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August 2006

No. 185

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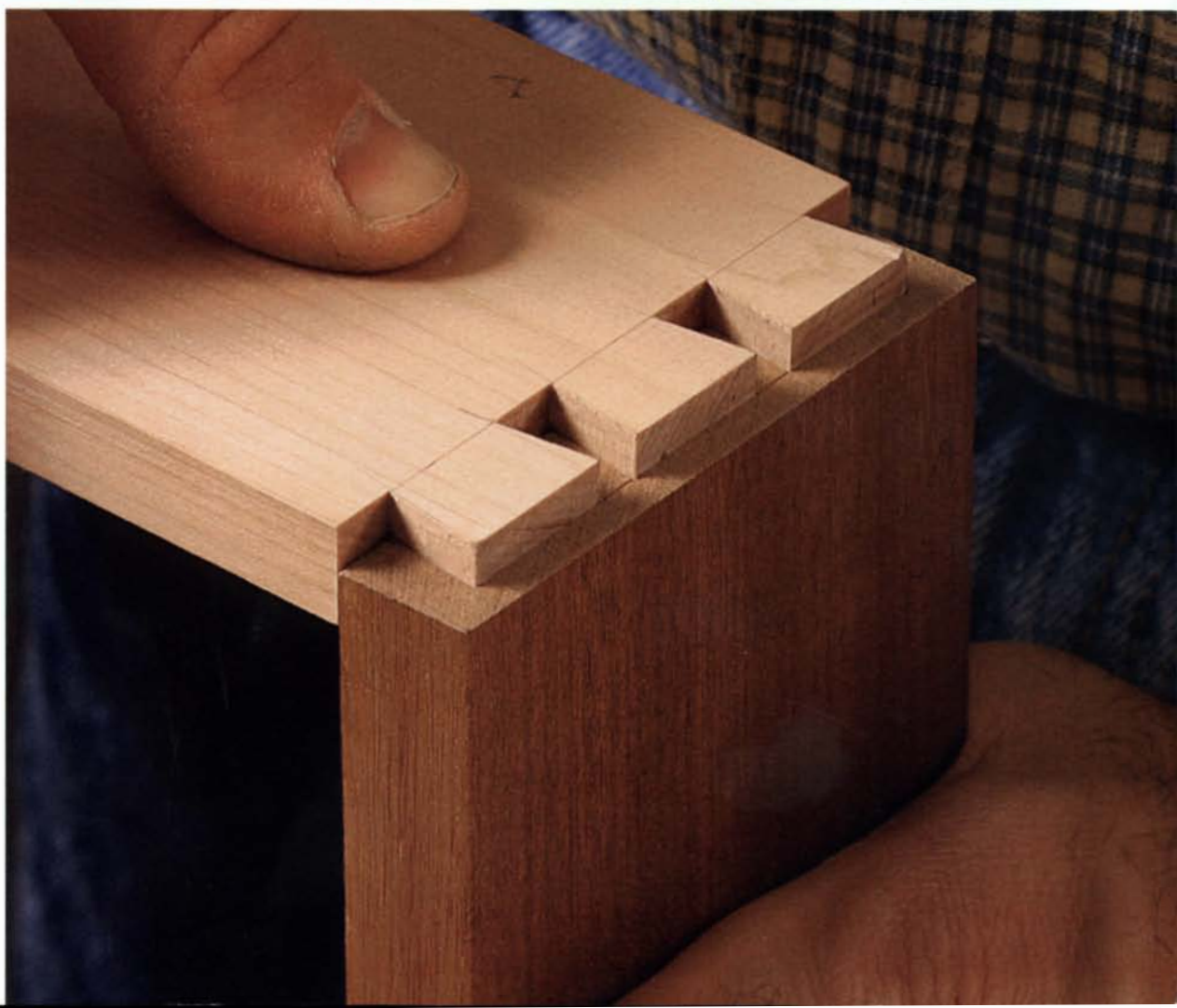
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The Smart Shop

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Sharpening a Mortiser Bit

JUNE 19: Most hollow chisels simply don't work out of the box. Contributing editor Roland Johnson shows how to tune them up and keep them sharp.

Color-Matching Different Woods

JULY 3: Managing editor Mark Schofield uses stain to match the three different woods in a Chippendale mirror, topping it off with shellac.

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Fine Woodworking (ISSN: 0361-3453) is published bimonthly, with a special seventh issue in the winter, by The Taunton Press, Inc., Newtown, CT 06470-5506. Telephone 203-426-8171. Periodicals postage paid at Newtown, CT 06470 and at additional mailing offices. GST paid registration #123210981.

Subscription Rates: U.S. and Canada, \$34.95 for one year, \$59.95 for two years, \$83.95 for three years (in U.S. dollars, please). Canadian GST included. Outside U.S. and Canada, \$41.95 for one year, \$73.95 for two years, \$104.95 for three years (in U.S. dollars, please). Single copy, \$7.99. Single copies outside the U.S. and possessions, \$8.99.

Postmaster: Send address changes to *Fine Woodworking*, The Taunton Press, Inc., 63 S. Main St., P.O. Box 5506, Newtown, CT 06470-5506.

Canada Post: Return undeliverable Canadian addresses to *Fine Woodworking*, c/o Worldwide Mailers, Inc., 2835 Kew Drive, Windsor, ON N8T 3B7, or email to mfa@taunton.com.

Printed in the USA

HOW TO CONTACT US:

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Newtown, CT 06470-5506 203-426-8171

www.FineWoodworking.com

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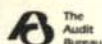
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Jere Williams (*Master Class*) has been designing and building studio furniture for 10 years. Along the way, he entered the graduate program in fine arts at Georgia State University, where he earned a master's degree in 2002 and was twice named "Most Outstanding Graduate Sculptor." His work has been featured in numerous art shows and is held in private and public art collections. Williams recently moved north with his wife, Sally, and two children, to teach art and sculpture at St. Paul's School, a private school in Concord, N.H.



After a break of 15 years, **Roger Heitzman** ("Square Peg in a Round Hole") thought it was time to get his byline back in the magazine. Heitzman's first appearance in *Fine Woodworking* was in its black-and-white days (*FWW* #37, pp. 106-107) when his tambour credenza was profiled. Since then he has enjoyed a successful career making furniture, more recently specializing in Art Nouveau and Art Deco pieces.

Carl Swensson ("Half-Blind Dovetails") has been building furniture on commission in the Baltimore area since the early 1980s, after completing a college woodworking course and studying informally with a Japanese master on the West Coast. Each summer, he teaches hand-tool techniques at Country Workshops in North Carolina. This year, he is making wooden parts for a church organ being built in Lynchburg, Va.



Like the work of any good artist, the furniture of **Garrett Hack** ("Five Overlooked Woods") continues to evolve. Compare his first piece in *Fine Woodworking*, a tiger maple and cherry table in #101, with "Lil' Shaker" on p. 81 of this issue. Both have a Shaker ancestry and common design elements, but the latter's outrageously figured wood, asymmetrical design, and mixed-media pulls reveal a confident craftsman at the top of his game.

Emily Palm ("Finishing Boxes Inside and Out") lives in the lakeside resort town of Petoskey, Mich., where she operates Blue Heron Woodworks, selling jewelry boxes and other items mainly over the Internet. Palm began her career by apprenticing with a local boatbuilder. She was "the only one he couldn't reduce to tears," Palm recalls.



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From the Editor



GETTING PAST THE JUDGES

When editors sit down each month to review the submissions for Readers Gallery, we are overwhelmed by the amount of careful photos and precise descriptions sent in, many with a touching story attached. What is there to criticize about woodworking, really? People start with stacks of rough boards and create their world. So it feels terrible to have to turn anyone down.

Sometimes the timing isn't right. Yours might be the fifth great table we looked at this month, and we have to mix in other types of furniture. But if you're wondering what we are looking for, there is no sense keeping it a mystery. The criteria is less subjective than you might think. I just got back from Minneapolis, where I helped to choose the winners at the annual show by the Minnesota Woodworkers Guild. The conversations among the three judges were the same ones that happen here.

Tip one is to think carefully about proportions. Are the legs too thick for the piece? Consider everything: tabletop overhang, width of an apron, sizes of rails and stiles, shapes made by doors and drawers. Are the details in proportion with the piece? Basically, don't rush the design stages.

Tip two is to make your furniture look handmade. As a woodworker, you have opportunities to be thoughtful where factories can't. You can create crisp details and flat surfaces where factories oversand and round over. You can find out which moldings and other design details go with which furniture styles. You can match boards and be thoughtful about grain. You can plane boards to odd thicknesses and avoid the 3/4-in. trap.

Tip three is not to overdo contrast. The exotic, intoxicating variety of woods has seduced many a craftsman. If the contrasting areas are large, make the difference subtle—think curly cherry door panels with a regular cherry frame. If the contrasting material is extreme, use it in small doses—beads, wedges, or pulls.

Last, don't run out of steam in the home stretch. We see wonderful pieces fall down in the finishing process. Use stains carefully.

"Finish the finish" to avoid a gummy or uneven look. Most folks do this with steel wool and wax. And don't skimp on hardware—you might get it past us, but you won't forgive yourself.

—Asa Christiana

Tough choices. The magazine receives hundreds of submissions a year for the Readers Gallery.

Safety concern: chains on chuck keys

When I read the Methods of Work tip about attaching a chuck key to a badge reel (*FWW* #183), an old memory came back with startling clarity. About 30 years ago I worked in the maintenance department of a large factory. There was a drill press in the cabinet shop with the very same device holding the chuck key. An unfortunate worker forgot to remove the key before starting the spindle. As the spindle started, it whipped the chain around and it somehow wrapped around the operator's left hand. In an instant, it removed his ring finger.

—NED SWEENEY, Wyomissing, Pa.

Dust collector "street price" needs reality check

Your review of portable dust collectors (*FWW* #183) could not have been more timely. I marched off to the local home center quoting your endorsement of the Delta 50-760. I got a case of sticker shock when I was shown a catalog order price of \$372 versus your article's quote of \$290. After a bit of soul searching, I ordered one anyway.

—JOHN HOLLER, Saint Robert, Mo.

Editor replies: We base our street prices on the best deals we can find at press time from reputable sources. Sometimes these are Web-based outlets such as Amazon.com. I'm sorry you weren't able to find a better price at your local bricks-and-mortar.

Writing an Article

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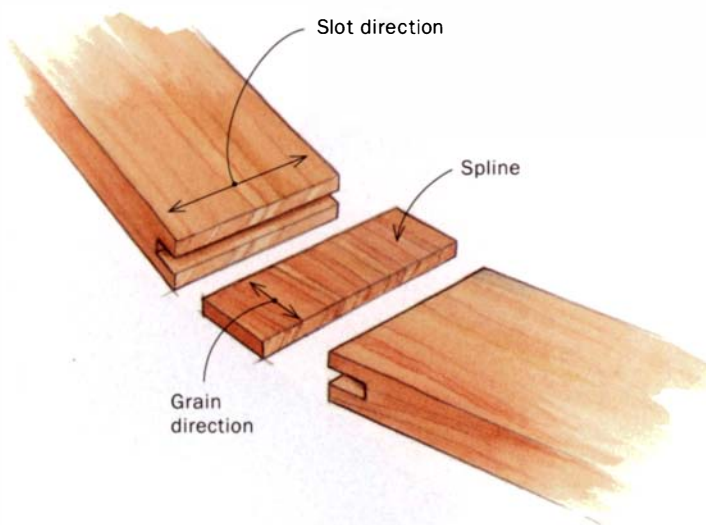
In the construction drawing for the “Durable Outdoor Table” in *FWW* #183, the spline to join the segments is shown with the grain parallel to the joint. The joint would be much stronger if the grain of the spline were perpendicular to the joint.

—GEORGE ARCHER, Savannah, Ga.

Art director replies:

You are correct.

In the illustration on p. 56 of *FWW* #183, the grain of the spline should be perpendicular, not parallel to the joint (see the drawing at right). The author had it right as well, but we drew it incorrectly. We apologize for any confusion.



More on “squeaky-clean” shops in *Fine Woodworking*

I am sure thousands of other woodworkers like me were amused at the letter from Paul Landers (*FWW* #183) regarding photos of beautiful workshops that appear to be surgically clean, each with a pristine workbench and a well-placed wood shaving to show that it is a hive of activity. Like most, my shop is not nearly large enough to accommodate my 40-year collection of tools, the random lengths of valuable wood resting against the walls, the large power tools that require me to walk sideways, the huge workbench with a top that looks like it was hit with bird shot and dragged across a slaughterhouse floor, and scores of tools that form a tight circle around my latest project. Yet I miraculously turn out complex reproductions, restorations, and guitars. Finishing of course is completed elsewhere, since it cannot be attempted in this space. I will continue to marvel at the wonderful shops in *FWW*, like the owner of a rusted Ford pickup looking at pictures of the new Lamborghini.

—RICHARD GOODALL, Salmon Arm, B.C., Canada

I have built a lot of furniture over the years, and my shop only looked clean on the day I finished building it. My wife used to come out to the shop and say, “Why don’t you clean this place up?” and I’d say, “Why don’t you go back in the house?” We are like the “Odd Couple” in that regard, but we have lasted 54 years and counting.

—ED MULLIKIN, Roanoke, Va.

My 4-year-old neighbor (I call him “Bug”) recently sought me out in my slovenly shop. Rather than give up for the day, I handed Bug the keys to my wet/dry vac and turned him loose on the potential fire hazard.

Two pee breaks, a sweater removal, and a juice box later I had a shop that rivals any in your periodical! Soon after the residue was extracted, I invited Bug to help me glue up some doors. He held the glue bottle while I guided its movement.

I will acknowledge that great care and patience must be exercised when allowing children of this age in a workshop. Unplug machines and retract

blades. I use earplugs for myself, and earmuffs for Bug. Most important, get the parents’ permission if your little friend is not of your own lineage.

—JAMIE CUBBON, Oil City, Pa.

That old-time religion

Like Bill Rohrs, who wrote about his week at Country Workshops, in Asheville, N.C. (Notes and Comment, *FWW* #183), I have recently been to the woods, making an oak basket, a carved bowl, stools, and a ladderback chair, all from various lumps of newly-felled timber, using naught but hand tools of the most basic kind. The experience and the products are indeed highly satisfying. But perhaps Bill has caught a touch of that old greenwood religion, as he tells us that hand tools are now his (sole?) mode of operation and that sandpaper has been banished from his presence.

I will remain practically tied to the tablesaw, bandsaw, router, and sander, so I can deliver more than one or two pieces of furniture per year, items often more demanding than a bowl or a ladderback chair. Of course, everyone should be free to practice their religion!

—DAVID TRUSTY, Galgate, Lancaster, England

Clarification

The Powermatic PM2000 shown in the recent 10-in. tablesaw review (*FWW* #184) has a fence with a 50-in. rip capacity. The average street price for that model is \$2,200. The \$2,100 street price we listed is for the model with a 30-in.-rip-capacity fence.

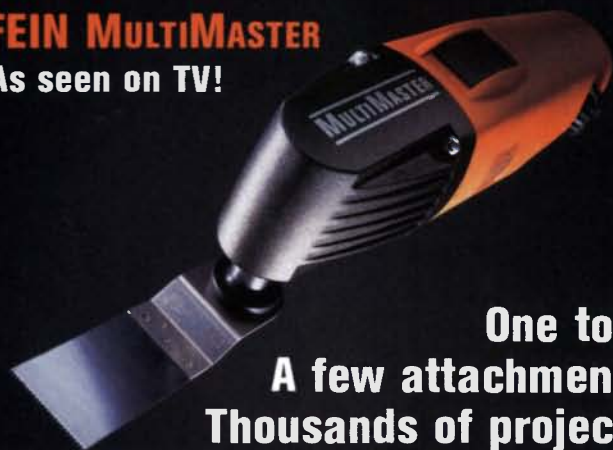
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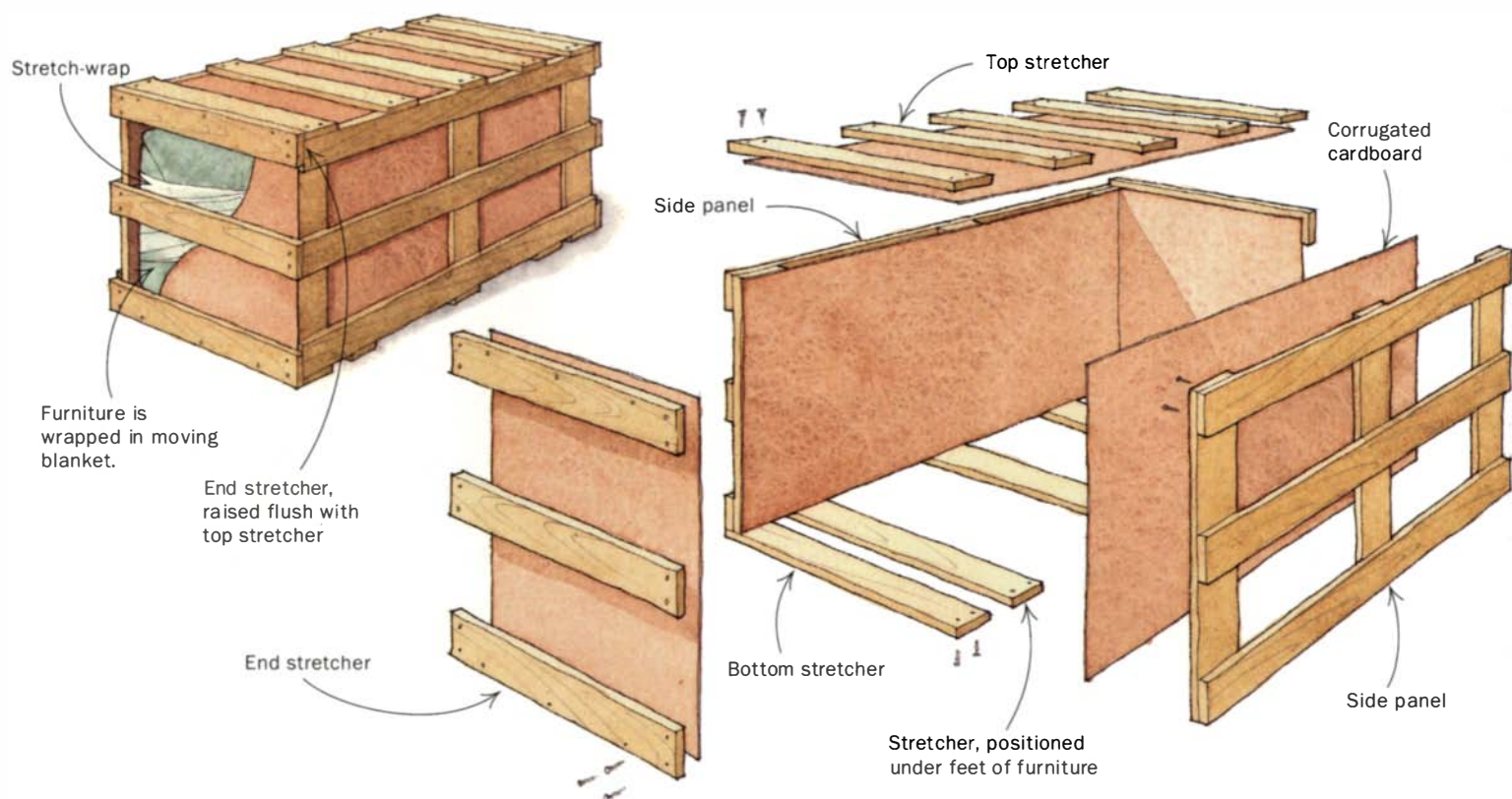
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READER SERVICE NO. 141



Best Tip **Crate protects furniture during a move**



It's often a challenge to keep a precious piece of furniture ding-free during a move. Wes Harper's beefed-up cardboard crate helps ease the anxiety. Harper lives in Erie, Pa., where he owns and operates a new business, Gem City Toolworks, a sharpening service for Western-style handsaws.

Faced with the problem of protecting furniture while moving, I developed this basic crate. It's light, strong, and easy to assemble, and it allows the furniture to be loaded easily. It's adaptable to most furniture.

The crate is made of 1x4 pine. It consists of two side panels connected by a number of stretchers. The furniture sits inside on the bottom stretchers, wrapped in a moving blanket.

Each side panel has three rails and three stiles. I line the top and sides of the crate with corrugated cardboard for dust protection, but I leave the bottom open so that any humidity can vent. If needed, you can install a hardboard (Masonite) floor. And if extra protection is needed, you can use 1/4-in.-thick plywood in place of the cardboard.

Measure the item to be crated and add 3 in. to 4 in. of clearance to each dimension. Make the two side panels first. Put the rails on the outside of the stiles to provide an easy-to-grip handle. To encourage whoever is opening the crate to remove the stretchers first, build the side panels with the screws on the inside.

Staple the cardboard to the inside of the side panels, then trim it flush with the edges. Install the bottom

stretchers, one on each end, one in the middle, and two to be centered under the furniture feet.

To close the ends, start by temporarily installing two top stretchers, one at each end. This will hold the tops of both side panels at the correct distance.

Then staple cardboard onto the ends of the crate and install the three end stretchers.

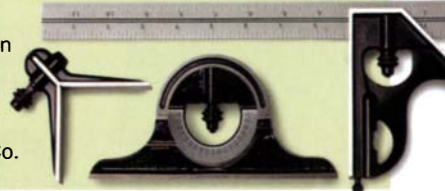
To complete the crate, remove the two temporary top stretchers, install a piece of cardboard, then install all five top stretchers.

—WES HARPER, Erie, Pa.

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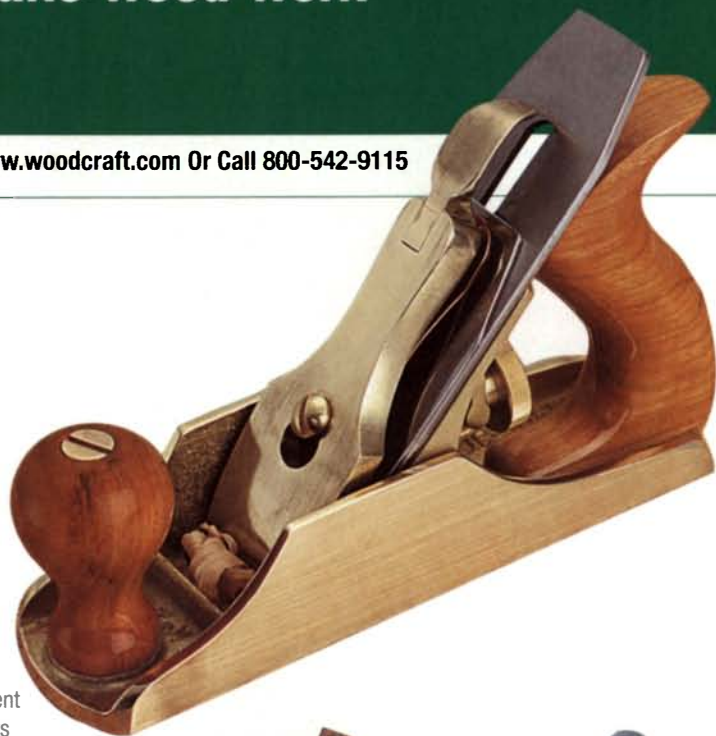
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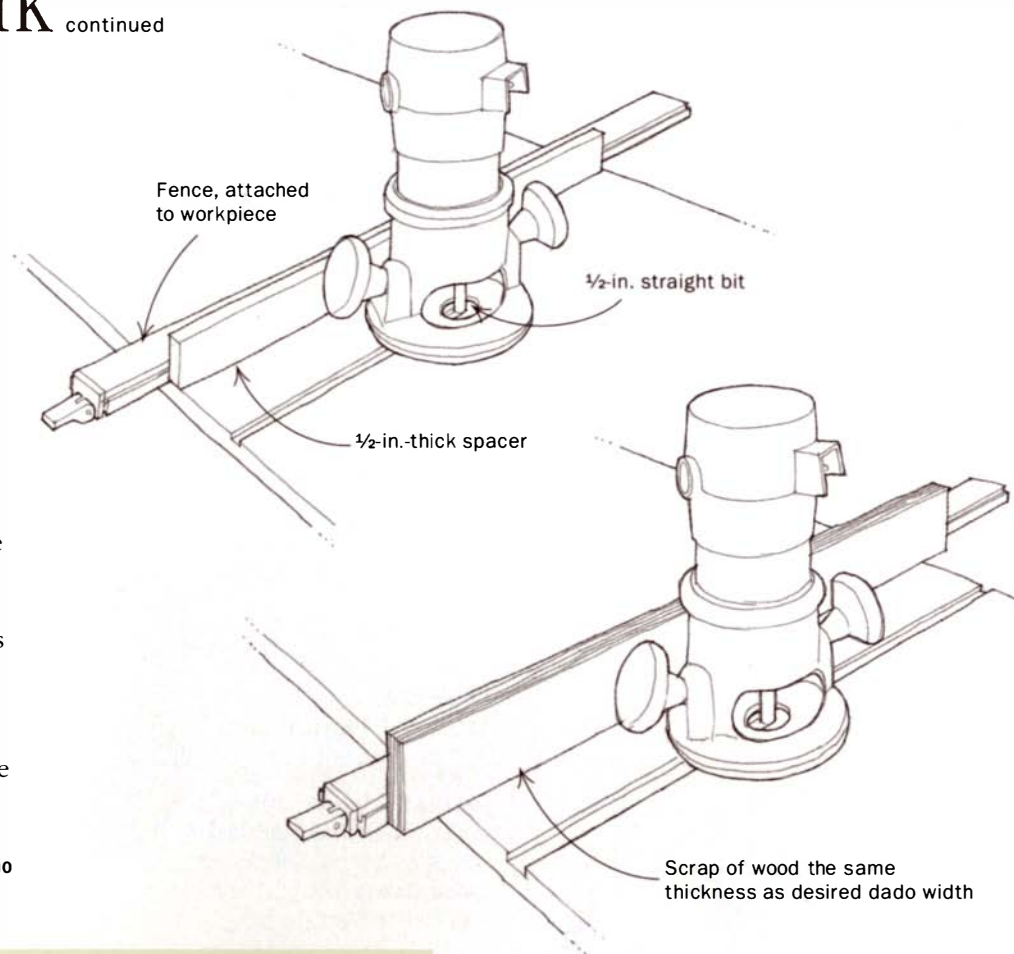
Rout perfectly sized dados

Here's a simple way to make a dado that is sized perfectly for the board that fits into it. First, set up a fence across the workpiece for the router to ride against as it cuts the dado. Against the fence, place a 1/2-in.-thick spacer that runs the length of the fence. Now, make a first pass to cut the dado using a 1/2-in. straight bit.

For the second pass, remove the spacer and replace it with a piece of wood that is the same thickness as the dado you want to cut. Make a second pass with the router. Presto—your dado is the perfect size! The process is simple and easy.

This technique works with any size router bit that is smaller than the final dado, as long as the spacer used in the first pass is the same thickness as the diameter of the router bit.

—DAVE LOEBACH, Cincinnati, Ohio



Quick Tip

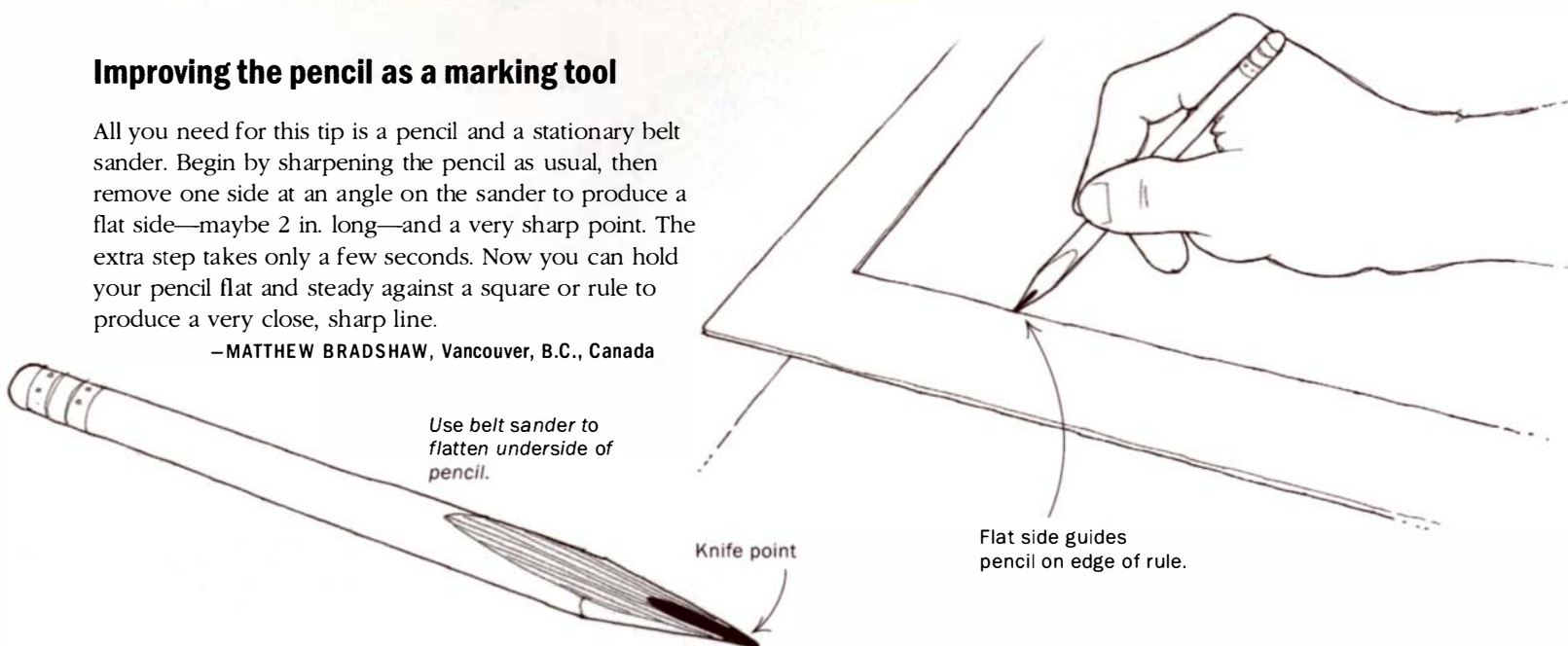
To see if you're sharpening a tool at the proper bevel angle, color the edge with a felt-tipped marker. After you touch the tool to the stone, you can see where the color has been worn off and make adjustments to correct the bevel angle as necessary.

—RICHARD HEINES, JR., Wood River Jct., R.I.

Improving the pencil as a marking tool

All you need for this tip is a pencil and a stationary belt sander. Begin by sharpening the pencil as usual, then remove one side at an angle on the sander to produce a flat side—maybe 2 in. long—and a very sharp point. The extra step takes only a few seconds. Now you can hold your pencil flat and steady against a square or rule to produce a very close, sharp line.

—MATTHEW BRADSHAW, Vancouver, B.C., Canada



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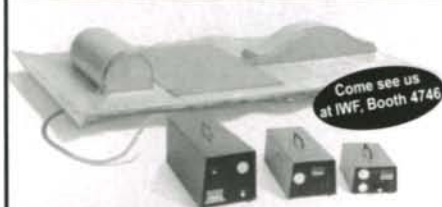
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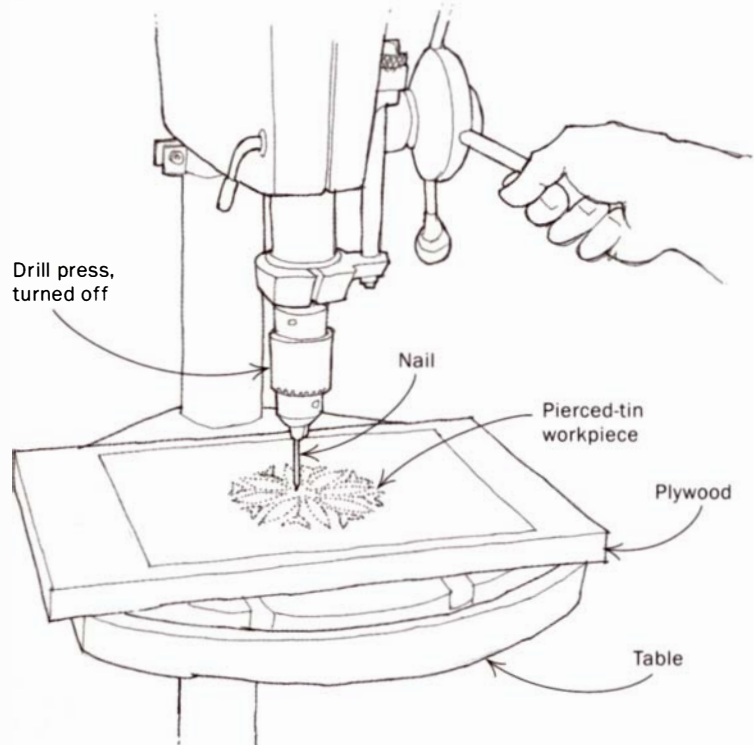
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Tin is easier to punch on drill press

After reading the “Build a Pie Safe” article in the January/February 2006 issue (*FWW* #182), I wanted to pass along an easier and faster method for punching tin. Plus, I find my method helps reduce sore wrists and upper arms.

First, mount a finish nail in your drill press and add a piece of plywood to the table. Set the drill-press depth stop so that the nail barely punches into the surface of the plywood. To use, make a test punch and adjust the depth stop up or down to produce the look you find most pleasing.

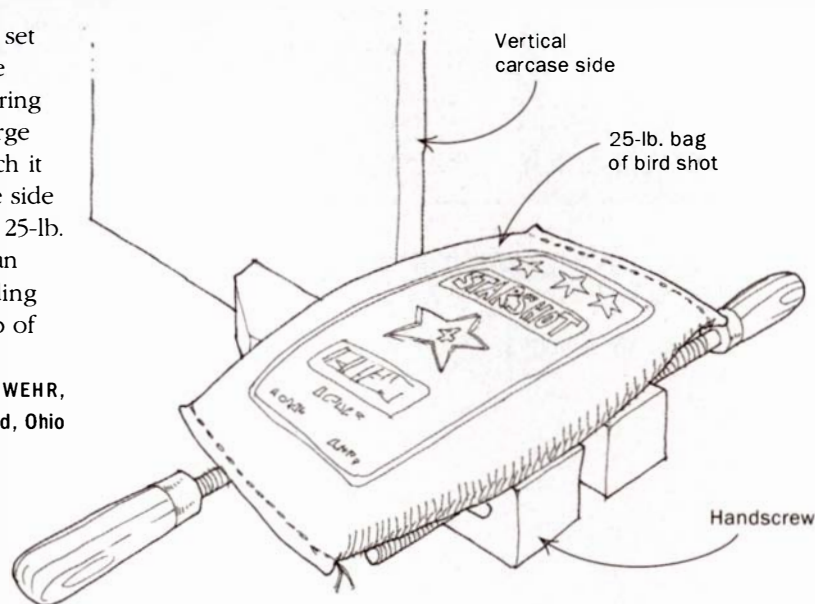
—DONALD WALLQUIST, Edwardsburg, Mich.



Bird shot as extra hands

Ever need a second set of hands to hold the side of a carcass during assembly? Take a large handscrew and attach it to the bottom of the side piece. Then place a 25-lb. bag of shot (less than \$20 from any reloading supply store) on top of the handscrew.

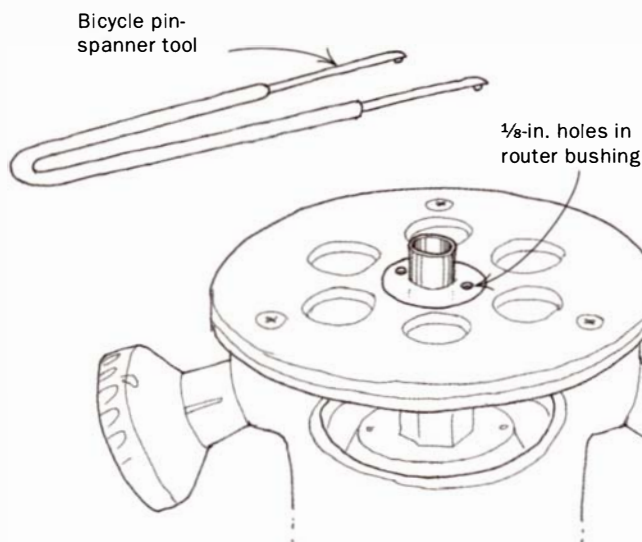
—JOHN LANDWEHR,
Loveland, Ohio



Quick Tip

A couple of strips of magnetic tape provide a quick and easy way to help protect the blade and sole of a handplane. Magnetic tape can be purchased from McMaster-Carr (www.mcmaster.com).

—JOHN BORGWARDT,
Eau Claire, Wis.



Lock down router bushings without damage

The common two-piece Porter-Cable-type guide bushings work great, but they can be fussy to lock and remove: When I turn the knurled locking ring, the bushing usually turns along with it. A finger grip won't keep the bushing from turning. Pliers hold well, but can easily damage the bushing. And if the bushing isn't tight enough, it will loosen during use, creating a big problem.

The solution is to drill two 1/8-in.-dia. holes in the bushing face and use a pin-spanner to hold the bushing while turning the knurled ring. I found my bicycle pin-spanner worked perfectly. You can buy one at most bicycle shops; mine cost \$6.50. Or, of course, you could make a similar tool using a couple of short pins on the end of a wood handle.

—KENNETH SHAW, San Diego, Calif.

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Self-taught hobbyist wins Cartouche Award



Faithful reproductions. Fred Stanley's attention to detail impressed the Cartouche judges.

FRED STANLEY'S BEGINNINGS as a furniture maker should sound familiar to the spouses of hobbyist woodworkers everywhere.

Newly married in 1972, Stanley told his young bride that the best way for the couple to afford nice furniture would be for him to make it. He had few tools and no experience, but she believed. The Stanleys skipped their honeymoon and used the savings to buy a lathe.

In the years that followed, Stanley indeed began to fill their home with historically accurate early American furniture: Chippendale pie-crust tables, Federal mirrors, Queen Anne tea tables, a pencil-post bed, and more. Progress was slow at first, but it eventually became clear that in his small shop Stanley was teaching himself the skills of a master craftsman.

Stanley's work was recognized earlier this year by the Society of American Period Furniture Makers, which awarded him its 2006 Cartouche Award. Stanley, a 57-year-old mechanical

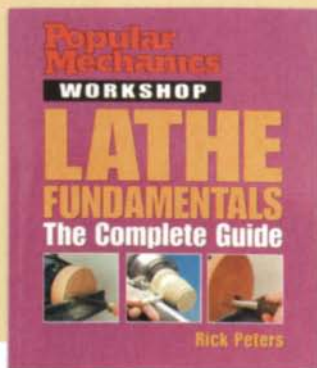


engineer, is only the second hobbyist furniture maker to win the prize, which is awarded each year to recognize lifetime achievement in American period furniture.

Selection committee member Mike Dunbar was impressed with the range of Stanley's work. "He had made a large variety of furniture forms and he had made them all very well," Dunbar said. He added that Stanley's design and construction were correct, indicating that he had examined original pieces in person instead of just taking cues from photographs.

—Steve Scott, associate editor

Book Review



Popular Mechanics Workshop: Lathe Fundamentals, The Complete Guide by Rick Peters. Hearst Books, 2006. \$17.95 paperback. 192 pp.

IF ERNIE CONOVER'S *THE LATHE BOOK* is a Lexus, this new guide for beginners is a Honda Civic. It's clearly written, well illustrated, and lives up to its title. But it lacks the depth and luxurious richness of detail that a master like Conover brings to his subject. The best parts of *Lathe Fundamentals* are the sections on the hardware of turning: types of lathes, chucks and faceplates, chisels and gouges. It also has a good section on maintenance and troubleshooting. But this is not the best book for learning how to handle wood-turning tools. And its rundown of wood-turning projects lacks breadth and imagination.

—David Heim, associate editor

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Beach-combing yields furniture detail

AMONG THE PIECES SHOWN AT the recent Northern Woods exhibition sponsored by the Minnesota Woodworkers Guild, a cabinet and music stand by maker Mark Munson drew attention for their use of a unique material.

Both pieces featured parts made of fan coral, storm-tossed onto Caribbean beaches and gathered by Munson on the island of Carriacou. His find highlights the advantage of keeping an eye out for unusual materials.

Sanded to 180-grit and polished on a buffing wheel, the material has a burlled

appearance, varying from dark brown to black and highlighted by streaks and swirls of white.

Fan coral cuts, sands, and finishes like most woods, Munson said, but has an unpleasant, dead-fish smell when sanded. Because its diameter is rarely more than 1 in., he finds the material best suited for drawer pulls, accent pieces, inlay, or small turning stock.

You can find the material for sale on the Internet, but the best way to make sure that it is gathered responsibly is to do it yourself. On a trip in January, Munson spent



A woodworker's treasure. Fan coral washed ashore by storms makes attractive drawer pulls and other accent pieces.

five days beach-combing and brought home 50 lb. of brown and black fan coral.

"What a great excuse for a vacation," Munson said.

—S.S.



D.C. program redeems kids with woodworking

IN AN IMPORTANT WAY, THE ARTISANS WOODSHOP in Washington, D.C., is like the prestigious woodworking programs at North Bennet Street School and College of the Redwoods. All three are dedicated to teaching the discipline and craftsmanship of woodworking. But at Artisans, the stakes are higher.

That is because the teenage students at Artisans are all either homeless or "at-risk," teetering between stability and street life in neglected and crime-plagued neighborhoods.

Artisans, a six-month career training workshop started in 2001 by the nonprofit Covenant House in Washington, admits just 24 students a year. Roughly 80% complete the course and find internships or jobs in cabinet shops or in other fields.

While working to earn their diplomas, students spend three months learning fundamental woodworking skills and the next three months working in a production shop. They also learn to market their finished products through an affiliated program that sells jewelry boxes and other small items.

Bob Hughes is one of 10 volunteer instructors who devote time to the program. "It is rewarding to see a life change," he said, "and a character begin to emerge."

—S.S.



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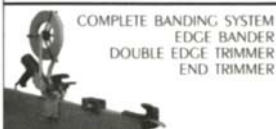
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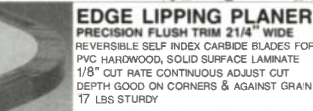
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POWER TOOLS

Innovative plunge router from Down Under

THE NEW 2¼-HP TRITON PLUNGE ROUTER (model MOF001KC) is a versatile, easy-to-use machine designed with ergonomics and safety in mind. Made in Australia, the router excels at both plunge- and table-mounted routing and offers a number of features that distinguish it from other plunge routers on the market—all for \$200.

When plunge-routing, the Triton allows precise, on-the-fly depth adjustments. A push button in the center of the right-hand knob controls the plunge mechanism, and a ring on the inside of the knob dials in the depth with a rack-and-pinion system. The router also features a microadjust knob for added precision, as well as excellent dust control with an integral dust port in the base.

Depth stops are adjusted with the typical three-position turret on the router base. But thumbwheels on threaded shafts allow fine-tuning of two of the turret positions, and the spring-loaded depth rod is easily locked down.

The Triton also is well-suited for table-mounted applications. The microadjust shaft is accessible under the router base for above-table height adjustments with an included crank handle.

Bit changes are a cinch, too. When the collet is extended past the baseplate, it locks in place, allowing for single-wrench bit changes and eliminating painful knuckle-raps.

The router and kit, which includes a fence that can be adapted for circle-cutting applications, seven template guides, and the router-table crank handle, is available for \$200 at Amazon.com. You can find out more about the Triton router by visiting www.Triton.com.au.

—Roland Johnson is a contributing editor.



Versatile fence. The Triton's fence serves as an edge guide for straight cuts. It also comes with a circle-cutter pivot for routing circles from 6 in. to 14 in. dia.



Triton MOF001KC

Price: \$200

Weight: 10.4 lb.

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—William Duckworth is a contributing editor.



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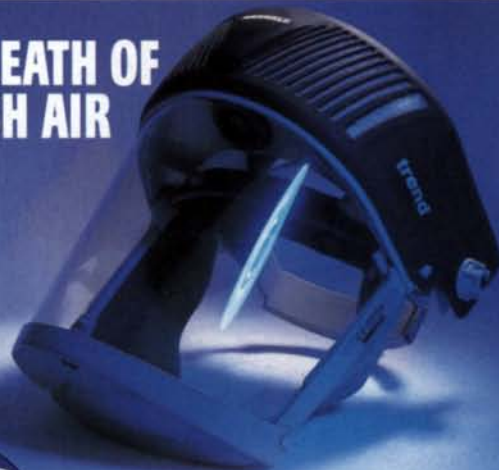
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READER SERVICE NO. 161

■ ACCESSORIES

Two-in-one tool for scraper prep

THE FILE-BURNISHER from Glen-Drake Toolworks is a combination tool for sharpening a card scraper, cabinet scraper, or scraper plane.

One face of the tool is a very fine (70 tpi) file used to joint the scraper edge. The other face is a polished, flat burnisher used to create the cutting burr on the edge of a scraper after filing. The tool edges are rounded and polished as well, which is helpful if more concentrated pressure is needed to roll a burr during burnishing.

The working portion of the tool is 7 in. long and fitted with a comfortable, easy-to-grip wood handle.

I worked with the tool for a few hours, trying it on a number of scrapers. Using one tool for a dual purpose is a convenient and efficient idea, but I had



Part file, part burnisher. Glen-Drake's file-burnisher has three working surfaces: a flat, extrafine file, a flat burnisher, and two rounded, narrow edges for concentrated burnishing.

some issues with Glen-Drake's offering. The burnisher worked well; however, the extrafine file cut slowly and tended to clog with filings pretty quickly, which made it hard to get consistent results from scraper to scraper.

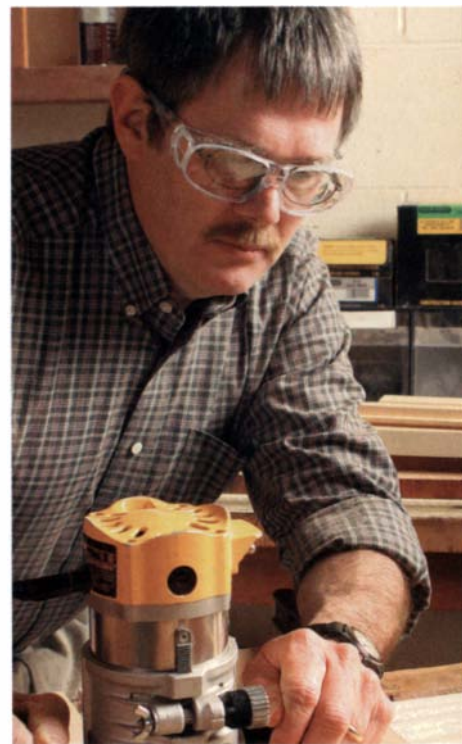
The tool sells for \$39 and is available from Hartville Tool (www.hartvilletool.com).

—Chris Gochmour is a woodworker and hand-tool aficionado near Salt Lake City.

■ ACCESSORIES

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EYE ARMOR SAFETY GLASSES fit over prescription glasses. They come with scratch-resistant, antifog, polycarbonate lenses that provide protection from flying debris coming from many angles. You also can choose clear or tinted lenses (yellow or smoke). Unlike one-size-fits-all designs that have been around for years, the Eye Armor glasses are



available in three sizes and styles to fit over almost any pair of prescription glasses. An adjustable elastic strap holds them firmly in place. The glasses cost \$25, which includes a cloth storage bag. To locate a dealer, contact the manufacturer (800-834-2563) or visit www.liveeyewear.com.

—W.D.

■ FINISHING

LINSEED OIL AND WAX IN ONE EASY STEP

MANY WOODWORKERS PREFER an oil finish followed by wax because both are simple to apply and together they add depth and warm luster to a piece. Carnoil, a new finish from Montour Professional Finishing Products, combines boiled linseed oil with wax, allowing you to apply both in one step.

I compared two coats of Carnoil with a traditional oil-and-wax finish (two coats of boiled linseed oil with a wax topcoat), applying both to the same



cherry board. The linseed oil and wax darkened the wood significantly and actually obscured some of the figure due to blotching. Carnoil, on the other hand, enhanced the figure without discoloration or blotching.

Like any oil-and-wax finish, Carnoil offers limited protection, but if you're looking for an easy-to-apply finish that accentuates the wood's character, Carnoil fits the bill. A 22-oz. can sells for \$11.75 (www.montourwax.com).

—Tom Goffe is an assistant editor.

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■ CLAMPING

QUICK-RELEASE LEVER SAVES YOUR THUMBS

IT'S THE SIMPLE THINGS that bring us the most joy. For woodworkers who often wear out their thumbs on bar and pipe clamps during glue-ups, the EZ-Clutch quick-release system is a windfall of happiness.

The devices resemble oversize bottle openers, and they are about as simple to use. Just slip one over the clutch plate of a clamp, and get to work. The lever is easy to grip and makes sliding and releasing the clamp pain free.

The EZ-Clutch is available in two designs: one for 3/4-in. Sure-Foot and Pony pipe clamps and another for standard 3700 bar clamps (Jorgensen).

Although both systems work well, I found that the bar-clamp version was even more comfortable and convenient because of the orientation of the clamp handle to the lever.

The EZ-Clutch sells for \$3.99 (\$3.59 if you buy four or more) and is available from Rockler (www.rockler.com).

—Tom McKenna is an associate editor.

■ HEAD TO HEAD

Cordless screwdrivers do one thing very well

FOR MANY WOODWORKERS, a single cordless drill is all they need for drilling and driving screws. But a hefty drill/driver can be overkill. For instance, some pros drive dozens of screws at a time into plywood cabinet joints and get tired of lifting and toting a big drill/driver. And some hobbyists like specialty tools that are designed to do just one thing very well. For these folks, a cordless screwdriver may be just the ticket.

Two new cordless screwdrivers—the 10.8v, lithium-ion-powered, Bosch PS20 and the 9.6v Ridgid R81030 (nickel-cadmium)—are strong enough to drive 3-in.-long screws yet small enough to fit into tight spaces (the Bosch can be tucked into an apron pocket).

We tested both drivers in the *Fine Woodworking* shop. In a head-to-head comparison, we drove as many 2½-in.-long drywall screws into a 2¼-in.-thick slab of medium-density fiberboard (MDF) as each tool could handle. The Ridgid drove an impressive 201 screws on a single charge, compared with a more-than-respectable 167 for the Bosch. The Ridgid also exhibited greater torque, driving a 3/8-in. lag screw farthest into a 4x4.

Both drivers offer two quick-charge batteries (full charge in 30 minutes), and both employ a quick-change chuck that accepts only hex-shank bits. The Bosch tool is much smaller and lighter (1 lb. 12 oz.) and features a nose-mounted light that's helpful inside dark cabinets. The Ridgid is a beefier tool at 3 lb. 2 oz., and it can pivot from a straight stick style to a right-angle handle in a jiffy.

Although both dedicated tools performed well, we think the Bosch is the ideal workshop driver, while the Ridgid is probably the better choice for pros on the job site who may need the extra power and torque to drive a bucket of screws without pilot holes.

The Ridgid sells for \$99 at The Home Depot; the Bosch has a street price of \$130. For more information, go to www.ridgid.com and www.boschtools.com.

—Asa Christiana is the editor; John White is *FWW* shop manager.

Big power in a petite package. The Bosch driver fits comfortably in the palm of your hand and is powered by a lithium-ion battery, which is smaller and lighter than a nickel-cadmium battery of the same voltage.



Driver with a twist. To accommodate different working situations, the Ridgid can pivot from a straight-stick style to a right-angle handle with a quick twist of its housing.



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READER SERVICE NO. 169

Bevel-gauge basics

SIMPLE TOOL
TAMES ANY ANGLE

BY PHILIP C. LOWE

Judging by how little space it gets in popular woodworking catalogs, the bevel gauge, or sliding bevel, is an easily overlooked tool.

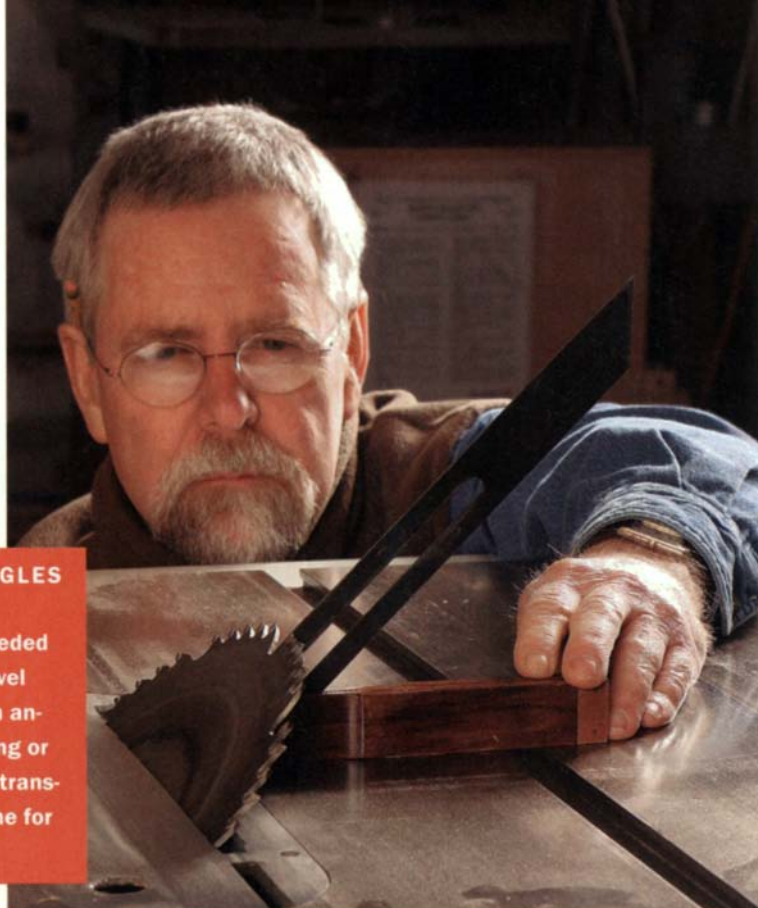
Don't be fooled though.

This simple-looking tool is especially useful because it copies angles exactly without measuring them. Degrees don't matter with a bevel gauge; only the angle itself counts. Nothing beats a bevel gauge for laying out dovetails and other angled joinery, and the tool makes it easy to set up machines for angled cuts.

There are three main parts to the bevel gauge. The head, or handle, is often made of wood, sometimes reinforced

TRANSFER ANGLES TO MACHINES

No protractor needed here. Use the bevel gauge to copy an angle from a drawing or workpiece, then transfer it to a machine for an angled cut.



with metal strips at the edges. Some handles are all metal. The handle holds a steel or brass blade, which is secured and adjusted with a wing nut, knurled fastener, or lever mechanism.

Bevel-gauge blades range in length from 4 in. to 12 in. On a well-made gauge, the blade and handle are the same width. The blade edges are parallel to one another, as are the sides of the

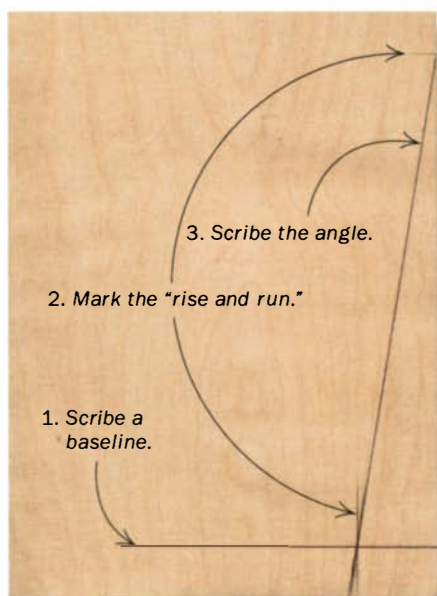
handle. Also, look for a wing nut that does not project beyond the handle edges, preventing the gauge from sitting flat, and hindering accurate layout.

Copying angles from workpieces and drawings

To copy an angle from a workpiece, loosen the blade, hold the handle firmly against one face of the angle, and

LAY OUT DOVETAILS USING AN ANGLE BOARD

An angle board is a handy and durable reference, made from cutoff stock, for setting a bevel gauge to mark out dovetails or angles for other joinery. The board shown here is for a 6:1 dovetail angle.



Set the gauge and lay out the joinery. Hold the head of the gauge firmly against the angle board's edge and swing the blade until it matches the scribed angle line. Tighten the adjustment screw. Mark the pins or tails, whichever you cut first.

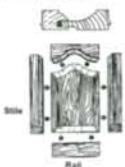
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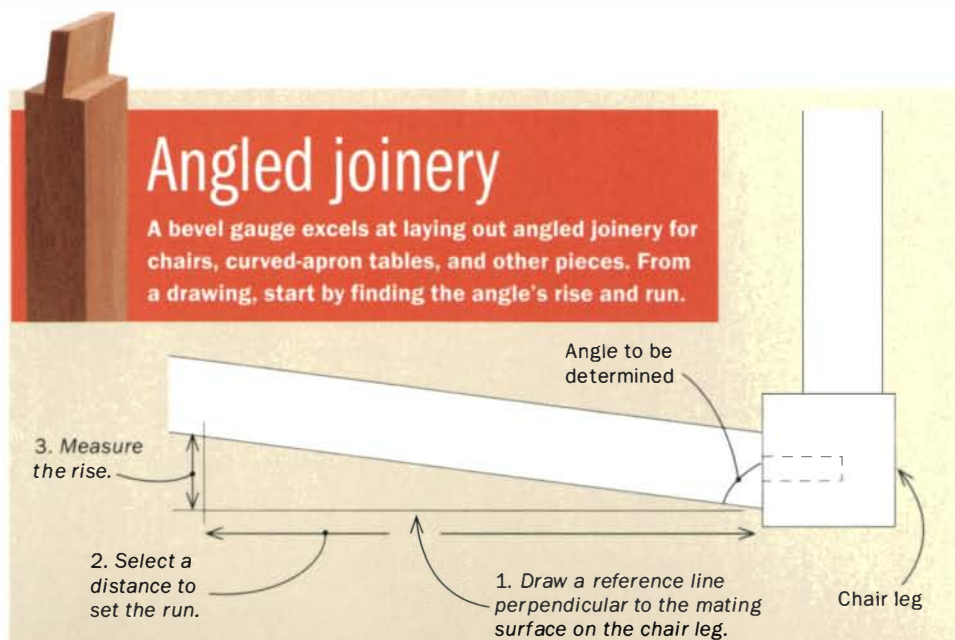
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Create an angle board and lay out the shoulder. Using the dimensions from the drawing, scribe the angle on a cutoff with square edges (above). To lay out the shoulder for this chair-rail tenon, rest the head of the gauge against the workpiece's length (right).



Reset the gauge. To capture the angle for the tenon cheeks, set the gauge against the angle board's other edge (above). This lets you keep the head of the gauge secure against the face of the workpiece (right) as you mark the cheeks.



adjust the blade to fit snugly against the opposite face. Retighten the blade, taking care not to alter the setting as you do so. Now you can use the gauge to set up a machine for an angled cut or to mark the angle on another workpiece.

To capture an angle from a drawing, you could use the bevel gauge to copy the angle directly, but you would need to rest the head and blade of the gauge against a pair of short boards to ensure accuracy. I find this cumbersome.

The following technique takes me further and allows me to copy any angle that I've drawn, even if I don't know its measurement in degrees. I duplicate the angle by establishing a ratio for it like the one used to create dovetails.

I begin by penciling a line on my finished project drawing, perpendicular to the baseline of the angle I want to copy. I mark this line at a convenient distance, say 8 in., to establish the angle's "run." From this mark I draw another line, perpendicular to the first and connecting it to the angled line. The length of this second line is the angle's "rise." I transfer these rise and run measurements to an angle board, connect the marks, and set my bevel gauge to the resulting line.

Laying out angled joinery

The sliding bevel really demonstrates its flexibility when it comes to laying out angled joinery. Its most familiar use is no doubt in laying out dovetails (see photos, p. 32), but that's just the beginning. Take, for example, an angled tenon.

To capture the tenon's shoulder angle, set the gauge with its handle against the baseline side of your angle board and swing the blade into place. Make sure the blade is pulled halfway through the head. In this way, you can mark the angle on your stock from either edge of the blade, and from either side of your workpiece.

To lay out cheeks for a tenon that's perpendicular to this angled shoulder, you'll need to draw angled lines lengthwise along the narrow edge of the workpiece. You could do this without changing the setting on your bevel gauge

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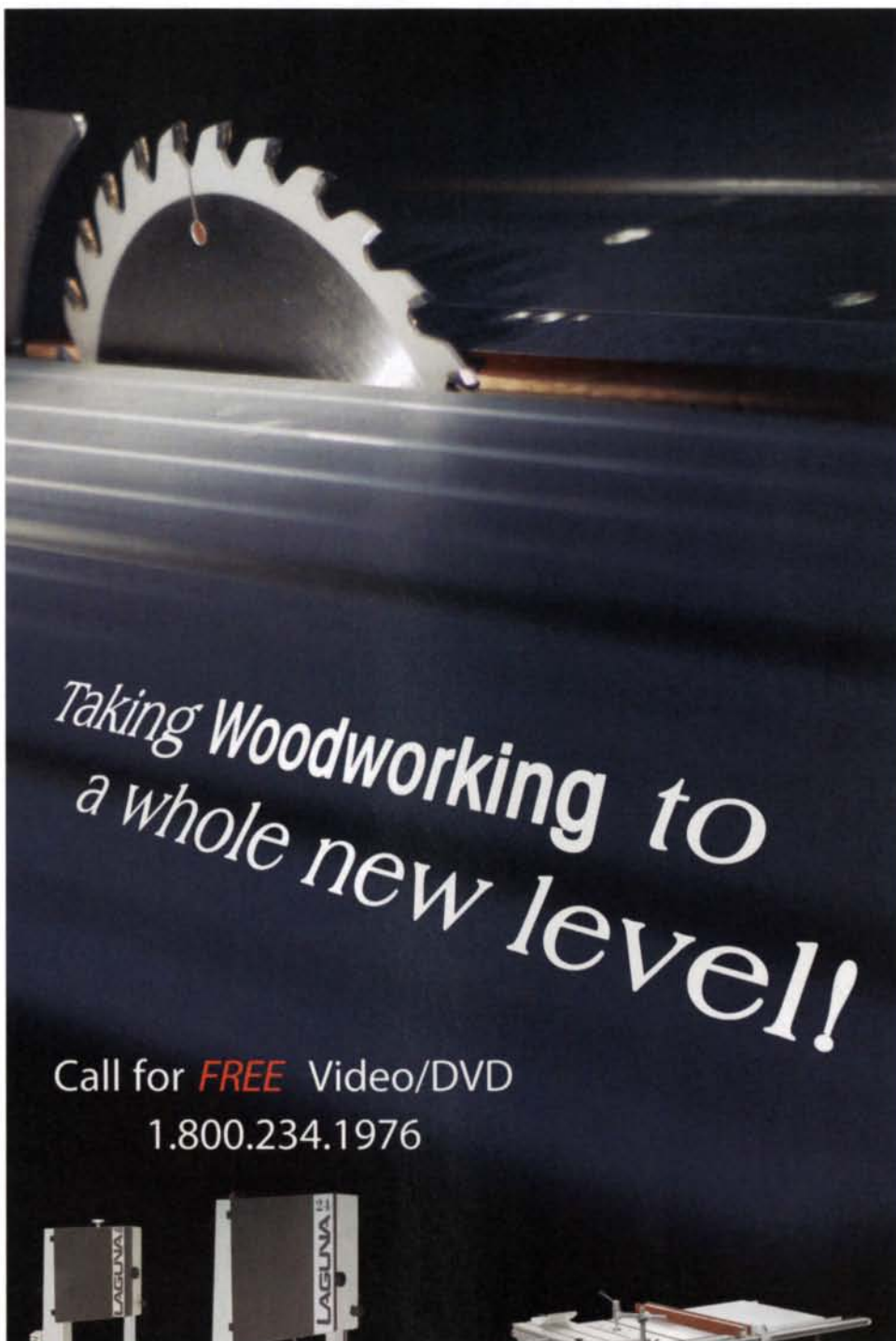
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Determining miter angles

Corners that aren't square can be a challenge to fit with molding or edging. A bevel gauge can help you cut accurate miters by splitting the angle precisely.



Copy the corner angle. For a snug miter around a corner that's not perfectly square, start by recording the angle on the workpiece.



Bisect the angle. Scribe a baseline and copy the angle onto an angle board, then use a compass to strike arcs at equal distances on each leg (1). From each of these intersections, strike new arcs that cross one another opposite the angle's vertex (2). Scribe a line connecting these two points (3). The bisected angle should be precisely half of the angle you picked up from the corner.



Transfer the angle. Use the gauge to adjust your blade tilt or, in this case, the miter-gauge angle (above). Cut your edging or molding at this setting (right). Two pieces cut at this setting should make a snug-fitting miter.



by using the end of the workpiece as the bearing surface for the bevel's handle. But this isn't enough to steady the gauge, which is likely to wobble as you try to strike your lines.

Fortunately, the gauge allows you to capture the same angle from a different surface. To do this, rest the bevel's handle against the "vertical" side of the angle board. Readjust the blade, tucking it closely into the handle to match the angle. This new setting will allow you to mark out the tenon cheeks while resting the bevel's handle securely against the face of your workpiece.

Set blade and fence angles without numbers

One of the handiest uses for the bevel gauge lies in picking up an angle from your work or a drawing and transferring it to your machines to cut matching parts. The following examples deal with the tablesaw, but the same principles apply to tilting your jointer fence or bandsaw table.

When picking up an angle and transferring it to a machine, be sure to pull the bevel's blade all the way through the head. This way the round end does not protrude and prevent the gauge from sitting flat on the machine.

To use the bevel for setting the tilt angle on a tablesaw blade, hold the gauge head flat against the table with its blade pointing upward and slide the gauge against the sawblade. Make sure the edge of the bevel blade is square to the face of the sawblade. Adjust the arbor tilt until the sawblade lies down on the blade of the gauge with no light showing between the two.

To copy an angle onto the miter gauge, raise the sawblade to full height and loosen the adjustment on the miter gauge. Hold the bevel's handle against the miter-gauge fence and swing the bevel-gauge blade until it lies snugly against the sawblade. Tighten the miter gauge, taking care not to change the angle as you do so.

In either process, make sure that the bevel's blade does not rest against a sawtooth, preventing you from fully aligning the gauge.

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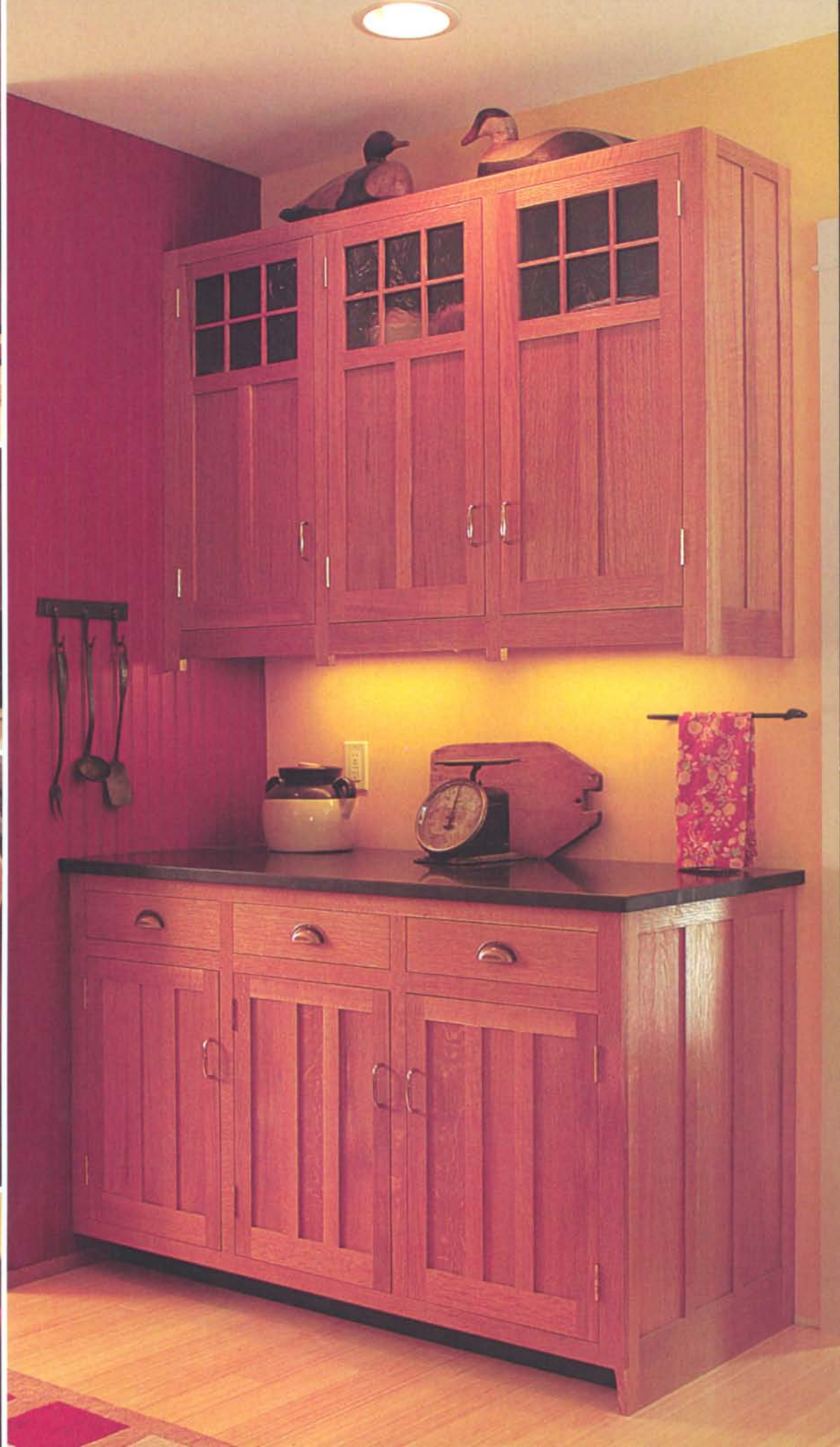
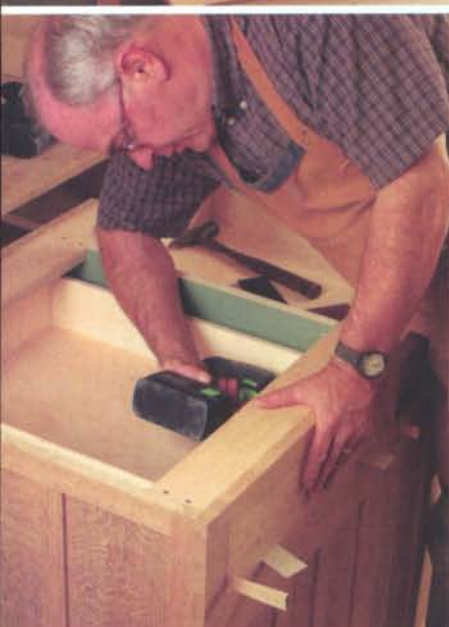
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A Woodworker's Kitchen

Save money and show off your craftsmanship
by building custom cabinets

BY SCOTT GIBSON

Making your own kitchen cabinets offers one of those rare chances to get more by spending less. It's far less expensive than ordering cabinets from a showroom, yet the result should be better than virtually anything you can buy. Think of a set of cabinets as a room-size piece of furniture. You choose the materials you like and steer the project wherever you want creatively. In the end, you get a kitchen that's been tailored to suit your tastes and meet your needs exactly.

Building cabinets isn't complicated, although it can seem repetitive at times. It requires only the tools that most home woodworking shops already have.

I have three or four books that explain how to make cabinets, all of them a little differently. My approach is a mixed bag that includes some fussing over details but also relies on assembling cabinet boxes and drawers quickly with biscuits, glue, a few screws, and pneumatic nails. I use inset drawers and inset doors with butt hinges for a fine furniture feel.

I'd never argue that my approach is the only way, but it will give you strong, durable, and attractive cabinets that are easy to adapt to kitchens of different architectural styles.

Planning early prevents headaches

Taking enough time to plan the project is the key to creating a great-looking, truly functional kitchen. Before you touch a piece of stock, develop a floor plan showing cabinet locations and dimensions and a detailed map of where you want everything to go. That includes canned vegetables, cutlery, the coffee pot, your beloved Kitchen Aid mixer, recycled newspapers—everything. If you're planning a kitchen with your mate, this is the time to decide

together how the space should be used. Don't miss a chance to make the kitchen completely your own.

Kitchen design is a complex trade, and there are a variety of sources available for industry standards on cabinet sizes and heights, and recommended distances and clearances between cabinets and appliances. For more information, visit the

National Kitchen and Bath Association at www.nkba.com.

One of the first steps is deciding how to break up runs of cabinets into smaller, more manageable units. I'd rather not move anything longer than about 60 in. because it is heavy and awkward.

In this kitchen, the peninsula that includes the dishwasher, sink, and butcher-block

SAVE THE FINE WOODWORKING FOR THE OUTSIDE

Gibson focuses his efforts on the elements that people will see—face frames, doors, drawer fronts, and end caps. His cabinets combine Shaker simplicity with a hint of Craftsman style that is appropriate to his new Maine home. He relies on a basic set of dimensions that is flexible enough to be adapted to almost any kitchen.

Glass panels in upper doors

Mortise-and-tenon face frames and doors

Stiles extend below rails.

Center stiles in doors

Frame-and-panel end caps

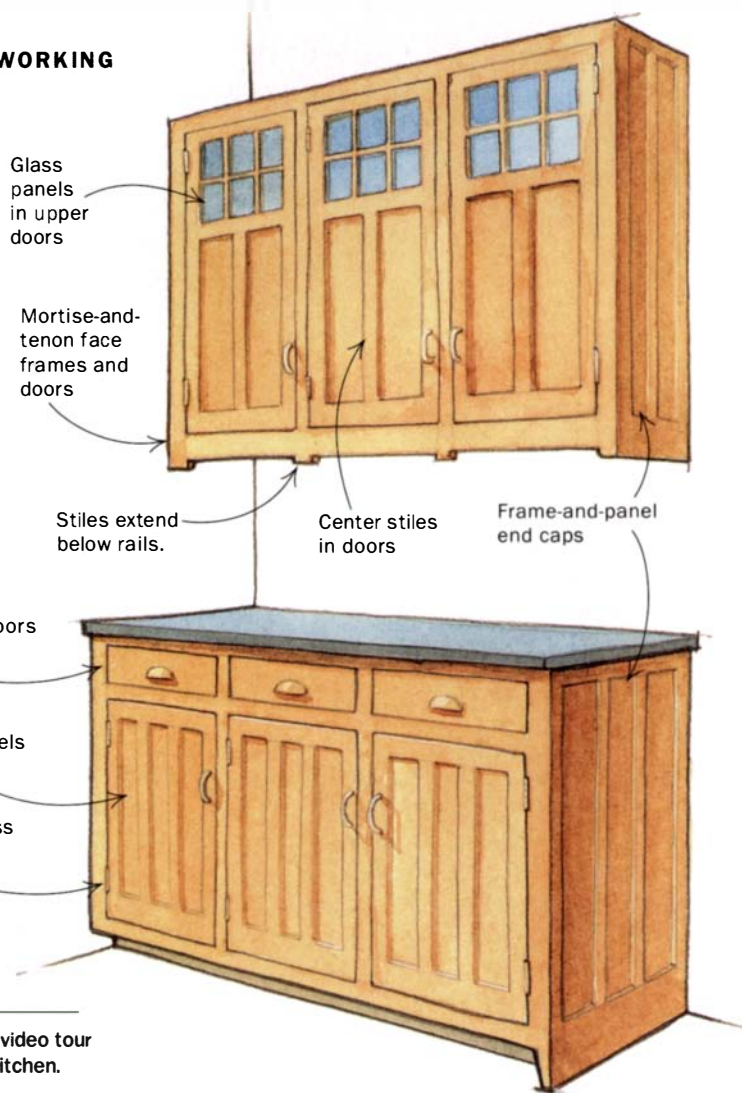
Flush-fitted doors and drawers

Matched quartersawn panels

Mortised brass butt hinges

Fine
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Visit our Web site to take a video tour of Scott Gibson's finished kitchen.

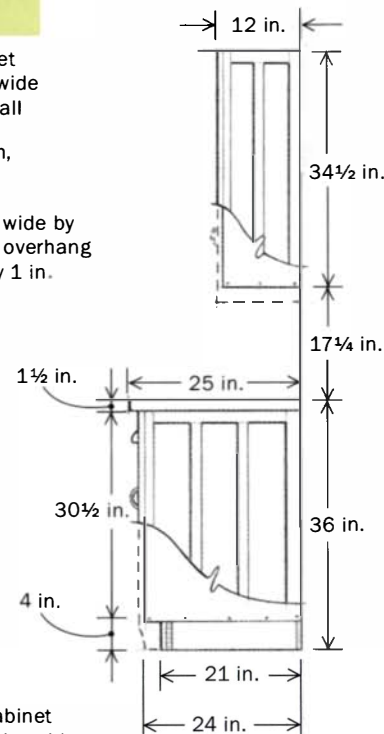
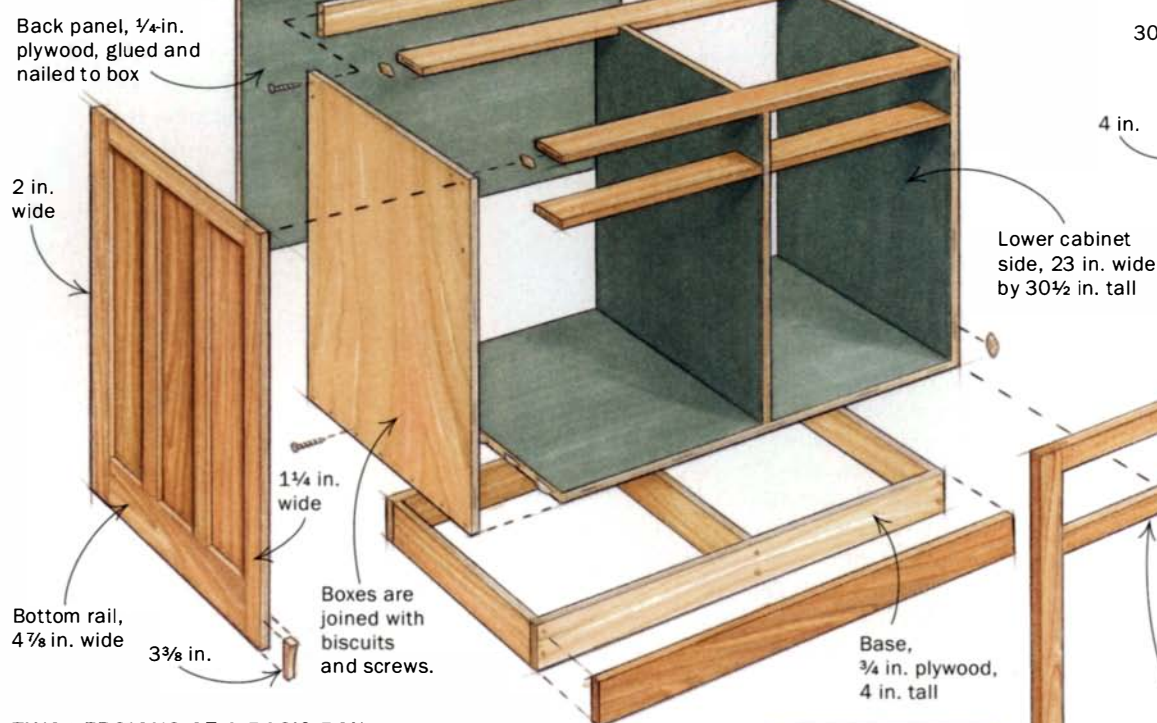


Building the cases

UPPER CABINET



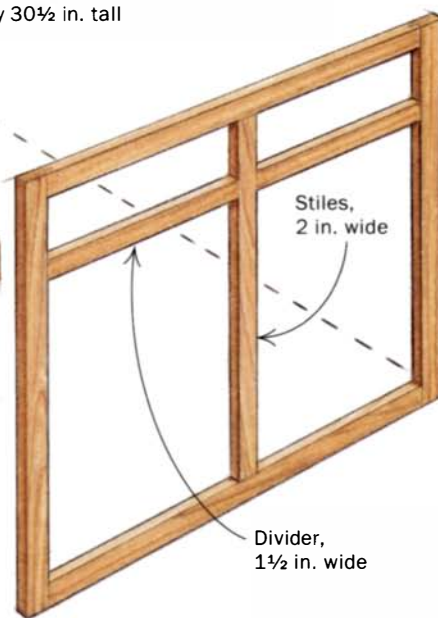
BASE CABINET



TWO VERSIONS OF A BASIC BOX

Maple plywood is used for the boxes. Quartersawn white oak is used for the face frames as well as for the doors and drawer fronts. The lower cabinets are 24 in. deep, and the upper cabinets are 12 in. deep. The width of the cabinets will vary based on the individual characteristics of the kitchen. Cabinets wider than 60 in. should be built in multiple sections for ease of construction and installation.

Rails and stiles are $1\frac{1}{2}$ in. wide, except where noted.



food prep area calls for about 80 in. of cabinets. I split that into two pieces, one cabinet for the sink and an adjacent cabinet for storage. The longest piece is just over 60 in. Even with drawers and doors removed, that cabinet with its finished end panel was a chore to move, but there was no logical way to divide it into smaller sections. On the other end of the spectrum, cabinets narrower than about 12 in. aren't

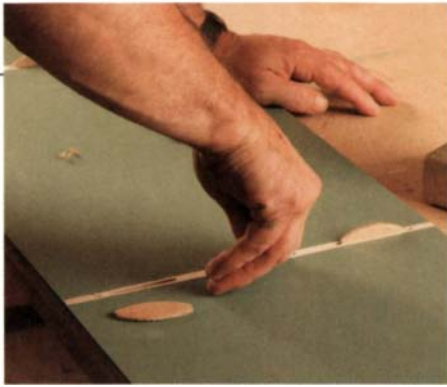
of much use for general storage but may be ideal for cookie sheets, spice jars, and odds and ends. In a kitchen, every inch counts.

A blend of plywood and hardwood

These cabinets are made mostly from $\frac{3}{4}$ -in. maple plywood plus solid hardwood for face frames, doors, and drawer fronts. The hardwood in this kitchen is quartersawn white oak. At the time, it was between \$1

and \$2 cheaper per board foot than either walnut or cherry.

I gladly spent extra money on Baltic-birch plywood for the drawer sides and bottoms. Although not as easy to find, it has more plies, fewer voids, and greater strength than standard veneer-core plywood. For cabinet backs, the \$12-a-sheet $\frac{1}{4}$ -in. lauan plywood works just fine, but it's just too flimsy to use on drawer bottoms.



Biscuit joinery is quick and strong. Biscuits align and anchor the interior dividers to the cabinet shelves. Note that the mating surfaces were not stained.



The cleat bears most of the cabinet's weight. It is attached to the back of the cabinet box and used to anchor it to the wall. The cleat provides enough strength to hold a fully loaded cabinet.



Brads secure the back. Gibson uses brads to attach the 1/4-in. plywood back of the cabinet. This gives the inside a finished look and adds stability to the box.

Baltic-birch plywood comes in 5x5 and 4x8 panels. The larger size typically gives you more flexibility in cutting out cabinet parts with less waste. For instance, the drawers in my kitchen are all 22 in. long. I can get four drawer sides from a rip on an 8-ft. panel with only 8 in. of waste. The advantage of the 5x5 sheets is that they're lighter and easier to maneuver single-handedly over the tablesaw.

Lower cabinets: Divide and conquer

While each upper cabinet is a single box, lower cabinets consist of two parts: a cabinet box and a separate base that creates the toe-kick, that space at the bottom of a cabinet that allows you to stand and work comfortably at the counter. Having the base as a separate unit makes both construction and installation easier; the base is leveled before the cabinets go on.

When completed with a face frame, these cabinet boxes are 24 in. deep by 30½ in. tall. The bases are 4 in. tall. Taller people may prefer their completed cabinets an inch or two taller, including the counter, than

the 36-in. standard that I used. The upper cabinets are 12 in. deep by 34½ in. tall.

After cutting out the pieces for the upper and lower cabinets, I cut a ¾-in. by 3-in. notch in the top rear corner of any internal partitions. This is for the cleat, a 3-in.-wide piece of plywood used to anchor the cabinet to the wall. On the upper cabinets, this cleat supports the cabinet's entire weight.

Once pieces are cut, they can be laid out for biscuit joints. I use #20 biscuits and 1¾-in.-long screws. The screws add some strength, but their main purpose is to clamp the pieces together while the glue dries. These joints are very strong.

Before assembling the boxes, sand and finish the inside surfaces of all cabinet parts and then cut all the shelf-pin holes in the parts for the upper cabinets. I taped off the areas where parts would join, and then I stained the inside of the boxes with a latex stain that covers nicely in two coats and dries quickly.

Traditional joinery makes strong frames

A cabinetmaker friend asked how I made face frames. Mortise and tenon, I told him. Oh, he said, you'll have to get over that.

No doubt cutting mortises and tenons is time-consuming, but I think it makes the frames easy to assemble and glue up. I

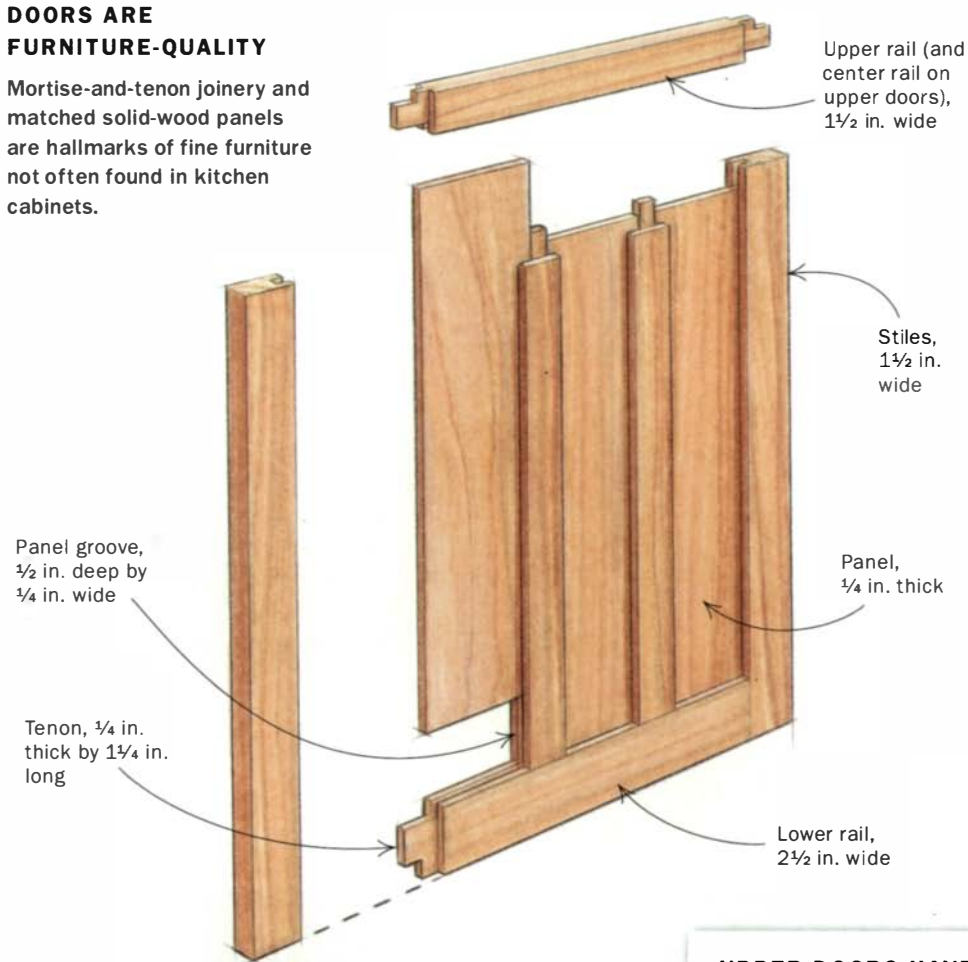


Biscuits align face frames with cabinets. Accurate measuring is critical when installing biscuits.

Doors vs. drawers

DOORS ARE FURNITURE-QUALITY

Mortise-and-tenon joinery and matched solid-wood panels are hallmarks of fine furniture not often found in kitchen cabinets.



cut mortises with a benchtop hollow-chisel mortiser and tenons on a tablesaw. Once you get into a rhythm, it goes quickly. You also could use biscuits or pocket screws.

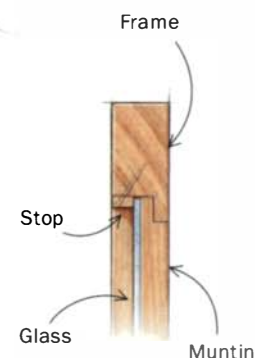
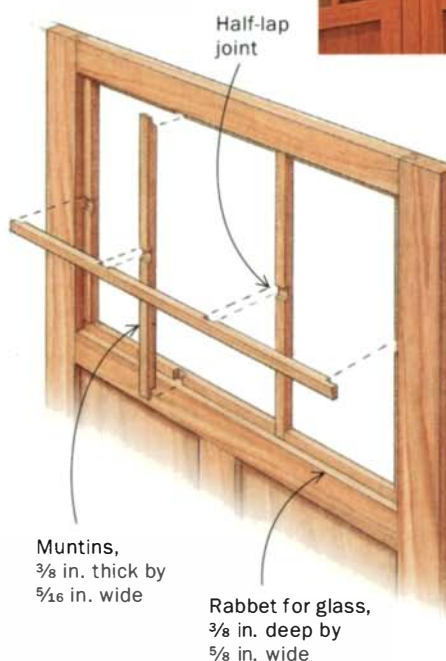
Determining the widths of individual face-frame members is a matter of personal choice. It's all about what your eye likes. Lay out the face frame so that it's at least ¼ in. wider on each side than the plywood box. That allows the cabinet to be scribed to an adjacent cabinet or a wall (in old houses with really crooked walls, make the allowance greater than that). Take care to make and clamp the frame so it's square. This is more important than getting a perfectly square plywood box.

One preliminary step that saves time later is to cut any mortises for butt hinges in the stiles before you glue the frame together. It will never be easier than right now.

When the frame has been glued up and allowed to cure overnight, I lay the cabinet on its back, put the frame on the face, and mark both the frame and the cabinet



UPPER DOORS HAVE GLASS PANELS



CROSS-SECTION DETAIL

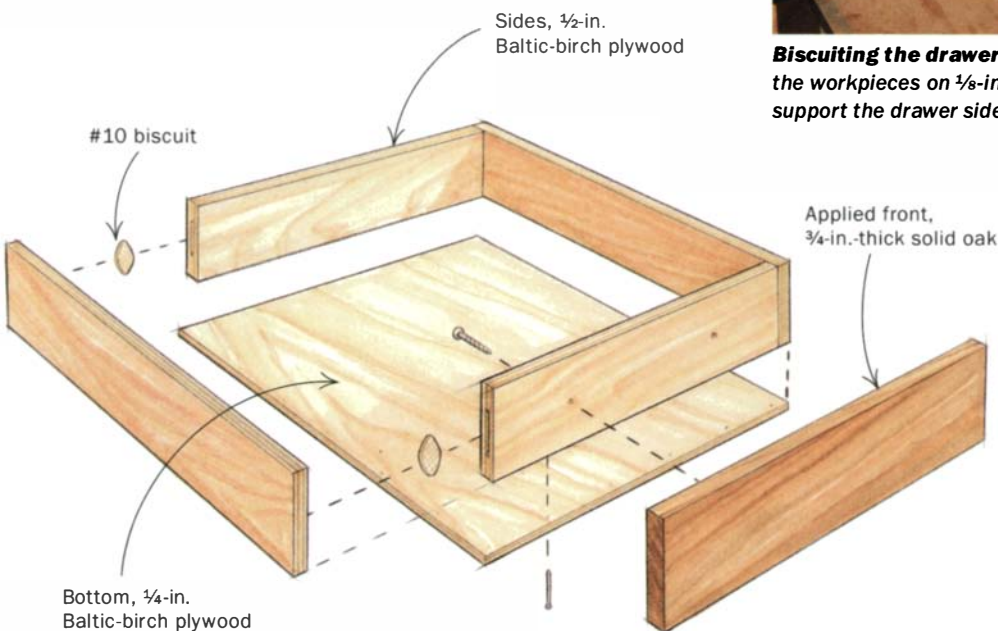
INSTALLATION TIP

Attach hinges to the face frame first. Use shims to set the lower and upper gaps. Then mark the door with the location for the hinge mortises.



DRAWERS ARE SIMPLE AND STRONG

Gibson used Baltic-birch plywood for the drawer boxes, which are biscuited at the corners. The bottom is glued and nailed on. The drawer boxes are 22 in. deep and 1 in. narrower than the opening to accommodate slides.



box for biscuits. Yellow glue is probably all that's required to keep the face frame in place, but a few biscuits will help align the frame and keep it from drifting out of place when it's clamped. You usually can clamp the perimeter of the frame, but for the middle of the box you can use pieces of wood flexed between the cabinet and the ceiling to create downward pressure.

Drawers: Simple boxes with solid fronts

When it comes to drawers, I look for sturdy boxes that can be made quickly and accurately. I used to make dovetailed drawer boxes from yellow poplar, but I gave that up in favor of 1/2-in. Baltic-birch plywood with a single #10 biscuit at each corner. It's very fast and the drawer boxes are strong and, at least to me, attractive.

Drawer bottoms traditionally fit in a groove cut into the sides of the drawer box. Instead, I attach the bottom with glue and brads. The drawer slides I use—full-extension ball-bearing models—disguise the edge of the plywood on the bottom. Just remember to sand the insides of all the pieces before assembly, and keep the small

bead of glue for the bottom to the outside so that you don't get too much squeeze-out in exposed parts of the drawer box.

Drawer faces are applied to the box and screwed on from the inside. The drawer boxes don't have to be the same height as the drawer opening. Keeping them a little undersize makes installation easier. But the drawer fronts should fit the openings exactly, with a narrow, even margin all the way around. Leave more room in the winter than you do in summer to account for seasonal expansion and contraction.

Doors are mortise-and-tenon with solid panels

After saving all that time on the drawers, I feel like I've earned the time to fuss over the doors. As the most dominant visual element in the kitchen, they're worth the effort. I like inset doors with butt hinges because to me they look like something you'd put in a piece of furniture. European-style cup hinges are a lot more versatile and easier to adjust, and overlay doors are not nearly as much trouble to install, but I've never warmed up to that style. My



Biscuiting the drawers. To center the slots in 1/2-in. plywood sides, place the workpieces on 1/8-in. shims (left). Gibson uses a right-angle jig to support the drawer sides (right). A 1/8-in. shim is needed under the end.



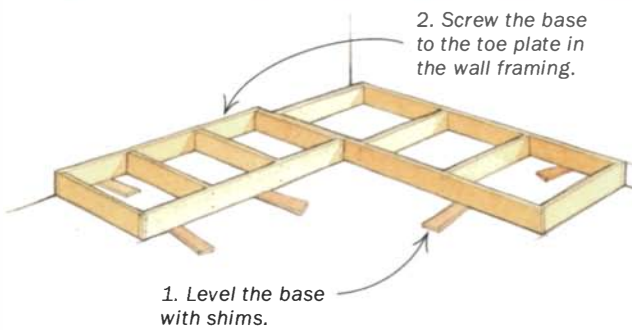
Glue and brads attach drawer bottoms. This simple approach provides strength and durability.



Install the drawer and then the front. Shims ensure that the space between the frame and the drawer front is uniform on all four sides.

Installation

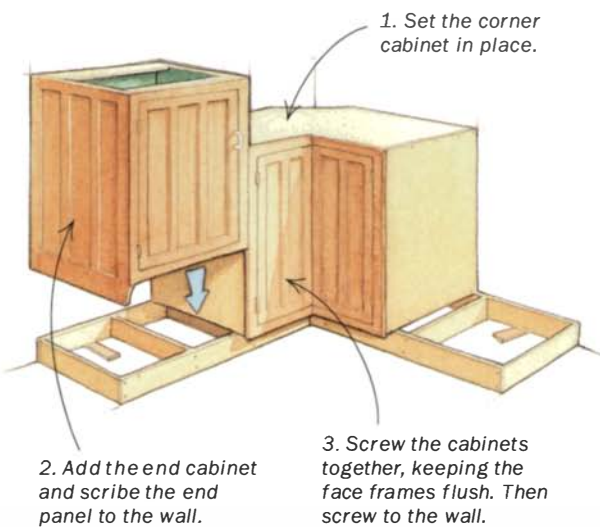
1. LEVEL AND ANCHOR THE BASES



Level with shims. Check side to side and front to back, shimming as necessary (above). When the base is level, attach it to the wall using 3½-in. screws (right). The screws are secured to the toe plate behind the wall.



2. INSTALL THE LOWER CABINETS



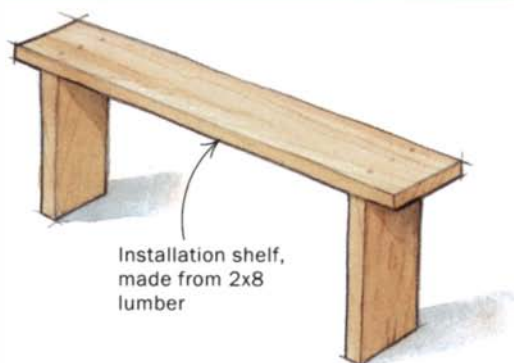
When installing cabinets, start from the corners. Lock those into place and work outward from there.



Scribe the back edge of the cabinet to the wall. Scribe the end cap to the uneven wall and trim it as needed to eliminate any gap (above). Align the face frames and screw the cabinets together to create a solid unit (right).



3. INSTALL THE UPPER CABINETS



Installation shelf,
made from 2x8
lumber

Temporary shelf eases installation. It supports the heavy cabinet and guarantees uniform spacing between the upper and lower cabinets. Place a scrap of plywood on the lower cabinets to create a stable base.

approach is to avoid a manufactured look and to create a more personalized feel.

Sizing door parts, like face frames, is really about personal preference. I think the proportions of rail and stile width on these doors are about right. Try to make the doors so that they just squeeze into the openings. If something is out of square, you will have enough excess material to trim the door to a good fit without making the margins too wide.

When doors call for 1/4-in.-thick flat panels, as these do, I like to resaw them from a single plank. This method takes a little time



but rewards you handsomely in the end. I chose this option because I had some special 4/4 lumber that I wanted to use for the doors. A simpler alternative would be to use quartersawn white-oak plywood.

Be careful to keep the doors flat when you're gluing them up. Use the hinge mortises on the stiles to locate the mating mortises on the doors.

I don't know of any shortcuts to hanging inset doors. You have to install them, see how they fit, remove them, and trim them until the margins are equal. (We're woodworkers. We're supposed to like this stuff.) For door catches I use 1/4-in.-dia. rare-earth magnets from Lee Valley (www.leevalley.com). They're very forgiving to install.

Cabinet installation requires a sound, level foundation

If you've made the bases separately from the cabinets, it's fairly simple to level them. After you've set a base in place, find the high spot and shim everything to that level. Take your time; bases should be level front to back and side to side. Adjacent cabinets must align evenly with each other so that countertops can span them smoothly.

I make the bases from strips of 3/4-in. plywood, the same material I used on the cabinet boxes. Mine are 4 in. tall, but that dimension can change depending on the

height of your box, the counter height, and whether you set the cabinets before or after the finished floor is installed. Plan to add a second face board to the base when you're through. It will hide any gaps.

To secure the cabinets, run screws through the cleat at the back of the base cabinet and about 1 in. into the wall studs.

With an integral cleat that's glued and screwed in place and reinforced with a plywood back, the upper cabinets don't really need a ledger on the wall for support. But installing a level ledger first will make it easier to hang the cabinets correctly. These cabinets will carry a lot of weight, so do not substitute brittle drywall screws for good-quality steel screws. I use #12 screws that penetrate 1 1/2 in. into the studs.

Some of the finishing details, such as a crown molding (if desired) on top of upper cabinets, may have to wait until last if the cabinets were scribed to fit walls. And it's possible that a few of the doors and drawers may need to be adjusted again to correct their fit after the cabinets are installed. Why a door fits beautifully in your shop but not after the cabinet has been installed is just one of those life mysteries we're destined not to solve. □

Scott Gibson is a woodworker and writer in East Waterboro, Maine.



Attach the cabinets to the wall. Drive 3 1/2-in. screws through the cleat and into wall studs to lock the cabinet to the wall.

Random-Orbit Palm Sanders

The best are both smooth and aggressive

BY ANDY ENGEL



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Sanding is as dull as dirt. I don't find even a Zen satisfaction in it, just tedium followed by finer grits, numb fingers, and dust in what's left of my hair. The best sander for me is the one that most quickly produces a good surface without making my fingers tingly or making me breathe fine dust.

Although woodworkers today hold vibration and dust collection to be crucial, the central question hasn't changed in years: Can a sander produce a good finish?

So that's where I started when I tried out nine 5-in., hook-and-loop base, variable-speed random-orbit sanders—the type most commonly found in woodworking shops. Production shops might use 6-in. sanders, but most hobbyists end up with the lighter, less expensive 5-in. models.

Starting with P100-grit pads and ending with P220-grit, I sanded a sample cherry board with each machine until I was satisfied with the surface. I did no hand-sanding afterward, wanting each sander to show its worst. Nonetheless, once stained (using a pigment stain, which tends to accentuate scratches) and shellacked, the boards were indistinguishable. The difference was that some sanders took longer than others to achieve that result. Also, dust collection and comfort varied widely.

Uniform scratch pattern is key

Although an evenly distributed scratch pattern may seem like a contradiction in terms for “random”-orbit sanders, it means

that no particular area is abraded more than any other. Random-orbit sanders create a uniform scratch pattern by combining a spinning motion with an orbital motion that generally distributes the scratches as evenly as possible. Although the various scratch patterns didn't show up on the boards once finish was applied, the sanders with the most uniform patterns tended to be the most aggressive.

Aggression and dust collection

For each test run, I equipped the sanders with fresh P100-grit Norton 3X abrasive pads, which remove wood more quickly than common aluminum-oxide pads.

To figure out which machines removed the most material, I used a digital timer and a scale that was sensitive to 1 gram (28 of which, more or less, equal an ounce). I tested each sander several times on a chunk of poplar cut from the same plank. I weighed the wood, sanded for five minutes, then weighed the wood again. The difference showed how much wood the sander had removed. While testing aggressiveness, I also measured dust collection. To see how well the sanders' integral dust collectors performed, I weighed each dust collector before and after sanding. The difference between how much wood the sander removed and how much dust it collected was floating in the air.

To measure how well each sander accommodated powered dust extraction, I attached the sanders to a Festool vacuum



Features to look for

Hook-and-loop is the most common method to attach paper. Changing the paper is fast and easy, and a partially used sanding disk can be reinstalled.

Variable speed is useful on resinous woods. Because pads run cooler when they run slower, low speeds slow the clogging of paper on woods such as pine.



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www.ryobitools.com
Street price: \$50

equipped with paper bags. Here, I weighed the wood and a fresh bag before and after sanding for five minutes. One surprise was that many of the sanders removed noticeably more stock when attached to the vacuum. So, if you don't bother to collect dust for the sake of your health, you might consider doing so for the sake of efficiency. The notable exception in this test was the Craftsman. I tested it three times to make sure, and each time this sander removed less stock when attached to the vacuum. Hard to explain.

While buying the sanding pads, I also cleaned out the local hardware store of clear Plexiglass. Again using P100-grit pads, I sanded the plastic. By making one pass at what felt like a uniform speed, I got a pretty clear idea of which machines produced the most uniform scratch patterns. The differences between the best were fairly subtle, but the difference between the best and the worst was striking. The most aggressive sander also had the most even scratch pattern.

But I never make one pass with a sander and call it good, so I cut a bunch of Plexiglass squares and did some timed sanding. After 30 seconds, all the machines had completely etched the Plexiglass. Sanding for just 15 seconds, though, showed some differences. Again, the most aggressive machines in terms of stock removal also had etched the plastic more uniformly.

Comfort: Smoothness and steering

I expected comfort to be subjective and difficult to rate. I was wrong. The differences were marked, and I have no hesitation in preferring some machines because they vibrated less. Some of the sanders were almost uncontrollable, and keeping them on the board was tiresome. Others steered like a dream, and I hardly knew I was holding a sander. Still others steered OK, but caused the board to spin on the table, twisting the nonskid pad underneath like a crumpled-up bath towel.

All of the sanders can be held comfortably either with your hand on top or around the sander's waist. That's a matter of personal preference. I find that I vary hand position on long sanding jobs, but whether I do it to improve my comfort or to alleviate my boredom is hard to say.

Weight is a factor with most handheld power tools. But unless you're planning to

use a random-orbit sander for a vertical job like sanding existing interior trim, weight is not a big deal here. Most woodworkers only pick up a sander long enough to move it from the shelf to the board that's about to be sanded.

Noise is the final comfort factor, and it varies considerably. The quietest sander produced 82 db.; the loudest 90 db. An 8-db. difference may not sound like a lot, but the decibel scale is logarithmic, not additive. When you add a shop vacuum, which I feel is essential to collect the finest, most dangerous dust, the noise level will be well over 90 db. Anything over 90 db. is hearing-protection territory (conservative sources say 85 db.).

After sanding off more than a pound of wood and spoiling more than 30 sq. ft. of Plexiglass, I have clear favorites. Because they produce outstanding scratch patterns, remove material quickly, perform well with dust extraction, and are relatively comfortable to use, I'd buy either the Bosch or the Klingspor, which actually appear to be the same machine. I made the Bosch my best overall pick, as it had the lower street price. □

Andy Engel, a former senior editor, is a carpenter and freelance writer in Roxbury, Conn.

Model	Street Price
BEST OVERALL BOSCH 1295DVS	\$70
CRAFTSMAN 27989	\$70
DEWALT D26453	\$86
FESTOOL ES125 EQ-PLUS	\$165
KLINGSPOR 1893 DVS	\$80
MAKITA B05012K	\$80
PORTER-CABLE 333VSK	\$80
RIDGID R2600	\$80
RYOBI RS281VS	\$50

The testing process: Scratch patterns and stock removal

Engel tested the sanders for aggressiveness by sanding a poplar board for five minutes and measuring how much wood was removed. Then he measured the amount of dust each sander collected. Finally, he sanded Plexiglass to compare scratch patterns.



Plexiglass shows off scratch patterns. In theory, random-orbit sanders uniformly abrade the workpiece because they move randomly and don't make discernible scratch patterns. But some work better than others. Compare the scratch pattern from the Bosch with that from the Craftsman.



Five minutes' sanding yielded measurable dust samples. Each machine was tested several times for aggressiveness and effective dust collection by sanding sample boards for five timed minutes.



The scale doesn't lie. Before and after weights show the amount of wood removed.



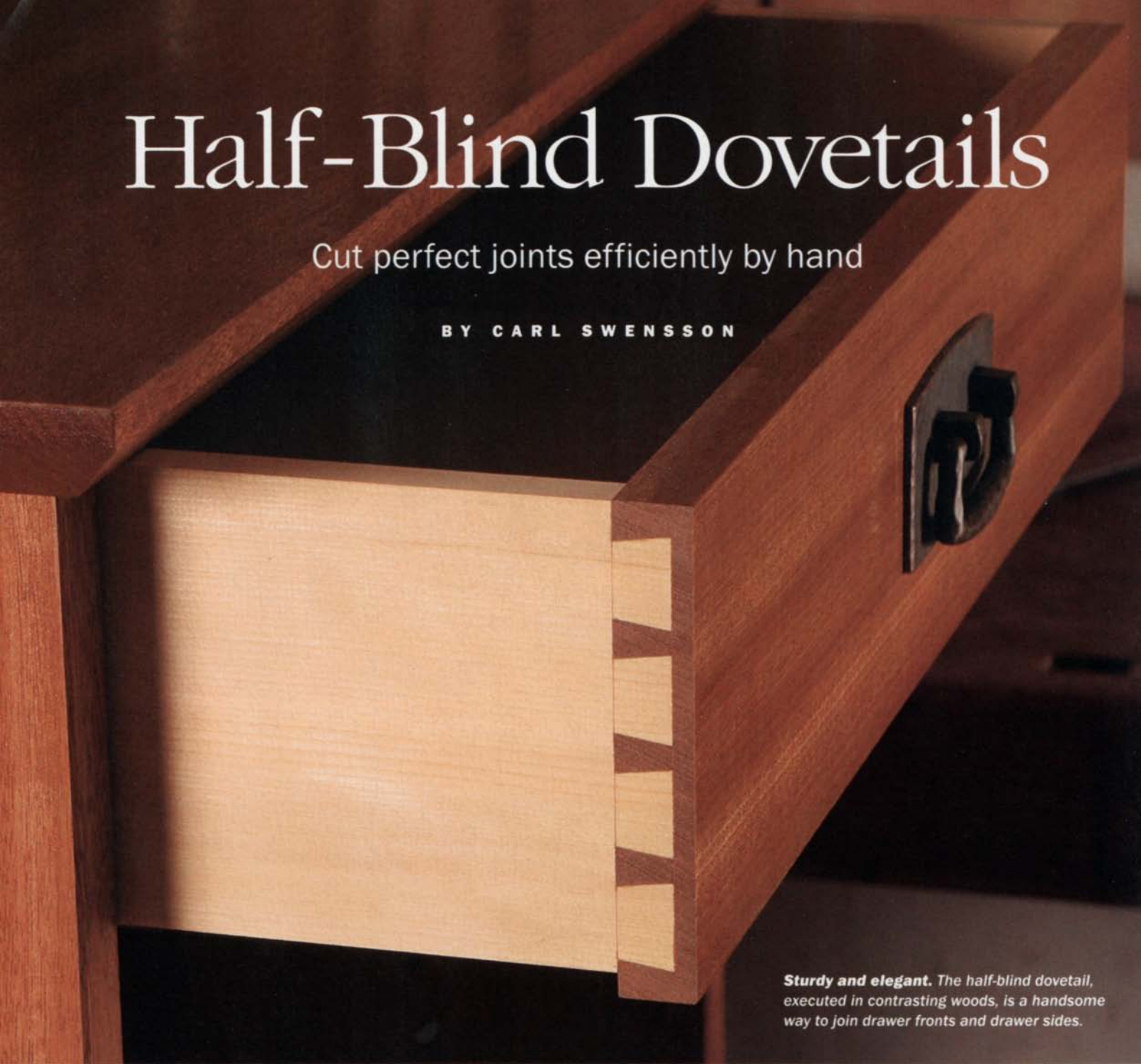
What isn't collected goes in the air. Comparing the before and after weights of the sander and its dust bag (or the vacuum's dust bag) shows how much dust was collected.

Stock removal test	Stock removal test with vacuum	Scratch pattern	Built-in dust collection	External dust collection	Vibration	Noise	Comments
10g	13g	Excellent	60%	90%	Very good	85 db.	Easy to control but moves workpiece. May be difficult for those with weak hands to attach vacuum adapter. Adapter not included.
9g	5g	Poor	67%	88%	Poor	90 db.	Very hard to control. Aggression dropped off with vacuum, retested twice to confirm.
8g	12g	Good	75%	75%	Fair	87 db.	Fair control but moves workpiece.
6g	11g	Good	83%	100%	Excellent	86 db.	Very easy to control. Nine-hole paper required with included base. Standard 8-hole base available, tested both.
8g	11g	Excellent	75%	100%	Very good	86 db.	Appears to be the same machine as the Bosch. Performance is nearly identical.
8g	7g	Very good	88%	100%	Excellent	85 db.	Easiest sander to control, and did not move work. Light and wieldy, a good choice for jobs off the bench. Odd, whiny noise.
8g	10g	Fair	88%	100%	Very good	82 db.	Light, smooth, good control. Moves work a bit.
8g	8g	Good	63%	73%	Good	88 db.	Easy to control. Moves work a bit.
8g	7g	Good	63%	86%	Poor	85 db.	Very hard to control. Comes ready for PSA paper; hook-and-loop base is user installed.

Half-Blind Dovetails

Cut perfect joints efficiently by hand

BY CARL SWENSSON



Sturdy and elegant. The half-blind dovetail, executed in contrasting woods, is a handsome way to join drawer fronts and drawer sides.

A tightly fitting half-blind dovetail is easy to find and easy to admire. Locating one can be as simple as opening the nearest drawer, because the technique most often is used to join drawer fronts to drawer sides. When made with contrasting woods, the hand-cut joint, with its narrow pins and variable spacing, is especially attractive.

Many a woodworker uses a router and jig to cut snug half-blind dovetails with relative ease. But the joint also can be cut

efficiently by hand. In fact, with careful attention to sawing and chiseling techniques, I can cut a snug pair of half-blinds in about an hour. Here's how I do it.

Start with the tails

Cutting the tails first helps me to lay out the pins accurately and get a tight-fitting joint. The finished tails act as a template that is traced easily onto the pin board.

Start the layout with a marking gauge, using one setting to scribe the length of

the tails on the end grain of the drawer front and on the drawer side.

Before continuing with the tail layout, reset the gauge to about $\frac{1}{32}$ in. wider than the thickness of the drawer side. Scribe a line on the inside face of the drawer front, marking the length of the pins. The extra $\frac{1}{32}$ in. lets the pins stand slightly proud of the assembled joint, so that they can be planed flush.

I allow for this excess material in advance, because I will be cutting stock

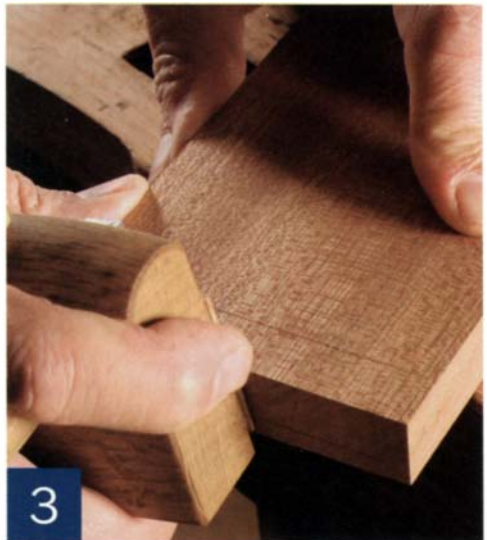
A perfect fit begins with accurate layout



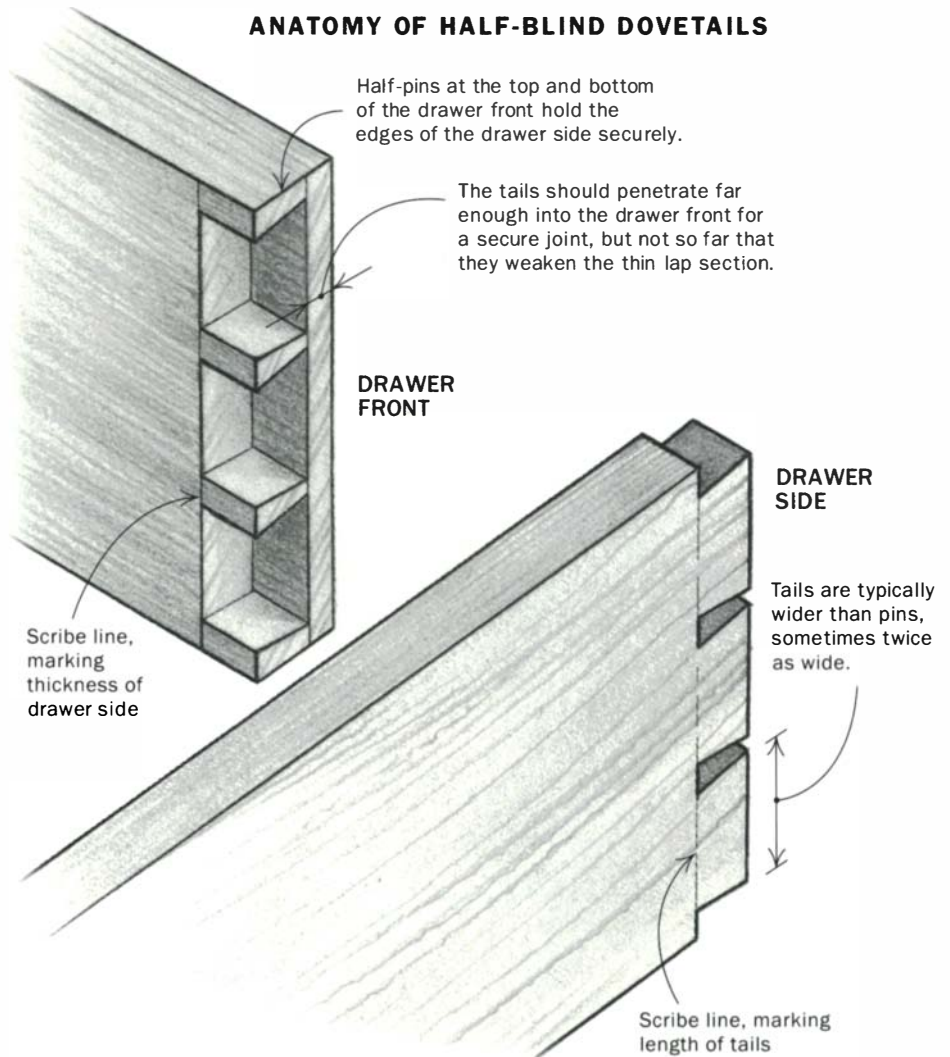
Determine the length of the tails. In the end grain of the drawer front, scribe a baseline for the sockets that will house the tails. The tails should penetrate about two-thirds of the way into the drawer front for heavy-duty applications, four-fifths of the way for more delicate work.



Mark the mating piece. Use the same gauge setting to scribe a corresponding line on the drawer side, again marking the length of the tails.

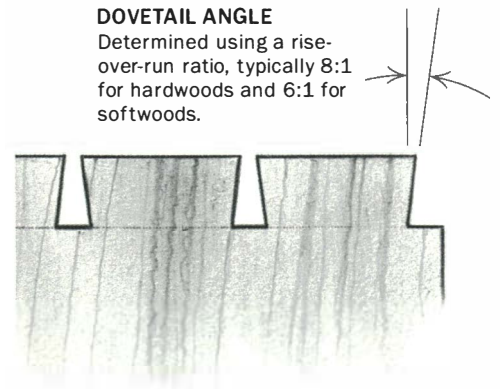


Set the socket depth. On the inside face of the drawer front, scribe a line to match the thickness of the drawer side, plus $\frac{1}{32}$ in. or so.



DOVETAIL ANGLE

Determined using a rise-over-run ratio, typically 8:1 for hardwoods and 6:1 for softwoods.



Lay out the tails. Set a bevel gauge to your dovetail angle and use a pencil to draw the angled lines on the drawer side. Use a square to carry the lines across the end grain.

Cut the tails first



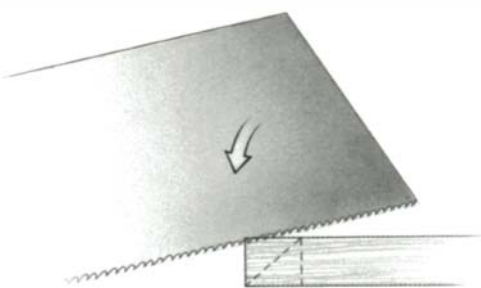
1 **Start the saw at a low angle.** This helps establish the kerf over the full length of the cut. Swensson secures the drawer side flat on the benchtop with the end grain facing him.



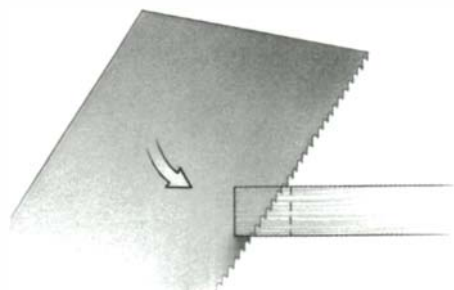
2 **Steadily steepen the cut.** Alter the angle slightly with each stroke, bringing the blade vertical as you finish. When finished, you might be down on one knee.

SAWING TECHNIQUE

1. Start the cut at a very low angle to help establish the kerf. Steadily steepen to a 45° angle with the goal of reaching the bottom corner and the scribed line at the same time.



2. Steepen the angle to vertical as you finish the cut, taking care not to lift the saw out of the kerf or overcut the scribed line.



for my drawer fronts to fit the drawer openings.

Next, lay out the angled sides of the tails using a pencil and a bevel gauge. I like to set the angle at a 1:8 ratio, or about 7°. Slightly smaller or larger angles will work, but I find this one offers a good balance between visual effect and structural strength. Finally, use a square to continue the layout lines across the end grain.

For all of this work, keep your pencil extremely sharp. I sharpen mine to a chisel edge by pressing the point flat on a sanding block and working it vigorously back and forth. Others prefer marking with a knife for accuracy, but I've learned I can cut just as precisely to a pencil line, and I can see it much more easily.

Next, begin to saw the tail cheeks. My goal is to produce a finished surface directly from the saw. I use a Japanese rip saw that cuts on the pull stroke. Its thin blade requires less cutting effort than a Western saw. Its long handle helps minimize steering errors, which are easier to correct because of the blade's flexibility.

I hold or clamp the work flat on a bench with the end grain toward me. In this way

the stock is oriented properly for the rip saw, letting the saw work in the direction of the long grain. The pull stroke also lets much of the sawdust fall to the floor, keeping the layout lines clear of debris. I hold the saw roughly midway along the handle. This hand position gives me greater control as I slowly start the cut. With the saw held at a very low angle, start with short, light strokes to split the line, using the small teeth nearest the handle for the greatest control.

If the saw jumps or lurches as you pull, it might mean that your angle is too high and the teeth are catching the corner. You also might be pushing down too hard, trying to cut too aggressively. The saw should slip into the wood.

Once the saw has broken the surface and opened a kerf, I progress gradually from the low angle to about 45°. This puts the saw as deep into the kerf as possible, providing more control and dampening the error from any offline strokes. I then move my grip to the base of the handle and begin to saw with the whole blade.

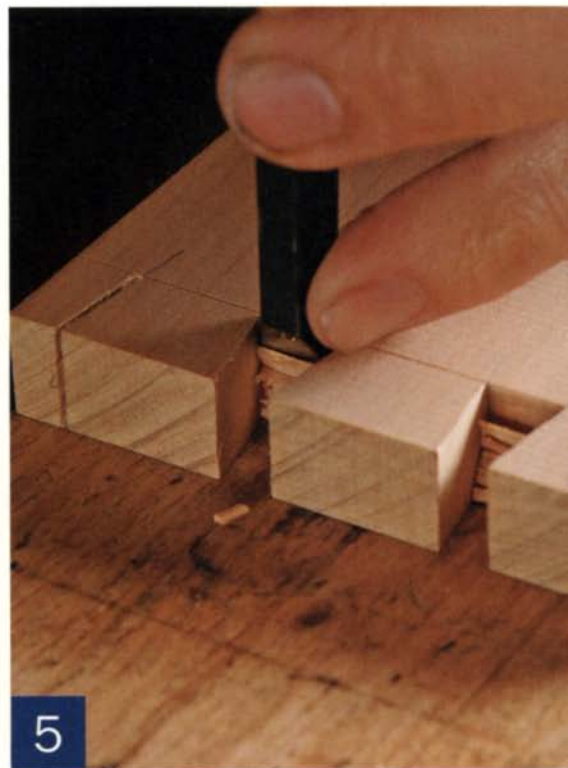
While sawing, I keep a loose grip on the saw handle. This lets my hand sense



Start chopping out the waste. Make a vertical cut about $\frac{1}{32}$ in. on the waste side of the scribed line. If you start in the scribed line, the natural cutting action of the chisel will push it past the line.



With the bevel down, cut a trough into the waste. Continue to chop and pare until halfway through the waste. Then work from the other side.



Pare to the layout line. Afterward, use a small square to check that the sawn and chiseled surfaces are square to the face of the board. This helps ensure that the finished joint will go together tightly.

and immediately correct any vibration or binding of the saw in the kerf. A tight grip mutes these important sensations.

Accurate hand-sawing yields straight, clean surfaces exactly where you want them, but the skill takes time to develop. Beginners tend to be too careful and to saw too slowly. This results in a rough surface. To cut cleanly, the saw needs momentum through the cut; you would not run your tablesaw at half speed and expect a good result. Your saw stroke should exhibit the confidence of an expert with the open mind of a student.

As I cut, I watch the layout lines on both the face grain and end grain. My goal is to make steady progress toward the scribed depth of the tail and the opposite corner, and I aim to reach both at the same time.

It is an accepted practice at this point to flip the board and repeat the process, sawing this same triangular section and then finishing the cut to the final depth of the tail. This yields a predictably good result with perhaps a little cleanup with the chisel. A risky and more fun method is to keep the board in one position and continue sawing until you have reached the

finished depth. I do this by keeping the front of the blade near the scribed depth and pivoting the handle end downward as I continue sawing. When the sawblade is vertical, I have reached finished depth on both sides of the board.

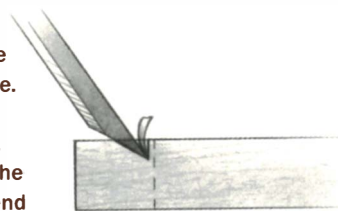
With practice, it's possible to use this technique without seeing where the saw is cutting. How the saw feels as it glides through the kerf tells one if the saw is going straight. If you do it right, the result is excellent. If you do it wrong, the reward is more practice.

Chop out the waste—After sawing all the tail cheeks, begin to remove the waste with a chisel. I choose the largest chisel that will fit in the joint without accidentally marring the sides. Placing the chisel about $\frac{1}{32}$ in. on the waste side of the marked depth of the tail, make a series of firm vertical cuts, each followed by a bevel-down angled cut. The angled cut removes a chip and allows the next vertical cut to go deeper. Stop about halfway through.

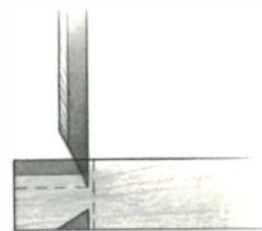
I never split off the waste on this side with a chisel cut on the end grain. The wood that remains will support the waste when working from the other side and will

CHISELING TECHNIQUE

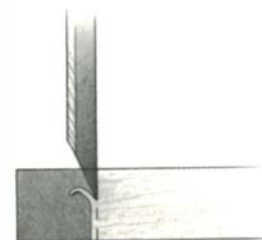
1. Start with a vertical cut on the waste side of the scribed line. Then cut out a V-shaped groove. Do not chip out the waste from the end of the board—yet.



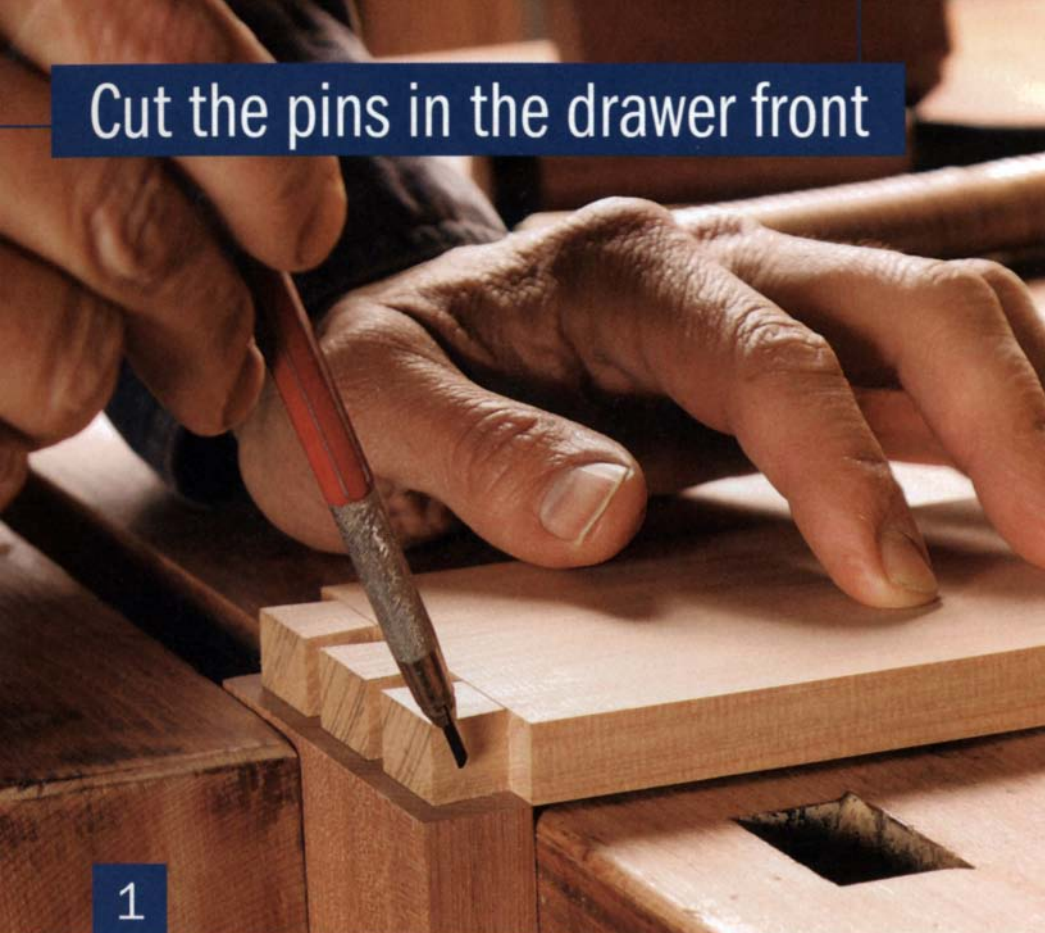
2. Flip the board onto its other side. The remaining shelf of waste will serve as a support that prevents the end grain from tearing out as you chop from the other side.



3. Finish by paring the tails to the scribed line and to the saw lines, working inward from both sides.



Cut the pins in the drawer front



1 **Trace the tails to lay out the pins.** Place the drawer front vertically in a vise. Hold the drawer side firmly in place while tracing the outline of the tails on the end grain. Swensson uses a pencil sharpened to a chisel edge on a sanding block.

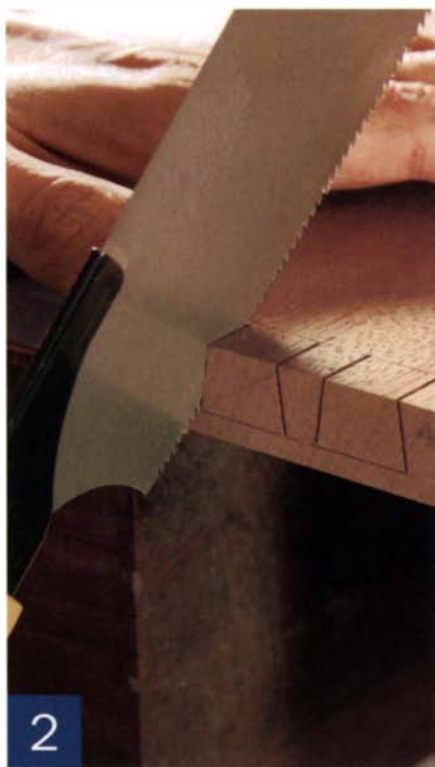
prevent an end-grain chunk of wood from being pulled out of the finished joint.

Flip the board and repeat the process. On this side it's OK to split off the waste from the end grain. With the waste gone, place the chisel in the cut from the marking gauge. Chisel the bottom of the joint square or with a slight undercut, working toward the middle from each side. The approximate $\frac{1}{32}$ in. of waste helps to control the edge of the chisel as it cuts. With good technique very little, if any, paring or fixing of the joint is needed. Think like a joiner, not a wood-carver.

Laying out the pins

Use the finished tails as a template to lay out the angled sides of the pins. I mount the drawer front in a vise, end grain up, and align the tails across it. Holding the drawer side firmly in place, I set my pencil tightly against the tails and trace their outline onto the drawer front.

As you begin to saw the cheeks of the pins, saw tightly to the waste side of the line. This gives the closest fit to the mating surface. I saw the pins with the same technique as the tails, except that the joint geometry does not allow me to saw through.



2 **Start the kerf with a saw.** Again, start at a shallow angle and steadily steepen the cut. Make sure that the saw arrives at both corners simultaneously.



3 **Finish it with a scraper.** Gently hammer a card scraper into the kerf. This extends the kerf into the corner that the saw can't reach. Make several passes with the scraper, starting near the top of the kerf and working down to the baseline.



4 **Clear the waste.** After forcefully chopping away the bulk of the waste, use a narrower chisel to gently clear material from the corners.

ASSEMBLY TIP



A chamfer eases the fit. Cut a narrow chamfer on the mating edges of the pins and tails. This protects the corners from crushing or tearing when fitting the joint.

Hammering the edges of a scraper into the kerf extends the kerf to the corner of the joint. I use a scraper as thick as or slightly thinner than the kerf. One end and one side are filed and honed flat and square to the face, as they would be prior to burnishing. (A knife edge might split the wood or stray outside the kerf.)

To remove the waste, place the chisel about halfway between the end of the

board and the scribed layout mark on the inside face. I use as big a chisel and hammer as I dare and power the chisel vertically, stopping just short of the bottom of the joint. Most of the waste will break loose cleanly as I chop, leaving very little material to pare from the end grain. The cuts are actually well controlled by the wood, leaving a fairly clean surface. As before, clean up the end grain of the joint to the layout mark.

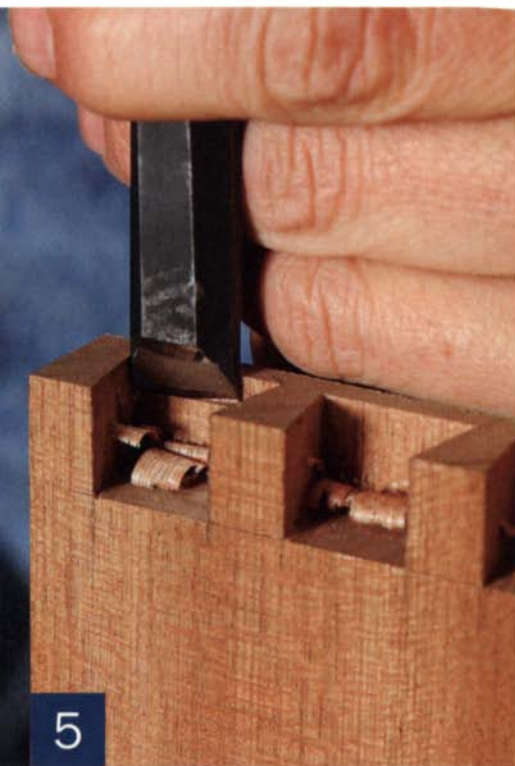
Bringing it all together

To prepare for assembly, cut a small low-angle chamfer on the inside edges of the tails and on the outside edges of the pins. The chamfers on the pins should be on the waste part that will be planed off at the end. These chamfers on the pins and tails will help the joint slide together, will distribute the glue, and will reduce the chances of blowing out the side grain of the tails.

The joint can be hammered together, but pulling it up with clamps offers more control. I use a glue-up block that allows the pins to protrude. This glue-up block should be made of a softer wood than the drawer side so it will not compress the wood of the drawer side. A little shellac or wax will keep it from sticking to the drawer. A well-made joint will not have to stay clamped up while the glue sets. The fit of the joint will do the job. I do not recommend dry-fitting the dovetails, as each fitting loosens the joint.

If you sense that the joint is coming together too tightly, pull it apart and pare any high spots where the pins or tails are rubbing. Look for shiny areas where the friction of fitting has compressed the wood fibers. Also check any suspect areas with a small straightedge. □

Carl Swensson is a furniture maker and designer in Baltimore.



Clean up and check the fit. Pare to the layout lines (above), again checking the chiseled and sawn surfaces for square. A firm rap with the fist should be enough to get the joint started (right).



Master the Mortiser

Simple tips for sharpening, setup, and cutting sequence

BY ROLAND JOHNSON

A mortiser, also called a hollow-chisel mortiser or mortising machine, cuts mortises remarkably quickly and accurately. Indeed, this machine can cut a typical leg-to-apron mortise in well under a minute. Benchtop models are most common, although larger, freestanding machines also are available.

On the downside, mortisers define the word finicky. If yours isn't set up and used correctly, you'll wonder why you bought one.

Fortunately, mortiser-induced headaches can be treated with relative ease. Simply follow the steps outlined here, and you'll find that quick, clean, and accurate mortises become the norm, not the exception.

A sharp chisel and bit are a must

A mortiser won't work effectively when the bit and chisel are dull, so keep both parts sharpened (see photos, facing page). No need for a lot of tools, just a chainsaw file, a round and a flat slip stone, a little sandpaper, an abrasive pad, and some honing oil. Don't expect a brand-new bit and chisel to be adequately sharp. Almost all I've seen needed extra attention out of the box.

Hone the outside faces of the chisel—I begin sharpening by honing the four outside faces of the chisel. To ensure an adequately flat honing surface, I use spray adhesive to mount P400- and

KEYS TO SUCCESS

Mortisers require extra attention, but the payoff makes it all worthwhile. Don't ignore any of these steps.





Cutters need sharpening

Like any cutting tool, a mortising chisel and bit must be sharp to work well. A few minutes spent sharpening pays many dividends.



Smooth the outside surfaces of the chisel. A chisel with rough outside faces can't be sharpened and won't be easy to plunge and retract. Use fine sandpaper on a flat surface to smooth all four sides.



OR



Hone the bevels. A little work with a round slip stone (left) or a special, cone-shaped, diamond-coated abrasive (right) produces fresh, sharp edges that ensure a cleaner cut. Use a flat slip stone to remove the burr that results.

P800-grit sandpaper to a granite plate. A piece of plate glass glued to $\frac{3}{4}$ -in.-thick hardwood plywood also makes a good flat surface.

To reduce clogging, I spend time tuning up the bore. The smoother the bore, the easier it is for chips to slide up the auger bit. I use a chainsaw file to remove any internal burrs or machining grooves. A small, round, tapered slip stone works well for cleaning up the ejection slot.

Hone the bevels—A round slip stone is all that's needed to hone the bevels. Keep in mind that not all mortiser chisels have the same bevel angle. Clico, a British manufacturer, and Asian and Japanese sourced chisels use a 60° bevel angle, while Forest City, a U.S. maker, uses a 45° bevel.

With the shank of the chisel secured in a vise, place the stone flat against a bevel and work it back and forth with a light touch. Be sure to wet the stone first with a few drops of honing oil. To avoid creating a groove, keep the stone moving from side to side along the bevel and don't stay in one spot for more than a few strokes. Try to remove about the same amount of material from each bevel.

If you prefer a process that's somewhat less fussy, there is a special cone-shaped tool (available from Rockler; www.rockler.com) that allows you to sharpen all four 60° bevels at once. If the chisel has a 45° bevel, tilt the cone and sharpen only a portion of the bevel at a time.

Honing the bevels will produce a burr along the outside edge of the chisel. To remove it, hold a flat slip stone flat against the outside face of the chisel and drag the stone lightly toward you.

Sharpen the bit—Depending on the manufacturer, the auger-style drill bits for mortiser chisels are either a single spur/flute brad point or a double spur/flute without a centering point. I find that the single spur/flute with its higher-helix flute evacuates chips faster than the double-flute bits. But any type you use must be sharp and burr-free.

In an auger-style drill bit, all the cutting gets done in just two places: at the spurs and at the flutes. So that's where



Sharpen the bit.

Use a flat slip stone to hone the bit in two places: the spur and the cutting edge. If your bit has a centerpoint (not all do), hone each of the three facets of the point, too.



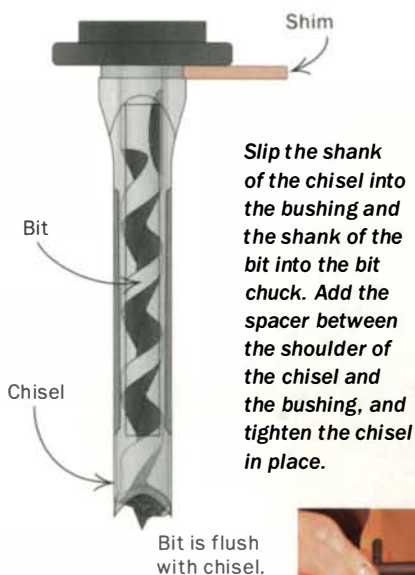
Add some lubricant.

To help reduce friction during cuts, spray both the chisel and bit with dry lubricant after sharpening. Later on, when cutting mortises, an occasional squirt of lubricant on the chisel and bit will fight friction.

Set the right gap

A sharp chisel and bit are not the end of the story. The two parts must be installed correctly to minimize friction and maximize chip removal.

1 TIGHTEN THE CHISEL IN THE BUSHING



2 TIGHTEN THE BIT IN THE CHUCK

While holding the spur of the bit about flush with the points of the chisel, tighten the shank of the bit in the drill chuck.



3 NOW READJUST THE CHISEL



Remove the spacer and raise the chisel until it butts against the bushing. A squaring board ensures that the chisel is square to the fence. Tighten the locking knob.



you need to sharpen. If the bit has a brad point, I usually sharpen the point, too. The machining process at the factory sometimes leaves ridges or burrs at the transition area between the spurs and flutes. Use a slip stone to smooth any you find. After that, polish the flutes with a medium-grit abrasive pad to create a slick route for the chips to follow.

Install the chisel and bit correctly

The installation of the chisel/bit in the mortiser should follow a precise sequence. If you do it properly, the chips will eject easily and the hole will be square to the workpiece.

Determine the gap—

When installing the chisel and bit, it's important to have

the proper gap between the chisel bevels and the end of the bit. I vary the gap based on the size of the chisel and the material. Softwood typically produces large chips that can clog the chisel quickly. Large mortise chisels and bits also make large chips, even in hardwood. I like to leave a $\frac{1}{16}$ -in. to $\frac{3}{32}$ -in. gap when using small ($\frac{1}{4}$ in. and $\frac{5}{16}$ in.) and medium ($\frac{3}{8}$ in.) bits in hardwood. A little more clearance, about $\frac{3}{32}$ in. to $\frac{1}{8}$ in., is adequate for small and medium bits in softwood. For large bits ($\frac{1}{2}$ in. and larger) in hardwood and softwood, a full $\frac{1}{8}$ -in. gap works best. These clearances aren't carved in stone, so if you find the going tough or your chisel plugging frequently, try increasing the gap between the chisel and bit.

Set the gap—Knowing the gap that's needed, you can go ahead and install the bit and chisel. Be aware that the points on the chisel are very sharp, so use care. I usually wear a leather glove on the hand supporting the chisel and bit.

First, rip a piece of scrap stock to the thickness of the intended gap to use as a spacer. Then place a short length of board on the mortiser table to forestall any damage to the points of the chisel or the cutting flutes on the bit should either be dropped.

Insert the bit into the chisel. Then slip the shank of the bit into the bit chuck and the shank of the chisel into the mounting bushing. (Some machines require a sleeve sized to fit the chisel shank.) At the same time, place the spacer between the shank of the chisel and the bushing. Then tighten the chisel. After aligning the spur of the bit with the chisel points, tighten the bit.

To complete the gap-setting procedure, remove the spacer and raise the chisel until the shoulder is seated tight to the bushing. Tighten the chisel, and the offset will be correct.

The chisel must be parallel to the fence—Slip a flat piece of wood—I call it a squaring board—between the fence and the chisel. Next, loosen the fence and chisel and, keeping its shoulder

Start cutting mortises

With the chisel/bit sharpened and installed, the general setup procedure is over. Now make the final machine adjustments for the mortise you want and follow a specific cutting sequence.

1 SET THE MORTISE DEPTH

After marking the mortise depth on the end of the workpiece, lower the chisel and bit to the marked line and set the depth stop on the machine.

tight to the mortise-head, rotate the chisel and pull the fence forward until the chisel sits flat against the board. Then tighten the chisel.

Square the chisel to the table—Make sure the centerline of the chisel is square to the table in two directions; front to back and side to side. Use a square to do the checking. Don't panic if all's not well. Most mortisers have the mortising head and support column mounted to the table with bolts. It's a simple matter to loosen those bolts and shim (I use automotive alignment shims) the appropriate side of the column base to get the chisel square to the table.

Square the fence to the table—When the fence isn't square to the table, the mortise won't be square either. Check it with a square. If it's off more than say, 0.005 in. over 3 in., you'll need to shim the fence bracket where it attaches to the base or add a wooden fence that can be shimmed or beveled to square.

Hold-downs keep the workpiece on the table—Position the hold-down so that there is just enough clearance to allow the workpiece to slide under the hold-down without binding. I keep a 1/64-in.-thick strip of stock handy as a spacer.

Avoid overlapping cuts

In the first cut by a bit and chisel, all four faces of the chisel will get equal support, so the bit is sure to stay square to the table throughout the cut. But if the next cut overlaps the first so that one side is unsupported, the chisel will tend to bend slightly toward that unsupported side. That causes the outside of the bit to rub against the inside of the chisel, which leads to friction, heat, and noise.

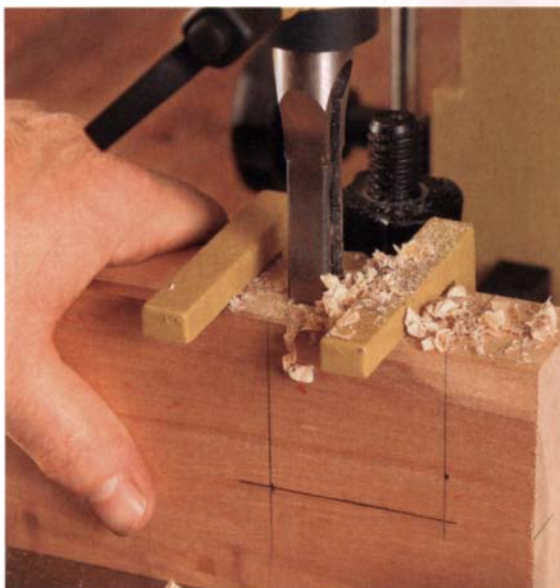
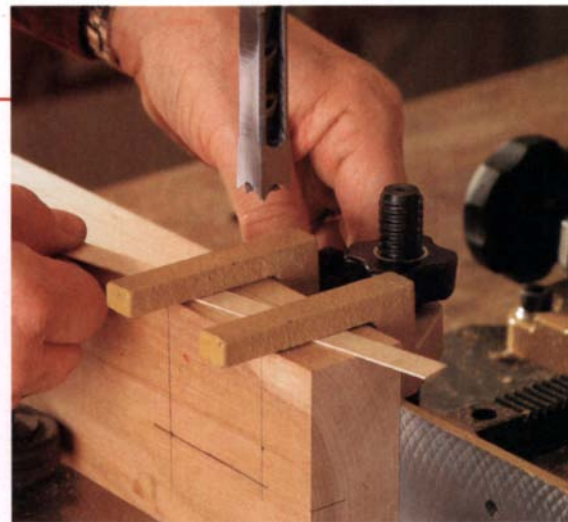
To avoid the overlap problem, make a pair of cuts, one on each end of the mortise. Then make a series of unconnected cuts to begin to remove the waste stock in between the ends. Leave a little less than a bit's width between these cuts. That way, the chisel is always fully supported. After that, go back and make cuts as needed to clean up the mortise. □

Roland Johnson is a contributing editor.



2 ADJUST THE HOLD-DOWN

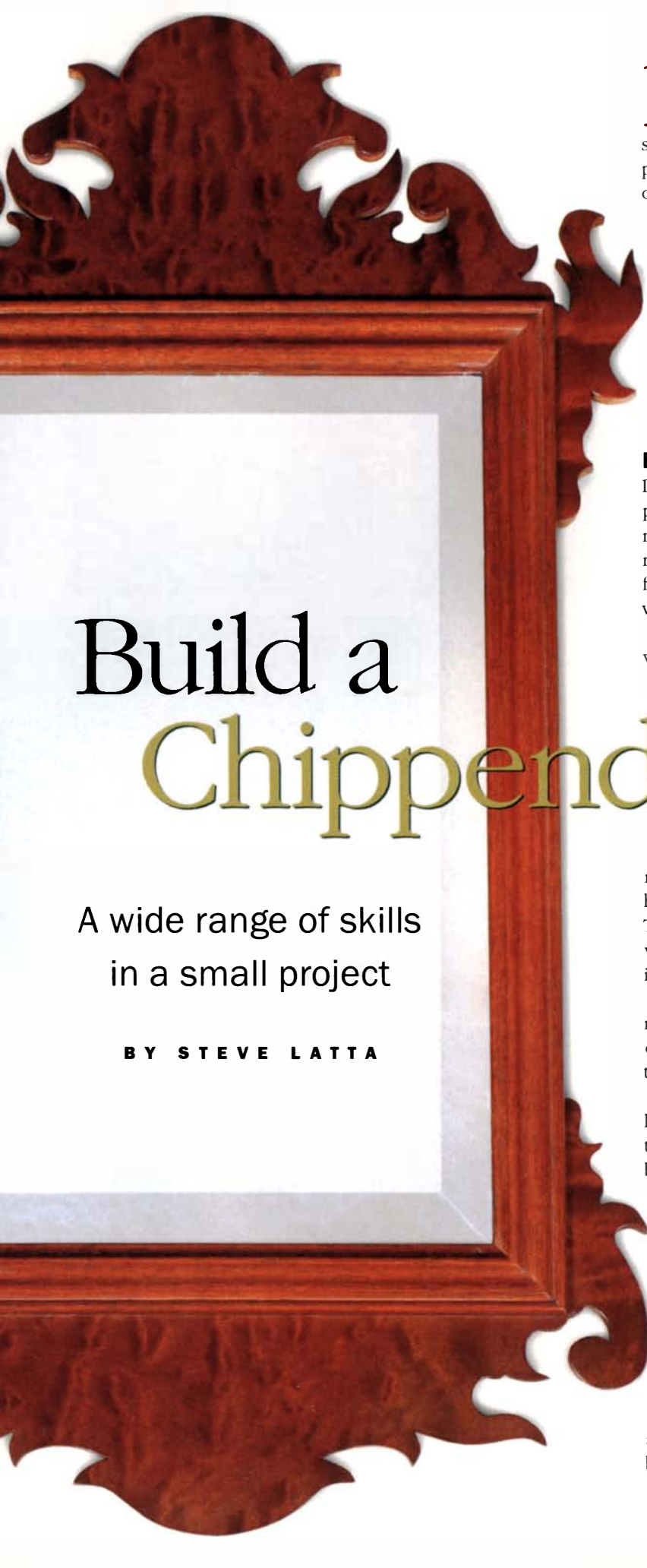
A thin, wood spacer creates a slight clearance between the top of the workpiece and the hold-down, making it easy to slide the workpiece sideways.



3 CUT EACH END OF THE MORTISE FIRST



Make two cuts, one at each end of the mortise (left). Then make a series of cuts, leaving a web of wood in between each cut. Last, make cuts (above) to clean out the webs.



Build a Chippendale Mirror

A wide range of skills
in a small project

BY STEVE LATTA

During the late 18th century, elaborately framed mirrors, known as looking glasses, served as testimonials to the wealth of their owners. A looking glass similar to the one shown here would have cost the owner 10 to 12 shillings, a hefty price considering that the average wage for a skilled tradesman of the time was about 6 shillings a day.

This is the first serious piece I give my students to make. Because I'm blending a traditional piece into a modern curriculum, I don't go nuts over historical precedence and technique, and I take full advantage of modern machinery. For a small project, this mirror introduces a wide range of skills from basic design and layout to veneering and scrollwork. Each year, my class ends up with a great collection of stunning mirrors that they present as thank-you gifts to mom and dad for the thousands doled out for tuition.

Begin by constructing a two-layer frame

Despite its elaborate appearance, this project has only two main parts. The frame, which I make first, consists of a visible mitered molding in mahogany that sits on top of a poplar subframe; surrounding it are scrollsawn parts made from a shopmade core with figured veneer (in this case makore) as the face veneer and plain veneer on the back.

The common way to build a frame is to use $\frac{3}{4}$ -in.-thick primary wood and miter the corners. Even when the joints are splined or

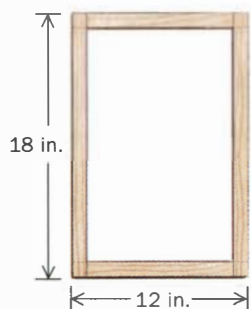
nailed, this is a poor approach. I make a poplar subframe with half-lap corners using stock that is $\frac{5}{8}$ in. thick by 1 in. wide. This approach creates a much stronger frame, uses less primary wood, and is historically correct. Don't worry about the contrasting woods—when stained, the poplar will blend right in.

Before you start milling, purchase the mirror so that you can measure its exact dimensions and size the frame accordingly. You could use ordinary $\frac{1}{8}$ -in.-thick flat mirror, but this frame justifies the extra cost of $\frac{1}{4}$ -in.-thick mirror with a 1-in. beveled edge.

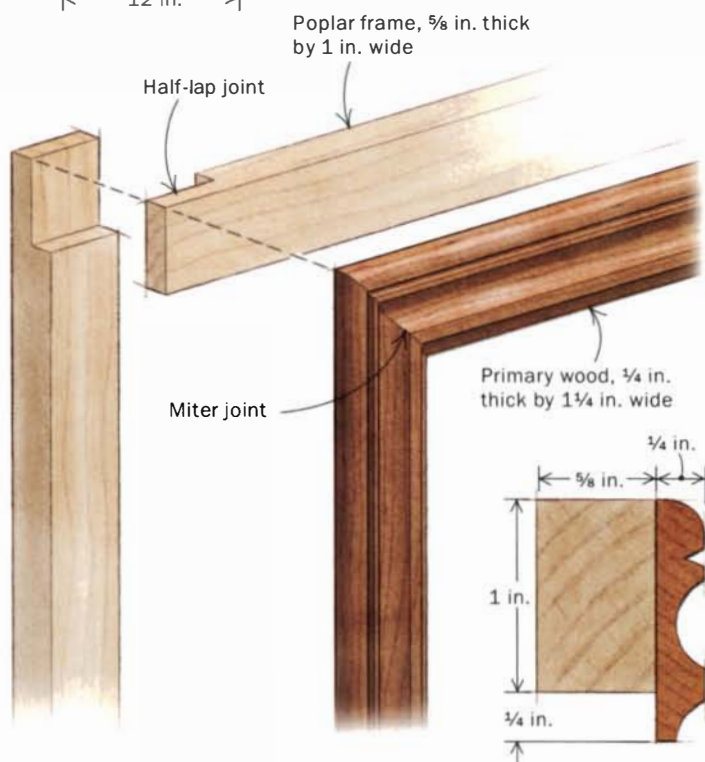
Mill the poplar subframe members an extra $\frac{1}{16}$ in. long to allow the joints to overhang slightly, and cut the half laps on the tablesaw using a miter gauge with an auxiliary fence to prevent blowout, and a tenoning jig for the cheek cuts. Dry-fit the subframe, glue opposite corners to make sure they are square, and then glue the rest. Trim the overhang with a chisel, making sure that you don't round the edges. Remember that the veneered ornamental pieces will be glued to this surface and any irregularities will make for a poor joint. If the frame turns out square, mitering the molding pieces is a snap. If the frame is at all out of square, you'll have to fudge the joints in order to get a nice, tight fit.

After I've profiled the front, visible moldings (see drawings, facing page), I cut their miters. With an L-shaped auxiliary fence attached to the chopsaw, make 45° cuts to the left and right, but be careful to keep the cut as shallow as possible and avoid

Build a strong frame



For durability, a poplar subframe with half-lap joints supports a mitered molding of mahogany. Because the mahogany is $\frac{1}{4}$ in. wider than the poplar, it provides a lip to hold the mirror. To hold a standard 10-in. by 16-in. mirror, the outside dimensions of the frame are 12 in. by 18 in.



cutting through the fence. These initial cuts become reference marks for the exact location of future cuts, so rather than shifting the blade angle $\frac{1}{2}^\circ$ or so, I use scrap pieces of veneer to shim the molding in, out, up, or down to tweak the miter if needed. After completing a cut, slide the molding away before you raise the blade; most damage to trim cuts occurs as the blade is lifted up from the stock.

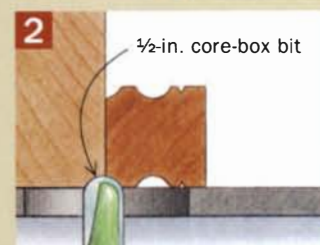
There is a logical system to follow for making all of the cuts smoothly with superior results. First, fit the top piece of molding with a 45° cut on both ends. Clamp it in place using two or three spring clamps. Custom cut the adjoining miters on both side pieces, making sure that they are tight across the joint and run evenly along the full length of the poplar subframe. Take the right-side piece, mark its length, and cut a 45° miter at the bottom. Clamp it in place using spring clamps. Custom cut the bottom miter to fit this piece, but cut the opposite end about $\frac{1}{8}$ in. long for final trimming.

Measure the length of the left-side piece and cut the bottom miter before clamping it in place. Don't try to lay the bottom molding over the side moldings and guesstimate the final miter joint. Remove the right-side molding and fit the left-hand miter of



Construct the subframe. When gluing the poplar subframe, make sure it is perfectly square. If not, applying the mitered molding becomes much more difficult.

THREE BITS COMBINE TO MAKE THE MOLDING



There are many historical designs for the molding, so feel free to experiment with your existing router bits. If you want to use the same bits I did, you should be able to find them fairly easily. Freud and Amana both make all three. Sources include: Tools Plus (www.tools-plus.com; 800-222-6133) and International Tool (www.internationaltool.com; 800-338-3384).



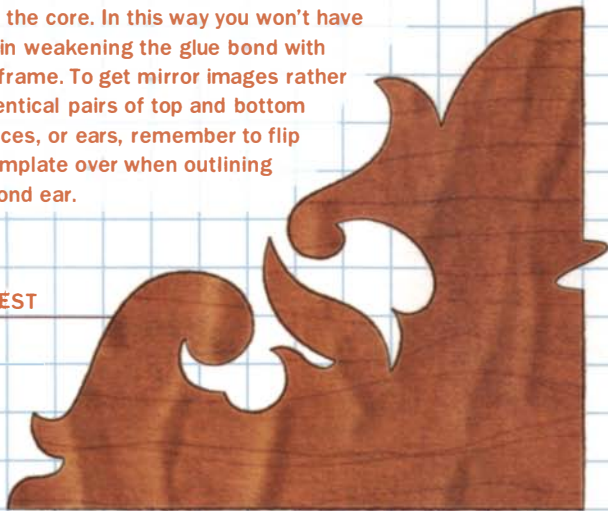
Dry-fit the molding. The secret to perfect miters is to dry-clamp each piece so that the subsequent section can be located accurately.

Attachments adorn the frame

LAYING OUT THE ATTACHMENT TEMPLATES

When using the four templates to lay out the attachments, keep the flat sides parallel to the grain of the core. In this way you won't have end grain weakening the glue bond with the subframe. To get mirror images rather than identical pairs of top and bottom side pieces, or ears, remember to flip each template over when outlining the second ear.

TOP CREST



TOP EAR

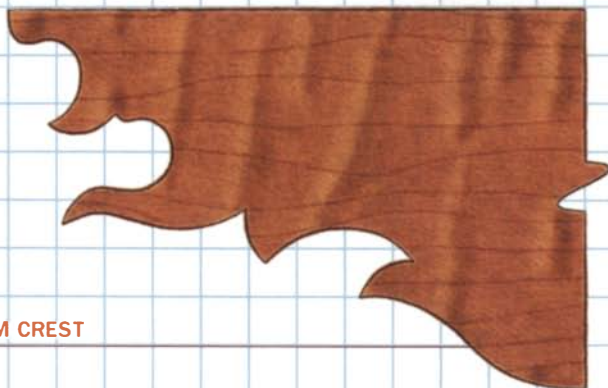


BOTTOM EAR



Enlarge the plans on a photocopier at 200% to obtain the full size.

BOTTOM CREST



the bottom piece, leaving the piece a hair long. Clamp the right-side piece back on and slide in the bottom molding. Because the proper angle of cut already has been established, it should need only a slight cut to bring it to final length.

Dry-fit all of the pieces onto the frame using lots of spring clamps. To prevent sliding, glue the top and bottom sections first, angling the spring clamps so that they push the miter joints tight. Once these pieces have tacked, glue the sides, again using the clamps for directional pressure. Before the glue has set, check the inside edge for squeeze-out that might interfere with the mirror.

Make the core, and then apply the veneer

With the double frame complete, work on the veneered attachments: the top and bottom crests and four side pieces, or ears.

The core will be visible, so make it from solid wood. Do not use plywood or medium-density fiberboard (MDF). Like the subframe,

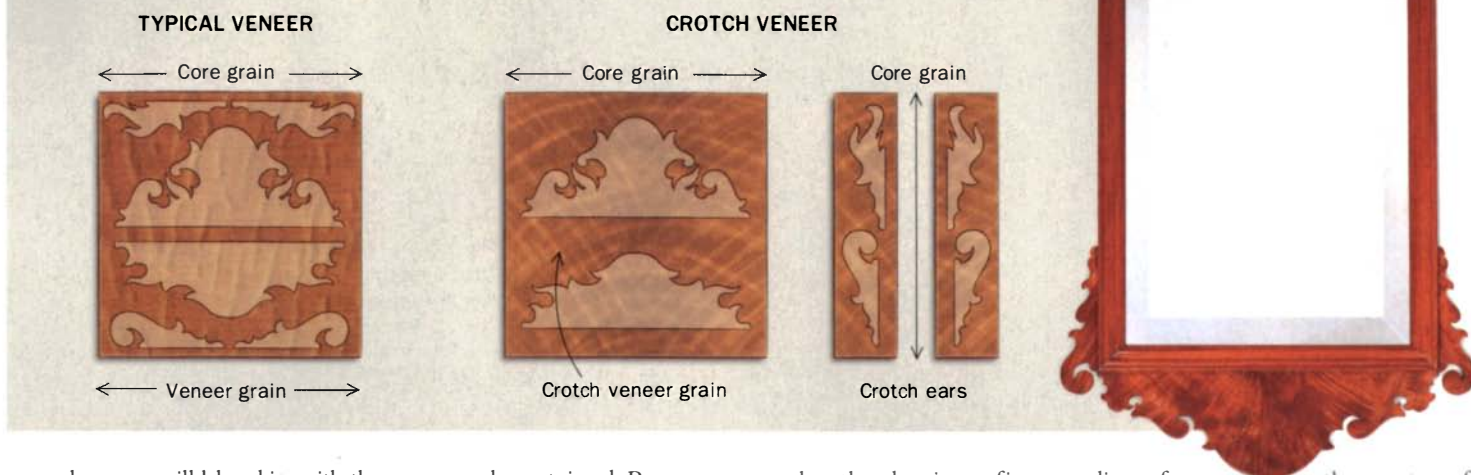
1. GLUE THE VENEER TO A CORE

Use a short-nap paint roller to apply a thin but even coat of yellow glue to both the veneer and the poplar core (right). When clamping the veneer in the press (below), apply pressure to the center cauls first. This helps prevent air from getting trapped under the veneer.



Orienting the patterns

With most veneer, orient the grain parallel to that of the core. With crotch veneer, to make the veneer appear to radiate out from the mirror (right), the veneer's grain is laid perpendicular to the core's grain and the templates are laid out differently. To prevent the core from cupping, you also should use crotch veneer for the back side.



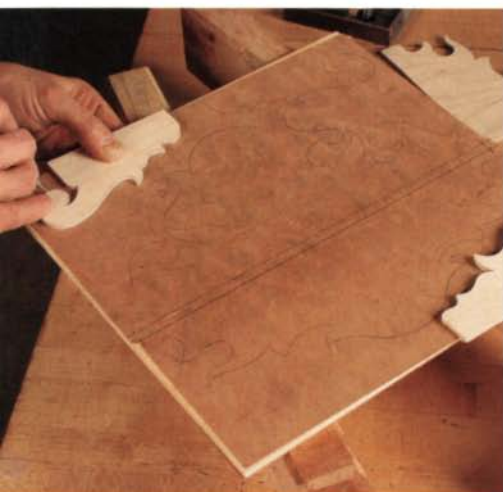
a poplar core will blend in with the veneer when stained. Because the core is 12½ in. sq. but only ¼ in. thick, I make it from a series of 2½-in.-wide strips to reduce the risk of cupping. To avoid wasting stock, I resaw strips of 1-in.-thick poplar on the bandsaw or tablesaw. If your planer can handle 12½ in., glue up the entire core, paying attention to grain orientation to reduce the likelihood of cupping and tearout during final thicknessing.

Although the backs of the attachments will not be visible, I veneer both sides of the core to reduce the potential for warping. The grain of both veneers should run parallel to the poplar core

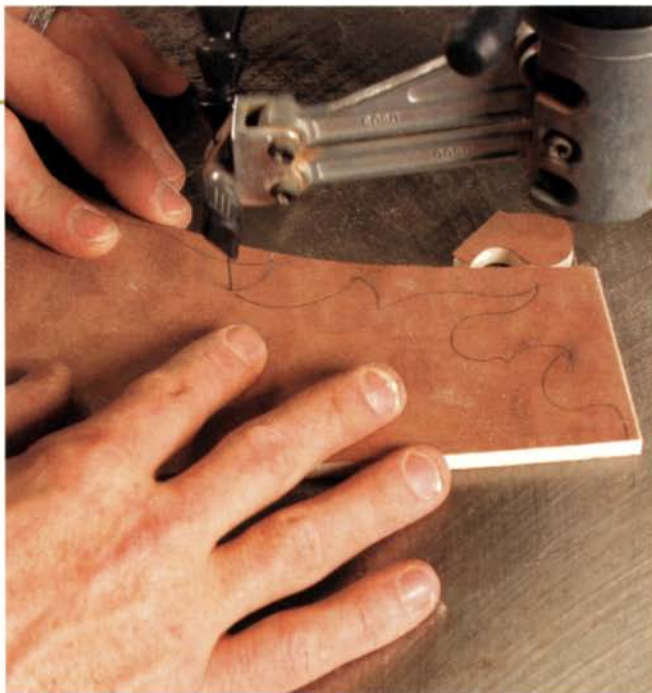
so that the dominant figure radiates from the center of the mirror. Make sure the figured face veneer is the same thickness as the plain veneer on the back. Take time to study the veneers and select the smoother side as the outside face. If the veneers must be seamed, locate the joint at the separation between the top and bottom crests. Seam the two parts with 2-in. clear packing tape; it allows you to see the actual joint and, with white or yellow glue, peels off if removed within an hour.

The easiest veneering method is to use a vacuum bag, but you can make a veneer press for a project this size. It consists of top

2. CUT THE ATTACHMENTS WITH A SCROLLSAW



Lay out the attachments. Spray-mount the patterns to ¼-in.-thick Masonite or plywood and cut out the templates with a scrollsaw. Use these templates to lay out the designs on the veneered panel. Scissors and cardboard work well, too.

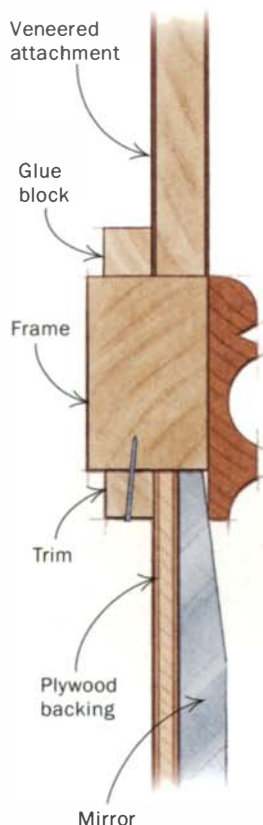


Saw the attachments. When coming to a sharp internal corner, don't try to revolve the piece around the blade. Instead, back out and saw in on the adjacent line.



File the edges. Use a fine file to remove sawmarks, but angle it slightly to avoid breaking the back edge.

Rubber bands clamp the pieces to the frame



A good contact surface. Joint and square the straight edges of the attachments with a block plane so that they will have good glue contact with the frame.



Fit to length. After the top and bottom crests have been cut out, hold them against the frame and mark any overhang for removal.



Glue on the first attachments. Apply a thin film of glue to the straight side of the top crest, place it on the poplar subframe, and begin clamping with rubber bands. Use two rubber bands knotted together to stretch around the frame, securing the ends over projections on the crests. Because the attachments do not touch each other, if you work carefully it is possible to apply all six at one time.

and bottom plates that are about 13½ in. sq., made from two or three layers of ¾-in.-thick MDF glued or screwed together. The thickness adds stiffness and gives a better transfer of clamp pressure. Cover the inside surfaces with plastic laminate or strips of clear tape to prevent squeeze-out from binding the veneers to the press. I also make three sets of cauls out of 8/4 pine that are about 3 in. wide by 18 in. long, crowned in the center by about ⅛ in.

Use a narrow short-nap paint roller to apply a film of glue on both the core and veneers. Always roll veneer with the grain or the veneer will curl on the roller and break. Apply a strip of clear tape that ties the front and back veneers together along the side to reduce slippage during the pressing. Place the stack between the MDF slabs, apply the cauls top and bottom, and clamp the center pair of cauls first. Slowly tighten only until the bow in the cauls is flattened out. Do this in a controlled manner, directing the squeeze-out to the outside edge. Overtightening or clamping too quickly can create glue pockets under the veneer that will be a problem down the road. After about half an hour, open the press and carefully remove any tape used to seam a joint. Clamp the press back up and let the assembly dry overnight.

Remove the veneered core from the press. Scrape away squeeze-out (any shiny spots of adhesive on the core will scrape right out) and sand the core to P220-grit. Wipe the grain with a moist cloth

and double-check for glue; it will be tough to remove after the parts have been sawn. Even when fully cured, keep the uncut blank covered and under weight to reduce the chance of cupping.

Cut the ornamental attachments with a scrollsaw

Orient the patterns as shown in the drawing on p. 63, leaving about ½ in. between the top and bottom crests. Make sure that the straight edges of all four ears are parallel with the grain of the core. This prevents cupping and gives a good surface to be glued to the frame.

My students typically come in with poor hand-eye coordination, and there's nothing like a scrollsaw for bringing it up to par. Before scrolling your pieces, practice, practice, practice. The more you practice, the less cleanup you'll need. Although a bow-saw with a narrow blade or a fretsaw would work, an electric scrollsaw with a #4 double-tooth blade is best. Don't worry about

Fine
WoodWorking.com

Visit our Web site for full-size,
downloadable plans of this mirror.



Add glue blocks. Apply small sections of wood to the back of the frame to reinforce the veneered attachments.



Install the mirror. After finishing the frame, place four dabs of clear silicone caulking on the inside of the frame and then lower in the mirror. Use tacks or a pin nailer to attach mitered trim to hold the mirror and plywood backing in place.

getting a straight cut along the edges that mount to the mirror frame as you'll clean these up with a block plane. With the parts cut out and any rough areas filed, break all of the edges with sandpaper. Mark and trim the top and bottom crest pieces to length.

To join the pieces to the frame, put a thin bead of glue on the edge of each attachment (not on the frame) and apply it by pressing the face edge down and then rolling it back until it is perpendicular to the poplar frame. This moves the squeeze-out to the back edge where it can be removed easily with a chisel. Clamp the pieces to the frame with rubber

Sources of Supply

VENEER AND SHELLAC
www.rockler.com
800-279-4441

SCROLLSAW BLADES
www.wildwooddesigns.com
800-470-9090

**MOHAWK'S
ULTRA PENETRATING
BURNT UMBER DYE**
www.ofscorp.com
800-381-3126

bands. Check the mirror from the side and make sure the pieces aren't leaning, tweaking the front and rear pressure of the rubber bands if necessary. When dry, reinforce the joints with glue blocks applied using a simple rub joint.

After final sanding and cleanup, finish the frame by wiping or spraying on a non-grain-raising burnt umber dye to harmonize the woods, and then brushing on garnet shellac to give the piece an antique appearance. Install the mirror using a few small dabs of silicone along the inside lip of the frame. The mirror is backed by a piece of 1/8-in.-thick birch plywood fastened in place with 1/4-in.-sq. poplar strips mitered and tacked in place. Be sure to cut the bottom strip in two so that you can lever away the strips in case the glass needs replacing down the road. □

Steve Latta is an instructor at Thaddeus Stevens College in Lancaster, Pa., and a regular contributor.



Choosing and Using Spokeshaves

For shaping and smoothing curved parts, nothing beats this time-honored tool

BY CHRIS GOCHNOUR

I recently completed a writing desk that had curves and contours nearly everywhere—in the legs, the aprons, the drawer fronts, and even the top. All of those curves meant that my trusted handplane had to stay on the shelf for extended periods. The handplane, after all, is designed to make things straight and flat—hardly what you want when working with curves. For this project, I reached instead for the handplane's versatile cousin, the spokeshave.

Spokeshaves are simple tools, consisting of a wooden and/or metal body with handles, a blade, and a narrow sole. The tool often is associated with chair makers who use it with a drawknife for shaping spindles, legs, and rungs. But with a spokeshave, you

can perfect and smooth any number of curved furniture parts, from complex cabriole legs to simple arched table aprons.

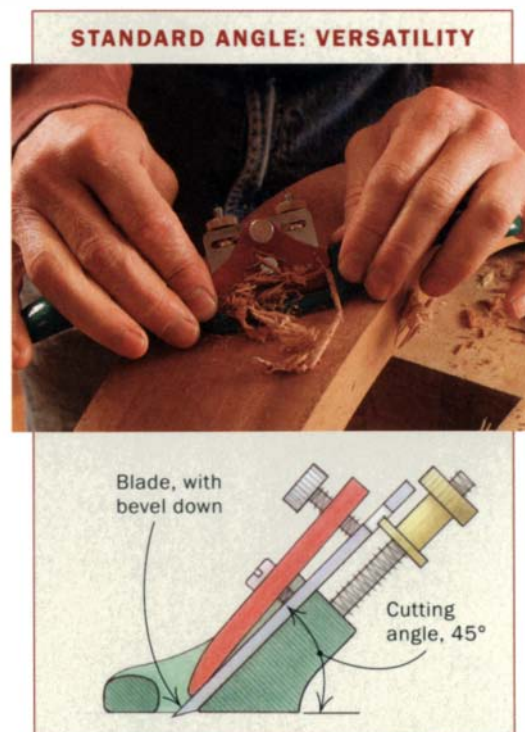
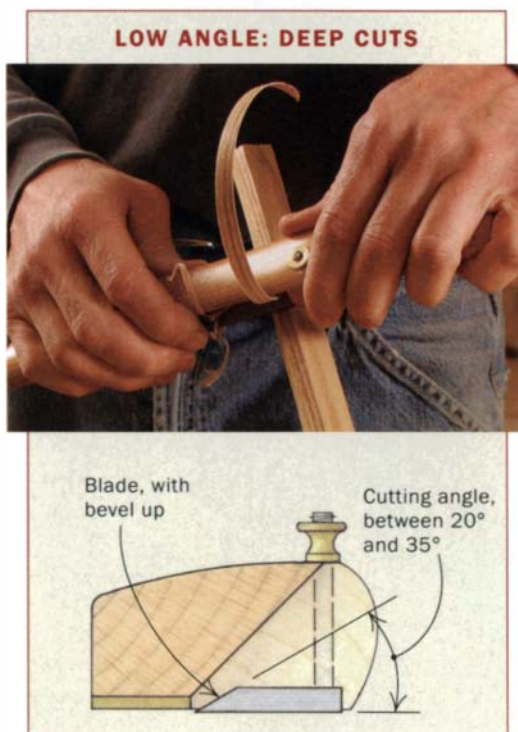
There are many diverse styles and models of spokeshaves. For this review, I looked at 11 shaves with flat soles and straight blades. This style shave is a good, all-around performer, capable of handling most shaving tasks well. Within this group, the shaves are classified as low angle or standard angle, depending on how the blade is bedded. Both low- and standard-angle shaves have their places. The secret lies in knowing which type of shave is best suited to the work that you do.

Chris Gochmour is a frequent contributor.

Low-angle vs. standard-angle shaves

Although some woodworkers classify spokeshaves based on the material from which they are made (wood vs. metal), the real difference among these tools is how the blade is oriented in the body (bevel up or bevel down) and thus the cutting angle created by that orientation.

Spokeshaves that have blades bedded bevel up have low cutting angles, from 20° to 35° depending on the bevel angle. The lower cutting angle makes it easy to take heavy cuts. Spokeshaves with blades bedded bevel down, which I call standard-angle shaves, have a steeper cutting angle of around 45°. The steep cutting angle deftly handles tricky grain.



Low-angle spokeshaves can take heavy cuts

Low-angle spokeshaves have a number of advantages. The shaves seldom jam because they have no lever cap or chipbreaker, which gives shavings an unobstructed path to pass through. This design allows the shaves to handle heavy shavings and thin, wispy ones equally well.

Unlike older versions of low-angle shaves, which had blades with tangs on the ends that were pressed into the shave's body, modern shaves rely on threaded posts and thumbscrews to hold the blade rock solid. The design allows for easy blade removal and a fit that doesn't loosen over time. Many of these shaves employ setscrews to regulate blade depth, making it easy to reset things after sharpening.

Low-angle shaves slice effortlessly through straight-grained wood, which is why chair makers often favor them for whittling and shaping rived, green wood into arms, legs, rungs, and spindles. Low-angle shaves work great on end grain, too, because their low cutting angle slices cleanly across the fibers.

On the downside, the small sole (only in front of the blade) and low cutting angle make this category of shaves less predictable and harder to control when smoothing curves along a board's length, as in cabriole legs, arched aprons, and curved slats. Also, when a low-angle shave encounters areas of figured or reversing grain, it is prone to lifting and tearing out the wood.



DAVE'S SHAVES NO. 1 TRADITION

Source: www.ncworkshops.com

Price: \$89

Body: Cherry, 12 in. long

Blade: High-carbon steel, 2¾ in. wide

Comments: Dave's No. 1 Standard Tradition is a simple tool that simply works well. The shave came sharp and tuned just right. It worked well for cutting thick, aggressive shavings, such as those required for spindle work, but it also made fine finishing cuts with no problem. Even on end grain, it left a clean, almost polished, surface. The only negative about this shave is that to set the blade depth, you have to remove the blade to adjust the screw jacks (left photo, below), an inconvenient process.

HARRIS TOOLS

Source: www.traditionalwoodworker.com

Price: \$80

Body: Tropical hardwood, 11 in. long

Blade: Carbon steel,
2½ in. wide



Comments: The Harris Tools low-angle spokeshave is a high-quality shave that is easy to set up and use. The rock-solid, ⅜-in.-thick blade is nearly one-third thicker than that of any other shave reviewed. The blade can be adjusted instantaneously with no backlash via a pair of spring-tensioned thumbscrews (right photo, below). This blade-adjustment system is the most convenient of the low-angle shaves I tested. Unfortunately, the blade on this shave wasn't machined flat, and its bevel required a good honing. Once properly sharpened, though, the Harris shave performed well.



Two ways to adjust the blade. On some low-angle shaves, you have to remove the blade to change the depth of cut (far left). Other models (left) allow you to adjust the blade depth without removing the blade, a more convenient system.

KANSAS CITY WINDSOR STANDARD

Source: www.toolsforworkingwood.com

Price: \$100

Body: Western big leaf maple, 13½ in. long

Blade: A2 steel, 2¾ in. wide

Comments: The Kansas City shave is a lightweight, graceful tool that was razor sharp and fully tuned out of the box. The blade is hollow ground on both its bevel and underside—a unique design that made honing a breeze. On the downside, the thin handles are a bit difficult to grasp, particularly if you have large hands. Also, to reset the depth of cut, you need to adjust screw jacks between the blade and body, an inconvenient task. On top of that, the opening between the blade and wear plate is so small that thicker shavings had a tendency to jam in the throat.

VERITAS LOW-ANGLE SPOKESHAVE

Source: www.leevalley.com

Price: \$52.50

Body: Cast aluminum, 10½ in. long

Blade: A2 steel, 2 in. wide

Comments: The Veritas is a lightweight shave similar in concept to vintage Stanley Razor Edge shaves. The blade is easy to adjust for light or coarse shavings, and it has no posts, so it's a breeze to sharpen. On most low-angle shaves, the blade sits in a fixed position. As a result, the mouth tends to widen gradually as the blade is sharpened. The Veritas shave, however, allows you to adjust the blade forward as it shrinks from wear. The sole is reversible—flat on one side and round on the other—which allows the shave to work either gradual or tight curves. Overall, the Veritas shave is a versatile, well-thought-out tool at a reasonable price, which is why it is my choice for best value among the low-angle shaves.



Sole reversal. Both the Veritas and Woodjoy low-angle shaves have a reversible sole: flat on one side, round on the other. The round edge is useful for shaving along tight curves.

WOODJOY MASTER SPOKESHAVE

Source: www.woodjoytools.com

Price: \$100

Body: Cocobolo, 12½ in. long

Blade: A2 steel, 3 in. wide

Comments: Woodjoy's Master Spokeshave was ready to go right out of the box. The blade is mounted to the body with two screws, so there are no posts or tangs to get in the way when you sharpen it. Also, blade depth is adjusted easily via a couple of screw jacks that are accessible from the top of the shave. The Woodjoy has an innovative reversible brass sole that adds versatility to the tool. One side is flat; the other is rounded, which is useful for getting into concave areas. The Woodjoy is a great all-around shave that can handle tight curves and end grain, as well as chair spindles and rungs. It's my pick for best overall of the low-angle shaves.



Spokeshaves can be pushed or pulled

Both low-angle and standard-angle spokeshaves are finesse tools, and with a little practice, they are a pleasure to use.

They're equally suited to being pushed or pulled with the grain in either a straight or skewed position. When pushing the shave (top photo, below), place your thumbs on the back, just behind the blade, your index fingers on the top front edge, and your other fingers on the handles. Use



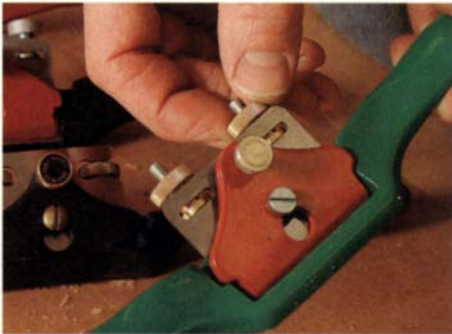
When pushing or pulling the shave, work with the grain. On a concave surface, that means starting at the ends and working downhill toward the middle. On a convex surface, work from the middle toward the ends.

your index fingers to push down the front of the shave and your thumbs to power the shave through the cut. When pulling the shave (bottom photo, above), move your index fingers to the back to power the shave and exert pressure on the front with your thumbs to keep the shave steady in the cut.

Standard-angle spokeshaves handle tricky grain

The design of a standard-angle spokeshave is akin to that of a bench plane. It has a sole that surrounds the blade, making the tool easier to control, and it typically is equipped with a lever cap that acts as a chipbreaker. As a shaving enters the throat, it is broken abruptly by the steeply pitched blade and lever cap, weakening its ability to tear the grain. Many standard-angle shaves also make setting the blade easy and ensure that, once set, it will stay set. Like their low-angle counterparts, they can be pushed or pulled. In general, this good all-around performer is the shave to pick if you can afford only one.

The steeper 40° to 55° cutting angle helps these tools handle tricky grain well, leaving the wood with a clean, smooth surface, even when shaping figured or reversing grain. The downside is that the tool requires more force in use, and, if not sharpened and well tuned, is liable to skip and chatter.



Tap or twist. All of the standard-angle shaves Gochmour tested allow for easy blade adjustments via thumbscrews on the lever cap (above) or with the tap of a hammer (below).



ANANT A151

Source: www.woodworkersshop.com

Price: \$17

Body: Cast iron, 10 in. long

Blade: High-carbon steel, 2 in. wide

Comments: The A151 is a copy of Stanley's original 151 and is the least expensive shave I tested. As you might expect, it had some rough edges. On the model I tried, the thumbscrew blade adjusters were rough and didn't rotate smoothly, and the body casting had deep recesses where the thumbs rest, which made it uncomfortable to hold for extended periods. In spite of shortcomings, the Anant has the basic ingredients of an effective shave. It would make a good general-purpose shave for someone with a limited budget and the willingness to spend some time tuning it up.

HNT GORDON SPOKESHAVE

Source: www.hntgordon.com.au

Price: \$130

Body: Macassar ebony, 11 in. long

Blade: High-carbon steel, 2 in. wide



Comments: The Gordon spokeshave is a well-made tool, similar in form to a traditional Japanese spokeshave.

A wedge holds the blade in place, and quick, precise adjustments can be made using a hammer. The Gordon is a smooth, solid performer. The steep cutting angle (55°) keeps tearout to a minimum, even on figured and reversing grain. However, the shave seemed too large, and its flat edges made it difficult to grasp. Its wide brass sole (1 7/8 in.) makes the tool suitable for flat, convex, and slightly concave surfaces, but it can't handle tight curves. I'm accustomed to working tighter curves, even with a flat-soled shave.



KUNZ 51A

Source: www.traditionalwoodworker.com

Price: \$20

Body: Cast iron, 10 in. long

Blade: High-carbon steel, 2 in. wide

Comments: Of the three Stanley 151-style shaves I reviewed, the Kunz had the cleanest machining, with smooth-working blade-adjustment knobs. However, the lever cap didn't seat on the blade right and was prone to jamming, and the bed and sole had some rough edges. So I spent 30 minutes tuning the shave, and it was time well spent. After that, the Kunz worked extremely well. The shave is available with an aftermarket, high-speed-steel blade (\$28). The Kunz is my choice as the best value of the standard-angle shaves.



LIE-NIELSEN BOGGS SPOKESHAVE

Source: www.lie-nielsen.com

Price: \$125

Body: Bronze, hickory handles, 10 in. long

Blade: A2 steel, 2 in. wide

Comments: The Lie-Nielsen is a top-notch shave designed by renowned chair maker Brian Boggs. The bed and sole of the tool were milled precisely, and with a bed angle of 40° (the lowest of the standard-angle shaves), the tool requires less energy to use and makes end-grain work easier. Blade-depth adjustments are easy to make by tapping the blade with a hammer. The mouth is quite narrow, which limits the shave to moderate to light cuts, but the tool renders an exceptional, tear-free finish, with no chatter. Overall, the Lie-Nielsen shave has a distinctly sure and solid feel.

STANLEY NO. 151

Source: www.woodcraft.com

Price: \$25

Body: Cast iron, 10 in. long

Blade: High-carbon steel,
2 in. wide



Comments: The Stanley 151 is a design that has been around for nearly 100 years. In general, the tool worked well in a variety of situations (on both concave and convex surfaces, end grain, and spindle work), and its low price makes it very appealing. The blade is easy to adjust and remove for sharpening, and a lever cap keeps it steady in use. On the downside, the castings and machining were a bit rough on the tool I tested, and the tool was susceptible to a high-pitched chatter, even after sharpening the blade. I was able to reduce the chatter by giving the shave a complete tune-up.



VERITAS FLAT SPOKESHAVE

Source: www.leevalley.com

Price: \$75

Body: Ductile iron, African rosewood handles, 10½ in. long

Blade: A2 steel, 2 in. wide

Comments: With its flat spokeshave, Veritas has taken the standard-angle shave to a new level of performance. The tool came sharp and ready to go right out of the box. Blade adjustments were smooth and precise with minimal backlash, and both the lever cap and bed were well-machined and needed no further refinement. This shave is equally at home in soft or densely figured hardwood, and it comes with two shims that can narrow the mouth opening to help reduce tearout in figured woods. For those looking for a high-quality shave, the Veritas will fill the bill. It's my choice as best overall of the standard-angle shaves.

Skew the spokeshave to reduce chatter



Smooth cuts in rough areas. Skewing the shave on end grain and tricky or reversing grain helps reduce the effective cutting angle of the tool, allowing for smooth cuts without chatter.

A frequent problem with spokeshaves is their propensity to chatter. But the problem can be overcome by taking light cuts, holding the shave properly, and working with the grain (see photos, p. 69). Another way to overcome chatter is to skew the shave, which lowers the blade's effective cutting angle, reduces resistance, and makes the shave cut with greater ease, particularly on end grain. When smoothing gentle curves, skewing the shave in effect lengthens the sole, giving it a broader footing and helping to stabilize the tool. On tighter curves, skewing the shave has the effect of raising the blade to give a lighter, polishing cut in the final passes.

Square Peg in a Round Hole



A streamlined approach to making decorative plugs by the dozens

BY ROGER HEITZMAN



The last time I chopped square holes for decorative pegs, I finished the task with a sigh of resignation and a silent lament: “There must be an easier way.” That was years ago, and after I again went and designed almost 50 such pegs into several Arts-and-Crafts-style pieces for a client, my first thought was, “OK, wise guy, now what?” My second thought was to use this opportunity to find that easier way to make and install this attractive detail.

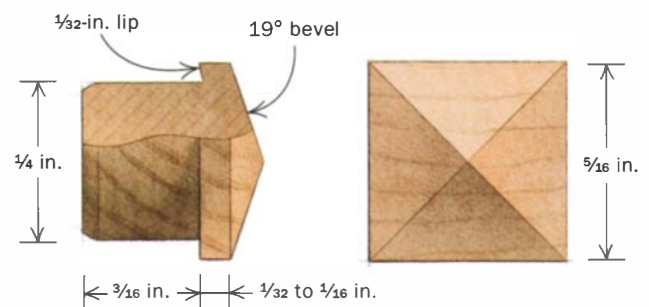
There are three steps in the traditional method of making decorative pegs: Bore the holes and make them square, fabricate the pegs, and dress the exposed ends. I wanted to streamline all three operations.

The first step was to eliminate the repetitive chore of striking a round hole square. That meant I had to find a way to create a round stem on a square body. The plug cutter came immediately to mind. My plug cutters all had sharp-angled shoulders, unsuitable for this use, so I took a $\frac{1}{4}$ -in. plug cutter to my grinder to reduce the shoulder bevel to a more practical, almost square, angle.

Armed with a suitable cutting tool, I was left to decide whether to cut the stem on pre-squared stock or to cut the squares after drilling the stems. A few trials left little doubt that the required precision and speed would come only from cutting the squares after drilling the stems.

Using my drill press, tablesaw, and bandsaw, I was able to produce and install the pegs in a fraction of the time it took to make them the old way, and with more consistent results.

Roger Heitzman is a woodworker near Santa Cruz, Calif.



1. Make the pegs



1 **Modify a plug cutter.** Chucked in a variable-speed drill, the cutter is slowly rotated into a spinning grinding wheel. Dip the cutter frequently in water. When done, grind a slight back bevel on the tip of each tooth.



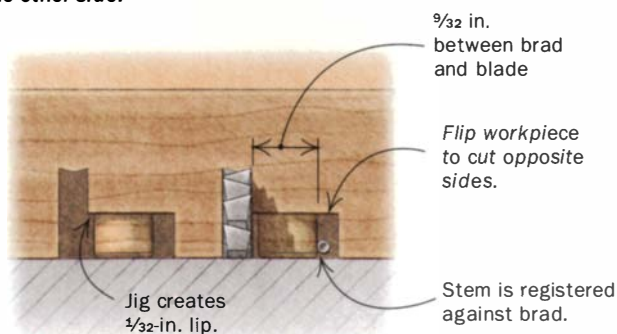
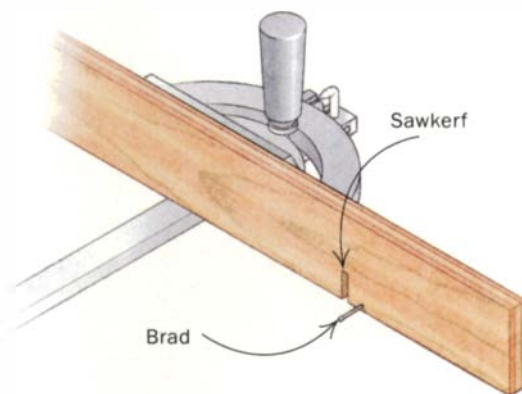
2 **Drill the stems with the modified cutter.** The distances between the stems are not important, but use the depth stop on the drill press to keep the lengths of the stems consistent and clamp a fence to the drill-press table to keep the rows straight.



3 **Rip strips to form the pegs.** Keep the stems centered on the pegs as you create the desired peg width (in this case, a $\frac{5}{16}$ -in. square needed a cut $\frac{1}{32}$ in. to either side of the $\frac{1}{4}$ -in.-dia. stem).



4 **Crosscut the pegs.** A shopmade indexing jig allows you to register one side of each stem against a brad so that the saw cuts the side of the cap exactly $\frac{1}{32}$ in. away from the stem. After completing all of the cuts on one side of the stems, turn the piece around and cut the other side.

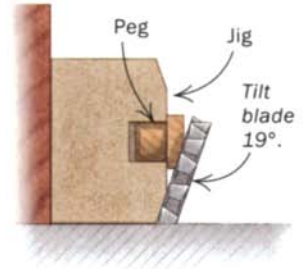


5 **Cut off the pegs.** Set the bandsaw fence and saw the pegs off the stock to their overall height.

2. Bevel the tops



1
Insert the pegs in a jig. Drill $\frac{1}{4}$ -in. holes through a piece of medium-density fiberboard (MDF) and insert the pegs. Make sure the sides are aligned and the grain is parallel to the long axis of the jig.



Bevel two sides. With the tablesaw blade tilted to 19° and the fence carefully set, bevel the first face of the pegs. Then flip the jig body and bevel the opposite face.



3
Turn the pegs. Using pliers, carefully turn each peg 90° in its hole (above) and bevel the two remaining faces (right).



3. Apply the finish

Expose the sides of the pegs. To apply dye to the whole cap of each peg, use a thin rod or nail punch to press each peg almost halfway out of the jig. Use a permanent marker to dye the caps of the pegs, unless you intend to use shellac as a topcoat. In that case, use a water-based dye.



Remove the pegs. Use a rod or nail punch, clamped in a vise, to press each peg out of the jig.

Finishing Boxes Inside and Out

Easy ways to protect the wood
and line the interior

A box is a deceptively complex piece of woodworking. Small components must fit precisely. Surfaces inside and out must be as close to flawless as possible in order to withstand close scrutiny. There are lots of nooks and crannies where finish can pool. Also, one small box may be made from several woods chosen for their contrasting grain, color, or figure. So the choice of finish becomes critical.

Like many other woodworkers, boxmakers Doug Stowe and Dave Shaw experimented with different finishes until they settled on the one that works best for them. Stowe uses Danish oil. Shaw finishes his boxes mainly with hand-rubbed shellac.

The right finish for a box doesn't always have to come from a can.

A luxurious lining of suede cloth or velvet imparts its own special look and feel. Woodworker Emily Palm uses those fabrics in conjunction with wooden dividers to line her oiled hardwood boxes.

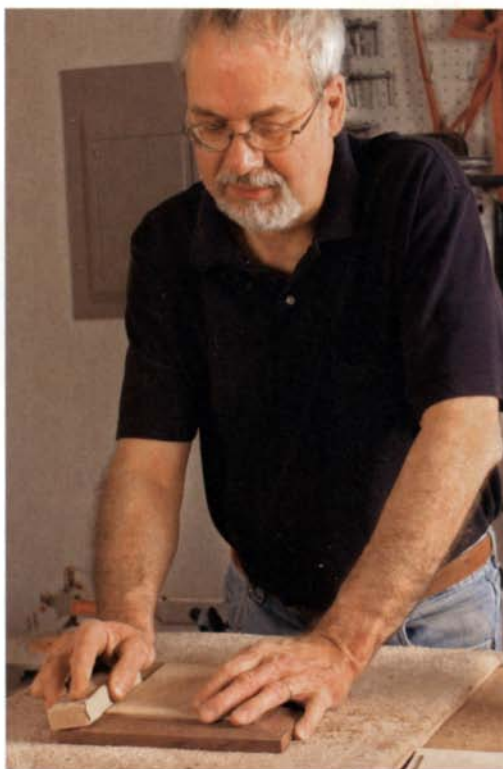




Danish oil: durable wipe-on finish

BY DOUG STOWE

A good combination. This type of finish combines oil and urethane, which is harder than oil alone.



Finish in stages. With larger boxes, sand individual components and apply oil before final assembly.

I finished my first boxes with Deft brush-on lacquer, but because I worked and finished in the same space, the fumes were horrid and dust settled on the surface. I started using Watco Danish Oil, but it never really looked like the wood had a finish. I tried Minwax Antique Oil, but I wasn't happy with the smell.

When I discovered Deft Danish Oil, my problems were solved. Now I finish in the same room that I use to cut wood, and the odor is tolerable. The oil heightens the contrast between the local woods I use, making the inlay patterns more distinctive.

When designing a box, think about how and when you'll finish it. In

my experience, larger boxes or complex designs of any size should be broken down into their essential components and finished before assembly. But with small, simple boxes, you can apply the oil after finish-sanding and assembly.

I sand on a 6x48 belt sander up to P180-grit, paying close attention to avoid putting too much pressure in one spot. I finish sanding by hand or with an orbital pad sander to P320-grit.

Then I apply a heavy coat of Danish oil. It often helps to rag on a second coat of oil on the outside. Most of the boxes I make are small enough to hold in my hand while being oiled. With a larger box, I oil the insides and sides, then flip it over onto sticks to oil the bottom.

About an hour later, I'll begin wiping the box to remove and redistribute excess oil. Using a rag slightly damp with oil helps to work the finish into the wood. If the boxes still seem wet, I'll go through them all again, paying extra attention to places where excess oil might collect, such as the areas around joints or floating panels.

I put small boxes or components on sticks and let them dry overnight. Next day, I repeat the oiling and wiping. I've found that it pays to be conservative on the second oiling. I generally put a third coat on the outside of most boxes. You can build the finish to a sheen or use 0000 steel wool to dull the gloss.

Doug Stowe, author of Taunton's Complete Illustrated Guide to Box Making (The Taunton Press, 2005), works in Eureka Springs, Ark.



Flow it on and wipe it off. Apply liberal amounts of oil with a rag (above) or brush. After an hour, wipe off the excess oil (right). Repeat the oiling once for the interior, twice for the exterior.



Shellac offers a few options

BY DAVE SHAW



Some years ago I used nitrocellulose lacquer on my boxes, but I could only spray that stuff outside. Worse, bugs would land in it, leaving interesting trails across the surface. I still use lacquer occasionally, but I've switched mainly to dewaxed shellac, whether

I want something nearly invisible or a high-gloss French polish.

Begin by mixing fresh shellac to a 2-lb. cut. While the flakes dissolve, take the time to make the pieces of the box as flawless as possible. Steam out any dents. Scrape and sand the outside to CAMI 220-grit to remove all remaining blemishes. Also sand the pieces for interior dividers or trays to 220-grit.

When I'm ready to finish, I dilute the shellac to about a ½-lb. cut. Exact proportions aren't critical, for this is a very forgiving finish.

I get better, more uniform results if I apply the shellac before I glue up the box. Blue painter's tape keeps shellac out of areas to be glued. Use a pad to put a few thin layers of shellac on each piece. (Use a lint-free rag or paper towel to apply shellac to small pieces or to work it into grooves.) If I'm coloring the wood, I'll stop here to apply a dye. The shellac controls blotching. If not, the shellac dries in minutes, so you can pad on more coats almost immediately until you have the sheen you want. Stop when the wood begins to look shiny or when it stops changing color. Let the shellac dry and then finish-sand with CAMI 600-grit paper or, better, a gray abrasive pad.

For a very hard, clear finish, use shellac as a thin seal coat under spray lacquer. I've had good results with water-based lacquer and aerosols such as Behlen's Master Jet Spray Lacquer. Let the lacquered pieces cure for a week, then begin rubbing out the finish. If the sandpaper clogs too much, let the finish cure for another week.

My boxes always get a coat or two of Clapham's lavender-scented beeswax polish at the end. It gives the wood a wonderful sheen and makes the shop smell good.

Dave Shaw makes boxes, bowls, and furniture in Tucson, Ariz.



Dilute the shellac. Mix dewaxed pale blond shellac to a 2-lb. cut, then add more alcohol until the liquid is a pale yellow (left). Make a pad by wrapping lint-free cotton padding in muslin (above) and apply the shellac.



Finish before assembly. The first pass of shellac (above) will begin to pop the wood grain. Keep rubbing on finish until it has the depth and sheen you like. Dowels, later used in joinery, make convenient holders (left). Before assembling the box, go over each piece lightly with a gray abrasive pad.

Padded lining adds a final touch

BY EMILY PALM



Lining a box with fabric not only protects the items inside, but also greatly enhances the overall look of the piece. In my boxes, I line the bottom and removable trays with thin foam pieces wrapped in velvet, synthetic suede, or other luxurious fabrics. I also fit fabric around thicker foam to create holders for rings and other small pieces of jewelry (see facing page).

Choose the fabric with the same care you used to select the wood for the box. Because the color of wood can vary dramatically from board to board, what looked good next to, say, cocobolo last time might clash with it now. Keep in mind, too, that real suede will tarnish silver; synthetics make better lining fabrics.

I like to use Darice Foamies 2 mm foam sheets, available at craft and fabric stores. These sheets have one paper-backed adhesive side. You could use cardboard, but flexible foam is better. It makes the lining feel upholstered because it gives when you touch it.

Mark the foam sheets with the dimensions of the box or tray. Whenever possible, take measurements directly from the dividers fitted inside the box, rather than trying to measure interior dimensions of the box itself. Be sure to allow for the thickness of the fabric—as much as $\frac{1}{16}$ in. per side for thicker velvets, as little as $\frac{1}{64}$ in. per side for suede cloth.

Rich, protective lining.
Synthetic suede cloth feels like the real thing but won't tarnish silver.



Cut the padding to size and glue on the fabric. Fit the foam to the box and trays, leaving a slight gap to accommodate the fabric (above). Spray a light coat of adhesive on the back side of the fabric and on the side of the foam sheet that is not preglued (right). Palm puts paper towels and cardboard under the foam and fabric to catch overspray.



Trim and fold. Attach the fabric to the foam sheet, then miter the corners (top). Remove backing from the preglued side of the foam sheet, then carefully fold over the excess fabric (above).

Use a straightedge and a craft knife to cut the foam sheets to size, then test to be sure they fit snugly. Once you've glued on the fabric, it's too late to make adjustments to the foam core.

Fabric can reflect light differently from different sides, especially if it has a nap, so orient all the foam sheets in the same direction on the cloth. Rough-cut the fabric to size, allowing about 1 in. extra all around to fold over the edges of the foam sheets; you don't have to be exact because the extra fabric doesn't show.

Iron the fabric good side down, using steam and a low or medium heat setting. Then spray adhesive to the back side of the fabric and to the plain side of the foam sheet (not the paper-backed adhesive side). I use Duro All-Purpose Spray Adhesive. Like similar products, it carries a list of safety warnings; I try to do my spraying outside.

Keep the fabric good side down. Turn the foam sheet so that the side you've sprayed with adhesive faces down, and press it onto the fabric. Smooth it with your fingers to be sure it adheres uniformly. Trim the fabric corners on a diagonal, staying about $\frac{1}{16}$ in. away from the foam at the corner; if you cut right up to it, the foam will peek through. Peel away the backing to expose the adhesive, then fold the fabric edges over. Press the fabric down and smooth out wrinkles.

Fit the finished liner inside the box. Run a table knife around the edges to tuck in and smooth the edges.

Emily Palm, the owner of Blue Heron Woodworks, makes boxes and hair accessories in Petoskey, Mich.



Refine the fit. As a final step, run an ordinary table knife around the lining to smooth the edges in place.

How to make ring holders



Just about any box becomes more useful if you add ring holders, which look like slotted pieces of soft foam. The slots are nothing more than fabric folded around pieces of thick foam.

I use high-density rolled foam, the same stuff used for sleeping-bag pads. It's available at craft and fabric stores, in $\frac{3}{8}$ -in. or $\frac{1}{2}$ -in. thicknesses, and cuts with scissors or a sharp craft knife.

Trim three or more pieces to fit snugly inside one compartment of the box; exact dimensions will depend on the size of the box. As with a liner for the bottom of a box, be sure to allow for the thickness of the fabric.

Cut a piece of fabric an inch or so wider than the foam pieces, and about twice as long as the compartment. Spray the wrong side of the fabric with adhesive, then accordion-fold the fabric between the foam pieces (see photo, above right).

Finally, carefully trim away most of the excess fabric, leaving only small flaps on the ends. Wrap those flaps over the sides and tuck them in place with the end of a blunt knife.

— E.P.



Shape the ring holders. Accordion-fold the fabric over small blocks of resilient foam.



Test and trim. Cut away most of the excess fabric and check the dividers' fit.



Fit and smooth. Fit the ring holder and divider into the box and smooth the fabric into place.



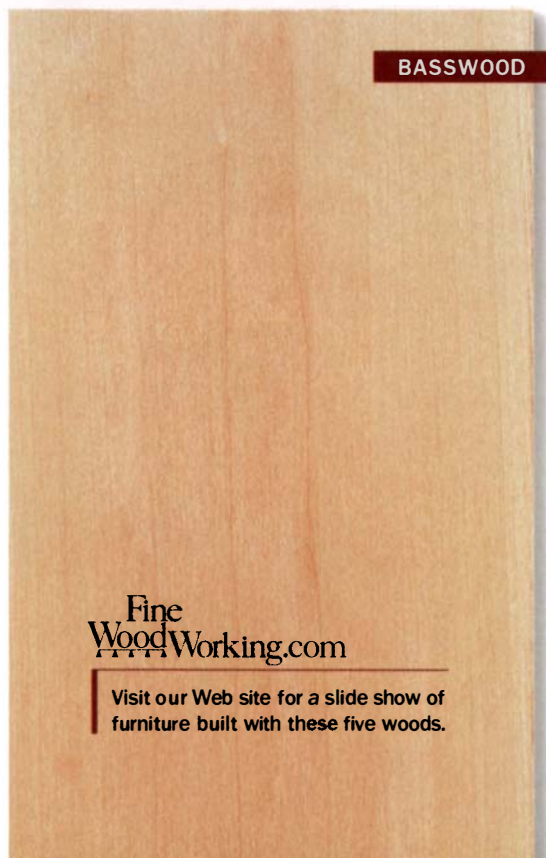
BUTTERNUT



BEECH



APPLE



BASSWOOD

Five Overlooked Woods

Discover these woods and make your projects stand out from the crowd

BY GARRETT HACK

Teaching a class recently, I was introducing basswood as one of the materials we would use when one of the students spoke up: "Isn't that just a carving wood?" That question made me realize that there are many native woods that essentially are ignored by today's furniture makers. In their desire to stick with familiar woods such as cherry, walnut, oak, and maple, they are missing a great many unusual trees.

Early settlers appreciated the unique qualities and usefulness of each tree in the forest—that it bent well, didn't rot, was particularly tough, or sawed clear, wide boards with beautiful color. Look closely at Shaker woodworking and you'll see how readily they used many of their local woods: On a single drawer the sides could be light and strong butternut, the bottom sweet basswood, and the knobs apple, polished to a gleam over time.

My five favorite overlooked woods will add color to your palette, and their unique personalities, figure, and workability can only enhance your experience and enjoyment of woodworking. If you can't find these woods at the local lumberyard, I've included an Internet site that lists suppliers.

Garrett Hack, a contributing editor, makes furniture on his Vermont farm overlooked by a diversity of trees.

Fine
WoodWorking.com

Visit our Web site for a slide show of furniture built with these five woods.

FLAME BIRCH

Revealing the figure is worth the effort

I always wondered why you see curly maple furniture, but rarely curly birch; here is a wood with the most dazzling figure that emanates from deep within the surface, with a warm, light-golden color and a very fine, smooth grain. I found out when I started working boards that flame (or curly) birch, for all its beauty, is also one of the most challenging woods to plane by hand.

Curly figure is as rare in the yellow birch tree as it is in hard maple—perhaps a tree or two in a hundred—and the intensity of curl is just as varied, ranging from a few lazy waves across a board to waves spaced inches apart that give the appearance of a quilt pattern.

I can only guess what makes flame birch so challenging to plane, for it sands, scrapes, and screws well. The curls that make it so irresistibly beautiful are broad areas of reversing grain, and being a little softer than maple, the fibers are more prone to tear from the surface rather than to cut cleanly. I thought that being highly figured, the wood would respond best to a high-angle cut, but tuning my planer for more of a scraping action still produced tearout. I was surprised to find that of my dozens of planes, only a low-angle smoother successfully handled the wood.

Flame birch will wear well, but it's only moderately stable. To be on the safe side I would not use curly birch for door panels, drop leaves, wide tabletops, or any part without good support to keep it flat.

The flame revealed. Its reversing grain makes flame birch difficult to work. Hack finds that a low-angle plane and a scraper work best.



A little Shaker, a lot of shimmer. The flame-birch carcass and top of this piece built by Hack dance in the light when viewed from different angles.

Common name
YELLOW BIRCH



Latin name *Betula alleghanensis*

Other names **Flame/curly birch**

Price per board foot \$5-6

Specific gravity 0.62

Percent shrinkage, green to kiln-dried

Tangential 9.2 Radial 7.2 T/R ratio 1.3

For more on wood shrinkage, visit www.fpl.fs.fed.us.



BUTTERNUT

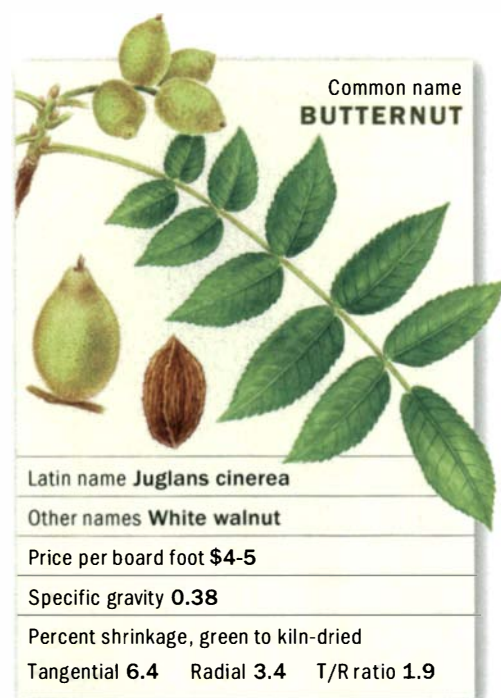
Walnut's country cousin

For many years I've valued butternut for its wide boards, handsome, even grain, and golden tan color with a background of fine darker flecks. Butternut is similar to black walnut and is sometimes even called white walnut. Just as black walnut has a distinct dark heart and light sapwood an inch or more in width (unless it is steamed to even out the color while being kiln-dried), butternut has a heart/sap contrast. This wood is considerably lighter in weight and softer than black walnut, but with the same modestly pronounced grain that hides gluelines so easily.

Butternut is very stable. I once had a set of boards that were 24 in. wide and perfectly clear, that shrunk little and stayed nearly dead flat. It was pure pleasure turning them into single-board chest sides and a few wide tabletops.

Typical defects are black knots and occasional voids, and a hollow black pith that can weave through a board. Butternut is quite weak—only slightly harder than white pine—making it unsuitable for chairs or parts that must withstand much wear. Its softness makes it especially friendly to work with hand tools, but sometimes a board that appears to have even grain has an internal curl that can be challenging to smooth. However, these challenging boards often are the ones with the satiny depth and luster that make butternut so alluring. On the jointer and planer, you can get occasional tearout around swirls and echoes of knots.

Butternut ages slowly, if anything getting lighter and always more beautiful over time.



Understated beauty. Restrained butternut is a good partner for the vivid holly and ebony adornments on this chest built by Hack.

Easy to work, consistent in grain and color

The natural habit of basswood is to grow straight and shed any lower branches, so it's common to saw a 12-ft. log of considerable diameter completely free of knots and defects. The wood is creamy white with little visible grain, although some pieces have dazzling depth and a pearly luster. Quartersawn faces have a fine fleck pattern that is especially appealing. While basswood is soft, it also is surprisingly tough for its weight. I'm at a loss to explain why basswood lumber is so little used, for here is a light and stable wood, easily worked, without any of the pitch or knots found in slightly softer white pine.

Basswood's lightness is also its strength: Before medium-density fiberboard and plywood came on the scene, basswood was used as the core of veneered panels, yardsticks, and puzzles. It is ideal as a secondary wood for drawer bottoms, dust panels, case backs, or for patterns and mockups, and of course carving. It is a dream to plane—it will make you feel like a hero—with only the occasional tearout in the contorted grain around the echo of a knot.

Trees can yield board after board of straight-grained basswood that sand, glue, shape, and screw easily. Defects, if any, will be elongated dark stains spread out across a board, similar to and larger than those in cherry. Carvers prize basswood for its even grain that carves smoothly in almost any direction, but other woodworkers should share the bounty of this overlooked wood.

Common name **BASSWOOD**



Latin name **Tilia Americana**

Other names **Lime, linden**

Price per board foot **\$2-3**

Specific gravity **0.37**

Percent shrinkage, green to kiln-dried

Tangential **9.3** Radial **6.6** T/R ratio **1.4**



Plane like a hero.
The even grain of basswood that appeals to carvers also makes it an ideal wood for novice handplane users. The clear, wide, lightweight boards make excellent drawer bottoms.

APPLE

Dense but full of character

Although apple trees are native to the United States, within a forest they are usually so stunted and misshapen that their only use is for smoking meats (second only to maple in my opinion). Most apple lumber comes from orchards, when rows of trees are cut to make room for some hot new variety. Don't expect very long logs, for fruit production and easy picking are opposite goals to lumber quality. A further drawback is that the largest and oldest trees tend to rot from inside so that only part of the main trunk will yield anything useful.

Apple is dense, heavy, hard, and tough, perhaps because the trees have a hard life and grow slowly, sometimes twisting as they grow. It also tends to have a variety of knots, from tight little swirls almost like little burls, to punky black holes. Apple is similar to cherry, with dense, dark heartwood surrounded by considerable white sapwood, but with wider variation in the color and grain. I have an old drop-leaf table made from four unusually wide apple boards that has aged to a very rich red with tones of dark brown. Apple works much like cherry, but requires more effort due to its hardness. Take light cuts when planing and scrape any minor tearout. It is nearly as hard as hickory, our hardest native wood, and it takes and holds fine details on a par with many tropical woods.

Since most logs yield modest-size pieces, apple is best used for knobs, tool handles, or small projects that show off the beauty of the wood.



Crisp and polished. The hard wood of apple develops a natural shine when used for frequently handled parts. The density means it can hold sharp details.



Common name APPLE		
		
Latin name Malus		
Price per board foot \$4-5		
Specific gravity 0.71		
Percent shrinkage, green to kiln-dried		
Tangential 10.1	Radial 5.6	T/R ratio 1.8

Good for more than tools and workbenches

Beech was once the favored wood for planes and other tools because it is tough, fairly easy to work, even grained, and very handsome. It resembles the soft flesh tones of pear, only lighter and more tan colored, with a background of very fine, dark flecks. These flecks are so distinctive that if you saw only a square inch of beech you would know it in a second. The quartersawn faces of both oak and beech have the same prominent ray flecks, but while those on oak are heavy, those on beech are finer with a slight shimmer.

Beech is not known for being overly stable, and its high tangential shrinkage would make me leery of gluing wide boards into a trestle tabletop with little support to keep it flat. As with any wood, choose your pieces carefully for their intended use and you will have fewer problems. My workbench is beech; it has stayed flat for almost 30 years, and it has not only been durable but has mellowed to a warm honey color. Many of my old molding planes with quartersawn beech bodies are also dead true.



Smooth running. Beech's tight grain makes it ideal for parts subject to wear from friction.

Beech steam-bends very well and frequently is used for chair parts. Because it imparts no taste or smell, it is ideal for food containers. It planes and machines well, much like maple, and it sands to a perfect smoothness. For many years beech was used for school furniture or the like, much as we use birch today. I think this gave it a reputation for being plain and utilitarian, but it deserves consideration for your next project.



A nice complement to oak. This Arts and Crafts style blanket chest made by Jeff Dilks is quartersawn white oak with panels of European beech, similar to American beech.



Common name
AMERICAN BEECH



Latin name *Fagus grandifolia*

Price per board foot \$2-3

Specific gravity 0.64

Percent shrinkage, green to kiln-dried

Tangential 11.9 Radial 5.5 T/R ratio 2.2

Sources of Supply

Local lumberyards will stock some of these woods. Alternatively, go to www.woodfinder.com and type in the species you are looking for and your zip code. The site will list the 10 nearest lumberyards that stock that wood. If none are nearby, many lumberyards offer mail order, often with no minimum volume.

readers gallery

AL PILLSBURY

Foxboro, Mass.

"This was a fun piece to make," says Pillsbury of his reproduction Hepplewhite sideboard, because it allowed him to expand his repertoire of woodworking skills. The Boston Museum of Fine Arts allowed Pillsbury to photograph and measure the original, which helped him tremendously with the design and construction. This large-scale project (29½ in. deep by 72½ in. wide by 38¾ in. tall) took more than 1,000 hours to build. The piece is made of mahogany, with poplar as a secondary wood, and various inlays of maple, cherry, walnut, and mahogany. The finish is French polish.



SAM NORRIS

Burlington, Vt.

Norris built these hickory chairs in his second year in the Fine Woodworking Program at the College of the Redwoods in California. Initially, he planned to make just the child's chair (13 in. deep by 16½ in. wide by 27 in. tall) but decided to make the larger version (18 in. deep by 22 in. wide by 38 in. tall) as well to illustrate the relationship between children and adults. The front legs are based on elements in Edward Barnsley chairs, while the back splats and chair profiles were influenced by the elegant lines of Ejler Hjorth-Westh's Casper chair. The upholstery is cotton, and the finish is oil-varnish. PHOTO: SETH JANOFSKY



VERN BONHAM

Clarkrange, Tenn.

Bonham thinks of his boxes as small jewels. Though petite (3 $\frac{3}{8}$ in. sq.—about palm-size), this box took him about 10 days to construct. It is made of box-elder burl with a strip of black-dyed boxwood. The finish is satin polyurethane, rubbed out and waxed to a soft sheen. PHOTO: JOHN LUCAS

KEVIN McMAHON

Boulder, Colo.

McMahon named this two-piece hanging wall cabinet after a woman's bathing-suit design, called a "tankini," which combines a tank top with a bikini bottom. The cabinet is made from a single board of spalted cherry, with ebony wedges in the through-tenons in the tops and bottoms. The top section has a spalted maple back. The pulls are a sandwich of cherry and ebony. The cabinet is 7 in. deep by 10 in. wide, and is 36 in. tall when hung as shown. It is finished with tung oil and wax.



SCOTT AND KATHY KING

Waterloo, Ont., Canada

The Kings made this piece for a client who wanted a room divider that reminded her of some of the plants and fruits of her native Barbados. Scott created the main frame out of Spanish cedar and used South American mahogany for the inner frames. The panels are Kathy's original silk paintings, mounted between glass. For variety, the frames can be removed and rearranged. The Kings commissioned Bob Sanderson to make the custom hinges, which allow the sections to be folded forward or backward. The divider is 1 $\frac{1}{8}$ in. thick by 80 in. wide by 73 in. tall and is finished with Liberon Finishing Oil.

Submissions

Readers Gallery provides design inspiration by showcasing the work of our readers. For consideration, send entry forms (available at www.FineWoodworking.com) and photos (unaltered digital images, prints with negatives, or slides) to Readers Gallery, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwgallery@taunton.com. If you want materials returned, you must include a self-addressed envelope with appropriate postage.





DEBEY ZITO

San Francisco

Zito, a woodworker for more than 20 years, prefers simplicity in her furniture forms. The subtle curves in her cabinet's door rails and bottom apron, as well as the soft taper in the columns, echo that philosophy. The cabinet is 23 in. deep by 60 in. wide (at the top) by 70 in. tall, and was a team effort. Nickel-plated handles, which mimic the overall form of the piece, were made by Audel Davis. The pussy-willow details in the upper door panels were carved and gilded by Terry Schmitt. The finish is

Tried & True Linseed Oil. PHOTO: DAVID RAMSEY



LAURA SMITH

Seattle

Though diminutive in size (11¼ in. deep by 21½ in. wide by 28½ in. tall), Smith's demilune table delivers a visual punch. The octagonal mahogany legs are tapered on all sides and have feet of turned maple. The curved apron is veneered with pommele sapele over a bending-plywood substrate. The top, also pommele sapele veneer over plywood, is accented with holly stringing and framed with solid mahogany. The finish is lacquer.

MALCOLM TIBBETTS

South Lake Tahoe, Calif.

For this chess ensemble (chairs, table, and chess pieces), Tibbetts cut almost 4,000 pieces of wood (such as myrtlewood, ebony, and curly maple). Yet the project took only 300 hours to complete. Tibbetts turned the massive pieces on a big, custom-welded lathe. The table has dovetailed drawers to store the game pieces. Tibbetts says he has always enjoyed the challenge of large-scale segmented work. He likened the design and building process to the game of chess, which "requires a lot of thought and planning." The table is 42 in. dia. by 40 in. tall. The finish is sanding sealer and a tung oil/polyurethane mixture.



DON KONDRA

Saskatoon, Sask., Canada

This coffee table (18 in. wide by 50 in. long by 17 in. tall) was created from a single slab of eucalyptus (about 2 in. thick by 3 ft. wide by 7 ft. long), straight from Australia, courtesy of a client. "This was the perfect project," says Kondra. "The client had the wood, a function for the piece with rough dimensions, and was willing to give me total freedom in design—on approval, of course." The finish is tung oil and spar varnish.



ROY HOWARD

Sydney, Australia

This piece was inspired by a Dutch cabinet-on-stand (circa 1650) that resides in the state bedchamber at Ham House in Richmond, England. Howard built the cabinet (20 in. deep by 48 in. wide by 64 in. tall) out of New Guinea rosewood, and cut several hundred pieces of jarrah, rosewood, mahogany, blackwood, walnut, silver ash, and ebony for the marquetry in the door panels and the banding around the drawer fronts. The process took about 650 hours. The finish is Feast Watson's Fine Buffing Oil and Proofseal, a combination that did not darken the wood or inlay.



ERIC GRANT

Berlin, N.H.

Grant's Queen Anne side table is an original design. The table features elegant cabriole legs with trifid feet, and a curved-ray shell in the front apron as the focal point. The table is 21 in. deep by 54 in. wide by 30 in. tall and is made of lightly figured Adirondack cherry. Grant was fortunate to have found a single, wide piece of stock for the top—a rare discovery. The finish is Watco Danish Oil and lacquer. PHOTO: BILL TRUSLOW



Shopmade fence for a miter gauge

Q: I often see a long wood fence attached to the miter gauges featured in your articles about tablesaw techniques. Why bother?

—WALLACE WELLS, Des Moines, Iowa

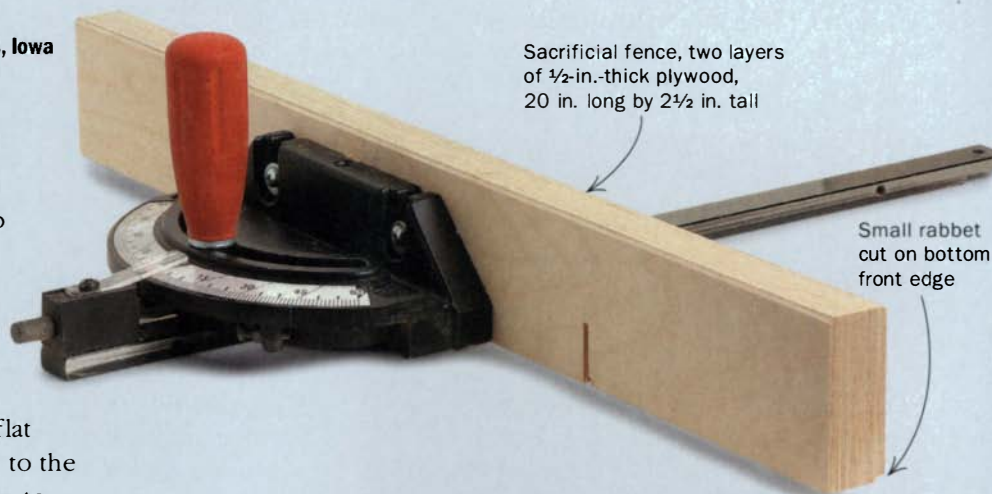
A: A LONG, STRAIGHT SACRIFICIAL FENCE provides better support for workpieces, which yields more precise cuts. It provides a mounting surface for stop blocks or a stop extension stick. And it prevents chipout on the back edge.

To construct a flat, stable fence, start with two ½-in.-thick pieces of hardwood or plywood. Make them about 20 in. long by 2½ in. tall and face-glue them against a flat reference surface. Before securing the fence to the miter gauge, cut a small rabbet in the bottom to give sawdust a place to go.

Mount the fence so that one side can act as a sweep for moving cutoffs past the blade. That means having a few inches of fence extending past the blade. To make a nonslip surface, you can glue fine sandpaper to the fence.

Finally, add a stop assembly. There are several versions commercially available for about \$20 that can be attached to a wooden fence via a rail. Or, simply use a small wood handscrew or a small block of wood. If you're making repetitive cuts longer than the fence, clamp on a long, thin piece of wood with its own stop block.

—Tim Albers reviewed miter gauges in FWW #165.



Holding stock steady. A sacrificial fence can yield cleaner cuts, and it supports the offcut. A stop block clamped to the fence allows repetitive cuts.



Ask a question

Do you have a question you'd like us to consider for the column? Send it to Q&A, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwqa@taunton.com.

Stacking wood on end

Q: My basement workshop has an uninsulated concrete-slab floor. If I store wood on end, will it draw in moisture from the floor?

—CORREY SMITH,
Bar Harbor, Maine

A: EVEN THOUGH STORING WOOD VERTICALLY IS CONVENIENT, the end on the floor often will have a higher moisture content than the end near the ceiling. That's especially true in a basement shop with a concrete floor. You can minimize moisture pickup by covering the floor with plastic or by resting the wood on scrap stock or a pallet. But I have found that it's best to reacclimate wood stored vertically. A couple of weeks before you want to use it, restack the wood horizontally off the floor.

—John White is FWW shop manager.

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How much curve to put on curved cauls

Q: Your article on surviving glue-ups (FWW #177, pp. 34-41) explained how curved cauls can be used to apply pressure where clamps can't reach. But you didn't say much about how to make the cauls. Is there a rule of thumb for the amount of curvature per foot of caul? Does the curve have to be symmetrical? What woods are suitable?

—F.H. LOTT,
Minneapolis

A: YOU DON'T HAVE TO BE VERY SCIENTIFIC to make useful curved cauls. Just be sure they're long enough for most of your glue-ups.

I use ordinary fir construction lumber for my curved cauls. It is inexpensive and less likely to mar hardwood workpieces. I have some cauls that are 16 in. long and some that are 24 in. long, which takes care of most of the cabinet work I do. I've found that tapering the cauls by $\frac{1}{8}$ in. to $\frac{1}{4}$ in. at their ends gives plenty of curvature, but don't be afraid to experiment.

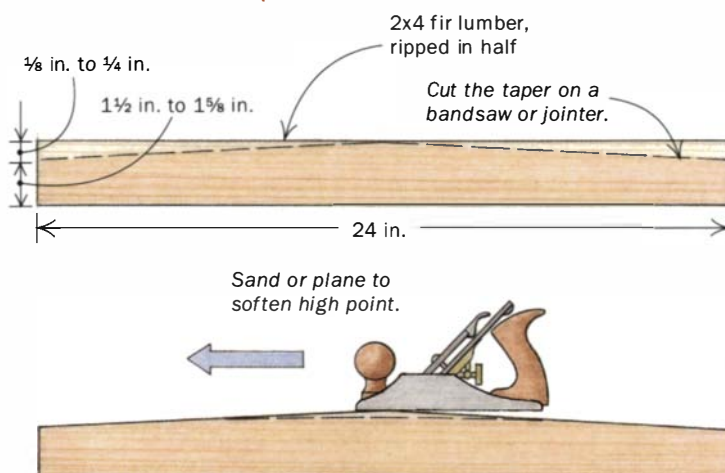
Frankly, I spend more time thinking about the national debt than I do about making the curves symmetrical. To make a caul, I cut tapers into the fir starting from the center. Then I blend in the high point with a handplane.

Try the cauls when you dry-fit a piece. If they seem to have too much curve to them, plane the middle of the caul to flatten it a bit more. If they don't press down enough, increase the taper.

—Gary Rogowski is a contributing editor.

MAKING CURVED CAULS

Use 2x4 fir construction lumber about 24 in. long, depending on the size of the case. Rip the stock approximately in half, then taper each end from the center about $\frac{1}{8}$ in. to $\frac{1}{4}$ in. A handplane softens the midpoint to equalize the clamping strength and to knock off a corner that could mar the workpiece.



Curved cauls clamp across wide cases. Getting a clamp to actively apply pressure in the center of a case can be impossible. With a curved caul, pressure can be applied from the ends to the center.



Oil finish can go wrong on walnut

Q: I wanted to give some European walnut a very fine, soft finish. I tried tung oil, but the surface looks muddy and the sapwood has a yellowish tinge. Am I doing something wrong?

—PETER GRUNDY,
Grellingen, Switzerland

A: PURE-OIL FINISHES SUCH AS TUNG OIL aren't a good choice for a wood like walnut. The oil penetrates enough to darken the wood quite a bit, particularly the end grain. That can be objectionable on a naturally dark wood like walnut.

The oil also obscures the wood's character, making the subtle pinks, reds, yellows,

and greens in the heartwood disappear. The sapwood, however, takes on the color of the tung oil, so it appears quite yellow.

To rescue the wood, I would sand or strip away the oil and try a very light (super-blond) dewaxed shellac. It will preserve the delicate colors in the walnut and leave a crisp, light

appearance while adding an overall luster.

If you don't want the finish to seem thick, use only two or three coats of shellac. Rub it out with 0000 steel wool if it has too much gloss. Then finish up with a light coat of paste wax.

—Jeff Jewitt, a wood finishing expert, covered walnut finishes in FWW #176.

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READER SERVICE NO. 56

Which plane to buy: No. 4 or No. 4½?

Q: I want to purchase a smoothing plane, and I'm trying to choose between a No. 4 and No. 4½. What's the difference between these two planes?

—DAVID CHRISTY,
Carmichael, Calif.

A: BOTH SMOOTHING PLANES have their blades bedded at 45°, bevel side down. The No. 4 is lighter, narrower, and shorter than the No. 4½, and these traits make the two planes perform differently.

Generally, your choice will depend on the type of work you do and whether you use a lot of figured woods. The longer sole and added weight of the No. 4½ make it more suitable for flattening and smoothing large areas, and the wide blade allows you to remove more material in one pass. But the size can become a hindrance when working with figured woods because the tool is harder to maneuver.

I find the No. 4 attacks more types of wood success-



Tale of two planes. The 9-in.-long No. 4 (right) has a 2-in.-wide blade. The No. 4½ is 10 in. long and has a 2½-in.-wide blade. The No. 4½ weighs close to 5 lb., about 1 lb. more than the No. 4.

fully. It's comfortable to use on straight-grain surfaces and excels at working even the most highly figured woods, such as crotch walnut, from a variety of directions.

The downside of the No. 4 is that it may not be as efficient at flattening a board as the No. 4½ because its shorter, 9-in. sole tends to follow hills and valleys instead of leveling them.

Try to use both planes before you buy one. As with many tool choices, it will boil down to personal preference and your comfort level. Personally, I love my No. 4 because of its versatility, and I often choose it for tasks where the No. 4½ would be the "correct" choice.

—Mario Rodriguez is a woodworker and teacher in New York City.

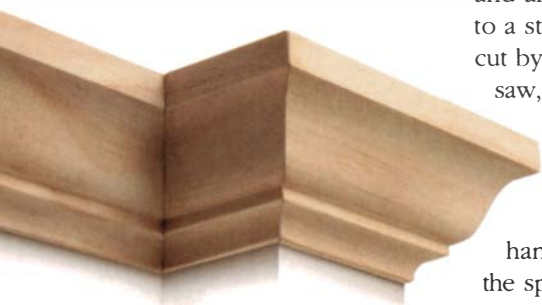
How to cut clean miters in small pieces of molding

Q: I am installing crown molding that has to fit around pilasters that are 2 in. thick. What's the best way to cut such small pieces?

—JOHN TROTH JR.,
Coatesville, Pa.

A: MITERING MOLDINGS AROUND PILASTERS can be fussy work. The miter-saw blade can catch and chew up the short segments for the sides. To avoid that, I don't cut all the way through the stock with a power miter saw. Instead, I cut most of the way through and allow the blade to coast to a stop. Then I finish the cut by hand with a fine-tooth saw, carefully following the initial cut. Just be sure to start with a piece of molding that's long enough to keep your hands safely away from the spinning blade.

—Lonnie Bird is a contributing editor.



START THE CUT ON THE MITER SAW

A powered miter saw may tear up short pieces of crown molding. To keep the molding intact, start the cut on the miter saw but stop short of finishing.



FINISH THE CUT WITH A HANDSAW

This will keep the short piece of molding from breaking.



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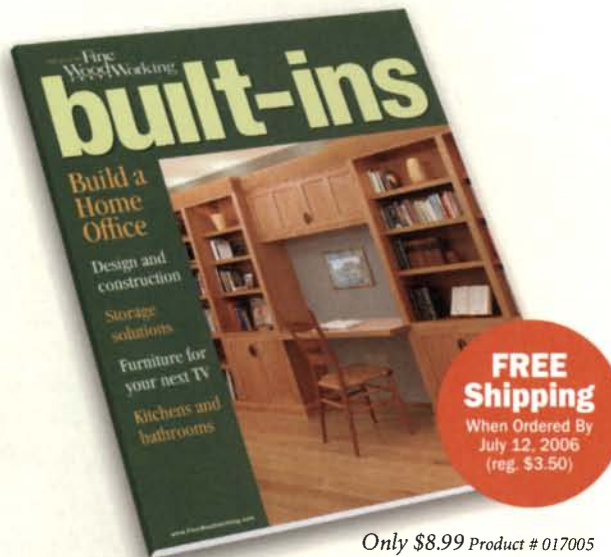
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Use an angle grinder to sculpt flowing joinery

BY JERE WILLIAMS



My background is in sculpture, and the qualities that I most admire in modernist pieces are the organic forms and lines, the sense of peaceful repose, and the strong tactile attraction. I felt that these highly desirable qualities were lacking in my studio furniture, so I began designing with a flowing, organic style of joinery.

The shaping technique was not easy to perfect. I tried spokeshaves, drawknives, wood rasps, and carving gouges before settling on the angle grinder as the main tool for the job. Now I use these flowing surfaces and joints on both tables and chairs. Creating an organic feel in a piece also

enhances its handcrafted appeal.

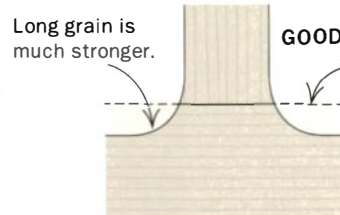
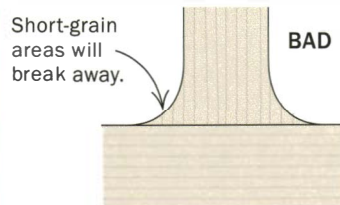
The only real drawback to this approach is the amount of dust it creates, so do your grinding outdoors if you can. When I work inside, I use open windows and an exhaust fan to create good airflow, and I wear earplugs, protective glasses, and a Dustfoe 88 respirator.

Shaping a piece of furniture with a grinder is both exhilarating and terrifying. After investing a great deal of time, money, and energy into making a perfect chair or table frame, it can be frightening to come near it with an aggressive grinder. But you'll be



Layout is critical

Make full-size templates and lay out the parts, keeping in mind where material will be removed. The deep, angled mortises often will come close to the outside of the finished pieces.



DESIGN JOINTS TO ELIMINATE SHORT GRAIN

Shift the locations of joints as shown to maximize the strong, long-grain areas and minimize weak, short grain.

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Listen to the author describe how he uses his right-angle grinder to sculpt a piece of furniture.

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READER SERVICE NO. 162

Before assembly, cut joinery and rough out curves



A simple setup for angled mortises. Williams uses a simple shopmade horizontal mortising table, moving the heavy workpieces by hand as he eyeballs the layout lines.



After mortising, rough out the curves. Cut right to the layout lines; these bandsawn surfaces will guide the shaping process later.



Some grinding is best done before assembly. Some areas will be easier to reach now. To ensure symmetry and flowing joints, leave the bulk of the grinding for afterward.

surprised at your level of control with the right grinding attachment and a little practice.

I prefer not to use power-sculpting or -carving wheels on the grinder because they tend to bounce and are completely inflexible. Instead I use a rubber backer with abrasive-coated fiber disks. Strictly speaking, this means I am sanding, but most sculptors (and welders) still call this grinding. Combined with the raw speed and power of the grinder, these attachments allow you to remove material with unmatched speed and accuracy. Also, you can work the grain in a number of directions.

After grinding, I smooth the surfaces with a series of familiar woodworking tools.

Lay out curves and cut joinery carefully

This type of joinery demands precision because the process of shaping the jointed areas will expose any internal gaps. To be sure that all of the tenon shoulders are perfectly flush, I use simple butt joints and floating tenons, with mating mortises made on a horizontal mortising machine (though a router could do the job).

For strength, the tenons must be as large and long as possible, which means they will penetrate 1 in. or more into each piece, often at an angle and coming close to the final outer surface. This requires careful layout of both the curves and the mortises.

First, joint and plane the stock to a thickness and width that will allow enough room for the shape of the finished piece. Cut the mortises before roughing out the curves: You'll need the straight, square reference surfaces. Draw guidelines on the square stock for tenon width, length, and angle.

Once the mortises are cut and the tenons are fit, rough out the shapes on the bandsaw. Practice and forethought will help you to know where



Clamping requires square surfaces. Note the stock left in strategic areas to serve as clamping pads. Be sure each joint closes completely.

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After assembly, the sculpting really begins



No vise necessary. The piece is large enough to lie solidly on a rubber mat. Grind slowly and methodically, using heavy cuts at first and finishing with long, light strokes as you work toward a smooth, symmetrical piece of furniture.

Half-round rasps and files are next. Heavy gloves allow a variety of comfortable grips.



to leave additional material for clamping. After assembly, the angle grinder will make quick work of these extra chunks of wood.

Do most of the grinding after assembly

You will want to shape back splats (in the case of a chair) and some other hard-to-reach areas before gluing, but the bulk of the work should be done on a completed frame. Many sculptors agree that the only way to achieve uniformity, balance, and symmetry is to work on the entire piece at once, slowly shaping the entire surface down to the finished form. Working on a completed frame also allows me simply to lay the piece on a rubber mat on the floor to work it over. This eliminates clamping and orientation problems—greatly increasing my speed while allowing me plenty of leverage.

The basic technique requires that you control two factors: pressure and the speed with which the tool is moved over the surface. To get a smooth, fair surface with no unwanted undulations, begin with heavier, biting strokes and finish with very light pressure (often less than the weight of the tool itself) and many long strokes. While doing so, keep the tool in constant motion; otherwise it will burn wood quickly, especially on end grain.

Rasps go where the grinder can't

The grinder works well in areas where you can get the wheel to come into good contact with the material, but the crook of a joint is beyond its capabilities. Once the rough shaping with the grinder is complete, I begin working with a Nicholson No. 49 patternmaker's rasp. The quality of the cut is excellent when used with or across the grain, though both rasps and files can cause some short-grain tearout. In general, follow proper wood-cutting technique: Go from high to low to work with or across the grain.

Once I have achieved fair, uniform curves with rasps and files, I work the surfaces with an orbital sander, moving from 100- through 220-grit. The orbital sander has the same drawback as the grinder when it comes to shaping the inside of a curve. To complete the corners, I use fine-cutting riffler files and adhesive-backed sandpaper that I stick to my fingers. □



Sandpaper delivers the final surface. Williams uses a random-orbit sander for the wide-open areas, and finishes with adhesive-backed sandpaper stuck to his fingers.

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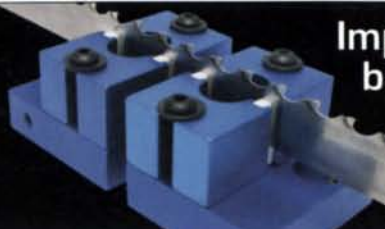


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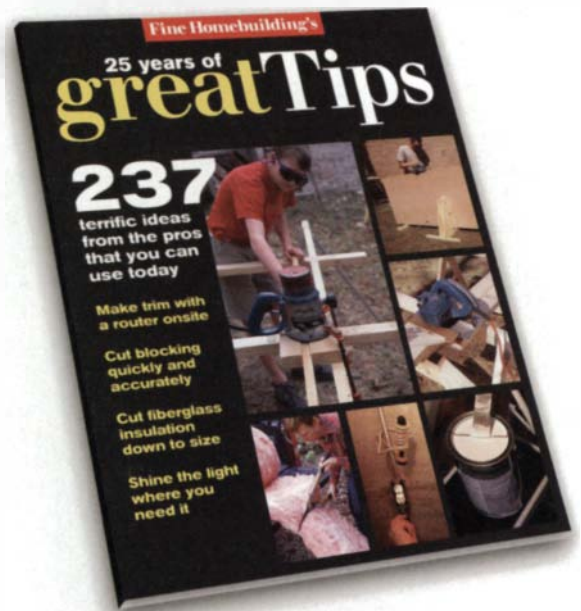
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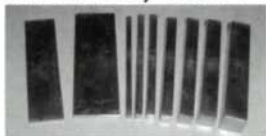
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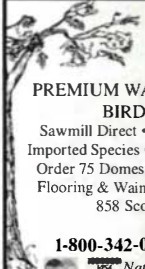
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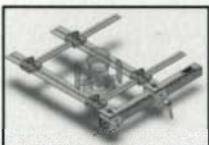
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Creative bleaching techniques

BY JEFF JEWITT

Most woodworkers associate bleach with getting rid of stains, whether they occur naturally in wood or were caused by contact with iron or when the wrong dye was applied. But there is a creative side to bleaching wood: You can achieve new looks by removing a wood's natural color; you can produce a neutral base for gray, pickled, and other finishes; and you can match the color in older furniture.

Use a special two-part wood bleach

There are several products sold as wood bleach, but for this technique you will need a two-part bleach also known as A/B bleach. Check your local paint or

hardware store, or order it online (www.woodworker.com, 800-645-9292). This product is sold as a package of two bottles; part A is sodium hydroxide and part B is hydrogen peroxide.

Sodium hydroxide is particularly dangerous. You must wear eye protection because a healthy splash in your eyes may cause permanent blindness, and wear long sleeves and thick (preferably nitrile) gloves to protect your skin from chemical burns.

Mix and apply the bleach—Because bleaching will raise the grain, don't bother to pre-sand beyond P180-grit. Some brands of bleach instruct you to apply first part A and then part B. The brand I used, made by Klean-Strip, said to mix the two parts together in equal amounts in a nonmetallic container. Mix only what you will use; the mixture weakens after three or four hours.

Apply the bleach evenly with a disposable foam or nylon-bristle brush.

The bleach may foam a bit when the wood is wet, a sign that it's working. The results may start to be visible in 10 to 15 minutes, but let the wood dry at least six hours to judge the full effects. If the wood isn't pale enough, try a second application. But be cautious; more than two coats will raise the grain severely and may produce a greenish cast.

Neutralize the bleach, and sand—

Particularly after a second application, wait at least two hours and then neutralize the reaction with a mixture of white vinegar and water. Follow the instructions for the exact ratio.

Let the wood dry for 24 hours out of direct sunlight, then sand with P180- or P220-grit sandpaper, being careful not to sand through to the unbleached wood.



Brush on the bleach. Combine the two bleach components in a nonmetallic container and apply the mixture to the wood.

Applying the bleach



Neutralize the bleach. When the wood is the desired lightness, apply a mixture of white vinegar and water to stop the chemical reaction.



Sand the surface. Because bleaching raises the grain, sand the wood with P220-grit paper before applying a finish.

Finish options for bleached wood

PRESERVING THE BLEACHED LOOK

If you simply want to preserve the bleached color, just apply a topcoat. On nearly white bleached woods such as ash or this piece of curly maple, use a nonyellowing finish such as water-white, CAB acrylic lacquer; blond shellac; or a water-based finish (see "The Clearest of Finishes" by Peter Gedrys, FWW #184, pp. 42-45).



A PROPER PICKLE

A true whitewashed or pickled effect can be achieved only on bleached wood. A whitewash typically is done on pale tight-grained woods such as maple to give a thin and transparent effect evenly across the wood. A pickled effect is achieved on open-grained wood where uneven collection of the pigment enhances the grain pattern. On this red oak, only the bleached end reveals the pickled effect. Both effects are achieved by brushing on a white pigment stain and wiping off the surplus.



TRUE GRAYS

To produce certain transparent colors on wood, you need as neutral a base as possible without any of the natural yellows and browns fighting your color. Only by bleaching the wood can you achieve this neutral base for pastel colors such as a true gray. On this tiger maple, the diluted black dye appears dark brown on the unbleached end and the desired gray over the bleached wood.



REPLICATING ANTIQUE WOOD

Walnut, teak, and mahogany lighten in color with age, and the best way to mimic that look on new wood is to bleach and then dye it. With the original antique within view, apply bleach to the new wood, keeping the surface wet with bleach until you reach the color you're after, or a hair lighter. Immediately apply the diluted vinegar to halt the action of the bleach, let the wood dry, and then sand it. In most cases, as with this piece of mahogany, you'll need to fine-tune the color match using a dye stain.





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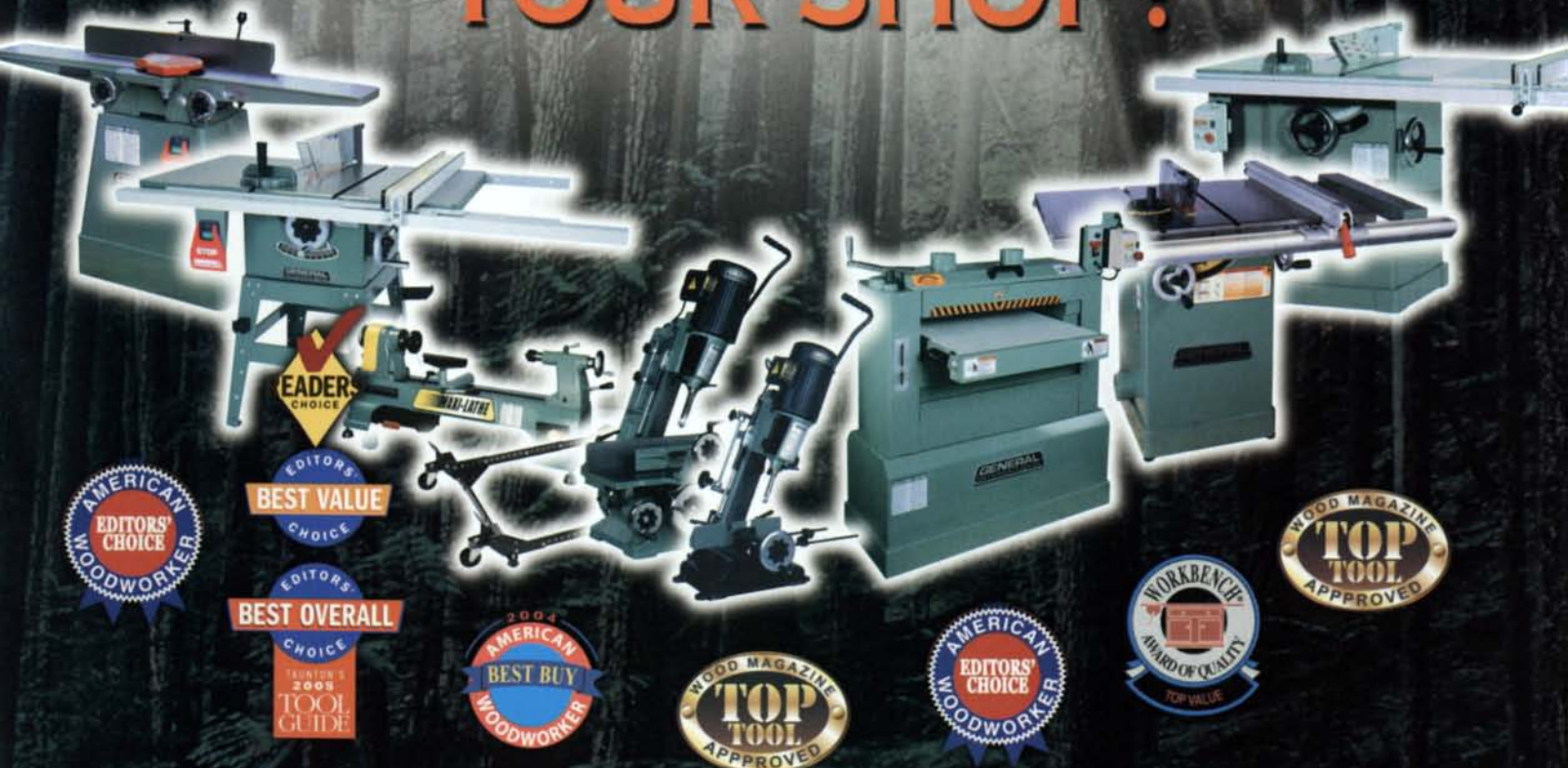
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Gerald Curry worked in his father's hardware store outside Boston from third grade through high school, long enough to develop a deep affinity for tools and handwork—and a deep dislike for long days of waiting on customers. It struck him that a career making furniture in a one-man shop could answer both issues. Unschooled in furniture making, Curry set out to learn the craft by copying museum pieces. He figured he could develop his own designs later. As it happened, after moving to Maine in 1976, Curry spent nearly 25 years reproducing American furniture of the late 18th and early 19th centuries. Then in 2000 he quit reproductions cold turkey to build original work. His new designs, like this sideboard in quartersawn walnut and curly maple, are a breath of fresh air. Made with traditional joinery and steeped in the shapes and proportions of the past, they are transformed with a clarity, lightness, and restraint that future furniture makers may well want to copy.

—Jonathan Binzen



Pro Portfolio Visit FineWoodworking.com to learn more about Curry's design inspirations in an audio slide show of his work.