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October 1997, No. 126
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DEPARTMENTS

On the Cover:
Cabinetmaker and teacher James Krenov with some of the wooden planes he has made. Beginning on p. 64, Krenov talks about the tool he made famous. On p. 67, his College of the Redwoods colleague David Welter explains how to make one. Photo: Boyd Hagen

Making a coopered door, p. 40

Fuming with ammonia, p. 46

Survey of jigsaws, p. 52

Fine Woodworking (ISSN 0361-3453) is published bimonthly, January, March, May, July, September and November, by The Taunton Press, Inc., Newtown, CT 06470-5506. Telephone (203) 426-8171. Periodicals postage paid at Newtown, CT 06470-5506, and additional mailing offices. United States newsstand distribution by Curtis Circulation Co., 730 River Road, New Milford, NJ 07646-3048 and Eastern News Distributors, Inc., One Media Way, 12406 Route 250, Milan, OH 44846-9705. GST #123210981.

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Arts-and-Crafts sideboard, p. 78

Postmaster: Send address changes to *Fine Woodworking*, The Taunton Press, Inc., 63 S. Main St., P.O. Box 5506, Newtown, CT 06470-5506 Printed in the USA

Sandpaper grading still a mystery— Strother Purdy's article (*FWW* #125, pp. 62-67) on the nomenclature of abrasives was long overdue. If in the 40 odd years that I have been in the woodworking business I've learned anything, it's that woodworking is a learning business with new information and techniques around every corner.

However, I was surprised that Mr. Purdy did not give a nod to the past and mention the abrasive grading system that most of us old coots grew up with. That's the one that is based on fractions, single digit numbers and a mess of zeros. We refer to paper as single-aught, or four-aught, where (for the linguistic purists) *aught* is a colloquialism or corruption of *naught*. This system seems to have disappeared into oblivion sometime back in the early '60s. The only place that I can still see it in use is in the grading of steel wool.

—Bernie Maas, Edinboro, Pa.

Strother Purdy's article on sandpaper has comprehensive information about sandpaper that does not often appear in other magazine articles. However, the table comparing abrasive grading systems leads to questions about the CAMI and micron systems. For example, converting a particle size of 15 microns in the metric system to its equivalent in English units becomes about $^{1}/_{1.693}$ in. Yet the table implies a CAMI grit size of about 700 rather than the 1,600 or 1,700 (if such a size were available) that would be expected. Other calculations for the table show equivalent discrepancies in which the tabulated grit size tends to be something like one-half of the conversion from microns.

—Roy Levy, La Canada Flintridge, Calif.

STROTHER PURDY REPLIES: With the many different grading systems for abrasives, it's no wonder confusion abounds. The micron scale is based on actual measurements of abrasive particles; the CAMI and FEPA scales are not. The numbers in these scales correspond to the sizes of wire-mesh sieves used to grade the particles.

Honing steel blades on aluminum— It's not surprising that you can hone steel on aluminum as James Thomson suggested (see *FWW* #124, p. 32). Aluminum rapidly forms a thin, tight layer of aluminum oxide on the surface. You are really honing on a layer of natural abrasive. The oxide was first found quite a long time ago. It is called corundum. When it occurs in clear crystals of certain colors, we call it ruby or sapphire.

—Edward J. Mattson, Port Chester, N.Y.

Advice was right after all—There seems to be considerable confusion over the properties of high-speed steel. High-speed steels are ferrous alloys containing tungsten or molybdenum and, to a lesser extent, cobalt. These three alloying constituents confer on high-speed steel a property known as red hardness. Once hardened, high-speed steels can be brought to a dull red (1,100°F) and kept at that temperature for a period of some hours before they begin to soften.

American machinists have for close to a century routinely sharpened high-speed tooling dry on grinding wheels. Flood or aerosol cooling at the grinding wheel is nice if you can get it, but it's for purposes of reducing microscopic cracking near the tool edge, not for preventing drawing the temper from the tool.

Ernie Conover's assertions about high-speed steel (*FWW* #123, pp. 70-73) were undeserving of criticism, and I cannot really conceive how a woodworker could ruin a high-speed cutting tool at the grinding wheel. That's far from the case with carbon-steel tooling.

—Cameron Brown, San Juan Bautista, Calif.

Waterlox works over cedar—I read with interest Chris Minick's explanation of the effect of aromatic cedar on the drying of varnish and his suggestion that wax be the only finish applied to the underside of the blanket box lid (*FWW* #125, p. 20).

I built a cherry blanket box six years ago that was lined with aromatic cedar. The entire box, including the underside

Writing an article

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Subscription rates: United States and possessions, $32 for one year, $56 for two years, $82 for three years; Canada and other countries, $38 for one year, $67 for two years, $95 for three years (in U.S. dollars, please). Single copy, $6.95. Single copies outside the U.S. and possessions: U.K., £4.25; other countries and possessions, $7.95. Address all correspondence to the appropriate department (Subscription, Editorial, or Advertising), The Taunton Press, 63 South Main Street, PO Box 5506, Newtown, CT 06470-5506. List management: The Kleid Co., 530 5th Ave. New York, NY 10036-5101.

of the lid, is finished with six coats of Waterlox and one coat of Butcher's wax. The finish has never become tacky and is still in perfect shape.

—Barry Siegel, Chevy Chase, Md.

Log recovery hurts environment—I read with interest your article about the recovery of first-growth lumber from sunken logs (*FWW* #125, pp. 82-85). As beautiful as this wood is, the recovery of these logs is not without a substantial environmental effect. Removing them from river beds is quite destructive to the river bottom where they have lain for as long as 100 years. This results in silting and disrupted fish nests, among other things. In response to this destruction, the state of Florida has prohibited the salvage of these logs. Woodworkers should be aware of the often substantial environmental costs of the materials they use. *—William Kastern, Ocala, Fla.*

GEORGE GOODWIN OF GOODWIN HEART PINE CO. REPLIES: River-recovered logs are a precious commodity, as is the environment in which they lay dormant. Log recovery can be done by hand with care, one log at a time, or executed with no concern for the underwater habitat. Less than 1% of the submerged logs we find are old-growth. The more prevalent logs are those washed downstream by storms, which provide a lot of cover for fish. We have no intent of disturbing these storm logs. The effects of our hand-picking is minute compared to the river's movement of these logs, and an area that had no logs one year may have several old-growth logs the next. As a fisherman and a diver, I have witnessed that storm trees with tops offer a lot of fish habitat whereas an old-growth river log is a solid cylinder with no limbs or roots. It's about as biologically correct as an overgrown beer can. It was placed there by man and provides no fish habitat.

Globe secretary is a winner—Mr. Marsden says his globe secretary (*FWW* #125, p. 110) won a second place medal in a furniture exhibition. What the heck took first place? He must not have had enough political pull with the judges. My finest wood creations would be lucky to get enough points for 150th place. I do have fun working with wood, and occasionally someone says, "Gee, that's nice." There are lots of good things in *Fine Woodworking*. This project is just one of them.

—D.J. Plummer, Fort Myers, Fla.

I am intrigued by David Marsden's globe secretary. In my opinion, it's one of the most interesting and unusual pieces you've exhibited in your magazine over the past several years. I think you should contact Mr. Marsden and ask him to write an article that explains how he built it. I, for one, would love to know.

—Thomas Hall, Oxford, Ohio

Self-leveling finish for furniture—A reader asked in a previous "Questions & Answers" column about a thick, transparent finish on tabletops (*FWW* #125, p. 20). I also have seen this, and I'm also interested in how it is done. The book *The Gougeon Brothers on Boat Construction* discusses a procedure called Flocoat, in which a very heavy layer of epoxy is applied over a wet base coat and allowed to self-level.

The appearance of the tabletops I have seen, including the table in the salon of a sailboat, appears to be based on a similar approach and is nearly glass smooth. I do not expect that these finishes are epoxy. It would be interesting to find a coating that provides the same self-leveling ability on the top that's still spreadable on the remainder of the piece.

Chris Minick replied to the question by saying that the finest furniture is not intended to be subjected to the kind of treatment for which this coating is capable, but some fine furniture is. I think it would be a valuable service to your readers if you could confirm how this is done. *—Joe Mahowald, Ann Arbor, Mich.*

CHRIS MINICK REPLIES: You're right. I neglected to mention epoxy finishes. Pour-on epoxy offers an alternative to two-part polyester when striving for that thick, encapsulated wood appearance. But I've found some epoxy materials yellow over time when applied as a thick finish. Worse yet, they tend to turn brittle and crack with seasonal wood movement. I must admit I have no experience with the Gougeon Brothers' products. Perhaps their formulation has solved both problems. Multiple layers of high performance, oil-modified varnish, such as Behlen's Bar Top varnish or Pratt & Lambert's #38, will produce a similar plastic-coated effect. Be aware, though, that between-coat timing is critical. Too many coats too fast will result in a soft, under-cured and easily damaged film. Follow the manufacturer's instructions to the letter, and above all, practice on scrap.

A source for Scheppach machinery—One of your readers asks where he can get Scheppach parts and accessories. Mad

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—Norm Morrissette, Mad Machinery

More on edge-jointing boards—Gary Rogowski's article on edge-jointing (*FWW* #124, pp. 46-51) lays out all the basic moves for fitting boards edge to edge using either hand or power tools. What seems to have been overlooked is the purpose of these operations, which is to assemble a number of narrow boards into one wide board that will resist warping and be easy to plane.

About 90% of lumber bought in random boards will be flat grained, that is, the annual rings curve across the width of the board when seen from the end. In drying, the natural tendency for such boards is to cup so the hollow is to the outside of the tree. When assembling any number of flat-grained pieces to make a wide board, the following method is the best one I know:

1. Check each piece for grain orientation by taking a pass with a jack plane on one face and mark with an arrow the direction in which there is no tearout. The arrow on the other face *must* go in the opposite direction.
2. Check the end of each piece, and draw the curve of the annual rings on it.
3. Assemble all the pieces so the arrows point the same way and the annual rings alternate inside and outside.
4. Place a big letter V across the face of all pieces, and number them sequentially. Quartersawn pieces may be fitted anywhere as long as the arrows line up.

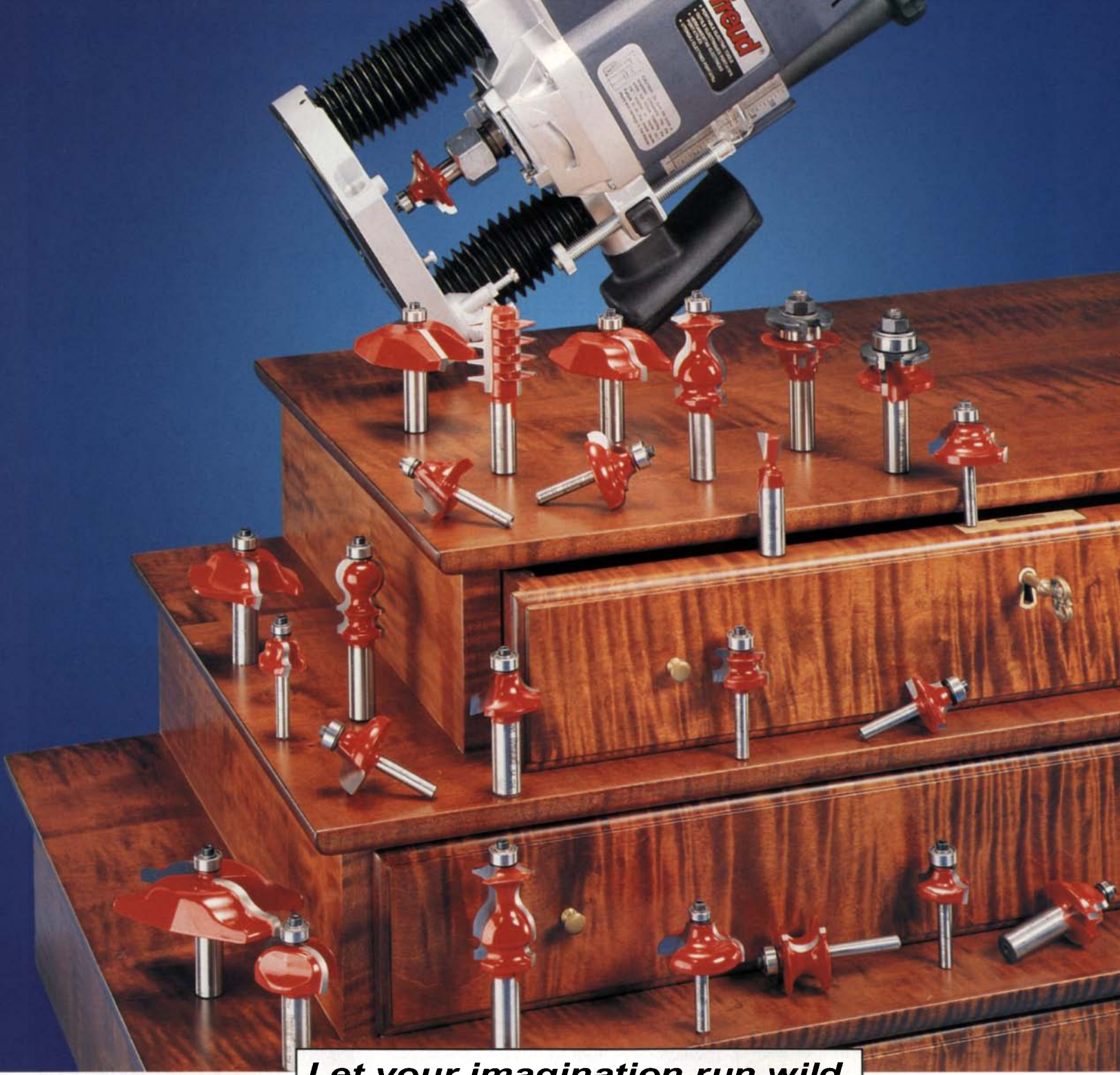
The best fit and surface for gluing is made with a handplane, preferably a 22-in. Stanley No. 7 with a blade ground square. It is the long bed of the jointer that produces the straight edge on the board, so the advice to skew the plane is incorrect because this reduces the length of the sole in contact with the wood.

Hand-jointing is a highly rewarding exercise in control. A perfectly hand-fitted joint is accurate beyond the ability of any woodworking machine and equals the fit produced in metal work by a surface grinder. No woodworker can truly call himself a craftsman unless he can consistently edge-joint by hand.

—James Thomson, West Vancouver, B.C., Canada

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

—Scott Gibson, editor



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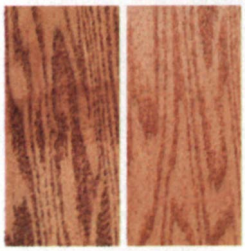
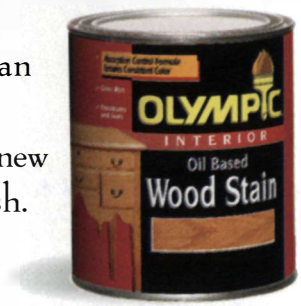


Ordinary stain Olympic



READER SERVICE NO. 144

Avoiding tearout when handplaning

I'm trying to smooth the surface of a long bench made of flatsawn ash using a plane and scraper only—no sandpaper. After machine planing the boards to thickness, I used a freshly sharpened low-angle jack plane to remove the mill marks. On straight grain, the plane performed spectacularly, but where the grain direction reversed, I got a fair bit of tearout (see the drawing). Did I get into trouble because of the low blade angle? What's my best strategy for avoiding tearout in the future?

—Chan Beals, Redwood City, Calif.

Garrett Hack replies: You've run into a typical planing problem—tearout around irregular or inconsistent grain. It's the rare board that doesn't have some grain reversal, and using your low-angle jack plane probably contributed to the tearout.

When planing end grain or planing with the grain on straight-grained wood, a low-angle plane works beautifully. The angle of its iron helps it shear the wood's surface more easily than a standard jack or smooth plane would. Where the grain reverses, however, the low angle will likely cause major tearout. The higher the angle of the iron, the more quickly the shavings are curled and broken against the leading edge of the throat. A bench plane iron has a pitch of about 45°. A hand-held or cabinet scraper has an even higher angle. This explains why a scraper can often handle ornery grain that other tools can't.

To avoid tearout in the future, start by tuning up a No. 4 or No. 5 bench plane. Use the thickest iron you can find that fits in your plane. A heavier iron will be stiffer and will cut more smoothly. Grind and hone the slightest curve along the cutting edge, so its corners don't dig into the wood. Set the iron for a fine cut. Keep the throat opening very small—the finer the throat, the less the tearout.

Start by planing diagonally across the board at about 45°. When the board is fairly flat, determine which way the grain is running as best you can by looking at the edge of the board and its face.

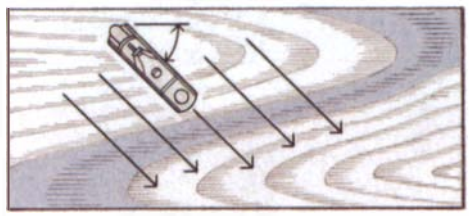
If you're still experiencing tearout, resharpen the iron, set it for a lighter cut and plane from end to end, skewing the plane at about 30°. Increase the skew if necessary around difficult areas.

Alternately, after getting the board fairly flat by planing it across the grain, you can finish smoothing it with a scraper or scraper plane. Scrapers cut more slowly than planes, though. And I believe scrapers leave a surface that's less smooth and polished. I prefer to stay with a plane for the best surface.

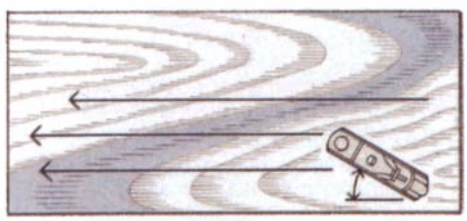
As a last resort, plane with the grain, letting any resistance tell you when to change direction. When I do this, I ease the plane onto the board, plane until the grain reverses, then ease the plane smoothly off the board again. Once I've smoothed the board as best I can, I do use a hand-held scraper to remove slight remaining blemishes or irregularities. [Garrett Hack farms, writes and makes furniture in Thetford Center, Vt. His book, *The Handplane Book*, was recently published by The Taunton Press.]

How to avoid tearout

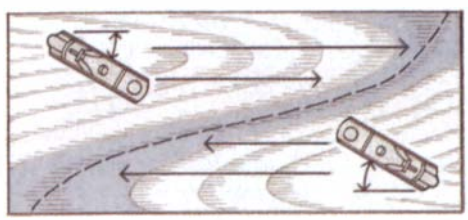
Tearout occurs in blue area.



To flatten a board without causing tearout, plane across it at 45°. Plane both ways, and then choose the direction that leaves the smoothest surface.



Plane the length of the board with the plane skewed at about 30°. Take very light passes with a freshly sharpened iron, and increase the skew around problem areas.



For really difficult areas, plane in the direction that works, taking an extremely light cut. Smooth any remaining blemishes with a hand-held scraper.

How tight should a joint be?

How much clearance should there be in a machined mortise-and-tenon or dovetail joint? I realize that too loose a joint will be weak, but I'm concerned that a joint that's too tight could be starved for glue.

—Werner Steinle, Roanoke, Va.

Peter Korn replies: Whether a joint is cut by hand or by machine, it should fit like a hand in a glove, but not the way a dishwashing glove that's a size too small fits and not the way your dad's glove fit when you were 6 years old. A well-cut joint slides together with just hand pressure and shouldn't require any persuasion from a mallet. And there shouldn't be any play in it. Don't worry about the glue getting scraped off mating surfaces. White and yellow glues (polyvinyl acetates, or PVAs) work best where wood contacts wood. If you do cut loose joints, assemble them with a polyurethane glue or epoxy, both of which have better gap-filling properties than the PVAs.

Where you *do* want a little space is at the bottom of a mortise. Cutting the tenon slightly shorter than the mortise is deep gives the glue a place to collect and ensures that the tenon doesn't bottom out. [Peter Korn teaches woodworking at the Center for Furniture Craftsmanship in Rockport, Maine.]

Finishing children's toy blocks

I have a number of scraps of native hardwoods—primarily cherry, red oak, white oak, poplar, ash and also some pine. The scrap is too small for a large project, but I thought that it would make good building blocks for a child. I'm wondering why I couldn't just leave the wood unfinished. Is there any type of wood that should not be used?

—Edward G. Trzeciak, Ligonier, Pa.

Jon Arno replies: Natural compounds

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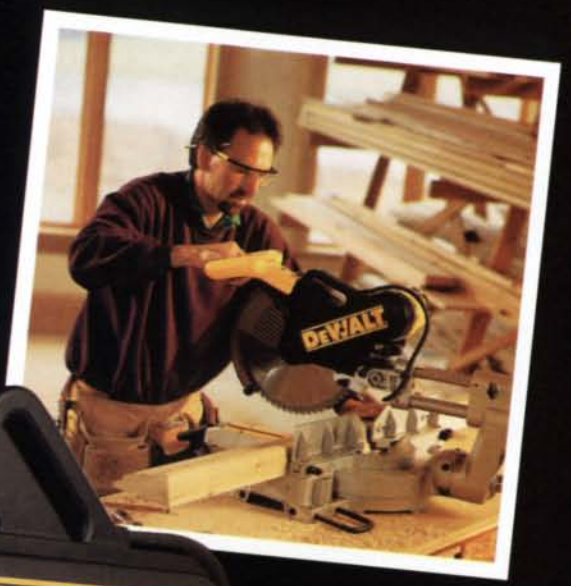

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found in many woods aren't altogether friendly. Most woods contain some compounds that could adversely affect health if consumed in an adequately high dose. These compounds, however, pose very little risk when put in the mouth for a short while. So I doubt that blocks of any of the species you mention would be harmful to a child.

The bigger risk is asphyxiation. Children, especially toddlers, have an irresistible urge to put everything into their mouths. It's critically important the blocks be large enough to prevent a child from getting one stuck in his throat.

Oak contains high levels of tannic acid, and pine contains resins and terpenes. If a child were to gnaw on either of these woods vigorously, the result could be a very memorable bellyache.

Cherry produces cyanide-like compounds, which are potentially lethal, but they tend to concentrate in the fruit and foliage of the tree. The wood is not known for causing fatalities.

Walnut contains a substance called juglone, which is both a sedative and a laxative. I never use walnut when making toys or kitchen utensils, though I'm probably being overly cautious.

Still, using a finish is a good idea. Blocks will stay bright and clean. Also, a finish will seal the grain, making it less likely the child will pick up any splinters or that germs will establish a home in the pores of the wood. But be sure to select a finish that you know to be nontoxic. Shellac is probably your best bet.

[Jon Arno is a woodworker and wood consultant in Troy, Mich.]

Reviving a factory-finish on teak-veneered furniture

About eight years ago, I purchased a teak-veneered bedroom set that I thought had an oil finish. When I asked the dealer about re-oiling it, he said the finish was not oil but a permanent finish. He didn't have any more information, and he has since gone out of business. The finish is beginning to look dried out in places, and I would like to restore it. How would you suggest I do that?

—Walter Murek, Amherst, N.Y.

Chris Minick replies: A thin layer of chemically cured conversion varnish is typical on this style of furniture. Applied at the factory, this varnish is significantly more durable than traditional oil and easier to apply. It's a great finish from the factory's perspective, but there are some serious disadvantages for the customer.

First off, conversion varnishes, though durable, do wear. And when they do, you're out of luck. Applying another coat of finish over the worn finish won't work (the new layer will just peel off). Also, conversion varnishes are impervious to almost everything, including paint and varnish remover. Sanding is your only option, and with veneered furniture, it's not a good one.

It's probably a better idea to rescue the existing finish than to try to renew it. A thorough cleaning with soap and water (don't get carried away and saturate the wood) followed by a coat of paste wax may be enough to restore the bedroom set to almost like-new condition. Select a colored paste wax for your project. Clear paste waxes often leave a white residue in the open pores of the wood. Colored waxes leave a residue as well, but because the color blends with the wood, you can't see it.

[Chris Minick is a finish chemist and woodworker in Stillwater, Minn. He is a contributing editor to *Fine Woodworking*.]

Woodwise wood putty

In his article "Using Wood Putty" (FWW #121, pp. 89-91), Chris Minick mentions a latex wood filler used by flooring installers. The label reads Woodwise Full-Trowel Filler. I can't find anyone who carries it or any similar product.

—Lawrence E. Daly, Barryton, Mich.

Chris Minick replies: Woodwise filler (manufactured by Design Hardwood Products, 16149 Redmond Way, Suite 118, Redmond, WA 98052; 206-869-0859) and Wood Stuff (made by Wood Floor Products, P.O. Box 16392, Seattle, WA 98116; 206-630-0754) are the two hardwood floor putties (or fillers) I like best. They both work on tabletops and floors, drying faster, shrinking less and sanding easier than putties sold for woodworking. Both products are available in a number of common wood tones. Wood Floor Products will even mix custom colors for large-scale jobs.

Mica for Arts-and-Crafts lamps

Where can I find mica like that used in the Arts-and-Crafts lamps? How do I go about cutting it to shape?

—Bradley Schilling, Fairview Heights, Ill.

Vincent Laurence replies: You have at least two possible sources. For $20, Asheville Schoonmaker Mica Co. (900 Jefferson Ave., Newport News, VA 23607; 757-244-7311) offers a sample box with price sheet and instructions on working with the material. (The $20 is applicable to your first order.) Mica New York (75 Varick St., New York, NY 10013; 212-219-0201) requires a minimum order of $100 but offers a wide selection of mica, both natural and bonded into sheets, from 5mm to 20mm. Mica can be cut with shears or even with a utility knife.

[Vincent Laurence is an associate editor of *Fine Woodworking*.]

Simple, inexpensive CAD programs

I'd like to use a computer-aided design (CAD) program to design chairs and other freestanding furniture. I'm looking for a program that will operate satisfactorily on a fairly high-powered personal computer (PC) but doesn't require extensive knowledge to operate. I'd also like it to be reasonably priced.

—Frank Barr-David, Darling Point, Australia

Patrick Nelson replies: There are a number of CAD programs that meet your requirements. Keep in mind that CAD software will probably not save time initially. The first time you work on a design, you'll likely spend as much or more time as you would at the drafting board. When you need to revise that design for another client, however, most of your work will already be done.

I have used CAD software for more than eight years in my one-man, custom furnituremaking business. For me, ease-of-use and low cost are the most important factors. I use a basic two-dimensional program called Drafix CAD Professional for Windows 95. I've tried several others and have always returned to this program.

The next most important thing to look for in a program is whether it allows you access to your old drawings. Find out if the current version of any program you're

interested in lets you access drawings made with previous versions. Many do not. Having access to old drawings, whether to share with other craftsmen or clients or to revise for a more current application, is an essential requirement for a drafting program.

It's also important to buy a program that's compatible with the industry standard CAD program, AutoCAD. If I'm bidding on a job and I want to send a drawing to an architect, for example, I don't want fonts and line thicknesses changing when the file is opened.

Here's a short list of some CAD software and respective web sites worth exploring. Some of these web sites may have demonstration programs to download on a free trial basis:

- AutoCAD LT for Windows 95 (www.autodesk.com)
- Design CAD (www.viagrafix.com)
- Drafix CAD Professional (www.drafix.com)
- MicroStation 95 (www.bentley.com)
- TurboCAD (www.imsisoft.com)
- Corel Visual CADD (www.corel.com)

Everyone who uses CAD software has a personal preference. Talk to as many CAD users as you can before settling on a program.

[Patrick Nelson designs and builds furniture professionally in Fulton, Mo.]

Dangers of a jointer with a square cutterhead

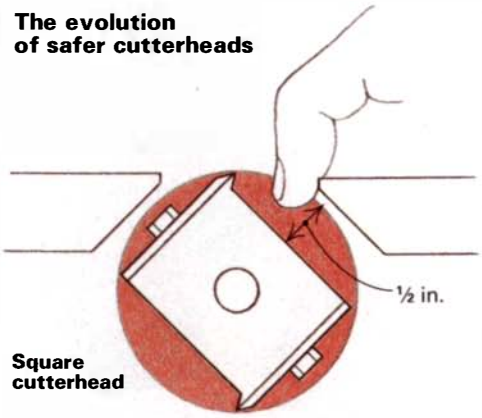
I have a 20-in. jointer with a square cutterhead, two knives and babbitt bearings. The knives are 5/16 in. thick and 2½ in. wide. At what speed should this jointer run?

—Fuat Latif, Saranac Lake, N.Y.

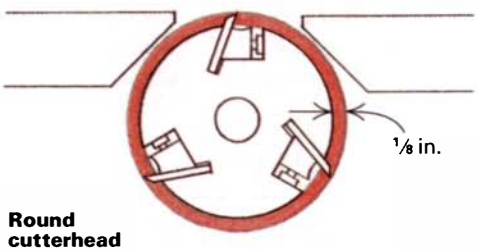
Robert Vaughan replies: My liability insurance doesn't allow me to work on such machines, and I'm even hesitant about making suggestions about the operation of such a relic. Square-cutterhead jointers are much more dangerous than machines with round cutterheads. If one gets entangled with the spinning knives, the blade-cutterhead angle will cause the cutterhead to grab and pull, unlike a round cutterhead. Also, there's a huge gap between the cutterhead and beds for most of the cutterhead's rotation, which is more dangerous.

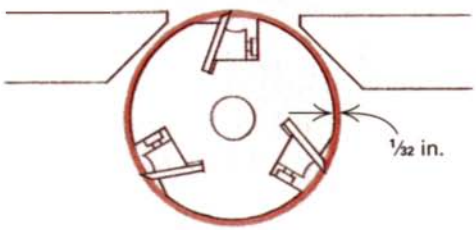
The distance between the arc of the knives and the cutterhead on square-cutterhead jointers can be almost ½ in. That's a potentially giant bite. The first generation round cutterheads reduced this distance to ⅛ in. or so. The safest type of cutterhead being manufactured today uses machined flat sections behind the knives to reduce the potential bite to as little as 1/32 in. If you do happen to drop your finger into the cutterhead of one of these newer jointers, you might lose your fingertip. When old-timers get together and tell woodworking war stories, tales of losing an entire hand to a square-cutterhead jointer invariably come up.

The evolution of safer cutterheads



Early jointer cutterheads were square—and dangerous. The distance between the arc of the knives and the body of the cutterhead permitted a bite of nearly ½ in. Round, three-knife cutterheads were an improvement, reducing the potential bite to ⅛ in. Safer yet are cutterheads with machined flats behind the knives, a design limiting the bite to as little as 1/32 in.





Those old machines generally ran off line-shaft belts, and there was no hard-and-fast rule for the correct speed. The ones I've seen (which have all been removed from service) were run about 3,000 rpm. But badly worn bearings or a poorly balanced cutterhead can make even this speed potentially catastrophic.

You should seriously consider replacing your squarehead jointer with one that has a round cutterhead and ball bearings.

[Robert Vaughan tunes, repairs and restores woodworking machinery in Roanoke, Va. He is a contributing editor to *Fine Woodworking*.]

Gear lubricant for old scroll saw

I recently acquired an old Sears scroll saw made by King-Sealey. It is in very good condition, but it came with a dry crankcase. I have been told to use a standard 90-120 weight gear lubricant, but it seems to me a motor oil might be more appropriate.

—B.J. Jackson, Gainesville, Ga.

Robert Vaughan replies: Your King-Sealey scroll saw will work fine with a 30-weight, nondetergent motor oil—the same kind often used in lawn mowers.

Looking for a saw vise

Can you point me in the direction of vendors who still sell saw-filing vises?

—Dan Brown, DeWitt, Mich.

Mario Rodriguez replies: Saw-sharpening vises are available from many dealers who specialize in used or antique tools. One of the dealers I've bought from for many years is Tom Witte (Tom Witte's Antiques, P.O. Box 399, Front St. W., Mattawan, MI 49071-0399; 616-668-4161). Expect to pay between $30 to $50.

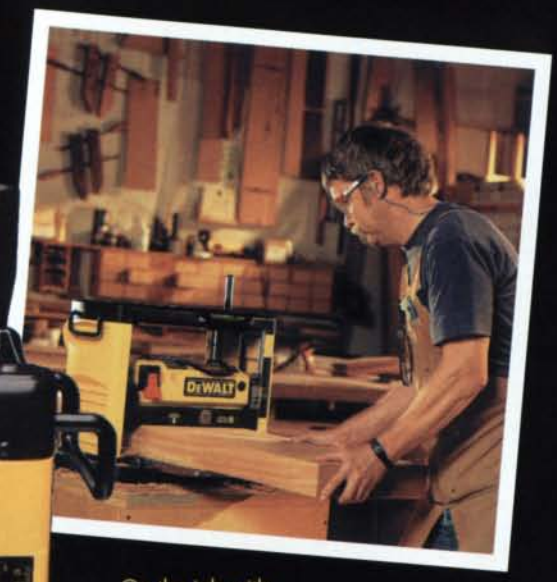
A new saw vise is available from Lee Valley Tools (P.O. Box 1780, 12 E. River St., Ogdensburg, NY 13669-0490; 800-871-8158). It sells for $32.75.

[Mario Rodriguez teaches woodworking at the Fashion Institute of Technology in New York City and at Warwick Country Workshops in Warwick, N.Y. He is a contributing editor to *Fine Woodworking*.]

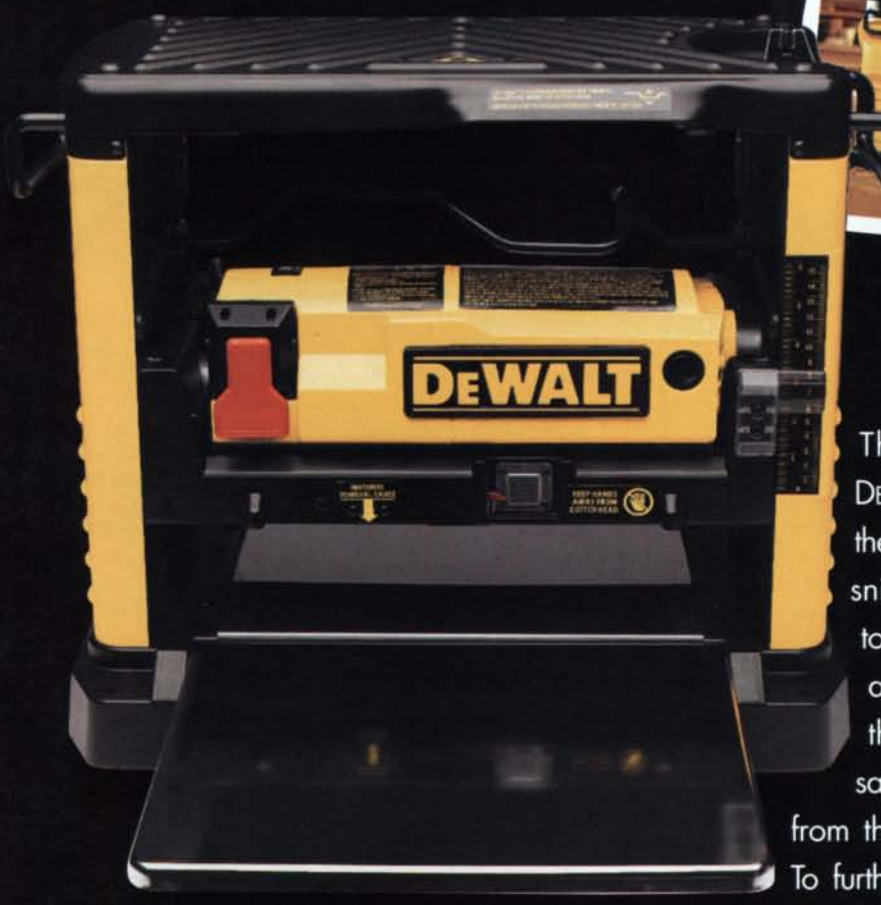
Do you have a question you'd like us to consider for the column? Send it to Questions & Answers, Fine Woodworking, *P.O. Box 5506, Newtown, CT 06470-5506.*

THE NEW DW733 12-1/2" PORTABLE PLANER FROM DEWALT

AVOIDING SNIPE IS A LOCK.



On the job with O.B. Williams Company,



The exclusive four-column DEWALT Head Lock eliminates the movement that contributes to snipe. Simply push the handle to securely lock the cutterhead against four steel columns. With the cutterhead stabilized, the same amount of stock is removed from the entire length of the board. To further reduce snipe, the DW733 has large infeed and outfeed tables to stabilize and reduce movement of material passing through the planer. And, unlike other planers, the DW733 has the exclusive DEWALT turret depth stop to quickly and accurately return to pre-set thicknesses. The planer's easy-to-read magnified depth scale measures to 1/32", while a material removal scale measures to 1/64" and a calibrated depth crank measures to 1/16" per rotation. The DEWALT knife changing system features a magnetic gauge to accurately hold the knives in position and free both hands. It's not just a planer. It's a DEWALT. For more information, call 1-800-4-DEWALT.

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• DeWalt 8-1/2" & Ryobi 8-1/2"x60Tx5/8"	$179	$109
Delta 9"x80Tx5/8"	$204	$119
• Ryobi-Makita & all 10"x80Tx5/8"	$207	$129
• DeWalt, Makita, B&D, Hitachi 12"x80Tx1"	$229	$139
Ryobi-Makita 14"x100Tx1"	$266	$179
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9"x60Tx5/8" 3/32"K	$156	$119
8"x60Tx5/8" 3/32"K	$150	$109
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14"x30Tx1"	$195	$139	$125	$111
12"x40Tx1"	$183	$129	$116	$103
12"x30Tx1"	$162	$119	$107	$ 95
10"x40Tx1/8" or 3/32"	$156	$119	$107	$ 95
30T 1/8" or 3/32"	$135	$ 99	$ 89	$ 79
9"x40T	$146	$109	$ 98	$ 87
30T	$125	$ 99	$ 89	$ 79
*8-1/4"x40Tx3/32"	$136	$ 99	$ 89	$ 79
8"x40T 3/32"	$136	$ 99	$ 89	$ 79
30T	$115	$ 89	$ 80	$ 71
7-1/4"x30T 3/32"	$112	$ 69	$ 62	$ 55
**6"x40T 3/32"	$136	$ 89	$ 80	$ 71

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Fine Woodworking Magazine test, Oct. 96, page 43

After installing your blade and 5 in. stiffener the vibration in my saw went down another 20%. I ran several pieces of hardwood through the saw, both crosscut and ripping, and was amazed at the smoothness. It was like cutting butter, maybe smoother. I have never had a saw blade that cut this smooth.

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8" x 80T x 1/8" & 3/32"K	$202	$169	12"x100T x 1-1/8"K	$253	$215
220mm x 80T x1/8" x 30mm	---	$159	14" x 80T x 1"	$232	$197
9" x 80T x 1/8" & 3/32"K	$207	$179	14" x 80T x 1"	$266	$226
10" x 80T x 1/8" & 3/32"K	$207	$159	16" x 80T x 1"	$262	$223
12" x 80T x 1-1/8" K	$212	$181	16" x 100T x 1"	$294	$243

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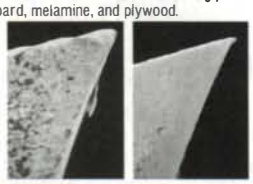

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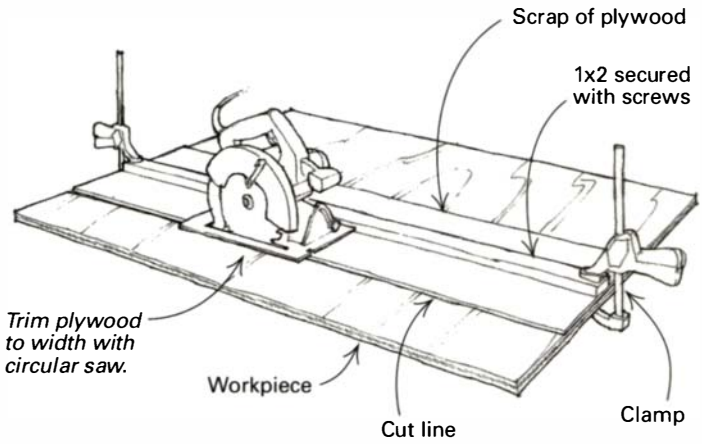
edited and drawn by Jim Richey

Cutting sheet goods with a circular saw

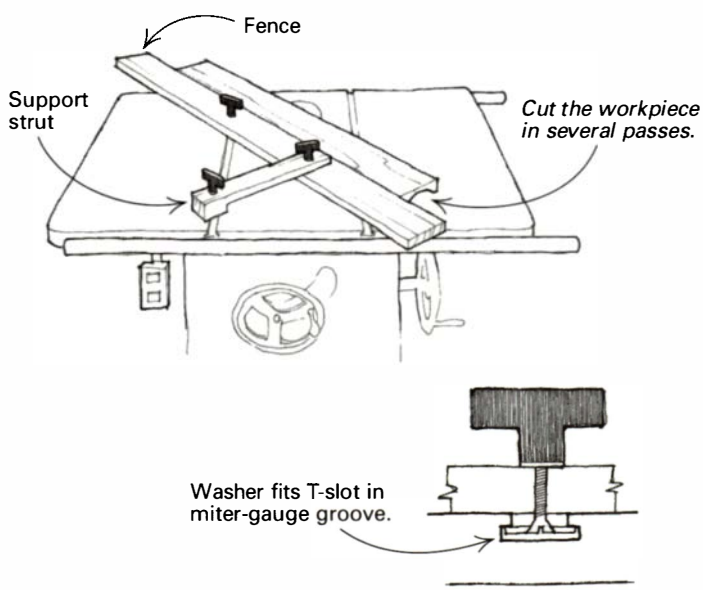


This fixture for cutting sheet goods with a circular saw is simple to make and gives accurate results. Attach a 4-ft. or 8-ft. length of 1x2 lumber to the middle of a piece of plywood that's the same length and about 12 in. wide. With the saw's base bearing against the 1x2, which is the fence of the fixture, rip off the edges of the plywood. You're done. Attach this jig to anything at any angle, putting the edge of the jig right on the cut line. You will know exactly where your saw will cut. Splintering is eliminated underneath the guide. Rip one edge at 45° if you like—it could come in handy.

The accuracy of this fixture depends on a straight fence, so pay attention when you attach the 1x2. Use a 4-ft. or 8-ft. straightedge, or just use the factory edge of a piece of plywood.

—Gary Allan May, Seattle, Wash.

Cove molding on the tablesaw



If you cut lots of cove molding on your tablesaw, this fixture will certainly repay the time invested in making it. The fixture requires a T-shaped miter-gauge slot, which is found on most newer tablesaws. To make the fixture, start by selecting a flat washer that fits the T-slot. Countersink two washers to fit the head of a machine screw. The washers and screws will provide hold-downs for adjusting and locking the fence in place. Select a clear, straight 1¼-in.-thick board for the fence. Assemble the fence and the support strut with the hold-downs and knobs, as shown in the sketch. You can buy the knobs or make your own.

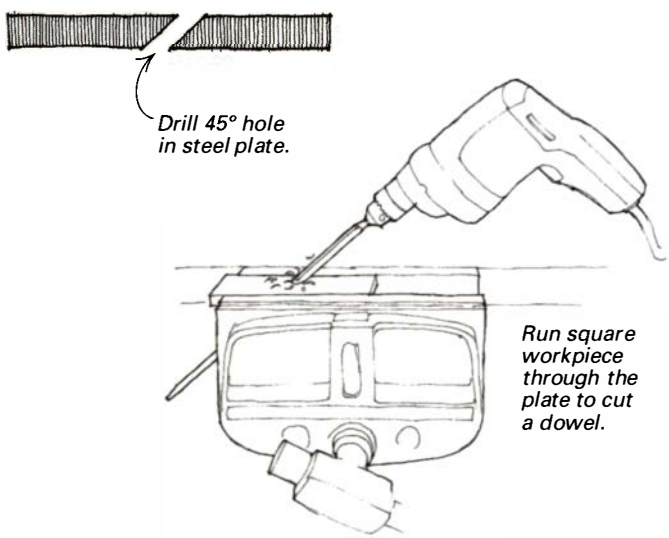
To adjust the fence, set the sawblade at the full height of the finish cut. Move the fence to the near side of the blade. With a second straight edge held just tangent to the far side of the blade and parallel to the fence, vary the angle of the fence until you get the correct width of the cove between the fence and the straight edge. Tighten the knobs to lock the fence in place, lower the blade until about 1/16 in. protrudes above the table surface, and make the first pass to produce a small concave cut. Make successive cuts raising the blade 1/16 in. on each pass until you reach the desired cove depth.

—Roy H. Hoffman, Oriental, N.C.

Quick tip: To trace the outline of solid-wood inlays accurately, stick the inlay to the wood with double-faced tape, and trace the outline with a fine X-Acto knife. The tape will keep the inlay piece from slipping during tracing and will create a perfect cut line.

—Michael Fiedler, Clifton Heights, Pa.

Making wooden dowels



When I needed dowels in sizes and wood species not commonly available, I first tried making dowels the age-old way. I forced a square wooden rod, tapered on the end and chucked in a drill, through a hole drilled at 90° in a metal plate. This process was slow and unsatisfactory. So I drilled an angled hole through the metal plate, which created a sharp cutting edge on half of the circumference of the opening. The sharpened portion of the hole pares the wood off the rotating workpiece and cuts the dowel smoothly and quickly.

To drill the angled hole in the plate, start with a pilot hole, and then follow with the appropriate drill bit. You may have to clamp another piece of metal to the plate to provide enough support to get the bit started. This will keep the bit from skating off the

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surface as you start drilling. Use steel plate that is sufficiently thick to act as a channel for the dowel—I used 3/16 in.

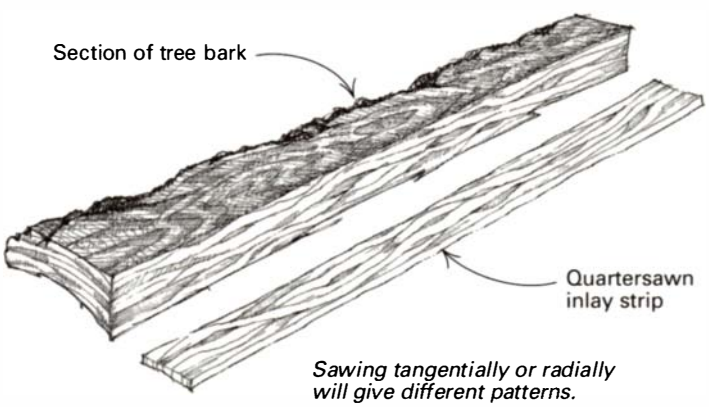
To use the dowel maker, chuck a square blank into your drill. Taper the end by sandwiching the blank between two pieces of medium-grit sandpaper while the blank turns in the drill. Insert the tapered end into the hole in the plate, turn on the drill and push the blank through the hole. *—Richard L. Runyan, Louisville, Ky.*

Sanding block for inside corners

After gluing up a little shelving unit for my daughter's bathroom, I found that I needed to do a little light sanding in the corners. With a traditional sanding block, I could concentrate only on one surface at a time. So I made a sanding block that allows me to sand both surfaces of an inside corner at the same time.

Making the block takes only two different settings and four passes on the tablesaw. Starting with square stock, sized to fit your hand comfortably, make two cuts parallel to the outside edges. Then tilt the blade to 45°, reposition the fence and make two more cuts to define the handle. *—Al Ching, Huntington Beach, Calif.*

Burl inlay from tree bark



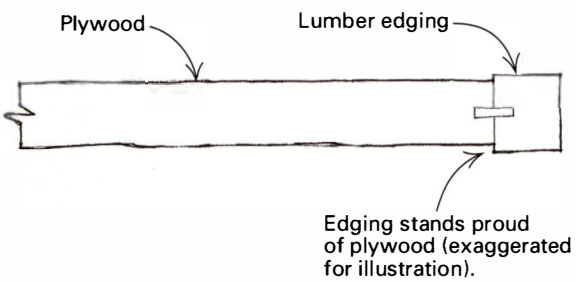
Most of the time, tree bark is wasted or turned into mulch. But not around here. I cut hemlock bark into 1/8-in.-thick, 3/4-in.-wide strips and inlay it into boxes and borders. When cut radially (quartersawn), the material shows a striped pattern. When cut tangentially (plainsawn), the grain has a curious burl effect.

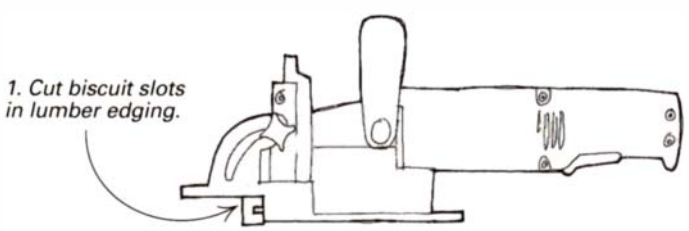
To finish, wet-sand using 80-grit wet-or-dry sandpaper. This will create a paste that acts as a filler. Continue sanding until nearly dry, letting the paper fill so it makes a smooth surface. When the bark veneer feels dry, coat it with as much lacquer sanding sealer as it will take. The result will look terrible at this stage. Let it sit for a few days, and then sand until the grain shows.

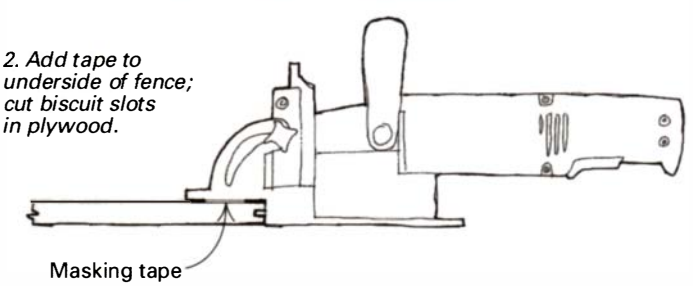
Add one light coat of sealer with a cloth, and finish up with extra-fine steel wool and wax. *—Roger Russell, Anderson Island, Wash.*

Quick tip: When spreading glue, I like to use a 3-in. paint roller. Its nap and diameter are perfect for applying the proper thickness of glue. The store-bought 3-in. rollers are relatively expensive, so I make my own by cutting 9-in. rollers into thirds. A single roller can be made to last several weeks by covering it with plastic wrap after each use. *—Garrett K. Spitzer, Jamestown, N.Y.*

Biscuit-joined edge-banding







Biscuit joints are an effective way to attach solid-wood edging to plywood or medium-density fiberboard (MDF). But I like to offset the biscuit slots a bit to ensure that the edge-banding is slightly raised above the surface of the plywood. Otherwise, the edging will sometimes dip slightly below the surface of the veneer.

You may be tempted to offset the slot by adjusting the fence, but don't do it. It's not only time-consuming but risky, because the fence can sometimes end up slightly out of parallel to the first slot. Cut the slots in the edging first, and then add one or two layers of masking tape at the front and the back of the fence before you cut the slots in the plywood.

The masking tape will slightly offset the slots by just the right

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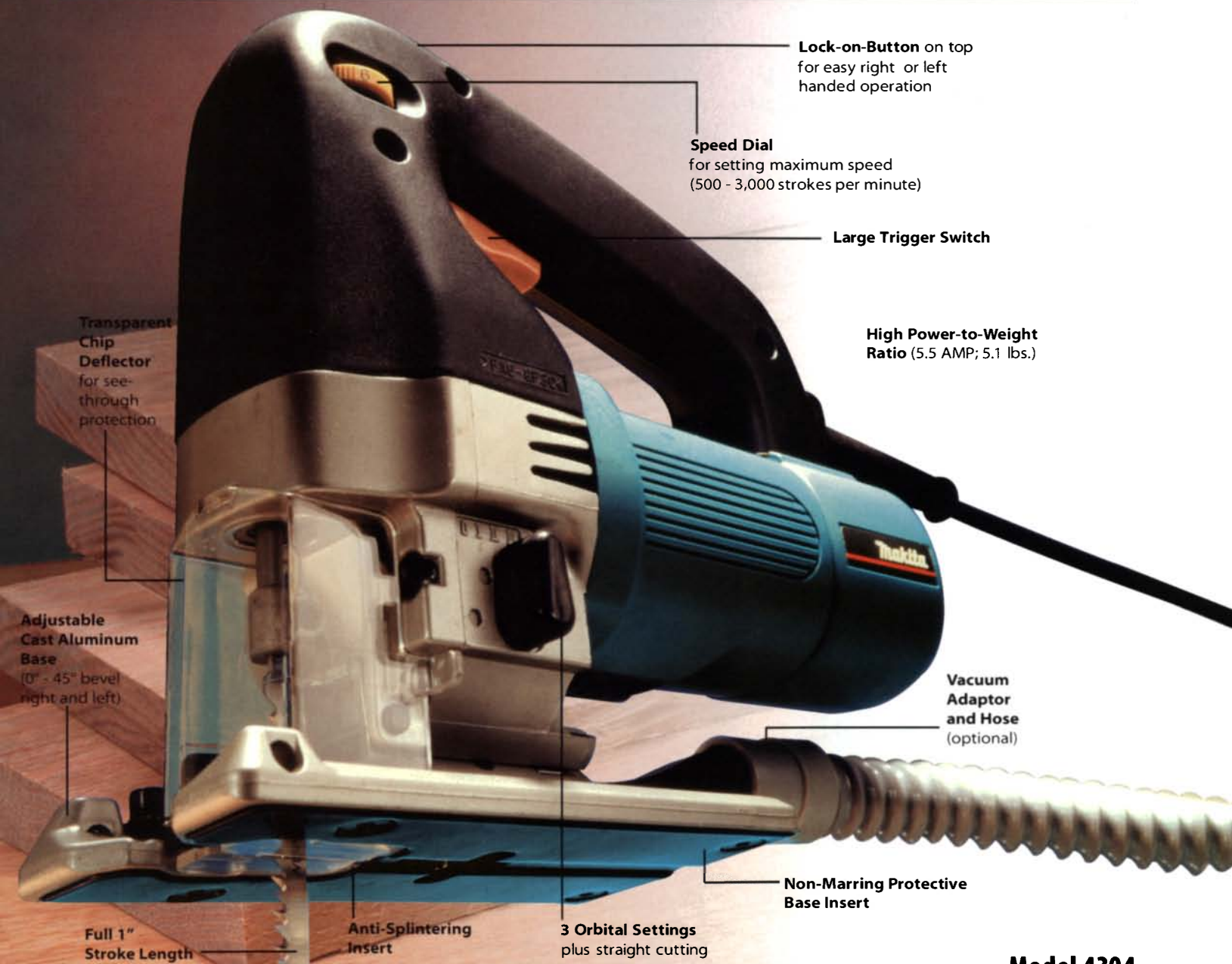

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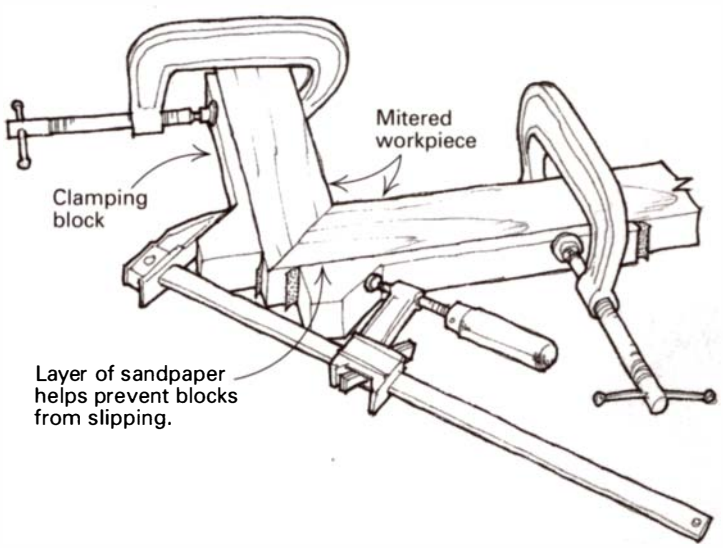
amount. A skewed block or smoothing plane will trim the edging flush to the veneered plywood. —*Ken Shaw, San Diego, Calif.*

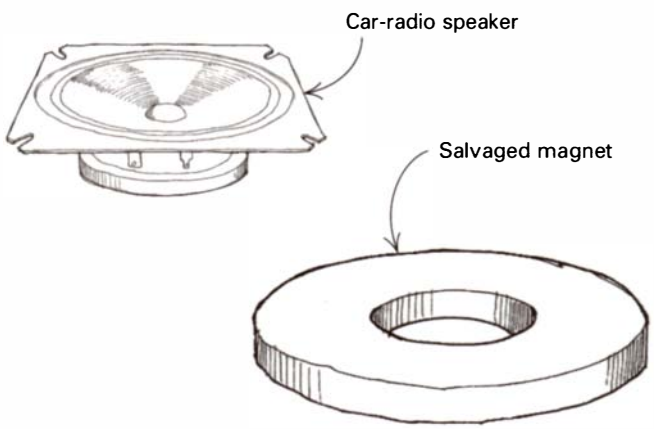
Miter clamping blocks



These auxiliary clamping blocks provide an easy and inexpensive way to clamp mitered workpieces. Bandsaw the blocks from a piece of hardwood scrap the same thickness as the stock being glued. For 90° corners, angle the face of the clamping block at 45°. For other odd angles, cut the face at half the angle of the finished joint.

To use, secure a clamping block to each side of the miter joint with a C-clamp. Add a strip of double-faced sandpaper between the clamp block and the workpiece. I make the sandpaper strips by gluing 180-grit sandpaper back to back. The sandpaper layer eliminates slippage with no harm to the workpiece. Spread glue on the joint surfaces, and clamp across the joint with a quick-acting bar clamp. —*Ilmars Vilmanis, St. Petersburg, Fla.*

Shop magnets from old speakers



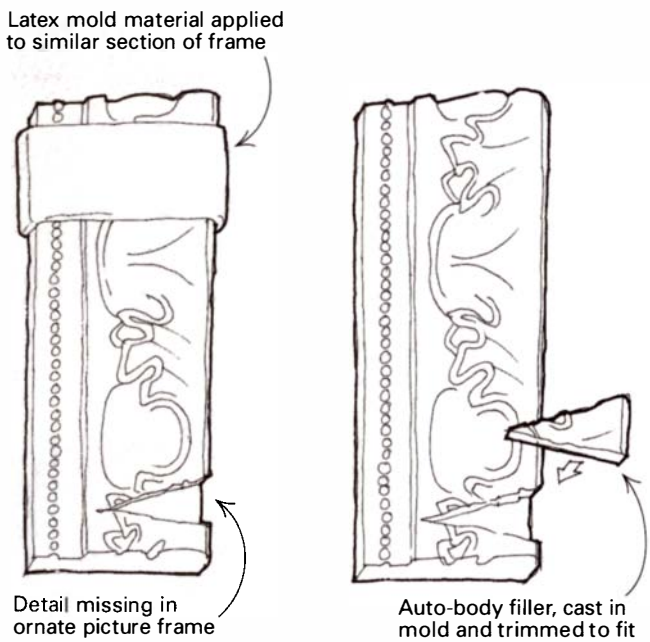
Old car-radio speakers yield various sizes of circular magnets, which can be handy in any shop. I use large ones to hold fences in place on the bandsaw and tablesaw and to secure pivot points in place on the bandsaw table for cutting curved pieces. They're also good for holding steel rulers and wrenches in handy positions. The magnets can be slapped onto any convenient flat metal surface; the larger ones are very strong. To disengage them, slide them to an edge, and tilt them.

—*Alan J. Wilson, Nelson Bay, N.S.W., Australia*

Quick tip: The shank of a solid-carbide router bit makes an excellent burnisher for cabinet scrapers.

—*Roger Russell, Anderson Island, Wash.*

Low-budget composition castings



I recently restored a 75-year-old mirror frame that had much of the composition floral detail missing. Because of a tight budget, I had to find a low-cost way of duplicating the missing decoration. After several trials, I found a method that worked.

First make a mold of the existing decorative elements using latex mold material, commonly available at craft stores. Fill the mold with plastic auto-body filler. Just after the body filler starts to set up but is still in a plastic state, remove the cast from the mold. Trim the cast with a razor blade to make a piece that fits the missing section. The piece can be formed to fit a curved frame. Set the new piece in place, and weight it down with a bag of sand until it is fully cured.

To ensure the cast does not stick to the frame prematurely, sprinkle talcum powder on the frame. After the cast has cured, you can easily cement it in place with a new batch of body filler. Then you're ready for finishing. —*Scott R. Carnegie, Downers Grove, Ill.*

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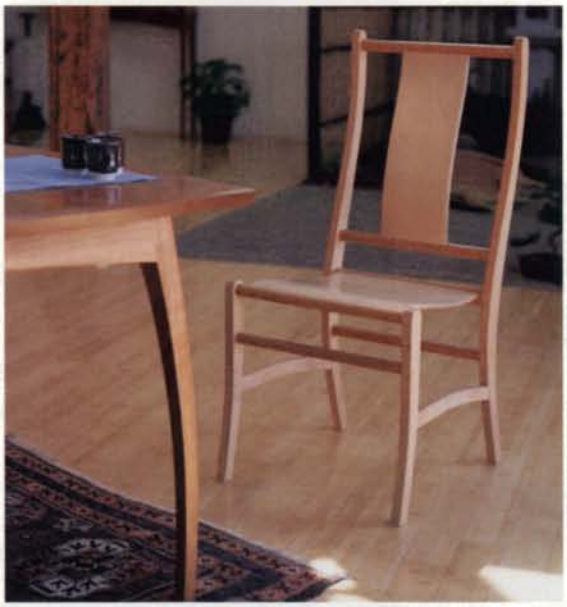

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Coopering a Door

Accurately beveled staves produce a graceful curve

by Garrett Hack

Before I went to woodworking school, all of my work tended to be flat, straight and square. It wasn't intentional. Rectilinear work was all I had ever seen. When I arrived at school, everyone was designing and building curved forms, making tapered laminations—doing all kinds of curved work. It was a liberating experience to see beyond flat and square.

My first project with curves was a toolbox with a pair of coopered doors. I chose to cooper the doors—that is, to create the curves from a number of relatively narrow, bevel-edged pieces called staves—because I wanted the doors to be solid, not veneered. Coopering seemed like the simplest and best technique.

Coopering has been around since biblical days and has been most commonly used for making barrels and buckets. It appeals to me because it yields predictable results with a minimum of effort, and few tools or special fixtures are required. With careful layout and accurately cut bevels, I can make curved doors (or other furniture elements) of nearly any radius.

The only real alternative to coopering for making curved doors is laminating, either of solid layers or of veneer over plywood. Although laminating is somewhat stronger than coopering, it requires either carefully matched forms or a vacuum press, and results are less predictable. Laminated curves always have some degree of springback, and it's impossible to know just how much before they come out of the press. If you're willing to make a trial lamination or two to check springback and fine-tune the form, laminating will give you a very strong curved door. I've found, however, that it's not worth the effort for just a door or two.

Coopering is not without its disadvantages, but they're minor. If you want a smooth curve, rather than a faceted one, the whole door must be planed and scraped after assembly because the curve is fashioned from a number of flat pieces. The convex outer face is fairly easy to smooth. And I generally leave the inside faceted, intentionally revealing the method of construction. As for strength, as long as the glue joints are sound, a coopered door should last as long as any flat-panel construction. Also, a coopered door will shrink and swell as any solid timber will, but because of the angles at the joints, it can subtly change shape as it changes dimension. If you're concerned that a single wide door might move too much (its movement will be equal to a board as wide as the length of the curve), make two narrower doors instead.

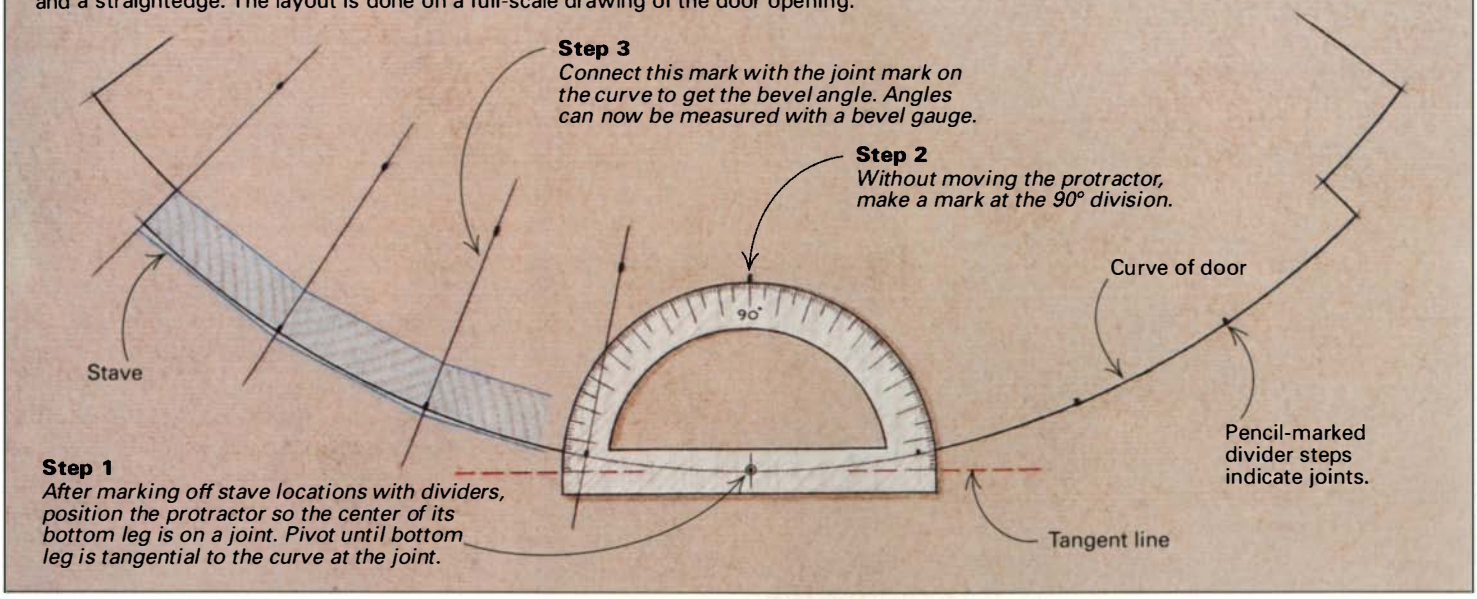
Curve layout takes place on a pattern

The key to building any coopered door is an accurate pattern. It's on the pattern that I figure the number of staves, their width, thickness and the bevel angle at each joint. Just before assembling the case, I draw a curved pattern from the case top, bottom or even a shelf. Then I build the door to match this curve. I include the case stiles (where the door hinges and latches) on the pattern to make fitting the finished door easier. When making the coopered door for the cabinet shown in the photo at left, I started with the curved,

Laying out and beveling the staves

Determining bevel angle

The bevel angles for the joints between staves are easily determined with a drafting protractor and a straightedge. The layout is done on a full-scale drawing of the door opening.



Record each angle. *Use a bevel gauge to measure the angles on the drawing. Then record them on scrap.*

Transfer angles to the saw. *The author uses the bevel gauge to set the tablesaw blade at the correct angle.*

With the angle set, make the cut. *Cut all the bevels of the same angle before changing the blade angle.*

laminated drawer fronts. I used the shape of the drawers to determine the curve of the case and the pattern for the door.

To establish the number and width of each stave, I used a trial block cut to what I guessed the thickness and width of the completed staves would be. By laying this out around the curve on the pattern and tracing around the block each time, I got a good idea of what the profile of the finished door would look like. This approach allows me to change a trial layout by simply trying a different-sized block.

The more staves you use, the smoother the curve, but for every stave you add, there's another joint to fit and glue. For doors with a nearly consistent curve such as this one (it's a section of an ellipse), I use staves that are all the same width. For asymmetrical curves, increasing the stave width where the curve is flatter simplifies construction. For a tighter curve, narrower staves work better.

If I am going to fair the curves (either just the outside face or both inside and outside), I allow extra thickness for each stave because some material will be planed away. The fewer the staves, the thicker they need to be because more material will have to be removed to create a smooth curve. Superimposing the trial block on the curve of the door drawn on the pattern gives me a good idea of how thick to make my staves.

I rough cut the staves about ¼ in. wider than their final dimension and at least an inch longer. I start out with this much extra because after the bevels have been ripped, I still want to have roughly 1/16 in. per joint to allow for the fitting between each pair of staves and for the final fitting of the door in the case. Any extra material can be trimmed equally from the two outside staves when fitting the door. Once the staves have been milled, I lay them out to get the best color and grain match. I mark each joint so I know which side is the face and which end is up.

Although the trial block tells me how many staves I need, I still have to mark off the exact location of each joint on the drawing. I do this by walking a set of dividers around the curve, marking off equal segments (for a symmetrical curve) from one end of the curve to the other. As the drawing above shows, a pair of staves

Photos: Vincent Laurence; drawing: Vince Babak

Keep checking the door against the drawing. *To avoid having to remove a large amount of material after the door has been glued up, be sure the bevel angle between staves conforms exactly to the full-scale drawing.*

will meet at each of the marks on the curve.

It's not absolutely essential that each pair of staves meet at the same bevel angle, but their surfaces will be flush inside and out if they do. This makes clamping and fairing the curves a bit easier. For a curve that is an arc of a circle, each bevel angle is the same. For any other curve, I determine the bevel angle at each joint by bisecting the angle formed by the two staves. The easiest way to do this is to draw a line perpendicular to the tangent of the curve at each joint (see the drawing). Then I take a bevel gauge and transfer the angle from the drawing to a piece of scrap I call a bevel board (see the photo at left on the facing page). All the angles are now safely recorded.

Rip bevels on the tablesaw; joint with a handplane

I set the blade angle on the tablesaw by referring to my bevel board (see the center photo on the facing page). To bevel the first edge, I set the fence ⅛ in. or so wider than the stave's final width and passed the stave over the saw with a jointed edge against the fence (see the photo at right on the facing page). In general, if there are any other bevels that need to be sawn at the same angle, I'll rip them all before changing the blade angle. It's easy to get a stave oriented incorrectly, so I double-check every setup.

For the second edge on a stave, I set the fence so the stave was about 1/16 in. over its final width. Repeatedly resetting the tablesaw blade angle and fence for all the bevels results in slight differences in stave width, but it doesn't affect the result.

To get good glue joints, I jointed the tablesawn bevels with a No. 5 jack plane. (For a taller door, I would use a longer plane.) This also let me fine-tune the bevels. I started with the first stave in the curve and clamped it in a shoulder vise at a comfortable height. I took a very light cut, just enough to get a straight, polished edge. Then I did the same to the matching joint in the next stave. After shooting both bevels, I held the staves together on the pattern and checked for fit. (If need be, I can reshoot one of the bevels, taking a slightly heavier shaving toward one side of the edge or the other until the stave angles match the pattern exactly.) Before gluing

Gluing the door

Gluing up an entire door at once would be nearly impossible, so the author starts with a pair of staves and then adds one stave at a time as the glue cures. When clamping the first pair (1), downward pressure helps close the joint on its outside face. Cauls that match the faceted inside curve of the door can make clamping the joints much easier as staves are added (2). On this door, the author glued up two halves separately; then he joined the two in a final glue-up (3).


1


2


3

them, I jointed the second bevel on the second stave. I wanted the back of this door faceted, so I also finish-planed the inside surfaces of both staves. If I had wanted the inside surface to be a smooth curve like the outside, I'd have skipped this step.

Glue and clamp just one joint at a time

Gluing the staves together is, without a doubt, the trickiest part of coopering, often demanding some creativity. The trick is to exert pressure evenly across the joint so that it doesn't open up either on the inside or outside. Many strategies will work: using shaped cauls, driving pinch dogs in the ends of the staves, gluing pine blocks to the faces of the staves temporarily to get a good clamping angle (with a sheet of paper in the joint so they can be broken off cleanly afterward), or just rubbing a joint together and holding it for a few minutes until the glue grabs. I always try to use the simplest clamping method that suits the scale and curvature of the door.

You can use a spline, a few biscuits or even brads (with their heads cut off) to help maintain alignment when gluing staves together. For a door this small, alignment was not very difficult. I just took the time to get it right when clamping each joint.

The bevel angles for this door were close enough to 90° that I was able to clamp them almost as I would two square-edged boards. You may find it helpful, as I did, to exert pressure both across and down onto the joint to close it up on the outside face. I used three clamps across the top side of the staves and then clamped right into the joint (using cauls to prevent marring) against the top of my bench (see the top photo at left).

For this door, I glued up two halves, one stave at a time, and then joined these two assemblies together. Because there were an odd number of staves, one-half had four staves, and one-half had only three. I glued up the first pair of staves for each half and let the glue cure before adding the next pieces. Building the doors a piece at a time makes the glue-up slower but much more manageable. Cauls can help. To glue the third stave to the first pair, I shaped two cauls with a bandsaw and block plane. I clamped the staves to these cauls and clamped across the joint with light bar clamps. Because the angle between staves can change as you work your way around the curve, the cauls may have to be reshaped (see the center photo).

When I spread glue on a joint, I kept it very thin toward the inside surface so that there would be little or no squeeze-out to clean up afterward. Nevertheless, I still used a rabbet plane and a small scraper that I ground to the angle between staves to get the inside joints sharp and distinct. I reshaped the scraper with a fine file to fit each successive joint.

Before gluing on each successive stave, I checked the joint against the pattern by holding the stave tight to the ones already glued together. I fine-tuned when necessary and finish-planed the inside surface. The final glue-up—connecting the two assemblies, one with the first four staves and the other with the last three staves—was the most complicated. It required another pair of shaped cauls and battens (see the photo at left). Even so, it wasn't that unwieldy because there was only one joint to worry about.

Fit the door to its opening

After the door was assembled, it was about an inch taller and just slightly wider than its opening. I crosscut the door on the tablesaw, leaving it slightly long to allow for a precise fitting after I'd cut it to width (see the top left photo on the facing page).

To fit to width, the hinging and closing edges need to be beveled

to match their respective stiles. I could have cut these edges when I was beveling the staves initially, but I decided to keep them wide so no harm would be done by the inevitable clamping dings. Because I was very close to the width of the opening, I just took the bevel angles off the pattern and planed them by hand, checking as I went with a bevel gauge.

Once I had the door cut very nearly to width (the final fitting took place after it was hung), I planed its ends to length so that it would fit snugly, but all the way into its opening. Then, with the door in its opening, I traced a light pencil line of the curve around the top and bottom edges (see the bottom left photo). This gave me reference lines to plane to when fairing the outside to a smooth curve. For designs where the door's final shape can't be traced so easily, another possibility is to cut out the paper pattern and transfer it to the ends of the door.

I shaped the outside with a block plane, working initially across the grain and at a diagonal, paying attention to the reference lines on the top and bottom edges (see the photo below right). Most of the wood to be removed is at the joints. This is also when I fine-tune the shape of the door by checking it in its opening often. Planing the door to match the case opening precisely may leave the door slightly thinner in places, but it's hardly ever noticeable. For the final smoothing, I use a scraper and fine sandpaper.

The inside is harder to plane to a smooth shape. Coopers use a stoup plane with a doubly compassed sole. When I want a smooth inside face, I use spokeshaves and shaped scrapers.

Once you understand the basic technique, it's not that great a leap to make a tapered door with tapered staves or even one curved in three dimensions. By tapering the staves, steam-bending them to shape and then shooting the joints between them, you can cooper some dramatic curves. But you don't need to go this far to add a pair of elegant doors to your next project. □

Garrett Hack is a farmer, writer and furnituremaker in Thetford Center, Vt. His book, The Handplane Book, *was recently published by The Taunton Press.*

Fitting the door

With the glue fully cured, the door can be cut to the right height on a tablesaw (1). The author strives for a snug fit. Pencil lines drawn on the top and bottom edges of the door (2) are reference marks that guide the final shaping of the door front (3). When the door has been planed and scraped to the lines, it will be flush with the rest of the case.

Fuming with Ammonia

How to get an authentic Arts-and-Crafts finish safely and effectively

by Kevin Rodel

Photo this page: Dennis Griggs

***Fuming with ammonia** gives white oak that classic golden-brown color. Before it's been fumed (inset), white oak is a pale, almost cool, tan.*

Anyone who's spent time mucking out stables, or just walking through a working barn, knows how pungent ammonia fumes are. Those fumes have darkened the beams of many a barn over the centuries. I wouldn't doubt that many farmers put two and two together when they noticed how quickly oak acquired an aged patina.

Around the turn of the century, fuming became popular with many of the furnituremakers and manufacturers working in the Arts-and-Crafts style. So much so that when most people think of Stickley, Limbert or Roycroft furniture, fumed white oak is what they see in their mind's eye. Other woods can be fumed, but white oak responds best and most predictably to fuming (see the bottom photos on p. 48). For a look at the effects of fuming on other woods, see the box on p. 49.

Regardless of species, boards that will be fumed should all come from one tree. Different trees within a species will vary in their tannin content because of growing conditions. This will affect how they react to the ammonia. Because it's difficult to get boards all from one tree at a regular lumberyard, I buy most of my lumber from specialty dealers who saw their own.

I began fuming furniture because I'd become increasingly interested in the Arts-and-Crafts movement. I had been making more furniture in that tradition, and I wanted it to convey the look and feel of the originals. The finish seemed like an important element in the whole equation. Fuming is not the perfect colorant for every situation and wood species, but where it does work, it works very well and can give a superior finish to stains or dyes.

Stains obscure the surface of the wood somewhat. Worse yet, on ring-porous woods like oak, pigments collect in large open pores, making the rings very dark and overly pronounced. The effect is quite unnatural and looks to me like thousands of dark specks sprinkled across the surface. Also, stains are time-consuming to apply, and I have a strong aversion to exposing myself to the volatile fumes of the petroleum-based products found in most commercial stains.

Aniline dyes do a better job than stains, but they're also rather labor-intensive and can be very tricky to apply well. Dyes also fade over time, especially in direct sunlight. Fumed wood is colorfast.

The thing I like best about fuming is that what you see after the process is still only the wood, just as clearly as before. It's just darker. That's because the ammonia reacts with tannins that are naturally present in the wood, actually changing the color of the wood, not merely adding a superficial layer of color. Samples of fumed wood that I've cut open show a ragged line of darker wood between 1/16 in. and 1/8 in. deep.

Another thing I like about fuming is that it's virtually foolproof. The first piece you fume will look great. Unlike stains or dyes, fuming won't make a piece look blotchy or cause drips. And there's one other benefit to fuming. While the piece of furniture is being fumed, you can get back to work. The ammonia keeps working while you're taking care of other business.

Handle ammonia with care

The first and most important consideration when fuming is safety. Before you even buy the ammonia, make sure you have a properly fitted face-mask respirator with ammonia-filtering cartridges. Other types of cartridges, such as those used for spraying lacquer or other finishes, are not designed to filter ammonia fumes and will not offer protection. Ammonia cartridges are inexpensive and available at any fire or safety equipment store. Look in the yellow pages for the one nearest you.

Eye protection is essential. I use swimming goggles, which fit tightly around the eyes. The purpose of the goggles is to protect the eyes from fumes, not just accidental splashes. Rubber or plastic gloves are also necessary. Read the precautions on the side of the ammonia bottle, too.

Finally, if you're trying this for the first time and you work in a basement shop, wait until the weather is nice and do the fuming outside. After you become comfortable with the procedure, you can consider doing it indoors.

The reason for all the precautions when fuming is that ammonia used for fuming wood is not common household ammonia. It is a strong aqueous solution that has between 26% and 30% ammonium hydroxide. Household ammonia has less than 5%.

You'll want to buy the ammonia locally and pick it up yourself. Because it is considered a hazardous substance, shipping charges are high (more than the cost of the ammonia). This industrial-strength ammonia is used in machines that reproduce blueprints and surveys, so you can usually find it at business-supply, blueprint-supply or surveyor-supply stores (look in the yellow pages for a supplier). It's sold by the

Photos except where noted: Vincent Laurence

***Aqueous ammonia is poured into a glass container** placed at the bottom of the fuming chamber (above). Then the top of the chamber is lowered quickly onto its base (right). Protective gear is essential.*

gallon. Here in Maine, it costs between $6 and $10. And 1 gal. fumes a lot of furniture.

Bringing ammonia and wood together

With safety equipment and ammonia in hand, you're almost ready to fume. All you need now is some kind of fuming chamber—the more airtight the better. The most versatile and efficient chamber construction seems to be a heavy-gauge (3 mil or greater) plastic wrap stapled to a simple softwood frame that's held together with drywall screws (see the photo at right).

This type of chamber is lightweight, can be made to just about any size and can be broken down into flat panels for storage. If a fairly large chamber is needed, one side panel can be used as a detachable doorway. Use spring clamps or hand screws to attach the door panel and felt weather stripping as a gasket to seal the chamber. Small chambers can be placed over the items being fumed, as in the photo at right above. If you're fuming outdoors, be sure to weight or tie down this kind of chamber. They're very light and blow over easily.

I've used many other types of fuming chambers as well—everything from large plastic trash cans (perfect for small items) to a rented moving van. The van allowed me to fume an entire bedroom set at one time for a reasonable cost. The ammonia did no harm to the van, and by the time I returned it the morning after fuming, there was little if any residual smell. And because every piece was exposed to the ammonia for the same amount of time, I was able to achieve a precise color match.

Prepare a piece of furniture to be fumed the same way you would for staining or finishing. Scrape or sand until the surface is smooth, and remove any hardware. Place the piece of furniture in the chamber so that no part that will be visible is touching anything. If the ammonia vapors can't circulate, they won't be able to react with the tannins in the wood. As a result, that spot will not darken like the rest of the piece.

Never let the furniture come into direct contact with the aqueous ammonia because it is very corrosive. I use glass pie plates to hold the ammonia. They're relatively inexpensive, clean up completely and can be used over and over again. They

White oak (unfumed to 32 hours exposure)

Wood sample photos: Scott Phillips

also present a large surface area to the air so the ammonia evaporates readily.

I fill a plate about half full and place it on the floor of the chamber (see the photo at left on the facing page). The plate should be filled quickly but carefully. If you're fuming a particularly large piece or more than one piece, you may want to use two or three pie plates. Attach the door to the chamber, or lower the chamber onto its base. With the fumes confined to the chamber, you can remove your mask and goggles. Note the time so you can keep track of the exposure.

Test pieces determine color

The length of time a given piece will need to be fumed depends on the volume of the chamber, the amount of ammonia used, the species of wood being fumed and the depth of color you're looking for. Knowing when to remove a piece is largely a matter of personal experience. You can hedge your bets, though.

The best way to know when you have achieved the desired amount of fuming is to use test pieces. I always place three or four pieces of scrap, preferably cutoffs from the same project, on the floor of the chamber. When I think enough time has gone by, I don mask and goggles, quickly open the chamber, remove one of the scrap pieces and reseal the chamber.

When it first comes out of the chamber, the wood will have a gray, almost weathered, look. Don't be alarmed; this is normal. To see an approximation of what the finished piece will look like, I apply a coat of finish. As soon as the finish goes on, the real color imparted by the fuming appears instantly, almost magically. If I want the piece darker, I'll continue checking the color of the scrap boards at regular intervals until I'm happy with the result.

If, after eight hours in the chamber, a piece is still lighter than you'd like, you should replace the ammonia. I put on my mask, goggles and gloves, open the chamber and dump the old ammonia into a bucket of water. I add fresh ammonia to the pie plate, reseal the chamber and leave the bucket of diluted ammonia outside for a day. Then I pour it around the trees in our orchard or on the compost heap.

Once you've decided the wood is dark enough, remove it from the chamber, and let the piece of furniture off-gas for eight to 12 hours. I try to plan my fuming sessions so that the piece comes out of the chamber at the end of the work day. By morning, there's little residual smell.

At this point, you can apply your finish. Oil, varnish, shellac—any finish will work. There's no problem with compatibility between a piece of furniture that's been fumed and the topcoat. At the same time, fuming doesn't protect the surface of a piece in any way, so build up your finish as you would normally.

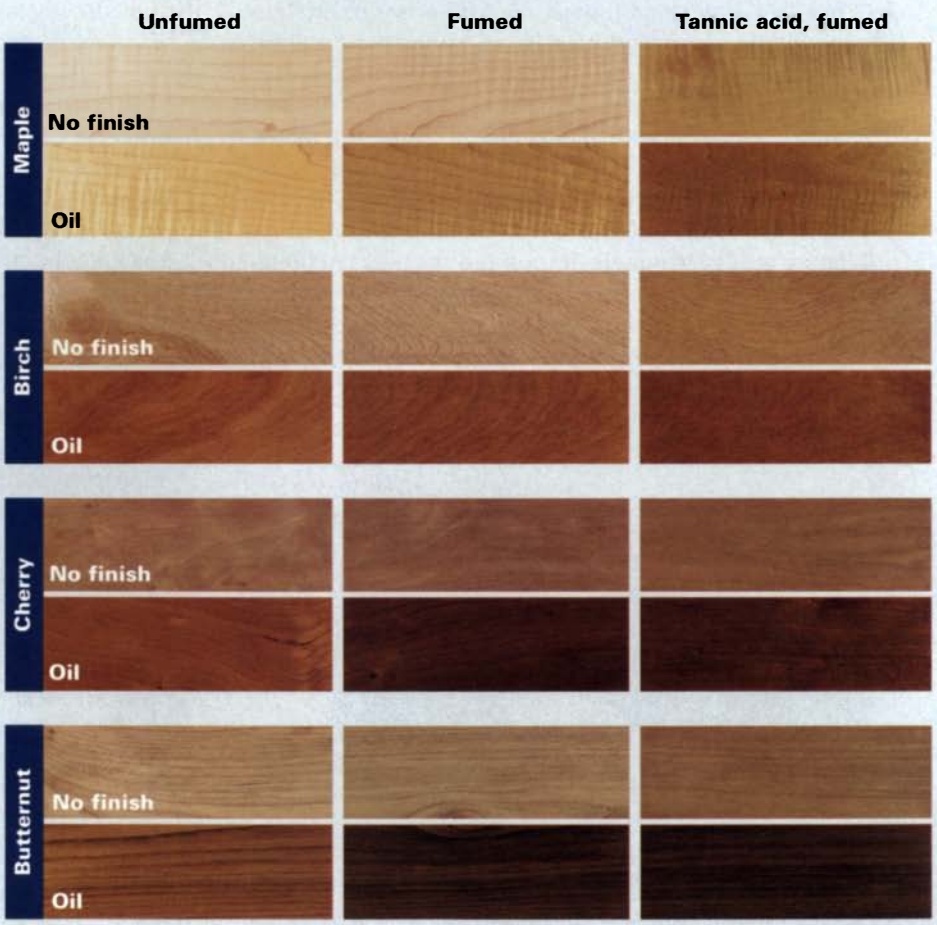
My preferred finish has always been boiled linseed oil (I use Tried and True brand because it builds quickly and contains no metal driers). Three or four coats over fumed oak impart a subtle amber overtone that's in keeping with the look of Arts-and-Crafts furniture. □

Kevin Rodel designs and builds furniture with his wife, Susan Mack, in Pownal, Maine. They have been building furniture, primarily in the Arts-and-Crafts tradition, for 11 years.

Fuming common furniture woods

The practice of fuming wood to enhance its color is most often associated with white oak. The oaks in general are high in tannin and fume well, though red oak tends to turn greenish rather than deep brown like white oak. Other species contain varying amounts of tannins and can be fumed, but the effects are generally not as pronounced as with white oak. I was curious about the effects of fuming on other furniture woods, so I fumed a number of them for four hours.

I'd heard that nontannic woods could be fumed if a solution of tannic acid was applied to the surface of the wood first, so I tried that as well. (Tannic acid is available from Olde Mill Cabinet Shoppe; 717-755-8884.) Tannic acid is sold as a powder that you add to water. I added tannic acid to a pint of water until the solution was saturated, applied the solution with a foam brush and then let the samples dry overnight before fuming. Here are the results. —*K.R.*



Adjustable Lathe Jaws

These easily made jaws attach to standard four-jaw chucks

by Jim Leslie

A finely produced turning should display no telltale signs of how it was mounted on a lathe. Unlike marking-gauge lines on dovetailed furniture, grip marks on the base of a bowl are not meant to be seen. To get rid of them, you need to be able to mount your work so that it is held by its rim, and then turn the base. Large, adjustable jaws with rubber bumpers are commercially available, but they cost about $100. After looking them over, I decided I could build my own with scrap plywood and a few dollars worth of materials. It took me about three hours to construct my adjustable jaws, and after countless hours of use, I'm very satisfied with the results.

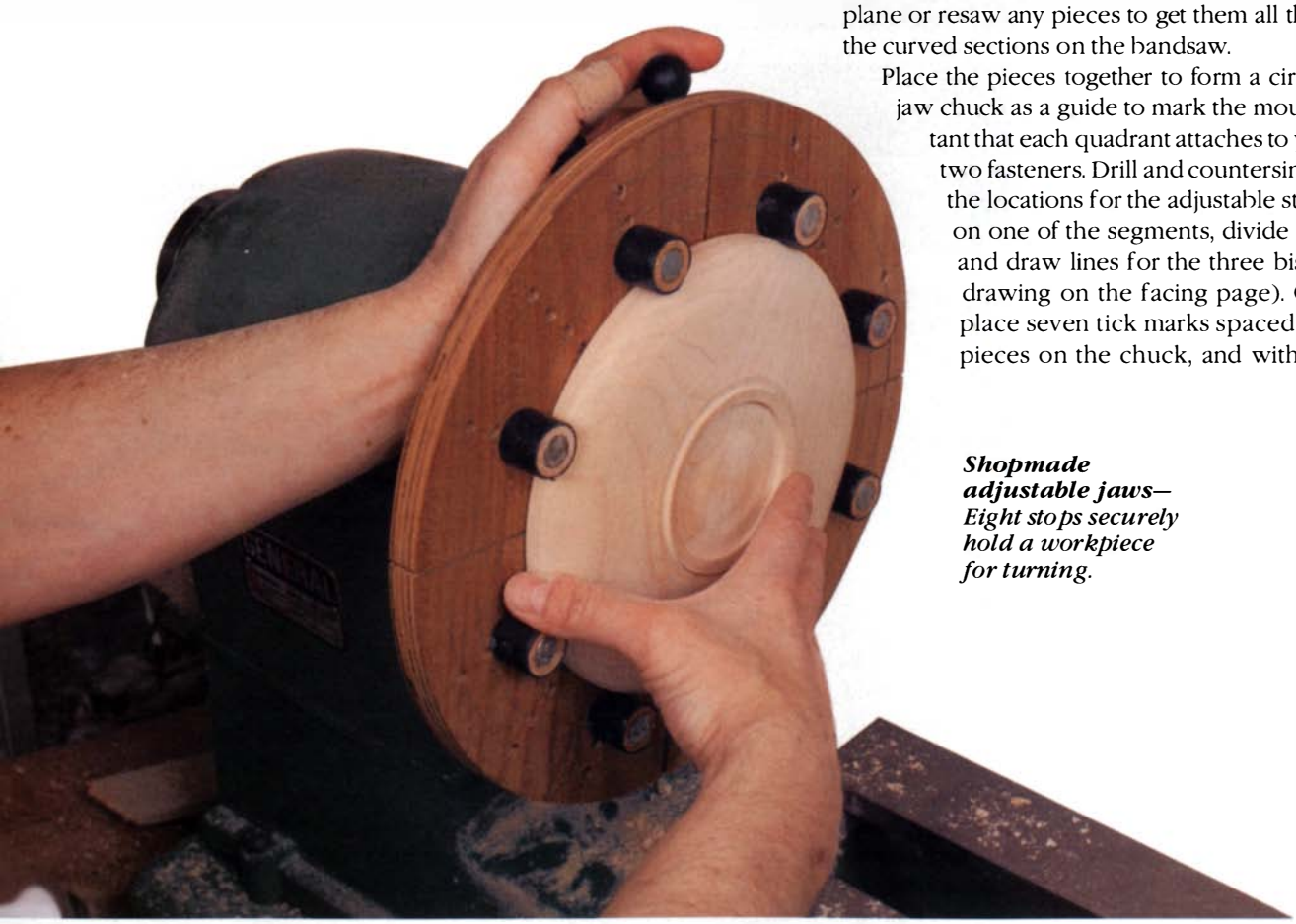
I built my jaws to fit an adjustable, four-jaw Nova chuck, but the fixture may be adapted to other four-jaw chucks by using the same procedures. These jaws allow me to mount bowls, rings and plates of different sizes. The jaws will also hold oddly shaped pieces.

Make the body of the jaws out of plywood

Every woodworker I know has a few scraps of plywood lying around. A 12-in. square is about all you need. It should be free of voids and at least ½ in. thick. The diameter of your jaws will depend on the swing of your lathe. Make them about 1½ in. to 2 in. less than the maximum swing so that when you fully open your chuck, the jaws don't strike the lathe bed.

Using a straightedge and a sharp knife, connect the corners of the plywood square, marking two diagonal lines to divide it into quarters. Where the lines intersect, place a compass point, and draw a 12-in.-dia. circle. Cut the piece into quarters. (If necessary, plane or resaw any pieces to get them all the same size.) Then cut the curved sections on the bandsaw.

Place the pieces together to form a circle, and use your four-jaw chuck as a guide to mark the mounting holes. It's important that each quadrant attaches to your chuck with at least two fasteners. Drill and countersink each hole. Next mark the locations for the adjustable stops. Using a protractor on one of the segments, divide it into four equal parts, and draw lines for the three bisecting angles (see the drawing on the facing page). On one of those lines, place seven tick marks spaced ½-in. apart. Mount the pieces on the chuck, and with the lathe turning at a



Shopmade adjustable jaws—Eight stops securely hold a workpiece for turning.

Photos: Alec Waters; drawing: Tim Langenderfer

slow speed, touch a skew to the ½-in. marks. Drill the holes for the stops where the skew marks intersect the radial lines. Before removing the segments for drilling, take a gouge or scraper to the outside edge of the plywood and turn it round.

After detaching the plywood segments from the chuck, stack and clamp them on the drill-press table, and bore the holes for the stops using a 13/64-in. drill. Finally, tap all the holes with a ¼-in.-20 tap using a reversible drill. If you plan to turn irregularly shaped pieces, you can machine a long, ¼-in.-wide slot at the 45° marks, which will give you infinitely variable attachment points for four bumpers. (Use longer bolts for those bumpers, and secure them with nuts.)

Use straight dowels for the bumpers

Dowel stock is sometimes more oval than round. Select round stock so that your bumper stops will exert even pressure on workpieces. I used ¾-in. maple dowels, which I cut into ¾-in.-long segments. Each of the eight dowel pieces was countersunk ⅛ in. deep exactly in the center with a ½-in.-dia. brad-point drill. This is best done on the lathe so everything is centered. After countersinking each piece, I switched to a ¼-in. drill and bored all the way through each one.

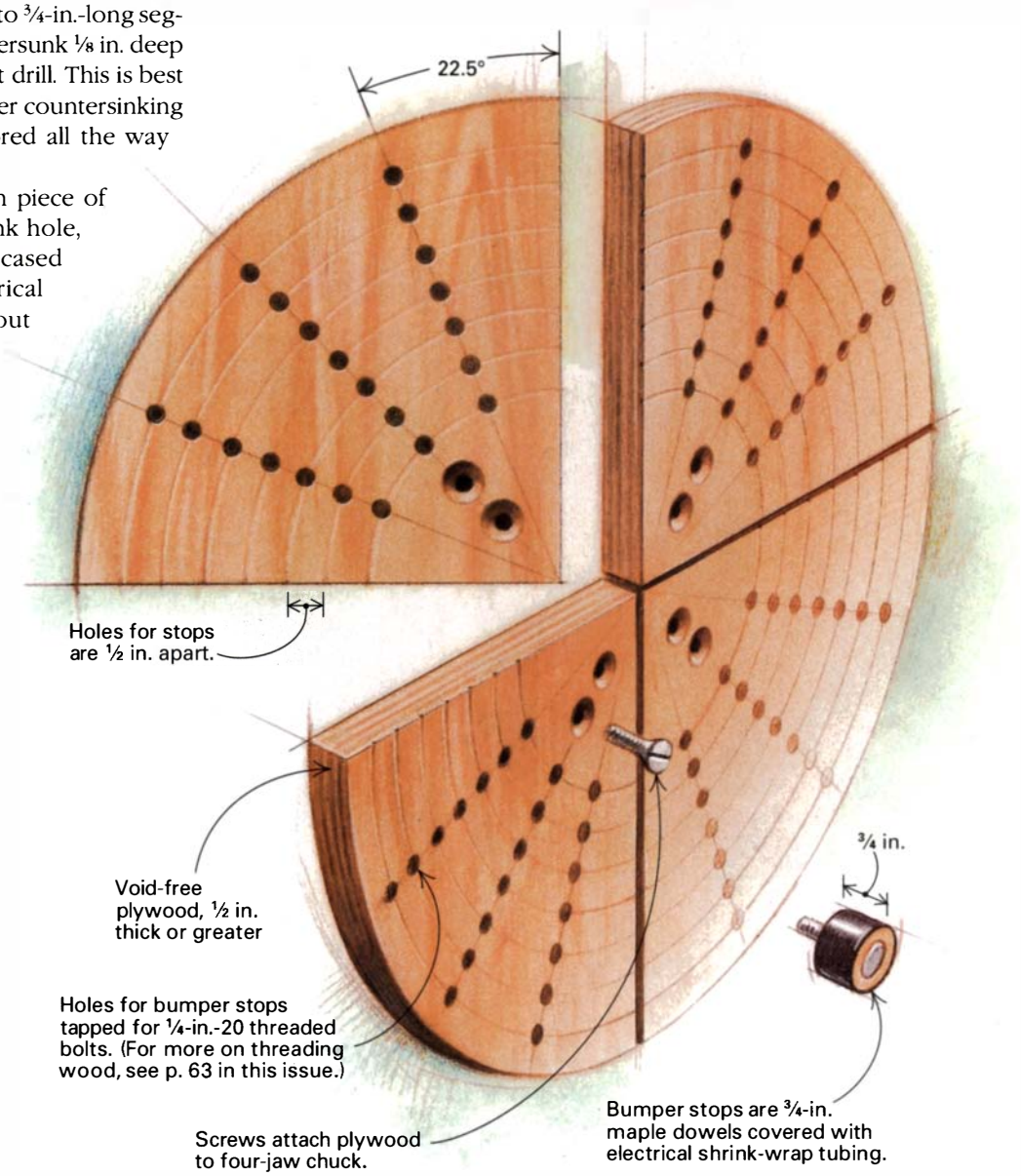
I fit 1⅜-in.-long, ¼-in.-20 bolts through each piece of dowel, recessing the head into the countersunk hole, and glued them in place with epoxy. Then I encased each dowel with a piece of shrink-wrap electrical tubing, which helps grip the workpiece without marring it.

Give the jaws a test run

Assemble the segments on the chuck, and test the operation. You should be able to expand and contract your chuck without the jaws binding. They should also nest together flat when fully contracted. Mount something to the jaws that you know is round, such as a pie plate, to see whether the stops are concentric. If some of the stops don't close in properly, start over using a new piece of plywood. □

Jim Leslie is an amateur woodturner who lives in Calgary, Alberta, Canada.

Screws hold jaws to a lathe's chuck. *The four-piece jaws can be attached to any four-jaw lathe chuck.*



Making the jaws
These jaws will securely hold a turning by its rim, allowing you to finish working on the base. Size the plywood so that the finished assembly is 1½ in. to 2 in. less in diameter than the swing of the lathe.

Evaluating Eight Professional-Grade Jigsaws

The biggest differences are in ergonomics and blade-changing mechanisms

by Roland Johnson

Photos: Anatole Burkin

Earlier this year, I was hired to build a Victorian-style partition for a foyer in an older home. The design included turned and carved columns, raised panels and a lot of fretwork that required a great deal of intricate cutting. The main panel was too heavy and wide to saw on my bandsaw and too thick to cut with a scroll saw, at least easily. So I reached for my 15-year-old jigsaw.

My saw was a top-of-the-line tool when I bought it, but it lacks modern features that would have saved me time and aggravation. While cutting tight curves, the tool wanted to dance out of my hand. In long, gently curved sections, I wished it would cut faster. It was time to invest in a new jigsaw—one with variable speed for cutting tight curves, adjustable orbital action for setting the aggressiveness of the cut, a top handle and 4 amps or more of power.

I tried out eight saws that met those criteria: the Bosch 1587DVS, DeWalt DW321, Freud FJ85, Hitachi CJ65V2, Makita 4304, Milwaukee 6266-6, Porter-Cable 7549 and Ryobi JS048. Prices you would pay for the tools through mail order or at a discount store ranged from a low of approximately $90 for the Ryobi to a high of about $179 for the Bosch.

Using a new blade in each of the saws and cutting through some thick walnut, one thing became clear: All had plenty of power. Most of them come equipped with acceptable blade guides. The significant differences are in the way the saws felt in my hand and in how blades are changed.

A good location for a speed-control switch—*Makita's speed-control dial operates smoothly and is easy to reach.*

Difficult to get a grip—*It takes some maneuvering on Hitachi's jigsaw to move the small, recessed speed dial.*

Speed controls vs. variable speed

Although manufacturers use the terms *variable speed* and *speed control* interchangeably, I think there's a difference between the two. A true variable-speed tool has a rheostatic trigger that changes the motor's speed with a change in finger pressure. The Bosch, DeWalt, Freud, Milwaukee and Ryobi have this kind of trigger. They also have a dial, either on the trigger or on the saw body, that limits the speed.

The Hitachi, Makita and Porter-Cable saws have speed-control dials separate from their triggers. There is no variation in the speed when you press the trigger. To change speeds with the tool running, you extend your thumb and turn the dial. Some of these dials turn smoothly and are easy to reach, such as Makita's (see the photo at left above). Others are difficult to operate. Hitachi's dial is small and awkward to move with your thumb because it is deeply recessed (see the photo at right above).

If you have to alter your grip to change speeds when you're cutting, your chance of straying off the cutting line is increased. You could use your other hand to adjust a speed dial while in the middle of a cut,

Bosch 1587DVS

A comfortable handle that lets you place your hand far forward, a quick blade-changing mechanism and a variable speed trigger make this a top-quality jigsaw.

Discount price	$179
Weight	5.5 lbs.
Amperage	5.0
Speed switch	Variable with trigger wheel
Blade type	T-shank
Blade change	No tool required
Foot plate	Tool required
Anti-splinter device	Yes
Dust control	Vacuum hookup

DeWalt DW321

DeWalt added a rubber grip on its handle. This tool shares a similar blade-changing device with the Bosch.

Discount price	$165
Weight	5.3 lbs.
Amperage	5.8
Speed switch	Variable with trigger wheel
Blade type	Universal and T-shank
Blade change	No tool required
Foot plate	Lever action
Anti-splinter device	Yes
Dust control	No

Handles are either sloped or flat. *Bosch (above) has a handle that slopes toward the rear of the tool, which puts your hand in a more natural position for pushing the saw. Handles that are flat to the tool body, such as on the Porter-Cable (right), are less comfortable to operate for extended periods.*

but that's not always possible.

I prefer a variable-speed tool because I have more control when cutting intricate shapes where many speed changes are necessary. I like being able to adjust the motor's rpms with just my trigger finger. I can keep my grip firm and that means there's less chance of cutting off the line. Freud's saw has the finest variable-speed trigger, allowing for very sensitive adjustments at low rpms.

A good grip provides more controlled cutting

Often I find myself using a jigsaw with one hand because I am either holding the workpiece with my other hand or I'm bracing myself as I reach over a large panel to make the cut. The handle has to be comfortable and sized properly for a good grip. Rounded handles stay comfortable in my hand long after the square-shouldered ones cause discomfort.

There are two ways that handles are positioned on these jigsaws: parallel to the saw body or angled slightly toward the rear. The Bosch, DeWalt, Freud and Hitachi all have angled handles. When you grab one of these, your arm is in a more natural position to push.

I also prefer a handle that places my grip far forward, as close to the blade as possible. The nearer my hand is to the blade, the more responsive the saw and the better I sense how it is tracking. The Bosch handle felt good in my hand. It also seemed to place my hand closer to the blade than the other saws (see the photo at left).

A soft vinyl insert on the DeWalt provides a comfortable, slip-free grip. The only drawback with this handle is that it is a bit far back on the saw and tends to make the saw seem larger than it is. Freud's handle is square-shouldered and too fat for my hand. The handles on the Makita, Milwaukee, Porter-Cable and Ryobi jigsaws are oriented horizontally. When pushing these, your arm is positioned unnaturally, and that tends to lift up the back of the saw.

Blade changing made easier

The small Allen wrenches or screwdrivers required to change blades on jigsaws have a way of getting misplaced in a workshop. Many tools now come with tool holders, either on the cord or in the tool body, and that helps, as long as you use them. A better solution is to do away with the tools altogether. Three jigsaw manufacturers—Bosch, DeWalt and Milwaukee—have done so.

Milwaukee's blade-changing system, which consists of a spring-loaded toggle switch on the front of the saw, is the most efficient. By swinging the toggle to one side, the collar on the plunger rotates and releases the blade (see the bottom photo at right). A blade change takes seconds. The locking mechanism holds the T-shanked blade very securely.

Bosch uses a twist-lock blade holder. To change a blade, a knob at the top of the saw is pulled upward and rotated to loosen the collet. It's not as fast as the Milwaukee, but it does hold the blade very securely.

DeWalt's system is similar to Bosch's (see the photo at right). It is a little fussier to get the blade well seated, but it still does a good job of firmly holding the blade. The other saws require a tool, either a straight-bladed screwdriver or an Allen wrench, to change blades.

Good guides keep saw on track

All of these jigsaws come with what the manufacturers call blade guides. I think they ought to be called followers. With the exception of the Porter-Cable tool, the saws use a grooved wheel to support the back of the blade. Tolerances vary, and some have a fair amount of side play, which reduces their effectiveness.

The Porter-Cable jigsaw (see the bottom right photo on p. 56) has the most elaborate and precise guide system, something

***Two good ideas**—DeWalt and Bosch (above) have very similar blade-releasing knobs located at the top of the tool. No tools are required.*

***Tool-less blade-change**—Pushing a spring-loaded lever at the front of Milwaukee's jigsaw (left) releases the blade.*

Freud FJ85

The handle on this saw is very large and square-shouldered. A hex wrench is required to change blades.

Discount price	$130
Weight	5.4 lbs.
Amperage	4.8
Speed switch	Variable with trigger wheel
Blade type	Universal and T-shank
Blade change	Tool required
Foot plate	Tool required
Anti-splinter device	No
Dust control	Yes

Hitachi CJ65V2

An angled handle makes this saw comfortable to use. The tool would benefit from a larger speed-control dial.

Discount price	$175
Weight	5.3 lbs.
Amperage	5.2
Speed switch	Speed control with thumb wheel
Blade type	T-shank
Blade change	Tool required
Foot plate	Tool required
Anti-splinter device	Yes
Dust control	No

Makita 4304

The speed-control dial on this machine is well-placed and easy to adjust while operating the tool.

Discount price	$170
Weight	5.1 lbs.
Amperage	5.5
Speed switch	Speed control with thumb wheel
Blade type	Universal
Blade change	Tool required
Foot plate	Tool required
Anti-splinter device	Yes
Dust control	Optional vacuum port available

Milwaukee 6266-6

With its self-locking toggle lever, Milwaukee offers the quickest blade-changing system for jigsaws.

Discount price	$170
Weight	5.3 lbs.
Amperage	5.7
Speed switch	Variable with thumb wheel
Blade type	T-shank
Blade change	No tool required
Foot plate	Tool required
Anti-splinter device	Yes
Dust control	Yes

akin to a bandsaw's guides. The blade is supported from behind with a smooth roller and is trapped on the sides by a set of adjustable, solid-steel guides. I was able to stay on line with this saw in the tightest curves because the guides reduce blade deflection. The drawback to this saw is that its base is fixed and will not tilt.

Freud's saw has a big guide wheel with deep shoulders for the blade and very little side play in the bearing surface or the guide holder. The guide wheels on the Makita, Milwaukee and Ryobi also have deep shoulders, but all have some side play. Bosch and DeWalt installed small guide wheels on their saws and these have nominal side play. Nonetheless, these five saws all performed equally well when cutting curves. Hitachi's guide wheel had the most play, and I found I had to be vigilant when cutting curves to keep the blade from deflecting and wandering.

Rate of cut determined by orbital-action setting

The saws I tested all have three orbital-action settings plus a non-orbital mode (straight up and down cutting action). In orbital mode, the blade, as viewed from the side, travels in an elliptical path. There were no noticeable differences in performance among the saws in this area.

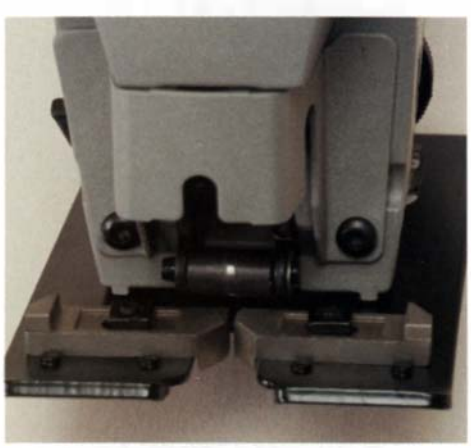
The non-orbital mode is best for tight-radius cuts or fine cutting in delicate materials such as thin plywoods or laminates. The cutting action is slower, but tearout is minimized (see the top left photo on the facing page).

The other three positions set the blade in increasingly aggressive orbits for faster cutting. When in the orbiting mode, the blade is pushed out into the work on the up, or cutting stroke, for a more aggressive cut. On the down stroke, the blade is retracted toward the saw, reducing friction and allowing for more efficient sawdust removal.

I prefer using the second position (smallest orbit) when cutting all but the tightest curves in solid hardwood. In this setting, the saws cut cleanly, with minimal binding, even better than in the non-orbital mode. A slight orbital action helps clear sawdust from the kerf. The maximum orbital setting is great for fast, rough work. But don't try it on plywood unless you don't care that the edges of the kerf will become badly torn.

One way to reduce tearout in plywood is to use an anti-splinter insert and operate the saw in the straight-cutting mode. Inserts are provided with the Bosch, DeWalt, Hitachi, Makita and Milwaukee saws. The small plastic devices, much like close-tolerance tablesaw throat plates, fit into the

***Typical blade guide**—Most jigsaws come with a single, free-spinning guide located directly behind the blade. Some have quite a bit of play in them, which may allow the blade to deflect.*



***Precision blade guides**—The three blade guides on Porter-Cable's jigsaw help reduce blade deflection. They are positioned at the left, right and rear of the blade.*

baseplates. Ryobi addressed this problem in a different way: The baseplate has two openings, a wide and narrow slot, and can be shifted by loosening the baseplate pivot screws. The Freud and Porter-Cable saws have no anti-splinter features.

Dust control and chip blowers are built into some saws

More and more, the words *sawdust* and *carcinogen* are being used together—a sobering thought for those of us who spend many hours a day engulfed in a cloud of the stuff. Bosch, Freud and Milwaukee saws are equipped with fittings for a shop vacuum or dust-collection system. Makita offers an optional attachment for a vacuum hookup. The rest of the saws do not have dust-collection capabilities.

There is one big drawback to all the dust-collection setups: To increase the effectiveness of the vacuum, a detachable plastic chip guard comes attached to the front of the saw. During use, these chip guards get coated with sawdust and eventually obliterate your view of the cutting line. Although I admire the manufacturers for addressing this issue, it's awkward to drag a vacuum hose across the work when cutting intricate shapes.

More than once, I've found myself hyperventilating from blowing sawdust off the line when using a jigsaw. The Bosch, DeWalt, Milwaukee and Porter-Cable saws take care of this by channeling some air from the tool's fan toward the blade. They do an admirable job of keeping sawdust away from the cutting line.

***Orbital action**—A switch sets the amount of orbital action (right). In non-orbital mode, the tool cuts slowly but leaves a clean kerf. In orbital mode, the saw cuts faster but creates tearout.*

Personal needs should determine your choice of saw

If I were to design the perfect jigsaw, I'd start with Bosch's body, add DeWalt's soft grip, steal Milwaukee's blade-changing mechanism, take Freud's sensitive trigger, borrow Makita's smooth speed dial, install Porter-Cable's blade guides and make it light and compact like the Ryobi.

But forced to choose one of these eight saws, I'd pick the Bosch, not because it excels hands above all the other tools, but because it doesn't have any drawbacks. It has a comfortable feel and solid adjustments. The DeWalt is very much in the same league. If you change blades often, the Milwaukee would be a smart choice. Though the Ryobi weighed in a pound lighter (and almost an amp shorter) than the rest of the pack, for $90 it's a good value. □

Roland Johnson restores antiques and builds reproduction furniture and architectural millwork in his one-man shop in St. Cloud, Minn.

Porter-Cable 7549

Porter-Cable's precision blade-guide system helps prevent the blade from deflecting. But the system doesn't allow the base to be tilted.

Discount price	$140
Weight	6.5 lbs.
Amperage	4.8
Speed switch	Speed control with thumb wheel
Blade type	Universal or hook shank
Blade change	Tool required
Foot plate	Fixed
Anti-splinter device	None
Dust control	No

Ryobi JS048

This is a basic jigsaw without any bells and whistles, but it has plenty of power and a low price.

Discount price	$90
Weight	4.5 lbs.
Amperage	4.0
Speed switch	Variable with trigger wheel
Blade type	Universal
Blade change	Tool required
Foot plate	Tool required
Anti-splinter device	Yes
Dust control	No

Bookcase Made with Biscuit Joinery

Lumber matched for color and figure lends elegance to this charmingly simple case

by Peter S. Turner

***A small bookshelf—** This V-shelf bookcase is made of solid cherry, joined with No. 10 biscuits.*

Furniture with few design flourishes benefits from wood that has lots of figure. When I build simple bookcases like this one, I look for cherry with bold grain patterns, which I often find when sifting through stacks of No. 1 and No. 2 common grades. Using lumber with beautiful figure, selecting and matching all the stock, is really my favorite part of furnituremaking. I modeled this bookshelf after one that once belonged to my great grandmother. It's a small, easy-to-build piece whose few design details are quite simple. For the joinery, I use No. 10 biscuit joints for everything. All the pieces are ½ in. thick, which gives the bookshelf a light and delicate look.

Roughing out all the pieces

When picking lumber for this project, I select stock that's at least 7 in. wide, so each half of a V-shelf requires only one plank (see the drawing on p. 60). You can edge-join two boards for the sides and bottom shelf, or you can use single boards if your stock is wide enough. If I edge-join two boards for the sides, I make sure that the glueline ends up in the exact center.

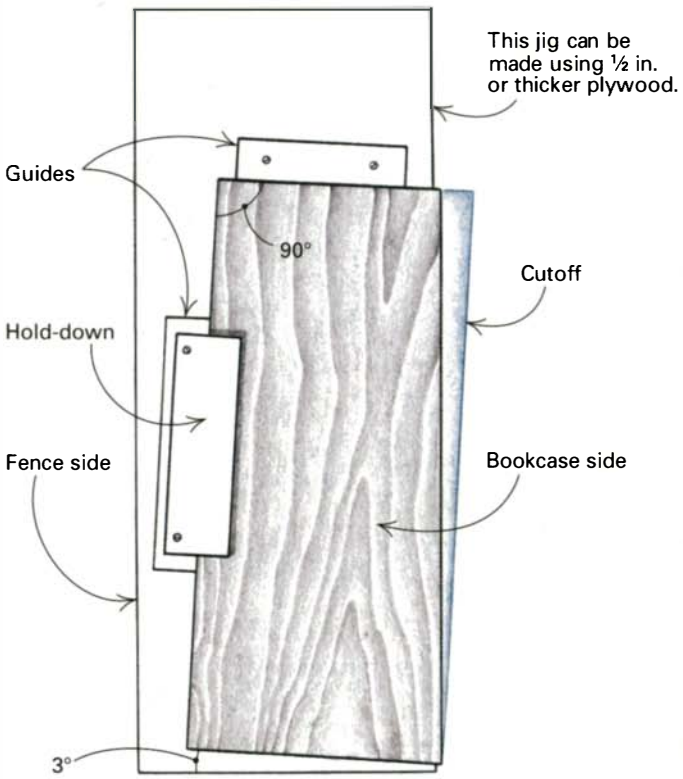
I begin by flattening, edge-jointing, then thickness-planing all my stock down to 9/16 in. Then I pick through the boards and find the best matches to make up the two sides and bottom shelf. I glue up the sections using pipe clamps. After the glue is dry, I clean up any squeeze-out and joint one edge of each side and the bottom shelf. Then I select the boards for the two V-shelves, joint one edge and rip them slightly oversize on the tablesaw.

At this point, I run the lumber through a thickness sander until everything is ½ in. thick. I prefer a sander because on highly figured woods, my planer produces tearout. You could, of course, thickness-plane the boards, and take care of any blemishes with handplanes and scrapers. Once all the stock has been sanded to ½ in., I rip it to final width on the tablesaw.

Using the sliding crosscut sled on my tablesaw, I cut the sides and shelves to length. It's critical that the shelf components all be

Photos: Anatole Burkin

SIMPLE JIG FOR CUTTING TAPERS



square and exactly the same length. The joint between the shelves and ends are what will make or break this piece, so be sure your crosscut sled is right on.

I taper the sides using a homemade jig on my tablesaw (see the drawing above). The jig is just a piece of plywood with a few guides screwed to it at an angle. To use the jig, I place it flush against the tablesaw's fence and nudge the fence toward the blade until the left side of the jig just touches the blade. I lock the fence, place one of the sides in the jig and screw a piece of scrapwood onto the right-side guide to act as a hold-down. I cut the taper by pushing the jig along the tablesaw fence (see the top photo at right).

To cut the opposing taper, I flip the workpiece on its other face, place the cutoff against the right edge of the workpiece and, finally, place a shim the same thickness as my tablesaw blade between the cutoff and the jig guide (see the photo at right). I make sure all the pieces are snug, attach a hold-down and cut the taper.

Join V-shelves, and shape edges

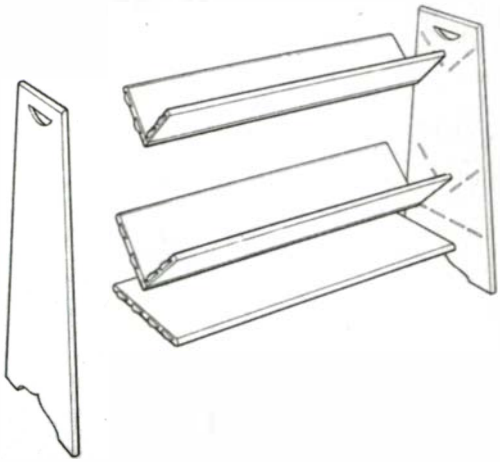
With all the pieces cut to size, it's time to join the V-shelves and cut the biscuit slots

Rip one side. *A hold-down screwed to the right guide of the jig keeps the workpiece snug when sawing.*

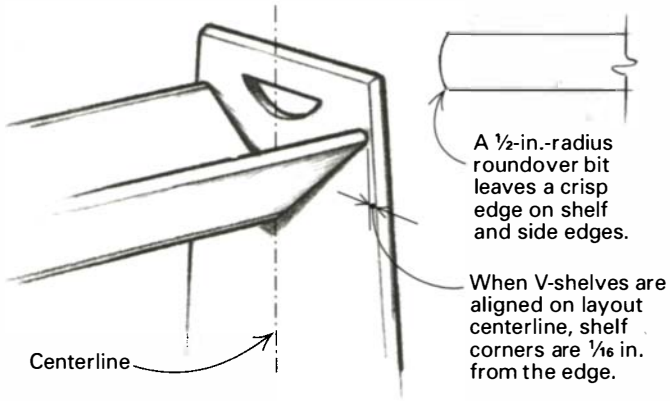
Cutting the opposite taper— *Place a shim the thickness of the sawblade against the right guide, then the cutoff and, last, the workpiece, which is turned over on its other side.*

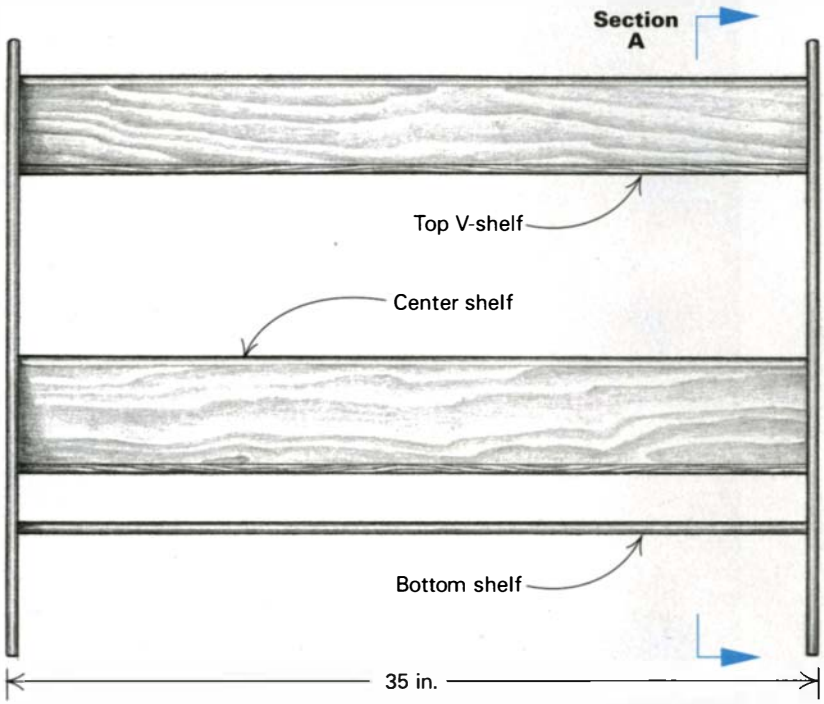
Drawings: Heather Lambert

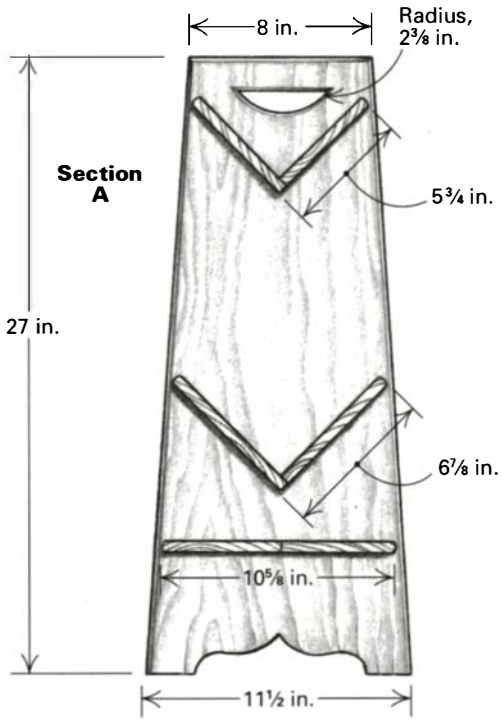
Bookcase with V-shelves



All parts of this bookcase are made from ½-in.-thick material. The shelves are joined to the sides with No. 10 biscuits. The lengths of all three shelves should be the same and the ends of the V-shelves dead even.







These joints hold the case together. *The V-shelves are joined at 90° to each other. Biscuit slots cut in the ends of the shelves join them to the case sides.*

in the sides that will fasten the shelves. First I join the V-shelves. I use four biscuits per shelf, evenly spaced. For each V-shelf, one set of slots is cut in the edge of one board, and the mating set is cut into the face of the other board.

To glue up the V-shelves, I use scrap along the faces where the clamps are positioned to protect the wood. I'm not worried about the edges because they get shaped later. When I tighten the clamps, I use a try square to check that the pieces stay 90° to each other (see the far left photo). I use four clamps for each shelf, each clamp positioned over a biscuit joint. The ends of each V must be dead even. When the glue is dry, I rip each wing of each V-shelf to its final width on the tablesaw.

The long edges of both V-shelves and all edges of the sides, excluding the feet and

cutouts, are rounded over leaving a crisp edge where the roundover meets the edge of the board. To get that shape, I set my router-table fence slightly past the outside edge of the pilot bearing on a ½-in.-radius roundover bit. I use hold-downs and featherboards to make sure the stock passes firmly and squarely over the bit. Because all the stock for this project is ½ in. thick, I only have to set up once. When all the edges are machined, I lightly scrape and sand them to get a fair roundover, being careful not to soften the edges.

Slots in sides and shelves need to match

I first cut all the slots in the shelves with the biscuit joiner. The shelves have four slots cut on each end. After I cut these, I'm careful not to get carried away and erase the layout marks until I have transferred them onto the sides.

To mark the location of the mating slots on the bookcase's sides, I use the V-shelves as layout guides. First I draw a vertical centerline on the inside face of each side. To locate a V-shelf, I place it on end against a side, keeping the apex of the V on the centerline, and slide it along the centerline until both edges are inset 1/16 in. from the case side. I hold the shelf in place and trace along the bottom edge with a pencil. I also transfer to each side the layout marks showing where the biscuit slots should be cut.

To cut the slots in the sides, you need something to register the biscuit joiner against because you can't use the tool's fence as you did on the shelves. I clamp a straight block of wood parallel to the lines I traced off the shelves. I offset this straightedge to make up for the fact that I'm registering the base of the biscuit joiner, not its adjustable fence, against the straightedge. Here's how I figure out the offset: I measure the distance from the bottom face to the bottom of a V-shelf slot (see the photo at right). On my biscuit joiner, I measure the distance between the bottom of the blade (I use a raker tooth) to the base. I subtract the first number from the second; that's the offset, which I lay out on the side (see the top right photo). I use two clamps each time I reposition the straightedge, and then I cut all the slots.

Template routing the cutouts and shaping the edges

I made up a template for the cutouts in the sides using a piece of ¼-in. hardboard. It's

USE V-SHELVES AS LAYOUT GUIDES

Mark the inside faces of the sides. *Transfer the biscuit slot marks from the shelves to the sides.*

Mark the offsets from the lines just traced. *These new marks are used to position a straightedge for the biscuit joiner.*

A straight board guides the biscuit joiner. *The author places the base of the tool against a board clamped to the side to cut the slots for the shelves.*

Assemble the bookcase on end. *Cauls, a squaring jig and backer boards ensure that the case is clamped tightly and won't be marred.*

easy to work with, and if you don't like the look of a template you've just shaped, it's cheaper and faster to make another template than another bookcase side. If you add a router with a guide bushing, a template also makes quick work of cleaning out the cutouts. When I made my template, I used a compass to draw the curve of the handle and a French curve to draw the whale tail. I faired out the curves by sanding and filing.

I mark the cutouts on both ends and remove the waste with a jigsaw, staying at least 1/16 in. off the line. Then I clamp the template over a cutout and go over the area again using a router fitted with a 5/16-in. guide bushing and a 1/4-in. straight bit. The bookcase's handles get one more run past the router. After removing the templates and guide bushing, I chuck a 1/4-in. roundover bit in the router and ease the edges of the cutouts.

The final shaping of the sides is accomplished using hand tools. Using a file and chisel, I shape the corners of the handles and the sharp junctures where the curves of the whale tails meet.

Assembly, cleanup and finish

Before final assembly, I dry-fit the case to make sure that everything lines up. To avoid marring the piece and to make sure I get even clamping pressure, I use cauls and backer boards. The backer boards are two pieces of scrap plywood slightly larger than each side. To these, I attach a pair of cauls with double-faced tape.

I also use a shopmade squaring jig that's nothing more than a right-angled triangle made of scrap. I clamp this jig to the bottom shelf and one side to keep the case properly aligned during glue-up.

When I assemble the case, I stand it on its side. After clamping it, I check whether all the shelves fit flat against the sides (see the photo at left). I mark any that don't and after unclamping the case, plane them to fit.

Prior to finishing, I sand all the pieces through 180-grit. Then I wipe everything down with a damp rag to raise the grain. When the pieces are dry, I continue sanding up to 320-grit. When I sand the edges, I'm careful not to lose their definition.

I lied earlier when I said that selecting and matching the stock was my favorite part of building furniture. I forgot about applying the first coat of oil. It's nice to see the grain and figure pop out when oil is rubbed into the wood.

I use three coats of Kaldet finish oil, which is made by Livos, a German company. It is a linseed oil-based product that contains citrus solvents. The oil is available from The Natural Choice (800-621-2591). I prefer Livos products because of their low toxicity, nice satin sheen and pleasant lemony scent. □

Peter S. Turner designs and builds furniture in a cooperative shop in Portland, Maine.

Threading Wood for Machine Screws

Cut durable threads in wood with metal taps

by Pat Warner

Machine screws make excellent joints in wood. They are hard to break, and some of the head configurations are quite decorative. I use them for knockdown furniture joints and for adjustable jigs that need to be strong. But machine screws are not as simple to use as wood screws because they don't cut their own threads the way wood screws do.

The most common solution is a threaded insert (for more on this, see *FWW* #120, pp. 79-81). But I've found you really don't need inserts to make strong joints with machine screws. Metal taps will cut crisp, strong and durable threads in any hardwood. It takes about the same amount of force to strip wood threads as it does to pull a threaded insert out of its hole. And if you tap the wood deeper than a threaded insert requires, the wood joint will be stronger. Machine screws in an inch of wood threads will make a really tough knockdown joint.

Tooling to cut threads for 5/16-18 machine screws

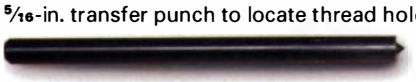
Pilot hole

5/16-in. drill bit for pilot hole

5/16-in. countersink

Threaded hole

5/16-in. transfer punch to locate thread hole



1/4-in. drill bit for thread hole

1/4-in. countersink

5/16-18 tap for thread hole

Photos: Strother Purdy

Wood threads require careful drilling and tapping. The wrong size drill bit or a misaligned hole will lead to a weak connection. But by following the drilling schedule at right and using the proper tools, you can produce deep, crisp and strong threads without too much trouble.

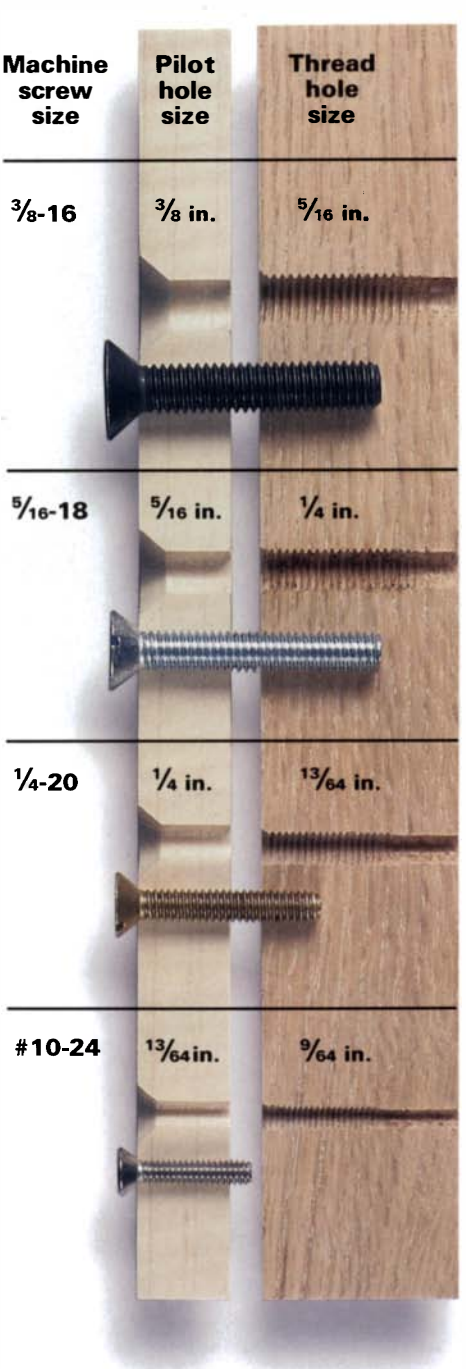
The only specialized tools that you will need are taps. I have taps in four screw sizes: 3/8-16, 5/16-18, 1/4-20 and #10-24 (the first number is the diameter of the screw; the second is the number of threads per inch). You will also need drill bits, transfer punches and countersinks.

The pilot holes need to be drilled first to locate the thread holes properly. The machine screw should slide easily through the pilot hole, just as a wood screw should. If the head configuration calls for it, I would countersink the pilot holes for the screw heads at this point.

Clamp the piece with the pilot holes to the piece that receives the threads, and transfer the hole locations. I use a transfer punch the same size as the pilot hole, drilling the thread holes on the punch marks. Chamfer the mouth of the thread holes about 1/32 in. greater than the tap diameter. If you don't, the tap may tear out the surface grain when you cut the threads.

I have tried tapping by hand with a wrench, but I just can't tap straight. A drill press will give you excellent results safely every time. Just don't turn on the drill press. In fact, unplug the machine before starting this procedure.

Clamp the work firmly, and put the tap in the chuck. Turn the drive pulley by hand while guiding the tap into the thread hole with the quill feed. Once you've started the threads, you can tap the rest by hand if you like. □



Pat Warner is a woodworker and instructor at Palomar College in San Marcos, Calif.

Making Music with a Plane

A celebrated craftsman explains his devotion to an indispensable cabinetmaking tool

by James Krenov

When I was in school in Sweden, we had regular European planes that had to be held in a certain way. For some reason, curiosity or whatever, I made a little wooden plane out of maple. Suddenly, my friends are gathered around, and we're making shavings. I realized the versatility of that little block of wood. It was comfortable with two hands on it. It was comfortable with one hand doing a tiny little edge or corner. It had a new dimension because it did not force me to relate to it very rigidly in one certain way.

I don't think that you can prove in a court of law that these little wooden planes make thinner or better shavings than any other plane. I think the emotional element is the main difference, not necessarily performance only. It's a connection, an intimacy. The really good plane becomes an instrument. It becomes something that you want to make music with.

I used to make planes as a kind of therapy. Between jobs, I couldn't be idle and sit around. I'd finish a piece and have time to catch my breath, so I'd make a couple of planes. Some I'd give away: I've never sold one, and I never will.

There's no magic in any tool until you put the magic in it. The magic doesn't come with the tool. There's no one plane that will do everything. Mine go from jointer size down to very small. My favorite one is the little cocobolo one pictured in *A Cabinetmaker's Notebook*. It was my favorite, and I gave it away to someone very nice. I don't have a sentimental attachment to the planes anymore. I just want the ones I have to work well for me, and it doesn't matter which one it is; they are all good.

Don't be a slave to accuracy

You come to a point where you can either engineer a plane or follow your common sense logic and feelings about it and arrive at about the same point. I make a good plane and then somebody else comes along and tells me it's a good plane because this angle is like this, and this thing is like that, and you've got the wedge this way, and you've got the opening like that. And I say, "Oh, is that what makes it good? I didn't worry about that. I just made it."

So somewhere the engineer and the peasant reach a parting of the ways, which is true throughout the craft. You can get so exact that you immobilize yourself with accuracy. I joke about it. You buy this square, and you pay $400 for it and it's accurate to a 10,000th of an inch. Then all you've got to do is get yourself a job with Boeing building 747s and it's great. It's what you want, but it's not a woodworker's measurement, and it never will be. Somewhere there is a flexibility that relates to the kind of person you are and the kind of work you do, and it has nothing to do with sloppiness. It's just flexible enough to keep you from being paralyzed.

"The first attempt with a plane that succeeded may have been the turning point of my life."

Can you get results that are good with a metal plane? I think so, yes, and I've seen it. We've never said to our students here, "Put that thing away." As long as it's working well for them, and it's tuned up properly, and it's kept in perfect shape, and they do beautiful work. I would never want anyone to quote Jim Krenov as saying that you have to have a wooden plane. It's nice if you like them, but there isn't only one way.

Making your first plane a success

My first suggestion would be to ask yourself, "Am I doing this out of curiosity, or do I believe in it? Do I intend to arrive at the point where this becomes the thing for me, and I know I can make a good wooden plane anytime I want to and I can do fine things with it?" If it's mere curiosity, then it becomes just like anything else we do for the sake of exercise. Just to prove that we can go through the ABCs of it.

I think it's important not to fail completely with the first plane, because then you might not make a second one. You could be missing something. Do try to get the essentials right on the first one, and get it to where, yes, it does work, and yes, I can make one better, and yes, I *will* make one better.

One key element is what happens when you raise or lower the pin in relation to where the shavings need to exit. You can put the pin so far down that you choke the plane up. But once you have this and a few other things right, then you're off and running. If I had the wood and the iron and the breaker, I'd have a plane done by evening, and I'd start using it the next morning. Tune it up, and forget about it.

The first little attempt with a plane that

Photo: Boyd Hagen

succeeded may have been the turning point of my life because it opened up the fact that tools can be better, that tools can be more personal and intimate. Had I failed, I might have just fallen back into the general pattern. That doesn't mean I wouldn't have become a cabinetmaker, but I might never have been able to make music as I try to do.

Don't let sharpening take over

A plane is no better than its cutting edge. But you can develop an imbalance in the relationship of your work and the sharpening. There should be a nice balance between the time you work and the time you care for your tools, whether it's a chisel, a knife, a plane or anything else.

The tendency ever since the Japanese waterstone thing is that people are more worried about the stone not being perfectly flat than about how they hold the iron or about working harmoniously. Even with a perfectly flat stone, they're not going to get what's needed. It's not in the stone. I observed in Japan some house builders who were pretty casual about their stones, yet they got their planes to sing.

There should be a balance there somewhere. Gradually, you arrive at a point where the sharpening is minimal rather than maximal. It won't be a chore anymore. You'll do it and do it fairly quickly.

I think that having two or three nice oilstones and a little bottle of kerosene can compete with having a Japanese waterstone, because the Japanese method of sharpening tools is almost an art form or ritual. Doing it haphazardly or not completing the process is neither here nor there. You can spend an awfully long time sharpening but what you're really doing is honing too much. If you hollow grind a tool, a very slight hollow, then all you need is to just hone until you get a tiny little burr, and then quickly move to a finer stone and not keep going on until you flatten out the hollow, because you'll always have the burr as long as you use that stone. So with just a few strokes, you get the scratches from the wheel off, and then you go to a finer stone right away.

I've had the same oilstones for 30 years, and I've never trued them up or anything, which doesn't speak well for me. I've got an old Carborundum that I found in Stockholm, a soft Arkansas and a hard Arkansas and a little kerosene and that's it. People wonder if I ever sharpen my tools because they hardly ever see me doing it. When I do, it's just a little bit. It becomes self-defeating if carried too far because you're fussing more about your tools than you are working, and at some point, fussing just takes over.

I've got planes I haven't touched or adjusted or sanded or trued up for several years. I just pick them up, and they're ready to go. One thing that is amusing is if the last time I set a plane the air was very dry and since then it has rained and increased in humidity, I'll pick up the plane and it won't cut because the wood has expanded a little bit and the iron is no longer protruding. The opposite is also true. If I set it on a very humid day or part of the year and later we get a cold snap, I'll pick it up and it will really dig in, cutting much too deeply. It's like a musical instrument that you have to tune up a little bit before you start the concert.

"It's like a musical instrument that you have to tune up a little bit before you start the concert."

I look at the plane from behind rather than in front. I look at the bevel and lower my eye to the level of the plane itself. I can see the glint before the iron reaches the level of the bottom of the plane, and then I tap on the iron very lightly. You'll never get a good cut if the iron is not absolutely parallel with the bottom of the plane. You'll get an angled cut. You want to tap the iron itself, not the plane body. When you tap the plane body, you have no guarantee that the iron won't slip sideways as it moves forward or back. You do tap the back of the plane body to retract the iron. But readjust it by tapping the iron itself.

The wedge should not be too tight. You should be able to remove it easily with your fingers by just zig-zagging it out. The tendency is to really bear down on it, but you don't need to do that. You want a low-angle wedge. If you have a high-angle wedge, it's apt to kick out when you are doing coarse work.

You very seldom have to go back and true up a plane. If you notice a consistent misbehavior or if the plane tends to produce an arch or a dip, then you can fine-tune it. But it also becomes second nature with you. Where to press, now to do that. It's very minimal and elementary.

For cabinetmaking, the plane is a basic tool

A plane is a favorite of mine by necessity. In other words, it is *the* tool in case work. With the kind of work that I and other cabinetmakers do most, it's almost indispensable. Because I started out not being able to afford a jointer and I only had a bandsaw, I discovered I couldn't even bandsaw anything without having a plane to true it up a little bit. I almost killed myself doing it, but it showed me how necessary the plane was, not how refined it should be but just how necessary it was.

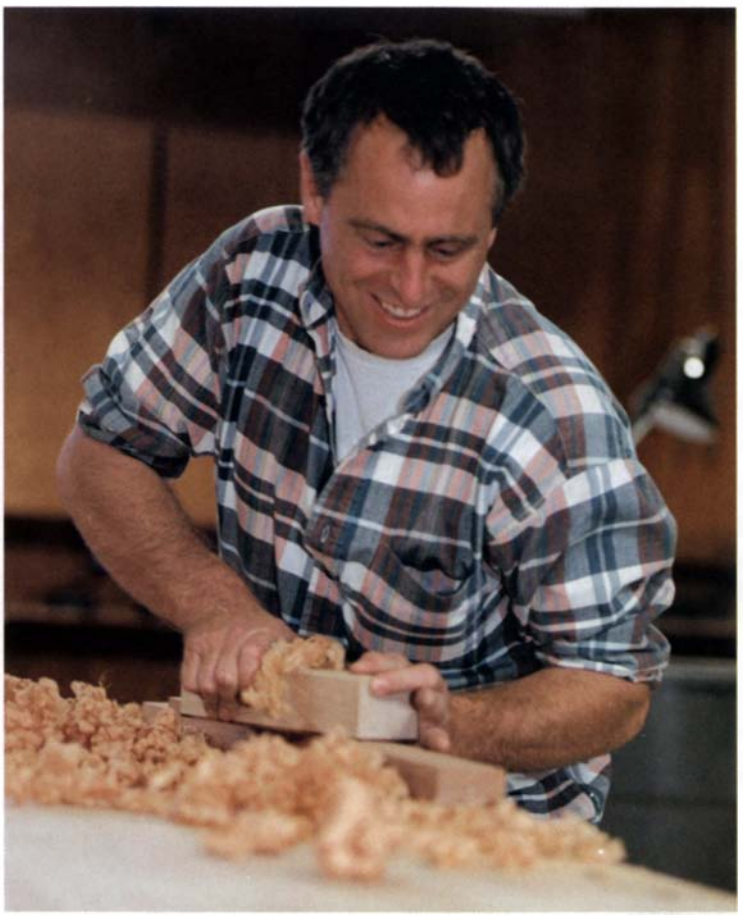
I think there's a line between sentiment and positive emotion or creative emotion. In other words, you buy a yard sale tool and you fix it up as best you can and you know it will never sing, but it has something and gives you something emotionally. It has a sentimental value. Then there's this other element that is not sentimental, but is emotional, where you believe that you work better with this finely tuned instrument than you do with something more awkward or more coarse. That, I think, is the difference. You don't get carried away by the fact that it is an antique or that George Washington used it or something. You just think of what it will do and what you can do with it. □

James Krenov works and teaches at the College of the Redwoods in Fort Bragg, Calif., and he has authored four books about craftsmanship and cabinetmaking. This article is adapted from conversations recorded in Fort Bragg in July 1996.

Wooden Planes

A small investment in time and materials yields a tool that performs beautifully

by David Welter



Making planes is one of the first things we teach in the College of the Redwoods' furniture program. These tools are essential to cabinetmaking, and making one or two of them is a good way to get started. Although construction requires care, making a plane is not a difficult process, and a wooden plane is not a fussy tool to adjust or maintain. Best of all, these planes are a delight to use.

The plane body can be made of any dense, stable wood. People like the romance of an exotic hardwood; its weight feels good in use. But it can be disappointing to experiment with a precious commodity. Maple is an excellent choice for a first plane. Cherry, hickory, locust and black walnut are other suitable common materials. Look for stock that's fairly straight-grained. A plane built from stock with tension in it will be a perpetual aggravation.

Unless the wood you've chosen for the body of the plane is especially dense and hard, you will need a tougher wood for the sole, one that is fine-textured, dense and polishes up well. Lignum vitae is the best, but it can be hard to obtain. Gonçalo alves has served our shop well for years. The thickness of these dense woods should be kept to under 3/16 in.

We use the short, thick irons made by Ron Hock for the planes we make at the school (Hock Handmade Knives; 707-964-2782). You can also use a standard plane iron.

Start by squaring up the block

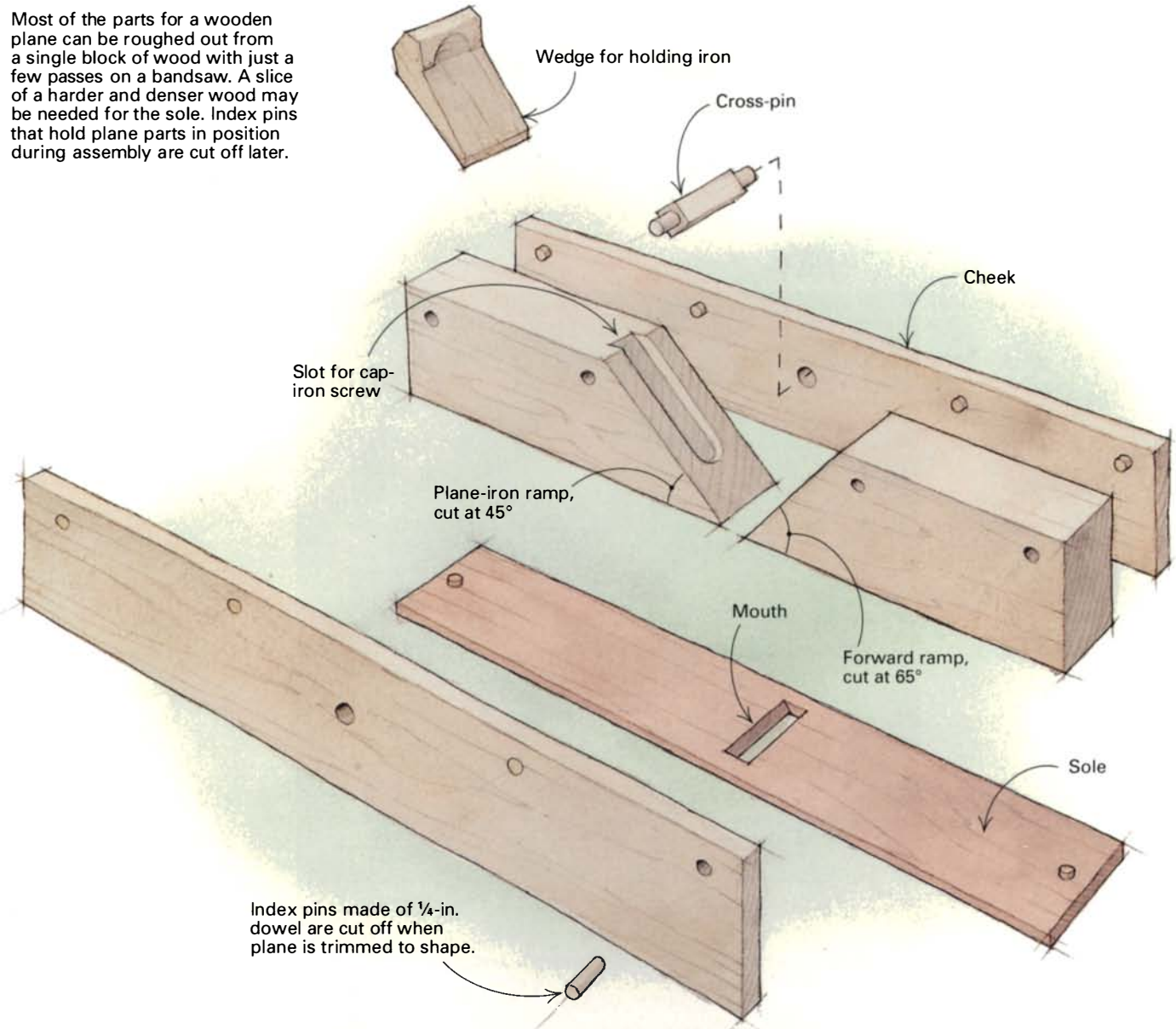
A wooden plane starts with a block of wood that will be sliced into three sections: the body and two cheeks. There's a certain appeal to having a plane constructed from a single block of wood, but the stock also may be built up from two or more pieces. Keep balance in mind if the stock needs to be built up. The thickness of two or more joined pieces should be the same.

Minimum height for the plane blank is about 2 in. Its width is determined by the choice of plane iron, plus a finished di-

Photo this page: Boyd Hagen

SAW A PLANE BODY FROM A SINGLE BLOCK OF WOOD

Most of the parts for a wooden plane can be roughed out from a single block of wood with just a few passes on a bandsaw. A slice of a harder and denser wood may be needed for the sole. Index pins that hold plane parts in position during assembly are cut off later.



Cut stock in three pieces. *Two passes on the bandsaw divide dimensioned stock into two cheeks and a center block.*

Divide body in two. *Cut the center block to create the halves of the plane body—a forward and a rear block.*

Save the wedge. *The triangular offcut will be used later to make a wedge for the plane iron. Don't throw it out.*

Drawings: Jim Richey

mension of 5/16 in. for each cheek. To the width of the iron, add 1/16 in. to get the finished width of the center block of the plane. The extra room allows the iron to be pivoted so it's parallel to the sole without binding. Safe margins for bandsawing a solid block require 1 in. in addition to the plane iron's width; make that 1¼ in. if tablesawing the block. After jointing and thicknessing the block, mark the top of the plane with a cabinetmaker's triangle to serve as a reference during assembly.

Cut the cheeks, and lay out the mouth

After cutting the cheeks on either a bandsaw or tablesaw (see the far left photo on the facing page), lightly plane the mating faces of the center block and the cheeks. Plane only enough to remove the mill marks—you want the stock faces parallel.

The location for the mouth of the plane is laid out on the center block. The mouth opening should be somewhat forward of center. The exact location is not critical. Because you most often push a plane, the back absorbs most of the effort. But a somewhat longer than usual fore section helps get the plane started correctly.

A plane-iron ramp of 45° serves well for general purpose work (see the drawing on the facing page). Exactness of that angle is less important than ensuring that the ramp is flat and square to the sides. The forward ramp, cut at about 65°, may be mildly concave to allow a little more finger room for clearing shavings. If you take this extra step, leave the lower ¼ in. at the original 65° rather than running an arc to a featheredge at the throat opening. We cut the ramps on a bandsaw and true them up with a plane (see the center photo on the facing page). You could also use a tablesaw or a power miter saw. Save the cutout. It will be useful later.

Fitting cheeks to plane body

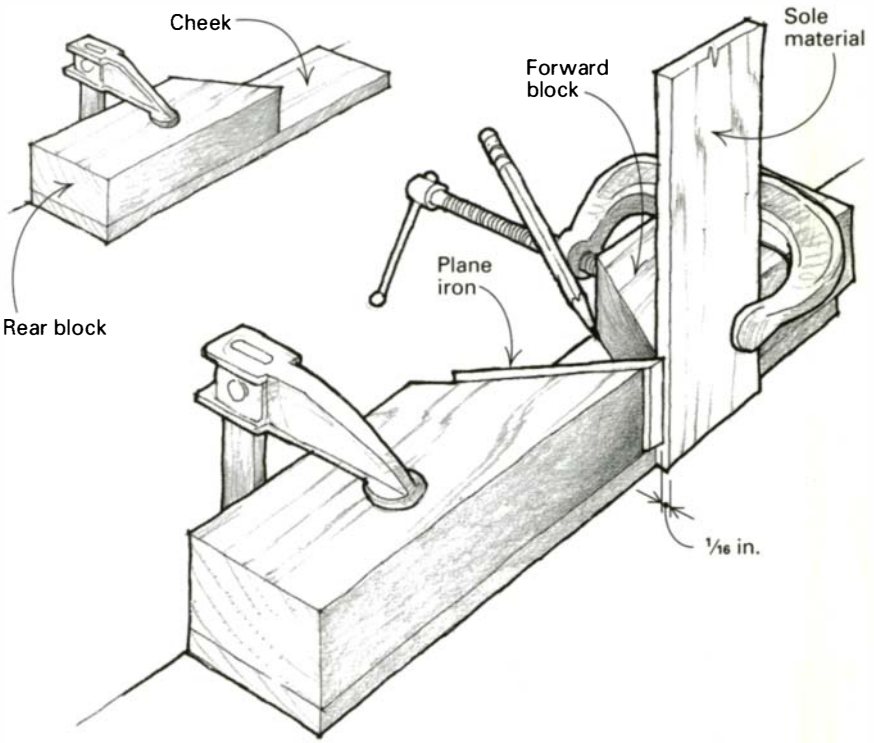
To establish the positions of the forward and rear blocks, you will need the sole stock in hand. Sole stock about ¼ in. wider than the plane body will allow a margin of adjustment in alignment. Lay one of the cheeks on the bench with the inside facing up, and place the rear block on it (the back end of the block can protrude slightly beyond the end of the cheek). Clamp the block and cheek to the bench, and draw a pencil line along the 45° ramp on the cheek.

Clamp the sole onto the bottom of the forward block, aligning one edge of the sole with the edge of the ramp (see the drawing above). Place the forward block and sole onto the cheek that's been clamped to the bench, and put the plane iron (bevel down) on its ramp. Set the iron to near cutting depth, and slide the forward block back until the sole contacts the cutting edge of the iron. Juggle the position of the blade and block until the blade touches the sole about 1/16 in. below the outside surface. Now mark the forward ramp's location on the cheek. When the plane is assembled with the center blocks in this position, the iron will not quite come all the way through—exact fitting will come later.

Using the lines marked on the cheek as a reference, position the center blocks between both cheeks, and clamp all three pieces together. To keep the relationship of the parts definite, index each cheek onto

POSITION AND INDEX THE PLANE BODY

To locate the forward block correctly, start by clamping the rear block to one cheek on the bench and the forward block to the sole material. One edge of the sole should line up with the bottom edge of the forward ramp. The forward block is then shifted until the plane iron can come within 1/16 in. of the outside surface of the sole. Mark the cheek here.



With blocks clamped, index the body. *The author drills through the plane cheeks into the body to set the indexing pins.*

Index pins made of 1/4-in. dowel *hold plane parts in position during assembly. They will be cut off after the plane is finished.*

Photos except where noted: Scott Gibson

both center blocks with ¼-in. dowels (see the photos on p. 69). Place these index pins as near as possible to the ends or tops of the cheeks so they can be cut off when the plane is trimmed to shape.

Layout for cross-pin must be exact

Before the three pieces of the plane body can be glued together, you must cut a slot into the center of the rear block to accommodate the cap-iron screw, and you must make a cross-pin. The slot can be chopped, routed or sawn. Cut it a little deeper than the screw head is thick, about ⅛ in. wider than the screw head, and stopped about ¾ in. from the bottom of the ramp (see the photo at right).

The center of the cross-pin falls at the intersection of two lines: one perpendicular to the bottom and the other parallel to the plane-iron ramp (see the drawing below). The pin should be high enough in the plane to allow your fingers to clear shavings from the throat and low enough for the wedge to exert pressure near the working edge of the iron.

As the drawing shows, the center point is established on the inside of one of the cheeks. That point will need to be transferred to the outside of the other cheek so that the cross-pin holes will be in line with each other. Square a line starting from the center point to the top of the cheek, across the top of the plane and then down the outside. Measure up that line, from the bottom, the same distance.

A slot for the cap screw—*The rear block is slotted with a ¾-in. router bit to accommodate the cap screw on the plane-iron assembly.*

The 5/16-in. holes for the cross-pin tenons can now be drilled. Drill through both cheeks from one side to guarantee that the holes will be in line (we use a horizontal boring machine, but you could use a drill press). Use the center block cutout to back up the hole while drilling to prevent blowout when the drill exits the stock. If the hole is drilled crookedly, the wedge won't grab the plane iron evenly.

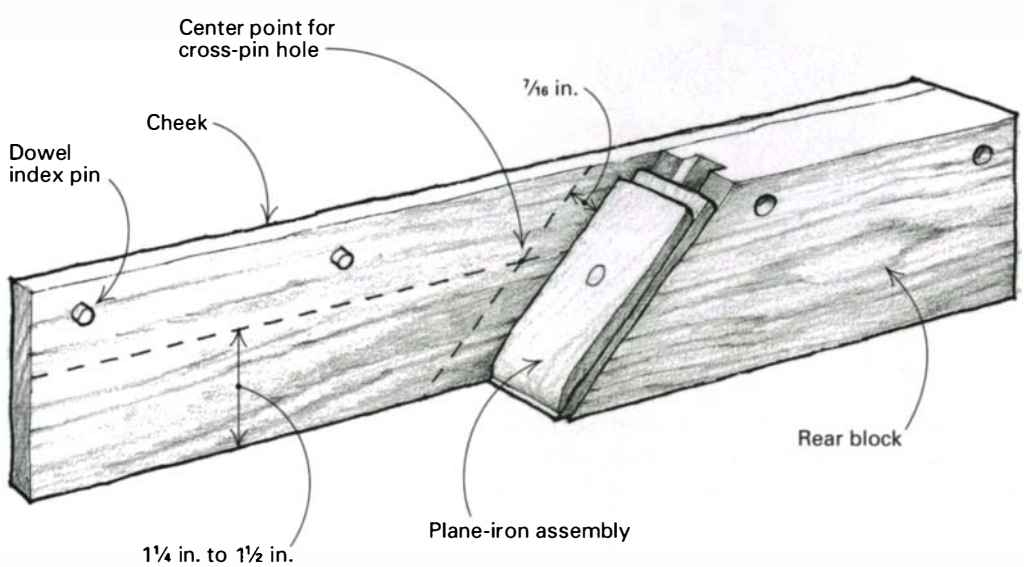
First a cross-pin, then a test-fit

To make the cross-pin, dimension a 12-in. length of stock to ½ in. sq., which is more than you need. With this extra length, your hands will be well out of the way when you rough out the tenons in a crosscut sled on the tablesaw. And as long as the saw is set up, cut an extra pin as a backup. The length of the pin between the tenons should be slightly less than the thickness of the center block (see the top photo below). Once the tenons have been cut, the pin can be separated from the stock.

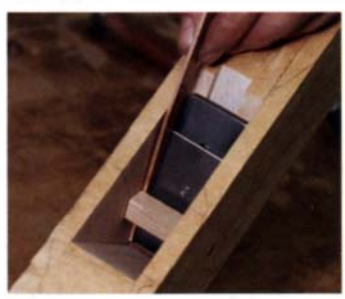
Trim the square tenons to fit the round holes with a knife or chisel, fairing with a file if need be. Test the size of the tenon in

SHAPE AND LAYOUT CROSS-PIN

A 5/16-in. hole is bored in each cheek for the cross-pin. To find the center point of the hole, lay the rear block on one cheek, and place the plane-iron assembly on the ramp. The hole is drilled at the intersection of two lines: one 7/16 in. away from the plane-iron assembly and one 1¼ in. to 1½ in. up from the bottom of the block.



Cheeks should not pinch the cross-pin. *When cut correctly, the cross-pin can rotate freely in holes bored through the cheeks.*



Spacing should be even. *A thin strip of wood helps the author make sure the distance separating the cross-pin from the iron is uniform.*

a hole drilled in scrap stock. The cross-pin should turn freely when in place.

All the parts are now made (see the photo at right), and when you assemble them, you'll get your first look at a nearly completed plane. You still need to check that the space between the plane-iron assembly and the wedge is uniform. One way to do this is to make a tapered gauge from a thin piece of wood (the gauge also will serve as a template for making the wedge). With the plane-iron assembly in place, push the gauge between it and one end of the cross-pin (see the bottom photo on the facing page). Mark the gauge at the point where it becomes snug. Move the gauge to the other end of the cross-pin, and compare the point of snugness to the mark. Make adjustments by planing the pin, ensuring that the surface is kept straight. Note left and right on the pin if an adjustment is made.

Reach into the mouth opening to make sure there is enough finger room to clear away shavings. The cross-pin can be whittled down or the forward ramp adjusted so that the throat is accessible. Ease the corners of the pin that face away from the plane iron. Those soft corners will be easy on your fingers.

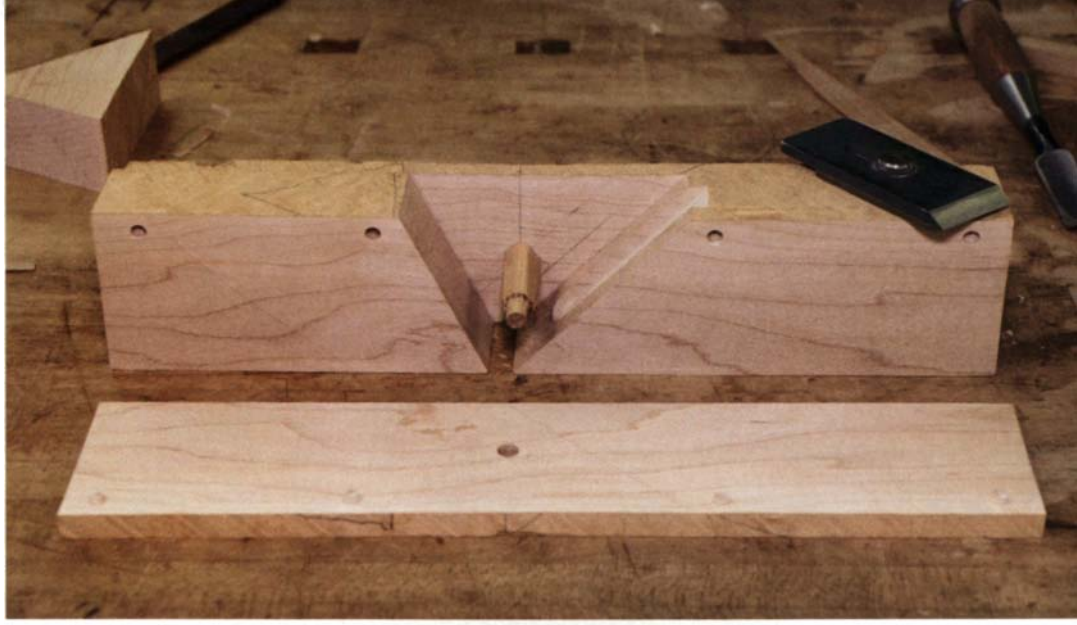
Don't skip the final dry-fit

A dry run of the glue-up greatly reduces the chance of disappointment. Make sure that neither the index pins nor the cross-pin tenons protrude beyond the cheeks (if so, they will interfere with the cauls used in glue-up). Use ¾-in. cauls the same size as the cheeks both to protect the wood and to disperse clamp pressure.

Have enough clamps on hand to be able to place them 2 in. to 3 in. apart. When the clamps are in place, be sure the cross-pin rotates. If the shoulders are tight, they might prevent the cheeks from coming home. Alignment of the center blocks can be ensured by clamping them down to a block or bench before clamps are applied to the cheeks. Once a few clamps are in place, the first ones can be removed.

I like to have newspapers and a damp rag on hand for the glue-up. Leave the cross-pin in one of the cheeks. Spread glue on the first cheek, staying about ½ in. away from the mouth opening. Position the center blocks onto the glued surface, and apply glue to the dry sides. Then place the second cheek, and start clamping. Remove any glue squeeze-out from the mouth opening with a stick and a damp rag.

The clamps may be removed after several hours, but the glue should cure at least overnight before doing further work. When the assembly has dried, the bottom of the plane may be trued with light passes on the jointer.



***Test-fit**—With a cross-pin fitted in one cheek (above), the plane parts are brought together for a dry-fit before the author reaches for the glue bottle.*

***Glue at last.** Cauls should be about the same size as the plane cheeks to ensure that clamping pressure is spread evenly. The author uses ordinary white PVA glue to bond the parts.*

True up the plane body with a wedge installed

The pressure of the wedge against the iron can cause distortion in the bottom of the plane. That condition can be taken care of in this truing process. Cut one scrap of wood that represents the plane-iron assembly in width and thickness and another for a temporary wedge. Place the faux iron in the plane, and seat the wedge firmly, but not aggressively. Resist the temptation to skip making the stand-in iron from wood. An iron that vibrates loose while jointing will most likely lead to disaster.

Care must be taken that jointing is done parallel to the bottom of the center blocks. Check as the work progresses that the throat opening appears squarely across the bottom. When the surface has been cleaned up, check the trueness on the jointer table by pushing on each corner of the plane body in turn. If the opposite corner lifts off the table, there is still an inaccuracy to deal with. If squareness of the sides is an issue, square them in reference to the bottom after it has been trued.

Adding the sole and wedge

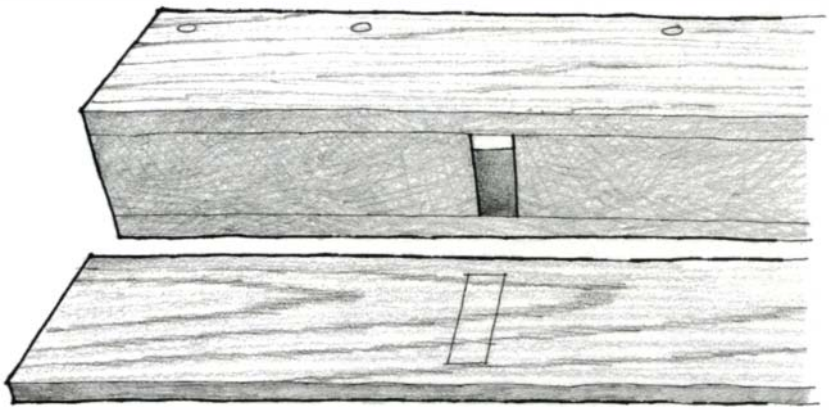
The opening for the plane iron in the sole must now be laid out and cut. Before you do, though, determine which end of the sole piece should be at the front of the plane. Run your fingertips lightly from one end to the other. A sensitive touch will reveal that one direction is smoother than the other. Orient the sole so the fur runs from front to back. The drawings on p. 72 show how the slot is laid out and cut in the sole.

When you do the glue-up, use cauls on the top and the bottom. The top caul should span the mouth opening to allow the clamps to be placed uniformly along the plane's length.

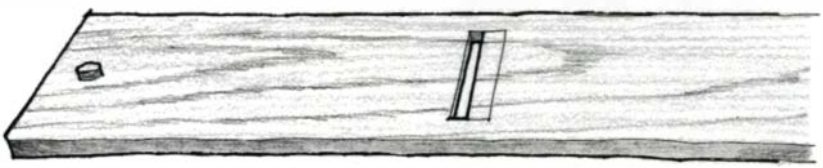
While the glue is drying, the wedge can

LOCATE AND CUT THE MOUTH

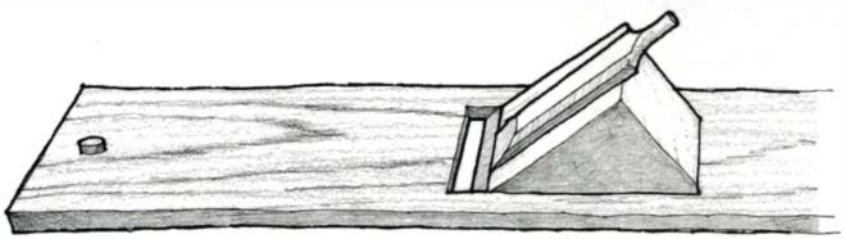
The best time to cut a mouth, or opening, for the plane iron is before the sole is attached to the body of the plane.



1. Lay the plane body on the sole, and mark the outline of the opening.



2. Cut the slot with a chisel or router, ⅛ in. wide for a standard iron and ¼ in. wide for a thick iron. Position the sole on the bottom of the plane body so the iron comes within 1/32 in. of the bottom surface of the sole. Ideally, the forward edge of the slot will line up with the forward ramp. Clamp and index the sole.



3. Take the sole off the plane, and carry the 45° angle through the sole, using the offcut of the center block as a guide. Now glue the sole to the body.

***Cleanup**—The author uses a chisel to make sure the plane iron ramp and the bevel in the slot are in line.*

***Square up the throat.** A file fine-tunes the throat opening. To avoid tearout, cut on the push stroke only.*

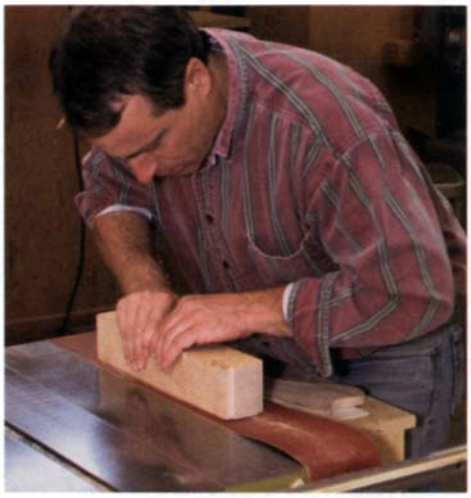
***Center block offcut becomes the wedge.** The author details the plane's wedge, which should be cut to a slope of 6° to 8°. A flat at the back presents a good surface for the hammer.*

be roughed out. Its slope is critical. It should allow for a short range of tightness. If the slope is too slight, the wedge can be driven to an excessive degree; if the slope is too great, the wedge will be either loose or tight and tend to pop out. A slope of about 1:10, or 6° to 8°, is just about right.

The offcut from the center block has enough stock to provide for the wedge. (You do still have it, don't you?) Lay it out so the grain runs along the length of the wedge. The top end should be broad enough to present a good target for tapping with a hammer and rise away from the iron so you can tap either the iron or the wedge, but not both at the same time (see the photo above). Bandsawing is the safest way to work with such small stock. The wedge should be at least 1/16 in. narrower than the thickness of the center block so it can be wiggled out when you want to remove the iron.

After you've removed the clamps from the sole, make sure the bevel in the sole is truly in line with the plane-iron ramp. Any protrusion here will give a false reading when fitting the throat opening and will create a bump on the bottom of the sole. Lay a sharp chisel on the ramp, raise it slightly, and pare away excess sole material.

The remaining truing of the plane may be accomplished by lightly sanding the sole on a strip of 120-grit sandpaper clamped to a tablesaw (see the top photo on the facing page). Place the plane iron in the body so it nearly comes through the sole, and seat the wedge firmly. Check for inaccuracies with a straightedge both along the plane's



***Easy does it.** The author uses 120-grit sandpaper clamped to a flat surface to true up the sole of the plane. Using very light pressure, he sands only until the surface is uniformly abraded.*

length and across its width. The tension exerted by the wedge tends to create a bump behind the iron. With gentle pressure in the problem area, make a light pass on the sandpaper, and make sure that material is indeed being removed from where it ought to be. Don't use too much force. This task is complete when the entire surface has been uniformly abraded.

I aim for a final throat opening of about 1/16 in. Work from the outside in with a file, angling slightly toward the front to provide shaving clearance (see the bottom right photo on the facing page). Remember that a file cuts only on the forward stroke. Pressure on the backstroke will likely produce chipout at the opening.

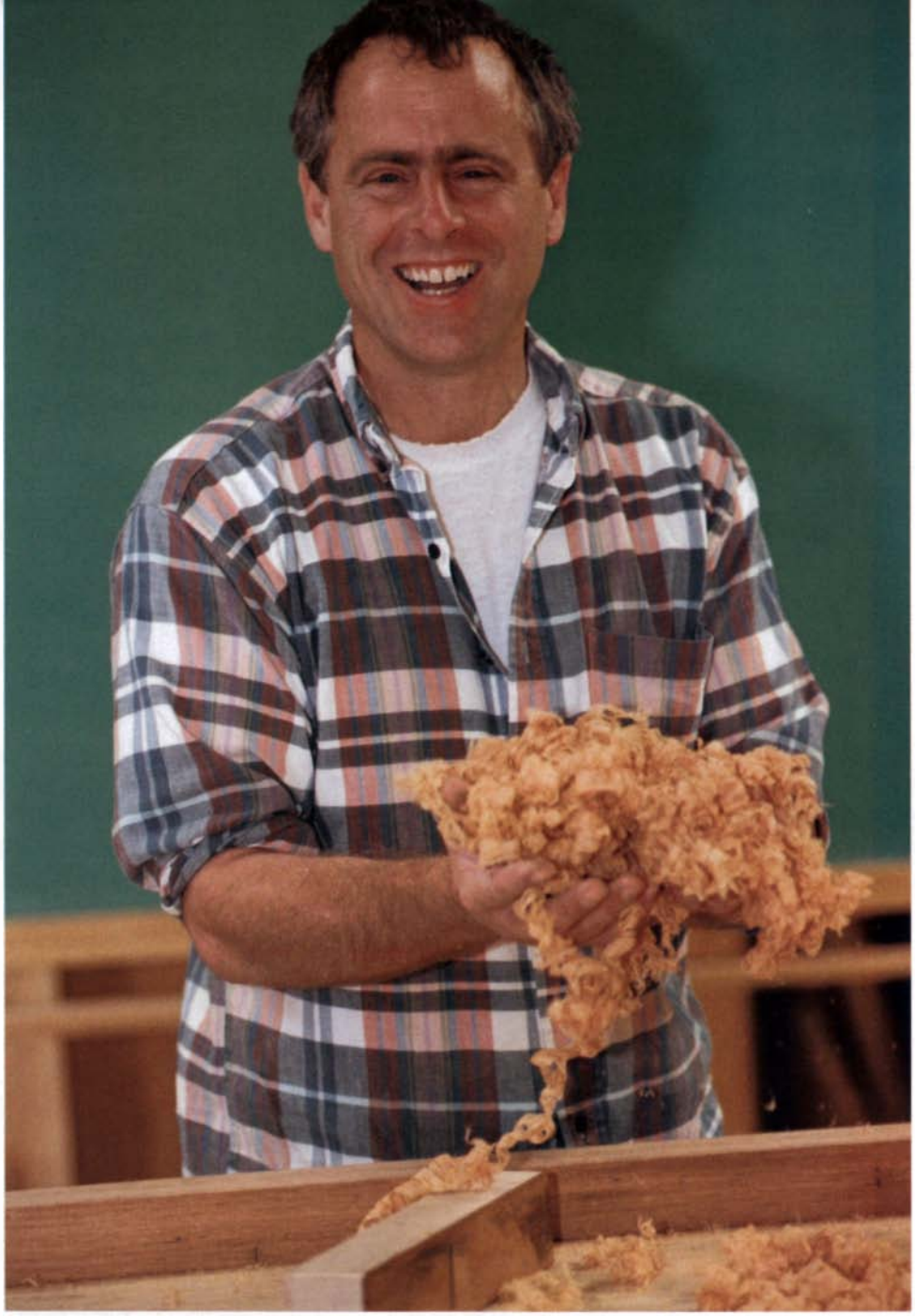
Making your first shavings

You are now at the point you have been anticipating: making shavings (see the photo at right). Place the iron assembly in the body at a height above where it would begin to cut, and lightly tap in the wedge.

We have all been taught in our early years to gauge the depth of the iron by sighting along the bottom of the plane from the front. A sharp, finely set iron's edge is difficult to see in that manner. I find it much easier to adjust the iron while sighting from the back of the plane. The iron should barely present itself above the sole. It's important to get the blade parallel to the sole. If the iron is set too deeply, rap the back of the plane to back it out, set the wedge and begin again.

Two problems often show up with a new plane that can be attributed to a bump on the sole behind the iron: The plane seems to dig in at the beginning of the cut and then skate, or one of the corners of the iron constantly digs in. To correct those problems, flatten the bump with a hand scraper. It is acceptable to create a slight hollow when doing this. The plane will then sit flat when re-truing on sandpaper.

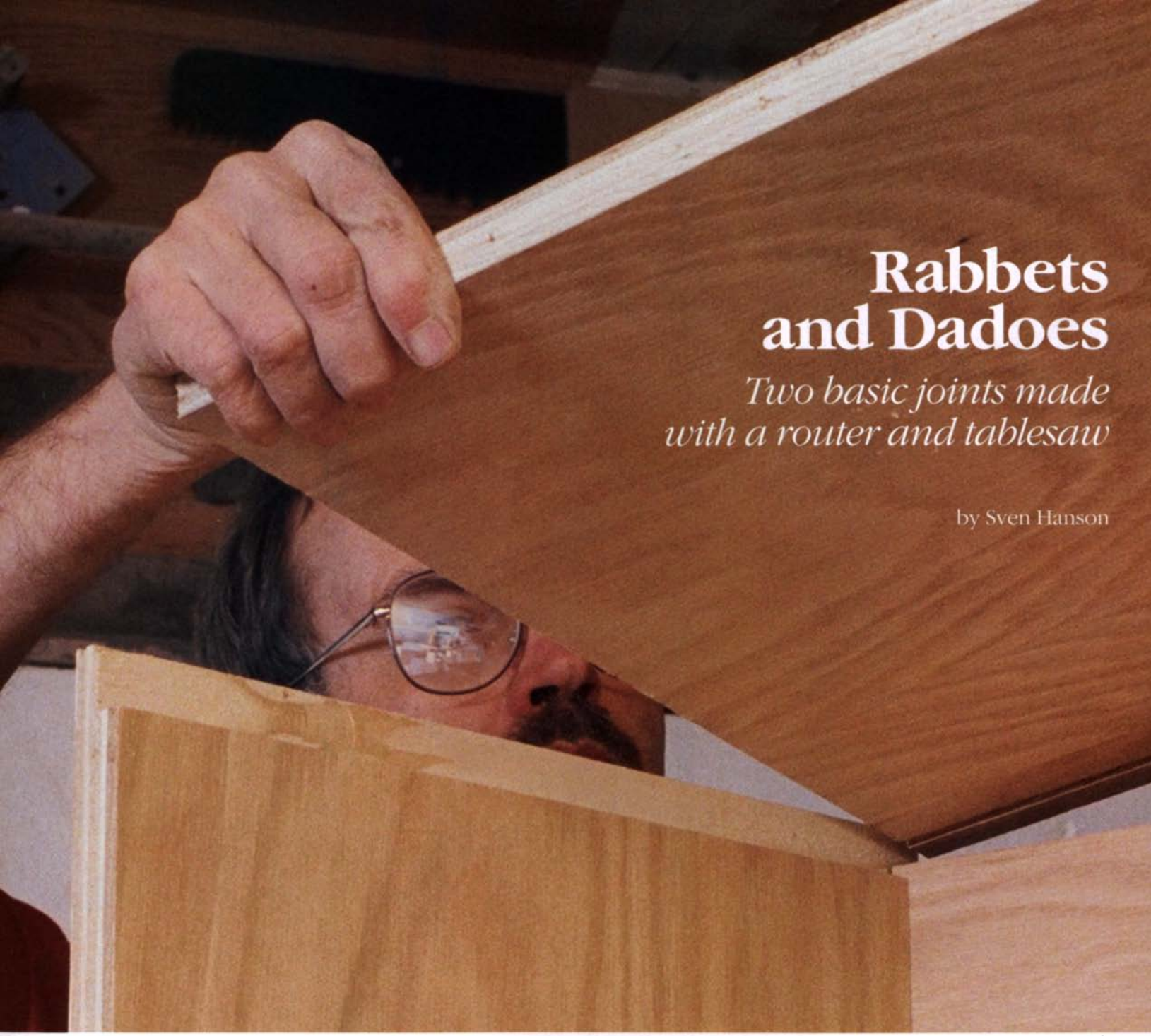
Difficulties in adjustment of the iron generally involve the wedge. Drive it in only as much as is necessary to hold the iron. A burr from the cap-iron screw may catch on the wedge. A swiveling iron may indicate that the wedge is not making uniform contact with the cross-pin. Look for burnish marks on the wedge that indicate the nature of the fit. Ease the edges of the plane, and start using it before committing to the shape of the body. An advantage to the lack of knobs and handles is that the hand's position may be shifted around in use. □



***Using a new plane is a delight.** After it's adjusted with a few taps of a light hammer, the plane can get right to work. It will need very little maintenance.*

David Welter has been a staff member at the College of the Redwoods in Fort Bragg, Calif., for 11 years. During seven years of teaching summer classes, he and colleague James Budlong have helped students build some 500 planes.

Photo at right: Boyd Hagen



Rabbets and Dadoes

Two basic joints made with a router and tablesaw

by Sven Hanson

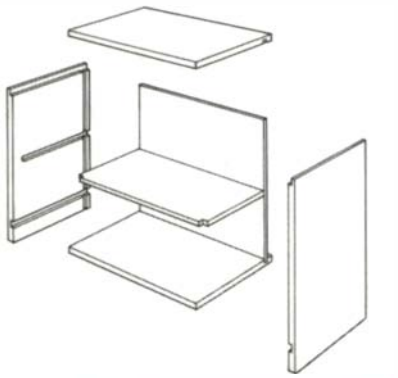
Judging by the attention that dovetails get, you'd think every craftsman cuts 200 of them a week. In reality, the rabbet, a joint with a single shoulder cut at the edge of a board, and the dado, a groove plowed inside the edge, are what many cabinetmakers use to join everyday case work.

On the evolutionary scale of joinery, the rabbet is a step above the butt joint, but it's a big step. The shoulder of a rabbet adds additional glue surface to the joint and supplies mechanical support. A dado has two shoulders, adding even more strength. The shoulders of rabbets and dadoes aid in the assembly of case work. They align the pieces when dry-fitting a case. You can check for size and fit before applying glue and clamps, which is a real boon in a one-man shop. In addition to their many applications in case work, these two joints also can be combined to produce simple but very sturdy drawers.

You can use hand tools to cut rabbets and dadoes, but these joints are usually machined with a router or a tablesaw. Each tool has its advantages. By choosing the right tool and using a few shopmade fences and jigs, you can cut these joints accurately and quickly. The techniques are as straightforward and uncomplicated as they are useful.

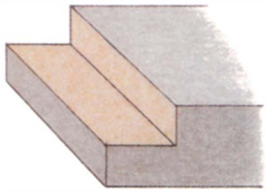
Photos: Anatole Burkin

The router reigns for case work



For joining the tops, sides and backs of most case work, I prefer the rabbet joint. It's strong and simple to cut, and rabbets help with the alignment of parts during assembly. Most of the time, the rabbets go across the grain at the ends of vertical cabinet pieces (or ends of the drawer sides). I prefer using a router to cut this joint because the bit leaves a cleaner cross-grain cut than a dado blade would.

The rabbet



Maneuvering components smoothly over a tablesaw or a router table can be difficult when building large cases. Additionally, any slight cup of the workpiece will prevent the blade or bit from cutting to its full depth. That's why I like using a hand-held router for cutting rabbets in the tops and bottoms of cases (see the photo at right). A router bit cuts cleanly and leaves a sharp, square inside corner that gives a very good surface for gluing.

Rabbeting bits come with guide

Router bits with bearings have limitations. *A bearing-piloted bit (top) will dip into voids and round corners. The result is a sloppy rabbet (bottom).*

A block of wood and two clamps make a fence. *An auxiliary fence helps create a clean rabbet by spanning dips that a bearing would follow.*

Drawings: Vince Babak

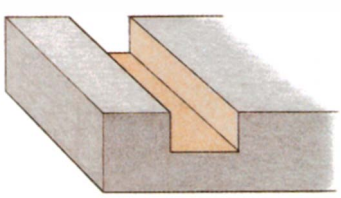
bearings, but I usually remove them and guide the tool with an auxiliary fence. Bearings follow every dip in the wood, which could round the corner at the start or end of the cut (see the photos at left on p. 75).

My fence, which is nothing more than a straight block of wood clamped to the router base, provides a secure surface from start to finish, and it gives me an infinite range of adjustment. A fence also gives me the option of using straight bits to cut rabbets. When I make case goods, I usually make the depth of the rabbet half the thickness of the stock.

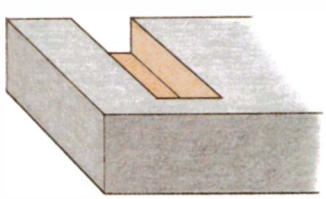
A cut begins with the bit well away from the work. I wiggle the router to check that the fence is snug to the edge of the board, and then I take a slow, steady pass. At the beginning of the cut, I press the front of the fence against the workpiece. Near the end of the cut, I push on the rear of the fence.

If there's no block clamped to the far side of the workpiece to combat tearout, I stop the cut an inch from the end, lift the router past the end of the board and carefully back the cutter in to complete the cut. A second pass along the rabbet ensures a good cut.

The dado



The stopped dado



Shopmade T-fence for cutting dadoes—*Screw two strips of plywood together at right angles to make a guide fence for cutting dadoes with a router.*

Tall cabinets, such as entertainment centers, require internal structural support to prevent racking. Here's where I use the dado joint. A fixed shelf or panel dadoed into the sides near the center of the case adds a lot of rigidity. I cut the dadoes as deep as the corner-joint rabbets. For a snug fit, use a straight bit whose diameter matches the thickness of the panel that will be captured by the dado. If you're using sheet goods, you can order slightly undersized bits. They come in odd sizes such as 23/32 in., which is the actual thickness of most 3/4-in. plywood (for more on selecting router bits, see *FWW* #116 pp. 44-48).

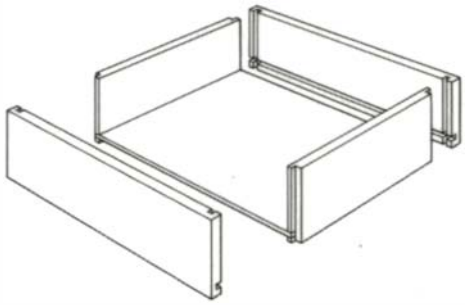
To guide the router, I use a shop-built T-fence (see the photos above) clamped to the workpiece. A dado slot in the top of the fence provides a reference point for positioning the jig. When using it, I install a square base on my router. Round router bases tend to plow sawdust into the fence and then ride up on the dust bank. I prevent tearout on the far side of the cut by clamping a backer block of hardwood where the bit will emerge.

A dado plowed right through the edge of a case side is not a pretty joint. I usually stop the dado before it comes out the front edge. Cutting a stopped dado with the T-fence and router is easy because I can see the layout marks.

The tablesaw dominates for drawers

Nothing cuts a dado faster than a tablesaw equipped with dado blades. Dado blades can be of the stack variety (see the photo at left), with two outside cutters and various-sized internal chippers and shims, or wobble-style (see the photo at right), with one or two blades and a hub that allow you to dial in different settings. Stack dadoes tend to cost more but usually give you a smooth, flat-bottomed cut.

The drawer joint

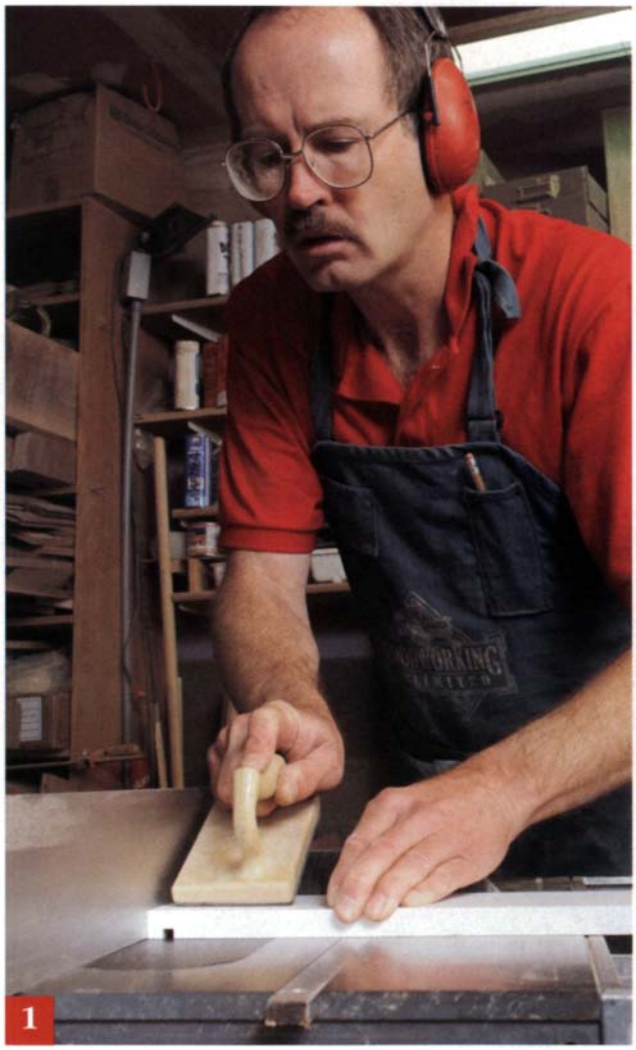


Around the time the tablesaw was invented, woodworkers figured out how to make this strong joint without the fuss and time required for dovetails. The simplified version of the drawer joint combines dadoes cut in the drawer sides with tenons cut on the front and back pieces.

Before beginning, make a custom throat plate for your tablesaw. It will reduce tearout by supporting the wood fibers on the edges of the cut. I create the opening in the plate by lowering the blades below the insert, turning on the saw and raising the dado blades through the insert to a predetermined height. Instead of starting and stopping the saw to measure the blade height, I mark the depth of cut on my rip fence and slowly raise the blade to that mark.

I begin this joint by first crosscutting a dado on the insides of the sides using the tablesaw's miter gauge and rip fence for guides (see photo 1). I position the dado so that when the drawer is assembled the sides will be proud of the front by just 1/32 in. That way, when you fit a false drawer front, it will fit snugly against the ends of the sides. For the drawer to end up nice and square, I make sure the rip fence is parallel to the blade and the miter gauge is square to the rip fence.

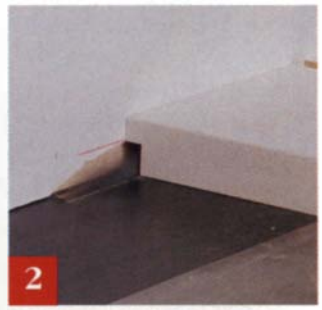
To make a matching tenon on the drawer front, I set up my saw for a rabbet cut. I set the rip fence so the dado head is partly buried in it. Because that's incompatible with hardened aluminum extrusion, I keep surplus 3/4-in. melamine-surfaced particleboard on hand for making disposable fence faces. I set the fence so the exposed portion of the dado head equals the width of the rabbet. The exact width of the dado head doesn't matter as long as it's wider than the intended rabbet. The depth of the rabbet is set by the height of the blade. The stock is again guided by a miter gauge and a rip fence (see photo 2). It's a good idea to run some scrap stock the same size as the workpiece to check settings. The joint should be snug. If it's too tight, the short-grained sections of the mortises could break off during assembly. □



1. Cut the mortise first. *Guide a drawer side against the rip fence using a miter gauge when cutting the mortise.*

2. Next cut a rabbet to create a tenon. *Make this cut in a piece of scrap first, and check the fit.*

3. You want a snug, not tight, fit. *You should be able to squeeze the joint together by hand.*



Sven Hanson builds custom cabinetry and furniture in Albuquerque, N.M.

Arts-and-Crafts Sideboard

Part two

Adding drawers and doors to a basic carcase

by Gary Rogowski

I've seen many a piece of furniture that looked great from across a room but fell short on closer inspection. Often, it's something as simple as a drawer binding in its opening or a pair of doors that aren't aligned properly. That's why building and fitting these parts carefully is every bit as important to a piece of furniture as making a sturdy case.

The previous issue of *Fine Woodworking* covered carcase construction for the Arts-and-Crafts style sideboard in the photo at right. That article ends with the mahogany case pieces made and mostly glued up. Now it's time for those all important details: adding web frames to support the three drawers and then building and installing both drawers and doors.

Building web frames for the drawers

On many case pieces, the front rail of a web frame—also called a drawer divider—is visible on the outside of the case. On this sideboard, however, I kept the dividers hidden behind the drawer fronts to act as

Bottom photo: Jim Piper

drawer stops. One other benefit of keeping the dividers hidden is that the front of the sideboard has a cleaner, less cluttered look.

All three web frames are made of western maple. The side rails of the upper two frames have tongues that are glued into stopped grooves in the plywood dividers (see the drawing on p. 81).

The side rails are joined to the front web-frame rails with stub tenons ⅜ in. thick and ¼ in. long. The front rails are joined to the plywood dividers with stub tenons of the same size. Web-frame joinery was done on the tablesaw and router table (see the top photo at right). No matter how you do it, make sure the shoulder-to-shoulder lengths of the front rails are all exactly the same. Otherwise, the plywood dividers won't be straight when the rails are in place, altering the size of the drawer openings and making drawer fitting much more difficult.

The bottom drawer also needs a web frame, but I was concerned that if I used the same joinery as I had for the upper two web frames, the grooves would be too close to the spline joints connecting the dividers and divider rails. Grooves located this close to each other would have compromised both joints.

My solution was to use 1½-in.-wide stock for the front and side rails of the bottom web frame (this increased the glue surface area), biscuit the side rails to the divider rails and rabbet the front web-frame rail over the front rail of the carcase (see the drawing on p. 81). The side rails, or runners, were simply butted to the backs of the front rails. After all the web-frame rails were fitted, I planed their tops and bottoms flush to one another and cut grooves for the dust panels.

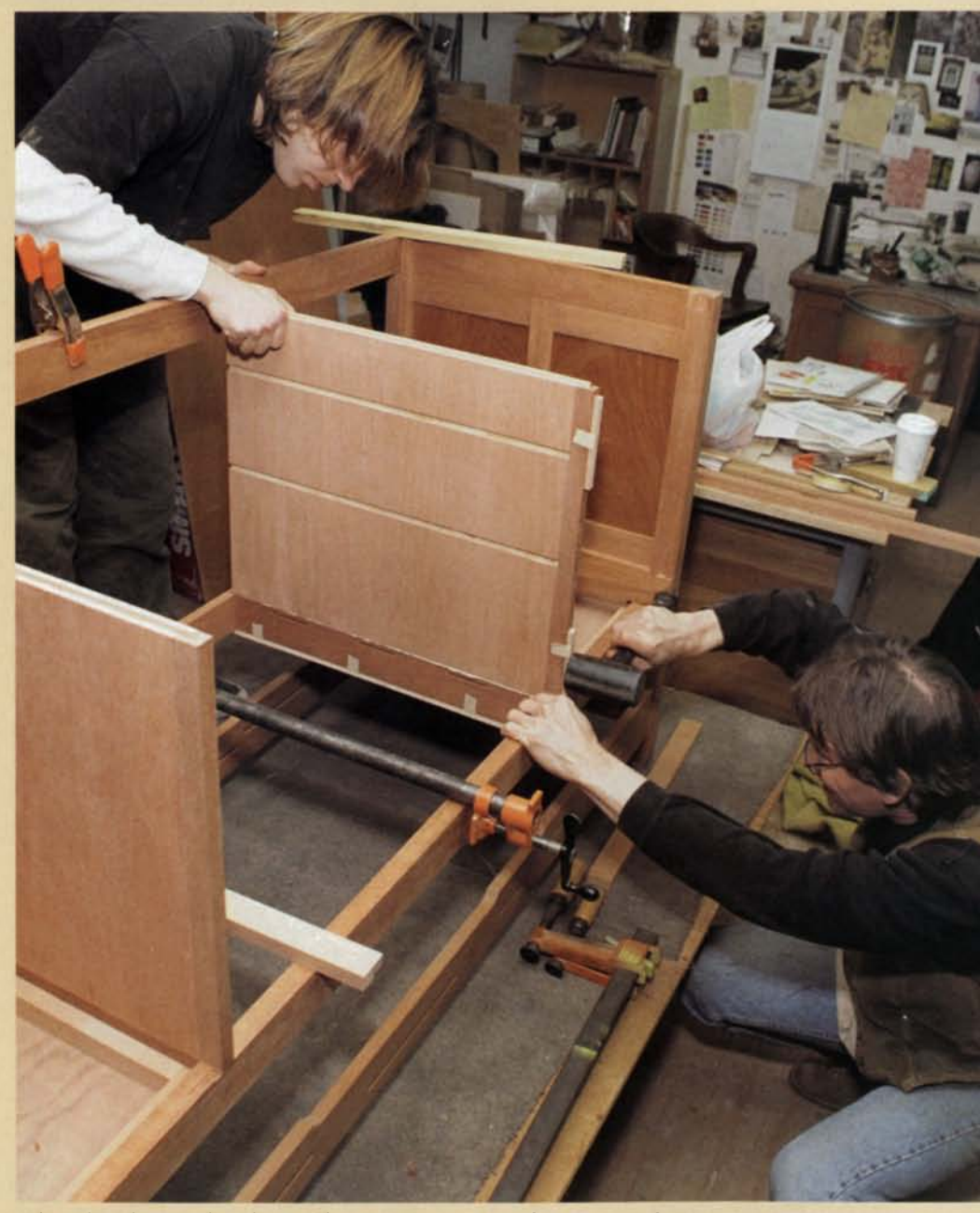
Glue in dividers, top rail and kickers

The next step was to finish assembling the case. I glued the dividers to the divider rails (see the photo at right). I glued in one at a time and used the front bottom web-frame rail as a spacer between the plywood dividers when gluing in the second one. Dry-clamping the top front carcase rail and kickers to the dividers kept the drawer openings precisely aligned during assembly. After both dividers were in, I glued the top rail and then the kickers in place.

I set the web frames back in place, and checked them for twist using a pair of winding sticks. I pre-finished the web-frame rails with three coats of shellac, being careful to keep it off the joinery. Then I

GROOVES FOR WEB FRAMES

Rout web frame grooves in dividers. *Start and stop marks are penciled on the masking tape on the router-table fence and on the divider itself. Dividers get two grooves on their inside faces for the top two web frames.*



Glue divider to divider rail. *Once the grooves for the web frames have been routed, the dividers can be glued into the case. Make sure the front of the dividers are flush with the outer face of the lower front rail.*

Photos except where noted: Vincent Laurence

glued all the web-frame rails in place.

I cut dust panels out of ⅛-in.-thick mahogany plywood, but when I slid them in place, they sagged too much for my liking. To remedy this, I added rear rails to the web frames, using ⅛-in.-thick splines to attach them to the side rails (see the photo at right). I left these rear web-frame rails unglued until after the drawers had been fitted, so I would have a better view of the drawers while working on them.

Make doors and drawers of quartersawn stock

I used quartersawn mahogany for the drawer faces and doors for two reasons: the grain pattern of quartersawn stock is less flashy than flatsawn (it works better as a background for inlay), and quartersawn shrinks less than flatsawn.

I had a problem at first with the quartersawn mahogany, though. I would get tearout every time that I sent it through the planer because the grain was interlocked. I'd heard that dampening wood reduces tearout, so I gave it a shot. It worked beautifully. Just before sending a board through the planer, I dampened (not soaked) its face with a rag. This softened the fibers just enough that they could be cut cleanly with no tearout.

I was concerned about finding a secondary wood for the drawer sides that would move at the same rate as the mahogany. I wanted a wood that was also quartersawn but wore better than the mahogany. I was fortunate to stumble across some quartered sycamore that was glorious to look at and tough enough for the job. Using the formula in Bruce Hoadley's book *Understanding Wood* (The Taunton Press, 1980), I compared the shrinkage rates of mahogany and sycamore. I found that in a board 8 in. wide—the width of my widest drawer—there was less than 1/32 in. of difference in shrinkage between the two species. I had found the right wood for my drawer sides. And sycamore is a beautiful contrast to the mahogany.

I resawed the sycamore to just over ½ in. thick, stickered it for a few days and then milled it to ⅜ in. thick. I kept the drawer sides thin to reduce the weight.

Dust panel is supported on all four sides. *Because the ⅛-in.-thick plywood panel sagged when he first slid it home, the author added a rear rail to the web frame.*

Drawers are dovetailed—I don't cut half-blind dovetails every day, so I swept the shop floor twice (okay, three times) before getting down to business. But once I started cutting them, things went smoothly. When I cut dovetails for drawers, I lay out the joints so the drawer sides are slightly proud of the tightly fitted drawer fronts when the parts are glued together. This results in easier planing and a better final fit.

I joined the drawer backs to the sides with sliding dovetails (the backs sit on the drawer bottoms). I roughed out the slots in the sides on a tablesaw and then routed them to finished size on a router table. The dovetails on the ends of the backs were cut on the router table using the same bit and height setting used for the slots. Rather than resetting the fence if the joint doesn't quite fit, take a pass with a handplane across the face of the board, and then run it by the bit again. Taking one light pass off the end grain of the dovetail also helps ease the fit.

I added drawer slips to the inside bottom edges of the drawer sides to give the edge of the drawer more bearing surface (see the drawing on the facing page). This helps prevent wear in the drawer runners. Drawer slips also are grooved for the drawer bottoms. This is stronger than grooving the ⅜-in.-thick drawer sides. Slips are notched to fit around the drawer backs.

I glued the half-blind dovetails at the front of the drawers with the back set in dry to keep the drawer square. I checked diagonal measurements inside the drawers to make sure they were the same and used a clamp to adjust the drawers square where necessary. After the glue had set, I carefully removed the backs, checked and trimmed the height of the drawer sides to fit their openings. Then I glued the backs in place, using scrap plywood in the drawer grooves to keep the back from going down too far in the dovetailed slot.

A feeler gauge helps fit the drawers—If the drawers go together square, half the battle is over. Fitting each drawer to its opening will be much easier. I started planing at the rear of the drawer sides and worked my way forward, fitting the drawers until they slid home smoothly. I used a long, very thin feeler gauge (available from most auto-parts stores) to let me know where a drawer was hung up. Once all the drawers were fitted, I trimmed the top and bottom edges of each of the drawer fronts to get even reveals between them all. I planed the drawer faces flush to each other last.

One final touch for the top drawer in this sideboard was to glue in a divider and a velvet bottom to protect the silverware that would likely be put in it. I glued the velvet to a thin piece of cardboard using a can of aerosol spray mount (you can buy it at art-supply stores). You'll want to use a respirator when using this stuff. Then I trimmed off the excess fabric around the edges and glued the cardboard to the plywood drawer bottom. Make sure the groove for the drawer bottom is wide enough to accommodate the extra thickness of the cardboard and velvet.

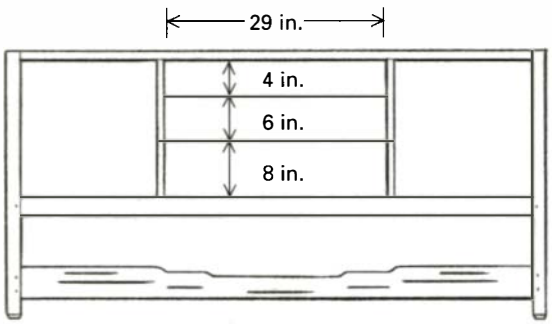
A shaped divider slides into dadoes cut in the front and back of the top drawer. I screwed the drawer bottom to the divider from below to prevent the bottom from sagging under the weight of silverware.

Breadboard ends keep door panels flat—Because the door openings are 18 in. sq., I thought two doors for each side would look better than one. Rather than using a traditional frame-and-panel con-

> "I'd heard that dampening wood reduces tearout, so I gave it a shot. It worked beautifully."

WEB FRAMES SUPPORT THE DRAWERS

Each web frame consists of a divider, or front rail, a pair of runners and a rear rail. The pieces are grooved for a dust panel. The two top frames are dadoed into the divider panels. The bottom frame is joined to the carcase with biscuits.



Section through carcase with plywood divider panel removed

Top rear rail

Top front rail

Drawer slips, ¾ in. sq., support the drawer bottoms and strengthen the drawer.

Dust panel, ⅛-in.-thick plywood

Kicker

Spline, ⅛ in. thick, connects rear web-frame rail to runners.

Tongues on drawer runners mate with ¼-in.-deep, ⅜-in.-wide grooves in divider panels. Stub tenons on ends of runners mate with shallow mortises in the backs of the divider rails.

Runner

Drawer divider rail

Drawer fronts extend below drawer sides by about ¾ in. When a drawer is closed, the divider rail serves as a stop.

Bottom front rail

Drawers are 21¾ in. from front to back.

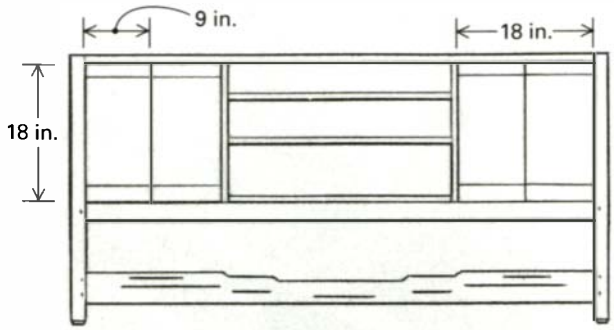
Front stretcher

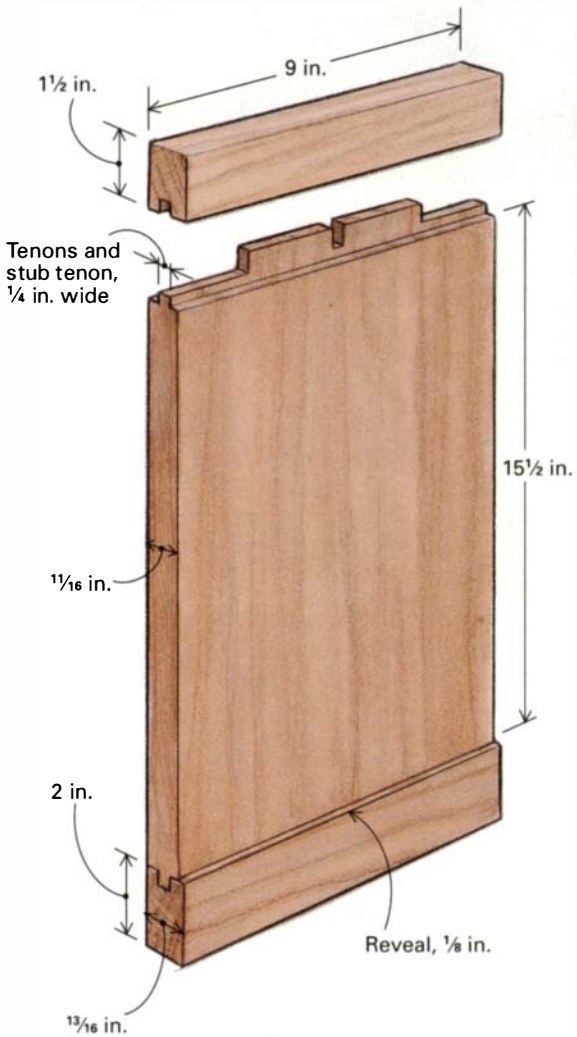
Rear stretcher

Bottom runners are attached to the carcase with #20 biscuits. The runners butt against the bottom drawer divider rail, which is rabbeted over the bottom front rail.

BREADBOARD-END DOORS

Breadboard ends ⅛ in. thicker than door panels keep the doors flat. Quartersawn stock ensures a minimum of movement across the door panels.





***Shims of plastic laminate** keep the reveal around the door consistent.*

***Tap the screw hole** with a steel screw, and then replace it with the softer brass screw.*

struction, I designed the doors as panels with breadboard ends (see the drawing above). This helps reinforce the strong horizontal lines of this sideboard and keeps the front from looking cluttered. The breadboard ends keep the panels flat yet still allow for movement, and the quartersawn mahogany minimizes the amount of shrinkage. The breadboard ends are ⅛ in. thicker than the panels to add a shadow line to the front of the sideboard.

When fitting the joints, make sure that the breadboard ends slide onto the panels with just hand pressure. Otherwise, the ends may split.

To keep the breadboard ends tight against the panels, I planed a slight concavity along their lengths. When I glued the ends in place, I used a clamp to draw in their centers. This forces the ends in tight.

One of the other advantages of dimensioning the breadboard ends ⅛ in. thicker than the door panels, besides the shadow line, is that you can hammer against this lip to disassemble the doors when you're fitting them. I used a block of scrap and held my hammer flat to the panel. The disadvantage is that you can't plane the face of the door to make it flush with its neighbor—the breadboard end gets in the way. To simplify things, I disassembled the doors and cleaned up the ends and panels individually before gluing each assembly together. Then I glued only the center 2 in. to 3 in. of the tenon and clamped the breadboard ends to the panel.

Laminate shims help set reveal—Because door rails should line up horizontally, whatever you do to the rail on one door, you need to do to the corresponding rail on the other door. I started by fitting the bottom rail and hinge side of one door to the opening. Using pieces of laminate to set the reveal, I handplaned the bottom and hinge edges of the door until the reveal was consistent. Then I mortised the door for the bottom knife hinge.

With the bottom hinge in place (but not screwed in), I trimmed the door's top rail until its reveal was consistent with the bottom and hinge side reveals. Then I mortised for the top hinge. I repeated these steps for the second door. Something to keep in mind is that if the doors don't align across their faces, you can alter that alignment somewhat by moving a hinge mortise slightly in or out. Make any adjustments on the bottom rail hinge mortises where they won't be noticeable.

Before any final fitting of the door reveals, I set steel screws into the hinges. I used a Vix bit, which is self-centering, to set the screw hole center. Then I drilled the hole to depth, put some wax on a steel screw and drove it home. This cut the threads for the hole and eliminated the risk of snapping off the head of one of the softer brass screws.

When both doors were hinged and all screws had been driven home, I checked the reveal between the two doors (see the top photo at left) and planed as necessary to make this reveal the same as the others. Also, I planed a slight bevel along their mating edges so the doors would have room to open. Then I replaced the steel screws with the brass ones that came with the hinges.

Bullet catches give a positive stop—Bullet catches make a satisfying thunk

Drawings: Bob La Pointe

INSTALLING BULLET CATCHES IN DOORS

Door catches must be aligned perfectly. *Bullet catches won't work unless the catch and strike plate line up precisely, so the author drills through the top rail and into the door to locate the holes for both parts simultaneously. The guide block clamped to the top rail prevents the drill bit from wandering.*

Bullet catch pilot holes *are enlarged separately. Using a portable drill with a masking tape stop on the bit, the author enlarges the catch and stop holes and drills them to depth. The doors should be supported when the catch holes are being enlarged.*

when they engage, but they have to be placed with bull's-eye accuracy if they are to work at all. I wedged the doors firmly in place with scrap; then I drilled down through a guide block, through the top front rail, through the scrap and into each door with a 3/16-in.-dia. bit (see the photo at left above). Drilling both holes at once guaranteed that mating pieces of the catch would be aligned.

Once I'd established the location of the holes with the 3/16-in.-bit, I used a series of progressively larger twist drill bits to enlarge the holes to 1/4 in. I enlarged the holes in the door and rail separately, drilling up into the front rail and down into the edge of the door. I supported the doors when drilling the holes to avoid putting a lot of shear on the hinge screws. I used masking tape stops on the bits to let me know when I was at depth. I set the bullet catch and strike plate into their holes with a dab of epoxy and used a clamp and a wooden caul to pull them home. I applied clamping pressure very gradually because both catch and strike plate tended to resist the clamping force at first and then give way all of a sudden.

I attached door stops to the insides of the door openings with brass screws. Leather pads were set into shallow mortises in the stops with barge cement. □

Gary Rogowski designs and builds furniture in Portland, Ore. He teaches at the Northwest Woodworking Studio and is a contributing editor to Fine Woodworking *magazine.*

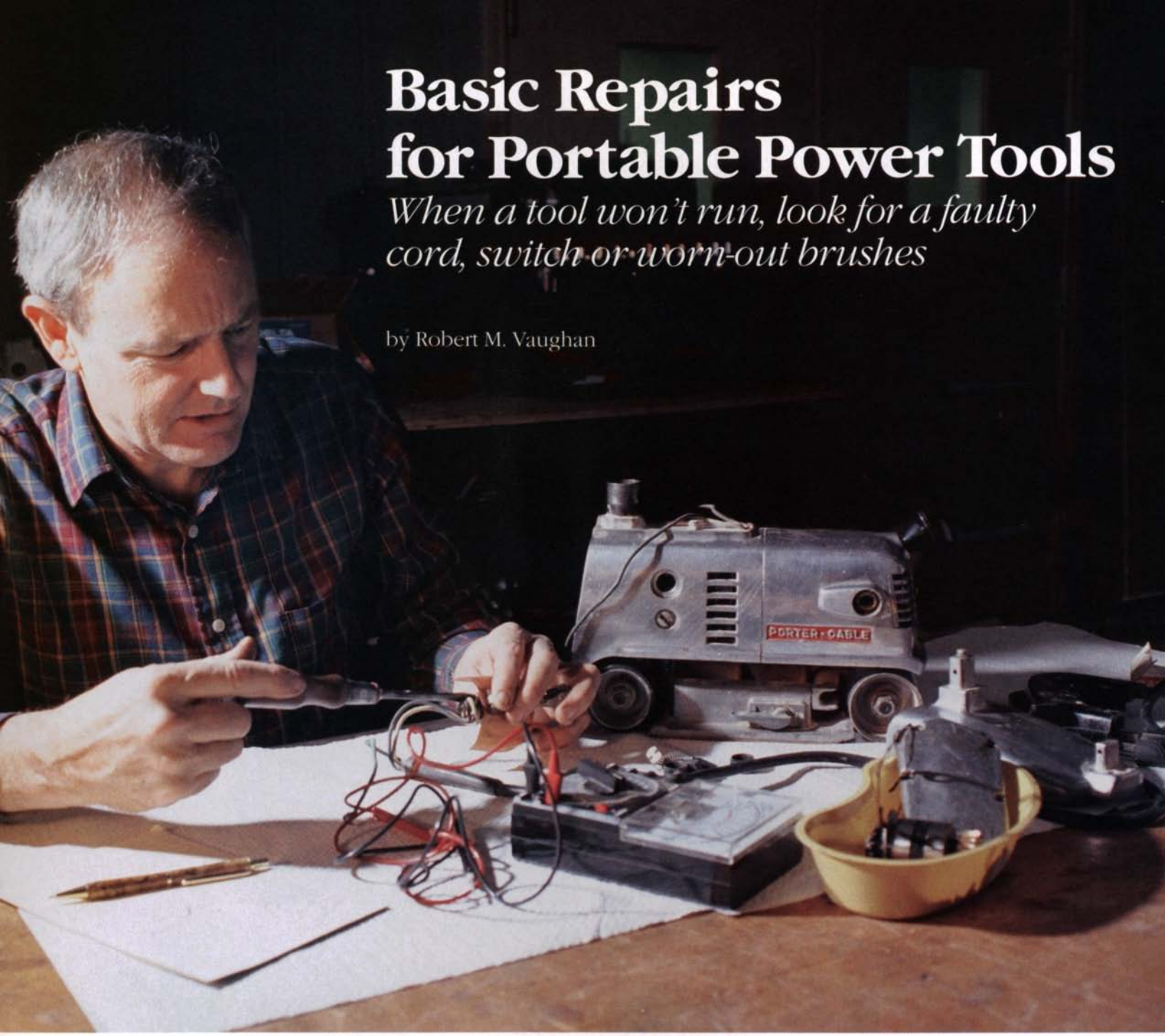
Next issue: inlay, pulls and handles

In the next issue, Gary Rogowski completes this sideboard. After describing the construction of the top and back rail, he focuses on carved inlay, pulls and handles. An article in the previous issue explained the construction of the carcase.

Basic Repairs for Portable Power Tools

When a tool won't run, look for a faulty cord, switch or worn-out brushes

by Robert M. Vaughan



***Rejuvenating old power tools**—Electrical problems often can be traced to the cord, switch or brushes. When making repairs, be sure to keep your tool unplugged, and make a diagram to aid in reassembly.*

A portable power tool is a small universal motor with a wood-shaping instrument on one end and a woodworker on the other. Mechanical details among drills, routers or belt sanders may vary. But the basic electrical components, such as cords, switches and brushes, are similar, no matter what the machine.

When a power tool won't start, it's a good bet that an electrical part is broken. My procedure for tracing problems begins with testing and examining wires, then switches and finally brushes. The only special tool you will need is a multi-tester, available from an electronics shop for about $25. With it, a host of problems can be traced right to the source.

Many electrical components on power tools can be replaced for $20 or less if you do the repair work yourself. Rechargeable power tools are another matter and won't be addressed here. Before tackling disassembly, be sure to unplug your tool. Find a spot in your shop that is clean, neat and well lighted. Take an organized approach to the job, and draw diagrams of wires and other disassembled components (see the photo above).

Start by checking the cord for breaks

If you have a tool that won't start, examine the power cord first. Serious kinks, abra-

Photos: Anatole Burkin

sions or cuts sometimes point to a broken copper wire. To check the cord, you have to get inside the tool and find where the cord meets the switch. This is often inside the handle (see the top photo on p. 86).

With the tool open, locate the wires coming from the cord. Connections at these points vary. Among the most common are screw-on terminals, spring-loaded terminals and wire nuts. If there's bare metal at these connections, such as screws, you can test the cord without further disassembly because the probe of your multi-tester can make contact with the screw.

When wires go straight into the plastic housing of a switch, the connection is probably spring-loaded. You'll need to pull out these wires. To remove the wires, insert a needle or thin probe into the small slots located next to the wires. Push until you feel some resistance, and then pull on the wires, one at a time.

With the ends of the cord exposed, use a multi-tester to determine whether current can flow from the plug prongs to the wire ends. The continuity setting on a multi-tester measures electrical resistance. Wires, plugs and simple on/off switches (in the "on" position) should show a resistance reading of zero, which means the current can flow unimpeded. (The multi-tester actually sends a tiny flow of current through its two probes.) Never plug your tool into an outlet when testing its components.

Locate the hot wire (usually the black one), which should be connected to the switch. The switch is sometimes labeled "load" at this spot. The neutral wire (usually white) goes to the motor, and the ground (usually green) is attached to a metal part of the tool.

Touch one probe of the multi-tester to the load wire, and place the other probe against one blade of the plug. If the multi-tester doesn't respond, touch the probe to the plug's other blade (see the center photo on p. 86). One of those blades (the narrow one, if they're not the same size) is the hot side, and you should get a reading of zero. If there's a break in the wire, the meter won't yield a reading at all. If you wiggle the cord during this test, you may get an intermittent reading; that's a sign of a broken wire.

If there are kinks or breaks in the outer insulation of the cord, then those sections are suspect. Breaks are often located near the handle or the plug. At this point, make your best guess about where the trouble spot is, cut the cord and then expose some wire.

Replace broken cord and plugs

Cord breaks often occur near strain reliever. *The plug on this cord is missing the grounding prong and needs to be replaced.*

Hardware store replacement plug—*If a cord breaks near the plug, cut it off there and install a new plug.*

If you think the wire break is located near the plug, cut the cord there, and perform another continuity check on the bare wires between the switch and the cut end of the cord. If you get a zero reading, celebrate by installing a new aftermarket plug, available in any hardware store (see the bottom photo). Be sure to use a three-prong plug if that's what the tool came with. A tool with a metal housing must be grounded to avoid a serious shock hazard. Double-insulated tools come with two-prong plugs.

Cord breaks also commonly occur near the thick section of cord called the strain reliever (see the top photo). If your tool has a damaged molded-on strain reliever, it's time for a new cord. Some cords have strain relievers that slide over the cord. If you find the cord inside this section is damaged, pull that portion through the strain reliever, cut it off, strip off some insulation and check for continuity. If, after all this,

you still can't find the break, chuck the cord and get a replacement.

Generic tool cords are available from electrical-supply houses. But before ordering one, examine your power cord carefully. Strain relievers have a section called the clamping ring, which fits a part of the tool housing. These rings vary in shape and size. Check the dimensions before getting a replacement cord. Original equipment cords are also available from the manufacturer or, in some cases, local repair shops.

Preparing raw wire ends

A repaired or new cord is only as good as its connection. Whenever you have raw wire connections, it's best to solder the ends of the wire to prevent the strands from unraveling.

With a soldering gun or iron, you can create nice soldered loops that take the place of crimp-on loop terminals you'd have to buy. Don't be put off by soldering. It's a very simple procedure, no matter what type of connection you are faced with.

Strip off just enough insulation (refer to the original connection). Begin by dipping the exposed wire end into paste flux. Touch the soldering gun's hot tip to the wire. When the flux starts to boil, touch the solder to the wire. After the solder flows into the wire's strands, remove the gun. Dripping solder can burn, so don't do this over your lap. For push-in switch and plug connections, twist the exposed wire in a straight line, and add just enough solder to bind the strands together. Too much solder may make it impossible to get the wire back into the switch.

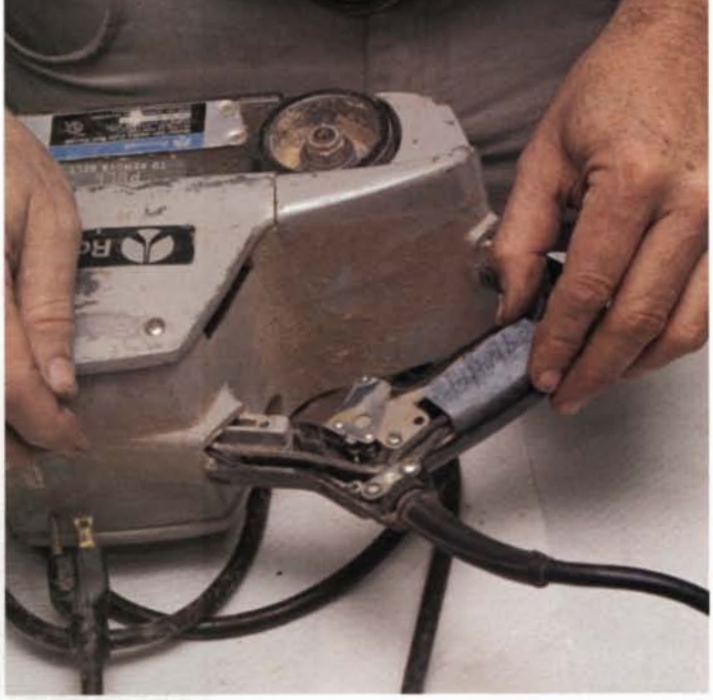
Soldered loop

For screw-on connections, making a soldered loop is the ticket. Twist the wire, and then form it into a closed loop around a form slightly larger than the shank of the screw terminal it is attached to. Remove the form, and flow solder on the wire.

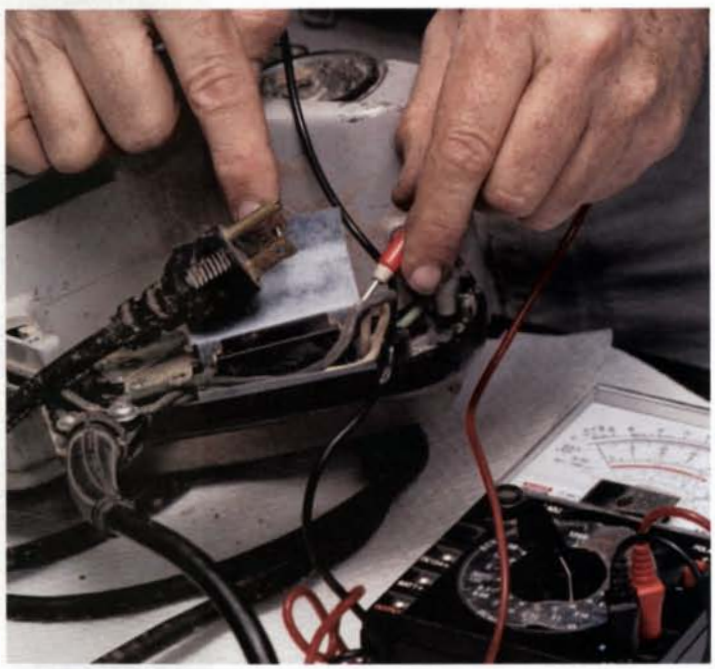
Testing for a bad switch

A switch is simply a device that interrupts current to a tool's motor. Switches come in many styles and types, from simple toggle switches to complex trigger-action rheostats. I will tackle basic on/off switches

Test cord and switch



Find the end of the power cord. *Dismantle the tool's housing to expose the end of the power cord.*



Test the cord for continuity. *A multi-tester will tell you if a cord is broken. Current should flow from the plug's prongs to their connections inside the tool.*

Testing a switch. *While the switch is locked in the "on" position, touch one probe of the multi-tester to the incoming line and the other probe to the outgoing line. If the switch is working, the multi-tester should read zero.*

Replace worn brushes

Some tools make access to brushes easy. *Brushes in this router are exposed by backing out a slotted cap on each side of the housing with a screwdriver.*

With cap removed, brush pops out. *Spring-loaded brushes should come out of their guide channels easily once the end caps are out of the way.*

Carbon brushes wear over time. *The brush on the left is new; the one on the right has worn down to where it needs to be replaced.*

here. The testing procedure is the same as the one used to examine a cord: Check whether current flows when the switch is in the "on" position.

Trace the wire from the power cord to the switch; then locate the wire that leaves the switch and goes to the motor. Using the multi-tester, touch one probe to the incoming line and the other probe to the outgoing line. Cycle the trigger to the full power position. The multi-tester should read zero. If it doesn't, the switch is broken.

Few switches can be successfully disassembled for repair and cleaning. But if you can't resist, do it in the bathtub with the drain covered and the shower curtain pulled. Switches contain tiny parts under spring-loaded pressure that will instantly evaporate in a workshop. When I'm faced with a defective switch, I order a new one.

Examining and replacing the brushes

If you've checked the cord and determined that the switch is working, but you still can't get your favorite router to run, it's time to check the brushes. Power hand tools have a pair of these components, which are simply blocks of carbon. Springs keep the brushes pressed against a cylinder of copper strips (called commutator bars) located on one end of the motor. The brushes and springs fit inside enclosures called brush channels.

Electricity is fed to a brush either by a direct wire to the brush or via a conductive metal housing surrounding the brush. When you turn a tool on, current must flow through the brushes and onto the commutator bars before you can make sawdust. Over time, brushes wear down and shorten in length (see the photo at right above). Eventually, there's not enough spring tension left to keep them pressed snugly against the commutator bars.

Some brushes can be accessed via screw-on caps. These caps are usually plastic, and they're somewhat fragile (see the left and center photos above). Often, part of the tool casing must be disassembled to reach the brushes.

Although there's nothing in a woodworker's tool chest that can be used to determine whether a brush is definitely shot, a reliable test can be performed with a probe, such as a pencil. Find a place where you have access to the end of a brush where it meets the commutator. Press the pencil against the edge of the brush, and then push the brush back into the guide channel. The brush should return smoothly and immediately when you release pressure. If it seems loose and sloppy, replace it. Another way to measure brush wear is by visual examination. A rule of thumb: If a brush is shorter than it is wide, replace it.

Rust and dirt can contaminate brush channels and cause brushes to jam. If you suspect this problem, remove the brushes and clean out the channels with a wire brush. Also, check the wire connections at the brush or brush channel. Sometimes these work themselves loose.

Here's one last thing to look for before reassembling a tool. If the commutator bars look broken, have missing sections or irregular channels between the bars, there's a possibility that your tool has some more complicated electrical malfunctions.

It may be tempting to take the motor apart to try to fix it, but more complicated repair work is best left to a local repair shop or a company repair center (the manufacturer can tell you where to find one). It may be cheaper to replace the tool, but it's worth checking first. □

Contributing editor Robert Vaughan repairs and restores woodworking machinery in Roanoke, Va.

Manufacturing Veneer

Where those amazing flitches come from

by William Duckworth

Walk into the burl warehouse of the M. Bohlke Veneer Corp. in Fairfield, Ohio, and you might be struck with an almost religious reverence for the place. Unlike the other buildings that house this veneer manufacturing operation, this storage building is dead quiet, cool and damp. Burls of amboyna, Carpathian elm, maple, redwood and walnut—some of them as big as 8 ft. in diameter—lie in bunches on the floor like giant mushrooms sprouting from the moist concrete. Owner Manfred Bohlke's private collection of totem poles, reaching toward the 25-ft. ceilings, stand guard over the harvested burls and add to the cathedral-like effect of this space.

Bohlke joined the ranks of this business 25 years ago when he purchased a small operation called the Fairfield Veneer Mill. Back then, he had a slicer, a drier and only a few employees. Nowadays, he has 13 slicers, nine driers and 350 employees who produce some two million square feet of veneer per day.

The Bohlke Corp. is one of 100 or so manufacturers in the United States and Canada that slices the veneer used for doors, furniture, plywood panels and high-end architectural millwork. The annual production of all the manufacturers in North America works out to many billions of square feet of veneer. Figuring an average tree yields about 7,000 sq. ft. (depending on how thick you slice it), that means somewhere close to a million trees are felled and made into premium-quality veneer every year.

It's all in how you slice it

Bohlke's burls set the company apart from some of the other high-end veneer plants that I visited. Because of their odd shapes, burls are best cut on a rotary lathe. Bohlke has four of them. The knife remains fixed, and the burl rotates in a complete arc. The company also has eight plain slicers and one half-round slicer—essential equipment for premium-quality veneer production.

Plain slicers (see the top photo on the facing page), also

Photos: author

called flat-cut slicers, accomplish most of the veneer-cutting work at all of the manufacturing plants throughout North America. Plain-sliced, book-matched veneer is what you will find on the best plywood panels and the most expensive manufactured furniture.

With both plain slicers and half-round slicers, the flitch is moved against a fixed knife. Plain slicers move the flitch straight up and down at a slight angle left to right, similar to the way you would work a knife against a ripe tomato to get a clean cut. Half-round slicers (see the bottom photo) rotate the flitch in an arc almost parallel to the center of the log, so you get veneer very similar to plain-sliced but with less-pronounced cathedral patterns showing on the face.

According to John Ackerman, general manager of the Genwove U.S. Ltd. plant in Indian Trail, N.C., the customer decides how thick the veneer will be cut. And customer demands vary widely. Veneer manufacturers sell primarily to panel and door manufacturers, furniture manufacturers and large architectural millwork facilities worldwide. At Genwove, they slice a lot of softwoods: Douglas fir, hemlock, eastern and western knotty pine, and southern yellow pine. The standard thickness for those species is 1/26 in. When the plant cuts hardwoods, settings vary from 1/36 in. to 1/50 in. The slicers at Genwove can be set as thick as 1/8 in. or as thin as 1/85 in.

At a brand new 320,000-sq.-ft. facility in Darlington, Pa., the Interforest Corp. has set up a production plant that cuts only domestic hardwoods: ash, birch, cherry, maple, red and white oak, and walnut. With seven state-of-the-art slicers, this facility can cut veneer from 2.5mm to .2mm thick. That translates to a range from approximately 3/32 in. to 8/1,000 in. With a plain slicer chopping veneer at an average of 70 strokes per minute, those kinds of tolerances require an extremely sharp knife.

***Plain slicers are the most common** for premium-grade panel and furniture veneer. These machines move the wood up and down and in a sideways motion against a fixed knife.*

Knives are sharp and very big

At all three plants I visited, one routine is constant: Each knife is sharpened after every eight-hour shift. Sizes vary, but the largest knife I saw was 5/8 in. thick, about 10 in. wide and 18 ft. long (see the top left photo on p. 91). No carbide here; most of these knives are made in Germany or Japan of steel that can be honed to a razor-sharp edge.

At Genwove, knives are sharpened with only one bevel, using a grinder that rides on a track. The edge is honed with a stone by hand. At Bohlke, a Japanese-made computerized sharpening system grinds the knives with four different bevels on one side and two bevels on the other. Four of the bevels are ground at a

***Half-round slicers minimize waste** by cutting the flitch in an arc. Flitches are clamped to the beds of these machines by means of grooves milled into the flat back of the flitch.*

***Preparing a burl for the lathe**—Stephen Fowler, an employee of the M. Bohlke Veneer Corp., checks for debris before making the end cuts on a redwood burl headed for a rotary lathe.*

micro-level. The precise angles at which the bevels are ground vary with the species the knife will be cutting.

When a single knife can cost as much as $4,000, veneer manufacturers all share the same enemy: debris hidden within the flitch (see the photo at right). A good log buyer out in the field is trained to look for signs of some of the more common rubble—bullets, fence wire, nails, porcelain insulators and horseshoes—but they can't catch everything. *Horseshoes?* Yes. During the latter part of the last century, cowboys had a habit of hanging used horseshoes over the limbs of trees, where they would eventually be covered over and buried inside of the growing tree.

Log buyers: an unseen source of supply

Greg Kelley, a plant engineer at Bohlke for 17 years, told me he's never met a log buyer. Buyers work in the field, as full-time employees of the company or as free agents, foraging sawmills and cruising timber stands throughout the Midwest, Northeast and the South for veneer-quality logs. It's an art as well as a science, according to Brent McClendon of the Hardwood Plywood and Veneer Association. Deciding which logs qualify for veneer mills is a complex talent based on years of experience.

Buyers want logs that are especially straight and clear. When they purchase already felled trees from a sawmill, end cuts will usually reveal the quality and color of the grain. Buying standing timber is more risky. They look at the slope and grade of the land and the condition of the soil. The color and texture of the bark will some-

***The enemy is metal.** A worker points to a nail found in a walnut burl. The lathe operator periodically stopped the machine and chopped around the nail with an ax to remove it bit by bit and prevent damage to the knife.*

"A good log buyer out in the field is trained to look for signs of some of the more common rubble—bullets, fence wire, nails, porcelain insulators and horseshoes—but they can't catch everything. Horseshoes? Yes."

***An 18-ft. razor**—Keeping the knives sharp is a top priority for veneer makers. It takes about a half hour for automated grinders to sharpen a knife.*

times reveal problems lurking underneath the surface. But until a log is sawn in half—after it's been bought and shipped to the mill—they may not know it contains mineral streaks or insect damage.

Little waste and lots of productivity

All of these factories are a marvel of efficiency when it comes to using their own waste. Bark, cutoffs, sawdust, even scraps of veneer that fall to the floor are collected and fed into burners. The burners heat vats of water used to soak the logs before slicing and the press driers that remove the moisture afterward. Flitches come out of their concrete or stainless-steel cooking baths at about 55% moisture content, steaming hot. After the flitches are sliced, the press driers heat both sides of each leaf at 300° to 350°F to keep the veneer from curling. The water from the vats is filtered and reused. The backing boards, meaning the slabs left over after a flitch is sliced, are often milled and sold as flooring, or they're simply cut up as firewood. Computerized bar-coded labels track each flitch through the production process. At the end of the clipper line, where flitches are trimmed to final size, electronic eyes read and calculate the total square footage to be shipped or put into storage.

Some veneer is very dear

As they do in any business, prices for veneer fluctuate depending on supply and demand. But some really exceptional trees can command prices that are hard to believe. Manfred Bohlke has a special showroom chock full of those kinds of flitches (see the photos at right), including an American walnut tree nicknamed "The Beast." This tree was felled close to 30 years ago, and Bohlke is the fifth or sixth owner. The unusually wide and clear veneer, cut at a full 1/28 in. thick, is for sale at $3 per square foot. The only catch is that you have to buy the entire flitch. It is 17 ft. long and contains 36,000 sq. ft. of veneer.

I saw a Macassar ebony flitch totaling 10,000 sq. ft. that sells for $7 per square foot. I also saw a Brazilian rosewood flitch that looked like half of a very large old-growth tree. Felled in 1975, long before the export ban on this species, the rosewood veneer had to be close to 4 ft. wide. You can cart this rare flitch home to your garage shop for a mere $175,000. □

William Duckworth is an associate editor of Fine Woodworking.

***Rare, expensive veneers**—The Macassar ebony (top left), German white oak (top right) and Brazilian rosewood (bottom) at the Bohlke showroom represent some of the most expensive veneers on the market. The rosewood is so valuable that every leaf was photographed for an album to show to prospective buyers.*

In a durability test, the competitor's hammer lasted 60 seconds. If you happen to need one for longer than that, buy a Stanley hammer.

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*Overstrike test conducted by striking hammer handle against metal object. © 1994 The Stanley Works.

Ultimate planes

***Top of the line**—A reproduction Norris plane made by Carl Holtey in England is meticulously detailed, performs beautifully and has a price to match.*

During the first third of this century, T. Norris and Son of London, in business since the 1860s, manufactured a line of bench planes considered the hallmark of quality in hand tools. They featured dovetailed bodies, rosewood infill, a very heavy cutting iron and, in the best models, a patented adjuster used to set the depth and tilt of the iron. Their heavy weight and solid construction permitted exceptionally fine work.

Many of these old planes are still in use today and tool collectors are snapping them up, often at very high prices. Because they have become scarcer, the motivation to reintroduce them has steadily increased. During the last 20 years or so, a number of individuals and small companies have attempted to recreate the Norris planes in style and quality. Because authentic construction methods are labor intensive and the market is relatively small, most of these past efforts have failed.

Making a reproduction Norris plane was an irresistible temptation for cabinetmaker Carl Holtey of Finmere, Buckingham, England. Several years ago, he began producing Norris reproductions with the skill and precision of a watchmaker. Today, he makes about a dozen models. They range in size from a thumb plane to a number A1, which is a 22½-in. jointer. Holtey has made a number of refinements on the originals.

The parallel smoother, based on the Nor-

Photo this page: Irvin Rzepnick

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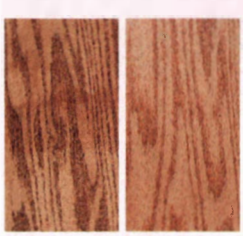

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ris A13, is typical of Holtey's work (see the photo on p. 98). It's constructed of steel, naval brass and Indian rosewood.

Holtey's plane outperformed even the most carefully tuned plane in my collection, leaving a flawless surface on everything from pine to highly figured maple. And this plane was able to generate continuous shavings thinner than .001 in.

Although this plane is a profound delight to look at and use, it's not really clear whether Holtey is producing workshop tools or works of art. One wonders how many of his planes are in actual use and how many are only admired. Prices start at £960 ($1,625) for either the thumb plane or chariot plane and go all the way up to £2,130 ($3,608) for a skew shoulder or a rounded smoother. The plane I used costs £1,470 ($2,490). Holtey, working alone, makes only about 20 planes a year. He can be contacted at Hedgelands, Fulwell Road, Finmere, Buckingham, England MK18 4AS.

—Allan J. Boardman

Photo: courtesy of Porter-Cable Corp.

***Porter-Cable's 24-in. belt sanders** make less noise.*

Psst: Porter-Cable's Whisper Series belt sanders

Porter-Cable's Whisper Series belt sanders sound more like vacuum cleaners than power tools. I compared a new 360VS (which uses a 3-in. by 24-in. belt) against one of their older models, the 352VS (with a 3-in. by 21-in. belt). At peak speed, the older tool produces a high-pitched whine; the Whisper Series machine sounds more like a medium-pitched whoosh.

A whisper it's not, but a sound-level meter confirmed what my ears were telling me. The new model pegged the meter at 95 dB, 10 dB less than the 352VS at peak power. That's a significant reduction. At low speeds, both machines pegged the meter at 92 dB. I got these readings by placing the sound-level meter at ear height about 3 ft. away from the machines.

Occupational Safety and Health Administration (OSHA) standards limit industrial workers to a noise-level exposure of 95 dB for four hours. At 105 dB, the limit is one hour. It's still advisable to wear hearing protection.

Engineers reduced the noise level of the sanders by making several changes, including refining the air flow from the fan and replacing the cog belt drive with a V-belt. The Whisper Series includes all Porter-Cable's 3-in. by 24-in. and 4-in. by 24-in. belt sanders.

And, yes, the 360VS sands too—just as well as the noisier model. The sander sells for about $250. *—Anatole Burkin*

New Powermatic 3520 lathe

Students in my woodturning classes often ask me for a recommendation on which lathe to buy. I advise them to shop carefully, look at features like swing, type of speed control, size and price. Then I suggest they select the lathe with the fewest objectionable qualities.

Earlier this year, I purchased a new Powermatic 3520 woodturning lathe (see the photo below) using the same checklist I give my students. When I first saw the lathe, I couldn't find anything objectionable. That still holds true after several months of use.

Premier woodturner Rude Osolnik was asked to consult on the building of this machine, which Powermatic introduced in January. The result is a 20-in., variable-speed lathe that is powerful, quiet, stable and comfortable to use.

One of my favorite features is the way the headstock can be positioned anywhere along the length of the bed. When I hollow out vessels, I can position the headstock and workpiece at the end of the lathe. That means I don't have to lean

***American-made lathe**—Powermatic's new 3520 lathe features a 20-in. swing and a variable-speed, 2-hp motor.*

Photo at right: courtesy of Powermatic

over the lathe bed as I work.

The headstock, tool rest and tailstock are easy to adjust with beefy cam levers that cinch down everything. The 650-lb. weight of this machine makes it very stable, even when turning large pieces.

The Powermatic 3520 comes with a 2-hp Baldor motor and an electronic, variable-speed control (0 to 3,000 rpm). The tool-rest holder is a generous 19 in. long. Distance between centers is 34½ in. If you need more length, two accessory extensions—18 in. or 50 in.—are available. Other accessories include a 48-position indexer. The U.S.-made lathe sells for about $3,800.

—Charles R. Alvis

Chairmaker's travisher

Travisher by Fred Emhoff—A retired tool-and-die maker manufactures these hand tools used for scooping out the seats of chairs.

A few years ago, Fred Emhoff, a tool-and-die maker, attended Michael Dunbar's Windsor chairmaking workshop in Hampton, N.H., hoping to develop a second career as a chairmaker. While at the workshop, he learned how to use a travisher, a spokeshave-like tool with a compound radiused bottom used for carving and smoothing the recessed contours of the Windsor seat. Though not essential, a good travisher makes quick work of a chair seat.

Emhoff liked the way the travisher shaped a seat and decided to make his own version of the tool. After all, he's a toolmaker. After developing a prototype, he sent it to Dunbar for a critique. What Emhoff got instead was a dozen orders.

His travishers come with 6-in.-radius blades that are friction-fit to wooden bodies and held fast by a pair of setscrews. I've cut across the grain and even climbed the grain with it. This is a sleek tool that takes a nice cut and leaves a beautiful finish.

Emhoff makes his travishers from scratch. He rough cuts the wooden body on the bandsaw and then shapes it by hand with rasps and files. He also hardens and tempers the blades himself. Every tool is then tested and sent out ready to use. Emhoff sells the tools from his shop (607-965-8420) for $120.

These days, Emhoff is so busy with orders that he hasn't had time to build Windsors.

—Mario Rodriguez

CMT Florida goes white; Italian CMT stays orange

A few months ago, there were two companies calling themselves CMT and selling orange router bits. A tussle over the name and other issues ended up in court, and a jury was asked to sort things out. The dust hasn't quite settled, but this much seems clear: Now we can choose between orange bits from CMT U.S.A., Inc., or white bits from the renamed Jesada Tools.

A jury in Tampa, Fla., ruled that CMT U.S.A., Inc., the North Carolina company whose bits are made in Italy, gets to keep the CMT name and the color orange. What was CMT Tools, the Florida company with the striped-orange logo that introduced the Italian bits to the U.S. market and now manufactures them here, gets $1.7 million for "unjust enrichment."

The U.S. district court judge in this civil trial has the ultimate power to enforce the jury's verdict, and the last we heard, lawyers for both sides still were trying to sway the judge with post-trial motions.

Nonetheless, the Florida company reacted quickly and changed its name to Jesada Tools. The orange logo remains, but the bits coming out of the factory are white.

The jury's verdict may be in, but the bigger decision remains for woodworkers worldwide: What goes better with a yellow router, white or orange? *—A.B.*

Allan J. Boardman is a retired aerospace industry manager and woodworker from Woodland Hills, Calif. Anatole Burkin is an associate editor of **Fine Woodworking.** ***Charles R. Alvis, president of the American Association of Woodturners, teaches woodturning at Arrowmont School of Arts and Crafts in Gatlinburg, Tenn. Mario Rodriguez is a contributing editor to*** **Fine Woodworking.**

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	Assortment	$2.05
5" / 5 holes	100 & finer	$2.05
	80 Grit	$2.20
	60 Grit	$2.30
	Assortment	$2.20
5" / 8 holes	100 & finer	$2.05
	80 Grit	$2.20
	60 Grit	$2.30
	Assortment	$2.20
6" / 6 holes	100 & finer	$3.00
	80 Grit	$3.15
	60 Grit	$3.35
	Assortment	$3.15
6" / 8 holes	100 & finer	$3.00
	80 Grit	$3.15
	60 Grit	$3.35
	Assortment	$3.15
6" /16 holes	100 & finer	$3.00
	80 Grit	$3.15
	60 Grit	$3.35
	Assortment	$3.15

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Size	Grit	Price
4½" / 8 holes	100 & finer	$1.60
	80 Grit	$1.65
	60 Grit	$1.75
	Assortment	$1.65
5" / 5 holes	100 & finer	$1.60
	80 Grit	$1.65
	60 Grit	$1.75
	Assortment	$1.65
5" / 8 holes	100 & finer	$1.60
	80 Grit	$1.65
	60 Grit	$1.75
	Assortment	$1.65
6" / 6 holes	100 & finer	$2.25
	80 Grit	$2.35
	60 Grit	$2.50
	Assortment	$2.35
6" / 8 holes	100 & finer	$2.25
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	60 Grit	$2.50
	Assortment	$2.35
6" / 16 holes	100 & finer	$2.25
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	60 Grit	$2.50
	Assortment	$2.35

Heavy E-weight paper, Hook & Loop

Size	Grit	Price
4½" / 8 holes	100 & finer	$2.75
	80 Grit	$3.00
	60 Grit	$3.35
	Assortment	$3.00
5" / 5 holes	100 & finer	$2.75
	80 Grit	$3.00
	60 Grit	$3.35
	Assortment	$3.00
5" / 8 holes	100 & finer	$2.75
	80 Grit	$3.00
	60 Grit	$3.35
	Assortment	$3.00
6" / 6 holes	100 & finer	$3.90
	80 Grit	$4.50
	60 Grit	$4.95
	Assortment	$4.50
6" / 8 holes	100 & finer	$3.90
	80 Grit	$4.50
	60 Grit	$4.95
	Assortment	$4.50
6" / 16 holes	100 & finer	$3.90
	80 Grit	$4.50
	60 Grit	$4.95
	Assortment	$4.50

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Size	Grit	Price
5"	100 & finer	$3.25
	80 Grit	$3.40
	60 Grit	$3.55
	50 Grit	$3.75
	40 Grit	$3.95
	36 Grit	$4.15
6"	100 & finer	$4.65
	80 Grit	$4.90
	60 Grit	$5.20
	50 Grit	$5.55
	40 Grit	$5.85
	36 Grit	$6.20

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Size	Grit	Price
5"	100 & finer	$1.05
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	60 Grit	$1.15
6"	100 & finer	$1.30
	80 Grit	$1.35
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	150 Grit	$2.75
	120 Grit	$2.95
	100 Grit	$3.40
	80 Grit	$3.90
4½" x 5½"	220 & Finer	$0.70
	180 Grit	$0.80
	150 Grit	$0.85
	120 Grit	$0.90
	100 Grit	$1.00
	80 Grit	$1.15
3⅔" x 9"	220 & Finer	$0.95
	180 Grit	$1.05
	150 Grit	$1.10
	120 Grit	$1.20
	100 Grit	$1.35
	80 Grit	$1.55

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Size	Grit	Price
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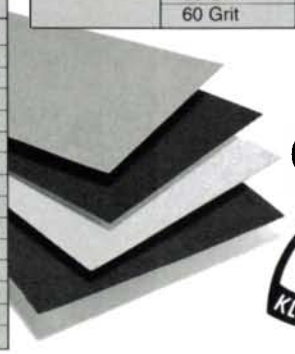
	80 Grit	$5.25
	60 Grit	$6.35
	50 Grit	$6.80
	40 Grit	$7.30
4½" x 5½"	100 & Finer	$1.45
	80 Grit	$1.55
	60 Grit	$1.90
	50 Grit	$2.00
	40 Grit	$2.15
3⅔" x 9"	100 & Finer	$1.95
	80 Grit	$2.10
	60 Grit	$2.50
	50 Grit	$2.70
	40 Grit	$2.90

Aluminum Oxide Paper

Size	Grit	Price
9" x 11	100 & Finer	$1.75
	80 Grit	$1.75
	60 Grit	$2.00
4½" x 5½"	100 & Finer	$0.45
	80 Grit	$0.55
	60 Grit	$0.60
3⅔" x 9"	100 & Finer	$0.65
	80 Grit	$0.70
	60 Grit	$0.75

Stearate

Size	Grit	Price
9" x 11	100 & Finer	$2.17
	80 Grit	$2.50
	60 Grit	$2.80
4½" x 5½"	100 & Finer	$0.63
	80 Grit	$0.70
	60 Grit	$0.84
3⅔" x 9"	100 & Finer	$0.84
	80 Grit	$0.98
	60 Grit	$1.12



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DEWALT TOOLS

DW321K	Top Handle Jigsaw Kit	300	164
DW364	7-1/4" Circ. Saw w/brake, 13 amp	294	162
DW306K	8.0 amp Recip Saw v/s w/ case	291	155
DW610	1-1/2 HP 2 handle Router	266	152
DW411	1/4 sheet Palm Sander, 1.7 amp	88	58
DW705	12" Compound Mitre Saw	734	359
DW705K	DW705 with 80 tooth blade	Sale	395
DW704	12" Mitre Saw	570	329
DW100	3/8" Drill, 4 amp, 0-2500 rpm,rev	118	68
DW274	Drywall Gun, 0-4000, 6.3 amp	160	95
DW268	Tek Gun, 0-2500 rpm, 6.5 amp	288	159
DW402	4-1/2" Grinder 6 amp	166	89
DW682K	Biscuit Joiner with case	448	199
DW625	3 HP Electronic Plunge Router	520	279
DW625	**router comes with DW6913 edge guide !**		
DW621	NEW 2 HP Plunge Router	400	218
DW621	**comes w/ FREE fine height adjuster !**		
DW675K	3-1/8" Planer with case	292	164
DW431	3 x 21 var. speed Belt Sander	338	188
DW420	Palmgrip Random Orb Sander	124	69
DW421	above Sander with dust collector	144	74
DW423	Palm Random Orbit Sander variable speed	170	94
DW444	6" Random Orbit Sander	266	145
DW443	DW444 with hook & loop pad	266	145
DW935K	14.4V 5-3/8" Trim Saw kit	444	237

DEWALT CORDLESS DRILLS

DW952K-2	3/8" v/spd w/ two 9.6V batt.	284	129
DW972K-2	3/8" variable speed w/ two 12V XR batteries	362	182
DW904	12 volt flashlight		29.95
DW972K-2 drill & DW904 flashlight		*Sale*	*199*
DW991K-2	3/8" v/spd w/ two 14.4V XR batteries	415	209
DW994KQ	1/2" variable speed w/ one 14.4V XR battery	458	239
DW996K-2	1/2" v/spd Hammer drill w/ two 14.4V XR batteries	396	259

Above drill kits come w/charger & steel case !

DW991KS-2 DW991K drill, DW935 saw, &case 349

DeWalt 18 volt Cordless Tools

DW938K	NEW Recipro Saw Kit	520	289
DW995K	1/2" Drill Kit	428	229
DW997K	1/2" Drill / Hammer Drill Kit	454	249
DW936K	5-3/8" Saw Kit	458	249
DW995KS-2	DW995K Drill, DW936 Saw, and case	Sale	395

WAP VACUUMS

Model	Description	List	Sale
766RDF	10 gallon turbo vacuum	845	465
766RDF-D	"Drywaller" 10 gal turbo vac	915	549
766RDF-DAS	Same as above w/auto start	950	589

CLAYTON OSCILLATING SPINDLE SANDERS

140	Portable sander w/ 4-1/2" spindle.	625	559
146	Portable sander w/ 9" spindle	685	609
100	Floor mount sander w/4-1/2" spnd.	785	709
106	Floor mount sander w/ 9" spindle.	845	759

DREMEL TOOLS

3955	Moto Tool Kit with bits & case	134	75
3956	Super Moto Tool Kit w/ acc.	152	85
1672	16" Scroll Saw - 2 spd "Best buy"	302	174
1695	16" var. speed Scroll Saw	408	229
290	Electric Engraver with point	25	16
1731	5" Disc1" x 30" Belt Sander	189	114

JORGENSEN ADJUSTABLE HANDSCREWS

Item#	Jaw Length	Opening Capacity	List	Sale	Box of 6
#3/0	6"	3"	17.05	9.90	56.50
#2/0	7"	3-1/2"	18.30	10.70	60.95
#0	8"	4-1/2"	20.35	12.10	66.95
#1	10"	6"	23.30	12.90	71.95
#2	12"	8-1/2"	26.75	14.90	83.95
#3	14"	10"	33.85	18.55	105.75
#4	16"	12"	44.05	24.65	140.95

JORGENSEN STYLE 37 2-1/2" Throat 1/4"x3/4"

Item#	Jaw Length	List	Sale	Box of 6
3706	6"	10.85	6.20	33.50
3712	12"	12.05	6.80	37.25
3718	18"	13.25	7.60	41.05
3724	24"	14.55	8.15	43.95
3730	30"	16.20	9.05	48.85
3736	36"	17.70	10.20	54.95

JORGENSEN STYLE 45 5" Throat 1-3/8" x 5/16"

Item	Jaw Length	List	Sale	Lots of 6
4512	12"	34.50	20.75	114.95
4518	18"	36.35	22.30	122.95
4524	24"	38.50	23.65	129.95

JORGENSEN STEEL "I" BAR CLAMPS

Model	Size	List	Sale	Lots of 6
7224	24"	35.75	20.30	112.95
7236	36"	38.35	22.35	124.75
7248	48"	42.15	24.45	134.95
7272	72"	48.50	29.60	168.75

PONY CLAMP FIXTURES

Model	Description	List	Sale	Lots of 12
50	3/4" Pipe Clamps	15.45	8.10	92.50
52	1/2" Pipe Clamps	12.65	6.95	74.95

MK TILE SAWS

Model	Description	List	Sale
MK270	1/2 HP - 7" blade, light-30 lbs.	415	299
MK770	1/2 HP - 7" blade	795	589
MK660	3/4 HP - 7" blade	795	595
MK880	1 HP - 8" blade	986	859

We stock all replacement blades for above saws.

Msxe6362	FEIN Triangle Sander v/spd	Sale	199
Msx625	FEIN NEW Air Triangle Sander	Sale	195
LPN672	PONY Air Palm Nailer w/ glove	Sale	89
LPN672K	LPN672 w/ case & 3 special tips	Sale	109
RTM01	ROTOZIP Drywall cutout unit	Sale	68.95
SCS02	ROTOZIP NEW cordless unit	252	169

BLACK & DECKER

1166	3/8" Drill 0-2500 rpm 4 amp	118	68
2600	3/8" Drill 0-1200 rpm 4.5 amp	173	98
WM425	NEW Workmate 425	191	109
1350K	1/2" Timberwolf Drill 2 speed	573	335
1180	3/8" Drill rev. 0-1200 rpm 5 amp	215	119
2670	1/2" Impact Wrench w/ detent pin	298	169
2038	Drywall Gun 0-2500 rpm 5 amp	178	95
2054	Tek Gun 0-2500 5.0 amp	289	159
2750	4-1/2" Grinder 10,000 rpm 6 amp	159	89
2694	7-1/4" Super Sawcat Circ Saw	294	149
2695	8-1/4" Super Sawcat Circ Saw	328	169
3339	Elu 3 HP v/spd Plunge Router	520	269

CRAIN FLOOR COVERING TOOLS

800	Super door jamb saw kit	Sale	275
520	Swivel-lock stretcher	Sale	489
499	Junior power stretcher	Sale	419
507	Stairway stretcher	Sale	135
600	Adjustable deluxe knee kicker	Sale	93
612	Knee kicker 17-1/2" to 21-1/2"	Sale	86
505	Economy adjustable knee kicker	Sale	69
506	Mini knee kicker	Sale	65
785	Toe-kick saw - 110 volt	Sale	188
890	6" S/C pro iron 250° - 375° F	Sale	125
920SC	Deluxe heat bond iron - 800 watt	Sale	83
245	Deluxe carpet trimmer	Sale	49

DURA III- ADJUSTABLE STILTS

Model	Description	List	Sale
D1422	14"-22" extension	270	209
D1830	18"-30" extension	288	229
D2440	24"-40" extension	304	249

Above models include strap adapter kits

SIOUX TOOLS

8030	3/8" variable speed Drill	263	149
8000	3/8" variable speed close quarter Drill 0-1300rpm	211	125
8005	Same as 8000 but is 0-2500 rpm	221	139
690	5" Air Random Orbit Sander	228	132
790	NEW lightweight 5" Sander	235	138

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ALUMINUM LADDER JACKS
Must be installed on Type 1 or Type 1A ladders only

Model	Accepts Stage Width	Spans	Attaches to Rung	Sale
10-14-02	14"	2 rung	2 rungs	83.95
10-20-02	20"	3 rung	2 rungs	89.95
10-20-03	20"	3 rung	3 rungs	99.95

ALUMINUM ARTICULATED LADDERS
TYPE IA -300 # RATING

Model	Length	Weight(lbs.)	Sale
M7-14	7'	43#	159.95
M8-16	8'	46#	179.95

FIBERGLASS STEP - TYPE 1- 250# RATING

6004	4'	13#	57.95
6005	5'	16#	67.95
6006	6'	18#	69.95

FIBERGLASS STEP - TYPE 1- 250# RATING

6004-S	w/pail shelf 4'	15#	63.95
6005-S	w/pail shelf 5'	18#	70.95
6006-S	w/pail shelf 6'	20#	74.95

FIBERGLASS STEP - TYPE 1A- 300# RATING

6204	4'	14#	66.95
6205	5'	18#	72.95
6206	6'	20#	79.95

ALUMINUM FLAT STEP TYPE 11- 225# RATED EXTENSION

Model	Size	Working Length	Weight(lbs)	Sale
D1224-2	24'	21'	33#	184.95
D1228-2	28'	25'	42#	215.95
D1232-2	32'	29'	53#	249.95
D1236-2	36'	32'	62#	279.95

ALUMINUM FLAT STEP TYPE 1- 250# RATED EXTENSION

D1324-2	24'	21'	39#	209.95
D1328-2	28'	25'	50#	239.95
D1332-2	32'	29'	62#	268.95
D1336-2	36'	32'	77#	328.95
D1340-2	40'	35'	85#	369.95

ALUMINUM FLAT STEP TYPE 1A- 300# RATED EXTENSION

D1520-2	20'	17'	37#	199.95
D1524-2	24'	21'	45#	234.95
D1528-2	28'	25'	56#	259.95
D1532-2	32'	29'	66#	299.95
D1536-2	36'	32'(250# rating)	79#	339.95
D1540-2	40'	35'(250# rating)	89#	389.95

FIBERGLASS FLAT STEP TYPE 1A- 300# RATED EXTENSION

D6216-2	16'	13'	34#	209.95
D6220-2	20'	17'	40#	228.95
D6224-2	24'	21'	53#	264.95
D6228-2	28'	25'	60#	298.95

FIBERGLASS FLAT STEP TYPE 1A- 300# XTRA HEAVY DUTY EXTENSION

D7120-2	20'	17'	43#	289.95
D7124-2	24'	21'	58#	319.95
D7128-2	28'	25'	66#	359.95

Buy any 3 ladders (can be asst) deduct additional 5% Prepaid freight and best prices too!

STABILA LEVELS

Model	Description	List	Sale
21990	NEW 10" Torpedo Level	Sale	12.95
24640	24" Level w/ hand holes	62.20	43
24670	48" Level w/ hand holes	79.70	55
24610	48" Level w/ angle setter vial	79.70	55
24610 level comes with Free 21990 Torpedo level			
24680	72" Level w/ hand holes	145.45	99
27170	48" Level w/o hand holes	71	49
27000	78" Level w/o hand holes	146	105

RECORD WOODWORKING VISES

Model	Jaw\Width	Opening	List	Sale
53E	10-1/2"\15"	Quick release	248	109
52D	7"\8"	Quick release w/dog	169	79
52-1/2D	9"\13"	Quick release w/dog	231	95

KRAUSE MULTIMATIC LADDERS

Model	Description	List	Sale
121482	12' Aluminum Multi Purpose	264	128
121499	16' Aluminum Multi Purpose	286	148

HITACHI TOOLS

Model	Description	List	Sale
C8FB2	8-1/2" Slide Compound Saw	1169	489
998862	8-1/2" Carbide blade - 60 tooth	Sale	44.95
C10FS	10" Slide Compound Saw	1627	739
C7SB	7-1/4" Circular Saw	Sale	105
M12V	3 HP variable speed Router	541	245
TR12	Plunge Router 3 HP	377	189
SB-75	3 x 21 Belt Sander w/ bag 2 spd	315	158
DH24VBK	15/16" SDS Rotary Hammer	298	179
C10FC	10" Mitre Saw	533	199
C15FB	15" Mitre Saw	1346	659
DN10DYK	9.6V Right Angle Drill Kit	370	159
G12SA	4-1/2" Grinder 6.9 amp	177	95
FDS10DVA	9.6V Drill Kit w/ flashlight	Sale	99
DV14V	3/8" Hammer Drill with case	230	115
NR83A	Framing Nailer 2 - 3-1/2 Full Head.		389
NR83AA	Framing Nailer 2- 3-1/2 Clip Head.		369
NV45AB	Coil Roofing Nailer 7/8 - 1-3/4	935	399
N5008AB	7/16" Stapler-16 ga. 1 - 2 lgth	679	305
EC6B	1 HP Oil Compressor	540	279
EC6C	1 HP Oil-less Compressor	580	295
C10RA	NEW 10" Table Saw	632	319
NT65AA	15 ga. Brad Nailer 1-1/4 - 2-1/2.	636	365

WAGNER PAINT & SPRAYER PRODUCTS

959	Power Roller	140	109
255	Airless Kit	180	135
375E	Airless System	195	164
404	Airless Painter & Roller	320	265
505	High performance Airless Painter	440	369
HVLP	Fine coat finishing HVLP System	195	159
CS2000	Pro fine finish HVLP System	339	278

DAVID WHITE INSTRUMENTS

Model	Description	List	Sale
LP6-20	Sight Level package - 20x	329	215
LP6-20XL	LP6-20 with 9056 tripod & 7620 rod	409	269
L6-20	Meridian Level - 20x	309	199
LT8-300	Level Transit - 26x	739	489
LT8-300P	above Level with optical plum.	869	565
LT6-900	Level Transit - 20x	419	269
LTP6-900	Above Level with tripod & rod.	615	389
ALT6-900	Automatic Level - Transit - 18x.	666	429
ALTP6-900	above Level with tripod & rod	799	499
ALP6-18HD	Auto. Level-18x with tripod & rod	599	395
AL8-22	Automatic Level - 22x	583	339
AL8-26	Automatic Level - 26x	854	379
ALP8-26	above Level w/ tripod and rod	977	499
ML100T	Laser Level	1099	945
ML100	Laser Level w/detector	1249	1075
ML200	Visible Beam Laser	979	799
ML200T	ML200 w/o detector & bracket.	749	625
LL100	Finish Line Laser Level	199	135

QUAL-CRAFT JACKS

Model	Description	List	Sale
2200	Pump Jack	79	58
2201	Pump Jack Brace	30	20
2203	Pump Jack guard rail holder	31	21
2204	Work Bench & rail holder combo	53	39
2500	Adjustable Roofing Bracket	9.95	7.95
	Buy any 6 (can be assorted) deduct additional 10%		
2601	Wall Jack	167	108
	Lots of 4 deduct additional 10%		

PASLODE IMPULSE GUNS

Model	Description	List	Sale
IM250	Trimpulse Finish Nailer Kit complete drives 3/4" - 2-1/2" brads	1130	548
IM325	Impulse Framing Nailer Kit complete drives 2" - 3-1/4" nails	1130	548
CT325SS	Cordless Framing Nailer Kit complete drives 2" - 3-1/4" nails	1120	495

SENCO AIR NAILERS

Model	Description	List	Sale
SFN1+	Finishing Nailer 1" - 2" w/ case.	448	345
SFN40	Finish Nailer w/case 1-1/4"-2-1/2"	569	389
SN325	Nailer 1-7/8" - 3-1/4"	665	419
SLP20	Pinner w/cse 5/8" - 1-5/8"	422	279
SKS	Stapler 5/8" - 1-1/2"	390	279
M2	Stapler 1-3/8" - 2" length	535	375
SN70	Framing - Clip Hd 2" - 3-1/2"	725	449
SN60	Framing - Full Hd 2" - 3-1/2"	708	459
SN65	15% more power than SN60	709	465

JAMERCO AIR NAILERS

Model	Description	List	Sale
JTBN1832	Brad Nailer - 5/8" - 1-1/4"	96	69
JTSO61825	Narrow Crown Finish Stapler 1/2" - 1"	96	69
JTFN1650	Finish Nailer - 3/4" - 2"	245	139
JTAFN1464	Angle Finish 1-1/4"-2-1/2"	360	225
JTFN1664	Finish Nailer 1" - 2-1/2"	360	225
	Above nailers come with case!		

AIRY AIR NAILERS

Model	Description	List	Sale
0241SK	Brad Nailer 3/8" - 1-9/16"	180	98
0250SK	Brad Nailer 3/4" - 2"	296	164
0626SK	1/4" Crown Stapler 3/8" - 1"	194	104
0645	1/4" Crown Stapler 3/4"-1-9/16"	310	175
EZ-2	NEW Multi-purpose nailer & stapler	240	139
	Above nailers come w/case, fasteners, oil & wrenches		
0565T	Angle Finish Nailer 1" - 2-1/2"	386	205
8290	Framing Nailer 2" - 3-1/2"	475	315
	Airy nailers use Senco brand fasteners		

DUO-FAST AIR NAILERS

Model	Description	List	Sale
LFN-764	Finish Nailer 1" - 2"	611	329
CN-350	Framing Nailer - Full Head	702	369
CN-325	Framing Nailer - Clip Head	682	369

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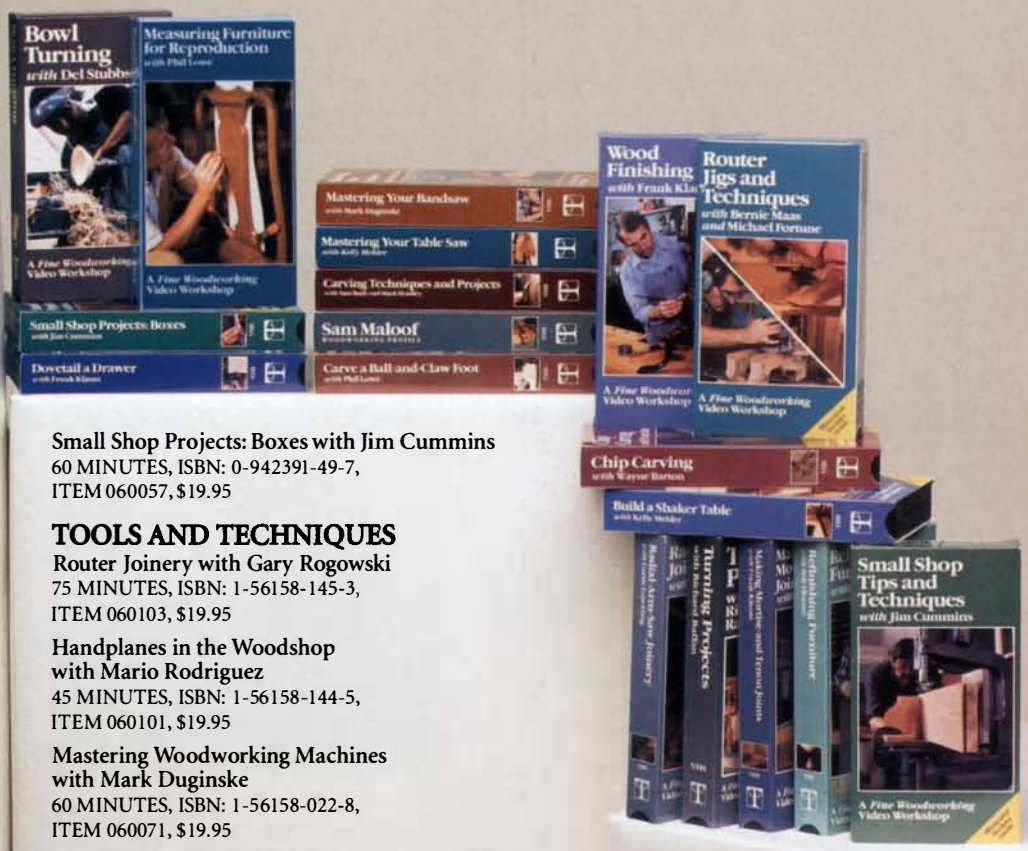

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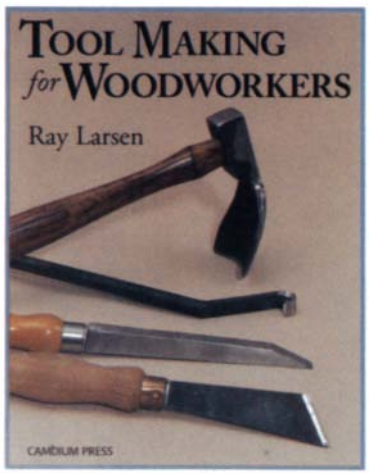
Tool Making for Woodworkers by Ray Larsen. *Cambium Press/Lyons & Burford, New York, N.Y. (212-620-9580); 1996. $19.95, paperback; 160 pp.*



Teaching toolmaking to woodworkers is a frustrating job. Apart from the Alexander Weygers series, *The Making of Tools*, there hasn't been a good book to guide the novice. And Weygers' work is now out of print, hard to come by and expensive if you do. I've long been looking for a good, basic book on toolmaking, so I jumped at the chance to review this one.

Tool Making for Woodworkers contains a great deal of basic information on building a forge, blacksmithing tools and methods. It also has considerable information on tool steel, heat treating and tempering.

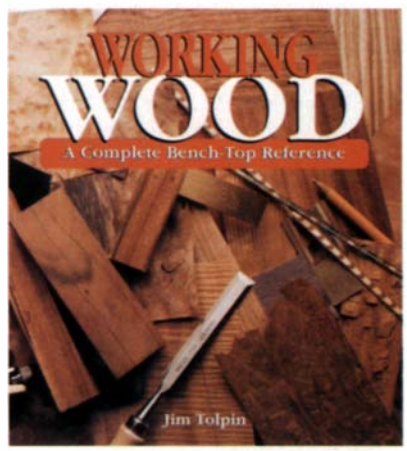
Larsen walks you through four projects, explaining how to make a carver's skew chisel, a hollowing adze, a hook tool for wood turning and a mortising chisel. Some are a bit challenging for a beginning smith. Tool steels are tough materials, and forging the wide blade of the adze may be a bit of a heavy pound for a novice.

I appreciated the chapter on general design considerations. The simple, clean lines of Larsen's compass scribe make a particularly elegant design, and I'm inspired to make one for myself.

My only real criticism is that some photos show drifts and chisels with mushroomed and split heads—a serious safety hazard. I still have a piece of shrapnel in my arm from one. Larsen does warn against using tools with mushroomed heads, but the photos should match his warnings.

I strongly recommend this book for beginning as well as experienced smiths and woodworkers interested in fashioning or reshaping their own tools. The price is right, and Larsen has done a fine job of describing the toolmaking process. I definitely will get copies of this book for my toolmaking courses. *—Don Weber*

Working Wood: A Complete Bench-Top Reference by Jim Tolpin. *Davis Publications, Inc., Worcester, Mass. (800-533-2847); 1997. $19.95, paperback; 208 pp.*



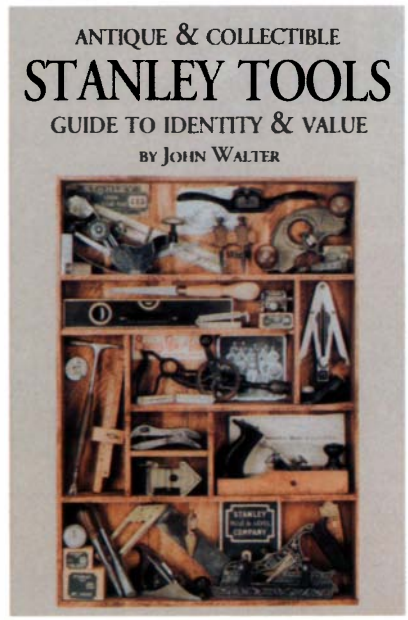
Reference books put extra demands on both writer and reader. The author must compress 20 books worth of information into one well-organized volume. The reader can't expect a thrilling read and has to find his own ways to put the information to good use. If either party falls asleep, the book doesn't work.

This reference book works. Each page sums up a single topic from buying wood to furniture repair. Easily understood line drawings illustrate everything from shop layouts, benches and sharpening to joinery and furniture design.

A 30-page reference section covers a wide range of topics: metric conversions, spindle speeds for many types of bits, even guidelines for designing furniture to fit human dimensions, and a key for British woodworking terms.

Tolpin packed *Working Wood* with accurate information that can answer a wide range of questions. Although you'll find other books better for decorating your coffee table or teaching you how to build one, this book is a perfect first reference for newly minted woodworkers and will even make a worthy addition to the libraries of graybeards. *—Sven Hanson*

Antique and Collectible Stanley Tools by John Walter. 2nd ed. *The Tool Merchant, Marietta, Ohio (614-373-9973); 1996. $30, paperback; 897 pp.*



Riveting reading it is not. But if you've ever wondered how old that bit brace you found in the attic is or what that Stanley spokeshave you picked up at the flea market is worth, this is the book for you.

Walter's enlarged second edition covers everything any woodworker with more than a passing interest in old tools would want. In addition to providing the dates and values for more than 2,000 different tools, Walter explains how various types of tools evolved. Often those little, short-lived design modifications substantially increase one plane's value over another. There's also a long discussion of tool condition, the used Stanley tool market, a company history, a glossary, a patent chronology (useful for dating a tool) and a bibliography. *—Vincent Laurence*

Don Weber is a furnituremaker turned blacksmith and toolmaker in Mendocino, Calif. Sven Hanson builds custom cabinetry and furniture in Albuquerque, N.M. Vincent Laurence is an associate editor of FWW.

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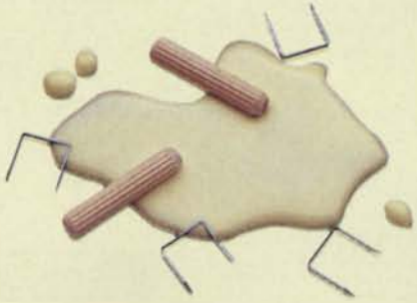

This compact powerhouse cuts smaller slots and uses miniature "Accu-biscuits™" to fit where standard biscuits don't. And its price is as small as its biscuits. But the Detail Biscuit Joiner is big on performance, from its beefy motor to its die-cast base and see-through fence. So see the new Ryobi Detail Biscuit Joiner at your local home center. It'll get your wood working like never before.

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Listings of gallery shows, major woodworking fairs, lectures, workshops and exhibitions are free but are restricted to happenings of direct interest to woodworkers. Only workshops sponsored by not-for-profit groups are listed. We list events (including entry deadlines for future juried shows) that are current with the time period indicated on the cover of the magazine, with overlap when space permits. We go to press three months before the issue date of the magazine and must be notified well in advance. For example, the deadline for events to be held in March or April is January 1; for July and August, it's May 1, and so on.

ALABAMA: **Meetings**-The Alabama Woodworkers Guild meets the second Thursday of each month at 7 p.m. at Acton Moulding & Supply Co., Helena. For info, contact Leonard Sanders at (205) 822-6876.

ALASKA: **Meetings**-Alaska Creative Woodworkers Association meets at 7 p.m. on the fourth Monday of each month at the Anchorage Museum. (907) 345-3077.

ARIZONA: **Exhibitions**-Masterworks in Wood with David Ellsworth, Michelle Holzapfel and more, Oct. 1-31; Bent-wood sculpture with Barbara Cooper and Furniture with Tommy Simpson, Nov. 1-31. Joanne Rapp Gallery, 4222 North Marshall Way, Scottsdale (602) 949-1262.
Call for entries-Desert woodcarving show, Feb. 21-22. Phoenix Civic Plaza. Deadline: Feb. 20. For information, contact Mel Donaho, Grand Canyon State Woodcarvers, P.O. Box 9112, Scottsdale, 85252-9112. (602) 935-5648.

ARKANSAS: **Meetings**-Woodworker's Association of Arkansas meets the first Monday of each month at 7 p.m.; Central Arkansas Woodcarvers meets the second Tuesday at 7 p.m. and the fourth Tuesday at 6:30 p.m. Arkansas Arts Center. For more info, call (501) 985-1118.
Exhibition-Moving Beyond Tradition: A Turned Wood Invitational, Oct. 19-Nov. 19. Decorative Arts Center, 7th and Rock, Little Rock, 72203. (501) 372-4000.
Meetings-Ozark Woodturners meets the third Saturday of each month in Mountain Home. For more info, call Michael Kornblum at (501) 424-5893.

CALIFORNIA: **Exhibition**-Expressions in Wood: Art of John Cederquist, Sept. 13-Nov. 30. Oakland Museum of California, 1000 Oak St., Oakland. (510) 238-2200.
Exhibition-Tuolumme Woodworkers Association's fifth annual wood craft exhibition, Oct. 5-19. Furniture, wood turnings and carvings. McHenry Mansion, 906 15th St., Modesta. Contact Mervin Bennett (209) 545-1407.
Exhibition-Celebration of Sierra Woods, Sept. 26-Oct. 18. North Columbia Schoolhouse Cultural Center, 17894 Tyler Foote Crossing Road, Nevada City. (916) 265-2826.
Show-Central Coast Woodcarvers 20th annual show, Sept. 13-14. Coast Union High School, Cambria. For info, call Pat Rygh (805) 528-8107.
Show-The San Francisco Bay Area Woodworking Show, Nov. 7-9. San Mateo Exposition Center, Fiesta Hall, 2495 S. Delaware St., San Mateo. For info, call (800) 826-8257.
Show-The Greater Los Angeles Woodworking Show, Nov. 21-23. Orange County Fairgrounds, Building 10, 88 Fair Drive, Costa Mesa. For info, call (800) 826-8257.
Lecture-American Decorative Arts Forum presents Furniture as Social History with Laurel Thatcher, Dec. 9. M.H. de Young Memorial Museum, Golden Gate Park, San Francisco. For more info, call (415) 499-0701.

COLORADO: **Workshops**-Woodworking and furniture design, thru Sept. 19. Anderson Ranch Arts Center, P.O. Box 5598, Snowmass Village, 81615. (970) 923-3181.
Show-The Colorado Woodworking Show, Oct. 24-26. Denver Merchandise Mart, Mart Pavilion, 451 E. 58th Ave., Denver. For info, call (800) 826-8257.
Call for entries-Woodworker's Guild of Colorado Springs 13th annual juried exhibition of fine woodworking, Sept. 19-Nov. 8. Deadline: Sept. 10. The Colorado Springs Museum, 215 S. Tejon St., Colorado Springs. For more information or application, contact John Lewis, 1644 W. Vermijo Ave., Colorado Springs, 80904. (719) 636-1257.

CONNECTICUT: **Show**-Gallery 12's woodworking show, Oct. 5-Nov. 2. Gallery 12, 29 Whitfield St., Guilford, 06437. (203) 458-1196.
Exhibition-Woodworkers Guild 10th annual fall members exhibition, Oct. 24-Nov. 30. For further information, contact Randy Bemont (860) 653-0316.
Workshops-Woodworking workshops held year-round. Brookfield Craft Center, P.O. Box 122, Route 25, Brookfield, 06804. (203) 775-4526.

DELAWARE: **Exhibition**-Wood Dreaming in America, Sept. 27-Oct. 31. Creations Fine Woodworking Gallery, Powder Mill Square, Greenville. For info, call John Sherman (302) 655-8311.

DISTRICT OF COLUMBIA: **Call for entries**-16th annual Smithsonian Craft show and sale, April 23-26. Deadline: Oct. 10. For more information or an application, send an SASE to Smithsonian Craft Show, Arts & Industries Building, Room 1465, MRC 411, Smithsonian Institution, 20560, or call (202) 357-4000.

FLORIDA: **Meetings**-South Florida Woodworking Guild meets every second Monday at 7 p.m. Constantine, 1040 E. Oakland Park Blvd., Ft. Lauderdale. For information, contact Charlie Womack (954) 561-0941 or (561) 447-8016.
Meetings-Central Florida Woodworkers Guild meets the second Thursday of each month. American Legion Hall, 2101 Lee Road, Orlando. For more info, call Bob Lamprey (407) 292-8324.
Meetings-Tallahassee Woodcrafters Society meets the second Tuesday of each month. For info, contact Walt Behrle at (904) 668-6653 or Austin Tatum at (904) 386-6876.
Meetings-St. Petersburg Woodcrafters Guild meets the fourth Thursday of every month at 7 p.m. P.V.T.I., 6100 154th Ave. N., St. Petersburg. Contact Wally Hebel, 1200 19th St. N., St. Petersburg, 33713. (813) 898-0569.
Meetings-Capital City Woodcarvers meets every Monday at 7 p.m. at the Senior Citizen Art Center. For more info, contact Lee Roberts (904) 893-4293.
Meetings-North Florida Woodturners meets the first Tuesday of every month. For more information, contact John Penrod at (904) 385-0608.

GEORGIA: **Meetings**-Woodworkers Guild of Georgia meets the second Monday of every month. Southern College of Technology, 1100 S. Marietta Parkway, Marietta. (404) 299-3972.
Symposium-Third annual mini-symposium: Turning Southern Style III featuring Philip Moulthrop, Robert Rosand, Rodger Jacobs and Willard Baxter, Sept. 19-21. Unicoi State Park and Lodge, Helen. Contact Jim Hutchinson, 2197 Kodiak Drive, Atlanta. (404) 633-4172.

HAWAII: **Exposition**-Fifth annual furniture and woodworking exposition, Sept. 13-21. Aloha Tower Marketplace, Pier 10, Honolulu. Contact Lin Butts, Woods of Hawai'i, P.O. Box 6232, Kaneohe. (808) 239-5563.

ILLINOIS: **Classes**-Ongoing woodworking classes, all levels. Elston Woodworking School, 2228 N. Elston Ave., Chicago, 60614. (312) 342-9811.
Exposition-Valley Woodland Exposition, Aug. 15-16. Marshall-Putnam Fairgrounds. For more info, contact Kimberly St. John, Prairie Rivers Resource Conservation and Development, 400 Edward St., Henry, 61537. (309) 364-3979.
Meetings-Chicago Woodturners meets the second Tuesday of every month at York High School, Elmhurst. Contact Harris Barbier at (630) 964-0354.
Show-The Chicagoland Woodworking Show, Oct. 10-12. Odeum, South Hall, 1033 N. Villa Ave., Villa Park. For more info, call (800) 826-8257.

KENTUCKY: **Meetings**-Kyana Woodcrafters meets the first Thursday of each month. Bethel United Church of Christ, 4004 Shelbyville Road, Louisville, 40207. Contact Ray Thornton (502) 499-1388.

MAINE: **Meetings**-Guild of Maine Woodworkers meets the first Wednesday of every month. Call (800) 805-5100.

MARYLAND: **Classes**-Woodworking classes, thru December. Glen Echo National Park, 7300 MacArthur Blvd., Glen Echo, 20812. (301) 492-6266.

MASSACHUSETTS: **Classes**-Woodworking classes, most of the year. For more information, contact Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.
Classes-Year-round intensives in woodworking and wood carving. Horizons New England Craft Program, 108 N. Main St., Sunderland, 01375. (413) 665-0300.
Classes-Woodworking classes held year-round. North Bennet Street School, 39 North Bennet St., Boston. For more info, call (617) 227-0155.
Exhibitions-The Society of Arts and Crafts presents Centennial Furniture/Wood Exhibition, Sept. 13-Nov. 2. 175 Newbury St., Boston. (617) 266-1810 and Emerging Artists: Furniture/Wood, Sept. 16-Oct. 31, 101 Arch St., Boston. (617) 345-0033.
Workshops-Traditional timber framing, Sept. 24-28. Hancock Shaker Village, Hancock. (413) 684-3223.

MICHIGAN: **Meetings**-Metro Carvers of Michigan meets second Tuesday of each month (except July and August) at 7:30 p.m. Helen Keller High School, 1505 N. Campbell Road, Royal Oak. (810) 771-1040.
Show-The Metro-Detroit Woodworking Show, Dec. 5-7. Novi Expo Center, Main Hall, 43700 Expo Center Drive, Novi. For more information, call (800) 826-8257.

MINNESOTA: **Meetings**-Minnesota Woodworkers Guild meets the third Tuesday of each month at 7:15 p.m. Demonstrations each month. Contact Richard Gotz (612) 544-7278.
Classes-20th annual kiln drying short course, Sept. 15-18. University of Minnesota, St. Paul Campus, 2004 Folwell Ave., St. Paul. For more info, call (612) 624-3407.
Call for entries-Minnesota Woodworkers Guild's Northern Woods exhibition, Oct. 16-19. Southdale Center, Edina. Deadline: Sept. 16. For application, write Northern Woods Exhibition, 4th Street Guild, 2625 4th St. S.E., Minneapolis, or call (612) 378-2605.
Show-The Twin Cities Woodworking Show, Oct. 3-5. Minnesota State Fairgrounds, Education Building, Snelling and Dan Patches Avenues, St. Paul. (800) 826-8257.
Show-Seventh annual Seven Corners Hardware Woodworking tool show, Sept. 24-27. Seven Corners Hardware, 216 W. 7th St., St. Paul. (800) 328-0457.

MISSOURI: **Meetings**-Kansas City Woodworkers' Guild meets the third Wednesday of each month. Contact Eugene Caples (816) 452-6379.
Symposium-Joy of Turning, Sept. 13-14. Woodturners of St. Louis, 430 Bryan Ave., Kirkwood, 63122. (314) 966-2268.

NEBRASKA: **Meetings**-Omaha Woodworkers Guild meets at 7 p.m. the third Tuesday of every month. Libert Christian Center (former Ryan High School), 60th and L St., Omaha. For more information, contact John Cahill, Box 45494, Omaha, 68145. (402) 334-5550.

NEW HAMPSHIRE: **Gathering**-Scroll Saw Central invites scroll sawyers across the Northeast to share their information and work, Oct. 18. For info, send an SASE to Scroll Saw Central, 44 Timber Swamp Road, Hampton, 03842.
Show-New England Woodworking Show, Sept. 12-14. National Guard Armory, 771 Canal St., Manchester. For more info, call (800) 826-8257.

NEW JERSEY: **Show**-For the Love of Art: Folk Carvings by Albert Hoffman, thru Sept. 21. The Noyes Museum of Art, Lily Lake Road, Oceanville. For more information, contact Andrew Cripps at (609) 652-8848.

NEW MEXICO: **Classes**-Chairmaking seminar with Brian Boggs, Oct. 3-5; Santa Fe Community College New Mexico Woodworkers' exhibition, Oct. 3. For more information, contact Michele Lis, The Center for Continuing Education, Santa Fe Community College, 6401 Richards Ave., Santa Fe, 87505. (505) 438-1251.

NEW YORK: **Meetings and classes**-New York Woodturners Association meets bi-monthly. YWCA, 610 Lexington Ave. (53rd St.), New York City. For more information, contact Howard Alalouf (914) 337-0226.
Classes-Traditional and contemporary woodworking with Maurice Fraser, Bill Gundling and Susan Perry. The Craft Students League at the YWCA, 610 Lexington Ave., New York City. For more information, call (212) 735-9731.
Exhibition-Shaker Museum and Library presents Orren Haskins: his works from furniture to tools, thru Nov. 2. 88 Shaker Museum Road, Old Chatham. For more info, call Tresca Weinstein (518) 794-9100 ext. 100.
Exhibition-Second annual membership exhibition presented by The Long Island Woodworker's Club, Oct 25. The Brush Barn-Village of the Branch, 211 Jericho Turnpike, Smithtown. For further information, contact Lance Baker (516) 423-1183.
Show-The Syracuse Woodworking Show, Sept. 19-21. New York State Fairgrounds, International Pavilion, 581 State Fair Blvd., Syracuse. For more info, call (800) 826-8257.

NORTH CAROLINA: **Meetings**-North Carolina Woodturners meets the second Saturday of each month. For more

info, contact Tom Fitz, North Carolina Woodturners, P.O. Box 1833, Hickory, 28603. (704) 890-4451.
Symposium-Second Carolinas woodturning symposium hosted by North Carolina Woodturners and Triangle Woodturners of North Carolina, Oct. 25-26. Contact Robert Austin (919) 851-4361.
Show-Midwest-Grand Rapids Woodworking and Furniture Supply Fair, Nov. 6-7. Grand Center. For further information, contact Trade Shows, Inc., P.O. Box 2000, Claremont, 28610-2000, or call (704) 459-9894.

OHIO: **Meetings**-Cincinnati Woodworking Club meets at 9 a.m. on the second Saturday of January, March, May, September and November. Reading High School, 801 E. Columbia Ave., Reading. For more info, contact the club at 10125 Montgomery, Cincinnati, 45242.
Show-The Greater Cleveland Woodworking Show, Sept. 26-28. Cuyahoga County Fairgrounds, Building 23, 164 Eastland Road, Berea. For more info, call (800) 826-8257.
Workshop-Bowling Green State University presents a spray finishing technology workshop, Oct. 22-24. Contact Dr. Richard A. Kruppa (419) 372-7560.
Meetings-Woodworkers of Central Ohio meets on the second Saturday of November, February, April and June. For more info, call Chuck at (614) 457-3704.

OREGON: **Meetings**-Cascade Woodturner's Association meets every third Thursday. For more info, contact the association at 11575 S.W. Pacific Highway, #104, Tigard, 97223. (360) 834-6325.
Meetings-Guild of Oregon Woodworkers meets the third Wednesday of each month (except Dec.) at 7:p.m. For more information, contact the guild at P.O. Box 1866, Portland, 97207-1866. (503) 492-1515.
Show-The Oregon Woodworking Show, Oct. 31-Nov. 2. Portland Expo Center, Hall C, 2060 N. Marine Drive, Portland. For info, call (800) 826-8257.

PENNSYLVANIA: **Conference**-1997 World Turning Conference, Sept. 25-28. For info, contact Wood Turning Center, P.O. Box 25706, Philadelphia. (215) 844-2188.
Show-Mid-Atlantic woodworking and furniture show, April 3-4. Ft. Washington Expo Center, Ft. Washington. Contact Keith Eidson (704) 459-9894.

RHODE ISLAND: **Juried show**-Second annual fine furnishings-Providence, Nov. 14-16. Rhode Island Convention Center, Providence. For more info, call (401) 751-8989.

TENNESSEE: **Workshops**-Turning, carving and more, year-round. Arrowmont School of Arts and Crafts, 556 Parkway, Gatlinburg, 37738-0567. (423) 436-5860.
Classes-Lumber selection and more. Tennessee Valley Authority, 17 Ridgeway Road, Box 920, Norris, 37828-0920. (615) 632-1656.
Show-12th annual Master Woodworkers show, Oct. 24-26. Candy Factory, Knoxville. For info, contact Tim Snow, East Tennessee Woodworkers Guild, P.O. Box 21, Powell, 37849. (423) 687-7474.
Conference-Hardwood Manufacturers Association's 1998 National Conference, March 4-6. Renaissance Nashville Hotel. For more information, contact the association at 400 Penn Center Blvd., Suite 530, Pittsburgh, PA 15235, or call (412) 829-0770.

TEXAS: **Meetings**-Woodturners of North Texas meets the last Thursday of every month, 7:30 p.m. Paxton Beautiful Woods Store, 1601 W. Berry St., Fort Worth. For more information, call (817) 927-0611.
Exhibition-East Texas Woodcarvers' Wooden Wonderland '97, Nov. 13-15. Tyler Rose Garden Center, Tyler. For more info, contact Charles or Kathy Brooks, P.O. Box 1065, Whitehouse, 75791. (903) 839-7042.
Meetings-North Texas Woodworker's Association meets the third Tuesday of each month. For more information, contact Bruce May, P.O. Box 831567, Richardson, 75083. (972) 271-0125.
Show-12th annual Rio Grande Valley Woodcarvers show and sale, Jan. 16-17. McAllen Civic Center, McAllen. For more information, contact Dorothy Chapapas, RR2, Box 150, McAllen, 78504. (956) 581-2448.
Show-The Houston Woodworking Show, Oct. 17-19. Astroarena, Hall B, Fannin at the 610 Exit, Houston. For info, call (800) 826-8257.

WASHINGTON: **Meetings**-Northwest Corner Woodworkers Association meets the first Tuesday of every month year-round. For further information, call Mike Hess (360) 650-0964.
Show-The Seattle Woodworking Show, Nov. 14-16. Seattle Center, Exhibition Hall, Mercer St. at 3rd Ave. N., Seattle. For info, call (800) 826-8257.

WEST VIRGINIA: **Workshop**-Examining Wood Joinery with Kermit McCartney, Sept. 26-28. Crafts Center, Cedar Lakes, Ripley. For more information, contact Gloria Gregorich, Crafts Coordinator at (304) 372-7873.

WISCONSIN: **Show**-The Greater Milwaukee Woodworking Show, Dec. 12-14. Wisconsin Center, Great Hall, 500 W. Kilbourn Ave., Milwaukee. For further information, call (800) 826-8257.

CANADA: **Association**-Canadian Woodturners Association, 12A-4981 Highway 7E, Suite 236, Markham, Ont. (905) 479-0755.
Association-Superior Woodworking Association meets 7 p.m. the last Monday of each month. Confederation College, Thunder Bay, Ont. For more information, contact Vic Germaniuk at (807) 767-5964.
Juried exhibition-Southern Alberta Woodworkers Society exhibition, September. For more information, contact Graham Dolby, SAWS, P.O. Box 6753, Station D, Calgary, Alberta T2P 2E6. (403) 240-4227.
Show-Fraser Valley Woodturners Association show and sale, Nov. 22-23. Woodturning demonstrations. Fort Langley Community Hall, 9167 Glover Road, B.C. For more info, call (604) 931-5952.
Call for entries-Canadian Woodturning Championship, Vancouver, B.C., Oct. 24-26. (604) 533-1142.

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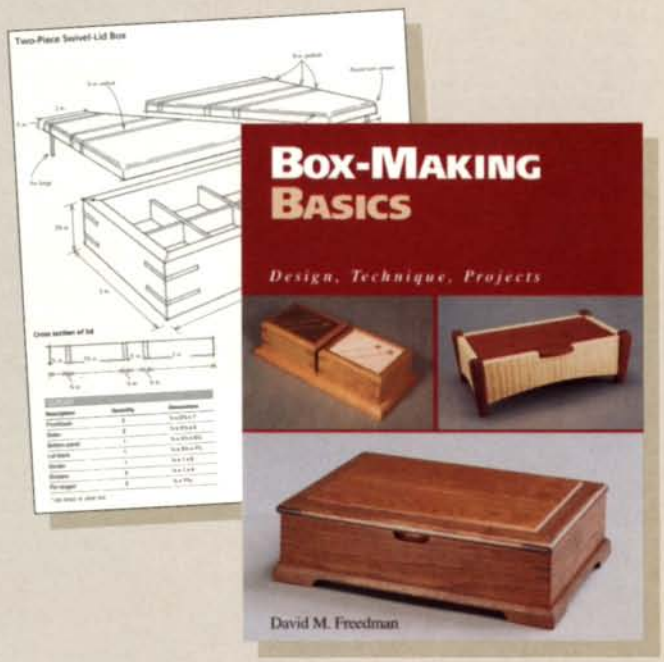

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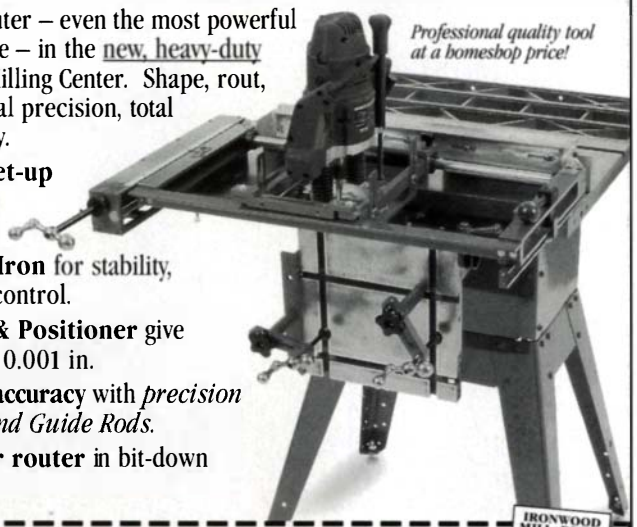

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Folding rule cabinet

A cabinet for an antique tool collection—*The author built this cherry cabinet modeled after a right-to-left reading folding rule. It is 79 in. high, 16 in. wide and 11 in. deep.*

I designed and built this cabinet to look like an old-fashioned folding rule for two reasons: first, to express my appreciation for antique woodworking tools, and second, to store my growing collection of wooden planes.

The cabinet is scaled 1 in. to 1 ft., and it's modeled after a ruler that reads right to left. I built it out of solid cherry and joined the case with through dovetails. Brass inlay was added to the top and bottom portions of the doors. To recreate the numerals, I picked a typeface on my computer that resembled the font used on an old folding rule in my collection, printed the numerals in the size required and mounted them on poster board. Then I cut them out, traced the numerals onto the cabinet doors and relief-carved them by hand.

—Michael A. Mason, Greendale, Wis.

Woodworking in rural, northern Spain

Fernando Erece's *carpinteria* in Colombres, Asturias, on the coast of northern Spain, fit right in with all my preconceived notions of Old World shops. Tucked into a corner of the ground floor of his home, his shop seemed more like a cave than a workplace. In the dim light, I could make out an ancient universal woodworking machine, a bandsaw and a quirky collection of the tools and personal effects of a family of woodworkers 50 years in the same spot. Sounds of household activity filtered down from above, a niece dashed through and neighbors drifted in and out. I was in Spain on a sabbatical from woodworking, but I couldn't completely exile myself from the siren calls of whistling sawblades and the scent of fresh sawdust.

In Spain, a *carpintero* makes and installs a home's wooden detailing—doors, windows and staircases. It is the mason who is responsible for the building's frame-

Photos this page: Anatole Burkin

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work. *Carpinteros*, such as Erece, use sophisticated, traditional designs in their millwork. For example, a typical in-swinging sash has a shutter hinged to the sash itself. Both the sash and the jamb are mortised and tenoned, with all kinds of double and triple rabbets and kickers to keep the water out. This kind of sash is Erece's bread and butter. He also builds doors, staircases and furniture (well-made but heavy and simple), and he even repairs wooden farm equipment.

I asked Erece about his prospects. He thought that his business and lifestyle would continue not too differently from the lifestyle enjoyed by his father and uncle. Cheap manufactured sashes and doors are available in Spain, but he doesn't fear the competition because in small towns like his, the tradition of buying from local craftsmen is strong.

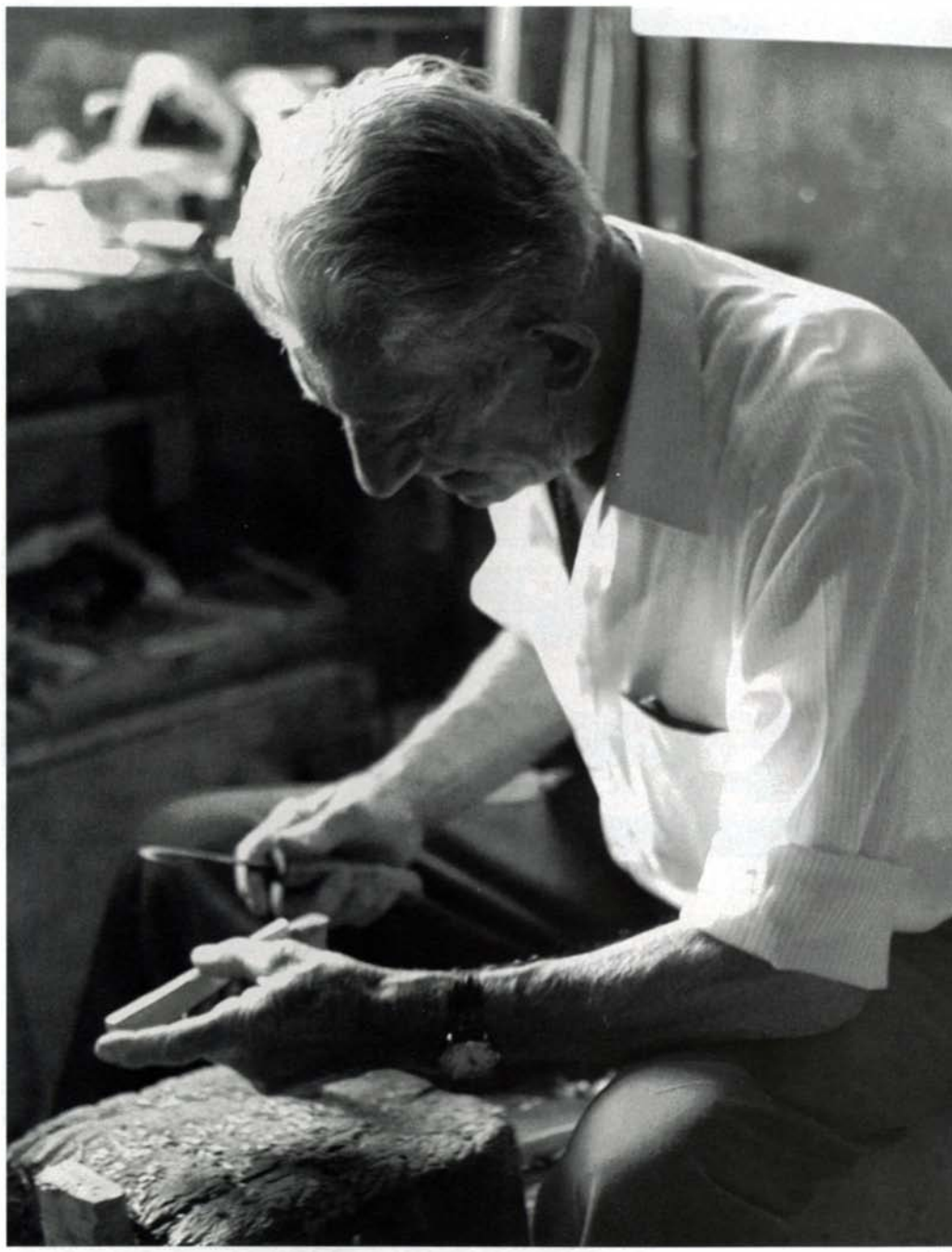
The pleasant Old World impression imparted by Erece's shop was dispelled the next day when I visited a woodworking business in the neighboring town of Bustio. Owned by Lali Guitierrez, the shop was large, airy and well-equipped. Guitierrez had spent about $25,000 on large equipment in a shop where he and his brother are the only employees. The radial-arm saw, something of a novelty here, was nondescript, but the other tools (bandsaw, universal saw with mortiser, thickness planer and shaper) were enormously heavy by American standards. These tools were obviously built to last generations, but they put the buyer deeply in debt. Like Erece, Guitierrez makes most of his income from building components for homes, such as doors and windows. Guitierrez builds in the traditional style, but his tools and methods are more sophisticated.

Guitierrez's shop felt a little too familiar, so it was with some relief that I was directed to a neighbor who made wooden hay rakes (see the photo at right). Censio Cosiño was recovering from throat surgery. I found him hoeing in his garden, following the Asturian prescription for recuperation: more hard work.

A retired dairy farmer, Cosiño makes rakes and scythe handles. These garden tools are a perfect example of how wood is still woven into the texture of daily rural life. The locals don't use metal rakes; they don't like the way the rakes grab. They prefer the wooden rakes even though those rakes don't last as long. Locally harvested ash is used for the handles and crossbars and hazel for the teeth.

Cosiño still cuts and splits the ash billets himself. He stacked his lumber in the window openings of an abandoned neighboring mansion, which made a picturesque drying rack. When the wood was ready, Cosiño would labor away at his own pace and make up to eight rakes a day.

—Andrew Davis, Santa Fe, N.M.



***Censio Cosiño, a retired dairy farmer in northern Spain,** makes wooden hay rakes using hand tools. He is using a hook knife to shape rake tines.*

Photo: Andrew Davis

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Liberation at last

Last year, I noticed that the Center for Furniture Craftsmanship in Maine was offering a class in stick furniture. Michael Emmons was the teacher, and the course catalog showed him smiling as he worked. He also was wearing a nail pouch! The list of suggested tools to bring to class included a pruning saw, pruning shears, a hammer and a tape measure. Could this be true? I wondered if there really was a way to build furniture that didn't involve all the minutia that I had grown used to.

I felt guilty, almost sneaky. Everything I had been taught about furniture building told me this was wrong. This wasn't, couldn't, be even remotely related to building serious furniture. I was really confused, yet I couldn't wait to get there.

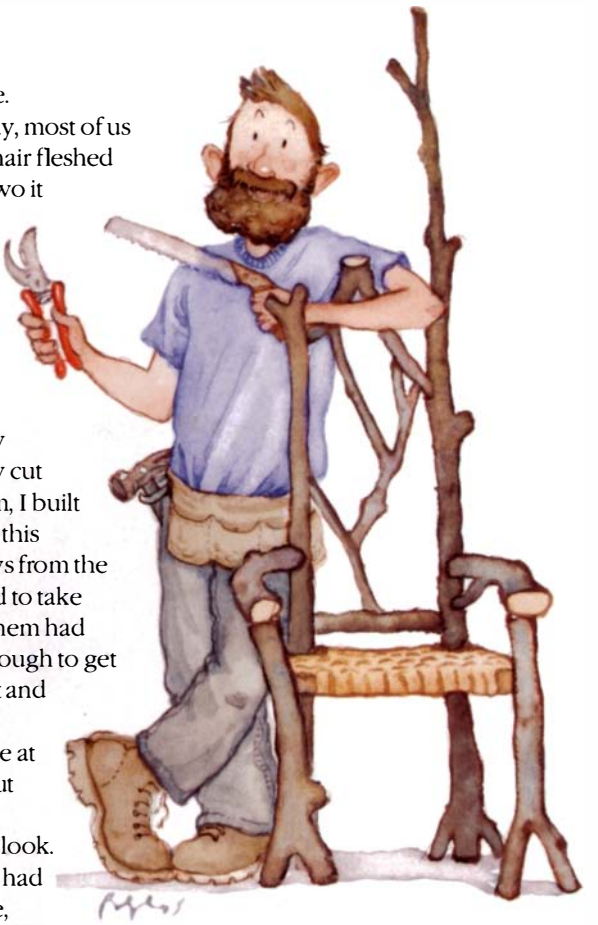
When I arrived at the school, I was shown to the stick furniture room. Large tables dominated the room, and there was an ample amount of natural light. Another class on veneering and furniture design was being run in the bench room adjacent to ours. There were a total of three students in my class. Emmons, cool, collected and from California, was thrilled. After the introductions and a few quick drawings, we pulled on our field boots, grabbed our pruning saws and set out to gather our stock. No more than 100 ft. from the school was a stand of early growth alder, mixed with some cherry and a little maple. All saplings and all fair game.

In no time, we were at work thinning the small stand. I was actually sweating. My legs were scratched up, and mosquitoes were buzzing around my head. My Japanese pruning saw was tucked neatly away in my pouch, and the smell of freshly cut green wood clung to my clothes. I had just prepared all my stock with yard tools, and the best was yet to come. We were about to be issued nails!

Michael gave us the basic heights and depths of chair seats and backs. He showed us how to select the best stock for the frame and how to find little details in each branch that would lend an interesting look to our first assignment: a child's chair. We learned to detect flaws in each branch, which species would bend the easiest and the pros and cons of debarking a tree immediately after it's cut.

Out of curiosity, I peeked through the window of the large door separating us from the other class. As I watched, I could sense the backs of the students in the furniture design class tightening, their hands pulling through their hair as they realized the enormity of what they were about to begin. In two weeks, they hoped to have a small piece of furniture built. In five days, I intended to fill a house! I turned back to my pile of alder and pulled out my pruning saw and tape measure. The tension drained from my body. I was elated. Normally, that would be me in the other room, sweating every detail, matching every bit of grain, honing until I could see my part in the back of a plane blade. Now, new possibilities flooded my head.

For starters, the class would help me solve a problem. For eight to 10 weeks each summer, I live on the coast of Maine in my family's modest summer home. We get by comfortably without indoor plumbing or electricity. I love it there but always find myself wanting to get back to the shop and build something. I have often collected driftwood with an eye to creating something, but I'd never taken the initiative. Without a shop or electricity, I felt like a fish out of water. What I was now learning could be done outside on the picnic table or on the rocks in front of the house. The raw materials were everywhere.



After the first day, most of us had our child's chair fleshed out, and by day two it was done and we were on to other things. I had decided to bring my collection of driftwood to the workshop and by combining newly cut wood and flotsam, I built a bench. It was at this point that the guys from the other class started to take notice. Many of them had been walking through to get coffee on the first and second days and didn't even glance at us "stick guys." But now they were pausing to take a look. In three days, we had two, maybe three, pieces done, and they were still dimensioning their stock. We were having relaxed lunches; they were on the phone ordering veneers, tools and all the other stuff we woodworkers have gotta have. They began to ask questions and, above all, give praise. They were getting the bug too.

I left that five-day workshop with five pieces—the child's chair, the driftwood bench, two tall backed dining chairs and a small stool I made just to use up my scraps. At the start of the new school year, I showed my students the things I had made. At the time, they seemed amused but not impressed. But within two weeks, I noticed something different. They began to approach stick furniture in a way that I had not envisioned. Where I had been under the impression that the stick use had to be all or nothing, my students incorporated it so that it was accent in their work. A stretcher that would normally have been cut from a board was fashioned instead from a branch. A bench project for one student became one very large log, beautifully sanded and finished. Other students have incorporated branches into their fine furniture: a stick here, a log there.

This has been a very unexpected but wonderful interpretation of the work that I had done and had introduced to them. Now I guess it's my turn to interpret their work. After all, that's how this all started.

Carter Sio has been designing and building contemporary furniture for 16 years, and for the past 13 years has been running the woodworking and design program at the George School in Newtown, Pa.

Drawing: Jackie Rogers

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30 years in the making

A client of English furnituremaker Stephen Owen purchased an especially attractive piece of green slate in England's Lake District. Returning later to collect it, he found the shop had attached four black and brass legs to create a table. And so it remained for 30 years, a table used all over the house. When asked to mount the slate in a new table, Owen came up with this design in European cherry. The missing leg corresponds to a missing corner of the slate. The floating shelf stops just short of the solid cherry legs. Dowel-reinforced layers of medium-density fiberboard were shaped into curled corners and then lipped in solid wood and veneered. A concealed weight improves the table's stability.

Photos: Stephen Owen