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# Fine WoodWorking

CELEBRATING 30 YEARS

February 2006
No. 182

## Pie safe for modern storage

### Get more from your drill press

### Expanding a dining table

### TOOL TEST: Sharpening machines

### Find fresh design ideas

### 11 essential layout tools

### User's guide to dyes and stains


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# contents

JANUARY/FEBRUARY 2006 ■ ISSUE 182

## features



Cover photo: Michael Pekovich




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# contributors

**Michael Fortune** ("Nine Tips for Better Design") has designed and made furniture since 1975 for clients across North America, typically making numerous pieces for each home. A key to his success as a designer/maker is his sketchbook, where he brainstorms and refines ideas before committing to a more detailed illustration of a final design for a prospective client. His old, dog-eared sketchbooks are also a reservoir of new ideas. In 1993, Fortune became the first furniture maker to receive Canada's prestigious Bronfman Award; he was inducted into the Royal Canadian Academy of the Arts in 2000.

**Roland Johnson** *("Get More From Your Drill Press")* divides his time between writing for *Fine Woodworking*, building stuff for himself and clients, and keeping his 40-acre homestead humming. Nearly 30 years ago, Johnson planted hundreds of trees in an old gravel pit, turning it into a wooded retreat where he has built his home and shop. He is also the founder and president of the Central Minnesota Woodworkers Association.

**Paul Snyder** *("Combining Dyes and Stains")* is a professional finisher from Fredericksburg, Va. His work ranges from restoring antique furniture to finishing new furniture, cabinetry, and architectural woodwork. Using skills acquired as a technical instructor and writer, he has taught a number of apprentice finishers and is developing a Web site, www.furniturefinishwizard.com, as a learning resource.

**Jeff Miller** *("Making a Dining Table Expand")* made the shift 20 years ago from professional musician to furniture maker, starting out with what he calls "a modicum of skill, a great deal of audacity, and a full measure of good fortune." He divides his woodworking time between making furniture; teaching at Furnituremaking Workshops, the school he founded in Chicago; and writing books and articles.

**Chris Gochnour** *("11 Essential Measuring and Marking Tools")* discovered the pleasure of building things by hand as a teenager, making his own skateboards and snowboards. His enthusiasm for carving turns on a board eventually was replaced with a passion for building things out of wood. Gochnour has spent the past 17 years building custom furniture near Salt Lake City, and teaching the craft in Utah and across the country.


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# letters

## Spotlight


looking back
The Wood Butcher

### ON BUTCHERING WOOD AND WORDS

**ISSUE NO. 180**
**December 2005**
**Page 122**

When the December copy of *Fine Woodworking* reached my mailbox, I was again excited by possibility. And as always I was satisfied with what was introduced and reiterated to me. Then I reached the last page of content and was met with great angst. Offended is the first and only word that rang in my head. How dare those elitist rich snobs with their million-dollar workshops put down the up-and-coming and never-will-bes of woodworking. I am a carpenter and come as close as I can to doing fine woodworking and still make a living. Maybe I will never be a professional furniture maker, maybe I will always be just a carpenter with some tools and a dream, but a butcher I think not!

—NATHAN C. RISH, Akron, Ohio

Until today I thought I was a competent weekend woodworker who gave up golf five years ago to pursue this most rewarding obsession. But alas! I have now realized that I am only a common Wood Butcher. What should I do? I have already talked to my priest, but I really don't feel forgiven. Am I doomed to a life of perfected patches? Should I go back to golf? Even with a bad case of Yips? HELP!

—CHIP COOPER, via email

I could not believe how Mr. Hall so eloquently and accurately described me in my shop-garage. His observations are gut splitting. I discovered that I am not at all by myself; there surely is a whole population of Wood Butchers out there. I just wanted to thank you for giving us this delightful gem. Yes, it will be hung in a frame over my workbench ... right next to one of my favorite quotes: "Every man should have a hobby he can't afford." Another proud Wood Butcher.

—MARCO ESPOSITO, Laval, Quebec

### Corrections

In our recent review of honing guides (*FWW* #179, pp. 38-41), we incorrectly stated that when working through stones of varying thicknesses using the Sharpening Sled SS1 (www.alisam.com), "you'll have to reset the blade to ensure the same angle." Although it's true you'll have to reset the blade by sliding it forward or backward to meet the stone, the bevel angle remains the same, locked in place by the jig. Also, since the review was published, the manufacturer has released new models with more features.

Although Lonnie Bird has used Formby's Tung Oil Finish and Waterlox Original Sealer for many years as part of his finishing process ("An Antique Finish for Tiger Maple," *FWW* #180), these products are technically not oil finishes as described but rather oil-based wiping varnishes. If you prefer, you can use a pure oil finish such as boiled linseed oil.


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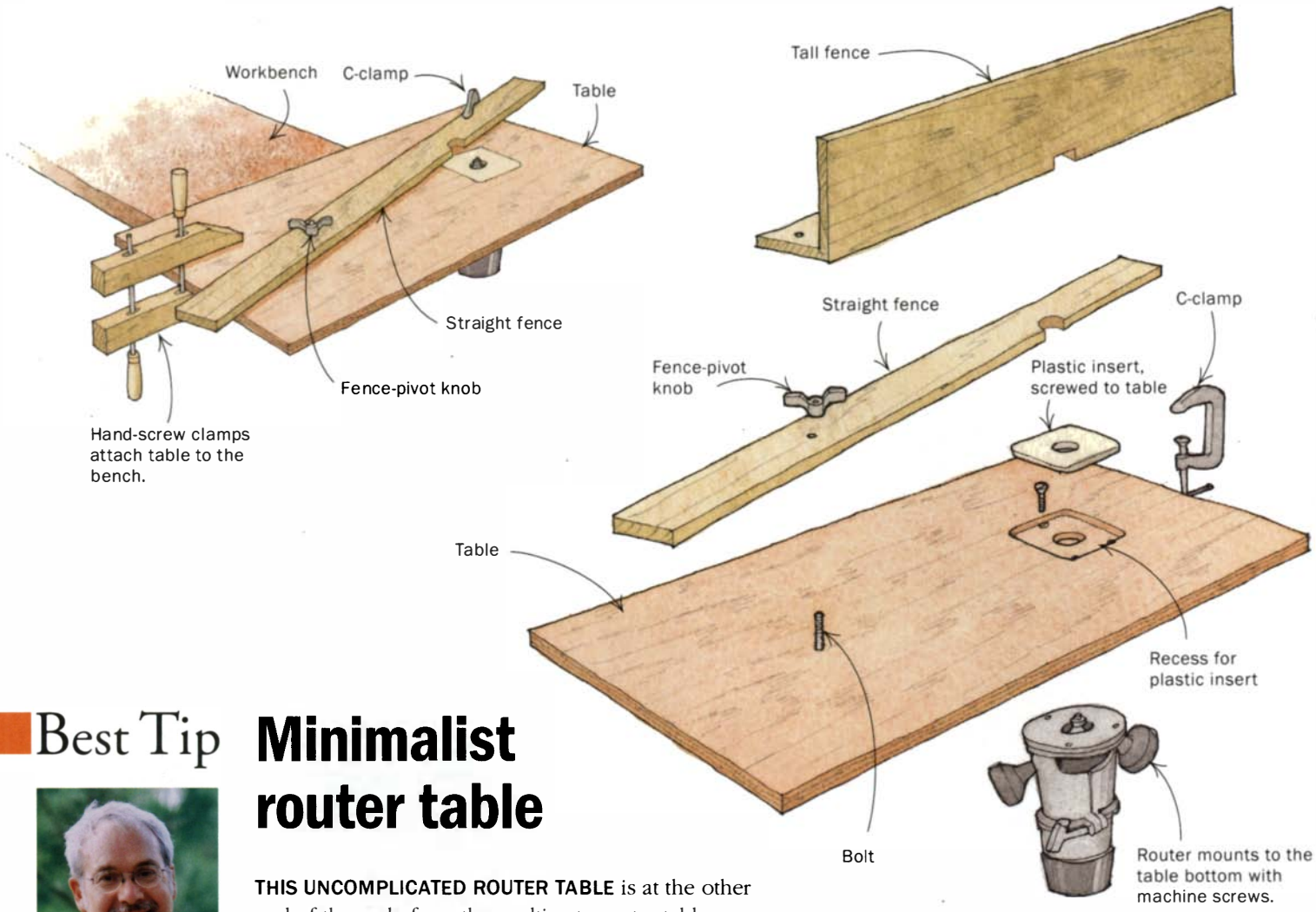



Best Tip

# Minimalist router table



**In addition to building furniture at his Arkansas shop, Doug Stowe teaches and writes about the craft. Information about his books, woodworking, and school program called "The Wisdom of the Hands" can be found online at www.dougstowe.com.**

**THIS UNCOMPLICATED ROUTER TABLE** is at the other end of the scale from those ultimate router tables replete with bells and whistles. It is just a router mounted upside down on a piece of plywood. The simplicity of the design makes it far more flexible than most router tables. You can build it in about 20 minutes and add a simple fence in another 10. Additional fences are made easily for special purposes.

To make the table, start with a piece of ¾-in.-thick plywood about 2 ft. by 3 ft. Cut a hole in the center of the table. Make and install a plastic insert to fit around the bit. Make additional inserts as needed to provide a close fit around other bits in your collection. Also, to prevent the insert from lifting when the router runs, screw the insert to the table. Attach the router to the table by running machine screws through the recess for the insert.

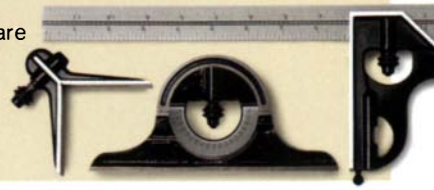
The fence is simply a 1x4 that pivots on one end and is clamped on the other. A small movement at the clamp end provides very close and precise movement at the bit, allowing for adjustment in the thousandths of an inch. When the standard flat fence does not fit the application, I just make a new fence. I use a tall fence for making lock miters and making raised panels.

To use the table, simply clamp it to your workbench with wooden hand screws. When you're done, just unclamp the whole fixture and store it out of the way to save space.

—DOUG STOWE, Eureka Springs, Ark.

## A Reward for the Best Tip

Send your original tips to Methods of Work, *Fine Woodworking*, PO Box 5506, Newtown, CT 06470. If published, we pay $50 for an unillustrated tip; $100 for an illustrated one. And if your tip is the best, you get a 12-in. combination square (with center head and protractor) made by the L.S. Starrett Co.

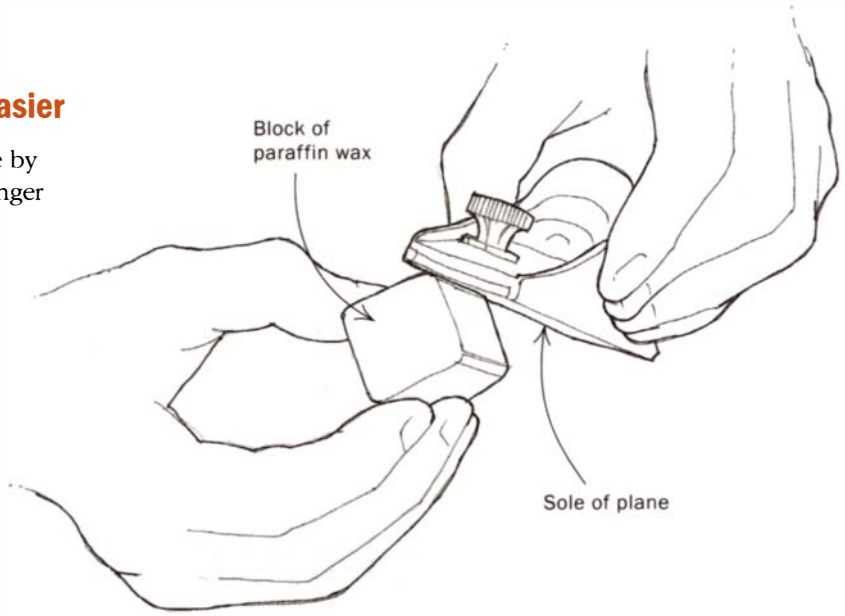


## Block of wax makes setting a plane blade easier

I find it difficult to set the depth and tilt of a plane blade by sighting down the sole of the plane or by rubbing my finger across the blade. The alternative method I use is quick, simple, and accurate.

I take a block of ordinary paraffin wax and run it edgewise along the sole of the plane, engaging the blade and producing small shavings on each side of it. The blade depth and tilt are adjusted easily to produce balanced, thin shavings. As a bonus, the paraffin lubricates the sole of the plane so that it glides easily over the wood.

—LOUIS MENGOLI, La Mesa, Calif.

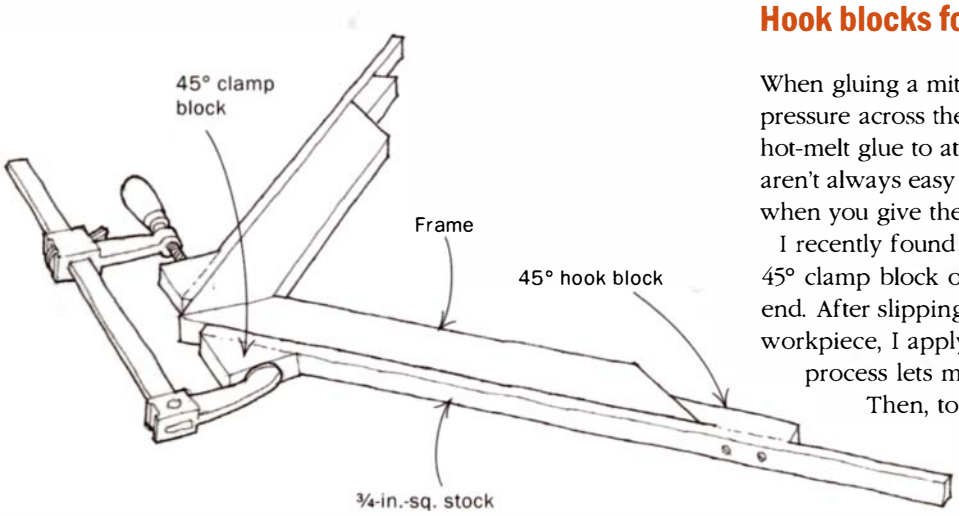



## Hook blocks for clamping miters

When gluing a miter joint, it's important to have strong clamping pressure across the joint line. To create clamping surfaces, I've used hot-melt glue to attach blocks to the frame parts. But these blocks aren't always easy to remove. And they sometimes pop loose, usually when you give the clamp handle a little extra twist.

I recently found a better way. Using ¾-in.-sq. stock, I screw a 45° clamp block on one end and a 45° hook block on the other end. After slipping the hook block over the ends of the mitered workpiece, I apply pressure across the 45° clamping blocks. This process lets me build the two mitered halves of the frame. Then, to assemble the halves, I replace the 45° hook block with a 90° block and repeat the clamping process on the other two corners.

—DAN McARDLE, Clancy, Mont.



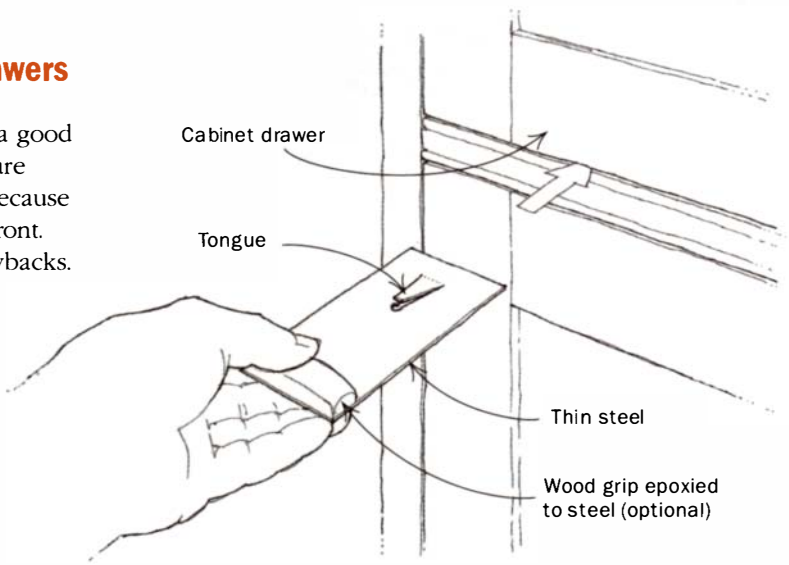

## Gadget helps when fitting inset cabinet drawers

Anyone making inset drawers is likely to remove them a good many times during the fitting process. Before the pulls are installed, however, the process can be a chore. That's because there isn't a means to get a decent grip on the drawer front.

Various methods I've used in the past have had drawbacks. This little gadget—a thin piece of steel with a raised tongue—solved the problem. I just insert the steel into a seam and give a pull. The drawer slips right out. It works just as well on inset doors.

To make the gadget, drill a starter hole and then use a jigsaw with a metal-cutting blade to cut the tongue. File all the edges so that they won't damage the cabinet.

—DAVID RING, Yodfat, Israel



## Tension a bandsaw blade with a dial caliper

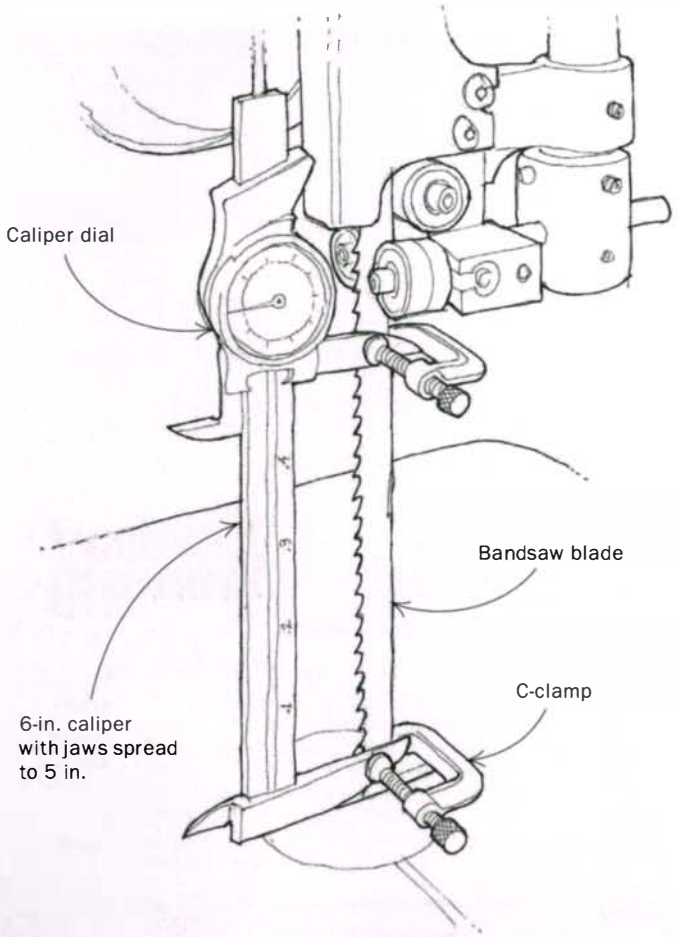
A bandsaw cuts best when the blade is properly tensioned. For resawing wide stock, blade makers generally suggest a maximum bandsaw-blade tension of 15,000 psi. For thin stock, a tension of about 8,000 psi works best.

When it comes to measuring tension, however, the gauges built into the machines are often inaccurate. I found a better gauge in the form of a 6-in. dial caliper. No need for a pricey caliper here; an inexpensive one works fine.

The method I use is based on information gleaned from the article "Shopmade Tension Gauge" in the January/February 2001 issue (*FWW* #147, pp. 80-83). According to the article, a 5-in. length of steel bandsaw blade stretches 0.001 in. for every 6000 lb. per square inch (psi) applied to the blade.

Based on this information, before resawing, I open the caliper to 5 in. and attach it to the bandsaw's blade with small C-clamps: one on the fixed blade of the caliper and another on the movable blade. After setting the caliper to zero, I apply tension to the blade until the dial reads just shy of 0.003 in., resulting in the desired tension of 15,000 psi. As I suspected, the built-in tension gauge on my saw was off by quite a bit.

—KURT LOUP, Baton Rouge, La.




***Two usable sides, etched in stainless steel.*** *One side is marked in half-degree increments of angles from 0° to 60° (above). The other side displays common dovetail angles and miter settings for making various polygons. The Bevel Setter is used to transfer a known angle to a workpiece or machine (below).*

MEASURING

# A best friend for a bevel gauge

WHILE A SLIDING T-BEVEL GAUGE IS indispensable for angled work, I've often wished that mine was marked off in degrees, like a protractor. A T-bevel may provide an excellent way to match the angle of a splayed leg or an inside corner, but it is a less-than-ideal tool.

When you must work from a known degree setting, such as when cutting compound angles, making miters or polygons, or laying out dovetails, a bevel gauge needs help. Also, when you hold the bevel against a miter-saw fence or a tablesaw miter gauge to set the angle of the cut against the sawblade, it's easy to throw off the setting. And then, because you never had a reading on the actual angle, you have to spend time sneaking up on the cut. The Bevel Setter is etched with precise settings from 0° to 60°, with a long stop to lock in any setting. On its reverse are common dovetail angles and 12 standard settings for polygonal work. (Quick—you have to make an octagonal frame, what's the bevel setting for the miter cuts? This tool will give you an answer fast.) The tool is also marked in 1/16-in. graduations on each long edge. Standard and metric versions sell for $24.50 from Lee Valley Tools (800-871-8158; www.leevalley.com).

*—Michael Standish is a woodworker and a trim carpenter in West Roxbury, Mass.*


CORDLESS TOOLS

## MAKITA, DEWALT ADD LITHIUM-ION TOOLS

**MILWAUKEE TOOLS WAS THE FIRST** manufacturer to bring lithium-ion batteries to the cordless market with the advent of its V28 series (*FWW* #181, p. 32). With other announcements, it's beginning to appear that lithium-ion technology is the wave of the future for cordless tools. Lithium-ion batteries can deliver more power and hold a charge longer, even though they weigh less than conventional nickel-cadmium (NiCd) and nickel-metal hydride (NiMH) batteries.

In early October 2005, Makita introduced its LXT line of tools, including a cordless drill, a hammer drill, an impact driver, circular and reciprocating saws, and a flashlight, all rated at 18v. The LXT tools cost about 20% more than Makita's other 18v tools and weigh about the same as its 12v tools. A month later, DeWalt announced its 36v lithium-ion cordless tools, coming in January 2006.

I'm left wondering whether any manufacturers will incorporate lithium-ion technology into 12v or 14.4v platforms, which are better suited to woodworking.

**—WILLIAM DUCKWORTH is a contributing editor.**



Photos, except where noted: Rodney Diaz

ROUTER BITS

## LOTS OF DOORS? TRY INSERT BITS

**INFINITY TOOLS HAS COME OUT WITH** a new system of insert tooling for router bits to make frame-and-panel doors. Called *Insert-Pro* cutters, these bits offer three different profiles so that you can cut multiple cope-and-stick patterns with just one router bit. Consequently, this system is more economical than having to buy three separate bits. When I tested the Insert-Pro cutters, another benefit was immediately obvious: Incorporating both the cope and stick knives on the same router bit saves setup time. These are big bits, and it would not be safe to use them in a hand-held mode, only in a router-table setup with an adjustable-speed router. I used them with a 3¼-hp router, set at approximately 13,000 rpm, and they cut superbly clean profiles without bogging down the router.

The cope-and-stick bit sells for $160, and the raised-panel bit sells for $140. Each bit includes one set of knives. Additional pattern sets of knives cost about $30. For more information, go to www.infinitytools.com, or call Infinity at 877-872-2487.

—W.D.

***Interchangeable carbide knives, ground to a mirror finish.*** *Insert tooling used to be available only for industrial shaper/cutters, but now is found on router bits, so buying multiple sets is more affordable.*

POWER TOOLS

## Ridgid belt sander is well designed

**RIDGID'S NEW VARIABLE-SPEED BELT SANDER** is a thoughtfully designed tool with a sturdy feel and attractive features. Heavier 4x24 and 3x24 sanders may be better suited for sanding large surfaces, but the Ridgid R2720, like other 3x21 sanders, is more maneuverable and easier to use off the bench—held horizontally to scribe woodwork to the wall, for example.

Among praiseworthy features: a trigger lock and a speed-adjustment knob that are easy to reach, a lighted plug that tells you at a glance whether the sander has power, a dust bag that is simple to attach and detach, a multi-position front grip, and a hook-and-loop strip to contain the 12-ft. power cord. The sander's in-line design keeps it narrow and means it can sand flush with a vertical surface on one side. Its rubber-like grips are comfortable.

My only gripe was with the platen: It was held in place by two screws whose heads were not fully set into the surface. It was easy to countersink the holes a bit deeper and solve the problem. The sander retails for about $180.

*—Scott Gibson is a woodworker and a writer in Maine.*

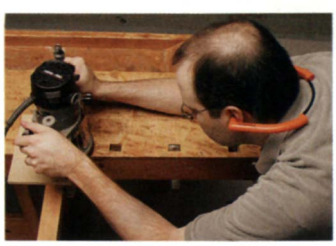

***Lightweight and aggressive.*** *This new belt sander from Ridgid is powered by a 10-amp motor, and the profile of the design allows the user to sand flush with another surface on one side of the tool.*

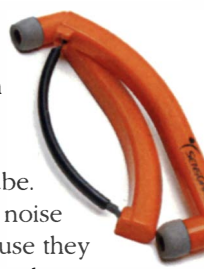
ACCESSORIES

## EAR GUARDS ARE LIGHT BUT EFFECTIVE

**WE'VE ALL HEARD THE TERM "AN OUNCE OF PREVENTION,"** but in this case it's 1.7 oz.—the weight of the new ZEMs hearing-protection system made by SensGard. Sound in the ear canal is directed into a hollow chamber where it is absorbed by a dampening material and cancelled out by reflection from the ends of the tube. After several months of use, I found the noise reduction comparable to earmuffs. Because they are so comfortably small and light, I wear them around my neck and put them on every time I do something noisy. They cost $25. For more information go to www.sensgard.com or call 877-208-0883.

*—Craig Smith is a woodworker in upstate New York.*







Photo, bottom: Bill Duckworth

HAND TOOLS

## AURIOU SCRAPERS HANDLE MANY MOLDING PROFILES

The eight-piece set of Auriou cabinetmaker's scrapers, which comes with a micro-burnisher, fits a wide variety of moldings made by both older molding planes and newer router bits. The African rosewood handles fit comfortably in hand. The flattened profile and oval ferrule prevent the scrapers from rolling off the bench and allow them to be held in a vise for burnishing the edges. Beware: Turning the burr on some of the smaller profiles takes some concentration.

At $229 for the set (www.thebestthings.com), with smaller sets available, these tools might be a luxury purchase for some woodworkers, but well worth it for those who can afford it.

—PHILLIP LOWE teaches woodworking in Beverly, Mass. (www.furnituremakingclasses.com)

***Premium-quality hand tools made in France.*** *Auriou, a well-known maker of rasps, rifflers, and carving chisels, also makes this finely crafted set of scrapers. They are better than sandpaper for cleaning up the surfaces of carvings and moldings.*

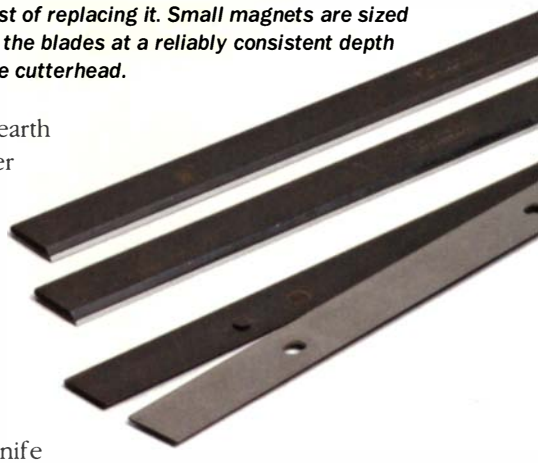
ACCESSORIES

## Quick-change knives for planers and jointers

CHANGING KNIVES on my planer used to be one of the most dreaded chores in my shop. Even with the relatively good setting gauge I bought a few years ago, the process took at least an hour. I recently came across an advertisement for the Dispoz-a-Blade disposable-knife system, ordered a set for my old Belsaw planer, and couldn't be happier with the results.


***Disposable blades without an expensive cutterhead change.*** *The author converted the cutterhead on an old 12-in. planer (above) for a fraction of the cost of replacing it. Small magnets are sized to locate the blades at a reliably consistent depth within the cutterhead.*

Dispoz-a-Blade uses double-edged, disposable knives. They are located precisely by pins on a reusable holder, and are secured in the cutterhead slot by knife supports, which are rare-earth magnets accurately sized for proper blade extension. Changing knives or reversing the blades to a sharp edge is a simple matter of loosening the gib screws, removing the knife and holder, changing or rotating the knife, reinstalling the holder in the cutterhead, and tightening the gib screws. Shifting a nicked knife is equally simple. The initial setup took about half an hour, and the cutting action is as good as my original knives freshly sharpened and accurately installed.



A set of three disposable 12-in. knives costs $39, which is comparable to the cost of a couple of professional sharpenings. A 12-in. starter kit, which includes a set of three knives, three holders, and six Posi-Set knife supports, costs $263 (plus shipping and handling). Sets are available in 6-in., 8-in., 12-in., 15-in. and 24-in. sizes for virtually any planer or jointer. Contact Dispoz-a-Blade at 800-557-8092 or www.estausa.com to order or to find a dealer.

*—Roland Johnson is a contributing editor.*



Photo, top right: Roland Johnson

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# Inner fire

## TAKING ADVANTAGE OF WOOD'S LUSTER

BY THOMAS R. SCHRUNK

If you've ever made a mahogany frame-and-panel door, you've probably wondered why sometimes the rails appear light while the stiles are dark, and at other times the appearance is reversed. Or perhaps that book-matched veneer you labored over is dark on one side and light on the other, undoing your efforts to achieve perfect symmetry. You also may have marveled at how some boards appear to glow when the light strikes them in a certain direction. What you are seeing is two sides of the same coin, namely, luster.

Luster is a natural quality of wood that can add great interest to a piece of furniture, or can distract from it. Understand the physical causes of luster and you can use different woodworking techniques to conceal it or reveal it.

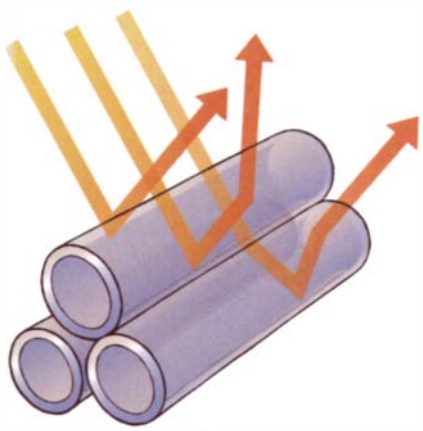
***Room divider.*** *Squares of lustrous, striped mahogany veneer, cut at different angles to the grain, flow across the four panels of this room divider.*

### How the structure of wood reflects light

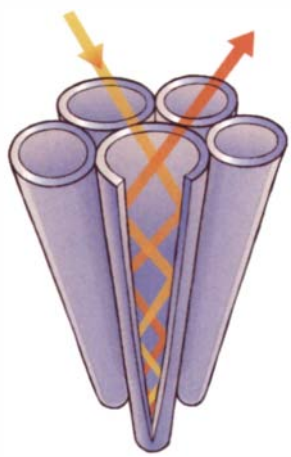
Wood is made up largely of vertically aligned cells called trachaeids. Shaped like double-ended needles with hollow centers, trachaeids are 100 to 150 times longer than they are wide. Almost transparent in the sapwood, those in the heartwood normally are colored with extractives, a mixture of resins, tannins, and waxes that insects and microbes find difficult to digest. These extractives can be opaque or transparent in different woods and help determine their luster.

Viewed under a microscope, these cells appear as glassy tubes, pressed intimately together. As light strikes the surface of a cell, a small percentage is reflected back, while the rest enters the cell at a slightly altered angle (refraction) and continues to the inner cell wall. There, a small

### LIGHT REFRACTION IN WOOD



The rounded nature of most cell walls means that light is bent in many angles before it re-emerges. It is this light, re-emerging quickly from the cells, that we refer to as luster.



When entering end grain, light must travel 100 to 150 times farther before finding a place to reflect or refract. For this reason, end grain is always darker than long grain.

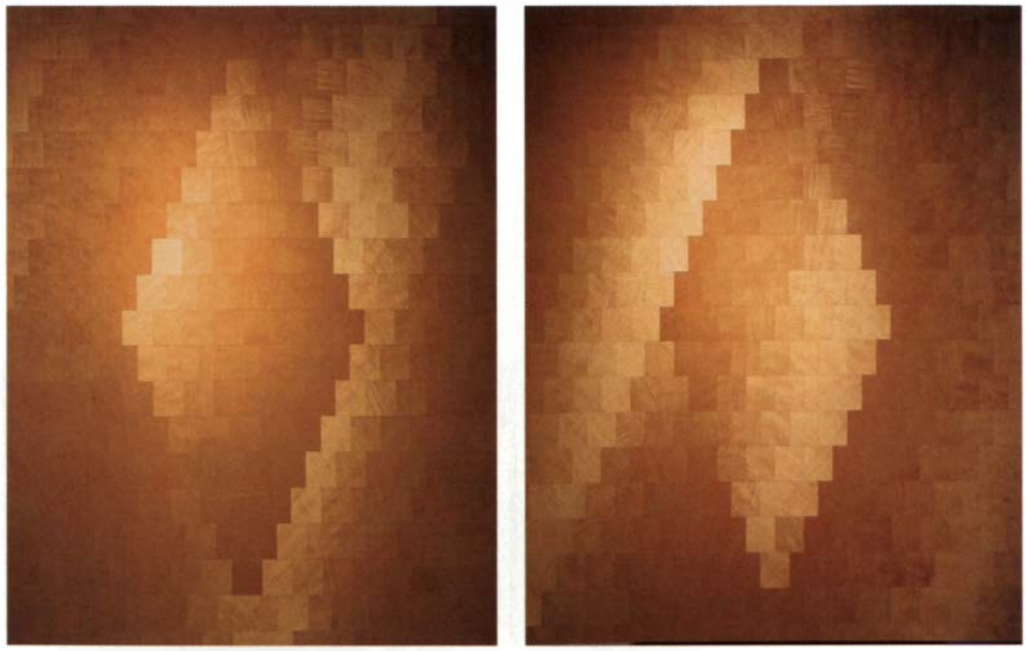


Photos: Mark Schofield; drawings: Stephen Hutchings

### 90° MAKES THE DIFFERENCE

**The central section of this panel is made visible by the difference in luster between it and the outside section. This is because the squares in the center have been placed at 90° to those on the outside. The panel relies solely on luster for its interest, as the quarter-sliced maple veneers have almost no visible grain.**

***Change the angle to change the look.*** *This cherry block shows that by simply rotating the piece, you can vary the appearance.*



percentage of light bounces off and makes its way back out, and the rest penetrates farther, reflecting and refracting multiple times. It is this light, re-emerging from inside the cells, that we refer to as luster. The different cell structures of different species create their recognizable patterns of luster. Some light is absorbed and never re-emerges, and some is partially absorbed by the extractives.

**Some woods just have more—**Although luster can vary from board to board, and even within a single board, certain types of wood generally have more luster than others. Mahogany, birch, koa, and rotary-cut bird's-eye maple veneer can be especially bright; zebrawood, some rosewoods, and gumwood can appear devoid of luster because their cells contain opaque compounds that block light penetration.

Light is scattered more by figured wood than straight-grained wood. Straight-grained woods produce luster in fairly defined areas, while figured woods such as fiddleback, quilted, and pommele may give bright highlights from a much wider field, with darker areas often adjacent to and highlighting the bright ones.

### Making the most of luster

This light and dark contrast can either attract or distract. A half-round fan made from book-matched sections of fiddleback maple (see photo, right) exploits the alternating light and dark areas from panel to panel.

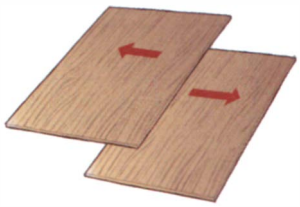
However, this dramatic contrast sometimes can make book-matching of lustrous woods problematic. A feature on one side of the line normally appears bright, while its mirror image can be quite dark, ruining the symmetry. Referred to as the barber-pole effect, it can be avoided by slip-matching the panels instead of book-matching them.

**The effect of surface treatment—**You are not entirely at the mercy of the wood when determining the degree of luster. The way that you sand and finish the surface plays a large role.

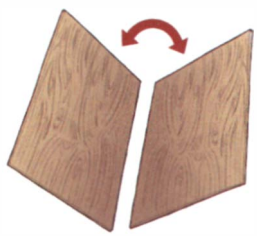
The best surface for revealing luster is devoid of scratches, dents, and dust. In theory, a handplane leaves the cleanest surface, but it may be difficult to achieve perfection over the entire surface.

Sanding is an easier surfacing technique, but the rougher the surface, the more the light will be scattered and the less luster you will get. When I want a piece to really glow, I sand to at least P320-grit sandpaper, and often to P400 grit.

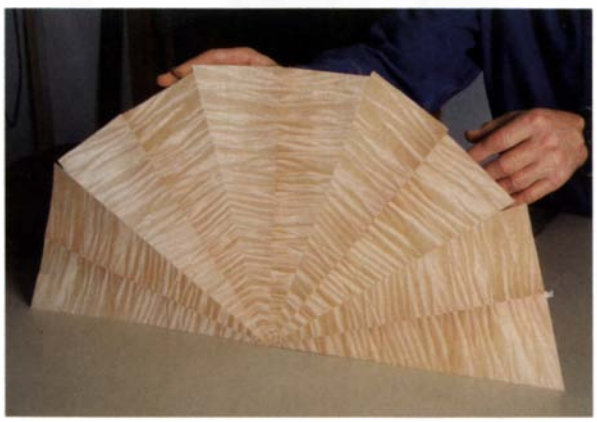
On darker, open-pored woods such as walnut and mahogany, allowing fine sanding dust to accumulate in the pores can spoil the luster. The finish simply



Slip-matching boards or veneer leads to consistent luster from panel to panel.



Book-matching leads to contrasting luster from panel to panel.



***Exploiting luster.*** *By book-matching each pair of sections, Schrunk took advantage of the alternating light and dark stripes to amplify the wood's fiddleback appearance.*

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The Taunton Press

### ENEMIES OF LUSTER

**Maximum luster requires a finish that conforms closely to the bare wood. Neither water-based finishes nor waxes provide such conformity. Also, nongloss finishes have matting agents, which appear under a microscope as small, translucent snowflakes. With multiple coats, these particles cloud the finish. And pigment stains, in particular, interfere with the passage of light into and out of the wood.**


isn't able to penetrate this fine dust, which makes the pores appear as light-colored dots. The best solution is to blow the pores clean with compressed air.

**How finishes enhance luster—**Luster is an optical phenomenon, and to achieve the highest and purest display you need the purest optics. This means you will need a gloss finish that attaches closely to the wood cells, with a finely polished surface atop the finish.

We all are familiar with the dramatic color change that happens when wood has been wetted, either with water or with finish. When the wood is dry, light passes from a low-density medium (air) to a relatively high-density medium (wood cells). This density differential at the interface significantly hinders the passage of light from one medium to the other. When we add a medium-density liquid that intimately conforms to the surface, the density differential is considerably more favorable, and the full depth of color and contrast becomes visible.

It is this intimate conformity that makes the difference between finishes: Waterborne finishes and waxes don't bring out the full color of the wood because they can entrap a thin layer of air, which keeps the finish from making full contact with the cell surfaces. Oils and solvent-based finishes achieve much more intimate contact and make the passage of light more pure, fully deepening the wood's color. If you wish to use a waterborne topcoat, prefinishing with shellac can provide a clear layer to which the waterborne or wax finish can bond for better results.

For maximum luster, apply a gloss finish. Cans of semigloss, satin, and matte finish all have matting agents to cut the gloss. Under a microscope, these appear as small, translucent snowflakes. When the solvent evaporates and the finish cures, these snowflakes cause a roughened surface. With multiple coats, these particles cloud the finish and disperse the luster. Creating a satin finish with steel wool also will lessen luster.

Luster also requires that there be a smooth, filled surface. A finish that is dimpled at each pore makes each one a concave lens, which creates tiny bright lights all over the surface, distracting the eye and interfering with luster.

I'm a purist when it comes to coloring wood. I tell my clients, "If you want a different color, use a different wood." Avoid pigmented stains that contain opaque particles that adhere to the surface (or are suspended, as in varnish stains) and block light as it enters the wood. The reduced light that makes it into the wood cells must go through these same blocking particles to escape. If you must alter the color of the wood, use water-based dyes that go into the cell structure and actually change the color of the cell-wall components.

Of course, if you want to kill luster stone dead, stop sanding at 60-grit, apply a pigment stain, then topcoat with a nongloss, water-based finish!

If a piece is being designed for a specific location where there is a fixed source of light, such as a window, you can incorporate luster into the design process. Even something as basic as laying a wooden floor should take luster into account. You will get a light, bright floor if the boards are laid at the viewer's mirror angle to the light source. The floor will appear darker when viewed from the other side of the room.

Once you discover luster, it opens up a whole new aspect of woodworking. □

### FINISHES THAT BRING OUT LUSTER

**Good choices include shellac, oil-based varnish, and lacquer. These, rather than grain fillers, should be used to fill the grain and built up until there is a glass-smooth surface.**

# Build a Pie Safe

## A 19th-century cook's companion adapts well to modern storage

BY MIKE DUNBAR

When my wife and I decided recently that we needed more room for her holiday dishes and large servingware, we agreed that an attractive way to store them would be in a hardwood pie safe. Although the first pie safes were built to protect cheese and baked goods in 19th-century kitchens, their simple design adapts comfortably to today's more modern and more formal surroundings.

Being pieces of utilitarian kitchen furniture, most of the early pie safes were quite simple, sometimes downright crude. The average piece was made at home from local softwoods such as pine or yellow poplar and finished with paint. Still, some very sophisticated and elegant hardwood pie safes were made in cabinet shops for those families who could afford the very best.

This pie safe was inspired by the more formal examples. I kept the simple design of the originals but made it more of a showpiece by using figured hardwood—yellow birch with a flame figure.

### The carcase is a large frame

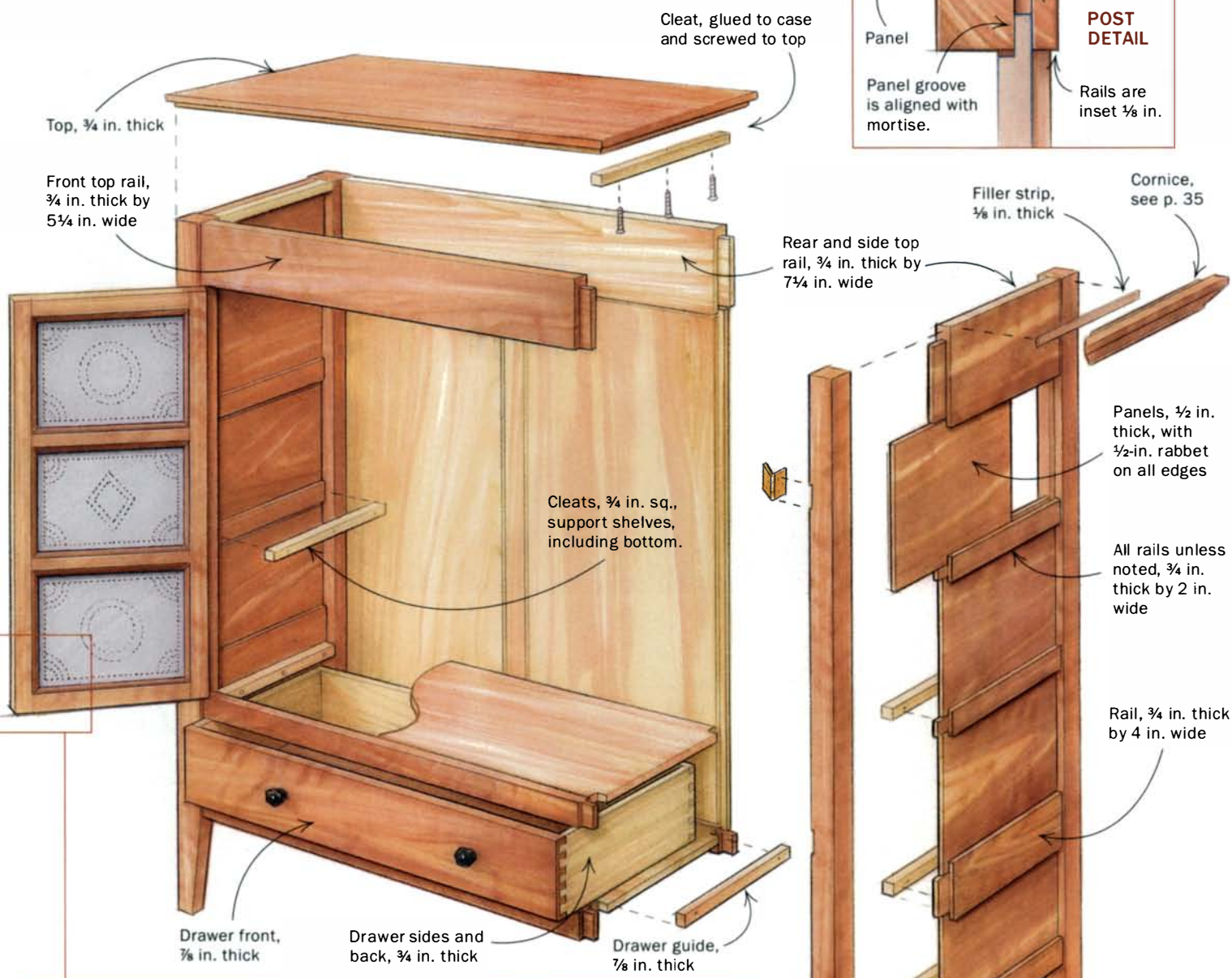
Most of the joinery for the case can be tackled on the mortiser and tablesaw. The challenge is in staying organized while cutting the 48 mortise-and-tenon joints the piece requires. Make the mortises in the



Photos: Steve Scott

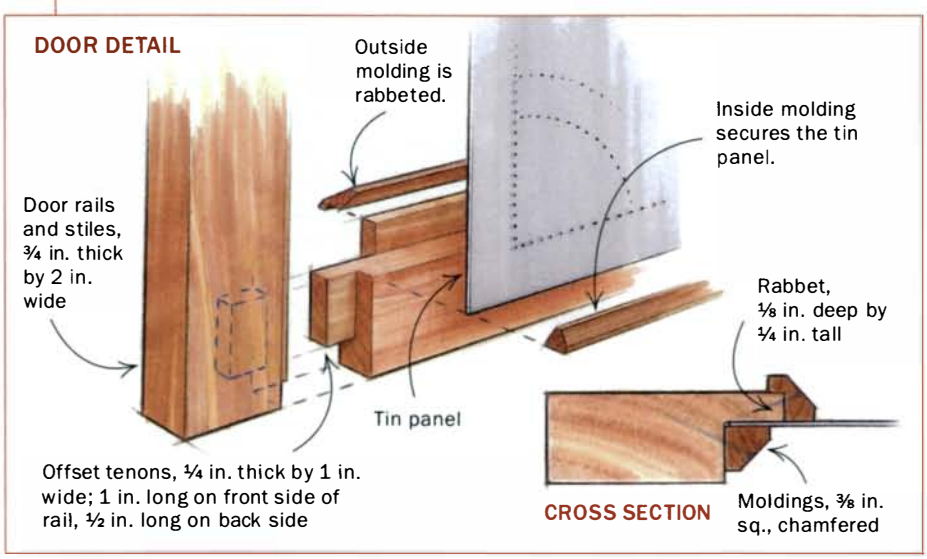
## A STUDY IN FRAME AND PANEL

**This 19th-century pie safe is made of flame birch, with tin door panels. Eastern white pine is used as a secondary wood for the back panels, shelves, and shelf cleats.**





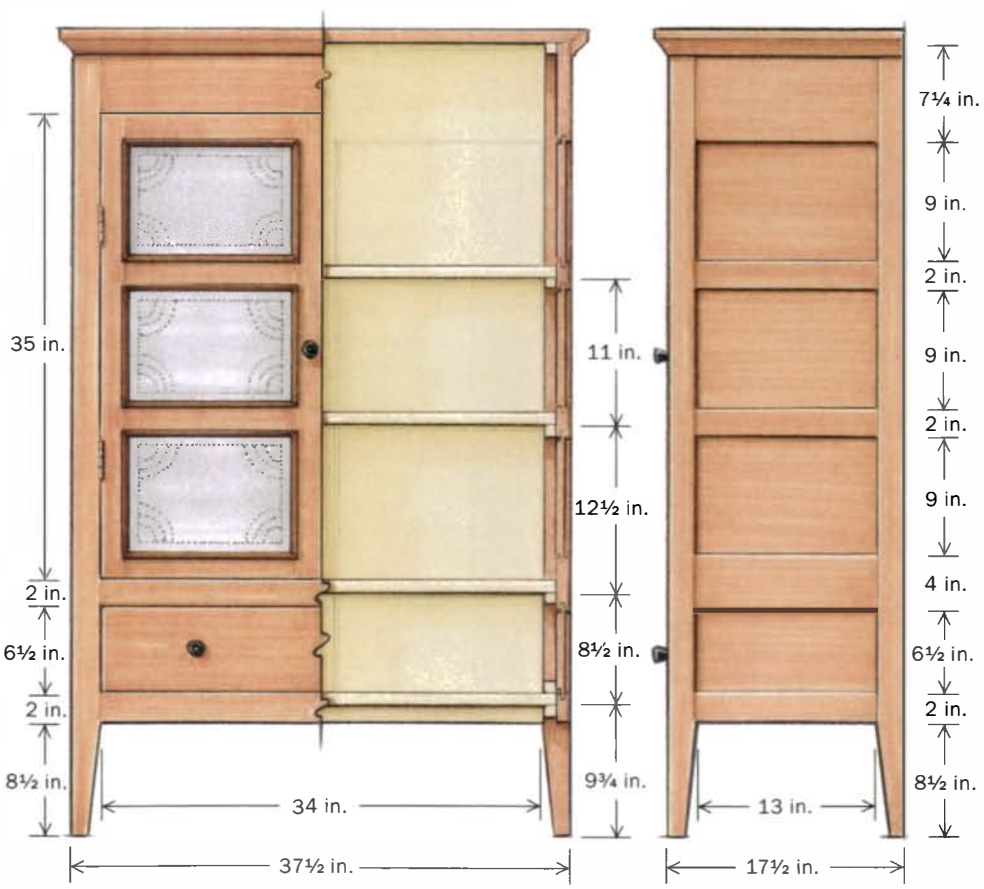





Drawings: Bob La Pointe

## START WITH THE ENDS WHEN GLUING THE CASE

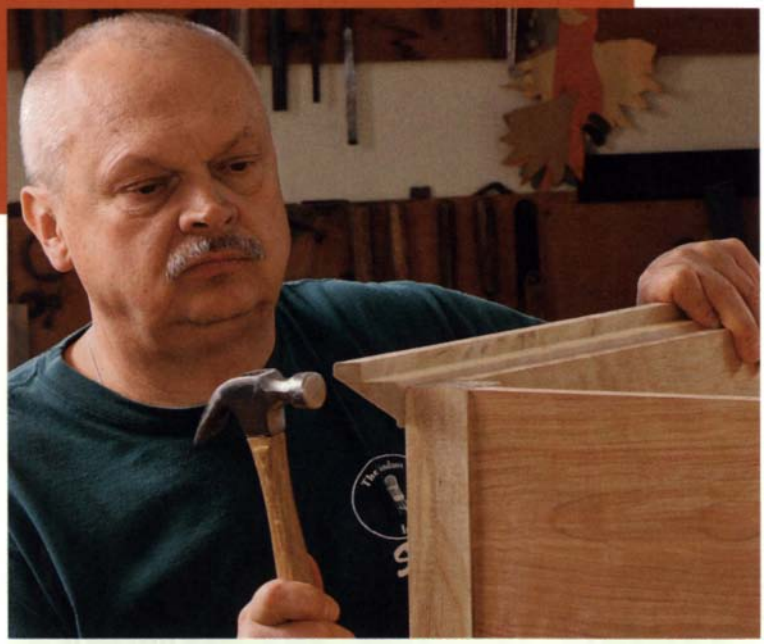
***Slide the rabbeted panels into position and clamp everything.*** *Then join the case together. Glue up the stretchers and back, and put the whole assembly under clamps.*




posts first. Because all the posts are identical, confusing them is a real possibility. Mark each with its location in the frame. Then identify the surfaces to be mortised. Finally, lay out the mortises. Check your work one last time before cutting. With the mortises cut, it is possible to cut and fit test tenons on a piece of scrapwood until you reach a setup that gives you a smooth, easy fit. Cut the rail tenons and dry-fit the frame under clamps so that you can check it for square.

For the side panels, I chose a birch board with a pattern of circles that resembled a string of pearls running up the center. It is a pattern I do not recall seeing before. Lay out the order of your panels in the board you choose and cut them to dimension. Identify the front surfaces and cut the rabbets. At the same time, cut the rabbets on the large pine panels for the back.

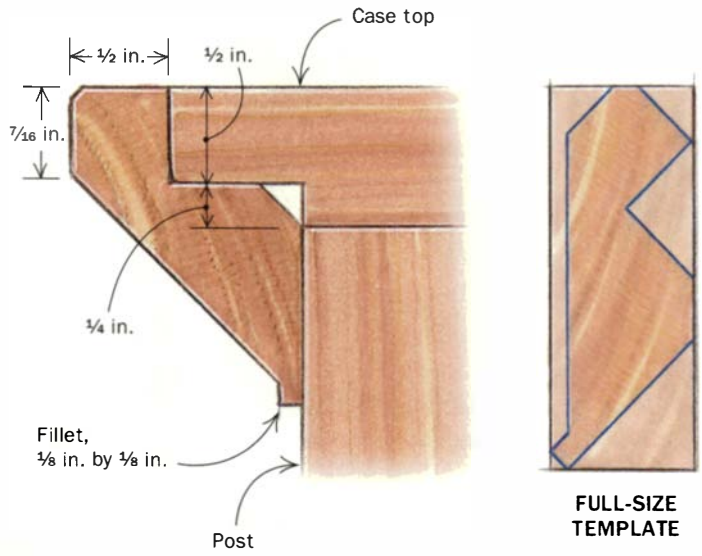
Groove the posts and rails to receive the rabbeted panels. In the posts, the groove's lower end is blind (stopped) to prevent it from showing in the legs. I did this by starting the router cut in the lowest mortise. Some pie safes had punched-tin panels on the sides as well as the doors. If you choose this approach, you will have

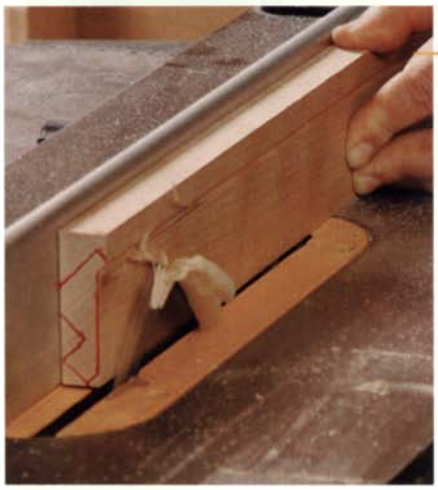


***Tack the cornice into place.*** *The molding's angular profile accentuates the square corners of the piece.*

## Crown molding that you can make on the tablesaw

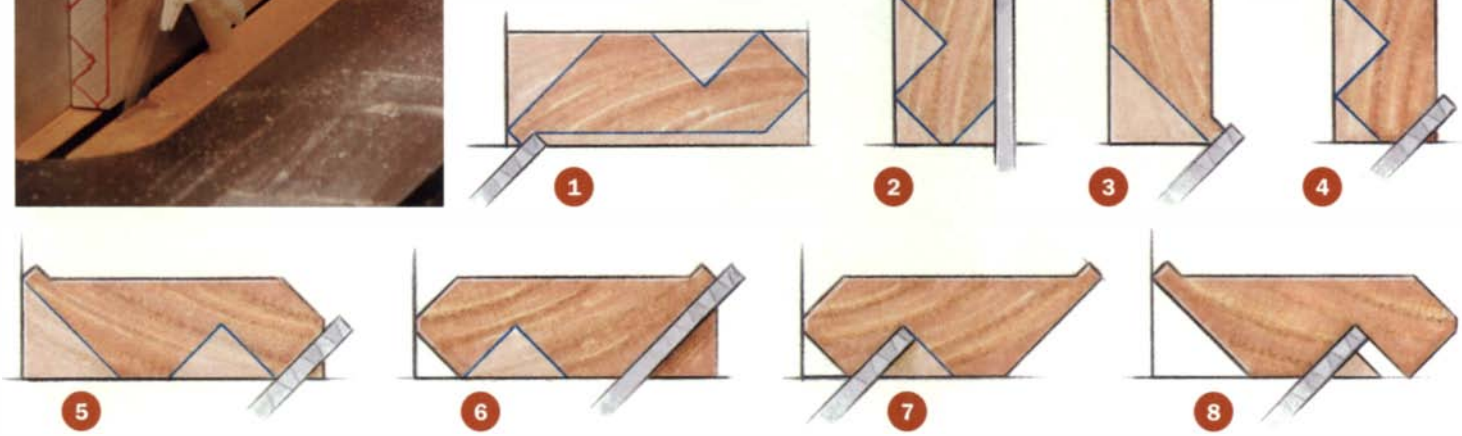
**A series of angled cuts yields a rabbeted cornice that accepts the top of the case and creates a flat surface for displaying items on top.**



### CORNICE CUTTING SEQUENCE

**This simple, angular profile can be milled from a piece of stock ¾ in. thick by 2 in. wide. It requires a series of eight cuts, all but one made with the blade tilted to 45°. Cutting in the sequence shown ensures a flat reference face for each cut.**




to rabbet the rails and glue vertical support strips to the posts.

Take apart the carcase. This is a good time to taper the posts. Dry-fit again with the side and back panels in place, and pull the frame together with clamps. When satisfied, disassemble the parts and remove any machine marks and other blemishes that would show through the finish. I handplaned each surface, but sanding or scraping also would work. When the glue is dry, secure the shelf cleats and fit the shelves, including the bottom panel. You can secure the shelves in place, but I let gravity do the job.

### A cornice that doesn't hide the top

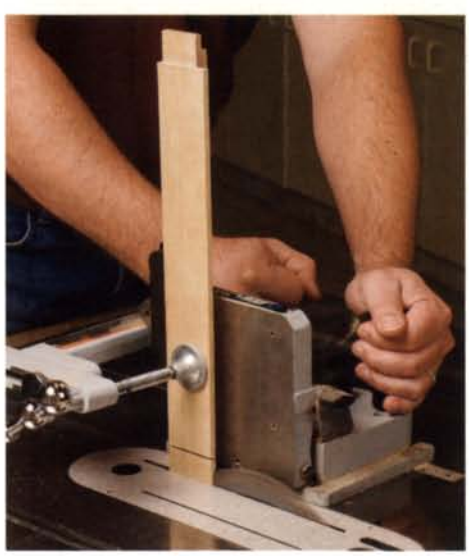
The cornice figures prominently in this pie safe. My wife wanted to use the top of the pie safe as a display shelf. For that reason, I made the cornice sit flush with the top, cutting a rabbet into the back of the cornice to accept the edge of the top. This way, objects placed there will be entirely visible. The pie safe is square and flat. I wanted to use a cornice that continued that theme but added some visual interest. What I like about this one is that it is made completely on the tablesaw (see drawings, above).

Fit the cornice and top to the frame. When satisfied with the fit, screw the top in place through the interior cleats and nail the cornice in place with finish brads. Because the rails are recessed ⅛ in. from the front of the posts, I used a ⅛-in.-thick

## RABBET THE DOOR FRAMES BEFORE ASSEMBLY

***Rabbet all the rails and stiles at once.*** *This means fewer setups on the tablesaw.*

***Cut mortises before tenons.*** *The tenons then can be sized for a precise fit.*



***Rail tenons look lopsided.*** *The joinery needs shoulders of different heights to seat properly in the rabbeted stiles.*

spacer behind the cornice that matched the width of the cornice and the length of the rails.

### Assemble and fit the doors

To make the doors, begin by cutting a rabbet on the rear inside edges of the stiles and rails. Next, mortise the stiles. The mortises are cut into the rabbets' shoulders and are of necessity only ¼ in. wide.

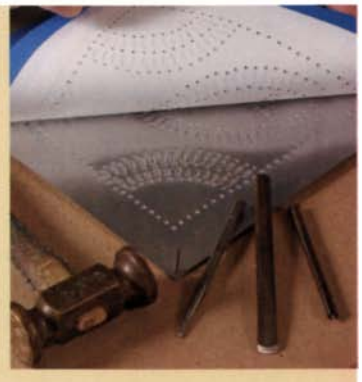
The tenons on the rail ends have offset shoulders to accommodate the rabbets in the stiles. Cut the tenon shoulders in all the rails first, taking care to ensure that each tenon's short side is cut on the back side of the rail. Use a tenoning jig to cut the cheeks, raising the blade to cut the longer surfaces. Dry-fit the doors under clamps and check for square. Scrape, sand, or plane all visible surfaces, and glue and assemble the two doors.

Fit the doors to the carcase and mount them on their hinges. With the hinges fitted, mount the tin panels. As an accent to the light-colored birch, I chose to hold the tins in place with walnut molding inside and out that also acts as a shadow frame. The outside molding is rabbeted in the back

***Assemble the door frames.*** *Dry-fit the doors, check them for square, and prepare surfaces for finishing before breaking out the glue bottle.*

***Tack the tin onto an MDF backer board and tape the pattern in place.*** *Punch the tin through the pattern using consistent force to ensure an even result.*

## Punching tin



**The punched-tin door panels for this pie safe were easy and fun to make, requiring a few simple tools and some inexpensive materials.**

**Punches can be found online for as little as $4.95 (www.piercedtin.com). A basic pointed tool and a chisel-type punch should be enough to make an attractive design. A 10-in. by 14-in. sheet of tin costs $3 at Van Dykes Restorers (www.vandykes.com). Patterns are available from craft stores, or you can make your own by tracing or photocopying images that appeal to you. Be sure to choose a design that isn't too busy and that lends itself to making a clear silhouette. Consider wearing some support for your wrists. After a lengthy punching session, the hammer may leave the upper arm and wrist sore, and keeping a tight grip on the punch also can cause an aching thumb and forefinger.**

***--Priscilla Chellis***

so that it fits over the edges of the doors and overlaps the stiles and rails. I glue the outside molding into place, but secure the inside molding with brads.

### Apply the finishing touches

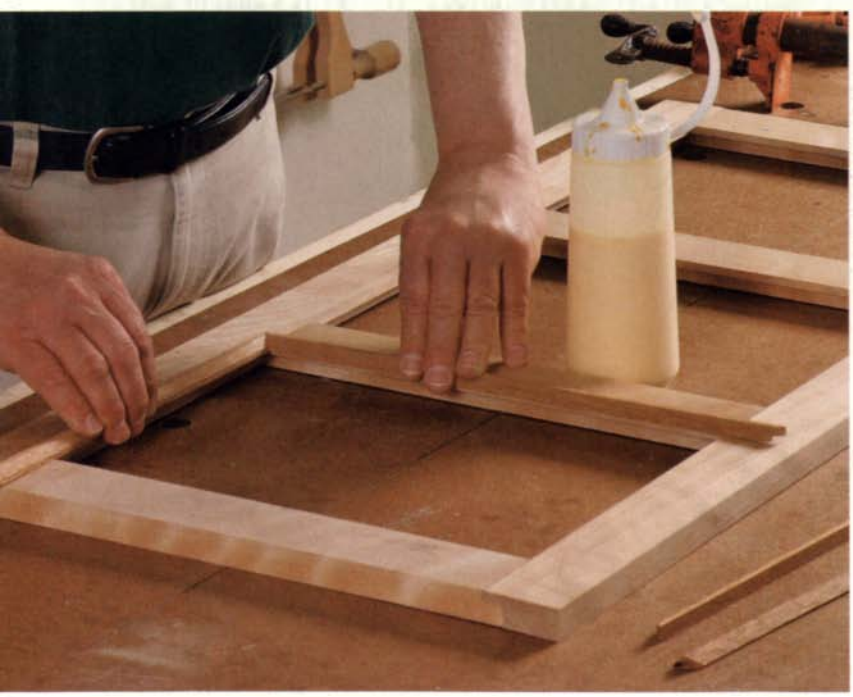
The drawer construction contains no surprises. I hand-dovetailed mine. You can use any drawer-construction techniques that you prefer.

The drawer will be used to store linens, which are lightweight. For that reason, I felt perfectly comfortable with the traditional solution of gluing in hardwood runners instead of installing heavy-duty drawer slides.

The final touch is the hardware. Because pie safes come from a particular period, I chose to remain within the flavor of that time. Rather than plain butt hinges, I selected distinctive late-Victorian hinges with removable pins. The green glass pulls evoke the same period.

There is a lot of contrast between yellow birch's tan-colored heartwood and its creamy sapwood. I wanted to tone down this contrast while making sure the flame remained visible, so I stained the piece with a strong brew of ordinary tea. I boiled a couple of cups of water and tossed in 10 tea bags, letting it brew for about 15 minutes. When the brew had cooled, I brushed it onto the piece. After the first coat had dried, I sanded with 330-grit paper. Not happy with the amount the wood had darkened, I applied a second coat and sanded again. Finally, I applied two coats of polyurethane, sanding each with 330 grit. □

*Mike Dunbar is a contributing editor. His assistant, Fred Chellis, and his wife, Priscilla, helped in the construction of this project.*



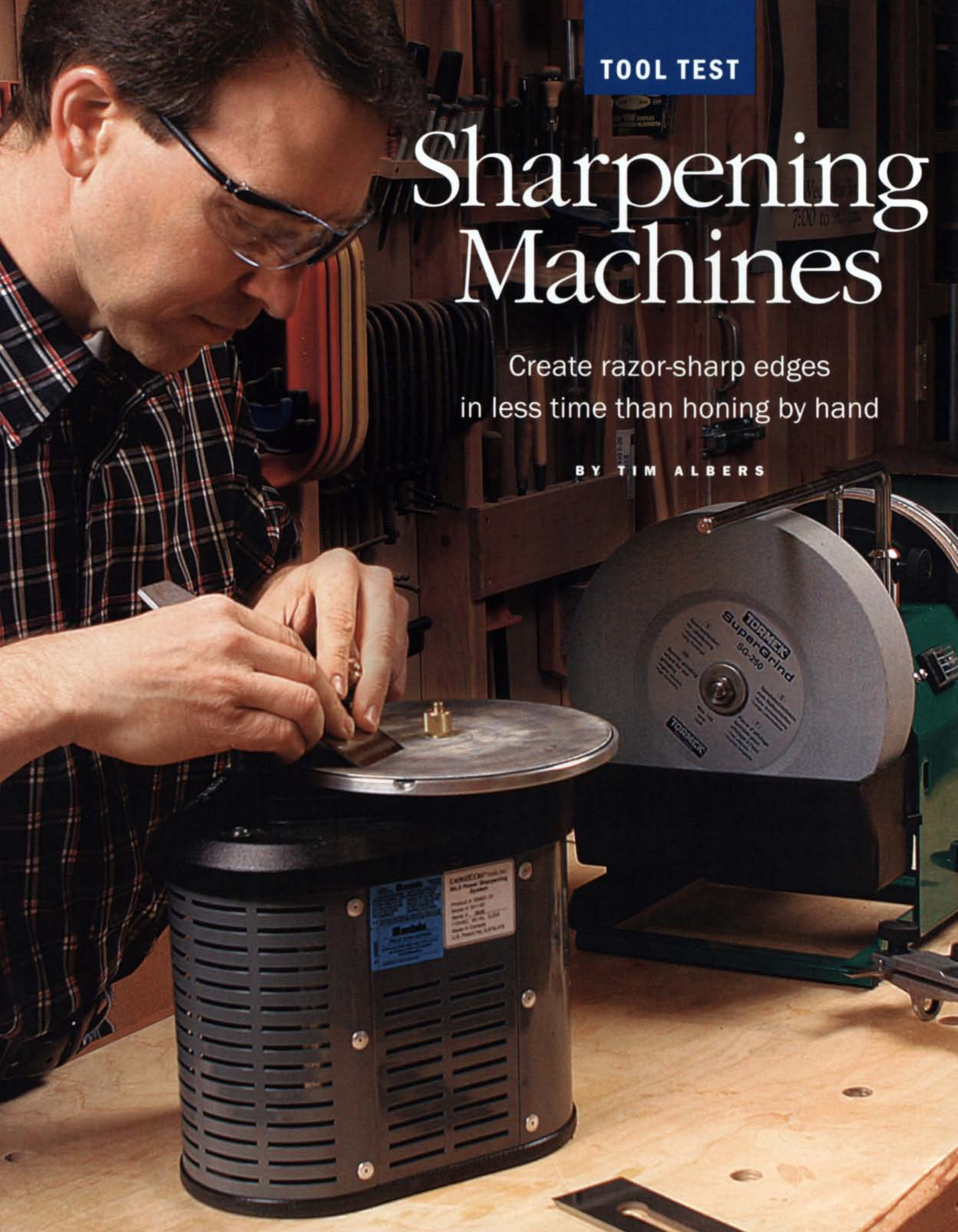
***Secure the tin panels from the rear.*** *A strip of molding, mitered and tacked into place behind the tin sheet, holds the panel in the frame created by the rabbets in the rails and stiles.*

TOOL TEST

# Sharpening Machines

## Create razor-sharp edges in less time than honing by hand

BY TIM ALBERS



When I'm in the middle of a project, I hate to stop and sharpen my tools. Instead I find myself picking up another chisel or plane—even if it's not ideal for the task at hand. Only after I have exhausted my supply of sharp chisels and plane irons will I dedicate time to sharpening, and at that point I typically have a day's worth of tools to grind and hone.

So naturally I was curious about the host of motorized systems on the market that promise to make sharpening not only faster and more convenient but also more accurate. The machines vary from horizontal sandpaper platters to water-cooled wheels. Some also include a dry, high-speed wheel for rapid grinding, but I excluded standard bench grinders from this review because they are not marketed as complete sharpening systems.

To evaluate the best edge each system could produce, I sharpened a plane iron on each one and installed it in a well-tuned handplane. I then compared—system to system—the quality of cut and ease of planing on figured maple, one of the more challenging woods. I did the same for chisels, comparing their ability to pare end grain cleanly. Last, I checked to see how these systems performed with turning tools, short blades, and carving tools.

I found that a few of these machines really are complete sharpening systems that can replace the bench grinder, sharpening stones (or sandpaper system), and grinding and honing jigs. Others work for grinding only; with these you'll need to keep your honing tools.

### A few machines stood out

The Veritas is my choice for the best overall machine. For sharpening chisels and plane blades, it generates results equal to those achieved with the finest sandpaper or waterstones, but it cuts the time significantly and makes the process much easier.

I didn't choose one of the machines as the best value, because I still would recommend a bench grinder and sandpaper or stones as the least expensive option for an entire sharpening system. Just be sure to use a good honing guide.

If you want to upgrade your bench grinder only, the relatively inexpensive Delta 23-710 will flatten backs and grind bevels accurately with little chance of overheating the edges.

*Tim Albers is a hobbyist furniture maker and tool refurbisher in Ventura, Calif.*

## WET-GRINDING WHEELS

**With their slow speeds and constant streams of cool water, these wet-grinding wheels won't burn any edges (which removes hardness). However, only the Tormek and Scheppach machines offer a means to move beyond fine grinding into true honing.**


# Delta 23-710 Sharpening Center

**Source:** www.deltawoodworking.com
**Price:** $160
**Flattening/lapping backs:** Good
**Grinding bevels:** Very good
**Honing:** n/a

**The Delta model 23-710 is a two-part machine, offering a fast, dry-grinding wheel coupled with a horizontal, 1,000-grit stone spinning at about 400 rpm and kept wet by a drip system. For establishing the initial bevel on a tool, the small, friable white wheel will remove a lot of steel without overheating it, and the extra width is convenient. The traditional L-shaped tool rest is a bit crude, but with a little experience users can produce consistent results.**

**The wet wheel is really the heart of the machine and the reason most woodworkers would consider purchasing it. Once set up, the tool rest works well for grinding the bevel on most tools. The tool clamp holds the tool square to the wheel as you move it from side to side. This system is an upgrade over a standard bench grinder, but keep your sandpaper or stones for honing a truly sharp edge.**

**For flattening the backs of blades, the 1,000-grit wheel works well but takes longer than sandpaper on a flat surface would. And when you are done, the surface requires additional work with finer stones.**

***First-time setup is fussy.*** *At least four adjustments are needed to set up the tool rest for sharpening.*

***Lapping is effective but inconvenient.*** *You'll either have to remove the tool rest or lower the splash guard, sending water flying.*

Photos: Asa Christiana


## Delta 23-700 Sharpening Center

**Source:** www.deltawoodworking.com
**Price:** $155
**Flattening/lapping backs:** Fair
**Grinding bevels:** Good
**Honing:** n/a

**The 23-700 incorporates a traditional dry-grinding wheel for initial grinding and a slow-speed wet-grinding wheel for finer work. The 10-in.-dia. wet wheel spins at an extraslow 70 rpm.**

**Tool backs must be flattened on the small usable side surface of the wet wheel, which is awkward. Backs and bevels ground on the 1,000-grit wet wheel must be further honed on sandpaper or stones to produce a truly sharp edge.**

**Grinding the bevel goes quickly if you use the dry wheel to establish the bevel, and refine the edge on the wet wheel. The tool rest for the wet wheel has drawbacks: It is easy to adjust and has a large working surface, but it is too large for short chisels and occasionally flexed during use.**

***The dry wheel has a poor tool rest.*** *It is rounded and too far from the wheel.*

***Wet wheels grind nicely but don't hone.*** *On this machine, a small miter gauge keeps the tool square for an accurate grind.*

## Makita 9820-2 Blade Sharpener

**Source:** www.makita.com
**Price:** $260
**Flattening/lapping backs:** Good
**Grinding bevels:** Good
**Honing:** Fair

**The Makita model 9820-2 uses a horizontal, 8-in.-dia., 1,000-grit waterstone, spinning at 650 rpm and kept wet by a drip system. There are optional 60-grit and 6,000-grit wheels. While the tool-rest assembly is substantial and easy to adjust, it has no blade holder for chisels and plane irons. The 1,000-grit wheel flattened backs and ground bevels a bit more quickly than the other 1,000-grit wheels in this review. When working the backs of tools, however, the splash guards had to be lowered.**

**To get the best edge possible, I tested the Makita system with the 6,000-grit waterstone. It yielded a scratch pattern equal to a 4,000-grit (or less) waterstone, so the edge required honing on finer abrasives. Also, it took a few minutes to switch stones and readjust the tool rest.**

***Great for planer knives.*** *The tool rest and tool clamp are designed for sharpening planer and jointer knives and work well.*

***Not as good for everything else.*** *Chisels and plane irons must be guided freehand on the tool rest.*

# Scheppach TiGer 2000

***Rougher grinding means slower honing.*** *Even when graded to its finest grit, the Scheppach's grinding wheel (top) leaves deeper scratches than the Tormek's does, which means more time at the honing wheel (bottom).*


**While the Scheppach TIGer 2000 has been produced and sold in Europe for several years, it is new to the U.S. market. It is very similar to the Tormek in its appearance, operation, and wide variety of tool-holding jigs.**

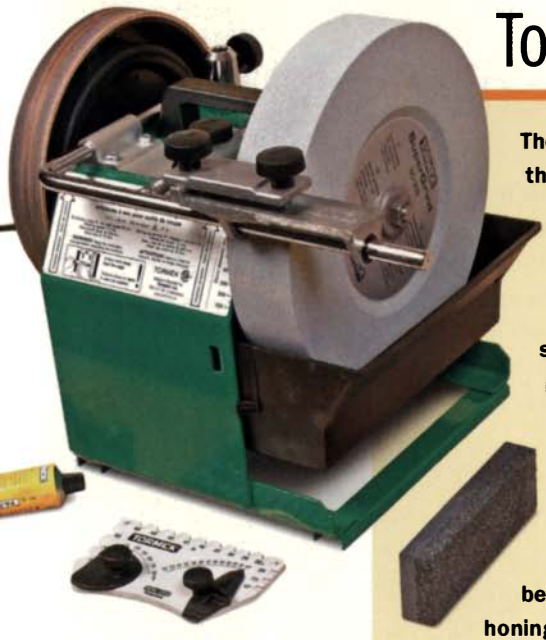
**The wet wheel on both machines can be modified from rough to fine with a grading tool. Opposite the grinding wheel is a slightly smaller, leather wheel, which gets charged with honing compound.**

**While the initial setup is simple, the owner's manual is crude in comparison to the Tormek. But the TiGer offers nearly as many sharpening jigs, and they attach in the same way.**

**The major difference between the two machines, when it comes to flattening backs and grinding and honing bevels, is that the finest grind achieved with the TIGer is coarser than that of the Tormek. So you'll spend more time at the leather honing wheel removing the deep scratches left by grinding. Also, at less than 8 in., the grinding wheel is smaller, and the container for the honing paste is awkward. That said, the Scheppach TiGer is an effective and versatile machine, which retails for less than the Tormek.**

Source: www.hartvilletool.com
Price: $300
Flattening/lapping backs: Fair
Grinding bevels: Very good
Honing: Very good

# Tormek SuperGrind 2006



**The Tormek employs a 90-rpm, 10-in.-dia. grinding wheel that runs through a water trough. The system offers a variety of optional jigs and excellent instructions for precise sharpening of just about any tool, including planer and jointer knives, axes, and scissors.**

**The heart of the system is the micro-adjustable steel rest, which supports the jigs solidly in different positions. The straight-edge jig is included with the basic machine. A bevel-setting guide quickly registers the tool against the grinding wheel at almost any angle. After establishing the bevel, the tool rest can be moved to the honing wheel or honing can be done freehand. It takes a couple of minutes to grind and hone an edge—just a little slower than the Veritas.**

**The basic machine is $400; a deluxe system with all 13 accessories is priced at more than $900.**

Source: www.sharptoolsusa.com
Price, as equipped: $400
Flattening/lapping backs: Good
Grinding bevels: Excellent
Honing: Very good

***Flattening is easy on the side of the wheel.*** *But lapping is done on the leather wheel, and requires careful technique to avoid rounding the back.*

***A great grinder.*** *The clever tool holder offers easy setup and precise results.*

***Charge the leather wheel with honing compound.*** *Then switch over the tool rest, or do the honing freehand.*

## SANDPAPER PLATTERS

**These systems employ horizontal platters covered with adhesive-backed sandpaper. In general, they provide speedier grinding and honing than machines that use wet-grinding wheels.**

# Lap-Sharp LS-200

**The Lap-Sharp's abrasives are applied to 8-in.-dia. aluminum platters that can be changed quickly. The abrasives that come standard with the machine go up to 10 microns, equivalent to 800-grit sandpaper, so I opted for the Polish Pack ($67), which includes three additional aluminum platters with 5-micron, 3-micron and 1-micron abrasives (1 micron is the rough equivalent of an 8,000-grit waterstone). The unit comes with an excellent manual and a DVD.**

**This very solid machine didn't slow even under heavy pressure. The foot switch is standard, and makes it possible to keep both hands on a tool when starting the machine, a help when working on the backs of tools. For working on bevels, I was slightly disappointed in the $80 tool-guide assembly. It works best when used with the tool clamp, which takes some setup. Once tightened, however, an excellent edge can be ground and honed quickly and accurately on chisels and plane irons.**

**Source:** www.woodartistry.com
**Price, as equipped:** $600
**Flattening/lapping backs:** Excellent
**Grinding bevels:** Very good
**Honing:** Very good

***Unmatched at flattening and lapping backs.*** *The foot switch and slow speed make the process easy to control, and the sandpaper quickly produces a mirror polish.*

***The tool clamp could be better.*** *You must eyeball the angle to determine blade extension, and use a small square to ensure the blade is 90° to the clamp.*

# ShopStrop Precision Sharpening Kit

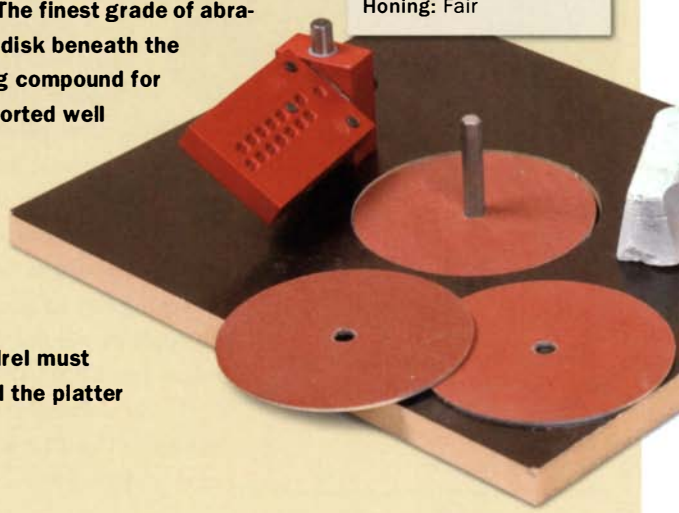
***Fast but inaccurate.*** *Runout in the thin aluminum platters creates rounded surfaces when lapping and grinding.*

***Tool holder requires trial and error.*** *To adjust it, the holder must be lifted off the guide post.*

**The ShopStrop is the only system in the group that is not self-powered. It is mounted on a drill press, which provides the power and a stable base for the sharpening platform. The ShopStrop uses three thin, 4-in.-dia. platters that slide over a mandrel, which is chucked in the drill press. The finest grade of abrasive paper is 600 grit, but a leather disk beneath the platters can be charged with buffing compound for final honing. The tool holder is supported well by a work platform and guide post.**

**The thin aluminum platters were distorted, which caused excessive wobble. I could create a mirror polish quickly, but the backs and bevels weren't flat. Also, for each abrasive change, the mandrel must be removed from the drill chuck and the platter re-leveled with the work platform.**

**Source:** www.bigleg.com
**Price:** $100
**Flattening/lapping backs:** Fair
**Grinding bevels:** Good
**Honing:** Fair



# Veritas Mk.II Power Sharpening System

Source: www.leevalley.com
Price, as equipped: $320
Flattening/lapping backs: Very good
Grinding bevels: Excellent
Honing: Excellent

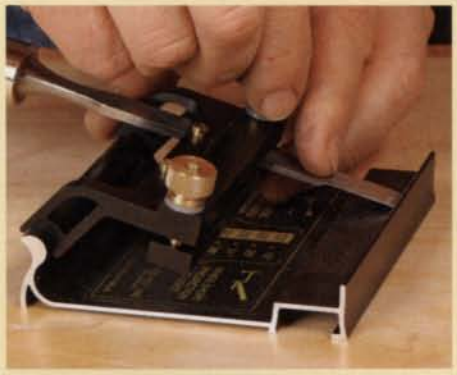
**The Veritas spins an 8-in.-dia., grit-covered disk at 650 rpm. The standard machine comes equipped with two dead-flat, stable aluminum platters, each with a different grit of sandpaper on both sides, with 9-micron (1,200-grit) paper the finest grit. As with the Lap-Sharp, a thumbscrew allows the platters to be changed out quickly. A great touch on the Veritas is that the two aluminum disks are of different thicknesses—4 mm for the coarse abrasives and 3 mm for the fine abrasives—creating an automatic 1° microbevel when you are using the tool holder and switch disks. The tool holder works for both straight-edged tools and skew chisels, both short and long blades.**

**I opted for the accessory felt wheel ($25), which is charged with honing compound ($7) and used freehand to deliver an edge equal to one honed on an 8,000-grit waterstone.**

**The Mk.II is a solid machine. Under heavy pressure, the disk spins smoothly and quietly at full speed. The cutting action is fast and aggressive, so it requires careful technique to get even results when flattening and polishing the back of a blade: Touch down an area far from the edge first, and then lower the leading edge onto the disk.**

**For working on bevels, the entire tool holder assembly is simple, solid, and well thought out. Because the machine works dry and can be left set up, periodic touchups can be completed quickly. Curved-edge tools can be guided by rocking them on the tool rest. While this is not an ideal approach, with a little practice I was able to put a uniform edge on basic turning and carving tools.**

**The downside to this machine is the continuing cost of abrasive disks, which are $2.95 each. However, the finest grits will last for 20 to 30 sharpenings, and the coarser disks much longer.**



***Setup is quick and precise.*** *A clever registration jig sets the projection of the tool for various angles, and the tool holder keeps the blade square and level.*

***The work goes quickly.*** *The speed of the platters makes for rapid cutting action, while the tool holder rides on a level rest for precise results.*

***Use the felt wheel for truly sharp edges.*** *This accessory wheel is charged with buffing compound and used freehand to bring backs and bevels quickly to a mirror polish.*

# Combining Dyes and Stains

## Use them together to bring out the best in a variety of woods

BY PAUL SNYDER

***Dye only.*** *Dye adds a uniform color change to the whole surface of the wood. The translucent color in dye will highlight a wood's figure without obscuring it.*

***Stain only.*** *The pigments in stain lodge in open-pored woods, emphasizing the grain structure. Because they add less color to tight-grained areas, stains do not add color evenly to a board.*

***Dye followed by stain.*** *A combination of dye and stain enhances both the curl and the grain, while the bright dye shining through the darker stain gives the wood a look of greater depth.*

You may think that the only reason to dye or stain a piece of furniture is to change its color, but many more subtle changes are possible. With dyes and stains you can pop the curl in curly maple, enhance the rays of quartersawn white oak, and give fresh-cut, pallid cherry the deep glow of an 18th-century antique. More often than not, the secret to using these products is knowing that coloring wood is not a single process, but a multistep technique that combines a dye with a stain.

### Different effects using dyes and stains

Some manufacturers tout combination dyes and stains as one-step solutions to coloring wood, but applying these elements separately will give you greater latitude over the final appearance.

The color of the dye will have a big impact on the look of the finish. Brighter colors, such as golden brown, red, yellow, amber, and orange create highlights that will transmit through a wide variety of stains, increasing the depth and visual appeal of the wood. A stain applied over the dye adds color, either by contrasting or harmonizing with the dye, and defines the grain and pore structure. Examples are dying walnut or mahogany yellow and then applying a dark stain, or using a red dye to enhance that tone in mahogany.

**Enhance the natural look of a wood**—Using colors that occur naturally in wood as it ages, you can give your piece an antique appearance. Use a dye the underlying color of the antique to bring out the figure and the chatoyance. Then use a stain to tweak the color, to enhance the grain, and to add depth.

**Replicate dark woods**—This two-step method also can be used to get a deep, dark color such as ebony or dark mahogany from a different wood species. Often a dye or stain alone won't produce these deep shades, but using a dye and a stain in the same color range will make the final color much darker.

### For subtle color change, try glazing with stains

Until now I've talked about applying stain directly to dyed wood. When a stain is applied over a coat of clear finish, it is known as a glaze. You can buy purpose-made glazes, or you can use a heavy-bodied stain such as a gel stain.

**First apply a washcoat**—Before using a glaze, seal the wood to prevent stain from penetrating it (possibly causing blotching),



Photos, except where noted: Michael Pekovich; this page, top left: Mark Schofield

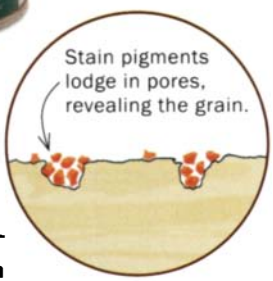
# The difference between dyes and stains




## DYES DISPLAY FIGURE

**Dyes are made up of molecular-size particles that attach themselves to wood fibers. Because dye particles are microscopic, they are essentially transparent and can add a lot of color without loss of grain definition. Dyes are available in liquid form or as powders to be dissolved in a solvent such as water, alcohol, or oil. Unlike pigments in stains, dye molecules stay in solution and don't settle to the bottom of the container.**

**Because dyes are transparent, they enhance the figure and make wood shimmer (an effect known as chatoyance). On highly figured woods like curly maple, dye produces a dramatic, three-dimensional look. But dyes do have limitations: They can cause bad blotching on woods such as pine and cherry, and can leave open-pored species like oak looking off-white.**




## STAINS ENHANCE GRAIN

**Stains consist of colored pigments combined with a binder that glues them to the wood. The binder can be oil, varnish, or acrylic (water-based), in liquid or gel form. Unlike dyes, which penetrate the wood, the pigments in stains color the wood by lodging in the grain and pore structure. This makes them a good choice for open-pored woods such as ash and oak. On tight-grained woods such as maple, the pigments find very little structure to lodge in, so most of the color is removed when the excess is wiped off, and the result is uninspiring.**

**Although stains accentuate the grain and pore structure in the wood, the figure (shimmer) is not highlighted nearly as well as with a dye. Pay careful attention to surface preparation as stains will lodge in any scratches, tearout, or gouges that you may have overlooked.**

**Multiple coats of stain become more like paint, and because the binder usually isn't very strong, multiple coats become a weak link in the finish.**

Drawings: Michael Pekovich

### 1 BEGIN WITH A DYE

**Alter the underlying color of the wood and bring out any figure by applying a dye to the bare wood.**

### 2 A WASHCOAT IS OPTIONAL

**A thin coat of finish, known as a washcoat, can be used at this point to seal the wood and control the stain's penetration. Dewaxed shellac is ideal for this step.**

### 3 WIPE ON A STAIN

**After working the stain into the grain, wipe off the surplus. When a thick-bodied stain is applied over a washcoat, it is known as a glaze.**


#### TEST THE STRENGTH OF YOUR DYE

Before using a dye, you should test it in various dilutions on a color-step sample board. Dyes in small containers (for example, 2 oz.) are very concentrated and are designed to be diluted to a "standard" concentration of 1 oz. dye per quart of solvent. To use less dye, I start with ½ oz. dye and 16 oz. solvent. After testing the standard concentrate, I thin it with equal parts solvent, then two parts solvent to one part dye, then 4:1, and possibly 8:1, applying each dilution to the board. If the standard dilution is too weak, add more of the undiluted dye, but measure precisely and record the amount.

Dyes in larger bottles usually aren't as concentrated. With these, I make a step board starting with dye straight from the bottle and thin from there. Keep the step boards for future reference.

#### Sources of dyes, stains, and shellac

**WOODWORKER'S SUPPLY**
www.woodworker.com
800-645-9292

**HOMESTEAD FINISHING**
www.homesteadfinishing.com
216-631-5309

but not so much that the pores are filled (unless you don't want to accentuate the grain patterns). Dewaxed shellac works well for this first step, known as a washcoat, because it can be thinned while still providing a continuous seal. Thin the shellac to a ½-lb. cut or a 1-lb. cut. Use a ½-lb. cut on woods with a fine pore and grain structure in combination with a thick oil-based glaze. For a water-based or thin oil-based glaze, a 1-lb. cut helps prevent blotching. Also use a 1-lb. cut for wood with larger pores, perhaps applying a second coat to further limit how much color the glaze will add. If you use Zinsser's SealCoat, dilute it with denatured alcohol in a 1:1 ratio for a 1-lb. cut or 2:1 ratio for a ½-lb. cut. If you make shellac from flakes, a 1-lb. cut is about 10% flakes by volume. For example, to make 8 oz. of shellac, pour 7.2 oz. of alcohol into a measuring container and add flakes until the level reaches 8 oz.

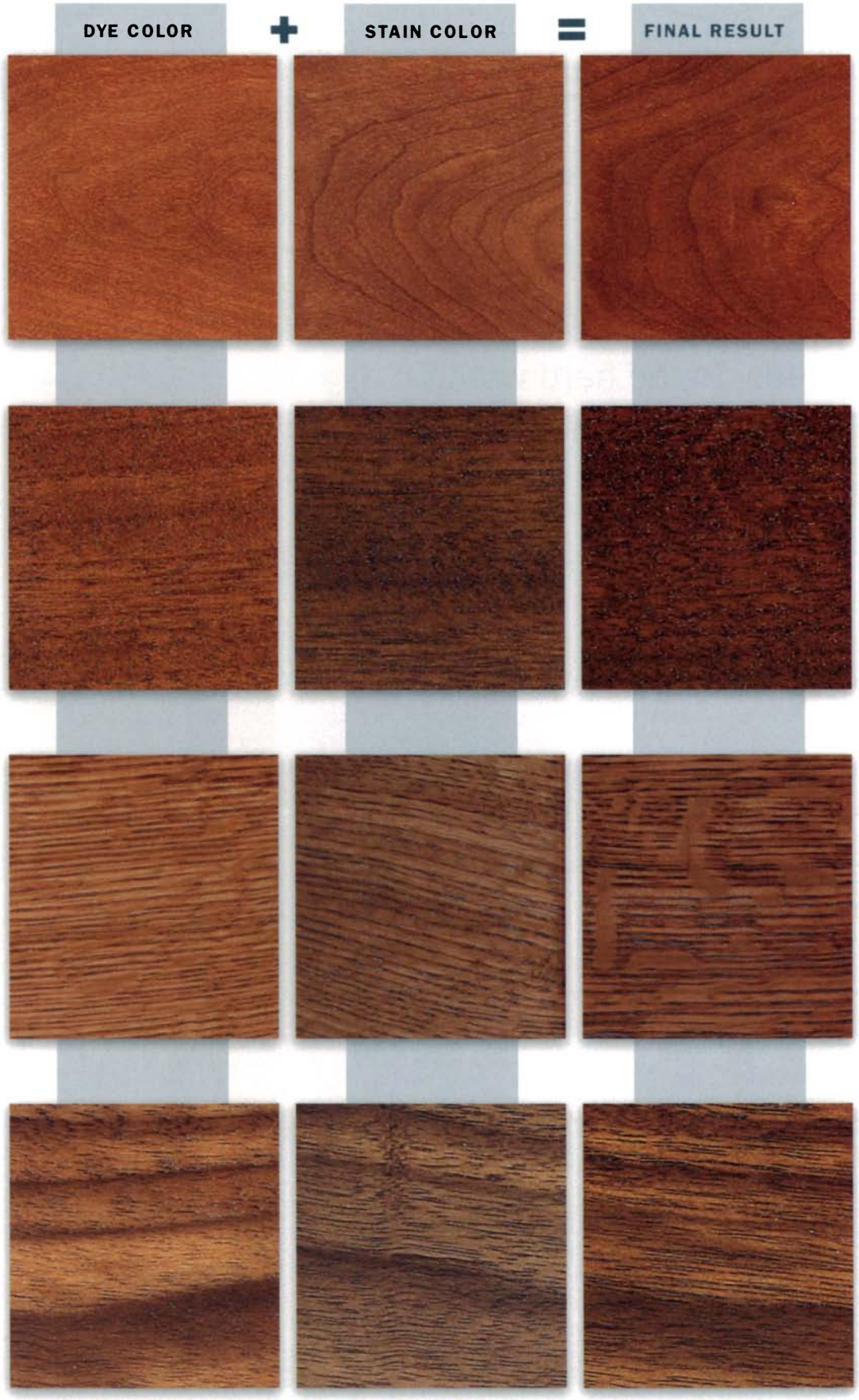
**Working with blotch-prone woods—**Woods such as alder, aspen, birch, cherry, and pine may appear mottled or blotchy when a dye or stain is applied to bare wood. This is especially true for darker colors. The solution is to apply a diluted dye to the bare wood to pop the figure, then seal the wood and apply a dark glaze to add more color without blotching.

**Adjust the grain pattern or tweak the color—**On wood with a prominent grain structure, a washcoat will allow glaze to accentuate the grain, without unduly coloring the whole board.

Because the surface of the wood has been sealed, the glaze will add only a small amount of color. The effect is rather like looking at the wood through colored sunglasses. Just as some sunglasses improve the contrast of everything you see, a glaze should have the same kind of effect on the wood.

*Paul Snyder is a professional finisher near Fredericksburg, Va.*

# Recipes for dyes and stains




### INSTANT ANTIQUE CHERRY

Apply the following blend of Solar-Lux dyes: 3 parts golden fruitwood, 1½ parts American walnut, 12 parts denatured alcohol. After the dye has dried, seal the board with a washcoat of shellac. When dry, wipe on a coat of General Finishes black cherry water-based stain. Used as a glaze, the stain brings out the grain and imparts a darker tone, but won't blotch the wood.

### A DEEPER, DARKER MAHOGANY

Apply a coat of TransTint honey amber dye at standard strength to give the wood a warmer undertone. Then wipe on and wipe off Minwax's red mahogany oil-based stain. Used on bare wood, the stain gives a dark but shallow appearance. Used in combination, the overall look is darker, but the brighter dye shows through, giving greater depth.

### AN ARTS AND CRAFTS FINISH FOR WHITE OAK

Here is a way to maximize the impact of quartersawn white oak. Dye the board with TransTint golden brown at standard strength. Next, apply a washcoat of shellac. Then wipe on and off a coat of Zar oil-based walnut stain. The combination gives the wood a rich tone, highlights the grain structure, and pops the ray flecks.

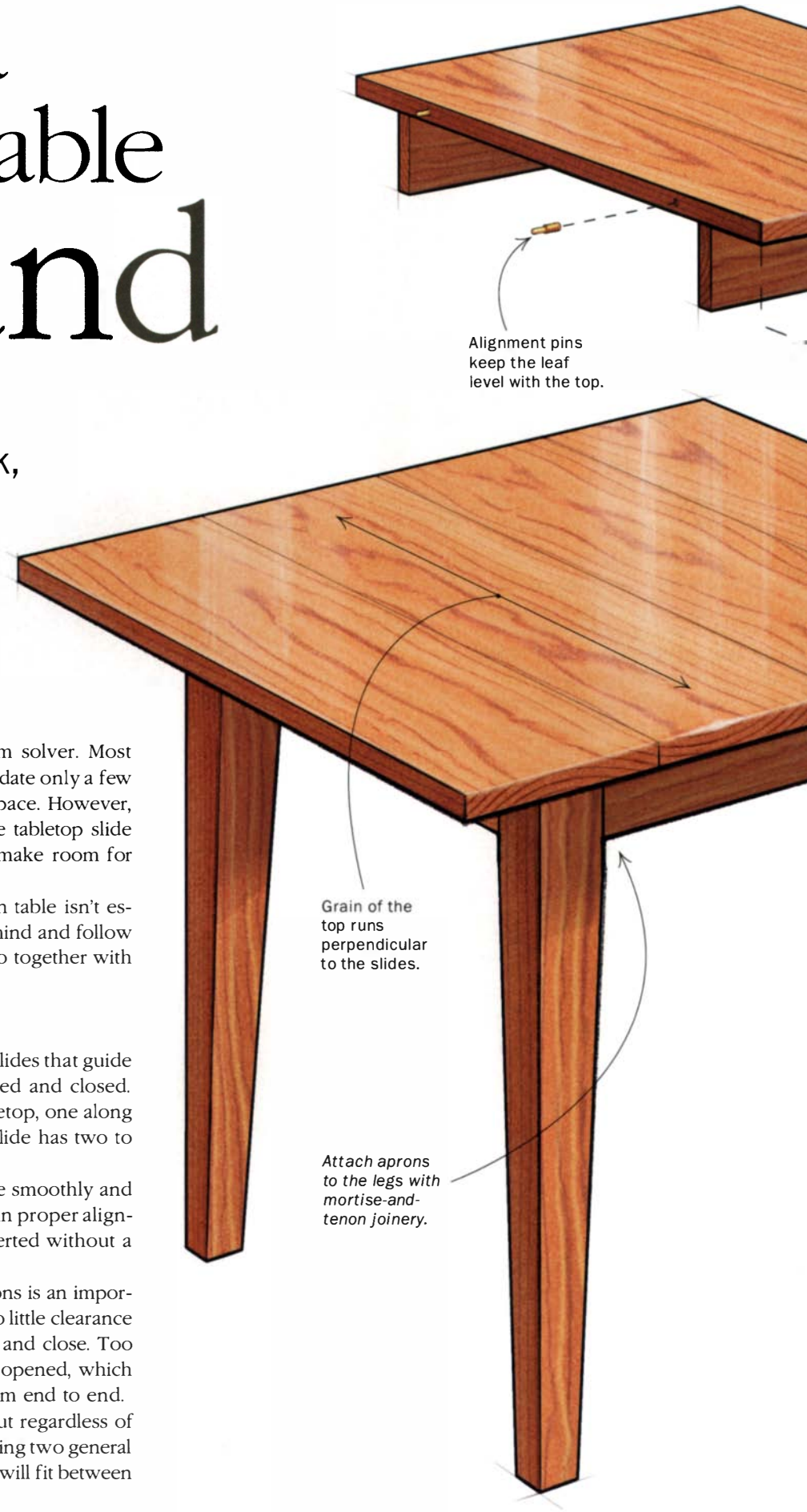
### LIVEN UP KILN-DRIED WALNUT

Most commercial walnut is steamed during the kiln-drying process, which neutralizes the sapwood but leaves the whole board with a gray, pallid appearance. Use TransTint medium brown dye to improve the color. Next, use Bartley's dark brown mahogany gel stain as a glaze to deepen the color without hiding the figure.

# Making a Dining Table Expand

## Slides do the hard work, but construction is different, too

BY JEFF MILLER




An extension table is a great problem solver. Most days, when the table has to accommodate only a few people, it remains compact to save space. However, when company comes, the two halves of the tabletop slide apart and a leaf (or two) can be added to make room for the extra diners.

Building a sturdy, smooth-sliding extension table isn't especially difficult. If you keep a few rules in mind and follow the basic procedures outlined here, things go together with relative ease.

### Anatomy of table slides

At the heart of an extension table is a pair of slides that guide and support the halves as the table is opened and closed. The slides mount to the underside of the tabletop, one along each side, connecting the halves. A typical slide has two to four sections.

Good extension-table slides open and close smoothly and easily. They should hold the tabletop halves in proper alignment so that the leaf (or leaves) can be inserted without a lot of fuss.

The amount of play inside the sliding sections is an important part of the smooth and easy equation. Too little clearance and the mechanism may be difficult to open and close. Too much clearance and the table may sag when opened, which means the tabletop and leaf won't be flat from end to end.

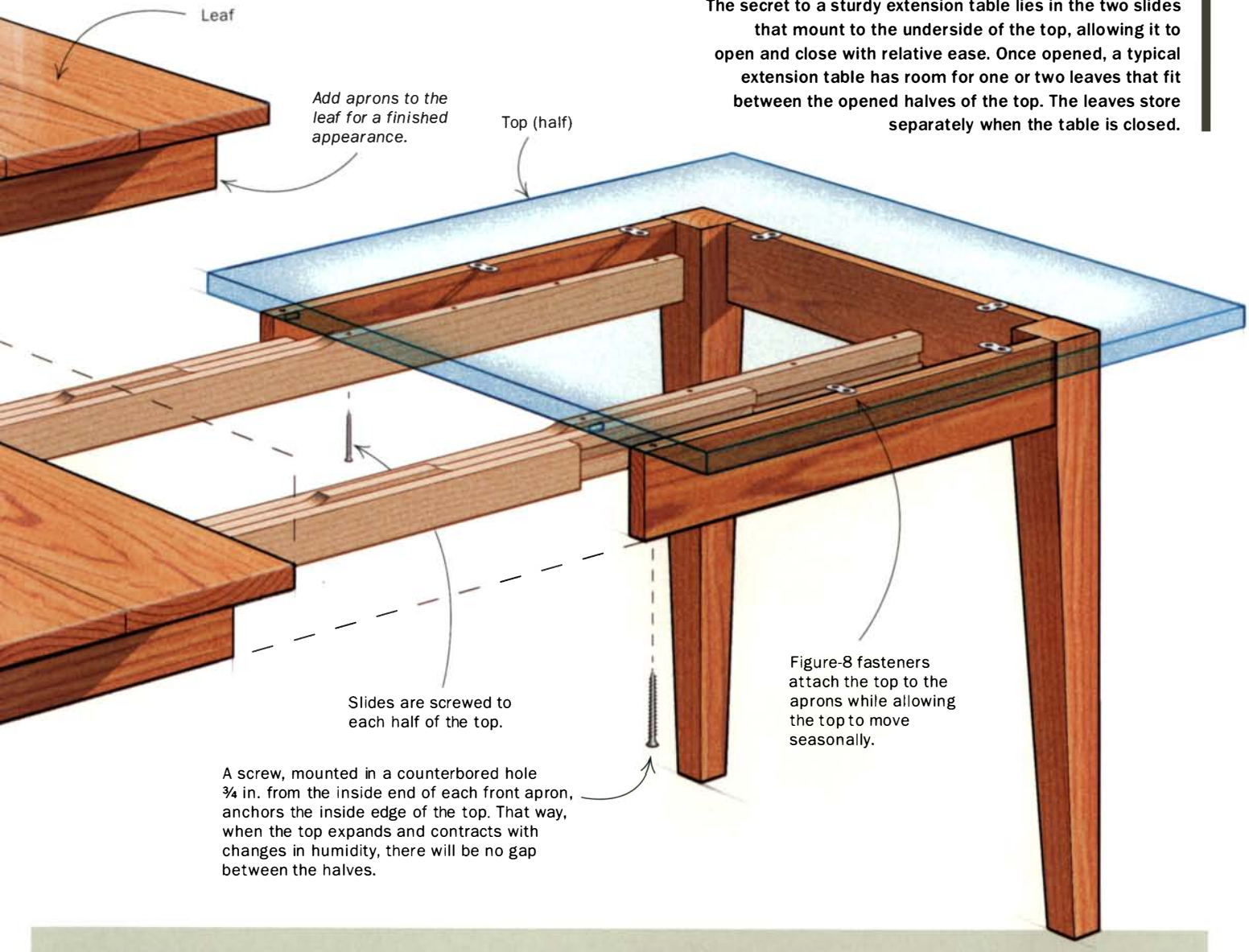
There are a few different types of slides, but regardless of which you use, you can minimize sag by keeping two general rules in mind. First, use the longest slides that will fit between



Drawings: John Hartman

## PUTTING THE EXTENSION IN EXTENSION TABLE

**The secret to a sturdy extension table lies in the two slides that mount to the underside of the top, allowing it to open and close with relative ease. Once opened, a typical extension table has room for one or two leaves that fit between the opened halves of the top. The leaves store separately when the table is closed.**




## Room for company

Each additional leaf gets you two more seats at the table. A table measuring 4 ft. square can comfortably accept four diners, while one that's 4 ft. wide by 6 ft. long provides room for six. A 24-in.-wide leaf provides adequate elbow room, but if dining-room space is at a premium, you can get by with a 20-in. leaf.

Table for 4

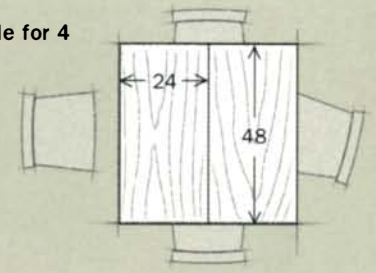
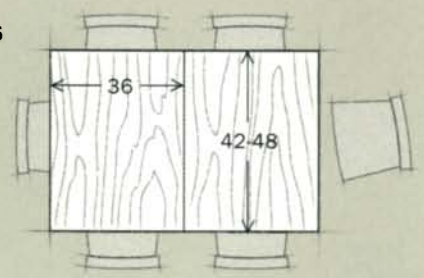
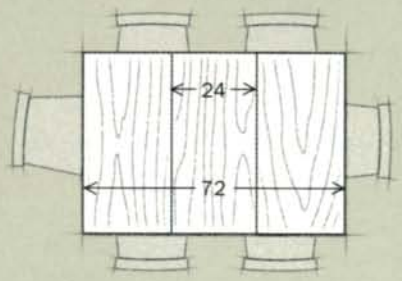


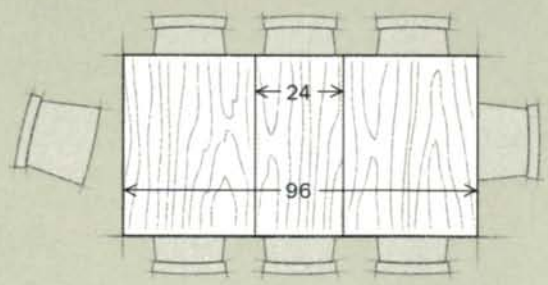

Table for 6




Adding a leaf makes it a table for 6




Adding a leaf makes it a table for 8



# Choose the slides

**Extension-table slides come in two basic types: commercially made wood and commercially made metal. I often use a third type, shopmade slides made from heavy-duty drawer slides.**

**Wood slides (top) look reasonably good and slide smoothly, but they are a bit more likely to sag than other types.**

**Metal slides (center) slide smoothly, have little sag, and don't warp. But they come up short in the looks-and-feel department.**

**Shopmade slides (bottom) operate exceptionally smoothly, can be made of any hardwood to add eye appeal, and offer excellent rigidity.**





**SHOPMADE SLIDE HAS JUST THREE PARTS**

The shopmade slide consists of a heavy-duty full-extension drawer slide, a hardwood channel, and a hardwood extension piece.

the end aprons when the table is closed. That's because when the table is opened to accept the leaves, it's best if each section doesn't open all the way. The resulting overlap helps stiffen the slides. Second, as long as you have adequate extension, a slide with fewer sections is better than one with more sections.

## The best slide for your table

You have options when choosing a commercial tabletop slide: commercially made wood or commercially made metal. A shopmade slide using heavy-duty commercial drawer slides is a third option and one that I often use. Each option has advantages and disadvantages.

**Commercially made wood slides—**The most common commercial slides are wood. They are available in a variety of configurations. Most work smoothly and look better than steel. However, they tend to have a bit more sag than I like. That usually can be overcome if the table has enough room for long slides with only a few sections.

**Commercially made metal slides—**Metal extension slides also work smoothly. They have less sag than standard wood slides and don't warp. To me, though, metal slides look somewhat unsightly inside a high-end piece of furniture.

## *Sources of Supply*

**WOOD AND METAL SLIDES**

**Lee Valley Tools**
800-871-8158
www.leevalley.com

**Rockler**
800-279-4441
www.rockler.com

**DRAWER SLIDES**

**Accuride**
562-903-0200
www.accuride.com

**ALIGNMENT PINS**

**Lee Valley Tools**
800-871-8158
www.leevalley.com

***Assembling the slide.*** *The main part of the drawer slide screws into the channel piece. Screws also are used to mount the drawer-slide leg to the extension piece (above).*



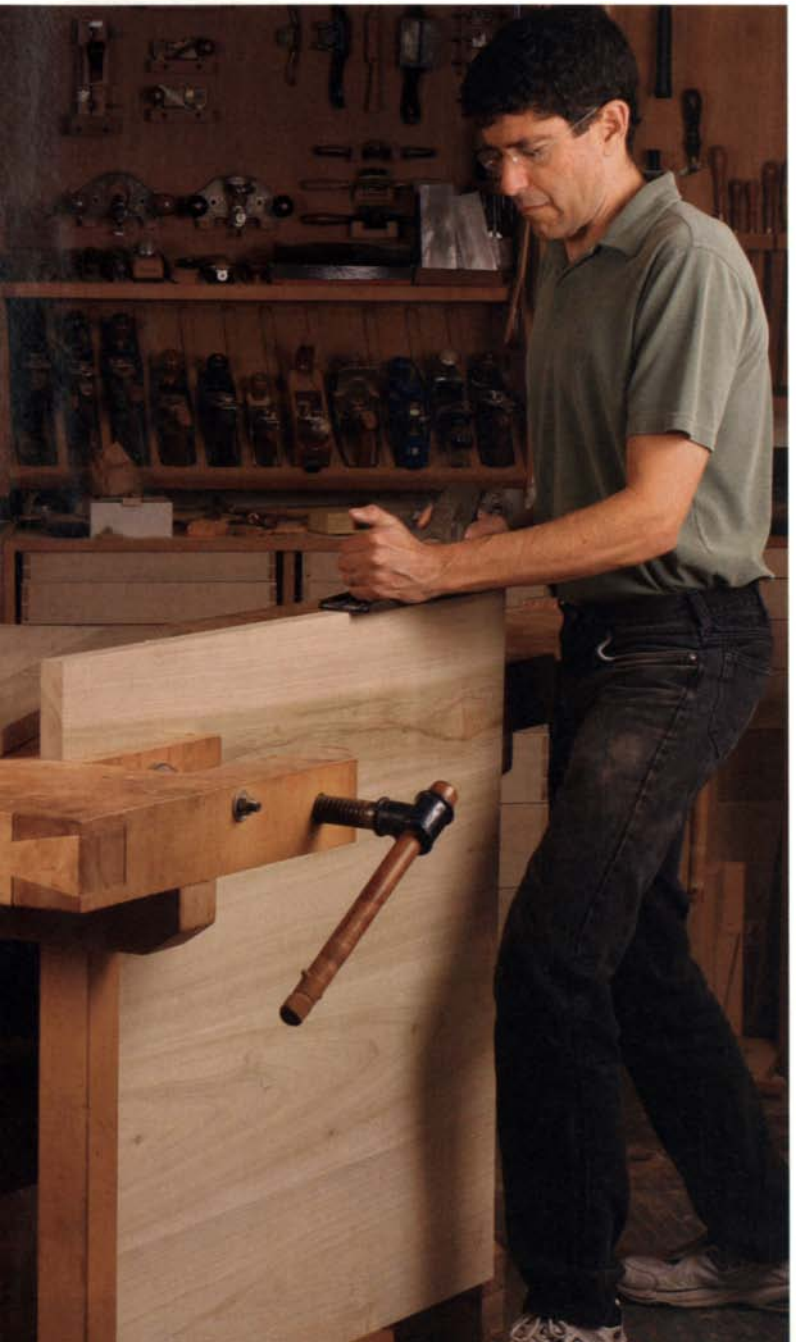
Photos, except where noted: Tom Begnal; slides: Rodney Diaz

As they are opened and closed, metal slides often feel a little rough and produce a metal-on-metal sound that's unpleasant to my woodworking ears. This roughness and noise usually can be improved if the edges of the slides are sanded a little. A coat of wax on sliding surfaces also helps. Of course, these issues are only a concern during the short time it takes to add or remove a leaf, so it's hard to completely frown on the use of metal slides.

**Heavy-duty drawer slides**—My favorite choice for extension slides is a shopmade hybrid that combines some hardwood milling and jumbo-size full-extension drawer slides. The result is a slide that looks good, has little sag, and is an exceptionally smooth operator. The downside is added weight (about 25 lb.) and cost.

## Tabletop considerations

Making an extension table involves more than simply building the tabletop halves and choosing slides. The top requires extra attention to work effectively.



**Run the grain widthwise**—Most solid-wood tabletops are made with the wood grain running lengthwise. On the top of an extension table, however, the grain must run widthwise. That way, when the top halves expand and contract with changes in moisture content, the slides are less likely to become misaligned. Plus, the seam is less visible. When edge-gluing stock for the halves and the leaf, try to make sure that the face surfaces are flush. Later, when flatness and uniform thickness really matter, you won't spend as much time getting the top and the leaf level.

**Joint the mating edges**—Before you can start leveling the top halves and the leaf, you must joint all the mating edges so that they butt together without gaps. The halves and leaf usually are too big to run over a jointer, so you'll need to use a handplane, the longer the better. Secure each part in a bench vise, then plane to get the edges flat and square.

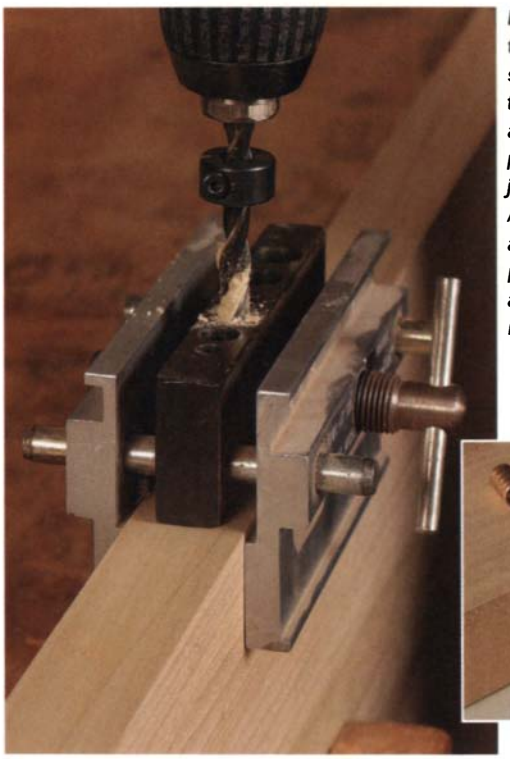
**Add the alignment pins**—To help ensure perfect alignment between the mating edges of the top halves and the leaf, two pins are added to one edge of one top half and each leaf. When drilling for these pins, be sure to use the top surface as your reference edge.

You can find pins made from wood, but I prefer to use the type made from steel with a brass finish. Each pin fits into a sleeve mounted to the edge of a mating part. The metal pins slip smoothly into the sleeves and hold up better under wear.

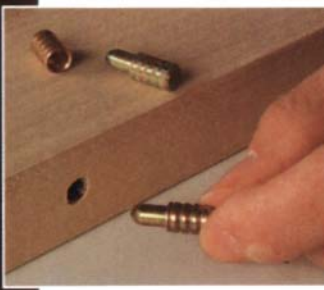
**Level the top halves and the leaf**—For the tabletop to look good, all the top edges should be flush. To do that, you

## Install the alignment pins

***Plane the edges.*** *Any gap along the mating edges of the top halves and leaf won't look good, so Miller handplanes the edges square and straight (left).*



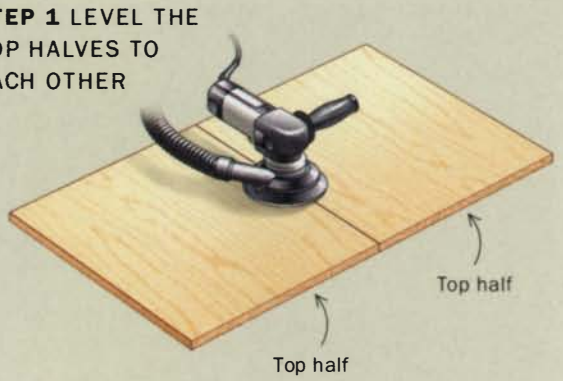
***Drill holes for the pins and sleeves.*** *Because the holes must align just about perfectly, a dowel jig (left) is a must. After the holes are drilled, the pins and sleeves are simply tapped into place (below).*



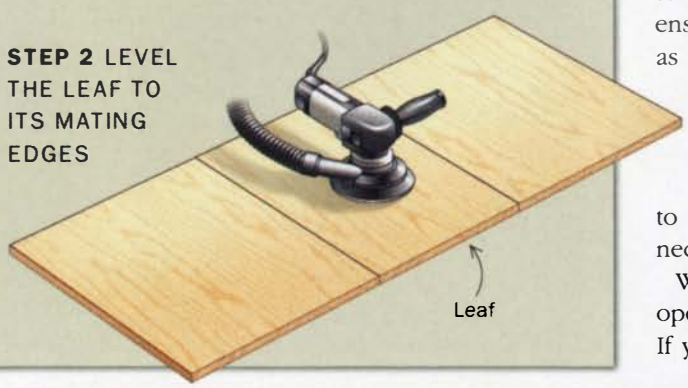
## Level the leaf and top

**The top halves and leaf must be flat and level with each other. First level the two top halves to one another, then level the leaf to its mating edges. If the leaf is lower than the top halves, go back and sand the halves level with the leaf. Be sure the alignment pins are in place as you sand.**

**STEP 1** LEVEL THE TOP HALVES TO EACH OTHER




**STEP 2** LEVEL THE LEAF TO ITS MATING EDGES




need to level all the tabletop surfaces (see photo and drawings, above and left). With careful preparation of materials, a precise glue-up, and accurate alignment pins, you shouldn't have too much to do here.

### Table slides must be square and parallel

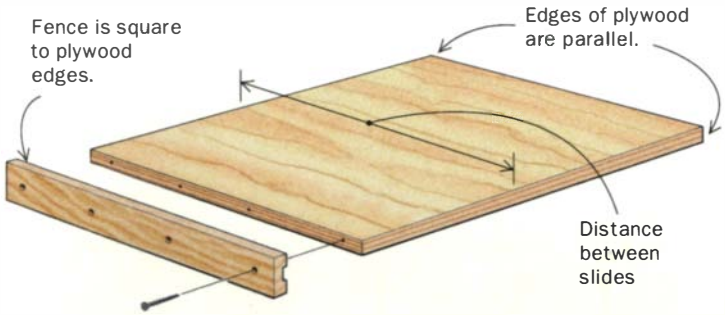
Typically, I position each slide about 1¾ in. from the inside face of the side aprons. To work properly, the slides must be parallel to one another and dead square to the mating edges. To help ensure both, I make a quick jig by ripping a piece of plywood as wide as the distance between the slides and adding a fence to one end (see drawing, facing page). For some tables, you might need to drill two oversize holes in the fence so that it can fit over the alignment pins.

Because the grain runs across the table width, you will have to elongate the screw-mounting holes in the slides. This is not necessary for the holes closest to the center.

Without careful planning, the top can shrink back from the opening edge between the two table halves relative to the slides. If you have installed the slides when they are fully closed, the

# Install the slides

**For the slides to work smoothly, they must be parallel to one another and square to the mating edges of the top halves. A two-piece jig positions the slides just right.**




***Center the jig.*** *Miller uses a tape measure to help center the jig on one of the top halves.*

***Mount the slides.*** *Use screws to secure one end of the slide to one of the top halves (left). Then screw the opposite end of the slide to the other half (above).*

top then may have a gap. You can prevent this by extending the slides slightly from the fully closed position before screwing them into place.

## Aprons allow for wood movement

Wood movement is also a factor when attaching the aprons. Fix each apron in place with a single screw no more than 1 in. from the seam between the table halves. The remaining screws either should be slotted through the aprons or attached with figure-8 fasteners (or table buttons) to allow for wood movement.

To account for wood shrinkage, leave a slight gap between the ends of the side apron halves when the tabletop halves meet. If the top shrinks a little, the aprons won't butt together and prevent it from fully closing. Similarly, if the leaf has aprons, cut them a little short of the leaf edges, so if the top of the leaf shrinks, the aprons won't end up wider than the top and prevent it from closing fully. □

*Jeff Miller makes furniture and teaches woodworking in Chicago (www.furnituremaking.com).*

***Attach the base to the top halves.*** *With all the parts upside down, Miller mounts the table aprons to the underside of the top halves.*

# 9 Tips for Better Design

## How to find new ideas and do justice to them

BY MICHAEL FORTUNE

Several times a year I have the opportunity to teach a two-week class in furniture design and construction. I enjoy the challenge of working with people who think they are incapable of designing their own furniture. Most of my students are mystified about where design ideas come from and how they are developed.

Most articles about furniture design begin with the classical orders—golden mean, Fibonacci series, etc.—and end with well-known period pieces. My broader approach to design was distilled from my training at a commercial furniture-design school in the early 1970s, and refined over my 30-year career as a furniture designer and maker. I've found that great design ideas can come from anywhere, and the standard rules can choke inspiration rather than free it. For example, look to other cultures and you'll find ideas that will appear brand-new in your own. Some of the most obscure corners of history are hiding beautiful ideas that you can borrow and adapt.

After you find a rough idea that resonates with you, you'll need to work out the overall proportions, lines, and details, guiding the design toward a successful conclusion. I'll share my primary sources of inspiration, and some visual dos and don'ts that have worked for me.

*Michael Fortune is a furniture maker in Lakefield, Ont., Canada, and teaches classes throughout North America.*

## Look around you

***From tire tracks to a table.*** *In the interplay of curves on a snow-covered driveway, Fortune found the base of this hall table.*

If you are receptive, ideas can come from almost anywhere. In design school, my instructor's interest in three-dimensional puzzles spilled into his furniture. I admired the unusual origin of his designs, and was inspired to look differently at objects around me.

Almost anything from any culture—bridges, buildings, fine art—can inspire a design. If it strikes you as beautiful, it probably will resonate with others. Better yet, they won't know exactly why. When walking through a museum with my children, I came across a vase made in Mesopotamia about 6000 B.C. Captivated by the simple elegance of the shape, I returned to my workshop and doodled casually in an effort to convert the profile of the vase into the profile of a table leg and apron.

If you like gardening or the outdoors, natural forms are worth exploring. Plant stalks can become table legs, and leaves might inspire shapes for tabletops. If you are intrigued by structures like bridges, dams, and buildings, they can inspire any number of table bases.



Photos and drawings, except where noted: Michael Fortune

***Organic curves.*** *The leaves of a backyard ash inspired this pivoting side table (top). The stalks and leaves of the daylilies in Fortune's backyard inspired this table base (right).*

***Nonstandard thicknesses.*** *The thick, solid-wood top on this nightstand helps to distinguish it from factory furniture.*

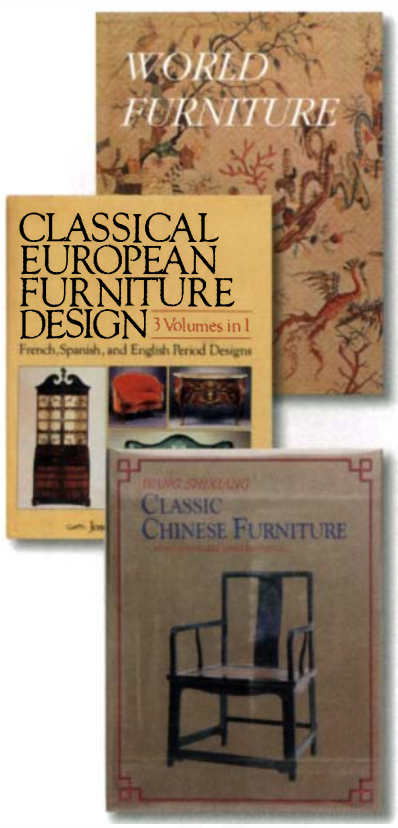
# Avoid factory dimensions

Mass-produced furniture is characterized by a limited number of thicknesses. These endlessly repeated dimensions are everywhere—in chairs, tables, and cabinet frames. This is because it is much cheaper for lumber mills to work in huge quantities, taking all 1-in. lumber to a uniform ¾-in. thickness. Fine furniture is not made with the same expediency, so we can successfully mill 1-in.-thick stock to ⅞ in. or thicker. Avoid common cross sections such as ¾ in. by 1¾ in. or ¾ in. by 2 in.; basically, avoid any common premilled dimension found at large lumber retailers.

# Look to history

The history of furniture is wonderfully diverse and goes back about 6,000 years. It is a rich source for inspiration. It isn't necessary to copy what has been done before, but it is important to learn from it. Try as you might to be completely original, you can't escape being influenced. Your furniture-design preferences are shaped by the style of furniture that you grew up with and what is immediately around you. By browsing through historical texts, you can gain a much broader interpretation of what you like and of what furniture can be. For example, the Cubist painting style made famous by Picasso, circa 1920, also spawned a Czechoslovakian Cubist furniture style. If you are interested in furniture made entirely with angled shapes, then this era is worth further research.

Over the years I have collected many reference books on the history of furniture. I turn to a few of them again and again to develop the proportions or other details of my rough ideas. When I designed my No. 1 chair in 1979, I was initially inspired by a piece of old, rusted, metal garden furniture. I was fascinated by the unusual placement of the various parts and how they intersected. I added the influence of several furniture designers, notably Charles Rennie Mackintosh (Scotland), Hans Wegner (Denmark), and Frank Lloyd Wright (United States). To blend all of these ideas successfully, I moved from numerous simple sketches to quarter-scale models and then to several rough, full-size mockups. I have sold 300 of these chairs.




***Books are another source.*** *To generate ideas, Fortune flips through* World Furniture, *edited by Helena Hayward. To refine his ideas, he consults the clear line drawings in* Classical European Furniture Design, *by Jose Claret Rubira. He also looks at* Classic Chinese Furniture, *by Wang Shixiang, which has clear photographs of spare yet beautifully proportioned furniture dating back to 1400.*

***His signature chair.*** *Fortune's No. 1 chair was inspired by a piece of rusty garden furniture. He refined the design with the influence of several past furniture designers.*

***Mesopotamian lines.*** *An 8,000-year-old vase in a museum inspired this table's leg and apron profile. Fortune reversed the lower curve to avoid a pigeon-toed look.*

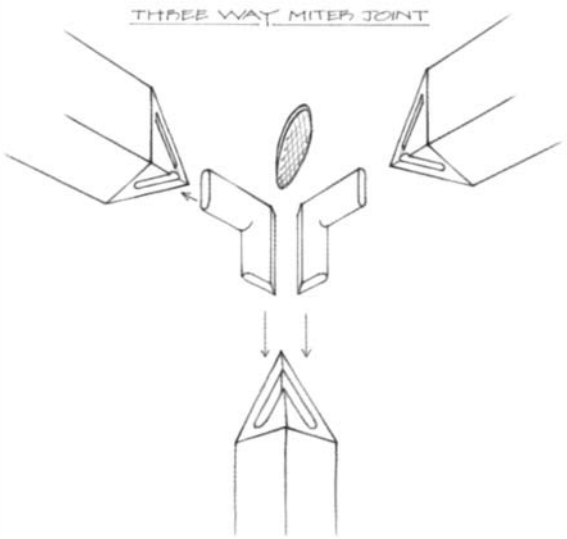


Photos, bottom left: Michael Pekovich

# Design first, engineer second

Your creative process can be restrained by your existing knowledge of how to work with wood, so don't worry about the details of the "how-to" during this time. Just keep in mind the bigger issues like structural integrity and wood movement. Before you think about joinery, brainstorm and develop the design.

Once you have a design you like, tackle the technical details. There is so much excellent reference material available these days, such as books, magazines, and DVDs, to assist us with resolving the construction details of furniture. Rarely will you invent a design that is completely new. More often than not you will find a joint or a woodworking technique that is close to what you need.




***First the table, then the joint.*** *Searching for an efficient way to build this clean-looking three-way miter joint, Fortune came up with a pair of L-shaped plywood tenons that fit into router-cut mortises. The joint, in turn, made dozens of other tables possible.*

***The rule of three.*** *Don't combine more than three strong design elements. The focal point of the cabinet (above) is its curved and stepped front. The bee's-wing mahogany is the second element, and the contrasting detail is the third. The dominant feature of the table (left) is the shape, low but with dramatically curved legs. The contrast between the Macassar ebony and the Australian lacewood is the second element, while the four-way matched grain is the third.*

# Simple is good

It's easy to overdo things with ideas under the heading of "Wouldn't it look nice if I..." Don't get too complicated when developing your designs. I generally recommend working within a loose guideline I call "the rule of three." By that I mean that each piece of furniture should have no more than three strong design elements that work together to complete the whole.

Decide first on a focal point—the primary design element—and showcase it. Let the other two elements play a supporting role. The primary element is usually, but not always, the overall form or shape. The second may be the color and texture of the dominant wood. And the third element is usually any obvious detailing like inlay or knobs and pulls.

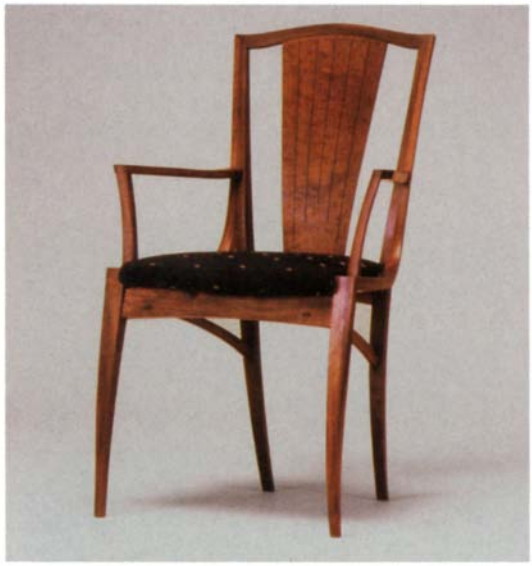
An accumulation of disparate shapes, woods, doors, drawers, and shelves easily can overpower an overall design. It very well could be that there is simply more than one piece of furniture on the drawing board and that they have to be separated. So build one, and just sketch the others to be built later as part of a series.

# Think of pieces as people

Objects broadcast signals that we interpret according to our own likes and dislikes. I am attracted to objects that have a receptive, almost human quality. For example, when I walk into a room with several different chairs, I go to the chair that looks comfortable and appears to have its arms open, welcoming the viewer. I have designed many chairs over the years with this receptive quality in mind.

People are used to seeing bodies and evaluating posture, so pay attention to the stance of your pieces in a human sense. Just as someone standing with their feet pigeon-toed appears awkward, almost embarrassed, furniture with inward-pointing feet also will seem ungainly. The same goes for a bow-legged stance (knees out) or knock-kneed (knees in): Neither is seen in the enduring fine works of art. Curves are also an essential human quality (see p. 59).

Similarly, I find the graceful form of a ballerina more attractive than the bulky, knotty shape of a wrestler. With this in mind, I am inclined to design furniture that is composed of lightweight linear elements rather than massive shapes. A boxy, heavy shape can be lightened simply by putting it on a pedestal that is set back from the leading edges (sometimes called a "toe kick").



***A ballerina's stance.*** *Fortune prefers graceful forms to knotted, muscular shapes, and believes others feel the same way.*

***A welcoming embrace.*** *With arms open, Fortune's chairs invite the viewer to take a seat.*

# Upward and outward

Another way I try to make a connection with the person viewing my furniture is to have it connect to its surroundings. Most of my furniture consists of shapes and details that extend outward as they move upward, subliminally connecting them to their surroundings. Usually this means pieces are larger at the top than at the bottom, but sometimes a flaring cornice is enough. Furniture that has inward sloping lines may appear to be solitary, less engaging, and even heavier than it really is.

***Connected to the world.*** *Fortune's pieces reach outward as they move up, tying them to the space and objects above and around them.*

# Curves add interest

A simple approach to making your work stand out is to use techniques that appear to be difficult to master. Curves are a good example. Keep in mind, though, that lots of curves on one piece of furniture can distract and ultimately tire the viewer.

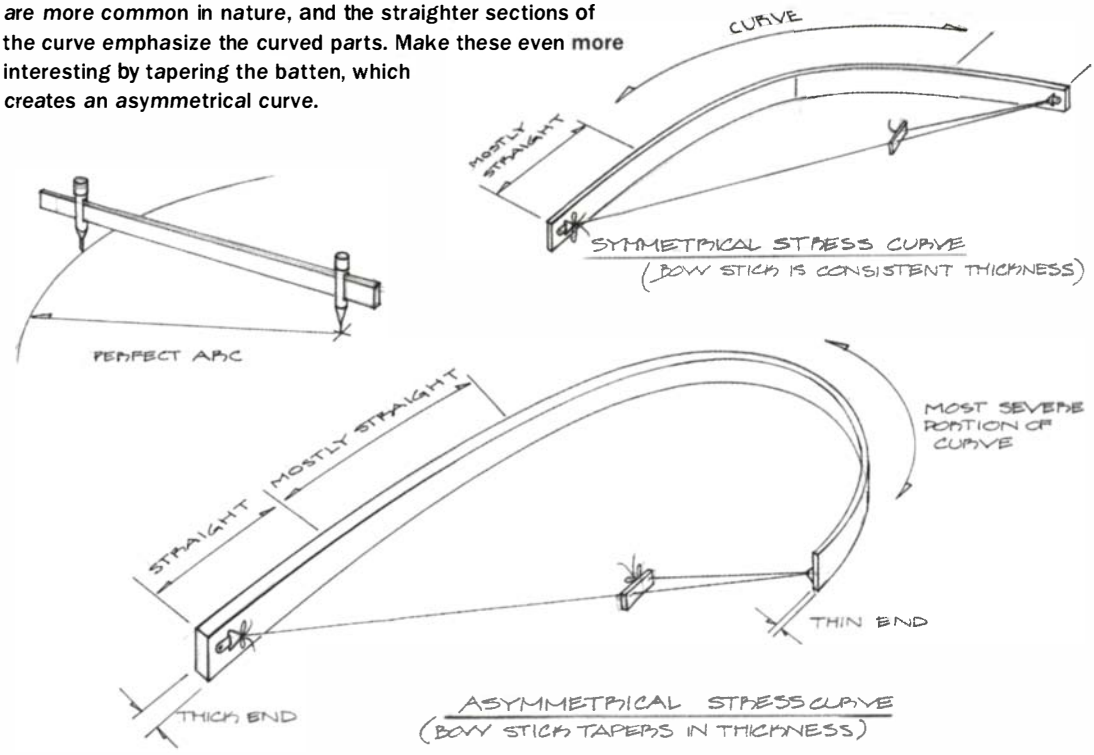
Other woodworkers may be intrigued by the technical mastery involved in working with complex curves, but I don't think most viewers or buyers are knowledgeable enough to be sufficiently impressed. I rarely design furniture with compound curves, which move in two planes at once; I prefer to work with a few simple, single-plane curves in each piece.

On the other hand, try not to interrupt curved elements just to make joinery easier. For example, a graceful curve on a chair leg can be compromised by leaving a flat section to accommodate an intersecting stretcher. Similarly, a flat spot on a table leg where it meets the apron smacks of the expeditious joinery techniques found on mass-produced furniture.

***Curves soften a boxy dresser.*** *Bent-laminated drawer fronts turn an ordinary chest of drawers into a more graceful and unique piece of furniture.*

### DRAW A RADIUS OR BEND A BATTEN

While a simple radius curve will liven up a rectilinear piece of furniture, a stress curve is even more dynamic. Stress curves are more common in nature, and the straighter sections of the curve emphasize the curved parts. Make these even more interesting by tapering the batten, which creates an asymmetrical curve.




***From lawn to living room.*** *Fortune's design for a simple garden chair led to a hardwood version. Aside from the dark wood and upholstery, he added a soft arch to the seat rail.*

# Evolution, not revolution

Designing and building furniture as part of a series is a great way to completely explore and resolve an idea. You take what works best in each piece, and then apply it to the next. Your design and construction learning curve will shorten. You also may save time by reusing specialized jigs or bending forms. At the very least you will build confidence as you go. Remember, a design idea doesn't have to stay within one group of furniture, but can extend from tables to cabinets to chairs.

I call this an "evolutionary" approach rather than "revolutionary." I might work in the same vein for months or even years until my designs evolve into something quite different. Along the way I am continually making design discoveries and recording them in a sketchbook for exploration someday. The great thing about revisiting an idea months or years later is that you come at it with experiences collected along the way.

# Get More From Your Drill Press

The right bits, jigs, and techniques turn a metalworking tool into a versatile machine for woodworking

BY ROLAND JOHNSON

Originally designed as a tool for machinists, the drill press has become a standard fixture in woodworking shops. It is capable of drilling both small and large holes more accurately and safely than a handheld drill, and it has a built-in depth stop. The rack-and-pinion pressing action of the machine gives easy leverage for boring large holes in hard material. Throw on a simple, shop-built table and fence, and you add the ability to support and stabilize large and small workpieces in precise, repeatable positions.

Most woodworkers are familiar with the basic function of a drill press, but not everyone knows how to squeeze the greatest versatility and performance out of this woodworking mainstay.

The first step is to make sure the machine is drilling holes that are straight and true, perpendicular to the table. For basic troubleshooting on a drill press, you'll need an accurate square,



Photos: Asa Christiana

## Tune-up is quick but crucial

***A wobbly chuck can be corrected.*** *You'll need a dial indicator and some drill rod to test for runout. If you find more than 0.005 in. of wobble, use a deadblow hammer to knock the chuck free. Clean any gunk off the taper, and reinstall the chuck.*

***Squareness is a must.*** *Again, the piece of drill rod is helpful. Drill-press tables include a side-to-side adjustment. If the table isn't square from front to back, you'll have to shim the auxiliary table (see drawings, p. 62).*

a deadblow hammer, a dial indicator with a magnetic base, and a length of drill rod (available at machine shops and many hardware stores, as well as by mail order).

The most important factor for accurate drilling is the squareness of the table to the bit. Use the square to determine if the table is perpendicular to the chuck. If the table is out of square from side to side, fixing it is a simple matter of loosening the bolt that secures the table, making an adjustment, and tightening the bolt. If the table is out of square from front to back, the auxiliary table (described on pp. 62-63) can be shimmed to compensate.

If you have a dial indicator, use it and the length of drill rod held in the chuck to check the chuck for runout. Any wobble should be less than 0.005 in. measured at 1 in. from the jaws. If there is any more wobble than this, bits will tear the rim of a hole upon entry and re-entry. If the chuck is not concentric to the shaft, use a deadblow hammer to knock the chuck free of the shaft, and check the taper to make sure it's clean and smooth. Use a rag and some solvent to clean the taper. Anything more abrasive than steel wool will change the taper and will weaken the bond. Replace the chuck and recheck the runout.

When reinstalling the chuck, you can angle the hammer blow to get it to seat properly on center. At that point, if you are still measuring too much runout, remove the chuck and check the

# Auxiliary table is a must

**This simple, shopmade table supports long workpieces and offers a number of ways to locate and secure them. It includes a sacrificial backer board to eliminate blowout on the backs of workpieces.**

Fence, ¾-in. plywood, 3 in. deep by 2½ in. tall by 35½ in. long

Rabbet, ⅛ in. by ⅛ in., prevents debris from affecting workpiece alignment.

Ratcheting clamp handle

Triangular brace, glued and nailed

End stop, ¾ in. thick by 2½ in. wide by 4 in. long

Sacrificial board, ½-in. plywood, 4⅞ in. square, ¼-in. radius at corners

T-track

Clearance hole, 1½ in. dia.

Bolts, ¼ in. dia., counterbored into table

Simple work stop, ¾ in. dia. by ¾ in. thick, glued onto ⅜-in. dowel

Numerous ⅜-in. holes for work stop

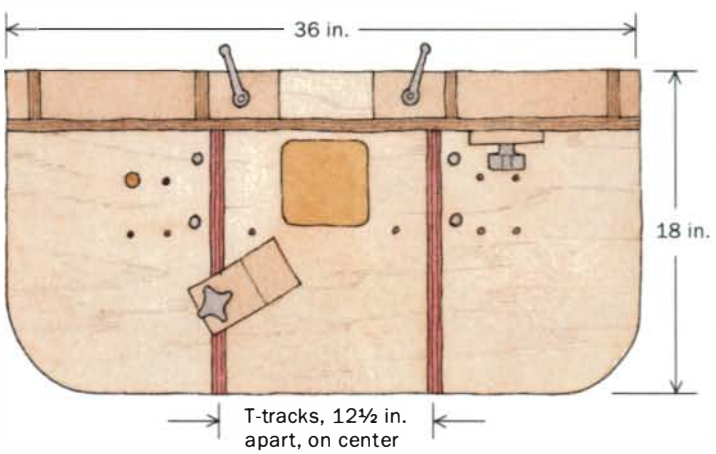
Table, ¾-in. plywood, 18 in. deep by 36 in. wide

6-in. radius at corners

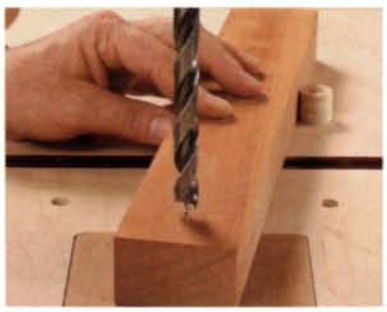
Hardwood support brace, 1 in. sq. by 33 in. long, near front edge, keeps table flat.

Attachment cleats are designed to fit a specific drill-press table and allow the auxiliary table to slide easily on and off.

Clamp handles




## USING THE TABLE



***A pin is the simplest stop.*** *It offers a quick way to keep a workpiece from spinning (above). The fence works well for holes in a row (right). The T-tracks and clamp handles make for quick adjustment and a secure grip.*



Drawings: Jim Richey

taper itself. You might have to contact the manufacturer to replace that shaft.

If you are a bit more ambitious, the rest of the drill press comes apart for cleaning and lubrication, which will smooth out any sticky action. Also, if you notice excessive vibration when the press is running, it may be caused by poor-quality or old V-belts. These can be replaced with segmented belts.

Note to lefties: Many machines can be set up for left-handed crank operation simply by swapping the return spring and handle assembly side-for-side.

## Drilling tip

*For greatest accuracy when using brad-point and twist bits, use a center punch before drilling.*

### An auxiliary table is a must

Even though many drill presses are used exclusively for woodworking, they still are equipped with a machinist-oriented table that tends to be too small for many woodworking operations. An auxiliary table that bolts to the drill-press table greatly enhances versatility and safety. A wood or melamine surface is also kinder to workpieces. My version consists of a ¾-in. piece of veneer-core plywood, with aluminum T-tracks inset to accommodate a fence and various hold-downs.

Through-holes will tear out without a fresh backer board below the hole. I inset a small, sacrificial piece of plywood into the auxiliary table. For critical holes, flip or rotate the board to find a clean area, and replace it when it is riddled with holes. The replaceable insert also allows the bottom end of a sanding drum to be set below the table surface.

### Four basic settings

There are a few simple settings on a drill press. You'll need to understand and use them all to get the most from the machine. The most frequent adjustment you'll make is tightening and loosening the drill chuck. Use all three tightening locations to be sure each jaw is well-seated, especially with big bits. This also can help to center the bit.

To accommodate various thicknesses of workpieces and various lengths and types of tools, you'll adjust the table quite often. Usually this means cranking the table up and down a gear rack on the support column, and locking it in place. Most tables also can be tilted for angled holes.

It also is important to match the speed to the bit. For woodworking, this does not have to be an exact science. Basically, you should not run any bit faster than 3,000 rpm, and you should slow the speed considerably for bigger bits. For example, a 1-in.-dia. bit should run at 300 rpm to 500 rpm in hardwood. On moderately priced drill presses, you'll have to turn off the machine to change speeds by moving the belt(s) across stepped pulleys. Some heavier-duty machines offer infinitely variable speed that can be changed on the fly.

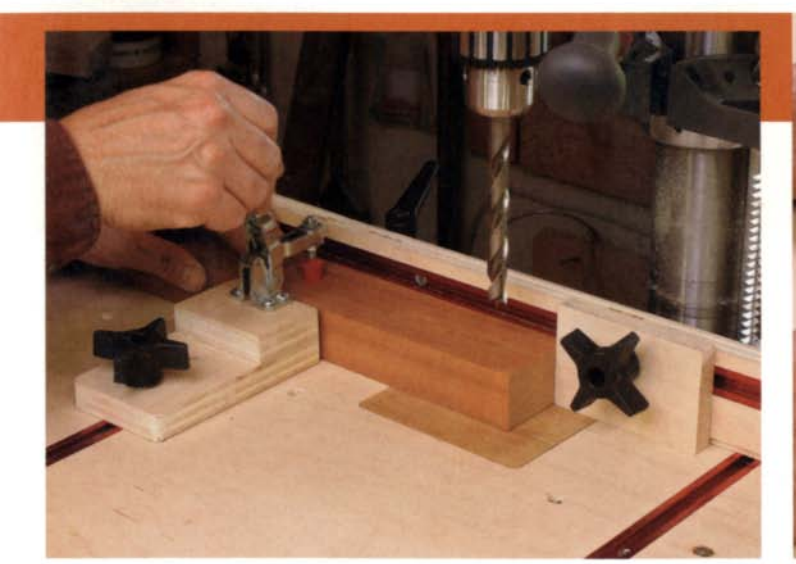
Last, you occasionally will use the depth stop. On many drill presses, this is a rotating collar located behind the feed handle. Higher-end machines have a better system: a vertical rod that travels with the quill, with stop collars setting the depth.

### Safety: Spin and climb are the enemies

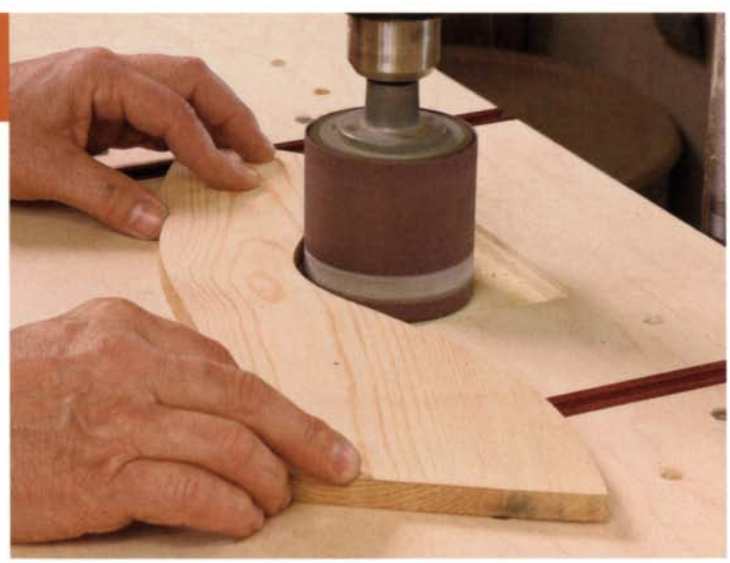
Two nasty events that can occur when drilling holes are spin and climb. If a bit grabs the wood—from too fast a feed rate, a dull cutting edge, or a sudden change in density of material (think plywood)—the work can go from zero to the drill's rpm in an instant, a potentially dangerous situation.

Almost any type of stop will prevent spin. I drilled a series of ⅜-in.-dia. holes in my auxiliary table, into which I simply drop a doweled stop. It works quickly for pieces of almost any size and shape. Just be sure that the work is against the stop when you begin. A fence will give the same protection, but it sometimes is not as quick or convenient to use, especially with odd-shaped pieces.

Drill-bit climb is another danger. This occurs as a large bit breaks through the back surface of the wood and jams in the hole,



***T-tracks add versatility.*** *Tracks in the table and fence make it easy to secure the fence, end stop, and various hold-downs.*



***Sanding drums are good for curved work.*** *The cutout in this table allows the drum to contact the workpiece properly.*

# Other drilling techniques

***Make a V-block for round stock.*** *Use a hold-down for even more stability and accuracy.*

***Tilt the table for end-grain and angled holes.*** *To drill into the ends of long pieces, turn the table to 90° and use the auxiliary table's fence, stops, and hold-downs to secure the work (above). For angled holes such as through-mortises in the top of a stool (right), tilt the table and use the fence as a work stop.*

creating a reverse screw action. This causes the work to climb the drill bit until something stops it. If the workpiece clears the stop or fence, climb quickly can lead to spin. The cure is to clamp the piece to the tabletop. I prefer to use a small toggle clamp mounted to the T-tracks in my auxiliary table. I also use these clamps on special drilling jigs that I make for repetitive tasks. They can be mounted on tall wood blocks for clamping thicker or taller items.

## Drilling clean, accurate holes

Experience will give you a feel for the proper feed rate, but as with any machine, don't push too hard. Let the bit cut, pulling on the crank handle just enough to keep chips coming steadily.

For deep holes and also for certain bits (such as Forstners), it is important to clear chips often. Do this by lifting the bit until it almost, but not quite, leaves the hole. Pulling the bit all the way out of the hole can tear the top edge on the way out or in.

For the ultimate accuracy in locating a hole, use careful layout with a sharp pencil, and then use a center punch to place a divot where the crosshairs meet. On most bits, the tip will gravitate to the center of the divot. When this happens, to avoid bending the bit or drilling a crooked hole, allow the workpiece to move slightly into a better position.

**Use a V-block to drill round stock—**A simple V-trough cut into a piece of heavy stock will keep round stock from rolling while being drilled.

**Angle the table or make a jig for angled holes—**If you angle the table, the small scale will offer a fairly accurate reading. If a precise angle is needed, make a setup block on the tablesaw at the exact angle, and use it to set the drill-press table to the desired angle with the drill bit. Forstner bits work best for drilling angled holes, because the cutting rim will keep the bit from wandering.

**Pivot the table for end-grain drilling—**To drill into the end grain of a long workpiece, such as when drilling bedpost sections, pivot the table to 90° and use hold-downs to attach the workpiece

to the table. Twist bits work better than brad-point or Forstner bits for drilling into end grain.

**Use the fence when drilling mortises**—To bore the sequential holes that rough out a mortise, use a Forstner bit and overlap each successive hole by about 25% (see photo, p. 60). This leaves little to clean out with a chisel, creating a quick, accurate mortise without the need for a hollow-chisel mortiser.

**Use hole saws for large diameters**—To cut a large hole easily in materials up to 1½-in. thick, use a hole saw. Hole saws are pressed steel cups with saw teeth cut into the rim. They are available in many sizes, starting at ¾ in. dia. and increasing in small increments to over 5 in., and they mount on an interchangeable arbor with a centering drill bit. The assembly chucks into the drill press. Use slower speeds for these tools.

**The trick for plug cutters**—Plug cutters work great for cutting edge-grain plugs that cover screw holes. There are basically two types: One cuts a tapered plug and the other cuts a straight plug. The best way to cut plugs is to use stock that is thicker than the plug length, cut to the depth of the plug cutter, and then make a resawing cut on the bandsaw to free the plugs.

### Drill presses are great for sanding

Sanding drums work well for edge-sanding, especially when the piece has an irregular or curved edge. For a smooth, fair curve, use as large a drum as possible, and keep the pressure light and the piece moving steadily. Drums are available in at least a couple of variations, one that takes cylindrical sanding sleeves and another that accepts flat sandpaper. □

*Roland Johnson is a contributing editor.*

## An essential set of bits

**For most drilling tasks in wood, use brad-point bits. They have a center spur for accurate location, outer spurs for cleanly cutting the wood fibers at the rim of the hole, and helical flutes that quickly evacuate waste, allowing deep holes without constantly backing out the bit to clear waste. They also cut a relatively flat bottom.**

BRAD-POINT

**With their straight leading edges and knife-edge or toothed cutting rim, Forstner bits cut even cleaner holes, with flatter bottoms, than brad-point bits. Because they register off their rim, these unique bits can enter angled surfaces and turned work cleanly and accurately. The only drawback is that they must be raised frequently to clear chips.**

FORSTNER

**Twist bits are inexpensive workhorses that work well for boring end-grain holes and, when sharp, cut clean enough for many woodworking needs. They will keep a sharp edge when drilling hardwood, composite material, plastic, and soft or ferrous metals. One great feature of a twist bit is that it is relatively easy to sharpen on a bench grinder.**

TWIST

**Straight holes aren't ideally suited to traditional wood screws. For better holding power, tapered twist bits also drill the countersink and even can drill a counterbore for plugging.**

TAPERED TWIST

**For countersinking alone, a Weldon-style countersink gives the cleanest results.**

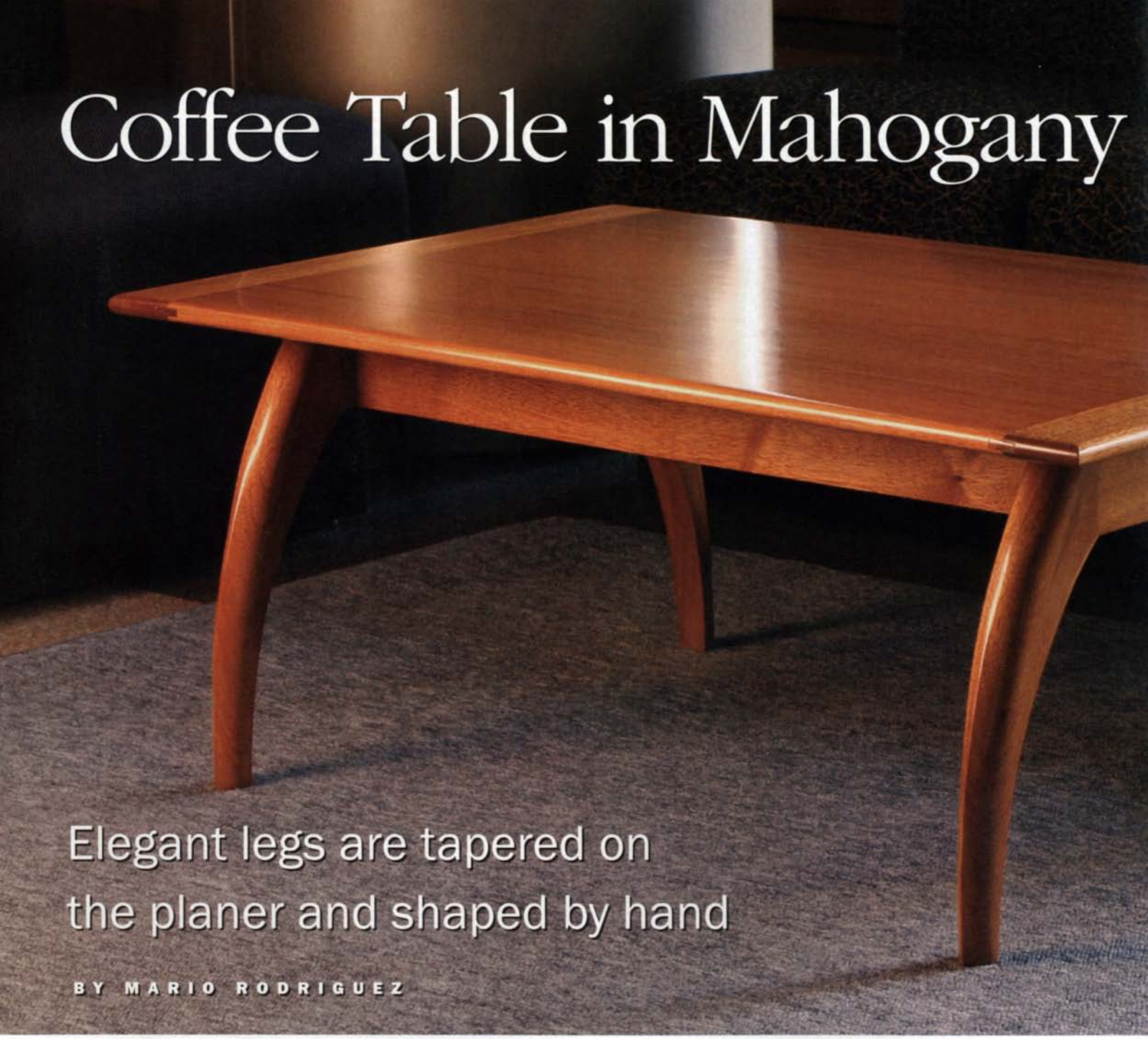
COUNTERSINK

## DRILL LARGE, CLEAN HOLES WITH A HOLE SAW




***Drill from both sides.*** *With the workpiece secured safely, drill partway through the first side (1) so that the center bit pops through the back. Then flip the stock and find the center (2). Finally, finish the cut (3) and remove the plug. Because it is only half-buried in the saw, the plug is knocked free much more easily.*

# Coffee Table in Mahogany



## Elegant legs are tapered on the planer and shaped by hand

BY MARIO RODRIGUEZ

New York City's Lower East Side is an area often credited with cutting-edge trends in fashion, food, and home décor. Visit any specialty furniture shop there and you'll likely find some good examples of modern solid-wood Scandinavian furniture from the 1950s. Resurrected mostly from garages and attics, this is a style that appeals to a fast-paced crowd that likes furniture with bold, vigorous lines and a clean, uncluttered look.

This table incorporates much of what's good about furniture from the post-World War II era. A thin top appears to hover above two muscular arching leg frames that look ready to stride across the room. At the bottom, the outside surface of each leg is shaped to create an edge at the center that looks much like a crease. As the crease extends higher on the leg, it gradually morphs into a smooth radius. It's an interesting detail, and one that's not easily lost on the eye.

### Mill the material, then make the legs first

I used 8/4 stock for the legs and the leg rails of the table, and 4/4 stock for the stretchers, the top, and the breadboard ends. Mahogany is a good choice for this project. It's readily available in long, wide boards, it works easily with both hand tools and machine tools, it sands smoothly, and it takes a finish well. Plus, the patina improves with age. Indeed, it has been just over a year since I finished the table and it already has acquired a deep, coppery color.

I milled the stock to its final thickness: 1¾ in. thick for the legs and the leg rails, and ¾ in. thick for the stretchers, the top, and the bread-



Photos: Tom Begnal; drawings: Vince Babak

board ends. Then I cut the stretchers and the leg rails to width and length. Each leg starts at the floor as a slender, pointed foot. As it curves upward and disappears under the top, the edge of the leg flattens out to a smooth, robust curve.

**Use a template to draw the legs**—Begin work on the legs by making a template that matches the curve of the leg when viewed from the side (see drawing, p. 68) Rather than draw the entire outside arc of the leg on the template, leave a little extra wood in the form of a "horn" at the top of each leg. This horn will provide a parallel surface so that later, when it's time to clamp the leg and the leg-rail assemblies, you can apply plenty of clamping pressure to ensure a tight joint. The horns will be cut off after the legs have been assembled to the top rails.

For each leg, you need stock that's 1¾ in. thick by 6 in. wide by 16 in. long. At least one of the corners must be square. Place the template on the stock, taking care to align the top and the inside edges with a square corner on the stock. Trace the outline with a pencil, then cut it out on a bandsaw, staying just slightly on the waste side of the marked line.

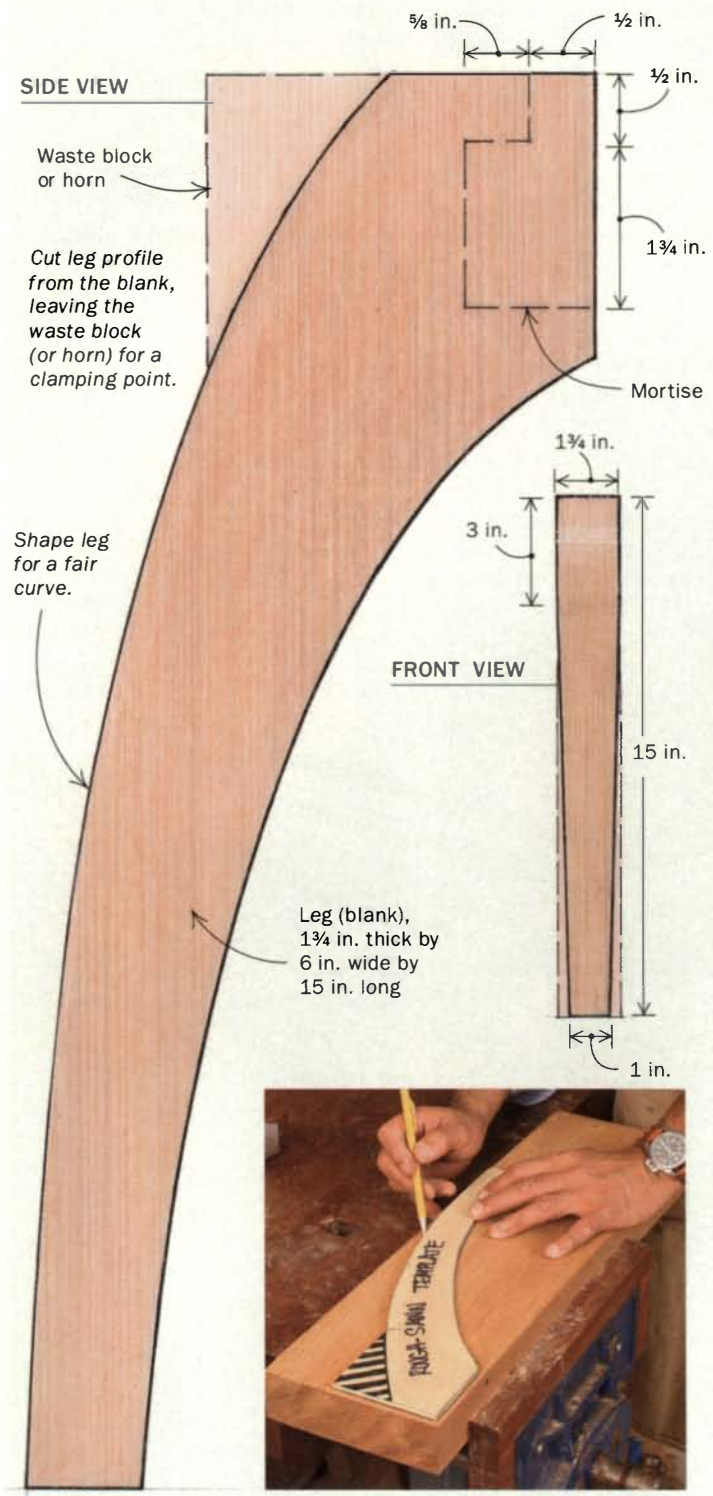
I cut the leg mortises before the tenons. That way, if the mortises end up oversize or undersize, the tenons can be adjusted as needed for a snug fit. Lay out the mortises with a marking gauge, positioning them exactly on center. The mortises can be cut


**JOINERY FOR A STURDY TABLE**

# Do some shaping before assembly

**THE OVERALL PROFILE**

**Use a template to trace the shape of the leg (including a temporary horn), then bandsaw the profile and cut the leg mortises. Setting a photocopier to 200% will produce a full-size copy of the leg.**






***Use a template to trace the leg profile.*** *Duplicating the legs is much more uniform with a template.*

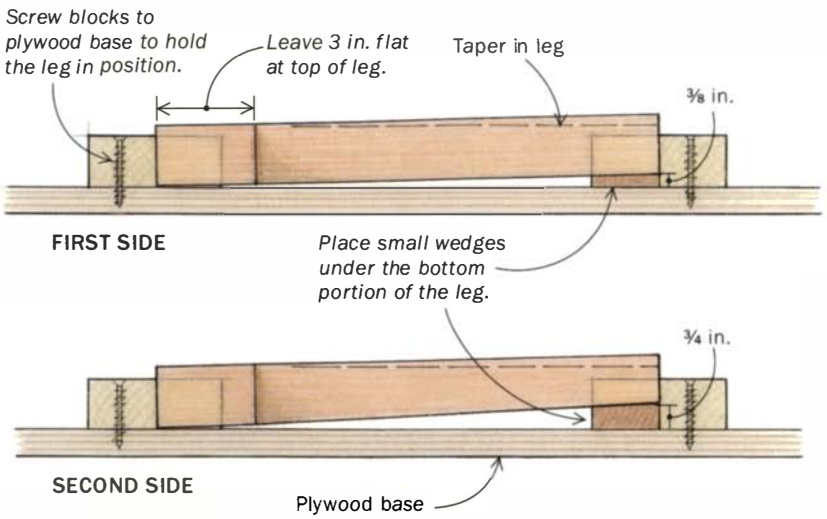

easily enough with a drill and chisel. But I'm fortunate to have a mortiser, so I immediately put it to good use. To make the mortises at the right angle, I rest the horns on a block on the mortiser table.

**Taper the leg**—The leg taper is next. Each taper starts at a point 3 in. below the top and extends to the bottom of the leg. At the starting point, the leg has the full 1¾ in. width; then it tapers ⅜ in. on each side to produce a thickness of 1 in. at the bottom.

I use a thickness planer and a couple of simple jigs to create the tapers (see drawings, p. 69). Each jig is a rectangular base piece made of ¾-in.-thick plywood. The leg blank is placed on the base, roughly perpendicular to the planer cutterhead. Then a few wood blocks are butted up to the blank to hold it in position as it travels through the planer. The first jig has a spacer that raises the end ⅜ in. above the base. The second jig, which is a mirror image of the first, has a spacer that raises the opposite face of the leg a total of ¾ in.

If you'd rather not make the jigs or use a planer for the tapers, you can scribe the tapers along the edge of each leg and then use a bandsaw to trim away most of the waste. A couple of lengths of masking tape work just fine as straightedges that easily conform to the curve of the leg. After bandsawing, complete the taper by

***Taper the legs.*** *A thickness planer and two jigs are used to taper the sides of the legs (left). With a leg in one of the jigs, taper the first side by elevating the bottom end of the leg ⅜ in. Then, transfer the leg to the second jig and taper the second side by raising the leg ¾ in.*





using a handplane to smooth the sides of each leg right up to the scribed lines.

## Make the leg rails and assemble the legs

With the leg tapers completed, work on the two leg rails. Each one needs tenons on both ends and a pair of dovetail mortises on the inside face. A haunched tenon is a good choice. The haunch provides added glue surface without weakening the tops of the legs.

Use a marking gauge to lay out the tenon thickness. Then, with a tablesaw and miter gauge, make a cut along both sides and the bottom edge to create the shoulders. After that, use the tablesaw to make the first haunch cut. Following the layout lines, cut the cheeks a little fat on the bandsaw. Make two more cuts on the bandsaw, one to complete the haunch and one to trim the tenon to width. Finally, use a fine rasp or shoulder plane to thin the cheeks as needed for a perfect fit in the mating leg mortise.

The dovetail mortises for the leg rails are cut with a router and a ¾-in., 7° router bit. I stop the dovetail mortises ½ in. short of the bottom edge of the rail. A pencil mark on the router table tells me when to stop.

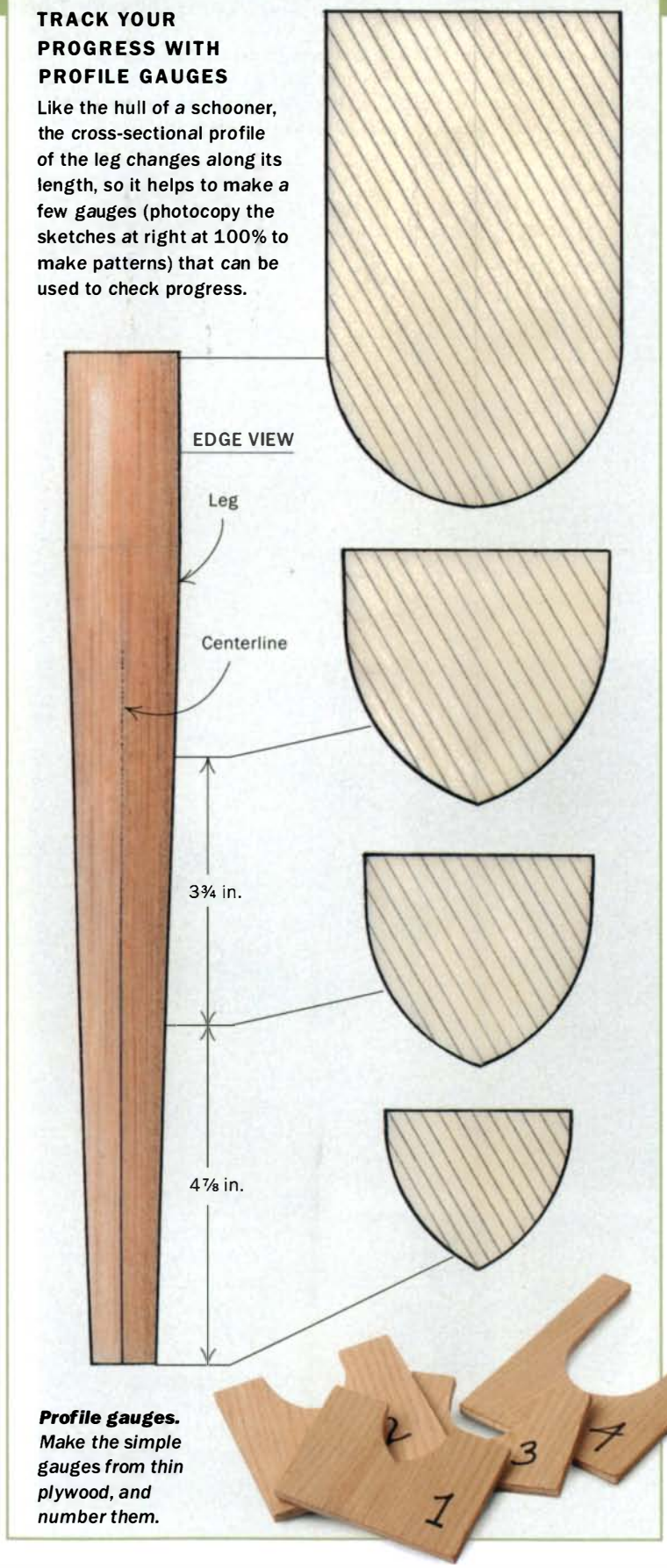
Each leg frame is made up of two legs and a leg rail. With the horns still attached to the legs, you should be able to

***Assemble the leg frames.*** *Cut the dovetail grooves in the leg rails, then join the leg rails to the legs (above). The horns prove handy here, as they provide purchase for the clamp jaws. Trim the horns after the glue dries (left).*

# Sculpt and smooth the legs

**TRACK YOUR PROGRESS WITH PROFILE GAUGES**

Like the hull of a schooner, the cross-sectional profile of the leg changes along its length, so it helps to make a few gauges (photocopy the sketches at right at 100% to make patterns) that can be used to check progress.




***Profile gauges.*** *Make the simple gauges from thin plywood, and number them.*

***Fair the leg curves and mark the centerline.*** *The bandsaw leaves the legs with a rough surface, so Rodriguez starts the shaping process by smoothing the front of each leg and marking a centerline (above) with a strip of tape serving as a flexible straightedge.*

glue up each frame with a couple of clamps. Before gluing, though, give the underside of the legs and the rails a thorough sanding. After gluing up, check the flatness of the frames with a straightedge. Clean up excess glue with a damp rag, then set the frames aside to dry.

## Now finish shaping the legs

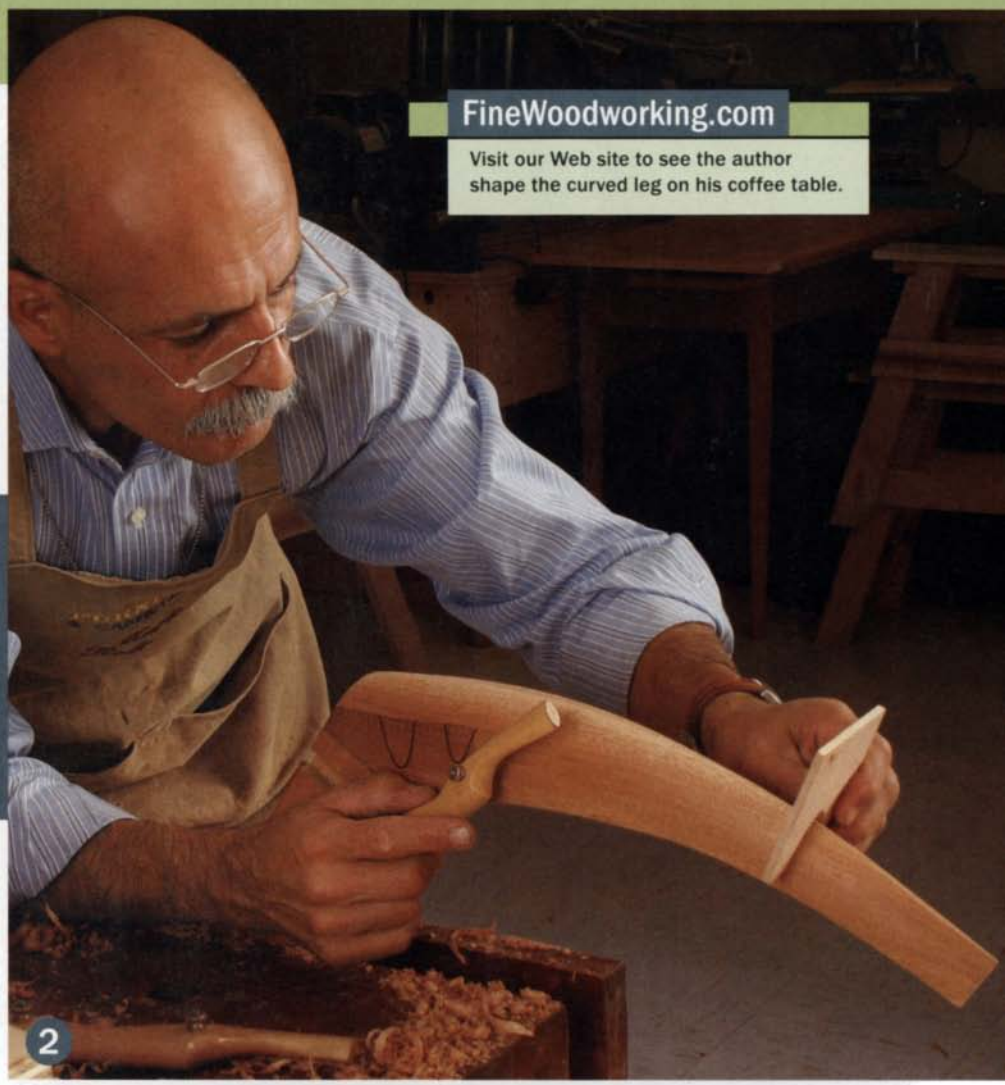
After removing the clamps, return to the bandsaw to cut away the horns. Now it's time to finish sculpting the legs. There are two objectives at this point: The first is to shape the outline to a smooth arc with no blips, depressions, or flat spots. The second is to shape the changing profile of the leg.

I use a spokeshave to shape the arc of the leg into a smooth curve. Adjust the spokeshave to produce thick curls for the heaviest cuts, then readjust the blade for fine, gossamer shavings as the curve becomes more refined. A microplane (one of those stainless-steel cheese-grater-type cutters) can be helpful here. It can be easier to use in situations where the grain constantly changes.

With the arc of the curve generally smooth, I use a piece of tape as a flexible rule to mark a line down the center and establish the crease. For the crease to really stand out, cut away material just to the sides of it. Otherwise the curve will flatten out, appearing fat and making the crease look soft.

To gauge progress, it helps to make a series of section templates to fit against the work as you shape the legs. Work away from the scribed line and the "knee," in the direction of the grain, always careful to leave a smooth surface with crisp corners. Once most of the material has been removed with a spokeshave, a wood rasp is perfect for adjusting the profile and shaping the razor-sharp crease in the front edge of the leg. The longer the rasp, the easier it will be to achieve a smooth curve.

**Start shaping the legs.** *Using a spokeshave, start profiling the leg (1). With the gauges in hand, periodically check the progress of the profile along the front edge of each leg (2). After the spokeshave has done much of the heavy lifting, a rasp is perfect for further smoothing the leg surfaces. Sand the leg with a block to get a smooth surface without rounding the center crease (3).*



**FineWoodworking.com**

Visit our Web site to see the author shape the curved leg on his coffee table.

For the final shaping and smoothing, a flat card scraper is indispensable. I reground the edge of my scraper to a subtle concave curve to better blend the changing contours of the leg.

Finally, use 100-grit sandpaper to remove tool marks, finish off the crease, and complete the shaping of the legs. I find 100-grit coarse enough to remove material and make subtle changes in the shape, but not so coarse that it takes hours of remedial sanding to remove leftover scratches. During this stage, I often wet the leg with denatured alcohol to highlight any tearout, tool marks, or rough spots that need to be removed before progressing to a finer grit.

## Make the stretchers

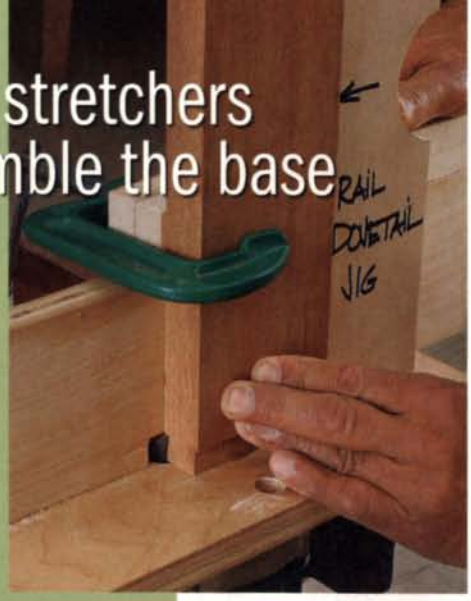
The two stretchers connect the leg frames, forming the base of the table. The stretchers also provide a means to attach the tabletop to the base.

I put my router table to use again, this time cutting the dovetails on the stretcher ends. There's no need to do anything with the bit; it remains at the same height for this cut. This time, though, use an L-shaped fence clamped to the table to support the stretcher. A notch in the fence allows you to bury the bit. In addition, I use a secondary fence to prevent the piece from tipping from front to back. Make a few trial cuts until the fit is perfect.

Using a rasp, round over the bottom edge of the notch so that it fits at the end of the dovetail mortise in the leg rail.

The top edge of each stretcher is cut away at the ends, producing the effect of a tabletop that floats above the leg frames. Begin by marking out the location of the cutout that creates the narrowed

# Make the stretchers and assemble the base




***Cut a dovetail on the stretcher ends.*** *The same router bit used earlier to cut dovetail grooves in the leg rails, set to the same height, cuts the dovetail on each end of the stretchers (top). Aim for a smooth, sliding fit. A rasp then shapes one end of the dovetail (right) to fit the stopped dovetail groove in the leg rail.*

end. Cut it out on the bandsaw, staying just on the waste side of the line. Use a drum sander, then a scraper to smooth the sawn edge to the line.

After the leg frames have been sanded, apply glue to the stretcher dovetails and the dovetail mortises on the leg rails. Then, assemble the stretchers and the leg frames, adding a couple of bar clamps to make sure everything stays in place until the glue has dried.

Using the router and a ⅛-in.-wide slot-cutting bit, cut four short grooves in each leg rail. Make them just long enough to accept small, metal tabletop clips on the inside surface of the rails.

## Glue up the top and add the breadboard ends

After ripping the boards for the top to nearly equal width, and crosscutting each one a little on the long side, I join them with biscuits. Once dry, I use a crosscut sled to square the ends of the assembled top on the tablesaw.

Breadboard ends give the table a clean look and help to keep the top flat. The easiest way to mount the breadboard ends is to use a router with a ¼-in. slot-cutting bit and cut a groove on the inside edge of each breadboard and on the ends of the top. A solid-wood spline goes in the grooves. The top must be able to expand and contract with seasonal changes in humidity. To accommodate this movement, I glue the spline to the top along its entire width. On the breadboard end, I apply the glue at the midpoint for about


***Install the stretchers.*** *Once glue is applied to the mating surfaces, slip the stretcher dovetails into the leg-rail mortises. Add clamps to the assembly. A pair of clamps spanning the stretchers helps ensure a tight joint.*

# Add breadboard ends and attach the top

***An easy technique for breadboard ends.*** *A long mahogany spline (above), capped on each end with a short piece of walnut, is glued into a groove on each end of the top. On the breadboard-end groove, apply glue on only about 12 in. at the midpoint. A couple of pipe clamps (right) apply pressure to the joint connecting the top and breadboard ends.*

12 in. This is sufficient to keep the top flat and strong, yet allows it to move without cracking.

I use ¼-in.-thick mahogany stock for the spline, but any hardwood will work. In order for the spline to move in unison with the top, the grain of the spline must run parallel to the grain of the top. The spline doesn't need to be one piece from one side of the top to the other. Several narrower pieces, placed side by side, work just as effectively. To create visual contrast, I add a short piece of walnut at each end of the spline. This is an eye-catching detail, so a clean, tight job is a must.

Once the top, the splines, and the breadboard ends are assembled, a couple of pipe clamps provide enough pressure on the joints.

Now, with the breadboard ends mounted, round over all the top edges using a ⅜-in. quarter-round bit on the router table. The result is a ¾-in. radius around all four edges of the top.

Next, place the base in the center of the upside-down tabletop. Slip the table-mounting clips into the slots cut earlier. Secure each clip to the underside of the top with a screw.

## Apply finish to the table

I chose Waterlox Original for the finish. It's easy to apply and can be rejuvenated without fuss. After sanding all surfaces with 220-grit paper, brush on two coats within a couple of hours and allow the table to dry for 24 hours. Then sand with 220-grit sandpaper. The result is a casual open-pore surface that's easy to maintain.

Adding more coats and wet sanding with Waterlox produces a smoother, high-gloss finish. Either approach gives great results.

The next step is to wipe on a light coat of Waterlox with a rag to brighten and even out the finish. As a final step, apply a coat of paste wax and buff all the surfaces to a soft luster. □

*Mario Rodriguez is a contributing editor.*

***Mount the top and apply the finish.*** *After attaching the top to the base, finish the table. A few coats of Waterlox Original, followed by a coat of paste wax, complete the project.*

# 11 Essential Measuring and Marking Tools

## Accurate layouts become routine when the right tools are close at hand

BY CHRIS GOCHNOUR

Careful layout is important to every woodworking project. Measure or mark a part inaccurately and it almost certainly will cause problems along the way.

That point was driven home recently as I taught a woodworking class where students used mostly hand tools to build a Hepplewhite writing desk. As the class progressed, the correlation between effective layout and successful woodworking was clear. Students who carefully laid out their projects with crisp, concise markings built their desks quickly and efficiently, with fewer setbacks. Students who laid out their projects with faint and irregular markings had to work at a slower, less productive pace. Not surprisingly, the latter group took longer to complete their desks, and the quality level was not up to that of the other students.

All that led me to consider my favorite measuring and marking tools, the ones I keep within easy reach and use nearly every day. These 11 tools are as important to my work as any hand or powered cutting tool. A well-equipped workshop, I feel, should include one of each.

*Chris Gochnour lives in Murray, Utah, where he builds furniture and teaches woodworking.*

## 12-in. combination square

***A square and more.*** *Perfect for scribing a square line on boards up to a foot wide, this tool has several other features that come in handy.*

**The 12-in. combination square is an 8-in-1 tool that I find indispensable. Its versatility comes from the unique shape of its head and an adjustable blade that's incrementally marked as a rule.**

**A 12-in. combination square can be used as a long- or short-bladed try square, as well as a miter square. The adjustable rule enables it to serve as a depth gauge to verify the depth of a mortise, dado, or hole. It also can be set up as a height gauge to check tablesaw-blade or router-bit height. Used with a pencil, it can scribe lines parallel to board edges, much like a marking gauge.**

**A glass level vial, set in its head, verifies that things are plumb and level. As a final benefit, the blade can be removed altogether and used as a precision rule or straightedge.**

**Inexpensive, discount-store varieties are usually not well marked or machined. To get the most from a combination square, it's best to purchase one from a reputable maker of precision engineer's tools.**

Photos, except where noted: Tom Begnal; individual tools: Rodney Diaz

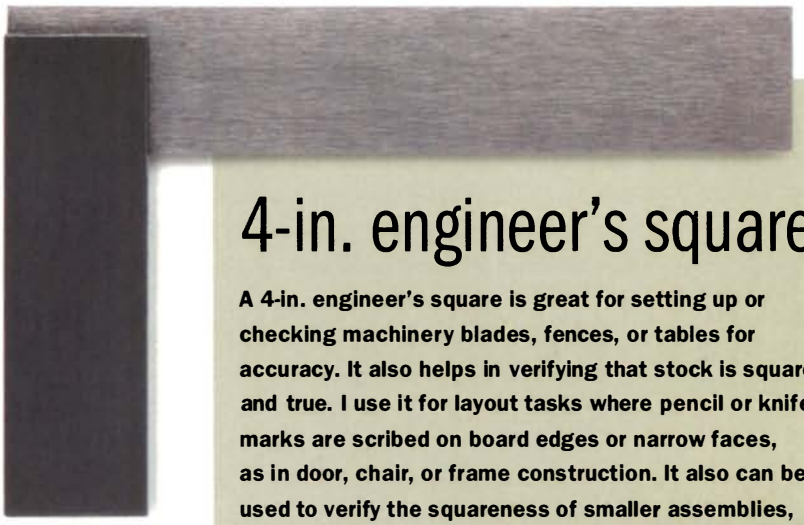
***Framing square for bigger jobs.*** *When scribing a line across a wide workpiece, like a panel, a framing square is Gochnour's tool of choice.*

## Framing square

Another square I find useful, particularly for large-scale work, is the framing square. Although generally viewed as a carpenter's tool, it is extremely useful in the woodshop. Made from one piece of aluminum or steel, roughly ⅛ in. thick, with one arm incrementally marked to 16 in. and the other to 24 in., it serves as a jumbo try square for larger work.

Among other tasks, I use mine to lay out cut lines on panels or wide lumber, to define joinery across wide case pieces, to test the corners of panels to verify accuracy, and to check case assemblies for squareness during glue-ups.

Although framing squares are not expensive and generally are not viewed as precision tools, I've used the same one for 20 years and have never had to true it up. I treat it with care, and like an old friend, it has never let me down.



## 4-in. engineer's square

A 4-in. engineer's square is great for setting up or checking machinery blades, fences, or tables for accuracy. It also helps in verifying that stock is square and true. I use it for layout tasks where pencil or knife marks are scribed on board edges or narrow faces, as in door, chair, or frame construction. It also can be used to verify the squareness of smaller assemblies, such as doors, drawers, cases, and the like.

Made of precision-milled steel, engineer's squares are dead accurate. And they stay that way indefinitely, given proper care. They are relatively inexpensive, and the little extra spent on a reputable brand will pay for itself in the long run.

***Compact and precise.*** *Small enough to fit into the pocket of a shop apron, a 4-in. engineer's square has a lot of good uses in the shop, including, as shown, scribing the end lines on dovetail joints.*


# 12-ft. tape measure

I use a steel tape for many of my day-to-day measuring tasks. Tapes range in length from 8 ft. to 25 ft.; the blade widths run from ½ in. to 1 in. I like a 12-ft. tape. It's long enough for most furniture-making needs, but not so heavy as to weigh down my pocket or belt.

I prefer a ¾-in.-wide blade, simply because it is more rigid than the ½-in. That's useful when the blade must extend unsupported in order to make a measurement. The blade markings should be clear and easy to read.

I use a tape for most inside and outside measuring tasks. The hook on the tape end is designed to move in or out its exact thickness, enabling the tape to read inside and outside measurements accurately. If the hook is bent, the measurement will be inaccurate. Periodically check the hook against an accurate rule, and correct as needed.

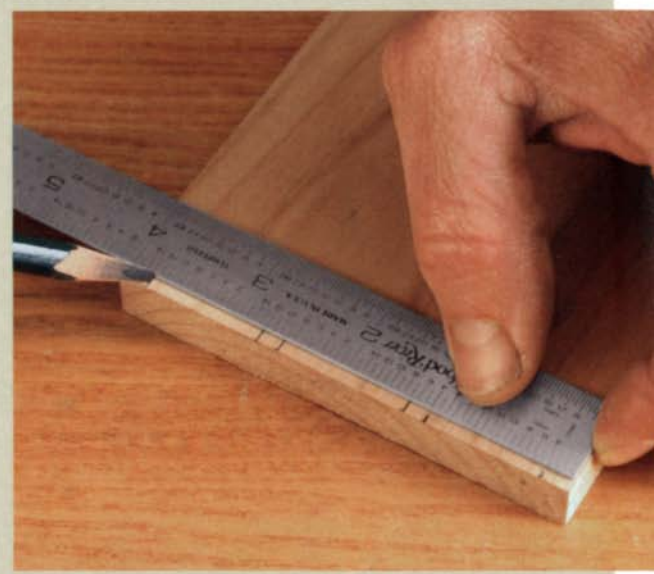
If real precision is required, I like to bypass the tape's hook and line up the tape on the 10-in. mark, take the reading, and then subtract 10 in.

***Tape measure gives all-around accuracy.*** *As workpieces get bigger, a tape measure is the ticket to long measurements.*


# 6-in. steel rule

A 6-in. steel rule is handy for setting the fences on tablesaws, routers, marking gauges, or plow planes. I also use it to set up blade or bit heights and to check stock thickness. It's great for laying out the full range of joinery, from mortise-and-tenon and dovetail joints to dowels and biscuits.

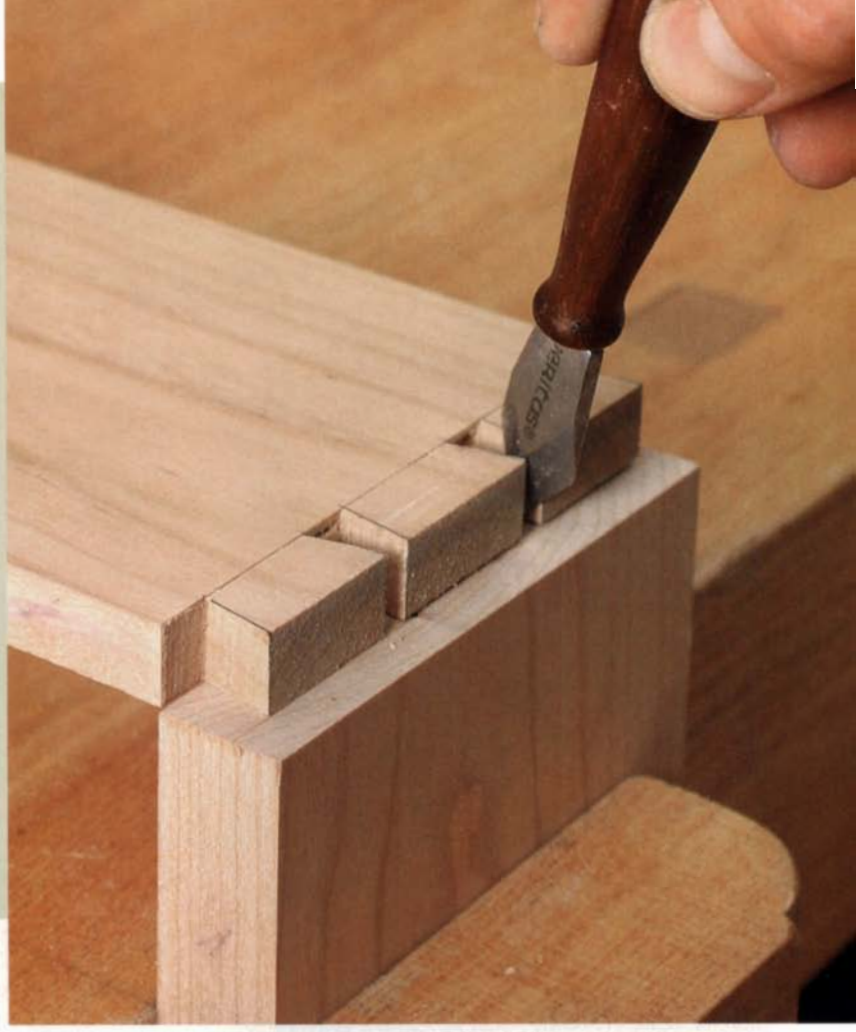
Look for a rule with markings etched into the steel, as they generally are easier to read. The markings should run from end to end so that you can measure from an inside corner. A rule that also has marks parallel to one end (not shown) is a plus, as it makes some height adjustments easier.



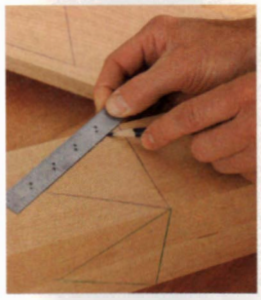
***Easy to use.*** *A short, easy-to-read, 6-in. steel rule is perfect for precise measuring and marking.*


# Marking knife

When a task requires a finer line than a pencil can make, a marking knife is my tool of choice. One of my favorites is a version made by Veritas, called a striking knife. It has a slender blade that tapers to an acute point, which is easy to slip between tight spaces and reach into tight corners. The blade is flat on one face but has two bevels on the other, making it suitable for both left- and right-handed marking. The flat face also allows it to fit right up to an edge. The blade is housed in a comfortable rosewood handle that is easy to grasp and enhances precision and control. The sides of the handle are flattened so that it won't roll off the workbench.



***Use a marking knife for sharp lines.*** *For scribing razor-sharp lines, even in tight places, a marking knife is a handy tool.*

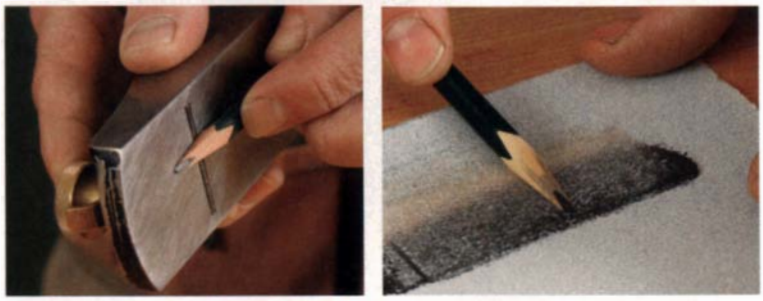


***Colored pencils offer good visibility.*** *Using pencils of different colors can help distinguish between similar parts. Also, lines from a white-lead pencil tend to show better on dark-colored woods.*

# Pencils


I use a variety of pencils, each suited to a particular task, such as marking boards for rough dimensions, basic joinery layout, designating waste areas, and shop math. For general shop use, I prefer a No. 2 pencil, sharpened to a point with a conventional sharpener. For jobs such as dovetailing, where a finer, more precise line is needed, I use a No. 3 pencil because it has harder lead. I shape the point with a block plane and sandpaper to create a fine, knifelike edge.

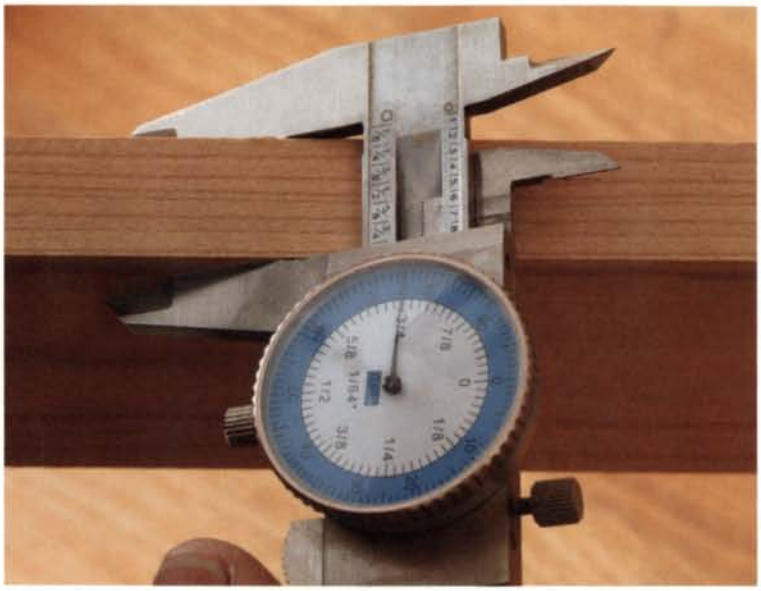
Colored pencils also are useful. For dark-colored woods like walnut and wenge, the mark from a white-lead pencil is easier to see. I use other colors on all wood types to define and designate cabinet or chair parts.



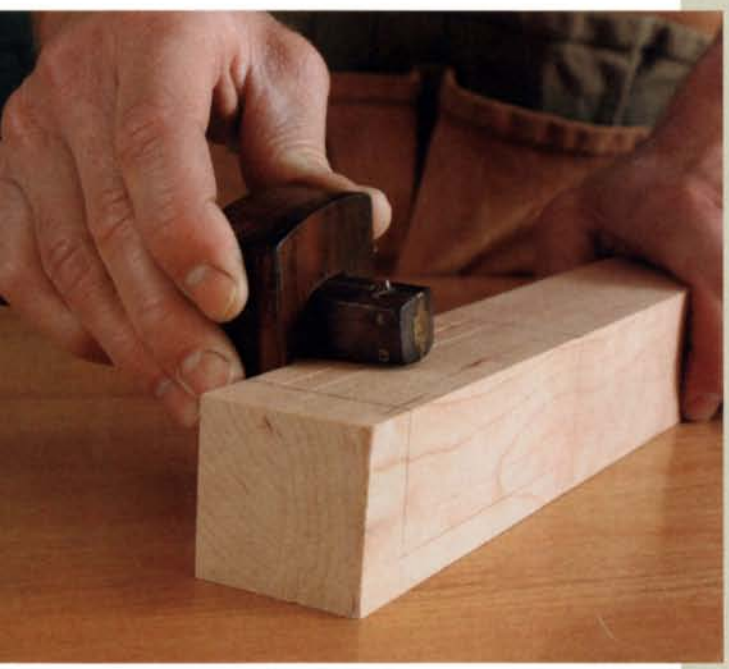
***A cleaner line.*** *Gochnour uses a No. 3 pencil when it's important to get an extrafine mark or line, but first he shaves the wooden end to a flat point on his handplane and then further hones the lead on a piece of fine sandpaper.*

# Fractional dial caliper

Dial calipers generally are viewed as machinists' tools, but they are great in the woodshop. They are capable of inside, outside, and depth measurements. A thumbscrew locks the jaws for measurement transfer. I find dial calipers helpful for verifying stock thickness, checking joinery size and spacing, and measuring turned parts. Unless you enjoy reading conversion charts, I would recommend the type with a dial incrementally marked in both fractions and decimals.



***When precision is a must.*** *When it comes to fine measuring, few woodworking tools match a good dial caliper. The decimal scale can measure to within 0.001 in.; the fractional scale to 1/64 in.*



***Parallel lines.*** *The combination gauge shines when you need to scribe a number of identical mortises.*

# Marking gauge

A combination-type marking gauge offers the user two options. One side of the gauge has a single pin, the other has a pair of pins. It is important to sharpen all the pins to a keen edge that will produce a knifelike cut.

The single pin is used to scribe lines parallel to a board edge. It's used across the grain for such tasks as scribing a baseline for dovetails or a tenon shoulder. Working with the grain, the single pin on a combination gauge can define a rabbet cut, or scribe a reference line to work to while preparing stock with hand tools.

The side with two pins can serve as a mortise gauge, allowing you to scribe simultaneously two lines parallel to a board's edge.

# Scratch awl

Traditionally, an awl was used for scribing lines with the grain or on end grain where knife marks are more difficult to see. I like to use an awl to mark the center of drill-hole locations. The impression left by this pointed tool helps to center the bit and ensure precise drilling whether you use a twist, brad-point, or auger bit. It also can be used to locate or start a center for lathe work.

Awls come in all shapes and sizes. The bottom line is to get one with a comfortable handle. I like it to have a few flat spots to keep it from rolling off the bench and a tapered, cylindrical shaft that terminates in a sharp conical point. Plain or fancy, take your pick.

***Center-point marker.*** *Although it can be used to scribe lines, the awl is especially useful for marking hole center points.*

# Bevel gauge

A bevel gauge, or sliding T-bevel, adjusts to lay out or transfer a full range of angles. The gauge consists of a fence and an adjustable, slotted blade that can be locked securely at the required angle. The fence is typically wood, metal, or a combination, with plastic used on the cheaper models. The blade is generally steel. Various means are used to lock the blade in the fence, ranging from a simple wing or knurled nut to a locking cam lever or a thumbscrew on the fence end.

***For marking angles.*** *A bevel gauge comes in handy when you need to scribe an angled line.*

Look for a lock that holds the blade securely in the fence and doesn't interfere with the bevel when the tool is lying on its side. A bevel gauge is useful for laying out dovetail and angled mortise-and-tenon joinery, and particularly for transferring angles from a working drawing or an existing part to machinery blades, fences, or tables for angled cuts.

# readers gallery

## W. PATRICK EDWARDS
San Diego, Calif.

These dazzling tilt-top tables (each 40 in. dia. by 32 in. tall) are based on an original made for the eldest daughter of King Louis-Philippe of France and unveiled at the Products of Industry Exhibition held in Paris in 1834 (the original is housed in the Royal Palace in Brussels). The tables are a stunning example of marquetry veneer. Combined, they contain more than 6,000 individual pieces of rosewood and satinwood in the tops alone. The gilded egg-and-dart moldings on the pedestal base were cast in bronze based on a pattern supplied by Edwards; the gilded feet were cast based on a carving by master carver Boris Khechoyan. Edwards built the tables entirely with hand tools, a labor-intensive process that required about 1,000 hours for each. The finish is French polish. PHOTO: GLENN CORMIER

## STEVEN HODGSON
Northfield, Minn.

This Arts and Crafts desk is a modified reproduction of an original designed by David Robertson Smith and built by Stickley Bros. of Grand Rapids, Mich., for the 1904 Louisiana Purchase Exhibition. Hodgson's version is made of quartersawn white oak and is 15 in. deep by 60 in. wide by 60 in. tall. The stained glass was fashioned by David Kjerland, a local artist, and the copper hardware was made by Ball and Ball Hardware Reproductions. The piece is finished with dye, stain, and lacquer.

## MARK BASKINGER
Pittsburgh, Pa.

These poplar vessels are laced with ribbons and dots of white acrylic sheeting to create a sharp distinction between artificial materials and natural elements. Baskinger flame-treated the poplar to blacken it. Flame-treating, he says, provides a rich, warm, black tone that can be difficult to achieve with stain or dyes. He wiped on a coat of Danish oil and a topcoat of beeswax while the wood was still warm to add luster and depth to the turnings. Each vessel is 3½ in. dia. by 15 in. tall.

## JASON TUINSTRA
Hanford, Calif.

Tuinstra began building furniture in 1997, and since that time he's developed an affinity for the simple, unadorned forms of the Shaker style. With this tall cabinet (12½ in. deep by 18 in. wide by 78½ in. tall) made of cherry with walnut accents, he simply wanted to "let the wood do the talking." The sides are attached to the top with through-dovetails, the moldings around the top are connected with sliding dovetails, and the doorknobs incorporate a version of Christian Becksvoort's spinner latch featured in *FWW* #155 (pp. 46-47). The finish is a mix of boiled linseed oil, polyurethane, and mineral spirits.

## ROBERT ERICKSON
Nevada City, Calif.

A contoured upholstered seat adds to the comfort of this mahogany chair. The curved arms and back slats are steam bent, while the remaining parts are shaped from solid stock. Overall, the chair measures 38 in. deep by 28 in. wide by 34 in. tall. To finish the piece, Erickson used three coats of tung oil.

## Submissions

Readers Gallery provides design inspiration by showcasing the work of our readers. For consideration, send entry forms (available at www.finewoodworking.com) and photos (unaltered digital images, prints with negatives, or slides) to Readers Gallery, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470. If you want materials returned, you must include a self-addressed envelope with appropriate postage.

## CONGER MURRAY
Orrington, Maine

Murray made this table (24 in. deep by 48 in. wide by 30 in. tall) as his final project for a 12-week intensive course at The Center for Furniture Craftsmanship in Rockport, Maine. The table, made of cherry and bird's-eye maple, has subtle touches that invite a closer look. For instance, the curved aprons blend perfectly into the tops of the delicate legs, with a bead mating both elements, and the inlay in the top frames the figured cherry. The finish is an oil/varnish mixture.

## LEO GOLIN
Troy, Mich.

The design for this mahogany bombé chest (20 in. deep by 40 in. wide by 36 in. tall) came from an article by Lance Patterson in the March/April 1984 issue (*FWW* #45). Golin needed about 200 hours to complete the piece. It is finished with three coats of shellac.

## NICHOLAS FALZONE
Alameda, Calif.

Over the years, Falzone has developed an interest in Japanese furniture and culture. This shoji lamp allowed him to experiment with traditional Japanese woodworking tools and skills. Falzone cut 112 joints by hand to build this piece, including mortise-and-tenons, half-laps, and mitered half-laps. The entire process took about 60 hours. The lamp is 8½ in. square by 19 in. tall and is made of cypress, left unfinished.

## STEVE WARGO
Strongsville, Ohio

In building this silver chest-on-stand, Wargo culled ideas from the Federal period and furniture by Garrett Hack. The result is a piece with clean, classical lines and subtle, elegant details, such as the mahogany cock beading around the drawers and the ebonized beading under the aprons. The chest (14 in. deep by 24 in. wide by 45 in. tall) is made mostly of mahogany, with curly sycamore veneers and ebonized maple. It is finished with French polish. PHOTO: BRAD CROUCH

## JAMES M. CASEBOLT
Douglas City, Calif.

The client for this mahogany rocker (28 in. deep by 34 in. wide by 50 in. tall) wanted the chair to remind him of the interplay among planets as well as to commemorate the Chinese Year of the Snake. The serpentine form in the sides of the chair allowed Casebolt to do one of his favorite things: bend wood into complex curves. The planetary forms on the back were made from marble by David Salazar of Santa Cruz, and the spinning orbs on the front were turned by Casebolt out of bird's-eye maple and black walnut. The finish is polyurethane. PHOTOS: STEVE KIRKISH

## ROBERT ORTIZ
Chestertown, Md.

Ortiz designed and built this garden bench for the Adkins Arboretum on Maryland's Eastern Shore to help with the arboretum's fund-raising efforts. The bench (17 in. deep by 72 in. wide by 20 in. tall), made of western red cedar, melds Shaker and Japanese influences to create a practical seat with gentle curves and visible joinery. The bottom stretcher design is an homage to George Nakashima. Ortiz left the bench unfinished so that it will weather to a soft silver color, blending naturally into the landscape.

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Patrick T. Hankard–South Windsor, CT

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Carl Stude–Burbank, CA

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READER SERVICE NO. 113

# 10 tips for choosing a woodworking class

## ASK THE RIGHT QUESTIONS AND YOU WILL FIND A GOOD FIT

BY D.J. FAL

**My passion for woodworking began more than 15 years ago with a beginner's course taught by my county's parks and recreation department. As my work progressed, I found classes that focused on more advanced techniques to be invaluable. I could read and read, but seeing a technique executed just one time made all the difference in my ability and confidence to use it in my work.**

**Not every classroom experience has been a good one, however. I recently attended a six-day class that fell short of its pledge to teach advanced techniques, in this case because the instructor lacked an organized lesson plan.**

**There are a bewildering variety of classes out there, many advertised with minimal descriptions requiring you to take a leap of faith that your interpretation matches the intentions of the instructor. There's a very real chance of landing in a course that moves too slowly or is too advanced.**

**Some investigation ahead of time can help you avoid problems and choose the right course. And the school is not the only source of information available. Many instructors have a visiting relationship with several schools, and will be pleased to speak with you personally.**

**Woodworking classes require a substantial investment in time and money, and you deserve the best. Here's what to look for.**

### 1. Is the class appropriate for your skill level?

The instructor should specify whether the class is for beginning, intermediate, or advanced woodworkers. If the instructor hasn't decided what skill level is appropriate for the class, don't attend. Beyond that, the instructor should be able to describe the specific skills needed for the course. For example, students in an intermediate, machine-oriented class might be expected to have experience in face-jointing, edge-jointing, planing to thickness, edge-gluing boards, ripping and crosscutting on a tablesaw, and cutting dadoes and tenon shoulders on a tablesaw.

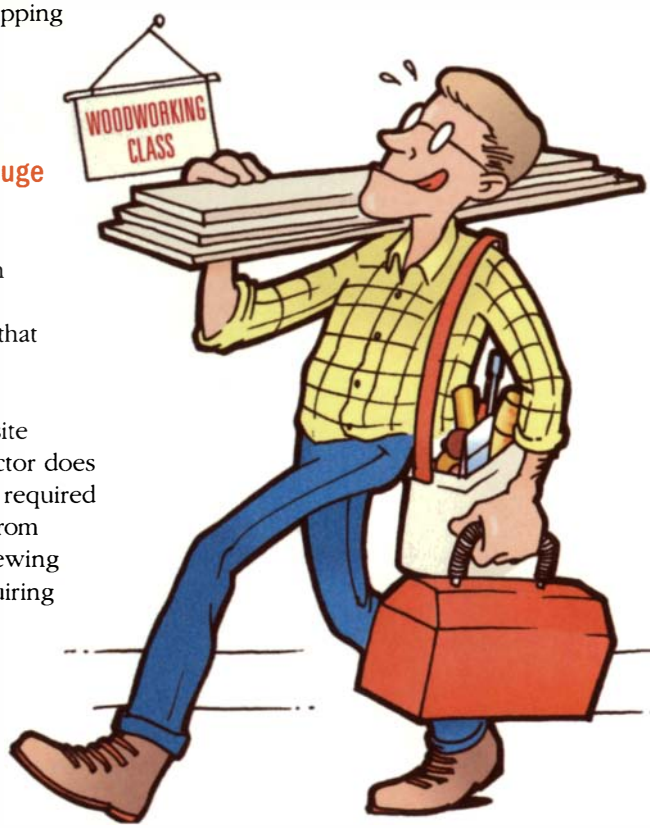
### 2. How does the instructor gauge students' experience?

Extra instruction for beginning woodworkers can slow down an intermediate class, preventing other students from learning all that the course advertised. An astute instructor will screen students to prevent this. Is there a prerequisite class? If not, ask what the instructor does to ensure that students have the required skills. The answer could range from simple phone interviews to reviewing photos of students' work to requiring reference letters from previous instructors.

### 3. Will the instructor teach what you're looking for in an organized way?

Ask for a detailed class outline, in advance, that describes the main topics and specifies when each will be covered. Even in an advanced class, in which each student works on a different project, the instructor should have an outline of new techniques that he or she plans to introduce to all the students each day.

Be especially wary if the instructor has no set schedule for introducing topics but instead says "it depends on the pace of the class," or "I work with each person individually so you can set your own pace." It is the instructor's




Drawings: Scott Johnson

responsibility to set the pace to accomplish his or her teaching goals.

If there is a set schedule, pay close attention to the order in which the topics will be presented. Does the instructor plan to wait until the last day to address the complicated topics, or do students have enough time to practice new techniques?

Don't expect to come home with a finished piece of furniture. Do expect to at least observe a demonstration of the processes needed to complete your piece when you return home. Some courses split up the instruction over a period of months, such as holding classes on three separate weekends so that the students can complete the project at home as the course progresses.

The instructor might also provide a suggested reading list in advance so that each student can arrive prepared to make the most of the experience.

### 4. Does the teacher have adequate experience?

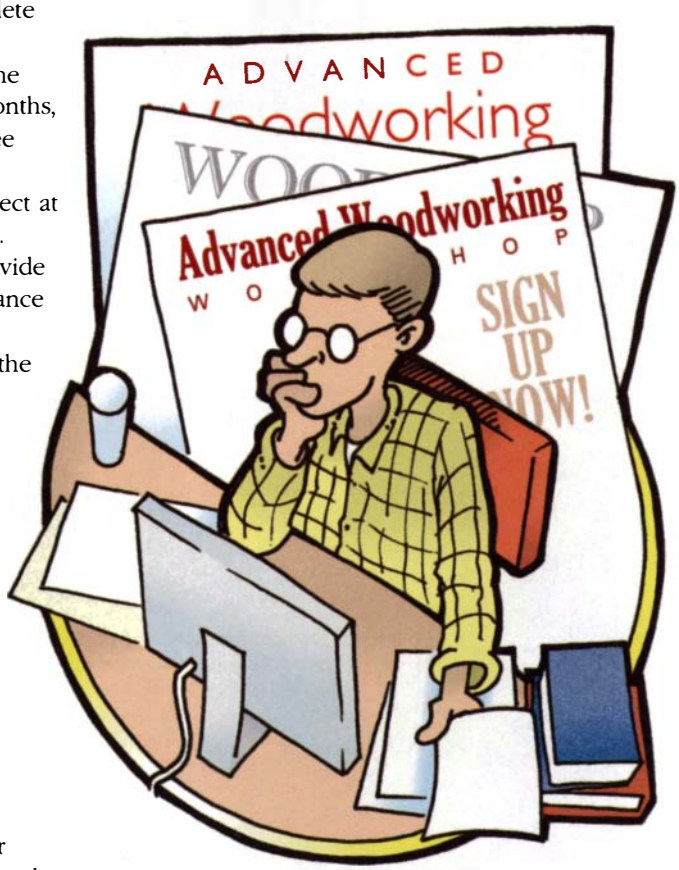
Find out what you can. Some suggestions: Ask where the instructor learned and has taught woodworking. Ask to see examples of his or her work. For a project-oriented class, ask to see a completed example. More important than whether you like the project is the likelihood that you can transfer the skills you would learn to another piece when you return home. Look for depth of technical ability and communication skills. Even a first-time instructor can be great if he or she has an organized approach. Ask the instructor if you can call a former student for a reference.

### 5. What equipment will be used?

What you really want to know is, "Will I be able to do everything at home the same way I'll do it in your shop with an investment I can afford?" Beware of classes that rely on digitized industrial machines or elaborate commercial jigs.

### 6. What advance preparation is required?

Ask for a rough cutlist of materials to be milled in advance. If the project requires a number of large glued-up parts, such as a chest of drawers, the instructor should require glue-up to rough size in advance. If not, you can expect to spend much of your class time milling and gluing parts and you may never get to other, more challenging tasks.




### 7. Is there enough individual supervision?

Every student will make mistakes that require individual assistance. Some schools restrict the number of students to as few as six, while others have as many as 20 in a class. Ask about class size and whether there is a qualified teaching assistant who can help with the technical aspects of your project, rather than just monitor machine safety. Determine whether the student-teacher ratio makes sense given the nature of the class. If the instructor also runs the school, find out whether he or she uses class time for administrative work. If so, this can distract from teaching duties.

Will the instructor allow one student to work on a different project from all the other students? If so, that one student will receive 50% of the instructor's time.

Ask how the instructor shares the learning experiences of the individuals with the rest of the class.

### 8. Will there be adequate shop time?

Ask what hours the facility and the machines will be available for you to use. Some schools staff the shop with assistants from 7:30 a.m. to 9 p.m. so machines can be used. At other times, the facility may be restricted to hand-tool usage only, but available on a 24-hour basis. Judge whether the shop hours will offer you enough access given the size of the project and the milling needs.

### 9. Are the facilities adequate?

Regardless of how organized the instructor is, inadequate school facilities can hinder both the instructor's ability to demonstrate techniques and your opportunity to practice those new skills. Don't be swayed by gourmet meals and pretty scenery. What is important here are adequate workbenches, tools (so you can practice before you invest), and machinery.

### 10. Is the school considerate of your time and investment?

Ask how many students must enroll before a class goes forward, how much notice the school will give you when they decide to cancel a class, and what the refund policies are if you need to cancel or are dissatisfied with the class after taking it. □

Q&A

# Drilling benchdog holes in a thick top

**Q: I recently built a workbench, and I'd like to install benchdogs in the top, which is 2½-in.-thick hard maple. How do I drill the ¾-in.-dia. dog holes accurately on my layout marks and perpendicular to the surface?**

**—TONY P. ZAMBITO, Grosse Pointe Park, Mich.**

**A: THERE ARE A FEW WAYS TO CREATE BENCHDOG HOLES,** but for dog holes that are dead-on perpendicular and accurate, I use a plunge router.

The first step is a careful layout of the ¾-in.-dia. dog-hole positions. Mark a line down the center of each row of dog holes, then use a compass to draw the outline of all the holes along that line.

Next, drill a pilot hole through the top using a handheld drill and a ⅝-in. drill bit. (If you've bought a premade benchtop, be careful of steel in it. I purchased a premade top once, and while drilling the pilot holes, the bit hit steel embedded in the wood. Bummer.)

After drilling all the holes from the top, chuck a ¾-in.-dia. straight bit in a plunge router and set the depth to plunge as deep into the top as you can go. The longest ¾-in. bit I can find is 2 in., so you'll have to cut mostly from the top and finish the cut from the bottom.

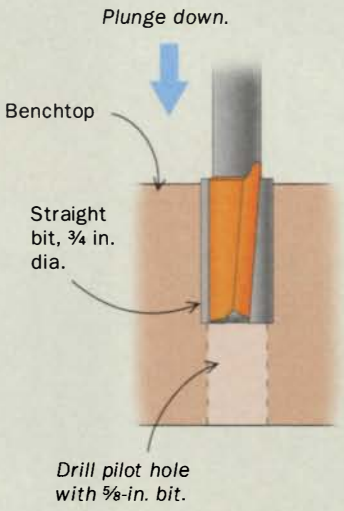
The router will want to walk when you begin cutting, so clamp it firmly in place. If you have a wide enough base, you can use clamps or place two stout 2x2s on top of the base and clamp them along their lengths to hold the router in place. If you have a narrow base, a surefire method to hold down the router is to attach it to an auxiliary base made of ¼-in.-thick Masonite or plywood sized to fit the width of the benchtop. Screw the router to the auxiliary base and plunge the ¾-in. hole through the base. Align the hole in the auxiliary base over the hole laid out on the benchtop, and clamp the base down firmly.

Turn on the router, and plunge to depth. After routing all the holes from the top, flip it over and finish the holes from the bottom using a ½-in.-dia. bearing-guided straight bit.

*—Gary Rogowski, contributing editor*

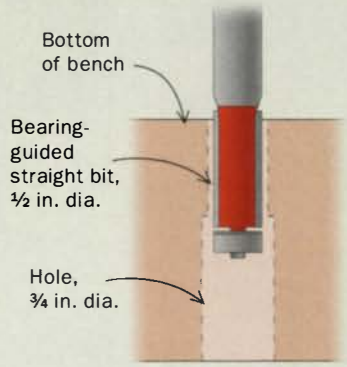
### 1. CUT FROM ABOVE WITH A PLUNGE ROUTER AND STRAIGHT BIT

***First drill pilot holes using a handheld drill and a ⅝-in. bit. Then attach a ¼-in.-thick auxiliary base to the router, and clamp it firmly to the benchtop to prevent the router from walking during the cut. Align the hole in the auxiliary base with the hole marked out on the top. Set the plunge router to cut as deep as the bit will allow. Take your time with the cut.***




### 2. CLEAN OUT THE WASTE FROM THE BOTTOM

***A bearing-guided straight bit will follow the surface of the hole cut from the top. (Be sure the pilot hole you drill is large enough to fit the bearing.)***






Photos, bottom, Thomas McKenna; top, Kelly J. Dunton

# Support thin tabletops with a frame

**Q: I have large pieces of beautiful bubinga. The straight and flat boards are 40 in. wide by 12 ft. long, but they're only ⅜ in. thick. Can I use this wood for a tabletop?**

**—ANDY BUCHANAN, Chester Springs, Pa.**

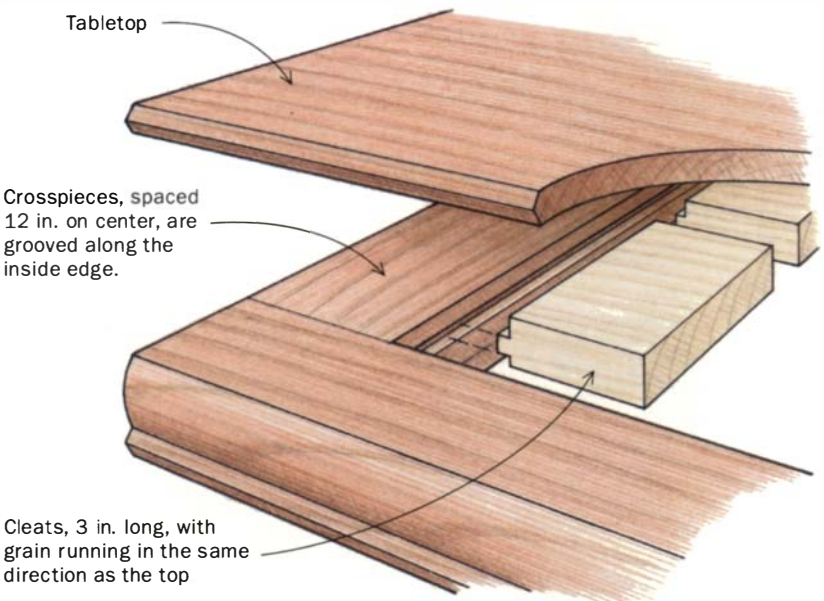
**A: YOUR BUBINGA PANELS ARE TOO THIN** to be structurally sound or aesthetically pleasing as a tabletop unless you build a framework that supports the thin panels unobtrusively from underneath.

Short cleats, glued to the underside of the thin top, fit into grooves in the frame, allowing the top to move without lifting off the frame. And the edges of the top panel and frame are molded to make the tabletop look thicker and downplay the movement.

In general, I plan on 3/16 in. of wood movement per foot across the grain, which means your 40-in.-wide panel could expand and contract by as much as ⅝ in.

The grain of the cleats should run in the same direction as the top. The tongues on the cleats hook into the grooves in the frame and allow for movement across the width of the table. For the top to move evenly above the frame, fix it to the cross-frame members at its centerline.

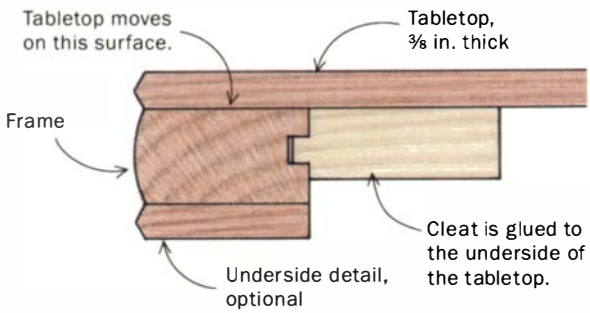
*—Michael Fortune, furniture maker in Lakefield, Ont., Canada*




**SUPPORT FRAME ALLOWS FOR MOVEMENT**

**A thin tabletop board is attached to the framework at its centerline so that the movement across the grain will be equal on both sides. Cleats, spaced 4 in. on center, are glued to the underside of the top and mate with grooves in the crosspieces to allow for wood movement.**

**EDGE DETAIL**




# How to remove bugs from reclaimed wood

**Q: We are using reclaimed wood to make a project for our daughter, and from sawdust deposits next to the wood we have detected some bug activity. How do we get rid of the bugs without using harsh chemicals?**

**—KEVIN DANEY, Silver Spring, Md.**

**A: YOU HAVE TWO MAIN OPTIONS:** using borate compounds or sealing the wood. One kills the larvae of wood-boring insects; the other stops their reproduction cycle.

Borate compounds are classified as low-risk chemicals and are available to consumers as wood preservatives. Applied in a thin penetrating liquid, these compounds leach out slowly, making them a long-lasting solution for indoor or outdoor use. Two brand names are Bora-Care and Termite Prufe.

Sealing the wood is a nonchemical alternative to treating infested wood. But it means applying paint, varnish, or oil, letting the existing larvae pupate and leave, and then sealing the wood again to close their exit holes.

*—Lee Grindinger, furniture maker in Livingston, Mont.*


***Safe for humans but toxic to wood borers.** These two products are available at local hardware stores and online.*



Drawings: Vince Babak; photos, this page and p. 94: Marcia Ryan

# How to hold Japanese saws

**Q: While I am accustomed to Western saws, I am a little lost when it comes to Japanese saws. What is the proper technique for holding one?**

**—BRUCE MACEACHERN, Ottawa, Ont., Canada**

**A:** UNLIKE WESTERN SAWS, Japanese saws cut on the pull stroke. Their blades tend to be thinner and more flexible. To keep the blade from buckling, it is essential to cut only on the pull stroke, and not to bear down on the blade. Hold the handle quite loosely, near the end where it flares out slightly. Position your index finger along the ridge of the handle, making sure your grip is comfortable. I usually start the cut with the heel of the blade on the far side of the workpiece and pull the saw toward me.

*—Simon Watts, San Francisco furniture maker*

***Hold the saw at the far end of the handle.*** *Cut only on the pull stroke, and let the saw's weight do the work.*

## Ask a question

Do you have a question you'd like us to consider for the column? Send it to Q&A, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwqa@taunton.com.

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# Inlaying ornamental bellflowers

BY STEVE LATTA

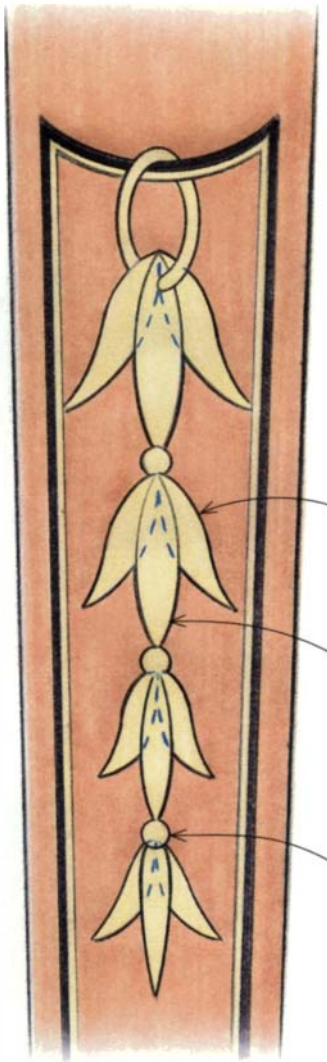
Bellflower inlays come in many variations, but the type used on the card table I built (see "Federal Card Table," *FWW* #180, pp. 54-63) are common to Baltimore work and are extremely beautiful.

If you've never attempted this type of inlaying before, I urge you to go ahead, but to practice first on a dummy table leg. You'll need a bright light and a steady hand, but with a little patience you'll raise your woodworking skills to a new level.

### Prepare the petals

Use the full-size image at right to photocopy each of the four outer and four center petal sizes. Spray-mount these onto a sheet of holly veneer and punch them out with carving gouges, (primarily #7-20mm and #8-7mm). Then use these petals as templates to lay out identical petals.

Try to arrange the petals in rows with the long axis parallel to the grain. After layout, cut the veneer into single-row strips so that when you cut the petals free with the gouges, the veneer won't split across an adjoining line



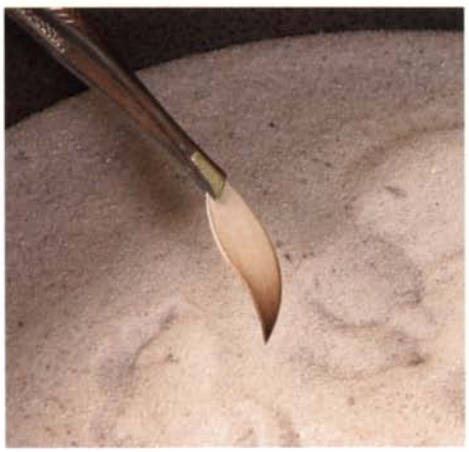

**FULL-SIZE TEMPLATE FOR THE LEG INLAYS**

Make a photocopy of this illustration on paper and cut out the different-size petals to use as templates for the holly bellflowers. To locate the bellflowers, make a photocopy on a transparency and place that on top of the leg blank. When you are happy with the location, mark the ends of each petal with a sharp point.

## Create the petals

***Lay out the petals.*** *Cut out one petal of each size and use that as a template. The points of a divider work well to hold down the petal as you draw around it with a sharp pencil.*

***Chop out the petals.*** *Use different-size carving gouges to slice out the petals from the holly veneer.*



***Scorch the petals in hot sand.*** *Dip the petals into fine sand heated on a hot plate. The graduated shading will give the petals a three-dimensional appearance.*



Photos: Mark Schofield; drawings: Bob La Pointe

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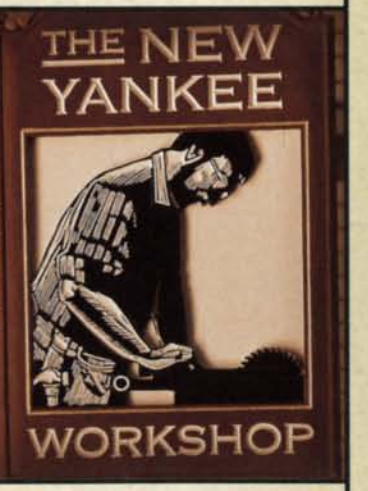




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## Inlay the petals


***Lay out and outline the bellflowers.*** *Position a transparency of the flowers on a leg and then mark the tips of each petal with a sharp point (above). Use dabs of hide glue to stick the outer petals in position temporarily, and outline them with an X-Acto knife (right). When done, pry off the petals with a chisel.*

***Excavate the recesses.*** *Latta uses a Dremel tool fitted with a router base and a small spiral bit to remove the bulk of the wood (top). He cleans up the cut with a narrow chisel (above) and a router plane fitted with a pointed blade.*

of petals. Be sure to make several extra petals in each size. To keep the different sizes separate, I made a special holder from a piece of scrapwood with four rows of three 1½-in.-wide holes.

To give the petals a three-dimensional appearance, I scorched certain edges in hot sand to darken them. The key to even shading is to use very fine sand, about the texture of table salt. Coarse sand will cause parts of the holly to burn but will leave adjacent sections white. I used sand brought back from a family holiday in Siesta Key, Fla., but I'm sure you can find equally good supplies at craft stores. Place about an inch of sand in a cast-iron skillet and warm it on an electric hot plate or stove. Use some of the extra petals to test the length of time to immerse the holly for the most attractive shading.

### Trace and inlay the petals

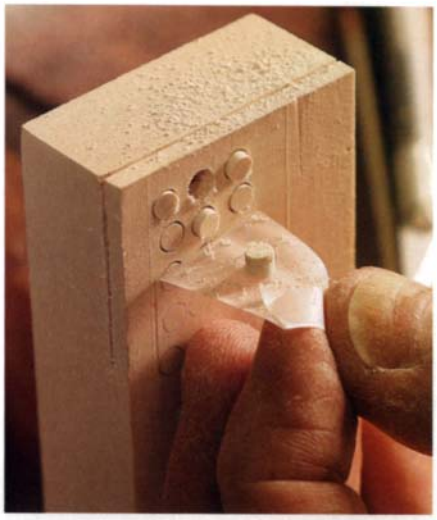
The easiest way to locate the flowers on the leg is to photocopy the full-size image onto a transparency. Copy centers or office-supply stores can do this. Position the transparency on the leg and then mark the location of the tips of the petals with a sharp point. Note that the top two petals stray over the stringing.

Remove the transparency, and then tack the correct sequence of outside petals to the leg using a couple of small dabs of hot hide glue—dabs, not droplets. If you use too much glue, you'll have a terrible time getting your petals off in one piece. I prefer hot hide glue because it sets up quickly and fills any gaps during the actual inlaying. White glue is an acceptable alternative.

Once the glue is dry, scribe around the petals with an X-Acto knife, cutting with the flow of the grain. Apply firm, controlled

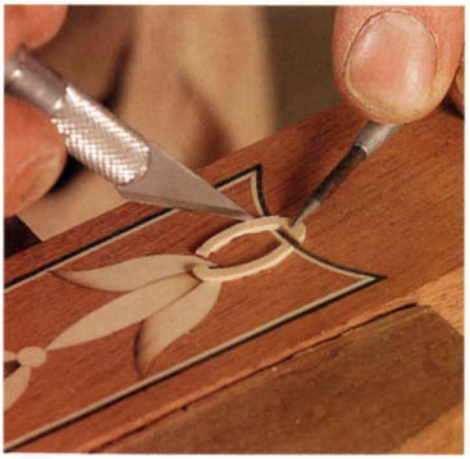
***Glue in the pieces.*** *Start with the outer pairs of petals, using a clamping caul lined with clear tape to prevent sticking. The next day, you can inlay the center petals.*

## Complete the inlay



**Custom plug cutter.** *The author files teeth on the end of a brass rod (above) and uses a drill press to drill the holly plugs. Clear tape prevents the plugs from falling out when slicing them free with a handsaw (right).*

**Inset the plugs.** *Drill holes for the circles with a brad-point bit and insert the plugs with a little hide glue. When dry, pare them flush with the leg.*



**Delicate work.** *Make the loop that suspends the bellflowers from laminated holly veneer to prevent it from breaking. Inlay the two pieces in the same way as the petals.*

pressure; the cuts should go fairly deep. Carefully pry off the petals with a chisel and put them aside in the correct order. Use a small router plane, or a rotary tool with a base (like a Dremel) to remove the waste. Clean up the recess with your router plane or a narrow chisel. Use a syringe to apply a film of hide glue into the cavities. Glue all four sets of outer petals into place, clamping them with a block covered with clear tape to prevent sticking. When dry, scrape or pare away the outside leaves until they are just proud of the surface, and repeat the inlaying process with the center petals.

### Create and inset the circles

The bellflowers are connected by circles that are actually holly plugs. Because you are unlikely to find a 5/32-in. plug cutter, I made my own from a section of brass tubing available at most good hobby stores. Take a triangular needle file and form teeth in one end. Gently chuck the tubing into a drill press and cut a series of plugs in a block of holly. To remove the plugs, lay a piece of clear tape over them, saw behind the plugs, and peel them away. Use a matching size brad-point bit to cut the holes, then glue in the plugs.

### A ring and an oval finish the job

The top ring that suspends the bellflowers has left and right sections and also is punched out with chisels. However, unlike the single veneer used for the petals, because the ring pieces are such erratic shapes, I make the inlay from two pieces of thin holly glued cross-grain to each other. This helps them to hold together better when cut.

The ornamental thistle was made using a similar method to one discussed in my earlier article, "Federal-Style Oval Inlays" (*FWW* #138, pp. 70-75). Alternatively, you can buy ready-made ovals (www.doverinlay.com, 301-223-8620). The oval is inlaid in exactly the same way as the petals. Do a final sanding when all the inlays have been scraped roughly level with the leg. □

**Crowning glory.** *The pilaster of each leg is decorated with an oval inlay that can be bought or shop-made.*

# You can brush lacquer

## GOOD BRUSHES AND THE RIGHT INGREDIENTS MAKE A FAST-DRYING, DURABLE FINISH WITHOUT SPRAYING

BY ROLAND JOHNSON


Lacquer is almost always sprayed on, and most folks think brushing it is nearly impossible to do well.

Sure, lacquer dries quickly, and that can make it difficult to apply without brush and lap marks. But using the proper additives to slow the drying and quality brushes for even application, I can get a good lacquer finish without dragging out the spray gun.

Lacquer's short drying time means less opportunity for dust to settle on the wet finish, and less time between coats. It also wears better than shellac or varnish. And because dried lacquer forever remains soluble in lacquer thinner, repairing a lacquer finish is a simple matter of applying a new coat.

### The right recipe

Several companies—Behlen, Briwax, Deft, McCloskey, and Minwax—make lacquer designed for brushing. I prefer Behlen because they sell a special thinner, a lacquer retarder, and a flow-out extender: I use all three. Flow-out extender and retarder are types of thinner. Flow-out extender slows the initial flash to give the lacquer more time to level out. Retarder, often referred to as blush inhibitor, slows the final flash and the overall drying time, giving moisture time to escape. Moisture trapped in lacquer shows up as a white fogginess called blush.

Lacquer thinner is highly flammable, and two of its solvents are particularly harmful. Benzene is a known carcinogen; toluene is linked to birth defects. Wear a respirator with cartridges rated for organic solvents, and be sure there are no open flames nearby.

Start with a level surface, or between-coat sanding will take high spots down to bare wood and leave low spots untouched. I finish-sand the piece

## Use about 10% thinner in the first coat

Use pencil marks on masking tape to keep track of the amount of thinner you are adding (left). Brush the edges before the top or bottom. With any brushed finish, there's a tendency to build up finish at edges. By brushing the top last, it is easy to smooth out this buildup.

***This coat is not fussy but should be uniform.*** *Start laying the finish on a flat surface a couple of inches from the edge, brushing toward the edges (above left). Then, using the same starting point, brush toward the center (above right). Apply this sealer coat liberally, brushing out runs as you go, and blending everything together with one long finish stroke.*

Photos: Andy Engel

## Blend lap lines for smooth finish coat

The same brushing pattern is used for the finish coats, but the lacquer is thinned 5%.

***Sand level and recoat.*** *A hard sanding block knocks down runs (above). Apply the lacquer heavily enough that the brush marks start to blend almost immediately (right). Don't brush long enough to dissolve the previous coat, or it will be uneven. Lay it on, tip it off, and leave it alone.*

using P180-grit paper on a block. When sanding is complete, I clear the surfaces with compressed air and a tack cloth.

This is the time to fill the pores of an open-grained wood. In tight-grained wood, the lacquer will fill the grain adequately.

Make sure stain, dye, or colorant, if used, is completely dry before applying lacquer. If not, residual thinner from the stain eventually will soften the lacquer.

I usually make a sample board from scraps sanded and colored to the same finish as the project. As finishing progresses, I experiment on the sample.

### The right brush

Use high-quality, soft, natural-bristle brushes. My favorites are a 2-in. Omega Lily Oval that I use for larger areas (it holds a lot of finish) and a 2-in. Omega Lily Filbert that I use for small surfaces. Two sources are Homestead Finishing Products (www.homesteadfinishing.com) and Jamestown Distributors (www.jamestowndistributors.com).

The soft tips of these brushes leave very fine marks, important when tipping off the finish. "Tipping off" refers to the final few strokes of a coat, when just the tips of the bristles are used to level out bigger ridges.

For the first coat, or seal coat, I thin the brushing lacquer about 10% with the brushing-lacquer thinner. I mix a small batch in a glass jar so that I won't contaminate the lacquer in the can or waste finish.

After the sealer has dried for a couple of hours, I sand it with P320-grit sandpaper on a block. Use long, light strokes to get all the nubs and dust off the surface. When the surface feels silky smooth, clean it with compressed air and a tack cloth.

I start by thinning the finish coats about 5% for better flow. (I have added as much as 30% thinner, though.) To find the right combination of thinner, flow-out extender, and retarder for the finish coats, I experiment on the sample board.

On hot summer days, lacquer can dry so quickly that it's almost impossible to blend lap lines and get rid of brush marks. It's better to work when it's cooler. As the lacquer dries on the sample board, watch for blush. If any appears, add retarder to the lacquer you'll brush onto the workpiece. □

## ACHIEVE A LOW OR HIGH GLOSS

**Lacquer brushed on can be sanded and rubbed out to either a low luster or a high gloss, depending on how many coats are applied.**

### LOW GLOSS

A low-gloss finish takes only one or two finish coats. If there are obtrusive flaws, a light sanding of the hardened lacquer with P600-grit paper comes first. Then rub out the finish with 0000 steel wool for a lustrous finish.

### HIGH GLOSS

If your goal is a high-gloss finish, you'll need three to four coats. Build up enough lacquer to allow a final sanding with P800-grit paper and a rub-out. I use automotive rubbing compound and a cotton cloth.

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## Index to issues 175 through 181

This alphabetical index covers the issues of *Fine Woodworking* published in 2005 (FWW #175 through #181). For a more comprehensive index, go to www.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.

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# Hand-crafted by Machine



Don Green's furniture gives production work a good name. Very good. Schooled in sculpture yet determined to make woodworking profitable, Green has designed a line of furniture that combines elegance with efficiency.

The elegance derives from fine proportions, handsome materials, crisp detailing, and the sparing use of curved elements in primarily rectilinear pieces. The efficiency? It's a function of Green's almost exclusive reliance on machine processes. As soon as the hand tools come out, he says, the profits go down.

This equation has long ruled the furniture industry, but rarely does production furniture have anything like the tactile appeal and personal flavor of Green's work. His upstate New York operation is, with the exception of a very occasional assistant, a factory of one.

*—Jonathan Binzen*

Photos: Drew Harty