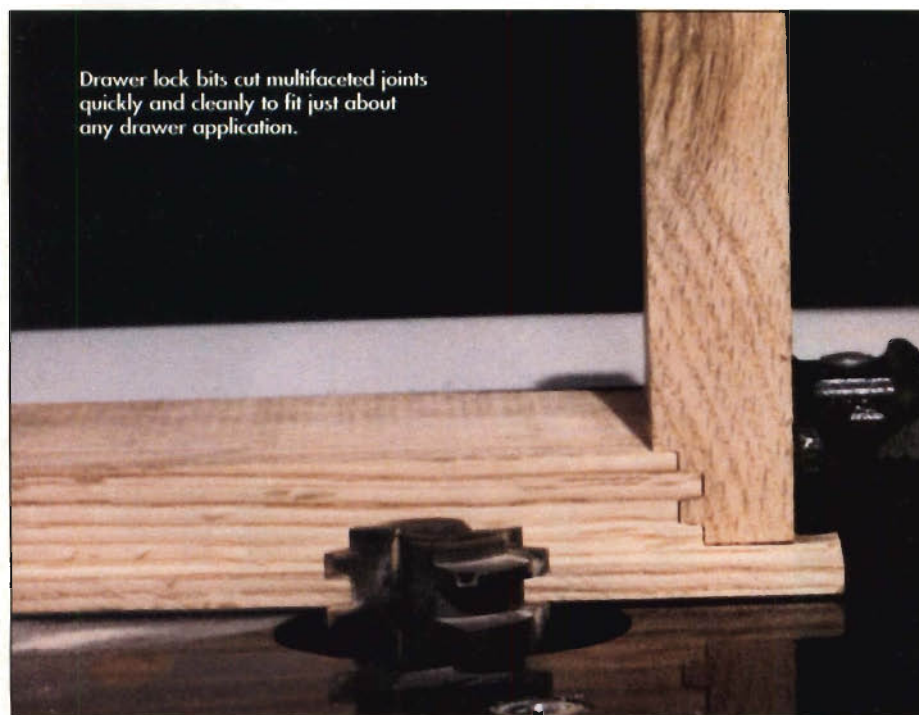
Ryobi's new Multi-Tool™ delivers more power than any other

brand of rotary tool. When others bog down, this tool hangs tough. The Multi-Tool includes more bits, plus a carrying case. Yet it costs less. So for more power – and value – pick Ryobi.

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The Drawer Lock Bit

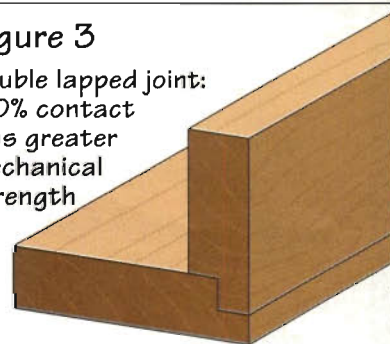
An easier approach to cutting strong drawer joints *by Rob Cook*



Drawer lock bits cut multifaceted joints quickly and cleanly to fit just about any drawer application.

Figure 3

Double lapped joint:
150% contact
plus greater
mechanical
strength



offered the same contact area as the lapped joint but enhanced its mechanical strength considerably.

The Drawer Lock Bit: More Facets, Less Work

The logic goes something like this: A glue joint will generally be stronger than the wood surrounding it (joints in oily woods excepted). Also, the greater the contact area, the larger the gluing surface, and therefore the stronger the joint.

Another and maybe more important factor that affects joint strength is the number of facets in the joined surfaces. Consider the butt joint, for example, which has only one facet or contact sur-

face (figure 1). We generally consider it the weakest of all woodworking joints.

As tool-making evolved, furniture makers developed hand planes that enabled them to create increasingly complex joints. The rabbet plane, for example, made it fairly easy to form the lapped joint (figure 2). With its two-faceted configuration, it increased the contact area of the butt joint by 50 percent. The double-lapped joint (figure 3), which provided three facets,

Figure 1

Butt joint:
100% contact

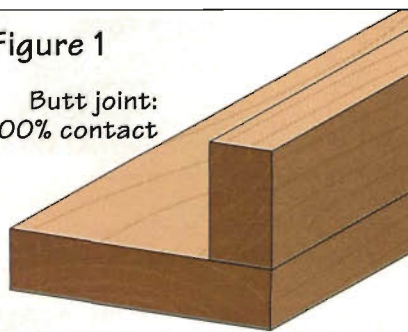
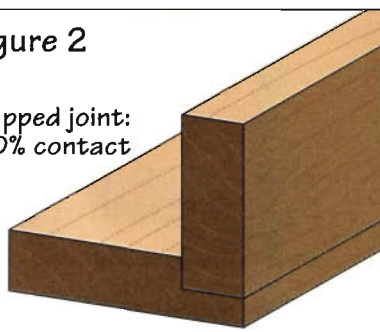


Figure 2

Lapped joint:
150% contact



Drawer lock bits currently come in two basic profiles and several sizes. Before I describe them, a word of caution: These bits must be used only with table-mounted routers. (For a list of manufacturers, see Sources at the end of the article.)

In their primary function as drawer joint cutters, Profile 1 bits (as I'll call them) create eight facets, increasing the contact area of the joint by roughly 200 percent over that of the lapped joints (figure 4). Profile 2 bits, with five facets, provide approximately 170 percent more contact (figure 5). In end-grain joinery, however, the real advantage

offered by both profiles is greater mechanical strength. The interlocking tongues and grooves also help align the parts during assembly.

Before you invest in one of these bits, note that both profiles have their limitations. To use the 1"-high bits, you'll need to make your drawer fronts at least 3/4" thick; for the 3/8" bits, make them at least 1/2" thick. For best results with both profiles, the drawer sides need to be 3/8" thick or thicker.

Accurate Bit Setup Is Critical

To rout the ends of the drawer front, lay the workpiece on the router table with its inside face down, so that it feeds into the bit as shown in *photos A and B*. To feed the drawer sides, stand them on end with their inside faces against the fence (*photos C and D*). One bit setting cuts both parts, but the bit must be adjusted to the correct height to ensure that the joint goes together properly. As the photos show, you'll need to use different fence settings for the front and sides.

The setup may require some tweaking to get the bit height properly adjusted, but the rest of the operation will be

pretty straightforward. Make several trial cuts to determine the proper depth of cut for the bit, then mark and save the best test piece to use as a gauge the next time you set up the bit.

I also measure the height of the bit above the table with an accurate calipers, then write the setting on the bit's shaft with an indelible pen. Either method will get me close enough the next time I set up that I'll need to make only one test cut and a very minor adjustment to arrive at the correct setting.

Drawer lock bits vary in size depending on the manufacturer and the profile. Bits over 1" in diameter require considerable power and torque to cut hardwoods. You can get by with a 1- or 1½-hp router, but a 2- or 3-hp unit will give you cleaner cuts.

For safe operation, run the larger-diameter bits at lower speeds. To do this, you'll need either a router with built-in variable speed or an auxiliary speed control. Also, with larger bits, select the 1/2"-shank versions whenever possible. They provide greater stability and make smoother cuts.

Continued on page 18



Photo A: Profile 1 bit cutting drawer front. Note that a rabbet must be cut around drawer face to the same depth as the joint. Make several passes, resetting fence to reach final depth.



Photo B: Profile 2 bit cutting drawer front. Use a backing board behind the part to minimize tearout and provide stability. Make several passes, resetting the fence to reach the required depth.



Photo C: To cut the drawer sides with a Profile 1 bit, stand the parts on end with the inside face against the fence. Use a backing board to minimize tearout and increase stability.

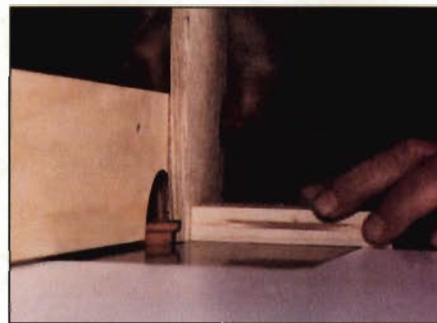


Photo D: Profile 2 bit cutting drawer side. When routing longer sides, use a tall fence, a longer backing board, and a feather board for better support of the workpieces.

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The Drawer Lock Bit

Continued from page 17

Edge-Join With These Bits, Too

Besides cutting sturdy drawer joints, the Profile 1 bits, with their symmetrical cutting surfaces, let you cut faceted joints in edge grain. As with the drawer joints, these enhance both the mechanical strength and gluing surface of edge-joined panels (*photo E*).

The thickness of stock that can be joined with Profile 1 bits depends on the cutter profile. You'll need to experiment with the individual bit to determine the



Photo E: Profile 1 bits will also cut edge joints that enhance the strength of edge-glued panels. For this purpose, adjust depth so bit centers on stock, then run one piece faceup, the next facedown.

Figure 4

Profile 1:
8 facets

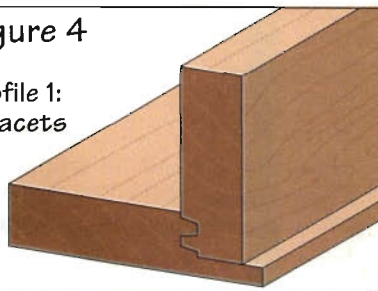
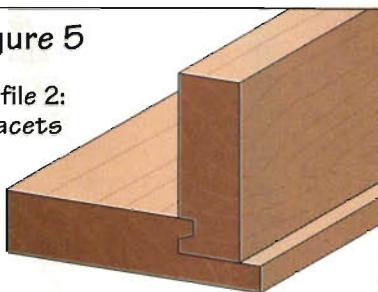


Figure 5

Profile 2:
5 facets



correct depth setting and maximum thickness you can rout. MLCS's $\frac{3}{4}$ " cutter, for example, works for $\frac{1}{2}$ "-thick stock. The $\frac{5}{8}$ " and 1" bits from Eagle America will join $\frac{7}{16}$ "- and $\frac{9}{16}$ "-thick stock respectively.

Profile 2 bits don't permit edge-joining. However, most manufacturers make other bits specifically designed for this task. **W**

SOURCES

Amana Tools
800/445-0077
Profile 2

Cascade Tools
800/235-0272
Profile 1

CMT
800/531-5559
Profile 2

Eagle America
800/872-2511
Profiles 1 and 2

Freud (Woodworker's Supply)
800/645-9292
Profile 2

MLCS
800/533-9298
Profile 1



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Edging Plywood

10 Ways To Improve Plywood's Image

by Bob Colpetzer

Hardwood plywoods and other manufactured sheet goods bring a number of advantages to fine cabinet and furniture construction. But, as we learn to utilize them, a serious problem remains: how to deal with the exposed, unfinished edges?

Edge-Banding: Simplest and Fastest

Without question, you'll find edge-banding the easiest and quickest way to cover the raw edges of sheet goods. You simply attach a thin strip of hardwood veneer that matches the plywood's veneer. Since it's made of actual hardwood, you can sand, stain, and finish the edge band just like the plywood.

You can buy veneer tapes made specifically for edging in widths of $\frac{1}{16}$ " to 2" and in lengths as short as 8' for those of us with limited needs on up to 25, 50, and even 250'. You'll find them offered with three different backings: self-adhesive, heat-activated adhesive, and plain-backed (*photo A*).

Fortunately, woodworkers have developed some cunning techniques for hiding the plywood edge. In this article, I'll show you a number of them. As you read on, evaluate each one in terms of how well it might work on your upcoming projects.

I find the self-adhesive edging easiest of the three to apply. You peel off the paper backing to expose the adhesive, position the banding, and press it in place (*photo B*). Running a veneer roller or the blunted corner of a wood scrap along the tape applies enough pressure to ensure good adhesion.

The quality of the adhesive used on the tapes varies with the manufacturer, although all of the brands I've tried have adhered quite adequately. Self-adhesive edge-banding does cost a bit more than the others, but with its ease of application, I consider it a good value.

To apply heat-activated edge-banding, first position the tape on the plywood edge, then heat it using a special banding iron. For small jobs, a



Photo B: To apply self-adhesive tape, peel off the protective paper backing and press the tape into position.

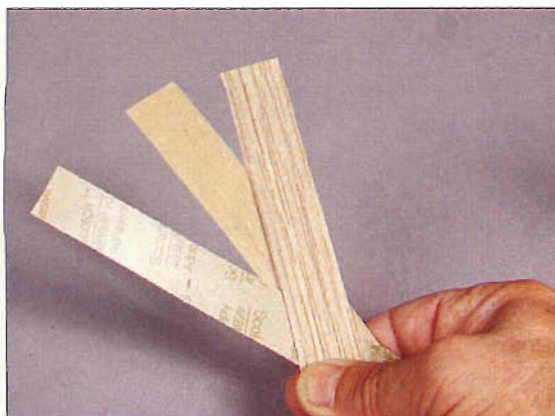


Photo A: Edge-banding tape comes with three different backings (l to r): self-adhesive, heat-activated adhesive, and plain.



Photo C: Tape with heat-activated backing requires heat to melt the adhesive. Here, author uses a household iron on high (cotton) setting.



Photo D: Use contact cement to adhere plain-backed tape. Author inserts small wooden strips to prevent contact between surfaces before positioning the tape.

household iron set to the hottest (or cotton) setting will work (*photo C*). In either case, hold the tape in place until the glue melts, then remove the heat and let the adhesive set.

Ironing the banding can be tricky because the hot adhesive gets slippery and the tape tends to slip out of position. An aggressive tug on the tape or too much drag on the iron may move the tape before the glue has set up. To prevent this, I heat the tape 3 or 4" in from the starting point and allow the adhesive in that area to set up first. Then, I stretch the remaining tape into position and iron it down as I work my way along the project's edge.

For good adhesion, press out any trapped air bubbles. To do this, roll the tape or rub it with a blunted scrap while the glue cools and sets up. If I find air bubbles or loose spots, I'll simply heat the spot again to reactivate the glue, then roll it tight. Work a section at a time, and go back over it to remove any bubbles before going on to the next section.

A word of caution: As you iron veneer tape, be careful not to scorch the wood. It takes just a few seconds to melt the adhesive and achieve a good bond and only a few more seconds to scorch the tape. To test the materials, I apply a section of tape to a scrap of plywood first, checking the heat setting and timing so I'll know how fast I can safely work.

Plain-backed tape costs less initially, but it also requires the most work to apply. You can use standard wood-

working glue and simply clamp the banding in place, but I find this impractical for many projects because of the time and elaborate clamping techniques involved.

I prefer to use contact cement to adhere plain-backed edging. As with other contact cement applications, you apply the adhesive to both surfaces. After the cement has dried to the correct consistency, bring the two surfaces

together for an instant bond. But beware: you won't get a second chance to position the tape. When working with contact cement, I place small wooden strips at intervals along the



Photo E: Roll the banding with a veneer roller to remove air bubbles and ensure good contact between tape and edge.

plywood edge to keep the banding from contacting it (*photo D*).

After aligning the tape with the plywood edge, I start at an end and remove the wooden strips one by one, pressing the two surfaces into contact as I go. After I've removed all strips and pressed the banding into place, I roll it with a veneer roller to ensure good contact and adhesion between the two surfaces (*photo E*).

Some plywoods and particleboards will absorb most of the contact cement and leave it short of adhesive. To overcome this problem, apply a first coat to the edge, allow it to dry, then apply a second coat and wait until it dries to the touch before applying the banding.

Always use fresh contact cement. I've found that if a can has been sitting on the shelf for some time, its contents may be too thick to spread smoothly. The adhesive will ball up, leaving you with a sloppy fit and a lumpy edge.

Trim the Ends and Edges

To trim the ends of your banding, stand the panel on edge on a flat piece of scrap (it serves as a cutting board). Using a sharp utility knife or single-edge razor blade, trim the overlapping end of the tape flush with the plywood (*photo F*). Most tapes will cut cleanly across the grain.

To trim the edges, use one of the following: a sharp utility knife (or single-edged razor blade); a router and flush-trim bit; or a special edge-banding trimmer.

If you're using a utility knife or razor blade, lay the panel flat on the bench. Shave the excess banding as close to the plywood face as possible, angling the blade to direct the cutting force toward the plywood.

Before you cut, try to "read" the grain direction in the tape, then cut with the grain where possible. With difficult grain, you may need to cut from both directions to avoid splitting or tearing the tape. Then, very lightly sand the banding flush with the face of the plywood.

To use a router and flush-trim bit, first trim the ends with a utility knife as described earlier. Then, clamp the panel vertically in a vise. If you're trimming a large panel, secure the end with a bench slave. Next, prepare a 2x4 support and clamp it to the face



Photo F: Trim the end of the banding with a sharp utility knife. Tape will cut cleanly across the grain.

Tips For Successful Edge-Banding

- 1** Prepare a flat, smooth, and clean plywood edge. However, don't sand or joint plywood edges.
- 2** Don't be stingy with the tape. Cut the piece long enough to overhang each end by at least $\frac{1}{2}$ ".
- 3** Plan ahead. Lay out the work so that the most prominent or visible edge will be the last one banded.
- 4** Have all materials and tools on hand before you start.
- 5** Trim the banding carefully. Avoid chipping the band or cutting into the panel face.



Photo G: Trim the edges of the banding flush with the panel's faces. Here author uses a single-edged trimmer.

opposite the face along which the router bearing will track. (See the Pro Tip *opposite* for details.)

Check the grain direction of the tape, then rout. You may have to "climb-feed" the router (move the router in a clockwise direction in relation to the panel edge) to minimize grain tear-out.

You can also acquire trim tools made just for this purpose; they work like a small plane (*photo G*). Manufacturers offer both single- and double-edged models, allowing you to trim one edge at a time or both edges simultaneously.

I prefer the single-edged variety, which lets me read the banding's grain and trim in whichever direction works best for it. I've found that these

tools don't work well where I've used contact cement. In these situations, I'll flush-trim with the router.

Solid Hardwood Edging

Although edge-banding with tape will hide raw edges quickly and easily, it doesn't leave you the option of profiling the edge or radiusing the corners. In addition, some projects will require a more substantial or durable edge than tape provides. Solid-wood edgings answer these needs. They can be molded into almost any configuration to match your project and will also stand up to heavy use.

You can make solid edgings or "nosings" from $\frac{1}{4}$ to $\frac{1}{2}$ " wide. (See several variations in *figure 1a* and *photo H*.) Plane your stock for the nosing slightly thicker than the plywood to be edged. Adhere it to the edge with woodworker's glue, orienting it so that the nosing's face grain corresponds to that of the plywood.

Taking the time to match the color and grain of the nosing to the plywood's veneer ensures a more natural-looking edge. During glue-up, I use clamp pads over the nosing to reduce the number of clamps needed and to distribute the pressure more evenly. After the glue has dried, you can trim the nosing flush with the panel faces and radius the corners if you wish without exposing the plywood's edge.

You can buy square or shaped edging stock, which comes with a $\frac{1}{4}$ " pre-cut tongue (*figure 1b*). You must cut a mating groove into the panel edge to attach it.

On door edges that require butt hinges, a nosing provides solid stock



Photo H: Nosings made of $\frac{1}{4}$ " or $\frac{1}{2}$ "-wide hardwood strips make durable edges. Shape them before or after application.

Figure 1a

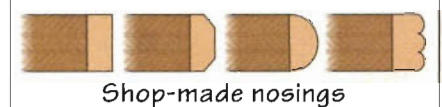


Figure 1b



for the hinge gains. I dislike cutting hinge gains into plywood edges, not to mention that hinge screws hold much better in solid wood.

I have my own favorite method, which produces a mitered edging (*figure 2*). I like it because it looks like edge-banding but has some of the best attributes of hardwood nosing. Depending on where you trim it after glue-up, you can cut a reasonable radius without exposing the plywood. Since mitered edging extends into the plywood, it provides additional glue surface and won't chip or peel.

To make the bevel cuts to form a V-groove for mitered edging, I tilt the saw blade to 45° and then make two

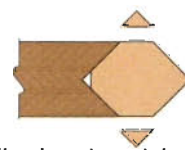
Figure 2



Step 1: Saw, rout, or shape a V-groove in the plywood.



Step 2: Glue a $\frac{3}{4}$ "-square hardwood strip in the V-groove.



Step 3: Flush-trim with router, plane, or sand hardwood flush to the plywood face.



Step 4: Rip excess hardwood from edge. Leave sufficient shoulder to radius as needed.

PRO TIP

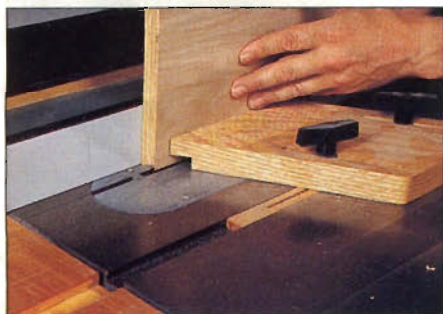


Photo I: For mitered edging, bevel-cut a centered 45° V-groove into the edge of the panel to accept a square hardwood blank.

cutting passes with the panel standing on edge. A feather board on the table-saw helps hold the panel vertical and tight against the rip fence (*photo I*). After you've cut the V-grooves, handle the panel carefully to protect the fragile edges.

As an alternative, mount a V-groove cutter on your table-mounted router, shaper, or tablesaw molding head and cut the V in one pass. Just make sure to center the cut in the edge and extend the angles to the face of the plywood veneer.

To make mitered-edging blanks for 3/4"-thick panels, joint one edge of a length of stock, then rip a 3/4"-square strip from it. Break the sharp edge of the strip that will go into the bottom of the V-groove to prevent it from bottoming out.

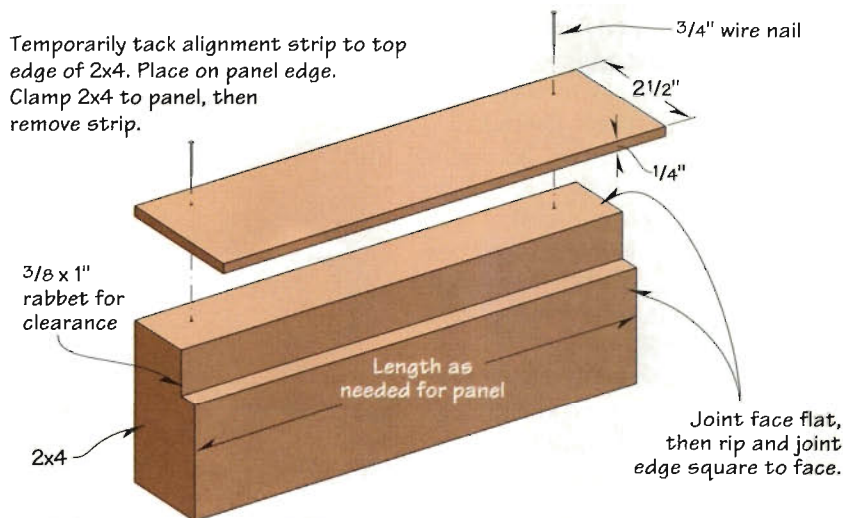
Apply glue to the V-groove surfaces, then clamp the square into the groove (*photo J*). After the glue has dried, trim the hardwood flush to the plywood faces on both sides using your router and a flush-trim bit (*photo K*). Rip the remaining waste from the hardwood, leaving about 1/16" of extra edging so you can joint the saw marks from the ripped edge (*photo L*). Save the waste rip strip—you may be able to use it for another edge.

When using a router and piloted flush-trim bit to trim edging, you need to provide adequate support surface for the router. To do this, prepare a length of 2x4 as shown in the drawing *below*, then align its top edge with the panel edge. To make this alignment easier, temporarily tack a plywood strip to the top edge of the 2x4, then place the 2x4 against the panel. Once you've aligned the two edges, clamp the 2x4 to the panel, then remove the alignment strip.



For quick, easy alignment of 2x4 router support with workpiece, tack a piece of 1/4" plywood to top edge of 2x4; align and clamp 2x4, then remove plywood strip before flush-trimming.

Router base support for flush-trimming edges



To edge all four sides of a panel, cut identical V-grooves into all panel edges, and prepare the hardwood blanks. Next, miter the blank ends to join them at the panel corners (*photo M*). Once you've fitted them, apply glue, slide the corners together, and clamp. Note: To cut the mitered ends at the correct

angle for joining, I hold the stock in a small V-block (*photo N*).

For special designs or visual effect, you may want to apply wide edgings (*figure 3* and *photo O*). I mitered the hardwood edging on the ends and attached them to the four edges of a panel to make the end cabinet top



Photo J: Trim a corner of the hardwood blank to keep it from bottoming out, then glue and clamp the square into the V-groove.



Photo K: Using a router and a piloted flush-trim bit, trim the hardwood edging flush with the plywood panel faces.

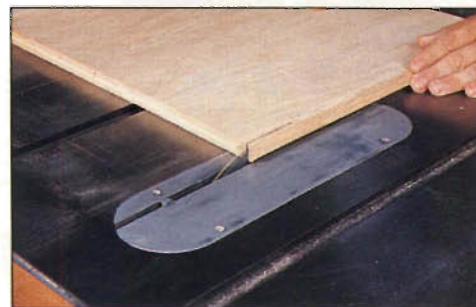


Photo L: Use the tablesaw to square the mitered edging. Note: Saw guard removed for photo clarity.

Figure 3

Vary width depending on needs and design

**Solid wood edging**

V-groove may be cut next to glue line if desired

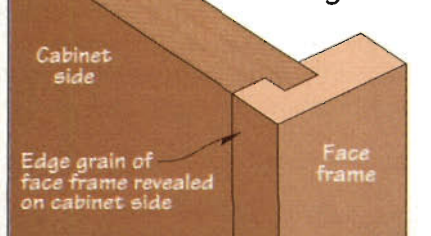
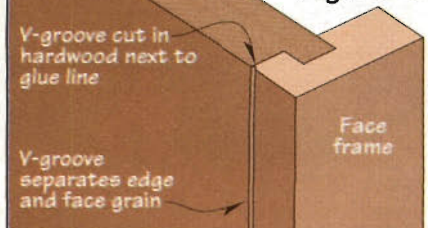
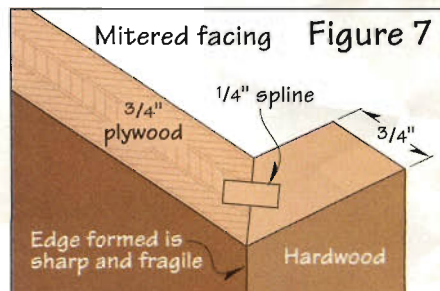
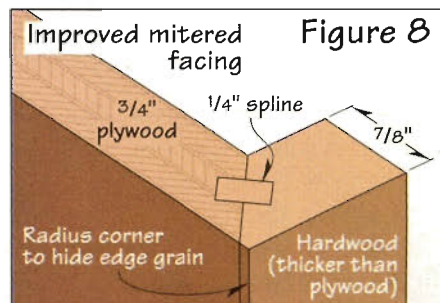
Figure 4

Two ways to attach thicker hardwood to make the panel appear thicker

(photo P). I used a veining bit to form a shallow groove at the glue joint, which created a framed effect.

Edging a panel with thicker stock can make the whole panel look thicker. For wider or thicker edgings, you need to use a tongue-and-groove, spline, or similar joint to attach them to the panel (figures 3, 4 and photo Q). This not only provides more glue surface but aligns the edging flush with the face of the plywood, which becomes critical with thin-veneered plywoods that won't permit much sanding.

On plywood cabinets, I often add a face frame that also serves as edging for the sides (figure 5). To do this, I cut a tongue along the plywood edge that fits into a groove in the hardwood edging. Cutting a V-groove or vein along the glue line between the plywood and hardwood adds a detail that helps to visually separate the edge grain of the frame from the face grain of the plywood panel (figure 6 and photo R).

Figure 5**Figure 6****Photo M:** Miter the ends of the hardwood squares, test-fitting them as you work.**Photo N:** To miter the ends, author uses a small V-block to hold the edging at the correct angle.**Photo O:** For special designs or visual effect, apply wide edgings to panels.**Photo P:** Wide edging with mitered ends enhanced by small groove at the glue joint produces a framed effect on this cabinet top.**Photo Q:** Applying thicker edging increases perceived thickness of the plywood panel.**Figure 7****Figure 8**

A Quick Word About Plastic T-Molding

Although you won't normally use T-molding on hardwood plywood edges, you'll often see it used on sheet goods coated with plastic laminates or on melamine. Made from durable plastic, it makes an excellent edge for panels that sustain heavy use and wear.

To install T-molding, you first rout a $\frac{1}{16}$ "-wide slot along the center of the panel's edge. Then, press the molding's barbed tongue into the slot. With its great flexibility, T-molding installs easily around radiused corners. To install it on square corners, cut a 45° notch on the tongue at the point where the molding starts to bend around the corner. Use a soft-faced mallet to set the tongue. After you've installed the molding, use a sharp utility knife to trim any excess along the edges.

**Photo R:** For plastic T-moldings, cut a $\frac{1}{16}$ " slot along the panel edge, then press barbed tongue on molding into the slot.

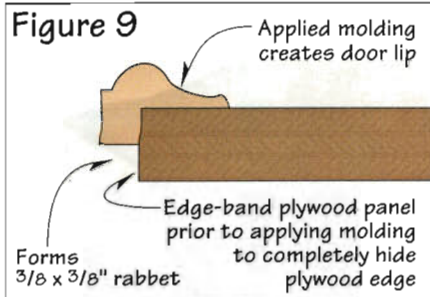


Photo R: Hardwood edgings applied to cabinet sides form a face frame that also conceals plywood edges. Both a square and a radius corner are shown here.



Photo S: On a conventional mitered corner (left), hardwood face frame hides edge of plywood but offers little protection to mitered plywood corner. Thicker face frame stock (right) provides square hardwood corner that protects plywood edge.



Photo T: Commercial moldings, available in various styles and woods, have a 3/4" rabbet that forms a 3/8" lip when glued to edge of 3/4" plywood.



Photo U: To avoid clamping difficulties with shop-made molded edging, author suggests attaching the edging to the panel first, then molding it to shape.

Figure 10



Shop-made applied moldings

Mitering the joints completely hides the edge grain of a facing (figure 7). However, I've found the edge of this joint to be somewhat fragile, and I don't recommend it for corners that will receive a lot of wear and tear.

The improved miter joint shown in figure 8 protects the corner more effectively because there's no plywood exposed at the corner. Note that you need to make the hardwood stock slightly thicker than the plywood. This way, when you cut the width of the miters to match, the hardwood forms the corner. Once you've joined the facing to the plywood, you can radius this corner, and any small reveal of end grain will go unnoticed, even when viewed from the side of the cabinet (photo S).

Applied Moldings

Whether you purchase factory-made or use your own shop-made, you can apply variously shaped and sized moldings to a plywood edge. Commercially machined molding stock comes with a rabbeted edge (photo T). Applied to a door panel, it forms a 3/8" lip without any more machining (figure 9).

You can shape your shop-made moldings first, then attach them to a panel (figure 10 and photo U). However, with difficult-to-clamp profiles, I usually find it easier to attach the blanks to the edge first and then shape them.

The variety of edge designs you can make in your shop is limited only by the router bits or shaper cutters you have available. As the illustrations and photos have shown, I generally try to keep the top shoulder on my shop-made moldings fairly minimal. This helps make the molding look more like an integral part of the plywood. 

Photographs: The author

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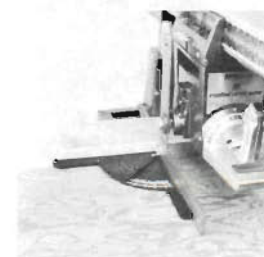
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When we asked resident craftsman Dick Coers to design and build a "fancy" toolbox for our 20th anniversary festivities, he rose to this special occasion. For his one-of-a-kind, furniture-quality piece, Dick started with a general theme he'd seen and admired on a dining-room breakfront designed by Frank Lloyd Wright. He built the case from distinctive bird's-eye maple plywood (a lucky find), trimming it with cherry and walnut. "A box like this will speak volumes," says Dick, "about your desire to step up to a complex project and about your interest in giving fine tools the respect they deserve."

Before You Start

Dick joined this case with biscuits, using them generously to ensure a sturdy structure. He cut the plywood case parts slightly undersized, edge-banded most of them with $\frac{1}{8} \times 1\frac{3}{16}$ " cherry strips, then cut them to final dimension. The lid and base are edged with cherry moldings. Note that the Bill of Materials lists finished (edged, banded) dimensions for all parts. Please read the text carefully—that's where you'll find initial dimensions for the case parts.

Build the Drawers First

Step 1. Resaw, joint, and plane roughsawn $\frac{1}{4}$ " cherry stock to two $\frac{3}{16}$ " thicknesses. Then, rip 30 linear feet of this material to $3\frac{1}{4}$ " wide. Note: To book-match the drawer fronts, lay out

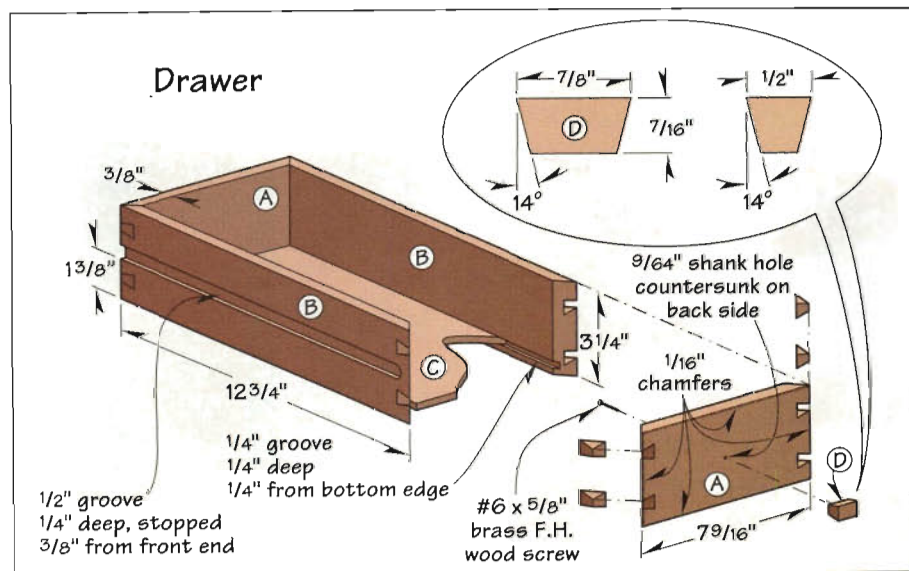
and cut them in sequence from the resawn halves of a single board and mark them in order.

Step 2. Using your tablesaw, cut a groove along one face of this stock $\frac{1}{4}$ " from one edge to accept the bottom

panel. (See the Drawer drawing below left.) Next, miter-cut 16 fronts/back (A) and 16 sides (B) to the lengths listed in the Bill of Materials. From $\frac{1}{4}$ " plywood, cut eight drawer bottoms (C) to dimension.

Step 3. Find the center of one drawer front by drawing faint diagonal lines on the back face. Drill and countersink a $\frac{9}{64}$ " shank hole through it at this point. Using a fence and stop on your drill press, drill a centered hole through the remaining fronts.

Step 4. Arrange the fronts, backs, and sides to make up eight drawers.



BILL OF MATERIALS

DRAWERS

PART	T	W	L	MTL.	QTY.
A Fronts/back	$\frac{3}{8}$ "	$3\frac{1}{4}$ "	$7\frac{9}{16}$ "	C	16
B Sides	$\frac{3}{8}$ "	$3\frac{1}{4}$ "	$12\frac{3}{4}$ "	C	16
C Bottoms	$\frac{1}{4}$ "	$7\frac{3}{16}$ "	$12\frac{3}{8}$ "	HP	8
D Pulls**	$\frac{7}{16}$ "	$\frac{1}{2}$ "	$\frac{7}{8}$ "	W	9

CASE

E Sides* **	$\frac{3}{4}$ "	$13\frac{5}{8}$ "	$16\frac{9}{16}$ "	HP	2
F Lid*	$\frac{3}{4}$ "	$18\frac{1}{8}$ "	$30\frac{3}{4}$ "	HP	1
G Base*	$\frac{3}{4}$ "	$14\frac{13}{16}$ "	$29\frac{9}{16}$ "	HP	1
H Dividers*	$\frac{3}{4}$ "	15"	$16\frac{9}{16}$ "	HP	2
I Back **	$\frac{3}{4}$ "	$16\frac{1}{2}$ "	$27\frac{15}{16}$ "	HP	1
J Front panel—center* **	$\frac{3}{4}$ "	$3\frac{1}{4}$ "	$10\frac{7}{8}$ "	HP	1
K Front panels—outer* **	$\frac{3}{4}$ "	$3\frac{1}{4}$ "	$8\frac{3}{8}$ "	HP	2
L Tray bottom**	$\frac{3}{4}$ "	$14\frac{1}{4}$ "	$26\frac{15}{16}$ "	HP	1
M Runners**	$\frac{1}{2}$ "	$13\frac{1}{32}$ "	$12\frac{1}{2}$ "	H	16
N Door*	$\frac{3}{4}$ "	10"	$13\frac{3}{16}$ "	HP	1

*Parts cut smaller initially, then edged with cherry to these finished dimensions. Please read all instructions before cutting.

**Parts cut to final size during construction.

MATERIALS LIST

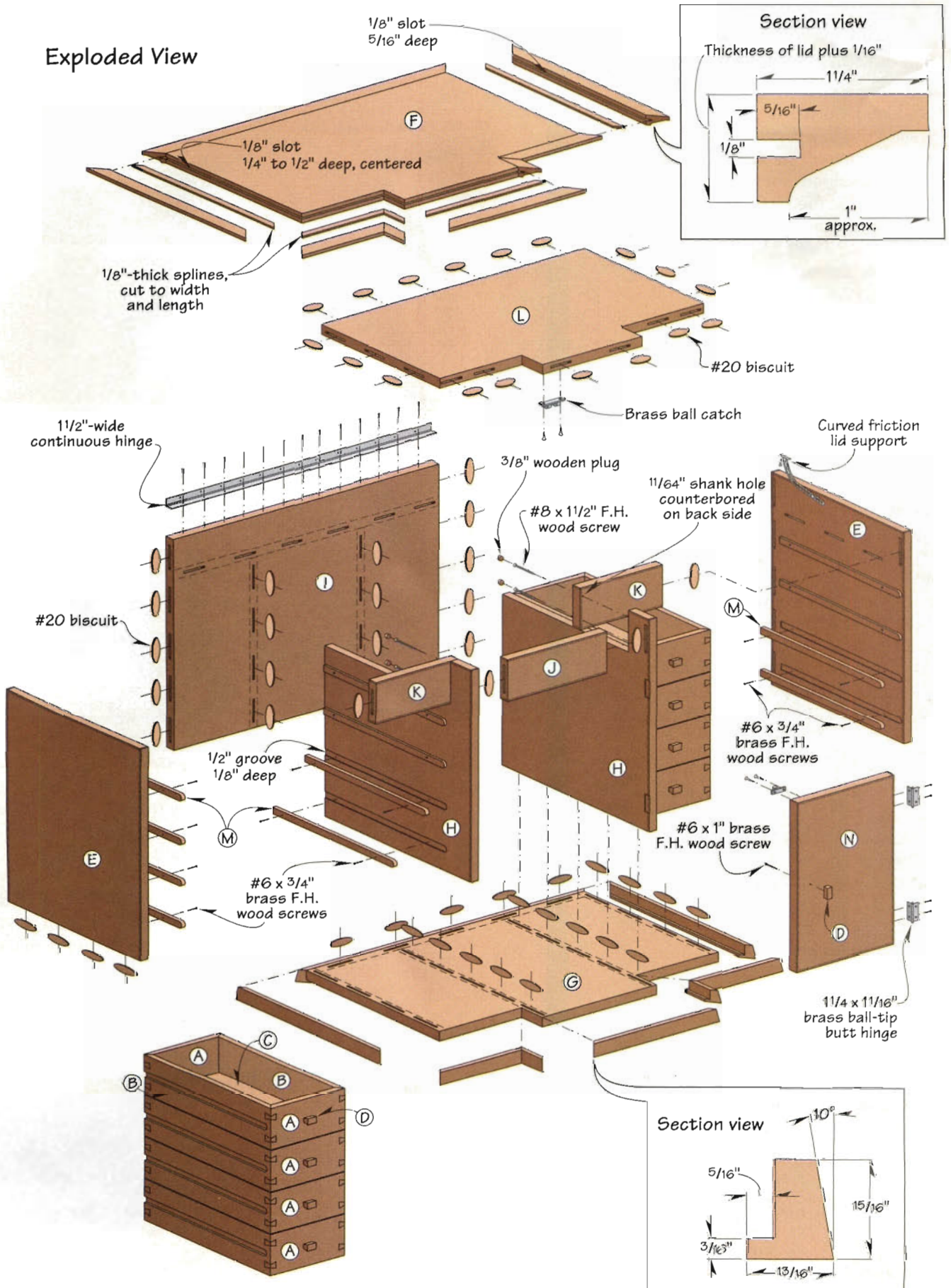
C—cherry
HP—hardwood plywood
W—walnut
H—hardwood

SUPPLIES

#6x $\frac{5}{8}$ ", $\frac{3}{4}$ ", 1" brass flathead wood screws; #8x1 $\frac{1}{2}$ " flathead wood screws; #20 biscuits; semi-gloss lacquer. (For other supplies, see Sources at end of article.)

WIN
THIS TOOL CHEST!
See Page 80
for Details

Exploded View



Lay the parts inside face down in front-side-back-side order. Position the ends firmly against each other and tape them end to end. Next, turn over each drawer, apply glue to the mitered ends and grooves, and assemble the taped parts around a bottom. Pull the last joint tight and tape it. Then, clamp each drawer with a bandclamp, check it for square, and allow the glue to dry.

Step 5. Fit your table-mounted router with a 14° 1/2" dovetail bit, and set it to cut 3/8" deep. Next, make a jig that will stand the drawer on its corner at a 45° angle. Set a fence 13/16" from the center of the bit. Place the drawer in the jig and rout a slot in each corner of every drawer. Flip each drawer, then rout a second set of corner slots centered 13/16" from the opposite edge.

Step 6. To prepare blanks for the corner keys and pulls, joint and plane scrap lengths of maple and walnut to 9/16" thick. (For safety, don't work pieces less than 12" long.) From the maple, rip four 2"-wide pieces at least 12" long. (Use one piece for testing the setup.) Rip a 12" length of walnut to 2" wide as well.

Step 7. Elevate the bit to 1/2" and reset the fence. Then, rout the dovetail profile along both edges of just one face



Photo A: Note corner keys, pull, and runner groove on the bottom drawer. Dimensions allow 1/16" clearance on all sides of each drawer.

of each blank. (See figure 1.) To rout the opposite face, "sneak up" to final thickness, test-fitting the test piece in the drawer slots as you work. Since the glue will cause the keys to swell slightly, aim for a snug fit that does not require tapping in. Rout the walnut to the same profile.

Step 8. Rip the maple key blank in half, then crosscut 1"-long keys from it. Apply glue to the keys and insert them

into the slots on all drawers. After the glue has dried, bandsaw away most of the waste, then belt-sand the keys flush. (See photo A.)

Step 9. Rip the profiled edge of the walnut blank to 7/16" wide. (See the pull detail shown with the Drawer drawing.) Next, tilt your bandsaw table to 14° from square. Using a miter gauge with wooden extension, bevel-cut nine pulls (D) as dimensioned.

Step 10. Sand all pull surfaces, then very lightly break the edges. On the shorter face of each pull, lay out and drill a centered 3/32" pilot hole 1/4" deep.

Step 11. Switch to a 1/2" straight bit in your table-mounted router, and set it to cut 1/4" deep. Rout a groove in both drawer sides 13/8" from the bottom edge, stopping it 3/8" from the front of the drawer. (See the Pro Tip at right.)

Cut and Prepare the Main Case Parts

Step 1. For continuous grain, cut the sides and lid in side-lid-side sequence. From 3/4" hardwood plywood, cut the side blanks (E) to initial dimensions of 13 3/4" x 16 7/16", the lid (F) and base (G) blanks to 15 3/4" x 28 3/8", and two divider (H) blanks to 15" x 16 7/16". Mark the top end, front edge, and outside face on the sides for identification.

Step 2. Joint and plane cherry stock to 13/16" thick, then rip 15 linear feet of 1/8"-thick edge-banding from it. Edge-band the top end of each side, centering the band on the plywood edge. Flush-trim the edging, then trim both sides to 13 3/8" wide. Band the front and back edges of each side, overlapping the band on the top end. (See figure 2.) Trim the edgeband, then finish-sand the panels.

Step 3. Select and mark a top end, front edge, and outside face on the two dividers (H). Since most of the top end of the dividers will be cut out for the tray, band only the front 3" of each (figure 2). Flush-trim the band, then trim the front edge to 14 7/8" wide. Now, band this edge only, overlapping the top band.

Step 4. Measure the thickness of the (3/4") plywood you intend to use for the back. Subtract this actual thickness from the width of your sides. Then, lay out the notch on the two dividers as

PRO TIP

To cut the 1/2"-wide grooves in the drawer sides, remember that you must keep the same drawer edge against the fence for all cuts. (We always ran the drawer's bottom edge against the fence.) Since you feed the router bit right to left, this requires that one of the grooves be started with a plunge cut (in our setup, the right side).

To do this, first place the drawer on the router table and mark the stopline on the fence. Start the router and lower the drawer onto the bit, making the plunge cut somewhere just inside the stopline. Slowly back-feed the drawer to the stopline. Then, complete the cut by feeding from right to left. Use this same technique later to rout the grooves that seat the runners in the sides and dividers.

Figure 1 Routing stock for the corner keys

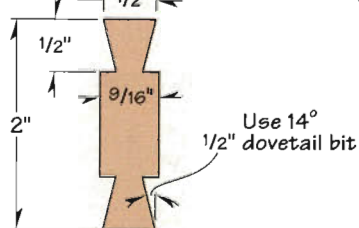


Figure 2 Front edge

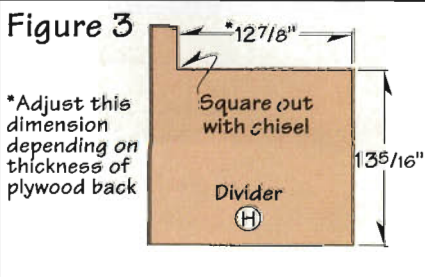
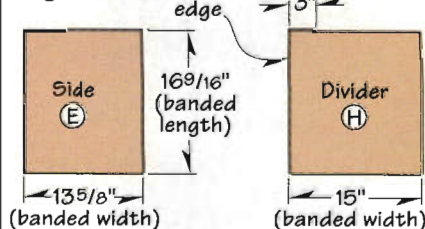




Photo B: Use a drawer and a $\frac{1}{8}$ "-thick spacer as a fence for the plate joiner.

dimensioned in *figure 3*, adjusting the $12\frac{7}{8}$ " notch width to reflect the result of any subtraction.

Step 5. Bandsaw outside the layout line to remove most of the notch waste on the two dividers. Then, clamp straight-edged boards along the line (or make a pattern) and flush-trim the notch on one of the dividers using a handheld router. Use the trimmed divider as a pattern to flush-trim the other divider. Square the routed notch corners using a broad, sharp chisel.

Step 6. Lay out and cut slots for four #20 biscuits in the mating surfaces of the base and each side. (See *figure 4* for the biscuit layout.) Next, lay out and cut five slots to join each divider to the base. (For layout, see *figure 5*.) To do this, first dry-assemble one side to the base using biscuits. Then, place a $\frac{1}{8}$ "-thick hardboard spacer and one of the drawers against the side to serve as a fence for the plate joiner (*photo B*).

Step 7. With the dividers and sides dry-assembled to the base, lay out the two cutouts along the base's front edge. To do this, trace a pencil line

along the outside edge of each divider. Then, using a square, scribe a line from each divider edge to the front edge of each side. (For reference, see the Top View drawing *opposite* and the Exploded View.)

Step 8. Disassemble the parts, then bandsaw the base cutouts to rough shape, keeping the blade outside the line. Next, reassemble the dividers to the base (again without glue). Flip the assembly upside down, and rest it on the notched divider surfaces (*photo C*). Clamp the two sides to the top face of the inverted base, aligning the ends and back edges. From scrap, cut a spacer to fill in the space between. With a router, flush-trim each base cutout, using the sides and dividers as your pattern.

Step 9. To shape the lid, clamp the lid blank you cut out earlier to the base. Then, rough-cut and flush-trim the lid to the same profile.

Prepare the Other Case Parts, Then Assemble

Step 1. Dry-assemble the sides to the base, then measure the distance between them and also the actual length (top-to-bottom) of the sides. From $\frac{3}{4}$ " plywood, cut the back (I) to fit, leaving the width $\frac{1}{8}$ " short to allow for the continuous hinge gain on the top edge. Lay out and cut biscuit slots to join the back to the base and sides as dimensioned in *figure 6*.

Step 2. To make the center front panel (J) and two outer front panels (K), first cut a 3x30" piece of $\frac{3}{4}$ " plywood. To maintain the grain flow, cut the parts in outer-middle-outer sequence. Band the inner *end* of each outer front panel and then both *edges* of all three parts (*figure 7*).

Step 3. Dry-assemble the dividers and sides to the base. To space them

properly, insert a drawer plus a $\frac{1}{8}$ "-thick spacer between them. Fit the outer front panels first, trimming their unbanded ends to length, then the center panel. Note: The inner ends of the outer panels parts overlap the dividers as shown on the Exploded View. The dividers overlap the ends of the center panel (*photo D*).

Step 4. Lay out and cut centered biscuit slots in both ends of the center front panel and the outer ends of the outer front panels. (See the Exploded View.) Cut mating slots in the dividers and sides. Next, drill and counterbore

Figure 4 Side (E) biscuit location

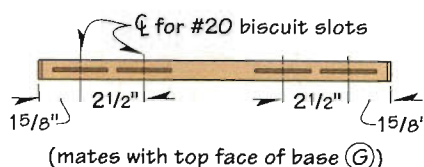


Figure 5 Divider (H) bottom view

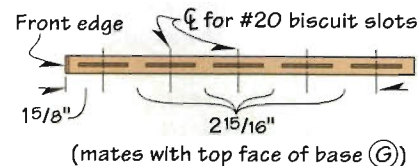
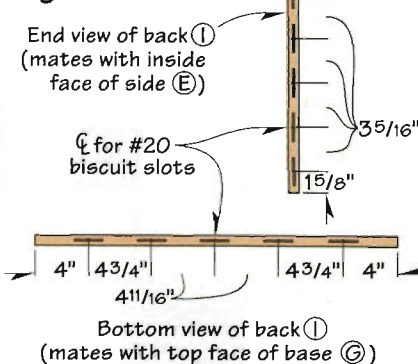


Figure 6



Cutting and edge-banding the front panels

Figure 7

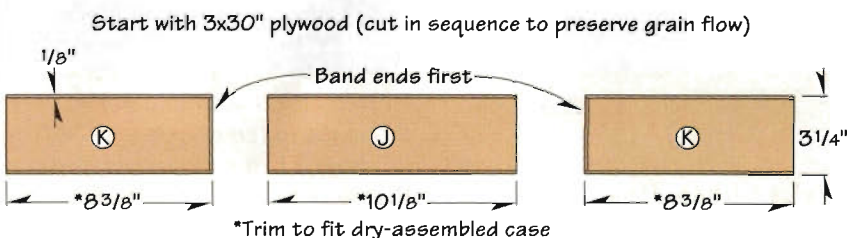


Photo C: Use the sides and dividers as a pattern for flush-trimming the base cutout.

a pair of $\frac{3}{32}$ " shank holes through the back face of each outer front panel to attach the panels to the dividers. Center these holes $\frac{3}{8}$ " from the banded end of each panel.

Step 5. Position and dry-clamp the three front panels to the dry-assembled dividers and sides. Now, dry-assemble the back (with biscuits) to the base and sides. Clamp the entire dry assembly, then measure interior dimensions for the tray bottom. Cut the tray bottom (L) to size, then lay out and make the cutouts. (We used the tablesaw, stopping short of the corners. We hand-sawed the corners, then squared them with a chisel.)

Step 6. Dry-fit the tray bottom to the assembly and check its fit. At the same time, trace along the top edge of this part to mark its location on the back. Disassemble the parts, clamp a straightedge along this line, then lay out and cut biscuit slots in the back where dimensioned in *figure 8*. Cut mating slots into the back edge of the tray bottom.

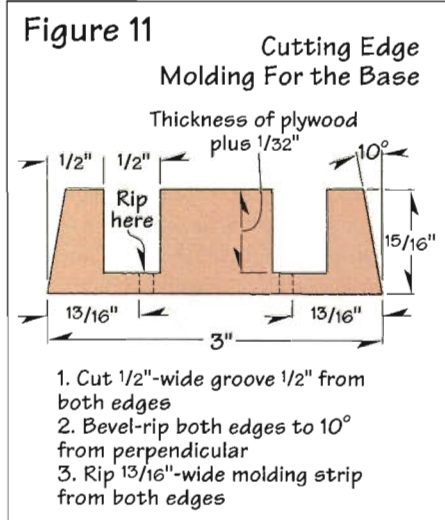
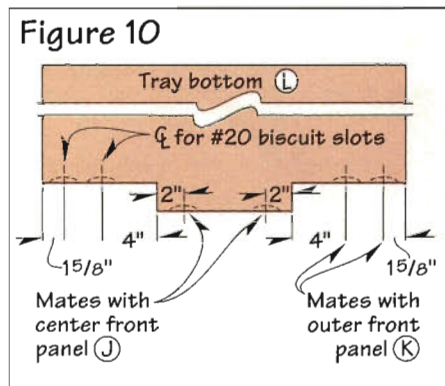
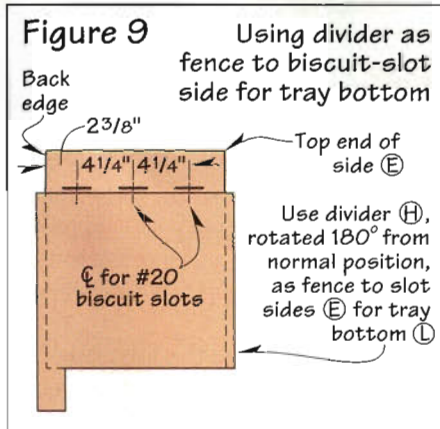
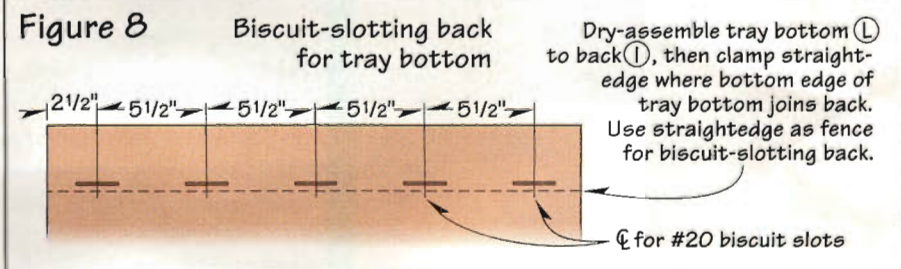
Step 7. To slot the sides for the tray bottom, turn each divider upside down, and clamp it to the inside face of one side, aligning its top edge with the bottom end of the side. (See *figure 9*.) Using the divider as a fence for the plate joiner, lay out and cut slots in the side where shown. Next, cut mating slots in the ends of the tray bottom. Lay out and cut slots in the front edge of the tray bottom and mating slots in the back faces of the three front panels. (See *figure 10*.)

Step 8. Dry-assemble all case parts with biscuits. Check for fit, adjust as necessary, and then disassemble.

Fit the Base and Lid With Edge Moldings

Step 1. From $\frac{1}{8}$ " cherry stock, cut 8 linear feet of molding for the base. To do this, first cut a 3x48" blank, then use a dado head to cut a $\frac{1}{2}$ "-wide groove along one face $\frac{1}{2}$ " in from both edges. (See *figure 11*.) Note: To determine the groove's depth, add $\frac{1}{32}$ " to the actual thickness of your $\frac{3}{4}$ " plywood.

Step 2. Flip the blank over, and bevel-rip both edges to 10° from square. Note: Save the 10° cutoffs to use as clamp pads during glue-up. Reset the



blade to 90° , then rip a $\frac{13}{16}$ "-wide molding strip from both edges of the blank.

Step 3. Starting with the breakfront section of the base, miter-cut sections of molding to fit, then glue and clamp them to the edges. Use the 10° cutoffs as pads to apply even clamping pressure. Note: Clamp only two or three pieces at a time, and make sure the rabbeted shoulder presses tightly against the base bottom.

Step 4. To machine molding for the lid, first joint and plane $\frac{1}{4}$ " cherry stock to the thickness of your lid plywood plus $\frac{1}{16}$ ". From this, rip and crosscut a 3x48" blank. Using a panel-raising bit, rout both edges of the blank, working up to full profile in several passes. (See the detail shown on the Exploded View.)

Step 5. Rip a $\frac{1}{4}$ "-wide strip from both edges of the profiled blank. Next, stand each strip on its square edge, and cut a centered, $\frac{1}{8}$ "-wide slot $\frac{5}{16}$ " deep in this edge. Note: Test the setup on a piece of scrap first to ensure alignment. If you use a tablesaw to cut this slot, make sure the blade cuts a $\frac{1}{8}$ " kerf.

Step 6. Fit your handheld router with a $\frac{1}{8}$ " slotting cutter. Adjust the cutter height to center it on the edge of the lid. Rout a test slot in a scrap piece of this same plywood to check for alignment with the molding slot. With the slots aligned, the top and bottom faces

of the molding should stand slightly proud of the plywood faces. Now, cut a centered slot (between $\frac{1}{4}$ " and $\frac{1}{2}$ " deep, depending on your cutter's bearing diameter) around all lid edges.

Step 7. To make spline stock, either rip hardwood to $\frac{1}{8}$ " thick or use hardboard. Rip splines to width depending on the depth of your lid slot, but make them $\frac{1}{16}$ " narrower than the combined depth of the lid and molding slots. Next, miter-cut the splines to fit each section of the lid edge. For the two inside corners formed by the breakfront, double-miter the mating ends of the splines as shown in *figure 12* to clear the radius left by the slotting cutter. Dry-assemble the splines to the lid slot to check for fit.



Photo D: Outer front panels overlap dividers, which in turn overlap center front panel. Note edge banding on panels and door.

Step 8. Starting with the breakfront section, miter-cut the molding to fit the lid edge. As you work, dry-assemble the pieces to the splines to check for fit. Once you've cut all sections to fit, glue the splines into the slot, then glue the moldings, two or three pieces at a time,

to the splines and lid edge. Clamp carefully, then check each joint both top and bottom for contact. Adjust the clamping pressure to close the joints.

Step 9. Scrape or sand the lid and base trim flush with the plywood faces. Block-sand all trim, breaking the edges slightly.

Make and Install the Drawer Runners

Step 1. Rout four $\frac{1}{2}$ " grooves $\frac{1}{8}$ " deep in the outside face of each divider and the inside face of each side to accept the drawer runners. (See *figure 13* for locations. To set up for this operation, see the Pro Tip at right.)

Step 2. To make the 16 runners (M), plane hardwood stock to $\frac{13}{32}$ " thick. Cut eight blanks to $\frac{1}{2} \times 25\frac{1}{2}$ ", then mark a "top" edge on each. To ease the fit of the drawers (parts will swell with humidity), saw or rout a very slight ($\frac{1}{64}$ "-deep) rabbet along the bottom edge of each blank, leaving the $\frac{1}{8}$ "-thick section that seats in the case groove full width. (See *figure 14*.)

Step 3. Lay out and sand a $\frac{1}{4}$ " radius on the front ends of the runners, then crosscut them to $12\frac{1}{2}$ " long. Note: Because the sides (E) lap the ends of the back (I), the stopped back ends of the runner grooves will be concealed and "squared" by the back. Dry-assemble the runners into their grooves in the dividers and sides, making sure all rabbeted edges are down. Drill and countersink two shank and pilot holes for #6x $\frac{3}{4}$ " brass flathead screws through each runner and into the case parts. (For locations, see *figure 15*.) Set the runners aside for now.

Assemble the Case, Then Fit and Hang the Door

Step 1. To start assembly, glue, biscuit, and clamp the middle and outer front panels to the front edge of the tray bottom. (We used white glue for longer open time.) After the glue has dried, sand the bottom surfaces flush.

Step 2. Glue, biscuit, and clamp the back to the back edge of the tray bottom. Check for square and make sure the ends are flush. After the glue has dried, glue, biscuit, and clamp the sides to this assembly.

PRO TIP

To rout stopped, uniformly spaced dados for the drawer runners, first cut a set of three $3\frac{5}{16}$ "-wide spacers. Install a $\frac{1}{2}$ " straight bit and set it to cut $\frac{1}{8}$ " deep. Set the fence $11\frac{1}{8}$ " from the cutting edge of the bit to rout the top groove.

Lay out start- and stoplines across the tabletop for both parts, then use these lines to position and clamp long, straight-edged stopblocks perpendicular to the fence. Test each setup on same-sized scrap pieces before routing.

Note: Since these are mirror-image dado cuts, you'll need to plunge-start the cuts on one of the paired parts, using the same technique you used to cut the grooves into the right drawer sides. Note also that the divider dados start $2\frac{1}{2}$ " from the front edge and go clear through to the back edge, which butts against the back (I).

After you've routed the top dado, add a spacer between the fence and workpiece, securing it to the table with clamps or double-faced tape. Rout the second dado, then add a spacer, and so on. Change the stop setup before routing the dividers.

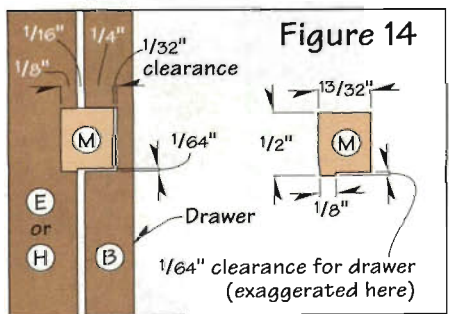
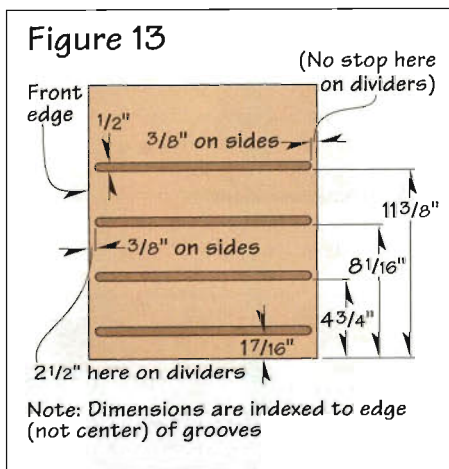
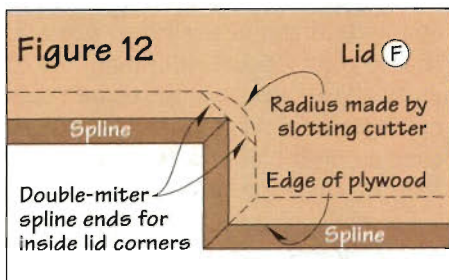
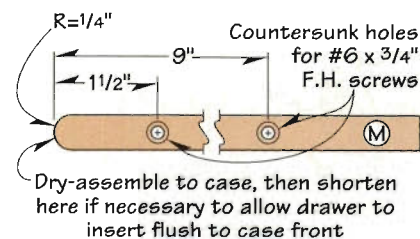


Figure 15 Fitting and installing the drawer runners



Step 3. Cut hinge gains for butt hinges in the front edge (inside face) of the right divider where shown on the Front View drawing. (To do this, we made a pattern by tracing the hinge leaves onto a $3 \times 13\frac{3}{16}$ " piece of $\frac{3}{4}$ " plywood, spaced as shown, then cutting them carefully to shape. We then clamped the pattern to the inside face of the right divider, aligning their front edges and centering the pattern vertically in the opening. We routed the

gains to shape using a piloted hinge mortising bit, then squared the corners with a chisel.)

Step 4. Assemble all the clamps you have on hand, and recruit the help of an assistant if possible. Glue and biscuit the dividers to the base. Also, glue in the biscuits where the front panel will join. Then, glue and biscuit the previous assembly to the base. You'll have to spread the dividers slightly in order to get the biscuits into the slots. Check to make sure the outer front panels fit tightly against the dividers. Add more clamps to pull the joints tight.

Step 5. Screw the ends of the outer front panels to the dividers using #8x1½" flathead screws. Glue ⅜" plugs into the counterbores, then trim and sand them flush.

Step 6. Measure the door opening, then subtract ⅛" for edge-banding and ⅛" for clearance on all edges. Cut the door to fit from ¾" plywood. Next, band the top and bottom ends of the door, then the sides. To mount

the pull later, lay out and drill a countersunk shank hole for a #6x1" flat-head screw through the back of the door, centering it vertically where shown on the Front View drawing.

Step 7. Lay out and cut hinge gains in the right edge of the door. (We clamped our pattern to the door and routed the gains, squaring them with a chisel.) Next, hang the door, attaching hinges to the door first. Now, attach the catch, first to the back of the door, then to the underside of the tray bottom.

Add the Finishing Touches

Step 1. Rout a ⅛" chamfer around the door front and drawer fronts. Note: Sand the hinged edge of the door so as not to rout into the gains. Then, finish-sand the door and drawers to 220-grit.

Step 2. Temporarily press the drawer runners into their grooves, then slide the drawers into their openings. If the drawer fronts will insert flush to the front of the case, go ahead and screw (but don't glue) the runners to the case

using #6x¾" brass flathead screws. (This allows you to remove the runners to adjust clearances later if necessary.) If the drawers protrude a bit, remove the runners and re-radius the front ends to shorten them slightly. Adjust until the drawers insert flush.

Step 3. Measure the top edge of the back, then cut a 1½"-wide continuous hinge to fit. Lay out and rout the hinge gain along the back edge of the plywood face of the lid. (We clamped on a straight-edged guide, then routed the gain using our piloted mortising bit, again squaring the ends with a chisel.)

Step 4. Fit and install a curved lid support, temporarily attaching it to the right side and the underside of the lid. (We found that even the low-profile support that comes with the kit bottomed out slightly on the tray. We solved the problem by lightly filing the lower edge of the curved arm.)

Step 5. Remove all hardware. Break the corners, then finish-sand any parts that still need it to 220-grit. Apply your choice of finish to all parts. (We spray-applied three coats of Magnalac semi-gloss lacquer, scuff-sanding lightly between coats with 320-grit sandpaper.)

Step 6. Attach the pulls to the drawer fronts and door using #6x⅝" and #6x1" brass screws respectively. Then, reattach the hinges, lid support, and door catch parts. 

Project designer and builder: Richard Coers

Lead photograph: Lynxwiler Photography

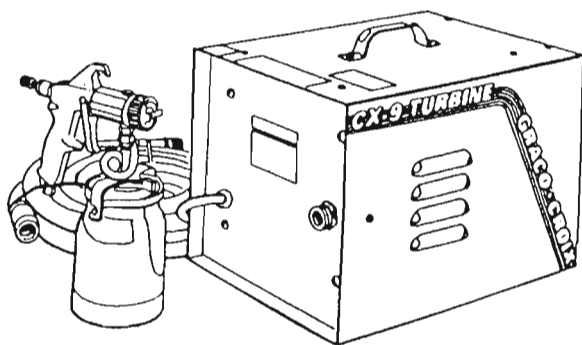
Other photographs: StudioAlex

Produced by: Doug Cantwell

Tools: Courtesy of Bridge City Tool Works, Inc., Portland, Oregon

THE WOOD FINISHER'S "POLLUTION SOLUTION"

- EASY TO USE ●MINIMAL OVERSPRAY
- SHOW QUALITY FINISHES
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Pat Trujillo

Linking Traditional
Craftsmanship With
Modern Form

by Sven Hanson

"I'm in this for the long term," says carver and furniture maker Pat Trujillo of La Madera, New Mexico. "I choose work that interests me and makes me proud. A successful project advertises my work, and if it takes long hours, so be it."



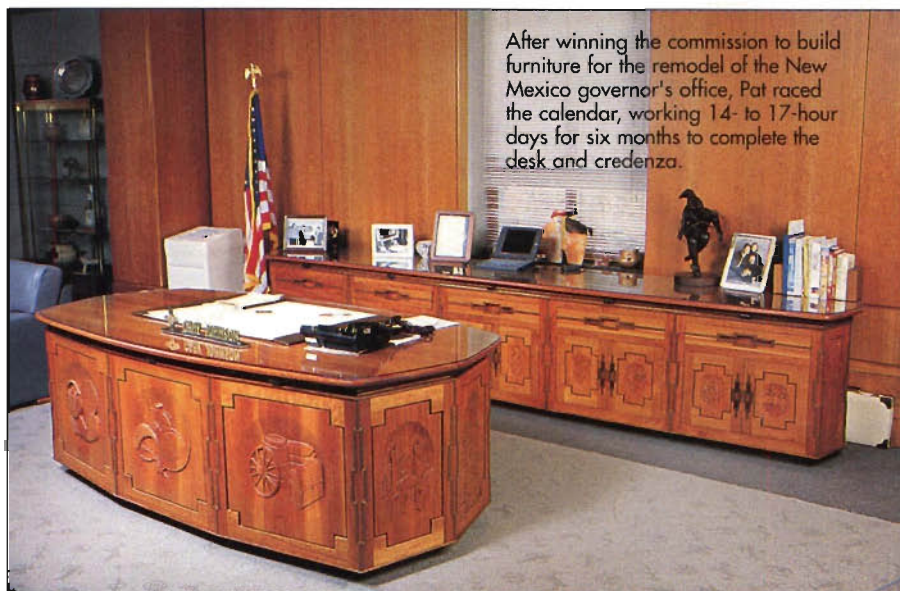
When Patrick Trujillo won a commission to build the desk and credenza for the remodel of the New Mexico governor's office, it took the local crafts community by surprise. Most of them had figured that the work would go to a better-known artisan, one of those big names even a non-woodworker would recognize.

To those who didn't know Pat's background, he looked like an overnight sensation. Few knew that four years earlier he'd completed a large and detailed public reception desk for Santa Fe Community College, or that he'd spent more than 10 years working up to that commission.

The award also surprised those who were acquainted with Trujillo and his work. The solicitation guidelines had specified a traditional New Mexican design from the state's Spanish Colonial era. Although Trujillo

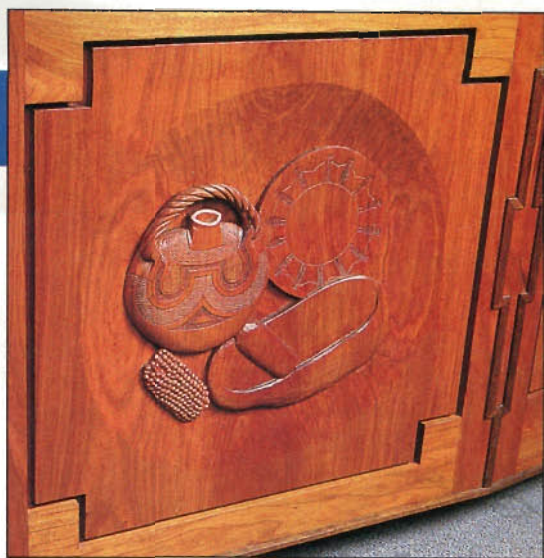
comes from one of New Mexico's 300-year-old founding families, his friends and colleagues knew that in his 17-year career he'd already covered the traditional ground.

In recent years, Pat has specialized in blending traditional, regional elements into modern furniture forms—which didn't sound like what the remodel committee had in mind. In fact, he had





Detail of the credenza in the governor's office shows New Mexico wildflowers and meticulously crafted walnut trim. Trujillo carved 23 panels for the credenza and desk.



The carved cherry panels on the governor's desk depict artifacts from several centuries of New Mexico's culturally diverse past.

at first decided not to apply, assuming that whatever he came up with would not jive with anybody's idea of Spanish Colonial. However, when the designer in charge saw his preliminary drawings, she insisted that the committee meet with him.

The personable Trujillo made a good impression and soon emerged as the front runner. After he'd presented a second and then a third set of drawings, the committee finally awarded him the commission—but gave him little time to congratulate himself. He was to deliver the seven-foot desk and 12-foot credenza by January 1 for the ceremonial opening of the remodeled capitol building. This gave him five months, Trujillo calculated, to do a 10-month job.

Pat shifted into a "wartime" production schedule of seven-day weeks and 14- to 17-hour days, taking time off, as he recalls, only for Thanksgiving and Christmas dinners. He soon found that he could cut interruptions by working nights and sleeping days. His life partner of 10 years, artist Judy Adams, knew what he was up against and ran interference for him with family and friends. "Sometimes I felt like the sheriff's wife," says Judy, "bringing the prisoner a hot meal and dropping it at the cell door."

Sketching Success

For Trujillo, the hard work starts even before he gets a job. He puts hours into sketching and drafting, after which he develops a bill of materials and figures up a bid or estimate. Pat stays open to possible improvements as he works but never begins without a very firm design. "It's too much of a distraction to 'design in the wood' or create a design around the lumber," he observes. "It doesn't work on large projects and slows you down a lot even on small work."

Pat has found that clear plans and sharp drawings, besides improving overall efficiency, help sell clients on his work. He aced the drafting and art courses he took at military prep school, which gave him the skills to create a very accurate preview of the finished project. "Clients don't want to be pleasantly surprised," observes Pat. "They want to receive the work you promised."

His firm adherence to a plan shows up in his execution of the simplest carved detail. If the knife slips or hid-



Trujillo built and carved the massive marble and walnut reception desk at Santa Fe Community College. A local politician commissioned him to do the work, then donated the piece to the college.

den cracks open up, the piece goes straight into the firewood barrel—no super glue, no recuts, no regrets.

Making the Lumber Fit the Design

To make sure he ends up with sound, good-looking wood throughout, Trujillo usually purchases about 100 percent more lumber than his bill of materials requires. He lays out the cuts for the most prominent pieces first—usually tops, panels, and frames.

For frames and panels like those you see on the SFCC reception desk, Pat lays out the panel first, preferring to

For the frame stiles and rails, Pat selects four pieces that match each other (and also the adjacent frames) in color and grain. He looks for an arch in the grain and generally turns all the arches outward. "That draws a circle around the panel, emphasizing it," Pat explains. If you turn the arches inward, they emphasize the corners, creating a more severe look that enhances certain modern and Asian designs.



Trujillo likes to take care of all facets of a job. For the Mediterranean Cafe, he designed and installed the tile, the lighting, and the ironwork visible in the background, which he also welded.

On-The-Job Training

After graduation from military school, Pat had jolted his parents with the news that he intended to go to work with his hands rather than continue formal study. His first job put his hands to use driving for a welding-supply company. This, however, gave him a chance to acquire tools on his employee discount, and at night he began building furniture for family and friends in his grandfather's old shop.

At that point, many of us would've quit the day job, but Pat knew that he needed to learn more to ensure his success as a professional craftsman. He hired on as set builder with the Santa Fe Opera, building ancient cities from pine and painted canvas. He'd get an assignment to build a Greek forum for one production, then a monk's cell for the next, both of which had to fill the same stage.

This work taught him a lot about styles and proportion as well as the gentle art of illusion. "As great as set-building was for learning styles, I learned almost as much from the engineering," Pat recalls. "The sets had to be light enough to move on and off the stage and still last through a three-month season."

Going Solo

In 1984, Pat called on the many contacts he'd developed during six years of working for other people and got a cabinet business going at full capacity almost overnight. In the evenings and on weekends, he refined his skills by building custom furniture. At the same time, Pat advanced his carving career by taking night courses at a local college. Word of mouth created enough demand for his carved furniture that it soon became the focus of his business.

One commission led to another, including a suite of office furniture for an influential local politician. This client admired the quality of the work so much that he commissioned Pat to design and build the SFCC desk, which he then donated to the college.

Building this marble-topped, walnut-paneled masterwork required three months of full-time work. "Because of the budget limitations and a number of functional requirements that I hadn't allowed for, I ended up making about a dollar an hour," Pat recalls.

However, Trujillo is not one to brood over profit margin. "A big commission can be a strain," he points out, "because you make a long-term commitment without being certain of prof-



One of Pat's most recent commissions, the Mediterranean Cafe in Santa Fe, pays homage to classical Greece with pediments, cornices, and fluted columns.

use the least number of boards possible. For a typical panel, he'll use three boards, doing his best to center the middle board. He generally arranges all of the arches ("cathedrals") in plain-sawn stock to point upward, which he believes creates the strongest appearance. If the project calls for a softer, more casual look, he'll arrange the grain to point downward.



Between jobs, Trujillo likes to disappear for a week with his horses and dogs. To rough out ideas while they're still fresh, he takes along a portable carving studio that folds up into his horse trailer.

itability until you get well into it. Even if it's a money loser, though, I feel I've got to give it my best." Trujillo sums up his philosophy with a proverb: "The value of creating good work lasts much longer than the sting of working for too little money."

An Economic Realist

At this point in his career, Trujillo can afford to select jobs according to personal preference rather than profit margin. "I'm in this for the long term," he says. "I choose work that interests me and makes me proud. A successful project advertises my work, and if it takes long hours, so be it."

On the other hand, Pat is not shy about talking money when necessary. When informed that he'd won the governor's office commission, he had already calculated materials costs of \$8,000. He told the committee that he needed \$4,000 more than the \$16,000 they had budgeted for the work. Because he had hard figures in hand—and a design that they liked—the committee agreed to the higher fee.

Finding the Time

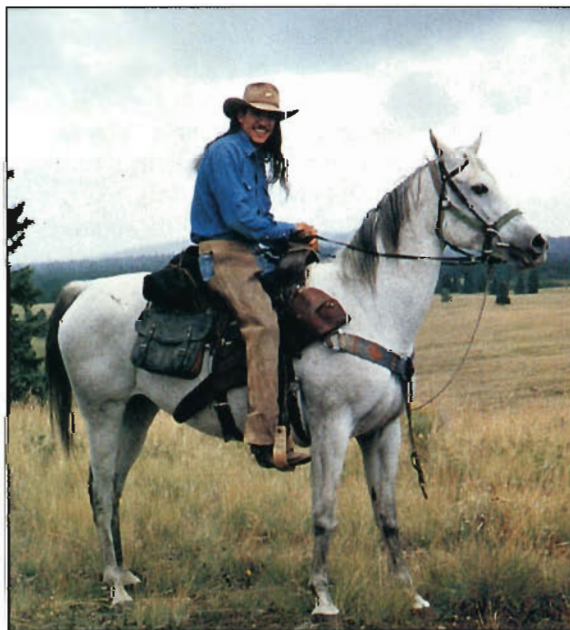
Pat and Judy live an hour north of Santa Fe in La Madera, a village of 500 people. The town nestles

among Ponderosa pines in a remote valley surrounded by national forest lands. They sought out this seclusion for the long, uninterrupted days of work it affords.

Although Pat takes something of a monomaniac approach to getting the job done, he works in a deliberate and unhurried way. Yet, despite this steady forward momentum, he never skips over a difficult

step or detours around unforeseen problems. He views success as a continuous process of building skills and completing projects.

Between jobs, Trujillo will often reinvigorate body and soul by disappearing into the Sangre de Cristo mountains for a week with his horses and dogs. "About half the time, I'm just getting away from things," he says, "and the rest of the time it's more of a pilgrimage in search of the next design idea. Nature is my main source."



Pat roams the Sangre de Cristo mountains to restore body and soul and seek inspiration for his next design. "Nature is my main source," he says.

To rough out designs while the inspiration is still fresh, Pat has rigged up a portable carving studio in the front half of his horse trailer. After leading the horses out, he pulls out and folds down a custom work surface and cabinets—better equipment than most of us have at home.

The Steady Climb

Trujillo has now completed four highly visible commissions in northern New Mexico. In addition to the governor's furniture and SFCC front desk, he recently finished two other Santa Fe jobs. At Evangelo's Bar, you enter an interior of marine motifs carved lavishly in Honduras mahogany—sea turtles swimming lazily through coral reefs and barracudas lunging after smaller prey.

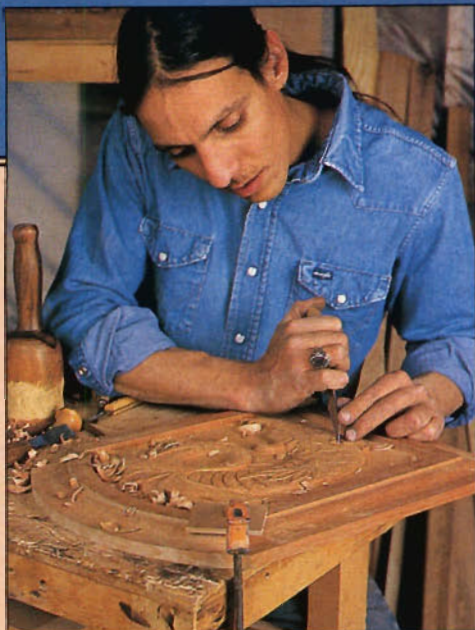
A second commission for the same client, the Mediterranean Cafe, pays homage to classical Greek architecture with carved columns, cornices, and pediments. "Nick Evangelo, the owner, asked for a design that was definitely Greek—not Roman," says Pat, "so I had to research this one."

Besides doing the cabinetry and millwork, Trujillo prefers to take care of almost every other facet of a job. In this case, he installed the tile-work, most of the lighting, and even the ironwork enclosures for the cafe's open-air courtyard, which he designed and welded.

There are better-known artisans who exhibit one set of fancy pieces at every show and hand out thousands of brochures—but don't very often seem to do new work. Instead of spending time marketing his old work, Pat stays busy doing new things, escaping now and again on horseback into those restorative New Mexico mountains.

Photographs: By the author

A Carving Lesson With Pat Trujillo



"You have to get your whole body into the act," Trujillo explains. With his right leg braced behind him, he leans into the work, as if positioning himself for "a friendly shoving match."

Assume the Position

Most carving technique lessons begin with how to sharpen tools, or how to grip the chisel, or how to approach the grain. Pat has a different idea of the basics: "You should first focus on getting your whole body into the act." He carves standing up, with the work secured firmly to the bench at elbow height.

Pat starts with the correct posture, setting shoulder over elbow over hip in a single power lineup. "If you try to carve with just wrists or arms, you'll tire quickly. That's when miscuts and injuries happen." He puts his left foot forward and right foot noticeably back, "like a guy positioned for a friendly shoving match."

Get a Grip

Trujillo positions the tool in the palm of his right hand, aligning the shank with the bones of his forearm. "The angle will vary as you work, but start in the strongest position," he advises.

With the left hand, he grips the tool between thumb, index, and middle finger as close to the tip as possible without getting in the way of the cut. "Your fingertips both steer the tool and absorb feedback about the progress of the cut. This gives you a better feel for the structure of the wood, for the grain direction, and for when it's time to sharpen the tool."

Economize On Movement

Pat prepares his shop and tools thoroughly before starting to work. When he knows he'll carve that day, he grinds and hones two complete sets of chisels, including both Japanese and Western-style tools. It's a routine that sets the rhythm for most work days, but Trujillo doesn't belabor it. "I try to zip through the sharpening job and get on with the carving. That's the part I love."

To position the cuts, he copies the lines from his full-scale drawings onto the workpiece and then keeps the drawing beside it. He tries to stick as closely as possible to the original design for the sake of both quality and efficiency.

Pat normally works from outside to inside, taking large chips wherever he can. He cuts to the line using the fewest strokes possible. "Sandpaper cuts slowly and roughly compared to a sharp chisel. Besides," he laughs, "people pay for my carving, not my sanding." 



With the left hand, Pat grips the tool between thumb, index, and middle finger as close to the tip as possible. His fingertips both steer the tool and keep him in touch with wood structure, grain direction, and sharpness of the tool.



To grind chisels, Trujillo uses three different waterstones. For gouges, he's ground several channels into the face of each stone. He grinds square-edged chisels on the edge.

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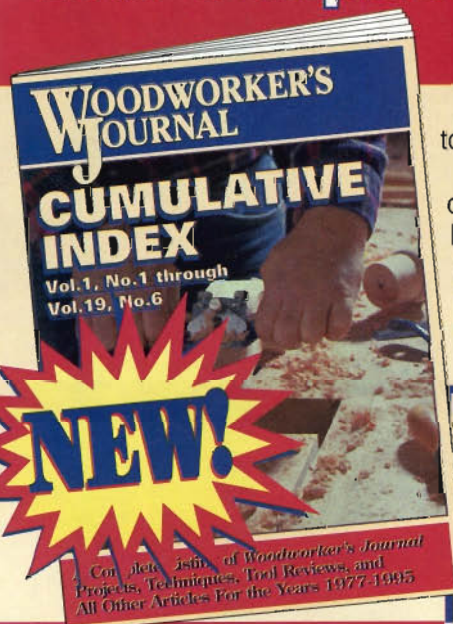
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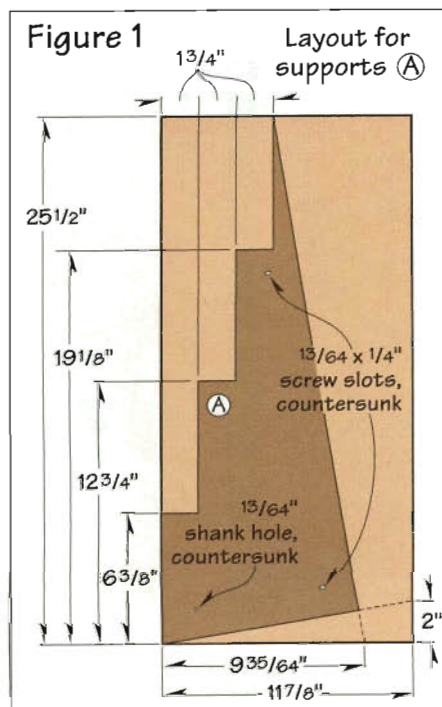
If you're trying to encourage your children (or, as in my case, your grandchildren) to enjoy books and, at the same time, to take good care of them, you might want to consider the solution I came up with. This rack displays books in a manner that gets kids' attention.

I built one for each of my grandchildren. The racks were a big hit with them and an even bigger hit with their parents. The drawer at the bottom provides convenient storage (that kids can easily reach) for crayons, coloring books, and small toys.

I invite you to build this project and experience the satisfaction of seeing it in constant use by appreciative youngsters. The visible portions of the rack were made from mahogany and mahogany plywood, although oak makes a good alternative; or, choose materials that match your existing furniture. I built the display shelves as four subsections, then assembled them into a single unit. I built the case by assembling this shelf unit to a pair of sides and a frame. Finally, I built and fitted the drawer.

Build the Shelf Unit

Step 1. From $\frac{3}{4}$ "-thick plywood, cut a pair of $11\frac{7}{8} \times 25\frac{1}{2}$ " blanks for the supports (A). (See figure 1.) Note: Even



BILL OF MATERIALS

PART	T	W	L	MTL.	QTY.
SHELF ASSEMBLY					
A Supports	$\frac{3}{4}$ "	$11\frac{7}{8}$ "	$25\frac{1}{2}$ "	BP	2
B Backs	$\frac{1}{4}$ "	$9\frac{1}{2}$ "	36"	MP	4
C Front	$\frac{1}{4}$ "	$3\frac{1}{8}$ "	36"	MP	1
D Bottoms*	$\frac{3}{4}$ "	$1\frac{1}{2}$ "	36"	M	4
E Trim strips*	$\frac{3}{4}$ "	$\frac{1}{2}$ "	36"	M	5
CABINET					
F Sides*	$\frac{3}{4}$ "	15"	36"	M	2
G Face frame—rails	$\frac{3}{4}$ "	$1\frac{1}{2}$ "	34"	M	2
H Face frame—stiles	$\frac{3}{4}$ "	1"	8"	M	2
I Web frame—front rails*	$\frac{3}{4}$ "	$1\frac{1}{4}$ "	36"	H	2
J Web frame—back rails	$\frac{3}{4}$ "	$1\frac{1}{4}$ "	$36\frac{1}{2}$ "	H	2
K Web frame—stretchers	$3\frac{3}{4}$ "	$2\frac{1}{4}$ "	$10\frac{5}{8}$ "	H	4
DRAWER					
L Front	$\frac{3}{4}$ "	$5\frac{1}{16}$ "	$34\frac{1}{2}$ "	M	1
M Sides	$\frac{1}{2}$ "	$4\frac{13}{16}$ "	$13\frac{1}{2}$ "	H	2
N Back	$\frac{1}{2}$ "	$4\frac{13}{16}$ "	$33\frac{1}{4}$ "	H	1
O Bottom*	$\frac{1}{4}$ "	$12\frac{7}{8}$ "	$33\frac{3}{8}$ "	BP	1
OTHER					
P Drawer runner	$\frac{3}{4}$ "	1"	$12\frac{1}{2}$ "	H	1
Q Drawer guide	$\frac{3}{4}$ "	$2\frac{1}{16}$ "	13"	H	1
R Frame guides	$\frac{3}{4}$ "	$1\frac{1}{2}$ "	13"	H	2
S Spreaders	$\frac{3}{4}$ "	$2\frac{1}{2}$ "	36"	M	2
T Filler*	$\frac{3}{4}$ "	$2\frac{1}{2}$ "	36"	M	1
U Back*	$\frac{1}{4}$ "	$28\frac{3}{8}$ "	$36\frac{5}{8}$ "	BP	1

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

MATERIALS LIST

M—Mahogany
MP—Mahogany plywood
BP—Birch plywood
H—Hardwood

SUPPLIES

$\frac{3}{8}$ " hardwood dowel stock; #6x $\frac{3}{4}$ "
#10x $1\frac{1}{4}$ " flathead wood screws; #18x $\frac{3}{4}$ "
brads; stain; satin polyurethane finish;
2-brass drawer pulls.

though a significant portion of the blanks will be cut away, start with the specified dimensions in order to lay out the supports accurately.

Step 2. Align the two blanks, then screw them together temporarily where shown in figure 1 using #10x $1\frac{1}{4}$ " flathead wood screws. Note: Don't slot the screw holes until Step 4.

Step 3. Lay out the supports as dimensioned in figure 1. Then, cut away the waste in this order: first, the three-stepped front edge, then the angled bottom end, then the back edge. Note: The bottom end and back edge should form a 90° angle. (I used the tablesaw to make the long cuts on

the front edge, raising the blade to full height to make as perpendicular a cut as possible. I stopped short of the mark, then squared the corners with a chisel. To cut the steps, I used the miter gauge with a long extension. I then cut the bottom end and back edge with the jigsaw, keeping the blade outside the line. I clamped on a straightedge as a guide, then used a router and flush-trim bit to trim to the line.) Now, separate the supports.

Step 4. Enlarge the three holes in both supports to shank-hole diameter ($\frac{13}{64}$ " for #10 screws). Elongate the two rear holes horizontally to form $\frac{1}{4}$ " slots, then countersink all three.

Step 5. From $\frac{1}{4}$ "-thick mahogany plywood, cut four shelf backs (B) and one shelf front (C) to dimension. Note: Use a miter-gauge extension and stop-block setup to ensure identical lengths. Keep this same setup for later use to cut the shelf bottoms, spreaders, and filler, and also to trim the assembled face frame to exactly 36" long. To minimize splintering, apply masking tape along the cutline before cutting.

Step 6. Measure the actual width of the horizontal steps on the front edges of the supports. Then, check the actual thickness of your $\frac{1}{4}$ "-thick mahogany plywood, and subtract this thickness from the step width. (See the Side View drawing on page 46.) Rip four shelf bottoms (D) to this resulting width, then crosscut them to 36" long.

Step 7. Finish-sand the shelf bottoms, backs, and front to 220-grit. Next, stand the two supports on their back edges on your bench. Glue and clamp a shelf back to the top step (vertical surface) on the supports, aligning the ends flush with the outside support faces. Check for squareness. Next, dry-fit a shelf bottom on the horizontal step. Make sure that the front edge of the bottom aligns flush with the front edge of the step. Adjust if necessary, then glue and clamp the shelf bottom to the supports and the shelf back.

Step 8. Repeat the previous step for each of the other three shelves, applying glue to the front edge of the preceding shelf bottom as you attach each successive shelf back. (I clamped each shelf back against the preceding shelf bottom using a slightly convex caul to apply pressure along the entire joint.) Now, glue and clamp the shelf front to the bottom shelf using the convex caul. Remove any squeeze-out from the assembled shelves and brackets.

Step 9. On the back side of the shelf assembly, drill and countersink three evenly spaced holes through each shelf back and into the attached shelf bottom. (For locations, see the Exploded and Side View drawings.) Then, drive $\#6 \times \frac{3}{4}$ " flathead wood screws to reinforce the long glue joint.

Step 10. To make the five shelf trim strips (E), first cut three $1\frac{1}{2} \times 37$ " blanks from $\frac{3}{4}$ "-thick mahogany. Mount a $\frac{5}{8}$ " dado head on your tablesaw, and cut a centered, $\frac{1}{2}$ "-deep groove along one

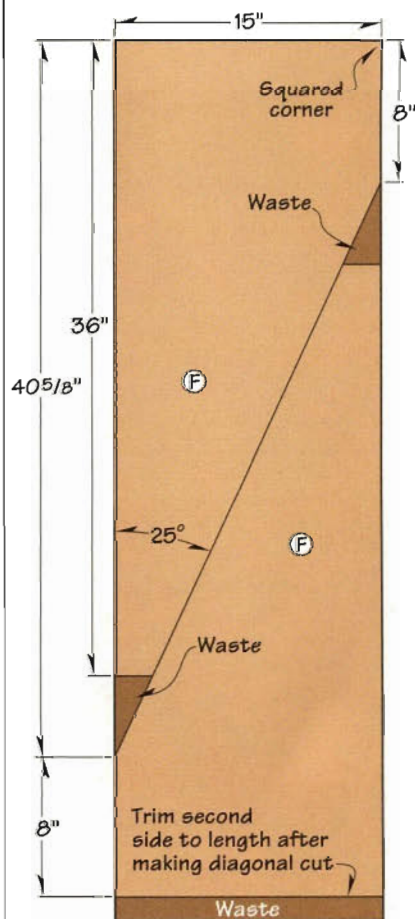
face where shown on the Shelf Trim detail on the Exploded View. Now, using a $\frac{1}{8}$ "-thick blade, rip each strip in half where shown on the detail to make two trim strips of equal width. Note: If you use a blade of a different thickness, adjust the width of the blanks to compensate for the difference. Set the five strips aside for now; you'll trim and assemble them later.

Make the Sides

Step 1. To make the two cabinet sides (F), plane $4/4$ mahogany boards to $\frac{13}{16}$ " thick, then edge-join them to make a blank at least $15\frac{1}{2} \times 50$ ". After the glue has dried, plane or belt-sand the blank to $\frac{3}{4}$ " thick. Joint one edge, then rip the other edge to 15" wide. Now, square one end.

Step 2. Select and mark the better face, then lay out the two sides on the opposite face of the blank as dimensioned in figure 2. To do this, start by marking one edge 8" from the squared

Figure 2 Layout for cutting the sides (F)



PRO TIP

As an alternative technique for ensuring identical angles on the two sides and getting a clean, smooth edge, try the following. First, cut along the outside of the diagonal line with a portable jigsaw as you did on the supports. Next, square the end of the second side, leaving it 40% long ($\frac{1}{4}$ " longer than finished length).

Stack the two pieces, align the bottom ends and back edges, then clamp a 6"-wide straightedge along the diagonal layout line. (The generous width allows you to clamp without obstructing the router's path.) Using a router and $1\frac{1}{2}$ "- or 2"-long flush-trim bit, rout the edges of the two aligned sides, allowing the bit's pilot bearing to track along the straightedge.

corner. Mark the opposite edge 40% from the same end, then connect these two points with a diagonal line. (I laid out and cut the sides this way to ensure a uniform angle on the front edges and to conserve material.)

Step 3. Make the diagonal cut to separate the two sides. To do this, cut along the outside of the line (relative to the squared end of the blank). Note: Because the angular front edges of the assembled sides will be highly visible, take pains to make this a clean, smooth cut. (I clamped on a straight-edged guide and used a circular saw with a new blade. After making the cut, I crosscut the second side to match the length of the first. For an alternative approach, see the Pro Tip above.) Now, using the same miter-gauge setup you saved earlier, crosscut the top ends of the sides to 36" final length.

Step 4. Using your drill press and a bradpoint bit, drill $\frac{3}{8}$ " dowel holes $\frac{1}{2}$ " deep into the inside face of one side. (For locations, see figure 3.) Insert a dowel center in each hole, then carefully align the two sides and transfer the hole centerpoints to the inside face of the other side. Now, drill identical holes in that side.

Step 5. Lay out and cut the two $\frac{3}{8}$ "-deep mortises in the inside face of each side where dimensioned in figure 3. (I clamped on a straight-edged guide, then plunge-routed the mortises using

side and flush with its bottom end. Tap the stile to transfer the dowel hole centerpoints. Repeat these steps on the opposite side and stile. Mark the stiles to identify which side they go on.

Step 3. Glue, assemble, and clamp the face frame (G, H) as shown on the Exploded View, keeping the marked edges of the stiles on the outside.

Step 4. Center a doweling jig over each of the centerpoints on the two stiles, and drill a $\frac{3}{8}$ " dowel hole $2\frac{1}{8}$ " deep through the stile and into the end of the rail. Note: To ensure that the face frame length will be a uniform 36" long, trim it using the miter-gauge extension and stopblock setup you saved earlier.

Step 5. From a $\frac{3}{8}$ " dowel, cut four $2\frac{1}{2}$ "-long pins. Groove the sides and chamfer both ends. Next, glue and insert a dowel pin into each hole, leaving $\frac{7}{16}$ " of each exposed to fit into the side during final assembly. Note: Use a pipe clamp to drive dowel pins to a precise depth and distribute glue along the length of the pin.

Build the Web Frames

The web frames will form a case for the drawer. They'll also support the shelf unit and help keep the cabinet square. Since they are not normally visible, I used poplar to reduce material costs.

Step 1. From $\frac{3}{4}$ "-thick hardwood, rip two web frame front rails (I) and two web frame back rails (J) to width. Trim the back rails to $36\frac{1}{2}$ " long to allow $\frac{1}{4}$ " of tenon length at both ends. Using the miter-gauge setup you saved earlier, trim the front rails to 36" long. Note: Save the setup for later.

Step 2. Lay out and cut two $\frac{1}{4} \times 1\frac{3}{4}$ " mortises $\frac{5}{16}$ " deep in the inside edge of each web frame rail (I, J) where detailed on the Exploded View. Note: To compensate for the $\frac{1}{4}$ " of tenon length added at each end of the back rails (J), lay out the mortises on these parts $\frac{1}{2}$ " from the ends. On the front rails (I), lay them out $\frac{1}{4}$ " from the ends. (I roughed out the mortises on the drill press, then cleaned them up with a chisel.)

Step 3. From the same $\frac{3}{4}$ "-thick stock you used in the previous step, cut four web frame stretchers (K) to dimension. Next, cut a $\frac{1}{4} \times \frac{1}{2} \times 1\frac{3}{4}$ " tenon

on both ends of each. See the end view detail shown on the Exploded View drawing. (Note that I cut these tenons $\frac{1}{16}$ " shorter than the mortise depth to ensure good shoulder contact and allow glue space. I formed the shoulders using a miter-gauge extension and stopblock on the tablesaw, then cut the cheeks using the bandsaw and rip fence.)

Step 4. Mark the four web frame rails to identify them as top, bottom, front, and back. Next, insert dowel centers in the holes on the back of the face frame top rail. Align the front edge of the top front web frame rail flush with the top of the face frame, then transfer the hole centerpoints to the frame rail. Repeat this procedure to transfer the bottom rail holes to the bottom front web frame rail. Using the drill press and a bradpoint bit, drill the six $\frac{3}{8}$ " holes 1" deep.

Step 5. Glue, assemble, and clamp each web frame. Check for square and flatness, then allow the glue to dry.

Step 6. Cut, groove, and chamfer six $\frac{3}{8} \times 1\frac{3}{8}$ " dowel pins. Next, glue them into the web frame holes, leaving $\frac{7}{16}$ " of each dowel available for insertion into the face frame. Note: Let the glue dry to ensure that the dowel won't be forced farther into the web frame during assembly.

Step 7. Cut braces from scrap material to hold the web frames parallel to one another and perpendicular to the front face. Using these, dry-assemble the web frames to the face

frame. Check to make sure that the web frames do not extend beyond the ends of the face frame (except for the rear frame rails). If they do, trim the web frames. Now, glue, assemble, and clamp the parts, then check them for squareness.

Now, Make the Drawer

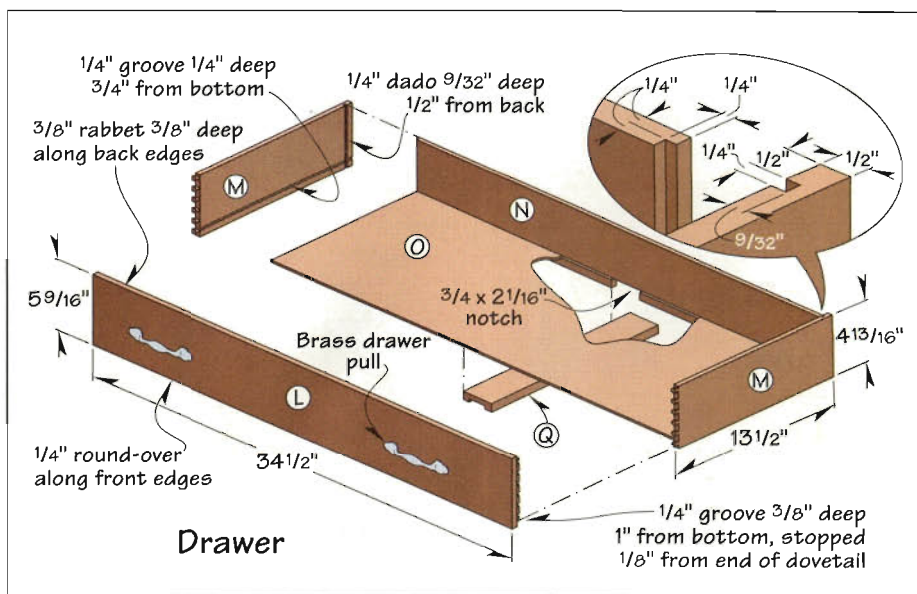
Step 1. From $\frac{3}{4}$ "-thick mahogany, cut the drawer front (L) to dimension as shown on the Drawer drawing below. Select the better face and mark it "front." Fit your handheld router with a rabbeting bit, and rout a $\frac{3}{8}$ " rabbet $\frac{3}{8}$ " deep around the back edges of the front. Note: Remember to rout counterclockwise in end-edge-end-edge sequence.

Step 2. From $\frac{1}{2}$ "-thick hardwood stock, cut the drawer sides (M) and back (N) to size. (I used poplar for these parts.)

Step 3. Cut half-blind dovetail pins in the rabbeted shoulders along the ends of the drawer front. Then, cut mating tails in the front ends of the drawer sides. (I used a dovetail jig and router with $\frac{1}{2}$ " bit.)

Note: Before proceeding, check the actual thickness of the $\frac{1}{4}$ " plywood you've procured for the drawer bottom. If necessary, adjust the width of the grooves you cut in the following steps to fit.

Step 4. Mount a $\frac{1}{4}$ " dado head on your tablesaw and set it to cut $\frac{9}{32}$ " deep. Cut a dado near the back end of



necessary adjustments to achieve snug joints. Disassemble, then sand the parts to 150-grit.

Step 9. Glue, assemble, and clamp the drawer, allowing the bottom to float in its groove without glue. Check for squareness and remove any glue squeeze-out. After the glue has dried, sand the joints flush. Now, sand the drawer front to 220-grit.

Make the Other Cabinet Parts

Step 1. From ¾"-thick hardwood, cut a 1x12½" blank for the drawer runner (P) and a 2½x13" blank for the drawer guide (Q). Fit your tablesaw with a ½" dado head, elevate it to cut ⅛" deep, and cut a centered groove along one face of the runner where shown in *figure 4*. Now, elevate the dado head to ⅜", and make three passes to cut a centered, 1⅛"-wide groove along one face of the guide.

Step 2. Center, glue, and clamp the guide (Q) to the drawer bottom, seating one end of it in the notch in the drawer back. Check to make sure that the guide is square with the front of the drawer, then allow the glue to dry.

Step 3. Lay out, drill, and counter-sink a $\frac{9}{64}$ " shank hole and a $\frac{9}{64} \times \frac{1}{4}$ " shank slot through the runner where shown in figure 4.

Step 4. Using a bandsaw and rip fence, stand the runner on edge and cut a notch at both ends where dimen-

sioned in figure 4. Then, lay the runner flat and bandsaw $\frac{1}{4}$ " dog-ears on the end that has the 2"-long notch.

Step 5. From $\frac{3}{4}$ "-thick hardwood, cut two $1\frac{1}{2} \times 13$ " frame guides (R). Next, insert the drawer into the frame assembly, and measure the clearance between the top of the drawer sides and the top web frame stretchers. Subtract $\frac{1}{8}$ " from this measurement to leave a bit of clearance, then plane the frame guides to this thickness. Glue and clamp the parts to the web frame stretchers, centering them along the frame ends and aligning the inside edges.

Step 6. Using the miter-gauge setup you saved earlier, rip and cross-cut two spreaders (S) to $2\frac{1}{2} \times 36''$ and a blank for the filler (T) to $3\frac{1}{2} \times 36''$ from $\frac{3}{4}''$ -thick mahogany. At the same time, cut a 36'' length of scrap to use as a brace. Next, tilt your tablesaw blade to 10° from perpendicular, bevel-rip one edge of the filler, then lay it aside until final assembly.

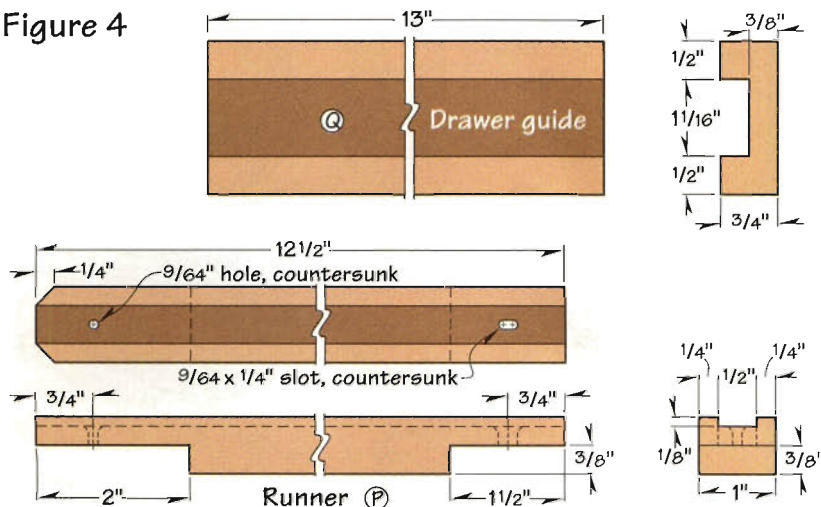
Step 7. Lay out the spreader locations on the inside face of one side where dimensioned on the Side View drawing. Then, insert dowel centers in the four holes along the back edge of each side. Stand the sides on their back edges and clamp the scrap brace between the front edges to hold them in position. Make sure they're aligned. Now, position both spreaders between the sides, and apply clamps to pull the parts together and transfer the hole centerpoints.

Step 8. Using a doweling jig, drill $\frac{3}{8}$ " holes 1" deep in each end of both spreaders. Cut, groove, and chamfer eight $\frac{3}{8} \times 1\frac{3}{8}$ " dowel pins as you did before, and glue one in each hole, again leaving $\frac{7}{16}$ " protruding. Then, sand the spreaders to 150-grit.

Assemble the Subassemblies, Then Apply Finish

Step 1. Finish-sand all parts that still need it. Next, lay one side on a flat, clean work surface with the inside face up. Dry-assemble the face frame/web frame assembly, shelf/support assembly, and spreaders. Make any necessary adjustments to ensure snug joints. Note: For final assembly, I suggest using white woodworker's glue for extended open time.

Figure 4



Step 2. Assemble the frame to one of the sides. To do this, apply glue only to the face frame stile (H), the end of the front web frame rail (I), one end of both spreaders (S), and all associated dowel pins. Use clamps to pull the assembly together, leaving a temporary $\frac{1}{16}$ " gap between the parts, then remove the clamps. Note: Allow the end of the back web frame rail to float in its mortise without glue. Apply glue to the other ends of the frame parts and spreaders, then assemble the other side to the frame. Apply clamps at both spreaders, at the top and bottom ends of the face frame stiles, and at the ends of the back frame members. Before tightening, drop the shelf/support assembly into position between the sides and on top of the frame, aligning it with the marks you made earlier. Now, tighten the six clamps one turn at a time to pull the joints together evenly. Check for square, and remove any glue squeeze-out.

Step 3. Drill centered $\frac{1}{8}$ " pilot holes through the screw slots and hole in each support. Using no glue, attach the supports to the sides using #10x1 $\frac{1}{4}$ " flathead wood screws. (This will allow the sides to expand and contract seasonally.)

Step 4. Measure the width between the front of the face frame and the shelf front (C). Tilt your tablesaw blade to 25° from perpendicular and bevel-rip the front edge of the filler to this width. Note: The filler, like the face frame, should be recessed $\frac{3}{8}$ " back from the front edges of the sides. Finish-sand the filler, then glue and clamp it where shown on the Side View drawing.

Step 5. Lay the book rack on its back. Next, insert the drawer runner into the guide slot (with the dog-eared end in front), then slide the drawer into its opening. Center the drawer side to side, then mark the location for the runner. Attach it to the bottom frame members using #6x $\frac{3}{4}$ " wood screws.

Step 6. Measure the distance between the two sides along the tops of the shelf backs and front. Crosscut the shelf trim pieces (E) to this length, then glue and clamp them in place where shown on the Side View drawing.

Continued on page 50

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Child's Book Rack

Continued from page 49

Step 7. Rout a $\frac{3}{8}$ " rabbet $\frac{1}{4}$ " deep all the way around the back opening (sides and spreaders) to accept the cabinet back. Square the rabbet corners with a chisel. Measure the opening, then cut the back (U) to these dimensions from $\frac{1}{4}$ "-thick plywood. After applying finish, attach the back using #18x $\frac{3}{4}$ " brads.

Step 8. Lay out and drill holes for two brass drawer pulls in the drawer front according to the manufacturer's instructions. Then, apply your choice of stain to all mahogany parts. (I used Minwax #225 Red Mahogany stain mixed 1:1 with Minwax Natural stain. I then sprayed on three coats of a satin polyurethane, sanding between coats with 320-grit sandpaper.)

Step 9. After the finish has dried, mount the pulls. Apply wax to the mating surfaces of the drawer runner and guide, then insert the drawer in its opening. 

Project designer and writer: Samuel T. Goforth Jr.

Photograph: Todd Lista

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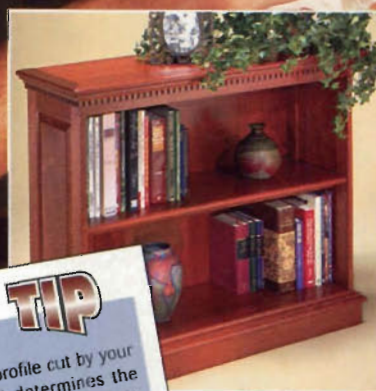
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PRO TIP

The width of profile cut by your panel-raising bit determines the final size of the crown. To calculate the crown's width and height, measure the width of the profile cut by the bit to route the crown. Make a test cut on scrap wood. Measure the width of the crown.

To calculate the crown's height, measure the length of the crown (rail plus stiles), then divide the width of the bit's cut (to allow for a 1/4" reveal at each end). To calculate the crown's height, add the width of the bit's cut, then add 1/4" for the reveal.

When working with narrow and narrow pieces, you start with a piece wider for safer handling in the routing operation, then rip it to final width later.



Old style draw-leaf design offers extendability

English Pub Table



We based this friendly, come-as-you-are table on an authentic antique namesake imported from England. Building it will give you practice at spindle turning, mortise-and-tenon joinery, and frame-and-panel work. Retracted (as shown), the table takes up about a square yard of space. Extend both draw-leaves, and you'll have a full five feet of tabletop. When you've finished it, why not relax with a pasty and a pint of bitter?

Laminate the Legs

Step 1. To make the two legs (A), rip and crosscut four $2\frac{7}{8} \times 30$ " pieces of $\frac{8}{4}$ red oak. Face-joint and plane them to $1\frac{1}{2}$ " thick.

Step 2. Sort the four pieces into two sets, matching them for grain and color. Align both pairs, making sure that the edge grain in each runs in the same direction. Face-glue and clamp both sets.

Step 3. Scrape off any glue, then joint two adjacent sides of each blank. Rip and plane them to $2\frac{3}{4}$ " square. Now, crosscut each blank to $27\frac{1}{2}$ " final length.

Step 4. Draw diagonals on both ends of each leg, mark the center-points, and scribe centerlines. Next, using the dimensions shown on the Leg drawing on page 55, lay out the mortises and tenons on the ends of both legs.

Step 5. Form the mortises and tenons in each leg. (We cut the stopped mortises on the inside faces of each leg by first boring overlapping 1½"-deep holes at the top and 1"-deep holes at the bottom using a ¾" Forstner bit in our drill press, then squared them with a chisel. We cut the open mortises on the leg tops and the tenon on the leg bottoms on our tablesaw fitted with a high fence.)

Step 6. To prepare the leg-buildup stock for the turned center section, first rip and crosscut two 42"-long pieces of 6/4 stock to 4½" wide. Joint and plane the pieces to 1⅜" thick, then crosscut four 10"-long pieces from each.

Step 7. Glue and clamp these buildup pieces to the legs where indicated on the gridded Leg half-pattern on page 55, arranging them around the leg as shown in figure 1. After the glue dries, bevel-rip the corners on the bandsaw (or plane them) to remove excess stock before turning.

Next, Turn the Legs

Step 1. To prepare the legs for turning, cut two 2¾" squares from ¾"-thick plywood. Scribe diagonals to find the centerpoint on each square, then punch the centerpoints to accept a drive center.

Step 2. Center a plywood square on the top of each leg by aligning its edges with the leg sides. Screw the squares to the legs. Next, punch the centerpoint that you marked earlier on each leg bottom to accept a live center.

Step 3. Mount one leg on your lathe, position the tool rest, then hand-spin the leg to make certain it clears. Next, test-spin the leg at low speed to check that you have it centered on the lathe's head- and tailstock.

Step 4. Run the lathe at slow speed. Using a gouge, rough out the buildup stock to a 5½"-diameter cylinder.

Step 5. Using the gridded Leg pattern as your guide, make a full-sized cardboard template of the leg turning. Transfer the turning profile from the template onto the turning blank. Then, using a parting tool and calipers, cut in the major diameters to correct depth.

Step 6. Using the template as a guide, make shearing cuts to finish

BILL OF MATERIALS					
PART	T	W	L	MTL.	QTY.
LEG ASSEMBLY					
A Leg*	5" dia.		27½"	O	2
B Feet	1¾"	3¾"	24"	O	2
C Supports*	1¾"	2¾"	8¾"	O	4
D Stretcher*	1¾"	2½"	26¾"	O	1
E Shoes*	¾"	4¼"	7"	O	4
TOP FRAME					
F Aprons*	¾"	3"	29"	O	4
G Stretcher*	¾"	3"	27⅞"	O	1
H Apron supports*	⅝"	2¾"	8¾"	O	4
I Glue blocks*	¾"	1¾"	5⅝"	O	4
J Cleat	⅝"	3½"	33⅝"	O	1
TABLETOP					
K Top panel**	¾"	30¼"	28¼"	OP	1
L Leaf panels	¾"	6¼"	28¼"	OP	2
M Rails—leaf*	¾"	3¾"	14¼"	O	4
N Rails—top*	¾"	3¾"	35¾"	O	2
O Stiles	¾"	2¾"	29¼"	O	6
P Brackets*	¾"	1¾"	11¾"	O	2
Q Bearers*	¾"	1¾"	30¾"	O	4
R Guides	¾"	2¾"	3½"	O	4
S Restraints*	¼"	3½"	3½"	P	2
T Stops	¾"	¾"	1"	O	4

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

**Cut top panel so grain direction runs across shorter dimension and matches leaf panels.

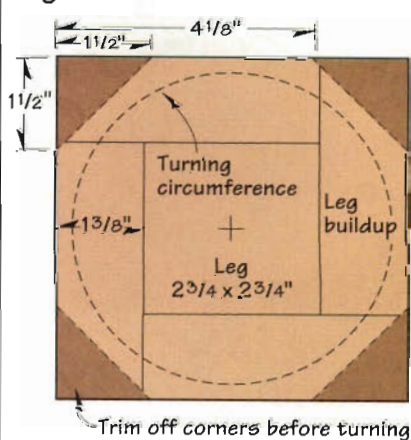
MATERIALS LIST	SUPPLIES
O—Red oak	#20 biscuits; ¾" dowel; #8x¾", 1¼", 1⅝" flathead wood screws; stain; finish;
OP—Oak plywood	4—nylon feet.
P—Plywood	

turning the profile. Next, finish-sand the turned portion of the leg. Now, turn and sand the second leg to identical dimensions.

Make the Feet and Stretcher

Step 1. Face-joint and plane a 4x50" piece of 8/4 oak stock to 1¾" thick. Joint one edge, then rip the piece to 3¾" wide. From this piece, crosscut two 24"-long feet (B). At the same time, prepare two additional pieces of 1¾"-thick stock: one 3x38" for the leg supports (C) and one 2½x26¾" for the stretcher (D). Set these two pieces aside for now.

Figure 1 Section view



Step 2. Lay out a through mortise on each foot where dimensioned on the Foot drawing *opposite*. Use a mortising machine or bore overlapping holes with a 1" Forstner bit to rough out the mortises, then square them with a chisel.

Step 3. Using a 1"-radius round-over bit in your table-mounted router, rout both ends (top face only) of each foot, cutting to full depth in several passes. Note: Save this setup to rout the stretcher.

Step 4. Cut a tenon on each end of the stretcher (D) you cut earlier. (For dimensions, see the detail shown on the Exploded View.)

Step 5. Test-fit the stretcher tenons in the inside leg mortises. Adjust the fit if necessary, then mark the mating ends. Now, round-over both top edges of the stretcher, undercutting slightly with the 1"-radius round-over bit.

Step 6. Test-fit the leg tenons in the feet mortises and adjust as needed. Then, glue and clamp a leg to each foot, square the assemblies, and allow the glue to dry.

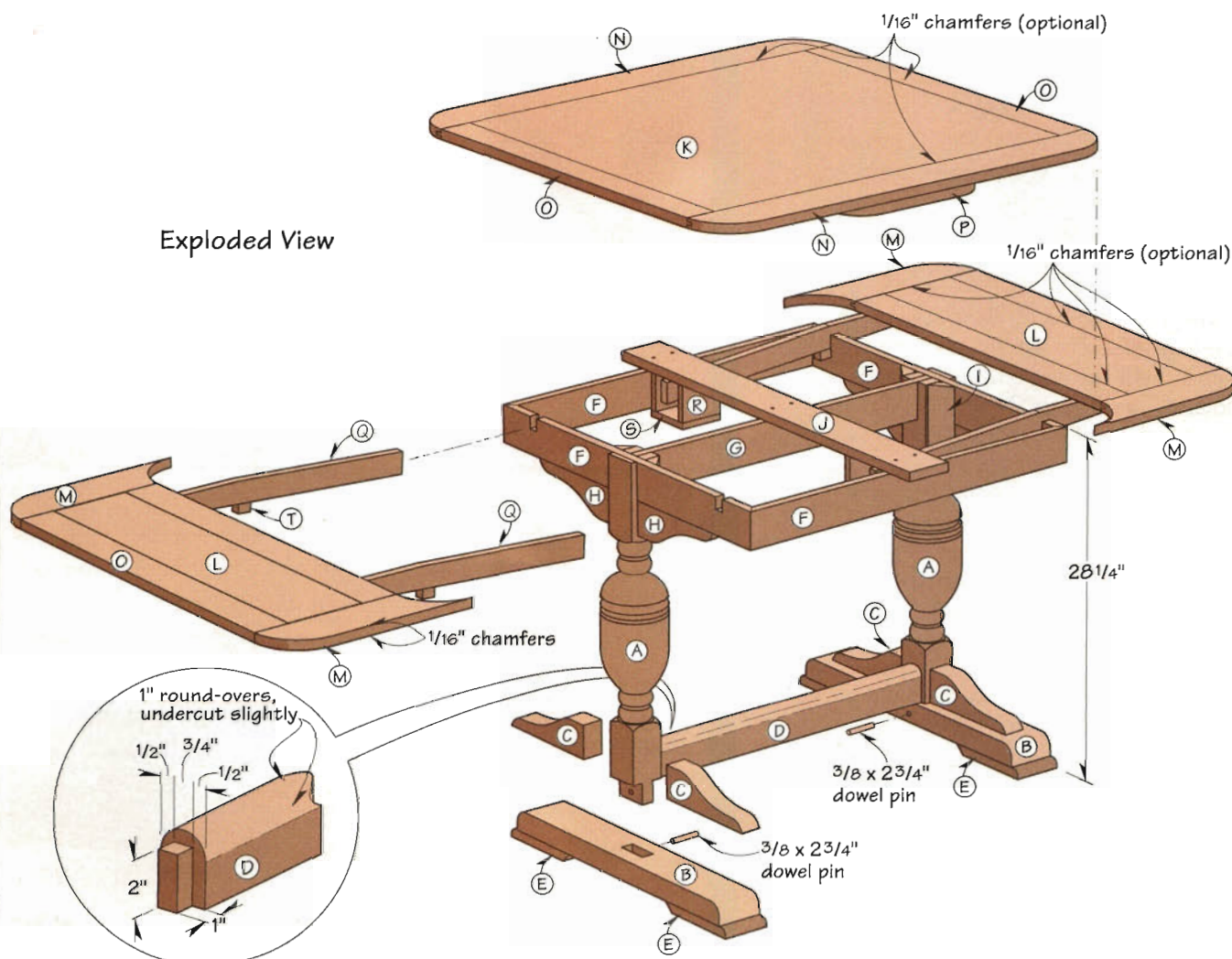
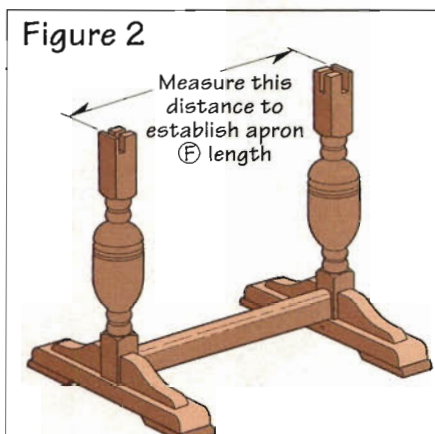
Step 7. To pin the joints, center and drill a $\frac{3}{8}$ " hole $2\frac{3}{4}$ " deep on the inside edge of each foot. Cut, groove, and chamfer two 3" lengths of $\frac{3}{8}$ " dowel, then glue them into the holes. Later, trim and sand the pins flush.

Machine the Shoes and Leg Supports

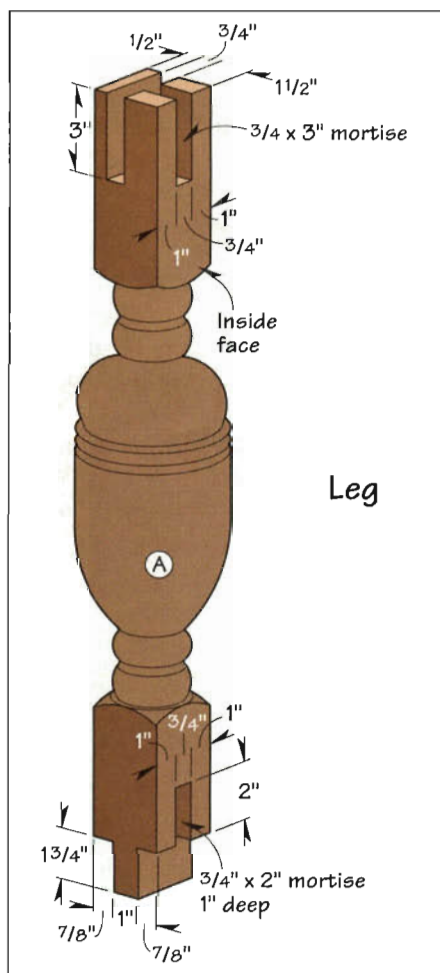
Step 1. To cut the leg supports (C), make a full-sized pattern using the gridded Support drawing on *page 57*. Trace four copies of the pattern onto the 3x38" blank you prepared earlier. Bandsaw outside the line, then sand the supports to shape.

Step 2. For the shoes (E), cut a 4 $\frac{1}{4}$ x30" piece of $\frac{3}{4}$ "-thick oak. Cross-cut four 7 $\frac{1}{8}$ "-long blanks from it.

Step 3. Install a $\frac{5}{8}$ " round-over bit in your table-mounted router, then



round one end (top face) of each shoe blank where shown on the Foot drawing. Next, bevel-cut the opposite end of each shoe at 35° from square to 7" long. Note: This will form a 55° bevel.



Step 4. Center, glue, and clamp the shoes to the bottom of the feet where shown on the Foot drawing. Allow 3/4" of each shoe to extend beyond the foot.

Step 5. Glue and clamp the supports to both leg/feet assemblies, centering them on the feet and butting them against the legs.

Step 6. Measure the finished length of the stretcher (D) not including the tenons, and cut a piece of scrap to this length to use in the next step.

Step 7. On a level surface, glue and clamp the legs to the stretcher. Position the scrap piece between the tops of the legs to hold the assembly apart. Check the assembly for square by measuring diagonally across the feet.

Make the Top Frame

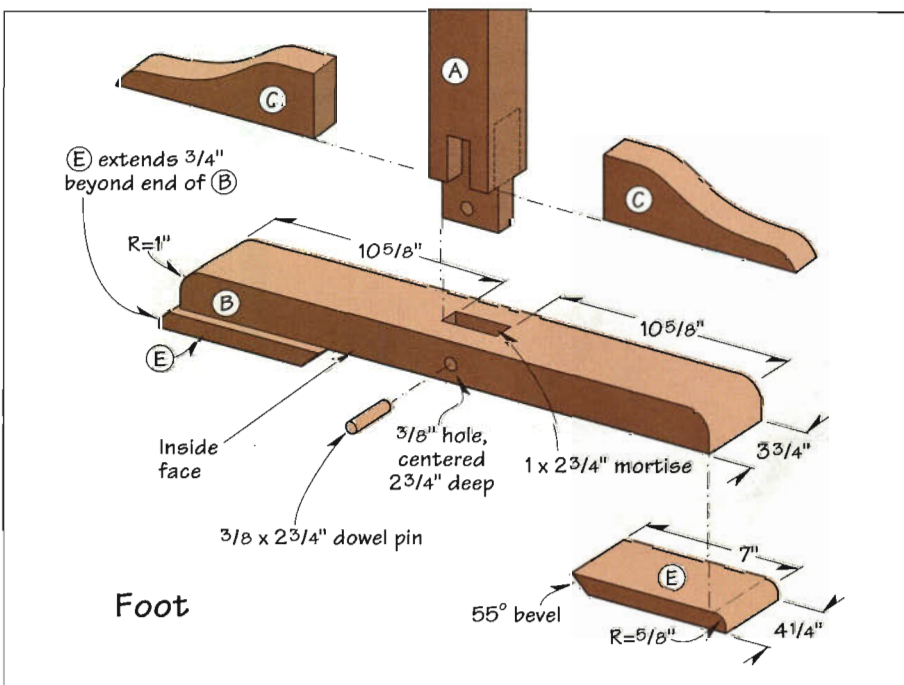
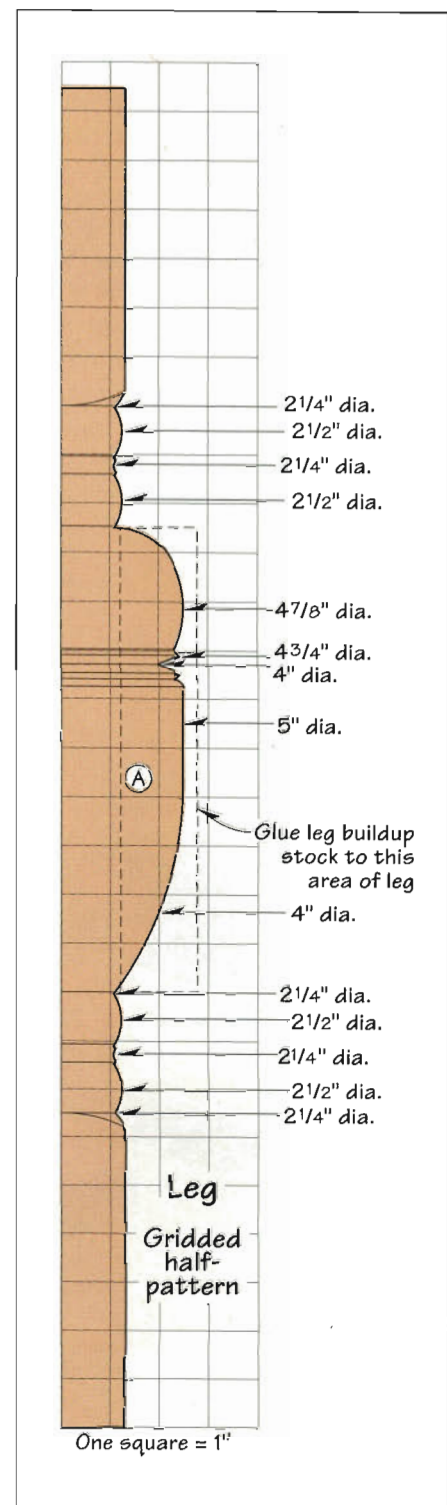
Step 1. To make the aprons (F), rip and crosscut two 3/4 x 60" pieces of 4/4 oak. From the same stock, cut a 3/4 x 30" piece for the middle stretcher (G). Joint and then plane these pieces to fit snugly in the open leg mortises. Now, rip them to 3" wide.

Step 2. To determine final apron length, measure the distance between the open leg mortises (outside edge to outside edge) as shown in figure 2. Then, bevel-cut the four aprons to this length from the two 60"-long pieces you prepared in the previous step.

Step 3. Cut slots for #20 biscuits (or for splines) in the beveled ends of

the four aprons as detailed on the Top Frame drawing on page 56. Set two apron pieces aside.

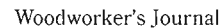
Step 4. Measure the thickness of the aprons, then mount a dado head matched to this thickness on your tablesaw. Elevate it to cut 3/16" deep. Then, cut a dado (centered between the ends) across the width of two aprons. (See photo A.)



Step 8. With the frame still in position, mark leg locations on the apron faces for later reference. Remove the

Step 2. Join the supports to the frame using two #20 biscuits or splines. (See the Top Frame drawing for position.) To locate the slots, align the wide end of each support with the leg reference marks you made earlier on the frame. Also, index the slots

Step 6. For the center cleat (J), plane and cut a piece of $\frac{5}{8}$ "-thick stock to dimension. Rout a $\frac{1}{16}$ " chamfer around the top edge. Next, center and



clamp the cleat on top of the frame where shown on the Exploded View and Top Frame drawings. Drill countersunk shank and pilot holes for #8x1¼" flathead wood screws. Then, glue and screw the cleat to the frame.

Now, Make the Tabletop

Step 1. From ¾"-thick oak plywood, cut the top panel (K) and two leaf panels (L) to dimension. If possible, work from a factory edge when cutting the larger panel to ensure a square piece.

Step 2. For the tabletop rails (M, N), select two of your straightest pieces of 4/4 oak stock measuring at least 4x64", then joint and plane them to the thickness of your plywood panels. At the same time, plane additional stock to the same thickness for the six stiles (O).

Step 3. Cut the six stiles (O) to dimension. Rip the two 64"-long rail boards to 3¾" wide, but do not cross-cut them. Mark the better face of these eight pieces.

Step 4. Mount a ¼" slotting cutter and elevate it to cut a ½"-deep slot centered along the edges of the rails and stiles. With the better face up, rout slots along the *inside* edge of each rail and stile board. (See the slot detail shown with the Tabletop drawing below.)

Step 5. Using the same slotting cutter setup, rout identical slots along the four edges of the plywood top panel and both leaf panels.

Step 6. Cut ½"-long tenons ¼" thick centered on both ends of the stiles as detailed on the Tabletop drawing.

Step 7. From ¼"-thick scrap, cut 1½"-wide splines to fit all edges of the

top and leaf panels. Then, dry-assemble the panels, stiles, and rail boards (with splines) and check for fit. Before disassembling, mark all parts so you can reassemble them in the same position.

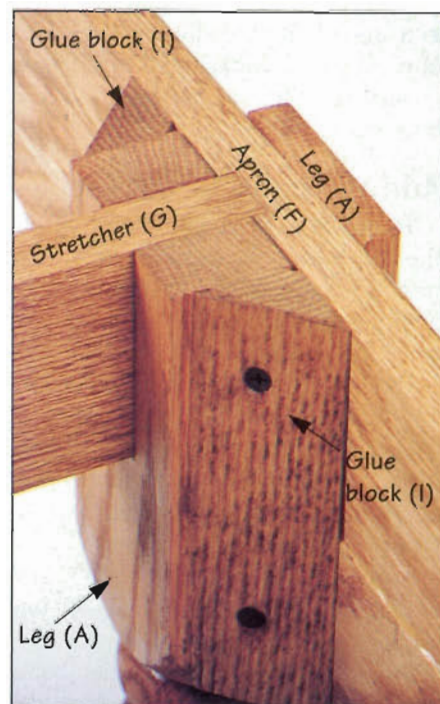
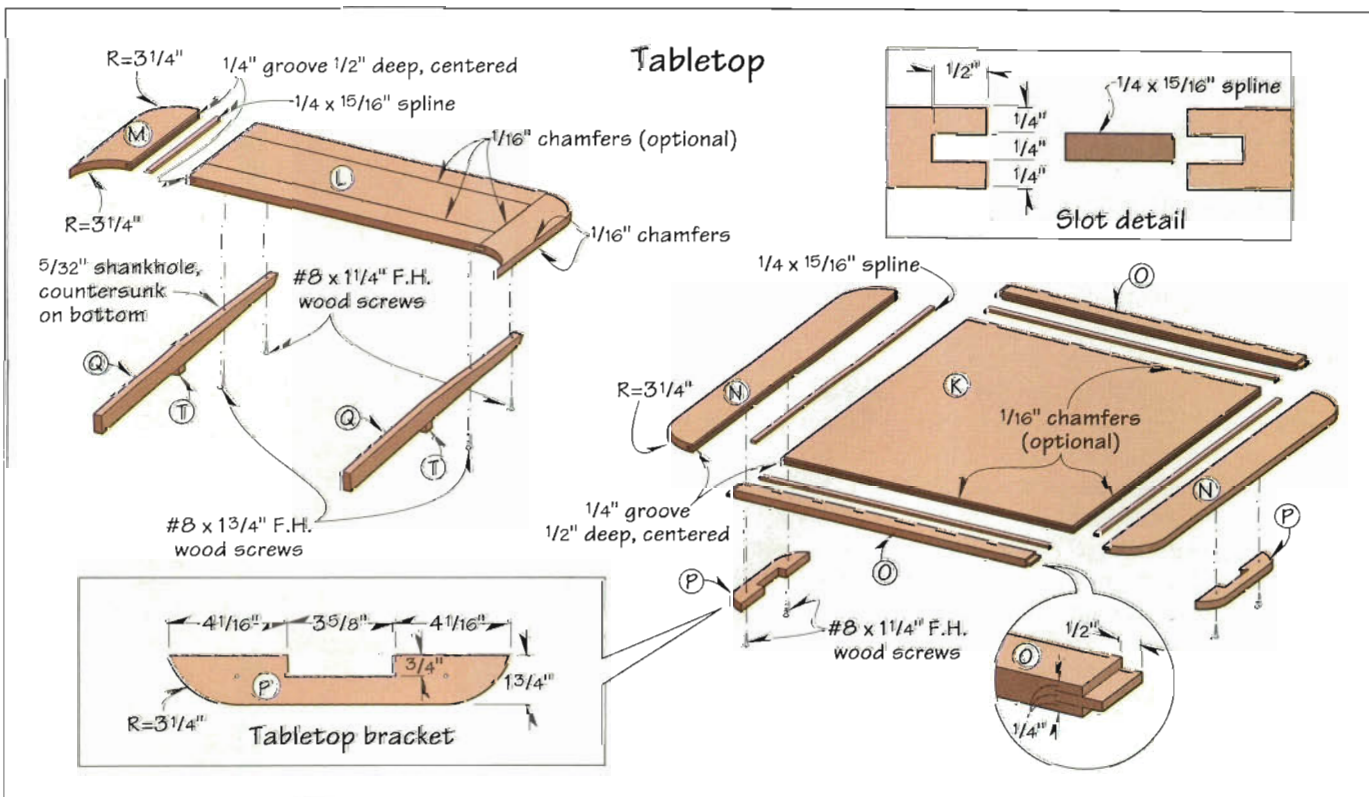
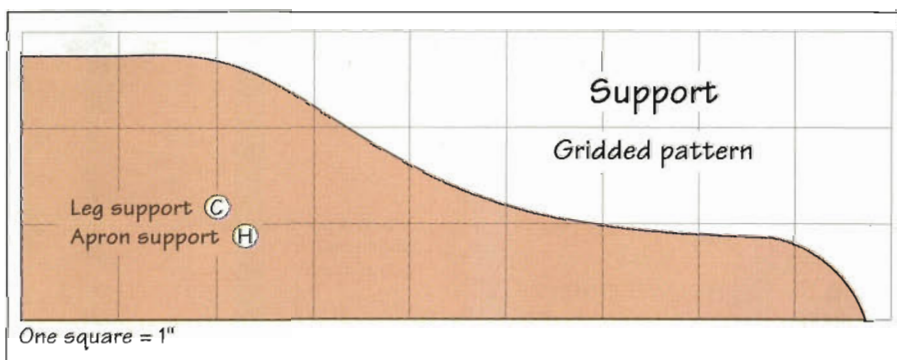


Photo A: Apron (F) seats in the open mortise in the leg (A). Apron is dadoed to receive stretcher (G), which seats in closed leg mortise. Glue blocks (I) reinforce corners.



Step 8. Cut $\frac{1}{16}$ " chamfers along the inside edges of the stiles (O) to set them off from the plywood panels. Note: Omit this step if you prefer not to have grooves in your tabletop.

Step 9. Glue the splines in the slots of the three plywood panels. Then, glue and clamp the stiles to the edges of each panel. Measure the panels to ensure they are of uniform width at both ends.

Add the Rails To the Top

To preserve grain continuity, we cut the left-side rails from one 64"-long piece in order (leaf, center panel, leaf) and the right side rails from the second piece in the same order.

To shape the corner radii, make two templates (A and B) as described in "Making the Corner Templates" below. Using the templates, work one corner at a time, hand-fitting each rail part as you work along the tabletop.

Step 1. With the tabletop dry-assembled, scribe the $3\frac{1}{4}$ " radii on one end of one rail using template A.

Step 2. Remove the rail, then bandsaw the radius, sawing wide (outside) of the line. (We used a $\frac{3}{16}$ "-wide bandsaw blade.) Next, clamp template A over the rail end, aligning the template's edge with the scribed line.

Step 3. Using a pattern or flush-trim bit in your handheld router, place the bit's bearing against the template edge, and rout the corner. Note: You may need to climb-feed the router to avoid chipping the edge along the shallow portion of the arc.

Step 4. Temporarily rejoin the rail to the leaf, aligning the corner you just cut with the leading edge of the draw-leaf. Note: If necessary, sand lightly to blend the rail arc into the stile's edge. Next, using a straight-edge, mark the point where the edge of that draw-leaf stile meets the rail. (See figure 3.)

Step 5. Remove the rail again. Position both templates on the rail as shown in figure 4, aligning the corner of template B with the mark you just made on the rail. Scribe both arcs.

Step 6. Remove the rail board from the panels and bandsaw between the two arcs to separate the shorter leaf rail (M) from the long piece. Next, clamp template B to the leaf rail, aligning its edge with the scribed line. Then, flush-trim the radius. Now, clamp template A to the end of the longer rail piece, align it with the scribed line, and flush-trim that radius.

Step 7. To prepare the middle rail (N), fit the remaining rail blank back onto the edge of the center panel and

Figure 3

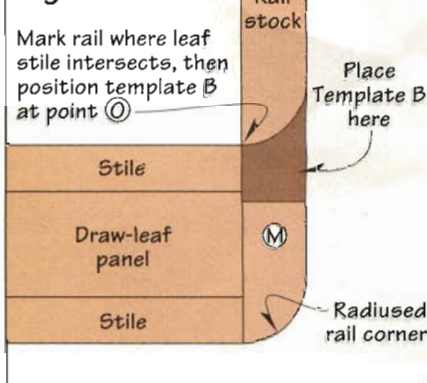
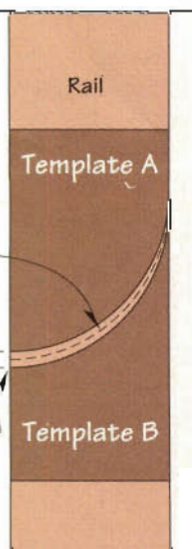


Figure 4

Step 1. Place templates A and B $3\frac{1}{8}$ " apart. Align edges, then scribe arcs.

Step 2. Bandsaw between arcs to separate rail pieces

Marked point on rail aligned with tip of template B



Making the Corner Templates

Cut a template blank to the dimensions shown on the drawing at right. You will run a pattern bit's or flush-trim bit's pilot bearing along the template edge, so make it out of $\frac{1}{4}$ "-thick or thicker material.

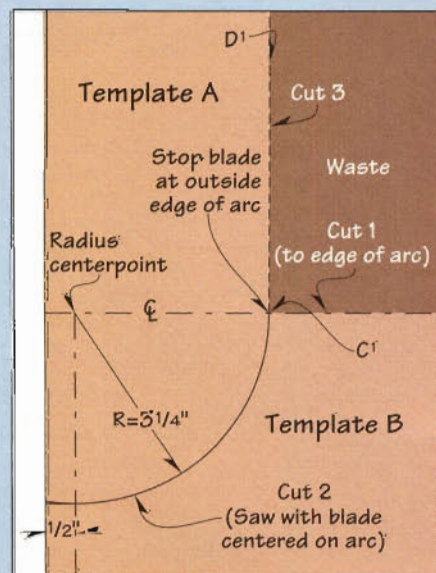
To make the templates, locate and scribe the short centerline on the blank, then locate the centerpoint for the $3\frac{1}{4}$ "-radius arc where dimensioned. Using a compass, scribe the quarter-circle. With a framing square, extend a line (C₁ to D₁) from the arc to the end of the blank.

Using your bandsaw, make cut 1 along the centerline to the outside edge of the arc. Do not cut into the arc line. Back the blade out of the kerf.

Bandsaw the quarter-circle (cut 2), centering the blade on the arc's line. Make the cut as accurate and smooth as possible. Next, make cut 3 along line C₁-D₁, separating the two templates, then discard the waste. Lightly sand out minor irregularities in the arcs, but do not change the curvature of either one significantly.

Note: If you make the templates out of plywood, fill any voids along the arc edges that might interfere with the router bit's bearing.

Use template A to lay out the radii on the rail ends; use both A and B when you lay out the corners of the tabletop and draw-leaves.



align the radiused end with the stile. Mark the opposite end of the rail where the center panel ends, then remove the rail and redo steps 5 and 6.

Step 8. To fit and shape the last rail (M) on the draw-leaf, mark the rail's length, bandsaw it, and then use template A to shape it as described in steps 2 and 3. Use the same sequence of steps to fit and shape rails M and N on the tabletop's opposite edge.

Step 9. Dry-assemble the rails to the tabletop and leaves, then pencil-mark the two points on the inside edge of each rail where the two stiles join it. Remove the rails and rout a $\frac{1}{16}$ " chamfer along each inside rail edge (top face only), starting and stopping at the pencil marks. Note: Disregard this step if you did not chamfer the inside edges of the stiles.

Step 10. Arrange the rails and panels with their top faces up. Then, glue, assemble, and clamp the fitted rails to the panels.

Step 11. Set your tablesaw rip fence $14\frac{1}{4}$ " from the blade and trim the sharp tips on the inside radii of both draw-leaves. Rout a $\frac{1}{16}$ " chamfer around the top and bottom edges of the three top panels.

Make the Tapered Bearers

Step 1. Invert the tabletop center panel, then invert the draw-leaves and place them on the top (simulating their retracted position). Align the edges, then clamp them.

Step 2. To prepare the brackets (P), measure the distance between the inner ends of the two draw-leaf

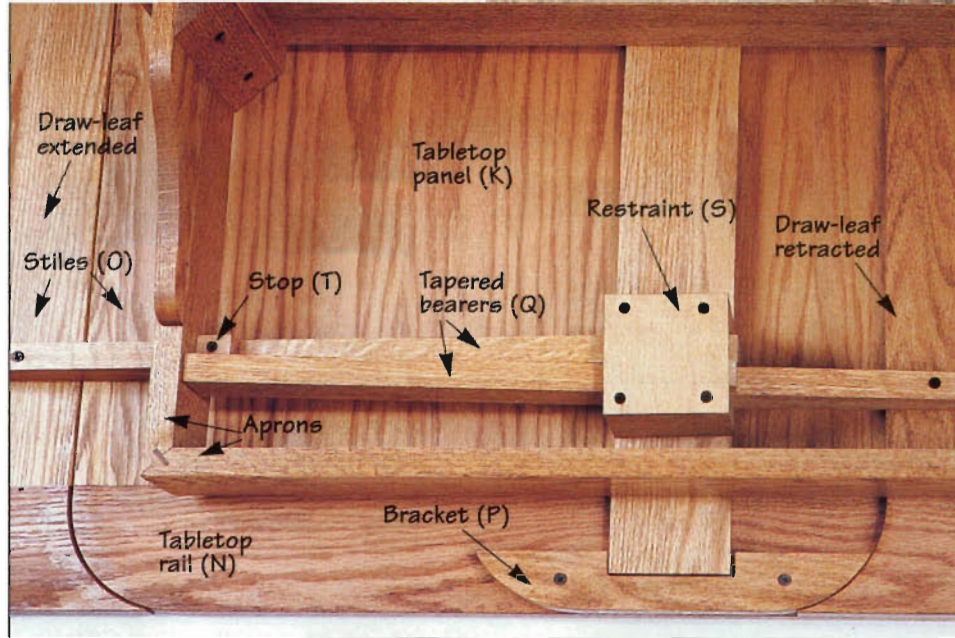


Photo B: Underside of table. Left draw-leaf extended; right draw-leaf in retracted position.

rails at the foot of the inside radii. Note: The two brackets fit (fairly snugly) in these areas when attached to the tabletop. Compare this measurement to our bracket length as detailed on the Tabletop drawing, and adjust if necessary. Also, measure the width of your center cleat (J), and add $\frac{1}{8}$ " to determine the notch length on your brackets.

Step 3. To make the two brackets (P), cut a $1\frac{3}{4}\times 24$ " piece of $\frac{3}{4}$ "-thick oak, then crosscut two 12"-long blanks from it. Stack the pieces using double-faced tape. Lay out the part on the top blank as detailed on the Tabletop drawing or using your modified dimensions. Cut the center notch with a dado head mounted on your tablesaw. Lay out the corner

radii using template B, then bandsaw and sand the corners to shape. Separate the brackets and chamfer the edges. Square the chamfer's corners with a chisel.

Step 4. With the tabletop and leaves still clamped and inverted, place the legs/frame assembly on top. Place the brackets in position and clamp them to the tabletop rails, aligning their outer edges. Drill and countersink holes for #8x1 $\frac{1}{4}$ " flathead wood screws, then attach the brackets using glue and screws. Keep the parts clamped and assembled for now. Note: The assembled tabletop will be positioned by the brackets and cleat and supported by the draw-leaves. Do **not** attach the tabletop to the frame. (For a bottom view of the assembled table, see *photo B*.)

Step 5. From $\frac{3}{4}$ "-thick oak, cut four identical blanks for the bearers (Q) to dimension. Align and clamp the blanks **face to face**, then drill countersunk shank holes for #8 flat-head screws through one edge where shown on the Tapered Bearer drawing on *page 60*. Cut the taper on each bearer where dimensioned on the drawing, then miter-cut both ends.

Step 6. With the table parts still inverted and clamped, position and clamp two bearers to each leaf as follows. With the tapered (top) edge down, butt the wide end of each bearer against the frame, fitting the narrow end through the notch in the

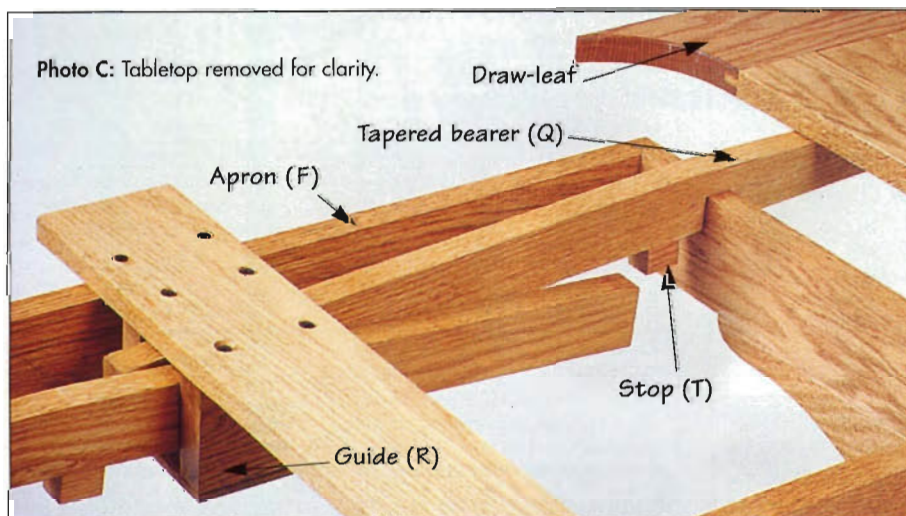
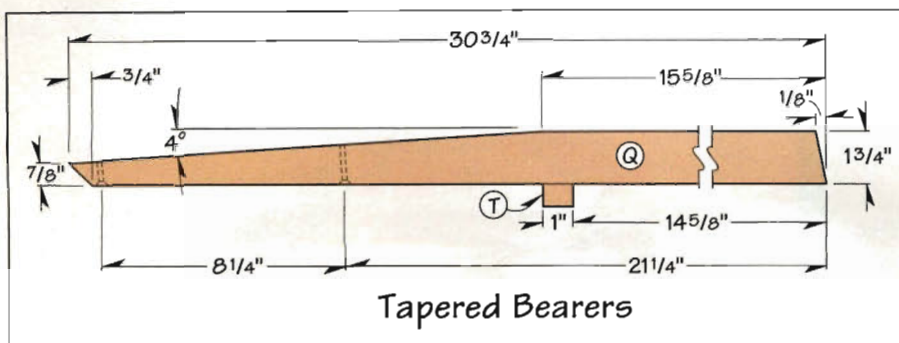


Photo C: Tabletop removed for clarity.



opposite apron. Insert a $\frac{1}{16}$ "-thick spacer between the wide end of the bearer and the frame to create clearance. Square each bearer to its leaf at the inner stile edge, then clamp the bearer to the leaf, allowing approximately $\frac{1}{16}$ " of clearance between the opposing bearers. (See photo C.)

Step 7. Using the shank holes as guides, drill pilot holes into the leaf stiles. Then, glue and screw the bearers to the leaves using #8x1 $\frac{1}{4}$ " and 1 $\frac{3}{4}$ " flathead wood screws.

Step 8. Cut four guides (R) to dimension from $\frac{3}{4}$ "-thick oak. Position a guide on each side of both pairs of

opposed bearers, allowing $\frac{1}{16}$ " of clearance. Square the guides to the cleat (J), and mark their positions.

Step 9. Disassemble the table and draw-leaves, then clamp the guides to the cleat where marked. Next, drill countersunk shank and pilot holes through the top of the cleat for #8x1 $\frac{1}{4}$ " flathead screws. Unclamp, apply glue, then attach the guides. Cut two restraints (S) to size from $\frac{1}{4}$ " plywood, then attach them to the guides.

Step 10. Turn the table upright, and place the leaves in the frame in their extended position. Position the tabletop on the center cleat, making

sure the leaves nest snugly around the ends of the top. Next, mark the bottom edge of each bearer where it laps the inside face of the notched apron. Cut four $\frac{3}{4}$ x $\frac{3}{4}$ x1" oak stops (T), then glue and screw a stop to the bottom edge of each bearer $\frac{1}{32}$ " to the inside of each mark.

Apply the Finishing Touches

Step 1. Sand all parts that still need it to 180-grit. Sand the tabletop and draw-leaves to 220-grit.

Step 2. If desired, apply a stain to all surfaces. (We used Minwax Golden Oak, wiping off the excess after 10 minutes.) After the stain has dried, apply finish. (We sprayed on three coats of satin polyurethane, sanding lightly between coats with 320-grit sandpaper.) To protect floors, fasten a 1"-diameter nylon foot to the bottom of each shoe.

Photograph: StudioAlex

Illustrations: Cad Art

Table photographed at Jumer's Castle Lodge, Peoria, Ill.

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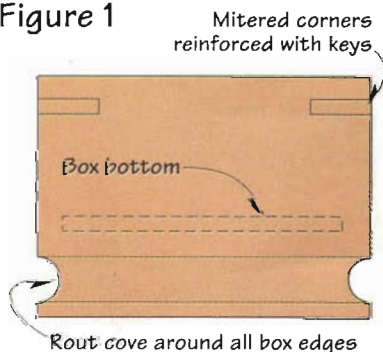
and then plane the key stock to thickness to fit the grooves snugly. Cut the keys, glue them in place, then trim and sand them flush.

Rout the Cove

Install a $\frac{3}{8}$ " core box bit in your table-mounted router. Then, rout a cove along all four faces of the box $\frac{1}{8}$ " from the bottom edge. (See *figure 1*.)

Note: We chose cove and foot dimensions appropriate for this small $2 \times 2\frac{3}{4} \times 3\frac{1}{4}$ " box. If you make larger boxes, adjust the cove and foot dimensions proportionately.

Figure 1

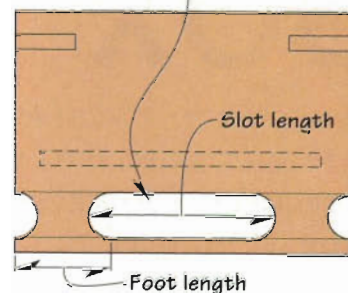


Cut the Slots

Without moving your router table fence, switch to a $\frac{3}{8}$ " straight bit. Note: This bit must have the same diameter as the core box bit you just used. Elevate the bit to cut slightly deeper than the thickness of the box sides.

Next, decide how long you want to make the feet. (We made ours $\frac{3}{4}$ " long on all sides.) Mark start and stop lines on your router-table fence to indicate the slot length (distance between the feet). Then, clamp stop-blocks at these marks.

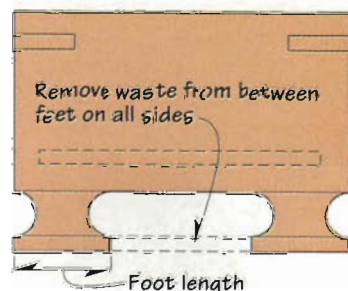
Figure 2 Rout slot with straight bit using start/stop blocks on router fence. Slot all sides of box



Note: If you're making a square box, use the same stopblock setting for all sides. For a rectangular box, change the settings as needed to make the feet equal in length on all sides.

Holding the right corner of the box firmly against the right stopblock and fence, turn on the router. Lower the box onto the bit, cutting through the side. Then, feed the box to the left stopblock to finish the slot (*figure 2*). Stop the router, and remove the box from the bit. Repeat this procedure to rout the remaining sides.

Figure 3



Complete the Feet

On each box side, mark the ends of the feet. Then, remove the remaining waste strip between them using a fine-toothed backsaw (*figure 3*).

Photograph: StudioAlex

Georgia reader Ian Cummins recently sent us a box displaying his simple but elegant coved box feet. We thought his technique made a lot of sense, so we contacted him for additional information in order to pass it along to you.

Ian reports that he makes a lot of small, mitered-corner music boxes but doesn't like to handle or join a lot of small parts to make feet. So, he came up with a four-step solution that greatly simplifies the foot-making process.

These coved feet also provide clearance beneath the box for a music movement's winding key, although they will enhance the appearance of any box. Here's how Ian makes them.

Build a Mitered Box

First, build a box with mitered corners, reinforcing the corners with keys. (If you'd like detailed instructions for making this type of box, see the Sept./Oct. '94 and July/Aug. '88 issues of *Woodworker's Journal* and also our *Woodworker's Project Book*.)

Note: Cut grooves for the box bottom along the inside faces of the sides before assembling them. Then glue, assemble, and clamp the box. Check for square, and allow the glue to dry. Cut the key grooves in the corners,

Techniques from the past enhance a modern design

SLIDING DOVETAIL BOX

Box collectors tend to seek out a variety of shapes and styles as well as unusual construction and mechanics. Woodworker's Journal staff member Craig Moro gave this box mitered dovetail joints and a lid that slides on dovetailed runners. The dovetailed handle serves to keep the lid from cupping, much as dovetailed battens did for old tabletops. A chip-carved rosette, consisting of eight identical chips, swirls dynamically out of the grain on the front face.

Start With the Sides

Step 1. Plane a $3\frac{3}{4} \times 28$ " piece of cherry stock to $\frac{1}{2}$ " thick. Joint one edge, then rip this piece to $3\frac{1}{2}$ " wide.

Step 2. From this $3\frac{1}{2}$ "-wide stock, crosscut a right side (A), left side (B), and a front and back (C) to the lengths listed in the Bill of Materials plus $\frac{1}{16}$ ", cutting in A/C/B/C sequence and marking the pieces so the grain will "wrap" around the assembled box. Note: You'll trim this extra length from the protruding pins and tails after assembling the box.

Step 3. Lay out and cut the corner joints. To do this, follow the procedure described in "Cutting Mitered Dovetails" on page 65. You'll find the technique slightly different from most, but not any more difficult.

Step 4. Dry-assemble the box parts and check the assembly on a flat surface. If the top or bottom edges don't sit flat and square, true them by sliding the assembly back and forth on a piece of sandpaper adhered to a flat piece of plywood. Now, disassemble the parts.



Carve the Rosette

We designed this optional rosette as a chip carving. You can also use the pattern to make a painting stencil, or omit it if you wish. (For more detailed information on chip-carving, see "Build A Better Bat House" in the March/April '96 issue of *Woodworker's Journal*.)

Step 1. Scribe horizontal and vertical centerlines on the outside face of the front (C). Transfer the full-sized Rosette pattern shown on *page 64* to this face. (You can adhere the pattern using spray adhesive and carve right through the paper, or use a hot dry iron to transfer a photocopy directly to the wood.)

Step 2. Carve the rosette, starting where indicated on the Carving Sequence drawing and removing the chips in the order shown using a chip-carving knife. Try to remove each chip in as few passes as possible. If you keep your cutting angle constant (about 65° is best), each chip will have a neat central ridge or point. Note: When carving two adjacent chips, begin removing the second chip by carving away from the previous chip.

BILL OF MATERIALS

DOVETAIL BOX

PART	T	W	L	MTL.	QTY.
A Side—right*	1/2"	3 1/2"	5"	C	1
B Side—left*	1/2"	3 3/8"	5"	C	1
C Front/back*	1/2"	3 1/2"	7"	C	2
D Bottom*	1/4"	4 3/8"	6 7/16"	C	1
E Lid*	7/8"	5 1/8"	7 7/8"	C	1
F Handle*	5/8"	7/8"	4 7/16"	C	1

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

MATERIAL LIST

C—Cherry

SUPPLIES

3/4" dowel; #6x1" brass flathead wood screw; hardening oil finish; paste wax

Cut Grooves, Then Fit the Bottom

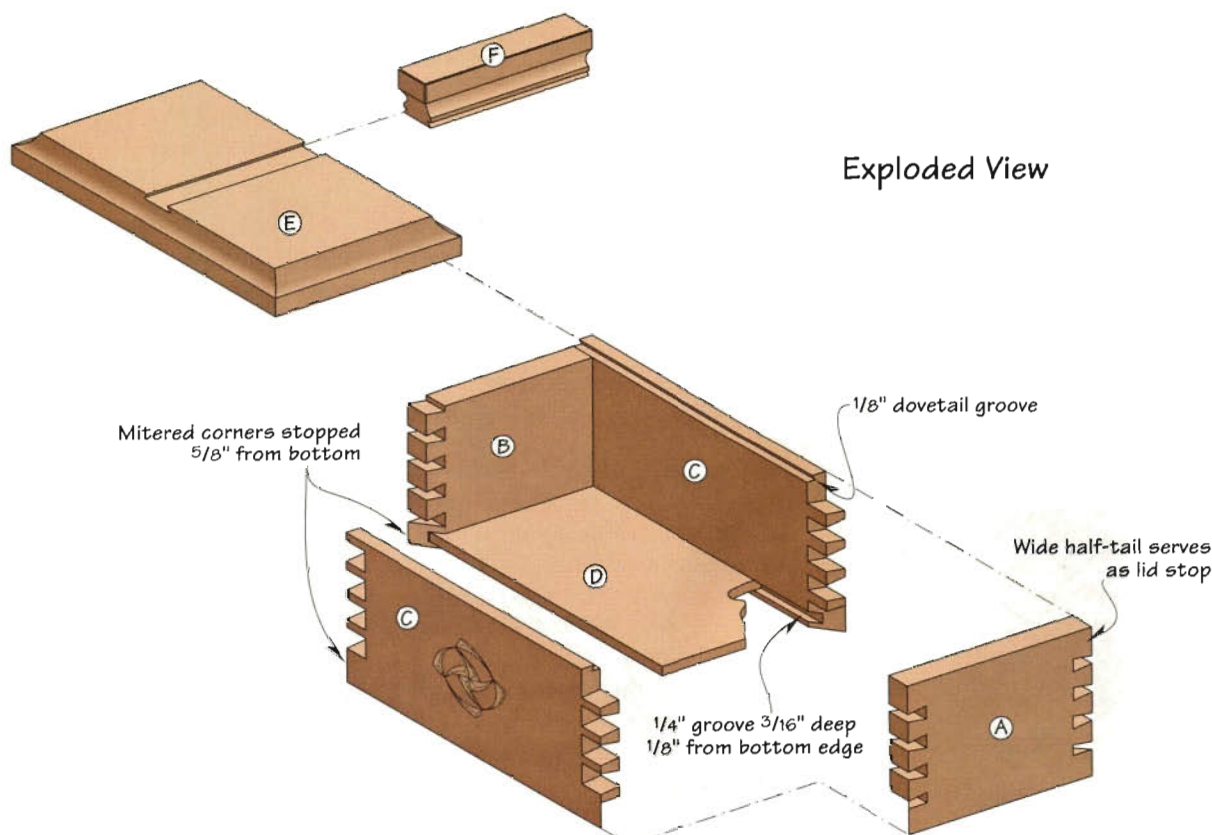
Step 1. Cut a 1/4" groove 3/16" deep along the lower inside face of each box part 1/8" from the bottom edge.

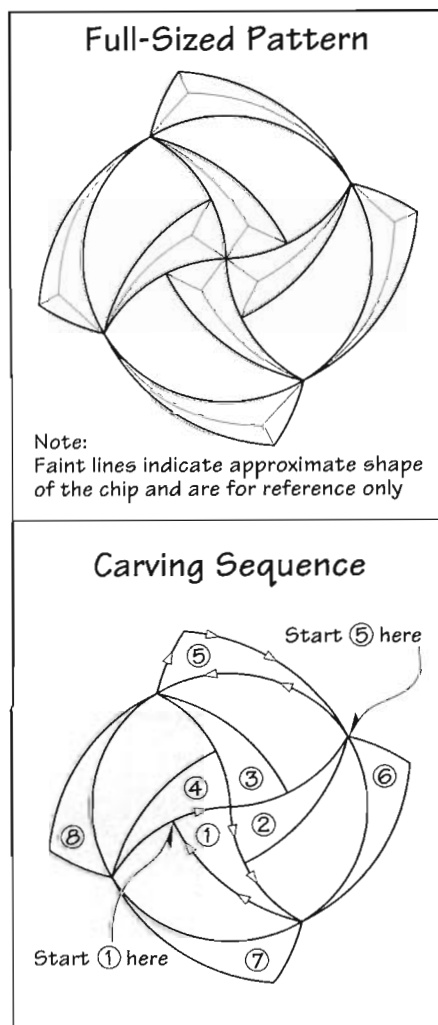
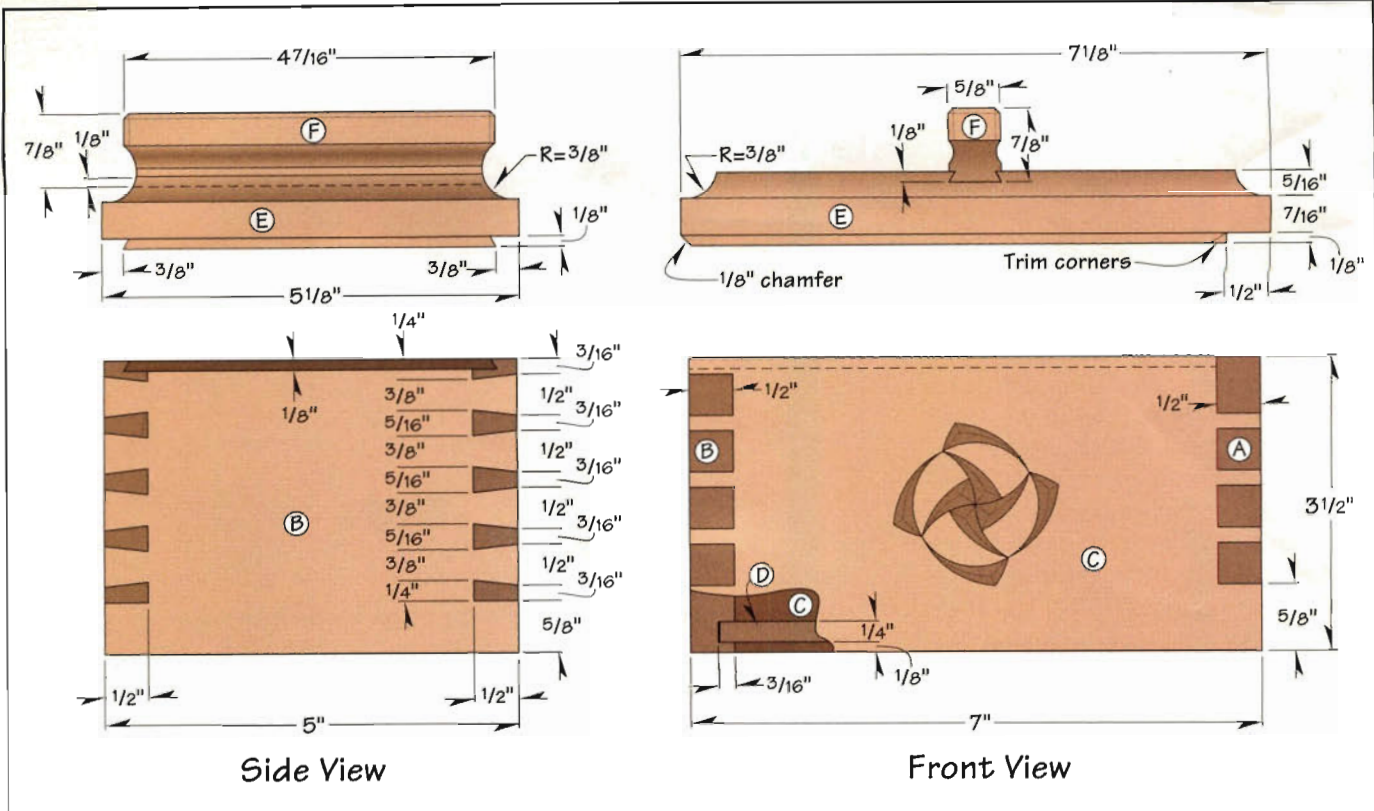
Step 2. Fit your table-mounted router with a 1/2" dovetail bit and raise it to cut 1/8" deep. Set a fence that buries all but 1/8" of the bit (measured from the

cutting edge). Then, rout track grooves along the top inside edges of the front and back where shown on the Exploded View drawing. Leave the bit height set as it is so you can rout the runners on the lid later.

Step 3. To size the bottom (D), dry-assemble the dovetailed pieces again and measure the dimensions inside the grooves. Rip a piece of 1/4"-thick cherry

Exploded View





stock to the width you measured minus $\frac{1}{16}$ " (to allow for seasonal movement). Then, crosscut it to length minus $\frac{1}{32}$ ". Test-fit the bottom in the grooves, sanding if necessary to ease the fit.

Step 4. Mark the inside face of the left side (B) where it meets the track groove in the front and back. Carefully trim the top edge of the side to this mark until it is flush with the bottom of the track groove. (We cut $\frac{1}{32}$ " to the waste side of our mark on the bandsaw, then trimmed to final fit using a handplane.)

Step 5. Sand the inside faces of the box parts (A, B, C, D) to 220-grit. Apply glue to the pins and tails, then assemble the sides, front, back, and bottom, leaving the bottom to float in its groove without glue. Use clamping blocks like those shown in figure 1 to concentrate pressure on the tails. (To make our blocks, we attached small bits of $\frac{1}{8}$ "-thick hardwood scrap, sized and arranged to align with the tails only, to $\frac{1}{2}$ "-thick scrap pieces using cyanoacrylate glue.)

Step 6. After the glue has dried, use a file to trim the protruding tail and pin ends flush. (We wrapped masking tape around the tip of the file to avoid scratching the workpiece faces.) Finish-sand the outside faces

of the box to 220-grit, taking care not to deform the details of your carving.

Make and Fit the Lid

Step 1. To make the lid (E), joint and plane a 6x12" piece of 4/4 cherry stock to $\frac{7}{8}$ " final thickness. Then, rip and crosscut it to the dimensions listed in the Bill of Materials.

Step 2. Use a try square and pencil to mark centerlines on the top edge of the left side (B) and one end of the lid blank near the inside face. (See figure 2.) Align these two centerlines, then mark the distance between the track grooves at their widest point on the end of the lid blank.

Step 3. Center the lid on the box and mark the location of the end rabbet as shown in figure 2. Use a try square and pencil to extend this mark across the inside face of the lid.

Step 4. Reset the fence on your table-mounted router, then rout dovetail runners on the inside face of the lid as shown in figure 3. (We tested our setup on a same-sized piece of scrap, sneaking up to final fit in four passes. The lid should fit closely but not tightly to allow for wood movement.)

Step 5. Adjust the router table fence so the dovetail bit will contact

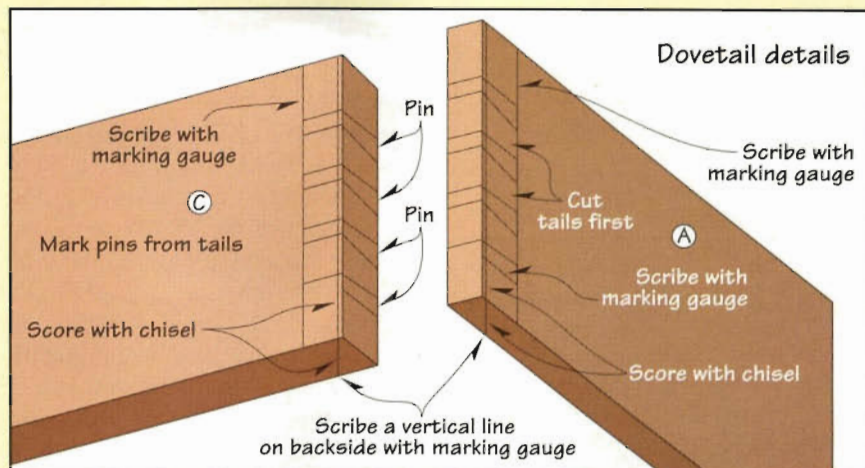
CUTTING MITERED DOVETAILS

Stopped grooves for floating box bottoms were difficult to work in the days before power routers. In order to cut a through groove that wouldn't leave a "mousehole" after assembly, woodworkers devised mitered dovetails. These are no more difficult to cut than standard dovetails once you know how to manage the corners.

Lay out as you do for ordinary through dovetails. Set a marking gauge to the thickness of the material plus $\frac{1}{32}$ " and scribe shoulder lines around the ends of all box parts (A, B, C).

Set the marking gauge to $\frac{1}{2}$ " and scribe longitudinal lines for the mitered bottom corners on the ends and both faces of the sides (A, B). On the front and back (C), scribe lines on the ends and inside faces only as shown *top right*. Lay out the miters using a combination square. Use a chisel or marking knife to score the layout lines on the bottom edges and front faces where shown in the figure.

Using a dovetail marker or sliding bevel gauge, lay out the dovetails on the sides as shown *top right* and on the Side View drawing.



Note: For our box, you make the right-side and left-side layouts slightly different. The upper corner of the right side (A) has a wide half-tail instead of a pin. (See the Exploded and Front View drawings.) This hides the track grooves you will cut in the sides later and provides a stop for the sliding lid.

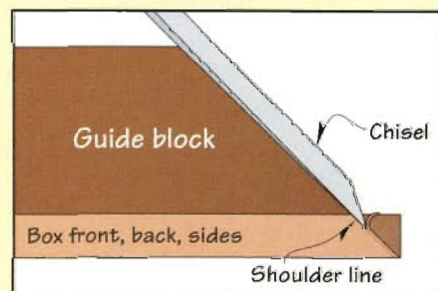
Cut the tails using a fine-tooth backsaw. Use a coping saw to remove the bulk of the waste and a sharp chisel to cut to the shoulder lines. Wait until later to cut the mitered corners. Note: For detailed instructions on hand-cutting dovetails, see Roger Holmes' article in the Nov./Dec. '94 *Woodworker's Journal*.

Lay out the pins on the ends of the front and back (C), scribing their outlines from the mating tails. Use a try square to transfer these lines onto the faces of the material. Cut all pins—except for the one adjacent to the miter—following the same procedure you used for the tails.

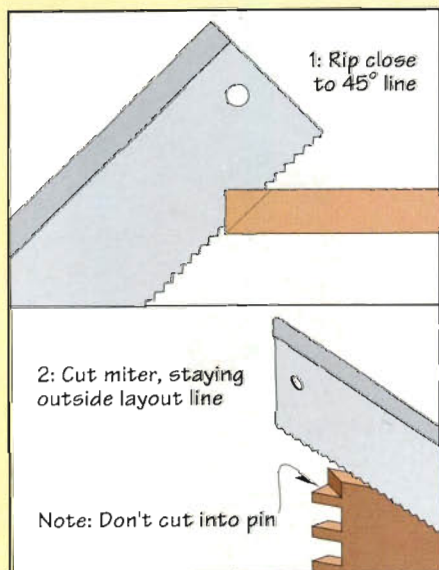
Use a fine backsaw to cut the miters on the side (tail) pieces (A, B), cutting just to the waste side of the layout lines. Set these pieces aside for now.

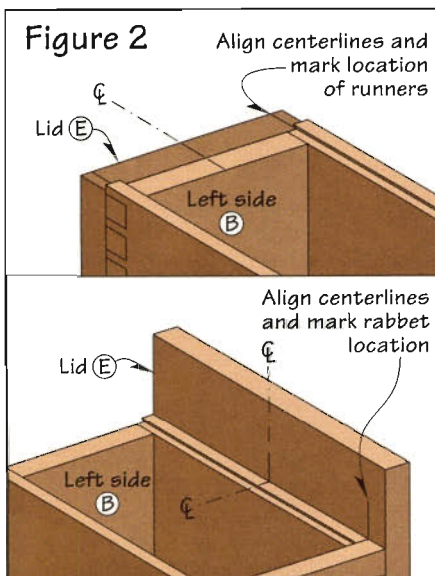
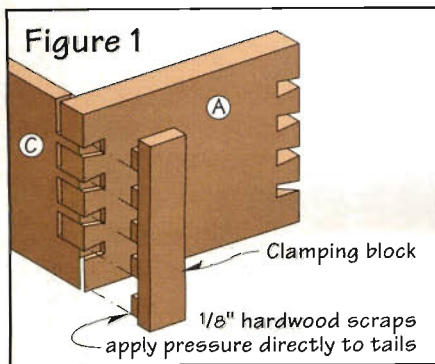
Next, cut the mating miters on the front and back (pin) pieces (C). Use the backsaw to

make 45° rip cuts on the ends as shown *below left*, stopping short of the faces. Make the miter cuts as you did on the tail pieces, staying slightly to the waste side. Don't saw all the way down to the pin. Snap off the waste piece when you get close, then clean up the cut using a sharp chisel.



To complete the miters, first make a guide block by miter-cutting one end of a short, thick piece of hardwood. (I used a length of $1\frac{1}{2} \times 1\frac{1}{2}$ " white oak.) Lay a box front, back, or side flat on the bench with the inside face up. Clamp the mitered guide block to the workpiece as shown *above*, aligning the long point of the miter with the scribed shoulder line. Using a sharp chisel held flat against the guide block, pare the mitered corner to final shape. Now, test-fit the joints, carefully trimming the pins and tails as necessary.





the lid $\frac{1}{16}$ " to the waste side of the line you marked for the rabbet. (You could at this point change to a rabbeting bit, but the dovetail bit is already set to the correct height.) Rout the end rabbet, keeping the lid end against the fence and using a $\frac{3}{4} \times 7 \times 8$ " plywood backing board to stabilize the workpiece and minimize chip-out. Now, trim the rabbet shoulder square to the layout line with a sharp chisel.

Step 6. Slide the lid into place on the box. It should overlap the box $\frac{1}{16}$ " on all sides. Mark the dovetail runner across its bottom face where it protrudes from the box. Now, use a hand-plane or sanding block to chamfer the end of the runner where shown on the Front View drawing.)

Step 7. Scribe a widthwise centerline on the top face of the lid. Reset the router table fence so the center of the bit's cutting profile aligns with the centerline, then rout a $\frac{1}{8}$ "-deep dovetailed dado across the top face of the lid. (We used our plywood backing board again to improve stability and reduce chip-out on the lid.)

Now, Make the Handle

Step 1. To make the handle (F), plane a 2×12 " piece of $\frac{3}{4}$ "-thick cherry stock to $\frac{5}{8}$ " thick. Joint one edge, then rip a $\frac{7}{8}$ "-wide strip from this piece. Mark the jointed edge.

Step 2. Set the router table fence to expose a scant $\frac{1}{16}$ " of the dovetail bit. Stand the handle blank on its jointed edge, then rout a dovetail profile along one face. Turn the blank end for end, keeping the jointed edge on the table, and rout the opposite face. Make several very light passes, resetting the fence each time and test-fitting the sliding dovetail in the lid groove until it just begins to enter under pressure. Note: You'll drive the handle into the lid later, using a mallet.

Step 3. Change to a $\frac{3}{8}$ "-radius core box bit and elevate it to cut $\frac{1}{8}$ " deep. Set the fence $\frac{3}{8}$ " from the exposed edge of the bit, and lay the handle blank facedown with its top edge against the fence. Rout a cove along this face, then flip the blank end over end and cut a matching cove in the opposite face.

Step 4. Change to a piloted chamfer bit and adjust the height to cut a $\frac{1}{16}$ "-wide chamfer. Stand the handle blank on its top edge, and rout a chamfer around all four edges.

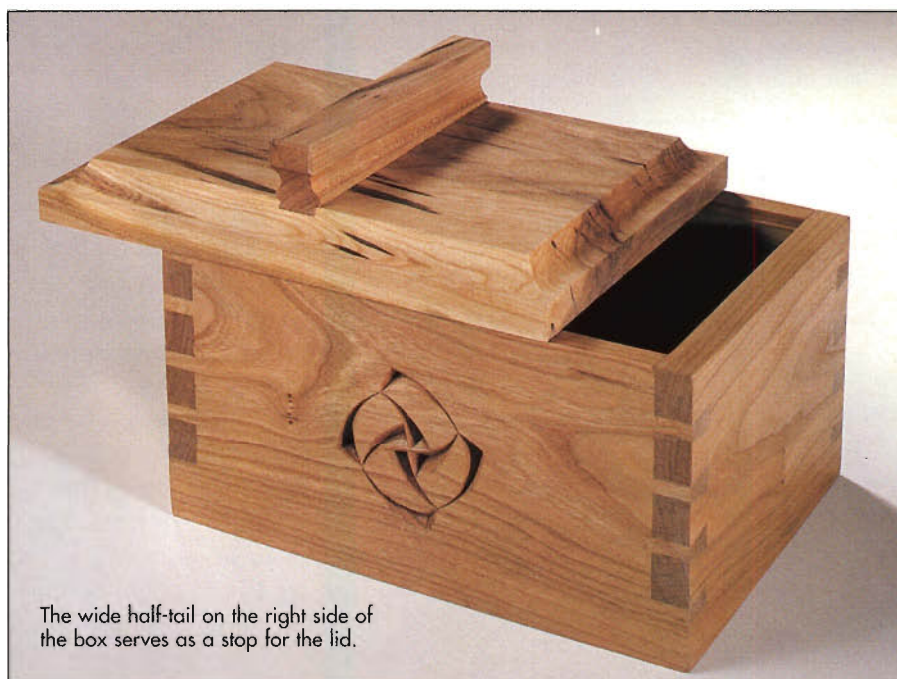
Step 5. Change to a $\frac{1}{2}$ "-radius cove bit, and set the fence flush with the front edge of the bit's bearing.

(This gives your workpiece better support than simply guiding it against the bearing.) Rout a $\frac{5}{16}$ "-deep cove around all four edges of the lid's top face, cutting to final depth in two passes.

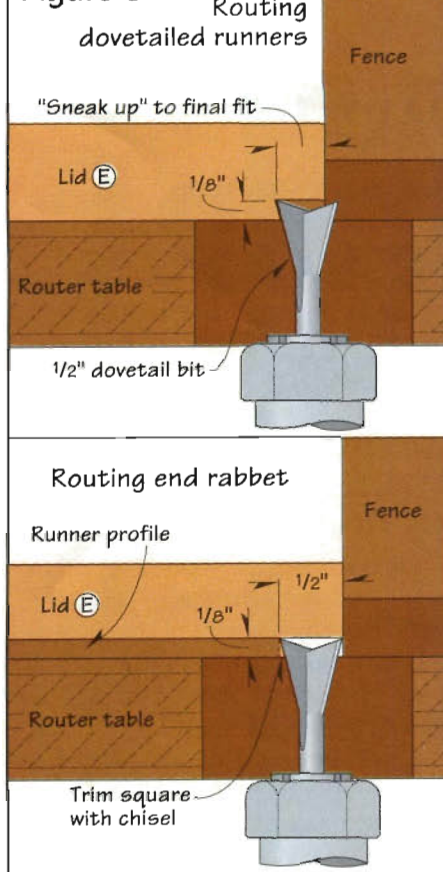
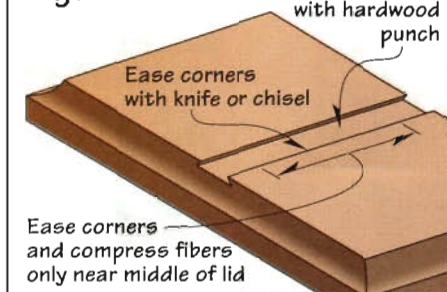
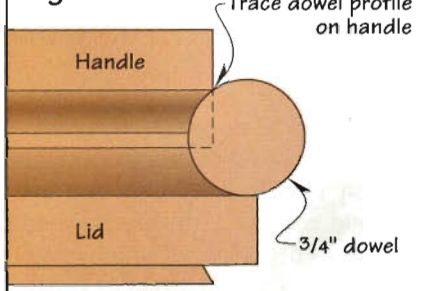
Step 6. Ease the sharp corners of the middle portion of the dovetailed dado in the lid where shown in *figure 4*, using a knife or sharp chisel. To keep the fit looking crisp, don't ease the groove near its exposed ends. Using a mallet and a short length of hardwood as a punch, tap repeatedly to compress the wood fibers in the same portion of the groove. Note: The compressed fibers will relax in time and grip the handle tightly.

Step 7. Measure the length of the bottom of the dovetailed dado and cut the handle from the handle blank to this length plus $\frac{1}{8}$ ". Use a wooden mallet (or a hammer and short wooden block) to tap the handle into position. Center it on the lid, leaving a $\frac{1}{16}$ " overhang on each side.

Step 8. Cut a 4" length of $\frac{3}{4}$ " dowel and use it as a template to trace an arc profile on each end of the handle as shown in *figure 5*. Carefully tap the handle out of the dado. Mount a $\frac{3}{4}$ "-diameter sanding drum on your oscillating spindle sander or drill press, and sand the profile on each end of the handle, stopping $\frac{1}{32}$ " outside the layout line.



The wide half-tail on the right side of the box serves as a stop for the lid.

Figure 3**Figure 4****Figure 5**

Complete the Lid, Then Apply Finish

Step 1. Tap the handle into the groove, centering it as you did earlier. Wrap your length of $\frac{3}{4}$ " dowel in sandpaper, then use it to blend the curve

in the handle end with the lid cove. Now, finish-sand the end-grain coves.

Step 2. Lay out, drill, and counter-sink a $\frac{5}{64}$ " shank hole and $\frac{3}{32}$ " pilot hole centered under the handle in the inside face of the lid. Drive a #6x1" brass flathead wood screw to lock the handle in place.

Step 3. To ease placement and removal of the lid, trim the leading corners of the dovetail runner where shown on the Side View.

Step 4. Apply finish to the outside of the box and lid. (We used two coats of a hardening oil finish, wiping off the excess with a clean cotton cloth. We rubbed the finish with 0000 synthetic wool after each coat.)

Step 5. Apply paste wax to the interior of the box and lid. Let the wax dry for 15 minutes, then buff it to a soft luster. (We used wax to avoid a lingering odor of curing oil. If you choose a film finish, you may need to adjust the fit of the dovetail runners using a folded piece of sandpaper.)

*Project design: Craig Moro
Photographs: Studio Alex*

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BUYER'S GUIDE TO ROUTER TABLES: PART 1

BENCHTOP ROUTER TABLES

We review nine good choices

by Jim Barrett

A router table ranks as the single most useful accessory one can buy for a router. With a good table, you can perform a wide variety of edge-shaping and jointing procedures with far greater safety and accuracy than if you try to “free-hand it” with a router alone. Secured to a table, your router becomes a small stationary shaper that enables you to edge-route and groove workpieces, make moldings, and cut precise tenons, sliding dovetails, box joints, and raised panels.

You’ve probably seen more than a few articles for shop-built router table

projects. However, even the most ingenious build-it-yourself designs I’ve seen lack the refinements, features, and options available on most manufactured tables, of which you’ll find a slew on the market. And I do mean a slew. For this review, I ordered, assembled, and tested 20 tables, ranging from small, inexpensive benchtop versions to large, stationary floor models. With so many choices available, I decided it was best to divide the review into two parts. In this article, I’m evaluating the benchtop tables; next issue, we’ll explore the floor models.

Which Is It: Benchtop Or Floor Model?

I’ve defined as “benchtop” those units that are small and lightweight and that come with all of the manufactured components (table, fence, and base or leg set) needed for a basic setup. In general, their legs or bases provide just enough room to mount a router under the table.

Floor models, on the other hand, usually have larger table surfaces and longer fences. The tables generally mount on a floor stand or cabinet base that positions the table at a comfortable

A table increases the versatility and usefulness of a router.



working height. Instead of selling you a complete package, most manufacturers offer the individual components—tabletop, fence, stand, and accessories—separately. While the floor models typically provide better support than benchtops for larger or longer workpieces, they also require more shop space.

The term “benchtop” as used here doesn’t necessarily imply a lack of precision, quality, or versatility. As you’ll see, you can pay anywhere from \$40 for a small “hobbyist” benchtop table to over \$500 for a sophisticated “routing machine” such as the ShopCenter described on *page 73*.

Features To Look For

For this review, I focused on versatility and capacity. In other words, will the table (with its accessories) do what you want it to do? Will it accept your router? Will it handle the size of stock you want to work with?

As you compare features, look at the overall dimensions of the table as well as its construction. The smaller, lighter-weight units such as the Skil, the Sears model 25479, and the Vermont American were not designed to accept the larger 2½- to 3-hp routers, to handle big or heavy workpieces, or to do continuous production work. Even with standard or optional table extensions, they lack the stability to support long stock or big panels and must be bolted to the bench.

The larger, heavier tables provide more support, both for the router and the stock. For some units, the manufacturer offers optional riser blocks you can place under the legs to accommodate larger routers; or, you can make your own risers. As a rule of thumb, however, if the router won’t physically



Photo A: Unique router clamp on the Veritas table top enables you to attach and detach router quickly without using tools or removing the router subbase.

The PortaNails, Rebel, ShopCenter, and Sears all employ removable insert plates (aluminum on the Rebel and both Sears units, clear polycarbonate [Lexan] on the PortaNails, phenolic resin on the ShopCenter).

The Sears Industrial table comes with predrilled holes

in the plate that accept most Sears routers; you may have to drill additional holes to accept other brands. The remaining tables have blank plates that you must drill and countersink to accept your router.

For my money, the Veritas has the most convenient mounting arrangement of all—a quick-change clamping system that accepts a wide variety of round-based routers (*photo A*). For all tables, I’ve included specific router-mounting details in the individual discussions. If, after reading this article, you still don’t feel sure whether a table will accept your particular router, contact the manufacturer directly. (See Sources listed on *page 75*.)

Fences. Each table takes a slightly different approach to fence mounting and adjustment. The Porter-Cable, Rebel, Skil, and Vermont American employ a split fence that lets you move the infeed and outfeed fences forward or backward independently. This feature comes in handy for operations that require support on the outfeed side for the routed portion of the workpiece (*photo B*). The other tables employ different means to accomplish the same task, which I’ll discuss later.

Ideally, the fence should include a wood or plastic subfence or have a provision for attaching one. This way, you can make the fence as tall or long as you want (within reason) for supporting long stock or vertically positioned boards. On the better units, fences or subfences also adjust laterally so you can support stock effectively when using a variety of bits.

Some woodworkers make their own zero-clearance fence by attaching a continuous board across the infeed and outfeed fences, then slowly rout-

fit under the table, the table probably isn’t sturdy enough to accommodate the router or the work you would want to do with it.

Most of the units I tested are made of aluminum, although Skil and Vermont American fabricate theirs from lightweight fiber-reinforced polyester. This material provides sufficient support in relation to the table’s size for the smaller routers you would use with them. Veritas offers a heavy steel table that easily supports any router you can mount on it. In my opinion, all of the tables tested provide ample support for their size and function; that is, they won’t warp or deflect when you attach one of the recommended routers to them.

Router Mounting. Which tables accept which routers? This depends on the table’s height and on the mounting system required for the router in question. The Sears model 25479, Skil, and Vermont American tables provide countersunk holes drilled directly into the tabletop that will accept most smaller routers with 6"-diameter bases. You may have to drill additional holes for other (6" or smaller) bases. The rest of the tables reviewed here accept routers with bases of up to 7½" in diameter.

Typically, you have to remove the router’s subbase and use the subbase screws to attach the router to the table. Porter-Cable’s table, for example, has holes drilled directly in the cast-aluminum tabletop that fit most of that firm’s routers.

Photo B: Several of the tables allow you to offset the infeed and outfeed fences to support the workpiece after it has passed the bit.

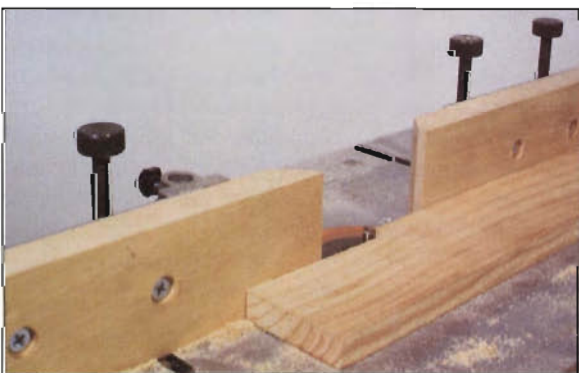




Photo C: On several tables (including the Veritas shown here), you can attach wood subfences for zero-clearance routing. Note how the subfences conform precisely to the router bit.

ing into it to form an opening of the bit's exact profile. This method virtually eliminates tearout. Also, when you shape the subfence opening this way, the bit itself acts as a vacuum, ejecting most of the chips and sawdust behind the fence and keeping the cutting area cleaner (*photo C*).

On some tables, you can position the fence behind the centerpoint of the router bit. This allows you to rout grooves, slots, or beads along the bottom face of the work. The fence on the Rebel table, for example, can be set 4" behind the bit's center, enabling you to center a groove in boards up to 8" wide.

The ShopCenter uses a different approach: a sliding crossfeed moves the entire router assembly ahead of the fixed fence to do the same thing. (See the discussion of this table for more details.)

The fences on the Veritas and ShopCenter have T-slots along their length for attaching various accessories such as featherboards, bit guards, hold-downs, and stopblocks. On others, you can retrofit the fences or wooden subfences to accept similar aftermarket devices. Both Sears tables offer a "unitized" fence with a sliding push shoe that lets you clamp and safely rout board ends (*photo D*).



Bit Guards. Most of the tables I tested provide some sort of guard, usually a clear plastic shield that both protects the operator from airborne chips and offers a clear view of the work. The better guards also help keep your fingers clear of the bit; however, note that some of them serve this function better than others. Although it may not be possible to use a guard for all operations, you should have one in place whenever possible.

Accessories. All tables except for the Veritas and ShopCenter come equipped with miter slots that accept miter gauges and other accessories such as hold-down clamps. A miter gauge comes standard on the Skil, Sears, and Vermont American tables and is sold as an optional accessory on the others. While I found the plastic miter gauges on these three smaller machines to be skimpy and difficult to set accurately, the large, sturdy gauge offered by Rebel is one of the best I've seen on any woodworking machine. (See *photo E* and the closeup discussion on *page 72*).

The Rebel gauge also fits the standard $\frac{3}{8} \times \frac{3}{4}$ " slot in the PortaNails and Porter-Cable tables. (In addition, these

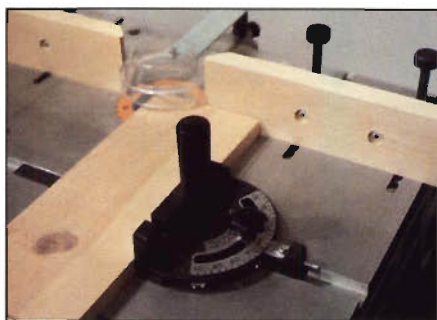


Photo E: Some operations, such as shaping board ends, call for a miter gauge. The tractor-type gauge provided with the Rebel is one of the best I've encountered on any woodworking machine.

tables accept standard tablesaw miter gauges such as the Delta no. 34-895). A miter gauge is used as a support for shaping or tenoning the end of a board, although I've never felt entirely comfortable with this operation. At the least, I would fit the gauge with a hold-

Photo D: Sears "unitized" fence incorporates a sliding push-shoe clamp for safer, more stable routing of board ends.

down clamp or extension to help keep the stock square.

I consider dust collection a "must have" on just about every woodworking machine. Among the tables I tested, only the ShopCenter, the two Sears units, and the Veritas provide for dust pickup. The Sears tables have $2\frac{1}{2}$ " dust ports attached to the fence. The ShopCenter comes complete with a flexible $1\frac{3}{4} \times 36$ " hose with a $2\frac{1}{2}$ " fitting, as shown in the photo on *page 73*.

Veritas offers a unique magnetized dust chute (*photo F*). The other tables offer no means of dust collection,

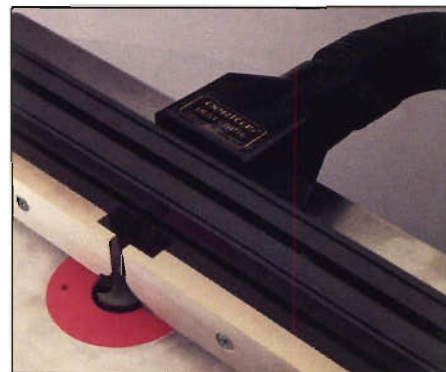


Photo F: Magnetic dust chute on Veritas accepts $1\frac{1}{4}$ " and $2\frac{1}{2}$ " hoses. You can use the chute with other tables and machines that have cast-iron or steel tables.

although PortaNails and Porter-Cable reps told me that both firms plan to include this feature on their tables in the near future.

Another feature I wouldn't willingly do without is a side-mounted on/off switch and cord set. I don't like having to reach under the table to turn on the router. If the manufacturer doesn't offer this option, plug your router into a heavy-duty power strip attached to the bench in front of the machine, and use it to operate your router and shop vacuum simultaneously. As an alternative, connect the router to a universal foot switch.

Other accessories available for some of the units include plastic table inserts, hold-down clamps, featherboards, stopblocks, table extensions, and floor stands. All of the tables accept starting pins for freehand routing. Most of them also accept shop-made jigs and various aftermarket accessories. (I've listed the manufacturer's accessories for each table in the individual discussions.)

A Closeup Look At The Tables

PortaNails Universal Router Table

PortaNails touts this unit as a "three-in-one" router system. The basic setup enables you to attach the router in two different positions: under the table or to an adjustable vertical side plate the company calls its "Joint Maker." This horizontal routing option allows you to cut rabbets, tenons, sliding dovetails, box joints, and raised panels (using vertical bits), all with the workpiece

lying flat on the table (photo G).

The third part of this system consists of an overarm attachment for pin routing. Sold as an accessory for about \$50, the attachment also serves as a bit guard when you mount the router under the table.

The PortaNails table came fully assembled in the box and included a nicely finished plywood base already attached to the legs. The solid 16x20" cast-aluminum table includes a standard 3/4x3/4" miter-gauge slot that accepts most tablesaw miter gauges and aftermarket miter-gauge accessories, plus a large starting pin for freehand routing.

To mount a router, you drill countersunk holes in the removable 8"-diameter Lexan mounting plate. The plate has two leveling screws and a 1 1/2"-diameter opening—which, unfortunately, doesn't accept larger bit profiles and offers no provision for inserts. To provide space for working with the Joint Maker, the designers positioned the mounting plate close to the front of the table, placing the bit's centerline only 6" from the

front edge. This leaves less support area for wide stock than I'd like. I noticed two elongated slots in the table edge that are probably intend-

ed for attaching a table extension, although PortaNails doesn't offer one.

Besides the overarm kit, the only other accessories available for the PortaNails table include the fence and the miter gauge. Although sturdy, the miter gauge has no calibrated marks, so you'll need a protractor to set it to precise angles.

The fence consists of a continuous 2x2x21" length of aluminum angle stock that you fasten to the table with C-clamps. It has four holes for mounting a wooden subfence and a clear plastic guard on the backside of the fence opening (the reason for which I couldn't fathom). Similarly, a second angled guard hidden beneath the table slot in front of the Joint Maker seemed to serve no purpose other than trapping sawdust.

The table supplies no guards that actually cover the bit. Nor does the unit presently provide a means of dust collection, although a company rep told me that the firm will offer such an accessory within a few months, possibly by the time you read this article.

While the PortaNails is superbly machined and quite versatile, I'd like to see better guarding, a more sophisticated fence, and a few more accessories. However, once set up for a particular task, the table is sturdy enough for continuous production work.

PortaNails Universal Router Table, \$359; Overarm Kit, \$49.95; Fence, \$19.95; Miter Gauge, \$14.49.

Photo G: Adjustable vertical slide plate on the PortaNails table lets you do many horizontal routing operations, such as cutting a tenon with a straight bit.



Porter-Cable Heavy Duty Shaper Table (model 696)

If you read my review on Router/Shapers in the March/April '96 *Woodworker's Journal*, you'll notice that I tested this table equipped with a 1 1/2-hp router motor (model 6912). The firm offers it in that configuration as a router-shaper (model 695). However, you can buy the table separately (as model 696) with pre-drilled holes that fit Porter-Cable router models 514, 518, 520, 630, 690, 691, or 693. While you could adapt the table to accept other router makes, the company advises against this because of the difficulty of drilling precise enough holes in the ribbed cast-aluminum table to keep the bit centered in the insert hole.

This 16x18" table with its sturdy base provides plenty of stability. However, to install the firm's larger routers, you'll need to add riser blocks under the base (or purchase the optional metal leg set, which converts the

table to a floor model).

The table also has adjustable infeed and outfeed fences, an overhead cutter guard, a separate, stand-mounted on/off switch, a dust-collection port, and a standard 3/4" miter-gauge slot that accepts the venerable Delta miter gauge.

Porter-Cable reps recently reported that the firm is hard at work improving this product. The new model will incorporate a taller base and predrilled holes to accept the larger 2 1/2" and 3 1/4"-hp P-C routers; a 3/8" insert hole to accept larger raised-panel bits; an improved, easier-mounting fence that will include a bit guard and a 2 1/2" dust-collection port; and a new table that offers an additional 2" of length and 1" of width to the present 15 3/4x17 3/4" table. (Although the firm did not have a prototype available for this review, it will probably release the new unit by the time you read this.)



Other than these improvements, the new table will have the same features as the one described here. Porter-Cable officials expect it to sell for about \$10 less than the price listed below.

Porter-Cable Heavy-Duty Shaper Table (model 696), \$140; Leg Set (no. 6961), \$31.

Rebel Router Table

If you want a super-sturdy, easy-to-use table, consider the Rebel. This rock-solid unit has ample clearance under the table for the largest router you can buy. You'll find the table, mounting plate, and leg set all made of cast aluminum and nicely machined. The table initially came with a phenolic mounting plate, but the company recently switched to an aluminum plate to provide better support for heavy routers.

To attach a router, remove its base plate and use it as a template to drill countersunk mounting holes in the table's 11x11" plate. On some routers, you'll need to replace the original base screws with longer ones to accommodate the thicker plate. The plate includes four leveling screws for adjusting it flush with the tabletop. The designers offset the router mount plate toward the back of the spacious 18x24" table, providing plenty of area in front of the bit for routing wide stock or panels such as cabinet doors.

The split fence has two individually adjustable aluminum fence brackets with

3x12" maple subfences. Both fence segments allow a generous amount of front-to-back travel—from about 2½" in front of the bit's



center to 4" behind it. Slots in the fence brackets also enable you to move the wooden subfences laterally to provide an opening from 3" to about 8" wide. Unfortunately, you can't move the subfences closer together to provide additional support for smaller bits. A

company rep told me that this was done mainly to keep larger bits from accidentally chewing up the ends of the subfences. However, it would be simple enough to make and attach your own subfences or zero-clearance fence.

Rebel's large precision miter gauge also impressed me. It has adjustable positive stops at 90° and 45°, and the slotted face allows you to attach extension boards and other fixtures to it. To collect dust and chips, you can attach a 3" flex hose to the top of the safety guard.

Standard accessories include the fence, miter gauge, bit guard, two plastic insert rings, and a starting pin for freehand shaping. The optional, locking on/off switch shown costs an additional \$13. This unit will accept a variety of aftermarket accessories and fixtures, including the IncraJig and JoinTech fences.

Rebel Router Table, \$160; switch/cord set, \$12.95.

Sears "Best" Router Table (model 25479)

With its ribbed cast-aluminum table and unique "unitized" fence, this table represents a good buy for the dollars. The small 13¼x18" table limits the size of the work it can handle, although Sears does offer accessory table wings (quite similar to those shown on the Vermont American table) that will help support your longer and heavier workpieces.

I especially like this unit's fence, which includes a sliding push shoe that secures boards (up to 4½" wide) vertically against the fence for routing tenons, sliding dovetails, rabbets, and tongue-and-groove joints into the ends. (See photo D on page 70.)

The fence also incorporates an integral "pocket fence" or shoe on the outfeed side that slides out ½" beyond the main fence to support the stock when you're jointing or tak-



ing full cuts. You can also detach the entire fence and reposition it backside out to permit grooving or veining of wide stock. (Note the red plastic bit guard located on the back side

of the fence for this.) On the front side, a hinged, clear acrylic bit guard enables you to view the work while protecting your fingers.

The pre-drilled tabletop accepts most of the firm's smaller fixed-base routers and some other brands. The entire unit weighs just 13 pounds, so you'll definitely want to bolt it to a bench or sturdy plywood base to prevent tipping or walking. You can also mount it on an optional steel floor stand (leg set) that also fits the larger Sears table.

Standard accessories include a 2½" dust port, an adjustable protractor-type miter gauge, and six plastic table inserts. Optional accessories include the table wings and leg set mentioned above, a hold-down clamp that fits the miter slot, and a separate, locking on/off switch/cord set.

Sears "Best" Router Table, \$64.99; Table Extensions (2), \$12.99; Floor Stand (leg set), \$39.99; Hold-Down Clamp, \$8.99; Switch/Cord Set, \$19.99.

Sears Industrial Router Table (model 25490)

A step up from the Sears "Best" Router Table, this model has a 14x24" aluminum table with a similar "unitized" fence (including vertical push shoe, pocket fence, and dust port). This fence isn't reversible like the one on model 25479, but it can be repositioned 2½" back from the bit's centerline, allowing you to center grooves in boards up to 5" wide.

The table uses a removable, pre-drilled mounting plate that accepts most routers with bases up to 7½", including the larger Sears plunge routers. With some routers, you may have to drill additional countersunk holes in

the plate to mount them. The plate also accepts a starting pin, which is provided. With a taller, sturdier leg set, you can easily fit most larger routers beneath this unit.

Although Sears markets this as an "industrial" table, I think it's a mite undersized for true production work or for handling large workpieces. However, it should be fine for most home woodworking projects and includes enough desirable features to justify the price. Accessories include the unitized fence, a miter gauge, six plastic table inserts, and a starting pin. Optional accessories are the same as those listed for the smaller Sears table.



Sears Industrial Router Table, \$94.99.
(For accessories, see Sears model 25479.)

ShopCenter (model RS-290)

While I was preparing this review, the manufacturer changed the table's name from RouterShop to ShopCenter, hence the discrepancy with the name you see in the photograph. By either name, it's a highly versatile, super-sturdy table.

I like the unique tilting table leaf. With it, you can orient the router bit at anywhere from 0 to 90° to the workpiece. This greatly increases the number of profiles you can get from a single bit. In the full horizontal routing position, you can safely perform such difficult operations as cutting large profile moldings, rabbets, mortises and tenons, tongues and grooves, and straight bevels, all with the workpiece flat on the table. (See photo H.)

With the unit set up as a horizontal router, you can also make use of the increasingly popular vertical raised-panel bits, which I feel are much safer than conventional, large-diameter raised panel bits.

I also like the unit's crank-actuated carriage assembly (called a "calibrated crossfeed" by the manufacturer). This moves the entire router forward or backward across the table and eliminates the need to reset the fence for different cuts. The crossfeed has an easy-to-read scale calibrated in sixteenths of an inch (one full turn of the crank equals ¼"). Using this scale,



together with the angle scale on the tilting table and a bit-height scale on your router, you can record the settings for a particular profile, then duplicate it in the future.

I found the ShopCenter exceptionally well made and easy to operate, once I got it assembled. (It takes time to mount the router on the crossfeed assembly.) The large 19¼x24" reinforced aluminum table provides generous support for long stock, and the unit was stable enough that I didn't need to bolt it to the bench for small work.

A combination guard/dust collector, complete with hose extension for 2½" shop vacuum hoses, comes with the unit. The slotted aluminum fence (also standard) and table accept a variety of accessories available from the company: feather boards, adjustable stops, zero-clearance fence inserts and extensions, 12" and 18" miter-gauge extensions, auxiliary fence, dado fence, biscuit miter jig, sliding mortising table, and riser blocks for use with taller routers.

There's also an optional on/off switch you can mount on the front of the table. (Contact the firm for current prices.)

The enclosed base design made it a bit awkward to switch the router on and off, adjust the bit height, and change bits, all of which must be done from the backside of the machine. To facilitate bit changes, the manufacturer recommends

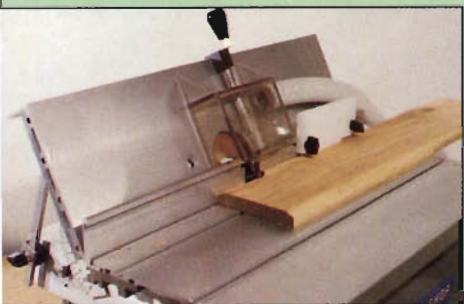
using fixed-base routers with easily detachable bodies, which you can remove after tilting the table to the 90° position.

While the phenolic mounting plate on the crossfeed accepts routers with bases of up to 7¼" in diameter, the owner's manual cautions that some plunge routers won't work well with the table unless you remove the springs on the plunge mechanism. It also recommends that you install a router with an easy-to-operate depth adjustment and calibrated depth scale—and one that will let you plunge the collet to a level flush with, or slightly proud of, the router base.

In spite of these few minor inconveniences, the ShopCenter earned an A+ in my hands-on tests; I found it to be the best of the bunch. The manufacturer offers a generous selection of optional accessories—but be prepared to pay the price. The ShopCenter comes in two sizes: the RS-290 (shown) and a smaller version, the RS-190.

Photo H: Table leaf on ShopCenter tilts from 0 to 90°, allowing multiple profiles from a single bit. The tilting leaf (shown here cutting a 60° bevel with a straight bit) also lets you cut tenons, sliding dovetails, box joints, and raised panels.

ShopCenter RS-290, \$550; RS-190, \$475. (Contact the manufacturer for current accessories and prices.)



Skil makes its small, lightweight table (including the split fence and leg set) of fiber-reinforced plastic, which provides enough support for small routers and workpieces. The unit accepts most lightweight routers, which you attach directly to the table using pre-drilled holes in the tabletop.

The two-piece fence adjusts forward and backward but not laterally. It won't accept a wooden subfence unless you drill holes in the plastic fence to attach one, which would be fairly easy to do. The low fence by itself doesn't provide much support

for short workpieces, and I wouldn't expect much accuracy when running boards through it standing vertically.

Standard accessories include a miter gauge



(the same one found on the Sears and Vermont American tables) and a lift-up plastic bit guard. I found no evidence that Skil offers any optional accessories for this table.

On the plus side, I found the Skil easy to assemble and adjust for simple edge-routing tasks. As priced, it makes a good beginner's table for small projects and occasional use. You'll definitely need to bolt it to a bench or other solid surface to use it.

Skil Router Table, about \$40.

Veritas Router Table Top (model 05J20.01)

Veritas takes a "kit" approach with this precision-milled 16x24" plate steel table top. The firm sells the top (with plastic insert and router clamping device) and the Veritas fence separately. It does not offer a

clamp brackets, and slide the brackets against the router base. Then, position the clamp bars and snug down the four knobs to tighten the bars. The clamp system automatically centers the router in the bit opening, and the whole process takes a minute or less. This system makes a lot of sense if you're likely to remove the router frequently for other jobs. (See photo A on page 69.)

The designers have offset the 3½" bit opening toward the back of the table to provide plenty of table support in front of the bit for wide stock. The table comes standard with ½" and 1½" plastic inserts, and you can buy several other sizes.

The Veritas fence consists of three sections of 2"-square anodized aluminum. The upper section, a single continuous piece, provides rigidity. The two lower sections slide laterally to vary the size of the bit opening. Both the upper and lower segments have T-slots on both faces and on the top edge for fitting wooden subfences and various accessories. The whole unit secures to the table with spring-loaded fence clamps.

I found this fence exceptionally sturdy and easy to set. Although the two sections of the split fence can't be offset fore to aft, Veritas does offer an optional set of plastic jointing shims that you place between the fence and subfence on the outfeed side to provide a slight offset for basic jointing (photo I).

The fence also incorporates a micrometer fence-adjusting device that clamps to the table for minute fence adjustments. This calibrated device provides direct readings of the amount of fence movement at the bit, not at the fence



Photo I: Veritas offers an optional set of plastic shims that let you offset the two subfences for basic jointing.

end where it's attached—a great gadget for woodworking perfectionists.

You can buy several nice accessories for the table, including a magnetic dust pickup chute fitted for 1½" and 2½" vacuum hoses (shown in photo F on page 70). The pickup fastens firmly to the steel table by means of four strong magnets. You can use this handy accessory with other steel or cast-iron tables as well. (For other accessories, see the list below.)

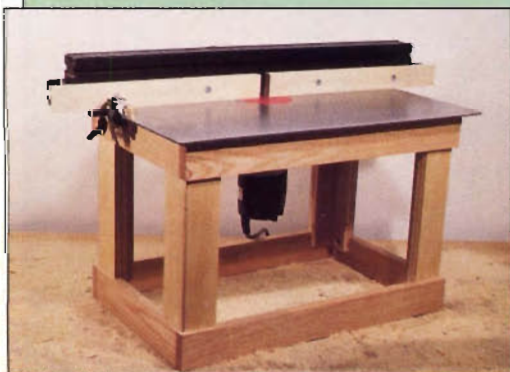
The table makes no provision for a miter gauge or bit guard, but you could easily rig up a guard or sliding miter guide that would fit into one of the T-slots in the fence. If you want to do precise work with plenty of support for large stock, the Veritas would be a good choice.

Veritas Router Table Top, \$149; Fence, \$125; Phenolic Inserts (3 flat, 3 template), \$4.50 each; Magnetic Dust Chute, \$19.95; Fence Position Stops, \$8.50; Jointing Shims (set of 3), \$5.75; Wooden Subfence Replacements, \$5.95.

leg set or base for the top, but provides plans for the base you see in the photo. The underside of the top includes four threaded studs for attaching this base or a similar one of your own design. You can also make your own fence or fit the top with one of several after-market fences.

You won't find a sturdier top than this one. Made of ¾" plate steel and milled flat to within .004", it won't sag no matter how big a router you use with it. This helps ensure very accurate cuts.

I also like the table's quick-change clamp system for mounting round-based routers of up to 7½" diameter. In most cases, you won't even have to remove the router subbase. You simply invert the router, place it between the



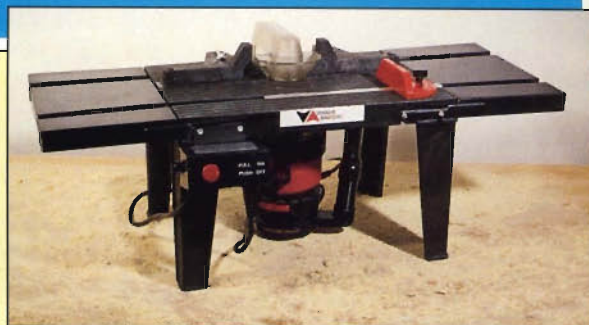
Vermont American Woodcrafter's Series no. 23467

This unit looks nearly identical to the Skil (Vermont American makes both) but includes a separate on/off switch and two stamped-steel table extensions. Note, however, that the Vermont American extensions won't fit the Skil, because this table has slots with captured nuts to attach them, which the Skil doesn't.

Like the Skil, this table was designed for

light-duty or occasional work. The extra table space provides fairly good support for stock up to about 36" in length, but the extensions require a bit of fiddling to adjust them parallel to and flush with the table.

Vermont American Woodcrafter's Series no. 23467, about \$100.



SOURCES

PortaNails Nails, Inc.
800/634-9281

Porter-Cable
800/321-9443

Rebel Router Table
Woodstock International
360/734-3482

Sears Craftsman
Catalog Orders: 800/377-7414
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ShopCenter
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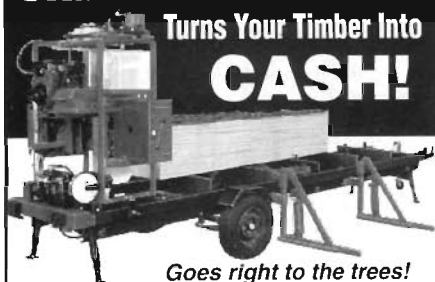
Skil Router Table
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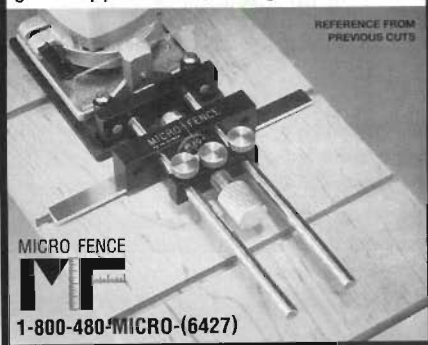
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SHOP TEST

Sears 10" Contractor Saw

Improved fence breathes new life into tablesaw

by Tom Jackson

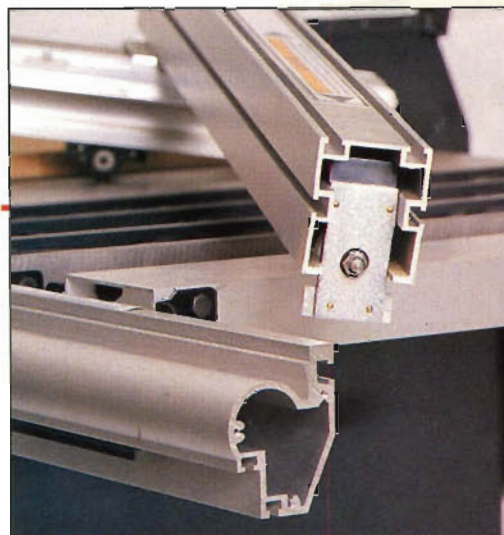
Woodworkers have grumbled for years about the angle-iron fences on the Sears Contractor Series saws. So, when Sears recently introduced its newest version of the saw with a brand-new fence system, we quickly ordered one in for

testing. After putting the saw and its "Exact-I-Rip" fence (catalog #29911N) through their paces, our resident designer and craftsman Dick Coers reports, "I'm happy to see this fence!"

Designed For Accuracy

Even at a glance, you can't help noticing the massive, extruded-aluminum fence. The tubular front rail matches the curved profile of the mating surface on the 12"-long locking head. Push down on the locking handle, and the two curved surfaces snug up to one another, aligning the fence laser-straight.

We especially like the way the locking head glides smoothly along the rail on nylon bearing points. For fine adjustments, Sears has added an easy-to-read hairline cursor and a



New rip fence (top) and fence rail (bottom) consist of extruded aluminum. T-slots in rip fence make it easy to mount auxiliary fences, hold-downs, featherboards, and similar accessories.

micro-adjust knob that lets you dial in precise fence position—a nice touch for adding that additional hair-width space.

Sears' suggested fence-mounting position provides 30" of ripping capacity to the right of the blade and 24" to the left. But because the rail bolts to the saw via a lengthwise T-slot, you can simply loosen the mounting bolts, slide the rail to right or left, and enjoy almost 48" of capacity on either side—a feature that southpaws in particular will applaud. The on/off switch also mounts by way of a T-slot, so it too can travel anywhere you want it along the rail.

On the top and sides of Sears' 3½"-tall, extruded-aluminum rip fence, you'll find more T-slots. These allow quick and easy attachment of hold-downs, stops, featherboards, jigs, and auxiliary fences. (See the photo above.) With this "bolt-and-go" system, you won't need to drill through the fence or build a saddle to secure auxiliary items.

Setting up the fence was fairly straightforward, and after one minor adjustment, it locked repeatedly without deflection. Our straightedge revealed only .0015" of front-to-back bow. That's nearly perfect. (If these numbers bewilder you with their abstraction, consider that a human hair measures about .002" to .004" thick.)



Continued on Page 79

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CONFORMS TO ASTM D 4236

Shop Test

Continued from Page 76

Good Dust Collection And Blade Guard

Sears has put some thoughtful engineering into the dust-evacuation system and blade guard.

The dust-collection box and hose come standard on this saw, and a shield at the rear helps prevent dust from blowing out the back. Hooked up to our dust collector, the system collected approximately 80 percent of all sawdust created.

The blade guard can be removed and reinstalled any number of times, and it always returns to the same spot—centered over the blade. A single thumbscrew makes installation an easy, single-handed operation. Raise the guard to change a blade, and it stays up on its own.

These features may seem elementary, but not all saws offer them. It's been our experience that if a guard is easy to use, it will get used.

What We Would Change

The cast-iron, open-rib extension wings were neither perfectly flat nor dead square to the table surface. We had to flex them in order to align them flush with the main table. They also bowed .014" front to back and .019" side to side.

We noticed some flex in the saw's sheet-metal cabinet whenever the blade carriage bumped up against the tilt stops. We've seen this problem on other saws, and it tends to undermine your faith in blade-angle accuracy. A short length of angle iron spot-welded to the cabinet would solve this problem.

We also have some doubts about the use of aluminum rather than cast iron for the trunnion brackets. Machines with cast-iron components usually get passed on to the next generation. How the tool is used will obviously make a difference, but we don't expect cast-aluminum parts to hold up

Miter gauge comes standard with a large hold-down clamp, and the saw's blade guard proved easy to work with.

over the years quite as well as their cast-iron counterparts.

The miter gauge was something of a mixed bag. We liked the large hold-down clamp, which comes standard, but the bar on our gauge measured .005" narrower than the miter slots. The bar didn't rattle in the slot, however, because it was bent about .005" out of alignment. We concluded that this would probably cause some uneven wear that would result eventually in some slop.

Nor did we care for the screw arrangement that holds the blade insert to the tabletop. If you change blades and inserts as often as we do, removing and replacing the screw will slow you down.

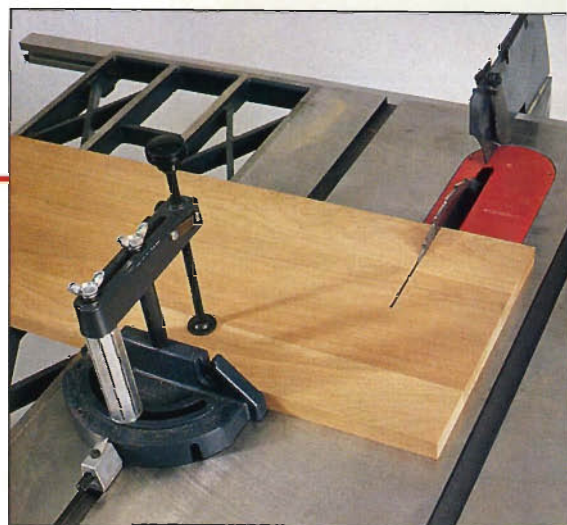
The rest of the saw's tolerances fell within a good-to-acceptable range. Blade runout measured about .003". The main table had a slight bow front to back (.006") and side to side (.0015"). Out of the box, the saw's miter-gauge-to-blade alignment was off by .011", and the blade stop at 90° was off .008". However, we easily corrected both settings during the initial tune-up.

Power Adequate For Most Tasks

We found the saw adequately powered for most jobs. It did, however, fall a bit short when cutting wide ($\frac{3}{4}$ "), deep ($\frac{5}{8}$ "), and long dadoed grooves. Even using a super-sharp, high-quality dado head, we had to slow the feed rate a bit to compensate for the lack of power. Switching to a coarser-cutting dado set helped, but the resulting cut wasn't as clean.

Our Conclusions

We give this saw a thumbs up. For light to medium shop work, it would make a good choice. The fence we



consider a winner. (For about \$270, you can retrofit many older Sears tablesaws with the Exact-I-Rip fence.) The price of the saw and fence together, \$730, positions this unit competitively with other contractor-type saws that come fitted with quality after-market rip fences.

With a little patience, you can easily work around the Sears saw's shortcomings and take advantage of a terrific fence system that you won't find on any other saw. **W**

Photographs: Kevin May

SPECIFICATIONS

**Sears Contractor Series
Tablesaw, model no. 29911N**

Blade diameter10"

**Maximum depth
of cut @ 90°**3 $\frac{3}{8}$ "

**Maximum depth
of cut @ 45°**2 $\frac{1}{4}$ "

**Maximum width
of dado head**1 $\frac{3}{16}$ "

**Maximum diameter
of dado head**6"

**Table size
w/ extensions**27 x 44"

**Motor..
(dual 120/220V)**13/6.5 amps

Motor speed3,450 rpm

Weight265 lbs.

Warranty1 year

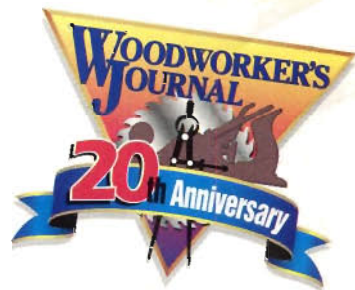
WIN THE *WOODWORKER'S JOURNAL* TOOL CHEST

Dear Reader:

To enter your name in the drawing for the *Woodworker's Journal* tool chest pictured on the cover and described on page 26, simply answer the questions in this survey, fill out the entry form at the bottom, and return this page to *Woodworker's Journal*. The lucky winner will be notified by August 31, 1996.

Thank you and good luck!

Charles Summers



1. How did you acquire this issue of *Woodworker's Journal*?

- ☐ Subscription ☐ Newsstand ☐ Borrowed

2. What types of projects found in *Woodworker's Journal* have you built during the past two years? (check all categories that apply)

- ☐ Furniture ☐ Decorative items ☐ Toys
☐ Outdoor items ☐ Shop projects/jigs ☐ Gifts

3. When choosing projects to make, what factors influence your decision the most? (check up to 3 factors)

- ☐ Photograph ☐ Interest
☐ Challenge ☐ Need or use
☐ Cost ☐ Size
☐ Skill required ☐ Tools required
☐ Full-sized patterns ☐ Adequate instructions/plans

4. Which topics would you like to see more articles written about in *Woodworker's Journal*? (check all that interest you)

- ☐ Other woodworkers ☐ Turning
☐ Carving ☐ Shop jigs
☐ Intarsia ☐ Finishing products/techniques
☐ Scrollsawing ☐ Complex joinery
☐ Modern furniture ☐ Unique woods
☐ Hand techniques ☐ Tool collecting
☐ Furniture styles ☐ Tool sharpening
☐ Selling your work ☐ Tool maintenance
☐ Machine techniques ☐ Outdoor furniture
☐ Built-in furniture

5. Have you ever bought kits or supplies from the firms we list as sources in our project articles? ☐ Yes ☐ No

6. How often do you do woodcarving?

- ☐ Often ☐ Occasionally ☐ Never

7. What kind of tool articles most appeal to you?

- ☐ Description of tool ☐ Tool comparison
☐ Single tool evaluation ☐ User report
☐ Other _____

8. What changes would you like to see in the tool articles?
Specifications? ☐ More ☐ Less

Performance information? ☐ More ☐ Less

Close-up photographs? ☐ More ☐ Less

9. Which of the following woodworking techniques would you like more help with? (check all that apply)

- ☐ Designing ☐ Layout
☐ Wood selection ☐ Stock preparation
☐ Gluing/clamping ☐ Joinery
☐ Sanding ☐ Finishing
☐ Hinges ☐ Hardware installation

10. What power tools do you plan to buy during the next year?

11. Where did you buy your last woodworking tool? (check one)

- ☐ Woodworking store ☐ Discount store
☐ Hardware store ☐ Home center
☐ Mail order ☐ Other _____

13. Do you own a personal computer? ☐ Yes ☐ No

14. Do you subscribe to any on-line services? ☐ Yes ☐ No

15. If so, which ones? (check all that apply)

- ☐ America Online
☐ CompuServe
☐ Delphi
☐ Microsoft
☐ Prodigy
☐ Other _____

16. Do you access Internet/Worldwide Web? ☐ Yes ☐ No

17. Do you use CAD software? ☐ Yes ☐ No

ENTRY FORM—TOOL CHEST GIVEAWAY

Yes, please enter my name in the Tool Chest Giveaway!

Name _____

Address _____

City _____ State _____ Zip _____

Daytime phone no. _____ / _____

Deadline: July 31, 1996

Please mail to:

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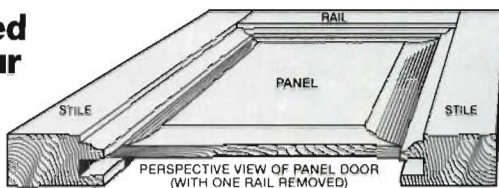
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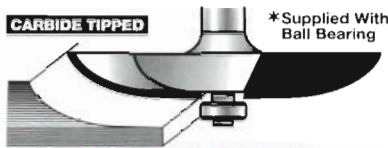
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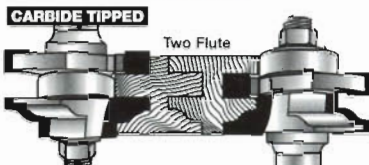


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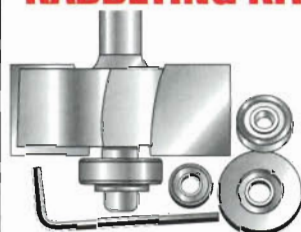
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