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October 2006
No. 186

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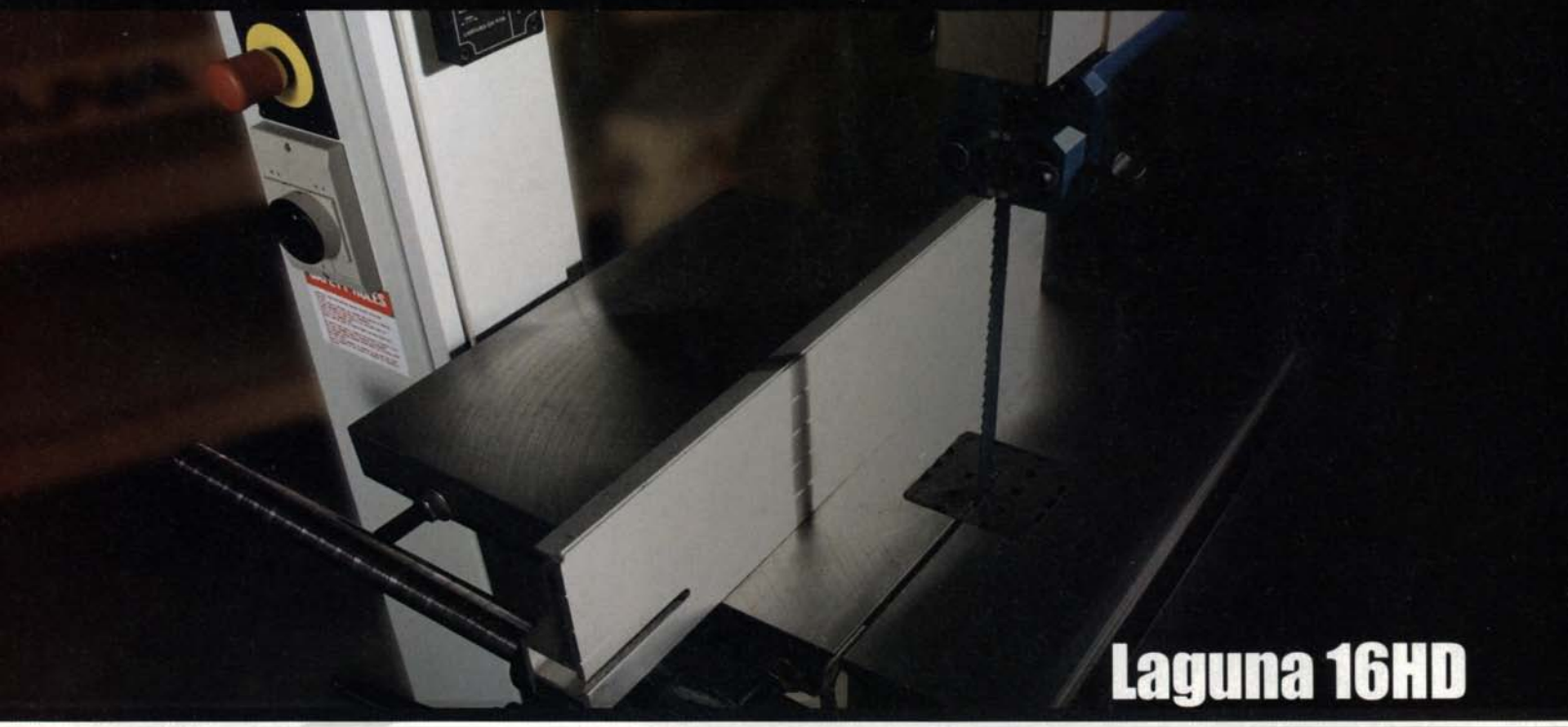

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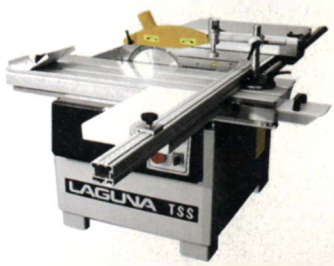

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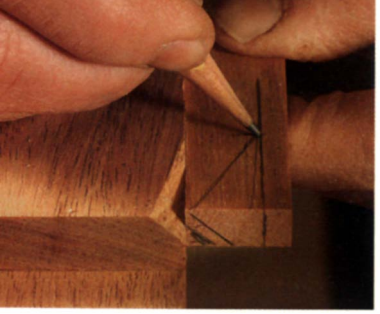

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Eugene Landon ("Philadelphia Side Chair") explores the design and construction of his quintessential period chair.

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Quick and Sturdy Door

SEPTEMBER 4: Teacher and furniture maker Mario Rodriguez goes step-by-step through the construction of a frame-and-panel door.

The Craftsmen Behind Greene and Greene

SEPTEMBER 18: Darrell Peart looks into the lives of John and Peter Hall, the brother craftsmen who built furniture and architectural millwork for the famous Arts and Crafts designers.

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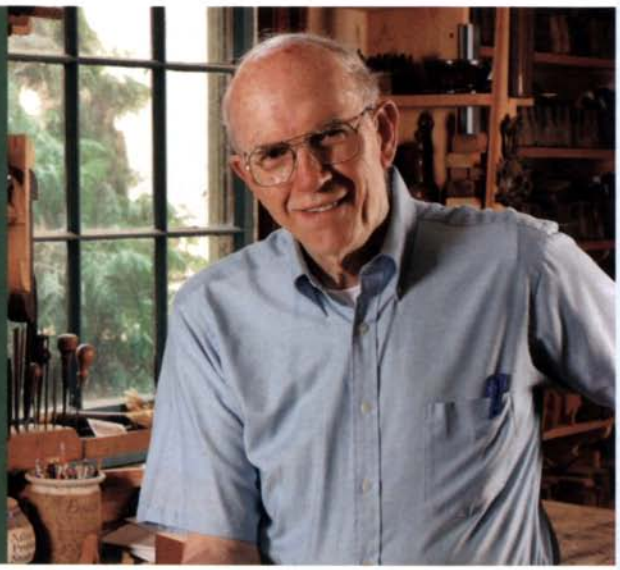

Eugene Landon (*"Philadelphia Side Chair"* and Master Class) is one of the most prolific builders of authentic reproduction furniture. He was honored by the Society of American Period Furniture Makers in 2003 with its annual Cartouche Award for lifetime achievement. Landon is a frequent instructor at the Olde Mill Cabinet Shoppe in York, Pa., but sign up early as he has a large band of repeat students.

Contributing editor **Gary Rogowski** *("Ten Essential Router Bits")* started woodworking in 1974 in Portland, Ore., with a radial-arm saw and his dad's old handplanes. Since then he has designed and built work for clients and galleries nationwide. He opened The Northwest Woodworking Studio in 1997 to promote traditional woodworking, and is the author of *The Complete Illustrated Guide to Joinery* (The Taunton Press, 2005). Every day he takes Jimmy the beagle for two walks; it keeps them both young.

J. Speetjens *("Get the Most From Your Jointer")* lives with his wife and two children in Greensboro, N.C., where he has been a professional woodworker for 20 years. Trained in stringed-instrument making, Speetjens began his career designing and building electric guitars. For the last 15 years, he has operated a furniture studio selling original work directly and through select galleries.

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For more information on our contributors, go to www.FineWoodworking.com/authors.

Kelly J. Dunton *("Arts and Crafts Side Table")* started working with tools very young, in his father's shadow. An associate art director for *Fine Woodworking* for nearly five years, he has married his natural design ability with his growing skill as a woodworker to build furniture for himself and his family. Away from work, he enjoys cruising the scenic Hudson Valley and the mountains of New York State on his motorcycle and bicycle.

Lyn Mangiameli *(A Closer Look)* is one of those rare woodworkers equally at home on the lathe and at the workbench. The common thread is his preference for highly figured exotic woods, which provide a challenge to handplaning and turning alike. A forensic neuropsychologist by profession, Mangiameli is also known for his Internet reviews of wood-turning tools and handplanes, many of which illustrate ways woodworkers can evaluate the performance of their own tools.

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letters

Spotlight

ISSUE NO. 185
August 2006
pp. 38-45

FEEDBACK ON 'A WOODWORKER'S KITCHEN'

Having done many kitchens, I was very appreciative of Scott Gibson's kitchen and the design and craftsmanship that went into it.

While the temporary shelf shown on p. 45 does ease installation of the upper cabinets, it rests on the base cabinets, and there are two good reasons why upper cabinets should be installed first. One, you can stand directly under the upper cabinets when lifting them into place. And two, you are less likely to mar the base cabinets by leaning against them with an errant tool.

—CHIP RESSEL, New Canaan, Conn.

I am writing with great concern over the kitchen article in issue #185 of *Fine Woodworking*, my favorite magazine. Throughout the years, the magazine has maintained great design integrity in its articles—always looking for the "fine" way to create the project at hand. I believe this kitchen article belongs in *Fine Homebuilding*, not *Fine Woodworking*. Kitchen cabinets are definitely not *FWW* items. Second, note the headline: "Save money and show off your craftsmanship by building custom cabinets." This is not how *FWW* readers think.

But the real problem is within the article. I don't believe I've ever seen such poor drawer design in *FWW*'s long history. For the author to claim his design is "...strong and simple" and that it "...provides strength and durability" is sheer folly. Past articles in *FWW* have never suggested nailing a drawer bottom to the bottom of the drawer. In this same issue, there is an article on half-blind dovetails in drawers. What a contrast!

—MICHAEL DENNIS, Fort Collins, Colo.

Editor replies: Like all fine woodworking, these tastefully designed cabinets don't look like anything you can buy. Like all fine woodworkers, Scott Gibson chose his materials and joints carefully, fitting each to the job at hand. While the hidden cases are maple plywood, the face frames are quartersawn oak, with inset drawers, mortise-and-tenon doors, and book-matched panels. Gibson's drawer design is innovative in its efficiency and strength. Remember that the commercial slides will both hide and strengthen the edges of the nailed-on bottoms.

Points missing from tablesaw reviews

I wish I had read Roland Johnson's review of cabinet saws (*FWW* #184) before I bought my latest. I certainly wouldn't have bought a saw without a European-style riving knife and blade guard.

But there are a couple of features of tablesaws that never seem to be covered in reviews. The first is the ability to mount a dado set on the arbor. I can barely mount a ¾-in.-wide dado set on my saw, and then only if I use a thinner washer and nut than those supplied. I'm not sure how safe this is.

The second feature not discussed is how easy it is to access the tilting and raising mechanisms for cleaning and lubricating. On my saw it appears to me that I would have to remove the table and extensions to gain access.

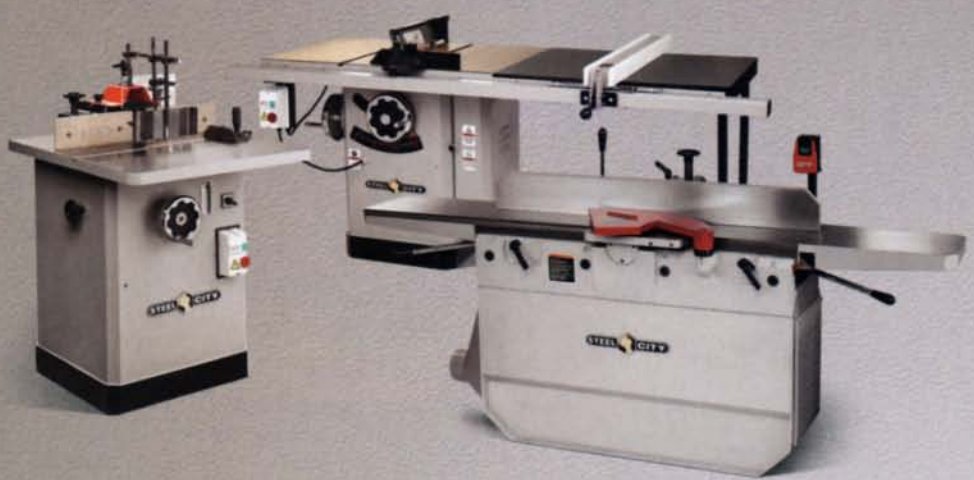
Another minor point is the mounting pads for the blade inserts. On my saw, these pads are not at a uniform depth from the surface of the table. This means that it isn't possible to plane zero-clearance blade inserts to a uniform thickness and have them be level with the table. My only recourse is to buy expensive $20 inserts with leveling screws, or go through a tedious shimming process to level my shopmade inserts.

—JOE KUHN, Tullahoma, Tenn.

Roland Johnson replies: All of the arbor shafts on the machines I tested will accept a complete (13/16-in.-wide) dado stack,

Writing an Article

Fine Woodworking is a reader-written magazine. We welcome proposals, manuscripts, photographs, and ideas from our readers, amateur or professional. We'll acknowledge all submissions and return those we can't publish. Send your contributions to *Fine Woodworking*, PO Box 5506, Newtown, CT 06470-5506, or email fw@taunton.com.



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although the Woodtek requires an arbor change to do so. On tablesaws, the length of the arbor is limited by the fact that at full tilt and full blade height, the arbor approaches the bottom of the throat insert. To get a wide dado stack onto the arbor, use the standard arbor nut without the washer, but do not use a thinner nut.

As for cleaning and lubricating the trunnions, larger access doors do make it easier to get at the inner workings, but ultimately it is much easier on all of these saws to remove the table and work above the internals rather than trying to work from the bottom.

To create a perfectly flush fit between the tabletop and the insert without shims or setscrews requires absolutely accurate machining of the mounting pads and the insert, which is not common and is probably cost-prohibitive on these saws. Also, shopmade inserts tend to move a bit with moisture changes.

Your best bet is either to put small setscrews into your wood inserts, or use masking tape to shim them level.

How to lay down a plane

I noticed the cover of *FWW* #183 shows a block plane lying on the tabletop. A block plane should never rest on its bed, because it dulls the blade and may scratch the wood surface. It (the plane) should have been resting on its side. My old college woodworking professor would have bopped Christian Becksvoort on the head for such a goof.

—DICK SCHOENBAECHLER, Atlanta, Ga.

Christian Becksvoort replies: Remind me to wear my hardhat should I ever meet your college professor. In some respects, he's right, but in this specific case he's wrong. If I were working on a bench that had hardware, nails, or sandpaper on it, I would never place my plane (or chisel) sole down—likewise, if I were constructing something large on a concrete floor.

In the cover photo I'm working on freshly milled cherry. That plane could sit there for 200 years without getting duller. One half-hour of heavy planing on the cherry tabletop would dull the blade, but that's what planes are designed to do.

Jewelry boxes are beacons to thieves

I once made a jewelry box as a commission, but I would never make one for my wife. They tell robbers where to go!

The house next to ours was robbed, and the thieves went straight to the bedroom, spied the box, and took all of the family's jewelry and coins. (The swag was hauled out in a pillowcase borrowed from the bedroom.) We have a safer place for valuables, and we also use a safe-deposit box.

—HENRY FISHER, Columbus, Ohio

> "I once made a jewelry box as a commission, but I would never make one for my wife. They tell robbers where to go!" —HENRY FISHER

More on "Getting Past the Judges"

I enjoyed your editorial "Getting Past the Judges" (From the Editor, *FWW* #185, p. 10) but I would add to your list, "Does it hold together stylistically?"

As I help students design furniture, and view gallery and show pieces around the country, I ask myself the question, "Does the style hold together?" and sometimes, "What is that style?" Many pieces of current work are of mixed styles (e.g., Hepplewhite legs, with Greene and Greene cloud-lift rails, Art Nouveau hardware, and ogee edge treatment) that look as if the maker was trying out new techniques. Most of the furniture in *FWW* is stylistically cohesive and sets the bar for high-quality design and craftsmanship. Keep up the good work.

—PAUL KINSEY, assistant professor, College of the Redwoods, Eureka, Calif.

In Mr. Christiana's "From the Editor" piece, he wrote, "The criteria is." "Criteria" is the plural form of "criterion." It should have been "criteria are."

—PAUL S. COLLINS, Ocala, Fla.

Oversights in "Overlooked Woods"

Our watchful and erudite readers noticed a few missteps in "Five Overlooked Hardwoods" (*FWW* #185). Denis Lock, of Bedfordview, South Africa, pointed out that we mistakenly said that the percentage shrinkage rates for the different woods were from green to kiln-dried. We should have said green to oven-dried, the standard way of measuring wood shrinkage.

Michael G. Messina, a professor at Texas A&M University, noted that we made a couple of mistakes with scientific names of wood species. The scientific name of yellow birch is spelled *Betula alleghaniensis*, not *Betula alleghanensis*. And the scientific name of basswood is spelled *Tilia americana*, not *Tilia Americana* (the specific epithets of scientific names should not be capitalized, even when they are derived from a place name). He also suggested that all scientific names should be italicized or underlined, not printed in standard font, and we'll do that.

About your safety

Working wood is inherently dangerous. Using hand or power tools improperly or ignoring standard safety practices can lead to permanent injury or even death. Don't try to perform operations you learn about here (or elsewhere) until you're certain they are safe for you. If something about an operation doesn't feel right, don't do it. Look for another way. We want you to enjoy the craft, so please keep safety foremost in your mind whenever you're in the shop.

—Asa Christiana, editor

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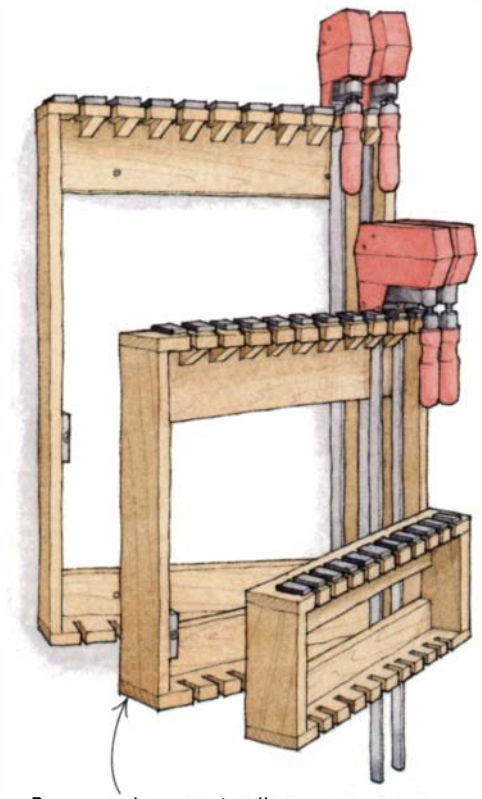
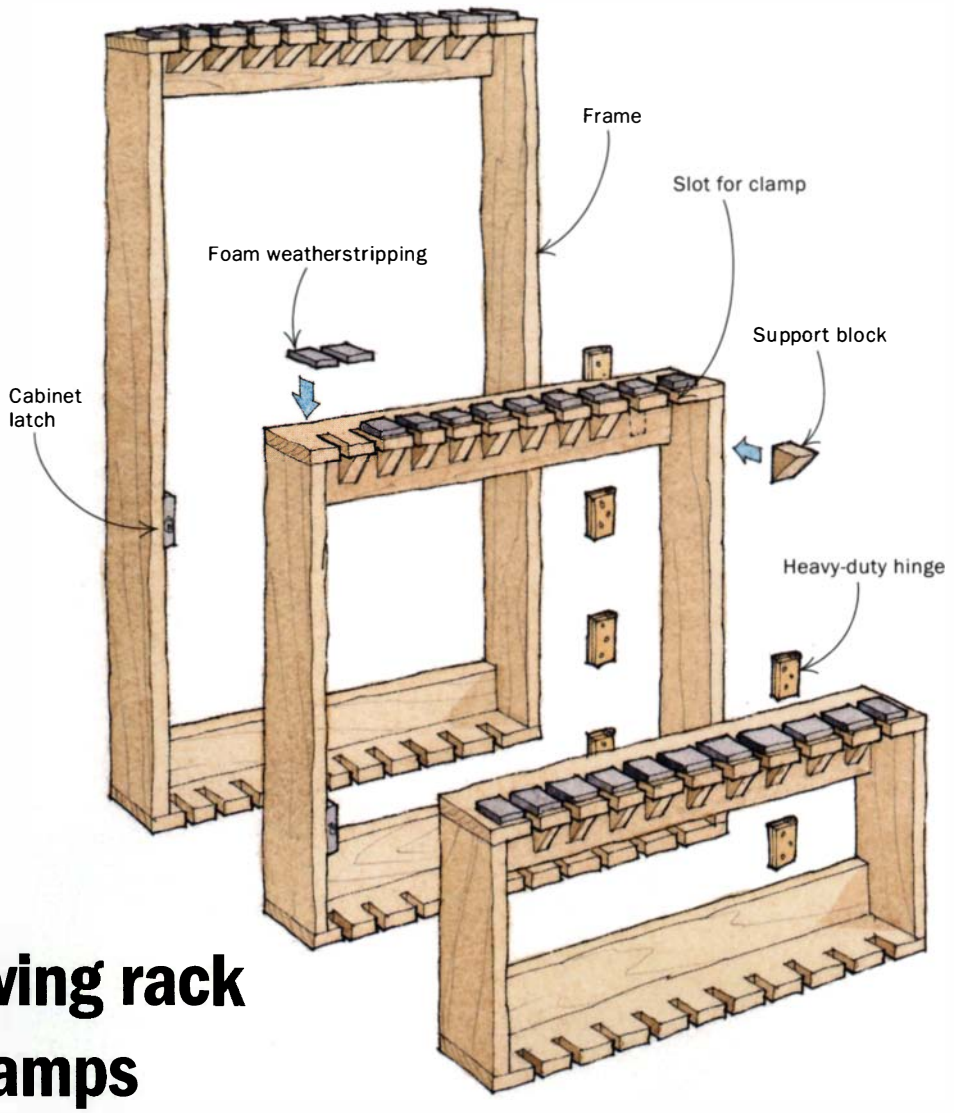
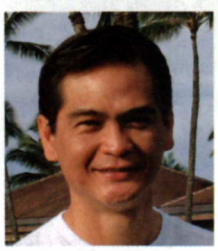


Frames swing open to allow storage of more clamps.



Best Tip

Space-saving rack for bar clamps



During the day, Suwat Phruksawan works as a software architect for a financial firm. On nights when his workload isn't keeping him busy, he heads to his garage workshop, where he finds sanctuary by listening to the radio and tinkering with all things woodworking.

Wall space is at a premium in my shop. As my bar-clamp collection grew, I found that clamp racks were taking up precious wall real estate. To solve the problem, I built this space-saving rack.

The design is simple enough—just three wood frames of varying heights attached to each other with hinges. The hinges let the frames open like a book. Now I can store 30 clamps in a space that used to be limited to 10.

To make the racks, cut all the pieces and notch the top and bottom member of each rack. Size the notches wide enough for the thickest bar clamp and space them to allow the clamps to fit side by side.

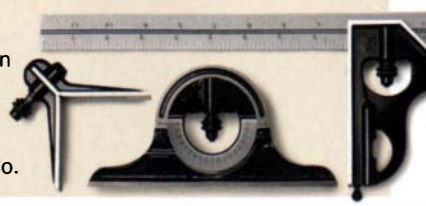
Assemble the three frames with biscuits, glue, and screws. Use heavy-duty hinges to join the frames so that they won't sag from the weight of the clamps.

Reinforce the notches with support blocks. Also, add small pieces of foam weatherstripping between the notches on the top of each rack. The foam pieces serve as protective cushions and keep the clamps from moving around when you open the frames. Two magnetic cabinet-door latches keep the frames closed.

—SUWAT PHRUKSAWAN, Pleasant Hill, Calif.

A Reward for the Best Tip

Send your original tips to Methods of Work, *Fine Woodworking*, PO Box 5506, Newtown, CT 06470, or email fwmow@taunton.com. If published, we pay $50 for an unillustrated tip; $100 for an illustrated one. The author of the best tip will get a 12-in. combination square (with center head and protractor) from the L.S. Starrett Co.



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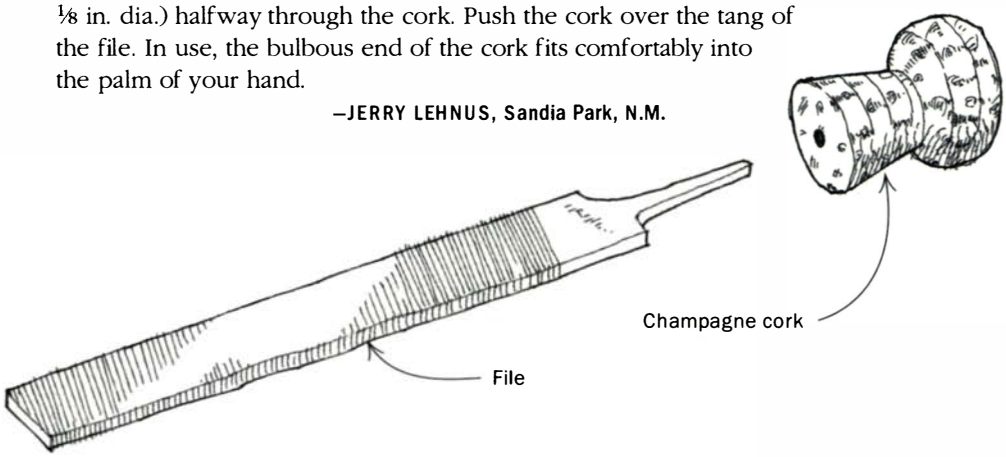
FESTOOL

READER SERVICE NO. 102

File handle from a champagne cork

I find the best file handle is the cork from a champagne bottle. The method is simplicity itself. Starting from the bottom, drill a small hole (perhaps ⅛ in. dia.) halfway through the cork. Push the cork over the tang of the file. In use, the bulbous end of the cork fits comfortably into the palm of your hand.

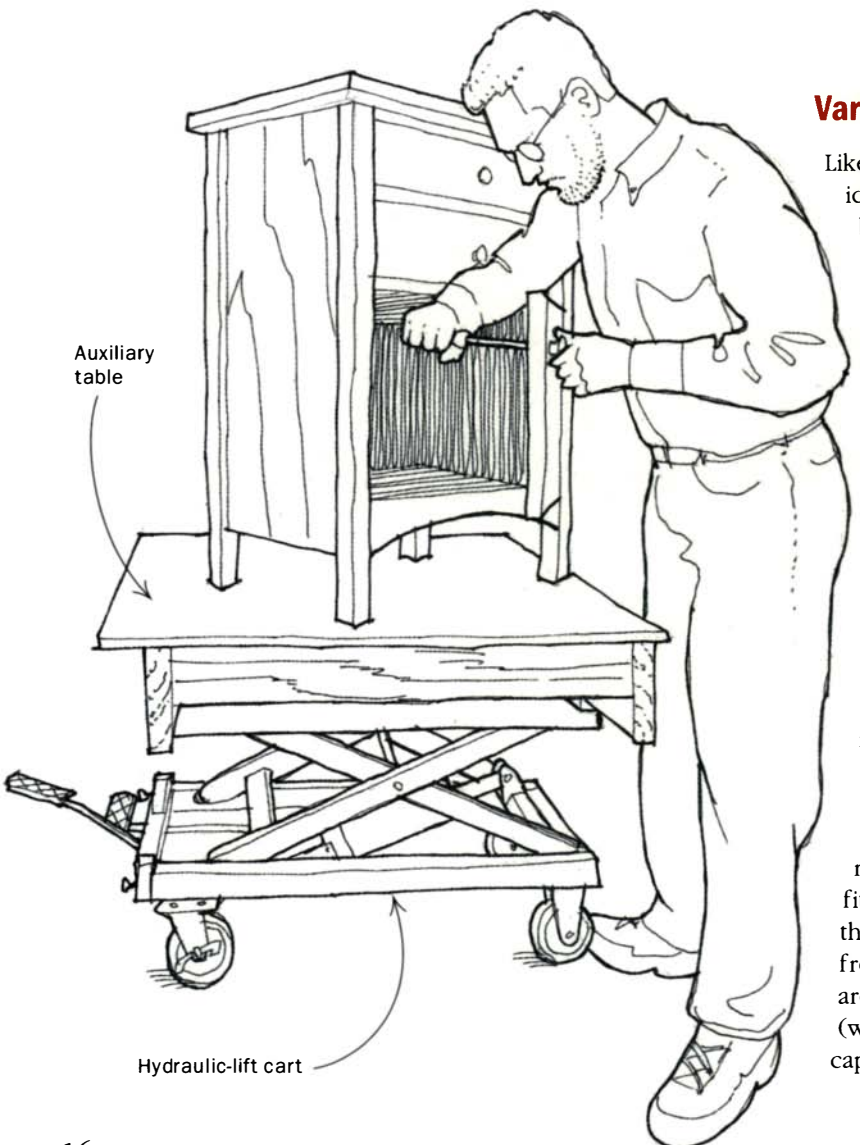
—JERRY LEHNUS, Sandia Park, N.M.



Quick Tip

Portable thickness-planer feed-rollers often slip when coated with sap and dust. I clean them by applying the belt dressing made for squeaking automobile belts. Just raise the planer head, spray on the dressing, and wipe it off with a rag. Continue rotating, spraying, and wiping until the rollers are clean and work like new.

—JAMIE BURTON, Hagerhill, Ky.



Variable-height worktable

Like many woodworkers, I used an assortment of less-than-ideal methods—tables, crates, sawhorses, and knockdown boxes, among others—to raise workpieces to comfortable working heights. Even then, I often found that I needed the workpiece at several other heights as construction progressed. For example, I might start out working on the base, then the drawers, and finally the top. For each of these steps, the ideal working height is different. I wanted a means of easily moving a workpiece up or down.

Looking through an industrial-supply catalog, I spotted just what I was looking for—a hydraulic-lift cart. The cart uses a hydraulic cylinder, a foot pedal, and a scissor-type lifting mechanism to move a platform up and down parallel to the floor. The cart I purchased came with a 20-in. by 32-in. steel table and four 5-in.-dia. casters.

I built an auxiliary table from framing lumber and plywood. It increases the area of the top and elevates it about 8 in. Now the cart adjusts from 19 in. to 38 in. If needed, I add a blanket or scrap of carpet to serve as a protective pad under the work.

The cart makes work go easier and faster in a number of ways. In addition to the up-and-down movement, I can roll my work around the shop when repeated cutting and fitting are required or when I want to take advantage of the best light. I've also used it to transport heavy materials from one end of the shop to the other. Hydraulic-lift carts are available from companies like Amazon.com or Grainger (www.grainger.com) and start at about $150. The lifting capacity on my cart is 600 lb. It weighs about 130 lb.

—ZOLTON COHEN, Kalamazoo, Mich.

How Do You Create Beautiful, Strong Entry Doors With A Router?

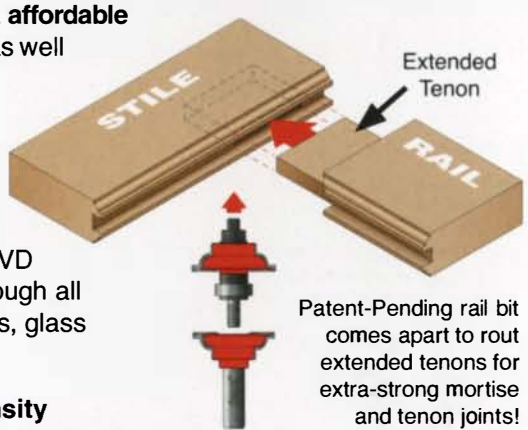
99-267 Set shown here. Other sets available.

With Freud's NEW Entry & Interior Door Router Bit System

Thanks to Freud's latest patent-pending innovation, you can create unique wooden doors with the security of durable mortise-and-tenon construction with extended tenons of virtually any length!

A beautiful, custom crafted wooden door can enhance any home, adding curb appeal and value to the exterior and a warm decorative touch within. Traditional custom doors have been too expensive for most homes, but this new router bit set from Freud has changed the equation. Now anyone with a suitable 1/2" collet router* can build beautiful, durable, **affordable 1-3/8" and 1-3/4" thick interior or exterior doors** - as well as sidelights and transoms - in any size or style!

This system lets you build doors with true mortise-and-tenon construction, **including extended tenons,** for rock-solid joints that last a lifetime. No other router-based tooling has ever offered this capability with such ease of use. The DVD video and poster included with the set take you through all the steps, including routing, mortising, raised panels, glass installation and much more.



Patent-Pending rail bit comes apart to rout extended tenons for extra-strong mortise and tenon joints!

These bits feature Freud's exclusive **TiCo™ Hi-Density Carbide** designed and manufactured by Freud for a flawless finish in millworking applications. They also feature Freud's **Perma-SHIELD® permanent coating** to reduce heat and corrosion for long cutting life. Visit your Freud dealer and see the latest in router bit design and innovation today!

*A minimum 3HP router recommended. Some 2-1/4HP routers are acceptable, consult your router users manual before using any router bit.

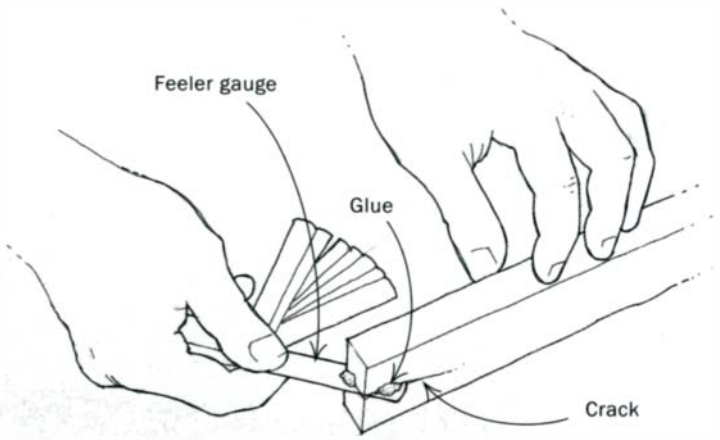
To sign up for Freud's e-mail newsletter or to find a dealer near you visit: www.freudtools.com (US) 1-800-334-4107 (Canada) 1-800-263-7016

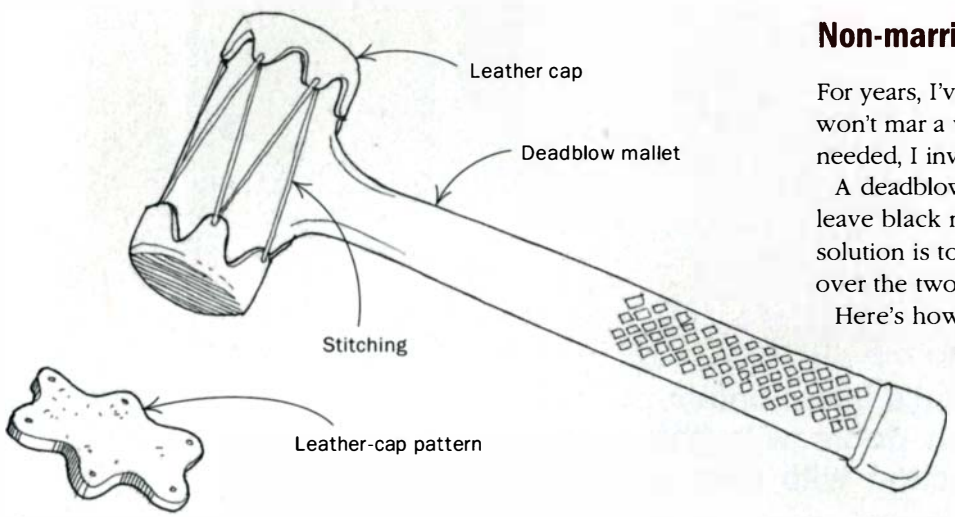
READER SERVICE NO. 162

Feeler gauge works glue into cracks

I use a thin feeler-gauge blade to work glue into cracks or under veneers. I've had 100% success using this inexpensive tool that's available at any auto-parts store.

—BUDDY TAVARES,
Kelowna, B.C., Canada





Non-marring mallet

For years, I've been looking for a heavy assembly mallet that won't mar a wooden surface. When I couldn't find what I needed, I invented it myself.

A deadblow mallet is the best choice for the job, but it can leave black marks and the face is occasionally too hard. My solution is to take two leather caps and stitch them in place over the two faces of the deadblow mallet.

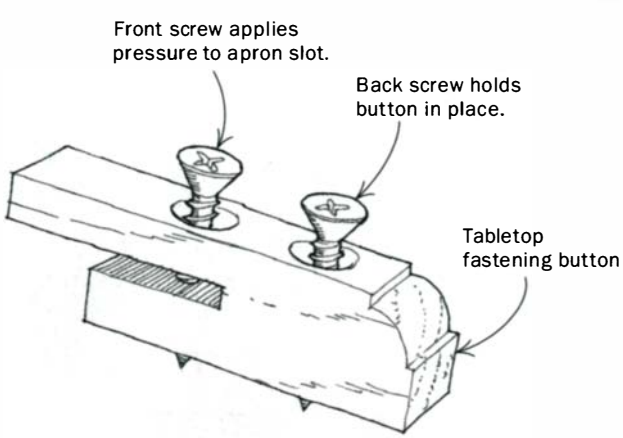
Here's how to make each cap. On a piece of leather, scribe a circle with a diameter about 1½ in. larger than the mallet-head diameter. Make six equidistant marks along the circumference of the pattern diameter. The idea is to make a wavy pattern with these marks as the crests of a wave. Then, punch or drill holes in the two pieces of leather and lace them together as shown.

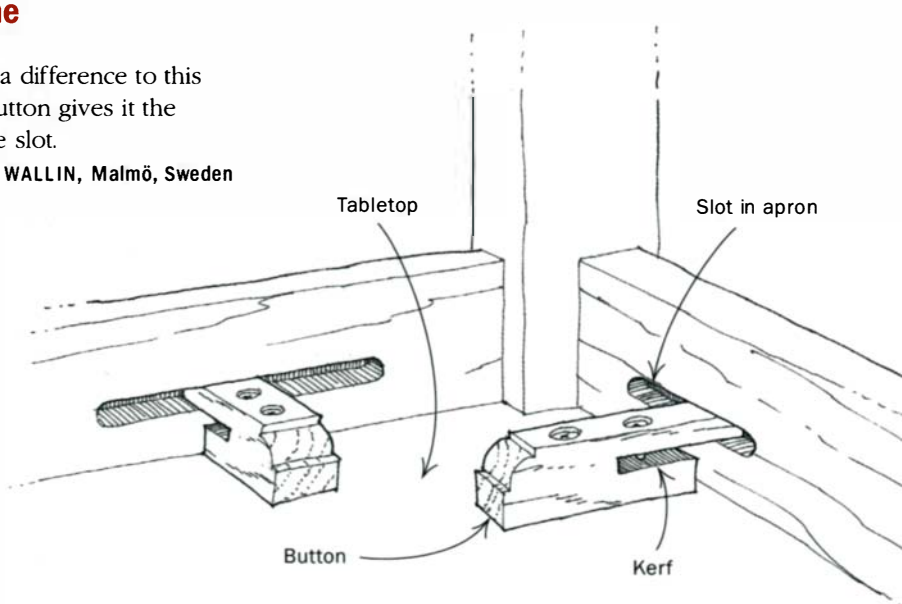
—BILL WILSON, Warkworth, Ont., Canada

Improved tabletop button fits slot every time

An apron slot that's a little too high or low won't make a difference to this tabletop button. A kerf under the working end of the button gives it the flexibility to bend up or down as needed to slip into the slot.

—PETER WALLIN, Malmö, Sweden



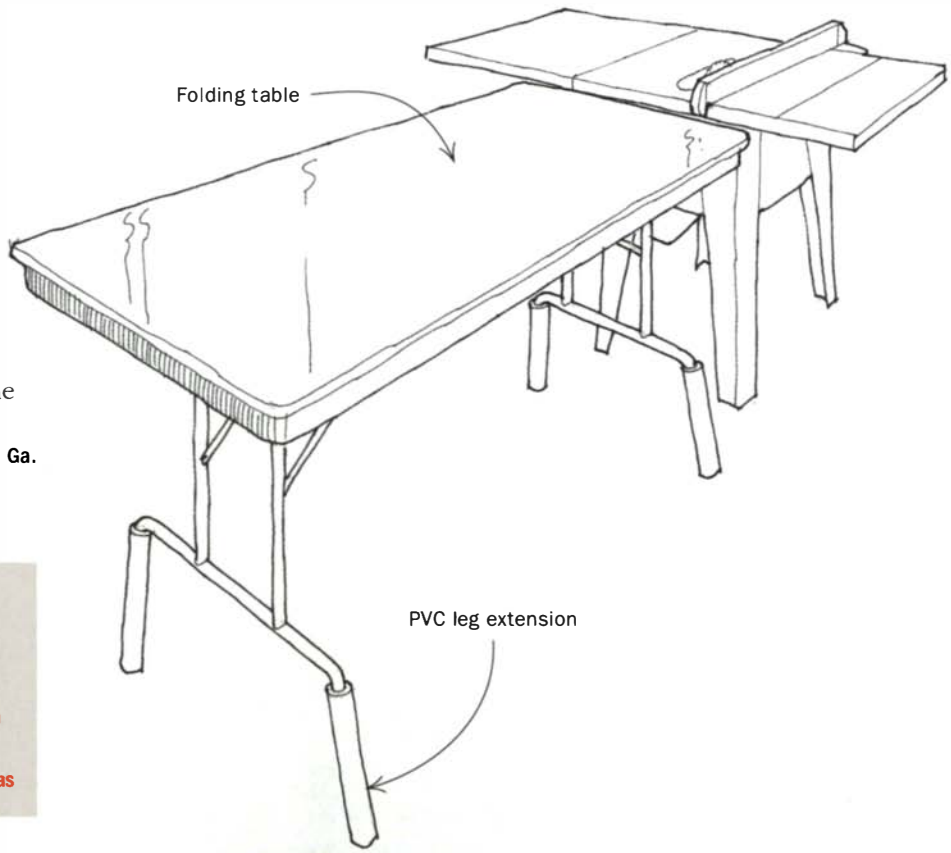


Quick outfeed table

Only rarely do I need an outfeed table for my tablesaw, and I don't have room for a permanent table. So I came up with this simple space-saving solution.

I raised a folding table to the same height as the tablesaw by extending the legs with four lengths of 1½-in. PVC pipe. The pipe isn't permanently attached; I just slip the pieces over the existing metal legs. When I'm finished with the table, it folds quickly for storage.

—DON ELLIOTT, Marietta, Ga.

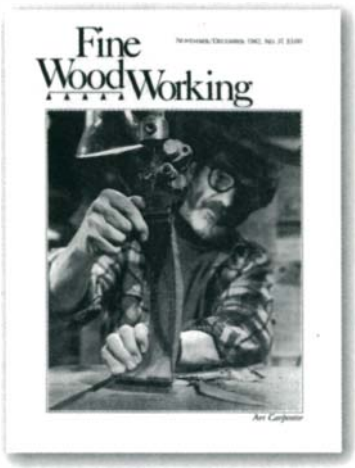


Quick Tip

Plastic zip-ties make sturdy and inexpensive clamps for gluing odd-shaped pieces. Keep a variety of sizes on hand. Attach several of them head-to-tail if you need a larger size.

—WARREN D. CALDWELL, Richardson, Texas

Art Carpenter, 1920-2006



Art Carpenter. *His work gave momentum to the West Coast style of furniture making, known for its rounded-over edges. Two of his most recognizable designs are the clamshell desk and the wishbone chair.*

ART ESPENET CARPENTER, a woodworking innovator whose original designs were exhibited in the Smithsonian and New York City's Museum of Modern Art, died of a heart attack May 25 at his home in Bolinas, Calif. He was 86.

Carpenter's unique furniture portfolio included sculptural pieces like the wishbone chair and the clamshell rolltop desk that were widely celebrated as art. But he told *Fine Woodworking* in 1982 that he wanted his furniture to be useful and affordable as well as beautiful.

"I want what I make to be lived in and on and around," he said. "Anyone can make a $1,500 chair. But a $500 chair deserves its own accolades."

Born in New York City, Carpenter earned an economics degree at Dartmouth College and served in the U.S. Navy during World War II. In the late 1940s, a show of utilitarian design at the Museum of Modern Art led him to pursue woodworking. He moved to California, bought a lathe, and began. A few years later, his bowls won a place in the exhibit that had inspired him.

Carpenter was not formally trained in woodworking, and his reliance on self-teaching led to several innovations familiar to modern woodworkers. He learned to cut dovetails by hand, but finding the process too time-consuming, he invented a technique that used a router and a shopmade jig. "He had no predecessor to copy," said his son, Tripp Carpenter.

Carpenter also was a founding member of his local craftsman's guild and taught as many as 200 apprentice woodworkers, his son said.

—Matt Berger, managing editor, FineWoodworking.com

Maryland furniture maker named Best New Artist at Philly show

Marquetry as accent. *A morning-glory inlay graces a mahogany and maple-veneer cabinet.*

EACH YEAR AT THE PHILADELPHIA Furniture and Furnishings Show, *Fine Woodworking* selects the show's Best New Artist in Wood. This May the nod went to Len Dougherty. Dougherty began his furniture-making career in 1990 after a decade spent renovating buildings and helping his brother run a couple of pubs in Baltimore.

He began incorporating marquetry in his furniture five years ago, after a two-week workshop with master ebeniste Silas Kopf. Dougherty adopted Kopf's double-bevel veneer-cutting method, but uses a treadle-powered scrollsaw he designed and built himself.

Dyed veneers are often used in marquetry, but Dougherty typically uses woods in their natural colors for a more muted, earthy palette. He obtains a gradual darkening in places with the traditional sand-shading method.

His current furniture uses marquetry sparingly, rather than as a pattern that dominates the surface of a piece.

—Jonathan Binzen

Photos, this page: Tripp Carpenter (chair and desk); Len Dougherty (cabinet and portrait)

Student work was a show highlight. *The "Faculty Selects" exhibit at the Furniture Society conference featured student pieces nominated by instructors. A visitor appreciates an ash bench by Michael Albanese of the Rochester Institute of Technology.*

Studio furniture makers share ideas at Indianapolis conference

THE FURNITURE SOCIETY HELD ITS 10TH ANNUAL CONFERENCE in June at the Herron School of Art and Design in Indianapolis. Like its predecessors, this year's conference featured a lively mixture of technical demonstrations, slide presentations by individual makers, panel discussions, and lectures.

Standout demonstrations included one on surface carving by Michael Cullen (see his work on the back cover of *FWW* #184); one by Marc Adams on dyeing veneer; and one by John Kriegshauser on building super-light furniture from sustainable materials. Kriegshauser showed how he built a supremely comfortable 12½-lb. chair using ⅛-in. plywood, as well as an intriguing 10½-lb. coffee table with a base composed of thin sticks and small spheres.

These aren't Tinkertoys. *This table of Siberian elm is supported by a lightweight structure of linked tetrahedrons.*

Fine Woodworking sponsored a discussion on furniture design details with Cullen, Kentucky chairmaker Brian Boggs, and Bill Keyser, the longtime Rochester Institute of Technology teacher who received the Society's Award of Distinction in 2003. As usual, conversations begun during the presentations spilled into the hall and across the grounds.

No fewer than six exhibitions were mounted, from an invitational show of pieces with drawers to an unjuried show of work by Society members (there are 1,550; 352 attended the conference).

—*J.B.*

Dedication to craft earns shop teacher national recognition

At last summer's Association of Woodworking and Furnishings Suppliers (AWFS) show in Las Vegas, the student design competition featured work from roughly two dozen high-school woodworkers. Half of them were students of one man—Keith Yow.

Yow, a tireless instructor who occasionally stocks his school's woodshop with lumber felled on his own property, was named woodworking teacher of the year for 2005 by WoodLINKS USA. The award is sponsored by WoodLINKS, the Taunton Press, Laguna Tools, Delta Machinery, and Porter-Cable.

Yow's students at Cedar Ridge High School in Hillsborough, N.C., told the selection committee that he often opens the school woodshop an hour before school begins and stays until 9 p.m. or later so students can work on projects.

"My style of teaching is up and active and in the shop," Yow said.

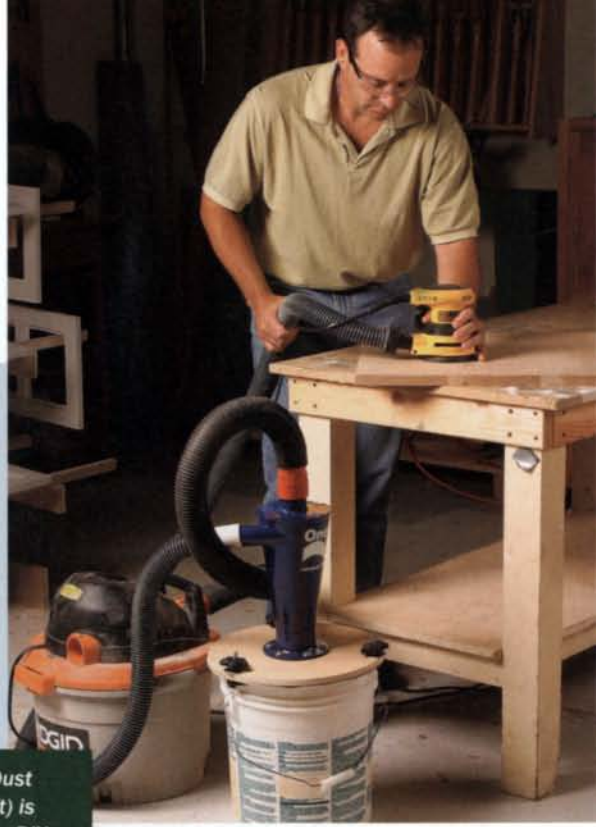
In addition to woodworking, Yow's students wrote that they learned lessons in "integrity and honesty," diligence, and patience. In preparing for the Las Vegas show, "we often spent our Saturdays in his shop, ordering pizza for lunch or dinner and then going back to work," wrote Meredith Smith. "It was more than a class; it turned into an experience, at times as consuming and unifying as any of my sports."

The nonprofit WoodLINKS USA was started in 1998 by woodworking manufacturers and educators. Among the group's goals is to foster high-school woodworking programs throughout the country.

—Steve Scott, associate editor

A busy shop. *Keith Yow's students at Cedar Ridge High School learn fundamental skills and advanced techniques, such as veneering and marquetry.*

Photos, this page: Jonathan Binzen (Furniture Society); Cathy Maready (portrait); Keith Yow (bottom right)



DUST COLLECTION

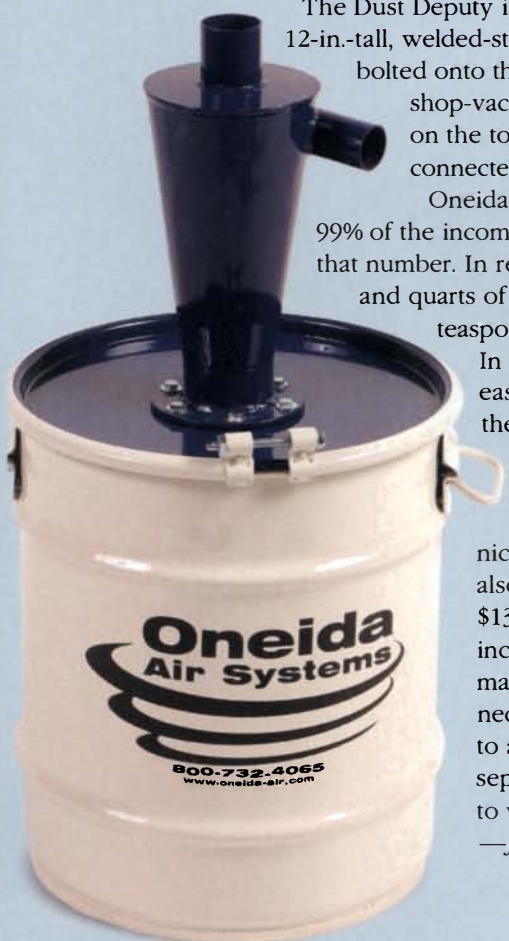
Dust Deputy arrests fine dust before it reaches the vacuum

SHOP VACUUMS ARE GREAT for cleaning up the shop and for catching dust from small power tools, but most of the convenience is lost when it comes time to clean out the vacuum itself. Many vacuums are awkward to empty, and cleaning off the fine dust caked on the filter cartridge liberates much of that unhealthy powder right back into the shop's air. Oneida's Dust Deputy is designed to capture even the finest dust in a simple bucket—before it gets to the filter. And that is exactly what it does, remarkably well.

Deputized. *The Dust Deputy (below left) is also available as a DIY kit (above). Both are so efficient at trapping fine dust that you won't have to interrupt sanding chores to clean a clogged vacuum-filter cartridge.*

The Dust Deputy is a hefty but small, 12-in.-tall, welded-steel cyclone that's bolted onto the lid of a 10-gal. steel barrel. The shop-vacuum hose attaches to the 2-in.-dia. port on the top of the cyclone; the pickup hose is connected to the 1½-in.-dia. side port.

Oneida claims the Dust Deputy captures 99% of the incoming dust, and I wouldn't argue with that number. In repeated tests using sawdust, shavings, and quarts of the finest sanding dust, not even a teaspoon of the dust made it into the vacuum. In an average shop, this means you could easily go a year without having to clean the vacuum and its filter; instead, you just empty the barrel when it's full—an easy task.



The Dust Deputy is solidly made and nicely finished and sells for $200. Oneida also offers a do-it-yourself kit for $130 (see photo, above right), which includes a cyclone, instructions for making a shopmade lid, and the necessary hardware to mount the lid to a drywall bucket. Hoses are sold separately. For more information, go to www.oneida-air.com.

—John White is Fine Woodworking*'s shop manager.*

ACCESSORIES

EXTENDING ROLLER STAND HAS LIMITED USE

WOODCRAFT'S HEAVY-DUTY ROLLER STAND rests on four locking casters, and expands from 19 in. to 53 in. long and from 24 in. to 39 in. tall. But at 83 lb., using the stand as an outfeed support is not easy to do, because each leg must be adjusted individually while you support the heavy stand. The stand would be helpful when handling sheets of plywood or MDF, but at $250, I could buy two or three smaller stands (see *FWW* #166, pp. 58-61) and get the same versatility while saving money. The stand is available at www.woodcraft.com (800-225-1153).

—Mark Schofield is managing editor.

Photos, except where noted: Rodney Diaz

CLAMPING

Tough, inexpensive holdfasts

OFTEN USED IN PAIRS or in conjunction with benchdogs or clamps, the venerable holdfast is like having a third hand to help hold a workpiece against a bench for tasks such as planing, chiseling, and carving. And it will hold any shaped piece, from flat panels or tabletops to curved and carved cabriole legs (for more on using holdfasts, see *FWW* #155, pp. 79-80). Gramercy Tools recently introduced an L-shaped, forged-steel holdfast that fits ¾-in.-dia. holes. The holdfast is tough, and at $17 ($30 for a pair), it's a great value. However, if you have storage cabinets below your benchtop, you may have to cut the shaft to fit (not recommended by the manufacturer) or remove the cabinets. The holdfasts are available from www.toolsforworkingwood.com.

—Garrett Hack is a contributing editor.

Instant clamp. *With strategically drilled holes in your bench, a holdfast provides clamping pressure where you need it. Rap it on top to increase the holdfast's grip; hit it on the side to loosen.*

INDUSTRY NEWS

NEW MACHINERY COMPANY TARGETS SERIOUS WOODWORKERS

REVERSING THE RECENT TREND of mergers and acquisitions in the tool world is Steel City Tool Works (their Web site, www.steelcitytoolworks.com, is due to launch shortly), a new tool manufacturer launched by former executives, product managers, and salespeople from the big conglomerates. The company hopes to succeed in a crowded marketplace by targeting the dedicated woodworker and producing an unmatched blend of innovation, value, and customer service.

Steel City Tool Works will focus on serious woodworking equipment—jointers, tablesaws, and the like—with benchtop tools limited to a portable planer, a hollow-chisel mortiser, and a few bench grinders. A key element in the business plan is bypassing the big-box stores and Internet clearinghouses in favor of set prices and a limited network of regional dealers. This way, Steel City plans to ensure its licensed retailers a fair markup in return for good product knowledge and careful customer service. A standard five-year warranty is planned.

For more on the Steel City launch, go to www.FineWoodworking.com/extras.

—Asa Christiana is the editor.

ROUTER ACCESSORY

ADJUSTABLE BASE CONVERTS TRIM ROUTER TO PRECISION INSTRUMENT

THE PORTABLE THREE-AXIS MILL from Micro Fence converts a fixed-base, laminate-trimmer-style router into a micro-adjustable plunge router, perfect for fine inlay work. Versatile and accurate, this little rig provides exceptionally precise milling capabilities (accurate to 0.001 in.) in a compact, easily handled unit. At $400, it is not for everyone, but there simply is nothing on the market that can match it.

It takes only a few seconds to install or remove the router for bit changes. The plunge action is smooth, and the locking mechanism is simple to use and functions well. The stainless-steel depth-stop rod is held in place by a knurled brass thumbscrew and, combined with the dial micrometer, makes it easy to zero out the bit and then precisely dial in the depth of cut. A three-position turret simplifies multiple-depth operations. Auto-centering for mortising operations can be achieved quickly by screwing included shoulder bolts and bearings into the base. Dust collection is also handled well, with top- and bottom-mount dust hoods and a hose adapter. The hoods can be added or removed quickly.

The mill comes with a number of accessories, such as a movable LED light and a ball-tip screwdriver that fits all the setscrews on the unit, and fits a number of Micro Fence jigs. To order, or for more information, go to www.microfence.com.

—Roland Johnson is a contributing editor.

Photos, this page: Roland Johnson (top right); Thomas McKenna (center)

HOLDS 15 BLADES.
YES WAY.

FatMax® XTREME™ Knife
Die-cast aluminum case with brass knob. Easy access to 15 blade storage. Strong enough to pound a nail. Available in fixed or retractable blade models. Learn more at stanleytools.com/knife

STANLEY®

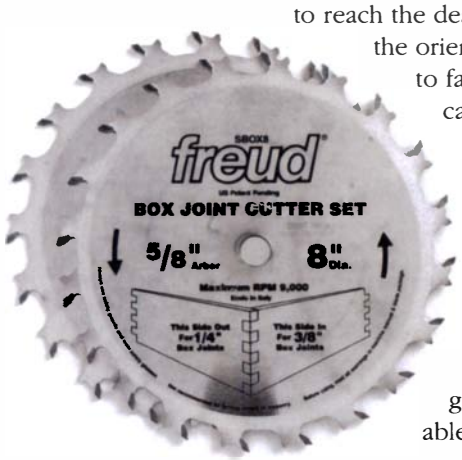
Always wear safety goggles.

READER SERVICE NO. 63

BLADES

Better box joints on the tablesaw

WITH THE NEW BOX-JOINT CUTTER SET from Freud, you can get precise, flat-bottomed cuts every time with little fuss. The set comes with two carbide-tipped blades with 20 teeth and a flat-top grind. Unlike a dado set, you don't need to play with shims to reach the desired width. Depending on the orientation of the blades—face to face or back to back—they can make either ¼-in.-wide or ⅜-in.-wide slots that are dead-on accurate. The set also cuts clean dadoes and grooves, although the widths are limited to ¼ in. and ⅜ in.



The quality of cut for box joints was quite good—better than I've been able to get with a high-quality dado set. Used in tandem with a backer board on a crosscut sled or miter gauge, the blades cut with zero tearout. Also, the bottoms are dead flat, which means no gaps in the joints.

If you need to make box joints but don't have a decent dado set, Freud's Box Joint Cutter Set is the solution. The set comes with a carrying case and detailed instructions on setting up a box-joint jig for the tablesaw. The set retails for $80 on a number of Web sites.

—Tom Goffe is an assistant editor.

Perfect cuts every time. *Freud's box-joint blades cut beautifully and come with detailed instructions on how to make a box-joint jig.*

Using push sticks

SHOPMADE HELPERS ARE A CHEAP WAY TO STAY SAFE

BY PETE SCHLEBECKER

At the Center for Furniture Craftsmanship, where I teach and also manage the woodshops, showing students how to safely operate power equipment is one of our first tasks. The lesson always includes push sticks.

A push stick is a shaped length of wood or other material that helps control the movement of a workpiece. It is most needed at the tablesaw, jointer, router table, and bandsaw.

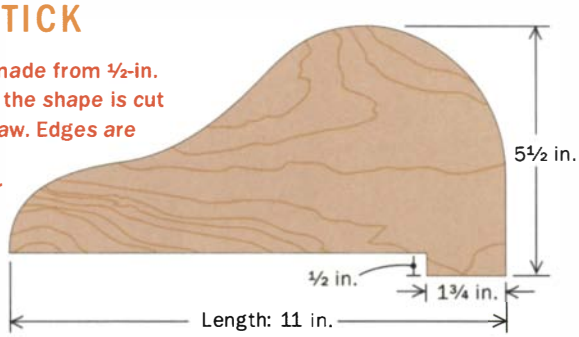
Using a push stick keeps hands away from blades and cutters. It also helps maintain an even pressure and feed rate, reducing the risk of kickback and producing a smoother cut. In our shops, we keep extra push sticks handy, and there is always one sitting on top of a machine table or hung on a hook nearby. We encourage students to get in the habit of looking for the push stick before they turn on the machine.

There are many well-designed push sticks for sale, but shopmade sticks are easy and inexpensive to make from materials as close as your scrap barrel. A well-made push stick will hold the work securely with a notch, cleat, or nonslip surface. It will feel right in the hand—an awkward handle can be unsafe if it forces you to shift your hand for a better grip. And it will be easy to make, because shopmade sticks are meant to contact the blade at times and eventually to be replaced.

Here's a look at a variety of shopmade push sticks in use where they're needed most.

TABLESAW: SHOE-STYLE PUSH STICK

This stick is made from ½-in. plywood, and the shape is cut on the bandsaw. Edges are rounded over with a rasp or router.



A simple plywood cutout for safe ripping

Many projects require ripping stock to width, a task done most quickly and cleanly on the tablesaw. But ripping stock on the tablesaw also can be dangerous.

A workpiece that's not properly guided through the cut can veer into the back side of the blade and be kicked back at the operator. This is especially true if the splitter is not in place. When ripping narrow stock, the fingers can come too close to the blade, leading to tragedy in an instant. For these reasons, we teach students to use a push stick when ripping to a width

Always keep a push stick handy. *Store it within easy reach of your working position (above). Push between the blade and the fence (right) and make sure that the workpiece clears the blade when the cut is finished.*

Don't spare the stick. *If the push stick won't fit between the blade and fence, it's safe to drive a shopmade wooden stick into the blade (observe precautions on blade height) and complete the cut.*

Photos: Steve Scott; drawings: Kelly J. Dunton

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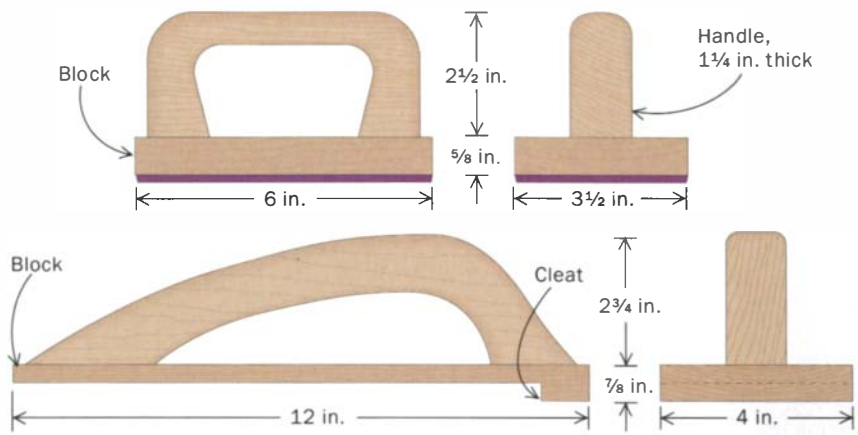
JOINTER: PUSH BLOCKS

The cleated design is used in the right hand, at the board's trailing edge, to feed the work into the cut. The cleated block's handle can be very simple, but the sloping shape pictured here shows which end has the cleat on it.

The padded block is used in the left hand, to keep the board from bouncing as it crosses the cutterhead. For the rubber-grip surface, Schlebecker used spray contact adhesive (3M Super 77) to attach a piece of an inexpensive yoga mat. Bandsaw the handle from a scrap of solid wood.



Easy to assemble. *A cleated push block can be made in less than 15 minutes. Because the glue joint is long grain to long grain, screws are not needed.*

of 6 in. or less. With the stick in your right hand, place the notched end at the rear of the workpiece between the fence and the blade. Use the stick to feed the piece all the way past the back of the blade.

If you need to drive the push stick into the blade, be sure to keep the push stick parallel to the fence, and be prepared for increased resistance as the blade cuts through the bottom of the stick. To minimize this resistance, and for safety reasons, set the blade height so that it doesn't cut very deeply (¼ in. or so) into the stick. Once you've cut through your push stick in this way a few times, it's a good idea to trim back the frayed surface with a bandsaw or discard the stick and make a new one.

To rip longer pieces that extend past the leading edge of the table, leave the push stick within reach on top of the rip fence. Start the cut by pushing the rear of the piece by hand until it reaches the edge of the table. If you use the stick before this point, you may place downward pressure on the back end of the board, lifting the front end away from the blade.

Use a pair of push blocks for face-jointing. *It's best to have a nonskid block at the board's leading edge and a cleated block at the rear.*

When flattening boards, use a broad, flat push block

Using a jointer to flatten a board's face or to straighten an edge on narrow stock can bring the operator's hands dangerously close to the machine's horizontal cutterhead.

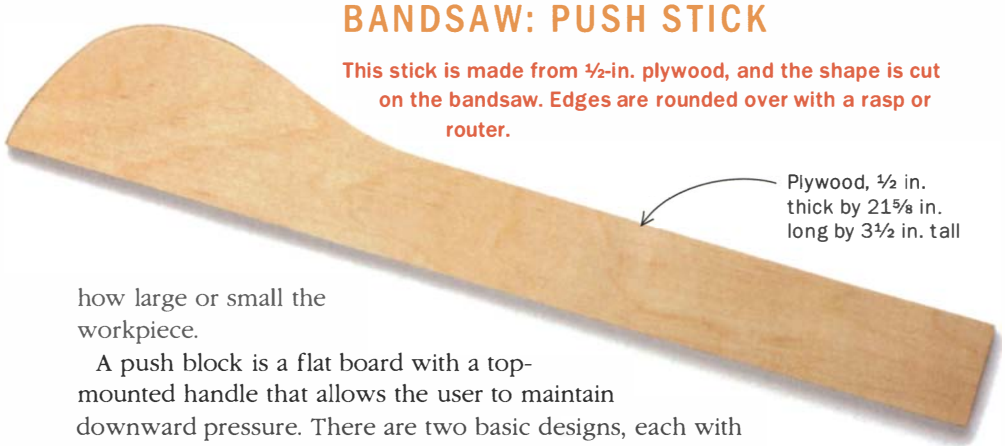
Guiding the work with push sticks helps keep your hands out of danger. It also helps achieve a clean cut by ensuring that the work doesn't bounce or "chatter" as it crosses the cutterhead's rotating knives.

For face jointing, a flat style of push stick known as a push block works best; we ask that students use them no matter

The shoe-style stick is excellent for edge-jointing. *It works especially well with narrow stock that is tall enough to clear the blade guard but too short to stand above the fence.*

BANDSAW: PUSH STICK

This stick is made from ½-in. plywood, and the shape is cut on the bandsaw. Edges are rounded over with a rasp or router.



how large or small the workpiece.

A push block is a flat board with a top-mounted handle that allows the user to maintain downward pressure. There are two basic designs, each with a distinct function. One uses a cleat on the back to grip the trailing end of the stock. The other, used at the leading end of the workpiece, has no cleat but grips the stock with a nonslip rubber pad.

To use them, take the cleated stick in your right hand and the rubber-soled block in your left to maintain downward pressure at the leading end of the workpiece.

A notched board with handles helps guide stock on the router table

The safest way to get a routed profile on a narrow workpiece is to cut the profile on the router table before ripping the stock to final width. Working with wider stock allows you to feed the work past the bit without putting your fingers in harm's way.

Occasionally, though, you might need to rout a shape onto a piece that's already quite narrow. Featherboards will help hold the piece firmly to the table surface, but you'll need a push stick to guide the work snugly against the fence.

An effective push stick is a simple piece of plywood with a notch cut into one end. The strip lies flat on the router table, with the notch at the trailing end. Two vertical handles, mounted with countersunk drywall screws and glue, make the push stick easy to grab. For the handles, I use scraps from our wood-turning studio, but a large dowel or rounded square stock will do fine.

Use a long push stick at the bandsaw. *This allows the user to push the workpiece from behind the fence without risk of running thumb or fingers into the blade.*

A long reach keeps fingers safe when resawing

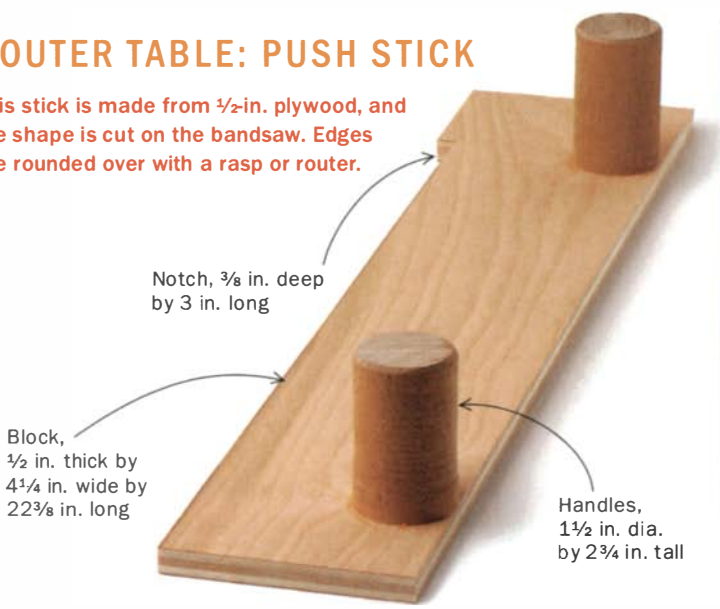
Resawing---or slicing stock along its face to make thinner boards—is a great reason to have a bandsaw. But the operation requires care, especially when the fence is close to the blade. The trick is to push the stock from the rear at an even rate all the way through the cut, and keep your fingers out of the way as the blade emerges from the tail end of the workpiece.

Almost any length of scrap will work as a push stick for this task, but it's nice to have one with a comfortable grip nearby.

The dedicated stick we use is easy to make—another shape cut out on the bandsaw. Make sure the stick is long enough so that the front end reaches just past the blade while the rear is still a couple of inches behind the fence. This way, the fence won't interfere with your grip as you finish the cut. □

ROUTER TABLE: PUSH STICK

This stick is made from ½-in. plywood, and the shape is cut on the bandsaw. Edges are rounded over with a rasp or router.



Rout narrow stock without fear. *This notched stick, with handles attached, keeps hands away from the cutter.*

Seven Joinery Fixes

Don't scrap a valuable workpiece; make an invisible repair

BY PHILIP C. LOWE

The work of cutting accurate joinery involves two basic, and contradictory, truths.

The first truth is that to hone your craft, you must learn and practice the correct skills, keep your tools sharp, and focus on your work. In short, avoid mistakes.

The second truth is that you cannot avoid mistakes.

Let's face it: No matter how skilled we become, we still slip with a chisel now and then or get too aggressive with the tablesaw. Occasionally, despite our best efforts, a router bit chips away a corner.

Sometimes it's simple enough to grab a fresh piece from the lumber rack and start again. But if you're working with a limited supply of lumber, don't want to discard a grain-matched board, or already have invested hours in shaping or carving a part, a joinery mistake poses a serious dilemma.

Fortunately, you almost always can save the part you're working on. Here are some ways to fix mistakes when cutting tenons, dovetails, and dadoes.

Philip C. Lowe is a furniture maker and teacher in Beverly, Mass.

Photos: Steve Scott

1 Shim a miscut tenon cheek

A too-slender tenon. *A tenon that has been cut or trimmed too narrow creates a weak joint.*

Add a shim. *Make a shim from the material used for the workpiece and glue it to the tenon. Make sure that the grain runs in the same direction on both pieces.*

Trim the excess. *After the glue has set, use a shoulder plane to pare the tenon to proper size. Check your progress frequently as you plane away the excess material. Stop when you have a snug push-fit.*

The critical parts of a tenon are the cheeks and shoulders, and each can be miscut in several ways. Let's start with the cheeks. Planing a tenon too thin is probably the most common mistake, but you also can create tenons that are twisted or trimmed narrower at one end than the other. The strategy for repairing any of these problems is to glue a slightly oversize shim to the offending side of the tenon and plane away the excess wood until the tenon is square and fits the mortise.

Make sure that the surface to be corrected is flat so that the added piece will have an adequate glue joint. For shim stock, I typically use a thin cutoff of the workpiece material. The grain of the shim should run in the same direction as the tenon so that it will shrink and swell in the same way.

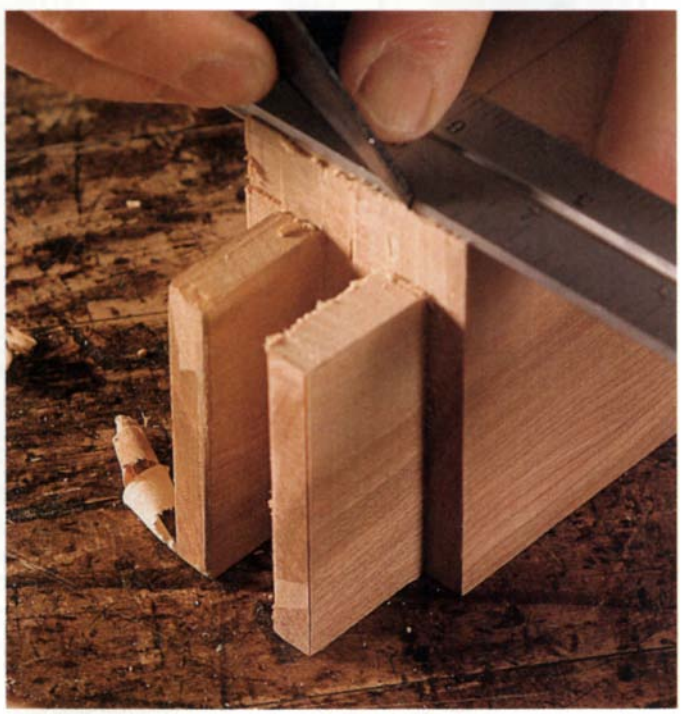
When gluing, I use a thick block as a caul to distribute the clamping pressure evenly. If the shim is very thin, glue can seep through so I use a sheet of waxed paper to prevent the caul from sticking to the work.

Although I want to do the repair work carefully, I don't want to lose too much time in the process, so I typically use the quickest-setting glue that will hold the repair. Instant glues such as cyanoacrylate can get you working again in a few minutes, but they tend to darken the area around the repair and make it more visible. Yellow glue works fine for most repairs, but it needs to set for an hour or so. Hide glue is the slowest option; however its dark color can help some repairs disappear. It's also water soluble, so you can redo the work if needed.

2 Trim a damaged shoulder

Another common mistake is going too far when sawing the shoulder of a tenon, or making a bad cut with a shoulder plane when trimming the shoulder. The best correction is to scribe another line and pare the shoulder to it. Remember that the corresponding tenon shoulders on an opposite rail (or ralls) should be trimmed to the same length; otherwise you will build the frame out of square. You won't always have the room to fix errors in this way because it will change the finished dimensions of the piece.

An ugly result. *A slip with the shoulder plane can leave unattractive gaps.*



Mark out the repair. *Scribe a line for a new shoulder just behind the damaged edge (above). Don't forget corresponding parts. You'll need to trim the opposite apron to match the length of the piece you're repairing, so transfer your newly scribed line to the second piece (right).*

Cut a new shoulder and check the fit. *Use the new line as a guide to pare away the waste and create a new surface (left). Careful work with the chisel yields a clean line at the joint (above).*

Photos: Steve Scott

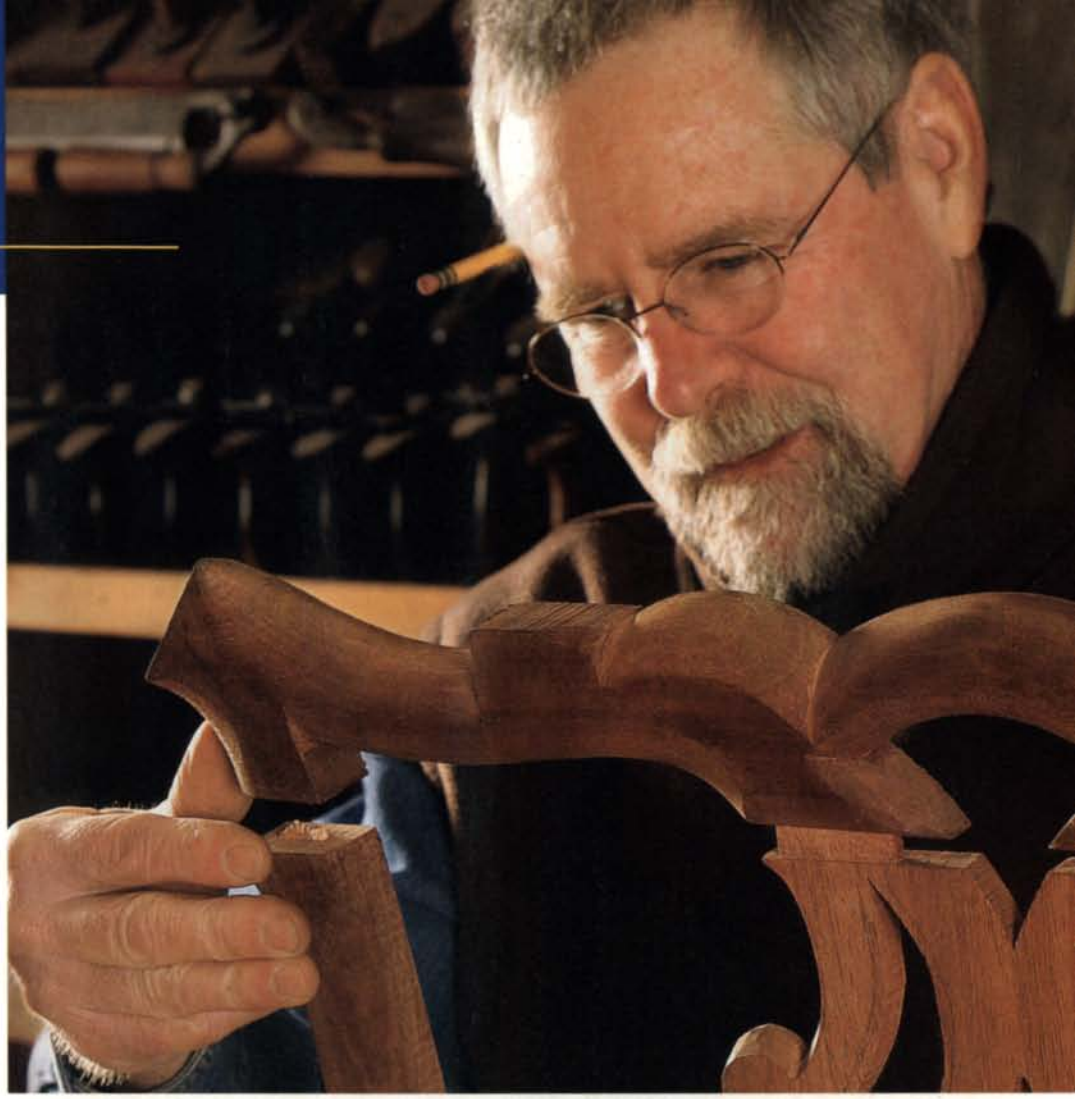
3 Replace a broken tenon

If the damage to a tenon is bad enough, it can compromise the tenon's strength, making it necessary to eliminate the tenon completely. In a situation like this, I cut off the damaged tenon and install a loose tenon.

A loose, or slip, tenon goes into a mortise in each mating piece. So after removing the damaged tenon, I cut a mortise where the tenon used to be.

When deciding on the size of this mortise, I make sure to leave an adequate shoulder area around the tenon. This might mean that the new mortise is smaller than the original mortise in the mating piece. If that happens, I'll make the loose tenon with different-sized ends, so that each end will fit its own mortise.

I use West System epoxy for this repair because it adds strength to the shoulders where the end grain comes in contact on each piece. The glue dries slowly, but the result is a more solid joint.



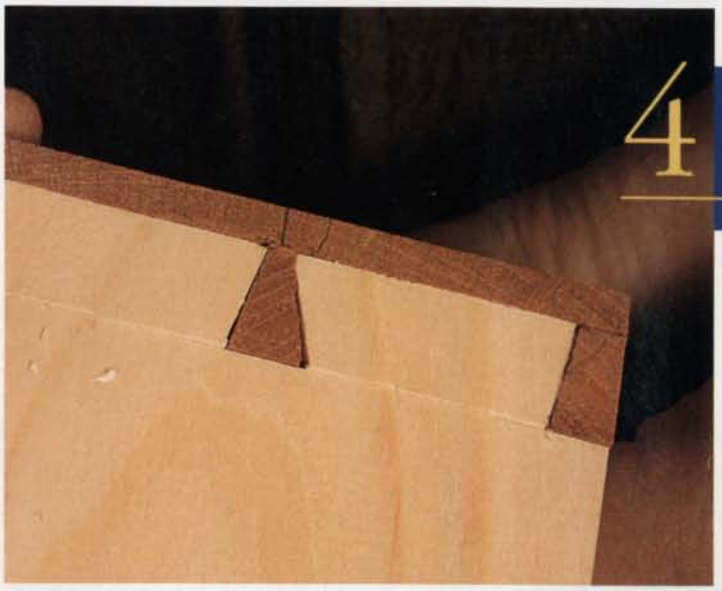
The problem. *Through accident or rough treatment, a tenon has broken off.*

Create a mortise. *Saw and chisel away the broken remnant of the tenon for a clean surface. Use dimensions from the mating piece to locate the new opening.*

Fit the new tenon. *Size and shape the repair piece to fit the newly created mortise. Then glue it in place.*

Trim the exposed end. *After the glue sets, trim and pare the tenon cheeks to fit the mortise in the mating piece and get the parts to line up.*

Fixing mistakes in dovetails



4 FILL GAPS IN DOVETAILS

A little too roomy. *A mistake with the saw or chisel has resulted in a loose fit around one of the pins.*

A number of mishaps can occur when cutting dovetails by hand.

If you cut the pins first, like I prefer to do, you can wind up miscutting the tails so that they don't mate snugly with the pins. It's also possible to pare a pin too aggressively, causing a poor fit or a weak joint.

When I miscut a tail, I typically will go ahead and glue up the work and then fill the gaps by gluing in wedges. I make the wedges using cutoff stock from the pin board. When choosing material for this repair, I look closely at the end grain and try to match the annual growth rings of the pins as closely as I can.

For wedge stock to repair through-dovetails, I like to use waste material that was sawn away from between the pins when I roughed out the work with a coping saw.

Be sure to set aside some of these waste pieces as you cut them. If you need them for repairs, the grain and color of the material will match perfectly.

Fill the gap. *Use a chisel to pare a short, thin wedge from a cutoff of the drawer-front material. Orient the grain in the same direction, dab one end in glue, and tap the wedge home between the pin and tail (left). Cut the wedge flush with the surface of the drawer side. After planing the surface, the finished repair disappears (above).*

5 REPLACE A BROKEN PIN

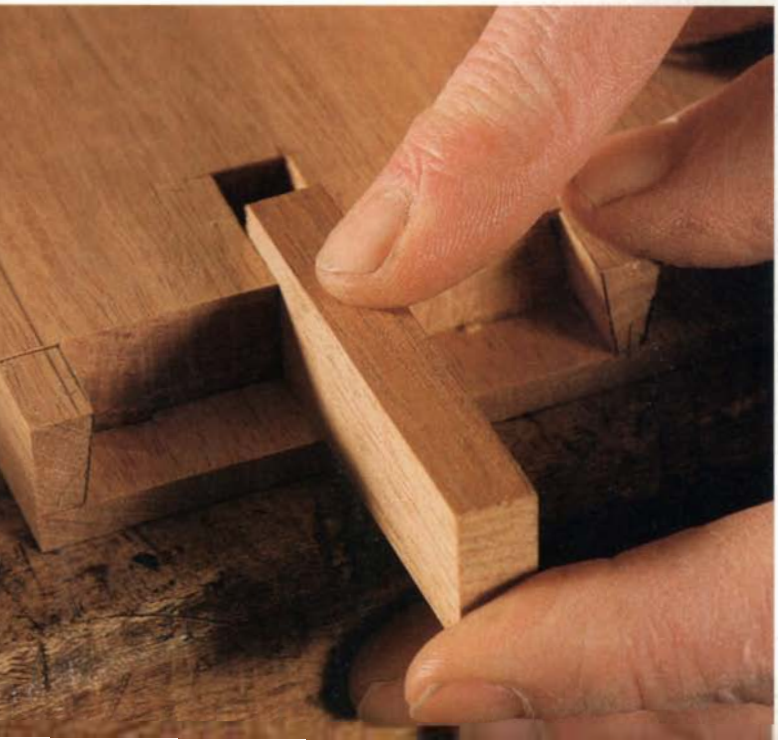
This can't be shimmed. *A slip with the chisel left a broken pin.*

If you find that you've pared a pin at an angle, you can repair the mistake with a shim. Glue a piece of small, thin stock to the side of the pin, then trim it flush to the inside face of the board and to the end. Pare the restored pin carefully with a chisel for a tight fit.

It's also possible to salvage a pin that you've broken off or weakened by paring it too small. To do this, I begin by chiseling away the broken pin altogether. Continuing with the chisel, I then cut an open-ended mortise immediately behind the pin location. This mortise will accept an oversize, rectangular replacement piece from which I'll cut a new pin.

The piece, milled from cutoff stock, is glued in place and then sawn, planed, and pared to fit. Use the tail board as a template to mark out the sides of the new pin.

Mark out for pin removal. *Scribe lines to create a rectangular mortise matching the maximum width of the pin (above). Remove material by making angled chisel cuts to create a ramp to the baseline at the front of the pin. Then pare from the front (right) until the bottom is square.*



Use cutoff stock for the repair. *Fit and glue in the rectangular repair piece (left). Trim the new piece flush with a saw and handplane. Use the tail board to mark out the sides of the new pin. Be more careful this time!*

6 Patch and recut a dado

A dado is cut across the grain and a groove is cut with the grain; both are set in from the edge or end of the board. A rabbet is a dado or groove that is open on one side, such as on the edge or end of a panel. If you cut these joints too wide or too deep, the easiest repair is to fill the cavity, plane it smooth, and cut it again.

Fill a dado with a piece that also runs across the grain so that the infill piece will shrink and swell along with the panel. To make the glueline as invisible as possible, I use the cutoff from the end of the panel as the filler. A miscut groove can be repaired in the same fashion, but the grain should run with the length of the groove instead of across it. This repair can be done with a cutoff from the edge of the panel if it is large enough; it will be far less visible because the long grain will line up with the edges of the groove. These techniques also work for repairing miscut rabbets.

That sinking feeling. *The wrong end of the workpiece was against the fence, so the center dado is in the wrong place.*

Save your cutoffs. *A crosscut scrap from the end of the board is trimmed to fit and glued in place. Plane the repair piece flush (right) for a barely detectable repair. The dado can now be recut in the right place.*

Fine WoodWorking.com

Visit our Web site for more joinery-repair tips. Author Philip Lowe demonstrates techniques for perfecting a lap joint.

7 Repair a chipped corner

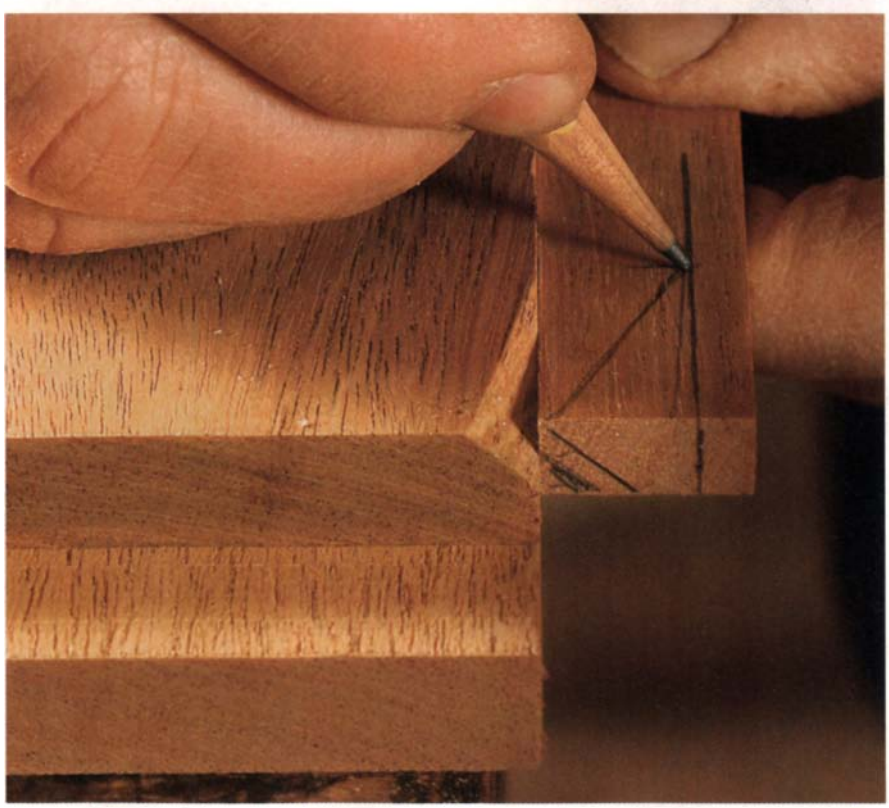
A chipped-out corner. *An otherwise clean rabbet cut is marred by a triangular chip torn from the edge.*

Any kind of through-cut across the grain can end in a chipped corner. If the damage is minor, you might be able to soften the rough edge with sandpaper to make it disappear. But when the damaged area is large enough, you'll need to replace the missing wood. The trick is to do it without it being too obvious.

First, use a bench plane or block plane to make a nice tapering cut off the corner to create a flat surface for gluing. Next, create a repair piece by sawing a corner from a cutoff piece. Be sure to cut the repair piece at an angle that matches the flat surface on your workpiece; this way the grain will run in the same direction as the grain on the part. It's important that the surfaces mate as closely as possible so that the glueline is invisible.

Attach the repair piece with a rub joint and hold it in place with a spring clamp if necessary. Once the glue sets, carefully plane the proud surfaces of the repair piece flat to the surrounding surfaces of the workpiece, and use a chisel to pare the overhang flat to the shoulder.

Create a clean surface for the repair. *Use a bench plane or block plane to make a flat base on which to glue the repair piece. This will minimize the glueline and help make for an invisible repair.*



Custom-fit a repair piece. *Mark out and saw the repair piece to fit the missing corner (left). Take care to ensure that the grain direction matches the workpiece as closely as possible. Glue the repair piece in place, leaving the outside surfaces proud of the workpiece. Once the glue has dried, carefully saw, pare, and plane it flush to the workpiece (above).*

Photos: Mark Schofield

10-in. Sliding Compound Miter Saws

BY ANDY BEASLEY

They're versatile, accurate, and reasonably priced

If you're like me and didn't make a fortune by starting up a computer software company, you probably juggle cost and performance tradeoffs when making a purchase for the shop. A well-made tool that's capable of multiple tasks is always near the top of my shopping list. That's why I like the miter saw so much. But if you are shopping for a miter saw, the choices can be bewildering, with four major types available. There are fixed compound-miter saws (CMS) as well as sliding compound-miter saws (SCMS), and both come in 10-in. and 12-in. blade sizes.

To help select which type you need, consider two common scenarios: mitering tall moldings and crosscutting wide stock. Compared to any SCMS, both the 10-in. and the 12-in. CMS can cut taller material standing vertically against the fence, but the 10-in. sliding saw beats both CMS sizes when you lay the molding flat on the table. Need to crosscut a 12-in. plank? Forget about a standard CMS; even the 12-in. version can crosscut only about 8 in. Finally, while a 12-in. sliding saw can crosscut wider stock than a 10-in. model, you'll pay about another hundred bucks for the measly half-inch of additional capacity.

The ability to miter, bevel, crosscut wide material, make compound cuts, and even plow dadoes, all at a reasonable price, makes the 10-in. slider a perfect fit for many shops. However, some saws achieve this compromise between cost and capability better than others.

A good saw is the sum of its parts

A sliding compound-miter saw must perform three basic operations: The head must pivot to create miter cuts; it must tilt to perform bevel cuts (the compound action makes use of both features); and the cutterhead must slide in and out on tubular steel guide rails to give the machine its impressive crosscut capability.

I tested the six 10-in. sliding compound-miter saws on the market. All offer similar cutting capacities, but two were available as left-hand, single-bevel models only. To cut a right-hand bevel you must swing the workpiece around, perhaps awkward in a cramped shop.

While the saws are similar in basic features and specifications, the details are what make the

Miter adjustments

Obscured miter scale. *Although the scale is clearly printed on the Makita saw, the pointer's location on the side of the table makes it hard to read, especially when cutting a right-hand miter.*

Detent override is useful. *It can be difficult to set a miter angle fractionally different from one with a preset detent. The Milwaukee (shown here) and Bosch saws feature a detent-override lever that solves this problem.*

Cast scales are hard to read. *Saws with miter scales cast in the metal were harder to read than those with printed scales. Metabo's was a particular eye-strainer.*

Angle adjustments

The bevel-angle setting is on the back of most of the saws. *Milwaukee's top-mounted knob and dust-free scale were the best of the bunch.*

Tune-ups maintain accuracy. *Most of the saws will require minor tweaking to set and maintain accurate angles. In this regard, the Bosch saw was the most user-friendly.*

Fences must adjust, too

Clever design. *On the Milwaukee, the tall end of the left-hand fence is kept close to the blade for miter cuts. For bevel or compound cuts, the fence is unclamped and flipped so that the short end will not interfere with the blade.*

Problem fence. *When bevel-cutting on the Metabo, the rectangular auxiliary fences must be removed.*

difference when it comes to achieving high-quality, repeatable results. Because these tools may cut miters one minute and bevels the next, all adjustment controls must be easy to access, operate, and lock. All angles—fence to table, fence to blade, and blade to table—must be right on target, and the saw's design should facilitate adjustments to maintain accuracy.

Selecting accurate miter angles should be easy— The miter angle is the setting that is changed most often on these saws, so the scales must be readable and the angle setting precise. The most readable miter scales are those on the Chicago Electric, Hitachi, and Makita saws, while the blunt, raised castings of the other saws aren't as legible. However, because the Makita's scale rotates with the table, it can be awkward to get a straight view of the side-mounted angle pointer.

All the saws feature detents at the frequently used angles, but it can be difficult to lock in an angle just shy of these fixed detents. The Bosch and Milwaukee saws feature an override for precise angle selection.

Setting the bevel angle can be hit and miss— Bevel controls typically get less frequent use, but on some of the saws the scales and controls almost appear to be an afterthought. The standout is Bosch's front-mounted lock; it makes even continual changes a breeze. The other five saws feature rear bevel locks. Milwaukee's is the easiest to use, and this saw also has the best bevel scale (it's large, easy to read, and attracts less dust than the scales on the other saws).

Tables and fences work together for stock support— The fence plays an important role in accuracy and safety; it should be 3 in. to 4 in. tall to support vertical workpieces on both sides of the blade, and the

Some handles are better than others

Custom-fit handle. *The twin red safety buttons make the handle on the Bosch suitable for left- or right-handed users. In addition, the handle can be rotated to four positions based on personal comfort.*

Right-handers only. *The black trigger lock on the Hitachi is designed to be depressed by the thumb of the right hand. Lefties will find the operation awkward.*

Hang on tight. *Milwaukee's open handle, made from slippery plastic, makes it easy for your hand to slide away from the switch.*

user should be able to move it quickly out of the way when the cutterhead is tilted for beveling. Because most of the saws pair a large, moveable left fence with a low, fixed right fence, the Bosch really stood out from the crowd: Both of its easily removable fences are 4 in. tall and offer great support close to the cut.

The tables on these saws are fairly compact. The exception is the Makita, which boasts a large, steady surface. However, all of these tools would benefit from shopmade extensions for supporting larger stock (see "Add wings to your saw," *FWW* #181, pp. 62-63).

Dust collection and lasers vary in usefulness

I tested each saw with its dust bag (except the Metabo, which doesn't have one) and then connected it to an excellent Fein vacuum. The first thing I learned was that dust collection was most effective when cutting solid wood at least 2 in. thick. In this situation, the sawteeth and the chips exit the wood close to the typical dust-pickup port. The chips from thinner stock and the dust from sheet goods often escaped entirely.

Bearing those limitations in mind, I found that the Hitachi worked well with just the dust bag attached, with the Makita a close second. On all the saws, collection improved significantly with the vacuum attached; the Hitachi, Makita, and Bosch saws being roughly equal. The exception was the Metabo, whose fixed, rear-mounted dust port was too far from the cutting action for the vacuum to be effective.

The laser cutting guides available on the Bosch, Hitachi, and Makita saws don't live up to their billing. None are sharp enough or display well enough to replace the more accurate method of aligning the blade

Setting up a new saw

It may sound crazy, but read the owner's manual first. Unpack the saw by grasping its base or carrying handle(s) and not the saw head, which can cause damage. Check the depth stop to ensure that the blade cannot hit the tool base when the saw head is fully lowered. If your saw has adjustable kerf inserts, leave them spaced wide open; you can move them closer to the blade later, after the blade angle is dialed in (the Milwaukee is the exception—its solid kerf plate must be cut by the user).

Because most saws will arrive out of alignment, expect to refer to the owner's manual for corrective action. Get the saw to the point where all of the detents for common angles yield perfect results.

Attach the machine to its permanent worktable with screws or bolts through the mounting holes in the base. These are large tools, so even with the miter-control knob and part of the turntable overhanging the front of the worktable, you'll still need about 30 in. of working depth.

Make a series of test cuts to check the tool for square. *Use a wide strip of plywood to test miter accuracy, and a thick piece of wood to check the bevels (including the vertical setting).*

BOSCH 4410L

The best saw in this survey has many features that make it exceptionally easy and enjoyable to use. The adjustable, four-position grip is ideal for either hand; up-front controls make this saw the most convenient for permanent mounting; and the large workpiece clamp operates like a bench holdfast and is the easiest to position. In addition to its miter-detent override, the saw features a microadjustment knob for fine-tuning a cut 2° on either side of a detent. That's good, because the miter scale and its chubby pointer aren't all that precise (though the detents are). The laser cutting guide aligns with only the left edge of the blade and is too blurry for accurate work.

with a pencil mark or using a stop. The only time I found a laser useful was while cutting molding at large bevel angles: The line helped me to visualize where the tilted blade would enter the profiled material.

Performance: I don't want much, just great results

My testing focused on saw performance in four areas: smoothness, accuracy, power, and ease of use. I evaluated smoothness of cut by crosscutting wide pieces of veneer plywood and 8/4 hard maple. This included a trimming cut near the end of the maple to see how much the blade tended to deflect when not supported equally on both sides of the cut. Because many users will replace the manufacturer's blade, I duplicated each test with a top-quality aftermarket blade, a new 80-tooth Forrest ChopMaster. I measured the tools' accuracy (once I'd set them up properly) by cutting material at selected miter and bevel settings, then checking the results with a Starrett square. The power test was a subjective evaluation of motor drag while crosscutting a wide hardwood plank. Finally, after cutting various materials in as many different settings as possible, I scored each saw on how easy it was to use.

And the award goes to...

I'm often asked if I get to keep the tools I review. Unfortunately, the answer is an emphatic no. But if the rules change, the saw I'd keep is the Bosch, my choice for best overall. Cutting performance was superb and the saw's many smart features made it a pleasure to use. The Makita was a close second—it cut marginally better than the Bosch but didn't handle as well.

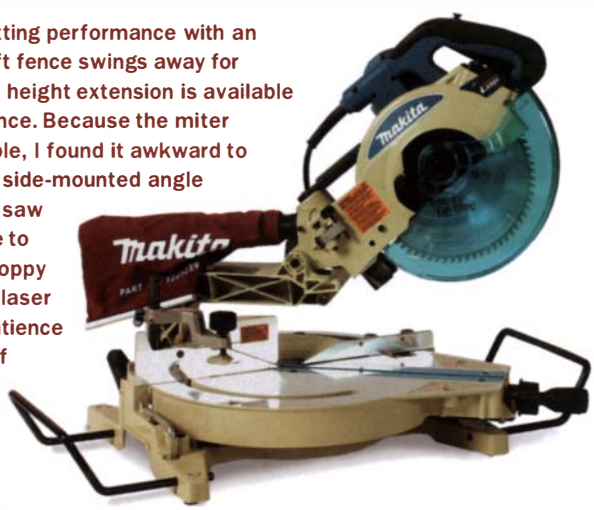
If you're looking for a solid, dependable saw at a fair price, the best value of this group is the Milwaukee. It's only a single-bevel tool, but the lower price is worth the slight inconvenience. □

Andy Beasley is a retired U.S. Air Force pilot and lives in the mountains of Colorado.

MODEL AND SOURCE	STREET PRICE	AMPS	MAX. CUTTING DEPTH IN.	MAX. CUTTING WIDTH IN.
BEST OVERALL **Bosch 4410L** boschtools.com 877-267-2499	$510	15	0° bevel, 3⅞; 45° bevel, left 2⅜, right 1½	0° miter, 12⅛ 45° miter, 8¾
Chicago Electric 90891 harborfreight.com 800-444-3353	$100	5.1	0° bevel, 3½; 45° bevel, left 1¾	0° miter, 12 45° miter, 8⅛
Hitachi C10FSH hitachipowertools.com 800-706-7337	$500	12	0° bevel, 3 11/32; 45° bevel, left 2 3/16, right 1 3/16	0° miter, 12 9/32 45° miter, 8 19/32
Makita LS1013L makita.com 800-462-5482	$500	15	0° bevel, 3⅝; 45° bevel, left 2, right 1¼	0° miter, 12 45° miter, 8½
Metabo KGS 303 metabousa.com 800-638-2264	$570	15	0° bevel, 3 3/16; 45° bevel, left 2⅛, right 1	0° miter, 11 7/32 45° miter, 7⅞
BEST VALUE **Milwaukee 6497-6** milwaukeetool.com 800-729-3878	$430	15	0° bevel, 3 7/16; 45° bevel, left 2⅛	0° miter, 12⅜ 45° miter, 8¾

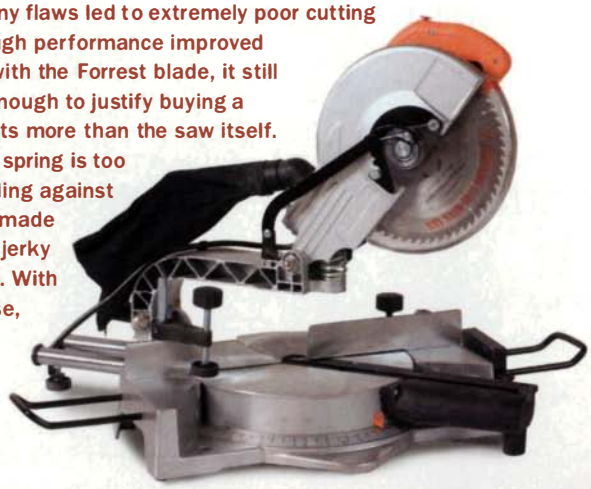
MAKITA LS1013L

This saw pairs superb cutting performance with an innovative design. The left fence swings away for beveling, and an optional height extension is available for the undersize right fence. Because the miter scale rotates with the table, I found it awkward to get a straight view of the side-mounted angle pointer. Additionally, this saw was the most susceptible to angle errors caused by sloppy miter detents. The blurry laser guide required a lot of patience to adjust from one side of the blade to the other.



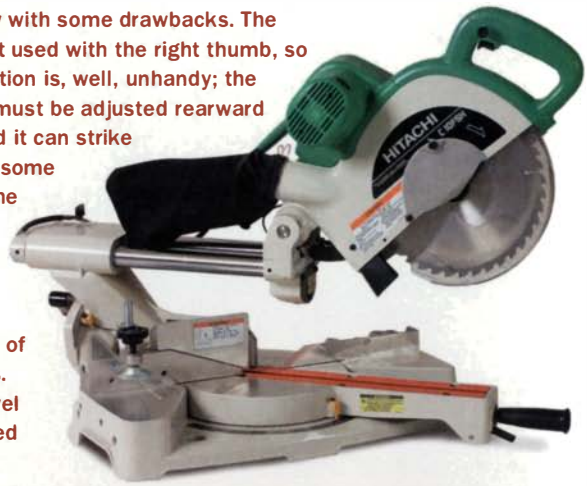
CHICAGO ELECTRIC 90891

This tool's many flaws led to extremely poor cutting results. Although performance improved dramatically with the Forrest blade, it still wasn't good enough to justify buying a blade that costs more than the saw itself. The saw-head spring is too strong; struggling against its resistance made all operations jerky and imprecise. With left-handed use, the retracting blade guard struck the fingers.



HITACHI C10FSH

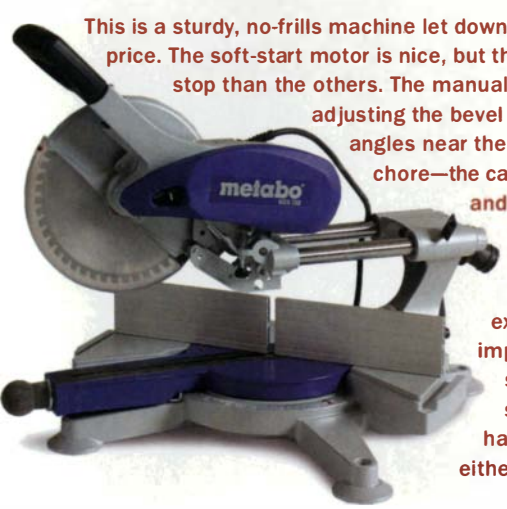
This is a good saw with some drawbacks. The trigger lock is best used with the right thumb, so left-handed operation is, well, unhandy; the rear blade guard must be adjusted rearward when mitering and it can strike the fences during some compound cuts; the tiny right fence isn't too helpful, but the excellent left-side fence smoothly flips out of the way for bevels. The miter and bevel scales are cluttered but very precise.



					TESTING RESULTS				
BEVEL RANGE	MITER RANGE	FACTORY BLADE	LASER BLADE	WARRANTY	SMOOTHNESS factory blade	SMOOTHNESS Forrest blade	POWER	ACCURACY after setup	EASE OF USE
Left 47° Right 46°	Left 52° Right 60°	60-tooth carbide	Yes, fixed	1 year	Excellent	Excellent	Excellent	Excellent	Excellent
Left 45°	Left 45° Right 45°	60-tooth carbide	No	90 days	Poor	Fair	Fair	Good	Fair
Left 45° Right 45°	Left 45° Right 57°	40-tooth carbide	Yes, adjustable	5 years	Fair	Good	Excellent	Excellent	Good
Left 45° Right 45°	Left 47° Right 52°	70-tooth carbide	Yes, adjustable	1 year	Excellent	Excellent	Excellent	Good	Good
Left 48° Right 48°	Left 50° Right 60°	48-tooth carbide	No	1 year	Good	Excellent	Fair	Excellent	Good
Left 48° Right 3°	Left 51° Right 59°	80-tooth carbide	No	5 years	Good	Good	Good	Excellent	Good

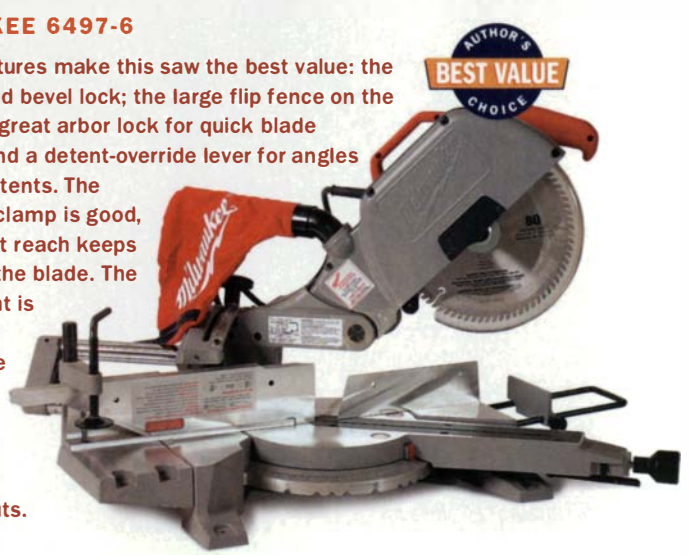
METABO KGS 303

This is a sturdy, no-frills machine let down by its relatively high price. The soft-start motor is nice, but the blade takes longer to stop than the others. The manual gives no guidance for adjusting the bevel stops, and selecting angles near the miter detents was a chore—the cast scale is imprecise, and there's no override to overcome the tension of the detents. The auxiliary fences are excellent and a huge improvement over the small ones fixed to the saw. The horizontal handle is perfect for either hand.



MILWAUKEE 6497-6

A lot of features make this saw the best value: the top-mounted bevel lock; the large flip fence on the left side; a great arbor lock for quick blade changes; and a detent-override lever for angles near the detents. The workpiece clamp is good, but its short reach keeps it far from the blade. The fence height is adequate; the left side can be quickly unclamped and flipped for bevel cuts.



One Fast Finish

Luster of oil and sheen of shellac—in a day or less

BY JEFF JEWITT

I've had to learn to do quick finishing jobs and make fast fixes in my refinishing business. This method is both fast and attractive, whether you're working on a holiday gift on Christmas Eve or you just prefer no-fuss finishes. I came up with the technique based on necessity, but I'm sure it will save you when time is tight.

This finish is ideal for a low-build, "in-the-wood" type of look, where durability is not the key factor. However, you can build the shellac to increase the level of protection. The ingredients—boiled linseed oil, denatured alcohol, a can of amber shellac, and a few rags---can be found in most woodshops or at the nearest hardware store. The wipe-on technique avoids the hassle of most oil finishes, which can take days to complete. In fact, it works so well that it might become your favorite finish.

A thin coat of oil lays the foundation

For surface preparation, scrape, plane, or sand the wood with the grain to P220-grit. Wipe with naphtha or denatured alcohol to remove dust, dirt, and sanding debris. The solvent will highlight potential problems like glue spots and scratches.

Applying boiled linseed oil is the first step in French polishing, a more tedious and time-consuming technique from which this finish is derived. In fact, you could call this a "down and dirty" French polish.

I'm a big fan of boiled linseed oil for this step, because it contains driers that cause it to cure faster than tung oil. Pour a small amount onto a small cotton cloth. Apply just enough oil to make the wood appear "wetted," which is about a teaspoon per square foot depending on wood species. Don't use the "flood on, let sit, then wipe" method. If you do, the oil will seep from figured areas through the thin shellac that is applied in the next step.

Remove excess oil with a clean rag, then lightly buff the surface with a gray synthetic abrasive pad such as 3M Scotch-Brite or Mirka Mirlon. The pad will pick

THREE-STEP FINISH

Oil, shellac, and wax are easy to find and just as easy to apply using this simple, three-step process. Don't be surprised if this fast finish becomes one of your favorites.

Photos, except where noted: Tom Goffe; this page: Michael Pekovich

up residual oil and will smooth the wood surface further.

Pad on shellac right away

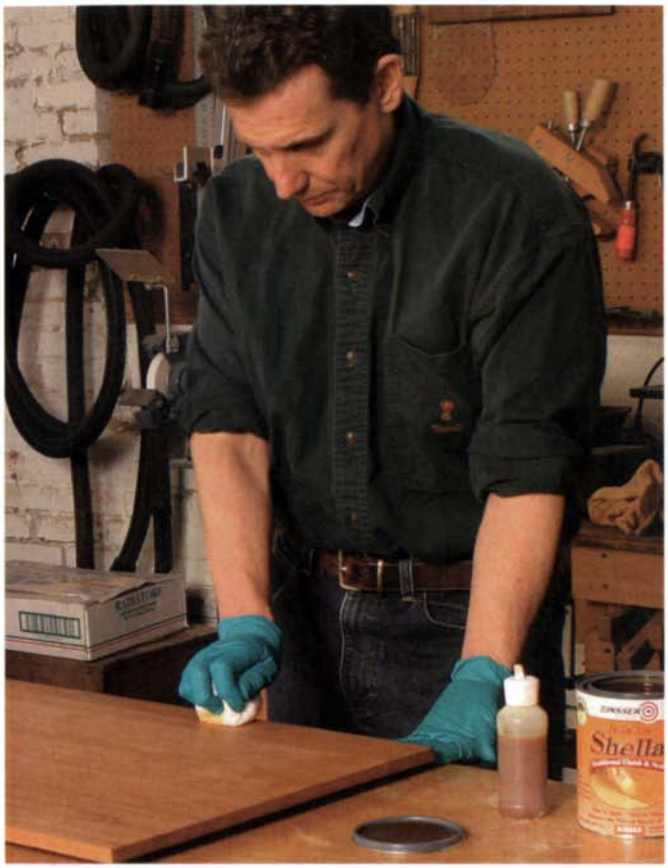
Normally, you would let the oil cure for 24 to 48 hours. You can wait, but if you go directly to the shellac application, it will speed things up and the oil will provide a bit of lubrication for the shellac. The thin coat of oil cures fine below the shellac.

Plain, orange, waxy shellac (sold in a can as amber shellac) works well and is easy to find. The brand I use comes in a 3-lb. cut that I dilute by mixing 2 parts denatured alcohol with 5 parts shellac. Put the mixture in a squeeze bottle with a dispensing spout.

I use a padding cloth to wipe on the shellac. It should be as absorbent, clean, and lint-free as possible. Old, clean T-shirts work fine. Cotton is preferred, because polyester does not hold or absorb liquids as well. Wad up the cloth so that the bottom part is as smooth and free of wrinkles

BEGIN WITH A LIGHT COAT OF LINSEED OIL

Because this finish does not provide time for the oil to dry, compensate by using a whisper-thin coat. Use just enough to bring out the beauty of the wood. Immediately remove any residual oil with a clean, lint-free cloth (left). A good rubdown with a synthetic pad (below) will smooth the surface and add a nice sheen.



WIPE ON SHELLAC

Thin the shellac you'll use by mixing 5 parts shellac with 2 parts denatured alcohol. This thinner shellac is easier to apply, especially on small or intricate surfaces. Wipe it on thinly with a cloth pad, starting with flat surfaces (above) and then working the sides and edges (right). Use 600-grit sandpaper to smooth out application marks or remove debris (facing page).

as possible. Make the pad a manageable size. Large pads are great for big, flat surfaces but don't work for smaller and more intricate projects.

Dispense about 2 oz. of denatured alcohol into the pad and compress the pad with your hand several times to work the solvent through it. Then squeeze the pad to remove excess solvent. Pour about 1 oz. of shellac solution onto the pad bottom.

Padding shellac simply means wiping it on thinly with this cloth pad. It is best to practice on a flat surface to get a feel for applying it smoothly and evenly.

Finishing different surfaces requires an assortment of techniques

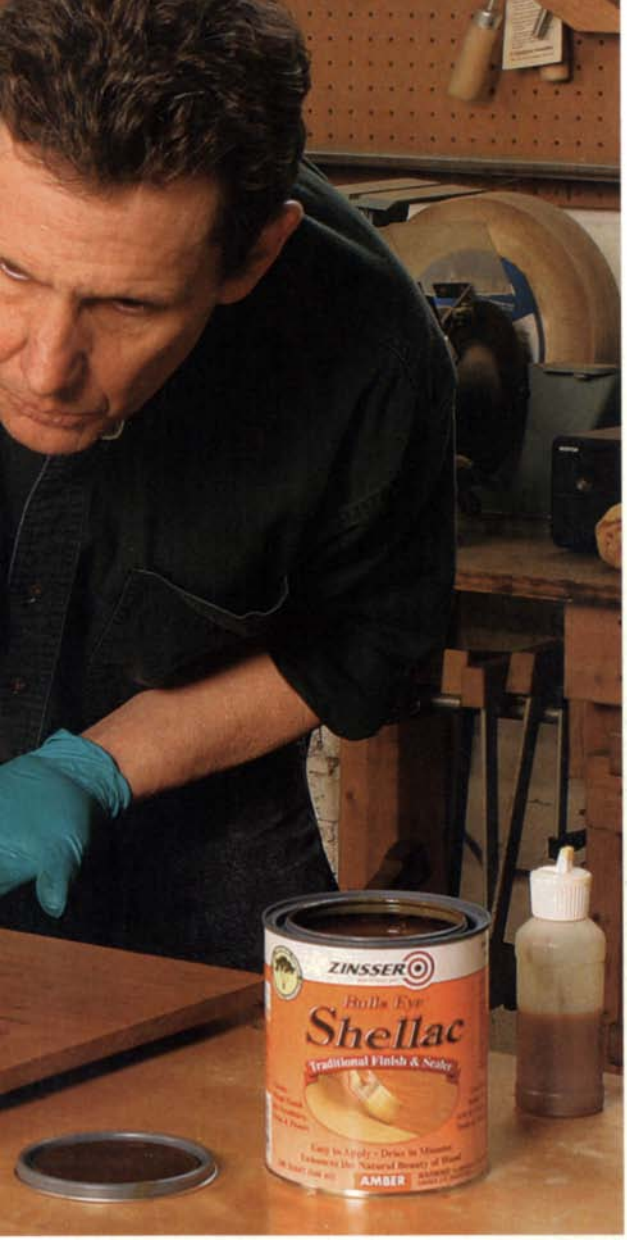
For flat surfaces, bring the pad down lightly near one edge and drag it across the top and off the opposite edge, like an airplane landing and then taking off again. Come in from the other side and repeat the stroke. Continue down the board in alternating stripes, with the grain. When you've reached the bottom, start again at the top. One of the great benefits of shellac is that it dries quickly enough for you to repeat the sequence rapidly. Work the sides and edges in a similar fashion. As the pad starts to dry out, reload it with shellac.

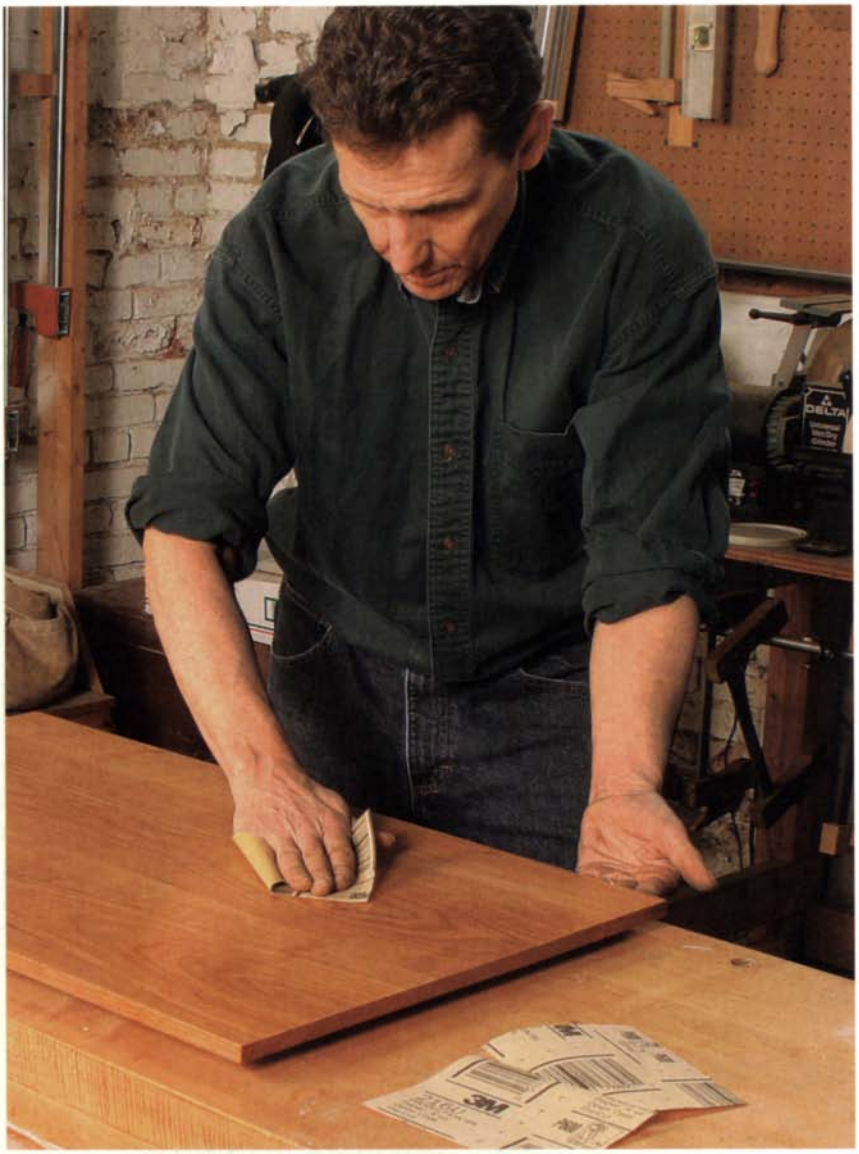
For complex surfaces such as furniture interiors, tight corners, or other challenging areas, you'll need to modify things a bit. Start with the pad anywhere that's convenient and move it toward corners, right angles, and such. Always keep the pad moving. When you recharge, make sure you don't put too much shellac in the pad or you'll pool it. Bring the pad down on the surface and immediately begin to move it using just the pressure of your fingers or the weight of your arm.

To finish routed or other three-dimensional surfaces, wad up the cloth and compress it into the profile of the edge. Use a small, well-wetted portion of the pad to get the shellac into small or tight areas. But again, don't get the pad too wet or you'll create problems.

It probably took you longer to read about the shellac application than it will to actually do it. For a medium-size project like a small cabinet or table, I spend only about 30 minutes with the shellac. Smaller projects are a little harder, because you risk returning to an area before it dries, and dragging the gummy shellac. Move the pad more slowly, or try using a smaller pad.

You may encounter streaks or fibers in the sticky shellac. Any application marks





or debris can be rubbed out with some 600-grit (CAMI grade) sandpaper followed by 0000 steel wool after the shellac has cured for about eight hours. Because there are no "coats" of finish in the conventional sense, just keep applying the finish to achieve the look you want.

Applying the final touch

Near the end of the process, if you use all the shellac in the pad and keep rubbing with the dry pad, it will burnish the surface and give it a nice soft glow. For a lower luster and extra protection, wait a day and then apply some paste wax with 0000 steel wool. Buff the wax with a soft cloth. □

Jeff Jewitt is a professional finisher and author of Taunton's Complete Illustrated Guide to Finishing *(The Taunton Press, 2005).*

FINISH WITH STEEL WOOL AND WAX

Paste wax adds a more even sheen and a nice feel to your project. Apply it with 0000 steel wool. When the wax appears hazy, buff it with a soft, clean cloth.

Arts and Crafts Side Table

Versatile design is quick to build, but rewards precise joinery

BY KELLY J. DUNTON

The inspiration for this table dates back a century to designs by Gustav Stickley. He defined his furniture philosophy as being "where the beauty lies in simplicity of the wood and of the joints themselves." To be faithful to the original designs, I built my table from white oak with pegged through-tenons joining the lower stretchers to the legs.

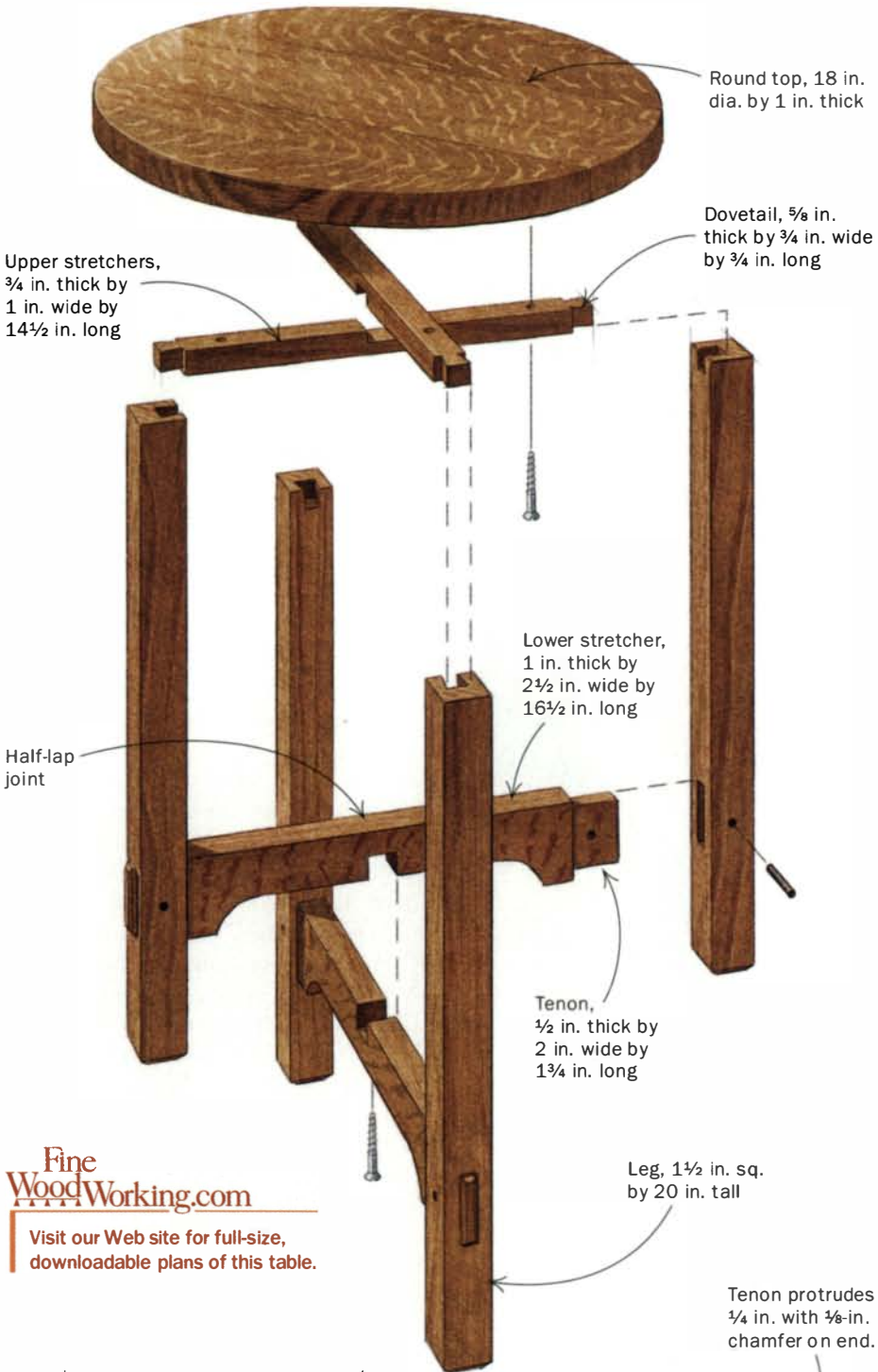
There are many uses for a small table: With slight changes in size, it can sit next to a chair in the family room, serve as a bedside table, or be used as a plant stand. Made from cherry or maple, this design would fit nicely into more modern décor.

This is a relatively simple project that uses little material and can be built with common hand tools and machines. So sharpen your chisels and planes and let's get started.

Lay out the legs and cut the mortises

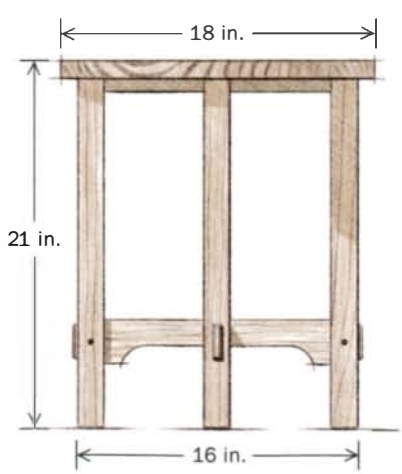
Much but not all furniture in this style was made from quartersawn white oak with its characteristic ray flecks running across the grain on opposite sides of the board. I chose this type of wood for the prominent top of the table, but for the rest of the

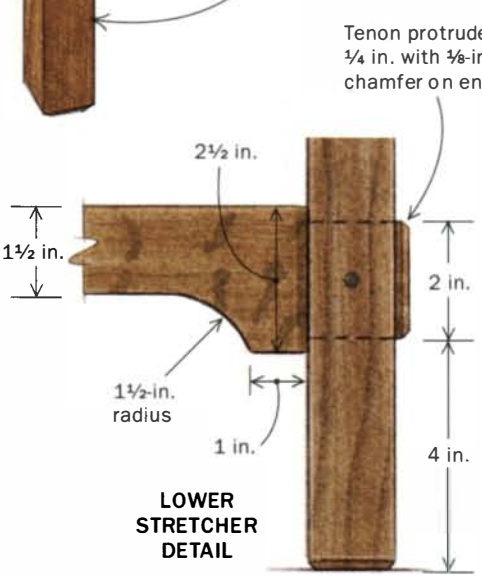
Photo, this page: Michael Pekovich; drawings: John Hartman



Fine WoodWorking.com

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

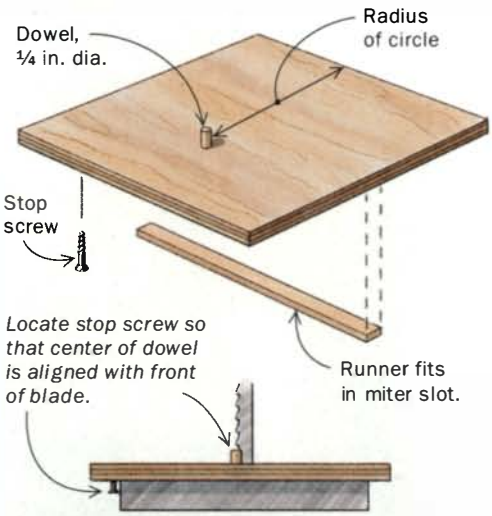




LOWER STRETCHER DETAIL

BUILD A SIMPLE CIRCLE JIG

To cut the circular top, Dunton uses a jig that sits in the miter-gauge slot and has a dowel that fits into a hole drilled in the underside of the tabletop. The distance from the side of the jig that touches the bandsaw blade to the dowel equals the tabletop radius. Slide the jig until the front edge of the blade is aligned with the center of the dowel, and insert the stop screw.

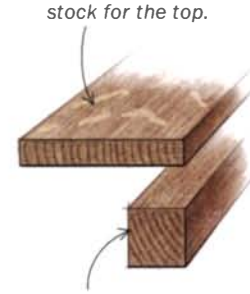


SIDE VIEW

Use the circle jig. *Place the tabletop on the jig and slide it forward until the stop screw hits the saw table (top). Then rotate the top to cut the circle (above).*

piece I used more readily available riftsawn boards (see drawing, below).

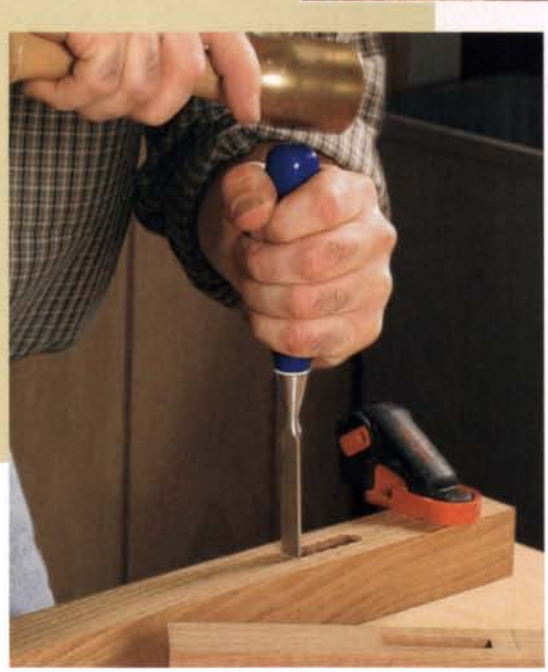
Because three sides of each leg will have near equal exposure to the viewer, I cut and surfaced the legs to size, and then selected the least attractive side of each leg to face inward. When laying out the mortises, make sure to place them accurately on all the legs and make sure the leg dimensions are identical; this will keep the table square and stable. Because the lower stretchers end in through-tenons instead of the more common blind tenons, remember to mark both sides of the legs using the same side as a reference edge. I lay out the mortises using a marking gauge, a square, and a knife. I prefer a knife to a pencil because it gives greater precision and allows you to set the chisel in the knife cut later for the final paring cuts. These joints will be exposed, so take the time to lay out and cut them precisely.



There are several ways to cut the mortises. A hollow-chisel mortiser is the quickest method, but lacking this tool I chose to remove most of the waste at the drill press and then clean up the sides and ends with a sharp chisel. (Drilling by hand is an option, but it is important to drill straight and true.) To hold the workpiece securely and to prevent tearout on the bottom side

DRILL AND CHOP THE MORTISES

Drill-press jig. *To keep the mortises straight and square and to prevent tearout where the bit exits, a jig consisting of a backer board and a right-angle fence (above) is clamped to the drill-press table. With a Forstner bit (inset), you can overlap each hole and remove more waste.*



Clean up the mortises. *Use a chisel the same width as the mortises to clean up the ends (right), and then a wider chisel on the sides (far right). Creep up to the line. Don't place the tip of the chisel in the line left by the marking knife until you have only a thin slice of wood to remove.*

Photos, except where noted: Mark Schofield

Tenons on the tablesaw. *Use a dado set for quick tenons. For accuracy and clean cuts, outfit the miter gauge with an auxiliary fence and a stop block. Through-tenons must look good and fit right, so clean them up with a shoulder plane, a block plane, and/or a chisel.*

of each leg, make a small fence consisting of two pieces of plywood or MDF glued and screwed at a 90° angle, which gets clamped to the drill-press table.

Install a bit that is slightly smaller than the width of the mortise, center the mortise on the bit, and then drill out the waste, starting at each end. It's best to use a Forstner bit because you can overlap the holes without causing the bit to wander off course. A second choice is a brad-point bit—cut the holes as close to each other as possible without overlapping.

With the leg clamped to the workbench, clean up each end of the mortise using a chisel that matches the mortise width as closely as possible. Keep the chisel off the layout line until the final cut, which should remove only a sliver of wood. Work into the center from both sides, but try to get the cleanest cuts on the visible outside of the leg. With the mortise ends established, use the widest chisel that will fit the length of the mortise to pare the sides. Working with white oak will probably require a mallet and a few trips to your sharpening stones. With patience and determination, you'll soon have clean mortises.

Create the upper and lower stretchers

With the legs nearly complete, turn to the upper and lower stretchers. Both pairs are connected with half-lap joints, but the lower stretchers have a curved profile on the bottom edges and terminate in through-tenons. I used a marking gauge, a try square, and a marking knife to lay out the tenons.

I cut the tenons using a dado blade on the tablesaw. It is helpful to make test cuts on a piece of scrap the same thickness as the stretchers. Check the fit until it is still a bit fat, and then pare the tenons with a block plane, a shoulder plane, or a chisel. In this way you will get a precise fit and nice clean cuts on the exposed tenon ends. Number each joint when you are done.

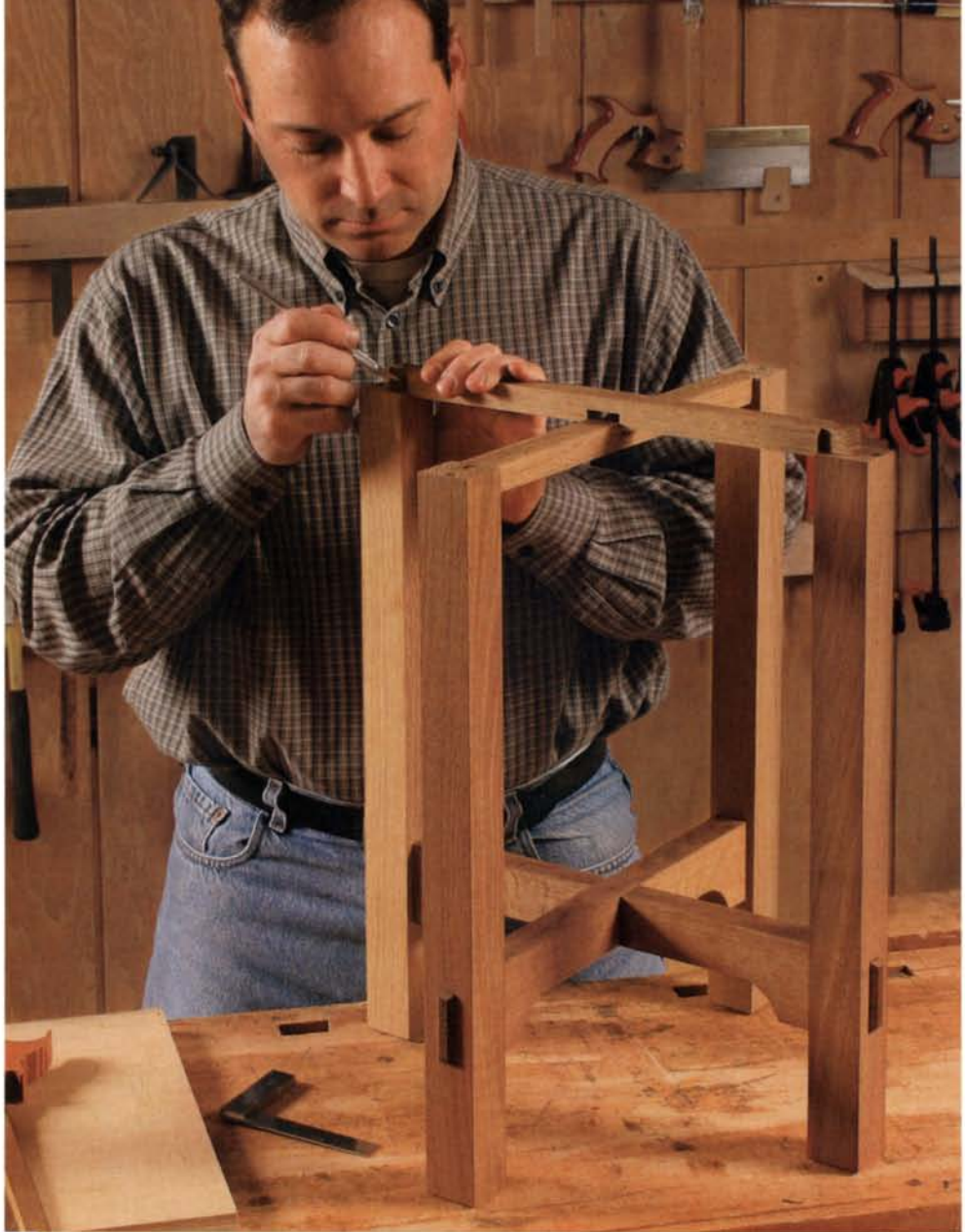
Now mark and cut the half-lap joints in both pairs of stretchers. Work from the

CUT THE TENONS AND HALF-LAP JOINERY ON THE TABLESAW

Cut the half laps. *With the same miter gauge and auxiliary fence used to cut the tenons, cut the half-lap joint on each stretcher.*

Profile the stretchers. *Join the lower stretchers with double-sided tape and then bandsaw the profile.*

Chamfer the tenons and legs. *A ⅛-in. bevel gives the exposed through-tenons and leg bottoms a softer look and creates interesting shadow lines.*



center points of each pair and mark the widths of each at the crossing point. Mark for the depth from the top of each stretcher and label which side is to be removed. Using a miter gauge, make multiple passes on the tablesaw to remove most of the waste. Then pare with a chisel to a perfect fit.

To bandsaw the profile on both lower stretchers at once, join them with double-sided tape. The curve also can be cut with a jigsaw—but clamp or tape a piece of scrap to the upper side of the stretcher to keep the cut as clean as possible.

When the upper stretchers are cut to size, saw a dovetail on each end. A handsaw and/or tablesaw can make these cuts, leaving just a bit of chisel work. Cut a ⅛-in. shoulder on the lower side. This shoulder can be registered against the side of the leg to transfer the shape of the dovetail to the top of the leg. After laying out the mortises in the legs, remove some of the waste on the drill press, and then clamp the leg in a vise and chop away the rest with a chisel.

The final work on the top stretchers is to drill and countersink screw holes through which to attach the tabletop. To allow for seasonal movement of the top, elongate the holes in one of the stretchers.

Make the round tabletop

It is worth spending time at the wood supplier searching for a quartersawn board with a decent amount of ray fleck in it to form the tabletop. Making the top from

DOVETAIL THE UPPER STRETCHERS

Saw a dovetail onto the ends of the upper stretchers. Dry-fit the table and scribe the location of the dovetail on the top of each leg (above). Saw on the scribe mark (right) and remove most of the waste on the drill press. Clean up the joint with a chisel (far right).

ASSEMBLE THE BASE IN TWO STAGES

Begin base assembly. *Glue and clamp the first pair of legs to their upper and lower stretchers. On the second pair of legs, glue only the lower stretcher in place.*

Peg the joints. *The pegs are inserted from both sides of the leg to avoid blowing out the wood when they exit.*

Finish base assembly. *Because you need to overlap the two halves of the base, only attach the second upper stretcher after the lower stretchers are together.*

three well-matched pieces from a single board is better than using two wider but conflicting pieces from different boards. Prepare, glue up, and clamp the pieces.

There are many ways to cut the circular top. The simplest is freehand, using either a bandsaw or a jigsaw and cleaning up the edge with hand tools and sandpaper. I used the bandsaw, but with a jig that sits in the miter-gauge slot and has a center point that fits into the underside of the tabletop (see drawing, p. 57). Slide the jig until the front edge of the blade is aligned with the center of the tabletop, and rotate the top until the circle is complete. Clean up the edge with a block plane, file, and sandpaper.

Assembly sequence and finishing

To be historically accurate I decided on a fumed finish, which uses ammonia fumes to darken the oak chemically and is best done with the piece dry-fitted (see Finish Line, pp. 116-117). As for a topcoat, whether you fume the oak or prefer a natural look, it is beneficial to prefinish pieces before assembling them.

Sand all surfaces to P220-grit and then carefully wipe a clear finish on all the surfaces that will not be glued, including the ends of each tenon that will protrude from the legs.

Begin assembly by preparing the mortises for pinning. I marked the center points of the mortise sides and drilled all the way through using a sharp brad-point bit with a piece of scrap under the leg to minimize breakout. After the stretchers are glued to the legs, you'll drill into the existing hole and through the tenon before inserting ebony pins.

Glue the first pair of legs and stretchers and clamp until dry. Apply glue just to the tenons after they have been partially inserted into the mortises to reduce squeeze-out. The second pair overlaps the first, so don't glue in the second top stretcher until after the two pairs of legs are connected. I drove a screw into the bottom of the lower intersecting stretchers. □

Kelly J. Dunton is an associate art director.

Ten Essential Router Bits

These bits will conquer the majority of woodworking tasks

BY GARY ROGOWSKI

You've bought a new router, unpacked it, and even found the switch on it. But that's only half the battle. Woodworkers new to the router will encounter a bewildering array of bits that do all sorts of work. Which ones do you buy first?

High-quality router bits are not cheap, and making the wrong choices can hurt your wallet and limit your woodworking. So I've come up with a basic set of bits that will do a lot of things well, from cutting joinery to shaping profiles to pattern-routing. You can get the entire kit for around $260—well worth the money when you consider all the jobs you can complete with it.

Most of the bits in this group are carbide-tipped, which makes them more durable than high-speed steel bits but less expensive than solid carbide bits. Also, most have ½-in. shanks, which are less prone to breaking than bits with ¼-in. shanks. I don't claim that these bits will be the only ones you'll ever need, but they will create a rock-solid, versatile foundation for routing that can be expanded as your woodworking repertoire expands.

Gary Rogowski, a contributing editor, runs The Northwest Woodworking Studio in Portland, Ore.

Operating: handheld vs. table mounted

For safety, Rogowski does most of his routing on a table, because it provides a stable worksurface. He uses a handheld router when a workpiece is too unwieldy to handle on a table or when the task simply is more suited to handheld routing, such as chopping mortises or running dadoes across a case side. When using a handheld router, work left to right. When routing on a table, work right to left.

Photos, except where noted: Thomas McKenna; individual bits and boards: Kelly J. Dunton

A BASIC BIT KIT

- ¼-in. straight bit
- ½-in. straight bit
- ⅜-in. spiral-fluted straight bit
- Rabbeting bit with four bearings
- ½-in. dovetail bit
- ¼-in. roundover bit
- ⅜-in.-radius cove bit
- 45° chamfer bit
- Three-wing slot cutter
- ½-in. flush-trimming bit

Straight bits

Straight bits do the yeoman's work in a router-bit kit. Designed for square, uniform cuts such as grooves and dadoes, they also can be used to clean up edges and to cut mortises, tenons, and rabbets. Straight bits have straight or spiral flutes. Two useful sizes of straight-fluted bits are ¼ in. and ½ in. (Choose a ¼-in. shank for the ¼-in. bit; a ½-in. shank will limit the depth of cut.) A ⅜-in.-dia. spiral-fluted up-cutting bit is perfect for chopping mortises.

GROOVES AND DADOES

A groove is cut along the long grain of a board, while a dado is cut across the grain. A sharp straight bit makes quick work of both tasks and gives you grooves and dadoes of uniform size.

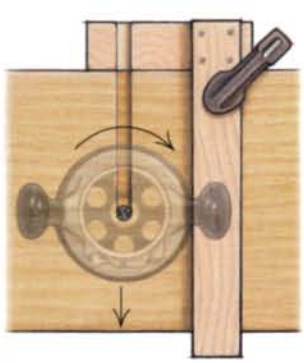
Generally, grooves are easier to cut on a router table, but it's possible to cut them with a handheld router. Use a plunge router for stopped grooves. For accuracy, you'll need to employ the router's edge guide or secure a straightedge to the workpiece to guide the router.

Dadoes often are cut in multiples and on longer, wider stock for case goods, so it makes sense to cut them with a handheld router. For speed and accuracy, it's a good idea to use a right-angle jig that clamps to the workbench and across the stock (see photos, below). Fed properly, the router base will be pushed by the cutting action against the fence of the jig, ensuring a straight cut.

Make the jig out of ¾-in.-thick plywood: Screw a fence to the base (both about 4 in. wide) at a precise 90° angle. Place the router base against the fence, then rout a dado in the base of the jig. Use that dado to align the jig with layout lines on the workpiece.

Grooves are best cut on the router table. *For smooth cuts with little burning, take light passes, gradually raising the bit to full height.*

Right-angle jig ensures straight dadoes. *Align the dado in the jig with the layout lines on the workpiece, then clamp the jig in place.*



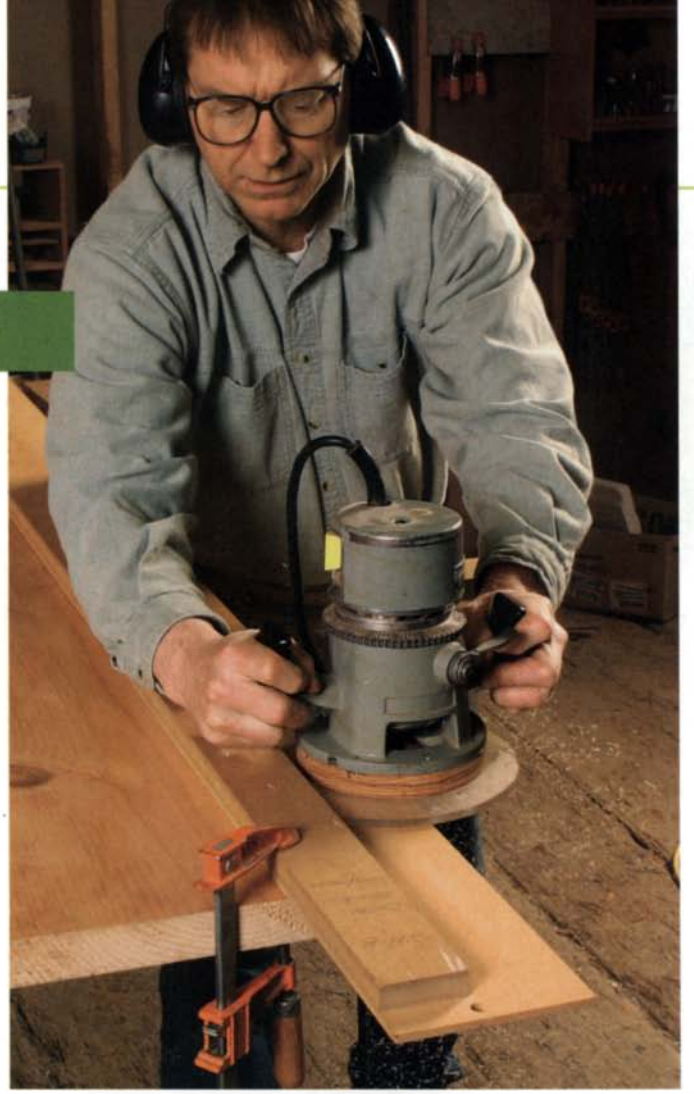
Work on this side of the fence. *Then the bit's rotation will pull the router base against the jig's fence, ensuring an accurate cut.*

Photos, this page: Michael Pekovich (bottom two); drawings: Christopher R. Mills

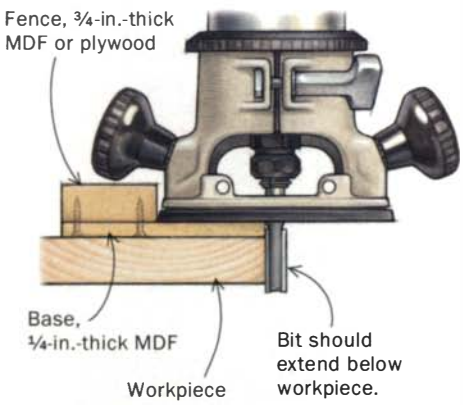
EDGE TRIMMING

You can use straight bits to make edge cuts just like a jointer. I often use this technique on workpieces such as tabletops that are too unwieldy to clean up on a jointer.

To ensure a straight cut, make a jig a bit longer than the longest edge you need to rout. The jig should have a base of ¼-in.-thick medium-density fiberboard (MDF) and a ¾-in.-thick fence (see drawing, right). Start by using the router to trim the edge of the base. Then just place that edge on the line you want to cut. Be sure the cutting edge of the bit is long enough to reach past the bottom of the workpiece.



Router as jointer. *With the help of a jig, you can clean up rough-sawn edges on large workpieces such as tabletops. Work from left to right.*

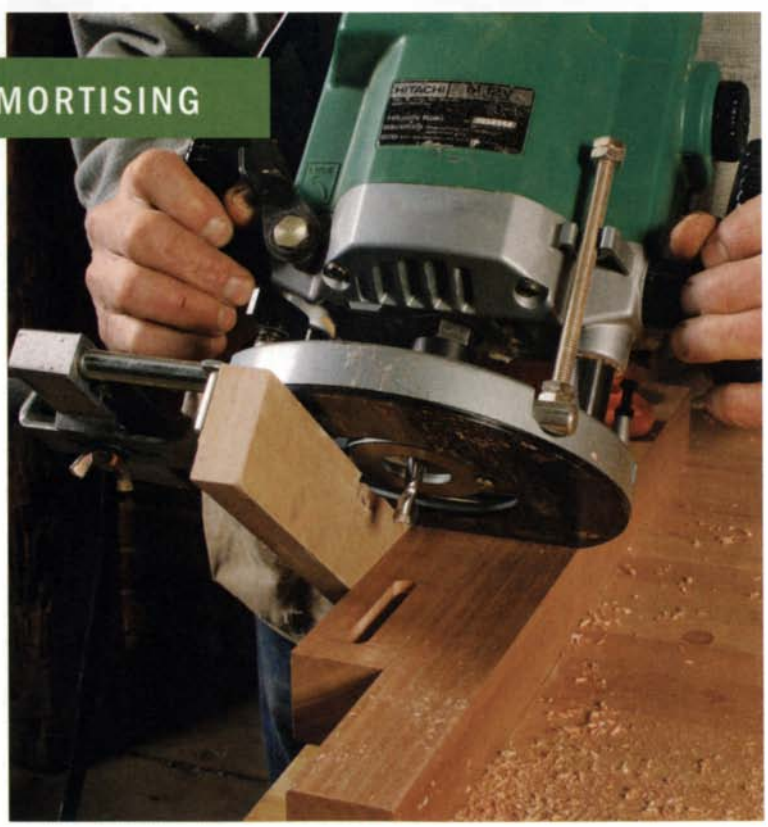


USE A SPIRAL BIT FOR MORTISING

It's tough to find carbide-tipped spiral bits these days, so I chose a solid carbide bit for the kit. It's an expensive piece of tooling, but if you plan to cut mortises with a router, this is the bit to have. The flutes spiral around the bit, similar to the way a drill bit is cut, so it pulls chips up and out of the mortise. And with spiral flutes, there are always two cutting edges in the work, making for a smooth, shearing cut.

TIP

Don't toss your loose bits in a drawer. If they roll around and bump into each other, the cutting edges could get chipped. Instead, hold bits in their original packaging, or drill a wood scrap to make a simple holder for the set.



Mortises in a flash. *Mounted in a plunge router, a spiral bit cuts a mortise easily. Use a router fence for accuracy. To prevent the router base from wobbling on narrow stock, support it with an extra piece of stock.*

Rabbeting bit

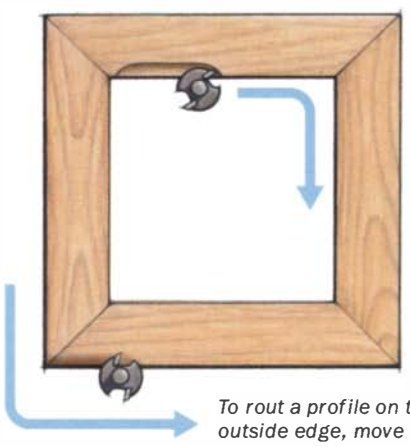
As the name implies, a bearing-guided rabbeting bit excels at cutting rabbets of varying sizes. Although a straight bit can do the job, the bearing-guided bit ensures uniformity, an advantage if you're cutting a number of identical rabbets.

A rabbeting bit with a set of different-diameter bearings allows you to change the width of the rabbet simply by switching out the bearings. Rabbets typically are not much deeper than ½ in., so the set I recommend adjusts to cut rabbets from 5⁄16 in. to ½ in. wide. You can use the bit in a router table or in a handheld router.

One advantage of a bearing-guided rabbeting bit is that you can cut rabbets in frames after they have been glued together, which ensures perfect alignment. The bearing controls the rabbet's width, so there's no need for a fence to guide the cut. Move the router clockwise around the inside of the frame (see drawing, left).

Rabbets made easy. *A bearing-guided rabbeting bit allows you to rabbet a glued-up picture frame. You can dial in the depth of the rabbet and prevent tearout by making a series of shallow passes (1⁄32 in. to 1⁄16 in. deep) until you reach the final depth. You'll have to clean up the corners with a chisel.*

PROFILING THE EDGES OF A FRAME



To rabbet the inside edge of a picture frame, move the router clockwise.

To rout a profile on the outside edge, move the router counterclockwise.

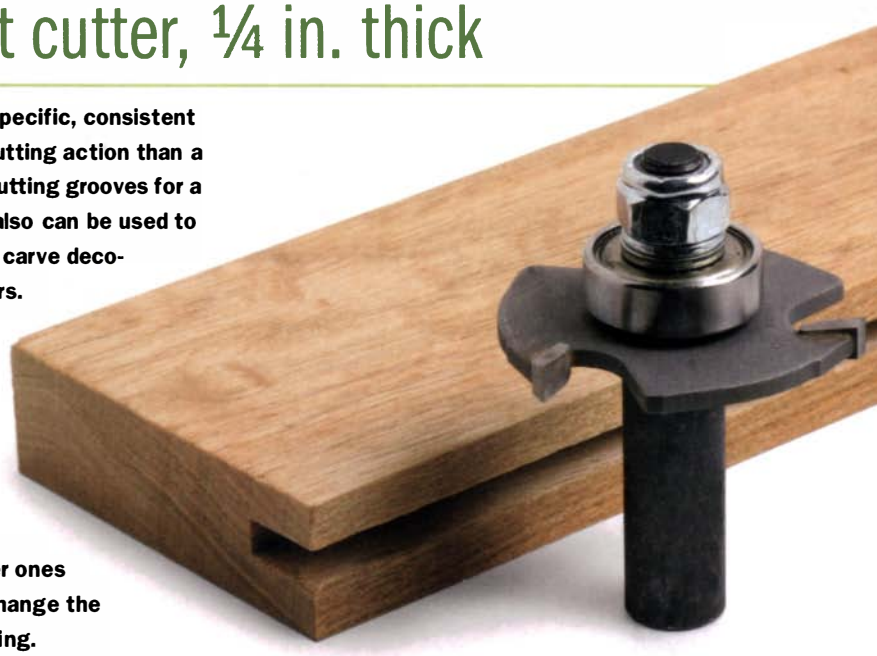
TIP

Buy quality bits from reputable sources. Generally, a cheap bit won't last as long as its pricier cousin because it's not as well made. You could end up spending twice as much to replace a bit that dulls prematurely, breaks, or chips.

Three-wing slot cutter, ¼ in. thick

A slot cutter makes grooves to a specific, consistent depth and width, with a cleaner cutting action than a straight bit. It is used mainly for cutting grooves for a frame-and-panel assembly, but it also can be used to rabbet the edges of panels and to carve decorative grooves in panels or pilasters. Each of these jobs is best done on a router table.

I chose a bit with three wings that cuts a ¼-in. kerf. Three wings provide more balance than two. The smaller kerf allows you to cut grooves for ¼-in.-thick panels as well as larger ones with a series of passes. You can change the depth of cut by changing the bearing.



Photos, facing page: Michael Pekovich (top right, center right)

½-in. dovetail bit

Dovetail bits are designed to make dovetails for drawers or carcases as well as sliding dovetails. Most dovetail bits have angles ranging from 7° to 14°. I prefer the 10° angle, which works well for both hard and soft woods.

Both parts of a sliding dovetail joint can be cut on a router table. Dovetail bits are made to cut full depth. So before you cut a sliding dovetail slot, run a ¼-in. straight bit through first to clean out most of the waste. Follow with the dovetail bit. This will extend the life of the bit and leave a cleaner cut.

Cut the slot first, with the stock held flat on the table and a backer board behind it to keep the workpiece square to the fence and prevent blowout. With the bit height unchanged, reset the fence to cut the dovetail on the end of the mating piece. Make test cuts in a scrap piece the same thickness as the stock.

Sliding dovetail: solid and sturdy. *Make the slot first, holding the board flat on the table (above). Leave the height of the bit as-is, and adjust the fence to cut the mating dovetail with the stock held vertically against the fence (right). Again, use a backer board to prevent tearout and to keep the workpiece aligned.*

45° chamfer bit

The chamfer bit is used to bevel the edge of a workpiece. The 45° model I've included in this kit (1¼ in. dia.) is the most common. It's faster than a block plane for creating uniform chamfers on legs, aprons, and tabletops. You also can use it to achieve great visual effects (see photo, far right). The bearing on the bottom of the bit allows you to make cuts without a fence. To increase the depth of the chamfer, raise the bit.

Eased edges. *A 45° chamfer bit can soften the edges of legs, aprons, and tabletops.*

Thick and thin. *You can make a beefy top look thinner by chamfering the bottom edge (top), and a thin top look thicker by chamfering the top edge.*

¼-in. roundover bit

A bearing-guided roundover bit eases sharp corners and softens the look of a piece. The ¼-in. bit is a good moderate size to start your collection, because it will cut roundovers with or without a step (fillet) and can be used to create ½-in.-thick loose tenon stock as well as molding profiles (see drawings, below).

To help prevent tearout, take light passes, gradually raising the bit until you're cutting at full depth. End grain is prone to blowout at the end where the wood fibers are unsupported. The solution is simple: Round over the end-grain edges first, then rout the long grain. Working this way removes any blowout that occurs on the end grain.

Two profiles, one bit. *Use the roundover bit to create a soft edge (bottom) or a rounded edge with a step, or fillet, along the top of the profile.*

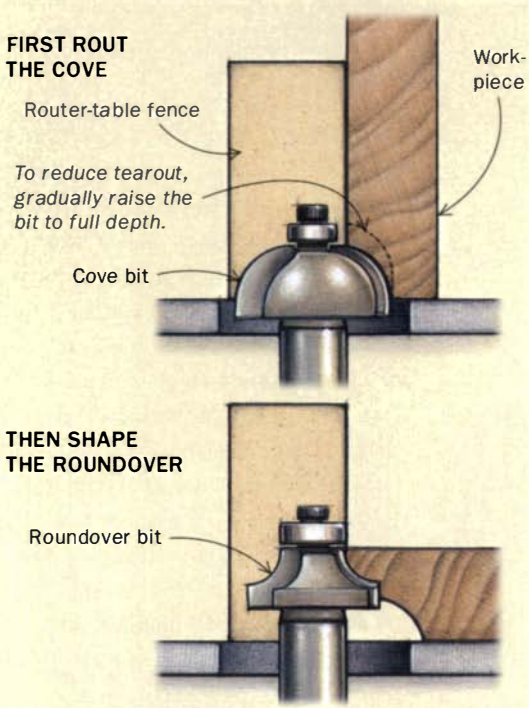
⅜-in.-radius cove bit

Some router bits are designed simply to make decorative cuts. One example is the cove bit, which creates a simple concave edge. I use this bit often to create a hidden pull in a drawer front. Because the cove bit is designed to make profile cuts, this choice is simply a matter of taste (I like the shape). You might choose a different profile, depending on the work you do. The bonus of having both a cove and a roundover bit in your kit is that you can use the bits in tandem to create a complex profile (see photo and drawings, right), or a drop-leaf table edge if both bits are the same radius.

Hidden pull. *You can use a cove bit to carve a drawer pull on the back lower edge of a drawer front.*

ROUNDOVER AND COVE BITS CREATE A CLASSIC PROFILE

You can combine roundover and cove bits to create an ogee profile with a fillet. Make the first pass with the cove bit, then finish with the roundover cutting full depth.



Photos, facing page: Michael Pekovich

½-in. flush-trimming bit

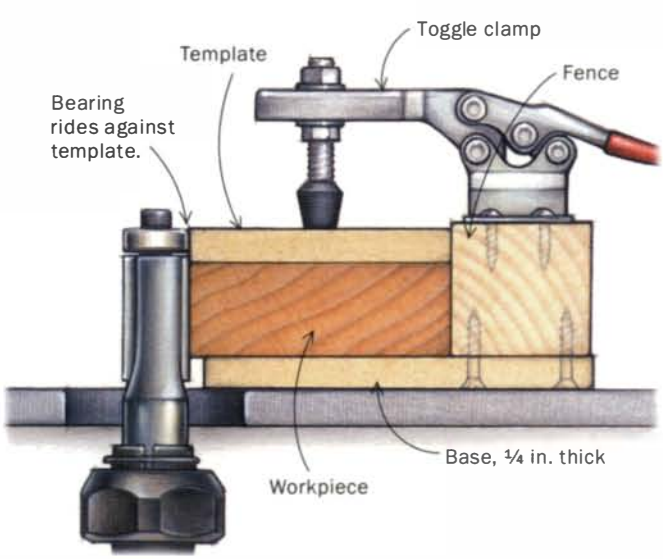
With a bearing-guided flush-trimming bit, ½ in. dia. is pretty standard, but you could choose a different diameter if you'd like. I recommend getting a 1½-in.-long bit, though, because the extra length comes in handy when working with thick stock.

The flush-trimming bit is indispensable for trimming face frames flush to carcases, and for trimming edge-banding flush.

With the flush-trimming bit, you also can duplicate pieces easily on a router table (called pattern, or template, routing). The bearing rides either against the original piece or against a pattern or template secured in a jig with hold-down clamps (see drawing, below). Before mounting the workpiece in the jig, cut away most of the waste on the bandsaw. Be careful not to rout uphill (against the grain), which could cause severe tearout. When you reach the point where the grain changes direction, reverse the workpiece in the jig.

Trim face frames flush to case. *The bearing on a flush-trimming bit is the same diameter as the cutter, allowing you to bring a frame flush to a carcase using a handheld router.*

PATTERN-ROUTING JIG



FineWoodworking.com

Visit our Web site for a demonstration of template routing.

Create identical parts on the router table. *Cut away most of the waste on the bandsaw first, then place the workpiece in a jig with the template on top (see drawing). The bearing will ride against the template, making an exact copy of the original. Cut with the grain, and reverse the workpiece in the jig (if possible) when the grain changes direction.*

Copying Museum Pieces

Bring the right tools, enter with respect, and go home with accurate plans

BY GEORGE WALKER

It's not uncommon for a small town to have a local museum or historic home that's open to the public. Visitors to these places often find wonderful furniture pieces on display, sometimes dating back to the Colonial and Early American periods, with remarkable regional pieces as well. And, I've discovered, some museums will let you do more than look. Not too long ago, I received permission to take measurements from a tall case clock in the collection at the historic Spring Hill home in Massillon, Ohio (www.massillonproud.com/springhill).

Before heading pell-mell to the nearest museum, it's a good idea to do some groundwork. A little preliminary effort pays dividends when it's time to take measurements.

First, get permission from the museum

The first item of business is to contact the museum and request permission to measure

Get it down on paper. *If you've properly planned a museum visit, it won't take long to measure the furniture piece and record all the important dimensions.*

Photos: Tom Begnal

Assemble a basic measuring kit

A measuring kit is handy for documenting a piece. The kit I use helps me take accurate measurements without risking damage to the piece. It includes a cloth measuring tape, a pair of wooden folding rules, a flashlight, a magnifying glass, cotton gloves, an inspection mirror on an extension handle, graph paper, and a pencil. If the piece has detailed turnings or carvings, consider using turning calipers and dial calipers. To prevent scratching the patina, put a strip of masking tape over the jaws or make a simple pair of wooden calipers with the tips rounded off.

First, do no harm. *Permission to measure a museum piece carries with it an obligation to use exceptional care. Light cotton gloves help prevent fingerprints. A cloth measuring tape won't scratch or dent the wood like a steel one would (top). With the help of a mirror and flashlight, you can look at the underside of a table without turning it upside down (center). Applying masking tape to caliper jaws makes them friendlier to wood (bottom).*

the piece that has caught your eye. I find it best to approach the process like a job interview. If you don't know anyone at the museum, try to tour the building when visitor traffic is low. You're more likely to find someone with time to talk.

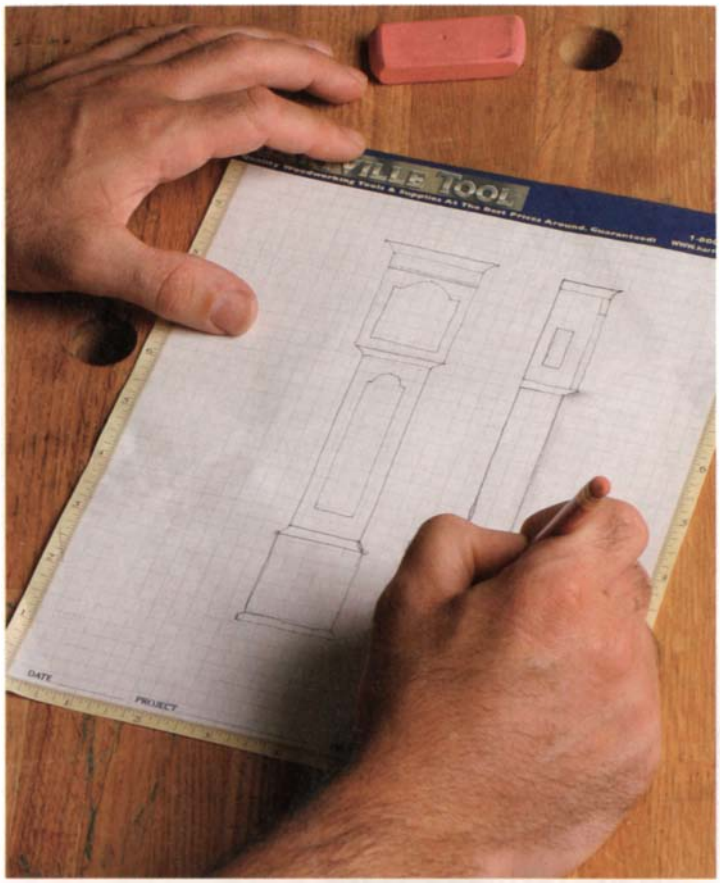
You might want to bring photos of your work to show to the museum staff. It lets them know that you are a serious woodworker. In the course of your discussion, make sure your enthusiasm for the museum collection comes across. Be patient. Listen to their concerns, and be willing to work within the museum's framework of rules and regulations. For example, they might want an agreement that says you won't make the piece commercially.

The answer to your request for permission can run the gamut from a simple "yes," to "take 20 minutes right now," to "we need to wait for approval from the board of directors," to a polite "no." Don't be offended if you are denied permission. Many of these antiques are valuable, and some museums simply don't want to risk damage to an important piece in their collection.

If you get an OK, be ready to go to work, especially if you get the "... right now" response. Basic research and preparation can help you make the most of your opportunity.

Preparation is the key to getting detailed plans

In the best-case scenario, you have found an interesting piece and you can arrange to come back to the museum later to take



Make preliminary sketches of the piece. *Before heading for the museum, Walker draws rough sketches of the front and side views of the piece, and any important close-up details he expects to see.*

measurements. Before returning, do some preliminary research and find out what kind of joints typically were used on such a piece when it was made. The research information you collect might help you determine the joinery and speed the process. For example, the notes you record on one dovetailed drawer can apply to all the drawers in a chest.

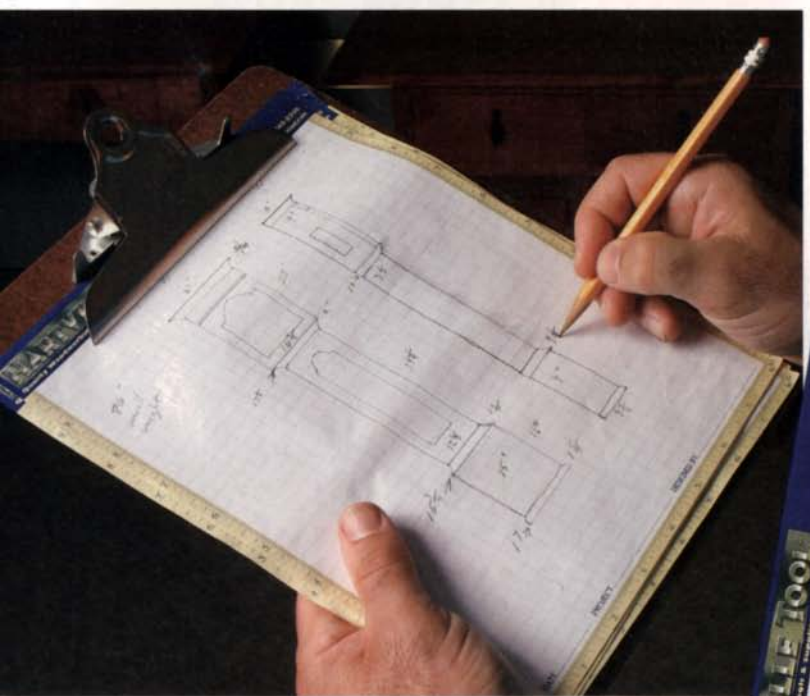
I like to prepare rough sketches from memory ahead of time. That way I can focus on recording the dimensions and not waste time drawing the obvious. To the casual observer my sketches might look somewhat crude, but I am not worried about a polished drawing at this point, just complete, accurate data.

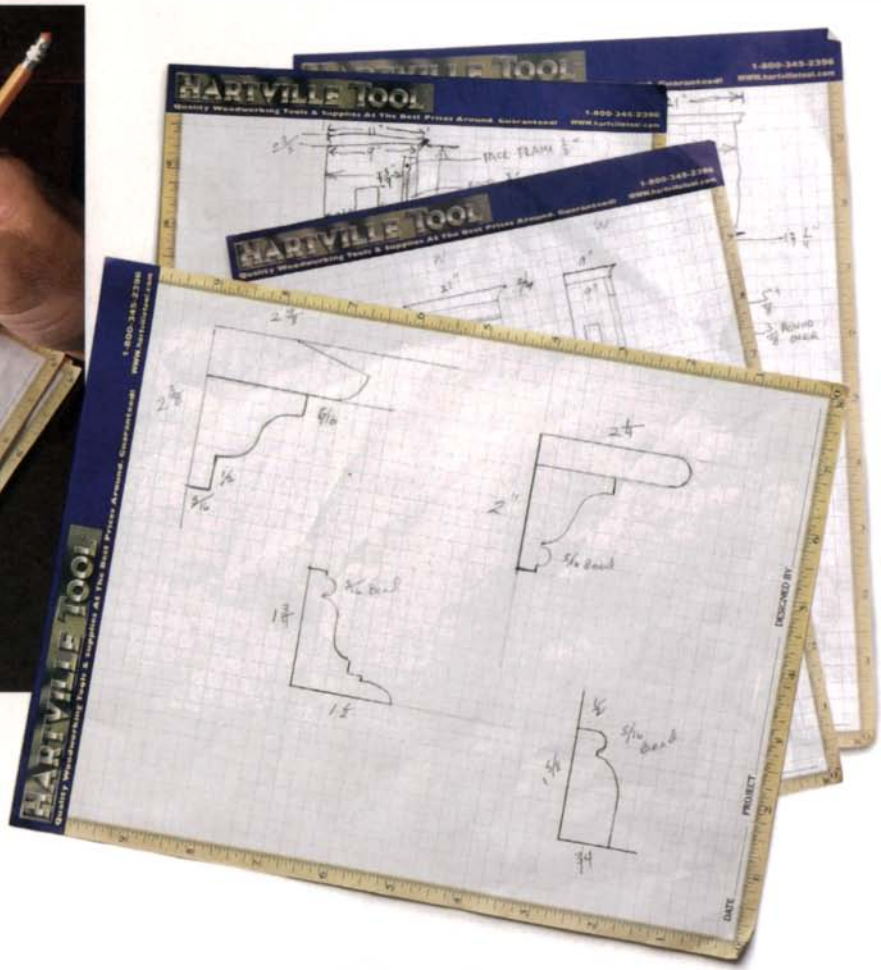
For this project, I prepared front and side views of a generic tall clock, with additional sketches of the base, waist, and hood. With the sketches in hand, it was easy to plug in the measurements. As you measure, be sure to draw the various moldings or curved parts as well.

Take a logical approach when gathering data

Begin recording measurements with a few basics: overall height, depth, width, primary and secondary woods, finish type, condition, general joinery, and construction notations. Note also the nominal thickness of most of the boards. Usually it is ¾ in. or ⅞ in. Once noted, only record the thickness on parts that vary from the norm.

Then start to measure. Record all vertical elements from bottom to top for the front and then the side views. Try to use a single reference point, like the bottom edge of the base, to avoid accumulating errors. Cross-check the sum of the individual elements against the overall height. Repeat the same process for all horizontal elements for the front and then the side views. Try not





Record the dimensions. *With sketches in hand at the museum, it becomes relatively simple to plug in the dimensions (above). Close-up details (right) can be drawn and measured on site.*

Don't forget a camera

If the museum allows the use of cameras, bring one along. Photos are always handy when you get home and start drawing the plans.

Keep in mind, though, that some museums frown on cameras, mainly because regular exposure to camera flashes eventually can change the patina of the wood. Other museums might let you take photos, but only without a flash.

You can get good photos even if a flash isn't permitted, but you'll be limited to using the ambient (natural or electric) light that falls on the piece. You'll need a camera that allows manual setting of the shutter speed and aperture. A tripod is a must. And you might want to bring along a 2-ft. square of white posterboard to use as a reflector. With the camera held in the tripod, you can set an especially slow shutter speed without worrying about a blurry image. This will give you a good exposure even in low light. Your camera manual provides the specifics.

Start by taking a front-view shot of the entire piece. Then move in closer, taking detailed shots of moldings, beads, carvings, and the like. Photograph the side of the piece in the same way.

Remove any drawers and shoot them from the front, side, top, and bottom. Also, get shots of the drawer joints. Then point the camera into the case and photograph the framework.

If you're not using a flash, the reflector is great for getting an extra measure of light into a dark place, such as the interior of a cabinet. Angle the reflector (an assistant would be helpful here) to bounce the ambient light into the darkness.

Bring your camera. *If the museum allows it, be sure to take photos. Shoot the piece from several levels and a variety of angles. Get in close to show details such as beads and moldings.*

to hop around the piece taking measurements; it is too easy to neglect something.

Next, draw the profiles of any moldings or curved parts. Use the pair of wooden rules to determine transition points and then connect the dots freehand. Carved or sculptural elements are the most challenging and may require several views. Make sure you record major and minor diameters of curves and the points where transitions occur.

Finally, review the sketches and make notes on joinery and hardware placement as needed. On visible boards, be aware of any special edge treatment. Also, record the grain direction, fastener placement, and the location of any glue blocks or pegs.

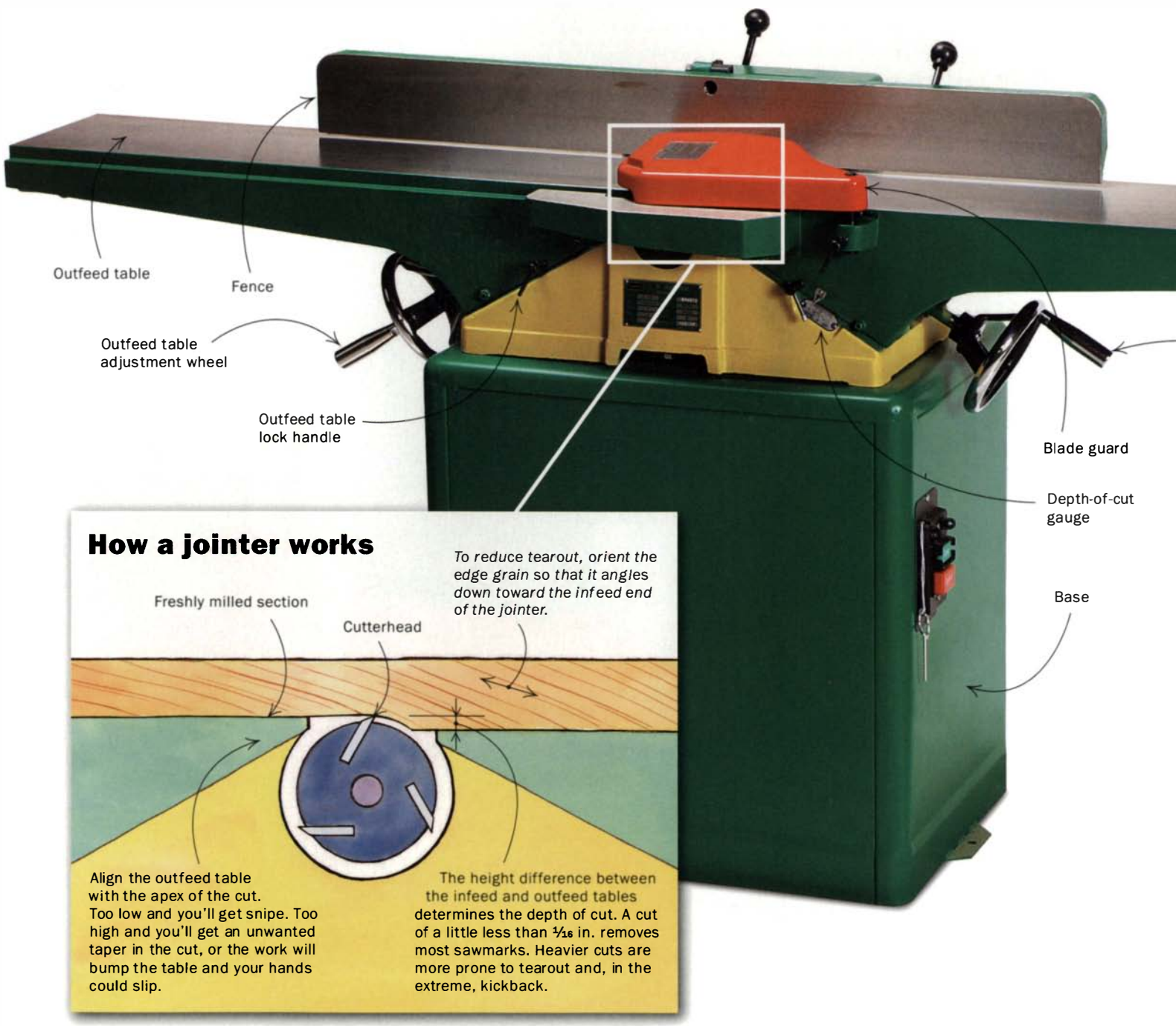
When you leave the museum, you will have a comprehensive set of notes and sketches. Be sure to go over them as soon as you return home, while your memory is still fresh. Then you can begin converting all that raw data into a set of clear and detailed drawings. □

George Walker reproduces period furniture at his home in Canton, Ohio.

Get the Most From Your Jointer

Shop mainstay makes flat boards—and much more

BY J. SPEETJENS



How a jointer works

To reduce tearout, orient the edge grain so that it angles down toward the infeed end of the jointer.

Align the outfeed table with the apex of the cut. Too low and you'll get snipe. Too high and you'll get an unwanted taper in the cut, or the work will bump the table and your hands could slip.

The height difference between the infeed and outfeed tables determines the depth of cut. A cut of a little less than 1/16 in. removes most sawmarks. Heavier cuts are more prone to tearout and, in the extreme, kickback.

Photos: Steve Scott; drawings: Stephen Hutchings

The process of cutting accurate, tight-fitting joinery relies on beginning with straight, flat stock. It is the foundation of quality work. That's why the jointer—a machine designed to straighten and flatten rough boards—is central to everything I do as a woodworker.

A jointer consists of a horizontal cutterhead mounted between two dead-flat, cast-iron tables that sit end to end. A board pushed lengthwise across the machine passes over the cutterhead as it moves from one table to the other. The outfeed table is set to match the height of the knives, with the infeed side slightly lower. This height difference determines the depth of cut. The machine quickly creates a flat face on a rough board or a straight edge that is square to that flat face, both crucial steps in milling cupped, bowed, or twisted stock to be flat, straight, and square.

But the jointer handles more than these core operations. It offers a convenient alternative to other tools that need special templates, jigs, or other lengthy setups to taper legs, fit doors, and cut long chamfers, bevels, and roundovers. Here's how to get the most from this pivotal machine.

Follow the fundamentals for clean, safe cuts

There are some basic guidelines for operating the jointer safely and for getting high-quality results.

For safety, keep the guard in place and use a push pad and a push stick whenever possible to keep your fingers away from the cutterhead. I use a push pad and a push stick for all face-jointing operations and a push stick for all edge cuts on boards less than 3 in. wide. The minimum safe length that can be cut on most jointers is 12 in. Use a roller stand or other support for long or heavy boards.

For most material, orient the stock so that the grain angles down toward the infeed side of the cutterhead. For woods with interlaced or curly grain, make light test cuts to determine the best feed direction.

Concentrate on applying light downward pressure to the surface of the board as you feed it over the cutterhead at a moderate, consistent pace. Apply only enough pressure to prevent the board from bouncing on the cutter. If you deflect the bow or cup during the cut, it will remain afterward.

Feeding stock into the cutterhead too quickly will cause tearout or a wavy surface. But if you go too slowly, you risk dulling the blades or burning the wood. Stopping in the middle of a cut will leave a burnished dimple or a burn mark.

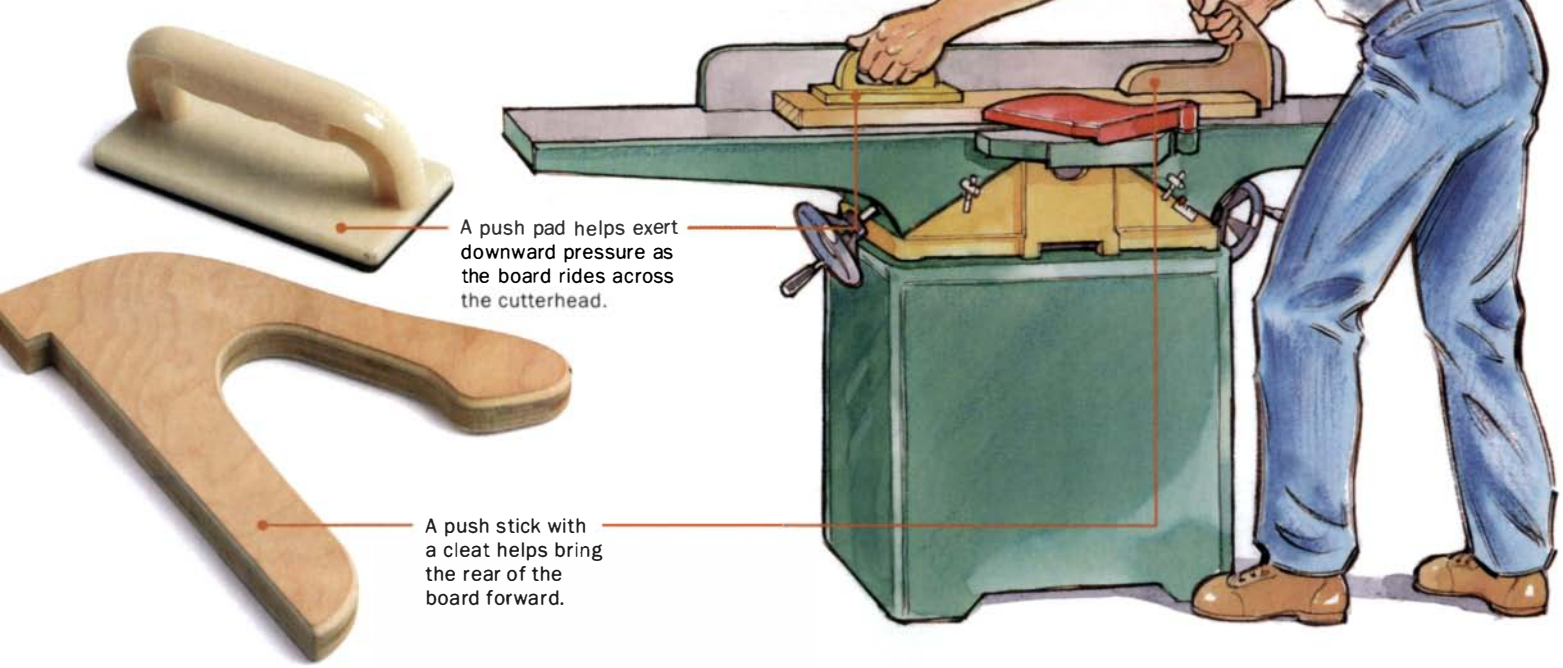
Face-jointing flattens cupped, bowed, or twisted stock

After rough-cutting stock slightly oversize, the next step in creating dimensioned lumber is face-jointing. The goal is a flat surface that will ride on the planer bed when the stock is thicknessed. For most boards, make your first jointer pass with the bow or cup facing down.

To face-joint boards shorter than 4 ft., stand near the cutterhead and use your left hand to apply light downward pressure with a push pad near the leading end of the stock. Hook a push stick over the trailing edge if you can reach it comfortably. If not, start the cut by feeding the board with your right hand and then

KEEP A STABLE STANCE AND PROTECT YOUR HANDS

Distribute your weight evenly and try to remain in one spot unless you're working with an especially long board. Keep a push stick and a push pad near the jointer and use them often, especially when working with small stock that will put your hands near the cutterhead.



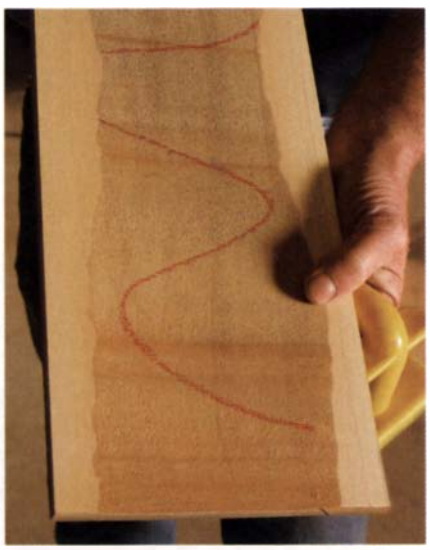
Jointer basics: flattening the face and squaring an edge

The jointer plays two crucial roles in squaring stock. After you cut stock to rough dimensions, use the jointer to flatten one face prior to thickness planing. Afterward, use the jointer again to straighten one edge before ripping the board to final width.

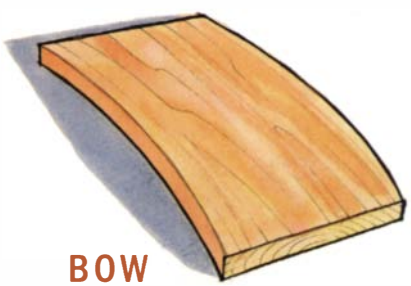
CUP

Cup refers to the curve across the width of a board and is most pronounced in flatsawn lumber. You can minimize waste in jointing by ripping rough stock beforehand into the narrower widths you'll use in your project.

Flatten a cupped board. *Mill with the concave side facing the cutterhead so that the board rests on the two "lips" of the cup. Don't press down hard in the middle. Exert just enough pressure to keep the stock from chattering as it crosses the cutterhead.*



The first pass shows results. *The edges that contacted the cutterhead are flat. Subsequent passes will widen this area until the entire board has been surfaced.*



BOW

Bow is the curvature of a board's face along its length. You can reduce bow in a piece of long stock—and minimize the waste in jointing—by cross-cutting it into shorter lengths.

Bow, like cup, should face the cutterhead. *To correct a bowed board, apply light pressure at the leading and trailing ends of the board. Do not press down in the bowed middle.*

The cutterhead joints the ends of the board first. *On subsequent passes, the cutter will take more of the stock.*

switch to a push stick before your right hand gets near the cutter. Keep the push pad in your left hand positioned over the first few inches of the outfeed table.

For longer boards, I stand at the trailing end to start. I feed the cut with my right hand, switching to the push stick as the cut progresses. I keep the push pad in my left hand as far forward as I can reach comfortably, exerting light downward pressure.

For pieces that are bowed and cupped on opposite faces, make the first pass with the bowed face down. Use the push pad to control rocking, removing the most material from the middle of the board's width.

Minor twists are not difficult to deal with, but large twists—if improperly identified and managed—can prevent you from getting the maximum thickness out of a piece. Place the board on a clean, flat surface. With three corners touching the table, gauge the height of the elevated corner.

For twist of ⅛ in. or less, use the push pad to rock the board so that two diagonal corners are touching the infeed table and the other two corners are elevated equally. Place the push stick at the rear corner that is touching the table to avoid deflecting the raised corners. Reassess the twist after the first pass.

For boards with larger twist, place a stack of small veneer shims, about ¾ in. by 1 in., under the high corner at the board's trailing edge so that the two high corners are elevated equally. Joint as if you had a minor twist. Make sure that you don't deflect the raised corner on the leading edge. One pass should reduce the twist enough that shims are not needed for the remaining passes.

Edge-jointing straightens crooked boards

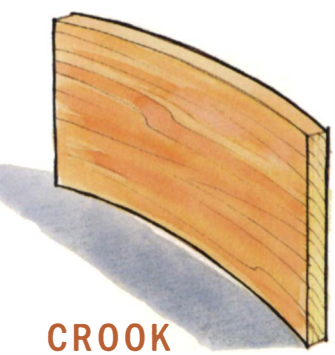
After you've jointed one face flat and used the planer to make the opposite face

TWIST

Twist occurs where the two long edges of a board are bowed to varying degrees and so are not parallel. To maximize yield when jointing twisted stock, keep the board as level as possible as it rides its two low corners.

A little shimming can help. *Mill large amounts of twist out of a board by shimming the high corner in back to about the same height as the opposite high corner.*

The first pass yields two starting points. *The low corners touching the table are surfaced first. On subsequent passes, apply pressure on these corners to keep the board level and steady.*



CROOK

Edge-jointing straightens a board's edge by removing crook, a concave curve along an edge. The process also makes the edge square to one face. You can joint an edge before rough-cutting stock to create a reference surface for the saw's rip fence.

parallel, the next milling step is to joint an edge to make it square with the two faces. Most of the time, I joint the crooked or concave edge.

For safety, I edge-joint stock that's between 1½ in. and 3 in. wide using the tip of my thumb and the side of the index finger of my left hand to guide the board and keep it against the fence while feeding the stock with a push stick in my right hand.

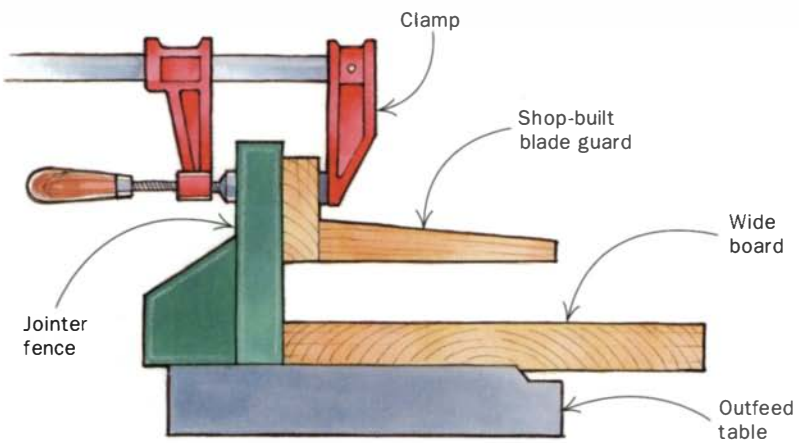
For wider boards, I feed and guide the cut freehand, but I make sure to hook a few fingers or a thumb over the top of the jointer's fence to prevent my hands from slipping toward the cutter. For pieces

Edge-joint with the bowed or crooked side down. *Use a push stick at the back edge for any stock less than 3 in. wide, along with a push pad in front for anything narrower than 1½ in.*

FLATTENING WIDE BOARDS

Face-jointing boards wider than your cutterhead requires removal of the blade guard. Create a new blade guard before attempting this.

1 The task is half finished. *An initial pass surfaces one side of the board, but leaves the other rough. If the rough strip is narrow, clean it up with a handplane.*



2 Joint the other side. *The finished surface may still be somewhat uneven and require cleaning up with a handplane before it is ready for the thickness planer.*

narrower than 1½ in., I use both a push pad and a push stick.

The most efficient way to straighten a badly crooked board is with a series of cuts that start at the end and go to the point where the edge of the board clears the cutter; then reverse the board and joint from the other end. Do this until most of the crook is removed. Finish up with at least one pass that runs the length of the board.

After one edge has been jointed, you can straighten the second edge with a ripping cut on the tablesaw.

Make tapered cuts to shape or fit parts

Among other things, tapered cuts can be used to straighten convex surfaces, fit doors and drawer faces to their openings, or mill a tapered leg. Make a tapered cut by lowering the work onto the cutters while the machine is running. Carefully pull the blade guard back with your left hand or push it aside with the end of the board. Place the board's leading end about ½ in. over the near edge of the outfeed table and feed the cut as normal. The amount of the taper is equal to the depth of the cut. Depth settings of 1/16 in. or less reduce the risk of tearout. Multiple cuts make larger tapers.

The type of taper and the proportions of the piece to be tapered will determine the best way to lower the work onto the cutter. To mill a taper on the face of a board, on the edge of a long, narrow board, or on a board that will receive only a partial taper, place the leading end onto the outfeed table. Lower the near end of the board onto the infeed table.

To taper the edge of wide boards or cabinet doors, set the trailing edge on the infeed table and lower the leading edge carefully onto the outfeed table. Note that even a properly adjusted jointer will leave a small divot where the work was lowered onto the cutter. If the divot is significant, clean it up with a light pass over the entire length afterward.

You also can use tapered cuts to straighten the back side of a board that is bowed or to straighten the convex edge of a crooked board. Rock the board backward with the push stick, elevating the front edge above the cutter and onto the outfeed table. Ease up on the downward pressure on the push stick and lower the board onto the cutter. Feed the rest of the cut as normal. □

J. Speetjens makes furniture and cabinetry in Greensboro, N.C.

TAPERING A LEG

For a partial taper, place the leading end on the outfeed table and gently lower the piece onto the infeed side before passing the work over the cutter.

Tapering a leg. *Begin the taper by resting the workpiece on the outfeed table and lowering it onto the cutterhead.*

Take several passes. *Begin each pass in the same way. Soon enough, the taper becomes pronounced.*

CUSTOM PROFILES

Tilt the fence to easily chamfer the edges of a board along its length or to mill bevels up to 45°. Combine bevels to cut simple profiles.

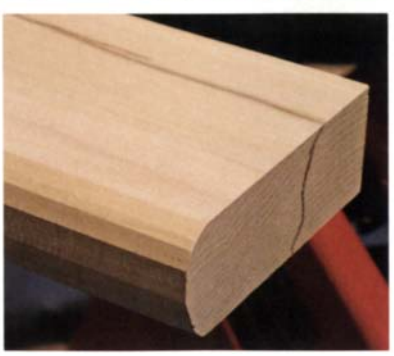
BEVELING NARROW STOCK

Tilt the fence back to bevel narrow stock. *This allows clear access with push sticks and push pads. Take care—very narrow boards tend to slip away from the fence.*

BEVELING WIDE BOARDS

Tilt forward to bevel wider boards. *In this way, the stock is less likely to be levered away from the cutterhead as you make the pass.*

BULLNOSE PROFILE



Only a few passes are needed to create this bullnose. *Adjust the fence back and forth as needed to cut the various angles that are required. The multifaceted surface can then be sanded or scraped smooth.*

Philadelphia Side Chair

Exercise your carving skills as you tackle one of the greatest American chairs

BY EUGENE LANDON

Built around 1760 in Philadelphia, this chair represents the high point of Colonial Queen Anne chair-making. The piece has a sense of movement throughout its design, from the ball-and-claw feet to the flowing crest rail with its double volutes. The carving is attributed to a master craftsman whose name is a mystery, but who is known as the Garvan Carver because of several pieces attributed to the same craftsman in the Garvan collection at Yale University.

If you've never built a chair or picked up a carving gouge, this is an ambitious place to start, but if you've had some experience in either field, I encourage you to tackle this project. Construction is not as hard as it looks and is broken into three phases: the rear formed by the back legs, the crest rail, and the splat; then the front and side rails; and finally the front legs with their attached knee blocks. So find some good straight-grained mahogany, and let's get to work.

Join the back legs with the keystone; then add the crest rail and the splat

You'll need mahogany that is 3½ in. thick by nearly 7 in. wide by 37 in. long for a pair of back legs. (If you are building two chairs, you can get four legs out of a 12-in.-wide board.) After you have roughed out the legs on the bandsaw, lay out and cut the blind mortises for the back rail and the through-mortises for the side rails. Shape each leg except for the very top where it will transition into the crest rail.

Cut and tenon the back rail, also known as the keystone because of its shape, and dry-fit it to the legs. Adjusting its shoulders will fine-tune the splay of the back legs. With the distance between the back legs established, you can mark and excavate the three mortises on the underside of the crest rail while it is still a blank. Now bandsaw the crest rail and then carve the shell and the connected spirals, or volutes. As with the tops of the legs, leave the transition areas uncarved until the crest rail is glued to the legs.

The next task is to resaw the curved back splat from a thicker piece and scrollsaw the profile on its face. Although by now the splat is relatively thin, there is still a lot of wood to carve away to give it the maximum

Photos: Mark Schofield

CARVING AND FITTING THE BACK SPLAT

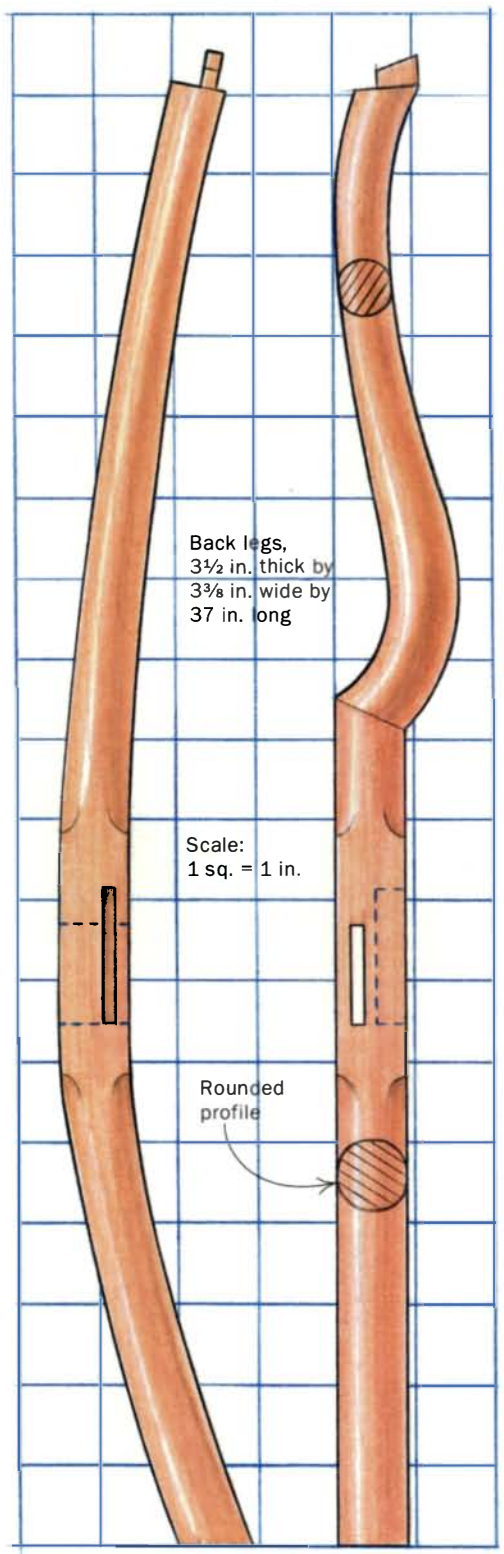
Carve the back splat. *A variety of gouges are used to carve the volutes while a ½-in. bench chisel is used to relieve flat surfaces (above).*

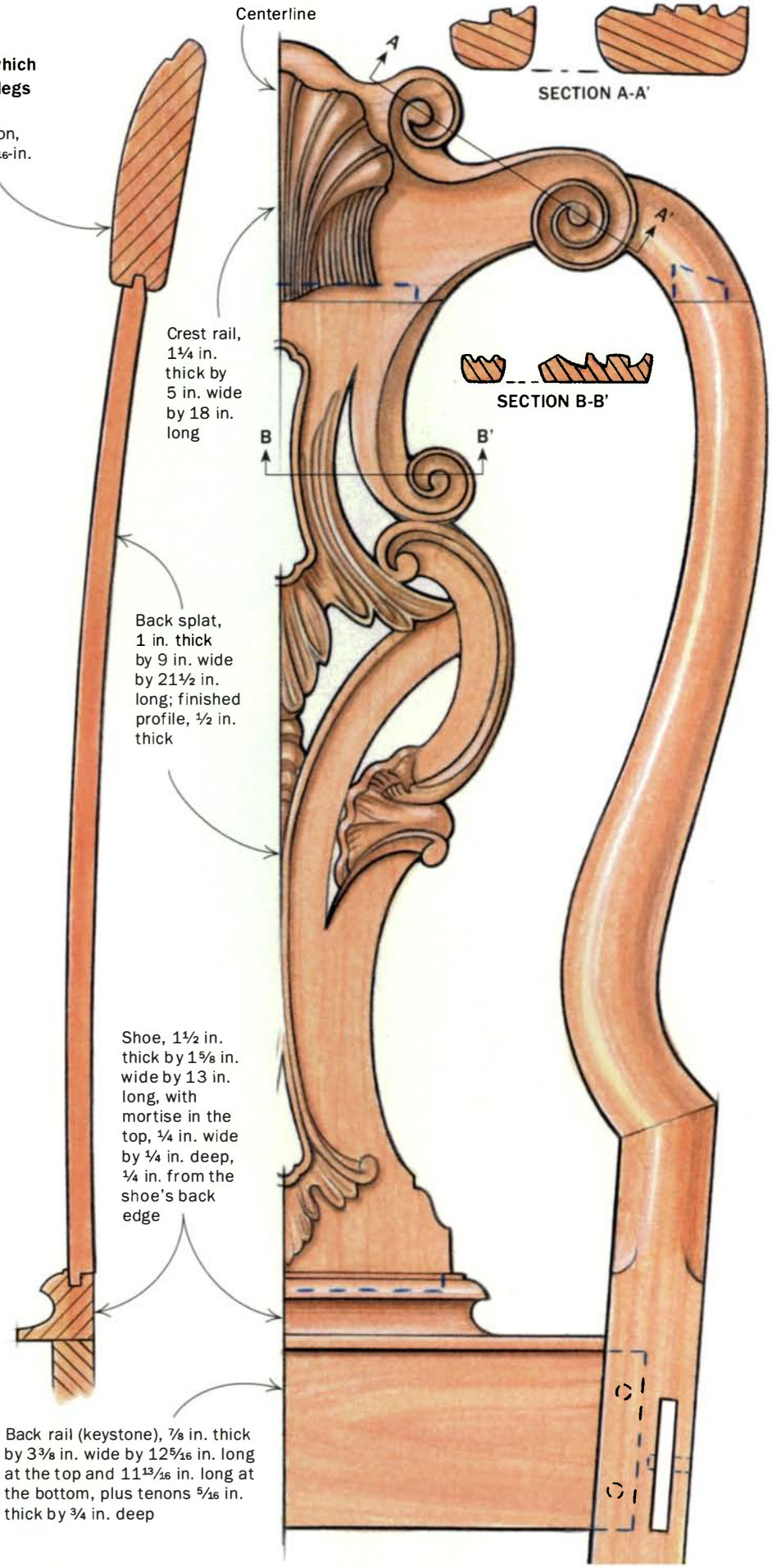
Fit the back splat. *The tenon at the bottom fits into the shoe (top). The assembly is then inserted into the crest rail and slid between the back legs onto the back rail (above).*

Smooth the transition. *Although most of the crest and the back splat is carved before being assembled, the area where the two parts join (above) is carved flush after assembly.*

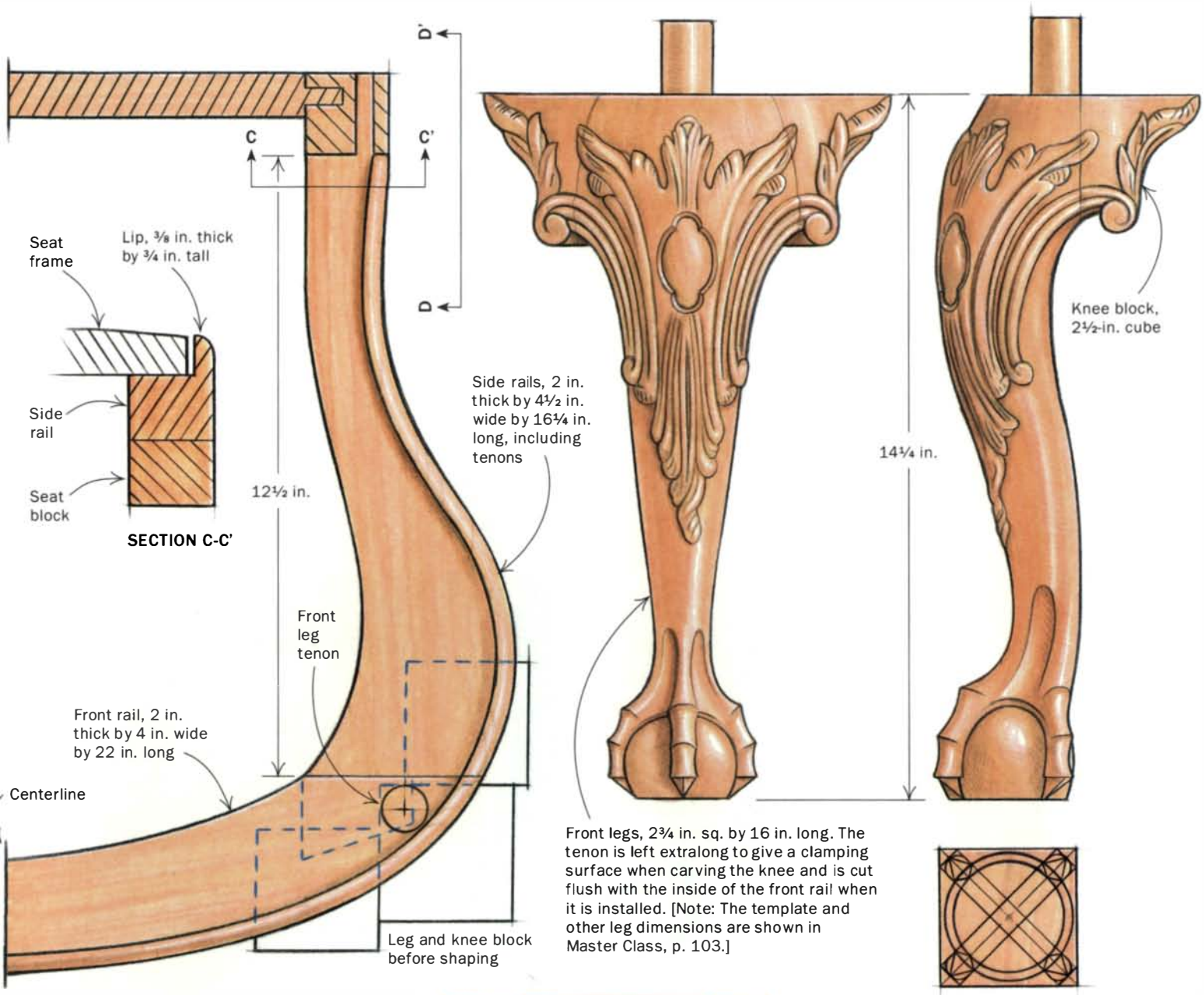
QUEEN ANNE CHAIR PARTS

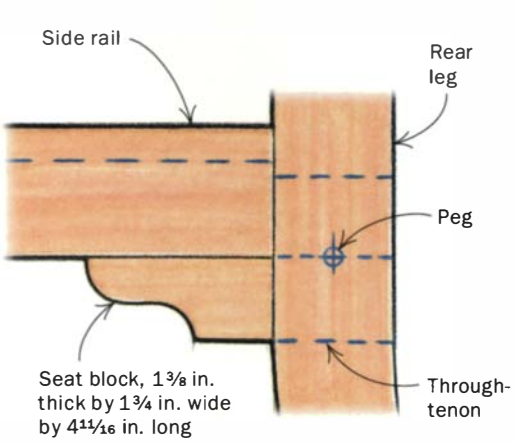
In all cases, the dimensions refer to the blank from which the piece is sawn. All of the parts except for the rear legs are drawn at 33% of actual size.





Drawings: Bob La Pointe





SECTION D-D'

NOTE: Full-size plans of this chair are available for purchase at www.oldemill.com.

MARK AND SHAPE THE KNEE

After the bottom of the front leg has been carved and shaped, insert the round tenon into the horseshoe and mark where the leg meets the front rail (left). Bandsaw the knee profile on each front leg and then refine the curve with rasps and files (above).

FRONT VIEW

SHELL DETAIL

SIDE VIEW

three-dimensional appearance. The splat has ¼-in.-thick by ¼-in.-deep tenons on the back edge of the top and the front edge of the bottom. The top tenon fits into the crest rail; the other fits into the shoe, a piece of wood attached to the keystone. Neither of the tenons is glued, and the shoe is attached to the keystone with reversible hide glue and a couple of nails. This way, a broken splat can be replaced without damaging the rest of the chair.

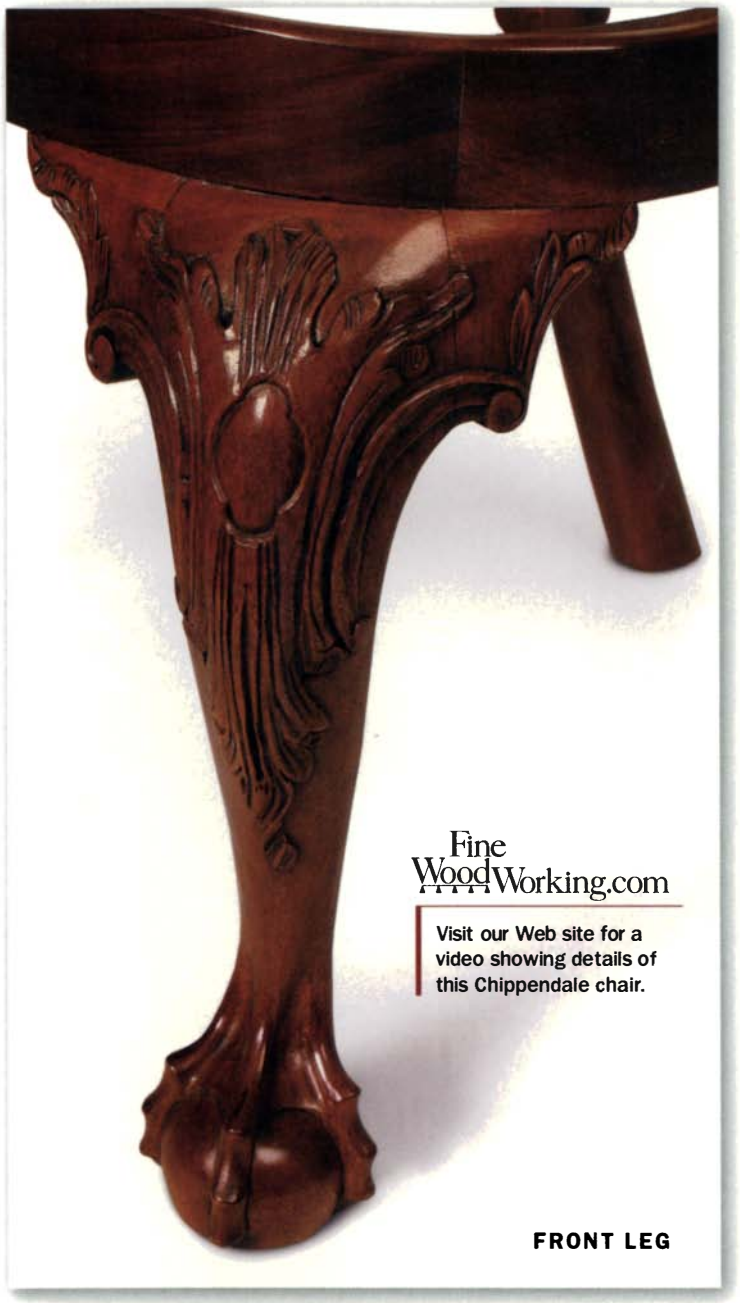
I shape the profile along the front of the shoe with molding planes, although you could use different bits in a router table and ease any transitions with carving gouges. Although you could profile the shoulders of the shoe in the same way, a quicker method is to cut off a thin slice from one end of the shoe and use it to transfer the profile to the back of the shoe. Cut this with a scrollsaw to establish the profiled shoulders of the shoe.

With the crest rail glued to the legs, you can fit the splat. Rest the splat in the shoe; slide the shoe into its location on the keystone; mark and cut the tenon on the top of the splat; and then fit it into place and fair the carvings at the joint.

The front and side rails form the horseshoe

With the back complete, turn to the front. The front and side rails are made from 8/4 material with a ⅜-in.-wide by ¾-in.-tall lip around the top outside edge to secure the seat. Rather than being applied, the lip is formed by removing the material behind it—forming a rabbet. This traditionally is done with chisels, but you can remove the bulk of the material with a router or a drill press.

As with most chairs, the joint that absorbs most of the stresses connects the side rails and the back legs. Attach a profiled seat block under each side rail to reinforce this critical joint, then cut and fit the tenons on the front and back of the side rails, and mortise the front rail. After the front and side rails are connected, drill a 1-in. hole through each joint to accept the round tenon at



FRONT LEG

the top of each front leg. When inserted and wedged, the round tenons will lock the three parts of the horseshoe together.

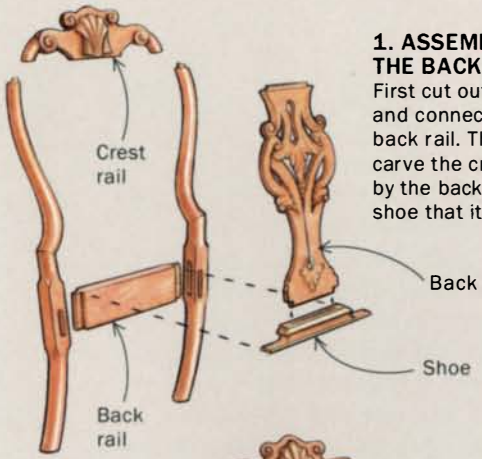
After bandsawing the rough cabriole profile on the front legs, carve the ball-and-claw feet (see Master Class, pp. 102-106). Use a saw and rasp to form the round tenon on the tops of the legs. Insert them in the rails and mark the edge of the front rail on the top of the legs. Bandsaw and then file the knee profile; then attach the knee blocks and cut their profile to match that of the legs. Last, lay out and carve the pattern on the knees.

With the chair assembled and the non-carved areas sanded, follow the steps I described in "A finish that adds 200 years," (*FWW* #168, pp. 121-122). Because of the curved shape of the seat, I recommend having the upholstery done by a professional. Your masterpiece deserves nothing less. □

Eugene Landon is a period furniture maker in Montoursville, Pa.

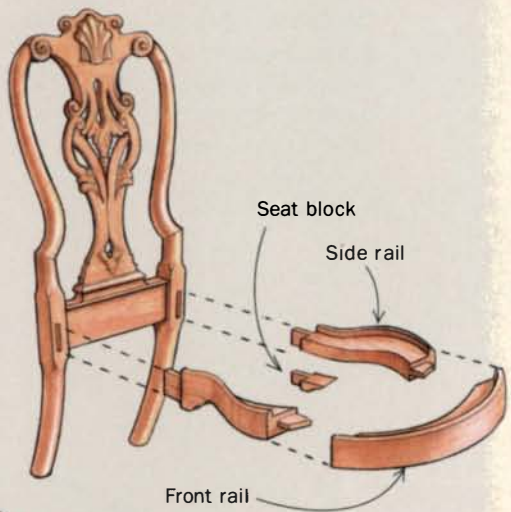
BUILD THE CHAIR FROM BACK TO FRONT

Parts are fit to the chair as it comes together, rather than measured exactly and precut. Therefore, it is important to build the chair in the correct sequence.



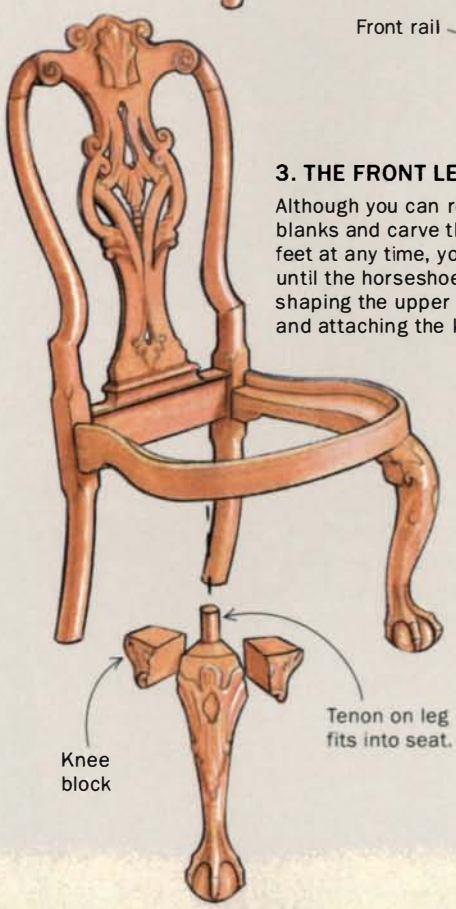
1. ASSEMBLE THE BACK

First cut out the back legs and connect them with the back rail. Then cut out and carve the crest rail followed by the back slat and the shoe that it rests in.



2. CONNECT THE SEAT

The three parts that form the seat of the chair are known as the horseshoe because of their shape. The critical junction with the back legs is reinforced with seat blocks.



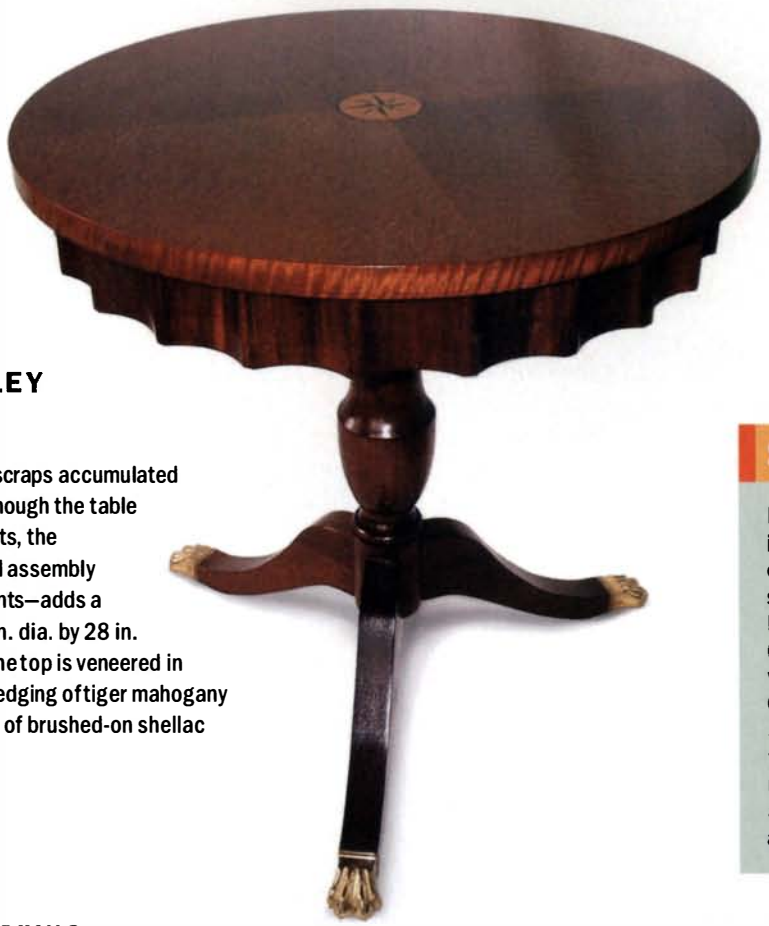
3. THE FRONT LEGS COME LAST

Although you can rough out the blanks and carve the ball-and-claw feet at any time, you need to wait until the horseshoe is done before shaping the upper part of the legs and attaching the knee blocks.

readers gallery

JULIA C. McLAIN
Stow, Mass.

McLain's cedar-lined, white-oak blanket chest (18 in. deep by 40 in. wide by 33 in. tall) is a close replica of the "Norman Tooth Chest," which she saw in Wallace Nutting's *Furniture Treasury*, Vol. 2. Fortunately, while she was working on the chest, the original happened to be on exhibit at the Wadsworth Atheneum in Hartford, Conn., so McLain was able to get measurements and detailed photographs. The lid opens on a shopmade wooden hinge, and all of the intricate carvings were done by hand. The finish is a hot-wax mixture consisting of beeswax, carnauba wax, and Japan colors. PHOTO: LANCE PATTERSON



STEPHEN BAILEY
Strasburg, Va.

Bailey made this table from scraps accumulated during previous projects. Although the table clearly has Duncan Phyfe roots, the scalloped apron—a coopered assembly of wide cove-molding segments—adds a distinct twist. The table (24 in. dia. by 28 in. tall) is made of mahogany. The top is veneered in quartered pommele with an edging of tiger mahogany veneer. The finish is 10 coats of brushed-on shellac and a wax topcoat.

Submissions

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

ROB BROWN
Toronto, Ont., Canada

As one who has always been drawn to nature, Brown often finds inspiration for his furniture while hiking. The marquetry on this chest of drawers (16 in. deep by 18 in. wide by 40 in. tall) is based on the branches of a pussy willow. The carcase and top are cherry, the side panels and drawer fronts are maple, and the marquetry was created from cherry, walnut, and mahogany. The finish is varnish. PHOTO: KEITH BARKER

JIM JASPERSON
Osceola, Wis.

This gentleman's dresser began in Jasperson's backyard, with wood taken from a white oak that used to live there. The asymmetry in the piece breaks up the expansive façade, while the gentle curves on the right mesh smoothly with the rectilinear section on the left. Meanwhile, the stained glass and carving add texture and color. The piece is large—20 in. deep by 44 in. wide by 75 in. tall—and took Jasperson about two years, working on and off, to construct. The stained glass was made by his wife, Lorna. The finish is water-based dye, Watco Danish oil, polyurethane, and several coats of wax.

PETER H. WALLACE
Kutztown, Pa.

This triple-bow settee was built from a single piece of highly figured tiger maple—the best figure Wallace's lumber dealer had seen in a decade. The settee (17¼ in. deep by 98⅞ in. long by 38 in. tall) features hand-turned spindles, stretchers, legs, and arm supports. Wallace also carved the knuckles on the tips of the armrests and saddled the seat like a Philadelphia low-back. Assembly was no easy task. The three sack-backs were particularly difficult. They interlock with pinned half-lap joints and are anchored to the back rail with shouldered tenons. To showcase the figure, Wallace finished the piece with oil-based polyurethane.

BRAD GREENWOOD
Beckwourth, Calif.

When Greenwood builds his rustic-style furniture, he doesn't try to cover any scars of handwork, nor make a habit of straightening or refining wavy edges. He lets the wood do the talking. "Wood left close to its natural form pays homage to the history of the tree," he says. "Being perfect is not considered a quality." Woods in this desk and chair include oak, English and black walnut, elm, sycamore, madrone burl, and eucalyptus. Other materials are copper, rawhide, telegraph wire, and iron. The desk is 32 in. deep by 52 in. wide by 50 in. tall; the chair is 19 in. deep by 23 in. wide by 38 in. tall.

WADE F. CURRAN
Longmont, Colo.

Curran designed the doors in this maple cabinet to remind himself of an autumn day, with blazing yellow aspen leaves cascading past his window. The cabinet was built to house stereo components, but at 21 in. deep by 47 in. wide by 34 in. tall, it's a suitable size for a sideboard. Curran turned the rosewood pulls, and hand-cut the beading in the frame parts. The inlaid leaves falling across the front were cut from dyed veneers. The finish is polyurethane.

ALEX CAMERON
Surrey Downs, Australia

Cameron based the design of this clock on an original he saw in the venerable book *The Victorian Cabinet-Maker's Assistant* (plate VIII, Fig. 4), published in 1853. He started building the clock (5½ in. deep by 7½ in. wide by 32 in. tall) while he was enrolled in a wood-carving course at the Hoad Woodcarving Academy in Adelaide, South Australia, and it took him about a year to complete. To simplify the construction and carving of the clock, Cameron cut up separate segments of mahogany on the bandsaw, glued them together, and then carved the details. The finish is sprayed-on shellac.

PETER LOH
Bellevue, Wash.

While on a camping trip, Loh thought he had been bitten by a recluse spider. Curious about the arachnid and its bite, Loh researched the recluse when he got home. The bite turned out to be a wasp sting, but Loh's research was not unrewarded: The lines of this table are traced from the anatomy of the spider, in particular the triangular, segmented legs. The table is made of Bolivian rosewood, zebrawood, and curly maple and is 16 in. deep by 66 in. long by 35 in. tall. The finish is shellac and Danish oil.

ANDREW J. RITCHIE
Toronto, Ont., Canada

Ritchie built this spinning wheel (20 in. deep by 35 in. wide by 50 in. tall) as a tribute to his late mother, who had always wanted a traditional spinning wheel. He spared no expense when it came to the wood for this sentimental piece, choosing stunning curly and bird's-eye maple. Ritchie's lathe did not have the capacity to turn the rim of the wheel on the outboard side, so he had to devise another method. He assembled a rough circle of segments attached with screws and mortise-and-tenon joints, then cut a perfect circle using a router and jig. This method allowed him to take apart the rim, add the spokes and hub, and then reassemble the wheel. The finish is linseed oil and beeswax.

CRAIG JENTZ
Minneapolis, Minn.

Made as part of a bedroom set, this youth bed (46 in. wide by 84 in. long by 36 in. tall) was designed to capture the energy and playfulness of Jentz's boys. The headboard and footboard have compound curves, achieved in a vacuum press with bending plywood. They are capped with a laminated and bent top rail, also made in a vacuum press. The curved elements, combined with the turned, tapered legs, make the bed look like it is springing to life, which, Jentz confesses, "I wish the boys would be better at each morning." The bed is made of ash and ash veneer and is finished with alcohol-based dye and varnish.

Q&A

A lesson in butterfly keys

Q: I want to reinforce a checked board with butterfly keys. What's the best way to lay out and install them?

—GORDON ECHOLS, Lynchburg, Va.

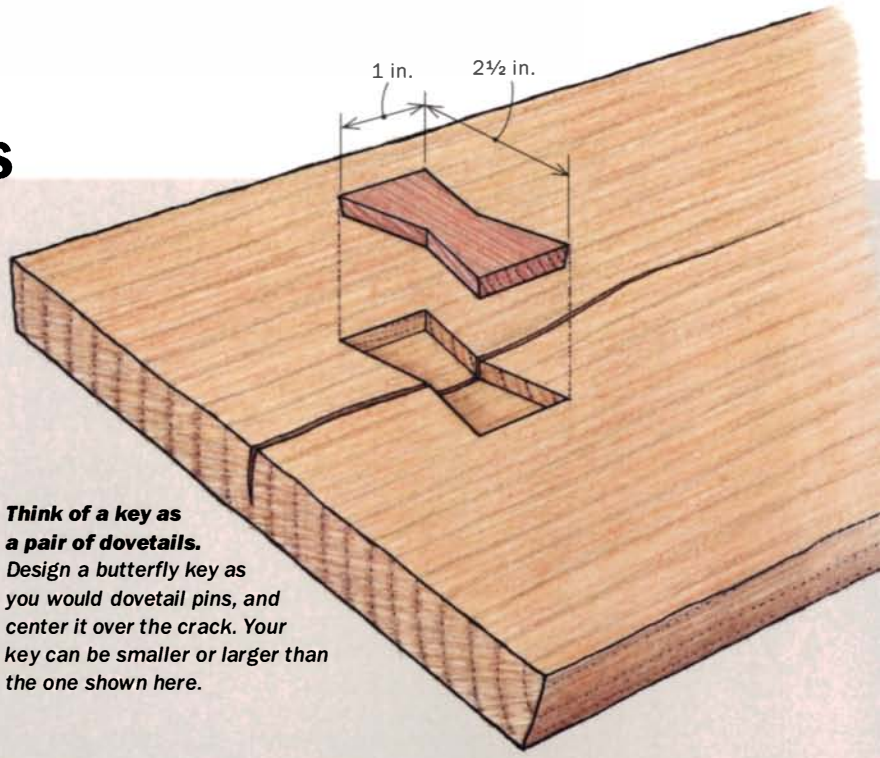
A: BUTTERFLY KEYS NOT ONLY HELP PREVENT CHECKING, but they also add interest and beauty. Because the keys you need are structural, plan to make them ¼ in. to ⅜ in. deep. If the checking is very serious, put keys into both sides of the board. Longer keys provide more strength, but keep their overall length under 3 in. to avoid problems caused by wood movement in the keys themselves.

I cut keys on a bandsaw, but you could use a handsaw. Either way, plan to use a chisel to clean up the point of the V at the center of the key. If you bevel the sides at a very slight angle, the key will be easier to install.

Hold the key in place with a steady, firm hand and mark its position on the board with a knife. I use a small router to hollow most of the recess, because that guarantees the key will sit on a good, flat surface. I use a 3/16-in. straight-cut bit and move the router from right to left—climb-cutting to keep the bit from pulling past my layout line. Clean up the sides and corners with a chisel.

Test-fit the key. I like to be sure that at least half its thickness will fit in the recess, and if it sticks, I gently pry it free with a knife or chisel. Trim and pare as needed for a snug fit. When you're sure the key will fit all the way, put glue in the recess, hammer the key home, and then plane it flush.

—Gary Rogowski is a contributing editor.



Think of a key as a pair of dovetails. *Design a butterfly key as you would dovetail pins, and center it over the crack. Your key can be smaller or larger than the one shown here.*

Outline it precisely. *Once you've cut the key, hold it firmly in place on the checked board and scribe its outline with a knife.*

Set the bit depth. *Set the router bit to cut just a hair shallower than the key itself. That way, you can plane or sand the key flush later.*

Rout and chop carefully. *After routing the recess, finish clearing it with careful strokes of a chisel. Test-fit the key often.*

Drive it home. *When the key fits snugly into the recess all around, apply glue and pound the key home with a mallet.*

Ask a question

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

Photos, this page: Kelly J. Dunton; drawing: Vince Babak

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The Taunton Press

A finish for oily woods

Q: I have a teak table to refinish. Will i need a sealer under the finish? What finish do you recommend?

—ROBERT A. FUNK, Hollister, Calif.

A: TEAK HAS A REPUTATION for being difficult to finish because the oils in the wood may interfere with finish adhesion. But teak is no more difficult to finish than any other wood species, provided you use solvent-based finishes (as opposed to water-based). A solvent-based brushing varnish is a good choice.

Whether you use a sealer (sometimes called a sanding sealer) first or varnish alone, make sure you wipe down the table with a rag soaked in mineral spirits to remove the surface oil before you begin.

This method also applies to other oily woods such as cocobolo and rosewood.

—Chris A. Minick is consulting editor.

Varnish is a good finish for teak. *A solvent-based finish like this stands up to the oils in the wood.*

Remove surface oils. *Use a cloth soaked in mineral spirits to wipe down the surfaces of a teak table before you apply a solvent-based brushing varnish.*

Sharpening a scrub plane

Q: Much has been written about how to sharpen regular plane blades. But how do you sharpen the curved blade of a scrub plane?

—LEE SPEARS, Delta Junction, Alaska

A: A SCRUB PLANE HAS A BLADE with a pronounced curve and works something like a gouge, removing lots of wood in a hurry. However, you sharpen the blade much the same way that you sharpen a blade with a straight edge.

Begin by flattening and polishing the back, then work from coarse to fine stones to hone the bevel to about 25°. Do this freehand.

To be sure you keep a uniform bevel on the curve, use your wrists to rock the blade from side to side as you move it forward and back on the stone. That way, you'll hone progressively along the entire curved edge.

—Garrett Hack is a contributing editor and author of The Handplane Book *(The Taunton Press, 1997).*

Scrub-plane blade has a curved edge. *It takes a little extra work to sharpen this blade and keep the bevel uniform.*

Rock and hone. *To sharpen a scrub plane, begin with one edge against the stone (left), then rock it to the other side as you move it over the stone (right).*

Photos, this page: Marcia Ryan (top); Thomas McKenna (bottom)

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Wax keeps rust off hand tools

Q: What should I use to keep hand tools from rusting? I've seen suggestions ranging from paste wax to WD-40 to camellia oil. Do any of those substances work better than good old 40-weight motor oil?

—JERRY MALONE, Pueblo, Colo.

A: IN MY EXPERIENCE, LIGHT RUST ON HAND TOOLS means that the shop is too humid. If you can, keep the shop heated and cooled; at a minimum, run a dehumidifier during the summer.

If climate control isn't practical, coat the metal surfaces of hand tools with a substance that keeps rust away. Paste wax will work. Just buff it to remove the excess, and reapply the wax regularly because it wears away with use. You also can store tools in a canvas tool bag in a room that has reasonable humidity levels. But I wouldn't use camellia oil or motor oil. In my experience, they stain the wood, and I don't like the oily feel when I use the tool.

—Lonnie Bird is a contributing editor.

***Corrosion prevention.** A light coat of paste wax can help prevent tools from rusting. If you apply the wax with 0000 steel wool, you can remove light rust from the tool.*

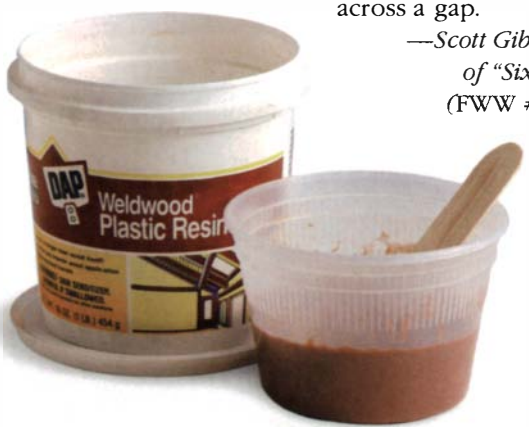
Plastic resin glue more versatile than label says

Q: I used Weldwood Plastic Resin glue to laminate curved chair parts. Will it also work for assembling the chair? The label specifies a required pressure, which won't work on the joints I'm using.

—GARY ZIMMERMAN, Bend, Ore.

A: ACCORDING TO DAP, which makes the Weldwood glue, you shouldn't have to worry about putting pressure on the joint during glue-up. As long as the glue joint is undisturbed for the glue's full curing time, the bond should be strong. Most glues aren't good gap-fillers, so the pieces should fit snugly. If the joint is sloppy, try using an epoxy, which has a long open time and makes a good bond across a gap.

—Scott Gibson is the author of "Six Essential Glues" (FWW #176, pp. 42-49).



Building with the optimum moisture content

Q: I've read that wood should be allowed to acclimate to the shop before use, but wouldn't this put moisture back into wood that's been kiln-dried to 7% moisture content? How did woodworkers of the past get around this problem?

—DAVID WENZEL, San Antonio, Texas

A: YOU WANT WOOD IN EQUILIBRIUM with its environment. If the air has high relative humidity, the wood will readily reabsorb moisture, no matter how low its moisture content. That's what acclimating the wood to your shop atmosphere for a couple of weeks is all about.

However, you don't lose all the benefits: Once dried to between 7% and 8%, wood still sees slightly less annual shrinking and swelling when going from dry winters to humid summers. I air-dry my wood and have no problem getting its moisture content this low in my heated shop in winter. Woodworkers of the past did the same, but didn't have to contend with the dryness of our well-heated houses.

—Garrett Hack is a contributing editor.

Photos, this page: David Heim

Handplane blade angles

VARY THE ANGLE OF ATTACK TO ENSURE SUCCESS ON A WIDE RANGE OF WOODS

BY LYN J. MANGIAMELI

It is no surprise that most woodworkers have limited knowledge of handplane blade angles: For most of the 20th century, little attention was paid to the link between the angle that the blade entered the wood and the resulting surface. The rule of thumb was to select a low angle (37°), bevel-up plane for end grain, and a standard pitch (45°), bevel-down plane for everything else. Correct to a point, but you're missing a lot of capability.

While many factors determine a plane's performance, including how well it is tuned, the depth of cut, and the size of the mouth's opening, altering the angle at which the blade enters the wood, or the effective cutting angle (hereafter known as the cutting angle), can vastly expand the types of wood that you can handplane successfully.

As well as covering low- and high-angle planes that are available off the shelf, I'll show you how you can modify existing planes and adjust the way you orient your plane to tackle difficult woods.

Think of the fibers

Before learning which type of plane to choose when faced with a challenging board, it helps to understand what happens when the blade enters the wood. Maximum smoothness, color, and clarity on a planed board are achieved when all the wood fibers fail (separate) right at the cutting edge. Defects occur when the fibers part away from the edge and instead fail along natural weaknesses in the wood.

These defects fall into two main categories based on the cutting angle and the type of wood.

Softer fibers tend to bend and stretch—A plane with a standard 45° cutting angle often poses problems for large-celled, more elastic softwoods and spalted woods. Considerable deformation of the wood can occur before the fibers separate. In some cases, the wood bends and stretches, piling up in front of the cutting edge, and then cyclically fails in a process called compression shearing. This leaves a rougher, often "fuzzy" texture as the surface goes through cycles of piling up and failing. In

Low angles

BEST SUITED FOR

Softwoods, poorly supported end grain, and areas of rot and spalting.

PERSONAL OBSERVATIONS

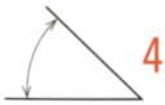
Lower angles are better, but there are two limiting factors. First, is the bed angle of the plane so much below 12° that it becomes too thin and weak? Second, a blade angle of less than 20° is too thin to retain a sharp edge. These limitations can be overcome by skewing the plane when using it (see p. 100).

Block planes for small areas. *A low-angle block plane is the best choice for planing small areas of end grain.*

Low angles for smoothing spalted wood. *Spalted wood is very soft, so you need a low-angle blade to slice through it with minimal compression.*

Photos: Mark Schofield

Medium angles



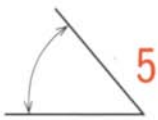
42°-47°

BEST SUITED FOR

Easily worked hardwoods like poplar and mahogany.

PERSONAL OBSERVATIONS

This versatile angle is easy to obtain, gives decent edge life, and requires little effort to push. It is used for other planing tasks besides smoothing, such as flattening rough boards.



50°

BEST SUITED FOR

Straight-grained boards of moderate-density hardwoods such as walnut, cherry, and ebony.

PERSONAL OBSERVATIONS

Little added resistance to cutting from 45° and a good alternative standard angle for those who favor these woods.

A different angle for different species. *Easily worked boards of low-density hardwoods such as this piece of mahogany work best with the blade at a medium angle of around 45°.*

the worst case, the flexible, elastic fibers bend and stretch before the blade, then pull loose behind the blade edge, and usually well below it, leaving large irregular pits. This is most common in areas of poor integrity such as spalting. The solution is to use the lowest possible cutting angle so that the blade slices the wood while compressing it as little as possible.

Dense and highly figured woods break before they bend—For small-celled, dense, hard, rigid woods that deform little in the face of shearing forces, a very high cutting angle can leave a glass-smooth surface when a lower angle results in tearout.

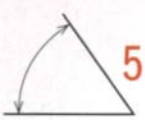
On woods such as tiger maple, it is impossible to avoid planing against the grain. When planing at a low or medium cutting angle, the blade lifts the wood instead of slicing it, causing the wood to fail ahead of the blade, a failure known as diagonal splitting. Other such woods are those with reversing grain such as ribbon-stripe and dense, figured woods such as cocobolo. The solution is to use a much higher cutting angle. This causes less of a wedging action into the fibers and more of a shearing action; the shaving is more quickly turned upward by the steeper blade face behind the cutting edge, thus "breaking" the chip earlier.

Two ways to obtain low-angle cuts

Now that you know the angle to use, how do you obtain it? For a low-angle cut you can purchase a

High blade angles. *Woods such as tiger maple cut best at about 55° (top), while cocobolo (above) should be worked with the blade cutting at 60° to 65°.*

High angles



55°-57°

BEST SUITED FOR

Denser figured hardwoods, and most hard maple and white oak.

PERSONAL OBSERVATIONS

Noticeable but still moderate increase in resistance, but with a clearly improved surface finish on these dense or figured woods.

60°-65°

BEST SUITED FOR

Highly figured woods such as cocobolo and many Australian woods.

PERSONAL OBSERVATIONS

Clearly greater resistance, particularly if the blade is wide. The cut must be very light to avoid strain on the operator or on the body of the plane.

low-angle, bevel-up plane, or you can skew the plane relative to the workpiece.

Bevel-up planes achieve lowest-angle cuts—The principle feature that divides smoothing planes into two families is whether a plane is designed to support its blade with the primary bevel facing down or up. The former support the blade on a fixed bed or movable frog, most commonly angled at 45°. No matter what angle the blade is ground at, the bed/frog angle is the lowest cutting angle that plane can achieve.

Planes with the primary bevel facing up typically have a bed angle of 12°-20°. Combined with a blade angle that offers reasonable edge retention (a minimum of 20° on softwoods, 25° on hardwoods), this achieves a minimum effective cutting angle of 32° to 37°. By "edge retention," I mean avoiding an edge that comes to such a point that it chips or otherwise deforms after minimal use. The usual term for these planes is low angle, but because they can be modified to cut at high angles, there is a move toward calling them bevel-up planes.

Lower the cutting angle by skewing the plane—So far the discussion has assumed that the plane travels only in a direction directly perpendicular to the blade's cutting edge. When that direction is changed, called skewing the plane, the wood climbs the blade somewhat diagonally at what is known as the functional cutting angle. Thus, a plane with a 45° effective cutting angle, when skewed to 20°, develops a functional cutting angle of 42°. If the skew is increased to 45°, the wood will climb only a 30° slope.

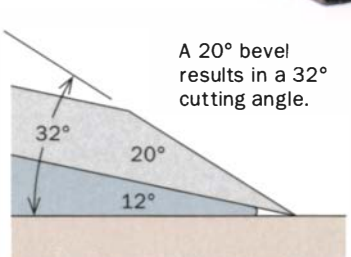
This principle applies to any plane: A bevel-up plane with a 12° bed, the blade beveled at 20° and skewed at 60°, (the lower limits in all three parameters), has a functional cutting angle of a little over 15°.

Skewing can be a very useful means to maximize the versatility of a single plane, and allows you to adapt to changing characteristics of the wood surface without having to turn to another plane or a different blade geometry. One warning about skewing: Don't counteract a deliberately high effective cutting angle by inadvertently skewing the plane during use—an easy thing to do when working a large surface.

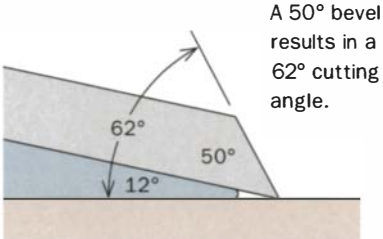
Bevel-up planes

The bevel determines the cutting angle

Bevel-up, also known as low-angle, planes range in size from block planes to jointers. A fixed bed supports a plane iron whose bevel faces up.



A 20° bevel results in a 32° cutting angle.



A 50° bevel results in a 62° cutting angle.

Bevel-up planes have great versatility because altering the angle of the bevel will directly alter the cutting angle of the plane. The cutting angle is the sum of the bed and the bevel angles.

A GLOSSARY OF ANGLES

Bed angle
The angle of the fixed bed or movable frog relative to the sole of the plane.

Bevel angle
The angle of the blade's bevel relative to the back of the blade.

Effective cutting angle
The combination of the above two angles. Referred to simply as the cutting angle.

Functional cutting angle
The angle at which the blade cuts if the plane is skewed relative to the workpiece.

Modify your plane to cut at high angles

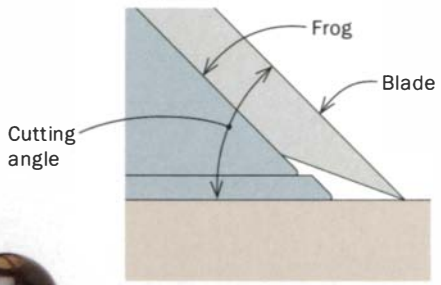
For most bevel-down planes, the angle of the bed or frog is established by the manufacturer and cannot be modified easily. The exception is the Lie-Nielsen bench planes that can be retrofitted with a 50° frog, increasing the cutting angle by 5°.

A more versatile option is to bevel the back of the blade in addition to the main bevel on the face. A back bevel is typically very narrow because it must

Drawings: Michael Pekovich

Bevel-down planes

The frog determines the cutting angle



On a typical bevel-down plane, the cutting angle is equal to the angle of the frog, on which the blade rests. The angle of the main bevel does not affect the cutting angle.

SKEW THE PLANE TO LOWER THE CUTTING ANGLE

Slice soft wood. *The effective cutting angle on any plane can be lowered by skewing the plane so that it is not perpendicular to the board.*

extend only slightly beyond the depth of the cut—for smoothing purposes, about 1/32 in.

The effective cutting angle is now the back bevel and the bed angles combined. So on a plane with a typical bed angle of 45°, a back bevel of 10° gives an effective cutting angle of 55°. A narrow back bevel can easily be ground away to return a blade to a flat back or to establish another back bevel angle; better still, have an extra blade or two on hand.

Because back bevels are so narrow and the angle is typically 10° to 20°, they can be hard to hone freehand, and most commercial honing guides are not designed to produce these smaller angles. The best solution is the Veritas Mk.II (www.leevalley.com), designed to produce bevels from 2° to over 54°.

Convert your bevel-up plane to a high-angle plane—Increasing the effective cutting angle on a bevel-up plane only requires altering the blade's face bevel. Thus a plane with a 12° bed coupled with a blade beveled at 38° yields an effective cutting angle of 50°, while a bevel of 50° yields an effective cutting angle of 62°. Again, consider buying an extra blade or two. Lee Valley offers blades with different bevel angles for some bevel-up smoothing planes.

How best to increase your range of angles

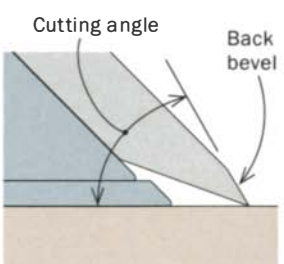
If you are buying your first plane, consider a bevel-up one. The design allows a greater range of effective cutting angles (32° to 65° assuming a 12° bed) than the bevel-down design (45° to 65° assuming a 45° bed). On the other hand, if you already own a good-quality bevel-down plane, experiment with back bevels. If they work for you, buy an extra blade.

A well-tuned plane of either type will handle most boards, but when that special, highly figured board comes along and you are struggling to reveal it in all its glory, I hope this information assists you. □

TWO WAYS TO RAISE THE CUTTING ANGLE

Use a plane with a high-angle frog. *Lie Nielsen makes an optional 50° frog (shown in the plane) as well as the standard 45° (in the foreground) for some of its bench planes.*

Grind a back bevel on the blade. *The cutting angle on bevel-down planes can be increased beyond the angle of the frog by grinding a shallow back bevel.*



Carve a ball-and-claw foot

BY EUGENE LANDON

FRONT

SIDE

BACK

BOTTOM

The ball-and-claw foot is thought to have originated in China as a dragon's claw grasping a pearl, but by the mid-18th century it had become firmly associated with the Chippendale furniture style. The design lends itself to interpretation and there are variations associated with different parts of the 13 colonies. While the claws and the talons may appear intimidating, carving them isn't.

The secret is in the layout lines. With these to guide you and by following the correct sequence of cuts, carving these feet is like carving by numbers. Nor do you need a cabinet full of carving gouges: Five or six will get you by, with a ½-in. bench chisel doing much of the work. After perhaps one practice foot on an easily carved wood such as basswood, you'll be ready to slice into mahogany.

Bandsaw the blank and lay out the lines

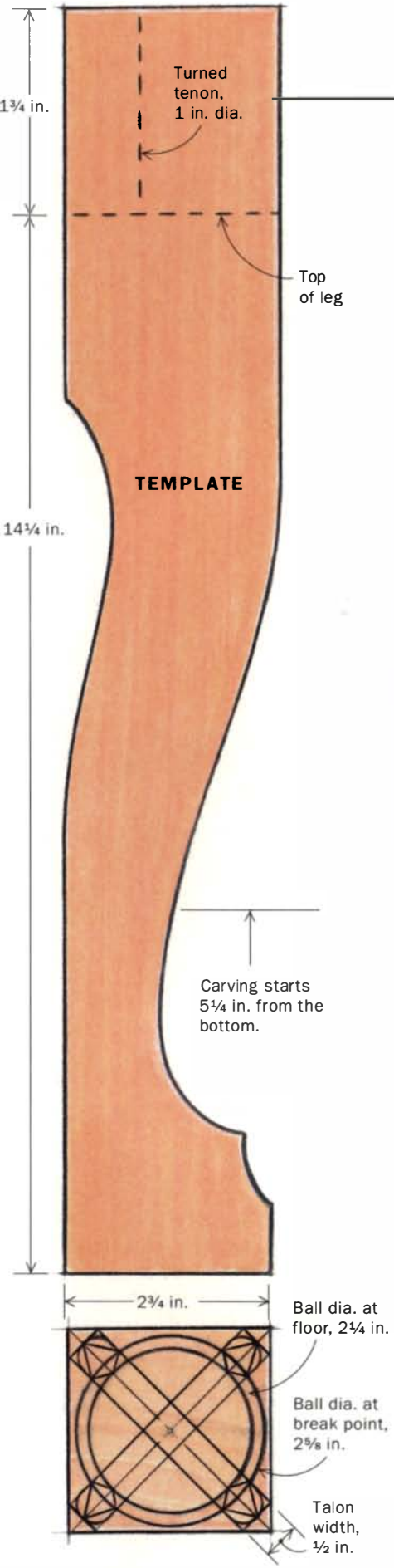
After bandsawing the leg blank (in this case 2¾ in. sq. and at least 16 in. long), I begin by marking out the base of the foot (see photos, facing page).

Many carvers use a chisel to define the edges of the talons, but I saw down the layout lines until I reach the outer circle. (I know this quicker method was used in the past, because I have found traces of sawtooth marks when examining antiques.) On the front talon and the front faces of the side talons, you can keep the saw perpendicular to the base of the foot; but on the remaining cuts, saw only the bottom half of the ball to avoid cutting into the ankle. In all cases, saw just outside the line to preserve the full width of the talon.

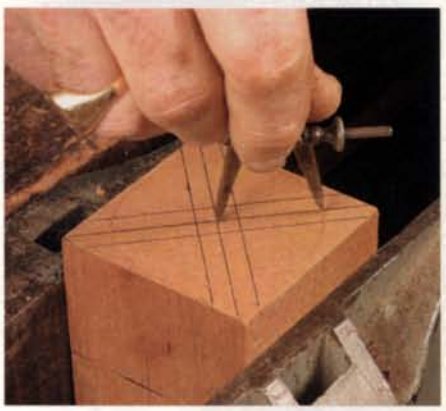
Now lay out the rest of the ball (see photos, facing page). First draw lines on the bottom of the foot from the intersection of the talon lines and outer circle to the edge of the foot. Then, on all sides of the foot, mark the break point (the widest point of the ball), the height of the ball, and the center point of

Photos: Mark Schofield; drawings: Bob La Pointe

Lay out the foot

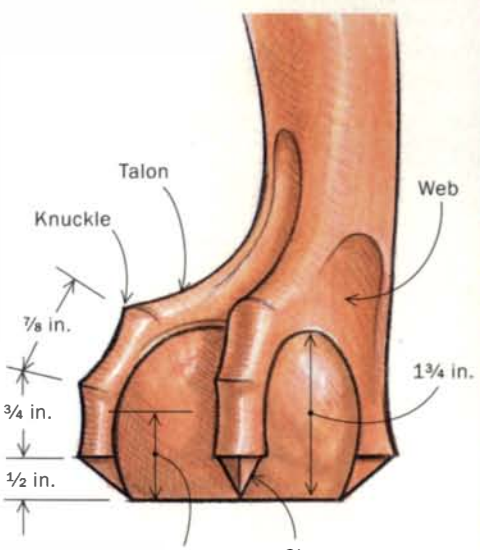


Lay out the leg. *Use the template to lay out the cabriole leg on adjacent sides of the blank.*



Lay out the base. *Draw lines connecting the opposite corners and lines ¼ in. on either side to define the width of the talons. Then use a compass to scribe the diameter of the ball at its widest point and at the floor.*

Define the talons. *Use a fine-tooth saw to cut just outside the lines marking the width of the talons.*



Where the talons meet the ball. *Draw lines parallel with the edge of the foot from where the outer diagonal lines intersect with the outer circle.*

The top of the ball. *Extend the lines you drew in the previous step until they reach the break point of the ball. Then draw an arc from these points that connects the midpoint at the top of the ball.*

Carve the ball

BEGIN BY MAKING A CYLINDER

Start with the back quadrants. *Use a #7-18 mm gouge to define the arc of the ball and then to remove the wood outside it, creating a trench around what will become the ball.*

Create a cylinder. *Use a ½-in. bench chisel. Cut down to the outer circle and use a square to check that the whole surface is perpendicular to the bottom of the foot.*

The front quadrants are different. *Use a gouge and chisel to create a semicircular hollow that forms the top of the ball, then shape the cylinder at the base.*

the ball. Next, extend the lines you drew on the bottom up to the break point, and then outline the top curve of the ball connecting the center point down to the break point. Now you can finally pick up a gouge and start carving.

Carve the front and rear of the ball

The first step is to relieve the wood around the sides of the ball. Beginning with the back quadrants of the foot, make vertical cuts around the top half of the ball and then relieve the cuts by removing wood from the top side of the cuts. The cut needs to extend 5⁄16 in. deep; measure it with a depth gauge or improvise with a nail driven through a small piece of wood. Extend the channel down the bottom sides of the ball.

Before shaping the ball, establish a cylinder. Pare away wood until you get down to the outer line on the bottom of the foot. Use a square to check that the surface of this cylinder is flat.

Carving the front quadrants begins slightly differently. Where the line marking the top of the ball and the center line of each quadrant intersect, make a series of vertical cuts with a #7-18 mm gouge, working progressively toward the front. Next, with a ¼-in. bench chisel, make small horizontal cuts to create a semicircular hollow. Then

THEN TURN THE CYLINDER INTO A BALL

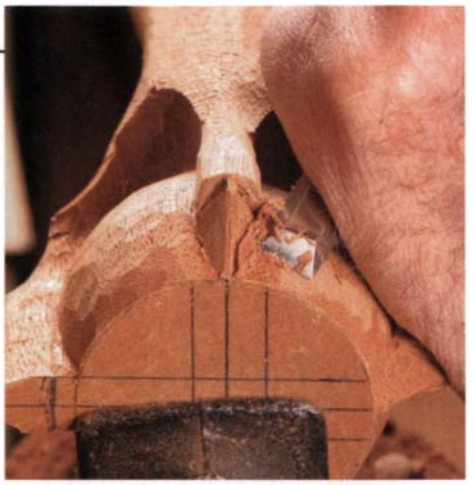
Mark the middle of the ball. *Before turning the cylinder into a ball, use a gauge to mark the widest point, known as the break point. From here, the ball breaks downward in both directions.*

Now carve a ball. *Use a ½-in. chisel to turn the top of the cylinder into a ball. Don't worry about leaving a series of facets; these can be sanded later. Round over the bottom half of the ball until it meets the inner circle on the bottom of the foot (left). You should now have a multifaceted but recognizable ball divided into four parts by the unfinished talons.*

Carve the talons and claws

Rasp the talons. *Use a patternmaker's rasp to flatten the triangular profile from the second knuckle to the base. Then create the concave profile between the second and third knuckles (above).*

Create the claw profile. *Use a chisel to slice downward from the first knuckle to the base of the ball to create a flat, sloping plane.*



Carve the claws. *With a chisel, square off the bottom of the first knuckle, then pare downward on both sides from the center line. Finally, cut away the claw (above) until it comes to a point at the bottom of the ball.*

follow the same steps as the back quadrants and establish a flat cylinder.

Reestablish the break-point line at ⅞ in. from the bottom. With the ½-in. chisel, create the top curve of the ball (see bottom photos, p. 104) and then pare down to the inner circle on the bottom of the foot to establish the lower curve of the ball.

Shape the talons, claws, and web

It doesn't matter if you start shaping the talons before you finish carving the lower side of the ball. The first step is to use a #49 patternmaker's rasp on the triangular bottom section of each talon; then create a concave profile between the second and third knuckles. Use the rasp to round the ankle of the leg and round over the shin area.

Round over the flat-topped knuckle and claw section using a ½-in. chisel. With a marking gauge set to ½ in., mark the junction of the first knuckle and the claw. With the chisel, refine the concave sections between the lower two knuckles on the front three talons. The rear talon has only the lowest knuckle.

To carve the claws, use the ½-in. chisel, and start by carving a flat slope from the first knuckle down to the inner circle on the bottom of the foot. Extend the line on the bottom of the foot up the center of the slope to mark the center of the claw. With the chisel parallel to the bottom of the foot, drive it into either side of the slope at the first knuckle until the corners of the chisel just touch the center line and the surface of the ball. You are undercutting the first knuckle. Then pare away the wood on either side of the center line to create the claw.

The final step is to create the concave area between the front tendon and the two side ones. Known as the web, it represents the stretchy skin found on the feet of birds of prey. Create the center of the groove, and then establish the top and the sides. Then flatten the center of the web with a #5-16 mm gouge, and if necessary, reestablish the line where the webbing meets the ball with the #7-18 mm gouge.

Your ball-and-claw foot is complete. Go back and smooth the ball with small rasps and files, and the ankle and talons with files and a scraper. Leave a few carving facets to show that this was created by man and not a machine. □

Carve the web. *Use a #8-13 mm gouge to hollow out the areas between the center and side talons (left). Work upward from the ball until you feel the wood start to tear, and then make relief cuts downward. Use a #9-7 mm gouge to create the sharp transition from the web into the tendons (above).*

WOODWORKERS MART

See ad index on page **115** for reader service number.

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Fumed finish: authentic Arts and Crafts

BY KELLY J. DUNTON

Having been faithful to Gustav Stickley's design ideas and materials when building my table (see "Arts and Crafts Side Table," pp. 56-61), it seemed only right to use his finishing method.

The technique that Stickley and other Arts and Crafts furniture makers employed was to expose their oak pieces to ammonia fumes. This gave the furniture its distinctive brown appearance and highlighted the rays of quartersawn oak.

This method has several advantages over dyeing or staining. With open-pored woods, pigment stains will collect in the pores, exaggerating the grain structure; dyes avoid this problem but are not lightfast; and both dyes and stains are labor-intensive to apply. With fuming, time and nature do all the work and the resulting change is permanent.

There are also several disadvantages to the process. Household ammonia won't do the job. You'll have to find industrial-strength ammonium hydroxide, which is dangerous stuff (see below). Also, ammonia reacts with tannin in the wood, the amount of which varies from tree to tree. You probably can't create your whole piece from a single tree, but try to use as few boards as possible and make the most visible parts, such as tabletops, out of a single board.

Save your offcuts for fuming samples

To get an idea of how long your project will need to be fumed, do a trial run with scrap pieces from the boards you used. Take the pieces out of the fuming tent at intervals and record the length of time on each piece. Not only will you see how long it will take to get the desired color, but you also will see if different

Not your mom's ammonia

The ammonium hydroxide used for fuming contains around 28% ammonia compared to less than 5% in household ammonia. You should therefore take extra precautions when handling this material, also known as aqua (or aqueous) ammonia.

Avoid eye or skin contact with the ammonia by using goggles or a full-face shield, and protective gloves. A respirator with cartridges designed for ammonia is ideal, but basic charcoal vapor filters will reduce the exposure. If you don't have a respirator, use a fan and stay upwind of the fumes.

Use a glass or plastic container rather than a metal one to hold the ammonia while fuming. Make sure that you don't use an aluminum pie plate because the ammonia will dissolve it.

After you have finished fuming, dispose of the used ammonia in a large bucket of water, which can then be poured on the ground or on the compost heap. It makes a good fertilizer.

If you can find this type of ammonia locally, you will save yourself a large fee for shipping and handling this hazardous material. This type of ammonia is used in the manufacture of large blueprints, so possible sources include office-supply stores. You can purchase it online at www.hvchemical.com for just under $14 a gallon, but the shipping will cost you $39.

How to handle ammonia. *Take care not to come in contact with the 28% ammonia solution. Wear heavy-duty gloves and eye protection, and use a glass or plastic container to hold the liquid when fuming.*

Photos: Mark Schofield

Fuming white oak

Preparing to fume. *Pour about an inch of ammonia into a container (above) and place it under the project. To reduce the risk of inhaling ammonia fumes, use a fan to stay upwind of them. Lower a cardboard box over the table and the ammonia container (left). To reduce fume leakage and to keep the box from blowing over, place a few bricks or stones on top.*

HOW LONG TO FUME?

Expose scraps from your project to the ammonia fumes for different lengths of time to judge how long to fume your project. Dunton exposed cutoff corners from the round top for two, five, and seven hours respectively. He gave half of each sample a coat of finish to evaluate the final appearance. Be aware that lumber from different sources may fume at different rates. In this case, Dunton fumed the top longer than the rest of the piece to achieve a uniform tone.

2 HOURS

5 HOURS

7 HOURS

Check your progress. *After four hours, Dunton removed the box and inspected the color of the table (left). To bring the top to the same color as the base, he fumed the top on its own for another couple of hours (above).*

parts of the table will darken at different rates. In this case, the scrap from the base got noticeably darker than the corner scrap from the tabletop, so I knew that I'd have to fume the top longer.

Fuming makes white oak brown, but with a greenish cast. Warm up the look by using a finish with an inherent amber cast.

Set up the fuming tent

The wood won't achieve full color on any surface that is in contact with another surface, so the easiest way to achieve an even color is to assemble your project before fuming it. If possible, dry-assemble it so that you can take it apart after it has been fumed and apply a coat of finish before glue-up. You will need an enclosure big enough to hold the whole project. I used a large cardboard box, but you may need to construct a tent from thick plastic and battens to enclose the fumes.

It is unlikely that the enclosure will be totally fume-proof, so try to do the fuming outside. Higher temperatures will speed up the process, so make sure the temperature is about the same when you fume your project as when you fumed the samples. Ensure that no children or pets can disturb the process or come into contact with the ammonia. Reduce the chances of wind toppling the box by placing bricks on the top or tying it down.

When my table had fumed long enough to get the base to the color I wanted, I took the base out and left the top in, placing it on a cardboard stand to let the fumes circulate.

After the fuming has ended, let your project shed fumes for 24 hours before you apply a finish. Test the finish that you plan to use on a piece of the scrap fumed earlier. Choices include boiled linseed oil for a darker look, tung oil, or an oil/varnish mix, any of which can be topcoated with shellac. □


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READER SERVICE NO. 124

New Wave Rocker

Tony Kenway builds rocking chairs and other furniture in Byron Bay, a beach town with big surf midway down Australia's east coast. Kenway is an avid surfer and diver himself and credits the sea with influencing the soft polish of his chairs. Their fluid curves and lack of hard edges evoke a surf-tossed stone. Boats, too, were essential to the evolution of Kenway's rockers. After apprenticing as a cabinetmaker, he spent several years building boats. "Coming out of cabinetmaking," he says, "I was stuck in the linear. Learning to loft and build boats released me into three dimensions." A book on Sam Maloof gave him the impetus to bring a more sculptural tone to his work. Using regional hardwoods like this chair's quilted Tasmanian blackwood (a close cousin to koa), Kenway saws all the parts out of solid wood except the rockers, which are bent laminations.

— Jonathan Binzen

Pro Portfolio Visit FineWoodworking.com to watch an audio slide show of Kenway's work.

Photos: David Young; inset, Warren J