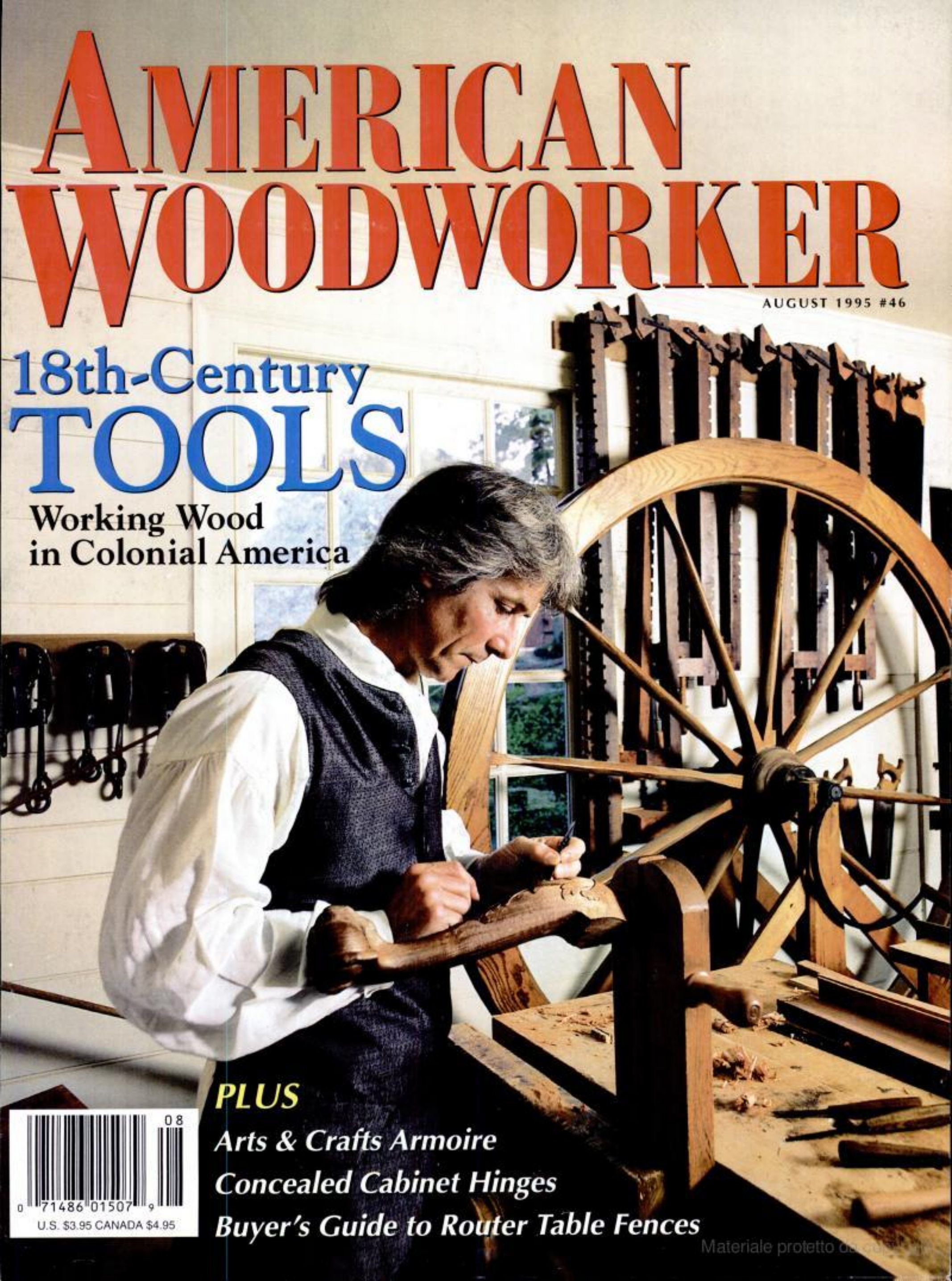


AMERICAN WOODWORKER

A craftsman with long grey hair, wearing a white shirt and a dark vest, is focused on carving a wooden wheel. He is in a workshop filled with various tools and wooden components. The background shows a window with a view of greenery outside. The overall scene is a detailed representation of 18th-century woodworking.

AUGUST 1995 #46

18th-Century TOOLS

Working Wood
in Colonial America

PLUS

Arts & Crafts Armoire

Concealed Cabinet Hinges

Buyer's Guide to Router Table Fences



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AMERICAN WOODWORKER

Issue No. 46 August 1995



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On the cover: Master cabinetmaker Mack Headley carves a cabriole leg in the 18th-century workshop at Colonial Williamsburg. See page 33.

COVER PHOTO BY JOHN HAMEL



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A WORD FROM THE EDITOR

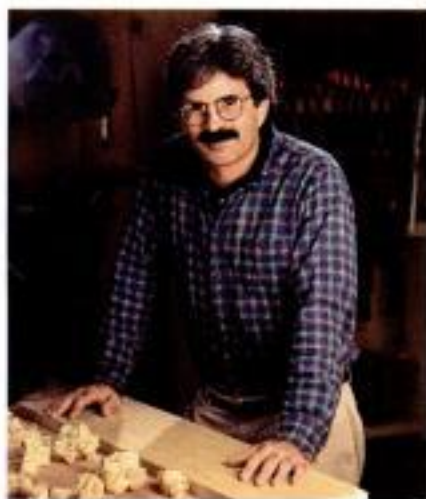
THE OLD AND THE NEW

Have you ever wondered what it was like to be a woodworker in Colonial America? If you're really curious, try making a highboy like the one on page 44 with just hand tools.

Start by throwing your log into the buckboard and driving it to the closest water-powered sawmill to be sawn into lumber. Then, after a couple of years, when the planks have dried, you can rip and plane all your highboy parts by hand. Chop the mortises with chisels and make the moldings from scratch with your hand-made molding planes. No routers allowed here. And you'd better plan on working during daylight hours—it's awfully hard to see those gauge lines by candlelight.

Today we take heating, lighting, and power tools for granted. But in the 1700s such conveniences were unheard of. Cabinetmakers were totally dependent on hand tools, raw ingenuity and muscle power to get the job done. Yet, despite the hardships, they managed to create some of the finest furniture the world has ever seen.

Most of us aren't willing to spend the time or the effort to do things the old-fashioned way. Nor should we; much of it was merely thankless work. On the other hand, some of the old methods have never been surpassed. A hand-planed surface is still cleaner than one produced by a machine. A hand-cut dovetail is more satisfying to make than one made with a router. Some things don't change.



It seems fitting for this magazine to tip its hat to those tenacious early American woodworkers and their hand-tool legacy. Join us for a glimpse into our woodworking past, as assistant editor Paul Anthony visits an exceptional exhibit, "Tools: Working Wood in the Eighteenth

Century," on display at Colonial Williamsburg through September 4, 1995. If your summer travel plans take you near eastern Virginia, be sure to visit the show in person. Never before has the past been so faithfully brought to life.

While I'm on the subject of shows, there's another show that deserves a mention: the first annual Philadelphia Furniture Show, which took place in April. This show brought the *present* to life as almost 200 craftsmen displayed their wares—ranging from the traditional to the outrageous—for more than 8,500 show-goers during the three-day event. Touted by its promoters as the largest show of exclusively "studio" furniture in the country, the Philly show's objective was to provide a showcase where small, independent woodworkers could interact directly with the buying public, rather than attempt to sell their work through high-priced galleries.

Judging from the positive responses on both sides, we'll be seeing more shows like this in the future. For information on next year's Philadelphia show, contact Josh Markel or Bob Ingram at (215) 440-7136.

Ellis Walentine
Executive editor

PLAY IT SAFE

Woodworking can be dangerous. Safety equipment such as guards, hold-downs, goggles, dust masks and hearing protection can greatly reduce your risk of injury. But even the best guard won't make up for poor judgment. Use common sense and caution in the workshop. If a procedure feels dangerous, don't try it, no matter how many other folks work that way. Figure out an alternative that feels safe. Your safety is your responsibility.

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LETTERS

Concerns About Gorilla Glue

I recently picked up a bottle of Gorilla Glue. When I read the label, one of the ingredients gave me pause: methyl diisocyanate, or MDI. I work with a group of pulmonary physicians and we have seen people who, upon exposure to MDI or similar compounds, have developed intractable asthma. This effect is well documented in the medical literature. People become sensitized to MDI and subsequent exposure—even in minute amounts—can produce asthma attacks.

The label on Gorilla Glue cautions that MDI is present in the formulation, that it is harmful if swallowed and that it produces no hazardous fumes. I am familiar with the Material Safety Data Sheets regarding MDI and I am concerned that, based on the known effects of this chemical, there may potentially be a problem with the glue. I wonder if exposure during application of Gorilla Glue or during cutting, sanding or other woodworking activities presents any risks to the woodworker.

Bill Hamlin
Golden Valley, MN

As a woodworker with more than 30 years of shop time, I too share reasonable concerns regarding exposure to wood dust, solvents, aromatic hydrocarbons, and other possible irritants.

Gorilla Glue was originally developed in Europe as a safer alternative to epoxy resin. Unlike other polyurethane adhesives that are currently available, Gorilla Glue is 100 percent solvent free. Hypersensitivity to the respiratory tract is possible when moisture-cured polyurethane is sprayed. We do not offer Gorilla Glue in a solvent-based formula or at a viscosity suitable for spray application, and once it has cured, the glue is harmless during sanding or cut-

ting operations. Gorilla Glue has a tolerance level (TLV) rating four times lower than allowable limits and than other polyurethanes.

However, as with other polyurethane adhesives, Gorilla Glue does contain MDI. It is possible that trace amounts of MDI can be released during application and this information may be of concern to individuals with chronic respiratory ailments. We have had no reports of ill effects since introducing this glue to the U.S., or from worldwide distribution during the past 15 years. But Mr. Hamlin is correct—the potential for ill effects does exist. Recognizing this, we are contacting the manufacturer to review the warnings placed on the label.

Mark Singer
The Gorilla Group
Santa Barbara, CA

Another Perry Workbench

Your December issue (AW #42) was just great, as you can see by the enclosed photos. I had a ball making Frank Perry's workbench, and it will last a lifetime. My son said: "Make sure the one you build for us is just as nice." Thanks for a great magazine.

Robert Kowaleski
Jupiter, FL



AW reader Bob Kowaleski added casters and a tool tray to his version of Frank Perry's workbench.

Blowback Dangers

Your response to Pat Konstenius ("Q&A," AW #44) concerning furnaces, water heaters or gas dryers in woodshop spaces (particularly in basements) overlooked a potentially dangerous situation. You were correct in stating that dust can impede the efficient flow of air and gases through the unit. But many woodshops have high-volume exhaust fans for ventilation and vacuum dust-collection units. Airflow in equals airflow out, and in a tight space, as Konstenius described, the air drawn into a basement to replace exhausted air will follow the path of least resistance. Herein lies the problem. These exhaust forces could cause a furnace to backdraft down its flue, spilling carbon monoxide and other flue gases from the flue collar into the shop or basement.

Many of the newer furnaces and water heaters are "direct vent" units. Intake air is supplied from outside and exhaust gases are effectively vented to the exterior. These appliances give an extra margin of safety because they're designed to function independently of air pressure variations caused by vacuums or fans.

Even if you have direct-vent heaters in proximity to a workshop (and especially if you don't), it would be wise to isolate them in a very "tight" room, making sure that adequate intake and exhaust air is provided. Separate the functioning of these appliances from workshop ventilation and you'll be safer; the problem of sawdust fouling the appliances will also be minimized.

The study of the airflow in buildings is a new science—one that is not always understood by heating contractors unless they've been trained in building pressure diagnostics. If you're in a situation where workshop and combustion appliances might affect each other, be sure to get expert advice. Energy specialists and busi-

STAY IN TOUCH! If you have comments, corrections or news to share, we want to hear from you.

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nesses that provide weatherizing services are likely to have the equipment and training to test your shop or home for backdrafting problems, and they can offer the safest solutions.

R. Scott Waterman
Wasilla, AK

Thanks to AOL

I found AMERICAN WOODWORKER Online and seem to spend most of my time here. I have been a subscriber to your magazine for several years, and I appreciate the improvements you have made. At first I was going to cancel my subscription, but the articles and the contents have been getting better and better. Keep up the good work.

Bob Reid
Riverside, CA

Mystery Tool Cabinet

I happened to pick up your magazine (AW #44) in the grocery store this month and was intrigued by the tool

cabinet that is shown on the cover and again on page 30, in the background. Is this a plan that you covered in an earlier issue? If not, it would be a great project.



Pete Miller
peterj.miller@nwcs.org
Portland, OR

Editors reply: The cabinet in question belongs to assistant editor Andy Rae. Andy designed and built the piece before joining the AW staff, when he worked as a professional cabinetmaker.

Removing Milk Paint

I enjoyed Michael Dresdner's article on milk paint. I've used this kind of paint a few times. As satisfying as it is to apply, it can be hard to remove. I discovered this when trying to strip the paint off an antique oak table. I tried all kinds of removers, not to mention scraping and sanding, but the paint wouldn't come off. Then I remembered the cleaning properties of ammonia, so I tried it. A lit-

tle wiping with an ammonia-soaked rag and the finish (which I later discovered was milk paint) came right off. Thought you might want to pass the tip along.



Warren11@aol.com
Name and address
unavailable

Another Mail-Order Source for Screws

In addition to the sources for production screws listed in AW #45, these screws are also available from Bruss' Fastener Division. For a catalog, write to Bruss at Box 88307, Grand Rapids, MI 49518, or call: (800) 536-0009.

Corrections

In AW #45, the phone number for the Crafters' Insurance Program listed in "Offcuts," page 20, is incorrect. The correct number is (800) 526-1379. Also, the photo of the Greene and Greene rocking chair on page 47 is by Tim Street-Porter, not Marvin Rand.

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Building in Your Head

Q Great router table in AW #44. I would like to build it, but I haven't done much woodworking. Do you think a novice woodworker could build this project?

Billy Leone
Center Harbor, NH

A You're the one who knows best, but to help you decide, I suggest you take a good look at the plans before buying the materials. Figure out if you have all the tools you'll need and whether you want to invest in those you don't have. Can you borrow tools or have someone else do some of the work? Consider how long each step will take and figure out a schedule that's realistic. Don't hurry with all this.

Build the router table in your head first, imagining how you would accomplish each step. If you're not sure about a particular process or whether you have tools that will work for it, spend a little time in the shop working it out. If you don't have a biscuit joiner, try making a simple case using spline joinery if you haven't done it before. Practice cutting a mortise-and-tenon joint from some scrap. If you need help learning a particular process, refer to past issues of AW.

When you've gone over all of the construction steps in your mind and can see the finished router table from all angles

and in operation, you won't be a novice anymore. That's the way experts build things: They know that if you can build it in your head, you can build it for real.

Jim Cummins
Contributing editor & AW Online host
Woodstock, NY

Sawdust as Fertilizer

Q I enjoy both woodworking and gardening. Can I use the sawdust I produce for fertilizer or mulch?

Mark Dunne
Lake Zurich, IL

A Sawdust can be an excellent soil conditioner and mulch if you compost it for a year or so before adding it to your soil. Composting it first is necessary because the process of decomposition requires nitrogen: If you add uncomposted sawdust to your garden, it will rob nitrogen from the soil, and your plants need the nitrogen to grow. You can speed up decomposition by adding nitrogen-rich manure or green grass clippings.

Avoid using cedar or redwood sawdust; it inhibits plant growth. Don't use sawdust from pressure-treated lumber, particleboard or plywood, either. It can leach toxins into your soil, affecting your plants and possibly your health.

Diana Erney
Research associate
Organic Gardening magazine

Restoring Old Tools

Q A relative gave me some old hand-made wooden planes and spokeshaves. How can I clean them up and restore them without ruining the original finish? Is it worthwhile to repair cracks if they might affect the usability of a tool?

Joshua Gurland
Rockville, MD

A First of all, try to determine the value of your tools. Consult books on the subject or contact a tool association for advice. (See AW #45, page 45, for some associations.) Sometimes old tools have value beyond their usefulness to a woodworker. Collectors will pay good prices for certain tools in good condition. And some tools in original condition are rare and valuable. You wouldn't want to inadvertently destroy that value.

Next, learn how your antique tools work. That way, you can inspect them to make sure they can still do the job. Many old tools are worn out and not worth repairing. Large cracks can turn a tool into a wall decoration. Small cracks that don't affect a tool's performance can either be patched or left alone. A blade or plane iron should still have plenty of steel and should not be deeply pitted from rust. Wooden parts should not be battered or broken.

How to Detect Curly Figure in Logs

Q Is it possible to detect curly grain just by looking at the outside of a tree? I'm planning to fell some maple and cherry trees, and I'd appreciate any advice on identifying and milling them to best yield any curly figure.

Art Bloss
Medford, OR

A It's almost impossible to detect curly figure by looking at the bark of a tree. Skin the bark off with a drawknife after the tree is felled to look for the horizontal ridges that indicate curly figure. (See photo, right.) The spacing and depth of the ridges often

tell how highly figured the wood is, but they won't tell you how far into the log the figure goes.



Curly clues. Ridges under the bark on this cherry log indicate curly figure.

Curly figure is often found in localized patches under branches or at the base of a tree; it doesn't always run the full length of the log. Only a log with ridges running its whole length will yield fully figured boards, so check about halfway up the log by stripping away a band of bark all the way around. The ridges might encircle the log, or they might only run along one face. This will tell you which side to slab for figured lumber. To determine how deep into the log the figure goes, you'll have to cut a section off of one end and split it.

Rick Hearne
Groff & Hearne Lumber
Quarryville, PA

To clean a tool, disassemble it and clean each part individually. I usually don't use anything harsher than mineral spirits. This removes grease, wax and built-up oil. I remove rust and tarnish from metal parts using fine steel wool and mineral spirits. After cleaning everything, I oil wooden parts with a mixture of linseed oil and mineral spirits. I spray the metal parts with a rust inhibitor.

Mike Dunbar
Contributing editor
Portsmouth, NH

Workbench Height

Q I plan on building a workbench but am not sure how high to make it. I'm 6 ft., 3 in. tall. Are there other factors that affect bench height?

Peter Rothstein
Hastings on Hudson, NY

A Bench height depends on how tall you are, the type of work you do and whether you have back problems.

A low bench (about as high as your wrist is from the floor) allows you to put your body weight into planing and sanding and makes assembly of large pieces easier. A higher bench is better suited to laying out, hand-cutting joints and assembling small parts. The latter is also much easier on your back.

Although some woodworkers have both low and high benches, most of us work at a compromise height. Many six-footers find a 36-in. height a good compromise for planing, joint cutting and layout. I suspect that, at your height, a 38-in.- to 39-in.-high work surface would be a good compromise.

Before investing time and money in a good bench, consider cobbling up a temporary one first and working on it at different heights to see what suits you. The time it takes to nail together some 2x4s and an old door or piece of plywood would be well spent.

Paul Anthony
Assistant editor

Dust Collection on a Contractor's Saw

Q I'd like to hook a dust collector to my Delta contractor's tablesaw but the bottom and the back of the saw are wide open. Any suggestions?

Chris Lleida
Nassau, Bahamas

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Glider hinges are available from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374, (800) 279-4441.

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A If you close in the bottom of your saw with a panel that has a vacuum port, and plug any small holes around the saw body, you can collect about 80 percent of the sawdust. But keep in mind that a tablesaw requires a dust collector capable of inhaling at least 300 cubic ft. per minute (cfm), so a properly sized collector is a must. (See AW #37.)

To seal the base, you can buy an accessory panel that fits most contractors' saws (contact your local machinery dealer), or make one from plywood scrap.

To catch as much of the remaining dust as possible, you'll have to close off the back of the saw with a panel. To do this, cut a piece of plywood to fit around the motor support and belt, and attach it to the saw with a few sheet metal screws. While this won't allow the blade to tilt, it's easy to remove the panel for those occasional angled cuts.

Kelly Mehler
Furniture maker and author
Berea, KY

Stainless Handsaw

Q Where can I find a handsaw with a stainless steel blade?

Eli J. Hochstetler
Fredonia, PA

A In the 1950s two companies made such saws. But these were unpopular because the blades wouldn't hold an edge. Both saws—E.C. Atkins' Stainless Steel No. 500 and Disston's Stainless Steel D55—are now collectors' items.

Any chromium alloy steel saw will resist rust. Stanley's 15110 and Disston's D95 are in this category, and both hold an edge well. Each retails for about \$30.

Irv Schaffer
Antique tool collector
Madison, WI

Finishing Over PEG

Q How can I finish wood treated with PEG (polyethylene glycol)?

Don Boles
Atlanta, GA

A PEG (available from Craft Supplies, 1287 E. 1120 S., Provo, UT 84601, 801-373-0917) is used by turners to stabilize green wood. It keeps wood from shrinking as it dries. But it's also waxy and thus hard to finish.

Common film-forming finishes (lacquer, shellac, varnish) will peel when applied over PEG. Drying oils may peel, too, and nondrying oils won't give any more protection than PEG alone. But PEG itself is an adequate finish. Just buff the wood to remove residue, and then polish. For extra protection, coat PEG with a harder wax such as carnauba.

Michael Dresdner
Finishing consultant
Easton, PA

WOODWORKING QUESTIONS?

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NET NEWS



WHAT'S UP AT AW ONLINE

How would you like to get together with woodworkers from around the country to discuss various aspects of the craft? How about meeting and mingling with these folks without ever leaving your home? Log on to an AW "Shop Talk" chat on America Online and you'll be able to enjoy this stimulating electronic interaction. Shop Talk chats are scheduled every night of the week from 9:30 pm to 10:30 pm eastern time.

AW editors may attend as time permits. We'll also have celebrity guests and special topics. Join us for the following weekly chats:

Sunday: Finishing with Michael Dresdner

Monday: General woodworking chat

Tuesday: Carving

Wednesday: Furniture making

Thursday: Woodturning with Steve Blenk

Friday: Furniture repair and restoration

Friday 10:30-11:30: Women in woodworking with Anne McDonley

Saturday: General woodworking chat

All you need to get AW Magazine Online is a computer (PC or Mac) with a hard drive, a mouse and a modem. Call America Online at (800) 764-4400 for free software and 10 free hours of online time.

HONDURAN TEENS TURN WOOD TO CASH—AND HELP SAVE THE RAIN FOREST

Students in the highlands of El Carbon, Honduras, are working with The Woodworkers Alliance for Rainforest Protection (WARP) to learn a trade and save natural resources. Since 1993, WARP members Curtis Buchanan and Brian Boggs have conducted five workshops in the Central American country to teach young people the art of green woodworking.

Green woodwork requires neither expensive machinery nor complex joinery, and since there's no waiting for wood to dry, students can quickly turn their lessons to profit. These students are certainly quick: After only 15 days of instruction, seven Honduran teens completed more than 60 pieces of furniture, including stools, chairs, and a table.

The young Hondurans use *cola de pava*—"tail of the turkey"—a local hardwood named for the shape of its

leaves. *Cola de pava* splits and shaves well and resembles cherry in strength and density. It regenerates from cut stumps and roots, so it's fairly easy to harvest sustainably. In fact, the forests that supply trees for this project are certified through the Rainforest Alliance's Smart Wood program. (See AW #38.)

The students are selling their furniture locally, and they've also exhibited in the capital city, Tegucigalpa. WARP

plans to help them explore markets in North America.

For information about WARP or to support the Honduras project, write: WARP, 289 College St., Burlington, VT 05401.



Working "turkey-tail" wood. Above, Curtis Buchanan shows students how to use a drawknife. Inset, Ronny Antunes puts the final touches on a bar stool he built.

WATCO LIVES FLECTO BUYS ENTIRE LINE

WATCO lovers can put away their hankies: Thanks to The Flecto Company, Inc., the popular Danish Oil Finish is back. According to Flecto Assistant Marketing Manager Rebecca Merz, Flecto has purchased "an exclusive license to manufacture and market all WATCO products."

WATCO, previously distributed by Minwax, was off the market for only about six weeks. As of this writing, WATCO Danish Oil Finish has already started shipping to retailers nationwide. Next to return is WATCO Satin

Finishing Wax, due to ship July 1. Beyond these two, Merz says, Flecto is still in the process of deciding which WATCO products to bring back next.

The Flecto Company, Inc. also manufactures the VARATHANE line of finishes and stains. But the company's recent advertisements assure that Flecto will stick to WATCO's original 67-year-old Danish Oil formula. If you're a business interested in carrying the reborn WATCO line, call Flecto customer service at: (800) 635-3286.

\$5,000 DELTA DREAM SHOP WINNER



Mr. John Trembelas of McLean, VA, is the 1994 winner of the \$5,000 Delta Dream Workshop prize sponsored jointly by Delta International Tool Co. and AMERICAN WOODWORKER. Trembelas will choose \$5,000 worth of Delta tools and accessories for his shop.

GUILD HITS GOLD WITH ANNUAL EXPO

The Northeastern Woodworkers Association of upstate New York has again proven that people working together can make a difference. In March, the group staged its fourth annual Woodworking EXPO at the Saratoga Springs Civic Center, to the delight of almost 6,000 attendees. The show's biggest attraction was the woodworking competition, which included 525 pieces by 81 local artisans.

For two days, the 22,000-sq.-ft. exhibition hall was filled with the sights, sounds and smells of wood as craftsmen demonstrated their specialties and vendors displayed their woodworking wares.



Something for everyone. The fourth annual Woodworking EXPO in Saratoga Springs, NY was a rousing success.

There was also a "Distinguished Woodworkers Gallery" featuring works by George Nakashima, Sam Maloof, Bob Stocksdale and others—including "60 Minutes" star Andy Rooney,

who was spotted among the show-goers.

AW was well represented at the show. Contributing editor Mike Dunbar carved Windsor chair seats, while Michael Dresdner answered finishing

questions. Executive editor Ellis Valentine helped to judge the competition.

For information about Woodworking EXPO 96, call Herman Finkbeiner at (518) 371-9145.

BID FROM HOME ON ANTIQUE TOOLS

Hand-tool buffs won't want to miss the International Tool Auction, held by Tool Shop Auctions on July 28 at The Limes Hotel in Needham Market, Suffolk, England. And it doesn't matter if you're a jet-setter or a couch potato: You can place your bids by

mail. More than 1,000 lots will be auctioned, including four extremely rare 18th-century Granford hollowing and rounding planes.

"The hollows and rounds are singularly the most important find of 18th-century English planes in recent years," says Gail Parker of

Tool Shop Auctions. Virtually unused, they are among fewer than a dozen planes that still bear the legible mark of the Granford planemaking family. Thomas Granford is considered to be the earliest recorded commercial planemaker in England. He produced tools from 1654 to 1687. His son and grandson, also named Thomas, ran the family business until 1713. The four hollows and rounds are thought to be the work of the second Granford generation. They are expected to sell for between \$3,000 and \$6,000 apiece.

Many other tools are up for sale—and not all are this expensive. Catalogs are available for \$20. Make checks payable to Tool Shop Auctions, and send to: 78 High St., Needham Market, Suffolk, England IP6 8AW.



Rare rounds. Four extremely rare hollow and round planes by Thomas Granford will be auctioned July 28.

Jim's Corner

Offbeat Answers to Common Woodworking Questions



Q: What's considered the most useful hand tool?

A: Undoubtedly it's the cordless drill, with the router a close second.

Q: No, seriously. Isn't there still an indispensable hand tool or two?

A: A ruler is good. A pencil.

Jim Cummins is a contributing editor to AW.

TECH TIPS

BEST TIP WINS \$200

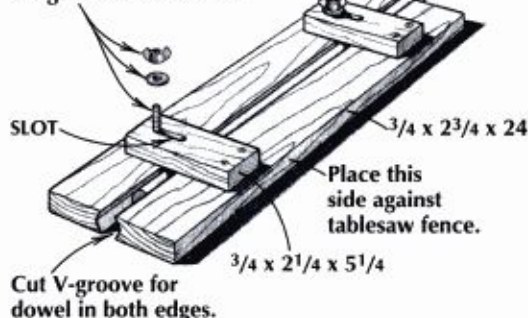
Know a better way of doing something? Designed a clever jig? Send your original woodworking tips, along with a sketch or a snapshot to: "Tech Tips," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. We'll pay \$50 for each tip we publish and \$200 for the best tip of the issue.

Dowel-Grooving Jig

One of my recent projects required sawing longitudinal slots in dowel rod. Rather than attempting this free-hand on my tablesaw, I made a jig that's guided by the rip fence. Adapt the dimensions shown in the sketch to hold the size of dowel you want to slot.

Mark Stryker
Jersey Shore, PA

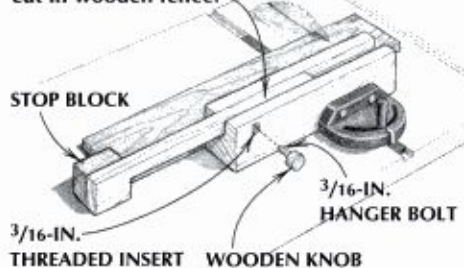
Use counterbored carriage bolts with wing nuts and washers.



Retractable Stop Block

I made this sliding stop block for my tablesaw miter gauge. It's a great convenience when you have to crosscut a number of pieces to the same length.

Hardwood arm slides in groove cut in wooden fence.



The adjustable arm is easily detached when not needed. To lock it in position, use the shop-made knob, which turns a hanger bolt in a threaded insert.

William Brown
Watertown, NY

Dowel-Rod Curves

When trying to trace a compound curved line I've found that a piece of dowel rod—1/8 in. or 1/4 in. dia.—works better than square-edged stock. If the curve is uniform, pull the two ends of the dowel together with string until you have the right curvature.

K. Kelzer
Freeland, WA

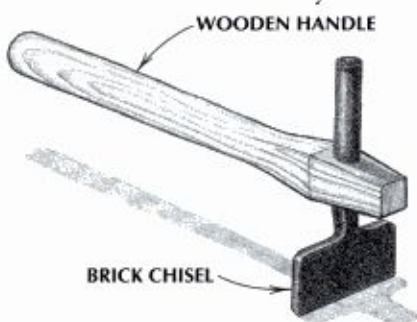
Sharpening on the Run

Instead of lugging sharpening stones from job to job, try 360- and 600-grit wet-or-dry silicon carbide paper. Lay the abrasive paper on plate glass or another flat surface and hone your tools using oil, water or kerosene as a lubricant. Wrap a strip of abrasive paper around a dowel, and you have a slip-stone for honing gouges.

Howard Ires
Danbury, CT

Veneer Hammer

I doubt that the folks who turn out brick chisels know that they make excellent veneer hammers. Cut yourself a

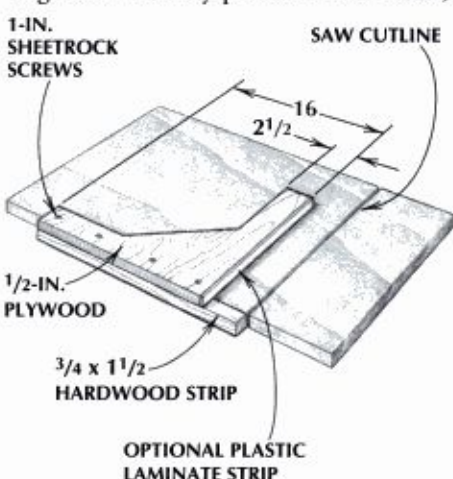


wooden handle and drill a hole in one end as shown. After rounding and smoothing the sharp edge of the chisel, glue it into the handle with epoxy.

Michael Burton
Ogden, UT

Sawing Square

Though I don't have a radial-arm saw or tablesaw, I can still make precise right-angle cuts with my portable circular saw,

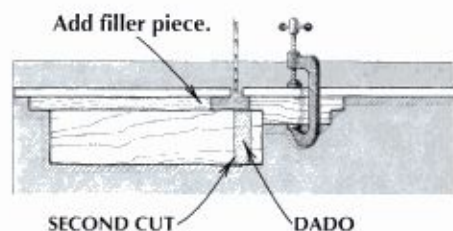
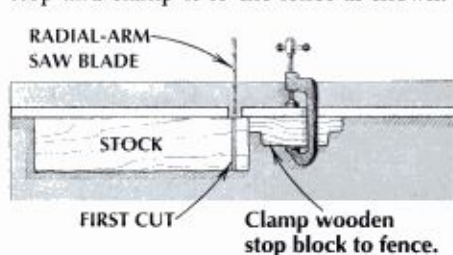


thanks to this T-square jig. For smoother operation, glue a piece of plastic laminate to the sliding edge.

Tony Kosykoski
Belle Vernon, PA

Dead-On Dadoes

To make accurate dado cuts using my radial-arm saw, I first make a wooden stop and clamp it to the fence as shown.

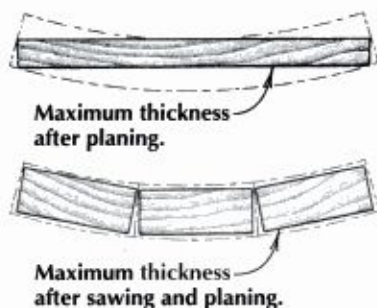


After making the first cut, I slip a filler piece behind the stock, slide it to the right and make the second cut. I remove the waste between the cuts by running the blade back and forth a few times.

David Botelho
Hawthorne, CA

Coping With Warp

Trying to get my money's worth out of some badly cupped boards was frustrating. I'd paid for 5/4 stock, but it



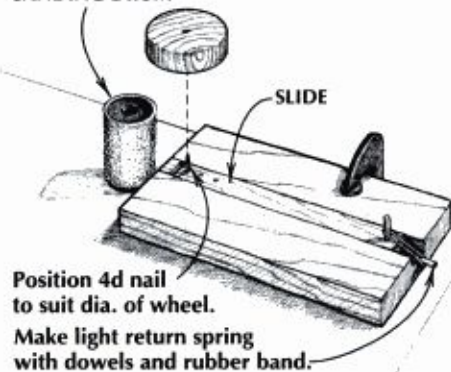
looked like I'd be lucky to end up with 5/8 finished. Rather than waste all that wood, I ripped my boards into three strips, jointed the edges, glued them back together and got the thickness that I needed.

Bill White
Williston, VT

Sanding Small Wheels

To make small wheels for toys etc., I cut them out on the bandsaw and then sand them in the jig shown. The wheel spins

SANDING DRUM



around the 4d nail as soon as it touches the sanding drum. I brake the wheel with my hand while gently pushing forward against the drum. The rubber band acts as a light return spring.

Mugs Storrow
Wallace, ID

Microwave Wood Bending

To steam short pieces of wood, I soak them in the bathtub and then stick them in a microwave oven. I take the pliable wood straight from the microwave and clamp it to the bending form. Then I let the part cool. Take care not to leave the

wood in too long, or it will dry out and become brittle. It's best to experiment on some scrap stock to get a feel for the best timing and power level.

Bruce Winterbon
Ontario, Canada

Upgrade Your Scroll Saw

Jigsaw blades only oscillate about 3/4 in., so all the cutting is done by the teeth in the blade's midsection. By raising the

Slide new plywood table
over original metal one.

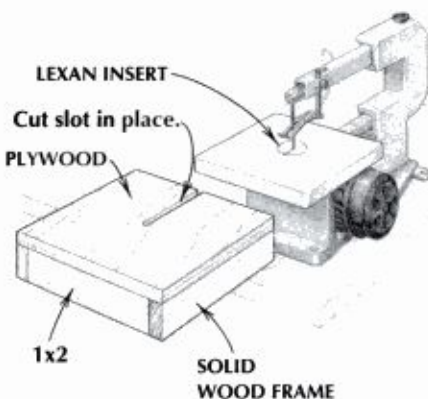


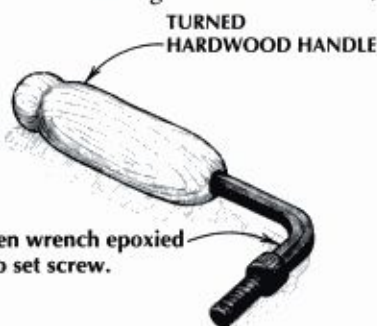
table with a piece of 3/4-in. plywood you can double the life of the blade.

I've also found that the metal table insert disc supplied has too large a slot for close work. I've replaced it with Lexan polycarbonate, using the jigsaw blade itself to cut the slot.

Jay Wallace
Ashland, OR

Allen-Wrench Handles

It's often impossible to get replacement handles when you're adjusting out-of-date woodworking machines. Instead, I

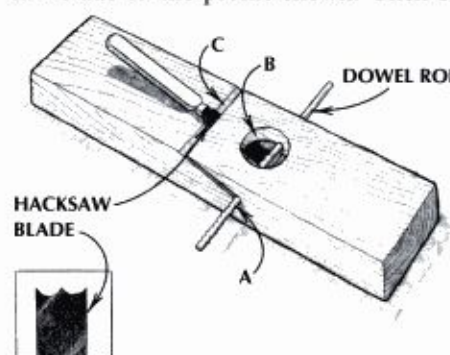


epoxy an Allen wrench permanently to the set screw and then turn a hardwood handle to fit it.

Lyle Terrel
New Orleans, LA

Steadyrest & Bearer

I devised this jig to make bead turnings on the lathe. I ground the end of a hacksaw blade to the profile shown. Then I



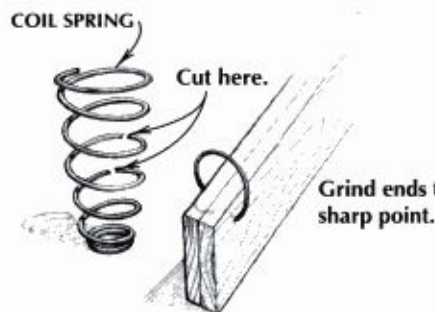
drilled two holes, A and B, in a piece of hardwood. Hole A is the diameter of the dowel blank; hole B is for the waste.

To use the jig, set one end on the lathe tool rest, then slip the cutter down into the bandsaw cut, C, to cut the first two beads. Use one of these to index the cutter for the next bead.

Robert Tupper
Canton, SD

Spring Clamps

To clamp small pieces of wood, I use spring clips that I make from the steel



coil springs found in innerspring mattresses. I cut out a nearly complete circle, then grind both ends to sharp points.

William Semple
North Brunswick, NJ

Round the Bend

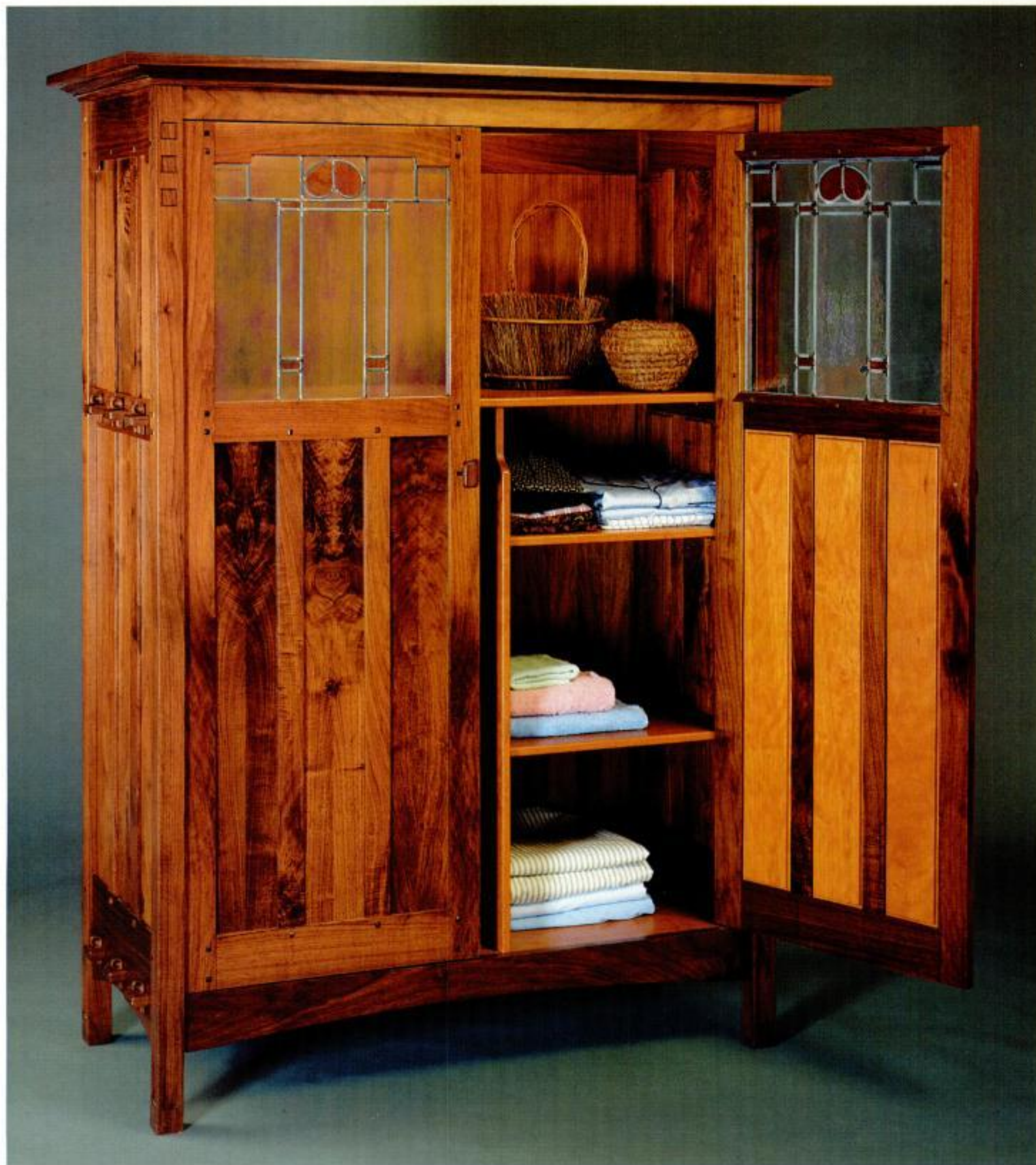
Sometimes when I'm making lamps I have to make a tight bend in a copper tube without collapsing the walls. So I wrap the pipe tightly with solder at the bend. This works best with solid solder—not resin-cored. When the job is done, just wind the solder back onto the reel.

Howard Moody
Upper Jay, NY

Arts & Crafts Armoire

Knockdown Construction Is the Key to this Elegant Cabinet

by Jeffry Lohr



“Real Arts & Crafts-style furniture is made by thoughtful individuals, not some computer-controlled machine...”

One of my art teachers once told me, “The originality of your design is directly proportional to the obscurity of your sources.” He was alluding to the fact that few designs are truly original. Since then, I have preferred to think of myself not as a designer but as a discriminating editor of some of the good designs that have preceded me. All I’ve added are my intimate familiarity with wood, several of my own ideas, and good manipulative tool skills.

In this walnut armoire, I combined elements from Arts & Crafts-style designers Greene and Greene (see AW #45), Charles Rennie Mackintosh and the Roycrofters. (See For More Information, page 31.)

Since I planned to exhibit this particular armoire at juried craft shows, I configured it as a lighted display cabinet, with leaded-glass door panels for maximum visual effect. If you want to use it as a full-height armoire, you might want to consider wooden door panels instead of leaded glass. This design flexibility is in keeping with the spirit of the Arts & Crafts tradition.

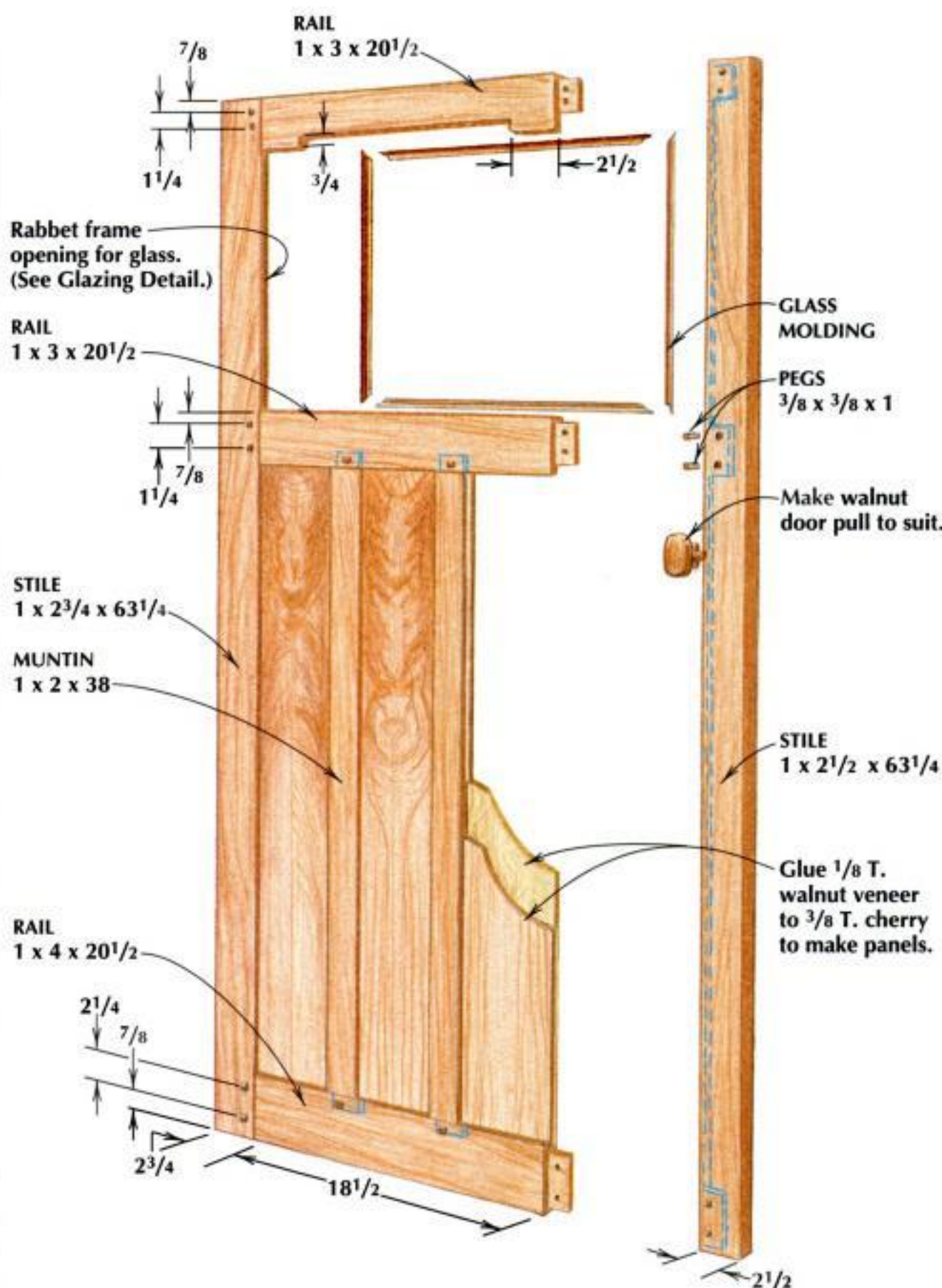
To make the piece portable and easy for one person to assemble, I used a knockdown construction technique common in 19th-century French armoires. Knockdown joinery is essential for successful large-scale furniture design. Without it, the sheer weight and size of a piece like this would make it impossible to move.

First Things First

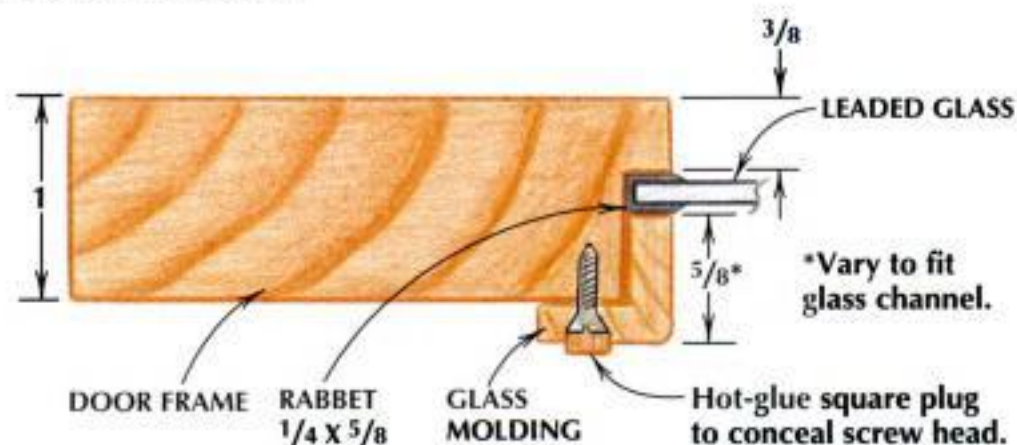
Most cabinetmakers construct the carcass of a case piece first and then make doors to fit. Here I did the reverse: I began with the bookmatched door panels to take full advantage of some extraordinary figured walnut from my

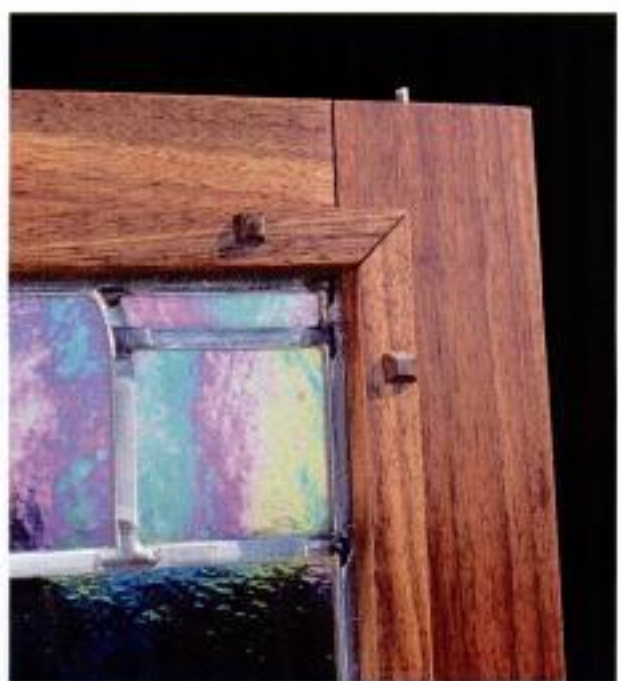
Rich detailing. Figured walnut panels, pegged tenons and leaded glass add to this exquisite armoire’s turn-of-the-century charm.

FIG. 1: DOOR CONSTRUCTION



GLAZING DETAIL





Glazing detail. Wooden plugs, held in place with hot-melt adhesive, conceal the screw heads on these L-profile glass moldings.

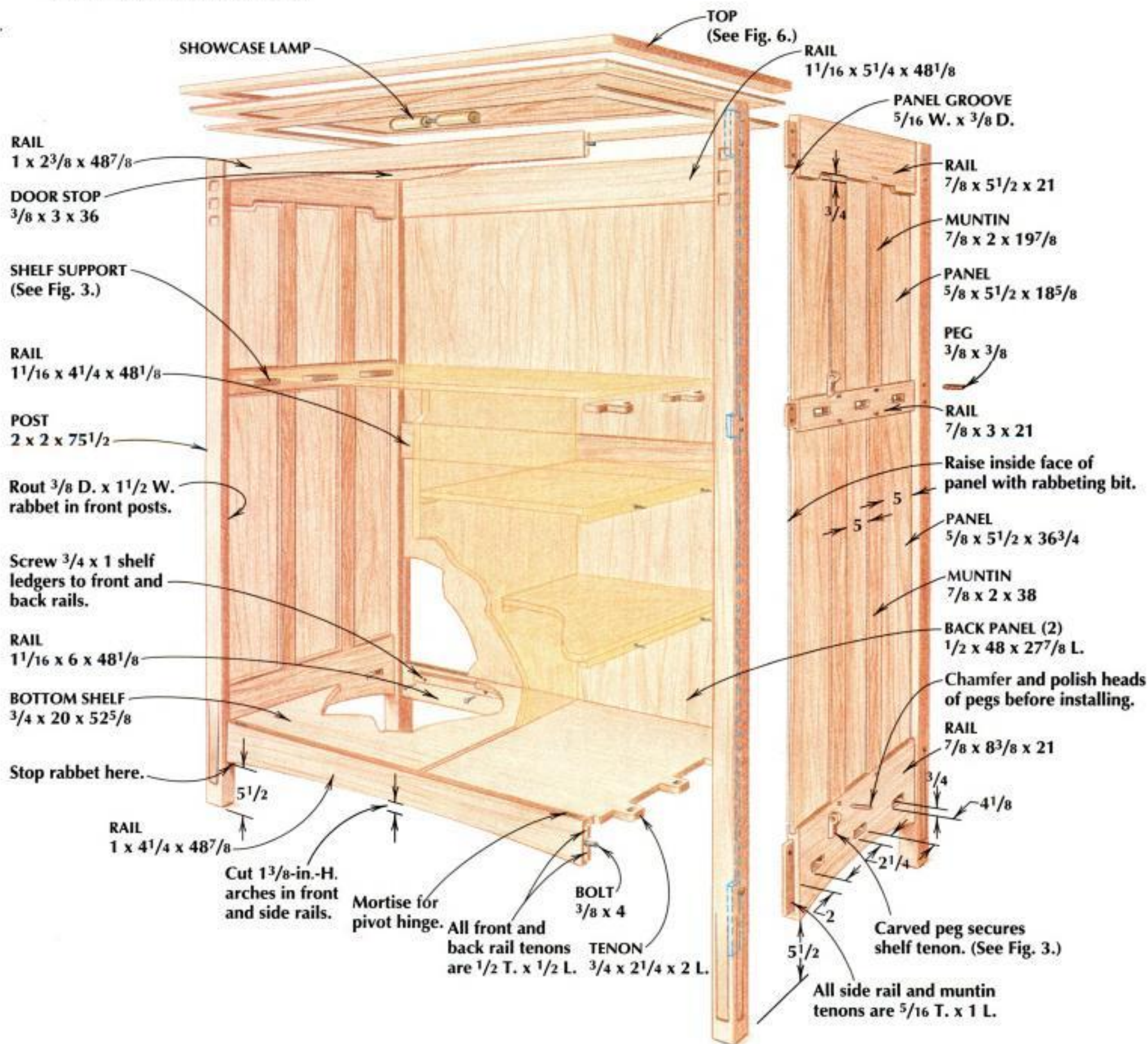
out-of-the-ordinary lumber inventory. This kind of sensitivity to materials is part of what the Arts & Crafts movement was about.

I believe that panels should be natural works of art framed by structural members. Accordingly, if I have to change the dimensions of my stiles and rails slightly to accommodate a particularly beautiful panel, so be it. If this makes

the frame appear out of proportion, I might add or subtract a panel instead. You have to be creative and make your own judgment calls.

This material-centered design philosophy which I've embraced is even more apropos today than it was more than 100 years ago, when it was conceived as a rebellion against the human and environmental degradation caused by industrialization. Real Arts & Crafts-style furniture is made by thoughtful individuals, not some computer-controlled machine that doesn't know whether it's cutting flakeboard or finely figured hardwood.

FIG. 2: ARMOIRE



Making the Doors

I made the door panels with book-matched crotch-grain walnut on the outside and cherry on the inside to give a surprise rush of color when you open the doors. (See lead photo.) I began by facing and jointing a few squared-up blanks of fancy walnut and then resawing them into $\frac{1}{8}$ -in.-thick veneers on my bandsaw. After taping the book-matches together with masking tape, I laminated them to $\frac{3}{8}$ -in.-thick cherry panels with plastic resin glue in a home-made veneer press. (See AW #40 and #42.) If you don't have a press or a fancy vacuum air-bag contraption, you

can press your panels between two pieces of particleboard weighted down with cinder blocks, drywall buckets filled with water, or anything else with a little heft to it.

Next, I made the door frame members, being careful to use straight-grained stock so these large doors wouldn't warp or twist in use. I joined each door frame with mortises and tenons and pegged the tenons with square pegs. (See Fig. 1.) Hot hide glue is my usual choice for any type of joinery that might require disassembly at some time. Hide glue sets quickly, cleans up easily, and can be taken apart with heat or steam.

The upper panels of my doors showcase the leaded-glass craftsmanship of fellow artisan Dick Giles, of South Mountain Stained Glass in Sinking Spring, PA. I set the glass panels into rabbets in the upper part of the frame and held them in place with L-profile moldings screwed to the door frame. (See Glazing Detail, Fig. 1.) I concealed the screw heads with wooden plugs, which I glued into the counterbores with hot-melt adhesive so they'd be easy to remove if I ever had to replace the glass. (See photo, opposite page.)

Making the Carcase

Once I completed the doors, I moved on to the carcase, which consists of two side assemblies joined by knockdown rails in the front and back. (See Fig. 2.) The detachable top assembly completes the carcase. (See Fig. 6.)

I constructed the frame-and-panel sides with pegged mortise-and-tenon joints like the doors, but this time I made the frames first. I began by dimensioning stock for the posts and rails.

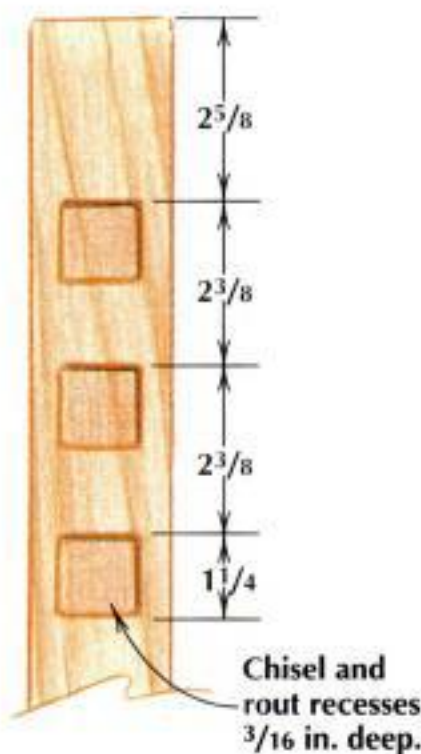


Routing tapered recesses. Lohr routs the recessed foot details on the posts using a wedged template to create the taper.

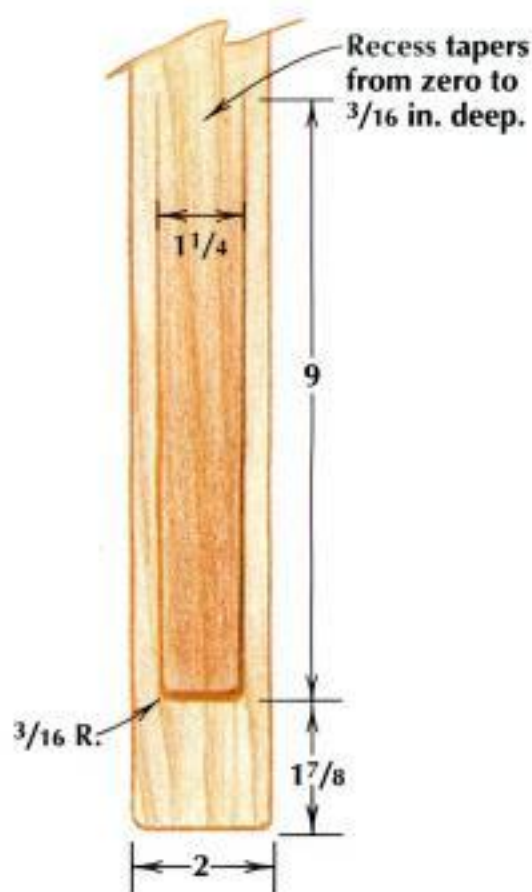
When roughing out the middle and lower rails, I added $\frac{1}{4}$ in. (the width of two saw kerfs) to the width of each rail blank. That way, I could create the rectangular slots for the Roycroft-style tusk tenons which protrude through these rails by ripping a $\frac{3}{4}$ -in.-wide strip out of each rail blank as shown in Fig. 2. I cut out the sections of the strips where I wanted the rectangular slots, then I carefully aligned the parts and glued the rails back together.

Before mortising the posts, I stop-rabbeted the front posts for the doors and front rails as shown in Fig. 2. Then I cut the mortises. Note that the mortises in the legs for the front and back rails are $\frac{1}{2}$ in. wide and $\frac{1}{2}$ in. deep, while those for the side rails are $\frac{5}{16}$ in. wide and 1 in. deep. After mortising, I cut the tenons on all the rails to fit the mortises.

POST DETAILS TOP

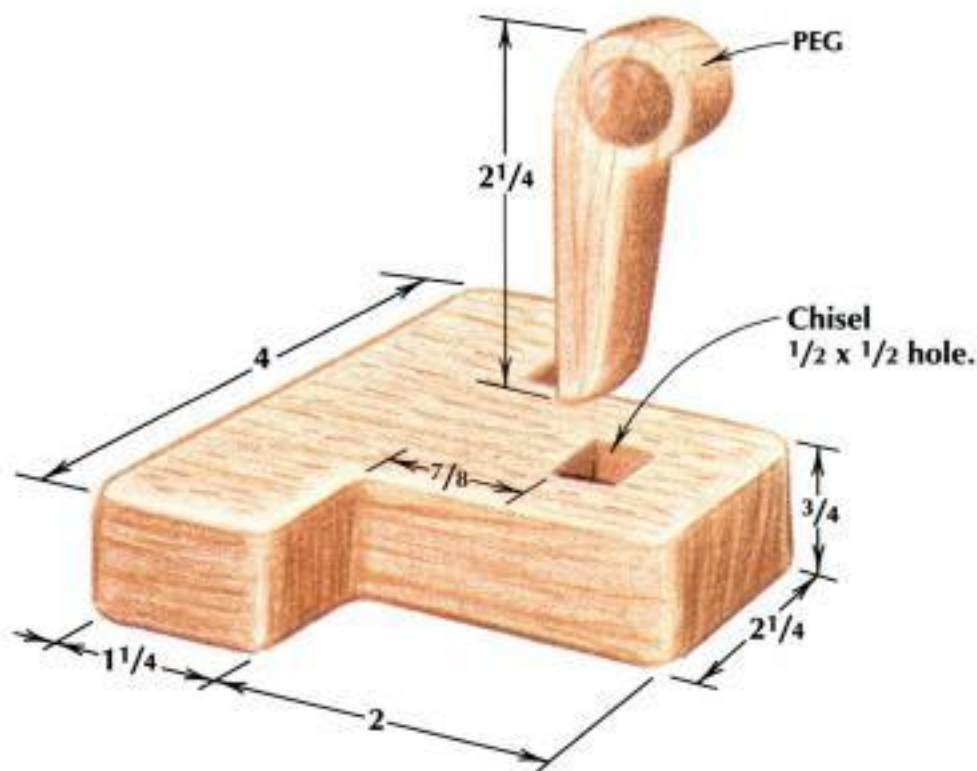


BOTTOM



Boring the bolt holes. The author's \$23 shop-made boring jig makes short work of drilling bolt holes in the ends of the front and back rails.

FIG. 3: SHELF SUPPORT



Shelf support option. Tusk-tenoned shelf brackets may be used to support a removable shelf.

Next, I bandsawed the shapes on the rails. (See Fig. 2.) The top side rails have a $\frac{3}{4}$ -in. lift detail, and the front and side lower rails each have a $1\frac{3}{8}$ -in. arc sawn in their lower edges. I also made the center muntins and cut mortises and tenons to join them to the rails. Then I grooved all the frame members with a $\frac{5}{16}$ -in. slotting cutter in a router, and I made panels to fit the grooves, allowing $\frac{1}{8}$ in. of expansion room on both sides of each panel. I raised the inside faces of the panels with a rabbeting bit to leave $\frac{1}{4}$ -in. reveals all around between the frames and the fields of the panels.

The final step before gluing up the side assemblies was to cut the details in the posts. To make the square recesses on the fronts of the posts (see Fig. 2), I knifed the outlines of the squares and

chopped on my knife marks with a chisel. Then I cleaned out the waste with a straight bit in a laminate trimmer and finished by scraping the bottoms of the recesses with my chisel.

I routed the tapered recesses at the foot of each post using a router template and bushing. To produce the taper, I wedged my template to the correct angle with tapered shims. (See top photo, page 29.)

Once I'd detailed the posts, I glued up the side assemblies with hot hide glue. Then I sanded the rails and muntins flush and cut the mortises in the rails and posts for the $\frac{3}{8}$ -in. square pegs that secure the tenons. To do this, I first drilled $\frac{5}{16}$ -in. holes at the peg locations with a brad-point bit. Then I chiseled them to $\frac{3}{8}$ -in. squares with an old hollow mortising chisel and a wooden

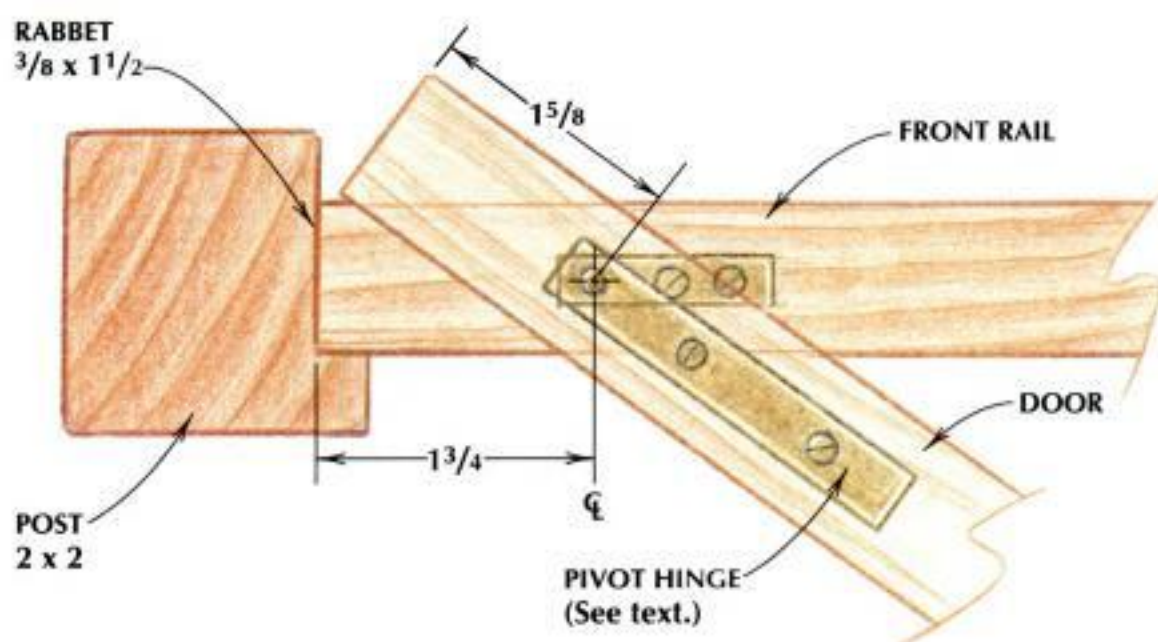
mallet. Before you try this on your own project, practice on some scrapwood, or you're liable to butcher your finished piece. Also, to save aggravation later, chamfer and polish the exposed ends of your pegs before you glue them in.

I won't lie to you—the square peg fastenings are tedious work. I personally find the visual effect worth the effort, but you may want to make your piece without them.

Knockdown Joinery

The structural integrity of the knock-down joints is largely dependent on the mortises and tenons. (See Fig. 2.) Though shallow, they bear the weight that is transmitted to the rails by the shelving, and their shoulders keep the piece square and rigid. Allen-head bolts

FIG. 4: DOOR HINGE DETAIL



Low-profile hinges. These tiny pivot hinges are almost completely concealed when the door is in place.



Putting it together. To assemble the knockdown rail joint, insert the tenon into the mortise and tighten the bolt.

connect the rails to threaded inserts in the bottoms of the mortises; they merely hold the tenons in place and pull the shoulders tight. (See photos, above.)

I drilled the holes for the threaded inserts in the bottoms of the mortises and the mating bolt holes in the ends of the rails with a shop-made horizontal boring machine (see bottom photo, page 29), but a hand drill would also work.

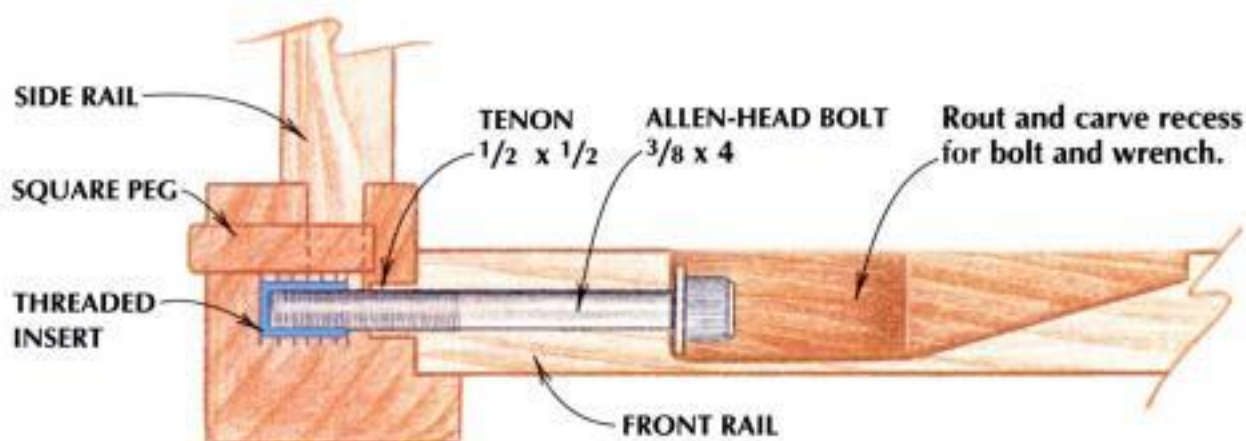
My horizontal boring machine is nothing more than an old electric drill permanently rigged in a horizontal position to a piece of plywood that's connected to another piece of plywood by two Accuride drawer slides. I secure my workpiece to this second piece of plywood and slide the work into the spinning drill bit. It sounds crude, but it cuts the mustard; and all it cost was \$23 worth of drawer slides, an old electric drill, and a few enjoyable hours constructing it.

After drilling the holes, I routed and carved recesses in the rails (see Fig. 5) so I could insert the bolts and tighten them with an Allen wrench.

Making the Top

The top of the carcase is built in three layers. (See Fig. 6.) I secured it to the cabinet with screws driven through the two lower layers and into the top edges of the front and side rails. I wanted to devise a more elegant way to secure the top to the carcase and square up the piece, but by this time I was running short on cash and had to get back to my regular paying commissions.

FIG. 5: SECTION THROUGH KNOCKDOWN JOINT



Knockdown cabinet back. Removable rails connect cabinet sides and hold plywood back panels in place.

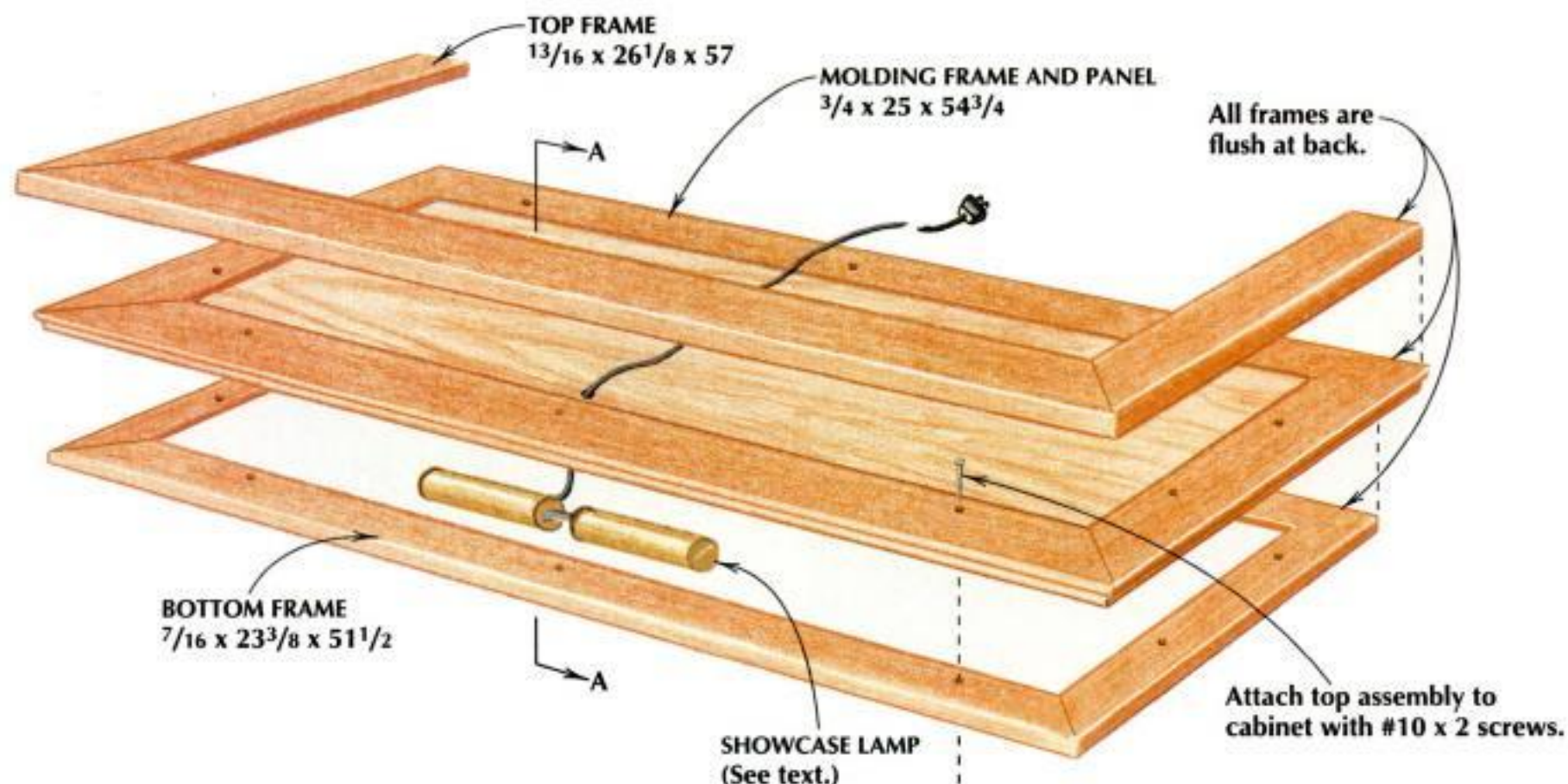
FOR MORE INFORMATION

To find out more about Arts & Crafts furniture, see the following books:

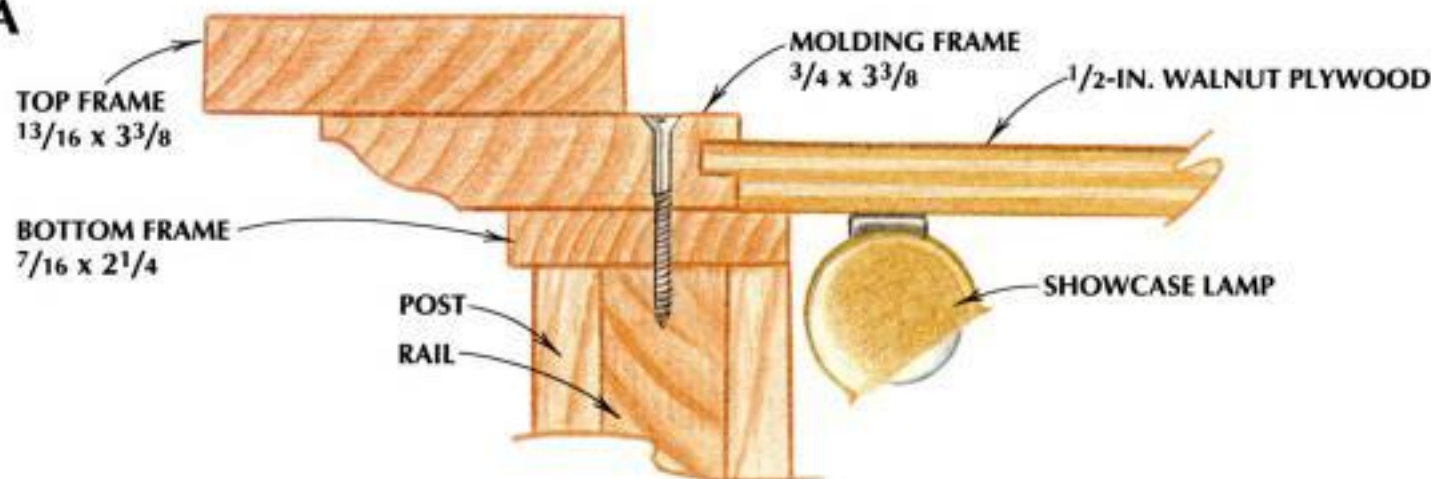
Treasures of the American Arts & Crafts Movement 1890-1920
by Tod Volpe and Beth Cathers
1988, Harry N. Abrams Inc.
100 Fifth Ave.
New York, NY 10011
(800) 345-1359

American Arts and Crafts: Virtue in Design
by Leslie G. Bowman
1992, Bulfinch Press
34 Beacon St.
Boston, MA 02108
(617) 248-2743

FIG. 6: TOP ASSEMBLY



SECTION A - A



Since this cabinet has glass door panels, I decided to light the interior. I installed a double showcase lamp (available from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, MN 55374, 800-279-4441) on the underside of the top.

Hanging the Doors

I try to avoid using metal hardware on my pieces, and when I do use it, I like it to be out of sight. So, for this piece, I decided to use pivot hinges (available from Häfele America Co., 3901 Cheyenne Dr., Archdale, NC 27263, 800-334-1873) and handmade wooden pulls on the armoire doors. I positioned the hinges so the edges of the doors would hide behind the rabbets in the posts when closed. (See Fig. 4.)

Once the hinges are installed, hanging the doors is easy. I just lift the door so the top hinge pin slips into its socket in the top rail, then I swing the bottom end of the door onto the bottom pivot

hinge (see bottom photo, page 30) and install the two screws that hold the hinge to the door.

The doors are held closed by thin wooden wedges glued to the bottom of each door. When you close the door, the wedge ramps up onto the front rail and holds the door closed by friction.

Interior Options

Roycroft-style cabinets often sported long tenons on the interior shelves that protruded through rectangular slots in the side rails. (See Fig. 2.) On this cabinet, I wanted to be able to change the shelf arrangement to meet the requirements of a potential customer, so instead of cutting integral tenons on the shelves themselves I made temporary shelves that rest on tusk-tenoned shelf supports. Fig. 2 shows these supports under the top shelf and integral tenons on the bottom shelf. Hand-carved pins hold the supports in place. (See Fig. 3.)

You may have other uses in mind for a cabinet like this. Traditional armoires often had drawers and a full-height section for hanging clothes. The cabinet would also work as an entertainment unit if you don't mind the fact that the doors open only about 120°. Fit out the interior to suit your needs.

I finished the armoire with five or six wiped-on coats of Waterlox "Transparent" (available at paint stores or by mail from Rudy's, 4086 E. 71st St., Cleveland, OH 44105, 800-248-7839). Oil finishes such as this are great for bringing out the depth of beautifully figured wood. ▲

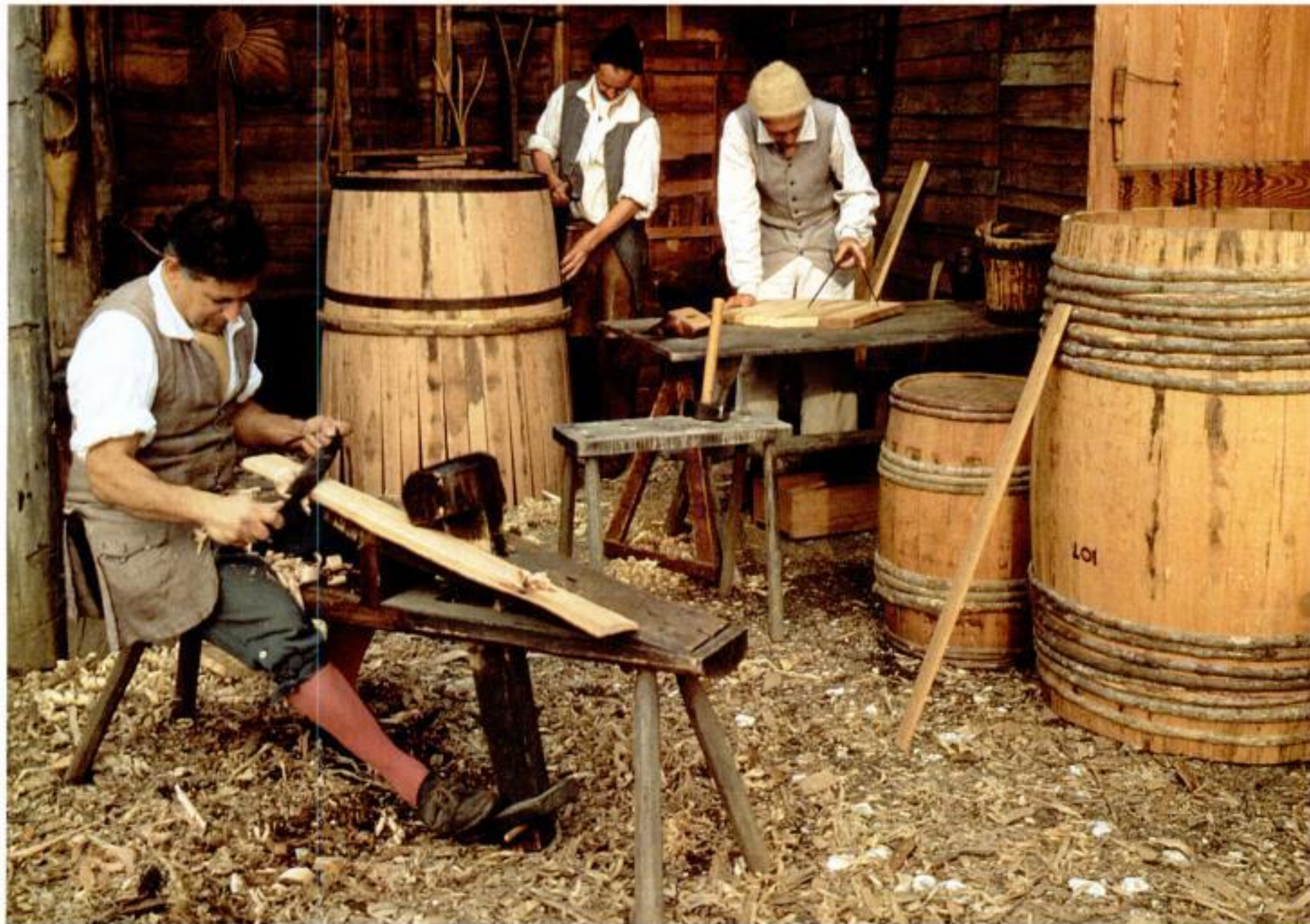


JEFFERY LOHR
has a custom
woodworking business
in southeastern
Pennsylvania.

Working Wood in 18th-Century America

Colonial Williamsburg Exhibit Celebrates Our Hand-Tool Heritage

by Paul Anthony



Keeping the past alive. Colonial Williamsburg is a "living museum" of Early Americana. You can step back in time with artisans like the coopers shown above, as they demonstrate tools and techniques from the 18th century.

"Man is a tool-using animal. Without tools he is nothing—with tools he is all." When poet Robert Browning wrote those words in the 19th century, he spoke to the hearts of craftsmen everywhere. Tools give us the means to explore our creativity and shape our world. As woodworkers, we tend to revere those old saws, chisels and planes that have worked their way down through time, passing from one generation of woodworkers to the next.

Now, in one of the largest and most comprehensive exhibits of early tools ever assembled, Colonial Williamsburg offers a visual feast for woodworking tool aficionados. The exhibit, "Tools: Working Wood in Eighteenth-Century America," showcases more than 1,500 authentic 18th-century and early 19th-century woodworking tools and related objects. Many of these pieces are owned by The Colonial Williamsburg Foundation, and hundreds more have been borrowed from museums and private collections for this show.

But the 2,400-square-ft. exhibition is not only about tools. The exhibit—which was seven years in the making—also offers a look at products and methods of work from 200 years ago, when hand tools were the primary means of production. Two of the most informative highlights are videotapes, in which craftsmen dressed in 18th-century garb actually use the tools and discuss their importance in the craftsman's life and livelihood.

WILLIAMSBURG TOOL EXHIBIT

Duncan Phyfe's tool chest. ▶ The exhibition features a number of tool chests complete with contents. Some craftsmen, such as the renowned 19th-century cabinetmaker Duncan Phyfe, used their tool chests to display their skills to prospective clients as well as to organize and protect their tools.



Veneering tools. ▲ As veneering gained popularity in the late 17th century, cabinetmakers began using veneer hammers and toothing planes in addition to their glue pots.



Bow drill. ◀ This reciprocal-action drill was used for drilling small holes. The bow string, wrapped tightly around the drum, spun the drill as the bow was pulled back and forth.

Sash planes. ▶

Molding planes were used to create the molding profiles on double-hung sash. The two planes on the left were single-purpose: One cut the rabbet, the other cut the molding profile. The "stick-and-rabbet" planes at right performed both operations at once.



Saw-sharpening tools. ▲ To sharpen their saws, most woodworkers owned various sized files to suit different saw teeth. The teeth were bent, or "set" using saw "wrests" like those shown here.

Chisel evolution. ▶

From the mid-1700s to the mid-1800s, chisel design evolved from gradually flared blades like those of the chisels at left to blades with parallel sides.



Cartwright's tool chest. ▼

Londoner George William Cartwright II brought his chest of tools with him to New York in 1819. Many of the tools were made before his birth in 1785.



Wooden squares. ◀

Woodworkers often made their own squares of wood. The shaping of the blade end, common at the time, was purely decorative.

Many of the tools tell their own stories: Bow drills and plow planes testify to the ingenuity of people to whom horsepower meant horses. Deep furrows worn into a pitsaw handle by the sawyer's fingers speak plainly of his sweat and toil. Ornately crafted planes and marking gauges adorned with brass and ivory tell of a man's affection for his creative implements. Some of the tools lie at the ready in recreated workshop environments, giving visitors a taste of the 18th-century woodworker's everyday life.

The elegance of many of these tools is impressive in that they were designed for function, not aesthetics. Their beauty is only a by-product of their fine balance and careful crafting. Toolmakers of the period were also tool *users* who understood the necessity of a comfortable, well-balanced tool that could be handled for hours at a time.

The remarkable assemblage of tools at Williamsburg provides a fascinating view of the past and leaves the viewer with a deeper understanding not only of woodworking tools, but also of the generations of woodworkers who came before us.

If you're not able to visit Williamsburg in person, you can still enjoy the exhibit through the companion book, *TOOLS: Working Wood in Eighteenth-Century America*, by James Gaynor and Nancy Hagedorn (available for \$19.95 from Colonial Williamsburg, Box 3532, Williamsburg, VA 23187, (800) 446-9240). ▲



PAUL ANTHONY
is an assistant editor of *AW*.



EXHIBIT INFORMATION

"Tools: Working Wood in Eighteenth-Century America" runs through September 4, 1995 at The DeWitt Wallace Decorative Arts Gallery, Colonial Williamsburg, VA. The exhibit features more than 1,500 woodworking hand tools from the 1700s and 1800s.

For more information, call:
(804) 220-7724.

Vacuum Clamping

Using Air Pressure to Hold Your Work

by Patrick Spielman



One-sided clamping. Spielman planes a board held by a pair of right-angle vacuum-clamping fixtures. Suction holds the fixtures to the bench and to the workpiece. The small venturi vacuum pump on the bench is driven by compressed air.

If there is one operation common to most woodworking projects, it's clamping. Hand-planing, routing, sawing, carving and drilling all usually involve the use of vises or clamps to hold the work. Unfortunately, clamps often get in the way of tools. They also won't reach to the centers of wide workpieces, requiring mechanical fasteners to attach jigs or patterns there.

Vacuum clamping offers an alternative. It will secure flat work without mechanical clamps or fasteners. Workpieces are held from one side only, presenting the other side for unobstructed tooling. Vacuum-held jigs and patterns for circle cutting and template routing don't require piercing the workpiece with screws or nails.

In vacuum clamping, you create a shallow vacuum chamber on one or both faces of a flat clamping "plate" by applying foam tape around the perimeter of the face. The plate is placed against another flat surface (a workpiece, workbench, or machine surface) and air is evacuated via a hose from the chamber, anchoring the piece by suction. (See Fig. 1.) You can combine plates to make specialty clamping fixtures, or you can shape the plates to create templates and jigs.

To set up a vacuum-clamping system, you'll need a vacuum pump, clamping plates, foam tape, hose and some simple fittings. You can put together an inexpensive, low-tech system using a scavenged pump and parts from the hard-

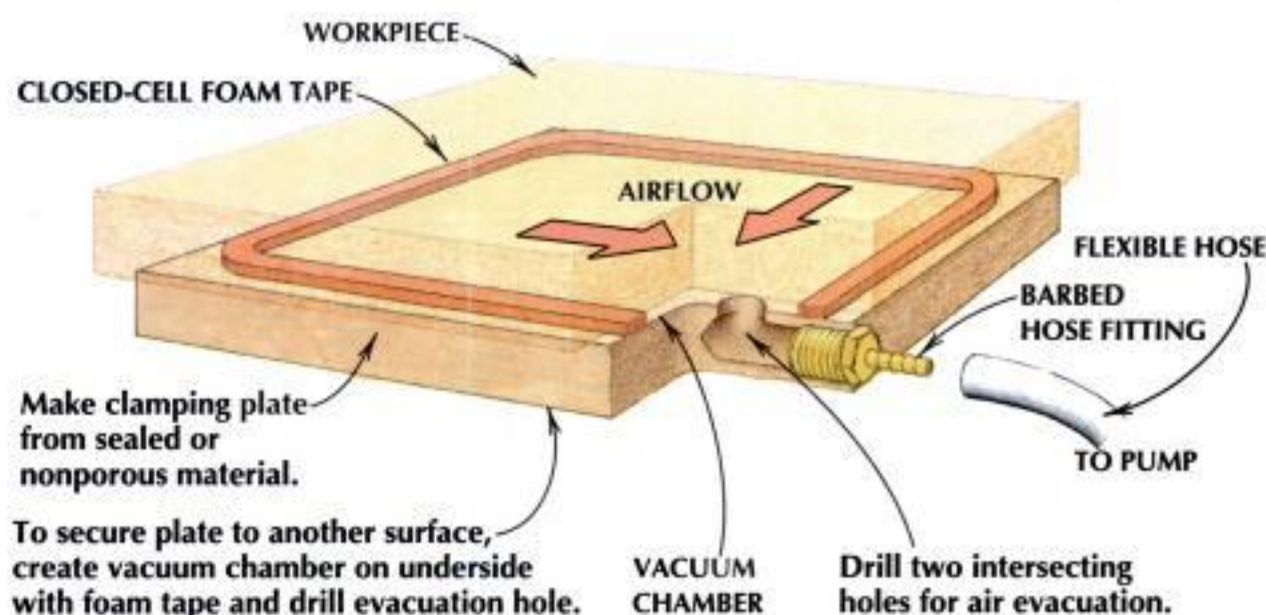
ware store or you can buy a complete commercially made system. (See Sources, page 39.) Either way, once you find out how easy and versatile vacuum clamping is, you'll be inventing new fixtures for all sorts of woodworking operations.

Vacuum Pumps

A variety of vacuum pumps are available but there are two basic types to choose from: electric and venturi. The vacuum flow of both types is rated in cfm (cubic ft. per minute). Most small-shop vacuum-clamping applications will require only 1 or 2 cfm of vacuum flow.

Electric pumps are dedicated vacuum units. (See photo, opposite page.) These can cost upwards of several hundred dollars depending on their cfm rating. They

FIG. 1: HOW VACUUM CLAMPING WORKS



run quietly and generally have higher cfm ratings than venturi pumps. As a cheap alternative, you can use an electric pump scavenged from an old refrigerator or milking machine. (See sidebar, right.)

Venturi pumps are good options if you own an air compressor. (See lead photo, opposite page.) These small pumps work by shooting compressed air past an orifice inside the unit. The vacuum is created as air is sucked through the orifice toward the stream of compressed air, in much the same way as leaves are sucked into the wake of a passing car.

Venturi pumps are available with various features. Vacuum gauges and air regulators let you control and monitor your clamping pressure. Manifolds with multiple vacuum ports provide hookups for more than one hose. Venturi pumps do hiss loudly in use,

but they're less expensive than electric pumps. Depending on features and cfm rating, these units can range from \$28 to hundreds of dollars. Most 1/2-HP compressors will provide the minimum 1 to 2 cfm at 60 to 80 psi (lbs. per square in.) required to operate a venturi pump effectively.

Both electric and venturi pumps will also serve for vacuum veneering, but the 1- to 2-cfm units will take a while to evacuate large bags. If you're planning on vacuum veneering as well as clamping, consider investing in a 5-cfm pump. (See AW #44 for more information on vacuum veneering and pumps.)

Making Clamping Plates and Fixtures

Clamping plates don't have to be large to work well. A 6-in. by 6-in. plate and 1-cfm vacuum flow will provide



Downsizing. To hold small workpieces, tape off a section of a larger clamping plate. The hose at right evacuates the chamber on the underside of the plate. Electric pumps, such as the one shown here, don't require a compressor.

VACUUM FROM SALVAGED PUMPS



Cheap vacuum power. This vacuum pump, salvaged from an old refrigerator, provides adequate suction for many small-shop clamping jobs.

A used refrigerator pump can provide effective vacuum for intermittent clamping jobs such as template routing and assembly work. (See photo, above.) These little units are inexpensive and readily available.

Caution: Don't try to remove a refrigerator pump yourself. Pre-1950 refrigerator pumps can contain sulfur dioxide, and newer refrigerators contain CFCs (chlorofluorocarbons). Both compounds are toxic, and it's illegal to release CFCs into the atmosphere. Buy your pump from a used appliance dealer who can remove it safely and legally.

Another option is an old milking machine. (See photo, below.) Many of these are obsolete and sit unused in the sheds of small dairy farms. They're somewhat inefficient for prolonged use but provide plenty of cfm for clamping large work. —P.S.

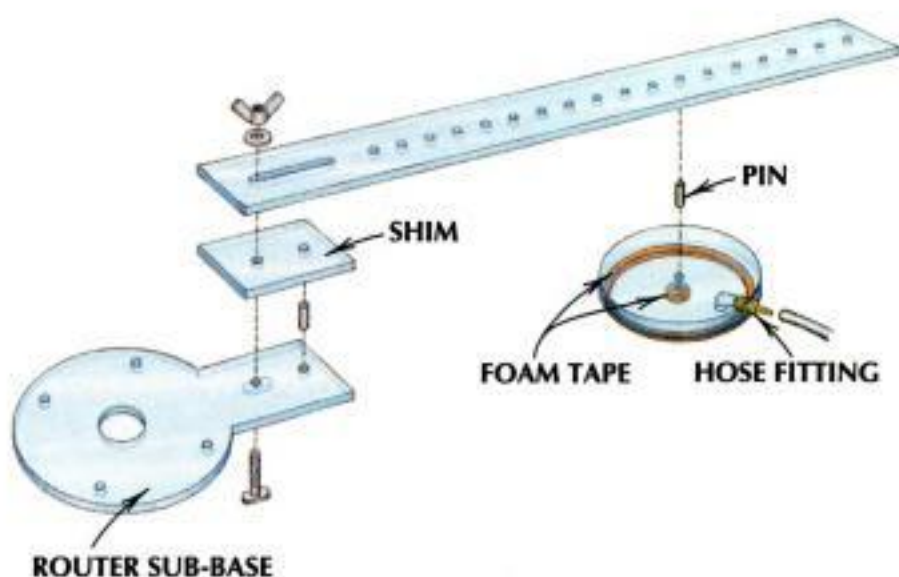


Clamping 'til the cows come home. Milking machines salvaged from dairies provide great vacuum for clamping large workpieces.

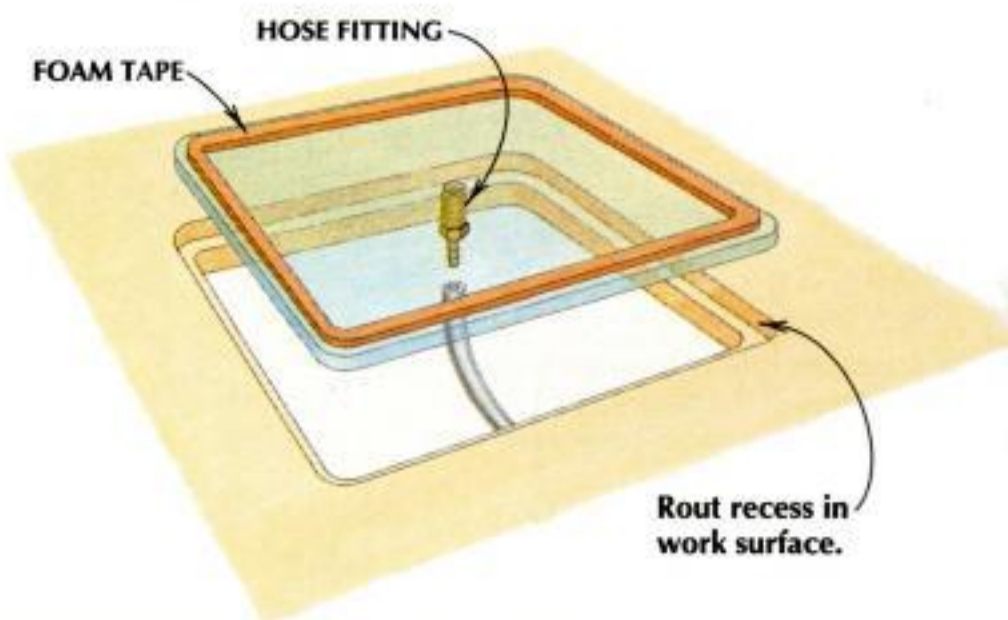
FIG. 2: VACUUM-CLAMPING JIGS

You can make vacuum jigs and templates to suit a multitude of purposes: The applications are limited only to your imagination. Here are a few ideas.

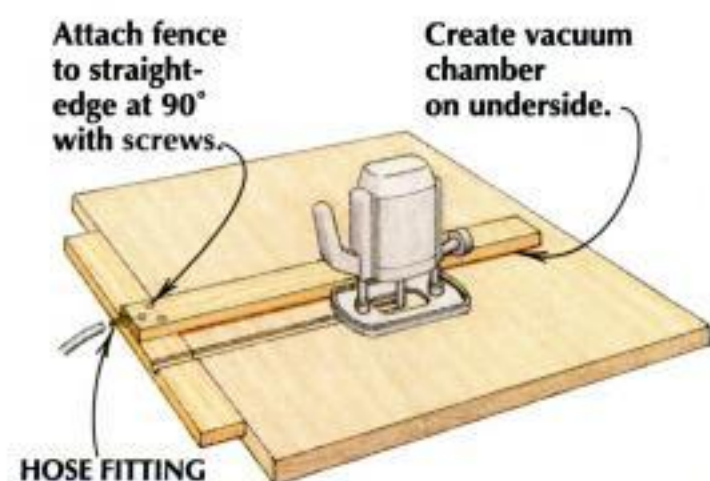
CIRCLE-CUTTING JIG



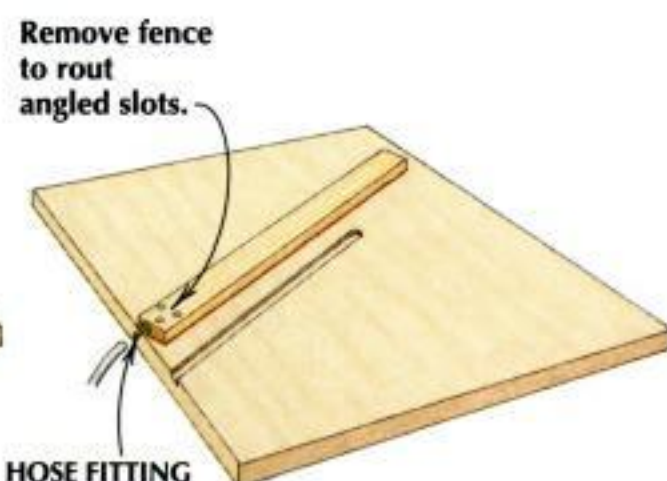
DROP-IN CLAMPING PLATE



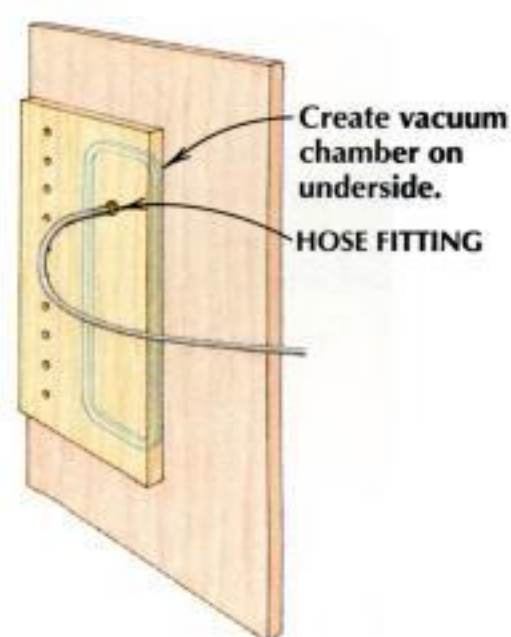
90° STRAIGHTEDGE



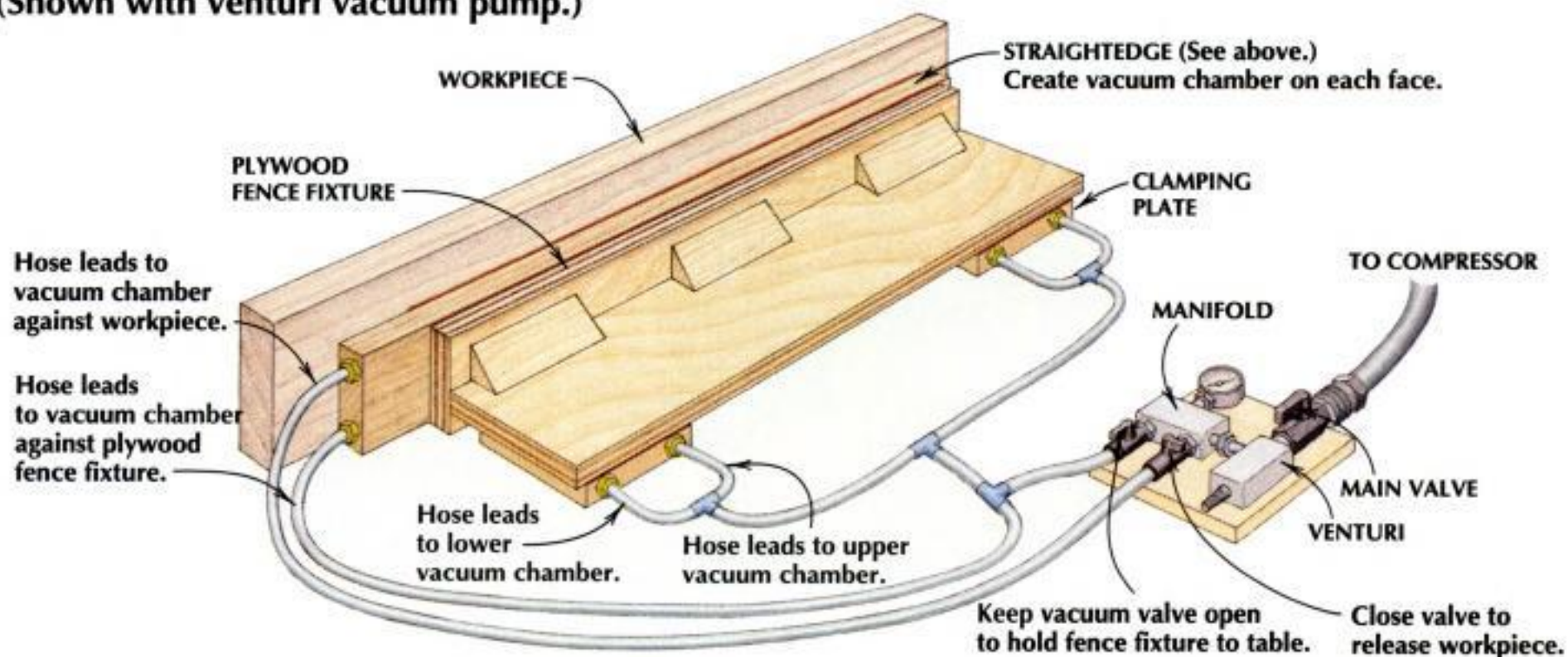
ANGLED STRAIGHTEDGE



SHELF-PIN HOLE-DRILLING JIG



RIGHT-ANGLE CLAMPING FIXTURE (Shown with venturi vacuum pump.)





Easy-on, easy-off. A vacuum template lets you pattern-route with a flush-trim bit without marring your workpiece with fasteners.

adequate suction for many applications. In theory, a perfect vacuum at sea level will allow about 15 psi atmospheric pressure on the workpiece. In practice, however, depending on material porosity, the tightness of your fittings and seals, and your pump's efficiency, you'll probably end up with about half that pressure. That's still about a half-ton of pressure per square ft.—plenty for most woodworking applications.

A couple of small vacuum plates strategically spaced will hold a large workpiece adequately; you don't need a massive plate. To hold small work, you can create a small chamber on a larger plate by sealing off one section with tape. (See photo, page 37.)

Make your clamping plates from any reasonably nonporous, flat material. Panels with a plastic-laminate or impregnated-resin face work well, or you can use sealed, close-grained hardwood or plywood. I prefer plastics such as high-density polyethylene or polycarbonate. Although these materials are relatively expensive, they don't leak air. (See Sources, or check your telephone book for plastic suppliers.)

Drill air evacuation holes in a plate where the hose fittings won't interfere with the work or tool. To evacuate air through the edges of plates, you'll need to drill two holes that meet each other. (See Fig. 1.) The hole placement isn't critical, as long as it reaches inside the chamber.

To create a vacuum chamber, use adhesive-backed, closed-cell foam tape. Weather-stripping tape (available at hardware stores) will work, but it tends to lose its resilience rather quickly. I rec-

ommend the more durable foam tape designed for vacuum clamping. (See Sources.) You can use 1/8-in.-thick foam tape if your clamping plates are fairly small and flat. But if they're large, you may want to use 1/4-in.-thick tape, which bridges warps and irregularities better. Don't use tape thicker than 1/4 in. It allows too much lateral movement between the plate and the workpiece.

Clamping plates with vacuum chambers on both sides can secure workpieces to a bench or tool surface. Place the plate under a workpiece to hold it for planing, sanding or routing. To support workpiece overhang, use shims that equal the thickness of the plates and the compressed tape. If you recess a plate into your router table or benchtop, you won't need support shims or a vacuum chamber on the plate bottom. You can connect plates with metal angles or other hardware to create special-purpose fixtures for jobs such as holding work for edge planing. The fixtures shown in the lead photo on page 36 will clamp work together at right angles for assembly with screws or other mechanical fasteners.

You can shape plates for use as vacuum templates. They're handy for duplicate routing with a flush-trim router bit. (See photo, above.) And you can make jigs for straightedge routing, circle cutting, shelf-hole boring and other applications. (See Fig. 2.)

Hose and Fittings

Any rubber, vinyl or plastic hose will work for vacuum clamping as long as it doesn't collapse under vacuum. I prefer a 1/8-in.-i.d., 1/4-in.-o.d. hose because it matches barbed fittings and push-pull connectors. Push-pull connectors let you switch fixtures easily. (See Sources.)

Fittings are relatively inexpensive, and many different types are available at hardware and auto supply stores or from mail-order suppliers. Basically, anything that provides an airtight seal between the vacuum chamber and the hose is satisfactory. I like fittings that have barbs on one end to slide inside a hose and threads on the other end to screw into

undersized holes on the plate. (See Fig. 1.) I've also used metal or rigid plastic tubing for fittings, sealing the tubing into the plate holes with epoxy or silicone. You can buy swivel fittings that prevent hoses from twisting during template routing.

A Word of Caution

The more vacuum clamping you do, the more uses you'll find for it. But there's one potential danger when vacuum clamping. If you lose vacuum when working, you may lose control of your workpiece or tool. Be sure your hoses are out of harm's way during use. ▲



PATRICK SPIELMAN
is a woodworker in Wisconsin. He's written more than 50 woodworking books.

SOURCES

Vacuum-clamping pumps, supplies and complete systems are available from:

CMT

(800) 531-5559 Circle #606

Gougeon Bros. Inc.

(517) 684-7286 Circle #607

Mercury Vacuum Presses

(800) 995-4506 Circle #608

Quality VAKuum Products

(800) 547-5484 Circle #609

Vacuum Pressing Systems

(207) 725-0935 Circle #610

Woodcraft

(800) 225-1153 Circle #611

Woodhaven

(800) 344-6657 Circle #612

Woodworker's Supply

(800) 645-9292 Circle #613
Also carries plastics.

Complete systems only are available from:

Rocking R Hardware

(800) 296-3700 Circle #614

Santa Rosa Tool and Supply

(800) 346-0387 Circle #615

The Woodworkers' Store

(800) 279-4441 Circle #626

Heavenly Hardwood

*Exquisitely Figured Wood Is the Rule—Not the Exception—
at Specialty Lumberyards*

by Tim Snyder

It's not difficult for woodworkers to recognize exceptional work. Harmonious proportions and meticulous fit and finish create a striking impression. But take a closer look. It's not just the proportions and the joinery. The wood is also exquisite. Maybe you're looking at the shimmering stripes of tiger maple, or perhaps it's a bookmatched panel of flame birch, or a varnished leg cut from quartersawn oak. The point is clear: The wood makes the masterpiece as much as the joinery and proportions do. Without good wood, even the finest craftsmanship doesn't amount to much.

The search for exceptional wood soon leads experienced woodworkers beyond conventional lumberyards, where hardwood is just a sideline. At these all-purpose outlets, hardwood boards have to compete for space with sheet goods, hardware and framing lumber. The bottom line: Forget about finding the tiger maple or walnut you need for that special project.

The place to go for specialty hardwood is a specialty lumber dealer. These outfits buy their wood while it's still in the log, then closely supervise the sawing, sorting and drying of their lumber. There are specialty wood dealers all over

the country, but they can be difficult to find. Most are small businesses run by people who love good wood as much as their customers do.

You'll find a half-dozen or so specialty dealers among the small display and classified ads in popular woodworking magazines. Or if you happen to be in the vicinity of southeastern Pennsylvania—as we are here at AW—you can benefit from an unusually dense concentration of specialty yards. There are at least five, all within a radius of about 40 miles. Between them, these dealers sold more than 1.5 million bd. ft. of wood last year. And quite a bit of this lumber left



The good stuff. From ash to walnut, specialty wood dealers stock a varied and ever-changing selection of domestic and exotic hardwoods. Above, in the amply filled warehouse at Groff & Hearne Lumber, Rick Hearne (in the cap) and a customer take the measure of a walnut board.

the yard just one or two boards at a time, shipped out on UPS trucks or hand-picked by woodworkers who traveled here from all over.

The specialty lumberyards (see Sources, page 43) I visited do their greatest volume in domestic hardwoods, though some also regularly stock popular tropical imports such as mahogany and rosewood. North American woods available include red and white oak, ash, cherry, maple, butternut, birch, walnut, basswood and hickory, just to name a few. But describing the selection by species alone does a great injustice. Among many species you'll find a stunning variety of grain patterns—what woodworkers call *figure*. Common figure designations include bird's-eye, curly, fiddleback, tiger, flame, and quilted. (See bottom photo.) These "exotic domestics" are treasured by furniture makers, turners and other woodworkers who do one-of-a-kind work.

The Money's in the Wood

Don't expect to find plywood, hardware or tools for sale at these specialty yards. Nor are there fancy showrooms. Instead you'll find racks and stacks of stickered lumber, a forklift to move stuff around, and expert advice (often from the owner or partner) on selecting your boards.

Call or visit a specialty yard and you'll discover that wood description goes far beyond the standard grade designations set by the National Hardwood Lumber Association. At Sandy Pond Hardwoods, for example, the bird's-eye maple is separated into four or five categories. Boards with extremely dense eye figure are put in a "heavy eye" group, and then divided once again based on color.

"Some people like the color variation in maple, while others want it white," explains Pat McDonnell, who runs Sandy Pond Hardwood's Quarryville operation. "We have separate categories for bird's-eye that's white on one side, white on both sides, or colored on both sides."

Beyond figure and color, boards can also be classified by milling specifics. If you're after the wild grain of burl or crotch, here's where to find it. Flitch-matched boards are available, as well as quartersawn stock.

Sam Talarico, proprietor of Talarico Hardwoods, even classifies his oak by texture and the tightness of the grain. "Tight-grained, slow-growth oak is far superior to the oak you'll find at a conventional lumberyard," he contends.



Custom cutting. Albert Bartel, a sawyer at Groff & Hearne, cuts a 5/4 slab of curly cherry with his diesel-powered bandmill. On-site cutting enables lumber dealers to fill custom orders and get the best lumber out of each log.



A log's-worth of lumber. Specialty lumber dealers can cut and sticker a log "in the boule," so that boards hold the same relative position they had before milling. This enables woodworkers to build a project using wood from the same tree—an important consideration when wood grain and color need to match.



Exotic domestics. Among the figured wood shown here are light and dark bird's-eye maple, tiger maple, walnut and cherry.

PHOTOS BY TIM SINTJER

PHOTO BY JOHN HAMEL, WOOD SUPPLIED BY GOOD HOPE HARDWOODS

VISITING A SPECIALTY WOOD DEALER

Follow this Advice to Make the Most of Your Trip

- Call first.** With the exception of Groff & Hearne Lumber, minimal staffing is the rule at these specialty yards. Arrive unannounced and you'll probably discover that the people you need to consult with are out looking at logs, supervising a sawyer, or otherwise unavailable.

- Bring your drawings.** If you call to schedule a visit, you can expect someone to be available to go over your cutting list. You may get valuable assistance in picking the widths and lengths that will minimize waste when you get to dimensioning stock.

- Take your time.** Don't be surprised if you arrive looking for curly maple and leave with flame birch. Cost, availability and the actual appearance of individual boards will all play a part in your buying decision. Keep an open mind, and be prepared to sort through more than a few boards. (See "Bring work gloves," below.)

- Watch your figure.** It's easy to go overboard when you find wood with incredibly rich or dense figure—and you probably will. Try to keep the end result in mind, however. In a picture frame, jewelry box or other small-scale project, wild grain or extreme figure will look stunning. On a tabletop or door panel, extreme figure can easily overwhelm the eye. Tailor your selection of boards to the scale of your project.

- Bring work gloves and a block plane.** The work gloves will enable you to move as much lumber as you need to without collecting a handful of fine splinters. With the block plane, you'll be able to shave the roughsawn stubble off of a board and get a better picture of its figure and color.

- Stay in touch.** If your dealer doesn't have the wood you're after, don't be discouraged. Inventory is always changing at specialty yards. The boards you're looking for could be in the next load of logs. —T.S.



Drawn and quartered.

Above, log ends are marked up to establish the proper sequence and orientation of cuts.

Below, the reward for positioning the log with care is a perfectly quarter-sawn board. A well-tuned bandmill like this cuts a kerf just 1/8 in. wide, leaving a smooth surface that can show figure clearly without planing.

PHOTOS BY SAM TALARICO

Like Talarico, most specialty dealers tend to cultivate a reputation for particular species, figure characteristics and even the way they mill their logs.

If you haven't bought wood at a specialty yard, you're in for some significant sticker shock. Board foot prices for most domestic hardwoods start around \$3 and go up to \$10 for wider, thicker stock. Flitch-matched boards, burl, and one-of-a-kind pieces (tabletop slabs, for example) are usually quoted on a piece-by-piece basis.

I asked Norman Hughes, owner of Good Hope Hardwoods, about the prices specialty wood dealers charge. "We get some resistance from first-time customers," he explained. "They may have found some curly cherry or tiger maple for the price of unfigured lumber. What we're able to do is find and offer high-quality figured wood on a regular basis, day in and day out."

From Logs to Lumber

Spending time with Hughes and other dealers gave me a better appreciation of the time and money involved in pro-

ducing premium hardwood lumber. These yards start by purchasing logs. Domestic hardwood comes from all over the U.S. and Canada. Hughes gets his Claro walnut from California and most of his maple from Pennsylvania and New York; cherry comes from northwestern Pennsylvania. Talarico buys high-priced oak logs from locations all over the Northeast. Groff & Hearne also have numerous sources for hardwood logs, including forests that they manage themselves.

"I was in the logging business before I began selling lumber," explains Rick Hearne, of Groff & Hearne. "We still harvest timber because it's good business for us, and we've built an excellent reputation for forest management. Farmers, homeowners and even landscapers come to us because they know that we'll take extra care in felling and removing their trees."

By closely supervising the milling process, specialty dealers make the most of their logs. (See top photo, previous page.) "I learned about milling by trial and error," says Sam Talarico, whose

quartersawn oak is sought after by makers of Stickley and Mission-style furniture. "Now I can look at a log and mark it up so that the sequence of cuts will yield just the boards I'm after." (See photos, opposite page.)

This custom-cutting demands a lot of the sawyer and his equipment. To optimize figure and grain orientation while avoiding defects, a single log might need to be repositioned again and again as it's milled. Then there's the danger of ruining a blade on "buried treasure" such as bolts, barbed wire, or the ceramic insulators from long-forgotten powerlines. Guy Bowers, who cuts logs for Good Hope and Groff & Hearne, remembers taking every tooth off his bandmill blade when he hit a set of four horseshoes in a maple log. "We try to find most of the bad stuff with a metal detector," says Bowers, "but every once in a while we miss something."

Once the boards are sorted and stickered, they're ready for drying. All of the dealers except for Talarico have specially designed dehumidification kilns. The wood loses its moisture gradually, thereby minimizing the incidence of warping and checking.

Orders Large or Small

I really liked the simple, effective concept of customer service I found among these wood merchants. They know that woodworkers need time to find just the right boards. That's why you're not likely to be hassled if you need to move a lot of lumber to get your order right.

Musical instrument makers rely on these dealers for orders as small as a single board. Furniture-making concerns pick up wood by the truckload. Only one dealer—Locust Grove Woodshop—has a minimum order requirement (50 bd. ft.). All the dealers I visited offer price breaks on larger orders (usually at the 300-bd.-ft. to 500-bd.-ft. mark) and on "close-out" stock.

By phone or face-to-face, you're fairly certain to have expert assistance at a specialty lumberyard. The person answering the phone, operating the forklift, and filling your order is likely to be the owner—especially if you're dealing with Talarico's, Good Hope, or Locust Grove.

"I spend quite a bit of time educating people about what's available," explains Norm Hughes. "If it's their first visit, it's like watching a kid in a candy store." If you're planning to visit a specialty yard, see the sidebar on the opposite page.

Boards by Mail

Pick up the phone, give your shipping address and credit card number, and put together a mail-order delivery of high-priced hardwood. Sound risky? Sure it does. But more and more woodworkers are buying wood sight unseen, trusting in the quality of the material and the concern of the dealer supplying it.

"Orders greater than 80 bd. ft. get shipped by common carrier," reports Pat McDonnell of Sandy Pond Hardwoods. "We get excellent freight discounts, which we are able to pass on to the customer. For smaller orders, we have to ship UPS, which costs more."

According to McDonnell, if a customer isn't satisfied with the wood that's delivered, there's no problem returning it. He says, "We want to cultivate repeat business, so we try to do everything pos-

sible to make customers happy."

The curly cherry I ordered from Sandy Pond arrived in good shape. Boards were well-matched for making a tabletop, as I instructed. Likewise, the butternut shipped to me by Groff & Hearne arrived clear, straight and uniformly thick. It's a good thing my workshop has such limited space for lumber storage. Otherwise, the lure of beautiful boards could lead to lethal hits on my credit card. ▲



TIM SNYDER
is managing editor
of *AW*.

SOURCES FOR SPECIALTY WOOD IN SOUTHEASTERN PENNSYLVANIA

Good Hope Hardwoods

1627 New London Rd., Landenberg, PA 19350

(610) 274-8842 Circle #601

In business since 1992

Principle domestic hardwoods: figured maple and cherry, Claro walnut

Exotic hardwood specialties: mahogany

Groff & Hearne Lumber Inc.

858 Scotland Rd., Quarryville, PA 17566

(800) 342-0001 • (717) 284-0001 • Fax: (717) 284-2400 Circle #602

In business since 1989

Principle domestic hardwoods: figured and FAS cherry, walnut, maple, white and red oak, birch, ash, poplar

Exotic hardwood specialties: mahogany, rosewood, padauk

Locust Grove Woodshop

West Chester, PA

(610) 793-1380 • Fax: (610) 793-0224 Circle #603

In business since 1978

Principle domestic hardwoods: wide cherry boards, other figured hardwoods

Exotic hardwood specialties: mahogany crotch lumber, extra-wide mahogany

Sandy Pond Hardwoods Inc.

921-A Lancaster Pike, Quarryville, PA 17566

(800) 546-9663 • (717) 284-5030 • Fax: (717) 284-5739 Circle #604

In business since 1986

Principle domestic hardwoods: figured maples and cherry, flame birch

Exotic hardwood specialties: mahogany, padauk, purpleheart

Talarico Hardwoods

RD #3, Box 3268, Mohnton, PA 19540-9339

(610) 775-0400 • Fax: (610) 775-1456 Circle #605

In business since 1974

Principle domestic hardwoods: quartersawn white and red oak, sycamore, ash

Exotic hardwood specialties: ebony, bubinga, cocobolo

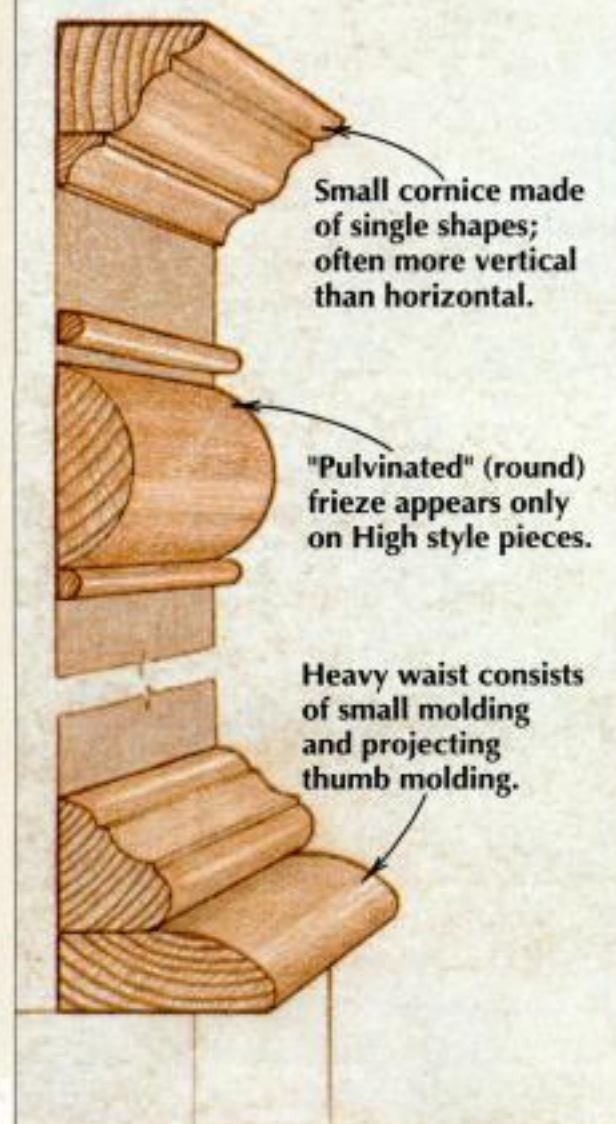
Period Furniture Moldings

Moldings Set the Style: Learn How to Recognize and Make Them with this Historical Guide

by Mike Dunbar

WILLIAM & MARY: 1690 TO 1720

TYPICAL CASE MOLDINGS



Sparse population and limited affluence constrained the development of case furniture in the New World during this period. The use of moldings was not as formalized as it would later become.

The highboy was introduced in this period. William & Mary highboys typically stood on six turned legs. (See photo, right.) Highboy cornices were relatively small in scale. (See drawing, left.)

Curiously, the largest molding on a William & Mary highboy occurred not at the top, but at the middle, or *waist*. The waist consists of a molding attached to the upper case, which nests in a recess (not shown) in the projecting lip of the lower case. Locating this much visual mass in the middle of the piece results in an ungainly appearance, which might explain why highboys of this period have never been as well regarded as those from later periods.

The drawers in a William & Mary case piece were hung flush with the drawer dividers and carcass edges. The broad surfaces of the drawer fronts were set off by thin strips of molding, usually a single or double astragal, attached to the dividers and carcass sides.



The earliest highboys.
Six legs, a small double cornice and a large waist molding give this piece a less graceful presence than later highboys.

PHOTO COURTESY OF THE METROPOLITAN MUSEUM OF ART,
GIFT OF J. INSLEY BLAIR, 1950. (50.228.2)
© 1982 BY THE METROPOLITAN MUSEUM OF ART

Whether applied or integral, recessed or relieved, moldings bring style to a structure. Different combinations of these concave and convex surfaces, or profiles, play with light and shadow to create the overall visual effects that define a piece of furniture. Moldings please the eye by easing transitions between parts and surfaces, by dividing large open areas into subsections, and by refining edges, corners and other borders. The size and overall shape of a molding can enhance the visual balance or scale of a piece, or even create an illusion of motion.

The use of moldings in furniture reached its zenith during the 17th and 18th centuries, when cabinetmakers worked by complex rules of form and

proportion. Today, cabinetmakers observe these same rules when building reproduction pieces. In this article, I'll go over some of the different molding details that were used on furniture during four different periods: William & Mary, Queen Anne, Chippendale and Federal. As you look at the profiles shown here, keep in mind that there are usually quite a few historically accurate options.

Architectural Origins

Cornice, rail, plinth, soffit—these are just a few of the terms that furniture makers borrowed from architecture. Even when cabinetmaking was recognized as a separate craft, apprentice cabinetmakers were taught the classic orders of architecture established by the ancient Greeks and Romans. With each of these

orders (Tuscan, Doric, Ionic, Corinthian) mathematical formulas determined the size, location, proportion and profile of every element—from a structure's height and width to the taper and fluting of its columns—even to the shape and size of its smallest molding.

Early American furniture makers adapted the proportional and ornamental rules of the classic orders to the furniture they designed and built. Thus it's no accident that period furniture appears so well-proportioned.

There are also practical reasons why period furniture moldings were similar to architectural moldings. With a few minor exceptions, the same molding planes used in carpentry were also used in cabinetmaking. By using the same moldings as housewrights, cabinetmak-

QUEEN ANNE: 1720 TO 1750



Small waist, curved bonnet.
The Queen Anne style introduced the broken arched pediment, or bonnet. The waist molding is small, simple and flush with the lower case.

PHOTO COURTESY OF WINTERTHUR MUSEUM

Due in part to new architectural books illustrating the classic orders, furniture and architecture both became more formalized during this period. Highboys, lowboys, desks-on-frame and tall chests of drawers all gained in popularity.

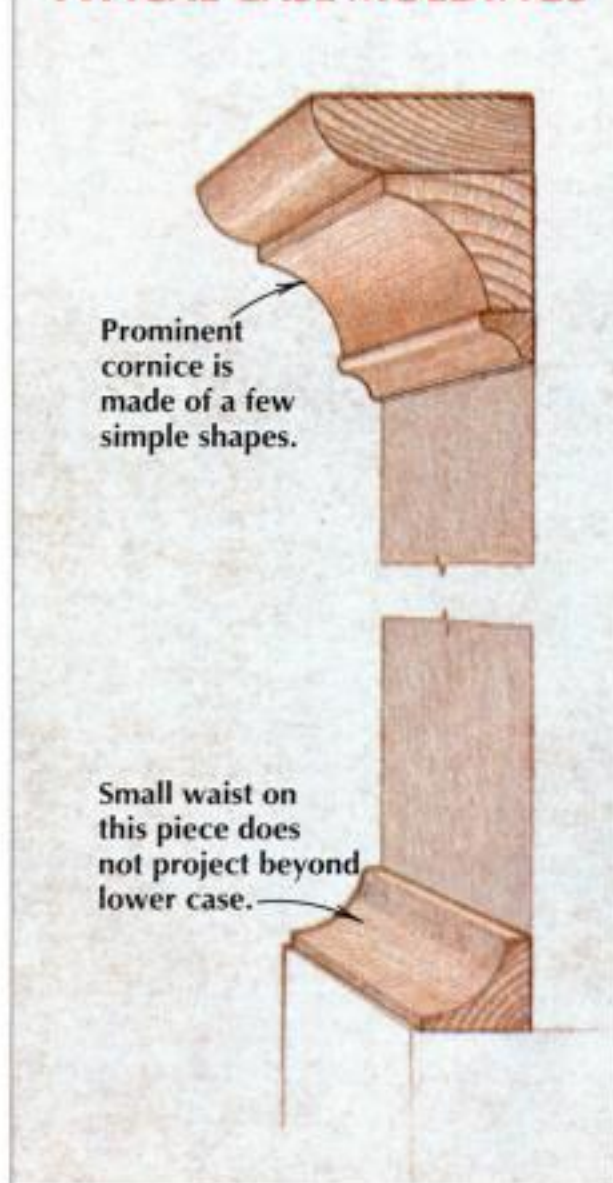
The cornices on Queen Anne highboys were larger and projected farther than William & Mary cornices. A favored arrangement was to place a molded lip, often a reverse ogee, over a large cove and astragal.

The Queen Anne idiom introduced the broken arched pediment, often called a "bonnet top." The curved moldings had to be roughed out with carving tools and finished with scratch stock. To make this work easier, large, simple profiles were used, such as a small ovolo over a large cove.

The waist molding on a Queen Anne highboy was much more restrained than on William & Mary pieces. In some localities, craftsmen held the waist molding flush with or set in from the lower case.

During the Queen Anne period, drawers were no longer installed flush with dividers. Instead, the facade was broken up by rabbeted overlay fronts outlined with a small "thumbnail" edge treatment. (See Basic Molding Profiles, next page.)

TYPICAL CASE MOLDINGS



Prominent cornice is made of a few simple shapes.

Small waist on this piece does not project beyond lower case.

BASIC MOLDING PROFILES



COVE



OVOLO



ASTRAGAL



THUMBNAIL



BEAD



REVERSE OGEE



OGEE

COMPLEX MOLDING

Complex moldings are made by combining basic moldings.



ers ensured that their work became a part of the room.

The best examples of architectural furniture are large casework pieces like those shown in this article—highboys, chests of drawers, chest-on-chests and secretaries. Tall clocks and mirrors can also serve as good examples.

Recognizing Period Moldings

There are two sorts of moldings: simple and complex. There are only a handful of simple profiles and no matter what kind of woodworking you do, it's worth learning to recognize and identify them by name. (See drawing, left.) Complex moldings are made up of two or more simple shapes. Combinations of these moldings are associated with particular furniture periods.

CHIPPENDALE: 1750 TO 1790

TYPICAL CASE MOLDINGS



Very large cornice consists of several complex moldings.

Frieze decorated with fretwork.

Visually heavy waist projects beyond lower case.

The Chippendale period earned the 18th century its title as the "Age of Cabinetmakers." By this time the American colonies had accumulated a great deal of wealth and could afford to patronize highly skilled artisans. Thomas Chippendale's book, *The Gentleman & Cabinet-Maker's Director*, provided scaled drawings of furniture as well as various molding treatments. (See sidebar, opposite page, for more information on this book.)

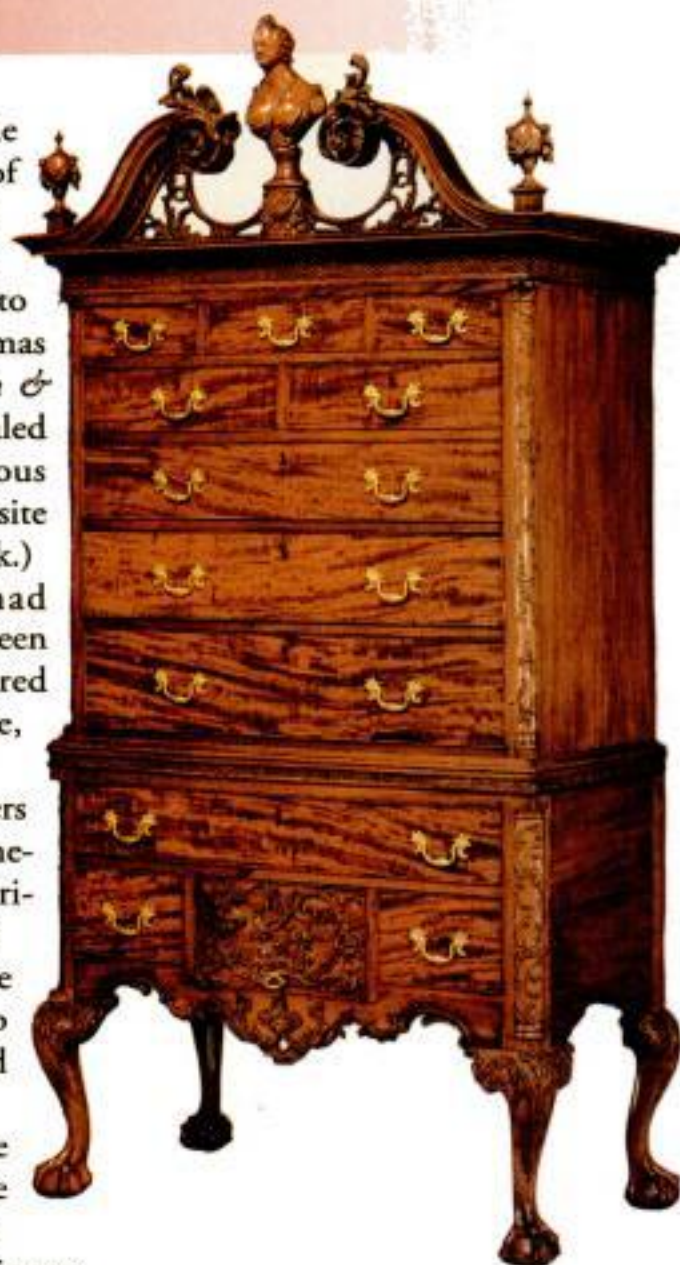
Chippendale highboys usually had broken arched pediments similar to Queen Anne pieces. Later pieces often featured broken triangular pediment and large, complicated cornices.

To show off their skill, cabinetmakers developed more complex profiles, sometimes adding entablatures and geometrically patterned friezes of sawn fretwork.

Chippendale highboys were more massive than earlier types. To break up their bulk, cabinetmakers reintroduced the heavy, projecting waist molding.

Chippendale drawer fronts were done in overlay style as in the Queen Anne period, with the same thumbnail edges.

Chippendale architectural case pieces stood on either short cabriole legs or bracket feet. In both cases moldings also defined the piece's lower limits—typically a narrow band, usually an astragal and cove or a stepped ogee.



A wealth of detail.
Chippendale cabinetmakers made a show of their skill with highly ornamental molding treatments.

PHOTO COURTESY OF THE METROPOLITAN MUSEUM OF ART, JOHN STEWART KENNEDY FUND, 1918. (18.110.4)
© 1983 BY THE METROPOLITAN MUSEUM OF ART

The details and historical overview on these pages are useful to anyone interested in buying, restoring or reproducing period furniture. I've selected individual pieces of furniture that typify the molding treatments used during each period. But it's important to realize that a great deal of variation can exist within each period. Working within the guidelines presented here, Early American craftsmen often took creative license. ▲



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MOLDINGS BY THE BOOK

Design books were instrumental in introducing Colonial cabinetmakers to new styles and types of furniture. Thomas Chippendale's *The Gentleman & Cabinet-Maker's Director* is as valuable to today's woodworkers as it was to cabinetmakers 225 years ago. Chippendale's book helped introduce or popularize several new forms of architectural furniture, including the secretary, the chest-on-chest, the tall clock, and the architectural mirror. Of course, the highboy and lowboy reached the heights of their popularity during the Chippendale period. Furniture aficionados often use the terms "High style" and "Low style" to describe how closely a particular piece resembles the plates in the book. High style pieces adhere most closely to the book's complex drawings.

In the late 1700s, America experienced a revival of classic Greco-Roman styles. George Hepplewhite's *The Cabinet-Maker and Upholsterers' Guide* and Thomas Sheraton's *The Cabinet-Maker and Upholsterers' Drawing Book* were important sourcebooks during this period.

Reprints of all these books are available from Dover Publications Inc., 180 Varick St., New York, NY 10014, (212) 255-3755.

FEDERAL: 1785 TO 1820



Return to simplicity.
Federal-style molding
treatments were simpler
in form and more restrained
in application.

PHOTO COURTESY OF WINTERTHUR MUSEUM

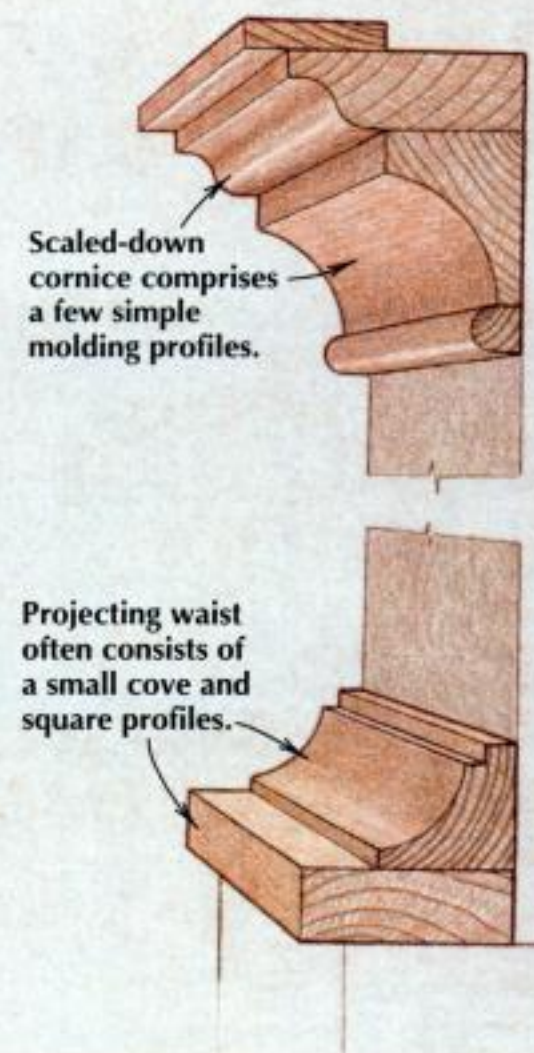
Where Chippendale furniture was massive and elaborate, Federal was delicate and chaste—a reaction against the established styles of previous periods. Cabinetmakers of the Federal period were more expressive and unconventional, though classical architectural details were still clearly illustrated in furniture design books, notably Hepplewhite's *The Cabinet-Maker and Upholsterers' Guide* and Sheraton's *The Cabinet-Maker and Upholsterers' Drawing Book*. (See sidebar, above.)

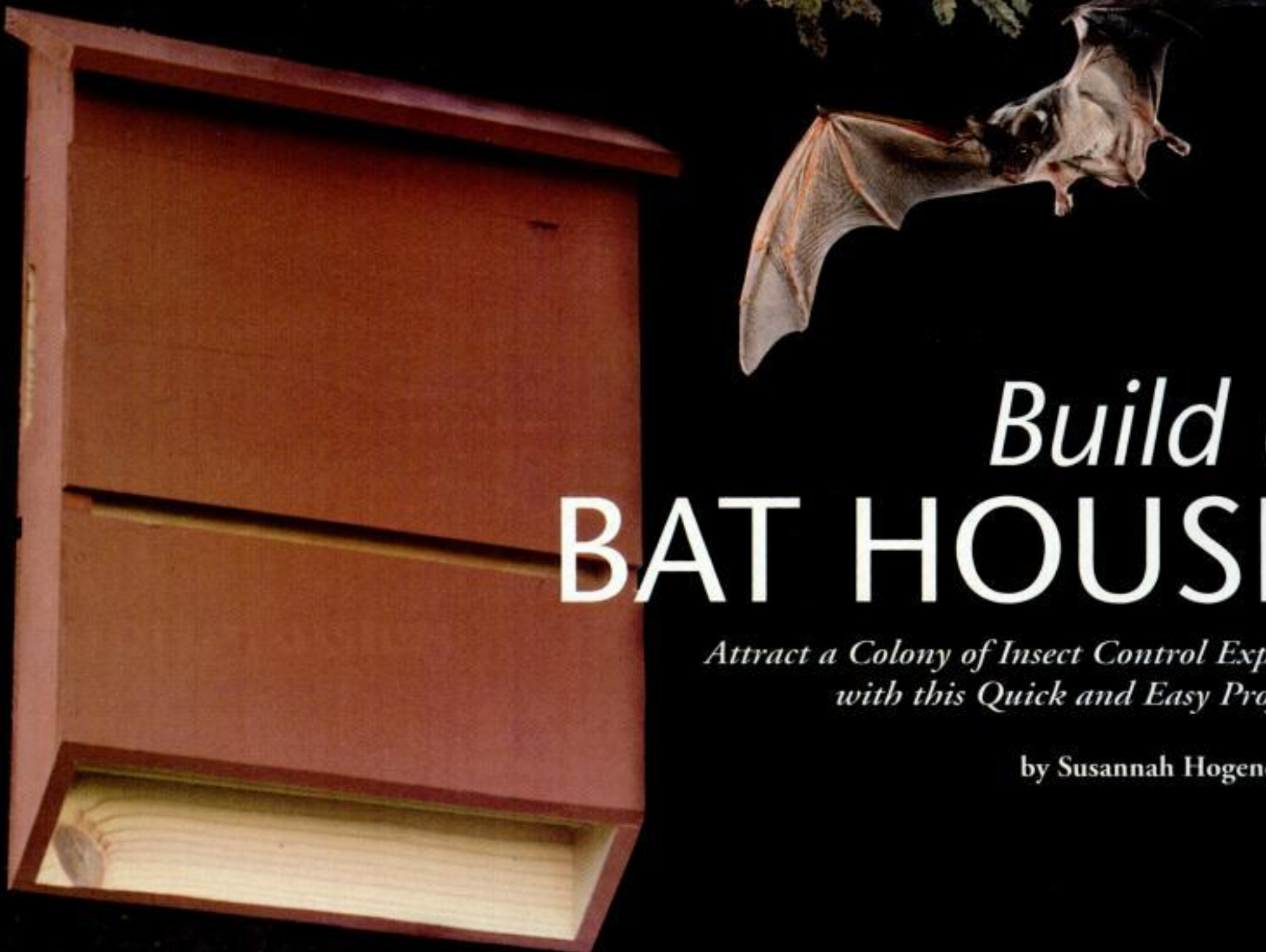
During the Federal period, the highboy and chest-on-chest passed out of fashion, leaving the secretary and the tall clock as the major architectural case pieces. (See photo, left.) In keeping with the Federal style, the secretary's cornice was scaled down, and typically consisted of an ogee or ovolo over a cove and astragal. The joint between the desk and bookcase was usually a simple cove.

Later in the Federal period the cornice became plain and projecting. Some late-Federal cornices were as simple as an inverted thumbnail on a thin projecting lip.

Drawer fronts were again set flush with the carcase and dividers, as they were in the William & Mary period. But Federal-period cabinetmakers added a narrow outline strip of molding called a *cock bead*. Set into a shallow rabbet, this thin piece of straight-grained wood protected the edges of veneered drawer fronts from any injury that would chip the veneer.

TYPICAL CASE MOLDINGS





Build a BAT HOUSE

*Attract a Colony of Insect Control Experts
with this Quick and Easy Project*

by Susannah Hogendorn

Bat habitat. This "bat house" is stone-simple to build, and it's designed by scientists to keep these insect-eaters comfortable.

A lot of people can't believe anyone would actually want to invite bats, those strange and mysterious nocturnal creatures, to inhabit their yards. But bats have gotten a bad rap. Contrary to popular belief, bats are no more likely than dogs or cats to carry the rabies virus, and rabid bats are less likely to attack humans. Plus, bats do a better job of consuming pesky insects like mosquitoes than those noisy and expensive electric "bug zappers" do.

If you decide to host a colony of these natural exterminators, here's a simple shelter designed by Bat Conservation International (BCI), a nonprofit organization devoted to bat conservation and public education, to attract bats and keep them comfortable. All you need to build it is some scrap lumber, a few nails and a free afternoon.

You can make your "bat house" as plain or as fancy as you like. I've even seen a Victorian-style model complete with gingerbread trim. The only crucial elements are the baffles, the interior boards that bats hang from while they sleep. Below are some general construction and mounting tips.

Expert Suggestions

Researchers at BCI conduct ongoing studies of bats and the houses they prefer. They offer the following suggestions to bat-house builders.

- **Choose a wood that can withstand the elements.** Western red cedar, white cedar, redwood and white pine are the best "outdoor woods" for a project like this. Make sure your lumber isn't chemically treated, or you may harm your wild guests.
- **Bats hang upside down to roost,** and they need a good foothold. Use rough-

sawn lumber for the inside walls and baffle surfaces. If you'd like to use plywood or surfaced wood, staple fiber-glass screening tightly around it, or use a saw 1/16-in.-deep horizontal grooves on 1/2-in. centers, as we have in the model shown here.

- **You can put as many baffles in your bat house as you want,** but make sure they're spaced at least 3/4 in. apart so the bats can fit inside. Leave the bottom of the bat house open so as not to attract squirrels or birds.

- **Use the right finish.** Left unfinished, your bat house will weather to a light shade of gray. If you decide to finish this residence, avoid paint. Instead, use an exterior stain—either semitransparent or solid-color. Unlike paint, stain will never peel.

Attracting Bats

Bat houses are usually inhabited only in the warmer months. Not all species of bats will live in bat houses, and those that do usually spend their winters hibernating in caves. Scientists

aren't sure why bats favor one house over another, but here are some rules of thumb.

You can mount your bat house on a tree or on a building, but make sure that the underside is free of obstructions. The house should be positioned at least 10 to 15 ft. off the ground.

For a small bat house, you can rout a couple of keyholes in the back prior to assembly and hang it from nails or screws. For a bigger bat house, use L-shaped aluminum brackets—the kind used for wall-mounted stereo speakers (available at most hardware stores). If you're mounting the bat house on the side of a building, make the two mounting surfaces flush or almost flush, or bats will roost in the crack between the structures.

Depending on where you live, you may need to change the location of your bat house to provide ideal roost temperatures. Larger bat species prefer roost temperatures from 80° to 90°F. Smaller species prefer higher temperatures—anywhere from 90° to 120°F. Nursery colonies need warmer roosts than bachelor colonies. The further north you are, the more sunlight your bat house will need. An east or southeast location provides early morning sunlight. Putting a dark finish on your bat house will help it absorb heat from the sun. Conversely, if you live in a very warm climate, you may need to mount your bat house in the shade.

Don't despair if the bats don't come right away. Sometimes it takes them a couple of years to move in.

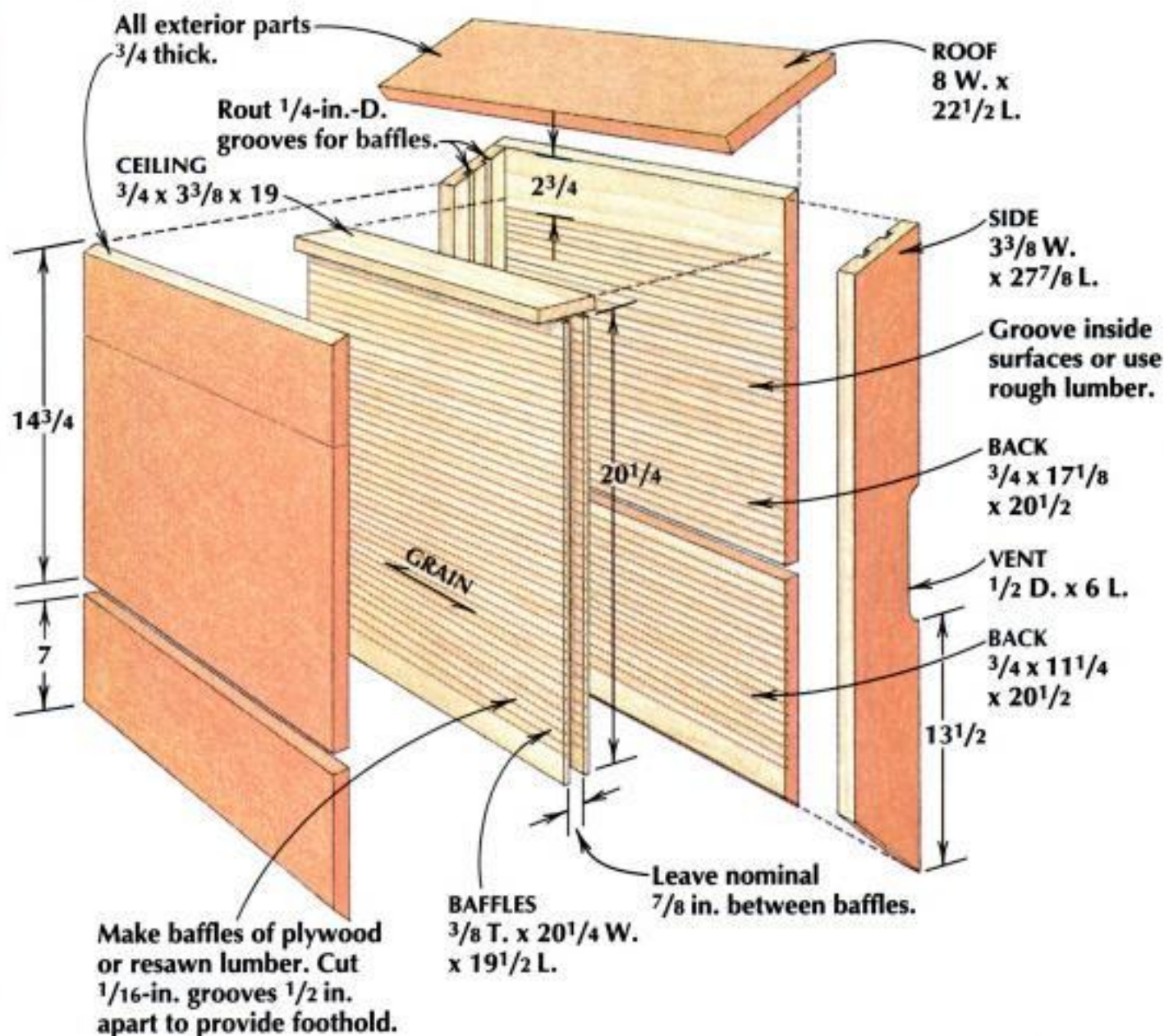
Final Notes

If you'd like more information on bats or bat houses, Bat Conservation International is the place to go. It publishes several books, including a very readable guide by bat expert Dr. Merlin D. Tuttle, called *America's Neighborhood Bats* (1988). To aid their research, BCI would also like to hear about your bat-house experiences. Write to: Bat Conservation International, Box 162603, Austin, TX 78716. ▲

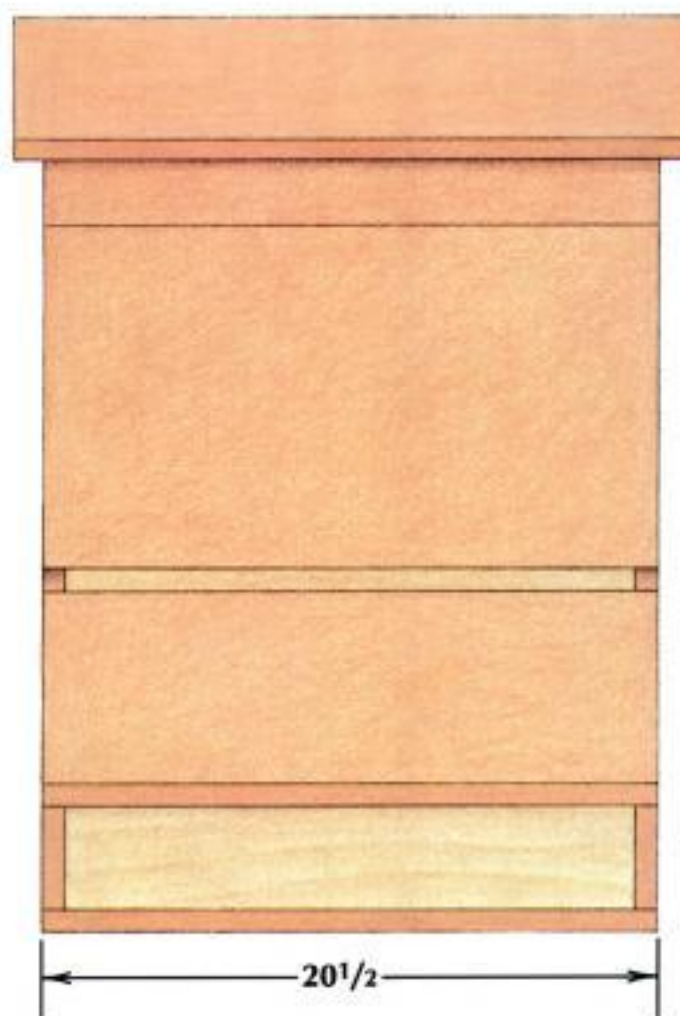


SUSANNAH HOGENDORN
is copy editor of AW.

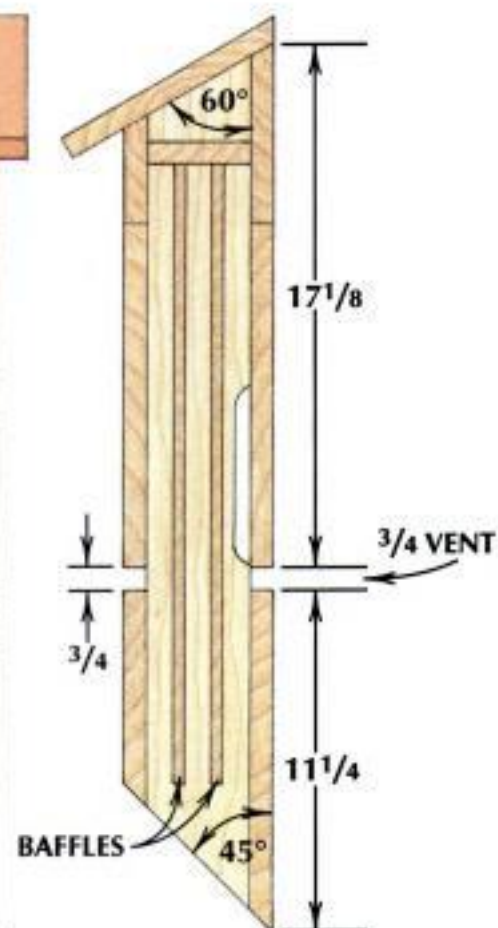
BAT HOUSE



FRONT VIEW



SIDE VIEW



Concealed Hinges for Cabinets

Well-Engineered Hardware that's a Cinch to Install and Adjust

by Paul Levine



Hidden beauty. Concealed hinges eliminate the need for a face frame. Mounted on the inside of the cabinet door and against the carcass side, the hinges are out of sight when the door is closed.

I remember being apprehensive the first time I used concealed hinges in a cabinet. With their cups, clips and interlocking arms, the mechanisms didn't look anything like the simpler cabinet hinges I had used in the past. And the installation details—drilling a round hole instead of chiseling a mortise—were similarly unfamiliar.

But it didn't take any more than that first job to win me over. Today, I always try to sell customers on the merits of Euro-style cabinetry and concealed hinges. This type of hinge is actually

part of a well-designed frameless cabinet system that offers many advantages over [traditional face-frame cabinetry](#). (See [sidebar, page 53](#).) In this article, I'll discuss how concealed hinges work, how to select the right type of hinge, and how to install and adjust the typical concealed hinge.

Before we get to the details, here are some general characteristics and capabilities that make concealed hinges unique. Despite their intricate appearance, concealed hinges are easy to install. Very little is required in the way

of special equipment, although there are different jigs available. And once you've hung the cabinet door, these hinges can be adjusted to make the door fit squarely and evenly.

The first thing you'll notice about concealed hinges is that most come in two parts: the hinge itself and the mounting plate, which is also called the *baseplate*. (See bottom photo, opposite page.) The hinge is set into a mortise in the back of the door; the baseplate is screwed to the inside of the case. To mount the door to the case, you simply attach the hinges to

their baseplates. Most newer hinges—the ones I prefer—can be snapped together and apart without any tools. With other types of concealed hinges, you'll need a screwdriver to separate the parts.

Selecting the Right Hinge

In selecting a hinge for your cabinet, your first decision is the overlay of the door. (See sidebar drawing, page 53.) Hinges are available for full-overlay, half-overlay or inset doors (not shown). Sometimes, the same hinges are used with baseplates of different thicknesses to create different amounts of overlay.

Overlay doors, which completely cover the front edges of the cabinet, are the least demanding type. If you're a little off on your dimensions, you can usually adjust the appearance by adjusting the hinges, as I'll explain below. I use full-overlay hinges for the end doors and half-overlay hinges where two doors must share the same case divider, as in the middle of a row of cabinets. I use inset doors only on the rarest occasions because their construction and installation demand a high level of precision.

Next, decide on the closing type. A "self-closing" hinge has a built-in spring mechanism that pulls the door shut when it's within 15° of closing so you don't need door catches. Self-closing hinges are the ones I use most often. If a self-closing door snaps shut with too much force, you can substitute a slightly less expensive, "free-swinging" hinge.

Free-swinging hinges exert no closing force, so you'll need catches to keep the door closed. If you want that sleek, "no-handle" appearance, use touch latches in conjunction with this type of hinge.

Opening angle is your next decision. Concealed hinges are available in a range of swing angles from 95° to 170°. The opening angle is very important and depends on the relative position of your cabinet in the room or in a line of cabinets. If the cabinet is to be installed in a corner, a 95° or 100° hinge is all you need. Otherwise, I normally specify 125° hinges for wall cabinets and 165° hinges for base cabinets.

Concealed hinge

anatomy. These hinges consist of two main parts: the baseplate (left) and the hinge mechanism.



EASY TO INSTALL

Drilling the door and the cabinet side are the two key steps in installing concealed hinges. The cabinet door requires a 35mm-dia. mortise hole for the hinge cup. The cabinet side needs to be drilled for the baseplate.

—P.L.



Drilling the door. Using a 35mm bit, Levine bores the hole for the hinge cup. Driving a pair of screws will install the hinge mechanism.



Drilling for the baseplate. Held against the front edge of the cabinet, this jig locates the pilot holes for installing the baseplate.

The large opening angle is a good choice for base cabinets. If you bump into an open cabinet door while carrying the Thanksgiving turkey, a 165° hinge will give; a 95° hinge won't. Extra swing capacity usually means extra cost and a larger mechanism, so don't use big-swing hinges if you don't need them.

Installing Hinges

Mounting the hinges is a three-step process: First, you mortise the hinge into the door. Then you screw the baseplate to the side of the carcass. Finally, you attach the hinge to the plate. Large shops have dedicated machines to drill for the hinges, but in the small shop you can get by without them.

Before drilling, lay out the centerlines of the hinge cups and the baseplates so they'll line up when you hang the door. I usually locate hinge mortises about 3 in. from the top and bottom of the door. Manufacturers recommend using more than two hinges on doors taller than about 36 in. or heavier than 12 lbs.

Note that you have the option of attaching the baseplates with "Euro"

screws (available from Woodworker's Supply; see Sources, page 53) directly to shelf holes that you've drilled with one of the 32mm drilling jigs on the market. If you opt to do this, center the hinge cups on the pairs of shelf holes you'll be using.

Before attempting to install your hinges, it's a good idea to make up a test model similar to the door and the cabinet side you're using. This way you can check to be sure the hinge will operate correctly and that there aren't any hidden problems such as a molded door stile that's too thin where the mortises are to be drilled.

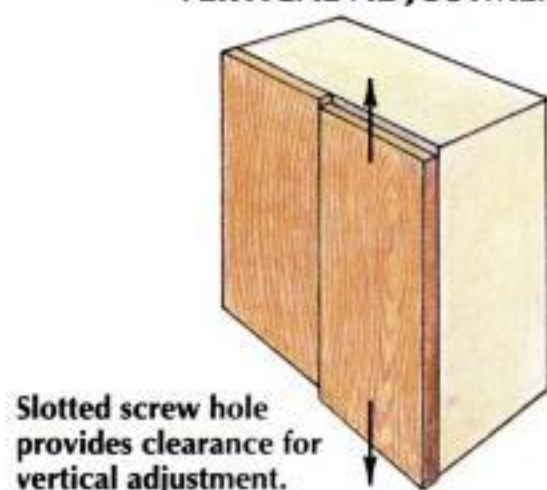
"Mortising" the hinge cup into the door is as simple as drilling a blind hole. All the manufacturers' hinge cups are designed to fit snugly in a 1/2-in.-deep, 35mm hole. You can drill these holes with either a special carbide-tipped 35mm bit available from common mail-order suppliers, or with a 1 3/8-in. Forstner bit. Special drilling jigs are also available for this operation.

To use your drill press for drilling the hinge mortises, screw a scrapwood fence to a piece of 3/4-in. plywood and clamp this jig to the table of your drill press so that the fence is 3/16 in. from the outside edge of your mortising bit. (See photo, above left.) I've found this distance is not very critical—you can make up for slight variations later, with the lateral adjustment feature of the hinge. Drill a

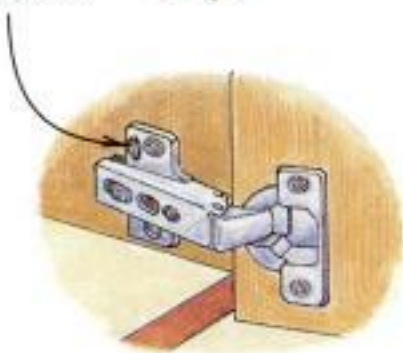
THREE-WAY ADJUSTMENT

Far more forgiving than other types of hinges, concealed hinges can easily be adjusted in three dimensions to align the door precisely with the cabinet. All adjustments can be made without detaching the hinge.

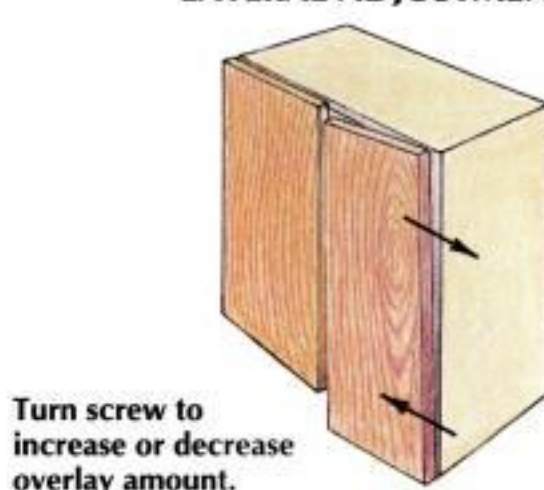
VERTICAL ADJUSTMENT



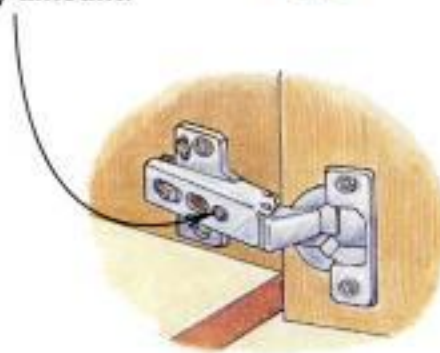
Slotted screw hole provides clearance for vertical adjustment.



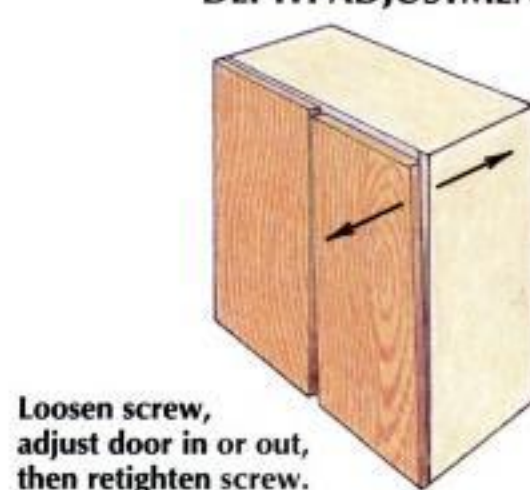
LATERAL ADJUSTMENT



Turn screw to increase or decrease overlay amount.



DEPTH ADJUSTMENT



Loosen screw, adjust door in or out, then retighten screw.



test hole in wood of the same thickness as your door and set the depth stop of your drill press.

Now, hold the door flat on the jig, with its show (exterior) side down and its hinge edge against the fence. Line up the bit with the layout marks that you've made on the door, and drill the mortises. Then press the hinge cups into them, square the hinge arms to the edge of the door, and secure the hinges to the door with #6 x $\frac{5}{8}$ Phillips-head sheet metal screws.

Mounting the baseplates to the inside of the case is next. If my cabinet sides are MDF or particleboard, I drill pilot holes for the baseplate screws; otherwise I just mark the hole locations with an awl. Either way, make sure that the baseplates are accurately located on the centerlines you laid out.

The setback from the front edge of the cabinet depends on the baseplate design. Refer to the manufacturer's specifications. You can use these specs to make your own drilling jig, or use an aftermarket jig. (See top right photo, previous page.) If you're using Euro screws, you'll simply screw into the shelf holes.

After drilling the holes for the baseplate screws, screw the plates to the carcass sides. If you've drilled accurately, they will be square to the front and properly spaced.

Mounting the door is the final step. Most hinge manufacturers offer two

types of hinges: those that attach with a locking screw and those that snap into place. The snap-on hinges are better looking but cost a bit more. They allow you to remove the door easily by pressing a release latch or by pulling up on the cover of the hinge.

Press-Fit Procedures

In production shops, the screws used to fasten the hinge and baseplate are fitted with ribbed plastic inserts that are press-fit into predrilled holes. A boring machine does the drilling work in doors and carcass sides. Then the same machine presses the parts into place. After press-fitting, the screws can be removed and replaced, but the plastic inserts remain permanently installed.

Besides being faster, press-fit installation of concealed hinges is particularly good if you're working with particleboard. The inserts remain anchored, so there's no danger of crumbling the board by driving, loosening and retightening screws. If you use concealed hinges often, you may want to consider switching from screw installation to press-fitting with plastic inserts.

Adjusting Concealed Hinges

No matter how carefully you install the hinges and mounting plates, your doors probably won't hang perfectly straight. Don't worry: The beauty of these hinges is their ease of adjustment. (See draw-

ing.) Depending on the manufacturer, you may have up to $\frac{1}{4}$ in. of play in two or three directions to adjust the doors.

Vertical adjustment is highly desirable but not available on all hinges. If the manufacturer doesn't offer a hinge with vertical adjustment, make sure the baseplate is adjustable. Whether the adjustment is on the hinge arm or the baseplate, the action is the same: Loosen the adjustment screw, move the hinge or plate up or down, and retighten.

Lateral adjustment is by means of a built-in adjustment screw in the hinge itself. Some of these work independently of the locking screw; others require some loosening and tightening of the locking screw in conjunction with the adjustment. I prefer the independent variety, such as the Grass 1006 or 3903.

Depth adjustment is accomplished by loosening the locking screw (or releasing the snap cover), sliding the hinge in or out on the baseplate and retightening. I usually aim for a consistent $\frac{1}{16}$ -in. gap between the front edge of the case and the back of the door. ▲



PAUL LEVINE

is a custom cabinet-maker and the author of *Cabinets and Built-Ins* (1994, Rodale Press).

FRAMELESS CONSTRUCTION

Euro-Style Cabinets Offer Sleek Lines, Extra Space, and Ease of Construction

The word "frameless" (or "Euro-style"), when applied to cabinets, refers to the absence of a face frame on the basic carcass. Since there is no face frame, the appearance of the finished cabinet is determined by the doors and drawer fronts themselves.

This arrangement opens many design possibilities, and the lack of a face frame saves a lot of work in the bargain. The front edge of the cabinet is the finished edge; there's no complicated, solid-wood face frame to build and install.

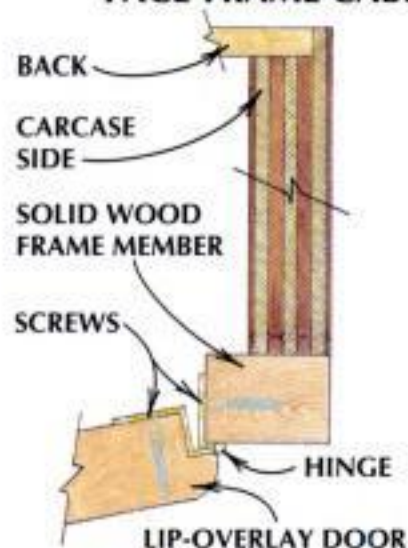
Frameless cabinets also let you take advantage of the wide variety of "32mm-system" hardware on the market, including concealed hinges. (See main article.) The 32mm system, which originated in Germany some 50 years ago, is a construction method based on drilling holes at multiples of

32mm spacings. In recent years, many new drilling jigs have appeared on the market that allow small-shop operators to drill accurately spaced holes with just a drill press or a portable drill.

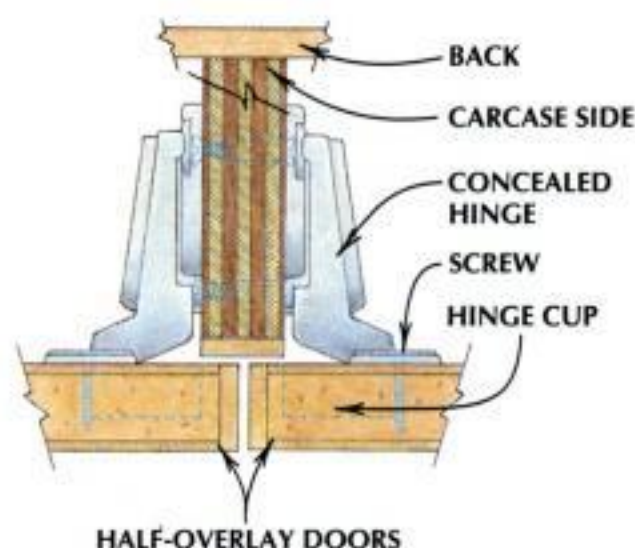
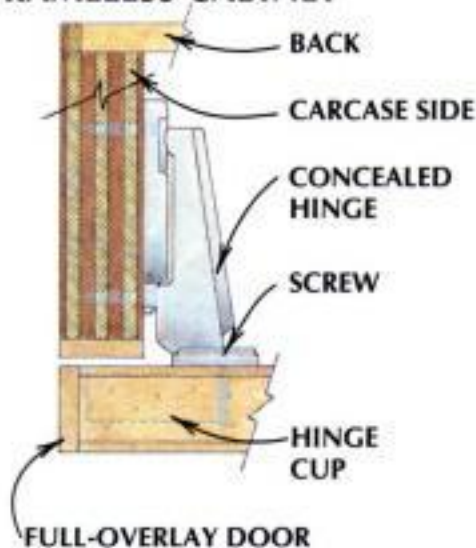
When you choose frameless cabinets over face-frame cabinets, you gain a surprising amount of space. The $\frac{3}{4}$ -in. thickness given over to the face frame becomes shelf space; and there are no frame members to block access to the interior. With the proper drilling jigs, hinges and drawer slides are easy to install and adjust. You can bore pilot holes for this hardware in the carcass sides at the same time you're boring shelf-support holes—or, if you're drilling shelf holes with a 32mm jig, you can simply install the hinge plates to these holes. —P.L.

FACE-FRAME VS. FRAMELESS CABINETRY

FACE-FRAME CABINET



FRAMELESS CABINET



FOR MORE INFORMATION

If you're new to concealed hinges, you'll find that hinge manufacturers' catalogs are useful sources of the technical information you need to choose the right hinges. This is especially true if you're looking for specialty applications. The following manufacturers offer catalogs and the names of local suppliers for their products:

Julius Blum Inc.

Blum Industrial Park
Hwy. 16-Lowesville, Stanley, NC 28164
(800) 438-6788 Circle #619

Grass America Inc.

1202 Hwy. 66 S., Box 1019
Kernersville, NC 27284
(800) 334-3512 Circle #627

Häfele America Inc.

3901 Cheyenne Dr., Box 4000
Archdale, NC 27263
(800) 334-1873 Circle #628

Hettich America L.P.

1607 Anaconda Rd., Box 489
Harrisonville, MO 64701
(800) 277-2222 Circle #629

Mepla Inc.

909 West Market Center Dr.
High Point, NC 27261
(910) 883-7121 Circle #630

Salice America Inc.

3301 Woodpark Blvd., Suite P
Charlotte, NC 28206
(800) 222-9652 Circle #631

SOURCES

Concealed hinges and installation jigs are available from:

The Woodworkers' Store

21801 Industrial Blvd.
Rogers, MN 55374
(800) 279-4441 Circle #617

Concealed hinges are available from:

Woodcraft Supply

210 Wood County Industrial Park
Box 1686
Parkersburg, WV 26102
(800) 225-1153 Circle #616

Woodworker's Supply

1108 North Glenn Rd.
Casper, WY 82601
(800) 645-9292 Circle #618

Three-Legged Stool

*Thoughtful Design and Clever Jigs
Yield a Comfortable Seat and a Stable Stance*

by Voicu Marian

Sculptural forms have always appealed to me. I enjoy creating angles and curves from rectilinear pieces of wood. The stool pictured below is a good example: Its deeply carved seat, splayed legs and hand-tooled surfaces give an overall effect you won't find in the realm of mass production. Building this stool also gives you the opportunity to refine your hand-tool skills.

Designing for Stability and Comfort

Since I like the stance of a three-legged stool, I incorporated this into my design. But I knew that stability would be a key issue because a chair with three legs can be "tippy." I also wanted a comfortable stool, so I used the dished seat design typical of Windsor chairs.

To make the stool as stable as possible, I established a center of gravity that

centers a person's weight over the legs. (See Fig. 2.)

To proportion the chair, I made a full-size scrapwood mock-up. The mock-up helped me determine the correct seat height and a comfortable position for my feet as they rest on the foot stretcher. I'm 5 ft. 7 in. tall: If the stool is to accommodate someone over 6 ft., I suggest you lower the foot stretcher accordingly. Also, feel free to alter the overall height of the stool if you wish. I designed this particular stool for a 39-in.-high bar. If you wish to make a taller or shorter stool, simply adjust the length of the legs below the foot stretcher.

With my design concerns addressed in the mock-up, I began cutting out the parts, starting with the seat.

Drilling the Seat

I made the seat from a solid blank of 8/4 walnut. Other easily carved woods such as poplar or cherry will work, too.

To start, I sawed the outline of the seat on the bandsaw. Then, on the bottom of the blank, I located the "center" of the seat and marked the locations of the leg holes in preparation for drilling. (See Fig. 2.)

I drilled all the seat holes before shaping the contours of the seat. To get the hole angles right, I designed a drilling jig to guide an extension bit chucked in my portable electric drill. (See photo, below, and sidebar, page 57.)

With the jig positioned and clamped over the center mark on the bottom of

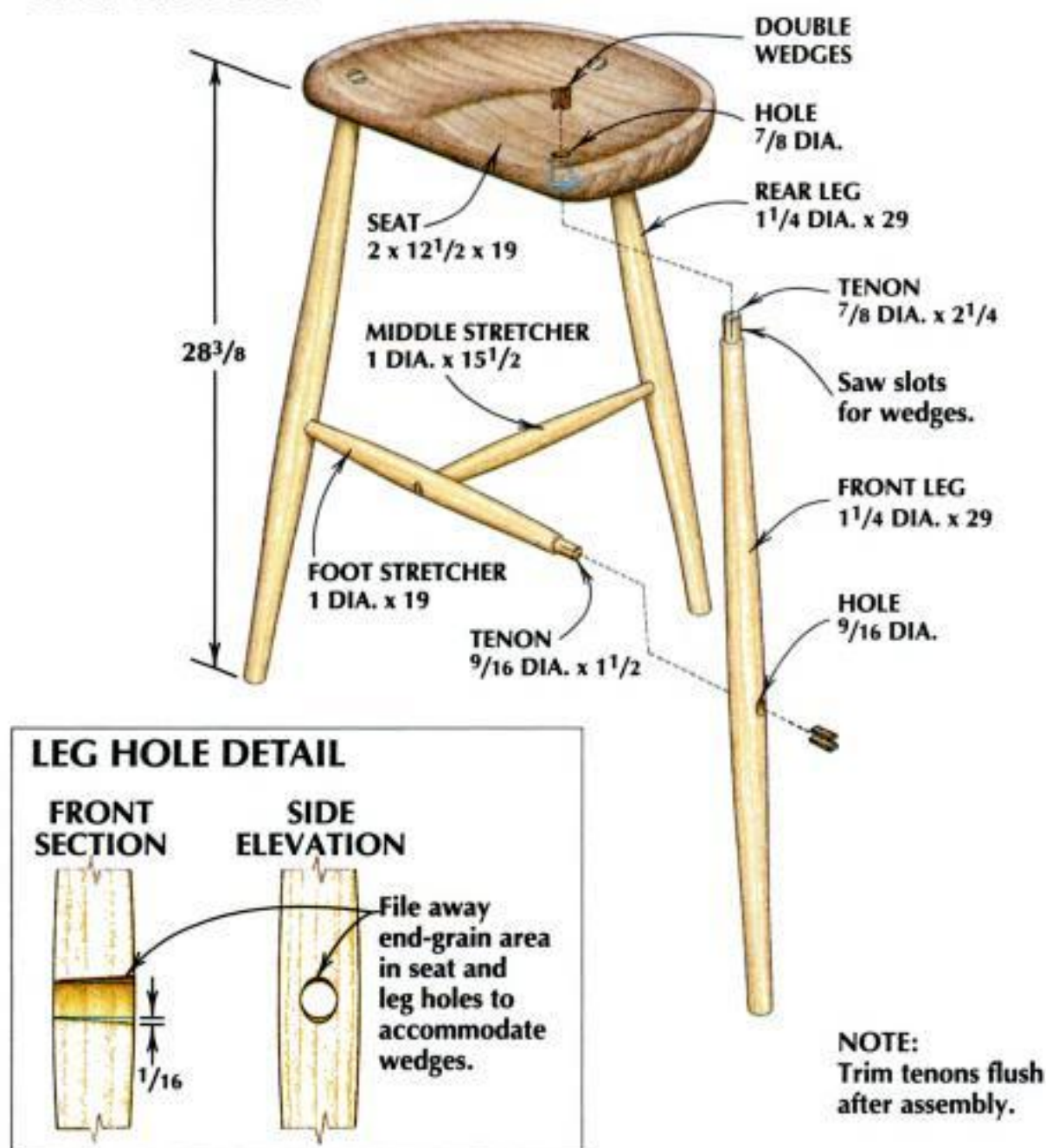


Sculpted for comfort. Hand-tooled touches distinguish this ash and walnut stool.



Drilling the seat. Marian's shop-made drilling jig is clamped to the underside of the seat to bore the three leg holes. The jig guides an extension bit chucked in a portable electric drill.

FIG. 1: STOOL



the seat blank, I moved the angle of the pivoting arm so the bit was over the hole to be drilled. (See right photo, opposite page.) I like to drill the hole in two steps: First, I use a 1 1/4-in. spade bit, drilling just deep enough to create a flat surface for the shoulder of the leg to sit against. (See Fig. 3.) Then I change to a 7/8-in. spade bit and finish drilling the holes through the seat.

Legs and Stretchers

With the seat drilled, I moved on to the legs and stretchers. I use ash for these parts, selecting straight-grained stock for strength. Oak, hickory and maple are equally suitable.

I sawed the leg and stretcher stock into square blanks, cutting the parts about 1 in. over length for subsequent trimming. While the stock was still square, I used a parting tool on the lathe to turn the tenons on these parts. (See Fig. 3.) You could also shave the tenons with a drawknife and spokeshave, using a sharp knife to cut the shoulders.

I drilled the holes in the legs and the foot stretcher next, using a 9/16-in. spade bit. I used the drill press to bore the hole

in the foot stretcher, then I detached the pivoting arm from my drilling jig and used it to drill the holes in the legs.

To position the jig, I temporarily installed the legs in the seat. Then I measured 16 in. down the inside face of each leg from the bottom of the seat and made a mark. I clamped the jig onto a

straight piece of scrap, then clamped the scrap to the legs parallel to my marks, with the point of the drill bit aligned with one of the marks. (See photo, below.) To prevent tearout, clamp a block of wood behind the leg where the drill bit will exit. I used the same procedure to drill the hole in the other front leg and in the rear leg.

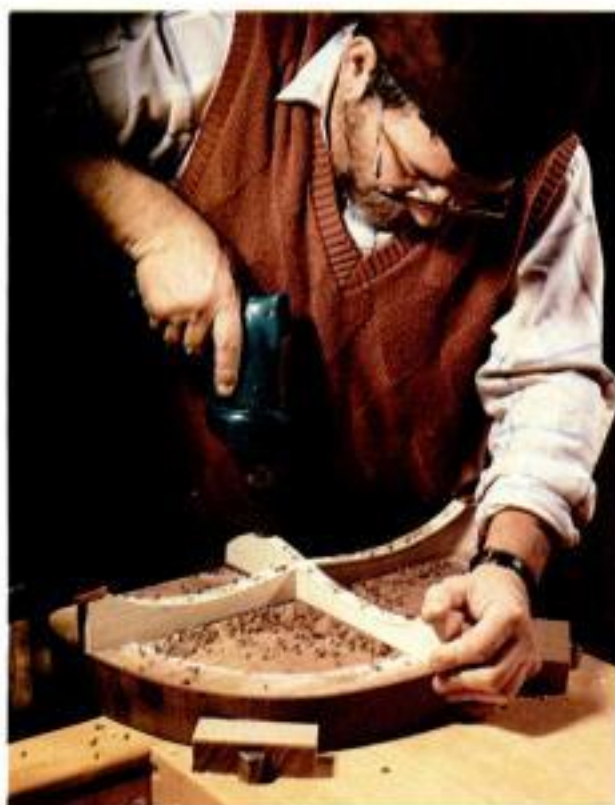
Shaping the Chair Parts

Once the holes were all drilled, I turned my attention to shaping the seat. Removing all the waste to rough out the contour of the seat takes a lot of time and effort if you use hand tools. To speed the process, I bored a series of 3/8-in.-dia. holes along the seat's x and y axes. I kept hole depth just shy of the seat's finished contour, using a simple jig that's clamped along the axis lines. (See left photo, next page.) Since the jig's top edges are cut to match the intended seat contour along the axis lines, it's quick work to bore to the contour depth when you fix a depth stop collar on your bit.

Next, I carved the seat to the depth of the holes. This kind of rough shaping can be done quickly with a "Lancelot" power-carving wheel, which is designed to be used on a right-angle grinder. (The Lancelot wheel is available from Woodworker's Supply, 1125 Jay Lane, Graham, NC, 27253, 800-645-9292.) *Caution: The Lancelot is designed to cut very aggressively. If you haven't worked with this carving accessory before, follow the manufacturer's directions closely and practice on some scrap first to get a feel for using the wheel.*



Drilling the legs. To bore the angled holes for the stretchers, the author clamps the arm of the drilling jig in position to guide his drill.



Shaping the seat. First the author drills a series of holes in the top of the seat, using a depth-gauge jig cut to approximate the finished contours (left). Then he carves to the depth of the holes, using a right-angle grinder fitted with a carving wheel (right).

FIG. 2: SEAT LAYOUT

1 SQUARE = 1 IN.

To create a stable stool, position the feet on the circumference of a 23-in.-dia. circle and locate leg holes as indicated.

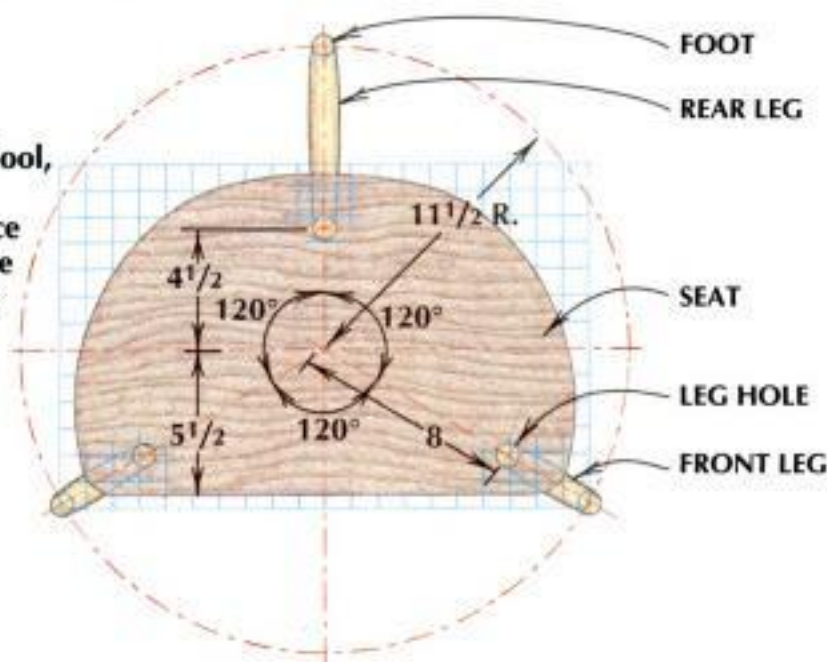
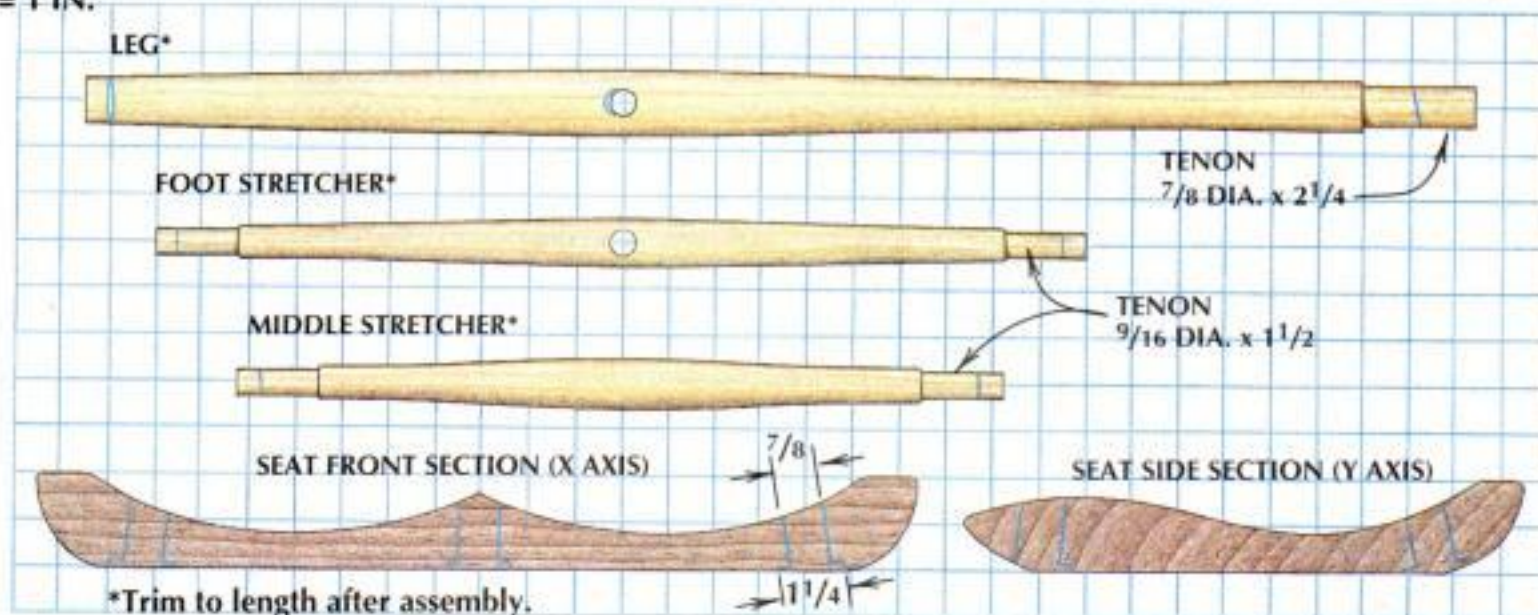


FIG. 3: LEG, SEAT & STRETCHERS

1 SQUARE = 1 IN.



With the seat held firmly to my benchtop, I started carving along the line of drilled holes. (See photo, left.) I made small arcing sweeps left and right, moving the cutter sideways and taking 1/8-in.-deep cuts until I reached the bottom of the holes. Then I carved near the perimeter of the seat and finished by carving the sections between the axis lines and the perimeter.

With the seat rough-carved, I replaced the cutter on my grinder with a 36-grit sanding disc backed by a flexible rubber wheel (available at automotive supply shops and some hardware stores) and concentrated on refining the carved surface with the coarse disc. I followed this with an 80-grit disc and then switched to an orbital sander, starting with 80-grit paper to remove the circular scratches left by the grinder and using successively finer grits up to 120 grit.

Shaping the legs and stretchers came next. Here, I use a drawknife and spokeshave. These parts could be turned on the lathe, but I enjoy working with hand tools, and I prefer the small facets and flats that these edge tools leave—the indelible “signature” marks of the maker.

With the drawknife, I quickly knock off the corners of the stock and rough out the overall shape. I pull the drawknife toward me with the bevel down to control the cut, taking a heavy shaving with each pass. (See top photo, opposite page.) Once the overall shape is formed, I refine it and smooth the surface with the spokeshave. Adjust the blade for a light cut and change directions as required, so you don't tear out the grain. Skewing the tool also helps reduce tearout.

Finally, I made pairs of walnut wedges for each joint. Using two wedges reduces the chances of splitting the



Shaving the legs. With the workpiece clamped between bench dogs, Marian uses a drawknife to shape the legs.

tenons. I cut the wedges on the band-saw, making them about $1\frac{1}{2}$ in. long and $\frac{3}{16}$ in. thick at the fat ends.

Assembling the Stool

With the parts near completion, I dry assembled the legs and stretchers and installed the legs in the seat. Then I marked around all the protruding tenons and drew pencil lines to indicate the correct positions of the wedges. I oriented the wedges perpendicular to the grain of the seat, legs and foot stretcher to prevent splitting. (See Fig. 1.)

Next, I took the stool apart and trimmed the tenons to length with a fine-toothed Japanese *dōzuki* saw. I also used this saw to cut the slots for the wedges.



Tracing the feet. Marian marks the compound angle on the legs with a pencil and some scrap.

The last step before assembly was to file the outside of the holes slightly oval to accommodate the action of the wedges. Using a round, $\frac{1}{2}$ -in. bastard file, I carefully filed a slight taper on each end-grain area of the holes. (See Leg Hole Detail, Fig. 1.) This gives a very precise fit for the tenons once they're wedged in place.

Next I assembled the legs and stretchers, spreading just a small amount of glue on the tenons and inside the holes. Then I joined the legs to the seat, using glue as before. Hand pressure alone is enough to bring these parts together. Once all the joints were seated, I put a little glue on the wedges and drove them in with a hammer. When the glue has dried, you can use a sharp knife or a handsaw to remove the protruding

wedges, and then clean up the joints with a fine file and sandpaper.

The last step is to mark and trim the "feet" so they don't wobble. I set the stool on a level surface and used a piece of wood and a pencil to scribe around the legs. (See photo, below left.) I trimmed the angle on the legs with my Japanese saw and, as a final touch, I filed a $\frac{1}{8}$ -in. chamfer on the ends of the legs to prevent splintering. ▲



VOICU MARIAN
*studies fine arts
and works wood
in northern Ohio.*

DOUBLE-DUTY DRILLING JIG

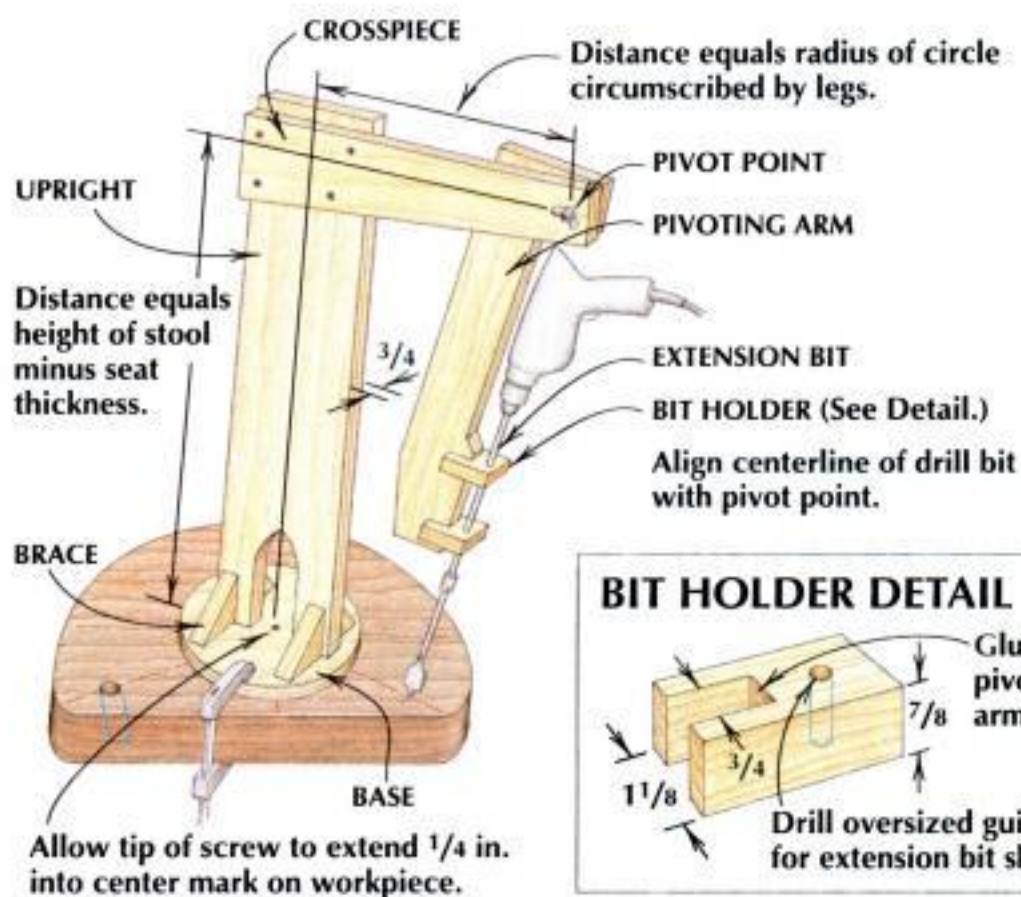
Guide Your Drill Bit for Straight Holes and Precise Angles

My jig for boring the stool's angled seat holes and horizontal stretcher holes does the work of a radial drill press, but you can make it from just a few wood scraps.

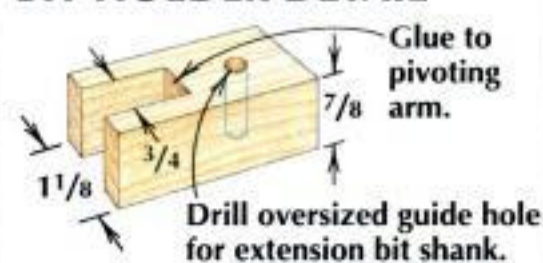
The jig is designed to guide an extension bit chucked in a portable electric drill. To drill the angled seat holes, I first position the jig on the underside of the seat, driving a 1-in.-long screw through the center of the jig's base and into the center point used to lay out the leg holes. I turn the jig on its screw until the point of the drill bit centers on the layout lines for a leg hole. Then I clamp the jig's base to the seat and bore the hole.

When I need to guide a bit for horizontal drilling, I remove the pivoting arm—with the drill attached—and clamp this arrangement to a scrap stick of appropriate length and width. The stick and pivoting arm can then be positioned to properly align the bit.

—V.M.



BIT HOLDER DETAIL



Buyer's Guide to Router Table Fences

Aftermarket Fences Offer Accuracy, Convenience and Capability



Adjustability, capability and precision. Aftermarket router table fences are designed to help you get the most out of your router table. Above, JoinTECH's Smart Fence with its optional MDF "Fence-Raiser" provides high support for operations like raising panels.

Not too long ago, a typical router table was little more than a router mounted upside down in a piece of plywood. Clamp a straight-edged piece of wood to the plywood and you'd have a fence. But times have changed. Today, the router table has come into its own as a stationary tool. Woodworkers expect more features and capabilities, and manufacturers have responded with tables, inserts, fences, stands, and accessories.

Except for the router itself, the fence is probably the most important part of a router table setup. You could build your own fence, but you'd be hard-pressed to incorporate some of the advanced features found on the aftermarket fences we tested here. Depending on your

needs, you might want a fence with micro-adjustment capability, one with ready-made T-slots convenient for mounting accessories, or maybe one that has a replaceable, zero-clearance insert to reduce chipout. A vacuum port for dust collection is also a big plus. You'll find these features and more among the 10 different fences we tested.

All the fences we tested have bases of cast or extruded aluminum. Clamps or knobs secure the base to the top of the router table, and the workpiece is guided by wooden or plastic *subfences* that are secured to the base. Only the Hartville fence is designed without subfences; its L-profile extrusion acts as base and fence.

Bit guards are important safety features, and all 10 fences have them. In

general, we liked the bit guards that mount to a fence's base rather than to its subfence, because you can adjust the subfence without loosening the guard.

As you check out each fence on the following pages, note the key features labeled in the photos. If you've already built or bought a tabletop for your router table, the "Fits table size" specs will be important. Factor in the price and weigh the "Pros" and "Cons" against the kind of work you plan to do. Then consider our picks.

Overall, all 10 fences filled the bill for standard routing tasks. Our Editors' Choice award goes to JoinTECH's Smart Fence for its innovative design and abilities. Our Best Buy pick is Woodhaven's model 202. (See pages 60 and 62.) ▲

Price: \$64

Construction: Cast-aluminum base; $\frac{3}{4}$ -in. birch plywood subfences. Fence height: $4\frac{1}{2}$ in.

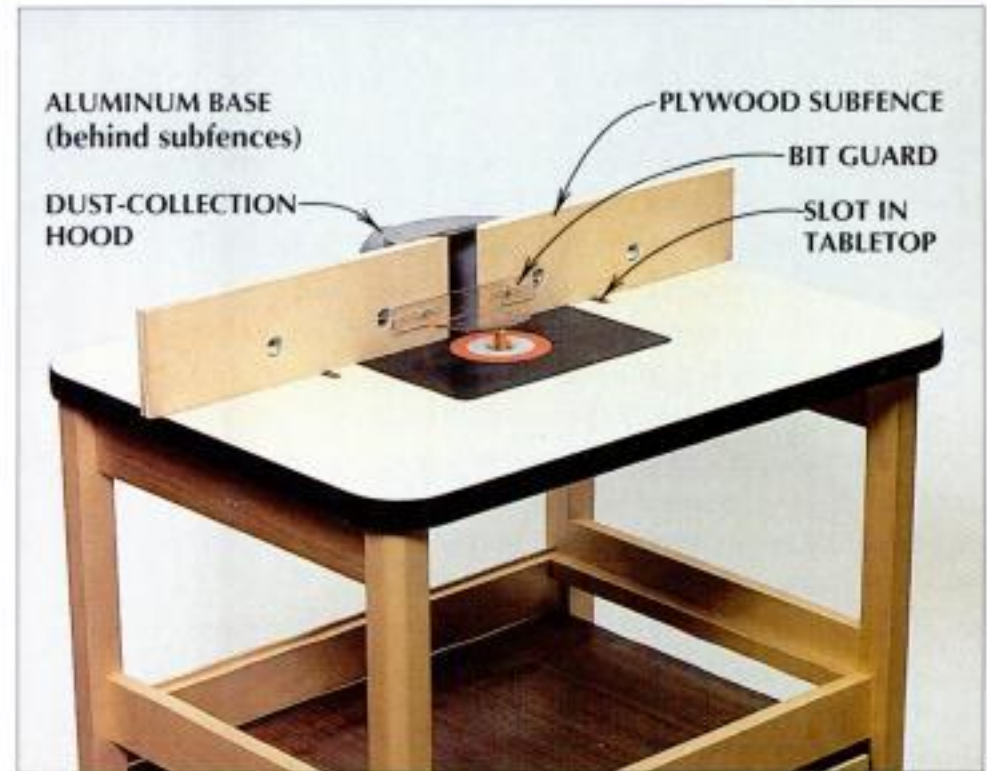
Fits table size: Fits any tabletop. Requires $\frac{7}{16}$ -in.-wide slots located $15\frac{1}{4}$ in. apart.

Special features: Large integral dust-collection hood.

Pros: Two-piece fence lets you adjust gap for bit from $\frac{3}{4}$ in. to $3\frac{7}{8}$ in. wide. Sturdy base. Dust-collection hood accepts $2\frac{1}{2}$ -in.-dia. shop-vacuum hose or 3-in.-dia. dust-collector hose. Tallest standard fence.

Cons: Fence requires slotted tabletop. You'll have to relocate screws to move the bit guard up or down. Fence lock knobs tend to shift when tightened.

Bottom line: This is a sturdy, adequate bare-bones fence. Low price is the main attraction.



EAGLE AMERICA 415-7000

Eagle America (800) 872-2511

Price: \$99

Construction: Extruded aluminum angle base; $\frac{3}{4}$ -in.-thick maple subfences. Fence height: 3 in.

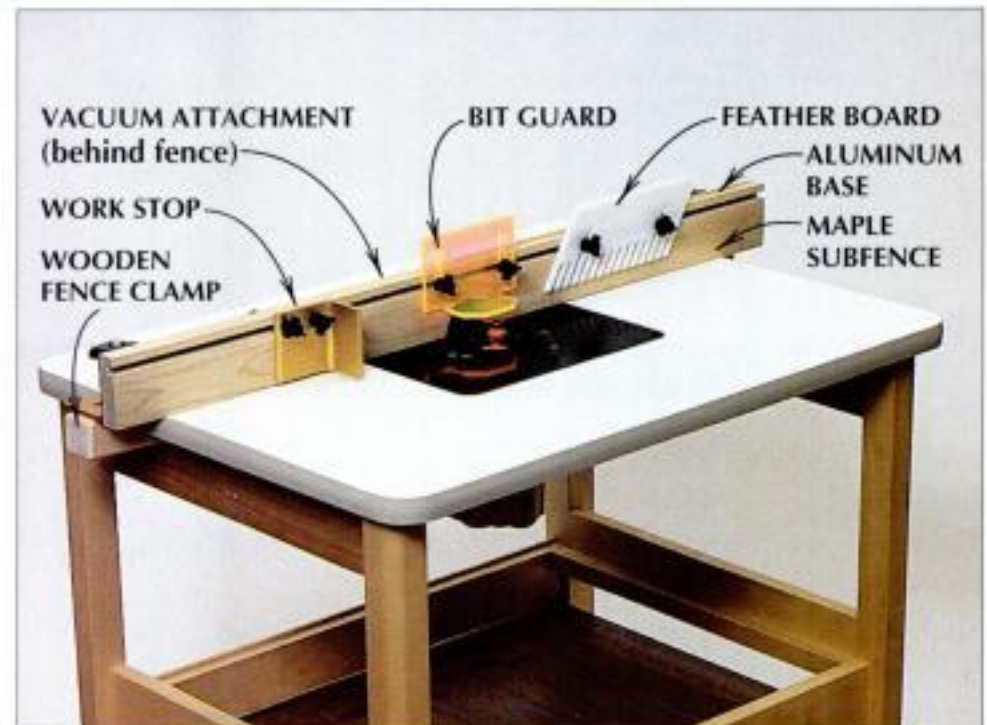
Fits table size: 1 in. to $1\frac{1}{2}$ in. thick, by 23 in. to $34\frac{1}{2}$ in. long.

Optional accessories: Plastic shims of different thicknesses to adjust outfeed subfence for jointing.

Pros: Two-piece fence lets you adjust bit gap from $2\frac{1}{2}$ in. to $4\frac{1}{2}$ in. wide. Bit guard adjusts vertically and horizontally. Large lock knobs are easy to turn.

Cons: Minimum opening between subfences is large ($2\frac{1}{2}$ in.).

Bottom line: A good basic fence that's solid, sturdy and easy to use. Feather board, bit guard and work stop are valuable standard accessories.



HARTVILLE TOOL 93151

Hartville Tool (800) 345-2396

Price: \$89.95

Construction: One-piece extruded aluminum angle base; no subfences. Fence height: 3 in.

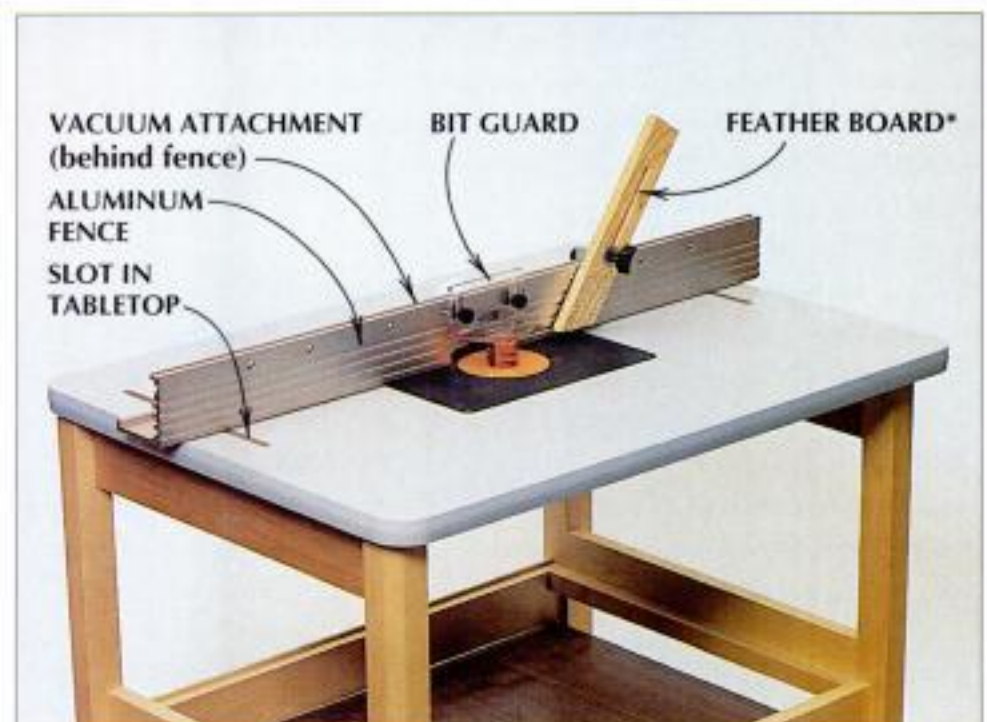
Fits table size: Fits any tabletop. Requires $\frac{3}{8}$ -in.-wide slots located $27\frac{3}{8}$ in. apart.

Optional accessories: Wooden feather board.

Pros: Aluminum extrusion is sturdy and straight. T-slots in back of fence let you mount Incra Jig, JoinTECH and other jigs.

Cons: Fence requires slotted tabletop. Feather board is awkward to use on stock thicker than $\frac{1}{2}$ in. You'll have to drill holes in the aluminum to attach a high fence or jigs.

Bottom line: Good, straight, no-frills fence.



Price: \$74.95

Construction: 48-in. extruded aluminum T-track; $\frac{3}{4}$ -in.-thick, 13-ply void-free plywood subfence. Fence height: $2\frac{3}{4}$ in.

Fits table size: Any thickness and width, up to 48 in. long. Must install T-tracks (included) at sides of tabletop.

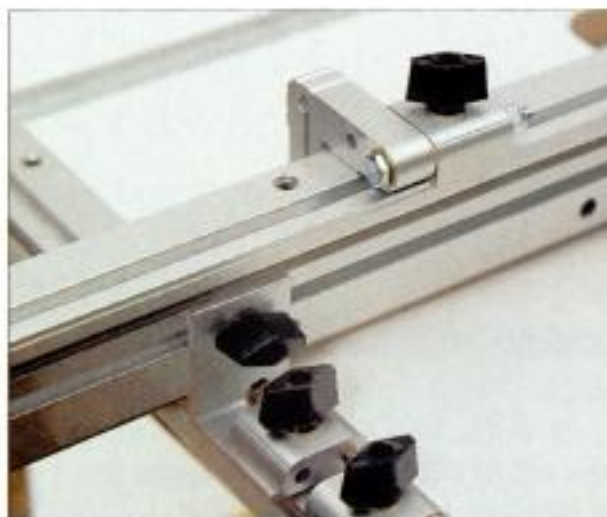
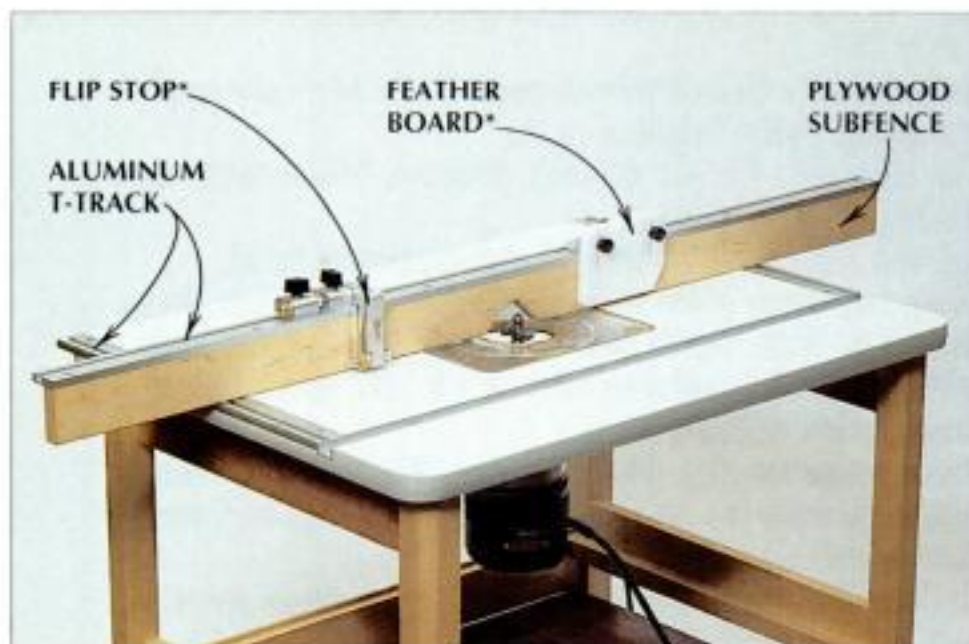
Special features: Designed as a modular "kit" consisting of T-track sections which can hold various components such as clamps, stops, guards and feather boards.

Optional accessories (starred in photo): Feather board; single flip stop; double flip stop; micro-adjuster; micro-base (see photo, below right); measuring rule.

Pros: Extra-long fence. Modular design lets you add components at any time. Components can also be configured for miter gauge, drill press, tablesaw and other machines. Micro-adjust capability is accurate, but not comparable to positioning jigs. T-tracks let you mount Incra Jig, JoinTECH, spring-loaded hold-downs and other jigs.

Cons: No dust collection. Top track can be tricky to install on the plywood subfence. Angle brackets flexed under pressure. (The manufacturer has upgraded with stronger angle brackets.)

Bottom line: The Fasttrack is an extremely versatile fence system with attachments and micro-adjust capabilities that work precisely. Its 48-in. length offers good support for long stock. If you don't mind assembling the components, it's a great value for the price.



Modular parts for micro-adjustment. Optional micro-adjustment hardware attaches to the T-track and to the back of the fence.



JOINTECH SMART FENCE SF-R32

JoinTECH (800) 619-1288

Price: \$159.95 for 32-in. length

Construction: Extruded aluminum. Fence height: 3 in.

Fits table size: $1\frac{1}{8}$ in. thick by 32 in. long, or $1\frac{1}{8}$ in. thick by 24 in. long.

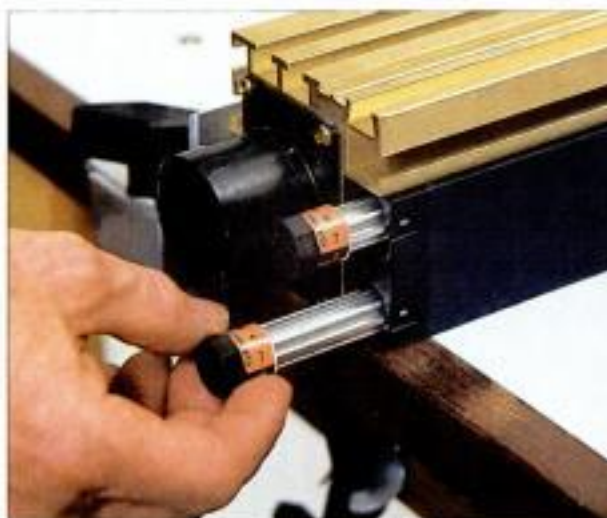
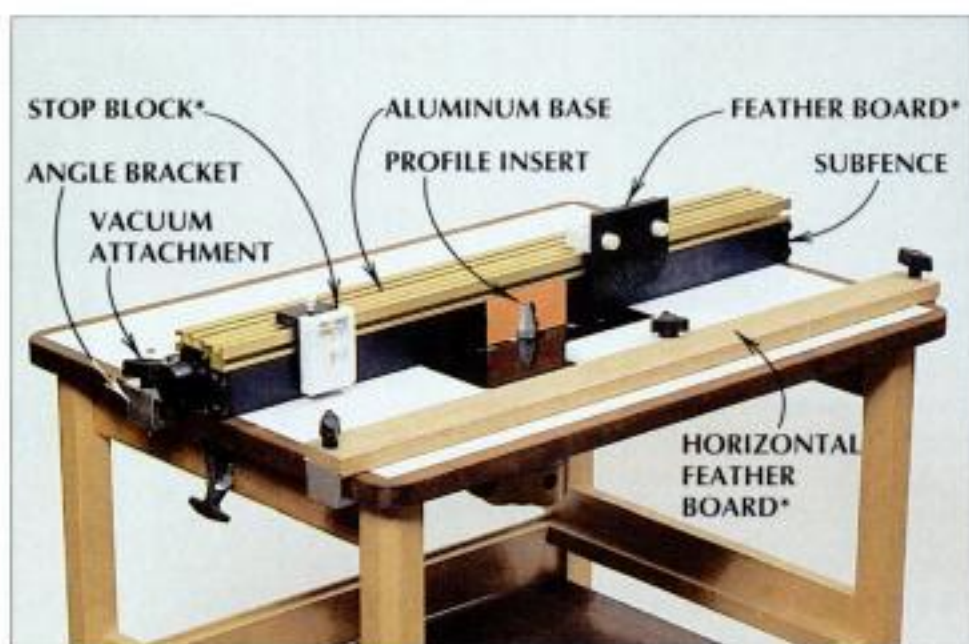
Special features: Zero-clearance profile inserts; subfence opening and offset independently adjustable.

Optional accessories (starred in photo): High MDF fence with table-mounted horizontal feather board (see photo, page 58); stop block; vertical feather board; vertical push fixture; clamps to install fence on $1\frac{5}{8}$ -in.-thick table; six blank profile inserts; video.

Pros: Plastic inserts let you make zero-clearance support for any bit profile. Two-piece subfences can be independently offset in $\frac{1}{64}$ -in. increments. T-slots in fence let you mount Incra Jig, JoinTECH, or shop-made jigs. Excellent dust collection. Bit guard is independent of subfences. Easy to install and remove the high fence and accessories in top dovetail slot.

Cons: Mounting brackets can flex under load. You can overcome this by clamping the fence directly to the table.

Bottom line: Innovative and well-designed, the Smart Fence lives up to its name, and earns our Editors' Choice award. It's the best companion fence for JoinTECH's incremental positioning machine (IPM). Even without the IPM, you get subfence adjustment to within $\frac{1}{64}$ in., zero-clearance inserts, a high auxiliary fence, and a table-mounted feather board—features you won't find standard on any other aftermarket fence.



Innovative fence adjustment. Each subfence on this JoinTECH fence can be offset in $\frac{1}{64}$ -in. increments by rotating these rods.

Price: \$70

Construction: Cast-aluminum base; $\frac{3}{4}$ -in. plywood subfences. Fence height: $3\frac{1}{4}$ in.

Fits table size: Fits any length top. Requires $\frac{7}{16}$ -in.-wide slots in tabletop, located $15\frac{1}{4}$ in. apart.

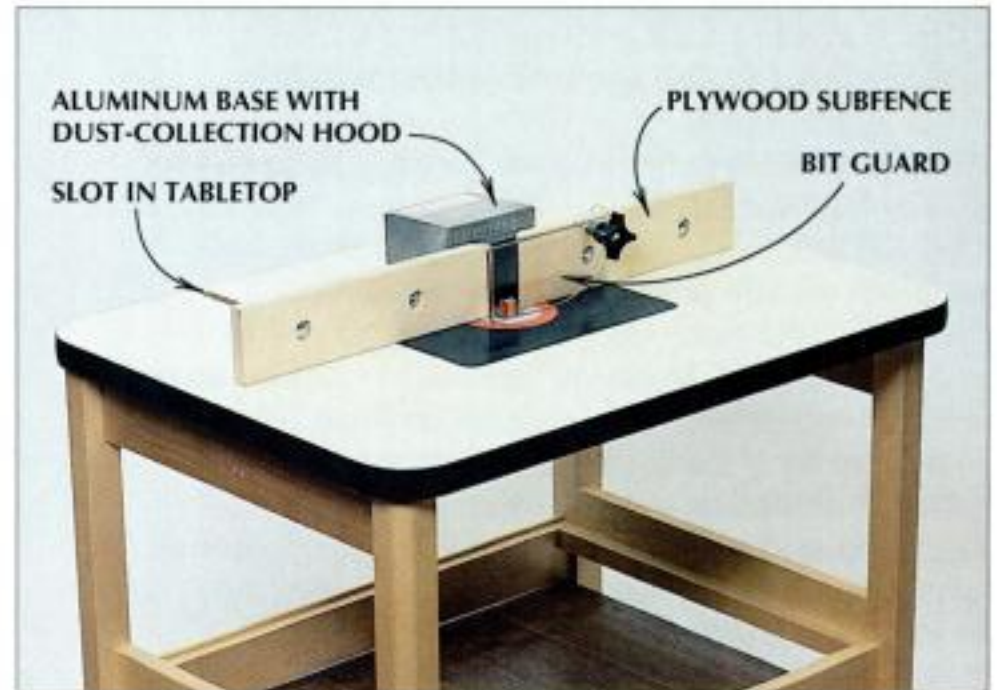
Special features: Spring-loaded Lexan bit guard.

Optional accessories: Spring-loaded roller hold-down.

Pros: Two-piece fence lets you adjust gap for bit from zero in. to 3 in. wide. Masonite cover on rear of dust hood can be cut to fit any size vacuum hose.

Cons: Fence requires slotted tabletop. Bit guard is flimsy; it could get caught in the bit.

Bottom line: A no-frills, low-tech fence. Cast-aluminum base is sturdy, but roughly machined. The spring-loaded bit guard is a novel feature (it works like a jointer guard) but the one we received worked poorly.



WOODCRAFT 24Z14

Woodcraft Supply (800) 225-1153

Price: \$104.95

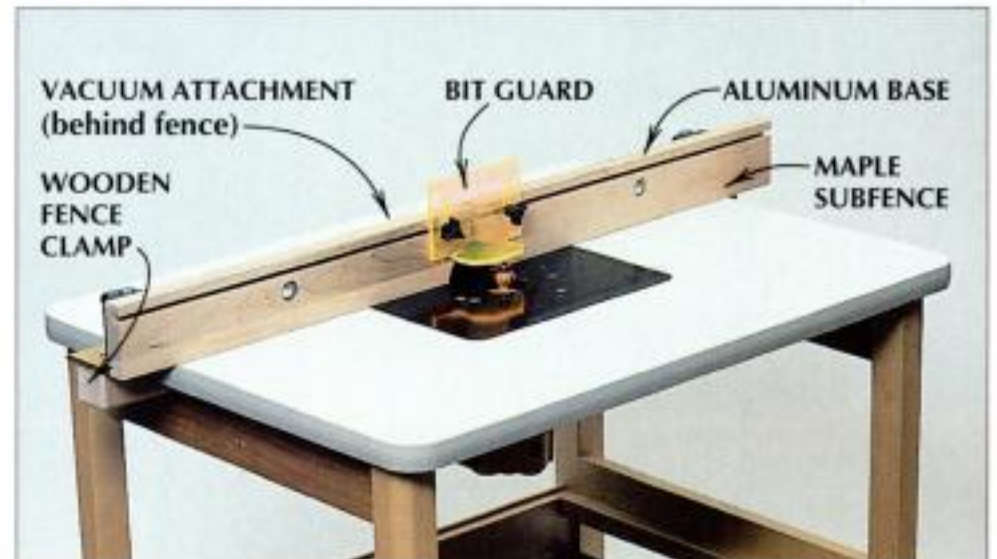
Construction: Extruded aluminum base; $\frac{3}{4}$ -in. maple subfences. Fence height: 3 in.

Fits table size: 1 in. to $1\frac{1}{2}$ in. thick, by 23 in. to $34\frac{1}{2}$ in. long.

Pros: Two-piece fence lets you adjust gap for bit from $2\frac{1}{2}$ in. to $4\frac{1}{2}$ in. wide. Bit guard adjusts vertically and horizontally. Large lock knobs are easy to turn.

Cons: Minimum opening between subfences is large ($2\frac{1}{2}$ in.).

Bottom line: A good but pricey basic fence that's sturdy and easy to use.



WOODWORKER'S SUPPLY 858-775

Woodworker's Supply (800) 645-9292

Price: \$99.95

Construction: Extruded aluminum base; oak subfences. Fence height: $2\frac{1}{2}$ in.

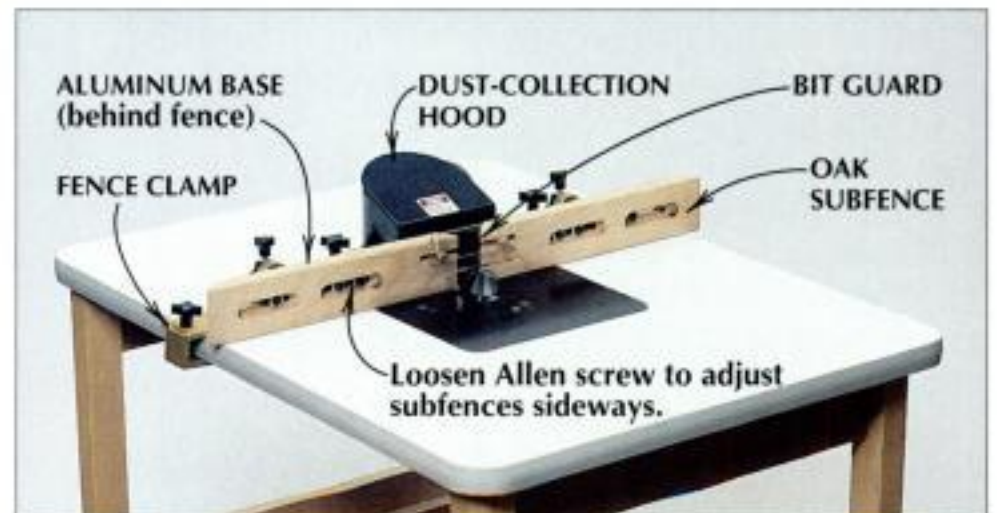
Fits table size: $\frac{3}{4}$ in. to 1 in. thick, by 24 in. long.

Special features: Subfence opening and offset independently adjustable.

Pros: Two-piece fence lets you adjust gap for bit from zero in. to $2\frac{1}{2}$ in. wide. Micro-adjust screws let you offset subfences precisely up to 1 in. in or out.

Cons: Requires Allen wrench to adjust subfences left or right. Shortest and lowest fence. Limited to 24-in.-long tabletops.

Bottom line: A short but adequate fence best suited to small-scale work. Micro-adjust capability works, but doesn't ensure parallel subfences. Check both fences with a straightedge before tightening lock knobs.



Micro-adjusting. Turn a knurled ring at the back of the fence to move either subfence in or out along a built-in scale.

Price: \$129.95

Construction: Extruded aluminum; plastic subfences.

Fence height: 3 1/4 in.

Fits table size: Up to 1 3/4 in. thick, by 24 in. to 30 in. long.

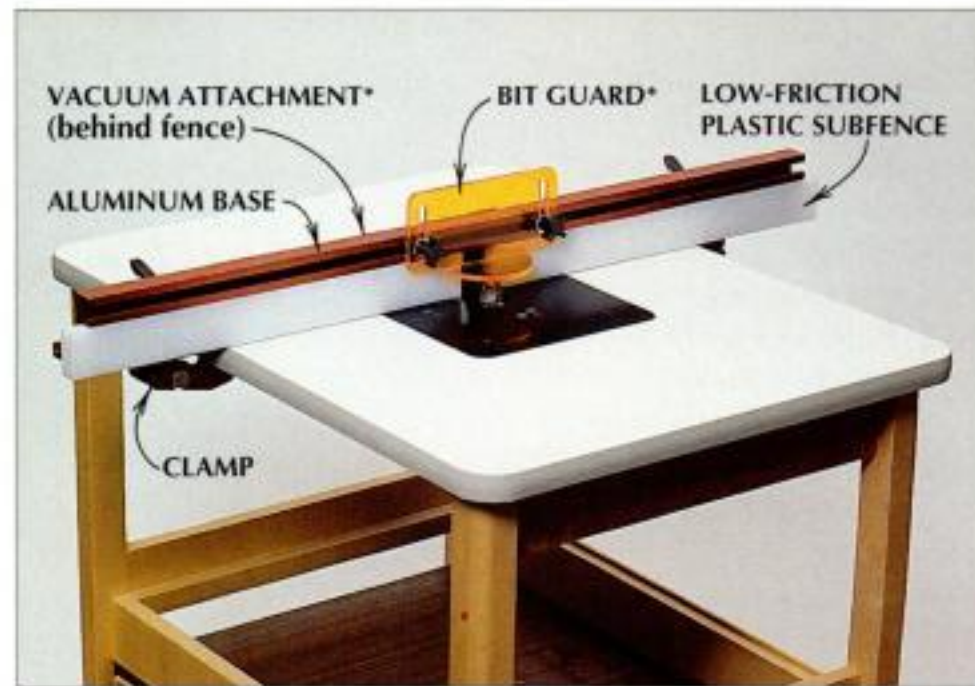
Special features: Quick-action cam clamps for table attachment.

Optional accessories (starred in photo): Feather board; bit guard; vacuum attachment for 2 1/2-in. hose.

Pros: Two-piece fence lets you adjust gap for bit from zero in. to 2 3/16 in. wide. Cam clamps lock fence in position securely with half-turn of lever. Base-mounted bit guard adjusts independently of subfences. Stock slides easily on UHMW (ultra high molecular weight) plastic subfences.

Cons: You can't screw into fence to mount jigs or auxiliary fence. Fence working height is only 2 in. because plastic subfences protrude slightly beyond the base.

Bottom line: Pricy, but well-made and sturdy, this is a great fence for basic routing operations. But it's too small to fit on popular 32-in.-wide or 34-in.-wide router tables.



Tight-gripping cam clamp. A half-turn of the handle locks Woodsmith's fence securely.



WOODHAVEN 202

Woodhaven (800) 344-6657

Price: \$79.99 for 32-in. fence

Construction: Extruded aluminum base; 3/4-in. maple plywood subfence. Fence height: 3 3/8 in.

Fits table size: Required table thickness: 1 in. to 1 1/2 in.

Five different fence lengths are available:

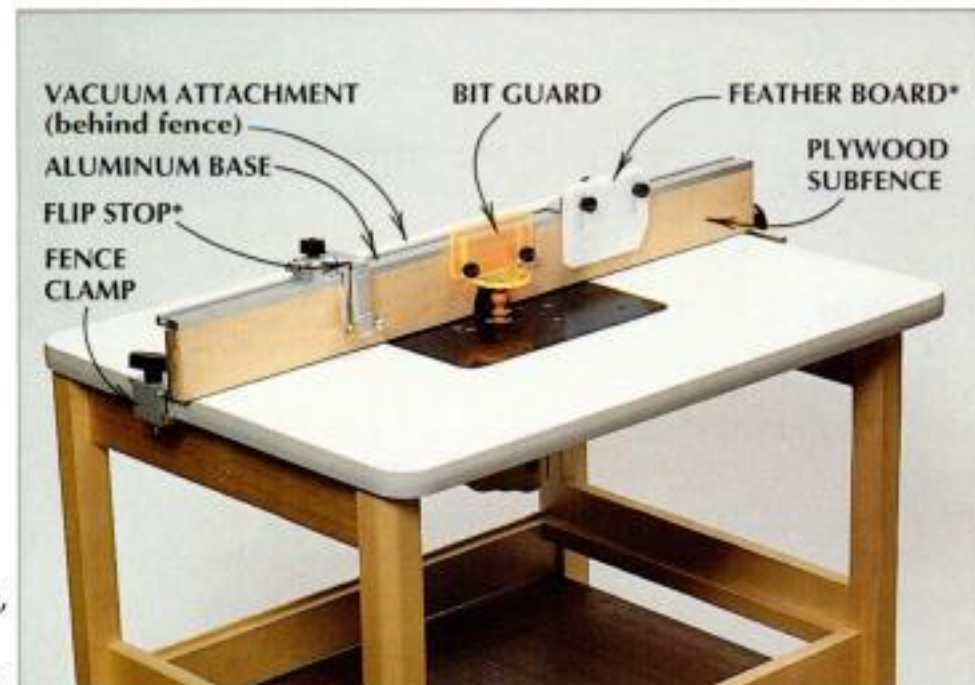
- Model #200 fits 24-in.-long table
- #201 fits 27-in.-long table
- #202 fits 32-in.-long table
- #203 fits 36-in.-long table
- #204 fits 48-in.-long table

Optional accessories (starred in photo): Fence adjuster; vertical and horizontal feather boards; wide bit guard; freehand routing guard; offset subfence for jointing; brackets to attach positioning jigs; fence upgrade kit (includes aluminum T-track for top of fence, flip-stop, and feather board).

Pros: Five different sizes are available to fit different size tabletops. Simple design. Base-mounted bit guard adjusts independently of subfences. Fence slides easily on small nylon pads.

Cons: No split fence.

Bottom line: A clear Best Buy award winner. Simple and sturdy in its basic form, this fence is a great value for \$79.99 (the base price for #202). The five sizes offer flexibility if you're building your own tabletop. And there's a wide range of options available if you want to upgrade your capabilities.



Optional adjuster. Woodhaven's optional fence adjuster accessory works like a table-saw fence. A scale and cursor let you locate the fence precisely and lock it parallel to previous settings.

WOOD FACTS

Yellow Poplar

by Paul McClure



Yellow poplar has been around since the Ice Ages, and at one time it thrived throughout eastern Europe. *Liriodendron tulipifera* survives

today in central China and North America. The tree can reach heights of nearly 200 ft. and diameters of 8 to 10 ft., but it typically grows to about 100 ft.

Yellow poplar is a member of the magnolia family, which includes about 150 species of trees and shrubs that grow in America and Asia. The yellow poplar is one of only a few species in the magnolia family valued for lumber. It is also called the "tulip tree" because of its greenish-yellow, tulip-shaped flowers. Two other members of the magnolia family—the cucumber tree (*Magnolia acuminata*) and the evergreen magnolia (*M. grandiflora* L.)—closely resemble yellow poplar and are often sold under its name.

The Indians called poplar the "white tree" because of the color of its wood. They hollowed huge logs to make 40-ft.-long canoes. Since Colonial times, other Americans have used the wood for furniture, turnings, baskets and boxes.

Appearance

Yellow poplar is close-grained and has a fine texture. The grain is straight and the wood has a very subdued figure which only rarely exhibits curl or blister. The greenish-yellow heartwood is sometimes streaked with green, red, black or purple which turn to shades of brown after exposure to light and air. The sapwood is white and retains its color over time, creating an interesting contrast with the heartwood.

Workability

Fairly soft, lightweight and stiff, poplar works easily with both hand and power tools and holds sharp details. It glues

and sands well and accepts many fasteners without predrilling, but it only has moderate bending capabilities.

Not a showy wood, poplar is usually painted or stained. Its smooth texture and lack of gum or chemicals make it a great candidate for painting. Before staining, apply a wash coat of shellac to prevent blotches. The woodworking industry often uses tinted lacquers to obtain an even color.

Uses

Poplar is used extensively in the furniture industry. Although it is not often used in exposed casework, it is commonly used for drawer boxes, interior framework, and as a veneer substrate. Commercial plywood made of poplar veneers is light and stable.

Poplar is also used for siding, sash, sills, moldings and other products—from caskets and ladders to piano hammer mechanisms and children's toys. ▲

YELLOW POPLAR

SPECIES AND COMMON NAMES	<i>Liriodendron tulipifera</i> —poplar, yellow poplar, tulip poplar, whitewood, canoe wood, canary wood
GROWING REGION	From southern Ontario to Wisconsin, south to Alabama and Florida; central China
SPECIFIC GRAVITY	0.40
DENSITY	28 lbs. per cubic ft.
WOOD MOVEMENT¹	Tangential (flatsawn): small ($\frac{3}{16}$ in. per ft.) Radial (quartersawn): very small ($\frac{3}{32}$ in. per ft.)
DURABILITY	Susceptible to insect and fungal attack
SUSTAINABILITY	Sustainable at current harvest levels
AVAILABILITY	Hardwood lumber dealers, some home centers
SIZE: THICKNESSES	4/4 through 16/4
WIDTHS	6 to 18 in. (sometimes wider)
LENGTHS	8 to 16 ft. (sometimes longer)
COST: LUMBER	\$1.70 to \$4 per bd. ft. depending on thickness
VENEER	45 cents per sq. ft.



QUARTERSAWN POPLAR



FLATSAWN POPLAR

¹Indicates movement across the grain from 6 to 12 percent moisture content.

JUST FINISHING

HVLP SPRAY GUNS

Save Time and Money with these Efficient Finishing Tools

by Michael Dresdner



The introduction of HVLP spray guns some years ago drastically altered the nature of spray finishing. HVLP (high volume, low pressure) guns can be much more efficient than conventional spray guns, saving you time and money when you're finishing your work.

Conventional vs. HVLP Systems

Conventional and HVLP spray guns are alike in that they both act as carburetors, mixing fluid with air. The air atomizes the finish into tiny droplets and deposits it on the workpiece.

The main differences between the two types of guns are the air pressure at the tip (expressed in pounds per square in., or psi) and the volume of air they move (expressed in cubic ft. per minute, or cfm). Conventional spray guns move low volumes of air (7 to 15 cfm) at high pressures. HVLP guns move high volumes of air (up to 105 cfm) at low pressures.

The high air pressure of a conventional gun (25 psi to 75 psi) causes the air/fluid mix to strike the surface of the wood at a high velocity. As a result, about 75 percent of the finish bounces back and floats in the air or lands on adjacent work surfaces. This results in a 25 percent *transfer efficiency*, since only 25 percent of the finish lands on the wood. (By comparison, a brush has nearly a 100 percent transfer efficiency.)

Because an HVLP gun has lower air pressure (below 10 psi), it deposits up to 65 percent of the finish on the wood. This 65 percent transfer efficiency means that an HVLP gun wastes less than half as much finish as a conventional gun. In addition, less overspray lands on the areas you already coated, resulting in smoother surfaces that require less sanding between coats. The

reduced overspray is particularly helpful when spraying the insides of cabinets.

Another difference between the guns is that HVLP guns use a pressurized pot to deliver the finish to the gun tip. Conventional guns use siphon-feed.

There are two types of HVLP guns: *turbine* and *conversion*. A turbine gun is designed to get its air from a turbine unit rather than from a compressor. Conversion guns convert compressed air into low-pressure air.

Turbine Guns

Turbine guns are designed for use with motor-driven fan units called turbines. The guns connect to the turbine with a 1-in.-i.d. hose, which can be somewhat clumsy in use. A turbine—which deliv-

ers heated air to the gun—is somewhat like a vacuum cleaner which blows air out rather than sucking it in. A turbine may have from one to three separate fans called *stages*. A two-stage unit produces 4 to 5 psi; a three-stage unit produces 5 to 6 psi.

Turbine guns will spray most lacquers and thin paints but, because of the limited air pressure produced by a turbine, they may have trouble atomizing some thicker coatings such as latex paint. The gun's air pressure is non-adjustable and is determined by the size of the turbine used to operate it.

Turbines produce a constant, large volume of air which must be allowed to "bleed"—either through a "bleeder" gun or through an in-line pressure



Turbine and conversion guns. A turbine gun (left) is designed to be powered by a turbine. Some—like this Accuspray 10—can also use compressed air if you attach an in-line conversion unit (shown). The transparent head shown here is for demonstration purposes and is not commercially available. More powerful than a turbine gun, a conversion gun (right) is powered by a large air compressor instead of a turbine. The gauge attached to the handle on this DeVilbiss JGHV-5284-FX gun regulates air pressure to the cup.

release valve. Bleeder guns blow air through the tip constantly, even when the trigger is released. Nonbleeder guns (which require the in-line valve) shut off both air and fluid at the gun when the trigger is released. I prefer non-bleeder guns, since constant air coming through a gun blows dust around the spray area.

Most turbines are portable and plug into a standard 115-volt electrical outlet, making them ideal for spraying on-site. Depending on quality and features, turbines can cost anywhere from several hundred dollars to more than \$1,000.

In my shop, I use an Accuspray 10, which is lightweight, comfortable, and delivers good atomization. This non-bleeder gun—like some other turbine guns—accepts a conversion unit which allows it to be powered off a compressor instead of a turbine. (See left photo, page 66.) Altogether, the gun, conversion unit, two caps, and three tip assemblies cost about \$495.

Conversion Guns

An HVLP conversion gun converts compressed air into low-pressure air by means of a conversion "unit" that is mounted either in the gun, on the gun, or on a wall. The first two types of conversion units use an easy-to-manage 3/8-in.-i.d. air hose. Wall-mounted units use a 1-in. hose.

Unlike turbine guns, conversion guns allow you to adjust the air pressure at the gun's tip by changing the line pressure going into the gun. A line pressure of 80 psi converts to 10 psi at the gun tip—enough to atomize even thick coatings. That 80-psi line pressure, however, must be backed up by 12 to 20 cfm of air, which requires at least a 5-HP compressor.

I also use a conversion gun—a DeVilbiss JGHV-5284-FX. This is the most powerful HVLP gun I've used. It provides great atomization and delivers lots of material fast. It requires about 18 cfm of air (at 80 psi) and sells for about \$400, but it's worth every penny.

Assuming you've decided to take the plunge into HVLP, your choice of gun depends on your finishing needs and existing equipment. If you don't own a large compressor and if you sometimes spray on-site, I suggest getting a turbine gun and turbine. If you own a large compressor, a conversion gun will provide greater power and finishing flexibility and save you the cost of a turbine.

See AW #28 for a review of HVLP turbines and guns. ▲



Join Michael Dresdner live on America Online Sunday nights from 9:30 pm to 10:30 pm eastern time for answers to your finishing questions. From AMERICAN WOODWORKER Magazine Online, click the "Shop Talk" icon to enter the finishing chat room.

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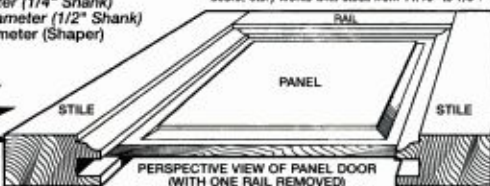
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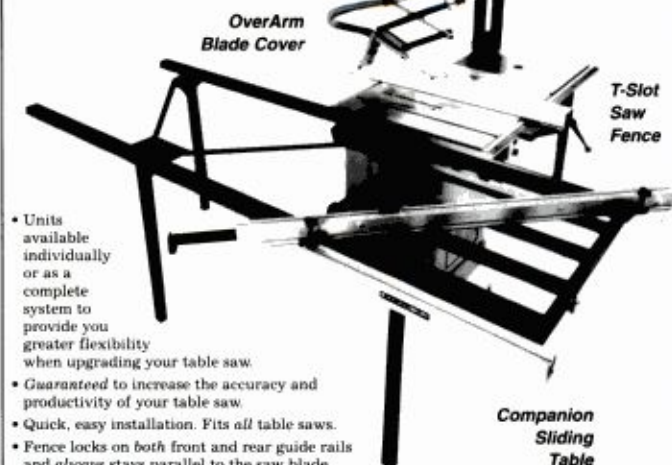
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TOOL BOX

Effective Sharpening Duo

Fred Matlack and Phil Gehret, who run the AW Design Shop, rely on the combined efforts of two relatively new tools for most sharpening tasks. Matlack reports, "Used together, these tools are especially good for gouges and other curved edge tools."

The Stephan Grinder has a "see-through" wheel that's actually a thin steel disc, coated with carborundum abrasive and cut full of slots. The disc spins horizontally in a metal housing; the disc's slots let you see through it as it spins. Aided by the built-in light, you can actually observe metal being removed from the chisel or blade you're grinding—something you can't do on a conventional grinder. (See photo.) This way you can



Stephan Grinder

grind very accurately without the aid of special jigs. Freehand grinding—a trial-and-error affair on a conventional grinder—can be done quickly and effectively on the Stephan. The disc's slots help keep the disc and the blade cool. The grinder comes with a 120-grit disc; 80- and 180-grit discs are also available. (Price: \$349.95; extra discs, \$99.95 ea.) *Woodcraft, Dept. AWT, 210 Wood County Industrial Pk., Parkersburg, WV 26102, (800) 542-9115. Circle #620*

Once you've ground the bevel on a tool, you can hone the edge to a mirror finish with Surgi-Sharp—a 1-in.-wide leather belt designed to fit 1-in. belt grinders. The belt comes in 30-in. and 42-in. lengths. Along with each belt purchased, you get a stick of medium-grade buffing compound. Charge the belt with compound, turn on the grinder and you're ready to put the finished edge on your tool. (See photo, left.) And if you prefer to shape your tool's initial bevel with a 1-in. abrasive belt, the company sells a handy angle guide that fits on the grinder's platen to support tools at precise angles. (Price: 30-in. belt, \$11.95; 42-in. belt, \$13.95; additional buffing compound, \$2.50; angle guide, \$16.95) *Wheatland Products, Dept. AWT, 7133 SW 59th St., Oklahoma City, OK 73179, (800) 346-4656. Circle #621*



Surgi-Sharp

New Paint, Old Colors

Historic Paints Ltd. has introduced a new line of paints formulated to accurately reproduce the colors of the 18th and 19th centuries. The paints rely on linseed oil, turpentine, organic resins and traditional pigments to produce their luster. These creamy, thick-bodied paints offer double the coverage of con-



ventional paints, and they dry with the "ropey" brushed texture commonly seen on antique furniture and architectural surfaces. A total of 17 standard colors are available, and the company can produce custom colors on request. (Price: pint, \$12.50; quart, \$21) *Historic Paints Ltd., Dept. AWT, Burr Tavern, Rte. 1, Box 474, East Meredith, NY 13757, (607) 433-0229. Circle #622*

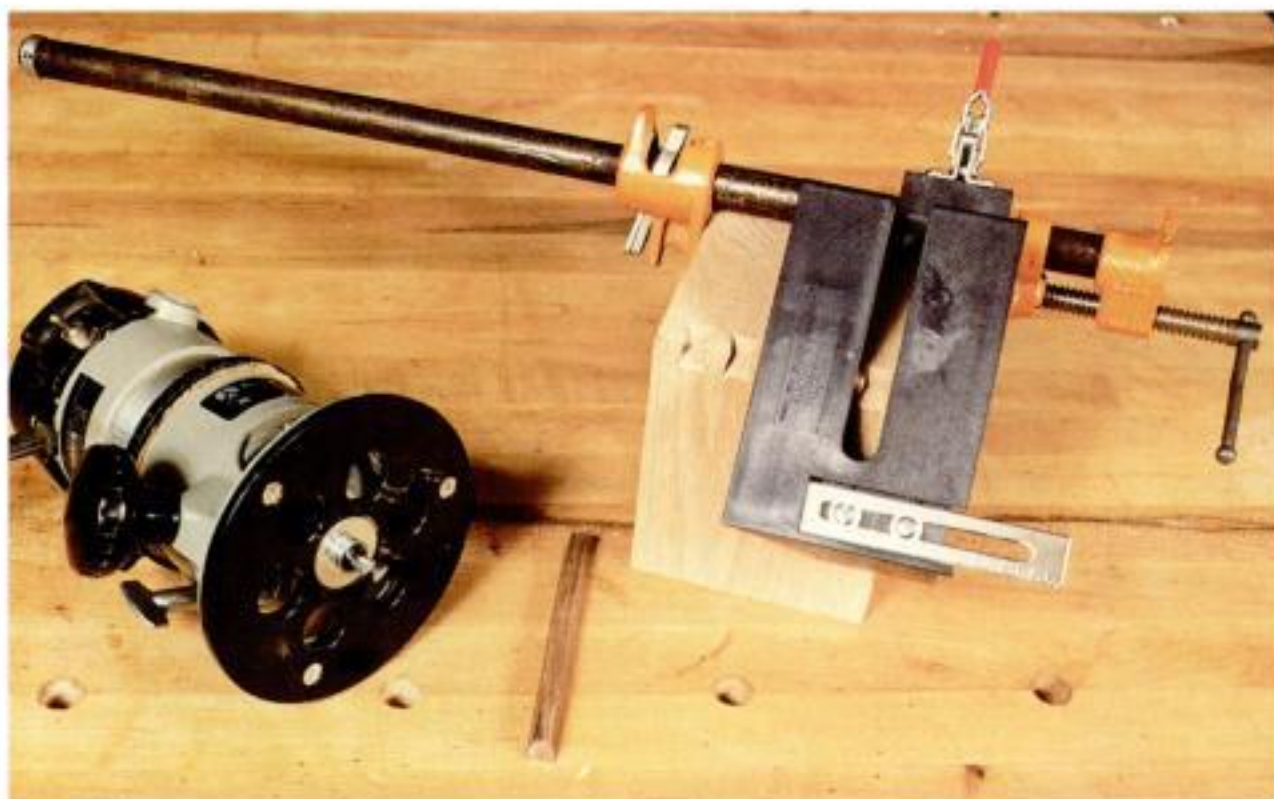
Laminate Cutting Guide

It's easy to run into trouble when you're cutting thin materials such as laminate or veneer on a tablesaw. The laminate can get caught under the fence, or it can be blown upward by the blade. It's also hard to feed thin material with a push stick. The Laminatrol Cutting Guide solves these problems. The 26-in.-long aluminum extrusion is designed to fit under the rip fence, providing a channel that guides the laminate during the cut. (Price: \$7.95) *Simp'l Products Inc., Dept. AWT, Box 187, City Island, NY 10464, (718) 885-3314. Circle #623*



Easy Splined Corners

Leichtung's Decorative Spline Jig lets you dress up and reinforce mitered corners using your router, a $\frac{5}{8}$ -in. template bushing and any one of several bits. The jig is designed to work with a $\frac{1}{2}$ -in. pipe clamp (not included) and can be used on just about any 90° corner. Depending on the bit you use, you can cut dovetail, square-edged or V-groove slots across the joint. An adjustable scale on the jig lets you reposition it easily, indexing against a previous cut; or you can cut slots at random spacings. Then glue in matching splines, trim them flush, and admire your customized corner. (Price: \$39.99) *Leichtung Workshops, Dept. AWT, 4944 Commerce Pkwy., Cleveland, OH 44128, (800) 321-6840. Circle #624*



AMERICAN-MADE WATERSTONES by Toshio Odate

The Norton Company is the world's largest manufacturer of abrasives. Now they have a new product line that will interest woodworkers—waterstones—the first and only American-made waterstones on the market today.

The idea of developing a set of waterstones wasn't easily accepted at Norton, where most of the profits come from traditional industrial abrasives. But since Paul Champagne joined Norton more than nine years ago, the waterstone project has grown. Champagne had been using Japanese-made waterstones for years to sharpen the blades on the swords and knives he made as a hobby. Upon joining Norton, he quickly took up the idea of developing a line of waterstones.

About three years ago, Champagne came to a tool sharpening seminar I was conducting. He brought a prototype set of stones with him and asked me to try them out. I started using the stones right away, giving Champagne my impressions and then retesting stones when he sent improved versions. Other woodworkers also participated in this evaluation process.

The result of this research and refinement is a very serviceable set of stones in four different grits: 220, 1,000, 4,000 and 8,000. How the stones work together is important. The delicate balance



True grit. Norton's new waterstones are available in four grits and perform comparably to Japanese stones.

between grits determines the quality of the final edge. While each of the stones cuts quite well, I found the 1,000-grit stone to be a little too soft, and the 4,000-grit stone to be a little too hard. Moving from a soft, coarser stone to a harder, finer one means that you have to do a little more work than necessary on the finer stone. According to Champagne, Norton is planning to adjust their formulations to reduce the discrepancy between these two stones.

Overall, I think that Norton's new stones stand up fairly well when compared to the different Japanese waterstones I've been using for many years. As a set, the stones will work even better

when the difference between 1,000-grit and 4,000-grit stones is reduced.

Norton is planning to market a set of "chisel-width" stones within the next year or so. I suggested these narrower stones (which will be made by simply cutting standard-size stones in half lengthwise) to Norton because they are much better for sharpening chisels. The dishing of the narrower stone can be corrected more quickly than is the case with wider stones. And these stones will cost much less than the full-size stones that are really better suited to sharpening wider blades such as plane irons. Also in the works: a thinner 8,000-grit stone which will make this grit more affordable, and a line of contoured waterstones for sharpening curved blades.

The Norton waterstones are currently available from only one source, although broader distribution is planned by the end of the year. (Prices: 220 grit, \$16.95; 1,000 grit, \$21.95; 4,000 grit, \$39.95; 8,000 grit, \$65.95) *Garrett Wade, 161 Ave. of the Americas, New York, NY 10013, (800) 221-2942. Circle #625*

TOSHIO ODATE is a noted sculptor and shoji maker who teaches at Pratt Institute in Brooklyn, NY.

**SHOP
TESTED**

Tiny Tools

Paul Hamler of Snellville, GA, makes tools any Lilliputian would love. He specializes in small-scale replicas of antique woodworking tools, some of which are shown here. Remarkably, all of his tools are *working* models.

What prompted this modern-day Gulliver to make the switch from furniture to tiny tools? Hamler says it started when he began buying old hand tools to use for making period furniture reproductions. "Then I was bit by the collecting bug," he explains. As his collection grew, he found he couldn't afford the more expensive hand tools, so he started making his own, scaling them down to save on the cost of materials.

Hamler casts metals such as gold, silver and bronze using the lost-wax process. To shape the delicate parts, he employs the same techniques used on full-size models. The difference is in the size of his machines and tools: For delicate shaping, he uses jewelers' and dentists' tools, plus a variety of home-made devices such as miniature router bits, scrapers and floats. One of his favorite machines is a Gorton pantograph equipped with a miniature router that he uses to cut inlays and engravings. Working at such a small scale calls for one more invaluable tool: his high-powered magnifying glasses.



▲ **English plow plane.** Ivory, silver. 3 L. Scrimshaw by Maurice Wheeler, Norcross, GA.



▲ **Brass-backed dovetail saw.** Beech, steel. 4 L.

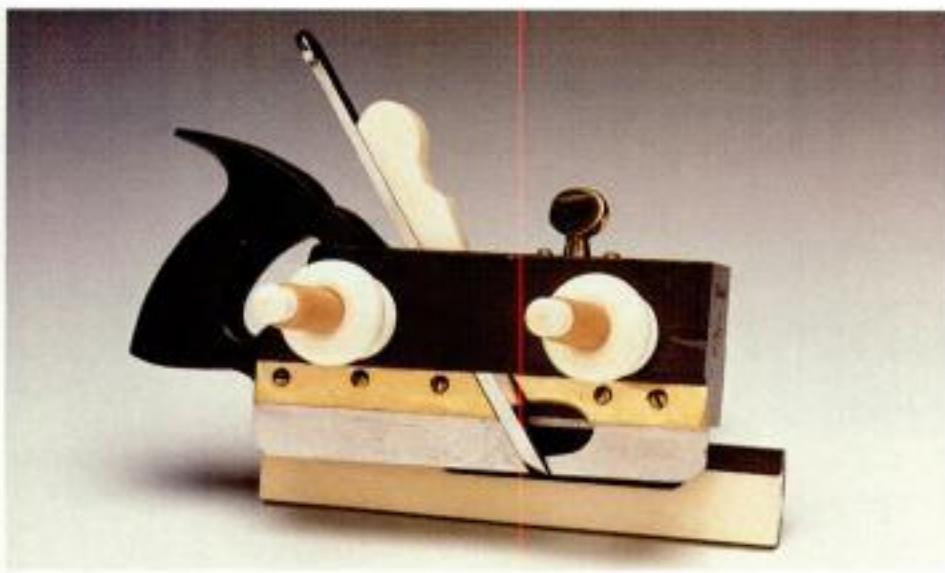


▲ **Stanley No. 4 smoothing plane.** Bronze, rosewood. 3 1/8 L.

► **Sheffield-style plated braces.**

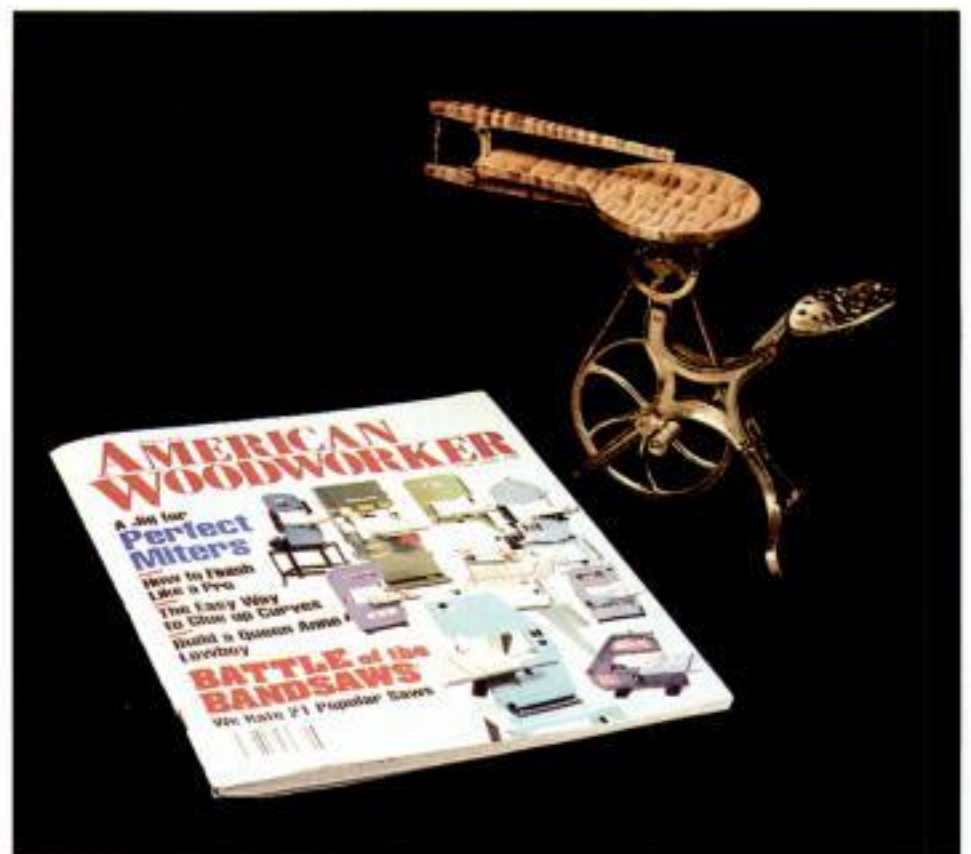
Left to right: Pilkington brace in ebony and silver; Marples Ultimatum in ebony and brass; Pilkington brace in boxwood and brass. All 4 5/8 L.





▲ **Classic screw-arm plow plane.** Ebony, boxwood, ivory, steel, brass. 3⁵/₈ L.

► **W.F. & J. Barnes Velocipede scroll saw.** Bronze, curly maple. 7¹/₄ L. x 6¹/₂ H.



▼ **Smoothing plane.** Gold. 3/4 L.
Carriage maker's plane. Silver. 1¹/₈ L.
Workbench. (By Bill Bilancio, West Palm Beach, FL.) Curly maple. 6¹/₂ L. x 2⁷/₈ H.



◀ **Stanley planes.** Left to right: No. 81 scraper in rosewood and bronze, 3¹/₂ L. No. 340 furring in beech and bronze, 3³/₁₆ L. No. 212 scraper in rosewood and bronze, 2⁵/₈ L.



▼ **English marking gauge.** Ebony, brass. 2³/₄ L.



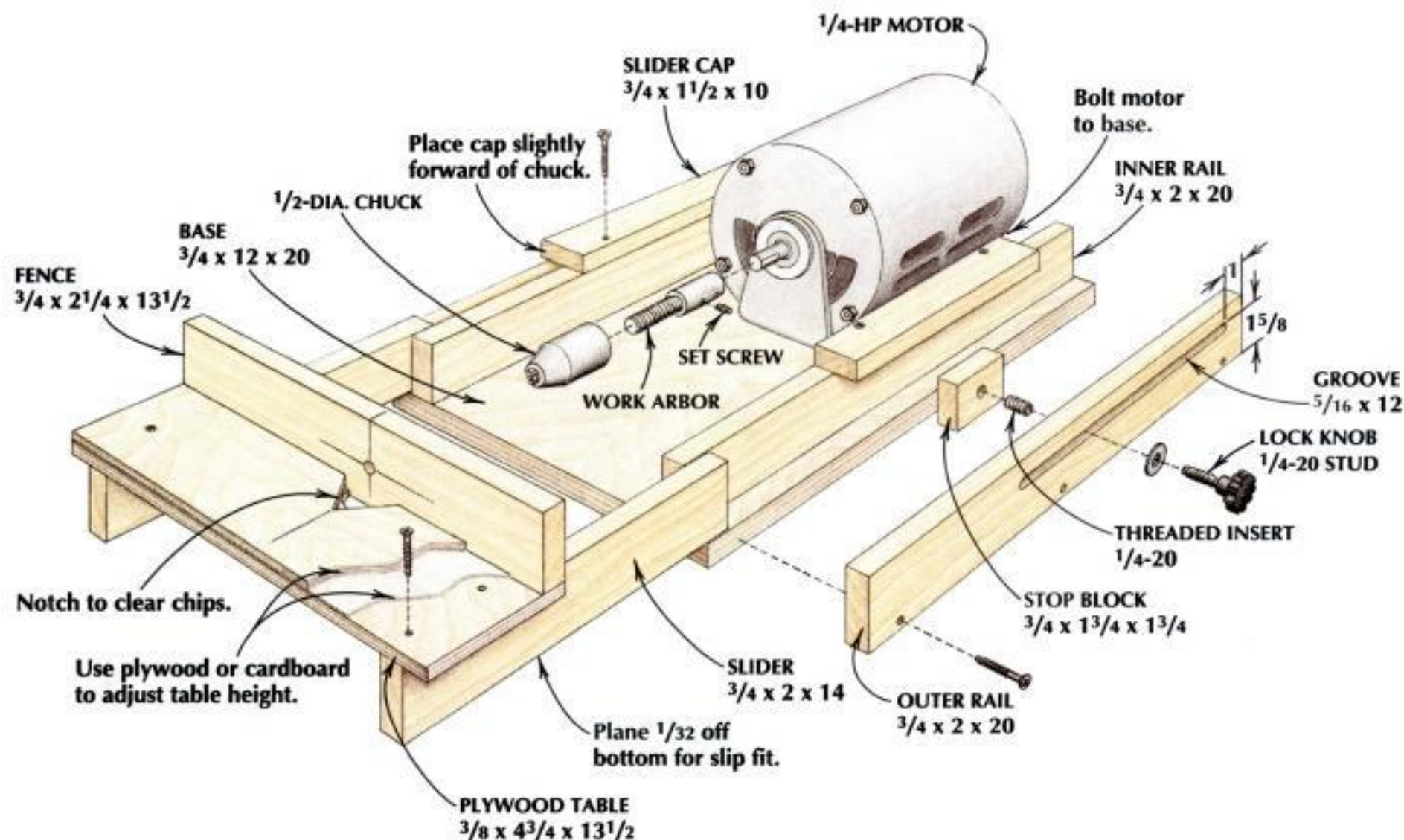
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SHOP SOLUTIONS

Simple Doweling Machine

Turn an Old Motor Into a New Horizontal Boring Machine

by Edwin Borgeson



Drilling holes accurately into the edge or end of a piece of stock is easy with my jig. It doesn't cost much to build: The basic ingredients are a 1/4-HP (washing machine) motor, a threaded work arbor and drill chuck (available from Woodcraft, 800-225-1153), and a few wood scraps.

The most critical part of assembly is getting a slip-fit for the table sliders. Fasten the outside rails to the base, position the sliders against the rails with a piece of paper in between, then install the inside rails against the sliders. This jig was designed for a motor I had handy. Shim the table or motor mount

as necessary to roughly center the drill hole to your fence.

To use the jig, I clamp the base to my bench and adjust the height of the plywood table with plywood and cardboard shims. Next, I set the hole depth by locking the stop block at the appropriate distance. I hold the stock against the fence, matching a line drawn on my stock with the centerline on the fence. Then I push the table and workpiece into the spinning bit. ▲

EDWIN BORGESON is a photographer and amateur woodworker who lives in Oregon.



Dead-on doweling jig. Just match a line on the stock with a line on the fence for accurate results.

Do you have a favorite shop fixture you'd like to share? Send a photo or sketch with a full explanation to: AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. Next issue's "Shop Solutions" contributor will receive this Bosch B1450 2-HP plunge router, list price \$365.

