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sharpening, p. 42

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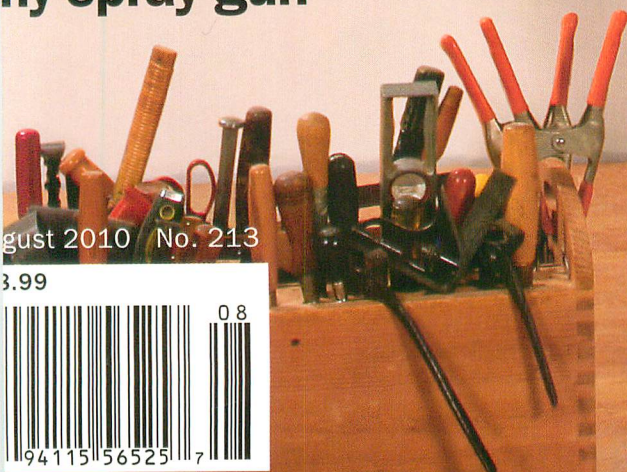
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August 2010 / No. 213

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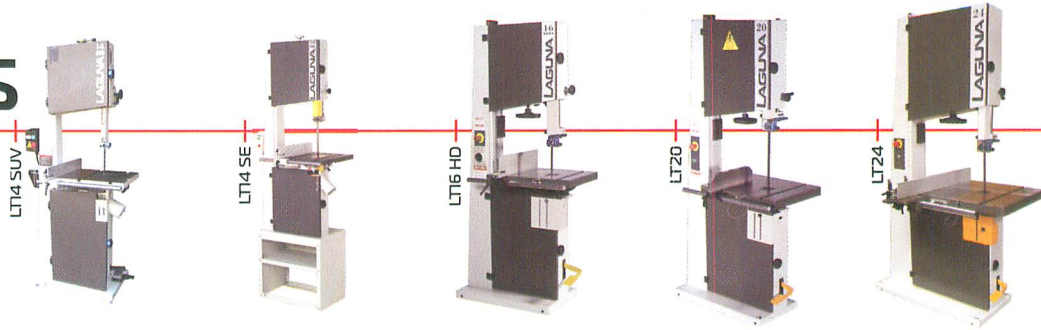


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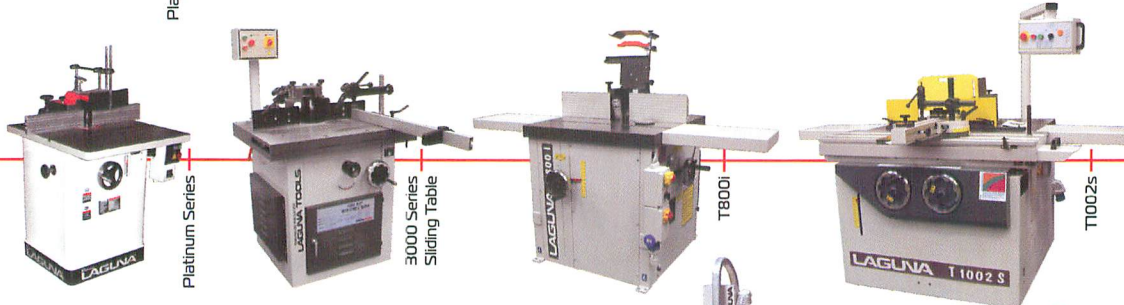
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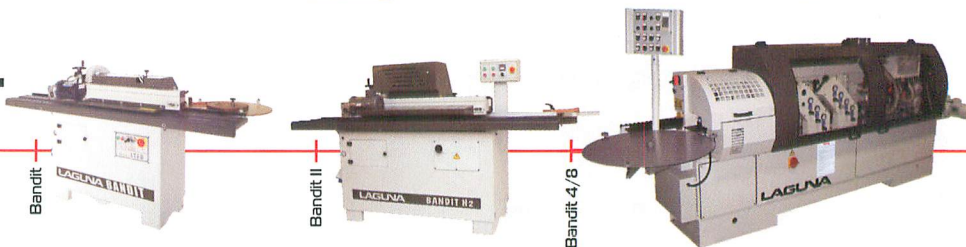
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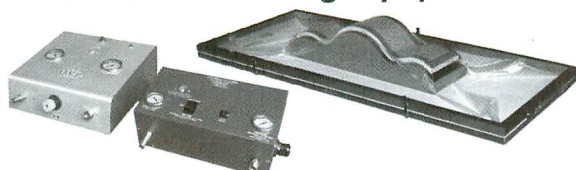
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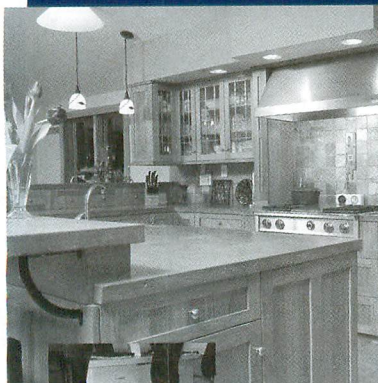
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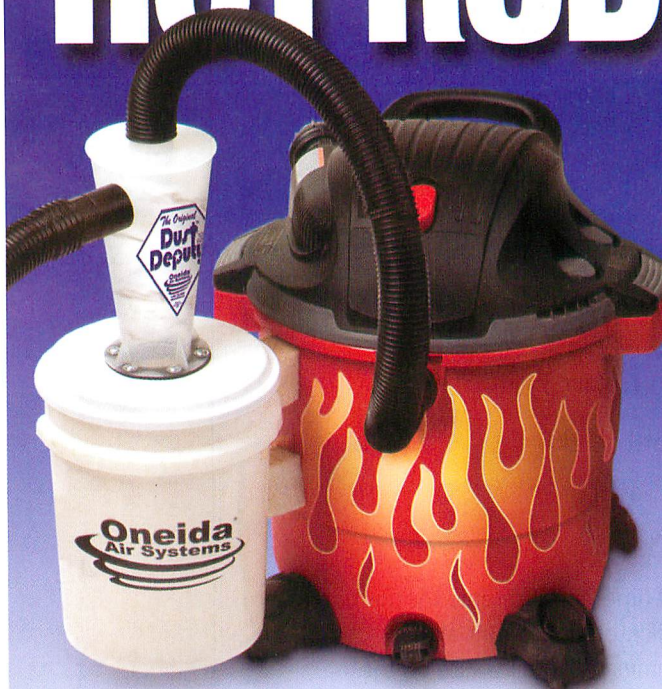


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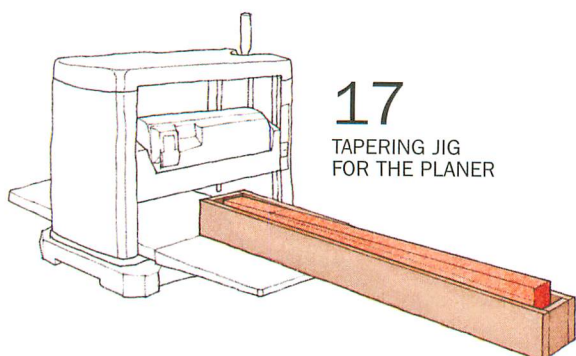


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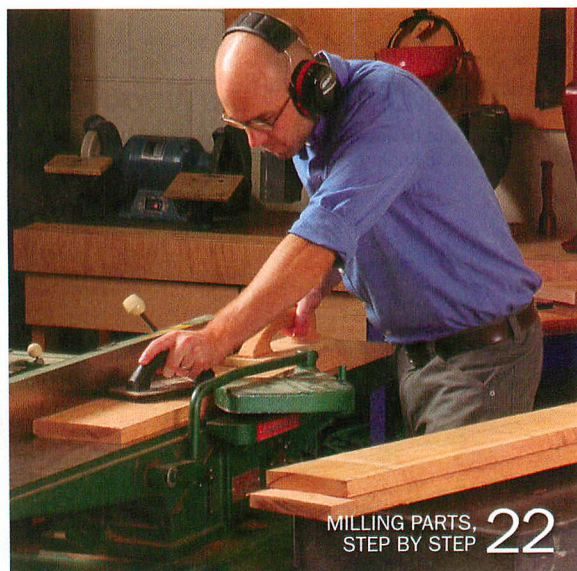
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Boston's North Bennet Street School turns 125

BY JONATHAN BINZEN



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BOTTOMS



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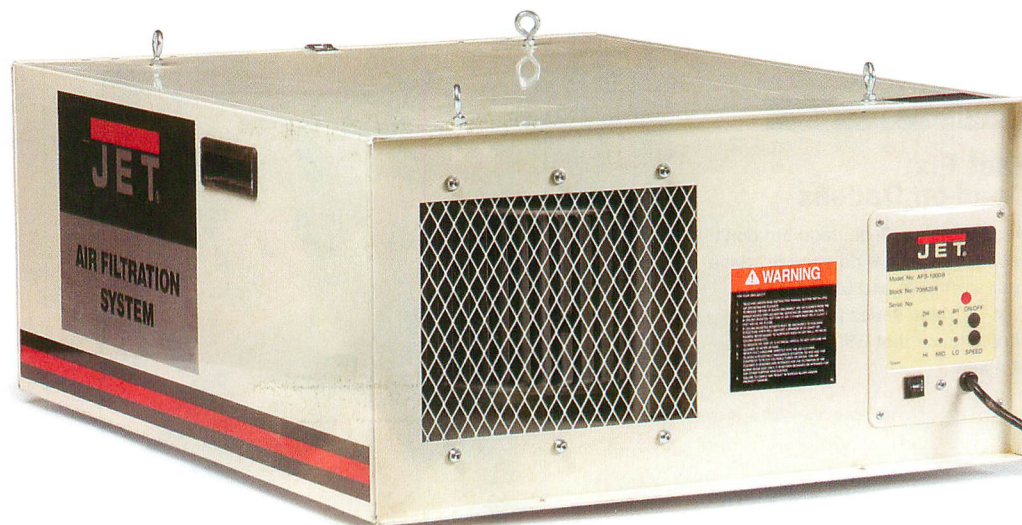
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The back cover explained

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on the web

THIS MONTH ON **FineWoodworking.com/extras**

Visit our Web site to access free Web tie-ins, available June 3. While you're there, don't miss our collection of free content, including tool reviews, furniture, shop and jig galleries, and must-read blogs.



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Sign up for our FREE eLetter at FineWoodworking.com/newsletter to receive plans, videos, and articles by email.



VIDEO: Built-in Build-Off

It's carpenter vs. woodworker as we go behind the scenes of a tradesmen's challenge and capture tips for better built-ins (catch the article, "Mudroom Built-in: Stop Clutter at the Door," on p. 28).



AUDIO SLIDE SHOW: New Twist on Bending Wood

Seth Rolland (back cover) creates astonishing shapes, without touching a steambox or using laminations.

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VIDEO

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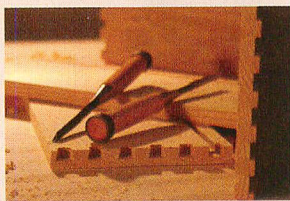
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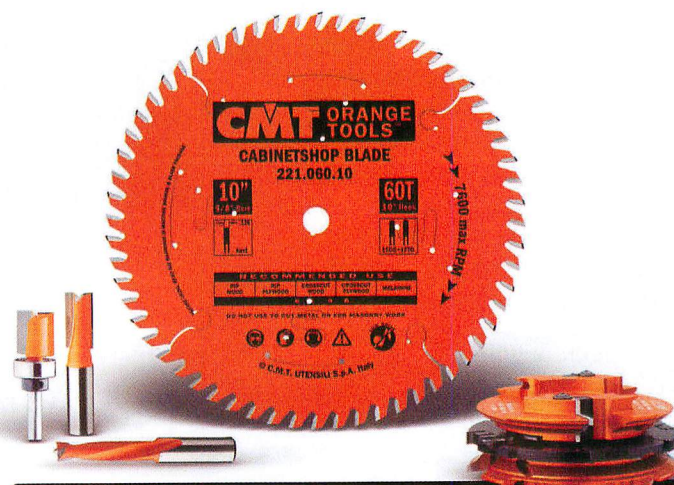
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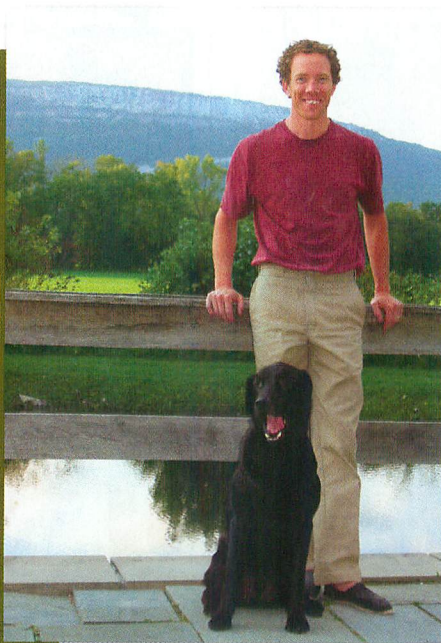
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contributors

When **Andrew Hunter** (*"Best Way to Attach Tabletops?"*) discovered **Toshio Odate's Japanese Hand Tools** (The Taunton Press, 1984), he fell in love with Japanese woodworking. Inspired by the discipline of the traditional Japanese apprenticeship, Hunter set out to teach himself to build furniture using Asian hand tools. Like a Japanese journeyman, he started with the core of the craft and worked outward. As he describes it: "Before you can build a piece of furniture, you must first learn to make rice." Fifteen years later, he designs and builds custom furniture full time in his own studio (andrewhunterart.com) in Gardiner, N.Y.



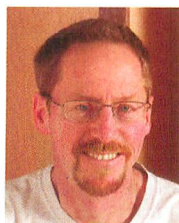
Deneb Puchalski (*"Get Sharp—Fast"*) has spent over 25 years honing his hand-tool skills in a variety of fields. After completing the 12-week program at the Center for Furniture Craftsmanship in Rockport, Maine, and a six-month stint there as the artist-in-residence, Puchalski went to work at Lie-Nielsen Toolworks. He's spent the past nine years demonstrating the use of hand tools at woodworking events all over the United States and Canada.

Josh Metcalf (*Master Class: "Miter your dovetails"*) describes his romance with woodworking in this way: "I majored in biology in college, but didn't fancy myself in a lab or in front of students, so I set out to learn woodworking. I took a job as a carpenter's assistant, when a friend with more faith than sense offered to help me buy basic equipment and pay her back in furniture. I've never had a job since!" To see more of the Vermont woodworker's furniture, go to joshmetcalf.com.



Ben Barrett (*A Closer Look: "How veneer is made"*) has spent his life in the lumber and veneer business. He grew up around his family's sawmill, went to lumber-grading school, then worked for two lumber wholesalers before discovering the world of veneer 22 years ago. After nine years with a pre-eminent veneer producer, he returned home to western Massachusetts to start Berkshire Veneer (berkshireveneer.com).

For the last 10 years, **Tony O'Malley** (*"Mudroom Built-in: Stop Clutter at the Door"*) has operated his own business specializing in built-in cabinetry (tonycustomwood.com). He started woodworking during college, and began in the trade shortly after graduating in 1982, working in several shops in the Philadelphia area. O'Malley has written many articles for *Fine Woodworking* and has edited four woodworking books for The Taunton Press.



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

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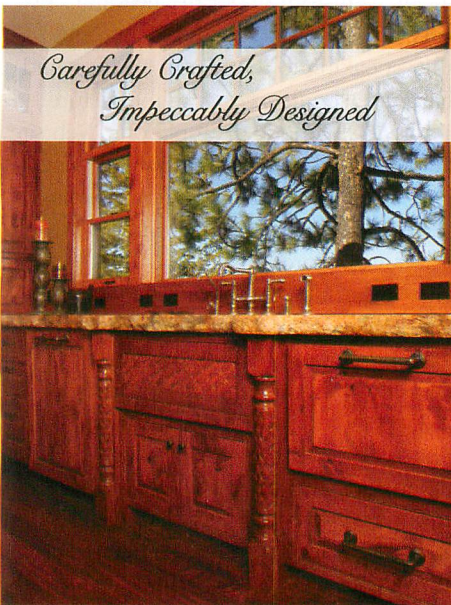
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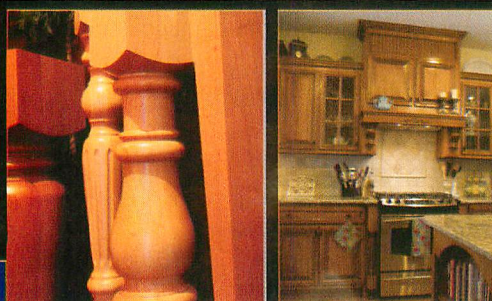
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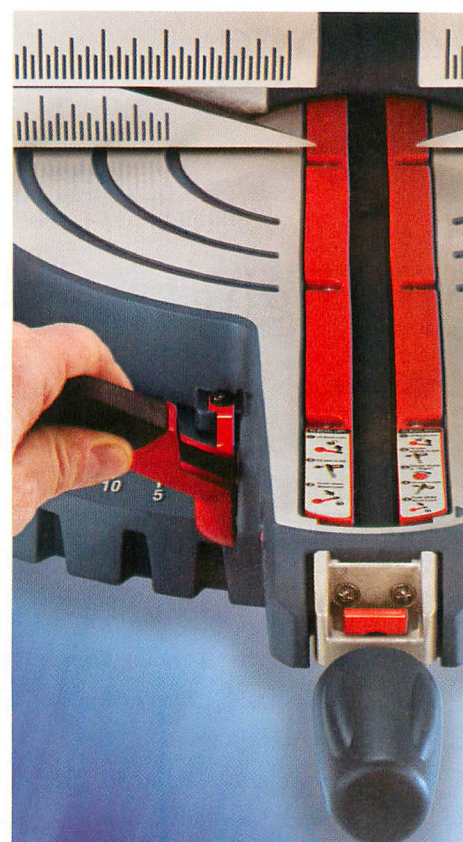
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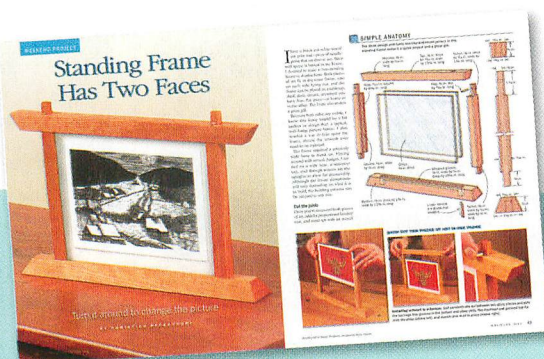
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Spotlight

ISSUE NO. 212
May/June 2010
p. 42



HOW TO FRAME A PRECIOUS PICTURE

Like all tradespeople, picture framers know some things that the average person doesn't. In "Standing Frame Has Two Faces," Christian Becksvoort has put two keepsake items in the frame. If they are truly dear to him, they need different framing.

Paper and fabric deteriorate if framed with incorrect materials. Old paper doesn't turn brown because it's old; it turns brown because it is being burnt by acidic materials such as wood or wood-based cardboard.

The Professional Picture Framers Association suggests some basic rules. The art should not touch the glass, for a number of reasons: Inks can adhere to the glass, condensation will stain the art, and the various materials won't be able to expand and contract independently—so fabric and paper will end up wrinkled and crooked in the frame. An acid-free mat board solves all of these problems. You should also consider conservation-grade glass that blocks UV light.

The framing in this article is fine for disposable art but not for art with monetary, historical, or sentimental value.

—JOHN GORNALL, certified picture framer,
Campbell River, B.C., Canada

Warning for metalworkers

After reading "Make Your Own Hardware" (*FWW* #212), I have a suggestion for your next metalworking article. Please emphasize the importance of full-frame, wrap-around safety glasses whenever sawing, drilling, grinding, or otherwise working metal.

Woodworkers often get away with slack safety procedures. These can get them in real trouble when metalworking. Just one

example: A little light sawdust in the eye has a good chance of being blinked or easily rinsed out without damage. Not so with a metal filing.

—CHRIS "C.A." HUDSON, via email

Safety first. Wrap-around safety glasses are a must when working with metal.

Cyanoacrylate glue is really super

In "Best finish for spalted woods" (*Q&A*, *FWW* #212), I learned that I am not the only woodworker using cyanoacrylate glue to fix wood defects. It indeed works well for stabilizing punky wood, but I use it most often on stress fractures in normal hardwoods. In some cases, these are defects found only after cutting the piece to size, and often when I must make do with the wood on hand.

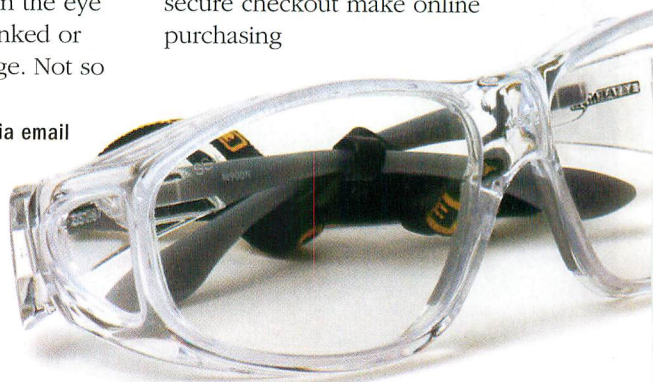
The reason this works so well is the capillary action of small cracks in wood. This draws in the thin glue and distributes it throughout the defect.

—JACKSON ANDERSON, Rapid City, S.D.

Wood supplier fears collateral damage

In the article "10 Tips for Mail-Order Lumber" (*FWW* #211), you ran a picture of our Web store under the heading, "Be wary of online photos and inventories." After speaking to the editor, I understand that *Fine Woodworking* ran the picture simply as a generic example of a Web site that sells lumber. But I'm afraid anyone who scans the heading without reading the article will feel they should be "wary" of our Web store in particular.

It is especially disappointing because, by the standards of the article, we are one of the companies doing things correctly. We have multiple pictures of every board in our store (www.pinecreekwood.com) along with dimensions and descriptions. We ship the exact board pictured in the listing, and our shipping calculator and secure checkout make online purchasing



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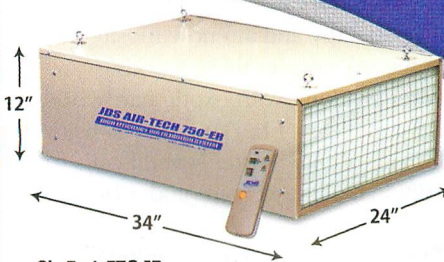
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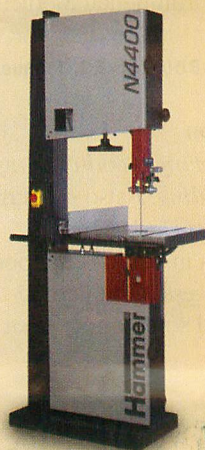
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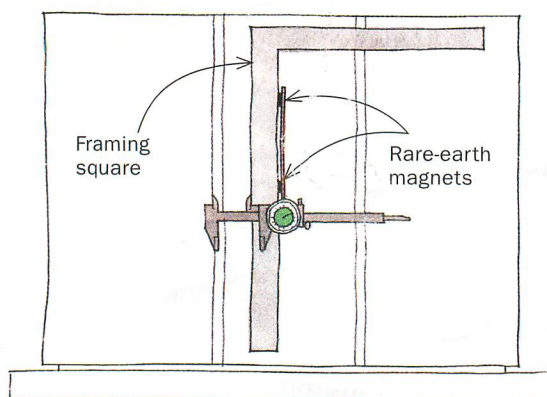
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—BOB SCHECTER, Pine Creek Wood Co.,
Friend, Ore.

Rare-earth magnets vary



Although the “Best Tip” in *Methods of Work* (“Check tablesaw setups with magnets and a framing square,” *FWW* #212) is a great idea, it does have some issues that must be addressed.

First, don’t assume that all rare-earth magnets are identical in thickness. Having just received a shipment of these, I checked them with my trusty digital micrometer and found that their thickness varied by 0.003 in., more than I’d like in my tablesaw setup. Also, the tip says to use an “accurate” framing square. I checked three of mine and found that the width of the legs varied by 0.003 in. to 0.006 in. over their length.

A machinist’s steel straightedge would work better for most of the steps pictured in the tip. And be sure to pick out a matching pair of magnets.

—JOHN CREA, Panama City, Fla.

New allergy therapy for wood dust

If you regularly work with exotic hardwoods like the rosewoods and ebonies and have developed persistent skin rash sensitivities or worse, help might be on the way. For two years, I received injections of a compound extracted from the dust of

dozens of exotic and domestic hardwoods in a treatment called Low Dose Allergen (LDA) therapy and am now mostly free of allergic reactions to these woods.

After working with exotic hardwoods for many years, I became very sensitive to many of them. After several calls to traditional allergy clinics and a bit of research, it became evident that there were no conventional allergy treatments available for wood dust in the United States as there are for more common allergens like pollens and molds. On a recommendation, I contacted the Santa Fe Center for Allergy and Environmental Medicine under Dr. W.A. Shrader, which specializes in LDA therapy.

After consultation, we agreed that a collection of more than 50 types of woods that I work with would be made into a single compound for LDA injection therapy. These shots were administered every two months at varying doses for a year, then a little less frequently in the second year. I now receive a “booster” every six months to make sure enough desensitized suppressor T-cells remain in the bloodstream.

There might be a specialist in your area who specializes in LDA. For more information, contact the Santa Fe Center for Allergy and Environmental Medicine at drshrader.com.

—BUD LATVEN, Tajiue, N.M.

Words of inspiration

I subscribe to both *Fine Woodworking* and *Fine Homebuilding*. I also subscribe to *Investor’s Business Daily*. One of my favorite sections in that newspaper is “Leaders and Success.” The Feb. 23 installment included some quotes that

inevitable part of the process of getting to the top.”

—Dr. Joyce Brothers

“When you follow your bliss ... doors will open where you would not have thought there would be doors and where there wouldn’t be a door for anyone else.”

—Joseph Campbell

“Taking risks is the essence of good work, and the difference between safe and bold can only be defined by yourself since no one knows for what you are hoping when you embark on anything.”

—Mike Nichols

“You can’t build a reputation on what you are going to do.”

—Henry Ford

“Iron rusts from disuse; stagnant water loses its purity and in cold weather becomes frozen; even so does inaction sap the vigor of the mind.”

—Leonardo da Vinci

—DENNY KROEZE, Visalia, Ga.

Kudos to FWW

I have some experience in amateur publishing, page layout, and the like, and I’ve been a subscriber to your magazine for a few years. The magazine, of course, directs its attention to craftsmanship and excellence in woodworking, but I don’t know how many readers notice the same qualities in the production of the magazine itself. I often reread past articles and refer to specific points on which I’ve kept notes. Each time I do so I’m impressed with the artistry and care used in creating the magazine. Consistently, the photography, scaling of pictures, use of color,

“You can’t build a reputation on what you are going to do.” —HENRY FORD

reminded me of my commitment to become a good craftsman:

“The person interested in success has to learn to view failure as a healthy,

drawings—virtually all aspects of page design and eye-appeal—are masterful. Moreover, I’m a retired college teacher of English with a good eye for language, and I haven’t found a mistake yet! Your

contributing woodworkers show artistry and craftsmanship, but those who edit, arrange, and print their work do so as well.

—BRUCE STURM, Nevada City, Calif.

A turner defends expanding chucks

I have to disagree with some of Ralph Tursini's article about four-jaw chucks ("The Lathe Accessory Everyone Needs," *FWW* #212). After turning and selling 7,000 bowls over the last 12 years, and using a recess exclusively to grip the vessels, I have found no inherent advantages to either grabbing a tenon as he recommends or expanding into a recess, which he warns against. Without exception, every failure I've had when using a recess has been caused by one of two things. One is faulty wood that is too

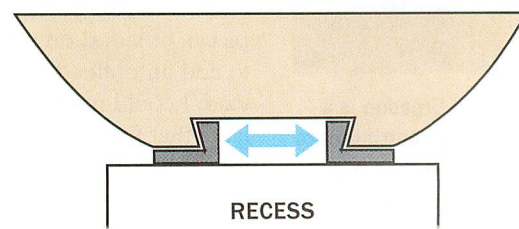
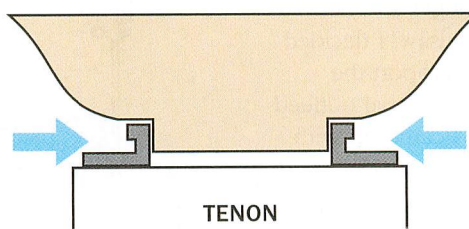
soft and punky, has bark inclusions, or has cracks in it. The other is a poorly fitted recess. If the fit is too sloppy and loose, you will not get a secure grip. And if you over-tighten, you can blow it out.

As to which jaws work best in recesses, I prefer the dovetailed ones. They create a mechanical joint, which holds better than a straight joint. Cutting a dovetailed recess on the bottom of the bowl is as simple as buying or making a dovetailed scraper.

It can also be cut with a parting tool or skew chisel. It is no more difficult to make an angled recess than it is to make the straight tenon and square shoulder that Tursini recommends.

There is only one situation where an expansion joint can be dangerous: when you are turning end grain, and the pressure wants to split your piece along the grain like firewood.

—REED GRAY, Eugene, Ore.



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 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, find another way. We want you to enjoy the craft, so please keep safety foremost in your mind.

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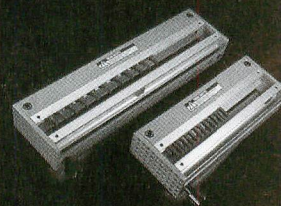
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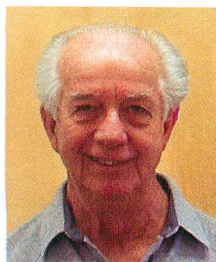


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Best Tip Part-time outfeed table for the bandsaw



Cecil Braeden is a repeat contributor to *Fine Woodworking*. His "Rock-Solid Plywood Workbench" was featured in the 2006 *Tools & Shops* issue (FWW #181). And he helped a reader in our Q&A section in issue #203 ("Plywood edging that matches perfectly").

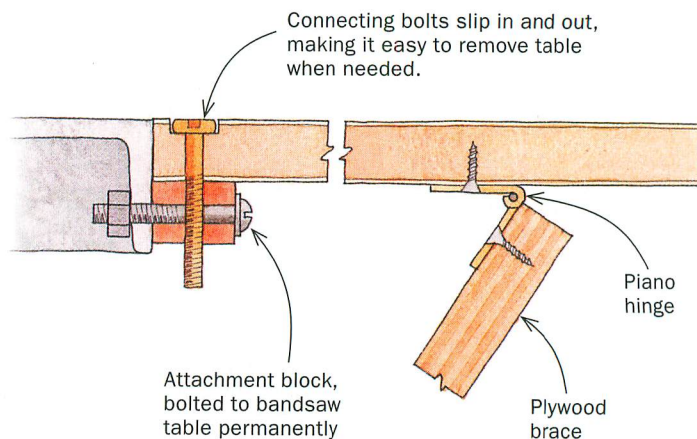
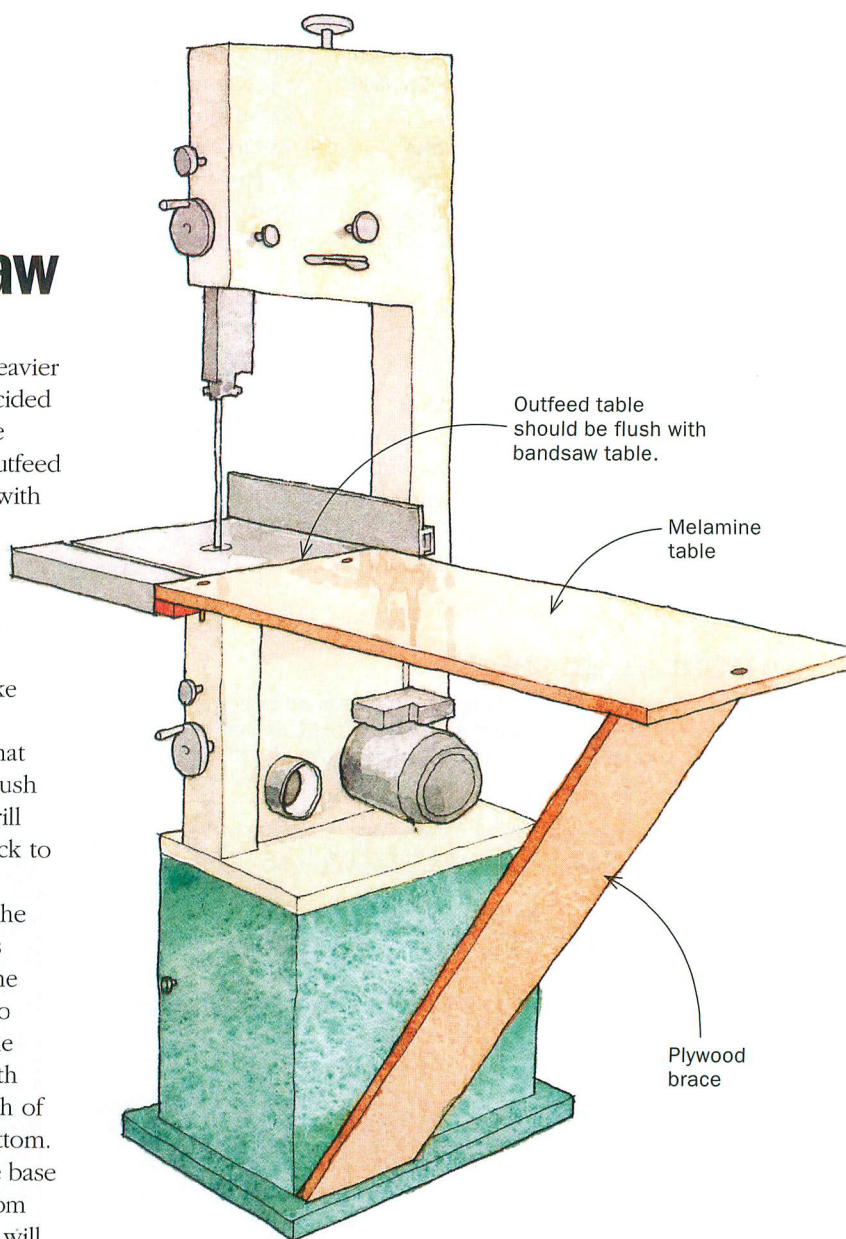
When I began resawing longer and heavier pieces of wood on my bandsaw, I decided to add an outfeed table to support the load. I could not find a commercial outfeed table that fit my needs, so I came up with this design, which is simple to make and can be installed or removed in seconds. One nice feature is that the table is always perfectly aligned with the bandsaw table.

To build the outfeed table, first make and bolt the attachment block to the bandsaw table. Locate the block so that the top of the outfeed table will be flush with the top of the saw table, then drill holes for the bolts and attach the block to the bandsaw table.

With a temporary support holding the outfeed table level, drill vertical holes in the front lip of the table through the attachment block and countersink two bolts to pin the table to the block. The connecting bolts will stay in place with gravity alone. Now measure the length of the brace and the cut angle at the bottom. My saw has a 1-in. platform around the base that makes a natural perch for the bottom of the brace. If your saw does not, you will have to attach a block near the bottom. Secure the top of the brace to the underside of the outfeed table with two hinges.

Remove the temporary support, and the outfeed table is ready to use.

—CECIL BRAEDEN, Anacortes, Wash.



A Reward for the Best Tip

Send your original tips to Methods of Work, *Fine Woodworking*, PO Box 5506, Newtown, CT 06470, or email fwmow@taunton.com. We pay for every tip we publish; the best tip also wins a 12V driver kit from Bosch (model No. CLPK21-120).



Dedicated sled delivers perfect finger joints

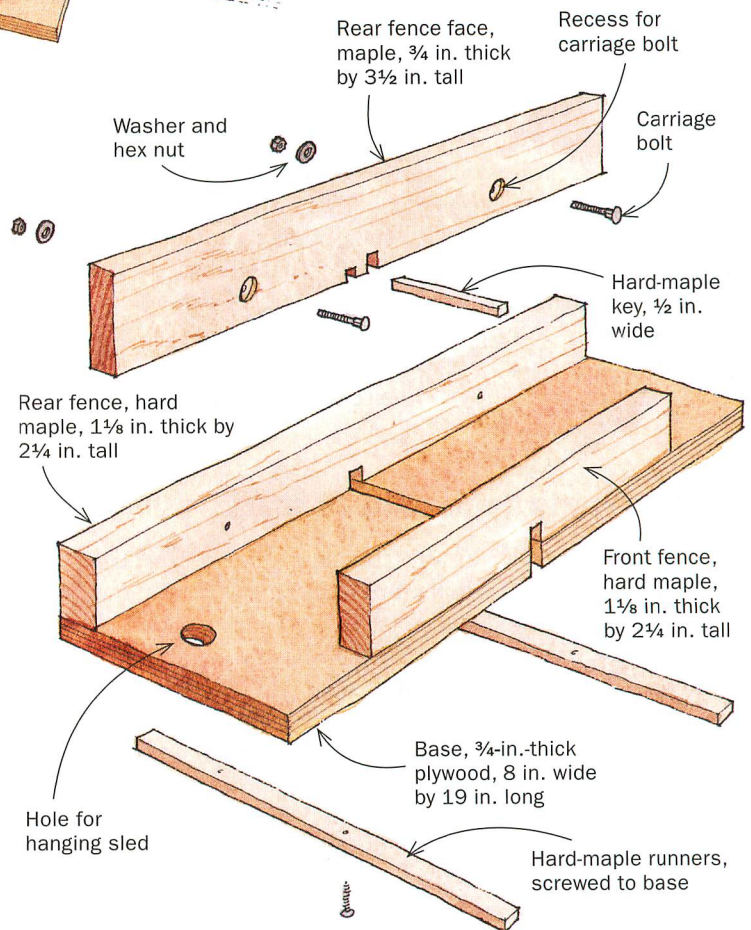
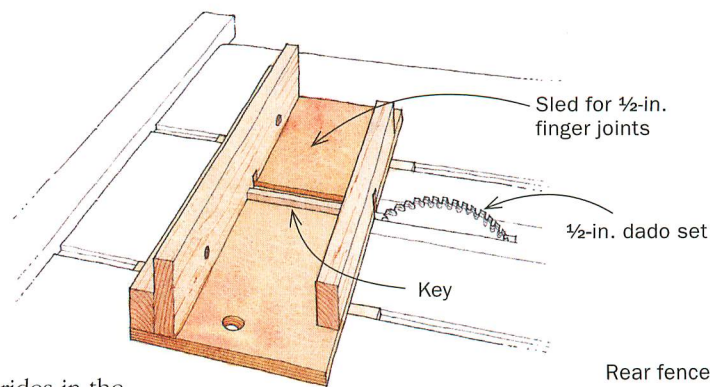
Most tablesaw jigs for cutting finger joints (also called box joints) mount to the miter gauge and must be tweaked every time they are reattached. I took a different approach, making a simple sled to cut one size of fingers. The sled ensures repeatable results without tweaking, and it rides in the tablesaw's miter slots, so it doesn't depend on the miter gauge.

To make a sled for 1/2-in. fingers, start with a Baltic-birch plywood base. Add hard-maple runners, sized to fit the miter slots, then add front and rear fences, also made of hard maple. After assembling the sled and cutting a 1/2-in. dado slot through it, use the same dado setup to cut a notch 1/2 in. wide by 1/4 in. deep in the lower edge of the rear fence face. Don't bolt this fence face to the rear (fixed) fence just yet.

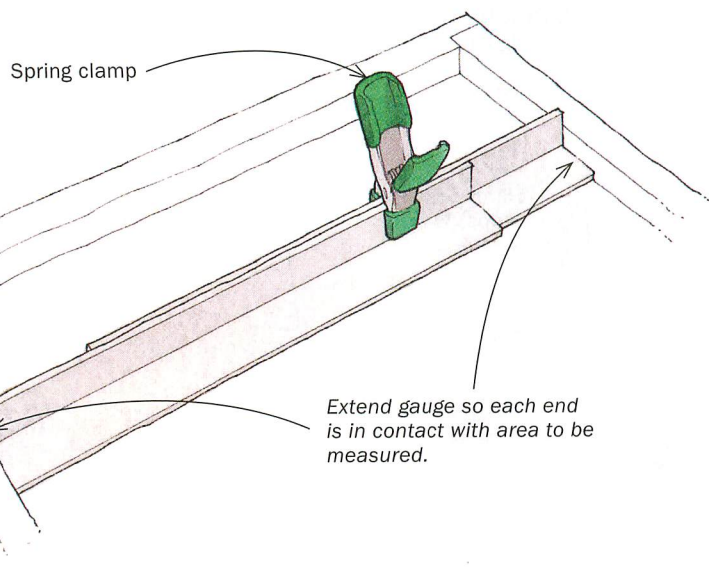
Glue a snug-fitting key in the notch and, using a scrap of the key stock as a spacer, position the fence face so the key is 1/2 in. from the slot in the base (this dimension will change if you use different size fingers). Clamp the fence face at this position, then install small recessed carriage bolts from the front of the fence face, enlarging the holes through the fixed fence slightly. Lock the fence with washers and hex nuts and cut a trial joint. If you need to adjust the setup, loosen the hex nuts slightly, tap the fence face left or right as needed, and retighten the nuts.

To use the jig, mount the appropriate dado blades, set the depth of cut to accommodate the stock thickness, and go. You can add a sacrificial backer board (1/4-in. hardboard) to reduce tearout when cutting fingers that are shorter than the slot in the fence. The 1/2-in. fingers work well for most of my needs, but if you need other sizes, make a separate jig for each size.

—DENNIS THEISEN, Grand Rapids, Mich.



Online Extra
Watch an animated version of this tip at FineWoodworking.com/extras.



Simple gauge for inside measurements

This tool is basically a telescoping device for transferring an inside dimension to a ruler or for setting up a stop block. The gauge is made from two nested sections of anodized aluminum angle held together with a small spring clamp. I have found the most practical size of angle is 3/4 in. by 1/2 in. (outside dimensions). Make sure you get the kind of angle with square inside corners rather than the kind with rounded inside corners.

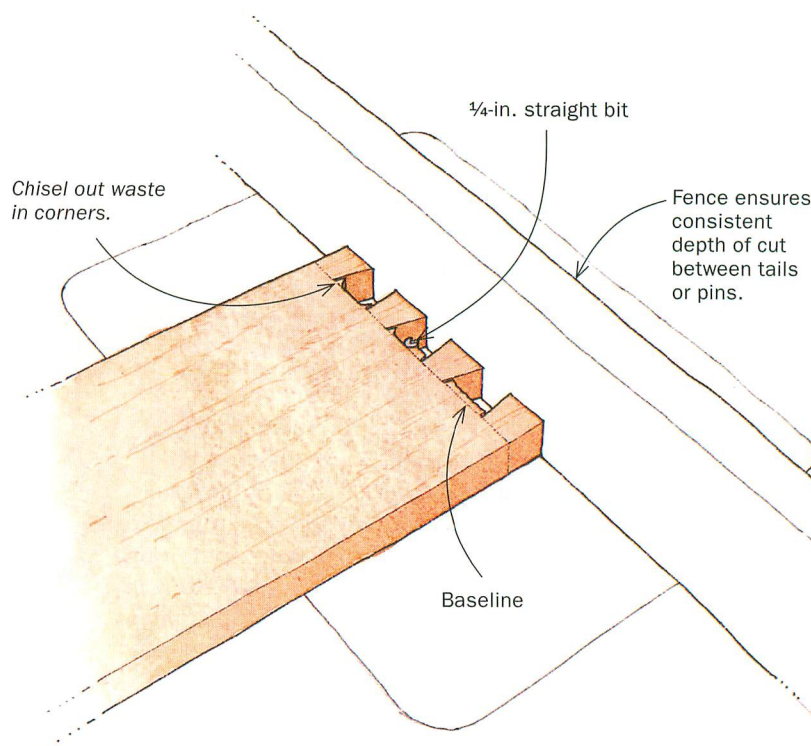
If you can't find a small spring clamp, a binder clip from a stationery store will work fine.

—RICHARD DUDA, Meadview, Ariz.

Trim dovetail waste on the router table

Here's a neat way to clean out waste between hand-cut dovetails and pins, without cutting beyond the baseline. First, mark out the tails (or the pins if you prefer) and use a handsaw to cut the sidewalls. Remove most of the material between tails with a coping saw, leaving about $\frac{1}{8}$ in. of waste at the bottom. Now, use a small straight router bit in a router table to clean out the rest of the waste. Use the fence to register the workpiece and to ensure the bit cuts to a consistent depth between tails. Don't let the bit slip into the tails. This process leaves the bottom of the waste area perfectly square to the sides and perfectly straight and flat. All that remains is a small amount of chisel cleanout in the corners. The waste between pins can be cleaned out the same way.

—BILL LAW, Cincinnati, Ohio



Another way to flatten warped boards with your planer

One of the most common ways to flatten a board in a planer is to glue sacrificial rails to the board and then rip off the rails once the planing work is done (see Jerry Lyons's method in *FWW* #208, p. 16). My approach eliminates those rails in favor of reusable $\frac{1}{2}$ -in. by $\frac{1}{2}$ -in. skid strips dry-fitted into grooves routed into one surface of the board.

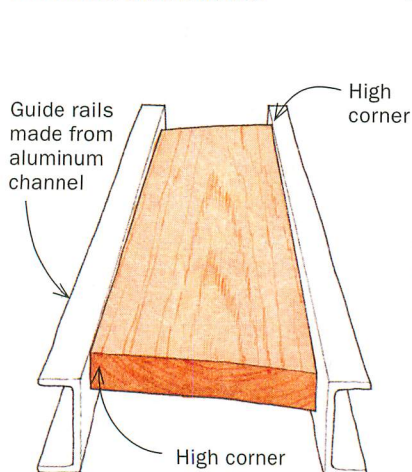
Joint the edges of the board and clamp it between two guide rails (I used aluminum channel, but you could use wood beams or steel angle iron) so that the two high opposite corners are near the top of the rails. Attach the router to a piece of stiff plywood wide enough to span the guide rails, make a $\frac{1}{2}$ -in. clearance hole for the bit, and screw a couple of guide cleats to

the edges. Adjust the bit so that it makes a shallow, flat-bottom groove for the whole length of the board. Now flip the jig and rout a second groove along the opposite side.

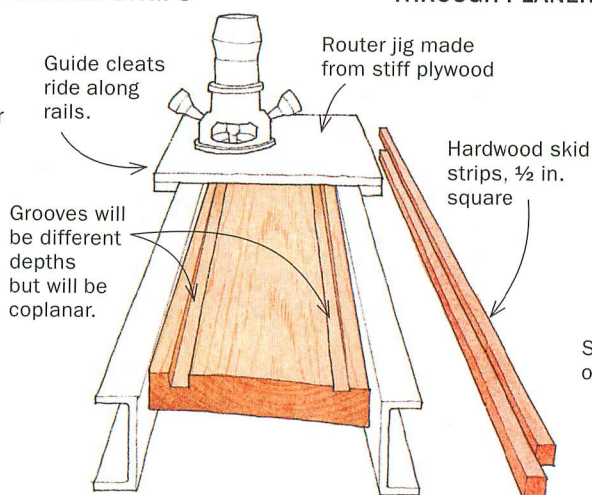
You now have grooves that are exactly coplanar at their bottoms. Remove the warped board from the jig and insert the skid strips into the grooves. Secure them with some double-faced tape or a few dabs of hot glue. Run the warped board through the planer with the strips down. When the upper surface is flat, remove the strips, and plane the other side. Save the strips for next time.

—BRIAN DOSS,
St. Butler, Pa.

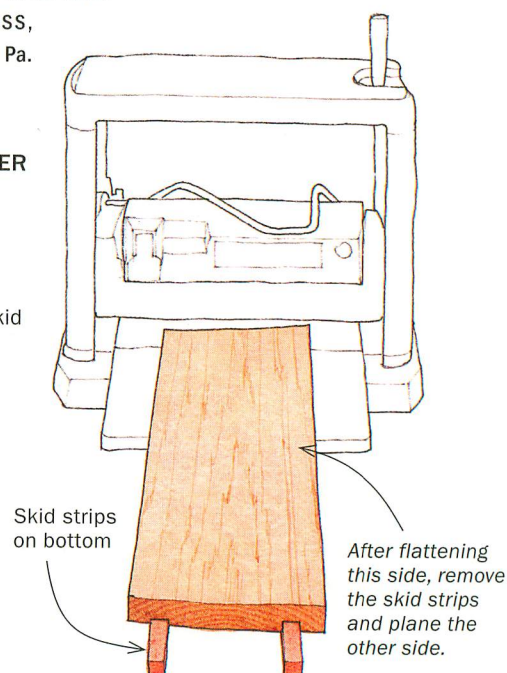
1. CLAMP BOARD BETWEEN GUIDE RAILS



2. ROUT GROOVES FOR SKID STRIPS



3. RUN BOARD THROUGH PLANER



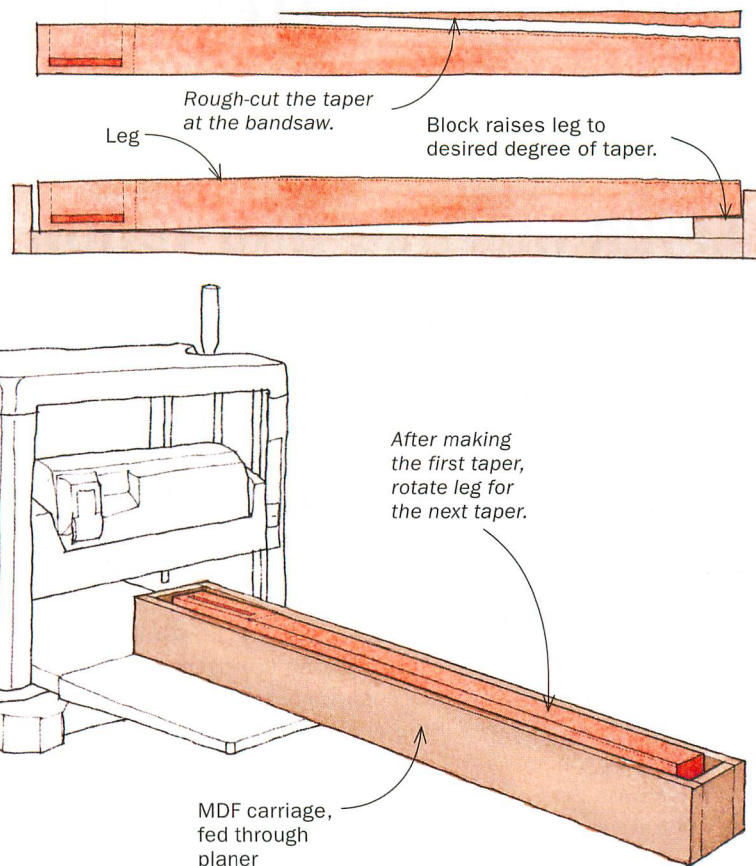
Make two-sided tapers more safely

My favorite project for new woodworking students is a Virginia side table because it introduces them to most of the tools they are likely to encounter in a shop. The table has legs with two-sided tapers. I never felt it was safe to have the students cut the tapers on the tablesaw, so I set out to find a better way. I came up with a simple carriage that goes through the thickness planer with one end of the leg elevated.

For the carriage, I used a $\frac{3}{4}$ -in.-thick MDF base a couple of inches longer and wider than the table leg. (You could make it wide enough to hold multiple legs.) I screwed a block at one end to elevate the bottom of the table leg by the amount of taper desired. To complete the carriage, I fastened pieces of wood to the sides of the MDF base.

To use the fixture, I simply drop in a table leg and send it through the planer. Orient the leg so you're planing "downhill," and take multiple passes to reach full depth. Then give the leg a quarter turn and plane it again. To save wear and tear on the planer, it's a good idea to rough out the taper on the bandsaw. It might take a few minutes more than using a tablesaw, but it is absolutely safe and, as a bonus, there are no saw marks to sand off.

—STEPHEN CHILDERS, Wyoming, Del.



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■ JIGS

Leigh mortise-and-tenon jig is a bargain



LEIGH INDUSTRIES recently debuted a new version of its FMT (frame, mortise, and tenon) jig. The Super FMT works much like the original, but at \$449 costs half as much. In a recent article (*FWW* #206) comparing mortisers, I gave the

original FMT high marks for accuracy, speed, and ease of use, so I was interested to see if the new model cut clean, matching mortises and tenons as well as the original. It did.

One reason the Super FMT costs less than the original is because it's made from formed steel instead of machined aluminum. This did not affect its accuracy. It also uses less-expensive F-clamps to hold the workpiece rather than the smooth-acting, cam-action clamps on the original. Another significant difference is the removable joint-alignment sight, which snaps into place on the new model instead of retracting into the jig housing.

To use the Super FMT, you first align a router to the jig table. Fortunately, this is a one-time setup and after that, the router can be removed and reattached easily. Next, you mark the joint centerline on the stock and clamp the stock to the front of the jig. Then you line up the table that supports the router using the



Less expensive option. Leigh's Super FMT costs about half as much as the original FMT, but matches the quality of its cuts.

snap-in sight. If you're cutting multiple pieces, this step is only done once. Plastic guides define the joint size and steer the router as it cuts. The jig comes with guides for $\frac{5}{16}$ -in.-thick mortises and tenons. Guides for other joint sizes from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. thick are available.

The Super FMT (leighjigs.com) gives you perfectly fitted mortises and tenons, of almost any size, at almost any angle, in minutes. Given its price and versatility, I'd take this jig over any benchtop mortiser.

—Tim Albers is a woodworker in Ventura, Calif.

■ HAND TOOLS

New blades boost performance of old planes

SOLD UNDER THE PINNACLE BRAND and manufactured by Industrial Blade Company (IBC), a full line of replacement blades for older Stanley and Record planes and modern Lie-Nielsen and Veritas planes, scrapers, and spokeshaves are now available from Woodcraft. I recently tried two of the blades in a vintage Stanley/Bailey No. 4. One is a high-quality replacement blade that's about one-third thicker (0.095 in.)



than the original Stanley. The second, produced in conjunction with hand-tool expert Rob Cosman, is even thicker (0.140 in.). It's paired with a unique chipbreaker that works without modifying the adjuster, although you have to widen the throat opening.

All Pinnacle blades are made from air-hardened A2 steel tempered to Rc 60–62. They're precision ground on all sides and lapped with 1,000- and 8,000-grit abrasive, so I had to spend only a few minutes honing both blades to my personal preference. In short, both blades perform on par with the best blades I've used, but I think the standard replacement blade at \$46 is a better deal. The Cosman blade and chipbreaker retails for \$99. Other blades in the product line range in price from \$9 to \$63.

—Chris Gochnour is a woodworker in Murray, Utah.

■ HAND TOOLS

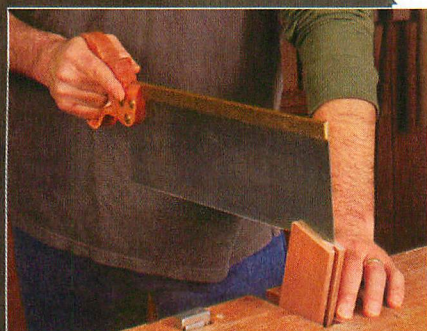
New handsaw is a tenon specialist

I'VE ALWAYS CUT TENONS with a handsaw. I've used Japanese

pullsaws and small Western backsaws successfully, but they all have drawbacks. For example, a typical dozuki has too many teeth, so it cuts very slowly. The rip teeth on a ryobi cut quicker, but without a back, the blade can buckle. The Western backsaw is close to perfect but it, too, has too many teeth for a fast cut. It's also fairly short, so it takes a lot of strokes to make a tenon.

The Lie-Nielsen 16-in. tenon saw (\$175, lie-nielsen.com) solves these problems. It has 11 teeth per inch, filed for a ripcut. Spread that over its 16-in. blade, and you can really move through the wood. The saw is well-balanced and has a comfortable handle. It really is the perfect saw for tenons.

—Matt Kenney is an associate editor.



Tenons, anyone? With a long, deep blade and 11 tpi, Lie-Nielsen's new saw is perfect for tenons.

■ NEWS

Tablesaw injury leads to \$1.5 million jury award

IN MARCH, A JURY AWARDED \$1.5 million in a case against Ryobi for a benchtop tablesaw injury, claiming that the saw should have been equipped with flesh-sensing, blade-braking technology, such as the SawStop system. The verdict, which has major implications for the tool industry, set off a flurry of commentary on the Internet, including FineWoodworking.com.

In a recent article that appeared in *The Oregonian*, SawStop President Stephen Gass said he felt vindicated by the award. Other tablesaw manufacturers in the industry, including Ryobi and its parent company, One World Technologies, won't

pieces of flooring from the saw table. Thinking he had solved the problem, he started cutting again, but his difficulties continued, so he pushed the board even harder. His left hand slipped into the spinning blade, nearly removing his pinky finger and severely cutting two other fingers and his thumb. Ultimately, Osorio would undergo five surgeries and 95 occupational therapy visits to treat his injured hand.

In April 2006, Osorio's lawyer, Richard Sullivan, who first saw the flesh-sensing technology in a CNN video, filed a civil complaint on behalf of his client against One World Technologies, the parent company

The blade guard and splitter were removed and he was making the cut without a rip fence.

discuss the award, but court documents shed some light on the case.

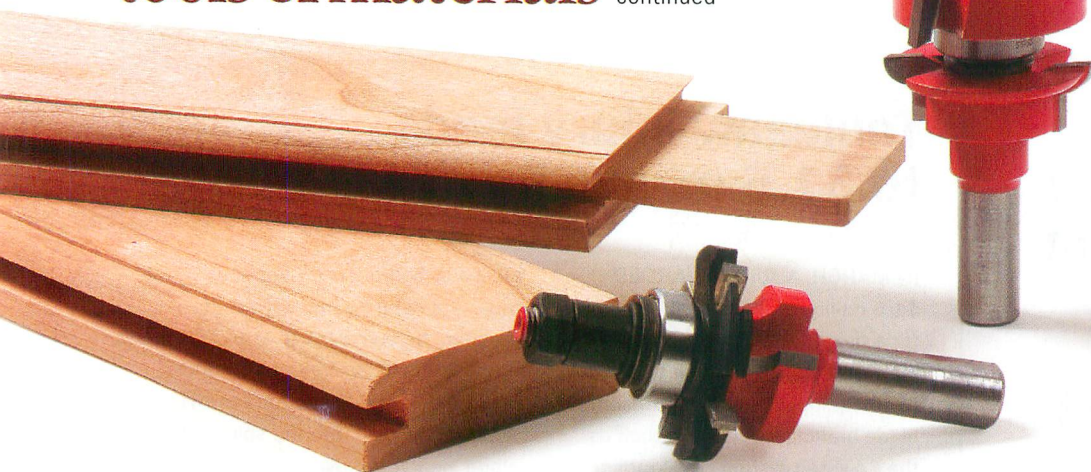
In April 2004, Carlos Osorio took a job as a flooring installer for PT Hardwood Floor Service in Medford, Mass. According to the defendant's trial brief, Osorio had never used a tablesaw before, so his boss showed him how to use the tool and cautioned him about the dangers. A couple of weeks later while installing an oak floor, Osorio was ripping a 2¼-in.-wide floorboard on a Ryobi BTS 15 benchtop tablesaw. The blade guard and splitter were removed and he was making the cut without a rip fence.

When he started cutting, he felt chattering and vibration, so he shut off the machine, removed the stock, and cleared away dust and other

of Ryobi, Ridgid, and Milwaukee power tools. The complaint alleged that the saw's design was inherently flawed because it didn't have "flesh-sensing technology," which would have stopped the blade when it detected Osorio's fingers.

Osorio's case went to trial in February of this year and was decided about four weeks later. A jury concluded that Osorio was 35% responsible for his injuries and One World was 65% liable. They awarded Osorio \$1.5 million in damages even though he was only seeking \$250,000. The verdict form indicated that the jury felt the saw was "defectively designed" and the defects were a cause of Osorio's accident.

(Continued...)



ROUTER BITS

Cope-and-stick bits allow long tenons

THERE ARE LOTS OF BIT SETS that can make tight-fitting cope-and-stick joints, but Freud's new rail and stile router-bit set (No. 99-760) allows full-length tenons, instead of the usual stub tenons created by these bits. The bits can be used with stock ranging from $\frac{5}{8}$ in. to $1\frac{1}{4}$ in. thick, and Freud claims the cutters have a unique geometry to reduce tearout. I tried the bit set with several different wood species and found the claim to be true, even with red oak, which is especially prone to tearout.

Removing the upper portion of the two-piece cope cutter—which includes the guide bearing—extends the tenon length infinitely. But you can only increase the length $\frac{1}{2}$ in. with each pass. If that takes too long,

you could rough out the tenon with a dado set or bandsaw and finish the cut with the cope-cutter. Another minor inconvenience is that it takes two setups to create the long tenon: one for the profile side and one for the back. And since you remove the guide bearing for the cope-cutter for the profile cut and lower it beneath the table during the back cut, careful setup of the fence and miter gauge is crucial.

By adding or removing shims, you can adjust the groove from $\frac{7}{32}$ in. to $\frac{3}{8}$ in. The set comes in roundover, ogee, roundover bead, and bevel patterns. The basic set is \$120 at woodcraft.com; double-profile (\$96; No. 99-860) and glass-panel (\$38; No. 54-760) cutters are also available.

—Roland Johnson is a contributing editor.

SAFETY

Pulling splinters just got easier

WITH THEIR FLIMSY, ILL-FITTING JAWS, I gave up ordinary tweezers as a way to pull splinters years ago. Given my usual alternative (self-surgery with a utility knife), I was delighted to find a pair of tweezers that actually work for splinters.

Pocketweez's razor-sharp jaws are easy to grip and pivot to fit inside the handle, so you can carry the all-stainless-steel tweezers in your pocket without stabbing yourself. The \$25 price tag (pocketweez.com) may sound a little steep, but the product is well made and will likely last a lifetime.

Get a grip. Pocketweez makes pulling splinters easy thanks to wide, razor-sharp jaws that fold inside a sturdy metal housing.

—Patrick McCombe is an associate editor.

NEWS

Jury award (continued)

Both Ryobi and Gass agree that Gass demonstrated his tablesaw invention to One World Technologies in October 2000. Gass, a patent attorney with a Ph.D. in physics, would later launch his own tool company when he was unsuccessful in licensing the technology to existing power-tool manufacturers.

Late in 2009, when responding to a *FWW* reader's question about why tablesaw manufacturers hadn't adopted the SawStop technology, the major tool companies pointed to a number of reasons why they hadn't struck a deal with Gass when he first approached them. These ranged from doubts that the technology would work over decades of hard use, to the difficulty—even impossibility—of rolling out the technology through an entire line of tablesaws, especially the small, portable, job-site saws (such as the saw in the Osorio case) that must stand up to weather and other forms of abuse. Also, most were concerned that if they rolled it out only on some of their saws, it might amount to a tacit admission that their other saws were unsafe.

In any case, Gass went on to found SawStop, which manufactures three tablesaws, two cabinet-style and one mid-sized contractor-type, each with the new technology. It is important to note that as a start-up company, SawStop was able to roll out one model at a time, giving them an opportunity to test their engineering and market viability with less risk.

Go to FineWoodworking.com/extras for reader comments and breaking news on this case.

—P.M.

■ HAND TOOLS

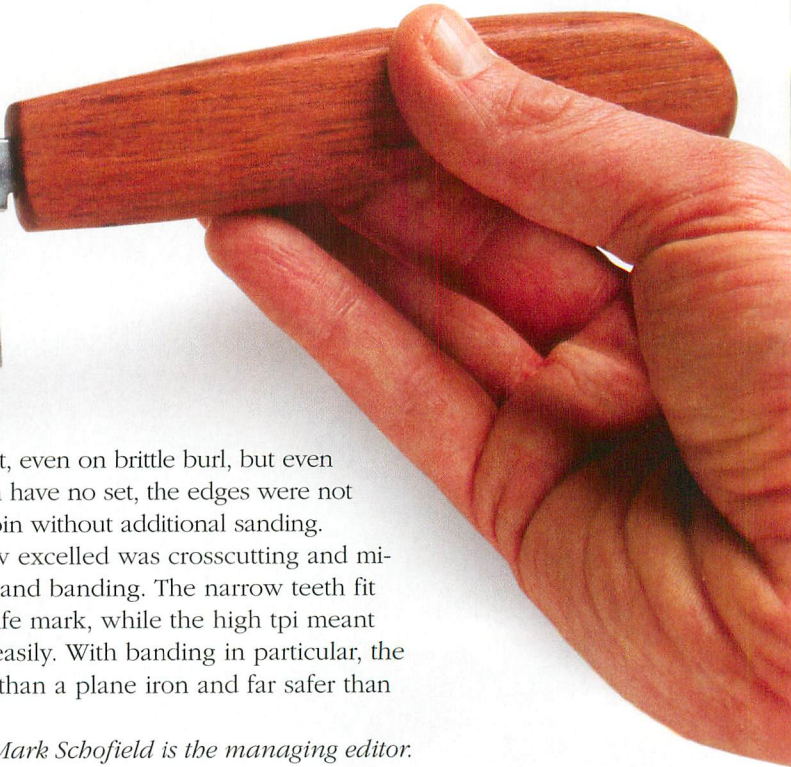
New veneer saw is best for inlay

AS A LEFTIE, I was excited to see Lee Valley's new veneer saw (No. 09A02.85; leevalley.com).

Unlike a traditional veneer saw with its offset handle designed for right-handed use, this saw's handle is in line with the blade so it can be used in either hand.

The other major difference is the number of teeth: Traditional veneer saws have about 15 teeth per inch (tpi). For the best performance, the teeth should be sharpened before use. The Lee Valley saw has an amazing 50 tpi and the teeth are sharp right out of the box.

Having more teeth means the saw cuts slower than a regular veneer saw, but it handled thin and thick veneer, both ripping and crosscutting. The cuts were



free from tearout, even on brittle burl, but even though the teeth have no set, the edges were not flat enough to join without additional sanding.

Where the saw excelled was crosscutting and mitering stringing and banding. The narrow teeth fit easily into a knife mark, while the high tpi meant the cut started easily. With banding in particular, the saw was better than a plane iron and far safer than a miter saw.

—Mark Schofield is the managing editor.

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Cutting parts to size

HOW TO TURN ROUGH LUMBER INTO STRAIGHT, FLAT, SQUARE FURNITURE PARTS

BY STUART LIPP

At my first job in a furniture shop, I spent most of my time cutting lumber to size. I learned quickly that to make beautiful furniture, you must mill carefully. Cut a board too narrow, for example, and you no longer have bookmatched panels wide enough for your doors. Mill a piece out of square, and you could throw a whole project off kilter.

The way to avoid mistakes, I discovered, was to follow a logical sequence, and stack my boards in an orderly fashion so that there was no question about how they should be fed into the waiting machines. To make things easier as I moved from one machine to another, I started using two carts, one for the infeed side and one for the outfeed side. If you don't have two carts, you can always use a counter or benchtop.

Stuart Lipp lives in New York City and works at Steinway & Sons, where he oversees the construction of limited-edition pianos.



Get organized to avoid mistakes. Inspect each board for grain direction, cupping, and bowing before you start milling, and keep them organized so you don't have to look at each one before feeding it into the next machine.

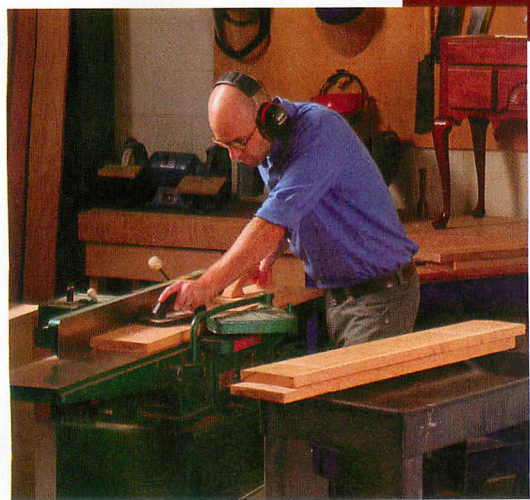
1. Flatten both faces first

Milling a board square starts at the jointer, where you flatten one face. Then you move to the planer and plane the second face parallel to the first.

Get your boards organized before you start. Stack them so that they can be taken off the cart and fed directly into the jointer, which means the grain runs from top to bottom as it goes from the front end of the board to the back. If any boards are cupped or bowed, stack them so that the cup or bow makes a frown. The two low ends will provide a more stable base than the

peak of the cup or bow. I also throw a scrap board on the stack so that I can test my machine setups as I work through the milling process.

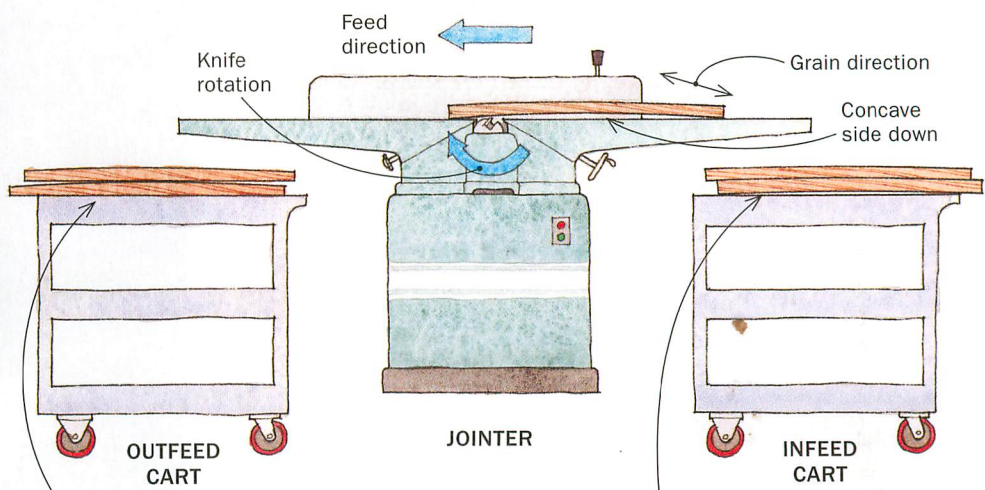
When planing, you can reduce snipe—the tendency of the planer to cut deeper at the front and back ends of the board—by feeding the boards through so that the leading end of one touches the trailing end of the one in front of it. Before the final pass, send the scrap piece through to check that the planer is set to the correct thickness.



Faces, but no edges. Lipp starts by flattening a face, but doesn't then straighten an edge. It's not always possible to feed edge grain into the jointer properly when only one face is jointed.

JOINTER FLATTENS AND STRAIGHTENS FIRST FACE

Because the jointer's cutter is below the board, the grain should run from top to bottom. Feed a board backwards and the jointer will tear out grain rather than cut it cleanly.

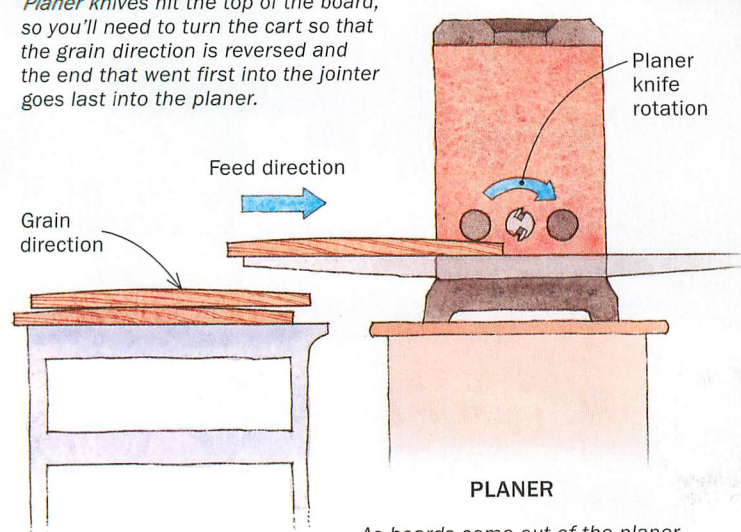


2. As you take boards off the jointer, stack them the same way they went in.

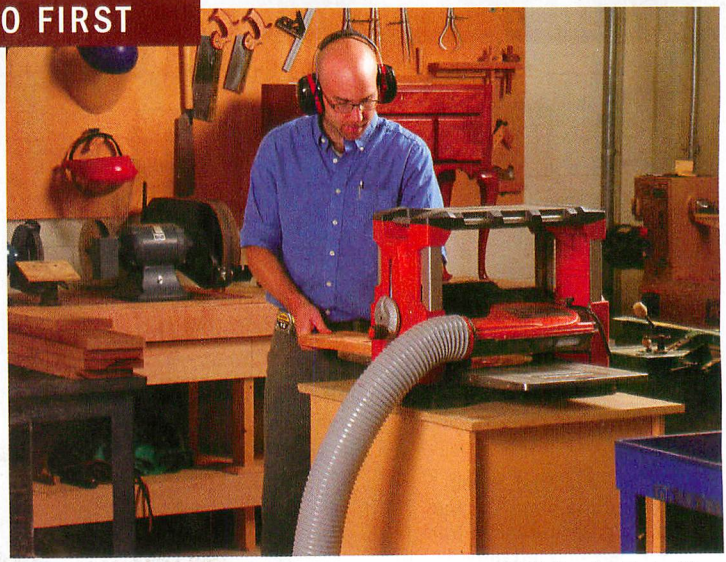
1. Stack the boards so you can take boards from the cart and feed them straight into the jointer.

PLANER MAKES SECOND FACE PARALLEL TO FIRST

Planer knives hit the top of the board, so you'll need to turn the cart so that the grain direction is reversed and the end that went first into the jointer goes last into the planer.



As boards come out of the planer, restack them so that the grain runs in the same direction.



Plane second face flat. When the board is about 90% flat, begin to flip it end for end after each pass. That keeps the grain running in the right direction as you take equal amounts off each face, which relieves internal tensions evenly and minimizes how much the board will cup afterward.

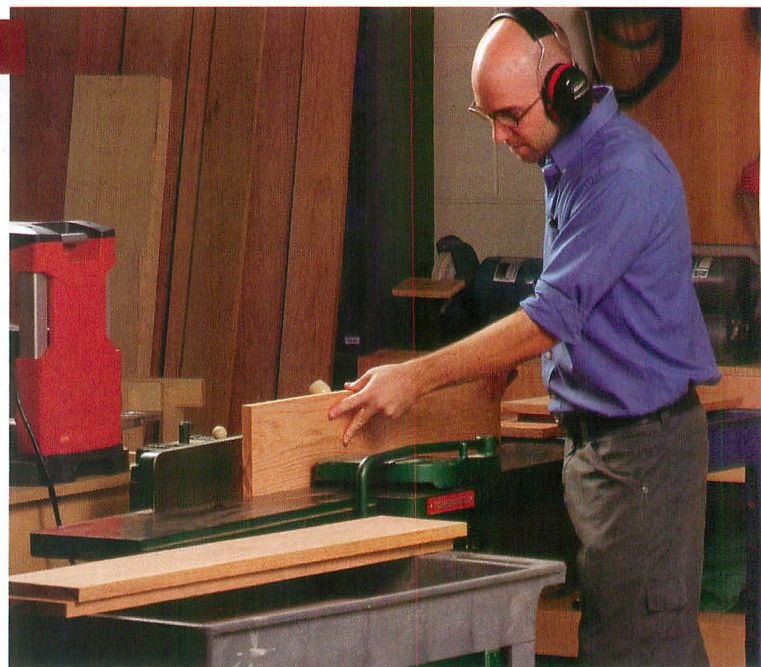
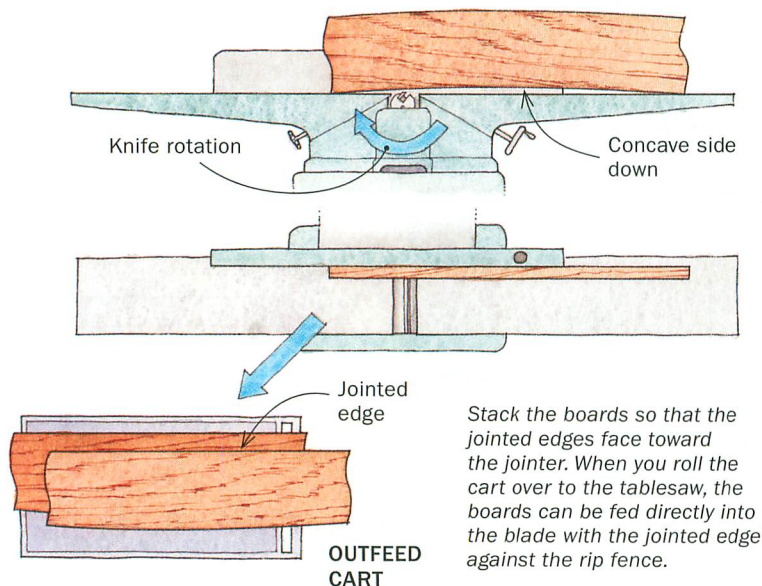
2. Rip wide parts to width before narrow ones

After the boards have been planed to thickness, joint one edge straight and then rip them to width. But don't joint any edges until you've checked to make sure the jointer's fence is 90° to its tables. When jointing the first edge, just like when jointing the first face, any crook in the board should face down.

At the tablesaw, use the scrap piece in the stack to check that the blade is square to the saw's table. Rip the widest parts first and work down to the narrowest—it's always better to accidentally cut a part too wide than too narrow. The jointed edge should run against the rip fence.

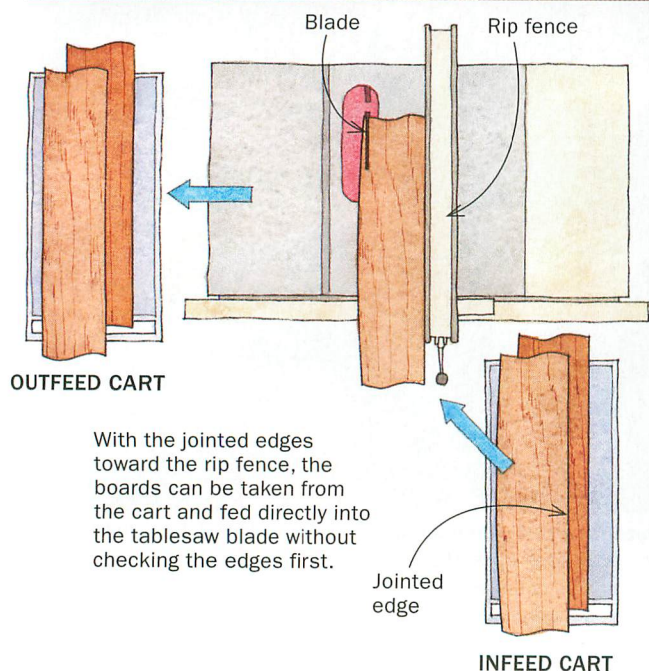
JOINT AN EDGE STRAIGHT AND SQUARE

Flip the board as needed to run the grain past the knives in the right direction. Curved edges should face down, because the two ends of the curve provide greater stability than the hump on the other edge.



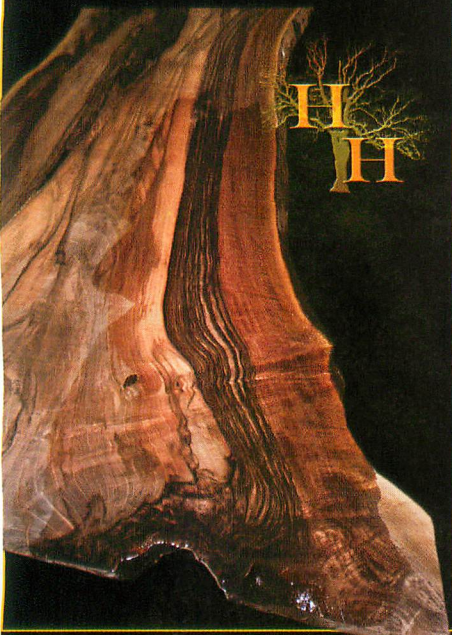
Right edge, right direction. Joint the concave side for stability. Both faces are flat and straight so you can flip the board either way to avoid tearout.

GOOD EDGE GOES AGAINST THE FENCE



Straight from cart to blade. For safer ripping on the tablesaw, a board must have a straight edge to run against the fence. Also, use a push stick on narrow boards.

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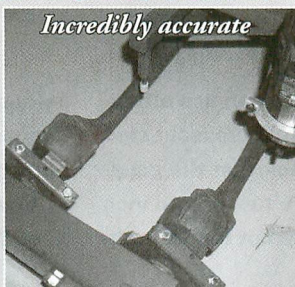
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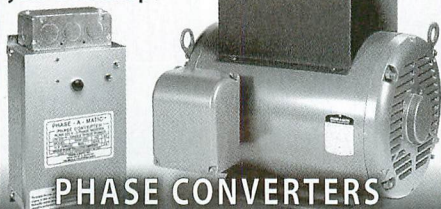
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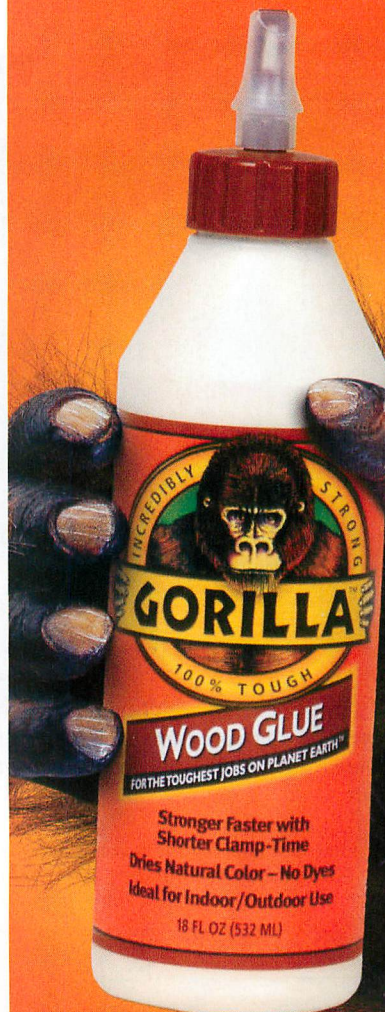
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3. Finally, cut parts to length

Now it's time to cut the boards to final length. You can use either a miter gauge with an auxiliary fence attached, or a crosscut sled. In either case, use the piece of scrap first to check that the gauge or sled is cutting square. Make sure to locate the test cut an inch or two from the end. If both sides of the blade are not buried in the

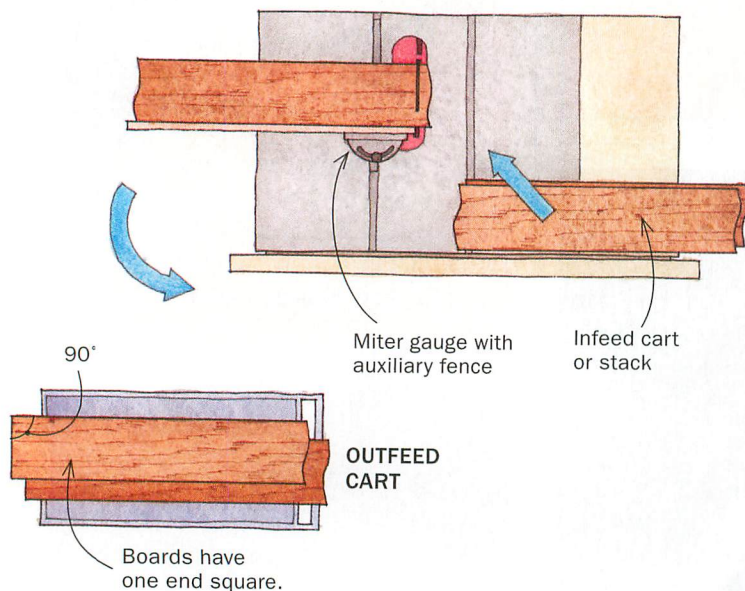
wood, the blade could deflect and lead you to think it's not cutting square when it is. Cut one end square on all of the boards. Then cut them to length, working from the longest parts to the shortest (it's easy to cut a piece shorter, but impossible to go back and cut it longer).

SQUARE AN END

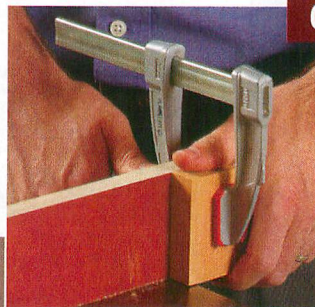


Smart stacking. Lipp saves time by stacking all of the pieces on the extension table. After cutting the boards to length, he stacks them on the outfeed cart.

Square the first end, flip the board end for end, and place it on the outfeed cart, ready to be cut to length.



CUT TO LENGTH

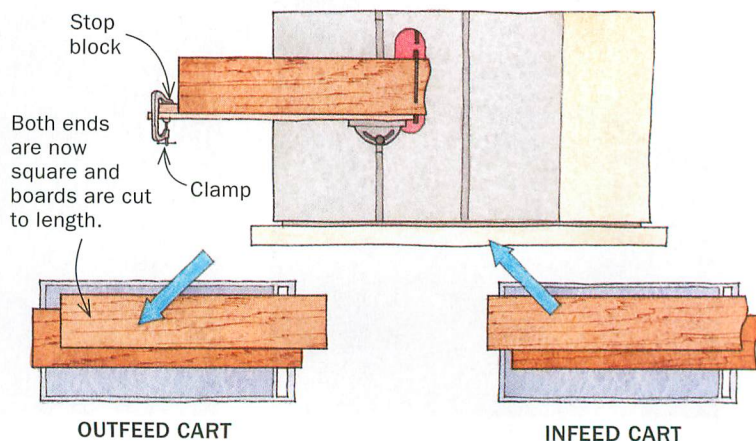


Nothing fancy. A square block clamped to the auxiliary fence works great as a stop. Cut every same-length part at once. Then move the block for the next shortest parts.

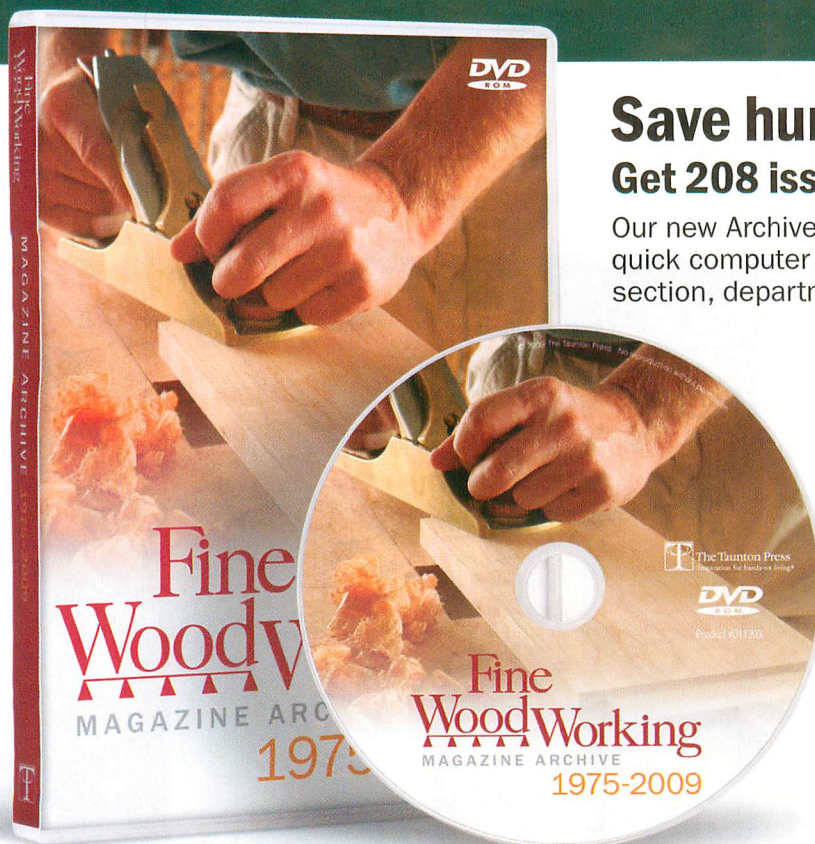


Work from long to short. To avoid cutting a piece too short, start with the longest parts and work toward the shortest. A board can always be cut shorter, but never longer.

Switch the carts around and cut the boards to length. Use a stop block when more than one part is the same length.



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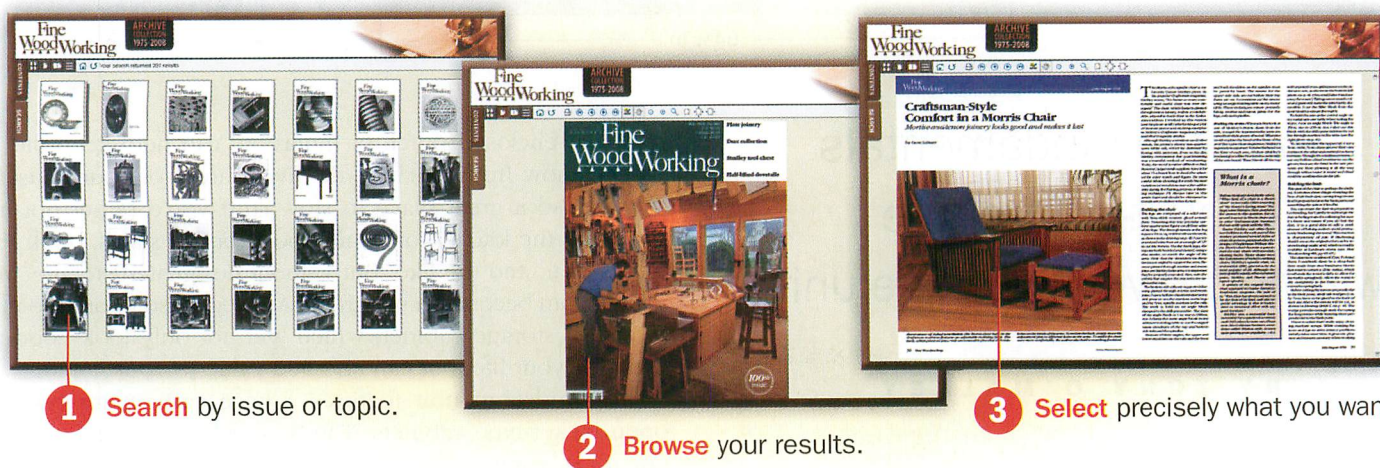
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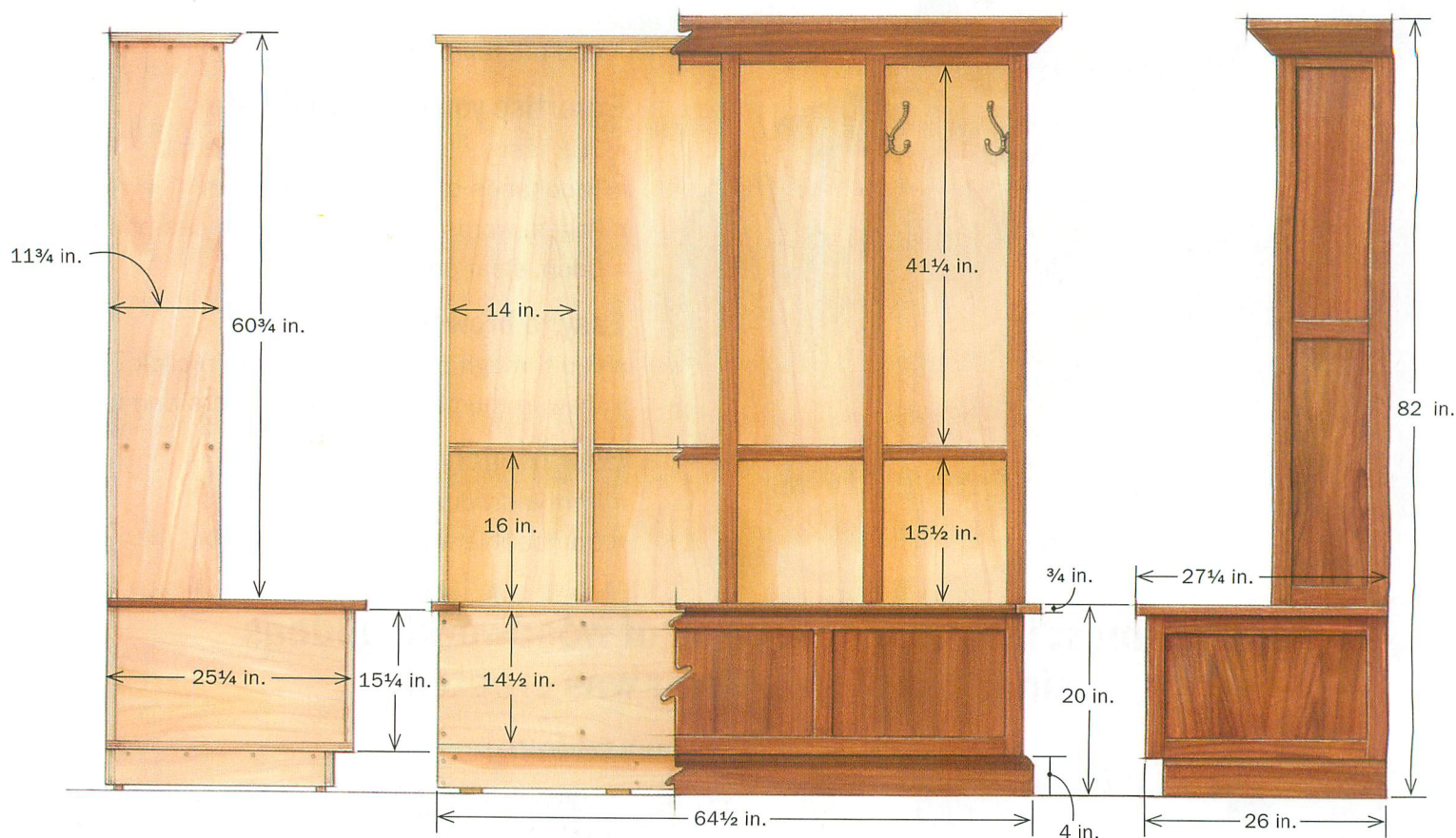
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Mudroom Built-In: Stop Clutter at the Door



Learn the fundamentals
of built-in furniture
with this stylish storage unit

BY TONY O'MALLEY

Online **Extra:** Built-in Build-Off

Go to FineWoodworking.com/extras to check out the Built-in Build-Off between *Fine Woodworking* and *Fine Homebuilding* magazines, where you can see how a carpenter and a woodworker approached this project in different ways. FWW online members also can read the companion *FHB* article online.

An enclosed porch or mudroom can help keep dirt and snow from reaching the living areas of your house. It's also a great place to stow stuff you'd rather not have cluttering the kitchen or family room: boots, shoes, book bags, sports gear, and the like. But without designated storage areas, a mudroom becomes a minefield. An elegant solution is to make a built-in storage cabinet, which will not only look good and organize your life, but can also add value to your home.

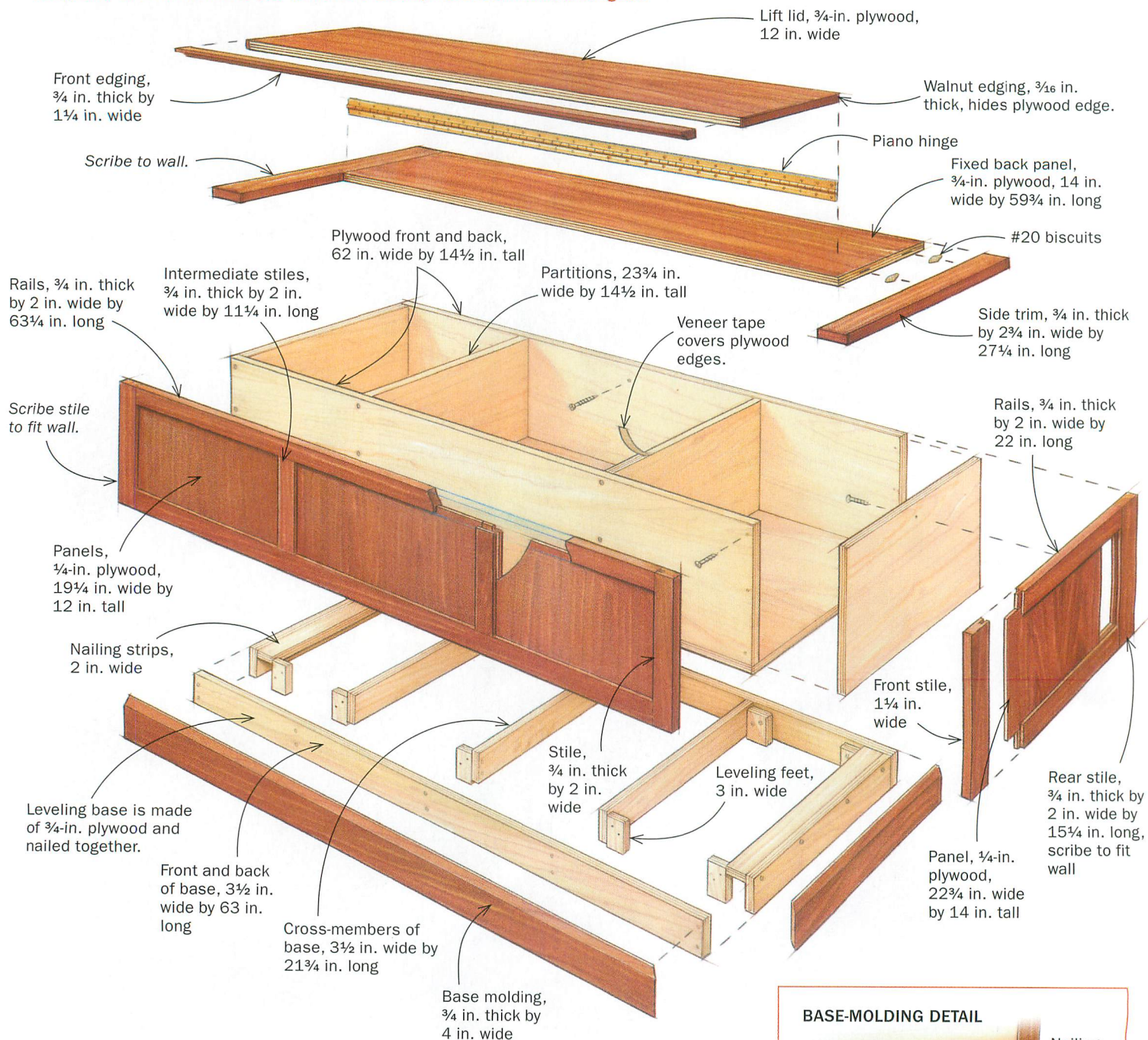
This mudroom unit features a base cabinet topped with open locker-type cabinets. The base cabinet has a lift-lid section for stowing out-of-season stuff like winter boots. The upper cabinets have fixed shelves and hooks for jackets. This piece is designed for a family of four—with each person getting his or her own locker space—but it can easily be made larger or smaller to suit a different-size family.

The construction is simple: maple plywood cases with walnut face frames and applied frame-and-panel assemblies, which give



BASE CABINET OFFERS SEATING AND STORAGE

The lower cabinet is a plywood box faced with walnut frames and panels. The height is perfect for sitting to change shoes, and the lidded box has plenty of room for items you don't want to see, like boots and outdoor gear.



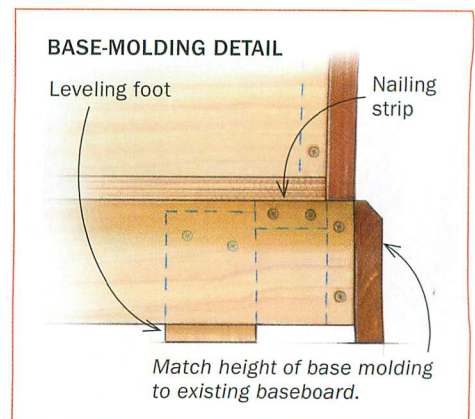
the piece a furniture feel. Most of the parts are made in the shop and assembled on site.

Build the plywood boxes first

For this project, I used prefinished $\frac{3}{4}$ -in.-thick maple plywood for all the cases. Though not commonly available at major home centers, the plywood often can be special-ordered at lumberyards. It saves you considerable finishing time, and

creates a bright, durable interior that looks great with the dark walnut exterior.

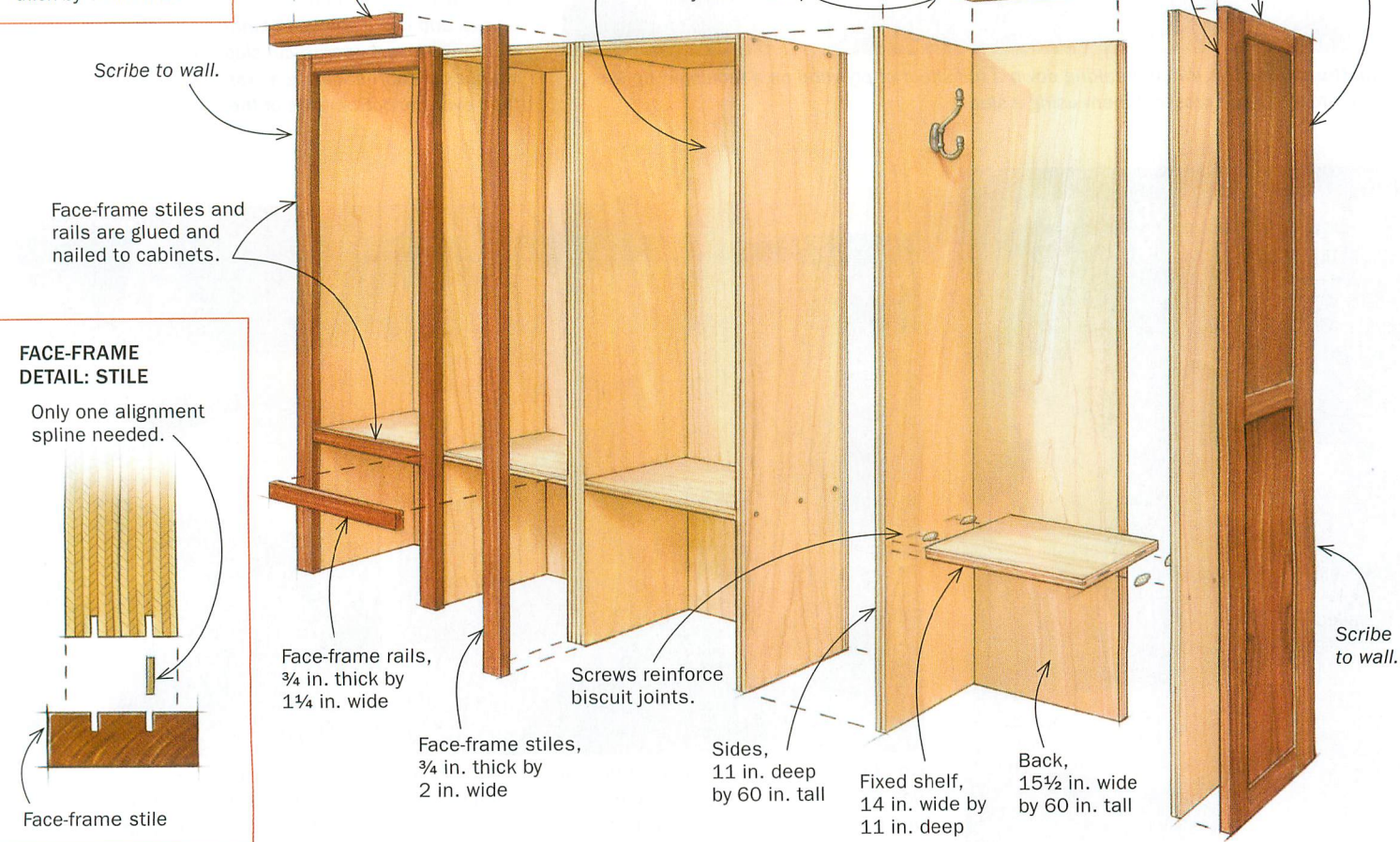
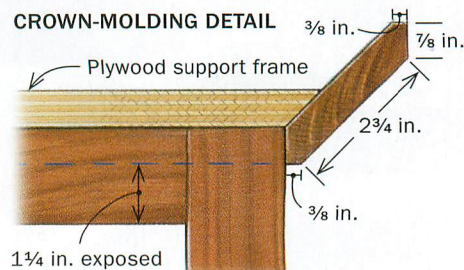
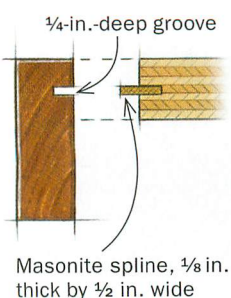
For the upper lockers, I made four identical skinny cabinets and screwed them together. These smaller cabinets are easier to build, move around in the shop, and install. And this method can make the difference between needing a helper and getting the job done on your own. The plywood edges on the upper lockers are hidden with



UPPER CABINETS SERVE AS LOCKERS

The top cabinets are individual plywood boxes screwed together and faced with solid walnut. These lockers have small cubbies for backpacks, purses, and briefcases, and larger spaces to hang coats and jackets.

FACE-FRAME DETAIL: UPPER RAIL



solid-walnut face frames, which are glued and nailed in place. To help align the face frames, I used 1/8-in.-thick splines cut from tempered Masonite. Before assembling the cases, I cut the grooves for the splines in all the front edges using a router and a slot-cutting bit. To assemble the cases, I used screws and biscuits.

Base cabinet is built the same way—
The base cabinet for this built-in goes to-

gether with the same biscuit and screw joinery as the locker cabinets. One difference is that I used an adhesive-backed maple edge-banding on the top edge of the two exposed partitions.

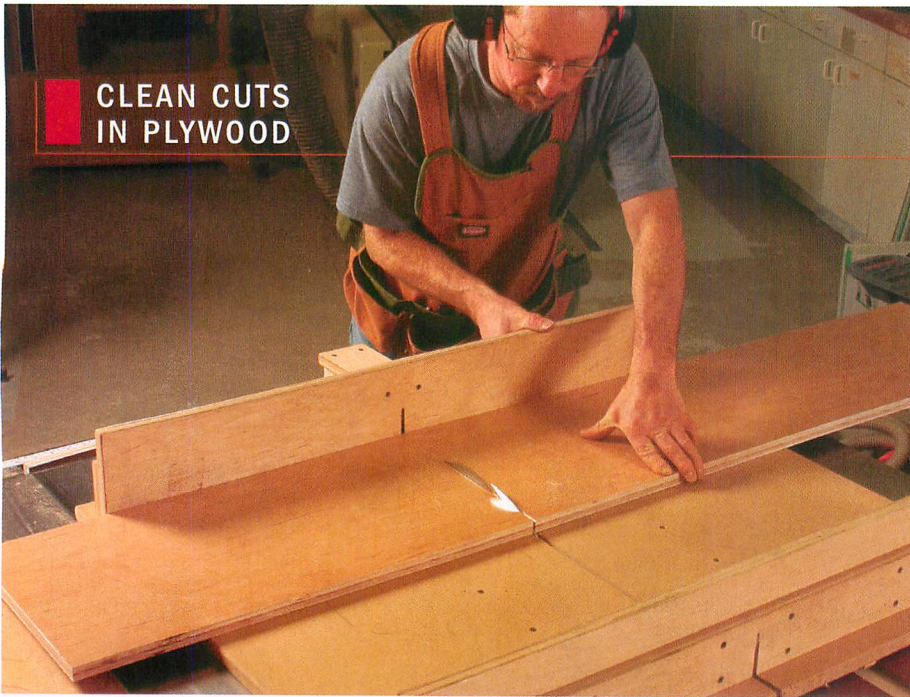
Put on the edge-banding before you cut the partitions to size. That way, the banded partitions don't vary in size from the unbanded ends of the case. Trim the edge-banding with a chisel.

Make and prefinish the walnut parts

Once the plywood cases are glued up, you can begin working on the walnut face frames, the frame-and-panel assemblies, and the lift-lid assembly. All of the walnut parts should be finished (I used Minwax Wipe-On Poly) before installation. It's much easier that way.

Because most walls aren't square or flat, you'll need to fit the end pieces of the

CLEAN CUTS IN PLYWOOD

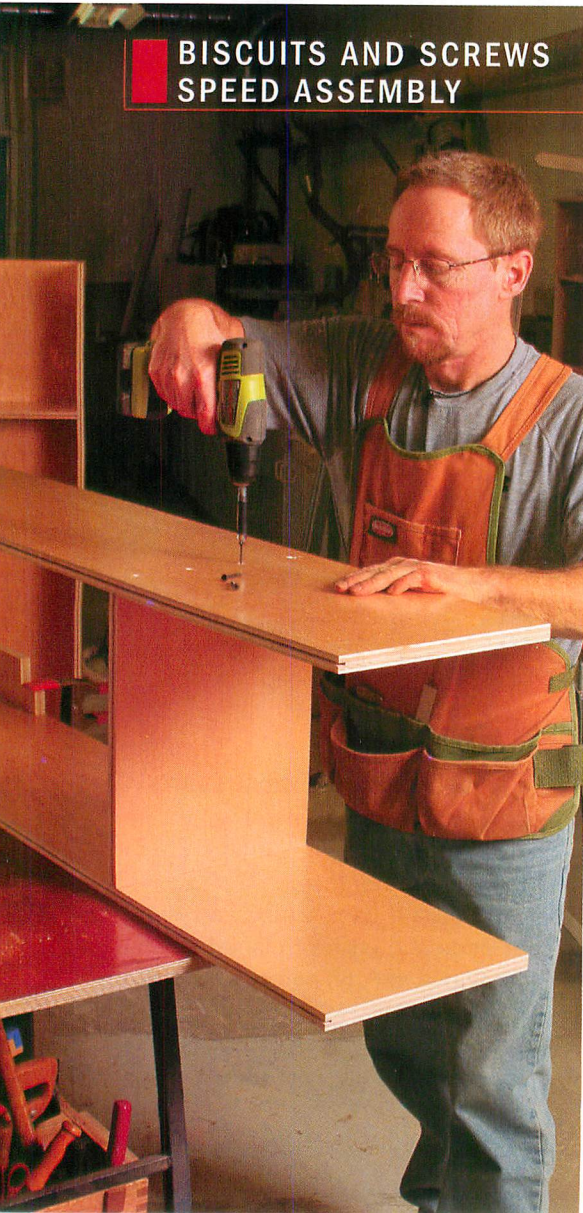


Rip, then crosscut. When breaking down a full sheet of plywood on a tablesaw, rip the pieces to size, then crosscut them using a sled.



The final cuts. To reduce tearout, keep the show face on top, and use a good combination blade and a zero-clearance insert or crosscut sled. To further reduce the chances of tearout during a crosscut, apply masking tape over the bottom side of the cut line.

BISCUITS AND SCREWS SPEED ASSEMBLY



No clamps required. Assemble the shelves, top, and sides with biscuits and screws. The screws not only reinforce the biscuits, but they also eliminate the need for clamps. Drill clearance holes and countersinks in the top pieces, and pilot holes in the edges below to prevent splitting.

built-in to that irregular surface. So leave any piece that butts against the wall about $\frac{3}{8}$ in. oversize in width (or length for the moldings) to allow for scribing and fitting.

Face frame—Mill the face-frame stock to thickness and width, but leave the pieces long. They'll be trimmed to fit the case during installation. That will leave the end grain unfinished, but no one will see it. I chamfer the edges and ends of every face-

frame part to create a small V-groove at each intersection; this detail not only looks good but also masks any minor unevenness at the joints. You can't chamfer the ends now, because the pieces aren't cut to final length, but you should chamfer the edges and prefinish the pieces.

Frame-and-panel assemblies—The front and exposed side of this built-in are covered with *applied frame-and-panel*

LIFT LID: A LESSON IN EDGING PLYWOOD



Fixed back gets solid edges. Attach the side trim pieces to the fixed back with biscuits.

assemblies made from solid walnut and 1/4-in.-thick plywood and assembled with simple joinery (see drawing, pp. 30-31).

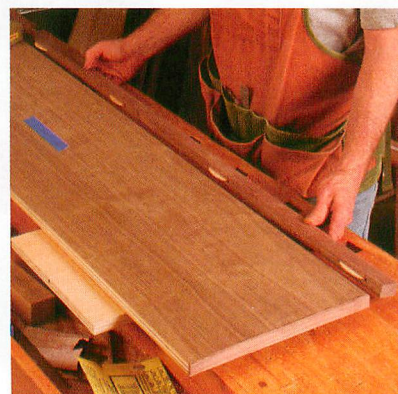
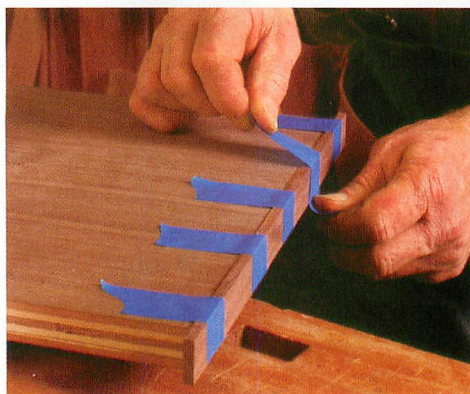
Base and crown moldings—Like the face frames, both the base and crown molding are solid walnut. For efficiency, mill up both at the same time. The base molding has a simple beveled profile. It's a good idea to leave it a bit wider than its finished size and trim it to fit after installation. The crown molding also is simple.

All four bevel cuts are made with the tablesaw blade at 42°. Clean up any saw marks with a handplane or sandpaper. The miters and scribing are done during installation. To support the crown, I use a beveled plywood strip screwed to the top of the case. Cut the strip and bevel its edge.

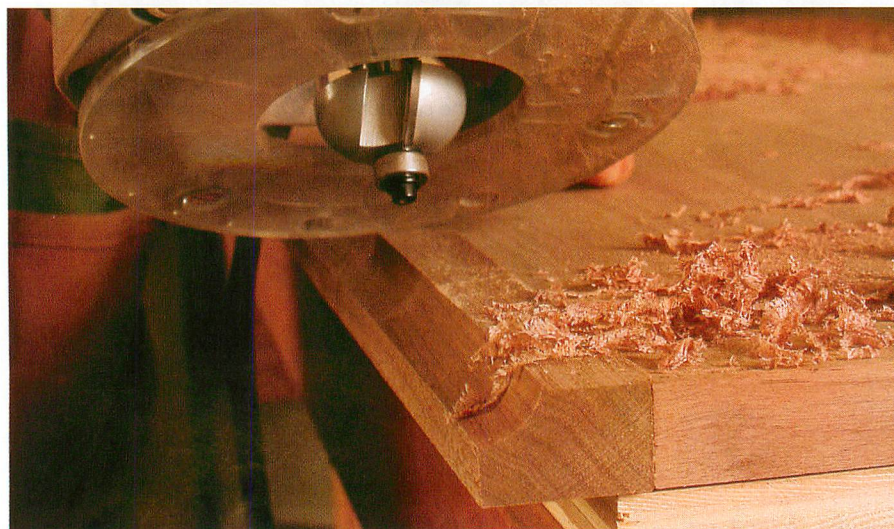
Last, the lift lid—The top of the lower cabinet features a lift lid, a fixed back (on which the upper cabinets will sit), and two pieces of side trim. I decided to use 3/4-in.-thick walnut plywood for the lid and fixed back to eliminate any wood movement worries. To ensure a good grain match, cut the fixed back and lid from one piece of plywood.

Assembly: Start with a level foundation

Built-in cabinetry must be installed level and plumb, no matter how out of whack the floors and walls may be. One of my favorite tricks is to install a separate base



Hide exposed edges on lid. The side edge-bandings are glued on with masking tape as the clamps, and the front edging is attached with biscuits. All the edging is trimmed flush with a block plane and cleaned up with sandpaper.



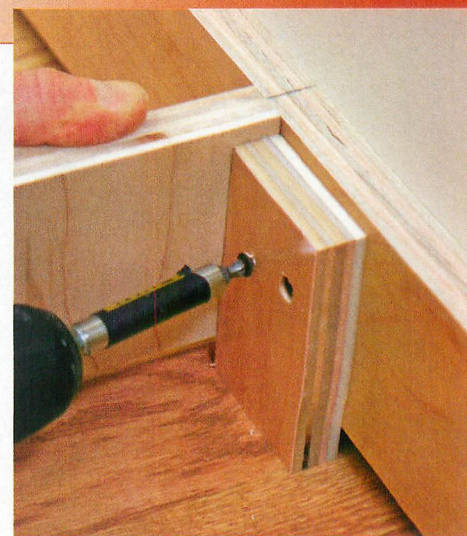
Soft landing for fingers. After gluing on the front edging and trimming it flush with the plywood, rout a cove along the bottom edge to serve as a finger pull.

Install from the ground up



BASE: SET IT AND FORGET IT

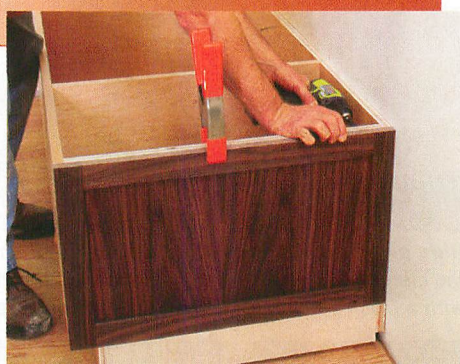
Installing the cabinets over a separate base makes leveling easy. Assemble the base from scrap plywood, using nails or screws; set it in place and level it. Once that's done, you know that all the cabinets above will be level.



Add feet. Use shims to get the base perfectly level (left) and up to the target height. Once the base is at the target height, screw on the plywood feet (above).

SCREW IN THE LOWER CABINET

First, screw the cabinet to the base and to the wall. Then add the side panel and the fixed back of the lid assembly.



Side panel is next. Scribe the rear stile to the wall and trim the panel flush with the front of the cabinet. Screw it to the cabinet from inside.



Top it off. Place the fixed back panel on top and screw it to the lower cabinet from above. The screws will be hidden by the upper lockers.

that can be leveled without moving the entire cabinet back and forth in the process (see photos, above). Once the base is complete, install the cases, starting with the lower cabinet and finishing with the upper lockers.

Cover up the plywood edges—Now it's time to install the front frame-and-panel assembly, the lid, the face frames, and the moldings. The front is screwed to the lower case from the inside. The lid is attached to the fixed back with a piano hinge.

When gluing and nailing on the face-frame pieces, attach the verticals first and the horizontals last. Because they're for alignment only, you need only one spline per vertical piece, even though the three middle pieces cover two cabinet sides.

On the horizontal frame pieces, remember to chamfer the ends, and apply finish to that small chamfer before installation.

Now all you have to do is install the crown molding and base molding. Once you're finished, you'll have a handy place to store all sorts of stuff, and a convenient seat where you can put on and take off shoes and boots. □

Tony O'Malley, a woodworker in Emmaus, Pa., specializes in making custom built-ins.

Put the cabinet on the base. Screw it to the base and to the wall with finish-head screws. Shim behind the cabinet if the wall isn't plumb.

UPPER CASES: ANCHOR AND SCRIBE

The upper cases are screwed to one another and to the wall. Then the side and front panels are scribed to the wall and screwed on from inside. If you don't like seeing screw heads inside the lockers, cover them with matching maple screw caps, available from Fastcap.

Clamp and screw. Set the four locker cabinets in place and attach one to the next with countersunk drywall screws, which help draw the pieces together. Screw the cabinets to the wall, shim-ming the back where necessary to keep them plumb.



Scribe to the wall. Where the frames meet the wall, you need to create a seamless fit. The best approach is to set the panel in place and slide a light-colored pencil (which shows on the dark walnut) along the wall to mark its contours. Trim up to the line using a block plane, jigsaw, or belt sander. Your other goal is a flush surface at the front of the cabinet.



FINAL DETAILS: LID, FACE FRAMES, AND MOLDINGS

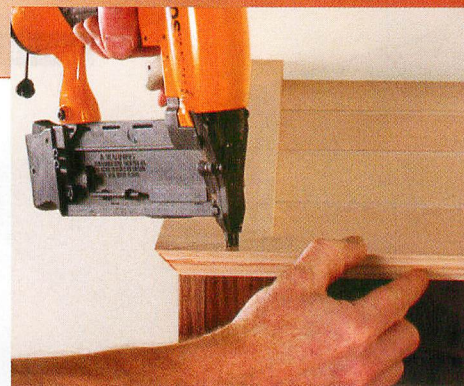
Once the upper lockers are in place, you're near the finish line. All that's left is to install the lid, the face frames, and the crown and base moldings. Don't hurry these jobs, because these details are the most visible. Conceal the nail heads with a colored wax crayon.



Hinge the lid. Screw the piano hinge to the lid, then attach the assembly to the fixed back.



Face frames without frustration. Rather than attaching a preassembled frame, O'Malley glues and nails on the pieces one at a time, beginning with the verticals. Then he fits the horizontals.



The topper. To give a better attachment surface for the crown molding, nail on a plywood support piece along the edges (above). Then miter the crown, and glue and nail it in place (below).



How to Tame

BY HENDRIK VARJU

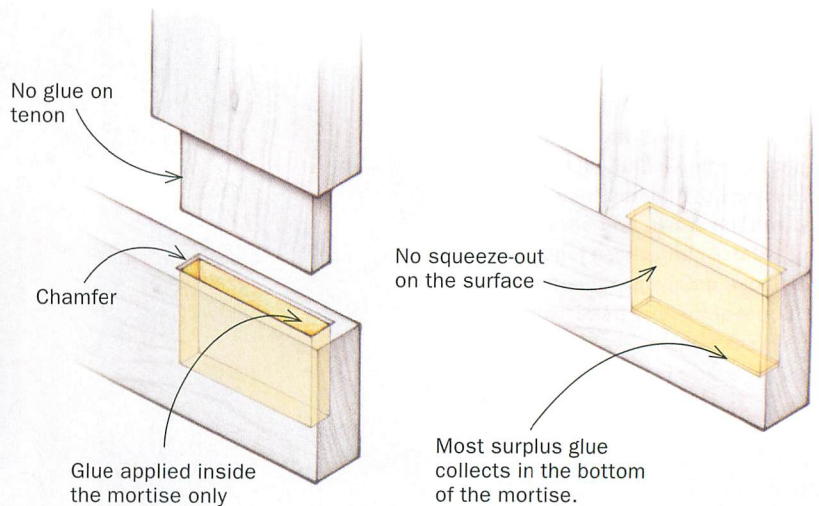
Every woodworker experiences that moment of pleasure when the first coat of finish brings out the beauty of the wood, only to be dismayed when the finish also reveals an area contaminated by glue squeeze-out. There is plenty of advice out there on how to remove squeeze-out, but as the saying goes, an ounce of prevention is worth a pound of cure.

The first step is to control the amount of glue you use. Less glue doesn't have to mean less strength, but it does mean less squeeze-out. The second step is to apply the glue to the right parts of a joint. If you follow both of these rules, squeeze-out will be either hidden inside the joint or directed to a place where it can be easily removed, such as the outside of a box that still needs planing or sanding rather than

Hide glue inside the joint...

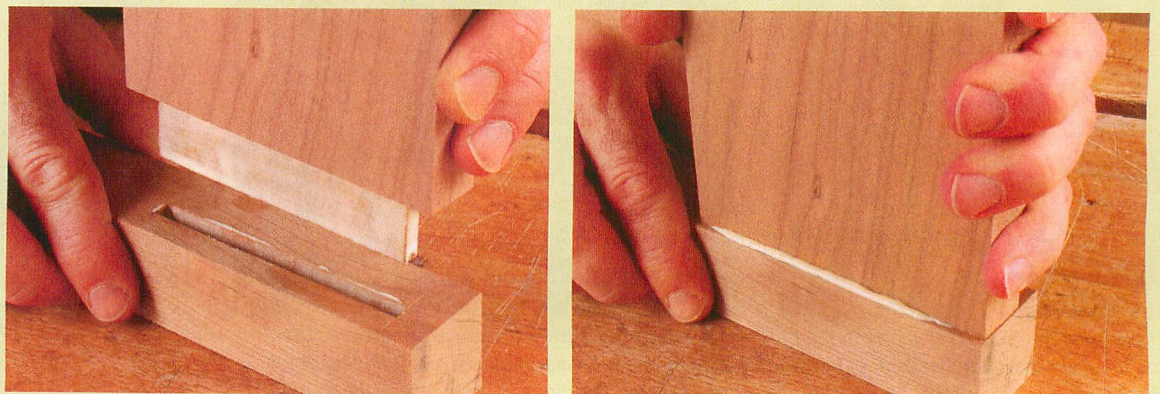
The best way to avoid squeeze-out is to push surplus glue inward, hiding it in empty areas inside the joint.

RIGHT



WRONG

If you spread glue on the tenon, it will be forced upward by the edges of the mortise and will squeeze out around the joint, where it is hard to remove completely.



Squeeze-out

a finished inside corner, where a chisel might leave marks and a wet rag will leave behind a thin film of glue.

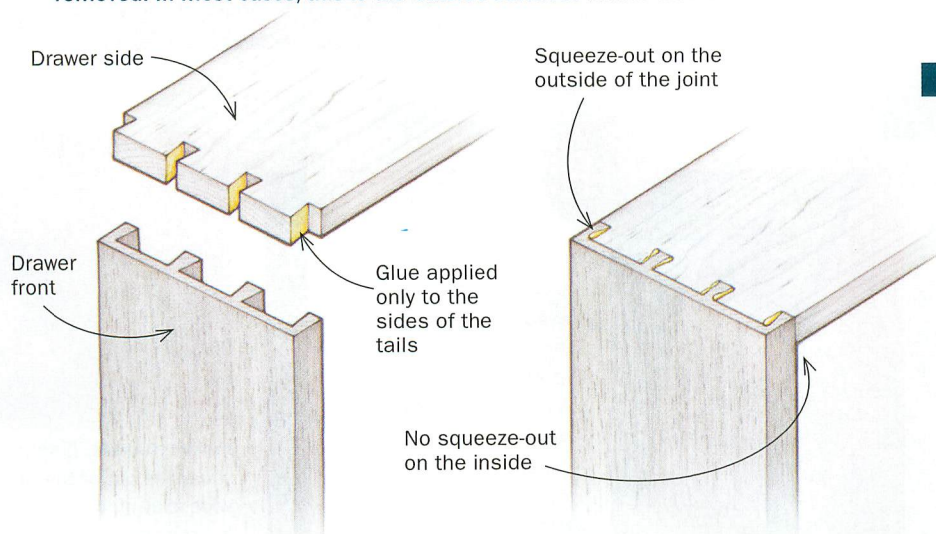
With most white or yellow woodworking glues, it is important that both surfaces are wetted by the glue within a short time. The normal method is to apply glue to both surfaces, but the downside on most joints is unavoidable squeeze-out. However, you can apply glue to just one side of the joint

if you use enough glue to wet the second piece. Just don't let more than a few minutes pass between applying glue and assembling the joint, because skinned-over glue cannot penetrate the second side sufficiently. As long as your joinery goes together quickly, you're fine.

Hendrik Varju is the owner of Passion for Wood (passionforwood.com) in Ontario, Canada.

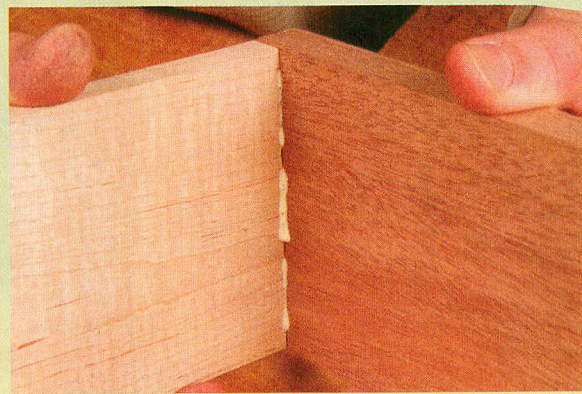
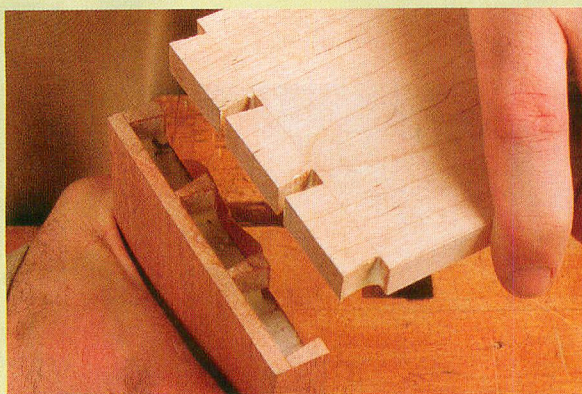
...or send it where it's easy to handle

If the design of a joint prevents you from hiding surplus glue inside it, the next best solution is to direct squeeze-out to the part of the joint where it can most easily be removed. In most cases, this is the outside surfaces rather than an inside corner.



WRONG

If you glue the pins, surplus glue will squeeze out on the inside corner of the joint, where it is hard to remove cleanly.



4 ways to hide it

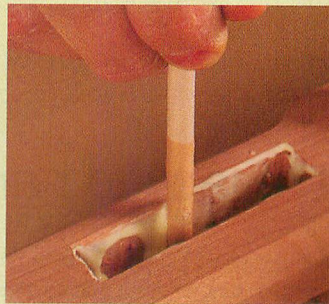
Hide surplus glue inside a joint and you can eliminate the problem of squeeze-out entirely. This technique works with mortise-and-tenon joints, dowels, and certain types of spline joints and dadoes. Apply the glue to one surface only and keep it off end grain, where it soaks in and adds little to joint strength.

1

Stop squeeze-out on mortise-and-tenon joints

Cut the mortise a minimum of $\frac{1}{16}$ in. deeper than the length of the tenon to provide a small void where the surplus glue can collect. Put glue in the mortise only and spread it with a thin dowel (below right). If you can see the wood clearly, you need more glue. If there is a huge puddle at the bottom, push the dowel to the bottom of the hole, pick up some of the glue, and wipe it off with a rag.

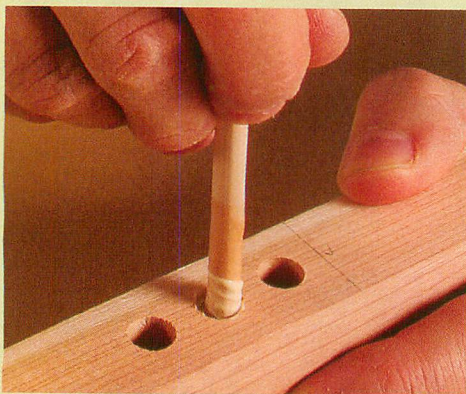
Extra line of defense. A small chamfer around the top of the mortise will catch any surplus glue not held at the bottom.



2

Trap glue in dowel holes

As with the mortise-and-tenon joint, drill dowel holes a little over $\frac{1}{16}$ in. deeper than necessary. Apply glue on the inside of the hole only, just below the surface. In a typical joint, where end grain meets face grain, don't apply any glue between the mating surfaces themselves—only in the dowel holes.

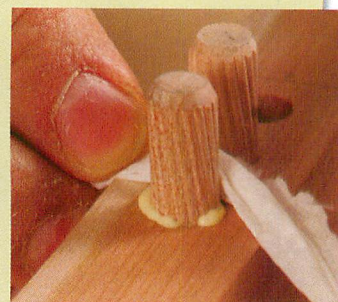
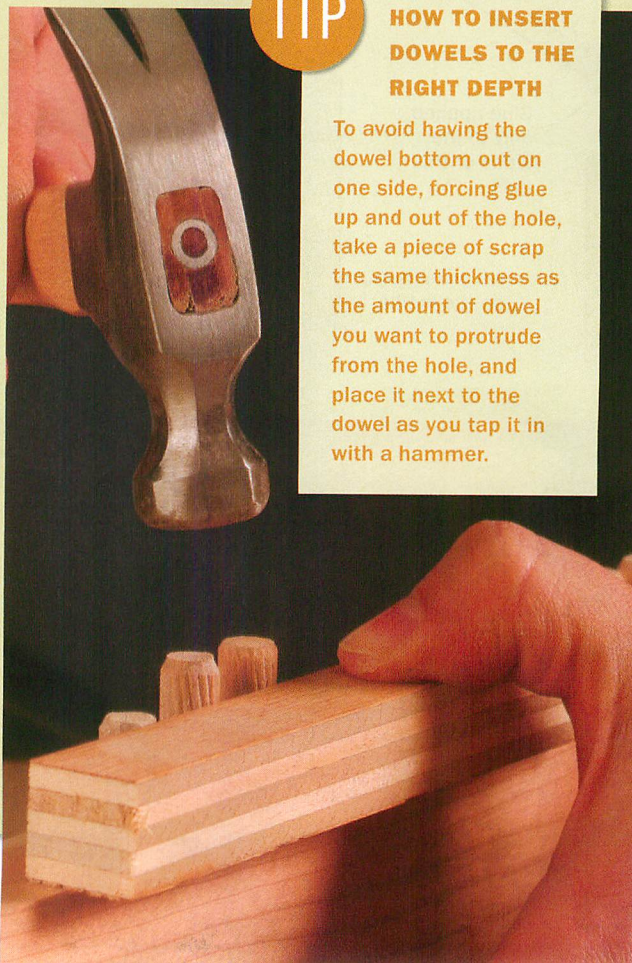


Glue holes, not dowels. Use a smaller-diameter dowel rod to spread the glue around the sides of the holes.

TIP

HOW TO INSERT DOWELS TO THE RIGHT DEPTH

To avoid having the dowel bottom out on one side, forcing glue up and out of the hole, take a piece of scrap the same thickness as the amount of dowel you want to protrude from the hole, and place it next to the dowel as you tap it in with a hammer.



Insert dowels. If some glue squeezes out of the hole, wipe it away before the joint is assembled.



No squeeze-out. By eliminating squeeze-out, Varju saves time and ensures a perfect-looking joint.

3 No-mess solid edging

Splines reinforce the joint between solid edging and plywood, whether for shelves or tabletops. Cut the spline grooves about $\frac{1}{16}$ in. deeper than needed and apply glue only in the groove, not on the spline. The space at the bottom of the groove will catch squeeze-out. For extra strength, apply a very thin film of glue to the inside face of the edging.



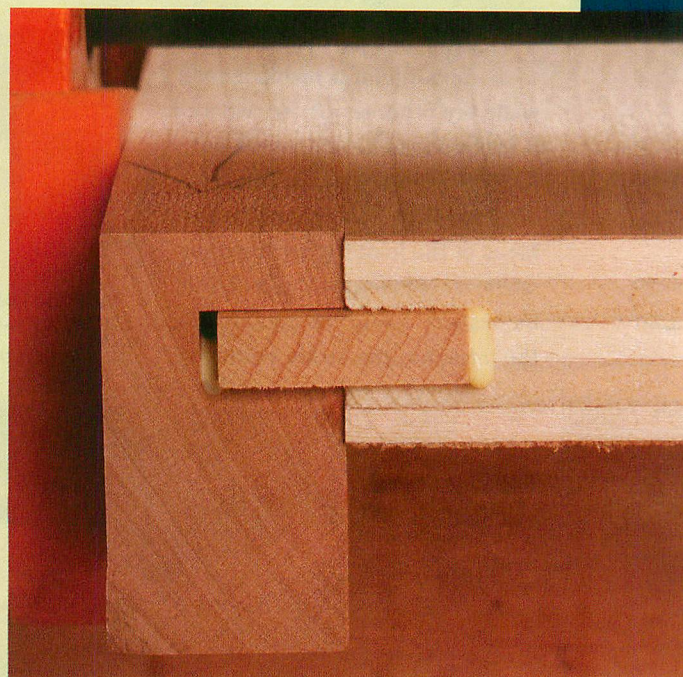
Insert the tenon. Place the unglued tenon into the mortise and drive it home (left). Surplus glue is forced downward and out of sight, leaving the outside of the joint glue-free (above).



Glue the groove. A spline adds strength when attaching solid edging. Apply glue to the groove only, not the spline.



Tap in the spline. Leave the spline $\frac{1}{16}$ in. above the bottom of the groove by using a piece of scrapwood as a depth stop.



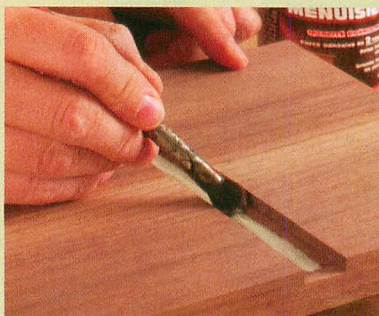
No squeeze-out. Surplus glue collects in the reservoirs at the bottom of each groove, leaving the outside of the joint clean.

4 Strong but clean dado joints

With a dado joint, such as where a shelf fits into a bookcase side, you can't use extra depth to hold excess glue. But small chamfers on the ends of the shelf can provide a small reservoir. Just be sure to avoid chamfering the front corners unless they will be concealed by a face frame or a stopped dado.



Create a hiding place. Chamfering the ends of the shelves creates a small void for surplus glue.



Glue the dado only. Place a small bead of glue along the center and brush it over the bottom and sides.



No squeeze-out. By applying a limited amount of glue, and only to the dado, surplus glue is confined to the chamfers.

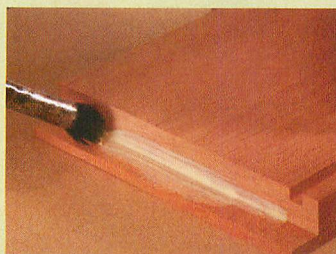
3 ways to direct it

If you can't hide squeeze-out, think where it would be easiest to remove. On the outside of a box or drawer carcass there is usually more hand-planing and sanding to be done, which also removes the squeeze-out.

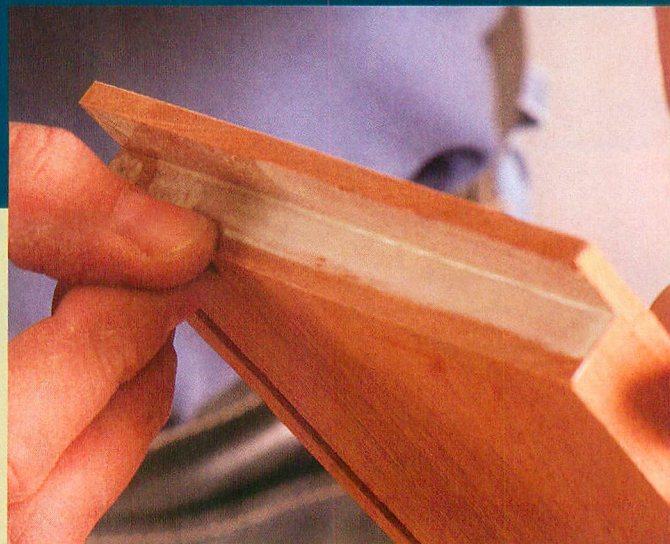
1

Squeegee the squeeze-out in a rabbet

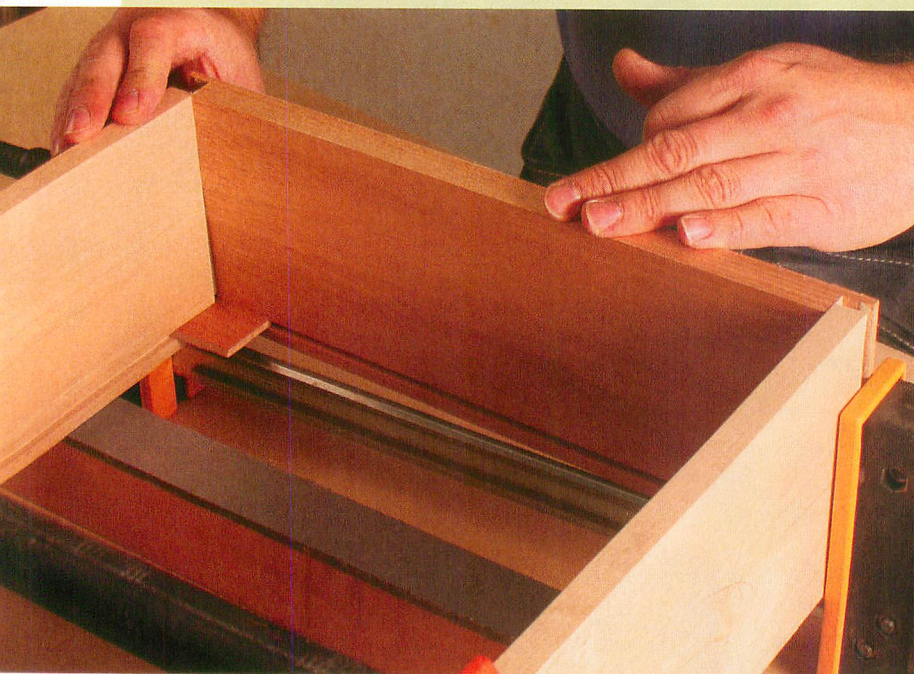
Often one part of a simple rabbet joint is inside a case while the other is outside, where it is far better to have squeeze-out. Apply glue to the rabbeted part only, and then hold the inside surfaces of the joint tightly together while assembling it. The glue will be pushed toward the outside of the case, not the inside corner.



Just the rabbet. Spread glue thinly on both faces of the rabbet, but not on the mating piece.



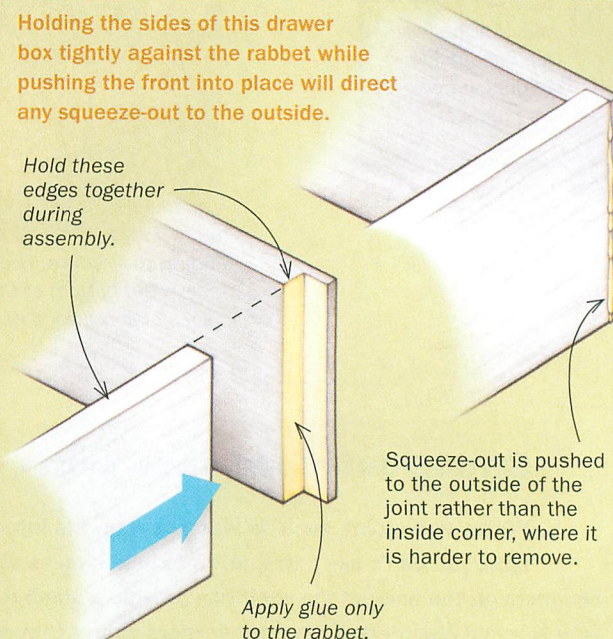
An extra precaution. If you get glue near what will become the inside corner of the joint, wipe it away before assembling the joint.



CAREFUL PRESSURE

Holding the sides of this drawer box tightly against the rabbet while pushing the front into place will direct any squeeze-out to the outside.

Hold these edges together during assembly.

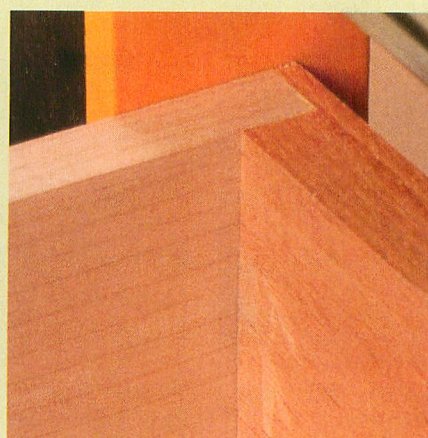
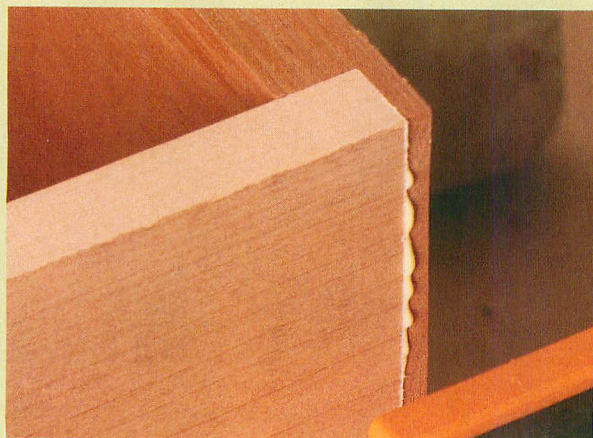


Squeeze-out is pushed to the outside of the joint rather than the inside corner, where it is harder to remove.

Apply glue only to the rabbet.

Easy cleanup.

The outsides of the drawer will be planed or sanded to fit the drawer opening, removing any squeeze-out or glue film at the same time.

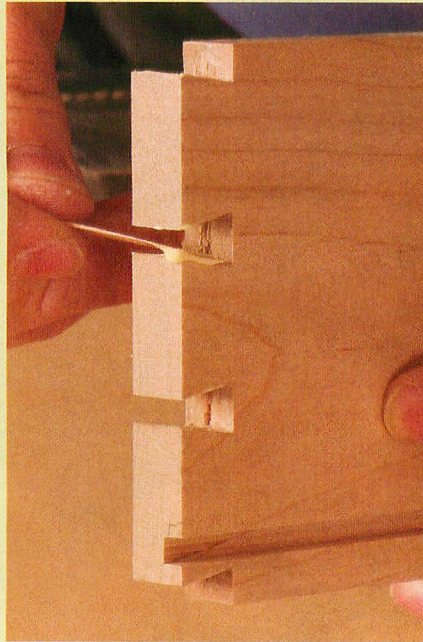


Nothing inside. The inside of the drawer is already completed, so any squeeze-out here would mean more work.

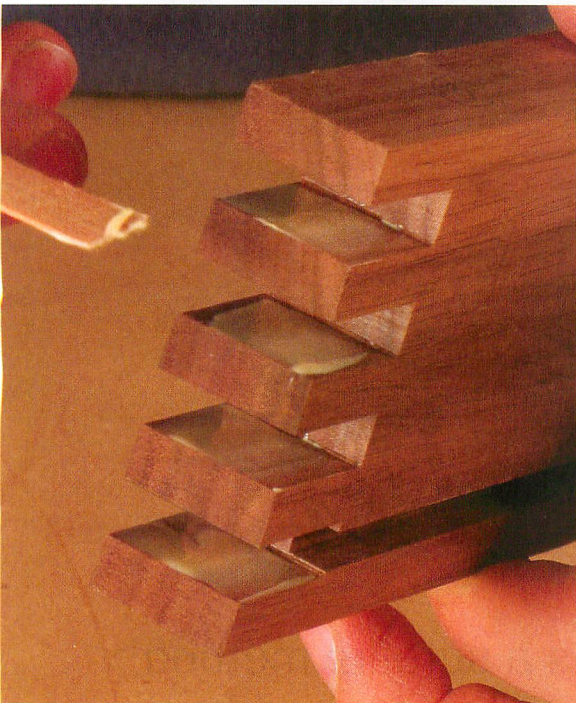
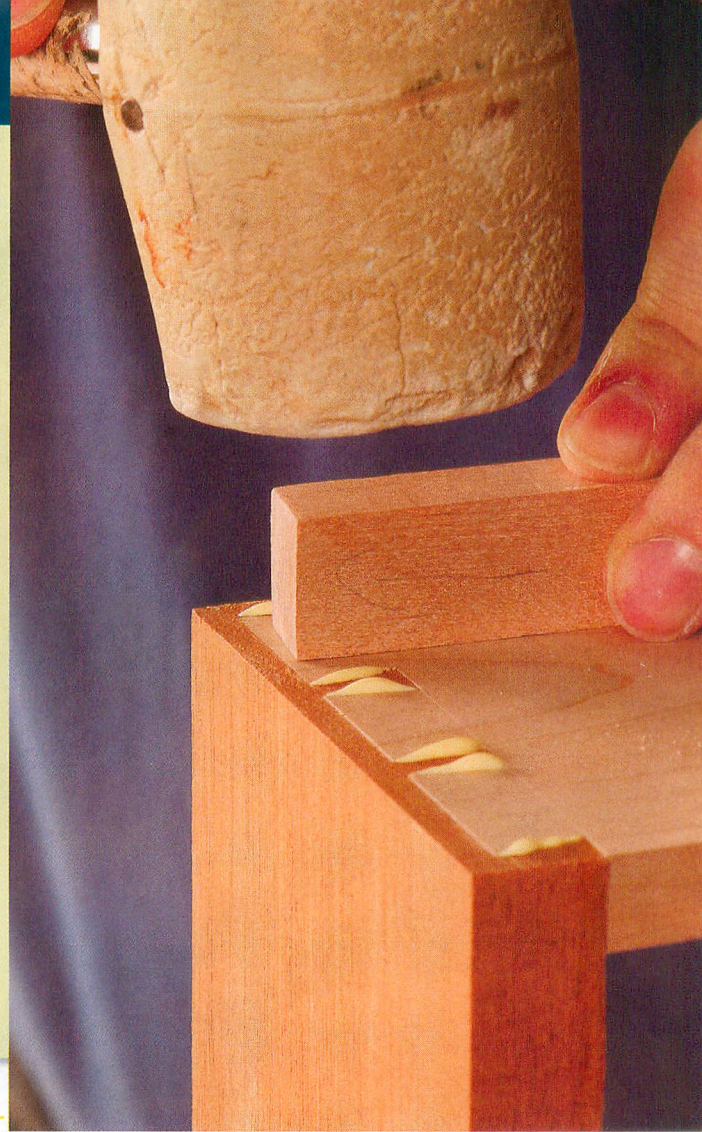
2

Glue specific parts of dovetails

Because the tails are pressed onto the pins, glue only the tails, whether they are through- or half-blind dovetails. That will push excess glue up toward the outside of the box. Any glue placed on the pins would get pushed down and into the inside corner. Because glue adds strength on long-grain surfaces only, glue on the ends of the tails of half-blind dovetails adds little strength and only causes squeeze-out. Worse, glue applied on the end-grain surface at the base of the pins (inside the sockets) is squeezed toward the inside corner of the box.



Tails, you win. Use a sliver of wood to apply glue just to the sides of each tail (above). Assembling the joint forces surplus glue to the outside (right), where it will be removed easily later.

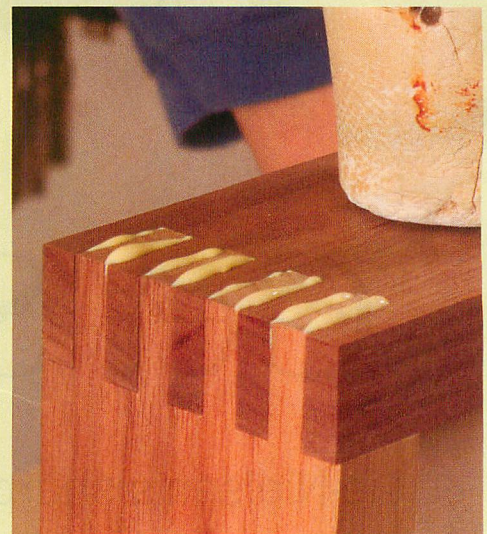


Just like dovetails. Designate two opposite sides of a finger-jointed box as having tails and the other two sides as having pins. Then apply glue just to the "tails."

3

Same thing for finger joints

Think of a finger joint as a dovetail and assemble it in the same way. For a small box, pretend that the front and back have tails and the sides have pins. Put the glue only on the long-grain surfaces of the "tails" and slide those parts directly into the "pins." Not a single drop of glue will make it to the inside. Like dovetails, finger joints are usually designed to need planing and sanding to level the outside surfaces, so you'll get rid of the glue squeeze-out at that time.



Push straight down. As with the dovetails, push the glued part of the joint onto the dry one to force surplus glue to the outside of the joint.



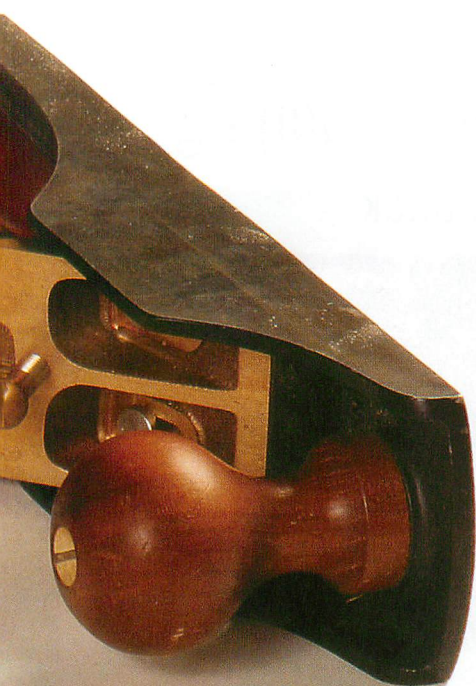
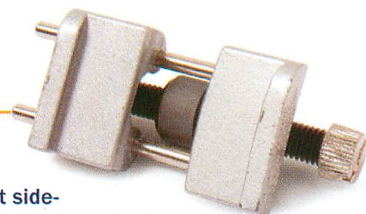
Get Sharp—*Fast*

Lie-Nielsen's sharpening expert shares a surefire method
for getting a keen edge every time

BY DENE B PUCHALSKI

AN ALL-IN-ONE HONING STATION

A board with multiple reference stops is a great way to set honing angles reliably. This compact jig also supports your sharpening stones. The measurements shown give approximate angles for most side-clamping honing guides. For best results, set your own stop distances as shown below.



For many woodworkers, sharpening plane irons and chisels is an intimidating and frustrating task. I've traveled the country teaching and demonstrating sharpening and hand-tool techniques for Lie-Nielsen Toolworks for the past nine years, and I've met plenty of woodworkers who struggle to get a consistently sharp edge on their tools and are convinced that sharpening is beyond their reach.

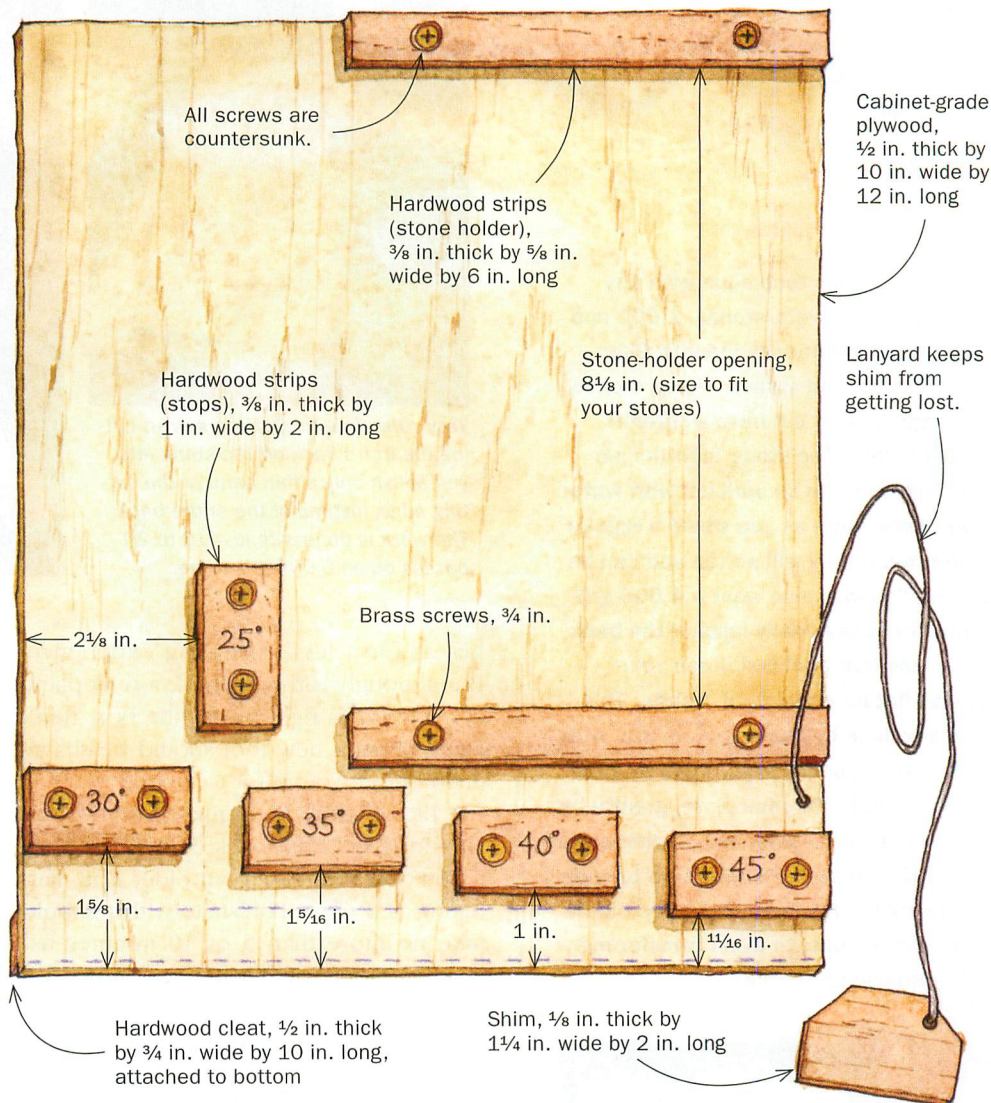
Sharpening doesn't have to be difficult and mysterious. The method I'll show you combines ideas I've picked up over 25 years of working with hand tools. I've demonstrated it countless times.

The heart of this approach is a collection of simple tools: a \$15 side-clamping honing guide, a supply of sandpaper in several grits, 1,000- and 8,000-grit waterstones (or a combination stone if you like), a thin metal ruler, and a shopmade stop board that will help you quickly and reliably set the correct honing angle every time. With these tools, you can handle the most common sharpening tasks—honing, grinding, and repairs—for every kind of blade.

Using this method, you'll get a truly sharp edge, allowing your tools to cut more cleanly and efficiently with less effort.

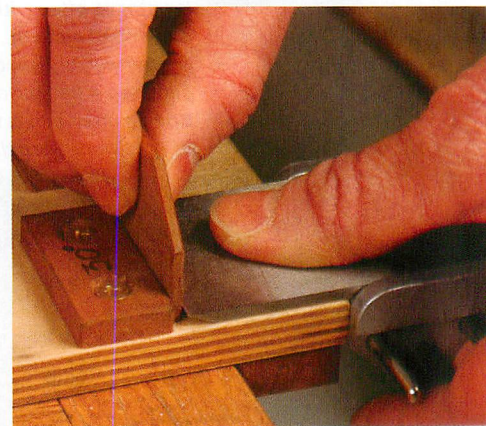
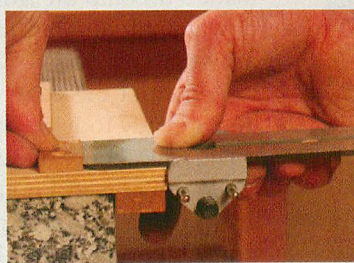
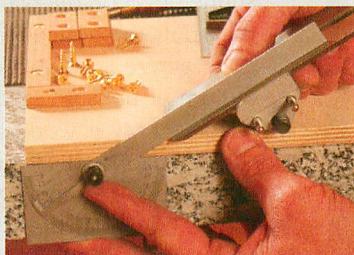
Start with a time-saver: The ruler trick

Many woodworkers buy a high-end hand-plane with the idea that their woodworking will get better. It's true that a better tool



SET YOUR OWN ANGLES

To locate a stop at the correct distance for a given angle, place an iron in the honing guide and use a protractor to set the angle. Then, butt the guide against the board and place the stop against the iron's edge. Use brass screws to secure the stop parallel to the edge.



Shim adjusts angles. The 1/8-in.-thick shim adds about 2° to shallower angles and up to 5° to steeper ones.

A new blade only needs honing

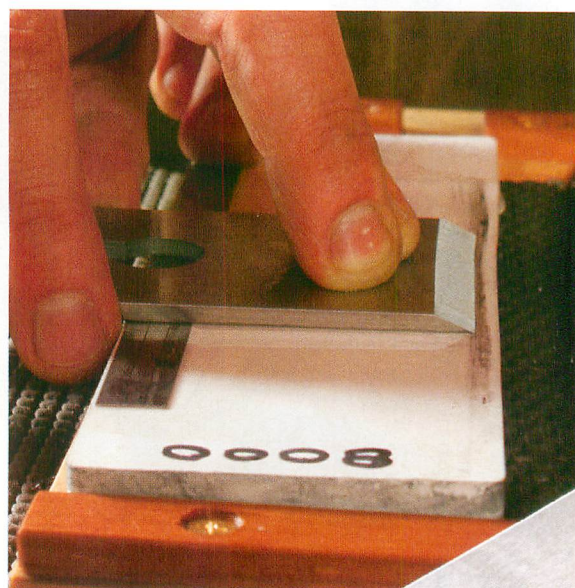
HONE JUST THE TIP OF THE BACK

Why I like waterstones

You can use this technique with any abrasive. I like waterstones, 1,000 and 8,000 grit, specifically the new Shapton glass-backed stones. These stones cut aggressively but have a ceramic binder holding the stone together, so they only need to be spritzed with water. Don't soak them as you would a regular waterstone; they will soften and can be ruined. You may also want a 4,000-grit stone for occasionally lapping the back of a plane iron or chisel. Keep your stones flat for consistent results. This is easily done by lapping frequently with a coarse wet-or-dry paper (150 to 220 grit) on a flat reference plate, granite or glass, or a coarse diamond lapping plate (45 to 55 micron). Also, be sure to wipe off the roller of your honing guide before switching stones, to avoid transferring grit from one to another.



Tiny ruler is a huge time saver. Lifting the iron's back off the stone lets you polish only a thin band at the cutting edge, instead of the entire back. The work is done with just 10 to 20 passes on an 8,000-grit stone.



makes for a less frustrating experience. But although you may think a new plane is ready to go right out of the box, think again. Even a new tool should be sharpened before you put it to wood.

A brand new, high-quality plane iron should have a flat back. If it doesn't, or if you're working with an older iron, flattening is a must. Fortunately, this should take no more than 5 or 10 minutes using the sandpaper technique shown on p. 46. Your goal is not a high polish but simply a flat back with no heavy milling marks running to the cutting edge. This is because, once I have the back flat, I use David Charlesworth's ruler trick to create a subtle bevel on the blade's back. The ruler trick puts the honed surface at the cutting edge where it belongs and eliminates the tedium of polishing the entire back.

Here's how it works: Place a thin metal ruler (0.020 in. thick or less) on one side of the 8,000-grit stone. Now place the back of the blade on the ruler and lower the blade's tip onto the stone. Work it up and down until you can see an even mirror polish about $\frac{1}{32}$ in. wide, from corner to corner, at the edge of the blade. Now you're ready to hone the bevel.

The typical bevel-down smoothing plane blade comes with a primary bevel of about 25°. There's no need to hone the entire primary bevel to get a sharp edge, though.

It's more efficient to create a small, steeper secondary bevel right at the cutting edge. For the most common primary bevel of 25°, a secondary bevel of 30° works well.

I use steeper angles with scraper planes, as well as bevel-up tools for working in hard, highly figured woods. The harder the wood, the higher the angle.

How to find and hold the right angle

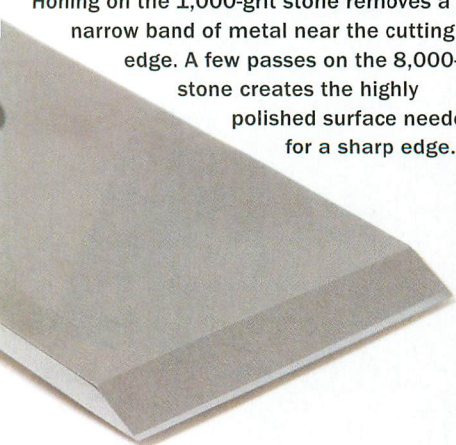
To hone the secondary bevel, I use a honing guide. Some woodworkers call this cheating. As someone who learned long ago to sharpen freehand, I say it's not. A honing guide holds the blade at a consistent angle as you work the edge and move from stone to stone. The secondary bevel remains flat, and each successive grit reaches all the way to the tip of the edge.



Keep your stones flat. Lap your sharpening stones often with a diamond plate or coarse wet/dry sandpaper on a flat surface. Do this often and it will be less work each time.

SAME GOES FOR THE BEVEL

Honing on the 1,000-grit stone removes a narrow band of metal near the cutting edge. A few passes on the 8,000-grit stone creates the highly polished surface needed for a sharp edge.



I use a simple, side-clamping honing guide. To set the angle consistently, I constructed a stop board (see drawing, p. 43), which consists of a plywood base and several stops to set the blade a certain distance from the front of the guide. The shorter the distance, the steeper the honing angle. My board has stops for five common angles: 25°, 30°, 35°, 40°, and 45°. I also use a 1/8-in. shim to increase an angle at any of the stops. With a long projection like 25° to 30°, 1/8 in. represents roughly a 2° increase in angle. With a short projection like 45°, the same 1/8 in. represents about 5°.

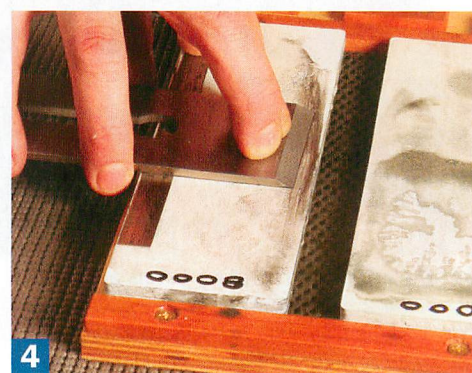
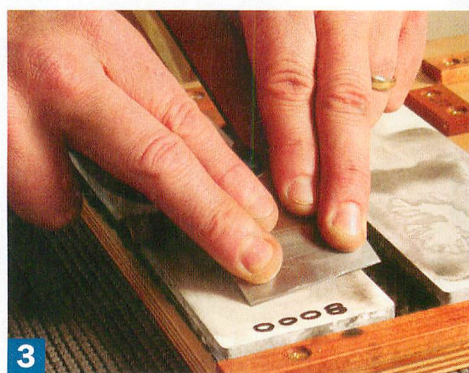
Honing takes less than a minute

Set the blade to the correct angle and tighten the guide so the blade won't shift. Begin with the 1,000-grit stone, working back and forth and applying even pressure. After four or five passes, you should be able to see and feel a burr or "wire edge" on the back of the blade. This burr indicates that you have removed the dulled edge and it's time to change stones.

Before sharpening on the 8,000-grit stone, wipe off the roller wheel of the honing guide so that you don't transfer grit from stone to stone. To ease off some of the burr, take one pass on the blade's back, drawing the blade toward you. Now work the bevel side, taking another four or five passes. When you see a clean and brightly polished parallel line right at the blade's tip, you are done. However, if you applied uneven pressure on the blade, the polish line will be wider at one corner than the other. This can be corrected



1 *This should take only a minute. Use the 30° stop on the board to set the iron in the honing guide (1). Four or five passes on the 1,000-grit stone should be enough to raise a burr on the iron's back (2). Take a handful of passes on the 8,000-grit stone to create a highly polished narrow band at the tip (3). Finally, repeat the ruler trick to remove any remaining burr on the back (4).*

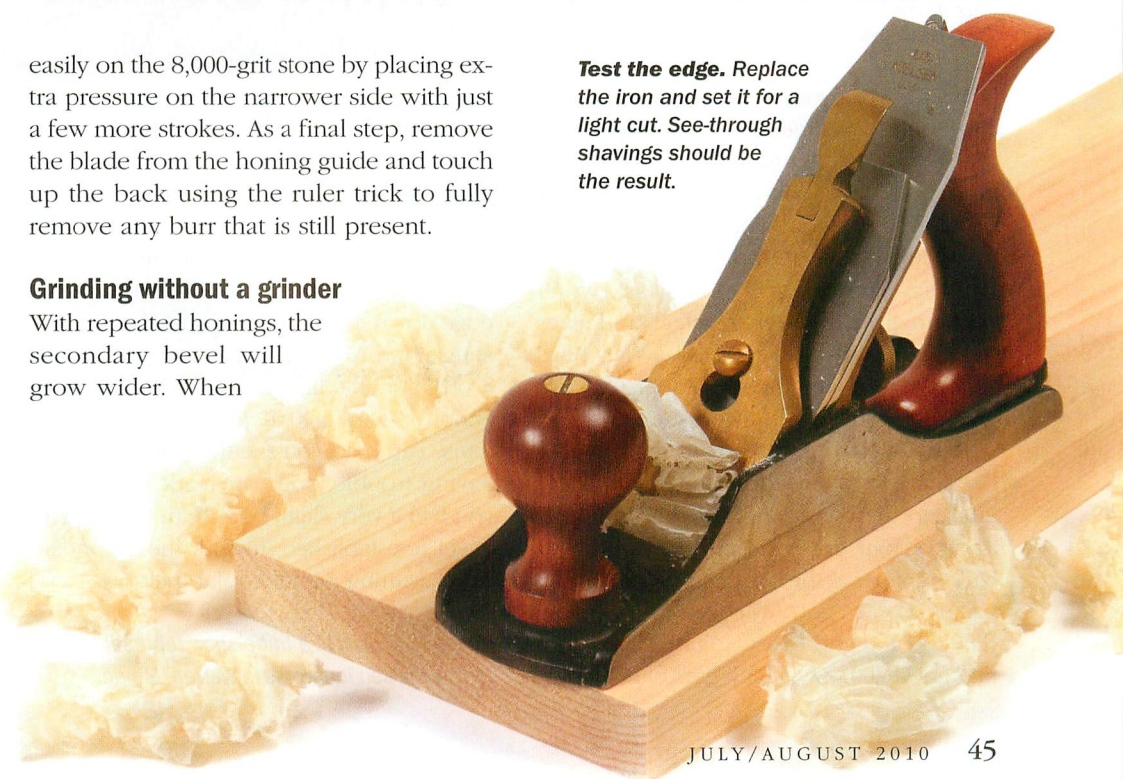


easily on the 8,000-grit stone by placing extra pressure on the narrower side with just a few more strokes. As a final step, remove the blade from the honing guide and touch up the back using the ruler trick to fully remove any burr that is still present.

Grinding without a grinder

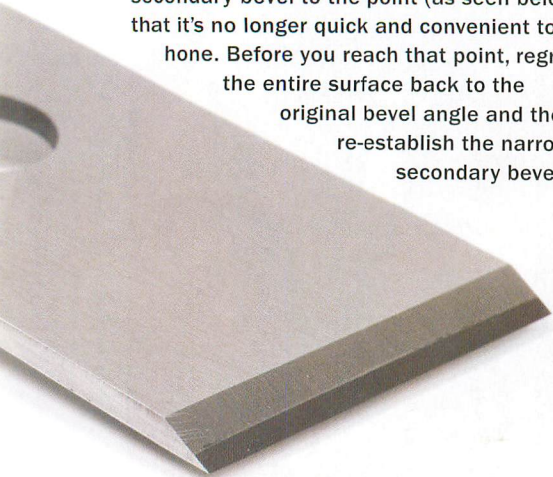
With repeated honings, the secondary bevel will grow wider. When

Test the edge. Replace the iron and set it for a light cut. See-through shavings should be the result.



Ready to regrind? Sandpaper is safer

Repeated honings will eventually widen the secondary bevel to the point (as seen below) that it's no longer quick and convenient to hone. Before you reach that point, regrind the entire surface back to the original bevel angle and then re-establish the narrow secondary bevel.



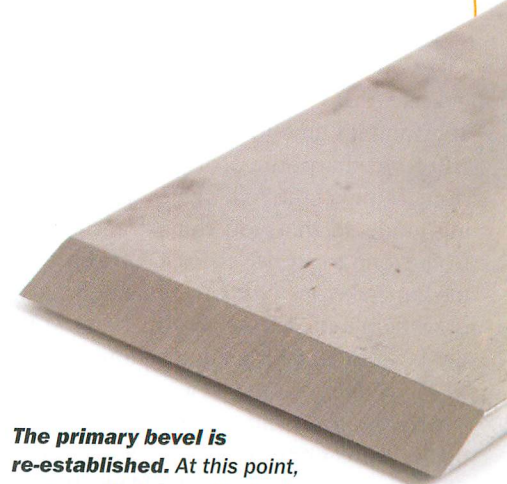
Set the angle. Most primary bevels are ground at or near 25°. Puchalski uses sandpaper in grits ranging from P80 to P400. He attaches the paper to a flat slab of granite and repeatedly works through the grits, taking about 10 to 15 passes over each grit.

it becomes too large, and you're spending 20 to 30 passes honing on the 8,000-grit stone, you need to re-establish the primary bevel. A lot of woodworkers use a grinder for this, but I've found that working by hand on sandpaper is just as fast, won't burn the tip and soften the steel, and gives me more control. You need a flat, hard substrate to attach the sandpaper to. I use granite, but plate glass works too.

Re-establishing the primary bevel—Use the stop board to set the blade in the guide to the correct primary bevel. Attach three or four grits of 3-in.-wide adhesive-backed paper to the substrate. Take 10 to 15 passes on each grit, switching from a coarse (P80 to P180 grit) to a medium (P220), to a fine grit (P400). Switching grits often avoids

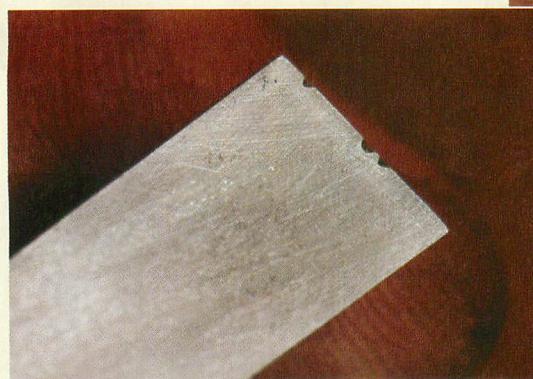
working too long in the same scratch pattern. It also helps prevent unintentionally crowning the blade, which makes honing difficult. Continue cycling through the grits until you achieve a consistent and straight bevel at the desired angle. Do not work the edge down to a point. Stop just short of creating a burr. You are done when you can see a very thin, flat line on the tip of the blade, about 0.01 in. or 0.02 in. thick. A jeweler's loupe can help you see this line. If you are having trouble, you can work down until you feel a very slight burr. With the primary bevel re-established, rework the secondary bevel, starting with the ruler trick. □

Deneb Puchalski is a trade-show representative for Lie-Nielsen Toolworks in Warren, Maine.

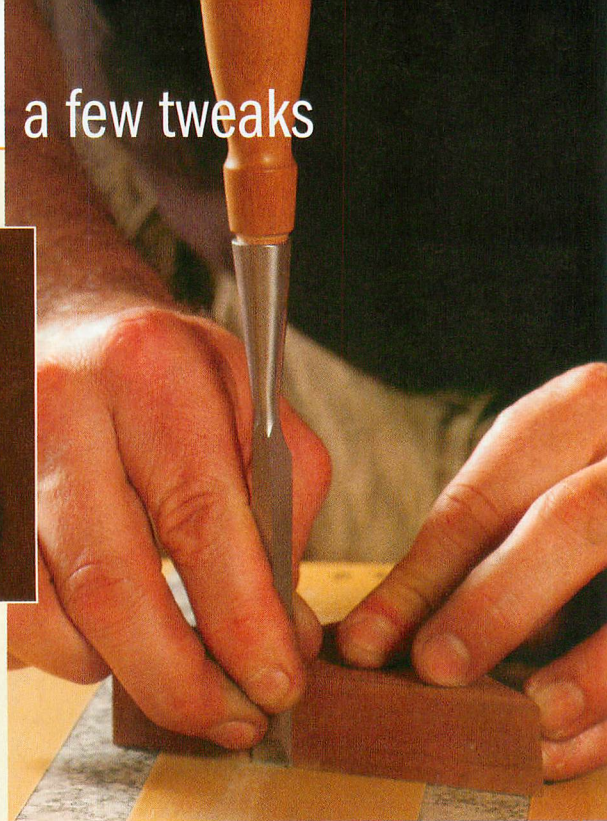


The primary bevel is re-established. At this point, you're ready to hone the back using the ruler trick and then hone the bevel.

Same method for chisels, with a few tweaks



Fix the nicks first. There's no point in honing this edge until the nicks have been removed. Puchalski uses a block of wood to hold the chisel perpendicular to the sandpaper as he grinds the edge back to remove the nicks. Then he regrinds the primary bevel with the chisel in a honing guide. The same method works for plane blades.



Like new plane blades, chisels aren't ready to go right out of the box. The good news is that this sharpening method works for chisels, too. The bad news is that the ruler trick won't work. You need to flatten (on sandpaper) and polish (on stones) the entire back because it serves as a reference for paring and other fine work.

Once the back is flat, mount the chisel in the honing guide. Its lower position in the guide creates a honing angle that is about 5° shallower than the marked angles on your board. So your 30° stop becomes 25° and so on.

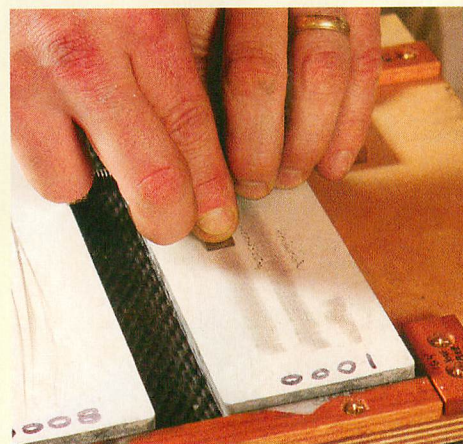
Because I can control the angle and am not removing much material, I work the entire face of the primary bevel on the 1,000-grit stone, then hone a secondary bevel a few degrees steeper on the 8,000-grit stone. Use the 1/8-in. shim to increase the angle. I avoid sandpaper grinding unless I get a heavy nick in the edge.



Fitting the chisel in the honing guide. The chisel rides in the lower set of jaws. The lower jaws also hold narrow plane blades.

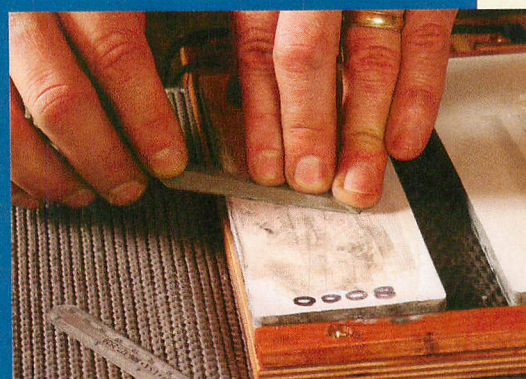


The angles are different. Chisels ride lower in the honing guide and project farther out of it. To compensate, choose a stop that is 5° steeper than your desired angle.



Honing in two steps. Puchalski works the entire face of the bevel on the 1,000-grit stone, then hones a secondary bevel a few degrees steeper on the 8,000-grit stone.

IMPORTANT NOTE!



Avoid the ruler trick with chisels. Once you're done honing, take a couple of passes on the back to remove the burr. Keep the back flat on the stone.

A Solid Drawer Bottom Is Worth the Effort

Plywood is easier, but it can leave a hollow feeling

BY GARRETT HACK



Plywood is popular for drawer bottoms because it's easy, but I think a solid bottom is better and more appealing. Solid wood is plenty strong, and it's definitely more attractive. Solid wood is also easy to customize: You can use thicker, stiffer stock for heavy drawers, or very thin, light stock for the smallest ones. You can use a wide variety of woods, and some, like cedar, have the bonus of a wonderful aroma. Last but not least, a smoothly planed solid-wood bottom attracts far less dirt than sanded plywood.

I must admit, I've repaired many solid-wood drawer bottoms that were split and falling out. Were the drawers overloaded, were the bottoms too thin, or was seasonal movement not considered? It's tough to say, but building a solid-wood drawer bottom that can last through the ages is no more difficult than fitting a panel to a frame. In this article, I'll explain how I make and fit a basic drawer bottom and show a few variations for large and small drawers.

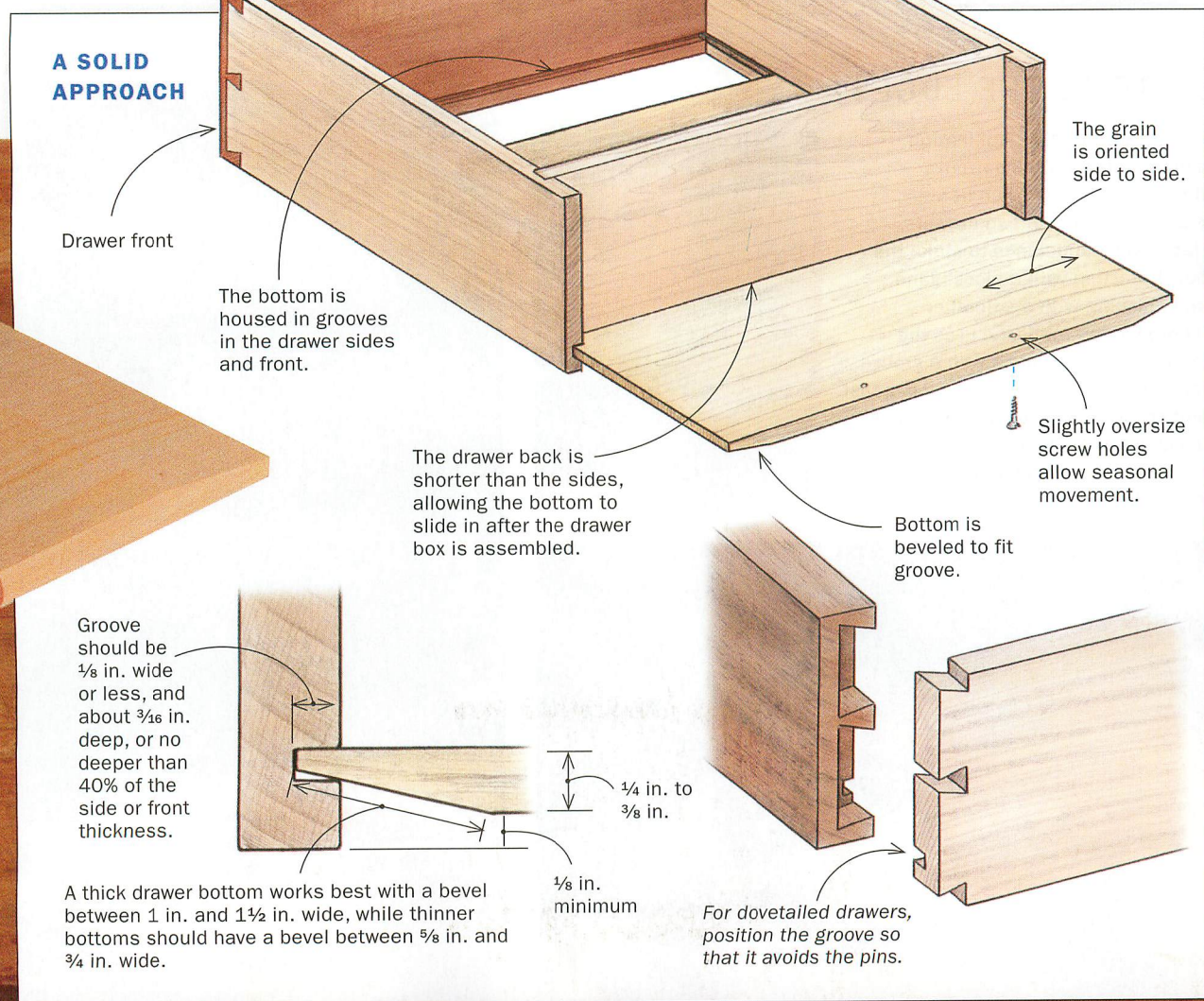
Anticipate wood movement

When building with solid wood, it's important to remember that a wide panel like a drawer

bottom will expand and contract seasonally—as much as $\frac{1}{8}$ in. with a large drawer. I deal with this movement in several ways. First off, I don't use glue, and I bevel the edges so the bottom can float in the grooves that house it. I also run the grain from side to side. Running the grain this way ensures that movement takes place from front to back, so the bottom doesn't shrink and fall out of the grooves. By making the groove in the drawer front deeper (40% of total thickness) than in the sides, additional movement is accommodated there. Last, I use quartersawn stock, which is more stable than flatsawn material.

There are a few other important tricks: The drawer back is shorter than the sides, stopping at the top of the grooves. This allows me to slide in the bottom after the drawer box is assembled. That gives me one less part to deal with during glue-up, and makes the bottom repairable. It also gives me another chance to fine-tune the bottom or better match a curved front.

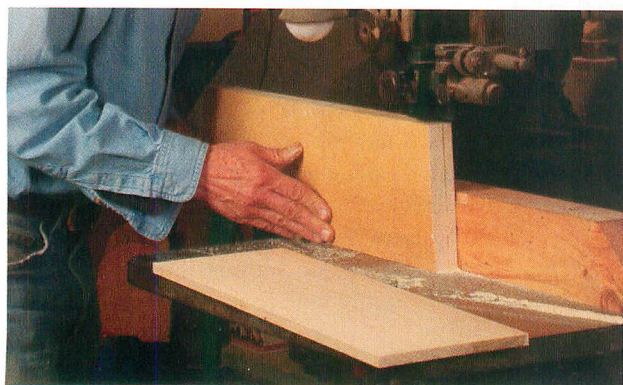
On antique drawers, the bottom is usually nailed up into the back (one cause of splitting). Today,



Solid bottoms, step by step

1. PREPARE THE BLANK

Hack resaws his drawer bottoms out of 8/4 stock for the best yield. He prefers quartersawn because its vertical grain means less seasonal movement. After gluing up the panel, a few passes with a fine-tuned handplane over the top and bottom produce a glassy-smooth surface that attracts less dirt than sanded surfaces.



2. BEVEL THE EDGES

Use a pencil and a combination square to lay out the bottom's three-sided bevel. When he's making only one or two drawers, Hack uses handplanes to make the bevel, starting with a block plane and finishing with a smoother (in production mode, he uses the tablesaw). A test block with a groove matched to the drawer groove is a fast and accurate way to check the bevel thickness. Making a final check with a second block is a good idea, as the groove in the first will widen with use.



I often see screws set in slots. The theory is that the slot allows for front-to-back movement, but I don't believe it works this way. Any weight in the drawer causes the screw head to dig in, preventing slippage.

My method is to place two screws (or three for especially wide drawers) in slightly oversize holes without slots. This allows the back to flex outward if the bottom expands, which might happen with large drawers. The deeper groove in the drawer front allows for shrinkage and expansion. Making sure your wood is suitably dry minimizes shrinkage problems.

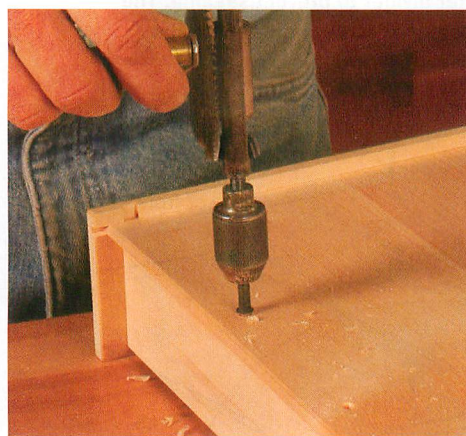
The drawer groove matters, too

The details of the side groove—its location, width, and depth—are very important engineering aspects of building a good drawer. Together with the screws into the back, it supports much of the weight in the drawer. The deeper and larger the groove, the more you weaken the side; the lower down it is, the less support it gives the bottom (this wood breaking away is another typical drawer repair). Beveling the bottom is an elegant solution, which puts the groove high yet the bottom as low in the drawer as is practical. I use a fine bevel in a narrow groove; it's very strong.

Like the front, the depth of the side grooves should be about 40% of the side thickness. I cut the groove in a single pass on the tablesaw with a standard-kerf blade, or a thin-kerf blade for smaller drawers. I sometimes use a dado blade for large drawers. I think about the position of the groove when laying out the dovetails, so as not to cut through a pin later, which would make the groove visible on the outside of the drawer. I also want at least $\frac{1}{8}$ in. of clearance under the drawer bottom, so it won't ever drag against the case. For large drawers where flexing of the bottom is a concern, I put the groove slightly higher.

Soft woods work best

My favorite woods for bottoms are softwoods or softer hardwoods, because they are easy to work, stable, lightweight but strong, and generally have low shrinkage. White pine, white or red cedar, basswood, aspen, and poplar are all good choices. But hardwoods such as oak, cherry, or maple are fine, too. While breaking a drawer bottom

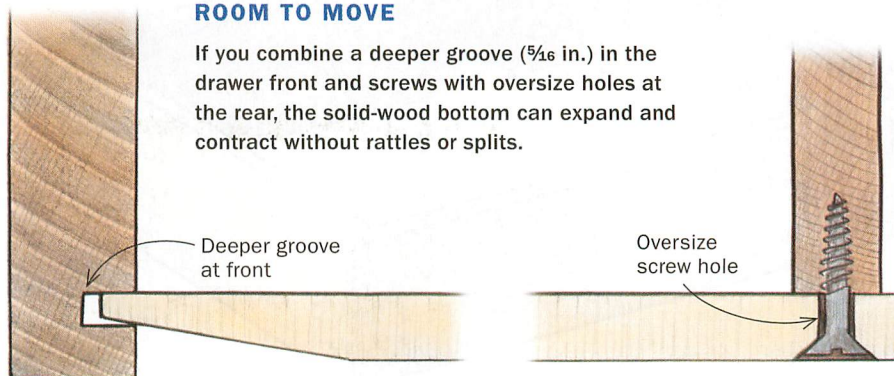


3. ALLOW FOR MOVEMENT

Dividing the space into thirds, Hack uses a pair of screws to secure the drawer bottom to the back of the box. The holes in the drawer bottom are slightly oversize to allow for some seasonal movement. A deep groove in the drawer front accommodates the rest (see below).

ROOM TO MOVE

If you combine a deeper groove ($\frac{5}{16}$ in.) in the drawer front and screws with oversize holes at the rear, the solid-wood bottom can expand and contract without rattles or splits.

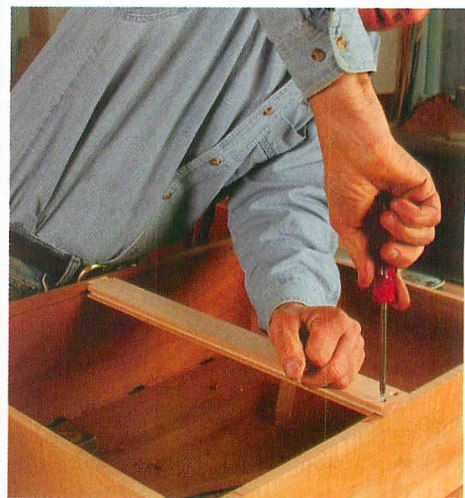




is unlikely, a heavy load could flex it enough so it drags on the runners below it. But because woods vary, I have no rule of thumb for how thick to make a bottom. A large dresser drawer might have one $\frac{3}{8}$ in. thick; a small drawer needs a bottom $\frac{1}{4}$ in. thick, maybe less. One advantage of a solid bottom is you can make it any thickness. So when I am planing materials for bottoms, I'll flex the wood as I go to sense how stiff it is. When glued together in a panel and supported by the grooves all the way around, the bottom will be stiffer still.

Making and fitting bottoms

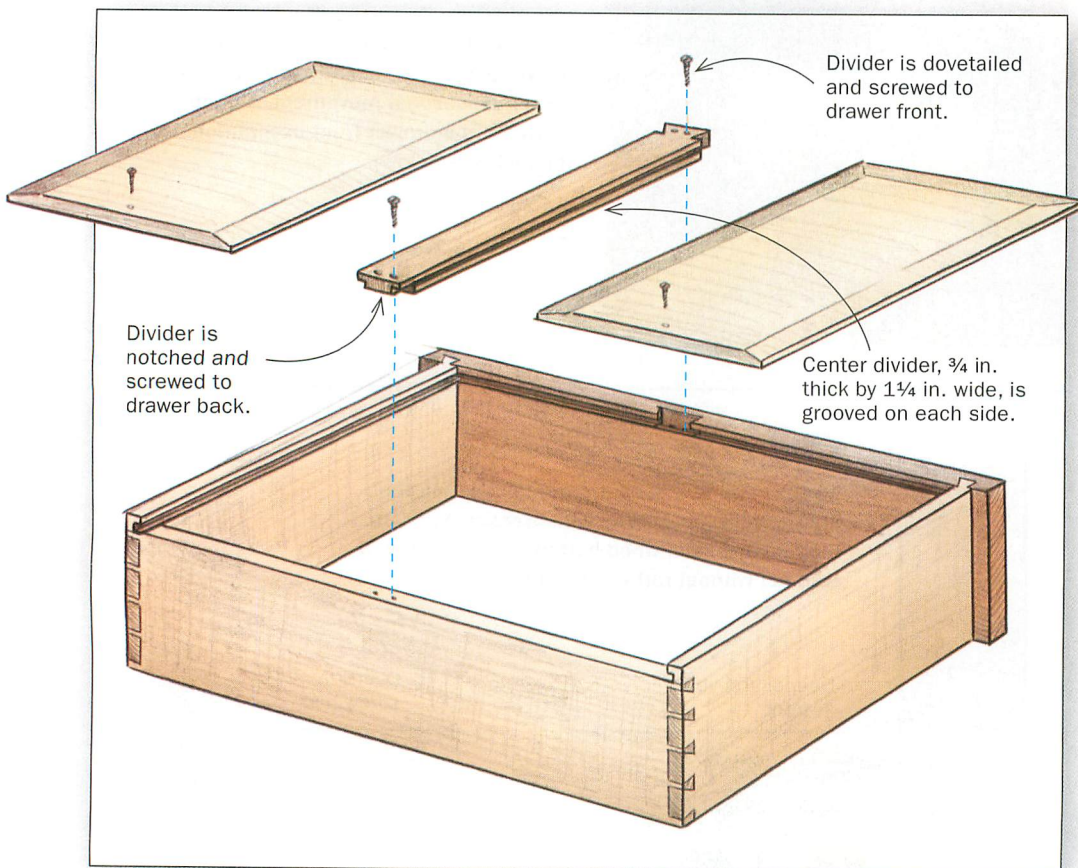
For me, making drawer bottoms begins on the bandsaw; it is an unforgivable waste of time and wood to plane down a $\frac{3}{4}$ -in.-thick board. I find that $\frac{8}{4}$ stock is the most efficient choice, typically yielding four or six pieces. Quartersawn stock is never very



Dovetail the front, notch the back. Hack dovetails the center divider into the front (top). After confirming that the drawer box is square, Hack centers the divider on the drawer back, then glues and screws it in place (bottom).

Wide drawers need a center divider

Drawers wider than about 28 in. should have a center divider to prevent sagging. The front of the divider is attached with a dovetail and a pair of screws; the rear of the divider is simply notched over the back and secured with screws.



wide, so I glue up my bottoms from pieces. As I send them through the planer, some clean up faster than others, so I put the thicker ones into one pile, the slightly thinner ones in another, and so forth. I often use the various thicknesses as graduated bottoms for graduated drawers.

Once glued into panels and cut to size (to length but slightly wide for now), I handplane the top surface smooth. This becomes my reference surface for beveling the bottom edges. I plane each bevel to a snug fit in a groove run on a scrap piece earlier. The bevel should almost bottom out in the groove, just as the bottom will fit into the actual drawer.

The last steps are to plane the underside and cut it to width. I leave the bottom a bit long at the back so that the screws into the back have plenty of wood around them. If I need to get the bottom out once it is in place (to tweak the squareness of the drawer), I drop the drawer, back down, on the edge of my bench. Last, I screw the back edge to the back, well in from the sides.

Wide drawers—The Gamble House in Pasadena, Calif., has a pantry drawer over 5 ft. wide. A single bottom won't work in a drawer this wide—it will flex too much and eventually fail. Better to divide the bottom into panels partially supported by a divider from front to back. It's essentially a modified frame-and-panel design. The front of this divider is dovetailed into the front, and the back is screwed to the back. It's even more efficient if the divider also becomes a center guide for the drawer.

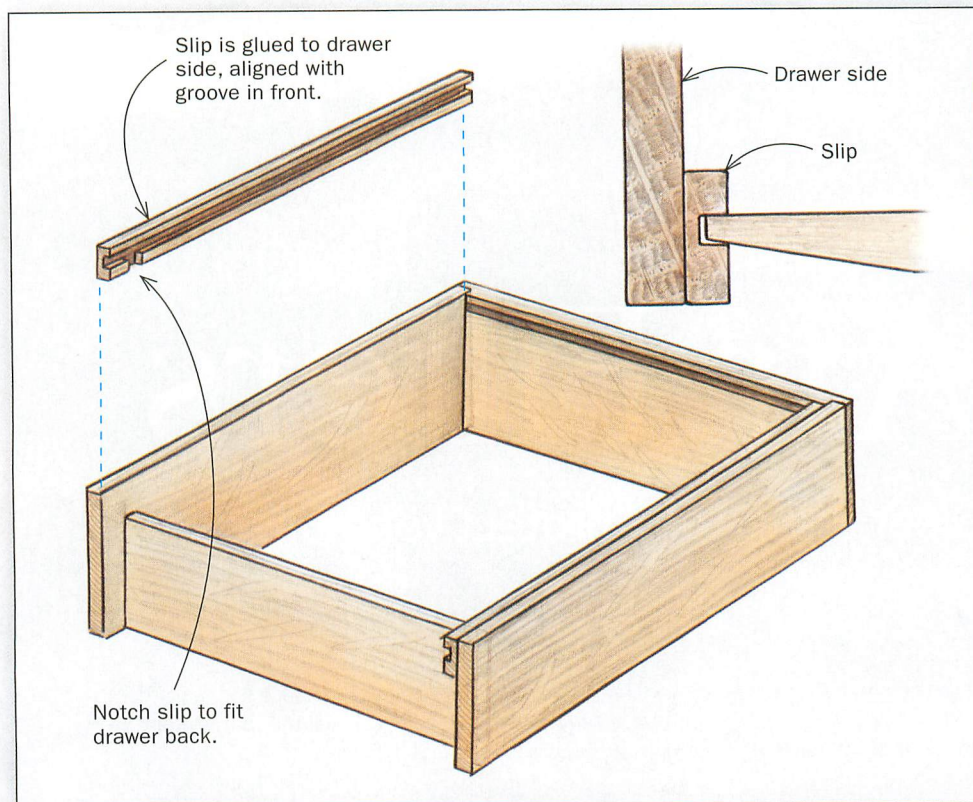
Use slips for thin sides

The English love very fine drawer sides. I do, too. I've made pieces with drawer sides as thin as $\frac{3}{16}$ in. Generally speaking, these sides are too thin for a groove that can house the bottom. The solution is to glue small grooved slips of wood to the bottom edges of the sides. The slips support the bottom, and the added thickness at the bottom edge of the sides doubles their wearing surface and longevity. I make up the slips separately, and glue them into place once the drawer box is assembled. □

Garrett Hack is a contributing editor.

Use slips for thin sides

When the drawer sides are too thin for a groove of reasonable depth, Hack simply adds a strip of wood, called a slip, to the sides. The extra thickness accommodates the groove and doubles the wear surface on the drawer sides.



Add the slip after assembly. A small notch toward the rear of the slip accommodates the drawer back, while easing the inside edge produces a clean, finished look. Gluing even the shortest slips will require a surprising number of clamps (right) because the material is thin.



TOOL TEST

Air Filters

Clear the air and protect your lungs

BY ERIC W. CONSTANS

Wood dust can cause health problems ranging from nasal irritation to bronchitis to cancer, so you should take steps to protect yourself from those hazards.

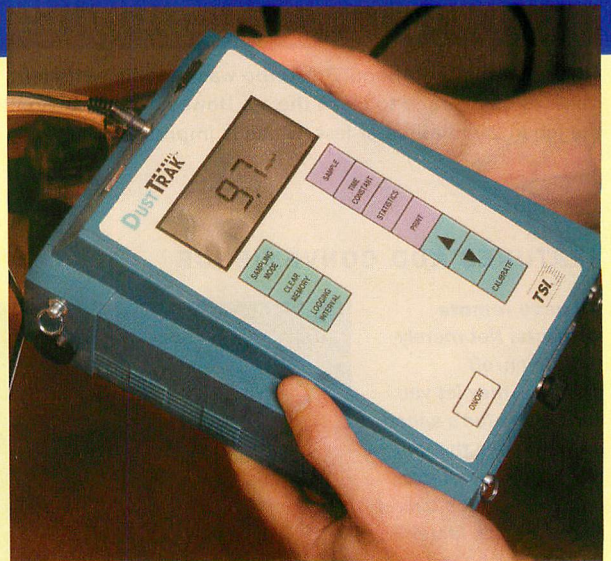
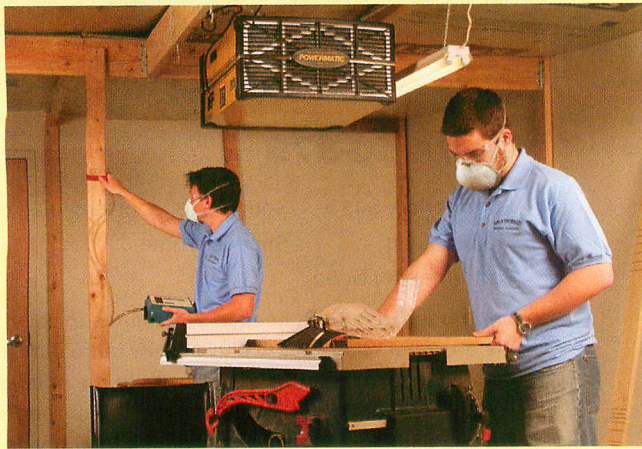
The first step is attaching all of your machines and as many power tools as possible to a dust-collection system. You also should wear a dust mask when sanding or producing fine dust in some other way.

A third step that many woodworkers take is to hang an air filter in their shop. However, some have challenged the effectiveness of these units. One manufacturer of dust-collection systems—who doesn't sell air filters—claims that air filters at best do not improve the quality of shop air, and might

Rowan University did the testing

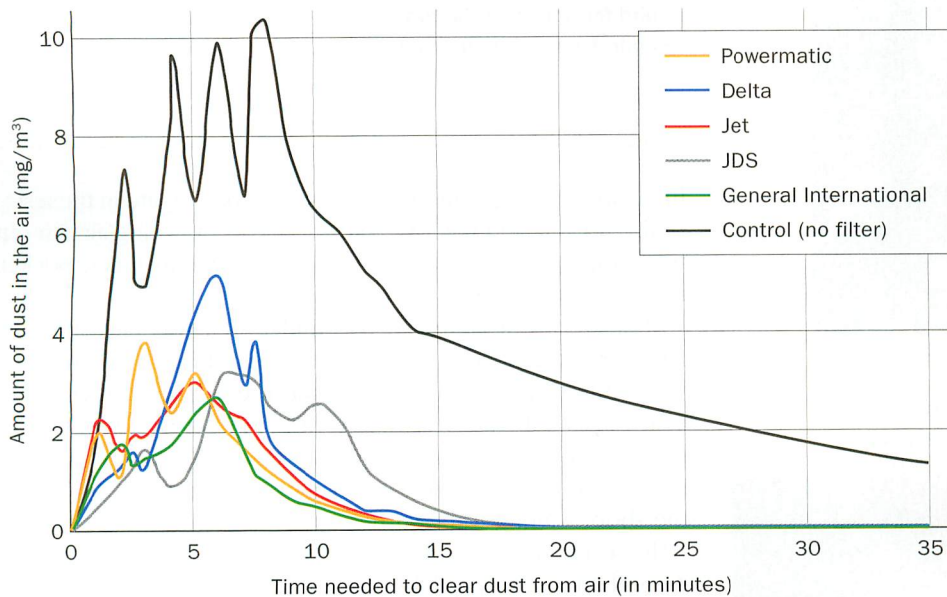
The author, a mechanical engineering professor, designed and performed a simple but accurate test on the air filters. With the help of some advanced engineering students, he built a special room, conducted several woodworking tasks—cutting on the table saw, routing, and sanding—and then used an aerosol dust monitor to track how quickly the filters were able to remove the dust in the air.

They made some dust. After turning the air filter to its highest speed, the students ripped MDF at the table saw, routed dados in a poplar board, and sanded a piece of red oak. They used the tools in succession and it took about seven minutes to get through all three.



Then turned on the meter. The monitor used to track dust concentrations detects particles between 0.1 micron and 10 microns, so it provided an accurate reading of whether the filter was collecting the most harmful dust.

AIR FILTERS CAPTURE DUST QUICKLY



TEST MONITORED SMALLEST DUST PARTICLES IN THE AIR

Constans and the students set up a typical shop space and sealed the room with foam window seals and duct tape. Then they used the aerosol dust monitor, set up at eye level, to determine the amount of dust normally suspended in the air, and that became the control level (0). Then, after completing three typical woodworking tasks, they took a reading once a minute for the first 15 minutes and then once every five minutes until the dust concentration in the air returned to the control level. They also ran the test without an air filter to determine whether the filters did a better or worse job than just allowing the dust to settle. And they cleaned and vacuumed the room thoroughly after each test.

even make things worse because they don't catch the smallest and most harmful dust particles, the ones between 1 micron and 10 microns. Rather, the same manufacturer says, they keep them suspended as they circulate the shop's air. Particles smaller than 1 micron are exhaled as you breathe and are not considered a health hazard.

With this in mind, *Fine Woodworking* asked me to put several air filters to the test. I relied on my training as a mechanical engineer and my experience as a woodworker to develop a test that was both rigorous and rooted in the conditions we all meet in the shop. With the help of my students at Rowan University, I put together a mock shop and generated wood dust via a fixed

amount of sawing, routing, and sanding, and then used scientific equipment to determine how well the air filters collected that dust. I discovered not only that they do in fact improve air quality, but also that some of them do it very quickly.

Air filters get the job done

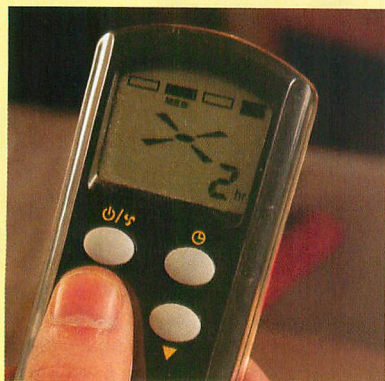
We chose to test ceiling-hung filters, priced between \$300 and \$440, and intended for use in a typical home shop—about 400 sq. ft. with 8-ft. ceilings. We tested five air filters: the Delta 50-875, the General International Pro Turbo 10-550, the JDS Air-Tech 750-ER, the Jet AFS-1000B, and the Powermatic PM1200. Grizzly, Laguna Tools, and Penn State Industries also make air

All of the filters performed well

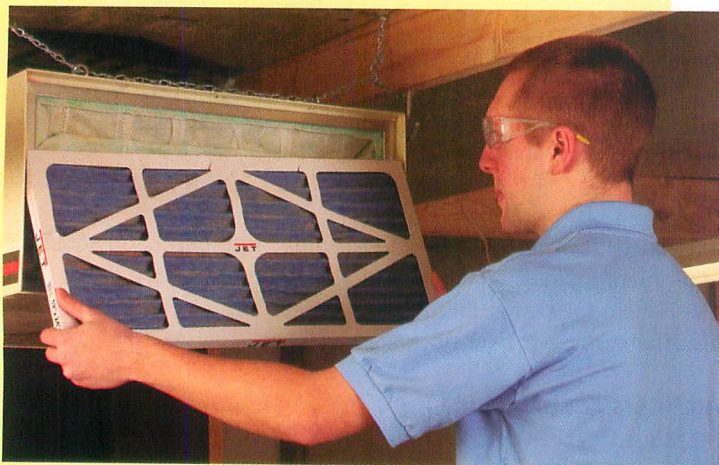
The General International Pro Turbo was the most efficient, needing 15 minutes on average to clean the air. However, all of the units managed the job in 20 minutes or less, which is impressive.

FEATURES ADD CONVENIENCE

All have remote controls. Not merely remote on/off switches, they let you control the fan's speed and how long the unit stays on. The fan icon on Powermatic's digital readout spins faster as the fan's speed increases.



Gauge tells you when to change the filter. The Delta, Powermatic, and General International have some kind of indicator to tell you when the filter needs changing. On the others, you'll have to make a visual check, which isn't hard.



Two-stage filtering. The outer filter traps dust as small as 5 microns. This is the filter you'll change most often, but it is a standard size, available for under \$20. The inner filter collects dust down to 1 micron. It is more expensive, and available from the manufacturer.



Delta 50-875

Street price: \$415 Source: deltaportercable.com

Motor: $\frac{1}{8}$ hp

Speeds: Three

Performance: Good

On average, the Delta needed 20 minutes to clean the air. Filter changes are only slightly more difficult than on the Jet. In terms of noise, it's in the middle, a steady hum that's not as quiet as the JDS or the Jet. It has a gauge that indicates when the filter needs changing. As airflow through the filters slows, a needle swings into a red zone, letting you know it's time to change the filters. The remote has one button for power, a second for adjusting the fan's speed, and a third for adjusting the timer, which has four settings: $\frac{1}{2}$ hour, 1 hour, 2 hours, and 4 hours.



filters in this range, but they declined to participate in the test. All of the units tested use two filters to clean incoming air. An outer filter traps dust 5 microns and larger, while an inner, pocketed filter collects dust down to 1 micron.

After all of our testing was completed, it was clear that these air filters do in fact clear the air of wood dust, as all of the units were able to get the air back to the pre-test level in 20 minutes or less. Also, it was clear that having no filter is worse, as it took more than 35 minutes for the dust to settle when no filter was present. And with no filter, even after settling, the dust was still in the shop, waiting to be stirred up and put back in the air.

However, when it came time to pick a winner, we looked at more than just how quickly these units cleaned the air. Since they should be left running for a while after you turn off your power tool or machine, we also considered how much noise they made. None of the units were so loud as to require hearing protection, but noise is noise. The JDS and the Jet were the least annoying. On filter changes, the Jet edged out the other air cleaners. Its outer filter is held in place by two easy-to-work clips, and the inner filter is easy to remove, too.

After all was said and done, the Jet AFS-1000B was our pick for best overall. It cleaned the air nearly as fast as the General International, but it is quieter and has easier filter changes. And as the least-expensive unit tested, it's also the best value. □

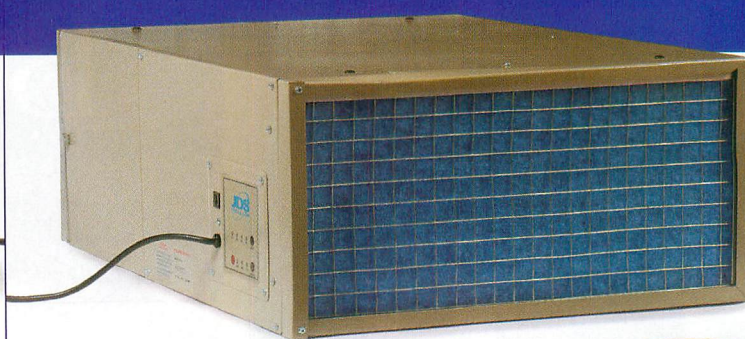
Eric W. Constans has a Ph.D. in mechanical engineering and is the chair of the Department of Mechanical Engineering at Rowan University in Glassboro, N.J.



General International Pro Turbo 10-550

Street price: \$430 Source: general.ca
Motor: 1/8 hp Speeds: One
Performance: Excellent

The Pro Turbo cleaned the air the fastest, needing only 15 minutes on average. However, there is a noticeable whirl noise made by the fan. It's just enough to become a nuisance when the unit is running in an otherwise quiet shop. And because the fan has only one speed, you can't turn on a lower speed to lessen the noise. Filter changes are not difficult, but they are not as easy as on the Jet. A light indicator tells you when the filters need to be cleaned. The remote allows you to turn the machine on and off and to set the timer, which can be set in increments of one hour, up to 15 hours.



JDS Air-Tech 750-ER

Street price: \$340 Source: jdtools.com
Motor: 1/4 hp Speeds: Three
Performance: Good

The JDS needed 20 minutes on average to clean the air, but it is the quietest. The outer filter slides out the side, which is unique, but not a real advantage. The inner filter also comes out the side, but only after you remove a thumbscrew. A diffusion filter on the exhaust side lessens turbulence and, according to the manufacturer, improves filtration. This unit has the second-best remote. You can use it to power the machine on and off, control the fan speed, and set the timer in one-hour increments between one and four.



AUTHOR'S CHOICE
BEST OVERALL
AUTHOR'S CHOICE
BEST VALUE

Jet AFS-1000B

Street price: \$300 Source: jettools.com
Motor: 1/8 hp Speeds: Three
Performance: Excellent

The Jet cleaned the air second fastest, taking an average of 16 minutes to return the air to the control level. In addition to its stellar performance, its filters are the easiest to change and it is second only to the JDS Air-Tech 750-ER in terms of noise. The remote has a button for turning the machine on and off, one for adjusting the fan's speed, and one for setting the timer, which can be set to two, four, or eight hours. This machine does not have an indicator for when the filters need to be changed, but a quick look at them will tell if they are dirty.



Powermatic PM1200

Street price: \$350 Source: powermatic.com
Motor: 1/4 hp Speeds: Three
Performance: Very good

The Powermatic cleaned the air in 17 minutes on average. Unfortunately, the fan has an annoying whine at high speed, and filter changes are a bother, because removing the grill covering the end requires too much effort. It has a filter for diffusing exhaust air and a small indicator light on the control panel that lets you know when the filters need changing. The remote is the best. There are three buttons: one for power, one for fan speed, and one for the timer, which can be set by increments of one hour, up to nine hours.



Better Way to

Dovetail cleat is strong



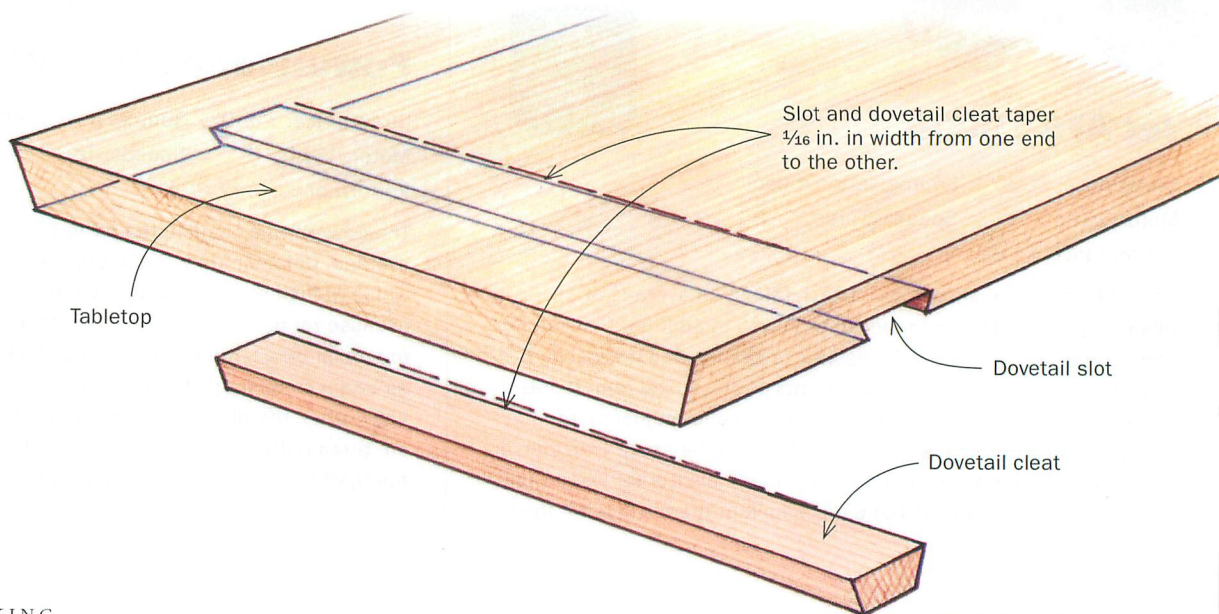
FLAT CLEAT

Simply a board with beveled edges, this cleat is easier to make than the shouldered version (facing page), but can't be very tall. It works well with a base that has four legs.



TAPER THE DOVETAIL FOR EASY ASSEMBLY

With the table base attached to the cleats, assembly would be devilish if the cleats and slot were not tapered a bit. It's not hard to do. Most of the work is done with machines, and handwork brings the taper to a perfect fit.



Attach Tabletops

and stylish

BY ANDREW HUNTER

The sliding dovetail joint is not a modern invention. Examples are found in furniture dating back over 500 years, and I suspect the joint's origins go back into ancient history. But I use this joint to secure tabletops to their bases. The dovetailed cleats keep a solid-board top flat, and they also allow for expansion and contraction. And by leaving them exposed, I make them part of the design.

A taper along the length of the cleat and slot makes for a tight-fitting joint. The farther you slide the cleat into its slot, the tighter the joint. This taper eliminates the precision needed to fit a straight cleat and the need for glue. With no glue, you can remove the base from the top if needed, and if the fit of the cleat loosens due

to wood movement, you can tap it back home or remove and shim it if necessary. I've never had to do either because I start off with very dry wood and use quartersawn lumber for the cleat.

I prefer this joint to slotted screws or steel brackets. When you put so much time and care into the base and top, it makes sense to put that same care into joining the two, without relying on mechanical devices.

I use two types of tapered sliding dovetails to secure tabletops: shouldered and unshouldered, depending on the design. Most of the work for an unshouldered cleat is done on the tablesaw, and I make the shouldered cleats on the router table. The key to a tight-fitting joint is matching the taper of the cleat with the taper of



SHOULDERED CLEAT

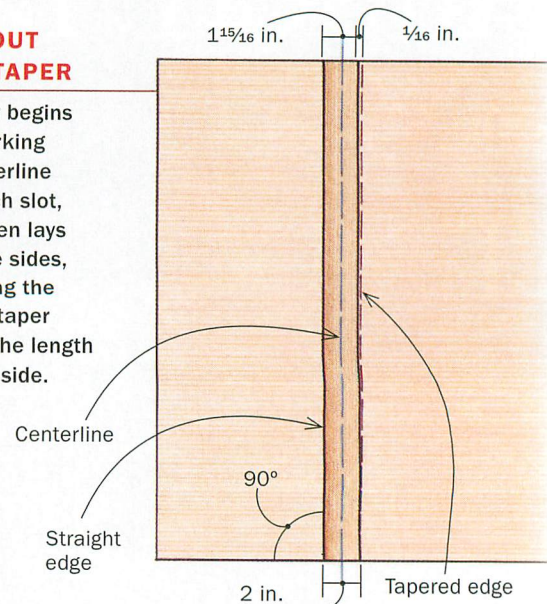
A shouldered cleat can be much taller and narrower, so it can be profiled and used as the top member of a trestle-style base.

For either type of cleat, rout the slot first



LAY OUT THE TAPER

Hunter begins by marking a centerline for each slot, and then lays out the sides, marking the $\frac{1}{16}$ -in. taper down the length of one side.



the slot, then fine-tuning the fit with a handplane. For shouldered cleats, you typically would need a specialized dovetail plane to adjust the tapered shoulder directly, but I figured out that a piece of wood taped to the edge of the cleat lets you use a router and then a bench plane instead.

Begin by gluing up the solid-wood tabletop, making sure it is straight and true. A sliding dovetail cleat can straighten a slight cup in a top, but correcting twist is difficult.

Cut the tapered slot

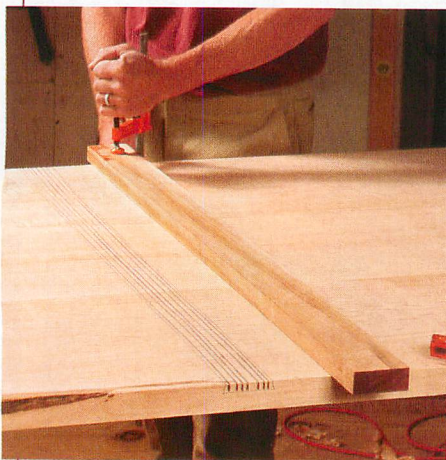
It's easiest to rout the tapered dovetail slot in the underside of the tabletop, and then create the cleat and tweak it to fit. For both shouldered and unshouldered joints, the slots are made with a handheld router and clamped straightedges. First, draw



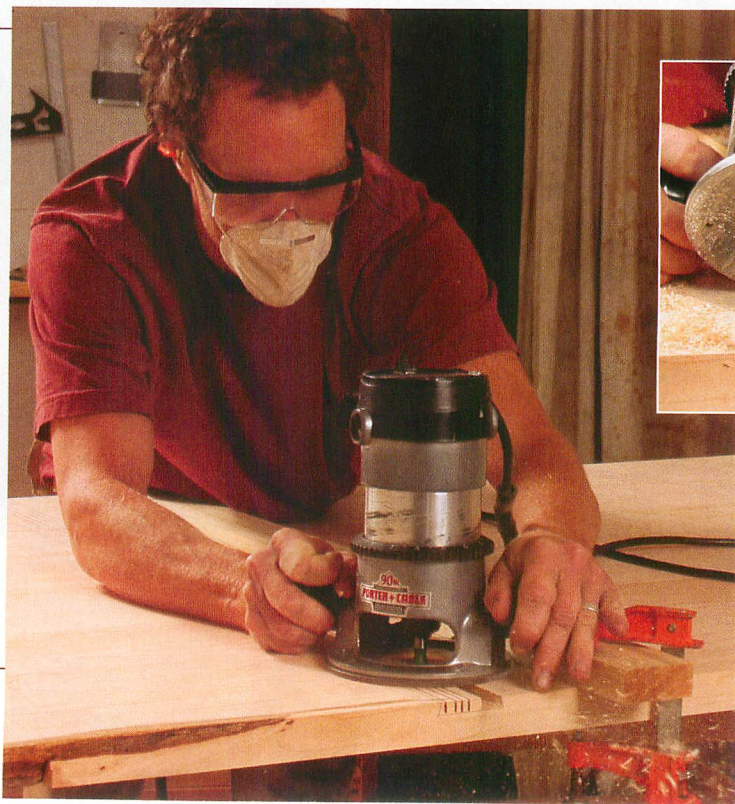
TIP

Clear the waste. Before routing the slot, take a few passes with a circular saw, set to depth, to make it easier for the router to go through the wood.

SAW AND ROUT THE SLOT



Straightedge keeps router in line. A solid-wood straightedge clamped to the tabletop guides a hand-held router.

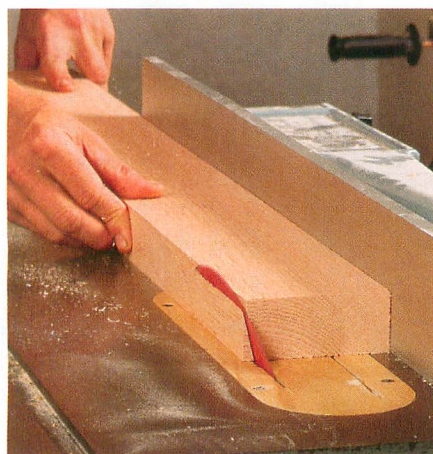


Three passes to a clean slot. Hunter cuts one edge of the slot, resets the straightedge to waste away the center, and resets it again to cut the other edge.



Unshouldered cleat is quick and easy

To make an unshouldered cleat, use the tablesaw to cut one untapered edge, and a jig on the tablesaw to cut the tapered edge. Then fine-tune the fit. Because the angled edge is wide and flat, it is easy to use a bench plane to tweak the taper to the perfect fit.



Tablesaw cuts both edges of cleat. Cut the straight side of the cleat on the table-saw with the blade tilted (above). Then use a simple L-shaped jig with a $\frac{1}{16}$ -in. shim between the jig and cleat to cut the tapered side of the cleat (right), and tweak the fit with a handplane.



a centerline for each slot, making sure they are parallel to one another and square to the table edges. Then lay out the sides, marking the taper down the length of one edge.

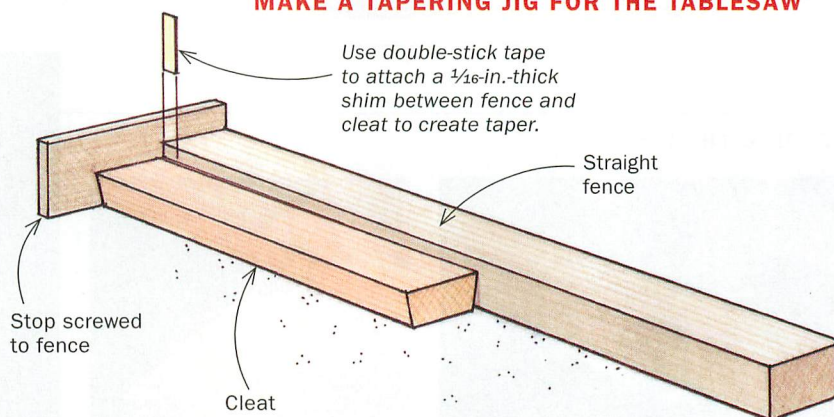
Using a dovetail bit and a clamped straight-edge, rout a test piece to determine the exact distance from the straightedge to the inside and outside edges of the slot. Transfer these measurements to the underside of the top, clamp the straightedge along those lines, and then rout.

How to make the cleats

To make an unshouldered cleat, begin with stock 6 in. longer than the width of the tabletop. This extra length helps when fitting the cleat to the slot. Lay out the joint on the blank, centering it in its length. With the tablesaw blade tilted to match the angle of the dovetail slot, cut the straight edge of the cleat. Then, using a simple tapering jig (above), cut the tapered edge of the cleat to match the tapered edge of the slot. Handplane the taper to get an exact fit in the slot. After waxing, drive it home and mark and cut its finished length.

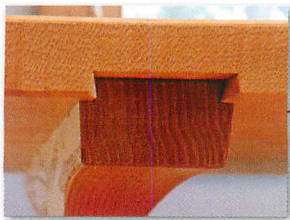
To make the shouldered dovetail cleat, begin as with an unshouldered cleat, with a blank longer than the table is wide. Now lay out the dovetail, centering it on the cleat and tapering one edge $\frac{1}{16}$ in. over the same length as the slot. Cut the dovetail shoulders on the router table. For the straight shoulder, simply run

MAKE A TAPERING JIG FOR THE TABLESAW



that edge of the cleat along the fence, cutting to the layout line. To cut the tapered shoulder, handplane the desired taper onto a long stick, and attach it to the edge of the cleat. Run this edge along the router-table fence. Creep up on the cleat's fit, testing it in the slot as you go. The joint can be fine-tuned by handplaning the stick and rerouting until the tapers match exactly and the cleat can be driven to the far end of the tabletop. The extra length of the cleat comes in handy here. Now wax both the slot and the cleat and drive it home. Remove the tapered stick and cut the cleat to length. □

Andrew Hunter designs and builds custom furniture in his studio in Gardiner, N.Y.



Route the shouldered cleat

The shouldered cleat uses the same concept as the unshouldered cleat, but the dovetail is best made at the router table, with a simple stick attached to create just the right taper. Start by routing the straight side of the dovetail, and then proceed as follows to cut and fit the tapered side.

TAPER AN AUXILIARY STICK

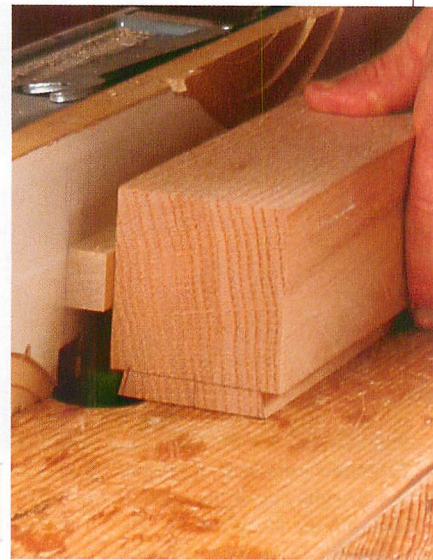
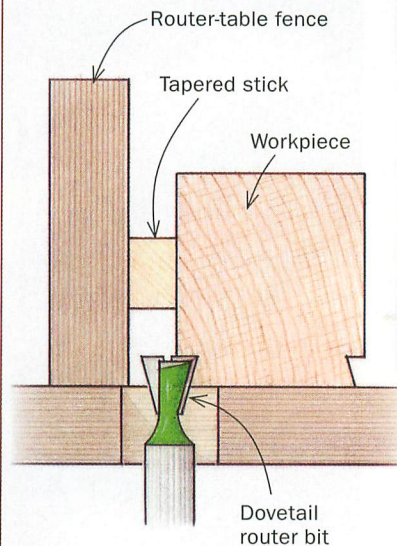
Plane the taper. Draw the $\frac{1}{16}$ -in. taper along the side faces of a $\frac{3}{4}$ -in.-square stick and simply handplane to the lines.



Attach the tapered stick to the cleat. Use double-sided tape to ensure it stays attached to the cleat during routing.

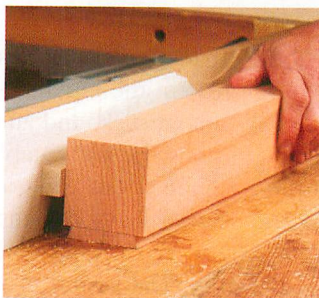
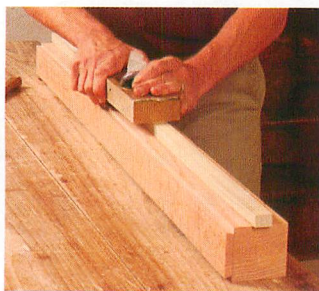


ROUT THE DOVETAIL



Run the tapered stick against the router-table fence. This automatically builds the taper into the dovetail shoulder on the cleat.

FINE-TUNE THE FIT



Test-fit the cleat in the slot. You can check the accuracy of the taper by inserting the cleat and lifting the front and back. If either pulls away from the top, it is loose in that spot. Plane a shaving off the stick in the tighter area and rerout.



A Woodworker's Guide to Photography

Take great furniture photos
with the camera you already own

BY MICHAEL PEKOVICH

Same camera, very different results. The harsh gleam of on-camera flash puts your work in an unflattering light (left). A professional-looking image (below) is much easier and less expensive than you might think.

FROM THIS...

Ten years ago, if you had asked me how to get good photos of your work, I'd have told you to hire a pro. Not today. With simple lighting and a digital camera, you can use pro techniques to take great pictures.

This is possible largely because a digital camera's display screen provides instant feedback that lets you craft a shot step by step. Also, even a basic digital camera has all the image sharpness you'll need to create eye-catching photos of your work for the Web, or for printed photo albums, post cards, etc.

Getting started is easy. From camera setup to lighting to fine-tuning a shot, I'll share a stripped-down version of the process we use at *FWW* to get magazine-ready pictures.

Why do so many pictures of great furniture turn out badly? The three basic components of a shot are the camera angle, the



...TO THIS

A short equipment list

CAMERA

The type of digital camera you have is not as important as how you use it. For this article, Pekovich used a typical point-and-shoot: the Nikon Coolpix. Most cameras have enough resolution and the important features that you'll need: a tripod mount and a flash system that you can turn off.



LIGHTS

The single biggest improvement you can make in your photos will come from avoiding the on-camera flash. At the magazine, we use a set of high-powered strobes. Another option is an inexpensive hot-light system in which the lamps stay on continuously. For this article, Pekovich used two halogen work lights available from any home center for around \$70. Add another \$20 or so for some heat-resistant diffusion sheets (Rosco 105 Tough-spun filter, \$6.50 for a 20x24 sheet at bhphotovideo.com) to soften the light, and a couple of pieces of white foam-core poster board to use as reflectors.



TRIPOD

Even with a couple of brilliant halogen bulbs shining on your work, you won't have as much light as with a flash system. That's why a tripod is crucial. Its most basic function is to hold the camera still, which lets the shutter stay open longer without resulting in a blurry picture. This lets you take advantage of lower light sources that would normally result in under-exposed pictures.



BACKDROP

Another way to dramatically improve your furniture photos is to shoot against a seamless paper backdrop to eliminate background distractions. Rolls of backdrop paper are inexpensive and readily available in a variety of colors; white, gray, and light neutrals are the most versatile. A 9-ft. by 36-ft. backdrop (\$40 from bhphotovideo.com) should work for most furniture projects and can be easily suspended from your shop's ceiling for out-of-the-way storage. Backdrop stands are also available.



background, and the lighting. Most home photos fall down in all three. Taking a picture of a piece from a few feet away using an on-camera flash will typically yield a distorted shot with harsh glare, dark shadows, and a distracting background. The fix is simple: First, set the furniture on a white backdrop. Second, move the camera back and put it on a tripod so you can turn off your flash. Then add a couple of utility lights to create natural shadows and you're well on your way to a great shot.

Set the scene and read the camera's manual

Work in a place where you have enough room to arrange the camera and lights. A garage or shop is fine; a living room can work if you move the other furniture out of the way. To remove background clutter and to isolate the piece of furniture, place it on backdrop, or seamless, paper. Pull out enough paper for the piece to sit on, with a gradual curve where the paper meets the floor. This creates a subtle gradation and pleasing shadows in the photo's background.

Now move the piece into place. A good rule is to angle the furniture to the camera so that the front and one side are visible, with emphasis on the front. Place the camera roughly at eye level—the height from which furniture is normally viewed. This is also a good time to set your camera's controls for the best quality shot. Start by turning off the built-in flash and adjusting the ISO setting to its lowest level. The ISO controls the camera's sensitivity to light; a higher setting requires less light but yields grainier pictures.

For sharp focus throughout the image, the lens opening, or f-stop, should be as small as possible. But most point-and-shoot cameras won't let you control the f-stop setting manually. Instead, they offer preset "shooting modes," a combination of flash, ISO, shutter speed, and f-stop preferences. Your camera's manual should tell you which of these preset modes emphasizes depth of field—the amount of the image that will be in focus. Landscape mode, often represented by a mountain-and-cloud icon, is typically a good choice.

A small lens opening means the shutter must stay open longer, increasing the chance of blur from a shaky camera. To avoid shakes, set the camera on a tripod and use the camera's electronic timer to avoid vibrations caused by depressing the shutter button.

The last function to check is the white balance. Every light source, from daylight to fluorescent to incandescent, has a different color cast. The camera's white-balance circuitry tries to adjust for the particular light source you are using to render colors accurately. Most cameras have preset options for various light sources as well as an automatic setting usually identified as AWB. This automatic setting is probably the best choice unless your camera lets you create a custom white-balance setting. A custom setting requires taking a picture of a white object positioned under your light-source. Foam-core is perfect for this. The camera

3 steps to a great shot

Angle the piece to the camera.

Place the piece forward on the backdrop for natural shadows.

Backdrop paper

Position the main light to one side of the piece to create realistic shadows.

Place a second, less powerful light opposite the main light to reduce the shadows.

Position the camera 10 to 15 ft. from the piece.



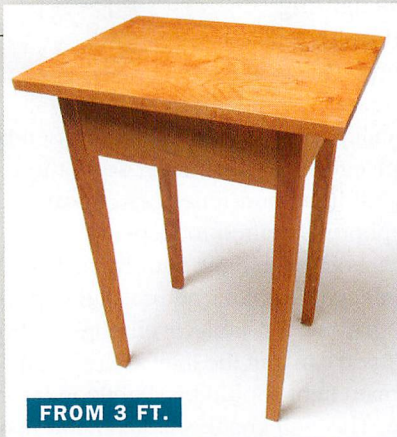
A backdrop, two lights, and a tripod. Halogen work lamps from a home center provide ample light for photography. Diffusion film in front of the bulbs softens the light. Position the main light high, to one side, and slightly in front of the piece.

STEP 1 POSITION THE CAMERA

Start with the seamless backdrop. Drape the paper onto the floor in a gentle curve; pull out enough to run underneath the piece with some to spare in front.



Compose the shot. To avoid distorting the proportions of the piece, back up. The image should fill the viewfinder with the lens set toward the midpoint of its zoom range.



FROM 3 FT.



FROM 12 FT.

TIP

MOVE BACK AND ZOOM IN

Most cameras have zoom lenses. From a close distance, the lens acts like a wide-angle lens and creates greater distortion in a photo. For example, a table shot from a short distance will appear to have a large top and legs that taper inward. Moving the camera back will cause the lens to act like a longer angle lens so the same table will be more proportionately correct. Perspective distortion can be corrected in image-editing programs, but the less you begin with, the easier it is to fix.

STEP 2 ADD THE LIGHTS



Start with the main light. Tape heat-resistant diffusion sheets to the halogen light to soften its effect (above). Position the main light high, to one side, and slightly in front of the piece. The upside of “hot lights” (lights that stay on) is that they let you see how the photo will look. So work in a darkened room to avoid stray light (right).

then analyzes the image and adjusts the white balance.

You're in control of the lighting

With the furniture and camera ready, it's time to set up the lighting. This is where it pays to think like a woodworker. Just like a logical approach to milling parts, cutting joinery, assembly, and finishing are essential to a successful piece, so is the order of placing the main light, fill light, and reflectors critical to a good photograph. A well-lit photo is crafted in steps.

The first step is to locate the main light. Start by raising the light as high as you can. This will mimic a natural light source and create natural-looking shadows on table overhangs and molded profiles. For a tall piece, you can aim the light at the ceiling so that it bounces down. The main light should be slightly in front of the subject and to one side. This will create shadows that rake at an angle, to highlight and help define vertical moldings or setbacks. Position the main light and stand back at the camera to see the effect. When you think you're close, snap a test shot. At this point, the shadows may look quite dark. Don't worry. Look at where they fall. For this piece, I want a shadow under the top that looks natural but doesn't obscure the drawers. I also want shadows to help define the shell carving and drawer edge profiles.

Now add the fill light. This should be on the opposite side of the piece, also slightly in front. It should be less powerful than the main light, to open up the shadows without eliminating them. If your fill light is too powerful, just move it back.

Reflections can be both helpful and harmful

Even a properly lit piece can have a problem reflection or two, with tabletops and polished hardware being common culprits. In each case, the fix is typically simple and involves positioning a black or white reflector to kill glare or highlight dark areas. □

Michael Pekovich is the art director of Fine Woodworking.



Add the fill light. Position a weaker lamp opposite the main light to brighten the deepest shadows. If it is too bright, it will eliminate the shadows and create a “flat” photo. Remedy this by moving the light farther away from the subject and bouncing it off a reflector (see Step 3).

Online Extra

For more lighting tips and ideas for sharing your photos, go to FineWoodworking.com/extras.



Close but not perfect. The high position of the main light creates a natural-looking shadow below the tabletop and on the shell carving. The fill light keeps the shadows from being too dark. What's not so nice is the washed-out look of the side and tabletop caused by the reflection of the backdrop. Also, the hardware looks too dark because it is reflecting the back of the darkened room.

STEP 3 FINE-TUNE THE REFLECTIONS

Defeating glare. The color and figure of the lowboy's top and side are obscured by the bright reflection of the backdrop. A strategically placed black cloth and card will cut the haze and reveal the wood's beauty.



Brighten the brass. The polished hardware appears black because it is reflecting darkened areas of the shop. To make the brass show, Pekovich uses a piece of white foam-core poster board as a reflector.



BEFORE

AFTER



Keep shooting. With the main shot in the bag, it's time to think about other views. Pekovich chose a front-view shot to highlight the clean lines and symmetry of the case, and close-ups of the shell carving, dovetailed drawers, and drop finial. For each shot, he repeated the process of positioning the camera, adjusting the lights, and fine-tuning the reflections.

How to Troubleshoot a

Learn to handle the typical problems

BY JEFF JEWITT

As the technical troubleshooter for my business, I've been asked to solve just about every spray-gun problem imaginable, from a new gun that just hisses air to an old gun that used to spray perfectly and now leaves a horrible finish.

The good news is that in most cases, you can diagnose the cause of the problem by analyzing the spray pattern. In a few other situations, a slight change in your spraying technique can help. Even if you're just considering taking the leap into spray finishing, knowing how to achieve and maintain a good spray pattern will give you the confidence you need.

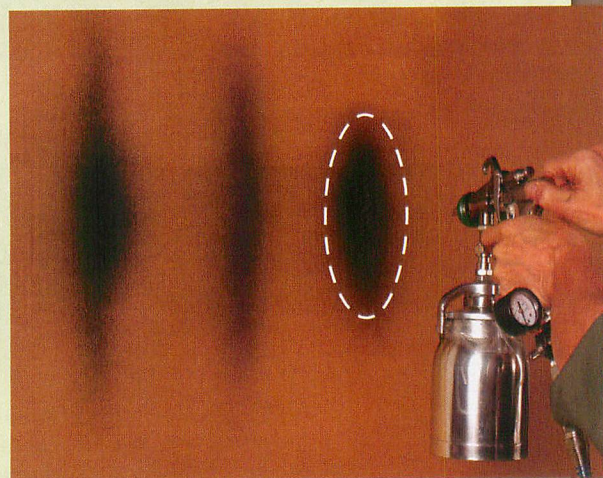
Since all spray guns operate on the same basic principle, it doesn't matter whether you have a high-volume, low-pressure (HVLP) gun or a non-HVLP gun, a turbine-driven system or a compressor-driven system. When differences exist, I'll call them out.

Most of the time some finish comes out of the gun, just not in a manner to give that thin, even coating that makes spraying so worthwhile. One of the most common problems is uneven coverage, which leaves a repeating light/dark effect when the finish dries. You can study the spray pattern with a light shining through it. If you find this difficult, spray some dark finish or stain onto cardboard. If you substitute a dark finish for a clear one just to test the pattern, be sure that it has a comparable viscosity.

Jeff Jewitt, who runs a finishing-supply company (homesteadfinishingproducts.com), writes frequently about finishing for FWW.

Test your gun

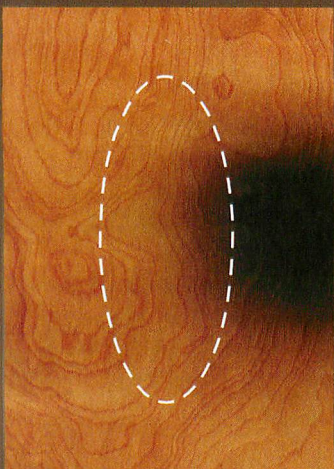
You want the gun to spray an elliptical pattern consisting of fine, even-sized droplets (far right). Most of the time, spraying clear finish onto cardboard will give you a legible spray pattern while the finish is wet. For an even clearer pattern, spray black stain or paint onto the cardboard as shown in this article's test panels.



Spray Gun

and enjoy carefree spray-finishing

Pattern heavy on one side



The typical culprit for this is a plugged or partially clogged air-cap port. It's easy to diagnose: Just rotate the air cap 180° and if the problem side reverses, then it's the air cap. Remove the air cap and soak it in lacquer thinner. Use micro-brushes to clean the air-cap ports as best you can. The ports meet inside the air cap at a 90° angle, so come in from both sides. A blow gun that has a protective rubber tip can be used to blow out the ports, but wear eye protection in case some thinner splashes out (I speak from painful experience).

If the pattern does not reverse when you rotate the air cap, then it is the fluid nozzle that is clogged, causing the spray to veer to one side as it exits the gun. If you have a gravity gun, you can easily diagnose a partially obstructed nozzle by unhooking the air line and pulling the trigger completely back with solvent or finish in the gun. The liquid should come out in a steady stream if the nozzle is clear. If you have a compressor-driven pressure cup and the gun has a cheater valve (an internal air shutoff), simply close the cheater valve and pull the trigger. Again, the finish/solvent should come straight out the front. On suction and turbine-driven pressure cups you can't do this, so you'll just have to see if cleaning the nozzle helps.



One side clogged. To find out if a clogged port on one side of an air cap is causing the spray pattern to be heavy on one side, rotate the air cap 180° and see if the heavy pattern also changes.



Blow out the problem. Air ports have a 90° turn in the air cap, so the easiest way to clean them is to blow out any obstruction with compressed air.

Which type of gun do you have?

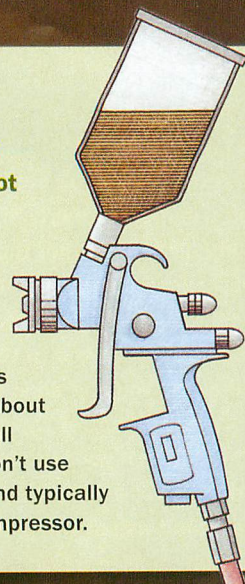
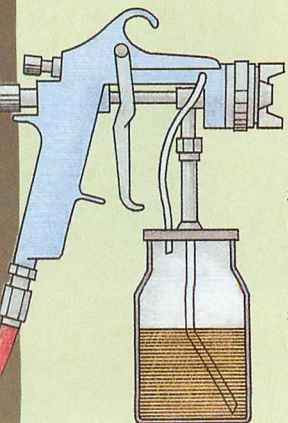
Spray guns come in two basic designs. Siphon cups (also called suction cups) have the storage cup under the spray gun, while gravity guns put it on top. To troubleshoot correctly, you need to know which type you have.

SIPHON CUPS

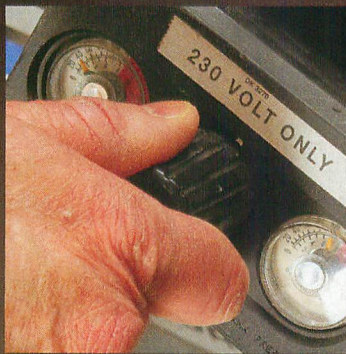
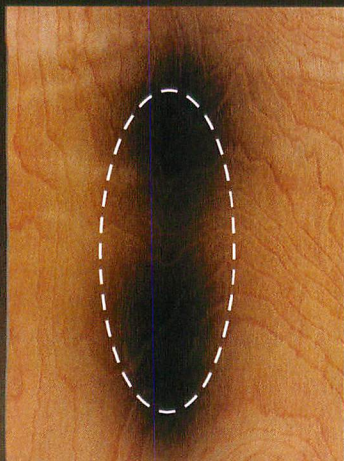
In a standard siphon cup, air exiting the front of the gun creates suction, pulling the finish up into the gun through a metal tube. With a pressurized siphon cup (usually called a pressure cup), the cup is pressurized by an external or internal tube that diverts a small amount of air from the gun. This pushes the finish up into the gun. All turbine systems use pressurized siphon cups.

GRAVITY CUPS

With the cup on top, gravity alone pushes the finish down into the gun. Gravity guns range from full-size cups (about 20 to 25 oz.) to detail guns (about 4 to 5 oz.) used for touchup and small projects. These small gravity guns don't use much air (4 cubic feet per minute) and typically can be run with a small portable compressor.



Pattern split in the center



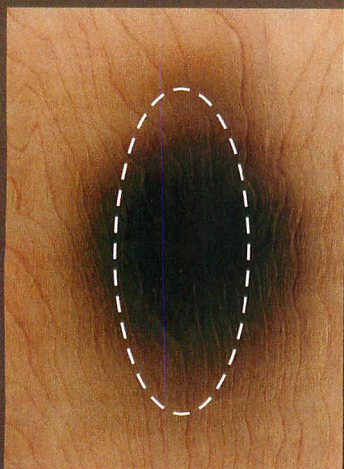
Less pressure. If there is no finish in the center of the spray pattern, try turning down the air pressure on the compressor or turbine.

If there is no finish in the center of the spray pattern, more than likely the air pressure is too high. Lower it and see if the problem gets better. On the few turbine models that lack air regulation, switch to a smaller fluid nozzle.



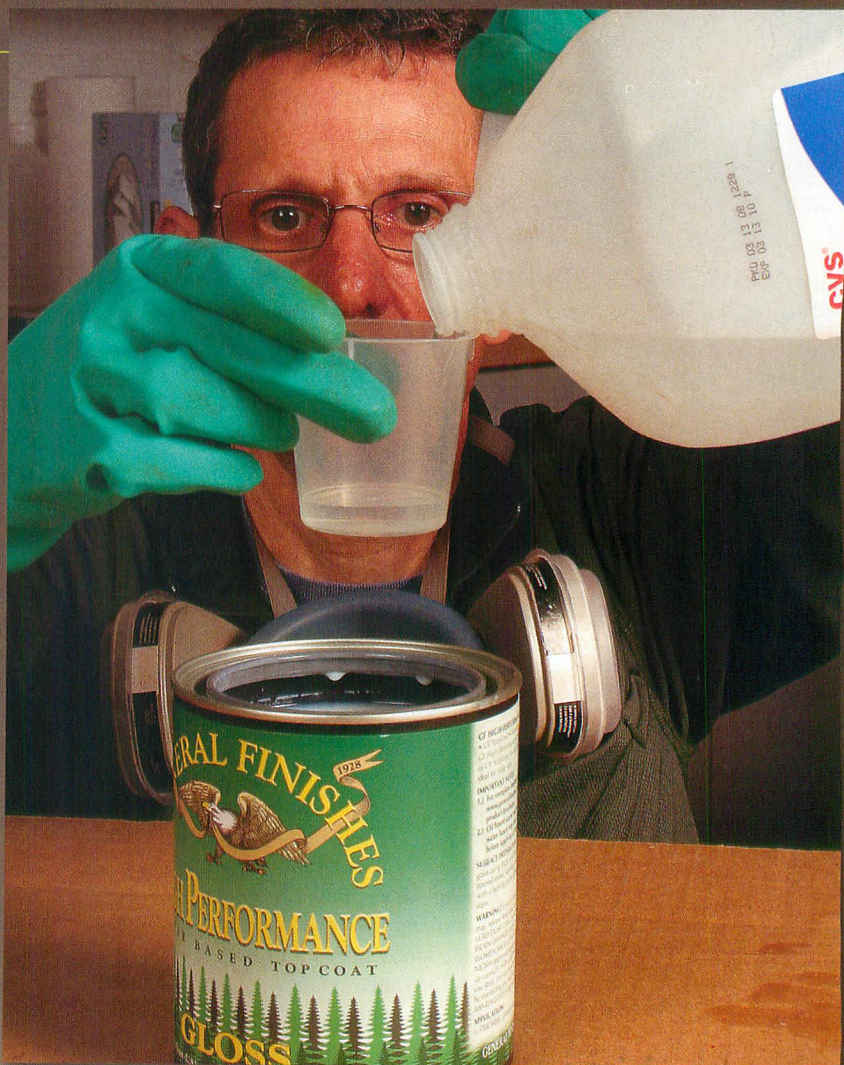
Adjust the nozzle. If adjusting the air pressure doesn't solve the problem, switching to a smaller fluid nozzle may help.

Pattern heavy in the center



Thin the finish. If you can't turn up the pressure, try thinning the finish in 10% increments.

If most of the finish is in the center, the air pressure is too low. If you can adjust the pressure, turn it up. On a compressor-driven system, turn down the atomizing air using either the compressor output regulator or a secondary supply regulator. This regulator can be wall-mounted if you have a metal air pipe, or a mini-regulator attached to the base of the gun. With turbines, all you can do is to turn down the atomizing air with an air-control valve mounted on or near the base of the gun. If your turbine has a speed control, you can adjust it for a slower speed, which reduces the air. If you can't adjust the pressure, try thinning the product or switching to a larger fluid nozzle.



You can't get a wide fan pattern

On a suction-feed gun, try thinning the finish, or even just spraying some solvent to see if you can get a wide pattern. If that doesn't help, try increasing the atomizing pressure. If both these steps fail, then install a larger nozzle.

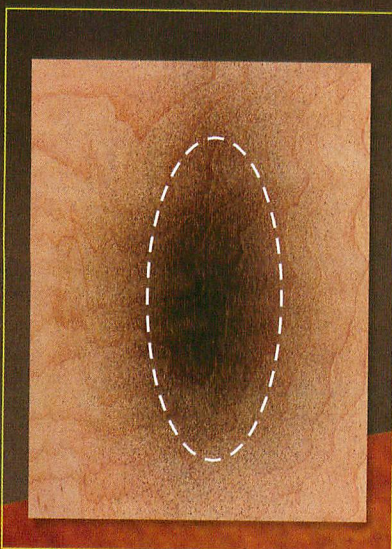
Though unlikely, both air ports on the aircap may be clogged, so remove and clean them as explained earlier. As a final cause, the fan-width adjustment valve assembly may be damaged or faulty, in which case you should return the gun if it is under warranty or seek out a repair shop. On gravity and pressure-cup guns, follow the same sequence of steps, but don't increase the atomizing pressure.

Coarse spray pattern

If your dried finish has little dimples all over it resembling the skin of an orange, you have "orange peel." Poor atomization (large droplets) is the main culprit, and this is often easiest to see if the spray pattern is backlit.

On all compressor-driven guns, try increasing the air pressure and see if the coarse pattern improves. If it doesn't, you can try thinning the product in 10% increments until it improves. If neither works, try a smaller nozzle.

With a turbine gun, make sure the air control (if you have one) or the speed control for the turbine is opened all the way. If this doesn't work, try thinning the material and then switching to a smaller nozzle.



Too much overspray

HVLP systems should limit overspray to 20% to 30% of the finish. If you think you're getting more, you can reduce it by turning down the air pressure. Just keep in mind that when you do this, the finish quality will start to suffer, at some point resulting in the orange-peel effect described above.

Bounce back. Old-fashioned spray guns created large amounts of overspray (right). Modern HVLP guns are designed to avoid this.



Throttle back the air. To reduce overspray, simply reduce the air pressure. If you build a dedicated spray booth, consider installing a combination regulator and air cleaner attached to the wall (above). The cleaner ensures that no contaminants reach the finish.

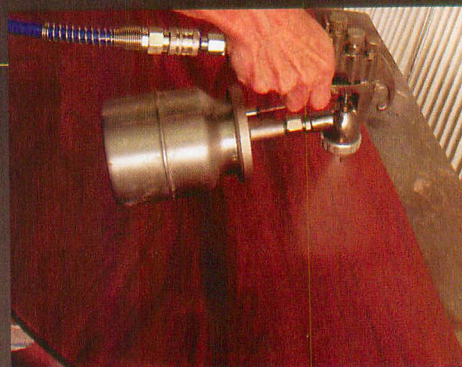
Dry or rough spray, or no spray at all

If the finish feels rough when it dries, there are some possible causes common to all guns. You may not be depositing enough finish: Try slowing down your motion as you spray to leave more finish on the surface. Likewise, the gun may be too far from the surface. The correct distance is 4 in. to 6 in. for HVLP and 6 in. to 8 in. for non-HVLP.

It could be that the overspray is landing on your work after you spray. Use a fan to remove the overspray. Last, the finish may be drying too fast because it's hot and dry. Use a retarder specified by the manufacturer to give the finish a longer time to flow out into a smooth film.

In extreme circumstances, you may get no finish coming out of the gun. You pull the trigger and hear air coming through the front but no finish comes out, or it sprays a little and then stops. All standard siphon and gravity cups have a small vent hole that allows air to enter the cup to displace the finish volume as it's pulled out through the fluid nozzle. Use a toothpick or micro-brush (see opposite page) to clear the vent hole. If there's a fair amount of hardened finish in the hole, soak the top in lacquer thinner, but be sure to remove any gaskets first.

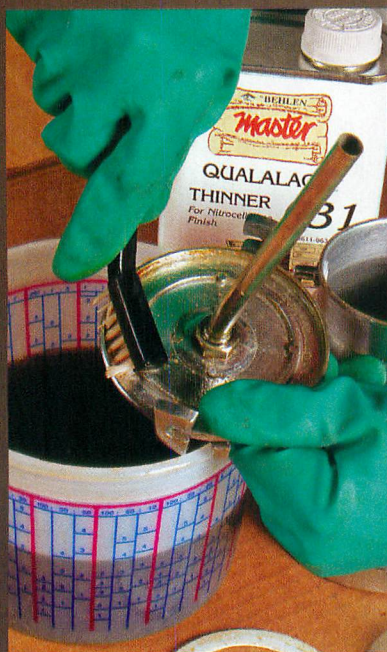
If that doesn't work, remove the fluid nozzle and see if it's clogged. Soak it in lacquer thinner to soften any dried finish and ream it clean with a micro-brush. Finally check the fluid pickup tube and see if it is clogged.



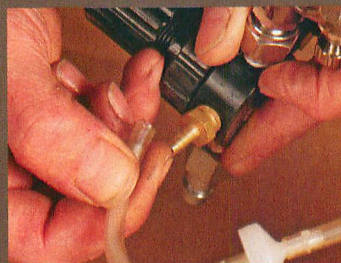
Get closer. If you use an HVLP gun more than about 6 in. from the surface, you run the risk of creating a rough surface.



Slow things down. A finish that dries before it can flow out will leave a rough surface. Adding a suitable retarder slows the evaporation and lets the finish dry smooth.



Remove dried-on finish. Soaking gun parts in lacquer thinner is the best way to remove hardened finish, but first remove non-metal parts.



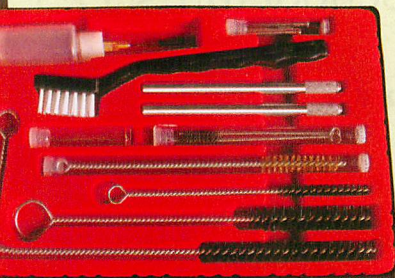
Trouble in the tube. If the tube that pressurizes a pot is clogged, finish will not fully flow to the gun. Remove the tube from the base of the gun and the top of the pot (above), and then blow through the tube to see if the check valve or tube is blocked (below).



Clean the splash guard. The small pressure vent can get plugged with dried finish, interrupting the flow. Use micro-brushes in a spray-gun cleaning kit to clean the hole.

Regular cleaning prevents most problems

If you are spraying a fast-drying finish such as shellac, solvent-based lacquer, or a water-based finish, each coat is likely to be 1 to 2 hours apart, so leaving finish in the gun between coats doesn't cause problems. However, if the finish needs to dry overnight, or if you change to a different finish, you should clean the gun.



Buy a full cleaning kit. To keep spray guns working properly, a cleaning kit should contain special brushes and needles to access the different parts of the gun.

When you use solvent-based lacquer and shellac, any new finish in the gun will re-melt any dried finish, so you typically don't have to clean the gun thoroughly. Just run some lacquer thinner or denatured alcohol through it, depending on the finish.

Finishes that require more diligence in cleaning are water-based and oil-based products (including latex and oil paint) because the cleanup solvent won't remove the dried finish. Therefore you should clean the gun soon after use. When cleaning guns that sprayed paints, remove the air cap, fluid nozzle, and needle so you can clean more thoroughly. The chart below tells you which solvent works best to clean the different finish types, or you can check the finish container for the proper solvent. Note that some products require a different cleaner once they have dried.



A thorough going-over. After spraying waterborne or oil-based finishes, guns need to be stripped down and thoroughly cleaned right after use.

FOR CLEANUP, MATCH SOLVENT TO FINISH

Finish	To rinse/clean	To remove dried finish
Shellac	Denatured alcohol	Denatured alcohol
Solvent lacquer	Lacquer thinner	Lacquer thinner
Waterborne finishes and latex paint	Water followed by denatured alcohol	Acetone/lacquer thinner
Oil-based finishes and oil paint	Mineral spirits/paint thinner/naphtha	Lacquer thinner

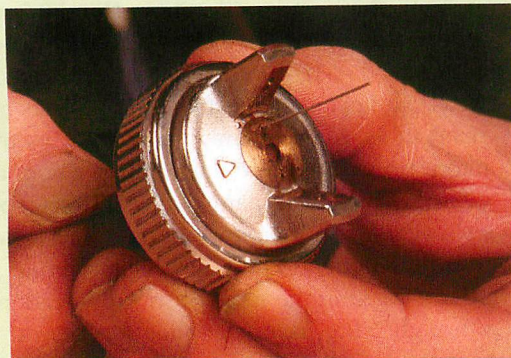
Let fluid flow.

Use a large brush to clean the main nozzle in the center of the air cap where finish exits the gun.



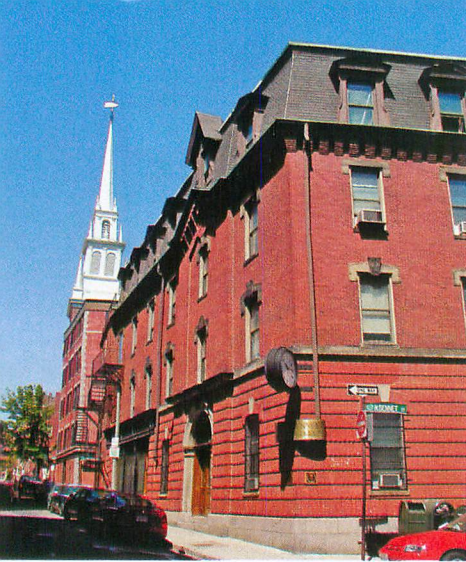
Air supply.

The small holes on either side of the fluid nozzle supply air that atomizes the finish. Clean them using thin needles.



Don't forget the needle and nozzle. After removing the air cap, unscrew the nozzle (top), and then use a micro-brush to clean inside it.





One if by hand. At 125 years old, Boston's North Bennet Street School (foreground) is roughly half the age of its famous neighbor, the Old North Church (background).

Stellar Training in

Boston's North Bennet Street School turns 125

BY JONATHAN BINZEN

Then



Shop class began in Boston. Beginning in 1889, North Bennet Street added classes in woodworking sloyd, a Swedish system of training schoolchildren in hand skills. The school also trained many sloyd teachers, helping to staff industrial arts classes across the country.

Women's work. From the start, girls were included in the woodworking sloyd classes taught at North Bennet Street. In today's full-time furniture program, about 10% of the students are women.



Steve Brown entered North Bennet Street School's Cabinet and Furniture Making program in 1988 with one year's experience in a shop that cranked out thousands of grouting trowels and street-hockey sticks. The furniture program was, he says, "a very intimidating place to come into." Everywhere he looked were students reproducing some of the most challenging pieces of period furniture ever designed. "The scope of the work and the level of quality were just overwhelming," he says. "You can't imagine that you'll ever be doing what other people are doing. But eventually you find out they were just like you."

These days, Brown is the lead instructor in the program, which runs for two years and has four teachers and some 40 students. After 10 years, Brown says, "I'm still blown away by what gets produced here." Sometimes in the early mornings, he walks around the empty shop and marvels at the work that's under way. "It's still incredible to me to see how somebody with very little experience can so quickly pick up the skill and the thinking required to produce work that matches pieces you'd find in a museum."

The school turns 125 this year, and for all that time it has occupied the same quirky building—a former church stitched together with three adjacent townhouses—in Boston's higgledy-piggledy North End. The school was founded to serve the teeming population of recent immigrants then living in the North End. Originally, it provided a range of social services: kindergartens, English classes, vocational training, recreational programs.

One program that had a profound national impact started in 1889 when Pauline Agassiz Shaw, the visionary founder—and funder—of the school, brought two Swedish teachers of woodworking sloyd to NBSS. Sloyd (craft, in Swedish) was an innovative method of teaching hand skills as an integral component of a broader education. Hundreds of grammar-school students attended sloyd classes at NBSS. The teaching of sloyd may have faded, but today's NBSS students, before they learn to use and maintain machines, do projects predominantly with hand tools. And certainly many students in the full-time furniture program—more than half of whom arrive with college degrees—as well as many of the 500 to 600 people who sign up each year for shorter workshops would concur with Shaw that "it is not enough to train the intellect alone ... the eye and the hand are together the most trustworthy leaders of the brain."

Although NBSS is not explicitly a period furniture making school, its instruction is based almost exclusively on American and European pieces from the 18th and early 19th centuries.

Online Extra

Hear more from NBSS teachers and alumni and see photos of their work at FineWoodworking.com/extras.

Craftsmanship. Period.

Miguel Gómez-Ibáñez, president of NBSS, says, "We didn't set out to be a period furniture making program. We set out to teach a certain set of skills. And the furniture built from 1750 to 1820 represents the most difficult shaping, the most complex joinery. If you can build that stuff, you can do anything."

This curriculum largely removes the issue of original design. "Our focus," Brown says, "is on craftsmanship. Construction, materials, tools, methods, techniques. Not that we're not conscious of design or don't care about it, it's just not our primary focus."

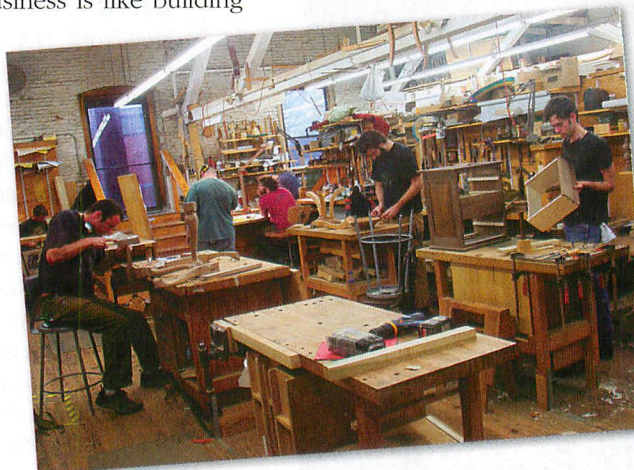
Cabinet and Furniture Making is just one of eight trade programs at NBSS. There are others in violin making and repair, carpentry, preservation carpentry, locksmithing, piano technology, jewelry making and repair, and bookbinding. NBSS is accredited as a trade school, which means students can apply for government aid, and the full-time programs are geared toward training for employment. This is a bit of a sticking point with many furniture graduates, who find it challenging to make a living. Phil Lowe, a former NBSS student and teacher who now runs his own school, says students "have to realize that building a business is like building a piece of furniture—it takes a long time. And they need to be as flexible as possible. It isn't always building masterpieces ... There were times we glued together old kitchen chairs to make money."

Whether or not graduates make a vocation of their skill, they share an unusual mastery. For graduate Jock Gifford, "the simple truth about the school is that it empowered me to believe that I can build any piece of furniture I can dream up. And make it very well. That's quite a wonderful feeling." □

Jonathan Binzen is a consulting editor.

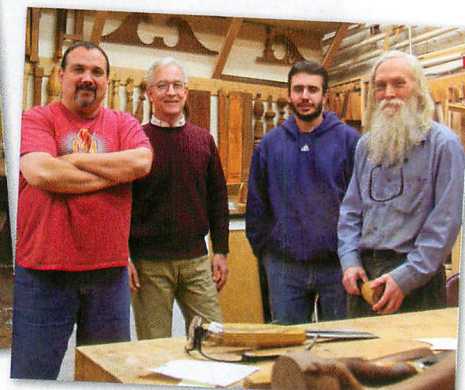


The period precedent. The curriculum at North Bennet Street unravels the complex shaping and joinery of classic period pieces. John McCormack built this mahogany and crotch mahogany bombé chest of drawers as his last project before graduating in 1988. He got the solid mahogany from a single 12¼ board, 23 in. wide by 13 ft. long, resawing it by hand with a two-handed bucksaw.



Cross-pollination. NBSS admits students twice a year to its two-year program, so there are always students at four different points in the curriculum. Many graduates point to the knowledge gained by watching other students as one of the most powerful elements of their experience.

Now



Handing down the legacy. From left, lead instructor Steve Brown, school president Miguel Gómez-Ibáñez, and teachers Dan Faia and Lance Patterson are all graduates of the furniture-making program.

North Bennet's legacy of craftsmanship

North Bennet Street School has been teaching woodworking in one form or another in the same building in Boston since the 1880s. At first, it pioneered shop class for grammar school students. Now it offers a wide range of workshops as well as perhaps the country's most rigorous two-year program in traditional furniture making. This gallery features work by just a few of the outstanding makers who have attended the school.

BRUCE EATON, CLASS OF 2006 Hampton, N.H.

Eaton spent nearly a decade working as an environmental engineer and became increasingly miserable "watching other people make stuff." A local woodworking class led him to NBSS. Eaton now runs his own shop. He built this Shaker desk (29 in. deep by 42 in. wide by 48 in. tall) from Vermont cherry. The interior is curly maple and the pulls are apple and ebony. "I've been thrilled ever since North Bennet Street," he says, reporting that although commissions are slow in coming, "I'm trying to be patient about it."



ERIC ENGLANDER, 1995 New York, N.Y.

When Englander arrived at NBSS, he says, "I had no tools, but I had a lot of furniture books." He had studied scenic and lighting design for the theater and worked building props, sets, and furniture for the stage. When he decided to study woodworking, he deliberately steered clear of a design-oriented program. "Design school had already given me the ability to see," he says, "I wanted to learn the craft." Since graduating, he's run his own shop, building high-end pieces in a range of styles. He built this reproduction of a Herter Brothers cabinet from the 1880s in solid French walnut with panels of claro walnut burl veneer. It is 18½ in. deep by 52½ in. wide by 46½ in. tall. The marquetry, in flame birch and curly maple, was done by fellow NBSS graduate Paula Garbarino. PHOTO: LANCE PATTERSON

PAULA GARBARINO, 1988

Medford, Mass.

Garbarino had been working in a cabinet shop for five years when she attended NBSS. "I finally decided I wanted to increase my skills," she says, and the experience was "the best two years of my life." In the NBSS shop, "there was accomplishment all around you. People pushing the envelope in all directions." Garbarino returned to teach at the school for five years in the late 1990s. Her Flowering Rush cabinet (21 in. deep by 53 in. wide by 38 in. tall) is made from curly soft maple with bubinga pulls; the marquetry flowers are in 14 species; the black background is dyed costello wood.



DONALD J. SUTKUS, 2004

Seattle, Wash.

By the time he'd gotten two degrees in aerospace engineering and worked for Boeing for six years, Sutkus says, "I just didn't feel like I was wearing the right clothes." After two years at NBSS, he is back in Seattle operating a one-man shop. He loved the program, but the transition has been a challenge. "It's so difficult to make a reasonable living," he says. "That being said, it was a great time." Sutkus's mahogany cabinet, 9½ in. deep by 15 in. wide by 19 in. tall, is made with satinwood and ivory inlay. Its interior arches were adapted from a piece by John and Thomas Seymour and the carving is drawn from a sofa by Samuel McIntire.

PHOTO: KEN WAGNER



PETER VAN BECKUM, 1982

Unionville, Conn.

Van Beckum, who grew up in a Wisconsin farming community and studied agronomy in college, traveled east in 1980 to look into Boston University's Program in Artisanry. Finding it to be "all about creativity" and seemingly "lackadaisical about craftsmanship," he was disappointed. Before leaving Boston, however, he visited NBSS, and "instantly wanted to go there," he says. "I loved their fussiness about tools and technique." Van Beckum has been making furniture ever since in styles that range from Windsors to contemporary pieces. His Art Moderne table, in black walnut and curly black walnut veneer, with cast brass feet and brass banding, is 75 in. dia. by 30 in. tall.



DEVIN REAM, 2009

Somerville, Mass.

Ream says he spent “about 95% of my time in high school hanging out in the woodshop.” But after majoring in history in college, he found himself applying to government-research jobs. Then NBSS appeared on his radar. He now works as a full-time furniture maker for another NBSS graduate, Peter Cabot, and builds his own work on the weekends. He made this dressing mirror, crammed with technical challenges, while still at the school. It includes tapered dovetails, French wedge feet, a stack-laminated drawer front, sand-shaded banding, and “ridiculously tiny” dovetails on the drawer. It is 9 in. deep by 16 in. wide by 24 in. tall. PHOTO: LANCE PATTERSON



JOHN P. McCORMACK, 1988

San Francisco, Calif.

McCormack's Pencil Chair represents the two sides of his training as a furniture maker—one of traditional craftsmanship and period furniture acquired at NBSS, and, six years later, an immersion in furniture design at the Rhode Island School of Design. McCormack, who builds furniture and teaches woodworking in the Bay Area, describes the teachers at NBSS as “kind and generous,” with “no real separation between teachers and students.” And despite “the conservatism and quirkiness” of the program, “it was also very free.” His chair, made of mahogany and aluminum framing squares, is 19 in. deep by 20 in. wide by 47 in. tall.

PHOTO: MARK JOHNSTON

MATT WAJDA, 2000

Portsmouth, N.H.

Wajda's father, a microbiologist, is a lifelong hobbyist woodworker. When Matt's mother gave his father a gift of a two-week workshop at NBSS in 1997 and invited Matt to go along, he somewhat grudgingly agreed. Two years later, Matt was enrolled in the full-time program, which he found “life altering.” Since then he's worked with Windsor chair maker Michael Dunbar and taught NBSS workshops himself. He now makes furniture in his own shop. He made this maple and rosewood bench (20 in. deep by 65 in. wide by 18 in. tall), one of a set of four, for a doctor's waiting room.

PHOTO: LANCE PATTERSON





JOCK GIFFORD, 1998

Waltham, Mass.

Gifford was in the midst of a successful career as an architect when he decided to take a sabbatical and study jewelrymaking at NBSS. Leaving the jewelry program each day, he would pass the furniture finishing room, and he soon decided he needed to go through that program as well. He built this chest in Carpathian elm burl and Cuban mahogany. It is 15 in. deep by 25 in. wide by 15 in. tall. He now makes jewelry and furniture for friends and family in a building he renovated just outside Boston.

TONY HAYDEN, 1993

Pebble Beach, Calif.

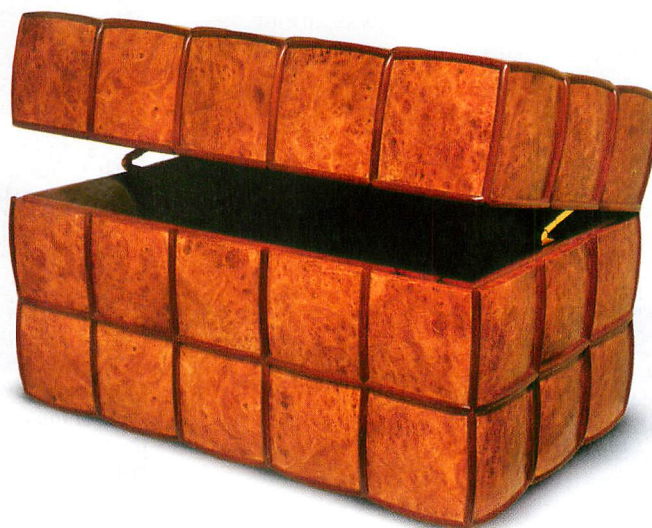
Hayden worked for years as a building contractor before going to NBSS in 1990. He's been running a custom woodworking business since returning to his native California. "I'd love to do nothing but high-style 18th- and 19th-century stuff—it's so powerful—but you don't get those jobs out here." The environment at the school, he says, "is not reality—but that's why it's so great; I'd love to go back through the program." His chair, based on one by Samuel Gragg from about 1810, is made of maple, ebony, and figured sycamore. It is 26 in. deep by 19 in. wide by 38 in. tall. PHOTO: LANCE PATTERSON



WILLIAM THOMAS, 1979

Rindge, N.H.

Thomas had been working as a carpenter in the 1970s when his father gave him an NBSS catalog. "As soon as I heard about it, I jumped all over it." The pace and ambition of the instruction was up to the individual, Thomas remembers. "I built at least 10 pieces in my year and a half there." A founding member of the New Hampshire Furniture Masters, Thomas continues to build primarily in late 18th- and early 19th-century styles. This mahogany and satinwood cylinder-fall secretary (23 in. deep by 42 in. wide by 102 in. tall), is based on a piece built in Baltimore between 1790 and 1810. The eagle was carved by Michael Dow. PHOTO: DEAN POWELL



How to cut clean dovetail shoulders

Q: Matt Kenney mentioned using his marking gauge to scribe dovetail shoulders so that he could pare away a wedge to use as a reference for his chisel (“Make Your Own Marking Gauge,” *FWW* #211). Could he explain his technique?

—SETH HANLON, Portland, Ore.

A: A COMMON PROBLEM when cutting dovetails is that the chisel goes past the baseline when chopping out the waste. With my method, the marking gauge doesn’t just mark the shoulder’s location, it starts cutting a clean and deep shoulder, which serves as a better guide for your chisel when paring away waste. I’ll show you what I do on a tail board, but the same technique applies to the pin board.

Mark the shoulder of the joint by making two successively deeper passes with the marking gauge. Then make small paring cuts with a chisel to turn that deep line into a notch. Next, define the sides of the tails with a backsaw and remove the waste in the pin socket with a coping saw. Do not attempt to cut along the shoulder line. Rather, leave just a bit of waste to be pared away, about $\frac{1}{32}$ in. to $\frac{1}{16}$ in. Register the chisel in the notch you made earlier and pare down through half of the board. Then flip the board and finish removing the waste.

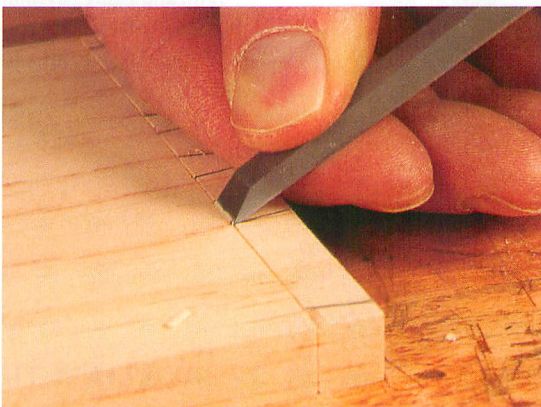
—Matt Kenney is an associate editor.

Ask a question

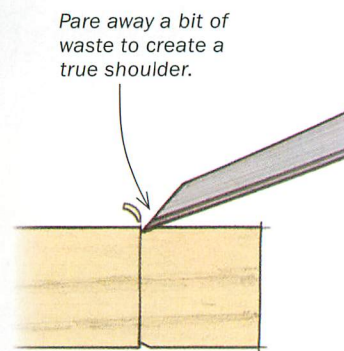
Do you have a question you’d like us to consider for the column? Send it to Q&A, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwqa@taunton.com.



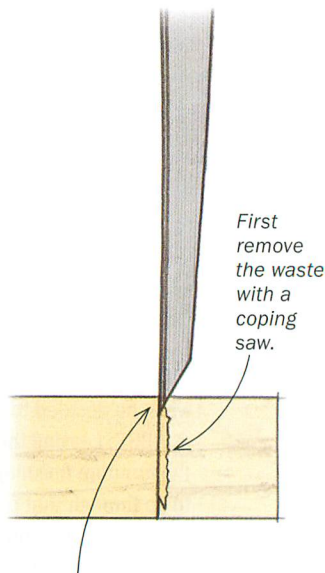
Start with a marking gauge. To get a deep and clean line, begin with a light and shallow pass. Use more force on the second pass to deepen the line. Hold the gauge’s fence firmly against the end of the board so that the cutter doesn’t wander out of the previous line.



Pare a little waste to create a shallow notch. It should be as deep as the line cut by the marking gauge. Because the gauge has already cut the shoulder line, the chips come out easily and the shoulder isn’t damaged.



Use the groove as a chisel guide. After sawing out most of the waste, place the back of the chisel against the deep shoulder cut by the marking gauge. With very little waste left, the chisel will not be forced past the shoulder.



Then use the shoulder as a guide for your chisel when paring.

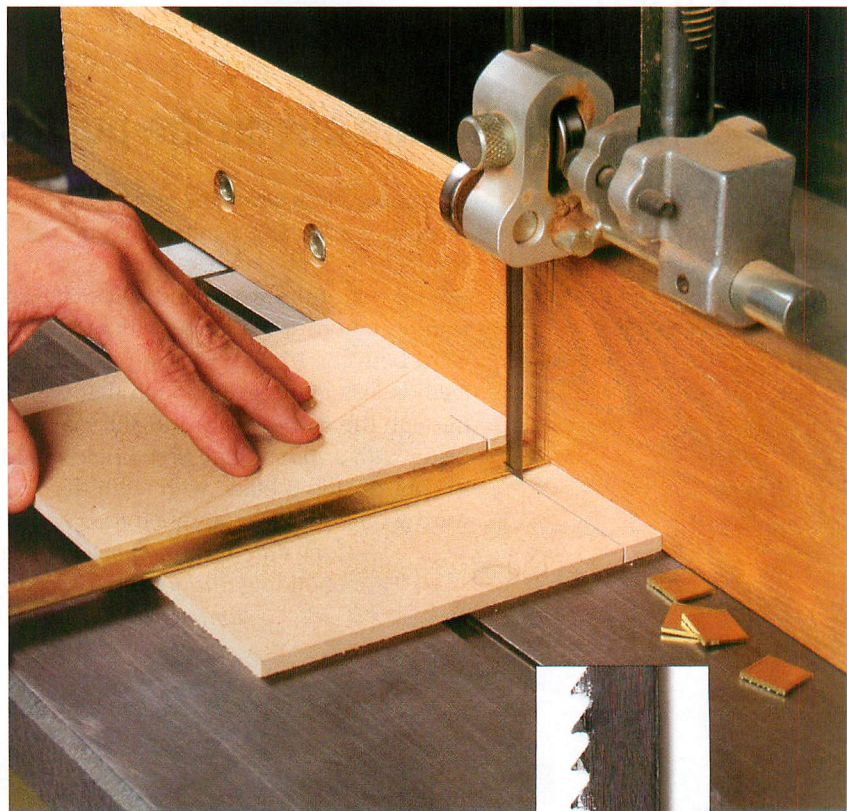
Two-speed bandsaws are overkill for woodworking

Q: I've seen several woodworking bandsaws with two speeds. When should the slower speed be used and when the faster one?

—DICK SCHAMBERGER, Painesville, Ohio

A: THE FASTER SPEED IS FOR WOODWORKING. The slower speed is actually for cutting non-ferrous metals like brass, copper, and aluminum. Typically, the slower speed is not slow enough to cut hard metals like steel. Don't bother buying a two-speed bandsaw, unless you plan to do metalwork regularly. For occasional cutting on non-ferrous metals, you can use a woodworking bandsaw equipped with a regular tooth, 14-tpi (teeth per inch) woodworking blade.

—Roland Johnson is a contributing editor and author of Taunton's Complete Illustrated Guide to Bandsaws (The Taunton Press, due out in November 2010).



Use a woodworking bandsaw for occasional metal cutting. In a pinch, a standard-tooth, 14-tpi woodworking blade can be used to cut non-ferrous metals like brass.

Can foam brushes apply a fine finish?

Q: In Mark Schofield's article ("The Best Brushes," FWW #212), I didn't notice any reference to foam brushes. Was this an oversight or does he avoid using them?

—JEFF BROCKTON, Biloxi, Miss.

A: I'VE TRIED FOAM BRUSHES as a replacement for filament brushes, but I've never had much luck. I find them hard to control and I end up with either a dry, streaky strip or a flood. However, I do use foam brushes as a cheap, easy, and quick way to apply anything that will be wiped off later, such as stains, glazes, oils, or oil/varnish blends.

—Mark Schofield is managing editor.



Foam brushes don't lay down perfect topcoats. But they are perfect for slopping on finishes that are soon wiped off, like boiled linseed oil.

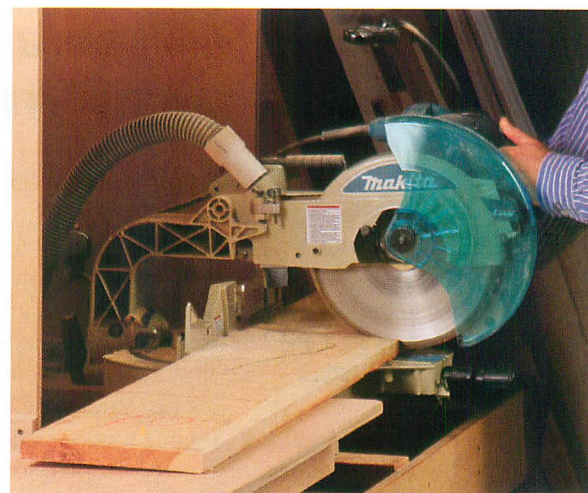
Sliding miter saws cut on the push stroke

Q: When using a sliding miter saw, should I cut on the push stroke or the pull stroke?

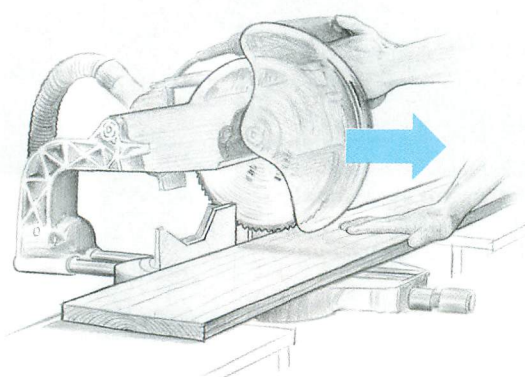
—BRENDAN
McMILLAN,
Wheaton, Ill.

A: SLIDING MITER SAWS ARE DESIGNED to cut on the push stroke. Pulling a miter saw through the cut results in a climb cut that could cause the blade to rise up out of the wood and chase after you. Also, it is important to use a blade with teeth that angle forward between 0° and 5°. The positive hook of the teeth is just aggressive enough that you can push through the wood easily and still maintain control. A blade with a more aggressive hook would be harder to control, and a blade with teeth that angle backward would require too much force.

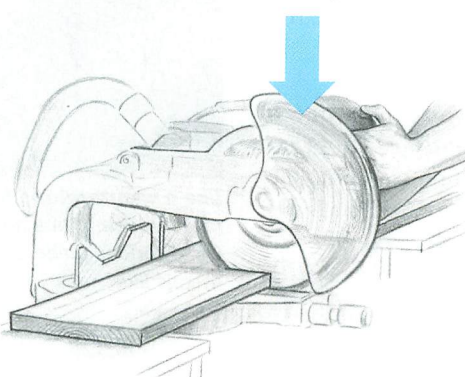
—Gary Katz is a frequent contributor to *Fine Homebuilding* and teaches carpentry clinics at lumberyards around the country.



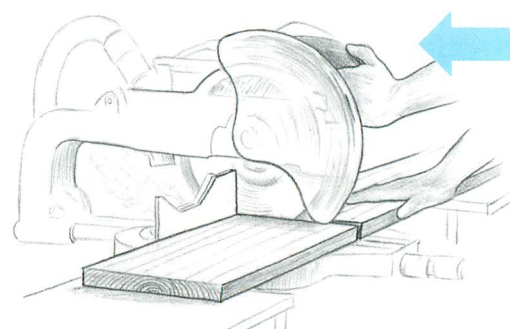
A sliding miter saw should be pushed through the cut. Otherwise, you'll make a climb cut, which can be dangerous.



1. Pull the blade over the workpiece.



2. Turn on the saw and plunge the blade into the wood.



3. Push the blade through the wood.

Store veneer flat

Q: I bought some veneer from an online retailer. It was sent to me rolled up in a box. Can I store it like that?

—CHRIS LANDRY,
Cincinnati, Ohio

A: DO NOT STORE VENEER ROLLED UP. The longer it is rolled up, the more likely it will remain curled after unrolling it. Unroll it immediately and keep it flat and out of direct sunlight.

Also, take care to maintain the veneer's moisture content. Put small pieces in a garbage bag, tape it shut, and put it between two pieces of cardboard, taped together. Wrap large pieces in black plastic and place them between pieces of MDF. Store in a cool place not subject to rapid changes in humidity.

—Ben Barrett is president of Berkshire Veneer and author of *A Closer Look* on p. 84.



For best results, veneer should be flexible and flat. Wrap it in plastic so it doesn't dry out and become brittle, and then place it between two pieces of MDF to keep it flat.

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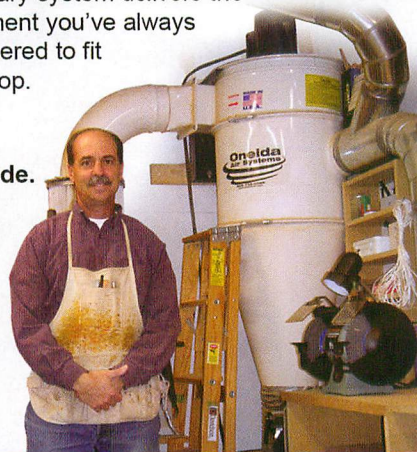
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How veneer is made

PEEK INSIDE A VENEER MILL, THEN LEARN HOW TO ORDER THIS VALUABLE PRODUCT

BY BEN BARRETT

As far back as the ancient Egyptians, people have been using veneer. It offers options for the woodworker that are simply unobtainable in solid wood. Grain patterns can range from a simple book-match to a breathtaking sunburst. Highly figured parts of the tree such as burls and crotches are much easier to work with as veneer than as solid stock. Using a stable substrate such as medium-density fiberboard (MDF) opens up new design and construction opportunities not constrained by seasonal wood movement.

Then there is the green aspect. The population pressures on the earth are only going to increase with time, and the demand for beautiful wood will never go away. One way to utilize this resource more efficiently is to use veneer. That way, future generations of woodworkers can have access to some of the precious woods we enjoy today.

I'll explain how a suitable veneer log is discovered, and the different ways veneer is made. Having spent more than 20 years in the veneer business, I'll show you how to work with a veneer seller to get exactly what you want.



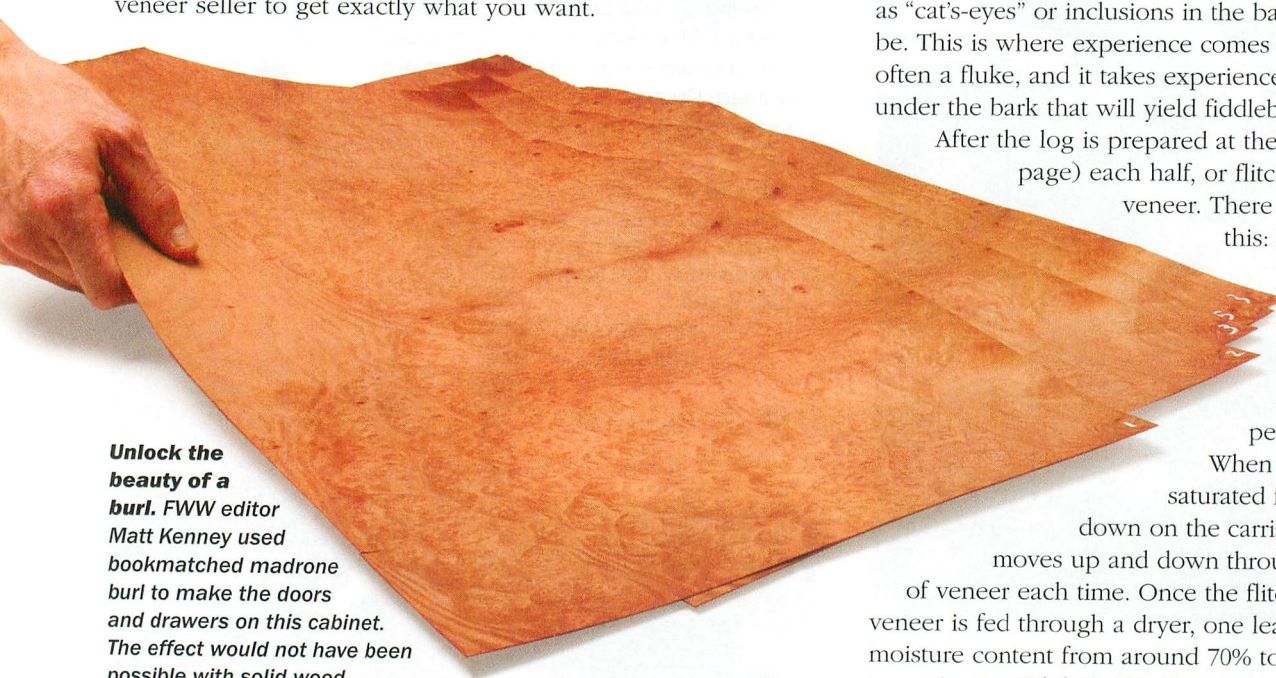
One tree in a hundred

While logs for lumber typically go to a sawmill in bulk, the very best ones are individually selected to go to a veneer mill. Obviously size and species play a role, but how is the maple with fiddleback figure spotted from the mass of other logs?

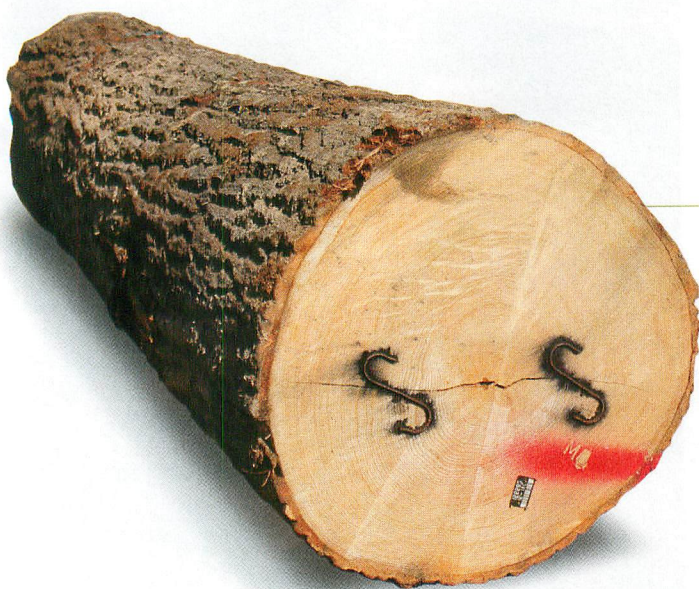
A specialist log buyer acts as the middleman between the forest owner and the veneer mill. He chainsaws off a thin slice from the end of a log, and then sprays the newly exposed wood with water to accentuate any defects or figure. He then rolls over the log to expose all four "faces," searching for defects such as "cat's-eyes" or inclusions in the bark where a branch used to be. This is where experience comes into play: Figured logs are often a fluke, and it takes experience to see compression figure under the bark that will yield fiddleback figure.

After the log is prepared at the veneer mill (see facing page) each half, or flitch, is ready to be turned into veneer. There are two main ways to do this: After the flitch is soaked in hot water, it either moves up and down past a knife, a process known as slicing, or it revolves against a knife, called peeling.

When slicing, the hot, super-saturated flitch is mounted flat-side down on the carriage of a slicer. The flitch moves up and down through the knife, slicing a leaf of veneer each time. Once the flitch is completely sliced, the veneer is fed through a dryer, one leaf at a time, reducing the moisture content from around 70% to about 15% in less than two minutes. While in the dryer, it passes over a measurement



Unlock the beauty of a burl. FWW editor Matt Kenney used bookmatched madrone burl to make the doors and drawers on this cabinet. The effect would not have been possible with solid wood.



Hand-picked. The logs arrive at the veneer mill already marked with a unique barcode. Metal "S" irons or plastic "I" clips minimize end splits.

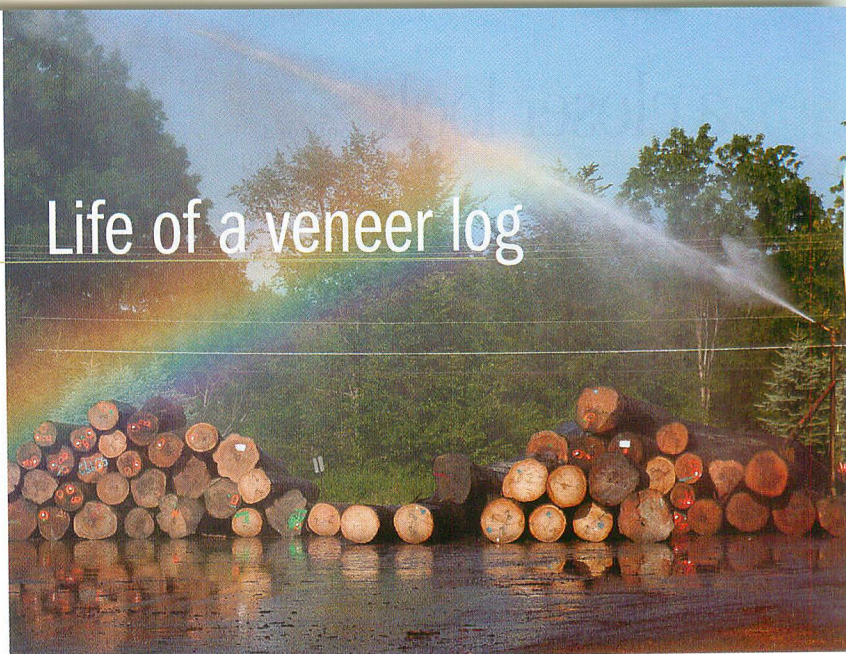
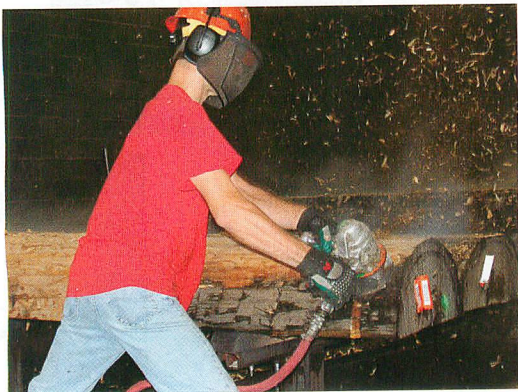
Sawn and soaked.

After being debarked, the logs are sawn into halves or quarters depending on the size and species (right). After a week in hot water, the halves and quarters, banded together, emerge black and steaming (far right).



Skimmed off.

Soaking the logs causes minerals to collect on the outside. To protect the veneer-slicing knives, workers grind away the contaminated surface of the logs.



Kept wet. Sprinklers keep the logs wet and prevent them from drying out and checking.



Honing the edge.

Before running each new log through the veneer slicer, they hone the 12-ft.-long knife with an oilstone and remove any wood remnants with a penknife.

system that calculates its square footage. Now it's organized by length and grade and ready for presentation to a buyer.

The most common method for cutting decorative, high-end veneers—those with cathedral pattern in the grain—is plain or flat slicing. Quarter-sliced veneer is just like quartersawn lumber, where the goal is to generate product with the growth rings 60° to 90° to the face. This produces a strong medullary flake figure in oaks and lacewoods, superimposed on an extremely straight-grained background.

There are also different methods to peel veneer. A full rotary cut involves mounting a log on a lathe and peeling off sheets,

much like a paper towel is pulled off a roll. There is little waste but it creates a wild, erratic grain, so this is primarily done for utilitarian uses. A half-round cut is used mainly to increase the yield from smaller 13-in.- to 16-in.-dia. logs. Generating an effect similar to plain slicing, it is often used on maples as it allows the white part of the log to be fully used.

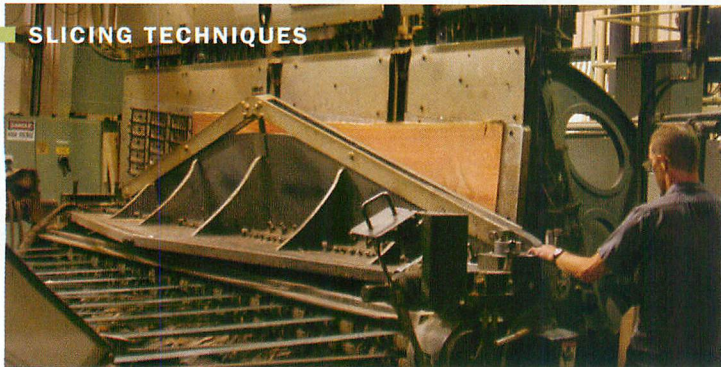
Why does veneer keep getting thinner?

A hundred years ago, veneer averaged 1/8 in. thick; today, most veneers are sliced from 1/42 in. to 1/49 in. thick, whether for plywood or veneer sold retail. Can it get any thinner? In Asia,

Two ways to make veneer

Depending on the intended use of the veneer, the log size, and the wood species, it can be sliced or peeled. At International Veneer Company's Mercer, Pa., mill, both methods are used.

SLICING TECHNIQUES



One at a time. The log, attached to the flat steel plates, moves up and down past a knife attached to the triangular shaped section.

FLAT-CUTTING

Flat cut or plain slicing is by far the most common way to cut high-quality veneers.

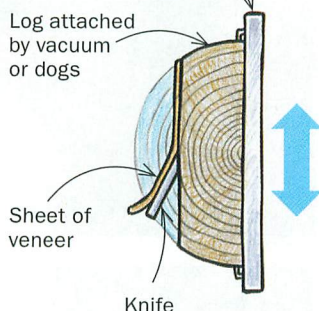
Among the species commonly plain-sliced are cherry, walnut, red and white oak, and mahogany. Crotches are also plain-sliced.

Flitch-cutting table

Log attached by vacuum or dogs

Sheet of veneer

Knife



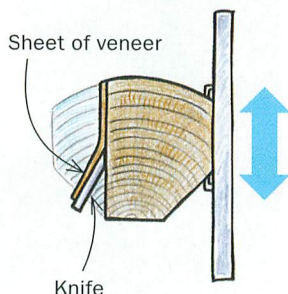
QUARTER-SLICING

White oak is commonly quarter-sliced to reveal the ray flecks also seen in quartersawn lumber.

Other species quarter-sliced to produce a ribbon-stripe figure include mahogany, sapele, and sycamore.

Sheet of veneer

Knife



some use 1/85-in.-thick veneer, so thin that the core must be color-coordinated to the veneer because it shows through.

A cynic would say profit was the only motive for this ever-decreasing thickness, but there are benefits. The thinner the veneer, the smoother the surface, as thick veneer does not slice as cleanly and tends to tear as it comes off the knife. And on plain-sliced veneer, the thinner the veneer, the smaller the jump in grain pattern between sheets.

Learn the lingo to get what you want

The more information you share with your suppliers, the better they can meet your needs with the most cost-effective veneer for

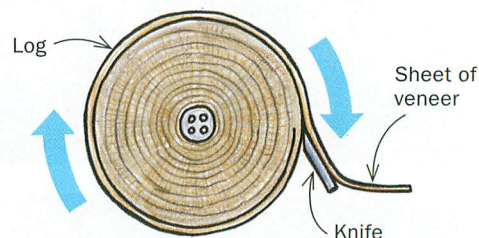
PEELING TECHNIQUES



Round and round. Rotary-cutting, or peeling, produces wider sheets from smaller logs and is also used for certain figured veneers.

ROTARY CUTTING

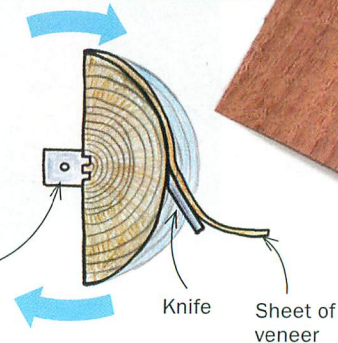
Peeling a whole log typically produces veneer with wildly alternating grain best used for utility plywood. However, the method enhances bird's-eye maple.



STAY-LOG CUTTING

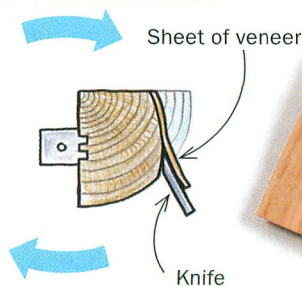
Veneer mills employ this machine for two reasons. It is a way to create flat-cut veneer from smaller logs, and it is also used to make rift-cut veneer, particularly from oak and walnut logs.

Bed of peeler fits into two grooves cut down the length of the log.



RIFT-CUTTING

Done almost exclusively in oaks, it requires larger-diameter logs, which are quartered and peeled on a bias to limit the medullary flake figure. The need for larger logs means rift-cut veneers command a premium over plain-sliced ones.



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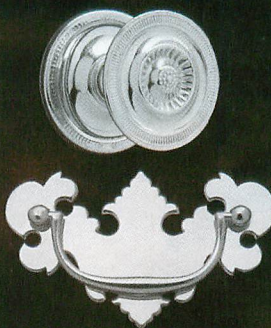
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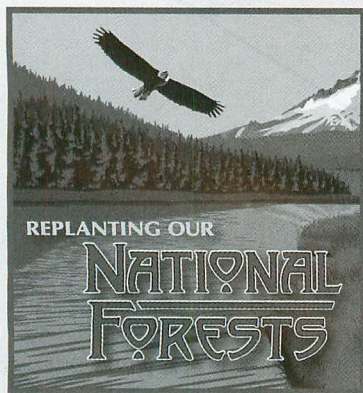


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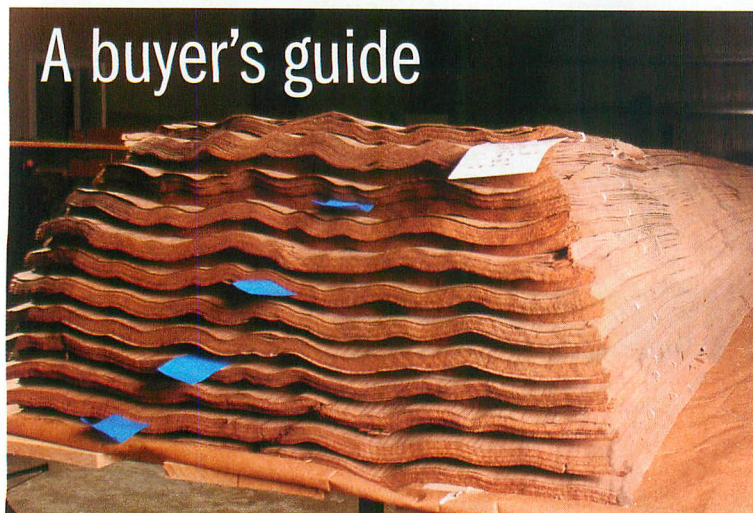
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A buyer's guide



Half a log. This walnut flitch represents one half of the log. The blue tape marks where individual sheets have been removed and sent to a prospective buyer for inspection.

Keeping track.

When you receive consecutive cuts of veneer, the first thing to do is clearly number the sequence. This way you can shuffle the sheets around, arranging them in a sunburst, for example, without losing track of the order.



A rose(wood) by any other name. Santos (pau ferro), Brazilian, and East Indian all fall under the name rosewood. If possible, specify the Latin genus and species name when ordering.

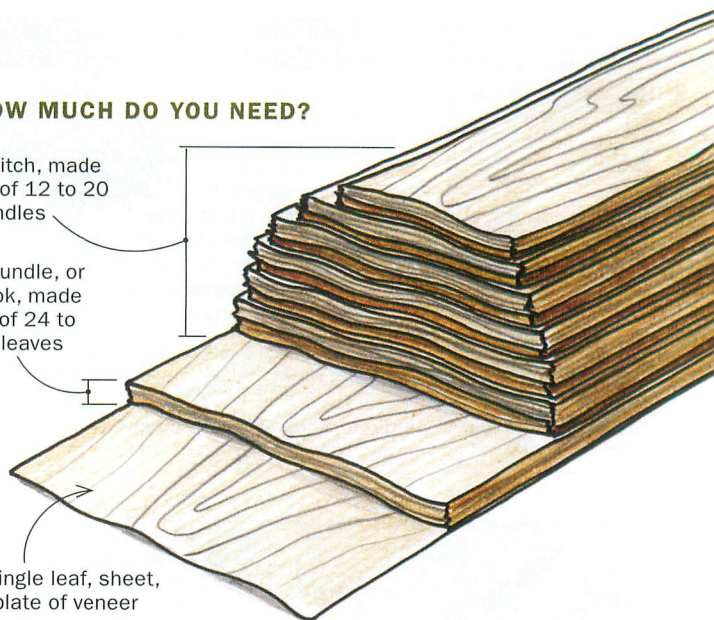


HOW MUCH DO YOU NEED?

A flitch, made up of 12 to 20 bundles

A bundle, or book, made up of 24 to 32 leaves

A single leaf, sheet, or plate of veneer



your project. And talking the talk reduces miscommunication. Don't make the mistake one of my customers made by asking for a flitch when all he wanted was a bundle of veneer. I think I'm still selling off that flitch.

Begin with the species you want. If possible, give the Latin genus and species to remove ambiguity. Your supplier won't know where to begin if you simply ask for "rosewood." Instead specify *Dalbergia latifolia* or East Indian rosewood. If possible, give a backup alternative to rare veneers in case what you're after doesn't exist.

For lengths and widths, give the net size of your project. Don't call for 12-ft. veneers for a 10-ft. project just because that's what you do when ordering lumber. Tell the supplier you're looking to "net 120 in." and they might have stock that's 128 in. clean (meaning no end splits or defects) that will work fine and save you money.

Don't forget that you will also need to veneer the back of the core to prevent cupping. The thinner the core, the more important it is to use the same species, thickness, and cut as the face veneer. However, if you're using something pricey, ask your supplier for a cheaper substitute with similar density, cellular makeup, and shrinkage coefficient.

Veneer production is very exacting — the tolerances are measured in thousands of an inch and there are plenty of things that can go wrong. You should not accept "rough" veneer where the cutting process has smashed the wood fibers and distorted the grain—no amount of sanding will cure this. Also reject thick and thin veneer where the thickness varies from side to side or end to end. However, don't expect all veneers to arrive dead-flat. Crotches and burls are typically buckled and need to be flattened prior to use (see "An Introduction to Veneering," FWW #189).

If you haven't tried veneering, I encourage you to give it a go. It opens the door to a wider world of woodworking and leaves some wood to future generations. □

Ben Barrett is president of Berkshire Veneer Co. in Massachusetts.

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The Taunton Press

Miter your dovetails

STRONG, ELEGANT JOINERY
ALLOWS A DECORATIVE EDGE

BY JOSH METCALF

Among my favorite things about making this small dresser mirror is the joinery—two different combinations of dovetails and miters that are strong, look great, and allow me to cut molded profiles on the edges and faces of the piece.

On the case, the lap of the half-blind dovetails enables me to cut a continuous ovolo edge detail around the top. The miter at the front of the joint also lets me cut a molded profile on the front of the case.

I wanted the same molding details on the edge and face of the mirror frame, and I wanted its joinery to visually echo the dovetails on the case. The joint I use—a dovetailed through-tenon with a miter in front and a half-lap in back—is challenging but fun to execute, and the results speak for themselves.

Josh Metcalf is a furniture maker in Woodstock, Vt.



IT WORKS ON FRAMES ...

The interlocking nature of a dovetail adds strength to the miter. The square shoulders of the half-lap make it easy to square the frame and prevent the miters from slipping during glue-up.

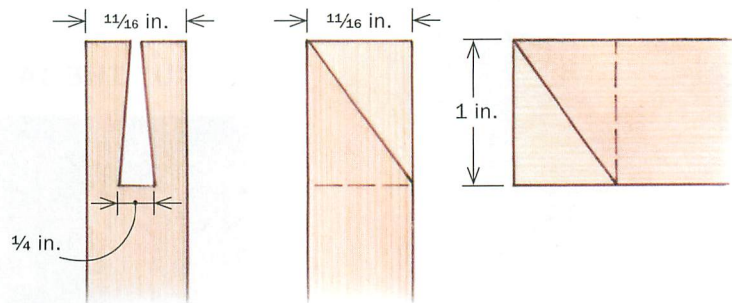
... AND CASES

Like the frame version, the mitered front on the half-blind dovetailed case sides lets Metcalf cut a continuous decorative profile on the case front and along the edges.

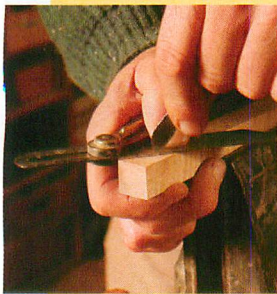


The frame version

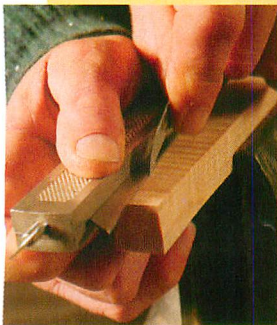
This joint can be used in a variety of applications, such as mitered cabinet doors or picture frames. It works especially well for small frames that are too thin for a standard mortise and tenon. The joint has great mechanical strength and it clamps easily across the face to ensure the best bond. However, it's not an easy joint to cut. Visualizing it can be confusing, and the sawing and fitting must be accurate. Also, the dovetail layout is a little out of the ordinary. The dimensions of the joinery make it very awkward to transfer the layout from one workpiece to another, so Metcalf lays out the tail and socket separately using the same gauge settings for each. Still, with careful layout and saw work, the result is strong and pretty.



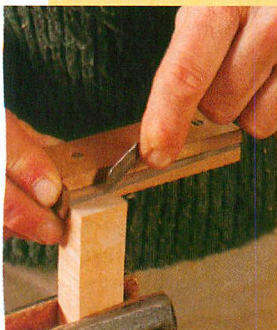
LAYOUT IS CRITICAL



Start with the miter. Use a marking gauge to scribe the width of each piece onto both edges of its mate. Then use a bevel gauge to lay out the angles on the front faces.



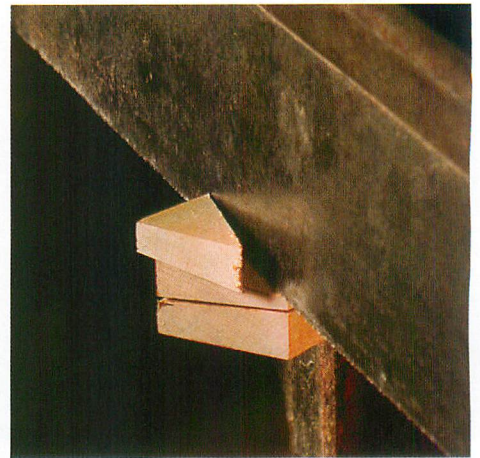
Mark out the socket. Use the bevel gauge to mark the angled socket cheeks on the edge of the piece. For the pin, the straight lines are on the edge and the angles go on the end grain.



Bevel gauge alternative. For easier layout on narrow stock, Metcalf made an adjustable jig by fitting Plexiglas into a kerf in a hardwood block and adding screws. A cleat on the end helps locate the jig.



Cut the dovetailed tenon. The front cheek is cut at an angle (left) with the saw stopping just before the outside corner of the miter. The rear cheek is cut to the baseline. Clamp the stock horizontally to cut away the waste (right). Cut on the waste side of the line and pare with a chisel.



A single, long socket. A pair of angled cuts establishes the socket walls. Carefully saw to the waste sides of your marks (left), and then use a bandsaw or coping saw to hog out the majority of the socket (right). The remaining waste can then be cleared with a coping saw and chisel.



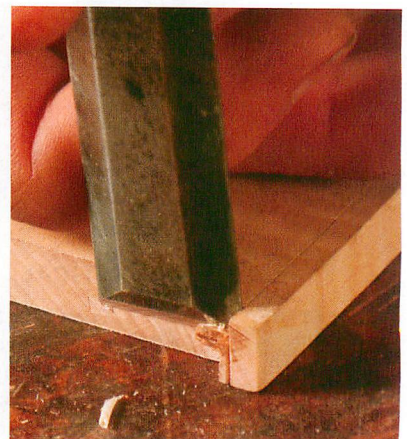
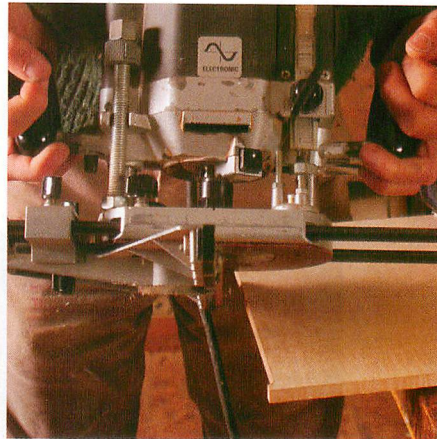


Add a miter to half-blind dovetails

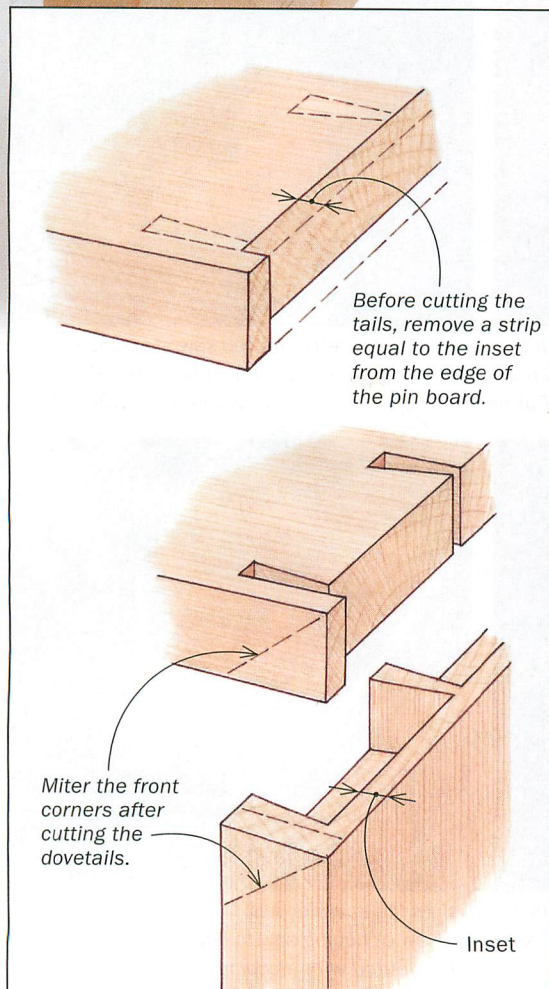
The dovetails for the case are, for the most part, ordinary half-blinds. However, the mitered front complicates the layout and joinery slightly. To begin with, you'll need to dimension the top piece so that it is the full length of the case, to allow for the miter at the front. And before laying out for the tails, you'll need to remove a narrow band of stock so that the tails will come up short of the end of the case.

On this case, the top and sides were also of different thicknesses. This meant the miter wasn't 45°, requiring different bevel-gauge settings to create the mating angles.

1. CUT THE TAILS



Trim the tail board. With a router and fence, remove the extra material (left). Use a chisel to square up the tab (right), which will form one half of the mitered front. Its rear face also captures the half-pin behind the miter.



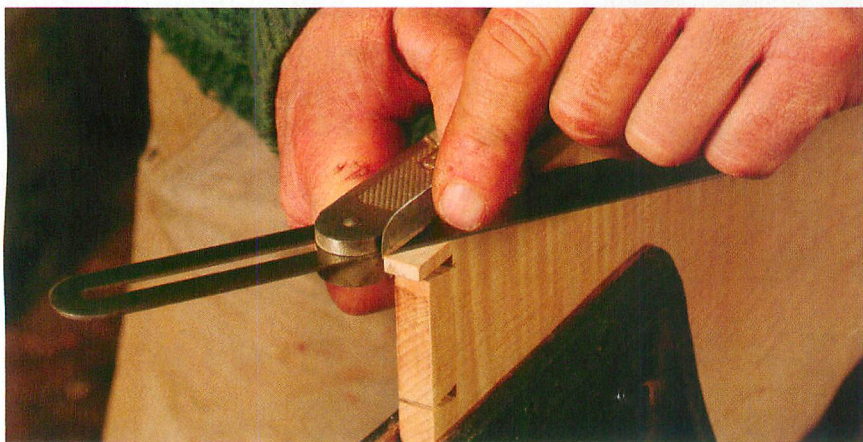
Mark and cut the tails. Scribe a line for the tail length using a gauge setting picked up from the pin board. You can scribe the underside of the top all the way across, but scribe the show face only between your angled pencil lines. To pare the waste from the narrow sockets (left), Metcalf uses a chisel that he ground to $\frac{1}{16}$ in. wide.

2. CUT THE PINS



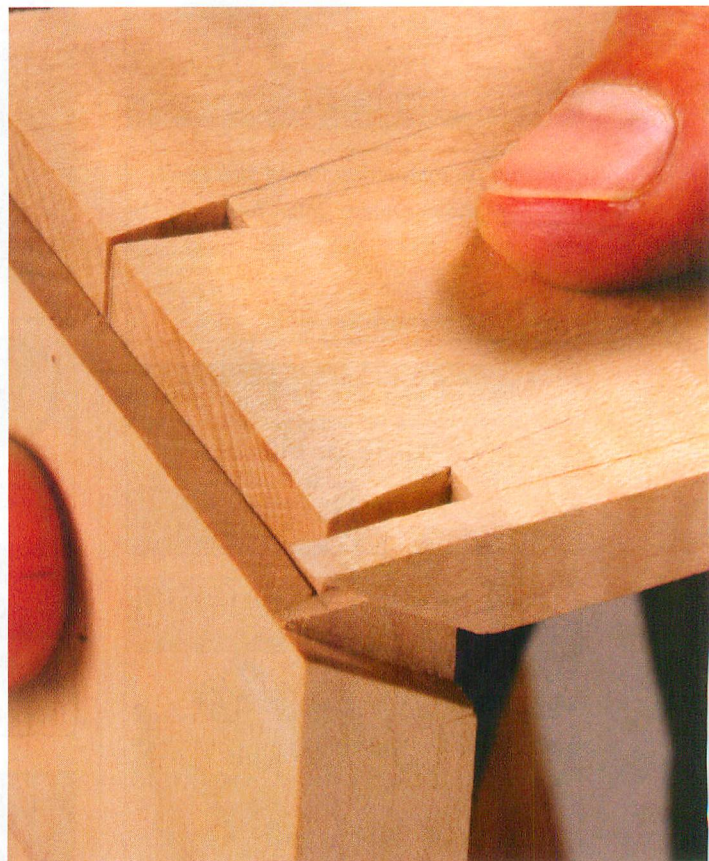
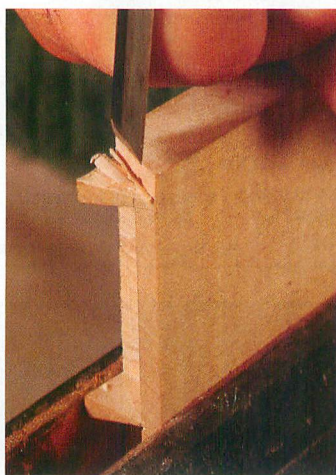
Transfer the layout and cut the pins. Scribe the socket shoulders with a knife (left), then flip the piece in the vise and mark the vertical portion of the pins with a pencil. After sawing to the lines and hogging away the waste with a router, Metcalf does a careful final cleanup with a chisel (above).

3. MITER THE CORNER LAST



Mark out the miter for the top.

Adjust the sliding bevel to the angle between the top's outside corner and the scribe line for the tails on the underside. Trim the miter. After sawing tight to the line with a fine saw, the paring required should be minimal.



Check the fit. If all is well, you should now be able to tap the top and sides together, and you should have a tight-fitting miter at the front.

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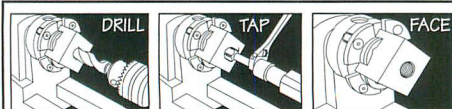
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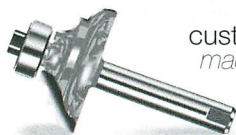
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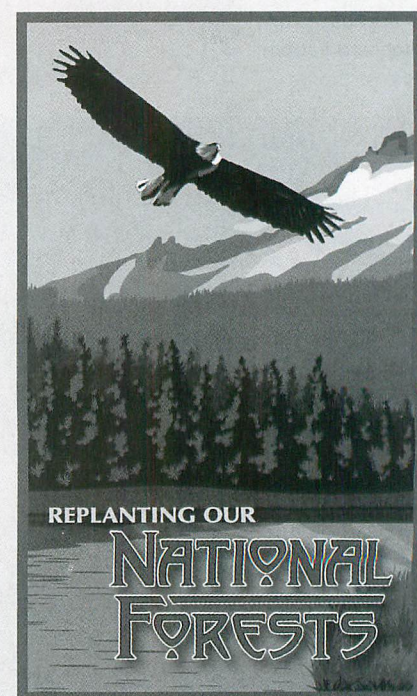
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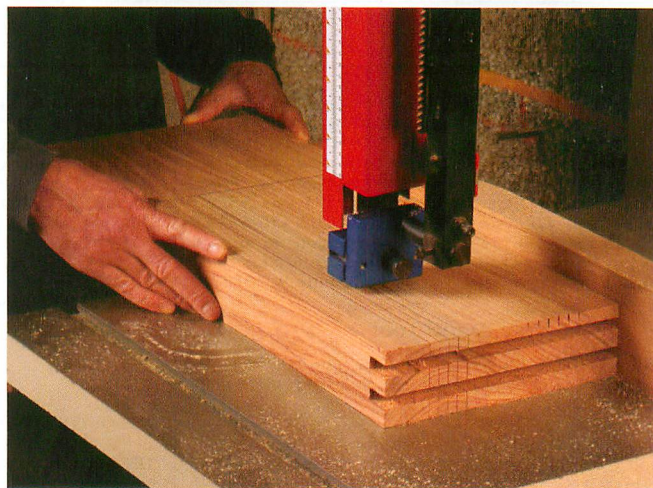
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how they did it

The drama unfolds

BY ANISSA KAPSALES

Seth Rolland's striking table (see the back cover) is at once timeless because of its classic demilune form, yet playful and modern in its curved, flared slats, which are created much like the way you would cut and unfold paper dolls. But the execution is anything but child's play. Creative bandsawing and careful cleanup are the keys to this organic table.

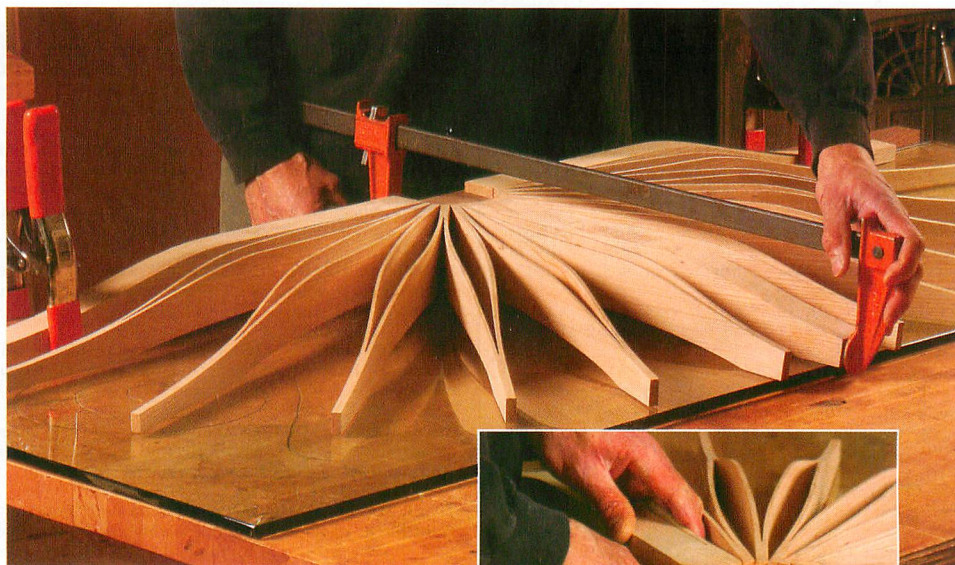


Back-and-forth cuts establish pattern. After cutting dadoes in one end, Rolland makes a stopped cut, then moves the fence and flips the board end for end for the second cut. He continues across the board with the uncut side always registered against the fence.

Shape the slats. After making all the stopped cuts, he stands the board on edge, holding it together with gentle hand pressure, and cuts the scoops on the top and bottom edges.

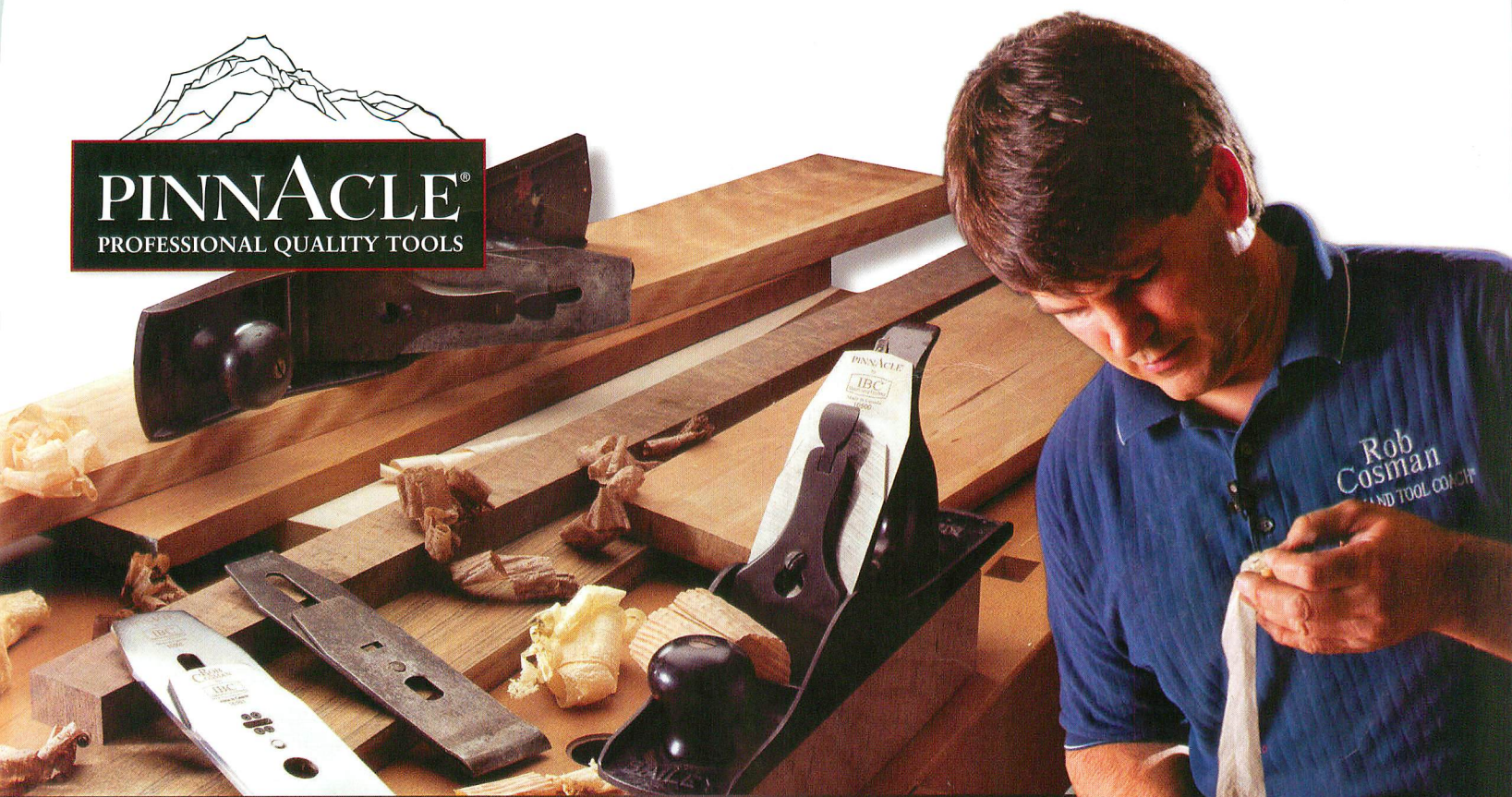


Cleaning between slats. Rolland has to get creative to reach into the tight corners between the slats. To get in the crevices, he attaches a scraper blade (with sandpaper taped to it) to a Fein MultiMaster tool.



An easy glue-up. Working with the tabletop upside down on a sheet of glass, Rolland glues curved disks (right) into the two dadoes. He clamps the walnut disks and the outermost members of the fan in place, and then places weights on the other pieces while the glue dries.





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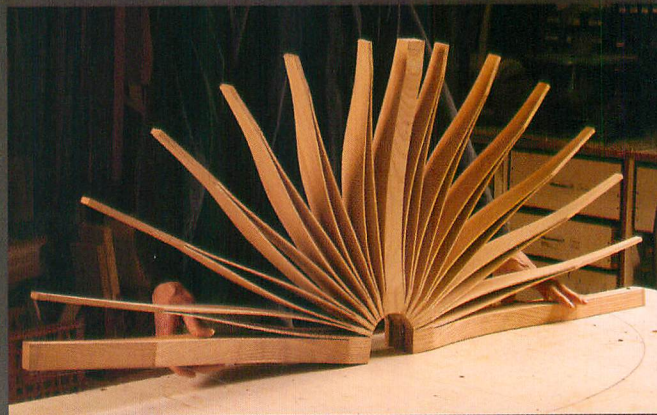
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The sunburst of slender ash slats on Seth Rolland's demilune table may be dazzling for its elegance, but it's equally impressive as a technical feat: The entire array is one piece of wood. Starting with a 12/4 board 10 in. wide and 30 in. long, Rolland makes alternating stopped cuts from either end and then unfolds the plank like a paper fan. Working alone in the shop he built in Port Townsend, Wash., Rolland likes to design things he doesn't

know how to build and then figure them out. In 2000, he made a tabletop composed of more than 100 tiny pieces of wood, which required 15 glue-ups to complete. The tedium of the process led him to think: "If I didn't cut the pieces apart, I wouldn't have to glue them back together." Since then, Rolland has used his slicing and bending technique to make a wide range of pieces that reveal the vast potential in a single plank of wood.

—Jonathan Binzen

Photos: Frank Ross (bottom); Matt Kenney (top three)

How They Did It Turn to p. 98 to see how Rolland cuts the array of slats from one piece of wood.

Pro Portfolio Go to FineWoodworking.com/extras to see more of Rolland's pieces made with the slicing and bending technique.