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April 2005
No. 176

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- **Contact our internet store:** www.stores.yahoo.com/forrestman

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Fine WoodWorking

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MARCH/APRIL 2005 ■ ISSUE 176

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Cover photo: Rodney Diaz

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Inspiration for hands-on living®

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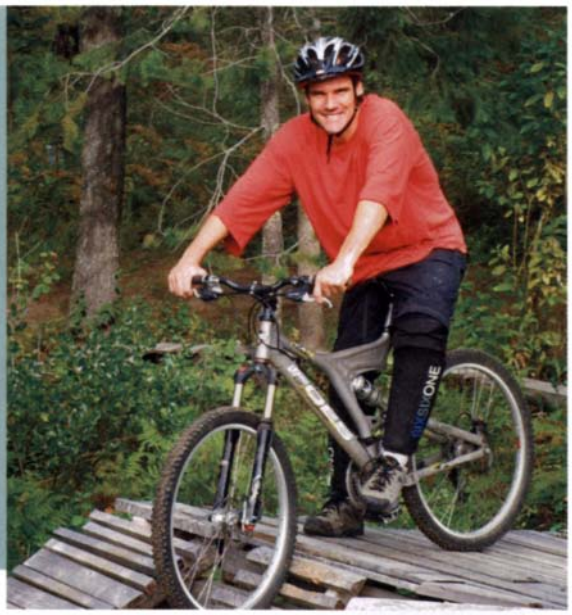
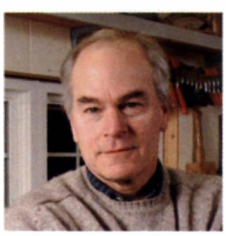
contributors

Mark Edmundson *(Master Class)* lives and works on a 10-acre homestead just north of Sandpoint, Idaho. Aside from building furniture, his weekly duties include entertaining his two mountain-bike-riding boys, Max, 5, and Teig, 3. This mostly involves building jumps and trails throughout their rolling property—some, admittedly, for dad only. Two additional bike riders are on the way, due to arrive this spring.

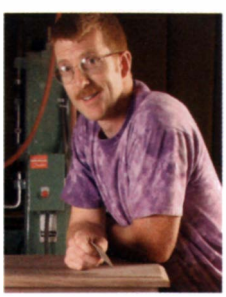




Scott Gibson *("Six Essential Glues")*, a woodworker for 25 years, has ruined many shirts and jeans by carelessly wiping glue on them. He only recently started wearing a shop apron. A former editor at *Fine Homebuilding* and *Fine Woodworking*, Gibson now is a freelance writer who works from his home in Maine. His book *The Workshop* was published last year by The Taunton Press.

John Zeitoun *("Pedestal Table")* studied furniture- and cabinetmaking at Algonquin College in Ottawa, Ont., Canada. He worked for several years in the field and opened his own shop, River Woodworks, in 1996. During the summer, Zeitoun teaches a workshop on building birch-bark canoes near his hometown of Wakefield, Que., Canada.

Bob Hamon *("All About Picture Framing")* is a certified picture framer who has been designing and making classic picture and mirror frames in wood since 1977. He has a bachelor's degree in art from the University of Arkansas, where his studies also included classes in architecture, industrial arts, and museum methods. Hamon can be reached through his Web site at www.artandmirrors.com.



J. Speetjens *("Install Inset Doors With Ease")* has been a professional woodworker for more than 20 years. Trained in the art of stringed-instrument making, Speetjens began his career designing and building electric guitars. Since 1992, he has been building custom furniture and millwork, ranging from entry doors to case goods to chairs, on spec and through galleries. Speetjens also teaches the martial art of Aikido. He lives in Greensboro, N.C., with his wife and two children.

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letters

Spotlight

THE INHERENTLY INTELLIGENT VS. THE KNOW-IT-ALLS

In FWW #172, Dan Faia used fire to achieve a finishing effect. *The technique drew a heated response from some readers.*

I find the letter writers who try to one-up the authors quite amusing. You meet people like this all the time—they are the ones who can't resist the opportunity to show how smart they are. This seems to be particularly true when it comes to safety issues. The editor gives us fair warning in every issue with the "About your safety" disclaimer. It's a fact that the shop contains many sharp objects that can maim, or even kill, if not used properly. Then there is dust, electricity, chemicals (this one seems to be a favorite for the know-it-alls), lifting heavy wood, hard floors, noise, and loose clothing or hair. Additionally, a person stands a fair chance of getting killed just driving the car to buy wood! Trust me, though, most of us are quite aware of all these hazards. For the others, well, there's always Darwinism. Meanwhile, I think we can trust the editors of *Fine Woodworking* to continue to bring us informative articles on the proper way to handle some of these risks, including the use of a torch to get an antique finish.

—JIM WILLIAMSON, Bucksport, Maine

Inspired to reorganize a shop

In the article, "A layout kit for small shops" (Shop Design, *FWW* #174, pp. 22-26), John Yurko motivated me to take a hard look at my overcrowded (16-ft. by 26-ft.) basement shop. Faced with a jumble of stationary and benchtop tools, and no assembly space to speak of, I used Yurko's suggestions and layout tools to create a shop plan on paper. I now have a pleasant, efficient, working shop with 30% additional free space for assembly and workflow.

—GEORGE DERING, Greenwich, N.Y.

Tablesaw problem

I purchased the Ridgid tablesaw (model No. TS3650) after reading a positive review in *Fine Woodworking*. But I discovered a design flaw that you missed. After stacking two outside dado blades to make a ¼-in.-wide cut, I noticed that one blade cut about 1/16 in. deeper than the other. The problem is that a small portion of the arbor is significantly narrower (0.030 in.) in diameter, causing the blade to spin off center. Can you help me out, please?

—JOEL STRONG, East Granby, Conn.

Shop *manager* John White replies:
You pointed out something we did indeed miss in our review. I contacted Ridgid about the problem and received this response: "Unfortunately, some TS3650 arbor assemblies have incomplete threads, which may cause problems when using a stacked dado. Correct arbor assemblies are available from Ridgid at no charge. A customer can elect to replace this assembly on his own or take it to an authorized service center for free replacement." Call Ridgid at 800-474-3443.

An example of humility

The article about Jimmy Carter (*FWW* #174, pp. 82-85) almost brought tears to my eyes. Maybe he was not the best person to project American might, but what a perfect example of humanity and humility. He and I have read the same books (mainly Tage Frid, of course), so how is he so much better a woodworker than I am?

—JOLYON JESTY, Mount Sinai, N.Y.

Another shop flooring solution

I just finished reading "Shop Flooring Solutions" (*FWW* #174, pp. 50-54). I would like to suggest another product—½-in.-thick rubber pavers from Re-Tek (www.softlandingrubber.com). I have dropped honed chisels on them with no damage, and the pavers have some give, so they are comfortable to stand on. They are priced at about $4 to $5 per square foot.

—RHETT FULKERSON, via email

Clarification

A number of readers voiced concern over the cover of our previous issue (*FWW* #175), which depicted an author using a tablesaw tenoning jig. While we don't recommend a knuckle-dragging posture for this procedure, the composition of the photo made it appear that the author's hands, which were actually more than 2 in. above the blade, were too close for comfort.

Correction

The price of the Milwaukee drill, model No. 0616-20, was listed incorrectly in the article "14.4v Cordless Drills" (*FWW* #174, pp. 40-47). The tool, with two batteries and a charger, costs about $190.

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.

—Anatole Burkin, editor

Photo, this page: Mark Schofield

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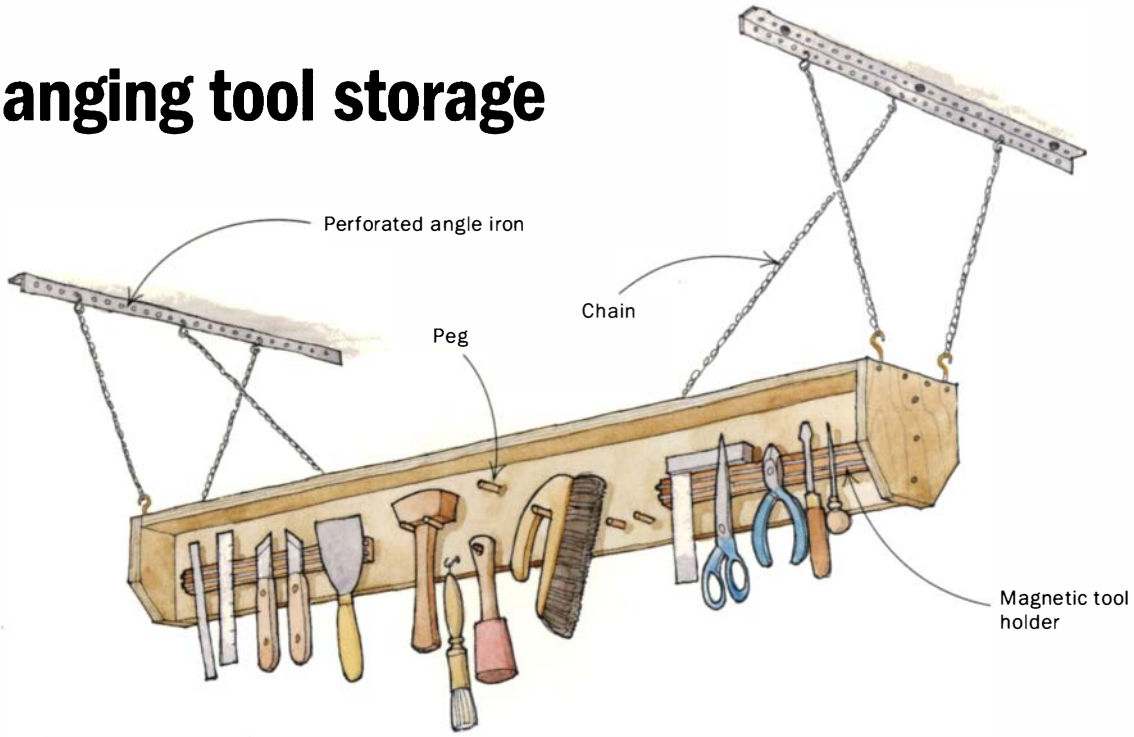
EDITED AND DRAWN BY JIM RICHEY

Best Tip

Hanging tool storage

Space is at a premium in Dick Rochester's garage shop, so he put the empty area above his workbench to good use. His hanging tool-storage system keeps a number of regularly used hand tools within arm's reach.

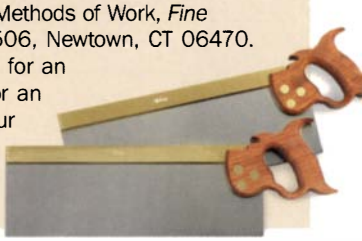


I suspended this tool-storage unit above my workbench so that the tools I use most often remain within easy reach. The unit is easy to move or raise, if necessary. I made it simply by screwing together two scraps of birch plywood into a T-shape and attaching end caps. To hang tools, I added wooden pegs and heavy-duty magnetic tool holders. To suspend the unit, I bolted two lengths of perforated angle iron (the stuff used to hang garage-door tracks) to the ceiling and attached the unit to the angle iron with three chains on each side. The three-chain configuration eliminates swinging.

—Dick Rochester, Lafayette, Colo.

A Reward for the Best Tip

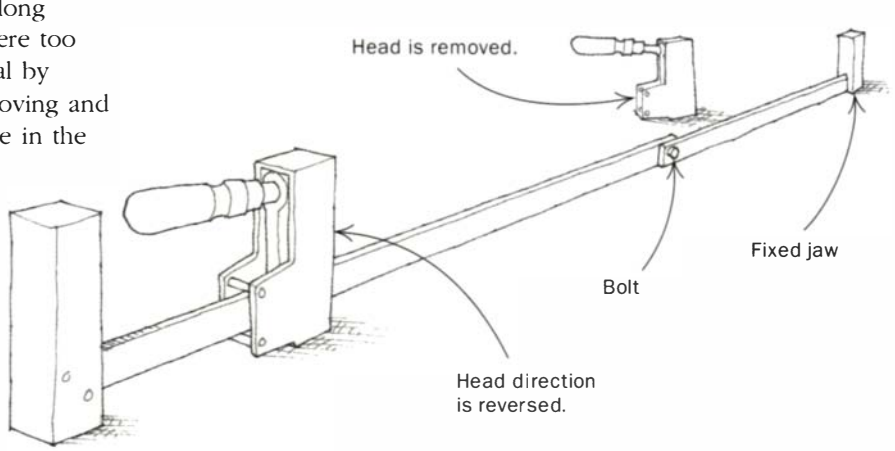
Send your original tips to Methods of Work, *Fine Woodworking*, PO Box 5506, Newtown, CT 06470. If published, we pay $50 for an unillustrated tip; $100 for an illustrated one. And if your tip is the best, you get a pair of 14-in. tenon saws made by Adria Toolworks.



Extralong clamps

I recently needed some long clamps to span an 8-ft.-long dining table, but my Jorgensen parallel-jaw clamps were too short. So I made a clamp twice as long as the original by removing the sliding head from one clamp, then removing and reversing the head on a second clamp. Using the hole in the bar where the sliding jaw goes, I fastened the two bars together with a short bolt. I had to enlarge the sliding jaw's hole slightly to accept a ⅜-in.-dia. bolt. (Keep in mind, though, that the jaws no longer will stay parallel in all situations.) You can use this technique on Bessey clamps if you file off the stamped keeper dimples and drill a hole for the bolt at the end of the bar.

—George Burman, Madera, Calif.



Router jig ensures flush edging

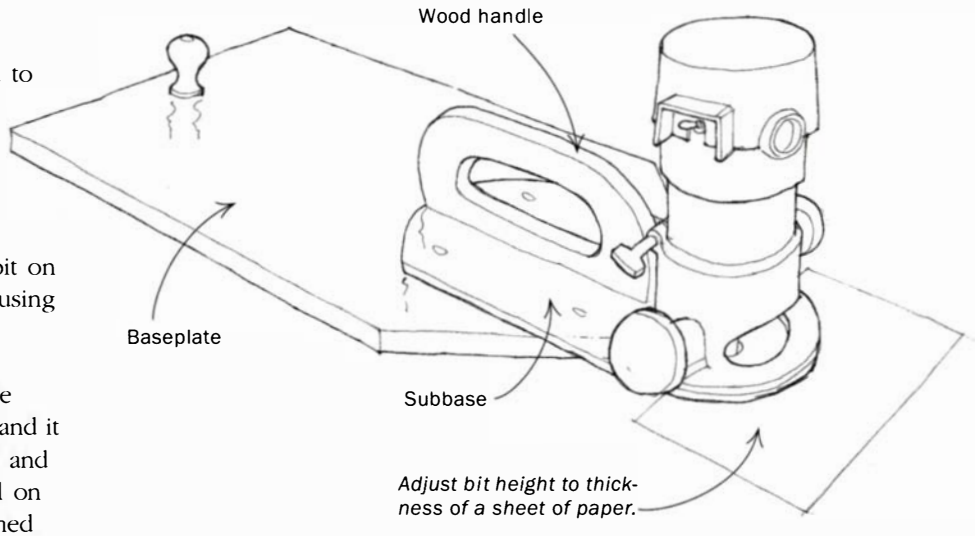
Solid-wood edging often is added to plywood to hide the core plies and to protect the fragile edges of the thin surface veneers.

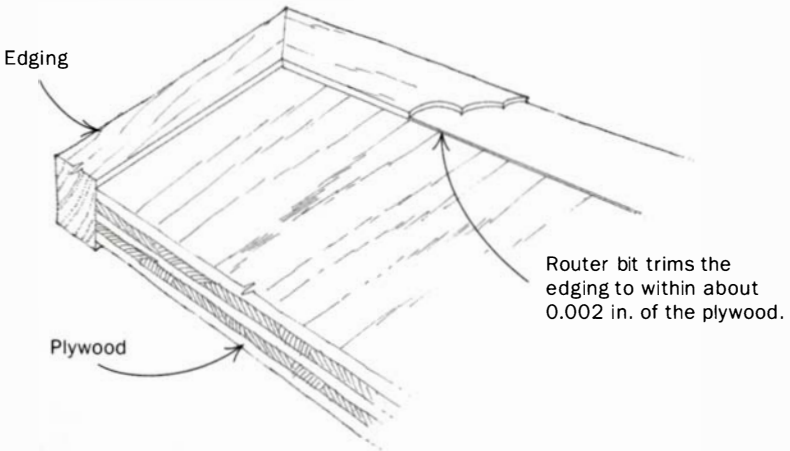
To ensure a good-looking, flush connection, I mill the edging about ⅛ in. oversize in thickness. Then I glue it to the plywood, making sure the edging projects a bit on both sides. After that, I trim the edging flush using a router and a shopmade jig.

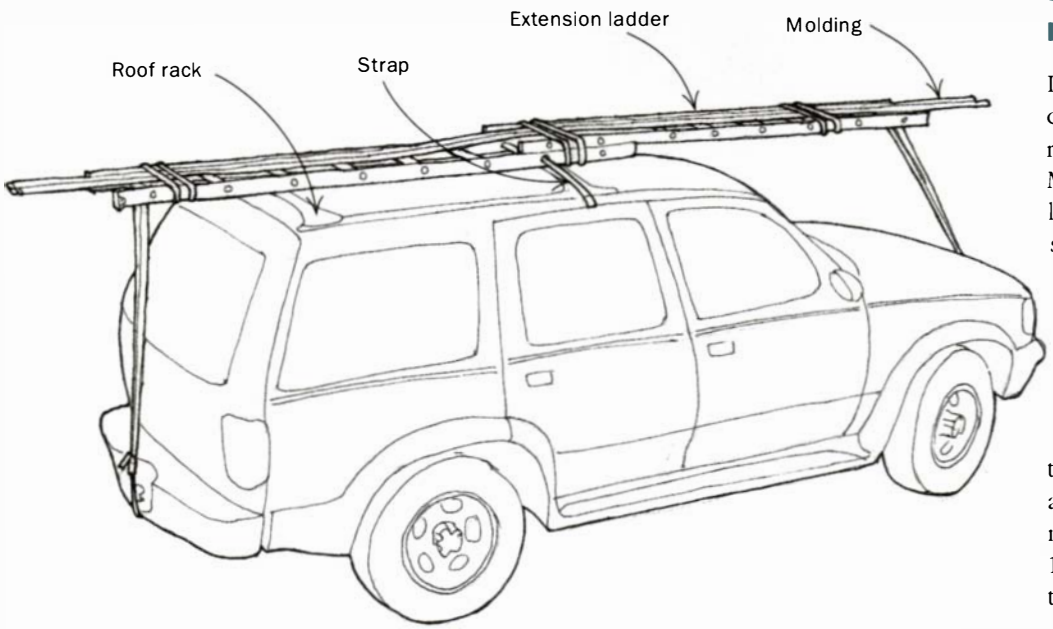
The jig has two parts: a router subbase of Plexiglas and a baseplate of melamine. I chose melamine because it is flat, smooth, and heavy, and it slides easily. I added a handle to the subbase and the baseplate to make the jig easier to control on large sheets. To use the jig in corners, I trimmed the front corners of the baseplate and positioned the router bit ahead of the point. The base is large enough that its weight counterbalances the router and keeps the bit from diving into the work.

With the router in the base, I adjust the bit to ride the thickness of a sheet of paper (typically 0.002 in. to 0.003 in. thick) above the surface of the plywood. This keeps me from removing any more material from the already very thin surface veneer. I then rout away the surplus edging on both sides of the plywood. As a final step, I use a card scraper to remove the router marks and to bring the edging flush with the plywood.

—Bridger Berdel, Tucson, Ariz.







Extension ladder secures molding in transit

I had to transport 24 pieces of 16-ft.-long crown molding on my SUV, but the roof rack wouldn't support such long lengths. My solution was to strap an extension ladder to the top of the car and then strap the molding to the ladder.

I attached the bottom section of the extension ladder to the car with two ratcheting straps---one in the middle and one from the back bumper to the bottom rung of the ladder. I also added another strap around the middle to keep the ladder sections from sliding apart. Then, when I picked up the molding, I telescoped the ladder out to 14 ft. and added another strap from the top rung to the front bumper.

—Paul Comi Jr., San Gabriel, Calif.

A Stacked Dado Set With No Shims Needed?

SD608
Dial-A-Width Dado Set

Not A Wobble Dado!

Introducing Freud's New Dial-A-Width Stacked Dado Set

U.S. Patent No. 5,368,079

Choose Freud's Dial-A-Width Stacked Dado Set, which is a must for fast, easy, and accurate flat-bottom dado cuts.

No More Shims

For a perfect fit every time, all you need to do is dial. Freud's SD608 Dial-A-Width Dado set performs like an ordinary stacked dado set, but the shims have been replaced with a patented dial system, which allows you to adjust the width via an exclusive dial hub capable of micro adjustments. Each "click" of the dial adjusts the blade by .004"– that's thinner than a sheet of paper. The adjustable width range for the dial is 1/4" to 29/32".

Easy and Accurate

Freud's innovative adjustable-hub design not only eliminates the need for shims, but allows you to fine tune the width of the dado without ever removing the dado cutter from your table saw. No more wasted time making adjustments and re-adjustments. A simple click of the dial ensures accuracy the first time.

Flawless Finish

The SD608 features the same premium materials and quality as all of Freud products. The blade bodies are laser cut for extreme accuracy, and the precision-ground arbor holes ensure precise blade alignment on any table saw. The MicroGrain carbide is manufactured specifically by Freud for splinter-free, flat-bottom grooves in all materials—including problem materials like veneered plywood or melamine.

Choose the dado set that produces the best finish and highest-quality cuts of any dado set today– choose Freud. Whether you're a production shop, custom woodworker, or serious woodworker, Freud makes it easy for you to endlessly create dadoes with flawless flat-bottom grooves.

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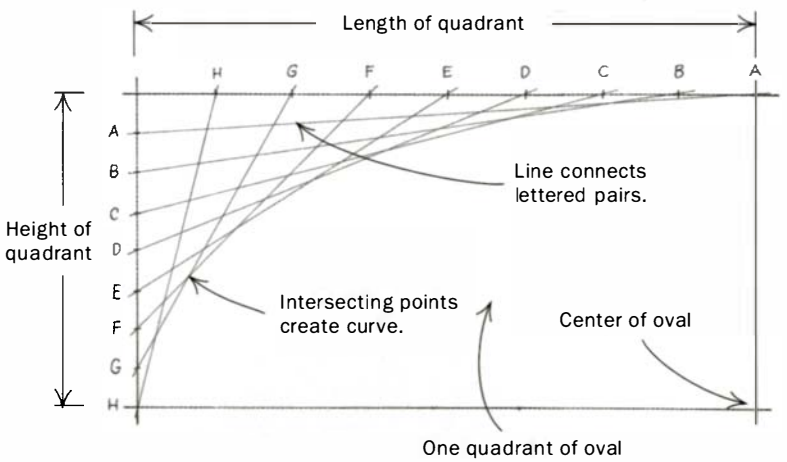
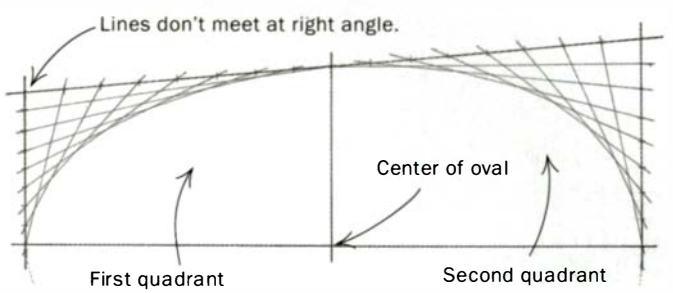
Simple method for drawing an oval

SYMMETRICAL OVAL



ASYMMETRICAL OVAL



I learned a simple way to draw an oval from a remarkable artist in his 80s named Art Overbeck. The idea is to create a curve in only one quadrant of the oval. Once the quadrant is drawn, it's used as a template to create the remaining three quadrants.

Start by drawing two perpendicular lines; one equal to the height of the quadrant, and the other equal to the length of the quadrant. Then divide each line into the same number of parts, with the parts on each line equally spaced. The more parts a line has, the smoother the resulting curve will be, but there's no need to go overboard here. It usually doesn't take a lot of parts to end up with an adequate curve.

Once the points have been marked on the lines, label each one with a letter as shown. (Note that each line ends up with the same letters, but the sequences differ.) Then draw a line between each matching letter, for example, A-A, B-B, and so on.

The next step is to draw a line connecting the intersecting points. You can draw this line freehand, or bend a thin piece of wood and use it as a ruler to draw the line, creating a smooth curve between the points. Cut the curve to create a template and use it to trace the curve in the remaining quadrants.

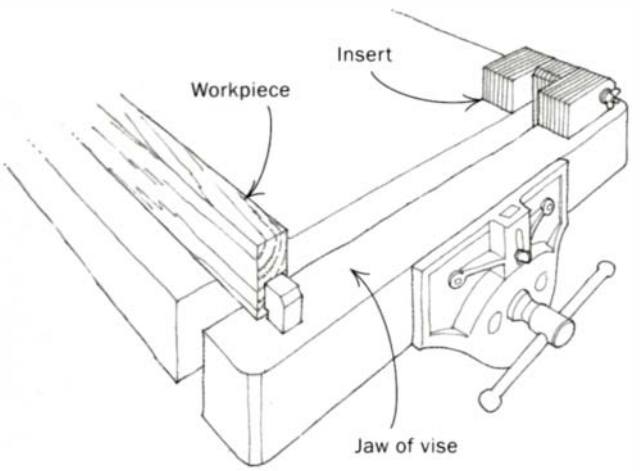
You also can use this technique to make an asymmetrical oval. The procedure is the same, except the marked lines aren't square to each other.

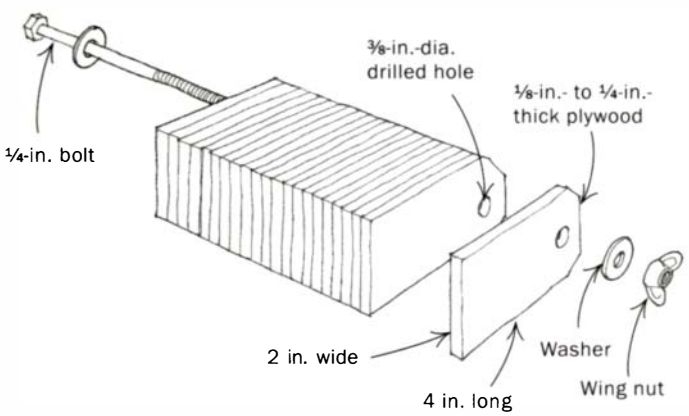
—R.B. Chambers, Richardson, Texas

Vise insert prevents racking

This simple little shopmade gadget prevents my vise from racking when the pressure gets cranked up on one end of the jaw. To make it, start by cutting a couple of dozen ⅛-in.- to ¼-in.-thick plywood scraps, each one 2 in. wide by 4 in. long. Then drill a ⅜-in.-dia. hole near one end of each piece. Fasten the pieces together with a ¼-in. bolt, washers, and a wing nut. After snugging up the vise to the workpiece, pivot the plywood spacers down into position as needed at the opposite side of the vise. With the insert in place, the vise won't rack, even if you tighten it down hard.

—Scott Cullen, Edina, Minn.



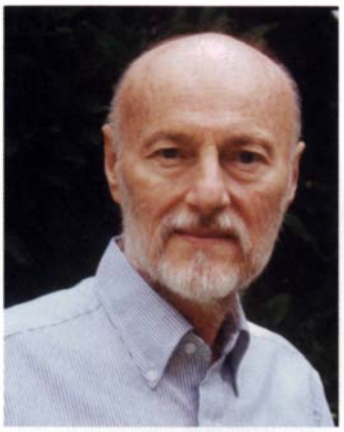


Quick Tip

When grain direction isn't obvious to the eye, dampen a paper towel and lightly rub the surface of the wood with a back-and-forth motion. The moisture causes the grain to rise just enough to catch the fibers of the towel when rubbed in one direction but not the other.

—DAVID FORE, Buffalo Junction, Va.

Jon Arno, 1940-2004



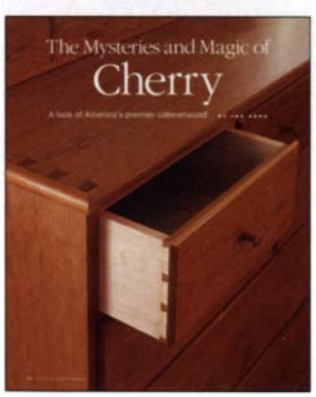
***A long history with* Fine Woodworking.** *Jon Arno's numerous articles stretch back to 1979. His writing about wood penetrated the surface and brought out the subject's character.*

JON ARNO, A RESPECTED AUTHOR and longtime contributor to this magazine, died Dec. 1, 2004, after a battle with cancer. The *Fine Woodworking* staff who worked with Arno, and a much larger world of woodworkers, will miss him.

Arno liked to call himself a wood technologist, and he relished sharing his incredible range of knowledge about trees and the products they provide. In his books and magazine articles, he revealed an encyclopedic command of the subject and a love for language.

As one of many *Fine Woodworking* editors who were privileged to edit Arno's manuscripts, I can testify that he made the job a joy. Except for the occasional misspelled word—he hated the constraints of conventional spelling and even had an eloquent argument against the need for it—the only difficulty was deciding what part of the copy had to be omitted in order to fit onto the pages allotted. (A limited word count was another concept he disdained.)

Arno was associated with this magazine longer than all but a handful of other writers and editors. His first article, a one-page item on mixing and using milk paint, appeared in *FWW* #15 (March 1979). Not long after, he developed his signature niche: writing profiles on many of the species and families of wood. The articles, nearly two dozen in all, made for lively reading. They offered practical advice to the woodworker with an engaging mix of botany, history, and storytelling. Although Arno had been ill for many years, he continued working and writing until recently. His last article for *Fine Woodworking*, "The Mysteries and Magic of Cherry," appeared in issue #169.



ON CHERRY

"Its density, texture, stability, durability, working properties, color, and figure are as beckoning to some woodworkers as a cold beer on a hot summer day."

Arno also wrote two books and contributed to a third. *The Woodworkers Visual Handbook* was published by Reader's Digest in 1995, and *Trees: An Explore Your World Handbook* was published by Discovery Books in 2000. His contributions can be found in *A Guide to Useful Woods of the World, Second Edition* (Forest Products Society, 2001).

ON SYCAMORE

"Late to leaf in the spring, their majestic gnarly branches and patchy, ash-gray bark have led sycamores to be called 'ghost trees.'"

Arno once told me, "I probably had sawdust in my diapers." One of his grandfathers trained as a cabinetmaker in London before moving to Michigan, where he shaped a career building curved staircases. Arno's father started a window-sash business that his mother's family built into a lumberyard and building supply, where Arno worked for many years. He also served as a consultant and gave seminars on furniture styles and wood identification for antiques dealers and museums.

In recent years, Arno became active on Internet discussion boards, including the *Fine Woodworking* Knots site. The technology allowed him to share expertise and ideas with new friends all over the world.

In a Knots posting three days before his death, Arno said a graceful and forthright farewell to his online colleagues: "There really isn't any need for sympathy," he wrote. "I've had a good life, and, while it is doubtful I am going to live much longer, I certainly don't feel cheated…

"It is a disappointment to have to hang it up, but that's just the way it has to be.

"Godspeed to you all. –Jon"

—William Duckworth, associate editor

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A variety of styles. *Mike Roths' Bitterroot China Hutch (above) features cowhide panels and horsehair tassles for drawer pulls. The settee (below) was built by Colorado furniture maker Bob Crutcher.*

Bold designs shine at Western conference

CODY, WYO., IS ABOUT AS FAR AS A WOODWORKER CAN GET from the galleries and studios of New York and Los Angeles. That alone makes it a surprising venue for one of the country's most influential and exciting exhibitions of furniture, fashion, and art.

Each fall, this tourist town at the gateway to Yellowstone National Park hosts the Western Design Conference. The 2004 event featured 80 furniture makers in the field of 100 jury-selected designers and artists. Furniture maker Scott Reitman of Cleveland said the show attracts a high-end clientele of collectors and interior designers, and a broad spectrum of talent. "A lot of the future of Western design is being dictated by what's happening at that show," he said.

Influences on Western design include America's pioneer and cowboy past and its Hispanic and Native American cultures. The style also can include Arts and Crafts or Asian elements.

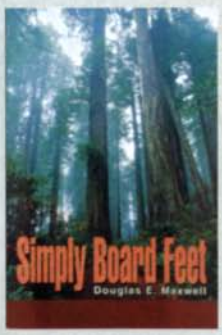
Among the pieces at the 2004 conference was a tall carved cabinet, called the Cody Cabinet (right), by Reitman's company, SAR Furniture. Mike Roths of Bear Paw Custom Woodworks in Stevensville, Mont., presented an enormous rustic cabinet called the Bitterroot China Hutch (above left). It features iron butterfly hinges, a clear varnish finish, and knotty cherry stock. At the other end of the scale was a simple Southwestern settee (left) by Bob Crutcher of Bayfield, Colo. The piece was built of walnut, African mahogany, and maple.

The conference is sponsored by *Western Interiors and Design* magazine. For details on the 2005 conference, visit www.westerndesignconference.com.

—John English, editor of Woodezine, a Web site devoted to woodworking (www.woodezine.com)

Impressive display. *The Cody Cabinet was inspired by the natural beauty of the West and features corner posts of 16/4 walnut carved to look like trees. The 8½-ft.-tall piece, designed and built by Scott Reitman and decorated by master carver Eddie Canano, took more than 600 hours to complete.*

Book Review



Simply Board Feet **by Douglas E. Maxwell. IUniverse Inc., www.iuniverse.com, 2003. $9.95 paperback; 59 pp.**

THIS SIMPLE BUT VALUABLE BOOK consists of tables, with board-feet values tabulated for lumber up to 25½ in. wide, 16/4 thick, and 20 ft. long. Whether you're adding up a stack of rough hardwood at the lumberyard or estimating materials and costs from a project cutlist, this logically organized, thin book does it in seconds. Got a 5/4 board in hand? Turn to that section, flip to the page with the right length on it, and skim down the width column to find the board-foot number.

Next time I go to the lumberyard, this low-tech calculator is coming with me, along with my tape measure, lumber crayon, clipboard, and block plane.

—Asa Christiana, managing editor

Photos, this page: John English (top left, middle left); courtesy of SAR Furniture (top right); p. 24: Timothy Sams

Don't know what to buy the woodworker in your life?

Whether you're a woodworker yourself or shopping for a woodworker, check out these listings for some great products.

Lowe receives 2005 Cartouche Award

PHILIP C. LOWE, A MASSACHUSETTS CRAFTSMAN and teacher known for his prolific conservation and reproduction of early American furniture, has won the 2005 Cartouche Award. The award, presented in January at the Society of American Period Furniture Makers' annual meeting at Colonial Williamsburg, is among the most prestigious of its kind. The prize recognizes lifetime achievement in building, promoting, and teaching about American period furniture.

Art Peters, chairman of the society's advisory committee, said Lowe's craftsmanship "represents some of the finest artistry on the entire planet." He also noted Lowe's teaching and his devotion to historical accuracy in period furniture making.

Lowe, 56, began building and restoring furniture full-time in 1986, after 13 years as a student and instructor at Boston's North Bennet Street School. A master carver and wood turner, and a frequent contributor to *Fine Woodworking,* he has done conservation work on hundreds of furniture pieces, including numerous examples of early New England furniture on display at the renowned Peabody Essex Museum in Salem, Mass.

His waterside shop in Beverly, Mass., also serves as a classroom. At The Furniture Institute of Massachusetts, Lowe offers a two-year program that concentrates on the forms and techniques of traditional American styles.

Among his current projects, Lowe is doing conservation work on a shield-back chair built by William Fisk, with carving by Samuel McIntyre of Salem, Mass., circa 1790.

—Steve Scott, associate editor

Lifetime achievement. *In receiving the Cartouche Award, Lowe was recognized for his devotion to American period furniture.*

HAND TOOLS

Lie-Nielsen debuts first set of chisels

Having made its name producing high-quality handplanes and saws, Lie-Nielsen Toolworks now completes the classic hand-tool trilogy with the introduction of its first chisels.

Patterned after vintage Stanley No. 750 socket chisels (which I have been collecting and using for years), the Lie-Nielsen chisels are more refined and versatile, yet they're every bit as rugged and serviceable. They also have the broken-in feel of well-maintained older tools.

The hornbeam handles are clean and simple, with no bothersome rings or end caps. They also are very durable and easily withstand the blows of a brass mallet or Japanese chisel hammer, which makes for crisp, efficient chopping cuts.

With an average blade length of 3¼ in., the Lie-Nielsen chisels are shorter and easier to control than many longer, European-style bench chisels and are well suited to all sorts of tasks at the bench. The hardy A-2 tool-steel blades are carefully machined, which makes grinding and honing easy. Because the backs are so accurately dressed, I was able to get these chisels honed, flattened, and put to work quicker than any other chisels I've ever used. This by itself makes them a good value, as anyone who has slaved over rusty or poorly machined chisels knows all too well.

The Lie-Nielsen chisels will take an edge that's almost as keen as that of a good Japanese chisel, but they will hold that edge longer. Plus, the new chisels are cheaper and in the long run less fussy to maintain, which is why they have become the everyday chisels of choice in my shop. Without hesitation, I use them for crude tasks like scraping glue, as well as for making delicate, refined paring cuts. At roughly $50 bucks apiece, these chisels are a worthwhile investment.

To find out more, contact Lie-Nielsen Toolworks at 800-327-2520 (www.lie-nielsen.com).

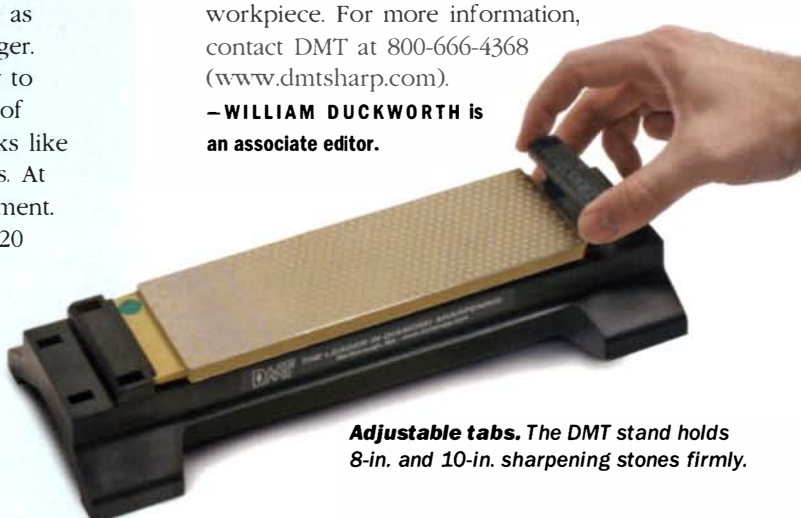
—WILLIAM TANDY YOUNG builds and refurbishes furniture in Stow, Mass.

SHARPENING

STAND LOCKS DOWN DIAMOND STONES

Fans of the two-sided sharpening stones made by Diamond Machining Technology Inc. (DMT), and others who own similarly sized sharpening stones, will be interested in the new Duobase stand, which sells for about $16. This plastic accessory is designed to be used with both the 8-in. and 10-in. DMT DuoSharp stones. While each of the stones comes with a nonslip pad, the Duobase is an improvement because it lifts the stone off the bench, giving you an additional 2 in. of clearance for tasks like flattening the backs of chisels. A molded handle under the base allows you to move the stone over a large workpiece. For more information, contact DMT at 800-666-4368 (www.dmtsharp.com).

—WILLIAM DUCKWORTH is an associate editor.



Adjustable tabs. *The DMT stand holds 8-in. and 10-in. sharpening stones firmly.*

Photos: Rodney Diaz

INDUSTRY NEWS

COMPRESSORS GET NEW HORSEPOWER RATINGS

Several power-tool makers are planning to change their system of horsepower ratings for midsize and small air compressors.

For years, manufacturers have rated and advertised compressors based on peak horsepower—the maximum horsepower a motor is capable of reaching before stalling out. Critics say this system tends to exaggerate a motor's strength because it yields horsepower numbers larger than those encountered in ordinary use.

From now on, manufacturers will rate compressors using "continuous" or "running" horsepower—the maximum power that a motor generates in sustained use.

Companies taking part in the change are Coleman, Campbell-Hausfeld, Ingersoll-Rand, and the division of Black & Decker that includes the makers of Porter-Cable, Delta, and DeVilbiss equipment.

An announcement posted on Porter-Cable's Web site said the change is aimed at making the ratings for small and midsize compressors more consistent with their larger, industrial cousins. Those machines already are rated with the continuous horsepower standard.

According to the announcement, the ratings switch should be completed by March.

—STEVE SCOTT is an associate editor.

BANDSAWS

Laguna's ceramic guides are available for other bandsaws

Ceramic guide-block systems from Laguna Tools are now sold as retrofit kits that can be used on other brands of bandsaws, including Agazzani, Bridgewood, Felder, Jet, Mini-Max, and most saws that have European-style guides. Kits also are available for most 14-in. Delta-style bandsaws.

With the ceramic blocks installed, a bandsaw can run while the blade is in light but direct contact with the guides, without causing any serious heat buildup. This contact between the blade and guides results in very accurate blade tracking. An added advantage is that the ceramic blocks will prevent pitch from building up on the blade when you're sawing resinous woods such as pine or cherry. Setting the ceramic thrust bearing is easy: Simply push the guide lightly against the back of the blade and tighten the setscrew.

Ceramic blocks reduce heat buildup in the blade. *Adjust these guides so that they lightly contact the blade, fully supporting it and preventing twist.*

You can purchase the kits from Laguna Tools (800-234-1976; www.lagunatools.com). Prices start at $240.

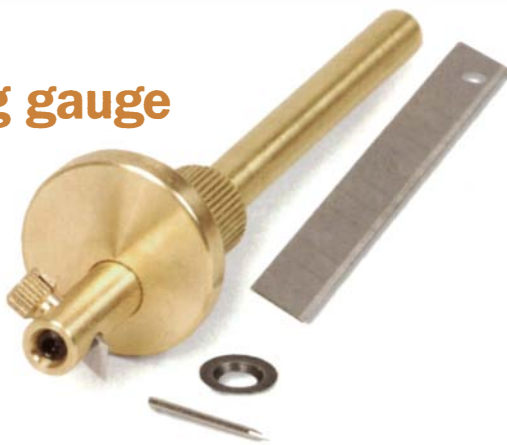
—ROLAND JOHNSON is a contributing editor.

LAYOUT AND MEASURING

Veritas 3-in-1 marking gauge

This compact layout tool by Veritas (613-596-0350; www.leevalley.com) works as a wheel gauge, a cutting gauge, or a conventional pin gauge. A chuck at one end of the stem holds the blade or steel pin and can be swiveled to adjust the cutting angle. The cutting wheel attaches to the end of the stem. The cam-shaped fence can be turned so that it won't rub against the benchtop when marking thin stock, and its shape prevents the tool from rolling. The all-brass tool is small—only 4½ in. overall with a maximum fence-to-blade distance of about 3¼ in. It comes with two pins, a dozen spare blades, and a wheel. At $15.75, it's a lot of tool for the money.

—SCOTT GIBSON is a journalist and woodworker in Maine.



Scribe with or against the grain. *The Veritas marking gauge can be fitted with a wheel, a blade, or a pin, giving the user the choice of marking layout lines perpendicular or parallel to the grain.*

ROUTING

Router bits create 17th-century moldings

Infinity Cutting Tools worked with British furniture restorers to develop a set of router bits based on profiles often found on late 17th- and early 18th-century English furniture. Of course, the original details would have been cut with molding planes, but these router bits can replicate a few of the shapes common to furniture from the William and Mary period, a style popular in Great Britain about 20 years before it came into fashion in North America. Using the bits, you can create profiles typically found on a William and Mary style highboy—the cornice, drawer divider, and waist moldings, in particular.

In the Architectural Profile Set, there are 11 router bits (profiles A through K) of varying shapes and sizes, also available individually for $30 to $60. All of the bits come with ½-in. shanks and two carbide cutters, and they're fashioned from anti-kickback designs. Three bits (profiles A, J, and K) are equipped with ball bearings. For safety, the manufacturer recommends that you use the bits in a router-table setup, not with a handheld router.

For a more detailed look at the shapes, or to buy any of the router bits, contact Infinity Cutting Tools (877-872-2487; www.infinitytools.com).

—PHILIP C. LOWE runs The Furniture Institute of Massachusetts (www.furnituremakingclasses.com).

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Finishing Walnut

Dyes and glazing bring out the best in this traditional hardwood

BY JEFF JEWITT

It's no mystery why so many antiques are made of domestic black walnut: It cuts and sands well, accepts stains without blotching, and can have attractive figure. However, there are two reasons why today's woodworkers sometimes are frustrated with walnut's appearance. Harvesting of smaller trees means that a greater number of boards incorporate sapwood, whose creamy color contrasts with the dark heartwood. Most commercial walnut is steamed and then kiln-dried, which darkens the sapwood but robs walnut of the richer colors seen in air-dried lumber.

To eliminate these problems, I apply dye to blend the sapwood into the heartwood and to give the whole piece a warmer tone. The first dye is sealed, then a second coat of dye provides a rich, deep color. The piece can be finished with a clear topcoat.

Warmer, more uniform color

If you wipe bare walnut with mineral spirits or alcohol, you can see what it will look like with a clear finish. Kiln-dried walnut, either solid or veneer, likely has a grayish color. You also may notice that different boards have contrasting color tones. Linseed oil, varnish, and shellac, because of their natural amber color, mitigate the first problem, but a better way to achieve tonal uniformity is to stain the entire piece.

Apply the base stain—The best way to start making different boards (or a combination of solid lumber and veneer) look more

1 WARM UP THE WOOD WITH A DYE

Staining the whole piece improves the color of kiln-dried walnut and gives different boards a more uniform appearance.

Apply the base stain. *If you apply the stain by hand, use water-based stains because their long drying time reduces the chance of streaks and uneven color.*

Conceal the sapwood

If your piece contains sapwood, the first finishing step is to blend it in with the heartwood. Because the color of heartwood doesn't change drastically over time, you can blend in the sapwood by staining it. Wipe the wood with a damp rag to preview the finished color of the walnut. Blend and dilute one or more water-based dyes, and dip in strips of white paper to judge the tone and intensity of the color. Lightly wipe the dye on the sapwood with a cotton rag; for molded edges or other hard-to-reach areas, use an artist's brush. When you've coated all of the sapwood, wipe the entire surface lightly with a water-dampened rag to blend the dyed area into the heartwood.

Reveal the contrast. *To see how much the undyed sapwood and heartwood will contrast under a clear finish, wet the wood with a damp cloth.*

Apply the dye with care. *Stain the sapwood with a small piece of cloth to ensure that you don't color the adjoining heartwood.*

How to reach small areas. *Use an artist's brush with either a pointed or a chiseled tip.*

Photos: Mark Schofield

2 ADD AGE AND DEPTH WITH A GLAZE

Seal and sand the surface, then apply an oil-based glaze made from boiled linseed oil, gel varnish, and artist's oil colors. The thin coat of color gives wood the appearance of greater depth and emphasizes the grain structure.

Seal the dye with shellac. *After the dye has dried, brush on a thin coat of dewaxed shellac such as Zinnser's SealCoat.*

A shopmade glaze. *You can make oil-based glaze using boiled linseed oil, gel varnish, and artist's oil colors (left). To check the color and translucency of the glaze as you add artist's oil colors, smear samples onto white paper.*

uniform is to apply a base stain to the piece. You can spray a non-grain-raising (NGR) or alcohol-based stain and save application and drying time. A water-based dye applied by hand dries more slowly, but it reduces the chance of streaking.

If you had to blend in the sapwood (see the story on p. 35), wait until that dye has dried and then apply a base stain of golden brown to the entire piece. Dilute the dye to the desired strength. In this case, I used ½ oz. dye to 1 quart water. As when applying dye to the sapwood, use a small piece of cloth to color the large areas and an artist's brush for crevices and corners. To force the dye onto the parts of raised panels within the frame, use compressed air. Using this method will prevent a strip of pale wood from appearing when the panel shrinks seasonally.

Seal in the dye with shellac—After the piece has dried completely, apply a thin coat (1-lb. to 2-lb. cut) of dewaxed shellac. You may want to apply a second coat to end grain to prevent these areas from absorbing the oil-based glaze and becoming too dark. When the shellac has dried, lightly sand the surface with P600-grit (FEPA grade) no-load sandpaper (400- or 320-grit CAMI grade). For moldings, use a gray fine-abrasive pad.

Oil-based glaze completes the transformation

The process of applying stain over sealed wood is called glazing. If you don't like the effect on the color from this step, you can remove almost all of it using mineral spirits without damaging the base stain. (Obviously, it's best to work out your coloring options on scrap first.)

Making oil-based glazes the easy way—Ready-made colored glazes are sold in stores, but I like to make my own because I have more control of the color and there is less waste. You'll need boiled linseed oil, an oil-based varnish, and artist's oil colors.

Sources of Supply

ARTIST'S OIL COLORS
www.dickblick.com; 800-828-4548

DYE STAINS, GEL VARNISH, ABRASIVES
www.homesteadfinishing.com
216-631-5309

Vandyke brown and burnt umber are good colors to start with, and you can use lamp black and red for fine-tuning. Japan colors work almost as well as artist's oils but are a bit weaker in tinting strength.

Mix one part boiled linseed oil and one part varnish. I use gel varnish because it makes the glaze thicker and less likely to run. It also hangs better in nooks and crannies. The glaze for this cabinet was made with ¼ cup (1 oz.) boiled linseed oil, ¼ cup Bartley gel varnish, ½ teaspoon Vandyke brown, ½ teaspoon burnt umber, and ¼ teaspoon deep Azo red. But feel free to experiment. To test the color and translucency of the glaze, simply smear it on a piece of white paper. Keep adding artist's oils until you are pleased with the color.

Apply, then remove the glaze—With an inexpensive natural-bristle brush, generously cover the entire surface with glaze. On relatively small areas like this cabinet, you can glaze the whole door before starting the removal process. Larger surfaces have to be done in sections to prevent the glaze from setting up.

Wipe off most of the glaze with a cloth, leaving a thin film of color on the surface of the shellac. The effect of these two colors,

Brush on and wipe off. *Don't worry about applying the glaze evenly. It is more important to cover the whole surface and to work fast so that the glaze can be wiped off before it becomes tacky. Leaving extra glaze in the recesses replicates the dirt often found on antiques.*

Dry brushing. *To remove surplus glaze from confined areas, use a dry brush and wipe it frequently on a clean cloth.*

the base stain and the glaze, is to create the illusion of depth. The glaze also darkens the pores, emphasizing the grain pattern. You can leave excess glaze in corners and crevices to simulate age.

If certain parts end up noticeably lighter in appearance, let the first coat of glaze dry overnight, then apply a second coat to the lighter areas.

Add a clear topcoat of your choice

Any solvent-based clear topcoat can be applied after the glaze has fully cured in 12 to 24 hours. In keeping with the country-style appearance of this piece, I wanted an open-grain appearance and a satin luster. I chose to wipe on a single coat of Waterlox satin finish, an oil-based varnish. If you wish to use a water-based finish, I recommend first applying a thin-cut coat of shellac to seal the oil-based glaze. □

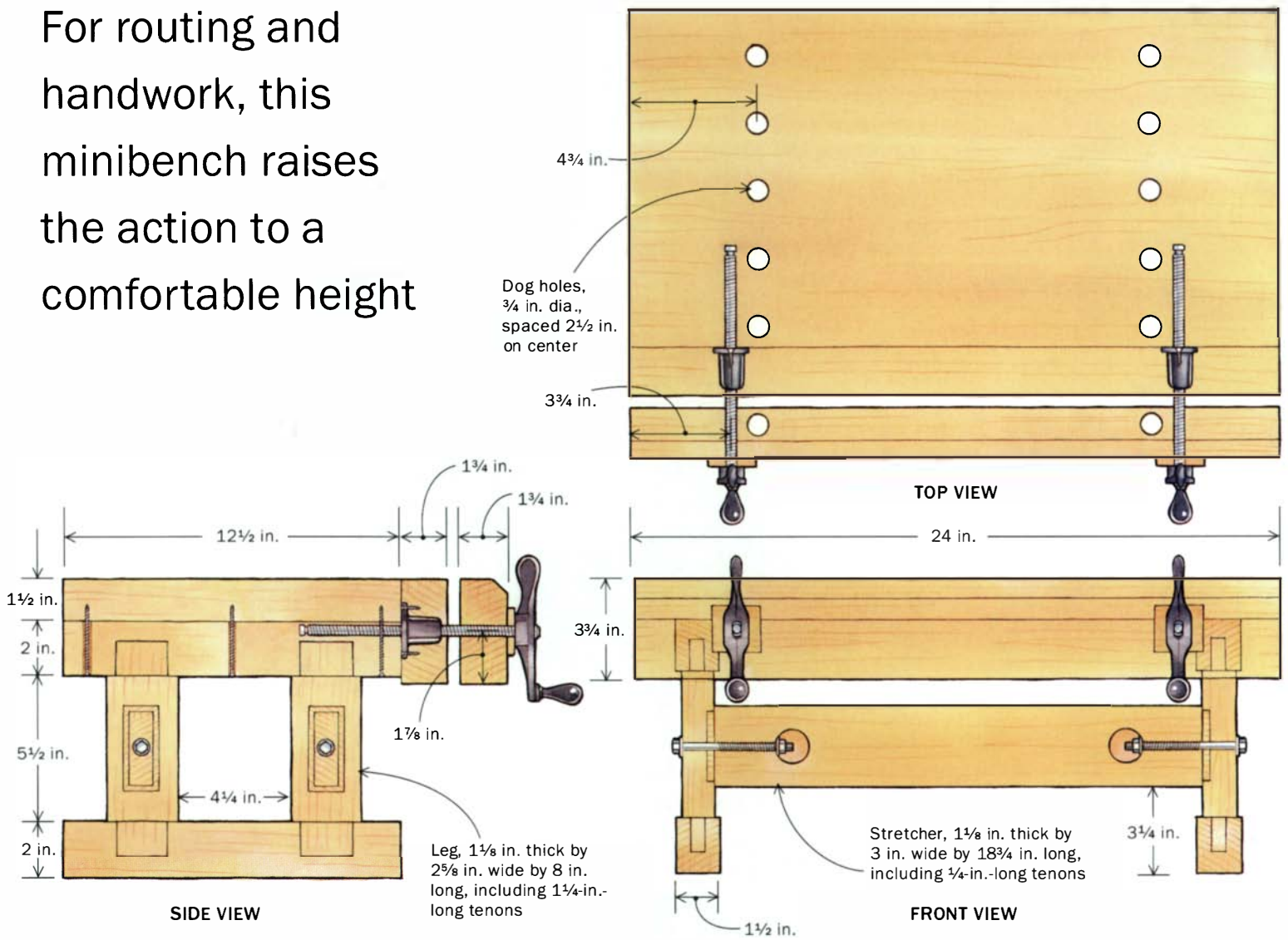
Jeff Jewitt is a frequent contributor of finishing articles to Fine Woodworking.

3 SEAL IN THE COLOR WITH A TOPCOAT

A wipe-on coat of satin finish gives this piece a low-luster, country look.

A Benchtop Bench

For routing and handwork, this minibench raises the action to a comfortable height



ELEVATED BENCH SAVES YOUR BACK

This benchtop bench elevates a workpiece several inches above a regular workbench, so it is more comfortable to do such tasks as cutting, carving, and routing.

Photos: Tom Begnal; drawings: Stephen Hutchings

BY JEFF MILLER

Woodworking benches are designed to place a workpiece at a height that's ideal for handplaning. But the perfect height for planing often is too low for other common bench tasks. For example, when routing, carving, cutting dovetails, or doing layout, I frequently have found myself bent over at an uncomfortable angle so that I could see clearly and work effectively. When performing these tasks, I like to have a workpiece positioned 6 in. to 10 in. above my waist level.

To bring a workpiece to my ideal height range, I made a small workbench that mounts quickly to my regular bench. When extra height is needed, the minibench effectively raises the worksurface to my comfort zone. The bench is easy to move, stores nicely under my bigger bench, and includes a vise that provides plenty of holding force. I made the bench out of maple, but any hard, dense wood will work.

finewoodworking.com

Visit our Web site to see the author demonstrate the benchtop bench.

Trestle design is simple yet strong

I wanted the benchtop bench to be as sturdy as my regular bench. I settled on a trestle-table design, which ensured a solid bench and simplified construction.

Begin by making the top. It can be sized to suit individual needs, but as a general rule, keep the top small enough to be moved without back strain. Joint and edge-glue the stock, then use a handplane and scraper to level and smooth the surfaces. Cut the piece to width and length.

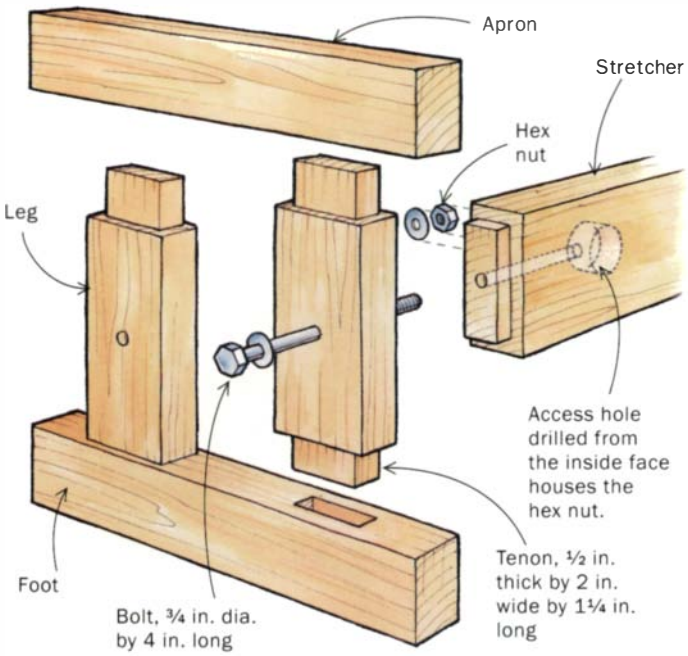
Next, mill the stock for the trestle base. I chose a mortise-and-tenon joint to connect the legs to the aprons and feet, but half-lap joints would work well, too. Cut mortises in the aprons and feet for the legs, then cut shallow mortises centered on the inside faces of the legs to locate and solidify the bolted joints with the stretchers. Cut and fit the tenons on the legs and the stretchers. The stretcher tenons will not be glued, so it's especially important that they fit without any slop. Now is a good time to drill the ⅜-in.-dia. bolt holes centered on the legs.

The trestle base is screwed to the top through three countersunk holes in the bottom of each apron. Elongate the center and rear holes to allow for the expansion and contraction of the top (see the left drawing on the facing page). To

TRESTLE DESIGN MAKES FOR A STURDY BENCH

BASE ASSEMBLY

The trestles and stretchers are assembled using mortise-and-tenon construction, giving the benchtop bench solid footing.



Glue up the trestles, then attach the stretchers. *A long bolt connects the end of each stretcher to the trestles. Note the access hole in the stretcher.*

glue up the trestles, spread glue in the mortises and very lightly on the tenons, push the parts together, then clamp up. Check for square and adjust, if necessary.

The stretchers need to be drilled for the bolts that will hold the base together. Use the bolt holes in the trestle legs as drill guides. Dry-assemble the base and clamp it together, but leave access to the bolt holes. Be sure to drill to depth straight; use a self-centering dowel jig, if you need to.

Mark the locations for the hex-nut access holes on the inside faces of the stretchers. Drill with a 1¼-in.-dia. Forstner bit to within 3⁄16 in. of the outside face of each stretcher. The hex nuts and washers go into these holes.

Vise adds versatility

The front vise makes it easy to clamp a workpiece either to the front of the bench or on top of it. While I wanted the vise to be simple and easy to make, I also needed it to accept wide boards for dovetailing carcases. As it turned out, a couple of veneer-press screws satisfied both requirements.

Mill the vise jaw and the bench face to their designated thicknesses, then cut them to the same width and length. Mark the locations for the veneer-press-screw holes on the inside of the bench face. Clamp the vise jaw and bench face together and drill through the bench face into the jaw with a ⅛-in.-dia. drill bit. This hole helps align the hole for the veneer-press nut with the one for the screw. Check the dimensions of the veneer-press screws. I used a (roughly) ⅝-in.-dia. screw, with the outside of the veneer-press nut measuring about 1 in. dia., although it tapered slightly. Drill the hole for the screw in the vise jaw, and the hole for the nut in the bench face. The end plate that comes with each screw will not be used. You can remove the plate simply by loosening the mounting screw.

Enlarge the hole for the veneer-press nut, concentrating on the end of the hole nearest the benchtop. Tap the nut into place to check your progress. (The paint on the nut will rub off when it is tapped in place, leaving a clear picture of the areas that need relief.) You can remove the nut by threading the veneer-press screw into place and then tapping the end of the screw (not the handle) with a mallet.

Once the nut fits, trace the outline of the flange onto the inside of the bench face. Rout away enough wood to allow the nut, and the screws that will attach it to the face, to sit flush with or slightly below the surface. Screw the nuts into place.

Clamp the bench face into position so that the top edge is flush with the benchtop, and screw the two outermost screws into place (drill and countersink pilot holes first). Turn over the benchtop and check where the veneer-press screw will come through the face. Depending on the size of your bench, you may have to rout a channel on the underside of the benchtop for the veneer-press screw. Mark exactly where the channel will be, then remove the bench face to rout

Hardware Sources

VENEER-PRESS SCREW

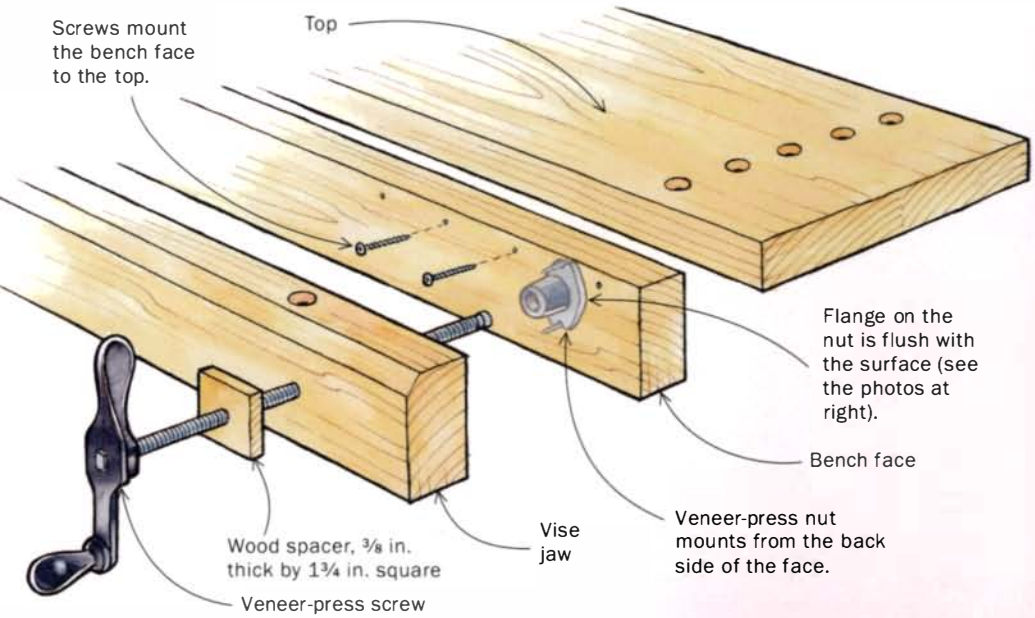
BENCH PUP

Lee Valley Tools
800-871-8158
www.leevalley.com

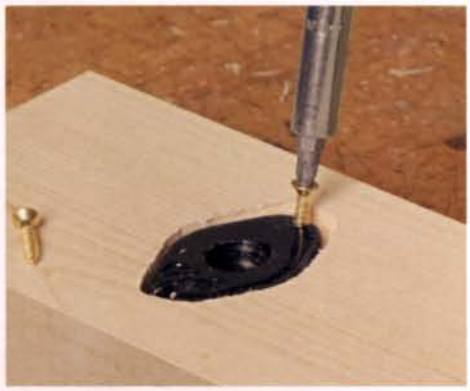
Woodcraft
800-225-1153
www.woodcraft.com

VISE ASSEMBLY

Before attaching the bench face to the benchtop, drill the holes for the veneer-press screws and install the hardware. The screws will close the vise jaw, but you'll have to pull it open manually.



Inset the veneer-press nuts into the back of the bench face. *Trace the flange profile (above) and rout a recess to set the nut flush with the stock. Secure with screws (below).*



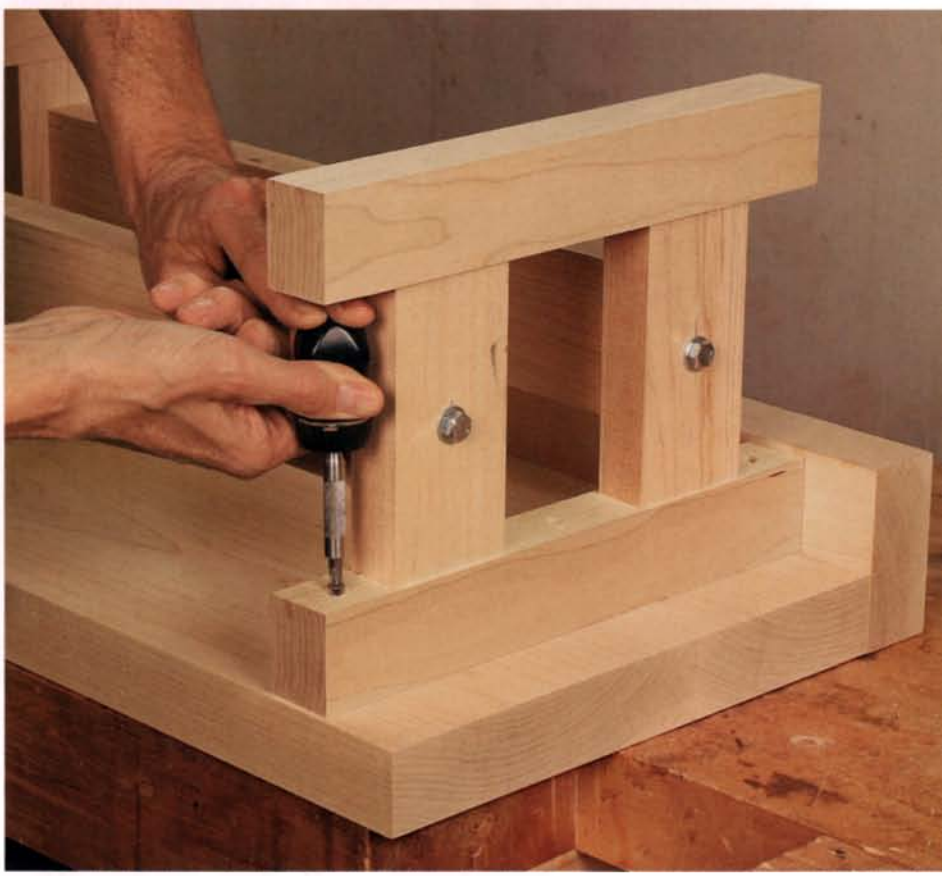
the channel. Reattach the face, and try to thread the vise screw into place. Remove more wood as necessary.

The veneer-press-screw handles will need more clearance to operate easily. Glue wooden spacers, roughly ⅜ in. thick by 1¾ in. square, over the veneer-press-screw holes. Run the bit you used to drill these holes through the spacers from inside the jaw. The vise jaw will not open automatically when you loosen the veneer-press screws. You can pull it open manually, or refine the vise with two modified ⅝-in. drill-bit stop collars or shaft collars. The bore of the collars might have to be enlarged to fit on the veneer-press screw. A machine shop can do this for you, or you can file it by hand.

Benchdogs boost performance

The addition of Veritas Bench Pups allows me to hold a workpiece on top of the bench. Lay out the positions for holes in the benchtop and the vise jaw, being careful to avoid the area over the veneer-press screws and the apron of the base. Bore ¾-in.-dia. holes and insert the Bench Pups. The benchtop holes are best drilled on the drill press, with the bench face removed.

Reattach the face when everything is positioned properly and works smoothly. Apply glue to the mating surfaces, then add the screws. Finally, mount the base to the top by driving screws through the holes in the aprons. □



Attach the base. *Mount the top to the base by driving three screws through holes (two slotted, one round) in each apron.*

Jeff Miller runs a custom furniture shop in Chicago, where he also offers woodworking classes (www.furnituremaking.com).

Six Essential Glues

BY SCOTT GIBSON

These adhesives handle most furniture-making needs

PVA

Versatile workhorse good for general assembly work and joinery

CYANOACRYLATE

Best for quick repairs of defects, such as cracks, small knots, and slivers

POLYURETHANE

Ideal for laminations, edge joints, and outdoor furniture

EPOXY

Good for laminations, outdoor furniture, and when a structural gap-filling bond is needed

Photo, above: Rodney Diaz

UREA FORMALDEHYDE

Good for veneering and bent laminations

HIDE GLUE

Excels at veneering and repairing period furniture and musical instruments

When I first started making furniture, I thought the chances of glue alone holding a piece of furniture together were pretty slim. Wouldn't it be a good idea, I wondered, to sneak in a few nails or screws to reinforce joints that otherwise would surely fail? But I learned that woodworking joints don't fail very often, and when they do, it's usually not the glue that's to blame.

Most woodworkers have their favorites, but few rely on a single type of glue, and for good reason. The many glues to choose from have characteristics that make them especially well suited to one job or another. Taking into account a wide range of woodworking applications, I've chosen six types of glue that will be useful in many shops: polyvinyl acetate (PVA) or yellow glue, polyurethane, two-part epoxy, cyanoacrylate, hide (both forms, dried and liquid), and urea formaldehyde (both types, one-part and two-part).

The bonding strength of each glue is derived from standard industry tests and ranges from 2,500 to 4,000 psi in shear. All of the glues are more than strong enough for general woodworking and furniture making, so to determine your choice, consider other properties such as shelf life, open time, clamp time, structural gap-filling properties, and pot life. Open time is the length of time that glued components can be left open to the air before they must be assembled. Each glue has a limited shelf life, which can be shortened by exposure to air, moisture, or heat. How long glue can sit around and still work as advertised varies from six months to several years. Two-component glues such as epoxy and urea formaldehyde also have a pot life, or the amount of time that the adhesive remains usable when left in its mixing container.

All glues differ in their levels of toxicity; if in doubt, get a Material Safety Data Sheet (MSDS) from the manufacturer for more information (these documents also are accessible on the Web).

Scott Gibson, a contributing editor to Fine Homebuilding, *is a freelance writer, photographer, and woodworker living in Maine.*

Photos, except where noted: Marcia Ryan

PVA
The reliable shop workhorse

BEST USES	General furniture making and woodworking
OPEN TIME	5 to 10 minutes*
CLAMP TIME	30 to 60 minutes, depending on humidity, temperature, and wood species
WATER, HEAT, AND SOLVENT RESISTANCE	Water resistance varies; standard formulations lose 50% of strength at 150°F; good solvent resistance
CLEANUP	Water
HEALTH AND SAFETY	Low toxicity; however, the small amount of vinyl acetate in yellow glue is considered a possible human carcinogen when inhaled
SHELF LIFE	1 to 4 years
COST	About $5 for 16 oz.

*Some specialized formulas offer longer open times.

Apply PVA to mating surfaces. *Once a mortise-and-tenon has been dry-fitted, use a stick to apply glue on the mortise walls.*

Work quickly. *PVA has a short open time. Once you've applied glue to all of the appropriate surfaces, promptly assemble the joint.*

Wait for the glue to set. *Squeeze-out is best removed after about 30 minutes, before the glue gets too hard.*

Yellow glue (also known as PVA glue) comes close to being an all-purpose adhesive for furniture making. Clamp times are short, and the glued-up components can be worked on in an hour or less if you're careful.

Yellow glue is great for biscuit joinery because the water in the glue swells biscuits rapidly and locks them in place. Yellow glue also is good for snug assembly joints, such as dadoes, mortise-and-tenons, and dovetails. Cured yellow glue has a certain amount of plasticity, which allows the wood in the joint to expand and contract without fracturing the bond line. Although the glue can fill small hairline gaps, joints must fit well overall for a strong bond.

Yellow glue is ideal for rub joints, in which a workpiece is glued in place simply by coating one surface and sliding the wood back and forth to create a vacuum—no clamps are needed. Yellow glue also acts as a lubricant while assembling dovetail joints. Apply yellow glue to the inside surfaces of the tails and to the top inside edges of the pins and then slide the joint together.

For all of its positive attributes, yellow glue has a few drawbacks. Standard formulations don't have much water resistance and can creep—that is, slowly stretch under long-term loads. That's why yellow glue is a poor choice for bent laminations whose members will be highly stressed.

Also, yellow glue has a short open time, which can be problematic. For instance, during big, complicated glue-ups, there may not be enough time to align and adjust all of the parts and pieces before the glue starts to set.

Uncured yellow glue cleans up with water. However, using water to clean up squeeze-out can fill pores with diluted glue and interfere with the finish. It's better to wait until the glue becomes rubbery and then scrape it off. Prior to applying a finish, dampen a rag with acetone or denatured alcohol and wipe areas where squeeze-out was removed to reveal any remaining glue, which then can be scraped off easily.

Not all yellow glues are created equal. There is a wide choice of formulations, with various grades of water resistance and chalk temperatures—the point at which the glue no longer bonds. If yellow glue turns white on a workpiece, it means the shop temperature probably has fallen below the glue's chalk temperature, and the bond will not be reliable.

Photo, this page (top): Rodney Diaz

Polyurethane

Long open time and good water resistance

BEST USES	Complicated assemblies; laminations, flat or bent; bonding hardware; outdoor furniture
OPEN TIME	15 to 20 minutes
CLAMP TIME	4 to 6 hours
WATER, HEAT, AND SOLVENT RESISTANCE	High water, heat (up to 360°F), and solvent resistance
CLEANUP	Soap and water, acetone, or denatured alcohol
HEALTH AND SAFETY	Contains polymeric MDI, a strong sensitizer that may provoke allergic reactions; stains skin; do not use if you have asthma or other chronic respiratory problems; work in a well-ventilated area; wear protective gloves and safety glasses
SHELF LIFE	1 year
COST	About $13 for 16 oz.

With its long open time, polyurethane often is the first choice for complicated glue-ups involving many parts and pieces. Thanks to its high water resistance, polyurethane can be used with confidence outside. Also, it's good for bonding dissimilar materials.

Polyurethane is more creep resistant than yellow glue, so it's a good choice for gluing up laminations, bent or flat. It also works well in edge joints because it forms a thin glueline.

As it dries, polyurethane glue expands into a messy pale brown froth, so don't use any more than you have to. Although it will fill minor voids, the glue doesn't have structural gap-filling properties. The best way to clean squeeze-out is to wait until the glue is thoroughly dry, then scrape or chisel away the excess.

Polyurethane also can stain the skin, so be sure to wear a pair of latex gloves when using it. Another disadvantage is cost. Polyurethane is more expensive than yellow glue, but its bond strength is roughly the same.

Without moisture, a glue joint made with polyurethane may fail. Polyurethane works best on wood with a moisture content of 10% to 25%. In general, dampen the surfaces of the assembly with water a few minutes before applying the glue.

Moisten mating surfaces. *Polyurethane glue needs moisture to cure, so use a damp cloth to wipe down both surfaces if using hardwood.*

Apply glue sparingly. *Polyurethane glue creates a very thin bond line, but squeeze-out will foam up when exposed to air.*

Wait six to eight hours before cleaning up squeeze-out. *Once hardened, polyurethane foam is removed easily with a chisel.*

Photo, this page (top): Rodney Diaz

Epoxy

Versatile, gap-filling, and waterproof

BEST USES	Complex glue-ups; outdoor furniture; bonding hardware; structural gap-filling repairs
OPEN TIME	Pot life of 4 to 50 minutes; depending on the temperature and type, open time of 5 to 30 minutes
CLAMP TIME	45 minutes to 15 hours
WATER, HEAT, AND SOLVENT RESISTANCE	Impervious to water; stable in temperatures under 200°F; susceptible to softening with continuous exposure to alcohol, acetone, or lacquer thinner
CLEANUP	Lacquer thinner, acetone, denatured alcohol
HEALTH AND SAFETY	Skin contact with resins and hardeners can cause chronic health problems; avoid inhaling vapors of uncured epoxy; never breathe dust from partially cured epoxy; wear gloves, safety glasses, and a respirator while mixing
SHELF LIFE	At least 3 years for the resin; 2 years for the hardener
COST	About $19 for 16 oz.

Two-part epoxy is a finicky glue but offers a kind of precision and predictability that no other woodworking glue can match. Epoxy is a thermoset plastic that cures to a solid as the result of a chemical reaction between a resin and a hardener when these contents are mixed.

Epoxy is versatile, and you can alter the mixture as circumstances require. With a range of different resins and hardeners, you can change open and cure times as well as the viscosity of the glue. Switching from a fast hardener to a slow hardener can double the glue's pot life. Heat also can play an important role in altering the working properties of epoxy. Higher temperatures speed cure times, and cooler temperatures slow them down. Another advantage of epoxy is that you can add thickening agents to help the glue fill gaps and to make it less likely to drip.

Like polyurethane, epoxy has a long open time, making it ideal for lengthy and complex glue-ups, such as case pieces. Epoxy doesn't shrink when it dries and so is the best glue to use when structural gap-filling properties are needed: It can be used to repair damaged wood or to compensate for badly fitting parts in new construction.

Fast-setting five-minute epoxy is especially suited to filling gaps. Mixed with sawdust, five-minute epoxy can be used to fill holes and can be colored to match a stain or tint. However, it does have a lower shear strength than conventional epoxy.

Exposed to temperatures below 200°F, epoxy doesn't exhibit much creep, so it can be used to form bent laminations in furniture. Keeping individual plies as thin as practical will help reduce stress in finished

A two-component glue. *The pumps on the resin and hardener make it easy to measure the right amounts every time.*

Ideal for oily woods. *Epoxy will provide good bonding and plenty of strength for this lap joint made with teak stock.*

Photo, this page (top): Rodney Diaz

Metal meets wood. *Epoxy forms a strong bond between dissimilar materials.*

Filling knots with sawdust and five-minute epoxy. *Not only does the glue secure the knot, but also it fills the gap and will accept tints and finishes.*

components, such as a stretcher on a table or chair or a curved handle.

Cured epoxy is unaffected by water, making it the glue of choice for projects that will be exposed to water, such as in boatbuilding. Epoxy also excels at bonding dissimilar materials, such as aluminum or steel to wood; some brands are specially formulated to work on oily woods such as teak and rosewood.

On the downside, epoxy is expensive and unforgiving. Its resin and hardener components must be proportioned exactly and mixed carefully. Even though metered pumps make mixing easier, they waste glue when you need only a very small amount.

Cyanoacrylate

Small jobs at warp speed

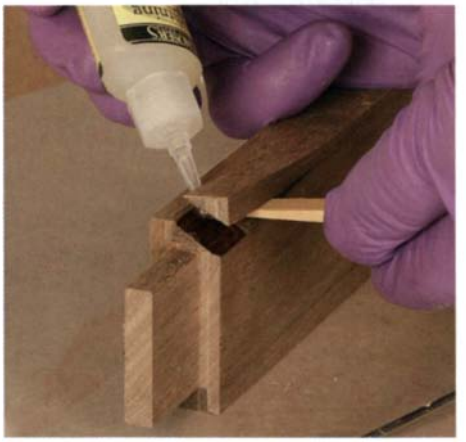
Cyanoacrylates are special-purpose adhesives. They are not designed as all-purpose woodworking glues, but they do create an almost instantaneous bond between porous surfaces. That makes them useful for repairing cracks, bonding small knots, and reattaching slivers of wood. And you can work the wood immediately after the repair.

The fast bonding times of cyanoacrylates allow them to be used to attach temporary glue blocks to hard-to-clamp furniture components, such as chair parts. Apply cyanoacrylate to a block of softwood, spritz the chair part with an accelerator, and stick the two together. When the blocks are no longer needed, break them away with a rap of a hammer.

Cyanoacrylates are available in several viscosities. They cure with the help of moisture in the wood and work at just about any temperature. Open times are extremely short, but lower temperatures lengthen the curing time. Although parts are firmly bonded after the glue is applied, a full cure takes overnight.

Keep a bottle of a proprietary debonder or acetone on hand for when the cyanoacrylate glue gets on your fingers. Debonder will soften hardened glue and allow attached items to be pulled apart.

BEST USES	Quick repairs of small pieces; glue blocks for temporary clamping
OPEN TIME	Less than 1 minute
CLAMP TIME	Less than 1 minute
WATER, HEAT, AND SOLVENT RESISTANCE	Low water resistance; begins to soften at 200°F; softens with exposure to acetone
CLEANUP	Proprietary debonder or acetone
HEALTH AND SAFETY	Avoid contact with skin and eyes; breathing fumes at high concentrations may irritate eyes, nose, and lungs; wear protective gloves and safety glasses
SHELF LIFE	1 year; longer when stored in a refrigerator
COST	About $10 for 2 oz.



Cyanoacrylates need very little setting time. *Within a minute of making a quick repair, you'll be able to go back to work.*

Accelerators speed up the already fast-bonding glue. *No clamps are needed when using an accelerator.*

Photo, this page (top right): Rodney Diaz

Hide Glue

Preferred by traditionalists

BEST USES	Applications where reversibility is an advantage, such as musical instruments, period furniture, and hammer veneering
OPEN TIME	10 minutes for liquid; temperature-dependent for dried
CLAMP TIME	Up to 12 hours for liquid; less for dried
WATER, HEAT, AND SOLVENT RESISTANCE	Low moisture and heat resistance, excellent solvent resistance
CLEANUP	Water
HEALTH AND SAFETY	Relatively low toxicity; can cause skin irritation; dust inhalation may irritate throat and respiratory track
SHELF LIFE	Indefinite for dried glue, unless exposed to moisture; 1 year for liquid form
COST	About $10 for 1 lb., dried; about $9 for 10 oz., liquid

Dried hide glue needs water and heat. *A dedicated glue pot will keep the glue at the optimum temperature of 140°F.*

Hide glue starts to set as it cools. *Apply glue on both bonding surfaces, the substrate (above) and the underside of the veneer.*

Unlike any other woodworking adhesive, hide glue is prized for its ability to come apart as much as it is for holding pieces together. Cured hide glue makes a long-lasting bond that resists solvents, but it has low resistance to moisture and heat. Because the bond can be coaxed apart with water and heat to allow for repairs, hide glue is the choice of many woodworkers who build or repair period furniture and musical instruments. Hide glue also is used for hammer veneering, a traditional hand technique that doesn't require a vacuum, clamps, or presses (see the photos at right).

Hide glue, a protein-based adhesive made from cow hides, is available in a ready-to-use liquid or in a dried form that must be mixed with water and heated before it can be used.

Dried glue comes in pearl or ground form, with the latter generally being of better quality; pearl glue is sometimes made from bones instead of hides. Open times can be lengthened or shortened by increasing or lowering the temperature and by altering the proportion of water to glue. Also, adding urea, a gel depressant available at garden-supply stores and online, increases open times but weakens the glue.

Hide glue can be heated and cooled a number of times before it should be discarded (you'll know when it's time by the bad odor caused by bacteria). Bacteria growth can be inhibited by adding 0.1% household bleach.

Liquid hide glue, which contains urea, stays in liquid form at room temperature, making it easier to use than the dried form. It has a shelf life of about one year (look for a date on the label or on the container itself). When in doubt, try gluing together two blocks of wood and then banging them apart with a hammer. If the bond is hard to break, the glue is fine.

Rub the veneer with a veneer hammer. *The glue on the veneer acts as a lubricator. Starting from the center outward, apply steady pressure with the edge of the hammer.*

Photo, this page (top): Rodney Diaz

Urea Formaldehyde

Performs well under stress

BEST USES	Veneering; bent laminations
OPEN TIME	Pot life of several hours; depending on temperature and mix, open time of 5 to 30 minutes
CLAMP TIME	Up to 13 hours for one part powdered; up to five hours for liquid
WATER, HEAT, AND SOLVENT RESISTANCE	Excellent solvent and water resistance; unaffected by heat up to 180°F
CLEANUP	Water
HEALTH AND SAFETY	Contains formaldehyde, a skin and lung irritant and a possible human carcinogen; wear protective gloves, safety glasses, and a respirator while mixing and using
SHELF LIFE	Up to 1 year; decreases in warm temperatures
COST	About $6 for 1 lb., dried; about $30 for 1 gal., liquid

Urea-formaldehyde glue has a long pot life and yields a rigid, high-strength bond that resists water and solvents, making the glue especially good for bonding wood veneer and gluing bent laminations. Gluelines won't creep and should not be affected by temperatures up to about 180°F.

Urea formaldehyde is available as a precatalyzed powder that's mixed with water and as a two-part adhesive consisting of a powdered catalyst and a liquid resin. Both types take a relatively long time to cure and need shop temperatures of at least 65°F to work properly. Ideally, wood should have a moisture content of between 6% and 10% for the one-part type and between 6% and 15% for the two-part type.

Like epoxy, urea formaldehyde is dramatically affected by temperature. According to one manufacturer, DAP Inc., pot life is four hours at 70°F but only about 30 minutes at 100°F. At 70°F, the clamp time is 13 hours, but it drops to five hours at 90°F.

Urea formaldehyde is more toxic than many other glues. Formaldehyde is a possible human carcinogen. It's also an irritant to the skin and lungs and a skin sensitizer that can lead to dermatitis with repeated contact. You should wear a respirator and protective gloves when mixing and using this type of glue.

The sale of urea-formaldehyde glue is prohibited by a small number of local authorities around the country. If you want to find out whether the glue is permitted in your area, call DAP Inc. at 888-327-8477.

Prepare water and powder quantities separately. *Add powder to a portion of the water, then add the remaining water.*

Apply a thin layer of glue. *When gluing up laminations, apply glue to only one face of each piece.*

Clamp from the center out. *When clamping the glued-up lamination, apply the clamps sequentially from one point outward.*

Photo, this page (top): Rodney Diaz

Fortify Your Joinery

Hidden corner blocks add great strength where it's needed

BY GARRETT HACK

Repairing furniture has taught me many lessons about what joints, woods, and techniques survive decades of use. One technique I see often in well-made work is the use of corner blocks to strengthen connections or hold parts in position. Often you'll find these small blocks glued behind bracket feet and crown moldings or under drawer bottoms and chair seats.

Corner blocks are simple, but for them to be effective, it's important to choose the right wood, use the right glue, orient the grain direction appropriately, and allow for wood movement.

White pine, poplar, and basswood are my first choices for most corner blocks because they shape easily and provide adequate strength. For chairs, I prefer cherry, walnut, or mahogany blocks, which are harder woods but still can be fitted easily with planes and chisels. With the exception of an occasional brad or screw to hold a block in position, corner blocks planed to fit can be glued into place using a rub joint. Apply glue and rub the block back and forth until the glue grabs, holding the block in place—there's no need for clamps. I use yellow glue because it is strong, grabs quickly, and allows a tiny bit of creep or movement. I try to orient the grain of the block in the same direction as the grain of the wood to which it's attached, but sometimes one face of the block will be joined across the grain. In these cases, glue with a little flexibility is useful.

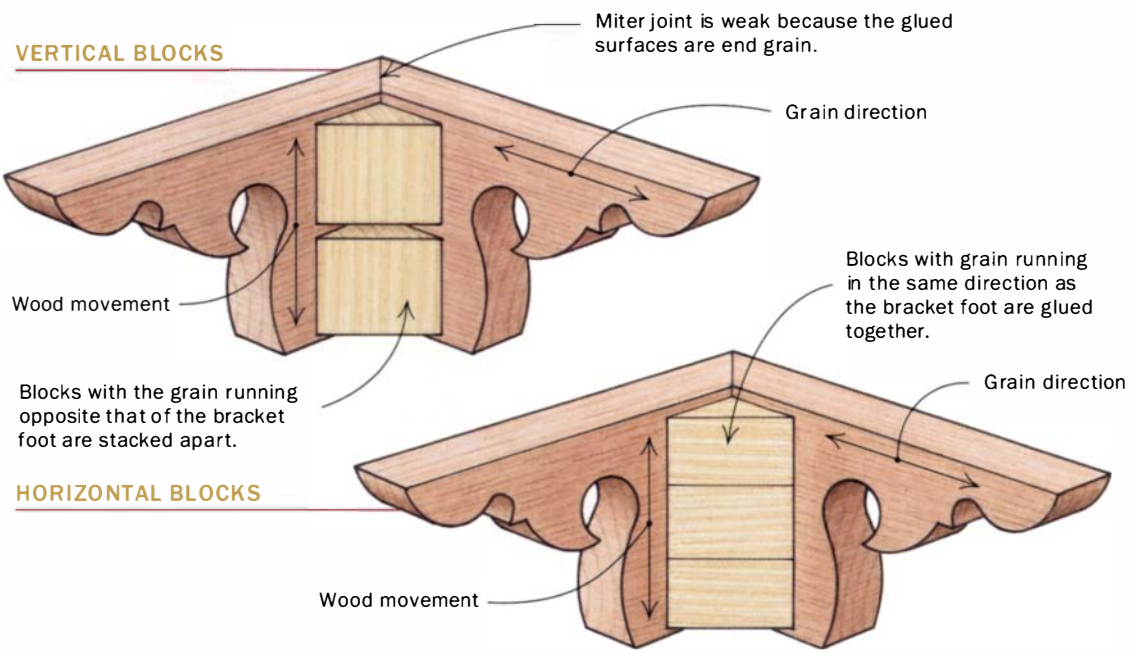
I think of corner blocks as points of strength, spaced apart from each other in much the same way as I use screws or nails. The short length of corner blocks, between 2 in. and 3 in., makes them easy to fit, especially when shaped into curved places. More important, compared with screws or nails, short blocks are less affected by wood movement in the piece to which they're attached.

Blocks reinforce case-work joinery

Typical case-work construction is full of joints and other places suitable for corner blocks. I have seen case tops secured by corner blocks alone that are still holding after a century or longer. While I wouldn't use corner blocks in this manner (too much potential wood movement on all but the smallest tops), they are ideal for

Two ways to strengthen bracket feet

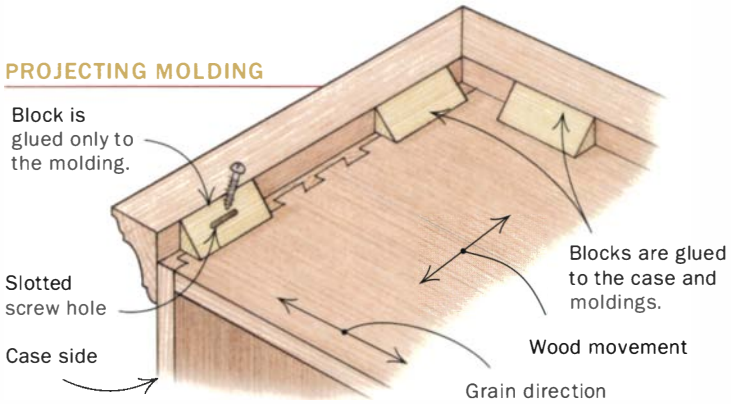
Corner blocks for bracket feet can be made of white pine, poplar, or basswood. The grain of bracket feet generally runs horizontally, and the grain of corner blocks can run either vertically or horizontally.

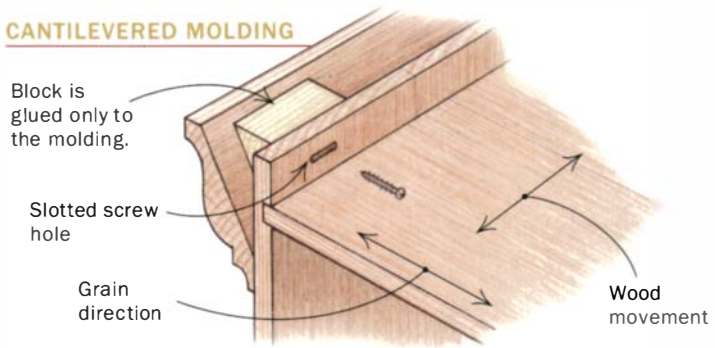


Photos, except where noted: Marcia Ryan; this page: Mark Schofield; drawings: Vince Babak

Short blocks support moldings at the top of a casepiece

Corner blocks strengthen the joinery between the case and large moldings. Blocks at the front of the case are glued to the case and molding; at the rear of the sides, they are glued only to the molding and secured with screws in slotted holes to allow for movement.





reinforcing bracket feet, the knees of cabriole legs, or the connection of the base to the case.

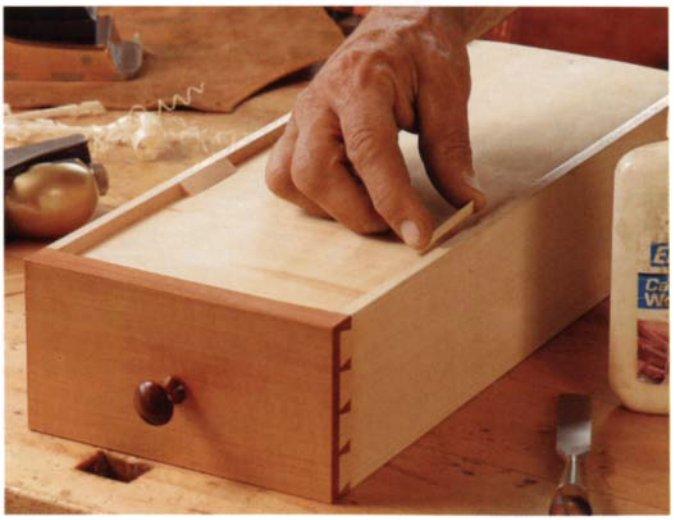
Attractive bracket feet often are mitered at the corners with the grain running horizontally, making for a weak joint. Vertical-grain legs, as in the butternut chest on p. 50, are only slightly stronger because the glue surfaces of the miters are long grain.

Corner blocks behind a bracket foot can run horizontally with the grain of the foot or vertically against it (see the drawings on p. 51). Run horizontally, the blocks can be stacked and glued together so they shrink and swell along with the foot; however, the glued surfaces are weak short grain. Run vertically, the blocks are strong because the glued surfaces are long grain. But you need to keep the blocks short and spaced apart so that each can move as the foot shrinks and swells. I tend to run blocks vertically because they are easier to fit.

Corner blocks also can strengthen the connection of base to case, or bottom to case sides (see p. 50). Where the sides and bottom meet and the corner blocks run cross-grain, the blocks must be short enough, about 2 in., to stay attached as the wood under them shrinks or swells.

Small blocks brace drawer bottoms

Corner blocks can be glued to the underside of drawers to provide rigidity to the sides and to keep the bottom secure in its groove.



Blocks are used to attach molding

When designing crown molding for a cabinet, I often include a bead or a similar detail to hide the brads used to attach the molding. However, brads alone are not sufficient support for a large molding, or even a smaller one, that projects above the carcase top. Corner blocks are an ideal way to strengthen this connection as well as any joints in the molding.

Photo, this page (top): Mark Schofield

Thick blocks reinforce chair rails

Made of cherry, walnut, or mahogany, corner blocks add considerable strength to a chair. These blocks generally are glued and screwed into place (right).

FITTING A BLOCK TO CURVED RAILS

Slip a piece of carbon paper between the block and the rail, and shift the block slightly to mark any high spots (top left). Then remove those spots with a block plane (left).

Run the grain of the blocks in the same direction as the molding. Grain movement is a concern only along the sides of very deep cases, where the molding runs cross-grain. Instead of gluing blocks to the case top, use screws in slotted holes, and glue only the joint between the blocks and the molding (see the drawings on the facing page).

To avoid wasting expensive, thick stock, crown molding often is cut out of a board or built up of separate parts and therefore must be angled (or cantilevered) away from the case. Corner blocks, cut to fit between case and molding, help secure the molding at the proper angle and greatly strengthen the connection.

Blocks stabilize deep, narrow drawers

A well-engineered drawer shouldn't need corner blocks, although I have seen the underside of drawers with many blocks stuck between sides and bottom and between drawer face and bottom. In these cases, the drawer sides and face were quite thin, and the groove holding the bottom was too shallow or worn to hold it securely.

On small drawers, especially deep, narrow ones with thin sides that can flex in or out slightly, the addition of a few tiny corner blocks under the bottom and against the sides will make the drawer more rigid and keep the bottom from popping out. Place the blocks near the middle of the drawer sides so the bottom can move slightly forward and back from them. Another option is to place the blocks between the drawer face and bottom to keep them well engaged and to direct any movement of the drawer bottom to the back only. Orient the grain of the blocks in the same direction as the sides or face of the drawer they're glued to.

Blocks strengthen hard-working chair joints

Corner blocks add measurably to the strength of a chair. Not only do they make the seat more rigid and help support the seat frame, but also they strengthen the vital leg-to-rail joints.

Fit and secure the corner blocks individually after the chair has been glued. For strength, make each block as thick as possible and about 5 in. long, with the grain running horizontally and parallel with the length of the block (see the photos above). Positioned at roughly 45° across the joint, a block ideally fills an entire corner, tying adjacent seat rails to each other and butting against the leg.

Fitting is a process of trial and error; first plane one side of the block for a tight fit and then the other. For maximum strength, glue the block in place and drive one or two screws through it into each seat rail.

The use of hidden corner blocks is a simple technique for adding considerable strength to certain joints. I use them anytime they fit the need. □

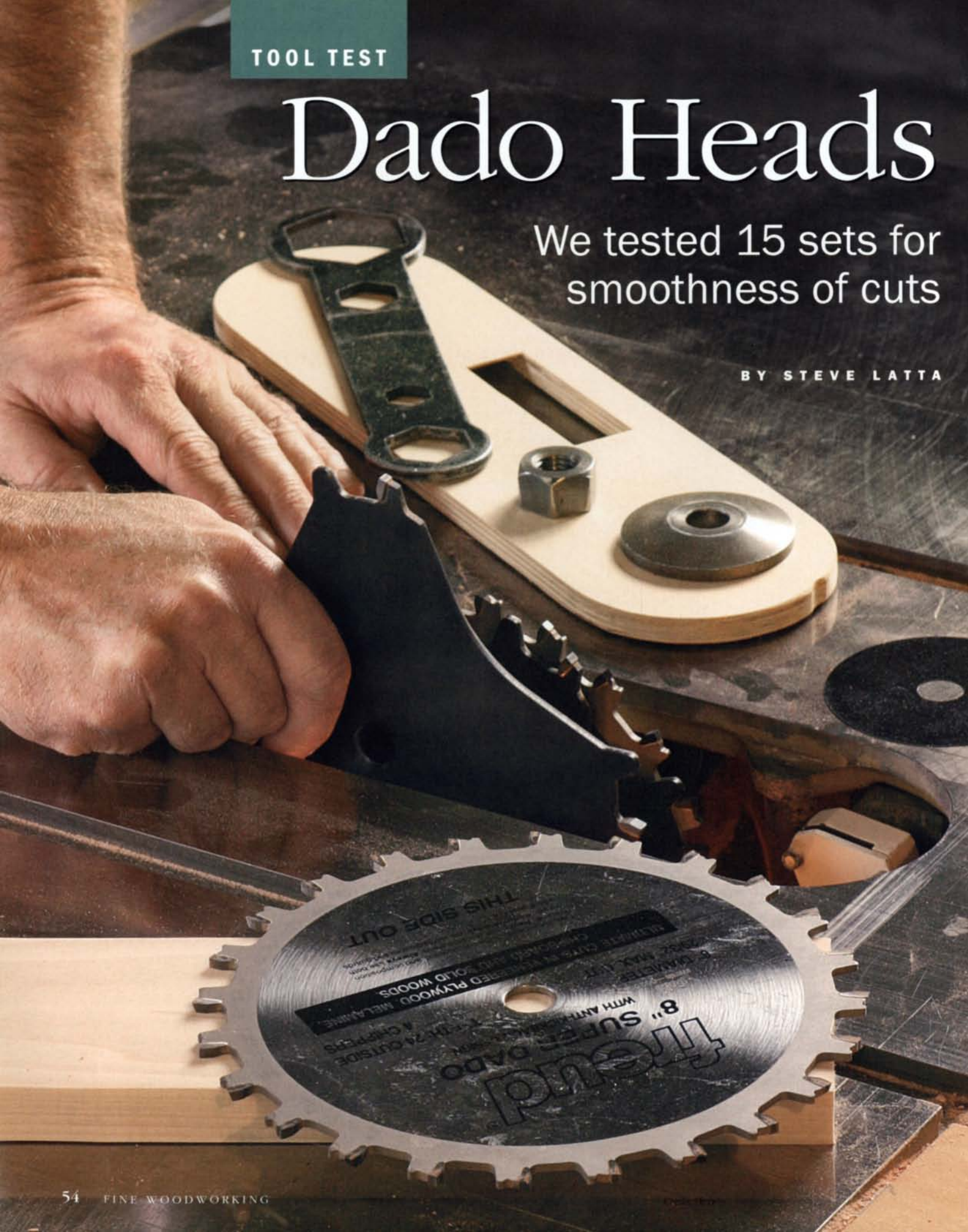
Garrett Hack is a contributing editor.

TOOL TEST

Dado Heads

We tested 15 sets for smoothness of cuts

BY STEVE LATTA



In many woodshops, you'll find dado heads being used to cut into sheets of veneer-core plywood and particleboard-core melamine for cabinetry casework, as well as solid lumber joinery (finger joints, lap joints, and mortise-and-tenons). I often use dado heads to cut tenons, dadoes, grooves, and rabbets. Because the cost of a good dado set can run more than $200, most woodworkers buy a single set and use it for a wide range of operations, regardless of the material being cut. Finding one that performs well and fits your budget is the trick.

I teach furniture making to young people who are interested in pursuing the trade as a career. When *Fine Woodworking* asked me to conduct a review of dado heads, I thought it would be a good idea to involve my students. Most of them will purchase a dado set at some point in their careers, and with the number of brands and designs out there, I knew they would benefit from investigating what separates the good from the not-so-good tooling.

Test setup ensured objective results

From the get-go we decided to limit the review to 8-in.-dia. (the size most commonly used in small shops) stacked dado sets with carbide teeth. You also can purchase stacked sets in 6-in. and 10-in. sizes and wobble-style dadoes. I never use a wobble dado, and I wouldn't recommend one because the cut is not as clean as that from a stacked dado set and does not have a flat bottom.

We tested each set by cutting wide dadoes in melamine and red-oak veneer plywood (cutting perpendicular to the grain of the face veneer). Experience has taught me that it is essential to use a sharp, top-quality blade when making cross-grain cuts in

Three ways to fine-tune the dado width

SHIMS

A standard design for stacked dado heads uses individual blades to build the correct width of cut. Fine-tuning is accomplished by adding shims between the blades.

Outside blades score the material and cut the dado at the shoulder line, usually with alternate-bevel teeth.

Chippers remove the waste between the outside blades.

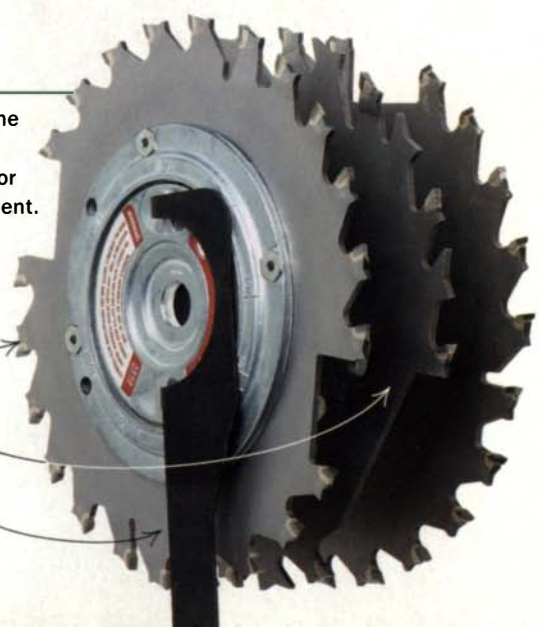
Shims (paper, plastic, or metal) are used to fine-tune the width of cut.

DIAL

A large dial allows the user to fine-tune a built-in shim on the inside face of the outer blade (inset).

WRENCH

A special wrench changes the distance between the outer (and inner, if used) blades for an infinite range of adjustment.



Only the outside blades are used for cuts between ¼ in. and ½ in. wide.

Add the center blade for cuts up to 13/16 in. wide.

Wrench

Testing the dado heads

Latta and his students cut and compared more than 500 ¾-in.-wide samples of each dado cut cross-grain in red-oak veneer-core plywood and particleboard-core melamine. For consistency, all samples were made with a power feeder.

POOR CUTS

Tearout in both the oak and melamine varied considerably among the many dado sets tested. Ratings are based on averages of the number of tearouts visible, taken from inspections of the multiple samples cut.

EXCELLENT CUTS

Many of the dado sets tested cut cleanly through the samples, showing very little—if any—tearout. Almost half of the dado sets were rated "Excellent" for the quality of cut in both the red-oak plywood and the melamine.

MAKE/MODEL NO.	WEB SITE/PHONE	PRICE
Amana 658030 (for wood and plywood)	www.amanatool.com 800-445-0077	$150
Amana 658040 (for melamine)*	www.amanatool.com 800-445-0077	$190
BC Saw & Tool 3008400	www.bcsaw.com 888-251-2236	$225
CMT Precision	www.cmtusa.com 888-268-2487	$200
Craftsman Excalibur 32608 (right or left)	www.craftsman.com 800-349-4358	$90
Delta 35-535	www.deltawoodworking.com 800-438-2486	$90
DML Thoroughbred 73500 or 73504 (right or left)	www.primarktoolgroup.com 800-742-3869	$268
Everlast DS840	www.everlastsaw.com 800-387-5278	$185
Forrest Dado King	www.forrestblades.com 866-398-9336	$250
BEST OVERALL Freud SD508	www.freudtools.com 800-334-4107	$200
Freud SD608	www.freudtools.com 800-334-4107	$250
BEST VALUE Infinity Dadonator	www.infinitytools.com 877-872-2487	$180
Promax 07-80145	www.promaxtool.com 800-933-1562	$40
Ridge Carbide NW8-DM-DS	www.ridgecarbidetool.com 800-443-0992	$170
Systimatic 37160	www.simondsinternational.com 800-426-0035	$200

*We found this set was also suitable for plywood.

SMOOTHNESS

Taking multiple passes with some of the blades resulted in visible scoring marks (left). Other blades left a smoother surface (right) because the height of the raker teeth more closely matched the height of the scoring teeth on the outside blades.

TEETH ON OUTSIDE BLADES	NUMBER OF CHIPPERS	TYPE OF SHIMS	STORAGE CASE	VISIBLE SCORING MARKS	FLAT-BOTTOM CUT	QUALITY OF CUT	
						PLYWOOD	MELAMINE
24	4	Plastic	Yes, plastic	No	Yes	Fair	Not applicable
46	4	Plastic	Yes, plastic	No	Yes	Excellent	Excellent
40	4	None	Yes, plastic/ foam inserts	Yes	Yes	Good	Excellent
24	6	Plastic	Yes, plastic	No	No	Excellent	Good
22	1	None; wrench adjusts width of cut	Yes, plastic	No	Yes	Fair	Fair
24	5	Paper	No	Yes	No	Poor	Excellent
22	1	None; wrench adjusts width of cut	Yes, plastic	No	No	Fair	Fair
40	4	None	Yes, plastic	Yes	Yes	Excellent	Excellent
24	6	None	Yes, plastic	Yes	Yes	Excellent	Excellent
24	6	Metal	Yes, plastic	No	Yes	Excellent	Excellent
24	5	None; adjustable dial	Yes, plastic	No	Yes	Excellent	Excellent
24	6	Plastic	Yes, cardboard	No	Yes	Excellent	Excellent
24	4	Brass	No	Yes	No	Poor	Poor
24	6	Plastic	Yes, plastic	No	Yes	Good	Excellent
42	5	None	Yes, cardboard/ foam inserts	Yes	Yes	Excellent	Excellent

plain-sliced red-oak veneer. The surface veneer on veneer-core plywood will always tear out more readily than lumber.

To prepare for the survey, we mounted a power feeder to a cabinet saw in the shop. A power feeder guaranteed that each sample was cut at the same feed rate and that it was held down under the same pressure. We also equipped the tablesaw with a new insert to minimize tearout on the outside edges of the dado cuts.

We prepared three test samples (12 in. by 16 in.) each of red-oak plywood and melamine to use on each dado set. We set up each dado head to cut a ¾-in.-wide by ¼-in.-deep dado and made six passes in each sample, using the power feeder and adjusting the fence setting for each cut. One run consisted of repeating that process for one sample of plywood and one sample of melamine for all 15 dado sets. Because we did a total of three runs, we had to set up and break down the tablesaw setup nearly 50 times. It was tedious, and we were methodical about keeping track of each sample.

To evaluate the cuts, we looked at tearout, whether the bottom of the cut was flat and smooth, and how deeply the outside blades cut a visible scribe into the corners of the dado.

Details of dado-blade designs

In some tool reviews, you'll often find a dozen clones. Not so with these dado sets: Many of the blade profiles and tooth configurations are very different. But with all of them, the two outside blades—where a clean cut is most essential—have beveled teeth ground away from the outside of the cut line alternating with straight raker teeth for removing the material. The beveled teeth score the material and define the scribed cut in the bottom corners of the dado; some are more prominent than others. This

Photos, except where noted: Kelly J. Dunton; facing page (top left and bottom right two): William Duckworth

detail matters only if the profile of the dado cut will show in the finished workpiece, such as the front of a bookcase.

Some but not all of the outside blades have expansion slots that help to keep the blade from warping from the heat generated by extensive use. And many of the outside blades and some of the chippers are made with antikickback fingers, a safety feature.

Chippers, stacked between the two outside blades to build up the width of cut and to hog out most of the material, vary from wing cutters with two teeth to almost full-size blades with six teeth. The number of chippers in each set varies from one to six, and their cut width from 1/16 in. to 1/4 in. Most dado sets include plastic, metal, or paper shims that you also can use to adjust the width of cut.

Tooth geometry matters

One curious difference among these dado sets is the hook angle of the tooth configuration. A slight majority (seven of 15) feature a negative hook on both the outside blades and the chippers; six of them have a positive hook on both the outside blades and the chippers; and two of them include a negative hook on the outside blades and a positive hook on the chippers.

A positive hook cuts more aggressively with less effort, and a negative hook is supposed to cut more cleanly. With the samples that we processed, it appears that a negative hook, on average, did cut the plywood veneers a little more cleanly, but it was difficult to come to any similar conclusion with the melamine.

As with regular sawblades, one other factor that affects how cleanly the dado heads cut is the number of teeth on the outside blades. Most of these dado sets have outside blades with 24 teeth, which is enough for an 8-in. blade to make sharp, clean cuts. Two of the sets (DML and Craftsman) have 22 teeth on the outside blades, and they tended not to cut as crisply. But the design of those two brands, which are virtually identical, is also quite different from all of the other brands. Other sets have 40, 42, and even up to 46 teeth; in general, the more teeth on the outside blades, the cleaner the cut. Amana offers dado sets for wood and plywood (24-tooth) as well as a melamine set (46-tooth). We used the wood dado set on only plywood but tested the melamine set on melamine and plywood. (For all of the test results, see the chart on pp. 56-57.)

Storage containers protect blades from damage

Obviously, the container the dado blades come in has no effect on how well they cut. But over time, it will affect the life of the blades. Every time you set up a dado head, install it on the saw, take it off, and put it away, the teeth are at some risk of getting banged into and nicked. A sturdy storage case is simply a welcome extra, so we took note of this detail with each set. Most of them come in plastic cases, some with plush foam liners; others are less elaborate but still protect the blades fairly well. A couple of the sets come in cardboard and plastic packaging that, once opened, must be discarded. But it would be easy to make your own storage container to keep the dado set from getting banged up. □

Steve Latta teaches woodworking at the Thaddeus Stevens College of Technology in Lancaster, Pa.

Using dado blades safely

If you've never used dado blades before, one important thing to remember is that you have to be careful not to attempt to remove too much material at once. The wider the cut, the shallower the first setting should be and the slower you should move the workpiece through the cut. With a 3-hp cabinet saw, you can comfortably hog out a 3/4-in.-wide by 1/4-in.-deep dado. But if you need to cut the same width at 1/2 in. deep, you should consider doing the work in two passes with two depth setups. If you're working with a 1 1/2 -hp contractor-style saw,

CROSSCUTS

Use a dedicated sled to cut dadoes for case work made with either plywood or lumber. Push down firmly on the workpiece and hold it tightly against the back fence of the sled as you make the cut.

RABBETS

To cut rabbets along the edge of a workpiece, mount more dado blades than you'll need for the full width of cut, clamp a piece of plywood to the fence, then raise the dado setup into the plywood.

Photos, this page and facing page (top right): William Duckworth

you might want to run some tests in scraps first, just to get a feel for whether a dado setup is going to work before plowing into a valuable workpiece. Keep steady pressure on the workpiece against the top of the sawtable and feed the workpiece steadily through the cut. If you have a problem with tearout, you usually can get a cleaner cut by slowing down the rate at which you pass the workpiece through the dado blade.

I keep various jigs on hand for different dado cuts. For crosscuts, whenever possible I use a sled to keep the workpiece from being held captive between the fence and the dado blade.

To cut rabbets along the edge of a workpiece, always use a sacrificial fence clamped or screwed to your regular saw fence, and bury part of the dado setup in the sacrificial fence. Never cut the rabbet joint along an edge with the workpiece trapped between the fence and the dado blade, because the workpiece can bind easily and cause a dangerous kickback.

If I'm cutting a lap joint in lumber, I'll use a miter gauge with a stop block clamped to the fence to index the shoulder cut.

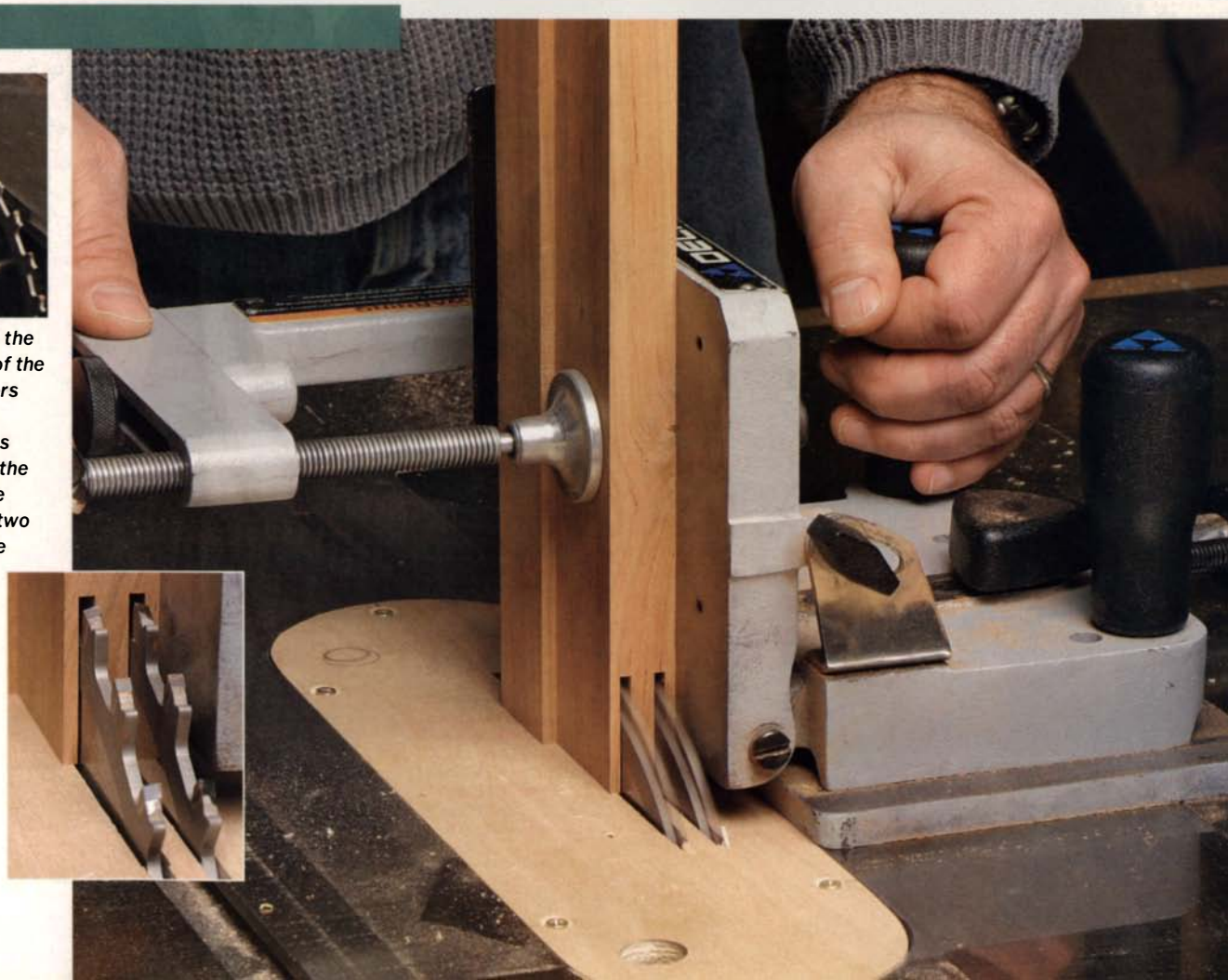
To cut tenons, I use the two outside blades of a dado set to cut both cheeks at once, and I reverse the intended left and right order of the two blades so that the scribed score cut removes a little more material at the shoulder line. The blades are held apart by metal washers or a shopmade wood washer, milled to the thickness of the tenon I want to cut. For this operation, I use a zero-clearance throat plate penetrated only by the two sawblades—the material between them remains intact and helps to keep the workpiece from falling down into the blades.

LAP JOINTS

Multiple passes will be necessary for lap joints that span fairly large areas. Use a miter gauge with a stop block clamped to the fence to index the cut.

TENONS

With enough care during the setup, you can cut both of the cheeks of tenons for doors and face frames in one pass. Make wood spacers (above) the thickness of the tenon to be used in place of the chippers. Use the two outside blades that come with the dado set and reverse them on the arbor (inset), leaving a scribed score cut at the corner where cheek meets shoulder. Make a special throat plate to use with this jig, keeping the material in the space between the blades intact so that it supports the workpiece as it's moved through the cut.



Pedestal Table

Router jig makes easy work of shaping round and curved parts

BY JOHN ZEITOUN

I love flipping through books of antique furniture and looking over pieces at garage sales, and I jump at the challenge of reproducing an antique in my shop. Such was the case when a client showed me a picture of a 160-year-old French Regency pedestal table from the book *The Furniture of Old Ontario* (Macmillan, 1973) and asked if I could make it for him.

The picture didn't explain construction techniques, but using generally accepted proportions, as well as considering the space it was to occupy, I was able to reproduce the table. According to the book, the original table had a hardwood base with bird's-eye maple veneer and a pine tabletop. But I chose to make mine out of walnut.

Work from the bottom up

The table offers a few challenges. For one, each piece either is curved or has a compound angle. I was able to simplify the construction process by breaking it down into small steps and by using a few jigs.

Prepare a trammel jig— The curved parts that make up the triangular base of the table are shaped using a router mounted to a large trammel device. The workpieces first are cut to rough size on the bandsaw and then are screwed to the base of the trammel jig (see p. 62), where a router is used to cut the inside and outside edges of each piece.

Before shaping the walnut, use the jig to make a particleboard template. You will use this template to rough-cut the triangular frame parts on the

Photos: Matt Berger

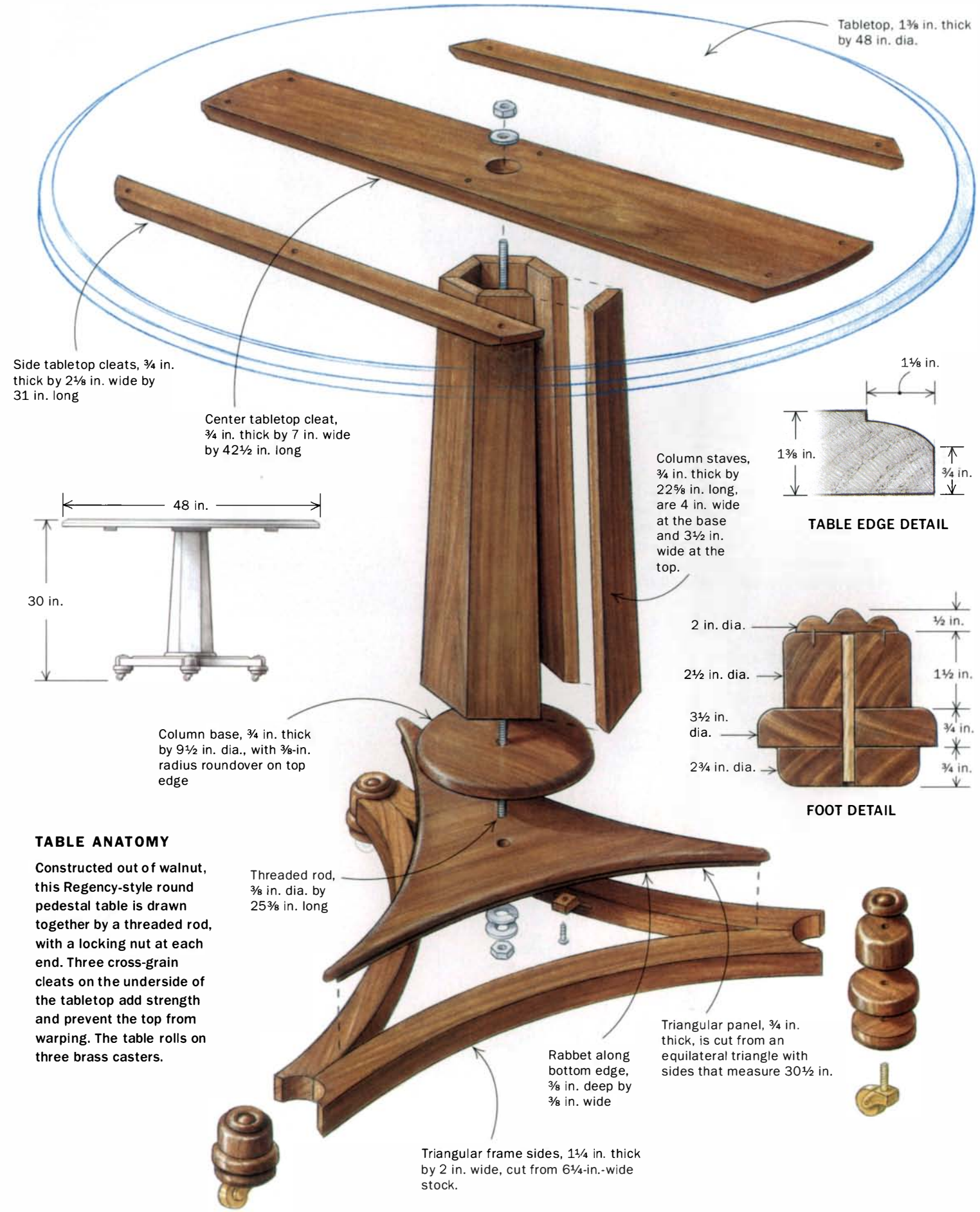


TABLE ANATOMY

Constructed out of walnut, this Regency-style round pedestal table is drawn together by a threaded rod, with a locking nut at each end. Three cross-grain cleats on the underside of the tabletop add strength and prevent the top from warping. The table rolls on three brass casters.

Drawings: Bob La Pointe

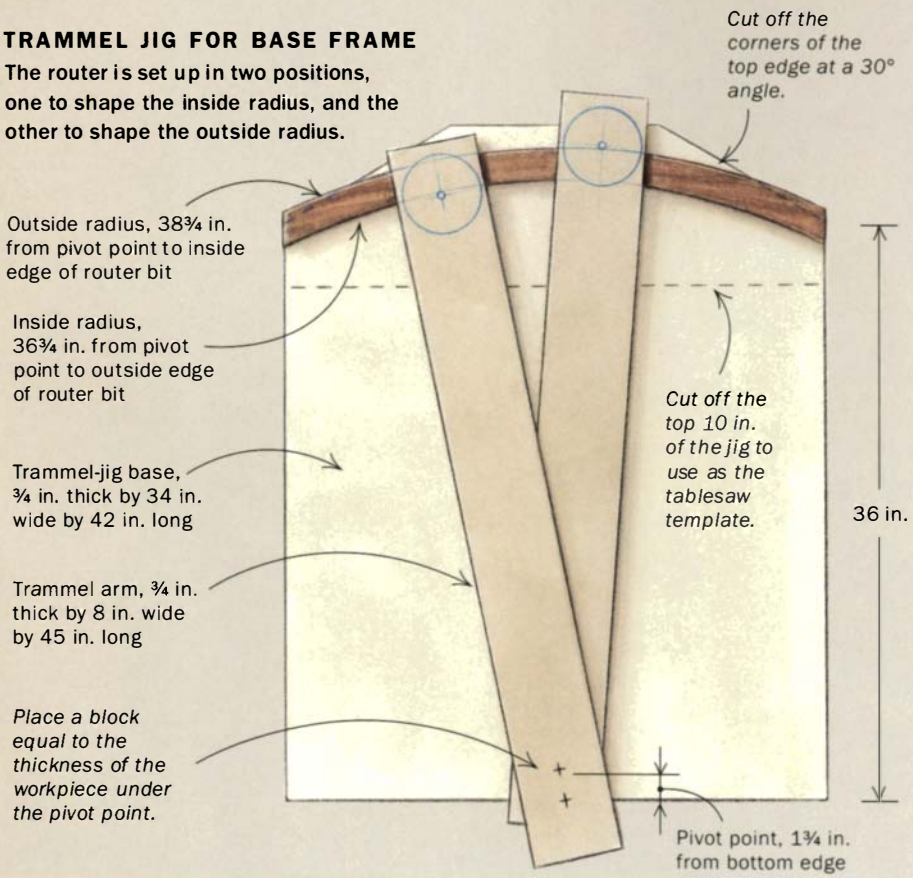
Router jig simplifies base-frame construction

The base frame of the table is made from three curved segments. A trammel jig is used to cut the inside and outside curves. The jig later will be cut down for use as a tablesaw template to cut the joining edges on the frame parts (facing page).

Routing the frame parts. *Use a template to mark out the piece on the rough material (above) and then cut to about 1/16 in. from the line on the bandsaw. Screw the workpiece to the trammel jig's base from underneath and rout the inside and outside radii. Take multiple passes with the router until you reach final depth (right).*

TRAMMEL JIG FOR BASE FRAME

The router is set up in two positions, one to shape the inside radius, and the other to shape the outside radius.



bandsaw. Mount a 6¼-in.-wide by 34-in.-long piece of particleboard to the trammel jig with two screws driven into the underside of the jig's base. Then position the router trammel on the jig, ensuring that the height of the pivot point is equal to the thickness of the workpiece being cut. Set the trammel to the distance of the inside radius and make several passes with the router, increasing the depth of the bit with each pass to prevent tearout and ease wear on the cutter and router. Reposition the router trammel to the distance of the outside radius and repeat this process.

Once the template is prepared, trace its shape onto the walnut and rough-cut three pieces on the bandsaw to within 1/16 in. of the line. Then attach each workpiece to the base of the trammel jig and follow the same procedure used to rout the template.

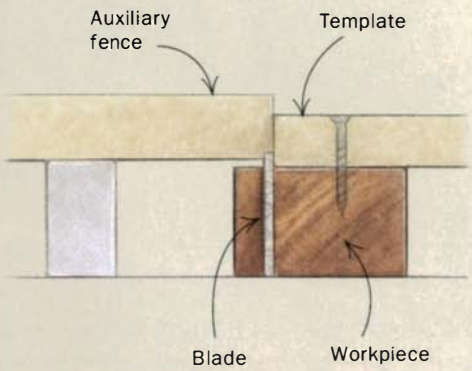
Cut flat surfaces on the three frame parts where they join—Use the tablesaw with a template and an auxiliary fence that acts as a template guide.

To make the template, lop off the top

Use the jig base to miter the frame

Cut off the top of the trammel jig. *This portion of the jig's base is now a template for cutting the frame joinery on the tablesaw.*

Cut to the template on the tablesaw. *Set the tablesaw blade in line with an auxiliary fence so that any material extending past the template is removed when it is run across the saw.*



Glue up the triangle frame. *After cutting slots along the inside edge of the frame (used to attach the panel), glue and clamp the parts on a flat surface.*

10 in. of the trammel jig. This section, with its top corners cut at 30°, becomes your template. Attach the auxiliary fence to the tablesaw (see the right photo above). Set the blade in line with the edge of the auxiliary fence and raise it until it just begins to cut into the fence above it (see the drawing above).

One at a time, screw the frame workpieces to the jig using the same screw holes from the routing process. Place the straight edge of the template against the auxiliary fence, and run it past the blade to remove any material that extends beyond the template.

On the resulting flat edges, use a biscuit joiner to cut slots into the inside edge, about 1 in. from the top edge. Locate the slots 2½ in. from the corners, and also cut one at the center of each piece. These slots will house cleats that fasten the triangular center panel to the frame.

To assemble the base, simply glue and clamp together the frame pieces with the flat edges registered against each other and the screw holes facing down. Put the frame aside while the glue dries and get started on the triangular panel.

Shape the triangular panel—The curved triangular center panel is shaped similarly to the three frame parts. On the underside of a glued-up panel, lay out an equilateral triangle with sides that measure 30½ in. Locate its center point, then mount the panel to another trammel jig (see the drawing on p. 64) good side down so that it pivots on its center. I drilled a 1/16-in. hole in the center of the panel as well as at the center point of the jig and aligned them with a 1/16-in. drill bit.

First, use a pencil in the trammel to mark the radius on each side of the triangular panel. To ensure that the triangle is properly aligned in the jig when marking the radius, double-check that the measurement from the trammel's pivot point to each corner of the triangle is equidistant. Remove the panel from the jig and cut it out on the bandsaw to within 1/16 in. of the line.

Remount the panel on the trammel jig and set up the router to cut the radius on all three sides. Before routing, be sure that two corners of the triangle are equidistant from the trammel's pivot point. Screw the panel to the base of the trammel jig to

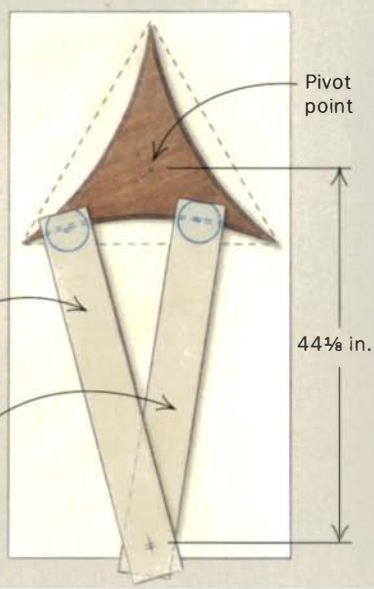
Curved panel and feet complete the base

The base panel is cut using a router mounted in a trammel jig. The panel rotates on a drill bit at its center and is screwed in place for layout and routing.

Lay out and rough-cut the triangular panel. *Align the glued-up panel on the trammel jig using the center point of the triangle as the pivot point. Then mark the radius on the three edges with the pencil trammel.*

TRAMMEL JIG FOR PANEL

Rout the radius curve on each side of the panel, rotating it and screwing it to the jig before each cut. Reset the pivot distance for the rabbet.



Rout the curves and rabbets. *After rough-cutting the panel on the bandsaw, reposition the panel on the trammel jig and screw it in place. Then take multiple passes with the router (above). Finally, adjust the length of the trammel to rout a ⅜-in. rabbet on the bottom edge of the panel (left).*

prevent the router from knocking it out of position. Rout the edge in several passes, exposing more of the bit with each pass. Unscrew the panel, rotate it to cut the next side, and continue the process until the radius is cut on all three edges.

The panel has a ⅜-in. rabbet to fit to the frame. Set up for this cut by extending the radius of the router trammel by ⅜ in. Again, screw the panel to the jig to prevent it from moving while you rout each edge. Last, turn over the panel and run a ¼-in. roundover along each edge with a hand-held router and a bearing-guided bit. Also, cut the three tips of the panel by hand to 16½ in. from the center and round them over with sandpaper.

Assemble the base—The center panel is secured to the triangular frame using cleats housed in slots in the frame. Screw the cleats to the underside of the panel so they align with the slots on the inside edge of the frame.

Once the panel is attached to the base, drill out the ends of the base for the feet. Measure and mark the location of the feet 18⅞ in. from the center point of the base. Drill the holes on the drill press with a 2½-in. sawtooth cutter, centered on the mark. Lop off the excess material with a handsaw just past the centerline of the hole (19⅛ in. from center). I marked this line with my pencil trammel, using the center of the base as the pivot point.

Build up the feet—If you own a lathe, constructing the feet is straightforward. But I don't have a lathe, so I assembled the feet from individual pieces cut using a circle cutter on the drill press.

The circle cutter bores a ¼-in.-dia. center hole in a workpiece while a spinning blade cuts the perimeter of the circle. The three circles in each foot require a roundover on

one edge: ⅜ in. on the two lower circles and 3/16 in. on the top one. For safety, I secured the small workpieces to my bench by driving a screw through the ¼-in. center hole so that the piece would stay put as I routed. The center hole also comes in handy for sanding: Fit a ¼-in. bolt through the hole and then tighten a butterfly nut from the other side. Now you can chuck the bolt in the drill press and sand the workpiece as it spins.

The feet are topped with rosettes cut on the drill press using a rosette cutter. Once the circles and rosettes have been prepared, glue the parts into stacks. Align the three circles with a ¼-in. dowel fitted through the center holes. To prevent the rosette from creeping when clamping pressure is applied, drill a few clearance holes in the top of the foot, cut off the heads of ¾-in. finishing nails, and insert the nails upside down into the holes so that the points stick out by 1/16 in. Center the rosette on the foot and apply pressure.

After the feet are assembled, apply glue only to the adjoining surfaces on the feet and base, and clamp the feet in place. The brass casters are installed after a finish has been applied.

Prepare the column staves

Constructing the hexagonal tapered column is another challenging part of this project. Each of the six staves tapers toward the top, and all four edges of each stave are beveled. The top and bottom edges of each piece are crosscut at 1½° parallel to each other so that they join flush to the base and tabletop. The side edges are beveled at 30°.

Start with six pieces of material, each measuring ¾ in. thick by 5 in. wide by 23 in. long. Cut a 1½° bevel on the ends, parallel to each other, so that the finished length of the stave is 22⅝ in. (measured from toe to heel on the face). Next, make and fasten a template (see p. 66) to the inside face of each stave, one at a time, and trim the workpieces on the tablesaw with the template guide attached to the saw fence.

Finally, cut the staves to width with the blade tilted to 30° (the 1½° taper changes this bevel angle, in theory, but not enough

Elegant feet without a lathe

Make a stack of disks. *The foot sections were cut with a circle cutter on the drill press (left). Each piece was rounded over with a router and sanded. A dowel aligns the three parts during glue-up (above left). The rosette, cut on the drill press with a rosette cutter, is glued to the top of the foot and aligned with nails with the heads clipped off (above right).*

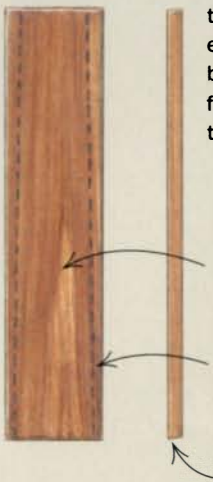
Attach the feet. *Drill the holes in the base, then saw off the excess material just past the centerline (left). Apply glue only to the surfaces that join, and then clamp each foot to the triangular frame (above right).*

Tapered column requires accurate bevels

The six-sided tapered column requires that each piece has compound beveled edges. Zeitoun came up with a method to cut the taper and the beveled edge in three steps at the tablesaw, using a template guide.

1 CUT A 1½° BEVEL ON EACH END

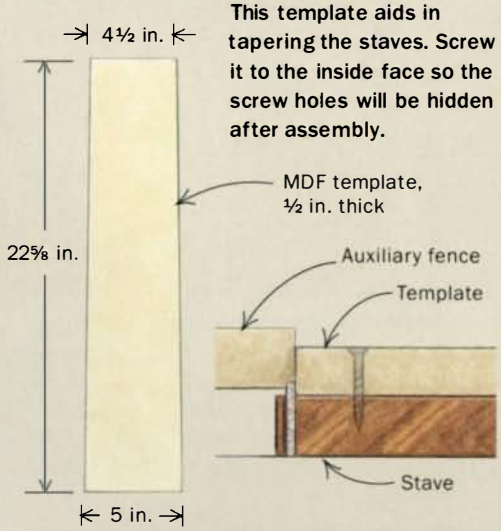
Because the column tapers, the top and bottom edges of each stave must be angled so that they are flush with the base and tabletop.



Bevel the stave ends. *Begin with a 23-in.-long board and crosscut it to its final dimension of 22⅝ in., with parallel bevels on each end.*

2 TAPER WITH A TEMPLATE

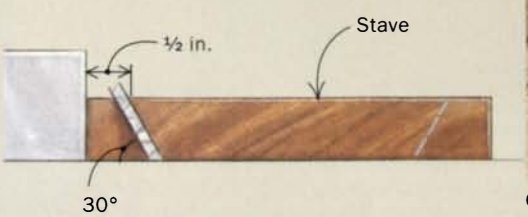
This template aids in tapering the staves. Screw it to the inside face so the screw holes will be hidden after assembly.



Taper the edges. *Screw a template to the inside face of the stave, then set up the template guide on the tablesaw fence and cut the pieces to size.*

3 BEVEL BOTH EDGES

Tilt the tablesaw blade to 30° and rip the staves to their final width with the inside facedown.



Cut the beveled edge. *Each stave is 1 in. oversize in width. Remove ½ in. from each side with the blade tilted to 30°.*

to matter in a practical sense). Set the fence to remove ½ in. of material, measured from the edge on the outside face. Once you are happy with your setup, run each workpiece across the tablesaw with each edge registered against the fence. My tablesaw has a right-tilting blade, so the bevels are cut with the screw-hole side of each stave facing the table.

Assemble the column—The column should go together easily. Place the pieces edge by edge with the outside face up and run several strips of tape across them to keep them aligned. Turn over the pieces, apply glue to the joining edges, and roll up the whole column.

Finally, apply clamping pressure to the column with strap clamps. Insert cauls between the column and the straps to spread the clamping pressure.

At the bottom of the column is a ¾-in.-thick by 9½-in.-dia. disk. Use the router trammel to cut this piece, then round it over with a ⅜-in. bearing-guided bit.

Keep the tabletop flat

To make the 48-in.-dia. tabletop, I glued up 5-in.-wide boards into a panel. I alternated the direction of the growth rings and

paid close attention to the grain to prevent warping or twisting.

I cut the panel round with the router trammel pivoting in a hole drilled into the underside of the table at the center. On the round top, I cut the edge profile with a bearing-guided router bit, creating a profile similar to the table in the photo. If you're not interested in buying what is likely to be a one-time-use router bit, you can use any profile you choose.

The original table did not appear to have an apron around the underside of the top. However, a top at those dimensions could not have withstood much weight across its grain without additional support. My solution was to attach long cleats, running across the grain, to the underside of the table. To allow for wood movement, the cleats are screwed in three locations (three on each side for the center cleat) and fitted into oversize screw holes with washers.

Assemble with a center rod

With the exception of the top, all of the table parts are sandwiched together using a ⅜-in.-dia. threaded rod with a washer and nut at both ends. The nut at the top of the rod is set into a ⅜-in.-deep square-bottom clearance hole in the center cleat. Countersink ⅜ in. into the tabletop, as well, to accommodate the remainder of the nut and washer. Use Loctite Thread Lock to keep the top nut from spinning when tightening the other end; however, before you assemble the table, finish all of the parts and install the brass casters.

Lay the top upside down on the workbench with the threaded rod extending up out of the tabletop, and drop the column and base over the threaded rod. Center all of the parts and tighten the nut on the bottom end of the threaded rod. Finally, flip it over, stand back, and take a well-deserved look. □

Finished table. *Apply finish to the unassembled table parts, then install the brass casters before putting the table back together and securing the threaded rod.*

John Zeitoun operates a custom cabinetry shop near his hometown of Wakefield, Que., Canada.

Roll up and clamp the column. *Lay all of the staves with their outside faces up and tape them together. Then flip them over in concert and apply glue to the joining edges. Roll up the column (left) and apply pressure to the joints with strap clamps. Zeitoun also uses steel pinch dogs from Lee Valley to help draw together the pieces at the joints (above).*

Assemble the table. *A threaded steel rod feeds through each section of the table. Secure the nut at the top with Thread Lock, then tighten the nut at the bottom.*

All About Picture

Make professional-quality, custom frames at a fraction of the cost

Framing is something woodworkers tend to shy away from: It may be fear of damaging an irreplaceable piece of art or of putting less-than-perfect miter joints on display. Frames tend to get scrutinized because they are the vehicles for displaying art; and because art is critiqued up close, the frame will be, too.

The good news is that professional-quality frames are not hard to make. The techniques are mostly familiar to woodworkers, there is only a modest outlay on tools and jigs, and frame stock can be purchased ready-made or built from scratch in your shop.

Artwork determines frame size and design

Art falls into two main categories when it comes to framing with and without glass: If the art is on paper, you should consider using a backing board, a mat, and glass as well as a frame; paintings on canvas look best with just a frame. The backing board keeps the art flat and secure, the glass protects the art from damage, and the mat keeps the art and glass from contacting each other and sticking together.

When it comes to mats, wider is better. Mats cut narrower than 2½ in. do not add much to the appearance of the framing. Aim for a mat that is 3 in. to 4 in. wide. Another option is to use two layers of mats, known as double matting, to give the framing a greater depth.

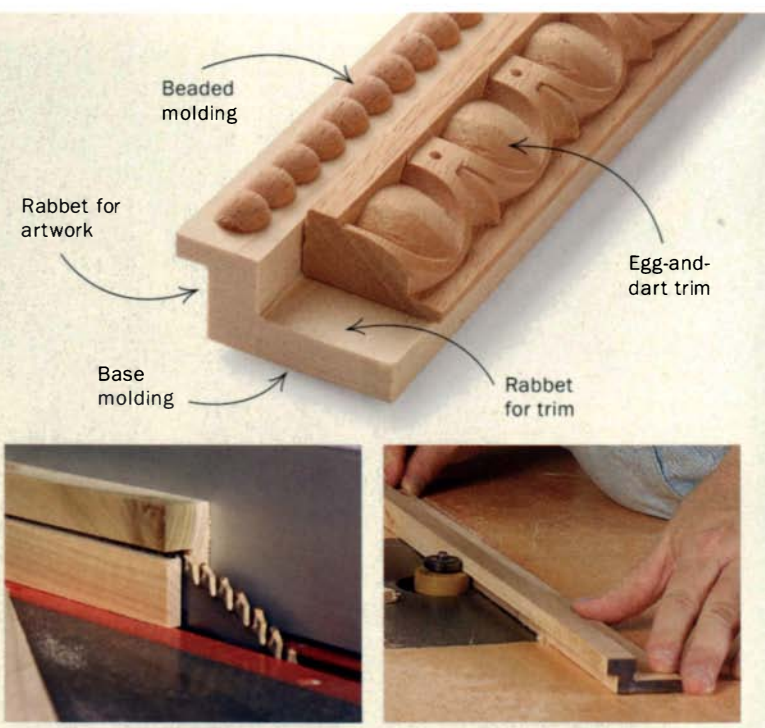
You need to visit a local picture-frame shop to select the mat, and to have it, the glass, and the backing board cut to size. Ask for acid-free materials in both

Three options for frames

BUILT-UP MOLDING FROM TRIM STOCK

Often a piece of ready-made molding will provide the inspiration for you to build a similar design from trim stock. Architectural trim moldings come in a large range of sizes and styles, but in most cases you will have to create a base and a rabbet. In this example, I started with a piece of poplar ¾ in. thick by 1¾ in. wide. I cut a rabbet ¾ in. wide by ½ in. deep on the tablesaw, and on the other side I routed a rabbet ¼ in. wide by ½ in. deep to hold the art. I then glued egg-and-dart trim to the wider rabbet and a strip of beading to the top surface.

Because the trim pieces may not match, paint is a better finishing option than stain. I sprayed a coat of gesso (a combination of plaster and glue) on this frame, followed by black and then bronze paint. After it dried, I rubbed the frame with 000 steel wool, then applied black wax to "age" it.



Rabbet the base and attach the trim. *After cutting the rabbet for the egg-and-dart molding on the tablesaw (above left), mill the rabbet for the artwork on the router table (above right). Glue the egg-and-dart trim to the rabbeted base, then add the beaded molding.*

Photos: Mark Schofield

Framing

BY ROBERT HAMON

the mat and the backing board. The additional charge is worth the protection it affords your artwork. Once you have all of these pieces cut to size, only then can you calculate the frame's dimensions.

Frame size refers to the dimensions of the artwork, not the outer size of the frame itself. When determining the size of a frame, measure to the inside of the rabbet. To allow for wiggle room, add an extra ⅛ in. in each direction. For example, a 16-in. by 20-in. piece of art gets a frame sized 16⅛ in. by 20⅛ in. When cutting the molding to rough length, add twice the width of the frame molding plus an inch or two as a safety margin.

Your picture frame must have a rabbet deep enough to secure the thickness of what you intend to frame. Mat board is 1/16 in. thick, backing typically is 3/16 in. thick, and glass is ⅛ in. thick. Most commercial frames have a rabbet depth of about ½ in. to allow for double mats and to leave enough space for fasteners to keep the contents in the frame. The standard width of the rabbet is ¼ in.

Miter corners on a special sled

Two factors are crucial for making mitered corners that fit perfectly. First, the 45° angles must be accurate. Second, the molding pieces that are opposite each other must be exactly the same length.

Cutting picture-frame miters on a tablesaw using a standard miter gauge is a real challenge. Problems include small amounts of play in the miter gauge and lack of support for the molding

MOLDING FROM SCRATCH

Although a frame does not require the strength of a hardwood, if you do use one, keep the design simple to show the figure of the grain to its best advantage. To make a frame with curves, use a softwood instead. White pine, fir, and spruce are easy to work, but if you plan to stain the frame, select the wood carefully to avoid streaks that may distract from the artwork.

The molding can be cut on a shaper, a router table, or with a molding head on the tablesaw.

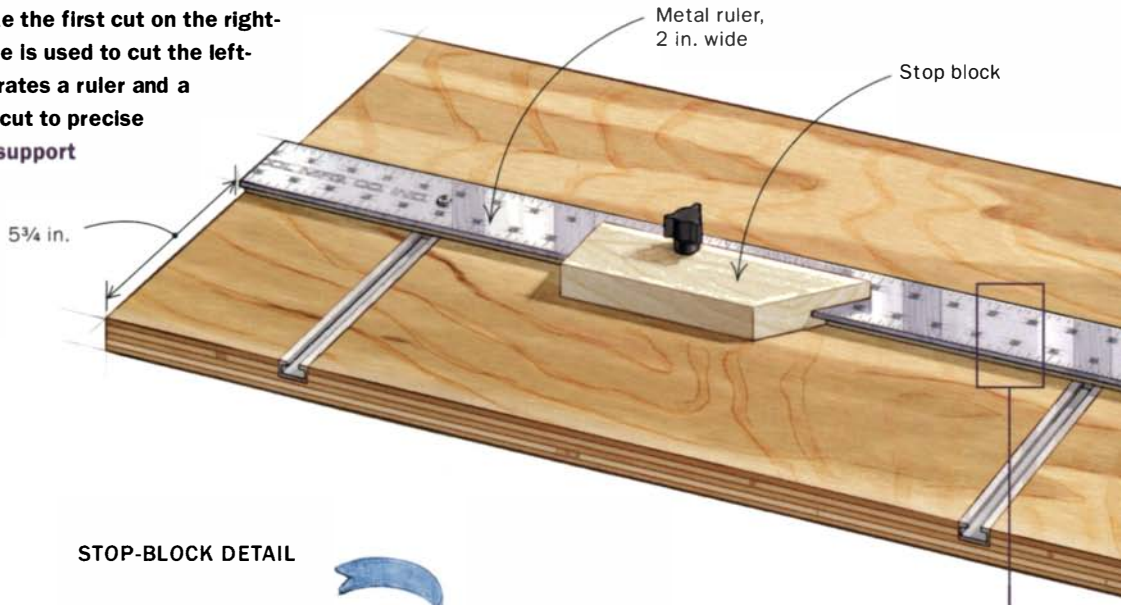
READY-MADE MOLDING

You can get the same finished moldings—ranging from classical to contemporary—that are available to framing shops (see Sources of Supply on p. 72). Or you can purchase unfinished moldings if you want to stain or paint the frame to match the artwork. Avoid moldings that have rounded edges on the base or a deep curve in the back because it will be harder to clamp the frame when it is being glued together.

Block print, this page: Laura Wilder

Cut perfect miters on the tablesaw

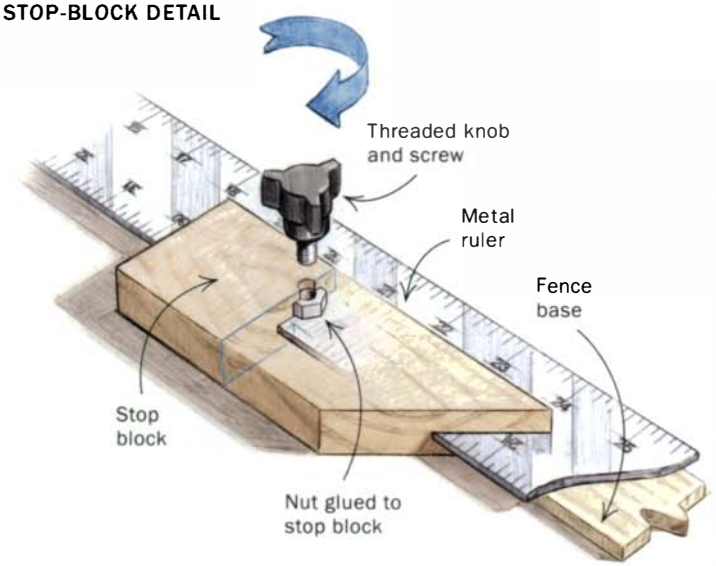
Unlike most tablesaw sleds, this one has two fences of different lengths. A short fence is used to make the first cut on the right-hand side of the molding; a long fence is used to cut the left-hand miter. The longer fence incorporates a ruler and a stop block that allow moldings to be cut to precise and repeatable lengths. Hold-downs support stock over its entire length.

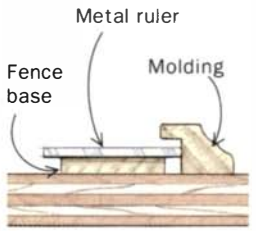


MATCH THE FRAME TO THE ARTWORK

Art on paper usually is surrounded by one or more mats and protected with glass before being framed (top). Oil paintings or reproductions may look best with just a frame and no mat or glass (bottom).

STOP-BLOCK DETAIL





ACCURATE FRAME DIMENSIONS

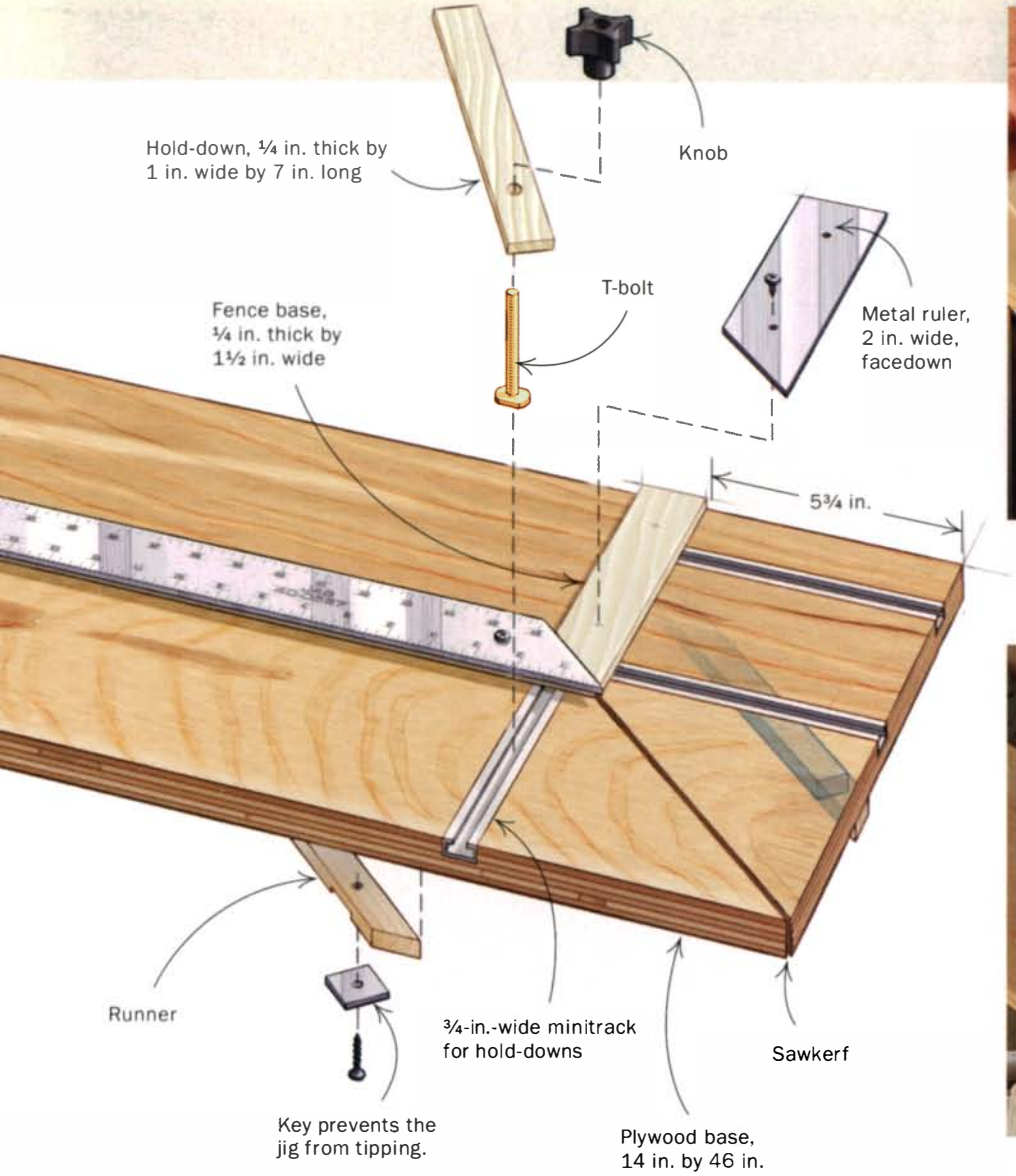
The size of a frame is measured from the inside of the rabbet, so the jig and the stop block are designed to take this into account.

near the blade. The traditional solution has been to build a miter sled or a sliding miter jig that eliminates any movement and supports the full length of the workpiece up to the blade. Clamps or hold-downs add to the jig's accuracy. You may have a jig already, but to cut picture-frame molding, you need a jig with two further attributes: It must provide an accurate way to measure and cut the lengths of molding so that the opposing sides are exactly the same, and it must be designed to cut the outside edge of the molding first to eliminate splintering on the most visible edge of the frame.

My jig (see the drawings above) is designed to miter picture frames. Rather than the typical square board, it is a rectangle, aligned to the miter-gauge slots at a 45° angle. Instead of two fences of equal length, one is short for making the first cut on each section of molding, while the fence for the second cut is 36 in. long—the practical limit for cutting frames on a tablesaw. Each fence consists of a base with a ruler attached to it. The ruler on the long fence allows you to measure each piece accurately before it is cut. An adjustable stop helps make accurate duplicate pieces.

When cutting frame molding, always cut the longer sides first. If you should err, you still will be able to cut the longer piece into a shorter side. With your rough-cut section of molding secured to the short fence, miter the right-hand end. Move the molding to the long fence, using the ruler to establish the desired length. Clamp the molding and set the adjustable stop at the end of the molding. Cut the left-hand miter. The parallel section of molding is cut in the same way,

Drawings: John Hartman; painting, this page: William Godfrey



The first miter cut. *Clamp the piece of molding, rough-cut to length, to the short fence of the jig to cut the right-hand miter.*

The second cut. *Clamp the molding to the long fence and set the stop block at the correct distance from the blade (above). Then cut the left-hand miter (below).*

but now you have a stop, making the two sections identical in length.

Glue and strengthen the frame

With all four sides cut, you're now ready to assemble the frame. Most of the strength in the miter joint comes from the glue but only if the pieces are clamped together firmly and accurately. My favorite clamping method is a miter vise, but other methods include a strap clamp, especially with the use of corner blocks, and a four-corner clamp that uses threaded rods.

Nails can be added to reinforce the joint. Most framers drill a hole using a slightly smaller nail chucked in an electric drill. Nails can be added while the frame is secured in a miter clamp, or with the frame braced to absorb the blows of the hammer. To lessen the chance

Two options for gluing miters

The best clamp. *An old-fashioned heavy-duty miter clamp works best to glue frames together (right). A pair of clamps allows you to glue a frame in two steps. For smaller frames, threaded rods and corner blocks are the clamping method of choice (below).*

OR

Reinforce the miter joint. *Use a nail to drill a hole horizontally in each corner of the frame. Then hammer in a nail slightly larger than the hole. A miter clamp lets you nail the joint while the glue dries.*

of splitting the wood, make sure the nail is driven with the dominant edge perpendicular to the grain.

Fit the artwork into the frame

Your framing project is not done until it is hanging on the wall. A painting on canvas will require fastening only into the rabbet from the back of the frame. Picture framers call this "fitting." Fitting items with mats and glass is slightly different: Lay the glass, mat, picture, and backing board faceup while you clean the glass. Spray a nonammonia cleaner onto a section of folded paper towel and wipe the glass from the center toward your other hand that is holding the edge of the package to prevent movement. Turn over the glass by the edges and repeat until it is free of specks. Then place the frame over the package, slide it to the edge of the table, grip the whole thing, and flip it over.

Fastening everything into the frame is easiest with a point driver, especially if it is a hardwood frame. The hand tool looks like a staple gun, but it shoots a ⅝-in.-long point out the front into the inside of the rabbet. Alternative methods include using a brad setter, glazing points, or S-clips (see the left photos on the facing page).

Seal the back with gummed-paper box tape to prevent insects and dust from getting into the frame enclosure. Moisten the tape, press it into place, and trim any excess. Do not use self-adhesive tape because the oils soak into the frame and backing board, and the tape eventually comes off.

To wire the back of the frame, use two screw eyelets and twisted picture wire. Hardware stores sell these in packages rated for different picture weights. About a quarter to a third of the way from the top of the frame, puncture the back with an awl. Start the eyelet in the hole and then, using the awl inserted into the eye, turn the eyelet into the frame until it is secure. In softer woods, screw the eyelet all the way down. Loop the wire through the eye twice and wrap the small excess around the wire. The other end gets the same treatment, after the wire is pulled tight to eliminate slack. You have the correct tension if only two of your fingers can fit between the wire and the back of the frame. Now you are ready to hang your work for all to enjoy. □

Robert Hamon is a professional picture framer in Mission, Kan.

SOURCES OF SUPPLY

Dick Blick
800-828-4548
www.dickblick.com

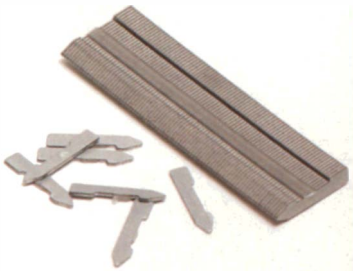
Lee Valley Tools Ltd.
800-871-8158; www.leevalley.com

Van Dyke's Restorers
800-558-1234; www.vandykes.com

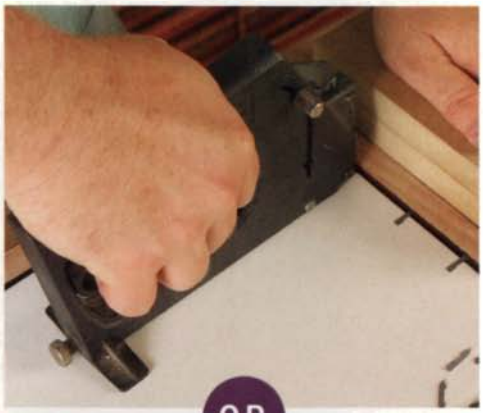
Woodworker's Supply
800-645-9292; www.woodworker.com

Secure the artwork in the frame

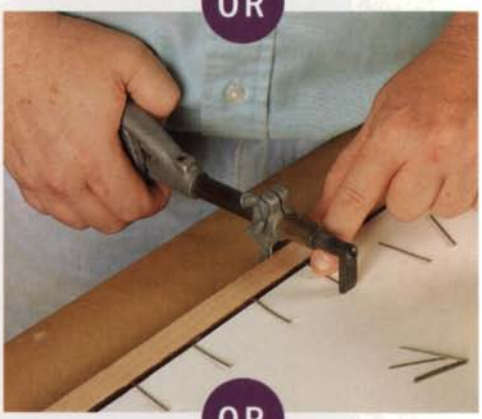
FOUR WAYS TO FASTEN EVERYTHING INSIDE



Points. *The easiest way to fasten the art is to use a point driver, which inserts arrow-headed points into the frame.*

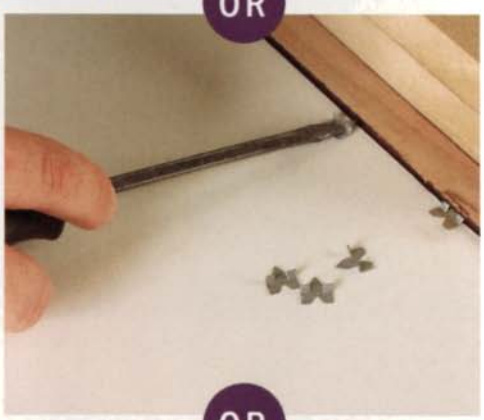


OR



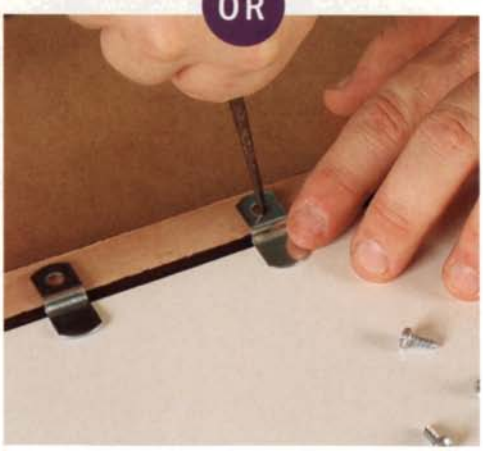
Brads. *Using a brad setter rather than a hammer lessens the chances of damaging the frame.*

OR



Glazing points. *Drive glazing points into the frame with a broad-tipped screwdriver. A block braces the pressure on the frame.*

OR



S-clips. *These clips are available in different sizes to match the distance the artwork is below the back of the frame.*

First, clean the glass. *Clean both sides of the glass with nonammonia-based glass cleaner. Then lower the frame onto the art package. Slide the art-and-frame combination to the edge of the table and flip it over to add the fasteners (left).*

Then seal in the artwork. *Attach gummed-paper box tape to the back of the frame to prevent dust or insects from getting into the framing.*

Now hang it by a wire. *The picture is hung using eyelets and twisted picture wire. Tension the wire until you can just fit two fingers under it.*

Install Inset Doors With Ease

Four-step process uses the jointer and tablesaw to guarantee a perfect fit

BY J. SPEETJENS

Over the years I've had to hang hundreds of inset cabinet doors. In that time, I have refined an efficient process for fitting them accurately to their openings. The method works for most styles of furniture and cabinetry.

As with any door fitting, the process is easiest if the door and the opening are reasonably square and free of twist to start with. However, my process makes it easy to compensate for typical variances in squareness—generally gaps less than ⅛ in.

What is different about this trimming and fitting process is that it relies on the jointer and tablesaw, as opposed to handplanes, to make all of the necessary cuts, whether straight or slightly angled. To reduce the amount of trimming, I build doors just a hair (no more than 1/32 in.) larger than the case opening. The ease and accuracy of the fitting process come with making light trim cuts in a specific sequence, and using simple but precise shims to check your progress and mark the next cut. I make furniture for a living, and this process lets me fit a typical door in about 15 minutes, leaving a thin, uniform gap all around—the calling card of a skilled craftsman.

Choose shims and prepare the case and door

The fitting process starts with an inspection of the hinges. When they're closed, butt hinges have a gap between the leaves, which creates the gap on the hinge side of the door after the leaves have been mortised in flush to the edge of the door and the case. To

Photos: Marcia Ryan

Steps to a perfect fit

When fitting an inset door in a cabinet, Speetjens starts with the bottom edge and the hinge side, making light, tapered cuts on each to avoid overcutting any one edge. Then he proceeds with the top edge, and finally trims the latch side once before and once after setting the hinges.

1 CUT THE BOTTOM

Set the door in the opening and check the fit at the hinge side. If there is a gap at the top or bottom corner, make a tapered cut along the bottom edge to remove most but not all of the gap.

2 TRIM THE HINGE SIDE

Check the fit at the hinge side again and remove any remaining gap by making a tapered cut on the jointer.

3 FIT THE TOP NEXT

Place the door on shims to check the top edge, and trim it on the tablesaw using the crosscutting sled. This cut determines the gap along both the top and bottom edges.

4 FIT THE LATCH SIDE

Check the fit of the last edge and trim it just short of the layout marks before hanging the door. Once the door is hung, verify the marks and make the final trim cut.

create a uniform gap along all four sides of the door, you must use shim stock that matches the hinge gap. I've found that a single thickness of laminate will yield a gap around the door that is between 1/32 in. and 1/16 in. thick, matching the gap in most high-quality extruded brass hinges. I use high-pressure Formica chips, but any hard shim stock will do. You also will need thinner shim stock, such as veneer.

After assembling the door, letter its top hinge-side corner and place a corresponding mark on the inside edge of the opening to keep track of the door's proper orientation throughout the process.

For inset doors to hang nicely in their openings, the case needs to sit in a plumb and level position. Level the case by setting it on a flat surface such as

Drawings: Don Mannes

1. Make light trim cuts as necessary. *The door should go at least partially into the opening. Then push the door against the hinge side.*

2. Measure the gap and mark the corner. *With a few thin shims, measure the thickness of the gap on the hinge side of the door. Then mark the corner of the bottom edge to be tapered.*

3. Trim the door bottom using a tablesaw crosscutting sled. *To make the precise, tapered cut, place shims against the fence equal in thickness to half or more of the hinge-side gap.*

1 Trim the bottom

The first step in the process is to measure the gap along the hinge side and eliminate some of it by trimming the bottom edge of the door.

a benchtop or a tablesaw top, or, for a larger case, by sliding wedges under the appropriate corners as it sits on the shop floor.

Now hold the door up to the opening and assess the general fit. If you sized the parts properly, the door should be just a bit longer or wider than the opening. However, the door must be placed at least partially into the opening for this fitting process to work. So make light trim cuts until the length and width of the door just slip into the opening. If the case is a bit out of square, the door may not fit entirely into the opening, but you will take care of that in the next step. Throughout the process, I make all cuts across the grain using a crosscutting sled on the tablesaw; for light cuts along the grain I use a jointer.

Start the fitting process at one corner

The first area of the door to be fit to the case is the entire corner formed by the hinge side and the bottom edge. Press the door as far as it will go into the opening, checking the fit along the hinge side. Try to keep the bottom of the door flat against the bottom of the opening. If an uneven gap of 1/32 in. or greater exists on the hinge side, you'll need to correct for some of that gap by making a light, tapered trim cut on the bottom edge of the door using the crosscutting sled on the tablesaw. This cut

2 Finish fitting the hinge side

After trimming the bottom edge, Speetjens removes the uneven gap left along the hinge side using a simple tapering technique on the jointer.

Check the gap and mark the cut. *Reposition the door against the hinge side. In this case, the gap is at the bottom (above left), so the tapered cut is marked at the top corner (above right). Trust your eye for layout.*

also might help the door slip all the way into the opening, if it won't do so already. It is critical that you don't trim too much off the bottom edge: Aim for eliminating only one-half to two-thirds of the gap. Later you'll eliminate the remainder by trimming the hinge side of the door, thereby not taking too much off any one edge.

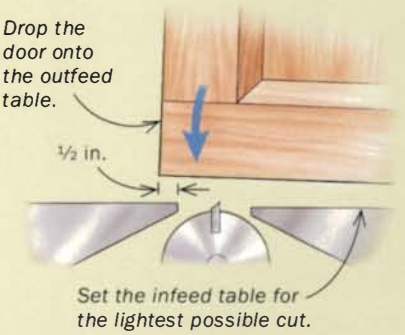
When measuring the thickness of the gap, use a stack of thin veneer shims. The advantage of using multiple shims is that you can take a few away when setting up the crosscutting sled to make an incremental cut that removes just a fraction of the actual gap. While the door is still in the opening, mark the bottom edge of the door at the point of the maximum depth of the taper. Then place a few of the veneer shims between the door and the back fence of the sled to set up the cut. With the tablesaw turned off, slide the sled forward and backward to check the position of the sawcut. I prefer to keep the door faceup on the crosscutting sled so that any blowout is on the back of the door.

Afterward, clean up the sawmarks along the bottom edge of the door using a sanding block or a block plane. To make the sanding block easier to balance on the edge—and less prone to rounding the edge—the width of the block should be no more than ¼ in. greater than the thickness of the door.

When one side of the case is bowed slightly, I've found that a cabinet scraper, such as a

PRECISE TAPERS ON THE JOINTER

This technique works well for light, tapered cuts along the grain. Use a combination of normal cuts and tapered cuts to sneak up on the layout marks.



Starting point. *With the jointer running, place the corner of the door to be trimmed onto the infeed table. Lower the opposite corner with about ½ in. overlapping the outfeed table.*

Making the cut. *Push the door through as you would for an ordinary cut. If there is enough material left, make a normal pass to clean up the edge.*

3 Use shims to fit the top edge

Two hinge-gap shims are set underneath the door, and a third is used to mark the top edge for trimming.

1. Place the door on shims. *With one shim at each bottom corner, push the door inward about ⅛ in. to prepare for the next step. The door probably will balance in this position.*

Stanley No. 80, works well for removing material along just a segment of an edge of the door. It takes some practice, though.

Finish by trimming the hinge side of the door— The door should slide more freely into the opening now. Again, slide the door along its bottom edge and against the hinge side. If the gap was very uneven earlier, there still may not be enough lateral space for the door to sit flat on its bottom edge. In that case, make straight, light jointer cuts on the hinge side of the door until it can rotate slightly in the opening and sit flat.

Now check the fit along the hinge side. You probably still will have an uneven gap, so eyeball the amount of material to be removed and lay out the cut by making a pencil mark at the maximum depth of the taper. If the gap is at the top end of the hinge side, you will need to trim an equal amount off the bottom end. If the gap is at the bottom end, trim conversely.

One of the keys to this fitting process is using the jointer to make tapered cuts along the grain. Set the jointer for as light a cut as possible, then determine the corner of the door that does not need any material removed. Place that corner about ½ in. onto the outfeed table and feed the door through the jointer normally. Light cuts will reduce the chance for tearout, and they also will leave smaller divots where the door was placed onto the cutterhead. To further reduce tearout when going against the grain, reduce the feed rate.

The door now should fit into the opening along both the bottom edge and the hinge side. If enough material is left, make a light, normal pass on the jointer to clean up the slight divot. Sand or plane away any tool marks before moving on to the next step.

Trim the top edge of the door

For this step you'll need the hinge-gap shims I described earlier. Place one at each end of the bottom

HINGES DETERMINE THE SHIM THICKNESS

Speetjens uses shims that match the gap between the hinge leaves to create gaps of even thickness around all four sides of the door.

2. Mark the gap at the top. *Hold a shim against the top of the case opening and mark the trim line at each top corner of the door.*

3. After trimming on the tablesaw, return the door to the opening. *Don't place any shims underneath the door. To check both the top and bottom gaps at once, slide two shims in the gap along the top edge.*

of the door opening. Position the door on the shims, and set it ⅛ in. back from the front of the case with the hinge side of the door tight against the case. Most doors will balance in this position. If the door won't go into the opening with the bottom shims in place, use the crosscutting sled on the tablesaw to make very light trim cuts along the top edge until it will. With the door in position in the opening, place another shim against the underside of the top of the opening and mark the thickness of the shim at each corner of the door. Use the crosscutting sled to trim to the marks.

Remove the shims and place the door in the opening in the same plane that it will hang. Using two shims that equal the desired gaps at the top and bottom edges, check the gap along the top of the door. The shims should slide smoothly. If necessary, make additional adjustments to the top edge of the door. Again, sand or plane the top edge to remove sawmarks.

Trim the latch side of the door

Before you hang the door on its hinges, the final side has to be fitted. Place the door in the opening with the front surface about ⅛ in. back from the front of the case. Slide the door to the hinge side and place two shims against the latch side of the case. Mark their thickness at the top and bottom of the latch side of the door, then use any combination of straight and angled cuts on the jointer to trim to within 1/32 in. of the marks. I like to wait until after I hang the door on its hinges before I trim the last 1/32 in. off the latch side. This extra material affords some leeway for any variances that may occur when setting the hinges.

After the door has been hung, verify the gaps with a shim above and below each hinge. If you're not satisfied with the setting of the hinges, deepen or add a veneer shim to one or more of the hinge mortises as needed (for more on installing butt hinges, see *FWW* #159, pp. 52-57). If the hinges don't need adjustment, use a shim to verify that your marks on the latch side are still accurate, and trim to the marks on the jointer. Then clean up the edge by sanding or planing the tool marks.

Remember, to ensure the success of this process, work in a methodical fashion, trimming excess material from each edge of the door in small increments. □

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

4 Fit the latch side while hanging the door

Do most of the fitting of the final edge before setting the hinges, but save some material for small adjustments afterward.

1. Mark the latch side for trimming. *Press the door against the hinge side, setting it inside the case slightly. Use two shims to lay out the opposite side. Trim this edge on the jointer to within 1/32 in. of the marks to allow for discrepancies that may occur when hanging the door.*

2. Hang the door before final trimming. *Work carefully to be sure each hinge leaf is set exactly flush with the surface.*

3. One last step. *After the door has been hung, slide a shim along the latch side to recheck your layout marks. Make the final trimming cuts on the jointer.*

Talking Shop With Kristina Madsen

"I love the technical aspect of woodworking"

BY JONATHAN BINZEN

One of the most admired and influential of contemporary furniture makers, Kristina Madsen works alone in an airy shop of her own design built on the property where she grew up in Southampton, Mass. Her furniture has origins in rigorous European-style cabinetmaking and classically derived forms, but then Madsen adds surfaces covered with intricate, incised carvings influenced by the South Pacific style. She embarked on an unusual education in woodworking when, at 19, she convinced David Powell, a transplanted Englishman who had trained under Edward Barnsley, to take her on as a student. Fifteen years later, she won a Fulbright grant to study with Makiti Koto, a master of traditional Fijian carving. Madsen's work not only has attracted collectors and museum curators but also has helped spark a widespread interest in surface decoration among fellow furniture makers.

FWW: In 1975 you left the University of Maine after one semester to study woodworking one-on-one with David Powell. What led to that decision? Had you done much woodworking growing up?

KM: No, none. The truth is, I've never even been able to make up a good story about what got me interested in woodworking. I didn't know anything about the contemporary furniture field. I just thought that I wanted to work with wood.

FWW: Did you have an interest in any one style of furniture?

KM: I didn't have any particular pieces that I wanted to build; it was just the process that interested me. I remember when David first asked me what I wanted to build, I very creatively said a wheelbarrow and a ladder. So it was the technical part of it that intrigued me. And it still is. I love the technical aspect of woodworking.

FWW: After 30 years, which technical challenges most appeal to you?

KM: One thing that I absolutely enjoy is making large chests of drawers. I love the construction part of them. I enjoy the mechanical—making something work well, making drawers slide nicely. I enjoy cutting dovetails, and I enjoy the result: A dovetailed drawer is a beautiful thing. And of course, chests are also a good format for the carving.

Chair building, too, is a bit more technical, and I really like that. The challenge of it interests me, the problem solving. And it's a pleasure to see, at the end, something that has come out well.

FWW: Is the carving a technical challenge in the same way?

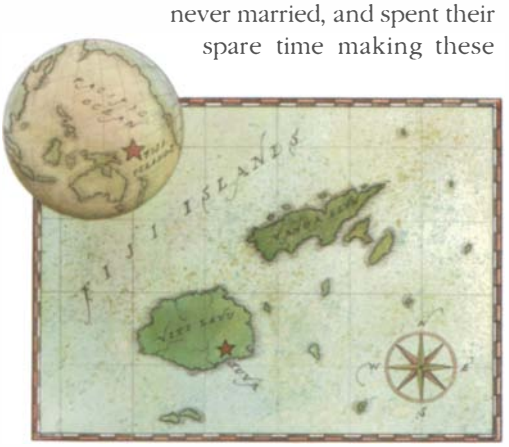
KM: The real challenge in the carving is not so much the technique itself as it is devising the pattern and laying it out.

FWW: What drew you to Fiji to study wood carving?

KM: The first seed was planted when I was 21. I saw some carvings in person, and I saw a big coffee-table catalog of the Fuller Collection of Pacific artifacts from the Field Museum in Chicago. The endpapers of the book had a map of the Pacific, and I specifically remember looking at it and thinking it's another world, never dreaming I would go there.

FWW: You did no woodworking growing up, but you did do quite a bit of needlework, such as quilting, lace making, crocheting.

KM: Indeed, and I still do. My first love was fabrics and fine linens. My three great aunts made exquisitely beautiful pulled linens—fancy work. They were all nurses, never married, and spent their spare time making these



Drawing: Kirk Caldwell; photo, this page: Jonathan Binzen

Marquetry adds mysterious beauty to a carved chest of drawers. *For the carved areas on this 2001 piece, Madsen created a winged marquetry composition with shop-sawn veneers of pau amarilla and bubinga. She glued that to a core of quartersawn maple and then topped it with a sheet of ebonized pear veneer. Her carving cut through the black veneer to reveal the marquetry pattern, producing a veiled and shifting effect.*

beautiful things, many of which were passed along.

FWW: What impact has that had on your woodworking?

KM: Textiles are my main source of reference for carving. That's where so many interesting patterns come from. I look at all kinds of textiles—carpets and weavings and bark-cloth patterns.

FWW: The carving on your pieces represents an extraordinary commitment of time. What is it like to do so much close work?

KM: Well, I enjoy it, but it is laborious. It takes hours and hours. There's nothing I can do to speed the process up. I just have to sit down and keep chipping away, plugging away, removing the material. So that gets a little overwhelming sometimes.

FWW: Do you listen to music or anything while you carve?

KM: Sometimes. If I am working on a carving where I don't have to be making decisions at all, I can listen to a book on tape or NPR news. Once I tried to listen to *The Canterbury Tales*, but I had to focus on the language, so that didn't work so well.

FWW: Is the frame of mind you enter while carving anything like the frame of mind during lace making and other needlework?

"I absolutely enjoy making large chests of drawers. I enjoy the mechanical—making something work well, making drawers slide nicely. And of course, chests are also a good format for the carving."

Photos, except where noted: Steve Reisling

"It doesn't do me any good to draw; it's not very informative. I need to see the carving. I can put something on paper and think it will look fine, and then it's totally, totally different when it's on the wood. When I carve a sample, I can very quickly see what I like and don't like."

KM: Absolutely so. One of the most frequent comments from people who see my work for the first time is "You must be so patient" or "I wouldn't have the patience to do that." But it's not a matter of patience. To the last person who said that, I simply said, "Well, you don't knit." It's the same thing. It's repetitive, it's meditative, you get into the rhythm of it and just go.

People are impatient today. They want things instantly. But any fancy work is time-consuming. Think how many beautiful objects from the past took just endless hours to make. The time I spend pales by comparison.

FWW: Is it important that the work be done by hand? If you could produce the same effect with a machine, would you use it?

KM: But you can't. You can't produce the same thing with a machine that I can by hand. At least not to my knowledge. The impact of these carvings depends on clean-cut facets and the reflected light bouncing off those facets. You could try using a laser, but I highly doubt that you'd get really crisp facets. You could get a patterned surface, but it would look completely different from what I do. So if you can give me a machine to produce something like [my carvings], I'll give it a try, but I don't know what would.

FWW: One of your extensively carved chests of drawers can take half a year to complete. How do you make it work financially?

KM: Of course, it's no way to get rich. But I enjoy every day that I'm out here, and I make enough to get by. I have only had myself to look after. If I had a family and other financial concerns, I wouldn't be doing this. But I have made a life in which the work has been the main focus. So until I'm either pressed for time or pressed for money, that carries me along quite happily.

The hourly wage is something I can't consider at all. At the end of a project I can hope to make a certain amount per week; that's what I try to keep in mind. Nobody makes a terrific living building furniture; it's not that lucrative a profession. I do it because I am interested.

The key to it for me is, at the end of the day, feeling satisfied—tired and satisfied. If I was compelled to rush things just to get them out, I'd quit.

FWW: I notice you have a large collection of sample carvings. When you design a pattern, is the first step on paper or on a sample board?

KM: It doesn't do me any good to draw; it's not very informative. I really need to see the carving. I can put something on paper and think it will look fine, and then it's totally, totally different when it's on the wood. When I carve a sample, I can very quickly see what I like and don't like.

Carving is contemplative, Madsen says. *She relishes both the active process of building her pieces and the meditative process of patterning. These pau ferro chests from 2002 afforded plenty of time for contemplation. The largest is 15 in. wide by 30 in. long by 11 in. tall. The chests are lined with silk.*

Madsen brings color to her compositions in various ways. *To make the pattern of triangles and stripes on this 2003 gallery bench for the Smith College Museum of Art, Madsen edge-glued pieces of ⅜-in.-thick ebony, maple, and bubinga and applied them to a quarter-sawn maple core.*

FWW: How do you compare your two mentors? David Powell has expertise in Western furniture-making techniques, and Makiti Koto is a master of traditional Fijian carving.

KM: In a lot of ways, they were similar as teachers, but the way they went about it was completely different. Makiti was very outgoing, a great storyteller who loved to laugh. And he was a very generous teacher. David was a very generous teacher, too, but in a much more reserved way. I've been very, very lucky to meet up with people who are masterful in their work. They both passed along their knowledge to me unreservedly.

FWW: Did you find it difficult to make the leap from Western-style woodworking to the Fijian style?

KM: From studying furniture making with David, I was used to working very accurately in a very measured way. But all of Makiti's work is freehand and a product of hand-eye coordination. He works with no measuring instruments at all. He has been building traditional Fijian artifacts since he was young, and he never used any drawings. When he made a paddle club, for example, which has a blade tapered to a very fine edge, the form was just adzed out. There was nothing other than swinging the adze that made that shape. He would draw an occasional pencil mark to get something going, but for the most part, he didn't use anything. He'd just start carving, and he didn't concern himself with ending perfectly. If the pattern didn't fit exactly, he'd fill it in with something else. It didn't have to have symmetry, and it was even more beautiful because there was an irregularity about it.

FWW: Were you able to adopt that loose way of working?

KM: I wish I had that inclination. Most of my patterns are calculated to start here and end there. I've done some less-studied patterns, but they don't come easily to me. You know, Judy McKie's carvings, and Tom Loeser's—they have a free spirit to them that I don't think mine have. And it's something I really admired in Makiti. I wish that I had the ability, but people are different.

FWW: How does it feel to put so much of yourself into your furniture and then have the pieces disappear into other people's homes?

KM: Well, I wish I could have some of the work. I don't have very much furniture at all, and it's time I did. I wouldn't want the sort of pieces I make to sell; they don't suit me. But I very much want some nice, simpler furniture. You know how the Shakers did their worldly work, their fancy work, to sell, and made plainer pieces for themselves? That would compare with what I'd do. Furniture I made for myself wouldn't be carved all over, and a lot of it wouldn't be carved at all. But yes, I would like to have furniture that I made. □

Jonathan Binzen writes about design from his home office in New Milford, Conn.

"The key to it for me is, at the end of the day, feeling satisfied—tired and satisfied. If I was compelled to rush things just to get them out, I'd quit."

Photo, this page (bottom right): Jonathan Binzen

readers gallery

TIM SWANBERG
Ovando, Mont.

This music stand is one of the first pieces Swanberg completed after studying marquetry at the Anderson Ranch Arts Center in Colorado. To prevent a flat or pressed-flower appearance, he designed the dogwood branch to suggest a larger scene, as if viewed through a window. Swanberg used Swiss pear, Chilean laurel burl, padauk, English maple, cherry, and satinwood in the construction of the piece. The stand is 24 in. wide by 44 in. tall and has a shellac finish.

BILL OOMS
Prescott, Ariz.

Ooms draws inspiration for his turnings from Native American pottery. For this petite vase, he was influenced by the black-on-white pottery of the Acoma Indians. Realizing the difficulty of re-creating the spirals of this intricate design with segmented pieces, Ooms decided to turn the vessel from a single piece of ash-leaf maple, and then burn fine lines in the wood to serve as a map for the black dye he used to create the contrasting pattern. The vase is 4¾ in. dia. by 3¾ in. tall and has an acrylic finish.

KAREN E. BAISCH
Chamberlain, Maine

"I love secret compartments," said Baisch, "and spice boxes are known for them." This 1740 Chester County, Pa., reproduction (11⅛ in. deep by 16¼ in. wide by 19¾ in. tall) has two secret compartments as well as one hidden drawer. Made of black walnut and a secondary wood of red cedar, the piece features inlays of holly, ash, tulipwood, and cherry and took about 400 hours to complete. It has a tung-oil finish.

PHOTO BY LANCE PATTERSON

ETHAN HUTCHINSON
Denver, Colo.

In this entryway bench, Hutchinson combines traditional design elements with a cleaner, contemporary feel. The bench has a Windsor-style seat with a spindle back combined with Danish legs and Maloof-style seat joints. The bench (20 in. deep by 60 in. wide by 32 in. tall) is made of cherry with moradillo plugs. It has a sprayed catalyzed-lacquer finish.

SPERO L. KRIPOTOS
Potomac, Md.

Inspired by *Fine Woodworking* articles and Readers Gallery submissions, Kripotos took a break from building for clients and family to make this writing desk (24 in. deep by 36 in. wide by 54 in. tall). The desk is made of African rosewood with cocobolo pulls. The finish is a clear shellac sealer under an oil-based varnish topcoat.

BRIAN DOODY
Waterloo, Ont., Canada

In search of a challenging project, Doody turned to the secretary on the cover of Mike Dunbar's book *Federal Furniture* (The Taunton Press, 1986). He strayed only minimally from the original, adding walnut-burl veneer to the drawer fronts and pediment. The cabinet (19 in. deep by 40 in. wide by 92 in. tall) is walnut with dovetailed top and bottom carcases, and the drawer bottoms and cabinet backs are maple plywood with walnut veneer. It took almost 400 hours to complete the piece, and Doody said at least a quarter of that time was spent perfecting the cabinet doors, which feature arched, double-beaded moldings. The secretary has glass shelves and a leather writing surface and is finished with four coats of tung oil and one coat of wax.

J. ALBERT HUDSON
Knoxville, Tenn.

Hudson built a pair of these reproduction Pembroke tables using curly cherry lumber "that looks like it's on fire," he noted. The handmade inlays and stringing and banding are done in holly, scorched and dyed holly, ebony, and hedgeapple. The inlay patterns are of his own design, but they are similar to the patterns used on classic pieces built during the 18th century. With the leaves folded down, the table measures 27 in. deep by 19 in. wide by 26 in. high. With the leaves up, it extends to 37 in. wide. Hudson hand-rubbed the finish with six coats of a mixture of linseed oil, tung oil, and polyurethane.

ANDY ANDRESEN
Grand Rapids, Mich.

After an exhaustive back-and-forth collaborative process, Andresen and his client finally settled on this bookcase design for a set of shelves for her ornate sewing room. The bookcase (17 in. deep by 44 in. wide by 73 in. tall) is made of cherry with tiger-maple slats for the fluted sides. The piece has a hand-rubbed polyurethane finish.

JOHN DEE
Kinderhook, N.Y.

While a student at the College of the Redwoods in Fort Bragg, Calif., Dee built this table based on a circa-1900 design by Ernest Gimson. The "hayrake stretcher," inlay, and dentil work are typical decorative elements employed by the founders of the Arts and Crafts movement. The table, 21½ in. deep by 54 in. wide by 36 in. tall, is made of white oak, ebony, and maple. It is finished with shellac and wax. PHOTO BY JAY ODEE

KEITH BETTERIDGE
Palmerston North, New Zealand

Betteridge made this tall case clock (13 in. deep by 21 in. wide by 82 in. tall) based on a photograph he saw in a woodworking magazine. The clock is constructed out of New Zealand kauri with madrona-veneer side panels and a maple-burl veneered face. He made the clock numbers from ivory piano keys and installed a Kieninger chiming clockwork. The clock is finished with a mixture of carnauba wax and beeswax.

Submissions

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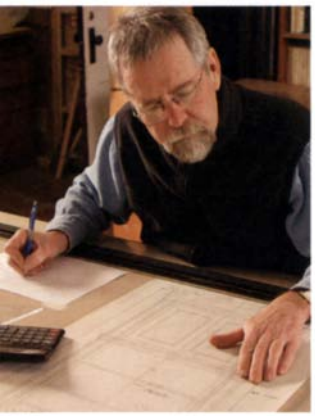
READER SERVICE NO. 188

BY PHILIP C. LOWE



Making a cutlist

On the list of fun things a new woodworker might want to try, making a cutlist is probably near the bottom. Most of us, beginner or not, would rather be in the shop.

But an accurate cutlist helps prevent the inconvenience of not buying enough material and the expense of buying too much. Close attention to a cutlist also can help avoid mishaps like forgetting to allow extra length for tenons, which can turn valuable wood into miscut scraps.

Building a good list takes some work, but you'll thank yourself later. The chart-style cutlist described here contains all the information needed to estimate lumber costs and to guide selection of stock at the lumberyard. When you organize your list, make sure that it contains the finished and rough dimensions for each part in your project, and that it lays out the numbers logically for easy addition.

Work backward from finished dimensions

Start with a carefully made drawing of your project. I like to work with full-size layout drawings (see *FWW* #161, pp. 68-74) for the greatest precision, but a smaller-scale drawing also can work for generating a list.

Take extra care when using purchased drawings or project plans from a magazine. Such drawings often leave out thicknesses, measurements for joinery, or other details, and missing them can lead to mistakes in buying and cutting stock.

I begin a list by filling in the names of the parts, the finished dimensions for each, and the number of parts needed (four table legs, for example).

When filling in the length, be careful to include the ends of any joinery—such as tenons—that are hidden in the finished piece. Overlooking joinery details is an easy mistake to make.

I also include special notes on my list for any curved parts that can be cut from the same board in a nested pattern. Typically, I make a separate drawing that shows how those parts can be laid out for cutting, and how large a board will be needed for this phase of the project.

Next, calculate the dimensions of the rough-cut pieces. Add 1 in. to all the lengths of the parts and

Note the details on a chart-style list

A good cutlist is basically an organized inventory and description of every piece needed to build a project. A complete and accurate list will help you to buy the right amount of lumber in the right sizes. It also will help to ensure you don't forget any parts when you're planning your work.

List the finished dimensions (length, width, thickness) from the layout drawing. Account for any material that might be hidden in the joinery.

To find the rough dimensions, add a set amount to the finished dimensions to account for waste in the milling process.

Calculate the board footage using the rough dimensions. Multiply the length by the width by the thickness in inches, then multiply that figure by the number of pieces. Divide the total by 144. To account for waste, add 15% to each part.

	FINISHED				ROUGH						
PARTS	No.	L	W	T	No.	L	W	T	WOOD	COMMENTS	BF
Bottom Side Rails	4	36"	2½"	⅞	4	37"	3"	5/4	Poplar		4.9
Upper Side Stiles	2	10"	4"	⅞	2	11"	4½"	5/4	"		1.0
Bottom Side Panels	2	24"	10"	¼	2	25"	10½"	¼	Birch Ply.		
Outer Door Molding	4	36"	1¼"	7/16"	1	37"	4"	7/8"	Cherry	Mold & Rip	1.47

List the parts by name.

List the quantity of each part.

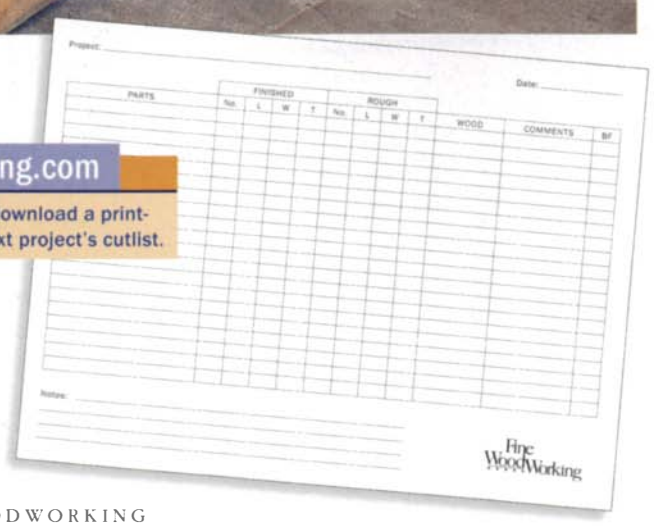
Note the wood species or material for each part.

List any special instructions. The notes here can refer to detailed cutting patterns, joinery, carving, or other issues.

Photos: Steve Scott

At the lumberyard

Take your list with you. *First look for boards of appropriate width and thickness (right). Then refer to your cutlist to chalk out the parts on specific boards (below). On your cutlist, check off the pieces you've selected. Be sure to restack any unwanted boards neatly when you're done.*



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Visit our Web site to download a printable chart for your next project's cutlist.

½ in. to the widths to ensure enough material in the rough-cut pieces to correct problems that arise during the milling process.

The standard thicknesses for roughsawn lumber are expressed in quarters of an inch. In determining the rough thickness you'll need, it's a good idea to allow at least ¼ in. of waste. This should provide enough material—even in cupped or twisted boards—for jointing and planing lumber to finished thickness. So if you have a finished thickness of ¾ in., you would record a rough dimension of 4/4, or 1 in. If the finished dimension is ⅞ in., you would mark down a rough dimension of 5/4, or 1¼ in.

Calculate board feet to estimate cost

Using the rough dimensions in your chart, you can calculate the board footage needed for each part (use the formula in the chart on p. 90). This calculation will help you to estimate your project's cost, but it won't tell you the length and width of the boards you should buy. For that you'll need to take your cutlist to the lumberyard.

To estimate your project's cost, multiply the various board-footage figures by the lumberyard's prices per board foot.

Take your list to the lumberyard

Even on small projects, having your list in hand as you shop is more reliable than trying to keep track of all the parts and dimensions in your head. Also, the rough dimensions on your list will help you to estimate the optimum lengths and widths for the boards you'll need to yield all of the parts.

At the yard, boards typically are sorted by thickness and wood type. When you find the stack you're looking for, put a ruler to the ends of the boards and look for stock wide enough to accommodate the parts you plan to cut.

After finding several candidates, dig through the pile and drag them out so you can scan the surfaces for color, grain, knots, and drying defects. Longer and wider boards are more likely to have some kind of defect. This is especially true for woods such as maple and birch, which tend to cup or twist as they dry.

When you find a board that looks good, lay out chalklines and, working around any defects, see how many parts you can get from the plank. As you lay out the rough dimensions of each part on the boards, put a check mark on the cutlist to indicate that you've found the stock for those parts.

In this way, work through the entire list—one thickness and species at a time—until you have enough stock to complete the job. □

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Q&A

Products for high-gloss polishing

Q: I was planning to use the pumice-rottenstone polishing method until I read your article about auto-polishing products ("Favorite Finishing Products," *FWW* #172, p. 43). I haven't found the Meguiar's New Car Glaze #5, shown in your article, but I found instead Show Car Glaze #7 and Swirl Remover #9. Which of these products do you recommend, and in what order?

—LLOYD PARKER, Oakville, Ont., Canada

A: THE #7 SHOW CAR GLAZE IS SIMILAR TO THE #5 NEW CAR GLAZE. The #7 has finer-quality oils than the #5, which makes it better for hand application. The #5 is suited for either hand or machine application, but a high-gloss polish is harder to achieve by hand. The #9 Swirl Remover, unlike the #5 and #7, has a microabrasive compound; while it can be applied by hand, it works better when applied by machine.

All of these products are used only after the initial rubbing-out schedule is followed, which includes making sure the surface is dead level by progressing through the various grit levels, working up to as high as the 4,000-grit foam-backed Abralon pad (for more information on rubbing out, see *FWW* #164, pp. 117-118). The Swirl Remover can be used instead of the fine and finer pumice and rottenstone abrasives in the final steps of the polishing process. To achieve a superior high-gloss surface, use the abrasive #9 followed by the #7.

—TERI MASASCHI,
a regular contributor to *Fine Woodworking* on finishing topics

Automotive products can be used in the final steps of the polishing process. *Instead of the fine and finer pumice and rottenstone abrasives, use the Swirl Remover. For the final, high-gloss polish, use the Show Car Glaze.*

Do I need a 6-in. or an 8-in. jointer?

Q: I'm a novice woodworker, and I'd like to know if an 8-in. jointer is worth the huge price increase over a 6-in. model.

—DUSTIN FUNK, Moose Jaw, Sask., Canada

A: IF I WERE JUST GETTING STARTED IN WOODWORKING, I would buy the best-quality 6-in. jointer I could find and use the savings for my next tool acquisition. A 6-in. jointer (the size is determined by the length of the knives) will easily straighten a 6-in.-wide by 8-ft.-long board, which is stock that's suitable for many projects. Shop space also is a consideration: An 8-in. jointer takes up quite a bit more room than its smaller brethren (the longer the knives, the longer the infeed and outfeed tables). I have an 8-in. jointer in my shop and only occasionally benefit from the added width. Also, an 8-in. jointer often requires 220v power, something not always available in a small shop.

—ROLAND JOHNSON, contributing editor

A good performer at a reasonable price. *A 6-in. jointer can flatten and edge-joint most boards and costs considerably less than an 8-in. jointer.*

Photos, except where noted: Marcia Ryan; this page (bottom): Lynne Christiana

Why is my mortise chisel twisting?

Q: I'm having trouble squaring up mortises with a chisel after I've drilled out most of the waste at the drill press. My mortise chisel twists and keeps getting jammed. What do you recommend?
—TIM HEYLAND, Toronto, Ont., Canada

A: YOUR MORTISE CHISEL MAY BE TOO WIDE for the mortise you're cutting, and a dull chisel could be contributing to your difficulty. Typically, you should use a chisel that's slightly narrower than the mortise. A narrower chisel encounters less resistance and can be moved easily with more control.

When cleaning up a mortise that has been drilled out, use a mortise chisel only when squaring the ends of the mortise. Use a wider paring chisel to clean the cheeks. If necessary, reposition the mortise chisel to clean out the corners at the ends of the mortise.

You also might try using a guide block, clamped at the end of the mortise, to support and guide the blade of the mortise chisel; this will give you more leverage and control without damaging the edges of the mortise. Make sure that the cutting edge of your chisel is sharp.

—MARIO RODRIGUEZ, contributing editor

Cleaning up a drilled-out mortise. *First, clean the ends of the mortise (top). Use a guide block and a mortise chisel that's slightly narrower than the mortise for better control. Then clean the cheeks with a wide chisel (bottom) to pare them flat and square.*

Offset hinges for lipped doors

Q: How do I set hinges on the door of a tall-case clock that has an overhanging molding on the hinge side of the door?
—ROBERT AINSWORTH, Ashurst Wood, England

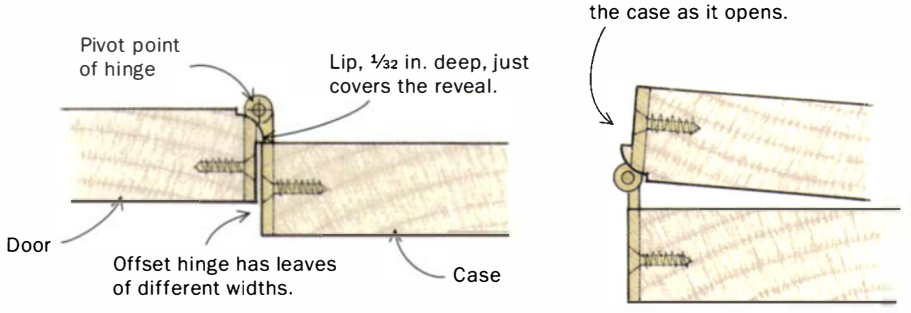
A: WHEN A PORTION OF A DOOR IS PROUD of the case work, the door requires offset hinges to prevent it from binding on the case. These hinges have leaves of different widths, which correspond to the amount of the door thickness that is outside the opening. The hinge barrel (the pivot point) is positioned out from the surface of the case. This allows the door to swing the usual distance, about 180°, without binding.

On many 18th-century Colonial American pieces, the portion of the door that is outside the case-work opening is rabbeted on all sides to create a decorative lip. The rabbet on the hinge side, however, is no more than 1/32 in. deep, which does not overlap the case but just covers the reveal, so all four edges of the door look the same. Like the door that you're making, these lipped doors require offset hinges. A number of companies that produce period hardware sell offset hinges, especially for clock cases.

—LONNIE BIRD, furniture maker and teacher

INSTALLING AN OFFSET HINGE

Offsetting the pivot point of the hinge allows the hinged corner of the door to move away from the case as it pivots, preventing the lip from binding.



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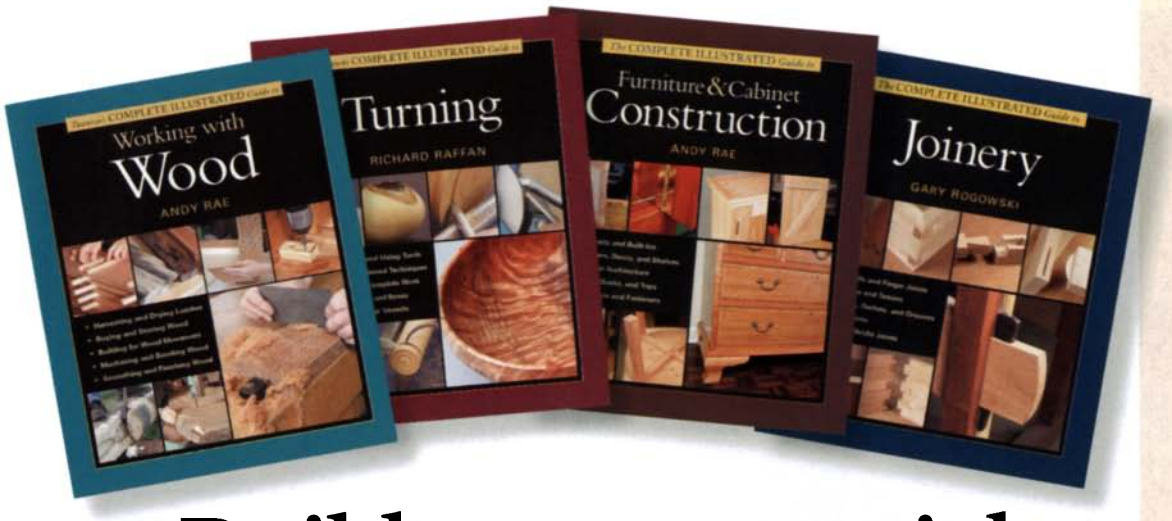

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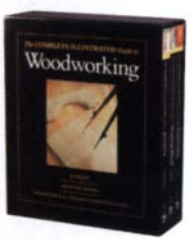

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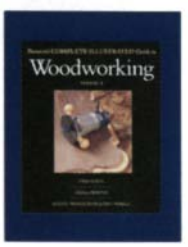

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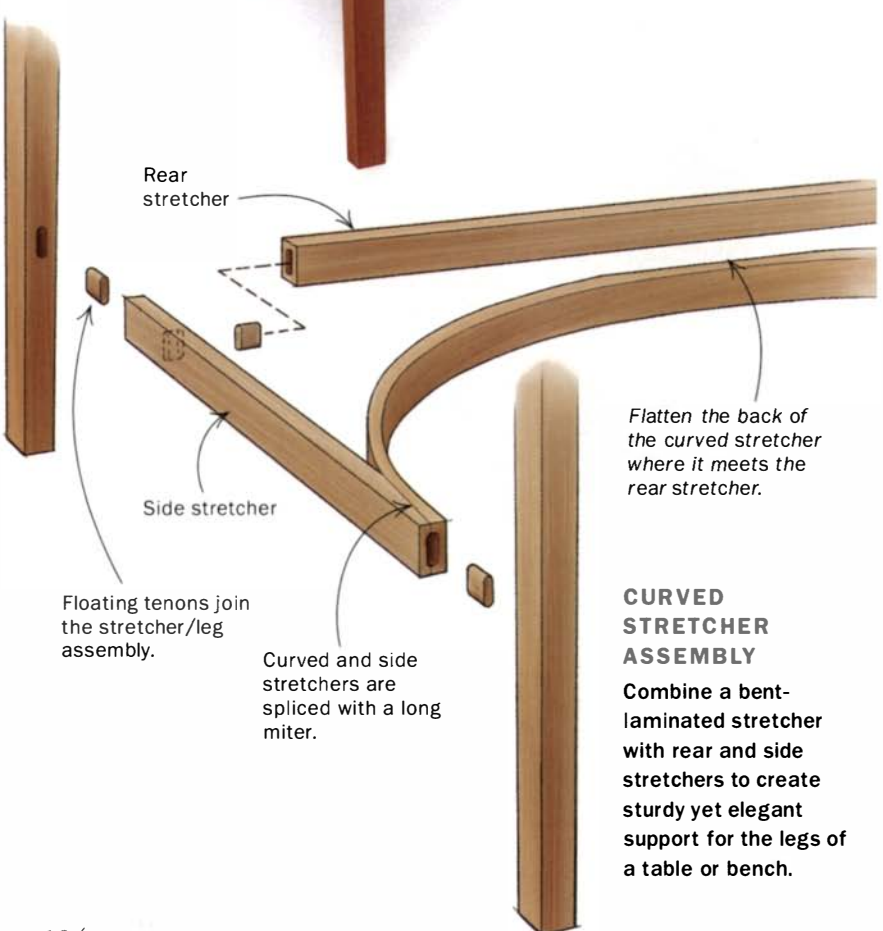
Curved stretcher adds grace and legroom

BY MARK EDMUNDSON



CURVED STRETCHER ASSEMBLY

Combine a bent-laminated stretcher with rear and side stretchers to create sturdy yet elegant support for the legs of a table or bench.

The first time I saw bent-laminated stretchers was on furniture made by Edward Barnsley. He used this detail with success on everything from chairs to dining-room tables. I admired the combination of graceful lines and the practical benefit of ample legroom. The bent-laminated stretcher struck me as a detail that would get attention, but in a subtle way. It also looked like it would be a challenge to construct.

When I finally slipped it into a design for a bench, I anticipated some frustration. However, as I built that piece and others like it, I found that the potential for inaccuracy doesn't have to threaten the success of the project. By leaving the stretcher-assembly stock extralong until the last moment, I've found that I can compensate for unforeseen discrepancies.

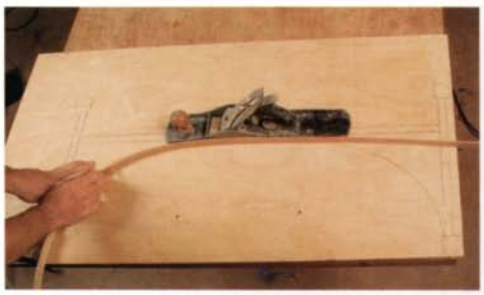
I highly recommend using full-scale drawings when building a piece with curved parts; you'll consult the plan view constantly for information. On the drawing, lay out the location and shape of the legs first and then the rear and side stretchers. The location of the rear stretcher is a matter of taste, but a couple of inches from the back legs is a good starting point.

The most critical areas are the splice joints between the front ends of the bent lamination and the side stretchers. Also, you must cut a flat face at the center of the lamination, where it attaches to the rear

Photos, except where noted: Asa Christiana; this page: courtesy of Mark Edmundson

Making a curved stretcher

Find a graceful curve that connects the side and rear stretchers, and then make a lamination form. After glue-up, trim the edges and ends of the lamination.



Lay out the curve on the drawing. *Use a flexible batten to create a curve that gets tighter near its ends. Trace the shape on your drawing to be sure the curve hits the right spots. Use that curve to make a lamination form.*

Assemble the lamination. *Start clamping at the middle and work toward the ends, using a clamping caul made from five or six strips of 3⁄16-in.-thick birch plywood to prevent bumps.*

stretcher. Use the full-size drawing to determine the curve of the lamination so that it meets the stretchers and front legs as it should.

The bent lamination needn't be a radius curve. In fact, a curve with tighter corners and a slight flattening in the middle is more graceful and provides more legroom. I lay out only half of the curve and then use a half-template to create a symmetrical, full template. Check the full curve on your drawing, then use it to make the lamination form.

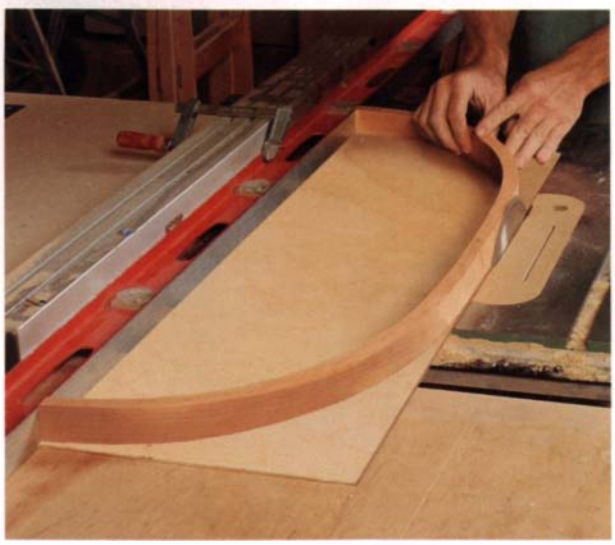
Glue up the bent lamination

The adhesive I use for bent laminations is Unibond 800, a two-part urea resin available from Vacuum Pressing Systems (800-382-4109; www.vacupress.com). This glue creates a more rigid glueline and less springback than yellow or white glue. Still, you should make the bent lamination a couple of inches longer than the finished piece to allow adjustments for a slight amount of springback. I've found that 3⁄32 in. is a good thickness for the plies.

After the glue has set, remove the bent lamination from the form and clean up the top and bottom edges. Start on the jointer, and then trim the other edge on the bandsaw. Finish off that bandsawn surface by running it through a thickness planer.

Return to the plan drawing with the curve. Does it still meet the leg in the intended location? If it

Trim the ends. *Again, use the drawing as a guide. Mark and trim each end 1 in. extralong at this point. Use a long stick to ensure that the cuts will be aligned.*

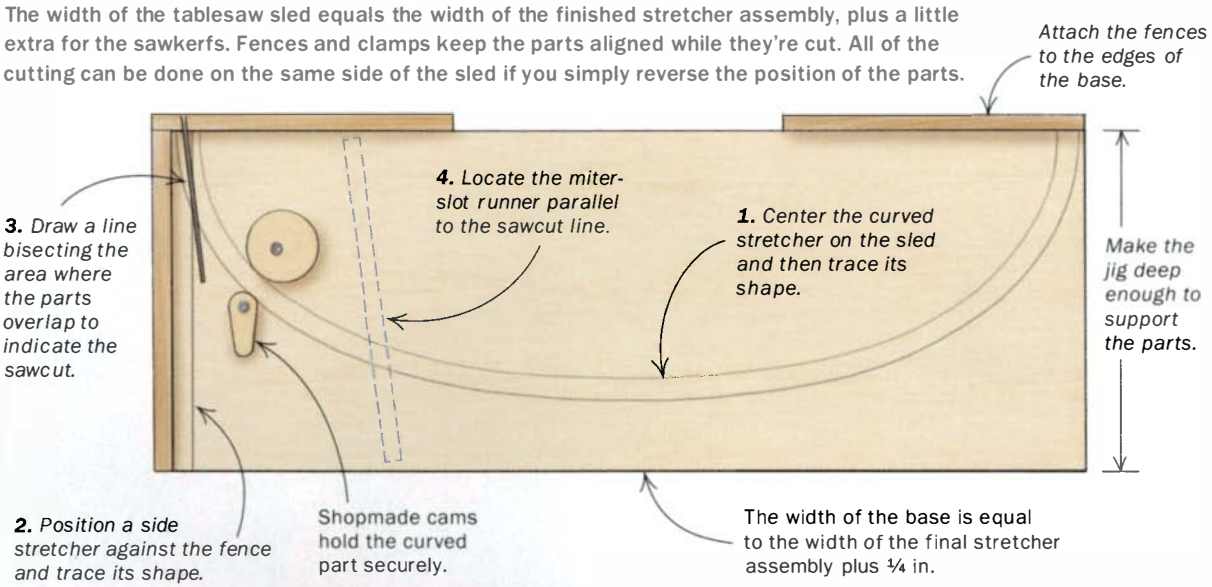


Flatten the back for a strong glue joint. *To keep the workpiece stable during the cut, tape or clamp it to a plywood base.*

Use a tablesaw sled to trim the stretchers

Lay out the sawcut and attach the miter-slot runner. *Place the curved stretcher and side stretcher on the sled and trace their shapes. Use a piece of wood the same thickness as the sawkerf to bisect the area where they intersect, and draw the path of the sawblade (above). Use a bevel gauge to transfer the angle and location of the cut from inside the sled to the front edge. Then use that angle and line (right) to position the sled on a miter-slot runner.*

The width of the tablesaw sled equals the width of the finished stretcher assembly, plus a little extra for the sawkerfs. Fences and clamps keep the parts aligned while they're cut. All of the cutting can be done on the same side of the sled if you simply reverse the position of the parts.



Cut the parts one at a time. *Cam-action disks clamp the curved part in place (left); the side stretcher simply is clamped to the fence (right). After cutting one joint, just flip the curved stretcher and repeat the process at the other end.*

has sprung outward more than you expected, don't worry—just move the curve toward the front of the table or bench until it intersects properly with the front leg. Note: This will change the location of the rear stretcher.

Decide on joinery

Now is the time to decide what type of joinery you plan to use where the stretchers meet the legs—joinery you shouldn't cut until the entire stretcher system has been assembled. I often use floating tenons, especially if the legs are curved or tapered, because it is easier to trim the stretcher ends for a flush fit than it is to saw tenons on all of them and maintain accurate shoulders.

Lay the bent lamination on your drawing to determine where to trim the ends. Leave them about 1 in. extralong at this point; it's good to have some room for small adjustments later. Keep the cuts aligned with each other and square to the overall lamination. Leave the side stretchers extralong, too. Once these sawcuts have been made, you can flatten the center of the lamination where it will join the rear stretcher. Rip the flat by attaching the bent lamination to a simple plywood base, with the front ends riding a long auxiliary fence on the tablesaw.

Use a tablesaw sled to cut the splice joints

Next are the splice joints between the bent-laminated stretcher and the side stretchers. This is the most involved part of the construction, and the goal is to keep the side stretchers in proper alignment. An elegantly simple tablesaw jig will ensure your

Drawings: Chuck Lockhart

Glue and trim the assembly

Return to the drawing and align the parts. *Clamp the parts and drill for alignment pins in the waste areas. Now you can locate the back stretcher precisely. Mark its length and position, then cut its joinery.*

Glue up the whole assembly at once. *Make curved clamp pads for the inside faces of the splice joints. The pins keep the splice joints from slipping.*

success. The rectangular plywood sled holds the mating pieces in their plan-view positions while you cut each face of each splice joint.

Use a bevel gauge to record the angle of the cut and also to carry the cut line over the front fence onto the front of the jig. Then use the bevel-gauge setting to angle the jig to the miter slot, and line up the cut mark with the sawblade. Temporarily clamp the jig in place and screw it onto a miter-slot runner underneath. Cut into the jig to check the alignment before cutting the actual joint.

You are just about ready to cut the joint, but you need a means for securing the curved part. Use the lines you traced earlier to locate two opposing cams. The straight side stretcher simply can be clamped to the side fence. Cut the pieces one at a time, then flip the curved stretcher in the jig to cut the same joinery at the other end.

With the front splices finished, check the joints against the drawing. Adjust the alignment of parts to create clean junctions between them and then clamp the parts in place. By leaving them extralong, you have created a waste area at the end of each splice joint. Drill through these areas for a small dowel that will lock each joint in position. Once you lay the rear stretcher against the flat area on the back of the bent lamination, you can see exactly where the rear stretcher will contact the side stretchers. If necessary, cut the rear stretcher a bit long or short to flex the assembly into alignment during glue-up. Now cut the joinery for the rear stretcher.

Glue up the whole assembly

Sand the parts before gluing up the stretcher system, as some areas will be hard to reach afterward. Use a slow-setting glue.

After glue-up, place the assembly on the plan-view drawing to mark the ends for trimming. To cut the ends, clamp the entire assembly to a tablesaw crosscutting sled (see the left photo below). Then reference the front ends to cut the back ends of the side stretchers.

With the stretcher system done, all that's left is to join it to the legs. For floating tenons, use a router and a template guide (below right). For sawn tenons, cut them by hand or make a tablesaw sled that can hold the entire assembly in the necessary positions.

The key to building this stretcher system is heading off potential mistakes. By using a full-scale plan and leaving pieces extralong until the last moment, you will be able to corral any wild outcomes to acceptable boundaries. □

Trim the assembly to final size. *Lay the stretcher assembly on the drawing to mark the final length of the front ends, and cut them with a crosscutting sled on the tablesaw. Then measure from the front ends to mark and cut the back ends.*

Router jig for floating-tenon joinery. *To cut a precise mortise in one end of the finished assembly, make a jig to secure the workpiece and act as a router template.*

WOODWORKER'S MART

See ad index on page **116** for reader service number.

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WOODWORKER'S MART

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BY MARK SCHOFIELD

True grit

Your sandpaper may have changed without you knowing

Sandpaper has many confusing specifications, from the type of abrasive to the weight of the paper, but at least the grit size has always been easy to understand. Unfortunately, this is no longer true: The world of sandpaper grits is undergoing a quiet revolution, and the grits you've always relied on for each stage of woodworking may no longer be the most appropriate.

CAMI once was dominant

A generation ago, most sandpaper sold in the United States had its abrasive size graded on a scale developed by the Coated Abrasives Manufacturers' Institute (CAMI) and approved by the American National Standards Institute (ANSI). This standard was so common that reference to it was not even included on the back of a sheet of sandpaper; it simply stated the grit number: 180, 220, etc.

In Europe, the Federation of European Producers of Abrasives (FEPA) had its own metric grading scale, but to avoid confusion, FEPA-graded paper carried the prefix P with the grit number: P180, P220, etc. Not only was the distinction clear, but FEPA sandpaper sold in the United States also was confined largely to that made by European companies such as Klingspor and Mirka. Having two grading methods would be of only academic interest if the same numbered papers produced the same results.

Unfortunately, the finer the grits become, the more the two grading systems diverge (see the chart at right). Below 220 grit, the size of the abrasive

Photos: Michael Pekovich

CAMI vs. FEPA grits

The two main methods of grading abrasives for sandpaper are the CAMI system and the FEPA system. A FEPA-grade grit generally is coarser than its CAMI equivalent but is produced with a tighter tolerance for particle sizes within each grit (see the graph at bottom).

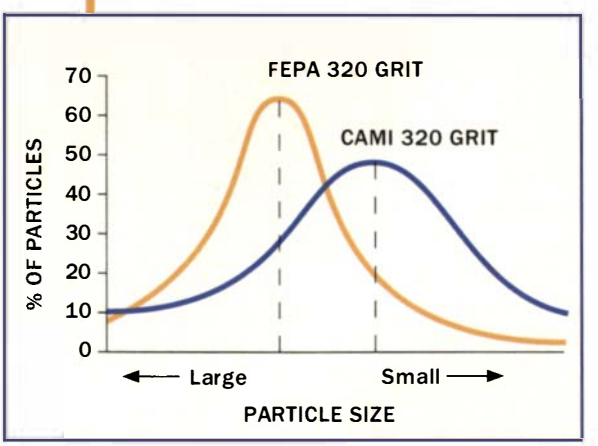
CAMI GRADING SYSTEM	FEPA GRADING SYSTEM
60	P60
	P80
80	
	P100
100	
	P120
120	
	P150
150	
	P180
180	
220	P220
	P240
240	
	P320
320	P400
400	P600
600	P1200
800	P1500

THE FINER THE GRIT, THE MORE THE GRADES DIFFER

Below about 220 grit, the size of the abrasive particles on both types of sandpaper is roughly equal. Above that level, FEPA sandpaper is increasingly coarse relative to the same grit number on the CAMI scale.

For coarse- to medium-grit paper, there is very little difference between the two grading systems.

For fine sanding and finishing, it is important to know which type of sandpaper grade you are using.



FEPA: ROUGHER BUT MORE CONSISTENT

The FEPA grading system requires that a higher percentage of the abrasive particles on the paper be close in size to the stated grit. This results in a narrower bell curve of particle-size distribution than for CAMI-graded grits.

particles represented by each number is almost the same. But to match the abrasive on CAMI-graded 600-grit paper, you need to use FEPA-graded P1000 or even P1200 paper.

FEPA papers gain wider use

A large producer of abrasives estimates that 10 years ago 50% of its customers used FEPA-graded sandpaper; today, the number is around 90%. The reason for the increase has to do with the advantages of FEPA papers. For one, in the grit sizes most used for sanding bare wood (80 to 150 grit), FEPA papers are slightly coarser and tend to cut more quickly than their CAMI equivalents. This is appealing to production shops where time is money; the slightly coarser scratch pattern left by FEPA sandpaper is of less importance.

Another advantage is that while all sandpaper is coated with a range of grit sizes, FEPA-graded papers have a greater percentage of particles close in size to the stated grit. Because of this, the scratch pattern left by FEPA sandpaper tends to be more uniform, an important characteristic as you begin to work in finer grits.

Advice for picking the right grit

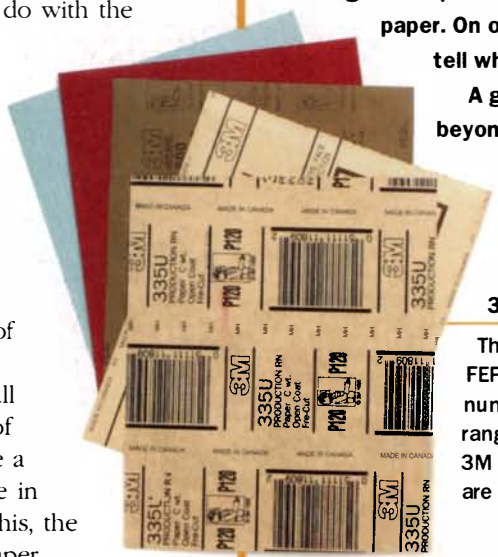
The first recommendation would be to check your current stock of sandpaper and separate it by grading method (right). You may find that when rubbing out a finish, you have inadvertently used CAMI 400-grit paper followed by P600 paper, even though the latter is slightly coarser.

For sanding bare wood, the differences between the two grades aren't as important. But for finer sanding between coats of finish and for rubbing out a finish, stick with FEPA papers because their tighter range of particle sizes for each grit results in a more consistent scratch pattern.

The industry consensus is that FEPA sandpaper will be increasingly dominant but that certain niche markets will remain on the CAMI system. Because of this, in the future, anytime a grit size is mentioned in *Fine Woodworking*, the number will be preceded by a P and refer to the FEPA scale, unless another scale is specified. □

Grading grits, brand by brand

When I began investigating this subject, I assumed that differentiating between CAMI and FEPA papers would be a simple case of looking for the P prefix on the back of a sheet of sandpaper. The deeper I dug, the more confusing the picture became, not only for me but often for the manufacturers and retailers I questioned. On some FEPA papers, the letter P is no longer stamped before the grit size but appears elsewhere on the sandpaper. On others, the letter P appears nowhere, leaving no way to tell whether the grit is graded on the CAMI or FEPA scale. A guide to every single type or brand of sandpaper is beyond the scope of this article, but the following generalizations can be made about sheets of sandpaper used by amateur woodworkers. Fortunately, most of the observations apply to sanding disks as well.



3M

The manufacturer 3M promises that all of its FEPA sandpaper has the letter P before the grit number. This includes the Sandblaster and Gold range of aluminum-oxide papers, but not some 3M wet-or-dry and garnet papers, which are CAMI graded.

NORTON

Norton has switched over almost entirely to FEPA grading. This includes the popular 3X range of sandpaper, but be warned: The P prefix is neither on the sandpaper nor on the packaging. Norton's only CAMI grade is silicon-carbide wet-or-dry paper.

KLINGSPOR

Klingspor uses only the FEPA system. However, while its silicon-carbide sandpaper has the P prefix, some of the garnet and aluminum-oxide papers do not.

MIRKA

Mirka uses the FEPA system, and all of its sandpaper appears to be labeled with the P prefix.

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Ancient Inspiration

It took some long-dead craftsmen to awaken a love of pure decoration in Wisconsin furniture maker Charles Radtke. Radtke spent years honing his technical skills and hewing to the idea that every detail in his furniture ought to be an expression of construction or function. But in the mid-1990s he began to take a more visual approach to design. The hand-cut dovetails, fox-wedged tenons, shopmade veneer, and handplaned surfaces became simply the grammar rather than the subject of his work.

One catalyst of the shift was a show of funerary artifacts from ancient Egypt. Radtke was inspired as much by their decorative power as he was by their longevity. In his recent cabinet, Sarcophagus #4, Radtke employs color, line weight, texture, and rhythm to create a composition as strong, subtle, and satisfying as a set of dovetails.

He made the piece with plain and quilted Belize mahogany, persimmon (the central square on each door), holly, pink ivory, and red paint.

—Jonathan Binzen

Photos: Richard Brodzeller Photography