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# Fine WoodWorking

February 1995, No. 110
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Sycamore

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Drawer slides

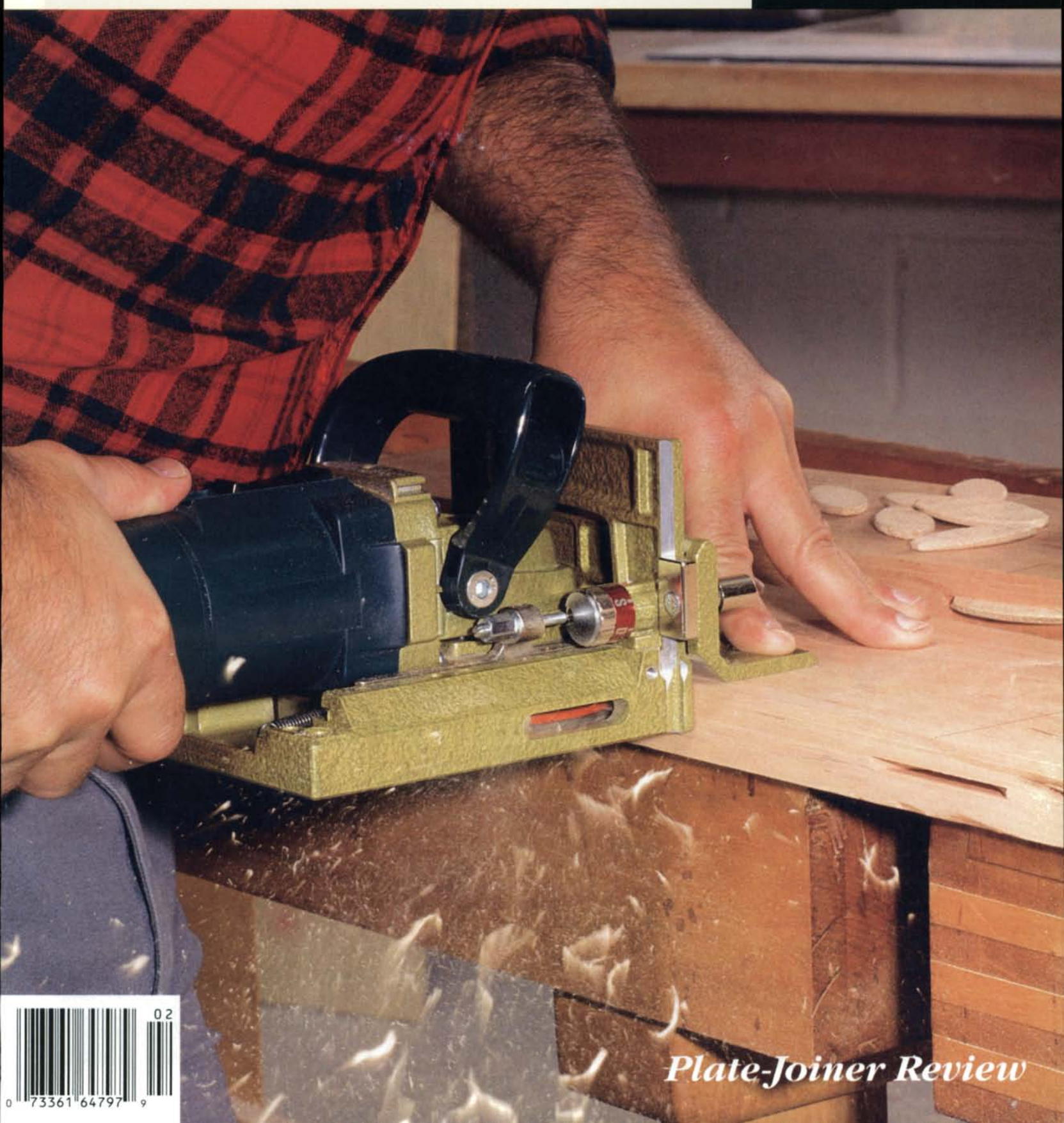

*Plate-Joiner Review*

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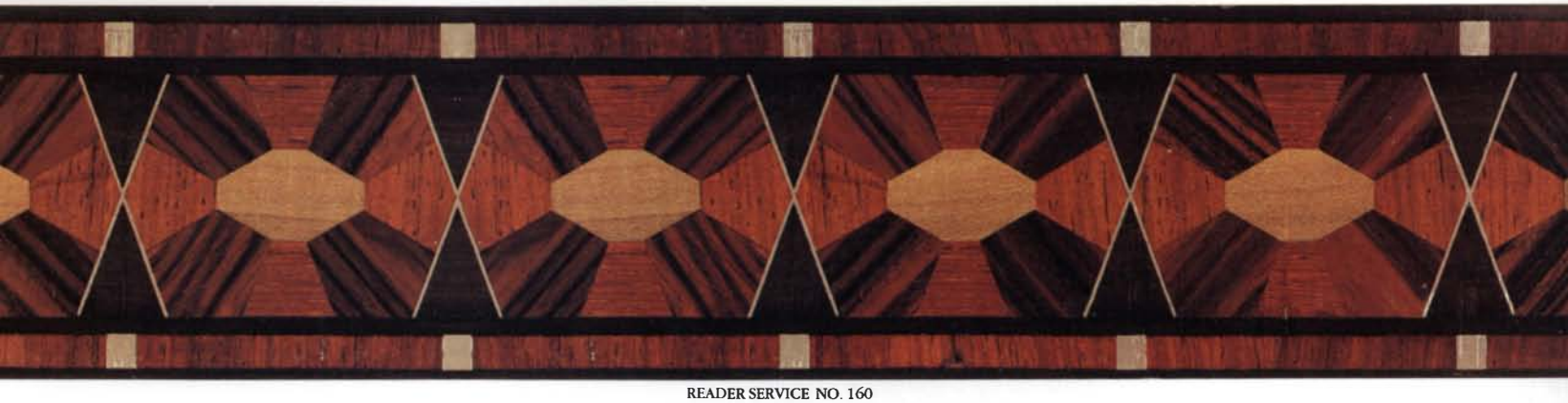

READER SERVICE NO. 160

Fine WoodWorking®

January/February 1995 No. 110

## DEPARTMENTS



## ARTICLES



*Space-saving panel router, p. 86*

*Choosing drawer slides, p. 64*


*Building a mantel, p. 44*

***On the Cover:*** *Plate joiners offer a quick way of making amazingly strong joints in wood. Associate editor Charley Robinson takes a look at 16 of these versatile tools on p. 52. Photo: Robert Marsala*

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**Rings don't belong in the woodshop—** For years, I'd heard the warnings about wearing a wedding ring (or any jewelry) while working in the woodshop, but it took a nonwoodworking accident to bring the point home. Without going into the gory details, I recently caught my ring on something while I was working outside and came close to pulling off both ring and finger. After the stitches were removed and a little therapy, the finger is pretty much back to normal. Other folks who suffer similar accidents aren't so lucky.

At *Fine Woodworking*, we work hard to make sure we describe and illustrate safe practices. Where there are dangers, we try to point them out and offer tips to avoid trouble. Jewelry is definitely one of those trouble areas, but it's one many of us skirt around. Even the doctor who sewed me up, who happened to be a woodworking hobbyist and an *FWW* subscriber, noted the incident will make him think twice the next time he's working in his shop.

**Making a contribution to share woodworking knowledge—**One of the things that is both a challenge and an opportunity for *Fine Woodworking* is how far-flung both our readers and our contributors are. In this issue alone, there are articles and photographs from across the United States, Canada and even Australia. The diversity of our authors reflects the diversity of our readership.

The same is true of our contributing editors. Last fall, we brought them together for a special meeting. They came from as far away as California and Texas to our offices here in Connecticut, all with one goal in mind: to help improve the quality of *Fine Woodworking* magazine. In a conference filled with frank discussion and serious reflection on how best to share valuable woodworking information, the contributing editors brought their diverse interests and backgrounds to the effort.

Tage Frid, the senior member of our roster of contributing editors, came from Rhode Island to give us the benefit of his experience. Christian Becksvoort interrupted his busy custom furnituremaking work to drive down from Maine. Jim Richey, who has done the "Methods of Work" column since the black-and-white days, came up from Texas. Robert Vaughan set aside his woodworking machine repair duties to fly here from Virginia. Sandor Nagyszalanczy took time away from his book and furniture projects to fly here from California. And Mario Rodriguez took a short hiatus from his woodworking and teaching activities to drive over from New York. It was the first time they all had met face to face.

We appreciate their commitment to the magazine. The breadth of their talents, experience and interests all combine to help us provide better quality information to our readers.

**A taste of biscuit joinery turns into a full meal—**Whenever we review tools, we encourage the whole staff to help out for a more thorough review. I had the opportunity to join in on Charley Robinson's review of plate joiners (see p. 52), and the experience was eye-opening.

Although it's no longer new technology, joining wood with pressed wood biscuits is still in its infancy. But it is growing fast both in acceptance by woodworkers doing quality work and by manufacturers developing new products for the process. Clearly, the competition is healthy as it helps to improve the quality of machines and lowers prices. For those who still haven't tried plate joinery, I recommend checking it out. You may be surprised how quickly and easily you can make strong, precise joints, especially in sheet goods.

**More on computer networks for woodworking—**Response has been positive to Michael Covington's article in *FWW* #108 about the woodworking forum (*rec.woodworking*) on the Internet, but a number of readers called to say they were having trouble connecting. Fred Garlick, a reader in Harrisburg, Pa., and an experienced Internet user, encountered the same problem, but he quickly found a solution. He explained there are two kinds of gateways to the Internet, either Bitnet or Internet. He listed three Bitnet gateways, any one of which will work to reach *rec.woodworking*. They are *cunyvm.cuny.edu* or *cornellc.cit.cornell.edu* or *pucc.princeton.edu*. Here's an example: *LISTSERV%ipfwvm.bitnet@cunyvm.cuny.edu*.

A number of readers have also phoned, faxed or written to ask that we include more computer-related woodworking information in the magazine. We are exploring several possibilities, and we are always open to more suggestions, including article proposals. *—William Sampson, editor*

**Errata—**In the review of jointer-planers in *FWW* # 109, some errors surfaced in the information about the Inca Model 570. It is the outfeed, not the infeed, table that must be removed to convert the unit to a thickness planer. The correct listing for cuts per inch should have been 91 or 130 (not 61 or 86). The unit does not come with a stand, but an optional stand is available.

In Worth Barton's article on making a rip fence (*FWW* #109), the Adjustable Clamp Co. was incorrectly listed as a source for aluminum and steel. Readers should check local phone directories for steel suppliers or contact Castle Metals (708) 455-7111.

*—Alec Waters, associate editor*

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***Writing an article***

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

**Stop the veneer presses—**I had just completed installation of my own vacuum veneer press, happy with all the space and money I'd saved, when the postman hands me a picture of Mario Rodriguez laying veneer with an iron (*FWW* #108). It's hot melt, I thought at first, and this will get more letters than the Norm Abram cover. But no, all I need is a bottle of glue and the household iron that keeps my coffee cup warm. They've both sat on my bench since Nixon went to China. In the future, please tell circulation to mail my copy sooner.—*Sam Clay, Venice, Calif.*

**More household devices for woodworking—**It is not easy to claim individuality when it comes to the craft (and art) of woodworking. With this preface, I relate the following personal experience. I was once faced with the task of applying 1cm strips of veneer to a complex-curved surface. I did have a small veneer iron, but the curves were too tight and complex to allow its use. Out of pure frustration, I borrowed a hair dryer that could put out a blast of air as hot as fire. To make the project work, I used Titebond II. It only takes about three to five minutes because I preheated the veneer strips when I pre-formed them to fit the complex-curved surfaces. The project is now four years old and shows no sign of separation. Though this idea was original with me, I'm certain somebody else somewhere else has tried it, too. —*Arthur L. Duell, Fayetteville, Ark.*

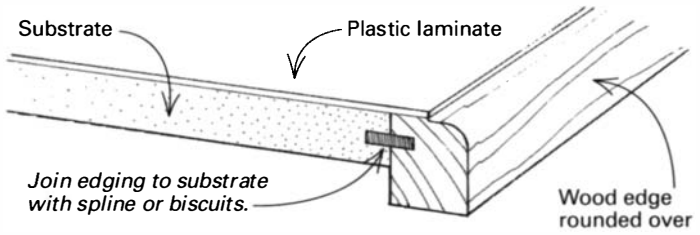
**Beltsand synthetic countertop edges—**This is in response to "Working with Synthetic Countertop Materials" (*FWW* #108). Several years ago, a professional installer of countertops suggested using a belt sander to make sure that the edge material is flush with the substrate before applying the top. By power-sanding both top and bottom surfaces, you prevent two problems from arising: First, if the edge extends slightly above the substrate, a hollow sound occurs when you tap the top. In time, this can cause separation. Even if the top edge is sanded a few thousands of an inch lower than the top surface, the laminate adhesive will hold. Second, by sanding the bottom edge, you eliminate the temptation of picking the edge with fingernails.

It is faster to sand the edge than to use a router. There is less potential for damage. —*Bill Page, Toledo, Ohio*

**More techniques for synthetics—**I enjoyed reading your article, "Working with Synthetic Countertop Materials" (*FWW* #108). As a plastic laminate installer, I would like to make a couple of comments that may be of help to some of your readers.

If your project will be used in a high-traffic area, such as on a kitchen table or countertop, then it would be better to apply your edging last. Most nicks or dents will occur at the very edge of the tabletop, and this edging can be removed easily and a new piece applied. If the nick or dent is in the top sheet of laminate, the whole sheet must be replaced or recovered.

When applying a wood edge to a countertop, first install the wood edge to the substrate (see the drawing) with biscuits, a spline or glue (no nails or screws); then glue an oversized sheet of laminate over the entire surface. Use a router with a roundover bit or ogee of your choice, setting the bit to cut just below the thickness of the laminate. This method really looks good for those who do not mind the thickness of plastic at the edge. The plastic also covers the joint between the wood edge and substrate. Finish the wood, and you're done.




Spray contact adhesive is available that can take away the messy part of laminating for the woodworker who would like to try his hand at laminate work. Spray cans are about $8 to $10 a can but cover quite a bit of surface area. The nozzle is adjustable from a narrow spray pattern to medium to large. And the spray dries fast and holds well. 3M is one company that makes it; another one is V&S Sales Co., Inc., 12115 Burke St., Suite #4, Santa Fe Springs, Calif. 90670; (310) 907-2826. V&S Sales' spray #185 is the one I prefer. It contains no ozone-depleting chemicals, dries fast and overspray is very slight.
—*Harold Stewart, Oxnard, Calif.*

**Using typewriter platen restorer on planer feed rollers—**In the October 1994 issue (*FWW* #108), Jay Trinia of Culpeper, Va., asked about slippage on his two-year-old planer. Robert Vaughan replied with a suggestion to use lacquer thinner or other solvent to restore the rubber. He continued to suggest typewriter platen restorer, "if you can still find such stuff." The stuff is called Fedron. As a computer service manager, I need Fedron to renew rubber rollers and other rubber parts. I recently purchased some from Precision Roller, Inc., 301 Carlton Drive, Carrol Stream, Ill. 60188; (800) 323-9523. It is not inexpensive (8 oz. costs me $10.50, and a gallon is $19.95, not including shipping charges), but Fedron is very effective for this purpose.
—*Richard Hallex, Richmond Hill, N.Y.*

**Another remedy for slipping planer rollers—**On p. 32 of the October 1994 issue, Jay Trinia described a problem with planer roller slippage. I solved a similar problem on a nearly new Delta 13-in. planer by cleaning the cast-iron infeed table (platen) with acetone and then applying TopCote product. This leaves the platen smooth and slippery and eliminates roller slippage.
—*Andy Bessette, Marina Del Rey, Calif.*

**Thanks from a Parks planer fan—**Robert Vaughan's article on planer tune-ups (*FWW* #107) was special to me. I've had a

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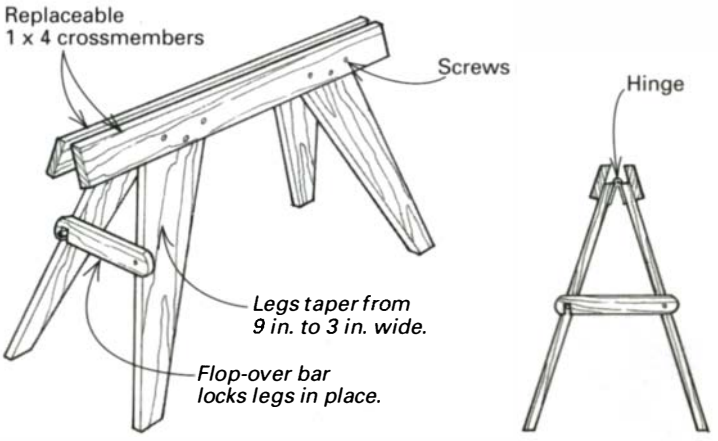
Parks 12-in. planer for 18 years. He is very generous to so completely describe all of his procedures, temporary bed roller shims, yet! Thank you for the article, not to mention the video.
*–Harold E. Harden, Garberville, Calif.*

**Shelving makes a good sawhorse**—*FWW* #108, p. 8, discusses "improved folding sawhorses," apparently built of 2x4s. These appear heavy and cumbersome compared with the design I've used for the past 30 years (see the drawing below). I use the same hinging method as proposed, but I use 1x12 #3 shelving for the legs and 1x4s for the top crossmembers.




I use a single flop-over bar rather than a chain to prevent the sawhorses from spreading and collapsing. The units are light, sturdy, collapsible and stackable. I use screws to attach the 1x4 crossmembers, so they can be replaced if they become damaged over time from sawing plywood, etc. If that is not a concern, I would recommend gluing the legs to the crossmembers.
*–Ross G. Roepke, Tullahoma, Tenn.*

**What he really wants is a shaper**—Reader John Weidner (*FWW* #108) calls for tool companies to develop a router specifically designed for table use. He suggests that such a machine be permanently table-mounted, have an on/off switch at the front of the table, a large height-adjustment wheel and an easily adjustable speed control.

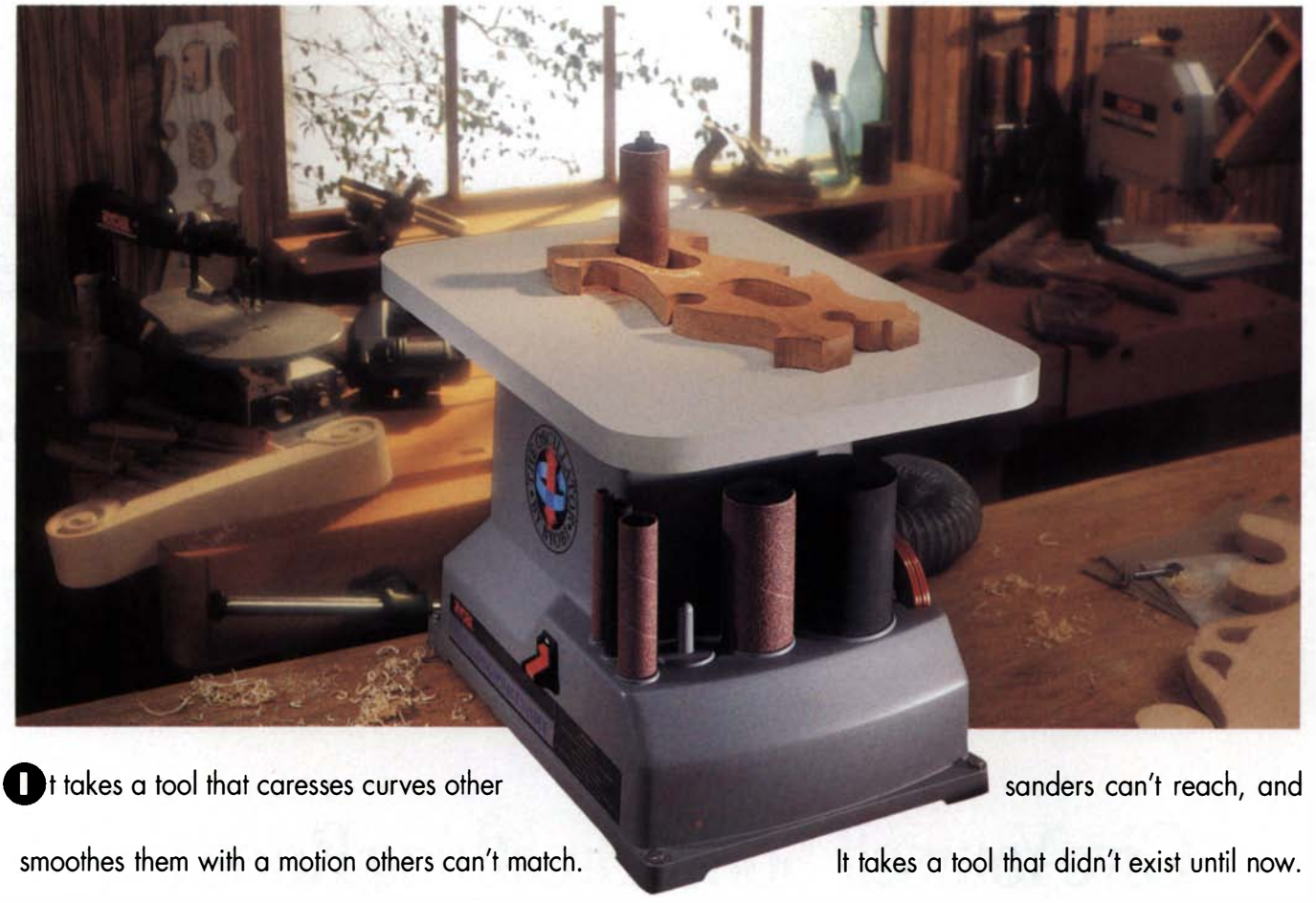
Whoa! There has to be a limit (silk purse from sow's ear-wise) to what one can do with an inherently limited tool. What Weidner really seems to want is a full-fledged spindle shaper at a router price.

Those clever woodworkers who first hung a router upside down had a strong motivation: to get, with a $200 router, most of the features of a $2,000 shaper. Nowadays, if you go the commercial-gadget route, it's entirely possible to spend as much for a router table as for a shaper. But what you have is still an upside-down router.

I join Weidner in wishing for a table-mounted machine that accepts router bits, runs them at appropriate speeds and costs in the ballpark of a high-end router. If the tool companies respond to his challenge, I suspect their offerings will look very much like a shaper and not at all like a router.
*–Donald C. Brown, Ruckersville, Va.*

**Fasteners for antique reproductions**—In the "Q & A" column of *Fine Woodworking* #108 (pp. 34 and 36), Robert H. Kuiper asks for a source of antique fasteners, such as slotted-head, unplated-iron or steel wood screws, for use in period reproduc-

# Man has always been attracted to curves. But until now, no one quite knew how to sand them.



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tions. For my antique hardware needs, I look for things such as, sturdy, well-constructed, plated hinges and screws. Slotted-head screws are seldom included with the hardware but are almost always available in separate packages.

I remove the plating by soaking the parts in a muriatic acid bath for an hour or more. I use approximately half water and half acid (for safety, be sure to add the acid to the water). Then I place the cleaned screws and other steel parts on a firebrick and heat the parts with a propane torch. The steel will turn to a variegated black-blue-brown color, which can be fixed by placing the heated parts in a bit of mineral oil. The oxide coating produced by heating protects the hardware from rusting; it is the finish you will find on many pieces of old hardware.

*—Richard R. Pruitt, Austin, Texas*

**Pricing methods for woodwork—**A question in *Fine Woodworking* #108 from Charles Mallon prompted me to write on how I do my pricing. I usually use four methods and then take an average. This eliminates the possibility of mistakenly pricing way too high or too low. The first method is to figure out the materials and multiply times three. You would be surprised at how close this amount comes to what I get using the other three methods.

The second method is to list all the steps that it takes to make the project. Then I estimate the time for each step, add up all the times, including a few miscellaneous hours, and multiply the total hours by how much money I want to make per hour. Then I add materials. And I don't forget to include things such as the time that it takes to do the plans, to cut the material and to visit the local hardware store.

The third method is to multiply the length of the project by a price per foot. My prices usually range from about $100 a foot for a simple no-frills bookcase to around $350 for specialized, fancy work.

For the fourth method, I just look at the project drawing, and based on a gut feeling, guess how many days it will take me to complete the project. I multiply this number by how much I want to make per day and add materials. When figuring materials, I usually figure the board footage of solid wood and then multiply by 1.4 to account for waste. To figure out sheet-stock quantities, I draw a bunch of 1-in. by 2-in. rectangles that represent plywood sheets. Then I sketch the parts of the project inside the rectangles.

After coming up with four prices using the methods above, I add them all together and divide by four to get an average. If my client strikes me as somebody who is willing to pay a lot, I might increase the price some. But if I am hard up for work or if I know I am bidding against several other people, I might decrease the amount some. *—Shane Stock, Laredo, Texas*

**Modifying a saw set for fine-toothed saws—**Concerning the setting of fine-toothed saws (*FWW* #108, p. 30), I would use a standard carpenter's saw set, but I would remove the plunger and grind the working end to a narrow "V" to fit the pitch or tooth size of the saw to be set. When grinding the plunger, I maintain the same angle. Properly used, this tool should give a perfect set to every tooth. *—Harold Anacker, Bellevue, Wash.*

**Spotting maple trees with bird's-eye figure—**I noticed a question from one of your readers (*FWW* #108) regarding bird's-eye maple trees. There was a response by Jon Arno indicating that "it is possible to tell if a standing maple tree contains bird's-

eye figure" and "experienced timber cruisers are even able to predict with relative accuracy the quality and extent of the bird's-eye figure in the tree simply by examining the bark."

I had heard that a person can tell by looking at the bark, but Arno did not tell us what the bark is supposed to look like if the tree is heavily figured with bird's-eye grain. Is it also possible to tell if a maple tree contains curly or tiger maple grain?

*—Donald Bradbury, Medway, Mass.*

**JON ARNO REPLIES:** Explaining how to identify bird's-eye maple in the standing tree is a difficult task, and acquiring the skill to actually do it requires some first-hand experience in the bush. To get good at it, you must develop a keen sense of what the bark and form of a normal maple tree look like so that subtle variations become obvious.

The first clue that a tree contains bird's eye can be spotted from a considerable distance. The trunk tends to be barrel shaped and bumpy rather than smooth and tapered. Because of the bumps, its silhouette generally displays a wavy lack of uniformity with respect to diameter, and the bark is often slightly darker than on normal maple trees. Upon closer examination, the plates of the bark will be patchy and irregular in terms of their shape and size.

Typically, the bark on a mature maple tree fractures into plates that are roughly rectangular in shape, usually ½ in. to 1 in. wide by 1 in. to 2 in. high. But bird's-eye bark will be peppered by patches of smaller plates less uniformly aligned and somewhat flaky (the corners of the plates lift away from the tree). The quality and extent of the bird's-eye figure in the log is indicated by the size and distribution of these irregular patches.

Quite often, a tree will produce only isolated sections of bird's eye, while most of the trunk is comprised of normal wood. In a top quality bird's-eye log, the irregular patches completely cover the bark and are so congested they flow into each other. Because the eyes in bird's eye tend to expand in diameter with each succeeding growing season, large irregular patches on the bark are a good indication that the tree has been producing bird's-eye tissue for many years.

As for the other special figures found in maple, logs with wavy grain usually can be identified by examining the end grain, although the ability to predict this feature before the tree is felled is far less certain.

**A simpler source for elastic clamping material—**In regard to 'Clamping awkward shapes,' "Methods of Work" (*FWW* #108, p. 20). For years, I've been using strips of rubber of any length and width cut from discarded inner tubes obtained free from most any filling station glad to get rid of 'em. With enough rubber and wet veneer, you can veneer a bowling ball.

*—Hamil Murray, M.D., Gainesville, Ga.*

**About your safety:**
Working wood is inherently dangerous. Using hand or power tools improperly or neglecting standard safety practices can lead to permanent injury or death. So don't try to perform operations you learn about here (or elsewhere) *until you're certain that they are safe for you and your shop situation.* We want you to enjoy your craft and to find satisfaction in the doing as well as in the finished work. So please keep safety foremost in your mind whenever you're in the shop.

*—James P. Chiavelli, publisher*

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| 12" x 40T x 1" | ~~183~~ | 129 |
| 12" x 30T x 1" | ~~162~~ | 119 |
| 10" x 40T x 1/8" or 3/32" | ~~156~~ | 119 |
| 30T 1/8" or 3/32" | ~~135~~ | 99 |
| 9" x 40T | ~~146~~ | 109 |
| 30T | ~~125~~ | 99 |
| *8-1/4" x 40T 3/32" | ~~136~~ | 99 |
| 8" x 40T 3/32" | ~~136~~ | 99 |
| 30T 3/32" | ~~115~~ | 89 |
| 7-1/4" x 30T 3/32" | ~~112~~ | 69 |
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Wood Magazine test, Sept., '93, pg. 45.


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David Sharp
Sugar Land, Texas

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Peter Lauritzen - Carpentry
Tesuque, NM
P.S. I hope to see these available in 7 1/4" size in the future, for skilsaws
"They are right now, Peter."
Jim Forrest

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Kenneth L. Salisbury
Huntsville, AL

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(From Another Customer)
In closing I would like to add that the Woodworker II blade is by far the finest saw blade that I have ever used. I also have the Forrest dado set which is without a doubt, the king of all dado sets. I work exclusively with red oak and oak veneer plywood and the dado set performs splinter-free cuts as advertised.
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| Hitachi 8-1/2" DeWalt 8-1/2" & Ryobi | 8-1/2" x 60T x 5/8" | 179 | 109 |
| Delta | 9" x 80T x 5/8" | 204 | 119 |
| Ryobi-Makita & all | 10" x 80T x 5/8" | 207 | 129 |
| DeWalt, Makita, B&D & Hitachi | 12" x 80T x 1" | 229 | 139 |
| Ryobi-Makita | 14" x 100T x 1" | 266 | 179 |
| Hitachi | 15" x 100T x 1" | 277 | 189 |

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| 10" x 60T x 5/8" 3/32" K | 162 | 129 |
| 9" x 60T x 5/8" 3/32" K | 156 | 119 |
| 8" x 60T x 5/8" 3/32" K | 150 | 109 |
| New 8-1/4" x 60T x 5/8" 3/32" K | 150 | 109 |
| New 7-1/4" x 60T x 5/8" 3/32" K | 150 | 109 |

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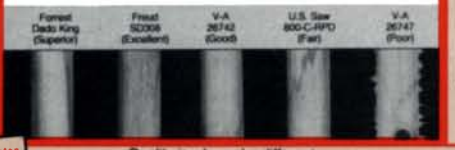


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### DURALINE Hi-AT

*Note: Fine Woodworking Editorial Nov./Dec. 1988 No. 73, pg. 65, S.N. recommends high alternating top bevel (ATB) thin kerfs and large blade stiffeners for smoothest cuts on RADIAL SAW, etc.*


Jim Forrest, President and designer microscoping cutting edge.

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| 14" x 80T x 1" | 232 | $197 |
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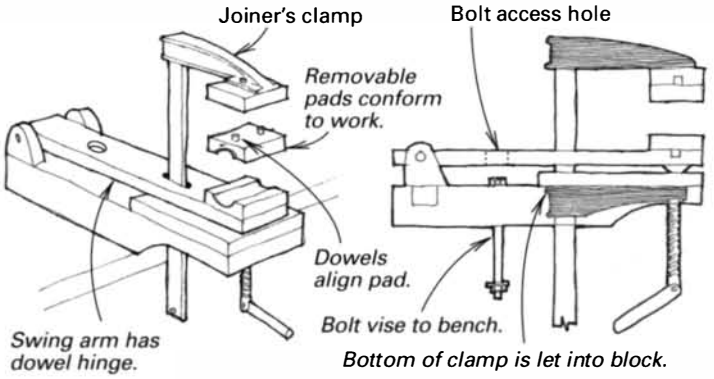
edited and drawn by Jim Richey

## Horizontal vise lends an extra hand

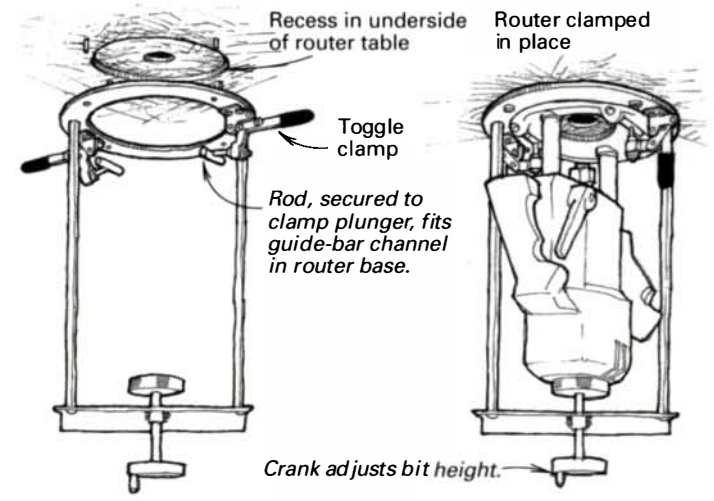



In the course of repairing furniture, I often need to hold irregular shapes in a horizontal position. So I made a horizontal vise using a Record joiner's clamp. I let it into an oak base, which I temporarily bolt to my bench when the vise is in use. Remove the stop pin from the joiner's clamp bar, so you can position the clamp with its fixed side above and its screw side below the vise. The lower side of the vise features a swing arm between the work and the vise screw. The swing arm pivots on a dowel hinge. Both the upper and lower jaws are drilled with two holes to receive specially shaped wooden jaw pads that have dowel-alignment pins. I have several pairs of pads shaped to fit the different profiles that I encounter.

To use the vise, I lift the fixed arm, place the work between the jaw pads and lower the fixed arm onto the work. A few turns of the handle secure it. *—William. D. Edwards, Burlingame, Calif.*

***Quick tip:*** For turning small spindle stock between centers, buy an extra cup center, and use it on the headstock as the drive center. If you have a dig, it will act like a clutch, spinning in the workpiece. Also, if you happen to touch it when working close to the headstock, it will not eat your gouge like a spur center will. *—Geordie Smith, Ruddell, Sask., Canada*

## Router-table mount allows height adjustment

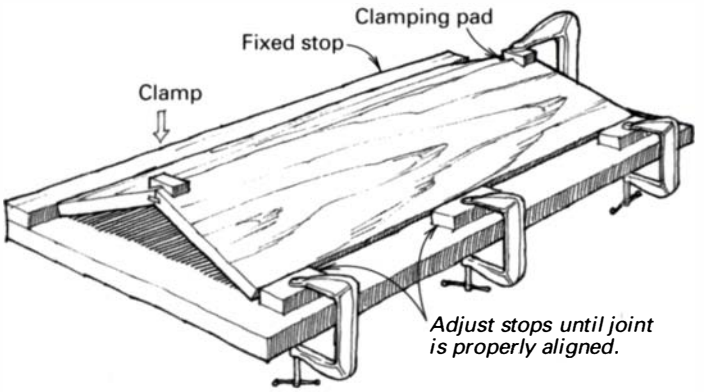



To enable me to rapidly insert and remove my router from my router table, I built the toggle-clamp fixture shown in the drawing above. I removed the rubber cushions from the clamps and substituted short sections of steel rod, tapped through the middle like barrel nuts. The rods clamp into channels (for edge-guided rods) molded in my router's base.

The fixture also features an easy-to-use height-adjustment screw, which is simply a length of threaded rod fitted with a crank on the bottom and a pressure-dispersing disc on top. The screw eliminates the problem of having to overcome the combined force of the plunge router's weight and the spring pressure when making small height adjustments.

The all-metal fixture in the drawing does require moderate metalworking skills and access to some metalworking machinery. However, many of the components could be replaced by wooden counterparts. *—Philip Blume, Albuquerque, N.M.*

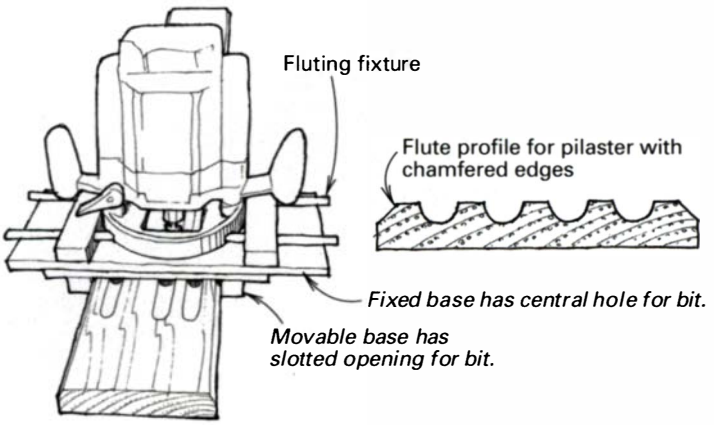
## Edge-gluing setup handles angled boards




After many trials and some wasted materials, I finally discovered this effective technique for clamping boards that are at a slight angle. Dry-run the clamping until the stops are located perfectly. I'd recommend using a slow-setting glue such as Franklin hide glue. If needed, clamp the central area of the boards by running a caul across them with a clamp on each side.

*—W.G. Sheard, Horseheads, N.Y.*

## Fluting jig guides router




Fluting in flat surfaces adds grace to fireplace surrounds, doorway casings and the like. This router jig simplifies the process.

Start by building a guide carriage with two parts: a fixed base that attaches to the router and a movable base that straddles the workpiece. I used ⅜-in.-thick Baltic-birch plywood, but any similar dense material will do. It is possible to fasten the two parts of the jig together with wing nuts and slots. But because there are usually only two settings, I screw the two parts together with six wood screws.

Tradition dictates four or five flutes. I like to use four flutes because I can get the maximum effect with the minimum of router settings. Either way, lay out the profile of your flutes on a piece of paper to determine the spacing of the flutes (the layout shows you the settings for the jig). Remember that you will be making identical cuts from both edges of the workpiece, so only two settings will yield four flutes. Draw index marks on the fixed base to show where you will attach the movable base.

Get the feel of your jig by making practice runs on a scrap cutoff. Take note of the following:

- The movable base must straddle the stock so that it slides

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freely but with minimal slop in the fit. This requires the stock to be perfectly uniform in width.

• Use new or freshly sharpened core-box bits. Dull bits are hard to push and leave burn marks.

• Check the spacing of the flutes with only two of the six base screws in place. Adjust the settings of the movable base if necessary. When the spacing is perfect, screw the movable base to the fixed base with all six screws.

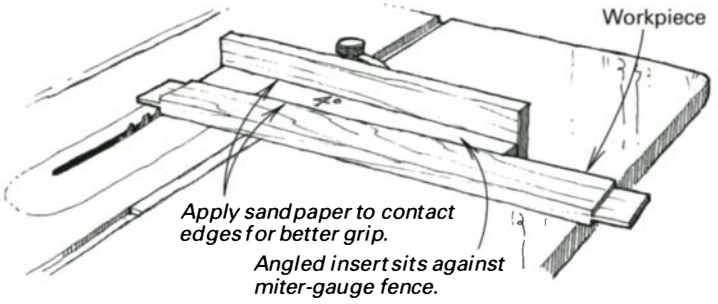
• Use a variable-speed router, if possible, and slow the speed at either end of the flute.

• Draw the router to you. Make several passes, and finish with a fine cut.

• Use a good respirator mask and a pair of goggles.

*—William D. Lego, Rockford, Ill.*

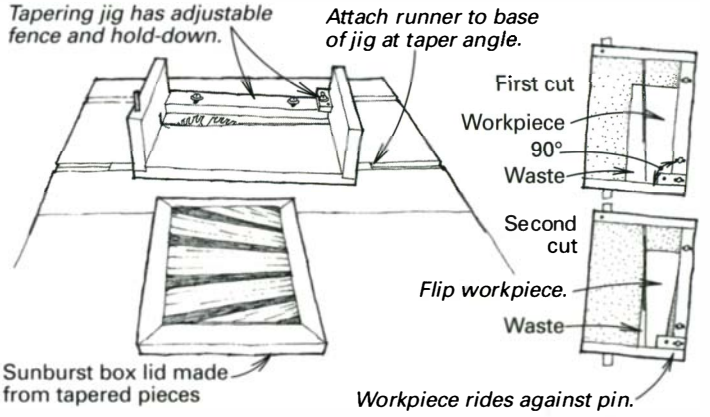
## Cutting angled tenons on the tablesaw




When cutting angled tenons like the kind needed on aprons of tapered-leg tables, using your tablesaw's miter gauge can be prone to error. And setting the miter gauge to the exact but opposite angle to cut the other side of the tenon is time-consuming. An easy solution exists. Cut your desired angle in a long piece of scrap, and then insert the scrap to add or subtract this angle from your normal 90° setup. If the miter gauge's 90° fence is accurate, the opposites will match exactly. Add a strip of sandpaper to the contact surfaces of the scrap to prevent slippage.

*—Robert J. Clark, Holland, Mich.*

## Tapering jig can handle small pieces




My jewelry boxes feature a sunburst pattern on the lid, which I make by gluing up nine or so tapered pieces into a fan shape. The jig that I use to cut these small tapered workpieces on my tablesaw is built like a miniature sliding crosscut table. One big difference, however, is that the runner (which fits in the tablesaw's miter-gauge slot) is attached at an angle to the centerline of the jig. The runner angle should be half the desired taper an-

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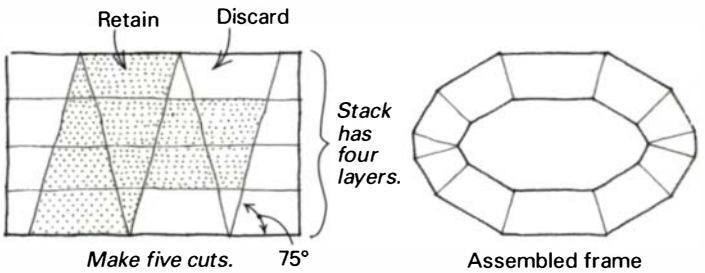
gle, which for my jig is 4°. An adjustable fence to the right of the kerf determines the width of the tapered piece's wider end. The lower end of this fence has an adjustable hold-down that registers the workpiece for the second pass. With this jig, you can vary the width of the workpiece but not the taper angle.

Equally taper both edges of the work. Here's how I do it: I draw each tapered piece to scale, and then I measure the dimensions. Next I set the jig's fence to the width of the workpiece's wider end (the end that meets the sawblade first), and I make the first taper cut. I place a brass pin (stored in the jig's rear cross brace when not in use) in the hold-down and adjust the pin to the width of the trapezoid's narrower end. I flip the blank over and make the second cut.

*—David M. Freedman, Cross Plains, Wis.*

## Make oval frames with only one cutting angle



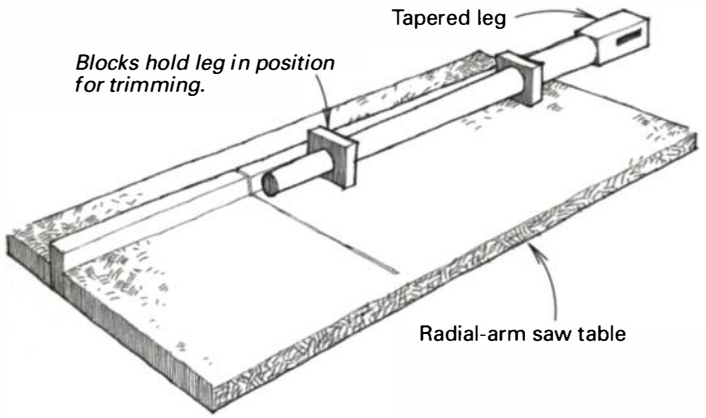

While building a small oval box, I worked up a system for elliptical frame construction that may be useful for oval mirrors and the like. It is basically a staving system, but the advantage is that only one miter angle is needed. Stack four layers, and make five crosscuts through the layers at 75°. The resulting pieces will assemble into an oval-shaped frame, as shown in the drawing.

*—Lee E. Dunbar, Elkton, Va.*

***Quick tip:*** To help visualize turned designs, hold a mirror at 90° to the outline of one-half of the turning. Change the position of the mirror until you like the design you see, and then mark along the edge of the mirror to record the centerline of the pattern.

*—Virgil Martin, Orrville, Ohio*

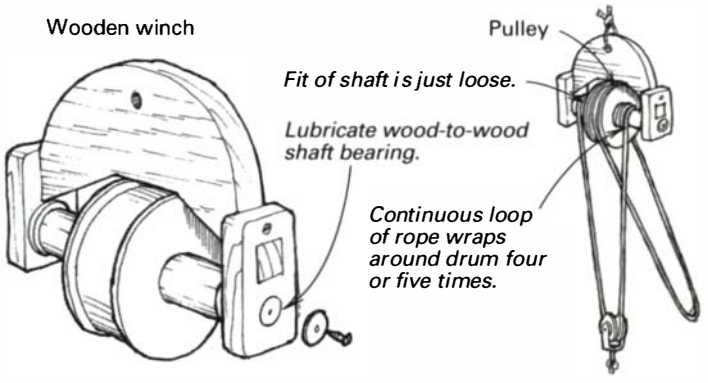
## Crosscutting tapered legs on the radial-arm saw




Recently, I had to shorten some factory-made tapered legs. To make sure the cut was perpendicular to the centerline of the legs, I used the following simple method: I cut two identical squares larger than the diameter of the leg. Then I drilled a different-size hole in each of the squares. When the squares

are pushed onto the leg, one is wedged near the small end and the other near the big end. When pressed against a radial-arm saw fence, the blocks will hold the leg in exactly the right position for cutting. The system can be used with round or square tapered legs. *—Bernie Badler, Castro Valley, Calif.*

## An all-wood winch




I have a very small workshop. So some heavy tools have to share a single stand. To make it easier to mount and dismount the tools, I built an all-wood winch. It serves its purpose well.

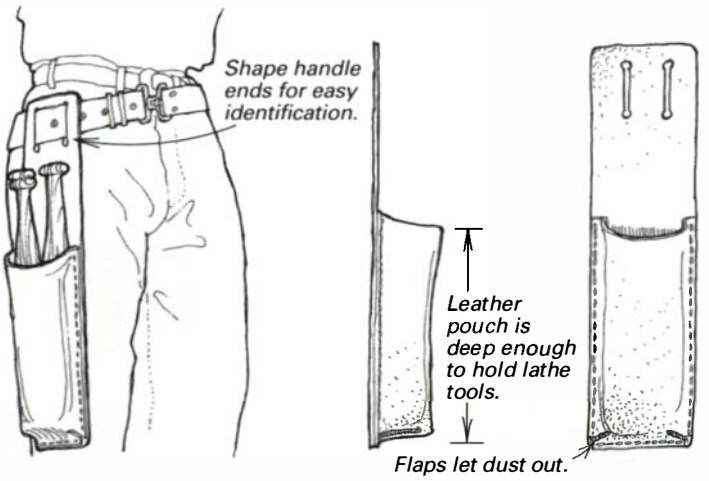
After you get a slightly loose fit of the shaft to its bracket, lubricate the wood-to-wood surfaces. To operate the winch, wind a rope around the inner drum four or so turns to provide a no-slip grip. Splice the other end of this rope so that it forms an endless loop. The force one has to apply to the winch rope is about one-fourth the weight lifted.

*—Abe Peled, Ramat-Hasharon, Israel*

***Quick tip:*** Use cooking oil (Mazola corn oil, for example) to safely remove spots of polyurethane from your hands. Simply rub about a spoonful on the area, and then wash with soap and water. Cooking oil is also a great solvent for pine pitch.

*—Jim Van Dreese, Wisconsin Rapids, Wis.*

## Lathe-tool pouch puts turning tools at easy reach




Most of my turning is done with only three lathe tools. When I got tired of losing them under mounds of sawdust, I designed a belt pouch like the knife pouch butchers use. The pouch is a rigid leather tube, closed at the bottom, that hangs from the tool belt at my side like a gunslinger's holster. I sized the pouch deep enough to contain all of a turning tool's blade and about half the handle, which is enough to prevent tools from falling out.

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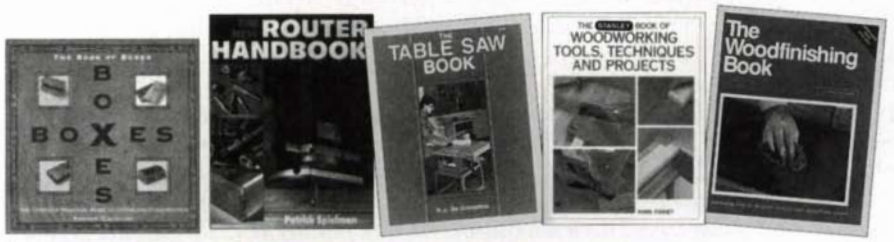


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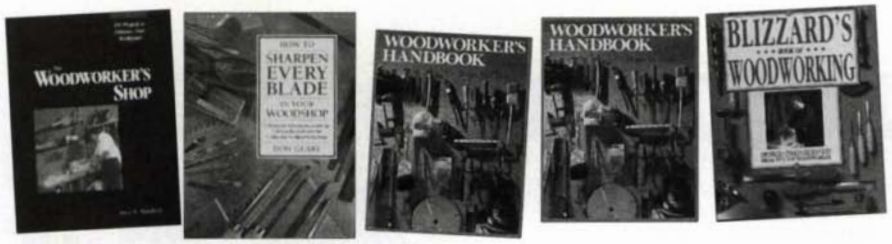


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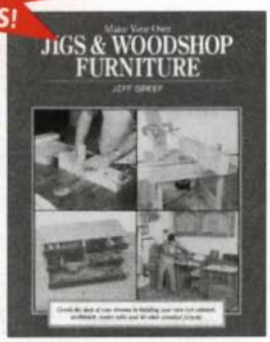


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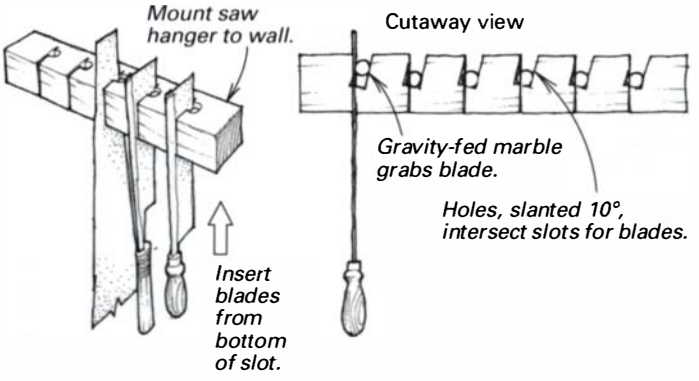
LAFD

I turn my own tool handles, so I made each of the handles distinctive enough that I can identify the tool just by touch. This allows me to quickly change tools without having to take my eyes off the work.

*–Anthony W. Clarke, Moonta Mines, Australia*

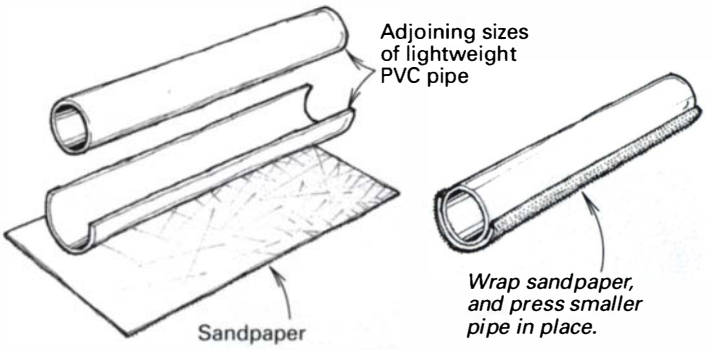
## Wall-mounted saw hanger secures blades




This device will provide neat, secure storage for your handsaws, which normally are cumbersome to hang on the wall. Start with a 2x2 block of wood. Cut equally spaced 1½-in.-deep slots, one for each saw you want to store, and buy enough marbles so that you have one for each slot. Now drill a hole beside each slot, slightly angled, so each hole intersects a slot. These holes should be 1 in. deep and just a bit larger in diameter than the marble. Attach the hanger on the wall of your shop, so the holes are on top. Then place a marble in each hole. Slide your saws up through the bottom of the slots, which will push the marbles up. Gravity will pull the marbles down to pinch against the blade and hold it in place.

*–Robert Andrews, San Diego, Calif.*

## Making a curved sanding block




Here is an easy way to make a curved sanding block for cove or circular holes. Split a piece of PVC 20 (the lightweight, cheaper stuff) lengthwise on the tablesaw or bandsaw, so you have just over a full half cylinder. Size the sandpaper so that it wraps around the half cylinder with an extra ½-in. flap on both sides. With the sandpaper in place, snap the block over a length of the next smaller size pipe to hold the sandpaper in place. Because this works with any two steps in size, you can vary the radius from ½ in. to 2 in.

*–Kenneth E. Vinyard, Medford, Ore.*

*Methods of Work buys readers' tips, jigs and tricks. Send details, sketches (we'll redraw them) and photos to Methods,* Fine Woodworking, *PO Box 5506, Newtown, Conn. 06470-5506. We'll return only those contributions that include an SASE.*

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| 330K | 330 WITH CASE & 2-10 YD ROLLS PAPER | 94 |
| 332 | QUIKSAND 5" RNDM ORB W/ STIKIT PAD | 65 |
| 332K | 332 W/CASE & 100 SHEETS PAPER | 92 |
| 333 | QUIKSAND W/HOOK & LOOP, DUSTLS | 73 |
| 333K | 333 W/ CASE & 50 SHEETS PAPER | 99 |
| 334 | QUIKSAND W/STIKIT, DUSTLESS | 73 |
| 334K | 334 W/CASE & 100 SHEETS PAPER | 99 |
| 340 | 1/4 SHT FIN SANDER W/DUST P/U | 49 |
| 340K | 340 WITH CASE & 10 SHEETS PAPER | 72 |
| 345 | SAW BOSS 6" CIRCULAR SAW | 104 |
| 347 | 7 1/4" FRAMERS SAW 15 AMP, 10.25 LBS | 127 |
| 351 | 3" X 21" BELT SANDER | 148 |
| 351K | 351 W/ 10 ASST BELTS & BELT CLNR | 158 |
| 352 | 3" X 21" BELT SANDER W/DUST BAG | 151 |
| 352K | 352 W/10 ASST BELTS & BELT CLEANER | 161 |
| 9352VS | 3" X 21" VS DSTLS BELT SANDR W/CSE | 165 |
| 9352VSK | 9352VS W/10 ASST BELTS & BELT CLNR | 175 |
| 360 | 3" X 24" BELT SANDER W/DUST BAG | 189 |
| 360K | 360 W/10 ASSORTED BELTS & BELT CLNR | 200 |
| 361 | 3" X 24" BELT SANDER | 182 |
| 361K | 361 W/10 ASST BELTS & BELT CLEANER | 193 |
| 362 | 4" X 24" BELT SANDER W/DUST BAG | 195 |
| 362K | 362 W/10 ASST BELTS & BELT CLEANER | 206 |
| 363 | 4" X 24" BELT SANDER | 191 |
| 363K | 363 W/10 ASST BELTS & BELT CLEANER | 204 |
| 410 | UNDERSCRIBE LAMINATE TRIMMER | 148 |
| 411 | MITER FOLD LAMINATE TRIMMER | 165 |
| 447 | 7 1/4" FRAMERS SAW W/BRAKE 15 AMP | 137 |
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| 505K | 505 W/CASE & 2-10 YD ROLLS PAPER | 159 |
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| 550 | *NEW POCKET CUTTER* | 178 |
| 556 | BISC JOINER W/CASE & TILT FENCE | 168 |
| 556K | SAME AS ABOVE W/1000 BISCUITS | 190 |
| 690 | 1 1/2 HP ROUTER W/1/4" & 1/2" COLLETS | 132 |
| 690K | 690 W/CS, EDGE GUIDE, & TEMP GD KIT | 179 |
| 9690 | 1 1/2 HP ROUTER W/CASE | 144 |
| 691 | 1 1/2 HP "D" HANDLE ROUTER | 148 |
| 691K | 691 W/CASE, EDGE GD & TEMP GD KIT | 204 |
| 693 | PLUNGE BASE ROUTER, 1 1/2 HP | 169 |
| 695 | SHAPER TABLE W/ 1 1/2 HP ROUTER | 216 |
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| 2620 | 3/8" VSR DRILL, 0-1200 RPM W/CHK | 86 |
| 2621 | 3/8" VSR DRILL, 0-1200 RPM, KEYLESS | 89 |
| 5008 | DOVETAIL TEMPLATE | 76 |
| 5009 | MORTISE & TENON JIG | 47 |
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| 7312 | OFFSET TRIMMER | 127 |
| 7319 | TILT BASE TRIMMER | 99 |
| 97335 | 5" RANDOM ORBIT SANDER, VS W/CSE | 132 |
| 7335K | 7335 W/CS, DUST EX SYS, 100 SHTS PPR | 165 |
| 97336 | 6" RANDOM ORBIT SANDER, VS W/CSE | 137 |
| 7336K | 7336 W/CS, DUST EX SYS, 100 SHTS PPR | 169 |
| 73333 | RANDOM ORBIT DUST EXTRACTION | 24 |
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| 7549K | 7549 W/CASE & 10 BLADES | 152 |
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| 7800 | DRYWALL SANDER | 329 |
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| 9118 | PORTA PLANE KIT W/CASE, CRBD BLD | 209 |
| 9314 | 4 1/2" TRIM SAW KIT | 152 |
| 9315 | 7 1/4" BUILDERS SAW KIT | 139 |
| 9345 | SAW BOSS 6" CIRCULAR SAW KIT | 123 |
| 9347 | 7 1/4" FRAMERS' SAW W/STEEL CASE | 138 |
| 9637 | TIGER SAW VAR SPD RECIP SAW KIT | 144 |
| 9647 | TIGER CUB RECIP SAW KIT | 119 |
| 9743 | 7 1/4" FRAME SAW KIT, 15 AMPS | 140 |
| 9653S | 12V CRDLS KIT W/2 BAT, CASE | 169 |
| 97310 | LAMNT TRIMMR KIT W/4 BASES & CS | 194 |

## AEG

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|---|---|---|
| TXE150 | 6" VS DSTLS RANDOM ORBIT SANDER | 138 |
| BSPE100 | BAREL GRIP JIG SAW, VS W/CASE | 155 |
| FSPE100 | TOP HANDLE JIG SAW, VS W/CASE | 155 |
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| 31-080 | 1" BELT 5" DISC SANDER | 93 |
| 31-460 | 4" BELT 6" DISC SANDER | 127 |
| 34-182 | TENONING JIG | 84 |
| 36-090 | 10" SIDEKICK MITER SAW | 214 |
| 37-070 | *NEW* 6" VS BENCH JOINTER | 248 |
| 40-560 | 16" SCROLL SAW, 2 SPEED | 178 |

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| 6491 | 10" MITER SAW W/BAG & 80T BLADE | 288 |
| 6494 | 10" COMPND MITERSAW W/CARB BLD | 309 |
| 6507 | VAR SPEED SAWZALL W/BLADES & CSE | 144 |
| 6511 | SAWZALL 2 SPEED WITH CASE | 139 |
| 6527 | SUPER SAWZALL W/BLADES & CASE | 172 |

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| 5051 | 1/2" HAMMER DRILL W/CASE, VSR, 4.2 AMP | 119 |
| 6030 | 1 1/2" SPLINE DRIVE ROTARY HAMMER | 409 |
| 7015 | 4 1/2" ANGL GRINDER, 6.4 AMP, 10,000RPM | 119 |
| 7016 | 4 1/2" ANGL GRINDR, VR SP, 1700-8500 RPM | 139 |
| 751 | 3/4" CAP HAMMER DRILL W/CASE | 169 |

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| SLP20 | BRAD NAILER W/CASE 5/8"-1 5/8" CAP | 268 |
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| 1273D | 4" X 24" DUSTLESS BELT SANDER | 208 |
| 1273DVS | 4" X 24" VS DUSTLSS BELT SANDER | 219 |
| 1370DEVS | 6" VS DSTLS RNDM ORB SNDR | 224 |
| 1584VS | CLIC BARREL HANDLE JIG SAW, VS | 148 |
| 1584DVS | BARREL HANDLE JIG SAW, DUSTLS | 193 |
| 1584VSK | 1584VS, CASE, 30 ASSORTED BLADES | 188 |
| 1587VS | TOP HANDLE JIG SAW, VARSP | 148 |
| 1587DVS | TOP HANDLE JIG SAW, DUSTLESS | 193 |
| 1587VSK | 1587VS, CASE, 30 ASSORTED BLADES | 188 |
| 1604 | 1 3/4 HP ROUTER | 142 |
| 1608 | LAMINATE TRIMMER | 94 |
| 1609KX | DELUXE INSTALLERS KIT W/4 BASES | 229 |
| 1613EVS | 2 HP VAR SP PLUNGE ROUTER | 194 |
| 1614EVS | 1 1/4 HP VAR SP PLUNGE ROUTER | 159 |
| 1615EVS | 3 1/4 HP VAR SP PLUNGE ROUTER | 278 |
| 3050VSRK | 9.6V CRDLS DRILL KIT W/2 BAT | 149 |
| 3054VSR | 12V CORDLESS KIT W/2 BAT, CASE | 188 |
| 3282DVS | 5" VS DUSTLESS RANDOM ORBIT | 104 |
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| EY6100CQKW | 12V CORDLESS VSR KIT W/2 BAT, CASE & 15 MIN CHARGER & FLASHLIGHT GIFT PACK | 204 |
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| 6095DWE | 9.6V CDLS DRILL KIT W/2 BATT | 145 |
| DA391DW | 9.6V ANGLE DRILL KIT | 175 |
| 5090DW | CORDLESS CIRCULAR SAW KIT | 139 |
| 4190D | COIRDLESS TILE CUTTER | 109 |
| 6211DWE | 12V KIT W/2 BATTERIES | 175 |
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| LS1011 | 10" COMPOUND MITER | 539 |
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| N1900B | 3 1/4" PLANER | 129 |
| BO5001 | 5" RANDOM ORBIT SANDER | 69 |
| GV5000 | 5" SANDER POLISHER, VAR SPEED | 79 |
| 6510LVR | 3/8" DRILL | 95 |
| DA3000R | 3/8" ANGLE DRILL | 189 |
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| 77M | 7 1/4" MAGNESIUM WORM DRIVE SAW | 164 |
| 1605-02 | BISCUIT JOINER | 129 |
| 2736-04 | 12V VSR CORDLESS DRILL KIT | 144 |
| 3400 | 10" TABLE SAW | 178 |
| 5657 | 7 1/4" CIRCLE SAW | 99 |
| 5660 | 8 1/4" WORM DRIVE SAW | 172 |
| 9410 | 4 1/2" DISC GRINDER | 59 |

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| DW421 | 5" DSTLS RNDM ORB SANDER, VELCRO | 79 |
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| DW431 | 3" X 21" DSTLS BELT SANDER VAR SP | 180 |
| DW610 | 1 1/2 HP ROUTER, 9 AMP | 147 |
| DW614 | 1 1/4 HP PLUNGE ROUTER | 143 |
| DW615 | 1 1/4 HP PLUNGE ROUTER, VAR SP | 158 |
| DW624 | 3 HP HVY DUTY PLUNGE ROUTER | 245 |
| DW625 | 3 HP HVY DTY PLUNGE RTR, VAR SP | 269 |
| DW682K | BISCUIT JOINER KIT | 224 |
| DW9090 | SUPER BATTERY CHARGER | 119 |
| DW930 | 12V CORDLESS CIRCULAR SAW | 109 |
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| DW935K | 14.4V TRIM SW KIT W/2 BAT, CHRGR, CS | 249 |
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| LU87M010 | 10" X 24T RIP BLADE THIN KERF | 39 |
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| SD308 | 8" SAFETY DADO WITH CASE | 116 |
| SD508 | *NEW 8" SUPER DADO SET* | 168 |

READER SERVICE NO. 64

## Closing gaps in miter joints

***I've made some wide pine picture frames with mitered corners, but I've had varying results with gaps opening at the inside of the miter joint. I use 3½-in.-wide stock air dried to 6% to 8% moisture content (MC). I use a plate joiner to reinforce the miter joint. Some have survived years without joints opening. Others open seasonally at the inside of the miter. How can I prevent this?*** ***—Mark Danielson, Bon Carbo, Colo.***

***Mario Rodriguez replies:*** Pine dried to 6% to 8% MC should certainly be dry enough, but the frames are wide and over time will almost certainly open on the inside of the miter. I don't think the biscuits are providing the strength where you need it most because of their shape. You might try a spline running along the full miter. If plate joinery suits your production setup better, you might consider stitching the back of the frame near the inside of the miter. Stitching involves using the biscuit joiner vertically to cut the boat-shaped recess into the surface of the frame and across the miter. Then fill the recess with a biscuit cut in half. This might provide a little more holding power at the inside of the miter. From the front, the biscuit won't be seen.

[Mario Rodriguez is a contributing editor to *FWW* and a woodworker in Warwick, N.Y.]

## Warped jointer tables

***The tables on my 6-in., long-bed Taiwanese jointer have warped in the four years since I purchased it. A friend told me this is due to internal stresses that develop in iron castings that are cooled too quickly. The tables are cupped 0.005 in., and the fence is bowed 0.008 in. What kind of dimensional tolerances are needed in a jointer for quality work? What are my options if my jointer exceeds them?***

***—Roger Lee, Lake Forest, Calif.***

***Ronald Rockovich replies:*** A multitude of reasons can cause a casting to distort. The quality and quantity of alloys that make up the cast iron will significantly affect its characteristics. One reason for cupping, bowing and twisting is the improper stress-relieving of the casting. Once a casting is poured, it must be stress-relieved. Manufacturers used to put a casting out to pasture (literally) and let it age or stress-relieve naturally for six to 12 months before it was cleaned up and machined. A much faster way to process a green casting is to heat and cool it at a controlled rate, but this can be expensive. To cut costs and speed up production, some offshore manufacturers simply pour the casting, machine a green casting and push the product out the door hoping that it doesn't cup, twist or bow.

Accepted tolerances by domestic woodworking manufacturers for twist, bow or cupping is 0.002 per foot. I don't think regrinding an import machine would be worth the investment. A good option would be to check your local want ads for an old, used 6-in. or 8-in. domestic unit. The cast iron in an old machine will be fully cured, and 99 times out of 100, you will find a good straight one. If, by chance, you do get a warped table, the quality of the machine makes it well worth the investment to have it ground flat.

[Ron Rockovich is a machinery rehabilitation and service specialist living in Swissvale, Pa.]

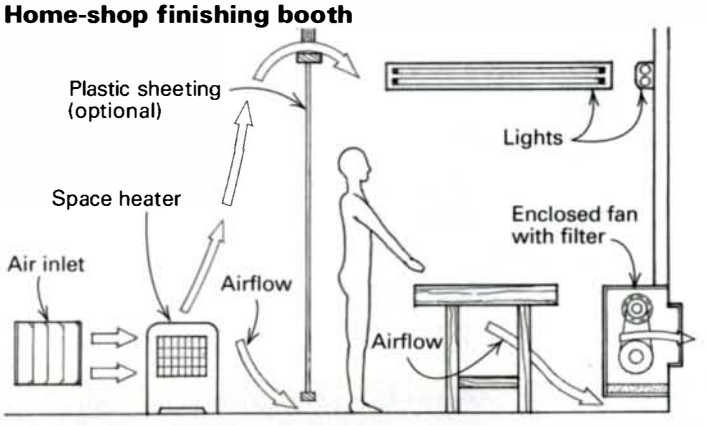
## Safe finishing booths

***I have two questions about setting up a finishing booth in an unheated garage. First, using the new*** FWW Index, ***I have tracked down and read "Q & A" items from issues #82 and #96 about fire-safe approaches to ventilation and lighting in lacquer spray booths. To what extent are these concerns relevant to oil and varnish wipe-on and brush work? Second, is there any way one can use an electrical heater to safely heat such a booth?*** ***—Richard A. Grimlund, North Liberty, Ia.***

***Thomas Ricci replies:*** Ventilation requirements for a finishing area where the finishing material will be wiped or brushed on rather than sprayed are quite different. Wiping or brushing is very efficient. Except for the occasional drip, all the material used is applied to the piece being finished, and there it sits till it dries or soaks in, and the excess is removed with a rag. When spraying finish, only 60 to 85% of the finish material, depending on the efficiency of the equipment used, ever hits the project and sticks. The rest of the material is launched into the air in tiny droplets and will soon form a noxious and explosive cloud. This cloud needs to be produced in a spark-free environment (for example, a spray booth) and exhausted to the outdoors through an explosion-proof fan.

The requirements for ventilating a non-spray finishing area are more like the requirements for a drying area. For this type of operation, you would not need a fireproof area. As long as you do not allow a buildup of drippings on the floor and practice common-sense housekeeping, there should be no conditions that are unusually dangerous. If the garage is unfinished inside, adding drywall will give it a nice finished surface, which would make the room easy to light and keep clean.

**Home-shop finishing booth**




Your ventilation requirements are a fraction of what you would need during a spraying operation. I recommend a complete change of air in the area about every 10 to 15 minutes. For example, if you are finishing a dining table in the back of your garage and you drape some plastic sheeting to enclose an 8-ft. by 8-ft. area and your ceiling is 8 ft. high, you will need a fan that can move 51 cu. ft. per minute (CFM) to accomplish a complete air change in 10 minutes. The formula that's used to calculate fan size in this case is volume divided by time equals CFM. In the previous example:

8 ft. x 8 ft. x 8 ft. = 512 cu. ft.
512 cu. ft. ÷ 10 min. = 51 CFM

Because vapors are heavier than air, I would mount the fan low on the outside wall, as shown in the drawing above, with some kind of door on the outside that can be closed when not in use. Or use an inexpensive single-panel shutter that opens when the fan is turned on. If the fan is turned on at the onset of the finishing operation, you will have no buildup of fumes. Although you probably don't need an explosion-proof fan, you should check with your local fire marshal to be sure.

The heat required to make up what is lost to ventilation will be minimal with the drying room. Because the same amount of air that you exhaust will be drawn back in from cracks, doors and windows all around the garage, I suggest you install a heat source in the garage but away from the vented area, to warm the air before it passes through the drying area. You could mount radiant heaters on the wall or use an electric baseboard in the area. I'd keep the heat source at least 3 ft. from the work.

Lighting can be fluorescent or incandescent and mounted, so the bulbs are protected from being hit when working in the room. Light should reflect off the work at an angle, so you can see what you are doing. Place switches away from the area, so

they can be controlled without disturbing the work.
[Thomas Ricci has designed and built commercial spray-booth installations and smaller ventilating booths in Lexington, Ky.]

## Pumice in your French polish

*In the article "French Polishing" by George Frank (*The Best of Fine Woodworking: Finishes and Finishing Techniques, *The Taunton Press), he mentions that beginners frequently have pumice heaps within the finish. I have this problem. How do I correct it, and what am I doing incorrectly?*

*—John Donoghue, Willowdale, Ont., Canada*

***George Frank replies:*** First you need a hard-wood sanding block. Mine is made of walnut. Cover it with a single sheet of 600-grit sandpaper. Put a drop of mineral oil on each pumice heap, and sand them off carefully with the tightly held sanding block. Heaps eliminated, wipe off the waste, and continue French polishing using only alcohol in your tampon for the first 10 or 15 minutes. Cheer up! The only way to learn French polishing is by doing it and fighting many such difficulties that you are facing now.
[George Frank is the author of *Adventures in Wood Finishing*, published by The Taunton Press, and lives in Warm Mineral Springs, Fla.]

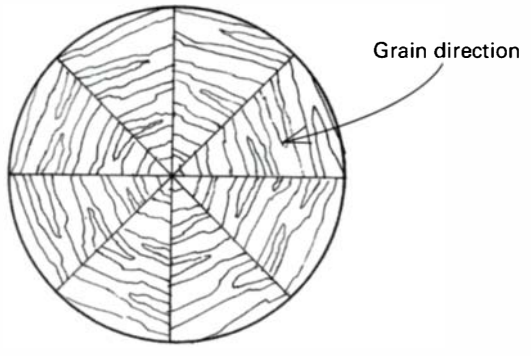
## Gluing up segmented bowl bottoms

*I want to understand the dynamics involved in a glue-up assembly problem I am having, and I want to eliminate or minimize it. I have been cutting triangular segments (8 segments at 22.5° taper, 12 segments at 15° taper, as shown in the drawing below) to glue up into a circle to use for the bottoms of bowls. The grain orientation is across the segment, so I can create a circular grain pattern in the bottom of a bowl. I realize I am gluing end grain to end grain. All surfaces are sanded smoothly, and the joints are good. I have been using Titebond yellow glue with a rubbed glue joint.*

*My problem is that after a period of time, particularly in the winter, segments begin to separate. I assume this to be caused by expansion of the wood, creating stress, which breaks the glue bond. Should I be using a different grain orientation? Would epoxy adhesive prevent the separation? Or am I fighting a losing battle?* *—David A. Taylor, Kingston, N.H.*

***Bruce Hoadley replies:*** Your assembly results in the grain direction following circumferentially around the disc, with radii of the disc oriented perpendicularly to the grain of the segments. This is the crux of the problem because only small changes in moisture content set up troublesome stresses.

**Gluing up bowl bottoms**




If the wood increases its moisture content by only a small percent, the diameter of the disc could try to swell by, say, 1% of its dimension. But if a circle increases its diameter by 1%, its circumference must increase by 3.14 times this. However, because wood is stable in its grain direction, your disc cannot expand its circumference as its diameter expands, so circumferential stress develops, which overcomes the strength of the end-grain gluelines. This dimensional change is destined to cause trouble. Epoxy adhesive may be the better bet to resist the stresses.
[Bruce Hoadley is a contributing editor to *FWW* and a professor of wood technology at the University of Massachusetts at Amherst, Mass.]

## Bubbles in a brushed-on finish

*How can I eliminate bubbles from my high-gloss, water-based finish? I do not have a spray system, so I must apply the finish with a brush. I have tried a number of water-based finishes and found that Minwax Polycrylic produces the fewest bubbles; however, one bubble is too many. I have followed all of the bubble-minimizing suggestions in Chris Minick's article on brush-applied finishes (*FWW *#98, pp. 54-56), and I still have a bubble problem.* *—Mark A. Pitman, Houston, Texas*

***Chris Minick replies:*** Bubbles in brushed-on finishes are a fact of life, especially for the new waterborne coatings. Totally eliminating every bubble from a finish is an impossible task; however, a few simple tricks can be employed to minimize the bubbles in your waterborne finish.

Brush selection is especially important for waterborne finishes. A high-quality nylon bristle brush works well for me. Bristles that taper to a sharp point instead of being fuzzy (flagged bristles) eliminate most of the bubbles right off the bat. Brush technique is also critical. Dip the brush in the finish, dab off the excess finish and then pull it across the wood surface with an even stroke about 18 in. to 24 in. long. The finish should flow off the brush in a smooth sheet. Avoid the back-and-forth brushing motion commonly used for applying house paint. This house-painting technique just aggravates the bubble situation and has no place in fine furniture finishing.

If good technique doesn't eliminate your bubbles, you may have to resort to more drastic tactics. As odd as it sounds, adding a small amount of half-and-half or unwhipped dairy whipping cream (about 1 oz. per gallon of finish) to a waterborne finish will eliminate even the most stubborn bubbles. Milk fat is chemically similar to many commercial waterborne finish defoamers; that is why this trick works. A little mineral spirits (again, not more than 1 oz. per gallon of finish) will also act as a defoamer for waterborne finishes but sometimes can cause the dry finish film to be a little hazy. If you choose to add either one, be sure to test compatibility by finishing some scrap before committing the adulterated finish to your project.
[Chris Minick is a product development chemist and amateur woodworker in Stillwater, Minn.]

## Dust collection vs. air filtration

*I am a hobbyist woodworker and am concerned about dust in my cellar workshop. The shop vacuum I use on my various machines gets rid of the heavy particles but not the fine dust that accumulates on everything. In one issue of* Fine Woodworking, *I saw an advertisement for an air-cleaning system. The manufacturer claims this system captures a significant amount of fine dust particles. I am considering purchasing one of the units and would appreciate your comments on the effectiveness of this system.*

*—Leonard Masonis, New Britain, Conn.*

***Peter Fedrigon replies:*** If I were working in an environment with even a small amount of material floating in the air, would I be satisfied? No. It has always been my interest to collect dust at the source of its generation; this is basic dust control. If the dust is floating in the air, it is very possible that my lungs will be filtering the air even before it gets to a small clean-air system.

A simple test for the clean-air system is to drop a small handful of dust in front of the system's inlet. Start about one foot in front of the system, and move farther and farther away, repeat-

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| JM100K | Biscuit Joiner Kit | 219. |
| RE600 | 3 HP VS Plunge Router | 255. |
| TR30U | Laminate Trimmer | 88. |
| BE321 | 3" x 21" VS Belt Sander | 129. |
| BE424 | 4" x 24" VS Belt Sander | 168. |
| TS254 | 10" Miter Saw | 209. |
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| 3810 | 10" Miter Saw | 225. |
| 1605-02 | Plate Joiner Kit | 119. |
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| 3050VSRK | 3/8" Cordless Driver/Drill2 Bat. | 139. |
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| 1194VSR | 1/2" VSR Hammer Drill | 159. |
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| 1613EVS | 2HP VS Plunge Router | 199. |
| 3270DVS | VS, 3"x21" Dustless Belt Sander | 165. |
| 1587VS | New Top Handle CLIC Jig Saw | 165. |
| 1584VS | New Barrell Handle CLIC Jig Saw | 159. |
| 1587DVS | CLIC Jig Saw w/Dust Collection | 194. |
| 1614EVS | 1-1/4 HP Plunge Router | 159. |
| 1632VSK | VS Panther Recip. Saw Kit | 145. |
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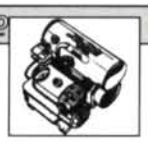
## Emglo



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| LU85M015 | 15" x 108T ATB Fine Cut Off | 105. |
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| 6211DWE | 12V Mak Pak w/2 batteries | 169. |
| 6302 | 1/2" VSR Drill, 5.2 AMP | 115. |
| 6201DWE | 3/8" VSR Hi-Torq Driver/Drill Kit | 159. |
| DA3000R | 3/8" VSR Angle Drill | 159. |
| 6404 | 3/8" VSR Drill, 0-2100 RPM | 58. |
| G3500R | 3500w Generator | 1075.* |
| 9207SPC | 7" Electronic Sander Polisher | 159. |
| N1900B | 3-1/4" Planer Kit | 129. |
| 9820-2 | Blade Sharpener | 199. |
| BO4510 | 1/4 Sheet Finishing Sander | 57. |
| BO4550 | 1/4 Sheet Dustless Finishing Sander | 54. |
| 9401 | 4"x24" Dustless Belt Sander | 189. |
| 9900B | 3"x21" Dustless Belt Sander | 155. |
| LS1011 | 10" Compound Miter Saw | 549. |
| LS1030 | 10" Miter Box | 229. |
| LS1440 | 14" Miter Saw | 599. |
| 4200N | 4-3/8" Trim Saw | 145. |
| 5007NBA | 7-1/4" Circular Saw, Elec. Brake | 129. |
| 5077B | 7-1/4" Hypoid Framers Saw | 155. |
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| 2708W | 8-1/4" Table Saw | 299. |
| 2711 | 10" Table Saw w/Brake | 569. |

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| 0402-1 | VSR 12v Driver/Drill w/Keyless Chuck | 168. |
| 6539-1 | Cordless Screwdriver | 75. |
| 6546-1 | Cordless Screwdriver, 2-spd | 82. |
| 0222-1 | 3/8" VSR Drill, 0-1000 RPM | 107. |
| 0224-1 | 3/8" Magnum Holeshooter, 0-1200 RPM | 114. |
| 0230-1 | 3/8" Pistol Drill, 0-1700 RPM | 112. |
| 0234-1 | 1/2" Magnum Holeshooter, 0-850 RPM | 119. |
| 0238-1 | 1/2" Pistol, 0-650 RPM | 119. |
| 0239-1 | VSR Keyless Chuck Drill | 125. |
| 0244-1 | 1/2" Magnum Holeshooter, 0-600 RPM | 119. |
| 0375-1 | 3/8" Close Quarter Drill | 127. |
| 0379-1 | 1/2" Close Quarter Drill | 145. |
| 0567-1 | Drain Cleaner Kit | 235. |
| 1676-1 | Hole Hawg Kit | 247. |
| 3002-1 | Electricians Rt. Angle Drill Kit | 197. |
| 6140 | 4-1/2" Angle Grinder | 99. |
| 6141 | 5" Angle Grinder | 109. |
| 5352 | 1-1/2" TSC Eagle Rotary Hammer | 455. |
| 3102-1 | Plumbers Rt. Angle Drill Kit | 197. |
| 3107-1 | VS Right Angle Drill Kit | 204. |
| 5371-1 | 1/2" Rev. Hammerdrill Kit | 185. |
| 5397-1 | 3/8" VS Hammerdrill Kit | 139. |
| 5192 | Die Grinder, 4.5 Amp | 175. |
| 5455 | 7"/9" Polisher, 1750 RPM | 140. |
| 6072 | 9" Sander, 5000 RPM | 130. |
| 5362-1 | 1" TSCR Hawk Rotary Hammer | 319. |
| 8975 | Heat Gun | 59. |
| 5936 | 4"x24" Dustless Belt Sander | 228. |
| 6008 | 1/3 Sheet Finishing Sander | 115. |
| 6010 | 1/2 Sheet Finishing Sander | 119. |
| 6016 | 1/4 Sheet Finishing Sander | 52. |
| 6126 | 6" Random Orbit Sander | 125. |
| 6215 | 16" Electric Chainsaw | 172. |
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| 6365 | 7-1/4" Circular Saw | 120. |
| 6377 | 7-1/4" Wormdrive Saw | 175. |
| 6460 | 10-1/4" Circular Saw | 259. |
| 6507 | VS Sawzall w/Quik-Lok | 132. |
| 6508 | VS Sawzall | 132. |
| 6511 | 2-spd Sawzall | 129. |
| 6527 | VS Super Sawzall w/Quik-Lok | 164. |
| 6528 | VS Super Sawzall | 164. |
| 6750-1 | VSR Drywall Driver | 93. |
| 6754-1 | VSR Magnum Drywall | 114. |
| 6798-1 | TEK Screwdriver | 109. |
| 8911 | 9 Gal. Wet/Dry Vac, H.D. Steel | 329. |

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| 6614 | 1/2" VSR Drill, 5.5 amp | 139. |
| 6615 | 1/2" Keyless VSR Drill, 5.5 amp | 139. |
| 6640 | VSR Drywall Driver, 5.5 amp | 119. |
| 7700 | 10" LaserLOC Miter Saw | 369. |
| 9852 | 3/8" 12v Magnequench Cordless drill | 149. |
| 9853S | 12v Magnequench w/keyless chuck | 164. |
| 9854 | 1/2" Magnequench cordless drill | 159. |
| 666 | 3/8" VSR T-Handle Drill | 125. |
| 320 | Abrasive Plane | 119. |
| 9118 | Porta-Plane Kit | 205. |
| 9367 | 3-1/4" Plane Kit | 159. |
| 9652 | Versa-Plane Kit | 299. |
| 555 | Plate Joiner Kit | 169. |
| 100 | 7/8 HP Router | 105. |
| 690 | 1-1/2 HP Router | 139. |
| 691 | 1-1/2 HP D-Handle Router | 155. |
| 693 | 1-1/2 HP Plunge Base Router | 175. |
| 7310 | Laminate Trimmer | 88. |
| 7312 | Offset Base Laminate Trimmer | 122. |
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| 7399 | Drywall Cut-Out Tool | 79. |
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| 7539 | 3-1/4 HP VS Plunge Router | 270. |
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| 330 | Speed-Bloc Finishing Sander | 58. |
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| 362 | 4"x24" Dustless Belt Sander | 189. |
| 504 | 3"x24" Wormdrive Belt Sander | 329. |
| 505 | 1/2 Sheet Finishing Sander | 118. |
| 7334 | 5" Random Orbit Sander | 119. |
| 7335 | 5" VS Random Orbit Sander | 129. |
| 7336 | 6" VS Random Orbit Sander | 135. |
| 314 | 4-1/2" Trim Saw | 138. |
| 315-1 | 7-1/4" Top Handle Circular Saw | 118. |
| 345 | 6" Saw Boss Circular Saw | 104. |
| 7549 | VS, Var-Orbit D-Handle Jigsaw | 145. |
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ing this simple test. Even with an air flow of 260 cu. ft. per minute (CFM), I doubt that any dust would be drawn into the system at a distance of more than 2 ft. I was recently in a small (24 ft. by 24 ft.) home shop that was covered with dust, in spite of two clean-air systems, four shop vacuums and a 2-hp, two-bag dust collector. The answer to his problem and yours is to trap dust at the source rather than trying to filter it from the air you are breathing.

In looking at any piece of air-filtration equipment, remember to keep the following principles of air filtration in mind: 1. Collect the dust at the machine so that no dust escapes into the room. 2. Filter out 100% of the dust. 3. Return the filtered air back to the shop. 4. Make the equipment and system easy to maintain. [Peter Fedrigon is a consulting engineer for industrial air filtration systems and owner of Oneida Air Systems in Cleveland, N.Y.]

## Seasoning lumber with your heating furnace

***I have a question regarding seasoning of green lumber. I will be putting in a new hot-air furnace this spring, and I am considering running a branch duct through a drying cabinet that I would construct in my basement. Is this feasible? Should I use the return side of the system? And could I use the built-in humidifier to control the rate of drying?***

*—Clark Sellars, Woodbury, Conn.*

***Jon Arno replies:*** I suspect hot air ducted directly from a standard home furnace into an enclosed chamber could be used to accelerate the drying time of lumber. However, don't anticipate that this arrangement will even remotely approach the efficiency of a true drying kiln. The environment required to kiln dry lumber is a world apart from one you and your family could tolerate living in. A drying kiln would entail insulating the chamber, installing separate controls for both temperature and humidity, as well as shut offs in the duct work to isolate the system from the balance of the home. Also, firing up the furnace to keep the chamber at something in excess of twice the temperature in the rest of the house would doubtless produce monumental heating bills, not to mention such a system might violate local fire codes.

Provided your objectives aren't this lofty, the concept of storing lumber in a warm place makes sense. For centuries, it has been common practice in cabinet shops to store lumber in racks around the chimney flue, and many modern woodworkers, myself included, place a high value on accessible attic space for wood-storage purposes. Schemes of this sort are practical for finishing the drying process and for keeping the moisture content of already well-seasoned lumber at acceptably low levels. However, it is not the right approach for handling large quantities of green lumber.

Green lumber has a very high moisture content, and as it dries, it is easily capable of increasing the humidity in the house to the point where steel tools rust and drywall mildews. It's best to begin the drying process outside, stacking the green lumber in a stickered pile where natural air flow can remove the bulk of its moisture. Once partially dried, the lumber can be brought inside and sticker-stacked again in a more arid location to finish the seasoning process. This slower but gentler approach minimizes drying stress in the lumber, and while not sweat-free, it is relatively laborless compared to installing new drywall.
[Jon Arno is a wood technologist and consultant in Troy, Mich.]

## Finishing old wood

***I frequently have to finish wood that's 50 to 100 years old when I'm restoring old houses. I like to use a natural finish, but my experience has been that no matter how I treat the wood, it ends up considerably darker than I would expect a new piece of wood to look. For example, I uncovered an old maple floor under many layers of plywood, tile, etc. I sanded until the floor looked like new, but when I put a standard floor varnish on it, the floor soaked up the varnish and ended up much darker than if it had been new maple. In fact, when I replaced some of the boards, I had to stain the new maple to match the old maple. I have encountered the same problem with old furniture that I have tried to put a natural finish on.***

*—Sam Rogers, Essex, Conn.*

***Tom Wisshack replies:*** The problem of old wood darkening under a standard floor varnish can only be controlled by switching to a completely different kind of product. I suggest a water-based polyurethane. It comes the closest to being absolutely clear when dry (it may appear milky in the can), imparting no tonal qualities to the wood.

I'll admit that switching to a water-based finish will have its challenges. The first coat will raise the grain of the wood. You can control this to some degree by raising the wood's grain ahead of time with hot water and letting it dry overnight. (The raised-grain roughness is often not as severe on old wood.) After the first coat of varnish dries, a light sanding with 220- or 320-grit automotive sandpaper will prepare it for subsequent coats. Once sealed, grain-raising is no longer a problem.

I suggest Daly's Crystalfin polyurethane/acrylic clear finish (Daly's Wood Finishing Products, 3525 Stone Way North, Seattle, Wash. 98103; 800-735-7019). It's nontoxic, nonyellowing and resistant to scuffing, alcohol and boiling water (and most household cleaners). You might also try General Finishes High Performance water-based polyurethane (General Finishes Inc., P.O. Box 51567, New Berlin, Wis. 53151; 414-786-6050).

I tried General Finishes' polyurethane on some inlay work because I didn't want to alter the delicate coloring of the wood. I was amazed at how quickly I could build a substantial finish, and I found that the product could be rubbed out to a surface as beautiful as any traditional varnish. There are many other companies that make similar products, and I encourage you to experiment with them to get the results you are after.

As to the use of varnishes and oils on old furniture, it's imperative that whatever finish you choose be reversible, so you don't permanently alter the wood's color and patina. One way of dealing with this problem—it's a procedure I use whenever restoring antique furniture—is to apply a barrier coat of shellac to the wood prior to the finish of your choice. You'll find that shellac (a film finish) darkens the wood less than some of the other finishes you've been using, partly because it dries rapidly and doesn't penetrate. You can buy shellac flakes and mix up your own solution or buy premixed shellac in cans. Be sure the shellac is dewaxed and that the expiration date checks out. It has a limited shelf life.

You could use varnish as a topcoat, and it will be compatible with the shellac, provided the shellac has been diluted, applied in thin coats and scuff-sanded when dry. I suggest Behlen's Water White Restoration varnish (available from Woodworker's Supply, Inc., 1108 N. Glenn Road, Casper, Wyo. 82601; 800-645-9292). Shellac as a finish itself naturally would be appropriate for antique furniture not subjected to daily use, though it will take some practice to achieve good results.

Be open to experimentation, and try various products and techniques to achieve the kind of surface you are after. But think in terms of how the piece would have been finished originally. Use products that are "sympathetic" to the way old pieces were finished so that you don't depart drastically from the intention of the original maker. The results will pleasantly surprise you.
[Tom Wisshack is an antique furniture historian and wood finishing consultant in Galesburg, Ill. He has been making and restoring fine furniture, and writing about it, for over 30 years.]

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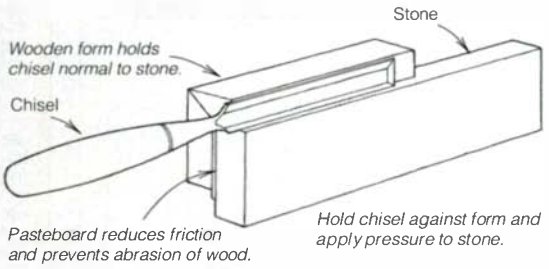


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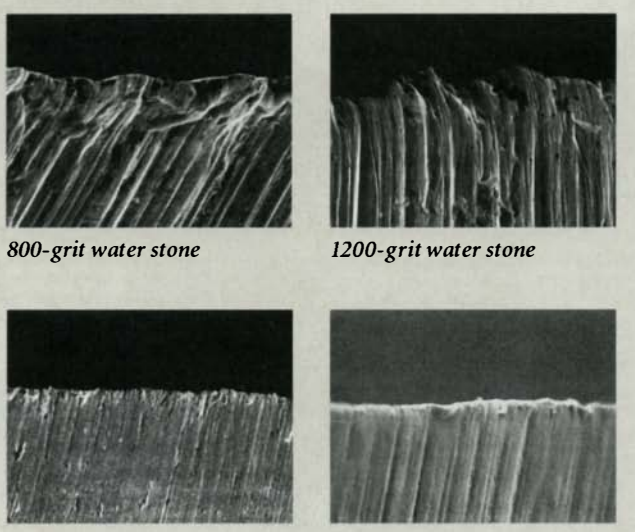

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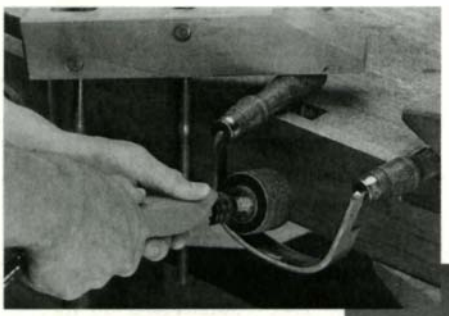

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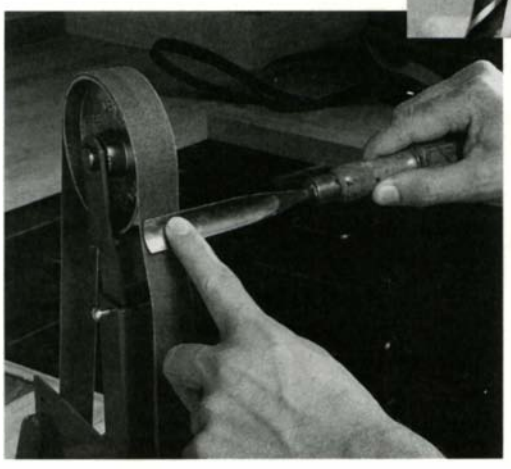

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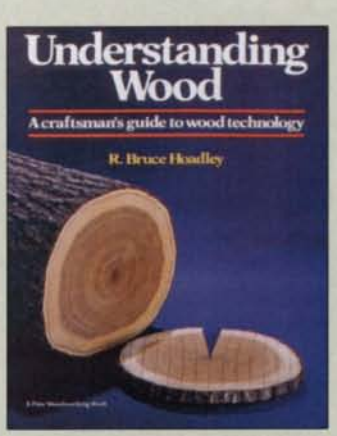


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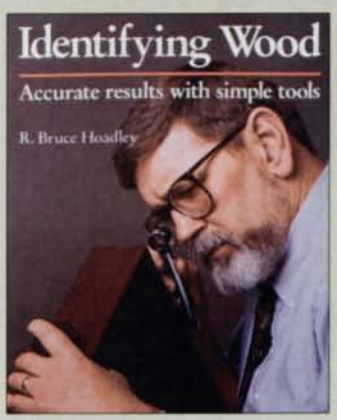


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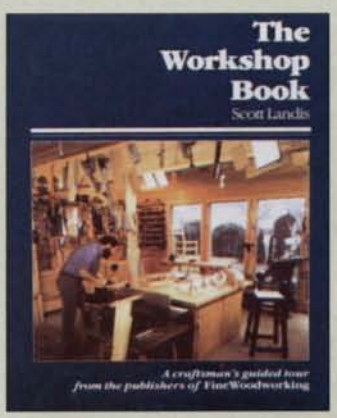


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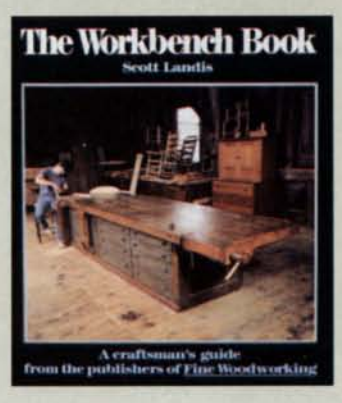


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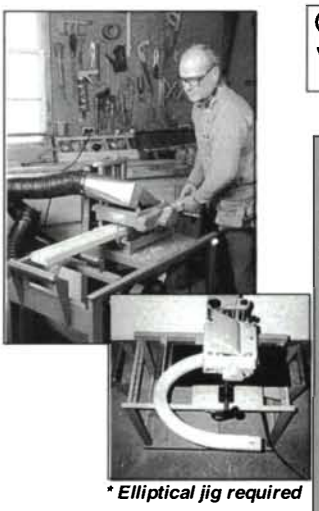

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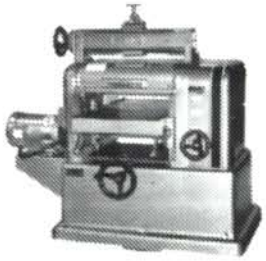

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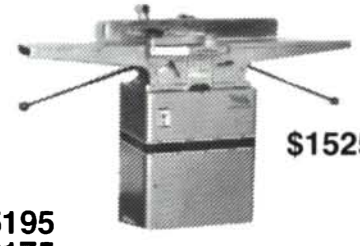

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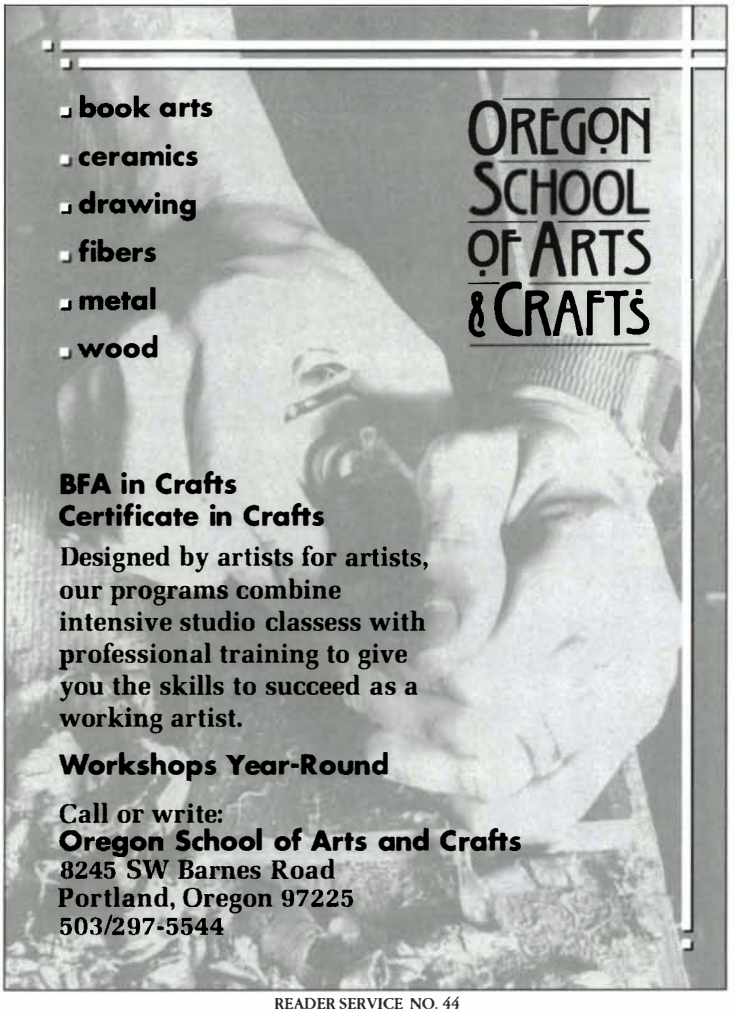


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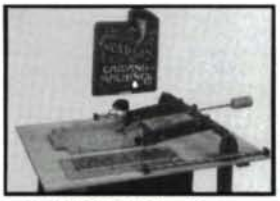
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110/220V MOTOR
LOW PRICE: $380.00
FREE EXTRA SET OF BLADES A $22.00 VALUE

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1-1/2 H.P., 220V MOTOR
LOW PRICE: $660.00
# EN3107, (2H.P.)
LOW PRICE: $690.00
FREE EXTRA SET OF BLADES A $25.00 VALUE

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3 H.P., 220V MOTOR
SALE: $750.00
FREE MOTOR COVER/ENLON EXCLUSIVE A $50.00 VALUE

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220V MOTOR
SALE: $715.00
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LOW PRICE: $1295.00
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FREE EXTRA SET OF BLADES A $83.95 VALUE

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SALE: $375.00
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Established 1933

### DELTA BENCH TOP TOOLS

| Model | Description | List | Sale |
|---|---|---|---|
| 23-700 | Wet/Dry Grinder/Sharpener | 234 | 155 |
| 23-680 | 6" Bench Grinder 1/4 HP | 86 | 75 |
| 23-880 | 8" Bench Grinder 1/2 HP | 151 | 115 |
| 23-980 | 10" Bench Grinder 1 HP | 255 | 239 |
| 11-950 | 8" Drill Press | 195 | 135 |
| 14-040 | 14" Drill Press | 382 | 345 |
| 28-160 | 10" Hobby Band Saw | 210 | 135 |
| 31-050 | 1" Belt Sander 2.0 amp | 104 | 75 |
| 31-460 | 4" Belt/6" Disc Sander | 198 | 129 |
| 31-340 | 1" Belt/8" Disc Sander | 268 | 204 |
| 31-080 | 1" Belt/5" Disc Sander | 134 | 89 |
| 40-560 | 16" 2 speed Scroll Saw | 266 | 178 |
| 23-580 | 5" Bench Grinder 1/5 HP | 68 | 52 |
| 11-990 | 12" Bench Drill Press | 276 | 195 |
| 11-090 | 32" Radial Drill Press | 399 | 305 |
| 43-505 | 1/2" Bench Router/Shaper | 399 | 285 |
| 36-220 | 10" Compound Mitre Saw | 350 | 229 |
| 33-060 | "Side kick" Miter saw | 510 | 375 |
| 14-070 | 14" Floor Drill Press | 450 | 349 |
| 40-640 | 20" Bench Scroll Saw | 466 | 295 |
| 23-675 | 6" Grinder/3 x 24 Belt Sander | 128 | 109 |
| 50-075 | Dust Collector/Sweeper 3/4 HP | 360 | 254 |
| 36-090 | 10" Sidekick Miter Saw | 293 | 214 |
| 37-070 | 6" var. speed Bench Jointer | 337 | 249 |
| 20-150 | 14" Abrasive cut-off saw | 375 | 219 |
| 28-180 | 10" Bench Band Saw | 232 | 158 |
| 46-700 | 12" var. speed Wood Lathe | 548 | 445 |

***SUPER SPECIAL***
22-540 12" Bench Top Planer ..... Sale 389

### NEW TOOLS BY DELTA

| | | | |
|---|---|---|---|
| 14-650 | NEW Hollow Chisel Mortiser | 668 | 279 |
| 28-190 | NEW 12" Band Saw | 465 | 389 |
| 37-190 | NEW 6" Deluxe Jointer | 554 | 479 |
| 36-275 | NEW 8-1/4" Builders Saw | 444 | 265 |
| 36-210 | NEW 10" Compound Mitre Saw | 438 | 255 |
| 36-070 | NEW 10" Mitre Saw | 284 | 169 |
| 36-540 | NEW 10" Table saw | 210 | 169 |
| 36-630 | NEW 10" Contractor Saw II | 700 | 575 |
| 34-555 | NEW Sliding Table | 459 | 359 |

### DELTA STATIONARY

| | | | |
|---|---|---|---|
| 36-755 | 10" Tilting Arbor Saw 2 HP | 1264 | 969 |
| 33-990 | 10" Radial Arm Saw | 818 | 645 |
| 37-280 | 6" Motorized Jointer | 488 | 389 |
| 50-179 | 3/4 HP 2 stage Dust Collector | 483 | 345 |
| 50-181 | 2 HP Dust Collector | 835 | 649 |
| 34-670 | 10" motorized Table Saw | 511 | 395 |
| 34-985 | 1/6 HP Stock Feeder | 723 | 539 |
| 34-444 | Table Saw complete with 1-1/2 HP motor & stand | 812 | 619 |
| 33-890 | 12" Radial Arm Saw 1-1/2 HP | 1829 | 1425 |
| 43-355 | 1/2" & 3/4" Shaper 1-1/2 HP | 964 | 759 |
| 17-900 | 16-1/2" Floor Drill Press | 462 | 399 |
| 34-080 | 10" Mitre box | Xtra Special | 198 |
| 33-055 | Sawbuck complete w/legs | 865 | 615 |
| 34-330 | 8-1/4" Table Saw 13 amp | 343 | 245 |
| 32-100 | Stationary Plate Jointer | 645 | 255 |
| 36-040 | 8-1/4" Compound Mitre Saw | 224 | 149 |
| 40-601 | 18" Scroll Saw w/stand and blades | 1003 | 759 |
| 28-560 | 16" Band Saw 1/2 HP 3 wheel | 487 | 445 |
| 70-200 | 20" Drill Press | 1011 | 789 |
| 34-915 | 30" Delta Unifence | 385 | 229 |
| 34-897 | 50" Delta Unifence | 525 | 285 |
| 28-245 | 14" Band Saw w/open stand 1/2 HP719 | | 585 |
| 36-380 | 10" Table Saw - XL10 | 525 | 429 |

### DELTA REBATES!

**The following Delta tools have a $50.00 rebate! Price shown is before rebate.**

| | | | |
|---|---|---|---|
| 28-283 | 14" Band Saw with enclosed stand | 910 | 745 |
| 28-283K | 28-283 Saw w/ 28-843 rip fence | Sale | 789 |
| 34-445 | 34-444 Saw with 30" unifence | 1200 | 775 |
| 34-445K | 34-445 Saw w/ 34-914 table board | Sale | 809 |

**The following Delta tools have a $75.00 rebate! Price shown is before rebate.**

| | | | |
|---|---|---|---|
| 22-661 | 13" Planer w/ 2 HP motor w/ stand | 1513 | 1189 |
| 37-154 | DJ15 6"Jointer with 3/4 HP motor | 1451 | 1165 |

### DELTA Industrial Saw Blades

**Carbide Tipped - 5/8" bore - Lifetime guarantee**

| Model | Description | Hook | Tth. | List | Sale |
|---|---|---|---|---|---|
| 35-593 | Sawbuck blade 8" | -6° | 48 | 52 | 39 |
| 35-616 | Crosscut 10" | 12° | 60 | 55 | 44 |
| 35-617 | Combo 10" | 15° | 50 | 54 | 43 |
| 35-619 | Slide Cmpd/Rad Arm 10" | -6° | 60 | 63 | 49 |
| 35-624 | Super Cutoff 10" | 10° | 80 | 78 | 59 |
| 35-625 | Super Cutoff/Rad Arm 10" | -6° | 80 | 77 | 59 |

### EXCALIBUR Fences & Tables

| | | | |
|---|---|---|---|
| TT45R24L9 | 24" Fence | 369 | 309 |
| TT45R50L12 | 50" Fence | 399 | 325 |
| EXSLT30 | Sliding Table - 40" crosscut | 599 | 485 |
| EXSLT60 | Sliding Table - 62" crosscut | 745 | 595 |

### BIESEMEYER FENCES

| | | | |
|---|---|---|---|
| B-50 | 50" Commer. Saw Fence | 345 | 298 |
| T-SQUARE 52 | 52" Homeshop Fence | 279 | 238 |
| T-SQUARE 40 | 40" Homeshop Fence | 259 | 208 |
| T SQUARE 28 | 28" Homeshop Fence | 249 | 198 |

### JORGENSEN CLAMPS

**STYLE 35 ALUMINUM BAR CLAMPS**

| Model | Size | List | Sale | Lots of 6 |
|---|---|---|---|---|
| 3524 | 24" | 31.40 | 18.95 | 99.00 |
| 3536 | 36" | 33.65 | 20.35 | 109.00 |
| 3548 | 48" | 36.95 | 22.45 | 125.00 |
| 3560 | 60" | 41.20 | 25.10 | 136.00 |
| 3572 | 72" | 44.50 | 26.95 | 145.00 |

**ADJUSTABLE HANDSCREW KITS**

| Model | for Jaw Length | List | Sale | Lots of 6 |
|---|---|---|---|---|
| J-04 | 4" | 7.95 | 4.99 | 29.00 |
| J-06 | 6" | 9.05 | 5.55 | 33.49 |
| J-08 | 8" | 10.15 | 6.19 | 36.95 |
| J-10 | 10" | 11.90 | 8.25 | 46.95 |
| J-12 | 12" | 14.75 | 9.30 | 52.95 |
| J-14 | 14" | 15.85 | 11.39 | 62.45 |
| J-16 | 16" | 19.25 | 12.99 | 69.99 |

**ADJUSTABLE HANDSCREWS**

| Item# | Jaw Length | Opening Capacity | List | Sale | Box of 6 |
|---|---|---|---|---|---|
| #5/0 | 4" | 2" | 14.34 | 8.35 | 48.59 |
| #4/0 | 5" | 2-1/2" | 15.40 | 8.95 | 51.99 |
| #3/0 | 6" | 3" | 16.53 | 9.59 | 55.75 |
| #2/0 | 7" | 3-1/2" | 17.75 | 10.35 | 58.95 |
| #0 | 8" | 4-1/2" | 19.76 | 11.75 | 58.00 |
| #1 | 10" | 6" | 22.63 | 12.50 | 68.00 |
| #2 | 12" | 8-1/2" | 25.95 | 14.50 | 78.00 |
| #3 | 14" | 10" | 32.88 | 18.00 | 99.00 |
| #4 | 16" | 12" | 42.76 | 23.95 | 139.00 |

**STYLE 37 2-1/2"Throat 1/4"x3/4" Bar**

| Item# | Bar Length | List | Sale | Box of 6 |
|---|---|---|---|---|
| 3706 | 6" | 10.65 | 6.05 | 32.50 |
| 3712 | 12" | 11.80 | 6.65 | 37.25 |
| 3718 | 18" | 13.00 | 7.45 | 40.50 |
| 3724 | 24" | 14.25 | 7.99 | 42.50 |
| 3730 | 30" | 15.88 | 8.85 | 47.75 |
| 3736 | 36" | 17.36 | 9.99 | 53.95 |

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

| Item | Bar Length | List | Sale | Lots of 6 |
|---|---|---|---|---|
| 4512 | 12" | 33.17 | 19.95 | 109.99 |
| 4518 | 18" | 34.97 | 21.45 | 116.99 |
| 4524 | 24" | 37.02 | 22.75 | 123.99 |

**PONY CLAMP FIXTURES**

| Model | Description | List | Sale | Lots of 12 |
|---|---|---|---|---|
| 50 | 3/4" Black Pipe Clamps | 14.87 | 7.80 | 88.95 |
| 52 | 1/2" Black Pipe Clamps | 12.40 | 6.70 | 71.50 |
| 53 | Double 3/4" Pipe Clamps | 42.90 | 27.95 | 299.00 |

**STEEL "I" BAR CLAMPS**

| Model | Size | List | Sale | Lots of 6 |
|---|---|---|---|---|
| 7224 | 24" | 34.36 | 17.99 | 103.00 |
| 7236 | 36" | 36.88 | 18.99 | 109.00 |
| 7248 | 48" | 40.54 | 20.99 | 119.00 |
| 7272 | 72" | 46.64 | 27.99 | 159.95 |

### PRAZI BEAM CUTTER

| Model | Description | List | Sale |
|---|---|---|---|
| PR-700 | 12" beam cutter for worm drive saws | 149 | 124 |

### SKIL

| | | | |
|---|---|---|---|
| 7102 | "Sandcat" 2-1/2" x 16" Belt Sander | 78 | 62 |
| 7313 | 3" x 18" Belt Sander | 85 | 69 |
| 7621 | 3" x 21" var. speed Belt Sander | 245 | 149 |
| 7575 | 1/4 sheet Palm Sander | 75 | 54 |
| 7576 | above Sander with bag | 81 | 59 |
| 1605-02 | Biscuit Joiner with case | 221 | 129 |
| 2735-04 | 12 volt cordless Drill with charger. case. and 2 batteries | 249 | 144 |
| 2736-04 | 2735-04 w/keyless chuck | 269 | 145 |
| 7484 | 5" Random Orbit Sander | 153 | 99 |
| 5250 | 2-1/4 HP Circular Saw | 82 | 65 |
| 5350 | 2-1/3 HP Circular Saw | 102 | 78 |
| 5750 | 7-1/4" Circular Saw drop foot | 259 | 165 |
| 3810 | 10" Mitre Saw 15 amp | 365 | 239 |
| 5825 | 6-1/2" Worm Drive Saw | 257 | 165 |
| 5660 | NEW 8-1/4" 60° Circular Saw | 238 | 149 |
| 5510 | 5-1/2" Circular Saw | 166 | 110 |
| 77 | 7-1/4" Worm Drive Saw | 257 | 144 |
| 77M | NEW 77 Mag Worm Saw - 2 lbs lighter than original saw | 300 | 164 |
| 5860 | NEW 8-1/4" 60° Worm Saw | 282 | 174 |
| 5790 | 10-1/4" Circ. Saw 15 amp | 472 | 305 |
| 5657 | NEW 7-1/4" Circ Saw - pivot foot | 205 | 118 |
| 5525 | NEW 6-1/2" Circ Saw - big capacity | 173 | 115 |
| 3400 | 10" Table Saw - Bench Top | 270 | 178 |
| 3330 | 16" Scroll Saw - Bench Top | 209 | 139 |
| 3370 | 4" Belt/6" Disc Sander - Bench Top | 209 | 145 |
| 3380 | 8" Drill Press - Bench Top | 209 | 145 |

### DUO-FAST AIR NAILERS

| | | | |
|---|---|---|---|
| BB-4440 | Brad Nailer 1/2" - 1-1/4" | 336 | 199 |
| LFN-764 | Finish Nailer 1" - 2" | 564 | 335 |
| HFN-880C | Finish Nailer 1-1/2" - 2-1/2" | 720 | 425 |
| RCN-60/225 | Coil Roofing Nailer | 740 | 435 |
| CN-350 | Framing Nailer - Full Head | 704 | 415 |
| CN-325 | Framing Nailer - Clip Head | 670 | 395 |

### ACCU-MITER

| | | | |
|---|---|---|---|
| 18-34 | Professional Mitre Gauge | 149 | 145 |

### HITACHI TOOLS

| Model | Description | List | Sale |
|---|---|---|---|
| C7SB | 7-1/4" Circular Saw | 233 | 125 |
| C7BD | 7-1/4" Circular Saw with brake | 258 | 105 |
| K10001 | Hitachi Steel case for above saws | Sale | 14.95 |
| M12V | 3 HP variable speed Router | 476 | 239 |
| TR12 | Plunge Router 3 HP | 389 | 188 |
| SB-75 | 3 x 21 Belt Sander w/ bag - 2 speed | 278 | 155 |
| F1000A | 12" Planer/6" Jointer | 4600 | 2349 |
| P12R | 12-9/32" Planer | 1470 | 789 |
| P12RA | 12-9/32" Planer/6-1/8" Jointer | 1940 | 989 |
| C10FC | NEW 10" Mitre Saw | 432 | 255 |
| C8FB | 8-1/2" Slide Compound Saw | 1400 | 599 |
| P20SB | 3-1/4" Planer 3.4 amp | 179 | 95 |
| FREUD LU91M008 | 8-1/2" carb. blade 48 tooth | Sale | 54 |
| C15FB | 15" Mitre Saw | 1320 | 675 |
| G12SA | 4-1/2" Grinder 6.9 amp | 160 | 89 |
| DS10DVAK | 12 volt cdls Drill Kit w/2 batt | 393 | 199 |

### Hitachi Air Tools

| | | | |
|---|---|---|---|
| NR83A | Framing Nailer 2" - 3-1/2" Full Head. | 700 | 395 |
| NR83AA | Framing Nailer 2" - 3-1/2" Clip Head | 750 | 419 |
| NT65A | 16 ga. Brad Nailer 1" - 2-1/2" | 610 | 335 |
| NT45A | 18 ga. Brad Nailer 13/16" - 1-3/4" | 490 | 275 |
| NV45AB | Coil Roofing Nailer 7/8" - 1-3/4" | 750 | 415 |
| NV83A | Coil Nailer 2" - 3-1/4" | 750 | 419 |
| NV50A1 | Coil Nailer 1-1/4" - 2" | 564 | 315 |
| N5008AA | 7/16" Stapler - 16 ga. 1" - 2" lgth | 580 | 325 |
| N3824A | 1" Stapler 16 ga. 1/2" - 1-1/2" | 630 | 359 |

### QUAL-CRAFT JACKS

| | | | |
|---|---|---|---|
| 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 |
| | **Buy any 6 (can be assorted) deduct additional 10%** | | |
| 2601 | Wall Jack | 167 | 108 |
| | **Lots of 4 deduct additional 10%** | | |

### WEDGE SMART LEVEL

| | | | |
|---|---|---|---|
| SM-PR2 | 2 FT Level with sensor and case | 120 | 88 |
| SM-PR4 | 4 FT Level with sensor and case | 150 | 105 |
| SM-PR6 | 78" Level with sensor and case | 180 | 139 |
| SL209 | 9" Torpedo Level w/sensor | 69 | 45 |
| SL224 | 2 FT Level with sensor | 79 | 58 |
| SL248 | 4 FT Level with sensor | 95 | 65 |

### AEG POWER TOOLS

| | | | |
|---|---|---|---|
| HBSE75S | 3" x 21" variable speed Belt Sander | 309 | 175 |
| ABSE15S | 1/2" cdls 12V Drill complete w/cse | 403 | 174 |
| FSPE100X | NEW Barrell Grip Jig Saw w/case | 274 | 155 |
| BSPE100X | NEW Top Handle Jig Saw w/case | 286 | 155 |
| TXE150 | 6" var/spd Rand Orb Sander | 304 | 139 |
| SKS300 | 10" Compound Mitre Saw | 1019 | 499 |

### DREMEL TOOLS

| | | | |
|---|---|---|---|
| 3950 | Moto Tool Kit with bits & case | 134 | 79 |
| 3952 | Super Moto Tool Kit with accessories | 152 | 95 |
| 1671 | 16" Scroll Saw - 2 speed "Bestbuy" | 302 | 174 |
| 1695 | NEW 16" var. speed Scroll Saw | 408 | 224 |
| 290 | Electric Engraver with point | 25 | 16 |
| 8508 | Cordless Moto Tool Kit with case | 109 | 64 |
| 1731 | 5" Disc\1" x 30" Belt Sander | 189 | 114 |

### FEIN

| | | | |
|---|---|---|---|
| Msx636 | Oscillating Triangle Sander | Sale | 185 |

### PONY

| | | | |
|---|---|---|---|
| LPN672 | Air Palm Nailer with glove | Sale | 94.99 |

### BOSTITCH AIR NAILERS

| Model | Description | List | Sale |
|---|---|---|---|
| N80S-1 | Stick Nailer | Super Sale | 348 |
| RN45 | NEW Coil Roof Nailer 3/4 - 1-3/4 | 845 | 409 |
| N60FN-2 | Finishing Nailer 1-1/4" - 2-1/2" | 650 | 335 |
| N60FN-2K | N60FN-2 with case. oil. & nails | 647 | 379 |
| T50S4-1 | Decking & Sheathing Stapler | 619 | 355 |
| MIIIFS | Flooring Stapler 15 ga | 931 | 535 |
| N100S | Stick Nailer 2" - 4" | 931 | 539 |
| T31 | Brad Nailer 5/8" - 1" | 281 | 145 |
| CWC1001 | HP Pancake Compressor | 463 | 289 |

### SENCO AIR NAILERS

| | | | |
|---|---|---|---|
| SFN1 | Finishing Nailer 1" - 2" | 448 | 298 |
| SFN40 | NEW Finish Nailer 1-1/4" - 2-1/2" | 571 | 385 |
| SN325 | Nailer 1-7/8" - 3-1/4" | 665 | 419 |
| SLP20 | NEW Pinner w/case 5/8" - 1-5/8" | 399 | 269 |
| SKS | Stapler5/8" - 1-1/2" - 1/4" crown | 390 | 269 |
| M2 | Stapler 1/16" wide - 1-3/8" - 2" length | 535 | 355 |
| SN70 | NEW HD Framing Nailer 2" - 3-1/2" | 690 | 475 |
| SN60 | Framing Nailer-Full Hd 2" - 3-1/2" | 638 | 445 |
| | Not available in all states | | |

### PASLODE IMPULSE GUNS

| | | | |
|---|---|---|---|
| IM250 | Trimpulse Finish Nailer Kit complete drives 3/4" - 2-1/2" brads | 849 | 565 |
| IM325 | Impulse Framing Nailer Kit complete drives 2" - 3-1/4" nails | 849 | 565 |
| IM-200-S16 | Impulse Siding Stapler | 849 | 565 |
| 402500 | Extra battery | 64 | 44 |
| 402502 | No-Mar Work contact element | 12 | 10 |
| | Paslode Nailers not available in MN. WI, IA | | |

### REMINGTON POWER FASTENING TOOLS

| | | | |
|---|---|---|---|
| 75707 | 476 Power Hammer with case | 48 | 28 |
| 77550 | 480 Power Driver with case | 169 | 95 |
| 78480 | 482 Multi Driver with case | 449 | 235 |

### SIOUX TOOLS

| | | | |
|---|---|---|---|
| 8030 | New 3/8"variable speed Drill | 250 | 145 |
| 8000 | 3/8" var/spd close quarter Drill | 201 | 125 |
| 8005 | Same as 8000 but is 0-2500 rpm | 200 | 134 |
| 690 | 5" Air Random Orbit Sander | 139 | 132 |
| 690V | 690 with vacuum pick up | 250 | 145 |
| 690VV | 690 w/ venturi dust collection | 281 | 169 |
| 658 | 5" Air Random Sander - dual action | 261 | 155 |

### LAMELLO BISCUIT JOINTERS

| | | | |
|---|---|---|---|
| TOP 10 | "Simply the Best" | 699 | 538 |
| STANDARD 10 | "Professionals Choice" | 499 | 399 |

### RECORD WOODWORKING VISES

| Model | Jaw Width\Opening | List | Sale |
|---|---|---|---|
| 53E | 10-1/2"\15" Quick release | 199 | 109 |
| 52D | 7"\8" Quick release w/dog | 137 | 85 |
| 52-1/2D | 9"\13" Quick release w/dog | 186 | 99 |

### WAGNER PRODUCTS

| | | | |
|---|---|---|---|
| 120 | Power Sprayer | 70 | 57 |
| CP | Cordless Painter | 100 | 79 |
| 230HD | Power Painter/Sprayer | 100 | 84 |
| 959 | Power Roller | 140 | 105 |
| 255 | Airless Kit | 180 | 130 |
| 375E | Airless System | 195 | 159 |
| 404 | Airless Painter & Roller | 320 | 249 |
| 505 | High performance Airless Painter | 440 | 369 |
| 550 | Professional Airless Painting System | 769 | 685 |
| HVLP | Fine coat finishing HVLP System | 195 | 155 |
| CS2000 | Professional fine finish HVLP System | 339 | 269 |

## BLACK & DECKER

| Model | Description | List | Sale |
|---|---|---|---|
| 1166 | 3/8" Drill 0-2500 rpm 4 amp | 118 | 65 |
| 2600 | 3/8" Drill rev. 0-1200 rpm 4.5 amp | 167 | 95 |
| 1180 | 3/8" Drill rev. 0-1200 rpm 5 amp | 207 | 114 |
| 1321 | 1/2"Spade handle Drill 450rpm 7amp | 320 | 188 |
| 1349-09 | 1/2" Timberwolf Drill 2 speed | 551 | 309 |
| 2037 | Drywall Gun 0-4000 5.0 amp | 184 | 98 |
| 2038 | Drywall Gun 0-2500 rpm 5 amp | 184 | 99 |
| 2054 | Tek Gun 0-2500 5.0 amp | 287 | 159 |
| 2050 | Tek Gun 0-900 5.0 amp | 260 | 169 |
| 2660 | Drywall Gun 0-4000 4.5 amp | 149 | 88 |
| 2665K | 3/8" cordless 12V Cyclone Drill | 294 | 168 |
| 5045K | MACHO Rotary Hammer Drill | 813 | 439 |
| 2750 | 4-1/2" Grinder 10.000rpm 6 amp | 156 | 83 |
| 3157 | Orbital var. speed Jig Saw 4.5 amp | 263 | 149 |
| 1703-1 | 10" Mitre Saw w/73-770 blade&bag | 344 | 198 |
| 79-032 | Workmate 200 | 155 | 78 |
| 79-033 | Workmate 300 | 175 | 89 |
| 79-034 | Workmate 400 | 184 | 109 |
| 1180 | 3/8" Drill rev. 0-1200 rpm 5 amp | 192 | 114 |
| 2694 | 7-1/4" Super Sawcat Circ Saw w/cse | 285 | 152 |
| 2695 | 8-1/4" "Super Sawcat" Circ Saw w/cse | 328 | 162 |
| BD5200 | Quantum New 5" Rand Orb Sander | 160 | 88 |
| BD5900 | Quantum New 1/2" Belt Sander | 121 | 69 |

### Piranha Carbide Tooth Saw Blade

| Model # | Diameter | # Teeth | List | Sale |
|---|---|---|---|---|
| 73-718 | 8 | 22 | 20.95 | 10.95 |
| 73-716 | 6-1/2 | 18 | 14.39 | 7.55 |
| 73-756 | 6-1/2 | 36 | 28.92 | 16.99 |
| 73-717 | 7-1/4 | 18 | 14.60 | 7.99 |
| 73-737 | 7-1/4 | 24 | 18.06 | 9.29 |
| 73-757 | 7-1/4 | 40 | 32.87 | 16.89 |
| 73-758 | 8 | 40 | 41.65 | 23.49 |
| 73-759 | 8-1/4 | 40 | 46.88 | 24.99 |
| 73-719 | 8-1/4 | 22 | 20.63 | 11.95 |
| 73-715 | 5-1/2 | 16 | 14.39 | 7.99 |
| 73-704 | 7-1/4 | 18 | 19.95 | 11.95 |
| 73-740 | 10 | 32 | 34.63 | 17.95 |
| 73-770 | 10 | 60 | 70.37 | 33.95 |
| 73-711 | 10 | 50 | 68.33 | 33.95 |

### ELU by Black & Decker

| | | | |
|---|---|---|---|
| 3304 | 1 HP variable speed Plunge Router | 307 | 169 |
| 3375 | 3-1/8" Universal Planer 7.2 amp | 329 | 159 |
| 3380 | Biscuit Jointer with case | 569 | 185 |
| 4024 | 3"x21" variable speed Belt Sander | 338 | 179 |
| 4029 | 4"x24" Belt Sander | 421 | 245 |
| 4015 | 1/2 sheet Sander 3.0amp | 230 | 135 |
| 3339 | NEW 3 HP var. speed Plunge Router | 511 | 269 |

READER SERVICE NO. 111

# DEWALT

| Model | Description | List | Sale |
|---|---|---|---|
| DW944K-2 | 3/8" 9.6V cordless drill kit w/2 batteries | 283 | 165 |
| DW945K-2 | 3/8" 12V cordless drill kit w/2 batteries | 309 | 169 |
| DW364 | 7-1/4" Circ. Saw with brake, 13 amp | 285 | 154 |
| DW306K | 8.0 amp Recip Saw with case var. speed | 291 | 164 |
| DW610 | 1-1/2 HP 2 handle Router | 274 | 149 |
| DW411 | 1/4 sheet Palm Sander, 1.7 amp | 97 | 58 |
| DW705 | 12" Compound Mitre Saw | 706 | 359 |
| DW704 | 12" Mitre Saw | 570 | 325 |
| DW100 | 3/8" Drill, 4 amp, 0-2500 rpm, rev | 118 | 68 |
| DW947K | 3/8" 13.2 volt cordless Drill Kit | 397 | 219 |
| DW420 | NEW Palmgrip Random Orb Sander | 120 | 69 |
| DW421 | above Sander with dust collector | 138 | 79 |
| DW930K | NEW 12 volt 5-3/8" Trim Saw kit | 370 | 199 |
| DW935K | NEW 14.4 volt 5-3/8" Trim Saw kit | 444 | 239 |
| DW444 | NEW 6" Random Orbit Sander - PSA pad | 266 | 149 |
| DW443 | NEW DW444 with hook & loop pad | 266 | 149 |

**SUPER SPECIAL**
DW682K NEW Biscuit Joiner with case ..... Sale 219

| Model | Description | List | Sale |
|---|---|---|---|
| DW250 | 4.5A Drywall Gun, 0-4000 rpm. rev | 169 | 94 |
| DW254 | 4.5A Drywall Gun, 0-2500 rpm, rev | 169 | 94 |
| DW280K | NEW Screwdriver kit complete | 207 | 119 |
| DW318K | Top Handle Jig Saw with case | 277 | 154 |
| DW402 | 4-1/2" Grinder 6 amp | 158 | 89 |
| DW614 | NEW 1-1/4 HP Plunge Router | 290 | 145 |
| DW615 | NEW 1-1/4 HP Electronic Plunge Router | 290 | 158 |
| DW624 | NEW 3 HP Plunge Router | 441 | 245 |

**SUPER SPECIAL**
DW625 NEW 3 HP v/spd Plunge Router ... Sale 269
Includes **FREE** DW6966 fine depth adjuster.

| | | | |
|---|---|---|---|
| DW675K | NEW 3-1/8" Planer with case | 289 | 164 |
| DW430 | NEW 3" x 21" Belt Sander | 291 | 165 |
| DW431 | NEW 3" x 21" variable speed Belt Sander | 331 | 179 |

**NEW DEWALT CORDLESS DRILLS**

| | | | |
|---|---|---|---|
| DW952K | 3/8" var/spd includes one 9.6V battery | 280 | 159 |
| DW953K | 3/8" var/spd includes one 12V battery | 306 | 175 |
| DW962K-2 | 3/8" var/spd incl. two 9.6V XR batteries | 324 | 179 |
| DW972K-2 | 3/8" var/spd incl. two 12V XR batteries | 352 | 189 |
| DW991K | 3/8" var/spd includes one 14.4V XR battery | 370 | 199 |

**Above drill kits come with charger & steel case**

# RYOBI

| Model | Description | List | Sale |
|---|---|---|---|
| JP-155 | 6-1/8" Jointer/Planer | 700 | 305 |
| TS-254 | 10" Mitre Saw | 440 | 209 |
| RE600 | 3 HP Plunge Router var speed | 500 | 235 |
| R175 | NEW 1-3/4 HP Plunge Router | 158 | 95 |
| RE175 | NEW 1-3/4 HP var/spd Plunge Router | 210 | 124 |
| BE321 | 3" x 21" var. speed Belt Sander | 310 | 139 |
| SC160 | 16" Bench Scroll Saw | 282 | 135 |
| SC162VS | NEW 16" var. speed scroll saw | 298 | 174 |
| TFD172VRK | 9.6 volt cordless Drill Kit w/2 batteries | 330 | 139 |
| TFD222VRK | 12 volt cordless Drill Kit w/2 batteries | 365 | 155 |
| TFF100 | Flashlight uses 7.2, 9.6, or 12V battery | | 19.95 |
| JM100K | Biscuit Jointer with case | 475 | 218 |
| BT3000 | 10" Table Saw with stand | 1125 | 529 |

**SUPER SPECIAL**
OSS450 NEW Oscillating Spindle Sander ... Sale 159

| Model | Description | List | Sale |
|---|---|---|---|
| TSS220 | 8-1/2" Slide Comp. Saw | 966 | 445 |
| TS260 | 10" Compound Mitre Saw | 486 | 239 |
| TR30U | 3/4 HP Trimmer | 174 | 85 |
| DS1000 | NEW Detail Sander | 90 | 44 |
| DS2000 | NEW Detail Sander - 2 speed | 112 | 64 |
| DC500 | NEW Detail Carver | 120 | 64 |
| RS112 | Palm grip Random Orb Sander | 90 | 55 |
| RS115 | 4-1/2" v/spd Random Orbit Sander | 136 | 74 |
| AP12 | NEW 12" Bench Planer | 884 | 395 |
| JS45 | NEW Top Hdle Jig Saw v/spd | 98 | 59 |
| TDS4000K | NEW 12V Drywall Gun kit 2 spd | 420 | 215 |
| RA202 | NEW 8-1/4" Bench Radial Arm Saw | 800 | 389 |
| BS900 | NEW 9" Bench Band Saw | 340 | 169 |
| IDV28 | NEW 28 Gal. Industrial Dry Vac | 225 | 119 |
| BMM2400K | NEW 24 volt Mulching Mower | Sale | 349 |
| W660C | 7-1/4"Circ Saw 13 amp | 184 | 79 |
| ML618 | NEW Mini Lathe variable speed | 418 | 219 |

# PANASONIC

| Model | Description | List | Sale |
|---|---|---|---|
| EY6205EQK | Same as EY6205BC but comes with NEW **Ironman** battery | 368 | 192 |
| EY6207EQK | 12V 1/2" Drill w/keyless chuck var. speed w/ 15 min. charger, case, & **Ironman** battery | 420 | 229 |
| EY6282EQK | Var. spd 9.6 volt Drill with 15 min. charger, case, and NEW **Ironman** battery | 315 | 169 |
| EY62821DKW | 9.6 volt Drill Kit w/2 batteries | 395 | 162 |

**Ironman Battery** = Battery has 40% more life and 20% more torque!

| Model | Description | List | Sale |
|---|---|---|---|
| EY6181CRKW | NEW 9.6V **PREDATOR** Compact Drill Kit with 2 batteries - 10% more power than EY62821DKW | 305 | 158 |
| EY6100CRKW | NEW 12V **PREDATOR** drill kit with 2 batteries, 1 hr charger, & case | 358 | 185 |
| EY6100CQKW | Same as **EY6100CRKW** but has 15 minute charger | 420 | 198 |
| EY6100EQK | NEW 12V **PREDATOR** drill kit w/NEW **Ironman** battery, 15 min. charger, & case | 375 | 199 |
| EY6100EQKW | Same as **EY6100EQK** but with 2 **Ironman** batteries | 473 | 225 |

# WERNER LADDERS

**Introducing a full range of Werner brand ladders at discounted prices! Werner ladders - A name you can stand on.**

**FIBERGLASS STEP - TYPE 1- 250# RATING**

| | | | |
|---|---|---|---|
| 6004 | 4' | 13# | 53.95 |
| 6005 | 5' | 16# | 64.95 |
| 6006 | 6' | 18# | 67.95 |

**FIBERGLASS STEP - TYPE 1- 250# RATING**

| | | | |
|---|---|---|---|
| 6004-S | w/pail shelf 4' | 15# | 59.95 |
| 6005-S | w/pail shelf 5' | 18# | 69.95 |
| 6006-S | w/pail shelf 6' | 20# | 73.95 |

**FIBERGLASS STEP - TYPE 1A- 300# RATING**

| | | | |
|---|---|---|---|
| 6204 | 4' | 14# | 65.00 |
| 6205 | 5' | 18# | 75.00 |
| 6206 | 6' | 20# | 82.00 |

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

| Accepts Stage | | | Attaches | |
|---|---|---|---|---|
| Model | Width | Spans | to Rung | Sale |
| 10-14-02 | 14" | 2 rung | 2 rungs | 68.95 |
| 10-20-02 | 20" | 3 rung | 2 rungs | 81.95 |
| 10-20-03 | 20" | 3 rung | 3 rungs | 89.95 |

**ALUMINUM FLAT STEP TYPE 1- 250# RATED EXTEN.**

| Model | Size | Working Length | Weight(lbs) | Sale |
|---|---|---|---|---|
| D1316-2 | 16' | 13' | 26# | 127.95 |
| D1320-2 | 20' | 17' | 32# | 152.95 |
| D1324-2 | 24' | 21' | 39# | 169.95 |
| D1328-2 | 28' | 25' | 50# | 199.95 |
| D1332-2 | 32' | 29' | 62# | 229.95 |
| D1336-2 | 36' | 32' | 77# | 299.95 |
| D1340-2 | 40' | 35' | 85# | 329.95 |

**ALUMINUM FLAT STEP TYPE 1A- 300# RATED EXTEN.**

| | | | | |
|---|---|---|---|---|
| D1516-2 | 16' | 13' | 31# | 159.95 |
| D1520-2 | 20' | 17' | 37# | 169.95 |
| D1524-2 | 24' | 21' | 45# | 199.95 |
| D1528-2 | 28' | 25' | 56# | 219.95 |
| D1532-2 | 32' | 29' | 66# | 259.95 |
| D1536-2 | 36' | 32'(250# rating) | 79# | 309.95 |
| D1540-2 | 40' | 35'(250# rating) | 89# | 349.95 |

**FIBERGLASS FLAT STEP TYPE 1A- 300# RATING**

| | | | | |
|---|---|---|---|---|
| D6116-2 | 16' | 13' | 34# | 179.95 |
| D6120-2 | 20' | 17' | 40# | 199.95 |
| D6124-2 | 24' | 21' | 53# | 239.95 |
| D6128-2 | 28' | 25' | 60# | 269.95 |
| D6132-2 | 32' | 29' | 74# | 309.95 |

**FIBERGLASS FLAT STEP TYPE 1A- 300# XTRA HEAVY**

| | | | | |
|---|---|---|---|---|
| D7116-2 | 16' | 13' | 37# | 209.95 |
| D7120-2 | 20' | 17' | 43# | 245.95 |
| D7124-2 | 24' | 21' | 58# | 279.95 |
| D7128-2 | 28' | 25' | 66# | 309.95 |
| D7132-2 | 32' | 29' | 79# | 369.95 |

**Buy any 3 ladders(can be assorted) deduct additional 5%**
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# DAVID WHITE

| Model | Description | List | Sale |
|---|---|---|---|
| LP6-20 | Sight Level package - 20x | 310 | 195 |
| LP6-20XL | LP6-20 w/9056 tripod & 7620 rod | 375 | 259 |
| L6-20 | Meridian Level - 20x | 290 | 188 |
| LT8-300 | Level Transit - 26x | 695 | 445 |
| LT8-300P | above Level w/optical plummet | 821 | 518 |
| LT6-900 | Level Transit - 20x | 389 | 249 |
| LTP6-900 | above Level with tripod & rod | 601 | 375 |
| ALT6-900 | Automatic Level - Transit - 18x | 638 | 409 |
| ALTP6-900 | above level w/9066 tripod and 7620 rod | 708 | 469 |
| AL6-18 | Automatic level - 18X | 449 | 315 |
| ALP6-18HD | above level w/tripod and rod | 570 | 375 |
| ALP8-20 | NEW Automatic level 20x with tripod & rod | 710 | 539 |
| AL8-25 | Automatic Level - 25X | 906 | 645 |
| AL8-22 | Automatic Level - 22X | 599 | 435 |
| ML100I | NEW Laser Level | 1099 | 945 |
| ML100 | NEW Laser Level w/ detector | 1249 | 1075 |

# AIRY AIR NAILERS

| Model | Description | List | Sale |
|---|---|---|---|
| 0241SK | Brad Nailer 3/8" - 1-9/16" Same as Senco SLP-20 | 180 | 98 |
| 0250SK | Brad Nailer 3/4" - 2" | 296 | 164 |
| 0626SK | 1/4" Crown Stapler 3/8" - 1" | 194 | 104 |
| EZ-1 | New Multi-Purpose Nailer & Stapler | 180 | 99 |

**Above nailers come with case, fasteners, oil, and wrenches**

| | | | |
|---|---|---|---|
| 0565T | Angle Finish Nailer 1" - 2-1/2" | 386 | 205 |

**Airy nailers use Senco brand fasteners**

# PORTA NAILERS

| Model | Description | List | Sale |
|---|---|---|---|
| 401 | Porta Nailer complete | 265 | 205 |
| 501 | Face Nailer complete | 265 | 205 |
| 1000 | Genuine Porta Nails 1000 Qty | | 15.89 |
| 5000 | Genuine Porta Nails 5000 Qty | | 71.50 |
| 10,000 | Genuine Porta Nails 10.000 Qty | | 121.85 |

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**SEE NEXT PAGE FOR MORE SPECIALS!**

# PORTER CABLE

## ROUTERS

| Model | Description | List | Sale |
|---|---|---|---|
| 630 | 1 HP Router 6.8 amp | 200 | 129 |
| 690 | 1-1/2 HP Router 10 amp | 260 | 138 |
| 9690 | 690 Router w/steel case | 305 | 145 |
| 691 | 1-1/2 HP Router D handle | 285 | 155 |
| 43800 | Router bit case | | 2.99 |
| 695 | 1-1/2 HP Router/Shaper | 400 | 223 |
| 696 | Heavy Duty Shaper Table | 230 | 129 |
| 100 | 7/8 HP Router | 190 | 109 |
| 5060 | "Stair Ease" Stair Templet | 208 | 145 |
| 5061 | "Stair Ease" Hard Wood Templet | 243 | 149 |
| 5008 | Dovetail Template kit | 130 | 85 |
| 5009 | Mortise & Tenon Jig | 75 | 48 |
| 693 | 1-1/2 HP Plunge Router | 320 | 174 |
| 6931 | Plunge Router Base | 125 | 77 |
| 5116 | 16" Omni-Jig | 470 | 258 |
| 7116 | 24" Omni-Jig | 535 | 294 |
| 7310 | 5.6 amp Laminate Trimmer | 165 | 95 |
| 7312 | 5.6 amp Offset Base Lam Trimmer | 230 | 128 |
| 7319 | 5.6 amp Tilt Base Lam Trimmer | 182 | 115 |
| 97310 | Laminate Trimmer Kit complete | 360 | 198 |
| 7518 | 3-1/4 HP 5 speed Router | 510 | 268 |
| 7519 | 3-1/4 HP 2 handle Router | 445 | 239 |
| 7536 | 2-1/2 HP 2 handle Router | 365 | 205 |
| 7537 | 2-1/2 HP "D" handle Router | 385 | 214 |
| 7538 | 3-1/4 HP Plunge Router | 445 | 239 |
| 7539 | 3-1/4 HP var. spd Plunge Router | 510 | 269 |

## JIG SAWS

| Model | Description | List | Sale |
|---|---|---|---|
| 7549 | Top handle Jig Saw | 270 | 135 |
| 7649 | Barrel-grip Jig Saw | 270 | 149 |

## SANDERS

| Model | Description | List | Sale |
|---|---|---|---|
| 351 | 3"x21" Belt Sander without bag | 280 | 154 |
| 352 | 3"x21" Belt Sander with bag | 290 | 159 |
| 352VS | 3" x 21" Belt Sander var. speed w/case | 305 | 169 |
| 360 | 3"x24" Belt Sander with bag | 365 | 194 |
| 361 | 3"x24" Belt Sander without bag | 345 | 189 |
| 362 | 4"x24" Belt Sander with bag | 380 | 205 |
| 363 | 4"x24" Belt Sander without bag | 360 | 195 |
| 503 | 3"x24" Belt Sander w/bag Worm Drive | 582 | 365 |
| 504 | 3"x24" Belt Sander Worm Drive | 565 | 359 |
| 330 | 1/4 sheet Palm Sander $10 rebate | 110 | 60 |
| 7400 | 7" Vertical Grinder 12 amp | 260 | 145 |
| 7401 | 7" Polisher 8 amp | 270 | 149 |
| 7403 | 6" Power Paint Remover 8 amp | 290 | 165 |
| 7402 | 7" Vertical Disc Sander 8 amp | 260 | 145 |
| 505 | 1/2 sheet Orbital Pad Sander | 230 | 128 |

## RANDOM ORBIT SANDERS

| | | | |
|---|---|---|---|
| 332 | Palmgrip Random Orb Sander | 120 | 69 |
| 333 | above Sander with dust bag | 135 | 75 |
| 334 | 333 sander with PSA pad | 135 | 74 |
| 7334 | 5" Pad 6000 rpm | 225 | 122 |
| 7335 | 5" Pad var. speed with case | 245 | 132 |
| 7336 | 6" Pad var. speed with case | 250 | 137 |
| 73333 | Dust Collection Kit | 31 | 24.50 |

## RECIPRO SAWS

| | | | |
|---|---|---|---|
| 9627 | Recipro Saw 2 speed 8 amp | 244 | 148 |
| 9629 | Recipro Saw variable speed 8 amp | 270 | 148 |
| 9637 | Full var/spd Recipro Saw 8 amp | 270 | 148 |
| 9647 | TIGER CUB Recipro Saw | 210 | 119 |

## DRILLS

| Model | Description | List | Sale |
|---|---|---|---|
| 7556 | 1/2" Right Angle 330/700rpm Drill w/case | 385 | 224 |
| 666 | 0-1200 rpm 3/8" var. speed Drill 4 amp | 230 | 128 |
| 7557 | 3/8" variable speed angle Drill | 295 | 195 |
| 97751 | 1/2" var. speed Hammer Drill w/case | 270 | 155 |
| 2620 | 3/8" HD var. speed Drill 0-1000 rpm | 185 | 105 |
| 6611 | New 3/8" Drill 0-1000 rpm 5.5 amp | 220 | 125 |
| 6614 | New 1/2" Drill 0-750 rpm 5.5 amp | 230 | 128 |
| 6615 | New 6614 with keyless chuck | 230 | 128 |
| 9852 | 12 volt 3/8" Drill w/case 0-400/0-1000 rpm | 280 | 154 |
| 9853 | 9852 with keyless chuck | 280 | 154 |
| 9853K | 9853 Drill Kit with extra battery | Sale | 164 |
| 9855 | 12V 1/2" Drill w/case 0-350/0-1000 rpm | 335 | 188 |
| 8500 | 12 volt battery for above Drills | 69 | 45 |
| 9841 | 9.6 volt cordless Drill Kit with 15 minute charger, battery, & case | 309 | 169 |
| 9840 | 9.6 volt cordless Drill Kit with 1 hour charger, 2 batteries, & case | 289 | 164 |
| 8400 | 9.6 volt battery for above Drills | 67 | 49 |

## SAWS

| | | | |
|---|---|---|---|
| 314 | 4-1/2" Trim Saw 4.5 amp | 255 | 142 |
| 9314 | above Saw with case | 280 | 158 |
| 345 | 6" Saw Boss 9 amp | 190 | 104 |
| 9345 | 345 comp. with case & carbide blade | 220 | 124 |
| 7700 | 10" "Lazerloc" Miter saw | 634 | 344 |
| 1400 | 14" abrasive cut-off machine | 372 | 215 |

## PLANERS

| | | | |
|---|---|---|---|
| 9118 | Porta Plane w/carbide cutter & case | 390 | 215 |
| 9652 | Versa-Plane w/carbide cutter & case | 479 | 319 |

## BISCUIT JOINER

| Model | Description | List | Sale |
|---|---|---|---|
| 550 | Pocket cutter with case | 330 | 179 |
| 555 | Plate Biscuit Joiner with case | 320 | 159 |
| 5554 | 1000 Assorted Biscuits | | 29 |
| 5553 | 1000 #20 Biscuits | | 29 |
| 5552 | 1000 #10 Biscuits | | 29 |
| 5551 | 1000 #0 Biscuits | | 29 |

**SUPER SPECIAL**
556 555Joiner w/5556 tilt fence ..... Sale 165

## DRYWALL GUNS

| | | | |
|---|---|---|---|
| 7399 | Drywall cutout unit 5.6 amp | 140 | 84 |
| 6645 | New 0-2500 Drywall Gun 5.2 amp | 195 | 99 |
| 96645 | New Screwdriver Kit | 226 | 129 |
| 1700 | Heat gun 750° - 1000° | 120 | 74 |

## NEW TOOLS

| | | | |
|---|---|---|---|
| 340 | NEW 1/4 Sheet Orb Sndr w/dust pickup | 89 | 55 |
| 511 | NEW Cylindrical Lock installation kit | 250 | 149 |
| 310 | NEW Production Laminate Trimmer | 250 | 145 |
| 312 | NEW Production Offset Lam. Trimmer | 295 | 169 |
| 410 | NEW Underscribe Trimmer | 266 | 155 |
| 347 | NEW 7-1/4" "Framers" Circ. Saw | 225 | 129 |
| 743 | NEW 347 Saw - left hand version | 225 | 129 |
| 9743 | NEW 743 Saw with case | 255 | 148 |
| 9347 | NEW 347 Saw with case | 255 | 148 |
| 843 | NEW 447 Saw - left hand version | 245 | 139 |

**SUPER SPECIAL**
447 NEW 7-1/4" "Framers" Circ. Saw w/brake Sale 134

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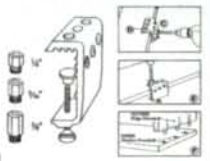

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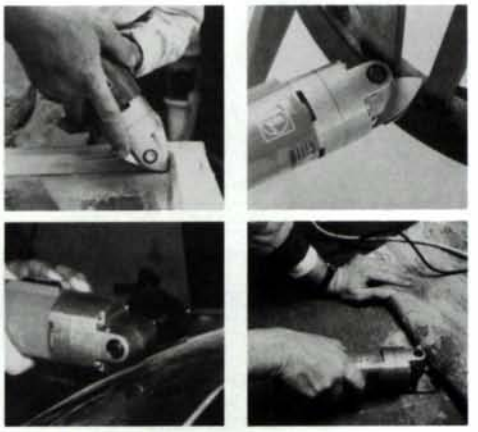

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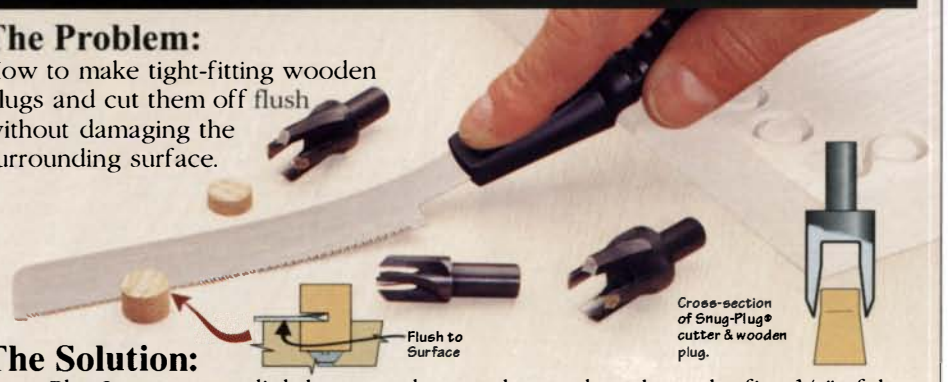


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Fine WoodWorking January/February 1995

# Mantel Makes the Room

*Sophisticated and complex-looking, mantels are actually simple to build*

by Mario Rodriguez

Walk into any room with a fireplace, and your eyes will be drawn to the mantel surrounding it. A fine mantel can warm up a cold room, even without a fire in the grate. Lots of separate elements make up a mantel, but they look far more complicated than they are. In fact, a mantel is a fairly straightforward woodworking project when it is approached one step at a time.

Building a mantel is essentially a process of layering, with each successive layer covering up the joinery or seams in the layer below (see the drawings throughout this article and the top photo on p. 46). The process can be divided into four basic steps: building the foundation; adding on the pilasters, or columns; adding moldings to hide all remaining seams and joinery; and attaching the mantel shelf.

By breaking the process down into its separate steps, you can build a beautiful mantel that will be admired for generations. The mantel shown in this article is a reproduction modeled on another mantel I did some restoration work on in my 19th-century house. Working on the old mantel gave me an opportunity to study the design and construction of Federal-era mantels. To gain an acquaintance with the architectural vocabulary of a mantel's parts and the relationship of those parts, take a look at the drawings on pp. 46-47.

## Building the foundation

The first layer of the mantel is the foundation, a simple structure that looks like an inverted "U," surrounding the fireplace opening. Much of the foundation will be covered by the layers that follow, so I decided to use mostly #2 pine for my foundation. It's significantly cheaper than clear pine, and I found that I could work around the knots quite easily by cutting short, wide sections or long, thin sections, depending on my needs. For the center panel of the frieze board and the upper section of the pilaster, I used clear pine because those sections are exposed (see figures 1-3 on pp. 46-47).

After dimensioning my stock and cutting pieces to size, I planed a bead with a return onto the edge of the vertical foundation boards. You could do the same with a router. In the 18th century, builders installed the interior woodwork first and then applied the plaster, using the woodwork as a stop. Often, over time, the woodwork would shrink away from the wall, creating a gap. The bead would overlap the plaster by about ⅜ in. and so would conceal the shrinkage and preserve the fine appearance of the room.

I modified the horizontal section of the foundation because I've seen too many period mantels with large, ugly cracks running the length of the frieze board. Early carpenters and joiners didn't always take into account the seasonal cross-grain movement of wood. To prevent the frieze from cracking, I divided it into three separate boards with ⅛-in. expansion gaps between them (see figure 1 on p. 46). The top and bottom boards of the frieze, which essentially frame the 10-in.-wide center panel, are glued to the vertical foundation boards over the length of their stub tenons. The center frieze board is glued into the groove in the vertical foundation board only at its center so that the board can move freely without splitting. The ⅛ in. expansion gaps between the three horizontal frieze boards are covered over later with moldings.

To widen the foundation board and to

## Moldings: planed, routed or stock

There are three main ways to obtain the molding you need for a mantel: You can make your own with a router or shaper; you can buy stock moldings off the shelf; or you can make your own with molding planes. You can also combine any or all of the above to come up with an attractive mantel. Your choice will depend on your skills and equipment, what kinds of moldings are available locally and how much time and money you have for the project.

**Shopmade moldings using a router or shaper:** If you have a shaper and a decent selection of knives, you're home free. But even if you have just a router table, you're still in good shape. Routing your own moldings is a quick and an economical way of producing a wide range of profiles in small quantities. Every shop has at least one router, and with molding bits averaging around $30, even a small shop can afford to maintain a good selection. If you need just 10 to 15 ft. of molding, which is the case with a mantel, making the molding on a router table probably offers the best combination of choice and efficiency.

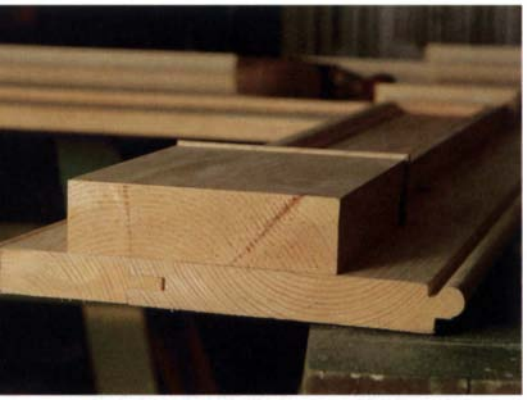
***Planes can make more refined moldings than routers or shapers.*** *Because they cut with a linear motion, molding planes can cut deeper quirks and smaller beads than bits or shaper cutters.*

**Off-the-shelf stock moldings:** Lumberyards, home centers and mill-work companies can be convenient and economical sources of moldings because they generally maintain a wide selection of stock at reasonable prices. Also, even if they don't have the molding you want in stock, they can often order many other profiles from a supplier's catalog. And don't overlook the mill-work shop that produces custom moldings for large contractors. These shops often sell remainders and shorts at bargain prices.

**Moldings from molding planes:** Now that I've made my arguments for speed and efficiency, let me contradict myself: Whenever I can, I use molding planes for this type of project. A plane produces molding with a distinct, handmade quality that can't be reproduced with a shaper or a router. Molding planes are also capable of producing more delicate shapes than router bits or shaper cutters (see the photo).

The first step in producing molding with planes is acquiring planes that work well. They're getting scarcer these days but can still be bought at reasonable prices from reputable antique tool dealers and at tool auctions (see *FWW* #98, p. 89 for a list of dealers and auctioneers). When shopping for antique molding planes, stick to simple profiles, like coves, ogees and beads. They are cheaper and easier to find than the more complex shapes. If you see a plane you think you might want, check the blade profile to see if it matches the sole of the plane, that the profile and sole are in alignment and that there's even projection of the blade over the entire profile. Check, too, to see that the plane body is not twisted. Finally, make sure that the blade isn't seriously rusty or pitted. A pitted blade, even when sharp, will leave a rough surface. —*M.R.*

Photo facing page: Sloan Howard



***A mantel is built in layers.*** *When viewing a section of the unfinished mantel from the bottom, foundation, pilaster and molding layers are all evident. As with most architectural woodwork, building a mantel is a lot simpler than it looks when completed.*

***Layout speeds assembly—****Laying out positions for the plinth, center and upper sections of the pilasters makes it easy to clamp the pieces in place, drill and countersink and then screw them home.*

**Fig. 1: Building the foundation**

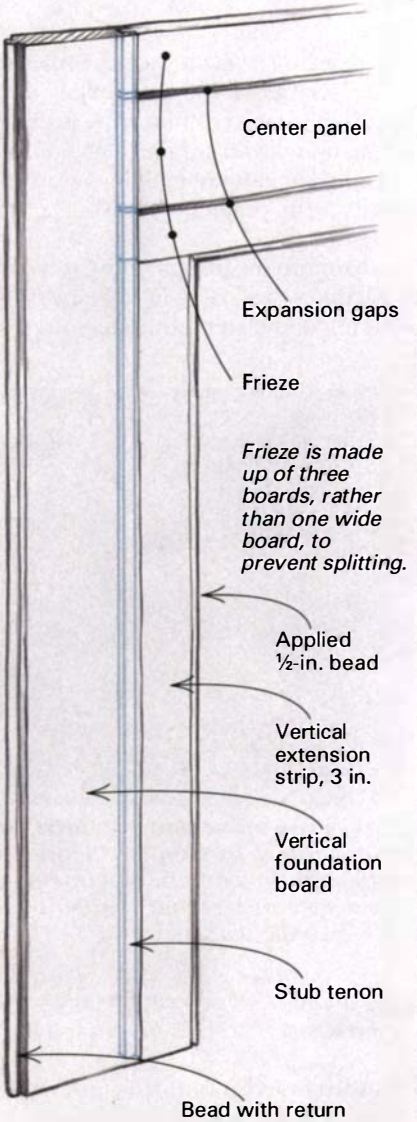



**Fig. 2: Adding the pilasters**

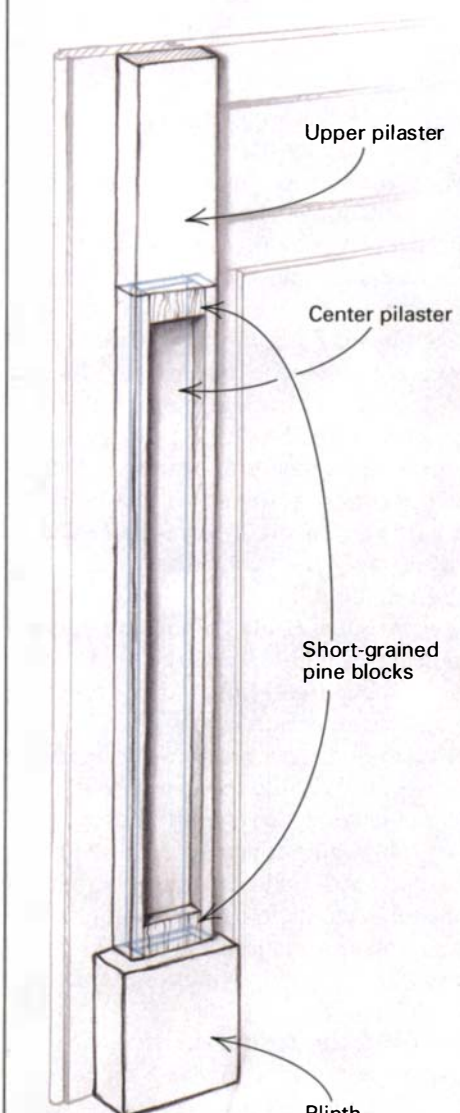
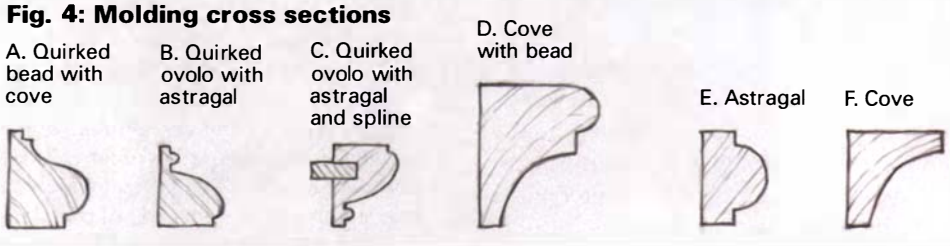



**Fig. 4: Molding cross sections**




help support the frieze, I glued a 3-in.-wide vertical strip into the groove along the inside of the vertical foundation board. Again, all the seams eventually would be hidden by pilasters and moldings. Around the inside of the foundation, against the 3-in.-wide strip and the lower frieze board, I glued and nailed a ½-in. bead, using 4d cut finishing nails. Because of their rectangular profile, cut nails are much less prone to split wood than wire nails, which need pilot holes to reduce the chance of splitting narrow strips of wood. Cut nails are available from the Tremont Nail Co. (P.O. Box 111, Wareham, Mass. 02571; 508-295-0038), which has been making cut nails since 1819.

## Pilasters

The pilasters are the chief vertical design elements of the mantel and give the impression of supporting the mantel shelf. I laid out and built the pilasters in three parts: plinth (or base), center and upper sections (see figure 2 and the bottom photo on this page). This three-part design made construction easier and allowed me to use cheaper material because I needed only short pieces of clear pine for the plinths and upper pilasters.

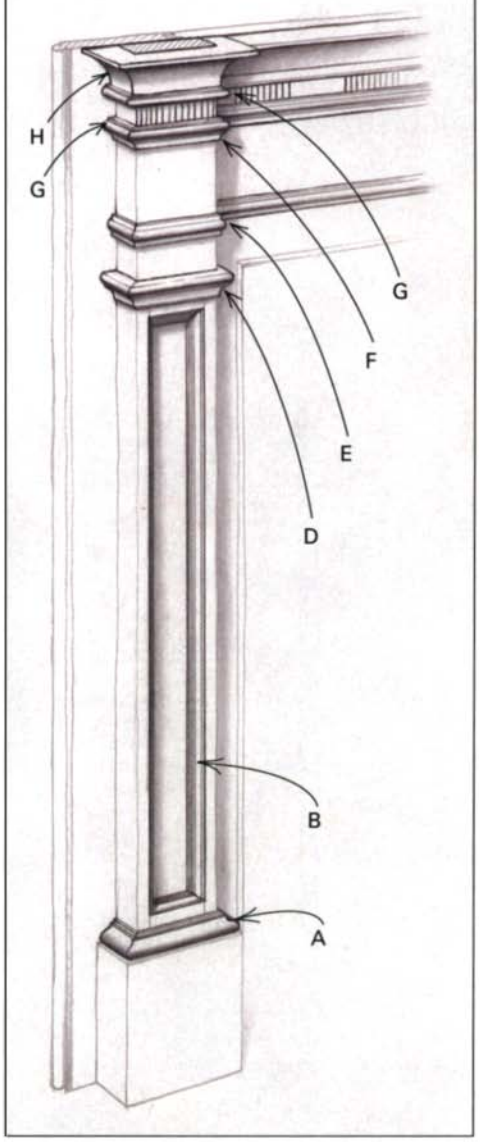
The plinth blocks that make up the base of the pilasters are thicker than the center or upper sections, so the blocks visually anchor the design, reinforcing the feeling of architectural solidity. The plinth blocks, like the rest of the pilasters, hide the seam between the vertical foundation board and the 3-in.-wide strip. Because the plinth blocks are so thick, I screwed them from the back of the foundation board with 1¾-in., #8 Phillips-head screws.

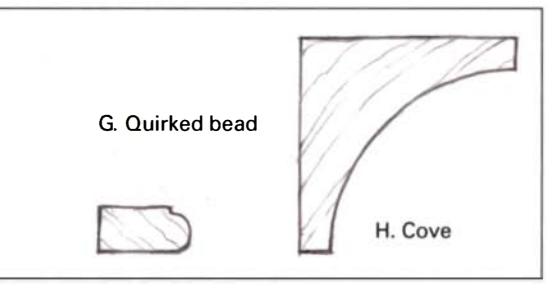
The center part of the pilaster looks like



Photos except where noted: Vincent Laurence

**Fig. 3: Applying the molding**





***Moldings cover fasteners.*** *Rodriguez checks his miters before gluing and nailing. This piece, about 5 in., is long enough to nail without splitting, but the smaller piece being held in place by his index finger will just be masking taped to the pilaster until the glue sets.*

a frame and panel. To make the panel and vertical frame members, I glued up a long U-channel. To form the horizontal frame members, I glued short pieces of pine between the verticals at each end. I ran the grain vertically in these little rails so that they'd expand and contract with the boards below. I attached this "frame and panel" to the foundation, screwing the assembly down at the edges of the "panel" sections. Later, I glued a small molding, mitered at the corners, all around the insides of the "frames" to hide the screws and to complete the visual effect.

I screwed the upper sections of the pilasters to the foundation but left them plain to create an easy transition into the frieze boards. Moldings cover up the screw holes.

## Moldings

There are no hard and fast rules for choosing types of moldings or for determining their placement. There are uses, however, for which moldings were traditionally employed and for which they still work well today. The moldings emphasize certain elements of a mantel, soften transitions from one area to another and highlight the outline of shapes. Moldings also create contrast and help modulate the relationship of one element to another. For instance, moldings attached to a cornice can help direct the eye upward, if you begin with small delicate shapes and progress to larger, more robust profiles.

It's also a good idea to start with small, simple moldings (a single curve or arc), built up or stacked to create more complex profiles. I often experiment when choosing my molding, trying different combinations in various orders until I find an arrangement that works.

I cut the miters on the molding for this mantel on my chop saw. You could also use a small miter box and a fine dovetail saw if you want to avoid the chop saw. I trued up any miters that were slightly off using a shooting board (for more on shooting boards, see *FWW* #106, pp. 72-73).

I glued and nailed the moldings to the mantel using the cut finishing nails I mentioned earlier (see the photo above), and then I set the nails and filled the nail holes.

## Mantel shelf

The mantel shelf has a gently curved front edge flanked by square projections at the ends where it sits over the pilasters (see figure 5 on p. 48). This is a handsome treatment that looks like more work than it is. I made the shelf of 5/4 pine and routed a rabbet ⅜ in. along the lower front edge, creating a step. The rabbet makes a thinner, lighter profile and, at the same time, creates a shadow that emphasizes the outline of the shelf.

Then I squared up the curved inside corners of the rabbet, marking the corner with a knife and rule and using a wide chisel to pare the walls of the rabbet (see the top photo on p. 48).

I glued and tacked the molding around the edge of the mantel shelf, using the 4d cut nails and nailing into the quirk, or recess, of the molding. Even though the mantel shelf is only 6 in. wide, I wanted to prevent any cross-grain movement problems. So I attached the pieces of molding at either end of the mantel to the shelf with a thin spline, gluing it only at the front. But I probably didn't need to go that far because the mantel I modeled mine on is in fine condition a century and a half later, and its shelf molding was just nailed on. On the front curved portion, I simply bent the slender molding around the shallow curve and then secured it with glue and finishing nails.

To work out the sharp inside miters of the shelf molding, where the curved section meets the section that comes out perpendicularly to the wall, I laid out the shelf full-size and then bisected that angle. I set my bevel gauge to that angle and set my

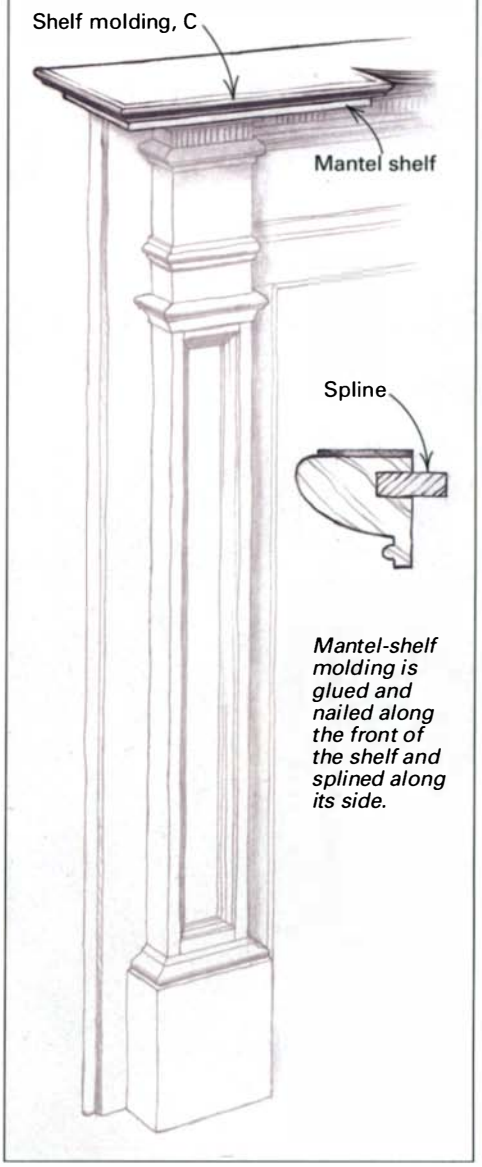
Drawings: Michael Gellatly

## PREPARING THE MANTEL SHELF

***Rout a rabbet and square the corners**—After routing a rabbet all around the underside of the mantel shelf, the author squares up the inside corners with a sharp chisel. Before chiseling, he marked out the corner with a rule and a marking knife.*

***Block plane blends molding to shelf.** Molding and shelf will never be perfectly aligned over their whole length after nailing the molding on, so the author uses a block plane to make things flush. Also, he eases the top outside edge of the molding to give the mantel a softer look.*

**Fig. 5: Adding the mantel shelf**




chop box from the bevel gauge.

For the sections of molding that were too small to nail (I didn't want to split them), I glued them and held the pieces in place with masking tape until the glue dried.

After the glue dried, I trimmed the molding flush to the top of the shelf with a block plane, eliminating the quirk in the process, and gently eased the top outside edge of the molding to give the mantel a softer, older look (see the bottom photo).

### Painting the mantel

Like most woodworkers, I prefer a clear finish over wood 99% of the time. But for my mantel and the other trim work in the room, I chose a paint finish, which was customary for the period. Paint renders the mantel all one unit, emphasizing the lines of the piece rather than the wood grain, the joinery or anything else. And because painting the mantel calls your attention to the lines of the piece, it's particularly important that there not be any blemishes or irregularities in the wood's surface.

To achieve a true period appearance, I handplaned every visible surface. I didn't want any mill stamps or planer chatter marks to telegraph through the paint later. With a sharp, properly set plane, you can achieve a clean, smooth finish ready for paint. I made sure to fill any small dents or gaps with a water-based filler. For the smallest dents and scratches, I found that joint compound worked perfectly.

I primed the mantel first, spraying it with two coats of BIN, a shellac-based primer and sealer (available at most hardware stores). Although it's expensive (about $24 a gallon), I prefer BIN to other similar products because it has excellent coverage, resists drips, seals knots and stains, and sands to a smooth surface.

After sanding the primer, I went over the mantel surface again, looking for any tearout or scratches I might have missed. Then I filled them and leveled the surface with joint compound. I filled any gaps with DAP painter's acrylic caulk, a premium-grade water-based paintable caulk available at most large paint stores. I also used the caulk to fill all sharp inside corners on the mantel to make it look like its gotten many coats of paint, as though it's been around for a couple of centuries.

Finally, I sprayed two coats of Benjamin Moore's semigloss enamel. I also added a product called Flo-Trol (available at most large paint stores) to the paint. It's an additive that retards the drying of paint, allowing it to flow out better. It's also handy if you don't have spray equipment and you're brushing on the final coats because it will give you enough time for brush marks to level out. □

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*Mario Rodriguez is a furnituremaker and teacher in Warwick, N.Y., and a contributing editor to* Fine Woodworking.

# Mix Your Own Oil Stains

*Simple recipe uses artist's pigments to get exactly the right tone and color*

by Tom Wisshack

I'll be the first to admit it. There's a real purity to a "natural," unstained wood finish, a real virtue to letting the wood's true figure and color come through. But if you are refinishing, restoring or reproducing a piece of furniture, well, a "natural" finish is something that you just can't afford. Color, tone and patina take years, sometimes decades, to develop on "naturally" finished pieces. In almost 20 years of refinishing and restoration work, I have developed a way to get the right color and patina in a matter of hours.

My technique for coloring wood is better than either aniline dyes or commercial stains because of the control I have over tone and depth of color. Also, the stains are largely reversible. I make my own oil stains with turpentine or paint thinner, linseed oil, Japan drier and artist's oil colors.

The turpentine serves as a solvent, diluting the pigments in the artist's oil colors; the linseed oil acts as a binder to

***Stain can bring out the best.*** *The author's table, veneered with crotch mahogany and built with cherry legs, received just one light coat of his homemade oil stain. After observing the natural colors already in the wood, he mixed a stain that accentuated them and gave the wood a head start on developing a patina.*

Photos: Vincent Laurence

***An infinite range of color choices is one good reason to make your own oil stains.*** *A sample board illustrates the subtle colors possible using artist's oils for your pigments:*

***A.*** *The first section is natural Honduras mahogany with just one coat of linseed oil.*

***B.*** *Section B has a light coat of the author's homemade oil stain applied to it. The stain consists of turpentine, linseed oil, Japan drier and just a bit of burnt-umber oil color.*

***C.*** *More umber has been added to the same stain to produce the tone in section C.*

***D.*** *Cadmium red and yellow are added to the same stain to heighten the colors already in the wood.*

***E.*** *Finding section D somewhat too red, the author added a little green to neutralize the red and to bring the tone back to brown.*

***F.*** *A little black adds depth to the stain.*

***G.*** *The mixture was thinned in half with turpentine to yield the natural-looking result in section G.*


keep the ingredients in solution; and the Japan drier ensures that the oil colors will dry within a reasonable amount of time (some dry much slower than others).

One exception is that I substitute copal painting medium (available in art-supply stores) for the linseed oil if I'm working on an antique. The reason is that linseed oil will tend to darken most woods over time. The copal works just as well as a binder. When working with an antique, I take another precautionary step. I also seal the surface prior to staining with shellac before applying any stain, so the stain can be removed entirely at a later date if more work is to be done on the piece.

The key to my stains—the secret ingredients—are the artist's oil colors. What makes them so special are the quality of the pigments used and the fineness of the grind. Artist's oil colors are generally ground much finer than the pigments used in commercial stains, which are often the same as those used in paints. Because the pigment particles are so fine, the resulting stains are much more transparent than commercial stains, letting more of the wood's figure and grain show through. And artist's oil colors are permanent and more fade-resistant than off-the-shelf wood stains.

## Mixing the stain

I mix the liquid ingredients in a glass jar. For a small batch of stain, I'll start with about a pint of turpentine or thinner, one-third cup linseed oil and three or four drops of the Japan drier. I mix the artist's oils separately on a small sheet of glass (my palette), and then I add the mixed pigments to the liquid mixture a little bit at a time until I get the depth of color I'm looking for. I adjust the mix of pigments to get the tone I'm after (see the photo on the facing page).

I'm looking for a *very* dilute stain, on the order of a tenth or so as concentrated as a commercial product but with the consistency of low-fat (2%) milk. The advantage of such a dilute stain is that I can control it by applying it in two or three coats rather than all at once, deepening the tone while still retaining a semitransparent surface. Additionally, if the color is not quite right, I can adjust it repeatedly to alter the tone without ending up with a muddy, murky mess.

The maximum amount of artist's oils I add to the 1-pint solution is about one-third of a standard-size tube, or a little


***Getting the color right**—Mix artist's oil colors separately on a sheet of glass, and then add them to a mixture of turpentine or paint thinner, linseed oil and Japan drier until you have the tone of the pigments you want. Copal painting medium should be substituted for the linseed oil whenever you don't want to darken the wood, such as when refinishing an antique.*

less than half an ounce. This can vary, depending on the intensity of the colors used, so you'll have to experiment. But even the finest quality artist's oils will give you an opaque finish if you get too heavy-handed with them. More light coats are better than fewer heavy coats.

Because these stains are so dilute, it's rarely necessary to seal new wood prior to staining. An exception is pine, which may appear blotchy regardless of how dilute the stain is. A penetrating sealer, such as one of the commercially available Danish oil finishes or a thinned solution of tung oil, eliminates this problem.

### Applying the stain

I generally brush on the first coat of my homemade stain, let it stand about 20 minutes and then wipe it off. Leaving the stain on the wood for more or less than 20 minutes will not dramatically alter the amount of color the wood absorbs but how you wipe off the stain will. A brisk rub leaves only traces of the stain on the wood's surface. Gently wiping in circles and then with the grain will leave considerably more stain on the wood. Subsequent coats can be applied with a cloth.

If you don't like the way the stain looks on the wood, usually you can remove most of it with steel wool and naphtha or paint thinner while the stain's still wet. After the wood has dried, you can try again.

### Sealing in the stain

After staining, I like to allow at least three or four days (a week is even better) before applying a finish. This allows the stain to dry thoroughly, minimizing the chance of it bleeding into the finish. An additional precaution I often take is to use a dilute coat of dewaxed (the most refined version, also called blond dewaxed) white shellac as a sealer between the stain and whatever I decide to use for a finish. The shellac will isolate the oil stain so that practically any finish can be applied without problems. Or you can just use the shellac itself as the finish.

Sometimes I'll also "spice" the white shellac with orange shellac. I add it in small increments to give the surface an amber tone that's reminiscent of an older piece. Whatever finish you use, though, be sure to refer to the can or the manufacturer's instructions to make sure it's compatible with the shellac sealer. □

*Tom Wisshack makes and restores fine furniture in Galesburg, Ill.*

# *Quick, custom oil stains from Japan colors*

by Mario Rodriguez

When building an antique reproduction or recreating a missing component, an important and difficult part of the job often can be the precise matching of the original's color. It's almost impossible to achieve this with the application of a single coat of stain even if you mix your own stains. The task often requires several coats, with successive coats used to deepen or adjust the previous application of color. My system of alternating a light coat of lacquer between coats of stain gives me unparalleled speed, flexibility and reversibility.

For my stains, I use Japan colors suspended in turpentine. Japan colors are highly concentrated basic pigments, usually in an oil-based solution, and are available in a variety of colors. A ½-pint generally costs from $7 to $12.

I can custom mix practically any shade I need by combining two or more colors, and I can control the intensity and opacity of the stain by varying the proportion of Japan colors to turpentine. I have used this technique to alter harsh or unnatural colors from commercial stains. Garish reds and oranges, for example, can be changed to cooler browns and rusts with a light wash of green. I've also warmed up plenty of dull gray-brown walnut pieces with a light red-orange wash.

I mix my stains by pouring a little more turpentine than I need into a glass jar, and then I add the Japan colors to the turpentine. I check the color and intensity of the stain on a sample board and adjust accordingly. Usually, I apply the color with a rag to eliminate lap marks. But I use a brush when I have to get the stain into tight areas.

After the stain is completely dry, I spray on a light coat of lacquer to act as a sealer or barrier coat. To apply the lacquer, you can use a conventional spray rig, an HVLP (high-volume, low-pressure) unit or even aerosol spray cans.

When the lacquer dries, another coat of stain can be applied to darken or change the color without disturbing the previous layer of stain. If the second coat of stain doesn't achieve the color or effect you want, simply wipe it off and try again. □

*Mario Rodriguez teaches woodworking in New York City, and he is a contributing editor to* Fine Woodworking.


***There are lots of plate joiners out there.*** *Choosing one isn't so easy, so we evaluated 16 of them for you. Pictured from upper left are (1) Black & Decker 3382, (2) DeWalt DW682, (3) Elu 3379, (4) Lamello Top 10, (5) Standard 10 and (6) Cobra 10 and (7) Virutex AB11C.*

# Picking a Plate Joiner

## *A survey of the latest offerings in this versatile joinery system*

by Charley Robinson

After more than eight years of using a plate joiner, I'd be lost without one in my shop. The first time I used a plate joiner was to complete some built-in cabinets in a house I had just sold. Time constraints ruled out the mortises and tenons and sliding dovetails I had planned. So I was eager to believe a carpenter friend when he told me that I could finish the job in half the time with plate joints, which were more than strong enough for the application. He was right, and I've been sold on plate joinery ever since.

Plate joiners offer a quick, easy and efficient method of joining wood. The joiner first cuts arc-shaped plate kerfs in the boards to be joined. Then, after applying glue to the kerfs, football-shaped, compressed plates (more often called biscuits) are inserted into the kerfs. Moisture from the glue swells the biscuit against the walls of the kerf, locking the pieces together. The resultant joint is amazingly strong.

Originally designed for joining manufactured sheet goods, plate joinery has become common practice in hardwood as well. Plate joinery can be used for everything from edge-joining boards for panels and tabletops to carcase-and-frame joinery.

The real beauty of plate joinery is that accurate alignment can be achieved in one plane with up to ¼-in. lateral play in the other plane. The play is made possible by the shape of the kerf cut by the machine and the fit of the biscuit in the mortise. The play provides some room for error in laying out joints. In addition to easy layout and quick cutting of joints, plate joinery simplifies stock preparation because you can cut the pieces to finished length without allowances for the tenons or tongues. And the expansion of the biscuits in the kerfs makes the joints exceptionally tight.

But the machine I bought eight years ago is not the machine I'd pick today. There have been lots of improvements over the years, and with 16 different models to choose from (see the chart on pp. 56-57), getting the most bang for your buck when buying a plate joiner can be a perplexing task. I set out to find the most accurate and easy-to-use machines in the group. Along the way, I found some key points to check when choosing a plate joiner.

### Safety

Used properly, the plate joiner is probably one of the safest tools in the shop. The blade is never exposed; it's either housed in the



Photos: Sloan Howard


***Plate joiners come in a variety of designs.*** *Pictured from upper left are (8) Porter-Cable 556, (9) Sears Craftsman 17501, (10) Ryobi JM100K, (11) AMT 4960, (12) Freud JS102 and (13) JS100A, (14) Bosch B1650 and (15) Skil HD1605. The Porter-Cable 555 is not shown.*

machine's base or plunged into the wood. However, there are a few precautions one should take. Using a balanced stance and a tight grip on the fence, which allows you to plunge the blade without wiggling the joiner, will ensure tight, accurate kerfs. Always clamp the work to a table, or use a back stop to brace the piece being cut, especially for small pieces. Because all of these machines are in the high-80 to low-90 decibel (dB) range, hearing protection is a must. In spite of their small 4-in.-dia. blades, these machines make lots of dust, so a collection bag or vacuum hookup will make your eyes and lungs a lot happier and your shop a lot neater.

### Comparing plate joiners

All of the plate joiners in this survey operate by placing a stationary fence or a machine reference surface against the workpiece and then plunging the blade into the stock. The blade and motor ride on a carriage guided by the tool's baseplate. It is a fairly simple operation, but one that can get tiresome on a machine that binds up or is hard to push because the return spring is too strong. But too soft a return spring may allow the cutter to be inadvertently pushed into the stock while trying to position the machine. Then, when the switch is flipped on, the blade binds with the workpiece or causes the machine to kick dangerously to the side.

When cutting, I use the fence to hold the machine in place while the other hand works the switch and plunges the blade into the stock. However, most manufacturers recommend using the top-mounted handle instead of the fence (probably for insurance reasons), but it's easier to hold the machine firmly against the stock by using the fence. Showing their heritage of having been adapted from angle grinders, many of these machines have barrel grips with a click-on switch located on the left side or on top of the barrel. The machines I found more comfortable and easier to use are those with a smaller grip and a trigger switch (see the photos above and on the facing page).

The flatness of the base, face and fence and the squareness of these components to each other should be checked on any machine. The more accurate the surfaces, the more accurate the joints they'll cut and the easier the pieces will go together at assembly.

To hold the joiner in position as the blade is plunged, all of these tools have some sort of friction surface on the face of the machine,

## *Tremendous strength from tiny plates*

Photo: Charley Robinson

***Biscuits come in three standard sizes: #20, #10 and #0.*** *For the greatest joint strength, use the largest plate possible, and doubleup on thicker stock.*

Who would believe that some skinny, football-shaped pieces of compressed wood could make a joint as strong as a big, beefy tenon? It took me a long time to put my faith in plate joints, but the only joint failure I've seen has been in the wood itself. The plates, or biscuits, which are the heart of this joinery system, were still intact.

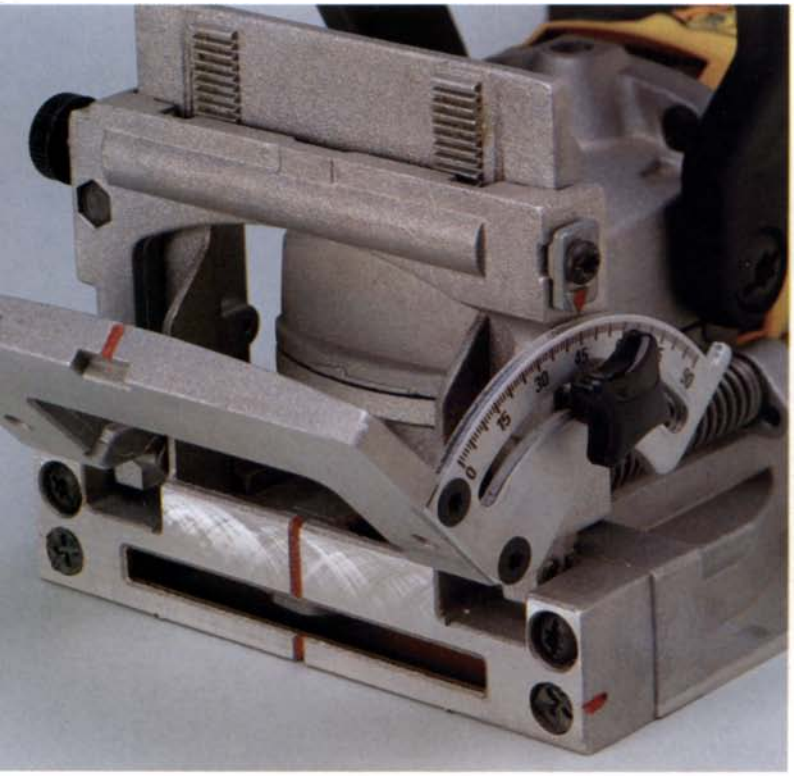
The beech biscuits are pressed to 5⁄32 in. thick with the grain running diagonally across the glueline for maximum joint strength. The standard-size biscuits, #0, #10 and #20 will handle most joinery situations. The rule of thumb is to use the largest plate possible, and when the stock is more than 1 in. thick, doubleup the biscuits by spacing one above the other for extra strength.

In addition to glue, high humidity also can cause the biscuits to swell, so it's best to store them in an air-tight container. If you have humidity-swollen biscuits, try drying them in a 200° oven for a couple of hours.

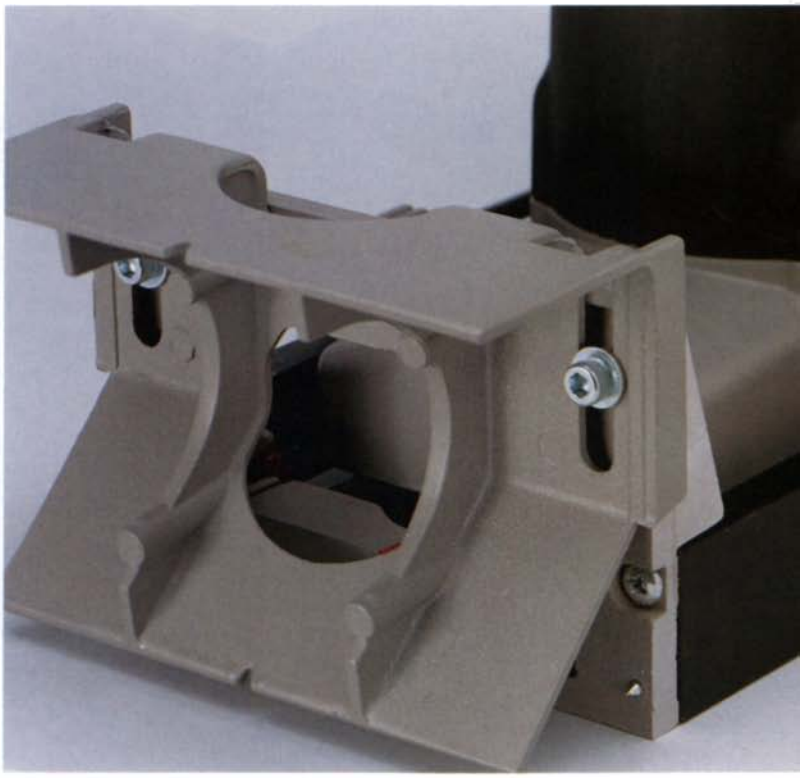
Black & Decker, Lamello and Freud all have machines with an additional "M" setting to handle the oversized #6 plate made for heavy-duty joinery in large, thick stock. The Lamellos and Freuds have additional settings (S,D,A,B) for other specialty hardware, such as hinges, self-clamping biscuits and knockdown fittings. *—C.R.*

## TYPES OF FENCES AND ANTI-SLIP FEATURES VARY

***Rack-and-pinion height adjustment is precise, keeps fence parallel to base. Separate knobs for angle and height and accurate, legible scales facilitate fence adjustment. Retractable pins on the base are effective yet can be disengaged for easier alignment.***



***Allen screws for fence adjustment are inconvenient at best. Single-point steel pins were least effective holding the machine in position against the workpiece. And for miter cuts, they sometimes jam, which changes both angle and depth of cut.***



either pins, rubber pads or rubber dots, as shown in the photos above and on the facing page. Single-pointed steel pins are the least effective. And when cutting miters, the oblique force sometimes causes the spring-loaded pins to hang up, preventing the face of the machine from butting tightly against the mitered edge.

Rubber dots could also be a problem when cutting miters, slightly altering the angle of cutter entry, which could cause some problems in getting a tight joint. The full rubber pads are effective in preventing movement, but my favorites are the retractable pins; with the proper grip, kickback isn't a problem, and by retracting the pins, I can easily slide the joiner along the edge of the board to line up the next cut.

Also, consider dust collection. Without a bag or vacuum connection, these are messy machines. But some bags are so small they require emptying after as few as a dozen cuts. Others tend to jam with shavings after just a few cuts, particularly when cutting soft, stringy wood like pine.

The most effective setup is to hook up a shop vacuum. This option eliminates the problem of small bags and plugged tubes but introduces new ones. The vacuum connections on many of the machines are non-standard and will require some ingenuity to hook up (some can't be connected to a vacuum). The vacuum hose makes the machine less maneuverable, and a screaming shop vacuum can quickly get on your nerves.

All of the machines come with a carrying case (either wood, steel or plastic) and tools for blade changes and depth-of-cut adjustments, except the Sears Craftsman, which comes as just a bare machine. Also, some of the machines include a few biscuits to get you started. AMT, Black & Decker, DeWalt and Elu don't. Bosch even throws in a glue bottle, while four others (Freud JS102, Lamello Top 10 and Standard 10 and Virutex) include a small oil bottle for regular maintenance.

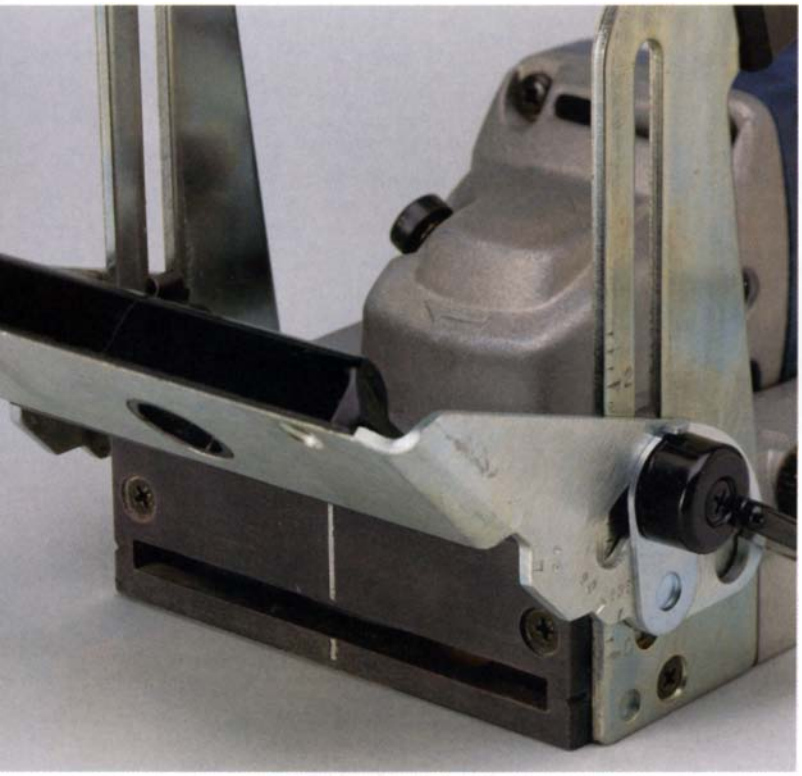
These machines all seem to work equally well left-handed or right-handed. However, the dust-ejection port on all the machines except the Sears Craftsman is on the right side of the machine. Without a collection bag or vacuum connected, left-handed woodworkers might get a lap full of wood chips with each cut.

### The fence is the critical feature

Though you should consider the previous features when buying a plate joiner, the single most important feature in determining the ease of use of one of these machines is the fence. It's used to reference almost all cuts (see the photos above and on the facing page). For accurate cuts, the fence must be square to the face and parallel to the base. If the fence is not parallel, the kerfs of two joining pieces will be out of parallel in opposite directions, thus doubling the error. It won't take much of a misalignment before you encounter problems when trying to draw the joint together.

Other than a simple depth-of-cut adjustment, setting the fence is about the only adjustment you'll have to make with a plate joiner. The height of the fence in relation to the blade determines where the cut will be, and the angle of the fence is adjusted for miters. The best fences have separate locks for these two adjustments. A real help in setting the fence, particularly for miter cuts, is a reference mark on the side of the base that shows the blade location within the housing (see the photo at right on the facing page). And though a fence fixed at 90° or 45° will probably satisfy 95% of your needs, an adjustable-angle fence will come in handy occasionally.

***Some fence-locking mechanisms are difficult to adjust.*** *Locking mechanisms that control both height and angle at the same time are awkward to adjust because you have to hold one setting while adjusting the other. Full-rubber pads worked to prevent movement.*



***Blade center mark on side of housing is handy*** *for setting fence height. Plastic base and fence were less accurate than machined metal. Rubber anti-slip dots protruding from face can cause joiner to rock, making it difficult to duplicate the exact angle of entry.*

The fence also determines whether the joiner registers from the inside or outside of a miter joint. This registration determines whether the inside or outside faces line up when the workpieces are of different thickness. A fence that angles up away from the face of the machine at 135° registers on the inside of the joint. To register from the outside, some fences angle down at 45° and others have a special notch. Some fences are capable of registering both inside and outside, leaving you more options.

Fence-locking mechanisms ranged from the quick-and-easy to the who-wants-to-bother. The worst ones require a separate tool to adjust two screws that control the height and parallelism to the base. Also inconvenient are the locking mechanisms that control both the angle and the height at the same time. The best system includes an adjustable-angle fence that locks with one knob and a rack-and-pinion height adjustment that locks with a separate knob. Accurate, legible scales are also helpful in setting up a plate joiner with a minimum of fuss.

## A look at 16 models available

The chart on pp. 56-57 is an objective listing of each model's features and specifications, but I've also made some specific observations about each machine's strong and weak points.

***AMT 4960: neither inexpensive nor easy to use***—The center of the AMT's blade is 9/16 in. above the base, meaning that a kerf registered from the base won't be centered on ¾-in.-thick stock. The small opening in the fence makes it hard to see layout lines at the front of the machine when slotting inside miters. The layout mark needs to be extended almost 3 in. to be visible along the outer edge of the fence. This requires a square to extend the mark accurately this far, slowing down the marking-out routine. The spring-loaded, fence-locking levers are more difficult to use than most, and the fence will slip unless securely tightened.

***Black & Decker 3382, DeWalt DW682 and Elu 3379 are the ones I'd buy***—These three identical machines are all made by Black & Decker, with the only difference between them being the color of the machine housing. Their fences all share the same rack-and-pinion height adjustment, which locks separately from the angle adjustment. Because of this feature, these joiners are exceptionally easy to dial just the right setting for miters or other adjustments. Accurate, legible scales, comfortable grip and trigger switch make these machines a pleasure to use. And the wide-opening dust bag is easy to empty.

***Bosch B1650's plastic components are less accurate***—I didn't care for the plastic base, face and fence on this machine, which are less accurate than those on most of the other machines. The fence is particularly bothersome to adjust, remove and replace. The switch position is somewhat awkward.

***Freud JS100A: a particularly inconvenient fence***—Although the fence isn't too difficult to adjust, it does require two hands to tighten the knobs. And changing over the fence from its 90° position to the 45° miter position requires removing the fence and all its hardware and then reassembling again—a real inconvenience. Also, there are no markings at the face for lining up miter cuts. The spring resistance on the switch is greater than the spring resistance

of the plunge mechanism, so it is easy to push the blade into the workpiece when turning on the machine. This could result in a dangerous kickback situation. Air from the blade blows dust in your face even though the dust bag works well.

***Freud Model JS102: adjustable fence improves the base model***—The JS102 offers an adjustable fence instead of the fixed fence on the JS100A, but there is no positive stop at 45°, and the cursor for the scale is not clear. The switch has the same problem as the JS100A, and the dust port tends to jam with the bag in place.

***Lamello Top 10 is the best-made machine***—The Top 10 is well-balanced and the best-made machine of the bunch. The base, face and fence are accurately machined, and the carriage movement is smooth and precise. The auxiliary fence used for registering outside miters has a small opening, though, making it hard to find layout marks. Rubber anti-kickback dots make for a rocky seating of face against miter that could cause miscut kerfs.

> The single most important feature is the fence used to reference almost all cuts.

***Lamello Standard 10 is accurately machined***—Like its big brother, the machining is excellent, the grip comfortable and the switch easy to work. But the Standard 10 also suffers from a small viewing port in the fence.

***Lamello Cobra 10: well-made but lacks power***—This little tool has the same outstanding machining as the other Lamellos. Its comfortable grip and good balance make it a pleasure to use, but it seems underpowered; the Cobra 10 takes a long time to wind up to speed and bogs down considerably when cutting maple.

***Porter-Cable models 555 and 556: fences are not worth the trouble***—The 556 is the same machine as the 555 but with an adjustable fence. Both fences are difficult to adjust, requiring an Allen wrench to tighten two separate screws while trying to hold the height setting and keep the fence parallel to the base. The plunge mechanism is not smooth, and the steel pins allow some sideways creep during the cut. The 5-amp motor is underpowered in maple and slows noticeably in pine.

***Ryobi JM100K's tall fence provides good support and grip***—The fence provides a good grip for holding the machine in position, but the two locking levers control both the angle, as well as the depth at the same time. Detents for common angles help to hold the angle setting while adjusting the height. The tall fence opens 180° to provide excellent vertical support when slotting in the face of a board. The black alignment line scribed into the black plastic is difficult to see.

***Sears Craftsman 17501: the cheapest of them all***—The plastic base, face and fence are not precise, but the fence does provide a good grip. The carriage return springs are strong, making it hard to plunge the unit. Dust collection is a small box fitted under the handle that fills quickly. This machine produces ragged kerfs, which can result in sloppy fits and weaker joints. At $99, this joiner costs far less than the others, but you get what you pay for.

***Skil HD1605: plastic components and an inconvenient fence***—Allen-wrench fence adjustment is inconvenient, and the Allen key is difficult to get out of its storage place in the base. There are no alignment marks at the face when in the miter mode, requiring extended layout lines. A strong air stream from the blade carries dust to the face while cutting kerfs.

**Plate joiners**

| Manufacturer or distributor | Street price | Comments |
|---|---|---|
| **AMT** 4960<br>(610) 948-0400 | $165 | Fence is inconvenient to adjust and use. |
| **Black & Decker** | | |
| Black & Decker 3382<br>(800) 923-8665 | $230 | Black & Decker, DeWalt and Elu nameplates are identical machines except for color. These machines have best fence system, comfortable grip and trigger. |
| DeWalt DW682<br>(800) 433-9258 | $222 | |
| Elu 3379<br>(800) 923-8665 | $229 | |
| **Freud** | | |
| Model JS100A<br>(800) 472-7307 | $134 | Switch's high-spring pressure can cause blade to engage stock when turning on machine. |
| Model JS102<br>(800) 472-7307 | $188 | This machine has same switch problem as Model JS100A; adjustable fence |
| **Lamello** | | |
| Top 10<br>(800) 252-6355 | $538 | Best-built machine; smooth performance |
| Standard 10<br>(800) 252-6355 | $399 | Excellent machining and performance; fixed fence |
| Cobra 10<br>(800) 252-6355 | $249 | Precision machine; pleasure to use but underpowered |
| **Porter-Cable** | | |
| Model 555<br>(800) 487-8665 | $159 | Fence adjustments are inconvenient. |
| Model 556<br>(800) 487-8665 | $172 | Same as 555 but with adjustable fence |
| **Ryobi** JM100K<br>(800) 525-2579 | $209 | Fence adjustments are inconvenient. |
| **S-B Power Tools** | | |
| Bosch B1650<br>(312) 286-7330 | $158 | Fence is hard to adjust and to put on and take off. |
| Skil HD1605<br>(312) 286-7330 | $123 | Allen-head screws for fence adjusting are inconvenient |
| **Sears** Craftsman 17501<br>(Contact local Sears retailer.) | $100 | Imprecise kerfs; small dust box fills quickly. |
| **Virutex** AB11C<br>(800) 847-8839 | $250 | Smooth action; exhaust port tends to jam without vacuum. |

| Fence | | | | | Biscuit sizes | Plunge pressure (pounds) | Anti-slip | Dust collection | Amp | Rpm | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Height adjustment | Angles | Locking | Scales | Miter registration | | | | | | | |
| Fair | Fixed: 90° & 45° | Fair | Poor | Inside | 0, 10, 20 | 12.5 | Steel pins | Bag\ vacuum | 6.0 | 10,000 | 6.6 |
| | | | | | | | | | | | |
| Excellent | Adjustable: 90° to 180°; stops at 90° & 180° | Excellent | Excellent | Inside & outside | 0, 10, 20, M | 10.0 | Retractable pins | Bag\ vacuum | 6.5 | 10,000 | 6.25 |
| | | | | | | | | | | | |
| Fair | Fixed: 90° & 45° | Fair | Good | Inside | 0 10, 20, A, B, M | 5.0 | Rubber dots | Bag | 5.0 | 10,000 | 7.0 |
| Good | Adjustable: 0° to 90° | Good | Good | Inside & outside | 0, 10, 20, A, B, M | 5.0 | Rubber dots | Bag | 5.0 | 10,000 | 6.875 |
| | | | | | | | | | | | |
| Good | Adjustable: 0° to 90° | Good | Good | Inside & outside | 0, 10, 20, S, D, M | 7.5 | Rubber dots | Vacuum optional | 6.4 | 10,000 | 7.25 |
| Good | Fixed: 90° & 45° | Good | Good | Outside | 0, 10, 20, S, D, M | 6.5 | Rubber dots | Vacuum optional | 5.8 | 10,000 | 7.125 |
| Good | Adjustable: 0° to 90° | Good | Good | Inside & outside | 0, 10, 20, S, D, M | 8.5 | Rubber dots | Vacuum optional | 2.1 | 18,000 | 6.625 |
| | | | | | | | | | | | |
| Poor | Fixed: 90° & 45° | Poor | Poor | Outside | 0, 10, 20 | 12.0 | Steel pins | None | 5.0 | 8,000 | 6.5 |
| Poor | Adjustable: 0° to 90° | Poor | Good | Inside & outside | 0, 10, 20 | 12.0 | Steel pins | None | 5.0 | 8,000 | 6.5 |
| Fair | Adjustable: 0° to 135° | Fair | Good | Inside & outside | 0, 10, 20 | 6.0 | Rubber pad | Bag | 5.3 | 9,000 | 7.25 |
| | | | | | | | | | | | |
| Poor | Adjustable: 45° to 90°; stops at 90° & 45° | Poor | Fair | Outside | 0, 10, 20 | 7.5 | Rubber dots | Bag\ vacuum | 5.8 | 11,000 | 6.0 |
| Poor | Fixed: 90° & 45° | Poor | Poor | Inside | 0, 10, 20 | 7.5 | Rubber dots | Bag | 6.0 | 12,000 | 6.0 |
| Poor | Adjustable: 45° to 150°; stops at 15° intervals | Fair | Fair | Inside & outside | 0, 10, 20 | 19.0 | Rubber pad | Box | 6.0 | 10,000 | 6.0 |
| Poor | Adjustable: 90° to 180° | Fair | Good | Inside | 0, 10, 20 | 10.0 | Rubber dots | Vacuum | 6.0 | 10,000 | 6.125 |

***Virutex AB11C is my third choice, but it has dust-clogging problems***—This is a well-made machine with a nice, smooth action that cuts tight plate kerfs. The fence height cannot be adjusted independently of the angles. A vacuum connector is included, but there is no bag, which is just as well because the dust port tends to clog up even without a bag. With a better fence-adjustment system and a larger chip-ejection port, the Virutex AB11C would be ranked with the other top units.

## Recommendations

Although the Lamello machines are the best-made units in my view, that quality comes at a fairly high price, ranging from about $250 for the Cobra 10 to $540 for the Top 10. The machines from Black & Decker, which includes DeWalt and Elu, however, offer high quality at a reasonable price (approximately $225). The fence is the most important feature, and Black & Decker's rack-and-pinion fence stands head and shoulders above the competition. The other features of these machines, such as an easily adjusted fence angle, comfortable grip with trigger switch, retractable, multipoint pins, clear reference markings and scales and effective dust collection, are just icing on the cake. □

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*Charley Robinson is an associate editor for* Fine Woodworking *magazine.*

# Bookcase Makes Waves

## *A fumed oak finish, routed curves and tusk-tenons make a practical project*

by C. Michael Vogt

***Serpentine-front shelves offer a graceful way to hold books.*** *The bookcase looks to be made with chisel and mallet, but much of it was done with a router and templates. Visible joinery and a fumed-oak finish give the piece a Craftsman flavor.*

***Tusk-tenons make the bookcase easy to disassemble,*** *and the wedges can be retightened anytime, so the joinery is strong.*

I finally got fed up trying to fit those big art and architecture books on shallow shelves meant to hold novels. That's why I made the shelves of my freestanding bookcase with serpentine fronts and graduated spacing (see the photo above). The design is reminiscent of the Craftsman style, especially when made in white oak and fumed with ammonia, as I did.

The case has precise-fitting joints and subtle edge treatments, and though they give the piece a hand-crafted look, the router was the chief tool used. It was indispensable for shaping the shelves, forming tenons and mortising. Templates keep the routing consistent and accurate, and they speeded the whole process.

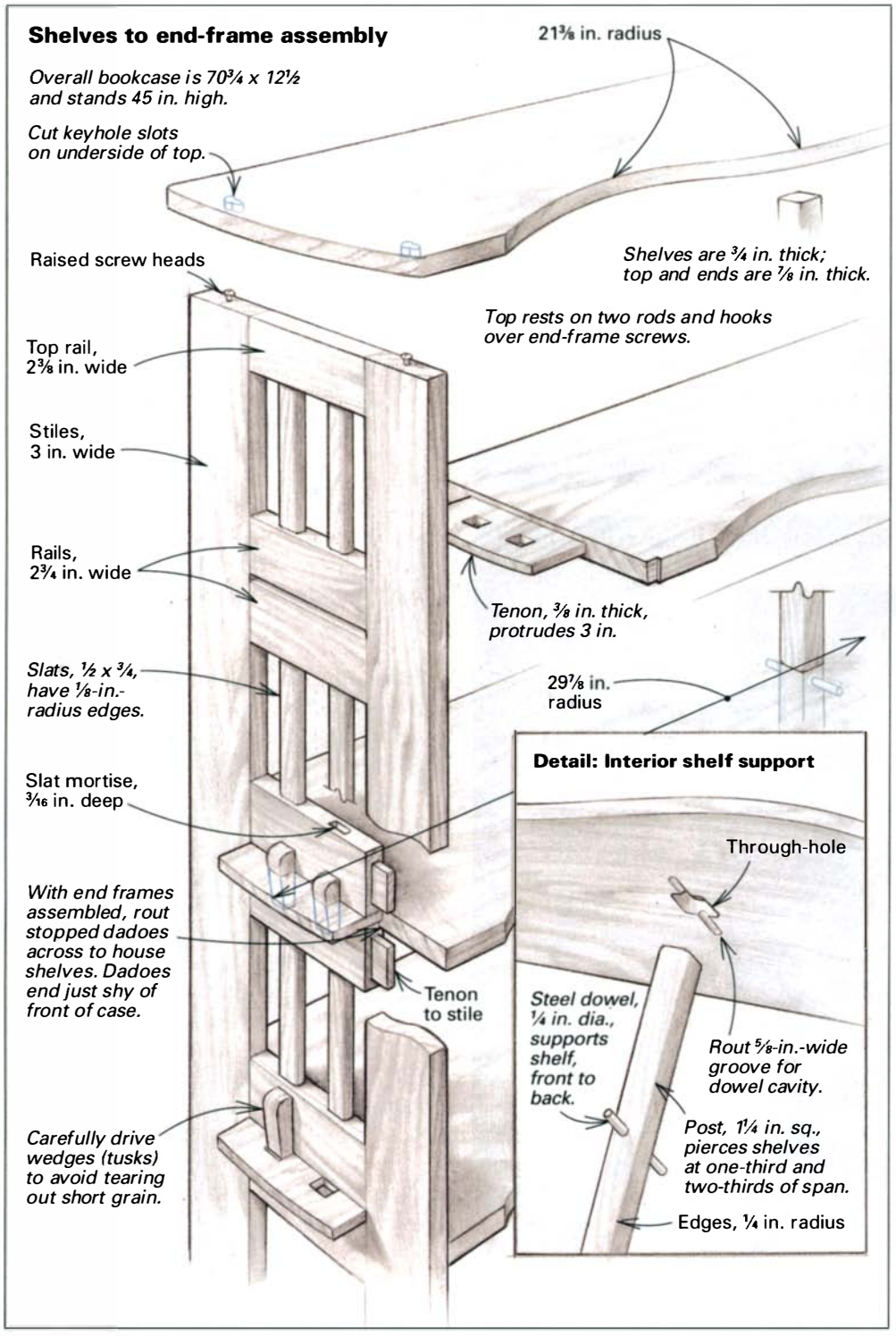
### Design and materials

To make the bookcase knock down for easy moving, I used tusk-tenon joinery (see the photo at left). These tenons connect the shelves to the ends. Two posts help hold up the shelves and serve as intermediate bookends. But because the rods enter each shelf at a single spot, I concealed steel dowels in grooves on the undersides (crossways), to prevent sagging shelves from heavy books.

Choosing stock that's flat and has straight



Photos: Alec Waters




***Templates and a router take care of shaping and mortising***—*Vogt made a plywood master template, so he could form the shelves, complete with tenons, using a straight router bit and a rub collar. The other templates are for shaping the slats, mortises and wedges.*

grain is important because cupping would make the joinery difficult to fit and knock down. The shelf stock is 13 in. wide by 72 in. long. The shelves are ¾ in. thick and the top and ends are ⅞ in. thick.

## Routing with templates

Because the router does the lion's share of work in the bookcase, make a good master template for it out of plywood (see the photo above). Use the template to rout top and shelves to final shape, position the shelves to rout tenons and align the holes and grooves for the posts and dowels. The template is also a convenient surface for drawing full-scale profiles of the case ends, which help to lay out the joinery.

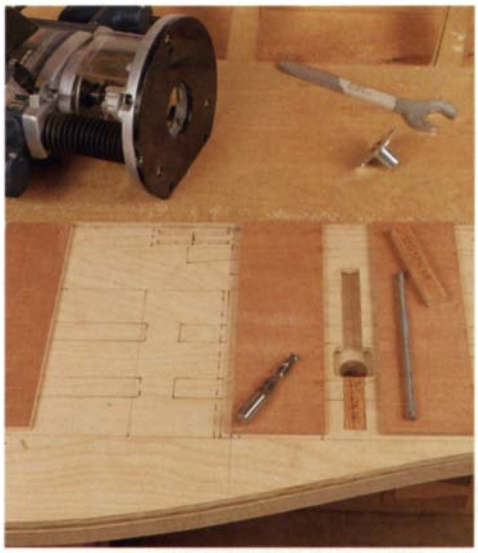
***The shelves and top***—The top is the same length as the shelves (including their tenons), but it is ½ in. wider. Bandsaw these parts just oversize, and trim them to final size with the template and a flush-trimming router bit. To keep from tearing out grain, climb cut (go with the bit rotation) when advancing the router uphill on the curved front edges. Finish the curves using a spokeshave and scrapers.

You can leave the shelf tenons full thickness, or you can cut ⅛-in.-deep shoulders (as shown in the drawing) to reduce the section as it passes through the end frames. With a straight bit and an offset auxiliary base, waste the tenon cheeks, working from the end toward the shoulder, being careful not to tilt the router. Next make the holes for the shelf supports by positioning the template on the underside of the shelf. Mark the square holes, and drill or saw them out, leaving a small amount for the router to trim with a guide bushing and a straight bit. Inserts (see the top photo on p. 60) keep the bit from following the dowel grooves during this operation. When the squares are cut out, remove the spacers, and rout the dowel grooves. Now the shelves and top can be planed, scraped and sanded, and the edges rounded over.

***The end frames and slats***—The end frames consist of stiles and rails joined by mortises and tenons. Pairs of vertical slats fill the three frame openings on each side. After you've cut all the end-frame pieces to size, clamp the frames together, and rout and chisel stopped dadoes on the inside for the shelves. The rails contact the shelves' through-tenons (top and bottom) on the outside, and the dadoes receive the shelves on the inside.

Actually, the dadoes are rabbets at the inner edges of the rails. The depth and width of the dadoes must be precise so that the shelves will fit tightly and the tusk tenons will be under tension from their

Drawing: Bob La Pointe



***Steel dowels in routed slots reinforce the shelves.*** *With the template flipped, the author will rout through-mortises for posts and rout grooves for dowels. The lauan overlay strips allow for the thickness of the guide bushing. The inserts are removable.*

***Fuming with ammonia adds dramatic color and highlights the grain*** *of oak but requires a chamber. A polyethylene-covered frame holds trays that will be partially filled with concentrated ammonia and the door will be sealed.*

wedges. To waste the rail tenons that enter the end stiles, measure back from the front stile edges to determine where the tenons pass through. Then saw away the waste. Leave enough room for the tenons to expand side to side.

Instead of cutting shouldered tenons for the slats, I housed them in mortises routed with a template. I used another template to form the slats. I rounded over the slat edges to match the radius of the mortises. After the slats have been cut to length, scraped and sanded, I clamp the frames with slats, and test-fit the shelves.

***The posts and dowels***—Make the posts slightly smaller than their holes; the posts' edges are rounded to match the radii of the corners of the holes. Hold the posts next to an end frame, and mark lines at the bottom edges of the shelves. Measure the exact depth the dowel grooves will be and drill all the holes through the posts. It's best to use a drill press and stop blocks for this.

## Tusk-tenons and wedges

While the case is clamped tightly, shelves in place, scribe from the outside where the tenons pass through the frames. Remove the shelves, and use the tenon template to mark the mortises. Drill out the bulk of the mortises, and use an angled block and chisel to pare the sloping shoulders. Undercut the innermost edges. Lightly chamfer around the edges of the mortises, so the wedges won't catch any grain going in and out (see the drawing on p. 59). Use the wedge template to mark the wedges. Saw them out, clean up the sawmarks, test for fit, and shape the edges and ends.

For the end-frame assembly, use a slow-setting glue. Then when installing the shelves, carefully drive the wedges so that you don't split out the shelf ends.

The top fits onto the end frames with a sheet-metal screw and a T-slot. I made two keyhole slots on each end to align with four screws centered in the top of the stiles (see the drawing detail). Let the top move separately from the end frames because the rails have grain running crossways.

## Fuming and finishing

This bookcase was fumed with ammonia to darken the oak, but the piece takes on an entirely different look when you use other finishes. For example, I painted one white for a light appearance, and I varnished another for a natural look.

If you fume with ammonia, it's healthier to do it outdoors. If, instead, you make a fuming chamber for the shop, as I did (see the photo at left), be sure to exhaust the fumes outside to minimize your exposure to the noxious gas. I sized my chamber to the bookcase and put trays for the ammonia in the bottom. Polyethylene wraps the framework top, back and sides. And duct tape laps all the seams. The chamber is on casters, so I can roll it out of the way. The front door is plastic-covered and screwed over the opening. For a seal, I used closed-cell weather stripping on the door back. I bought concentrated (28%) ammonia from a blueprint supply company.

During fuming, the wood closest to the ammonia darkened more than the rest, so I placed a small fan (available at heating supply stores) inside to circulate the fumes more evenly. I keep the tray bottoms barely covered with ammonia and judge the wood's color over a day or two. Ideally, all the ammonia in the trays will evaporate, but to make things safer, turn on the exhaust fan, and crack the door a bit. (For more on fuming safely, see *FWW* #101, p. 42.) After I retrieved my bookcase (without shedding a tear), I applied five coats of Waterlox oil/varnish to the piece. □

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*C. Michael (Tico) Vogt builds furniture in Saratoga Springs, N.Y.*

***Shaping refines a table's design.*** *The author first uses models, measurements and full-scale drawings to work out a dining-table design. Plywood templates (foreground) help execute that design. But even so, subtle shaping in the shop makes the table more inviting to the touch and to the eye.*

# Making Dining Tables That Work

## *Careful measuring and common sense ensure stability, comfort and good looks*

by Peter Tischler

"Make furniture that people can be comfortable living with." So said Sam Maloof, the noted chairmaker, and this same guiding principle is at the heart of the furniture I build. Optimum comfort certainly applies to chairs, and the same holds true for dining tables. When building a dining table, I start by finding out how the owner likes to dine and where the table is going. I use this information to come up with rough sketches and scale models, which convey material and proportions better than drawings. Then I measure everything—people, dining room, rugs, existing furniture and china—so I can translate dimensions to drawings and occasional mock-ups. This multi-step process almost always leads to a table that best suits the customer.

### Design is always a compromise

How a dining table relates to its users is just as important as how it relates to its surroundings. The best tables are the ones that make tiny compromises. For example, when building a table for a family with children, the durability of the finish on the tabletop outweighs the need of the finish to be authentic to the table's style period. Fortunately, there are some simple guidelines that will help with design decisions.

***Seating***—The first step is to determine the number of people to be seated, so you can figure the table size that will fit them comfortably. If the owner entertains regularly, you'll want to make a table with an expanding top that doesn't require a complicated leaf system or a forest of legs. I consult a number of references (see the further reading box on p. 63) to get ideas for seating needs. They are only a starting point, though. General rules (for example, the commonly given 24 in. of elbow room per person) may have to be increased or decreased to take into account the type of table, the space needed for the chairs or how else the table might be used. Figure 1 on p. 62 shows a typical table plan for seating six people.

***Basic dining dimensions***—I've found that the most comfortable height of a dining table is between 28 in. and 28½ in., which is a bit lower than what the textbooks say. But for a family, that height is more informal and makes the sitters feel relaxed. The height, of course, depends on the chairs and whether the table has an apron that will limit leg clearance (see figure 2 on p. 63).

The width and shape of a dining table's top also affect seating arrangement. Most chairs are 20 in. wide or so, but you will need better than 24 in. of place-setting width for most people and even more if you're dealing with squirming teenagers. For the minimum overall width of the table, I use 36 in. A table much over 40 in. wide will lose any feeling of intimacy between eaters on opposite sides. An oval top offers more side seating than a rectangular top of similar square footage. (It's easier to squeeze two more people

Photos: Alec Waters

***It takes more than a measuring tape for good table design.*** *The author uses small models, full-size chair and sideboard mock-ups, full-scale drawings and templates.*

***Quarter-scale models show table options—****From the left, the model bases are single pedestal, double pedestal, trestle and leg and rail. Models also present wood choices.*

in at the ends of an oval when company comes over). But because square and round tables take up less space, they often fit better in small dining areas.

## Measure everything before you cut anything

After you've figured out the seating and overall table size, take out a tape measure, sit at a comfortable dining table and think about the relationships of sitter to chair to table.

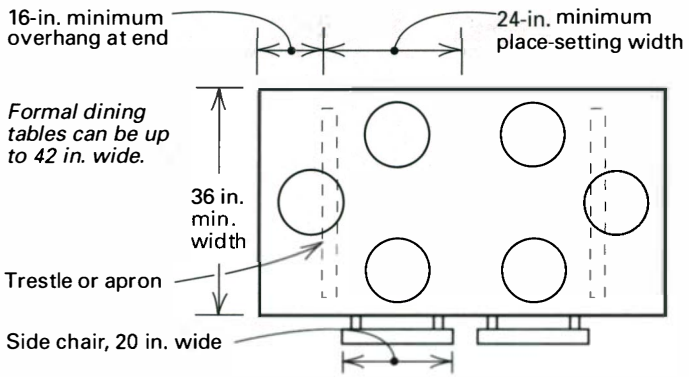
Then start taking real-life dimensions. With the biggest sitter in a relaxed, seated position, measure the distance between his or her elbows and knees. Measure knee heights, and add a little extra to establish the bottom of the apron height. Measure how far forward the person likes to put his or her feet. Measure dinner plates, serving platters and the room where the table is going. Exact dimensions aren't as important as how they all relate. Once you get to the final shop drawings (see the top photo), you'll already have a good idea of how the table will look, and consequently, how it will match the room and furnishings that surround it.

## Models show table proportions and styles

Most styles of furniture offer variations for dining tables, such as top shapes, woods to use and options for bases. It's worth looking at lots of examples of the period you're working in because you may have to do some hybrid designing to come up with a table that matches a sideboard or china hutch. Similarly, if you're making a contemporary table, it's useful to know the tastes of your client because you're likely to borrow the lines or elements of his or her favorite furniture pieces. Here's where models can help.

When I build quarter-scale table models, I make several variations to help the customer visualize differences in proportions and materials. I use various woods to show what color, figure and grain patterns will look like in the room. Alternative shapes for the top, such as free-form edges and book-matched halves, are another example of what models can depict. Models can also present a variety of base forms, which show how much room there will be under the top and how stable the footprint will be (for more on this, see *FWW* #92, p. 28). The following are the four most common base types I use.

**Fig. 1: Dining dimension guidelines**




*For single pedestals, limit circular tops to 54 in. dia., rectangular tops to 72 in.*

***Single pedestal—***In terms of stability and looks, the mahogany model (the first one in the bottom photo) shows the relative proportions a single-pedestal table should have. An oval top resting on a single-pedestal base is probably my favorite dining table, partly because it allows for extra sitters. Because this type of table has a central column, it makes sense to have an even number of people on each side (an odd number can cramp the person sitting in the middle). Single pedestals also lend themselves well to a round top, but there is a size limit that the pedestal will support. I limit round tops to 54 in. dia., unless the undercarriage is quite heavy. A rectangular top on a pedestal shouldn't be much over 72 in. long.

***Double pedestal—***A double-pedestal table (the second model in the bottom photo) will fit an odd number of sitters per side staggered around the columns. The model shows how a free-form top, here in wormy red maple, looks over a walnut base. The top's slightly asymmetrical shape, which widens in places, actually offers extra knee space where the curved vertical members are. The two pedestals spread out the center of gravity, so the table can be quite long. Double-pedestal tables are good for expansion (using draw leaves) because the place settings will be in the right spots.



Drawings: Maria Meleschnig

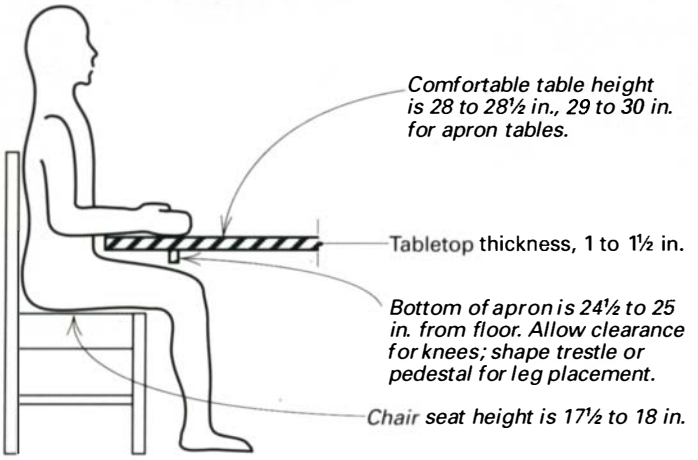
***Trestle***—Trestle tables (see the third model in the bottom photo on the facing page) are great for accommodating many people because there are lots of expandable-top options. Even without leaves, a trestle table can be long because the length mainly depends on the strength of the stretcher and how far the top boards can span. In the case of the trestle model, the book-matched cherry top has butterfly keys joining two large boards, similar to classic George Nakashima tables. The model also shows that the base uprights are shaped inward at knee level to accommodate sitters at the ends of each side.

There are two major drawbacks of a trestle table: First, it requires lots of overhang (compared to a leg-and-rail table) at each end to give enough room for end sitters. To allow for this, pull a chair up to the edge of a dining table, and measure how far in the ends are. I generally allow 16 in. as a minimum amount of overhang all around the tabletop. Second, the trestle's feet interfere with people seated at the ends of each side.

***Leg and rail***—Leg-and-rail tables, such as the fourth model in the bottom photo on the facing page, can be strong, as well as quick and economical to build. But because a table's legs can take up much of the sitter's leg room, I give each sitter at least 28 in. of width for comfort because about 3 in. is lost around each post. Or a leg-and-apron table can be fitted with a bow-sided top, like the model, and the legs spread out to the corners to provide more seating room. I build leg-and-rail tables slightly higher—about 29 in.—to allow enough leg clearance because the apron will take up some height. To do this, determine the bottom of the apron height by measuring the largest sitter in a chair. Chairs are typically 17½ to 18 in. high at the seat. Allowing 6 to 7 in. for the thighs to go under the top, the bottom of the apron should usually be 24½ to 25 in. above the floor (see figure 2).

***Designing for family needs***—*The author had the family in mind when he designed this table to seat six comfortably, with room for a high chair. He used end leaves to allow plenty of elbow and leg room without dividing or disrupting the figure in the tabletop's center.*

**Fig. 2: Seating clearances for dining**




## Further reading

*Designing Furniture* by Seth Stem, The Taunton Press, PO Box 5506, Newtown, CT 06470

*Encyclopedia of Furniture Making* by Ernest Joyce, Sterling Publishing Co. Inc., 387 Park Avenue South, New York, NY 10016

*Fine Woodworking on Tables and Desks*, The Taunton Press, PO Box 5506, Newtown, CT 06470

### The importance of scale drawings and materials

Proportions are such an important part of overall design. I've found that one-quarter scale drawings and models bring up the design issues and questions that I need to present to the customer. But to work out final construction details and to produce templates, I usually make full-scale drawings. I then use the templates to shape the parts (see the photo on p. 61).

There are benefits to using solid wood for the whole table, including the top. For me, the durability, variation in grain and smooth transition of top to edge make solid-wood tops worth the effort (see the photo). Though veneered tops may be stable and show consistent pattern and color, there are ways of achieving similar results in solid wood.

For stability, I use only well-seasoned stock. To keep the boards flat, I rough-mill in several sessions over two weeks to acclimate the wood to my shop. The best way I've found to keep consistent grain and figure patterns is by using the widest boards available. Wide boards are usually much easier to match than narrow ones.

For color continuity, I like the logs that are to be cut into tabletop stock to be sawn clear through. If this isn't practical, select boards from the same lot, and buy all your wood at the same time. Then when gluing up the top, go for the best grain match rather than trying to orient all the end grain a certain way.

Changes in top thickness as small as 1/16 in. can have a dramatic effect on how we perceive the table as a whole. My tops vary from 1 to 1½ in. thick. I allow extra thickness for planing the wood a few times before matching up the boards for glue-up. Longer boards will likely be cupped or twisted, so give yourself enough wood rather than under-sizing the top's thickness just to get it flat. When connecting the top to its base, allow for seasonal movement by using screws in slotted holes or cabinetmaker's buttons. □

*Peter Tischler is a North Bennet Street School graduate who runs a chairmaking and cabinetmaking shop in Caldwell, N.J.*

# Drawers on Wheels

*How to find beauty in ugly drawer-slide hardware*

by Jim Tolpin

***Beauty and the beast—****High-end cabinetry and steel drawer slides make an enduring marriage in kitchens, offices and even workshops. Because drawer slides can operate smoothly under very heavy loads (up to 175 lbs.) and because they keep drawers from sticking, they're perfect in heavy-use situations.*



Photo this page: Craig Wester

Let's face it. Metal drawer slides aren't pretty. You wouldn't install them on a Queen Anne dressing table or an Arts-and-Crafts style chest of drawers. But if you're making built-ins where the drawers will get lots and lots of use, whether in the kitchen, the office or even in your own woodshop, "pretty" may have to step aside for "practical."

Metal drawer slides aren't about to replace traditional wooden drawer parts in American period furniture reproductions. Some furnituremakers are never going to warm up to the idea, and some buyers of well-crafted furniture just won't accept them. But drawer hardware does have some real advantages.

Metal slides let you pull out a heavily laden drawer with a fingertip, and they let you shut the drawer with a casual push. You never have to worry about drawers sticking or binding. And you don't have to worry about the wood-to-wood wear and tear that inevitably happens over years of use.

If you're not familiar with all the different kinds of slides on the market, not to mention all the makes and models, finding your way through the array of available hardware can be tough and frustrating. Do you want the full-extension, heavy-duty, all-ball-bearing Accuride slides for $32 a pair? Or will the Blum single-extension, double-roller, epoxy-coated slides for $5.75 a pair do just fine? Do you want side-mount slides or bottom mount? And what's the difference between the self-closing feature and the stay-shut feature that many slides have?

## Drawer slides come in four basic types

From a cabinetmaker's point of view, the most logical way to categorize drawer-slide hardware is not by cost, feature or appearance but by where the hardware mounts on the drawer. That's where hardware has the most affect on design and construction of cabinetry. Certain types of hardware are suitable for particular designs and construction methods; other types are not.

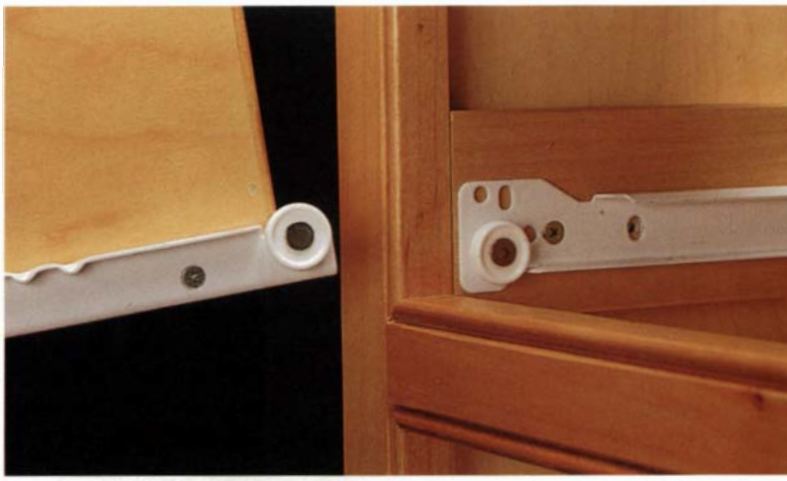
With mounting location in mind, there are four major types of drawer-slide hardware: Bottom-mount (European style) slides, which attach to the bottom edges of the drawer sides; side-mount slides, which attach directly to the sides of the drawer; undermount slides, which attach to the drawer bottom, one on each side; and center mount (the only single-slide system I'll describe here), which fastens to the center of the drawer bottom. Within each of these categories, there's a good deal of variation on the basic concept, and there are a number of different slides to choose from in each. Because the manufacturers listed in the sources of supply box on p. 69 make most types of slides, I'll mention brand names only when it seems appropriate.

In addition to the four types shown here, there are several other kinds of drawer hardware available, such as systems that use wheels without slides or slides without wheels. These designs really don't qualify as true slide systems nor do they, to my mind, perform as well and last as long as real slide systems do. So I haven't included any of them.

Please keep in mind that terminology can be a problem when studying up on drawer slides because catalogers and manufacturers sometimes call the same thing by different names, especially when referring to mounting locations. But the definitions above jibe with most of the product literature I've come across.

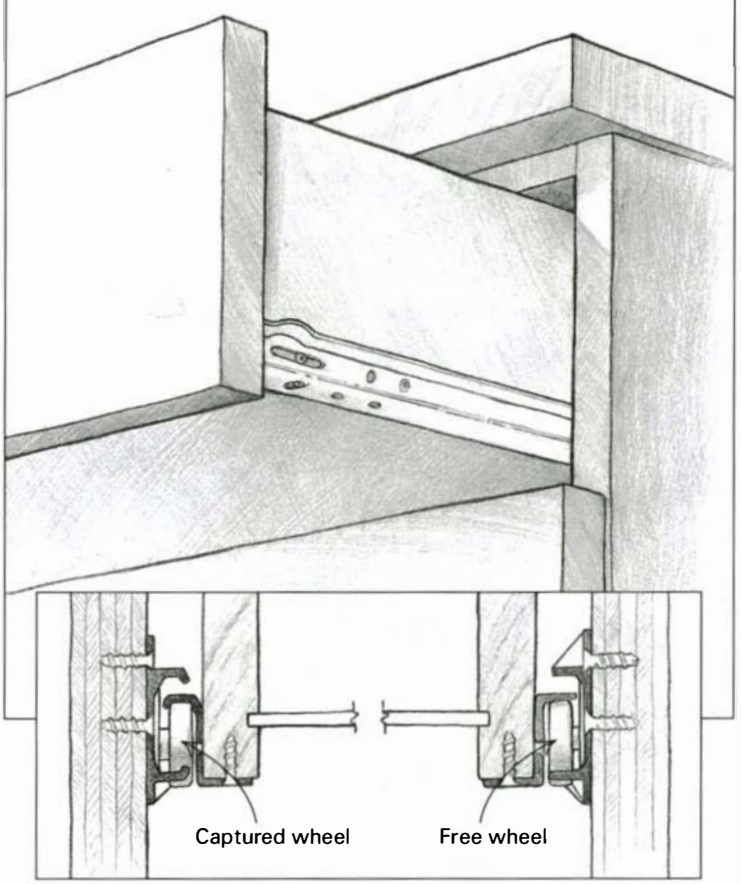
## Bottom-mount (European style) slides

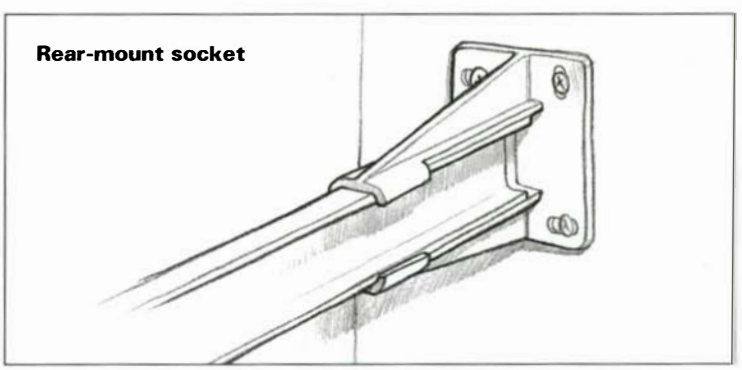
These slides mount along the bottom edges of the drawer sides and to the inside walls of the cabinet. Their steel runners are epoxy coated in white, almond or black for the sake of appearance and to prevent rust, which protects and extends the life of the nylon rollers. Most Euro slides are single-extension, and they open



***European-style slides mean smaller drawers** both in width and depth. The drawer boxes must be 1 in. narrower and almost 1 in. shallower.*

**Fig. 1: Bottom-mount (Euro style) slides**



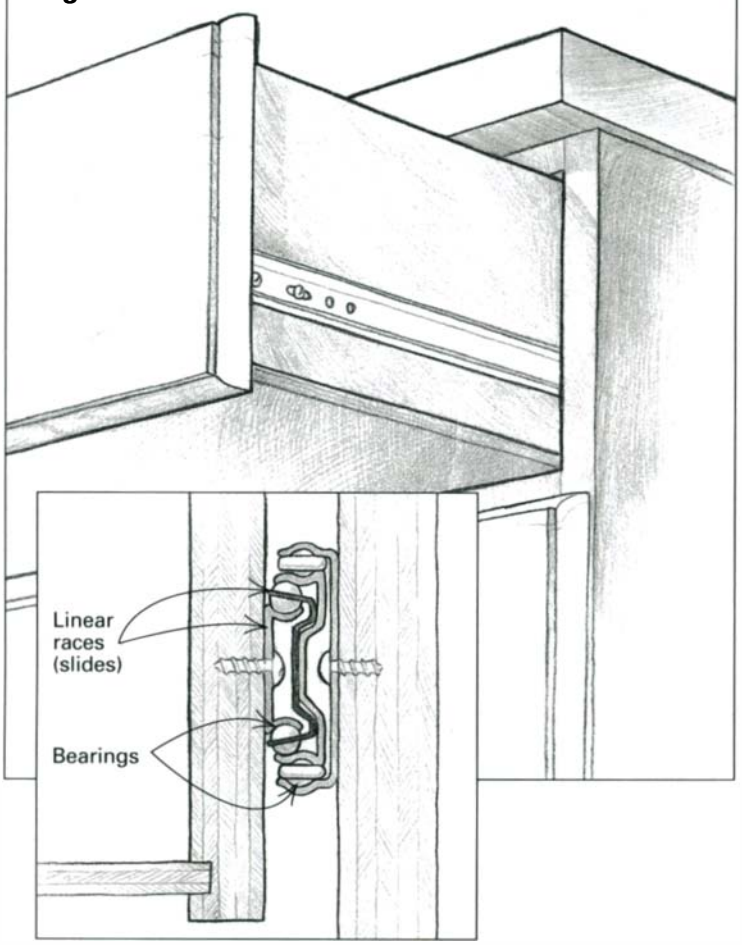

Photos except where noted: Vincent Laurence

## INSTALLATION TIPS

***Jig aids in aligning drawer slides—****Make up a simple jig with drawer-slide hardware traced on it. This will ensure the slide is properly aligned.*

***Shim slides to adjust the fit—****Use pieces of sandpaper to shim drawer slides to obtain the correct opening width. All runners and guides should be installed so that they are level with one another and square to the face of the cabinet.*

**Fig. 2: Side-mount slides**




the drawer to three-fourths its length. But some bottom mounts are dual-slide and full-extension. All bottom-mount slides are either self-closing or have a stay-shut feature. The self-closing action of some bottom mounts is a major benefit, and you may need it badly enough to use these slides in places where they're not particularly well-suited.

The primary advantage of bottom-mount slides is their good performance and low cost. Though visible at the sides of the drawers, they are not as obtrusive as side-mount hardware. (If, for example, you choose white melamine for the drawer boxes, the white coated slides will blend right in).

Another advantage is that these slides are easy to install. Especially if you are working with Euro-style frameless cabinets and using a 32mm grid system and system screws. (European cabinet construction employs a modular 32mm grid for the efficient use of sheet goods and standardized, adjustable hardware.) One more big plus: the side-to-side fit of the drawer in the opening is not critical. In fact, you have a full ⅛ in. of drawer width to play with. This is because one side uses a captive wheel-in-rail, and the other side uses an open track that gives the wheel some room to roam, as figure 1 on p. 65 shows.

Now for the disadvantages of Euro-style slides. First, you have to make the drawer box at least 1 in. narrower than the drawer opening. You also have to make the box about 1 in. shallower than the opening because when you insert the drawer into its tracks, you have to get the slide wheels up and over the wheels on the fixed runner. Second, you can't use most varieties of Euro-style bottom mounts if you intend to fully recess the drawer front inside the cabinet because the stay-shut action of the slide drops the drawer box about 3/16 in. when it's closed. The result—you get a big, sloppy-looking gap at the top of the drawer.

***Best uses—***Euro-style slides can be used successfully in face-frame cabinetry. But I recommend using them for moderate-duty, full-overlay drawers in frameless cabinets for kitchens and baths and in other cabinets where drawer fronts and doors overlay the case and don't have to fit inside frames with tight tolerances. Their low-profile appearance, ease of installation, good performance and low cost make bottom mounts well-suited to economy-minded makers of frameless, Euro-style cabinetry .

***Installation tips—***In frameless cabinets, installation is straightforward and unremarkable. But not so on face-frame cabinets. When I just have to use Euro slides in face-frame cabinets (let's say my clients demand self-closing drawers), I design the case sides to be flush to the inside edge of the face frames wherever possible. This lets me mount the hardware directly to the inside of the case (just as I would on a frameless cabinet) in predrilled system holes. If I can't make the face frame and case sides flush, I block out the case sides with scraps of plywood and mount the fixed part of the slide right on the blocking.

There's one other way around this problem, and it's not a good one. Most manufacturers of Euro slides offer what's usually called a rear-mount socket (see the drawing detail on p. 65), which lets you attach the fixed slide to the rear of the case. I use these things only as a last resort because they are difficult to install and adjust. And once properly installed and adjusted, the flimsy plastic that most of these sockets are made of sometimes cracks if the screws are over-tightened.

### Side-mount slides

These telescoping slides are made of a fixed channel and two steel runners, which all mesh with one another through races of nylon



Drawings: Bob La Pointe

or steel ball bearings (see figure 2). Mounted to the sides of the drawer boxes, these slides offer smooth, quiet, wobble-free motion. They all extend fully, and most will support a lot of weight and still operate with minimal effort. Most side mounts are made of zinc-plated steel, but some varieties now come with black or white epoxy coatings for a less in-your-face industrial look.

Reliable performance and durability are the chief advantages of side-mount slides. But on the downside, they are intrusively visible (a nice way of saying they're just plain ugly), they don't have a self-closing feature—a major drawback in high-traffic areas—and they aren't all that easy to install correctly.

***Best uses***—Superior performance makes side mounts the hardware of choice for any drawer that must carry heavy loads and needs to be extended fully. I recommend them highly for use in either Euro-style frameless cabinets or in furniture-grade, face-frame cabinetry where the drawer fronts have to be fully recessed into the case. Because there is no drop action when the drawer closes, as is the case with most Euro-style slides, you can achieve close, even margins around all four sides of the front. Ugly aside, I use these slides in really good pieces of furniture, such as desks, filing cabinets and entertainment centers, where the drawers have to be opened often and must support heavy loads.

***Installation tips***—These slides must be installed to very close tolerances, or they just won't work the way that they're supposed to. So to ensure a precise installation, I begin by laying out their positions on the case sides, marking the exact location of the drawers and their hardware. I mount the slides to the centerline of the drawer-box sides and the fixed channels to the corresponding position of these centerlines on the inside of the cabinet. I'm also careful when sizing the boxes to the openings, making them a precise 1 in. narrower.

When I mount the hardware, I get all the parts in approximate position using a pair of screws through the elongated mounting holes—the vertical holes on the drawer-box slides and the horizontal holes on the fixed channel or runner. When I've made the necessary adjustments, I lock the hardware in place with additional screws through the non-elongated holes.

### Center-mount slides

Designed to be used singly, one of these slides mounts under the drawer box at the centerline, so it is largely hidden from view. But it won't handle much weight (less than 50 lbs.). Some center-mount slides are not suitable for high-quality cabinetry or furniture work because they make for wobbly drawers and because they are noisy and rough in operation.

As far as I know, there are only two makes of center-mount slides worth putting in decent cabinetwork. They are the Accuride Series 1029 and the Knape and Vogt (KV) Series 1500. Both have smooth, wobble-free action thanks to their meshed steel runners and ball-bearing races. For drawers wider than 12 in., I would install two slides to ensure smooth, stable operation and to handle the extra weight that bigger drawers always wind up carrying.

But even the best center-mount slides have several disadvantages. They are the lightest duty of the slide hardware systems, and they are not available in either self-closing or full-extension versions. Both the KV and Accuride models are three-quarter extension, exposing 16½ in. of a 22½-in. drawer.

***Best uses***—I would use these slides primarily in face-frame cabinets (the front of the fixed channel must attach to a drawer divider) that include small, light-duty drawers in which I need to

## *Drawer-slide terminology*

**Full extension:** Multiple, telescoping slides let you pull the drawer clear of the cabinet, giving full access.

**Single extension:** A single slide lets you pull the drawer about three-quarters open. You have to reach inside the cabinet to get to things in the back of the drawer.

**Self closing:** A design that closes drawers automatically when they get within 2 to 4 in. from the face of the cabinet. This keeps you from snagging your shins or banging your hips on partially open drawers.

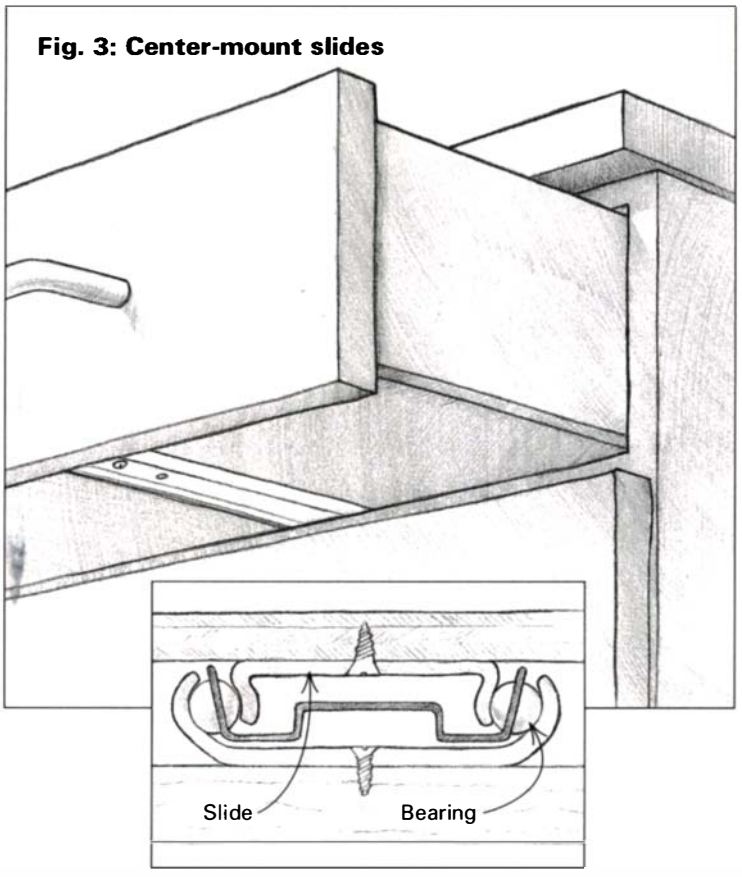
**Stay shut:** A depression, or detent, in the slide or in the fixed track holds a pair of rollers to keep the drawer from drifting open, like parking your car with its front wheels in a pair of pot holes. Some slides use friction catches to stay shut. Beware the pot-hole slides if you're installing inset drawer fronts that must fit closely all around.

**Load ratings:** Whether touted as heavy duty or not, most cabinet-drawer slides—single extension and full extension, are rated at a carrying capacity of 75 lbs. to 100 lbs., which is about right for most conventional installations. Some light-duty slides are rated at 50 lbs. to 60 lbs. Really heavy-duty slides meant for filing cabinet drawers are rated at 150 lbs. to 175 lbs.

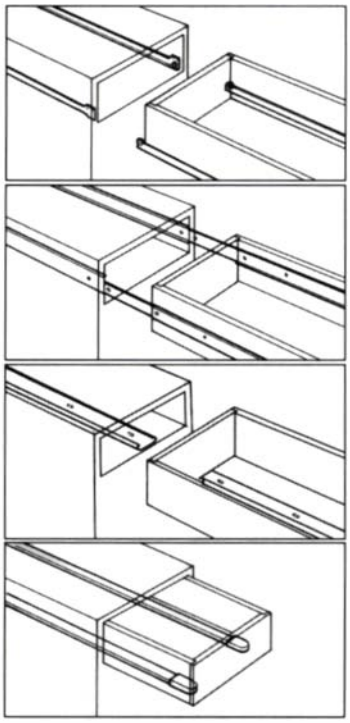
**Rollers vs. ball bearings:** As a general rule, single-extension slides use plastic or nylon wheels or rollers, and most full-extension slides use ball bearings, sometimes steel, sometimes plastic, sometimes a combination of both, in linear races between the telescoping slides.

**Epoxy finish:** Available on single-extension, European-style slides, an epoxy coating over the steel makes the hardware easy to clean as well as chip and rust resistant. Also, the slick finish makes for less wear on the rollers and smoother action.

**Fig. 3: Center-mount slides**



## Comparing drawer-slide hardware



| Type of slide | Weight capacity (static lbs.) | Extension range | Self closing available | Visibility on extension |
|---|---|---|---|---|
| Bottom mount (European style) | 50 lbs. to 100 lbs. | Three-quarter or full | Yes | Guide visible on outside lower edges |
| Side mount | 75 lbs. to 175 lbs. | Full extension and over-travel (1½ in. greater than full) | No | Guide prominently visible on side of box |
| Center mount | 35 lbs. to 50 lbs. | Three-quarter | No | Hidden |
| Under mount | 75 lbs. to 100 lbs. | Three-quarter or full | Yes | Hidden |

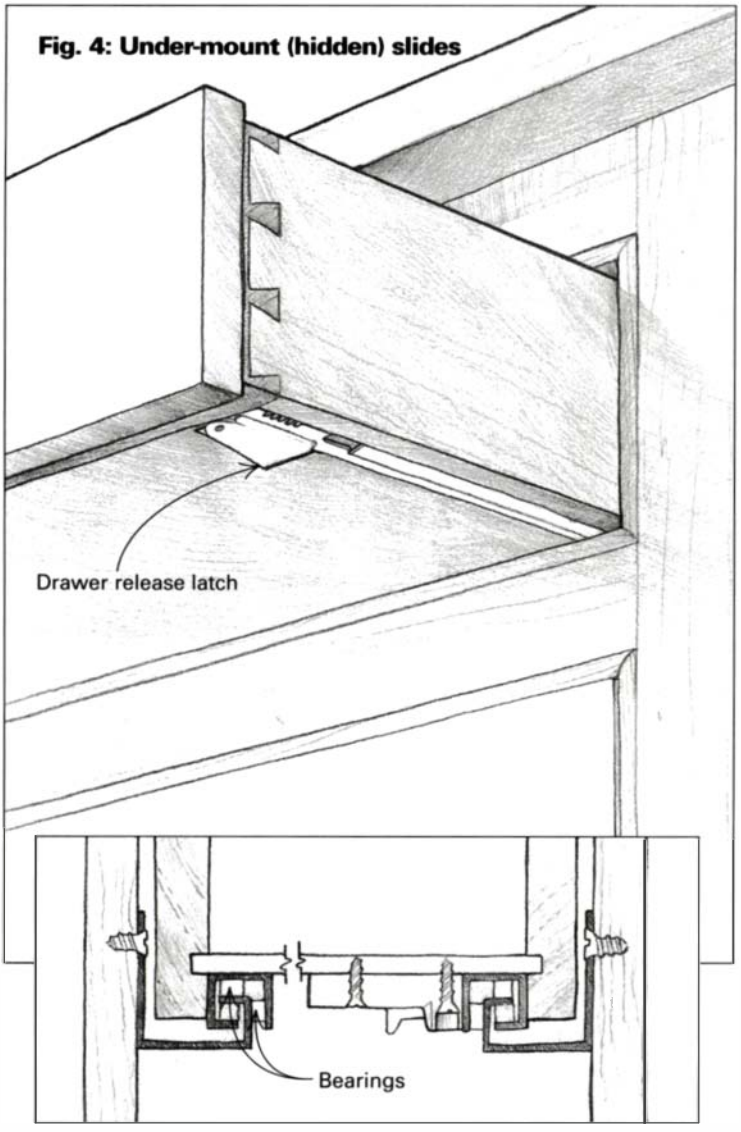



**Fig. 4: Under-mount (hidden) slides**

maximize drawer capacity. Center-mount slides are the only ones that allow you to make drawers that are fully as wide as the drawer openings. All the other hardware systems require from 3/16 in. to ½ in. of clearance on each side. Because center mounts are visible only on the underside of the box, they're good choices for people who just can't bear the sight of metal contraptions defiling their well-crafted drawers.

***Installation tips***—For center-mount slides to work properly, you must install them level and precisely square to the face of the cabinet. If you use a pair, they have to be installed parallel to prevent binding or resistance. Because the slides mount to the drawer bottom, the fixed runner can't be mounted to the case side. It's attached instead to the drawer divider in front and to the rear wall of the cabinet in back. And this means using one of those rear-mount sockets. But the center-mount sockets, because they're made of stamped steel, aren't quite as cheesy as the ones that come with some makes of Euro slides.

These rear sockets can be difficult to position correctly, though. I use a T-square rig with a torpedo level taped to it to find the mounting position at the rear of the case. I reference the square off the drawer divider and watch the bubble. I use pan-head screws for more holding power.

### Under-mount (hidden) slides

I've saved the best for last. I've just recently discovered under-mount slides, and they seem, from my brief experience with them, to have it all: The smoothest action of any slide system, positive self-closing, heavy-duty construction (rated for 75 lb. loads or greater), latch-in drawer connect and disconnect, three-quarter or full extension, and minimal clearances between drawer and case sides. But best of all, they're hidden, which is a good thing because naked to the light of day, they're the ugliest drawer slides you've ever seen.

These precision-made fittings, which mount to the bottom

| | Finish | Ease of installation and adjustment | Cost | Applications | Clearances between drawer box and opening (check manufacturer's exact specifications) |
|---|---|---|---|---|---|
| | Epoxy coating in white and almond | Easy | $7 to $15 a pair | Kitchen and other built-in cabinets | Each side: ½ in.<br>Top: ¾ in.<br>Bottom: ⅛ in. |
| | Steel, black and white coatings available | Moderate difficulty | $15 to $35 a pair | For all styles of cabinetry, but necessary in cabinets requiring high weight capacity and full extension | Each side: ½ in.<br>Top: Not critical<br>Bottom: Not critical |
| | Zinc-plated or coated brown/buff | Easy | $6 each | Light-duty utility case work | Each side: Not critical<br>Top: Not critical<br>Bottom: ½ in. for Accuride, 13⁄16 in. for Knape and Vogt (KV); others vary by manufacturer |
| | Steel | Precision in building and sizing drawer required | $20 to $25 a pair | High-end cabinet work and furniture | Each side: 13⁄16 in.<br>Top: ⅛ in.<br>Bottom: ⅜ in. |

against the sides of the drawers, feature a steel slide that moves in and out on two sets of ball or roller bearings instead of just one. One set of bearings provides vertical support, the other gives lateral support. The result is a firm, wobble-free, silky-smooth action that other slides don't have.

So surely, there must be something wrong with these things. I have tried to find it, but I can voice only three minor quibbles. Under mounts are on the expensive side. Only one brand offers a full-extension model, and these slides are the most demanding of all to install.

I've been able to locate five manufacturers of under-mount slides: Blum "Tandem," Fulterer "2130" series, the Mepla "Dynamic FFD 831," Hettich "Quadro" and Häfele "Soft Roller 40." There may be others out there, but I haven't found them.

***Best uses***—For high-end work. Especially in fine cabinetry and furniture with fully recessed drawer fronts and doors. And, yes, despite what I said at the start, I'd use these slides in that Arts-and-Crafts style chest of drawers.

***Installation tips***—When installing under-mount slides to the bottom of the drawer box, be sure to use the drilling jig supplied by the manufacturer. This will ensure that the quick-release mounting plates are properly oriented to the drawer box. Drawer-box dimensioning is critical here. And this includes the thickness of the drawer sides, as well as the width and depth of the box. So I'm especially careful to make the drawer according to the directions specified by the manufacturer. Note that the inset of the drawer-bottom panel (usually about ½ in.) is also a critical dimension for this type of slide. You can adjust the drawer box up and down by turning a fitting on the drawer-box mounting plate. □

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*Jim Tolpin is a woodworker and writer living in Port Townsend, Wash. He's the author of* Building Traditional Kitchen Cabinets *(The Taunton Press, 1994).*

***Fit for fine furniture***—*Completely concealed, undermount drawer slides combine premium quality, high performance and design freedom.*

## *Sources of supply*

The following companies manufacture drawer-slide hardware:

Accuride, 12311 Shoemaker Ave., Santa Fe Springs, CA 90670; (310) 903-0200

Julius Blum, Inc., Highway 16—Lowesville, Stanley, NC 28164; (800) 438-6788

Fulterer USA, Inc., 542 Townsend Ave., High Point, NC 27263; (800) 395-4646

Grass America, Inc., P.O. Box 1019, Kernersville, NC 27284; (800) 334-3512

Häfele, 3901 Cheyenne Drive, Archdale, NC 27263; (800) 334-1873

Hettich , 1607 Annconda Road, Harrisonville, MO 64701; (800) 777-1772

Knape and Vogt, 2700 Oak Industrial Drive N.E., Grand Rapids, MI 49505; (800) 253-1561

Mepla, Inc., 909 West Market Center Drive, High Point, NC 27260; (910) 883-7121

# Build a Shaker Round Stand

*Classic lines blend a simple turning and straightforward joinery*

by Christian H. Becksvoort

***The pinnacle of round-stand design** is reflected in this table based on a piece built by a Shaker craftsman from Hancock, Mass., circa 1830. Whether as a side table, end table, night stand or reading lamp stand, the smooth, flowing lines of this stand will brighten any room.*

Having built almost 70 round stands, I still continue to revise and refine the shape and dimensions in an effort to achieve the perfect shape. The Shakers built a variety of round stands. They were conveniently placed near reading chairs, desks, worktables, benches and beds because the Shakers did all after-dark work by candlelight. That's why round stands are often called candle stands. Although crude at first, the designs became more refined and delicate during the early 19th century.

The pinnacle of round-stand design was achieved by a Shaker craftsman from Hancock, Mass., in the first half of the 1800s. The original stand is now in New York's Metropolitan Museum of Art. The stand consists of a ½-in.-thick by 18-in.-dia. top with a rounded edge, and the stand's tabletop is attached to the post by a cross brace. The post is a 3-in.-dia. turning resembling a wine bottle, with a ⅛-in. indentation at the bottom to accept the legs. The post is topped with a tulip swelling that has a round tenon to fit into the cross brace. The legs are a smooth cyma curve flowing out of the post with an arched curve below. The shape of the post is reflected in the profile of the cyma curve, and the thickness of the leg tapers from ¾ in. at the intersection with the post, to ½ in. at the tip. Overall, it is a design so clean, so simple, it cannot be improved upon.

As far as I know, there are no measured drawings of this round stand, although pictures and overall dimensions appear in several books. The measured drawing shown on the facing page is by no means definitive, but it is as close as I have been able to come without actually measuring the original.

## Turning the post

Like the original, I made this round stand out of clear black cherry. I turned the post into a 3-in.-dia. cylinder on the lathe, and then I laid out detail lines, as shown in the drawing.

Although the turning is fairly straightforward, there are several locations where tolerances are critical. The first is the tenon diameter. I turned the tenon slightly oversized with a parting tool. Then I drilled a hole into a piece of scrap to test the diameter of the tenon. This way, I could turn the diameter for a perfect match to the drill bit I used to drill the cross brace.

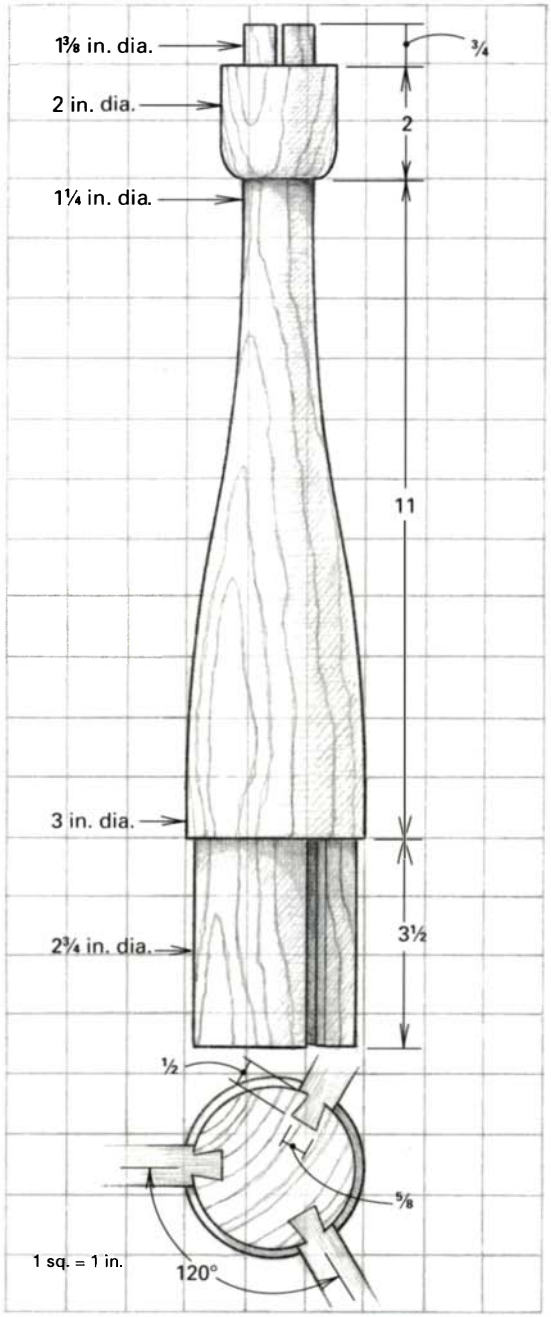
Next I sized the neck just below the tulip, using the parting tool and caliper. Then I roughed out the shaft, turned the tulip and undercut the shoulder of the tulip using the tip of a diamond-point tool. With the top of the post completed, I moved the tool rest to the other end and cut the reduced cylinder at the bottom. The actual dimension is not critical, but the cylinder must be perfectly straight to attach the legs properly. The best way to achieve that is with a straight, hardwood block

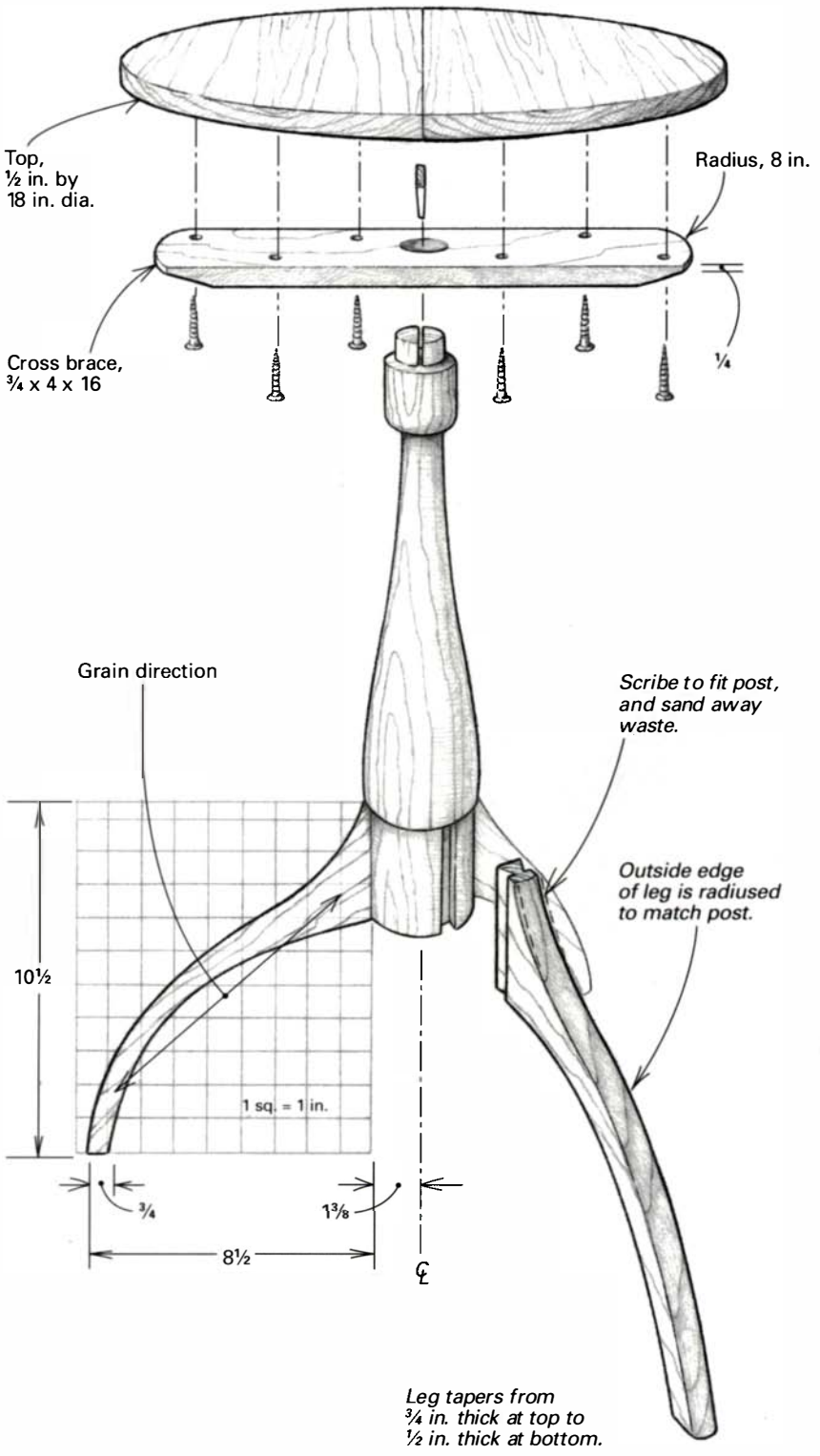


Photo this page: Robert Marsala

**Shaker round stand**

*This drawing is the author's interpretation of an original Shaker round stand built in the first half of the 1800s at Hancock, Mass. The original is now in the Metropolitan Museum of Art in New York City.*




wrapped in sandpaper and used in conjunction with a dial caliper.

Shaping the main shaft is the last step and visually the most difficult. There are only two reference points to rely on, the 1¼ in. dia. at the top and 3 in. dia. at the bottom. A series of light cuts with a sharp gouge got me to the elongated cyma curve that I was after. Then I sanded progressively from 120-grit to 600-grit. Finally, I reversed the rotation of the lathe and then polished the post with #000 steel wool.

## Dovetailing the post

Cutting the dovetail slots for the legs was the next step. Ordinarily, I make one stand at a time and find it just as fast (and a lot more fun) to cut the dovetail slots with a handsaw, chisel and mallet (see *FWW* #85, pp. 84-86). But this time, I had two orders of two stands each, plus I needed a stand for display, so I decided to make a cradle to hold the post for cutting the slots with a dovetail bit mounted in my spindle mortiser. An interesting and perhaps more approachable alternative for the home shop is the neat, on-the-lathe, router technique shown in the story on p. 72.

## Making the legs

The legs were cut using the pattern shown in the drawing. By tracing the pattern on the stock, I could be sure that the grain ran from the upper corner of the leg to the lower end for the greatest pos-

Drawing: Heather Lambert; photos except where noted: Charley Robinson

***Sanding all the legs to the same shape** is easier if the blanks are taped together before sanding to the layout lines. Bandsawing the legs close to the line reduces sanding.*

sible strength. For consistency of color, all three legs were cut from the same board. After the legs were bandsawn, I stacked and taped them together with masking tape. Then I used a disc sander and a pneumatic sanding drum mounted on my lathe to clean up the shape, as shown in the photo at left, sanding one untaped side at a time.

To cut the dovetail pins on the legs (see the top photo on the facing page), I used the same ⅝-in.-dia. dovetail bit I used to cut the slots. Only this time, the bit was in a table-mounted router. I set the depth of cut to the same depth as the dovetailed slot and slid the fence over to cut a dovetail just thicker than the ⅝-in.-dia. bit. Then, through trial-and-error cuts on a piece of scrap, I adjusted the fence until the dovetail pin slid snugly into the slot in the post.

The leg thickness was tapered on the jointer. I set the jointer to ⅛-in. depth of cut and used a wide push stick with a notch to hold the end of the leg. I slowly and carefully placed the upper section of the leg on the outfeed table, as shown in the bottom photo on the facing page. Then I pushed the leg across the blade, turned it over and repeated the process on the reverse side.

After completing the other two legs, I beltsanded them to 150-grit and dry-fit them into the post. Using a sharp, pointed knife, I scribed the top of each leg where it joins the post. At the same time, I marked the bottom of the post at the lower edge of the leg. I removed the legs and bandsawed the post to length. Then I sanded the legs to the scribed mark on the pneumatic sanding drum. The top of the legs have the same radius as the post and blended smoothly into the post when reassembled. All legs were then sanded to 600-grit and glued into place.

### Completing the top and cross brace

I glued up the top from two pieces cut from a single 10-in.-wide board to match color and grain. While the top was drying, I cut the

# *Router makes quick work of sliding-dovetails*

by Robert Treanor

As a teacher, I often suggest a round stand as a first project for beginning students. The stand's small scale and frugal use of material make it approachable, and the level of complexity in several processes, including hand-cutting the sliding dovetails, make it a nearly perfect project for the novice. Also, the students always appreciate the attractive piece of furniture they walk away with.

As one who believes teaching by example is sound, I, too, would cut the joints by hand. That is until I was faced with having to make three stands in short order. To speed up production, I developed a lathe-mounted jig (see the photo below) that let me cut accurate and repeatable dovetail sockets with a router.

***Cutting sliding dovetail sockets is a simple task with this lathe-mounted jig.** The jig must be square, accurate and parallel to the axis of the lathe for proper attachment of the legs. The stability of medium-density fiberboard makes it a good choice for jigs.*

**Constructing the jig**—I constructed the jig with medium density fiberboard (MDF) because of its stability and flatness. Other materials may be used; however, avoid solid stock because of its propensity to move. It is vital that the jig's pieces be square and accurate so that the router riding on top of the jig cuts parallel to the centerline of the lathe.

I began by cutting two pieces of MDF for the sides of the jig. The height of the jig needs to be equal to the swing of your lathe and at least one-half the diameter of the spindle you are turning. The length is limited by the length of the project mounted in the lathe. I cut a dado for the bottom of the jig about 1 in. up from the lower edge of the side.

cross brace, rounded the ends and drilled the center hole for the post tenon. Then I tapered the rounded ends back about 2 in. so that only ¼ in. of thickness was left on the ends. Finally, I sanded the brace from 120-grit to 600-grit.

I dry-fit the brace to the tenon, making sure it was perpendicular to one leg. I considered this leg the front of the table and picked the one on the quartersawn side of the post. I made a mark across the tenon, perpendicular to the grain of the brace. With a handsaw, I cut a slot in the tenon and made a wedge to fit. Then I applied glue to the hole in the brace, slid the brace into position and hammered in the wedge. The post must be hand-held, or the base of the post must be supported on the corner of the bench because the legs won't stand up to these direct hammer blows.

After the tenon was trimmed, I put the base aside to dry while I cut and sanded the top. I bandsawed the top just shy of the layout line and disc sanded to the line. I radiused the top's edge on a slightly deflated pneumatic-drum sander. This could also be done by hand. Although a router would make quick work of shaping the edge, I've never found an appropriate bit with the subtle radius I prefer. I then sanded the edge and both sides of the top to 600-grit.

Before attaching the top, I sanded the bottom of the post flush with the bottom edge of the legs. I lightly chamfered the foot at the bottom of the legs, so they don't splinter and catch on carpeting.

I screwed on the top, centered on the cross brace and oriented with the brace perpendicular to the grain of the top. The screw holes near the outside edge were elongated to allow for cross-grain movement of the top. The stand was now ready for finishing. The original has a clear varnish finish, but I've used a rubbed oil finish on mine. □

*Christian H. Becksvoort builds custom furniture in New Gloucester, Maine, and is a contributing editor to* Fine Woodworking.

***Sliding dovetail pins are cut easily with a dovetail bit** in a table-mounted router (left). The author tests the setup with scrap to be sure the pin fits snugly in the socket.*


***Tapering the leg thickness on the jointer** (below) requires carefully placing the pin end of the leg on the outfeed table and making a single ⅛-in.-deep pass on each side.*

The width of the bottom depends on the width of your lathe bed. On the underside of the bottom, I milled a shallow dado equal in width to the gap in the lathe bed. Into this dado, I fit another block of MDF that acts as a key to permit the assembled jig to slide along the bed of the lathe in line with the axis of the lathe centers.

I glued and screwed the jig together, checking carefully to be sure the sides were square to the bottom. Once positioned, I added a few braces to hold the sides square. After the glue dried, I drilled a hole through the bottom of the jig for the bolt that clamps the jig to the lathe bed.

**Using the jig**—To use the jig, I unplugged the lathe and clamped the jig to the lathe bed. My lathe has an indexing headstock, so I can lock the turning in position. If your lathe doesn't have a built-in indexing system, it's fairly easy to add a shop-built indexing wheel to the headstock. (For a suggestion on using a sawblade as an indexing head, see *FWW* #95, p. 14.)

I positioned the router so its bit would be at top dead center of the turning, and I adjusted the router's edge guide to ride along the side of the jig to control the cut. I chucked a straight bit in the router and then cut flats on the turning where the legs will butt against the post. The width of the flat needs to be just a hair wider than the thickness of the leg. After cutting the first flat, I rotated the turning 120°, repeated the process for the second flat and again for the third flat.

With the flats cut, I wasted away the bulk of the joint in two or three passes with a ½-in.-dia. straight bit, indexing the head as before. I completed the socket by switching to a dovetail bit and routing the sloping, dovetailed sides of the joint in one pass, as shown in the photo below. □

*Robert Treanor is a woodworker in San Francisco, Calif.*

***To cut the dovetail sockets,** the router rides on top of the jig, with an edge guide positioned to center the bit on the table post. The author first hogs out most of the socket waste with a straight bit and finally cuts the socket in one pass with a dovetail bit.*

# Taming Woodworking Noise

*Your machines may be even louder than you think, but protection is available*

by Jack Vernon, Ph.D.

***Proper ear protection helps prevent hearing damage—****Common woodworking machines, like this table-mounted router, can quickly damage hearing unless you protect your ears. LeRoy Schmidt, foreman of the carpenter shop at Oregon Health Sciences University, wears ear muffs during tests conducted by the Oregon Hearing Research Center.*

Those tools that we most need to use are the very ones that offer the greatest potential danger to our ears. Common woodworking machines such as routers, planers and tablesaws can cause permanent hearing damage. The good news is that there are easy ways to protect your hearing while continuing to work wood with power tools. But first it helps to understand the problem.

### Hearing-damage basics

Loud sounds damage hearing in much the same way that earthquakes damage buildings. Loud sounds simply shake apart the delicate inner-ear structures called hair cells. These hair cells are highly specialized nerve endings designed to receive sound energy and convert it into neural impulses. In turn, those neural impulses produce our ability to hear. Sound waves strike all parts of our body, but only the hair cells of the inner ear can convert that sound energy into what causes us to hear. Once destroyed, the hair cells are gone forever.

Open a pea pod, and take out one pea. That is about the size of your inner ear, and amazingly, it contains 30,000 hair cells and approximately the same number of nerve fibers leading away from the hair cells up to the brain. You can easily appreciate that the inner ear is not only a very delicate structure, but it is compacted into a very small space.

### Measuring woodworking noise

As might be imagined, damage to the ears produced by loud sounds is a combination of the intensity of the sound and the



Photos: William Sampson

***The ear is an amplifier—Using this miniature microphone inserted into the ear canal, researchers measured sound levels right at the ear drum. The findings showed the ear canal amplifies woodworking noise on average by about 7 dB over conventional readings taken at ear level.***

**How loud are woodworking machines?**

| Type of machine | Sound intensity | |
|---|---|---|
| | At ear level | At ear drum |
| **Nail gun** (6d 2-in. finish nail) | 104 dB | 110 dB |
| **Chop saw** | 102 dB | 108 dB |
| **Router** | 104 dB | 107 dB |
| **15-in. planer** | 96 dB | 105 dB |
| **10-in. tablesaw** | 95 dB | 103 dB |
| **Palm sander** (quarter sheet) | 96 dB | 103 dB |
| **Panel cutter** | 95 dB | 102 dB |
| **Dust collector** | 93 dB | 99 dB |
| **Bandsaw** | 92 dB | 98 dB |
| **Shop vacuum** | 90 dB | 97 dB |
| **10-in.tablesaw** (with Silencer blade) | 86 dB | 93 dB |
| **6-in. jointer** | 80 dB | 90 dB |

length of time to which one is exposed to that sound. Sound measurements of what we commonly call loudness, which actually measure the sound pressure level (SPL), are expressed in decibels (dB). Decibel units represent a logarithmic scale because the human ear can perceive such a large range of different intensities. Logarithmic notations are expressions of ratios; for example, if one sound is twice as intense as another sound, it is 6 dB more intense. If one sound is 10 times more intense than a second sound, the first sound is 20 dB more intense.

The federal Occupational Safety and Health Administration (OSHA) standards limit industrial workers to 90 dB SPL for an eight-hour day. For sound levels of 95 dB, only a four-hour work day is allowable. At a sound level of 100 dB, the allowable work day is two hours, for 105 dB one hour, 110 dB 30 minutes, 115 dB 15 minutes and so on.

To study how woodworking machines affect hearing, members of the Oregon Hearing Research Center staff measured the intensity (loudness) of the sound in the conventional manner, at the ear level. But we also used special equipment—a miniature microphone—to measure sound intensity inside the ear canal at the ear drum itself (see the photo). The chart lists our measurements of typical woodworking machines under appropriate and normal operating conditions. Keep in mind, however, that tools vary from maker to maker with some being louder than others.

The sound measured at the ear drum is significantly louder than that same sound measured at ear level. In practical terms, that means that the ear canal leading to the ear drum produces some amplification of the sound intensity. For example, the noise generated by the 15-in. planer was 9 dB more intense at the ear drum than when measured at the ear level. On average, the sound produced by the machines we measured was increased by the ear canal about 7 dB (and remember an increase of 6 dB is a doubling of the sound intensity). In other words, sounds are more than twice as loud at the ear drum.

Another problem with woodworking power tools is that when we hold them, we stimulate our ears by bone conduction (sound traveling through the body), as well as by airborne sounds. Ear muffs and ear plugs block out sound coming to the ear through the air. When bone conduction of sound is involved, it would be desirable to use the power tool in short bursts to minimize any accumulation effect (see the top photo on p. 76). Anti-vibration gloves may also help, but we have not tested them.

## Warning signs of hearing damage

When other parts of our bodies are damaged, the warning signal is pain. But for the ear, the warning signal is tinnitus (ringing in the ears). Ringing in the ears after exposure to a woodworking tool means that tool was too loud for your ears and that you should always wear ear protection in the future when using that tool. Don't be guided by the actions of others. Some people have tough ears, and some people have tender ears, with all grades in between. You may have noted that Norm Abram of *The New Yankee Workshop* seldom wears ear protection. I would assume that Mr. Abram has tough ears.

The way in which hearing impairment starts can be deceptive, so deceptive as to go unnoticed initially. Imagine the inner ear laid out like a piano keyboard, the low frequencies to the left and the high frequencies to the right, with each frequency systematically

***Harmful sound also can be transmitted through your hands**—Proper ear protection may not be enough when using hand-held power tools like this router. Bone conduction can transmit harmful noise through your body to your ears. Limiting the duration of use of such tools may help.*

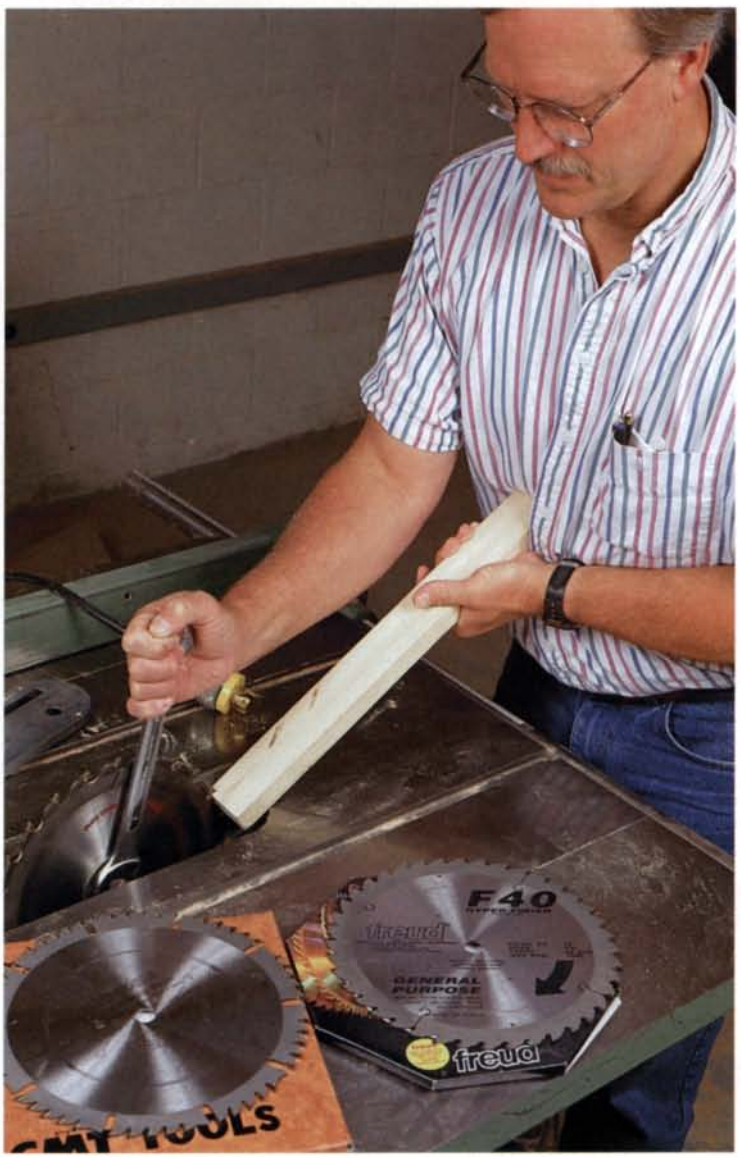
spaced in between. It is the high frequencies that are damaged initially by loud sounds, so one can sustain a considerable amount of damage before the ability to hear the lower pitches becomes impaired. The sounds to which we pay attention and which we commonly use are restricted to the low-frequency portion of the ear, starting with about 4,000 Hz (cycles per second) and moving to lower pitches.

The typical course of hearing loss is something like this: With the initial hearing loss, the person has no difficulty hearing and understanding speech as long as the person is in a relatively quiet place. But when there is background noise present (in a restaurant or at a cocktail party, for example), the person will hear speech, but he or she will not be able to understand it. This condition is an early warning of hearing loss. Moreover, that kind of hearing loss often can be compensated by a pair of properly fitted hearing aids.

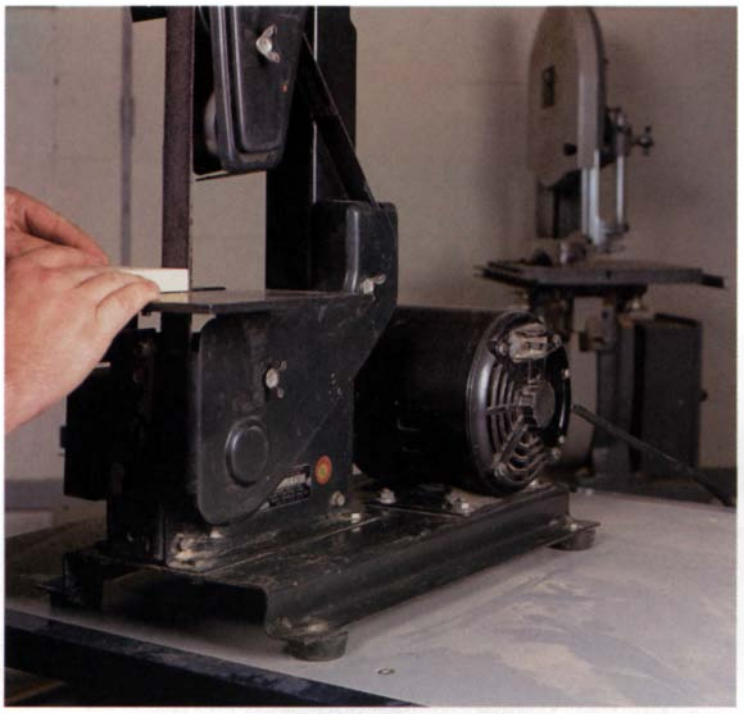
## Ear protection

There are two common forms of ear protection: ear muffs and ear plugs. In extreme cases, it is advisable to use both types at the same time. Much has been made of ear plugs as a protective device, and it is true that ear plugs work about as well as ear muffs. Ear plugs such as the foam EAR brand plugs available in most drug stores, are good protective devices, and they are inexpensive. A disadvantage of ear plugs is that they can be difficult to insert correctly. And it takes time to get them inserted. In addition, the ear plug is vulnerable to jaw movements, which can break the sound seal. Place your finger in your ear and move the jaw, as in chewing or talking, and note the amount of ear canal movement. It is this movement that can make ear plugs less effective.

Properly selected ear muffs offer as much sound protection as do custom-fitted ear plugs. More importantly, ear muffs are easier to put on and take off, provided they are available at each noisy machine. If the muffs are on the other side of the shop from the tool being used, there's an inclination to say, "This is a very brief task; I don't really need ear protection." We recommend that a pair of ear muffs be placed on each machine capable of producing ear-damaging loud sounds. The ear bows of safety glasses can break the sound seal for some ear muffs, but our research showed the cuffs on the Thunder 29 ear muffs (available from Safety and Sup-



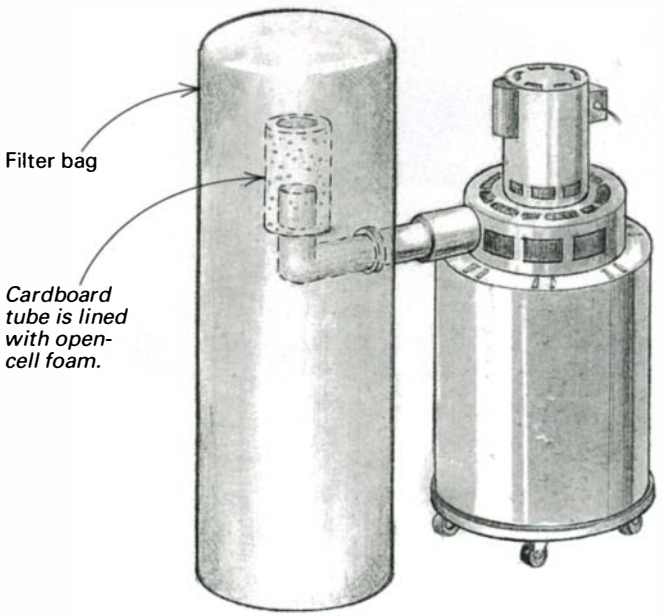

***Take off those noisy sawblades** and replace them. Several manufacturers, including Freud, CMT and Everlast (not shown) now offer special sawblades designed to cut down on noise. Changing to one of these blades may reduce saw noise by up to 7 dB. The blades have laser cuts that dampen noise and vibration.*



***Rubber mounting pads can cut machine noise**—Mounting machines on anti-vibration mats or on rubber foot pads, such as those on this 1-in. belt sander, can cut down on woodworking noise by isolating or dissipating the vibration that causes noise.*

**Muffling a dust collector**

*Simple device added to exhaust port cuts noise level.*




ply, 595 N. Columbia Blvd., Portland, Ore. 97217; 503-283-9500) are sufficiently pliable that they can be worn over glasses without any loss of sound protection.

## Quieting woodworking machines

In addition to ear protection, it is possible to reduce the amount of sound generated by certain machines. Several manufacturers are marketing so-called quiet sawblades (see the photo at left). We tried the Silencer 10-in., sawblade (available from Everlast Saw and Carbide Tools, Inc., 9 Otis St., West Babylon, N.Y. 11704; 516-491-1900), and we found it reduced tablesaw noise level by 9 dB when compared to a regular carbide blade. Remember that reducing sound intensity by 6 dB means cutting the intensity in half; a reduction of 10 dB means a reduction of three times. Thus the 9-dB sound reduction provided by the Silencer blade is significant.

Many machines, such as the bandsaw, produce some of their noise by the resonance of their metal panels. Attaching pieces of plywood to these panels helps reduce the sound generated by the saw. For example, the noise produced by a 16-in. Grizzly bandsaw was reduced from 92 dB to 89 dB by loading its panels with plywood. Mounting tools on rubber isolation blocks or wood mounts can reduce sound levels (see the photo).

Keep tools in good working order. Dull tools tend to make more noise than do sharp ones. Misaligned belts and pulleys can generate excess drive-train noise. Worn or poorly lubricated bearings will add to noise.

Think about your hearing when you purchase woodworking equipment. Some designs and individual tools are louder than others. Machines with universal motors tend to be louder than those with induction motors. Gear-driven tools are usually louder than belt-driven or direct-drive tools.

In general, shielding, insulating and muffling can reduce machine noise. The degree to which these procedures are effective depends in part upon the conditions of the individual shop, such as size, shape, surface of the walls, ceiling construction and ceiling height. Each situation requires individual attention. But the point is to look for ways to reduce sound levels, and you will find them. John Culp of Peachtree City, Ga., created a muffler for his two-stage dust collector using open-cell foam (see the drawing). He said the effect on the machine's performance was "negligible, but the high pitch whine is greatly reduced, making it much more comfortable for unprotected ears."

It's important to prevent permanent damage by protecting your ears from harmful noise any way you can. Remember: If after exposure to a noise your ears ring, even briefly, then the sound was too intense for your ears, and in the future, use ear protection. □

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*Jack Vernon is director of the Oregon Hearing Research Center at Oregon Health Sciences University in Portland, Ore. Jim Nunley and Jonathan Lay, also members of the research center, contributed to this article. All three men are active amateur woodworkers. Those who already may be suffering from tinnitus can contact the Oregon Hearing Research Center (3515 S.W. Veterans Hospital Road, Portland, Ore. 97201-2997; 503-494-8032) to learn about relief procedures for tinnitus.*

Drawing: Kathy Rushton

***Good breadboard ends allow seasonal wood movement while keeping a tabletop flat.*** *The battens on the top of the author's cherry dining-room table are mortised to receive four separate tenons at each end of the table. Rosewood pins add strength and visual interest.*

# Breadboard Ends Hold Panels Flat

## *Four ways to make this fundamental joint*

by Garrett Hack

Sooner or later every woodworker has to come to terms with breadboard ends. You can reject them as nonessential elements, or you can reject them just because they take time and effort to make and attach. But if you want an elegantly practical way to keep desktops, tabletops, chest lids and other panels flat, adding breadboard ends is the way to go.

But what are breadboard ends (sometimes, they are called just breadboards) anyway? Basically, a breadboard is just a narrow board (or batten) at the end of and running cross-grain to a panel, preventing the panel from cupping. To attach the breadboard to the panel, you need a joint that keeps the end snug to the end grain of the top. The joint must be strong enough not to break off (even if the panel is picked up by the breadboard end itself), yet it still must allow the top to expand and contract with seasonal changes in humidity.

Fortunately, there are a number of useful joints for attaching breadboard ends, ranging from crude but functional to fine and elegant, though more time-consuming, solutions. All share a tongue and groove or sliding dovetail, either of which will keep the batten and panel engaged over the whole length of the batten.

In deciding which technique to use for a particular application, I consider the end use of the item, the type(s) of wood in which



Photos: Vincent Laurence

I'm cutting the joint, the width of the panel being breadboarded, how wide the batten should be (both structurally and aesthetically) and how the breadboards relate to the overall design. For example, the breadboards for a cutting board don't need to be as fancy as those for a drop-front on a traditional desk. Similarly, the lid to a small writing box won't be subject to the rigors a dining-room table will be, so the simplest solution that's in keeping with the design of such a piece is probably best. Also, the wider the batten, the more stiffness it can impart, but the trade-off is that it's also more vulnerable to being broken off.

There's one final aesthetic consideration: Because the panel will be moving across its width with fluctuations in humidity, the outside edges of the table and the breadboard will rarely line up flush. Part of the year, the breadboard will project past the table edges slightly; at other times, the table edge will be proud. Some people find this objectionable and probably avoid breadboards because of it, but sitting at my favorite table, I often find my fingers seeking out this difference, as if to affirm the living nature of wood. I do take care, however, to keep the difference as consistent as possible from side to side, and I slightly ease any sharp edges at the batten ends.

## Quick, simple breadboarding

For utilitarian purposes, and even for smaller items you want to make look nice, there are some quick and simple methods of attaching breadboard ends. These basic methods include splining batten and panel together; tongue and grooving the panel end and one edge of the batten; and dovetailing batten and end together (see figure 1 at right).

If I'm using well-seasoned, dry stock, I generally feel pretty comfortable gluing the center third of the batten to the top, as long as the panel is less than, say, 30 in. For splined or tongue-and-grooved breadboard ends, I like to use at least two screws on either side of the glued center, one of them a few inches from each edge and one more centered on each side between the outboard screws and the inner pair (see figure 1). The outer screws should have elongated holes to allow for at least ⅛ in. of movement. For the screws closer to the center, I usually just drill slightly oversized holes.

You could also simply nail the batten on. The lids of many old blanket chests feature this construction using cut nails, which hold well in end grain and are less prone to splitting the panel than contemporary wire nails. And cut nails just look nice on more utilitarian, traditional pieces. Cut nails are still available from Tremont Nail Co., which has been making cut nails since 1819 (P.O. Box 111, Wareham, Mass. 02571; 508-295-0038). You wouldn't use this technique for fine work, but it works well for tops that are less than 20 in. or so and for softer woods. It is perfectly satisfactory where function is the sole criterion.

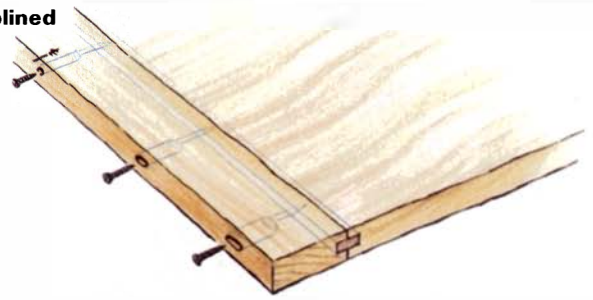
A sliding dovetail between batten and top is a good method for breadboarding smaller surfaces such as cutting boards and, if done well, can be strong and attractive. To work effectively, though, the joint must be tight over its whole length, and this is difficult to do over wide expanses. That's because wide panels tend to cup or warp, causing slight variations in thickness of the dovetail when you rout it, which causes the joint to be either sloppy or too tight in places.

Another drawback is the batten is potentially weakened by the dovetail: The dovetail flares in thickness, requiring that the walls of the batten around the dovetail slot be thinner than they would be for a tongue-and-grooved batten. This situation worsens with thinner stock. For these reasons, when using a sliding-dovetail batten, I keep the batten narrow, making it less liable to be broken off. I also drill and drive a wooden pin or two through the joint at the center of a dovetail batten to keep the movement even on both sides.

**Fig. 1: Simple breadboarding techniques**

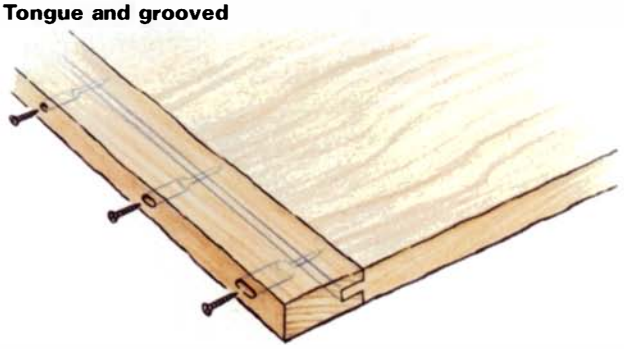
*Grooves are cut with the grain in the batten to take advantage of the long-grained strength of the tongue or dovetail in the panel. Spline should have long grain running with the panel.*

**Splined**



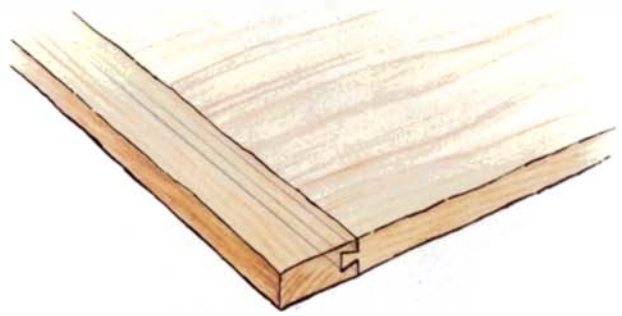
*Grooving the panel and the batten and inserting a spline is the simplest way to breadboard an end. Elongated screw holes allow the panel to move.*

**Tongue and grooved**



*Grooving the batten and rabbeting the panel on both sides to create a tongue take a little more effort, but the joint is stronger and looks nicer.*

**Dovetailed**



*Dovetailing the panel and routing a dovetailed groove in the batten provide mechanical strength to the construction. This joint looks nicer still, but the process requires greater precision.*

## The best breadboard: separate tenons, stub tongue

The breadboarding technique I turn to most often is a series of mortise and tenons and a stub tongue and matching groove (see figure 2 on p. 80). It's not overly complicated, but it's certainly more time-consuming than the other methods that I have described. It more than makes up for that, though, with its strength, durability and clean appearance. Large separate tenons lend strength and rigidity to the batten ends, helping them withstand

Drawings: Dan Thornton

## MORTISING AND GROOVING THE BATTEN ENDS

***A horizontal slot mortiser does a quick, accurate job*** *of mortising the battens. A router and mortising jig or drill press used with a fence would give you similar results.*

***Cutting a groove in a batten is best done on the tablesaw.*** *You can take multiple cuts with a standard blade, or you can shim a dado to get the proper-thicknessed groove.*

***Squaring to the mortise layout lines takes just a couple of minutes*** *with a sharp chisel and a mallet.*

being leaned on, lifted (so that they're supporting the entire weight of the table) and all the rest that a kitchen or dining table must endure. The stub tongue keeps top and batten aligned. Pinned, slotted holes in the outer tenons let the panel move while keeping batten ends tight against the panel.

After gluing up the top slightly wide and a couple of inches long, I handplane top and bottom flat, paying particular attention to the two ends where the battens will be attached. Then I square up the top on my bandsaw and jointer, or when working a very large panel, I'll use a handsaw and plane. I mill the battens at the same time, a couple of inches longer than needed and about 1/16 in. thicker than the table. After the joint has been assembled, I'll plane the whole assembly flat. Other woodworkers may choose to sand the top flat instead.

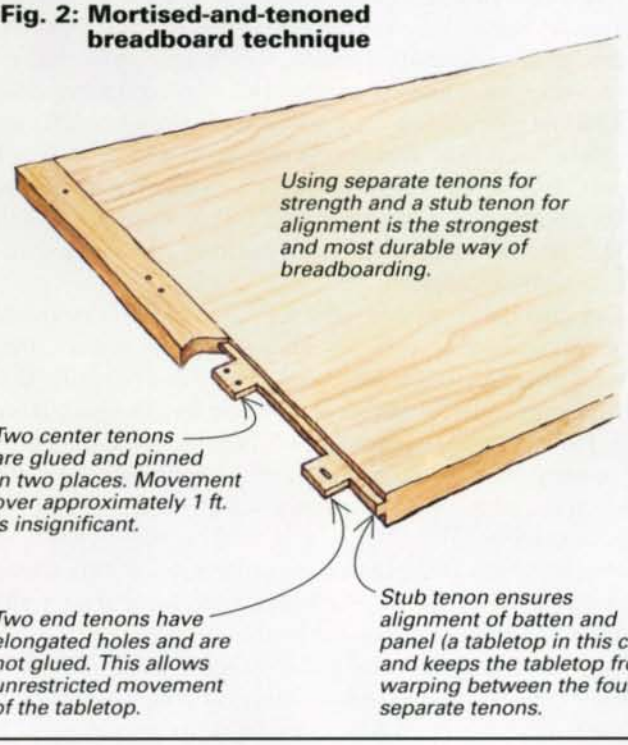
I mark out the tenons and the shoulder line for the batten on the top, using four tenons evenly spaced, with the outer two starting about 2 in. from the outer edge (2½-in.-wide tenons seem to work well). I make them as deep as possible to resist the bending stresses on the batten ends, usually stopping them just about ¼ in. from the outside edge of the battens. If the battens will be shaped later, though, I reduce the length of the tenons and the depth of the mortise, so I don't expose the tenons when shaping the batten.

I transfer the layout marks from table to batten, and I mark the tabletop's outer edges on the batten. In my experience, a cherry top of this size, made from straight-grained, not quartersawn, air-dried boards, will move seasonally about ¼ in. To compensate for this in the joinery, I mark out mortises about ⅛ in. wider than the outside tenons and about 1/16 in. wider than the pair of center tenons.

I always allow for both expansion and contraction, even if it's the end of the dry season and the wood is dry. At the opposite end of the moisture extreme, in more humid months, I'll allow for a bit of expansion, but mostly I plan for the inevitable shrinkage.

***Mortising and grooving the batten ends—***I cut the batten mortises on a horizontal slot mortiser, and then I square them to my layout lines with a paring chisel (see the top and bottom photos on this page). You could also do the mortises with a plunge

**Fig. 2: Mortised-and-tenoned breadboard technique**



router, on the drill press or even chop them entirely by hand.

Next I rip the groove that mates with the stub tongue on the tablesaw (see the center photo on the facing page). It's the same width as the mortises. There are times when, for aesthetic reasons, I prefer to have this tongue and groove blind at the outside edges of the table. In those instances, I stop the groove just short of each end by at least ¼ in. and mate it to a small haunch cut on the ends of the tongue.

***Cutting the tenons and stub tongue***—For the tenons, the first thing I do is rout the tenon and tongue areas down to thickness while leaving the stock between the tenons to support the base of the router (see the top photo). For the final router pass, I move the fence back ever so slightly to rout a crisp shoulder for the batten to snug up to. Then I do the same on the other side. I take care not to flip the board I'm using for a fence so that any slight deviation in the fence is *exactly* the same on both sides of the table. Also, it's critical to have both shoulders at exactly the same distance from the tenon ends. I ensure this by making a mark with my knife on either side of the table where the fence meets it and then squaring down from there to the underside of the table.

I square across the tenon stock from the layout lines on both the top and bottom of the table, and then I cut the cheeks with a backsaw and remove the waste with a coping saw (see the center photo). I find or plane a small block of scrap to the same thickness as the tongue height and scribe all along the tongue to give me a line to which I can pare and plane. Starting on the back, I use a large paring chisel and then a sharp rabbet plane to true up the tenon cheeks and tongue and just ease the arris (see the bottom photo). I fit the tenons and tongue in the top to the mortises, and I groove in the batten with careful passes with rabbet and block planes until the batten fits snugly over its whole length. A scrap with the batten groove ripped in it is useful to size the tenons and tongue. The extra inch or so of waste at either end of the batten is also helpful for tapping on to remove the batten as you're test-fitting.

***Attaching the battens***—The pair of center tenons will be glued and pegged into their mortises, but the only thing holding the batten to the table at the outside tenons are small pins, which I drawbore slightly and drive through elongated holes in the tenons to allow for wood movement. *Drawboring* simply means that I drill the hole in the tenon just a hair closer to the shoulder than the hole I drill in the batten. This causes the joint to "draw" up tightly when the pins are driven home.

I first drill all of the pin holes through the batten, separate from the table. I use a scrap the same thickness as the tenons inserted in each mortise to prevent tearout. I reassemble the joint, mark pin locations and remove the batten one last time. The holes in the outside tenons need to be slightly closer to the shoulder than the layout marks I transferred from the batten. They need to be elongated, so I use a scrap block of the appropriate thickness as a spacer to mark them. Then I drill all the pin holes and elongate the holes in the outer tenons with a small chisel or gouge.

Next I put a thin layer of glue on the inner tenons, clamp the whole assembly together and then drive the pins home. I like to use a hardwood, such as rosewood, for the pins so that they can be kept small and still work well. After the glue has cured, I'll cut the extra stock off the ends of the battens, trim the pegs nearly flush with the batten and then finish-plane the whole tabletop flat and smooth. □

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*Garrett Hack is a furniture designer, maker and one-horse farmer in Thetford Center, Vt.*

## CUTTING THE TENONS AND STUB TONGUE

***Waste stock between tenons supports the router base.*** *A series of passes with the router takes tenons to thickness.*

***Horizontal coping-saw cuts remove waste between tenons*** *after vertical backsaw cuts define tenon edges.*

***Pare the tongue to the line.*** *Use a sharp chisel between the tenons to clean up where the waste was sawed away.*

# Curved Panels from a Vacuum Veneer Press

## *Forms and thin plies make curves a cinch*

by Mason Rapaport

***Veneered curves are easier with a vacuum press.*** *One form and a simple caul are all that are necessary to press a curved, veneered component in a vacuum press. This table, veneered in cherry and walnut, consists of two simple laminations splined-tenoned together.*

One of the most used tools in my shop is my vacuum veneer press. In fact, its use in creating veneered curved panels, which are the major components in all of my furniture, is absolutely fundamental. My first encounter with a vacuum press was as an apprentice to woodworker Roger Heitzman in Scotts Valley, Calif., in 1990. At the time, I had no idea how essential to my woodworking that tool would become.

Before the advent of vacuum presses, it was necessary, if you were laminating curved shapes, to build separate male and female forms that both mated very precisely with the layers to be laminated. The whole assembly had to come together as a perfect sandwich, with the forms as bread and the veneers and substrate layers making up the fixings.

But with the vacuum press, I need to build only one form. The vacuum bag and cauls (layers of flexible material that distribute clamping pressure) made from whatever material I'm using as the substrate, take care of the rest. The process can be divided into four main steps: making the form, preparing the substrate and veneer, gluing up and using the vacuum bag to clamp everything together.

### Making the form

My bending forms are pretty simple. They consist of sections of particleboard or medium-density fiberboard (MDF) that are bandsawn and routed to the exact profile of the finished curve. These sections, or ribs, are then attached to one another with spacer blocks. The result, as shown in the



Photo this page: Robert Marsala

photo at right, looks sort of like an upside down boat without its hull.

The form needs to be 2 in. or so longer than the final length of the finished lamination. This excess allows you to glue up an oversized piece that is trimmed to fit later. Don't forget to add the excess, or you'll be sorry.

Because all the ribs have to be uniform, the first step is making a master template to cut all the ribs. I start with a scale drawing of the curve I want, and then I enlarge it to full size on a sheet of ¼-in. plywood to make the template. It's important that the template be cut and sanded to a fair curve. Any dips, chips or kinks in the edge of the template will show through on your finished piece.

Trace around your template onto the particleboard or the MDF, and then cut just shy of the line on a bandsaw. Next use a router with a flush-trimming bit, following your template, to get a clean, fair curve. This process ensures that each rib will be identical.

Once the ribs are all cut, take the waste MDF and cut small pieces to use as spacers. Spacing keeps the weight of the form down but maintains sufficient rigidity so that the form will not deflect under pressure. To assemble the form, I use yellow glue, along with nails or screws, and a good combination square to make sure the form goes together square. The form should be as wide as the final piece, plus an inch or so on either side to allow for final, accurate trimming.

***Bending forms are easy to make.*** *Using yellow glue and nails (or screws), you can assemble a form quickly from ribs of medium-density fiberboard (MDF). Use a combination square to make sure all the ribs are aligned.*

***Laminate trimmer and flush-trimming bit joint veneers.*** *To joint veneers for wide panels, the author uses a laminate trimmer (a small router) and a bearing-guided flush-trimming bit.*

## Preparing substrate

I use ⅛-in. Italian bending poplar or 1.5mm (about 1/16 in.) Finland birch for the substrate, depending on the radius of the curve I'm bending. The Italian poplar will bend to a radius of about 2⅛ in.; the 1/16-in. birch will bend to about 1 in. radius. When rough-cutting thin sheets, use an auxiliary fence or some other means to prevent the sheets from sliding under the tablesaw fence. Remember to cut the sheets of plywood slightly oversize; final trimming takes place after the piece comes out of the press. Bending plywoods are available in sizes down to .4 mm (about 1/64 in.) from specialty plywood dealers, such as Harbor Sales (1401 Russell St., Baltimore, Md. 21230; 800-345-1712).

## Preparing the veneer

If one sheet of face veneer will do the job, I just rough-cut it slightly oversize with a sharp razor knife or veneer saw. But if the face veneer has to consist of several pieces, things get a little more complicated. Their edges have to be precisely jointed. To joint two sheets of veneer, I just sandwich them between two boards; the edge of the bottom board must be jointed and stick out ever so slightly (say, 1/32 in.) beyond the top board. When clamped together with both pieces of veneer between and their edges sticking out past the bottom board, jointing is a simple matter of routing. With a bearing-guided, flush-trimming bit, make a pass down the board, and that's that (see the bottom photo on this page).

Use veneer tape (a water-activated adhesive tape available from veneer suppliers) to tape these jointed veneers together. Tape them along the seam on the face side. Then use a hot iron on the veneer tape to dry the tape and to shrink it a bit, so the joint between the veneer sheets is very tight. The veneer will warp a bit from the iron's dry heat but not enough to matter when it goes into the vacuum press.

The last thing to do before glue-up is to mark each ply and sheet of veneer on one edge with a tick mark at the center to help align the layers on the form.

Photos except where noted: Vincent Laurence

## Glue-up

Next I glue up the stack of plies and veneer using a urea-formaldehyde or plastic-resin glue. I use these glues because of their longer open times compared to yellow glue and because they don't creep. The glue I use most often, Unibond 800 (available from Vacuum Pressing Systems, 553 River Road, Brunswick, Maine 04011; 207-725-0935), also is available in different colors and can be dyed to make gluelines or squeeze-out less obvious. Unibond cleans up with warm water—not an easy thing to do with plastic-resin glues. And set-up time can be modified by the application of heat and by the ratio of resin to hardener you use.

Apply either of these types of glue with a thin, foam-covered roller (available at most hardware and paint stores). A thin, even coat on one of the two surfaces will create a strong glue bond (see the top photo on this page). Finally, after you've glued and stacked all the layers, use the tick marks on the veneer and substrate to align the stock correctly. Use masking tape to hold the stack together at the center on both sides.

## Into the vacuum bag

Inside the vacuum bag, I use a melamine platen (a large flat plate on which something is pressed). I cut ⅛-in.-wide, ⅛-in.-deep grooves with a tablesaw to make a grid of 6-in. squares on the platen, as recommended by the manufacturer. The platen is 2 in. to 4 in. larger than the base of the form, so there's plenty of bag to wrap around the form. The form goes in the bag and on the platen. I keep the form as close to the opening as possible to make it easier to put the lamination into the bag. I also roll up the unused end of the bag. That way, the vacuum pump doesn't have to work as hard at evacuating air from the bag initially, and the pump cycles-on less often while the glue sets.

Now I put the laminations into the bag with waxed or paper-wrapped cauls top and bottom to ensure even pressure over the entire lamination. The edges of the form and of the cauls are rounded over, so they don't puncture the bag. I usually duct-tape the whole lamination to the form at a center point I've marked on the form. The masking tape that I put on earlier over the center mark of the lamination locates its center. The duct tape keeps the lamination in place, but it still allows the plies to slide by each other as they get squished against the form.

Once I've closed the bag and started to pump out the air, I move quickly. It's important to make sure the bag isn't pinched between the form and platen, between lamination and form or between layers of the lamination itself. If you do pinch the bag, you'll end up with a void in the lamination and a bump on its surface.

It's also essential to check that the bag is bearing against the entire lamination, that it isn't hung up anywhere (preventing it from contacting the lamination) and that the bag has been evacuated completely (see the bottom photo). Sometimes air pockets remain because the bag has closed off any exit channels, which can keep layers of the lamination from bonding. If I see any gaps between plies at the edges, I'll turn off the vacuum pump, open the bag, let some air in, close the bag and start evacuating it again, taking more care to see that the bag seats flush against the entire lamination.

***Foam roller spreads urea formaldehyde or plastic-resin glues easily.*** *These two types of glue have longer set times than white or yellow glues, so they're better for most veneer work. A thin, even layer of glue on one of the surfaces is sufficient.*

***Make sure the bag isn't pinched.*** *Check that the bag isn't caught between layers of the lamination, the form or the platen. There should be no air pockets between the bag and the lamination, which would mean a weak bond in that spot.*

## Electric blanket speeds drying

To speed the glue-cure time once the lamination is under pressure, place an electric blanket, set on high, over the bag. This can reduce the cure time of the Unibond from about four hours to just over an hour. Electric blankets weren't designed to be folded over a plastic bag, though, so don't leave the blanket on unattended.

I leave my glue-mixing stick underneath the blanket on top of the vacuum bag, and I set an inexpensive plastic thermometer next to it. By knowing the temperature just outside the bag and comparing this information with that provided by the manufacturer of the adhesive, I can get a rough idea of how long before the glue will be cured; then I can turn off the blanket and the vacuum pump. The reason for keeping the glue-mixing stick there is just to play it safe. It will show me for certain when the glue has cured. When the thin film of adhesive that remains on the mixing stick has turned brittle and dry, then the lamination is ready. □

*Mason Rapaport designs and builds furniture in Easthampton, Mass.*

# *Curves to fit any style*

by Vincent Laurence

One of the great things about learning how to make curved, veneered panels is that the technique can be applied to many different kinds of furniture. As the pieces on this page show, curved panels faced with veneer can be used on everything from a Federal-style demilune table (see the top photo) to an Art Deco television cabinet (see the center photo). No matter what the style, the veneering process is the same.

Using a vacuum bag to press the veneer onto its substrate is more than versatile. It's also simple. Vacuum pressing means that you'll only need one form, not two, to get the right shape. The technique allows you to exert even pressure over the entire panel, making for a strong, reliable bond between the veneer and the substrate. The results can be gratifying—no matter what kind of furniture you like to make. □

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*Vincent Laurence is an associate editor for* FWW.

Photo: Tom McPherson

***Bending plywood hides beneath exotic veneers** on this Federal-style demilune table made by Daryl Keil of Brunswick, Maine. Keil used six layers of 1/8-in. Italian poplar bending plywood for the substrate of the front panels. The sunburst pattern in the top and the rectangular centers of the aprons are Australian lacewood. East Indian rosewood was used for the legs, the crossbanding around the panels and for the moldings.*

Photo: Ric Murray

***Inspired by Art Deco radios of the '30s and '40s,** Steven Turino made this TV/VCR cabinet. He used particleboard forms for all the curved sections of his cabinet and used Italian bending poplar as the substrate for the curves and medium-density fiberboard (MDF) as the substrate for the flat sections. The cabinet is padauk with African satinwood in the center and Ebon-X, an ebony substitute, for the base. The trim details on the side and at the top of the column are MDF with a crackle lacquer finish.*

Photo: courtesy of Peter Joseph Gallery

***Simple lines and stunning wood** are the strengths of this Ruhlmann-inspired Macassar ebony sideboard. Rhode Island furnituremaker Timothy S. Philbrick laminated the substrate for the front of the sideboard with two layers of 1/4-in. Appleply, a voidless American-made plywood.*

***Wall-mounted panel router is ideal for making quick dadoes.*** *Knowing his panel router had to save space, Skip Lauderbaugh mounted it to a wall at a comfortable height and angle. To build the jig, he used a router he owned and commercial hardware costing less than $100.*

# Compact Tool Makes Dadoes a Snap

## *This panel router folds flat against a wall and is inexpensive to build*

by Skip Lauderbaugh

Many of my cabinetmaking projects require panels that have dadoes, rabbets and grooves to allow strong, easy assembly. I've tried lots of ways of cutting these joints and have found that a panel router is the quickest and most accurate tool to use. Unfortunately, the expense of one of the commercial machines (up to $3,500) and the floor space it requires (up to 25 sq. ft.) is more than I can justify. As is often the case, however, once you have tasted using the proper tool for a particular job, using anything else becomes a frustrating compromise.

I had seen other shopmade panel routers (for one example, see Steven Grever's article in *FWW* #88, p. 48), but they lacked features I wanted and seemed complicated. So I set out to design and build my own version of a panel router. By simplifying the guide system and by using common materials and hardware (see the drawing on p. 89), I built a panel router for less than $100 (not including the router, which I already owned). And although this jig easily handles big pieces of plywood and melamine, the jig folds compactly against the wall when it is not in use.

### Designing the panel router

Because the guide rails used in industrial panel routers often get in the way, the rails were the first things I eliminated on my design. The next thing was to orient the machine so that gravity would help feed the router into the work. Big panel routers are oriented horizontally, and they have the capacity to handle 36-in.-wide pieces of plywood. But because shelf dadoes in cab-



Photos except where noted: Alec Waters

inets and cases are usually less than 3 ft. wide, I scaled things down a bit, and I situated the whole setup vertically. This orientation also saved considerable shop space. Then I came up with a clamp-on router guidance system, so I don't have to do any measuring or marking on a panel. Finally, I devised a router subbase that eliminates depth-of-cut adjustments when changing material thicknesses. To help you understand the abilities of this tool and how it is constructed, I've divided it into six basic components:

1. The workpiece table
2. The router guide system
3. The fence with adjustable stop
4. The upper and lower guide stops
5. The router subbase
6. The router tray

***The workpiece table***—A panel router requires a flat, stable work surface with a straight edge for mounting the fence. I chose an ordinary 3-ft.-wide hollow core door for the table because it provides those things, and at $15, it cost less than what I could build it for. I mounted the table to a ledger on the wall. The ledger is 75 in. from the floor to give a comfortable working height. A 5-in. space from the wall gives enough clearance for the guide system. Standard door hinges let the table swing out of the way during storage, and side supports hold the table at a 65° angle when the table is in use.

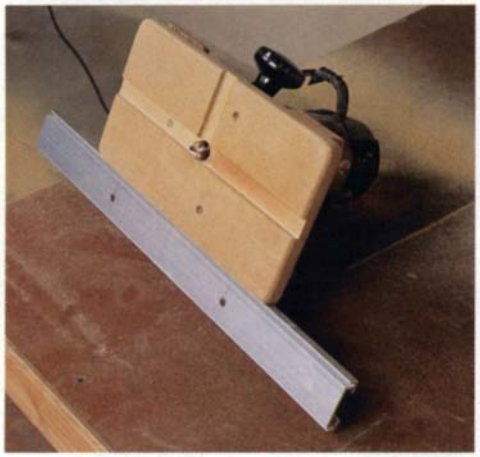
***The router guide system***—Several years ago, I discovered that the aluminum extrusions used in Tru-Grip's Clamp 'N Tool Guides (manufactured by Griset Industries Inc.; see the sources of supply box on p. 89) interlock when one is inverted (see the photo at right). In this configuration, the two pieces slide smoothly back and forth with little side play, like a track. This system has several benefits: A panel can be set directly on the table without having to go under fixed guide rails. The guide is accurately located, and the panel is clamped tightly to the fence and to the table. The clamps are available in several lengths, but I've found that 36 in. is the most convenient (see the sources box). The manufacturer recommends using silicone spray to minimize wear.

***The fence with adjustable stop***—The fence holds the bottom edge of a panel straight, adds a runner for an adjustable stop and measuring system, and gives a place to mount the lower guide stop. Fence construction is partially dictated by the stop you use. I chose a Biesemeyer miter stop because it has two adjustable hairline pointers, which let you set and read both sides of a dado (see the top photo).

For the adjustable stop to work, the fence should be 1½ in. thick and the top edge of the fence has to be 1⅝ in. above the top of the table. My fence is two thicknesses of ¾-in. plywood laminated to form a 1½-in.-thick piece that is 3 in. wide and 96 in. long. To allow the router to pass through at the end of a cut, I made a 1-in.-deep notch in the fence. The notch is 13 in. long to fit my router. I located this notch 36 in. from the right, so I can dado in the center of an 8-ft.-long panel. To finish off the fence, I glued plastic laminate to the top, faces and ends. Before mounting, I cut a ¼-in. by ¼-in. groove in the back to provide for dust clearance, which ensures that the bottom of a panel stays flush to the fence. The fence is mounted to the bottom edge of the table with 2½-in.-long screws.

***The upper and lower guide stops***—The upper and lower guide stops allow the Clamp 'N Tool Guide to be set exactly


***The fence's adjustable stop ensures perfect alignment.*** *A Biesemeyer micro-adjustable stop and measuring system precisely positions the left side of the work for each dado or groove. Lauderbaugh uses a pair of dividers to point out two cursors that indicate left and right limits of a cut.*



***Channels align subbase and evacuate dust***—*The underside of the router subbase reveals an inverted aluminum guide channel and a medium-density fiberboard bottom with dust-evacuation slots cut across it for the bit.*

***The key to the router guide is interlocking aluminum track.*** *When the author discovered the edges of Clamp 'N Tool Guides nest and slide easily, he made them into a two-piece guide system: An inverted 21-in. piece is fixed to the router subbase, and another piece is clamped to the work.*


Photo: Kent Ezzell

***Setup for dadoes is easy.*** *Just slide the Clamp 'N Tool Guide to the stops, and clamp the guide to the work by snugging up the black plastic dogs.*

## *Commercial bits make clean cuts*

Commercial panel routers work so well because the router bits are specifically designed to eliminate chipping and tearout, and they can also cut at higher feed rates. But their biggest benefit is that their cutter and arbor are two separate pieces (see the photo at right), which means that the arbor can stay secured in the router collet while you simply unscrew the cutter from the ½-in. arbor to change the bit size. Commercial panel-router bits (see the sources of supply box on the facing page) are available in a full range of sizes, including undersized ones for veneer plywood and oversized ones for two-sided melamine. An arbor and cutter set costs about $35, less than a decent-quality dado blade set.

When you need to change the width of a dado, select the correct cutter size, and screw it on the arbor (no wrenches required). The depth of cut doesn't need to be reset because the height of the cutter stays the same. This process is much quicker than using a dado blade on the tablesaw, where you have to use shims to get the proper width, and then make test cuts to set the depth of cut. —*S.L.*

***Panel-routing bits change easily.*** *The only things the author uses from industrial panel routers are the bits, which have interchangeable cutter tips.*

90° to the bottom edge of a panel. The lower guide stop is integrated in the fence (see the top photo on p. 87), and the upper guide stop is fixed to the top of the table. The lower stop is a ⅜-in. bolt threaded into a T-nut inset into a block and glued to a notch in the fence. The center of the bolt head should be 1⅛ in. above the work surface, or ½ in. above the bottom of the notch. The upper stop consists of two pieces of ¾-in.-thick plywood laminated to form a 1½-in.-thick piece, 12 in. long. The top is notched on both ends to leave a 2-in.- by 2½-in.-wide section in the center. Another bolt and T-nut are screwed to the shoulder. The center of this bolt is 1⅛ in. above the bottom of the notch. To fine-tune the stops for square, turn the bolts, and lock them with a nut. After the stops are set, adhere the measuring tape for the adjustable stops onto the top of the fence.

***The router subbase***—Parts for the router subbase consist of a medium-density fiberboard (MDF) bottom, an upper base made out of ¾-in. plywood that mounts to the router, and a piece of upside-down extrusion screwed to the side so it can engage the guide track. Drawing detail B shows the dimensions I used to mount my Porter-Cable model 690 router. But you could modify the subbase to suit your router. Regardless of the router, the bottom should be ⅝ in. thick so that the extrusions interlock properly.

After the bottom is cut to size, center the baseplate on the bottom, and align the router handles at a right angle to the extrusion. Drill and countersink the mounting holes and mount the upper base to the bottom. Next, carefully, plunge a ¾-in. bit by slowly lowering the router motor. Then cut two dadoes, each ¼ in. deep by ¾ in. wide across the bottom. The first dado runs the full length and the second goes halfway across, 90° to the first. This T-shaped slot removes dust from the subbase (see the center photo on p. 87).

For the piece of inverted extrusion, I obtained stock from the manufacturer. But because they currently don't sell this separately, just buy a 24-in. clamp, and cut off the ends. I used a 21-in.-long piece.

The bottom of the router subbase slides directly on the face of the panel so that the depth of cut is registered from the top of the panel. This is desirable because when you switch material thickness from ⅝ in. to ¾ in., for example, the depth of cut does not have to be adjusted. Also, if the panel is slightly warped or some dust gets between the panel and the table, the cutting depth is not affected. Interchangeable bits also speed up the process (see the box at left).

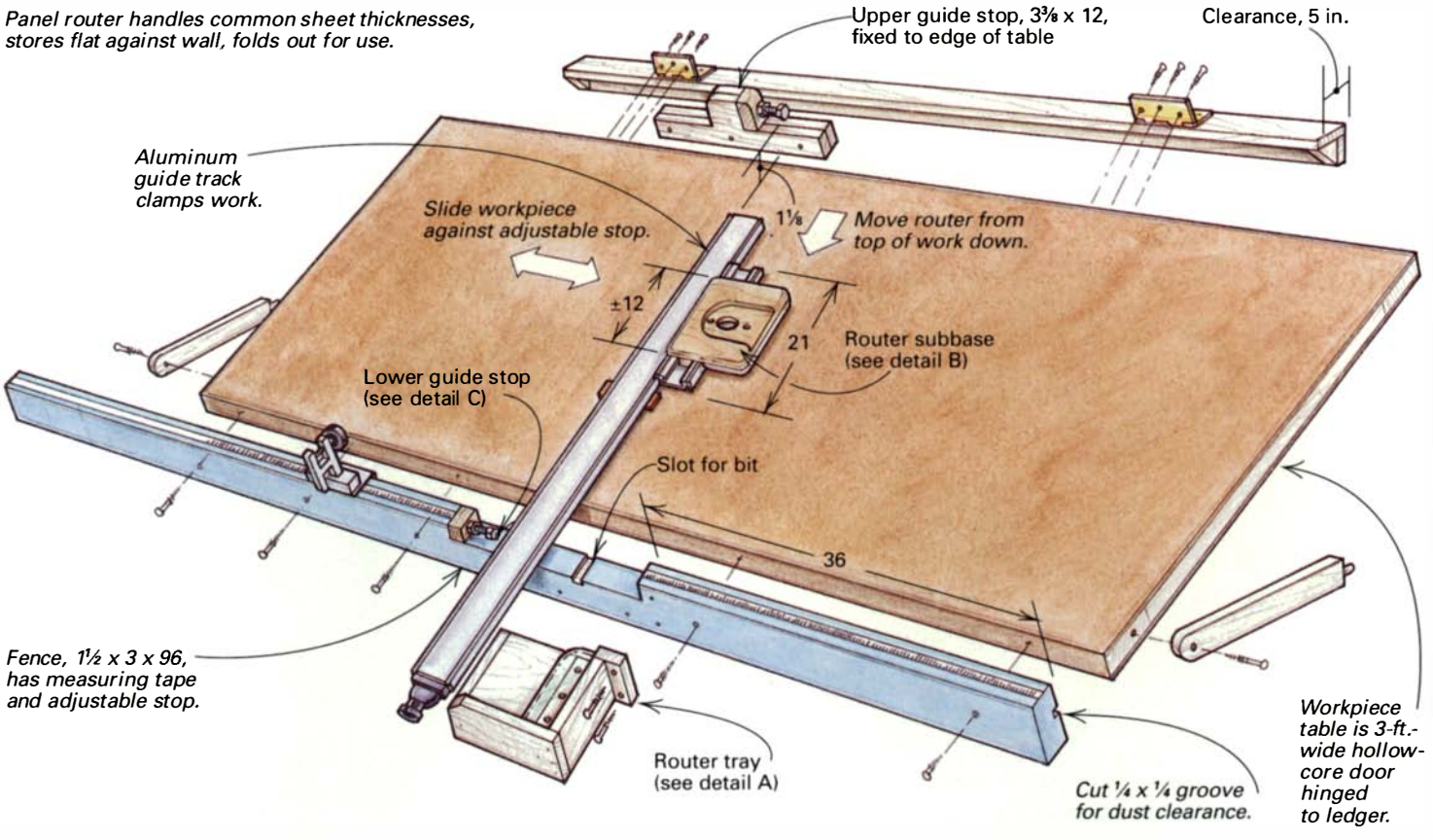
***The router tray***—The purpose of the router tray is to give the router a place to rest after it has completed a cut. The tray is mounted to the fence on the back side of the notched-out area. My tray is made out of ¾-in. plywood and is screwed to the fence. On the right edge of the tray, a piece of ⅛-in. Plexiglas protrudes into the tray opening. As the router slides down into the tray, the Plexiglas piece fits into a slot cut into the edge of the subbase and prevents the router from lifting out of the tray.

### Using the panel router

The panel-router sequence to make a dado goes like this: First, I set the adjustable

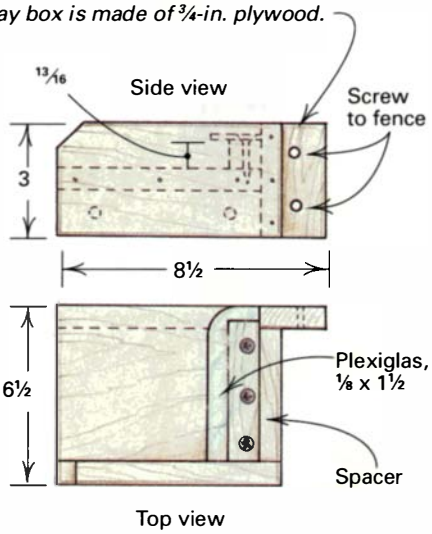
## Panel-router assembly

*Panel router handles common sheet thicknesses, stores flat against wall, folds out for use.*

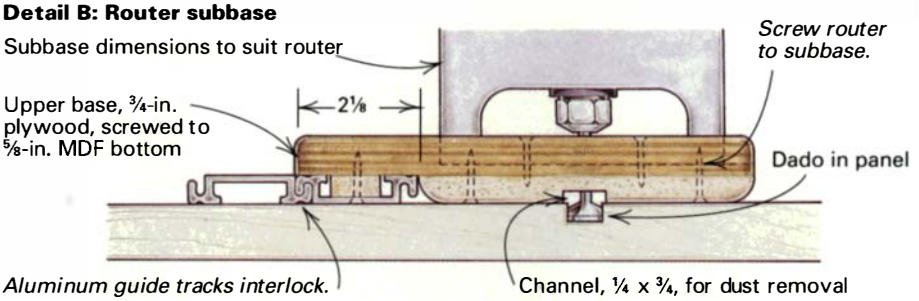



### Detail A: Router tray

*Tray box is made of ¾-in. plywood.*

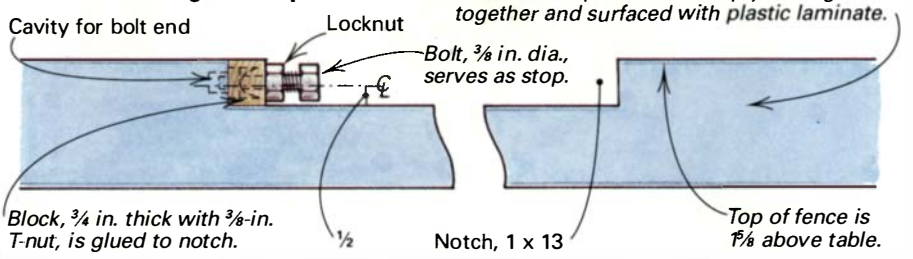



### Detail B: Router subbase




### Detail C: Lower guide stop

*Fence is two pieces of ¾-in. plywood glued together and surfaced with plastic laminate.*




stop to locate the dado where I want it. Second, I set the panel on the table and slide it up against the adjustable stop. Third, I place the Clamp 'N Tool Guide on the panel, slide it against the upper and lower guide stops, and clamp it down (see the top photo on the facing page). In this one step, the guide is squared to the panel and clamped to the table. Fourth, I set the router on the panel with the extrusions interlocked. I hold the router subbase above the top of the panel so the bit clears. Finally, I turn the router on and cut the dado. To make stop dadoes, I insert a spacer block in the bottom of the tray to prevent the router from cutting all the way across a panel. While this setup may not be perfect for a large production shop, it is certainly affordable and conserves space. □

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*Skip Lauderbaugh is a sales representative for Blum hardware and a college woodworking instructor. His shop is in Costa Mesa, Calif.*

## *Sources of supply*

**Clamp 'N Tool Guide**
Griset Industries, Inc., P.O. Box 10114, Santa Ana, CA 92711; (800) 662-2892

**Adjustable stop**
Biesemeyer, 216 S. Alma School Road, Suite 3, Mesa, AZ 85210; (800) 782-1831

**Panel-router bits**
Safranek Enterprises, Inc., 4005 El Camino Real, Atascadero, CA 93442; (805) 466-1563

Drawing: David Dann

# American Sycamore

## *Beautiful looks, unstable behavior*

by Jon Arno

***Sycamores boast big leaves and bold figure.*** *The trees have a variegated bark that sheds in sinuous strips, and when quartersawn, the wood looks like lacewood. Sycamore turns crisply and carves like cherry. Here, darker heartwood veneer contrasts with a sapwood board.*



Photo this page: Robert Marsala

Sycamores can be giants, reaching heights of more than 100 ft. and diameters in excess of 10 ft. Late to leaf in the spring, their majestic, gnarly branches and patchy, ash-gray bark have led sycamores to be called "ghost trees" (see the photo below). But for woodworkers, it can be a challenge to craft the wood into lasting projects. That's because sycamore can be as unstable as it is beautiful. To better understand and use this giant of the forest, let's look first at its history and its name.

## The roots of sycamore

Fossil records show that the sycamore family, Platanaceae, was a contemporary of the dinosaurs. These ancient tree specimens spawned at least 11 of the modern sycamore species, including the American sycamore, *Platanus occidentalis*.

Practically unchanged, American sycamore's rapid growth rate, impressive size and life expectancy of as much as 600 years suggest that it should have become an important timber species in North America. In terms of biomass, American sycamore is arguably the largest hardwood tree in North America. And sycamore's range is extensive, running from northern Florida to central Michigan and from eastern Texas to Maine. But sycamore is not abundant in upland forests. Its lack of shade tolerance and need for rich, moist soil cause it to congregate along river banks. Consequently, the ample sunlight of a river bank habitat lets it form low branches, diminishing the value of its logs. Few of the old-growth stands survived long enough to be used as lumber because the trees were cut down and burned by early settlers clearing land for farming.

***Without its leaves, a sycamore appears ghostly. With its light gray and dark gray bark illuminated by a late afternoon sun, this 5-ft.-dia. tree stands like a dead sentry.***

American pioneers commonly called sycamore "buttonwood" because its woody fruit could be quickly fashioned into crude but functional buttons. Sycamore is the accepted name in America today, but the same tree in Europe is called plane tree. In England, the name *sycamore* refers to *Acer pseudoplatanus*, which is a member of the maple family. Much whiter in color and often having curly figure, the maple variety has been used for furniture by European cabinetmakers since classical times.

## Appearance: pleasant to stunning

In contrast to the English sycamore/maple, American sycamore is deeper in color. Wood cut from the tree ranges dramatically from dark heartwood to light sapwood (see the bottom photo on p. 92). The tangential surface of flatsawn boards (growth rings parallel to the face) reveals a subtly pleasant figure freckled by a multitude of light-yellow ray flecks. Often, the flecks are partially obscured by the wood's overall yellowish-gray color and occasional warm reddish-tan highlights. However, the radial surface of quartersawn boards (growth rings perpendicular to the face) shows plentiful rays exploding as interwoven lustrous yellow bands to produce a bold lacewood-like figure that is truly stunning (see the photo on the facing page). It is this lacewood figure that is usually sought in sycamore veneers.

## Properties: nice to work, prone to rot

To the cabinetmaker, the American sycamore has a blend of unique virtues. It's a medium-dense wood with an average specific gravity of 0.46 and is about as easy to work as cherry (0.47). And like cherry, maple and birch, sycamore has uniform pores that are evenly distributed, though they are slightly coarser. Sycamore machines exceptionally well in turning, shaping and planing. It holds fasteners well, polishes smoothly and readily accepts adhesives, stains and finishes (see the photo at left on p. 93). It has good elasticity and outstanding resistance to shock. And sycamore's abundant rays, besides contributing to its appearance, add to the wood's strength and high resistance to abrasion and splitting.

Given that it has so many positive features, sycamore has long been popular for mass-produced articles, such as brush backs and handles. In fact, sycamore can be virtually interchangeable with beech, and at a glance, these two woods are often confused. But beech is heavier and harder and has a higher tannin content than sycamore. Beech usually has a tan to rusty-brown color and fewer and darker rays.

Sycamore's toughness in veneer thicknesses makes it ideal for woven baskets and food containers. In thicker sections, sycamore makes good drawer sides, and it is suitable for end-grain butcher's blocks. The wood's resistance to abrasion also makes sycamore good for pallet skids, and its ability to absorb shock allows it to perform well for such different things as railroad ties and gunstocks.

But sycamore is a bad choice for exterior woodwork because it is prone to rot, even in certain interior cabinet situations. To prevent items made of sycamore from rotting, make sure the wood is thoroughly finished and kept dry. Also, sycamore must be seasoned carefully to avoid blue staining.

## Instability: numbers are misleading

Sycamore sounds like it would be an irresistible cabinetwood. Especially because it comes in wide planks and at low cost. And its quarter-sliced veneer has been prized for marquetry and inlay work for centuries. But, alas, sycamore's greatest handicap is its lack of stability.

With a 7% rise in moisture content, a 12-in.-wide sycamore board will expand .14 in. radially and .25 in. tangentially. Why sycamore is so prone to move is a real mystery, not readily apparent by examining its shrinkage relative to other major cabinetwoods (see the chart on p. 93). The amount a given wood shrinks during the curing process is usually a good indication of how stable the wood is when dry. The more it shrinks, the less stable it will be. But

Photo this page: Jonathan Binzen

Photo: Michael Latil

***When oiled, sycamore looks rich.*** *To protect surfaces in his combination valet and vanity, Arnold d'Epagnier used linseed and tung oils, then wax.*

# *Using and finishing sycamore*

by Alec Waters

For all of sycamore's beauty and desirable qualities, it's not used much. Perhaps its deserved reputation as an unstable wood limits its commercial availability. After speaking with sawyers, cabinetmakers and *FWW* contributors for advice on cutting, milling and finishing the wood, I'm convinced that sycamore is destined for wider acceptance.

As Pennsylvania sawyer and lumber dealer Sam Talarico put it: "I've been trying to turn woodworkers on to sycamore for 25 years. Most are skeptical of its Achilles' heel instability." To minimize movement problems, Talarico recommends only quartersawn sycamore. Plainsawn, he says, is almost worthless. "When we cut at the mill, we actually do true quartersawing, which means we constantly turn each log on the carriage to keep the grain vertical (90° to the wide faces)." Although this is more wasteful, it yields wood that's more stable and more figured. Broad rays like those in quartersawn white oak are typical, though sycamore's are shorter. Good quartersawn sycamore looks like coarse Australian lacewood, but sycamore's grain is finer and works more easily.

Talarico mentioned other things to watch out for with sycamore. "If you're dealing with big trees that have fallen, you're likely to have wind shakes in the wood. Like poplar, sycamore is prone to sticker stain, especially when wet. Other markings, caused by mineral steaks, worm holes or fungi stains are common, too."

To keep sycamore from moving once a piece of furniture is assembled, finish it quickly and thoroughly. Arnold d'Epagnier, a Maryland cabinetmaker, said: "To prepare sycamore for a finish, I usually plane or scrape the surfaces, but if the figure is quilted or curly, it has to be sanded. Sycamore should be finished soon after surfacing because the wood becomes fuzzy. You have to use many coats of finish because the pores really soak it up. On a vanity (see the photo at left), I rubbed on multiple coats of oil and then waxed the wood, which really brings out sycamore's wonderful lace look. Similarly, for a table (see the photo at left on the facing page), I applied two coats of sealer followed by two coats of water-based urethane finish. Rubbing out the topcoat gave a nice satiny luster. The thick finish acts like a plastic coating that is durable and reduces moisture exchange."

Chris Minick, a finishing chemist, agrees that sycamore needs lots of finish. "Because sycamore is porous, like basswood and black willow, it absorbs finish deep into the surface," he said. "I use multiple coats of finish, starting with several coats of shellac as a sealer, followed by a couple of topcoats. I equally coat all surfaces, even those

sycamore's volumetric shrinkage of 14.1% (though high) compares well to maple (14.7%). Yet maple is more stable than sycamore.

But at least it cures evenly, and thanks to similar amounts of radial and tangential shrinkage, checking (cracking) is not normally a problem.

## Best uses: slice it thin, hold it down

Sycamore performs well when it is used in narrow components or when physically held in place, such as in glued-up strips. Sycamore veneer when bonded to a stable substrate also performs well. In addition, sycamore is suitable when its movement is neither critical nor noticeable. For example, it serves well in one-piece, shaped objects, such as turned kitchen utensils that can distort without impairing their use. But as a general-purpose cabinetwood, sycamore is best employed in the form of quartersawn boards. Fortunately, in the case of sycamore, this grain orientation also reveals the wood's most attractive, ray-dominated figure. □

*Jon Arno is a woodworker and wood consultant in Troy, Mich. He is a regular contributor to* Fine Woodworking.

Photo: Sam Talarico

***Quartersawing yields the best sycamore stock.*** *When quartersawing sycamore on a band mill, the sawyer keeps the log's growth rings at right angles to the face of each board. This method produces more stable wood and fuller ray flecks.*

Photo: Michael Lamb

***Heavy finish stabilizes the wood and brings out the figure.*** *Sycamore's subtle defects complement Arnold d'Epagnier's* Shoji Table. *Because the wood soaks up finish, he first applied two coats of sealer. Then he sprayed on two coats of water-based urethane.*

unseen places. This reduces moisture exchange and makes the wood more stable. The real trick is to let each coat dry thoroughly (several hours to overnight). Although the coating may look dry right away, inside the wood it is still wet. If you finish over this, the undercoat may shrink as it eventually dries. It may also bubble the topcoat as solvent evaporates from below. But by slowly building up a thick finish, the polymers penetrate and sort of caseharden the wood, which protects it and adds depth to the finish." □

*Alec Waters is an associate editor for* Fine Woodworking *magazine.*

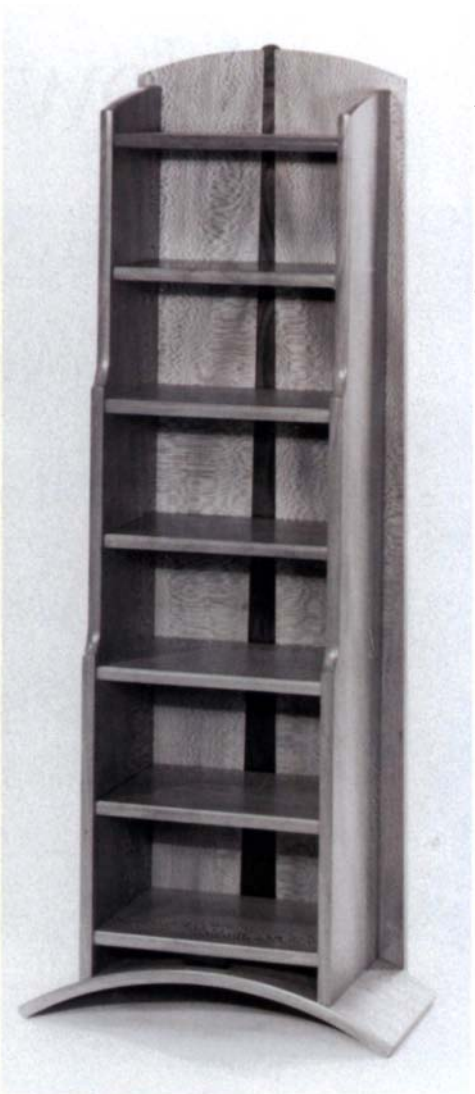

Photo: courtesy of Pritam & Eames Gallery

***Heralding sycamore's virtues—****Hank Gilpin designed a sycamore and walnut compact-disc rack to encourage the use of lesser-known woods. The case is part of a series of pieces using overlooked species.*

**Comparing stability of sycamore and common cabinet woods**

| | Shrinkage (percent from green to oven dry) | | | |
|---|---|---|---|---|
| **Species** | **Tangential** | **Radial** | **T/R Ratio*** | **Volumetric** |
| **Cherry** (*P. serotina*) | 7.1 | 3.7 | 1.92 | 11.5 |
| **Maple** (*A. saccharum*) | 9.9 | 4.8 | 2.06 | 14.7 |
| **Red Oak** (*Q. rubra*) | 8.6 | 4.0 | 2.15 | 13.7 |
| **Sycamore** (*P. occidentalis*) | 8.4 | 5.0 | 1.68 | 14.1 |
| **Walnut** (*J. nigra*) | 7.8 | 5.5 | 1.42 | 12.8 |

*The ratio between tangential and radial shrinkage is normally a good indicator of stability. A ratio greater than 2:1, especially when combined with high volumetric shrinkage, suggests instability but is not an infallible predictor. Sycamore scores better than it performs in practice.

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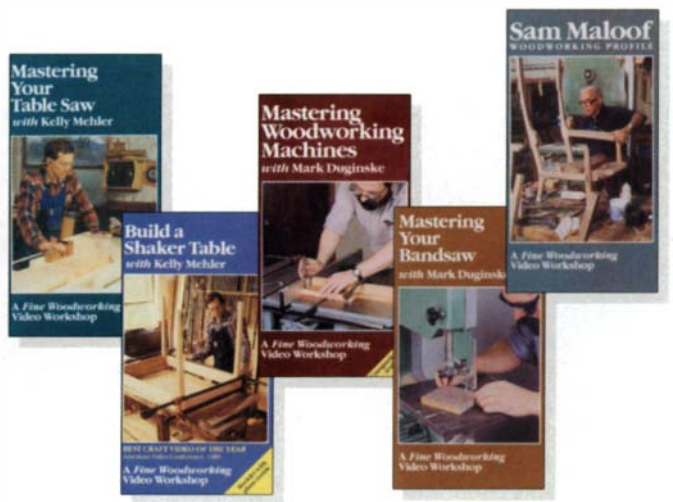


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# Fine WoodWorking®

## Index to issues 104 through 109

This alphabetical index covers all the issues of *Fine Woodworking* magazine published during 1994 (*FWW* #104 through #109). Starting in 1988, *Fine Woodworking* has published annual indexes, which can be found in *FWW* #74, #80, #86, #92, #98 and #104. The Taunton Press also sells a cumulative index covering issues #1 through #100 (Fall 1975 through May/June 1993) for $12.95. The format of each index reference is issue number:page numbers. A hyphen between page numbers means the discussion is continuous; commas between page numbers indicate an intermittent discussion. This index, like all previous indexes to *Fine Woodworking*, was prepared by Harriet Hodges, chairmaker, of New Castle, Va.

# T



# U



# V



# W



# Y



# Z

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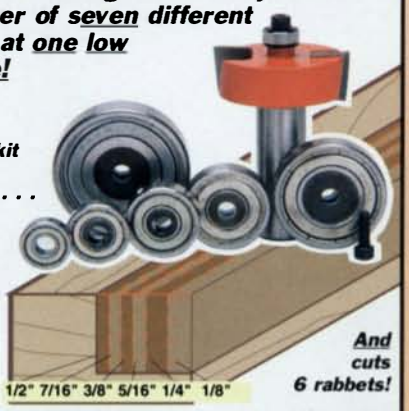


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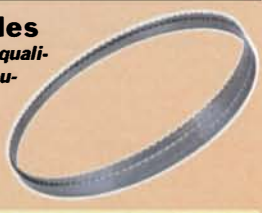

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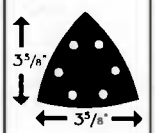


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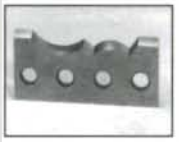

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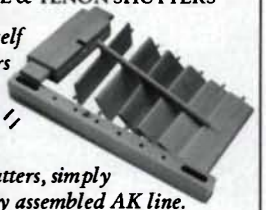

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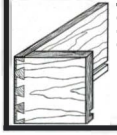

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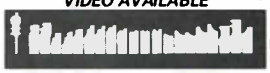

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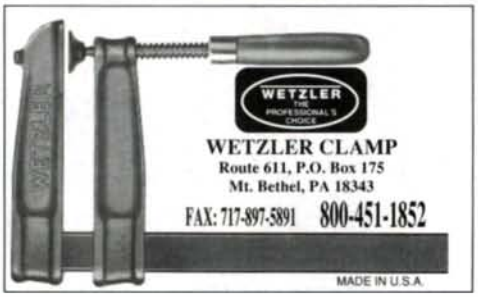


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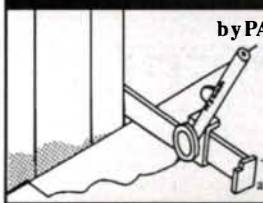

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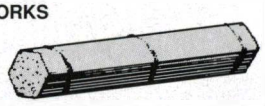

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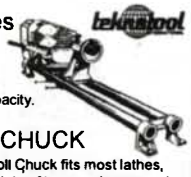

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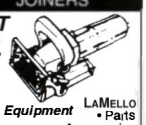
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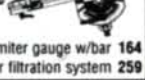

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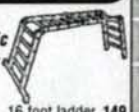

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| 2736-04 | 12v, 3/8" dr. kt w/2 bat 139 |
| 7484 | 5" random orbital sander 109 |
| 1605 | plate jointer w/case 139 |
| 77 | 7-1/4" worm drive saw 144 |
| 5525 | New 6-1/2" circular saw 119 |
| 5660 | 8-1/4" 60° pro bevel saw 149 |
| 5860 | 8-1/4" 60° rafter master 179 |

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|---|---|
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| 4024 | 3x21 vs sander 184 |

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| 1609KX | laminate trimmer kit 219 |
| 1195VSR | 3/8" 6 amp hmr drill 139 |
| 1194VSR | 1/2 vsr 6 amp hmr drl 159 |
| 11222EVS | 1-1/8"sds rotary hmr 429 |

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|---|---|
| 1614EVS | 1-1/4 hp, vs, plng rtr 169 |
| 1655 | New 7-1/4" circle saw 129 |
| 1289D | New 1/4 sheet palm sndr 69 |
| B1650K | New plate joiner kit 179 |
| B4050 | New in-line recip saw 129 |
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READER SERVICE NO. 46

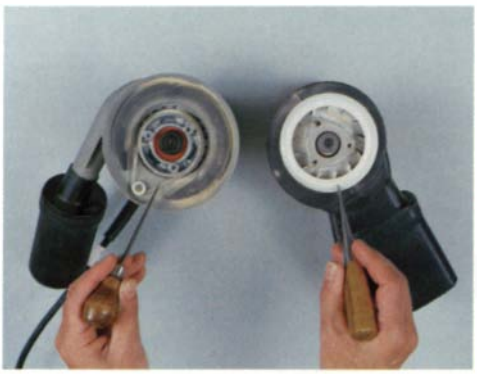
## Second generation of in-line random-orbit sanders has soft-start feature


***Aggressive sanding but no gouging.*** *These new in-line random-orbit sanders are just as aggressive as their precursors but have a soft-start, non-gouging feature.*

The first time I turned on a random-orbit sander and sanded out a scratched piece of hard maple was the last time I gave a thought to using my old orbital-action "jitterbug" (otherwise known as a palm or ¼-sheet finishing sander). Random-orbit sanders work far more aggressively than the old ¼-, ⅓- or ½-sheet sanders and vibrate substantially less than those forebears. Best of all, because the tool combines short, random stroking action with high-speed orbital motion, it can produce an almost swirl-free finish. But random-orbit sanders have their problems, too. Because the pad rotates freely when you lift the tool off the work, the pad tends to gain speed until it approaches the full motor speed—up to 12,000 rpm for many of the machines. Then when you set the pad down on the stock, you invariably get a momentary but uncontrollable jerk, which often leaves a gouge in its wake.

The manufacturers' original solution for this problem was to recommend waiting for the sander to coast to a stop and then restart the sander on the surface being sanded. Not a bad recommendation, as long as you have more time than you know what to do with. But for a professional, or for anyone who values his or her time, it's unsatisfactory.

Now two manufacturers—DeWalt and Porter-Cable—have done something about this problem. Both have introduced new models (DeWalt 420, 421 and 422 and Porter-Cable 332, 333 and 334) with friction brakes to keep the sanding pad from coming up to full speed when not under load (see the top photo). Though they arrived at different solutions to the same problem, both of them work well to prevent scratching or gouging of a workpiece.



***Brake parts wear but are easy to replace.*** *No special tools are needed, and the parts are readily accessible.*

The brake parts in both systems are wear parts and do need to be replaced periodically to maintain the soft-start effect. You'll know it's time to replace the brake piece when the sander jerks as you set it down on the wood. Both companies have engineered the sanders intelligently, though, so that the brake pieces—a plastic shroud for the DeWalt and a polypropylene belt for the Porter-Cable, can be replaced by simply removing the pad, removing the worn part with your fingers, replacing the new part and reinstalling the pad. It takes only a couple of minutes (see the photo at left).

The models I worked with were the DeWalt 421 and the Porter-Cable 333. Both worked as advertised: I could lift up and then return the sanders to the work with no perceptible grab. Of the two, the DeWalt seemed to have a slightly greater eccentric movement, making it a more aggressive sander. The brake seemed to be more effective, bringing the pad to an almost complete stop when I lifted the sander off the work. Though the Porter-Cable allows more pad speed to build up (to approximately 500 rpm), it's nowhere near fast enough to gouge the work.

I'm hooked on this new technology already, and I suspect many other woodworkers will be, too. Anything that saves as much time as these new random-orbit sanders do is going to find wide appeal. At least one other manufacturer, Bosch, plans to introduce a new line of random-orbit sanders later this year with an equivalent feature. Current street prices on all the DeWalt and Porter-Cable models range from roughly $70 to $80. *—Jim Tolpin*

## Warner offset router bases for plunge routers

Our reviewer in issue #101 said that one of Pat Warner's offset router bases made his router easier to control, particularly with bearing-guided bits. But you couldn't take advantage of those features if you had a plunge router because Warner didn't make bases for plunge routers.

But Warner has come to realize that many woodworkers do use their plunge routers to rout edge treatments, rabbets and other perimeter work, as well as traditional plunge-routing operations, such as mortising and routing keyhole slots. As a result, he's now manufacturing the bases for most plunge routers. To purchase a base or obtain more information, contact Pat Warner directly (1427 Kenora Street, Escondido, Calif. 92027; 619-747-2623).

*—Vincent Laurence*

## Veritas beading tool redux

When I reviewed the Veritas beading tool in "Tool Forum" (*FWW* #106, p. 104), I concluded that it was a nice tool that needed just one improvement: a pressure plate to prevent the clamping screw from galling the cutter-holding dowel. The review quickly prompted a phone call from Leonard Lee of Lee Valley Tools, the par-



Photos this page: Craig Wester

ent company of Veritas tools. He said, "Whatta ya mean it needs a pressure plate, we thought of that and put one in the tool." A quick look at a second beading tool verified that, indeed, the Veritas beading tool did have a small brass disc that serves as a pressure plate, and when it was tightened to normal torque, it prevented galling of the tool holder. One caution, however, the pressure plate is small and free-floating in a recess in the beading-tool handle. If the tool holder is removed from the handle, the disc will fall out and could quite easily be lost. I suspect that is what may have happened to the missing pressure plate in the original tool I reviewed. My apologies to Mr. Lee and Veritas Tools for the misinformation. *—Charley Robinson*

## Mastodon Jaw Extenders available for bar clamps

In *Fine Woodworking* #99, Jim Puterbaugh reviewed the Mastodon Jaw Extenders for ¾-in. pipe clamps. A similar attachment is now available for bar clamps, extending the depth to which the jaws can reach from about 2½ in. to 10 in. The Mastodon Extenders retail for $44.95, weigh just 3½ lb. a pair and can exert more than 1,000 lbs. of clamping pressure. Clamps with similar reaches retail for $100 and up. For more information, contact Wade Manufacturing Co. (P.O. Box 23666, Portland, Ore. 97281-3666; 800-205-8665). *—V.L.*

## Infinitii alignment tool good for many setups

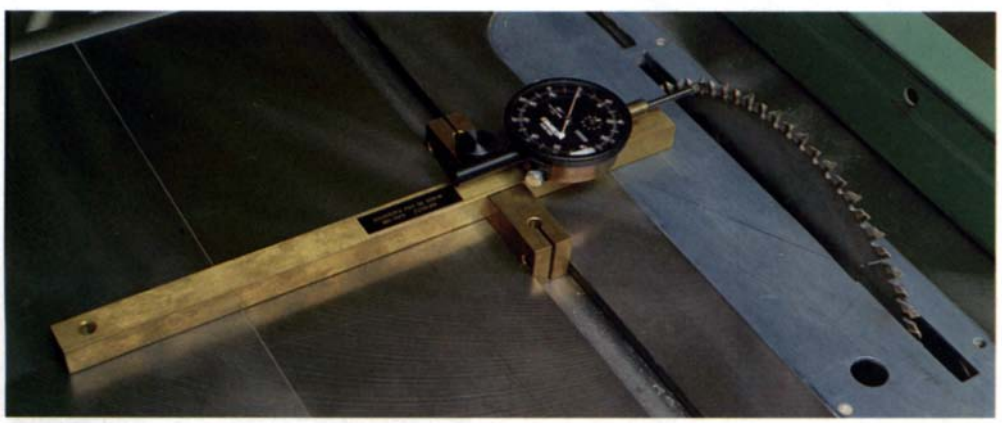
There's nothing more frustrating than ruining stock because of a poorly tuned machine. And even though 1/64 in. is generally a fine tolerance when working wood, it's unacceptable on the machines used to prepare that wood. That's why I was excited to check out the Infinitii alignment tool manufactured by the B.C. Ames Co. (131 Lexington St., P.O. Box 70, Waltham, Mass. 02254-0070; 800-438-4249).

The Infinitii is essentially a dial indicator mounted to an adjustable machined brass base. The base consists of an alignment bar (on which the dial indicator is mounted) and a perpendicularly oriented miter bar that's slotted to allow for adjustment (with two Allen-key setscrews) to obtain a snug fit in the miter slot (see the photo below). The unit came fully assembled. And it took no more than a minute to set up the unit to check if the miter gauge was parallel to my tablesaw's blade.

Actually checking for parallel (by comparing the indicator readings on the same marked tooth rotated fore and aft of center) took only a few moments. As it turned out, my saw was .002 in. out. I could observe the direction and amount the table was out on the indicator as I shifted the table parallel and then resnugged the bolts connecting table to base. So accurate results are guaranteed.

The Infinitii is also useful for setting fences on router tables and shapers parallel to their miter slots. The device records setups for future use and, in conjunction with a laminated angle-setting chart (included), sets virtually any angle on any machine, whether tablesaw blade, jointer fence or disc-sander table.

I enjoyed working with the Infinitii and found it simple to use. The bottom line was that the device allowed me to spend less time tweaking equipment and more time working wood, which is what it's all about. I found the instructions well-written and easy to understand. The tool sells for $149.95 plus shipping and handling and is available directly from the manufacturer.
*—Fred Farkas*



***Quick, accurate machinery setups.*** *The Infinitii alignment tool can be used to align and tune up a number of shop machines, but it's most useful on the tablesaw. The tool can be used to align the blade to the miter-gauge slot and set the blade angle.*

***The Starrett Digitape allows you to easily measure the insides of cabinets, drawers and such, displaying the measurement in the LCD on top of the case.***

## Starrett introduces a digital tape measure

Normally, I steer clear of electronic gizmos for woodworking, but the new Starrett Digitape ($30 to $35 retail), which bears the logo of one of the most respected names in measuring and layout tools, piqued my interest (see the photo above). A digital tape measure is innovative, but I wondered if it would be a worthwhile tool. After using the Digitape in my shop and around the house for nearly a month, I discovered many things about it I like and a few I don't

Starrett's advertising places a lot of emphasis on how easily this tape gives you inside measurements. A push of a button automatically adds the length of the case to the liquid crystal display (LCD) readout on the top of the case. But I found another feature to be of more use to me—the tape can instantly convert feet and inches to inches and back again. This feature is a godsend when doing layouts from architectural plans with dimensions given in feet and inches. No more calculating in my head, misreading the numbers on the tape or accidentally measuring 4'0 as 40 in. The tape also converts inches to centimeters with a punch of a button.

There's also a memory button on the tape. On one occasion, I was taking a measurement inside a cabinet, measuring the length of an adjustable shelf. In the dim light, I could see neither the LCD readout nor the marks on the tape. So I held the tape's case tightly to the sidewall and pushed the red memory button. And then I closed up the tape and brought it out into the light. There, blinking on the screen, was the inside measurement of the cabinet. Slick.

Another useful feature, especially when laying out balusters or stud framing, is the



Photos this page: Vincent Laurence

tape's zeroing option. At the press of a button, you can return the screen to zero. This allows you, for example, to move the tape 16 in., zero it, move it another 16 in. and so on. No need to do additions in your head or move the tape to get the spacings even. And though you lose the sum total of the distance on the LCD, you still have it right there on the tape.

So what didn't I like about the tape? The Digitape is a bit bulkier and heavier than a standard 1-in. wide, 25-ft. tape. I also found that my 47-year-old eyeballs had a hard time reading the LCD in dim light, and the digitally encoded tape, which I would inevitably kink, would cost me $13.50 and a week to 10-day wait to replace. Finally, thinking ahead to winter, I knew that the lowest recommended reliable operating temperature of 25°F might limit the tape's utility for carpenters and boatbuilders in colder climes.

I also had to ask myself whether there was any inherent advantage in having an LCD tell me what I already knew by reading the tape itself. And because the digital readout only goes to the nearest 1/16 in., the tape may be fine for rough framing, but it's going to prove too coarse a measuring tool for finish carpenters, cabinetmakers and other woodworkers who require very precise tolerances.

For more information, contact the L.S. Starrett Co., 121 Crescent St. Athol, Mass 01331-1915; (508) 249-3551. *—Jim Tolpin*

**Editor's note:** Non-digital inside-measuring tapes are available from Stanley Mail Media, Inc. (7815 S. 46th Street, Phoenix, Ariz. 85044; 800-453-6736) from its Tool Traditions catalog, and Kreg Tool Co. (P.O. Box 367, Huxley, Ia. 50124; 800-447-8638).

## Delta drill-press guard

A drill press can be a deceptive tool when it comes to safety. Clamping your workpiece securely to the table—rather than trying to hold it down with your hand—will eliminate most accidents, but putting excessive pressure on long, small-diameter bits has caused more than a few to shatter and fly. Also, wide bits (such as spade bits and expansion bits or fly cutters) have grabbed many a loose object innocently allowed to drift too close to the spinning bit. That's why it's a good idea to put some protection between the tool and your body (see the photo at right).

Delta's new guard fits the bill. It's a nicely made unit intended to fit virtually any model. Although I wasn't impressed with the mounting hardware (a hose clamp), the fully adjustable guard felt solidly attached to the column.

***New Delta drill-press guard helps keep you safe.** Its clear polycarbonate shield will keep thin, broken bits or other shrapnel from hitting you.*

The guard's shield, made of clear polycarbonate, seemed small at first, but it afforded much greater visibility than the standard wire-cage variety seen in many production shops. And the shield should help with dust collection, which would be helpful if you were using a sanding drum in the drill press, for example.

The guard lists for $33.90. For more information, contact Delta International (4290 E. Raines Road, Memphis, Tenn. 38118; 800-223-7278). *—Alec Waters*

## On the horizon

When tool manufacturers introduce tools, usually at one of the big summer woodworking or hardware shows, they often show preproduction prototypes. Here's a taste of some of the more interesting new tools that were unavailable at this writing, but which should be available now in stores and through mail-order catalogs.

**Delta introduced its new Contractor's Saw II** at the National Hardware Show in Chicago last August. Changes to the old Contractor's Saw include a T-slot miter-gauge groove, a paddle-style on/off switch that's conveniently located just below the fence rail at the front of the saw (so you can turn it off with your knee or hip if you have to) and an accessory dust-collection connector that mounts to the trunnion, beneath the blade, and should remove most dust right at the source. Retail prices on the saw are expected to range from $600-$650.

Also at the National Hardware Show, **Makita introduced the LS1211 sliding compound miter saw.** This new unit is more versatile than any other sliding compound miter saw on the market: Its head tilts up to 45°, to both the left and the right, and the whole cutting head swings up to 60° to the left or right. The saw features a 15-amp motor, a single-pole slide for the cutting head, an electric brake and a shaft lock for quick, easy blade changes. We'll be getting one of these saws for review soon. Look for the results in a future issue. **Hitachi also showed a new 10-in. sliding compound miter saw,** which the company says should be available this spring. No other information was available at this writing.

There was big news on the cordless drill front at the tool show. **Makita came out with both 9.6v and 12v batteries that are 40% more powerful than the old batteries** and last 40% longer per charge, according to the literature I collected at the show. Additionally, Makita now has a version of these batteries (in both voltages) that has a power display. The power display shows you how much juice is left in the current charge and how much overall battery life is left. And the display can warn you when you're overtaxing the tool. Sounds interesting. The new batteries are compatible with older Makita drill/drivers that have the orange-red Mak-Pak-style batteries.

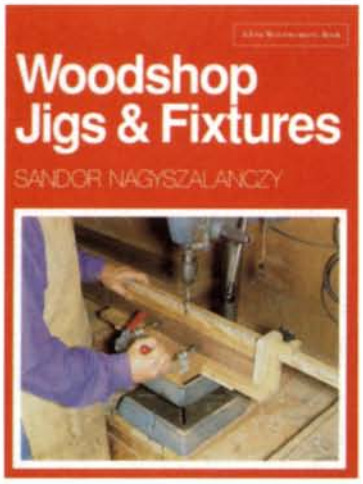
**Panasonic introduced the Predator Corner Master drill (EY6780CQK).** It has a revolving head that makes it look a bit like a Gatling gun. This mechanism allows you to drill or drive screws as close as 5/16 in. from a side wall. It's similar in all other respects to the rest of Panasonic's cordless drills (see *Fine Woodworking* #103, pp. 56-61 for more on Panasonic and other cordless drills, as well as information on what to look for in a cordless drill). This drill should be useful for cabinet installations and other close-quarter work. *—V.L.*

*Jim Tolpin is a writer and woodworker in Port Townsend, Wash. Vincent Laurence is an associate editor for* Fine Woodworking. *Charley Robinson is an associate editor for* Fine Woodworking. *Fred Farkas is a woodworker in Stony Point, N.Y. Alec Waters is an associate editor for* Fine Woodworking.



Photo this page: Alec Waters

**Woodshop Jigs & Fixtures** by Sandor Nagyszalanczy. *The Taunton Press, 63 S. Main St., Newtown, Conn. 06470; 1994. $22.95, paperback; 230 pp.*




When first asked to review *Woodshop Jigs & Fixtures*, I dreaded seeing another 200-jigs-for-this-or-that-machine-tool book. Such books are usually rich with examples but barren of construction theory. Much to my surprise, this book breaks that pattern.

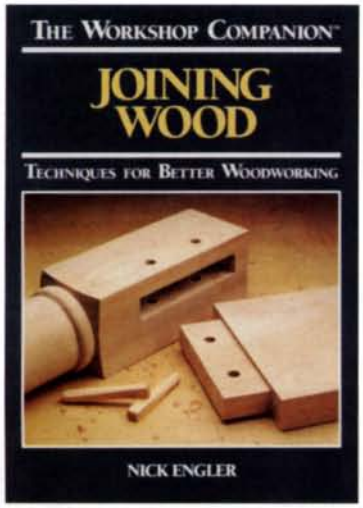
I was fascinated by many of the jigs and fixtures in the book because of their approach to a specific task. The tambour-slat fence for cutting multiple grooves on the tablesaw made me chuckle because it was so obvious yet so clever. The book's approach to simplicity is quite refreshing. Nagyszalanczy wisely distinguishes between a single-use jig and one that will run hundreds of pieces.

*Woodshop Jigs & Fixtures* has all of the most common jigs, but the book does not stop with the basics. The chapter on templates for shaped parts discusses machining simple and complex shapes using flush-cutting router bits, guide pins for overarm routers and vacuum-clamping systems.

Throughout the book, the author stresses safety. Guards and shields are used extensively on the examples he cites. I was appalled, however, that in the chapter specifically addressing safety, he suggests wearing gloves during a routing operation. Loose-fitting clothes, especially gloves on the hands is a definite "no" during any machining operation. My only other disappointment was the book's lack of a unifying, comprehensive theory of jig construction and use.

Photos and illustrations are accurate and easy to follow. The chapter on materials, hardware and construction is the most up-to-date and comprehensive discussion of available materials I've seen. His sources of supply section provides easy access to the materials needed to construct any type of jig or fixture. This book has a place in any shop, amateur or professional. *—Steve Latta*

**Joining Wood** by Nick Engler. *Rodale Press, 35 E. Minor St., Emmaus, Pa. 18098; 1992. $19.95, hardback; 128 pp.*



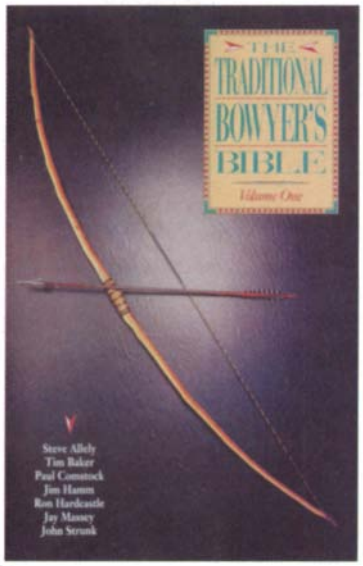

If I were to recommend a basic book for a beginning woodworker, it would be *Joining Wood*.

This is a book chock full of good, solid information, loaded with clear photos and hundreds of great drawings and diagrams. It is organized with chapters covering wood theory, tool selection and joinery, and it ends with a project section, which includes a small dovetailed stool and a cabinetmaker's bench. In addition, the text is full of vital information for the beginner on topics such as preparing stock, using a router plane and biscuit joinery.

*Joining Wood* is an attractive and well laid out book. There is no wasted space or wide margins. Scattered throughout the book are highlighted boxes with quick tips. There are also excellent designs for a cutoff jig, a splined miter jig and a finger-joint jig. Even the inside covers have useful charts on safety and a basic glossary.

Any beginner will feel a little less overwhelmed and a little more confident with this book perched on the workbench. *Joining Wood* is part of a series by Nick Engler. Other titles include: *Using the Tablesaw, Finishing, Routing and Shaping, Using the Bandsaw* and *Making Built-in Cabinets.* *—Mario Rodriguez*

**The Traditional Bowyer's Bible, Volume One** by Steve Allely, Tim Baker, Paul Comstock, Jim Hamm, Ron Hardcastle, Jay Massey, John Strunk. *Distributed by Lyons and Burford, 31 W. 21st St., New York, N.Y. 10010; 1992. $19.95, hardback; 326 pp.*




There is something magical and elemental about bows and arrows. As one of the oldest of man's weapons and tools for survival, the bow has played a pivotal role in history. Even today, the attraction of tying a string to a bent stick to send another stick flying through the air has led more than a few children to adventures in primitive woodworking. But the simplicity that has allowed the child or the ancient to succeed with a simple bow has been lost in modern archery with its space-age materials, cams and cables.

*The Traditional Bowyer's Bible* brings back the ancient art of bowmaking in its purest, traditional form, with no synthetic materials. Its authors, all accomplished bowyers and archers, describe in great detail how to build wooden bows.

But this isn't a romantic adventure back in time. The authors bring together modern science and supplies with a practical sensibility to promote bowmaking today as a viable endeavor for any woodworker. Tim Baker's chapter on bow design and performance alone is worth the price of the book because it explains fundamental principles of materials and construction. Not only are traditional bow woods such as osage orange and yew discussed, but there is talk about how to make a bow from a hickory tool handle obtained from the hardware store.

Any woodworker who has toyed with making a bow will find the tools to succeed in this book. Its clear discussions and descriptions are augmented by good black-and-white photos and drawings. Some of the explanation of green woodworking and basic principles of working wood go beyond just bowmaking. But the real value of the book is its ability to keep the magic of traditional bows and the bowyer's art alive in the hands of woodworking archers.

The book stands on its own, but it is also the first of three volumes on the subject compiled meticulously by this bowmaking team. The second and third books add more detail and an index to bring all the information together. *—William Sampson*

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*Steve Latta works for Kinloch Woodworking in Unionville, Pa. Mario Rodriguez, a contributing editor to* Fine Woodworking, *makes furniture and teaches woodworking classes in Warwick, N.Y. William Sampson is an archer and editor of* Fine Woodworking *magazine.*

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*Listings of gallery shows, major craft fairs, lectures, workshops and exhibitions are free, but restricted to happenings of direct interest to woodworkers. 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.*

***ARIZONA:*** **Call for entries**-Turning Plus... Redefining the Lathe-Turned Object III, thru Feb. 5. For information, send an SASE to Arizona State University Art Museum, Nelson Fine Arts Center, Box 872911, Tempe, 85287-2911. (602) 965-2787.

***ARKANSAS:*** **Show**-Grand Canyon State Woodcarvers 6th Annual Desert Woodcarving Show & Sale, Feb. 4-5, Phoenix Civic Plaza, Phoenix Room. For info, call (602) 345-9020.

***CALIFORNIA:*** **Workshops**-Woodworking for women. Furnituremaking with hand tools using traditional joinery, weekends. San Francisco. Contact: Debey Zito (415) 648-6861.
**Workshops**-Classes on woodfinishing and decorative painting for furniture and cabinets. For schedule, write Studio 1829, 1829 Stanford St., Santa Monica, 90404. (310) 453-0230.
**Workshops**-Shaker bench, sofa table, Mission lamp table, Adirondack chair, more. Saturdays and Sundays. No experience necessary. Private instruction available. For more information, contact the Woodworkers Place at (818) 952-3177.
**Workshop**-Woodworking and carving, ongoing courses starting in January. Martin Pierce Furnishings, 5433 W. Washington Blvd., Los Angeles. (213) 939-5929.

***COLORADO:*** **Classes**-Woodworking and related classes, year-round. For more info, write Red Rocks Community College, 13300 W. 6th Ave., Lakewood, 80401. (303) 988-6160.
**Seminars**-Woodworking seminars, September thru April. For more information, contact Schlosser Tool and Manufacturing Co., 301 Bryant St., Denver, 80219. (303) 922-8244.
**Exhibition**-The American Craftsmen 10th Annual Woodworking Exhibition, Jan. 1-15, Vail Public Library, Vail. For more information, call Tim O'Brien at (303) 328-7253.

***CONNECTICUT:*** **Exhibition**-Masters of Their Craft, featuring Dennis Elliot. March 18 thru April 23. Silvermine Guild Arts Center, 1037 Silvermine Road, New Canaan, 06840. (203) 966-5617.
**Workshops**-Furniture design, more. January thru March. Brookfield Craft Center, PO Box 122, Brookfield, 06804. (203) 775-4526.
**Call for entries**-Guilford Handcrafts Exposition, July 20-22. Deadline: March 11. Write: 38th Annual Guilford Handcrafts Exposition, PO Box 589, Guilford, 06437. (203) 453-5947.

***FLORIDA:*** **Exhibition**-Marriage in Form featuring Kay Sekimachi and Bob Stocksdale. Jan. 9-March 8. Tampa Museum of Art, Tampa. For info, call Kenna Moser (415) 329-2605.
**Call for entries**-Florida Woods, May 12-June 23. Deadline: Feb. 10. Send SASE to Dunedin Fine Art Center, 1143 Michigan Blvd., Dunedin, 34698.
**Show**-Central Florida Woodworking Show, March 3-5. Florida State Fairgrounds. Contact The Woodworking Shows, 1516 S. Pontius Ave., Los Angeles, CA 90025. (310) 477-8521.
**Meetings**-South Florida Woodworking Guild meets every second Monday, 7 p.m. Constantines, 1040 East Oakland Park Blvd., Ft. Lauderdale. For further information, contact Woody McLane at (305) 565-2729.
**Meetings**-Central Florida Woodworkers Guild meets the second Thursday of each month at 7:30 p.m. Woodcraft Supply Corp, 246 East Semoran Blvd., Casselberry. For more information, contact Roger Lovell at (407) 841-6155.
**Meetings**-Palm Beach Country Woodturners, monthly meetings. For more info, call Steve Blank (407) 747-7035.

***GEORGIA:*** **Show**- Atlanta Woodworking Show, Feb. 24-26. Gwinnett Civic Center. The Woodworking Shows, 1516 South Pontius Ave., Los Angeles, CA 90025. (310) 477-8521.

***INDIANA:*** **Show**-Indianapolis Woodworking Show. Jan. 27-29. Indiana State Fairgrounds. Woodworking Shows, 1516 South Pontius Ave, Los Angeles, CA 90025. (310) 477-8521.

***KANSAS:*** **Show**-Kansas City Woodworking Show, Feb. 17-19. Merchandise Mart. The Woodworking Shows, 1516 South Pontius Ave, Los Angeles, CA 90025. (310) 477-8521.

***MAINE:*** **Workshops**-Two-week basic and intermediate furnituremaking courses. Faculty includes Peter Korn, John McAlevey. For info, contact Center for Furniture Craftsmanship, 125 W. Meadow Road, Rockland, 04841. (207) 594-5611.

***MARYLAND:*** **Show**-Baltimore Woodworking Show, Jan. 6-8, Maryland State Fair Exhibition Hall. Contact The Woodworking Show, 1516 S. Pontius Ave, Los Angeles, CA 90025. (310) 477-8521.

***MASSACHUSETTS:*** **Show**-Massachusetts Woodworking Show. March 31-April 2. Eastern States Exposition. Woodworking Shows, 1516 S. Pontius Ave, Los Angeles, CA 90025. (310) 477-8521.
**Show**-Danforth Craft Festival, June 22-25. Danforth Museum of Art, Framingham. For more info, call (508) 620-0050.
**Classes**-Woodworking classes, throughout most of the year. For information, contact Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.
**Instruction**-Full-time program in fine furniture construction. Complete facilities. For more info, contact Wm. B. Sayre, Inc., One Cottage St., Easthampton, 01027. (413) 527-0202.

***MINNESOTA:*** **Classes**-Woodcarving classes year-round. For information, contact the Wood Carving School, 3056 Excelsior Blvd., Minneapolis, 55416. (612) 927-7491.

***MISSISSIPPI:*** **Classes**-Various woodworking classes. For more info, contact Allison Wells School of Arts & Crafts, Inc., Canton. (800) 489-2787.

***MISSOURI:*** **Call for entries**-Wood Concepts 95, October thru November 9. Deadline: April 21. For entry form and information, contact Columbia Art League, 1013 E. Walnut St., Columbia, 65201. (314) 443-2131.
**Show**- St. Louis Woodworking Show, Feb. 10-12, Gateway Center. For info, contact The Woodworking Shows, 1516 South Pontius Ave, Los Angeles, CA 90025. (310) 477-8521.

***NEBRASKA:*** **Meetings**-Omaha Woodworkers Guild meets at 7 p.m. the third Tuesday of every month. Westside Community Center, Omaha. For more information, contact John Cahill at 334-5550.

***NEW HAMPSHIRE:*** **Classes**-Fine arts and studio arts. Manchester Institute of Arts and Sciences, 114 Concord St., Manchester, 03104.
**Classes**-Various woodworking classes. For information, contact The Hand & I, PO Box 264, Route 25, Moultonboro, 03254. (603) 476-5121.
**Auctions**-Antique and craftsman's tool auctions, year-round. Contact: Richard A. Crane, Your Country Auctioneer, 63 Poor Farm Road, Hillsboro, 03244. (603) 478-5723.
**Workshops**-Week-long Shaker-style furniture and chairmaking workshops, year-round. For more info, contact Mary Sweet, Dana Robes, Wood Craftsman, Lower Shaker Village, Enfield, 03748. (603) 632-5385.
**Classes**-Make a Windsor chair with Michael Dunbar. Sack back, Jan 29-Feb. 1 and Feb. 25-March 1. Contact: Michael Dunbar PO Box 805, Portsmouth, 03802. (603) 431-4676.

***NEW JERSEY:*** **Show**-North Jersey Woodworking Show, Jan. 13-15, Garden State Exhibit Center. For more information, contact The Woodworking Shows, 1516 South Pontius Ave, Los Angeles, CA 90025. (310) 477-8521.

***NEW MEXICO:*** **Classes**-Woodworking classes. For more information, contact North New Mexico Community College, El Rito, 87520. (505) 581-4501.
**Classes**-Fine woodworking classes. For more information, write Santa Fe Community College, Santa Fe 87502, or call (505) 438-1361.

***NEW YORK:*** **Classes**-Various beginning and advanced woodworking classes. Constantine's, 2050 Eastchester Road, Bronx, 10461. (718) 792-1600.
**Classes**-Traditional 18th-century woodworking techniques with Mario Rodriguez. Contact: Warwick Country Workshops, PO Box 665, Warwick, 10990. (914)-986-6636.
**Meetings and classes**-New York Woodturners Association meets bi-monthly. YWCA, 610 Lexington Ave. (53rd. St.) New York City. Contact Howard Alalouf (914) 337-0226.
**Classes**-Woodworking, traditional and contemporary; turning and finishing with Maurice Fraser and Bill Gundling. All levels. The Craft Students League at the YWCA, 610 Lexington Ave., New York City, 10012. For more information, call (212) 735-9731.
**Call for entries**-Woodstock-New Paltz Art & Crafts Fairs. spring show, May; fall Show, September. Ulster County Fairgrounds, New Paltz, Deadline: Feb. 1. Contact Scott & Neil Rubinstein , P.O. Box 825, Woodstock, 12498 (914) 679-8087.
**Classes**-Wood inlay, sharpening, routing, spindle turning, woodcarving, veneering, finishing, tablesaw techniques and more, Saturdays. January thru April. For more information, contact Albert Constantine & Son, Inc., Woodworking Classes, 2050 Eastchester Road, Bronx, 10461. (718) 792-1600.
**Exhibition**-Woodworkers Expo 95, March 25-26. Saratoga Springs City Center, Saratoga. For more information, contact Joe Schanz, Woodworkers Expo 95, Northeastern Woodworkers Association, P.O. Box 94, Rexford, 12148-0094. (518) 783-8113.
**Show**-Greater Buffalo Woodworking Show, March 17-19. Erie County Fairgrounds, International Agri-Center, 5820 S. Park Ave., Hamburg, 14075. The Woodworking Shows, 1516 S. Pontius Ave., Los Angeles, CA 90025. (310) 477-8521.
**Class**-Intermediate Woodworking and Furniture Design, with Dennis Fitzgerald designer/craftsman, January 24-May 9. For more information, contact the Division of Continuing Education, SUNY, 735 Anderson Hill Road, Purchase, 10577-1400. (914) 251-6500.

***NORTH CAROLINA:*** **Meetings**-North Carolina Woodturners, second Saturday of each month. For more information, contact PO Box 1833, Hickory, 28603. (704) 324-5960.
**Show**-Charlotte Woodworking Show, March 10-12, Merchandise Mart. Contact The Woodworking Shows, 1516 South Pontius Ave., Los Angeles, CA 90025. (310) 477-8521.

***OHIO:*** **Meetings**-Cincinnati Woodworking Club meets from 9:00 a.m. to noon on the second Saturday of September, November, January, March and May. Reading High School, 801 E. Columbia Ave., Reading. For more information, contact Cincinnati Woodworking Club, 5974 Gaines Road, Cincinnati, 45247.
**Classes**-Turning and carving, January thru May. Contact: The Hardwood Store, 1695 Dalton Drive, New Carlisle, 45344. (513) 849-9174.
**Show**-Greater Columbus Woodworking Show, Jan. 20-22, Ohio Expo Center/Fairgrounds. The Woodworking Shows, 1516 S. Pontius Ave., Los Angeles, CA 90025. (310) 477-8521

***OREGON:*** **Meetings**-Cascade Woodturner's Association meets every third Thursday. For information, contact Cascade Woodturners, PO Box 91486, Portland 97291.
**Classes**-Oregon School of Arts and Crafts, 8245 S.W. Barnes Road, Portland, 97225. (503) 297-5544.

***PENNSYLVANIA:*** **Classes**-Windsor chairmaking, weekly and weekends. Contact Jim Rendi, Philadelphia Windsor Chair Shop, PO Box 67, Earlville, 19519. (215) 689-4717.
**Show**-The Furniture Market at Valley Forge, Feb. 10-13. Valley Forge Convention Center, King of Prussia. For more information, contact Robert Goodrich at (717) 245-9051.
**Call for entries**-Central Pennsylvania Festival of the Arts, July 13-16, State College. Deadline: Feb. 18. Send SASE to Katherine Talcott, Visual Arts Director, PO Box 1023 State College, 16804-1023. (814) 237-3682.
**Show**-22nd Annual Woodcarvers and Wildlife Art Festival, March 18-19. Student Union Building, Millersville University, Millersville. For more information, contact Mark Lenox at (717) 768-3092.
**Classes**-Bowl turning with David Ellsworth. Three-day weekend workshops in private studio, beginner to intermediate, January thru March. For more information, contact David Ellsworth, Fox Creek, 1378 Cobbler Road, Quakertown, 18951. (215) 536-5298.
**Show**-Philadelphia Buyers Market of American Craft, Feb. 17-20. Pennsylvania Convention Center. For more information, contact The Rosen Group, Mill Centre, 3000 Chestnut Ave., Suite 300, Baltimore MD 21211. (410) 889-2933.
**Show**-Fort Washington Crafts Festival, March 17-19. Fort Washington Expo Center. For more information, contact Sugarloaf Mountain Works, Inc., 200 Orchard Ridge Drive, Suite 215, Gaithersburg, MD 20878. (301) 990-1400.
**Show**-Harrisburg Woodworking Show, March 24-26. Farm Show Complex. Contact The Woodworking Shows, 1516 S. Pontius Ave., Los Angeles, CA 90025. (310) 477-8521.

***TENNESSEE:*** **Workshops**-Woodturning and coopering thru March. Arrowmont School of Arts and Crafts, PO Box 567, 556 Parkway, Gatlinburg, 37738-0567. (615) 436-4101.

***TEXAS:*** **Meetings**-North Texas Woodworker's Association meets the third Tuesday of each month. Contact Bruce May, North Texas Woodworker's Association, PO Box 831567, Richardson, 75083. (214) 271-0125.
**Classes**-Woodworking classes year-round. Bowl turning basics to advanced furniture and cabinetry. For further information, write to Woodshop, Inc. Woodworking School, 1225 West College, Suite 612, Carrollton, 75006, or call (214) 466-3689.
**Show**-Rio Grande Valley Woodcarvers show and sale, Jan. 20-21. McAllen, Civic Center. For more information, contact Dorothy Chapapas, Route 2, Box 150, McAllen, 78504. (210) 581-2448.
**Meetings**-The Woodturners of North Texas meets the last Thursday of every month, 7:30-10 p.m. For more information, contact the Paxton Beautiful Woods Store, 1601 W. Berry St, Fort Worth, 76110. (817) 927-0611.
**Classes**-Carving classes every Thursday, 6:00-9:00 p.m. Classes are taught by Don Schol. For more information, contact the Paxton Beautiful Woods Store, 1105 Sixth St., Carrollton, 75006. (214) 245-1192.

***VERMONT:*** **Courses**-Yestermorrow Design and Building School. For more information, contact the school at Route 1 Box 97-5, Warren, 05674. (802) 496-5545.

***VIRGINIA:*** **Call for entries**-Spring in the Valley Arts and Crafts Show, April 21-23, Salem Civic Center, Salem. Deadline: Feb. 1. For more information, contact Kathy Hudson, Fair Director, PO Box 1369, Salem, 24153. (703) 389-6163.

***WISCONSIN:*** **Show**-Greater Milwaukee Woodworking Show, February 3-5. Wisconsin State Fair. Contact the Woodworking Shows, 1516 South Pontius Ave., Los Angeles, CA 90025. (310) 477-8521.

***CANADA:*** **Workshops**-Traditional Windsor chairmaking. Weekly courses. For more info, contact David Goodwin, Village Chairmaker, Sparta, Ont., N0L 2H0. (519) 775-2751.
**Association**-Canadian Woodturners Association. Markham, Ont. For more information and to receive the quarterly newsletter, call (905) 479-0755.
**Meetings**-West Island Woodturners Club (Montreal) meets every Tuesday, September thru May. For more information, contact Dennis Brown, 8817 Cure Legault, Lasalle, Que. H8R 2V9. (514) 366-6071.
**Show**-Calgary Woodworking Expo, Jan. 13-15. Stampede Park, Roundup Centre, Calgary, Alberta. For more information, contact DJC Enterprises (403) 236-5834.

***SCOTLAND:*** **Workshops**-Ongoing workshops. For more information, contact the Myreside International School of Antique Furniture Restoration, Myreside Grange, Gifford, East Lothian, Eh41 4JA. (062 081) 0680.

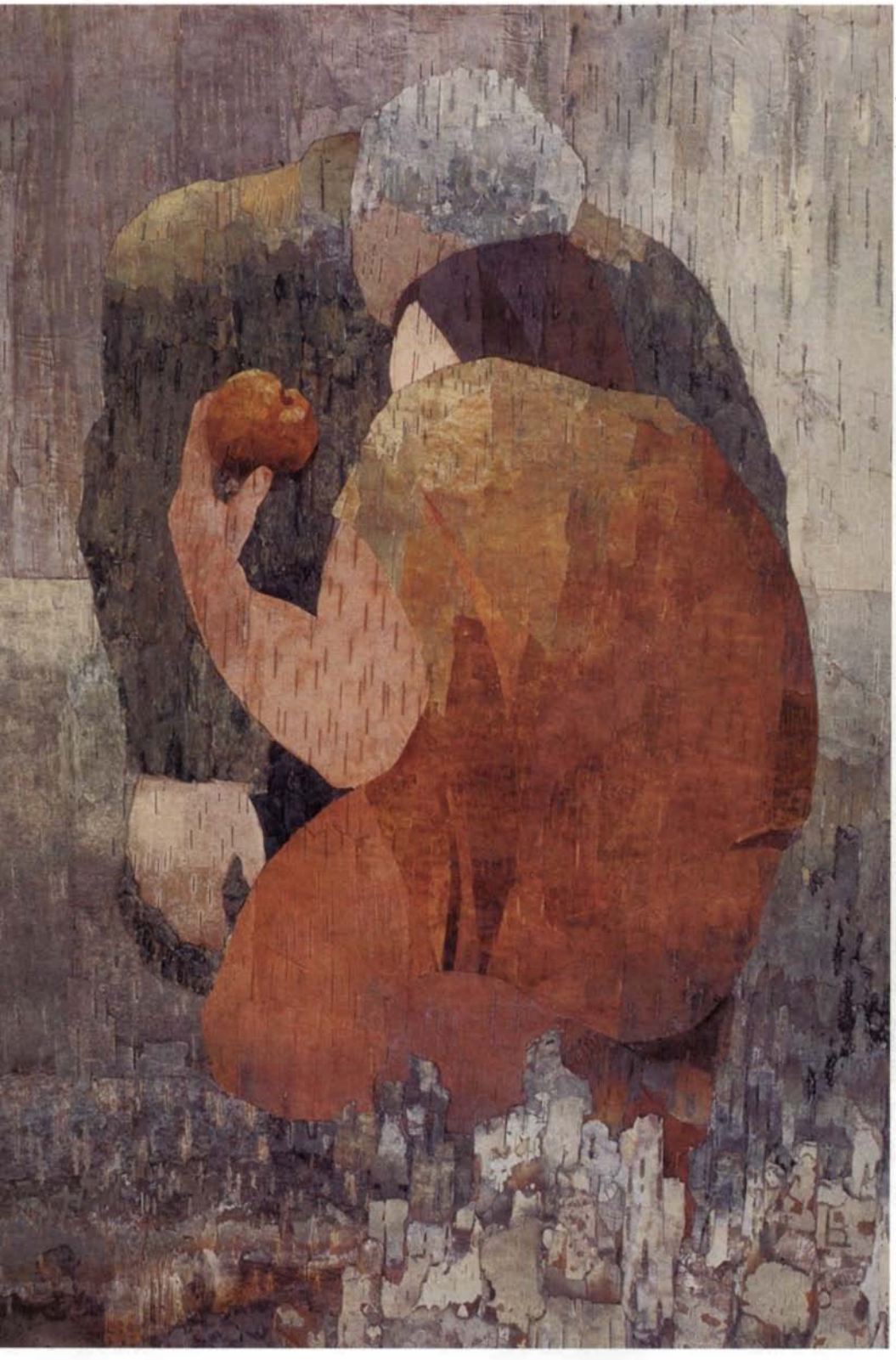

Photo: Dominique Leroy-Prince

Photo: Ray Prince

***Birch bark is easy to obtain** in much of northeastern North America. This downed tree was less than 50 ft. from the road in metropolitan Toronto. A pocket knife and patience were all that was needed to remove a large sheet of bark intact.*

Photo: Vincent Laurence

***Regular white glue works best for holding down birch bark.** A pallet knife makes it easy to apply glue precisely to small areas. The two boxes in the foreground show some of birch bark's wide color variation.*

***Collages show birch bark's extensive color spectrum.** The Apple (left), completed in 1993, is representative of much of Leroy-Prince's work in its emotionally evocative imagery.*

# Forest floor to gallery walls: a birch-bark odyssey

It was birch-bark canoes that first inspired Toronto artist Dominique Leroy-Prince to create works of art from tree bark. French-born Leroy-Prince was fascinated by the canoes and birch-bark documents (American Indians used birch bark as paper) she saw in the Ontario Museum more than 25 years ago. Armed with a classical art school background, she began experimenting with birch bark as a medium, steadily refining her technique over the years. The results are works such as those shown above and on the back cover. To date, she has had four solo shows, been in numerous group shows and sold approximately 40 of her birch-bark collages.

Leroy-Prince finds her raw material in the woods in and around Toronto, taking bark only from trees that are already down (see the top right photo). Often, she will

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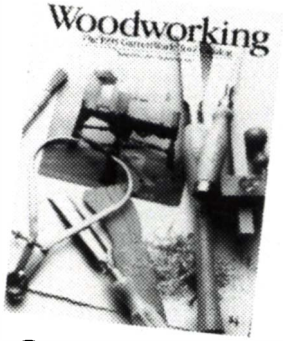


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iron the bark between a couple of paper towels, perhaps misting the bark a little bit on one side, to get it to flatten. Then she stores the birch bark in flat shirt boxes, plastic bags or whatever else she has around that will keep the bark relatively flat until she's ready to use it.

She cleans off any loose material using an old toothbrush and glues it onto acid-free cardboard, using a pallet knife to apply white glue (see the bottom right photo on p. 122). Where several layers of bark overlap, Leroy-Prince will fair the edges of the pieces on their backs by scraping them carefully with a razor knife. The result is a surface that has some texture but doesn't look or feel terraced. She leaves the surfaces of her collages unfinished, but she frames and mounts them behind glass to protect them from dust and dirt.

*—Vincent Laurence, associate editor*

## Built for speed

Thinking back to my younger days living on a lake in Sturbridge, Mass., I can vividly remember seeing an iceboat skimming across the surface of the ice. I was amazed at the speed and agility of this craft. Ever since then, the thought of building such a craft has been in the back of my mind. Then, a couple of winters ago, I was lucky enough to be able to take a ride in a "skeeter" on Lake George, N.Y. I knew right away that this project wasn't getting put off any longer.

The addicting part of ice boating is the sudden burst of speed that you get with a gust of wind. You will be going 20 mph, and suddenly you are launched to 35 or 40 mph, with nothing in between. On a good day, it's easy to reach up to two-and-a-half times the speed of the wind.

All visible parts of my iceboat are made from mahogany (see the photos below). The fuselage is constructed using ⅜-in. by 1¼-in. strips individually fitted, screwed, plugged and bonded with epoxy to a series of red oak ribs. The nose is a solid laminated block bandsawn and shaped with a power plane and belt sander. Holes were bored to allow for steering cables. The spring board and runner plank are laminated into an arc to compensate for the weight of the boat and its pilot. The mast is 18 ft. tall, laminated so that the center is hollow to allow for the halyard line. The finish was three coats of West System epoxy and two coats of spar urethane wet sanded between each coat.

Total set-up time is approximately half an hour from broken-down state to ready to sail. Overall dimensions are 11 ft., 2 in. wide by 17 ft. long. I spent about 135 hours on this project, which was well worth every minute.

*—Paul J. Girouard, Sturbridge, Mass.*

***Fine workmanship shows in the details—****The cockpit (below) shows the meticulous work Girouard put into his iceboat.*

***Iceboat is fast on the ice and quick to set up—****Paul Girouard's iceboat can be set up for sailing in about a half-hour, but it took him more than 100 hours to build the craft out of mahogany and oak.*

Photos this page: Alec Waters

## INDEX TO ADVERTISERS

## A davenport from Down Under

What is often referred to as a ship's desk or captain's desk is more correctly termed a davenport in recognition of the original designer. The first such desk was made by the English firm of Gillow for a Capt. Davenport in the late 18th century. There is a vast array of different designs for this desk, but they all had drawers in the side, usually on the right with dummy drawers on the left rather than in front.

I built my davenport of burl walnut, Brazilian mahogany, bird's-eye maple and Macassar ebony. My desk has taken about 600 hours to build over a long period interrupted for seven months by poor eyesight due to a cataract, which has now been successfully removed. I am retired and took up cabinetmaking in 1985 without any prior experience. I am self-taught with all the heartache and problems that involves.—*Warren E. Cuffe, Mullumbimby, New South Wales, Australia.*

Photos: Michael Collins

***Davenport divulges a secret compartment**—Warren Cuffe built his davenport to include several secret compartments, including the one shown here, which rises out of the desk's top when a hidden wooden spring-catch is released.*

***Spectacular burl clothes desk**—When Cuffe's desk is closed, the walnut burl he used as a primary wood is free to show off its wild figure. The desk also is made of Brazilian mahogany, bird's-eye maple and Macassar ebony.*

## My grandfather's shop

***Child's Christmas present is gift of woodworking**—This snapshot from John Osteraas' childhood shows the workbench his grandfather crafted for him, passing down a tradition of woodworking.*

One of my earliest childhood memories is of standing at my grandfather's side, watching him turn walnut gavels for his Masonic Lodge. I marveled at all the tools hanging on the wall of his shop.

For my fourth Christmas, he made a workbench for me, just the right height, with a vise, a drawer and a screwdriver rack (see the photo above). I learned to use a hammer by pounding every nail I could find into the top of that bench.

We moved 300 miles away when I was 5. To this day, I remember running into our new home and halfway down the basement stairs to make sure my workbench had made the move also. I no longer had the constant attention of my grandfather, but at least I had my workbench.

On my sixth Christmas, there was a present for me that I could barely lift: a handmade tool chest chock full of tools. Not toy tools but real tools from Sears. A hammer, three chisels, screwdrivers, pliers, a hand drill and bits, a folding rule, a carpenter's pencil and apron. The tools have long since been lost; I still have the chest, but it's much smaller than I remember it.

For my seventh Christmas, I received a small gift that was so heavy it felt like lead. It turned out to be a Sears sabersaw. A power tool! This was a gift more valuable than gold. But what I really wanted was a tablesaw like my grandfather's. Using some redwood scrap from a neighborhood construction project, I built a box to hold the sabersaw upside down, so I could feed wood into it. Although I didn't realize it then, cutting redwood with a sabersaw produces a distinctive, pleasant odor.

My grandfather died when I was 12, and I became the caretaker of all his tools. I spent my teen years puttering away in the basement shop. When I went to college, I gave away some of the tools and packed the rest in a friend's basement. For 20 years, those tools have moved with me. With school and career and kids, I don't have time to putter anymore. The tools are simply tools for household repairs.

But one night, I was working in the shed fixing an old wooden school clock when my 8-year-old daughter, Sarah, tiptoed out to see what was going on. She was fresh from her bath, wearing a clean pair of jammies. (Mom was out, so illicit activity such as going out to the shed in jammies was okay.) Sarah found a scrap and announced that she was going to "cut it with the cutter (jigsaw)." She set the hold-down and proceeded to cut the scrap into a dozen small pieces. With a note of triumph in her voice, she announced that she had made a puzzle and challenged me to put it together. After I figured it out, she asked me to tuck her into bed.

But that's not the end of the story. You see, the piece of scrap she had picked up happened to be a piece of redwood trim. Cutting it on the jigsaw created the odor from 30-some years ago and brought back all the memories I have recounted here. I was reminded of the simple pleasure of doing something for the first time, of all the hours of pleasure woodworking has brought me and how woodworking transcends generations. I was reminded of the exquisite pleasure of simply messin' around in the shop. But most importantly, I am glad to see myself in my daughter, and I hope she will carry on my and my grandfather's love of woodworking.

—*John Osteraas, Palo Alto, Calif.*

### *Notes and Comment*

*Got an idea you'd like to get off your chest? Know about any woodworking shows, events or craftsmen of note? Just finished a great project? If so, we would like to hear about them. How about writing to us? And, if possible, send photos or transparencies to Notes and Comment,* Fine Woodworking, *PO Box 5506, Newtown, Conn. 06470-5506.*

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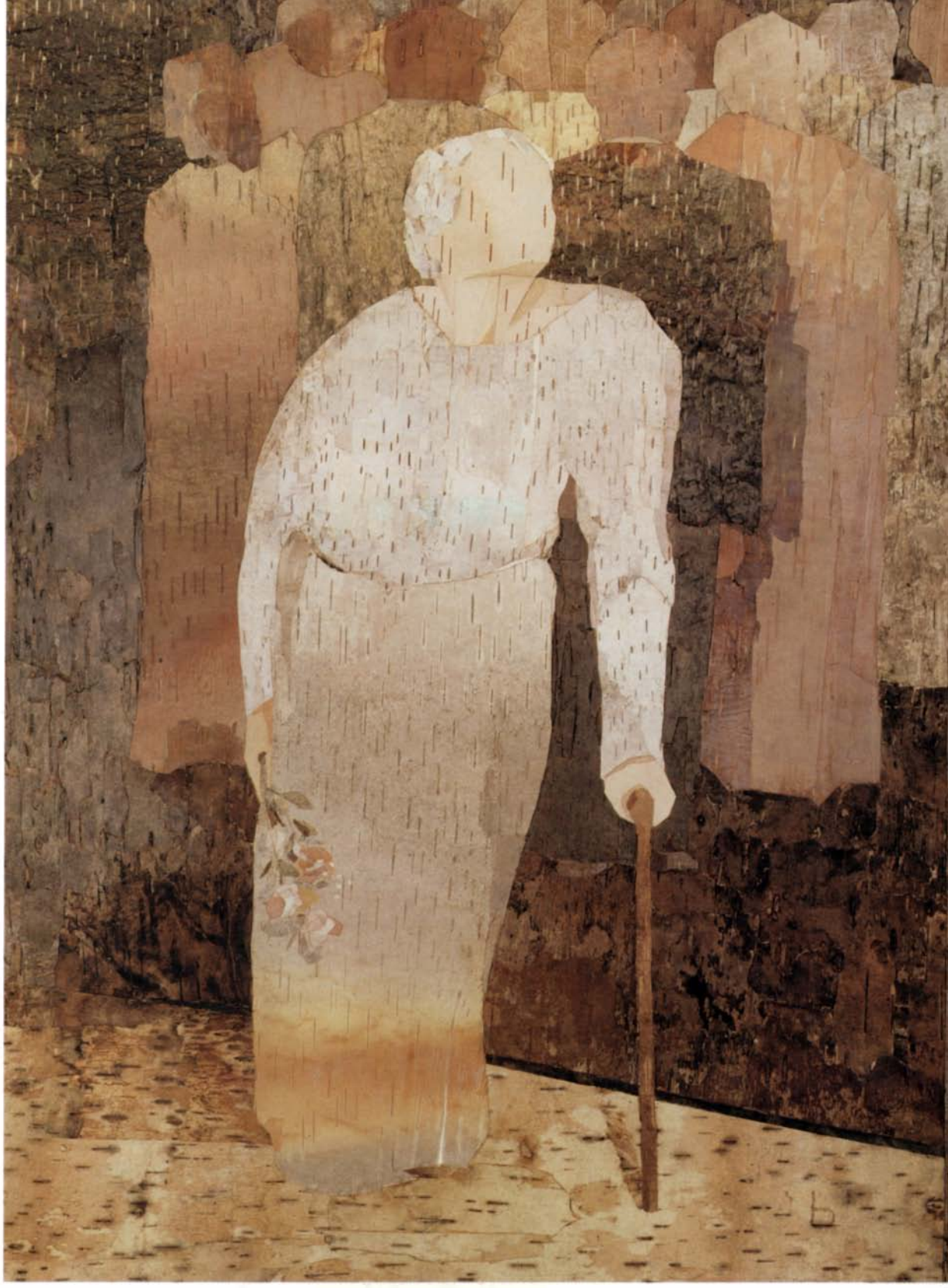
# ARTISTRY IN BIRCH BARK



Birch bark might seem an unlikely material for a fine artist, but Dominique LeRoy-Prince of Toronto, Canada, has found her niche using this humble, but incredibly varied material. Using nothing but birch bark, she's made beautiful marquetry-like images (she calls them collages) for the past 25 years. The piece above, *Birthday Party*, is 22 in. by 17 in. and was completed in 1992. For more on Leroy-Prince's work and technique, see p. 122.

Photo: Gary Graham