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Fine WoodWorking

April 2004
No. 169

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- User's guide to waterstones
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Departments

On the Cover: *We test ½-in. bandsaw blades to find out which ones are best for resawing. See p. 76. Photo: Michael Pekovich*

Classic tool chest built with hand tools, p. 36

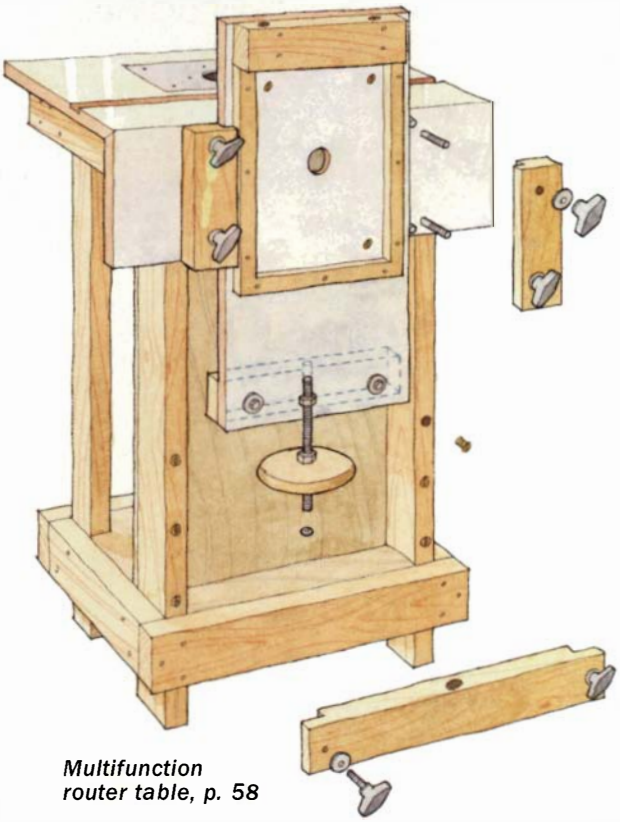
Sharpening tools on waterstones, p. 30

Repairing turning mistakes, p. 92

MARCH/APRIL 2004 NO.169

Articles

Spray finishing, p. 68



Multifunction router table, p. 58

Cherry, America's premier cabinetwood, p. 64

Contributors

Ernie Conover (Wood Turning) is a frequent contributor to *Fine Woodworking* and the author of a number of woodworking books. It is fitting for us to introduce our wood-turning department with an article by Conover, as he is an authority on the subject. He has written several wood-turning books for The Taunton Press—*Turning for Furniture* (1996), *Turn a Bowl with Ernie Conover* (2000), and *The Lathe Book* (2001)—and was co-designer of the Conover lathe. He and his wife, Susan, run Conover Workshops in Parkman, Ohio, where he teaches woodworking and turning, and she teaches fiber arts. Aside from woodworking, Conover enjoys reading, traveling, fly fishing, fast cars, and motorcycles.

Robert W. Lang (Rules of Thumb) has been a professional woodworker since 1973, designing and building custom cabinets, furniture, and millwork. He also is the author of *Shop Drawings for Craftsman Furniture* (Cambium Books, 2002) and *More Shop Drawings for Craftsman Furniture* (Cambium Books, 2003). His latest book, *Shop Drawings for Craftsman Interiors*, has just been published.

Richard J. Gotz ("Simplified Three-Way Miter") has been working with wood for more than 30 years, but said he became more focused when he joined the Minnesota Woodworkers Guild in 1993. He served as president of the guild for five years and was the coordinator of its annual juried exhibition during that time. Outside the shop, Gotz is a software engineer for Siemens, working on projects that run rail and subway systems in several countries. On the odd weekend when he isn't making sawdust, you'll find Gotz and his wife, Kate, on Minnesota's lakes in search of the elusive muskie.

Kevin McLaughlin ("A Versatile Router Table") lives in Helena, Ala., with his wife and two children. He was first drawn to woodworking by visits to his grandfather's workshop, which was filled with old hand tools. McLaughlin's many years working as a machinist and mechanical designer have influenced the tools and techniques he uses in his own shop, where he incorporates CAD, power tools, and precision measuring equipment. McLaughlin spends his free time in his basement workshop making toys for his children and furniture for family and friends.

David Charlesworth ("A User's Guide to Waterstones") began his career as a furniture designer and maker. For the past 27 years, Charlesworth has taught fine furniture making to students from all over the world. He has written extensively for the British publication *Furniture and Cabinetmaking*, and a two-volume collection of his articles is available at www.davidcharlesworth.co.uk. Charlesworth currently is working on a video about handplane use. He lives on the north coast of Devon, England, in a medieval manor house that he restored from a ruin, and his workshop across the garden is an airy, two-story converted stone barn of about 1,000 sq. ft.

George Walker ("Woodworker's Guide to Steel") has spent nearly three decades in the metalworking industry, starting out as an apprentice machinist. Today, he manages the steel supply for a busy Midwest factory that uses 400 tons of steel each week. For pure enjoyment, Walker builds reproductions of period furniture in his basement workshop, a place that's pleasantly devoid of clocks, quotas, and deadlines.

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Letters

A soldier's thanks

I just want to say thank you for such a helpful and rewarding Web site. Being stuck here in Kuwait in the middle of the desert in support of Operation Iraqi Freedom, your site is a joy to read and a valuable source of information. There really is no other place we soldiers can go to get this kind of information. Again, thank you.

—Spc. Glen Hicks, 1498th Transportation Co., Camp Victory, Kuwait

More on tabletop glue-ups

In reference to the lead photo in Gary Rogowski's "Gluing up Tabletops" (*FWW* #166, p. 46), I have two helpful suggestions on the gluing-and-clamping procedure.

1. Fold a piece of wax paper over the ends of the boards before clamping, to avoid any staining of the wood by the clamps and also to avoid the sticking of the clamps to the wood.

2. Use rubber covers on the jaws of the pipe clamps to avoid any marring of the edges of the boards.

—Art Nichols, Pittsfield, Mass.

Where's the dust?

Yesterday, the annual *Tools & Shops* issue (*FWW* #167) arrived. That was Friday, and it was a very full day, so there was no time to open the magazine.

Since today is Saturday, I waited until lunch before opening it so I would have the time to look through the articles at a leisurely pace. As usual, there were lots of pictures of projects as well as completed shops. My wife joined me for lunch and had a quick look at the magazine as well. That's when the trouble began.

Lon Schleining's "The Essential Workbench" (pp. 38-45) started it all. Yes, it shows an exploded drawing of the bench, but it also shows actual photographs of the bench in various stages of construction.

Nowhere is there any sign of sawdust or shavings to be found. My wife asked why my shop was never this clean even after I'd supposedly cleaned it up.

There was a picture of a benchtop planer in use (p. 43) but no fountain of shavings flying from the exhaust chute. I quickly explained that was because the author had a nice dust-collection system.

She pointed out that on the same page there were pictures of other tools in use that didn't have dust-collection systems attached, and they didn't seem to be producing shavings or dust either.

I didn't have a comeback, so I suggested we look at a different article. "A Shop Inspired by School Memories" (pp. 46-49) showed another pristine layout. I pointed out that the picture on p. 49 was computer generated, and dust and shavings were not likely details to be included by the computer.

She pointed to the pictures of the same shop on p. 47 and asked why there were no old pots of glue on the bench, no dust or shavings on the floor or on the occupant, and no unfinished projects lying about.

At this point, I felt like a courtroom witness who had encountered Perry Mason. Quickly, I leafed through the magazine and was delighted to find "Make a Wooden Scraper" (pp. 66-69).

There were shavings and sawdust in most of the shots. I tried to linger on those few photographs, but she found Bill Endress' "Roll-Away Workshop" (pp. 70-74). This one was really bad news: Even the two vehicles were clean, and the floor would have done an operating room proud. There wasn't even an oil stain from the vehicles.

Having made her point quite clearly three times, my wife left me to ponder my approach to plain, old-fashioned neatness and maybe even personal hygiene.

With a sigh, I turned back to the front of the issue and found the Shop Design

About your safety

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

—Anatole Burkin, editor

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department on "A shop in the backyard" (pp. 22-26).

Trying to change the subject somewhat, I commented that the author had built the shop largely by himself. I volunteered that there was no dust in this shop either, but that was because it was brand new.

You'd think that after all of these years I would have learned when to drop a subject. My wife picked up the magazine and spotted the price tag for construction: $83,000.

Sensing an opportunity to salvage something from the conversation, I said that I'd never spend that amount of money to build a shop. She warned that if I tried, my executors would have to finish the job. I'm not sure what she meant by that, but I don't think it's good.

If you have them, please send pictures of shops with lots of dust and shavings.

–Bill Howorth, North Vancouver, B.C., Canada

Stick to the title

I don't agree with Jim Johnson's letter "A view on editorial content" (*FWW* #167, p. 8), in which he says that *Fine Woodworking* should attempt to "reach across the broad spectrum from the beginner to the most experienced."

As readers and woodworkers, we can choose from a large number of magazines. I read *Fine Woodworking* because it generally is not oriented to the beginner. I also read other magazines because they are targeted to those of us with lesser skills and experience.

Editors must choose carefully the audience they wish to serve, since they cannot be everything to everyone.

Specifically, I found "Anatomy of a Chest of Drawers" (*FWW* #163, pp. 36-43) extremely useful because it discussed theory and principles rather than just following a set of drawings. I can apply that understanding to my own designs.

In contrast, "A Tablesaw Primer: Ripping and Crosscutting" (*FWW* #167, pp. 56-61) was quite disappointing. There was nothing in this article that I haven't seen a dozen times before.

If *Fine Woodworking* dilutes its content to basic skills and product reviews, then it's not living up to the promise of its title or my expectations as a subscriber.

–Alan K. Tope, Holly Springs, N.C.

Corrections

We listed two out-of-date prices for tools in the last issue (*FWW* #168). The correct price for the Veritas No. 6 fore plane (p. 29) is $219. And the price of the Leigh FMT jig (p. 53) from Lee Valley Tools is $749.

Writing an article

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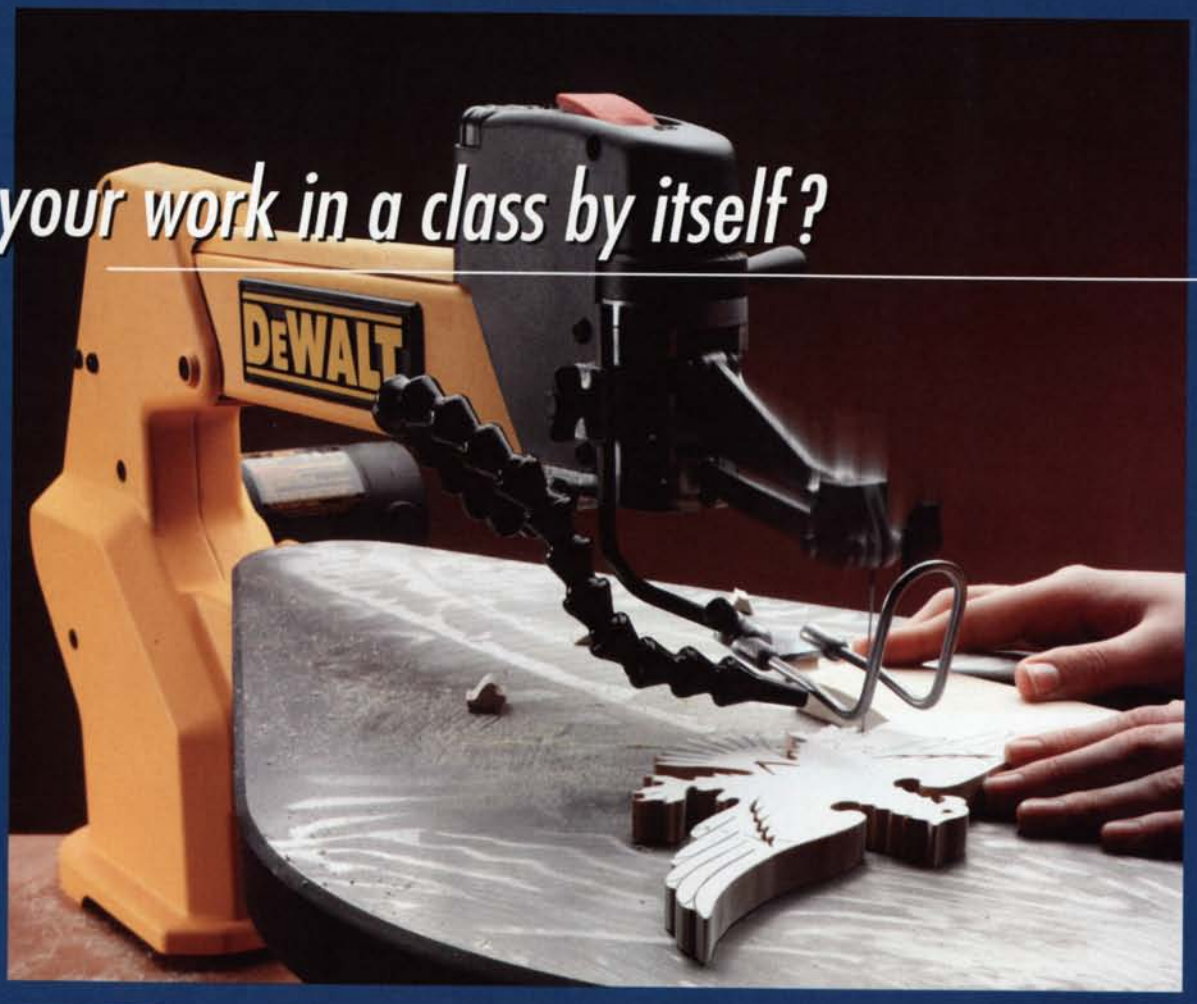
is your work in a class by itself?



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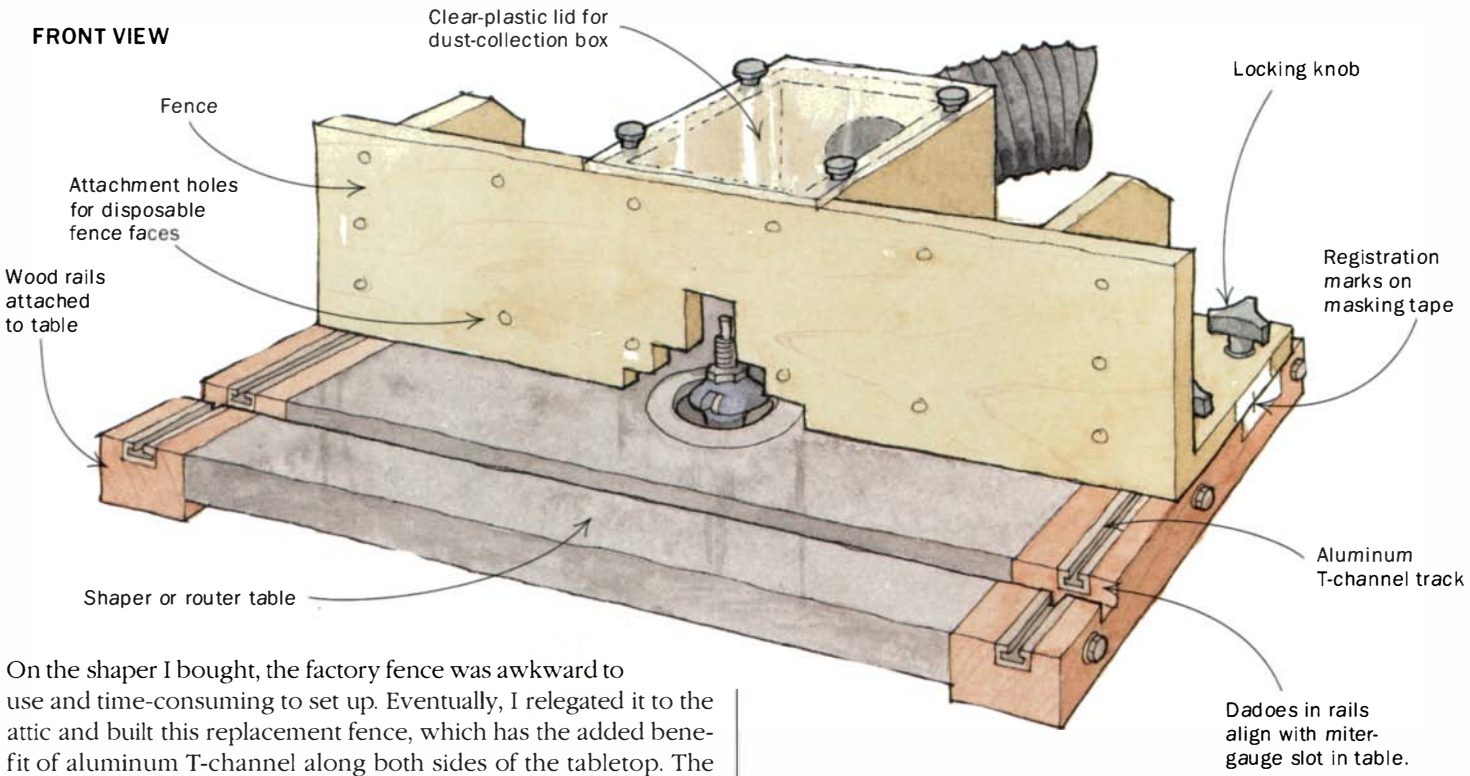
Methods of Work

EDITED AND DRAWN BY JIM RICHEY

Improved shaper fence

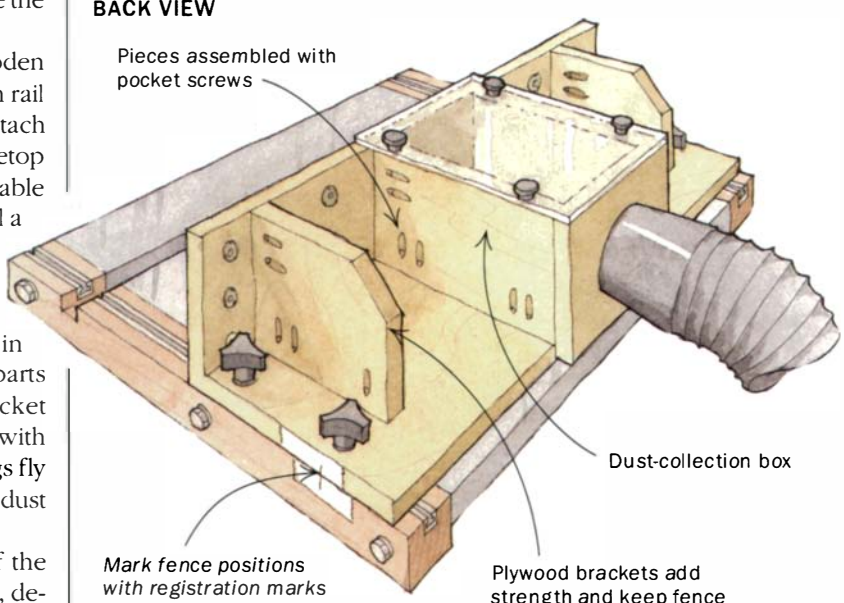


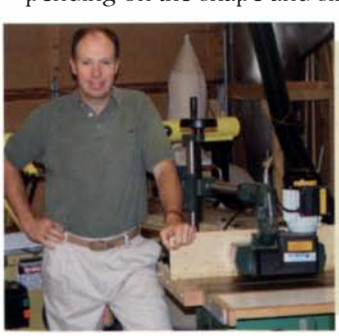
On the shaper I bought, the factory fence was awkward to use and time-consuming to set up. Eventually, I relegated it to the attic and built this replacement fence, which has the added benefit of aluminum T-channel along both sides of the tabletop. The T-channel track makes it easy to position, secure, and fine-tune the fence, which would work just as well on a router table.

To build the fence, you must first make the two solid wooden rails that attach to each side of the table. Rout a groove in each rail and install a length of aluminum T-channel in the groove. Attach the rails to the table by drilling and tapping holes into the tabletop and bolting the rails in place. Position the rails flush with the table or slightly below. Before securing the rails, you'll need to mill a dado across the width of each rail to line up with the miter-gauge slot in the existing tabletop.

Next, build the fence assembly and attach it to the table with flat-headed toilet bolts (also called closet bolts) that slide in the T-channel. I made the fence from plywood, aligned the parts with biscuits, and assembled the parts with glue and pocket screws. At the back of the fence, I added a dust-collection box with a clear-plastic removable lid because I want to see the shavings fly while the shaper is running. If a problem develops with the dust collection, I'll know about it right away.

To complete the fence, drill several holes into the face of the fence and install T-nuts in the back to attach a variety of faces, depending on the shape and size of the cutter you'll be using. I like





A reward for the best tip

Marshall Fletcher was frustrated with the fence that came with his shaper, so he built a new one of plywood, lumber, and aluminum that is more versatile and user-friendly. His design also would work on a router table. Fletcher was born in Rhodesia and educated in South Africa but now lives and works in Delaware as a corporate information systems manager. For his winning tip, he'll receive a set of hand-forged chisels (www.barrtools.com). Send your best tip, along with any photos or sketches (we'll redraw them), to Methods of Work, Fine Woodworking, *PO Box 5506, Newtown, CT 06470-5506.*

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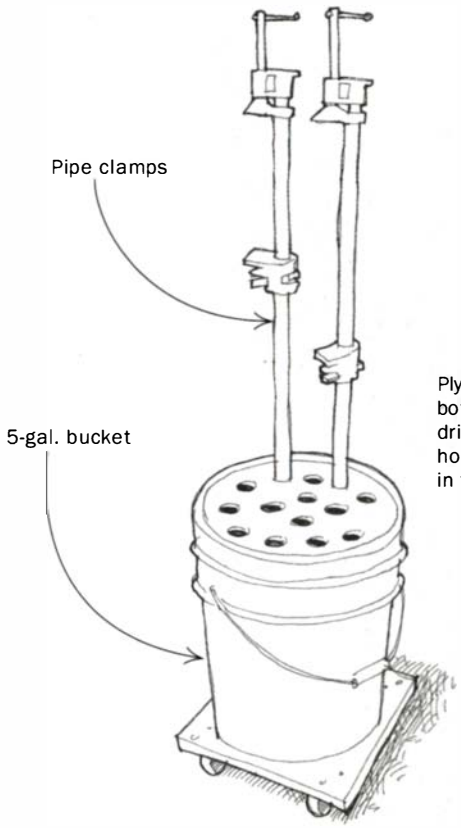
to use ⅜-in.-thick Baltic-birch plywood for the disposable fence faces. One final note: I recommend using masking tape on both sides of the fence and the rails to record registration marks after establishing a setup for a particular job. These marks allow you to repeat or make fine adjustments to the fence position.

—Marshall Fletcher, Dover, Del.

Clamp-storage bucket

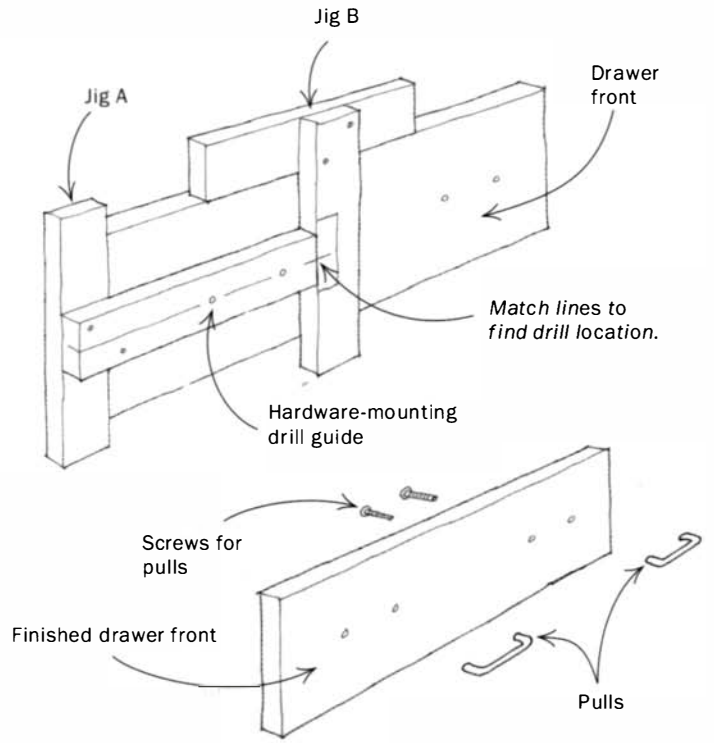


Here's an effective pipe-clamp storage solution that's portable and next to free. Starting with an empty 5-gal. plastic bucket, drill a series of holes through the lid to fit the pipe ends. Cut a ¾-in.-thick plywood disc to fit the bottom of the bucket and drill holes in it to match and line up with those in the lid. Add a plywood base and casters to make the bucket movable. Roll the bucket to where it is needed; then store it in the corner when it is not needed.

—Pat Murphy, Albany, Ore.

Hardware-mounting jigs

When I needed to mount 16 brass pulls on eight drawers of varying widths, I designed a pair of jigs for locating and drilling the screw holes (see the drawings above right). The idea is basically two simple T-squares built of ¾-in.-thick stock. Draw a centerline on the face of jig A and then, using a drill press, drill two holes on the centerline to act as a drilling guide. The holes should be spaced precisely to fit the hardware and at the desired distance from the edge of the jig. To make jig B, draw a witness mark that represents half of the drawer width. For example, if the drawer is 8 in. wide, then measure down 4 in. to make the witness mark. I like to use masking tape on jig B so that I can change tape and have a clean mark for each different drawer width.



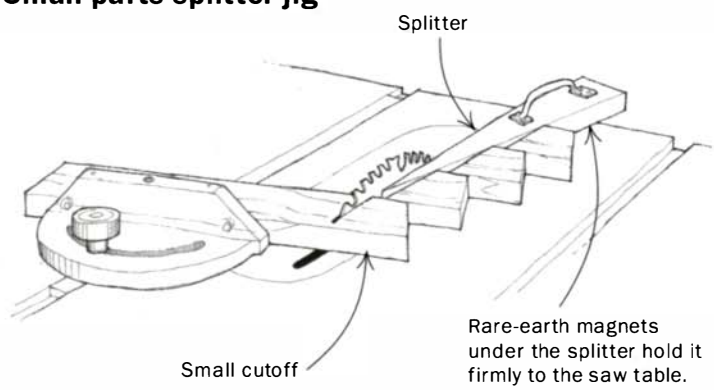
To use, place jig A on the side of the drawer and jig B on the top of the drawer. Slide jigs A and B around until the centerline on A and the witness mark on B intersect. Clamp jig A to the drawer front at this location and drill the two holes. Repeat this process on the opposite side of the drawer front and on all of the other drawers.

—Richard H. Jones, Walkerton, Va.

Quick tip: More than 50 years ago an old tool-and-die maker taught me to put mothballs in tool-storage drawers to keep the tools from rusting. It works with all kinds of tool steel.

—Loren Massie, Kenosha, Wis.

Small-parts splitter jig



When making multiples of small parts such as the segments used in a laminated bowl turning, small cutoffs can vibrate around the saw table, hit the back of the blade, and shoot around the shop—a dangerous situation. This simple jig prevents that from happening.

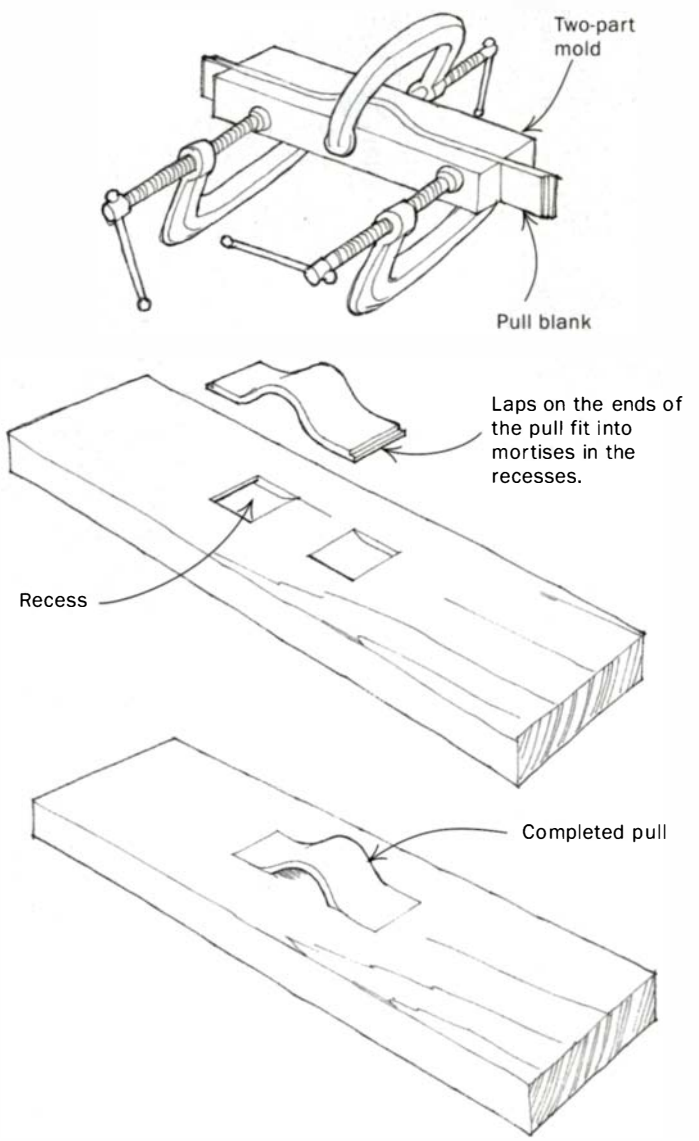
The jig is constructed from a 1x2 about 13 in. long. Taper the block over its length and position it so that the pointed end rides against the right side of the sawblade, below the arc of the

teeth. The jig is held securely to the saw table with a couple of ¾-in. rare-earth magnets, available from Lee Valley Tools (800-871-8158; www.leevalley.com). Be sure to purchase and use the holders for the magnets. A drawer pull makes a good handle to position the jig on the saw table.

When setting the jig in place, be careful to allow clearance at the back of the blade. Position the point of the splitter so that the cut is complete just before the workpiece meets the splitter. You don't want the splitter in the sawkerf before the cut is complete because it would cause the workpiece to bind against the blade.

—Ronald E. Young, Chattanooga, Tenn.

Flush-mounted laminated drawer pulls



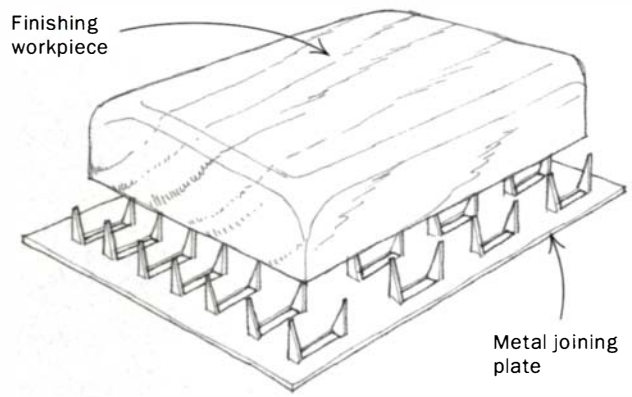
Here's an idea for flush-mounting laminated drawer pulls or door handles. I make the pulls from three 1-mm-thick pieces of birch, apply glue between the layers, and clamp them into a two-part mold.

When I remove a pull blank from the mold, I cut it to the desired length, square up the sides, and tenon the ends. Actually, the tenons are more like small laps on each end. To fit the pull, I cut two recesses in the drawer face, one for each end of the pull. Each recess has a matching mortise to fit the laps. I cut these mortises with a screwdriver that I sharpened just for this purpose.

I usually can flex the pull into position for a tight, snap-in fit. I add a little dab of glue at each end, and the result is a strong, attractive, flush-fitting drawer pull that requires no hardware.

—Joel D. Gese, Spokane, Wash.

Using joining plates to hold items for finishing

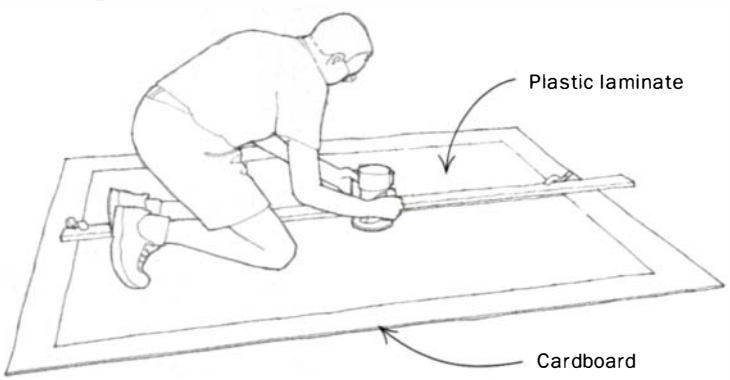


I use metal joining plates as supports for finishing. The plates serve the same purpose as driving fine nails or brads into a block of wood, except that the plates are ready-made. You can find them at a lumberyard that stocks metal framing anchors or at a roof-truss builder. A couple of common brands are Gang-nails and Simpson Strong-Tie.

The sharp points that project from the plates hold the workpiece being finished above the table and leave little or no marks on the underside of the workpiece. Use one plate to support a small item or several to support a larger item. I've used the plates to support objects as large as a chest of drawers.

—David E. King, Pendleton, Ore.

Cutting sheets of laminate



When you're working alone, cutting up large, floppy sheets of plastic laminate can be difficult. My method is to place cardboard on the floor and then place the laminate on top of that. I cut the laminate with a router using a ⅛-in. straight bit extending just far enough to cut through the laminate and partway into the cardboard. This works well for making both straight and curved cuts.

—Rolland Kuhlmann, Canon City, Colo.

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Notes & Comment

In memoriam: Ed Moulthrop, wood-turning pioneer

Ed Moulthrop, one of the fathers of modern wood turning, died recently in Atlanta at the age of 87. Moulthrop was one of five men who laid the foundation for contemporary, art-based turning, most of whom passed away in the past few years: James Prestini (1993), Mel Lindquist (2000), Rude Osolnik (2001), and Bob Stocksdale (2003). Each brought a unique background to his work and thus to modern wood turning; qualities ranging from thrift and ingenuity to scale, simplicity, and emphasis of the natural material. Their work was instrumental in establishing wood turning as an art worthy of major museum collections and high prices, and they opened doors for many turners.

Influential work. *Moulthrop's giant vessels, some of which are shown here, featured simple but classical lines and often were made from local woods.*

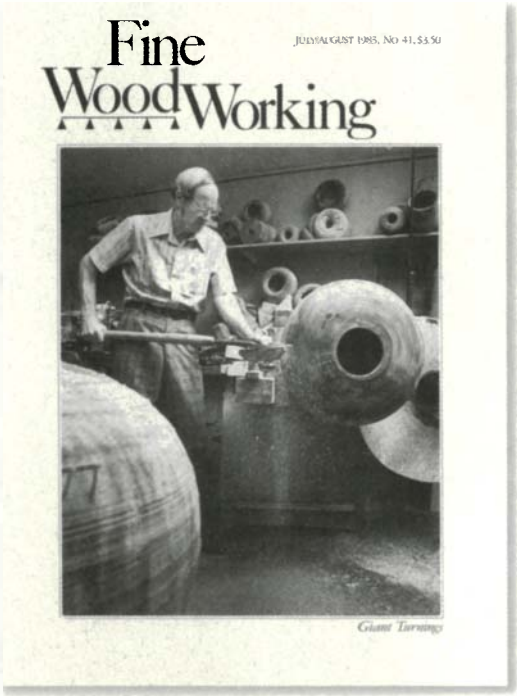
Moulthrop's work was shaped by his love of wood and his background in architecture. Like many of the other pioneers, he was self-taught, and an early experience with a tool being grabbed by the wood and hurled into the ceiling of his shop convinced him to take a blacksmithing class and make his own tools.

Similarly, Moulthrop designed and made his own bowl lathes, using scrap fixtures from junkyards. Without these large lathes, his monumental bowls wouldn't have been possible. Moulthrop's innovative method was to rough-turn his work and then soak it in vats of polyethylene glycol to stabilize the unseasoned wood. Later, he would refine the shape and finish the piece with a special solution.

A friendly man, Moulthrop will be missed, but his legacy and passion live on in the acclaimed work of his son, Philip.

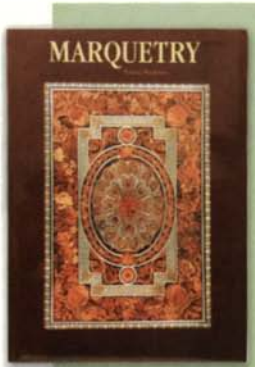
For information on an upcoming exhibition in Atlanta that includes Moulthrop's work, go to www.finewoodworking.com.

—Albert LeCoff is executive director of the Wood Turning Center (www.woodturningcenter.org) in Philadelphia, which produces Turning Points *magazine.*



Part of woodworking history. *Ed Moulthrop's large lathe, tools, and vessels were the subject of the cover story in* FWW *#41, in 1983.*

Book review



Marquetry *by Pierre Ramond. Getty Publications, Los Angeles; 2002. $75 hardcover; 237 pp.; www.getty.edu.*

In my never-ending search for trusted methods to produce high-quality woodwork, I've found few books as comprehensive, as beautiful to look at, and as compelling as this one by Pierre Ramond. First published in French in 1977, it has been revised by the author and translated into English.

The book gives detailed explanations of tools and step-by-step techniques used by the masters of marquetry, past and present. Along the way it defines and differentiates the many nuances of craft included under the heading of "marquetry."

For the woodworker interested in learning the intricacies of this craft, *Marquetry* is a resource beyond compare.

—Karen Wales, assistant editor

The bible of marquetry. *With precise working drawings, clear descriptions, and some of the finest examples of marquetry in the world, this book stands apart from all others on the subject.*

Photos, this page: Courtesy of the Wood Turning Center Library, Philadelphia (top right); Karen Wales (bottom left and right)

Probst Furniture Makers wins prize at Providence

Jim Probst, who runs Probst Furniture Makers in Hamlin, W. Va., received the Best in Show award at the Fine Furnishings Show in Providence, R.I., this past November. The award, which came with a $1,000 cash prize, was sponsored by *Fine Woodworking* and was presented by the editor, Anatole Burkin.

"Probst's work shows a dedication to craftsmanship as well as an elegant sense of design. Jim knows how important the details are to the overall look of a piece of furniture," Burkin said. At the show, Probst displayed a body of work—bed, casework, tables, and chairs—from his "Dora" line, named after his grandmother. The Dora line of furniture pairs figured maple with cherry, all in a natural finish.

Tom McColley

Probst is a self-taught furniture maker and was featured in *Fine Woodworking* once before (*FWW* #165, p. 82). To see more of his work, go to www.probstfurnituremakers.com.

The Fine Furnishings show, which is run by Karla Little, is coming up on its ninth year and attracts a talented pool of craftspeople working in wood, metal, stone, fabric, and other media. This year's show will be held Nov. 5-7 at the Rhode Island Convention Center. For more on the show, log on to www.finefurnishingsshow.com.

Brad Feinknopf (right)

Best in Show. *Jim Probst (left) was honored at the Fine Furnishings Show in Providence, R.I., for his original furniture designs (above).*

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DeWalt planer features a three-knife cutterhead

When they designed the model 735 planer, the folks at DeWalt incorporated some of the best features found on existing benchtop planers. They also added a few innovative features—in particular, a three-knife cutterhead—which results in an impressive machine.

All other things being equal, surface smoothness improves as the number of cuts per inch goes up. With three cutterhead knives instead of two, model 735 increases the number of cuts per inch.

Also, the 735 has two feed rates. When at the fastest rate, a speed good for general planing, it makes 96 cuts per inch. The slower rate produces 179 cuts per inch, more than any other planer on the market.

Even if you have central dust collection, you won't need to hook it up to this machine. A built-in chip-extraction system worked flawlessly, channeling the waste directly into a trash can with the optional ($45) hose and fabric collar.

To make knife changes easier, the top opens like the hood of a car, allowing comfortable access to the cutterhead. It takes only a single Allen wrench, with a magnet in the handle, to do everything from loosening the bolts to removing the knives. Despite the conveniences, though, the blade-changing process took longer than average when compared to other benchtop models I've looked at, in part due to having to change three knives instead of two.

SPECS AND PERFORMANCE

STREET PRICE	$480
MAXIMUM PLANING WIDTH	13 in.
WEIGHT (net)	92 lb.
SPEED (no load)	10,000 rpm
KNIVES REVERSIBLE	Yes
EXTRA KNIVES INCLUDED	No
PRICE OF KNIVES	$45
DUST-COLLECTION HOOD	Yes
AVG. SNIPE PER SIDE	Less than 0.001 in.
OUT OF PARALLEL	Less than 0.001 in.
NOISE (load)	102 db.
KNIFE-CHANGING TIME	21 min.

DEWALT 735

The planer caused only minor snipe, and the surface quality it left was excellent. Carriage parallelism was good. The built-in dust-collection feature worked well. On the downside, it's noisier, heavier, and more expensive than most other benchtop planers.

Cordless Dremel now has a lithium-ion battery

Dremel recently introduced its latest cordless tool, model 8000-01, the first power tool to have a lithium-ion battery. According to Dremel, the 10.8v battery provides 50% more power than the standard battery in other cordless rotary tools. Company research also says that, after four months, the lithium-ion battery will maintain 85% of its original charge, while a nickel-cadmium battery will be fully drained.

Model 8000-01 includes a variable-speed feature that allows you to set the speed

Photos, except where noted: Tom Begnal; DeWalt photos: Lon Schleining

Built-in chip collection. *The optional system, consisting of a hose and a trash-can fabric collar, did a good job collecting chips.*

I liked the double-edged knives. They include elongated holes that fit on alignment pins. Should the knives get a nick, the resulting raised line on the wood surface can be removed simply by slightly shifting one of the knives.

Although there is no cutterhead locking lever or knobs, DeWalt seems to have virtually eliminated the snipe problem. I found almost no measurable snipe.

The stock planer does not come with infeed and outfeed extension tables. Although they're not essential, I find them handy. DeWalt offers them as a $45 accessory. For more information, contact DeWalt at 800-433-9258 (www.dewalt.com).

—Lon Schleining is a contributing editor who lives in southern California.

Upgrade for Oneida cyclone collectors

I've been happy with the Oneida Air Systems 1½-hp cyclone dust collector I bought several years ago, except when it comes time to clean the standard internal-cartridge air filter. That task requires the cyclone to be partially dismantled and the air filter taken outside to be blasted with compressed air, a messy and time-consuming chore.

Oneida has solved that issue with a new, exposed filter. I tried the new setup, retrofitting the external components to my older-style system. The new filter is larger than the old one, so you probably can go longer between cleanings. But what's really great is that cleanup involves simply blowing compressed air across the exterior of the now-exposed cartridge, without the need for disassembly. Once the dust inside the cartridge settles, it is removed via a detachable dustpan.

No disassembly required. *The exposed filter on the Oneida Air Systems cyclone is cleaned with a blast of compressed air. Dust settles into a removable dustpan.*

The retrofit kit, which attaches to the exhaust port of the collector, has a side benefit in that it reduces the noise level. For 1½-hp dust collectors, the kit costs $234; elbow and square-to-round connector are extra. (If you buy a new collector and choose this option, the cost is slightly less.) Contact Oneida Air Systems at 800-732-4065 (www.oneida-air.com). ***—Anatole Burkin is editor of*** **Fine Woodworking.**

anywhere between 5,000 rpm and 35,000 rpm. It also has three LED lights that indicate the amount of battery-charge remaining, a feature I found most useful. Charging time for the battery is about three hours.

To get some sense of run-time on a fully charged battery, I did a couple of tests. For the first one, I simply started the tool and let it run until it stopped. I did this three times, recording an average run-time of 50 minutes, with each run coming in within one minute of one another.

Lights serve as fuel gauge. *Three side-by-side lights on Dremel's new cordless tool let you know how much battery power remains.*

Then, to get a better idea of run-time with the tool under load, I made a little testing jig. The jig simply applied a light sanding force to the tool. First, though, I mounted a ½-in.-dia. by ½-in.-long sanding drum to the tool, and then added a 60-grit sanding sleeve. After three tests, the average run-time was 32 minutes.

The Dremel model 8000-01 sells for about $70. It comes with a battery charger, 60 accessories, and a plastic carrying case. For more information, contact Dremel at 800-437-3635 (www.dremel.com).

—Tom Begnal is an associate editor.

Photo, this page (top right): Anatole Burkin

WondeRip tablesaw rip fence

Wazee Products has designed a Biesemeyer-style rip fence, called the WondeRip, that takes a lot of the risk away from ripping small parts. With the WondeRip, you start the cut in the normal manner. But for the last few inches of the rip, when your fingers would be most in harm's way, a mechanism inside the fence comes into play.

At that point, your right hand grasps the knob of a lever on top of the rip fence. Almost as soon as the lever is pushed forward, a small aluminum finger slides out from inside a long slot in the fence. As you continue to push the lever forward, the aluminum finger follows along in the slot, pushing the stock all the way past the blade. A pair of hold-downs helps keeps the stock from lifting off the table. And your pushing hand gets no closer to the blade than the top of the rip fence.

The WondeRip is smart and well made. And it works. Plus, it performs just fine as a regular rip fence because the finger stays out of the way when it's not needed. When you become adept at using the mechanism, you'll see an improvement in cut quality. The hold-downs and aluminum finger let you hold and push the workpiece more steadily, so the cut is straighter, and the edges have fewer saw marks.

The WondeRip must be used with a tablesaw splitter. Also, keep in mind that for the narrowest of ripcuts, the WondeRip can't be used with most blade guards.

My only complaint concerns the slot for the finger, which is 5/16 in. wide and runs the length of the fence face. I worry that thin workpieces, such as 1/8-in.-thick plywood, might slip into the fence face and either cause a kickback or ruin the cut.

The WondeRip costs about $270. For more information, contact Wazee Products at 559-297-0351 (www.wonderip.com).

—Strother Purdy builds furniture in Bridgewater, Conn.

Rip fence helps keep fingers away from the blade. *The WondeRip uses a lever attached to an aluminum finger to push narrow parts through the blade. The operator's notched stick helps hold the stock against the fence.*

Rabbeting-bit set from Infinity has 1-in.-long cutter

Infinity Cutting Tools, based in Clearwater, Fla., is a new company distributing cutting-tool products for woodworkers. Among its line of router bits is a rabbeting-bit set, part number 00-556, that includes a 1⅜-in.-dia. cutter and seven bearings with diameters that range from ⅜ in. to 1⅜ in. By changing bearings you can create six different rabbet widths: ⅛ in., ¼ in., 5/16 in., ⅜ in., 7/16 in., and ½ in. Or, with the largest bearing installed, the cutter becomes a flush-trimming bit.

The bit has a 1-in. cutting length, which is longer than other rabbeting bits I've seen on the market. Keep in mind, though, that if the rabbet is also a wide one, some routers might not have the power to make the cut in a single pass. That said, I was able to cut a ½-in.-wide by 1-in.-deep rabbet in one pass, albeit a slow one, with a 2-hp router mounted in a router table.

This set sells for about $39. For addition information, contact Infinity at 877-872-2487 (www.infinitytools.com).

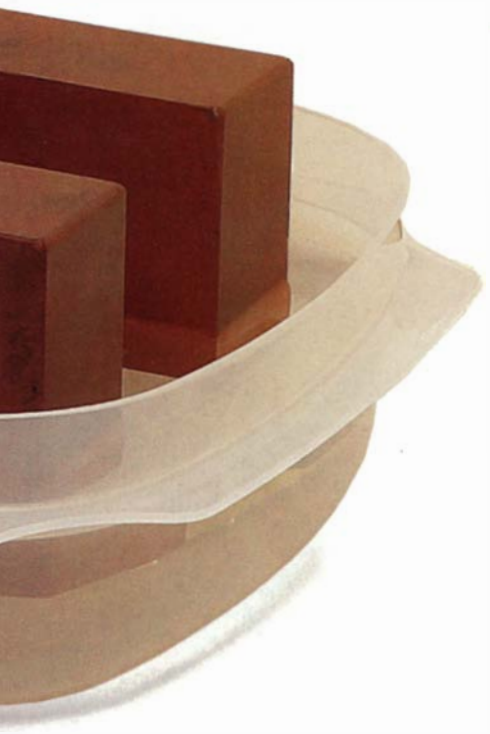
—T.B.

Rabbeting-bit set has extra cutting length. *With an uncommonly long 1-in. cutter, plus seven different bearings, this set can make rabbets of varying lengths and widths.*

WATERSTONE SHARPENING KIT

To get and maintain razor-sharp cutting edges, you will need an 800- and a 1,200-grit waterstone and a plastic food container to store them wet. The 8,000-grit stone is stored dry, then misted with water and rubbed with a small Nagura to create a slurry prior to use. A rubber mat stops the stones from slipping when in use.

A User's Guide to Waterstones



There's no faster or more economical way to obtain razor-sharp tools

BY DAVID CHARLESWORTH

Sharpness is a function of two polished surfaces meeting to form a cutting edge. The easier and quicker it is to polish these edges, the more likely you are to keep your tools sharp, and sharper tools will raise the quality of your woodworking projects.

My preferred method of sharpening is to use Japanese synthetic waterstones, and I recommend them to my students. They cut faster and give a better edge than most other sharpening systems. The grit size of an 8,000-grit stone is about 3 microns, meaning that scratches left by it may be no more than 1.5 microns deep. This is a much better polish than you get with alternatives such as translucent Arkansas, ceramic, or diamond stones.

The cost of a set of synthetic stones is less than that of most other sharpening systems. A basic set of stones—800 grit, 1,200 grit, and 6,000 grit with a Nagura honing stone—costs around $75. Substitute an 8,000-grit stone for a slightly finer polish, and the cost is still well under $100.

To get the best from these stones, a disciplined approach to both using and maintaining them is essential. I have developed a time-tested method for sharpening that requires minimal effort.

A sharpening and storage station

I store the coarser 800-grit and 1,200-grit stones on their sides in plastic trays of shallow water. A dash of household bleach can be added to the water to slow down the

FLATTEN THE STONE BEFORE SHARPENING

Mark the surface of the stone with a pencil. Then place a sheet of 240-grit wet-or-dry sandpaper that has been soaked in water onto a piece of ½-in.-thick glass. Keep abrading the face of the stone until all of the pencil lines have been removed, indicating that the surface is perfectly flat. After flattening the stone, ease the edges slightly.

Photos: Mark Schofield

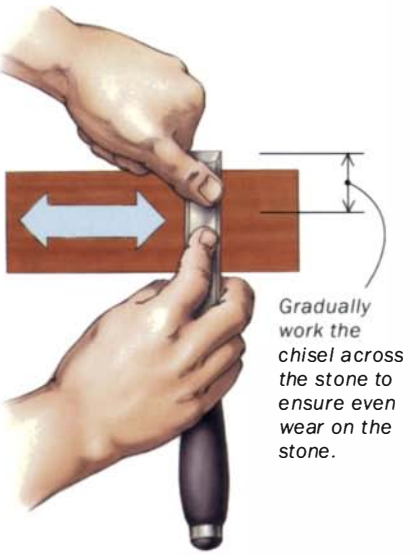
SHARPENING WITH WATERSTONES

Flatten the back of the tool

Almost all new chisels and plane irons need to have their backs flattened. To achieve this while avoiding hollowing out the waterstones, Charlesworth employs two different sharpening strokes.

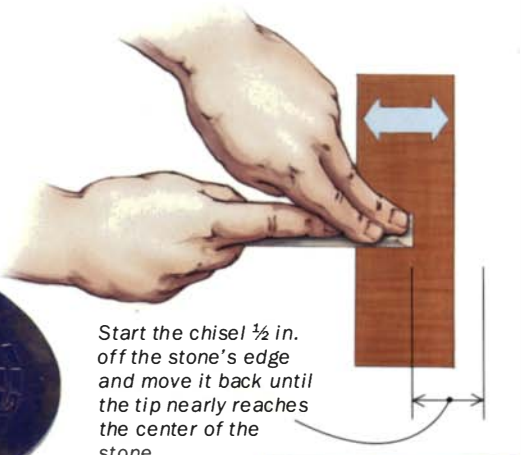
1. WORK THE LENGTH OF THE STONE

The chisel or plane iron is moved up and down the length of the stone. Over the course of about 10 strokes, the tip moves from ½ in. off the stone to one-third of the way onto it. With this technique, you avoid hollowing the middle of the stone. Rotate the stone 180° and repeat the process.



2. WORK ACROSS THE STONE

Move the chisel back and forth, gradually working down the length of the stone. This will replace scratches running across the back of the chisel with scratches running the length of the back.



WHAT YOU SHOULD SEE AT THIS POINT

After using the 800-grit stone followed by the 1,200, the back should look dull, with no deep scratches or machine marks left near the edge.

Drawings: Chuck Lockhart

growth of mold. Don't store your stones in water if your workshop freezes at night, because the stones will shatter. Stones stored dry will be ready to use after a five-minute soak. Stones of 4,000 grit and finer always are stored dry and sprayed with water only prior to use.

My sharpening station also includes a simple stone-flattening device: ½-in.-thick float glass attached to a Corian base that drains the sludge back into the sink.

Storing waterstones

Coarser (800- and 1,200-grit) stones are stored on their sides with water just above the lower edge of the stones. Stones of 4,000 grit and finer are stored dry and sprayed with water just before use.

Controlling the stone's wear

Because waterstones are designed to erode with use, in the hands of the inexperienced they quickly can develop a hollow profile. My sharpening technique minimizes hollowing, which is particularly helpful when flattening the backs of new plane and chisel blades.

Lengthwise flattening—There are two types of stroke, the lengthwise stroke and the crosswise stroke, which refer to the orientation of the stone rather than the blade. Lay the blade across the 800-grit stone with its edge about ½ in. off the left edge of the stone. (Left-handed readers, please substitute left for right in these directions.) Apply heavy pressure with your left hand just behind the grinding bevel, and gently grip the neck of the chisel with your right hand to stop it from pivoting. Use a full-length stroke to and fro, pausing just before either end of the stone.

As you work the chisel up and down the stone, allow the edge of the chisel to travel slowly to the right until it is one-third of the way across the width of the stone. When the chisel's tip reaches this point, allow it to drift back to its starting point, with the tip off the left side of the stone. The cycle then begins again. It takes about 10 strokes to and fro, traveling to the right and then back to the left.

By ensuring that the chisel tip spends 50% of its time off the left edge of the stone, the stone will wear slightly convex in its width, making it impossible to create a hollow in the width of the stone. The left edge will be worn slightly hollow in its length, but more on that later. After about 50 full-length strokes to and fro, rotate the stone 180° to work the other edge of the stone.

After 100 strokes, it's time to flatten the stone

Flattening is done with 180-grit or 240-grit wet-or-dry sandpaper stuck to the glass by water surface tension. New waterstones should be flattened before use. Mark a grid of pencil lines on the surface. By watching the grid change during flattening, you will be able to interpret exactly how the surface wore during honing. When all trace of this grid is gone, your stone is dead flat. Ease the soft edges to prevent them from crumbling in use.

Crosswise flattening—Relying on only lengthwise grinding could cause wide

3. REPEAT THE PROCESS ON THE FINE STONE

Before using the 8,000-grit stone, spray water on it and rub the surface with a Nagura. This speeds up sharpening by creating a slurry.

The same two types of strokes that were used on the coarser stones are used on the 8,000-grit stone. The aim is to keep the back flat while polishing the area behind the tip of the blade.

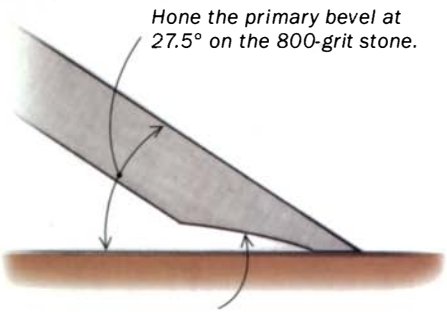
A PROPERLY FLATTENED BACK

The back of the chisel should have a nice polish and an even scratch pattern within ½ in. of the front edge.

Draw the chisel toward you with the pressure on the tip of the chisel, not on the wheel of the guide.

1. HONE THE PRIMARY BEVEL ON THE 800-GRIT STONE

***Set the bevel angle.** With the chisel mounted in a honing guide, line it up against a shopmade angle finder to establish the desired angle for honing a bevel on the 800-grit stone.*



chisels and plane blades to become convex in their width. The crosswise grinding stroke is much shorter and across the stone: The chisel tip starts off the stone and moves to a point one-third to halfway across its width. Gradually work down the length of the stone and back again; then rotate the stone 180° and use the other half of the face. When this is done, flatten the stone again and repeat the first type of stroke.

The scratch patterns on the chisel's back from these two different strokes will be at right angles to each other. If you watch how the first crosswise ones are replaced gradually by the lengthwise scratches, you will be able to see whether the back of the blade is flat.

Your objective is to remove the manufacturer's grinding marks adjacent to the tool's cutting edge. Depending on the quality of this grinding, you may have to repeat the cycle several times. A badly convex blade (which should have been rejected at purchase) could take an hour or two, while a well-ground blade might take only 20 minutes. You are done when at least the first ½ in. behind the tip of the chisel has uniform lengthwise scratches from the 800-grit stone.

By the way, for ¼-in. and narrower chisels, use the crosswise strokes only. Lengthwise strokes may rock the chisel and make it convex in its width.

This sharpening method creates a slight hollow in the length of the chisel's back. This hollow might amount to 1/64 in. over the length of a western chisel. The idea of a hollow in the length of the blade bothers many people, but I prefer it. Indeed, I was trained to look for chisels that had this feature and to reject any with a bellied (convex) back.

Work your way up to the finer-grit stones—Follow an identical sequence on the 1,200-grit stone. This should not take long, perhaps 10 minutes, as the main flattening work was done on the 800-grit stone. Always finish with the crosswise (second) stroke before moving to a finer stone, as this ensures flatness of the width of the back. When the 800-grit scratches are gone, move to the 8,000-grit stone.

Before using this stone, spray it lightly with water from a plant sprayer or flick a few drops of water on the surface. Then, with a Nagura, a small chalky block, rub the surface of the 8,000-grit stone in small circles to work up a little slurry.

Use the two types of strokes as before, and exploit the slight hollow in the chisel's back. With a slightly hollow back, the area of the blade adjacent to the edge polishes almost immediately. Another advantage is that on subsequent sharpenings, a small amount of

SOURCES OF SUPPLY

SYNTHETIC WATERSTONES AND HONING GUIDES

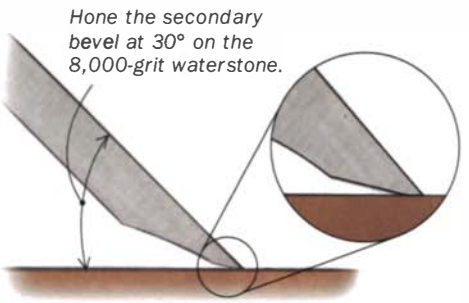
Garrett Wade: 800-221-2942; www.garrettwade.com
Highland Hardware: 800-241-6748; www.highlandhardware.com
Japan Woodworker: 800-537-7820; www.japanwoodworker.com
Lee Valley: 800-871-8158; www.leevalley.com
Woodcraft: 800-225-1153; www.woodcraft.com

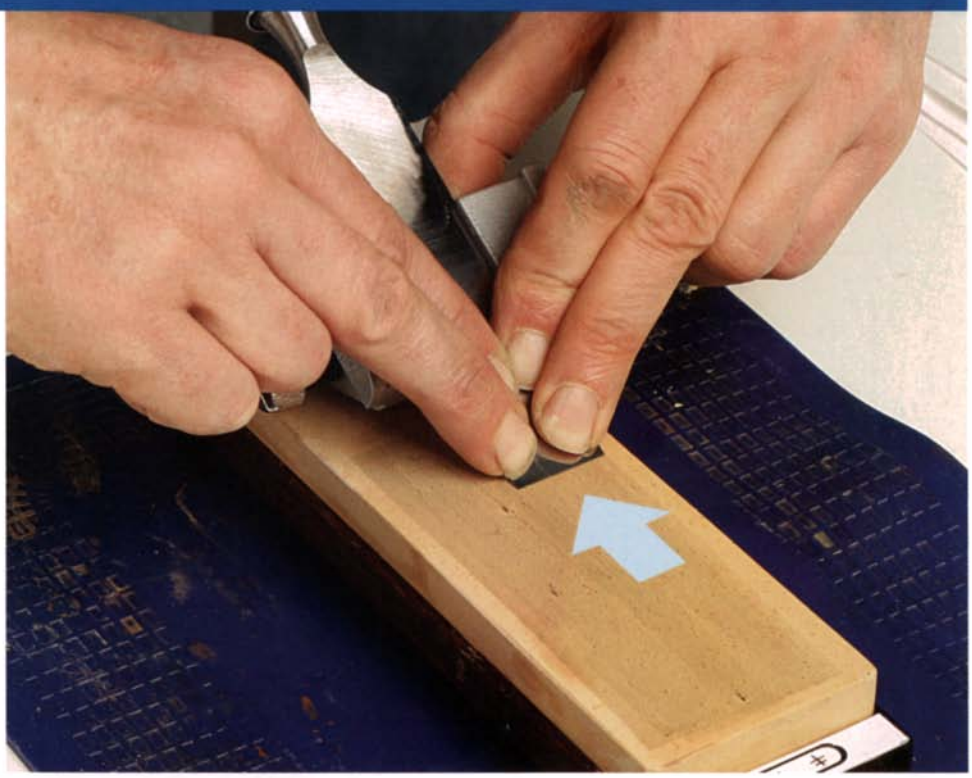
NONSTICK MATS

Dycem mats can be bought online at www.alimed.com.
A 10-in. by 14-in. mat costs $15.99, plus shipping and handling.

2. HONE THE SECONDARY BEVEL ON THE 8,000-GRIT STONE

Reset the honing guide. *To achieve the angle for the third bevel, withdraw the tip of the chisel about ⅛ in.*





A few light strokes. *Establishing the final cutting angle on the 8,000-grit stone requires only three or four light pulls.*

metal will be removed from this critical area. I can see no reason to polish any other part of the blade except this vital area adjacent to the tip, which forms half of the cutting edge.

Sharpening the bevel side

Compared to flattening the back side of the chisel, sharpening the bevel side is easy and fast. Decide what finishing angle will suit the type of timber and the work being done; 30° is suitable for general chisel work. I perform the main grinding on a wet grinder, selecting an angle of about 23° in this case. Precise angles are not important. There is no need to let the grinding surface meet the sharp edge of the chisel unless it is badly chipped or way out of square. I usually aim for about 1/32 in. to 1/64 in. away.

On the waterstones, I use a honing guide whenever possible; I like the cheap Far Eastern copy of the Eclipse model. I recommend using only a pull stroke, as this reduces the risk of digging into the soft surface of the stone.

For sharpening, I set an angle of 27.5° using a shopmade angle-setting guide, and raise a small wire edge, or burr, on an 800-grit stone. With a well-positioned bench light, you can see this edge as it forms. By withdrawing the chisel about ⅛ in. into the guide, the cutting angle is increased to 30° to create a secondary bevel. This has the advantage of making future touch-up sharpenings much quicker, as very little metal must be removed. Three or four light pull strokes are made on the 8,000-grit stone after spraying and preparing a slurry with the Nagura. I do mean very light pressure; remember, this is a polishing stone and not a big remover of metal.

The final stage is to repeat the last step of back flattening with just a dozen or so strokes of the crosswise type to pull the wire edge around and remove it. Future touch-up sharpenings take me no more than about four minutes. □

Remove the wire edge. *Pull the back of the chisel onto the 8,000-grit stone a couple of times to roll this thin burr around, and then make a few crosswise passes to remove it.*

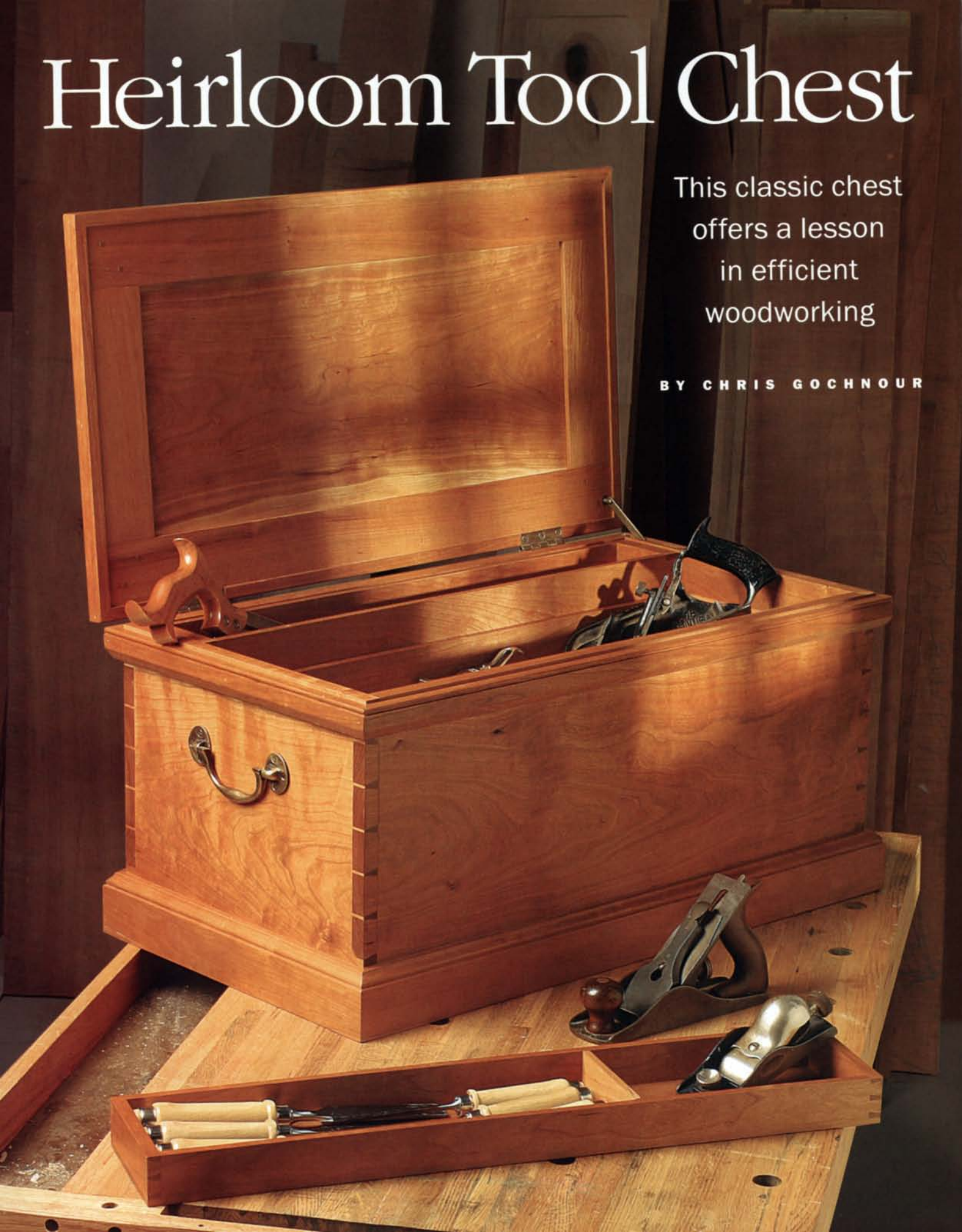
David Charlesworth teaches woodworking at his shop on the north Devon coast of England.

THE END RESULT
The initial grind, the primary bevel, and the secondary bevel all should be defined clearly with no scratches or wire edge left along the chisel's edge.

Heirloom Tool Chest

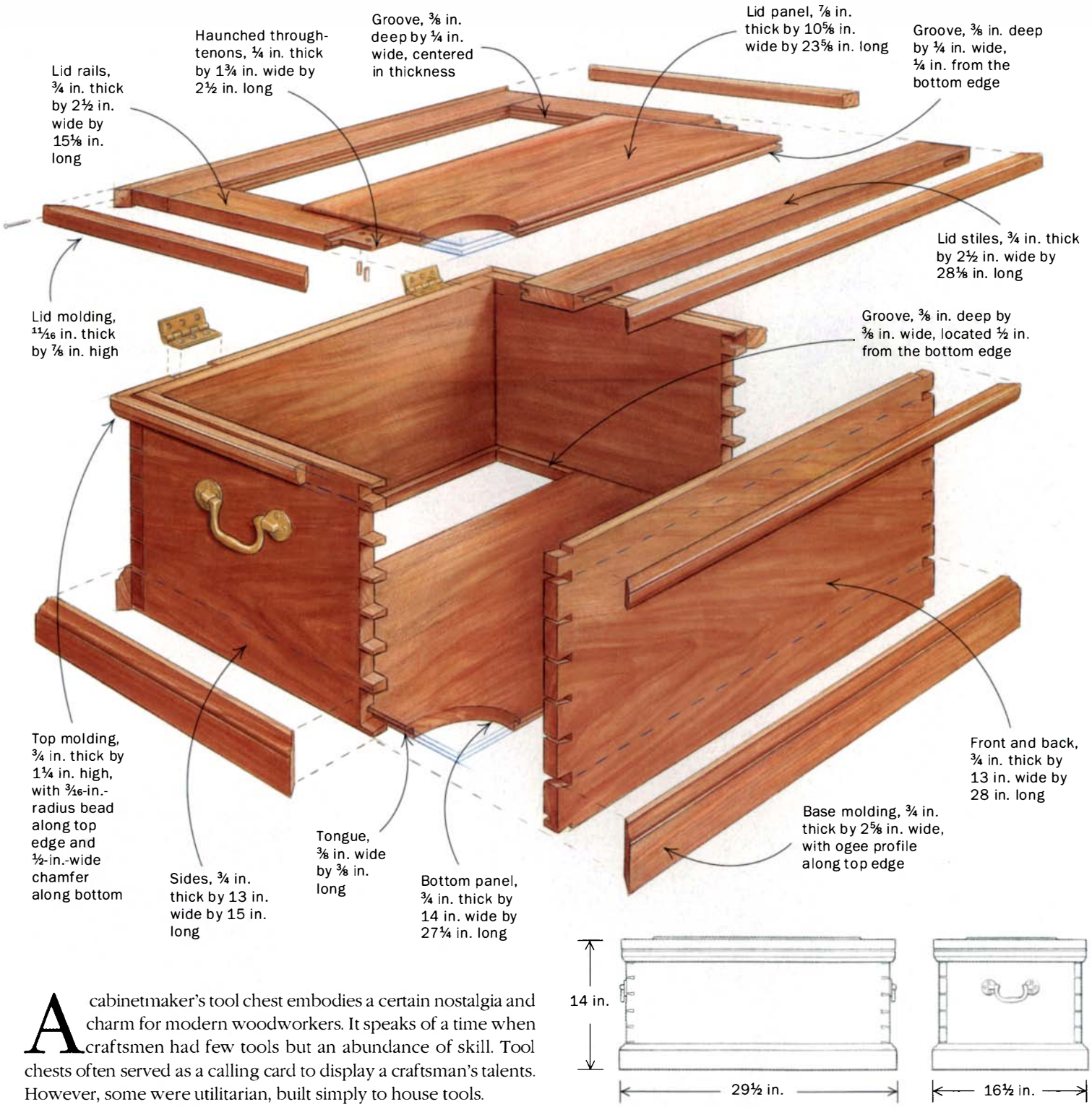
This classic chest offers a lesson in efficient woodworking

BY CHRIS GOCHNOUR



A COMFORTABLE HOME FOR TOOLS

Made of cherry and constructed entirely with hand tools, the tool chest incorporates dovetail joinery, frame-and-panel construction, and applied molding.



A cabinetmaker's tool chest embodies a certain nostalgia and charm for modern woodworkers. It speaks of a time when craftsmen had few tools but an abundance of skill. Tool chests often served as a calling card to display a craftsman's talents. However, some were utilitarian, built simply to house tools.

The tool chest described in this article is of the latter kind—practical, enduring, and simple. But in a time when woodworkers have an abundance of power tools at every turn, making this tool chest with traditional hand-tool techniques can be a bridge to an era past. I recommend using this project as a hand-tool exercise, though power tools could be substituted for any of the operations. Practicing the techniques involved in the chest's construction will make you more confident with hand tools, and you may find them an indispensable resource in your day-to-day shop tasks.

Choose and mark the material

Select a medium-density hardwood that is worked easily with hand tools. Because the tool chest is intended to be carried,

Photos, except where noted: Matt Berger; facing page: Michael Pekovich; drawings: Bob La Pointe

DOVETAIL AND ASSEMBLE THE CASE

Cut the tails. *Clamp both the front and back of the chest in a vise with the inside faces touching (right). Make the cuts with a backsaw. Next, clean out the waste one board at a time with a coping saw (below). Make sure you do not cut past the scribe line.*

choose wood that is lightweight yet durable. For this box I chose cherry, which is easy to work and attractive; however, woods such as red alder, poplar, and white pine also are appropriate.

To reduce the likelihood of warp and twist, select clear, straight-grained wood for the lid frame. This type of wood also is good for the moldings because it will make them easier to work with molding planes. Knots are fine on panels, but keep them away from the edges so that they will be out of the way of the joinery.

Once you've dimensioned the lumber for each part, mark them with cabinetmaker's triangles (see *FWW* #149, p. 90, 92). These triangles clearly identify the face and the inside and outside edges of each part. And they are helpful for identifying the orientation of the pieces when you begin cutting joints.

From here, follow a sequential pattern of construction: Join the box using dovetails; build the frame-and-panel lid with mortise-and-tenon joinery; shape and apply moldings; and install the hardware.

Practice and plan the carcase dovetails

I tell students that making dovetails is easy, but controlling a handsaw can be difficult. Get comfortable using a handsaw before you undertake the dovetails, and practice dovetail-like cuts on scraps of wood to improve your skill.

Clear and accurate layout is essential to hand-cutting dovetails. Much of your success will come down to your layout and your ability to work to the lines and never cut beyond, which comes with practice. The objective is to cut precisely to the layout lines each step of the way. This will greatly minimize cleanup and fitting, making the entire process more efficient and enjoyable.

Cut the tails two boards at a time—I cut the tails first and then use them to lay out the pins.

Chop to the baseline with a chisel. *Use a block of wood, securely clamped along the scribe line, to guide the chisel. Chop partway from both sides of the board to avoid tearout.*

I also cut the tails on the front and back of the chest at the same time with the two boards clamped together in a vise. It is faster and more accurate because the saw has a longer line to follow as you make the perpendicular cut along the end grain. Check your cabinetmaker's triangles to see whether you have oriented the boards correctly; the inside faces of the boards should be touching.

Next, remove the bulk of the waste with a coping saw one board at a time. Finally, chop to the baseline with a chisel. This is a critical step for the dovetails to fit together snug. One method I use is to guide the chisel with a block of wood clamped in place along the baseline. Chop halfway through from each side to avoid tearout.

Cut the pins to match the tails—The tails on the chest's front and back boards are used to lay out the pins. With one board secured vertically in the bench vise, place the adjoining tail board on top, carefully aligned, and secure it with a clamp.

Once again, make sure the box parts are oriented correctly, then define the pins on the end grain by tracing the tails with a marking knife. Next, deepen the marks using a broad chisel with its bevel facing the waste. This chisel mark will help guide your saw. Continue the layout line down the face of the board with a sharp pencil, stopping at the scribed shoulder line.

The pins are cut much the same as the tails; however, it is more critical here to cut to the line and not past it. With the saw resting to the inside of your chisel mark, make the vertical cuts down the waste side of the pins. Next, remove the bulk of the waste with a coping saw and pare to the baseline with a chisel.

Cut the bottom panel

The bottom panel of the chest must be sized and fitted prior to glue-up. The panel floats in a groove plowed on the inside of the sides, front, and back of the chest carcase. Use a mortise gauge to scribe two lines ⅜ in. apart, about ½ in. from the bottom. Now plow the groove with a plow plane. The scored lines from the mortise gauge ensure a clean cut.

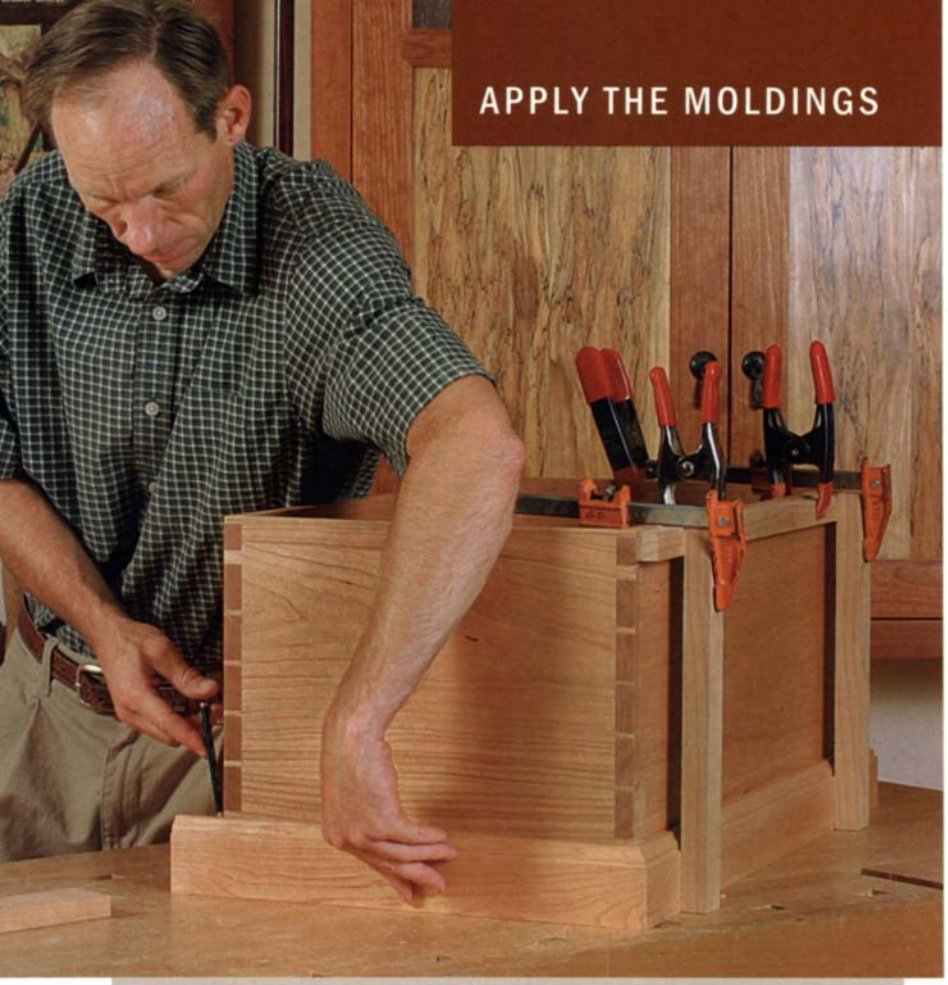
The chest bottom is rabbeted, leaving a ⅜-in. by ⅜-in. tongue that will be housed in the groove. Define the rabbet with two scribe lines, then remove the material between these lines with a fillister plane. Remember, the chest's bottom panel should be free to shrink and expand in the groove. Make sure it is slightly undersize, and don't glue it during assembly.

Glue up the chest carcase

Dry-fit the carcase prior to assembly to ensure that all of the dovetails fit properly and that the bottom panel has room to

Mark the pins with the tails as your guide. *With the tail board clamped firmly in place, trace the tails onto the end grain of the pin board with a marking knife. Deepen the marks with a chisel to provide a kerf for the handsaw.*

Glue up the carcase. *After dry-fitting all of the pieces, coat the dovetail joints with slow-setting wood glue and assemble. The rabbeted bottom panel floats in the grooves plowed into the four sides. No glue is used.*



Cut the front molding to size first. *Once the front molding has been fitted and clamped to the carcase, measure and cut the side moldings to fit. The back piece is cut and fitted last.*

move. I've found that the glue-up can take some time, so an extra pair of hands and slower-setting glue can be helpful.

I prepared notched cauls that fit around the dovetail pins to spread the clamp pressure evenly without getting in the way of the joinery. Four clamps evenly spaced are adequate for each side. Make sure the chest is glued up squarely, and readjust your clamps to correct any sides that are out of square.

Once the glue has dried, plane the dovetails clean and flush, and turn your attention to the chest's lid.

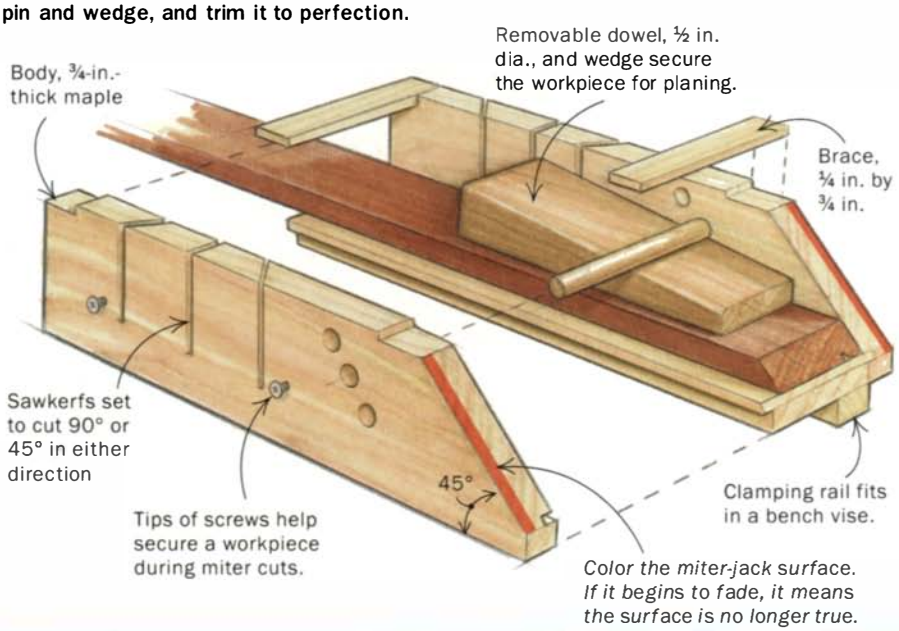
Through-tenons make a sturdy frame-and-panel lid

For the lid's frame, I used through mortise-and-tenons. Through-tenons make the lid stronger because they provide more glue surface, and the strong, long grain of the rails passes all the way through the weak cross-grain of the stiles. In this way, the tenon serves as a reinforcing cross-ply to the outside edge of the lid. Through-tenons also minimize the chance of twist in the frame. Because the mortises are chiseled out from both sides at the same point, it is impossible for the tenon to come through on an angle. Also, chopping all the way through the stile is faster because you don't have to clean the bottom of the mortise, a difficult task.

The lid should be 1/16 in. larger than the box on all sides to provide clearance for the applied moldings. Size your stiles and rails taking this into account. Also, overcut the stiles by 2 in. to account for horns, which

A VERSATILE MITERING JIG

This simple maple jig works as a miter box, accommodating a panel saw in three positions for cutting at 90° or 45° in either direction, and doubles as a miter jack. One end is cut at 45° and is designed for fine-tuning miters with a bench plane. Once you have sawn the miter, secure the workpiece in the shooting end of the jig with a cross pin and wedge, and trim it to perfection.



add strength to the material when cutting the mortises. The horns are trimmed off after the lid has been assembled.

One setting on a mortise gauge is used throughout—On the inside edge of the stiles, mark each end where the rails will intersect the stiles. Then measure ⅜ in. from these lines and draw two more marks to define the width of the mortises. Because it is a through-mortise, the lines also must be transferred across the face to the outer edge of the stile.

Set up your mortise gauge precisely to mark the groove for the lid panel as well as the mortises and tenons. Scribe all of these lines referencing off the face of the boards. Last, lay out the tenon cheeks, haunch, and shoulders with a marking knife.

Rough-cut the haunched tenons and then chop out the mortises—Once the lines have been marked, begin rough-cutting the tenons. Cut close to the lines, but leave material for final fitting later. Then plow the groove on the inside edge of all of the stiles and rails. Be sure to reference these plow cuts off the same face of each part, guaranteeing a consistent alignment of the groove.

Finally, chisel the mortises. The key to successful mortising is to use the right chisel—one with a thick blade to keep the chisel from twisting and a long bevel to take a shearing cut. Clamp together the two stiles in a wooden hand screw with the grooves facing up. Clamping the boards will prevent them from splitting as you chisel away the waste. Work your way through half the width of the stile on all four mortises. Then flip over the stiles and finish chopping from the other side. When you are all the way through, clear out the debris and use a paring chisel to clean up any irregularities, ensuring the mortise is straight and true on all four sides.

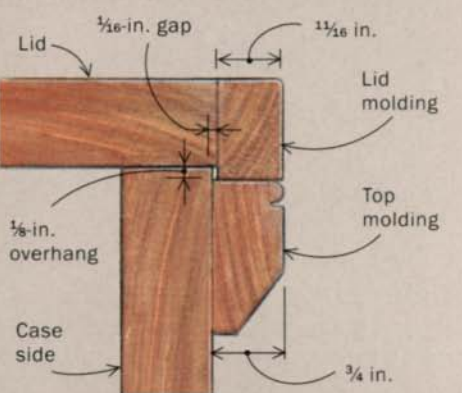
Once the mortises have been completed, fit the tenons. I used a paring chisel or shoulder plane to fine-tune the shoulder and a router plane set to the depth of the layout lines to fine-tune the fit of the tenons. Dry-assemble the frame, and use this as one more chance to get an accurate measurement for the panel.

Plow a groove in the panel and assemble—The panel should be sized to fit into the groove with some extra room to accommodate expansion and contraction with humidity changes. Locate and scribe a groove with the same setting on the mortise gauge as used for the frame. However, this time register off the bottom side of the panel. Then plow the groove on all four sides.

Next, shape a thumbnail molding on the panel with a block plane. Before applying glue, dry-fit the frame and panel to make

Glue the top molding. *Later, after the hardware has been installed, nail the molding with finish nails to add additional holding power.*

OFFSET THE MOLDINGS TO CREATE A LIPPED LID



The lid molding masks minor warp or twist in the frame-and-panel. *Set the lid on the box and apply the molding so that it rests on the edge of the carcase molding.*

MAKE AND HANG TOOL TRAYS

The interior tool trays slide along cleats attached to the carcase sides. The sides and bottoms of the trays are ¼ in. thick. The ends of the small trays are ½ in. thick. The ends of the saw box are ¾ in. thick and notched to fit the cleat.

Handsaw box, 6 in. deep by 3½ in. wide by 26½ in. long

Spacing of interior dividers, ¼ in. thick, is determined by the size of the tools to be stored.

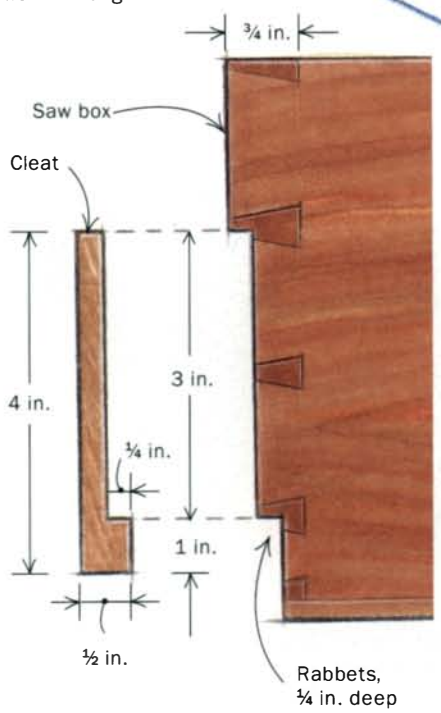
Chisel tray, 1¾ in. deep by 5½ in. wide by 26½ in. long, slides along the top of the cleat.

Handplane tray, 3 in. deep by 5½ in. wide by 26½ in. long, slides along the cleat rabbet.

Handsaw box is notched to fit over the cleat.

Cleat, ½ in. thick (at its thickest) by 4 in. wide by 13½ in. long

Bottom panel, ¼ in. thick, is glued flush to the tray's underside.



CLEAT DETAIL

Trays slide on cleats inside the chest. *Nail the cleats to the inside of the chest so that the trays slide front to back. The two shallow trays should have enough clearance to slide past each other.*

sure all of the parts go together well. After gluing up the frame-and-panel lid, trim off the horns and check that the lid is square to the box and slightly oversize.

Top off the chest with molding

The molding on the tool chest is not only attractive, but it also serves practical purposes. Along the bottom it provides a bumper to protect the box as it is toted from place to place. On the top, the molding seals the chest interior, keeping it relatively free from dust and humidity.

I enjoy shaping and applying the molding because I love working with molding planes, and I like seeing the box begin to take on its final form. Molding planes are simple tools, with only a contoured wooden body and a steel blade. They don't require electricity like a router does, and the only noise they make is the sweet sound of wood being sheared from a board edge in long, continuous shavings. I enjoy the slight physical workout involved when using molding planes and the satisfaction of seeing the molding emerge from the board edge. The whole process takes me back to a time when there was nothing between the board and the craftsman but a well-tuned tool.

I milled the base molding using a molding plane with an ogee profile. A cove, quarter-round, or simple bevel profile would suit the chest just as well. I shaped the molding for the upper portion of the chest with 3/16-in. beading on its top edge and a bevel on the bottom. The band of moldings for the lid is shaped with 1/8-in. roundover, but only after it has been applied to the lid frame.

Begin by cutting miters on the front base molding until the piece fits the carcase. Then work your way around the chest measuring and cutting the side pieces and finally the rear section. Carefully fit each miter joint as you move around the chest. I used a miter jack for this (p. 40). Apply the moldings first with glue and clamps, and then secure them later with finish nails, being careful not to put nails where the hinges and lid stay will be installed. Follow this series of steps to install the lid and the lid moldings.

Build the sliding trays to fit

Because this tool chest is such a personal item, the inner tray system can be personalized, too. I designed mine with three removable sliding trays, which hold saws, chisels, handplanes, and a host of other hand tools. The tray boxes are dovetailed, and the bottom of each tray is glued flush in place. Two stepped cleats tacked onto the inner sides of the chest support the trays, allowing them to slide forward and backward on different planes.

Install hardware and finish

Finish off the tool chest by installing the brass hardware, which consists of two 90° stopped handles, two mortised hinges, and a lid stay (Whitechapel Ltd.; 800-468-5534). The hinges are screwed onto the molding, which is why it's a good idea to reinforce the molding with a few finish nails once the hardware has been installed.

I finished the chest with three coats of Tried and True oil/varnish blend applied over several days, scuff-sanding between coats. Tool chests often get abused, so I avoid built-up finishes such as shellac or lacquer, which are prone to scratching and scuffing. But painting the chest would not be out of character with traditional tool chests. Use a flat acrylic latex paint, which imparts a look similar to milk paint, and top it off with a thin shellac topcoat. □

Chris Gochnour makes custom furniture in Salt Lake City, Utah.

Dovetailed trays hold hand tools. *The three trays are sized specifically to hold Gochnour's chisels, planes, saws, and various other hand tools. The sides are dovetailed, and the bottom panels are glued flush to the trays.*

Woodworker's Guide to Steel

An understanding of the basics can help when it comes time to buy cutting tools

BY GEORGE WALKER

Steel is a logical choice for cutting tools because it offers good strength and resistance to fracture. Plus, it's durable, resists wear, and is relatively economical, as materials go.

However, not all steel is created equal. I learned this 30 years ago as an apprentice in a tool-hardening shop hoisting chunks of hot steel in and out of furnaces. I shadowed a journeyman toolmaker who kept notebooks full of recipes: Cook steel one way to make a spring; use another recipe to make a knife. At the time, it looked like voodoo to me. Gradually, though, the experience grew into a working knowledge of steel.

Woodworking cutting tools present a special challenge. The blade is honed to a razor-thin edge, then the edge is pushed through a dense and stubborn material—wood. The entire load of the cutting tool is pressing on a very small area.

The strength of steel and its ability to retain a sharp edge are largely dependent on its microstructure. An edge won't stay sharp if the crystal structure is full of voids or foreign materials that will weaken it and break loose. Toolmakers strive to produce better steel by creating a stronger and more homogenous crystal structure. Steel moves closer to its maximum strength when the crystal grains are smaller, of consistent size, and absent of foreign materials. Such steel is said to be "fine grained" or "clean."

How carbon steel and alloy steel differ

Steel is a product of both iron and carbon. Carbon allows the steel to be hardened. When the ingredients are heated to about 1,800°F, the carbon dissolves into the iron to create steel. All types of steel can be grouped into two main classes: carbon steel and alloy steel.

Carbon steel—When steel is made almost entirely of iron and carbon—typically 98% iron and less than 1.5% carbon, with trace amounts of other materials showing up only inadvertently—it is called carbon steel.

Carbon steel is the least refined and lowest priced of the various steels. Steelmakers classify carbon steels into several groups, but only high-carbon steel is used in cutting tools. All high-carbon steel contains between 0.45% and 1.5% carbon.

Alloy steel—When steel has one or more alloying elements added specifically to customize it, carbon excepted, it is called

Different steel for different tools

CHISELS, GOUGES, AND PLANE IRONS

Bench chisels, gouges, plane irons, and spokeshaves have steel cutting edges that move slowly through wood. These tools need steel that holds an edge well yet is relatively easy to sharpen, such as A2 or A2 cryo, O1, O2, or W1 (see "Grading tool steel" on the facing page). The appropriate hardness range is Rc60 to Rc64.

CARD SCRAPERS

Card scrapers are made from either carbon steel or tool steel. The typical hardness range is Rc48 to Rc52.

HANDSAWS

Tenon saws and dovetail saws typically are made from an alloy steel with a hardness around Rc52. Using a process called induction hardening, some manufacturers further harden the teeth.

Photos, except where noted: Michael Pekovich; this page (top): Courtesy of Barr Specialty Tools

an alloy steel (see "Common alloys in steel" at right). The addition of one or more alloys can make steel better suited to certain applications.

Compared with carbon steel, alloy steel requires a more sophisticated refining process. Alloy steel has a cleaner and finer grain structure than carbon steel, so it often is used in demanding applications.

When steelmakers refer to tool steel, they usually are talking about a small group of alloy steels with especially good properties for making cutting tools. Tool steel also is used to make many other tools, including molds, dies, cams, and bushings. Because tool steel so often is used to make dies, it sometimes is called tool-and-die steel.

Although the ingredients may be similar to carbon steel or another alloy steel, tool steel is refined to a much higher degree. Indeed, tool steel is subjected to the most sophisticated refining process. As a result, it has a cleaner microstructure.

Not all tool steel can handle the high temperatures generated by tools or bits that encounter wood at high speeds. However high-speed steel (HSS) is one that doesn't lose its properties when it encounters high temperatures caused by friction. That's why it's often used to make router bits, drill bits, jointer and planer knives, and lathe tools.

Properties of steel can be adjusted

Steel used to make cutting tools has three main physical properties: hardness, toughness, and wear resistance. Invariably, when you increase one of the three properties, the remaining two usually suffer. A good

Grading tool steel

Tool steel is a group of highly refined alloy steels graded using a letter followed by one or two numbers. Depending on the grade, the letters can provide clues to the steel's ingredients, its hardening method, or its use.

Tool steels that start with the letter H are hot-worked, which means the hot steel is shaped while solid. Grades H1 through H19 have chromium as the primary alloying element (right). In grades H20 through H29, tungsten is the main element. And H40 through H59 is molybdenum based.

Grades starting with A, D, or O are cold-worked, meaning the steel is shaped after it becomes solid, usually at room temperature. Grade A indicates it is hardened simply by cooling in the open air. Grade D has a high chromium content. And grade O steel is hardened by quenching it in an oil bath.

Grades starting with the letter S offer good shock resistance. That means the steel is exceptionally tough.

Any tool steel with a W at the start has been hardened by quenching it in water.

Most HSS grades start with either an M or a T. An M means the main ingredient is molybdenum; a T has lots of tungsten. Powdered metal HSS, sometimes used in turning tools, represents the most highly refined steel, with a wear resistance approaching that of carbide.

COMMON ALLOYS IN STEEL

Chromium increases strength, wear resistance, and corrosion resistance.

Manganese adds strength and hardness, and improves response to heat treatment.

Molybdenum helps maintain strength at high temperatures.

Nickel improves toughness, strength, and hardness.

Silicon increases hardness.

Titanium adds hardness and helps produce a fine grain.

Tungsten improves strength at normal and elevated temperatures.

Vanadium creates a finer grain structure and helps improve strength of hardened and tempered steel.

COLD-TREATING TOUGHENS STEEL

Several planemakers now offer A2 blades that are cryogenically treated, meaning the steel is exposed to intense cold (about –300°F). The cold changes the grain structure of the steel, making it tougher while maintaining hardness. As a result, it holds an edge longer, although it takes some extra time to sharpen.

FILES AND RASPS

Files and rasps generally are made from high-carbon steel. The steel tends to run higher on the Rockwell scale—Rc66 to Rc67—which is not surprising when you consider that files often are used to cut steel.

PLANER AND JOINTER KNIVES

Because planer and jointer knives cut through wood at high speed, they are made from high-speed steel—either M2 or T1—in the hardness range of Rc61 to Rc63.

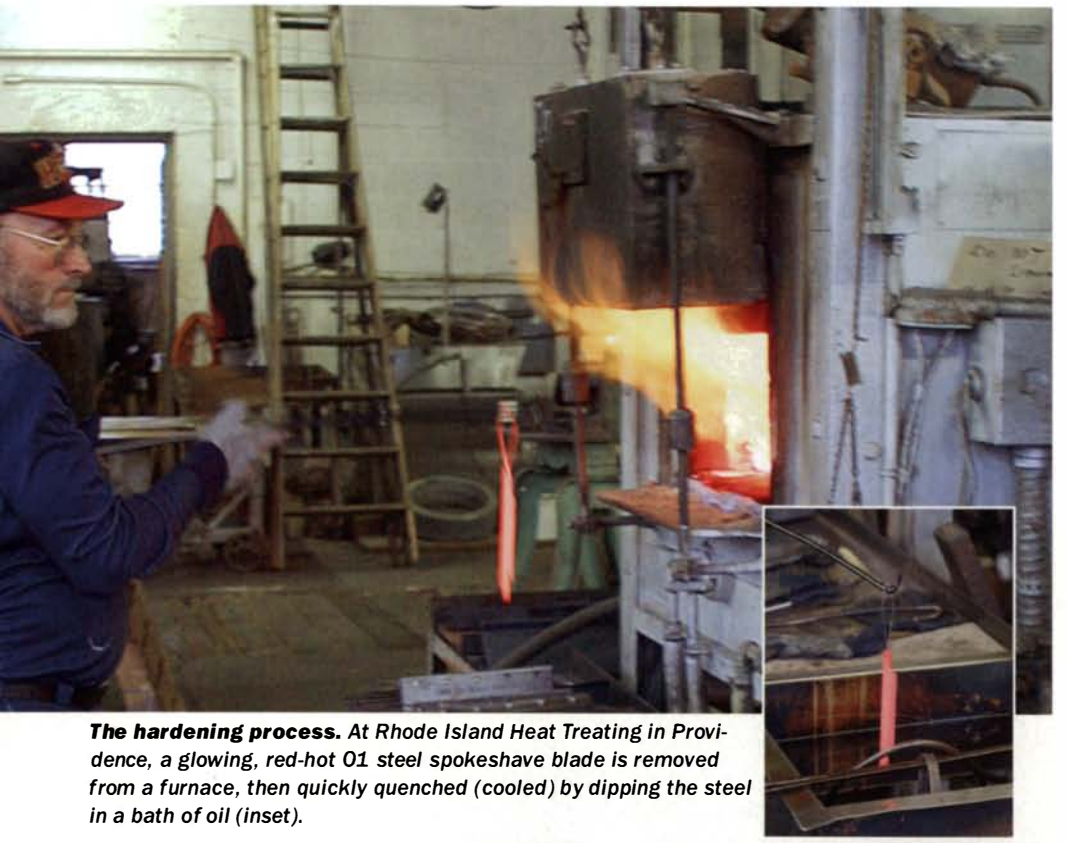
BANDSAW BLADES

Low-cost blades commonly are carbon steel of between Rc28 and Rc32. More expensive blades are made of tool steel (Rc40 to Rc50), with induction-hardened teeth of Rc60 to Rc64. Premium blades have HSS teeth (Rc66 to Rc68) welded to an alloy-steel back (Rc46 to Rc52).

TURNING TOOLS AND DRILL BITS

M2 high-speed steel often is used here. Look for hardness in the range of Rc60 to Rc64. Some turning tools use M4 powdered metal so that the edge remains sharper for longer periods.

Balancing the properties of steel



The hardening process. *At Rhode Island Heat Treating in Providence, a glowing, red-hot O1 steel spokeshave blade is removed from a furnace, then quickly quenched (cooled) by dipping the steel in a bath of oil (inset).*

Tempering improves toughness. *After quenching, the O1 steel is reheated to a temperature below the red-hot stage, which decreases hardness and increases toughness. The hardness of the blade, destined for a spokeshave made by Woodjoy Tools, is checked on a Rockwell-hardness tester (right).*

HARDNESS VS. BRITTLENESS

When it comes to cutting-tool steel, hardness is good. But as hardness increases, so does brittleness, and that isn't so good. Traditional chisels (top) use steel that's a compromise between the two. Some Japanese chisels (bottom) attack the problem by laminating a hard steel to a softer-steel back.

cutting tool is made from steel that best balances the properties based on the requirements of the tool and the material to be cut.

Hardness—The ability of steel to resist deformation is known as hardness, which is a primary indicator of steel's strength. Steelmakers have various ways of controlling hardness, including heating and cooling techniques. Hardness is a plus, but it comes at a price. When steel gets too hard, it becomes brittle, and brittle steel is more likely to fracture or chip out the cutting edge.

Because hardness is such an important property, toolmakers must be able to measure it. Most woodworking cutting tools are measured on a special machine called a Rockwell-hardness tester (see the photos at left).

Written out, a Rockwell-hardness measurement looks like this: Rc60. The uppercase "R" means the test was done using the Rockwell system. The lower-case "c" indicates the scale that was used (there are several Rockwell scales). The number, in this case 60, represents the reading on the scale. (The higher the number, the harder the steel.) Depending on the tool and the application, the steel for most woodworking cutting tools can vary from Rc28 to Rc68.

Toughness—The opposite of brittleness is toughness. When a steel has good toughness properties, it won't break easily. Higher toughness, however, usually results in lower hardness. Toughness can be improved by tempering, a process that involves reheating a hardened steel and cooling it at a controlled rate.

Wear resistance—When another material moves across the surface of steel, like wood across a chisel blade, the steel is going to wear. A cutting tool made from steel with good wear resistance will stay sharp for a longer period of time.

Striking a balance between hardness, toughness, and wear resistance

Steelmakers have four different ways to control the properties of hardness, toughness, and wear resistance. They can change the recipe or control the degree to which the recipe is refined. They also can change the way the steel is heated or cooled when solid or change the way the

steel is physically shaped, or, in steelmaking terms, how it's worked.

Adding ingredients, or changing the percentages of the ingredients, changes the properties of steel. In particular, the amount of carbon has a considerable effect. In addition to improving hardness, the carbon also helps make the steel more wear resistant. Adding alloying elements to the mix tweaks the properties even further.

The process of removing impurities from the molten steel bath is called refining. The amount a steel gets refined will have a direct effect on its final properties.

Another way to change the properties of steel is to alter the way it is reheated and cooled once solid. When a hot chunk of steel is cooled rapidly in a liquid bath, a process called quenching, the steel becomes harder than it would if slowly air-cooled. When a piece of heat-treated A2 steel is tempered by raising its temperature to 350°F, it results in a hardness of Rc62. Temper that same A2 steel by getting the temperature up to 1,000°F, and you end up with a hardness of Rc56.

The properties of steel also can change based on how steel is worked once solid. It can be worked either hot or cold. Commonly used methods of working steel include rolling, drawing, drop-forging, and hammer-forging.

Steel grade defines its properties

There are several thousand different types of steel, all with different properties, so manufacturers grade steel based on its individual properties (see p. 45). In the United States, most manufacturers use grades established by the American Iron and Steel Institute (AISI).

It's not uncommon to find steel touted in such terms as Sheffield (England), German, Swedish, or Swiss. Without a doubt, Europe has a long and impressive history of producing fine steel. Unfortunately, though, such romantic descriptions tell you nothing about the type and quality of the steel product. □

George Walker lives in Canton, Ohio, where he manages the steel supply for a factory. At home, he reproduces period furniture.

Shaping steel by hand and machine

Forging into shape. *At Barr Specialty Tools, a small toolmaking company in McCall, Idaho, a red-hot-steel chisel blade is forged into shape with a hammer. Large-scale toolmakers generally shape hot steel in a drop-forger, a machine that speeds up the process. Some woodworkers claim hammer-forged steel can produce a tougher edge.*

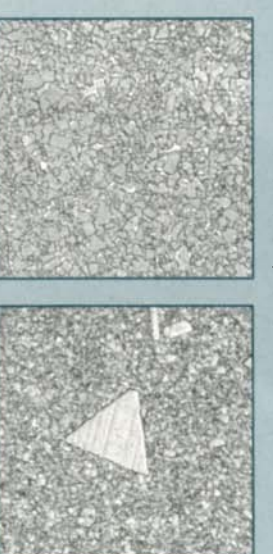
Machining the edge. *A special machine cuts the bevel on a blade made by Lie-Nielsen Toolworks, a toolmaking company in Warren, Maine.*

Carbide, the alternative to steel

Carbide is a compound made up of tungsten and carbon, with cobalt added as a binder. The material is refined into a powder, pressed into a mold, and then cemented at high temperatures.

Because carbide is expensive and is needed only at the cutting edge, it often is produced as small blanks that are brazed to an alloy steel. Then the blanks are ground to produce a sharp edge that's exceptionally hard. The terms carbide, cemented carbide, sintered carbide, and tungsten carbide are interchangeable. The resulting material is equivalent to Rc71 to Rc73 and is as much as 15 times more wear resistant than steel. However, it lacks the toughness of steel because carbide is much more brittle.

Carbide grades typically used for woodworking are C1 to C4, with C1 being tougher and C4 harder; they also can be listed under the International Standards Organization (ISO) grades of K01 through K40, with K01 being tougher and K40 harder.



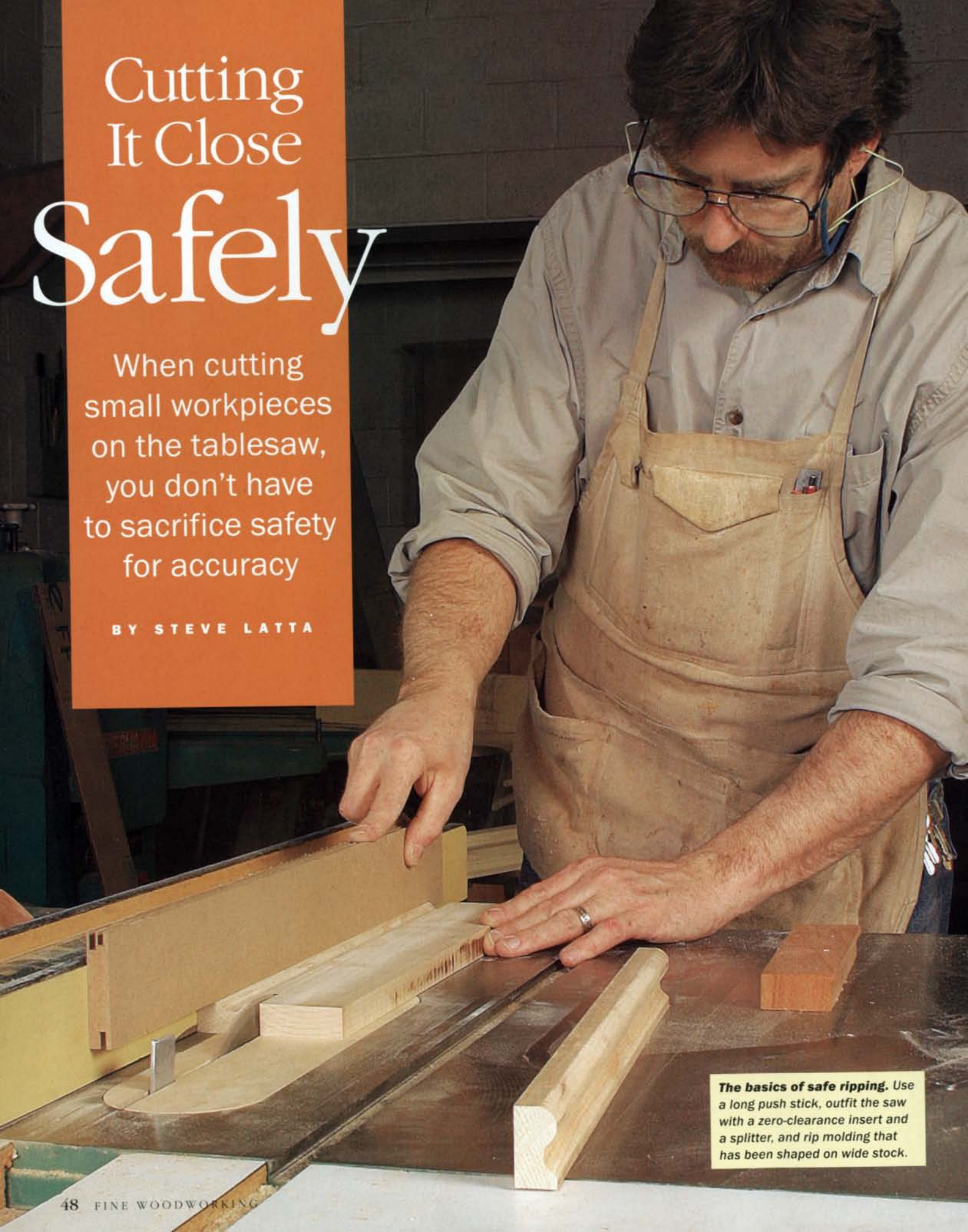
The quality and strength of carbide is governed by its microstructure. *Smaller grains of consistent size (top) offer superior performance. Recycled carbide (bottom) tends to fracture at the cutting edge.*

Photos, this page: Courtesy of Barr Specialty Tools (top left), Lie-Nielsen (top right), and CMT (photomicrographs)

Cutting It Close Safely

When cutting small workpieces on the tablesaw, you don't have to sacrifice safety for accuracy

BY STEVE LATTA



The basics of safe ripping. *Use a long push stick, outfit the saw with a zero-clearance insert and a splitter, and rip molding that has been shaped on wide stock.*

One of the written tests that I give my students includes this question: "Never stick your fingers in the (fill in the blank)." The question is just a freebie for bonus points, but it serves to remind my students to keep safety foremost in their routine work habits.

A lot of the safety techniques I use stem from a background in Federal furniture and the necessity for milling a lot of inlay and banding. Working safely can be a challenge when it comes to milling small pieces of molding, decorative banding, or beading for glass doors. Some common shop practices increase operator safety at the expense of accuracy, but there are ways to execute cuts on the tablesaw that will ensure both.

There are a few basics to keep in mind when milling small pieces of wood, but first and foremost is a healthy dose of common sense combined with a deep respect for the equipment being used. Machinery is both powerful and impartial, and I never let that slip my mind. If the techniques presented here rattle your nerves, don't use them. The only reassurance I can offer you is that they've worked for me for a couple of decades.

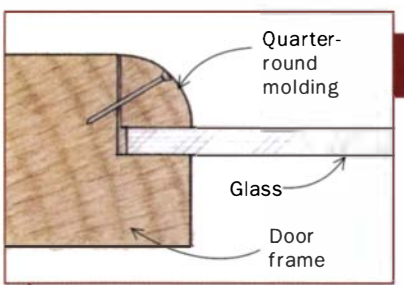
Steve Latta teaches woodworking at the Thaddeus Stevens College of Technology in Lancaster, Pa.

SAFETY TIP

A long push stick provides more control

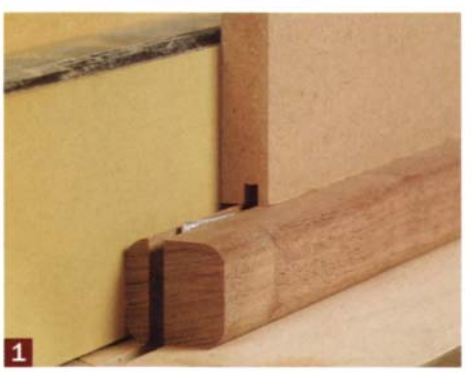
Push sticks are critical for holding down workpieces and keeping your fingers away from the spinning blade. Many people use the long-handle type with a simple notch cut into the end. In my opinion, these things are dangerous. They do little to hold down the stock on the saw table because they contact the stock only on one small area, and they're also prone to slipping into the blade during a cut. I prefer the longer and lower variety of push stick (often called a paddle or a shoe) because it holds the stock flat on the table and rides securely against the fence.

Large paddles make the best push sticks. *Latta prefers to use MDF to make a variety of paddle push sticks in different lengths. When each wears out, he simply makes a new one.*

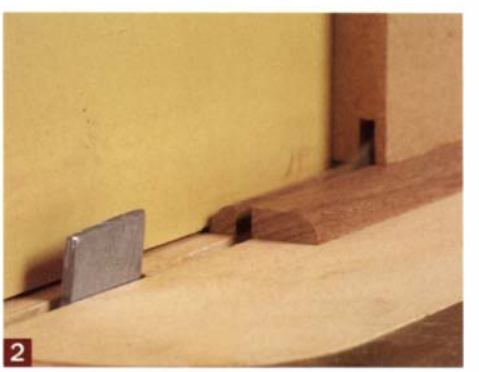


CUT SMALL MOLDINGS FROM LARGER STOCK

When making small moldings, such as quarter-rounds, I profile both edges of a piece of wide stock and then rip off the molding in strips. Many woodworkers rip in such a manner that the molding falls away outside the blade and the fence. With that method, the fence must be reset for each cut, which often leads to dimensional differences that can snowball into a variety of small nightmares. To avoid those problems, I rip small moldings between the blade and the fence.



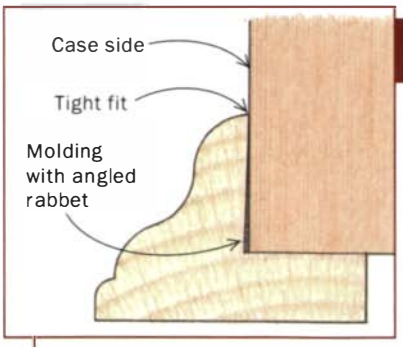
Rip the molding strips to thickness. *After shaping a quarter-round on all four corners of a piece of stock, rip two strips to the desired thickness.*



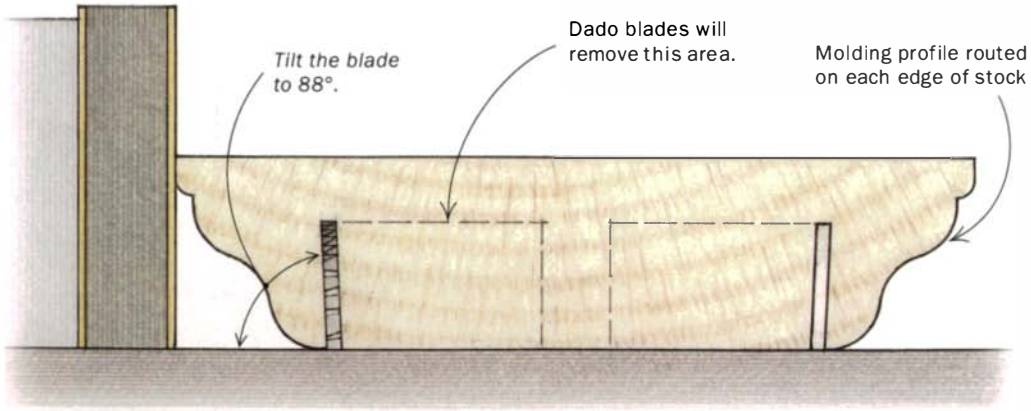
Rip the first edge to width. *With the fence held at the same setting, rip the first corner of each molding strip to width.*

Rip the second edge to width. *Rip the second and last piece of quarter-round molding from each strip. The square piece remaining on the outside of the blade is scrap.*

Photos: William Duckworth



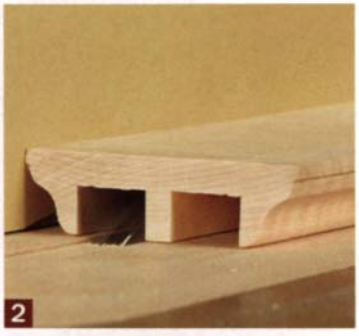
SHAPE COMPLEX MOLDINGS BEFORE RIPPING



Here is a trick to getting snug-fitting moldings. After shaping the molding profile on the edges of a board, tilt the sawblade a couple of degrees to cut the back edge at a slight angle. That way, the moldings will sit tight in a corner or at the bottom of a cabinet carcase.

You can plow out the rest of the waste with dado blades. For two pieces of finished molding, use a board that's wide enough to leave a small bit of extra wood in the middle, between the dado cuts, because it will be more stable on the saw table.

Use a rip or a combination blade for the first cut. *Tilt the blade to create a slight back bevel.*

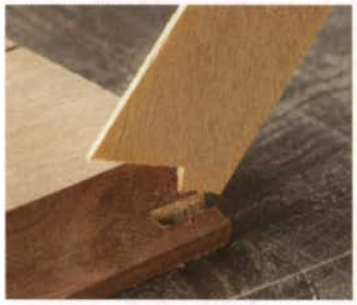


Use dado blades to form the rabbet. *Set the blades 90° to the saw table to shape the rabbet that fits around the bottom of the case.*

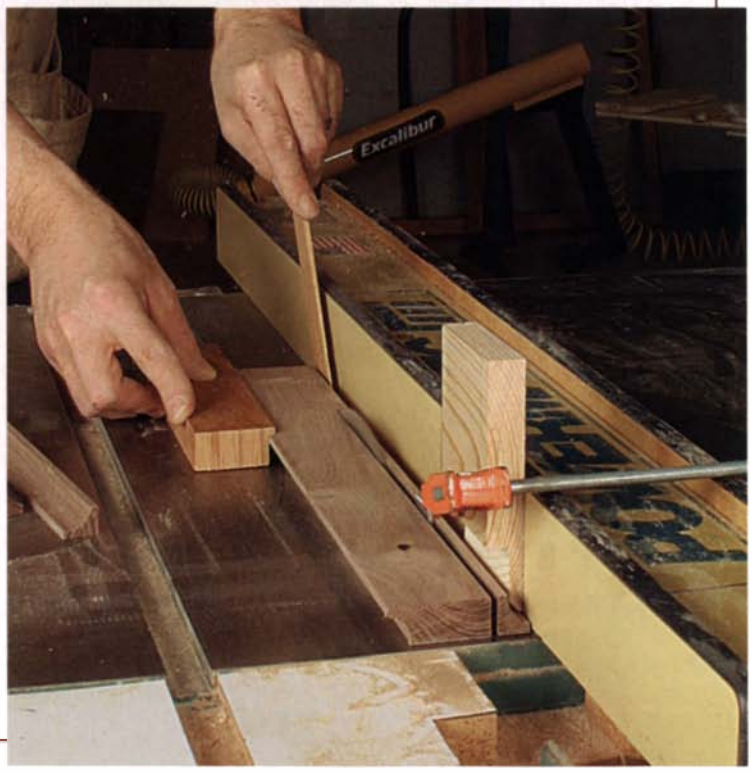
Cut the moldings to size. *Rip two finished lengths of molding from each shaped edge of the stock.*

USE THIN PUSH STICKS FOR THIN STOCK

One way to rip shaped moldings such as coves is to make an interlocking push stick that fits into a short bandsaw kerf cut into the end of the molding. Though I normally prefer the larger, paddle-style push sticks, I do sometimes use one made from a thin scrap of wood that fits into the bandsaw kerf and allows me to push the molding easily past the blade. I use thin push sticks only in conjunction with a hold-down clamped to the fence, behind the blade. The hold-down prevents the workpiece from lifting.



A push stick that locks in place. *Although he usually prefers larger, paddle-style push sticks, Latta occasionally uses a thin one shaped on the bottom to lock in place with a matching kerf.*



In some cases you may have to rip the molding with the fence set up to the left of the sawblade, as with the walnut cove moldings shown.

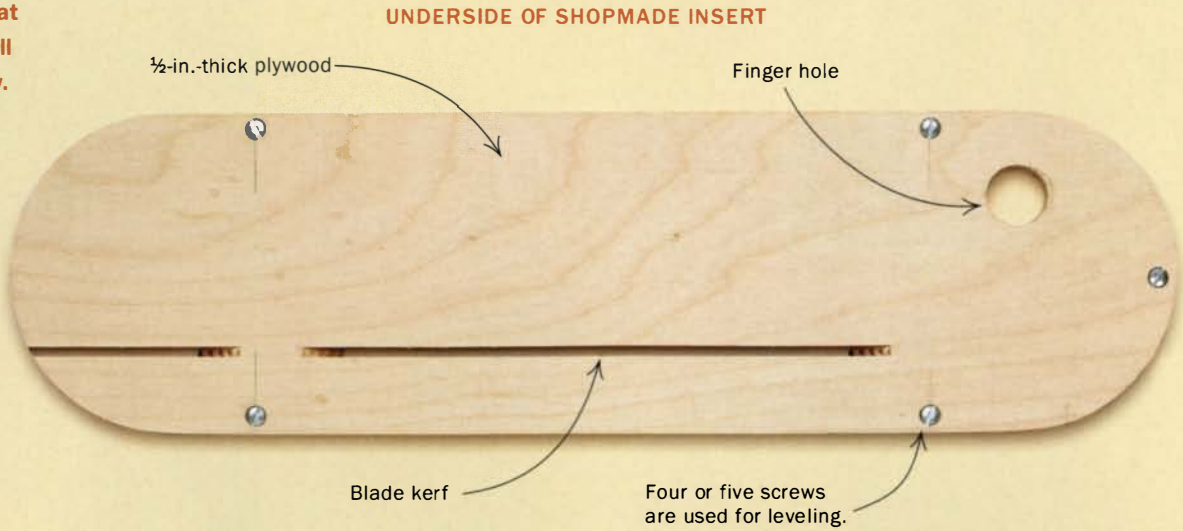
Drawings: Vince Babak

SAFETY TIP

Use a zero-clearance insert and splitter

A zero-clearance insert, or throat plate, is a must for cutting small pieces of wood on the tablesaw. On many saws, the factory insert that comes with the machine will accommodate a full ¼-in. dado set. With a space that wide, small workpieces can get jammed in the insert or lost to the dust-collection system, and safety is compromised. The solution is to use the factory-supplied insert as a template to make a replacement, such as the one at right.

I make inserts out of ½-in.-thick plywood with small screws in the bottom to act as levelers. On most 10-in. saws, the blade won't drop down far enough to place the uncut insert in the opening. To solve that problem, switch to an 8-in. single dado blade. Then position the fence over the insert stock. Place another piece of stock to the left of where the blade will emerge. Last, raise the spinning blade all the way through the insert.

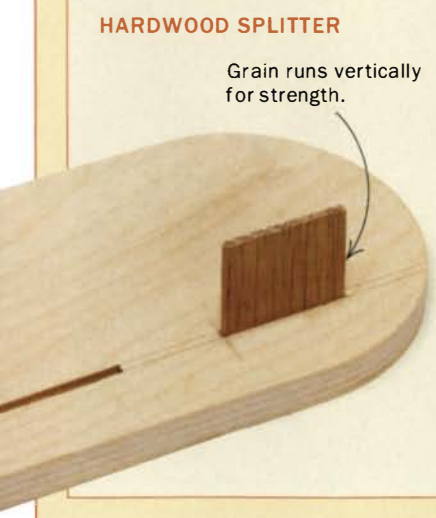


Use a dado blade for the first cut. *For 10-in. tablesaws, an 8-in. dado blade sits far enough below the new uncut insert that it won't contact the insert when the saw is turned on.*

Clamp the insert in place with the saw fence. *Position the fence over one edge of the insert and clamp it in place. Hold a piece of scrap over the other edge as you raise the blade into the new insert.*

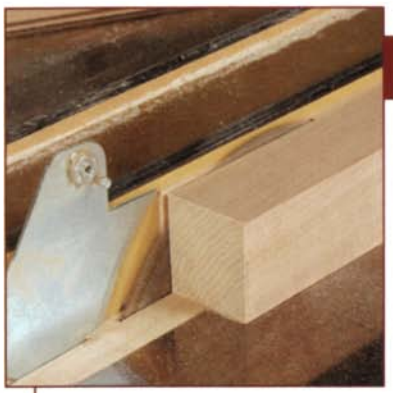
TWO SHOPMADE SPLITTERS

A proper splitter is critical for milling short or narrow stock. I use two types on my saws. The first is the large factory splitter that comes standard on many cabinet saws. I also use smaller shopmade stub splitters that project anywhere from 3/16 in. to ⅝ in. above the table surface; I make them from wood or steel bar stock available at most hardware stores. These splitters prevent narrow workpieces from pinching on the blade but don't get in the way of push sticks.

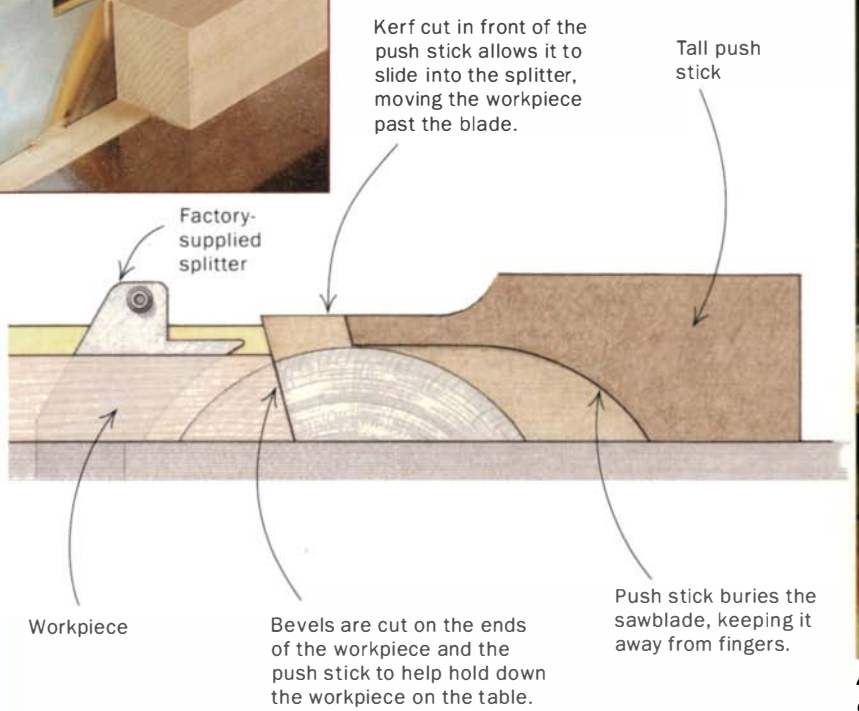


Drill the mortise. *Using a fence on a drill press, drill 3/32-in. holes in line with the blade kerf. Clean up the mortise with a chisel, and glue in the splitter.*

Make your own splitters for special tasks. *Cut steel bar stock, drill a hole for the fastening bolt, and file the leading edge of the splitter to a bevel.*



RIPPING THIN STRIPS



A push stick for ripping thin stock. *A beveled front end on this push stick keeps the back end of the workpiece from rising up during the cut.*

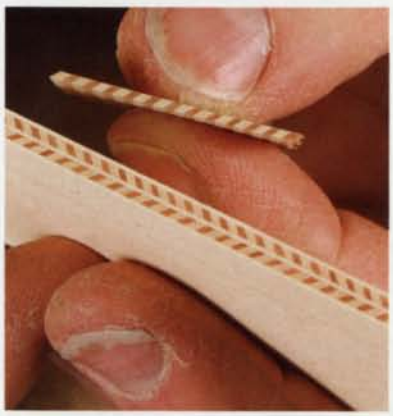
Commercially bought stringing is worthless, in my experience, because it dries out and becomes incredibly brittle. I make all of my own stringing out of 1/16-in.-thick holly stock that I cut on the tablesaw. I typically use 2-in.-wide stock about 30 in. long and saw it on edge. I cut a 15° angle on the back end of the board and a mating surface on the front end of my push stick to keep the stock from lifting away from the table. To cut stringing, I use the factory splitter, and the push stick rides through the cut until stopped by the splitter. This allows the holly to clear the blade completely. After finishing the cut, the push stick must be slid back over the blade while it is pressed tightly against the fence. It is critical that the push stick be long enough that the rear portion of it remains uncut and therefore sturdy and stable in use.

USE A SLED FOR SMALL PIECES

There are a lot of hold-downs, both shopmade and store-bought, that come in handy for securing small pieces during ripping or crosscutting. One jig I use a lot is a store-bought hold-down clamp screwed to a small carriage mounted with a runner that rides in the miter-gauge slot (see the photo at right). Sandpaper mounted to the carriage and a stop block help hold the workpiece in place.

When I use this hold-down jig, I often set the sawblade deliberately high for two reasons. First of all, the downward pressure created by the extrahigh blade actually helps hold the workpiece in place. Also, it reduces the possibility of tearout as the blade exits the cut. A blade set too low tends to lift the workpiece upward during the cut—an unsafe condition. This jig also has a handle on it that is placed well away from the blade.

CROSSCUTTING DELICATE BANDING



Handle with care. *This fragile decorative banding is about 1/16 in. thick by 1/8 in. wide. As it is crosscut on an angle, the thin pieces must be allowed to fall away from the spinning blade to keep from being destroyed.*

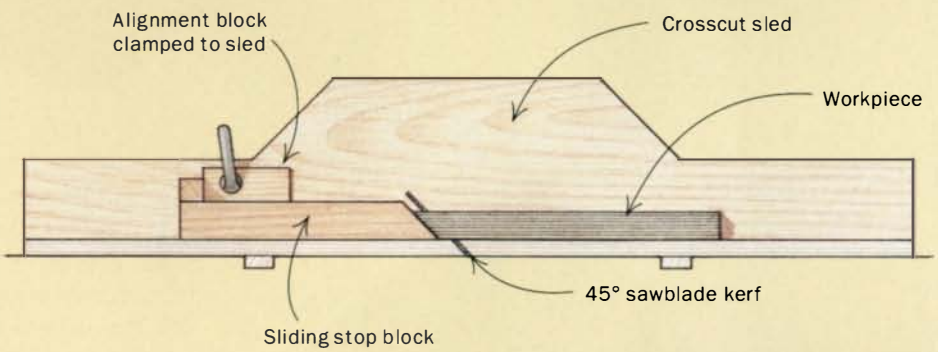
Making decorative bandings involves a whole series of very fine cuts—both rips and crosscuts. For ripping veneer strips down to 1/16 in. thick, I follow the method described at left, on the opposite page. For crosscutting thin slices of banding on an angle, I use a crosscut sled on the tablesaw with a sliding stop block. With the sliding block in position for the start of the crosscut, the workpiece is properly indexed for exactly the right thickness so that I can make repeated crosscuts at reliably the same thickness.

The key to making this setup work accurately is to position the alignment block before crosscutting any of the laminated pieces of banding. The alignment block serves as a stop for the sliding stop block, which is beveled on one end at a 45° angle. The thickness of the banding will be the distance between the beveled end of the sliding stop block and the sawblade. Use the sliding stop block to index the workpiece, and then, holding the workpiece firmly against the fence on the crosscut sled, slide the stop block out of the way before making the cut.

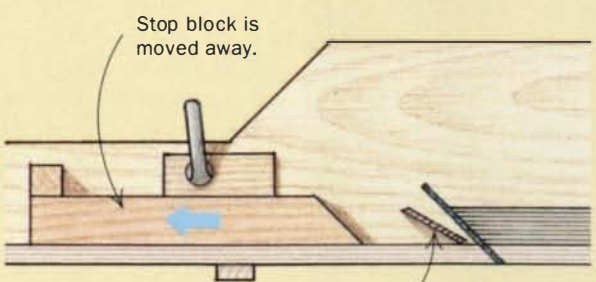
SAFETY TIP

A CROSSCUT SLED KEEPS FINGERS AWAY FROM THE BLADE

1. POSITION THE WORKPIECE



2. SLIDE THE STOP BLOCK OUT OF THE WAY

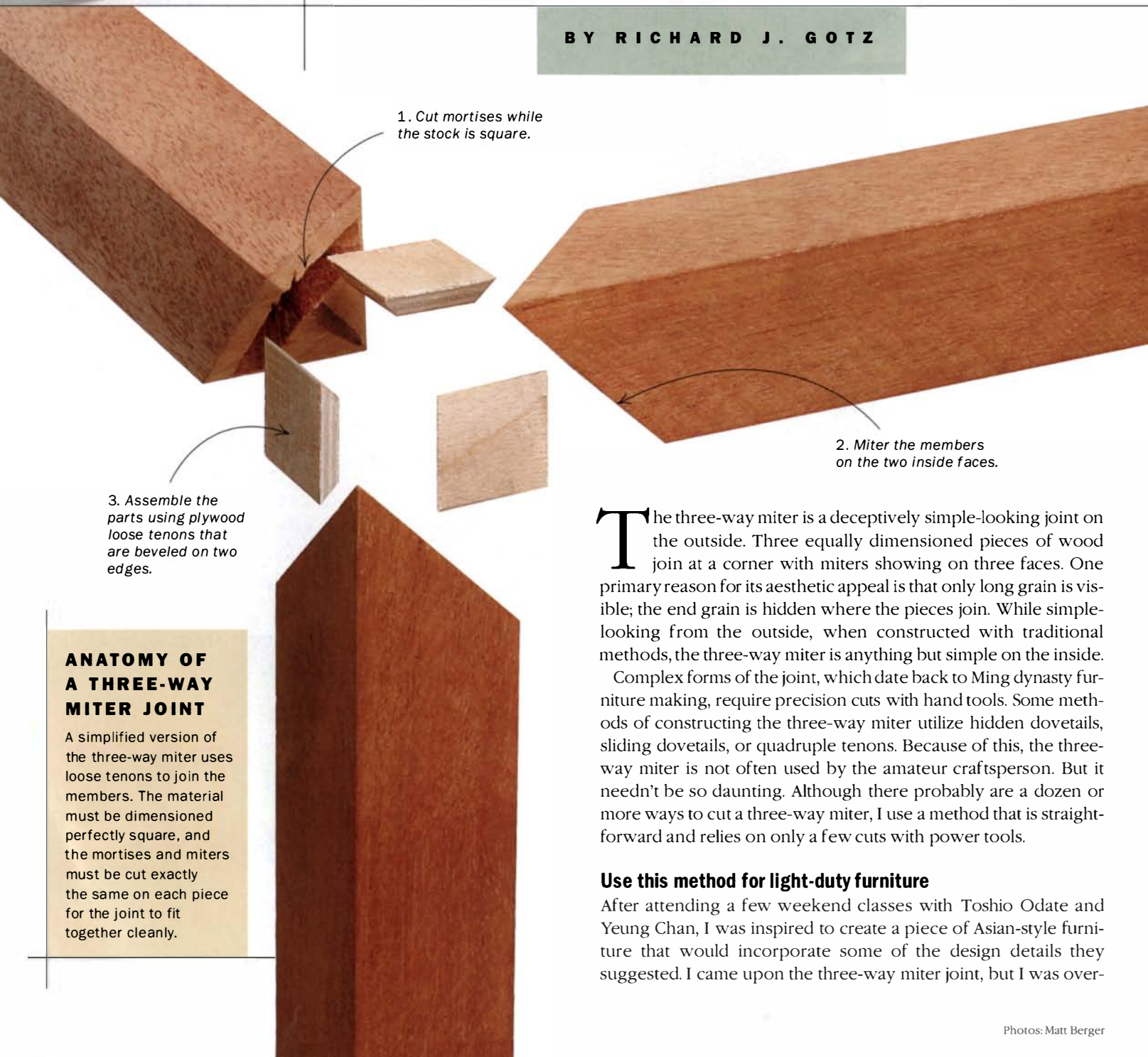


Free-falling. *Slide the stop block out of the way before making the cut to allow the cutoff to fall free of the blade.*

Simplified Three-Way Miter

A modern approach to a traditional Chinese joint creates striking corners on small tables and stands

BY RICHARD J. GOTZ



ANATOMY OF A THREE-WAY MITER JOINT

A simplified version of the three-way miter uses loose tenons to join the members. The material must be dimensioned perfectly square, and the mortises and miters must be cut exactly the same on each piece for the joint to fit together cleanly.

The three-way miter is a deceptively simple-looking joint on the outside. Three equally dimensioned pieces of wood join at a corner with miters showing on three faces. One primary reason for its aesthetic appeal is that only long grain is visible; the end grain is hidden where the pieces join. While simple-looking from the outside, when constructed with traditional methods, the three-way miter is anything but simple on the inside.

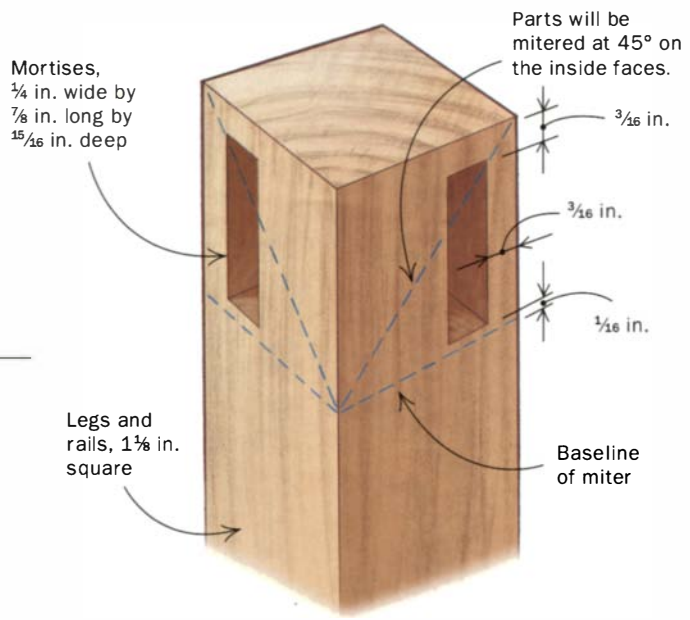
Complex forms of the joint, which date back to Ming dynasty furniture making, require precision cuts with hand tools. Some methods of constructing the three-way miter utilize hidden dovetails, sliding dovetails, or quadruple tenons. Because of this, the three-way miter is not often used by the amateur craftsperson. But it needn't be so daunting. Although there probably are a dozen or more ways to cut a three-way miter, I use a method that is straightforward and relies on only a few cuts with power tools.

Use this method for light-duty furniture

After attending a few weekend classes with Toshio Odate and Yeung Chan, I was inspired to create a piece of Asian-style furniture that would incorporate some of the design details they suggested. I came upon the three-way miter joint, but I was over-

Photos: Matt Berger

MORTISES BEFORE MITERS



whelmed with the elaborate techniques involved. Just in drawing the traditional method of construction, the joint was a humbling experience; I could only imagine how difficult it would be to cut it with a handsaw and chisel.

I decided to forgo the most elaborate forms of the three-way miter for a modern method. I tried a couple described in books by Chan and Gary Rogowski, but they required several different settings on the tablesaw, with each pass needing readjustment of the miter gauge, fence, or blade height. It was clear that achieving a tight fit with either method was going to require great precision in my setup. Any inaccuracy multiplies with subsequent readjustments and cuts.

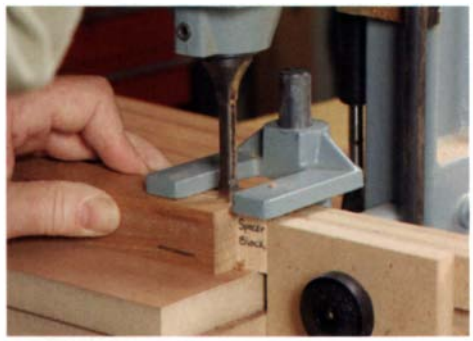
To reduce the chance of inaccuracy, I decided it would be necessary to reduce the number of individual cuts. I landed on a method in which all of the mortises are cut with one fence setting on a hollow-chisel mortiser; all of the miters are cut with one setting on the tablesaw; and loose tenons are used to join the pieces. Furthermore, the four rails and four legs that make up the basic table all are produced with the same series of cuts.

The strength of the three-way miter using this method, for the most part, relies on the loose tenons. Because the mitered surfaces of the rails and legs may not provide an adequate bond, be careful how you plan to use this joint. I would recommend it for light-duty use only. Aprons or stretchers will increase the strength, as will larger tenons.

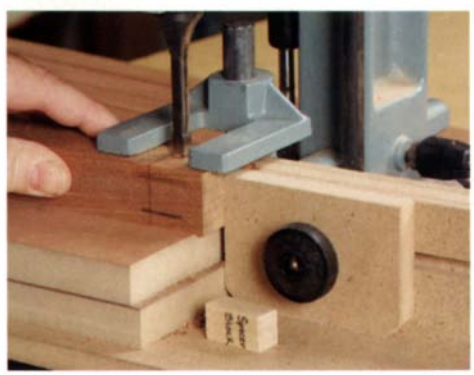
Legs and rails must be equal in width and thickness

Depending on the project you take on, your material can be any thickness and length. But for the basic table pictured in this article, I chose to make the legs and rails 1⅛ in. square. Starting with 6/4 lumber, mill the rough stock to size with a jointer, planer, and tablesaw. The thickness and width of each piece must be equal for the joint to assemble correctly, so my final step was to run each piece through the planer on its face and edge.

Accurate mortises with one setup. *Take your time when setting up the hollow-chisel mortiser. One fence setting can be used to cut all of the mortises in the table.*



Cut one end of the mortise on each piece. *With the stop block and fence set on the hollow-chisel mortiser, use a spacer block to guide the first cut for the mortise.*



Remove the spacer block to cut the other end of the mortise. *Once both ends of the mortise have been cut, nibble away at the remaining material.*

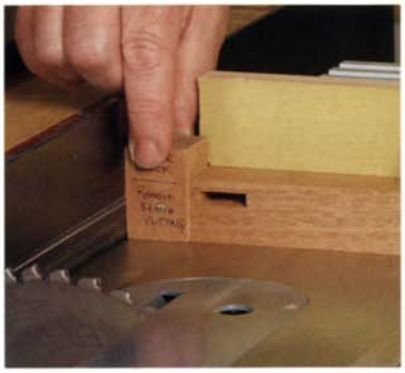
When you finish dimensioning each piece, you should have four equally sized legs and four rails. One pair of rails determines the table width; the other pair determines the table depth.

All of the mortises are identical

On the end of each leg where it meets the rails, cut two adjacent mortises. In addition, each rail will have two adjacent mortises cut at both ends. I used a hollow-chisel mortiser for this operation. However, if you don't have a hollow-chisel mortiser, you can

Drawing: Chuck Lockhart

MITERS MUST BE ACCURATE



Butt the workpiece against a stop block. *Position the stop block so that the sawblade cuts right to the corner of the workpiece. Be sure you don't cut past the corner line. The first miter is cut with the workpiece held so that one mortise is facing the blade and the other is facing the surface of the tablesaw.*

rough-cut the mortises with a drill press and carve them clean with a chisel.

Set up the hollow-chisel mortiser with a ¼-in. bit so that it cuts 3⁄16 in. from the fence. You can set the fence-to-bit distance by holding a 3⁄16-in. drill bit in between. Cut the adjacent mortises with the outside faces of the legs and rails registered off the fence. This will require that half of the mortises be cut with the material sticking out to the left of the bit and half with the material sticking out to the right. For each orientation (left facing and right facing), set a stop block 3⁄16 in. from the bit to cut one end of the mortise. A spacer block is used to set up the cut in the other end of the mortise. The spacer block is equal to the length of the mortise (⅞ in.), less the width of the hollow chisel. Once both ends of the mortise have been cut, remove the remaining material in between.

At this point, you can use a smoothing plane to remove any marks on the surfaces of the legs and rails. It's best to do this before you cut the miters so as not to damage the fragile corners.

Precise miters create a tight-fitting joint

For the four mitered corners of the table to be assembled absolutely square, it is paramount that you cut the miters exactly 45°—no more, no less. I chose to cut the miters with a miter gauge set at 90° and the tablesaw blade at 45°.

Make practice cuts with scrapwood before cutting into your project material. To test for square, cut two miters, place them together, and measure the 90° angle with an accurate square. If there is any discernible gap, adjust your sawblade and try again.

The miters are cut on each face where you already have cut the mortises. That means the legs will have two adjacent mitered sides, and the rails will have four miters (two on each end).

When cutting the adjacent miters, make the first cut with the material positioned so that one mortise is facing the surface of the tablesaw and one mortise is facing the blade. To cut the adjacent miter, rotate the workpiece forward so that the mortise that was facing the surface of the tablesaw is now facing the fence of the miter gauge. Beware of flying debris produced by this second cut. The small, pyramid-shaped cutoff has a tendency to ricochet off the blade unless you pass the material slowly across it.

Rotate the workpiece to cut the adjacent miter. *The mortise that was facing the surface of the tablesaw should be facing the miter gauge on the second cut.*

Once both miters have been cut, flip the workpiece and make the same two cuts on the opposite end. Always use a stop block to position the workpiece for each cut. I also glue 180-grit sandpaper to the face of the miter gauge to prevent the workpiece from slipping.

Mitered loose tenons increase the gluing surface

To produce a stable and strong joint, I make loose tenons from Baltic birch plywood. I increase the gluing surface of the tenons by mitering two of their edges.

Starting with ½-in.-thick plywood, rip several 12-in.-long pieces at ⅞ in. wide. Next, bring them down to the thickness of the mortises so that they fit just right—not too tight and not too loose. You

can do this on a tablesaw or planer. It's a good idea to cut these strips ahead of time because the subsequent cuts are made with the tablesaw blade set to 45°. Because you just cut the miters at that angle, you don't have to reset the sawblade.

Cut one edge of the plywood strip to 45°. Then crosscut each end of the strip with the blade still at 45°. With both ends mitered, cut one tenon from each end of the strip on a radial-arm saw or miter saw. Continue the process of mitering the ends and then chopping them to size until all 12 tenons have been cut. Cutting small pieces with power tools generally is a dangerous process, so use extreme caution.

Cut the tenons from a long strip of material. *Cut a bevel along one edge of the tenon stock. Then bevel one end and crosscut to length.*

After the tenons have been cut, arrange all of the legs and rails in the same orientation. Glue one tenon into each end of the rails and one tenon into the mitered end of the legs, making sure that the tenons are fully seated in the mortises. If not, they will prevent the joint from closing all the way. Also, all of the tenons should be glued into corresponding mortises. I chose to glue them into the mortise on the right side as I'm looking at the two mortises straight on.

Assembly requires two stages

Before gluing up the table, verify that the four legs and four rails are ready and oriented correctly. If you plan to incorporate aprons into the design, have them ready as well. Mark all of the pieces, then dry-fit them together. Once you are satisfied with the dry-fit, proceed with the glue-up.

Glue up two full sides of the table separately, let them set, and then join the two sides by gluing the two final rails in place. I use a frame clamp to glue one full side with a spacer set between the bottom of the legs to prevent them from bowing inward.

It would be nice if the clamps were transparent to detect any gaps in the miters, but you'll have to trust the part of the joint that is visible. If you have carefully cut the miters to 45° and aligned the mortises, the actual glue-up should go without incident. □

Richard J. Gotz is a software engineer and woodworker in Plymouth, Minn.

FOUR STEPS TO ASSEMBLY

Begin by gluing one tenon into each of the mitered ends (1). Gotz chose the mortise on the right. Then, using a frame clamp, glue one full side of the table (2). Fit a spacer block at the foot of the table to prevent the legs from bowing inward during glue-up. Fit the two remaining rails into the joint (3). If the tenons fit tightly, this may require moderate force. Finally, clamp the table for final glue-up (4). If necessary, use spacer blocks on the foot end of the table to prevent the legs from bowing.

A Versatile Router Table

This economical design is capable of conventional, overhead, or horizontal routing

BY KEVIN McLAUGHLIN

Over the years I looked at a lot of router-table designs, but every one I came across lacked one feature or another. Shopmade router tables usually are limited to tabletop routing and fall short if you want to do anything more, like mount the router horizontally or use an overhead pin routing guide. The same is true for most store-bought tables.

My own router-table design combines all of the features I was after. The table I arrived at is easy to build, and it can be made with low-cost materials. Above all, because it accommodates the router in a variety of orientations, it can handle any cut that I could possibly think of making.

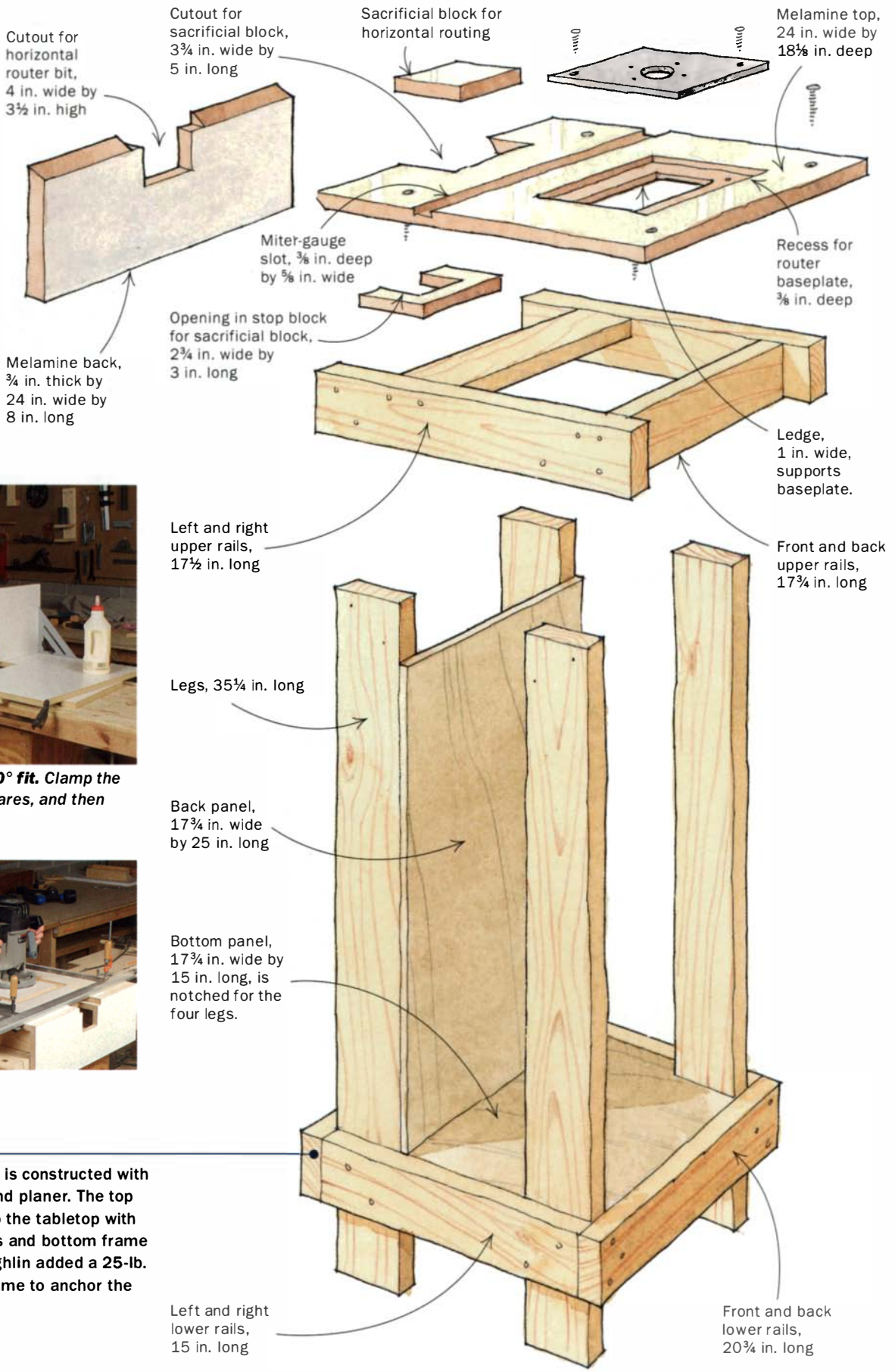
With the router mounted horizontally in an adjustable carriage, the table is set up ideally for cutting sliding dovetails or mortise-and-tenons. And shaping

ADJUSTABLE CARRIAGE ADDS VERSATILITY

An adjustable carriage holds the router in its horizontal cutting position (left) and acts as a base to mount overhead attachments, such as a pin routing guide (right) for template-guided cuts.

ROUTER-TABLE CONSTRUCTION

The tabletop and back are melamine and joined with a miter to provide a smooth, unobstructed surface for routing. The recess in the center of the table allows the router baseplate to sit flush with the tabletop. Size the opening in the top so that the router can be lowered in from above. The measurements in the drawing may need to be modified should you use different hardware.



Framing squares ensure a 90° fit. *Clamp the top and back to two Speed Squares, and then clamp the mitered joint.*

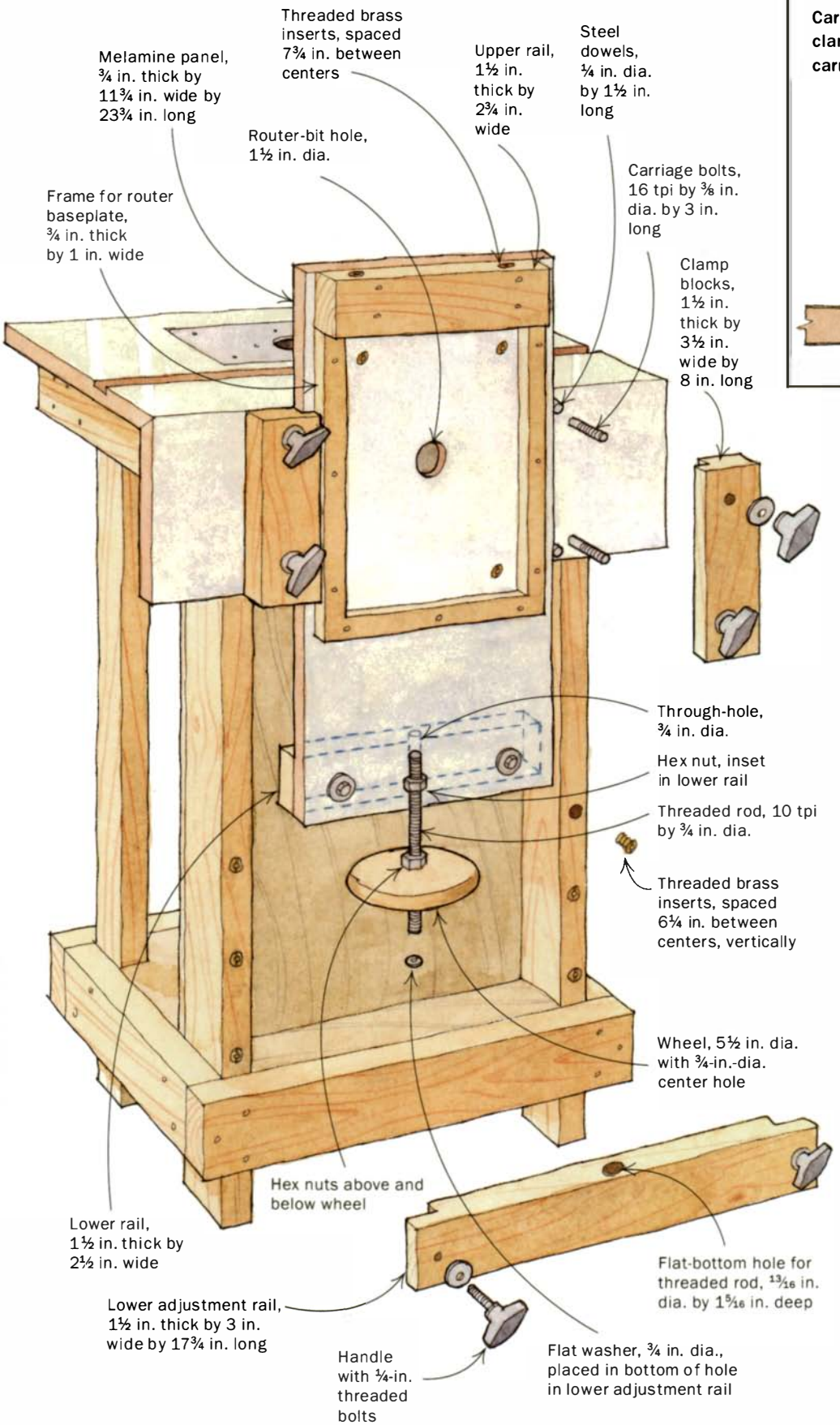
Rout the inset in the top. *Clamp router guides in place, then rout a ledge into the top. The router baseplate should sit flush with the top.*

NO-FRILLS STAND

To keep down costs, the stand is constructed with 2x4s milled flat on a jointer and planer. The top part of the stand is screwed to the tabletop with 1⅝-in. drywall screws; the legs and bottom frame require longer screws. McLaughlin added a 25-lb. weight housed in the lower frame to anchor the router table.

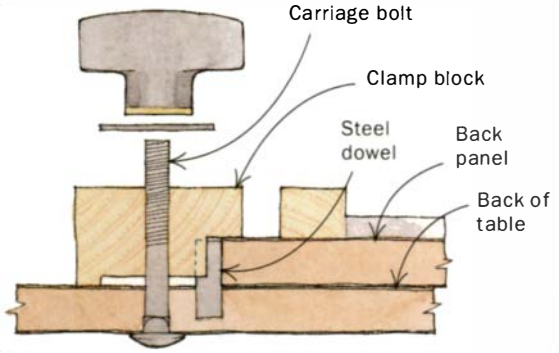
Photos: Matt Berger; drawings: Jim Richey

THE ADJUSTABLE CARRIAGE



CLAMP-BLOCK DETAIL

Carriage bolts and threaded knobs keep the clamps in place. The steel dowels keep the carriage in line.



the edge of a wide board doesn't require balancing unwieldy material on end.

The adjustable carriage also doubles as a base to mount several overhead attachments. A pin routing guide makes the table useful for template-routing. A fence guard is easy to set up for safety. Finally, a horizontal carriage attachment allows the router to be mounted upright above the table surface and the workpiece. In this orientation, you can reference the flat side of the workpiece on the tabletop, which is helpful when removing wide areas of material or when cutting irregular moldings. With such a simple system for mounting attachments, I can build new ones to tackle any tasks I think of down the road.

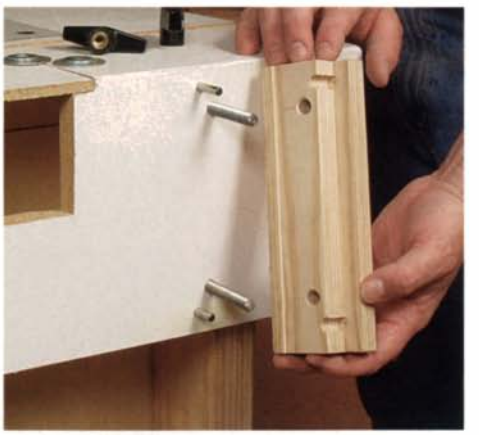
The adjustable carriage moves in a true vertical line perpendicular to the tabletop, so overhead attachments can rest on top and be moved up and down while remaining parallel to the tabletop, a design that's critical to using the overhead attachments effectively. This construction method differs from most horizontal router tables on which the router height is adjusted on a single pivot point, and the router moves up and down in an arc when it's raised and lowered.

The table is built with inexpensive materials

The construction of the router table is relatively simple. The stand is made of 2x4s held together with drywall screws. This is a sturdy and inexpensive method that can be modified easily if you want to add drawers or make an enclosed cabinet. Allow the

A frame on the back of the adjustable carriage holds a router baseplate. *The frame supports a horizontally mounted router. The upper rail also supports overhead attachments.*

Mount the adjustable carriage to the table. *Clamp the carriage in place so that it sits perpendicular to the tabletop. Drill holes for carriage bolts and steel dowels.*



Clamp blocks secure the adjustable carriage. *The clamp blocks fit over the carriage bolts and steel dowels and are tightened in place with threaded handles.*

2x4s to acclimate in your shop so that they don't move significantly after the table has been constructed, and mill them on a jointer and planer to help the parts fit together squarely.

For the tabletop and adjustable carriage I used ¾-in.-thick melamine. I purchased precut shelving material from a local home center. The precut material is easier to handle, but a 4-ft. by 8-ft. sheet also will do. I chose melamine because it has a slick finish and is extremely flat. The various attachments are constructed with melamine and ¾-in.-thick birch plywood.

Start with a flat tabletop

Begin by choosing a router-table baseplate, and build the tabletop to accommodate it. I chose the Bench Dog ProPlate, available from Woodcraft for $30. It has a simple design with openings that can accommodate several bit diameters.

The router-table top consists of a horizontal surface and a vertical back piece that are joined with a mitered edge. Care must be taken to ensure the top and back join at a perfect 90°.

Rough-cut the pieces ⅛-in. oversize, and trim them to exact dimensions using a router and a flush-trimming bit. This method will leave a clean edge on the melamine, unlike a tablesaw blade, which tends to chip the edges. Before assembling the two pieces, cut an opening in the back edge of the tabletop where the bit will be exposed when the router is mounted in its horizontal cutting position. This opening will hold a sacrificial block that can be replaced pe-

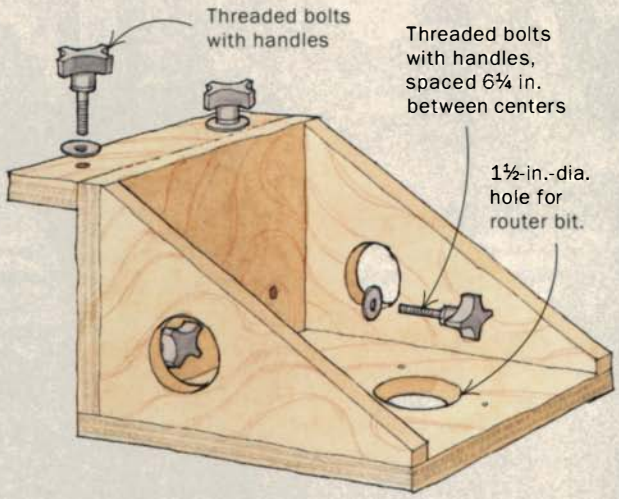
Two ways to set the adjustable-carriage height. *The position of the carriage can be finely adjusted with a wheel. Gross adjustments are made by moving the lower adjustment rail to different positions on the table legs.*

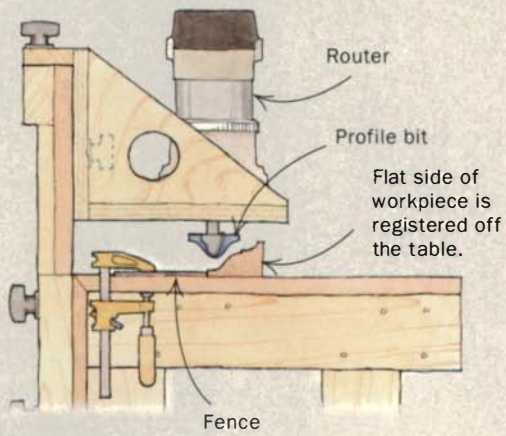
USEFUL ACCESSORIES

This router table can be modified easily to accommodate various routing tasks. With the router mounted upside down in the table, you can make use of several overhead attachments. For example, a pin guide allows for easy template-routing. McLaughlin built four attachments for his router table, shown here. They follow only one standard requirement: They must attach to the top of the adjustable carriage with two threaded bolts with handles that are placed 7¾ in. apart from center to center.

OVERHEAD ROUTER CARRIAGE

An overhead router carriage holds the router upright above the table, allowing the flat side of a workpiece to be referenced on the tabletop.





riodically. Once the opening has been cut, the top and back can be glued together.

Next, make a 2x4 frame to reinforce the tabletop. When building the frame, mill the 2x4s on the jointer and planer to get flat surfaces and right angles. This will prevent the top from warping when it is mounted on the frame. Assemble the pieces on a flat surface, and glue and screw them together. Then mount the tabletop to the frame with drywall screws and attach it to the stand.

Build the tabletop—With the top of the table assembled, make the remaining cuts on its worksurface to accommodate the baseplate and miter gauge. First, cut a recess into the tabletop for the baseplate. The baseplate must sit flush with the table, so the depth of cut is determined by the thickness of the baseplate. Cut the opening to match the baseplate. To do that, make a guide for the router to follow by clamping a straightedge and two right-angle squares onto the tabletop (see the bottom photo on p. 59).

Within the area that has been recessed, use a jigsaw to cut the opening for the router housing. I have a dedicated router that I use with this table, and I find it's easiest to just drop it into the table from above with the baseplate attached. This requires that the router opening be cut with enough clearance to accept the machine. You should leave at least a 1-in. ledge at the narrowest spot to support the baseplate.

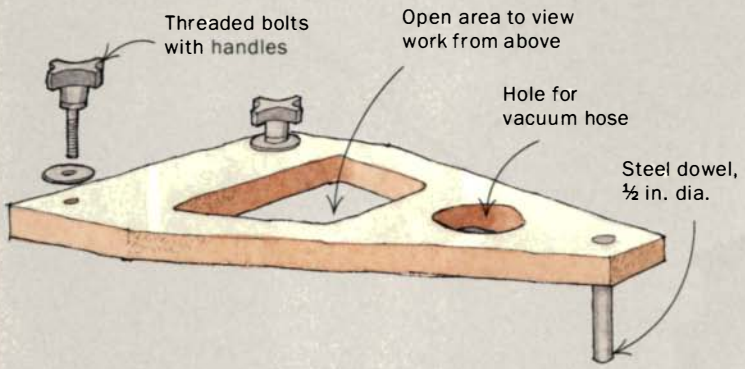
Finally, cut a slot along the width of the table surface for the miter gauge. Then attach the top and frame to the stand.

Construct the adjustable carriage

Cut the melamine back panel to size, then attach a frame to its back side. The frame not only holds the router in a horizontal position, ensuring that the router does not shift during use, but it also strengthens the back panel. Install two threaded brass inserts inside the frame for mounting the baseplate. Finally, drill a hole with a

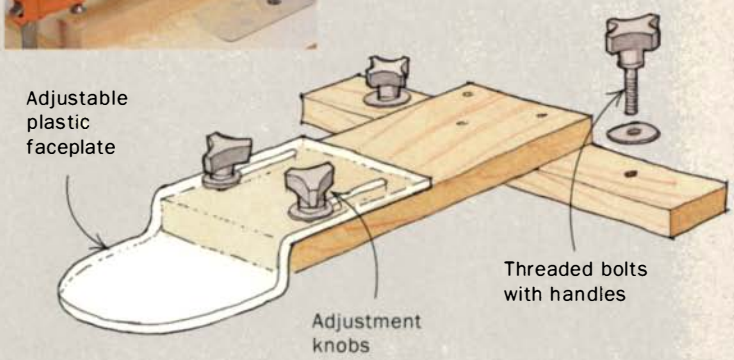
PIN ROUTING GUIDE

A steel dowel, positioned in-line with a non-bearing straight router bit, is used for template-routing. The template is guided along the pin while the router bit cuts the workpiece to match. The pin guide is attached to the adjustable carriage. First, locate the hole for the pin by lowering the carriage while the router is running. When the bit hits the attachment, the dimple left behind pinpoints the location of the pin.



FENCE GUARD

A clear plastic shield keeps fingers away from the bit when the router is mounted upside down in the table. A flattened 2x4 clamped to the table makes an adequate fence.



VACUUM-HOSE ATTACHMENT

This adjustable overhead attachment places a shop-vacuum hose right where you need it.

Forstner bit through the back panel where the router bit will be exposed.

The carriage has an upper rail to support overhead attachments. A lower rail is attached to the bottom edge of the carriage to house one end of the system for finely adjusting the height of the carriage.

Set up the adjustable carriage to slide vertically—The carriage is held in place with four steel ¼-in.-dia. dowels and two L-shaped wood clamp blocks, which secure it to the table.

To make the sliding assembly, drill and drive the steel dowels into the back of the tabletop. The back panel of the carriage should be snug between the pins to prevent it from moving from side to side. The clamp blocks fit over the dowels and are further secured to the back with threaded bolts with handles. Loosening the bolts allows the carriage to slide up and down. Tightening the bolts secures the carriage in place.

Build the system for making fine height adjustments—Fine adjustments are made by turning a wooden wheel that's attached to a threaded rod. The lower rail on the adjustable carriage accepts one end of the threaded rod. Another rail is bolted to the legs to accept the other end of the threaded rod.

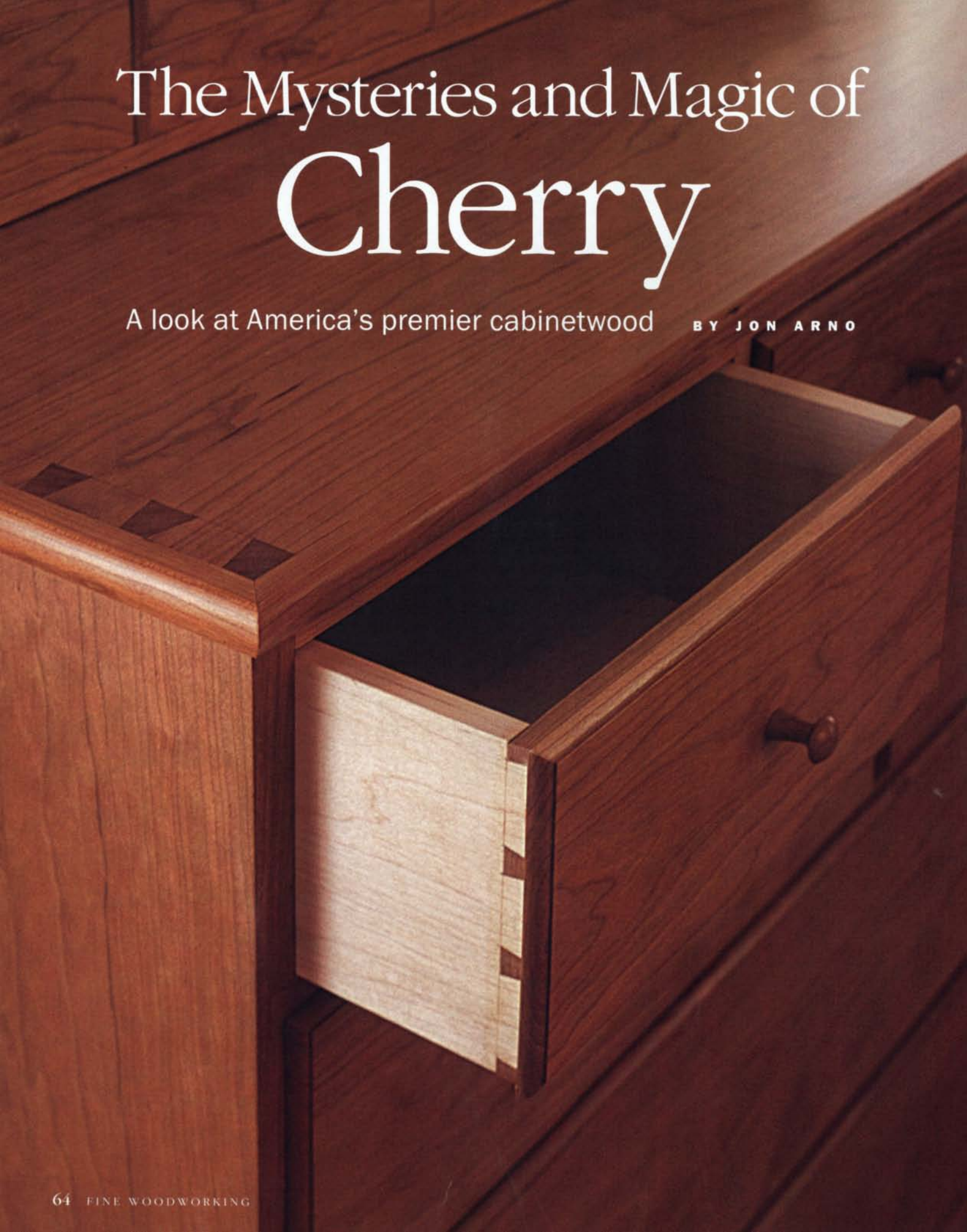
When constructing the adjustment system, use a ¾-in.-dia. 10-tpi threaded rod. One full turn of the wheel will move the carriage up or down 1/10 in. For large adjustments, pairs of brass inserts in three positions along the legs allow the rail to be unbolted and repositioned manually. Set in the lowest position, the top edge of the carriage should sit flush with the tabletop. The other positions will raise the carriage enough to mount the overhead attachments. The brass inserts can be set in various positions to accommodate attachments of your own design.□

Kevin McLaughlin is a mechanical designer and machinist by trade living in Helena, Ala.

The Mysteries and Magic of Cherry

A look at America's premier cabinetwood

BY JON ARNO



Of the hundreds of woods I've spent a lifetime studying, none has so captivated me as cherry. Even now, when I bring it into my shop, its pleasant scent, subtly warm appearance, and satiny feel soothe me with a sense of familiarity and comfort. And yet every time I choose it for a project, my confidence is shaken. This species often seems to have a hidden personality—always friendly but never totally forthcoming. There are, of course, tangible and physical reasons behind the mysteries and magic of cherry; at least, I've discovered a few of them.

In many ways, our native North American black cherry (*Prunus serotina*) is a nearly ideal cabinetwood (see the chart on p. 66). Its density, texture, stability, durability, working properties, color, and figure are as beckoning to some woodworkers as a cold beer on a hot summer day. And history would seem to second that conclusion, because cherry has figured prominently in American furniture. Museum-quality pieces turned out by skilled 18th-century cabinetmakers are among the finest examples of American craftsmanship of that period. Also, the Shaker craftsmen of the 19th century, who certainly knew a thing or two about practicality and function, chose cherry for much of their best work.

So, how could the beginning woodworker go wrong in selecting cherry? Actually, it's surprisingly easy. In experienced hands, cherry yields results of uncommon beauty, and it deserves its place as one of the world's most prestigious cabinetwoods. But learning the whims and ways of cherry is one of woodworking's great challenges, and cherry bestows its many charms only upon those who toil for the privilege.

Why the wood can vary so much

You never can count on any two shipments of cherry being quite the same in either color or texture. Nor can you ever completely count on its consistency from board to board within a given shipment. While one board may display the classic flesh-pink color and subtly intricate figure that is most common to this species, another will reveal a noticeably wavy curl in the grain. The next may be peppered with jet-black gum pockets, while still another will be slightly coarser textured, perhaps even flaunting decidedly greenish or chartreuse highlights. And if you're tempted to blame all of this inconsistency on sloppy handling and sorting at the mill, you'd probably be wrong. In fact, much of the varied lumber in each shipment you receive actually may have come from the same log.

The average cherry tree lives a hectic and stressful life because it is what ecologists and foresters refer to as a nurse tree. It performs the role of being one of the first species to get established when forest lands have been clear-cut or burned. Its roots help to hold the topsoil against erosion, while its foliage provides a sparse canopy for the retention of moisture and the protection of the seedlings of other species. In other words, cherry is a transitional player in the natural process of reestablishing a mature forest because it serves the needs of other species that will overtake it eventually. It helps to jump-start the reforestation process with its ability to disperse very quickly. Because birds eat the fruit and then pass the pit intact through their digestive systems, cherry arrives where it's needed, so to speak, by airmail. Given this symbiotic relationship with birds, cherry can become established on fallow land even though the parent trees may be located many miles away. In fact, so mobile is this species that pockets of it exist along bird-migration routes as far south as Central America. Also, cherry grows rapidly in full sunlight, but it is exceptionally shade intolerant and doesn't grow tall enough to compete for sunlight in the canopy of a forest with other more robust species like maple and oak.

Highlight the curl. *Clockmaker Ian Ingersoll finished this curly cherry clock with an oil-and-varnish mixture to bring out the wood's figure.*

You don't just work cherry; you compete with it. You dodge its deceptions while you snare its charms.

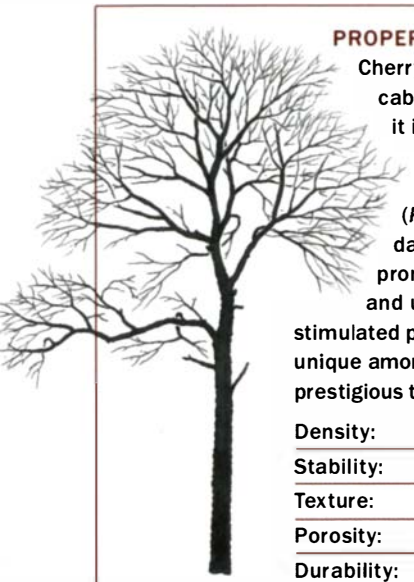
What all this means from the woodworker's perspective is that a typical cherry log represents a microcosm of perpetual change. Because a cherry tree spends its life struggling in an immature forest setting, exposed to constant shifts in the source of light and the ever-increasing competition from other species, it is in a state of constant adjustment. All trees compete for their place in the sun, but cherry virtually never wins. And as the surrounding canopy closes in above them, cherry trees often are weakened to a point where they are susceptible to infestation by insect larvae, triggering their natural defense mechanism to produce more gums. Those gums contain chemicals that affect cherry's pigmentation, its patina-forming properties, and its potential toxicity—all topics of considerable importance to the woodworker.

A color like no other

The chemical compounds produced by cherry, which wood technologists refer to as extractives, are the building blocks of the wood's

Photos: Michael Pekovich (facing page); William Duckworth (this page)

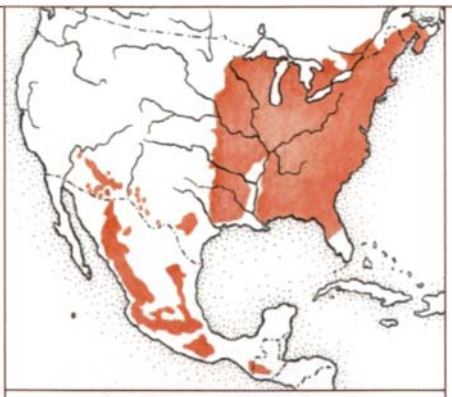
AN IDEAL CABINETWOOD



PROPERTIES

Cherry is unique among cabinetwoods in that it is the only major timber belonging to the Rose family (*Rosaceae*). Its darker color, more pronounced figure, and unusual, light-stimulated patina also make it unique among the world's most prestigious timbers.

Density:	Medium
Stability:	Good
Texture:	Fine
Porosity:	Diffuse
Durability:	Good



WHERE IT GROWS

North American black cherry primarily grows in the eastern half of the United States. Cherry trees reproduce with the help of birds that eat the fruit and distribute the seeds during migration.

LEAF PATTERN

Leaves are bright green, lance-shaped with serrated edges, and taper at both ends to a sharp point. Fruit is small (less than ½ in. dia.) and grows in clusters of six to 12 cherries, which become a dark, reddish black as they ripen in the early autumn.

unique pigmentation. As with all species, once the living tree produces these extractives, they are transported inward through the rays, where they are stored in the inner wood tissue that eventually becomes heartwood. It is the greater concentration of these extractives in the heartwood tissue, and their tendency to form more complex compounds called polymers, that produces the wood's natural heartwood color. With most species, these polymers develop more or less completely while the tree is still alive. They may oxidize and undergo subtle changes once the log has been milled, but the dominant pigmentation of most woods is relatively stable once the heartwood develops.

While cherry's extractives do polymerize to some degree in the living tree and give the wood its initial flesh-pink color, they remain exceptionally reactive, even after the log has been milled. Unlike most other species, the extractives in cherry are photosensitive. They tend to darken, rather than fade, when exposed to light. There are a few other woods with photosensitive extractives—purpleheart, for example—but in most cases, the exposure to light causes a rather quick and complete conversion of their extractives into relatively stable pigments. Cherry is different: While the initial darkening effects of light can be seen almost immediately, continued exposure to light seems to result in an ever-deepening patina over the span of years or even decades. To be sure, strong light eventually will bleach the pigments in cherry, as it will in all woods, but it is a long time coming before it happens to cherry.

A 200-year-old patina. *This Federal candle stand was made in Connecticut, circa 1790-1800.*

The patina that cherry develops is one of the key reasons cherry has such a dedicated following among experienced woodworkers.

The patina that cherry develops is one of the key reasons cherry has such a dedicated following among experienced woodworkers. The beautiful translucence and ever-darkening depth of color can't be faked, and there's no substitute. But getting the most out of cherry isn't an easy task, either when processing it from the log or when using it in the shop. As is the case with walnut, mills often steam cherry to make its color as uniform as possible. The heat generated by steaming darkens the sapwood in both species, but it seems to work more quickly and permanently with walnut because the extractives already present in the sapwood are more immediately and indelibly converted. At least up to the level of its raw, flesh-pink color, steamed cherry has this same initial advantage. However, the benefit is fleeting as its less stable, long-term patina-forming process kicks in.

I'm not certain whether the ultimate long-term color of cherry is more dependent upon differing quantities of extractives present in the sapwood versus the heartwood, but there is no permanent fix that will make cherry sapwood keep pace with the heartwood as the color changes over time. Woodworkers skilled in the art of touch-up staining can do wonders to mask the initial contrast between sapwood and heartwood, and the use of finishes that block ultraviolet light will retard the patina process, but nothing short of perpetual darkness will stop it. For this reason, most experienced cabinetmakers are a little more particular in avoiding cherry sapwood than they might be with other species.

Photo. this page: Courtesy of Wayne Pratt Antiques; drawings: Bobbi Angell

To be sure, there is nothing wrong with using cherry that contains sapwood, if your objective is to achieve a strikingly variegated appearance. But when you intentionally employ this artistic license, it is important to maintain a sense of balance so that the sapwood streaks are both plentiful enough to be an obvious part of the composition and well distributed throughout the piece.

From an artistic perspective, variegated cherry is just one of several legitimate options this species offers. I can think of at least four, or possibly five, subtly distinct cherry cabinetwoods: first, this variegated look, with its sharp contrast between heartwood and sapwood; the equally rustic look offered by the spotted or streaked appearance of gummy stock; the classic, mellow warmth you get when using top-grade, clear heartwood; and the fancier and more complex effect that comes from using a pronounced curly figure.

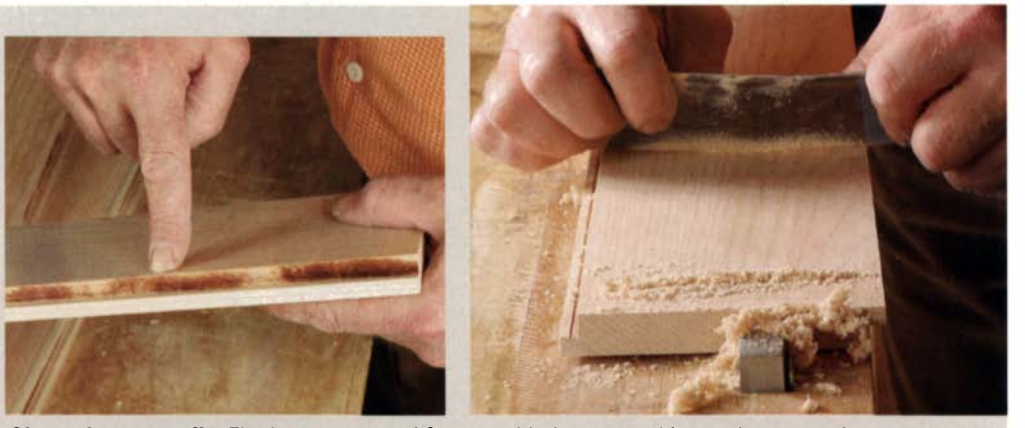
The fifth incarnation of cherry, and one of my personal favorites, is when the stock contains vivid greenish or chartreuse highlights. This unusual trait typically is seen in conjunction with stock that is a little coarser textured than normal and also is somewhat lighter in weight. It may in part be the product of cherry trees that have experienced spurts of unusually rapid growth, possibly in combination with something in the soil that interacts with one of cherry's extractives to create the greenish highlights. But whatever causes it, this trait is beautiful to my eye. The highlights are fugitive, and stock with this unique pigmentation never seems to darken quite as deeply as typical old-growth cherry heartwood. As with any of the other four variations this species yields, it is important to sort the stock carefully and use whatever form you choose exclusively in any given project.

Admittedly, for the small-time avocational woodworker, being extremely picky when it comes to stock selection isn't always an easy thing to do. Most hardwood retailers will allow their customers some reasonable freedom in sorting through their inventories. But in my experience, the best way to buy cherry is in the largest quantity you can afford. Because of the variability of cherry, I cannot overstress the advantage of having an abundance of it on hand in your shop while a project is in progress. (For more about cherry, visit www.finewoodworking.com.) □

Jon Arno retired from a family-owned lumber business and now spends his time writing and working on small projects in his basement shop.

The quirks of working with cherry

No other wood is so demanding in every step of the woodworking process, from start to finish. Each cherry board needs to be chosen carefully at the beginning of the project. The woodworker who buys too little or miscuts a piece is in trouble. While the wood's density and texture give it remarkably good machining and shaping qualities, cutting the joinery demands considerable concentration and care. Cherry's brittleness causes it to chip more easily than most woods, and its natural gums burn almost instantly when exposed to friction from sawblades and router bits. To minimize heat buildup, use exceptionally sharp blades and bits. For the same reason, it is absolutely critical that the stock be passed at a steady rate of feed into shapers, routers, planers, jointers, and even sanders. Just a fraction of a second of stall in the rate of feed, and cherry presents you with virtually indelible and very dark burn marks. To avoid them, I prefer scrapers when working with cherry and use only a fine abrasive (220-grit aluminum-oxide paper) to remove the last vestiges of light scraper marks at the very end of the final prep-for-finish process.



Cherry burns easily. *The heat generated from sawblades, router bits, and even sandpaper can burn the gums in cherry, leaving marks on the surface that are difficult to remove. For that reason, Arno prefers scraping rather than sanding the surface to prepare it for finishing.*

The final finishing process also cannot be taken lightly. While some cherry has flamboyantly curly figure, virtually all cherry has a subtly undulating grain. This sneaky feature of the wood's inconsistent anatomy is often missed by the inexperienced eye. However, the resulting variation it produces in the wood's porosity can cause cherry to accept finishes unevenly. Even clear varnishes or penetrating oils can produce blotches or patches of uneven luster. And then there is the mystery of cherry's light-sensitive patina-forming process: Patience pays a big reward to those who are willing to wait for the wood to darken from its exposure to light. For more on finishing cherry, see *FWW* #130, pp. 46-49.

Color changes happen fast. *This piece of cherry was partly covered with duct tape and left outside for four hours.*

Photos, this page: Rodney Diaz

Spraying Basics

Select your gun, match it to the finish, and then practice the basic spray strokes

BY JEFF JEWITT

It's a pity that so few woodworkers have taken the plunge and begun spray finishing. Lack of information is the main reason, and manufacturers bear much of the blame. Makers of professional spray systems assume you're already familiar with spraying, while the manuals for entry-level equipment give only basic details, and instructions on cans of finish tell you to consult your spray-gun manual.

To remedy this dearth of useful information, I'll describe the main types of spray guns and show you how to match the gun to the finish. By spraying various pieces of furniture, I can demonstrate the different spray strokes that will work best on each kind of surface. Together with the Finish Line (p. 117) on setting up to spray, this information will allow you to begin finishing the way the pros do.

Match the finish to the gun

A spray gun mixes pressurized air and liquid finish in a process known as atomiza-

CHOOSING A GUN

Newcomers to spraying should use a high-volume, low-pressure (HVLP) spray system for the efficient way it converts liquid to droplets (atomization) and transfers those droplets to the object being sprayed.

TURBINE-DRIVEN HVLP

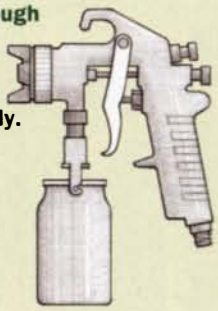
The first HVLP guns were powered by converted vacuum-cleaner motors, which evolved into two-, three-, and four-stage fans known as turbines. These HVLP systems offer a number of advantages to novice sprayers: They're normally sold as a packaged set, including the turbine, an air hose, a gun, and multiple needle/nozzle sizes for different finish viscosities, and generally come with good directions. Systems range in price from $300 to $1,000. You can get a good system for around $600.

COMPRESSOR-DRIVEN HVLP

If you already have an air compressor, you may want to consider buying a gun that will use the air from this source (see below). Known as conversion guns, they convert the high-pressure air from the compressor to a high volume of low-pressure air at the spray tip. Prices range from $100 to $500, with good-quality guns available for less than $300.

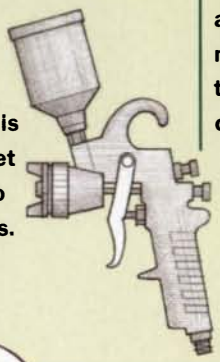
Suction feed

Air expelled through the front of the gun creates a venturi effect, pulling the finish into the gun. Although it's fine for medium- and low-viscosity finishes, this conversion spray gun can't pull up thick finish with enough speed to spray efficiently.



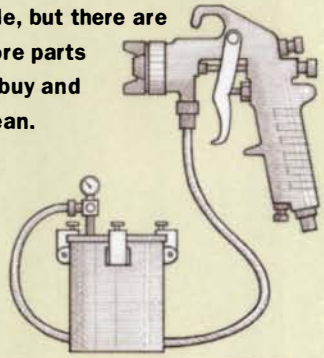
Gravity feed

With the finish container mounted above the gun, this system lets gravity push the material down into the gun. Not only can you spray thicker materials more efficiently, but the gun also is easy and quick to clean. However, it is harder to get the gun into tight spaces.



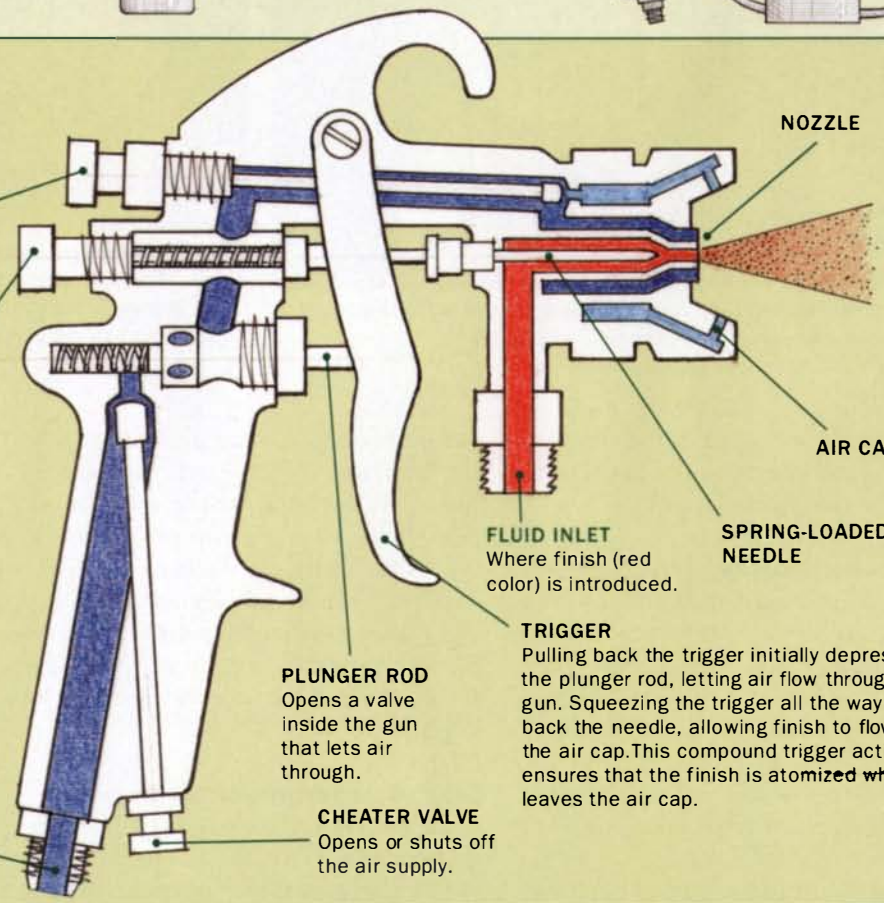
Pressure feed

You can pressurize either a cup attached to the gun or a remote pot that delivers the finish to the gun through a hose (below). The latter system makes the gun smaller and more maneuverable, but there are more parts to buy and clean.



ANATOMY OF A SPRAY GUN

The components of most spray guns are the same as this typical HVLP conversion gun.



FAN-WIDTH CONTROL VALVE
When the valve is closed, air is directed through the center and small annular holes of the air cap, resulting in a small, round spray pattern. Opening the valve lets air (blue color) into the outer horns of the air cap, which pushes the round pattern in from the sides, creating a flatter, elongated spray pattern.

NOZZLE

AIR CAP

FLUID INLET
Where finish (red color) is introduced.

SPRING-LOADED NEEDLE

FLUID-DELIVERY VALVE
Adjusts the needle to control the amount of finish let through.

TRIGGER
Pulling back the trigger initially depresses the plunger rod, letting air flow through the gun. Squeezing the trigger all the way pulls back the needle, allowing finish to flow to the air cap. This compound trigger action ensures that the finish is atomized when it leaves the air cap.

PLUNGER ROD
Opens a valve inside the gun that lets air through.

AIR INLET
The point at which air (blue color) is introduced into the gun.

CHEATER VALVE
Opens or shuts off the air supply.

Drawings: Vince Babak

START WITH THE FINISH

Measure the viscosity. *Submerge the viscosity cup in the finish and time how long it takes for the stream of finish to break.*

VISCOSITY CHART

Generic finish viscosity	Viscosity time [a]	Appropriate needle/nozzle size [c]		
		Gravity feed	Suction feed	Pressure feed
Thin	10-15 sec. [b]	1.1 mm	1.3-1.4 mm	0.7 mm
	15-23 sec.	1.2-1.3 mm	1.5 mm	0.8-1.0 mm
	23-35 sec.	1.5 mm	1.7 mm	1.1 mm
Medium	35-40 sec.	1.5-1.7 mm	1.9 mm	1.1–1.2 mm
	40-45 sec.	1.7 mm		1.2-1.3 mm
	45-55 sec.	1.9 mm	2.2 mm	1.3-1.5 mm
Thick	55+ sec.	2.2 mm	N/R	1.5-1.7 mm

[a] Measured in a Ford No. 4 viscosity cup with finish at 70°F
[b] Water = 10 seconds
[c] To convert millimeters to inches, multiply the millimeter figure by 0.03937

Choose the right-size needle/nozzle. *The higher the viscosity of the finish, the larger the needle/nozzle to achieve good atomization.*

Filter the finish. *Strain the finish through a cone filter to catch impurities that could clog the spray gun.*

tion. For proper atomization, it is critical to adjust the gun to the thickness, or viscosity, of the finish you want to spray.

Measure the viscosity of the finish—A viscosity measuring cup is small with a precisely machined hole in the bottom. Most turbine-driven spray guns come with this type of cup, but owners of conversion guns can purchase one for around $10. I use a Ford No. 4 cup, which is standard. If your cup is different, a conversion table is available at www.finewoodworking.com.

Viscosity is affected by temperature, so before you try to measure it, make sure the finish is at 70°F. Begin by submerging the cup in the finish, and then take it out. Start timing when the top rim of the cup breaks the surface of the finish. Raise the cup 6 in. over the can, and when the first break appears in the fluid stream, stop the clock. The number of seconds passed is the measure of the finish's viscosity (see the chart above).

Select the appropriate needle/nozzle—Once you know the viscosity of the finish, the next step is to choose the matching-size needle/nozzle and sometimes air cap. Keep in mind that the different styles of gun (gravity, suction, or pressure feed) use different-size needle/nozzles for the same finish. Always use the smallest needle/nozzle that you can, as the smaller-diameter ones generally atomize finishes best. Try thinning the product before you select a larger needle/nozzle.

Some cheaper guns may come with only one size needle/nozzle, and in extreme cases the manual may not even specify what size needle/nozzle that is. In this case, you'll have to thin the finish until you achieve good atomization. Manufacturers of water-based finishes typically recom-

Photos: Mark Schofield

ADJUST THE GUN

Set the air pressure. *With the gun's trigger depressed to allow only air to pass, set the outlet air pressure at the compressor, taking into account the hose-pressure drop (see the chart below).*

HOSE-PRESSURE DROP

Inside diameter of hose	Pressure at compressor	Pressure drop		
		15-ft. hose	25-ft. hose	50-ft. hose
5/16 in.	40 psi	1.5 psi	2.5 psi	4 psi
	60 psi	3 psi	4 psi	6 psi
3/8 in.	40 psi	1 psi	2 psi	3.5 psi
	60 psi	2 psi	3 psi	5 psi

Pressure drop is the amount of air loss from the compressor regulator to the gun's air inlet. For pressures below 40 psi, the pressure drops in the hose are negligible.

mend thinning with no more than 5% to 10% of distilled water. Beyond that, you will have to use a viscosity reducer dedicated to that finish. Add the water or reducer in increments of 1 oz. per quart of finish until it sprays properly.

For the best finish "off-the-gun," it is a good idea to strain all finishes as you pour them into the gun. A fine- or medium-mesh cone filter works well to strain impurities from water-based clear finishes; a medium-mesh filter works for paint.

Create a good spray pattern

Once you've matched the finish to the gun, make final adjustments at the gun. Also, select a respirator with cartridges suitable for the type of finish you will be spraying.

Setting up a conversion gun—High-volume low-pressure (HVLP) spray guns have a maximum inlet pressure of 20 to 50 psi; the exact figure is either stamped on the gun's body or given in the instructions. Conversion, or compressor-driven, HVLP spray guns are designed to reduce this inlet pressure to 10 psi at the nozzle, enough to atomize most finishes. With the trigger of the gun slightly depressed to release air but not finish, set the compressor's regulator to slightly above this maximum inlet pressure. This allows for the hose-pressure drop (see the chart above), which is caused by friction as the air passes through the hose. To avoid this calculation, install a miniregulator at the gun to set the pressure.

Turn the fan-width and fluid-delivery valves clockwise so that they're closed. If your gun has a cheater valve (a built-in air regulator), make sure it's open. While the trigger is fully depressed, open the fluid-delivery valve a few turns, which regulates the amount of fluid going through the nozzle. Set it low for delicate spraying of edges and small areas, or open it up for spraying large surfaces. Spray a piece of

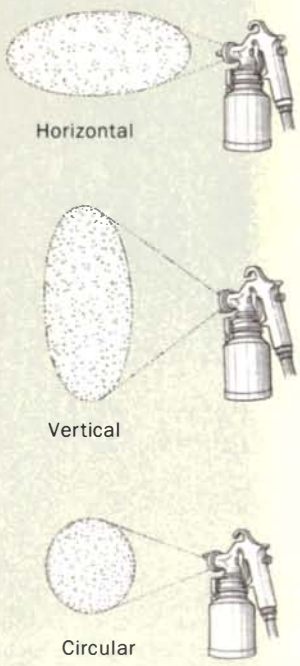
DIAL IN THE SPRAY PATTERN

The type of gun will determine the method of adjustment for the shape and orientation of the spray pattern.

Conversion guns require two adjustments. *A valve at the back changes the pattern from circular to elongated. Twisting the air cap changes the orientation of the spray pattern.*

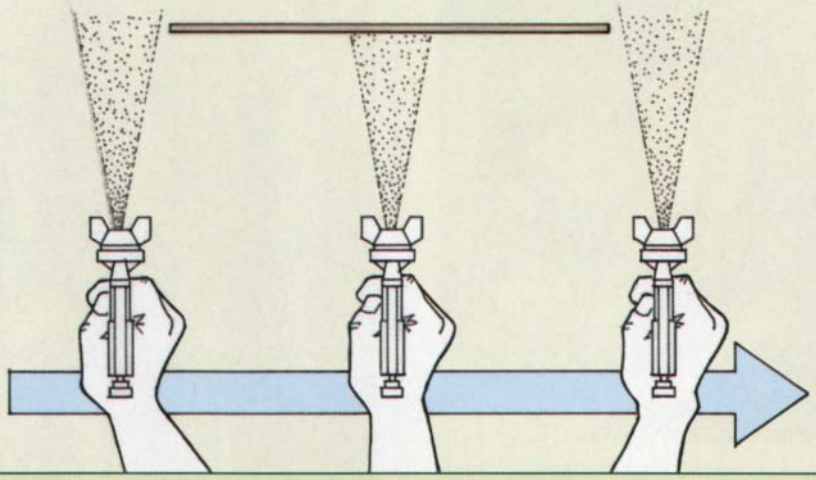
Turbine guns are adjusted at the front. *To adjust the pattern from circular to horizontal to vertical, just turn the air cap.*

Rather than alter the way you hold the gun, adjust the spray pattern to suit the object being sprayed. For vertical surfaces, a horizontal pattern gives optimum coverage; when spraying flat panels in the crosshatch pattern, adjust the gun to get a vertical pattern. A tight circular pattern reduces overspray when finishing narrow parts, such as slats and legs.



THE BASIC SPRAY STROKE

Hold the spray gun at the same distance from the workpiece for the entire pass over the surface. Start spraying off the edge of the workpiece and proceed over the surface. Stop spraying off the other edge.



scrapwood or some corrugated cardboard. Ideally, you want a fine and uniform pattern of droplets across the width of the spray. If you have coarse, large droplets, either the finish is too thin or the needle/nozzle is too large. The reverse is true if the gun sputters or spits. If the finish looks good, keep turning down the air pressure in 5-psi increments until you start to see the finish form a dimpled surface resembling an orange peel. Then raise the air back up 5 psi. Note this as the proper air pressure for the finish you're using. Operating the gun at the lowest pressure possible saves material by reducing bounce-back and overspray.

The fan-width control valve on the gun regulates the spray pattern. As you open the valve, the spray pattern becomes elongated (for more on spray patterns, see p. 71). When you open the valve, you also

FINISH A PANEL IN FOUR STEPS

To achieve a good finish on a flat panel, you need even coverage on all surfaces. The use of a nail board and turntable (see p. 118) allows you to finish the top surface while the bottom is still wet and to direct the spray (and the overspray) toward an extractor fan.

Spray the edges. *With the gun parallel to the panel's surface, make one pass on all four edges.*

Dealing with runs. *If you spot an area with too much finish, quickly wipe away the surplus and apply another light coat.*

Recoat the edges. *With the gun now at a 45° angle to the panel, give the edges a second coat of finish.*

may have to turn up the air pressure going into the gun, so it's a good idea to keep an eye on your regulator.

Setting up a turbine-driven gun—Fully open the cheater valve on the gun. The correct air/liquid balance is established the same way as on a conversion gun. However, on most turbine guns, the position of the air cap determines the shape and orientation of the spray pattern. When the air cap's horns are in the horizontal position, the spray pattern is wide and oriented vertically. When you rotate the air cap 90°, the spray pattern is horizontal. The intermediate position makes the spray pattern tight and round.

Mastering the art of spraying

Before spraying any piece of furniture, dismantle large items as much as you can. Remove backs from carcase pieces and remove drawer bottoms, if possible. If you have a complicated project that includes a lot of slats, consider finishing them before final assembly.

How much finish to apply—Novice sprayers often get carried away with the ease of laying down a finish, and so they apply too much at once.

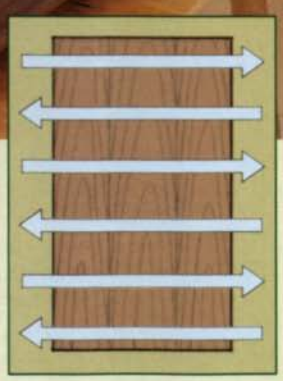
You should aim for each coat to be about two thousandths of an inch thick, or in spraying terms, two mils. A mil gauge is a piece of metal with teeth in mil increments. To use the gauge, spray some finish onto an impermeable surface such as laminate or glass. Drag the gauge through the wet finish, keeping it 90° to the surface and pressed down. Withdraw the gauge and note the first tooth that isn't coated with finish, as well as the one next to it that is coated. Your depth of finish will be an intermediate thickness between these marks. If you have trouble seeing clear finishes on the gauge, sprinkle talc on the wet teeth and blow it off. The talc will stick to the wet teeth.

The basic spray stroke—Lay a flat board or a piece of cardboard on a pair of sawhorses to practice on. Hold the gun perpendicular to the surface, about 6 in. to 8 in. away and about 3 in. off the bottom left-hand corner. Depress the trigger until finish comes out, and move the gun across the board until you get 2 in. to 3 in. past the far edge. Do not arc your pass; rather, lock your forearm so that the gun moves across the board at a constant height and in a straight line. As you make another pass, overlap the first by 50% to 75%. Move the gun fast enough to avoid puddles of finish,

Watch it on the Web To see a video of the author spraying a finish, go to www.finewoodworking.com.

3

Spray across the grain. *Maintaining the gun at an even height over the surface, spray overlapping strokes across the grain.*



4

Then spray with the grain. *Turn the workpiece 90° and spray with the grain in the second half of a crosshatch pattern.*

CASE PIECES

Get down, and get under your cabinet. *Spray the underside of the shelves first (above). Then complete the inside of a cabinet by spraying the sides (right) followed by the tops of the shelves. In this way, the most noticeable surface is sprayed last and won't be affected by overspray.*

but not so fast that the surface feels rough when it has dried.

I start with the surface closest to me and work toward the exhaust fan in my spray booth (see p. 117) to reduce overspray landing on the wet finish and leaving it rough. Practice this basic stroke until it becomes second nature, because it is fundamental to all spraying.

Flat surfaces—The basic spray technique for flat surfaces is called a crosshatch. Begin with the underside of the piece: At a 90° angle to the grain, start your first pass at the edge closest to you and spray a series of overlapping strokes. Then rotate the top 90° (it helps to have it on a turntable) and spray with the grain.

Holding the still-dry edges, turn over the panel and place it back on the nail board. Spray the edges with the gun parallel to the surface, then bring the gun up to 45° to the top and spray the edges again to get extra finish on them. Finally, repeat the crosshatching on the top side.

If you get a drip, and you won't be damaging a delicate toner or glaze underneath, wipe the drip immediately with your finger and lightly respray the area.

Inside cabinets—Spraying inside a cabinet is a lot easier if you remove the back. If you cannot remove the back, you'll get a face full of overspray unless you turn the air pressure way down, which may result in a poorly atomized finish. Start on the underside of the top and then the two sides, leaving the bottom last so that overspray doesn't settle there and create a rough finish. For each panel, spray all four edges first before doing the center. Rotate the piece so that you always spray toward the back of the booth; this way, the fan will draw the overspray away from the piece. Blow away

Avoid runs on vertical surfaces. *Apply overlapping strokes from bottom to top, but do not apply a crosshatch spray across the grain, as too much finish likely will sag or run on a vertical surface.*

SLATS AND SPINDLES

With the stool upside down (left), spray the underside of the rails and the inside surfaces that are least visible. Flip the stool (below) and spray the visible areas, keeping the spray gun the same distance from the workpiece.

RAISED PANELS

The procedure is identical to that of a tabletop, with the addition of a first pass with the gun angled around the inside edge of the frame.

GRIDS

Treat grids and frames for glass-panel doors as a flat, continuous surface, and apply a crosshatch spray pattern.

the cloud of finish left inside by depressing the trigger of the gun slightly so that air but no finish comes through.

Verticals—Start at the bottom and lay down a continuous layer of finish until you reach the top. Overlap each pass 50%—as though you were spraying a flat surface—but don't crosshatch, because the extra finish will cause runs. For face frames, adjust the fan width to match the width of the frame members, if possible.

Complicated pieces—To spray a stool or a chair, work from the less-visible parts to the most visible. With the piece upside down, spray the underside and inside areas. Though less visible, they still have to be finished. Turn over the stool and rest it on four screws driven into the feet (see the photos above) to prevent the finish from pooling around the bottom of the legs.

Now spray the sides of the legs and the slats, working quickly to apply light coats. Finally, finish the outside surfaces that are most visible. As with vertical surfaces, the trick is to keep the coats of finish thin and to avoid sags and runs. □

Jeff Jewitt is a frequent contributor to Fine Woodworking *on finishing topics.*

TOOL TEST

Bandsaw Blades

We review nineteen ½-in. blades to find the fastest and smoothest cutters

BY TOM BEGNAL AND JOHN WHITE

Resawing is the process of cutting a board to make it thinner. And when it comes to choosing bandsaw blades for resawing, woodworkers have no shortage of options. Almost a dozen different brands are available, and it's not unusual for each brand to offer several blades that can handle resawing tasks.

We tested a number of resaw blades in the *Fine Woodworking* shop. The test was limited to ½-in.-wide blades, a size well suited to resawing on a 14-in. bandsaw. The same bandsaw was used for all of the tests: a 14-in. Delta (model 28-241) with a 1½-hp motor and a 6-in. riser block.

Testing for speed, flatness, and smoothness

When it comes to resaw blades, most woodworkers have only three demands. The blade should cut reasonably fast, and the cut should be both reasonably flat and reasonably smooth.

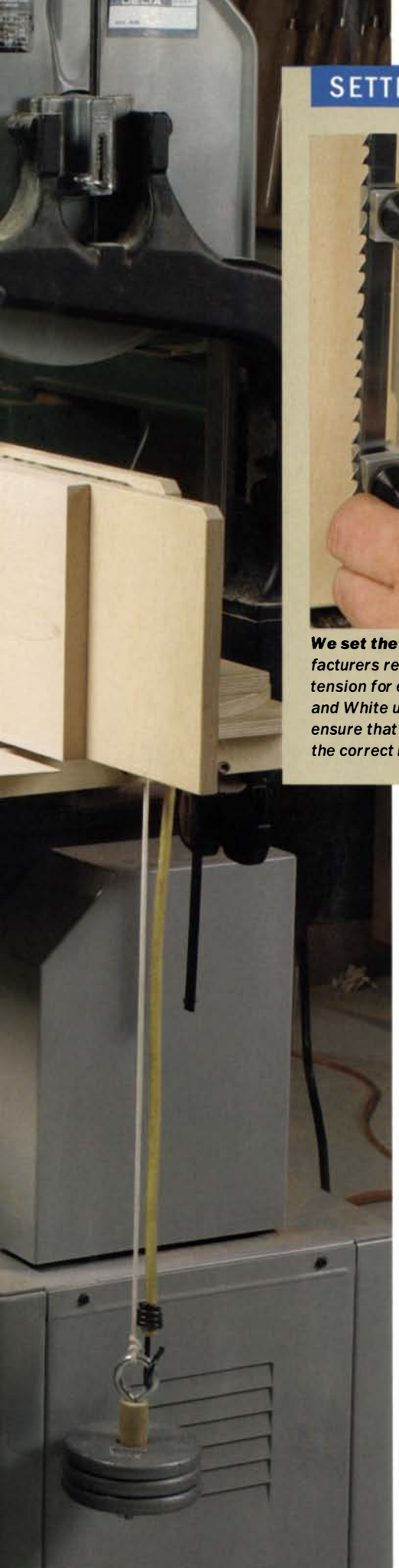
Some woodworkers are interested mainly in speed. They allow for extra stock, so a cut that's less than perfectly flat isn't a concern: After a few passes on the jointer, the surface is flat and smooth. For other woodworkers, though, a cut that's flat and smooth is most important. That's often the case

SETTING UP THE TEST

We set the blade tension. *Several manufacturers recommended a specific blade tension for each of their blades, so Begnal and White used a commercial gauge to ensure that each blade was tensioned to the correct number.*

And adjusted the carriage for drift. *After installing each blade, a test cut was made on a scrap block of wood to determine the angle of blade drift; then the carriage was adjusted to match the angle.*

Then mounted the test blocks securely to the carriage. *Each test block was screwed to the carriage before the test cuts were made.*



when resawing stock to create thin sheets of veneer. And when the wood is pricey, a flat, smooth cut is even more important.

Blade life can be an issue, too. But because the typical home-shop woodworker uses a bandsaw only occasionally, blade life is likely to be measured in years rather than in hours. Therefore, our tests didn't include one for blade life, nor did we look at any carbide-tipped blades.

With all that in mind, we established three different tests. First, we looked at cutting speed, and then we measured the flatness of the cut. Last, we looked at the smoothness of the cut. The results are shown in the chart on pp. 78-79. For the tests, each blade was installed in the bandsaw using the same setup and procedure, with one notable exception: The tension we applied to the blade was based on recommendations from the blade manufacturers.

The speed test—The cutting-speed test was pretty basic: We timed how long it took for each blade to cut through a section of 9½-in.-wide soft maple. Short times equated to fast-cutting blades. It took some extra effort to ensure a level playing field for the blades, starting with the stock. To minimize any physical differences in the wood, all of the test cuts came from the same board. After milling a 10-ft.-long board to 1¾ in. thick by 9½ in. wide, we cut 10, 1-ft.-long blocks from each one. All of the blocks were knot free and relatively straight grained.

To ensure a consistent cutting force, we devised a system that included a carriage and steel weights. The carriage, mounted to the bandsaw table, rode on ball-bearing drawer slides to minimize friction. The weights hung off a pulley on the end of the saw table, connected to the front of the carriage by a heavy line. Mounting a test block was simply a matter of driving a few wood screws through the back of the carriage.

We used 7½ lb. of weight as a standard. That number was the result of hands-on experiments that showed it as a comfortable force when cutting 9½-in.-wide soft maple with a ½-in. resaw blade on a saw with a

THE TESTING PROCESS

CUTTING SPEED
With the block mounted to the carriage, and the pulley-and-weight system providing a consistent cutting force, Begnal and White needed only to look on and measure the cutting time with a stopwatch.

BARRELING
After each cut, a straightedge and feeler gauges were used to check the face of the test block for any sign of barreling.

SMOOTHNESS
After testing each blade, Begnal and White ripped a cutoff piece from each block into a narrow strip. After its initial thickness was measured, the strip was sanded until all of the sawmarks disappeared; then it was remeasured. The difference in thickness represented the relative smoothness.

MODEL	SOURCE	PRICE
BC Saw	888-251-2236 www.bcsaw.com	$10
Delta Platinum Pro 28-960	800-438-2486 www.deltamachinery.com	$25
Grizzly G5188 Carbon Steel	800-523-4777 www.grizzly.com	$12
Highland Hardware Carbon Steel	888-500-4466 www.highlandhardware.com	$14
Highland Hardware Wood Slicer		$30
Jet Equipment & Tools Carbon Steel	800-274-6848 www.jettools.com	$25
Jet Equipment & Tools BandPlus		$23
Jet Equipment & Tools Silicon Steel Flex-Back		$28
Lenox Pro I	800-628-3030 www.lenoxsaw.com	$14
Lenox Pro II		$36
Olson All Pro	203-792-8622 www.olsonsaw.com	$16
Olson MVP		$30
Starrett Woodpecker Premium	978-249-3551 www.starrett.com	$14.50
Starrett Woodpecker Flex-Back		$16.50
Suffolk Machinery Timber Wolf A.S.	800-234-7297 www.suffolkmachinery.com	$18.50
Suffolk Machinery Timber Wolf P.C.		$17.50
SuperCut Carbon Tool Steel	800-356-9918 www.supercutbandsaw.com	$10
SuperCut Hawc Pro		$14.50
SuperCut Premium Gold		$20.50

1½-hp motor. In a few cases, the blade bogged down during the test cut. When that happened, we reran the test after either increasing the tension or reducing the applied weight. Only one blade, the Jet Carbon Steel, continued to stall even after we fiddled with the tension and the applied weight; a replacement blade also stalled.

After adjusting the carriage to allow for blade drift—that annoying propensity of bandsaw blades to wander from a straight cut—we used each blade to make three test cuts, for a total of 3 ft. With a stopwatch, we timed each foot-long cut; then we averaged out the three cuts.

The flatness test—Several of the blades produced cuts that weren't flat across the width of the test block. Instead, the cut surface had a bowed shape, much like that of a barrel. Indeed, it's called a barrel cut, or barreling, and it's not uncommon when resawing wide stock. We measured the amount of barreling using a straightedge and a set of feeler gauges.

The smoothness test—Not all resaw blades make equally smooth cuts. So to

Photos, except where noted: Tom Begnal; p. 76: Michael Pekovich

SPEED	FLATNESS	SMOOTHNESS	BLADE TYPE
Good	Excellent	Good	3 tpi, skip
Good	Excellent	Very good	4 tpi, hook
Very good	Fair	Good	3 tpi, hook
Good	Excellent	Good	3 tpi, hook
Excellent	Very good	Excellent	3-4 tpi, hook
Stalled during test	N/A	N/A	4 tpi, hook
Very good	Good	Fair	3 tpi, hook
Fair	Very good	Very good	4 tpi, hook
Fair	Excellent	Fair	3 tpi, hook
Fair	Excellent	Good	4 tpi, hook
Very good	Good	Fair	3 tpi, hook
Very good	Very good	Good	3 tpi, hook
Excellent	Good	Good	3 tpi, skip
Good	Very good	Fair	3 tpi, hook
Very good	Very good	Fair	3 tpi, hook
Very good	Fair	Fair	3 tpi, hook
Very good	Fair	Good	3 tpi, hook
Very good	Poor	Poor	3 tpi, hook
Good	Good	Fair	3 tpi, hook

find the smoothest cutters, we measured how much sanding had to be done to remove the blade marks.

Choosing the top performers

We found that most of the blades were capable of resawing 9½-in.-wide soft maple when 7½ lb. of force was used to feed the stock. But as soon as we began to think specifically about speed, flatness, and smoothness, we began to see differences among the blades.

The fastest-cutting blades—When it came to pure speed, we found two blades that stood out: the Starrett Woodpecker Premium and the Wood Slicer from Highland Hardware. The Woodpecker Premium needed, on average, only 13.69 seconds to make the 12-in.-long cut; the Wood Slicer did it in 15.07 seconds. Initially, the Woodpecker Premium stalled before completing the cut, and efforts to adjust the tension or applied weight didn't help. The test conclusions in the chart are based on a second Woodpecker blade we tried, one that cut considerably better.

Three other blades also performed well in terms of speed, with numbers in the teens: the Olson All Pro (18.34 seconds), the Timber Wolf P.C. (18.54 seconds), and the SuperCut Carbon Tool Steel (19.44 seconds). Blades that also did very well in the speed test were the SuperCut Hawc Pro (20.26 seconds), the Olson MVP (20.60 seconds), the Grizzly (21.43 seconds), the Timber Wolf A.S. (21.70 seconds), and the Jet BandPlus (24.18 seconds).

The flattest-cutting blades—Four of the blades—the BC Saw, the Delta Platinum Pro, the Highland Hardware Carbon Steel, and the Lenox Pro II—produced dead-flat stock when we measured for barreling. The Lenox Pro I also did very well, with only 0.002 in. of barreling. If a flat cut is especially important, you'll want to put these blades at the top of your list.

The smoothest-cutting blades—When smoothness of cut was considered, Highland Hardware's Wood Slicer was the top performer, requiring only 0.002 in. of sanding to produce a smooth surface. The Delta Platinum Pro and the Jet Silicon Steel FlexBack also had impressive numbers, needing just 0.004 in. of sanding.

The best all-around blades—With our tests giving it a grade of excellent in both speed and smoothness, and a grade of very good in barreling, the Wood Slicer blade from Highland Hardware was our choice for the best all-around performer. A $30 price tag makes it one of the more expensive resaw blades we tested, but anyone looking for fast and smooth cuts won't be disappointed.

The Delta Platinum Pro, which sells for $25, also garnered strong marks in the speed (good), smoothness (very good), and flatness (excellent) tests. Anyone looking for value should consider the BC Saw carbon steel blade; its $10 selling price won't make your wallet work too hard. □

Tom Begnal is an associate editor. John White is the shop manager for Fine Woodworking.

Current Work

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Philip A. Houck Boston, Mass.

This mahogany and ash armchair (19¾ in. deep by 23 in. wide by 37 in. tall) is a copy of one of two chairs on display at Boston's Museum of Fine Arts. "I wanted to make an armchair with stretchers and carvings for the experience of the construction," said Houck, "and this one is so delicate and lovely." Houck's wife loved it so much that it has become her "throne." The chair is finished with water-soluble dyes and shellac. Photo by Lance Patterson

Edward H. Stone
Bowie, Md.

An offshoot of Simon Willard's famous banjo clock, this mahogany lyre clock features a painted glass tablet and incorporates a dolphin design adapted from a 1730 English table. The hand-carved clock (3 in. deep by 12 in. wide by 40 in. tall) took Stone, an enthusiast of American wall and shelf clocks from 1800 to 1840, approximately 180 hours to construct. It has a gel-varnish finish. Photo by PRS

Gerald Ben Kailua-Kona, Hawaii

This ash and wenge buffet table (32 in. deep by 84 in. wide by 34 in. tall) is the fourth interpretation of a design concept Ben came up with 10 years ago. The main structural curves of the base and the top frame are tapered laminations. The veins in the center of the top frame (inset) are ⅛ in. thick and are under slight compression to help keep their shape. "I use a technique used by ukulele and guitar makers of steam-bending over a hot pipe to influence the curve that I want the veins to take," said Ben. The finish is lacquer.

Harry and Brian Hinteman St. James, N.Y.

After perusing Albert Sack's *Fine Points of Furniture* (out of print), the Hintemans were inspired to build this oxbow chest of drawers (20 in. deep by 38 in. wide by 35 in. tall) as their first piece of furniture. The chest—made of cherry and poplar—won Best of Show in the 2002 Long Island Woodworking Show. The Hintemans completed the chest in approximately 220 hours. It has a lacquer finish.

Albert Taylor Chillicothe, Ohio

Taylor made this desktop cabinet (7½ in. deep by 12 in. wide by 18½ in. tall) as his first project in a nine-month program at the College of the Redwoods. Made of Mendocino cypress and kwila, the cabinet features coopered doors. "The dovetailing of the inside drawer sides into the curved front face was something I'd wanted to learn," said Taylor. The cabinet is finished with shellac. Photo by David Welter

Harvey J. Von Culin Blue Bell, Pa.

Having an interest in Gothic art and the Middle Ages, Von Culin became inspired to build and carve this American black walnut chest (14½ in. deep by 26 in. wide by 17¾ in. tall) after reading Edward R. Hasbrouck's "Gothic Tracery" (*FWW* #5, pp. 44-46). He carved the linenfold side panels from a design he saw in Richard Butz's *How to Carve Wood: A Book of Projects and Techniques* (The Taunton Press, 1991). With the incorporation of both the tracery and the linenfolds, the chest is representative of pieces from the late 15th and early 16th centuries. It has a tung-oil finish.

Jim Howe Issaquah, Wash.

Working for a client who enjoys and collects Art Deco-style furniture, Howe designed this corner entertainment center (42 in. deep by 65 in. wide by 82 in. tall) to evoke the classic look of an Art Deco-style radio with bifold arched doors and side arches that provide storage for CDs and DVDs. The entertainment center is made of cherry and bird's-eye maple and took 340 hours to complete. The finish is hand-rubbed oil. Photo by Gus McBride Photography

Steve Antonellis South Glastonbury, Conn.

This mahogany table (18 in. dia. by 29 in. tall) features hand-cut mahogany veneer on the top, shelf, and apron, and maple inlay in the legs. "The grain pattern of the top and shelf results in a cube illusion that changes color and cube orientation when viewed from different angles," Antonellis said. The table is finished with oil and wax.

Eugene DeSombre Oak Park, Ill.

DeSombre built this china cabinet (24 in. deep by 90 in. wide by 36 in. tall) for his wife, who collects china. Designed to fit into an 8-ft. space in DeSombre's dining room, the piece is constructed out of walnut and walnut-burl veneer. All six doors are book-matched, and the three drawers are quarter-matched. The doors, drawers, and quarter-matched veneered top all are inlaid with maple and dyed-black castello. The finish is sprayed water-based lacquer.

Rod Chelberg Pittsfield, Maine

An emergency-room physician, Chelberg took up woodworking as a means of relaxation. He made this bench (24 in. deep by 60 in. wide by 36 in. tall) for the entryway of his home. The bench, made from cherry found in an old barn, features a back with a marquetry design comprising a wide variety of different hardwoods. "When I look at the bench," said Chelberg, "I imagine that I'm in a field looking at a tree branch with birds on it." The piece has a lacquer finish. Photo by Ann Lynn

Eliane Kinsley and Eric Sauvé
Montreal, Que., Canada

An exploration in contemporary marquetry, these two pieces are a collaboration between Kinsley, a professional marqueter, and Sauvé, a visual artist. The display cabinet (12 in. deep by 18 in. wide by 58 in. tall) and the four-door cabinet (12 in. deep by 30½ in. wide by 36 in. tall) both are constructed out of cherry, wenge, and English curly sycamore. Each of the pieces has a catalyzed-lacquer finish.

Gregory M. Glotzbach Yorkville, Ill.

"Grasping cubist inspiration, anthropomorphic rhythm, and contrasting curvilinear perspectives, and uniting them into a magnificent dry piece of wood is what drives me," said Glotzbach. "I am nurtured by the dream of sculpting the unique by hand without multiples." His latest sculpture, Ascending Nude, stands 27 in. tall. It is made from one solid piece of kiln-dried curly white maple and is sanded up to 2,000 grit.

Rules of Thumb

BY ROBERT W. LANG

Ten tips for measuring accurately

The ability to work accurately is one of the most important skills for a woodworker to master. If you can make a precise layout and produce parts that are consistently the right size and shape, with reliably straight and square edges, then you can build just about anything. Much of the skill to work precisely comes from the ability to measure accurately. Small errors that are allowed to slip by during construction will accumulate, and the end result will be off by at least the sum of them. What follows are 10 tips to get the most from your measuring tools.

1. Stay sharp mentally

Most measuring mistakes simply are the result of human error. In measuring, the brain is the most important tool, and you must keep it as sharp as your pencils. Working when you're tired or in a hurry may cause not only mistakes that waste time and material but also injuries. Sometimes the most productive thing to do is take a break and relax.

2. Treat your tape kindly

A sloppy tape measure or a well-kept tape that is used improperly can cause errors. Don't expect to get an accurate measurement from a tape with a hook that is bent or marred by a glob of hardened glue. I usually replace my tape measures after six months or a year of steady use. Even a tape in good repair can lead to errors. A sag in the tape can throw off a measurement, as can a tape that isn't held parallel to the line being measured.

Start with a good tape measure. *A bent hook or a twisted tape can cause measuring mistakes.*

3. Keep your eye on the line

The three elements involved in making precise measurements are the human eye, the reference line on the rule, and the point to be measured on a workpiece, which can be an existing edge, a surface, or a line marked with a pencil or knife. If the eye, the rule, and the point to be measured all are in a straight line, the measurement will be accurate. When the eye is to one side or the other of this imaginary line, then an error of parallax occurs. To demonstrate this, hold a tape measure against the edge of a workpiece. Line up your eye to check the measurement, and then shift your head to either side. You'll notice that the measurement changes as you shift your head.

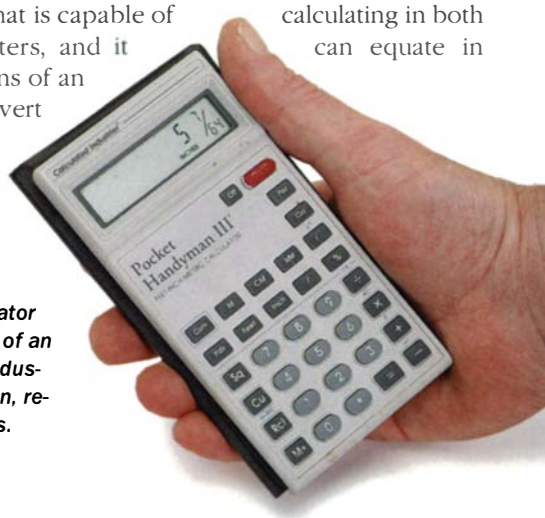
4. Mark material clearly

Use a sharp pencil or a marking knife to mark a point or line. I prefer a 0.5-mm mechanical pencil with a hard tip. No. 2 pencils or flat carpenter's pencils are not suitable because the soft lead point dulls quickly. It doesn't make sense to try to measure to 1/32-in. accuracy and then draw a line that is thicker than that. If you use a marking knife to create a defined line, be sure that the blade does not follow the grain of the wood and wander.

Thin marking lines yield accurate measurements. *A marking knife can offer a precise line to measure to and from. Avoid thick pencil lines.*

5. Use a calculator

Mathematical errors are a common cause of miscut parts. When drawing up measured plans or following plans in the shop, an error in arithmetic can impair a project and go unnoticed until it's too late. One tool I find most useful in beating mathematical mistakes is a calculator that works in fractions of an inch or in millimeters. I use one that is capable of calculating in both inches and millimeters, and it can equate in decimals and fractions of an inch. It also can convert measurements back and forth between all of those options.



Math helper. *A calculator that works in fractions of an inch, like Calculated Industries' Pocket Handyman, reduces arithmetic errors.*

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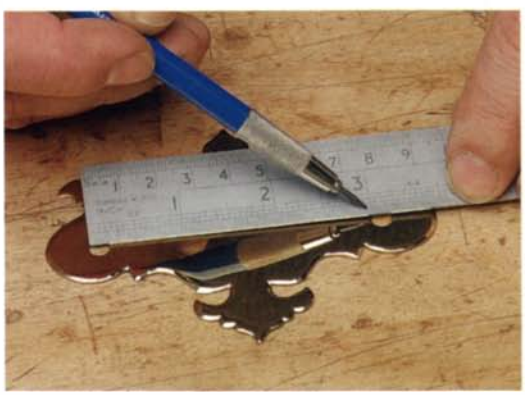
6. Measure from the 10-in. mark

Often, it's more accurate to measure from a mark on a tape measure—usually the 1-in. mark is used—rather than rely on the hook. This is a good method as long as you remember that you started at the 1-in. mark and not zero. It's easy to forget and miscut a piece by 1 in. I use a variation on this method and start each measurement at the 10-in. mark. The arithmetic is easy, and any mistakes should be so obvious that I will catch them before it's too late.

Start at the 10-in. mark. *When measuring interior dimensions of furniture parts, such as a drawer, it is more accurate to register the measurement from a mark on the tape rather than relying on the hook.*

7. Measure to and from a precise location

Another common measuring mistake can occur when the point being measured to or from is incorrect. I call this an error of reference. The best example of this is when measuring to the center point of a hole. When laying out a hole, the center naturally is used as the reference point. However, once the hole has been drilled, the reference point ceases to exist. There are several methods for locating the center. You can determine the precise distance between the centers of two equally sized holes by measuring from the edge of the first hole to the corresponding edge of the second hole. You can adjust the technique when the holes are of different diameters by adding to the measurement the difference of the two radii. This trick is especially useful in cabinetmaking when laying out hinges or shelf-pin hardware.



Finding the center. *To determine the center-to-center distance of the two holes on cabinet hardware, measure from one edge of the first hole to the corresponding edge of the second hole.*

8. Don't guess

One way to ensure that a part won't fit precisely is to eyeball a measurement. You cannot expect to get an accurate inside measurement by folding a measuring tape into a corner, or by using the length of the tape case as part of a measurement. If you are measuring an interior span, measure partway from one end, make a mark, and then measure to that mark from the other end. The sum of the two partial measurements will equal the total distance.

Folding a tape measure into a corner won't give an accurate measurement. *Instead, measure part of the distance and make a mark; then measure from the mark to the end.*

9. Maintain your measuring tools

Good measuring and layout tools represent a considerable investment. While the miser in me balks at paying the price for these tools, the craftsman appreciates the need for consistent references. These expensive tools must be taken care of. Keeping them clean is worth the effort. Most wood dust is relatively corrosive, and the water in most wood glues can cause rust to develop if glue is left on the tool. Wipe them down occasionally with steel wool or a rag dampened in light oil, and avoid dropping them. Tools that aren't quite right should either be repaired or disposed of.

10. Don't measure if you don't have to

Every measurement and calculation involves the risk of making an error, and in many instances it can be more precise and efficient to work without numbers. Take, for example, the opening for a drawer. If I measure the opening, then mark the material for the drawer front by measuring, I'm giving myself two chances to make a mistake. By holding the drawer front in the opening and marking it with a pencil, I can confidently transfer the correct dimension to the workpiece, eliminating most opportunities for mistakes. □

Measuring tool isn't always required. *To determine the length of a drawer front, line up the workpiece with the drawer opening and mark the location for a crosscut.*

Photos: Matt Berger

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Fixing turning mistakes

BY ERNIE CONOVER

Sometimes repairing a turning mistake is a better option than making a replacement part. For example, there are times when you don't have extra stock for a good match (in figure and grain) to the rest of the piece. Other times, starting over can be a blow to your morale, not to mention time-consuming.

Fortunately, there are several methods for fixing both turning mistakes and flaws in the wood itself, whether you are doing faceplate work or turning spindles.

Don't be afraid to vary the diameter of multiple parts, such as table legs, if it means cutting away a mistake or defect. Fortunately, while the eyes are able to discern when elements are misaligned in height, they are much less sensitive to variances in diameter. To this end, the quickest way to fix a goof is simply to turn the affected area to a slightly smaller diameter, removing the flaw.

Every turning has a major diameter, which usually is the diameter necessary to turn the block you started with round, and a minor diameter, which is the narrowest part. As long as the major and minor diameters are made fairly consistent, a lot of variation can occur between other elements without being noticeable. And slight variances among major and minor diameters may be almost imperceptible.

Can you tell the difference? *To conceal a mistake, the bottom spindle was turned to a slightly smaller diameter.*

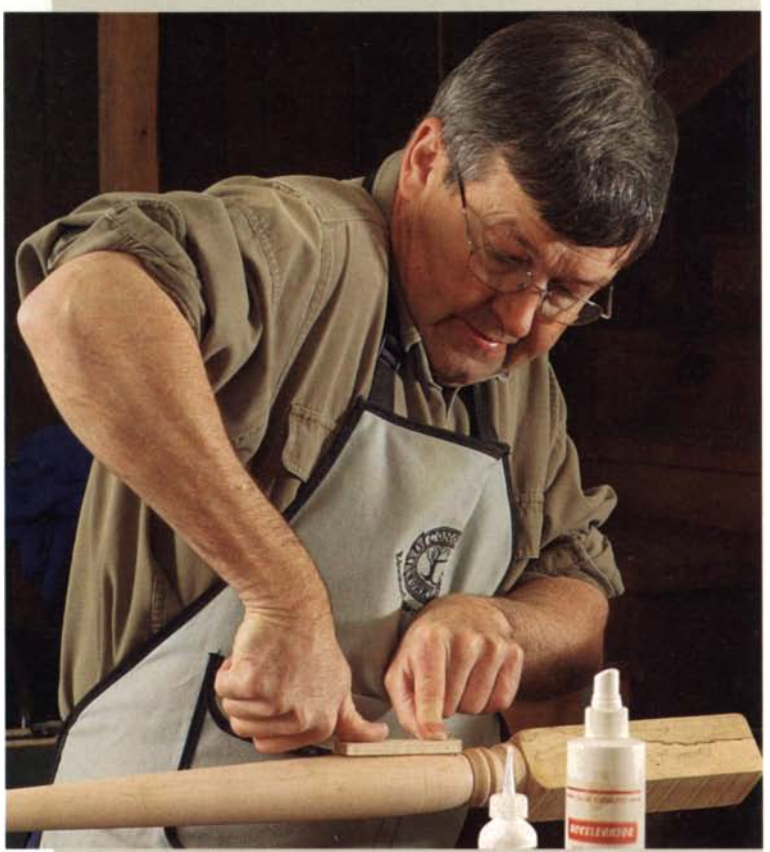
With experience, you'll realize when you can get away with variations in diameter and when you can't. For example, the legs of a table can be off in diameter by as much as 3/16 in. because they are positioned so far apart. Turnings that are closer together, however, such as chair legs, will tolerate variances of only 1/16 in. or so. Beads are especially prone to blunders, but exact duplicates are not necessary to create an acceptable match.

Plane a flat and glue on a patch

When you can't get away with varying the turning diameter to mask mistakes, the most effective repair is to patch the damaged area with wood of the same grain and color. When turning new spindles, this is easy because you probably will have cutoffs of like wood on hand. When repairing older pieces, finding exact

Flat patches

Plane away the mark. *With the workpiece mounted on the lathe, a few swipes with a smoothing plane clear away the mistake, leaving a flat, clean surface.*



Glue on a patch. *A cutoff of similar wood with a planed surface and matching grain is glued over the flat with cyanoacrylate (above). Pay attention to matching the grain, and a patch of this kind can go almost unnoticed after you re-turn the area (left).*

Photos: Matt Berger

Plugged patches

Drill away a deep gouge. *With a Forstner bit, drill a ¾-in.-dia. hole into the blemish to make room for a plug.*

Plug the hole. *Using a chunk of wood from the scrap end of the newel post, turn a plug and glue it in the hole.*

A newel as good as new. *Careful grain-matching can create a patch that will be imperceptible once this newel post becomes part of a staircase.*

species, grain, and color to match can be difficult, and all of your finishing skills are subsequently brought to bear.

The easiest way to patch an area with new material is to flatten the damaged area with a smoothing plane, and then glue a chunk of wood of like grain and color in place over the flat. I generally plane the workpiece on the lathe by locking the spindle, but sometimes I secure it between dogs on a workbench. The patch also must have one surface planed flat. Before gluing it in place, shape it on the bandsaw. Attach the scrap block to the flat with medium-viscosity cyanoacrylate glue and allow it to dry. Then return the area and sand it smooth.

Drill and plug a mistake

Another patching method is to drill out the damaged area with a short hole and plug it with matching scrapwood. It's important to turn the plug so that the grain direction matches the repair area on the workpiece. When this type of patch is used in a spindle turning, it generally means faceplate-turning the scrapwood with a bowl gouge so that the end of the plug shows the cross-grain. One thing to note is that while this is called faceplate turning, you need not use a faceplate. The key is the orientation of the grain. A plug also is an excellent method of patching end grain, in which case the plug can be spindle-turned so that the grain runs between centers. Use a spindle gouge for this operation. Once the plug has been turned, glue it into the hole, trim it with a handsaw, and then turn it flush.

Patch the area with a ring of wood

Some repairs call for more complex measures. If a bead has been damaged beyond repair, it can be removed, and a replacement ring can be turned and fitted to the damaged area. That ring then is turned into a bead.

Start by cutting away the old bead, leaving a smooth cylinder. Next, make a ring with an inside diameter that matches the outside diameter of the cylinder. If this diameter is small enough and matches a drill bit, you can make the ring by drilling a hole into a piece of scrapwood. If the cylinder has a large diameter, you can

Replacement beads

Cut away a botched bead. *Then turn a ring with an inside diameter that matches the outside diameter of the spindle.*

Glue the ring onto the spindle. *The ring should fit tightly over the affected area (above). Then turn a new bead. Well-matched grain will make it hard to detect.*

Sawdust filler

Patch a natural void. *Tape the rim of the bowl to create a dam for a glue-and-sawdust patch.*

Spray accelerator on the glue to speed the set time. *It may take several layers of glue and sawdust to fill the void.*

Once the area has been patched, re-turn the bowl. *The repair is not discernible.*

turn the ring on the lathe. Once you have a well-sized ring, glue it over the damaged area and re-turn the bead.

Fill a mistake with sawdust and glue

As my father would have said, "Without putty, paint, and glue, what would the poor carpenter do?" In wood turning, too, these materials can come in handy for patching and hiding mistakes and defects.

To fill a void left from a tear, gouge, or natural blemish, use cyanoacrylate glue, an industrial-grade super glue available at woodworking-supply companies such as Craft Supplies USA (800-551-8876; www.woodturnerscatalog.com). Mixed with sawdust, the glue can make a blemish blend right in on a finished workpiece. Cyanoacrylate glue comes in three viscosities: water thin, medium, and thick.

Apply water-thin glue to the surface of the workpiece before beginning the repair. This allows the patch to sink deep into the wood, ensuring that it holds well. Then sprinkle some wood dust and/or chips of the wood from your turning into the hole and apply medium- or thick-viscosity cyanoacrylate, depending on the size of the hole. With each application of dust and glue, spray the area with accelerator, which causes the glue to harden in as fast as 30 seconds, depending on temperature and the size of the patch. Stop filling when there is a bulge on the workpiece where there formerly was a hole. Then turn away the excess fill until the area is uniform with the rest of the surface. Finally, sand it smooth. I use this repair method more in faceplate work than on spindles. It is especially useful when turning bowls from green or dry wood.

For very large defects, use sawdust and five-minute epoxy, which is cheaper and faster than several applications of cyanoacrylate glue. The effectiveness of this patch varies greatly with the wood and circumstance. I also have used this technique to fill knots (especially ones with a loose piece still in place). Once it is sanded, I brush over the patch with India ink and apply finish after the ink dries.

Patch with a burn-in stick or putty

Burn-in sticks (which essentially are shellac with a bit of color added and then cast into a stick) are effective at patching minor defects or mistakes, such as small catches, pinholes, and small knots. There is no magic to patching with a burn-in stick; just melt the material into the hole and smooth it over with the hot tool as best you can. Avoid getting the burn-in stick so hot that it boils and turns blackish. For bigger defects, it is more effective to use two applications because burn-in sticks shrink as they cool. Quit when there is a slight bump on the workpiece where there used to be a dip. Then turn and sand the area. □

Melt on a patch. *A soldering iron melts the burn-in stick onto the marred area. The defect then can be re-turned and sanded smooth.*

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Q&A

Drawer muntins?

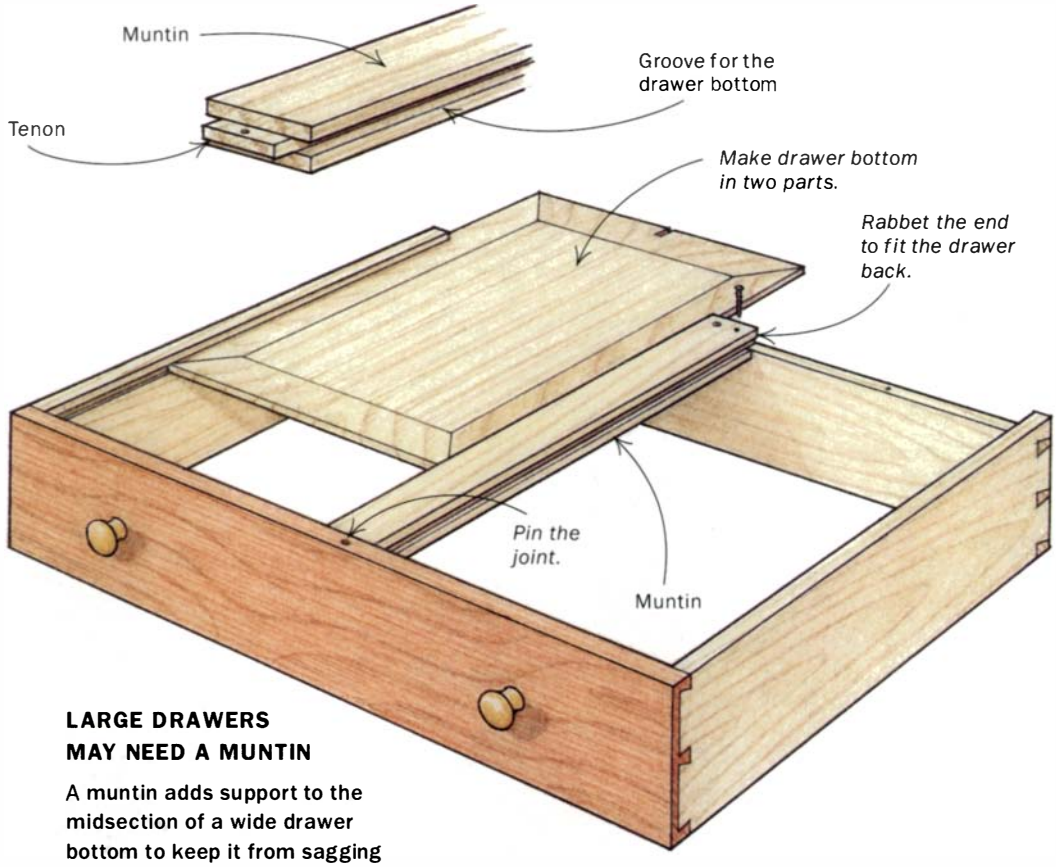
Q *I am making a large dresser for my daughter. The plan says I should make a muntin for each wide drawer. What is a muntin, and where does it go?*

—Al Starkweather, Tampa, Fla.

A **Gary Rogowski replies:** A muntin, or divider, is placed in the middle of a wide drawer bottom—oriented front to back—to help prevent the drawer from sagging when it's loaded with stuff.

To install a muntin, begin with a drawer bottom, still in two pieces, and place it into grooves cut in the muntin. Next, set in the muntin with a tenon fitting into the drawer's bottom groove. Finally, rabbet the muntin's back end to lay it onto the drawer back, and screw it into place.

[Gary Rogowski is a contributing editor.]



LARGE DRAWERS MAY NEED A MUNTIN

A muntin adds support to the midsection of a wide drawer bottom to keep it from sagging under the weight of its contents.

Uses for a router plane

Q *I just picked up a router plane at an auction. What is the best use for this tool?* *—Nick Stowell, Boulder, Colo.*

A **Mario Rodriguez replies:** This basically is a plane with a foot-shaped blade that protrudes from the sole. After a dado or groove has been defined and roughed out with a chisel, the router plane removes waste and creates a level cut that is parallel to the surface of the wood.

Historically, stairbuilders used large router planes to clear waste from tread housings on stair stringers. Smaller versions of the tool sometimes still are used by carvers for relieving background areas for their work.

However, with the advent of electric routers, there's little practical advantage to using a router plane. Like climbing the stairs instead of riding the elevator, I use a router plane only for exercise.

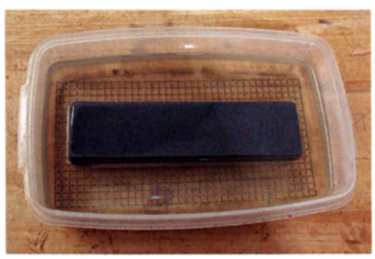
[Mario Rodriguez is a contributing editor.]

Oilstone prep

Q *I just bought my first oilstone. I have used one before but never fresh out of the box. I keep pouring honing oil on the surface, but the stone just soaks it up, and I feel like I'm scraping my iron on a bare stone. Is there some stone prep that I should be doing?*

—William Watson, Tulsa, Okla.

A **Lonnie Bird replies:** Oilstones use oil to float away the sharpening debris and to lubricate the cutting action. Coarse stones tend to be porous and absorb the oil as quickly as it is applied. If you soak a new stone in mineral oil overnight, this should take care of the problem.



Also, by storing the stone in a wooden box with a cover, you'll slow the rate of drying on the surface of the stone. Still, before each use, add a few drops of oil to the surface. Finally, remember that sharpening is messy work and should be done on a separate countertop or bench, away from your woodworking projects.

[Lonnie Bird teaches woodworking at his school in Tennessee. For information on classes, visit www.lonniebird.com.]

Photos, except where noted: Karen Wales; this page (bottom left): John S. Sheldon

Secondary wood

Q *I plan to build a desk with mahogany as the primary wood. I have noticed that a lot of traditional cabinets use poplar as a secondary wood, but I prefer the look of maple. Is poplar a better choice than hard maple as a secondary wood in fine furniture making?*

—Dave Brown, San Francisco

A **Mike Dunbar replies:** Secondary woods used in period furniture typically were local woods, so they do vary from region to region. Poplar often is less expensive than maple, and it's easier to use because it is softer. These concerns influenced woodworkers in the past, and they still do today.

However, if you are willing to do the extra work and pay the difference, there is no reason why you should not use maple as a secondary wood.

[Mike Dunbar is a contributing editor.]

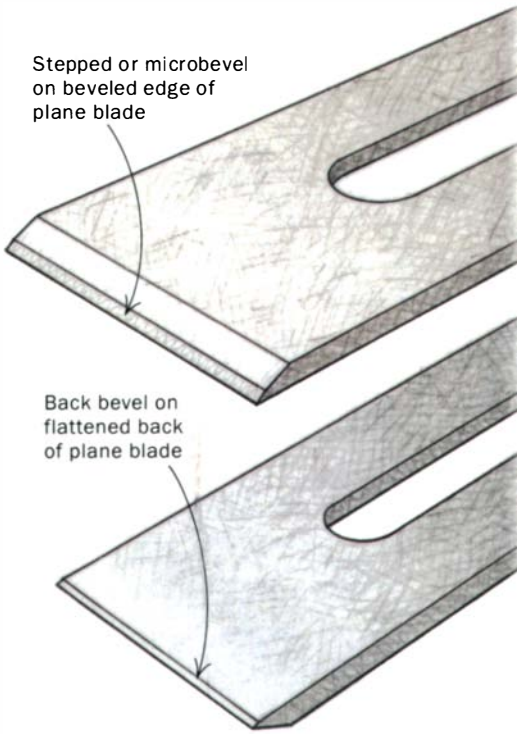
Stepped or back bevel?

Q *A friend gave me a sharpening lesson, during which he referred to a "stepped bevel." Is a stepped bevel the same thing as a back bevel? If not, what's the difference?*

—Thom Smith, Hamilton, Mass.

A **Garrett Hack replies:** No, a stepped bevel is not the same as a back bevel. The term "stepped bevel" refers to a microbevel or secondary bevel that can be honed to the bevel side of the cutting edges of chisels and plane irons. The steps are the main bevel and then a slightly steeper microbevel. This is quite different from a back bevel—a tricky little bevel honed to the flat side of some tools.

A microbevel strengthens the cutting edge considerably while still retaining the advantages of a finer bevel that can slice through wood fibers easily. Another advantage of a microbevel is that it is altered quickly, making it easier to tune your tools for varied work.



I would avoid the back bevel because it has limited advantages and is time-consuming to get rid of when retruing your plane for everyday benchwork.

[Garrett Hack is a contributing editor.]

Epoxy is an invisible filler for pitch pockets. *To fill pitch pockets without discoloring them, mix a small amount of five-minute epoxy in the base of a paper cup.*

Clear pitch-pocket filler

Q *I have a cherry tabletop with some pitch pockets. I like the look of the pitch pockets, but I'd like to fill them flat with clear filler before finishing the tabletop with a wiping varnish. Grain or pore fillers tend to be too thin to fill large holes, and I cannot find a wood filler that dries clear. Any ideas?* *—Mike Salvatori, Honolulu*

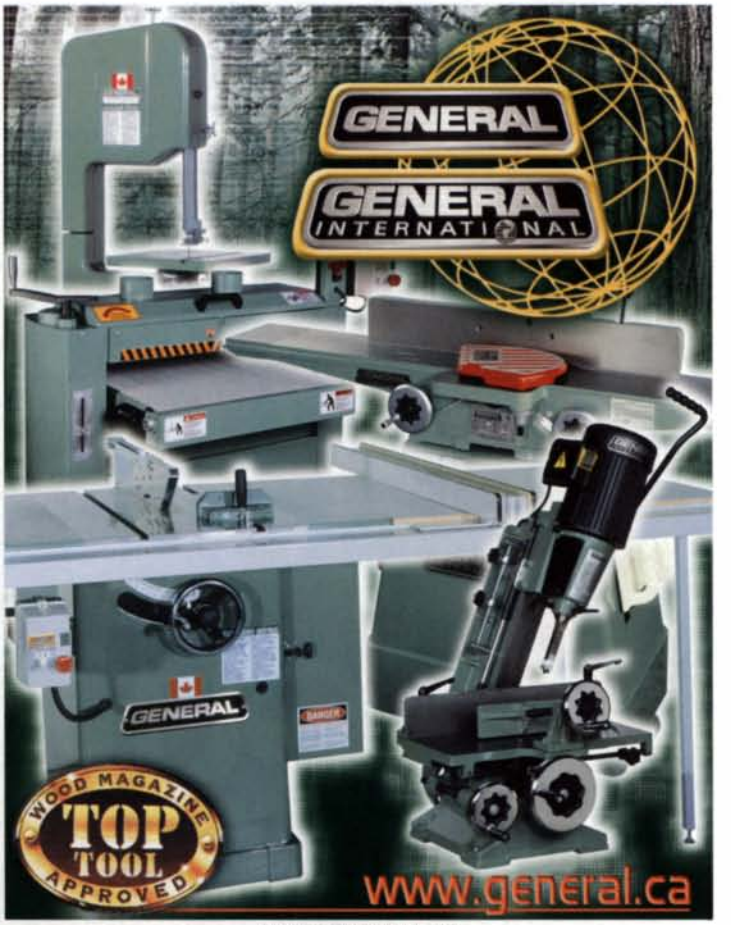
A **Christian Becksvoort replies:** Use a five-minute epoxy, which is clear and sets up quickly. Let it harden for at least two hours, then sand it smooth with silicon-carbide paper. Scratches leave a cloudy appearance, so sand with progressively finer grits until you get down to 600 or 1,200 grit. Epoxy does have drawbacks; it is not resistant to ultraviolet light, and it eventually will turn opaque and crumble from exposure to bright sunlight. Finally, check for compatibility with the varnish you'll be using.

[Christian Becksvoort is a contributing editor.]

Use care in filling pockets. *Flat toothpicks are a handy tool for dripping small amounts of epoxy into holes without spillage.*

Sand after the epoxy has cured. *Use a hard sanding block to avoid causing a hollow in the wood surrounding the pocket.*

Drawings Vince Babak



BY SILAS KOPF

Making oysters for veneering

One technique that I sometimes employ in furniture making (see the back cover)—and one that often is overlooked by most woodworkers—is the use of oysters, which are nothing more than thick, shopmade veneer made from the ends of limbs or small-diameter logs. The term was coined by 17th-century Dutch and English cabinetmakers who used oysters in patterns for decorative panels on casework or for the borders around tabletops. The veneer, which resembles oyster shells, is cut on the bandsaw by slicing it as you would slice a loaf of bread with a knife. You can vary the shape—circular or oval—by changing the angle at which you slice off the veneer.

Some woods work better than others for this technique. Because the cuts largely are end grain—including the pith of the limb—

Oysters falling through space. *Kopf used oysters as pictorial marquetry in this contemporary cabinet to create a striking image that conveys a sense of motion.*

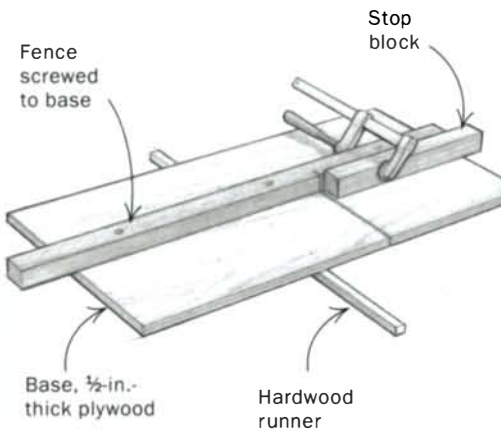
SLICE THE OYSTERS ON THE BANDSAW

1. PREP THE LOG

Strip off the bark with a chisel and mallet because the bark contains dirt and grit that will dull your sawblade. Flatten one side on a jointer or with a handplane, and then flatten an adjacent perpendicular face—just enough to make the log stable when you saw the veneer.

2. CUT AND STACK THE VENEER

A small plywood sled with a fence and a stop block are all you need to index the veneer cuts to the right thickness. Kopf uses a ½-in. blade (3 teeth per inch) and cuts the veneer about 1/16 in. thick. Much thicker, and the wood won't dry well; any thinner, and you may have difficulty making consistent cuts.



The angle of the cut affects the shape. *When the log is cut at an angle, the veneer will be elliptical. The steeper the angle of the cut, the more elongated the result.*

Keep track of the cut sequence. *Number each piece consecutively as it came off the log. Keeping the pieces in order ensures the best pattern match when laying out the veneer.*

Photos, except where noted: William Duckworth; this page (bottom left): David Ryan; drawing: Bob La Pointe

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they will crack unless the wood is relatively stable. Think of the wood in your firewood pile, and you'll recognize the problem of end-grain checking. This happens because the wood shrinks more tangentially than it does radially. Woods that have a lower tangential-to-radial ratio of shrinkage will dry more successfully.

Traditionally, woods used for oysters have a marked contrast between the heartwood and sapwood. Two of the most commonly used woods are walnut and laburnum. They both have dark hearts and creamier sap, and they are adequately stable. I cut the oysters shown here from the limb of a walnut tree that a neighbor offered to me last year when he had to cut it down. The trick is to cut the oysters while the wood is still wet. Freshly cut limbs or small trees will start to lose moisture immediately and to check on the ends. To slow down the drying, leave the bark on until you're ready to cut the veneer, and paint the ends of the logs with latex paint or coat them with melted paraffin.

After you dry and flatten the oysters, they can be worked just like other veneers. □

Traditional usage. *James Bowie's oyster chest is a reproduction that illustrates how oyster patterns often were used on 17th- and 18th-century Dutch and English furniture.*

DRY THE OYSTERS, THEN PRESS THEM FLAT

3. STICKER THE STACK TO DRY

Air needs to circulate around each piece of veneer so that it will dry evenly, so you should sticker the oysters as you would dimensional lumber. Clamp the stickered pile lightly between ¾-in.-thick plywood or flat scraps of lumber. The pressure should be just enough to keep the stack flat but not so much as to restrict the movement that will occur as the wood shrinks. Because the wood is so thin and mostly end grain, it will dry very quickly and be ready to use in two or three weeks.

4. ADD MOISTURE AND PRESSURE TO FLATTEN DRIED OYSTERS

The flattening process is the same that you'd use for any difficult veneer, such as crotch or wavy burls. Kopf uses a product called GF-20 veneer softener (800-825-0840; www.veneersystems.com), but you can make your own solution by mixing ½ cup of hide glue, 1 cup of water, and 1 oz. of glycerin. The solution moistens the wood and makes it more pliable. Mist each piece on both sides with the flattening solution, and sandwich each layer between several pieces of newsprint and scraps of plywood. Apply pressure either in a press or with weights, leave it for an hour or so, and then replace the damp newsprint with new sheets. Leave the treated layers under pressure for a day or two. The newsprint will wick away the moisture, and the dried oysters will be flat enough to work.

Photo, this page (bottom left): Lynn Rybarczyk and Ed Suszynski, courtesy of the San Diego Fine Woodworkers Association

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BY JEFF JEWITT

Setting up to spray

Few woodworkers can afford a purpose-built spray booth, especially one that meets health and safety codes for spraying solvent finishes. At the other extreme, waiting for a fine day and spraying outside also is fraught with problems; the wind blows the spray back in your face, and every bug in the neighborhood dive-bombs the wet finish.

The spray booth and accessories shown here cost less than $200 and will allow you to spray indoors in a controlled environment. The booth is designed just for water-based finishes. I advise you *not* to spray flammable materials indoors unless you have a dedicated room outfitted with an explosion-proof fan and explosion-proof lighting fixtures.

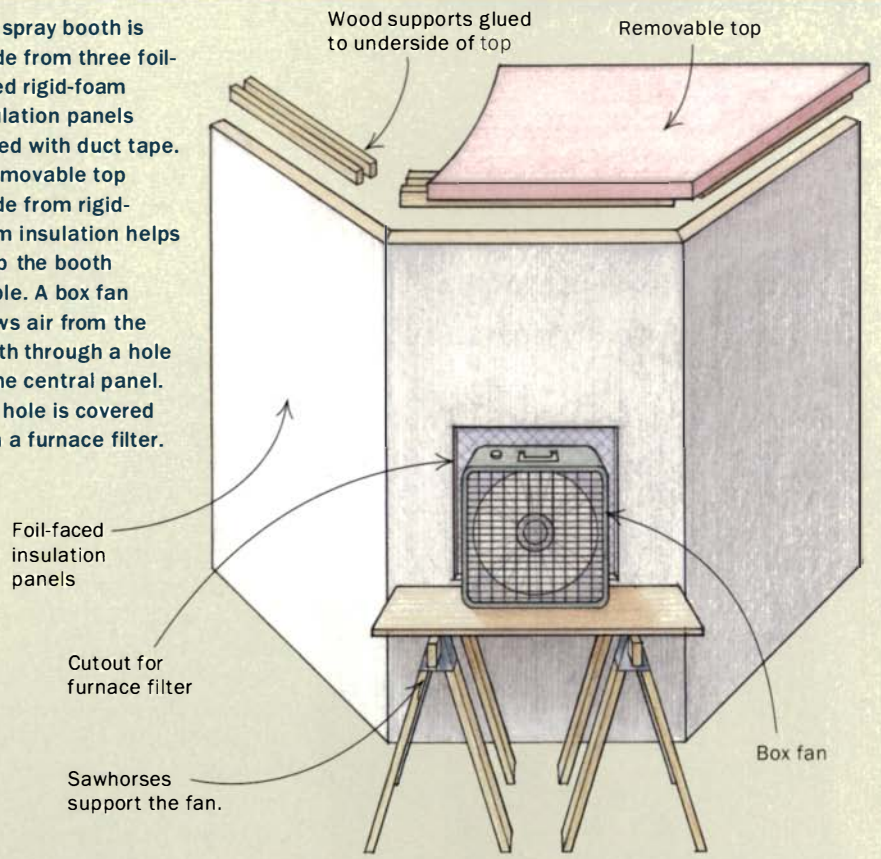
Booth controls overspray

When spraying indoors, it's important to evacuate the overspray produced by the gun, not only for health reasons but also to prevent the atomized overspray from settling on your furniture and creating a rough surface. A simple approach is to construct a booth using three panels of foil-faced rigid-foam insulation joined with duct tape. Furring strips glued to a fourth panel form the top, which keeps the booth stable.

Cut a hole in the center panel about 30 in. off the floor. Slide a furnace filter in front of the hole, and rest a box fan on sawhorses on the outside. Use a cheap, open-weave filter; the more expensive kinds designed to trap minute particles will get clogged with

LOW-COST FOLD-AWAY SPRAY BOOTH

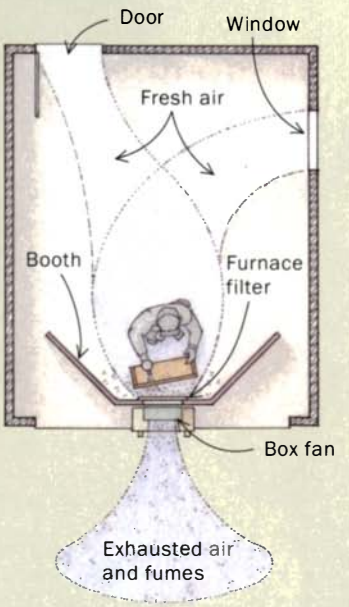
The spray booth is made from three foil-faced rigid-foam insulation panels joined with duct tape. A removable top made from rigid-foam insulation helps keep the booth stable. A box fan draws air from the booth through a hole in the central panel. The hole is covered with a furnace filter.



Garage spray booth. *The spray booth fits into a garage-door opening, and a box fan draws some of the overspray into the filter and fumes into the open air.*

FRESH-AIR SUPPLY

The box fan draws fumes and overspray outside. To achieve this, there must be a source of fresh air such as a door or window behind the operator.



Photo, this page: Mark Schofield; drawings: Vince Babak

finish too quickly. The 4-ft. by 8-ft. foam panels can be cut easily to fit any location, and when folded for storage, the booth is less than 2 ft. deep and light enough to be carried by one person.

Spraying accessories

Unless you don't care about spray getting on the floor, lay down a cotton drop cloth. Don't use plastic sheeting because it becomes slippery when wet.

Save large sheets of cardboard packaging to use for test spraying when setting up the gun or altering the fan pattern.

Drive multiple nails or drywall screws through a piece of cheap plywood. This nail board supports the work during and after spraying. Finish the nonshow side of the piece first; place that side on the points while you finish the show side. Because the workpiece needs to remain on the board while drying, you will need a separate board for each part you spray during each session.

A finishing turntable allows you to turn the workpiece instead of walking around it, and remain spraying toward the fan. A simple finishing turntable can be made by placing a 12-in.-dia. lazy-Susan swivel plate on a plywood base and then resting a nail board on top of the plate.

Place the finishing turntable on a pair of sawhorses to bring the workpiece up to a comfortable height and even with the fan for better fume extraction. For larger pieces, place the finishing turntable on the floor or rest the work on a dolly.

Spray-gun holders provide a resting place for the gun. Most cup and pressure-feed guns have a built-in hook and can be hung from plastic-coated hooks. Gravity-style guns require a gravity-gun filling station, which doubles as a convenient strainer support. Attach a piece of ¾-in.-thick plywood to the foam spray booth with construction adhesive, then screw on the gun holder.

To remove impurities from the finish, always strain it through a cone filter into the gun. A medium-mesh filter works best for most water-based clear finishes.

To prevent contamination from the compressor reaching the gun, invest in some inline air filters, which are available from auto-supply stores.

You will require bright lighting in the booth to differentiate between wet and dry areas when spraying. I like to use halogen work lights on a tripod. □

SPRAY-FINISHING AIDS

CONE FINISH FILTER
All finishes should be poured into the gun through a filter to remove impurities that might plug the gun.

GUN HOLDER
Gravity-feed guns need a special holder. This one includes a filter holder for straining the finish.

AIR REGULATOR
This miniregulator is installed to set the air pressure coming into the gun.

INLINE AIR FILTER
Disposable filters trap water, oil, and other impurities coming from the compressor that would interfere with the finish.

LAZY-SUSAN TURNTABLE
A turntable allows you to spin the workpiece to finish all sides instead of walking around it.

WORKPIECE SUPPORT
Nail boards can be made with nails or screws driven through a piece of plywood. Spray one side of a panel, then rest the wet surface on the nail board while the top surface is sprayed.

Photos, this page: Kelly J. Dunton

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READER SERVICE NO. 173

Cabinet on The Half Shell

Silas Kopf, a modern-day marquetry master, has taken an old technique and given it new life in some of his original designs. The practice of gluing up end-grain veneer (called oysters) cut from small logs was common among 17th-century Dutch and English furniture makers. Oysters are named for what they most resemble in shape and visual texture—oyster shells—especially when the veneer is cut from the log at an angle (inset). Kopf made the cabinet at left, called Falling Oysters, after a neighbor gave him the limbs cut from a walnut tree that had to be felled. The walnut oysters are set into a background of old purpleheart veneer that had oxidized to a deep, red color. The top and the base are ebonized ash. For more about how Kopf cut and dried the oysters, see Master Class inside (p. 106).

Photos: David Ryan (left); William Duckworth (inset)