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AMERICAN WOODWORKER

AUGUST 1994 #39

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Issue No. 39 July/August 1994
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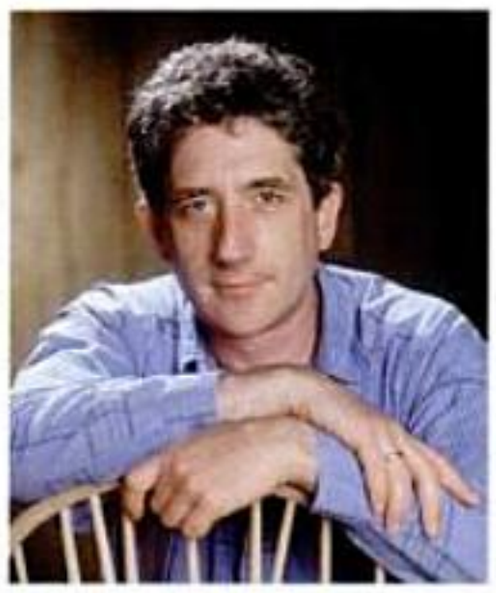
A WORD FROM THE EDITOR

KEEP THE OLD WAYS ALIVE

Last September AMERICAN WOODWORKER invited bodger Don Weber to demonstrate his wooden spring-pole lathe at our booth at the huge Woodworking Machinery & Furniture Supply Fair in Anaheim, California.



Don set up his lathe and his shaving horse in a huge convention hall filled with gleaming new edge banders and state-of-the art computer-controlled machinery. He split out a billet with his hatchet, shaved off the corners with his drawknife, chucked it up in the lathe, and started to turn. First one, then two, then a dozen people stopped to watch as Don pumped away on his primitive lathe. In minutes the crowd was packed five and six deep. Don Weber and his pole lathe were the biggest hit of the show.

Bodger Don Weber draws a crowd at the AMERICAN WOODWORKER booth.

Most woodworkers have a soft spot for old tools, but few know how to use them. Those of us who do have a responsibility to keep the skills of the past alive. We owe it to ourselves, our children and our grandchildren to hand down the old ways of working—to demonstrate the uses of old tools and tell about the quaint and curious ways our ancestors lived and worked.

Don't get me wrong, technology has its merits. I'm not about to trade my bandsaw for a bow saw or rip boards from a log by hand. But there's no better way to appreciate the power and accuracy of the machines we have today than to know what it's like to work wood without them.

August 12 and 13, I'll be turning on a 120-year-old wooden treadle lathe at the Goschenhoppen Folk Festival in East Greenville, Pennsylvania. Other folks will demonstrate cabinetry, rope-making, weaving, ironwork and dozens of other old-time rural crafts. August 25 through 28, Don Weber will be demonstrating his pole lathe in the AMERICAN WOODWORKER booth at the International Woodworking Machinery & Furniture Supply Fair in Atlanta.

There may be a similar traditional woodworking demonstration near you this summer. If so, I urge you to take your kids and encourage their questions. If you practice an old-time craft, get out there and share it.

Remember that knowledge is one thing you *can* take with you. When skills are forgotten, they're gone. Do whatever you can to keep the old ways alive.

David Sloan
Editor & Publisher

PLAY IT SAFE

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

AMERICAN WOODWORKER

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LETTERS

Tung Nuts Are Toxic

Re: "Tung Oil Nontoxic?" ("Letters," AW #38). I have been a coatings chemist for nearly 40 years, and I feel I must make a comment about tung oil: Variations in the climate can make the oil from tung trees less toxic some years than others, but it is toxic nonetheless, unless it is chemically treated very carefully. The more the treatment, the less the toxicity and the more expensive the oil.

I would not finish a food-contact item unless the finish is approved by the Food and Drug Administration for that purpose.

W.R. Horne
Coatings chemist
Chuluota, FL

The tung nut is not edible and neither is tung oil, whether it is "100 percent pure" or combined with other ingredients such as solvents or driers. According to Tom Brown of the FDA, "We [the FDA] have been aware for years and years that people have been [using tung oil on woodenware] and we've never had any complaints about it, but we really can't say anything because we've never thoroughly studied the issue."

Dandy Dust-Collection Article

Thanks for the highly informative articles on dust collection (AW #37). I will be building my own cyclone precollector and your air flow formulas and safety precautions solved my major design concerns.

Tom Ptasznik
Windsor, CT

Ire Over Pink Ivory

After I finished reading issue #38 of your magazine, I wondered how you can justify the dichotomy and the irony of the "Offcut" titled "Biggest Ivory Out of Africa" and the article by Scott Landis titled "Forests in Crisis." While I do not necessarily subscribe to all of Landis' theories regarding deforestation, the use of a one-of-a-kind pink ivory log for turning validates his underlying theme of irresponsible use of tropical woods.

Turning is perhaps woodworking's single greatest waste of wood, with 90 percent plus of the blank ending in shavings under the lathe. By the look of the two pieces you featured (pages 12 and 53) as turnings from the pink ivory log, I find further cause to question your judgment, since these two pieces are at best a sterile attempt to use a beautiful wood to justify lack of inspiration and harmony of form. Further, I find Cummings' turning "Passion Fire" effete and overworked.

Had the log been made into veneer, scores of woodworkers would have been able to participate in perpetuating this rare and beautiful wood, mostly in worthwhile projects. Your magazine's unintended glorification of using the log for turning rather than for veneer or small cuttings for inlays, etc. is hardly responsible journalism.

I wish that I could say, "keep up the good work."

Jose A. Caubet
Sonoma County Woodworkers Assoc.
Santa Rosa, CA

We reported on the large pink ivory log as a news item and refrained from editorializing on the environmental ramifications. For the record, it's not our intention to advocate or endorse consumption of tropical woods. Neither is it our intention to vilify woodworkers who choose to use exotics. We do hope to make woodworkers aware of the world timber situation so they can make informed decisions about what wood to buy.

Corrections

Due to production errors, on page 40 of our "Buyer's Guide to Bandsaws" (AW #38) we used the wrong photo for the Skil HD3640 bandsaw (above). Also, the photo of the Grizzly G1073 (right) should have indicated it was a Best Buy. Finally, the correct model number for Jet's new 14-in. bandsaw is WBS-14CS.

The "Pennsylvania Spice Box" article (AW #36) contained two dimensional errors. In Fig. 4, the length of the door panel should be 11⅜ in. from tenon shoulder to tenon shoulder. In Fig. 2, the height of the box should be 21 11/16 in. Also note the drawer dividers shown in Fig. 2 are 5/16 in. thick. The ¼-in. dimension shown on the drawing indicates the portion of the top drawer divider that will show when the overhanging fascia is in place.

Paying Attention Is Essential Too

Re: "A Saw Guard Is Essential" ("Letters," AW #37). I think the essential message was missed, and that is: Don't work with machinery if you're tired or distracted. Six or seven years ago my mother was admitted to the hospital and after spending the day with her, my dad came home and decided to make a small jewelry box for her. Because he was tired and distracted, he planed the last three fingers off his right hand. When I was first starting to work with Dad he told

TOO BUSY TO WRITE?

Call our LETTERLINE (610) 967-7776

LETTERS

me if you weren't careful "tools would jump up and bite you." I guess he forgot.

Norm Rein
Julian, CA

Tool Steels' Pedigrees

I'm curious about high-speed tool steels such as M2 and A11 and would like to know how they are used in making woodworking tools. Can you write an article that explains the characteristics of different steels?

Harold A. Hubbard
Emeryville, CA

You've hit on a good subject, Harold, but it's a complicated and vast one that could fill an entire book. Here are two good sources of information: Tool Steel Simplified, by Frank Palmer, George Luerson and Joseph Pendleton, Jr. (1978, The Chilton Company, 201 King of Prussia Rd., Radnor, PA 19089), and The Making of Tools, by Alexander Weygers (1973, Van Nostrand Reinhold Co., 450 West 33rd Street, New York, NY 10001). Both books may now be out of print, but you should be able to find them in a good library.

Don't Grind Those Drivers

Re: "New Road for Old Drivers" ("Tech Tips," AW #37). The practice of grinding the tips on drivers is not accepted by our trade association, the Hand Tools Institute. In use, [ground tips] can fracture or fragment, resulting in flying chips. You should only redress a driver tip with a file.

Joel Sys
Snap-On Tools Corp.
Kenosha, WI

Why No Early Index?

I hate to disillusion you but AMERICAN WOODWORKER had a life before Rodale purchased it. Why don't you index those first 12 issues and make the early issues more useful to those who have them? And why don't you print an annual index in the magazine?

Al Horowitz
Torrance, CA

We don't index pre-Rodale issues because we weren't involved in producing them and can't guarantee their accuracy. Instead of publishing an annual index in the magazine, we update the AW cumulative index yearly. The latest AW Index (1988-1993, Issues #1-35) is available for $4.95. To order, call: (800) 666-3111.

WHAT'S ON YOUR MIND?

We value your comments, complaints and corrections. Send your letters to: "Editor," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098, or telephone your message to us at (610) 967-7776. FAX: (610) 967-8956.

offcuts

AUSTIN'S TREATY OAK: TRIUMPH OVER TRAGEDY

Poisoned by a madman in 1989, the famous Austin Treaty Oak has been saved, thanks to a heroic effort.

MARK WIELAND

Five years ago it was nearly done in by a madman's poison, but today Texas' famous Treaty Oak is alive and well, with part of it now living on in works of art.

The Treaty Oak has played a special role in the life of Austin, Texas, for 500 years. But in 1989, a man poisoned the tree with a lethal dose of Velpar, an herbicide, in a bizarre attempt to avenge unrequited love. A heroic effort to save the tree ensued. Texas billionaire Ross Perot provided the cash, and city foresters provided labor. They shaded the tree to protect it from direct sunlight, sprinkled it with spring water, injected it with nutrients and completely replaced the soil around the base.

JAMES POPPELL

Thanks to all the work, the tree survived, but one major limb had to be removed. Realizing the limb was too important to be turned into common firewood, the city donated much of it to woodworkers, who have used the wood to create art commemorating the tree, including the pieces shown here. Several of these works have been auctioned to raise money for tree-planting in Austin.

This turning (left) by James Poppell, and this knife and matching case (below) by Harvey Dean were made from a limb of the Treaty Oak.

MARK WIELAND

INTERNATIONAL TOOL AUCTION ACCEPTS ABSENTEE BIDS

More than 1,000 lots of outstanding woodworking tools for both collectors and craftsmen will go up for bid at the International Tool Auction, Friday July 29 at the Limes Hotel in Needham Market, Suffolk, England.

You say your wife won't let you fly abroad for the weekend? That needn't stop you from bidding. Tony Murland, sponsor of the auction and co-owner of The Tool Shop in Needham Market, makes it easy for North American woodworkers to place absentee bids.

Here's how it works. Purchase the auction catalog (full of great color photos) and fill out the absentee bidder's form on the tool(s) you want to bid on. Indicate the *most* you're willing to pay for the item (in £ Sterling; £1 = approximately $1.50) and mail or fax back the form. If your bid is higher than the highest bid on the floor, you'll get the tool for £5 to £10 more than the highest live bid (plus a 10 percent buyer's premium—a common practice at many auctions). Murland will send you a bill (payable by check in U.S. dollars) and ship you the tool.

These rare planes will be sold at the International Tool Auction in July. From left: Gunmetal Scottish smoothing plane, 14 1/2-in. dovetailed steel Norris A1 panel plane, 20 1/2-in. dovetailed steel Mathieson jointer plane.

PHOTO COURTESY OF TONY MURLAND

For more information, or to order a catalog ($15), contact Tony Murland at Tool Shop Auctions, 78 High St., Needham Market, Suffolk, U.K. IP6 8AW. Phone (from the U.S.): 011-44-449-722992. FAX: 011-44-449-722683.

MAKITA PLANER UPGRADE

If you own one of the early Makita 2012 planers, you've probably had the bed vibrate downward during a cut, resulting in a board that's thicker at one end. That's because prior to October 1989 the planers didn't have a lock knob for the depth-of-cut adjustment. (The date of manufacture is stamped on the planer identification plate.) To solve this problem, Makita is now offering to install a lock knob for free if you take your planer to one of the company's 48 service centers nationwide. Call (714) 522-8088 for a service center near you.

DAN MAUERSBERG

TINY VIOLIN REALLY PLAYS

Lee Marbaugh of Columbus, Ohio, made this miniature violin from maple and basswood. It measures 3¾ in. long, 1⅜ in. wide, and the body is ½ in. thick. But what's really amazing is, this miniature actually plays. The tiny tunemaker took Marbaugh approximately 80 hours to build.

NEW TOOL-BUYING CLUB

Wholesale clubs have successfully sold everything from toasters and tomatoes to tires, but can they crack the woodworking market? Bob Hecker, founder of the Tool Network, thinks so.

The Tool Network is a "wholesale" woodworking tool club and outlet similar to Sam's Club. For a $35 annual membership fee, members receive a catalog and updates on the tools and supplies carried. The service sells abrasives and other supplies, plus hand tools, air tools, portable power tools, and accessories such as router bits and saw blades. The Tool Network will also negotiate directly with manufacturers to get the best price on special-order items.

Savings vary, but Hecker says the Tool Network is more than competitive with most wholesalers, and some products aren't offered wholesale anywhere else.

For more information, write: Tool Network, 181 W. Orangethorpe Ave. #C, Placentia, CA 92670, or call: (800) 234-0199.

Offcuts Contributors: Susannah Hogendorn, Andy Rae, David Sloan, Simon Watts

WOODWORKING QUIZ ANSWERS

The prizewinners from last issue's woodworking quiz are: Richard Holmquist of White River Junction, VT, first place ($100); Sharon Martin Howell of Oklahoma City, OK, second place ($50); and Jeff Brooks of Springfield, IL, third place ($25). Below are the questions and the correct answers.

1. If you were hand-planing the surface of this board along its length, which way would you push the plane? *This is our trick question.*

Reading the rising edge grain, it's clear the board must be planed right to left. Reading the end grain, you have to plane left to right. In truth, this board can't exist—it's a visual trick. We accepted both directions.

2. What does this symbol mean when written on a board? *It indicates a true reference surface; the mark points to the face edge.*

3. When would you be most likely to use an oval-headed wood screw? *Use it when you want to emphasize the screw or when you plan to remove the screws periodically.*

4. What types of fires would you put out with an ABC fire extinguisher? *You can use an ABC fire extinguisher to put out all fires.*

5. As it dries, is a green board more likely to cup away from the center of the tree, or toward it? *As a normal green board dries, the edges will cup away from the center of the tree.*

6. What government organization can supply information on commercially available timbers? *We accepted three answers: the USDA's Forest Products Lab (One Gifford Pinchot Dr., Madison, WI 53705), the U.S. Forest Service and the Small Business Administration.*

7. What tool was used in Colonial times for removing the bark from trees before hand-hewing? *The three tools designed especially for this task were the "barking iron," the "peeling chisel," and the "bark spud."*

8. What is a jack plane, and how did it get its name? *A jack plane is a general-purpose plane, longer than a smoothing plane but shorter than an edge-jointing plane. It is well described by the cruel phrase: "Jack of all trades and master of none."*

9. What is a *Schnitzelbank*? *A Schnitzelbank, also called a "shaving horse," is a bench with a foot-operated clamp used to hold a piece of wood for drawknifing or spokeshaving.*

10. How are sharks and woodworking related? *In the early 18th century sharkskin, or "shagreen," was sometimes used as sandpaper. It was also a popular covering for tool handles.*

ILLUSTRATIONS BY LARRY FREEDMAN

Jim's Corner

Offbeat Answers to Common Woodworking Questions

Q: What is "hide" glue?

A: Hide glue is any adhesive mixed with sawdust, stain, etc. that is used to conceal blemishes in the wood.

Q: What is "clear" pine?

A: Clear pine is what we used to call #2 Common. It doesn't really have a lot of knots at all, and mostly they don't go all the way through the board.

Q: What is "French polish?"

A: French polish is any finish applied vigorously with the lips and tongue.

Jim Cummins is a contributing editor to AW.

Q&A

Chamfering Plastic Laminate Countertops

Q How can I make a wide chamfer on a plastic laminate countertop?

Charles Black
Vancouver, WA

A You can make a beveled edge on a laminate counter with a hand-held router and two piloted router bits. If you glue the individual laminates from the bottom up, as shown in the drawing, they are less likely to catch and lift in use, and the joint lines will be less noticeable.

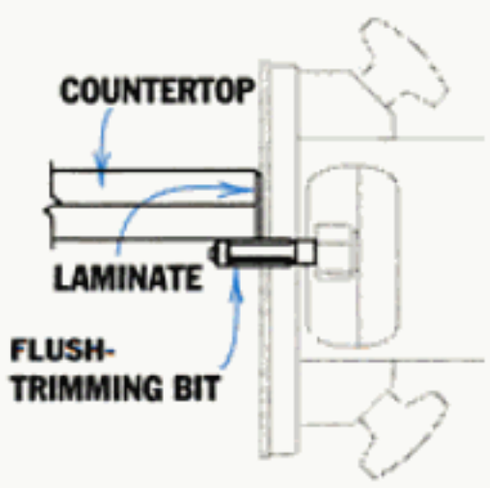
The drawings below show the general operation, but here are a couple points worth noting:

First, when you're trimming the laminate that's glued to the chamfer, you'll need to put a spacer on the top of the counter. This allows your router base to clear the untrimmed top edge of the laminate.

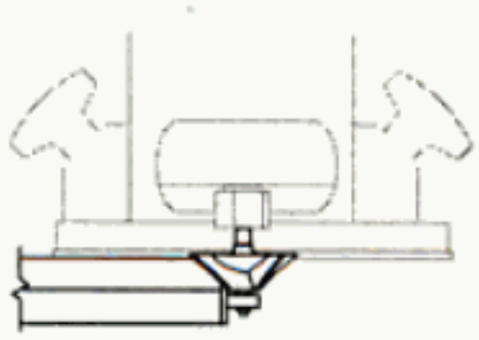
Second, make sure you apply firm, balanced pressure while routing, to keep the router from tipping.

Finally, if you use regular laminate, you'll expose the dark core of the laminate when you rout. This will produce a wide black line wherever the laminates meet. For seamless-looking joints, use a laminate that has a solid color throughout, such as Formica's "Colorcore" or Wilsonart's "Solicor."

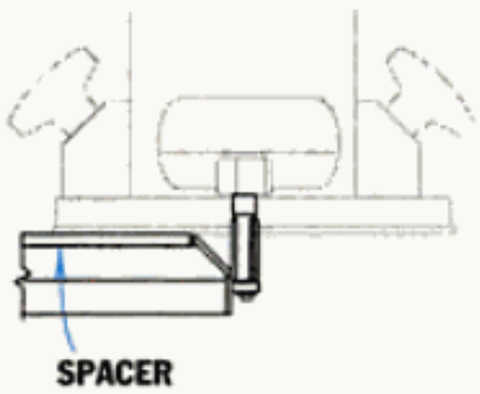
Andy Rae
Assistant editor



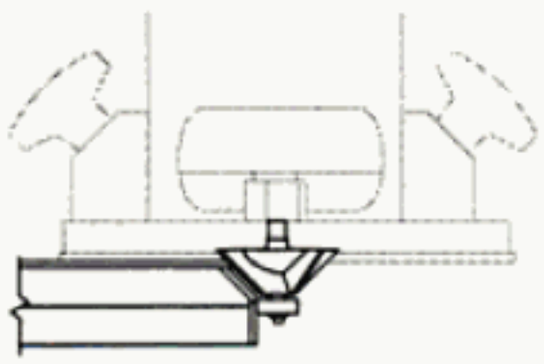
STEP 1: Glue laminate to front edge of counter, and rout bottom edge flush.



STEP 2: Rout bevel with chamfer bit.



STEP 3: Glue laminate onto chamfer, and trim flush with front edge, then with top.



STEP 4: Glue face laminate, and use chamfer bit to rout away all but 1/16 in. overhang. Finish up with mill file.

Sticky Bandsaw Blades

Q I noticed a heavy buildup on my bandsaw blade after resawing freshly cut plum logs. My saw is powered by a 1-HP motor, and I use a ½-in.-wide, 3-tooth-per-in. blade. Are there any tips for removing the residue, and is there anything I can do to prevent this buildup next time?

Larry Moseley
San Francisco, CA

A Even with a 1-HP motor and a resaw blade, you can still get buildup, especially with green wood. The key is to reduce the amount of friction—and thus heat—on the blade, because heat causes the buildup.

One source of friction is the speed at which the blade travels through the wood. The solution is to slow the saw blade down from its normal speed of 3,000 fpm (ft. per minute) to about 1,200 fpm, by installing a smaller-diameter pulley on the motor and a larger pulley on the saw's arbor.

A second source of friction is wood binding against the blade, which may occur if a workpiece twists during the cut, or if wood movement closes the kerf behind the blade. To prevent twisting, make sure the bottom of your workpiece is flat, or mount it to a carrier made from a flat board. If the kerf is pinching the blade, wedge it open as you cut.

Also, you can reduce friction by spraying a vegetable shortening such as "PAM" on the blade.

To clean a blade, remove it from the saw, coil it and put it in the sink. Then spray the blade with a foaming oven cleaner that contains a caustic ingredient such as lye. After 10 minutes, simply rinse away the residue with cold water and towel-dry the blade. Before reinstalling the blade, it's also a good idea to clean your bandsaw's wheels and guides with a brass brush.

Jim Cummins
Contributing editor
Woodstock, NY

Q&A

Hand-Plane Tuneup

Q A friend of mine told me that new bench planes are worthless right out of the box. He said that you have to take the plane to a machinist to have the sole flattened and the sides ground square. Is this really necessary to get good results?

Rich Kuyper
Amsterdam, NY

A New bench planes usually need attention, but you can easily do everything in your own shop.

First, check the sole for flatness by rubbing it over a piece of 220-grit wet/dry silicon-carbide sandpaper that's been spray-mounted to a dead-flat surface, such as ⅜-in. plate glass. Use kerosene or water as a lubricant. Rub the plane back and forth lightly a half dozen times, then look at the sole. The sandpaper scratches indicate the high points, and the dark metal on the sole indicates the hollows. Your goal is to sand until the critical areas of the sole—at the toe, around the throat, the heel, and along the edges—are flat. Less than an hour's work should be enough.

BENCH PLANE DETAIL

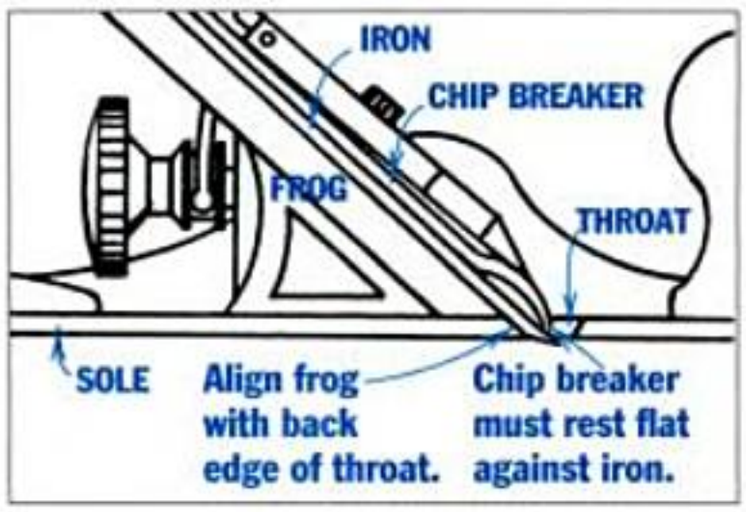


ILLUSTRATION BY FRANK ROHRBACH

Next you'll want to file the edge of the chip breaker so that it will rest flat against the iron. Any gaps will allow shavings to wedge between the two parts. To hold the chip breaker securely when you're flattening, clamp it in a bench vise so the edge you're filing is facing up and parallel to the floor.

Then adjust the position of the frog (see drawing) so it lines up with the back of the throat. Try the plane and if it chatters move the frog forward slightly. Once the plane is cutting well, you can do most of your planing without further adjustment. For diffi-

WHERE TO FIND IT

Bluing for coloring cabinet hardware, gun barrels and other ferrous metals is available from Brownell's, 200 S. Front St., Montezuma, IA 50171, (515) 623-5401.

Books and pamphlets on old and antique tools are available from Astragal Press, Box 239, Mendham, NJ 07945, (201) 543-3045.

Nickel-cadmium cells for rebuilding rechargeable battery packs are available from H & R Co., 18 Canal St., Bristol, PA 19007, (215) 788-5583.

cult woods, you can move the frog forward to narrow the throat opening for a smoother cut.

Leave the sides of your bench plane as they are. A rabbet plane should have square sides, but a bench plane is less demanding.

Peter Korn
Furniture maker and teacher
Rockland, ME

Keeping the Bark

Q I want to make a rustic-style bed from some birch trees, and I plan to keep the bark on the poles that I harvest. Is there a particular type of birch I should use, and how can I prevent the bark from coming off?

Joseph Beil
Pasadena, MD

A Birch bark, while beautiful, is very delicate. Proper handling and drying of the wood are essential to keeping the bark on.

First, be careful not to knock the bark while felling the trees or working the poles. A bruised spot will darken, and it may peel.

I would use gray birch (sometimes called "old field birch"), with yellow birch running a close second. Pick the healthiest specimen you can find, and harvest the tree in the dead of winter, or at least before the sap starts to rise. If your design permits, stay with poles under 3 in. dia. Larger stock will shrink more in the drying process, loosening the bark and causing excessive end checking.

Birch is prone to decay, so it's important to dry the felled poles properly. The easiest method is to stack and sticker the wood in a heated room in your house, using a small fan directed at the ends of the poles to blow air through the stack. If your spouse objects, a dehumidifier tent is the next best thing. You can make one from a sheet of plastic, a fan, and a small heat source such as an electric heater. Keep the ends of the tent partly open, stacking the poles and blowing air over them as described above. Don't let the temperature get over 100° F—you don't want to bake the wood. Either way, cut a few extra poles in case you lose a few to checking as they dry.

Don't put a finish on the completed work: It tends to "muddy" the clean appearance of the bark. As a final touch, use a stiff-bristled paintbrush to gently remove any loose bark.

Greg Harkins
Rustic chairmaker
Vaughan, MS

Got a woodworking question for the experts?
Send it to "Q&A,"
AMERICAN WOODWORKER,
33 E. Minor St., Emmaus, PA 18098,
or phone your message to us at
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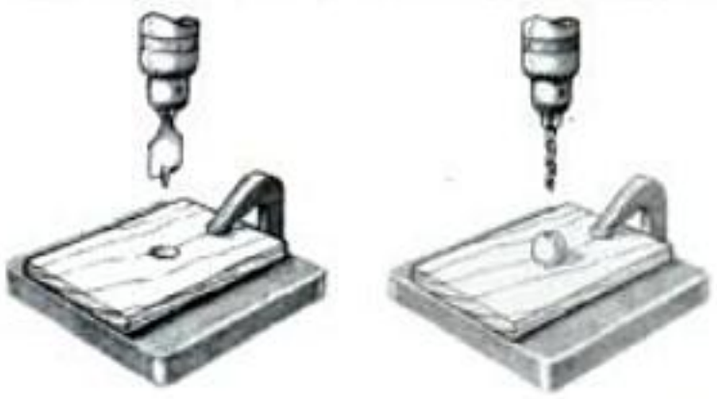
TECH TIPS

Hole in One

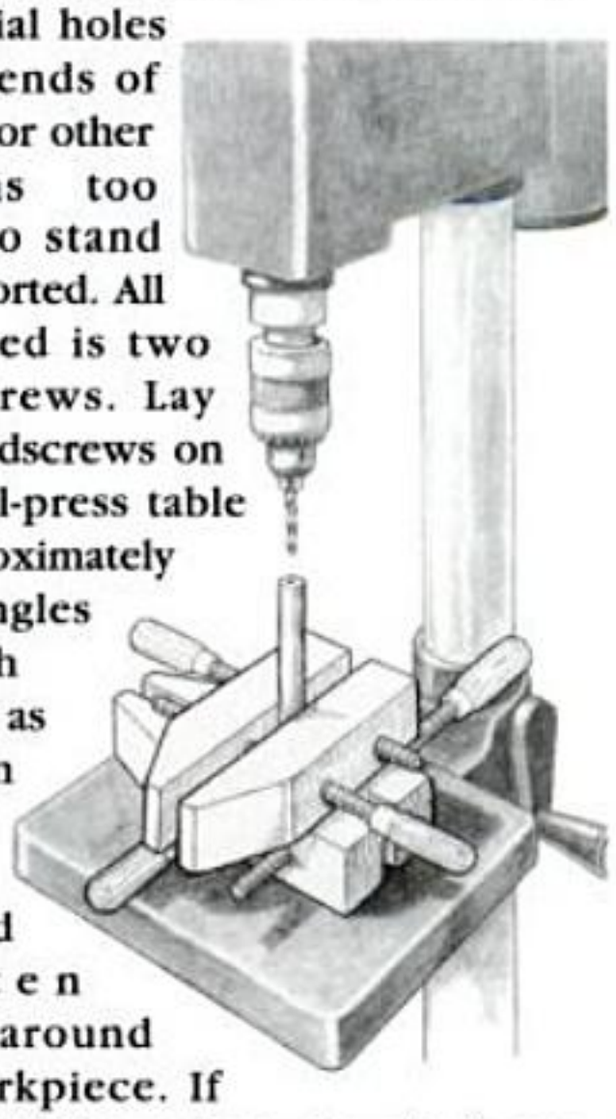
To drill holes exactly centered on a sphere, I first clamp a piece of scrap to the drill-press table. Then I drill a hole with a diameter about three-quarters that of the sphere. Without disturbing the setup I change bits, position the ball in the hole, hold it firmly and drill. I used this trick when drilling the feet for the napkin holder featured in AW #38.



Yeung Chan
Millbrae, CA

Drilling Axial Holes

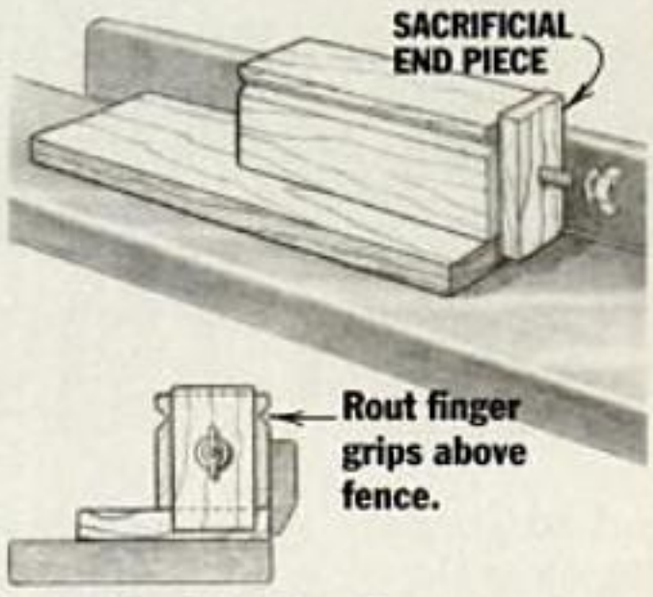
This is a quick, accurate method to drill axial holes in the ends of dowels or other sections too small to stand unsupported. All you need is two handscrews. Lay the handscrews on the drill-press table at approximately right angles to each other, as shown in the drawing, and tighten them around the workpiece. If you're drilling a long dowel, it can project down through the hole in the table. If the dowel is too large to fit through the hole, swing the table over to one side and let the clamps project over the edge.



Daniel Haubert
Farmington Hills, MI

BEST TIP

Chip Coffin, of Sunnyvale, CA, wins $200 for this labor-saving tip, judged by our editors as the best of the issue. For details on how you can win cash for your favorite workshop tips, see the box on page 20.



4x4 Push Block

I use this 12-in.-long 4x4 as a push block when jointing small pieces. This not only gives me better control, but the weight helps prevent kickback. Also, the push block has a sacrificial wood catch on the end (see drawing) which is easy to replace should it get cut by the jointer knives.

A stud and wing nut hold this sacrificial catch to the end of the 4x4. And I cut the hole in the catch off center so that the catch has two positions—one for pushing thick stock, the other for thin stock.

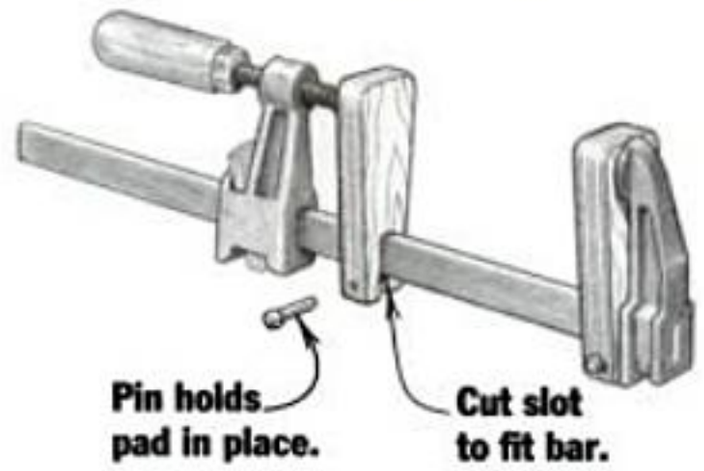
Reverse Clamping

If you have difficulty taking a joint apart after a trial fit, don't beat it with a hammer or mallet. Coax it apart by inserting a wooden handscrew between the parts and turning the screws in reverse. The Quakers have a name for this technique: "Friendly persuasion."

Deanna Driscoll
San Francisco, CA

Deluxe Clamp Pads

When clamping up finished surfaces with iron clamps, you need wood pads—fast. My pads stay put in any position yet are easily removed by pulling out the wood pin. The bearing surfaces are larger than those on the metal pads, so they're less likely to dent the wood. Plywood faced with a soft wood such as poplar or pine works best, but fir would do.

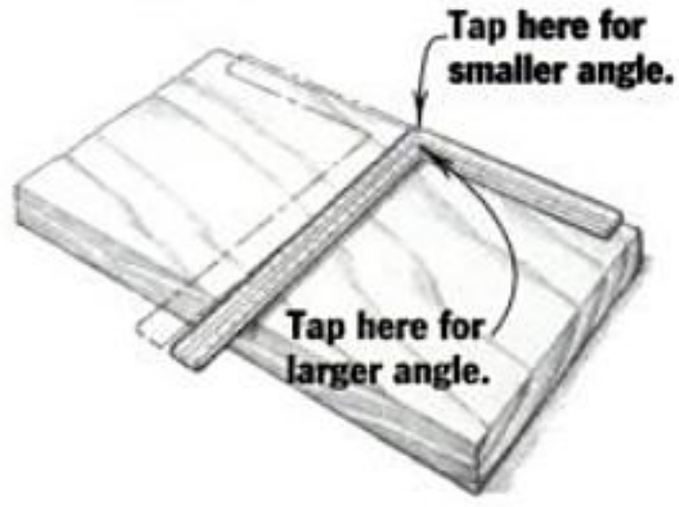


I made several sets of pads, both for my regular bar clamps and for my miniature clamps. I used 7/32-in. wood axle pegs for the pins, but 1/8-in. cotter pins would work equally well.

Ralph Sanders
Shoreham, NY

Squaring a Square

To check a framing square for accuracy, lay it along the side of a board and draw a line. Then flip it and do the same. If the lines coincide, that's all well and good. But if they don't...?



Lay the corner of the square on an anvil and tap the face with a ball-peen hammer. Hitting it close to the outside corner reduces the angle; tapping near the inside corner increases it.

Hugh Lineback
Siloam Springs, AR

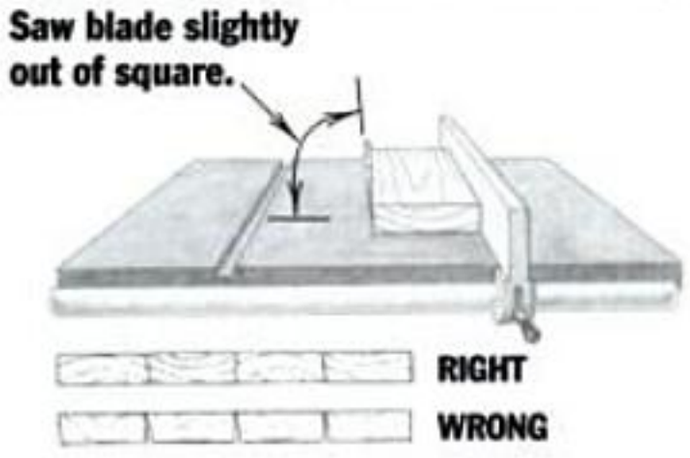
Ripping Stock for Glue-Up

When ripping stock for edge gluing, try alternating the boards face side up

ILLUSTRATIONS BY HEATHER BRINE LAMBERT

TECH TIPS

and face side down. You'll find that even if the blade is not set at exactly



90° to the saw table, the slight error cancels and the glued-up panel will be perfectly flat.

Howard Gaston
Naples, FL

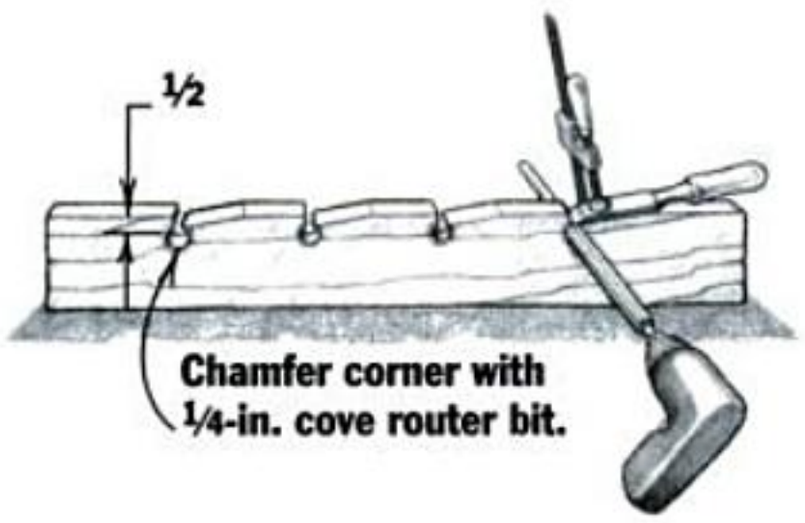
Slipping Clamps

If your pipe clamps slip, it might be because the pipes are made from galvanized rather than black iron. "Pony" clamps will hold well on black iron, but the clutch discs tend to skid across the zinc coating on galvanized pipe.

Willy Foxx
Little Rock, AR

Dowel-Rod Jig

This jig works very much like an old-fashioned pencil sharpener. After sawing and drilling in a piece of fir as shown, I clamp a 2-in.-wide chisel to it, bevel side up. The flat, on which the chisel rests, must be exactly tangent to the hole. I saw the dowel

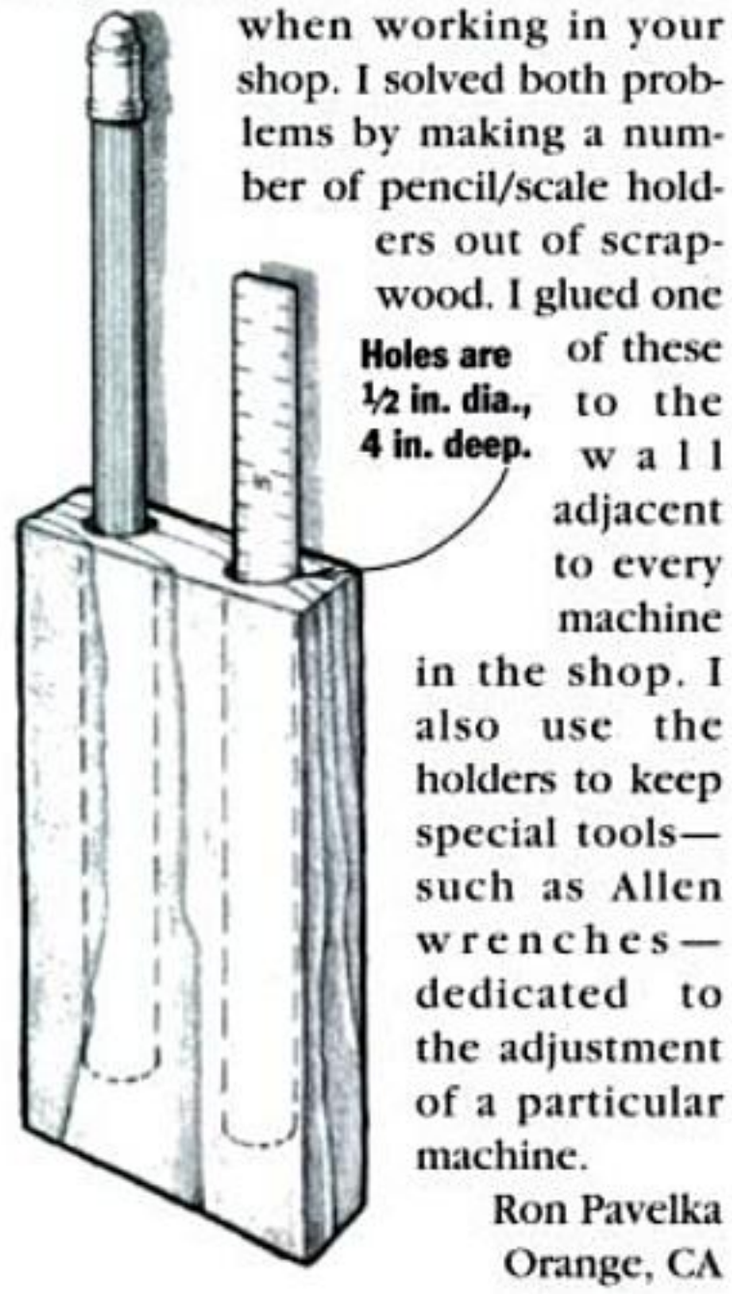


stock roughly to an octagon, chamfer one end and chuck the other end in an electric drill. Starting at slow speed, I feed the stock through the hole. Skewing the chisel slightly gives a smoother cut.

Robert Tucker
Canton, SD

Pencil/Rule Holders

If you are anything like me, you're always looking for a pencil or a scale when working in your shop. I solved both problems by making a number of pencil/scale holders out of scrapwood. I glued one



of these to the wall adjacent to every machine in the shop. I also use the holders to keep special tools—such as Allen wrenches—dedicated to the adjustment of a particular machine.

Ron Pavelka
Orange, CA

Hand-Friendly Knobs

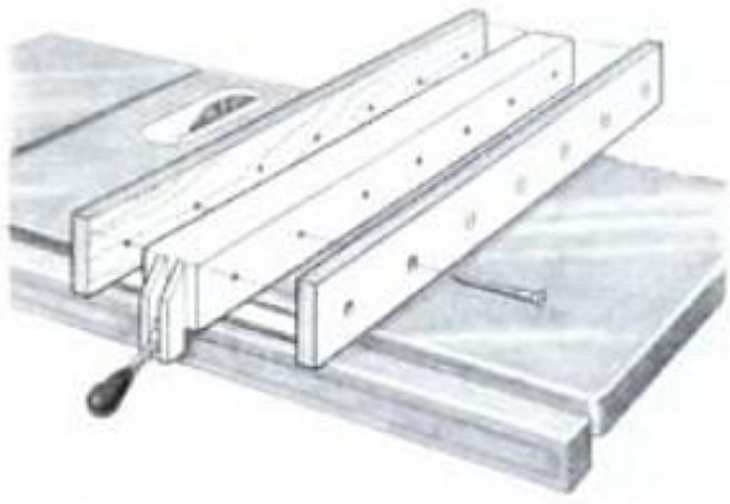
The blade-tensioning knob on my 12-in. Sears bandsaw is not too kind to

my arthritic hands. So I added a crank and an extra knob as shown above. Other hard-to-turn knobs would also benefit from this treatment.

Alexander Tryba
Benton, IL

Refacing Your Fence

If you've accidentally scarred your Biesemeyer fence with a moving saw blade, here's how to repair it: Remove the laminate from both sides of the fence and replace it with two pieces of ¾-in. plywood, faced with



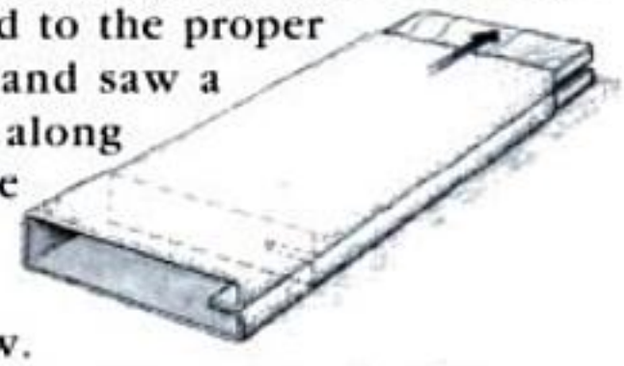
white plastic laminate on both sides. Attach the plywood by driving 3½-in. drywall screws through from the right side of the fence, so the screws penetrate but don't protrude from the plywood on the left side. Countersink the heads so they're flush.

I made the new facings for my saw higher than the standard ones supplied by Biesemeyer. I find higher facings to be an advantage.

John Grew-Sheridan
San Francisco, CA

Full-Sheet Sanding Pad

I don't like to waste time cutting up sandpaper to fit a sanding block, so I made this custom block to fit the paper instead. Just cut a piece of ¾-in. plywood to the proper width, and saw a groove along one edge with the tablesaw.



To get the paper started, slip one edge into the groove, wrap the paper around the block as shown, and slip the other end of the paper into the groove. Then you can slide the paper down the block. To hold lightweight paper in place, slide a tongue depressor into the slot to take up slop.

Bruce Hogan
Long Branch, NJ

BEST TIP WINS $200

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

Tuning Your Tablesaw

Improve Your Saw's Accuracy With These Basic Steps

By Roger Cliffe

To check parallelism of saw blade to miter slots, author holds stick against front of blade and spins blade by hand, noting sound (above). Moving to back of blade, he spins again (below). Difference in sound indicates *heeling*, or an out-of-parallel blade.

The tablesaw is one of the most versatile machines in any shop. You can use it to rip and crosscut truckloads of stock, or cut small, precise joinery, like dovetails or box joints. But sometimes your joints don't fit as well as you'd like, or worse, a board kicks back at you unexpectedly. That's usually a sign it's time to tune up your saw.

A careful tuneup will increase the accuracy of your saw and make it safer to use. And if you've just bought a new saw, it's likely it will need a tuneup. In this article, I'll talk about how to assess whether your tablesaw is out of tune, and I'll offer some simple techniques to help you get it running at peak performance. Since saws differ in design and construction, I'll cover the basic methods that work with any model. For specific techniques, you may need to refer to your owner's manual.

I divide a tuneup into four parts—vibration control, alignment, adjustment and cleaning—and I work through the tuneup in that order. If you change the order, you may find you have to repeat a process later. Remember to unplug the saw when appropriate.

Vibration Control

Most vibration in a tablesaw will eventually find its way to the saw blade. In addition to decreasing the quality of your cut, vibration can increase noise and even cause the saw to start walking across the floor.

There are clues that will tell you if your saw is vibrating excessively. Look for parts, such as the blade guard, that rattle while the saw is running. Or you can test for vibration by tilting the blade to 45° and cutting a miter: If the cut is ragged, you probably have a vibration problem. This could be the result of a badly vibrating motor or worn arbor bearings, and if either of these is the problem you'll have to replace the offending part. But if these check out, here's what to do next:

- **Check the saw blade:** Vibration can occur if a blade is poorly ground and tensioned, or if there's play between the blade's arbor hole and your saw's arbor. (See drawing.) Try replacing the blade with a more rigid one that has an accurately reamed arbor hole; it's less likely to vibrate. (See "Carbide Saw Blades," AW #32.)
- **Check the arbor assembly:** The arbor washer distributes the force of the arbor nut, holding the blade securely against the arbor flange. (See drawing.)

If the arbor flange has runout, the blade won't spin in a flat orbit. Check for runout on the flange by placing a dial indicator against the face of the flange near the rim. If the amount of runout is more than 0.001 in. on a 2½-in.-dia. flange, your best bet is to replace the arbor since the flange and arbor are machined as one piece. Refer to your owner's manual for this operation.

If the face of the arbor washer has bumps because it's been dropped on the floor, the washer won't sit flat against the saw blade. Flatten any bumps and high spots by working the washer back and forth on a flat sharpening stone.

- **Check the belt and pulleys:** (See drawing.) If the belt is flawed, it can ride roughly on the pulleys, a condition known as "belt slap." You'll also get vibration if

PHOTOS BY ROGER CLIFFE

ANATOMY OF A CONTRACTOR-TYPE SAW

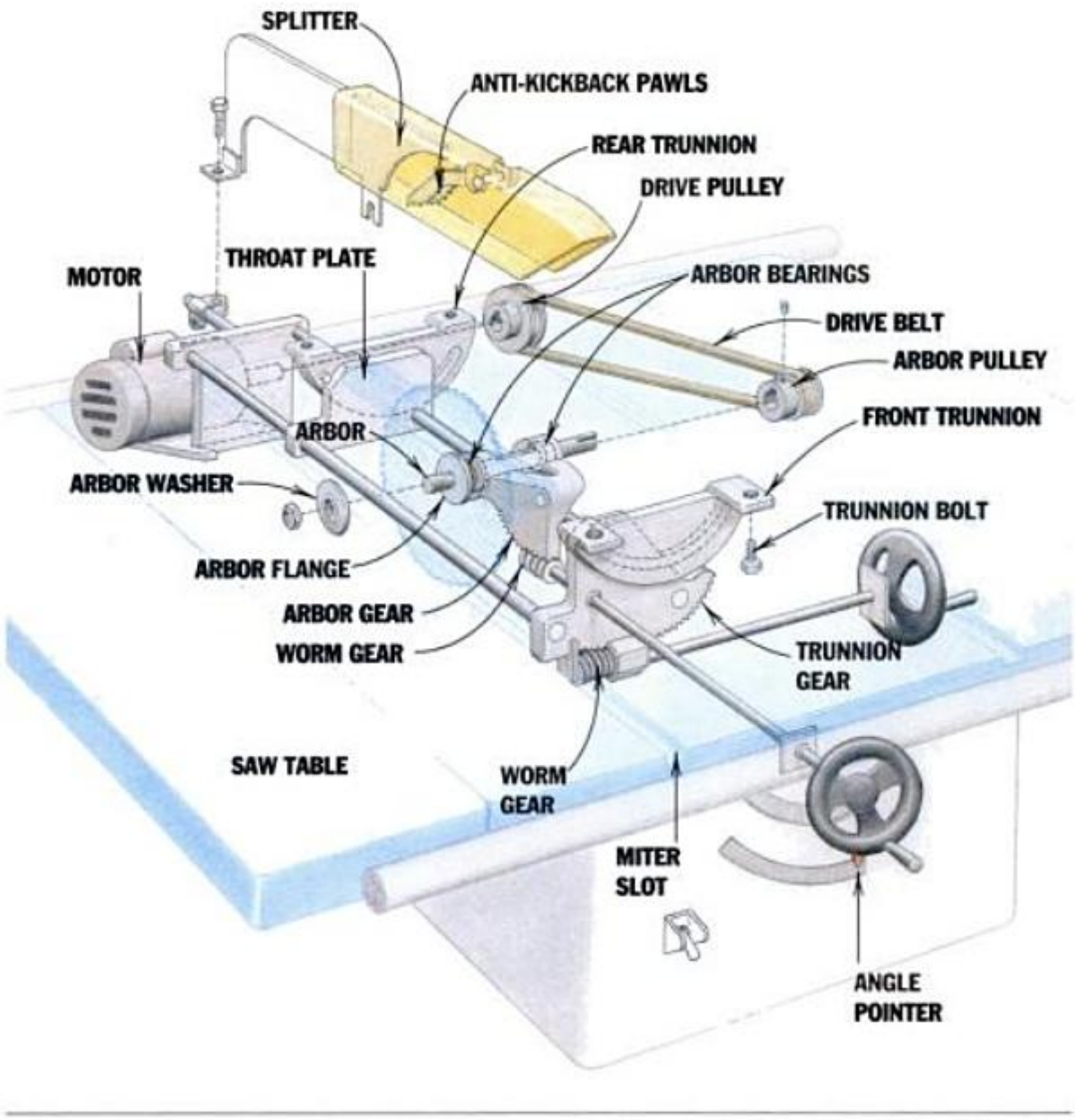


ILLUSTRATION BY FRANK ROHRBACH

the pulleys aren't aligned with each other or if they're out of balance.

To check the belt, feel where the ends of the belt meet. If it isn't smooth, replace the belt. Buy your belts from an electric-motor shop or a woodworking supplier, not an auto-parts store: Belts sold for automobiles do not have the appropriate "V" shape for electric-motor pulleys.

You might also try a segmented belt (see Sources, page 25), which is made up of separate links. These belts can cost three times as much as standard belts, but they smooth out vibrations since the flexible joints follow the pulleys' contours. (See photo, below.)

PHOTOS BY ANDY RAE

Segmented belts are less prone to vibration than standard one-piece belts.

Check pulley alignment by holding a straightedge across the face of both pulleys. If the two pulleys aren't in line, loosen the set screw that holds the drive pulley to the motor arbor, and move the pulley into alignment.

Once the pulleys are lined up, if the straightedge doesn't sit flat against the pulleys, the motor arbor and saw arbor aren't parallel. To correct this, loosen the bolts on the motor mount and shift the motor or insert shims between motor and mount until your straightedge contacts both pulleys fully, then retighten the mount.

Die-cast pulleys may have off-center holes, which will cause them to run out of balance. Check for this condition by removing the belt and holding a pencil point against the rim of the pulley as you spin the pulley by hand. If the lead line isn't continuous around the rim, the pulley is out of balance.

The hole in a die-cast pulley also may enlarge over time from motor surges, causing the pulley to wobble. Check for play by loosening the pulley's set screw and moving the pulley by hand. If it's sloppy, I recommend replacing the pulley with a cast-iron or steel machined pulley. (See Sources.) These pulleys resist wear much better, and their rims are machined round for better balance.

• **Check your saw's stance on the floor:** A saw that rocks will create vibration, and is unsafe. Some saws have feet that can be adjusted to compensate for an uneven floor. If there's no adjustment on your saw, insert shims or slips of veneer.

Installing blade stabilizers, either singly or in pairs, helps the blade run in a flatter orbit.

At this point, if vibration shows up in a test cut, try installing blade stabilizers. (See Sources.) These dampen vibration by holding the blade in a flatter orbit. (See photo, above.)

Alignment

Once you've eliminated as much vibration as possible, it's time to turn your attention to alignment problems. Poor alignment of the table or fence can reduce the control you have over your work, resulting in sloppy cuts or even kickback.

• **Aligning the blade:** A saw blade that isn't aligned parallel to the miter slots is said to have *heel*. This can cause your workpiece to creep into or away from the blade during crosscutting, or it can tear out grain on the underside. Also, a heeled blade can throw an excessive amount of sawdust back at you.

Check for heel with a simple test: Raise the blade to full height, then slide a thin stick along your miter gauge until it touches the teeth at the front or infeed side of the blade. (See lead photos, opposite.) Hold the stick firmly and spin the blade by hand, listening to the sound as the blade grazes the stick.

Next, holding the stick tightly

against the miter gauge, slide the gauge along the miter slot until the stick touches the teeth at the back of the blade. Spin the blade again. If the sound is the same, the blade is parallel to the miter slot. If the sound is louder, your blade is closer to the miter slot at the back. If the sound is faint, or you don't hear anything at all, it means the blade is heeling *away* from the slot at the back of the blade.

To realign the saw blade with the miter slots on a cabinet saw, loosen the bolts that hold the table to the machine's base, and shift the table by tapping the edge with a rubber mallet or a block of wood. Tap gently; excessive force could crack the casting.

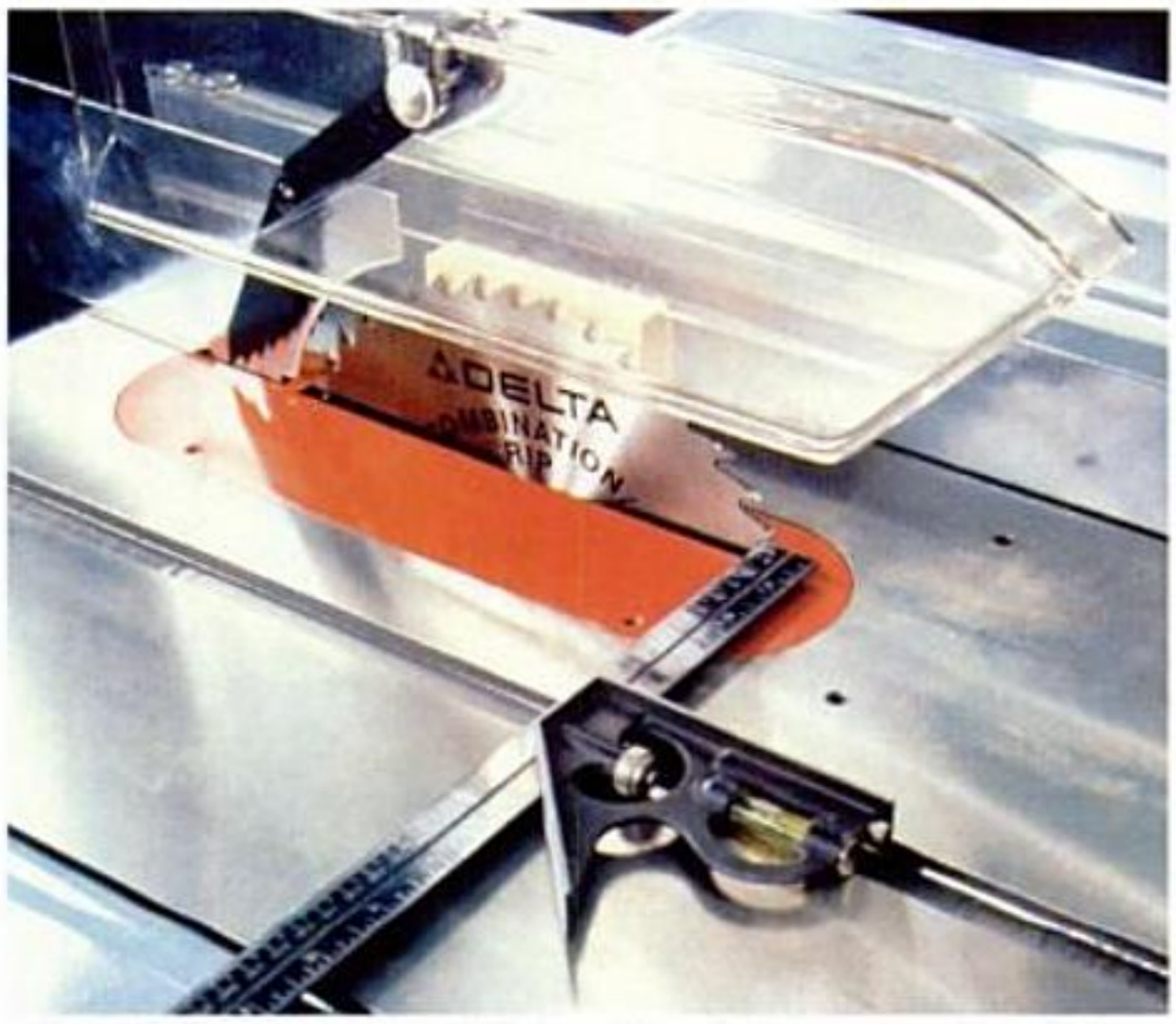
I use a combination square to check the alignment as I tap, though there are a number of devices on the market that will quickly give you dead-accurate alignment. (See Sources.)

First, choose a tooth at the front of your blade and mark it with a crayon. If you're aligning with a combination square, place the head of the square in one of the miter slots and extend the square's blade until it *just* touches the marked tooth at the infeed side of the blade. (See photo.) Then rotate the tooth to the outfeed side and reposition the square adjacent to the tooth. If it *just* touches the tooth here, the saw blade is aligned with the miter slot. If not, keep tapping the table (you'll have to readjust the square as you test) until the square touches the tooth evenly at both locations. Tighten the bolts, then check once more with the square, since the table can creep out of alignment as you snug the bolts down.

To realign the blade with the miter slots on contractors' saws and benchtop models, you have to move the front and rear trunnions (see drawing), which are attached to the underside of the table. To get at the trunnion bolts, reach inside the saw body from underneath, then loosen the bolts and tap the trunnion assembly, checking for alignment as described previously. (Some benchtop saws have adjustment bolts accessible from the *top* of the table, making this job easier.)

On some saws, the mounting holes in the trunnions may not have enough slop to let you align the blade with the miter slots. In this case, enlarge the mounting holes with a rat-tail or similar round file.

Whichever type of saw you own, I recommend replacing the mounting bolts with grade #5 bolts, which are marked by three radial lines on the heads of the bolts. The more common grade #2 bolts are softer and have a tendency to loosen over time. Most hardware stores either stock or can order grade #5 bolts, or you can order them by mail. (See Sources.)



When aligning the blade with the miter slot, measure the distance from the slot to the blade with a combination square placed in the table's miter slot.

ROGER CLIFFE

- **Aligning the rip fence:** A fence that's closer to the blade at the outfeed side of the saw can result in burning on the edge of your work and cause dangerous kickback when ripping, because you're feeding wood into a funnel. To determine if the fence is parallel to the blade, fit a scrap stick into the right miter slot and move the fence over until it almost touches the stick, then lock down the fence. (See photo, next page.) The gap between the fence and the stick should be uniform. If not, the fence isn't parallel to the slot.

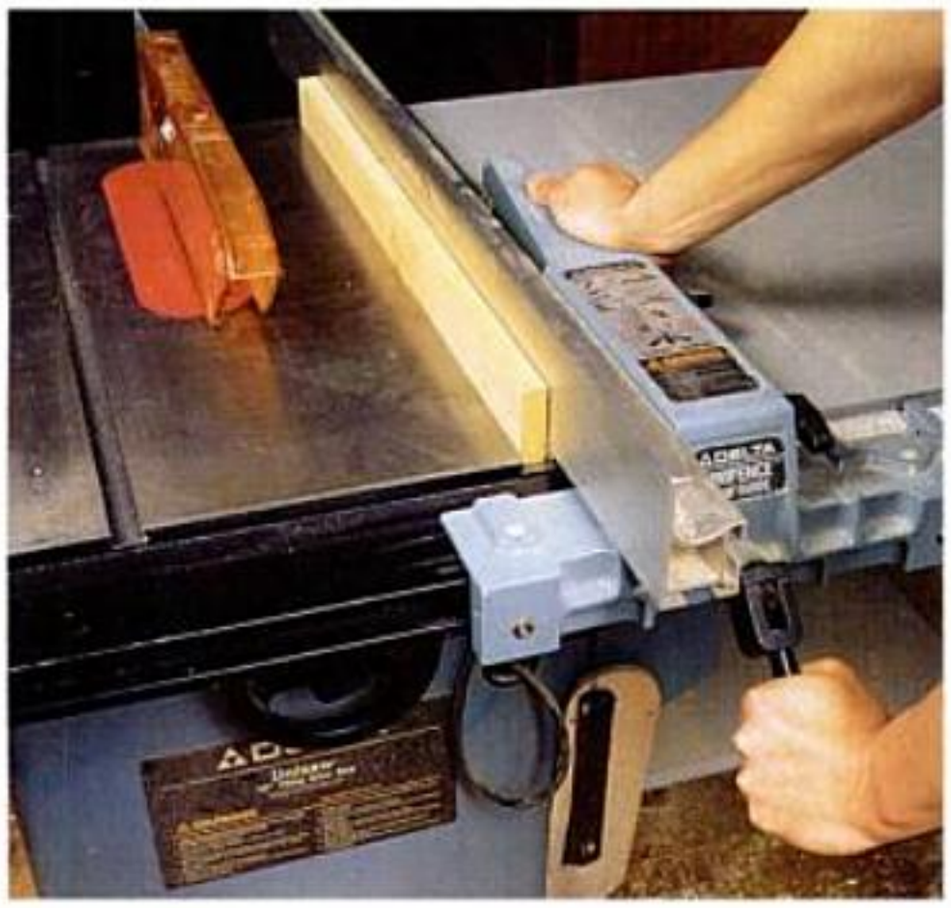
You can adjust most fences by loosening one or two bolts on top of the fence, shifting the fence until there's an even gap along your test stick, and then retightening the bolts. If your fence doesn't adjust this way, refer to the manufacturer's instructions.

Some woodworkers adjust the outfeed end of the fence so that it's 1/64 in. farther from the miter slot than the infeed end, to reduce the chance of kickback. I find this system flawed for two reasons: First, if you move the fence to the other side of the blade, (say, when raising a panel) you'll be feeding into a funnel and the work is likely to kick back at you. This means you'll have to realign the fence every time you position it to the left of the blade. Second, a fence aligned this way will cause the blade to throw more dust and chips at you, because the work follows the fence and is not moving parallel to the blade.

Finally, you'll need to use a square to determine whether the *faces* of the fence are perpendicular to the table. This is important if you plan to use an auxiliary fence for cutting raised panels or tenons, as any tilt will be transferred to the workpiece. If the fence is out of square to the table, you'll have to screw or bolt wooden auxiliary fences onto the rip fence and shim them to the correct angle.

- **Aligning the splitter:** Your splitter should be centered directly behind the saw blade so it doesn't snag your workpiece. (See drawing.) To check the splitter alignment, raise the blade to full height and hold a straightedge against one side of the blade, then the other. (Don't let the straightedge touch the teeth.) The splitter should not touch the straightedge. If it does, loosen the bolts that hold it in place, and realign it. Then recheck with the straightedge after you've tightened the bolts.

At this time it's also a good idea to check the anti-kickback pawls. They need to be sharp, or else they won't be able to grab a workpiece if it starts to kick back. To sharpen them, use a file.



ANDY RAE

Check to see if the fence is parallel to the blade by sliding the fence close to a strip of wood fit in the miter slot, and locking the fence. An uneven gap between fence and strip reveals a fence out of parallel to the slot.

Adjustment

Adjusting the tilting mechanism, miter gauge, and throat plate will increase your saw's accuracy and make it safer.

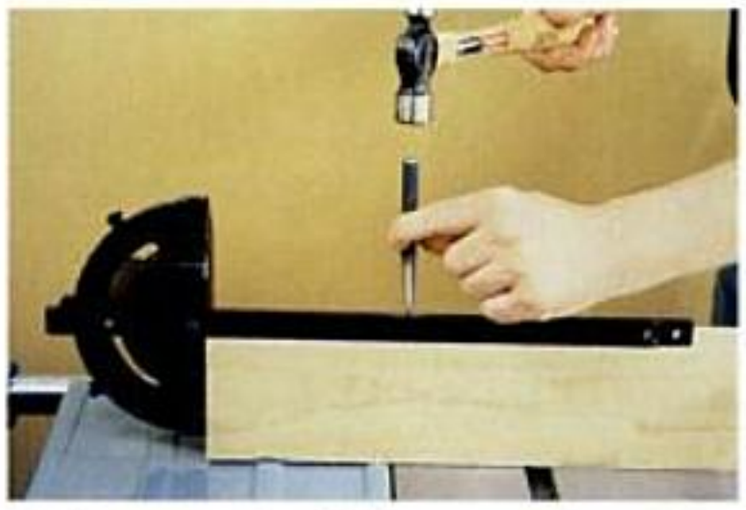
• Adjusting the tilting mechanism: Most tablesaws have stop bolts designed to register the blade at 90° and 45°. To check the 90° stop, raise the saw blade to full height and check with an accurate square that the blade is 90° to the table. If the angle is less than 90°, reach inside the saw and adjust the 90° stop bolt. Once you've squared the blade, turn the bolt tightly against its stop, then lock it in place with the jam nut. As a final test, make a crosscut on some scrap, and check it with your square. Use the same procedure to set up the 45° stop, but use a bevel gauge set at 45° instead of a square to measure the angle. Once both stops are set, readjust the pointer on the saw's angle scale.

• Adjusting the miter gauge: Your miter gauge may have stops for 45° and 90° angle settings. If they're out of position, you can adjust them with a square or a draftsman's triangle.

Next, check for slop between the miter-gauge bar and the saw's miter slots. Any side-to-side play in the slot can lead to inaccurate crosscuts. To eliminate the slop, hold the miter bar on edge on a scrap of wood, and make a series of dimples along the edge of the bar with a hammer and center punch. (See photo, above.) Test the fit of the bar in the slot. It should slide smoothly without play. If the bar is now too tight, use a file to reduce the height of the dimples.

It's also important for the face of the miter-gauge head to be perpendicular to the saw table, so that a workpiece placed against it will be supported fully as you slide it on the table. Check the face with a square: If it's out, screw a straight piece of wood to the gauge and shim it until its face is square to the table.

• Adjusting the throat plate: If the throat plate sits above the surface of the table, it will obstruct the workpiece or force the work off its intended path. If the plate is below the surface, the workpiece can catch on the back edge of the table opening, and thin workpieces may chatter during cuts.



ROGER CLIFFE

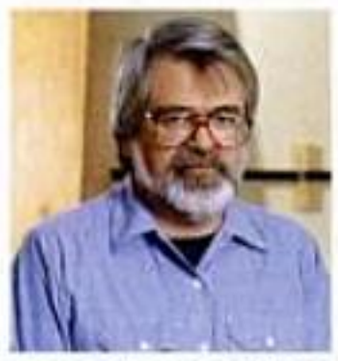
To improve the fit between the miter-gauge bar and miter slot, author makes a series of dimples along the edge of the bar with a center punch.

Most saw inserts have set screws that let you adjust them flush with the tabletop. Turn the screws in or out until the plate just touches the edge of a straightedge laid across the opening. If there are no adjusting screws on your insert, you can shim up the plate with masking tape or lower it by filing some material off the bottom.

Cleaning

Periodic cleaning can improve performance and help keep a saw in tune over time.

Regularly blow or scrape out any dust or resin buildup from the inside of your saw, paying special attention to the gears of the elevating and tilting mechanisms. Then lubricate the gears with paste wax. I wouldn't use a petroleum-based product such as grease or motor oil—it will attract dust. If your motor has ventilation holes, blow them out with compressed air to prevent dust from overheating the motor. To keep the table smooth and as friction-free as possible, rub the saw surface with a cloth dipped in paste wax. Finish by buffing with a soft cloth. ▲



ROGER CLIFFE *has taught woodworking for over 20 years and is the author of Table Saw Basics (1991) and Table Saw Techniques (1984), both published by Sterling Publishing (387 Park Ave. S., New York, NY 10016).*

SOURCES

Segmented belts and machined pulleys are available from:

E. James, 1725 W. Division St., Chicago, IL 60622
(312) 227-1881, Circle #601

Woodcraft, 210 Wood County Industrial Park, Box 1686, Parkersburg, WV 26102
(800) 225-1153, Circle #602

Saw blade stabilizers are available from:

CMT Tools, 5425 Beaumont Center Blvd., Suite 900, Tampa, FL 33634
(800) 531-5559, Circle #603

Forrest Mfg., 461 River Rd., Clifton, NJ 07014
(800) 733-7111, Circle #604

Freud, 218 Feld Ave., High Point, NC 27264
(910) 434-8312, Circle #605

Alignment tools are available from:

Accurate Technology, Inc., 11533 NE 118th St., Suite 20, Kirkland, WA 98034
(800) 233-0580, Circle #606

B.C. Ames Co., 131 Lexington St., Box 70, Waltham, MA 02254
(800) 438-4249, Circle #607

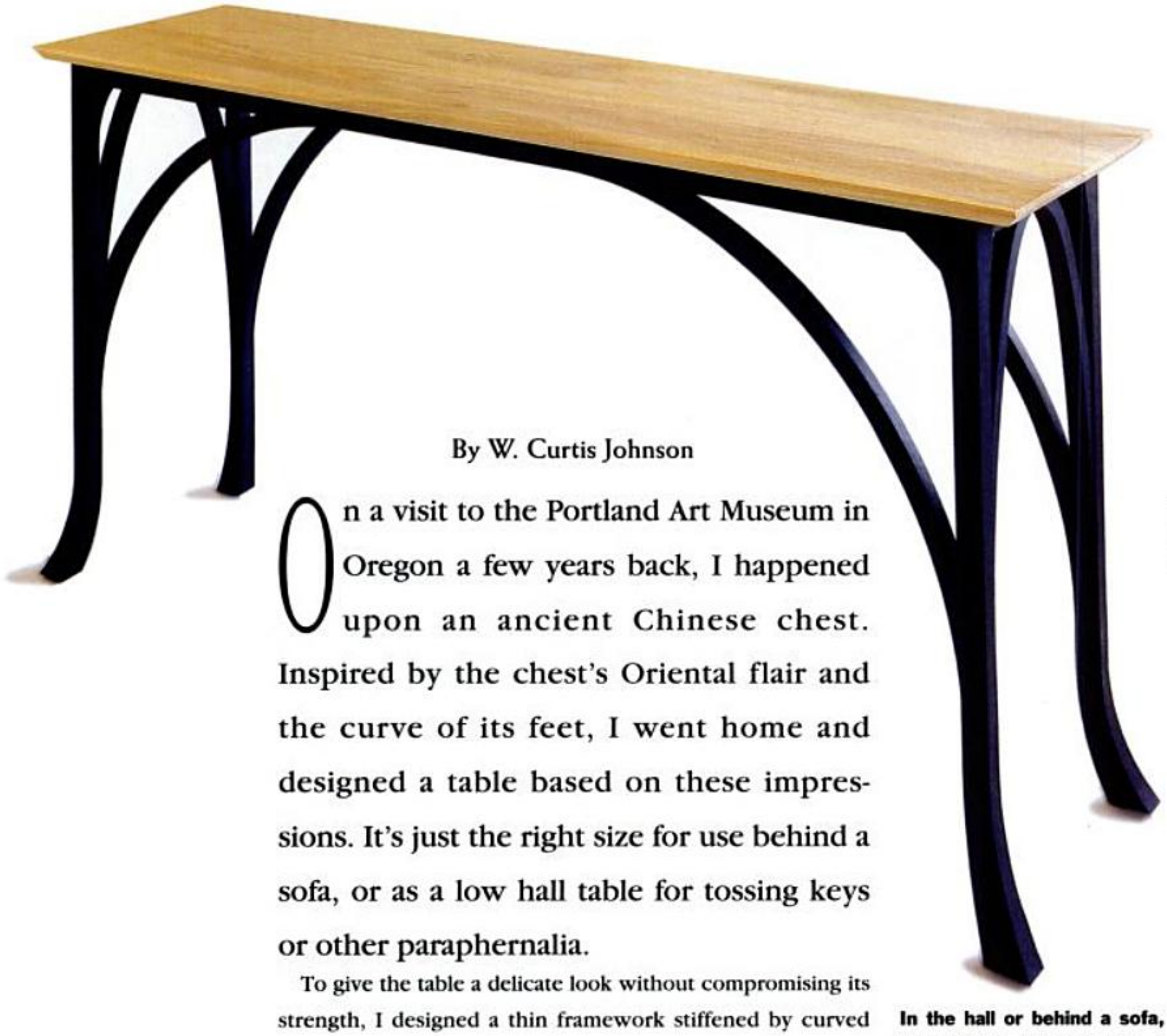
Exact Cuts Tool Co., Dept. AWT, Box 268, Florence, OR 97439
(800) 643-7411, Circle #608

Grade #5 bolts are available from:

Nolan Supply, Box 6289, 111-115 Leo Ave., Syracuse, NY 13217
(800) 736-2204, Circle #625

HALL TABLE

Slender Curves Create Strength and Beauty



By W. Curtis Johnson

On a visit to the Portland Art Museum in Oregon a few years back, I happened upon an ancient Chinese chest. Inspired by the chest's Oriental flair and the curve of its feet, I went home and designed a table based on these impressions. It's just the right size for use behind a sofa, or as a low hall table for tossing keys or other paraphernalia.

To give the table a delicate look without compromising its strength, I designed a thin framework stiffened by curved braces at the ends and the sides of the table. (See drawing.) I made these curved braces by gluing up thin strips of wood and bending them around a particleboard form. Small chamfers on the frame pieces and a larger chamfer on the underside of the top make the table appear even more slender.

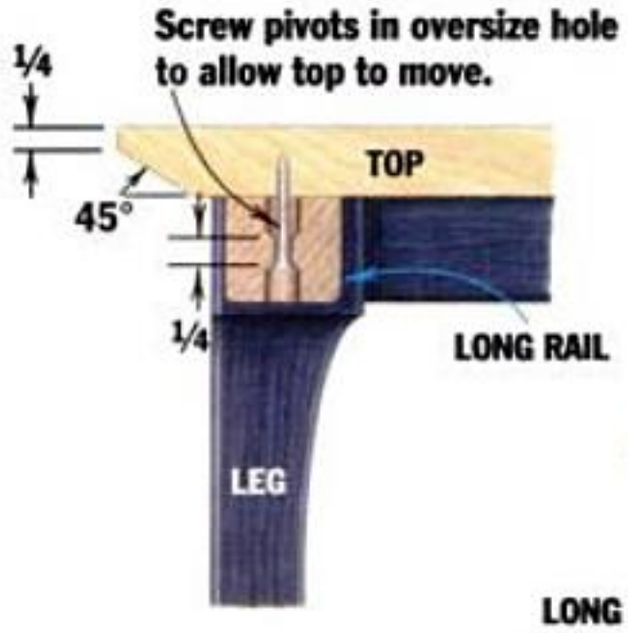
The color scheme also plays a part in the design: I chose a light-colored wood for the top, then set it upon a rich, black base made of ebonized walnut. (See sidebar, page 30.) The effect is reminiscent of a gemstone displayed in its setting.

In the hall or behind a sofa, this table showcases a vibrant top on an ebonized base with bandsawn legs and bent-laminated braces.

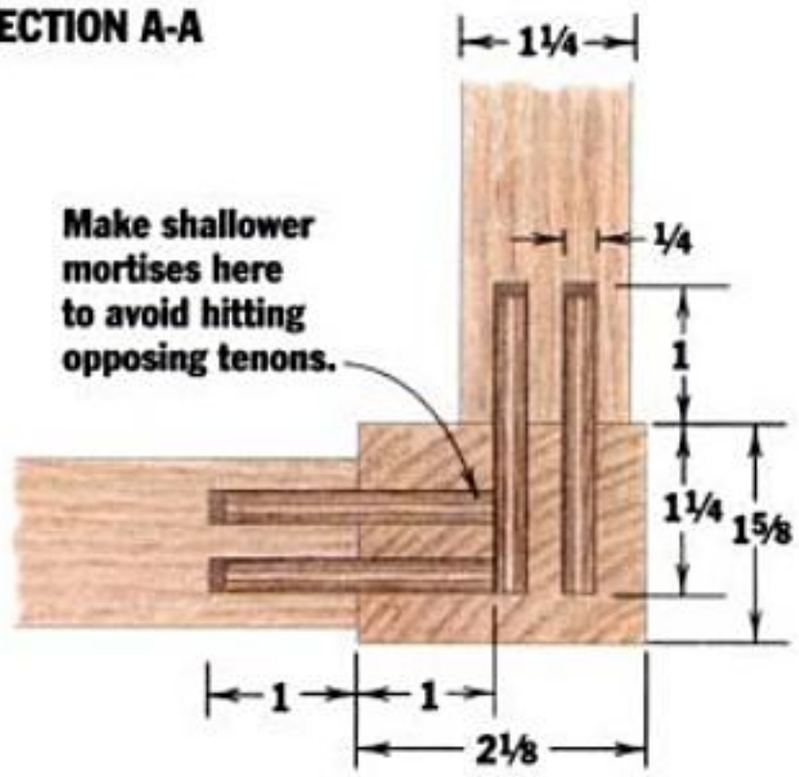
PHOTO BY WALTER C. JOHNSON III

HALL TABLE

TOP ATTACHMENT DETAIL



SECTION A-A



LEG AND BRACE DETAILS

1 SQUARE = 1 IN.

ILLUSTRATION BY FRANK ROHRBACH

Making the Base

The base of the table—bandsawn legs and curved, laminated braces—is made of ebonized walnut. (See drawing.) Why, you may ask, use a premium wood like walnut if you're just going to color it black? Walnut is plentiful in my neck of the woods, and since the black finish hides the wood's natural color, I make use of boards that contain sapwood or other color blemishes. Whatever wood you select for the base, it's important to cut the laminates for the curved braces from straight-grained stock to minimize breakage during bending.

After sawing the first face of each leg, author reattaches a bottom offcut with hot-melt glue to support the stock, and saws the second face.

PHOTOS BY W. CURTIS JOHNSON

Legs—To lay out the legs, I make two full-size leg templates from ⅛-in. hardboard, one for the leg's front profile and one for the side. (See drawing.) Note that the legs are beveled at the foot. This undercut removes what otherwise would be short grain prone to chipping from a stray shoe, and it defines the outline of the foot, even if the table sinks a little when placed on a carpet.

After laying out and bandsawing the templates, I fair the curves by hand with some sandpaper wrapped around a curved block of wood.

Next, using the template for the front leg profile, I trace the legs on 1⅞-in.-thick stock. You can glue up thinner stock to get the necessary thickness if you want, since any mismatched grain between boards will be hidden later by the black finish.

I'm careful to orient the template on the blanks so that the grain runs as straight as possible through the slender curve just above the foot. (See drawing.) Grain runout here could cause this thin area to break.

Once I've traced out the blanks, I bandsaw each leg, cutting about 1/16 in. from the line. Then I trace the other template onto the outside bandsawn face of each leg, flipping the template over on two of the four blanks to create right- and left-handed legs. Next, I reattach a bottom offcut with dabs of hot-melt glue, flip each blank 90° and saw the second face. (See photo, below.) After sawing, I pop off the hot-glued offcuts and stand the legs upright to promote even air circulation, waiting a day to allow the wood's moisture content to stabilize.

Now I'm ready to refine the shape of the legs. I true up the straight faces with a plane, keeping the shoulders flat, square and parallel. I smooth each leg's concave curves with a 2½-in. drum sander mounted in the drill press, and the convex curves with a stationary disc sander. A spokeshave and a scraper would also make short work of these curved areas. I aim for a sharp, square line where the curves meet the shoulders, and run my fingers over the surface occasionally to check that the curves are fair.

I trim the legs to length on the disc sander, holding each leg freehand and lightly sanding both ends to finished length. I check with a square to make sure the tops of the legs are square to the shoulders. You could also trim the legs on a radial arm saw or a chop saw if you use spacer blocks to support the curved leg against the saw's fence and table.

I clean up the bevels at the feet with the sander, too, eyeballing that the bevel line wraps around the legs evenly.

Rails—I machine the rails about ¼ in. over finished width and thickness, and then sticker them on a flat surface for a week to let the freshly cut wood stabilize. Then I cut the rails to finished size and drill oversized holes in the long rails for the screws that hold the top to the frame. (See drawing.)

Next, I rout double mortises in the legs and rails for the loose tenons that join them. Note that the mortise depths differ. (See drawing.) I cut these mortises with a homemade horizontal slot mortiser powered by my router (See AW #13 and AW #37 for slot-mortiser plans.) You might be tempted to use dowel joints here, but a loose tenon provides more long-grain gluing surface than dowels, for a better bond between these slender parts.

Once I've cut the slot mortises, I dimension stock for the loose tenons, milling long blanks of walnut for a perfect slip fit. I chamfer the edges of the blanks, which provides small gaps for air and glue during assembly, then I cut the tenons about ⅛ in. shorter than the combined depth of the leg and rail mortises.

Curved Braces—The eight curved braces come next. (See drawing.) As I mentioned above, I laminate each brace from glued strips of walnut clamped over a curved one-part form. (For more on bent lamination, see AW #38.)

Two forms are required to glue up the braces: one form for the end braces and one for the side braces. I make the forms by gluing two pieces of ¾-in. particleboard together and using full-size paper patterns to lay out the curves for each form. (See drawing.) I make the forms 6 in. longer than the finished laminations to ensure a smooth curve in the braces.

When I'm finished bandsawing the forms, I glue a particleboard base to the bottom of each form to help line

up the edges of my laminates for glue-up. (See photo, right.) I also make pencil marks on the forms where the brace ends will be, to aid me in cutting the braces to length later. A couple coats of varnish and some paste wax rubbed on the forms keeps the laminates from sticking to them during glue-up.

Next I resaw the laminates, cutting them about 3/16 in. thick and about 6 in. longer than the finished braces. (For more on resawing, see AW #4 and #38.) I cut extra strips as insurance against breakage and also to use as cover layers between the laminates and my clamps.

After resawing, I clean up the sawn surfaces by running the thin strips through my thickness planer on a shop-made carrier. (See photo below.) I plane the laminates for the side braces about 1/8 in. thick, and about 1/16 in. thick for the tighter bend of the end braces. At this point I test my strips by bending them around the forms by hand, discarding any that break.

Now I'm ready to laminate the strips. I use plastic resin (urea-formaldehyde) glue, applying a thick coat with a wide brush to one side of each strip. While white or yellow polyvinyl acetate glues (PVAs) are certainly strong enough, PVA glues often leave little raised ridges at the glue lines over time.

To surface thin laminates on the planer, author attaches the strips to a particleboard carrier with double-faced tape, then runs carrier through planer over Formica-faced board attached to bed of planer.

When I've spread the glue, I clamp the laminates and a waxed cover strip to the form, spacing the clamps about 3 in. apart. On the side-brace form, I start clamping in the middle and move out to both ends. On the end-brace form, I clamp at the tight end of the curve first. I leave the laminates clamped on the form for a minimum of 24 hours to allow the glue to dry.

Once the braces come off the forms, I square them up on the bandsaw. Then I remove the saw marks by running the supports through my thickness planer, but you could just as easily use a hand plane.

Author laminates braces from glued strips of walnut clamped over a one-part particleboard form (end brace shown here).

To mark the ends of the braces, I hold each brace back against its form to transfer the end marks from the form to the braces.

Next, I rout chamfers on the legs, rails and braces with a piloted chamfer bit, stopping the chamfers on the rails where the braces will join. (See drawing.) I fit my router with a small base, mount it upside down in a vise, and use it like a router table. (See photo, below.) The bit won't reach completely into the concave curves, so I still have some hand work to do with a spokeshave and scraper.

Now I'm ready to cut the braces to length. Note that the braces are scarfed against the rails and legs. (See drawing.) At the tops of the end braces, I reinforce the joint with a dowel because the angle of the grain is too steep to rely on the strength of the scarf joint alone.

The two joint surfaces at the ends of each brace must be square to each other. To mark these, I place a square piece of hardboard overtop of the brace, lining up the edges with the end marks on the brace. (See photo, next page.)

After marking the braces, I bandsaw the ends about 1/16 in. outside the line, then sand to the line on the disc sander, working with a light touch at the delicate ends of the long tapers. I double-check for accuracy with a framing square. You can hand-plane these joining surfaces instead if you support the work by clamping the braces in the forms.

To chamfer the base pieces, author inverts a router with a small base that allows concave work to get close to the bit.

To mark the ends of the braces and ensure that they're square, author places a square piece of hardboard overtop of the brace, lining up the edges with the end marks on the brace.

Assembling the Base

The table base is now ready for glue-up. First, I dry clamp the legs and rails to check that the shoulders fit tightly and that the legs are square to the rails. Then I glue all the loose tenons into the legs.

I glue up the front and back assemblies first, and when the glue is dry, I glue up the short rails to join the two assemblies, checking that the legs and frame are square.

Next I glue the curved braces to the rails and legs using small clamps fitted with protective pads. A slip of wood at the thin end of each brace directs the clamping pressure. Once the glue has dried, I use a scraper to smooth the juncture where the braces meet the legs and rails. Then I drill through each end support into the rail, glue in a ⅜-in. dowel, and trim the dowel flush to the surface. (See drawing.)

Now that the frame is assembled, the chamfers need some cleanup where the braces join the rails. I use a small knife and flat and round files to extend the chamfers on the rails so they meet the chamfered braces. The base is now ready for finishing.

Making the Top

On the tables I've built to date, I've made tops from elm, oak, cherry and myrtle, and I'm not done experimenting yet.

I make the top from one piece of wood when I can, or I glue up two boards to get the necessary width. When making a two-piece top, I'm careful to align the grain for a pleasing effect. After cutting the top to size, I chamfer its underside with a hand-held router fitted with a piloted chamfer bit, and I scrape and sand the top.

Finishing Up

My finishing scheme is dramatic but simple: an ebonized finish on the base and a clear finish on the top. I like the way a penetrating finish brings out the grain of wood, so for the top I wipe on one coat of a tung-oil-based product (McCloskey's Clear, #2931; available at many paint stores). I give this coat at least two days to dry thoroughly. Then I spray on several coats of clear lacquer, sanding between coats with 220 grit. A varnish finish looks nice, too, if you apply it evenly in thin coats.

When attaching the end braces, clamp at the rail first, then clamp at the leg, using a slip of wood to direct clamping pressure.

To complete the table, I place the top upside down on my workbench on a piece of clean carpet. I center the frame on the top and screw the two parts together. When the table's back on its feet, the top looks like a gem on its lustrous black setting.▲

W. CURTIS JOHNSON *is a biophysicist, woodworker, and member of the Mid-Willamette woodworking guild in Oregon.*

EBONIZING WOOD

For centuries, woodworkers have blackened ordinary woods to simulate the look of expensive ebony, or as a design accent on a piece of furniture. Their methods have ranged from old-timey approaches such as making black dyes from wood chips or iron filings soaked in vinegar, to more modern techniques using materials such as black aniline dyes or pigmented lacquer. My approach for ebonizing uses what was once a schoolroom staple: India ink.

I start with two 1-ounce bottles of Pelican #17 India ink from the local stationery or art supply store. To prevent this water-based ink from raising the grain, I wet the wood with water twice, sanding lightly with 220-grit sandpaper after each water application has dried. Then I apply a generous coat of ink with a stiff-bristle brush, rubbing vigorously to push the ink into the pores. When the ink dries I look for areas I've missed and apply a little more ink to these spots. At this point, the surface appears dull and patchy, but the next step will even it out.

I let the ink dry for 24 hours, then I apply several coats of gloss lacquer or varnish, sanding between coats with 220 grit. When the finish has dried, I rub out the sheen to satin with a 0000 steel-wool pad. The result is an even, jet-black finish. —*W.C.J.*

Buyer's Guide to Random-Orbit Sanders

Whether the Job Needs Heavy Sanding or Fine, These Tools Are Your Best Bet for a Scratch-Free Finish

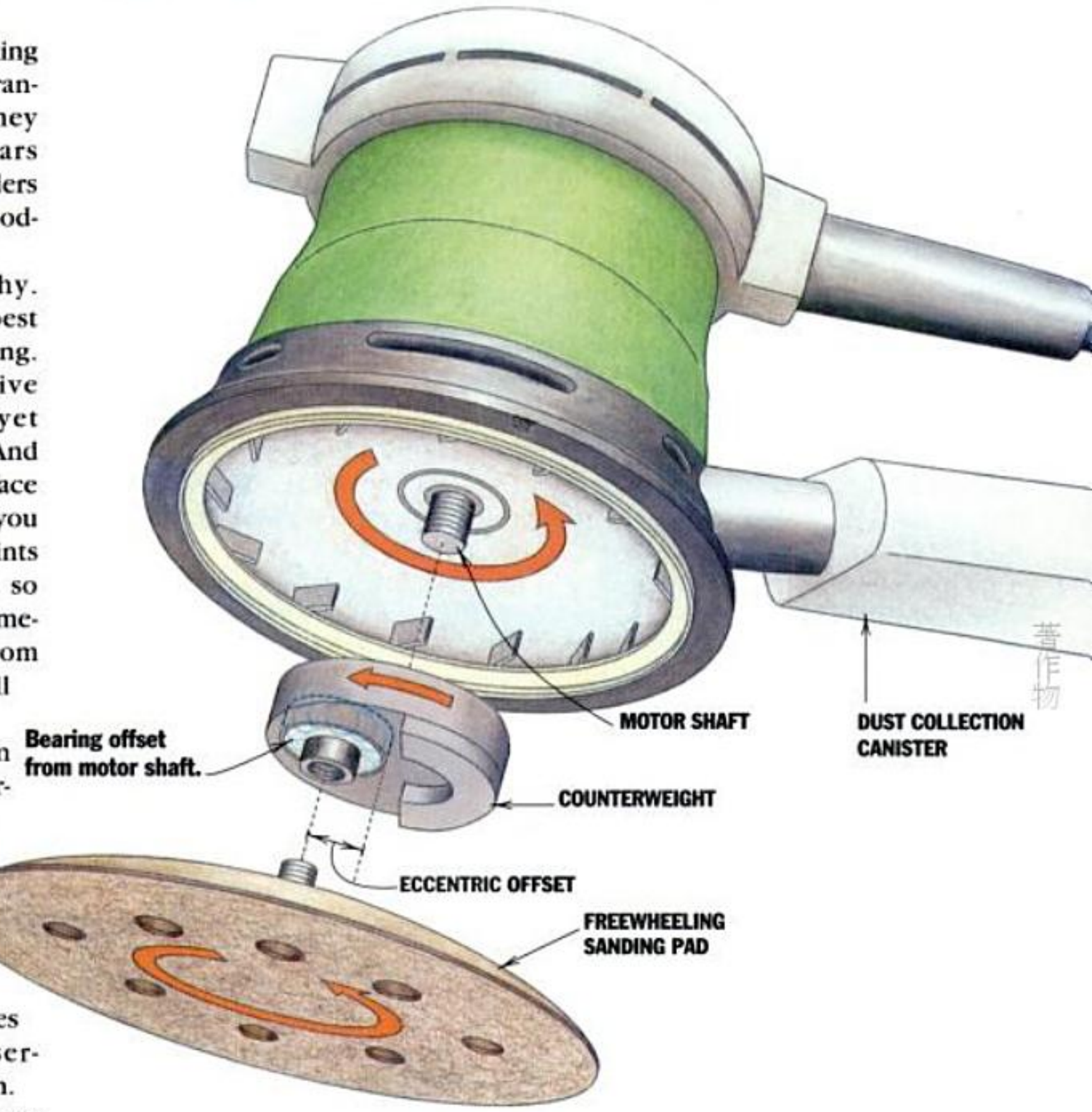
By Dave Sellers

What's hotter than a chili-cooking contest in Chihuahua? Try random-orbit sanders. Since they were introduced three years ago, these multi-purpose sanders have captured the interest of woodworkers and manufacturers alike.

It's easy to understand why. Random-orbit sanders are your best choice for all types of flat sanding. They're powerful and aggressive enough for heavy sanding, yet smooth enough for finish work. And they'll produce a scratch-free surface even sanding across the grain, so you can sand face frames after the joints are assembled. In fact, they sand so smoothly you can skip some intermediate grits—switching straight from 80 to 150, for example—and still obtain a scratch-free surface.

There are more than two dozen random-orbit sanders on the market today (and several new models on the horizon from Bosch and DeWalt). That's triple what was available when we reviewed them in 1991. (See AW #22.) And many of these new models sport features that make them even more user-friendly than that earlier generation.

To help you choose which one to buy, we tested every electric model available, and we also tossed six popular pneumatic units into the mix to show you how the air-powered and electric units compare. Our staff put the tools through hands-on evaluations in the AW workshop over several weeks, and then rated them on such factors as sanding power, ease of control, and vibration. Our findings are summarized in the chart on page 34, while specific comments on the sanders appear below. See the sidebar on page 35 for details on the pneumatic sanders.



Random-orbit sanders provide scratch-free sanding with a unique mechanism: The motor shaft drives a counterweighted assembly that contains an offset bearing in which the pad spins freely. This produces both orbital and rotational motion in the pad.

ILLUSTRATION BY FRANK ROHRBACH

Random Orbits Defined

Today's electric random-orbit sanders evolved from the dual-action pneumatic sanders that auto body shops have used for years. Like those auto body sanders, these electric models combine rotary and orbital action in a random, non-repeating way so sanding scratches cancel each other out, making them much less noticeable. By contrast, orbital sanders or disc sanders constantly repeat the same motion, creating swirl marks.

Random-orbit sanders accomplish their dual motion by allowing the sanding pad to rotate freely on a shaft that's slightly offset from the motor's drive shaft. (See drawing, above.) The offset causes the center of the pad to move in a small eccen-

PHOTOS BY DAVE SELLERS

Random-orbit sanders come in three basic configurations: Right-angle sanders (left) are the most powerful but aren't as well-balanced as other types, and require two-handed operation. In-line sanders (center) are closest to being an all-purpose machine, and they're well-balanced because the motor is positioned over the sanding pad. Palm-grip sanders (right) are well-balanced, and since they're the smallest, they're easy to control with one hand.

tric orbit, while the pad simultaneously rotates.

The amount of eccentric offset varies from sander to sander. (See chart.) Tools with a larger offset sand more aggressively and are good for fast stock removal. But they also tend to be harder to control and produce somewhat rougher surfaces. Smaller offsets are used in sanders made for finer work.

Three Types of Sanders

Though they all work the same way, random-orbit sanders have evolved into three basic handle styles: right-angle, in-line and palm-grip. (See photos, above.)

Right-angle sanders are configured like angle grinders, with a horizontal motor driving a vertical shaft through bevel gears. Generally, right-angle sanders have more powerful motors than in-line or palm-grip models, so they can sand more aggressively than the other two types and maintain rpm even when you bear down. On the downside, their bevel-gear drive systems are noisy, and right-angle sanders tend to jerk around in use, requiring two-handed operation. Also, with much of the weight situated far from the sanding pad, right-angle sanders are not as well-balanced as the other types.

In-line sanders have vertical motors directly above their sanding pads. This eliminates the noisy bevel-gear drive system found on the right-angle sanders, and gives them better balance as well. We found the in-line sanders ran so smoothly that it was possible to control them with one hand when the job required it.

In-line sanders vary in power. Units such as the AEG are nearly as powerful as the right-angle sanders. The Bosch 3283 DVS and Skil HD7750 represent the middle ground of power, while the Metabo, Ryobi RS-115 and Skil 7384 are more on a par with the power of typical palm-grip sanders. In general, the combination of power and smooth operation makes these sanders the most versatile of the three types.

Palm-grip sanders are like small, in-line sanders without handles. They are well-balanced, but since most tend to sand less aggressively than the other two types, they're better for fine finish sanding.

What to Look For

There are four major considerations when you're buying a random-orbit sander: sanding power, ease of control, vibration, and dust collection.

Sanding Power—The ability to turn wood into dust quickly is important if you intend to use a sander for heavy stock removal. To test how these sanders held up to heavy work, we installed fresh Klingspor 80-grit aluminum-oxide paper on each machine and then recorded how long it took to sand a 10-in.-dia. circle on rough-cut cedar. Since dust collection reduces clogging and extends the life of the abrasive pads, we used a heavy-duty Bosch shop vacuum to collect dust on sanders that had dust collection ports.

The full results of the power test are listed in the chart. The most aggressive were the Milwaukee 6126 among the right-angle sanders, the AEG among

RIGHT-ANGLE SANDERS

Skil 7484:05

Porter-Cable 7336

Bosch 1370 DEVS

Milwaukee 6126

DeWalt DW443

(available October 1994)

Porter-Cable 7334

Fein MSf 636-1

Milwaukee 6127

Porter-Cable 7335

KURT WILSON

DAVE SELLERS

Random-orbit sanders collect dust in four ways: (left to right, top to bottom) through dust canisters, as on Porter-Cable 333; dust boxes, as on Sears 11604; dust bags, as on AEG TXE 150; and central dust collection via a hose, as shown on Milwaukee 6127. Central collection is most effective.

the in-lines and the DeWalt DW421 among the palm-grips.

Smoothness and Control—Because their pads move in both rotary and orbital trajectories, random-orbit sanders can jerk around unpredictably on the surface of the workpiece. At best, this skittishness is annoying, and at worst it makes controlling the sander's movement difficult. As a group, the right-angle types with larger eccentric offsets (see chart) were more difficult to control than the others. The best of these hard-to-control right-angle models were the Milwaukee 6126 and the three Porter-Cables. The most difficult right-angle sanders to control were the Fein and the Skil 7484:05, which both felt as if they were constantly trying to get away.

Overall, the best sanders for smoothness and control were the AEG, the Bosch 3283 DVS, the Skil HD7750 and the DeWalt DW421.

Another annoyance that can affect smoothness is the peculiar tendency of some sanders to exhibit a slow, oscillating wobble when the pad is sanding flat on the work. Wobble can be caused by a warped or cupped sanding pad, or by a sanding pad that isn't exactly perpendicular to the motor shaft. In the first case we found you can fix the problem by changing the pad. If the pad isn't at fault, the motor shaft or bearings may be out of line. In that case there isn't much you can do to solve the problem except return the tool. The worst "wobblers" among our test sanders were the Ryobi RS-115, the Sears 11604 and the Skil 7484:05. The best were the DeWalt DW421, Bosch 3283 DVS, and Skil HD7750. Almost as good were the AEG and Makita.

Vibration—With any power tool, vibration is a concern. It makes using the tool irritating, and it's a suspected cause of carpal tunnel syndrome, a painful and debilitating inflammation of the nerves in the wrist. None of these random-orbit sanders were vibration-free, but on some of the sanders, such as the AEG and the Porter-Cable 333, vibration was dampened to well

SANDING DISC OPTIONS:
To stick or to hook?

When choosing a random-orbit sander you'll have to decide whether you want discs that attach with pressure-sensitive adhesive (PSA) or a "hook-and-loop" system.

Hook-and-loop discs are gaining in popularity. Their main advantage is reusability—you can take a disc off and reuse it several times. This makes it convenient to change grits often. Although hook-and-loop discs are more expensive than PSA discs, their reusability makes up for some of the difference in cost. On the downside, the hook-and-loop pad on the sander can wear out, and it will cost about $20 to replace if it does.

With PSA discs the main advantage is the initial cost; today, they're about 20 percent to 40 percent cheaper than hook-and-loop (though the price of hook-and-loop is coming down). However, PSA discs have a few drawbacks: You can't reuse them once mounted, and if they're not removed promptly they'll be hard to take off the pad. Also, PSA discs can deteriorate if stored in a hot environment, and they won't stick securely to a pad contaminated with dust or coated with a buildup of the PSA adhesive.

Most sander manufacturers now offer replacement pads that let you switch back and forth from PSA to hook-and-loop. There's also a kit that converts your present PSA pad to hook-and-loop duty (available from Klingspor's Sanding Catalog, 800-228-0000). —*D.S.*

IN-LINE SANDERS

Skil 7384

Sears 11604

Ryobi RS-115

Bosch 3283 DVS

Skil HD7750

AEG TXE 150

Metabo 0125

B&D Quantum BD5100

B&D Quantum BD5200

Wen 330 *(Cordless)*

KURT WILSON

RANDOM-ORBIT SANDERS

Name & Model	Street Price	EVALUATIONS[1] Power	Smoothness & Control	Vibration	Overall Rating[2]	SPECIFICATIONS Pad Dia. (in.)	Pad Type	Eccentric Offset (in.)	Motor Amps	No Load Orbits per Minute (opm)
ELECTRIC										
RIGHT-ANGLE										
Porter-Cable 7336 **(901) 668-8600** Circle #623	$143	●●●●●	●●●●◐	●●●●◐	91.5	6	PSA holes opt.	11/64	3.7	2,500 - 6,000
Porter-Cable 7335 **(901) 668-8600** Circle #623	139	●●●●◐	●●●●◐	●●●●◐	89.8	5	PSA. holes opt.	11/64	3.7	2,500 - 6,000
Porter-Cable 7334 **(901) 668-8600** Circle #623	127	●●●●◐	●●●●◐	●●●●◐	88.0	5	PSA holes opt.	11/64	3.7	6,000
Bosch 1370 DEVS **(312) 794-6600** Circle #624	259	●●●●●	●●●◐	●●●	87.2	6	H&L	11/64	5	4,800 - 12,000
Milwaukee 6126 **(414) 781-3600** Circle #626	150	●●●●●	●●●●◐	●●◐	86.3	6	PSA	5/32	5.5	10,000
Milwaukee 6127 **(414) 781-3600** Circle #626	190	●●●●◐	●●●●◐	●●◐	84.6	5	PSA w/holes	5/32	5.5	10,000
Fein MSf 636-1 **(412) 331-2325** Circle #627	589	●●●●●	●●◐	●●◐	75.9	6	H&L	5/16	3.3	7,500
Skil 7484:05 **(312) 794-6600** Circle #624	117	●●●●◐	●●●	●●●◐	75.0	5	PSA, H&L	1/8	6	10,000
DeWalt DW443 (Not Tested) **(800) 433-9258** Circle #634	175	Not available at time of test				6	H&L	3/32	4.3	4,000 - 6,800
IN-LINE										
AEG TXE 150 **(800) 243-0870** Circle #628	165	●●●●◐	●●●●●	●●●●●	95.0	6	H&L	7/32	3.5	8,000 - 11,000
Bosch 3283 DVS **(312) 794-6600** Circle #624	105	●●●●	●●●●●	●●●●◐	90.7	5	H&L	3/32	2.3	8,000 - 11,000
Skil HD7750 **(312) 794-6600** Circle #624	125	●●●●	●●●●●	●●●●◐	90.7	5	H&L	3/32	2.3	8,000 and 11,000
B&D Quantum BD5200 **(800) 762-6672** Circle #629	85	●●●●	●●●●◐	●●●●◐	89.8	5	H&L	3/32	2.8	7,500 - 10,000
B&D Quantum BD5100 **(800) 762-6672** Circle #629	65	●●●●	●●●●◐	●●●●◐	88.0	5	H&L	3/32	2.8	10,000
Metabo 0125[3] **(215) 436-5900** Circle #630	170	●●●◐	●●●●	●●●●◐	83.7	5	H&L	3/32	1.5	5,000 - 12,000
Ryobi RS-115 **(800) 323-4615** Circle #631	75	●●●◐	●●●●	●●●●◐	83.7	4 1/2	H&L	5/64	2	0 - 11,000
Sears 11604 See your nearest Sears store. Circle #632	70	●●●◐	●●●●	●●●●◐	82.0	4 1/2	PSA w/holes	5/64	2	11,000
Skil 7384 **(312) 794-6600** Circle #624	77	●●●◐	●●●●	●●●●◐	82.0	4 1/2	H&L	5/64	1.8	11,000
Wen 330 (cordless) **(800) 462-3630** Circle #633	50	●●	●●●●◐	●●●●	69.8	5	PSA	1/8	7.2-Volt Battery	5,000
PALM-GRIP										
DeWalt DW421 **(800) 433-9258** Circle #634	85	●●●●	●●●●●	●●●●◐	92.4	5	H&L	7/64	2	12,000
Makita BO 5000 **(310) 926-8775** Circle #635	70	●●●●	●●●●●	●●●●◐	88.9	5	H&L	5/64	1.7	10,000
Porter-Cable 333 **(901) 668-8600** Circle #623	77	●●●◐	●●●●◐	●●●●●	87.2	5	H&L	3/64	1.7	12,000
Porter-Cable 332 **(901) 668-8600** Circle #623	67	●●●◐	●●●●◐	●●●●●	85.4	5	PSA	3/64	1.7	12,000
Ryobi RS112 **(800) 323-4615** Circle #631	50	●●●◐	●●●●◐	●●●●◐	82.8	4 1/2	H&L	5/64	2	11,000
Sears 27714 See your nearest Sears store. Circle #632	50	●●●◐	●●●●◐	●●●●◐	82.8	4 1/2	PSA	5/64	2	11,000
Wen 15 **(800) 462-3630** Circle #633	50	●●●●	●●●●	●●●●◐	82.0	6	PSA	1/8	2.5	3,000
DeWalt DW420 (Not Tested) **(800) 433-9258** Circle #634	75	Not available at time of test				5	PSA	7/64	2	12,000
PNEUMATIC										
RIGHT-ANGLE										
Campbell Hausfeld PL 1504 **(800) 543-8622** Circle #636	55	●●●●●	●●●●◐	●●●●◐	85.0	6	PSA	3/16	13 @ 90[4]	10,000
Sears 18978 See your nearest Sears store. Circle #632	65	●●●●●	●●●●◐	●●●●◐	85.0	6	PSA	3/16	12 @ 90[4]	10,000
PALM-GRIP										
Dynabrade 57019 **(800) 828-7333** Circle #637	235	●●●●	●●●●●	●●●●●	97.2	5	PSA w/holes	3/32	14 @ 90[4]	10,000
Aro RS-25A-CSV **(910) 692-8700** Circle #638	170	●●●●	●●●●●	●●●●●	95.9	5	PSA w/holes	3/32	15.8 @ 90[4]	12,000
Sioux 690 VX **(800) 722-7290** Circle #639	195	●●●●	●●●●●	●●●●●	95.6	5	PSA w/holes	3/32	16 @ 90[4]	10,000
Stahr R051DF **(800) 466-7263** Circle #640	199	●●●●	●●●●●	●●●●●	95.4	5	PSA w/holes	3/32	14 @ 90[4]	10,000

[1] **KEY TO RATINGS SCORE:** ●=Unacceptable; ●●=Poor; ●●●=Fair; ●●●●=Good; ●●●●●=Excellent.

[2] Scores above 85 are considered excellent, between 75 and 85 good, under 75 fair. [3] Manufacturer claims tool is designed for fine finishing work.

[4] Continuous air consumption, CFM @ psi. Editors' Choice.

Dust Pickup	Freewheel Time (sec.)	Noise (dB)	Weight (lbs.)	Comments
Vac opt.	5	88	5.75	Very aggressive sander; moderate vibration; optional dust collection skirt and pad (used in test)
Vac opt.	3	85	5.65	Aggressive sander; moderate vibration; optional dust collection skirt and pad (used in test)
Vac opt.	3	86	5.35	Aggressive sander; moderate vibration; optional dust collection skirt and pad
Bag, Vac	3	91	6.25	Soft-start feature; drive adjusts for heavy or fine work; accepts 6- or 8-hole discs; has pad brake
None	7	92	5.15	Very aggressive sander; high vibration
Vac	4	91	5.25	Aggressive sander; high vibration; also available without dust collection (Model 6125)
Vac	3	91	6.85	Very aggressive sander; best dust collection when used with Fein vacuum; high vibration; has pad brake
Bag, Vac	12	97	5.20	Aggressive sander; noisy; adjustable front handle
Canister, Vac	N/A	N/A	5.70	Not tested; on sale October '94; also available with single-speed PSA pad (Model DW441)
Bag, Vac	3	84	5.95	Most aggressive in-line sander; very smooth operation; low speed faster than others; low vibration; has pad brake
Bag, Vac	10	87	4.50	Very smooth operation; excellent low-speed control; adjustable front handle; also available as Bosch Model 87250
Bag, Vac	12	87	4.50	Very smooth operation; adjustable front handle; similar to Bosch 3283 DVS
Bag	3	88	4.65	Best variable speed control switch; oblong holes help align sanding disc; front handle sets to any position; has pad brake
Bag	3	88	4.55	Oblong holes help align sanding disc; front handle sets to any position; has pad brake
Bag, Vac	18	82	5.50	Excellent low-speed control; builds up to speed slowly; dust shield has cutaway for access to corners
Box	12	83	3.30	Builds up to speed slowly; pad stalls at low speed settings; dust collection box removes easily
Box	12	83	3.30	Builds up to speed slowly; dust collection box removes easily
Bag, Vac	12	78	3.75	Has knob handle in front; smaller version of Skil HD7750
None	8	83	2.35	Will sand for 10 to 12 minutes on full battery charge
Canister, Vac	3	80	3.35	Very smooth operation; dust canister rotates to any position; has pad brake
Vac	12	83	3.00	Very smooth operation; finger can unintentionally bump exposed rocker switch
Canister, Vac	4	78	3.45	Dust canister rotates to any position; has pad brake; also available with PSA 5-hole pad (Model 334)
None	4	77	3.25	Dust canister rotates to any position; has pad brake
None	12	80	2.60	Builds up to speed slowly; switch too small for large fingers
None	12	81	2.80	Builds up to speed slowly; switch too small for large fingers
None	8	93	3.55	High profile, won't fit in small spaces; best control if held lower on body
None	N/A	N/A	N/A	Not tested; similar to DeWalt DW421, but no dust canister
None	4	99	4.35	Aggressive sander; high-profile pistol grip
None	3	95	4.40	Aggressive sander; high-profile pistol grip
Vac	5	82	2.25	Smoothest-running air sander; low-profile palm grip; has speed-control throttle
Vac	9	80	1.90	Smallest, lightest-weight air sander; low-profile palm grip
Vac	4	80	4.55	Heaviest air sander; low-profile palm grip; sheath expels exhaust away from work; has speed-control throttle
Vac	13	83	2.80	Low-profile palm grip; has speed-control throttle

AIR-POWERED SANDERS

Pneumatic random-orbit sanders have been used in furniture factories and auto body shops for years, and they have several advantages over electric models. Air sanders are smaller, lighter and more compact (see photo, page 36) than their electric counterparts, so they're easier to control and not as tiring to use. They also can't be damaged if you overload or stall them, and they have a longer service life.

Air-powered random-orbit sanders, like the variable-speed Dynabrade shown here, are more compact and run more smoothly than electric models.

PHOTO BY DAVE SELLERS

So why doesn't everybody use pneumatic sanders? Mainly because they take a lot of air to run. Our test sanders need 12 to 16 cubic ft. of air per minute (CFM) at 90 pounds per square in. (psi). That takes a big, two-stage air compressor of at least 5 HP. (I tried running several of our test sanders on my 1½-HP, 6-CFM-at-90-psi home shop compressor and found they'd only work well for about 15 to 20 seconds before the air pressure dropped too low.)

Also, most air sanders need daily lubrication with air-tool oil, which can contaminate your work as it comes out the tool's exhaust port. (The Aro Model RS-25A-CSV we tested doesn't require air lube.)

But if your compressor is large enough, you're in for a treat, as our tests showed. The four small palm-grip pneumatic sanders (see photo, page 36) proved to be in a class by themselves for smoothness and control. With their low profiles, they were less skittish than electric sanders, didn't wobble, and had plenty of power. They also fit easily into tight spaces.

The right-angle pneumatic sanders from Sears and Campbell Hausfeld proved to be the most powerful of the pneumatics. For our overall favorites, see "Editors' Choices" on page 36. —*D.S.*

Thanks to Campbell Hausfeld for providing the 7½-HP two-stage compressor used to test the pneumatic sanders.

EDITORS' CHOICES

There are a lot of factors to consider when choosing a sander. We settled on the following five machines to earn the Editors' Choice title for superior performance.

In the **right-angle** category, we picked the Porter-Cable 7336 because it's the smoothest to control, vibrates the least, and its power is in the same range as the most aggressive right-angle machine.

For the **in-line** group, we awarded two models our Editors' Choice: The Bosch 3283 DVS scored highest for smoothness and control of all the electric sanders we tested, and it has good power for all-around work. The AEG got our nod because it is the most powerful in-line sander, while still providing good smoothness and control.

Our Editors' Choice in the **palm-grip** class is the new DeWalt DW421. It runs extremely smoothly, it has a pad brake to control freewheeling, and it has an efficient dust collection canister. And although it wasn't an Editors' Choice winner, we also liked the Makita, which has excellent power and control but lacks a pad brake to slow freewheeling.

We picked the Dynabrade 57019 as Editors' Choice among the **pneumatic** sanders because it started on or off the work without jerking and ran smoother than the others at all speeds. The light weight Aro was the easiest of the six pneumatic sanders to handle.

PALM-GRIP SANDERS

within comfortable levels—say, less than on a typical quarter-sheet orbital sander. On other units, however, the vibration was so bad our hands were tingling after just a short sanding session. The worst offenders were the powerful right-angle units like the Fein, Bosch 1370 DEVS, Milwaukee 6126 and 6127 and the Skil 7484:05.

Dust Collection—Many of today's random-orbit sanders have built-in dust collectors that reduce the dust flung around your shop and improve sanding by limiting clogging. Most setups draw dust through holes in the sanding disc and pad (the AEG and Fein also have holes surrounding the perimeter of the pad) and blow it into an on-board dust bag or canister. (See photo, page 33.) You can also omit the bags or canisters and hook up the sander's vacuum port via a hose to a central dust collection system or shop vacuum. We found the sanders with dust bags and canisters could capture most of the dust the machines created, but all the sanders worked most efficiently when connected to a central collector. The only problem with central collectors is that the long vacuum hose can get in the way.

The Fein sander had the best dust collection in our test when teamed with its dedicated shop vacuum (Model FE92013; Fein claims 98 percent collection down to 1 micron for this model). An automatic switch turns on the Fein shop vacuum whenever you start the sander.

Most of the sanders with dust collection have dust skirts that encircle the pad to enhance collection. We found that the skirts obscured the view of the edge of the pad, but we recommend the skirts anyway because they definitely help collect dust more efficiently. We liked the skirt on the Metabo best, because it has a cutout on one side to let you get closer to edges. (See photo, opposite.)

Other Features

Pad Brakes—One of the big drawbacks with the first generation of random-orbit sanders was that the sanding discs would freewheel at high rpm when you removed them from the wood. This meant that when you

PNEUMATIC SANDERS (See sidebar, page 35.)

PHOTOS BY KURT WILSON

PHOTOS BY DAVE SELLERS

While random-orbit sanders can't sand right to the edge of a drawer or cabinet, the convenient cutout on Metabo's dust skirt lets you sand closer than other models with a dust skirt.

moved a sander from one workpiece to another or lifted it to inspect your work, the sander would jerk as you set it down, leaving swirl marks. And it meant that when you were done sanding, you had to wait until the sander stopped completely before you could set it down.

Freewheeling is still a problem with some of today's sanders. (The chart shows how long each tool took to stop after it was turned off.) However, several manufacturers have addressed the problem by introducing models with pad brakes (see chart) that slow the sanding pads' freewheeling speed to just a few hundred rpm. We found this to be a useful feature, and we particularly liked the pad brake on the

The Bosch 1370 DEVS comes with a reversible drive ring that lets you change how forcefully the tool sands. With the geared side of the ring facing down, you get a super-aggressive sander. With the rubber O-ring side facing down, the tool works less aggressively. Flipping the ring takes only a minute.

DeWalt DW421, which slowed the pad to a near standstill until you set it on the work.

Variable Speed—This feature is handy for slowing down the orbits per minute (opm) to perform delicate sanding tasks such as feathering a finish or buffing (some sanders offer accessory polishing pads). The best slow-speed sanders were the Bosch 3283 DVS and the Metabo, which ran smoothly at even the slowest speeds. We liked the variable speed controls on the B&D Quantum BD5200, Bosch 1370 DEVS, and Porter-Cable right-angle models, and on the new DeWalt DW443 right-angle model, best: These controls are separate from the trigger switch, so you can easily change speed while sanding.

Switches—We found the switches on all these tools were easy to reach and comfortable to control, with a couple notable exceptions. The small rocker switches on the two Ryobi and two Sears units were covered with a dust seal that made them difficult to turn on and off. The exposed rocker switch on the Makita was too easy to bump with your fingers, inadvertently turning the sander on or off. In general, we liked units with switches that could be locked on: They gave us freedom to alter the way we held the tool, reducing fatigue.

The Bosch 1370 DEVS deserves special mention for two of its innovative features. It has a "soft-start" switch that accelerates the disc slowly without jerking your hands. It also features a reversible drive ring. (See photo, left.) By unbolting the sanding pad and flipping the drive ring, you can switch from light- and medium-duty sanding to aggressive "direct-drive" sanding. Changing modes takes about a minute.

Recommendations

So, which sander should you buy? If you need a tool that will remove stock quickly, we recommend a right-angle sander with a 6-in. pad. We liked the Porter-Cable 7336 best among these types. (See "Editors' Choices," opposite.) But remember, right-angle sanders are somewhat harder to control than the other types, and they require two-handed operation. Also keep in mind that a right-angle unit with a 5-in. pad will jerk around less than one with a 6-in. pad, and you'll only be sacrificing a small amount of aggressiveness.

For fine finish work, the palm-grip sanders are the best, and our choice here was the new DeWalt DW421.

For all-around use, we recommend the in-line sanders because they will work well for both aggressive and fine sanding. Two sanders won our nod here: the Bosch 3283 DVS and the AEG TXE 150. ▲

DAVE SELLERS *is an assistant editor of AW.*

Thanks to Bosch Power Tool Co. for supplying the shop vacuum, and to Klingspor's Sanding Catalog for supplying the sanding discs used in our testing.

KITS CONVERT GRINDER TO SANDER

For a moderate price, you can convert your right-angle grinder into a random-orbit sander by installing one of these conversion kits.

If you're looking for a less expensive way to get into random-orbit sanding and you already own a 4½- or 5-in. right-angle grinder, you can buy an aftermarket random-orbit sander head, thread it on the grinder's spindle and go to work. Changeover takes just a few minutes.

We tried kits made by Marshco ($60, 207-722-3523), Milwaukee (#49367020, $40, 800-732-4578) and Wolfcraft (#2247, $49, 708-773-4777) (see photo) on an AEG grinder. They performed much like the dedicated right-angle random-orbit sanders with 5-in. pads.

—D.S.

TRICK BOX

See How Long It Takes Your Friends To Figure This One Out

BY JIM CUMMINS

Years ago, a friend showed me an antique puzzle box with a pivoting lid. The lock was a ball bearing, trapped in a wooden channel. To open the box, you had to rotate it a certain way so the bearing would roll into a secret recess, freeing the lid.

Obviously, a lot of people had tried to force the lid open over the years, and its wooden channel had become so worn and sloppy that the lock no longer held. I decided to devise a hidden catch from more durable materials—one I could adapt to boxes of various sizes, such as the narrow pencil box (see bottom photo) I made for my boy, James.

The lid of the pencil box consists of two parts. One, which I call the "end stop," is glued to the sides, while the other, larger part pivots on a concealed rotary hinge glued permanently into the lid and the box. (See drawing.) I made my own rotary hinge using dowel sections, a machine screw and a couple of locked nuts, but ready-made versions are available from Constantine's (2050 Eastchester Road, Bronx, NY 10461, 800-223-8087). To show puzzle solvers that they'd have to pivot the lid rather than lift it straight up, I separated the two pieces of the lid with a 45° bandsaw cut.

My updated catch mechanism consists of a steel slug that slides in a drilled cavity in the box, and a magnet glued into a recess in the lid. Turning the box upside down causes the slug to fall against the magnet, locking the lid. When you rap the bottom of the box against the heel of your hand, inertia breaks the magnetic attraction and carries the slug down into the recess, letting the lid swing open.

To prevent the slug from damaging the lid around the magnet, I epoxied a collar, or "keeper," over the magnet.

Try as you might, this box won't open 'til you rap its bottom on the heel of your hand. Disassembled box (below) shows catch mechanism and dowel pivot hinge.

The keeper—in this case, a penny with a hole in it—has an added advantage: When someone moves the lid from side to side, the metallic "click" produced by the slug in the keeper gives a clue that more than brute force is necessary to open the box. Also, because the penny is nonmagnetic, the slug won't stick to it, but will find its way into the hole.

Making the Box

I decided to make the box of mahogany, since I would be gluing the bottom and the small part of the lid at cross grain with the sides. Mahogany shrinks less than most other woods and would be less likely to crack over time.

I first cut and glued up the sides and end blocks. When the glue had dried, I cut the lid about 1 in. oversize. This extra width and length simplifies fitting and aligning the parts. In fact, I don't cut the lid to final size until after the whole box is glued up.

With the box upside down on the drill press, using a ½-in. Forstner bit, I drilled through the hinge end block and partway into the lid to make the recess for the rotary hinge. If the lid is thin, you may have to counterbore the end block so the top half of the hinge can rotate. (See drawing.)

With the hinge pressed into place but not yet glued, I drilled a ⅜-in. hole in the other end block for the copper tube, stopping this hole when the point of the Forstner bit just dimpled the lid. Using the dimple mark as a center point, I enlarged the hole in the lid to ¾ in. for the magnet and penny. This drilling order ensures that everything will line up.

Next I epoxied the magnet and its drilled-penny collar into the lid. The magnet I used was a common disc-shaped magnet from my local hard-

PHOTOS BY KURT WILSON

ware store; magnets are also available by mail from National Artcraft, 23456 Mercantile Rd., Beechwood, OH 44122, (800) 793-0152.

I made the steel slug for the catch from a ¼-in.-dia. steel rod. (See drawing and photo, below.) Since the strength of magnets differs, you should experiment to determine the optimum length for your slug. (Mine was about ¾ in. long.) It should be heavy enough to disengage when you rap the bottom of the box, yet it should stay in place during normal handling. The heavier the slug, the easier it will be to unlock the box.

To remove the rough spots on the ends of the slug, I chucked it in an electric drill and polished it with fine sandpaper. Then I hacksawed a slot in one end and spread the slot slightly with a screwdriver until the end of the slug was flared to just shy of ⅜ in.

I lined the slug hole with a section of 5⁄16-in. copper tubing (⅜ in. o.d.) to prevent the walls of the hole from wearing and to act as a stop for the flared end of the slug. I cut the tubing about ¼ in. shorter than the slug, then pressed it into place so I could test the action and make any final adjustments in the lengths of the tubing and slug. Then I epoxied the tubing in place, flush with the top of the end block.

Next I marked the curved cut for the top, keeping in mind the cut's 45° angle: I didn't want to lose too much glue surface from the bottom of the end stop, nor did I want to cut into the hidden magnet. The exact curve of the cut isn't important, as long as you keep the pivoting action in mind so the lid doesn't trap itself in the closed position. The curve should be slightly S-shaped so it can provide a positive stop for the pivoting lid. This will align the parts of the lock so they will engage and disengage smoothly, and it will also keep the closed lid neatly in position even when the lock is not engaged. I cut the curve freehand on the bandsaw, with the table tilted to 45°.

Hardware consists of a steel slug, copper tubing, a hardware-store magnet, and a pivot hinge made from dowel sections. A ready-made hinge is at upper left.

With the rotary hinge pressed into place again and the lock engaged, the final adjustment is to glue the end stop in just the right place. Because of the bandsaw kerf, the end stop will no longer align precisely with the rest of the lid, but the lid is oversize to allow for it. Glue the end stop so the lid butts against it when the magnet is directly over the slug hole.

When the glue is dry, you can cut the lid to size and add the box bottom. I don't usually glue the rotary hinge into place until I've completed the final staining and finishing.

A Word to the Wise

Reactions to puzzles vary. Legend has it that the army of Alexander the Great, on the way to conquer the world, once halted at the gate to an ancient temple. The entrance was secured with an intricately knotted rope, and only those priests who knew how to tie and untie it were entitled to pass. Unimpressed, Alexander simply slashed through the knot with his sword.

Knowing the similarities between world conquerors and small children, I made sure to demonstrate the solution to James when I gave him the box. But even so, maybe I should make another one to keep in reserve, just in case. ▲

JIM CUMMINS *is a contributing editor to AW.*

TRICK BOX

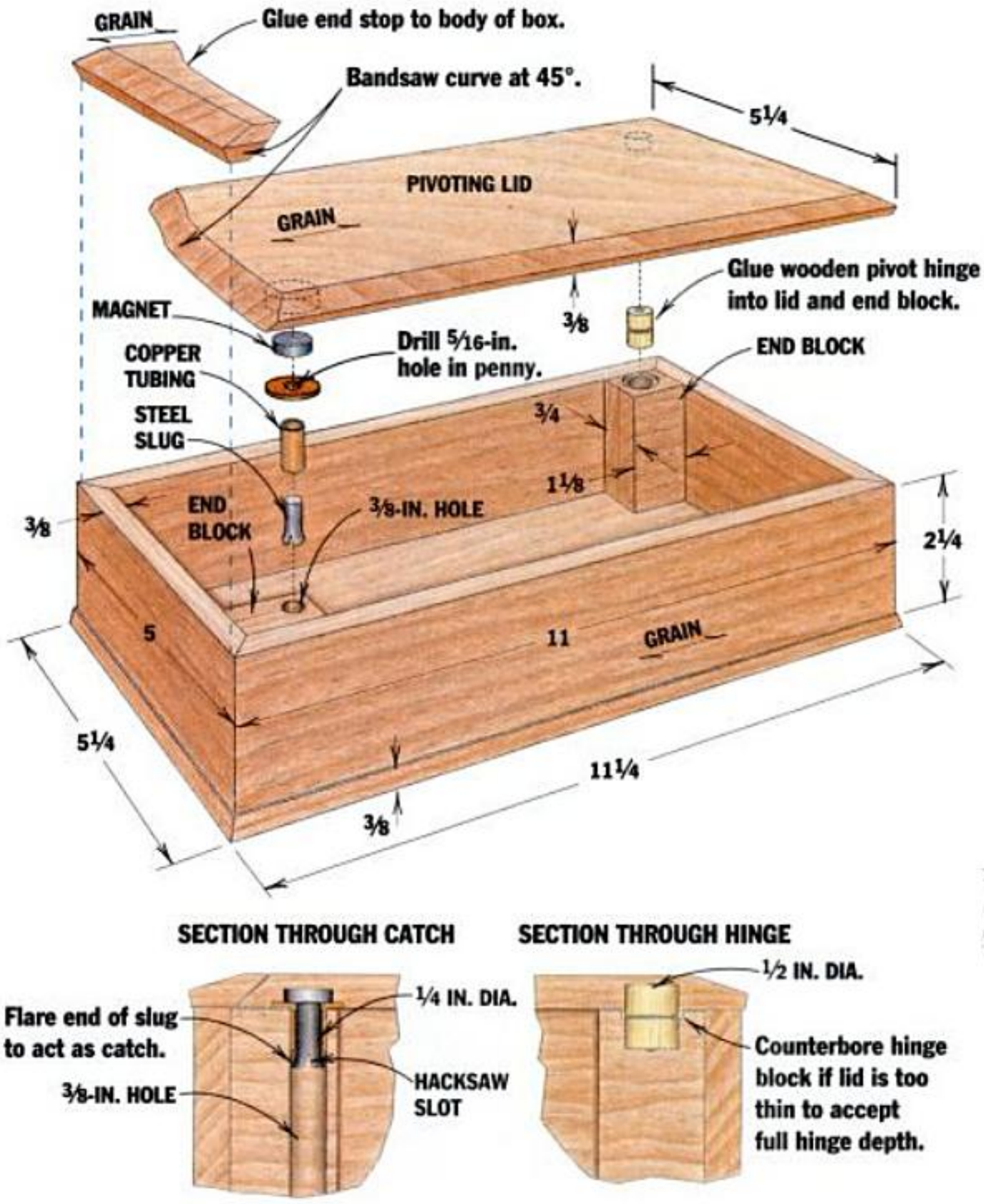


ILLUSTRATION BY FRANK ROHRBACH

A Life in the Woodshop

A Rarity in a Male-Dominated Craft, British Woodworker Judith Hughes Has Built a Distinguished 60-Year Career as a Furniture Maker and Designer

by Alan Peters

PHOTOS BY PAUL CONSTANT

Sixty years after she made it, Judith Hughes poses in front of a display cabinet that features marquetry and bold contrasting veneers of ebony, figured basswood, English elm, English walnut and figured birch. (See below.)

LADY FURNITURE MAKERS may seem rare today, but they were even more so back in 1934 when creative furniture makers of any description were very thin on the ground. That was the year 22-year-old Judith Hughes set up her workshop at one end of her parents' house in Tavistock, England. There she has quietly remained ever since, producing work of great distinction.

Judith, who recently retired from full-time furniture making, is one of the unsung heroines of the craft furniture movement. She started woodworking as a young girl, making models at the encouragement of her mother, a talented silversmith trained by C.R. Ashbee and George Hart—both pioneer figures in the Arts and Crafts movement. Then, after formal training, Judith began a professional career that spanned nearly 60 years.

Her work has ranged in scale from large commissions, such as a 21-ft. altar rail for a Cornish church, to delicate trays, to caskets—often with inlaid monograms, one of her specialties. She also has had some unusual

commissions over the years: Early in World War II, she and a young boy she trained made nearly 2,000 incredibly precise models of warships, which the British Navy and Royal Air Force used for identification training.

The work shown on these pages demonstrates her highly individual sense of design as well as her independence. Judith refuses to make reproductions because she says she wants the items she creates to come from her own thoughts and hands. She likes to mix contrasting woods in her work, and many of her projects feature flawless inlay and marquetry—two skills she developed during her studies at Plymouth Art School and the London Central School of Arts and Crafts, where she made this display cabinet. (See photos, this page.) Detailed with bold contrasting veneers and marquetry, it looks as fresh and provocative today as it must have 60 years ago.

Judith's works have been exhibited nationally in Great Britain, and in 1952, an inlaid coffee table she made was chosen for international exhibition in Florence, Italy. Over the years, she also has been featured on radio and television, and in print.

Now 82 and still remarkably active, she has taken one step away from the furniture making, but, with a twinkle in her eye, she says she will not be

disposing of her workshop or her tools. I suspect that she will continue to make things for a long while yet. ▲

ALAN PETERS *is one of England's foremost furniture designers/makers.*

Made from mahogany and cedar of Lebanon, this bowfront chest of drawers features Cuban-mahogany-veneered drawer fronts and carved handles.

PHOTO BY BERTOLD GRABE

Designed as a coffee table, this piece is just 16 in. high, and has a 25-in. by 14-in. oval top. It is made from satinwood with an inlay of ebony and burl walnut on the top, and a burl walnut inlay on the pedestal. The legs are satinwood veneer over plywood.

PHOTO BY PAUL CONSTANT

The top of this 5-ft.-long by 3-ft.-3-in.-wide dining table is made from two sections of a single board of highly figured sapele. The top edge features a satinwood inlay banding and cross-grain Honduras mahogany, while the base is made from Honduras mahogany inlaid with sapele and satinwood banding.

PHOTO BY PAUL CONSTANT

This rosewood and burl ash key cabinet is about 2 ft. high and is made to hang on the wall. The base conceals a small odds-and-ends drawer that opens from the side. (See below.)

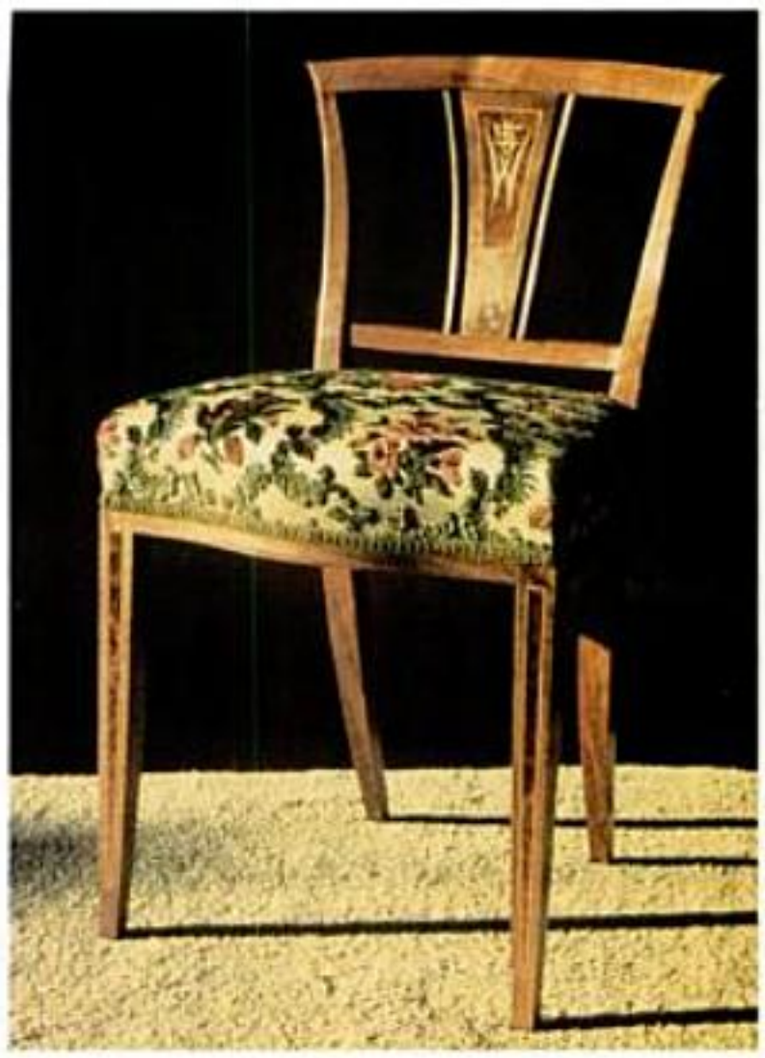
PHOTOS BY PAUL CONSTANT

Delicate rosewood inlay bandings highlight this satinwood mirror.

PHOTO BY JUDITH HUGHES

This upholstered chair was designed for use with a writing desk and is made from English walnut with inlays of burl walnut and satinwood.

PHOTO BY JUDITH HUGHES



BUILDING A

NEW MEXICAN CUPBOARD

Folk Art Meets Function In This Traditional "Trastero"

By Kingsley Hammett

Made entirely of lumberyard pine, this freestanding cupboard combines simple mortise-and-tenon joinery with decorative carving details.

Authentic New Mexican furniture has become increasingly popular in the United States over the past 15 years. The product of a long and colorful history (see sidebar, page 46), today's New Mexican furniture, with its distinctive traditional forms and its simple carved or painted decorations, has captured the imagination of many people yearning for a simpler, more rustic lifestyle.

The freestanding cupboard, or *trastero*, is a New Mexican furniture form that dates back to the earliest Spanish settlers. Traditionally used for storing dishes in homes that never had kitchen cabinets as we know them, early trasteros were built with long legs to keep rodents out. Modern versions—such as this one, which was designed and built by Taos furniture maker Roberto Lavadie (see sidebar, opposite)—might be used to store anything from books to hi-fi equipment. Similar but deeper cabinets for storing clothes are called *roperos*.

Trasteros may be built in any configuration: with single or double doors, with shelves above and drawers below, or with drawers showing or behind doors. Many trasteros have decorative spindles or carved "splats" in place of raised panels, in either the doors or the sides of the cabinet. Where dust is a concern, Lavadie sometimes installs glass behind the spindles.

This trastero is surprisingly simple to make with common power and hand tools and stock pine from the lumberyard, yet its carefully balanced proportions and softly distressed surfaces give it the look and feel of a prized antique.

Building the Trastero

Lavadie begins construction by dimensioning stock for the legs and rails (see drawing, page 44), then he cuts all the mortise-and-tenon joints for the carcase. The front and back rails have Mission-style through tenons (see AW #32) that protrude about ¼ in. beyond the legs. Lavadie chamfers the exposed ends of the tenons to a sharp edge with a block plane and a chisel. The side rails and door rails have ⅜-in.-long stub tenons reinforced with ⅜-in. dowel pins. (See drawing.)

Lavadie plows ⅜-in. by ⅜-in. grooves in the legs and side rails to receive the side panels, stopping the grooves so they won't show on the exposed parts of the legs at the top and bottom. Then he cuts the ¼-in. beads on the front and side rails with a molding head on his tablesaw. (See drawing.)

Next, Lavadie carves the decorative designs on the rails. He has chosen one of his favorite traditional motifs, the *el rayo* (Spanish for lightning bolt), for this piece. He first makes a hardboard pattern, then uses it to trace the design on the front and side rails. (See drawing.) Next he uses a "V"-parting tool to carve out the notches, working from the shallow end of each notch toward the deep end. (See photos, page 45.) Then he pares to his layout lines with a bench chisel and a small "sheep's-foot" European pattern knife (available from The Woodworker's Store, 21801 Industrial Blvd., Rogers, MN 55374-9514, 800-

279-4441). When carving, he's careful to work "downhill" on the grain to prevent tear-out.

He carves the V-shaped fans to a depth of about ¾ in. on the larger, center fan and ½ in. on the smaller fans, again removing most of the waste with the parting tool before switching to bench chisels for the final cleanup. Finally, when he's completed the carving on the crest rail, he cuts the curved top outline of the rail on the bandsaw.

Next, Lavadie makes the raised panels for the cabinet's sides and doors. The side panels are made of 1⅛-in. pine and the door panels of ¾-in. pine. (See drawing.) He raises the panels with a tablesaw blade, then, with the molding head mounted on the tablesaw, he cuts two vertical beads into the field of each panel. (See drawing.) After this, he trial-fits the side panels and the mortise-and-tenon joints and glues up the case.

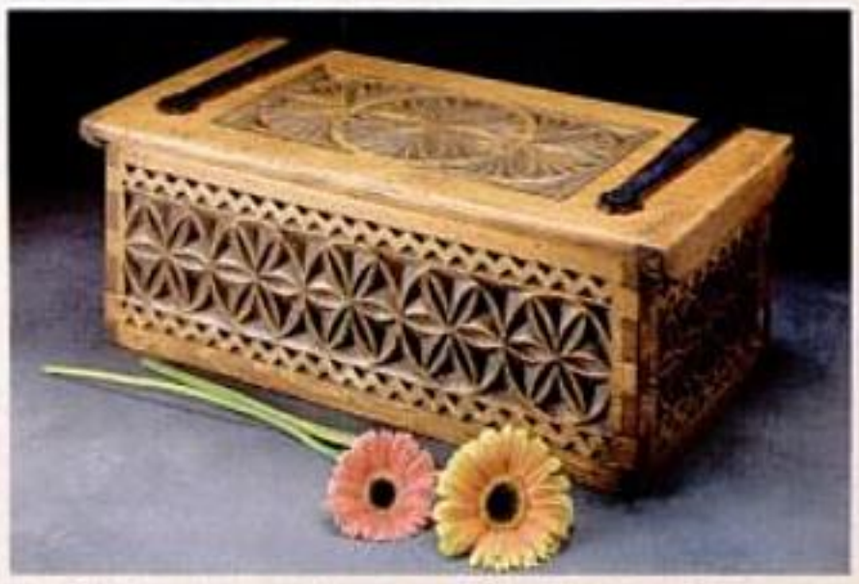
The back of the case consists of seven ¾-in. by 5-in. tongue-and-groove pine boards from the local lumberyard. Lavadie routs a ⅜-in.-wide by ½-in.-deep rabbet around the opening formed by the back legs and rails. Then he fits the boards into the rabbeted opening, working from the centerline of the cabinet outward so the end boards will be of equal width. He planes a ¼-in. chamfer around the perimeter of the back, then nails and glues the boards into the rabbet.

Lavadie makes the doors using 1⅛-in.-thick pine for the stiles and rails and for the decorative "lightning bolts" (see drawing) in the open top sections. After joining the door frames with the same stub-tenon-and-dowel joinery as he used on the sides of the cabinet, he cuts

A VISIT WITH ROBERTO LAVADIE

"My major influences are the culture I was born into and my desire to preserve it through building furniture."

Roberto Lavadie, a lifelong resident of Taos, is one of the master New Mexican furniture makers active today. His designs are adapted from traditional forms and motifs of the early Spanish and Pueblo Indian cultures of the region, and his work ranges from small, carefully carved jewelry boxes, to furniture, to the largest altar screen in the U.S.—a four-story-high extravaganza he built for the St. Francis Cathedral in Santa Fe.



Traditional rosettes and hand-forged hinges adorn this dovetailed pine jewelry box.

From Signs to Furniture—Descended from a long line of Basque sheepherders who emigrated here from the Pyrenees Mountains in southern France, Lavadie entered woodworking in a roundabout way. He initially worked as a sign painter after his discharge from the Navy, and, although he achieved some distinction for his work, the novelty of painting eventually wore off. So, he began embellishing his signs with woodcarvings. About 15 years ago, he noticed that his carved decorations could also work on a chair back or a mirror frame. From then on, he concentrated more on woodworking, teaching himself the finer points of traditional joinery as he went along.

This fly-tying bench is an example of a modern use for a traditional form.

Today, Lavadie's shop contains all the amenities of a professional workshop—14-in. tablesaw, jointer, planer, bandsaw, horizontal boring machine—but what sets it apart is his collection of carving chisels, with which he carves his trademark designs. Working with his helper, Leroy Mondragon, he can build a *trastero* (see main article), ready for delivery, in 40 to 45 man-hours.

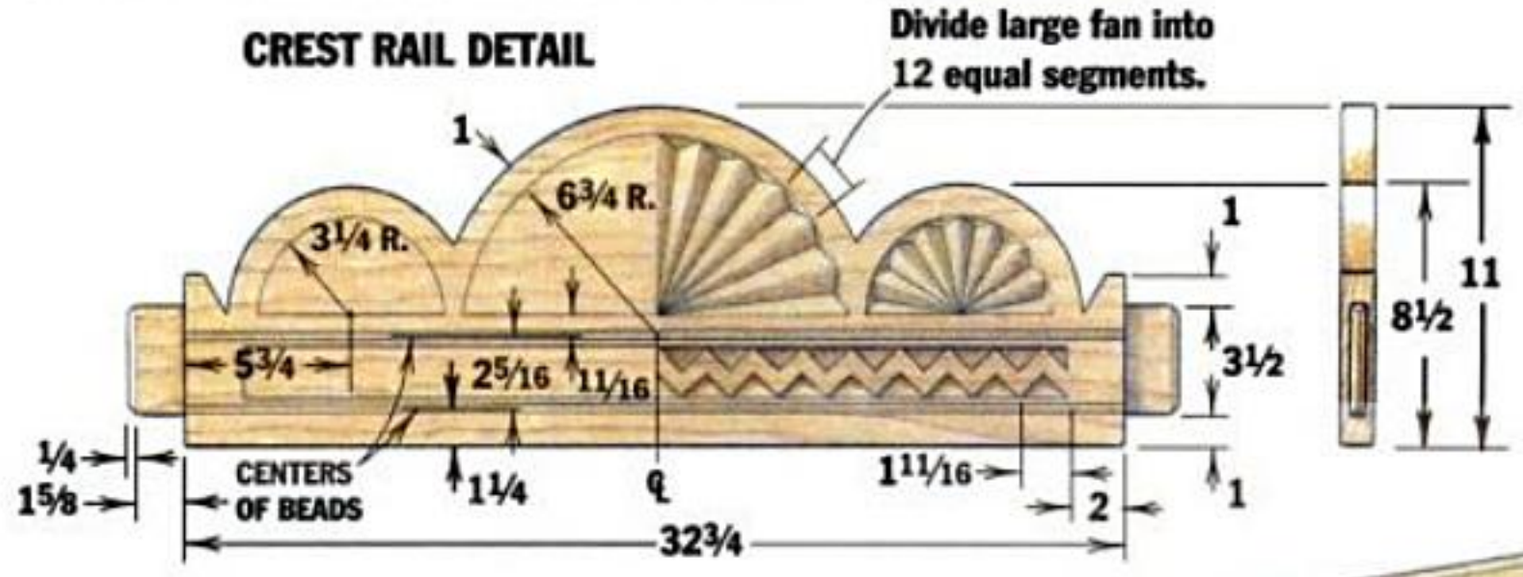
Regarding his designs, Lavadie admits that it's very hard to be original anymore. "You might see a particular rosette in almost any application—on a chair back, on a sign, or anywhere. I just try to combine traditional design elements in an authentic way that's aesthetically pleasing. In the end, the whole piece has to balance, both dimensionally and aesthetically.

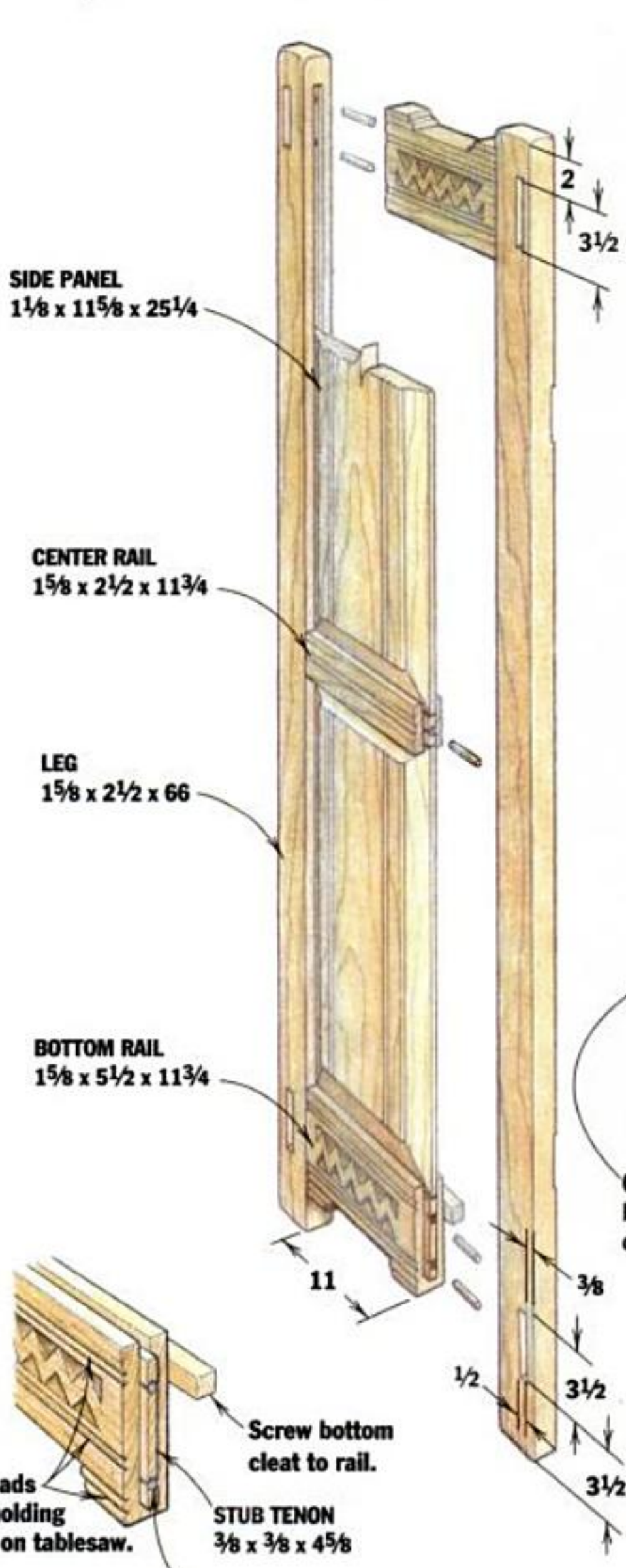
"My major influences are the culture I was born into and my desire to preserve it through building furniture," he says. "The woodwork has been a rich and enduring tradition—a tradition I hope will be passed down to future generations." —*K.H.*

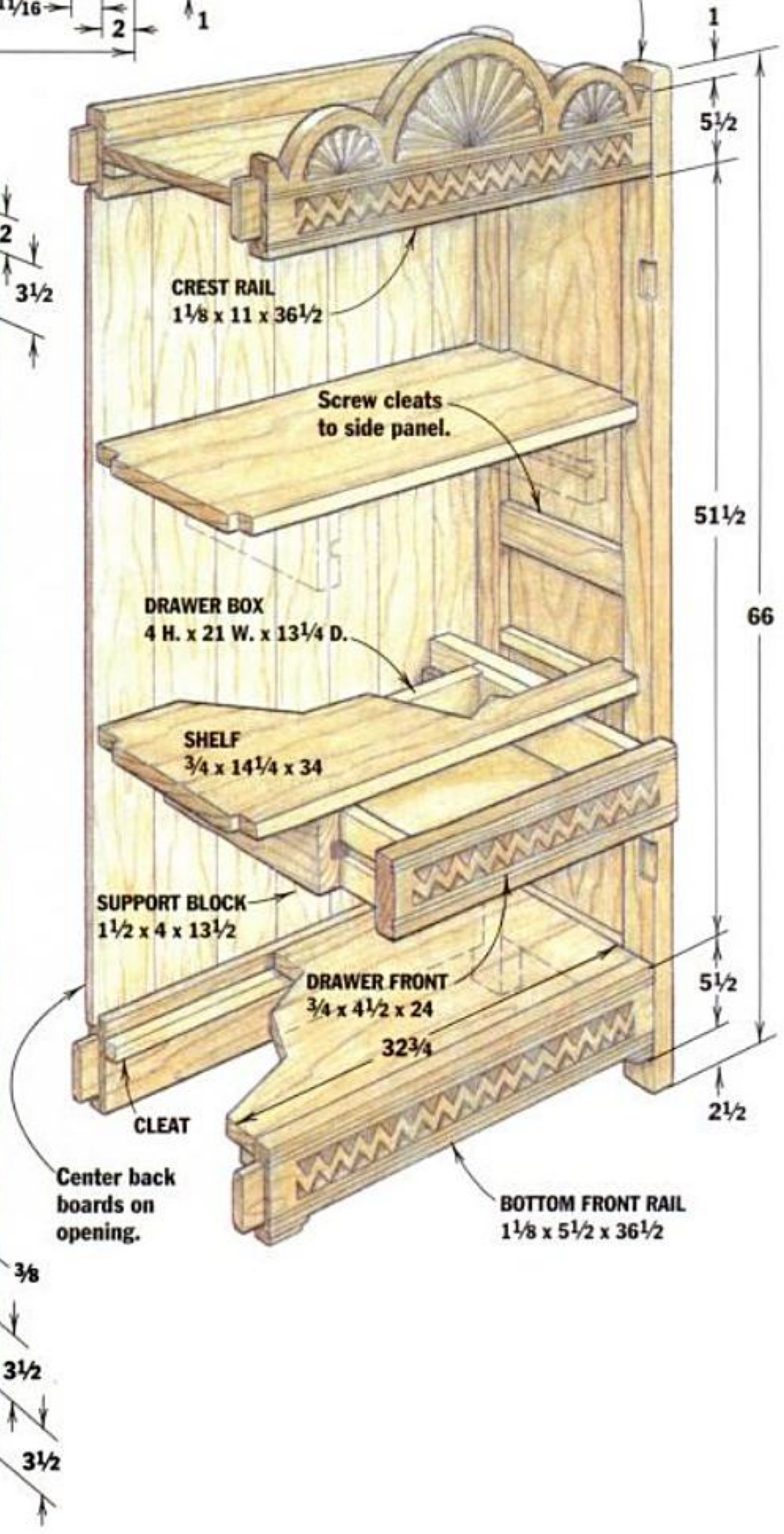
Lavadie used a pattern knife to outline the curved vines on this chest of drawers before carving out the background with a gouge.

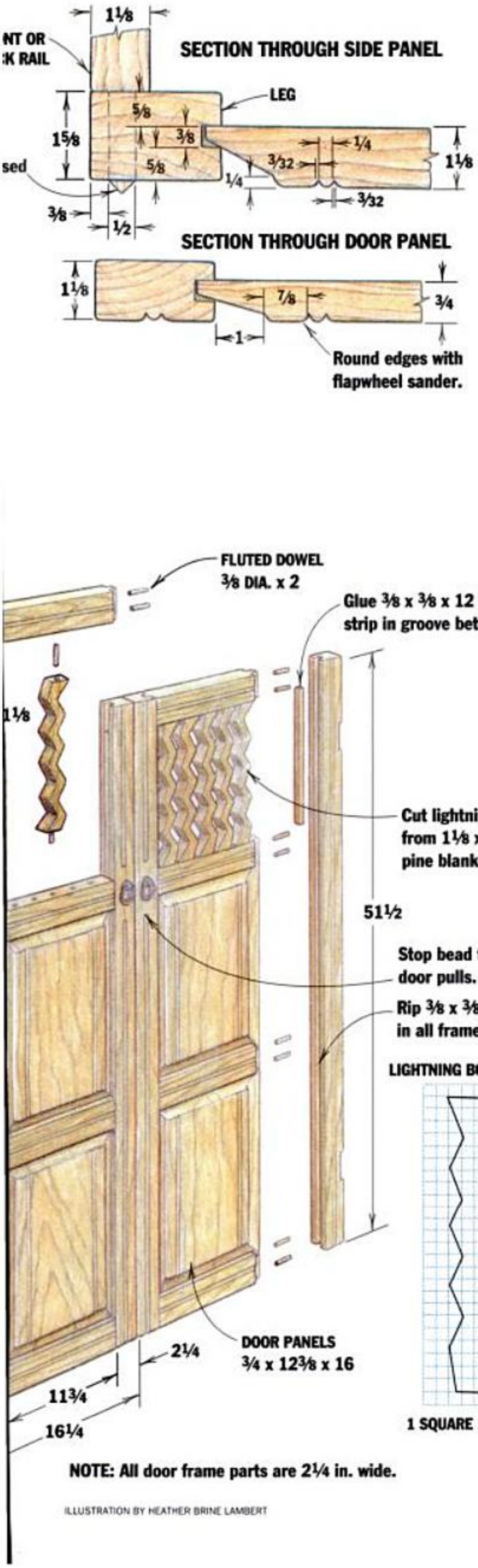
PHOTOS COURTESY OF ROBERTO LAVADIE

NEW MEXICAN "TRASTERO"









NOTE: All door frame parts are 2¼ in. wide.

ILLUSTRATION BY HEATHER BRINE LAMBERT

Lavadie completes the carcase joints first, then dry assembles the trastero frame.

PHOTOS BY KINGSLEY HAMMETT

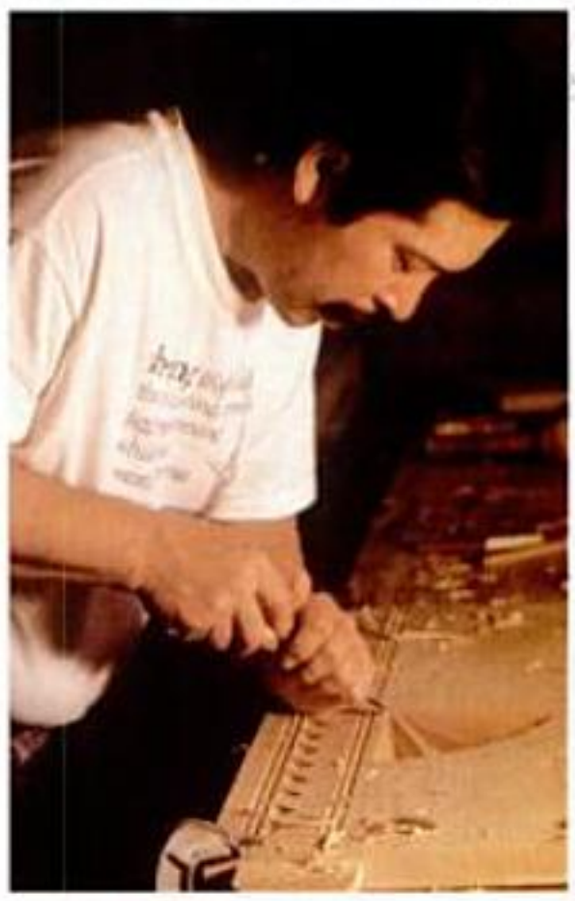
beads down the centers of all the frame parts.

Next, he uses another zigzag pattern to trace the lightning bolts before cutting them out with his bandsaw. After sawing, he cleans up the bandsawn surfaces with a chisel to give them handmade character. He trims them to the exact height of the openings and dowels them into the rails when assembling the doors.

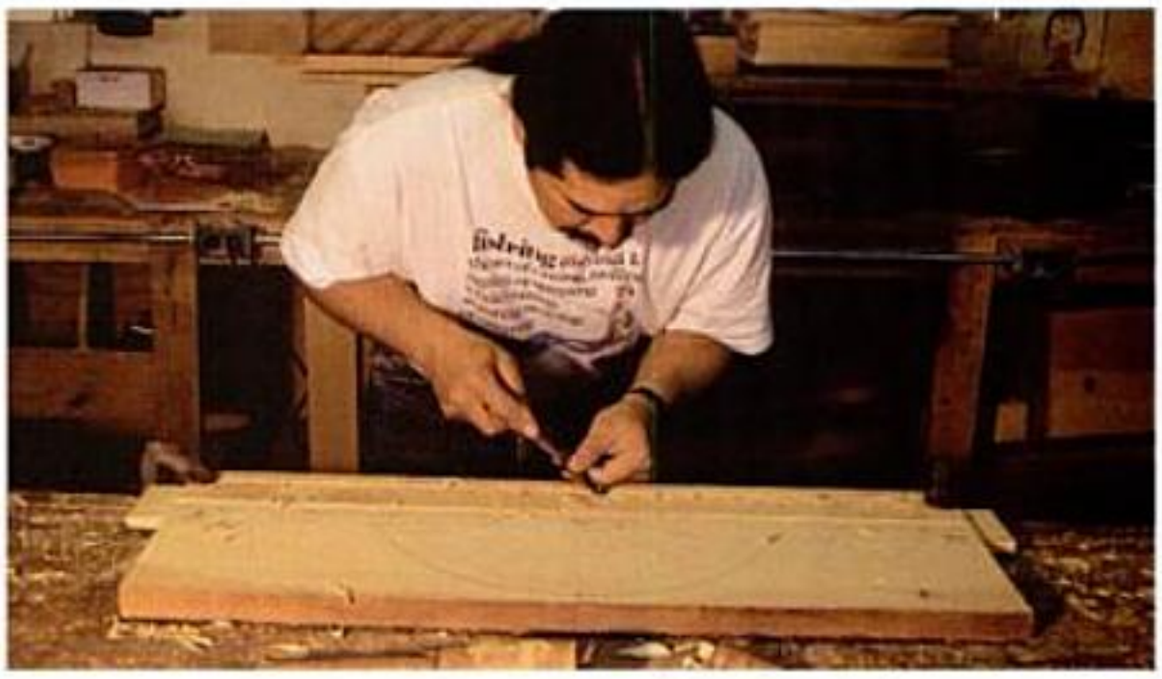
Lavadie makes the shelves of ¾-in.-thick pine, and he supports them with cleats screwed to the insides of the side panels. The drawers (see photo, page 47), made of ¾-in.-thick pine with ½-in.-thick pine bottoms, are simple rabbeted-and-nailed boxes with carved faces screwed to the fronts.

He suspends the drawers from support blocks which are screwed to the undersides of the shelves. (See drawing.) The drawer sides have ⅜-in.-deep by ½-in.-wide grooves that slide on ½-in.-thick runners dadoed into the support blocks.

To imitate years of wear, Lavadie rounds the corners and edges—even the faces of the panels—with a block plane and chisels, then he smooths them with a 2-in.-dia., 100-grit flapwheel sander (available from Klingspor's, Box 3737, Hickory, NC 28603-3737, 800-228-0000) in his portable drill. To further distress the surface, he loops a



Lavadie pares the *el rayo* (lightning bolt) design and the shaped fans of the crest rail with a V-shaped parting tool and bench chisels.



ORIGINS OF NEW MEXICAN STYLE

Four Centuries of Tradition in the "Land of Enchantment"

The romance of the New Mexican style, now caricatured around the world in everything from faux adobe homes to howling pink coyotes, is most authentically captured in the unique furniture of northern New Mexico.

New Mexican style has been over 400 years in the making. It has been influenced by the earliest Spanish conquistadors, the struggling Hispanic settlers, the conquering Yankees, and in this century by the influx of tourists, artists, archaeologists, architects and historians. It's possible to divide the style's evolution into three distinct periods that trace the history of this harsh and turbulent land.

Spanish Colonial Period: 1598 to 1821

Spanish colonists brought few pieces of furniture with them when they immigrated to the Southwest from Mother Spain, so they made their own, often from ponderosa pine, split and adzed to a workable thickness.

Carvings relieve the visual mass of this Spanish Colonial chest (c. 1800).

These carved and painted cupboard doors, made during the Spanish Colonial period, swing on pintle hinges.

These early furniture makers used mortise-and-tenon joinery, with square pegs or wedges to keep the joints tight in the arid climate. *Carpinteros*, as the craftsmen were called, relieved the massive boards of some of their visual weight by carving their surfaces with Spanish and Moorish motifs such as pomegranates, rosettes, shells, lions and scallops. Other embellishments included heavy grooves and cutouts along table aprons and bottom rails, and hand-carved spindles and splats inspired by the window grilles popular in Spain.

Trasteros, or cupboards, had doors that swung on "pintle" hinges (wooden pins carved on the ends of the hinge stiles). Crests, cut into the shape of fans or scallops, often adorned the top fronts and sides of such pieces and were secured by dadoes cut in the legs, which extended above the tops of the cabinets. Deep carvings suggesting corn stalks, rain, or the heavens indicate some pieces may have been built by Pueblo Indians.

Anglo-American Period: 1821 to 1900

The opening of the Santa Fe Trail in 1821 brought Anglo-American settlers, along with sawn planks, frame saws, molding planes and the furniture styles popular in the East.

In the isolated villages of northern New Mexico, local woodworkers absorbed these new influences into their own style. They decorated traditional New Mexican furniture with intricate cutouts, turnings and applied wood panels reminiscent of the Empire, Greek Revival, Mission and Craftsman styles. Trasteros became wardrobes and were topped with crown moldings. Some were highly painted and "grained," while others sported punched tin fronts

This Anglo-American-period cabinet resembles a Midwestern pie safe.

Mid-1800s bed shows intermingling of Anglo and Hispanic design elements.

like their Hoosier-cabinet cousins from the Midwest. (See photo, opposite.)

Spanish Revival Period: **1920 to Present**

New Mexican furniture making languished between 1900 and 1920 as the need for furniture was met by factory-produced imports. But interest in traditional New Mexican style arose again with the construction of the Fine Arts Museum in Santa Fe, in 1915.

Chair built for the Museum of Fine Arts in Santa Fe in 1917 is a fine example of Spanish-Revival-period furniture, with its Craftsman-style joinery and proportions.

This museum embodied Spanish Colonial and Pueblo Indian motifs in everything from the architecture to the furnishings. Decorative elements such as the carved designs on the massive beams and corbels, chip carvings painted in dull reds and blues (see photo, above), and protruding tenons derived from the Mission and Craftsman styles became signatures of the Spanish Revival period, and they continue to inform furniture makers of the region today.

With the onset of the Great Depression, New Mexico's rural subsistence economy collapsed. To help create jobs, state relief officials opened furniture-making programs throughout the state, giving rise to a new look in New Mexican furniture that would forever after be referred to as the "WPA style."

The state produced a mimeographed booklet that laid out acceptable design standards for reproductions of "traditional" 18th- and 19th-century pieces, encouraging a return to through mortise-and-tenon joinery and carved rosettes and sunbursts. While some teachers and students followed this "Blue Book" literally, others adapted the drawings to their own tastes. Today, well-worn copies of the Blue Book are still used in New Mexican cabinet shops, while the modest pieces crafted during the WPA period, their shellacked surfaces orange with age, fetch ever-rising prices on the antiques market. —*K.H.*

For additional reading, see *New Mexican Furniture, 1600 - 1940, by Lonn Taylor and Dessa Bokides (1987, Museum of New Mexico Press, Box 2087, Santa Fe, NM 87503).*

PHOTO CREDITS: LEFT TO RIGHT FROM TOP: INTERNATIONAL FOLK ART FOUNDATION COLLECTIONS AT THE MUSEUM OF INTERNATIONAL FOLK ART, A UNIT OF THE MUSEUM OF NEW MEXICO, SANTA FE, NM; MUSEUM OF NEW MEXICO COLLECTIONS, SANTA FE, NM; COLLECTION OF DR. AND MRS. WARD ALAN MINGE, CORRALES, NM; COLLECTION OF MR. AND MRS. BERNARD LOPEZ, SANTA FE, NM; COLLECTION OF MR. AND MRS. LARRY FRANK, ARROYO HONDO, NM; PHOTOGRAPHER: MARY PECK.

collection of odd nuts, bolts, and washers on a leather thong and lightly taps it against the surfaces where wear would ordinarily occur—particularly at the corners, below the pulls and near the bottom of the cabinet, where it would have been banged up by mops, brooms, vacuum cleaners and kids over the years. Then he hand-sands the entire piece with 100-grit sandpaper. He prefers this coarse grit because it helps the surface take stain better than finer grits would.

Finishing Up

Lavadie has devised a special finishing process that completes the aged look of the trastero. First, he applies a coat of Minwax "Puritan Pine" stain. Once the stain has dried, he sprays on a coat of lacquer sanding sealer (available at paint stores).

Soft edges and bead details in the rails and raised panels complement the geometric pattern of the *el rayo* carving.

Then he rubs the piece lightly with 220-grit sandpaper or 00-grade steel wool to produce a good bonding surface for his second coat of stain—in this case, Minwax "Special Walnut." He steel-wools the piece again, creating highlights where the lighter stain comes through and leaving the darker brown color in the recesses. Then he applies three or four coats of lacquer and finishes up by rubbing the surface with steel wool and wax to create a soft patina.

Lavadie uses standard magnet catches or roller catches for his cabinets. Likewise, his hinges are standard 2-in. by 2½-in. butt hinges, but with an added touch: To give them a handmade look, he heats them in his wood stove (you could use a torch) until the zinc coating has burned off. Before they cool completely, he brushes them with a wire brush and gives them a coat of paste wax.

Inside the cabinet, two drawers with carved fronts are suspended from simple shelves.

PHOTOS BY KINGSLEY HAMMETT

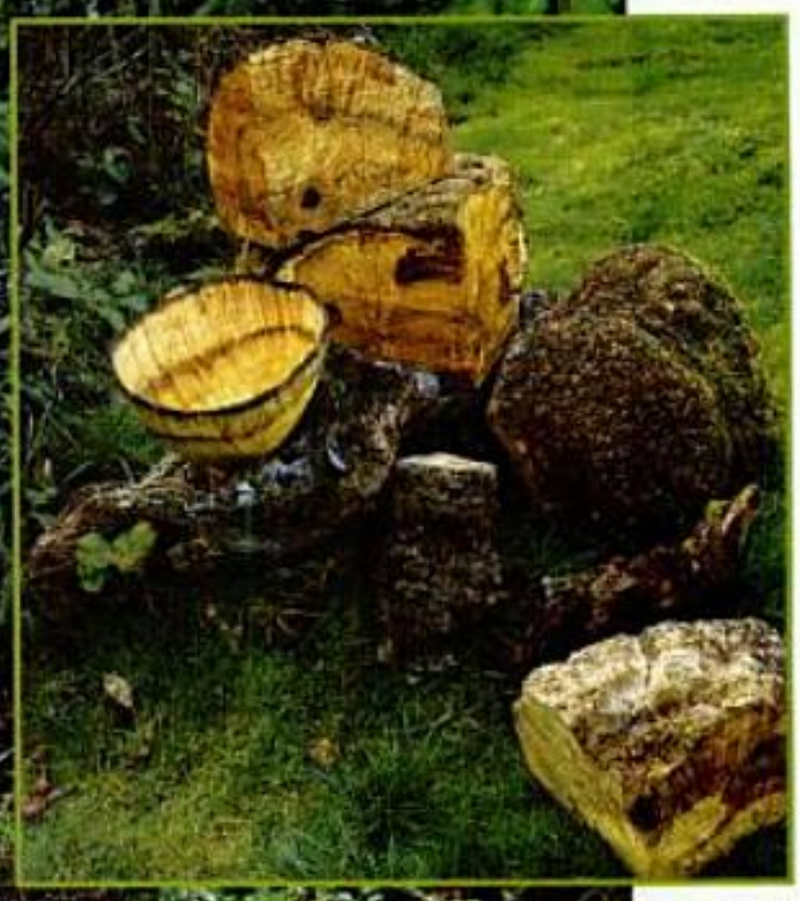
The door pulls (available from Roberto Lavadie, Box 522, Taos, NM 87571, 505-758-9130), are hand-forged by a local blacksmith, and are fastened to the doors with clinch pins. ▲

KINGSLEY HAMMETT *is a furniture maker and designer from New Mexico. He wrote the forthcoming book, Crafting New Mexican Furniture (Red Crane Books, 826 Camino Del Monte Rey, Santa Fe, NM 87501).*

Working With Burl

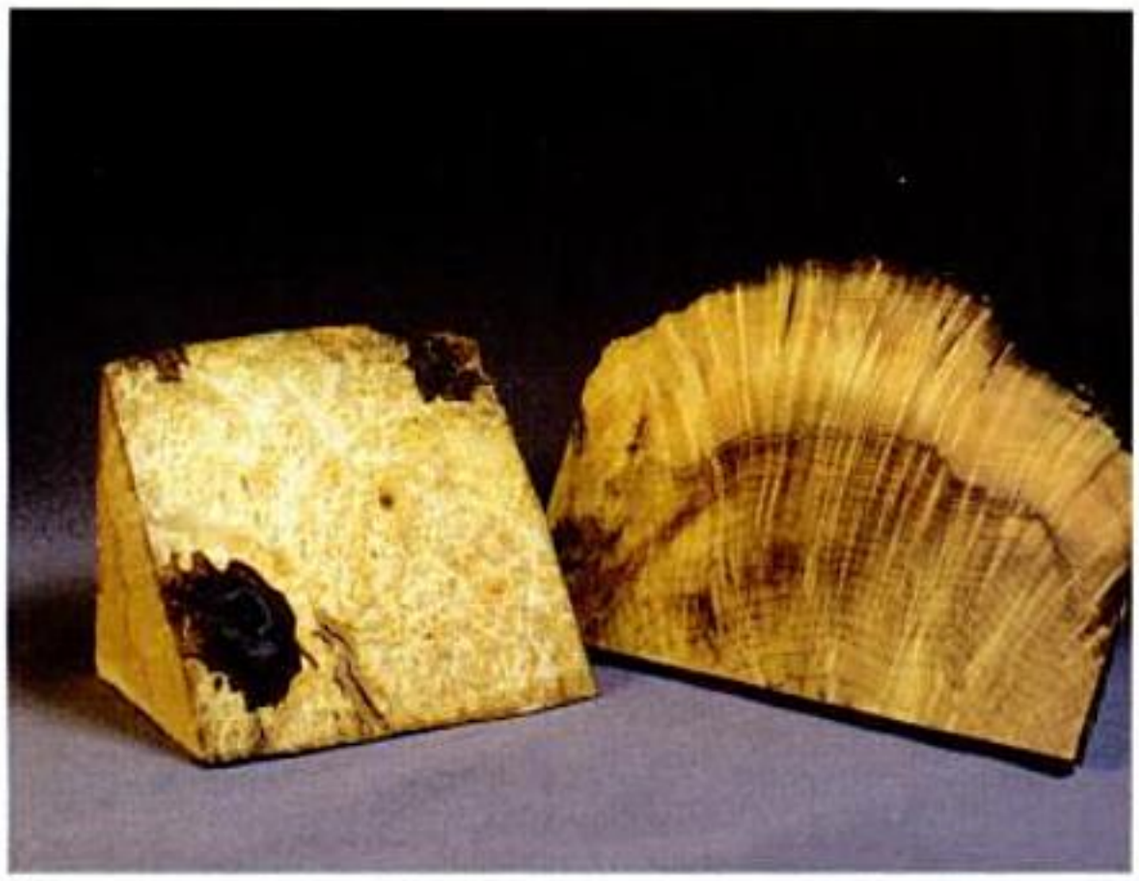
This Wild Wood Yields Spectacular Results, If You Know How to Work It

By Stephen H. Blenk

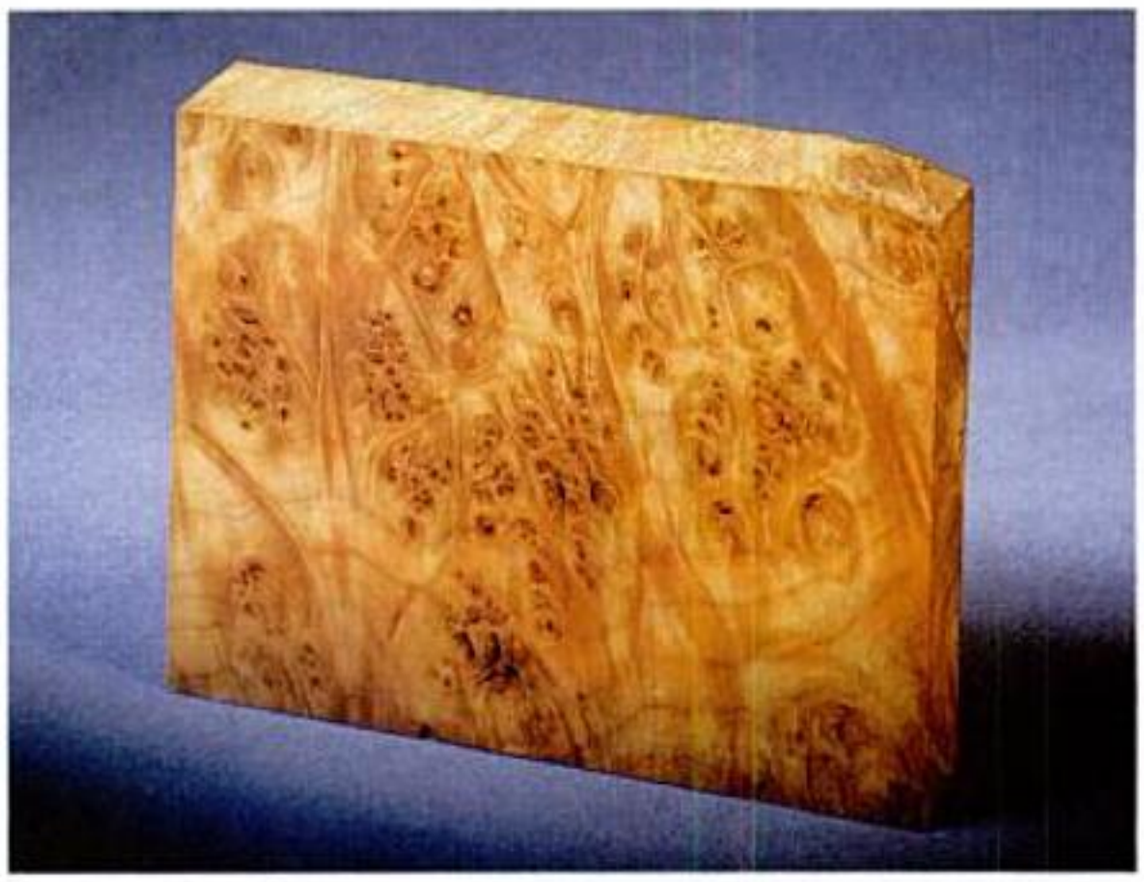


Burls like those growing on this maple tree can yield spectacular wood. Inset, from top to bottom, are myrtle, locust, apple and maple burls next to a maple burl bowl.

PHOTOS BY ROSS HAMILTON



How you cut a burl affects the figure. If you cut in a plane parallel to the tree surface, you'll get bull's-eye figure (left). Cut perpendicular to the tree surface and you'll get radial figure (right).



Looking almost like a cross-section of a blood cell, this blank displays the large eyes interwoven with highly figured wood that are common in root/trunk burls.

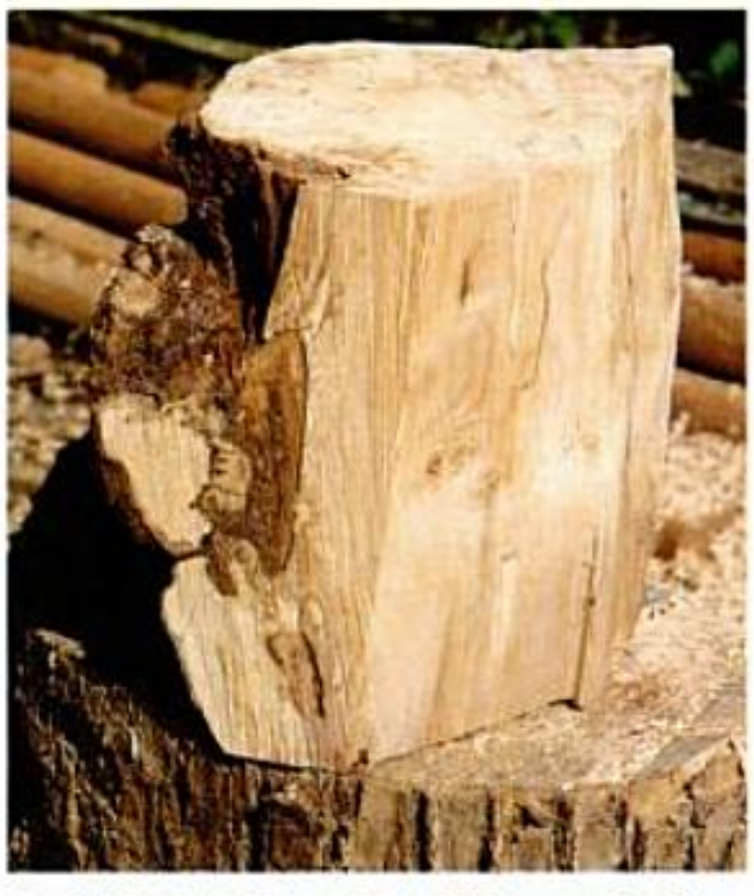
With its wild grain and shimmering colors, burl wood has long been prized by woodworkers. The ancient Romans valued tabletops made from sections of burl, and in this country, Native Americans often made treen (utensils) from burl. Today, turners and cabinetmakers continue to use burl for special effects. Yet despite its widespread appeal, few people seem to understand much about the technical properties of this precious material.

What is a burl? What causes it? How do you harvest one, store it and work it? Here's what I've learned through research and years of turning the wood:

Defining Burls

The term "burl" (or "burr" as the British and Australians say) has been used as a catch-all to describe any unusual lump or growth on a tree. Yet some of the things we call "burls" aren't burls at all, but "scabs" sealing the remains of a broken branch. The best description of a true burl I have been able to find without "cussing" in Latin is in Albert Constantine Jr.'s book, *Know Your Woods* (1975, revised ed., Charles Scribner's Sons, Macmillan Publishing Co., 866 3rd Ave., New York, NY 10022). He says a burl is "an abnormal, wart-like excrescence on the trunk or branches of a tree. Examined closely, it may appear to consist of a great mass of 'eyes' or dormant buds. The surface of such a bulge may be smooth or rough."

Burls can occur on the roots, trunk or branches of a tree, and sometimes in all those spots on a single tree. They can be huge (see lead photo) encompassing the entire base or trunk of some species, such as the California redwood, or very small and superficial, as on some fruit trees. Burls can be found on most species of trees, and though burls are rare in the overall tree population, they can show up on entire groups of trees in a relatively small area. A puzzle indeed!



Aerial burls often show little penetration into the heart of the tree.

What Causes Burls?

Why do burls occur? There really isn't much agreement among the experts. Burls have been blamed on everything from insect damage and viruses to genetic miscodes. The most believable explanation I found referred to them as "lignotubers" (shoots), which would make burls yet another method trees can use to propagate themselves. Take a green burl and plant it properly, and you will (probably) get another tree.

Burls are often found on a tree in stress. In my area, the Pacific Northwest, broadleaf maple (*Acer macrophillia*) is a classic example. Larger maples are prone to heart rot and will become peppered with burls as they slowly die from the center. When the trees finally fall, new growth will sprout from the burls.

Properties of Burls

Burls can be divided into two rough categories: aerial (high) burls (above left), and root/trunk burls (above right).

Aerial burls, as their name suggests, will be higher on the tree. Such burls tend to be finer grained with the knots or eyes of the dormant buds more densely clustered and evenly spaced. I often compare these burls to kernels of popcorn, because the largest area is usually the visible lump on the outside of the tree. As you go in further, the diameter of the burl grows smaller and will often vanish entirely, long before the heart of the tree. (See photo at left.)

Generally, an aerial burl is smaller than a trunk or root burl. Of course, there are no hard and fast rules. Note the maple on the opposite page, where the burl rings the tree at a height of almost 20 ft.!

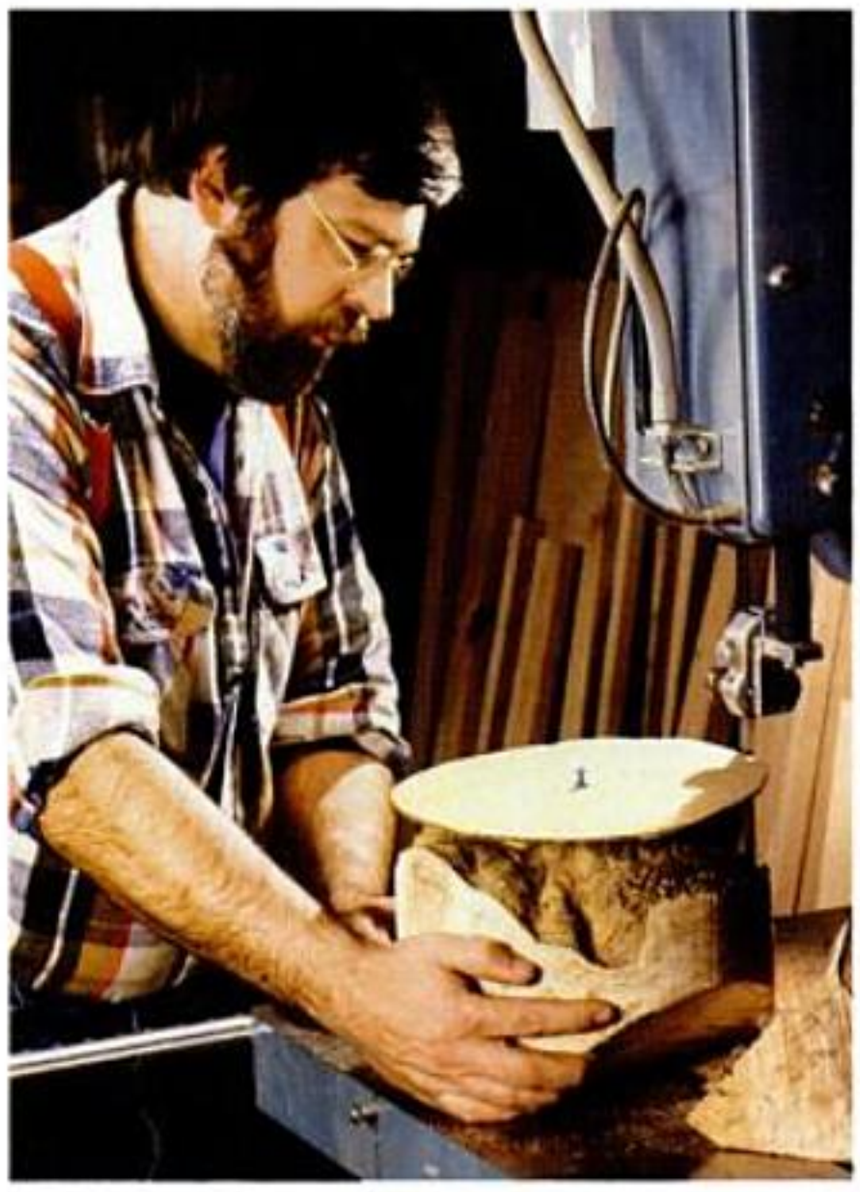
Root burls are the big monsters, often weighing in the thousands of pounds, and they are the stuff woodturners dream of for large bowl turning.

They are less evenly proportioned than their smaller relatives, and the dormant buds that form the eyes are often interwoven with highly figured wood (see top right photo, page 49), perhaps the result of compression growth in the heavy base of the tree.

Harvesting Burls

Woodworkers sometimes harvest aerial burls by "scabbing" them—sawing them off the outside of living trees—but I don't recommend this process. I believe it damages the tree, sometimes fatally, and leaves a large part of the burl material behind. Better to wait until a tree containing a burl becomes available, and then harvest the entire tree.

You can scavenge burls from downed trees, but since burls tend to be fracture-prone, you need to work quickly after the tree hits the ground. If you wait more than six months or a year, the burl is likely to be useless. (In fact, it may even have sprouted.)



Since he can't scribe a circle on the irregular surface of a burl such as this one, author nails a cardboard template to the top to guide him during bandsawing.

If an aerial burl is small enough, it should be cut out whole and left intact until you are ready to saw it for a specific purpose. Harvesting root burls may require some major equipment, like a backhoe: Root burls can be quite large, and often the largest part is below ground. The biggest I have seen was a madrone burl in excess of 2,500 pounds, but I've heard of larger ones.

I have cut large root burls into bowl blanks right in the woods, but it's a long, difficult process involving monster (60-in. bar) chain saws and far too much pick and shovel work. And it always seems that the best burls occur at the bottom of the local equivalent of the Grand Canyon; they migrate there to be harvested.

That last comment is only partly in jest. Burls can grow on trees anywhere, but I've found they love bottom land where there's a stream (perhaps because the water provides a constant flow of minerals) or ridgetops (where severe wind and weather conditions can stress a tree).

Storing Burls

What should the average woodworker do with a burl if he's lucky enough to get one? First, since burls are highly susceptible to checking and cracking, coat all sawn surfaces with a good sealer such as Anchorseal (available from UC Coatings, Box 1066, Buffalo, NY 14215, 716-833-9366). This will give the wood the chance to dry slowly. What you do next depends on whether you intend to turn it or use it in cabinetwork.

I prefer to turn burl vessels green, going to finished thickness of ¼ in. or less. I pack the vessel with wet shavings and slow the drying process by putting the bowl in a plastic bag and then turning the bag inside out every day or two to wick off excess moisture. After a week or two, I'm able to leave the bowl outside the bag for periods of time, to speed up the drying process. All told, it might take three months to completely dry the bowl, but this method seems to prevent most checking and limits severe deformation. Once the bowl is dry, I can remount it for sanding.

Drying burl lumber for cabinetry is a tough call. Kiln drying usually causes severe checking. Vacuum kilning gives better results, but if there is a significant thickness to the material, *some* checking will almost always occur. Even if you're using "seasoned" material, I suggest you cut it near final thickness, then sticker it and dry it a few days in your shop before dimensioning it. (For more on drying wood, see "Backyard Lumbermaking," AW #21.)

Burl veneer usually dries "wrinkled" due to uneven contraction of the eyes' concentric grain. It must be dampened with water and pressed flat before application. Master cabinetmaker Frank Klausz recommends treating veneer with a sizing mix: You can make your own from 2 parts hide glue, 3 parts water, 1½ parts glycerine and 1 part denatured alcohol. Spray the sizing on both sides of the veneer and stand it up until it's semi-dry so the wood can soak up the glycerine. Then pack the veneer between layers of brown paper (either wrapping paper or shopping bags) and weight it down. Add weight gradually (you can start with a single cinder block); otherwise the veneer may crack.

Cutting Burls

Root burls are likely to contain rocks and dirt, so they can be tough on saw blades. When possible I like to pressure-wash the wood before cutting, but most often I just accept the fact that I'll be sacrificing a certain number of chainsaw and bandsaw blades to the gods of the burls.

Just as with normal wood, how you cut a burl will affect the figure of the finished piece. Burl doesn't have any real grain, but the small dormant buds or eyes in the burl tend to be oriented to the outside of the tree. If you cut in a plane parallel to the tree's outer surface, your material will have a flat "bull's-eye" sort of pattern, as shown in the left burl in the top left photo on page 49. Saw it 90° opposed to the tree's surface, and you will display a radial sort of grain (see the right burl in the same photo) where the burl radiates from its starting point to its surface.

When sawn to display the bull's-eye grain patterns—the traditional veneer cut—burl tends to be more stable. While the centers of the eyes may eventually show small checking, large fractures seem to occur less often than when the material is cut to display the radial grain.

Since burl lacks real grain structure to guide you, cutting up a large burl for bowl blanks is an exercise in unscrewing the inscrutable. I recently purchased a 1,500-pound myrtle

ROSS HAMILTON

MITCH MANDEL

burl on behalf of our woodturners club, transported it to Washington state from Oregon, and then ducked out of the cutting party. I knew there were going to be as many opinions on how to cut as there were turners present.

Personally, I like to cut burl to maximize the number of bowl blanks with natural edge potential. I also try to locate "defects" creatively, so they can be used in vessel design instead of becoming discards. (See photo above.)

Working Burls

I prefer to turn myrtle, Western broadleaf maple and walnut burls, and I usually stay away from fruitwood burls because they're more susceptible to checking. But most every species of burl is suitable for turning. Burl wood in general is not strong, though, and I don't recommend using it for structural furniture parts such as chair legs.

Frank Klausz also advises against using solid burl for panels or door frames; it moves so much it won't stay

SOURCES

Burl wood is available from the following mail-order suppliers:

The Burl Tree
(blanks, whole burls & veneers)
3527 Broadway
Eureka, CA 95503
(800) 785-2875
Circle #609

Certainly Wood
(veneers)
11753 Big Tree Rd.
East Aurora, NY 14052
(716) 655-0206
Circle #610

Colonial Hardwoods Inc.
(blanks & veneers)
7953 Cameron Brown Ct.
Springfield, VA 22153
(800) 466-5451
Circle #611

Constantine's
(blanks & veneers)
2050 Eastchester Rd.
Bronx, NY 10461
(800) 223-8087
Circle #612

One Good Turn
(blanks)
3 Regal St.
Murray, UT 84107
(801) 266-1578
Circle #613

Randle Woods
(blanks & lumber)
Box 96
Randle, WA 98377
(800) 845-8042
Circle #614

Unicorn Universal Woods
(veneer & lumber)
4190 Steeles Ave. W.
Woodbridge, Ontario
Canada L4L 3S8
(905) 851-2308
Circle #615

Wood-Ply Lumber Corp.
(blanks & slabs)
100 Bennington Ave.
Freeport, NY 11520
(800) 354-9002
Circle #616

Two uses for burls: The voids and rough edges of one burl yielded this interesting bowl (left) by the author, while amboyna burl veneer graces a reproduction Chinese low table (below).

straight or flat. In fact, he says you'll even have problems laminating pieces more than ¼ in. thick to plywood or another stable substrate. Since the burl has no grain, it will move in all directions *and* move so much the lamination won't hold. You can use solid burl as a tabletop (as all those ugly redwood burl pieces from the 1960s proved), but you'll need to join it to the frame to allow maximum wood movement.

Like bird's-eye maple, burl is susceptible to tear-out, so you'll want to work it with razor-sharp tools. When turning, I stop frequently to resharpen my gouge. Klausz advises against using a planer or jointer on burl because tear-out is too great. Also, he's found pad sanders don't work well: There is such a great difference between the hard and soft fibers, the pad sander will dig in and give the wood a rippled surface. His finishing tool of choice is a sharp scraper.

If you're buying rather than harvesting burls you can expect to pay $3 to $6 a pound for blanks and $2 to $4 per square ft. for veneers. Obviously, at those prices these aren't puppies you'll want to waste. If you are fortunate enough to have a good supply of burl, use it well and wisely. Think of burl as the icing on your woodworking cake.

While experiments have begun to generate burls by transferring genetic material from burled trees to "healthy" ones, the demand still far exceeds the supply. Large quantities of burl are being shipped from the Pacific Northwest to Japan and other Asian countries, and it's becoming more difficult and expensive to get good burl. These tree-borne anomalies have gone from being mere oddities to being big business. I guess those Romans knew something. ▲

STEPHEN H. BLENK *is a turner in Washington state and founder of the Olympic Peninsula chapter of the American Association of Woodturners.*

ACCENTED JOINERY

Techniques For Adding Visual Interest

By Jim Tolpin

Emphasizing your joints can add visual interest to a piece. Here, furniture maker Jeff Lohr of Schwenksville, Pennsylvania, extends the couch's breadboard ends beyond the arms and bridges the offset with ebony splines to accent the joint.

PHOTO BY MITCH MANDEL

During the years I've been designing and building furniture, I've learned certain techniques that emphasize the look of my joinery rather than subduing its appearance or hiding it entirely. My tricks include offsetting joined surfaces, applying moldings over the joints, or simply cutting a recess to accent a joint line. All these techniques add visual interest to my furniture.

Recently, while perusing a 19th-century text on English cabinetmaking, I discovered there was a name for these design strategies: "frank joining." In reading a few other dusty tomes on 19th-century cabinetmaking, I found that frank joinery has historically fallen into three distinct styles: "cogged" joints ("cog" is an old synonym for tenon), "protrusion" joints, and "shadow-line" joints. Curious. Early woodworkers had not only used the same techniques I learned through trial and error—they'd even named them!

Now that I've found a name for what I've been doing all these years, I'll acquaint you with all three of these design options, and show you how and where you can use them in your own furniture designs. That said, let's start with the most common type of franked joint: the cogged joint.

Designing Cogged Joints

"Cogging" is another name for offsetting, where you create non-flush surfaces at the juncture of two or more pieces of wood. Cogged joints are perhaps the most common of the three varieties of frank joinery, because the technique can be applied to a variety of joinery situations, particularly in structural frame members.

I commonly employ cogged designs when constructing face frames. (See drawing.) By breaking up the monotony of a flush front, I can add some flair to the piece. At the same time I'm able to overcome problems brought on by wood movement, since expansion and contraction of adjacent members only changes the amount of reveal rather than creating the small but noticeable ridge common to flush joints. Also, with cogged joints I can final-sand the frame parts before assembly without worrying about misaligned parts come assembly time. This

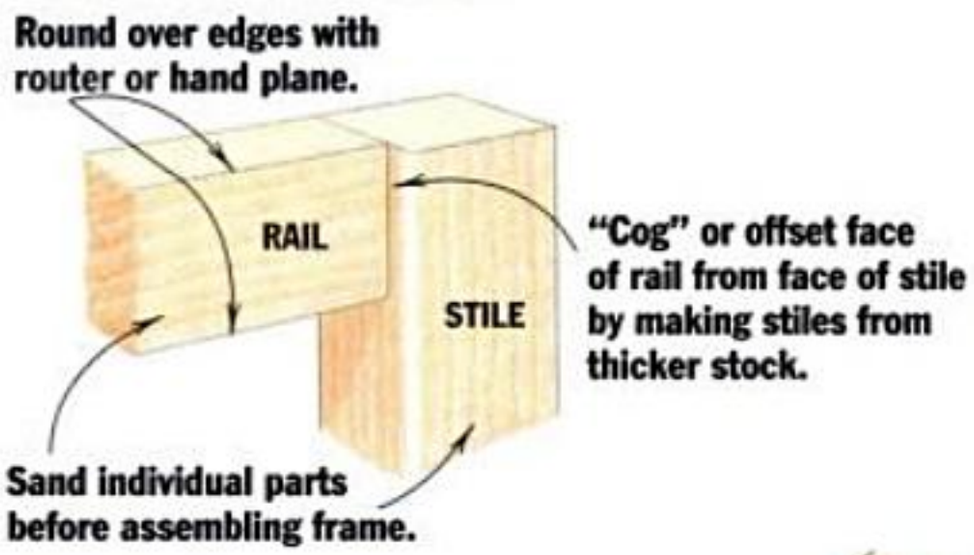
David Hazinski, from Asheville, North Carolina, creates "cogged" or offset surfaces at the leg-to-leg joints on this stepstool.

PHOTO BY DAVID HAZINSKI

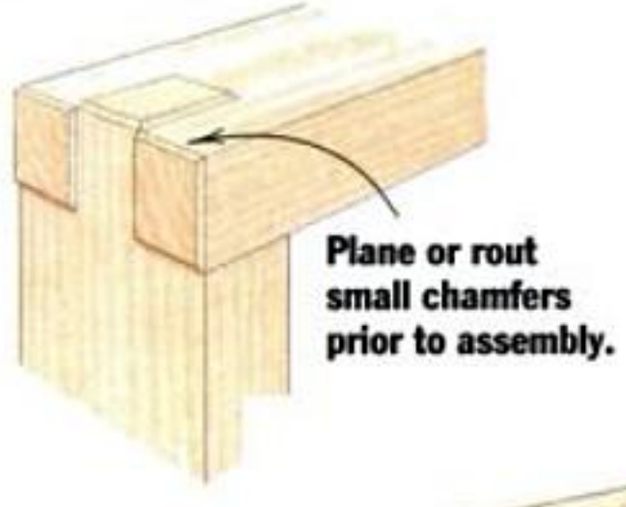
ACCENTED JOINERY

COGGED JOINTS

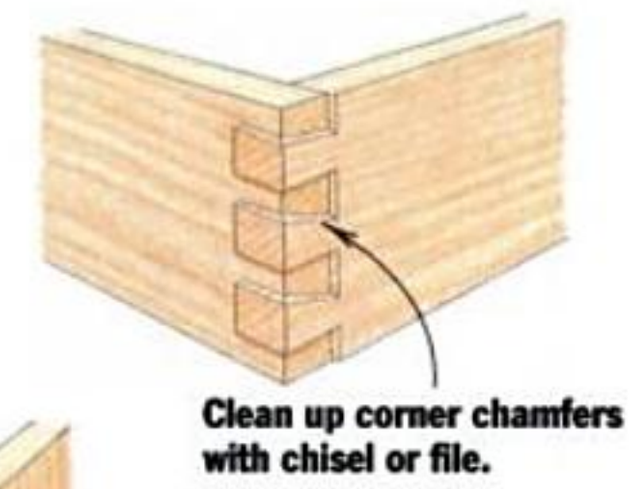
COGGED FACE-FRAME JOINTS

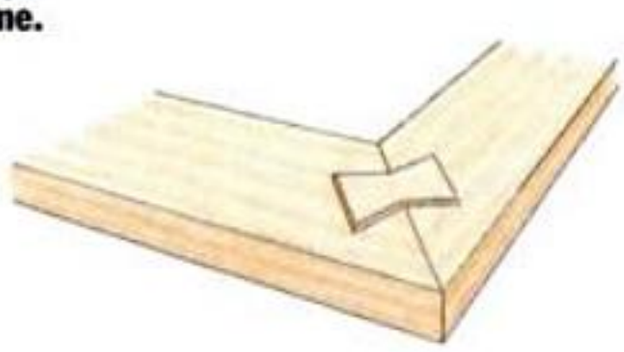


COGGED BRIDLE JOINT

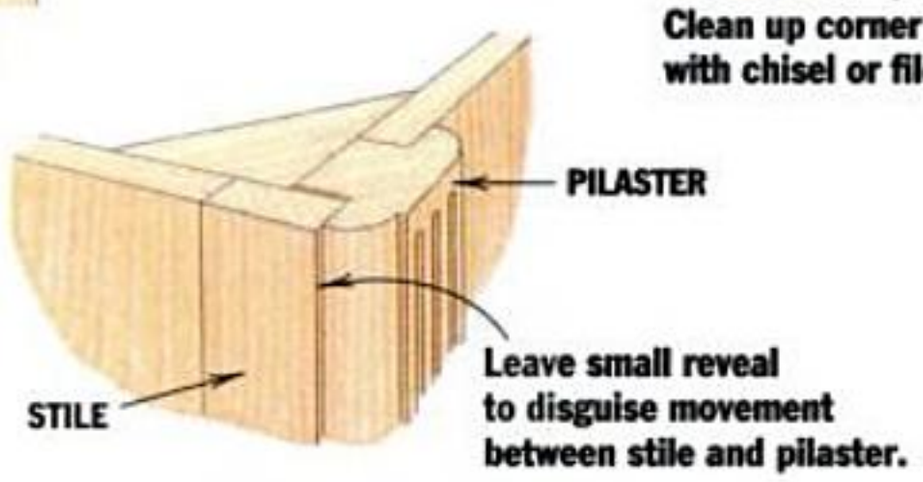


COGGED DOVETAIL JOINT



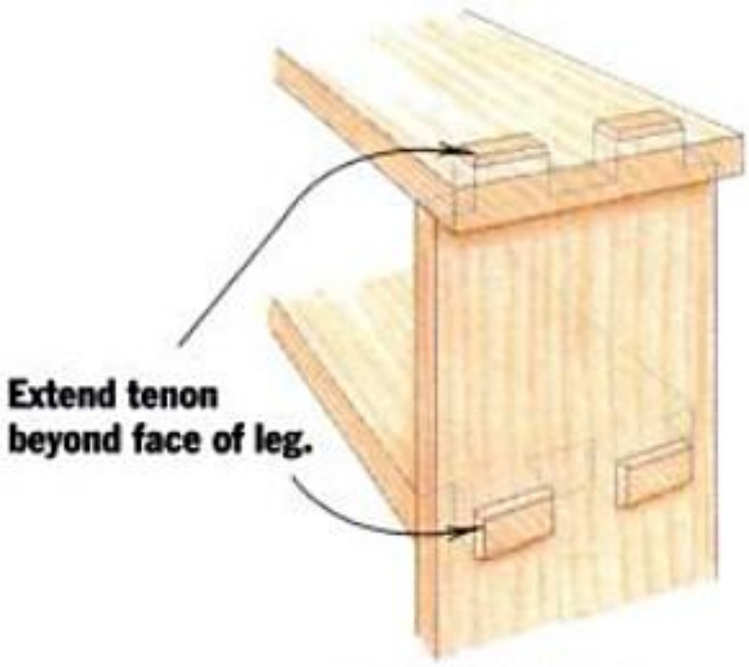


COGGED BUTTERFLY SPLINE

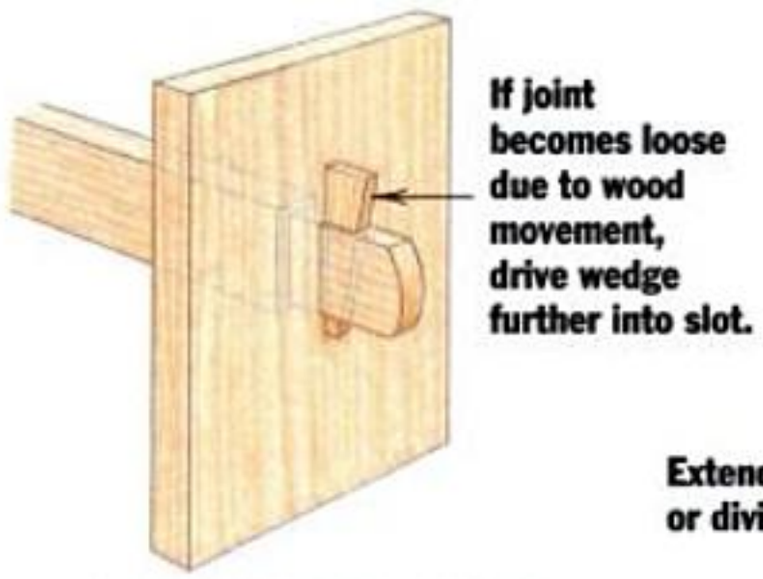


CARCASE CORNER

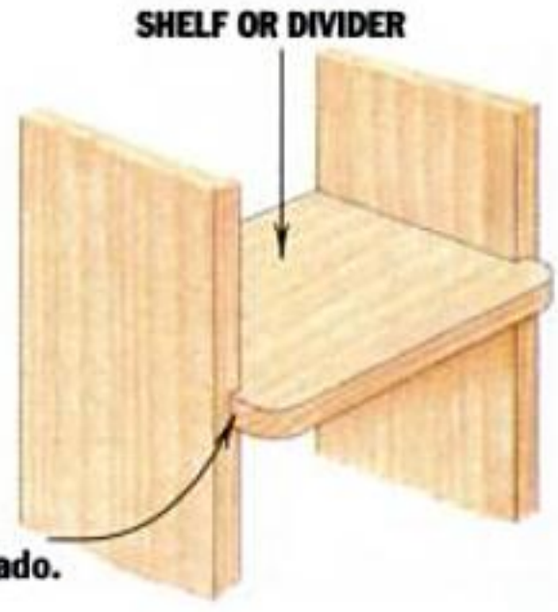
PROTRUDING JOINTS



THROUGH TENONS



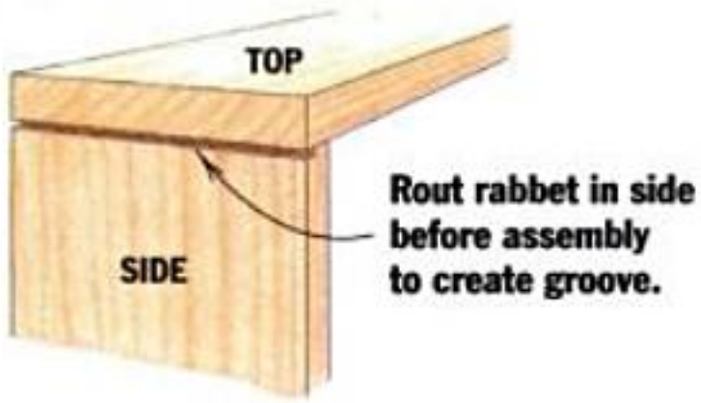
WEDGED THROUGH TENONS



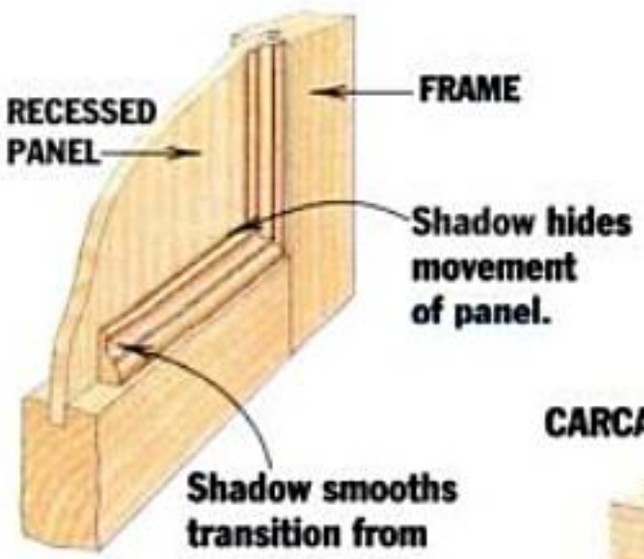
PROTRUDING SHELVES OR DIVIDERS

SHADOW-LINE JOINTS

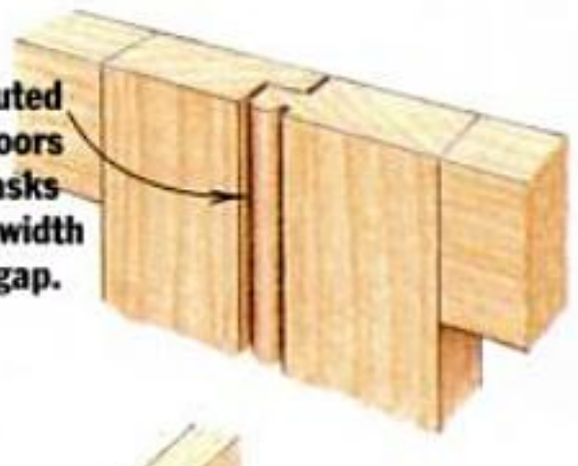
CORNER JOINT



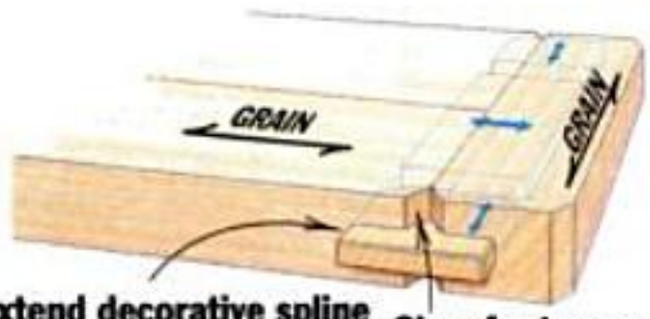
FRAME-AND-PANEL



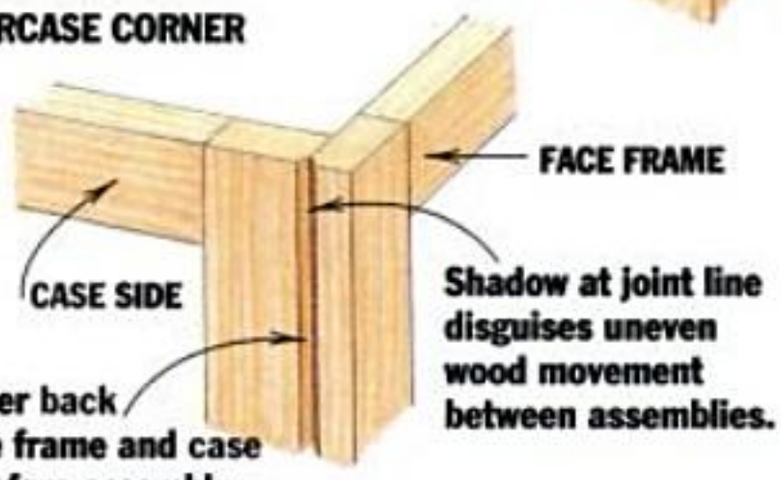
RABBETED DOORS



BREADBOARD END



CARCASE CORNER



sanding technique gives me greater control over the surface and saves time, since it's easier to sand individual parts than to deal with large assemblies.

You can also use cogging where two pieces of wood overlap. In the stepstool shown in the photo on page 52, the leg-to-leg lap joints are offset, offering the same advantages as the face frame: visual interest, camouflage for wood movement, and greater production efficiency. The offset is created by using legs of different thickness and by notching the leg members equally into one another, creating a mechanically strong joint.

The cogging technique also works well in a wide variety of corner joints. (See drawing.) I find chamfering or rounding over the protruding edges on cogged joints accomplishes several goals. These "softened" edges resist splintering, and they prevent a film finish like lacquer from peeling as it's prone to on sharp corners. Also, an angled or rounded edge is more inviting to the touch, and it looks good.

The three ebony details on this shelf unit by David Orth of Oak Park, Illinois, are actually caps that conceal bolts holding the two vertical structures together.

PHOTO BY AL DEERE

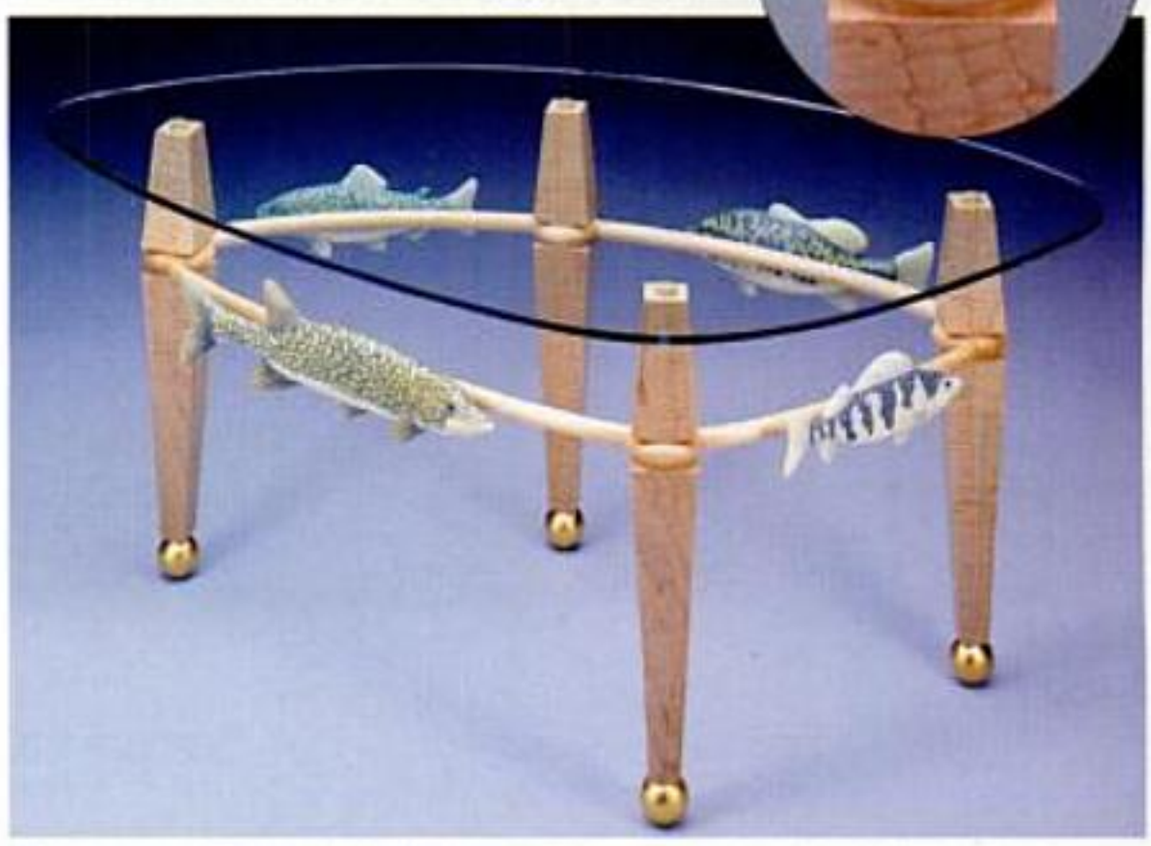
In an unusual variation of a cogged joint, offset surfaces can be shaped to contrast sharply with one another, as shown in the table at right. Here, a ring detail where the curved rail joins the straight-sided leg adds interest to the joint and also melds the rounded, more organic form of the apron member with the more rectilinear lines of the legs, unifying the overall design of the piece.

Devising Protruding Joints

The second design technique, using protruding elements, is similar to the first in that it involves non-flush members, but here one member passes through another, protruding beyond the surface. Like cogging, this technique adds flair and ensures that a piece looks good despite the movement of its individual parts.

I commonly use the protruding technique when I make a through mortise-and-tenon joint. I'm particularly fond of this joint because it's beautiful, fun to make, and it's one of the strongest joints you can devise when you need to join two pieces of wood. (For more on through mortise-and-tenon joints, see AW #18, and AW #29, page 49.)

But as with many joints, the beauty of a through tenon can be diminished if you don't allow for the effects of wood movement. I learned this the hard way when I cut a through mortise and tenon on a stool I had designed for outdoor use, where wood movement is greatest. To complete the joint, I carefully pared the tenon perfectly flush to the outside of the plank it passed through. While the joint looked great at first, during high humidity the plank expanded in thickness and—because wood expands only marginally along the grain—the tenon stayed the same length. The result was that the tenon end was recessed into the side of the plank—not the look I wanted at all.



A variation on the cogging technique: Here, Joel Evett and Roberta Boylen of Belmont, Massachusetts, juxtapose curved rings with straight-sided legs at the leg-to-rail joints on their "Fish Table."

PHOTO BY DEAN POWELL

Then, as the weather became drier, the plank shrank and the tenon stuck out ⅛ in. or so from the plank. "Aha!" I said, as the late-night lightbulb went on in my head, "Next time I'll begin by letting the tenon end protrude." Now, whenever the design allows, I make a through mortise-and-tenon joint with a tenon that protrudes at least 3/16 in. to ¼ in. from its mortise—whether the piece will live indoors or out. (See drawing, previous page.)

The design of a protruding tenon can exert a powerful and dramatic visual effect on a piece of furniture, and it also can provide a means for hiding fasteners, as seen in the top

Brad Schwartz of Deer Isle, Maine, creates a unified look in this matching desk and chair by using keys to secure his through tenons.

PHOTO BY DAVID KLOPFENSTEIN

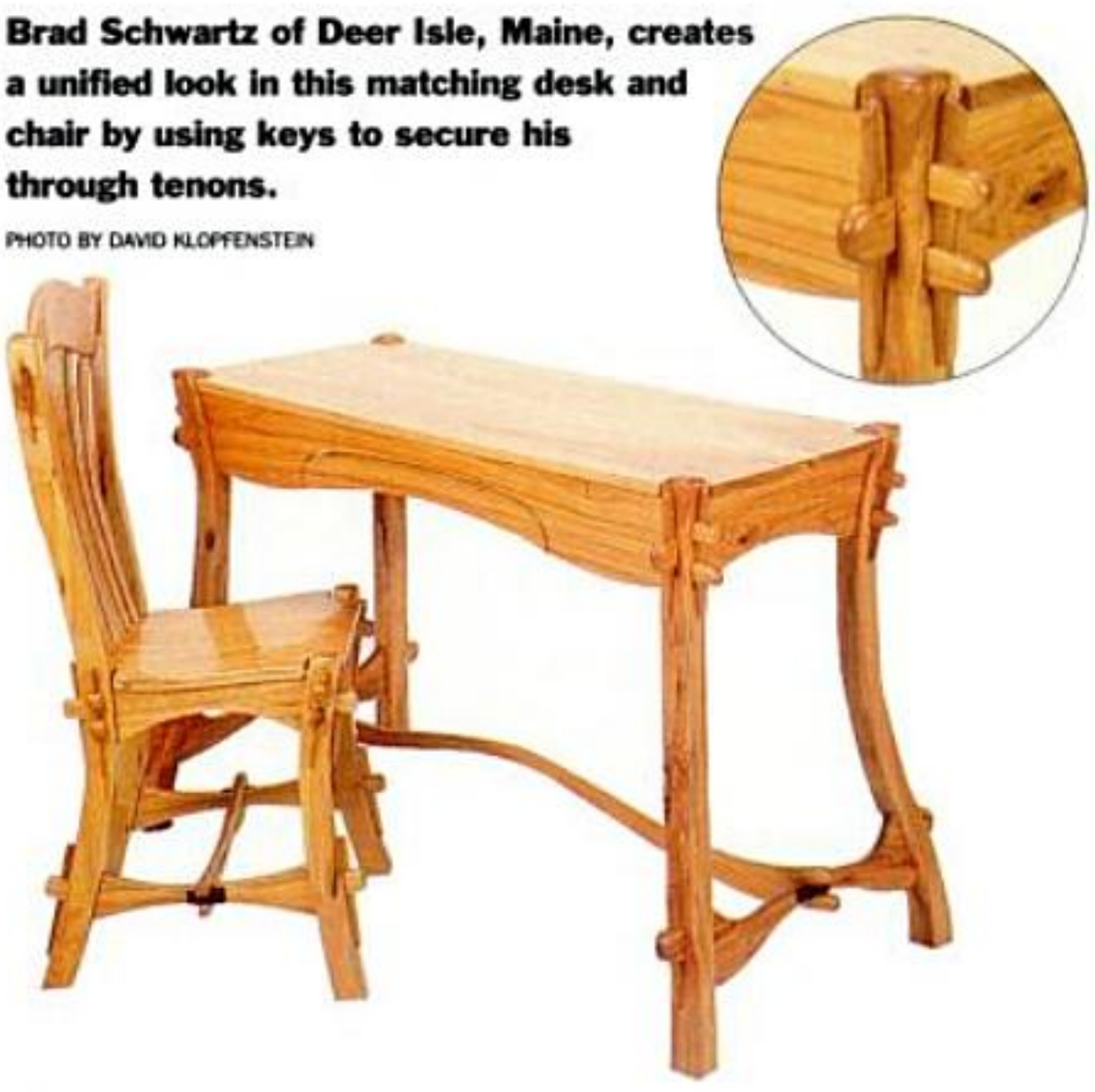


photo on the opposite page. The ends of the ebony "tenons" in this wall shelf are actually caps, concealing bolts that secure the two shelf units to one another.

A wedged through tenon (see drawing) has a useful and rather unique advantage when you're dealing with fluctuations in moisture content, which can cause joints to become loose as wood swells or shrinks. When a wedged joint starts to loosen, you can retighten it simply by driving the wedge further into its slot. (See drawing.) Plus, with both wedged and keyed joints you can disassemble a piece by tapping the wedge out of its mortise, or by removing the key, and sliding the structure apart.

In addition to extending a through tenon beyond its mortise, there are several other ways you can use protrusions as design elements and solutions for wood movement. One simple strategy is to extend shelves or dividers beyond their dadoes when building cases.

Beveled drawer fronts on this bureau by Allan Smith of Pennington, New Jersey, create integral drawer pulls and cast shadows that conceal the gaps between drawers.

PHOTO BY ALLAN SMITH

(See drawing.) This allows the protruding component to expand and contract at a different rate from the part to which it's attached, without visual defects like unsightly recesses or sharp ridges at the face of the joint. This is particularly effective when you're using plywood for case sides in combination with solid stock for shelves.

You can also use the protruding technique when attaching end braces, or "breadboards," to the end-grain edges of boards. For instance, in the lead photo the builder extended the breadboard ends beyond the edges of the couch's arms, creating in each case a visual transition from breadboard end to arm with the addition of a decorative spline

As an example, for years I've routinely made a slight chamfer on both the back edge of a face-frame stile and the front edge of a case side, then joined the two assemblies, creating a V-groove at the joint line. (See drawing.) I have also added moldings around the perimeter of recessed panels: The moldings create shadows as light falls over their contoured surfaces.

After encountering the concept of frank joinery in old books, I realize now that I was creating shadow lines. As I've found out, one of the primary design tools of classical architecture involves creating or manipulating shadows between structural elements, and there are two good reasons for doing this in furniture. First, a shadow creates a space within which wood movement won't be noticed, or where an uneven fit between two structures is masked. Any changes in dimension are disguised by the shadows created by a groove or by a piece of molding covering a joint line. These shadows fool the eye by adding complexity to the area where two or more elements meet, making it hard to detect variations that occur along the joint. The second reason for creating these shadows is quite simple: They look good.

Besides the examples above, there are a number of other design applications for shadow lines in furniture and case construction as shown in the drawing. These shadows are simple to make: You can use a router to cut grooves, rabbets, or beads in stock. For pieces of molding, use the router table or shaper, then cut the pieces to length on the tablesaw or miter box, and nail them in place with some glue and a few brads.

Often you can incorporate two or more frank strategies in the same construction. For example, I use shadow lines and protruding elements in the breadboard joint shown in the drawing. By creating a V-groove between the tabletop and the breadboard end, I get a dark line that adds detail and a shadow that disguises the cross-grain movement of the top to the breadboard. A close inspection might reveal that the individual chamfers don't always meet perfectly where they join each other, but this shadowed imperfection is less obvious than the ridge that would exist if the top and the breadboard were flush with each other.

In addition to the shadow technique, I create a protruding element by attaching a decorative spline and extending it beyond the edge of the table (see drawing), which adds more detail to the joint. And don't forget wood movement: If I were to trim the spline flush to the joint, the inevitable change in width of the solid-wood top would create a slight ridge or recession of the spline, just like that old tenon on my outdoor stool.

After all these years, I realize now that it would be difficult to design and build a piece of furniture without employing at least one of

Turning Stack-Laminated Bowls

Rude Osolnik Shows How to Make Bowls From Bandsawn Rings

By Stephen H. Blenk

STEPHEN BLENK

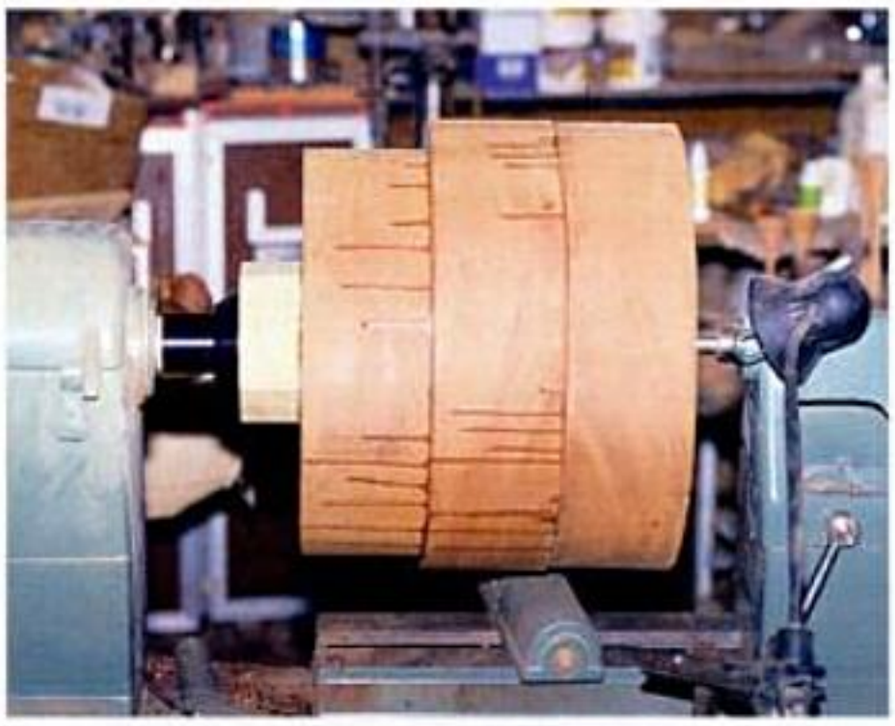
Turning bowls (right) from glued-up rings (above) cuts down on waste and turning time by eliminating most of the hollowing process.

There aren't many woodturners I'd travel 3,000 miles to visit, but when AW offered me a chance to work with Rude Osolnik, it didn't take a lot of arm-twisting to get me moving.

For the record, Rude (pronounced "Rudy") is probably one of the three top woodturners in the U.S. (To avoid disputes, I'll let you decide who the other two are.) His work is in museums throughout the world and even reached Buckingham Palace when Eleanor Roosevelt presented one of his bowls to Queen Elizabeth II.

Being able to tap into Rude's nearly 60 years of experience was a rare opportunity, and there were a million questions I wanted to ask. But the one at the top of my list was something that has always rankled me as a woodturner: How do you avoid wasting material when hollowing out bowls? Normally when you turn, the inside of a bowl blank comes out as shavings—expensive carpeting for hamster cages. As a turner, this has always hurt my feelings and my wallet.

Of course, there are tools designed to core the inside of a blank so you can turn one or more nesting bowls. But while good and functional, these systems either core out cone-shaped sections, which still wastes a lot of wood, or they limit your designs by producing blanks with curved bottoms that you can only make into basic, round salad-bowl shapes. What I wanted was a system that offered some variation, wouldn't cost a million bucks and was easy enough for most of us to try. Naturally, Rude had just the thing: stack-laminated bowls.



After gluing together the rings and a solid base, Osolnik glues a waste block to the base of the lamination, then uses a screw chuck to attach the assembly to the headstock.

To make a stack-laminated bowl, Rude starts with a thick, well-dried board that is surfaced on two sides. Then he bandsaws rings out of the board, glues the rings together to form the rough sides of a bowl, and adds a solid base. (See photos, page 58 and 59.) Once the glue is dry, he mounts this laminated blank on the lathe and turns it to final shape.

Cutting the Rings

I know you're wondering how he deals with the saw kerfs he must cut through the rings. Simple: There aren't any. To cut each ring, he breaks the bandsaw blade apart, inserts it through a predrilled hole in the blank and then silver-solders the blade together again. (See sidebar, page 58.) After cutting a ring, he breaks the silver-soldered joint, moves the blade to the next ring-hole and repeats the process.

Cutting enough rings to make a bowl this way only takes him about 30 minutes. And unlike some "ringing" techniques that require you to mount a blank on the lathe and part off the rings, Rude's lets you work stock that would be too thick to part off. (In these photos, Rude is working some *big* Honduras mahogany—3 in. thick.)

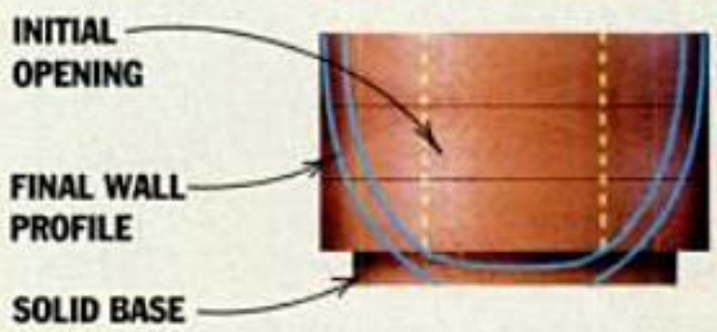
Laminating the Rings

Rude likes to make his rings about 2½ in. wide, because that gives him greater design possibilities. (See drawing, right.) For a bowl with a sharper taper, you could angle your bandsaw table when cutting out the rings, then laminate progressively narrower rings. Or you could even make a closed vessel by turning two stack laminations and then gluing these "halves" together, truing up the sides and adding a top with a hole in it.

It's best to use a straight-grained wood when stack laminating. That way the figure will match closely from one layer to the next. You'll also want to orient the grain so each layer is

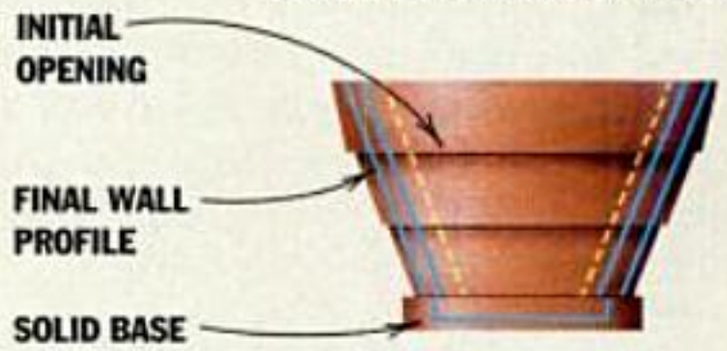
DESIGNING STACK-LAMINATED BOWLS

SLIGHTLY TAPERED BOWL



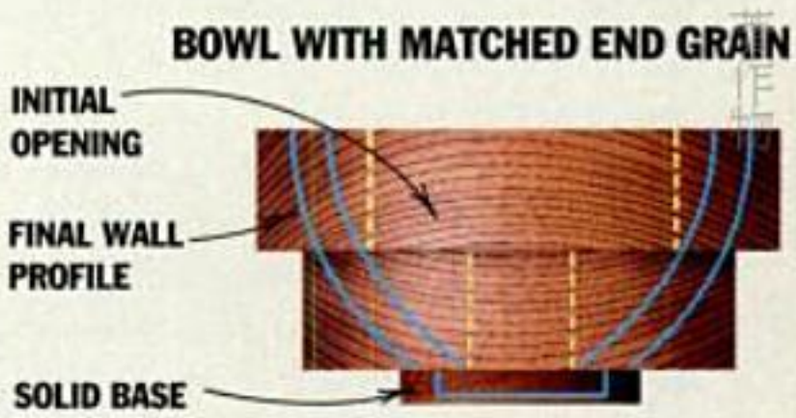
Glue together thick rings of similar dia., then turn.

SHARPLY TAPERED BOWL



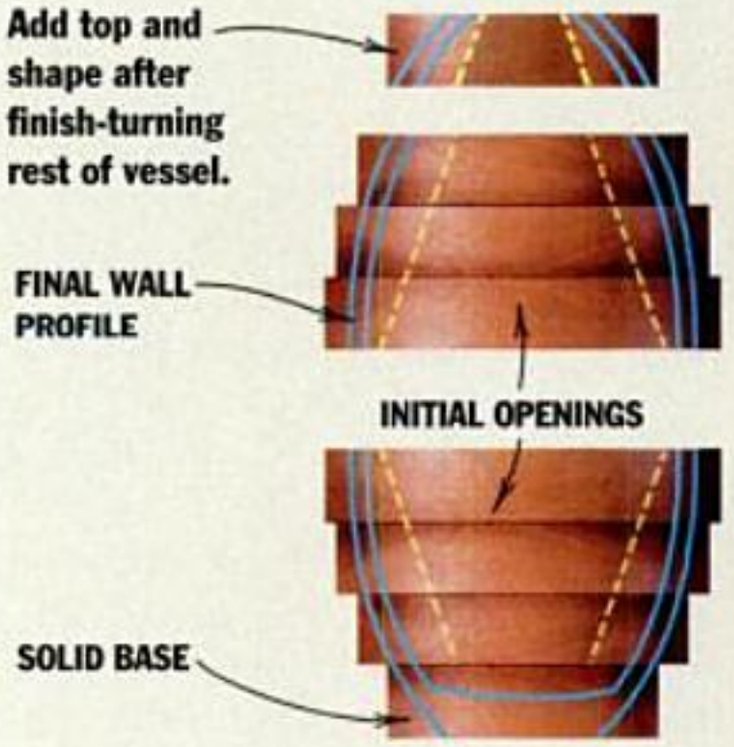
Cut rings at an angle, then glue together rings of progressively smaller dia. and turn.

BOWL WITH MATCHED END GRAIN



After cutting rings, invert one on top of another and glue together to form book-matched grain.

CLOSED VESSEL



Turn two halves separately, then glue them together, true up the glue joint and add and turn top.

STEPHEN BLENK

ILLUSTRATIONS BY GLENN HUGHES

CUTTING THE RINGS

STEP 1: Use a compass to lay out the rings on a flat, surfaced board.

STEP 2: Drill a hole on the inside of your line. For a tapered ring, drill angled holes.

STEP 3: Lay the board on the bandsaw table and feed one end of the bandsaw blade through the hole.

PHOTOS BY STEPHEN BLENK

going in the same direction. That ensures the wood will move in the same direction from layer to layer. If your wood is too highly figured for a good match from layer to layer, you might insert a contrasting ring between layers as an accent strip.

To laminate the discs, Rude uses plastic resin glue. It shrinks and moves less than standard yellow glue, though my guess is for most applications yellow glue would work just fine. Rude coats all surfaces to be glued, clamps the assembly with pipe clamps and allows 24 hours' drying time. He isn't concerned with perfect alignment when clamping, because Honduras mahogany has such a uniform figure it presents no real contrast problems.

After the glue is dry, Rude uses medium-viscosity cyanoacrylate glue

SILVER-SOLDERING BANDSAW BLADES

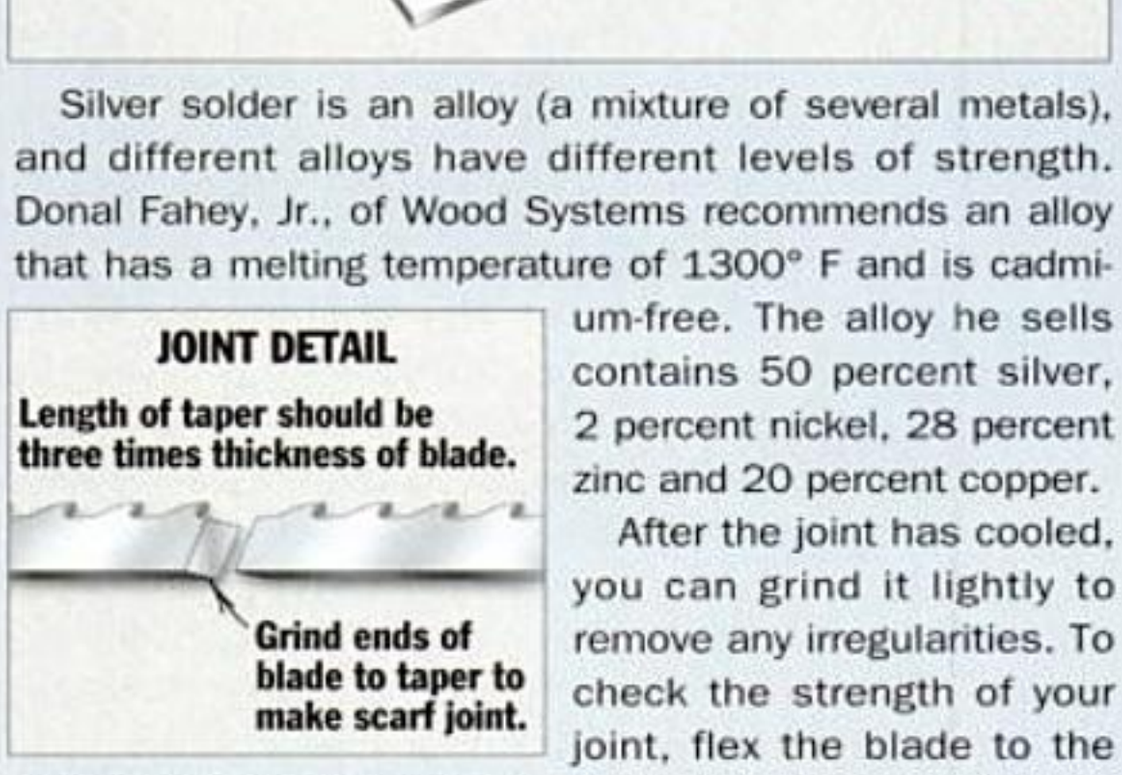
Using silver solder to join bandsaw blades is an old technique, and it can be a durable one if you do it correctly. The keys are getting enough heat on the joint and holding the band straight—if you solder the band while the ends are canted, it will "hula" (wobble) when you try to run it on your saw.

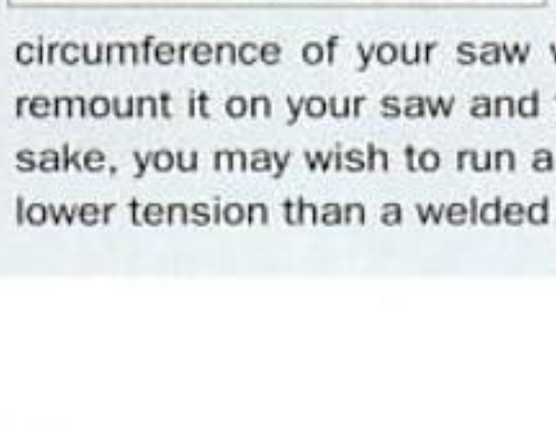
The first step in silver-soldering a blade is to grind back the two ends of the blade on a bench grinder to form a sort of tapered half-lap joint. (See "Joint Detail.")

After grinding, lightly sand with emery cloth and fine sandpaper to remove dirt, oil and oxidation from the faces adjacent to the ground surfaces. Otherwise, you won't get a good bond. Next, place the two ends of the band in a clamping setup that will keep the blade straight. You can buy a commercially made rig like the Blade Brazer (available from Wood Systems, Inc., Box 51744, New Berlin, WI 53154, 800-321-0834), but turner Rude Osolnik (see main story) simply reworked a lathe tool rest into a jig. (See drawing.) You could substitute a piece of 3-in. by 3-in. angle iron if you want.

Once the ends of the band are properly aligned and clamped in your jig, brush them both liberally with brazing flux. (Brazing flux and silver solder are available from hardware stores or by mail from Wood Systems, Inc., 800-321-0834.)

Heat the joint with an acetylene, MAPP or propane torch, keeping the blue part of the flame on the metal. You may need two propane torches to get up to soldering temperature—about 1350° to 1400° F. When the steel is dull red and the flux is completely liquid, touch the silver solder to it and the solder will run into the joint. Feed the solder until the joint is full.





Silver solder is an alloy (a mixture of several metals), and different alloys have different levels of strength. Donal Fahey, Jr., of Wood Systems recommends an alloy that has a melting temperature of 1300° F and is cadmium-free. The alloy he sells contains 50 percent silver, 2 percent nickel, 28 percent zinc and 20 percent copper.

After the joint has cooled, you can grind it lightly to remove any irregularities. To check the strength of your joint, flex the blade to the circumference of your saw wheel. If it passes this test, remount it on your saw and tension it slowly. For safety's sake, you may wish to run a silver-soldered blade at a bit lower tension than a welded blade. —*S.B.*

STEP 4: Silver-solder the ends of the blade together. (See sidebar, opposite.)

STEP 5: Mount blade, then cut out the ring.

STEP 6: Break blade, remove ring and repeat process.

(Special T, available from Craft Supplies USA, 1287 E. 1120 S., Provo, UT 84601, 801-373-0917) to attach a hardwood waste block to the bottom of the blank. He mounts the entire blank on a screw chuck. (Rude uses a Glaser screw chuck, Model 88, available from Craft Supplies USA.) Then, with the lathe running at 300 rpm, he faces the top edge of the blank. That way he can place a flat disc across the open end and bring up the live center to push against the disc, to help support the blank during turning. (See lead photo.) The flat disc is only held in place by the pressure of the tailstock, so he cranks the tailstock tightly.

Turning the Bowl

When rough-turning, Rude uses a ½-in. deep-fluted bowl gouge to true and shape the outside. He leaves the base thick initially so it will help support the blank when he turns the inside.

Rude doesn't get elaborate with his shapes. He prefers to "let the wood speak for itself." He says, "Simple forms are better, and they're harder to get right, 'cause there's nothing to distract your eye from any errors."

It was fun watching Rude make one of these bowls, especially when he backed off the tailstock and removed the disc to show a bowl interior that was already 90 percent hollow. Instead of spending time hogging out waste, Rude simply had to shape the interior walls with the deep-fluted gouge and turn the bottom to an appropriate curve.

Rude did the bottom work with something that was new to me: a hooked tool that sports a "training wheel" to keep it from catching. (See sidebar at right.)

The final sanding and finishing were standard turning procedure, a lot of which Rude pioneered. He power-sands both the interior and exterior with a commercial-grade silicon-carbide paper mounted on a flexible rubber pad that he chucks in his electric drill. Then he pad-sands the surfaces down to 400 grit or 600 grit, depending on the wood.

Rude finishes with Urethane Oil, a urethane and oil mixture manufactured by the Lawrence McFadden Co. (available at retail from Craft Supplies USA, 801-373-0917), first applying a coat of Deft clear finish as a sanding sealer on light woods to prevent darkening. On open-grained woods, he wet-sands with 600-grit wet-or-dry paper dipped in the urethane oil. This helps to fill the grain while giving a superb finish. He allows the oiled bowl to dry overnight between coats of finish.

Rude's ring technique allows you wide latitude in designing your forms, and no matter how you look at it, "ringing" bowls will save material and turning time. The end result is you get more bowls for your buck, and no turner can argue with that. ▲

STEPHEN BLENK *is a turner in Washington state and founder of the Olympic Peninsula chapter of the American Association of Woodturners.*

JOHN HAMEL

A TOOL WITH A "TRAINING WHEEL"

Hooked turning tools are great for removing end grain at the bottoms of deep bowls, but they're finicky creatures. Use a little too much pressure and the tool will catch, leaving a gouged bowl and your curses in the wake.

But now there's a new hooked tool on the market which has a beveled cover that fits over the cutting hook, preventing accidental catches. To vary the depth of cut, you move the cover back and forth, adjusting the amount of cutting edge exposed.

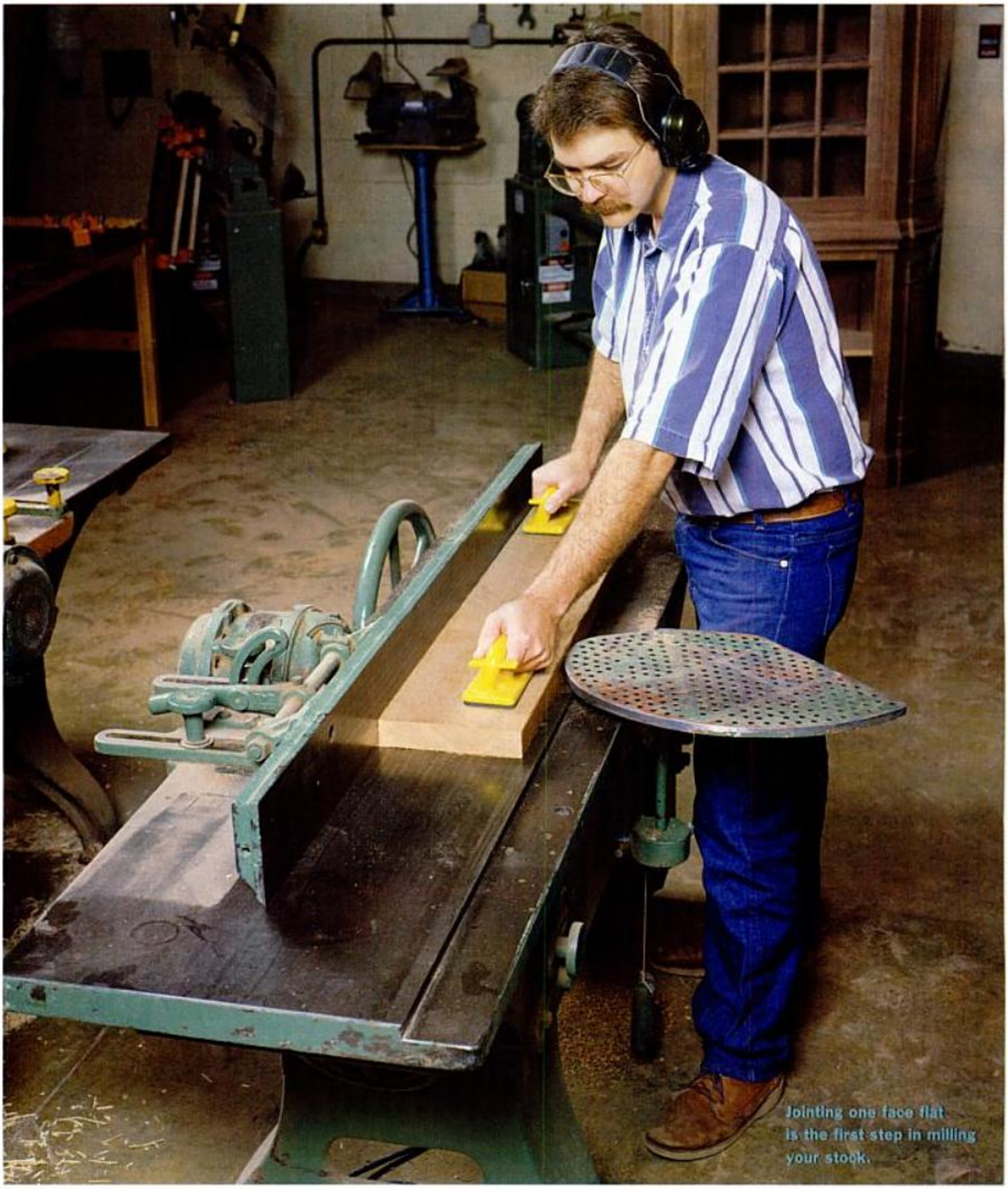
This hooked tool's cutting edge is covered to stop catches.

I tried the tool on a walnut end-grain turning and found it has all the advantages of a hook without the fatal "grab factor." The item is available from Osolnik Originals (Box 442, Berea, KY 40403) and comes in two models. The Mighty Midget Hollowing Tool ($79) is for shallow bowls. It is 20 in. long, including the handle, and is made from ½-in.-dia. steel. You loosen two Allen screws to adjust the cover. The Deep Adjustable Hollowing Tool ($225) is 40 in. long and is made from ¾-in.-dia. steel. You adjust the beveled cover by twisting the two-piece handle.—*S.B.*

Your Best Work Begins With Lumber That's Flat, True and Square

DIMENSIONING STOCK

By Lonnie Bird



Jointing one face flat is the first step in milling your stock.

PHOTOS BY JOHN HAMEL

There are many skills you need to master on the road to producing furniture you can be proud of, but at the heart of the process is the ability to dimension lumber. If you can't make your stock flat, true and square, your joints won't quite fit right, your parts will end up slightly misaligned and the final result will be a disappointment.

"But," you're thinking, "I buy milled boards at the lumberyard. They're already flat and true...right?" The answer is: Don't count on it. Most lumber sold as S2S or S4S (surfaced two or four sides) is not guaranteed straight or flat. And even if it were, lumber can warp as the moisture content changes or as you release the stress in the wood by sawing it to size.

You're better off dimensioning your own stock, either by remilling surfaced boards (you'll need to buy them oversized in thickness and width), or by working rough-sawn lumber. Fortunately, dimensioning lumber is simple if you work through this progression of jointing, planing and sawing:

STEP 1: Rough-Cutting the Stock

Since your wood may move after you saw it, the first thing you want to do is rough-cut the boards close to finished dimension, then sticker them on a flat surface for a few days. That way any wood movement will occur before you start the trueing process. As a general rule, keep your parts 1 in. oversize in length and ½ in. over in width.

I use the radial arm saw to cut stock to length because it'll handle long boards easily, but you could use a crosscut box on the tablesaw (see AW #14, June 1990) or a sliding compound-miter saw. From the radial arm saw I move to the tablesaw and rip the stock to rough width. If a board is severely warped, use the bandsaw instead, to avoid binding and possible kickback.

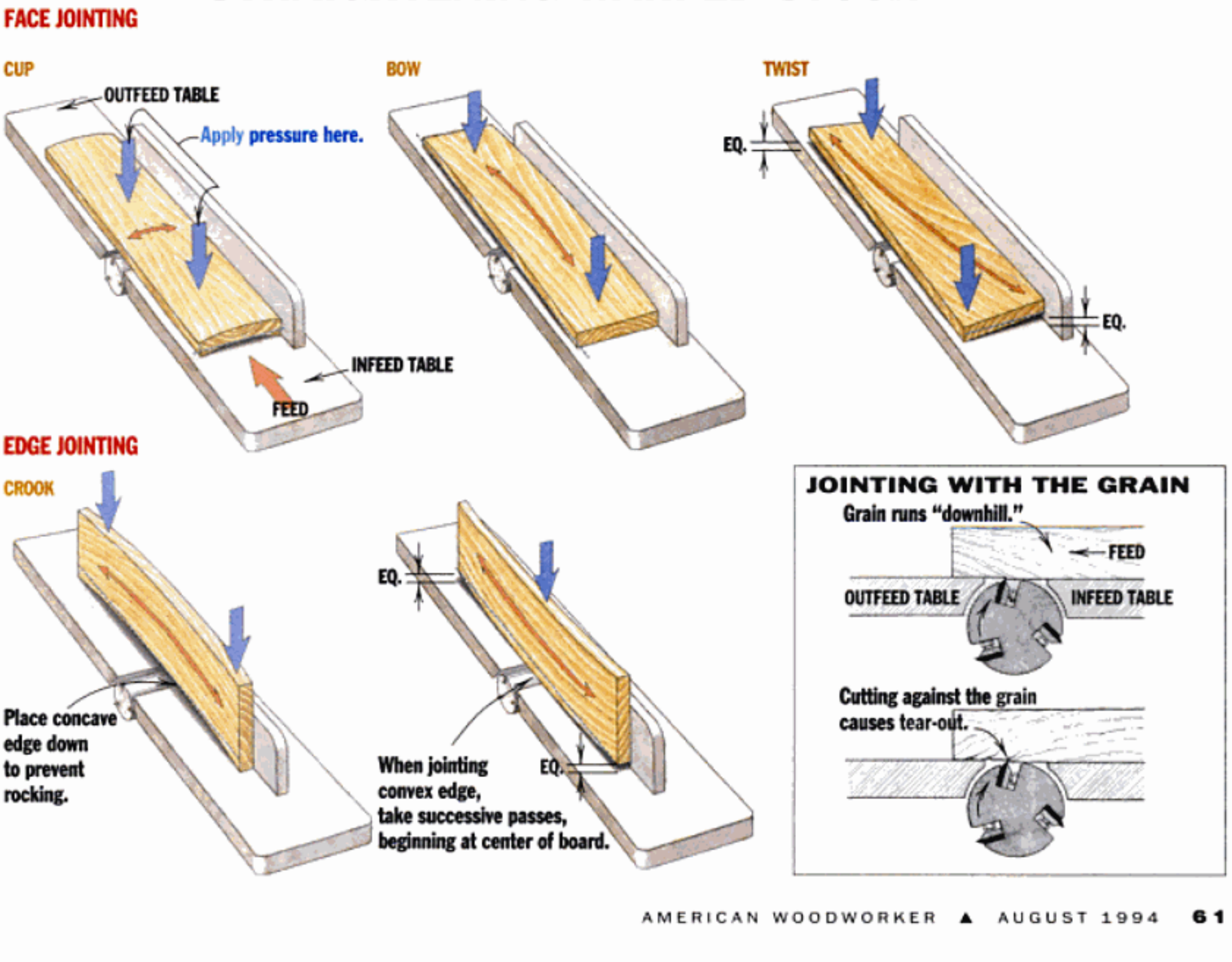
STEP 2: Jointing One Face

Once the stock has had a few days to settle, it is ready for jointing. This step is the most critical in producing a flat board, and proper jointer setup is the first step toward getting that flat surface. So, before you start the machine, check that the infeed and outfeed tables are parallel to each other, and that the knives are level with the outfeed table. (For more on tuning a jointer, see AW #3, July/August 1988.) Then lower the infeed table: For rough stock, set the table for a heavy cut—⅛ in. or so will work. If your board is relatively smooth, take a lighter cut. When you're ready to make your final pass, you'll want to raise the table for a 1/32-in. or finer cut, feeding the board slowly and steadily.

Next, sight along the board to determine what type of warp it has. A board may have *cup, bow,* or *twist,* as the drawing below shows. And many times you find that a single board has all three types of warp.

If the board is cupped but relatively straight, you'll want to place the cupped side down to prevent rocking, and distribute pressure along the length of the board as

STRAIGHTENING WARPED STOCK



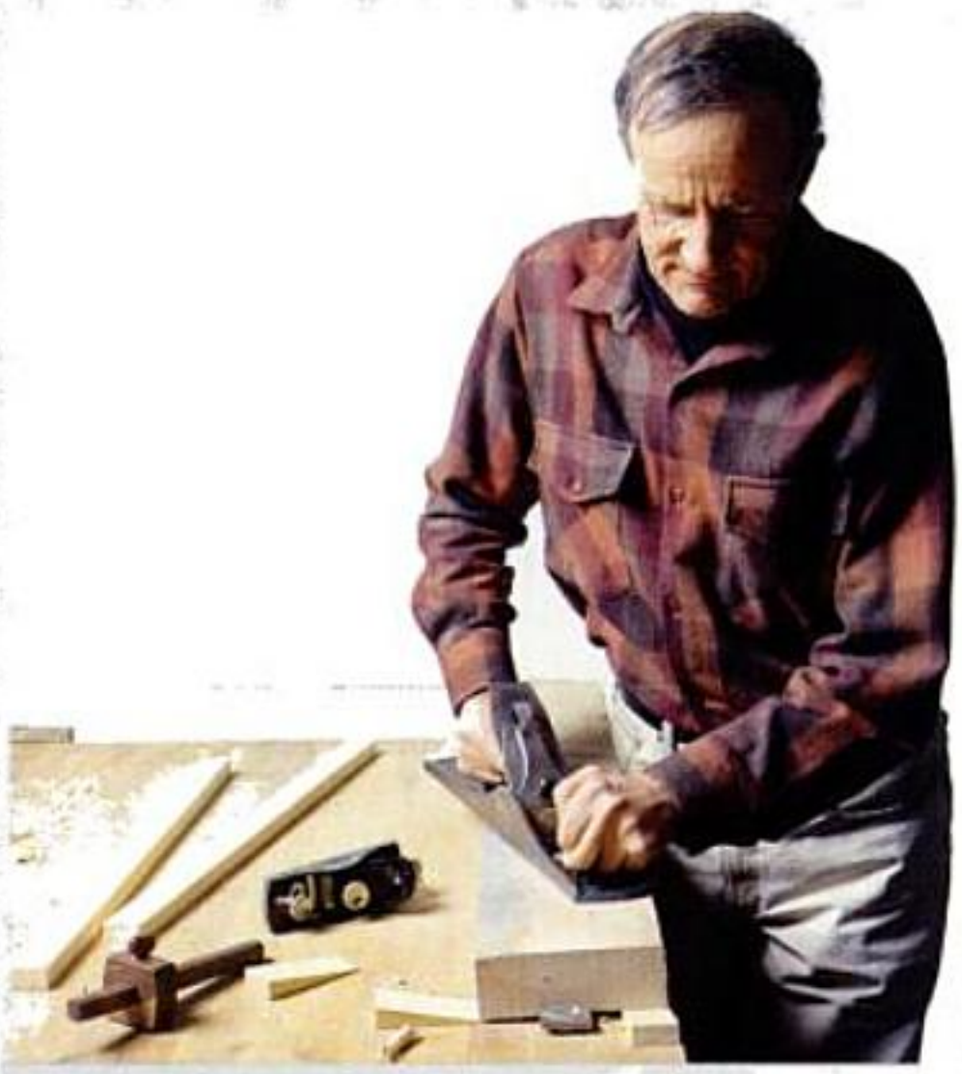
COLOR ILLUSTRATION BY FRANK ROHRBACH; BLACK AND WHITE ILLUSTRATION BY HEATHER LAMBERT

FLATTENING AND THICKNESSING BY HAND

By Simon Watts

Apart from stubbornness, there are some sound reasons for hand-planing a board flat and to a desired thickness. Not having a jointer or planer is, of course, the most obvious. But sometimes your stock may be too wide for your jointer, or too thick for the planer. Also, if you're working with recycled lumber, it's much less expensive to strike a hidden nail or screw with a plane iron than with the knives in your planer or jointer.

Although any kind of wood can be dimensioned by hand, you may find it best to start with a relatively docile wood, such as a clear piece of cedar or pine, to get a feel for the technique before tackling a harder wood.



With the stock wedged to prevent rocking and secured between bench dogs, author flattens one side of a rough board.

The first step in preparing wood by hand is to find its flaws by sighting along the board's length. You may notice a slight

Determine twist, or *wind*, by placing winding sticks at each end of a board, then sighting along the top edge of the sticks.

twist (called *wind*) and some cupping, and the board may also *bow*, or curve along its length. (See drawing, page 61.)

You can use a couple of winding sticks—two pieces of wood with straight, parallel edges—to locate any twist in the board. (See photo, above.) You'll want to plane the high spots indicated by the sticks.

If the board is cupped or bowed, place it concave side down on the bench. To deal with twist, slip thin wedges under two opposite corners of the board—plus anywhere else that needs support—so the board can't rock. Then clamp the board firmly between your bench dogs. (See photo, above.)

For flattening, I use an iron plane—an 18-in.-long Bailey. I like its length and weight, and the corner of the sole makes a good straightedge. Some woodworkers like to start flattening with a shorter and nimbler scrub plane. They quickly rough out just the high spots, then they switch to a longer plane.

Whatever plane you use, make sure the iron is razor-sharp. I grind a very slight crown to my iron to prevent the edges from gouging the work, then I hone it on my bench stones. I also rub a little candle wax on the sole of the plane to reduce friction.

Begin planing by moving the plane in a herringbone pattern, zigzagging diagonally across the stock. At the start, concentrate on leveling the opposite corners (if the board is twisted) or any bow in the board, as well as any other high spots. As you plane, check your progress frequently with the winding sticks, and lay a straightedge all over the board (here's where I use the edge of my jointer plane), looking for high spots. Mark these areas with a crayon as a reminder. When you've roughed out the surface, adjust your iron for a lighter cut to reduce tear-out, and keep planing diagonally.

When the surface checks out truly flat, you can thickness the board by working the opposite face. First, set a marking gauge to your desired finished thickness, then scribe a line around the perimeter of the board, referencing from the flat face. Next, clamp the board rough side up on your bench, and use a small plane to bevel the perimeter to the gauged line. (See photo, below.) Plane the rough surface, checking occasionally with your straightedge to make sure the stock is flat across its face. Your board is flat and uniform in thickness when the bevel is gone.

The final step is to remove the tool marks and any small tear-out left by your plane. For finish surfaces, no tool works better than a cabinet scraper. (See AW #30.) Skew the steel slightly as you scrape with the grain.

With one side flat, gauge a line around the board, then plane a bevel to the line as a visual guide for planing the face. When the bevel is gone, the board is at finished thickness.

SIMON WATTS *is AW's West Coast editor.*

JOINTING THE FACE

Begin jointing with both hands over the infeed table (left). When the leading end of the board has moved about 12 in. past the cutterhead, move your left hand to the outfeed side as you continue pushing with your right. Push blocks provide a better grip than hands alone.

you feed it. (See drawing.) If the board is bowed, you'll want to concentrate hand pressure on each end of the board, avoiding the middle. (See drawing.) Pushing on the middle of the board would flatten the board during the pass, but then the stock would spring back once pressure was released, and you'd still have bow. (You can speed up the flattening process on long, bowed boards by making a few cuts at each end to flatten these areas before jointing the full length of the board.)

Jointing twisted boards is a balancing act. Here, it's important to keep the opposite corners off the table by an even amount. (See drawing.) This ensures that you flatten the face without tapering the board into a wedge shape. If the twist is severe, knock off some of the high spots with a hand plane first to make the board sit more firmly on the jointer table.

For the smoothest cut, it's important to orient your workpiece so the jointer knives are cutting "downhill" on the grain. (See drawing.) Sometimes you can read the grain direction by looking at the edge or the face of the board. Other times, the grain can be misleading. In these cases, the best approach is to joint the board, and if you get tear-out, reverse the board and feed it in the opposite direction.

Once I've made a clean cut, I mark the jointed surface with an arrow indicating the grain direction, so that when I plane the board later I can feed it in the opposite direction through the thickness planer.

As you run the board over the jointer, keep your feet spread in a wide, comfortable stance, and apply even pressure to the board. (See photos, above.) Both hands should be over the infeed table when you start the cut. Then, once the board is about 12 in. onto the outfeed table, move your left hand just beyond the cutterhead and apply firm pressure on the board as you push and feed the stock with your right hand. If the board rises from the outfeed table even slightly at any point, you won't get a flat surface.

Two or three passes over the jointer are usually enough to flatten most boards. If you're working with a rough board, your board is flat once the saw marks are gone. For surfaced stock, draw pencil lines across the face and joint until they disappear. If everything goes well, you should feel a slight suction as you lift the trued board from the outfeed table.

Caution: Although the jointer may appear a rather docile machine, it can bite if you don't follow some precautions. Never pass your hands directly over the cutterhead, unless you're using push blocks. (See lead photo.) And don't joint stock shorter than 12 in.: Short boards can tip into the cutterhead's opening, and quickly take your hands in with them. To prevent a board from kicking back, I often use a shop-made push block that has a cross piece dadoed and glued at the back to "hook" the stock at its trailing end. (See "Tech Tips," page 18, for a similar device.)

STEP 3: Flattening the Opposite Face

With one face milled flat, now it's time to move to the thickness planer, to work the stock to finished thickness. First, adjust the planer to take about a 1/32-in.-deep cut. Then plane with the jointed face of the board down. This way, the jointed, or "trued" face, acts as a reference, so the top, planed face will end up parallel to the jointed face.

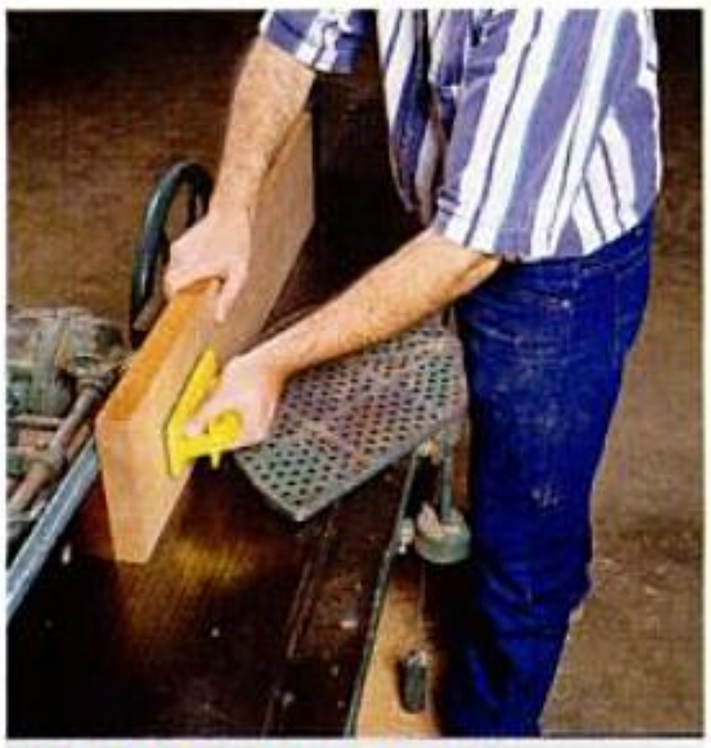
Again, to reduce tear-out you'll want to orient the grain in the proper direction. I do this by running the stock through the planer with my previously marked arrows pointing backwards. For safety, stand to one side as you feed the board into the planer, in case the knives kick the board backwards and out of the machine.

FLATTENING THE OPPOSITE FACE

Place the jointed face down on the planer's bed and plane the opposite face flat. Continue planing alternating faces to bring the board to finished thickness.

When the planed face is flat, flip the stock over *and* end-for-end (so the grain is running in the right direction), then plane the jointed face. Keep planing opposite faces in this manner as you mill, trying to remove an even amount of wood from both sides of the board. This reduces the chances of the stock warping as you expose the inside of the board, which may have a slightly different moisture content.

As you near final thickness, slow your planer's feed rate (if your machine is adjustable) and take light cuts to minimize tear-out. I leave my stock about 1/32 in. over finished



JOINTING THE EDGE

When edge jointing, hold board against fence with left hand as you feed the stock with right hand.

thickness, so I can come back later with a hand plane and sandpaper to remove the knife marks left by the planer.

STEP 4: Jointing One Edge

When your board is flat on both sides and planed to thickness, the next thing to do is machine it to width. Begin by jointing one edge so it's straight and square to the board's faces.

Adjust the infeed table on your jointer to produce a cut that's a little deeper than you used for face jointing, but again, take lighter cuts when jointing smooth surfaces. Then use an accurate square to check your fence for squareness to the jointer table.

Next check the edge of the board for straightness. A board that curves along its edge is said to have *crook*, and in most cases you'll want to joint the board with the concave edge of the curve down to prevent rocking. When jointing with the concave edge facing *up*, keep each end above the table by an even amount—similar to jointing a twisted face. (See drawing.)

Whichever way the crook faces, you'll want to orient the grain of the board to prevent tear-out. Here, look at the face of the board instead of the edge to read the grain. Then, butt one face of the stock against the jointer's fence (see photo, above) and joint. Be sure to maintain pressure on the outfeed table, and press the stock firmly against the fence. When jointing the concave edge of a severely crooked board, joint each end first, similar to working a bowed face. (See drawing.)

COMBATING WOOD MOVEMENT

Dimensioning your lumber will be a waste of time if the wood moves after your milling is done. Here are some quick tips to reduce wood movement:

- Always store your wood inside the shop for a couple of weeks before working it, allowing it to equalize with the moisture content of your shop.
- Choose your truest boards for the longest parts of your project, and use short, narrow or severely warped lumber for smaller furniture pieces.
- If you can, mill only what lumber you'll use within a few days. If you can't work straight through a project, stack milled parts on a flat surface and sticker the pile to promote even air circulation. Weight down the stack if the parts are under ½ in. thick to keep things flat. You can also cover parts in plastic wrap. I use a wrap similar to the kind used for wrapping pallet goods (available from Nifty Products, 4 Jocama Blvd., Old Bridge, NJ 08857, 800-631-2172) to prevent changes in moisture content. —*L.B.*

STEP 5: Ripping and Crosscutting

With one edge jointed straight and square, you can rip the opposite edge to width on the tablesaw. For ripping dimensioned boards I use a 24-tooth rip blade or a 40-tooth combination blade. Hold the jointed edge of the stock firmly against the fence so the ripped edge will end up parallel to the jointed edge. (See photo, right.) When ripping, I usually leave the board 1/32 in. over final width, then I go back to the jointer for a very thin final pass to clean up the saw marks.

RIPPING TO WIDTH

Place the jointed edge against your saw's fence so the sawn edge will end up parallel to the jointed one.

The final step is to cut the board to finish length. I do this on the tablesaw with the miter gauge. For greater control on long boards, you can screw a straight length of wood to the gauge as an auxiliary fence. (See photo, above.) Crosscut one end of the board first, then mark to length and cut the other end. If you're cutting several pieces of the same length, clamp a stop block to your auxiliary miter fence.

CROSSCUTTING TO LENGTH

Use a miter gauge to cut the board to length. A straight stick screwed to the miter gauge provides more control when cutting long boards.

Now that your lumber is flat and true, cut your joints and assemble your furniture. You'll be proud of the result. ▲

LONNIE BIRD *teaches woodworking and offers seminars on shaper use at the University of Rio Grande in Ohio.*

WOOD FACTS

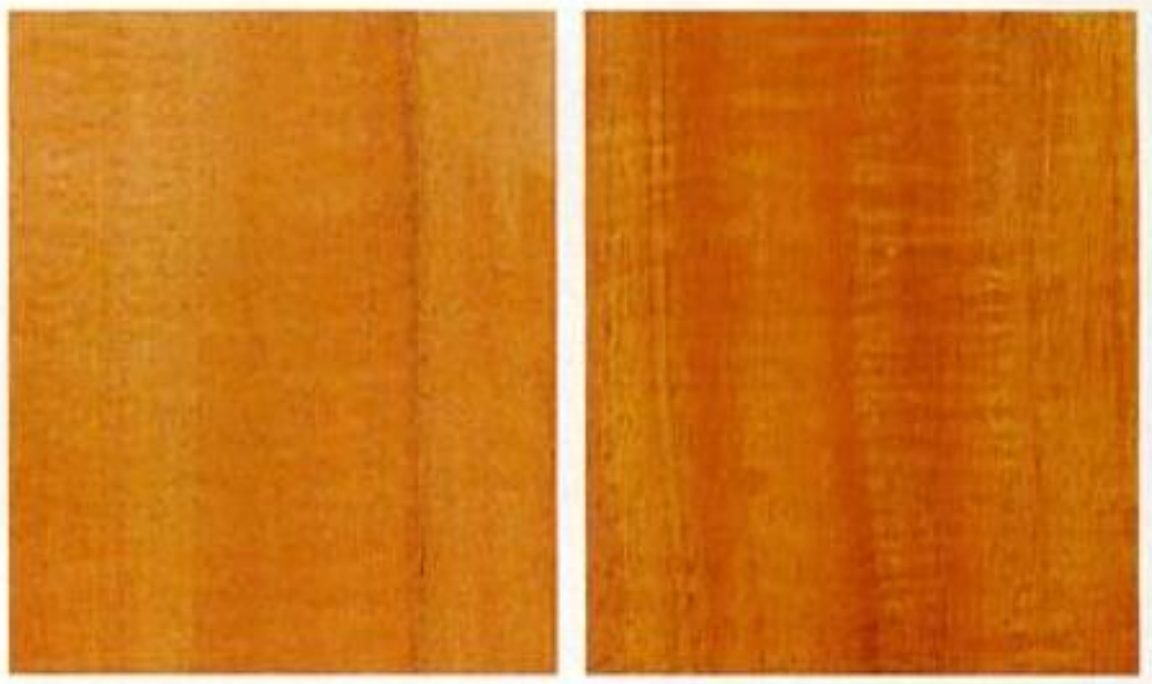
KOA

By Paul McClure

For centuries, Hawaiian craftsmen fashioned everything from ocean-going war canoes to furniture for royalty from a locally abundant wood which they called *koa-ka*. Today, we know it as koa, the luxurious, medium-density hardwood that is native to Hawaii.

Koa is best known as the wood used to make the traditional Hawaiian ukulele, which was patterned after a small stringed instrument brought to the islands in the 1700s by Portuguese traders. The wood came into its own in the late 1800s, when missionaries returned from Hawaii with ukuleles, furniture and tableware made of koa. Architects, designers and craftsmen were intoxicated by the wood's lustrous colors and figure, and soon the demand for koa logs increased dramatically.

Until the late 1970s, koa was cheap—comparable in price to oak—and readily available in the U.S. But supplies became scarce when the U.S. Forest Service shut down the largest koa mill in Hawaii for not replanting harvested areas. Today, a few small mills are again sawing koa, but the quality of the wood is generally lower and prices are high. Still, if you visit Hawaii, you should try to bring back a few boards of this royal wood.



PHOTOS BY ROBERT GERHEART

Koa's color ranges from gold to reddish brown, with variable markings and figure. Fiddleback figure (right) is prized.

Appearance

Koa heartwood is medium reddish brown in color, with variable hues of gold, purple, red, black, cream and tan. Its grain is wavy and interlocked, and often has a dramatic curly or fiddleback figure. The surface is lustrous, seeming to shimmer in reflected light. The pores are fairly large and visible.

Workability

Koa works and smells very much like black walnut. Although it works well with both hand and power tools, figured boards should be run through the planer at an angle—or, better yet, abrasive-planed—to prevent tear-out. Koa will burn if cutters are not sharp or feed rates are too slow. Its interlocked grain makes it very elastic and exceptional for bending. Koa glues very well, sands to a satin-smooth surface and accepts finishes readily. Stain is never used on koa; that would be like painting over a sunset.

Uses

Koa is used for fine furniture and cabinetry, as well as for gunstocks, musical instruments, architectural woodwork and boat fittings. Figured koa veneer is prized for furniture and decorative paneling. ▲

KOA	
SPECIES	*Acacia koa*
GROWING REGION	Hawaiian Islands
SPECIFIC GRAVITY	0.60 to 0.67
DENSITY	41 lbs./cubic ft.
WOOD MOVEMENT[1] (FROM 12% TO 6% MC)	Small (less than 1/4 in./ft.)
DURABILITY	Excellent; resistant to decay and insect attack
SUSTAINABILITY	Sustainable at current production levels
AVAILABILITY	Specialty lumber dealers
THICKNESSES	4/4, 8/4
WIDTHS	6 to 10 in.
LENGTHS	8 to 12 ft.
COST	
LUMBER	$10 to $12 per bd. ft.
VENEER	$1.50 to $3 per sq. ft.

[1] *Indicates wood movement across grain.*

JUST FINISHING

RUBBING TO A HIGH GLOSS

Follow These Steps to a Mirror-Smooth Surface

By Michael Dresdner

A mirror-smooth, highly polished surface may be the apex of the finisher's art, but it is also well within the reach of any woodworker willing to invest a little extra time and a lot of elbow grease. You just need to start with a clear gloss finish, sanded perfectly flat and with no evidence of the wood pores underneath, and then polish it with a fine compound. *(See AW #38 for rubbing to a satin finish.)*

Building the Finish

Most types of film-forming finishes (such as lacquer, shellac, varnish, and polyurethane) can be rubbed to a high gloss, as long as the film is at least 6 mils (0.006 in.) thick. However, the more brittle finishes—notably, nitrocellulose or acrylic lacquers and two-part urethanes and polyesters—buff up better than flexible finishes. Whichever you use, be sure it's clear gloss material: If you try to buff a satin product you will get a hazy film. For the purposes of this article, I'll assume you'll be using gloss lacquer.

Your main objective in the finishing process is to produce a dead-flat, continuous film, without voids or gaps. On open-pored woods, you'll have to fill the grain with pore filler before finishing. (See "Just Finishing," AW #27.) You can apply your finish by either brushing or spraying, but I recommend spraying, especially for fast-drying finishes like lacquer.

Begin finishing by spraying one or two thin coats of lacquer sealer, then build on several top coats of gloss lacquer. Between coats, sand the film with 320-grit stearated sandpaper until the surface is completely flat, with no dimples showing at the pore openings. Here you can use an orbital or random-orbit sander, or, if you're hand-sanding, you might want to use a flat cork or felt sanding block to keep the finish flat.

Before the final finish coat, wet-sand the surface with 400-grit wet-or-dry paper lubricated with either soapy water or mineral spirits. Be sure to remove all the sanding residue and lubricant with clean, soft rags before you spray the final coat. Lay the last coat on as smoothly and evenly as you can, then let the finish dry thoroughly before you polish; two days would be a bare minimum. You'll find that as the finish gets older, it becomes easier to polish. If you can afford to wait, let the finish cure at least two weeks. The result will be worth the wait.

Finish Sanding

Once the finish is dry and cured, sand it glass-flat, starting with 600-grit wet-or-dry paper, again lubricated with either soapy water or mineral spirits. Sand by hand: Electric sanders are too dangerous to use with a lubricant, and the slurry tends to ruin the bearings of air sanders that are not specifically made for wet-sanding. Sand carefully so that you remove any brush marks or "orange peel" without cutting through to the wood on the sharp edges of the furniture. Since you are sanding only finish (not wood) with such fine paper, the direction you sand is not particularly critical. I find that changing directions with each grit helps keep the surface flat. Follow the 600-grit paper with 1,000 grit, then 1,200 grit. Then wipe off any residue, and you are ready to polish.

Polishing Supplies

Buffing a furniture finish is exactly like buffing a car finish: First you *compound* the surface, then you bring up the final gloss with a *glaze*. Not coincidentally, you'll find a wealth of reputable brands of both compounds and glazes at your local auto supply store.

Compounds are usually sold as thick pastes in squat tins. The coarser ones are called *rubbing compounds* and the finer ones *polishing com-*

PHOTO BY MITCH MANDEL

You can rub a finish to mirror gloss by sanding to 1,200 grit, then polishing with compounds and glazes from the auto supply store.

pounds. You should have both kinds on hand, but in this case since you've already sanded to 1,200 grit, you can probably start with polishing compound. While you are at the store, choose a *final glaze* as well. These are thick liquids designed for buffing the surface after the final rub with polishing compound. They are usually sold in plastic squeeze bottles.

Rubbing to Gloss

The actual polishing may be done either by hand or with an electric buffer. If you are rubbing by hand, get ready for a good workout. Bundle a cotton cloth into a pad and dampen it with water, or use a damp felt pad. Apply a modest amount of compound to the pad and rub vigorously in small circles. Work on one small area at a time, and check your progress by letting the compound dry and wiping off the residue. Then add more compound (and water, if you need it) to your pad and move on to the next area.

When you've worked the entire surface this way, go back over it with long strokes, rubbing with the grain. If you started with rubbing compound, wipe off the residue and repeat the process with polishing compound. It won't take very long to develop a good shine if your sanding was adequate.

You can save yourself some time by using a buffer or a right-angle grinder or drill fitted with a lambswool bonnet. Make sure the bonnet is clean, and use a different one for each compound. (You can clean a bonnet by throwing it in the washing machine.) Screen your work area and wear an apron, because buffers throw polish all over the place.

Smear some polishing compound on the bonnet and touch it down gently onto the surface while you move it in large, sweeping circles. Your buffing pattern is not critical, since the bonnet itself is spinning in circles. Just keep the bonnet moving and be careful not to lean too hard or dwell in one place, or else you will "burn through" the lacquer. The weight of the buffer alone usually provides more than enough pressure. Be especially careful near the edges, or you'll cut through the finish in a flash.

A buffer will bring up a shine very quickly, so be prepared to stop as soon as you see the gloss develop. When you are through, wipe off any residue and go back over the surface with a clean, dry bonnet.

Whether you buffed by hand or machine, the last step—the glaze—is the same: Apply some final glaze to a clean soft rag, wipe it liberally onto the surface, and wipe it off immediately with another clean rag. Now, lean over, look deep into the finish, and watch the smile grow on the face reflected there. ▲

TOOL BOX

Eat My Dust

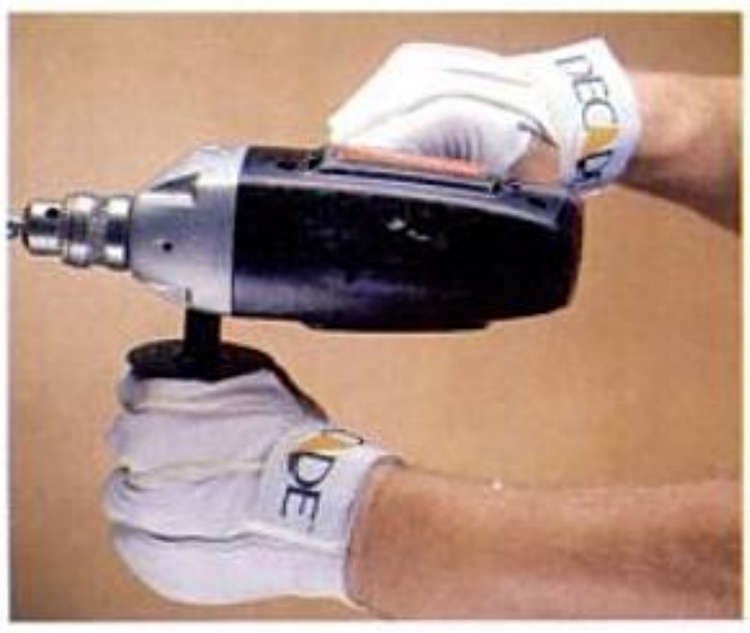
Klingspor's new Down Draft Sanding Table provides dust-free sanding without the hassle of an awkward dust bag or vacuum hose. The 21-in. by 25-in.

molded plastic unit hooks up to your central dust collector or shop vacuum and draws dust down through holes in the tabletop. When we connected it to a 2-HP dust collector, the sanding table collected virtually all the dust we generated with a random-orbit sander. (Collection efficiency may decrease if you use a shop vacuum or smaller dust collector.) The table comes with two rubber pads that help keep your workpiece from slipping. The manufacturer doesn't recommend using a belt sander with the Sanding Table. (Price: $69.95)

Klingspor's Sanding Catalog, Dept. AWT, Box 3737, Hickory, NC 28603-3737, (800) 228-0000. **Circle #617**

Relief for Tired Hands

If you're tired of the tingling sensation your hands get after using power tools for long periods, Decade Anti-Vibration Gloves can help. The gloves

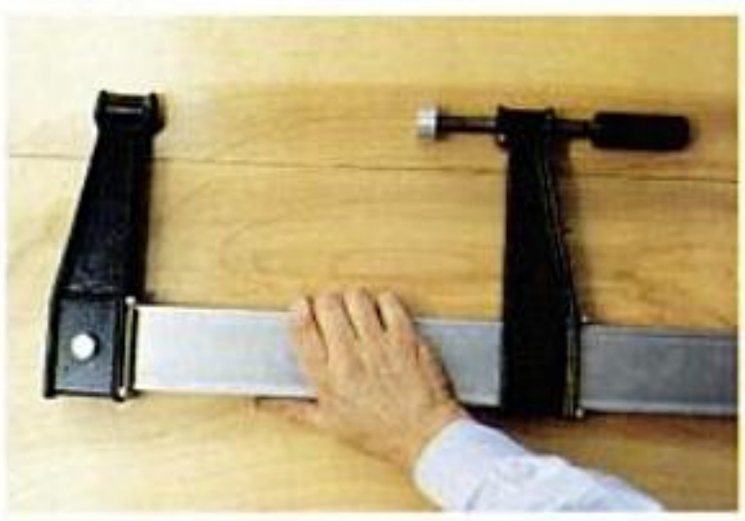


are made of goatskin leather with gel pads in the palm that absorb the vibration caused by motors and cutters. The manufacturer claims they'll even provide protection against carpal tunnel syndrome, a chronic wrist condition that makes it painful to do repetitive tasks. They're sold singly or in pairs, and you can buy regular gloves or half-gloves, which leave thumb and fingertips exposed for greater sensitivity. (Price: $20 per pair; $10 each)

Chase Ergonomics, Dept. AWT, 5921 Midway Park Blvd. NE, Albuquerque, NM 87109-5806, (800) 621-5436. **Circle #618**

Jumbo Clamp

No, it's not a prop for the David Letterman show. This big (6½-in. throat) aluminum Superlight Clamp offers as much clamping depth as a deep-jaw steel or cast-iron clamp,



with only one-third the weight. That means you can carry the clamps more easily, and they won't weigh down your project, deflecting the material. The I-beam bar won't rust and comes in lengths from 4 in. to 90 in., or you can order the bar stock in 10-ft. lengths and cut to suit your needs. (Price: $59 for 30-in.-capacity bar)

Super Square Corp., Dept. AWT, Box 636, Beacon, NY 12508, (800) 823-5344. **Circle #619**

Versatile New Glue

Elmer's new Weather-Tite Wood Glue gives you enhanced performance in several ways. It's water resistant (meeting ANSI Type II standards), and the glue's gel consistency means it won't run or drip during glue-up or

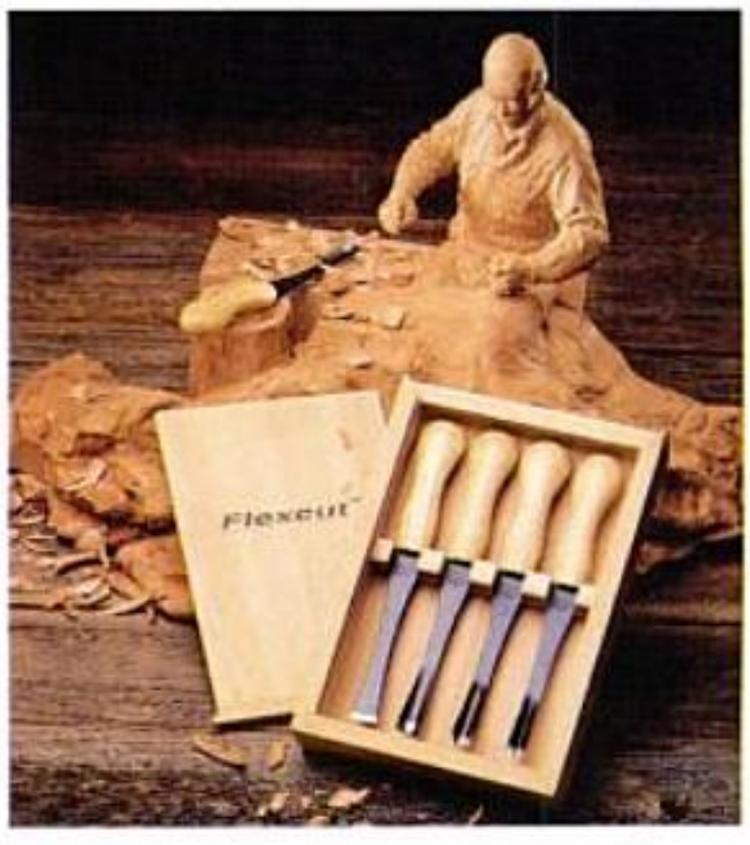
squeeze out during clamping. Also, the new formula contains real wood fibers so it accepts stain better and sands more easily than ordinary white or yellow wood glues. It cleans up easily with water. The glue is available at most hardware stores and home centers. (Price: $3.49 for 8 oz., $5.99 for 16 oz.)

Home & Professional Products Group, Borden, Inc., Dept AWT, 180 E. Broad St., Columbus, OH 43215-3799, (614) 225-7572. **Circle #620**

Flexible Carving Chisels

Flexcut's new Carving Chisels make it easy for you to carve with greater control and less fatigue than with conventional chisels. The keys are the tools' flexible spring-steel shafts that bend to conform to the contours of your work, and their thin tips, which are ground to an acute angle.

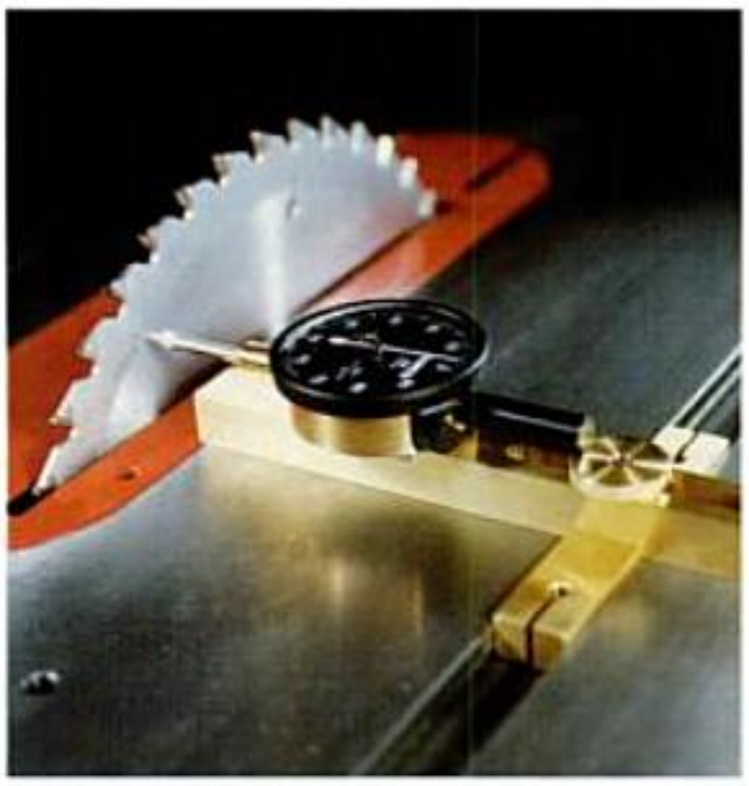
The tools' responsiveness is better than we've ever seen before. The ash handles are shaped to let you push



comfortably with the heel of your palm (they're not meant to be hit with a mallet). The four-piece set includes ¾-in. and ⅝-in. roughing gouges, along with a ¾-in. smoothing chisel and a ½-in. V-grooving chisel. (Price: $85.95 for set)
Falls Run Woodcarving, Dept. AWT, 9395 Falls Rd., Girard, PA 16417, (800) 524-9077. **Circle #621**

Precision Alignment Made Easy

With its built-in machinist's dial indicator, the Infinitii setup and measurement tool lets you perfectly align and adjust blades, cutters and fences on most stationary woodworking machines. For example, slide the tool's brass base into your tablesaw's miter slot, and you can check blade runout plus the alignment of the miter slot to the blade and the fence. You can also use Infinitii to set your blade's bevel and miter-gauge angles



or to micro-adjust jigs, stop blocks and fences. The manufacturer claims linear adjustments as fine as 0.001 in. and angular adjustments within ⅛°. You can measure stock thickness and the depths of holes and dadoes, too. (Price: $149.95)
B.C. Ames Co., Dept. AWT, 131 Lexington St., Waltham, MA 02254-0070, (800) 438-4249. **Circle #622**

IN THE WORKS

Carbide Planer and Jointer Knives

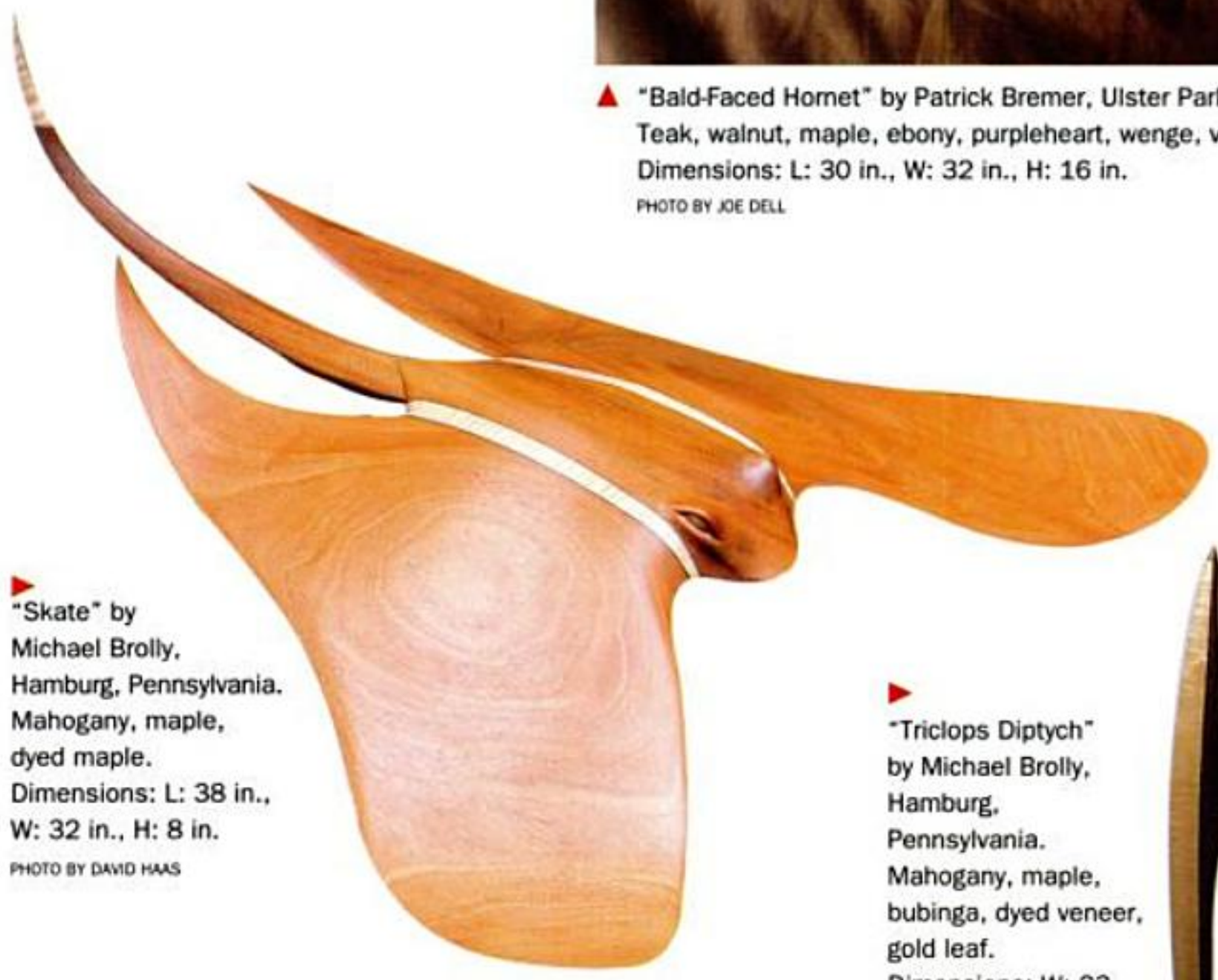
CMT, the well-known manufacturer of router bits and saw blades, will start selling a comprehensive line of replacement jointer and planer knives through the mail this summer. The company will offer standard knives in 18 sizes up to 20 in. long, in both high-speed-steel and new carbide-tipped versions. CMT will also furnish hard-to-find, carbide-tipped (and a few solid carbide) "specialty knives" for hand-held portable planers, benchtop portable planers and small benchtop jointers. The knives will be competitively priced: For example, a set of three carbide-tipped jointer knives (⅛ in. by ⅝ in. by 6 in.) will sell for about $72.

GALLERY

The "Lighter Side" of Wood

You may think a table has "grace," or a chair "flair," but these clever pieces of woodworking have a life of their own. Often whimsical—sometimes haunting—these creatures show that woodworking has its lighter moments.

▲ "Bald-Faced Hornet" by Patrick Bremer, Ulster Park, New York.
Teak, walnut, maple, ebony, purpleheart, wenge, vermillion, bronze.
Dimensions: L: 30 in., W: 32 in., H: 16 in.
PHOTO BY JOE DELL



▶ "Skate" by Michael Brolly, Hamburg, Pennsylvania.
Mahogany, maple, dyed maple.
Dimensions: L: 38 in., W: 32 in., H: 8 in.
PHOTO BY DAVID HAAS

▶ "Triclops Diptych" by Michael Brolly, Hamburg, Pennsylvania.
Mahogany, maple, bubinga, dyed veneer, gold leaf.
Dimensions: W: 23 in., D: 23 in., H: 60 in.
PHOTO BY MICHAEL BROLLY

Want to see your work in "Gallery?" Send color slides or color transparencies to: "Gallery," AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. Please include materials, dimensions, name of photographer, your name, address, and phone number. We'll pay you $35 if we publish your work. If you want your photos returned, enclose a self-addressed stamped envelope.

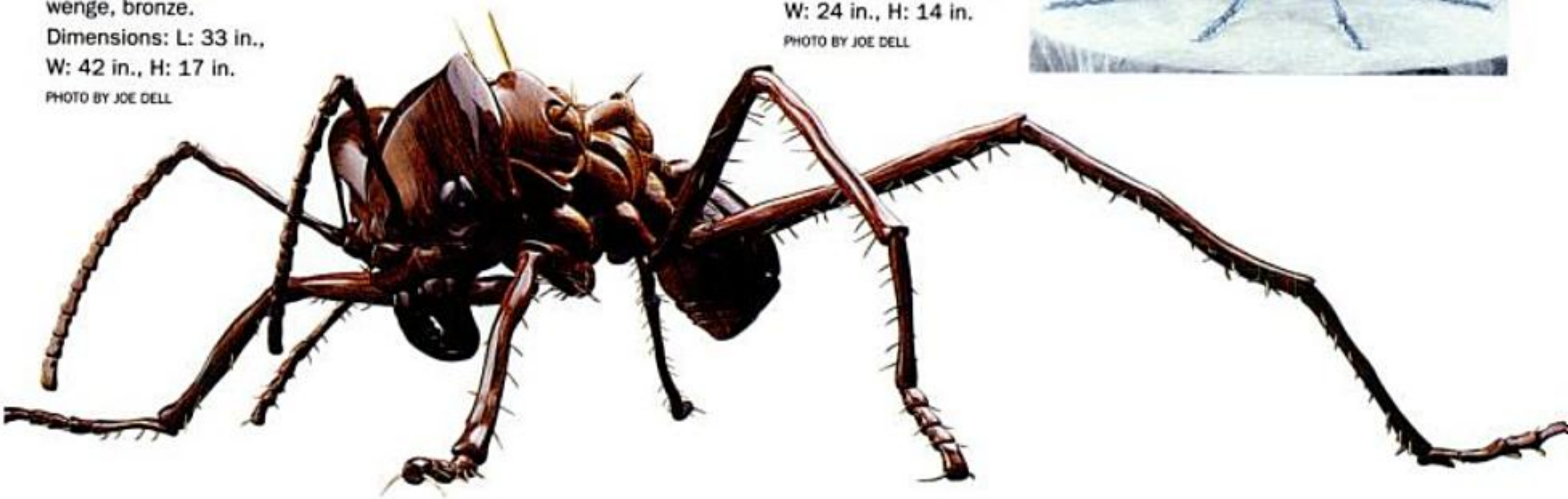
"Constriction Staffs" by Michael Sage, Redwood City, California. Maple, walnut, ebony. Dimensions: L: 42 in., Dia: 2 in.
PHOTO BY MICHAEL SAGE

"Gargoyle" by Colin Butler, Putney, Vermont. Walnut, holly, vermillion, ebony. Dimensions: W: 10 in., D: 14 in., H: 36 in.
PHOTO BY HYAM SIEGEL

"Lip-Sync" by Ric Stang, Skillman, New Jersey. Curly maple, redwood lace burl. Dimensions: L: 16 in., W: 7 in., H: 3 in.
PHOTO BY RIC STANG

"Leaf Cutter Ant" by Patrick Bremer, Ulster Park, New York. Teak, walnut, bubinga, rosewood, ebony, wenge, bronze. Dimensions: L: 33 in., W: 42 in., H: 17 in.
PHOTO BY JOE DELL

"Tiger Beetle" by Patrick Bremer, Ulster Park, New York. Maple, bubinga, pigmented lacquer. Dimensions: L: 28 in., W: 24 in., H: 14 in.
PHOTO BY JOE DELL



SHOP SOLUTIONS

ROLL-AROUND CLAMP RACK

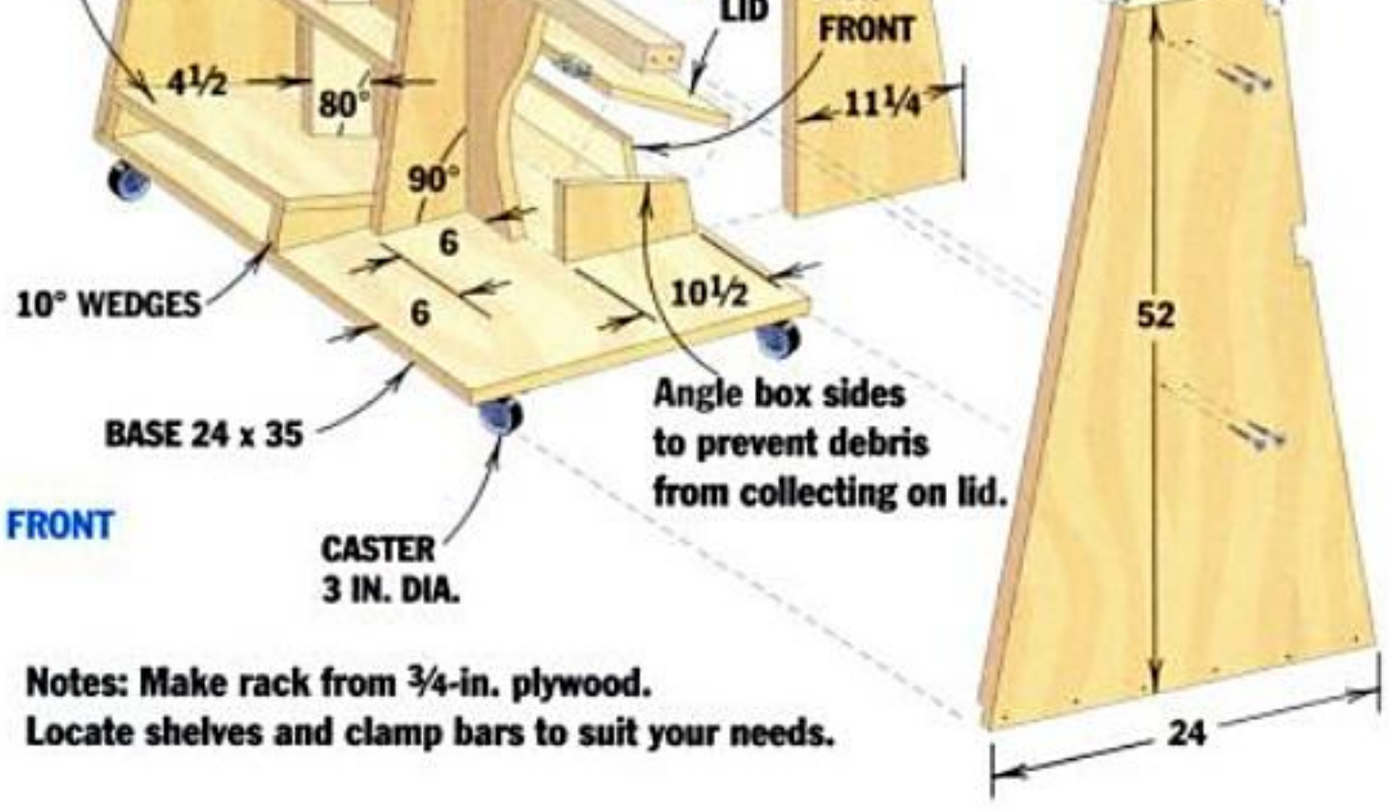
By Fred Matlack

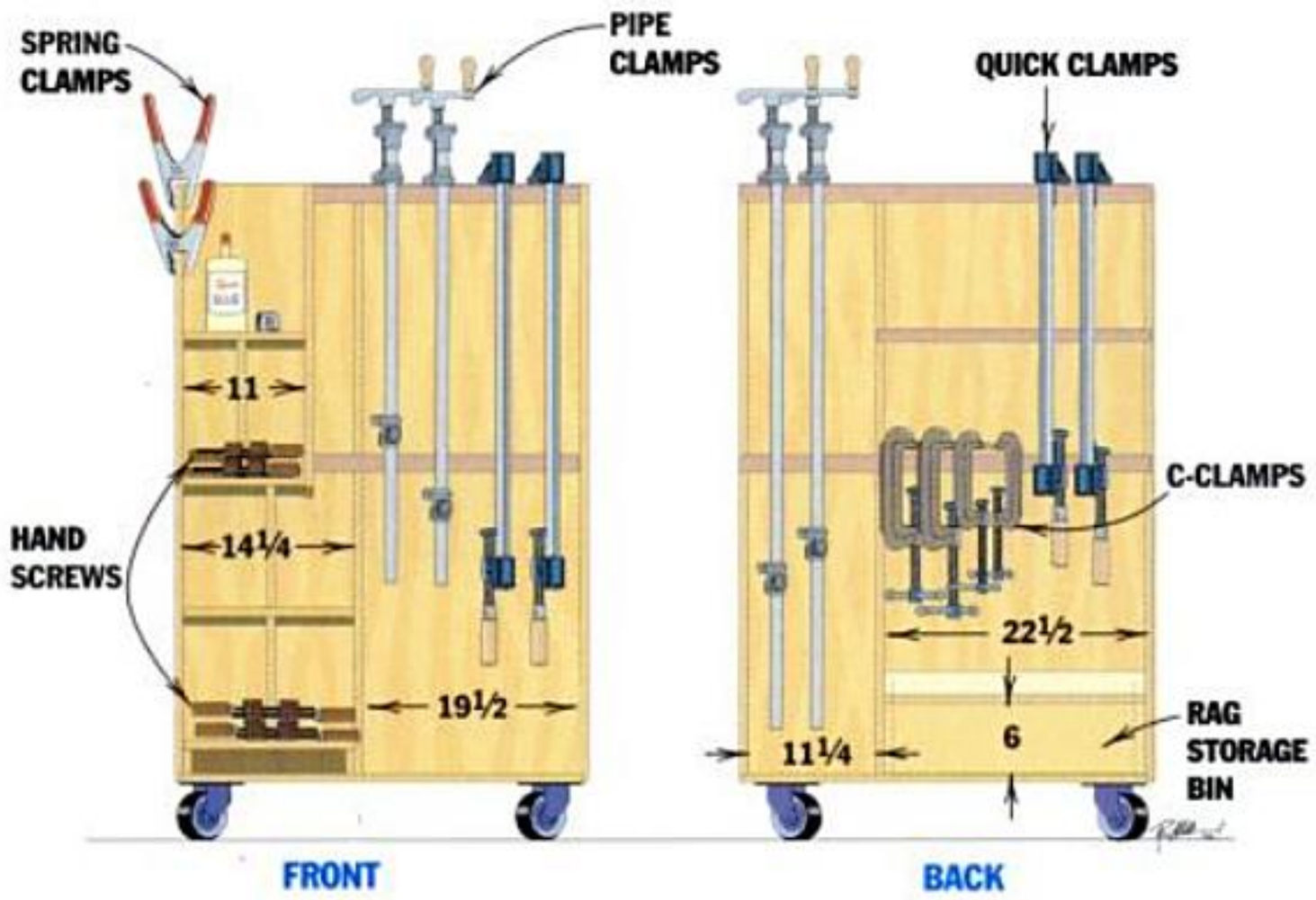
Clamps! Can't live with 'em, can't live without 'em. But a mobile rack like this one will change that old tune. With a convenient and organized place to put your clamps, they'll no longer be piled in your way when they're not in use. And they'll be easy to roll to wherever you need them.

This rack was sized to hold 30-in. bar clamps (six); 48-in. bar clamps (six); deep-reach 24-in. quick clamps (10); and a good assortment of smaller quick clamps. (The clamp bars are angled so you can just drape the clamps over them rather than tighten the clamps to keep them in place.) The shelves hold handscrews, glue containers and miscellaneous items like band clamps and picture-frame clamps. There's also room to expand as your clamp collection grows.

I built this rack from shop-grade ¾-in. plywood, with the front, back, base and divider glued and screwed together for strength. The hardwood crossbars on which the clamps hang are glued and screwed into notches in the plywood. The bin with a slanted lid is an option that you may want to include to afford some relatively dust-free storage for rags or other supplies.

Feel free to change the dimensions to fit your needs. Just make sure you use at least 3-in.-dia. casters on your cart to provide adequate support for all those clamps. ▲





FRED MATLACK *heads the AW Design Shop.*

Do you have a favorite shop fixture you'd like to share? Send a drawing or sketch with a full explanation to: AMERICAN WOODWORKER, 33 E. Minor St., Emmaus, PA 18098. If we publish your "Shop Solution" we'll send you this Forrest 8-in. dado set, worth $321.