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Fine WoodWorking

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February 2002
No. 154

Miter-saw tune-up

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Workshop lighting tips

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Shopmade tenoning jig

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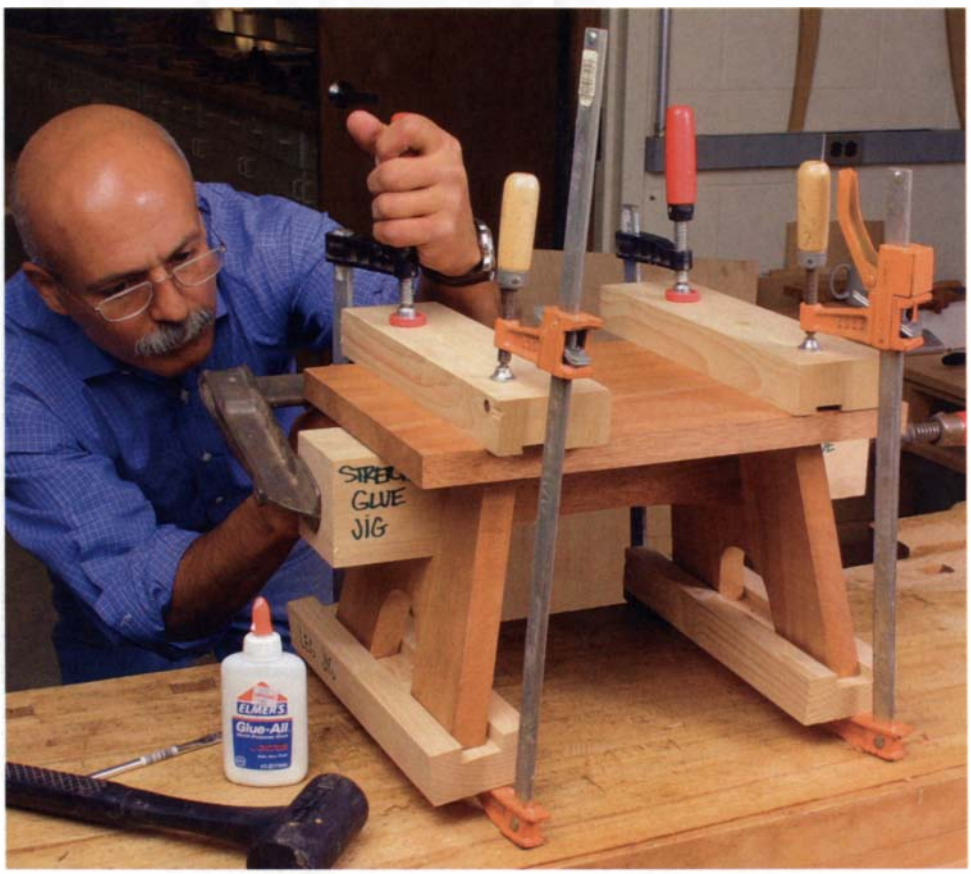

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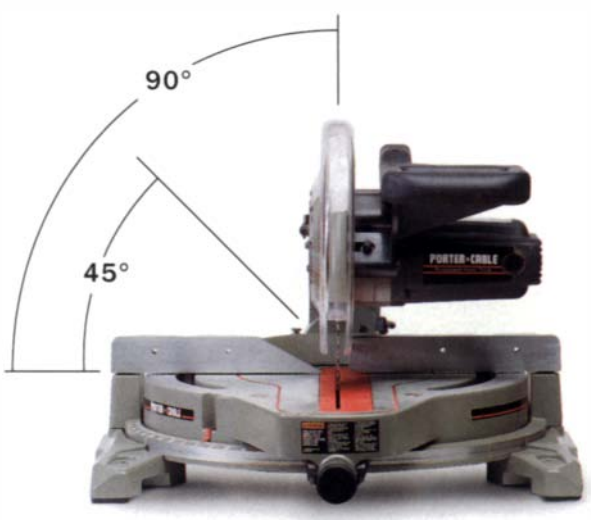

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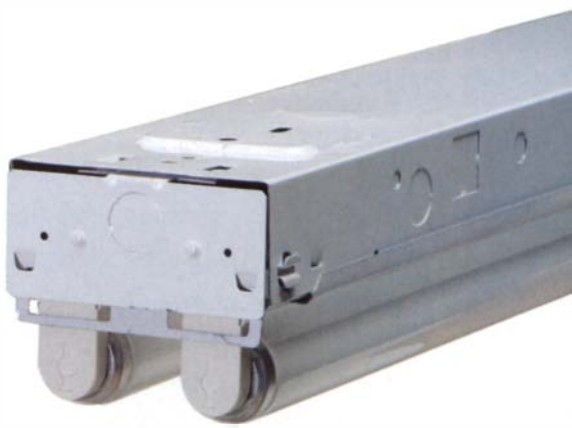

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Contributors

Lonnie Bird ("18th-Century Pennsylvania Secretary") builds period furniture in his shop in eastern Tennessee. His work has appeared in many woodworking magazines, and he is the author of three books, the most recent being *The Complete Illustrated Guide to Shaping Wood* (The Taunton Press, 2001). After running a college-level woodworking program for many years, he recently started Lonnie Bird's School of Fine Woodworking in Dandridge, Tenn., a historic town nestled at the base of the Great Smoky Mountains. For information on classes, you can write him at lonniebird@earthlink.net.

When not busy working as an apprentice carpenter, **Brad Schilling** ("Shopmade Tenoning Jig") often can be found tinkering in his garage-based woodworking shop. He also has been known to frequent auctions near his Fairmont, Ill., home, where he keeps a sharp eye out for used hand and power tools to add to his shop. To date, his best find is a 1950's-era Unisaw, which cost him all of $50.

Jeff Jewitt ("Touch-up Spray Guns") has been finishing furniture for more than 20 years and is a frequent contributor to *Fine Woodworking*. When not finishing, Jewitt makes and sells finishing products with his wife, Susan, through Homestead Finishing Products. And if that weren't enough, Jewitt has three books to his credit, including two for The Taunton Press, *Hand Applied Finishes* (1997) and *Great Wood Finishes* (2000). When not occupied with any of the former activities, Jewitt is usually found on a carbon-graphite bicycle frame pursuing other middle-aged maniacs in road races.

Jack Lindsey ("Lighting for the Workshop") retired as a senior engineer from the Southern California Edison Co. in 1996, where he worked as a lighting specialist for 28 years. He has taught courses in lighting at community colleges and a state university in California, and he is the author of *Applied Illumination Engineering*, a textbook on the subject. After retiring, he moved with his family to the mountains of southeast Oregon, where he built an enviable dream shop.

Cliff Scott ("Lumberyard Sleuth") received a bachelor's degree in economics, but it wasn't until 10 years later, when working in a cabinet shop, that he discovered that he enjoyed working with his hands. A career change took him to Olean, N.Y., where for the next 17 years he worked in manufacturing. In his spare time, he taught himself woodworking by making gifts and furniture for the family. When his children left for college five years ago, he started his own business, Carriage House Woodworks, making custom furniture.

Howard Lewin ("Turn a Hollow Vessel") has been a custom woodworker in Hawthorne, Calif., for 25 years. He said the local marketplace demands a versatile craftsman: "In Los Angeles you never know what jobs are going to come in—it's totally eclectic, from traditional to ultramodern." Aside from his turned vessels that he sells at local galleries and shows, Lewin has made everything from large turned speaker cones for a local audio inventor to curvy workstations built into a high-rise law office. He draws the line at MDF and particleboard, but only because he can't lift the heavy sheets. His business philosophy is simple: Don't turn anybody away. "I know a lot of guys who turn away fixing a drawer, but that job always leads to a bigger one. People don't forget the woodworker who helped them out."

Fine WoodWorking

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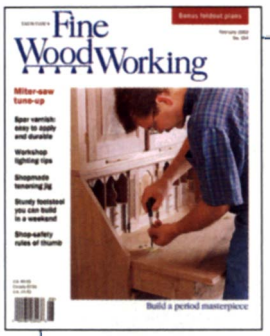
Letters



A test of two covers. *Depending on whether you are a subscriber and where you live, you received this issue with one of two possible covers.*

What makes a better magazine cover?

Is it a guy putting the finishing touches on a classic period masterpiece or a full view of the spectacular piece, finished and ready to admire? We figured both made splendid covers, so for the first time in our history, we've published an issue that has been distributed with one of two different covers.

No, we're not trying to trick anyone into buying two copies of the same issue. But we are curious about how you respond to our cover shots.

Newsstand sales are key indicators of a cover's appeal. For our test, we split the country. Newsstands in the far western section of the country got a cover that features the builder, Lonnie Bird, working on the piece (photo, top left). Newsstands throughout the rest of the country received the other cover (photo, bottom left).

Subscribers received the cover featuring the finished piece. We'd like to hear from you, too. Send me a note, or express your opinion on your favorite cover by going to our web site, finewoodworking.com, and clicking on the "Pennsylvania Secretary" link.

No matter which cover you received, inside you'll find the same material, including a bonus foldout set of plans to go with the article on building the secretary.

—Anatole Burkin, executive editor

And the winner is...—*Fine Woodworking* was recently honored by *Folio:*, a publishing-industry magazine based in New York City. *Folio:*'s annual Celebration of Excellence Awards, held Oct. 30, 2001, selected the top magazines from a field of 600 entries. Award winners were selected based on how well they fulfilled their editorial mission. *Fine Woodworking* received the Editorial Excellence award in the hobby category.

In case the award criteria has you wondering, our mission statement reads: "To be the premier source of how-to information for serious woodworkers of all skill levels who are interested in woodworking techniques, tools, projects, finishing and design inspiration, and to maintain this leadership position with high production values, accessible writing and clear illustrations."

—Anatole Burkin, executive editor

More needed on electrical safety—I greatly appreciated Ernie Conover's article "Turn a Classic Floor Lamp" (*FWW* #152, pp. 82-85), and I was happy to see the inclusion of information on properly using a polarized plug.

With that said, I want to point out an omission—the importance of providing strain relief after the wire is threaded through the socket cap and before it is attached to the screw terminals on the socket.

The underwriters (as in Underwriters Laboratory) knot is a pretzel-shaped knot that acts as a strain relief and prevents pressure on the electrical connections if the cord is pulled too tightly. A slightly less-desirable alternative to the underwriters knot would be to use a sufficiently large plastic wire tie or tie-wrap between the socket and the socket cap as a strain relief.

Also, it's important to wrap the wires around the terminals in a clockwise direction so that the tightening of the screw wraps the wire around the terminal instead of unwinding it. It doesn't take much force or much exposed wire to be pulled back far enough to touch the metal lamp rod or socket shell to cause a shock hazard.

Electricity is easy to work with if a few

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simple rules are followed, but it seems that sometimes woodworking articles have more safety notices concerning warning of splinters or dust inhalation than respecting electricity, which could kill you a lot sooner. Thanks for a great magazine. *–Jim Turcott, Amherst, N.Y.*

EDITOR REPLIES: The author did include information on strain relief, but our photo illustration did not go into sufficient-enough detail to explain this point. To make an underwriters knot, hold the threaded lamp cord so that it forms a Y-shape inside the socket. With each leg of the Y, make a loop and slip the end of each loop through the loop of the opposite leg. Tighten the knot, pull on the plug end, then make the final connections.

Further discourse on routers for router tables—I read with interest the letter from Richard A. Melloh Jr. concerning items falling into an upturned router (*FWW* #151, p. 8). Perhaps you would be kind enough to pass on this tip that is used on this side of the pond.

Make a washer from any firm but pliable plastic—an old polypropylene washing bowl will do. Make it as large as possible and as tight a fit on the router shaft as you can.

In use, the washer will throw the wood dust away from the router vents, helping to save the bearings. And when not in use, it helps stop widgets from getting into the router. *–Michael J. Ruck, Warrington, Cheshire, England*

Aerosol products and fine furniture—I have just finished reading Chris Minick's Q&A response "Maintaining fine finishes" (*FWW* #151, p. 112).

In his reply, Minick mentioned a series of different approaches including the use of aerosol-spray furniture-care products. As a conservator of fine furniture, I have seen many pieces spanning the last five centuries enter my workshop for a variety of reasons. I think we can all agree that fine furniture refers to beautifully crafted and finished pieces made from the finest timbers: including veneers, marquetry and hardware. We are also aware that finishes have changed through the centuries, and what was used for an 18th- or 19th-century piece may differ from one crafted this year. If you happen to own, for example, an original Georgian desk that still has its original finish, it will have taken on a rich glow from two centuries' of use and care. Occasional waxing, continual use and the maid's duster have produced a priceless patina. You want to preserve it at all costs.

Sadly, I have had to deal with beautiful pieces that have received the aerosol-spray bomb treatment. Although these products all vary, some are extremely bad for fine furniture. They tend to adhere to the existing finish and build up with each application even though you spray on and wipe off. At some point, the owner of the fine furniture notices that something is wrong with the finish and that nothing will improve it, so it comes to me. What I find is that so many of these spray-on products have, in fact, layered over time and formed an opaque and sometimes sticky coating. Although they were marketed as spray wax, there are other ingredients that you really do not want on a fine original finish. On flat surfaces, I can very carefully remove this buildup and preserve the finish in the same way old varnish is removed from an oil painting. On carvings and irregular surfaces, my job becomes very difficult and time-consuming, not to mention costly to the owner.

So what should be used? As Minick pointed out, there are many finishes that you will encounter on fine furniture. In most cases, a very light application of paste wax will be the safest approach because it is reversible. Modern finishes like nitrocellulose lacquer just need a little cleaning now and then, depending a lot on the use they receive. An oil finish may be oiled, but the vast majority of antique furniture I encounter was finished with shellac, sometimes varnish or just plain wax. I recently restored a Victorian game table veneered with burl walnut and beautifully inlaid. The owner had applied spray wax to the piece over a period of time. Whether it was the wax and other additives or a combination of everything, including the solvent used to keep the wax product in a liquid state, the original French polish was clouded and gummy. Fortunately, I was able to remove the residue without damaging the polish. From now on a very light application of paste wax is all that is required.

My final word is to treat the aerosol products with caution. Use them on that 1960s Sears coffee table that was a wedding gift from the in-laws if you wish, but please use great care if you intend to apply them to a valuable piece.

–Richard Goodall, Salmon Arm, B.C., Canada

More tips on air-drying lumber—Depending on your soil and how large a pile of lumber you have, the cement-block arrangement shown in the illustration and photograph on p. 74 of Lee Grindinger's article "Air-Drying Lumber" (*FWW* #151, pp. 72-75) might allow the blocks to sink into the earth and leave the pile uneven. Consider using cap blocks or other more solid supports under the regular blocks if they are oriented as shown.

Also, the definition of moisture content needs clarification. Weigh a sample piece of wood, then dry it in an oven at 220°F until it stops losing weight. The moisture

Fine WoodWorking .... around the country

If we're in your neck of the woods, come by and see us

Jan. 20-23 and 24-27: This year's annual conference on Working Wood in the 18th Century at Colonial Williamsburg will focus on making tables. The conference, co-sponsored by Colonial Williamsburg and *Fine Woodworking*, features furniture makers Allan Breed and Philip C. Lowe. For information, call (757) 220-7182 or e-mail tkinkead@cwf.org.

Writing an article

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

content is the weight loss divided by the dry weight.

And last, I've found that it is very difficult to keep the top layers of a lumber pile from warping. The best lumber should be stacked in the lower layers and the worst on top. If you are buying high-grade green lumber from a mill, get a couple of layers of cheap, low-grade lumber to put on the top, to shade and hold down the better material.

—Bill Tindall, Church Hill, Tenn.

The article "Air-Drying Lumber" was very good. I've found two other materials that make good sticker stock. When my pool deck was replaced with Trex, a synthetic material, I had a large number of scraps, which I ripped to about 1 in. wide. Since the cut edge looks very different than the face surfaces, it is easy to make certain that they are all laid out the same thickness. This material is very dense, does not absorb water and does not stain wood.

Another good material for stickers is ¾-in. plastic pipe (Schedule 40). Used as-is, the round pipe will allow the stack to roll. The solution is simple. Cut the pipe a little longer than necessary, then, using a hot air gun or a torch, heat the middle of each piece and give it about a 10° bend. When using plastic pipe, I also use more of them and space them a little closer together than if I were using wood or Trex. In this way the lumber on the stack is all spaced exactly ¾ in. apart, and the pipe will not roll.

—Edward H. Seagraves, Ridgefield, Conn.

More on miters—I enjoyed Gary Rogowski's article "Master the Miter" (*FWW* #151, pp. 42-49). I've been a professional picture framer for 18 years and have cut and joined tens of thousands of miters. Please allow me to add my comments to what Rogowski wrote.

Perhaps it goes without saying and may seem elementary, but you must begin with straight stock. All of your setups will be in vain if the material being cut does not register to the fence, no matter what method of cutting you use.

A fourth method of trimming miters, which will make the process almost pleasant, is to use a Lion miter trimmer (made by Pootatuck Corp.). Jim Cummins' comprehensive article "Miter Trimmers" (*FWW* #71, pp. 39-41) describes its use. The trimmer works well not only for picture framing but also for trimming cockbeading, applied moldings

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.
—Timothy D. Schreiner, editor-in-chief

and window and door trim. The cost, about $270, may seem prohibitive, but the trimmer's versatility and the satisfaction of a perfect miter make it a good investment.

If you want to "slow down your heart rate" even more at glue-up, a miter vise is a good clamping system. The Stanley No. 400, as seen in Stuart Altschuler's video *Making Picture Frames* (The Taunton Press) is the original, and knockoffs can be found for about $60. The vise only joins one corner at a time, but you can tell immediately if it fits correctly. You can also tweak individual joints if the miters are not perfect. The miter vise works best if the work is supported beyond the arms of the vise. Either add support blocks to the level of the arms or cut an access for the vise in a table so that the arms of the vise are flush with the top of the table. This prevents you from having to balance a long piece of molding while trying to clamp the miter. The latter method is more work initially but in the long run is more practical if you will be using the vise regularly.

One final point. Rogowski is correct in stating that a miter joint needs a form of strengthening. A traditional method, also seen in Altschuler's video, is to use nails. This method is useful if you don't want to take the time for splines or keys or if the work cannot visually or physically sustain them.

–Mark M. LaFond, Bemidji, Minn.

Shades of admiration for lampshade turner—When I read the Notes & Comment write-up "Turned lampshades from green wood" (*FWW* #150, p. 22), I thought, What a guy, looking through 90 gal. of chips to find just the few ounces of wood that he wanted to keep.

Imagine my surprise when a letter writer assailed the builder for being "downright immoral" and "wasteful."

Let's get a grip here. Peter Bloch started with a piece of firewood that when split and dried would yield about 30 minutes of heat on a New Hampshire winter evening. Granted, making firewood is moral and an appropriate use of a renewable resource, and so is making a lampshade and 90 gal. of mulch for your garden path.

Peter Bloch, you're still my hero.

–Reinhold W. Banek, Aptos, Calif.

Tool-storage tip—Roland Johnson's tool review "Jet spindle sander" (*FWW* #152, p. 36) lamented the fact that there was no means of storing his table inserts and wrench on the machine. If they are punched steel, as many are, rubberized magnetic strips with adhesive on one side can solve the problem. I store wrenches for many of my machines on their cabinets or sides, readily available for use. I also store wood and plastic push sticks using the same technique: I just stick the adhesive side to the wood or plastic.

–Larry Salibra, Gates Mills, Ohio

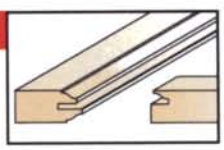
Correction—An illustration in the article "An Everyday Cabinet" (*FWW* #152, p. 69) listed an incorrect dimension. The top and bottom rails of the case sides are all 11 in. long (including the 1-in tenons).

What's missing from the perfect cabinet?

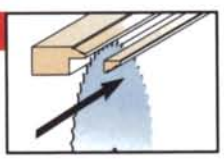
The perfect glass door...and the bits to make it.

Steps to Perfection

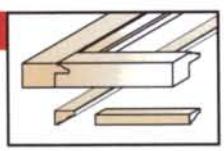
1. ROUT PROFILES ON STILES AND RAILS USING FREUD RECOVERABLE BEAD GLASS DOOR BIT SET.



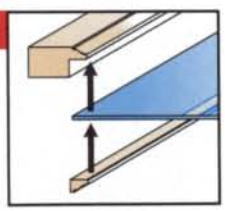
2. REMOVE BEADS WITH 1/8" KERF SAW BLADE (10" FREUD LM72 SERIES RECOMMENDED).



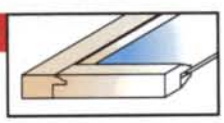
3. ASSEMBLE STILES AND RAILS. MITER CUT BEADS TO SIZE.



4. INSTALL 1/8" GLASS AND SECURE WITH BEADS.



5. NOW YOU HAVE CABINET DOORS THAT LOOK AS GOOD OPEN AS THEY DO CLOSED.



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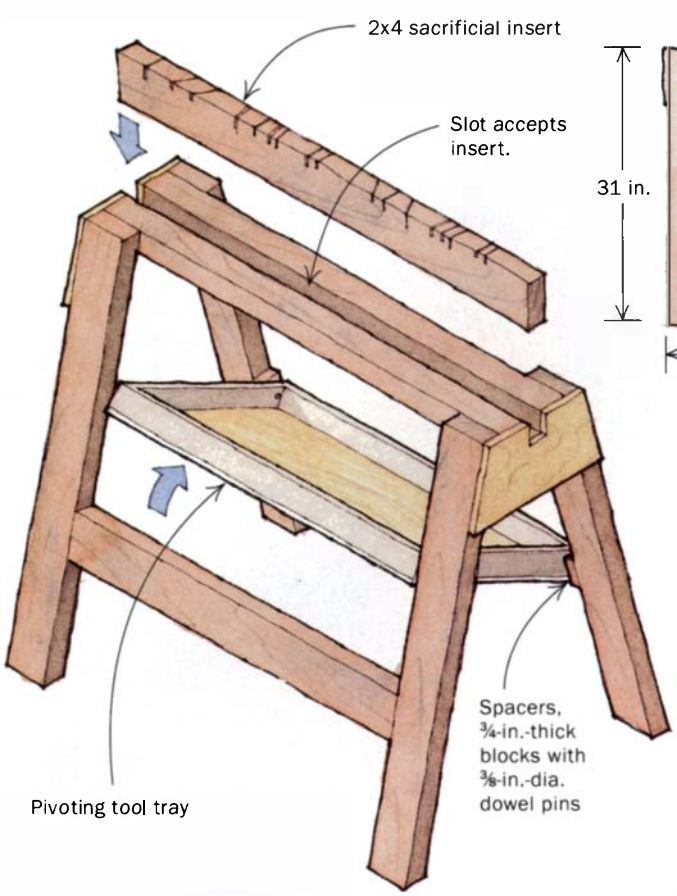
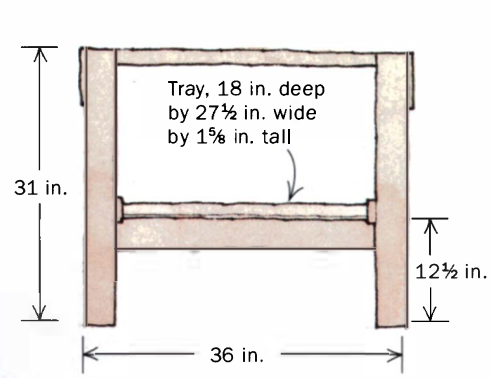
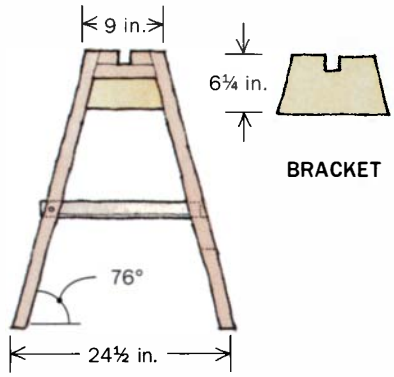
EDITED AND DRAWN BY JIM RICHEY

Improved sawhorse

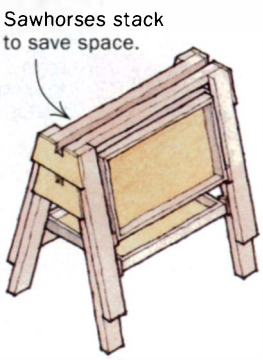






I've seen a lot of different designs for sawhorses, but none of them had all of the features I wanted. This one includes all of the improvements I was looking for: The horses are stackable, have a replaceable sawing insert and feature a flip-up tool tray.

Make the main structure of the sawhorse from 2x4s with plywood brackets (see the drawings above). The 1½-in. slot through the top of the sawhorse allows you to stand a sacrificial 2x4 insert in the slot. Use this when you're cutting plywood so that you won't destroy the body of the sawhorse. When the insert is full of sawcuts, throw it away and cut a new one to replace it.

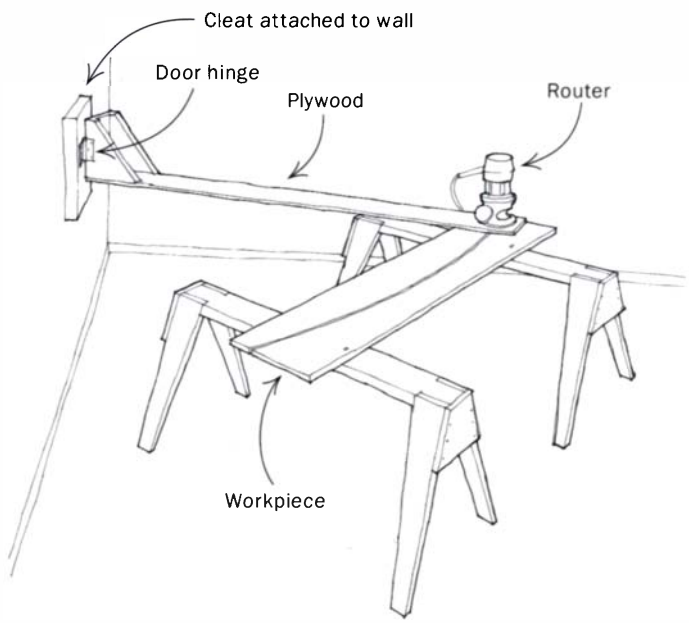


The tray is simply a plywood piece edged with ¾-in.-thick stock. The tray pivots on dowel pins on one side and rests on a 2x4 stretcher on the other.

To make these horses even more useful, I've made a 4-ft. by 8-ft. frame out of 2x4s. The frame slips into the slots of the sawhorses and supports thinner sheets of plywood better. I can also use the frame to transform two horses into a handy worktable.

—Kevin McLaughlin, Helena, Ala.

Cutting large-radius arcs with a router



I recently needed to cut a 7-ft.-radius arc in a piece of plywood with a router. After thinking about it for a while, I came up with this

A reward for the best tip

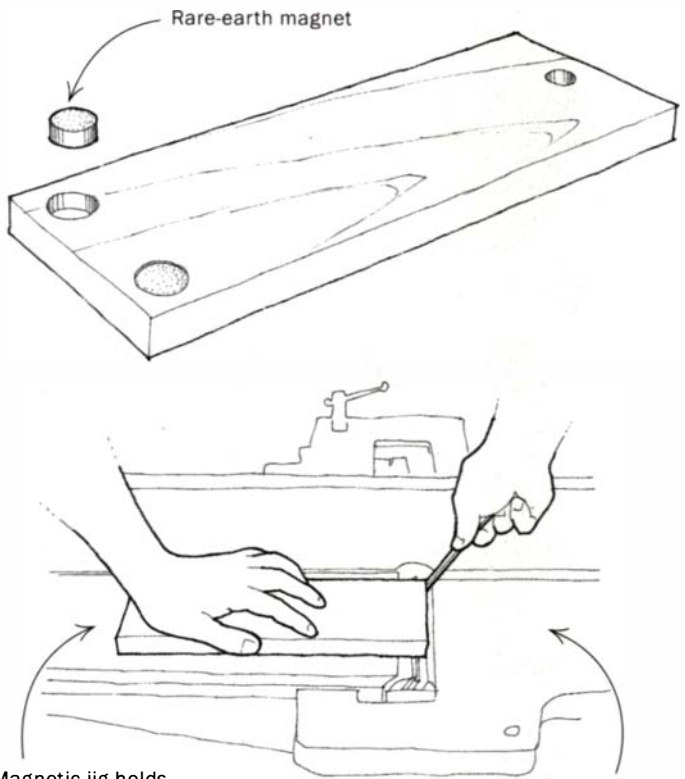
This issue's best method came from Kevin McLaughlin, who comes to woodworking with many years of experience as a machinist and a mechanical engineer. He works for a firm that designs and builds robotic systems for manufacturers. His sawhorse design struck us as useful and original, although he says modestly that he simply assimilated and combined others he had seen into a new integrated model. Send us your best tip, along with any photos or sketches (we'll redraw them), to Methods of Work, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506.

wall-mounted router-compass fixture that lets me work at a convenient height on sawhorses.

I started with a 7-ft.-plus length of ⅜-in.-thick plywood, 6 in. wide, and added a bracket on one end to provide a surface to attach an ordinary door hinge. I mounted my plunge router on the other end of the plywood, 7 ft. from the center of the hinge. I then secured the hinged end of the fixture to a cleat on my garage wall at the same height as the workpiece resting on the sawhorses. To cut the arc, I secured my workpiece on the sawhorses so that the 7-ft. arc was in the right location, and I made several passes.

—Lance D. Shields, Layton, Utah

Jointer knife-setting jig



Magnetic jig holds jointer knife while end bolts are tightened.

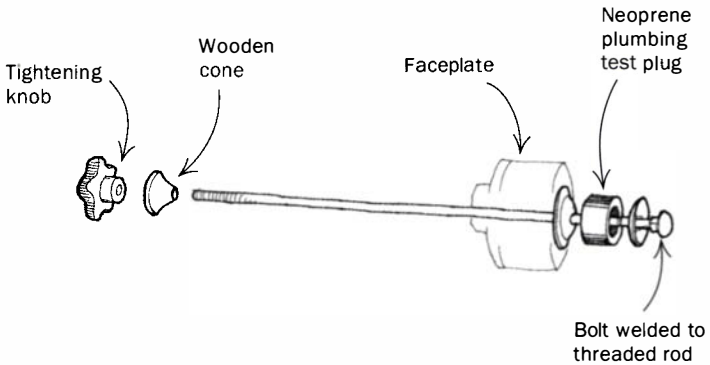
This knife-setting jig is as simple as it gets. Inlay two large, round rare-earth magnets near the end of a length of a ¾-in.-thick plywood scrap. Inlay the magnets just below the surface of the wood so that they will hold the knife without damaging a freshly honed edge. My jig, made for a 6-in. jointer, is about 4 in. wide and 12 in. long. To use it, place the jig on the outfeed table and hold it down with hand pressure. The magnets will hold the jointer blade at the outfeed-table height while you snug up the knife-holding bolts. When done, just slap the magnetic board against the outside of the jointer cabinet to store it.

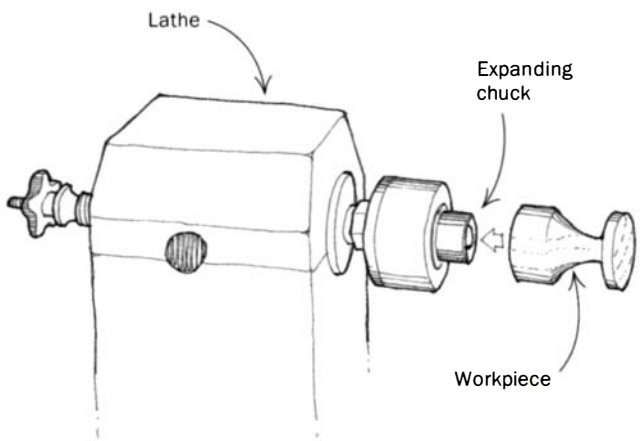
—J. Prendergast, Surrey, B.C., Canada

Quick tip: You can reduce the time spent cleaning brushes by wrapping the wet brush with plastic wrap and storing it in the freezer. Remove the brush about 10 minutes before the next coat and repeat the process when done. After applying the last coat, clean the brush or toss it.

—Jim Vasi, Williamsville, N.Y.

Compression chuck for the lathe





I turn a lot of small candle holders that have a 1½-in. recess in the top for a glass insert. After turning and parting off the holder, I like to reverse-chuck the piece and turn the bottom. The two traditional ways to reverse-chuck a workpiece are either to turn a wooden jam chuck or to use a metal four-jaw chuck. Both ways have problems. The jam chuck must be painstakingly turned to just the right size to work properly. The metal jaws of the four-jaw chuck will invariably mar the already-sanded workpiece.

This compression chuck for reverse chucking solves those problems. It is an adaptation of a plumbing test plug, a rubber expanding device commonly found in hardware stores. Test plugs come in several sizes—from 1½ in. dia. to 4 in. dia.—to fit the inside of common plumbing pipes. You can also use a rubber expansion plug (also called a freeze plug) found in automotive-parts stores in a number of smaller sizes.

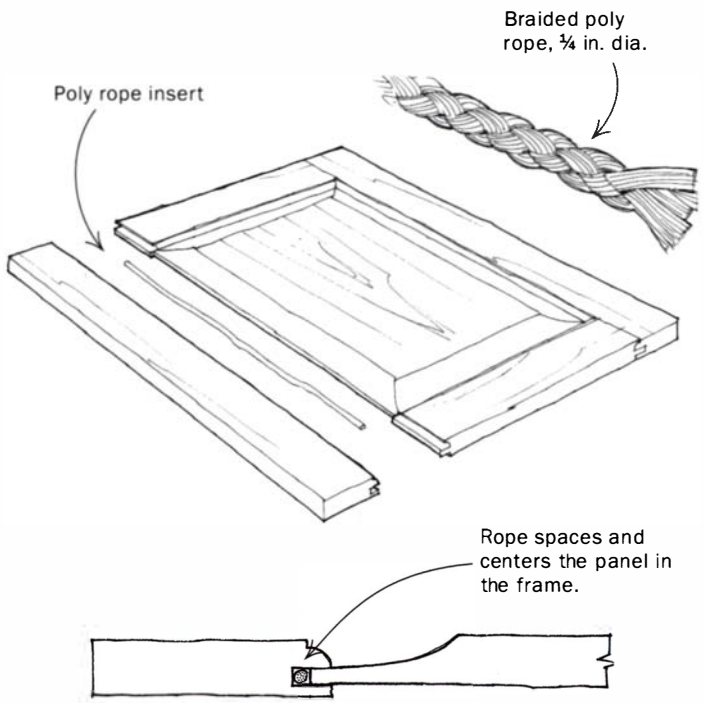
To make this chuck, screw a wooden scrap to a faceplate. Turn the scrap round and square off the face. Center-bore the wooden faceplate to fit the bolt in the test plug. Now remove the bolt from the test plug and extend its length by welding on a threaded rod. The lengthened bolt should extend entirely through the lathe headstock and out the other side by a couple of inches. On the outboard side, add a wooden cone and a threaded knob to tighten the chuck.

To use, turn the top part of the workpiece that includes a recess the same diameter as the chuck. Part the workpiece. Mount the expanding chuck on the headstock and slide the reversed workpiece

onto the compression chuck. Bring up the tailstock with a ball-bearing center to support the workpiece and hand-rotate the workpiece to see if it is centered. Once the workpiece has been centered, tighten the knob to expand the chuck and create a firm hold. Start the lathe slowly and work up to speed, making sure the workpiece is revolving accurately. You can now turn the bottom of the workpiece with ease.

One word of advice: Be careful not to overtighten the chuck with a thin-walled piece, such as a goblet, because the pressure may split the wood. *—James Meier, Batavia, N.Y.*

Centering raised panels with rope

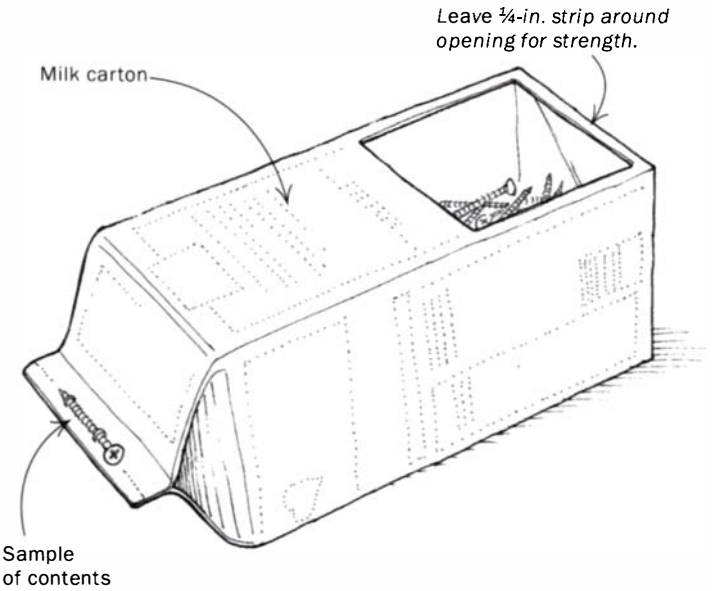


The shaper cutter I use to make stiles and rails for raised-panel doors cuts a ¼-in.-wide panel groove that is ⅝ in. deep. I like the resulting joint because it has lots of gluing surface that makes a strong joint on the door. However, the cutter that bevels the edges of my raised panels cuts a flat area (tongue) on the edge of the panel that is only ⅜ in. deep. The mismatch of the ⅜-in. tongue to the deeper ⅝-in. slot could permit the panel to slip off center within the door frame.

To solve this problem, I make inserts from ¼-in.-dia. yellow braided poly rope—the kind that is available at most hardware stores. I cut short lengths of rope and insert a piece into the groove of each stile and rail prior to assembling the door. The rope keeps the raised panel centered during glue-up, prevents the panel from rattling when the door is slammed and allows seasonal movement of the solid-wood panel. *—Don Warner, Lakewood, Colo.*

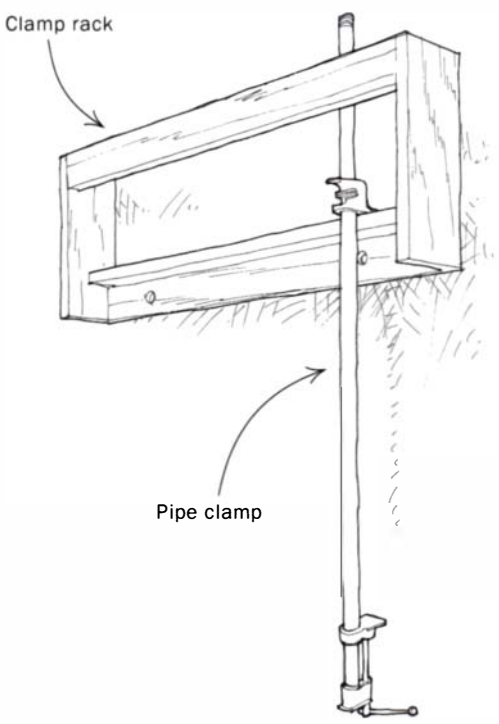
Milk-carton storage system

To make a simple and convenient storage system for nails and screws, simply cut an opening in the back of a 1-qt. or a ½-gal. milk container. Leave a ¼-in. strip of cardboard around the opening

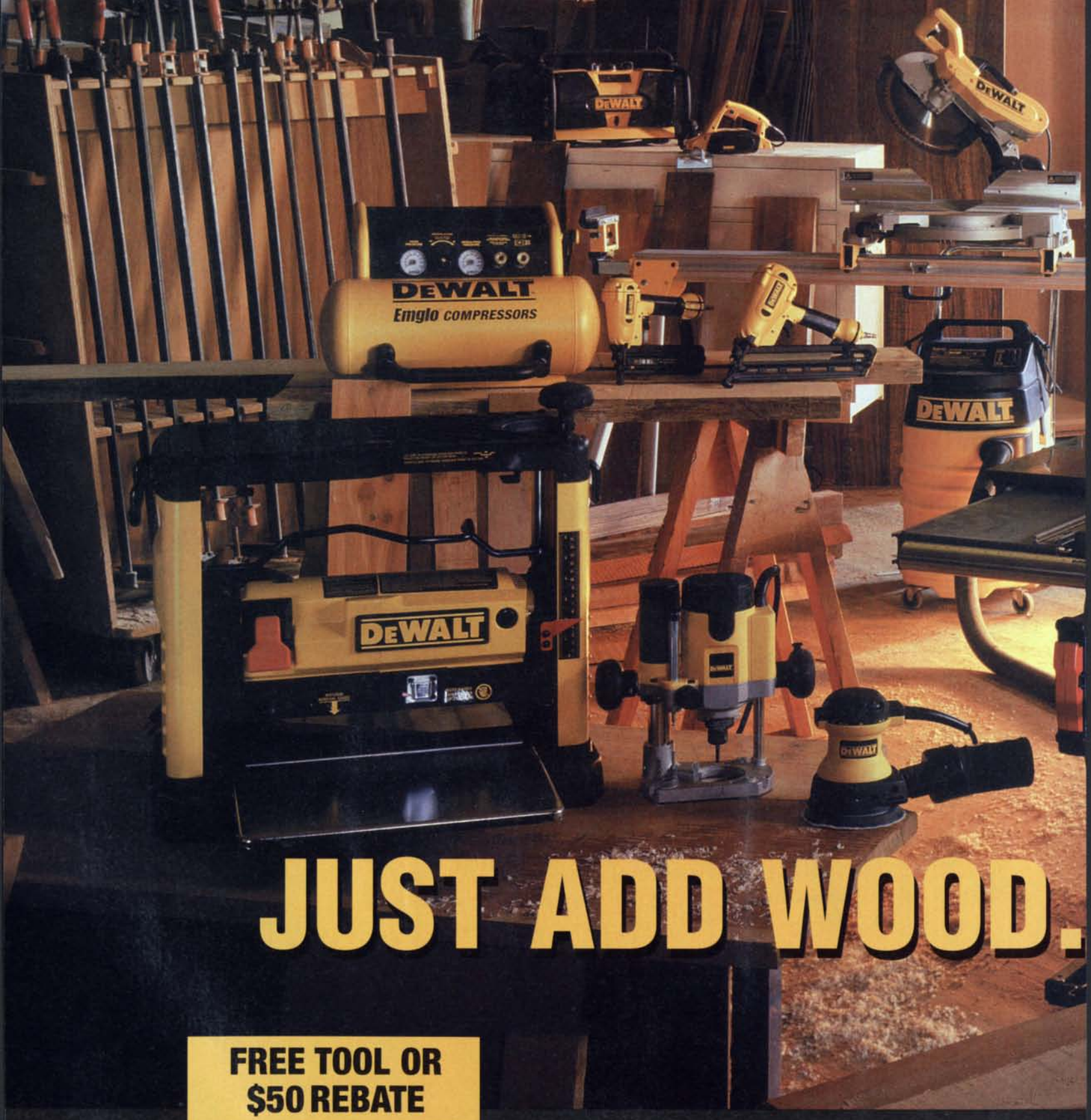


for strength and fasten a sample of the stored item to the top lip of the container to indicate the contents. The containers are sturdy, stackable and very economical of shelf space, and the contents are readily accessible. *—Don Anderson, Sequim, Wash.*

Pipe-clamp rack



This simple rack not only stores clamps securely, but it also allows you to remove them quickly with just one hand. Simply grab a clamp and pull it toward you. Gravity helps the clamps stay put. *—Roy H. Hoffman, Oriental, N.C.*



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Notes & Comment

High-school woodworking program makes money

Spreading the message. *Conrad holds a summer class for other woodshop instructors to teach them the revenue-raising techniques that can offset budget cuts.*

All across the country, junior and senior high-school woodworking programs are being closed. School administrators say the main cause is lack of funds, with so-called non-academic programs being the first on the chopping block. As the woodworking instructor at Moffat County High School in Craig, Colo., I have developed a program that has poured $100,000 into the school woodworking program over the last five years.

After a year of learning the basics of woodworking, second-year students take a program I have dubbed "unstoppable shops." The class votes on a project that is suitable for mass production. Then they build a prototype, construct jigs and fixtures, and the project goes into production. The program is successful because the students are coached to go out into the community and sell the product. Last year's students sold 530 folding chairs in five days, bringing in more than $21,000 and earning $7,800 for themselves.

I am now spreading the word so that other woodworking programs can share in this bounty. Each summer I run a workshop for instructors from all over the country to pass on the secrets behind the unstoppable shops.

For more information, contact me, Craig Conrad, at Moffat County High School, 900 Finley Lane, Craig, CO 81625; (970) 824-7036.

–Craig Conrad

Everyone's a winner. *Conrad's woodworking classes have raised an average of $20,000 a year for the program and the students. These are some of the projects.*

Harold Ionson: 1920-2001

Harold Ionson, who died Nov. 7 at the age of 81, was one of the most accomplished and unorthodox furniture makers of our day. Ionson's singular achievement, while working alone in his expanded garage shop in Westwood, Mass., was to build reproductions of supremely demanding pieces of furniture to nearly unimaginable levels of precision—in batch production. It was production less concerned with speed than with approaching an abstract ideal of repeatable perfection.

Ionson's magnum opus, a group of nine Federal-style 12-drawer demilune commodes, featured on the back cover of *FWW* #140, occupied him for most of the last two decades. Ionson was reverential about the exterior beauty of the original 1809 commode by Thomas Seymour, but he extensively reengineered and improved the interiors to make up for the original's technical failings.

Ionson learned his craft in Boston in the 1930s and 1940s, working in shops that produced period reproductions. He later worked in construction before retiring in 1975. In 2000 Ionson was awarded the first Cartouche award for lifetime achievement by the Society of Period Furniture Makers.

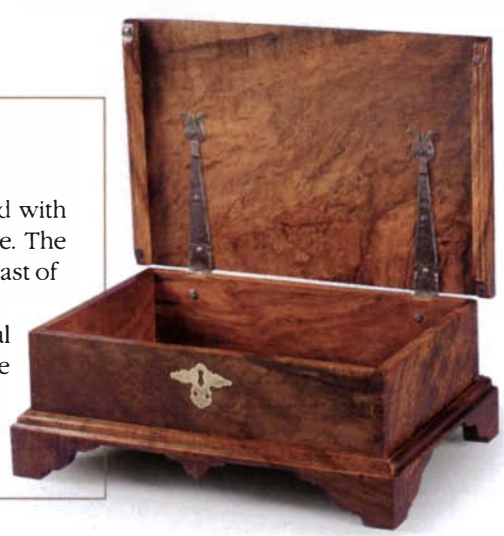
–Jonathan Binzen, former editor at Fine Woodworking

Box with historic links presented to Bush

At a ceremony in Philadelphia to mark July 4, President George W. Bush was presented with a Bible box made by Eugene Landon, restorer and replicator of 18th-century furniture. The wood came from a tulip poplar that stood for 600 years in Annapolis, Md., and was the last of the 13 Liberty Trees that served as meeting places for patriots before the Revolution.

The box, which measures 13 in. deep by 18 in. wide by 7½ in. high, is based on typical 18th-century Philadelphia Bible boxes and features historically accurate, custom-made hardware. Landon believes that the unusual deep amber color of the wood was caused by cement and iron, which were placed in the tree in 1904 to reinforce it.

–Timothy Sams, associate editor



Photos, this page: Craig Conrad (top and bottom left); Jonathan Binzen (top right); Eric Stashak (bottom right)

Lumber from Los Angeles

A good identification test for R. Bruce Hoadley. *Some of the species that East-West offers include, from left to right, olive, redgum, holly oak, walnut and Carolina cherry.*

The term "urban jungle" may have a new meaning if a wood supplier in southern California has its way. The trigger that caused Mike Easterling to start East-West Urban Forest Products was a California law mandating municipalities to reduce "green" waste by 50%. Now instead of city trees ending up in the landfill, Easterling's company mills them into usable lumber.

Because of the area's mild climate and the fact that many of the trees were planted for their looks and are nonnative, the range of woods that East-West offers is amazing. Exotics such as jacaranda, Chinese elm, carob and redgum are among three dozen species usually carried. The prices are competitive with suppliers of traditional lumber, ranging from $2 to $6 a board foot for 4/4 stock.

The company has been certified by Smartwood in its Rediscovered Wood program and is a good alternative for woodworkers concerned about wood supplies from the tropics. The company can be contacted toll free: (866) 234-9663. You can also visit its web site at eastwestwood.com.

—Mark Schofield, assistant editor

Try planing this. *East-West president Mike Easterling holds a board of Carolina cherry that appears to be almost entirely burl.*

Metal detection. *A common problem with nonforest logs such as this redgum is the risk of them containing nails, bits of fence wire and other blade-damaging objects.*

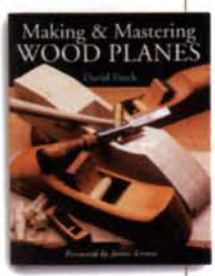
Notes & Comment

We welcome stories, anecdotes about woodworking, photos of unusual work—anything woodworkers might like to know about. We pay for material we use. Send submissions to Notes & Comment, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506.

Recently received books and videos

• *Shop Drawings for Craftsman Furniture* by Robert W. Lang (Cambium Press, 144 pp., $22.95) has detailed, drawings and cutlists for 27 pieces built by the Stickley brothers.

• *Making and Mastering Wood Planes* by David Finck (Sterling, 192 pp., $17.95), with an introduction by James Krenov, is a step-by-step guide to creating custom-built wood planes. Some of the photography is not the clearest, but the text and drawings make up for this fault.



• *Tradition in Contemporary Furniture* (The Furniture Society, 144 pp., $30) contains eight essays that explore studio furniture. Writers include Miguel Gomez-Ibanez, Jonathan Binzen, Jere Osgood and Scott Landis. Topics include understanding tradition, a meditation on the desk, the furniture of Bruce Beeken and Jeff Parsons, and art furniture.

• *The Custom Furniture Source Book* by Kerry Pierce (The Taunton Press, 264 pp., $29.95) is a guide to 125 craftsmen and their work. Although aimed at those looking to buy custom furniture, the book is also inspirational to those building their own furniture. All styles, from contemporary to Asian to Shaker, are represented here.

• *The Wood Collection, Vol. 1,* by John D. and James M. Lorette (Rare Materi-

Photos, except where noted: Mark Schofield

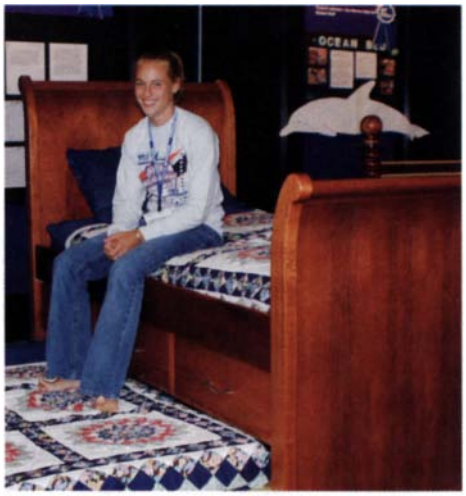
Ashley Nicole Hilton won first place for this serpentine corner chest with bird's-eye maple veneered drawers and cherry moldings.

Women take top prizes

At the 2001 AWFS fair in Anaheim, Calif., three women from one high school won prizes in the student design contest. Their success is all the more remarkable considering that last year women made up only 10% of the 100 students learning woodwork at the Orange High School in Hillsborough, N.C. This year, thanks to word of mouth, women make up more than 20% of the program that has been run by Keith Yow for the last eight years.

This fine work is produced on a shoestring, with this year's budget for materials limited to only $2,500. No money is allocated for new tools. For more information about the program, contact Yow at (919) 732-6133, ext. 3032. —*M.S.*

Katelyn Ander was given an honorable mention for her curved lounge chair and first prize in the traditional tables category for her table made of oak veneer and walnut beading.



Janine Sprague won first place in the traditional casework/cabinets section with her mahogany sleigh bed. The trundle bed and drawers ride on 500-lb.-capacity slides.

Krenov announces his retirement

At an exhibition to celebrate 20 years of fine woodworking by graduates of the College of the Redwoods, the man synonymous with that program announced his retirement at the end of this academic year. James Krenov told *Fine Woodworking* that at the age of 81 it was time to make a graceful exit after 21 years of "a wonderful adventure."

Admitting that he would miss working with the students, teaching them to think in a certain way and to become intimate with their work, he recognized that his will be a difficult act to follow. For this reason he plans to make a clean break with the school and to let a new director of the woodworking program establish himself.

Krenov's plans for the future include playing a little more tennis and finding "a small corner of a local shop where I can place my bench and potter about."

—*M.S.*

Books and videos (continued)

als Press, 80 pp. and 72 wood samples, $229.95) devotes a page to each wood, describing its characteristics and the history and uses of the wood. Inquiries: (603) 352-8000, wood@woodcollection.com.

• *Hand Tools with Frank Klausz.* 60 min. VHS; $29.95. To order call (973) 672-7600 or visit flamingoveneer.com.

• *Hand-cut Dovetails with Rob Cosman.* 47 min. VHS; $19.95. To order call (877) 967-5966 or visit woodhead@nbnet.nb.ca.

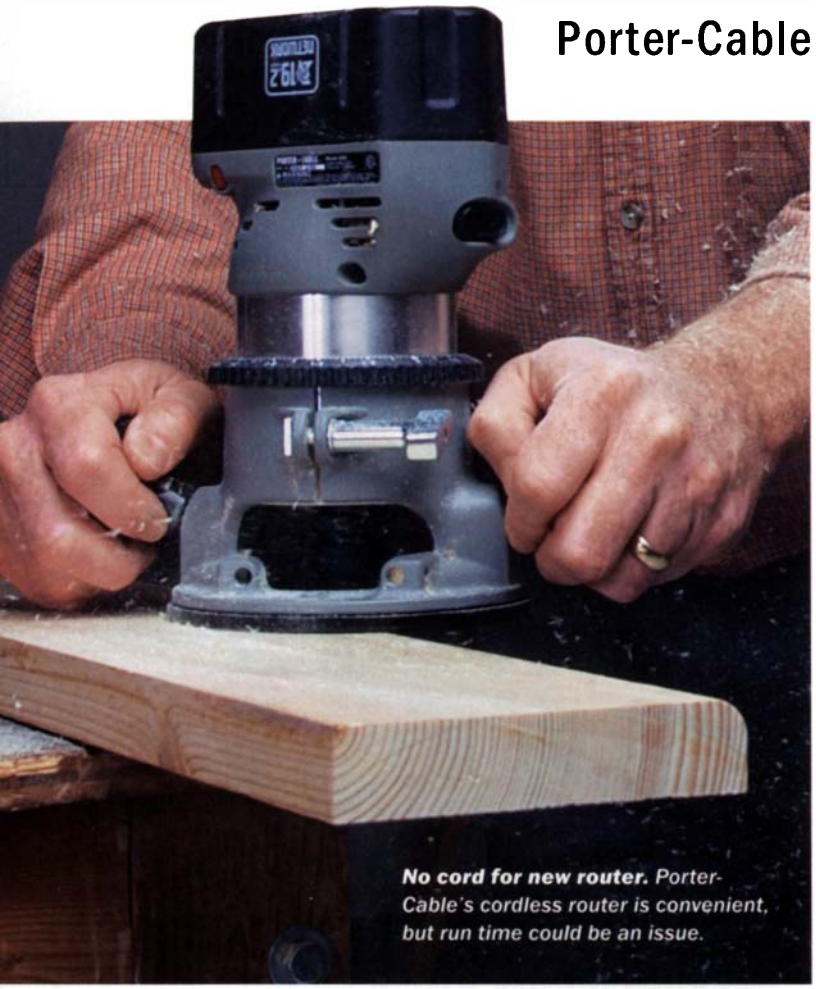
Despite being from different generations, Frank Klausz and Rob Cosman have much in common. They have both paid their dues by doing years of woodworking training and are highly accomplished hand-tool users as a result.

The trouble with both videos is that the methods we see don't seem very accessible for normal woodworkers. I've tried Klausz's freehand way of grinding a bevel on a chisel, and I think I'll stick with my jigs. Cosman's notion of gluing up dovetails without first dry-fitting is fine for him, but for mere mortals like myself, it usually takes a bit more tweaking. After viewing the tapes, I was left with the impression that both woodworkers were giving a performance rather than instructing, showing me how *he* did it, rather than how *to* do it.

Nevertheless, it was inspiring to see and hear Klausz's perfectly tuned handplane in action and to hear the ringing sound when Cosman tapped his flawlessly cut dovetails together.

—*Lon Schleining, contributing editor*

Porter-Cable introduces the first cordless router



No cord for new router. *Porter-Cable's cordless router is convenient, but run time could be an issue.*

Going to a place where cordless has never gone before, Porter-Cable recently introduced the industry's first cordless router, its model 9290. It features a 19.2-volt battery that powers a 23,000-rpm, 600-watt motor that's equivalent to just over ¾ hp. The router includes a ¼-in. collet, and it will also accept Porter-Cable's standard ½-in. collet.

The battery sits on top of the motor, which makes the router look top-heavy. But I didn't find balance to be a problem. And without a cord, every task, from bit changing to cutting to storage, is easier.

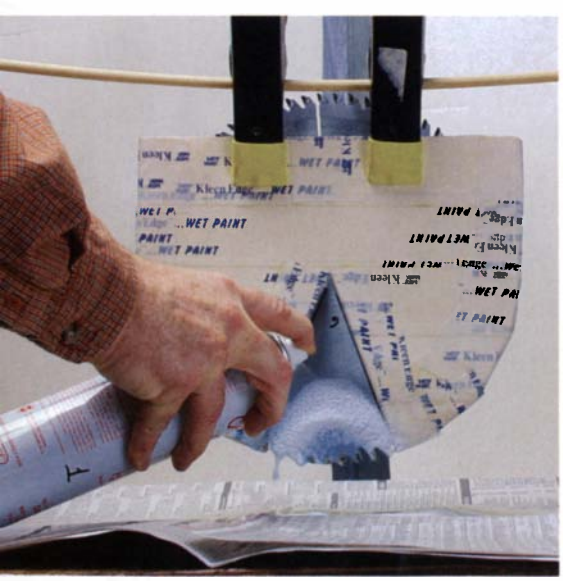
With the spindle lock, it takes just one wrench to loosen the collet nut. Because the router technically is always "plugged in" when the battery is installed, Porter-Cable made it difficult for the router to be accidentally fired up, designing the "on" switch to require some extra push. It takes some getting used to. Turning off the machine, however, requires little effort.

Collet runout on this machine was 0.006 in. compared with an average of 0.004 in. in a recent test of fixed-base routers (*FWW* #150, pp. 52-57). Noise was measured at 87 dB, an excellent score. And vibration was minor.

The base unit may look familiar because it's the same one used on Porter-Cable's venerable model 690. The motor also fits the 690's plunge base and D-handled base.

The handles fit my hands reasonably comfortably. But the thumbscrew system for locking the base to the motor was always a chore to tighten fully. And the opening in the plastic subbase is small (1⅜6 in.). I had to enlarge it to make cuts with a ½-in. radius roundover bit.

Shop Test Blade cleaners



Test setup. *A homemade shield ensured that only the intended teeth of the sawblade were wetted with cleaner.*

As the teeth of a sawblade slice through wood, they inevitably begin to build up a layer of pitch, which causes the blade to run hotter and, in turn, causes the teeth to wear faster. To prevent pitch buildup, it makes sense to clean the teeth regularly. Eight products are sold specifically for the task, and I put them all—along with six household products—to the test.

For the first part of the test, a blade long overdue for a cleaning was divided into eight segments, one for each blade cleaner: Blade & Bit, CMT 2050, Cutter Cleaner, Oxisolve, Pitch Rx, Pitch & Gum Remover, Resin Remover and Wood Pitch Cleaner. I left each cleaner on the blade for five minutes. Once all eight blade cleaners had been tested, I repeated the entire test on a second blade.

All of the cleaners worked, but three did the job noticeably better. Tied for first were Cutter Cleaner and Pitch & Gum Remover, which removed most of the pitch. But despite their effectiveness, these two cleaners were the least user-friendly, because the main ingredient is lye (sodium hydroxide).

Second place went to Blade & Bit. This nontoxic, nonflammable, biodegradable product was almost as effective as Cutter Cleaner and Pitch & Gum Remover.

For the second part of the test, I matched the winners of the blade-cleaner test—Cutter Cleaner, Pitch & Gum Remover and Blade & Bit—against six challengers in the household-products category: ammonia mixed with water, baking soda, Formula 409,

Photos, except where noted: Erika Marks

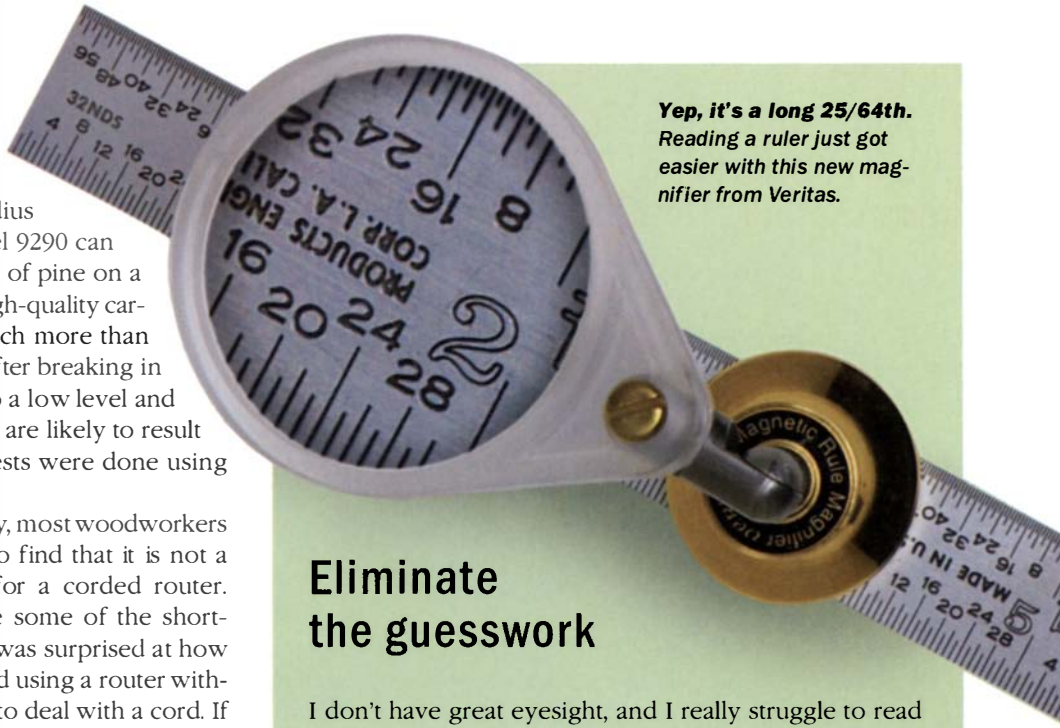
According to Porter-Cable, with a ½-in. radius roundover bit installed in the machine, model 9290 can cut, on average, either 100 ft. of oak or 200 ft. of pine on a single battery charge. In my test, with a new high-quality carbide bit in the router, I cut 154 ft. of oak, much more than promised, but only 164 ft. of pine. This was after breaking in the battery a half-dozen times by running it to a low level and then fully recharging it. More demanding cuts are likely to result in shorter run times. By the way, all of the tests were done using ¼-in.-dia. shank bits.

Because of the 9290's limited cutting capacity, most woodworkers are going to find that it is not a substitute for a corded router. But despite some of the shortcomings, I was surprised at how much I liked using a router without having to deal with a cord. If you can live with the tool's limitations, it might make a good second router. If I owned one, the 9290 would be the first one I'd reach for to make short, light-duty cuts.

The router, with battery and charger, sells for about $289. For more information, contact Porter-Cable at (800) 368-1487.

—Tom Begnal

Easy on and off. *The battery slips easily onto the motor housing and locks in place. Push a release button, and the battery will slide right off.*



Yep, it's a long 25/64th. *Reading a ruler just got easier with this new magnifier from Veritas.*

Eliminate the guesswork

I don't have great eyesight, and I really struggle to read the 1/32-in. graduated portion of a steel ruler, so for me, the Magnetic Rule Magnifier from Veritas is an extremely useful tool. The magnifier consists of three magnetized sections, a base, a shaft and a plastic magnifier arm. To focus or change the angle of the magnifier, it's simply a matter of moving the shaft up or down or moving the arm to the angle desired. The Magnetic Rule Magnifier sells for $19.95. For more information contact Veritas at (800) 871-8158 or visit leevalley.com.

—Christopher Xavier Baumann

lacquer thinner, mineral spirits and Simple Green.

Although all of these household products worked to some degree, none outperformed the blade-cleaner champs Cutter Cleaner, Pitch & Gum Remover and Blade & Bit. However, one of the household products did manage to stand out from the others: Simple Green, which is a nontoxic, biodegradable, around-the-house cleaning product, worked almost as well as Blade & Bit.

Cutter Cleaner can be ordered from Eagle America (800-872-2511). Pitch & Gum remover is sold by Trendlines (800-877-7899). Blade & Bit is available from PMS Products (800-962-1732). Look for Simple Green in grocery stores, hardware stores and home centers. ***—T.B.***

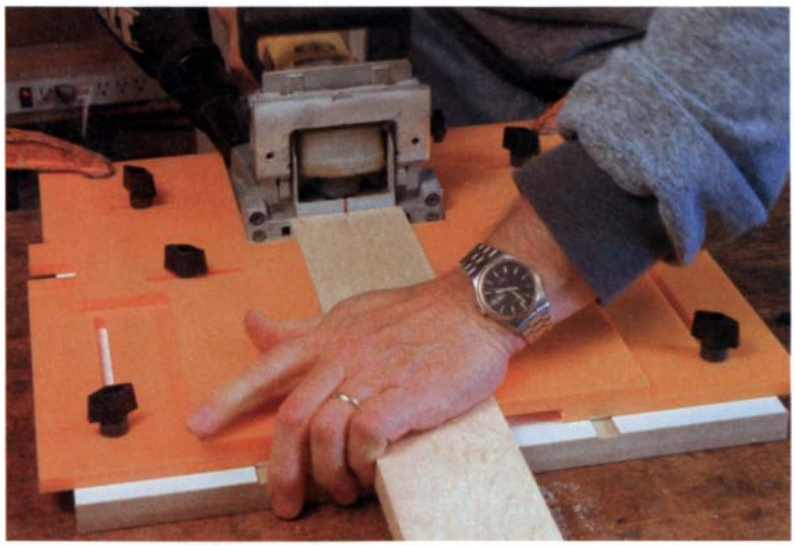
WHICH CLEANS BEST?

When it comes to choosing blade cleaners, woodworkers swear by all sorts of products. To find out if one worked better than another, Associate Editor Tom Begnal put a bunch of them to a cleaning test. Four cleaners—the three at left and the one at right—stood above the others.

BLADE CLEANERS

HOUSEHOLD PRODUCTS

Biscuit-joiner jig helps support narrow stock



New biscuit-joiner jig. *With narrow stock secured in the Biscuit Master, you get an extra measure of safety and accuracy when cutting with a biscuit joiner.*

Using a biscuit joiner to cut a slot in the end or edge of narrow stock can be dangerous unless there's some means of holding the work securely. I've seen woodworkers hold a narrow board by wrapping their fingers around the biscuit-joiner fence and then pushing the board tight to the blade housing. But that's risky, because a kickback could easily send the workpiece flying and pull fingers into the cutter. Kickback is also a concern when cutting slots in the end grain of narrow boards. It could toss the end of the board away from the cutter, damaging the workpiece or the user's hand.

A new jig from Woodhaven—the Biscuit Master—helps make it safer to cut slots in narrow stock. Slots in the base accept aluminum guides that are glued to polyethylene fences. Two of these fences enclose the biscuit joiner. The remaining four fences combine to form two units that secure the workpiece at a right angle or parallel to the base of the biscuit joiner. And a T-rail in the base allows the jig to accept mitered stock.

I used the jig to slot the ends of several 3-in.-wide pieces. The jig effectively held each piece, preventing it from kicking out to the side. I also edge-slotted some 1-in.-wide stock and enjoyed the fact that my hands were nowhere near the whirling cutter.

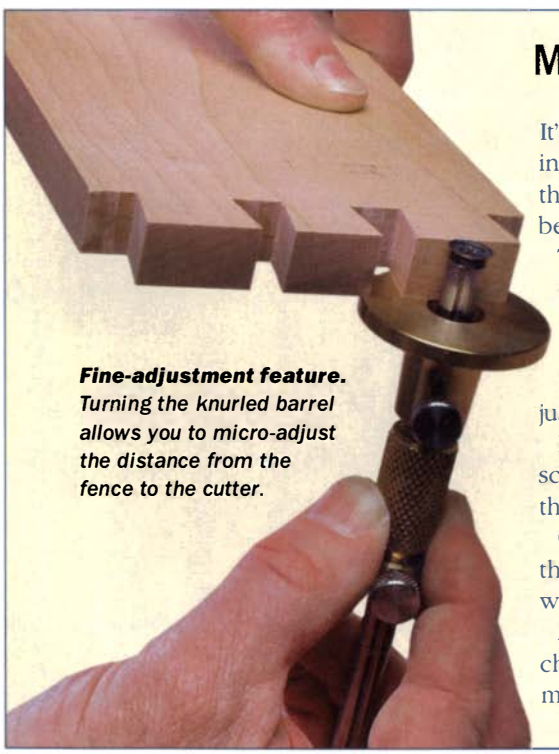
However, there's no way to clamp the workpiece to the base or fences. So even though the workpiece can't kick off to the side, it can still slide away from the cutter when slotting the end or kick back when slotting an edge.

Hand pressure on the workpiece can minimize such movement. But because both the melamine-coated base and the fences are slippery, it takes quite a bit of downward force to keep the workpiece from sliding away from the blade as the slot is cut.

Another inconvenience, albeit a slighter one, is that the slot height registers off the base. So when slotting boards thicker than ¾ in., I had to put shims under the joiner to center the slot.

Despite these drawbacks, I enjoyed the fact that narrow stock can be safely slotted without elaborate setups. If Woodhaven can find some way to securely hold the workpiece in the jig, this would be a must-have tool for any shop that uses biscuit joinery.

The Biscuit Master sells for $89.99. Contact Woodhaven for more information (800-344-6657). *—Roland Johnson*



Fine-adjustment feature. *Turning the knurled barrel allows you to micro-adjust the distance from the fence to the cutter.*

Micro-adjustable marking gauge

It's likely that the wooden marking gauge has been around since man began making tools. And until a few years ago, you'd find few made of anything but wood. But that's changing. A new generation of marking gauges made from steel and brass are becoming available. This tool, called the Tite-Mark, is one of them.

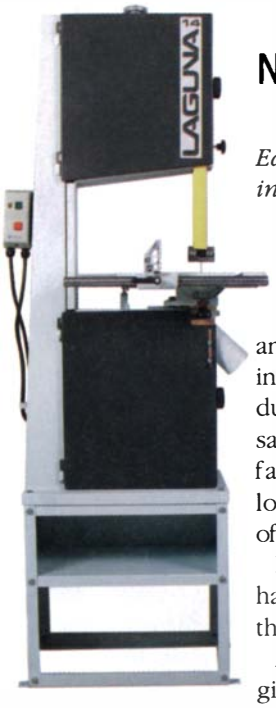
The gauge features a circular fence that slides along a cylindrical beam. Also, the cutter, located on the end of the beam, is disc-shaped. But what sets apart the Tite-Mark from other metal marking gauges is its micro-adjustment feature. To change the distance from the fence to the cutter, simply turn a knurled, brass barrel. And because one turn of the barrel translates into a fence movement of 0.100 in., adjustments as low as one-quarter turn (or about 0.025 in.) are easy to approximate.

In use, the gauge works nicely. It fit well in my hand, although a nylon tension screw, which doesn't seem all that necessary, dug into my fingers. The fence hugged the wood, and the cutter cut cleanly.

On the downside, the circular cutter can't be adjusted to make a heavy cut, something I occasionally want from a marking gauge. And the Tite-Mark is less useful when laying out a mortise and tenon, where a double-pin-style gauge is a plus.

At a price of $79, the tool isn't cheap. But for those interested in a beautifully machined, top-quality marking gauge, this one is well worth a look. For more information, contact Glen-Drake Toolworks at (707) 961-1569. *—Charles Durfee*

Photo, this page (top): Roland Johnson



New 14-in. bandsaw from Laguna

Editor's note: We reviewed 14-in. bandsaws in our last issue (FWW #153, pp. 92-99), but this new model showed up too late to be included there.

Typically, a 14-in. bandsaw is a light- to medium-weight machine. So I was pleasantly surprised to find that Laguna's entry into the 14-in. market, model LT-14, is an industrial-weight product. And although this saw didn't stand out when it came to surface finish—some castings on the tool I looked at were rough, and paint flaked off—it did have some very good features.

Like many European bandsaws, this one has a sheet-steel frame, but it's much stiffer than other 14-in. European saws I've seen.

A 230-volt, 1½-hp motor provides the giddyap. The wheels and pulleys are cast iron. And the axles and bearings are easily twice the size of those typically seen on 14-in. bandsaws. Both wheels were perfectly aligned, and runout was well within acceptable tolerances.

The tensioning and tracking assembly is considerably more substantial than what's found on a typical 14-in. bandsaw. Measuring with a commercial gauge, I achieved 15,000 psi of tension on a ½-in.-wide, 0.025-in.-thick carbon-steel blade.

The upper blade-guide support can be adjusted to run parallel with the blade, a feature you won't find on other 14-in. saws. The ceramic blade guides are the first of this type I've seen, and they worked well, but they were a chore to set up.

Overall, the machine was well made, with one notable exception. Apparently the saw we received wasn't standing square when it was welded to the baseplate, so the entire machine tilts a bit. Fortunately, this didn't affect performance.

The machine resawed stock up to 8¼ in. wide with ease, although some vibration was noted. A better tensioning spring would likely smooth out things. For light cuts and scroll work, the saw worked just fine. The fence locked easily and offered plenty of adjustment for blade drift. All things considered, including the $895 price tag, Laguna's LT-14 is a sturdy and powerful saw. With attention to a few more details, it would be a great bandsaw. Contact Laguna at (800) 234-1976. *—John White*

Tom Begnal is an associate editor; Christopher Xavier Baumann is the editorial assistant; Roland Johnson is a furniture maker in Sauk Rapids, Minn.; Charles Durfee builds custom furniture in Woolwich, Maine; John White is a contributing editor.

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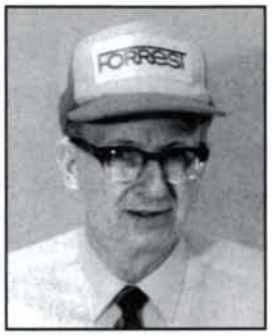

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Woodworker II

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12" x 40 T x 1"	~~$129~~	$116	$110
10" x 40 T (1/8" or 3/32" Kerf)	~~$119~~	$107	$101
10" x 30 T (1/8" or 3/32" Kerf)	~~$99~~	$ 89	$ 84
8 1/4" x 40 T (3/32" Kerf)*	~~$99~~	$ 89	$ 84
8" x 40 T (3/32" Kerf)	~~$99~~	$ 89	$ 84
7 1/4" x 30 T (3/32" Kerf)	~~$89~~	$ 62	$ 59
5 3/8" x 40T x 10mm (5/64" K)**	~~$89~~	$ 80	$ 76

14"x40Tx1", 14"x30Tx1", 12"x30Tx1", 9"x40T, 9"x30T, 8"x30T(3/32"K), 6"x40T(3/32"K) also available. Call for prices.

The 10"x40T earned the Editor's Choice for the best performance regardless of price. *American Woodworker April 1998, pp 68-69.*

*For Sears & Makita **For DeWalt Cordless Portables

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Specially designed for sliding compound miter, miter-chop, and radial saws.	Sale Price	10% Off First Blade	15% Off Second Blade
8 1/4" x 60T x 5/8" *Sears, Delta, Ryobi*	~~$109~~	$ 98	$ 93
8 ½" x 60T x 5/8" *Hitachi, DeWalt, Ryobi. Freud TR125*	~~$119~~	$107	$101
10"x80Tx5/8" *Delta, Bosch, Hitachi, Makita, Ryobi, AEG & all*	~~$139~~	$125	$118
12" x 80T x 1" *Delta, Hitachi, Makita, B&D, Sears & all*	~~$149~~	$134	$127
15" x 100T x 1" *Makita, Ryobi*	~~$199~~	$179	$169

6 ½" x 40T x 5/8", 9" x 80T x 5/8", 14" x 100T x 1" also available. Call for prices.

Woodworker I

Designed for radial arm or tablesaws–fine crosscut.	Sale Price	10% Off First Blade	15% Off Second Blade
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10" x 60 T	~~$129~~	$116	$110
12" x 60 T	~~$139~~	$125	$118

9" x 60T, 14" x 60T also available. Call for prices.

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12" x 80 T x 1" (1/8" Kerf)	~~$181~~	$163	$154

14"x100Tx1", 14"x80Tx1", 16"x100Tx1", 8", 7 1/4",others avail. Call for prices.

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A Sturdy Footstool

Simple jigs ensure that angled joints come together without a hitch

BY MARIO RODRIGUEZ

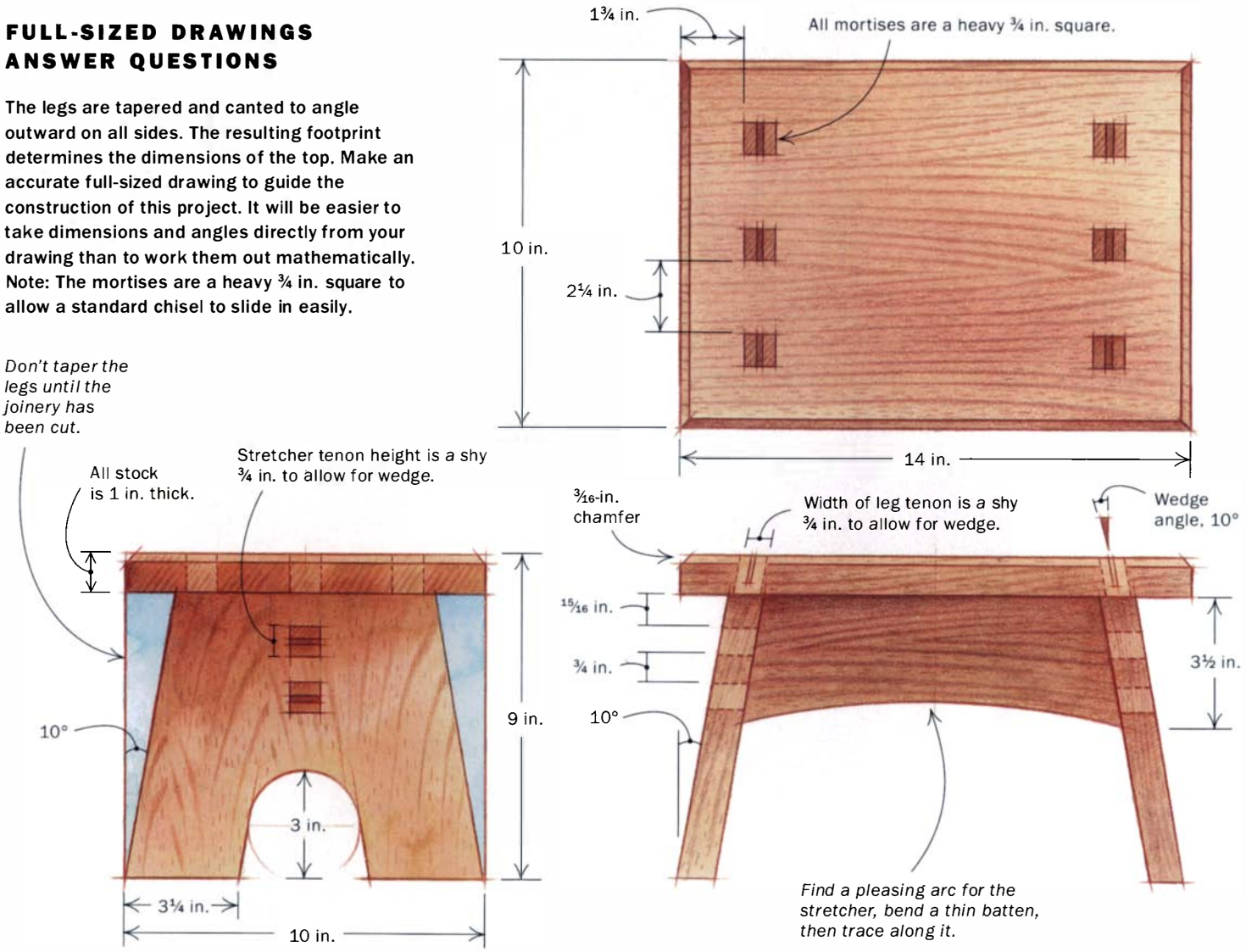
That top shelf is always just inches out of your reach. If you were a couple of inches taller, you would not have to trudge to the garage for that shaky, paint-spattered stepladder. At a time like this, wouldn't a neat little footstool be the perfect answer, tall enough to give the needed boost but small enough to tuck underneath a desk or in a corner? Small stools are also a favorite with kids, helping them do things on their own, from sneaking cookies to brushing teeth.

Recently I built this sturdy stool in mahogany. This simple project is a perfect way to spend a woodworking weekend. It can be made of short scrap pieces or a single board 10 in. wide by 50 in. long. It has

Photos: Asa Christiana

FULL-SIZED DRAWINGS ANSWER QUESTIONS

The legs are tapered and canted to angle outward on all sides. The resulting footprint determines the dimensions of the top. Make an accurate full-sized drawing to guide the construction of this project. It will be easier to take dimensions and angles directly from your drawing than to work them out mathematically. Note: The mortises are a heavy ¾ in. square to allow a standard chisel to slide in easily.



just four parts (two of them identical), and only one type of joint to practice and perfect. It's a manageable project for a novice, but the angled through-tenons will offer a challenge to any level of woodworker.

The height of the stool is about 9 in., a little taller than a typical stair tread, keeping it compact. Yet the step is large enough to easily accommodate two adult feet, side by side, with the splayed legs adding stability.

As with the dovetail, I find the through-mortise-and-tenon joint irresistible. I like the strong contrasting squares of end grain that break up the wood's surface. But this joint invites close inspection, so make it tight and clean. Unlike a single mortise and tenon, where a misfit can be fudged 1/16 in.

Mark the outlines and spacing of the mortises in the top. *With two lines already scribed to mark the thickness of the mortises, use the layout gauge to mark the other edges.*

one way or another, this joint must be dead-on. Wedging the tenons fills gaps, but only in one direction. Making the joinery more complicated is the 10° cant of the legs. However, I've come up with some jigs and techniques that will make things much easier on you.

Success starts on paper

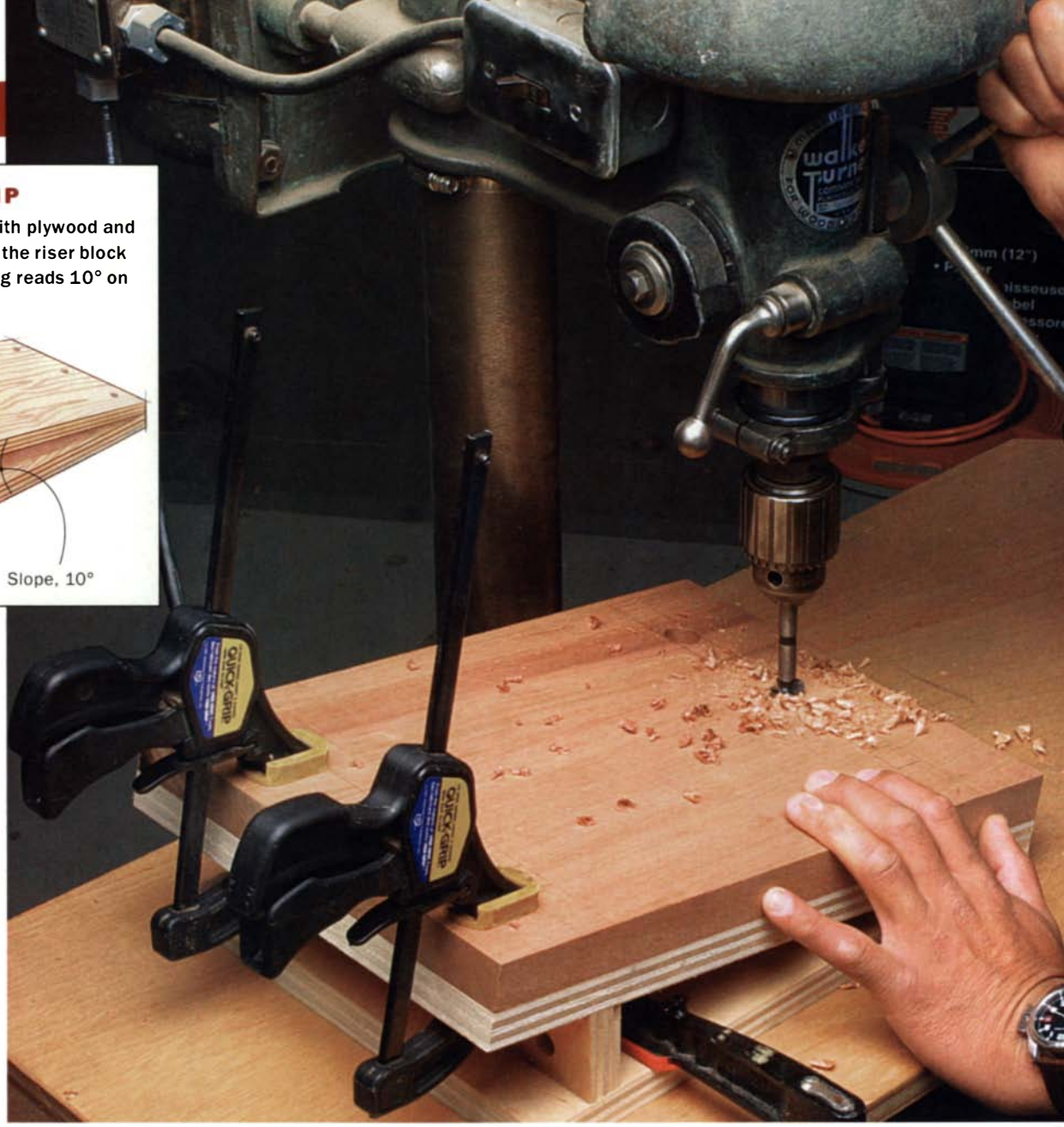
I began this project by making a full-sized drawing. By laying the pieces on the drawing as you proceed, you can check the dimensions and angles of each part and the position of the mortises.

After thicknessing the mahogany stock, rip the pieces to width, and cut them to length. Leave an extra 1/16 in. of length for

Drawings: Brian Jensen

PLYWOOD RAMP

Make this simple jig with plywood and drywall screws. Adjust the riser block until the slope of the jig reads 10° on a large protractor.



Drill out the angled mortises. *Use the ramp to position the workpiece at 10°. Square the workpiece with the edge of the ramp to be sure that the drilling angle is aligned properly. Then drill the mortises with a ¾-in. Forstner bit.*

leveling the legs and trimming the through-tenons later.

Leg-to-top joinery

The key to cutting these joints successfully is to lay out everything very carefully. Working from the drawing, mark out the thickness of the mortises across the top. Go 1/16 in. more than the thickness of the leg tenons. This will leave a gap for the wedging action to come later.

For the horizontal layout of the mortises—which must be dead-on—use a layout gauge, which is a small story stick that will standardize the width and spacing of mortises and tenons. Transfer marks from your full-sized drawing onto a small stick; then use the stick to mark all of the mortises in the top and the tenons on the legs. For a clean outline, I use a sharp marking knife. Each mortise is a little larger than ¾ in. to allow a ¾-in. chisel to slip in easily.

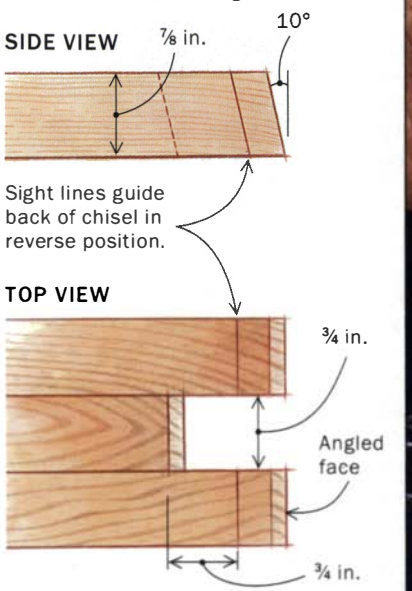
Accurate angled mortises—These mortises and tenons aren't straight up; they're angled at 10°. The key to a great fit is to ensure that the mortises are sloped very precisely, so the exposed tenon completely fills the mortise without any gaps. However, we'll work from the top side of the workpiece, where the accuracy of the mortise and tenon will be most evident, toward the bottom side, where the 1/8-in. shoulders around the tenon will hide small gaps. So relax—a little.

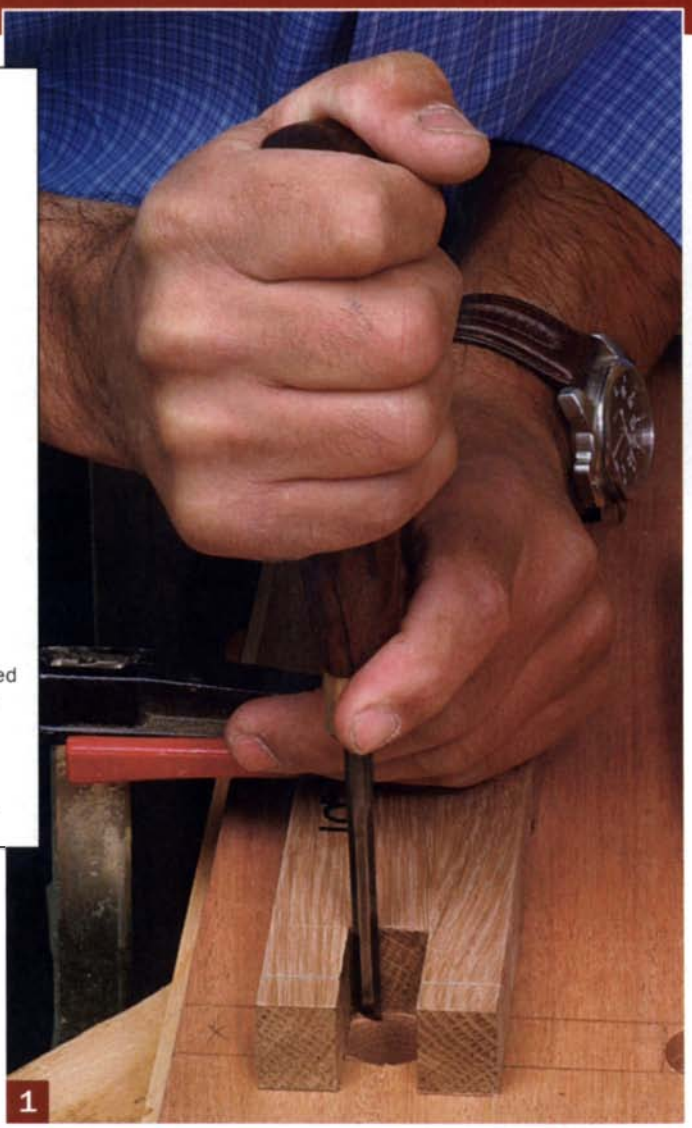
Drill out the majority of the waste on a drill press—supporting the workpiece with a 10° ramp and using a ¾-in. Forstner bit (see the photo and drawing above). This makes the chisel work much easier. The other secret to cutting these mortises accurately is to use a chisel guide (see the photos and drawings on the facing page). This is a simple jig made of three faces, each one cut to 10°. The center section, which matches the fat ¾-in. width of the mortises, is set back about 1 in. This pocket keeps the back of the chisel at the 10° angle and regulates the width of the mortise. The two angled sections that jut forward are used as a visual guide to keep the back of the chisel at the same angle when you work on the opposite angled wall of the mortise.

I square up the drilled holes with a series

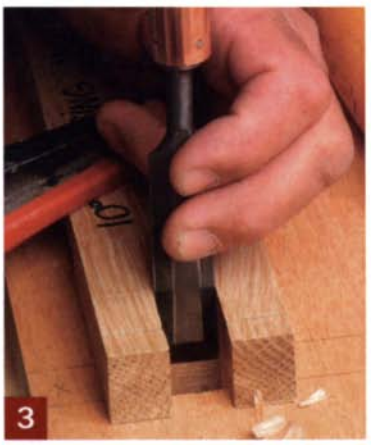
CHISEL GUIDE

Start with a block of wood with one end beveled at 10°. Then rip it into three pieces and reglue them to create the offset configuration.





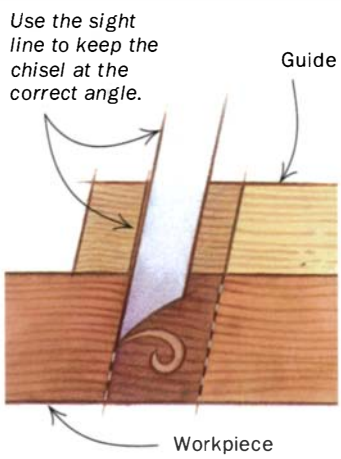
Three-chisel process. *With the help of the chisel guide, use a ¼-in. chisel to remove the corners (1), a ½-in. mortising chisel to rough out the rest (2) and a ¾-in. chisel to clean up the walls (3).*



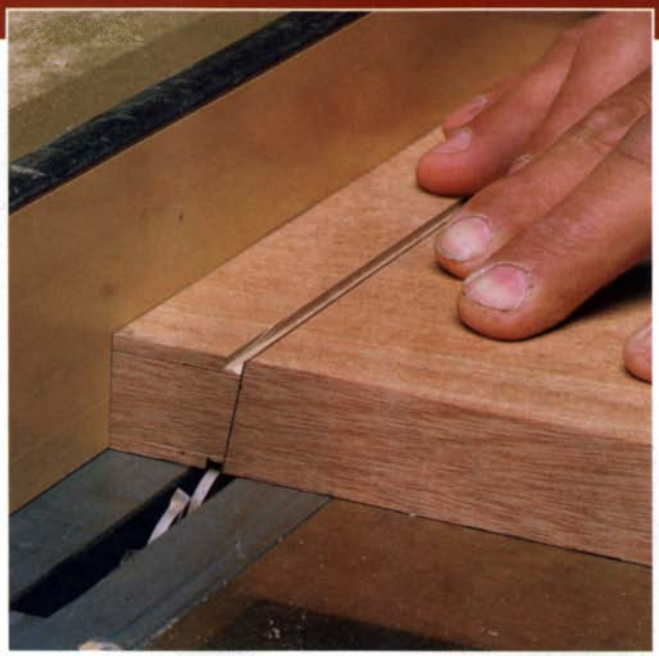
of chisels. I use a ¼-in. chisel to cut corners into the round holes and create a little room, then turn to my ½-in. mortise chisel to ride the slope and sides of the guide block, and cut the mortise to shape. Finally, I use a ¾-in. chisel to clean up the walls, flaring them slightly toward the hidden (bottom) side of the mortise, to allow easier assembly without compromising the appearance of the completed joint. Be sure to back up your workpiece with a piece of scrap to prevent blowing out the back of the mortise where your chisel exits.

While you're set up to drill and square up the mortises, do the pair of mortises in each of the legs. Use the plywood ramp and the chisel guide again—but pay close attention to the direction of the angle in relation to the mortises. You don't need a layout stick here, because the extra room for wedging adds a fudge factor to the spacing of these double mortises and tenons. As you proceed, check everything against your full-sized drawing.

The leg tenons—The next step in joining the legs to the top is to lay out and cut the



Guide works both ways. *The chisel guide also helps you cut the opposite angled wall of the mortise. Draw a line on the wall of the chisel guide parallel to its front edge.*



Cut the angled shoulders. *Set the tablesaw blade angle to 10°, and work to a scribed layout line when cutting the narrow outside shoulders.*

Set the blade to 90° to cut the outside cheeks. *This board is wide enough to be run on end. There will be a little waste left to be pared away later. The opposite cheek will require a change in blade height.*

leg tenons. Remember to leave them a little long, to be trimmed flush later. While the legs are still square (the sides untapered), cut the ⅛-in.-wide shoulders to their 10° angle on the tablesaw, working by eye to a layout line. After returning the sawblade to 90°, stand the board on end and cut the outside cheeks.

Next mark out the width and position of each tenon using the layout gauge, and make the interior cheek cuts on the bandsaw. Use the 10° plywood ramp to make the bandsaw blade meet the tenon shoulders evenly.

Cut out the waste with a coping saw; then use a chisel to trim the shoulders and pare the cheeks. Monitor your progress by frequently placing the top over the leg tenons and looking down into the mortises to see how the tenons are lining up.

As you continue to test-fit the pieces, note that the tenons should fit snugly across their width, but there should be wedging room left in their thickness.

Add the stretcher next

Working from your drawing, lay out the stretcher. Cut the ends on the chopsaw to 10°. You've already cut the mortises in the legs. Now you can cut the stretcher tenons using the same techniques and jigs as before; however, note that the stretcher tenons are angled in a different direction from the leg-to-top joinery. Once again, there is extra space in the mortise for the wedging action. Start on the tablesaw, cutting the outside shoulders and cheeks of the tenons. But before moving on, set the legs into the top, and place the stretcher shoulders between them to check the fit.

When you are done cutting and fitting the tenons, bandsaw the curve along the underside. Again, you can clean up the curve with a spindle sander or with a spokeshave and cabinet scraper, as I do.

The leg taper and cutout

The sides of the legs also have a 10° taper. Take the angle and dimensions off the full-sized drawing and cut just off the line on the bandsaw. Then smooth the edges on the jointer or with a handplane.

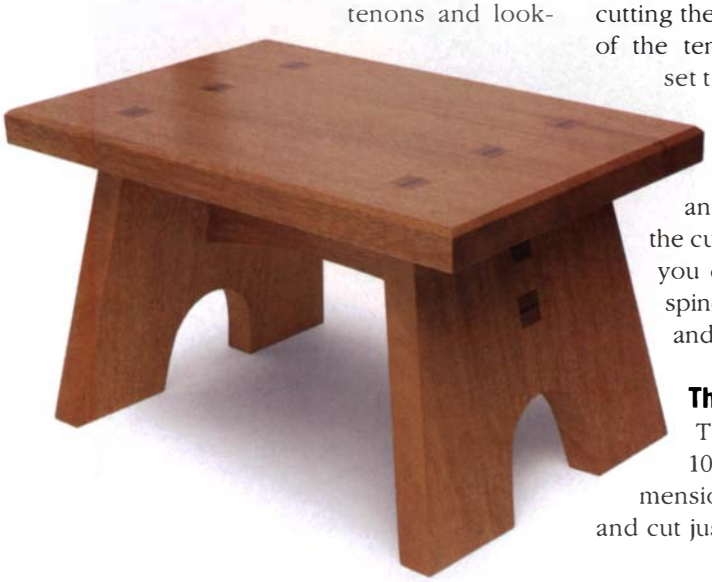
Beside adding a little visual interest to the design, the leg cutout helps to overcome an uneven floor. Draw the arc with a compass, and use a sliding bevel to extend the lines parallel to the taper of the legs. Again, make the rough cut on the bandsaw, and then clean up the cutout with a spindle sander or with rasps, files and sandpaper, as I do.

Assembly is also tricky

This is a difficult project to assemble because all of the parts—and all of the mortises and tenons—must converge at once. First you should assemble different parts, and place the partial assemblies on the drawing and against each other to check angles and fit. After tweaking and adjusting the parts, dry-fit the whole stool.

Getting the stool together and apart again won't be easy. Some advice: Work carefully, move slowly and be patient. Then position your clamps, and slowly draw the stool together. Listen for creaks and groans, and watch for splits. If you see the leading edge of the tenon splitting the top edge of a mortise upward, either tap the split area down with a mallet and small block, or trim the tenon.

Kerf the tenons for the wedges—Before gluing up, saw a thin kerf into the end of each tenon. This kerf will receive a small



Use the same layout gauge for the tenons. *There is no room for error here, and the layout gauge will ensure that the tenons match the mortises.*

Use the angled ramp on the bandsaw. *This lets the blade cut all the way to the angled shoulder. Leave a little on the cheeks for paring, and cut kerfs into the waste areas.*

Fit the leg to the top. *Clean up the shoulders with a sharp chisel, then pare the sides of the tenons, checking them frequently against their mating mortises.*

wedge, which will spread apart the tenon, locking it in place and closing the small gap. I find that a handsaw makes an appropriate kerf. Go about ¾ in. deep. Note that the wedges in through-tenons should always be oriented against the grain surrounding the mortise; otherwise, the wedges, which pack a lot of punch, will split the mortised piece.

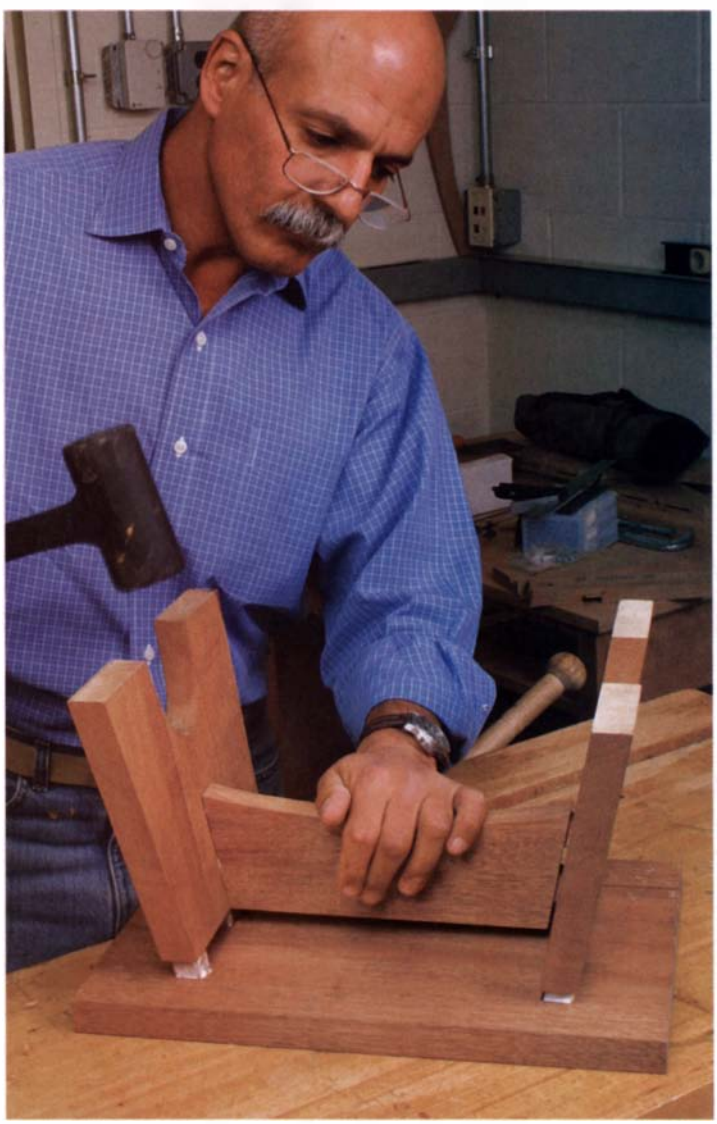
After applying white glue, which sets more slowly than yellow, draw all of the parts together completely. Let things set up for roughly 15 minutes, remove the clamps and blocks and tap in the wedges with a little glue on the tip of each one. A good angle for these small wedges is 10°. Tap them in until the gap around the tenon closes.

Finishing up

Leave the stool for at least 12 hours to let the wedges set up firmly. Then trim and plane them flush.

The last detail before sanding and finishing the piece is to chamfer the top. First, scribe lines 3/16 in. back from the edge. Then with a block plane angled at 45°, work down to the lines to leave a crisp, even chamfer. Of course, a router would also do the job, but I like the subtle character of handwork. □

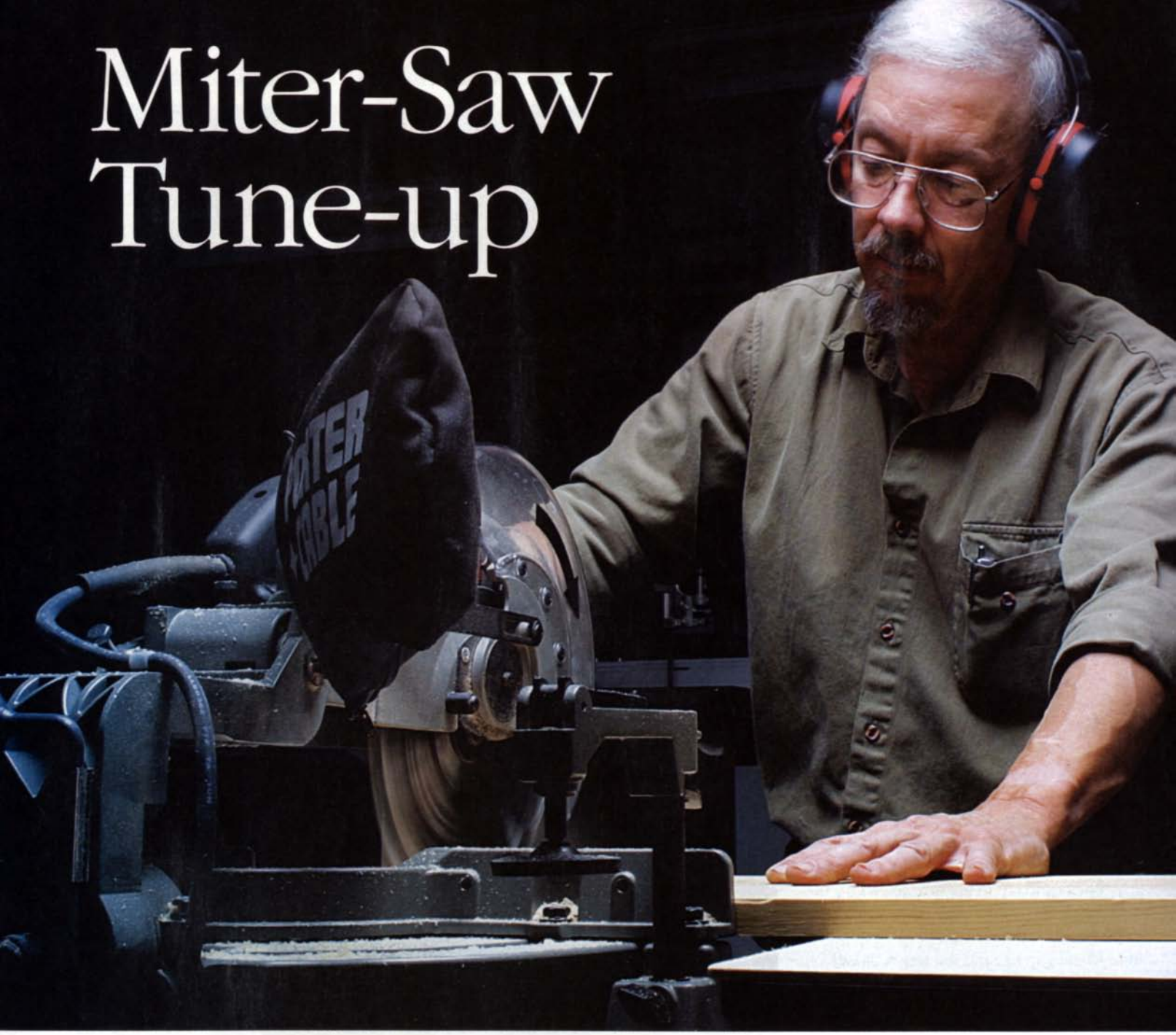
Mario Rodriguez is a contributing editor. He teaches woodworking in the furniture-restoration program at the Fashion Institute of Technology in New York City.



The parts all converge at once during glue-up. *Dry-fit everything beforehand. Assemble one leg and the top, the other leg and the stretcher, then drive the joints together carefully.*

Walnut wedges add contrast. *Cut the wedges to a 10° angle and tap them into the kerfs in the tenons until the tenons spread to fill the mortises.*

Miter-Saw Tune-up



Keep your chopsaw or sliding compound-miter saw in peak form

BY JOHN WHITE

Miter saws are showing up more and more in cabinet- and furniture-making shops. Although some of the early miter saws weren't reliably accurate, the current generation has evolved into tools capable of furniture-grade precision for joinery and trimwork. One big advantage of a miter saw is that you can get a cleaner cut—especially on long lengths—than you get with a tablesaw miter gauge because you're moving the blade into the stock, not the other way around. The result is less wobble when the cutting edge meets the workpiece. To get consistently clean cuts with one of these machines, whether you own a chopsaw or a sliding compound-miter saw, you first have to tune it up and then carry out periodic maintenance. □

John White is a contributing editor.

Photos, except where noted: William Duckworth

START WITH A THOROUGH CLEANING

Begin a tune-up by removing dust and chips from the base of the saw. You can safely use compressed air to blow out the crevices under the saw's table, but don't use it to clean off the rods of sliding saws because the blast of air can force dust past the seals to the bearings. A shop vacuum is the better choice. Take off the blade and clean out the inside of the blade housing and the guard, removing any pitch buildup that may interfere with the guard's motion. Spray penetrating oil, an efficient pitch solvent, on a clean towel and use it to wipe down the guard mechanism and the guide rods for the sliding mechanism. Don't leave excess oil on the rods; wipe them with a dry towel once they are clean. Use light machine oil to lubricate the pivot points where the head rotates when the saw is pulled downward.

Lubricate with two different kinds of oil. *Use penetrating oil on the sliding mechanism and light machine oil on pivot points for the head rotation.*

MAKE SURE THE FENCE IS FLAT AND SQUARE

Most miter-saw fences consist of an aluminum casting with a large semicircular segment connecting the left and right halves of the fence. The circular part of the casting is a weak spot that can get bent, throwing the two faces of the fence out of line. Check the fence with a straightedge. The left and right sides should be in perfect alignment. If the fence is bent, you have two options to correct the problem: You can try to straighten the casting, or you can add wood shims to the front faces. To straighten the casting, remove the fence from the saw and set it up across two blocks on the benchtop. With the high side of the fence uppermost, press down on it with moderate pressure for just a moment, then recheck it for straightness. Don't use a lot of pressure because most fences are not that stiff, and you can easily overdo it.

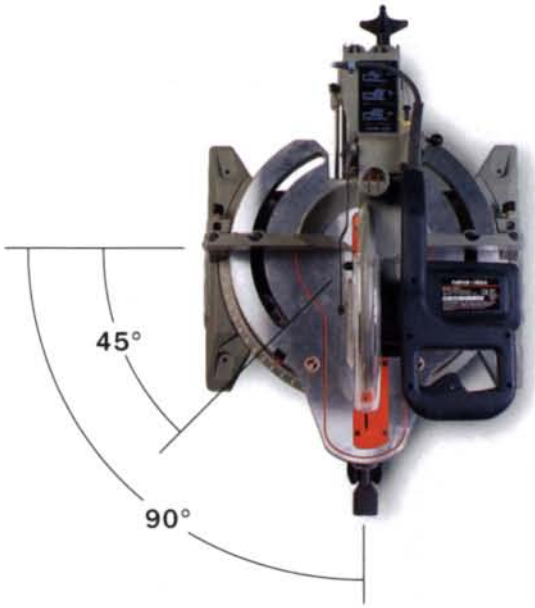
SQUARE THE FENCE TO THE TABLETOP

The face of the fence should sit square to the tabletop, but for most types of cuts a small discrepancy won't matter with this tool. If you have to use the saw to make miter cuts on large moldings, you can add a wood face to the fence and shim it as needed to square it to the tabletop. Masking tape makes a convenient shim material because it's thin enough for making small adjustments, and it'll stay in place as you screw the wood face onto the aluminum casting.

Start with a flat fence. *Slightly bent fences may be pushed back into alignment. White checks the fence with feeler gauges.*

The fence should sit square to the tabletop. *For most tasks these saws perform, this is not a critical condition. Slightly out-of-square fences can be shimmed into alignment with the addition of a new wood face.*

TEST FOR ACCURATE HORIZONTAL ANGLES



Built-in adjustability. *The two screws on either end of this fence pass through holes that are slotted, which allow you to square the fence to the blade.*

Most owner's manuals say to use a square to align the blade to the fence, but I think that approach is a waste of time. You're better off measuring the squareness of an actual cutoff and adjusting the setting as needed. Joint and mark one edge of a board that's 4 in. wide or more. For all of the test cuts, place this edge against the fence and use it to check the cuts with a square.

Correct for out of square by shifting the fence. But before loosening the bolts that clamp the fence to the table, scribe a pencil line at each end of the fence to mark its location. These marks will make it easier to judge how much you move the fence as you square it up. Once the saw has been properly aligned, set the pointer on the miter-angle scale to line up precisely with the 0° mark.

CHECK THE 45°-MITER SETTING

To check whether the saw will cut accurate 45° miters, you'll need two scraps at least 3 in. to 4 in. wide and a couple of feet long. As in the tests for square cuts, one edge on each board should be jointed straight and marked as the test edge.

With most saw designs you can only check whether the 45° stops were machined properly at the factory. The saw's turntable is positioned by a pin that engages a series of notches under the table. The notches can't be repositioned, so you're depending on the manufacturer to have properly located them when the saw was made. Make test miter cuts with the turntable swung both to the right and to the left to discover if they're both accurate. As a final test, cut one miter with the turntable in each location. This last test is a good indicator, because in day-to-day shop work, most miter joints are made from this combination of cuts. After sawing, butt the cut ends together on a flat surface and check the resulting corner with a square placed on the outside corner of the joint.

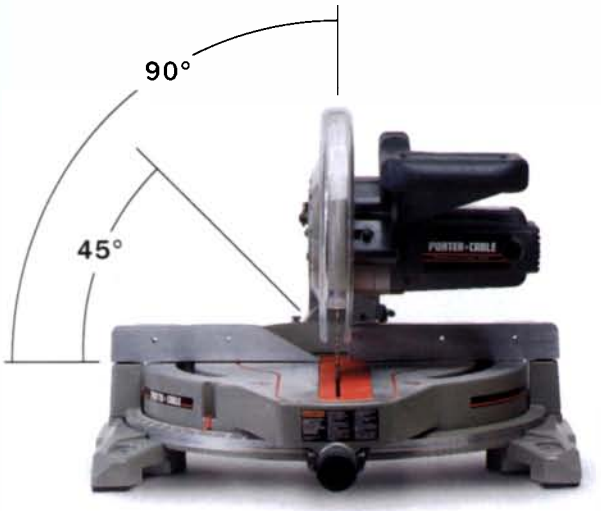
Ideally, you'll find that all three combinations produce 90° corners. If the joint made with one board cut on each side is good, but the joints made with both boards cut on either the left or the right side are off, chances are the fence was not set quite right. In that case you should readjust the fence for square. If the saw can't produce good miter joints in all combinations of left and right cuts, remove the turntable and examine the alignment notches. With luck, you'll find sawdust packed in one or more of the notches, and the problem will be solved with a simple cleaning. Another option is to align the fence to create a good joint on one side of the blade, with a loss of accuracy to other turntable positions.

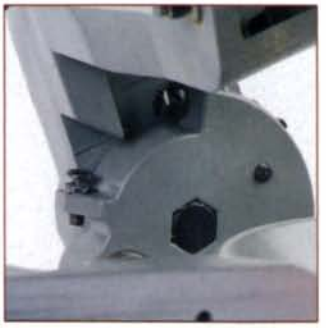
ADJUST THE FENCE FOR A SQUARE CUT

Ignore the owner's manual. *Joint the edge of a piece of scrap, place it against the fence and make a cut. Check the cut edge with a square to determine the blade-to-fence setting.*

Give yourself a reference line. *Use a pen or pencil to mark the location of the fence on the tabletop before making adjustments, which can easily be made by pivoting the fence.*

TEST FOR ACCURATE VERTICAL ANGLES





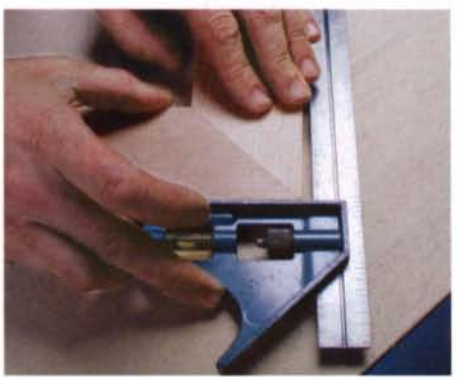
Vertical adjustments are easy. *Two bolts with locknuts act as 45° and 90° stops.*

To check the vertical alignment, follow the same procedure used for the horizontal setting, employing a test scrap 2 in. to 3 in. wide and a couple of feet long. Joint one edge until it's dead-on straight, then mark it. This edge will sit flat on the tabletop for all of the test cuts.

Set the saw at both the vertical and horizontal 90° settings and lock them in place. Make a test cut on one end of the scrap and check it with a square. If the cut end isn't square, adjust the stop, which is a simple job on most saws—typically it is a bolt and locknut easily accessed at the back of the saw. Some saws come with a special wrench to loosen the locknut because clearances can be tight.

To make an adjustment, tilt the saw head to take pressure off the stop bolt, then loosen the locknut. Turn the bolt to correct the alignment, lock it down again and make another test cut. It may take a couple of tries to get a perfectly square cut on the test piece. Once you're there, set the pointer on the bevel-angle scale to line up precisely with the 0° mark.

With the vertical and horizontal square stops set, you can adjust the stop for cutting 45° bevels. You'll need two boards about 3 in. wide and a couple of feet long. Square up the boards and mark the best edge on each board. Lock the saw head to the 45° vertical stop. Miter-cut one end of both boards, with the boards held vertically against the fence, keeping the designated edges against the tabletop. Cutting the boards vertically gives you a bigger miter to check for accuracy than what you'd get by cutting a bevel in the thickness of the boards. Assemble the joint on a flat benchtop. If the two boards don't form a square corner, it'll probably take several adjustments to get the joint square, but the effort is worth the trouble.



You need two pieces to test miters. *Scraps at least 3 in. wide are better than narrow pieces to get a good reading on a miter.*

Two wrenches required. *To adjust the 45° and 90° stops, you may have to tilt the saw head to access the bolts and locknuts.*

Troubleshooting at a glance

SYMPTOM	SOLUTION
Rough sawcuts	Replace the mediocre blade that came with the machine with a new 80-tooth crosscut blade
Loss of power, sparks in the motor	Replace the brushes (see the photos at right)
Out of square or off-angle cuts	Tune up settings and stops as indicated

This brush is still in good shape. *Worn-out brushes can lead to sparks coming from the motor, and they can indicate a loss of power. Replace brushes when they get too worn, which would be about half the size of the one shown here.*

Photos, this page (top left) and facing page (top left): Michael Pekovich

An Easy, Durable Finish

All you need is spar varnish, sandpaper and lots of clean rags

BY LON SCHLEINING

I wasn't asking for much: I wanted a finish with a rich, hand-rubbed luster, neither too glossy nor too dull, that illuminates rather than hides the grain—one that would offer real protection from moisture and sunlight and yet still feel like wood, not plastic. I also wanted a finish I could apply quickly and easily, and something I could use right out of the can. And it would be awfully nice if it smelled good. That isn't too much to ask of a finish, is it?

The answer turned out to be rather simple: high-gloss spar varnish, turpentine, wet-or-dry sandpaper in various grits, a few rags and a bit of elbow grease. Simply rubbing plain gloss varnish into the raw wood provided the protection, sheen, feel and ease of application I was looking for.

Start with a well-prepared surface

The key is to scrape, plane or sand each of the pieces of your project before you assemble it. Even if you have to touch up the sanding after final assembly, this step will save lots of time.

***Fine Woodworking* asked its contributors: What's your favorite finish and why?**

During the building process I sand by machine (belt sander, 120 grit), then sand by hand with a wood sanding block padded with felt. The sanding sequence will depend, in part, on the type of wood. On hard maple, for example, use 100 grit, then 120, 150 and finally 220 grit. With mahogany and its much more open grain, stop dry-sanding at 150 grit. Be sure to change sandpaper frequently.

Make sure the surface is clean by using a

Photos: Mark Schofield

vacuum to pull out the sanding grit from the pores of the wood. Don't worry if the surface is less smooth than what you normally shoot for. The sanding doesn't stop when the finishing begins. I wet-sand with finer and finer grits during the application of the finish itself.

Materials are easy to obtain

The heart of my finish is a high-gloss spar varnish, which has several advantages: Unlike plain oils, it hardens overnight; it's readily available; and it has much greater clarity than semigloss or satin finishes, whose additives not only dull the finish but also cloud the grain. Spar varnish also contains ultraviolet protection that will help keep the wood from fading or yellowing. I've used this varnish for years on boats, protecting the wood from salt water and abuse, so I know it provides the tough tabletop film I'm looking for. As an added bonus, this finish is quite easy to renew by scuff-sanding with 220-grit paper and simply wiping on an additional coat of varnish if the surface ever needs it. In addition, this finishing method will also work with other types of varnish, urethanes and even some finishing oils.

Though it's counterintuitive, gloss varnish does not produce a glossy surface when it's rubbed on. Because you're wiping off any excess varnish, not letting it stand on the surface, it doesn't get a chance to build up to its normal gloss.

To thin the varnish for the initial coat, I like to use natural turpentine instead of paint thinner, simply because it smells good. As a general rule, thin a finish with whatever the label suggests for cleanup.

You will need a few sheets of 220-, 320-, 400- and 600-grit wet-or-dry sandpaper for sanding in the varnish. For dry-sanding between coats, use open-coat, self-lubricating 320-grit paper. A box of soft cotton rags from the paint store ensures that you won't run out of clean rags just when you need one. Lastly, disposable gloves are essential. Not only will they protect your skin from solvents, but they also make the job a lot less messy.

Application is straightforward

Before starting, spread out a plastic sheet to contain drips and spills. This is also a good time to change into an old shirt and pants. (I might even follow my own advice about this one of these days.) Pour a small

FIRST COAT: THINNED VARNISH

THREE PARTS VARNISH ONE PART THINNER 220-GRIT WET-OR-DRY PAPER

Apply the finish liberally. *It is important to coat the whole surface as quickly as possible to avoid creating lines where the finish overlaps. Schleining uses his gloved hands to spread the thinned varnish over the surface before sanding it in with 220-grit wet-or-dry paper.*

Grain filler with a perfect color match. *Sanding the varnish with the grain creates a slurry that fills the pores of open-grained wood.*

FIRST COAT (continued)

Sand on and wipe off. *Before the varnish becomes tacky, wipe off the surplus using clean cotton rags. Keep changing the rags until no more finish can be removed and the surface can be buffed smooth.*

amount of varnish into a container using a piece of nylon panty hose as a strainer. Thin with one part turpentine to about three parts varnish. The first coat saturates the wood more effectively if it is thinned down a bit.

Wearing gloves, quickly flood the entire surface on all sides until it's completely coated, adding more varnish as needed. It's important to cover the piece completely, not in sections. Working on a small area at a time may leave a line where different areas of finish overlap.

Sand the wet varnish into the wood using 220-grit wet-or-dry paper. Sand with the grain until you produce a slurry. This helps fill the pores of open-grained woods, such as mahogany or oak, and the color match is perfect. While the varnish is still wet, wipe with a soft cotton rag to remove any varnish that has not soaked into the wood. When removing the excess varnish, there's a point at which the varnish gets quite sticky and difficult to wipe. Working on something like a large tabletop might require a helper. Rub across the grain to avoid pulling the slurry out of the wood pores. Be sure to spread out the oil-soaked rags to dry before disposing of them, to avoid the danger of the rags spontaneously igniting.

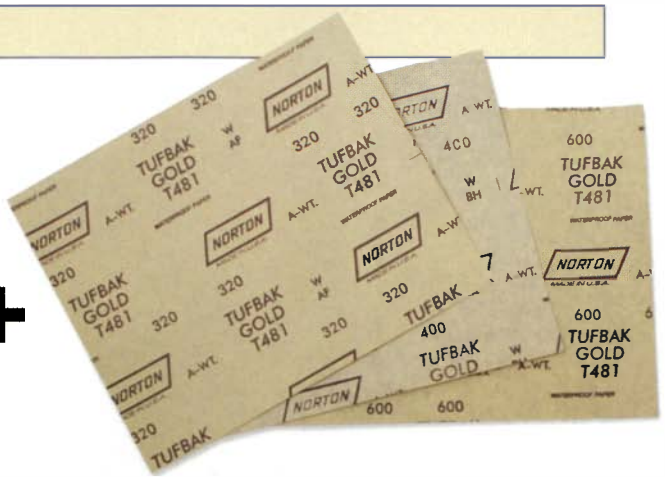
Buff with a fresh cloth until the surface is slick and smooth. Polish the piece every half hour or so to make sure no wet spots emerge on the surface. Joints, such as on

No place for surplus varnish to hide. *No matter how much you wipe, varnish has a habit of oozing out of joints after you have done your final buffing, creating sticky and glossy areas. Remove surplus varnish using compressed air, and wipe the area clean.*

ADDITIONAL COATS: UNTHINNED VARNISH

Scuff-sand the surface the following day. *Between coats, lightly sand the surface using 320-grit nonloading, or stearated, paper under a padded block. Always sand with the grain.*

UNTHINNED VARNISH



FINER-GRIT PAPER

the breadboard ends of a tabletop, will absorb excess varnish, which will gradually seep out after the rest of the surface has dried. To avoid this, I blast the joint with compressed air, forcing the surplus varnish out of the gap.

Let the piece sit at room temperature overnight. You can carry on working in the shop because it doesn't matter if dust lands on the piece, but it is a good idea to ensure adequate ventilation to avoid a concentration of fumes. The next morning the surface should feel smooth and dry. Lightly dry-sand it with 320-grit nonloading, or stearated, paper. Use a felt-padded block, and sand with the grain. Clean the surface with a vacuum or compressed air. Apply a flood coat of unthinned varnish and use 320-grit wet-or-dry paper to sand the varnish into the surface. Wipe and buff the excess varnish as before.

Repeat this process each day; wet-sanding with finer and finer grits until you have at least three coats. Additional coats will produce slightly more luster. Some folks like to wax the surface when it's dry, but I prefer to leave it unwaxed, because it's easier to recoat should the surface become damaged over time.

I haven't yet been tempted to throw away either my spray guns or my badger-hair brushes, but after using this finishing process on several projects, I can't remember the last time I used those tools. This simple technique meets all of my criteria for an ideal finish and produces very consistent results, all without a large investment in equipment. □

Lon Schleining is a contributing editor.

Build the finish. *Apply subsequent coats the same way as the first coat. Rub in each coat with a higher grit of wet-or-dry paper. The last coat is rubbed in with 600-grit paper to create a very smooth surface.*

A final buffing. *After the final coat has dried, the surface will be silky smooth with the pores filled. Rub the surface briskly with a clean cotton rag.*

18th-Century Pennsylvania Secretary

Part I

A pair of dovetailed boxes outfitted with drawers and doors make up the bulk of this period piece

BY LONNIE BIRD

During the 18th century, building a secretary was often considered the culmination of a cabinetmaker's skill. But for years I've taught inexperienced undergraduates to build the secretary seen on these pages. The key to building a large, complex piece, such as this reproduction of a Pennsylvania desk—with more than 100 parts and nearly that many joints—is to break down the process into small, easy steps. This secretary, like all casework, is just a series of boxes fitted within larger boxes. The moldings, curves, feet and other details are easily made but embellish the box, making the completed piece visually stimulating.

In this article—Part I of a three-part series—I'll focus on building the upper and lower cases. Subsequent articles will walk you through the process of outfitting the gallery with drawers and pigeonholes and then building and hanging tombstone doors on the upper case. Although I have a great appreciation for 18th-century design, aesthetics and joinery, I don't restrict myself to building absolute reproductions. Before building a piece, I study several related examples and combine the best design elements to come up with a piece that's my own. And I don't copy mistakes. If a door proportion doesn't work or a glue block was attached cross-grain, I'll make the necessary changes. I want my furniture to capture the spirit of period furniture without the shortcomings.

Watch it on the web
Get a tour of the finished piece at finewoodworking.com.

Build the lower case

Stripped of its drawers, feet and molding, the lower case is simply a box joined with half-blind dovetails. When laying out the joint at the top, keep in mind a couple of key points. First, begin the joint with a tail, which will hide the rabbet for the back boards. Second, the slope on the case sides begins 12 in. from the back edge. Mark the slope location and end the joint with a half pin.

Although you can use a jig to cut and fit the dovetails, I prefer the slight irregularities associated with a hand-cut joint. I use a router freehand to cut away the waste between the pins, then I use a chisel and mallet to square the inside corners between the pins. Finally, I scribe the tails from the pins and saw them by hand. The result is a joint with a handmade look but without much time or fuss.

The next step is to lay out the writing surface, the drawer dividers and the lid slope. The writing surface is positioned 11 in. below the top. Once the feet are attached to the case, the writing surface will be approximately 30 in. from the floor. Next, lay out the drawer placement. I think drawers look best if they graduate, meaning they gradually increase in height. To

Photos, except where noted: Matthew Teague; this page: Michael Pekovich

achieve proportional sizes I use arithmetic progression, a system in which a constant (X) is added to a drawer opening (A, B, C) to create the next. For example, A + X = B, B + X = C, and so on. In this case X is ⅞ in., the dimension of the drawer divider.

Next, lay out the the starting and ending points of the lid slope based upon the lid position when closed. After careful layout of the slope, saw away the excess corner with a bandsaw and cut to the layout line with a flush-trimming router bit. First, clamp a straightedge along the layout line to guide the router bit. To avoid tearout, use a spiral bit and cut with the grain.

After cutting the slope on the case sides, transfer the angle of slope to the edge of the top. Dry-fit the top to one of the sides, then mark the slope on the end grain of the top. Set the tablesaw blade to an angle that corresponds to this layout line, then rip the slope on the edge of the top. Afterward, turn over the top and rip the edge a second time to bevel the underside of the case top. Then smooth away the saw marks with a bench plane. The last step before glue-up is to mill a rabbet for the back boards along the inside edges of the top and sides.

Because of its large scale and the numerous tails and pins, gluing together a box this size can be quite a handful. To avoid panic, it's best to prepare by doing a dry run, checking for square as you go. After the dry run, use a mallet to tap the joints partially open; keeping the assembly partially intact makes glue-up much easier. Apply glue only to the pins with a small brush, and drive the joints home. After ensuring that the box is square, leave it on a flat surface until the glue dries.

Ready the lower case for drawers

The next step is to install the dividers, the drawer runners (which also serve as kickers) and the writing surface. The dividers are joined to the case sides with sliding dovetails, and the back edges of the dividers are mortised to accept tenons on the runners. The tenons at the back ends of the runners are dry-assembled with a ⅛-in. gap at the tenon shoulder. As the case sides expand and contract seasonally, the gap allows the tenons to slide freely in the mortises.

Fasten each runner to the case with a pair of screws. Using this method, the drawer runners serve as battens to help keep the wide case sides flat. To allow for movement in the case sides, elongate the screw holes in the runners. The writing surface is joined to the case sides with a sliding dovetail for the first 2 in. and a shallow dado for the remaining width.

Before beginning the next step, decide how many drawers you would like (or how many dovetails you want to cut). Original Pennsylvania secretaries typically had four, five or seven drawers, and many antiques used small drawers to support the lid. You can also divide the second row into two drawers.

After milling the stock for the dividers, the drawer runners and the writing surface, begin the joinery by routing dovetail sockets

PARTITIONING THE CASE

Dovetailing for the dividers. *Templates guide the router as it cuts sliding dovetails to accept the dividers. Using the same template on both sides ensures that the dividers go in square.*

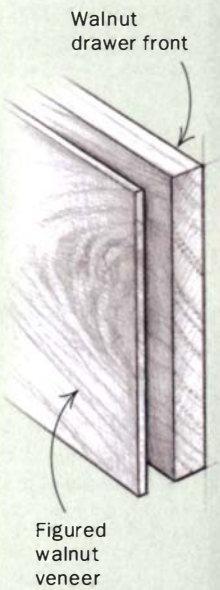
Installing the writing surface. *The writing surface slides into dadoes cut into the case sides, and 2-in. sliding dovetails at the front hold it in place.*

A final push. *Use a pipe clamp to slowly slide the dovetail into place, adding a touch of glue at the end.*

Drawer supports. *Runners are tenoned into the drawer stretchers, which are dovetailed to the case sides. The runners, which also serve as kickers, are left short and screwed to the case sides through elongated holes to allow for seasonal movement.*

VENEERING DRAWER FRONTS

Resawn drawer fronts match perfectly. *Bird chooses a nice piece of crotch wood and resaws drawer fronts on the bandsaw.*



into the case sides. To ensure uniformity, guide the router with plywood templates that register from the bottom of the case. Because I've built this secretary before, I have templates for each divider and the writing surface. But you can use one large template and reduce it in size for each series of cuts.

Cut each dovetail socket ⅜ in. deep by 2 in. long. Each setup requires four cuts, two on each side at the front and back. The exception is the writing surface, which has dovetails at the front but not at the back. There, the joint is completed with a dado (3⁄16 in. deep by ⅞ in. wide) to support the wide writing surface.

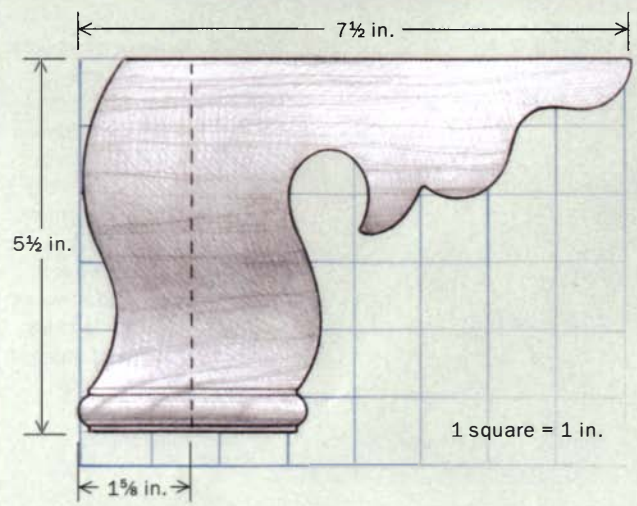
After routing the case sockets, cut the dovetails on the corresponding dividers to fit. Fitting the dividers can be tricky. But if you use the same dovetail bit mounted in the router table and are careful with the setup, it becomes much easier. First, mount a tall auxiliary fence on the router table to help support the stock. Then set the bit height to precisely ⅜ in., the depth of the sockets. Bury the bit in the fence to create a zero-clearance opening, and you're ready to begin.

Cut the dividers to length. For greatest accuracy, first square one end of the milled stock, then position a corner of the stock into a socket and mark the opposite end. One measurement should work for all of the dividers. If the case sides have warped slightly, the dividers will force them back into position when they are installed. Cut the dividers to final length with the help of a stop.

Now make one last adjustment to the router table: the position of the fence, which determines the thickness of the dovetail. Although the joint is glued, there's really no long-grain surface contact for a strong bond, so a very snug fit is necessary to hold the joint firmly. In fact, I use soft blows of a mallet to drive each dovetail into its socket. To ensure accuracy, use a test block and adjust the router fence until the fit is snug. Once you're satisfied with the fit of the test block, rout the ends of the dividers. Afterward, lower the bit to 3⁄16 in. and rout dovetails on each end of the writing surface. Then cut the writing surface 3⁄16 in. shorter on each end, leaving the dovetails on the front edge.

The next step is to mortise the back edges of the dividers to accept the tenons on the runners. Then cut the tenons to fit the mortises. Remember to subtract ⅛ in. at the rear tenon to allow the case sides to move. To ensure this system works as it should, cut the

MAKING BRACKET FEET



Feet are mitered, splined and cut to shape. *With the blade set to 45°, the mitered ends of the foot stock are cut to accept a hardwood spline (left). Before assembly, feet are bandsawn to shape (right).*

rear tenons for a slightly loose fit and rub paraffin wax on each tenon before assembly. Finally, drill a pair of holes in each runner for the screws that fasten them to the case sides.

Begin assembly by installing the dividers at the front of the case. First apply a thin coat of glue to the dovetails and slide the dividers into position. Then apply glue to the front tenons on the runners and slide them into the mortises from the back of the case.

The last step is to install the dividers at the back. Remember to apply glue to the dovetails but not to the mortise-and-tenon joints. Finally, screw the runners to the case sides. To keep the slides flat, the screws need to penetrate deep into the case.

Slide the writing surface into the dadoes in the case sides. Because there is so much friction, apply glue only at the dovetail and use a pipe clamp at each end to coax the joint together.

Build the large drawers

The large drawers are typical in their construction: half-blind dovetails in the front and through-dovetails in the back. The bottoms are thin, solid panels with beveled edges that slip into dadoes from the drawer back. Orienting the grain from side-to-side will allow expansion to occur at the back.

Traditional drawer fronts were lipped or flush with a cockbead. Also, drawer fronts are a great place to show off crotch wood; I bandsawed a crotch plank into veneer and glued it to each front with a vacuum press. This method ensures that all of the fronts match. If you choose to use a lipped drawer front, begin by milling the fronts oversized—7/16 in. longer and 3/16 in. wider than the opening. Then mill a 1/4-in. rabbet around the sides and top. No rabbet is used along the bottom edge. Now check the fit of the front within the opening. There should be approximately 1/16 in. total clearance at the top and 1/16 in. total on the sides. Next, mill the drawer sides and back so that they correspond to the size of the drawer front inside the rabbet. After dovetailing the parts, shape a 3/16-in. thumbnail profile around the perimeter of each drawer front.

If you use a cockbead, make and fit the drawers first. Carefully fit each drawer with a plane, then mill a shallow rabbet around the drawer perimeter. Next, miter the beaded strips and apply them to the rabbets with glue and small cut nails. Make certain that you are satisfied with the drawer fit before beginning the cockbead process. Any fitting after the cockbead has been applied will spoil the profile of the bead.

Use a single plank for the lid

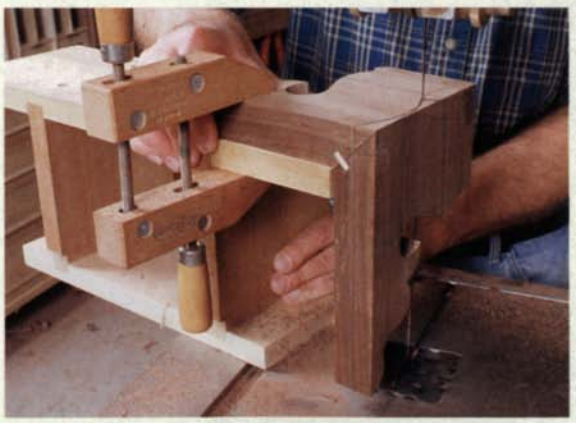
The secretary's lid is hinged to the writing surface and folds down to become part of the writing surface. Measuring more than 1 ft. deep and 3 ft. across, the lid is an ideal place to use a prized, figured plank. In fact, I never use more than one board for the lid because any seam would be a distraction. To keep such a wide plank from warping, use breadboard ends.

Begin by milling the plank and the breadboard ends to thickness. It's important to flatten the stock before milling it. If your jointer will not accommodate such a wide plank, you can use a long handplane instead. After milling, lay out and cut three mortises, 2 in. deep by 3 in. wide, in the breadboard ends. Next, cut the tenons on the ends of the lid for a friction fit within the mortises.

To allow for seasonal movement, apply glue to the center joint and leave the two outer joints dry. Wood pins will hold these joints tight while allowing for movement. When laying out the pins, offset the hole in the tenon 1/32 in. closer to the shoulder. This pulls the breadboard end tight against the tenon shoulder. Bore the hole in the tenon, then elongate it with a small file. After assembly, the pin can slide freely in the elongated hole as humidity changes.

To assemble the lid, apply glue to the center mortise-and-tenon joints at each end. A couple of pipe clamps will hold the joint closed while the glue sets. Afterward, drive the wood pins through the four outer joints and trim the pins flush with the lid surface.

After assembly, cut a 1/4-in. rabbet along the ends and top edge of



Quick jig helps profile the feet. *With the feet clamped to an elevated jig, rough out the side profile of the feet on the bandsaw.*

Follow the glueline. *Once the first profile has been cut, simply follow the exposed glueline to make sure the two sides match.*

MAKING CROWN MOLDING

Cove cutting the crown molding. *Using a cove cutter, the triangular stock is adjusted along a fence until the entry and exit points line up. Temporary fences are clamped into place, guiding the stock as the cove is cut. Take light passes, raising the blade slightly after each cut.*

the lid. Leave the lower edge of the lid square to achieve a flush fit with the writing surface. Slope the rabbet along the top edge to match the angle of slope on the lid lock.

Make the feet next

For this piece you can choose between flat or ogee bracket feet. Flat bracket feet are authentic to the period and easier to construct than the ogee bracket feet. They also are a good option if you prefer a simpler look. (For more on making flat bracket feet, see *FWW* #97, pp. 72-75.)

To make ogee feet, begin by building the base frame to which the feet are attached. The frame is 1 in. thick and fastens to the bottom of the case. After the feet are attached to the frame, a strip of base molding is mitered and applied over the base frame.

To determine the length and width of the base frame, measure the case and add 1/16 in. to the front and sides. Frame corners are joined with mortise-and-tenon joints, and the entire assembly is glued along the front edge of the desk. The rest of the frame is attached with screws to allow for seasonal movement. Once the frame has been attached, trim it flush to the case using a flush-trimming bit in the router.

The ogee feet at the front are constructed with miters and splines. The back feet are joined with half-blind dovetails. Once the joints have been cut, bandsaw the bracket outline and glue the foot halves together (see the photos on pp. 52-53).

Bandsaw the ogee contour into the face of each foot. This method is fast and requires very little handwork. But first you'll need to build a simple stand to support the foot on the bandsaw table while sawing.

After bandsawing the feet, remove the saw marks and smooth the curves with files and a scraper. A #5 carving gouge works well for refining the bead at the foot. Then cut a stopped rabbet along the top edge of each foot, long enough to accept a triangular glue block. The feet are fastened to the base with a pair of screws driven through the glue block. Finally, complete the base by attaching the strip of molding around the front and sides of the case.

Once the lower case has been finished, you can install the gallery—which I'll explain in the the next issue of the magazine—or begin work on the upper case.

Build the upper case

Begin by measuring the top of the lower case to determine the dimensions for the upper case. Subtract 1 in. from the depth and 1⅞ in. from the width, providing space for a transitional molding. The molding helps keep the upper case in position. Next, subtract an additional ⅞ in. from the depth for the thickness of the face frame. Now cut half-blind dovetails to join the top, bottom and sides to create a box. After dry-fitting the dovetail joints, rout the dadoes that support the shelves. You'll have to disassemble the case to cut the dadoes that are close to the corners of the base.

The proximity of these dadoes to the corners requires use of the router table and a fence. I also use the router table to cut rabbets along the inside edge of each side, providing a recess for the back

Finish the job at the router table. *Once the cove has been cut, an inverted cutter trims the top profile in a single pass. A small lipped roundover finishes off the crown molding.*

Attach the molding. *While traditional period pieces were often face-nailed, Bird installs the crown molding using unseen screws set into elongated holes.*

boards. Finally, apply glue to the half-blind dovetails, assemble the case and check it for square.

While the glue sets, begin working on the face frame. Many antique secretaries feature a pair of candleslides in the bottom rail of the frame. These drawerlike shelves provided a place to set candlesticks for light while working. Although obviously not necessary today, the candleslides provide reverential detail to the desk. Make the openings for the slides using stop cuts on the tablesaw.

When milling the stock for the face frame, add an extra 1/16 in. to the width of each stile to allow the frame to overhang the case. After the face frame has been applied to the case, it is quick work to trim the stiles flush with a router.

Once the basic case has been assembled, slide in the ¾-in.-thick shelves from the back. The shelves that fit behind the upper and lower rails are glued to the rails. I embellished the front edge of the remaining shelves with a pair of beads, but a simple chamfer will also soften the hard edges. After the shelves are in position, slide the vertical partitions in place.

The drawers use typical construction: dovetail joinery and a bevel-edged bottom panel. Because they close flush, fit them with a sharp plane after assembly. A small block glued to the underside of the shelf works as a drawer stop.

Make the crown molding from solid stock, if possible

Although the crown molding can be built up of separate strips, solid stock is easier to apply to the case. Also, shaping a piece of solid stock avoids potential mismatched color and grain that can occur from built-up moldings.

To shape the crown molding, rip a length of rectangular stock diagonally on the bandsaw and then cut the large cove on the tablesaw. To avoid excessive scraping and sanding to remove saw marks, I shaped the cove with a special cutter available from CMT (part No. 800.523.11). This unique tool is part of a crown-molding set I designed that also includes inverted router bits for shaping the small thumbnail and ovolo that flank the cove.

After shaping, miter the front molding to length, then miter the returns. If necessary, fine-tune the joint by making minor adjustments to the angle of the miter on the returns. Although fitting the miter joint precisely may seem tedious, it's actually quite easy with a chopsaw outfitted with a fine-tooth miter blade. On many old desks, the moldings were simply face-nailed, but I prefer a cleaner look. The molding is fastened from the inside with screws. I drill elongated holes in the case sides for the screws at the returns. This method allows the case to contract independently of the molding. To keep the miters tight, apply glue to both members of the joint.

Both upper and lower cases use ½-in.-thick shiplapped back boards. The boards are simply nailed to the rabbets in the cases and back edges of shelves and dividers. I always install the back boards after the finishing process, because it makes it easier to apply finish to the inside of the case.

At this point, the case is not quite done, but you begin to see how the finished piece will look. All that's left is to install a gallery in the lower case and hang doors on the upper case. In subsequent issues, I'll discuss building galleries and tombstone doors using detailed examples that fit the secretary seen here. □

Lonnie Bird builds period furniture in Dandridge, Tenn., where he also conducts woodworking seminars.

Parts II and III

In the next two issues, Bird will tell you how to install the gallery and build the tombstone doors.

Lighting for the Workshop

Tips for figuring how many and what types of fluorescent lights you need to create a comfortable working environment

BY JACK L. LINDSEY

The owner of a small shop can seldom justify the services of a lighting design professional. So the task of lighting a shop is usually accomplished by putting up a few fixtures and, if that doesn't work, adding a few more. Sometimes this works, but learning some of the basics about lighting will produce better results faster and more economically in the long run. The most common mistakes are using the wrong type of lamp or fixture, installing too few fixtures and putting fixtures in the wrong locations.

The first step in lighting a shop is to de-

Photos, except where noted: Erika Marks; this page: William Duckworth

cide what strategy to use: To light the whole shop in a reasonably uniform manner or to concentrate light at machines and work areas.

For small shops, I recommend uniform lighting because it allows you the freedom to change the location of machines and workstations within the shop. It also means you can install fluorescent fixtures in continuous rows. This reduces the cost of electrical wiring by allowing you to run wires through the fixtures instead of installing a separate feed to each fixture. If you take this approach, wires are run within 3 in. of

FIXTURES

Two basic types of fluorescent fixtures, called strips or industrials, are commonly used for shop lighting. Strip fixtures are simply metal channels fitted with lamp holders and ballasts. For really tight spaces, you can use a low-profile strip fixture with lamps mounted on the sides of the fixture instead of the bottom. Industrial fixtures are equipped with a white metal reflector mounted above the lamps.

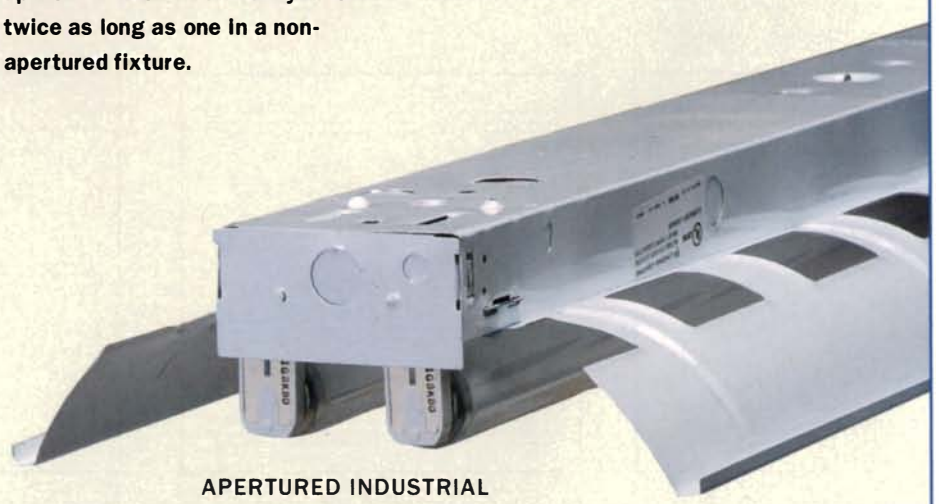
Strips should be used when fixtures are mounted directly to a finished ceiling that has been painted flat white. Industrials work better when the ceiling is not flat, not painted white or when fixtures must be suspended below the ceiling.

Industrial fixtures are available in two types—apertured and nonapertured. Apertured fixtures have a series of holes in the reflector that allow air to pass through, which helps keep lamp and fixture surfaces clean. Also, air circulation cools the ballast, thus extending its working lifetime. A ballast in an apertured fixture can easily last twice as long as one in a nonapertured fixture.

STANDARD STRIP

SIDE-MOUNT STRIP

NONAPERTURED INDUSTRIAL



APERTURED INDUSTRIAL

PLACEMENT

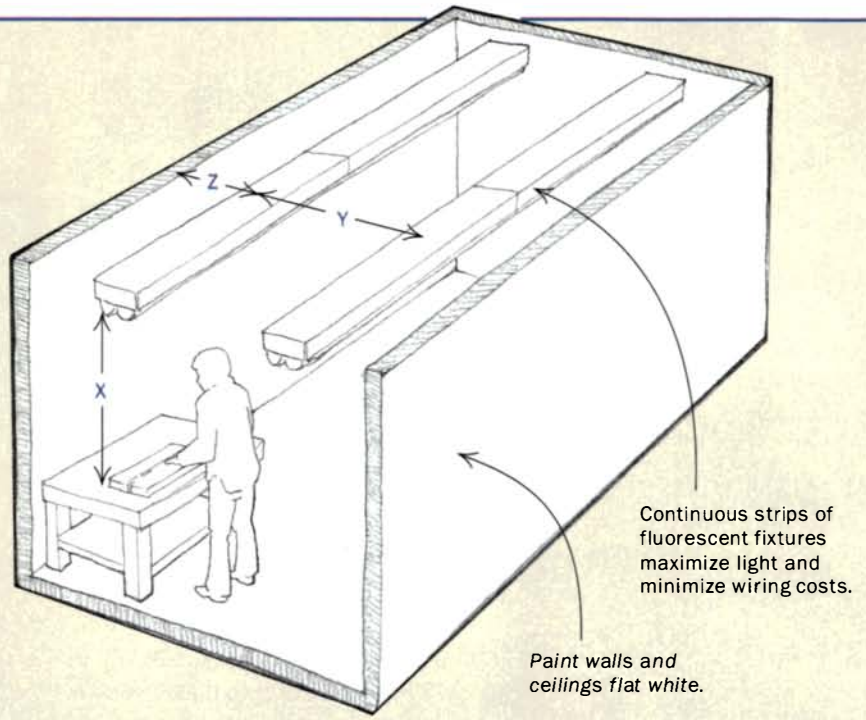
The older you are and the more detailed the work you do, the more light you need. Concentrated spot or task lighting works, but a uniformly lit space, like the one shown at right, will allow you more flexibility and improve your working environment.

Here are the steps for determining the placement of light fixtures:

1. Measure the distance between the light source and the horizontal work surface (X).

2. The distance between rows of fixtures (Y) should be a maximum of 1½ times the distance X.

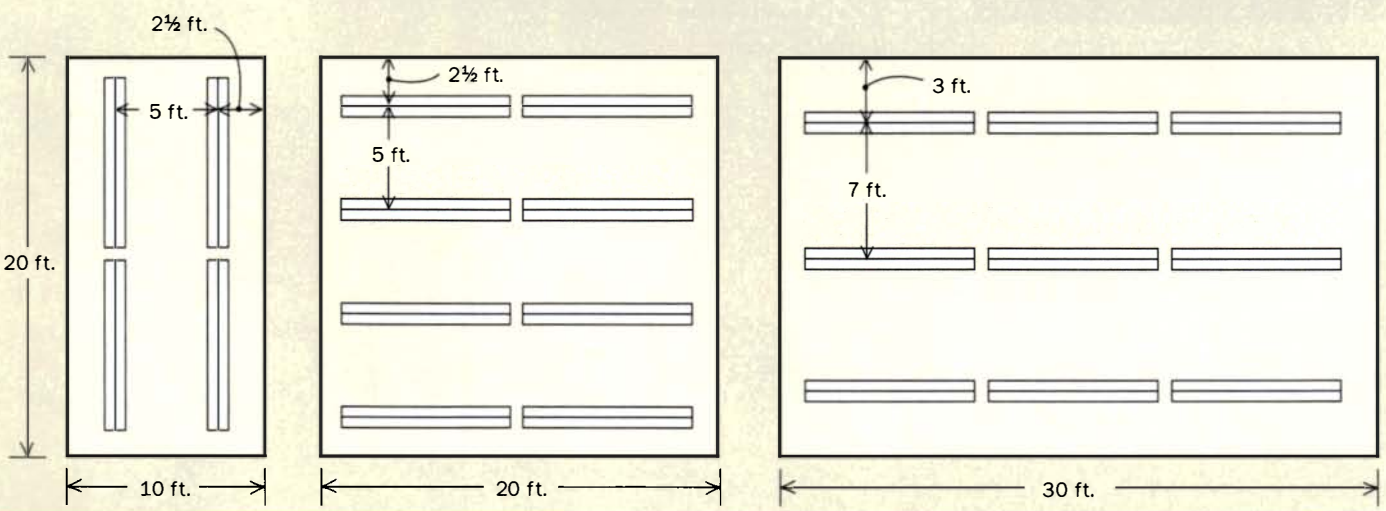
3. The distance between a wall and a row of fixtures (Z) should be approximately a third to half the distance Y.



CALCULATING HOW MANY YOU NEED

Here is a breakdown of how many two-lamp, 8-ft. fluorescent fixtures you will need to light a workshop uniformly to 100 fc of light. For 4-ft. fixtures, just double the numbers in the chart. Consult a qualified electrician to determine the size and number of circuits required to power your lighting needs.

ROOM SIZE	ENERGY SAVING 60 WATT	FULL WATTAGE 75 WATT	HIGH OUTPUT 110 WATT
10 ft. by 20 ft.	5	4	3
20 ft. by 20 ft.	8	7	5
20 ft. by 30 ft.	12	9	8
30 ft. by 30 ft.	17	13	11
30 ft. by 50 ft.	29	23	19



Drawings: Erika Marks

the ballast, so you must use wire that is rated for 90°C.

How many fixtures do you need?

How much light you need depends on the visual difficulty of the work you do and how well your eyes function. Eyesight deteriorates with age, so we need more light as we grow older. Lighting levels are described by a unit of measure called the footcandle (fc). A woodshop should be lit uniformly to a level of 50 fc to 100 fc. You can provide higher levels, if needed, with a separate fixture. Plan for 50 fc if the average worker is less than 40 years of age and doesn't do much work that is difficult to see, such as small, intricate shapes or dark colors. For workers who are more than 40 years of age or who do work that is difficult to see, plan for 100 fc.

As light leaves a fixture and travels to your workbench, it spreads out. You get higher lighting levels near the fixture, with those levels dropping rapidly as the distance from the fixture increases. Because of the diminishing levels of light, you need to limit the maximum spacing between fixtures to avoid dark spots. To figure the maximum spacing between fixtures, you need to know the type of fixtures and the horizontal plane in which visual tasks are performed—for most shops that means the top of the workbench, which is 2½ ft. to 3 ft. off the floor. If fixtures are mounted 10 ft. above the floor and the workbench height is 3 ft., the distance between the fixtures and the workbench is 7 ft.

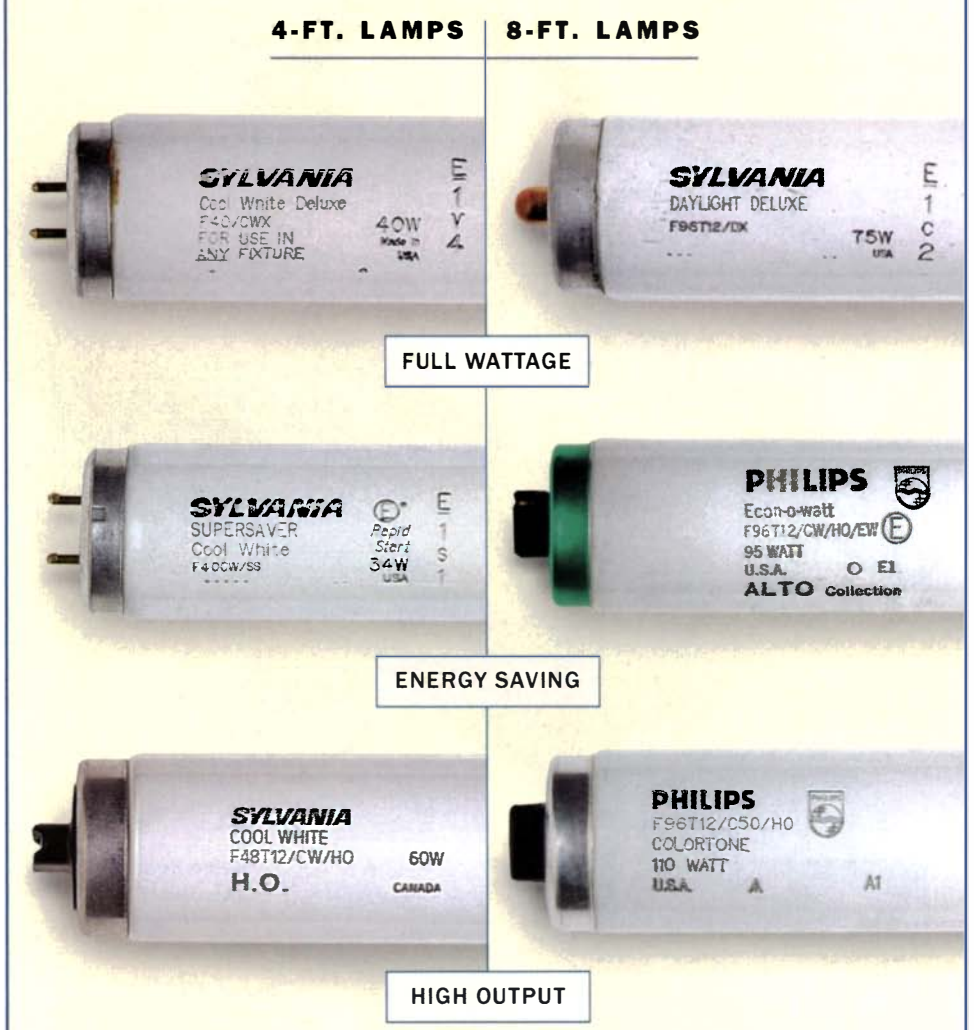
Typical strip fixtures should have a maximum spacing of 1.6 times that distance, or 11.2 ft. Industrial fixtures should not be spaced more than 1.5 times the distance, or 10.5 ft., for that workspace. Changing the fixture mounting height or the work-plane height will change the maximum spacing. Please note that this recommended spacing is not the optimum; it is the maximum. Closer spacing is usually required to achieve desired lighting levels. And remember, walls and ceilings should be painted with a flat white paint whenever possible to reflect light more uniformly around the shop.

Another general rule will help to avoid dark shadows where you least want them: The distance from the wall to a row of fixtures should be one-third to one-half the distance between rows of fixtures, because we often locate equipment and workbenches along walls. See the drawings and the chart on the facing page for more on determining how many fixtures you'll need for a workspace and where to put them. The calculated number of fixtures is seldom a perfect match to the layout of a space, so some juggling may be necessary to fit the fixtures into the room. Don't be afraid to look at alternate layouts before settling on a plan.

LAMPS

The variety of fluorescent lamps to choose from can make the uninitiated consumer dizzy. Full-wattage 8-ft. slimline lamps draw 75 watts, and the 4-ft. F40s consume 40 watts. Their energy-saving counterparts (labeled by manufacturers with such names as Watt-miser, Supersaver and Econ-o-watt) are rated at 60 watts and 34 watts, respectively. Full-wattage high-output 8-ft. lamps use 110 watts; the 4-ft. versions use 60 watts. To complicate matters more, T12 lamps come with three different styles of bases that must be fitted to matching fixtures.

Match the lamp base to the fixture. *Fluorescent lamps in all sizes come with a variety of bases to choose from (clockwise from the top): bi-pin, single pin and recessed double contact.*

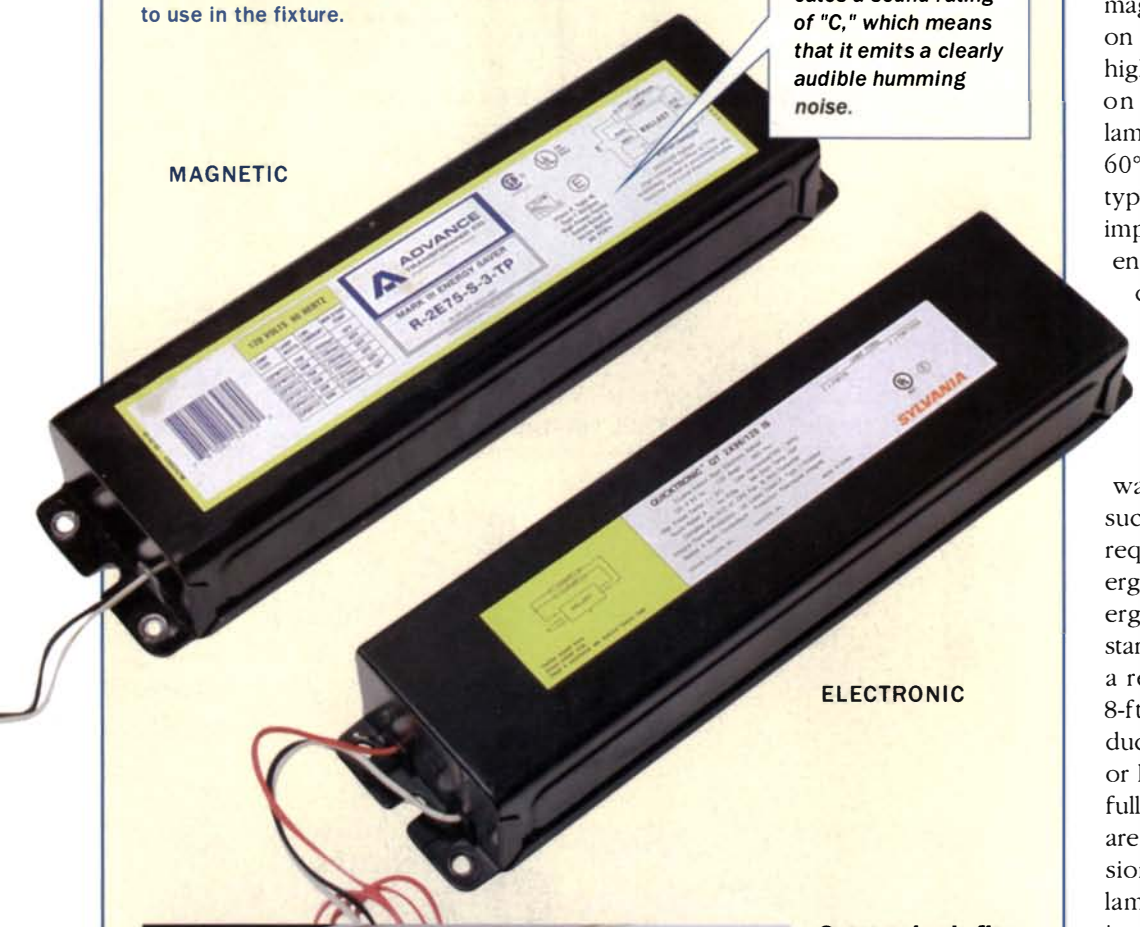


Shedding some light on lamps

Fluorescent lamps (shown above) are best for lighting small shops. The 8-ft. slimline lamp and the 4-ft. F40 are the most common. Both of these lamps are T12 lamps,

BALLASTS

When you buy a fluorescent light fixture, you're paying mostly for the ballast. Magnetic ballasts are less expensive and more common. With magnetic ballasts, you want to ask for a commercial-grade product. Electronic ballasts weigh less and cost about twice as much. All ballasts make noise—some more than others—and they're all rated on the label to indicate how much noise they make. An "A" rating is the quietest. Be certain the specifications on the ballasts match the size and number of the lamps you want to use in the fixture.



The label shown indicates a sound rating of "C," which means that it emits a clearly audible humming noise.

Some noise is fixable. *Most ballasts slip into a tab on one end and are fastened with a sheet-metal screw into the fixture on the other end. A loose fitting at either location can cause noisy vibrations. Bend the tab or tighten the screw to cure the problem.*

meaning the thickness is described in eighths of an inch: ⅛ in., or 1½ in. dia. High-output lamps can be used when higher lighting levels are desired. Smaller T8 (1 in. dia.) lamps are widely used for commercial and industrial lighting, but availability is largely limited to 4-ft. lamps.

Fluorescent lamps are sensitive to ambient temperature, especially when first turned on, and most lamps are produced in two versions—full wattage and energy saving. All full-wattage lamps start reliably at 50°F or higher when operated on standard magnetic ballasts, and 0°F when operated on low-temperature ballasts. Full-wattage high-output lamps will start as low as -20°F on standard ballasts. All energy-saving lamps are rated to start at temperatures of 60°F or higher regardless of the ballast type. Contrary to what the names seem to imply, full-wattage lamps are actually more energy efficient than their energy-saving counterparts, which save energy by burning less brightly, not by being more efficient. To understand why, a little history may help.

The National Energy Policy Act of 1992 banned the sale of low-cost, full-wattage lamps in most standard colors, such as cool white and warm white, and required that we buy more expensive energy-saving lamps. This was done as an energy-conservation measure, but it created starting problems in cold climate areas. As a result, full-wattage cool-white F40 and 8-ft. high-output lamps have been reintroduced in some areas of the country as cold or low-temperature lamps. Unfortunately, full-wattage cool-white 8-ft. slimline lamps are not available in cold-temperature versions. The only 8-ft. full-wattage slimline lamps available are the high-color rendering types exempted from the Energy Policy Act because of their superior color and premium prices. For example, energy-saving cool-white slimline lamps are available for less than $2 each in case quantities at discount stores such as Costco. Full-wattage, high-color rendering lamps are typically priced at $7 to $9 each.

In moderate climates, where temperatures at ceiling level are 60°F or higher, energy-saving lamps are preferred because they're cheaper. But if temperatures are normally lower than that, consider heating the shop before turning on the lights. Otherwise, you'll have to use the expensive full-wattage, high-color rendering

slimline lamps, cold-temperature high-output lamps or cold-temperature 4-ft. F40s. The drawback to 4-ft. lamps is that twice as many lamps and fixtures are required to light the space, which increases the labor required to install the system.

Lamps are rated for color—Fluorescent lamps come in many different colors and prices. Cool white is the most common and is usually the least expensive, and it has a fair color rendering. If you have to use full-wattage slimline lamps because of temperature constraints, consider the high-color rendering type. GE calls these lamps SP, Osram-Sylvania uses the Designer designation, and Philips calls them Ultralume. A numeric suffix describes the visual perception of the warmth or coolness of the lighted space: 3,000 is warm, 3,500 is neutral and 4,100 is cool. Full-wattage deluxe color lamps (such as Cool White Deluxe) are cheaper than high-color rendering lamps, but they are not the best choice for lighting a workshop because they're 25% to 33% less efficient.

If color matching is important in your work, you can buy special Chroma 50 lamps made specifically for this task. But because they are very expensive and less energy efficient, I would restrict their use to an area where color matching is done.

Weighing in on ballasts

Fluorescent lamps require a ballast to operate. The ballast provides the high voltage needed to start the lamp and the lower voltage required for normal operation. Ballasts are either magnetic or electronic, with magnetic being more common.

Let there be light where it's needed. *Even though Lindsey chose a uniformly lit approach for his own shop, he had to fill in some areas with task lighting.*

Magnetic ballasts used in fixtures designed for commercial and upper-end residential applications are commercial-grade, transformer types. Almost all 8-ft. fixtures employ this type of ballast. Many 4-ft. fixtures use commercial-grade ballasts, but others contain less expensive residential grades. The commercial versions drive lamps at about 95% of their rated light output. They also contain a capacitor to reduce the amount of current drawn by the ballast and can be identified by their larger size and the letters CBM (certified ballast manufacturer) inside a diamond shape on the label. Residential-grade ballasts produce lower light output, shorten lamp life and draw more current—all good reasons not to use them.

Some of the 4-ft. shop lights that sell for less than $10 at many retail outlets contain an inexpensive electronic ballast that does not meet the industry standards for commercial ballasts, meaning that lamp life and light output may suffer. But commercial-grade electronic ballasts regulate voltage and current quietly and efficiently, and they seldom produce audible noise.

Magnetic ballasts hum. The bigger the lamp, the more noise the ballast will make. Some hum more than others, and cold temperatures exacerbate the problem. All ballasts have a noise rating printed on the label—an A rating is the quietest. Although ballasts can be very noisy when they are started in a cold shop, they should be significantly quieter after they warm up. If you hear excessive noise from one or more fixtures, the cause may be a loose mechanical connection between the ballast and the fixture. Most ballasts are installed with one end slipped into mounting tabs and a screw securing the other end. Make sure the tabs and the screw are tight; if not, tighten the connection. If you still find that one ballast is much noisier than the others, replace it. And if the low-level hum that is typical of fluorescent fixtures in a normal operating mode annoys you, consider masking the noise with a fan, a dust filter or a radio. □

Jack Lindsey retired to the mountains of Oregon in 1996 after a long career as an engineer for the Southern California Edison Co. specializing in commercial and industrial lighting.

Clean lights are more efficient

A little routine maintenance goes a long way toward maximizing the performance of your lighting system. Fixtures and lamps collect dirt and dust, even in the cleanest of shops. A good dust collector and a ceiling-mounted dust filter can't capture all of the dust from woodworking equipment. Dust and dirt on lamps and fixtures can reduce light output by 10% or more during the first year, with additional losses of 5% or more each year after that. You should clean fixtures and lamps at least once a year to recover this loss. First turn off the power to the fixture. Then remove the lamps, and wash both the lamps and the fixture with a mild solution of water and dishwashing detergent. Rinse with a damp cloth, and dry the surfaces with another clean cloth, or let them air-dry before turning on the power again.

Clean lamps shine brighter. *Dust reduces the light output of fluorescent lamps. Clean them at least annually with a damp cloth and dishwashing detergent.*

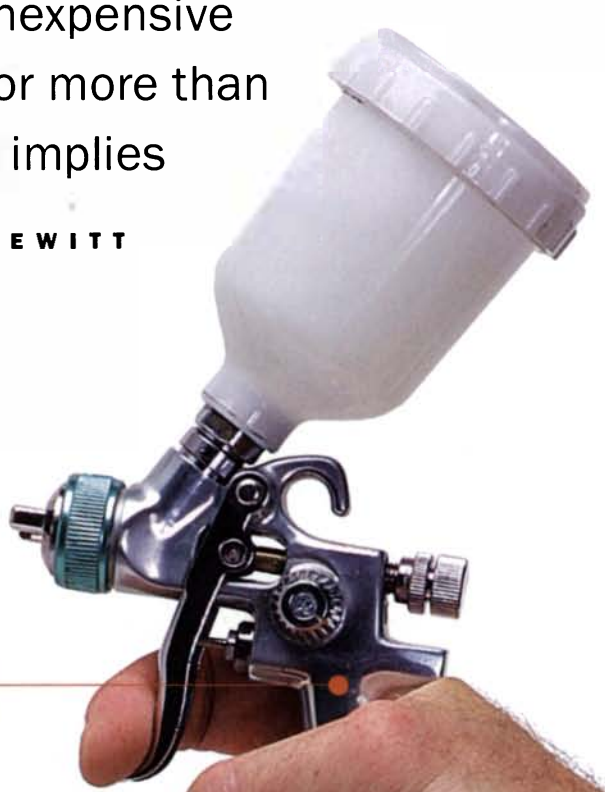
Photos, this page: William Duckworth

Touch-up

These small, inexpensive guns are good for more than their name implies

BY JEFF JEWITT

SIPHON-FEED GUN



GRAVITY-FEED GUN

Several choices, two basic styles

Touch-up guns are basically smaller versions of regular spray guns, but they're really available in only two styles: a siphon-feed, overhead trigger design (above left) and a gravity-feed version (above right). Both styles are available in either conventional air-driven or high-volume, low-pressure (HVLP) designs, with the HVLP models priced a bit higher.

The most expensive siphon-feed HVLP touch-up gun costs about $200, but you can get a conventional air-driven, Taiwanese-made, overhead trigger gun for less than $50. With the gravity-feed models, you can expect about the same price range. However, some of the gravity-feed models are available with adapters for airbrush bottles, which increase the versatility of these guns, particularly for touch-up work.

Touch-up guns can be a valuable asset to small shops. For one, they usually require only 4 to 5 cu. ft. of air per minute, which is a fairly small air demand that is within the range of almost any compressor. Also, the smaller size of touch-up guns makes them easy to maneuver in tight spaces and while putting a finish on small items. This is a real asset when you have to apply stain or a finish inside small cabinets.

They're smaller and less expensive. *The standard 1-qt. cup HVLP spray gun at left sells for about $170, while the small HVLP touch-up gun on the right holds about ½ pint of finish material and sells for $80.*

Spray Guns

Some woodworkers are addicted to power tools and collect routers. Others prefer hand tools and may have hundreds of planes or chisels. I have to confess an addiction to spray guns—I love them. At one time I counted more than 15 in my collection, and after selling half of them last year, the collection has grown into the double digits again. Out of all my spray guns, the one I reach for most often is a touch-up gun.

The touch-up gun is capable of jobs other than what the name implies. I routinely use these little gems for applying finishes to smaller projects, spraying stains, shading and toning finishes and, of course, touching up finishes that need minor repairs. And because some of these guns are dirt cheap, I don't care whether I muck up one of them by inadvertently leaving something in the gun that I shouldn't, such as milk paint or catalyzed lacquer.

I often apply stains in more than one layer. My favorite first (or ground) stain color is a water-soluble dye stain. And I've found that there is no better applicator than a touch-up gun, particularly on large pieces where brushing on a dye stain can cause lap marks (see the top photo at right). For a simple dye stain, atomization isn't critical, so I just use the gun to wet down the wood with a dye and then blot up the excess. For intricate inside areas, I can easily adjust the angle of the fan so I hit the corners first. I also cut back on the amount of air, so the vortex of the spray pattern doesn't prevent the dye from getting into tight corners.

Coloring sapwood to match heartwood is a snap with a touch-up gun. You can cut back on both the fan pattern and the amount of fluid to lay down a subtle line of color to match the sapwood to the heartwood. When I do this, I usually start by wetting down the whole area with solvent for the stain that I'm using—alcohol, water or mineral spirits—to get a better idea of the color I need to use.

Shading and toning are typically done after the base stain colors have been applied. My favorite toner is made by adding dye to a finish, creating a translucent effect. It can be used for the overall application of color (toning) or a more selective application (shading). Most standard-size guns and touch-up guns can be adjusted for the fairly wide fan pattern you need to apply a toner, but shading is definitely best done with a touch-up gun. If you want to shade an edge molding darker, or add a bit of dark color around the perimeter of a drawer or a tabletop, the touch-up gun is your best finishing tool (see the middle photo at right).

It's rare that I ever finish a piece of furniture without encountering some sort of problem, and one of the most common is rubbing through the finish and the stain when the job is nearly completed. If you have a gravity-feed gun with an airbrush attachment, you can literally "draw" some color or patch the finish on a particular problem area. If you don't have this attachment for your regular spray gun, the small spray pattern of a touch-up gun allows you to feather in finish or color so that it blends in invisibly.

When I do this, I take a piece of cardboard that's larger than the affected area by several inches on all sides and put a slit down the middle by raising my tablesaw blade up into it (see the bottom photo at right). This mask is taped or held over the spot that has been rubbed through, and then I use my touch-up gun to apply the missing stain. I let it dry, then apply some clear finish. But before that dries, I lift up the mask and gently spray several coats of clear finish in the correct sheen with the gun set for a small pattern. After the repaired finish is completely dry, I can blend or feather-in the finish as necessary with 0000 steel wool. □

Jeff Jewitt is a frequent contributor to Fine Woodworking *on finish-related topics.*

APPLYING STAINS

With a touch-up gun you can apply stains fast and evenly. Here, Jewitt uses the gravity-feed touch-up gun with a plastic cup to spray a water-based dye stain on an oak bookcase.

SHADING AND TONING

Before spraying a shading finish tinted with color, use a scrap of cardboard to set the size of your spray pattern.

TOUCHING UP

A mask makes a cleaner touch-up repair. A piece of posterboard with a sawkerf cut through it limits the amount of stain and finish applied to an edge on which the color has been rubbed through and removed.

Photos: Erika Marks (facing page); William Duckworth (this page)

Lumberyard Sleuth

Telltale signs to match and find wood that all came from one tree

BY CLIFF SCOTT

SAWMILL MARKS

A cut in common. *An error at the sawmill marks these two boards of curly maple as likely to have come from the same tree.*

Re-creating the tree. *Once you have found several matching boards, the end grain can sometimes reveal their original order in the log.*

In my early days at woodworking, I'd buy the board feet of lumber I needed for a project, build the piece and be on my way. As my knowledge of woodworking increased and my artistic side developed, I became more particular about which boards were placed together. Return trips to the lumberyard were frequently needed after planing the roughsawn lumber and finding that the color and grain didn't match. This caused a considerable waste of time and lumber.

I discovered the joy of making furniture with wood from a single log after I purchased some cherry from an individual who had cut down a tree on his property. This wood was completely uniform in color. It was easy to match boards for the drawer fronts, sides and top. Now I aim to use lumber from the same tree for every project.

Finding entire logs to saw up, however, isn't always a realistic option. Buying a whole tree is a large initial outlay, and air-drying lumber takes considerable time, assuming you have the space required. Fortunately, there are ways to find boards from the same tree at your local lumberyard. All it takes is a bit of patience and knowing what clues to look for.

The four key clues

When identifying boards that may come from the same tree, I look for four things: significant natural marks in the wood, marks made at the sawmill, grain pattern and color.

Distinguishing marks—When you stand boards on end next to each other, significant marks, such as knots, splits or dark streaks, usually stand out. Notice the width of the boards. Check whether the end is cut at an uneven angle. When boards have a combination of heartwood and sapwood, look for similar growth patterns.

An obvious large knot may pass through three or more boards, making them easy to match, while a small knot may show up on only one side of a board. Don't assume that the boards don't go together just because one has a knot and the other doesn't. Turn the boards around and upside down until you are sure there is no match, then set them aside.

Grain pattern—You can identify matching boards by looking at how the grain swirls or runs at a particular angle, and if it is excessively tight or loosely figured. Notice whether the grain is flatsawn or quartersawn. Once you have narrowed your selection, checking the end grain for growth rings can sometimes show in what order the boards were cut. One trick for finding curly grain is to

GRAIN PATTERN

Matching grain. *The "corrugations" of these boards are similar, clues that they may have come from a common log of curly maple.*

DISTINGUISHING MARKS

Blemishes can be a blessing. *Use these clues to identify boards that come from a single log.*

Check both sides of a board. *Because small knots may not pass through a board, check both sides when looking for distinguishing marks.*

PAINTED ENDS

Don't overlook the ends. *Boards with matching paint over the end grain probably came from the same sawmill. However, it's not a guarantee that the boards came from the same tree.*

Photos, except where noted: Mark Schofield; facing page (right): Kelly J. Dunton

HOW WOOD GETS SHUFFLED AT A SAWMILL

In a large-scale sawmill, logs go through five or six different processes before the lumber is bundled together. After the log has been sliced into planks, the bandsaw edger trims the rough outer edge. Then the planks travel to the trimmer saw, where a worker determines what defects need to be cut away. To eliminate flaws, boards may be split into narrower widths to create a higher grade of lumber, thus bringing a higher price per board foot. From there the lumber is sorted by species, length and width before being stacked in the kiln. Once dried, each board is inspected for grading, then boards are bundled and shipped by rail, truck or container to their destination. The likelihood of lumber from a whole tree remaining together throughout this process is very slim, but you may find a few matching boards.

One log among many. *After being debarked, logs from the same species are run through the sawmill, where the operator determines the thickness of the boards.*

Planks from one tree go their separate ways. *After being cut to length, the boards are stacked based on their length and thickness, then sent off to be kiln-dried. Even in this small sawmill, it is rare for all of the boards from a tree to end up in a single stack.*

shine a light diagonally down the edge of a board, which reveals the corrugated effect.

Sawmill marks—Sometimes an errant sawkerf can mark several boards, revealing their common ancestry. The color of the paint used to seal the ends of the boards can also indicate boards that came from one tree, or at least the same sawmill.

Color—The color in any given species can differ dramatically from tree to tree. This color variation can be a big clue in your search for wood from a single tree. If necessary, use a block plane to shave away a layer to reveal the color of clean-cut wood.

The color variations are caused by the chemical makeup of the soil, the weather, pollutants or insects. Trees growing on a hill will have a different color than those living along a creek bank. Cherry from Vermont looks different from cherry from New York or Ohio. Even trees grown a mere 100 yd. apart may not match in color.

Besides color variation caused by different growth patterns or conditions, color differentiations can occur among the variety of trees within a specific type of wood. There are 42 different species of red oak, any of which can be mixed in one lumber bin. The color varies from gray to a yellowish tan to pinkish beige. Wood sold as poplar can come from either the tulip or the cucumber tree, while a bundle of hickory can contain wood from four different pecan trees or four true hickories.

The lumberyard owner can help

The owner of my local lumberyard told me the yard orders from 15 to 20 sawmills, depending on which one can supply the species they need at any particular time. The best time to look for single-tree lumber is when the boards are all from one bundle or lot shipment. My supplier knows I look for matched grain. When I let him know I need a specific type of wood, he calls me the next time he receives a shipment. Sometimes I may find only two or three boards that match; other times I can re-create the entire log.

Ask your supplier when the next delivery day is. Depending on how large or small the lumberyard is, and how fast they make the wood accessible, you might want to show up on the day of delivery or several days after. By the way, when you're finished searching, don't forget to neatly restack the lumber you don't buy. □

Cliff Scott is the owner of Carriage House Woodworks in Olean, N.Y.

Photos, facing page: Cliff Scott (top, middle); Michael Pekovich (bottom)

Make the best use of your lumber from one tree

Using lumber from the same tree allows you to make pieces that enjoy a harmonious grain pattern. Book-matching can be used for doors or a series of drawers. On a box-shaped project, such as a cedar chest, cut the boards and orient them so that the grain runs from one side, across the front and to the other side. In a similar manner, if I have a tall project, such as an entertainment center or a cabinet, I cut the lumber so that the vertical grain on both sides of the corner comes from one board. This allows the grain, especially if it has some wave to it, to swirl around the corner.

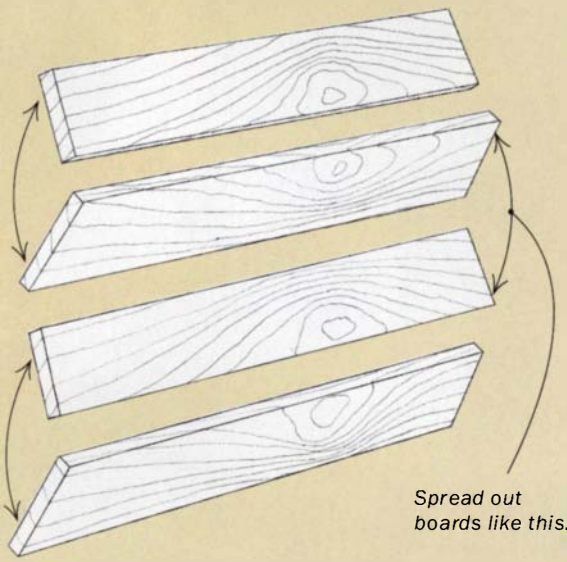
While a piece of furniture with unmatched boards stands out for the wrong reasons, the use of a continuous or matching grain pattern from a single tree is a subtle technique that doesn't readily jump out when you view a piece of furniture. Yet it adds a certain refinement to the overall look of your work.

CONSISTENT COLOR

Finding consecutive boards of curly maple at his local lumberyard allowed Scott to match the wood's color and curl in this table.

BOOK-MATCHING

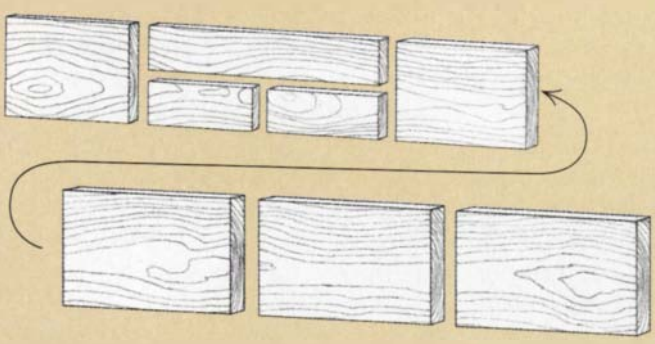
Scott made this chest of drawers with wood from a single log of walnut. All of the drawer fronts are book-matched.



Spread out boards like this.

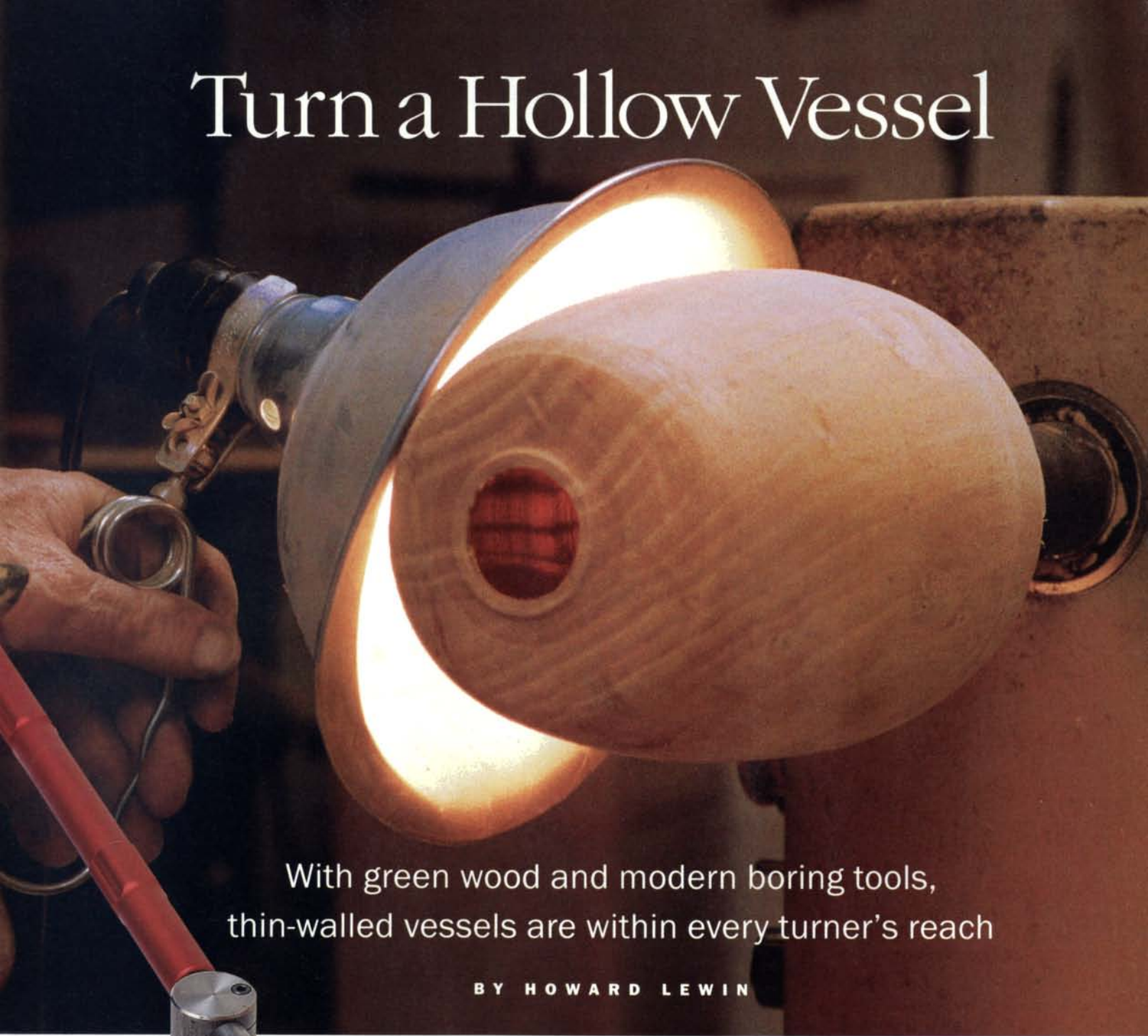
LONG BOARDS, MANY CUTS

In this piece by Michael Pekovich, sequential boards of cherry form the drawer fronts. The drawer fronts in the gallery box and the top of the chest are from one board.



Drawings: Kelly J. Dunton

Turn a Hollow Vessel



With green wood and modern boring tools, thin-walled vessels are within every turner's reach

BY HOWARD LEWIN

High-tech hollowing tool. *Lewin uses a boring bar, which has a counterweight and a double-articulating tip that keeps the cutting edge on the centerline of the tool. It is designed to prevent violent catches, the biggest problem in hollowing.*

During the past few decades there has been a revolution in woodturning tools, from lathes and chucks to gouges and boring bars. As a result, what once was deemed difficult or even impossible to turn has become commonplace.

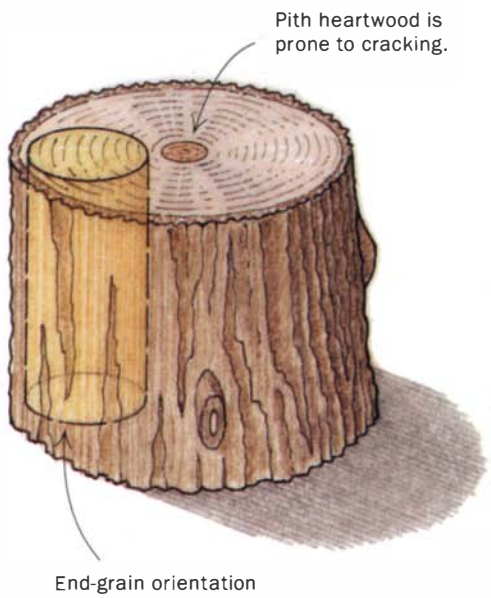
In the area of hollow-vessel turning, two innovators stand out. The first is David Ellsworth, who in the 1970s began turning vessels with small openings. His first tools were scrapers he had bent with a welding torch. Later he developed longer-handled tools with swivel tips that held machinist's tool bits. These offered more control and safety and could produce a wider variety of enclosed-vessel forms. Jerry Glaser, an aerospace engineer and hobbyist wood turner, took the ball from there, working to reduce the long tool's tendency to catch and jerk downward. He came up with a double-articulating tip that swivels to place the cutting edge at the tool's centerline. Other variations continue to emerge, making new vessel forms possible.

I use a Glaser-designed boring bar for my hollow-vessel work. The tool is available

Photos, except where noted: Asa Christiana

A SHAPE EMERGES

Orienting the blank with the grain, not across it, makes the green-wood vessel more stable during the drying process. Avoid the unstable center of the log for the same reason.



Don't fight the grain. *With the grain running parallel to the bed of the lathe, all cuts should be made from high areas to low areas. The blank is mounted on a faceplate, with the tailstock (and a live center) engaged to steady the blank.*

BOWL GOUGE

An extreme fingernail grind gets the corners out of the way. The gouge can be angled sharply in each direction to make planing cuts on convex and concave surfaces.

The last pass is a planing cut. *Turn the gouge and rest the bevel against the workpiece. For a smooth cut, gently pivot the tool until it begins cutting, and keep the bevel in contact with the stock.*

from The Woodturners Catalog (800-551-8876) for $150. The bar is filled with buckshot to dampen vibration. The tip is double-articulated, and a large counterweight attached to the bar reduces the impact of catches, which can be murder on the wrists. This tool's innovative design makes cutting into end grain much less daunting. The other key to success is using green wood.

Aside from the joy and ease of turning wet wood—ribbons just stream off the workpiece, even in end grain—I also like the subtle way green wood moves and dries. Many turners avoid green wood because of its tendency to crack as it dries. However, as I explained in an article on green-wood bowls (*FWW* #147, pp. 48-53), the drying process is easily controlled, reducing the likelihood of checking. The first key is to keep the vessel walls thin and uniform, which not only allow the walls to flex but also equalize drying stresses. The second is to wrap the freshly turned vessel in brown paper bags to slow the release of moisture. Following these guidelines, I seldom see checks or cracks.

Shape the outside first

Turn the outside of this piece just as you would the outside of any green-wood vessel. Start by locating the blank in a log and chainsawing it free. Remember, in this end-grain vessel, the grain runs straight through the piece from top to bottom (see the drawing above). You can choose a face-grain blank with the grain running from side to side through the piece, but the end-grain orientation is a bit more stable during the hollowing and drying processes.

Rough out the general shape on the bandsaw, cutting the bottom of the blank as flat as possible for a good mounting surface. Attach the faceplate with at least six or eight #8 by 1½-in. coarse-threaded drywall screws. After mounting the long blank on the lathe, put a live center in the tailstock and tighten it against the far end.

It helps immensely to have a variable-speed lathe, because a large blank must revolve slowly at first to create an appropriate cutting speed at the outer edges. Then, as the workpiece gets smaller, the lathe speed can be increased slowly to create the same ideal cutting speed at the perimeter. However, if you have a finite number of speeds to choose from, err on

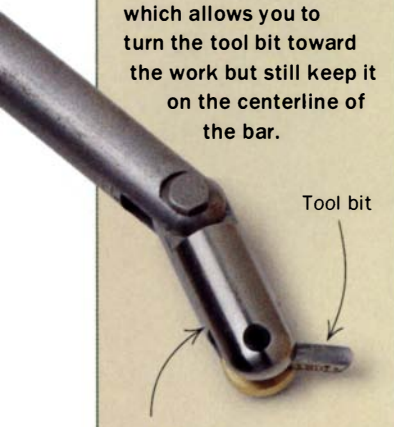
Photos, this page (bottom right) and facing page (bottom left): Kelly J. Dunton

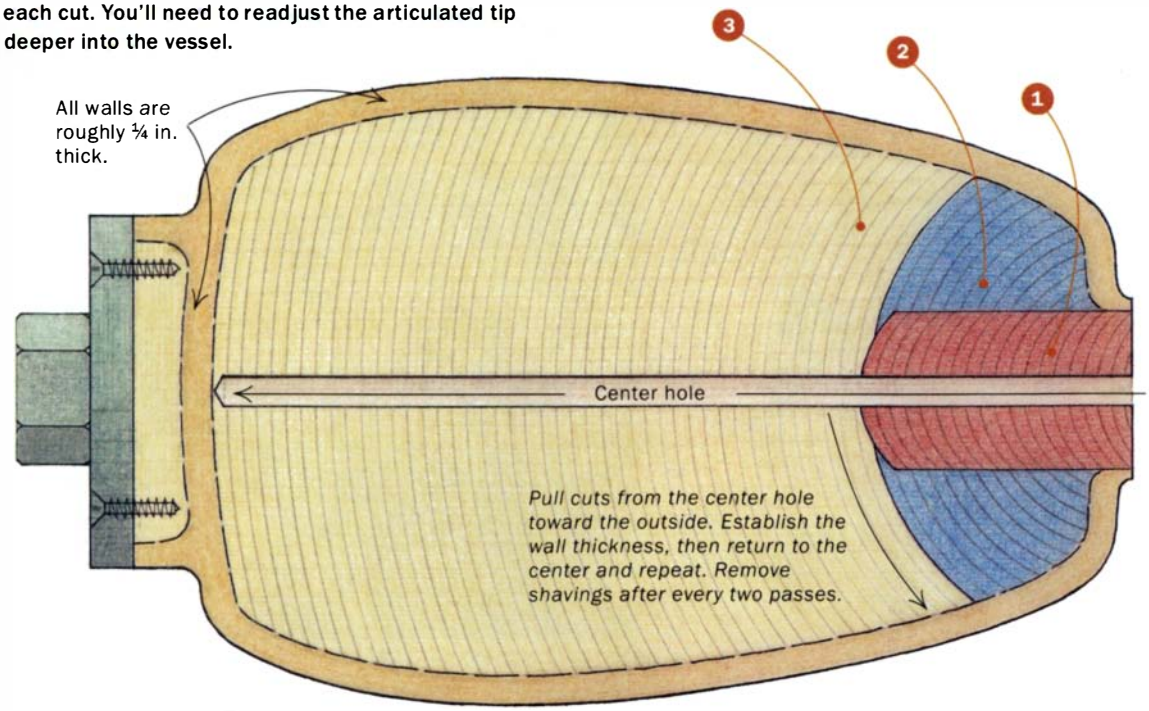
HOLLOWING, STEP BY STEP

After drilling an entrance hole, plunge the boring bar from the center out to the inner wall of the vessel to make each cut. You'll need to readjust the articulated tip of the tool as you work your way deeper into the vessel.

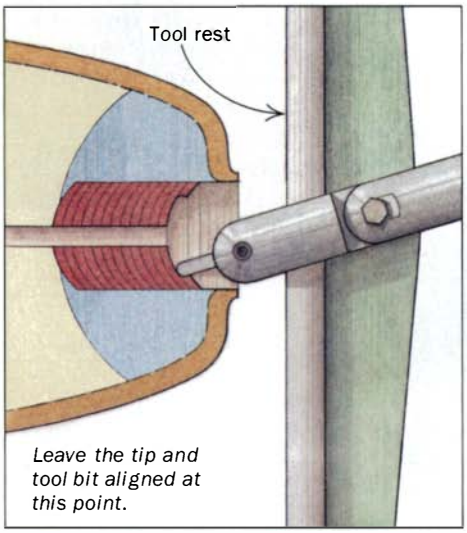
DOUBLE SWIVEL

The boring bar has a double-articulating tip, which allows you to turn the tool bit toward the work but still keep it on the centerline of the bar.

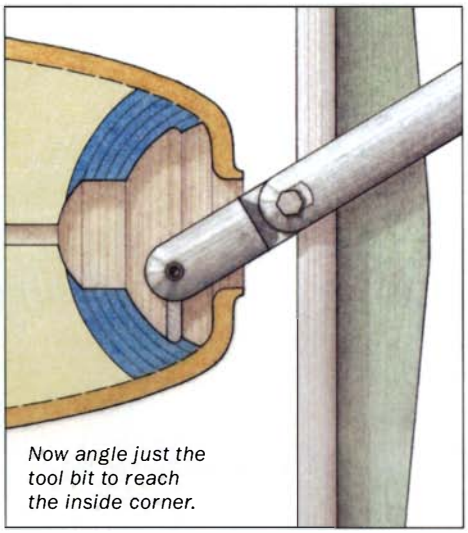




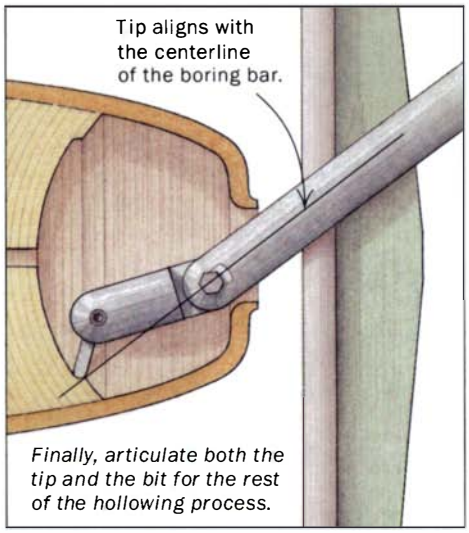
1 MAKE SOME ROOM TO WORK



2 REACH AROUND THE CORNER



3 COMPLETE THE HOLLOWING



the side of caution. It's better to take a little more time than risk a flying workpiece.

I turn the outside using a long, hefty bowl gouge developed by Glaser, which is available from The Woodturners Catalog for $95 to $170, depending on the size. The tool, which features A-11 tool steel, a deep flute and an extreme fingernail profile on the tip, makes the task go quickly and smoothly (see the photos on p. 69). With the grain running parallel to the bed of the lathe, all cutting on the outside should be done downhill—as if it were a spindle turning. In other words, cut from the largest diameter toward the narrowest areas. The last pass, a light planing cut with the gouge riding its bevel, leaves a smooth surface.

I like to turn a shallow foot at the bottom of my vessels, roughly one-third of the vessel's diameter and long enough to contain the screw holes. Later, after hollowing the inside of the vessel, I'll hollow the foot as well, which will remove the screw holes and keep the walls of the vessel roughly ¼ in. thick for successful drying.

Watch it on the web

To see a video clip of Howard Lewin hollowing a vessel like this one, go to finewoodworking.com.

Hollow out the inside

After sliding the tailstock out of the way, drill a hole to establish the depth of the cavity and to give the boring bar a place to start. You can put the bit in a drill chuck and hold the chuck in your hands to drill the hole. Just support the bit on a tool rest

Drawings: Vince Babak; photo, this page: Kelly J. Dunton

Drill a deep hole to establish the final depth. *Lewin uses a long drill in a handheld chuck, supporting the bit on a tool rest. He pauses every 1 in. or so to clear chips, and he checks the depth frequently near the bottom.*

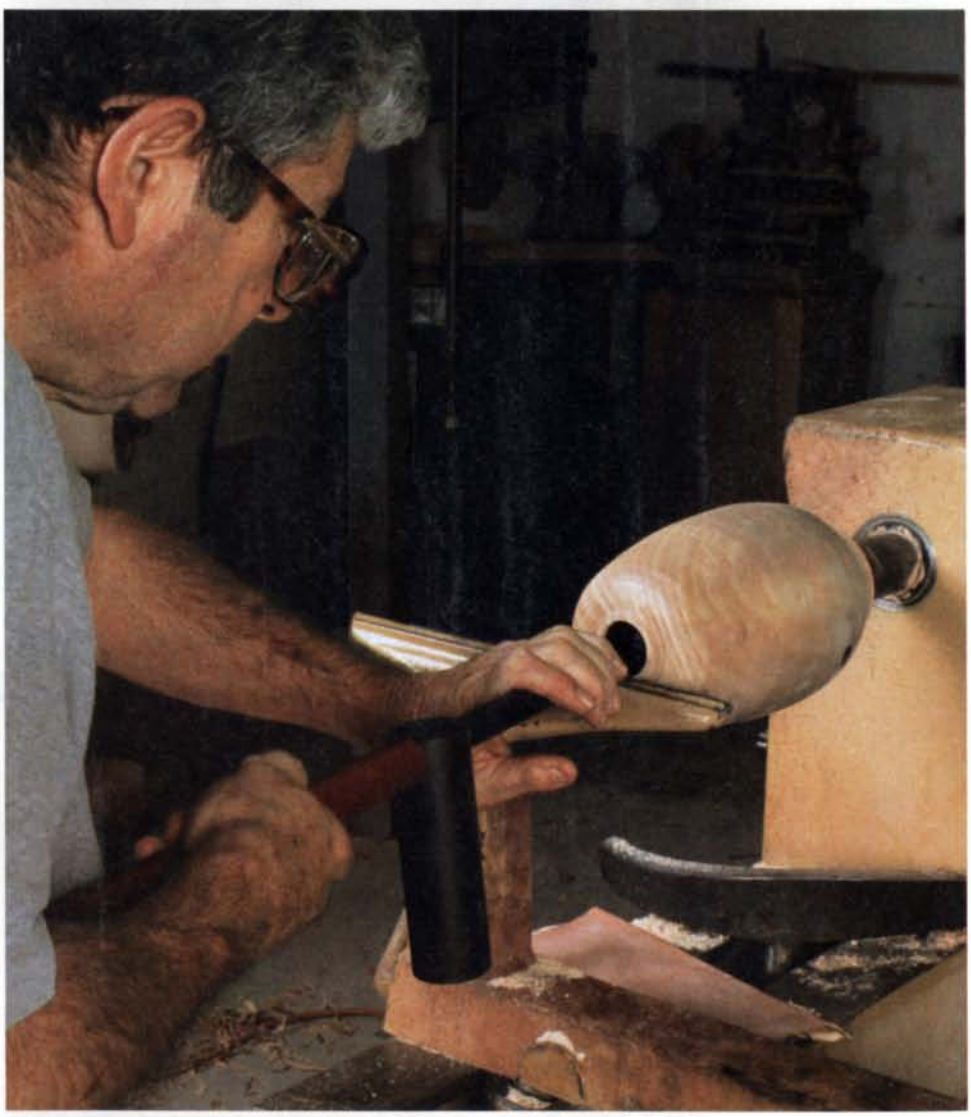
Open the entrance. *This is done with the articulating tip of a boring bar set in a straight position.*

as you feed it into the center of the stock. As the hole nears its final depth, check it frequently against the overall height of the vessel. Be sure to figure in the height of the foot and thickness of the bottom wall.

The 3/16-in.-square tool bit on the Glaser boring bar can either scrape the wood or slice it, depending on the angle at which it's held. Scraping is not usually feasible with green wood, but this small bit resists catches, which happen when the tool gets stuck in the wood, often drawing it in more deeply and damaging the workpiece. The angle I favor for hollowing is halfway between the two—sort of a peel. The mass of the boring bar and counterweight keep it steady. The tool bit is cobalt high-speed steel and will hold an edge for a long time.

After the hole has been drilled, set the double-articulated tip of the boring bar in a straight line (see the drawings on the facing page) and begin to widen the opening to give yourself enough room to work. Then articulate the end into the hook shape to reach around the inside corner. As soon as possible, realign the tip of the tool bit with the centerline of the bar to reduce the torque on your wrists.

The diameter of the entrance hole is an important design consideration. Many turners try to keep this opening very small to demonstrate their skills and to confound collectors. I don't go to those extremes, but I like to keep the hole small enough to be pleasing to the eye and keep probing fin-



Then swivel the tip and begin hollowing. *All cuts in this end-grain vessel start at the center hole and are pulled toward the inner wall of the vessel.*

FINISH THE FOOT

Reverse-mount the vessel to hollow the foot. *Use a jam chuck (left) and a cup center (right). The cup center is less likely to split the bottom of the vessel than a live center.*

Use a thin gouge to work around the center. *Hollowing the foot removes the screw holes and leaves the walls and bottom the same thickness as the rest of the vessel, which is important to the drying process.*

gers and eyes from the interior. That way I don't have to attempt to sand the inside.

Cut from the center out—The order and direction of the cuts when hollowing is the same for any end-grain vessel, open or closed; it's just a little more painstaking and time-consuming with the boring bar and the small tool bit than it is with a bowl gouge. Each cut starts at the center and is pulled toward the inner wall of the vessel. Green wood is especially pliable, so once a thin wall has been established, it becomes too floppy to return to later. So work toward the wall, establish the right thickness and then move back to the center of the hollowed area to begin another cut. Don't attempt to take a little off an area that you turned five passes earlier. There won't be enough material nearby to support the cut, and you will risk stressing and breaking the wall. I use long calipers after each cut to check the wall thickness. I also periodically hold a portable lamp against the outside of the vessel and examine the light getting through, which highlights any inconsistencies in thickness.

You must remove shavings from the inside as you go. Centrifugal force will plaster them against the side of the vessel, making the surface very difficult to penetrate. Trying to force the tool through this layer generally ends in disaster because the tool catches and goes through the side. I stop the lathe every two passes and use compressed air and a shop vacuum to clean out the vessel.

When you reach the bottom of the drilled hole, the hollowing is done. Check the bottom thickness with the lamp just as you did the sides.

Leave the vessel on the faceplate for about a day to let the surface moisture flash off, then remount it on the lathe and sand the outside.

Hollow the foot and dry the vessel

Last, remove the vessel from the faceplate, mount it in the reverse position and hollow out the foot, so all the walls are the same thickness. The reverse position is achieved with a jam chuck and a live center with a cup-shaped tip. The cup center is much less likely to split the bottom than a pointed center.

I do this hollowing with a thin bowl gouge, which allows me to work around the live center. The small tenon left connecting the vessel to the center can be knocked off later with a sharp chisel.

Now the vessel is ready for final drying. With three or four paper bags wrapped around it and curled shut, the vessel should be able to relieve its own stresses as it slowly releases moisture. Be ready for some subtle warps or bulges as the vessel goes from wet to dry. I think of these mysterious changes as the character of the tree revealing itself.

When the bags feel dry to the touch—usually after five to 10 days—the piece is dry. Give it a fine sanding by hand and seal it with your finish of choice. □

Howard Lewin is a woodworking instructor and custom woodworker in Los Angeles.

The finished piece. *One last sanding after it's dry, a few coats of lacquer, and the vessel is ready for display.*

Shopmade Tenoning Jig

Micro-adjustment feature adds ease and accuracy

BY BRAD SCHILLING

The mortise and tenon is one of the most common woodworking joints. So a good tablesaw tenoning jig is a valuable tool for the shop. But top-quality, commercially made jigs don't come cheap. When I was faced with cutting a bunch of tenons, I decided to build a jig that included all of the features found in a top-of-the-line model.

The jig has a tall fence to support the workpiece. And a heavy-duty hold-down keeps the stock securely in place. To minimize tearout, a narrow piece of scrap stock can be temporarily clamped in front of the workpiece. The jig slides smoothly along the table of the saw without side-to-side play. And a threaded rod with a crank allows easy and accurate adjustment of the workpiece relative to the blade.

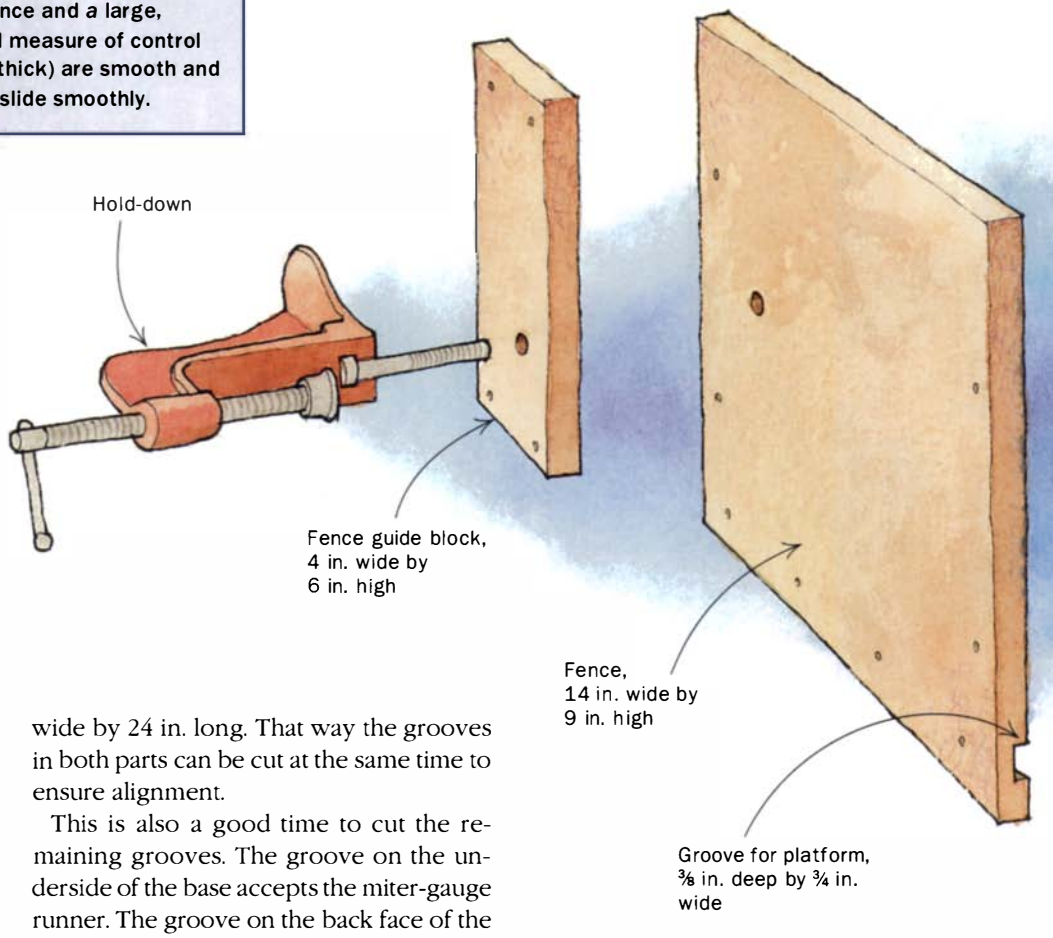
Once I worked out the design and bought the parts (see Sources on p. 75), I put together the jig in only a few hours. My total cash outlay for everything was about $40, inexpensive compared with a store-bought jig with the same features.

The jig is made of ¾-in.-thick medium-density fiberboard (MDF), a smooth material that tends to stay flat and is reasonably inexpensive. Keep in mind that the jig is sized for my Delta Unisaw. However, it can

Photos: Tom Begnal

TABLESAW TENONING JIG

With a heavy-duty hold-down, an extra-tall fence and a large, stable base, the tenoning jig provides a good measure of control and safety during a cut. MDF parts (all ¾ in. thick) are smooth and stay flat. Runners made from UHMW plastic slide smoothly.



fit almost any saw simply by adjusting the length of the base as needed.

One more point before starting. Most of the parts of this jig are cut on the tablesaw. That means the saw must be cutting accurately. If it isn't, the jig won't have the built-in precision that's needed to make perfect cuts. So, before you get going, make sure the blade and rip fence are parallel to the miter-gauge slot and that the blade is square to the table.

Rip the runners first

When the jig is in use, it's guided by an ultrahigh molecular weight (UHMW) plastic runner (see Sources) that travels along the saw's miter-gauge slot and fits in a groove in the jig's base. Cut the runner for a snug sliding fit in the slot. If the runner doesn't fit snugly, it can shift as it slides. While you're at it, cut the two plastic runners that mount to the platform. By the way, any good combination blade will produce a smooth cut in UHMW plastic.

Cut the MDF parts

With the runners cut, you can start working on the MDF base and platform. Because these two parts have a pair of parallel grooves that need to align when the jig is assembled, cut both parts from an oversized blank—a single piece of MDF, 14 in. wide by 24 in. long. That way the grooves in both parts can be cut at the same time to ensure alignment.

This is also a good time to cut the remaining grooves. The groove on the underside of the base accepts the miter-gauge runner. The groove on the back face of the fence accepts the platform.

Now cut the blank into two parts: one 9¼ in. long for the platform and one 13 in. long for the base.

The connecting block and the support block work together as part of the micro-adjust system. Both of these parts have a hole bored on one face, with each hole drilled just deep enough to accept a washer and nut. When the two parts have been assembled, the holes create a pocket that accepts both washers and nuts.

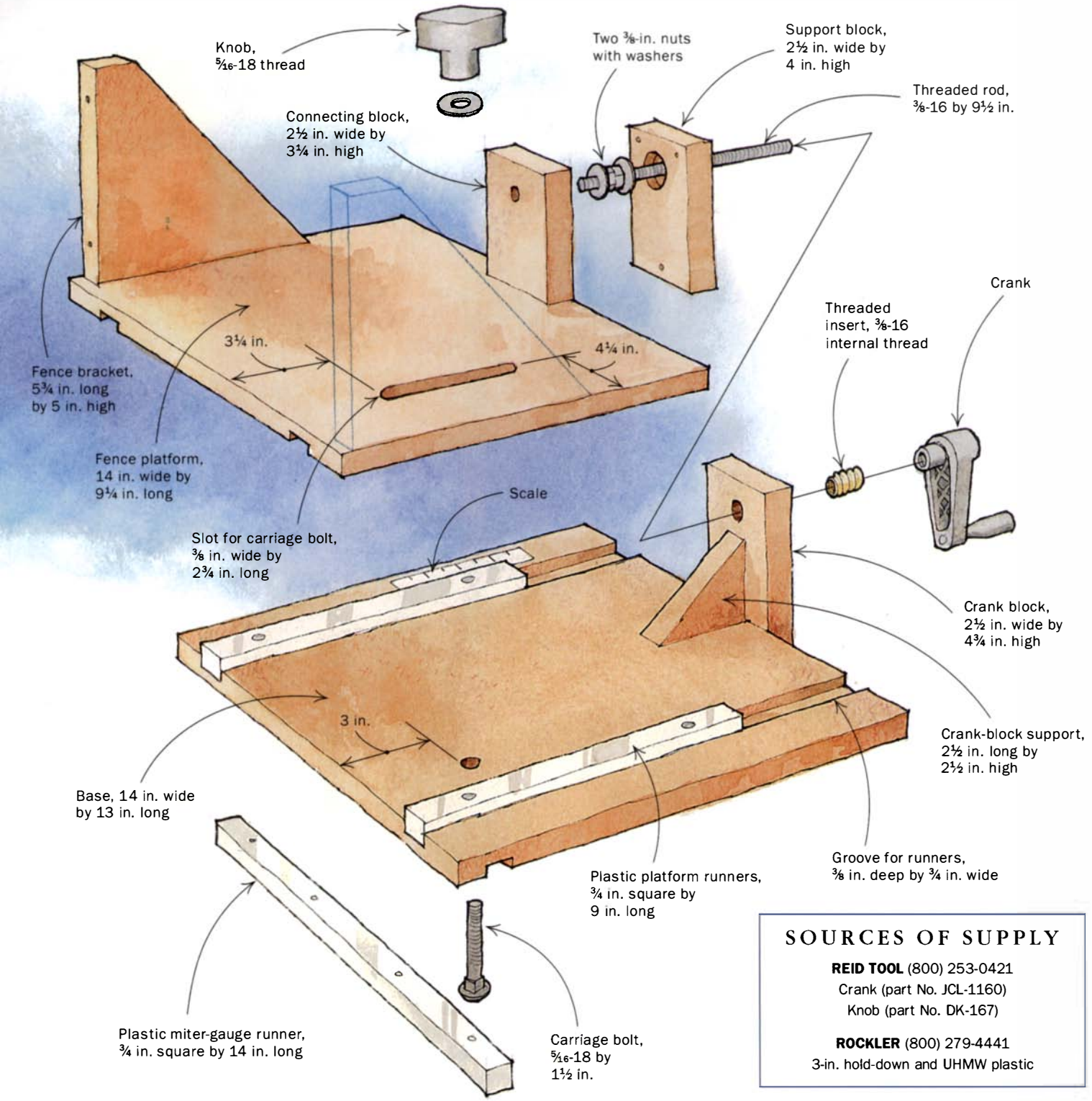
I used a router with an edge guide to cut the slot in the platform for the carriage bolt. Before routing, I drilled a 5⁄16-in.-dia. hole to provide a starting point for a ¼-in.-dia. straight bit. The head of the carriage bolt is

Rip the plastic runners. *A combination blade makes a smooth cut in UHMW plastic.*

Cut some grooves. *A dado head plows a pair of parallel grooves in an oversized blank.*

Cut the blank in two. *Crosscutting the blank provides stock for the base and platform.*

Drawing: Jim Richey



SOURCES OF SUPPLY

REID TOOL (800) 253-0421
Crank (part No. JCL-1160)
Knob (part No. DK-167)

ROCKLER (800) 279-4441
3-in. hold-down and UHMW plastic

recessed in a counterbore in the underside of the base. Now add the threaded insert to the crank block. Drill a ½-in.-dia. hole, lubricate the outside threads of the insert with wax and screw it in place.

Assemble and finish

At this point, all of the MDF parts can be screwed together. Keep in mind, though, that MDF tends to split, especially when screwing into an edge. So it's important to drill pilot holes before adding screws.

After that, cut the three runners to final length. Then drill, countersink and screw each runner in place.

The micro-adjust system comes next. Cut the threaded rod to length. Then add the crank, nuts and washers. To complete the system, it's just a matter of screwing the connecting block to the support block.

To add moisture protection to the jig, it's a good idea to apply a couple of coats of polyurethane to the MDF parts. Mounting the hold-down completes the jig. □

Brad Schilling enjoys working wood in Fairview Heights, Ill.

Current Work

Current Work provides design inspiration by showcasing the work of our readers. For more details and an entry form, visit our web site: finewoodworking.com. Send photos and entry forms to Current Work, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470.

Philip A. Houck Boston, Mass.

This card table (18 in. deep by 36 in. wide by 28 in. tall) is based on photographs from Albert Sack's *The Fine Points of Furniture* (out of print) and overall dimensions found in Benjamin Hewitt's *The Work of Many Hands: Card tables in Federal America, 1790-1820* (out of print). Houck worked more than 500 hours to complete the table, which is made of mahogany, holly, ebony and pine and has a padded shellac finish. Photo by Lance Patterson

Dale Kirstine Magalia, Calif.

Kirstine built this nine-drawer chest (22½ in. deep by 53 in. wide by 36½ in. tall) for his daughter and son-in-law. The Federal-style chest is constructed of alder. The drawer fronts feature California black-oak banding and walnut stringing. The same two wood species are inlaid on the top to form a decorative border. The piece has a lacquer finish.

Jeff Crigler McLean, Va.

Moved by classical music, Crigler built this music stand (24 in. wide by 48 in. tall) freehand and without plans. Made of maple, walnut, hickory, mahogany and rosewood, the piece took shape as he sorted through scraps left over from other projects. Crigler intended the stand to "float like a Bach cantata or a Mozart aria." He finished the piece with six coats of clear wipe-on polyurethane.

Wyeth Hunnable New York City

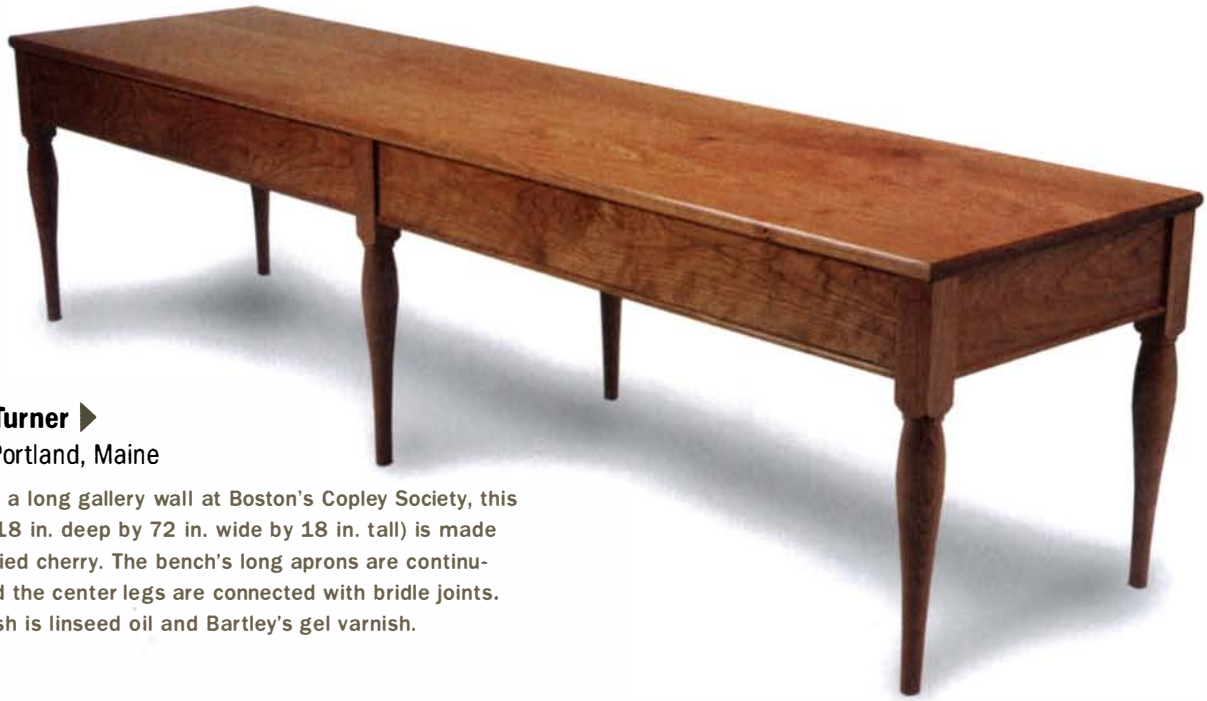
Hunnable designed this hall table (12 in. deep by 60 in. wide by 38 in. tall) to resemble the graceful contours of an animal, and he is now told by many that it reminds them of a gazelle. The table is constructed of Honduras mahogany and English sycamore veneer. The finish is a catalyzed varnish.

Barry Daggett Northampton, Mass.

This storage unit (17 in. deep by 28 in. wide by 75 in. tall) is made of spalted beech, walnut, maple and ebony. Daggett came up with the design in 1996 when he was a furniture-design student at the University of New Hampshire; however, he did not build the piece until late 1999, when he received some spalted beech from a friend who was clearing land in the Berkshires. Incorporated into the door construction are fiberglass rice-paper inserts. The unit has a Waterlox oil finish.

Jerry Cox St. Louis, Mo.

Cox designed this bedroom entertainment unit (27 in. deep by 67 in. wide by 87 in. tall) for a client who had lived in Japan for five years. Craig Vincent built the piece out of solid birch with redwood burl veneer on the drawer fronts and lower shelf. Vincent used dyed bamboo for the door inserts and side panels. The unit has an eight-step lacquer finish, which was applied by Larry Levleit.



Peter Turner ▶
South Portland, Maine

Built for a long gallery wall at Boston's Copley Society, this bench (18 in. deep by 72 in. wide by 18 in. tall) is made of certified cherry. The bench's long aprons are continuous, and the center legs are connected with bridle joints. The finish is linseed oil and Bartley's gel varnish.

◀ **Victor Marwin**
Buffalo, N.Y.

Marwin built this chest of drawers (20 in. deep by 34 in. wide by 60 in. tall) for his wife while taking an advanced furniture-design course at Buffalo State College. The chest is made of bird's-eye maple and black walnut. The piece features mortise-and-tenon joinery, resawn floating panels, French dovetailed rails and turned mortise-pinned feet and Shaker knobs. The chest was finished with Danish oil and hand-rubbed carnauba wax.

Dolph Reitenauer Baltimore, Md. ▲

"After attending last year's 18th-century furniture conference in Williamsburg," said Reitenauer, "I was inspired to build a chair using the same tools Mike Dunbar used." This comb-back Windsor (15⅜ in. deep by 27 in. wide by 44 in. tall) is made of poplar, maple and red oak and is finished with milk paint and boiled linseed oil. Photo by KGM Photography

John Nelson Fairfield, Iowa

This bedside cabinet (18 in. deep by 24½ in. wide by 48 in. tall) is one of a set made to match a very tall four-post king-sized bed. To come up with the design, Nelson worked with Betti Burke of Mystic Designs in Montecito, Calif. The cabinet is constructed of quartersawn padauk, holly and ebony and is finished with pickled shellac and Waterlox. Photo by Rick Donhauser

Alan E. Harvey
Mukwonago, Wis.

This tapered jewelry cabinet is made of koa and has ebony handles and fillets. Finished with polyurethane varnish, the cabinet is 24 in. square at the base and 18 in. square at the top. Standing at 52 in. tall, the upper section has seven drawers for costume jewelry. The lower cabinet holds a fireproof safe for the real valuables.

Steve Orton
Seattle, Wash.

Following the Ludwig Mies van der Rohe maxim of "less is more," Orton designed this demilune table (16 in. deep by 32 in. wide by 34 in. tall) to fill a space in his dining room. The table is constructed of solid cherry with a rosewood inlay, and the finish is tung oil, lacquer and black wax.

Tips for photographing your furniture

1. *Clean and dust the furniture.*
2. *The furniture will appear more three-dimensional if it is lit so that each plane has a different brightness. Take care, however, to avoid excessively bright highlights or dark shadows.*
3. *To be sure the photos will be free of distortion, avoid the use of wide-angle lenses, and photograph with the camera positioned even with the center of the furniture both vertically and horizontally.*
4. *Use 35mm color print (negative) film of moderate speed (ISO 200-400). If you're using a digital camera, shoot at the highest resolution and place the image on a CD.*
5. *Photograph the furniture from several angles. Include some head-on shots, as well as some shots that show both the front and side of a piece.*
6. *Keep the background simple. A cluttered or otherwise distracting background may draw the viewer's attention away from the subject.*

Fine WoodWorking®

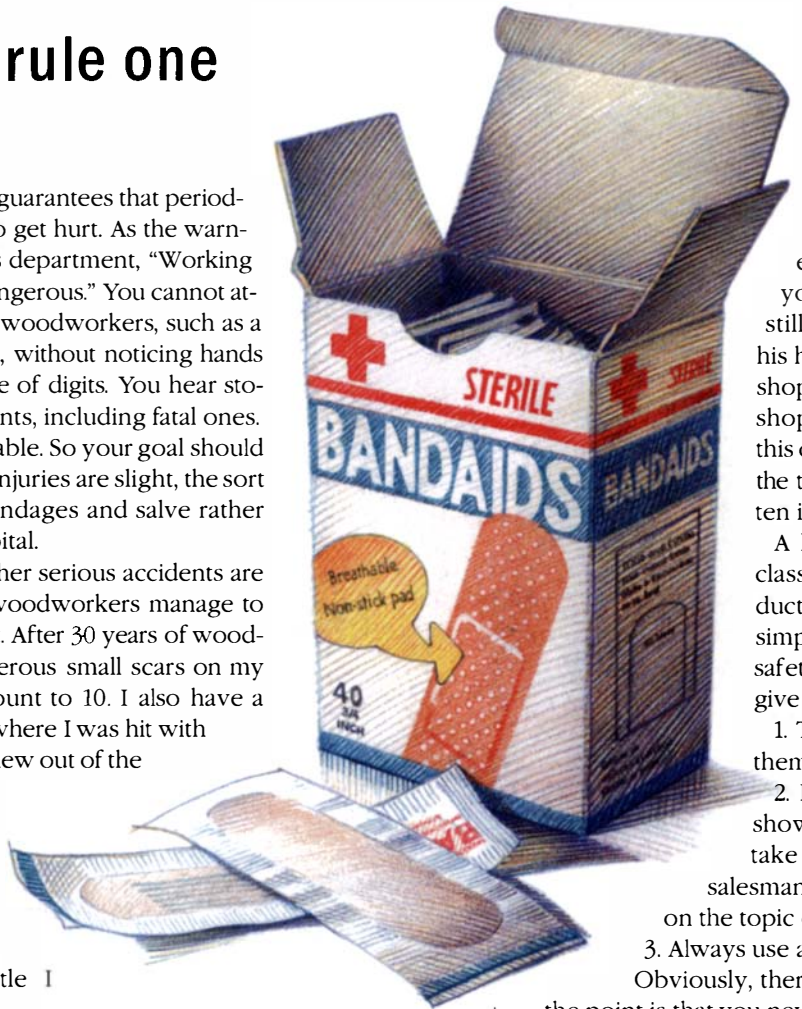
Index to issues 147 through 153

This alphabetical index covers the issues of *Fine Woodworking* published during 2001 (*FWW* #147 through #153). For a more comprehensive cumulative index, go to finewoodworking.com. The format of each index reference is issue number:page numbers. A hyphen between page numbers means the discussion is continuous; commas between page numbers indicate an intermittent discussion. This index, like all previous indexes to *Fine Woodworking*, was prepared by Harriet Hodges, chair maker.

Rules of Thumb

BY MICHAEL DUNBAR

Safety is rule one



Being a woodworker guarantees that periodically you are going to get hurt. As the warning says in the Letters department, "Working wood is inherently dangerous." You cannot attend any gathering of woodworkers, such as a show or club meeting, without noticing hands that are short a couple of digits. You hear stories of horrible accidents, including fatal ones.

Accidents are inevitable. So your goal should be to ensure that any injuries are slight, the sort you can treat with bandages and salve rather than a trip to the hospital.

Amputations and other serious accidents are not inevitable. Most woodworkers manage to keep their body intact. After 30 years of woodworking, I have numerous small scars on my hands but can still count to 10. I also have a scar on my forehead where I was hit with a piece of wood that flew out of the lathe. I wish I had started using hearing protection a lot sooner. My doctor tells me I cannot regain my hearing, only protect the little I have left. Otherwise, I am as complete as when I entered the world. After 21 years of teaching some 3,500 people, only two have cut themselves badly enough to require a doctor's attention. I like to think it is because of the safety lecture I give at the beginning of every class and the reinforcement we give before every demonstration.

Your goal should be to ensure that any injuries are slight, the sort you can treat with bandages and salve rather than a trip to the hospital.

Although there are lots of safety rules, safety is a state of mind. In other words, your best protection is learning to behave safely. Developing this state of mind requires embedding it in your brain so that a little voice screams every time you flirt with danger. You should create this state of mind while still a beginner, but it never hurts seasoned woodworkers to refresh and strengthen it.

The best reminders are simple and childlike, like the jingles Madison Avenue uses to embed product names in your mind. Our staff member Dan Faia still remembers the annoying little adage his high-school shop teacher used: "A clean shop is a happy shop. A happy shop is a fun shop. A fun shop is a safe shop." Although this corny ditty generated a lot of scorn from the teenage students, Dan has never forgotten it, and he is still influenced by it.

A local kindergarten teacher brings her class to our school every year for an introduction to woodworking, and we set up simple projects for the students to do. My safety instructions for them are the same I give to adults:

1. Tools are not toys. In other words, use them only for their intended purpose.
2. Never use a tool until you have been shown how to handle it properly. For adults, take time to learn to use a tool. Have the salesman give you some instruction, read a book on the topic or take a class.
3. Always use a tool the way you were shown.

Obviously, there are other important safety rules, but the point is that you never outgrow the basic truths, and you're never too smart to slip up.

Rules to live by

While each tool has its safety rules, here are some general practices that you should repeat until they become ingrained habits.

Don't hurry or work tired—Most accidents happen because the woodworker did not want to take the time to prepare for just one quick cut. The person knows the risk but figures it won't happen this one time. When you are fatigued or otherwise impaired, get out of the shop.

If it makes you nervous, don't do it—After all the effort you go through to train that little voice in your head, listen to it. Trust it to warn you when something is unsafe.

Heed the manufacturer's warnings—We all know those safety instructions are there primarily to protect the manufacturer from liability. However, liability means someone has gotten hurt, so they are there to protect you as well. This also applies to guards. Sure, some of them are a pain, but so is an injury.

Wear eye protection—Put on safety glasses whenever you are doing anything that can send even the smallest piece of wood or

Drawing: Linda Fennimore

metal into the air. Don them whenever starting a machine or swinging a hammer or mallet. My worst eye injury was temporary, but it sure hurt. It happened five years ago when I was trimming the end of a tenon with a gouge and mallet, and a chunk of wood popped upward. For 25 years, I had gotten away with doing this task without eye protection. With a hand over my throbbing eye, I swore if I was still able to see when I took the hand away that I would wear goggles ever after.

Protect your hearing and lungs—The injuries we risk are not always as immediate as being hit in the eye or trimming a digit off a hand. You lose your hearing so slowly you don't notice, but eventually you end up as I have, cupping your hand behind your ear to hear even a normal conversation.

Wood dust and other products we use can do cumulative damage to our lungs. Install dust collectors and air cleaners, and wear a quality dusk mask when doing anything that creates a lot of fine dust. Remember, the dust is there, even though you cannot see it most of the time. In the winter, when the sun is low and shines directly through your shop windows, notice the ever-present cloud of dust hanging in the air. The memory of this cloud should set off a little voice in your head that prompts you to turn on the air cleaner and put on a dust mask whenever you pick up sandpaper.

Keep the shop clean and uncluttered—I have heard of lots of accidents that involve tripping over clutter or tools falling into machines. These incidents are a lot less likely if you clean regularly. At our school, each student is instructed to immediately pick up any small pieces of wood that fall to the floor and place them in the burn barrel. Because the staff walks around constantly, we have a vested interest in this. I have nearly fallen several times stepping on small cutoffs.

We have students put away their tools and clean the benches after every operation. We stop the class and clean the shop several times a day and before leaving for the night. Clean and uncluttered also applies to your person. Remove jewelry, roll up sleeves, and tie up long hair.

Prevent accidents, but prepare for them—This sounds a bit contradictory, sort of like the old Roman saying, "To preserve peace, prepare for war." But a quick response can head off a true disaster. Keep emergency numbers by the phone. Keep a medical kit in the shop. Display and maintain your fire extinguishers. Install a master kill switch for all of your machines. Keep hearing, eye and dust protection at every workstation.

Protect your property—Finally, safety applies to your property as well as to your person. I know numerous people whose shops have burned to the ground. Dispose of oil-soaked rags properly. Keep flammables tightly capped and in a metal cabinet. Unplug battery chargers and portable power tools before leaving the shop for the night. □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Q&A

How to clean a brush

Recently I cleaned my natural-hair brushes thoroughly in turpentine and wrapped them tightly in newspaper to preserve their shape. After about two weeks they were very stiff. Do you have any tips?

—Brent Longtin, Natick, Mass.

Jeff Jewitt replies: Natural-hair brushes, while more expensive, definitely make brushing varnish much easier and produce better results. The answer to keeping a natural-hair brush in good shape is twofold.

The biggest problem with used brushes is the hardened finish that has formed near the metal ferrule. To limit this problem, before applying a finish, first dip the entire brush up to the ferrule in solvent appropriate to the finish. This wicks solvent up into the reservoir, which is the space created by the wooden divider near the base of the brush.

During use, dip the brush into the varnish only about halfway up the bristles. Dipping the entire length into the varnish overloads the reservoir, which is the hardest part to clean.

The second challenge is cleaning the brush. You are correct to use a solvent, but you should follow this with warm water and detergent. First, dunk the brush into solvent. Then go to the sink and lather up the brush with dishwashing soap. Bend the bristles back and forth to work the lather into the ferrule, and do the same when rinsing the brush under warm water. When the bristles no longer feel slimy, you're done.

Then, holding the brush handle between the palms of your hands, twirl the brush to spin out the excess water. Wrap the brush by folding paper towels around it to maintain its shape, and lay it flat on your bench to dry.

[Jeff Jewitt restores furniture in North Royalton, Ohio, and is author of *Great Wood Finishes* (The Taunton Press, 2000).]

Wash with soap and warm water. *To clean a brush, first soak it in solvent. Then wash it in warm, soapy water and rinse.*

USING A BRUSH PROPERLY MAKES CLEANUP EASIER

Before applying finish to a brush, dip the brush into solvent up to the ferrule, then wipe it clean.

When using the brush, dip the bristles only halfway. This will keep the finish from overfilling the reservoir.

Using old varnish

I am about to refinish an old desk and was planning to use some old varnish I found. But after reading Finish Line (FWW #143, pp. 121-122) on varnishes, I am a little concerned. The six cans of varnish were in an unopened box. I wouldn't be surprised if they are 15-plus years old. I thought it appropriate to use old varnish on an old desk, but what do you think?

—Tim Elder, Baton Rouge, La.

Chris A. Minick replies: Refinishing an old desk with vintage varnish has a certain romantic appeal, but I fear that doing so is asking for hair-pulling frustration. Varnish dries, or more appropriately cures, when the oil-based finish molecules combine with oxygen (from the air) to form a polymerized finish film. Metallic driers or catalysts that speed up the polymerization process are added by the manufacturer to ensure that the finish dries in a reasonable length of time. Unfortunately, these catalysts deactivate with time, even in the factory-sealed container. It is just a fact of chemistry—the older the varnish, the longer it will take to cure. Reasonable dry times can be expected from varnish that is less than one to one-and-a-half years old, but

Photos, except where noted: Kelly J. Dunton

varnish older than three or four years will remain tacky for what seems like aeons.

Adding a small amount of Japan drier, a commercially available mixture of metallic driers, can sometimes revive aging varnish. The exact proportion needed varies between manufacturers, so follow the directions printed on the label. Be aware, though, that more drier is not necessarily better. Too much can result in a brittle finish film, form a white haze called drier bloom or inhibit drying altogether. Experiment on scrap to ensure the proper drier concentration before committing the doctored varnish to your project. Money spent on Japan drier is probably better spent purchasing fresh varnish instead. Besides, it is a lot less frustrating.

Your 15-year-old varnish is a great collector's item, but it has passed its prime as a good finish.

[Chris A. Minick is a consulting editor.]

Kiln-dried vs. air-dried walnut

I've been using kiln-dried walnut exclusively, but I've heard that air-dried stock has better color and working characteristics. Is this true?

—John Halstrom, Gary, Ind.

Jon Arno replies: Many experienced woodworkers prefer using air-dried walnut, and there are some compelling reasons to do so. Air-dried wood seems to have subtle shaping characteristics that are superior. The wood tends to be less brittle, and the shaved surface reveals a waxy luster not typically found when this species is steamed and then kiln-dried, as is usually the case at the major commercial mills. Also, the heartwood of air-dried black walnut displays beautiful violet-purple highlights and a rich marbling of the brown tones.

On the other hand, there are some compelling reasons why the mills rely on kiln-drying. Walnut trees are exceptionally slow in converting their sapwood to heartwood. Logs from fully mature trees can have a sapwood band as wide as 4 in. To scrap this sapwood simply because it lacks the preferred dark brown color of the heartwood would be an appalling waste, especially because the outer portion of a log typically contains the most knot-free stock.

DRYING METHOD CAN AFFECT THE COLOR

The top piece of walnut was air-dried and has a deeper purple color than the bottom one, which was kiln-dried. The bottom sample is less spectacular, but its sapwood has darkened to a more uniform tone.

Fortunately, the sapwood can be darkened by placing the green, freshly cut lumber in a steam chamber for a few days before it is transferred to the kiln to reduce the wood's moisture content. The common misconception about the steaming process is that it causes some of the pigments in the heartwood to migrate into the sapwood and thus darken it. However, tests were conducted in the 1960s demonstrating that, when exposed to heat and steam, walnut sapwood darkens even when it is not in the presence of heartwood.

We don't know exactly what events the steam sets in motion inside the wood, but it has been suggested that the steam stimulates the formation of enzymes, which in turn cause some of the wood's natural phenols to polymerize, becoming dark brown pigments.

This process yields far more usable cabinetwood, but it robs from Peter to pay Paul in the sense that exposure to the steam destroys the beautiful purple highlights and homogenizes some of the tonal variety in the heartwood.

Proponents of the steaming process argue—and rightly so—that this is a small price to pay for the additional yield, because the purple highlights and some of the tonal variety are transient anyway and disappear as the heartwood develops its long-term, oxidized patina. Of course, the more uniform dark brown color requires commercial furniture makers to do less sorting and color matching. In any case, mediocrity has its benefits.

Also, contrary to popular belief, proper kiln drying will leave the wood less stressed than air drying, because of the way heat softens the lignin (the material that stiffens the cell wall and functions as a bonding agent between cells), allowing cells to change position and relieve internal stresses.

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

Handplane technique

I have learned how to keep my planes sharp and flat, but I'm still having problems getting consistent performance out of them. Do you have any suggestions?

—Floyd Nesser, Santa Fe, N.M.

Garrett Hack replies: While you didn't mention any specific problems, I can bet that you're having troubles in one (or more) of three common areas of planing: uneven cutting (or "chatter"), a clogged throat or a misaligned iron that leaves distinct ridges.

Chatter shows up as ripples in the surface where the plane stuttered and didn't cut smoothly. It can often be easily felt, heard or even seen. Typically, chatter will occur at the start of a cut, before the plane is firmly supported on the surface. The uneven cutting is caused by the buildup of pressure against the iron to the point that it starts to vibrate. As the iron springs forward and back, the cutting depth is raised or lowered slightly, enough to leave distinct parallel cuts in the surface.

You can reduce chatter by applying less pressure on the iron or by giving it more support. The simplest solution is to use a

Photo, this page: Timothy Sams

STOP CHATTERING

Chattering leaves small gouges in the wood as the blade skips along the surface.

Make a skewing cut. *Held at an angle, the plane is less likely to chatter. Reducing the depth of cut may also help.*

thicker, more stable iron. Alternatively, you can skew the cut to reduce pressure on the iron, or take a lighter cut. To make sure the iron is getting adequate support, check some of the tuning: Is the bed flat and even; is the cap iron fitted to the iron; is the frog adjusted too far forward, leaving the iron with little support near the cutting edge? It may be a combination of things, but check those and see if that helps.

Clogging can occur even with the best-tuned planes. Shavings bind up so tightly in the throat that the plane no longer cuts. The most obvious cause is that the throat is too tight. The solution is to open the throat or back off the cap iron 1/16 in. or so.

Clogging often can be eliminated simply by clearing the throat of large shavings at the end of each stroke.

Also, nothing clogs up a plane faster than a dull iron. Be sure to keep your iron sharp.

Clogging can also be caused by a poor fit on the cap iron and iron, which allows some shavings to build up under the cap iron. The cap iron should be smooth and waxed. The cap iron might be somehow blocking the shavings from escape. Bevel the front edge of the throat forward slightly to give the shavings extra room. A light cut always helps, but sometimes, no matter what you do, clogging is going to be a problem.

Lateral misalignment of the iron is rarely much of a problem, but it can be an annoyance. If the iron isn't parallel with the sole, one side cuts more deeply than the other. This is fine when rough surfacing a board, but for final smoothing, I want the iron parallel to the sole. I usually feel the depth of the iron projecting from the sole before starting and, if need be, make slight adjustments. By watching the thickness and width of the shavings while planing, I can make further adjustments, as necessary. Ideally, I want to see a shaving of consistent thickness curling nearly the width of the throat.

[Garrett Hack is a contributing editor and author of *The Handplane Book* (The Taunton Press, 1997).]

REMOVE THE GROOVES

Shallow grooves are the result of a misaligned iron.

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DW411K	1/4 sheet Palm Sander w/ case	58
DW682K	Biscuit Joiner with case	169
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DW680K	3-1/4" heavy duty Planer	155
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1613EVS	2HP var. speed Plunge Router	199
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3727DVS	6" Random Orbit Sander	149
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698	Heavy Duty Shaper Table	144
352VS	3"x21" v/s Belt Sander with bag	185
360	3"x24" Belt Sander with bag	235
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READER SERVICE NO. 175

Two types of dentil moldings

Dentil, or teeth-shaped, moldings have a long history. The Greeks placed dentils into the capital section at the top of their columns. Furniture makers have used them extensively to render a more classical flavor to a given piece. Thomas Chippendale incorporated the Greek key and block dentil into many of his designs.

In America, Thomas Elfe, a mid-18th-century cabinetmaker from Charleston, S.C., was familiar with Chippendale's work and used dentils quite effectively in his own pieces. Outside of Philadelphia, the Pennsylvania Germans developed dentil motifs that reflected a more rural flavor appropriate for their bulkier, less sophisticated furniture.

BY STEVE LATTA

In reproduction work, you must be careful to put the dentil in the right place. That's not as silly a warning as you might think. A lot of factory "period" furniture gets this detail wrong, placing the dentil as the first element of a cornice. By contrast, most American furniture from the English tradition has the dentil located above the frieze or in the upper section of the crown. Here I'll cover two common types of dentils: block and Greek key.

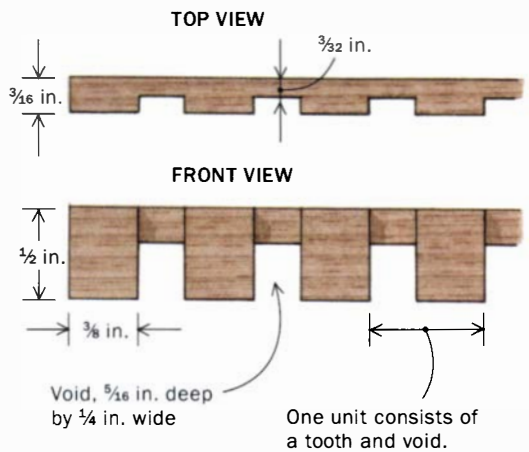
Block dentils are the most common

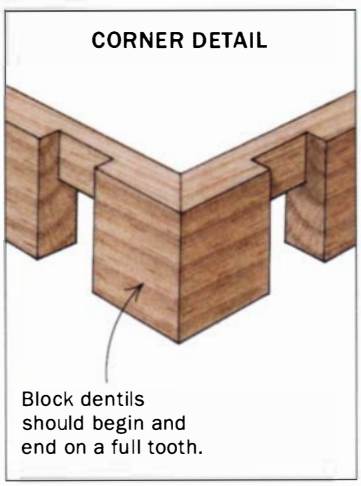
For a refined look, block dentil moldings should begin and end on a full tooth, although you can find pieces where this rule hasn't been followed. A few basic calculations, combined with a little fudging during milling, make ending the dentil on a full tooth easy to accomplish.

The process may seem a little complicated the first time you do it, but it's really quite simple. Take the length of the mold-

BLOCK DENTIL

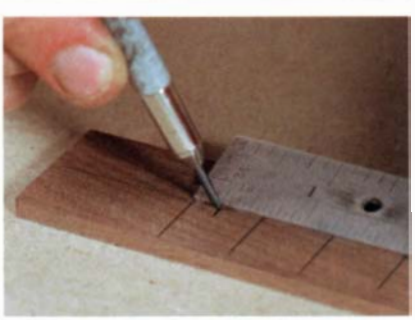
Cut on the tablesaw, block dentils are installed on the frieze of the crown molding.

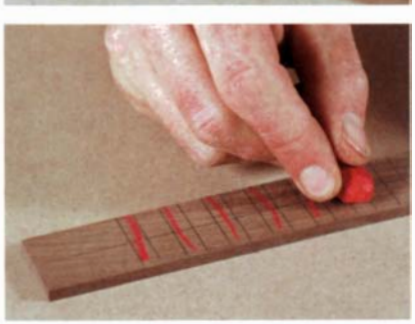




LAY OUT THE UNITS

The dentil stock is laid out using dividers. *The dividers are set to the width of one unit—the width of a tooth plus a void.*





Mark off the width of a void. *Then carry the lines across the stock using a square. To avoid confusion, mark off the sections to be dadoed. In the case of block dentils, you can make two strips by using double-wide stock.*

Drawings: Vince Babak

ing, figure out the size of each unit (a void and a tooth) and divide the length by the unit size to get the divisions. The only wrinkles are adding the overhang and making sure that you end up on a full tooth. The same process is used for the front as the sides.

A typical block dentil molding is made of stock 3/16 in. thick by 1/2 in. wide. Each unit consists of a 3/8-in.-wide tooth plus a 1/4-in.-wide void for a total of 5/8 in. per unit. (For block dentils, I usually make two runs at once by using 1 1/2-in.-wide stock, then ripping it to width.)

Using as an example the clock that my students make, I measured the front section of the crown and came up with 15 3/16 in., corner to corner. The length of the dentil itself is that distance plus twice its thickness to account for where it overlaps the return molding on the sides (15 3/16 in. + 3/8 in. = 15 9/16 in.).

The dentil should end on a full tooth, and each unit is a tooth plus a void. So to do the layout, subtract the last tooth from the overall length of the molding to figure out the number of full units that will fit across the case. In my example, that brings me back to 15 3/16 in. Divide that number by a unit, in this case, 5/8 in. Obviously, you will rarely end up with a whole number, but don't worry about that.

When I divide 15 3/16 in. by 5/8 in., I get 24.3 units. That means I am a hair over 24 units. I set my dividers to 5/8 in. and open them up just a hair. (If I had come out under 24 units, I would simply close up the dividers by a smidgen.)

Now it's time to see whether the dividers are set properly. Using a piece of scrap, mark out 24 divisions with the dividers. Tweak them until you come out right on the money, or within a hair.

Next, using a piece of milled stock several inches longer than the dentil needed, draw a centerline down the piece (if making two rows at a time). Then, beginning a few inches from one end, mark out the number of divisions, in this case 24. You should end up at 15 3/16 in. (The extra stock on each end allows you to cut the first and last teeth to fit the piece. Here's where you fudge a little if the layout isn't exact.)

You could proceed from here right to the tablesaw, but to avoid confusion, it doesn't hurt to make another set of marks that clearly define each void and tooth. To do

BLOCK DENTIL (continued)

MACHINE THE MOLDING

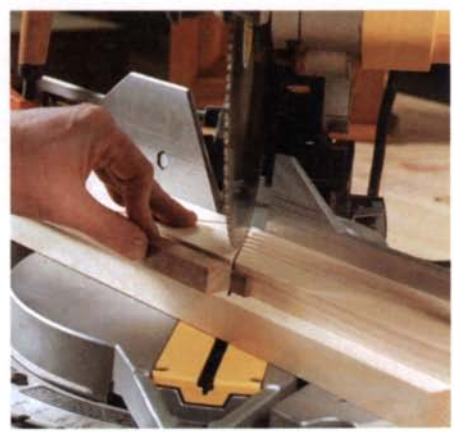
1. An L-shaped carriage, attached to the miter gauge, is used to cut the dentil. *With a dado set, cut the voids first, lining up the stock against the kerf in the fence.*

2. Reset the blade depth, then cut the shallow grooves. *Again, simply register the stock by eye along the kerf of the carriage.*

3. Rip the double-wide molding to width. *Be sure to use a long push stick and a zero-clearance insert plate.*

MARK AND TRIM

Mark off the locations of the miters. *The fit of the molding can be tweaked by making the outside full teeth a hair wider or narrower, as needed.*



An L-shaped block supports the delicate molding and prevents blowout. *During the cut Latta presses the molding against the block using a piece of scrapwood.*

Photos: Anatole Burkin

that, set the dividers to the width of the void (in my example, the size of the void equals the outside blades of my dado set, or about ¼ in.), and walk off another 24 divisions, which represent the voids. Using a square, extend all of the marks edge to edge. Last, mark the areas to be cut.

Before going to the saw, hold up the marked-off stock against the case to double-check your layout.

Machine the voids using a dado blade

To safely control the movement of the thin stock across the saw and avoid blowout, I make a carriage using two pieces of ¾-in.-thick medium-density fiberboard (MDF) screwed together at right angles and attached to a pair of miter gauges.

With the carriage in place, raise a ¼-in. dado set until it cuts a 5⁄16-in.-high notch. Use the kerf in the carriage to register the layout marks. Next cut all of the 5⁄16-in.-deep notches along one edge of the strip. Then reset the dado height for a little less than a ⅛-in.-deep cut. Lay the strip on its face and cut the shallow grooves.

Return the dado to the 5⁄16-in. setting and cut the voids along the other side (if making two sets at once). To rip the stock into two sets, use a zero-clearance insert plate and a long push stick. Even though the strips are stronger than they look, treat them gingerly.

Mount the dentil to the crown

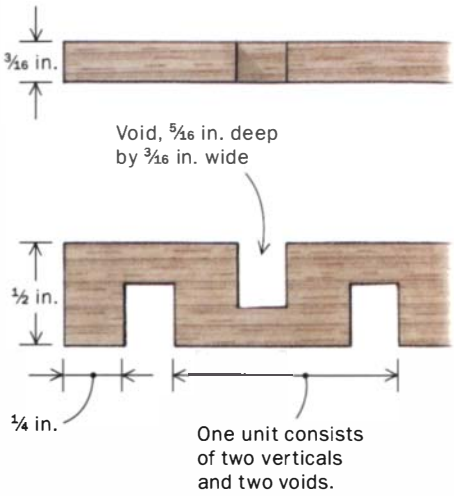
The best way to ensure that the dentil fits your piece exactly is to lay the strip atop the frieze, mark the length and then cut it.

I use a chopsaw to cut the dentil to length as well as to miter the corners. When doing this, it's important to support the molding on all sides. Otherwise, you may find little teeth flying all over the shop. I make a holder that attaches to the chopsaw fence. It's nothing more than a straight block of wood with a rabbet cut into it. The rabbet acts as a fence to support the molding. Before cutting the dentil, make two cuts into the block, one at 90° and another at 45°. The clean kerfs will prevent blowout and act as registration marks when cutting the dentils.

Once cut to fit, apply a dab of glue to the teeth and then clamp the molding in place with masking tape. □

GREEK KEY

The Greek key is made using tools and methods similar to those used on the block dentil.



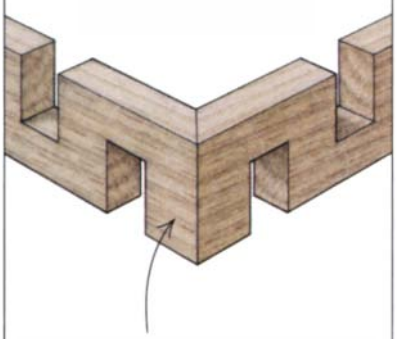
The cornice with the Greek key shown on the clock was taken from a piece made by Thomas Elfe in 1765. For the purposes of symmetry, the molding should end in vertical members at the corners, and the adjoining voids should either be at the top or bottom.

Unlike on the block dentil, cuts must be made on both sides of the stock, so you can't mill two sets at once. But like the block dentil, the molding is 3⁄16 in. thick and ½ in. wide and is cut on the tablesaw using the same type of carriage.

As with the block dentil, figure out a unit, then make the necessary calculations to do the layout. On the piece pictured, each void is 3⁄16 in. wide, and the solid vertical members are ¼ in. wide. A unit consists of two ¼-in.-wide verticals plus an upper and lower 3⁄16-in.-wide void, for a total of ⅞ in.

One last tip: The void's 3⁄16-in. width can't be made with many dado sets. I use a standard rip blade with ⅛-in.-wide teeth, and give it a slight wobble by inserting a wood shim between it and the arbor.

CORNER DETAIL



Greek key dentils should meet at the corners with a full vertical tooth on each side and adjoining voids in the same position (up or down).

To make a 3⁄16-in.-wide dado, add a shim between a rip blade and saw's arbor. *Most stacked dado sets cannot be configured to cut such a narrow void.*

Greek key molding is also cut on the tablesaw. *A miter-gauge carriage supports the stock. Note that because of the alternating voids, you cannot cut double strips of molding.*

WOODWORKER'S MART

See ad index on page **112** for reader service number.

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BY PHILIP C. LOWE

Burn-in sticks make nearly invisible repairs

In every job, whether it be making new furniture or repairing antiques, there is always the inevitable blemish: a dent here and a nick there, a joint that may not close quite right or a small piece of burl veneer or edge-banding that has chipped off. It's always distressing, particularly because the wood dough or filler used for most repairs never seems to match the color of the wood and won't accept a stain. The repair ends up looking worse than the original blemish.

That's not the case with burn-in sticks. Made from either shellac or lacquer, they come in a wide range of colors and are great for small repairs. Even when larger repairs require patching with solid wood or filling with epoxy, burn-in sticks serve to complete the repair and match it to the surrounding wood.

To get a good color match, apply some finish first

Because burn-in sticks do not change color when a finish is applied to them, the appearance of the finished wood must be obtained before selecting a matching burn-in stick. Raw wood can be stained, if desired, and should have a couple of coats of finish applied. If this is not done, trying to match the color of a burn-in stick to the likely color of the finished wood becomes a wild guess.

Another reason to apply more than one coat of finish is that when scraping or sanding away the excess burn-in material, you are less likely to damage the stain layer and have to perform tricky color matching.

When repairing a deep scratch that has penetrated a previously stained and finished surface, exposing the bare wood, apply some stain to this area. Otherwise, the slightly translucent burn-in material may allow the color of the raw wood to show through.

It's almost impossible to get a perfect match when choosing the color of the stick. Given two close matches, I will always err on the side of the darker stick. A repair that is darker than its surroundings doesn't stand out as much as one that is lighter. It's the same principle as a scratch on the surface of a finish. It stands out like a

PREFINISH FOR A PERFECT MATCH

Determine the final appearance. *To get a good match between the wood and the burn-in stick, the piece of furniture can be stained, if desired, and should have a few coats of finish applied.*

Repairs with a darker stick are less obvious. *The center stick may appear to be a better match with the overall color of the walnut, but the darker stick on the right will make an almost invisible repair.*

Photos: Mark Schofield

ELECTRIC KNIFE SIMPLIFIES THE PROCESS

Melt the burn-in stick. *Hold the tip of the hot knife against the stick until a bubble of molten material gathers on the blade.*

Apply the burn-in material to the cavity. *Don't worry about forming a smooth surface. The first step is to fill the void.*

Smooth and compress the filler. *Drag the hot knife across the surface to level the shellac with the surrounding wood.*

sore thumb when the contrast is there, but once darkened, it is not as noticeable.

How to melt burn-in sticks

Traditionally, burn-in sticks were melted using a knife heated by an alcohol lamp. I prefer to use a low-temperature electric knife because it maintains a constant temperature. A knife held over a lamp is too inconsistent in temperature, sometimes burning the wood you are trying to repair. The burn-in material can boil, causing air bubbles to leave voids below the surface that are revealed when leveling.

I apply the burn-in material by holding the stick against the knife. The stick melts onto the surface of the blade, forming a puddle of molten material. This melted material can either be dripped into the crack or dent, or the corner of the knife can be slid across the surface, leaving a line of material behind it. The material firms up quickly and needs to be forced into the opening. I do this by laying the knife flat and remelting the material while pressing and dragging it along the surface, forcing it into the void.

Filling larger holes takes two steps

Shellac and lacquer are brittle, so large repairs should not be made solely with burn-in sticks. Large patches are best made using wood, which can be stained closer in color to the surrounding material. Then use a burn-in stick to fill the small gaps where the patch doesn't quite fit.

On other occasions, you can fill large holes and gaps with a mixture of sawdust and five-minute epoxy. But be sure to use sawdust that is the same species as the wood you are patching. Before the mixture sets up, depress it with a cloth so it is recessed below the surface. Once it hardens, the burn-in stick can be applied to level the hole with the surrounding surface.

If an old piece of furniture is being repaired, or if a new piece of furniture has been stained and a source of matching sawdust is not available, powdered aniline dyes can replace the sawdust.

The hardest repairs to conceal are those in open-grained wood, where the smooth surface of the burn-in material stands out from the surrounding pore structure.

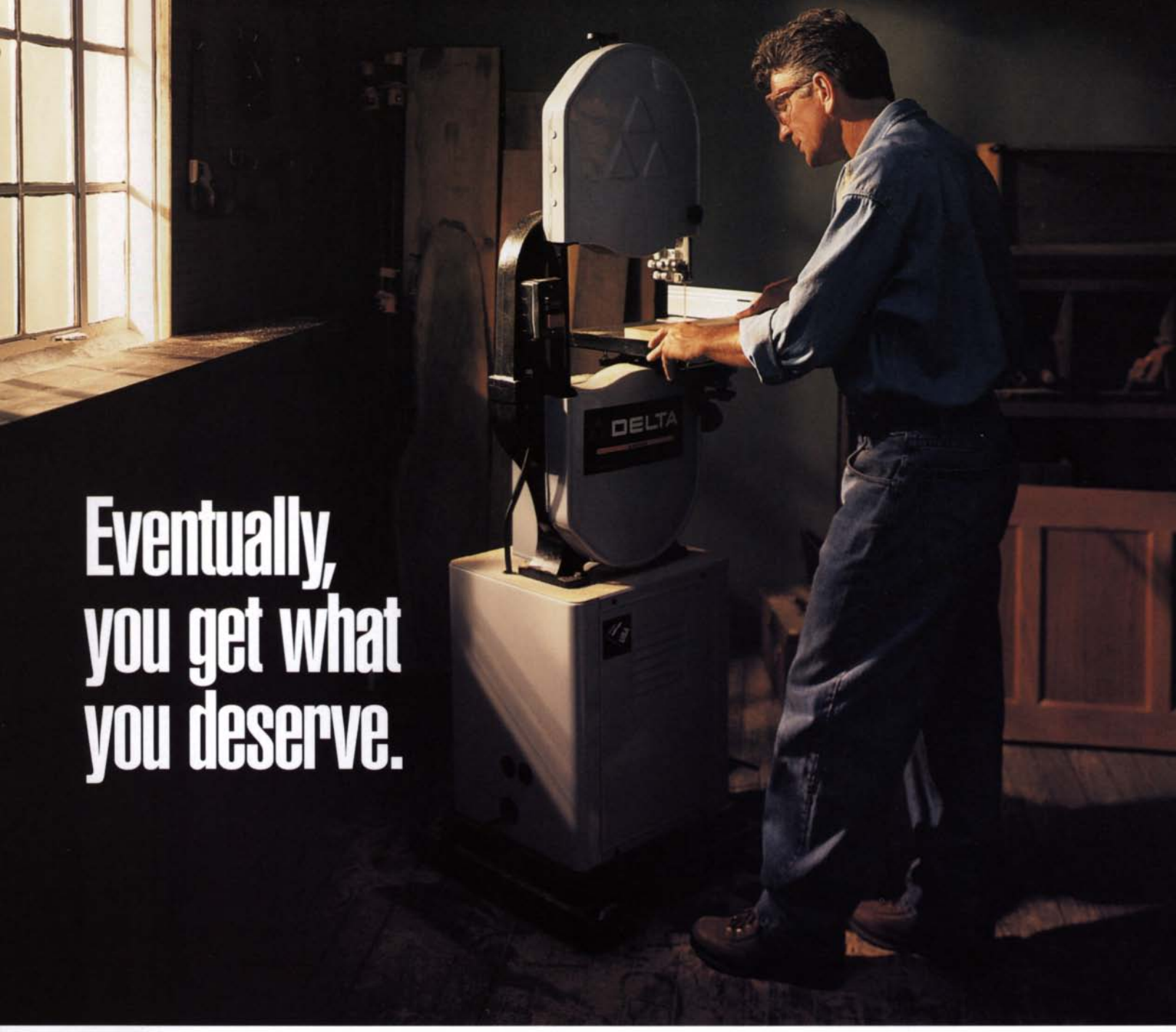
Clean up the surplus and complete the finishing

To level the repair, I use a sharp chisel to pare away the material above the surrounding area. Any remaining surplus can then be abraded and flattened with very fine (400- to 600-grit) silicon-carbide paper wrapped tightly around a block of wood and lubricated with water.

Shave off surplus filler. *A few strokes with a sharp chisel pare away most of the filler that is proud of the wood. A smooth finish is achieved with 600-grit wet-or-dry sandpaper wrapped around a block of wood.*

If you use too heavy a hand and damage the stain layer, restain as needed before applying more finish. You may find that the original stain doesn't penetrate partly finished areas. In this case, use an alcohol-based stain to add a layer of color between coats of finish. When more coats of finish are applied to the whole area, the repairs are less likely to be noticed.

One last word, if you use burn-in sticks made from shellac, some types of polyurethane finishes may not adhere. So be aware, and read the directions on the finish can. If you need to make repairs after the finishing has begun, apply all of your coats of finish, then make repairs with your burn-in sticks. When the repair is complete, rub out the final coat of finish, and wax the whole piece. □



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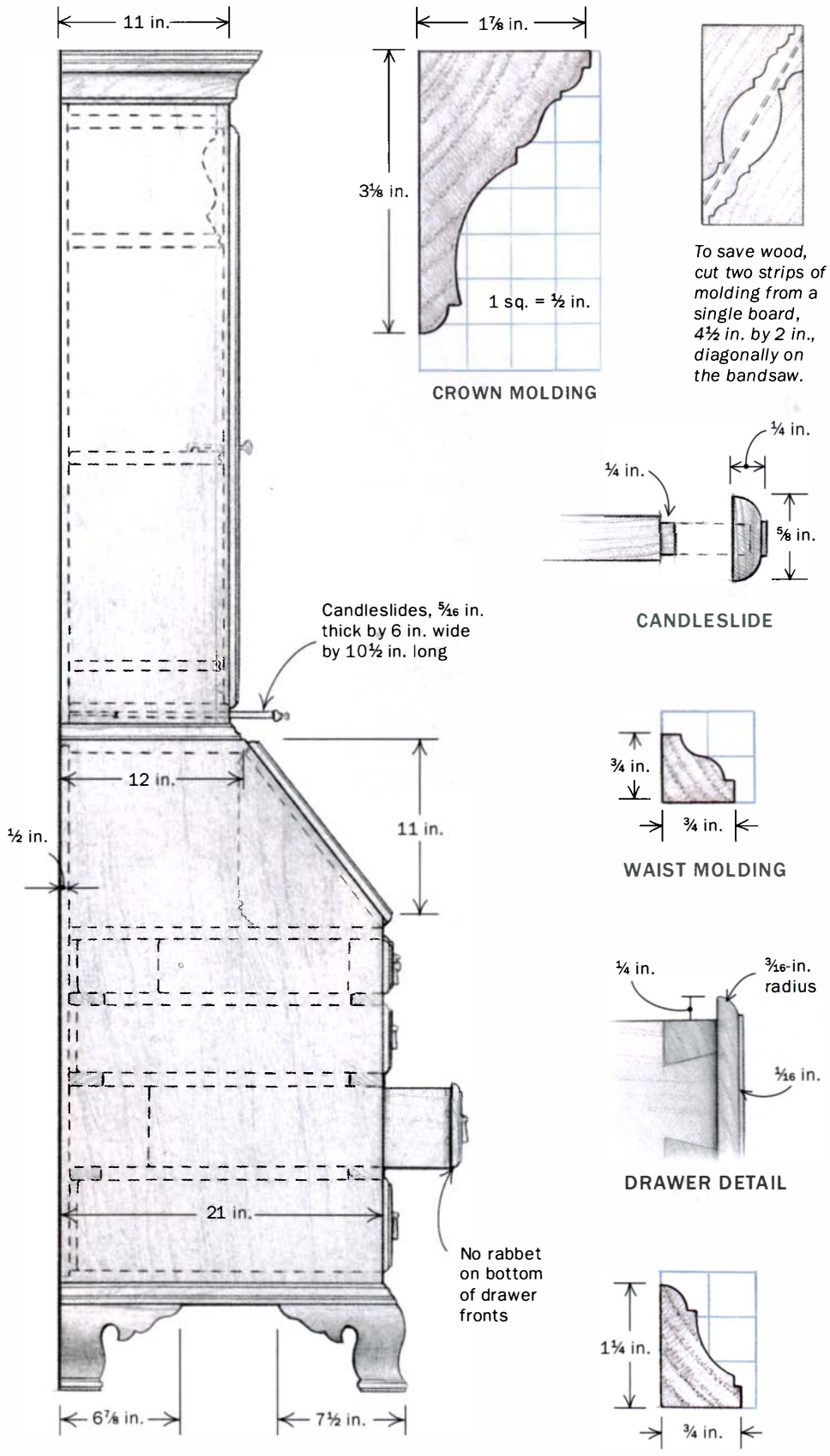
READER SERVICE NO. 119

NOUVEAU TECHNOLOGY

When William Doub received a commission to reproduce the Art Nouveau "Thistle Chairs," designed by A.H. Mackmurdo in the 1880s, he knew the ornate back splat would be a problem. Cutting the pattern with a scroll saw would require days of tedious sawing and handwork. The Massachusetts furniture maker remembered a laser-cutting process he had seen used for engraving wood. Doub brought a cardboard template of the chair back to Laser Process Manufacturing in Peabody, Mass., along with four curved plywood blanks. The company, whose clients include NASA, turned the template into a CAD drawing and fed it into a CNC laser, which burned the pattern through each piece. The entire job was done in a half-hour. The edges required only light sanding, and charring wasn't a problem because the design called for an ebonized back. Doub has a commission for another set of "Thistle Chairs," which he said represent the transition between Victorian and Art Nouveau styles as well as Mackmurdo's transition from textiles to furniture. Doub's work can be seen at customfurniture-doub.com.

From cardboard template to carved back splat. *Working from the single picture he had of the chair, Doub drew and cut out a pattern, which then was scanned into the computer and turned into a CAD drawing. The 40,000-volt laser did the rest.*

Photos: Kelly J. Dunton (top left, right); Asa Christiana (bottom left)



Old style, new methods

It's difficult to improve on many 18th-century joinery techniques. Dovetails are still the best choice for constructing drawers and casework, and no modern joinery method comes close to the strength of a door frame joined with pinned mortise-and-tenon joints. But a closer look at many antiques reveals that 18th-century craftsmen did not always choose the best construction methods to allow for seasonal movement. You'll often find drawer runners that were simply nailed to the sides of casework and ogee feet that were thin facades held together with a cross-grain glue block. Such practices have resulted in split case sides and cracked feet.

Today, craftsmen who choose to work in 18th-century styles must make choices about how far they will duplicate the work of the period. Because I want my furniture to have the look and feel of the originals, I work diligently to reproduce more of the lines, proportions and details. This often requires a great deal of painstaking handwork, such as planing and scraping surfaces or sawing dovetails by hand. But I don't feel a compulsion to duplicate the construction techniques that lead a piece to self-destruct.

This is why I fasten drawer runners with screws driven through elongated holes. And, if necessary, I beef up the construction a bit. For example, I added the dovetail dividers at the back of the lower case to help withstand the pressure of an upper case loaded with books. The result is a piece of furniture that's true to the style without some of the shortcomings.

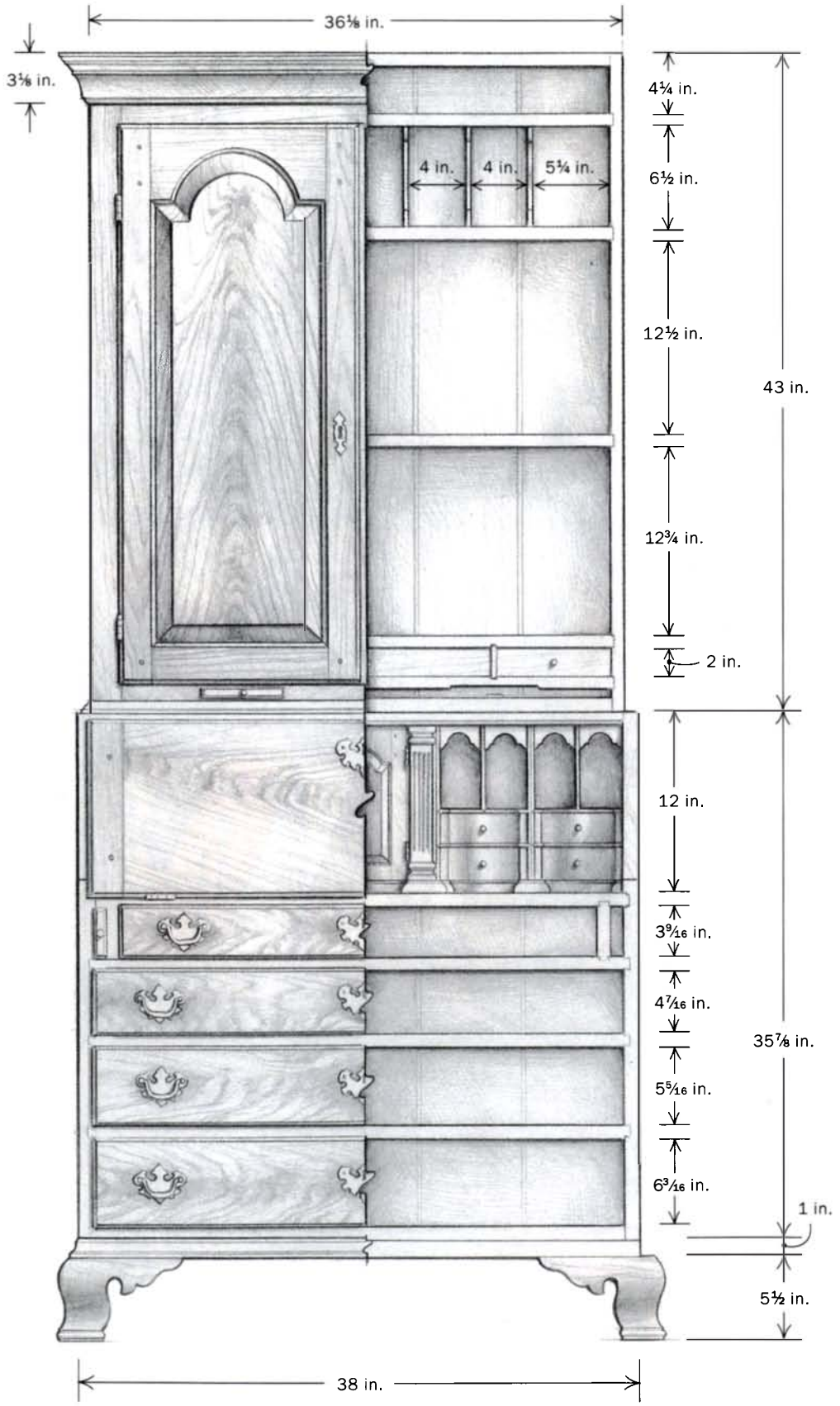
The 18th-century aesthetic

My eye has always been drawn toward the stylistic elements of American period furniture. But rather than make exact copies, I prefer to make subtle changes within the parameters of the style. Before building a piece, I study several related examples (other Pennsylvania secretaries, for instance) and borrow the best elements, such as the foot from one piece and perhaps the door from another. For example, the serpentine gallery on this secretary is common to many Pennsylvania secretaries, and the foot is a somewhat unique version from another Pennsylvania antique.

If I'm not comfortable with an original proportion, I change it. In my mind, no matter how fine the workmanship or dramatic the figure in a door panel, if proportions are clumsy, the piece isn't successful. To ensure that the piece looks balanced, I use one of several proportioning systems. I've measured enough antiques to be convinced that period craftsmen used them, too. The golden rectangle and ratios of whole numbers are very useful.

On this piece, for example, I chose the popular tombstone panel for the gallery's prospect door and divided the height by the golden ratio (1.618) to determine the width. The top drawer in the gallery measures 2 in. by 6 in., a ratio of whole numbers; and the drawer below it graduates by ¼ in., roughly the thickness of the divider.

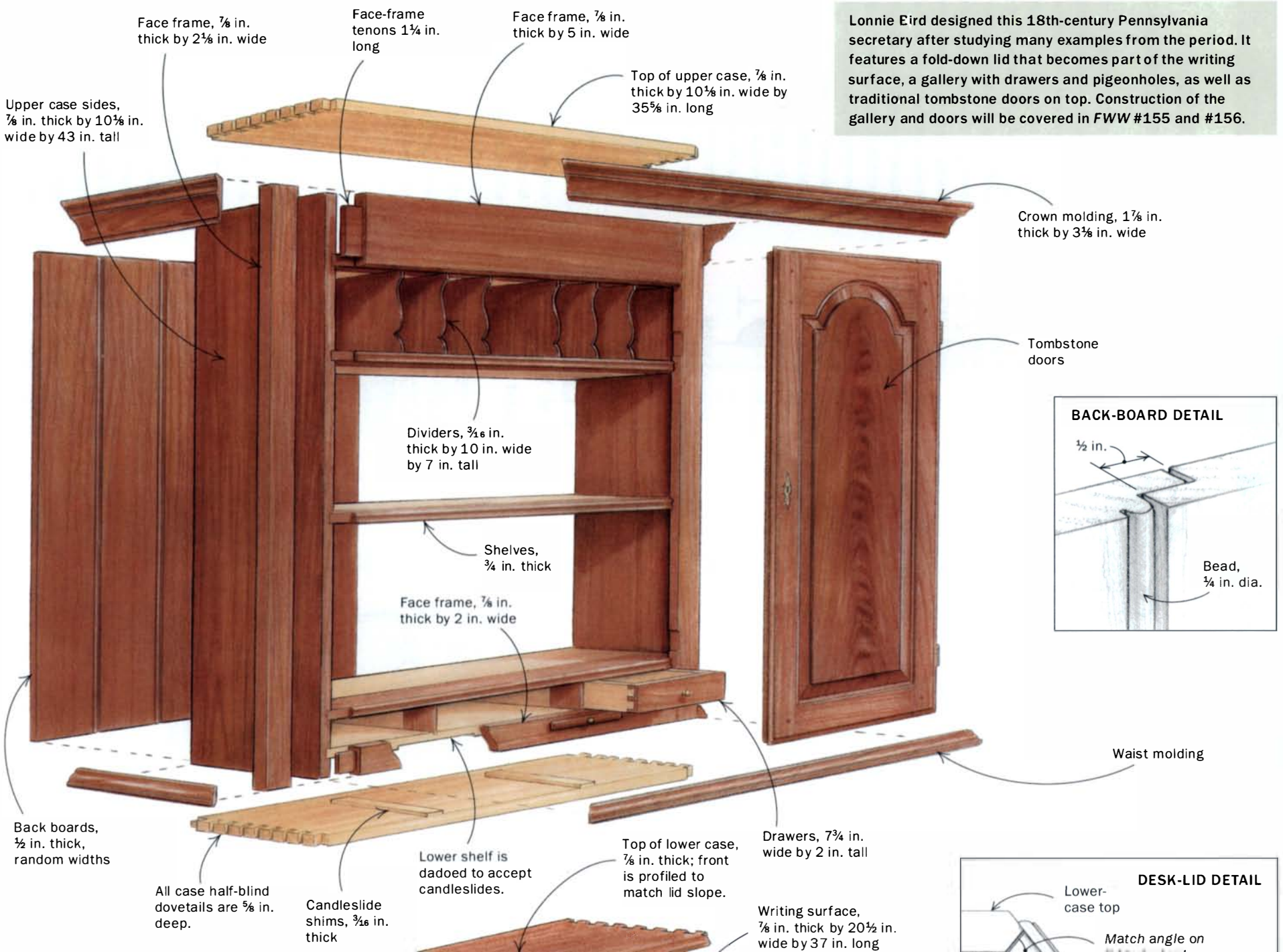
Using design elements from related examples allows me to keep in harmony with the Colonial cabinetmakers from a specific geographical region while building a piece of furniture that is distinctly my own.



FRONT VIEW

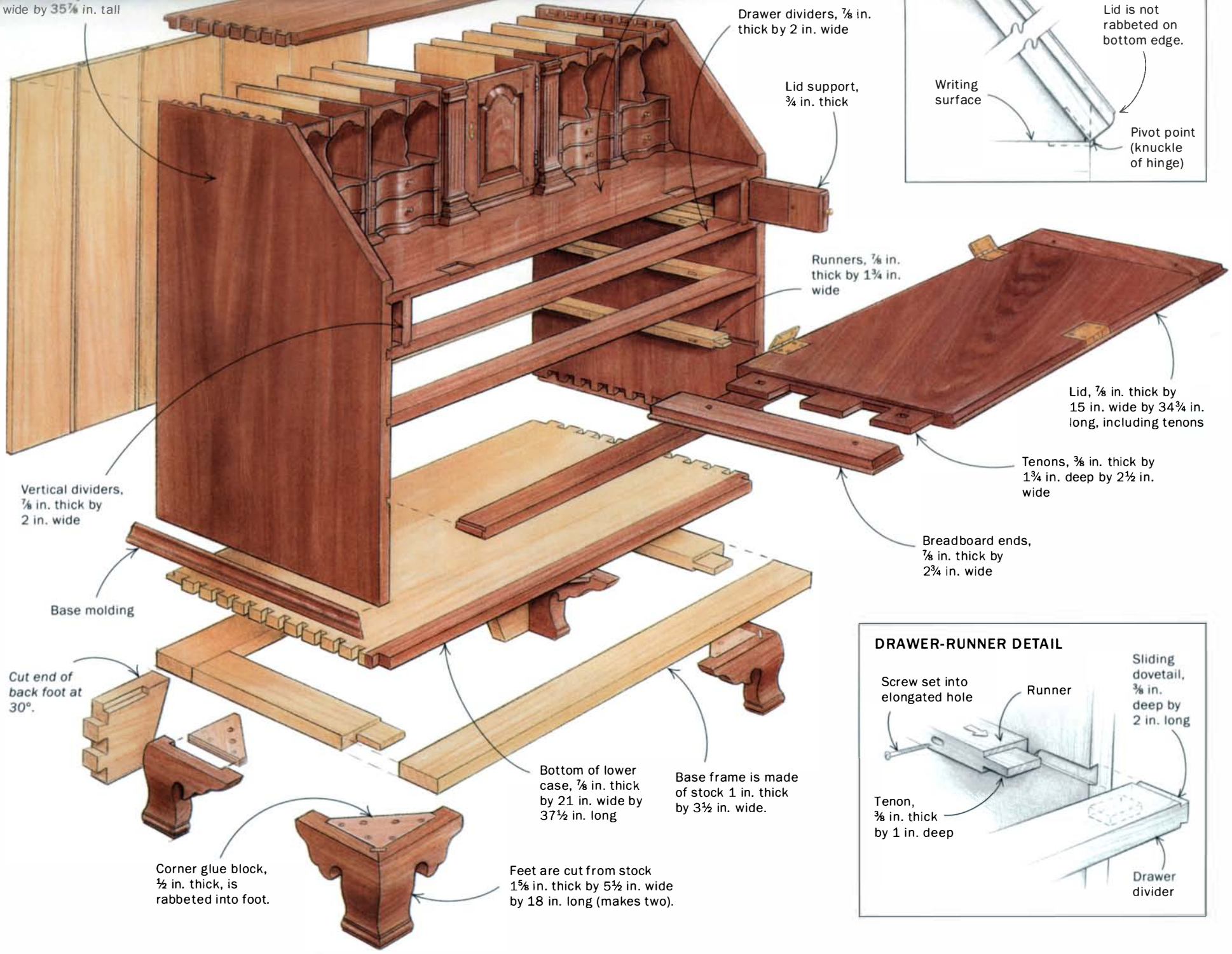
Drawings: Bob La Pointe

Lonnie Eird designed this 18th-century Pennsylvania secretary after studying many examples from the period. It features a fold-down lid that becomes part of the writing surface, a gallery with drawers and pigeonholes, as well as traditional tombstone doors on top. Construction of the gallery and doors will be covered in *FWW* #155 and #156.



BACK-BOARD DETAIL

DESK-LID DETAIL



DRAWER-RUNNER DETAIL