TAUNTON'S
# Fine WoodWorking

October 2003
No. 165

**No-mess glue-ups**

## Tool test: Miter gauges

A new twist on sharpening

How to deal with wood movement in furniture

Milling lumber

Best rulers for woodworking

Biscuit joinery

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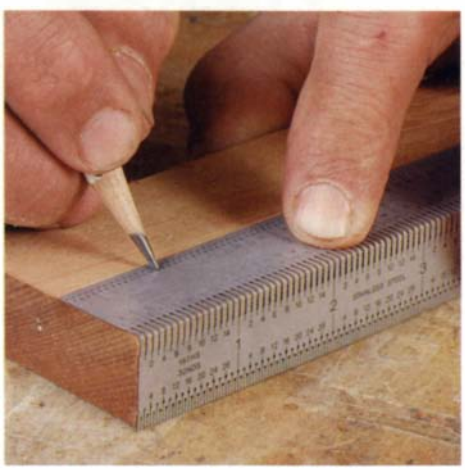
# Departments



***On the Cover:***
*Build an elegant pine cupboard—and practice your hand-tool skills at the same time.*
*See p. 54*
*Photo: Matt Berger*

***Transform rough lumber into flat, square stock, p. 32***



***Precision rulers for woodworking, p. 50***

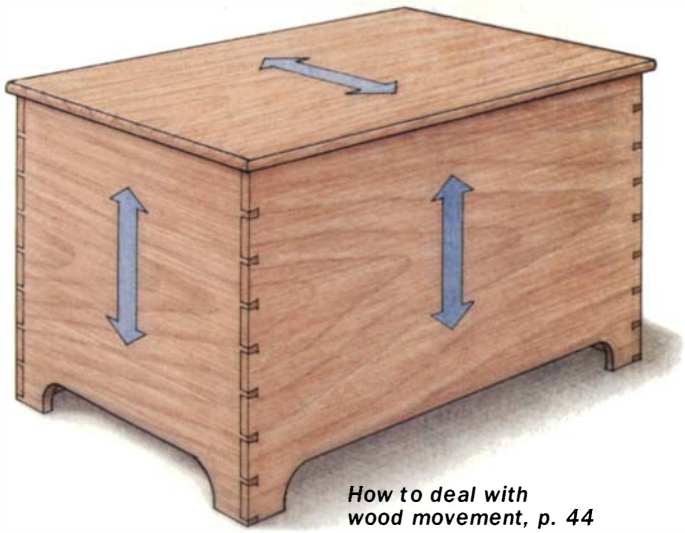
***Choose the right finish for turnings, p. 62***

SEPTEMBER/OCTOBER 2003 NO.165

# Articles




*Using a biscuit joiner, p. 66*



*How to deal with wood movement, p. 44*



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# Contributors

**Tim Albers** ("Replacement Miter Gauges") spends his days as the chief financial officer of a large produce company. But he spends much of his free time in his backyard woodshop in Ventura, Calif., producing mulch for his wife's garden and adjusting his woodworking machinery. Occasionally, some real woodworking takes place as he builds furniture for family and friends.

Trained in England and now based in Bloomington, Ind., **Nancy Hiller** ("Updating an Antique") makes furniture and cabinetry inspired by late 19th- and early 20th-century designs. A stickler for authentic detail, she has been known to buy entire sets of vintage cabinets for their hardware when the proper hinges or door pulls for her work are not available. Hiller has worked in shops ranging from a converted chicken coop to the Imperial War Museum at Duxford Airbase in England. Her current shop sits amid 40 acres of buffalo pasture.

This issue's Finish Line was an unusual joint effort: The flat-top Connecticut highboy was the first major period piece built by **Bruce Polsky** (left in photo), a relative newcomer to woodworking.

Polsky, like many woodworkers, was nervous that one false step in the finishing process could ruin months of hard work. Having taken a finishing course given by **Peter Gedrys**, a professional finisher in East Haddam, Conn., Polsky approached him to see whether Gedrys would give him private lessons, taking him through each finishing step. While the lessons cost extra, Polsky considered them a great investment in his finishing skills as well as the best way to get a finish worthy of his masterpiece.

Contributing editor **Mike Dunbar** ("Step-Back Cupboard") is known for his Windsor chairs and his book *Make a Windsor Chair with Michael Dunbar* (The Taunton Press, 1985). After falling into woodworking while in college, Dunbar resurrected the age-old process of Windsor-chair making with hand tools by studying antique examples of the chair. In 1996 he opened The Windsor Institute, where he gives classes to as many as 600 students each year. He also is an encyclopedia of information on antique hand tools and has accumulated quite a personal collection.

**Jay Haavik** (Master Class) has been a professional artist and woodworker for more than 30 years. He

is particularly interested in applying ancient motifs, themes, and woodworking techniques in a contemporary manner. This past summer, Haavik spent three months at the Viking Ship Museum in Oslo, Norway, studying Viking-era carving. His work may be seen at www.jayhaavik.com.

**Jenny Dubin** (Notes & Comment—"An American carves out a career in Nepal") has been living in Nepal for the past nine years working as a journalist and filmmaker. She writes for a variety of magazines, including *Outside* and *Marie Claire*, and has worked as a producer of the TV shows *Survivor 2: The Australian Outback* and NOVA's *Everest: The Death Zone*, as well as for the IMAX film *Everest*. She wrote the cover story for the April 2003 issue of *Outside* magazine, commemorating the 50th anniversary of the first ascent of Everest. Originally from Texas, Dubin first traveled to Asia in 1990. When she landed in Nepal, she said, "I felt like I was coming home."

This year marks a milestone in **Christian Becksvoort's** ("Understanding Wood Movement") career with the production of his 500th piece of furniture. His work pays tribute to the quiet presence and clarity of purpose of the Shaker traditions that have inspired his work for many years. Becksvoort is the author of *The Shaker Legacy* (The Taunton Press, 1998).


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# Letters

**Romanticizing prisoner woodworking programs—**This past year, *Fine Woodworking* offered not one but two articles about prison woodworkers: "Secret Spaces" (*FWW* #159, pp. 90-95) and "Making furniture behind bars" (*FWW* #163, p. 24).

I, on the one hand, am glad that prisoners are learning a trade instead of just sitting around or worse. On the other hand, I'm concerned that your articles have failed to mention that most of these prison workers are basically slaves: They're often paid 27¢ or less per hour. Also, there are corporations that are using these captives to compete with small and large companies, thereby putting them out of business.

The office-furniture industry has all but disappeared from our country. Clothing manufacturers, metalworking concerns, and others have to compete with this unfair and just plain wrong situation. The average Joe Six-pack will say, "Good, make these criminals work!" But they're uninformed. The prison building and operating industry is the largest industry in the United States, a country with more prisoners than any other in the world. If you keep promoting these prison workers without telling the whole story, you may find yourselves competing with a prison-based woodworker magazine. Their writers will be just as knowledgeable as you all and will work for 27¢ per hour, putting you out of business.

I am considering not renewing my subscription after seeing your second article in one year on this subject. Please review your stance on this issue. Your skewed and romantic articles about fine prison woodworking are acclimating people to this growing corrupt and destructive system.

*—Pat Henry, Philadelphia, Pa.*

**Woodworking tolerances—**I am compelled to respond to the advice given by Garrett Hack in the Q&A response "How flat is flat?" (*FWW* #163, pp. 98-100).

In discussing how flat a surface needs to be for sharpening chisels and plane irons, Hack stated that he "regularly polishes down to 3 microns and sometimes to 1 micron, the equivalent of 0.000039 in." This decimal is equal to 39 millionths of an inch!

I am more than mildly annoyed when the craft and art of working with wood is subjected to such absurd specifications.

As we all know, tolerances of perhaps 1/64 of an inch are achievable. I submit that working to 39 millionths is ridiculous!

*—Jim Vasi, Williamsville, N.Y.*

**GARRETT HACK REPLIES—**You confuse the practical working tolerance for a tool and the size of the sharpening grit used to hone its edge. They are vastly different. I hone down to 1 micron (that's 0.000039 in.) for the keenest edge on my best paring chisel or smoothing plane, and it makes a noticeable difference. This is hardly excessive when you consider

## Fine WoodWorking .... around the country

### Next Williamsburg conference to focus on tall-case clocks

Although it doesn't happen until January, it's not too early to start thinking about and planning for the annual "Working Wood in the 18th Century" conference at Colonial Williamsburg. Cosponsored by *Fine Woodworking*, the topic this year is tall-case clocks. Talks, demonstrations, and discussions will focus on making both formal, high-style tall-case clocks as well as their "simpler," but just as intriguing, country cousins.

Two identical sessions will be held, Jan. 18-21 and Jan. 22-25. Final details are being worked out, but if you want to get on the mailing list and receive an application brochure, call Colonial Williamsburg at 800-603-0948 or visit the Web site at www.colonialwilliamsburg.org.

***Writing an article***

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


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that a surgical black Arkansas is about 5 microns, an 8,000-grit waterstone is about 3 microns, and a 12,000-grit stone is about 1.5 microns, all of which typically are used for a final honing. Such fine grit polishes out the scratches left from coarser grits. A smooth edge is sharper and lasts longer.

As for working to 1/64 of an inch, I often plane shavings 0.001 in. thick, and I have heard about Japanese carpenters making shavings as fine as 0.0001 in. Practical working tolerances are relative, but I agree with you that woodworking is not rocket science. In fact, I often advocate putting away your tape and relying on your eye alone.

**Feline-free finishing—**Forget about missing blade guards, eye protection, and the like. In Jeff Jewitt's "Finishing Mahogany" article (*FWW* #164, pp. 36-41), there's a photograph on p. 41 showing a disaster just waiting to happen. From the look in the little fellow's eyes, it won't be long before Jewitt has a new problem to deal with: footprints.

*—Paul McElligott, Latham, N.Y.*

**Clarifying how compressors work—**In Roland Johnson's article "Choosing a Compressor" (*FWW* #164, pp. 50-53), there are a few myths and errors.

Let's start with size. The most important measurement of compressor size is the cfm delivered at the pressure the user needs. Pressurizing a tank to 175 psi instead of 125 psi when your tools only need 90 psi is a bad idea. When compressing air, increases in temperature and pressure are proportional; the higher the pressure, the hotter the temperature. Higher pressures produce more wear, not less. To achieve higher pressures, the pump must also run significantly longer and at a higher temperature. If anything, most users should turn the pressure switch down, not up.

Regarding larger tanks that store more air: The fact is, once air is drawn down and the pump kicks in, the compressor will have to keep up with demand all on its own. If the pump does not deliver the necessary airflow (cfm delivered) for the tool, you'll have to stop working until the tank is recharged. That's a pain for sanding and can ruin some sensitive finishes.

The references in the article to the sources of liquid water (condensate) in compressed air are inaccurate. Every type of compressor, single or two stage, piston or rotary, large tank or small, operating in identical atmospheric conditions, compressing the air to the same pressure, will produce the same amount of water in the compressed air. It's important to keep that water away from tools and workpieces.

A larger tank, for example, allows the air to cool and condense more water than a smaller tank. That's a good thing. An after-cooler will condense much of the water, usually allowing the condensate to drain back to the tank for eventual removal. An air dryer is the best solution for removing water. (The article got the points on tank size and after-cooler function quite backward.)

*—Philip Derrow, Air Technologies, Columbus, Ohio*

**Rust never sleeps—**In his Q&A response "Preventing rust in a toolbox" (*FWW* #164, p. 98), Christian Becksvoort missed the boat. He says to enclose metal objects in plastic bags to keep them from rusting. I live in western Washington, perhaps the most humid and wet area in the United States between October and April, and I know rust.

If you put ferrous metal in a bag without desiccant, it had better be dry and cool where you do it. If not, as soon as the temperature drops, you will have a bag of moisture and rust. The first thing I do when I get something wrapped in plastic is remove the plastic.

*—Patrick Sariego, Yelm, Wash.*

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

*—Anatole Burkin, executive editor*

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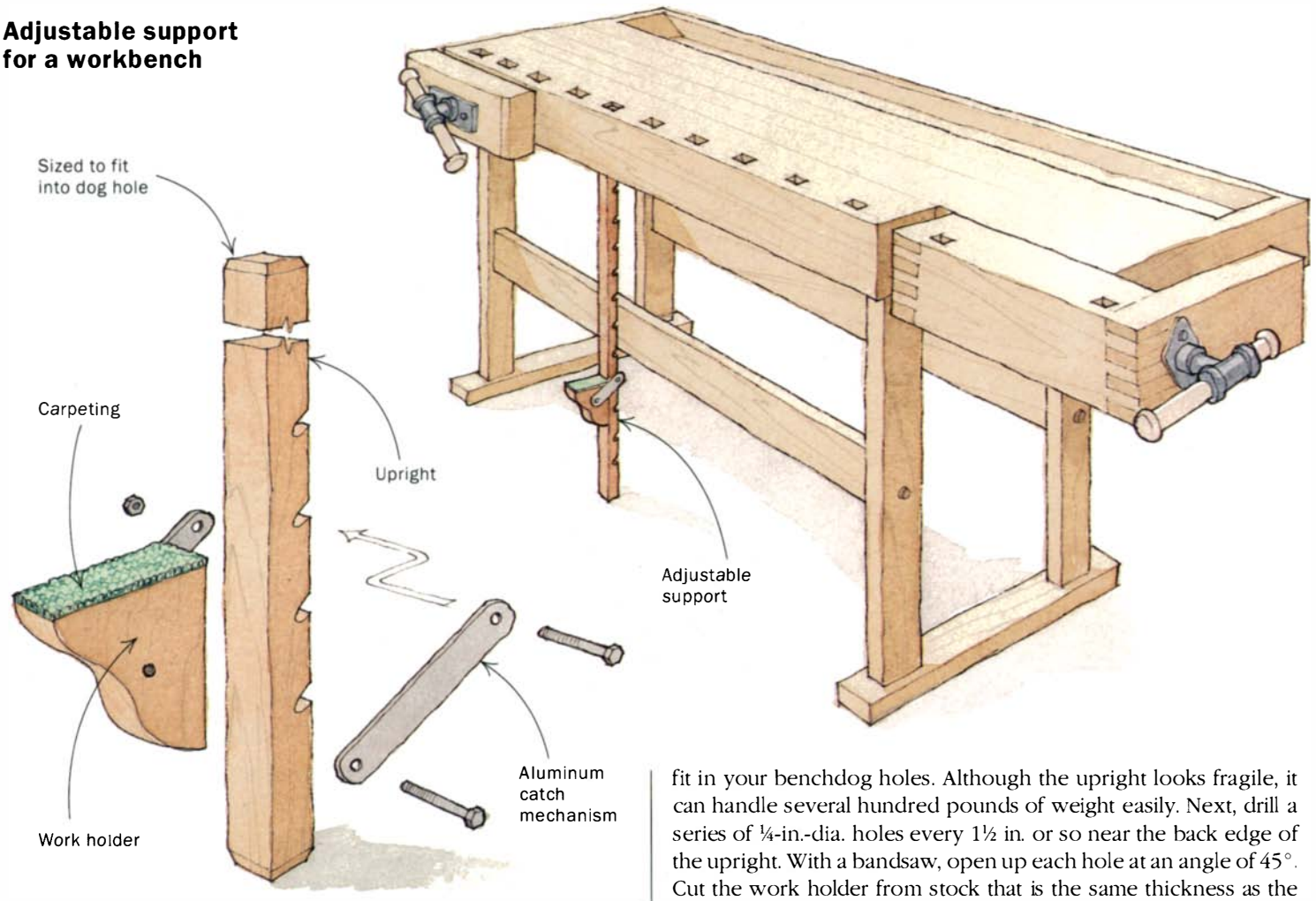
# Methods of Work

EDITED AND DRAWN BY JIM RICHEY

## Adjustable support for a workbench




From my own experience I know how important it is to put work at the right height. This goes not only for the workbench itself but also for everything that you do on it. For example, when you want to plane the edge of a shelf, it is important to have it at just the right height—too low will wear out your back, and too high will wear out your arms.

To put work at the right height, we Dutch use an adjustable support called a *knecht*, which translates to "helping boy." To eliminate some inherent problems in the traditional knecht design, which is freestanding, I modified it so that the upright fits into the dog holes in a traditional European-style workbench. The device is so useful that I find myself using it every day for many purposes: gluing, routing, sanding, and planing.

To make the support, first cut the hardwood upright for a loose fit in your benchdog holes. Although the upright looks fragile, it can handle several hundred pounds of weight easily. Next, drill a series of ¼-in.-dia. holes every 1½ in. or so near the back edge of the upright. With a bandsaw, open up each hole at an angle of 45°. Cut the work holder from stock that is the same thickness as the upright, and then make the catch mechanism from aluminum bar stock and a couple of bolts. Finally, glue a piece of carpeting to the top of the holder so that your workpiece won't be damaged.

To use the device, remove the work holder and slip the upright into a dog hole from the top. Slip the work holder back on the upright and, using the catch, set the height of the work holder for the job at hand. If you have a long workpiece to support, you may need two or even three of these fixtures.

*–Jos Mertens, Venray, The Netherlands*

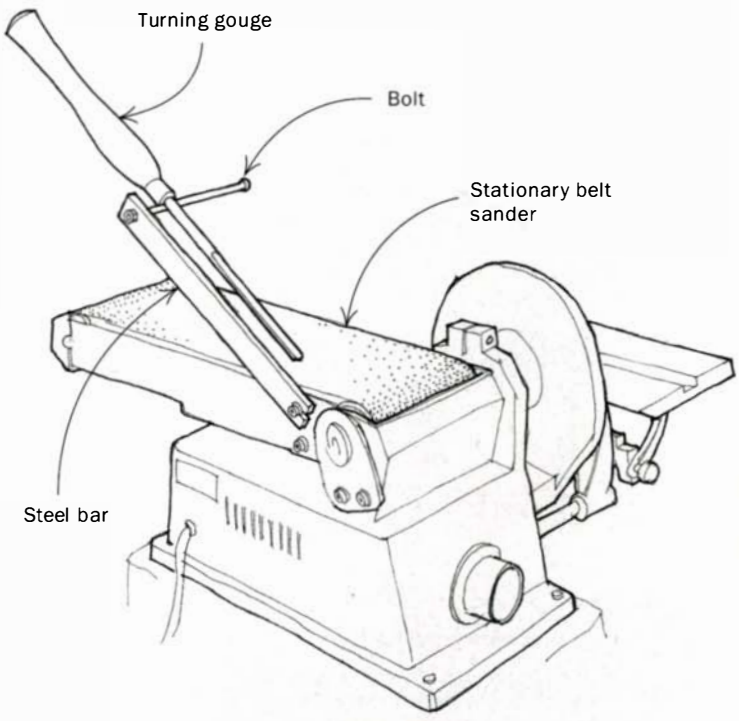
## Belt-sander sharpening jig

This simple, inexpensive jig for a stationary belt sander will revolutionize the way you sharpen turning and carving tools. Sharpening with this setup is fast, foolproof, and accurate.

Simply remove the work-support table that comes with the

### *A reward for the best tip*

*Jos Mertens adapted his adjustable workbench supports based on a more traditional freestanding design commonly used in European woodworking shops. Mertens lives in Holland and has worked for the past 15 years as a cabinetmaker for a business that was founded in 1875. For his winning tip, he'll receive a set of hand-forged chisels (www.barrtools.com), and we're wondering whether he's going to use them at home or at work. Send your best tip, along with any photos or sketches (we'll redraw them), to Methods of Work,* Fine Woodworking, *PO Box 5506, Newtown, CT 06470-5506.*




machine and attach a 12-in. length of rigid iron strapping (mine is ¼ in. thick by 1½ in. wide) in its place. Drill a ¼-in.-dia. hole through the top end of the strapping and attach a ¼-in.-dia. carriage bolt with a pair of nuts. The bolt should be long enough to span the width of the sanding belt.

To use, loosen the attaching bolt slightly and adjust the angle of the jig so that the bevel of the tool to be sharpened rests on the sanding belt, the tool's tang rests on the bolt, and the handle acts as a stop against the bolt. Now, simply lift the tool off the sanding belt, turn on the sander and lower the tool to the belt, rotating the tool to sharpen the beveled edge. If you start with an 80-grit belt, you can grind a new, flat bevel in seconds. Change belts to successively higher grits until you reach the level of sharpness you expect. For carving tools that just need touching up, start with 220 grit and work up to 600- or 800-grit sanding belts. Klingspor (800-645-5555; www.klingspor.com) and other abrasive-belt makers offer belts of very fine grades to fit any belt sander. If your belt sander has a quick-change release, this simple jig will enable you to grind a whole new bevel and hone it razor sharp in less than two minutes. *–Sandy Cohen, Albany, Ga.*

**Quick tip:** To deal with sawdust accumulation in the shop, tamp the sawdust into empty half-gallon milk cartons, and burn the resulting "log" in your fireplace. Each log burns about an hour. And you will have the neatest firewood stack in town.

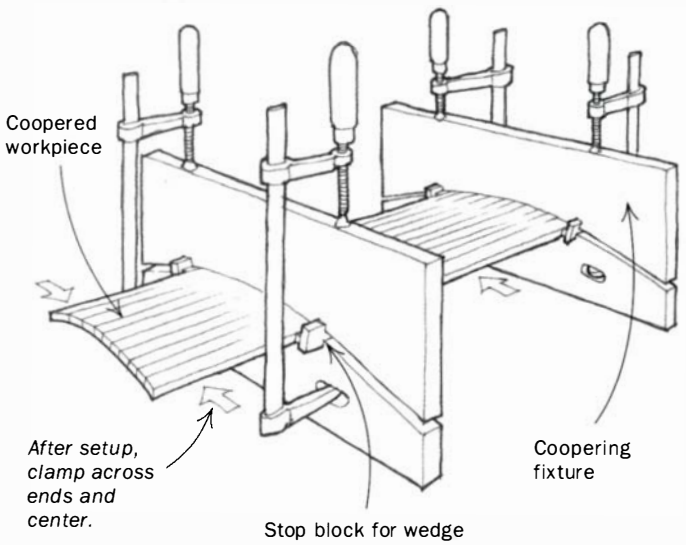
*–Raymond Finck, Las Vegas, N.M.*

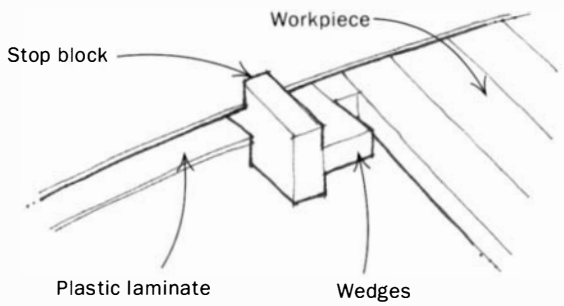
## Coopering fixture

I decided recently to make a pair of coopered cupboard doors, each of which had a dozen staves, each only ½ in. thick but 1 in. wide. The reason for the thinner-than-normal timber was that I was using an Australian wood called woolybutt, which is very dense. Sized any thicker, the doors would have been too heavy.

Coopering thin stock carries its own set of problems. What I needed was a fixture that held the staves in alignment to allow uniform clamping pressure during the glue-up.

The solution I devised consists of two ¾-in.-thick medium-density fiberboard (MDF) clamping cauls sawed into the desired curved profile, in this case a radius of 35 in. In use, these cauls are clamped together with adjustable clamps, as shown below, to hold the staves in place for the proper radius. I added plastic-laminate strips to the jaws of the cauls to create a smooth surface for clamping and to keep glue from adhering to them.




To provide the necessary tangential clamping force, I used a wedge setup. When tightened, the wedges force the staves to conform to the cauls and provide cross-grain pressure for a good glue squeeze-out. The wedges work against a stop block that is captured in slots cut into the cauls. I also added extra clamps across the ends and the middle of the staves to provide uniform clamping pressure along the length of the doors.

With this setup, I was able to glue up both doors by myself without getting glue all over my hands or my bench. Also, later when I needed to scrape and sand the inside of the doors, I was able to use the concave caul (turned upside down) to hold the doors steady.

*–Jim Jackman, Batemans Bay, Australia*

**Quick tip:** When lapping the backs of plane irons and chisels, my fingers usually take a beating and end up feeling tender for a day or two. Then one day, after my fingers had about all they could take, I had an idea. From an old computer mousepad, I cut a piece about

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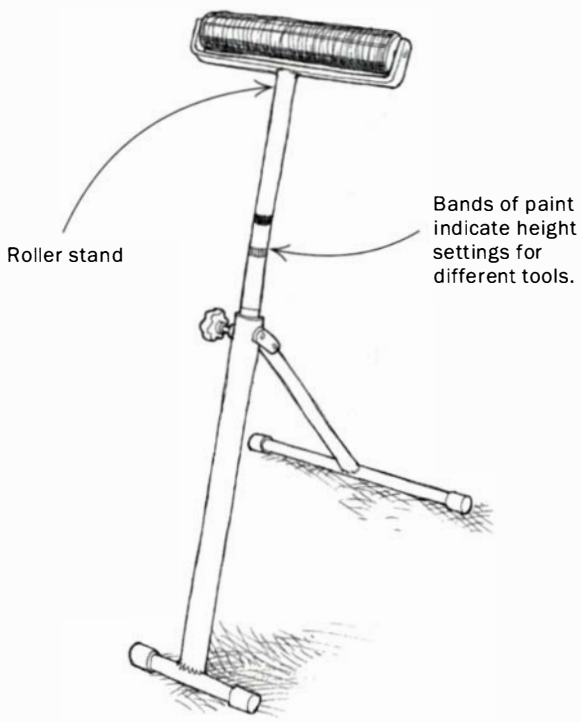
the size of the plane iron I was sharpening and used it to slide the iron back and forth across the abrasive. The rubber on the bottom of the pad gripped the iron quite nicely and saved my fingers from taking a beating. *—Jesse S. Bushman, Alexandria, Va.*

### Roller-stand improvement




I work in a one-person shop, which often requires moving a roller stand to use with several machines of varying heights. To make setting the stand's height fast and easy, I sprayed a band of colored paint on the adjustment column at the various height settings. That way, I can simply raise or lower the column to the bottom of the color band that I use to identify a particular machine. The bands scrape off in time but are easily renewed.

*—Bob Gleason, Kurtistown, Hawaii*

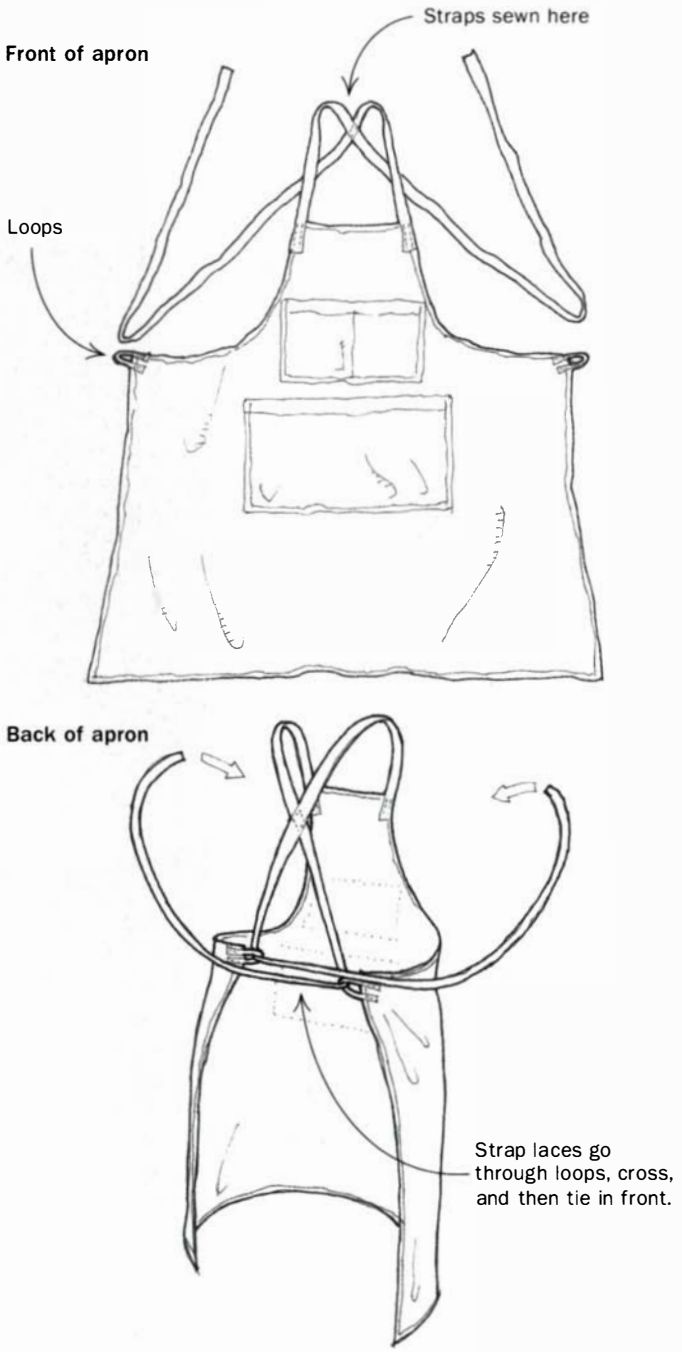
**Quick tip:** If you cut mortises with a router, you can save money by using end mills made for milling machines. For example, a ½-in., two-flute, high-speed-steel end-mill bit with a 2-in. cutting length is only $5.82 from my supplier (Enco; 800-873-3626). The bits are made with a spiral upcut design, which means they will clean out the sawdust nicely and leave smooth sides on the mortise. Many milling bits have a ⅜-in.-dia. shank, but these can be adapted for use in a router by using ½-in. to ⅜-in. reducer bushings, available from any machine-shop supplier.

*—Rich Haendel, Iowa City, Iowa*

### Improved shop-apron design

A shop apron is an important but often forgotten tool in a woodshop. However, most woodworking aprons are uncomfortable because the pockets are stuffed full of nails, punches, rules, squares, pencils, and shavings. All of this weight hangs directly from the neck.

With the help of my wife, I rethought the traditional apron design and improved upon it to get a comfortable and practical apron. The key is in the strap lacing. Notice that the straps cross at




the back and are sewn together at this point. The strap lacing then threads through loops at the sides, crosses at the waist on the apron's back, and ties in the front. This lets the laces at the waist share in carrying the weight.

*—John Tolhurst, Coffs Harbour, Australia*

**Quick tip:** To make a simple and efficient pad for hand-sanding, simply stick two pressure-sensitive sanding discs together back to back. For added versatility, select two discs of different grits.

*—S. J. Chant, Wyalusing, Pa.*

# Notes & Comment

## An American carves out a career in Nepal

For more than 25 years, American Lee Birch and a group of Nepalese woodcarvers have been creating one-of-a-kind pieces in a quiet neighborhood of Kathmandu. By finding patrons around the world, the group of devoted craftsmen is preserving Nepal's carving heritage. Birch's studio is known for distinctive designs that blend traditional and modern elements. "Right now we are working on an Art Deco bed of our own design for a client in Washington, D.C.," Birch said. "We are grateful to be so much in demand."

***From California to Kathmandu.*** *Lee Birch (front center), originally from California, runs a carvers cooperative in Nepal that is keeping the Newar-carving tradition alive by selling work to clients around the world.*

Trained as a painter at the California College of Arts and Crafts and later at the San Francisco Art Institute, Birch set out to explore the world in the early 1970s at the age of 23. Captivated by the land and people of Nepal, she settled in Kathmandu in 1974 and began to paint. While searching for craftsmen to build picture frames, she stumbled upon one of the world's oldest wood-carving traditions.

The wood-carving tradition in the Kathmandu Valley dates back to the 10th century, when the Newars, the original inhabitants of the valley, earned fame as decorative temple carvers.

Birch and the Newar woodworkers established a studio to make it possible for them to preserve their craft in the face of increased competition from the mechanized world. The 10 craftsmen use wooden mallets, foot-pedal scrollsaws, chisels, and other traditional tools.

For many years Birch struggled. Marketing was her biggest challenge. Nowadays, the studio's reputation for quality and reliability are well-known, and computers and the Internet make it easy to refine ideas for frames, tables, decorative panels, wall hangings, screens, and beds, and send them to clients around the world with a mouse click. For more information, go to www.leebirch.com. *—Jenny Dubin*

## Wood web

**www.woodbin.com**

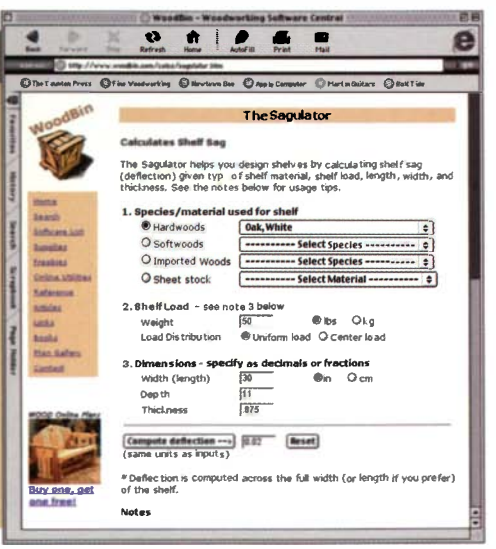
Woodbin.com offers the woodworking Web surfer a variety of free and useful calculators and utilities and has earned a coveted bookmark on my computer.

The Tabulator creates a nicely formatted cut list for any project, including board feet and total cost, even factoring in waste. I used it to create a quick cut list and cost estimate for a built-in bookcase.

Also on the site is The Shrinkulator, which calculates wood movement for 128 species. The Sagulator calculates shelf sag for a range of materials and spans. And a search engine for woodworking plans provides access to 10,000 projects, including 2,000 free plans, according to the site.

Woodbin.com includes links to special sales on the Web as well as the most popular woodworking-software packages and books, as rated by the site's visitors.

*—Asa Christiana, senior editor*






Photos, this page: Raju Bhandari

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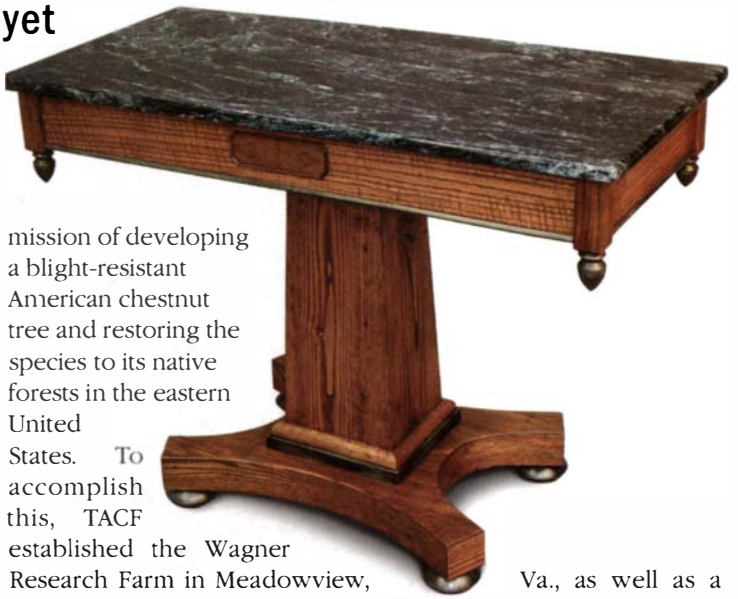
## American chestnut not dead yet



***Chestnut, past and future.*** *To draw attention to its mission—to restore chestnut trees to the eastern United States—The American Chestnut Foundation sponsored a large exhibit this year at The Grovewood Gallery in Asheville, N.C., featuring only items made of chestnut. These included Michael Brown's Contemporary Windsor and Dan Mosheim's chestnut table.*

An exhibit called "Fine Woodworks of American Chestnut: Restoring an Appalachian Tradition" was held in March to draw attention to its sponsor, The American Chestnut Foundation (TACF). The exhibit included only furniture and fine crafts made from native chestnut—just a few generations ago one of the country's premier hardwoods, before a blight left the species virtually extinct. All of the wood used by the more than 30 artisans in the exhibit was recycled from old barns, churches, furniture, and fence rails. The Grovewood Gallery in Asheville, N.C., provided the exhibit space at no charge, and more than 160 items sold at the show.

The nonprofit TACF was founded in 1983 with the mission of developing a blight-resistant American chestnut tree and restoring the species to its native forests in the eastern United States. To accomplish this, TACF established the Wagner Research Farm in Meadowview, Va., as well as a number of state chapters, where modern genetic techniques are used in a traditional backcross-breeding program. The essence of the program is to transfer the blight resistance of the Chinese chestnut to the American chestnut but not lose any of the American tree's characteristics.

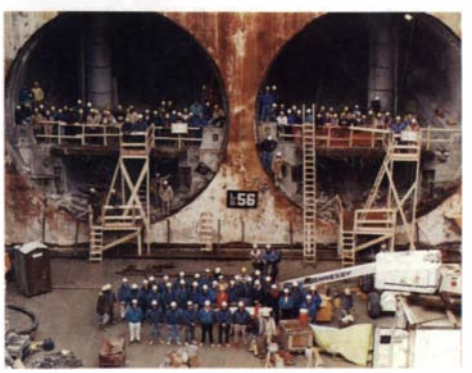
"We are in the homestretch," said Phil Pritchard, development director. "Some of the trees from which the final selection will be made are already in the ground."

For more information on TACF, call 828-281-0047 or go to www.acf.org.

*—A.C.*

## My bad arm forced a good decision

It was a typical day on the Big Dig, Boston's $15-billion effort to bore a central traffic artery through the city. Working as a carpenter, I was building forms when I tripped and hurt my shoulder. I didn't think much of it at the time, but it turned out that I needed surgery. A year later, after two surgeries and rigorous physical therapy, my doctor broke the bad news to me: I would have to give up carpentry for good. Luckily for me, my doctor had heard of Boston's North Bennet Street School and its furniture-making program. I was willing to try anything, so I checked it out.



***Construction on a different scale.*** *An injury on Boston's Big Dig (above) led construction worker Tom MacDonald to North Bennet Street School, where he built a Salem blockfront secretary (left) and launched a successful career.*

I was blown away by what I saw at the school, and I enrolled. Although at first I was intimidated by a classroom full of successful people from all walks of life (I was used to big construction sites full of wild guys), I found my second career at North Bennet.

The shoulder required cortisone shots and a third operation, but I made eight pieces (five more than required) over my two years at the school, one a Salem blockfront secretary, which took me 1,000 hours to complete and was featured on *Home Again*, Bob Vila's syndicated television show. I have sold all eight pieces.

*—Tom MacDonald*



Photos, this page: Michael Brown (top left); Dan Mosheim (top right); Tom MacDonald (bottom right); Mel Marchand, courtesy of BobVila.com (bottom left)

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## New 10-in. tablesaw from Wilke is well designed

Wilke Machinery Co. recently introduced the Bridgewood BW-10LTS, a left-tilting 10-in. cabinet saw. This saw is refined to an exceptional degree and rivals the quality of the Delta Unisaw and the Powermatic 66 tablesaws.

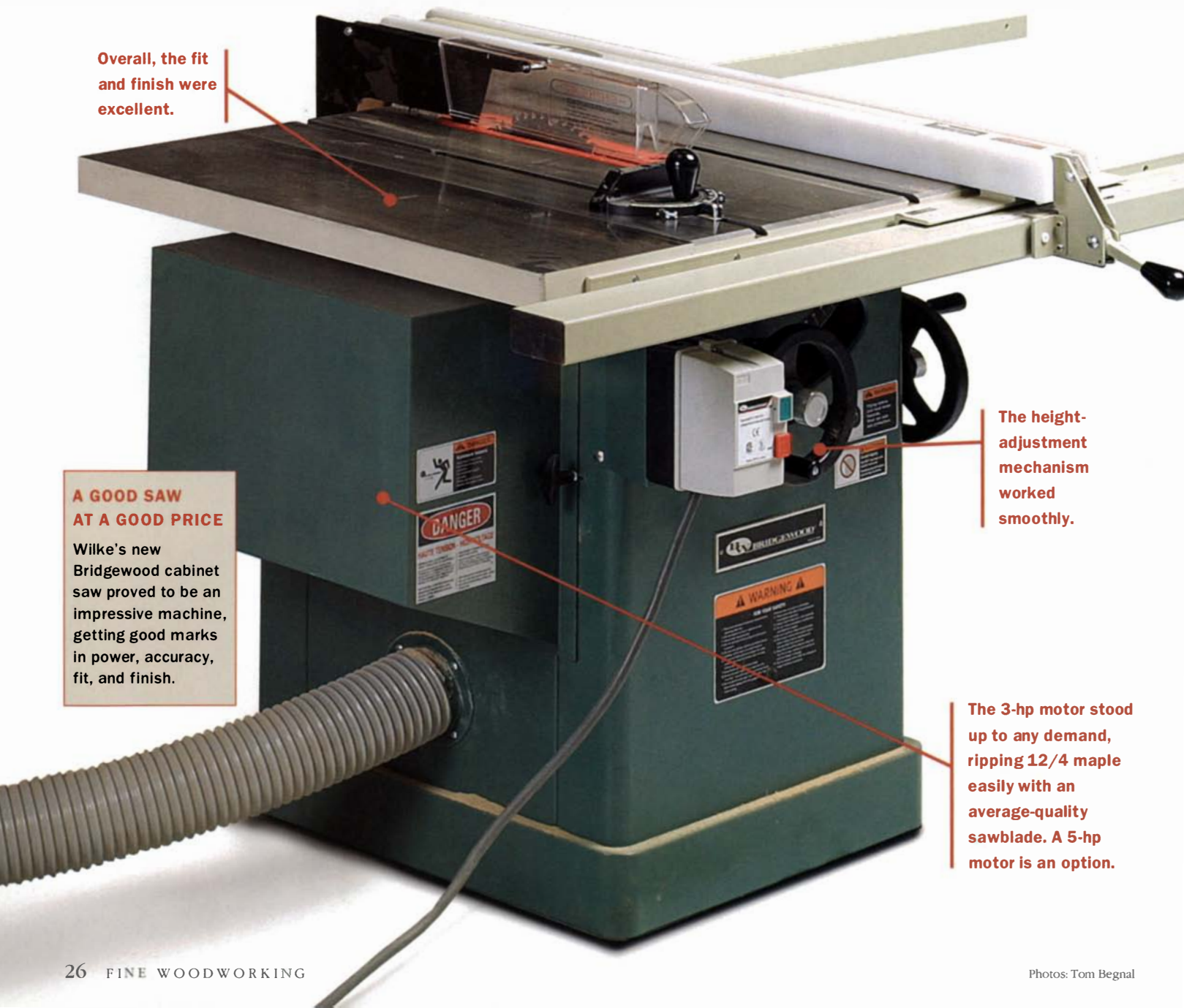
Even up close, the fit and finish were impressive. The top and the two cast-iron extension tables had an even satin finish. The cabinet and internal castings looked to be well made. Only a few edges were a little sharp, and one extension table was slightly rough underneath.

Several important parts were measured, and all of the results were excellent. The top and the extension tables, measured from front to back, were only mildly crowned and certainly within acceptable range—one wing was out by 0.003 in., the other by 0.002 in., and the top by less than 0.002 in. Arbor runout was less than 0.001 in. The tablesaw's miter-gauge slots were parallel to the blade but out of true by about 0.008 in. from the front to the back of the top, although this was easily corrected by adjusting the miter gauge.

The height-adjustment mechanism worked as smooth as silk. On the other hand, the tilt mechanism was noticeably rough. The problem seemed to be related to some roughness in the threads.

Some small details indicate that the designers were thinking. Flats on the arbor shaft let you use two wrenches to tighten or loosen the arbor nut. The pulley is a three-belt design, and a slanted floor in the cabinet directs dust toward the collection port.

The saw came with several unremarkable accessories: a 50-tooth blade, a stamped-




**A GOOD SAW AT A GOOD PRICE**

Wilke's new Bridgewood cabinet saw proved to be an impressive machine, getting good marks in power, accuracy, fit, and finish.



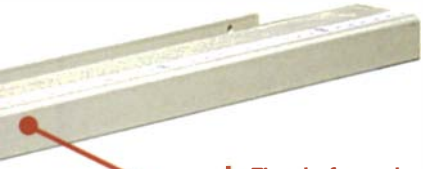
Photos: Tom Begnal

steel arbor-nut wrench, a blade guard with splitter, and a small miter gauge.

Vibration was very low. Indeed, my pencil stayed put on the extension table while the tablesaw was running. On my saw, it walks toward the edge and ends up falling to the floor.

The Bridgewood BW-10LTS sells for about $1,400. For more information, contact Wilke Machinery Co. (800-235-2100; www.wilkemach.com).

*—Strother Purdy makes custom furniture in Bridgewater, Conn.*



**The rip fence is a high-quality, 55-in. Biesemeyer clone. The plastic faces were flat and straight.**

## A better dust mask

A new respirator from Moldex, model EZ-ON N95, has some features I like a lot. It fits my face better than any other lightweight dust mask I've worn; it doesn't cause my safety glasses to fog; it's easy to put on and take off; and it's comfortable.

Elongated and pleated sides (Moldex calls them "Flexwings") that extend along the side of the face help contribute to the good fit. And because of that good fit, exhaled air exhausts through the filter and the exhalation valve rather than leaking out at the bridge of the nose to fog safety glasses. The easy-on, easy-off feature comes courtesy of a plastic harness attached to a substantial strap. And the mask's light weight contributes to its comfort.

***A dust mask that won't fog your glasses.*** *A new mask from Moldex is comfortable and easy to put on and take off.*

The Moldex EZ-ON N95 mask is approved by the National Institute for Occupational Safety and Health (NIOSH). It's available either with or without the exhalation valve; I tested one with the valve. You can choose from two sizes; small/medium and large. Currently, a bag of 10 masks with valves sells for $26.65. For more information, contact Gempler's (800-382-8473; www.gemplers.com).

*—Tom Begnal is an associate editor.*

## Handy positioning clamps from Jet

Most recreational woodworkers spend time alone in the shop, so it's not necessarily easy to find an extra hand when one is needed. Realizing that help isn't always going to be right around the corner, Jet now markets a small, easy-to-use clamp that's perfect for temporarily butting together a pair of boards and holding them in place at a right angle until clamps or screws can be added.

Called a jointer-clamp by Jet, it has spring-steel jaws that allow you to push the clamp into place with one hand. The clamp pulls off just as easily. It works with any material up to ¾ in. thick.

The jointer-clamps sell for about $20 a pair and are available from Woodworker's Warehouse (800-877-7899; www.woodworkerswarehouse.com). *—T.B.*

***Clever clamps lend a hand.*** *Slip one of these clamps onto a pair of butted boards, and the boards stay put until you're ready to add a clamp or drive a screw.*

## New shop vacuums from Alto Wap and Bosch

*Editor's note: Our May/June 2003 issue (FWW #163) featured a review by Roland Johnson of 13 shop vacuums. At that time, however, two new shop vacuums—the Alto Wap ATTIX AS/E and the Bosch 3931—were not yet available for testing. The two vacuums have since arrived in our shop, where the author recently gave them a closer look.*

### Alto Wap ATTIX AS/E

Alto Wap's newest shop vacuum is a compact machine with a 1,000w (about 8.5 amps) motor that offers a reasonable amount of power. The machine also is lightweight and easy to move, making it ideal for small cleanup chores and light dust collection.

A built-in electrical outlet has an automatic starting feature, called auto start, that's handy if you connect the vacuum hose to a power-sanding tool, such as a belt sander.

Variable-suction control lets you adjust the suction for peak efficiency. Also, with the push of a button, the vacuum sends a blast of air backward through the pleated filter to dislodge built-up dust and debris.

The ATTIX AS/E sells for about $475. For more details, contact Alto Wap toll-free (877-366-2586; www.alto-online.com).

### Bosch 3931

The two most important criteria for any shop vacuum destined for use in a woodshop are (1) plenty of power to suck up lots of sawdust and (2) efficient filters, so the collected sawdust does not escape into the shop air. Bosch has entered the shop-vacuum market with a machine that promises both.

On the new Bosch 3931, an 11.1-amp motor provides good suction. When used with the optional 2¼-in.-dia. hose, the Bosch did a good job collecting chips from a benchtop thickness planer.

The main filters are positioned above the sawdust in the upper housing. To ensure that the motor is cooled only by clean air, the filter system also includes a set of secondary filters behind the main filters. There's also a clever feature called Pulse-Clean, which gives the filters a vigorous electronic shaking to help dislodge accumulated sawdust and restore suction power.

The Bosch also has an outlet with an auto-start feature. With a maximum rating of 7.2 amps, the outlet should be able to handle most sanders and smaller-horsepower routers. Bosch has eliminated the annoying blast of exhaust air by diffusing the air around the motor housing.

The 3931 sells for about $440. For more information, contact Bosch toll-free (877-267-2499; www.boschtools.com).

*—Roland Johnson is a furniture maker in Sauk Rapids, Minn.*


**ALTO WAP ATTIX AS/E**

**BOSCH 3931**

| MODEL | Alto Wap ATTIX AS/E | Bosch 3931 |
|---|---|---|
| COST | $475 | $440 |
| AMPS | 8.5 | 11.1 |
| CAPACITY | 8 gal. | 11.35 gal. |
| AUTO START | Yes | Yes |
| VARIABLE-SPEED MOTOR | Yes | No |
| NOISE LEVEL | 69, 72 db.* | 74 db. |
| WEIGHT | 22 lb. | 42 lb. |
| HEIGHT (ON BASE) | 23 in. | 24 in. (not including handle) |
| EXHAUST | Diffused | Diffused |
| COMMENTS | Compact, quiet, and easy to move | Good filter system |

*Decibel readings were taken at low and maximum power.

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In 1947, the city of St. Louis hosted an unusual design competition. Its goal? A memorial to commemorate the westward expansion of the United States. The grand prize winner was Eero Saarinen's 630-foot-tall Gateway Arch. Construction on the arch didn't begin until 1963 but, when it did, the workmen were armed with two things—Saarinen's majestic vision and our tools. At Craftsman,® however, we realize St. Louis isn't the only place you'll find curved surfaces. That's why we recently introduced our revolutionary 3-D Sander. We at Craftsman have always prided ourselves on building better, more innovative tools. And our 3-D Sander does not disappoint. It combines three independent, pivoting heads with the known reliability of circular sanding. This gives it the ability to handle the kind of curved surfaces found in and around your home. Of course, you may never face a project of the arch's magnitude. But no matter what the project, the 3-D Sander's lightweight design will really lessen the workload. And changing the sandpaper is effortless, too. Just unhook, change, rehook and go. You can pick up this handy tool at Sears and Sears Hardware Stores. Or you can order it online at craftsman.com. Craftsman. Since 1927, we've been providing Americans with the right tools for the job. Whether they're restoring a Queen Anne table. Or building a gateway to the West.

*The 3-D Sander uses a Hook and Loop sanding pad. So changing sandpaper is quick.*

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## Smoothing plane with a classic pedigree

Late in the 19th century, British toolmakers Alexander Mathieson, Thomas Norris, and Stewart Spiers each was producing some of the most beautiful and effective planes ever made. The planes featured steel bodies, dense rosewood infill, and massive irons. Fortunately, that plane-making tradition remains in England, as toolmaker Ray Iles is making the most handsome of all those early designs: the Norris A5 coffin-sided smoothing plane.

The A5 is the tool to use when you want a final polished-wood surface. And the beautiful coffin shape maximizes the width of cut with less sole drag. Iles builds the plane with plenty of mass, which helps support the thick blade. Norris's original A5 planes were made using dovetails to join the steel sides and the sole. Iles welds his together for a stronger body that costs less to make.

The infill forms a simple front bun and a rear D-shaped handle. The handle might seem small, but it is ample enough for three fingers, with a fourth stretched along the side of the plane. True to the original, the Iles plane has an adjuster that sets both the depth of cut and the lateral alignment, making the plane easy to use.

I tested the A5 plane on a board with some curly grain. After first planing with the grain, I reversed the board to see how the plane cut against the grain. At the end of the test, both sides of the board had smooth surfaces.

***New version of an old classic.*** *English plane maker Ray Iles now makes the A5, a handplane originally produced in the late 19th century.*

It seemed to me, however, that a slightly narrower throat would improve the surface. So, to create the effect of a narrower throat, I shimmed behind the iron with a thin piece of note card. As a result, the surface looked even better. The current crop of A5s, I'm told by the manufacturer, all come with throats that are a bit narrower.

The Iles A5 smoothing plane sells for $650. It can be ordered from the Museum of American Tools (800-426-4613; www.toolsforworkingwood.com).

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

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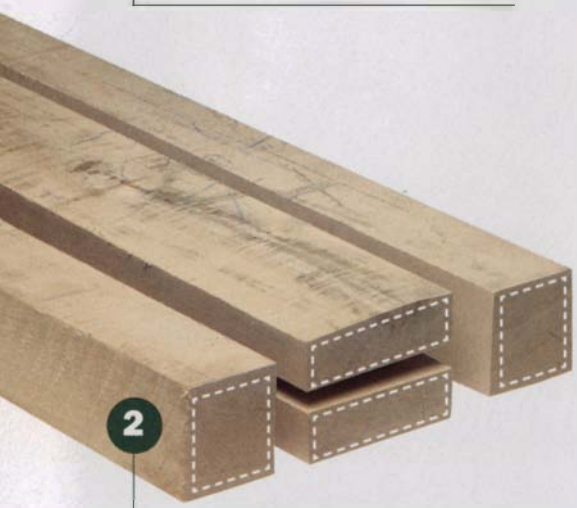
PICK GOOD STOCK AND LAY OUT PARTS




MILL THE PARTS OVERSIZE AND WAIT


MILL THE PARTS TO FINAL DIMENSIONS

# How to Get Square, Stable Stock

## For best results, rough-mill the wood, allow it to stabilize, then finish-mill

BY GARY ROGOWSKI

Take a piece of rough wood, fresh off the woodpile or lumber rack. Now transform that coarse stick into a square, flat piece of stock with parallel sides and ends, suitable for your latest project. It seems to take a sort of magic sometimes to make flat and smooth what starts out twisted and rough. The importance of this feat, however, cannot be overstated. If you lay a foundation of accuracy with your milling, then your joinery and assembly have a much better chance of going together smoothly and sweetly.

I am focusing here on milling rough lumber, as opposed to material already surfaced on two or four sides. When starting with rough lumber, you're not bound by the thicknesses that are commonly available in surfaced stock. Also, rough stock is less expensive. And there is no guarantee that surfaced material is truly flat or straight anyway. That leap of faith has gotten many a woodworker into trouble. So proper milling practices are important in any case.

### Start with proper selection and storage

Wood is alive. It moves despite our best efforts to keep it flat and square. How can we mill it straight and flat and then keep it so? Start by learning to read lumber to get a better yield with fewer defects. Learn to recognize end and surface checking, cupping across the width, bowing along the length and twisted sticks. The first step toward having square, flat, stable stock is to leave bad boards at the lumberyard.

Wood movement is dependent on the difference in moisture content from the outside to the inside of the board, so where your lumber is stored along the way also becomes important. Consider the relative humidity of the lumber dealer's facility and your work area. For example, if the stock is kiln-dried but went from outside storage to your shop, you may need to let it acclimate for a few weeks before milling it.

### Rough-mill to accommodate movement

As lumber dries in a kiln or elsewhere, different areas can dry at different rates, and internal stresses can develop that cause the board to move. By the time you get it, the board probably has stabilized, with its internal stresses in balance for the moment. However, when you cut the board into pieces or remove material from the outside, the balance of forces can be dis-



Photos: Asa Christiana

**LAY OUT THE PARTS**

*The first step in milling is to decide which parts are coming from which boards. Work from a cut list and measure from an end that is freshly cut and free of defects.*

turbed, causing the board to crook, twist, bow, or cup.

In the rough-milling stage, cut the boards a bit oversize and then wait for the stresses to work themselves out again. This may seem like piling more work onto an already big job, but it actually saves time and material. Rough milling won't stop wood from moving, but it leaves enough material to accommodate the movement. If the stock does warp or twist later, you will make it flat and square again when bringing it down to its final dimensions. You'll lose fewer boards this way and end up with flatter, more stable stock.

Using your power tools effectively also affects your millwork. Each of the tools in your shop is designed for a different part of the milling process.

**Length, then width, then thickness—** Start by crosscutting the stock by ½ in. to 1 in. over in length. Look for end checks and honeycomb checks inside the board after you make your first cut. End checks occur as a board dries out faster near its ends than it does in the middle. The wood cracks, or checks, to relieve this stress. It's very common and no cause for alarm. Plan on losing from 1 in. to 1 ft. of material at each end of a board. Look for checks in the end grain as you cut, but don't trust your eye. Take the offcut and tap it on the saw table or a bench. If the offcut cracks easily,

## 1 CROSSCUT OVERSIZE

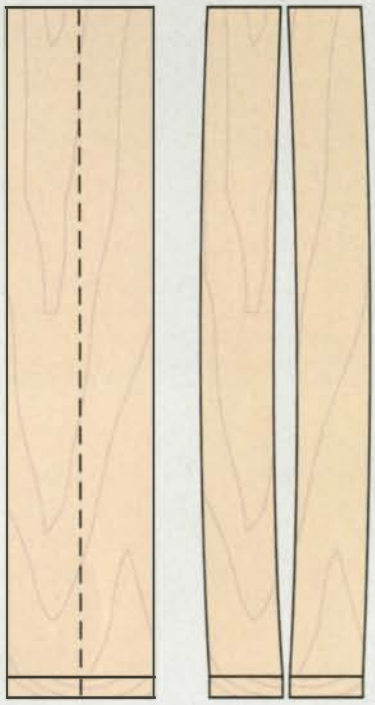
***Check for checking.*** *Take slices off each end of the board until the offcuts are sound. Test for cracks by striking the offcuts against the table. Then crosscut the parts ½ in. to 1 in. over in length.*

## 2 JOINT ONE EDGE, THEN RIP

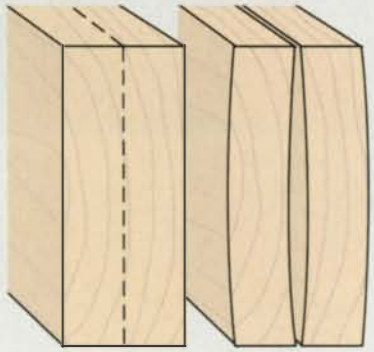
***Joint one edge.*** *It's not important that the edge be square to a face; it just has to be straight and flat. Check grain orientation to get a smooth cut.*

## Why rough-mill?

**After a kiln-dried board is put into storage, different areas dry and move at different rates, causing internal stresses to develop. When you cut the board into pieces or remove material from the outside, the balance of forces can be disturbed, causing the board to bend or twist. Milling stock a bit oversize in all dimensions leaves enough material to allow you to bring the board back to flat and straight before it is cut to final dimensions. When ripped, lumber tends to go crooked; when resawn, lumber tends to cup or bow.**



**◀ CROOK WHILE RIPPING**
When a board is divided into halves or even thirds, the new pieces tend to bend. Leave at least ⅛ in. extra width to allow for later straightening.



**▲ CUP WHILE RESAWING**
Resawing also disturbs the balance of internal stresses, causing the new pieces to cup across their width or bow along their length. Leave at least ⅛ in. extra in thickness so that you can flatten it later.

there is still some weakness there. Keep cutting until it doesn't snap easily.

Honeycomb checks are caused by a board drying too quickly on its outer surfaces. This "case-hardening" is often not visible on the surface but can riddle the interior of a board with checks, ruining it for anything but the fire pit. Other times the wood will relieve this stress with one large crack that runs the entire length of the 10-ft. board. Cut away the honeycombing when you find it.

Once the rough crosscutting is done, get your material roughed out to width. If a board is badly cupped across its width or length, running it over a jointer until it's flat can eat up a lot of wood. By ripping pieces to rough width, you work on narrower pieces and can get greater yield. You also can rough out around defects in a board, like knots, sapwood, or checks.

First, joint one edge on the jointer or with a handplane. Just get it flat; don't worry about its being square to any face just yet. When one edge is flat, rip the board ⅛ in. oversize in width on the bandsaw.

**Bandsaw vs. tablesaw for ripping rough stock**—A bandsaw is much safer than using a tablesaw for this ripcut, for a number of reasons: All of the cutting pressure is down into the table instead of at



Drawings: Michael Pekovich

## 3 FLATTEN ONE FACE AND RESAW

***Rip to ⅛ in. over in width.*** *The bandsaw is a safer tool for ripping rough lumber than the tablesaw, which is prone to kickback. The bandsaw also wastes less material.*

***Mill to rough thickness, if necessary.*** *If the stock must come down more than ¼ in. in thickness, flatten one face on the jointer (left), then resaw or plane to ⅛ in. over in thickness (right).*

you; there is a smaller kerf and therefore less waste; and if the board closes up on the cut, there is no danger of kickback. (I do not want to recommend that you rough-rip stock on the tablesaw, unless you get a note from your mother.)

Support both ends of the board on a runoff table or adjustable stand. Use a fence on the bandsaw and adjust for blade drift if your saw requires this to make a straight cut. Or just snap a chalkline on the board and make this cut freehand.

If your stock needs to come down more than ¼ in. in thickness, now's the time to do it. Joint one face flat on the jointer and then square an edge to that face before resawing the stock ⅛ in. oversize on the bandsaw. If your stock is close enough in thickness, rough milling is complete.

**Now stack the pieces and wait—**Next, you must sticker the boards so that air can move around them freely. Don't lay the boards flat on your bench or shop floor and expect them to dry any further. And avoid concrete floors, where boards may in fact absorb moisture and move some. Make ¾-in.-square by 12-in.-long stickers out of straight hardwood. The pile of stickers I made for my shop some 20 years ago still do their intended job very well.

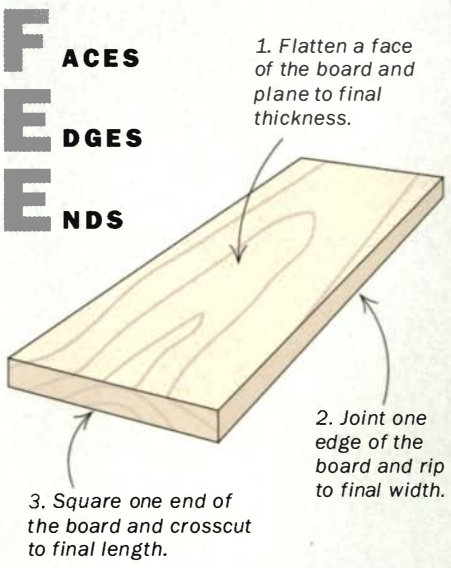
Let the wood sit for a week or so, de-

## 4 STACK THE PARTS ON STICKERS

***Stack it and wait.*** *Layer parts between stickers to let air circulate. Allow a week or more for the parts to move slightly and stabilize.*

**THE "FEE" SYSTEM**

Follow this sequence for final milling.




**1 JOINT AND PLANE THE FACES**

***Joint the first face.*** *Start the finish-milling process by jointing one face flat. Use push sticks or pads to hold down the stock, concentrating pressure just past the cutterhead.*

***With the jointed side facedown, run the boards through the planer.*** *Once both faces are flat, alternate faces to take off similar amounts from each side until the finished dimension is reached.*

pending upon how late your project is running, and allow it to finish moving before milling it to final dimensions.

### Use the FEE system for final milling

When finish-milling, use the FEE system: Work the Faces, then the Edges, and finally the Ends. This order is exactly the opposite of that for rough-milling.

All of the final milling starts with the jointer. (For a better explanation of how the jointer and planer do their distinctly different jobs, see *FWW* #160, pp. 64-67.) Simply put, you must use the jointer first to flatten one face. Then run this straight, flat side facedown in the planer to create a parallel, flat face on the top side of the board. If you flip over the board and joint the other side, there is no guarantee the faces will be parallel.

If the board is cupped across its face, run the cupped side down on the jointer table because the board will reference off its two outer edges and not rock. Take off small amounts of wood with each pass until you eventually flatten the entire face. Then mark the unjointed face with an X. Bowing along a board is just like cup, only it's along the length of the lumber. Again, it's easier to run the concave side down to the table and the humped side up.

For any of these cuts, check the grain direction of the board before passing it over the jointer. The grain should be running down and away from the front end of the board. This will give you a smooth cut with little or no tearout. Also, slow down the feed rate for the best possible results.

**Ripping to finish width is the first time during the entire milling process that the tablesaw has been turned on, and here only to take a sliver off one edge.**

A stumbling block you may encounter here is stock that is too wide for the jointer. There are many ways around this but none of them as convenient as having a wide jointer. You can level the first surface with a handplane, or use a sled or leveling strips to turn your planer into a jointer (see *FWW* #145, pp. 90-91). You may have to rip your boards to the width of the jointer, then reglue them after milling (see *FWW* #163, pp. 96-98, for other solutions to this common problem).

Next, run the boards through the planer, jointed side down. If you get considerable tearout on a face, dampen a rag and lightly wet down the surface of the wood before planing. This will soften the fibers and tone down the tearout. Also, wax your planer tables to help the machine feed the stock. A runoff table also is handy: It will catch boards for you and minimize snipe, which is the tendency of a planer to overcut at the end of a pass.

After the faces are flat and parallel, work on the edges. Check that the jointer fence is square to the outfeed table just beyond the cutterhead. This is the same point where your hand pressure should concentrate once the cut is established. Check for bowing along each board's edge and run the concave edge down on the jointer table. Arrange the grain direction for the best cut, and mark the squared edge and face after cutting.

The last edge needs to be cut parallel to the newly jointed edge. Again, you cannot just flip over this board and joint the second edge; it will not end up parallel to the first. Use the tablesaw to trim this second edge cleanly. Notice that this is the first time during the entire milling process that

## 2 FLATTEN AN EDGE AND RIP TO FINAL WIDTH

***Edges are next.*** *First, check the jointer fence for squareness (above). Check just past the cutterhead. Joint one edge square, flat, and straight (right), using push sticks or pads when your fingers would pass near the cutterhead.*

***Mill the final edge on the tablesaw.*** *Note that this is the first time the tablesaw has been used during the milling process, and only to remove a small amount of wood.*

## 3 CROSSCUT TO FINAL LENGTH

***Ends are last.*** *Use a tablesaw sled to cut the ends accurately. Square up one end first (above), then clamp a stop on the sled to cut the other end (right).*

the tablesaw has been turned on, and here only to take a sliver off one edge.

With the faces and edges done, you can finish the ends. Crosscut one end square on all of the boards using your crosscut sled or miter gauge on the tablesaw. Then clamp on a stop to index the final cuts.

The reward for all of this hard work will be square and flat stock that should stay that way as you cut joinery and assemble your project. □

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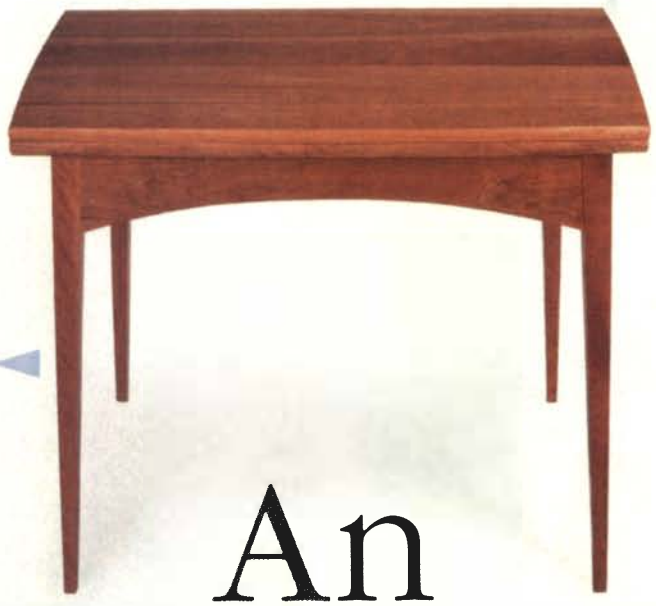
*Gary Rogowski, a contributing editor, runs The Northwest Woodworking Studio in Portland, Ore.*



# An Expandable Table

## With a twist and a flip, a table for two becomes a table for six

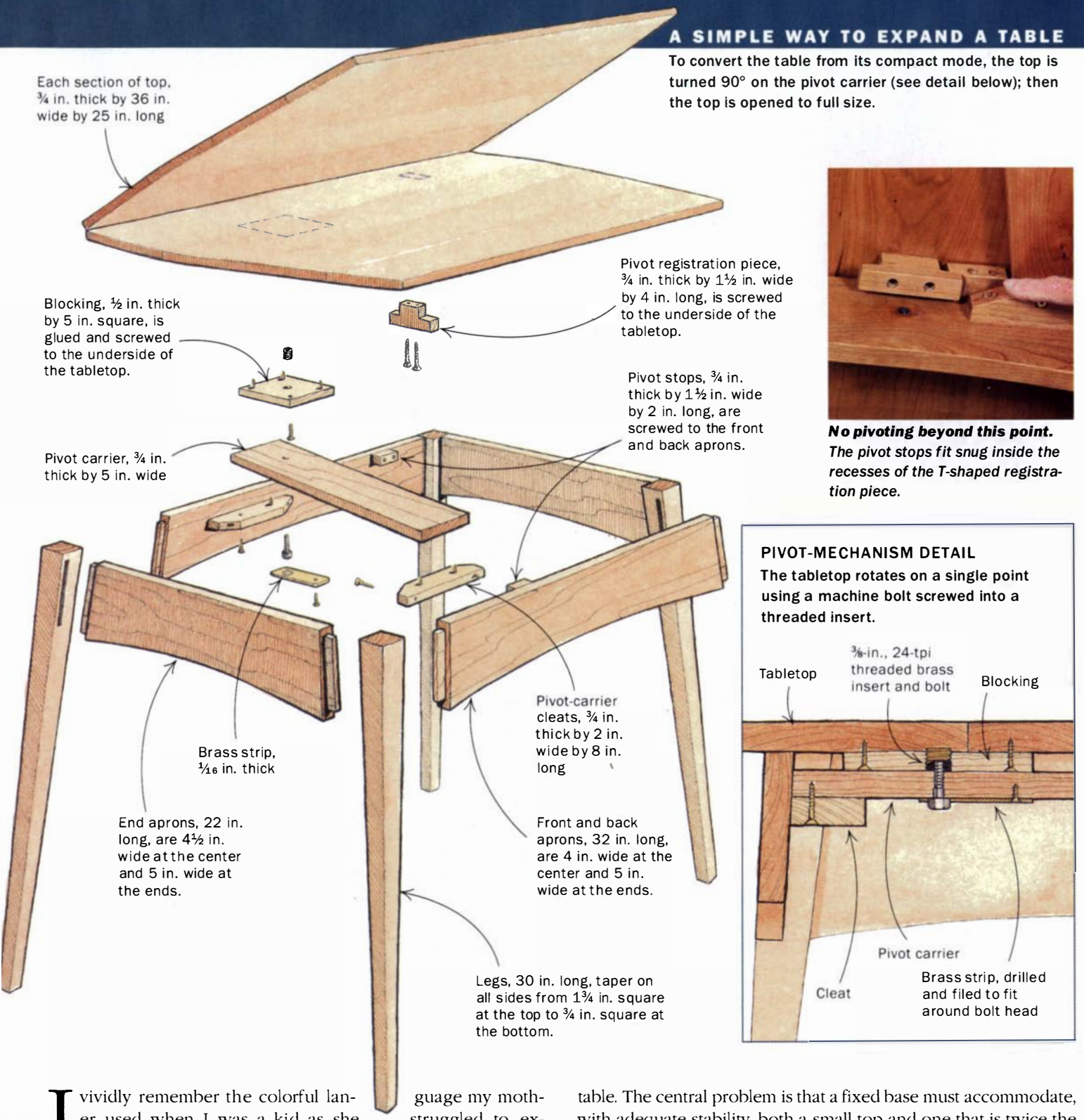
BY WILLIAM KRASE

***Hidden hinges.*** *The Soss-brand invisible hinges face the wall when the tabletop is folded and are concealed with the top open.*

Photos, this page (right, top and bottom): William Krase

## A SIMPLE WAY TO EXPAND A TABLE

**To convert the table from its compact mode, the top is turned 90° on the pivot carrier (see detail below); then the top is opened to full size.**






***No pivoting beyond this point.*** *The pivot stops fit snug inside the recesses of the T-shaped registration piece.*

### PIVOT-MECHANISM DETAIL

**The tabletop rotates on a single point using a machine bolt screwed into a threaded insert.**




I vividly remember the colorful language my mother used when I was a kid as she struggled to extend a removable-leaf table that was prone to jamming. So when a client asked for an expandable table, I sought a better solution. An apartment dweller, my client wanted a table that would fit against a wall and seat two and that could on occasion be expanded to seat six. He expected some sort of drop-leaf table, but it's difficult to sit around that kind of table when the leaves are down.

I recalled seeing a table where the top pivoted and then unfolded to double in size, a solution I thought would meet the needs of my client. The design meets several challenges inherent in this type of table. The central problem is that a fixed base must accommodate, with adequate stability, both a small top and one that is twice the size. At the same time, the footprint of the base should not extend beyond the "shadow" of the hinged top in its contracted size, lest the legs of the table conflict with the feet of the user.

The use of Soss hinges (www.soss.com) permits the leaf to fold over 180° in the closed position. When the table is open, though, the hinges are concealed. Two would have given enough strength, but I elected to use four hinges to help keep the leaves aligned.

The folding method I used is suitable for larger tables with a length-to-width ratio of 1.2 to 1.8, but it is not suitable for square,

Drawings: Heather Lambert; photos, except where noted: Tim Sams

## Locating and mounting the pivot

**The best way to locate the pivot point is to make an accurate scale drawing of the table frame. Overlay this with a plan of the tabletop in its folded position so that you can see the relationship between the frame and the top, both in its normal position and rotated 90°. Point A is the midpoint of the hinge line with the table folded in the two-seat position, while point B is the midpoint of the hinge line with the tabletop rotated and in the six-seat position. Draw lines from both points at 45° to the line A-B; their intersection marks the pivot point (C). Now, the pivot carrier and the pivot stops can be drawn in.**

**Measurements from the scale drawing can be taken to locate the pivot point on both the pivot carrier and the tabletop.**

**The pivot is a ⅜-in., 24-tpi machine bolt that mates with and turns in a threaded brass insert in the tabletop. The insert is set in a block that's glued and screwed to the underside of the tabletop. The insert requires a nominal ½-in. pilot hole and is ⅝ in. long.**

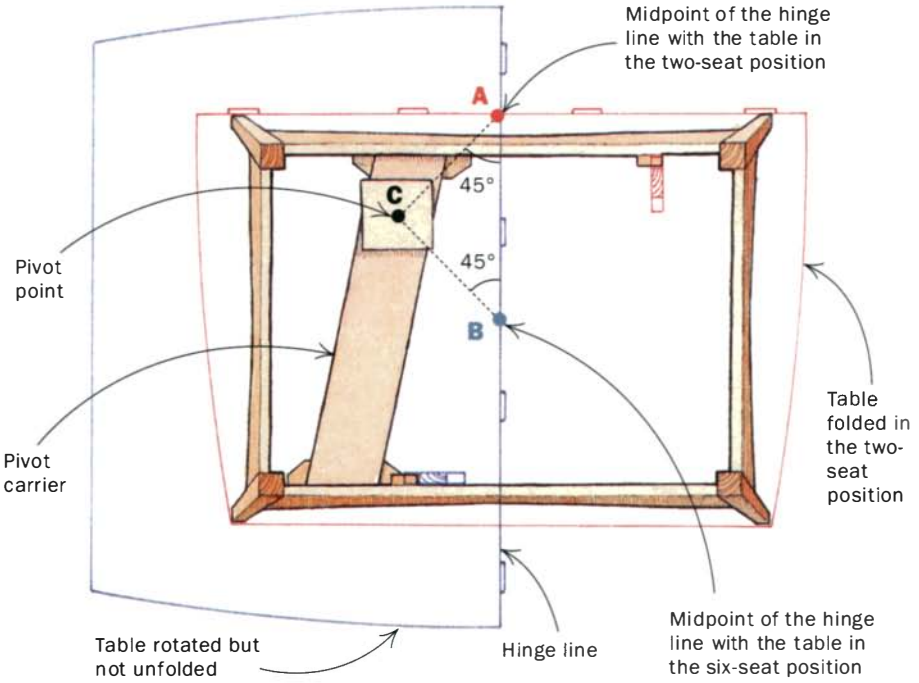
**Screwing the insert into hardwood is much easier if the nominal pilot hole is enlarged by 1/32 in. To install the insert perpendicular to the surface, use an auxiliary block of wood to make things easier.**

**The machine bolt passes through the pivot carrier and into the threaded insert. This type of pivot should be arranged to tighten a quarter turn when the table is expanded. This will pull the parts together very slightly, so clearance over the pivot carrier should be allowed.**

**The final step is to add a brass strip to prevent the pivot bolt from loosening or falling out. The strip is drilled and filed to fit over the bolt head and is screwed to the pivot carrier at the other end.**

**FINDING THE PIVOT POINT**

**First locate the center of the hinge line in the two-seat (A) and six-seat (B) positions. Then project lines from these points at 45°. The intersection of these lines (C) is the location of the pivot point.**




round, or oval tabletops. I made the open table boat-shaped, a design that affords everyone a better view of each other and that is conducive to conversation. The edge profile must take into account the sometimes-inverted position of one leaf. I used a simple long-radius roundover bit guided by a template.

I chose to splay the legs for extra stability and to taper them all the way to the bottom. The ends of the aprons are all 5° from the vertical with the tenons cut on the tablesaw using a jig I described in *FWW* #99, pp. 44-45 (or visit www.finewoodworking.com). Strictly speaking, the tenons should have been cut at a compound angle due to the splay of the legs, but I didn't do this because the second angle for a 5° splay is a negligible 0.2°. Make a scale drawing to locate the position of the pivot point (above).

Next, the recesses for the hinges need to be cut. Because the deep recesses are awkward to cut on the edge of the large tabletop, I made a 12-in.-tall auxiliary fence for my router table.

After the aprons and legs had been assembled, I attached the pivot carrier, which provides a point on which the tabletop can turn. The pivot carrier is secured to two blocks that are screwed to the aprons. The carrier is angled to expose the two stops that also are screwed to the aprons and limit the swivel motion. These stops register against a T-shaped piece of wood screwed to the underside of the leaf that doesn't flip over.

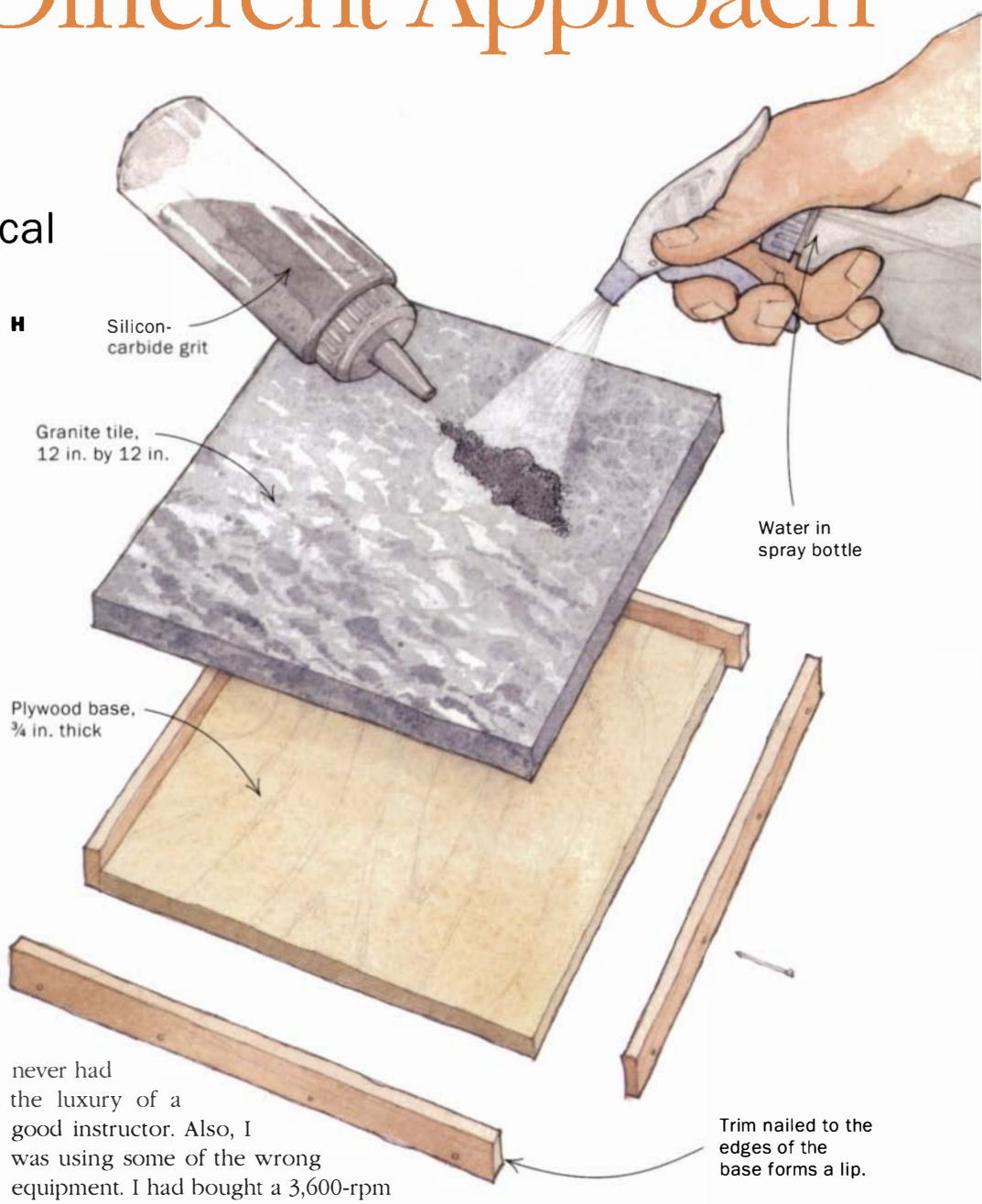
All tables of this design have one drawback: They cannot be lifted when the tabletop is open because the only permanent connection with the base is the pivot mechanism. □

*William Krase is a retired aerospace engineer who lives in Mendocino, Calif.*

# Sharpening— A Different Approach

## Powdered abrasives on granite are quick, efficient, and economical

**BY WILLIAM DUCKWORTH**




I've accumulated a motley collection of handplanes and chisels over the years. Some are decent tools (a set of Stanley chisels made in the 1940s), some are strictly utilitarian (solid-steel Klein chisels made for electricians who need to chop out floor joists), and until recently, none of them were razor sharp. As a matter of fact, I confess that I've used those chisels to open paint cans rather than walk the length of the shop to retrieve a screwdriver. In the never-ending debate of hand tools versus machine tools, I've always leaned heavily toward the latter. On an average day, you'd find my jointer knives in a lot better shape than my handplane blades.

To me, sharpening always seemed to be a dreadful chore—in part, I think, because I never had the luxury of a good instructor. Also, I was using some of the wrong equipment. I had bought a 3,600-rpm grinder that came with two silicon-carbide wheels. If I were buying a new grinder now, I'd get an 1,800-rpm machine. For stones I owned a cheap oilstone with a medium grit on one side and a fine grit on the other. I destroyed a chisel by overheating it the first time I used the grinder, and it wasn't long before the oilstone, which sat out on a workbench, got clogged with fine sawdust and dished in the center on both sides. In no time and out of desperation, I turned to my 6-in. edge sander to sharpen the edges of chisels and plane blades. Call it overkill, but a worn 120-grit belt on the edge sander worked well enough to bring a really dull edge back to a point where it could at least cut wood.

### A search that yielded results

In the process of organizing a new basement shop and fed up with dull tools, I de-

Drawing: Jim Richey

cided to improve my sharpening setup. Of all the articles about sharpening that this magazine has published over the years, the one that intrigued me most was in *FWW* #140, and it documented Mike Dunbar's system of sandpaper glued to a ⅜-in.-thick by 40-in.-long piece of glass. I liked his no-nonsense approach toward keeping tools sharp. But considering some of the obvious consequences, even Dunbar's method had its drawbacks for me. My new basement shop is small and has a concrete floor—40 in. of bench space is a lot of dedicated real estate in a small shop, and it's not hard to envision a future of sweeping up shards of broken glass.

I tried the method of placing wet-or-dry sandpaper onto a smaller piece of wetted glass but got mixed results. More often than not, I'd end up ripping the wet sandpaper, or else I couldn't get it to stay put. And then, quite by chance, I happened to have a conversation with a friend who had made his own telescope, including grinding the lenses himself. He told me that the same abrasives used to make that sandpaper are available in more affordable quantities from astronomical-supply businesses, such as Willmann-Bell Inc. (804-320-7016; www.willbell.com). I ordered an assortment of silicon-carbide and aluminum-oxide powders, tried them on a flat piece of granite, and was pleased with the results.

For the abrasive powders I ordered (120-, 220-, 320-, and 500-grit silicon carbide, plus some aluminum-oxide lapping powders in 12-micron and 5-micron sizes), I needed a hard and flat surface. I found a granite floor tile for $12 at a local home center, then made a plywood base for the granite with some scraps of Spanish cedar to frame the outside edges and to hold the granite in place on the workbench.

The abrasive powders came from the supplier packed in plastic bags. Available in 8-oz. or 1-lb. quantities and in various grits, the powders cost from $8 to $12 per pound. It's worth spending another few dollars for some plastic storage bottles with tapered-nozzle tops because they're much more convenient and less messy to use when dispensing the tiny amounts of powders needed for each sharpening.

### A little powder and a spritz of water go a long way

For blades that are in wretched shape, such as the mortise chisel shown at left, start

***Before.*** *This mortise chisel, covered with glue globs and rust and as dull as a butter knife, has seen better days.*

## Rescue a dull, rusty chisel at the grinder

**Many grinders come equipped with silicon-carbide wheels, which are not the best kind for sharpening woodworking tools. Silicon carbide is good for hogging out a lot of metal fast, but it's too easy to overheat a cutting edge and ruin the tool. Aluminum-oxide grinding wheels are the preferred alternative. They're slower cutting, so they're much less likely to overheat the edge. Aluminum-oxide wheels often are sold in white and pink, but they also come in gray. The color is essentially a marketing gimmick and has nothing to do with the way the material will perform. I bought a 60/80-grit wheel and a 100/120-grit wheel for my 25-year-old grinder. I use the grinder only as a first step for reshaping edges that are in really bad condition. Get the thickest wheel your grinder will handle, and buy a dressing tool to replenish the surface of the wheel when it becomes worn from use. A 36-grit diamond-wheel dresser costs about $10. Grinding and polishing metal is like sanding wood: You start with the coarsest grit you need to do the job, and then move through progressively finer grits.**


***Clean up the bevel first.*** *With new aluminum-oxide wheels (60/80 grit and 100/120 grit) installed on an old grinder (above), Duckworth removes the crud from the bevel (right). Aluminum-oxide wheels are better for grinding woodworking tools because they don't overheat and ruin the steel, which can happen easily with silicon-carbide wheels.*

***Getting there.*** *With rust and dried glue ground away, this bevel is ready for abrading on the stone.*



Photos: Kelly J. Dunton


## SANDPAPER IN A BOTTLE

**Silicon-carbide abrasives come from the supplier packed in resealable plastic bags that are cumbersome and messy. Transferring the abrasives to small plastic bottles makes it easier to mete out the small amounts needed.**

***Spritz and sprinkle a small amount of water and powder.*** *Wet the granite tile first with a spray of water, and then dole out dabs of abrasive as needed. Wipe the stone after each grit with a wet paper towel.*

with the 120-grit silicon carbide. Otherwise, 220 or even 320 grit may be all you need to start the sharpening process. I begin by spraying a light mist of water onto the stone, and then sprinkle over that a dab of powder. It's easy to use too much, and you'll quickly get a sense of how little you really need to create a sufficient slurry to sharpen steel edges.

With the flat of the blade down, hold the tool in one hand and keep it flat against the stone with your other hand. Move the blade first in a figure-eight motion, making at least a dozen passes. Follow that by moving the blade in circular patterns and then side to side. The friction created by rubbing steel against stone evaporates the water fairly quickly. Spray on more water as you need it; you'll want to keep the slurry wet to maximize its cutting action.

Turn over the blade, press the beveled edge flat against the stone with one finger, and strop it a few times in a backward motion through the wet slurry to remove any burr created by sharpening the flat side.

Paper towels come in handy to wipe off the slurry of each grade of abrasive before you move on to the next grit. A regimen of 220-, 320-, and 500-grit silicon carbide followed by polishing the edge with the 12-micron and 5-micron aluminum oxide was enough for me. You certainly could carry the process further, if you're so inclined, with some red rouge (also called jeweler's rouge) on leather or a cloth wheel on the grinder. But as far as I'm concerned, you don't need a mirrored polish on steel before it will cut wood just fine. □

*William Duckworth is an associate editor.*

***Work the flat of the chisel on the stone.*** *Press the blade flat to the stone and move it vigorously in figure-eight, circular, and side-to-side motions. The water and abrasive powder quickly form a slurry, and you can hear it do its work. When the slurry begins to dry out, wet it again with another spray of water.*

***Pull the bevel toward you.*** *After working the flat of the blade with each successive grit, turn it over, place the bevel in the slurry at the desired angle, and move it toward you in straight lines.*

# Understanding Wood Movement

## Proven methods for dealing with expansion and contraction

BY CHRISTIAN BECKSVOORT

For centuries, granite has been quarried along the Maine coast. Way back in the woods behind my shop, on a granite outcropping, sit a few leftover slabs 10 in. thick by 2 ft. wide by 12 ft. long. The granite faces show a series of ½-in. holes drilled 12 in. to 18 in. apart. The old-timers would have driven dried wood into these holes, then walked down the row pouring water onto the wood. Eventually, the granite slabs would split apart. When wood cells absorb water, they swell and expand, and not even granite can stop it. So forget about pins, glue, screws, or fancy joinery; wood will move and break apart your work if you don't follow the rules.

The exact amount of wood movement depends on any combination of several factors, including the environment (the degree to which humidity fluctuates) and how the lumber has been sawn (see below).

The amount of movement also varies among wood species, particularly among the hardwoods. For example, beech, hickory, oak, and hard maple move substantially more than cherry, walnut, and butternut.

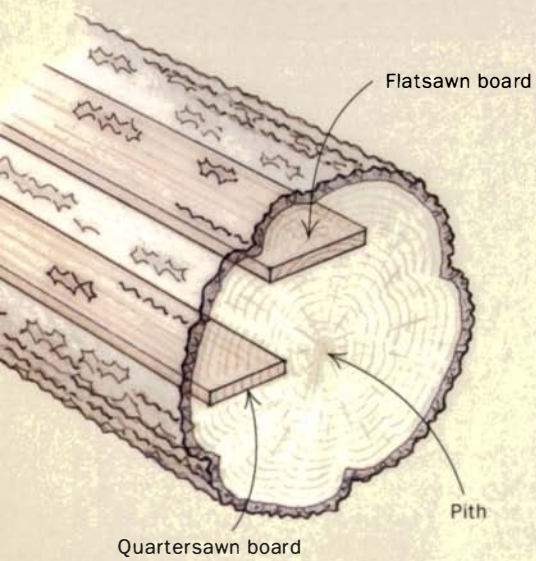
Last, the type of finish you apply to a piece affects wood movement. Because light skin finishes such as wax and oil allow greater moisture absorption, wood that has been coated with either of them moves more than wood that has been finished with deeper-penetrating sealants such as urethane and lacquer.

As a professional woodworker, I can't afford to cut corners when it comes to wood movement. So I devote my energy to building furniture right the first time—whether it's a chest, a case, a bed, or a table.

## How wood moves

### GRAIN ORIENTATION DETERMINES THE AMOUNT OF MOVEMENT

**You can predict how lumber will behave by looking at the growth rings. Flatsawn boards revealing long ring sections that are parallel to the pith of the log will move the greatest amount.**

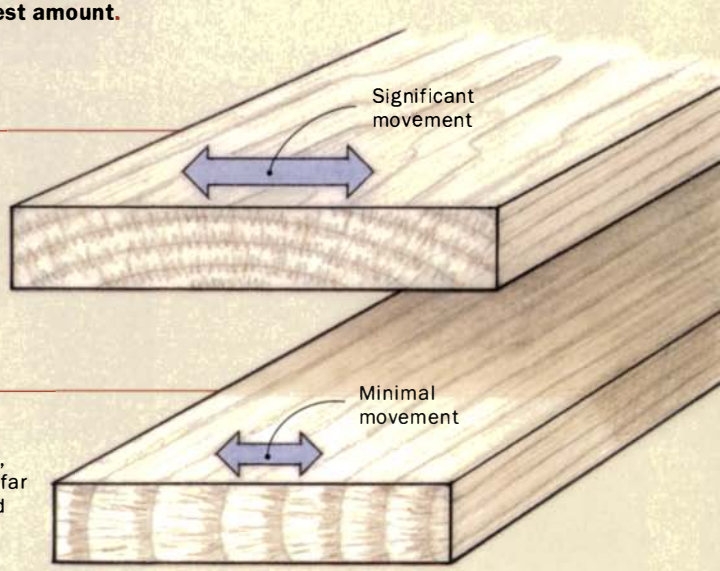



**FLATSAWN BOARD**

Most seasonal movement in a board is along the rings. With annual rings nearly parallel to the surface, flatsawn boards exhibit more seasonal movement and are prone to cupping.

**QUARTERSAWN BOARD**

A quartersawn board has annual rings running perpendicular to the surface, so the board will experience far less seasonal movement and will be less likely to cup.

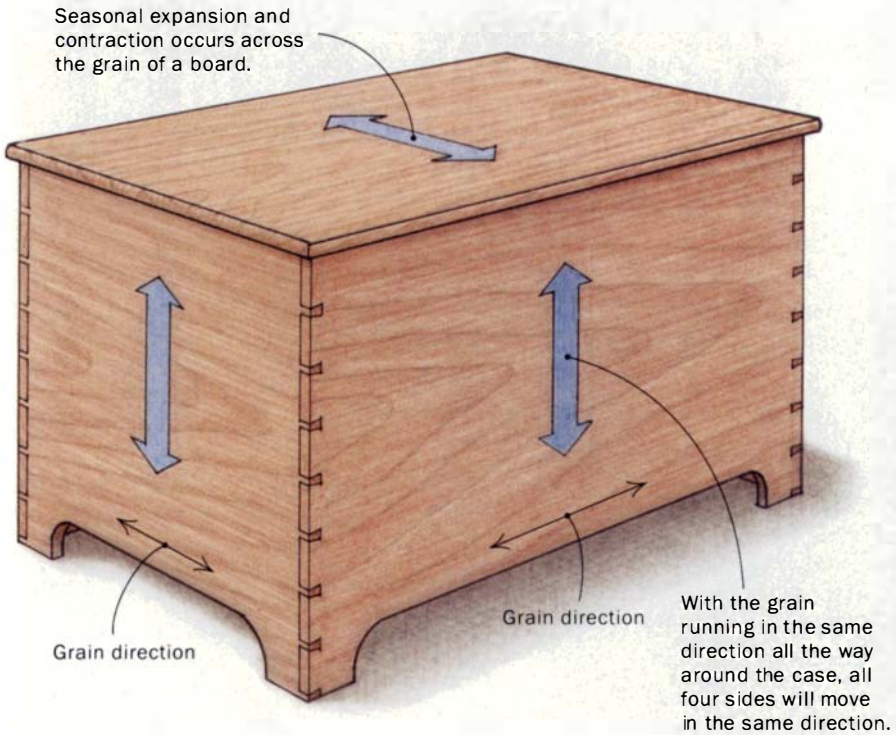





Photos, except where noted: Dennis Griggs; this page: Karen Wales

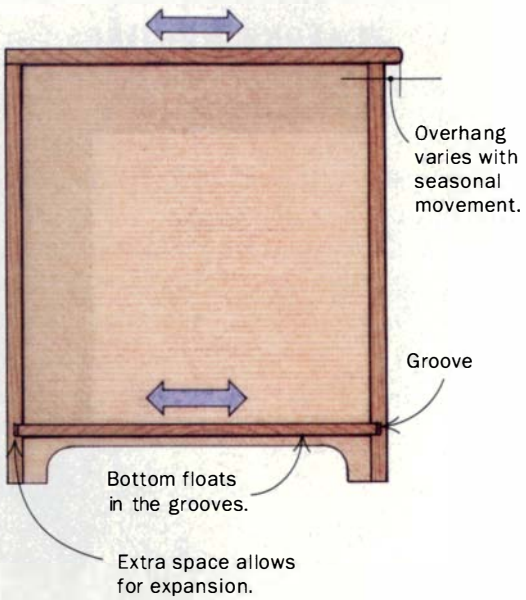
## SLAB CONSTRUCTION ALLOWS ENTIRE PIECE TO MOVE

**A blanket chest, in which the grain runs in a band around the entire box, is an example of slab construction. The depth and width of the chest remain constant, because the wood does not move lengthwise. But the wood does change in height in response to changes in humidity. The blanket chest gets slightly taller in summer and shorter in winter. Because movement in the top is from front to back, the hasps of the lock don't always fit. The solution is to use quartersawn wood for the top, file the hasp parts to increase clearance, and use a good sealing finish.**




### BOTTOM FLOATS IN GROOVES

**Grooves are cut into the four sides of the chest to hold the bottom. The bottom is sized so that there's enough space in the grooves to allow for seasonal movement.**

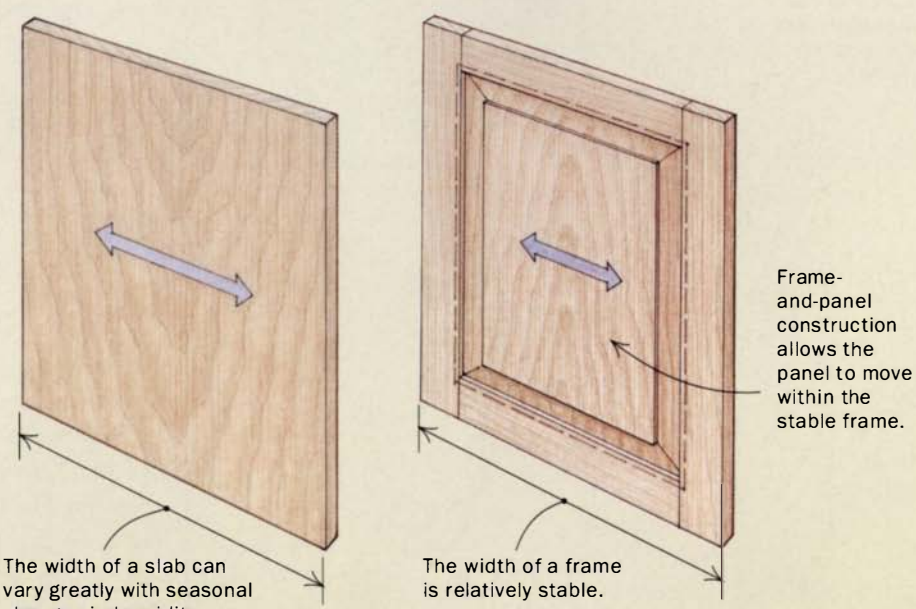



## FRAME-AND-PANEL CONSTRUCTION ISOLATES MOVEMENT

**Your approach to controlling wood movement will depend a lot on whether the piece is made using slab or frame-and-panel construction.**

**Slab construction is typical in chests, tabletops, and headboards and consists of single, wide boards or narrow boards glued up edge to edge. With solid-wood slabs, you have to worry about cross-grain movement, which can be significant with large widths.**

**Frame-and-panel construction, on the other hand, minimizes the effects of wood movement by isolating large areas (the panel) and restricting movement to relatively small areas (the frame). The panel is set into grooves of the appropriate depth, but it is not glued in place. Instead, this "floating" panel is free to expand and contract within the frame.**



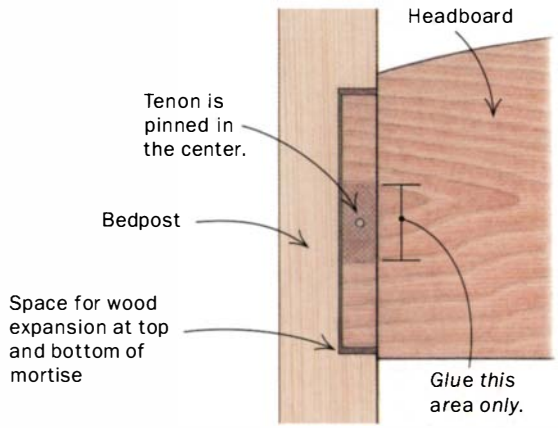

Drawings: Vince Babak

## BEDS

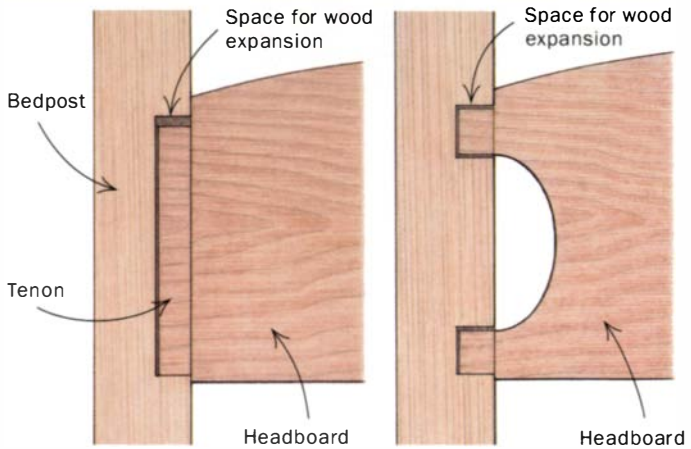
### SLAB HEADBOARDS NEED EXTRALONG MORTISES

**A slab headboard that's 12 in. to 14 in. wide may move up to ¼ in., which means the mortise into which it fits needs to be that much wider. If the headboard is to be pinned and glued in the middle (fixed), leave an ⅛-in. space at the top and bottom of the mortise. But the headboards on some beds, such as pencil-posts, sit loosely in the mortises on the posts. The unit is held together by bolts in the rails. Extratall headboards (as in old Victorian styles or sleigh beds) require extradeep grooves or large shoulders and mortises.**

#### ATTACHING A FIXED HEADBOARD




#### ATTACHING LOOSE HEADBOARDS



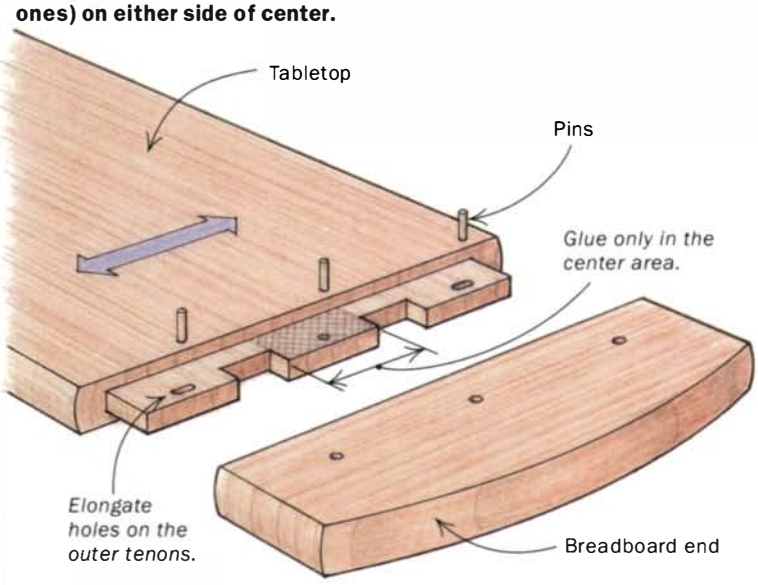

## TABLES

### BREADBOARD CONSTRUCTION KEEPS TABLETOPS FLAT

**Breadboard ends are added to tabletops to help prevent the top from warping or cupping. But they must be attached so as to allow the top to expand and contract.**

**The preferred method for making breadboards is a single tongue with cutouts. For a stronger joint, parts of the tongue are cut out to within ¼ in. to ½ in. of the shoulder, and the corresponding areas of the mortise are left in place to hold the weak faces of the breadboard together.**

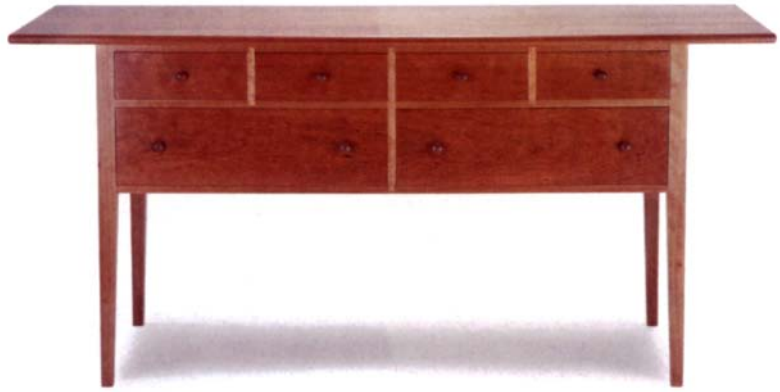
**The trickiest part of construction is pinning and gluing the breadboard ends. I like to plane a slight (1/16-in.) concave bow into the breadboard to keep the ends tight against the table. I make the mortise longer than the tongue, center the breadboard, and clamp both ends onto the table. I drill a ⅜-in.-dia. hole in the center and then one (for narrow tabletops) or two holes (for wider ones) on either side of center.**




**I remove the breadboard end and scribe a line along the edge of the holes closest to the end. Next, I elongate all but the center holes with a ⅜-in. rat-tail file. The farther from center, the longer the oval. For very dry wood (6% moisture content or less), elongate away from the center to allow the top to expand. For wet wood (12% moisture content or more), elongate toward the center to allow for shrinkage. Do not file beyond the scribe lines; doing so will relieve the pressure holding the breadboard to the table shoulder.**

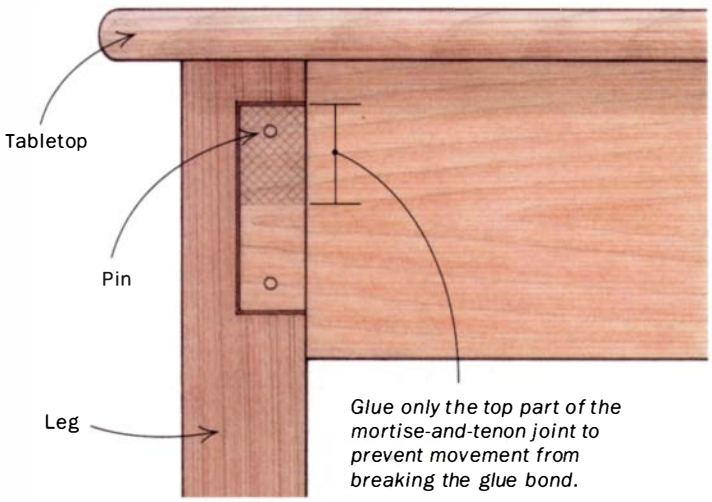
## MORTISE-AND-TENONS THAT BREATHE

**You may have have surmised that cross-grain gluing is a no-no. That is correct up to a point. Wood has a small amount of give to it, and aliphatic resin (yellow) glue is slightly elastic. So you can feel relatively safe making cross-grain joints, such as mortise-and-tenons, as long as the tenons aren't too wide. With cherry, for example, I limit cross-grain joints to a width of 5 in. As a precaution, I glue only the top half of the joint. Theoretically, the top of the rail will stay flush, and the bottom will move ever so slightly. That also should work for hardwoods that are less well-behaved than cherry.**



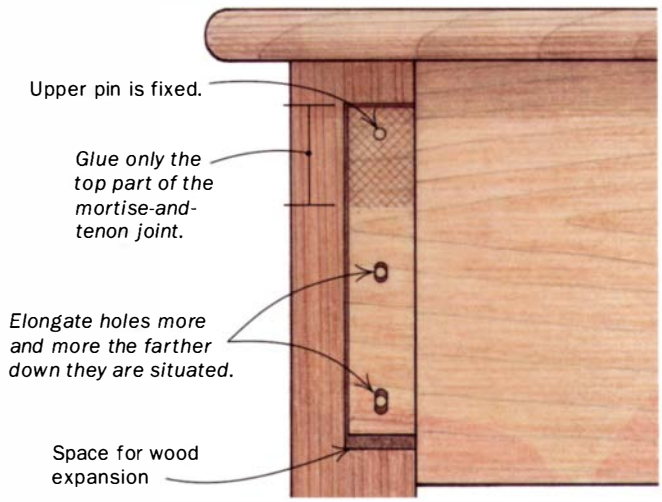
### NARROW APRONS CAN BE GLUED AND PINNED

In general, tenons for aprons that are less than 5 in. wide can be glued and pinned, but glue only the top portion of the joint.




### WIDE APRONS USE FLOATING PINS

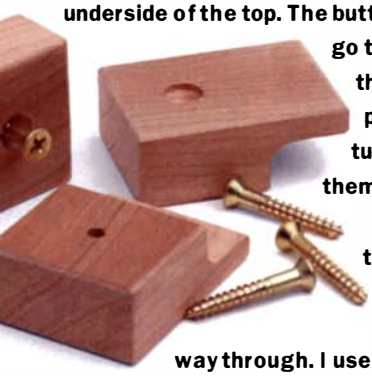
The tenon of a wide apron requires space at the bottom for expansion. A fixed pin at the top forces movement downward.



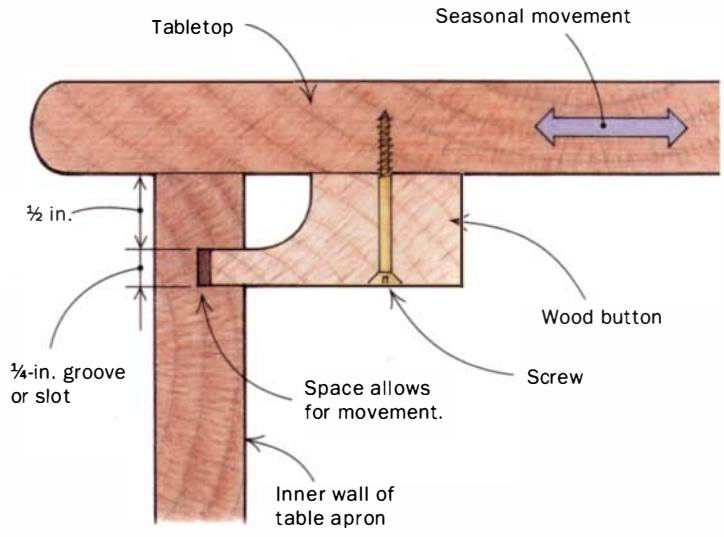

## TABLETOPS NEED ROOM TO MOVE

**No matter how I go about attaching a top to its base, I anchor it firmly in the middle, ensuring that both halves are free to move equally. As a matter of course, I orient the grain in the long direction to minimize the amount of movement.**

**A good way to attach tops is to make ¼-in. grooves, or a series of ¼-in. slots, ½ in. below the inside top of the rail. I then install shopmade wood buttons, which grip the grooves and screw to the underside of the top. The buttons at the ends of the tabletop can go to the full depth of the groove, while the buttons along the sides must be placed according to the wood's moisture content and the time of year. (Fit them tighter in summer, looser in winter.) For a table with rails substantially thicker than ¾ in., I countersink ½-in.-dia. holes from the bottom of the rails. Then I drill ¼-in. holes all the way through. I use a rat-tail file to elongate holes away from the center. Holes in the center of the end rails stay as they are. Because the wood movement is side to side, the ovals in the long rails run across the thickness of the rail. That's why I don't recommend this method for thin rails.**



**For more details on attaching tops, see *FWW* #62, pp. 58-59 and *FWW* #112, pp. 54-57.**

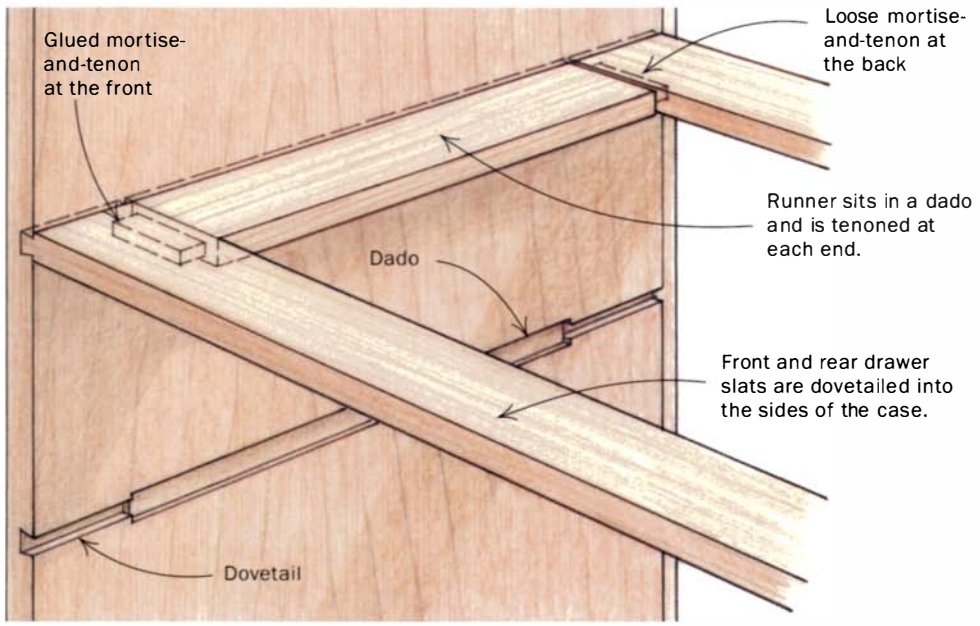



Photo, this page (bottom left): Kelly J. Dunton



## WEB FRAMES PROVIDE UNDETECTABLE MOVEMENT

**Web frames provide lightweight, low-movement alternatives to solid drawer dividers. For frame-and-panel cases, web frames are merely four slats—mortised and tenoned and then glued. For slab-constructed cases, web frames become a bit more involved. I start with four slats. Two are dovetailed into the sides of the case; one slat in the front, and one in the back (flush with the back rabbet). Before gluing, I rout a dado to connect the front and back dovetails. Then I cut a mortise into each end of both dovetailed slats. I measure the length of the drawer runners and add the depth of the two mortises, minus 1/16 in. for dry wood, or minus 3/8 in. for damp wood. I glue the front slat into the dovetailed slots and then cut the tenons on the front-to-back runners. The front tenon is glued into the mortise, and the runner is forced into the connecting dado. The back slat is then glued into its dovetail slot, but the back mortise-and-tenon is not glued.**



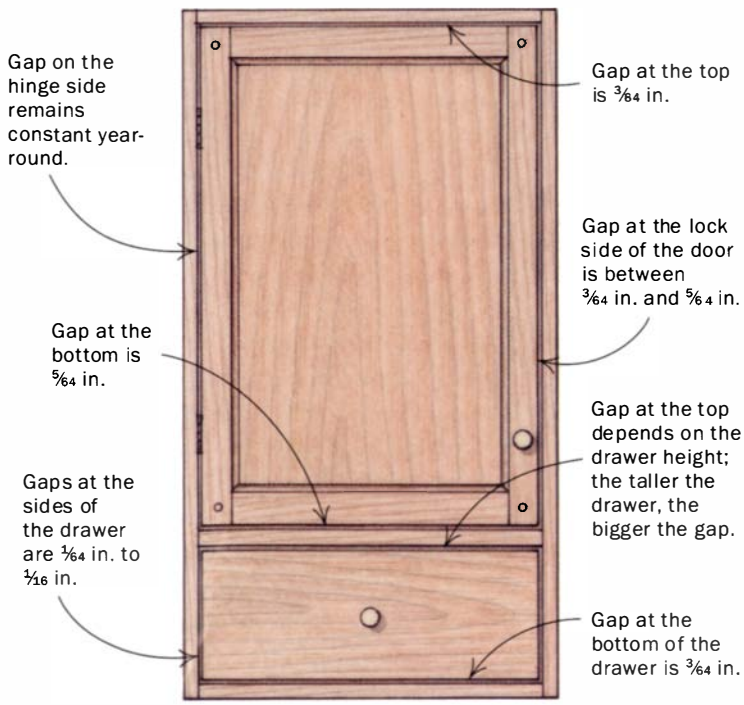

## FITTING DOORS AND DRAWERS

**The issue of wood movement in doors and drawers must be taken into account. Because they will change in width over the course of a year, I install slab doors only in narrower case openings using quartersawn wood and then stabilize the door with battens.**

**Frame-and-panel doors are much less of a headache. For quartersawn cherry, I aim for a gap at the lock side of the door that is between the thickness of a nickel (5/64 in.) and a dime (3/64 in.). The hinge-side gap is constant year-round; the top gap is a dime fit; and the bottom gap is a nickel fit.**

**Fitting drawers is bit more involved. Again, I prefer to use quartersawn stock to minimize wood movement. I start by making drawers the same size as the opening, side to side. When assembled, I trim them to fit, with a 1/64-in. (minimum) to 1/16-in. (maximum) total side clearance.**

**The top-to-bottom dimension is another story. The opening is constant, but the drawer front changes in height. I also make my front about 1/32 in. narrower than the sides by planing that amount off the bottom (after cutting the grooves for the drawer bottom).**



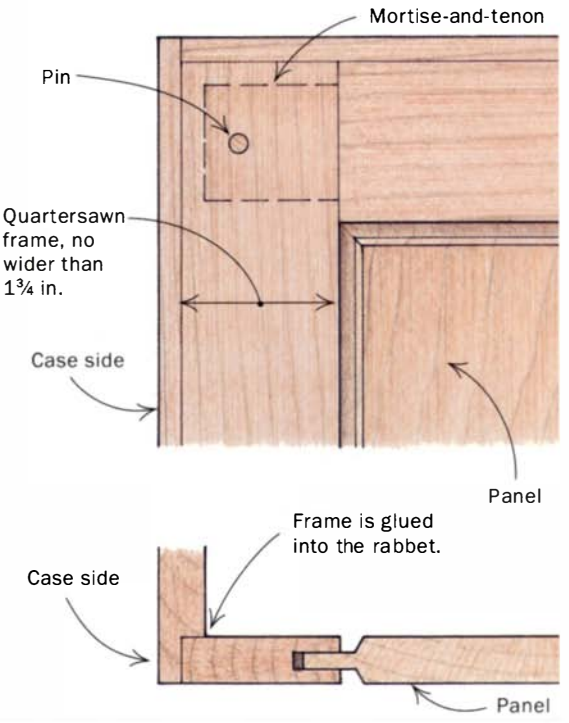



Photo, this page: Michael Pekovich

## A FRAME-AND-PANEL BACK ACCOMMODATES MOVEMENT

**Building high-end furniture and having a preference for solid wood, I make my backs as frame-and-panel units, set into rabbets and glued into place. This method creates a totally sealed back, which allows for movement yet provides racking resistance.**

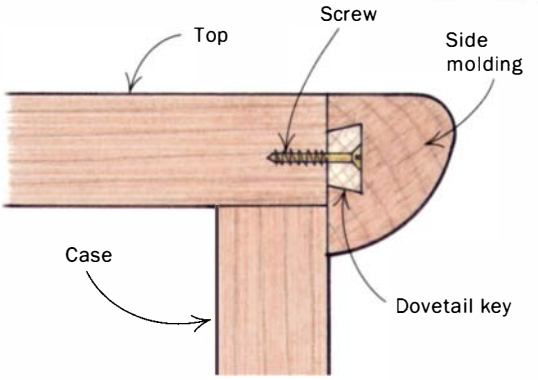
**The success of this method depends on the width and grain orientation of the outside frame members. Because the frame is glued into the rabbets, any excess wood movement will break out the lips of the side and top rabbets. I have determined that by using quartersawn cherry no wider than 1¾ in. for the sides and top of the frame members, there is enough give in the wood to accommodate any potential movement. Less well-behaved woods require correspondingly narrower stock. In any event, the stock must be quartersawn.**

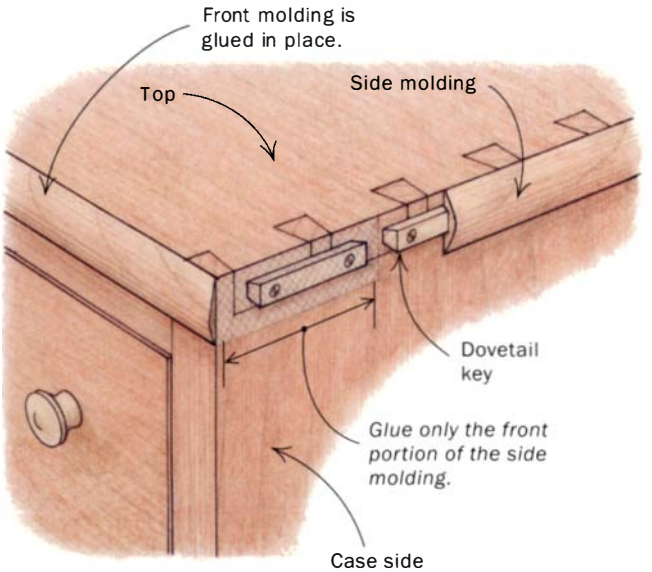



## SIDE MOLDINGS THAT HOLD

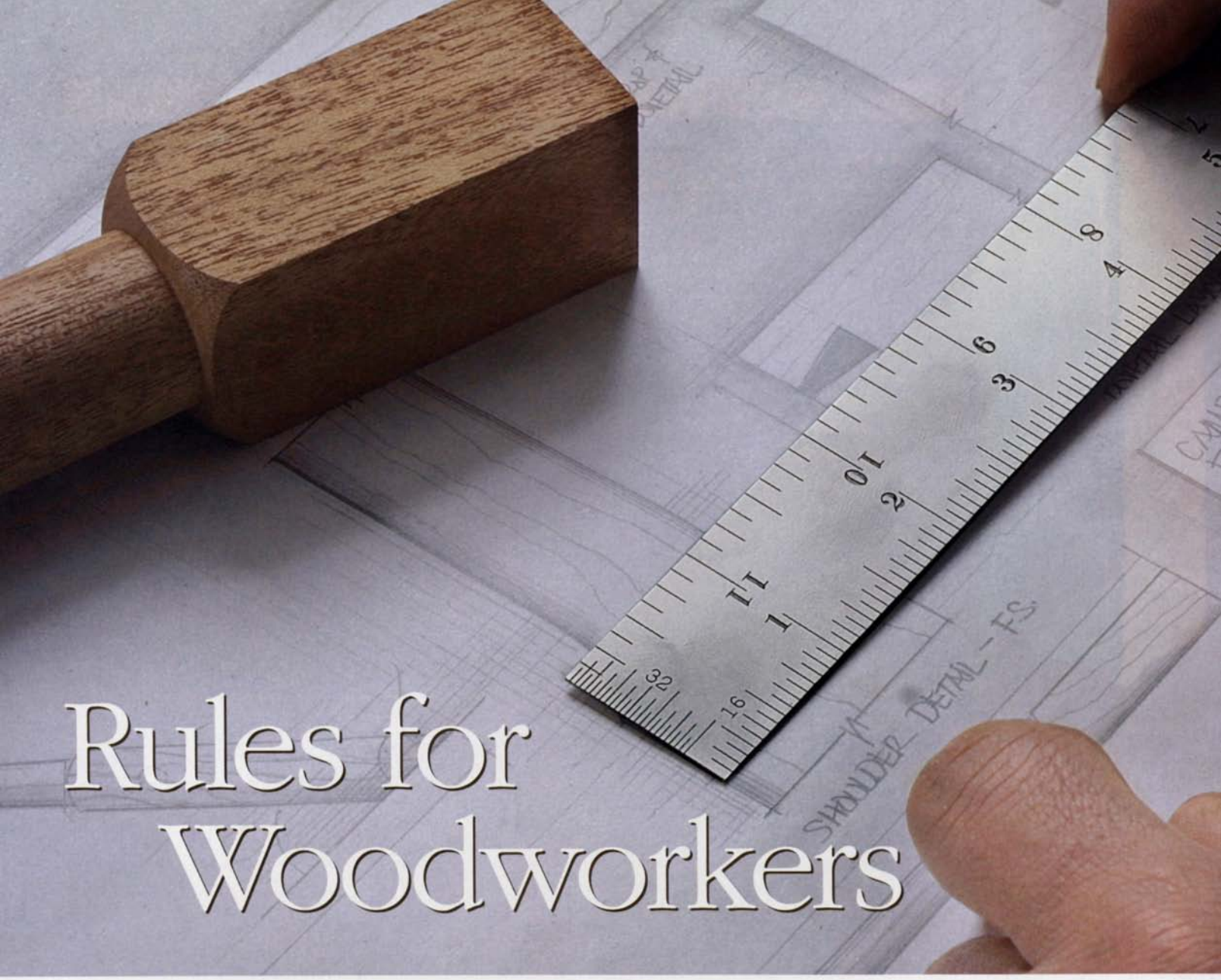
**Most antiques that I've looked at have the side molding glued (and/or screwed) at the miter and nailed the rest of the way back. As the case side moves over the years, the nail holes widen and the nails lose their grip. The long-lasting solution is to use dovetailed keys and slots. I cut my molding and miter the corners to fit. The side molding receives a dovetail slot that runs its full length, in the meatiest portion of the molding, not necessarily its center.**

**To locate the dovetail keys, I hold the molding in position, then make knife marks on the case side at the top and bottom of the slot, at both the forward miter and at the back. I connect these tick marks, then cut a dovetail key the length of the cabinet side. Ideally, you want it to be 0.003 in. to 0.005 in. thinner than the depth of the slot to draw the molding tight. Then I mark the strip into five or six equal parts. Into each segment I drill and countersink two holes to accept #4 flathead screws, 1 in. apart. Between these holes, I drill for a 20-ga. brad, apply a drop of glue around the underside of the brad hole, and position the strip between scribe lines. I nail the brads, then sink the screws. Once the long length of the dovetail key has been installed, I chisel out a ⅜-in. section at each pencil mark, leaving five or six perfectly aligned dovetail keys.**




Photo, this page (top): Michael Pekovich



# Rules for Woodworkers

## A survey of tools for making precise measurements

BY MARIO RODRIGUEZ

In the early stages of a project, preliminary measuring can be performed quickly and casually. Cutting large sheet goods or long boards to manageable dimensions doesn't require great accuracy. But as the parts are cut to final dimensions and joinery begins, even careful measuring with a tape measure will not provide the accuracy required for smack-dab machine setups or snug-fitting joints. At this stage a woodworker will benefit from the precision obtained from a ruler.

Basic shop rulers (the words rule and ruler are interchangeable and both in widespread use) are a varied group of short (usually 6 in. or 12 in.) strips of steel, available in different thicknesses and widths, engraved with clear, contrasting markings. Their compact size and the clarity of the markings make this group of specialized layout tools indispensable.

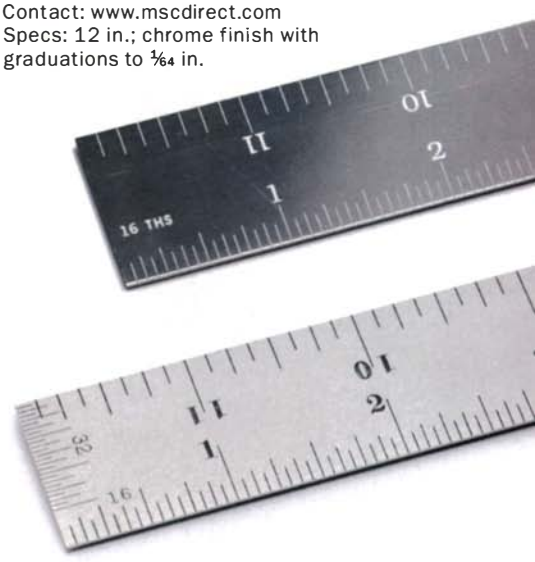
Besides the standard ruler design, numerous variations have been invented: There are rulers marked with perforations that accept a sharp pencil point, rulers that are triangular in section for rigidity, rulers that are hooked at one end for better registration with the work, and rulers that have a bend down the middle to al-

## Flat rulers

Available in 6-in. and 12-in. versions, a flat ruler with clear markings and a nonreflective surface places less strain on the eyes when you're doing close-up, detailed work.

***A cutting edge.*** *Steel rulers make excellent straightedges for cutting veneer. Thicker rulers work best because they provide a solid edge to guide the knife.*

**PEC TOOLS**
Model: 402-012 EZ
Price: $9.89
Contact: www.mscdirect.com
Specs: 12 in.; chrome finish with graduations to 1/64 in.




**STARRETT**
Model: C 304SRE-12
Price: $31.50
Contact: www.starrett.com
Specs: 12 in.; satin finish with graduations to 1/64 in.

low them to measure adjacent sides. I used each type of ruler to discover their strengths and weaknesses.

### The flat ruler is the workhorse of the workbench

Most 6-in. and 12-in. rulers are about 1 in. wide with an average thickness of about 1/32 in., making them slightly flexible. The measurement graduations are usually reversed along the opposite edge and reversed again on the other side. Some rulers go down to 1/16-in. graduations, while others go down to 1/64 in.

How much accuracy you need in a ruler depends on the work you're doing. For instance, to check the accuracy of machined workpieces, graduations to 1/16 in. usually are adequate. Also, for this job it helps to have a thin, narrow ruler, which allows you to check the depth of the narrowest plow or the tightest corner of a mortise. When measuring and laying out full-size details on drawings and story poles, I think it's useful to have a ruler with more precision—one with 1/32-in. graduations.

How much do you have to spend for a flat metal ruler? I compared the $9.89 Pec Tools 12-in. ruler to the $31.50 Starrett 12-in. ruler and found the former adequate for the majority of shop measuring tasks. However, the Starrett ruler was machined better. The edges were crisp without being sharp, and the satin finish was smooth and uniform, providing a true nonglare finish. When you're in the shop surrounded by gleaming surfaces and harsh light, a ruler with a nonreflective surface makes reading the numbers a little easier on the eyes. The graduations on the Starrett were easier to read than those on the less-expensive ruler from Pec Tools. I don't know whether the Starrett model was any more accurate than the Pec Tools model, but it sure was nicer to look at and to use.

Because of its low profile, a flat ruler is perfect for setting up cuts on machinery, as the graduated edge can be held flush with the sawtooth or knife blade.

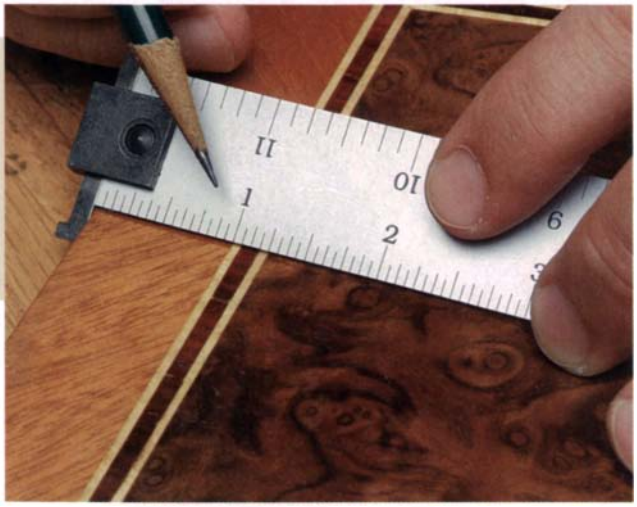
Flat rulers also work well as straightedges. For instance, when cutting edging or small pieces of veneer, I sometimes use a metal ruler as a straightedge to guide and support my marking knife or veneer saw. The thin profile provides excellent visibility exactly where the blade is cutting and a dead-straight edge. In this situation, I prefer a heavier ruler (close to 1/16 in. thick) that gives a

Photos: Mark Schofield

# Specialized rulers

### A USEFUL HOOK

**Rulers with hooks on one end allow distances parallel to an edge to be marked accurately, which is useful when inlaying borders or stringing.**



higher "curb" for better supporting my knife or saw.

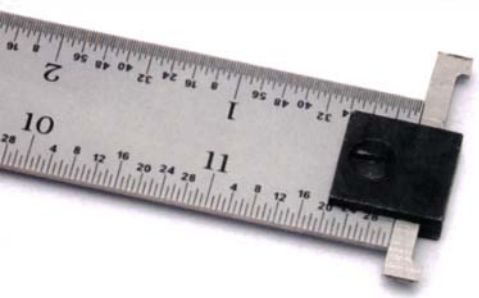
## Specialized rulers are of mixed value

Over time, manufacturers have developed rulers purpose-built for particular aspects of woodworking.

**Hook rulers**—The designs are meant to assist in registering the end of the ruler to the edge of the workpiece. However, in use the hook got in the way. The Lee Valley ruler's adjustable hook had sharp edges that could damage a workpiece easily. The hooks on both Bridge City triangular rulers were removable but stood a good chance of getting lost.

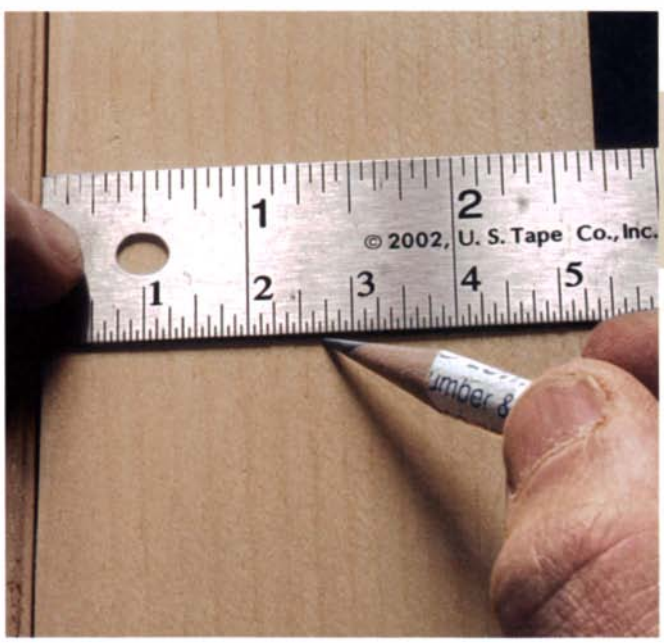
**Triangular rulers**—Available in 6-in. and 12-in. lengths from Bridge City Tools, triangular rulers provide an additional surface for graduations. On two sides there are 1/16-in. and 1/32-in. graduations that ascend in opposite directions, and on the third side there are millimeters and a center-finding ruler. On the plus side, these rulers were hard to lose on a cluttered bench, and the black surface didn't create any glare. On the negative side, I had to unscrew the end hook and spend a lot of time turning the ruler around until I found the scale I was looking for. Also, my eyes were strained by the concentration of numerals in a small space.

**Center-finding rulers**—These come in handy when laying out complex casework and frame-and-panel work or positioning hardware. The 12-in.-long Center Point ruler has 1/16-in. graduations along one edge, while the opposite edge is a half scale (1 in. takes up ½ in. of space) and goes up to 24 in. To use this ruler I first measured the actual distance on the 12-in. scale, then referred to the same number along the opposite edge: The location of that number was half the actual width, or the center of the object.



**LEE VALLEY**
Model: 12N08.11
Price: $21.95
Contact: www.leevalley.com
Specs: 12 in.; matte finish with graduations to 1/64 in.

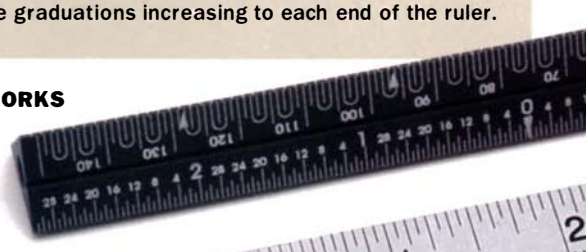
**BRIDGE CITY TOOL WORKS**
Model: 1101-137
Price: $19.95
Contact: www.bridgecitytools.com
Specs: 12 in.; black finish with graduations to 1/32 in.; includes millimeter scale and center finder.



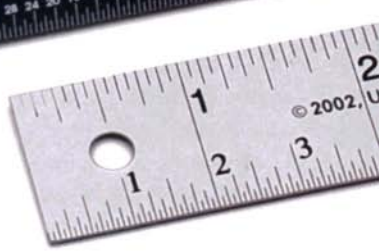

### CENTER-FINDING RULERS

**These come in two versions: One (left) has two scales on a face; the lower one is half the scale of the upper one. The other version (below) has "0" at the ruler's center with the graduations increasing to each end of the ruler.**

**BRIDGE CITY TOOL WORKS**
Model: 1101-124
Price: $14.95
Specs: 6 in. (see above)

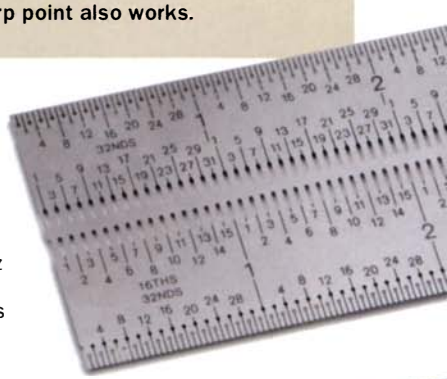


**U.S. TAPE COMPANY'S CENTER POINT**
Model: 60N46.02
Price: $8.95
Contact: www.leevalley.com
Specs: 12 in.; chrome finish with graduations to 1/16 in.



**PERFORATED RULERS**

**This right-angle ruler has a series of slots and holes in it, allowing you to mark the same exact length on adjacent surfaces of a board, useful when cross-cutting or in joinery. Although it's designed for use with a 0.5-mm mechanical pencil, a conventional pencil with a very sharp point also works.**

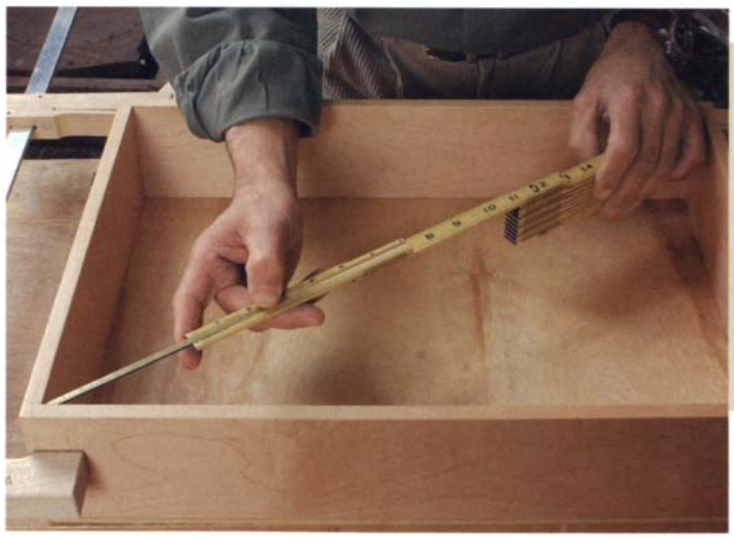


**INCRA MARKING RULER**
Price: $19.99
Contact: www.incra.biz
Specs: 12 in.; chrome finish with graduations to 1/32 in.

**INCRA BEND RULER**
Price: $24.99
Contact: www.incra.biz
Specs: 90° bent edge; 12 in.; chrome finish with graduations to 1/32 in.

The Bridge City triangular rulers are examples of another type of center-finding ruler that is marked "0" at the midpoint. From that point the graduations increase in both directions. To find the exact center, the ruler is moved across the workpiece until the same number on the ruler is at both ends of the workpiece.

**Perforated rulers**—This type of ruler made by Incra has small perforations at 1/32-in. intervals. The slots and holes are slightly offset so that they don't run into each other while providing pinpoint accuracy. Designed for use with a 0.5-mm mechanical pencil, these rulers also work with a regular pencil sharpened to a fine point. I suspect that once you get used to these rulers you will spurn any other kind, but I spent too much time making sure I stuck the pencil in the right hole.



**FOLDING RULER**

**The brass extension of this folding ruler is useful for measuring the inside diagonals of a drawer to check for squareness.**

**Bend or corner ruler**—Bent to turn a 90° corner, this ruler let me mark two perpendicular surfaces without moving the ruler. By measuring two surfaces at the same time, the ruler ensured a slightly higher degree of accuracy. Is the corner ruler essential? No, not at all, but each time I used it I shaved a few minutes off my layout work. Like the other Incra rulers, this one is perforated.

**Folding extension ruler**—This type of ruler was not as accurate as the other rulers I've described, but many a fine piece of furniture has been made using no other measuring device. The extension ruler offers acceptable accuracy to within 1/16 in. and has very clear markings—at least until they eventually wear away. A folding extension ruler takes up more room than a tape measure but supports itself over a longer length. Get one with a brass extension for taking inside measurements into tight corners. □

**STARRETT**
Model: 20K12.02
Price: $29.95
Contact: www.starrett.com
Specs: 72 in.; painted finish with graduations to 1/16 in.; 6-in. sliding extension

*Mario Rodriguez is a contributing editor.*

# Step-Back Cupboard

## Build this elegant 18th-century cupboard, and hone your hand-tool skills at the same time

BY MIKE DUNBAR

My wife had a narrow space in the kitchen where she wanted more storage. She had pestered me to make a piece of furniture to solve her problem, but I always had other things to do. One day I came home to discover she had bought a factory-made cupboard at a furniture store to fill the spot. One of the major reasons why I am a woodworker is that I want to be surrounded by furniture that is better than the mass-produced stuff. Factory furniture offends all of my sensibilities: It often lacks individuality, character, and craftsmanship; its designs are limited by the capabilities of machinery; and every surface is sanded to death.

I promised my wife that if she returned the piece, I would make something that we both liked better. She selected an antique cupboard on which this one is based. Besides the additional storage, she was happy to gain display space for some of her favorite items. The cupboard's small size also makes the piece versatile, and it can be used in any room if she redecorates or if we move.

The original piece that inspired this project was made in the late 18th century. The wood used in the original—eastern white pine—suggests that the piece was made in New England. While very handsome, the cupboard is not particularly complicated, especially if it is made using machines. However, the project presents a good opportunity to hone hand skills. So, even if you do use machines for most of the steps, I urge you to try at least some of the steps by hand.

### Cut stock to rough dimensions

I purchased 4/4 stock that I dimensioned with a jointer and a thickness planer. This is an important step because the stock must be perfectly flat. If I buy wood that already has been planed to thickness, I have to work with whatever warp or wind it has experienced while it was in the dealer's rack.

Begin by laying out the various parts on the lumber. Select the straightest and best lengths for the sides and the frame-and-panel



Photos: Matt Berger

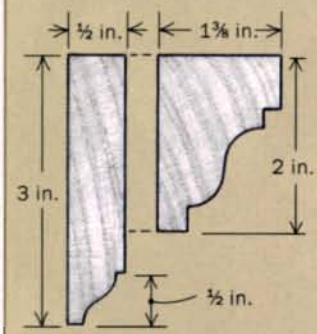
## PAINTED PINE CUPBOARD

The 18th-century cupboard is made of ¾-in.-thick white pine and finished with milk paint.

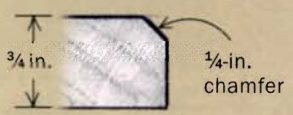

### EDGE PROFILES ADD DETAIL

Although Dunbar used molding planes to make the edge treatments, router bits may be used to create similar shapes.

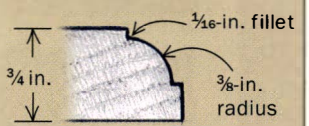
**CORNICE MOLDING**



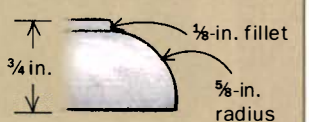

**INSIDE EDGE OF UPPER FRAME**



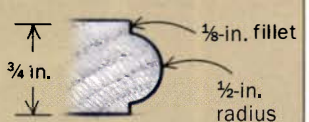

**OUTSIDE EDGE OF UPPER AND LOWER FRAMES**



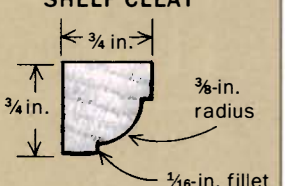

**WORK-SURFACE EDGE**




**SHELF EDGE**




**SHELF CLEAT**



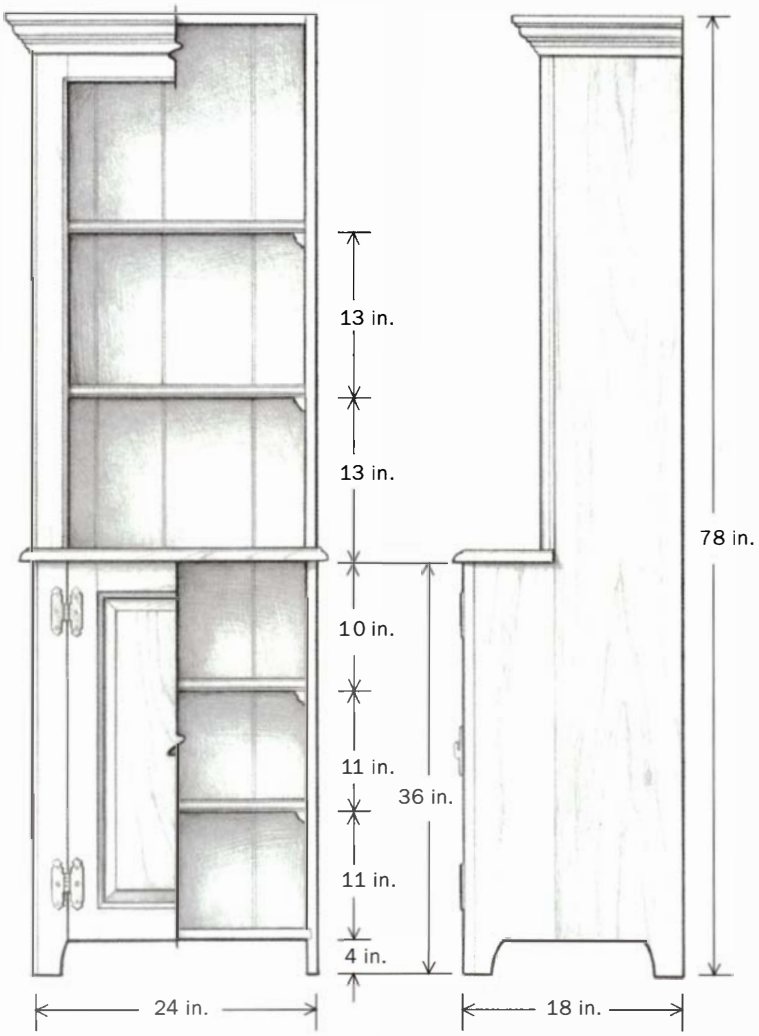

Drawings: Bob La Pointe

## CONSTRUCT THE CARCASE

***Form the step-back profile.*** *The base is built up by adding a short board to each case side.*

***Joint the edges.*** *By clamping the face of the short board to the face of the case where they meet, both boards may be planed simultaneously, ensuring that they will meet up perfectly.*

***Glue and clamp the two boards.*** *The show side can be handplaned to clean up any tool marks or excess glue.*




door. You don't want any warp or twist in these most visible sections of the cabinet.

Cut out the various parts to oversize dimensions. You will cut them to their final dimensions later. Finally, joint one surface of each board and plane them all to thickness. Use a handplane on each part to remove the planer marks as well as any dings or scratches that have occurred along the way.

### Cut and assemble the carcase pieces

Cut the pieces for the carcase to their final dimensions. Each side of the cupboard has a long piece running the full height of the cupboard and a shorter piece that completes the bottom portion. When glued together they create the step-back profile. These short joints are a nice place to practice jointing with a plane. Clamp the two boards face to face and plane them at the same time. This ensures they mate well. Unless you have stock wide enough to be used for the door panel as well as the work surface, you also will need to joint and glue up these pieces.

Dadoes in the sides hold the bottom board and the work surface. The dadoes can be completed fairly easily with machine tools, but I chose to use a dado plane. For a couple of dadoes, this tool is just as fast and a lot more fun than a tablesaw or router. Dado planes are not hard to find and can be purchased from used hand-tool dealers. They feature two nickers (cutters) that scribe the wood and help the tool cut across the grain. To ensure that the dadoes line up perfectly, butt together the two side boards and pass the dado plane across both boards. It will take several passes to cut the upper and lower dadoes to their depth.

Cut rabbets along the back edge of the carcase to accept the back boards. This step would be faster if done with machine tools, but I did the job with a rabbet plane, which is adjustable for width and depth.

Next, lay out and cut the dovetails that join the top board to the side panels. I chose to use half-blind dovetails. They require a bit

***Assemble the carcase.*** *The first step is to glue and clamp the case bottom to the cupboard sides.*

***Join the dovetails with gentle force.*** *With the bottom securely in place, apply glue to the dovetails and tap the top board into place.*

***Clamping the top to the sides.*** *Clamp blocks, positioned with wooden hand screws, provide gripping surfaces for the clamps to pull the dovetail joint tight.*

more work, but they make the project more interesting. Finally, trace the foot pattern on the bottom of both side boards using a template and cut out the feet with a coping saw. You might find it easiest to cut the curved portion with your coping saw and then use a panel saw to finish off the straight cut. The rough spots can be cleaned up with a spokeshave or rasp.

The carcase is assembled by first gluing and nailing the case bottom into the cupboard sides. Next, assemble the top to the cupboard sides. Clamp the dovetails while the glue sets.

When nails are exposed, as is the case with this project, I prefer to use cut nails. Their long, narrow heads are less obvious than the round heads of drawn finish nails. The right nails for this work are 6d fine finish cut nails.

After the carcase has been glued up, tack a cross brace across the back to keep it square while you work on it for the remaining steps.

## Mold and attach the face frames

The upper face frame is made up of three pieces. I laid out the mortise-and-tenon joints with a marking gauge and cut the tenons with a backsaw, and the mortises with a mortise chisel. When done, test-fit the face frame to the carcase. If necessary, plane the outside edges flush.

**Edge the upper face frame—**The inside edges of the frame are chamfered, which can be done with a chamfering plane if you have one. The chamfers on this frame are so narrow that you can lay them out with a marking gauge and cut them with a block plane. The chamfers on the stiles are stopped, and the plane will not reach into the corners, so complete the chamfers at the

***Slide the work surface into the dadoes.*** *The cupboard work surface should fit tightly in the dadoes cut into the cupboard sides. It is secured in place with glue and nails. The dadoes are hidden by the front of the work surface.*

## ADD THE FACE FRAMES AND CORNICE

***The upper face frame gets a chamfer on its inside edge.*** *Scribe the width with a marking gauge and use a block plane to bevel the inside edge of the top rail.*

***The upper face-frame stiles require a stopped chamfer.*** *Dry-fit the frame and mark the end of the chamfer (left), then plane the chamfer to within an inch or two of the stop mark. A drawknife will give you a smooth edge (center) as you cut away the remainder of the chamfer. Dry-fit again and finish the corner with a chisel (right).*

corners with a drawknife. A drawknife typically is used for coarse work, but with a steady hand, the tool can take fine shavings. Use a sharp chisel to complete the mitered corners where the chamfers meet.

Cut the ovolo profile on the outside of the stiles. This is an important detail. Although small, this profile softens the cupboard's vertical corners while giving them definition. Used above and below, the ovolo also ties together the open top and closed bottom.

Because I had to nail through the molding profile to attach the stiles to the carcase, I used 4d headless cut brads (1½ in.), which are less visible than the larger 6d cut nails.

### Thumbnail edge completes the work surface

The work surface separates the open top section of the cupboard from the lower, enclosed portion. Before cutting and fitting the work surface into the cupboard, add a thumbnail profile to its exposed edges. The thumbnail profile was common on 18th-century furniture. I made mine with a molding plane. Cut the molding on the end grain first. A waste strip on the far corner keeps the wood from chipping out on the exposed front corners. Now cut the thumbnail on the front, in the direction of the grain.

**Attach the lower face-frame stiles—**The lower face frame has only two stiles and no rails. Like the stiles on the upper face frame, the outside edges of the lower stiles are molded with an ovolo profile. Before securing the stiles to the carcase, cut out the feet to the same pattern as the sides. To protect the molding, I again used headless brads, but I used 6d nails to secure the stiles to the

***Attach the face frame.*** *Once the upper face frame has been assembled, glue and nail it onto the cupboard.*

bottom board. A nail through the work surface also strengthens the stile-to-case connection. I don't use any glue.

### Locate and cut the shelf cleats

The placement of the shelves is determined by what you plan to put in each section of the cupboard. The shelves are held in place within the cupboard by cleats.

Because some of the cleats in the open portion of the cupboard are visible, they are decorated with the same ovolo profile as the face-frame stiles. The easiest way to make these cleats is to cut the molding on the edge of a board. Rip off a strip to the width given in the drawing, and then cut the cleats to length. If you do not have stock long enough for all 10 cleats, run multiple strips.

Cut the cleats to length and nail them into the cupboard's upper and lower sections. Because the carcase sides are only ¾ in. thick and don't provide a lot of material for nailing, I also added a spot of glue in the middle of each cleat. The cleats run across the sides, but the nails are forgiving enough to accommodate seasonal movement. Also, gluing only in the center allows movement. The shelves are not secured to the cleats; gravity holds them in place.

**Make an edge on the shelves**—The molding profile on the front edges of the shelves is called an astragal and was a common 18th-century treatment for shelves. Its similarity to the ovolos on the carcase and the thumbnail on the work surface help tie together the piece's design.

You also can cut a groove in each shelf with a shoulder plane to prop up plates for display. Clamp a straightedge to the shelf and use this as a fence to guide the shoulder plane. Holding the plane at an angle will cut the V-shaped groove.

### Complete the carcase with a cornice

Because this cupboard is so narrow and tall, it needs to be balanced with a large cornice. As long as you design the cornice to the prescribed dimensions, it does not matter what profile you use. I own a nice profile called a stepped reverse ogee (cyma recta), but by itself it is not quite large enough for the piece. Therefore, I made a larger cornice by stacking two layers. The first layer has a small ogee (cyma reversa) that projects below the larger, resulting in a cornice with the necessary scale.

### Nail on the tongue-and-groove back boards

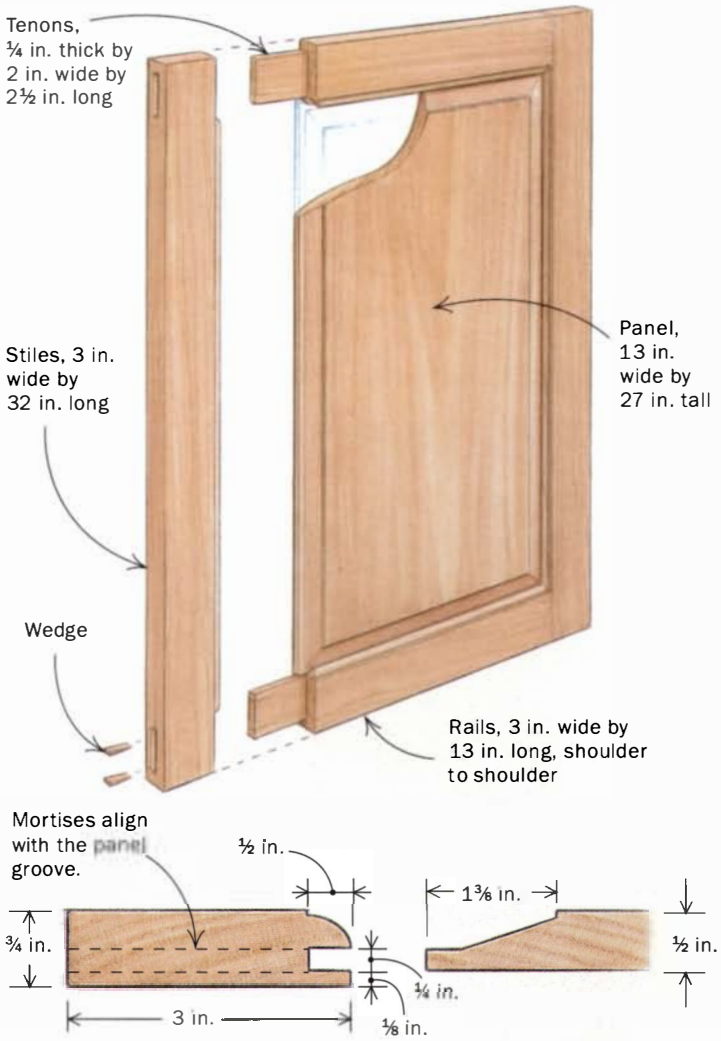
In 18th-century furniture, it was common to see back boards of random widths. Cabinetmakers typically used the widest boards

***Secure the lower stiles to the case.*** *Use 4d headless cut brads through the molding into the sides and 6d cut nails into the bottom.*

***Add a cornice to the top.*** *The cornice, shaped with a molding plane, is built up from two layers to achieve its pronounced profile.*

## HAND-CUT FRAME-AND-PANEL DOOR

**Raise the door panel with a molding plane. Wedges, not glue, secure the tenons in the mortises.**




on hand and the fewest needed to fill the space. To achieve this feel I used two wider boards on the sides and a narrow one in the middle. For these I used ½-in.-thick pine.

To avoid gaps in the back boards caused by seasonal movement, I cut tongues and grooves into their edges. I have a pair of planes that make this joint, called match planes. Like most hand tools, they are quick and easy for a small job like this.

The back boards are nailed into the rabbets in the cupboard sides. They also are nailed into the top and bottom boards and the work surface. Once again, pay attention to seasonal movement. In the winter, fit the back boards loosely. In the summer, you should snug them up, as they will shrink in the winter.

### Make the door parts by hand

The door is the most complicated piece of joinery in the cupboard. Using a plow plane, the first task is to cut a groove in the inside edge of each door stile. Next, cut a molding on the outer edge with the same plane used to make the thumbnail on the work surface. It is easiest to cut these profiles on long stock and then crosscut the stiles and rails from these strips.

Make the stiles slightly longer than the finished door. That way, you have extra length to help prevent the stiles from splitting when you're chopping the mortises. This extra length, known as a horn, can be trimmed after the door has been assembled.

Before cutting the mortise-and-tenons, identify all of the surfaces on the stiles and rails that will be facing out. The mortises are slightly offset and do not pass through the center of the stile's thickness. This will require laying out the mortises with the identical placement on both edges. And be sure to place the fence of the mortise gauge on the same surface of the stiles and rails. By always marking pieces with identifiers you will be able to cut consistently. The mortises are cut through, which means you can see the ends of the tenons in the edges of the stiles.

To avoid blowing out the back side of the stile when making the mortises, cut from both sides and then meet in the middle.

## MITER THE THUMBNAIL MOLDING

***Miter the inside corners of the door frame.*** *Saw and chisel away the waste. Cut the stiles slightly longer than the finished door to add strength to the board when chopping the mortises. The extra length, known as a horn, can be trimmed away once the door is assembled.*

***A jig for perfect miters.*** *When cutting the miters on the door stiles and rails, use a jig with a 45° slope to guide your chisel.*

You will have to trim away the thumbnail to join the mortise and tenons.

**Raise the door panel—**I have a very nice panel-raising plane that I enjoy using, so I made the panel by hand. When making only one panel, the plane is about as fast as the tablesaw or router, which also will make this cut. Measure the panel's length and width from the bottom of the grooves in the stiles and rails. If you live in an area of the country with cold winters and humid summers, you will want to accommodate the panel's seasonal shrinkage and expansion across its grain by adjusting the width accordingly. If you are making the cupboard in the summer, you should create a snug fit. If you're making it in winter, fit the panel loosely, as it will swell in the humid summer.

After testing the panel's fit, complete the door assembly. In the 18th century, doors usually were not glued, and over the centuries these doors have not sagged, so I followed suit and did not use any glue. Two wedges are driven into the ends of each tenon to tighten it in its mortise. You can strengthen the joint further by pinning the tenons.

After trimming the horns, plane the door's stiles to fit the opening. Your door's fit also will depend on the season. If you make a snug door in the winter, it will bind in the summer.

## SOURCES OF SUPPLY

**MOLDING PLANES**
Tod Herrli, 765-664-3325

**HARDWARE**
Horton Brasses, 800-754-9127
Ball and Ball, 800-257-3711

**CUT NAILS**
Tremont Nail, 800-842-0560

## Finish with fine hardware and milk paint

The original cupboard's door was mounted with wrought-iron hinges and held shut with a wooden turn button. I spruced up mine with cast brass ornamental H-hinges and a matching catch. These items cost about $80, but after all the work I put into the piece and the cost of the lumber, it seems only fitting.

Once the piece was complete, I finished it with milk paint (for more on milk-paint application, see *FWW* #136, pp. 64-67). To match the color scheme of our home, I finished the outside surfaces of the cupboard with barn red. For the exposed inside walls and back boards, I used mustard. □

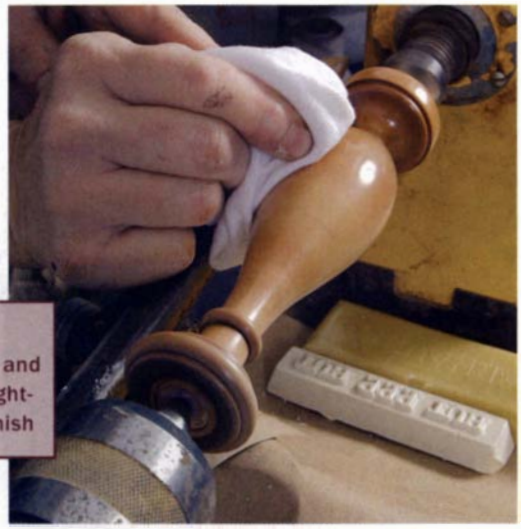
*Mike Dunbar is a contributing editor. This article is the fourth in a series of hand-tool-oriented projects (see FWW #134, #142, and #151).*

***Assemble the door and wedge the tenons.*** *Drive wedges into the tenons to secure them tightly in the offset mortises. Typical 18th-century tenoned doors were left unglued. Pinning the tenons will add even more strength.*

# Four Finishes for Turnings

## When to use wax, shellac, lacquer, and oil

BY TERI MASASCHI


Wood that is spinning on a lathe allows the finisher to apply various finishes rapidly and flawlessly. While most of the finishing materials used on turnings are familiar to wood finishers, the method of application is different. Sanding is far less of a chore, grain filling is quicker and less messy, and the friction caused by the applicator (usually a pad or cloth) dries the clear coating instantly. The problems of sags, dust, or other imperfections are simply nonexistent. In short, finishing turned work provides almost instant gratification.

### Which finish works best?

While the brand names are many, the actual categories of finishes used on turnings are few. The intended use of the turning is the key to choosing a finish: If it is a decorative object subject to occasional handling, such as a candlestick, shellac or wax would be fine. If it is a chair part subject to moderate wear, shellac or an oil finish are possibilities, while an item such as a kitchen-table pedestal needs a durable lacquer finish to resist shoe scuffs. Finally, salad bowls and other woodenware need food-safe materials applied to them, such as mineral oil, 100% tung oil, and some types of linseed oil (check with the manufacturer to make sure there are no added driers, which are toxic).

Some materials are initially applied with the wood standing still. Then, with the piece spinning in the lathe and a cloth held firmly against it, the surface is polished. Other materials are applied directly to the moving wood. They dry rapidly because of the friction and produce an instant gloss.

*Teri Masaschi is a professional finisher who lives near Albuquerque, N.M.*

**Watch it on the Web**
To see a video on finishing turned work, go to www.finewoodworking.com.

Photos: Mark Schofield

## Before finishing, it's important to sand, fill, and stain

If your work has been properly turned, you should only have to start with 180-grit paper—usually much higher. I use standard aluminum-oxide sheets of sandpaper, but sanding sponges are a flexible alternative (right).

***Sanding sponges protect fingers from friction heat.*** *They're also flexible, which allows them to enter coves without dulling crisp shoulders.*

For most liquid finishes you can stop sanding at 400 grit because most of them involve some scuff-sanding during the application. But a wax finish requires a perfectly smooth surface. So, at 500 grit, swap over to Abralon pads, progressing through 1,000, 2,000, and 4,000 grits. Then switch to sheets of Micro-Mesh abrasive, moving from 6,000 grit to 8,000 grit to 12,000 grit.

Most turning exposes a lot of the end grain, which absorbs stain and finish differently than face grain, so you may need to deal with this problem before applying a final finish (see *FWW* #156, pp. 113-114). Sanding up to 12,000 grit is one option to close up the pores and achieve an even finish penetration.

Instead, after a light sanding with 400 grit, you can use a grain filler. If you prefer a more open-grain look, glue size works well. Both grain filler and glue size can be applied while the workpiece is spinning in the lathe. The filler is forced into the grain quickly and smoothly with a rag, and the friction simultaneously removes the excess. The glue size is applied the same way. Both the filler and the glue size are dry to the touch in four to six hours. Once it's dry, you can jump right ahead to 4,000 grit to smooth and dewhisker the surface.

If you are going to color the workpiece, use an alcohol-based dye stain to achieve maximum transparency (water-based dyes gum up the glue size and some grain fillers). Or you can apply an oil-based pigment stain if you are more comfortable with this product. Application of either the dye or the stain is easier and will be more even if the wood is moving. Using a cloth, apply multiple thin coats until you reach the desired color.

### SOURCES OF SUPPLY

**FINISHES USED ON TURNINGS**

Woodcraft (800-225-1153; www.woodcraft.com)

Penn State Industries (800-377-7297; www.pennstateind.com)

**ABRALON PADS AND MICRO-MESH SHEETS**

Woodworker's Supply (800-645-9292; www.woodworker.com)

Micro-Surface Finishing Products (800-225-3006; www.micro-surface.com)

***Grain filler can be colored.*** *Use a cloth to apply the filler to the spinning wood (above), forcing it into the grain and removing any surplus. Smooth the surfaces with a 4,000-grit Abralon pad (left) before moving to the next finishing step.*

***A moving stain.*** *An alcohol-based dye or a pigmented oil stain is applied to the spinning workpiece in thin coats with a clean cloth.*

WAX

***Solid wax.*** *After holding the solid bar of wax against the moving section of a candlestick, burnish the surface with a clean cloth pushed hard against the wood.*

***Liquid wax.*** *Apply the shellac/wax cream while turning the work by hand. Once all of the wood has been coated, turn on the lathe and buff the surface to a high gloss.*

## A WAX FINISH REQUIRES CAREFUL PREPARATION

**Wax finishes are available in solid or liquid form. The traditional method of applying wax to turnings has been to use solid bars of carnauba wax or blends made by Hut. Press the bars against the spinning wood to apply a thin but uniform coating, then burnish the surface with a tightly held cloth. Turn over the cloth frequently to expose a clean surface to the wood. Burnishing leaves a thin but smooth surface that brings out the flawless beauty of the wood.**

**New alternatives to solid wax are the liquid shellac and wax mixtures such as Hut's Crystal Coat or Shellawax cream by U Beaut Polishes. These generally are applied to the workpiece while it is stationary in the lathe and then burnished with a clean cloth while the workpiece spins. As with solid wax, the gloss appears almost instantly, leaving a smooth surface.**

SHELLAC

## SHELLAC IS A GOOD ALL-PURPOSE FINISH

**Applying shellac to a turning is rather like French polishing in that multiple thin layers are applied over a short time. Instead of a special rubber (pad), a simple piece of cotton cloth is used as the combination applicator and burnisher. Because the shellac is applied in such thin layers, you can afford to use a heavy 3-lb. cut. Avoid using shellac on items subject to constant handling, such as pens and walking sticks, because the acid in human hands can eat into shellac.**


***A moving finish.*** *Apply the shellac by moving the cloth up and down the turning wood. The shellac dries instantly, allowing several coats to be applied in quick succession.*

## LACQUER


***Seal the surface.*** *Applying a cellulose sealer while the workpiece is stationary helps smooth the end grain.*


***Instant shine.*** *After sealing the workpiece, apply lacquer to the moving wood to give an instant high-gloss look.*

### LACQUER IS DURABLE AND QUICK TO APPLY

**Lacquer finishes, which include Behlen's Woodturner's Finish, Qualasole, and French Lac, all are applied with a lint-free cloth held gently against the workpiece while the lathe is running. There is no need to flood the wood because these film finishes are not meant to penetrate the wood.**

**For slightly open-grained wood or areas of exposed end grain, apply a coat of Myland's cellulose sanding sealer while the workpiece is stationary. After the sealer has dried, apply Myland's high-build friction polish using a lint-free cloth while the workpiece is turning. When building a finish, occasionally stop the lathe to check whether the surface has any nibs. You can remove the nibs with a 4,000-grit Abralon pad.**

## OIL

### OIL ACCENTUATES THE FIGURE IN WOOD

**Oil finishes, including Danish oil and Waterlox's Original Sealer, are applied to the moving workpiece with a saturated cloth. Once the wood has been coated, hold a 400-grit sanding sponge against the spinning work, which pushes the oil into the wood, creates a slurry that fills voids, and leaves the surface slippery smooth.**

**Oil also Is a good choice for turnings or parts of turnings that can't be finished while the lathe is moving, including offset turnings, spiral turnings, and legs that have square shoulders. The oil can be applied and then sanded by hand with no obvious distinctions from the power-sanded areas.**

**Most food-safe finishes are oil based and require heavy penetration into the wood to be effective. For this reason, it is less messy to apply the oil liberally while the woodenware is off the lathe and allow the oil to soak in. If necessary, the piece can be remounted and the oil sanded in with 400-grit sandpaper or a sanding sponge. Food-safe finishes include tung oil, Waterlox Original Finish, mineral oil, and linseed oil that doesn't include metallic driers such as Tried and True oils.**

***Wipe on the oil.*** *With the lathe off, apply the oil with a cloth, turning the workpiece by hand.*

***A penetrating finish.*** *After oiling the wood, turn on the lathe and wet-sand the surface with a 400-grit sponge. This pushes the oil and sawdust slurry into the voids, smoothing the surface and enhancing the figure.*

***Spare the oil and spoil the bowl.*** *Don't be afraid to flood the wood with a food-safe oil and let it soak in. Only in this way will the bowl survive future exposure to foods and dishwater.*

# Biscuit Basics


## This versatile and speedy system handles all the joints in plywood casework

BY TONY O'MALLEY

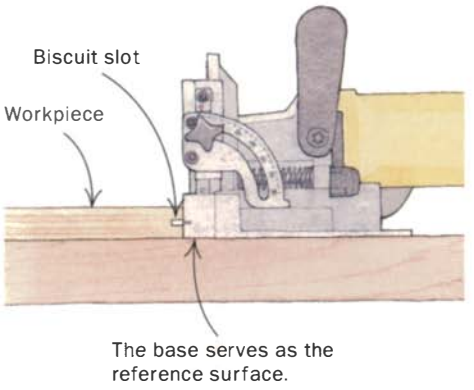
When I started my first job in woodworking in 1984, the biscuit joiner, also called a plate joiner, was just arriving on the shop scene. The company where I learned the trade still was using rabbet and dado joints to assemble plywood case goods. It's a tried-and-true system but one we abandoned forever after discovering the manifold benefits of biscuit joinery.

First, by using biscuit joints instead of rabbets and dadoes, every joint is a butt joint, which makes calculating dimensions from a measured drawing much less painful and error-prone—no more adding and subtracting to account for dadoes and rabbets. Second, biscuit joinery allows you to move a stack of freshly cut parts directly from the tablesaw to the workbench, where all of the joinery work can be done (maybe not a big deal in a one-person shop, but a definite advantage in a shop where coworkers are waiting to use the saw). Third, there's no need for dado blades and the finicky process of getting the fit just right. Fourth, biscuit joinery eliminates the frustrating task of sliding large workpieces across the saw to cut joinery. Sure, you can avoid

## ALIGNING BISCUIT SLOTS

### THE BASE IS A CONSTANT REFERENCE

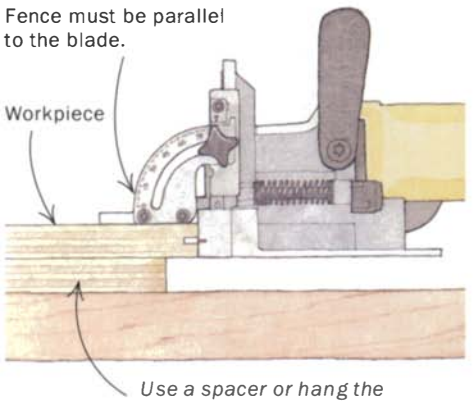
**Try to rely on the base of the machine as the reference surface. This generally is a better approach because the distance between the blade and the base does not change, whereas the fence is movable.**




***The standard position is shown at left.*** *To cut the mating slots, the workpieces or the tool (above, with the help of a jig) must be positioned vertically.*

### THE FENCE OFFERS FLEXIBILITY

**Make sure your fence is reliable, and be sure the base isn't getting hung up on the benchtop or another workpiece below.**




***Fence adds convenience.*** *If the fence is used for both cuts (left and above), the workpieces can remain flat without the need for jigs.*

these last two problems by cutting rabbets and dadoes with a router and T-square guide, but biscuiting is much faster. Fifth, assembling a case with rabbets and dadoes, no matter how finely fit, always requires some extra effort to get the case clamped up squarely—the joints just seem to lean a little bit on their own. A biscuit-joined case, in contrast, almost always clamps up squarely right from the get-go (assuming your crosscuts are square, of course).

But the biscuit joiner's usefulness goes far beyond joining carcases. From strengthening miters to joining panels, from assembling face frames to attaching them to cabinets, this versatile tool can be a major player in your shop's lineup. As a colleague recently observed, the biscuit joiner may be the most significant tool development for the small-shop woodworker since the invention of the router.

I should point out that dovetails and mortise-and-tenon joinery remain the best approaches for solid-wood furniture construction. But the biscuit joiner can handle all of the joints in a basic plywood cabinet—from the case to the shelves or dividers to the face frame, the base molding, and even a drawer—with the exception of the door, which requires traditional joinery for additional strength.

**Watch it on the Web**
**For video tips on using a biscuit joiner, go to www.finewoodworking.com.**

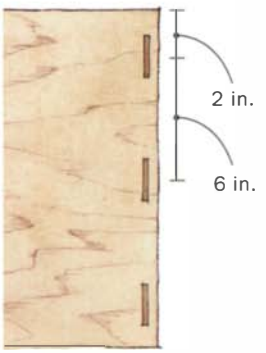
### What to look for in a biscuit joiner

Most of the time, the base of the machine can be used as the reference surface for making a cut. In most machines this positions the slot in the center of ¾-in.-thick

Photos: Asa Christiana

# LAYING OUT BISCUIT SLOTS

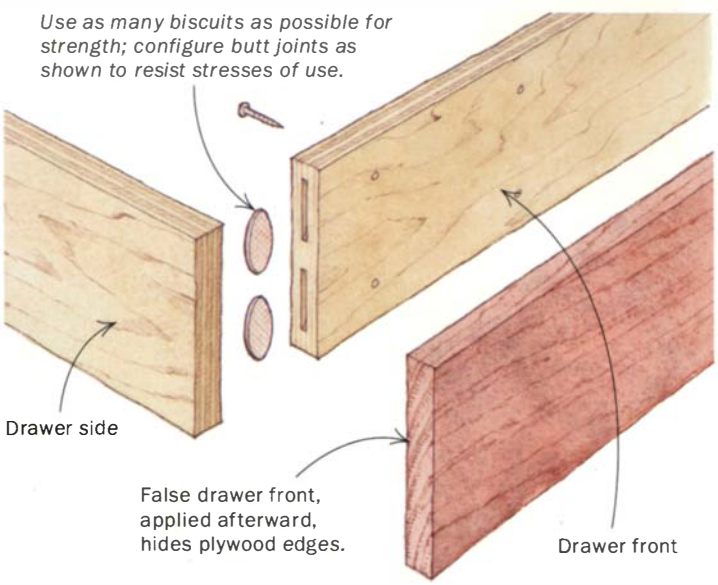
## HOW MANY BISCUITS?



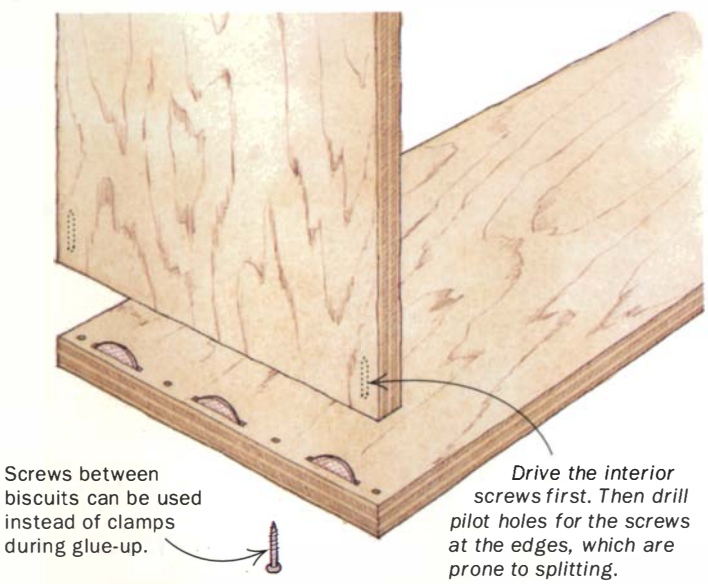

A good rule of thumb for carcase construction is to use at least one biscuit for every 6 in. of width. Locate them close to the front and back edges to keep the corners aligned, unless screws are used for assembly.

***Layout tricks.*** *For this carcase, only the center of three biscuits must be marked. To locate the outside biscuits, line up the edge of the tool with the edge of the stock. Mark the pieces as a group, first on their ends (left), carrying the marks onto the faces where necessary (right).*

## DRAWER-BOX CONSTRUCTION




## CARCASE CONSTRUCTION




## Two ways to locate dividers and shelves

***Cut slots for a single shelf or divider all at once.*** *After laying out all of the pieces and cutting slots in the divider or shelf, clamp the case parts together and use a long straightedge as a fence for the tool.*

***A jig to locate multiple fixed shelves.*** *For a symmetrical series of shelves, use a piece of sheet stock that reaches to the center shelf. A small cleat at the end locates the jig accurately each time (right).*



Drawings: Jim Richey

stock. However, a fence mounted onto the face of the tool provides more versatility in positioning the slot. So it is very important that the machine cut a slot parallel to both its base and its fence; otherwise, joints won't line up properly. (For a review of biscuit joiners, see *FWW* #151, pp. 58-63.)

Not all machines are created equal, and it's worth the time and effort to check that a new machine is accurate, and return it if it's not.

### Joining cases and boxes

When joining parts to form a case or drawer box, the first step is to mark the slot locations on all of the parts. Often, this can be done simply by aligning the two pieces as desired and then drawing a small tick mark across the mating edges. However, for casework, where there are several of the same type of piece—sides and shelves, for example—it helps to develop a system (see the drawings and photos on the facing page).

**How many biscuits and where?**—Biscuit joints in case goods supplant conventional joints like the dado, the rabbet, and the splined miter. These are long joints, and it seems logical to cram in as many biscuits as possible, but it's not necessary. Biscuits are manufactured by compressing the wood slightly so that upon gluing there will be a predictable amount of swelling. This swelling makes the joint at every biscuit stronger than a conventional wood-to-wood bond. My loose rule of thumb for case material is to use one biscuit for every 6 in. of width.

This is fully adequate, especially when using screws instead of clamps to pull together the cabinet during glue-up. When I can't use screws to clamp and reinforce the joint—when the sides will be exposed—I don't use more biscuits; instead, I position the end biscuits as close to the edge as I can.

**Whenever possible, use the base of the tool as a reference**—To cut biscuit slots along the edge of a workpiece, you have two choices: You can use the machine's fence or the machine's base to position the slots. Whichever you choose for any given joint, you need to use the same reference for both sides of the joint. Remember, too, that the reference surfaces

## JOINING MITERS


**STANDING MITERS**

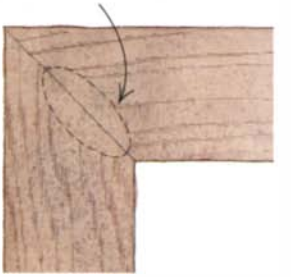
**To use the trusty base as a reference, clamp two pieces with their inside faces together, aligning them carefully. Then the biscuit joiner can rest in the 90° notch to cut slots in both miters.**

Biscuits are sized and located to avoid breaking through the outside faces.

**FLAT MITERS**

**Clamp down workpieces for safe and accurate results. Be sure to keep the tool pressed firmly in place throughout the stroke.**

Locating biscuits closer to the inside of the miter allows the outside edges to be profiled or molded.



**GLUING MITER JOINTS**

***End grain can drink up glue, starving the joint. Prevent this by brushing a thinned wash of glue on the joint and letting it glaze over before applying glue at regular thickness. Don't forget to put glue on the biscuits as well.***

**BISCUITS KEEP PIECES FLUSH**

***Narrow frame pieces require smaller, non-standard biscuits.*** *The Porter-Cable 55K Plate Joiner includes a smaller blade for joining pieces as narrow as 1½ in.*

***Determine where the biscuit will begin and end.*** *Allow extra room at edges that might be molded later, which could expose the biscuit. Mark the center of the slot, and then transfer the mark to the mating piece.*

on the workpieces should be the outside face and edge because they must end up perfectly aligned.

For most biscuiting tasks, you can rely almost solely on the base of the machine as the reference surface. Even on inexpensive biscuit joiners, the base usually is parallel to the blade. However, some fences are less reliable than others in terms of being perfectly aligned with the blade and staying locked in position. It's also easy to rock most biscuit joiners out of alignment when using the fence on the edge of a ¾-in.-thick panel; cutting those same slots with the base of the machine flat on a bench is a more stable and reliable approach.

When using the base as a reference, a biscuit joiner automatically places the center of the slot ⅜ in. from the bottom edge of the stock. To change that dimension, use thin stock such as hardboard to shim the machine or the workpiece to the proper position.

When joining box sides, cutting slots in the ends of panels is simple using the base, but cutting the opposite side of the joint—into the face of the panel—requires either holding the part on end or laying the part flat and orienting the machine vertically. For tall pieces the latter option is easier; so make a simple L-shaped guide to keep the machine perpendicular to the workpiece (see the top right photo on p. 67).

## Building and attaching a face frame

Biscuits can be used both for joining face frames and for locating a face frame on a cabinet. When assembling a face frame, use the largest biscuit that the stock will accommodate. In most situations, you don't want part of a cutoff biscuit showing at the corner of the frame. So narrow face-frame stock may require using the small biscuits designed for face frames (they require a smaller cutter). On wider stock, one of the standard three sizes should work fine.

**Just a few biscuits to locate a face frame—**When attaching face frames to cases, I generally rely on the long glue joint for strength, using a few biscuits to keep the frame from sliding around during the glue-up. A complete row of biscuits up and down every side would be overkill and would make it harder to fit the face frame to the case.

First, cut the slots in the case sides. This can be done before or after the case is assembled. Then glue up the face frame and lay it on the case to check the fit around the edges. Sometimes I build the frame to create a ⅛-in. to ¼-in. overlap on the outside of the case, which is fairly typical of kitchen-cabinet construction. Other designs require that the face frame be flush on the outside. Still other times I allow a very large overlap for scribing a built-in cabinet to a wall. If there is overlap, use plywood or medium-density fiberboard (MDF) shims to raise the base of the biscuit joiner the appropriate amount when cutting the slots in the face frame.

## Mitered joints

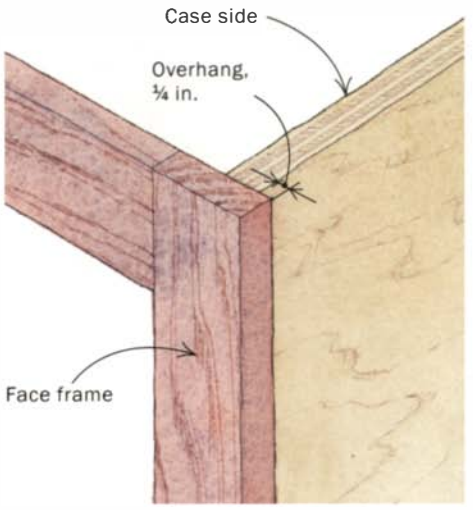
Miters provide clean-looking joinery in numerous situations. However, having an equal combination of end grain and long grain, miters need more than glue to hold them together for the long run. Biscuits are the perfect way to reinforce them.

There are two different types of biscuited miters, and plywood cabinets use both of them. Face frames often feature flat miters for a picture-frame effect. And base moldings usually have standing miters at their corners. Of course, both types of miters are used elsewhere in woodworking—in boxes, frames, and other moldings—and biscuits can be used for these, too.

**Biscuiting flat miters—**Once the stock has been mitered, determine which size biscuit will fit best. Be sure to factor in any shaping that may be in store for the assembled frame (rounding over or rabbeting,

**BISCUITS ALIGN THE FRAME AND CASE**

**For an overlapping face frame, offset the biscuits. The stiles on this shop cabinet will overhang the sides by ¼ in., which must be factored in when locating the biscuit slots.**




for instance). Usually, it's necessary that the biscuit be concealed in the stock. Remember that even a #0 biscuit is better than no reinforcement at all.

**Biscuiting standing miters—**The outside corner on a base-molding assembly is a typical situation for a standing miter reinforced with biscuits. I also use biscuits to reinforce mitered case corners, instead of the more conventional continuous spline. With base moldings, the bottom edge of the stock won't show, so you can use a larger biscuit and let it extend out the bottom. A bigger biscuit gives you a deeper and stronger joint, and the excess is easily trimmed with a flush-cutting saw or utility knife.

The main layout principle is to position the biscuit slots off center, closer to the inside of the miter; otherwise, you risk cutting through the face of the stock.

The best technique for biscuiting standing miters depends on the size of the stock and the configuration of the fence on your machine. Some fences offer a fixed 45° position, while others are adjustable. Some fences have a solid face, while others are an open frame. And the thicker and wider the stock, the more bearing surface you have for the fence to register on. □

*Tony O'Malley is a cabinetmaker in Emmaus, Pa.*

***Use the tool's base as the reference.*** *Cut the slots in the case as usual, but place a ¼-in.-thick shim under the tool when slotting the face-frame stiles.*

***Only a few biscuits are necessary.*** *These serve primarily to keep the frame and case aligned during glue-up. Use plenty of clamps to distribute pressure. The glue-up will go more easily if the piece is on its back with room all around for clamps.*

# Updating an Antique

## How an Arts & Crafts hall stand was redesigned for the 21st century without compromising its character

**BY NANCY R. HILLER**

Several years ago, I came across a photo of an Arts and Crafts hall stand in a book on English interiors. I was struck by the bold bevels of the crown and the interplay of vertical and horizontal elements throughout the piece.

Recently, while looking through a lumber broker's inventory, I ran across a stack of curly white oak. The figure, rippled like a pre-Raphaelite beauty's hair, immediately brought to mind the Arts and Crafts aesthetic of the era during which the original hall stand had been built. It was perfect for this early 20th-century piece.

The hall stand that inspired this piece featured umbrella stands flanking the central storage area. As delightfully English as that may have been, in the 21st-century

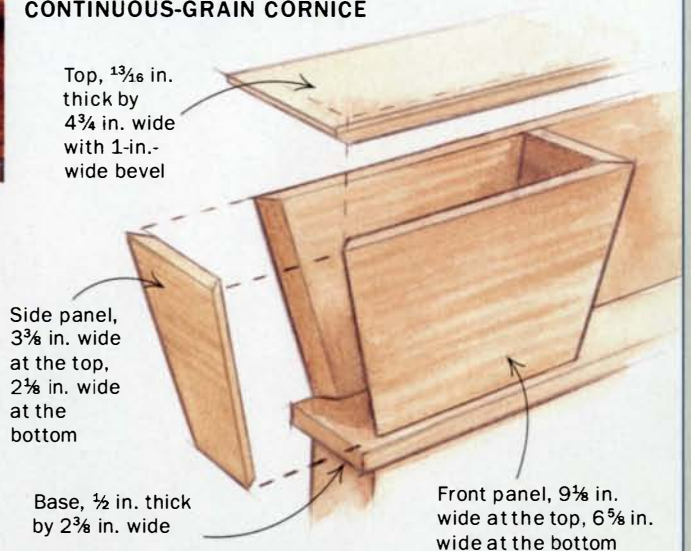
***Capped for practicality.*** *Storage compartments capped with Indiana limestone replace umbrella stands that appeared on the original.*

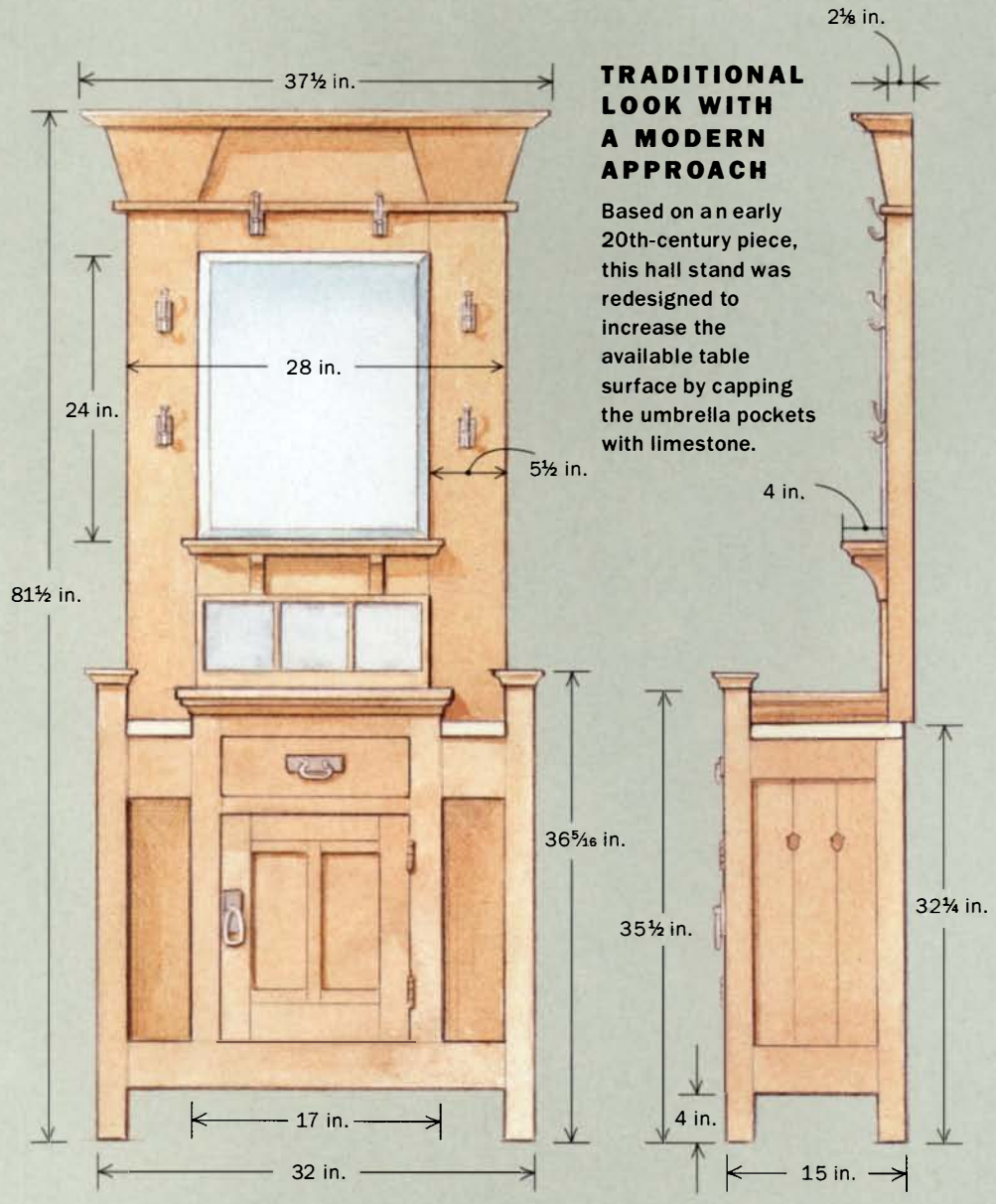


Photos: Spectrum Studio Inc.

**Mitered corners allow thin stock to be used in making heavier-looking pieces. With this technique, the grain pattern is carried around all sides of the cornice.**

**CONTINUOUS-GRAIN CORNICE**




## TRADITIONAL LOOK WITH A MODERN APPROACH

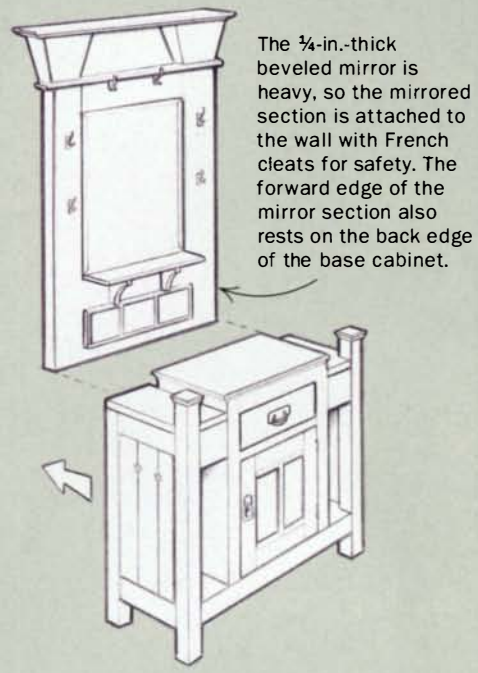
**Based on an early 20th-century piece, this hall stand was redesigned to increase the available table surface by capping the umbrella pockets with limestone.**

United States, relatively few people outside of urban areas use umbrellas. Still, I wanted to preserve the play between the different levels of the base that were integral to the piece's character.

I decided to enclose the umbrella-stand compartments and top them with a durable surface on which a person running out the door could place a cup of coffee while donning a hat or adjusting a scarf. For this surface I chose Indiana limestone because it's locally produced, affordable, and easily worked. To maintain the Edwardian character of the stand, I drew slatted side panels, incorporating a decorative cutout in period style. The side compartments can be used for storage or display, but at only 5½ in. wide, these areas are limited in their usefulness. I had considered enlarging the cabinet to make these areas more practical but abandoned the idea because it would have detracted from the hall stand's lovely proportions.

I designed my hall stand so that the mirror section fits against a wall, with the cabinet portion stepped forward slightly to accommodate a baseboard and shoe molding. The wooden top and side trim of the base cabinet end at the face of the mirror frame's bottom rail. It's a good idea to have a particular location in mind and to measure architectural moldings located there before finalizing this design detail.□

*Nancy R. Hiller operates NR Hiller Design in Bloomington, Ind.*



The ¼-in.-thick beveled mirror is heavy, so the mirrored section is attached to the wall with French cleats for safety. The forward edge of the mirror section also rests on the back edge of the base cabinet.

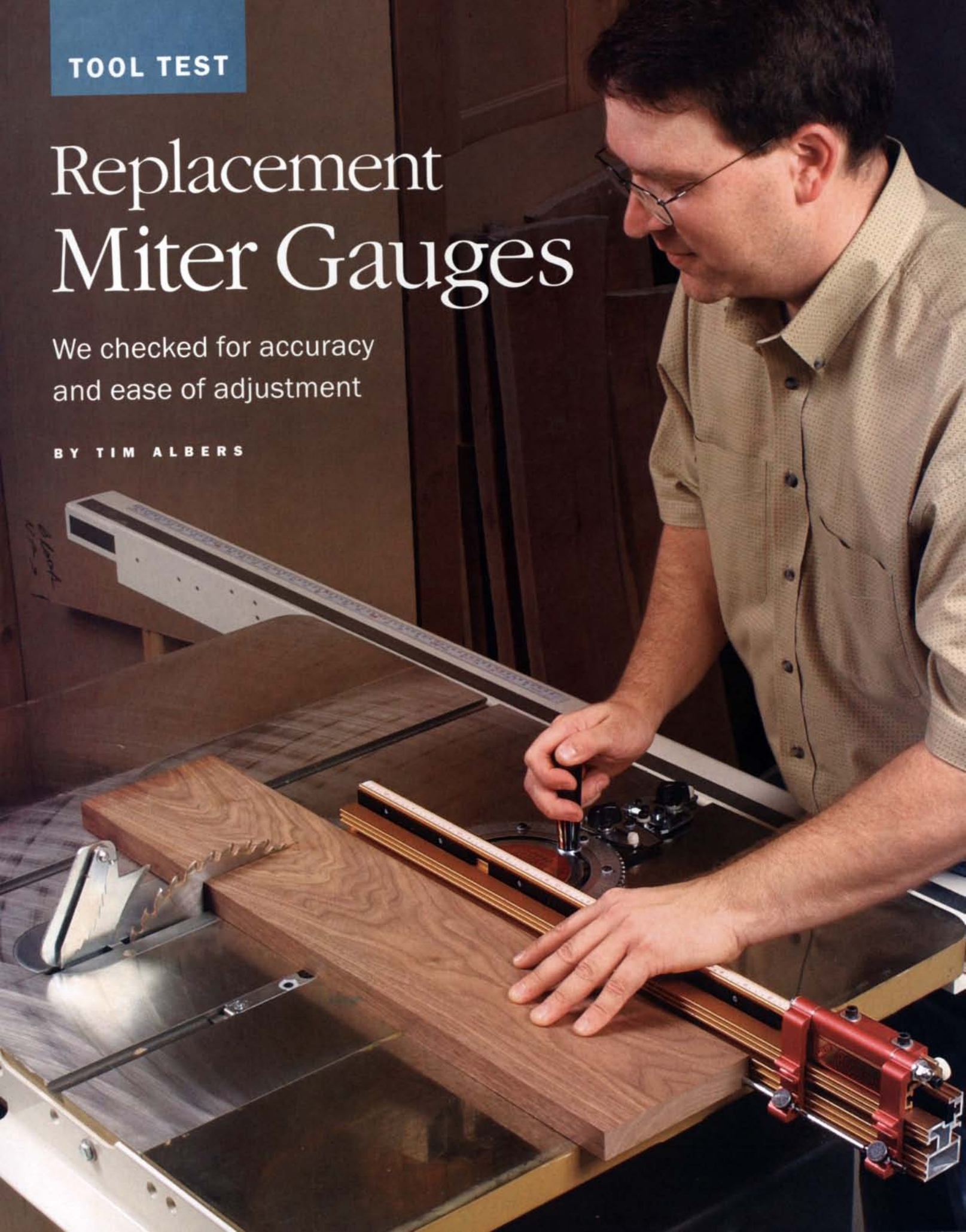
Drawings: Bob La Pointe

TOOL TEST

# Replacement Miter Gauges

We checked for accuracy and ease of adjustment

BY TIM ALBERS



Look in just about any woodworking catalog these days, and you're sure to see two or three replacement miter gauges. But why should you consider spending upwards of $150 when your tablesaw came with a miter gauge? The reason is that most replacement miter gauges are precision woodworking jigs—usually a vast improvement over the crude miter gauges supplied as standard equipment. While features and quality vary on replacement miter gauges, they all provide improved accuracy when crosscutting. All have positive stops at 90° and other common angles and some means for adjusting the fit of the sliding bar to the miter slot. Almost all offer a long fence, and most fences have a stop system.

Miter gauges won't solve all of your crosscutting needs. For wide boards, you'll still need a crosscut sled. Boards that are roughly 12 in. or wider will force the miter gauge off the front of the table, and long, heavy boards will drag on the saw table, pivoting and pulling away from the fence.

However, metal miter gauges have some advantages over wooden crosscut sleds: They won't warp or go out of square, they cut a number of common angles accurately, they generally are lighter and easier to place on and off the saw table, and they accommodate a tilted blade or dado head.

## The testing procedure

While miter gauges can be used on bandsaws, disc sanders, shapers, and router tables, for this review I limited my testing to the tablesaw, the machine most people think of when discussing miter gauges.

To test for accuracy, I verified that my saw was set up properly. I took test cuts in lumber that had freshly ripped and jointed edges, so both edges were perfectly parallel, straight, and square. Then I cut off a section from the end of the stock, flipped over the piece, and placed the two pieces together on the saw table. An accurate cut showed no light along the cut line.

I performed the same procedure at 45° and 60° on all miter gauges (except those with no fixed settings at 60°). And finally, I used all of the miter gauges in my shop over a period of several months.

The miter gauges come in three basic designs: variations on the traditional protractor head, the Incra products with their rack-and-key adjustment, and the Osborne product with its triangular support system.

## What I reach for

I used all 10 of these miter gauges in my shop, but two of them stood out and received more use than the others: the Woodhaven Deluxe (with its optional fence) and the JDS Accu-Miter. The Woodhaven Deluxe saw the most all-around use. But the heavy Accu-Miter, with its smooth micro-adjustable stop, was my tool of choice for joinery cuts.

For the more budget-conscious, the Woodhaven standard miter gauge requires a shopmade subfence and makes only 90° and 45° cuts, but I found the cuts to be precise. It also would make a great second miter gauge for making box joints or for use on the router table, bandsaw, or disc sander.

*Tim Albers is a woodworker and machine refurbisher in Ventura, Calif.*

## FEATURES AT A GLANCE

**ADJUSTABLE GUIDE BARS**

**To increase accuracy, all of the gauges offer some means for adjusting the fit of the guide bar in the miter slot. The Delta Deluxe Miter Gauge has steel setscrews (left), which threaten to wear a track in the cast-iron slot. Others have plastic or graphite screws. The Incra miter gauge has nylon washers that spread to fit the miter slot (right).**

**EASY, ACCURATE MITER CUTS**

**Replacement miter gauges offer positive stops at a number of common angles, from as few as three angles to as many as 364.**

**ACCURATE CUTS TO LENGTH**

**Most gauges also offer stop systems on their fences. Many flip up and out of the way when not needed.**

Photos, except where noted: Asa Christiana

# SIX PROTRACTOR-STYLE GAUGES

**These six protractor-style gauges all have a solid head that pivots on the guide bar, with positive stops at common angles. This is by far the most common miter-gauge design.**

## DELTA DELUXE

**Overall rating: Very good**

Source: Tool Crib/Amazon
800-635-5140
www.amazon.com

Price: $65

Positive angle stops (nine): 90°, 75°, 60°, 45°, 30° each way

**The Delta Deluxe is an accessory miter gauge that offers good value for the money. It's a traditional design with the head mounted on a steel bar by means of a 4-in.-tall clamping handle. The cast and machined protractor head on the model I looked at was straight and square to the table.**

**The Delta Deluxe uses a spring-loaded pin for positive stops, which work well and are adjustable. There is an optional cam-action clamp attachment, but no auxiliary fence or stop available.**

***The Delta Deluxe is difficult to set up.*** *It took some trial and error to adjust the four plates that contain the positive stops, as they tended to shift when they were being locked down.*

## WOODHAVEN DELUXE

**Overall rating: Excellent**

Source: Woodhaven
800-344-6657
www.woodhaven.com

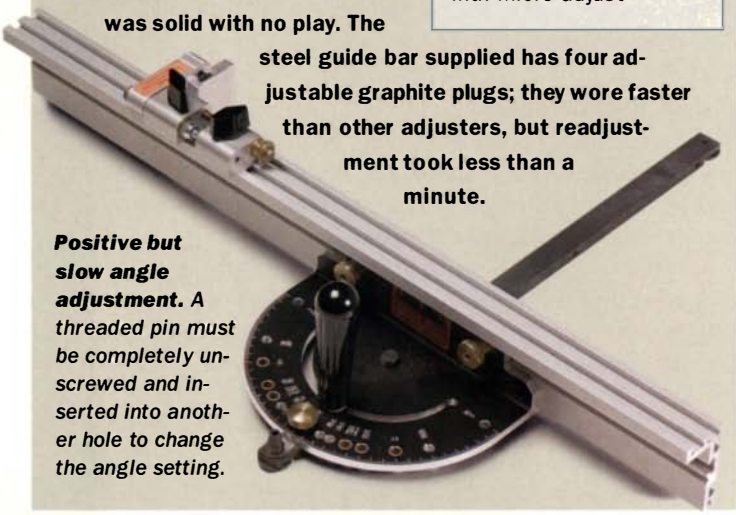
Price: $176 (includes auxiliary fence)

Positive angle stops (15): 90°, 80°, 75°, 67½°, 60°, 45°, 30°, 0° each way

Fence length: 24 in.

Fence stop: One flip stop with micro-adjust

**The Woodhaven Deluxe is sold through mail-order companies as simply a "deluxe miter gauge." I tested it with its optional fence and stop, sold as a package by Woodhaven. Accurate out of the box, the Woodhaven has a 24-in.-long sliding aluminum fence extrusion attached to the head via T-slots, allowing it to slide close to the blade. The L-shaped flip stop has a micro-adjuster, which was solid with no play. The steel guide bar supplied has four adjustable graphite plugs; they wore faster than other adjusters, but readjustment took less than a minute.**



***Positive but slow angle adjustment.*** *A threaded pin must be completely unscrewed and inserted into another hole to change the angle setting.*

## ROCKLER SURE-LOC

**Rockler's miter gauge looks like a basic design but actually uses a unique, secure locking system. The bottom of the head has small teeth that engage matching teeth on top of the bar. The head locks in place at a perfect 90°. However, the Sure-Loc does not allow any angle between the teeth increments. The rest of the tool was disappointing. The guide bar—one of only two aluminum guide bars in the test—flexed easily when even light pressure was applied to the fence. The guide bar is actually made from two separate pieces that can be adjusted outward to fill the entire miter slot, resulting in a very weak bar. The 22-in.-long fence on the model I tested was slightly concave along its face and out of square to the table surface. For most crosscuts the fence doesn't have to be 90° to the table, but there are critical instances when a piece is placed upright against the fence, such as when cutting joinery. Last, the fence-adjustment knobs have only ⅛ in. of clearance below and were awkward to turn.**

**Overall rating: Fair**

Source: Rockler
800-279-4441
www.rockler.com

Price: $130 (includes auxiliary fence)

Positive angle stops (240): at every 1½°

Fence length: 22 in.

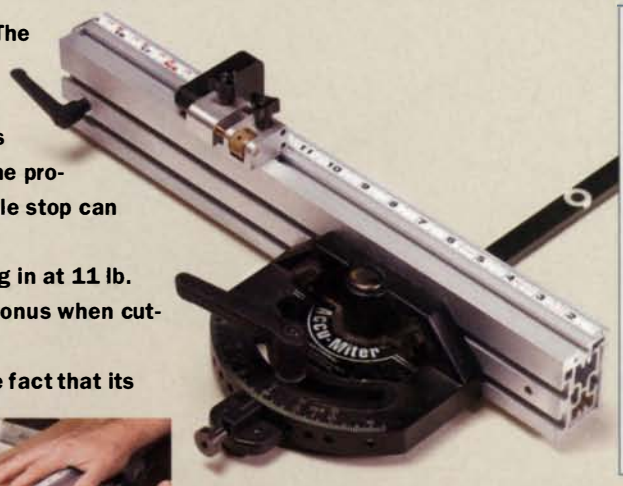
Fence stop: One flip stop

***The Rockler Sure-Loc has teeth.*** *These ensure accuracy but limit the miter gauge's settings to 1½° increments.*



Photos, this page (top left, top right, bottom left): Rodney Diaz

## JDS ACCU-MITER



**Overall rating: Excellent**

Source: Tool Crib/Amazon
800-635-5140
www.amazon.com

Price: $180 (includes auxiliary fence)

Positive angle stops (nine): 90°, 75°, 67½°, 60°, 45° each way

Fence length: 18 in.

Fence stops: One flip stop with micro-adjust; one fixed stop on end of telescoping fence section

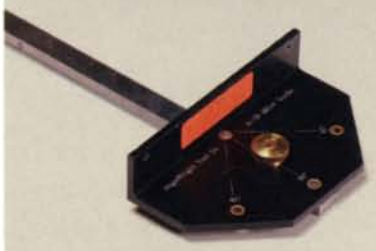
**The JDS miter gauge is a big, heavy workhorse. The cast-aluminum head was solid as well as flat and straight. The steel guide bar has split nylon washers for adjustment. The Accu-Miter requires assembly and setup before it can be used, but the procedure was straightforward. The fence and simple stop can extend to 34 in., and the flip stop was accurate.**

**This was the heaviest tool to handle, weighing in at 11 lb. However, I found its extra weight and rigidity a bonus when cutting joinery and angles.**

**The only shortcoming of the Accu-Miter is the fact that its angle markings are cast into the head. This makes them large and easy to read but imprecise compared with some others. Also, it comes with a workpiece clamp, but I found it to be awkward, so I removed it.**

***Two-stop system.*** *A micro-adjustable flip stop fits on only the main 18-in. fence, but the fence extension offers a simpler stop for greater capacity.*

## ANGLEWRIGHT A30



**Overall rating: Very good**

Source: AngleWright
510-608-2470

Price: $84

Positive angle stops (three): 90°, 45° each way

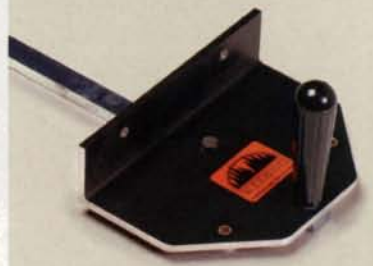
**Miter gauges don't get much simpler than the AngleWright: a machined steel bar and simple aluminum head with only three attachment angles—one at 90° and two at 45°. There are no settings in between. To change angles, you simply unscrew the brass knob, remove the head, and reposition it on the guide bar. There are no fine-tuning features on the head of this miter gauge, but it doesn't need any: It was straight and square out of the box.**

***Shopmade fence.*** *The AngleWright and Woodhaven (at right) have holes for attaching a sacrificial fence.*

**The AngleWright is supplied with a guide bar machined for the user's specific saw. The one specified for my tablesaw fit the miter slots almost perfectly. The guide bar has three small nylon adjustment setscrews for fine-tuning the fit.**

**The AngleWright has no additional features or available options. Basically, this streamlined but solid miter gauge cut the three commonly used angles accurately.**

## WOODHAVEN STANDARD



**Overall rating: Excellent**

Source: Woodhaven
800-344-6657
www.woodhaven.com

Price: $60

Positive angle stops (three): 90°, 45° each way

**Woodhaven's standard gauge is similar to the AngleWright with a nearly identical head assembly. Its head is slightly larger than that on the AngleWright, and it was machined flat and square. The Woodhaven gauge uses four graphite plugs to adjust the bar for a tight fit in the miter slot, like the Woodhaven Deluxe. Both the AngleWright and Woodhaven standard models made perfect cuts right out of the box, but with its lower price tag, the Woodhaven has a slight edge.**

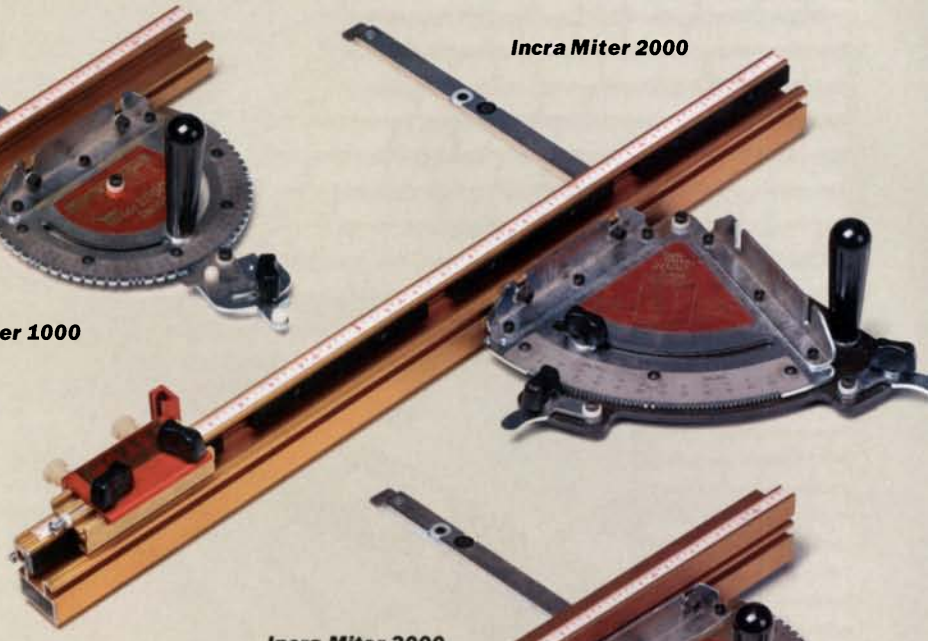
***Only three angles.*** *The Woodhaven and the AngleWright (at left) require removing the head and unscrewing a nut or bolt to change the angle. But they are very accurate.*

Photos, this page (top right, middle right, middle left): Rodney Diaz

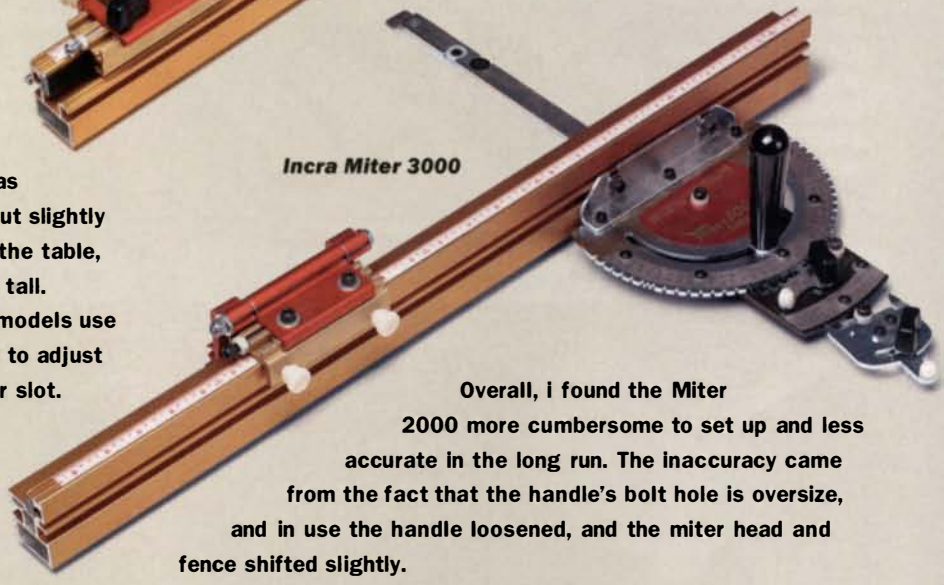
## INCRA USES RACK-AND-KEY ADJUSTMENT

The Incra miter gauges are a protractor-head design, but they use a toothed rack for adjustment, creating a greater number of positive stops. All of the Incra products slid very smoothly and had useful features, but for the price I would expect a higher level of precision on the Miter 2000 and 3000, along with improved stops. The Miter 1000 is a better value, with its easily adjustable guide bar and good fence.

*Incra Miter 1000*



*Incra Miter 2000*



*Incra Miter 3000*

The Miter 1000 is Incra's basic miter gauge and one of the least expensive on the market. The markings on the protractor head were clear, and the head was quick and precise to adjust. Once the fence's mounting bracket was set at 90°, the remaining adjustments were accurate. The fence was perfectly straight but slightly out of square with the table, even at only 1½ in. tall.

***Out of square.*** *The Incra fences weren't square to the table. The problem was fixed by shimming the fence-mounting bracket.*

All of the Incra models use nylon split washers to adjust for play in the miter slot. Easy to adjust, the washers allowed for smooth movement.

Aside from the initial adjustment of the fence-mounting bracket, the only shortcomings of the Miter 1000 were its small stop—which protruded only ¼ in. from the fence, leaving it unsuited for stacked cutting or pieces with angled ends—and the mini T-slot system for attaching an auxiliary fence. The size of the T-slots and their low position on the fence resulted in a wobbly auxiliary fence if it was more than a few inches high. However, at $90, the Miter 1000 is an excellent value, with 41 positive miter settings and accurate sliding action.

The Miter 2000 uses a different approach to the protractor head than the other two Incra products: a 90° head with fence-attachment brackets on two sides, for using the miter gauge on the left or right of the sawblade. The head is held to the bar by the handle bolt in the rear and a pivot point in front.

Overall, i found the Miter 2000 more cumbersome to set up and less accurate in the long run. The inaccuracy came from the fact that the handle's bolt hole is oversize, and in use the handle loosened, and the miter head and fence shifted slightly.

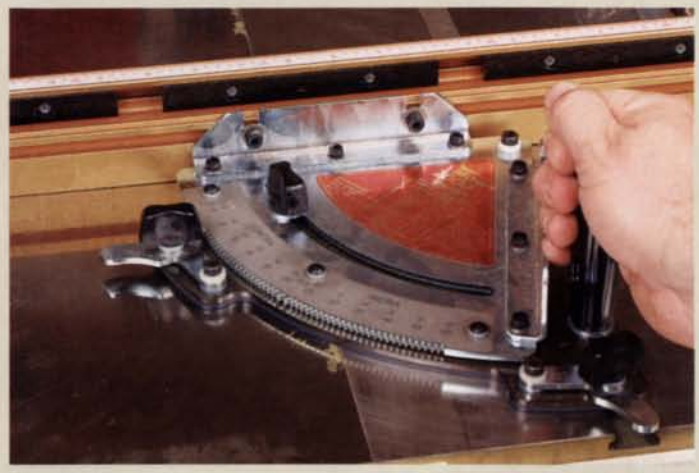
Another problem on the Miter 2000 was the fence itself: it not only was significantly out of square, but it also was warped. As with the Miter 1000, the manual suggests inserting shims, but it's difficult to correct both out of squareness and warp. The "Shop Stop" on the Miter 2000 offers a micro-adjustment feature that was not as precise as on the other designs, and it does not flip out of the way.

| INCRA MITER | 1000 | 2000 | 3000 |
|---|---|---|---|
| Overall rating | Good | Fair | Fair |
| Price | $90 | $150 | $210 |
| Positive angle stops | 41 stops: every 5°, plus 22½° and 67½° each way | 220 stops: every ½° on one side | 364 stops: every ½° each way |
| Fence length | 18 in. | 27 in. | 27 in. |
| Fence stop | One | One with micro-adjust | Dual flip stops with micro-adjust |

Source: Woodpeckers (800-752-0725; www.woodpeck.com)



Photos, this page (top, middle, and bottom right): Rodney Diaz



***The Incra 2000 can go out of square.*** *If the large black handle loosens with time and use, the fence-support plate will shift slightly left or right.*

**The Miter 3000 reverts to the head mechanism found on the Miter 1000 (which I prefer) with the addition of a 1° and ½° increment assembly. The finer degree adjustment was a nice feature, but with it the gauge took longer to adjust. However, if I were doing a lot of cutting that required precise half-degree adjustments, it would be a handy option.**

**The fence on the Miter 3000 was almost perfectly flat, but like the other Incra products, the fence was out of square to the table. Again, this can be corrected with shims.**

**After the testing period for this article, Incra debuted special editions of the 1000 and 3000 miter gauges, the 1000SE and the 3000SE, which offer longer, telescoping fences. Also, the 1000SE includes the two-armed flip stop found on the 3000 model.**

***Setting angles is less straightforward on the 3000.*** *The big rack has stops every 5°, and the smaller rack is used to add single and half degrees to those settings.*

## OSBORNE MITER GAUGE

**Overall rating: Fair**

Source: Tool Crib/Amazon
800-635-5140
www.amazon.com

Price: $160 (includes extension fence)

Positive angle stops (nine): 90°, 75°, 67½°, 60°, 45° each way

Fence length: 24 in.

Fence stop: One flip stop

**The Osborne gauge has a unique design with a support arm that forms a triangle with the fence and guide bar. The arm adjusted quickly with accurate detents at common angles. However, the gauge allowed too much flex and yielded inaccurate cuts in certain situations.**

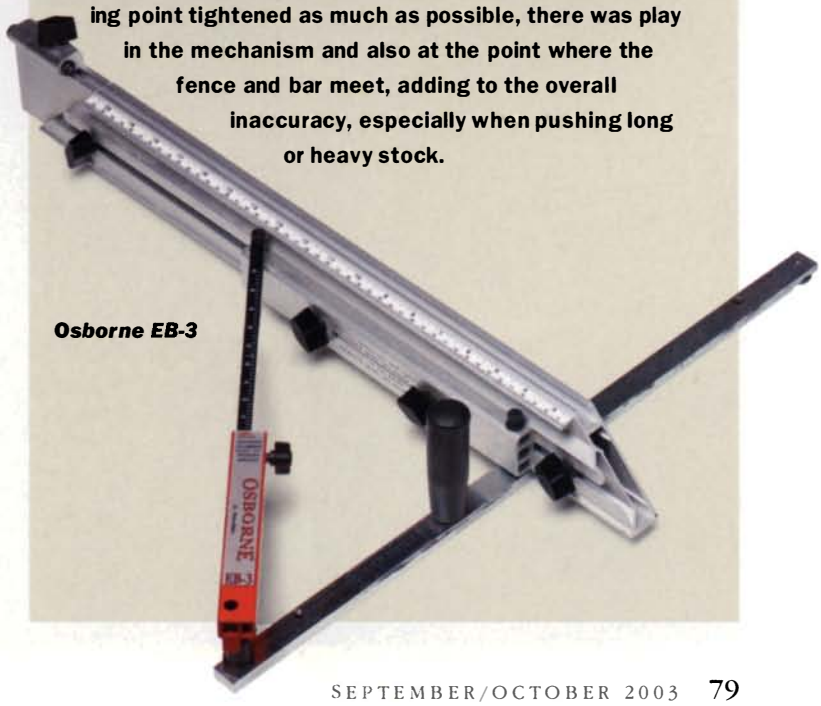
**One end of the fence connects to the center of the guide bar. The opposite end of the fence mounts to the support arm, which, in turn, is attached to the front of the guide bar. The parts pivot at each of these three attachment points.**

**Markings on the adjustable arm measure the angle, and a ball plunger holds the fence in place. The plunger allowed for a quick return to 90° or any of the preset angles in each direction.**

***The longest crosscut capacity.*** *The telescoping arms and extension block allow the stop on the EB-3 to work on boards as long as 42 in.*

**The EB-3's guide bar has three adjustment points to help provide a snug fit in the miter-gauge slot. The problem with the overall design is that wide stock pushes one of these points out of the miter slot, allowing the guide bar and entire miter gauge to flex.**

**The EB-3 incorporates an eccentric mounting point at the rear of the bar for the adjustment arm, allowing the user to fine-tune the angle settings. However, even with this mounting point tightened as much as possible, there was play in the mechanism and also at the point where the fence and bar meet, adding to the overall inaccuracy, especially when pushing long or heavy stock.**




***Osborne EB-3***

Photos, this page (bottom right): Rodney Diaz

# Current Work

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

**Jeff Koopus** Pittsford, N.Y.

Koopus was commissioned to build this cupboard (22 in. deep by 74 in. wide by 84 in. tall) for a client. Made from crotch mahogany and sycamore with bird's-eye maple and ebony veneer, the base was inspired by a Federal bowfront sideboard pictured in Albert Sack's *Fine Points of Furniture* (out of print), while the upper section was a collaborative effort with his client. The cupboard has an aniline dye, oil, and lacquer finish. Photo by Bruce Litolff

**Timothy Brennan** New Paltz, N.Y.

This mahogany chair (21 in. deep by 24 in. wide by 40½ in. tall) was made by tracing and measuring the design of an antique one. Brennan reproduced the original's carvings on the splat, crest rail, and ears; however, he carved the knees based on those of another chair. The seat is upholstered with wool brocade over horsehair, and the chair is finished with aniline dyes and shellac. Photo by Marlis Momber

**Ric Martinelli and Cat Dellavalle** Madera, Calif.

Martinelli and Dellavalle were commissioned to make this backgammon board (21⅝ in. deep by 11¾ in. wide by 3 in. high) as a gift from son to father. Based on an Art Deco theme, the piece is veneered in amboyna burl, Macassar ebony, African satinwood, and holly stringing. Each of the game pieces is inlaid with eight 2.35-mm black-and-white mother-of-pearl dots. The finish is conversion varnish. Photo by Mullins Studio

**Ian Christoph** San Francisco

Christoph built this dresser (20 in. deep by 58 in. wide by 35 in. tall) based on a design his wife had worked out. The primary wood is cherry, and the secondary woods are maple and oak. The piece features rosewood drawer pulls and has 122 hand-cut dovetails. The finish is linseed oil and wax.

**Tom Bodett** Gig Harbor, Wash.

"After working in the Arts and Crafts style for some time," said Bodett, mostly known as the voice of Motel 6 commercials, "I wanted to try a more fluid design in a table for my own living room." This lacewood, koa, and ebony table (20 in. deep by 20 in. wide by 25 in. tall) is what he came up with. The legs were shaped using the proportions found in the Fibonacci sequence, which "helped create a feminine foundation to the handsome Arts and Crafts lines and details." The finish is a combination of varnish, tung oil, mineral spirits, and wax.

**Jim Probst** Hamlin, W. Va.

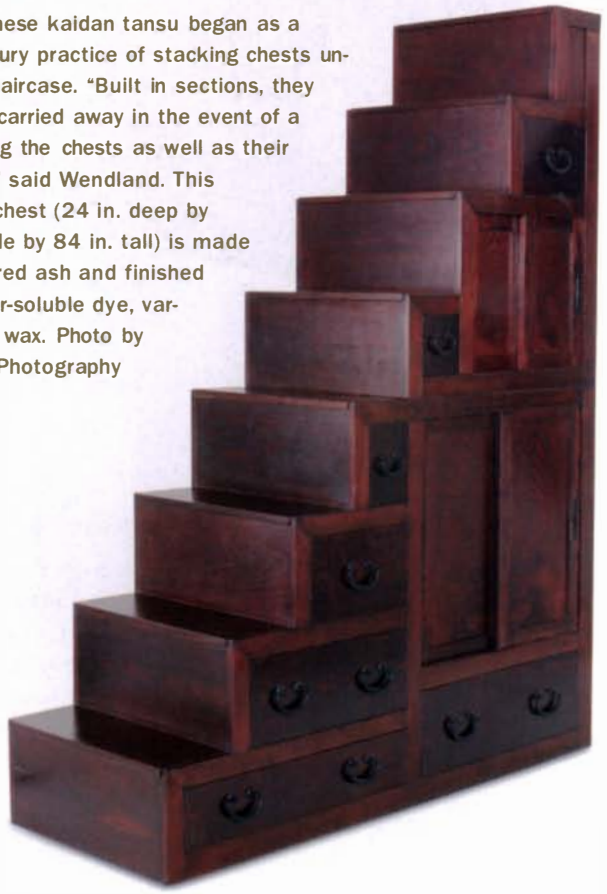
In 2001, Probst, a 13-year professional "mission-influenced" furniture maker, started producing a new style of furniture line that he had been designing and developing for several years. "My desire was to achieve an aesthetic that had a slight Asian influence and was a little softer, curvaceous, and more feminine," said Probst. This cherry and curly maple sideboard (22 in. deep by 62 in. wide by 32 in. tall) is representative of that new style, which he calls the Dora Collection. The piece has a tung oil and urethane finish.

**Keith Rogers** Plain City, Ohio

Rogers built this 18th-century desk (19 in. deep by 44½ in. wide by 42 in. tall) with some assistance from his wife, Sally. "My wife and I drew our own plans," said Rogers, "and changed them to suit us as construction went on." The desk is made from 60-year-old figured cherry that he bought from a friend. Rogers consulted various back issues of *Fine Woodworking* to make the shaded fan inlay, the cock beading, the hand-cut dovetails, and the column flutes. The desk is finished with stain and lacquer.

**Thomas Wendland** East Sound, Wash.

The Japanese kaidan tansu began as a 13th-century practice of stacking chests under the staircase. "Built in sections, they could be carried away in the event of a fire, saving the chests as well as their contents," said Wendland. This stairway chest (24 in. deep by 60 in. wide by 84 in. tall) is made from figured ash and finished with water-soluble dye, varnish, and wax. Photo by Blaisdell Photography



**Richard R. Colter** Gore, Okla. ▲

Made for Colter's daughter, this dressing glass (14 in. deep by 21 in. wide by 32 in. tall) was designed from plate No. 98 in Verna C. Salomonsky's *Masterpieces of Furniture* (Dover Publications, 1974) and a picture of the same piece obtained from the Boston Museum of Fine Arts. The piece is made of satinwood and basswood, with a secondary wood of poplar, and features crotch walnut veneers and ebony and holly stringing and banding. The gold-leafed mirror frame was carved out of basswood. The finish is French polish. Photo by Jim Fowler

**Réjean Roy** ▶
St. Lambert, Que., Canada

Roy built this cherry bookcase (13½ in. deep by 23 in. wide by 60 in. tall) to fit a narrow space in his bedroom. "I started making furniture a year ago after retiring from my regular job and taking a course in wood carving," said Roy. The bookcase's door is set with a pane of antique glass. The piece is finished with mahogany stain, shellac, and beeswax.

**Joe Mendel** North Andover, Mass. ▶

Mendel made this chest (18 in. deep by 43¾ in. wide by 26½ in. tall) as his first project as a student at North Bennet Street School in Boston. Constructed out of quartersawn white oak with a pine bottom, the chest was inspired by a John Thurston piece on display at the Wadsworth Atheneum in Hartford, Conn. It is finished with Danish oil and a mixture of carnauba and beeswax. Photo by Lance Patterson

# Premium-Quality Router Bits

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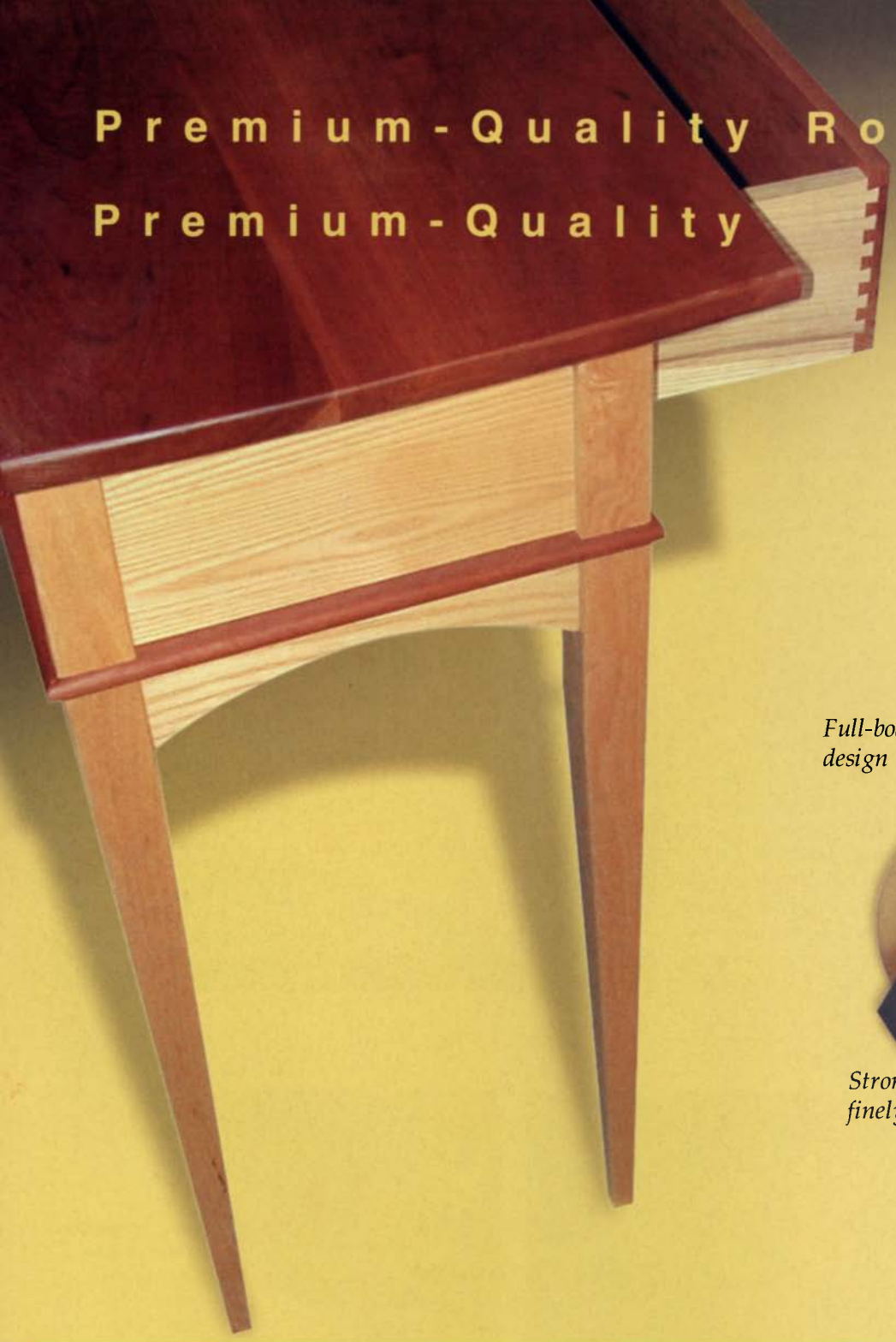

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# Rules of Thumb

# No-mess glue-ups

BY JEFF JEWITT

Every woodworker experiences the trauma of discovering an errant glue splotch on their project when they apply a finish. Over the years I've experienced many glue mishaps and tried every trick out there.

Problems with errant glue can be grouped under three headings: avoiding glue squeeze-out in the first place; planning for squeeze-out; and removing glue when it does squeeze out.

Woodworkers have access to all sorts of modern and traditional adhesives, but for the purpose of this article I'll deal with the most common glue, polyvinyl acetate (PVA), also known as aliphatic resin, which comes in white and yellow forms.

I do all of my gluing on a 4-ft. by 8-ft. melamine table that's about mid-thigh height and on casters. For convenience I put a few shelves underneath the table to store clamps. The slick melamine allows furniture to slide pretty easily as I'm pivoting and turning it during assembly, and it's easy to wipe up errant drips of glue. A good alternative surface material is tempered Masonite.

Before every glue-up, it's important to complete a dry run of the clamping procedure. The dry run allows you to double-check that all of the joints are correctly machined and to get all of the clamps that you'll need within easy reach. The other thing to do is fill a container with distilled water and place it nearby with rags. Keep your hands clean during gluing, and wipe them immediately

## AVOID GLUE SQUEEZE-OUT ON MORTISE-AND-TENON JOINTS

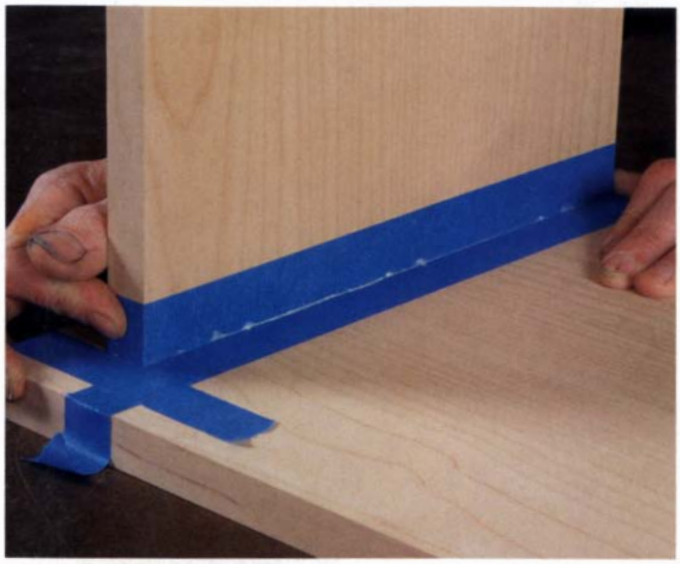
***Bevel the tenon and edges of the mortise.*** *Use a chisel, a shoulder plane, or even a coarse file to bevel the end of the tenon, which leaves additional space inside the joint for excess glue. Bevel the edges of the mortise with a chisel (right) to leave an area for any excess glue to hide in.*

***Apply glue only to the bottom end of the tenon.*** *Leave ½ in. below the shoulders glue-free. As the tenon slides into the mortise, the glue is spread along the tenon by the walls of the mortise.*



Photos: Mark Schofield

## PROTECT THE WOOD FROM GLUE WITH TAPE



***Containing squeeze-out.*** *Prior to assembly, apply blue masking tape to visible areas of a joint where squeeze-out may occur. During assembly, any squeeze-out goes onto the tape (right).*

with water and a clean rag if you get glue on them.

### Tricks to eliminate squeeze-out

With practice you can eliminate glue squeeze-out and still achieve full-strength joints. Two of the best ways to avoid glue seepage are to alter the design of the joint and to apply just enough glue to form a strong bond but not so much that you get excessive squeeze-out.

With mortise-and-tenons, both of these techniques come into play. The key is to keep the glue from coming out of the mortise when you clamp the joint. Cut the mortise ⅛ in. deeper than the length of the tenon, and bevel the edge of the mortise and the end of the tenon on all four sides with a chisel. This gives more room for excess glue to hide in.

Apply glue to the mortise walls and the tenon, keeping the glue at least ½ in. away from the shoulders. As the two sections are brought together, the excess glue is pushed up the tenon, but the bevel prevents it from riding up onto the mortise and instead rolls it over the glue-free section of the tenon.

### Ways to contain squeeze-out

Another approach is to accept glue squeeze-out but to employ strategies that make removing it easier.

**Tape off the wood**—With dadoes and sliding dovetails like those often found in chests of drawers and bookcases, I dry-assemble the piece and tape off around the joints with blue painter's masking tape, which can be removed cleanly with no residue. Apply the glue and assemble the piece in the normal way. When the glue has dried, peel away the tape, removing any residual glue. This doesn't require a lot of extra work, and the clean, glue-free joint is worth it.

**Apply finish before glue-up**—With any workpiece you always have the option of prefinishing, but it's my favorite technique for multislatted pieces or where there are a lot of complicated areas to finish. Cover tenons with blue masking tape and stuff paper-towel pieces into the mortises. Stain the piece, if applicable, and apply a couple of coats of finish. Don't apply a final coat of finish, as the surfaces may get slightly marred during assembly. Make sure you use clamps with protective faces so that you don't mar the piece. If your clamps have metal faces, use squares of HomaSote (an insulation material sold at builder's merchants) to protect the workpiece.

### Removing squeeze-out

Sometimes glue squeezes out no matter what precautions you take. On a prefinished surface, most glue squeeze-out can be scrubbed off with a toothbrush and water, and the surface wiped clean with a damp cloth. If you miss some of the glue, perhaps because it is under a clamp, let it dry for a few hours, at which point you can

## PREFINISH PARTS BEFORE GLUING

***Apply finish before glue-up.*** *Mask off areas that will receive glue. Tenons are wrapped in tape, while mortises are stuffed with paper towels.*

practically peel the glue off the finished areas with a chisel.

But if you get glue squeeze-out on bare wood, you have the options of letting it dry or semicure, or wiping it off immediately with water. In most cases I prefer to clean off the squeeze-out before it dries. Dried glue can be a horror to remove.

Rather than grabbing any old wet rag to remove glue, I take a more systematic approach: First, use distilled water, as tap water may contain dissolved iron salts that will cause little gray spots on tannin-rich woods like oak. Use a toothbrush to remove the glue, scrubbing with plenty of water. On open-pored woods, this method removes the glue that's inside the pores. Then, with a clean cloth dampened with distilled water, wipe the joint clean.

Because large panels are usually flattened using a drum or belt sander, don't bother to thoroughly clean off the beads of glue; let them dry six to 12 hours before scraping. If you wait any longer, the beads get too hard, and you risk pulling off hunks of wood as you scrape. □

## REMOVING SQUEEZE-OUT

***When all else fails.*** *If you get squeeze-out on open-pored wood, use a toothbrush to remove glue from the pores rather than a cloth, which forces glue into the pores. To avoid staining tannin-rich woods like oak, use distilled water.*

***Glue scraper.*** *On large panels, let the glue dry six to 12 hours and then use a cabinet scraper to remove the surplus glue. Waiting longer increases the chances of tearing out the wood.*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So to review, the JET 10" SuperSaw has better specs, more features, and a warranty that's twice as long. Oh, and did we mention it costs less? Visit your JET distributor for more details.


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# Q&A

## How stable is walnut?

***I am planning to build one or more secretaries like the one that Lonnie Bird built in FWW #154, #155, and #156 (see the photo below). Like Bird, I intend to use black walnut, but I have not used walnut before. My other choice for this project would be mahogany. How stable is walnut in comparison to mahogany? Will I have a terrible time keeping walnut flat and straight?***

***—Robert La Placa, Allentown, N.J.***

**Lonnie Bird replies:** Black walnut is a beautiful wood with rich, chocolate color and dramatic figure; as it ages, it becomes lighter and reveals warm red and yellow tones. The moderately hard, even texture of walnut makes it a pleasure to handplane and carve.

Although walnut isn't as dimensionally stable as mahogany, it's not difficult to work. In fact, the steps I take to ensure stability are no different from what I do with any native hardwood.

Begin by using dry lumber, and allow it to acclimate to your shop. Before milling the lumber to final dimension, use a jointer or large bench plane to flatten the face and true one edge of each piece of stock. Wait to flatten wide boards such as the hinged writing surface and door panels until you're ready to use them; if left lying around for several days, the boards are likely to warp.

***Walnut works for furniture.*** *Dry lumber, an awareness of movement patterns, and a good, sealing finish will ensure success with walnut.*

Second, be aware of potential cross-grain construction problems, and take the necessary precautions to allow for seasonal wood movement. For example, the breadboard ends on the secretary's hinged writing surface must be attached to allow for small amounts of movement that take place when the relative humidity changes.

Finally, after the secretary is complete, seal all surfaces with finish so that moisture exchanges occur at an even rate.

I'm sure that if you follow these guidelines, the surfaces will remain flat and free of stress cracks, and the doors and drawers will operate smoothly for years to come.

[Lonnie Bird teaches woodworking in Dandridge, Tenn. Visit his Web site at www.lonniebird.com.]

## Inlay, marquetry, and boulle work

***What is the difference between inlay and marquetry? How do those differ from boulle work?***

***—Parker Reeves, Shreveport, La.***

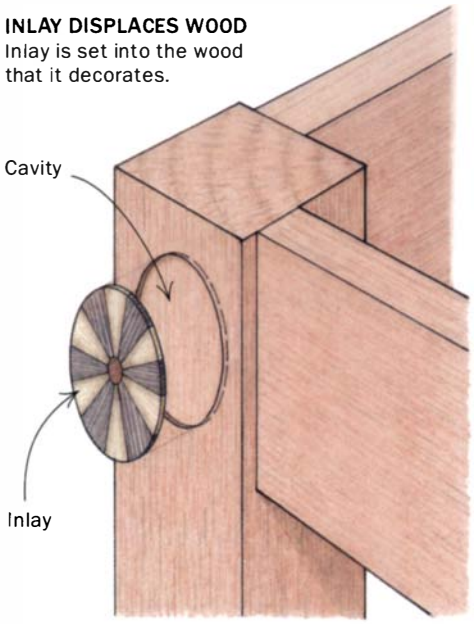
**Julia Godfrey replies:** Inlay, originally termed intarsia, began as early as 350 B.C. in Asia Minor. Artisans used a long-handled knife resting on the shoulder to cut cavities about 5 mm deep so that a veneer or composition of veneers could be placed into them.

Marquetry is the process of covering a surface with assembled veneer instead of placing veneer into cavities.

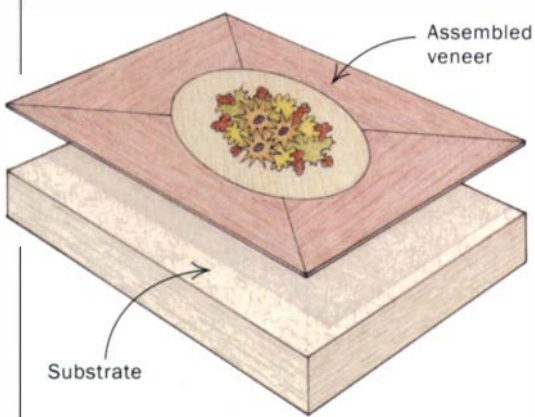
Boulle work refers to a unique style of marquetry that combines metal and other materials, such as tortoiseshell, mother of pearl, and wood veneers that have been stacked and cut with a fretsaw. Although named after Andre-Charles Boulle, he did not invent the method but rather refined it. Boulle created spectacular works for Louis XIV, and many of these works can be found in prestigious museums around

### HOW INLAY, MARQUETRY, AND BOULLE WORK DIFFER

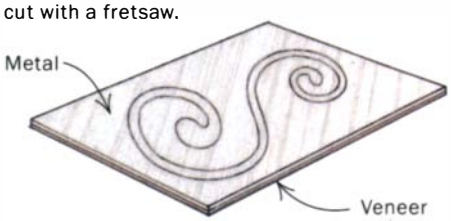
**INLAY DISPLACES WOOD**
Inlay is set into the wood that it decorates.




**MARQUETRY IS APPLIED TO WOOD**
Marquetry pictures are assembled and veneered over a substrate.




**BOULLE WORK IS A FORM OF MARQUETRY**
A stack of metal and one or more other materials, such as veneer or tortoiseshell, is cut with a fretsaw.




The positive and negative cutouts are combined into one unit.



Drawings: Vince Babak; photo, this page: Matthew Teague

the world. A school, L'Ecole Boulle in Paris, continues to teach the method.

Boulle-style marquetry owes its existence to the invention of the fretsaw in the 17th century. This tool was ideal for cutting sinuous curves with precision. German marqueteurs developed a technique of stacking and cutting veneers along the lines of a drawing placed on the stack.

In the 18th century, a German named David Roentgen discovered the technique of conical sawing. By angling his saw at about 12°, Roentgen found that stacked veneers would mate perfectly, with the angled cut eliminating the sawblade kerf.

The idea virtually was abandoned until the 20th century, when the studio of Pierre Roseau revived the technique of conical sawing, now called bevel cutting. Most marquetry done today in North America uses a variation on this technique. [Julia Godfrey builds custom furniture in Greenfield, Mass.]

## Cutting square pin walls in half-blind dovetails

***I recently learned to hand-cut half-blind dovetails. However, after I make the initial, diagonal sawcuts for my pins, I find it difficult to chisel them out square and cleanly. Nine times out of 10, I wind up undercutting. Is there a way to deepen the kerf squarely into the pin in the first place?***

***—Mike Brewer, Bozeman, Mont.***

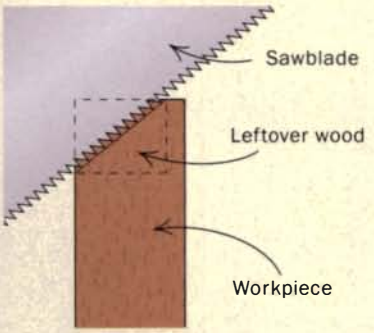
**Karen Wales replies:** After I cut the initial kerfs in half-blind dovetails, I use a modified saw to finish the kerf squarely. I took an inexpensive dovetail blade and filed off the teeth from about 2 in. of the forward end of the blade. Some people use an old scraper blade for this technique. While that will work, I prefer a sawblade that has a spine. The spine protects the striking tool, which, in turn, lets me make better contact with the pin corners.

Once the initial diagonal kerfs have been sawn, I set the toothless part of the blade in the kerf, sighting it to line up with my layout lines. Then I pound out the channel with a deadblow hammer or mallet. I don't try to get the blade all the way in with one blow. That's a sure way

### CUTTING DOVETAILS SQUARE AND STRAIGHT

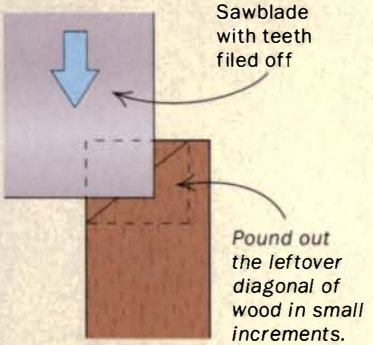
**SAW A DIAGONAL KERF**

***The kerf of a half-blind dovetail leaves a diagonal of wood that can be difficult to chisel out cleanly.***




**DEFINE THE WALLS WITH A MODIFIED SAWBLADE**

***Pound out pin walls in small increments, tapping the blade out of the kerf, realigning it and driving it in farther, until the pin walls are defined.***




**CLEAN OUT THE CORNERS WITH A SKEW CHISEL**

***Use a bench chisel to clean out the majority of the tail pockets. Then turn to a skew chisel to remove the corner nib, which is hard to reach with a flat-edged chisel.***

Photos, this page: Kelly J. Dunton

to split out the sides. Instead, I pound out a little at a time, working the toothless blade out of the kerf, resetting and pounding it in a bit farther, and pulling it out again. I repeat these steps until the saw fits squarely into the corner of the pocket. It usually takes about three repetitions until the chisel has a clear path to follow.

The toothless blade cuts cleanly to the base of the pin wall, reducing the leftover diagonal of wood to a tiny corner nib. This method makes cleanup of the pins more accurate, too.

[Karen Wales is an assistant editor.]

### Tearout trouble

***I love the figure of curly maple, but I have great difficulty working with it, especially when putting it through the planer. Is there any way to put this type of wood through the planer without tearing out the curl too much?***

***—George Michaels, Atlanta, Ga.***

**Brad Gordon replies:** There are a few things you can do to lessen tearout. First, make sure that your planer blades are razor sharp. If you haven't changed them out in a while, now would be the right time.

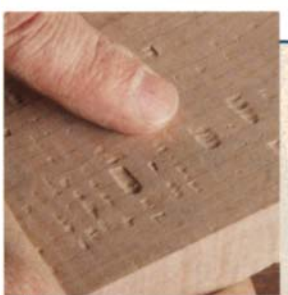
Second, feed your wood into the planer at an angle. Even a slight angle will make a difference. Angling the board allows the planer's cutterhead to slice shavings on the bias to the direction of the grain rather than shearing along the grain. This is important for planing curl, because the grain is compacted vertically like ribbon candy along its length.

Third, take light passes. Don't plane too much at once, or you will gouge the wood. Also, if you own a planer with a variable-speed feed rate, put it on the slowest setting to achieve the most cuts per inch while planing.

One final measure is to dampen the surface to be planed prior to feeding it into the machine. Just like raising your beard before shaving, dampening gets the wood fibers to stand up and be clipped.

Combining these methods will help you plane curly maple more successfully.

[Brad Gordon builds custom furniture and makes wood sculpture in York, Maine.]



## PREVENT TEAROUT IN FIGURED WOOD

**Curly maple tends to chip out when put through a planer. If the face of the board is dry, and it is fed into the machine perpendicular to the cutterhead, tearout can be so bad that it renders the piece useless.**

***Dampen the board face.*** *Dampening will swell surface fibers slightly, raising short fibers while keeping longer ones flexible.*


***Feed at an angle.*** *Angling the board will keep cutterhead blades from lifting long, undulating wood fibers along the grain.*

Photos, this page: Karen Wales

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The Taunton Press

# Master Class

BY JAY HAAVIK

## Bring life to flat panels by adding texture

***Tools for texturing wood.*** *The elbow adze (top) takes a bigger bite than the crooked knife (bottom). Both leave crisp, undulating surfaces that need no further work. These types of tools are available from Kestrel Tool (800-669-3943) or Diobsud Forge (360-468-4450).*

Native Americans along the Northwest Coast have a rich woodworking heritage distinct from what the early European settlers and their counterparts in the Old World were known for. Whether they created totem poles and masks or worked timber for their homes, Native American craftsmen worked wood with adzes and crooked knives instead of saws and planes, leaving textured surfaces, not smooth boards.

Although my work is primarily carving, I also build contemporary furniture, using the carving tools and techniques to add texture. A knife or an adze leaves texture that has a dramatic way of catching the light and can add interest to a plain panel, especially one surrounded by a smooth, nontextured frame in a contrasting wood.

While Western tools such as gouges and slicks can be used to texture wood, adzes and crooked knives allow for a uniquely controlled, symmetrical patterned effect. Softer, straight-grain woods such as red and yellow cedar, soft maple, or alder are good candidates for texturing.

### Crooked knife is a precision instrument

The crooked knife, also known as the curved or bent knife, has a blade of stone, metal, or bone, and the end is curved or hooked. One side of the blade is flat with the cutting edges on one or both edges. With a handle the blade forms a crook, or curve, at the tip. Before using the knife to carve, I usually draw lines on the wood with a soft lead pencil to serve as a guide.

There are two common ways of handling the knife. One is to hold the knife in hand and move your wrist away from the body as you carve. But I prefer to use two hands, with one hand holding the handle and the other pushing or pulling from the handle (called the haft) of the blade. Like all carvers, I have a large selection of knives for different effects. But if you want to test the water with this technique, I suggest getting either a Kestrel C-5 or Diobsud No. 012, which are good general-purpose tools.

For best results, hold the knife at a 45° angle to the grain while

### TWO WAYS TO USE A CROOKED KNIFE

***Push the tool.*** *Hold the knife in one hand. The other hand rests on the stock. Push with the thumb against the base of the handle and let your other hand guide the tool in an arc through the wood.*

***Pull the tool.*** *One hand holds the knife while the other rests on the stock with the forefinger wrapped around the handle near the base of the blade. Pull the forefinger toward you while rolling the tool with the other hand.*



Photos: Anatole Burkin

## ADZE TECHNIQUE

***An elbow adze takes a bigger bite than a crooked knife.*** *Hold the tool at about 45° to the line of cut and strike firmly but without undue force to remove material of a uniform thickness.*

making the cuts parallel to the grain. With more experience, you can create textured fluted rows across the grain and even on the end grain.

### Adze is for heavy stock removal

Ideal for removing a large amount of material quickly, the adze has been in use for thousands of years, to shape wood for boats, wagons, houses, and masks. Handles often are of bone or wood. Blades have been made from bone, stone, or metal.

The native peoples of the Northwest Coast employed two basic types of adzes: the D-adze and the elbow adze. Both serve to shape and texture surfaces (for more on these tools, see *FWW* #63, pp. 58-61).

For this technique, I use the elbow adze, which has its handle cut away between the head and the grip, to give spring for popping out the chips. The blade is reversed so that the bevel of the cutting edge faces away from the wood. The elbow adze usually is held with one hand. The tool is positioned so that the thumb is at a 90° angle from the blade's outside bevel. As you bring down the adze, the blade should hit the wood just behind the edge so that the edge slices through the wood. As with the crooked knife, cut with the grain at about a 45° angle.

Hitting the wood with the edge of the blade will only dig into the wood like an ax chopping into a tree. The hand, wrist, and elbow should move in a rhythmic motion, continued at a steady pace. I recommend Kestrel's E-5 as a good adze for a beginning carver and general all-around use. □

## Sharpening knives and adzes

***Sharpening a crooked knife.*** *To hone the cutting edge, use various grits of sandpaper wrapped around a dowel.*

**The hook on the blade of a crooked knife calls for a rounded sharpening device. A new crooked knife should have its back flattened. Start by drawing the knife's flat surface over 600-grit wet-or-dry sandpaper on glass, then move to 1,200 grit. Next, hone the inside edge of the knife in sequence using 400-grit through 1,200-grit wet-or-dry paper rolled around a piece of ⅜-in.-dia. dowel. Then finish with a leather strop and buffing compound.**

**An elbow adze is sharpened the same way as a gouge or chisel. First work the back side until it is nicely polished, then hone the bevel edge. With a new adze, or if the edge is severely worn, start with a medium-grit waterstone, then move on to 600-grit wet-or-dry paper on glass, then 1,200 grit. Remove the burr, and polish on a leather strop using polishing compound.**

***Honing the adze.*** *Swipe the bevel edge across the abrasive as you would a gouge. Finish with a leather strop.*

# WOODWORKER'S MART

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

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## INDEX TO ADVERTISERS

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| Reader Service No. | ADVERTISER, *page #* |
|---|---|
| | Abacus Chair Parts, *p. 89* |
| 98 | Accuride International, *p. 92* |
| 51 | Adams Wood Products, Inc., *p. 103* |
| 36 | Airware America, *p. 108* |
| 126 | Allred & Associates, Inc., *p. 15* |
| 35 | American Furniture Design, *p. 107* |
| 145 | American Sycamore Woodworking Retreat, *p. 105* |
| 177 | Ashman Technical, Ltd., *p. 105* |
| 120 | Astragal Press, *p. 108* |
| 90 | Australian School of Fine Furniture, *p. 103* |
| 41 | Ball & Ball Reproduction Hardware, *p. 89* |
| | Barr Specialty Tools, *p. 107* |
| 94 | Bauhaus Apprenticeship Institute, *p. 110* |
| 87 | The Beall Tool Co., *p. 106* |
| 142 | Belcher Veneer Co., *p. 109* |
| 147 | Bench Dog, *p. 100* |
| 20 | Berea Hardwoods, *p. 12* |
| 15 | Berea Hardwoods, *p. 92* |
| 194 | Bessey Clamps, *p. 9* |
| 175 | BrandNew Industries, *p. 107* |
| 110 | Brookside Veneers, Ltd., *p. 103* |
| 99 | The Burgess Edge, *p. 3* |
| 92 | CMT USA, *p. 15* |
| 67 | CT Valley School of Woodworking, *p. 108* |
| | Cabinetparts.com, *p. 107* |
| 149 | Canvas Goods, *p. 106* |
| 196 | Carter Products, *p. 92* |
| 45 | Certainly Wood, *p. 109* |
| 72 | Chips Fly.com, *p. 106* |
| 173 | Classic Designs By Matthew Burak, *p. 97* |
| | Classifieds, *p. 110* |
| 65 | Clayton Machine Corp., *p. 7* |
| 164 | Cohasset Colonials, *p. 89* |
| 78 | Colonial Saw Company, *p. 84* |
| 76 | Colonial Times Clock Company, *p. 110* |
| 63 | Conover Workshops, *p. 107* |
| 152 | Cook Woods, *p. 108* |
| 38 | Cormark International, *p. 107* |
| 22 | Crown Plane, *p. 109* |
| 178 | The Cutting Edge, Inc., *p. 106* |
| 6 | Dakota County Technical College, *p. 87* |
| 53 | Dana Robes Wood Craftsmen, *p. 109* |
| 155 | Delta Machinery, *p. 2* |
| | Delta Machinery, *p. 41* |
| 148 | Dewalt, *p. 23* |
| 180 | Diefenbach Benches, *p. 110* |
| | Diefenbacher Tools, *p. 107* |
| 169 | Dogwood Institute, *p. 3* |
| | Dovetail Restoration, *p. 110* |
| 96 | Downdrafter, *p. 108* |
| 70 | Dust Boy, Inc., *p. 108* |
| 183 | Eagle Tools, *p. 97* |
| 77 | Eagle Woodworking, *p. 109* |
| 187 | Engraving Arts, *p. 107* |
| 186 | Everlast Saw & Carbide Tools, *p. 15* |
| 49 | Felder USA, *p. 21* |
| | *Fine Woodworking* Slipcases, *p. 103* |
| | *Fine Woodworking* Subscription Offer, *p. 99* |
| 26 | Flamingo Specialty Veneer, *p. 92* |
| 139 | Forrest Manufacturing, *p. 17* |
| 73 | Freud, *p. 31* |
| 138 | Fuji Industrial Sprayers, *p. 12* |
| 62 | The Furniture Institute of Massachusetts, *p. 107* |
| 27 | General Manufacturing Co., Ltd., *p. 30* |
| 88 | Gilmer Wood Company, *p. 108* |
| 14 | Glass & Mirror Craft Industry, *p. 92* |
| 114 | Goby's Walnut Wood Products, *p. 110* |
| 7 | Good Hope Hardwoods, *p. 108* |
| 89 | Gorilla Glue, *p. 105* |
| 33 | Gougeon Brothers, *p. 107* |
| 32 | Groff & Groff Lumber, *p. 109* |
| 66 | HTC Products, Inc., *p. 90* |
| 130 | Harris Woodworking, *p. 109* |
| 69 | Hearne Hardwoods, Inc, *p. 98* |
| 64 | Hida Tool & Hardware, *p. 84* |
| 48 | Highland Hardware, *p. 101* |
| 84 | Hoffmann Machine Co., Inc., *p. 9* |
| 153 | Irwin Industrial Tools, *p. 24* |
| 37 | Iturra Design, *p. 105* |
| 68 | J.B. Dawn, *p. 107* |
| 128 | JDS Company, *p. 90* |
| | Jack Rabbit Tool, *p. 84* |
| 8 | The Japan Woodworker, *p. 101* |
| 52 | Jessem Tool Co., *p. 19* |
| 111 | Jet Equipment, *p. 91* |
| 10 | Jointech, *p. 15* |
| 157 | Journeyman Tool Co., *p. 3* |
| | Kayne & Son, *p. 109* |
| 34 | Keller & Company, *p. 3* |
| 171 | Kreg Tool Company, *p. 92* |
| 137 | Kremer Pigments, *p. 108* |
| 167 | Kuffel Creek Press, *p. 19* |
| 43 | Laguna Tools, *p. 13* |
| 176 | Launstein Hardwoods, *p. 84* |
| 158 | Lee Valley & Veritas, *p. 101* |
| | Leigh Industries, *p. 19* |
| | Leigh Industries, *p. 93* |
| 106 | Lie-Nielsen Toolworks, *p. 103* |
| 44 | Lignomat Moisture Meters, *p. 103* |
| 190 | Lin Mar Distributing, *p. 105* |
| | Logosol, Inc., *p. 108* |
| 57 | Luthiers Mercantile Intl., *p. 101* |
| 115 | MEG Products, *p. 109* |
| 170 | Manny's Woodworker's Place, *p. 19* |
| | Marc Blanchette Windsor Chair, *p. 109* |
| 18 | Mark's Tool School, *p. 110* |
| 60 | Mass Bay Wood Products, Inc, *p. 107* |
| 71 | Maurice L. Condon Co., Inc., *p. 15* |
| 61 | McFeely's Square Drive, *p. 93* |
| 102 | Micro Fence, *p. 3* |
| 118 | Microplane, *p. 98* |
| 108 | Miller Dowel Company, *p. 87* |
| 134 | Mini-Max USA, *p. 7* |
| 135 | Mini-Max USA, *p. 97* |
| 119 | Misugi Designs, *p. 108* |
| 168 | Murch Associates, Inc., *p. 109* |
| 9 | Noah's, *p. 108* |
| | Nora Hall, *p. 110* |
| 151 | North Bennet Street School, *p. 108* |
| 181 | The Northern Alberta Institute of Technology, *p. 9* |
| 162 | Northwest Timber, *p. 106* |
| | Oakwood Veneer, *p. 109* |
| 2 | Omer Direct, *p. 87* |
| 179 | Oneida Air Systems, *p. 100* |
| 42 | Originalfurnitureplans.Com, *p. 109* |
| 91 | Osborne Wood Products, *p. 108* |
| 85 | Outwater Plastics Industries, *p. 89* |
| 191 | Pacific Rack & Machine, *p. 9* |
| 13 | Packard Woodworks, *p. 3* |
| 103 | Peck Tool, *p. 109* |
| 80 | Philadelphia Windsor Chair, *p. 110* |
| 24 | Plansnow.com, *p. 110* |
| | Porta-Vise, *p. 110* |
| 160 | Porter Cable, *p. 115* |
| 117 | Pygmy Boats, Inc., *p. 109* |
| 112 | Quality Vakuum Products, *p. 105* |
| 109 | Quick Angle, *p. 107* |
| 12 | Rare Earth Hardwoods, *p. 110* |
| 50 | Ridge Carbide Tool Co., *p. 108* |
| 58 | Robert Larson Company, Inc., *p. 110* |
| 47 | Rockingham Community College, *p. 107* |
| 30 | Rosewood Studio, *p. 100* |
| 75 | Rousseau Company, *p. 87* |
| 107 | Router Bits.com, *p. 19* |
| 97 | Routerbitsonline.com, *p. 108* |
| 129 | Sauers & Co. Processed Veneers, *p. 107* |
| | Sawhelper, *p. 100* |
| 127 | Scherr's Cabinet & Doors, Inc., *p. 101* |
| | School of Woodworkers, *p. 107* |
| 83 | Sears Craftsman, *p. 29* |
| 163 | Shaker Workshops, *p. 9* |
| 25 | Sharp Tools USA, *p. 109* |
| 165 | Sherline Products, *p. 109* |
| 154 | Shopbot Tools, Inc., *p. 3* |
| 125 | Simp'l Products, Inc., *p. 19* |
| 124 | Simp'l Products, Inc., *p. 84* |
| 159 | Specialty Tools, *p. 109* |
| 81 | The St. James Bay Tool Co., *p. 110* |
| 116 | Stubai Direct, *p. 109* |
| 146 | Suffolk Machinery, *p. 108* |
| 55 | Super Shop By Smithy, *p. 97* |
| 132 | Sutherland Tool, *p. 107* |
| | System Three Resins, *p. 97* |
| 121 | Talarico Hardwoods, *p. 110* |
| 150 | Target Enterprises, *p. 98* |
| | Taunton *House Check*, *p. 106* |
| | Taunton *2004 Tool Guide*, *p. 95* |
| 184 | Tech Mark, Inc., *p. 101* |
| 193 | Tech-Wood, Inc., *p. 109* |
| 136 | Ten Fingers Corporation, *p. 12* |
| 19 | Tenryu America, Inc., *p. 103* |
| 82 | Thewindsorinstitute.Com, *p. 107* |
| 182 | Titebond Adhesive, *p. 89* |
| 17 | Tools For Working Wood, *p. 108* |
| | Traditional Woodworker, *p. 3* |
| 95 | Vac-U-Clamp, *p. 84* |
| 16 | Viel Tools Inc., *p. 84* |
| 195 | Viper Router Bits, *p. 85* |
| 79 | Virutex.com, *p. 84* |
| 141 | W. Moore Profiles, *p. 103* |
| 143 | West Penn Hardwoods, *p. 106* |
| 74 | Whitechapel, *p. 19* |
| 93 | Wilke Machinery Co./ Bridgewood, *p. 87* |
| 40 | Williams & Hussey, *p. 7* |
| 166 | Wood Rat, *p. 30* |
| 56 | Wood River Veneer, *p. 110* |
| 131 | Woodcraft Supply, *p. 10* |
| 190 | Woodcraft Supply, *p. 89* |
| 161 | Woodcraft Supply, *p. 93* |
| | Woodfinder, *p. 106* |
| 192 | Woodfinishingsupplies.com, *p. 106* |
| 1 | Woodjoy Tools, *p. 107* |
| 59 | Woodline USA, *p. 89* |
| 189 | Woodmaster Power Tools, *p. 12* |
| 188 | Woodmaster Power Tools, *p. 84* |
| 100 | Wood-Ply Lumber Corp., *p. 110* |
| 144 | Woodsmith Store, *p. 89* |
| 23 | Woodsmith.com, *p. 108* |
| 29 | Woodworker's Depot, *p. 92* |
| 54 | Woodworker's Supply, *p. 15* |
| 21 | Worcester Center For Crafts, *p. 97* |
| 101 | Yestermorrow, *p. 92* |

BY PETER GEDRYS

# Harmonize the colors of cherry

The natural colors of cherry range from pale yellow that could be mistaken for maple to salmon pink to medium red-brown that resembles mahogany. Some boards include this entire color spectrum. Bringing these disparate colors together to create an even hue and tone adds several steps to the finishing process, but overcoming this challenge can be as satisfying as building the project in the first place.

## Determine the finished look first

Before you start on the workpiece, you must decide what finished look you are seeking to achieve. Perhaps you want to match the project to another piece of furniture. Experiment on a piece of scrap, performing different coloring steps until you find the look you desire. Remember to keep notes on the materials used and the order of the steps taken.

Once you've established the finished look, wipe the surface of the workpiece with either denatured alcohol or mineral spirits. This step shows you how the boards will respond to a clear finish and indicates the range of color that must be harmonized. On this Connecticut highboy (below) built by Bruce Polsky, the challenge was particularly acute where contrasting boards are juxtaposed, as with some of the drawer fronts.

## Establish an even base color

A mistake that novice finishers often make is to try to replicate an exact color in one step. I liken finishing to the construction of a tall building: The first step is to get the foundation or base color right. Finishers often refer to this as discovering the wood's inner light. From there you can fine-tune the color using glazing and toning, each step building on the last. However, if you don't get the base color right, you'll find compensating for it much harder later.

Because it is easier to add color than to remove it, always start with your lightest-colored board. Using the finished sample, find a dye that most closely resembles the base color. I like to use water-based dyes made by Lockwood for their light-fastness and range of colors. I prefer water-based dyes over alcohol-based nongrain-raising dyes (NGRs) for two reasons: With a water-based dye I can control the strength easily by adjusting the amount of powder. Second, I find NGRs to be unrealistically bright and, because they dry so fast, prone to streaking.

When using any water-based dyes, start by raising the grain with water. After it has dried, resand the surface lightly with either the last grit of sandpaper used or the next-highest grit.

The normal working strength for dyes is 1 oz. per quart of warm distilled water. Because it is easier to dilute a dye than to make it more concentrated, I mix the initial batch with 1 tsp. of dye in 8 oz. of water, the equivalent of 2 oz. per quart. I then cut this by 50% for the initial test. When comparing the result to the board, remember

## MIX A DYE FOR THE LIGHTEST BOARDS

***The finished look.*** *Wetting the surface with denatured alcohol or mineral spirits shows how the unstained boards would look if just a clear finish were applied. This indicates the magnitude of the color contrast between different boards.*

***Prepare the dye.*** *Stir 1 tsp. of dye powder into 8 oz. of warm distilled water to create a dye that is double the normal strength.*

***Adjust the tone.*** *On a sample board, the first swatch was too dark, the second too light, and the third had the right depth but was too orange. Some black was added to adjust the tone.*

Photos: Mark Schofield

## DYE THE LIGHTER BOARDS FIRST

***Brushing it on.*** *An artist's brush is useful for getting into corners, but be careful not to load too much and have the dye run over an edge.*

***Using a pad.*** *Large surfaces are dyed quickly with a pad of crumpled cheesecloth.*

that because the incremental finishing steps gradually darken the appearance, the base color should be significantly lighter.

In this case, my first test was too dark, the second wipe with diluted dye was too light, while the third was the right depth of color but slightly too orange. This was adjusted by adding some dissolved black dye and making a fourth test strip that I judged to be a good fit. Use caution when adding black to any formula, as it can overpower any color quickly.

### Apply the dye with a pad and brush

I prefer to start with the small areas first, such as the rabbets on the drawer fronts. You can use either a small piece of cheesecloth crumpled into a ball or a No. 1 or No. 2 artist's brush. The brushes can get into corners easily, but there is a greater risk of applying too much dye at once and causing a run, or part of the brush going over an edge and dyeing an area meant to be left natural. I find it easiest to use both application methods, using the cheesecloth first and then filling in any gaps with a brush.

After you have finished dyeing the lightest board and while it's still wet, place it next to a dark board and wipe the latter with denatured alcohol. This will help you determine the level of contrast and how much you will need to dilute the dye before applying it to the darker board.

After you have dyed the dark board, let it dry and then compare its appearance to the dyed light board. In this case, the lowest drawer front that started out light ended up slightly darker than the drawer above it, but the tone was close enough to be corrected easily in the glazing process.

### Seal in the dye before continuing

The next step in building a finish is to seal in the dye. There is no better method than to pad on a coat of blond shellac. Not only does this show how the dye will look under a clear finish, but it also isolates the dye from future finishing steps such as glazing. This means that if you apply a glaze that is too dark or the wrong color, it is fairly easy to wipe off the glaze before it has set. Without a sealer, the glaze would grab the wood, masking the base color, and would be impossible to control or correct.

I apply the shellac with a pad because I can control the amount of liquid in the pad as well as the pressure of the pad on the wood. Three or four passes are sufficient to force the shellac down into the pores and seal the dyed wood.

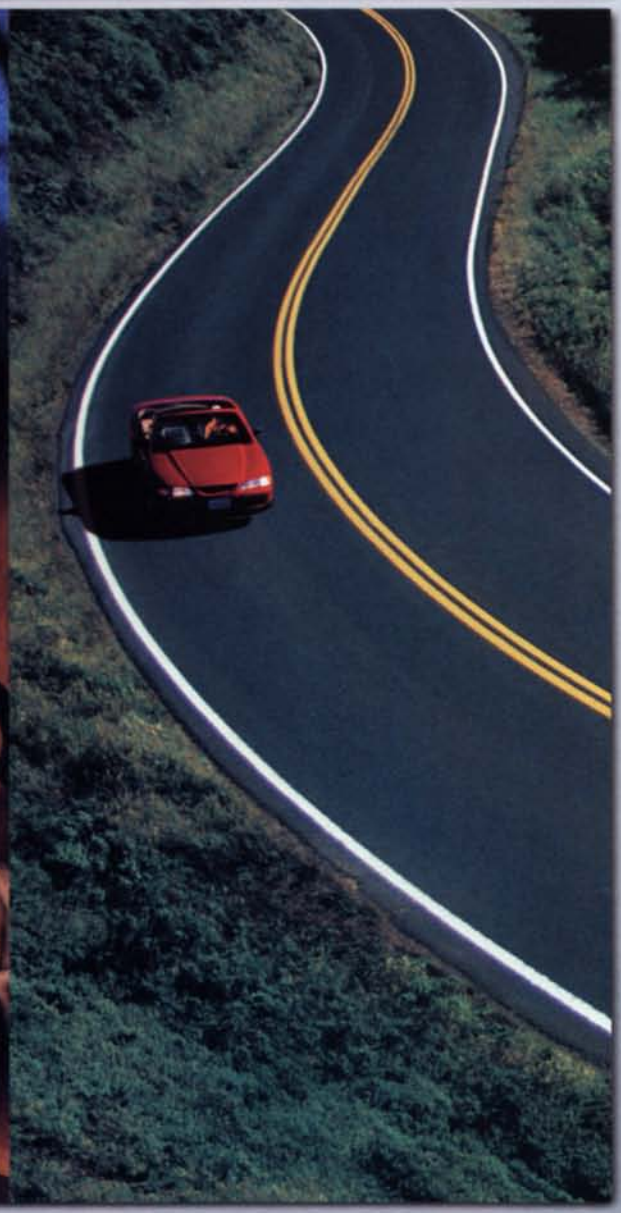
As you can see, the highboy is far from finished, but the extreme color contrast of the unfinished boards has been neutralized, and the foundation for a beautiful finish has been laid. □

## THEN DILUTE THE DYE FOR DARKER BOARDS

***Refresh the color.*** *After you have dyed a light-colored section, while it is still wet, dampen a dark section with a solvent to check how much dye the darker wood will need.*

***Come together.*** *Don't worry if the different sections of the case don't match after being dyed. Future finishing steps, such as glazing and using different types of shellac, will create a harmonious whole.*

# DO IT. FEEL IT.

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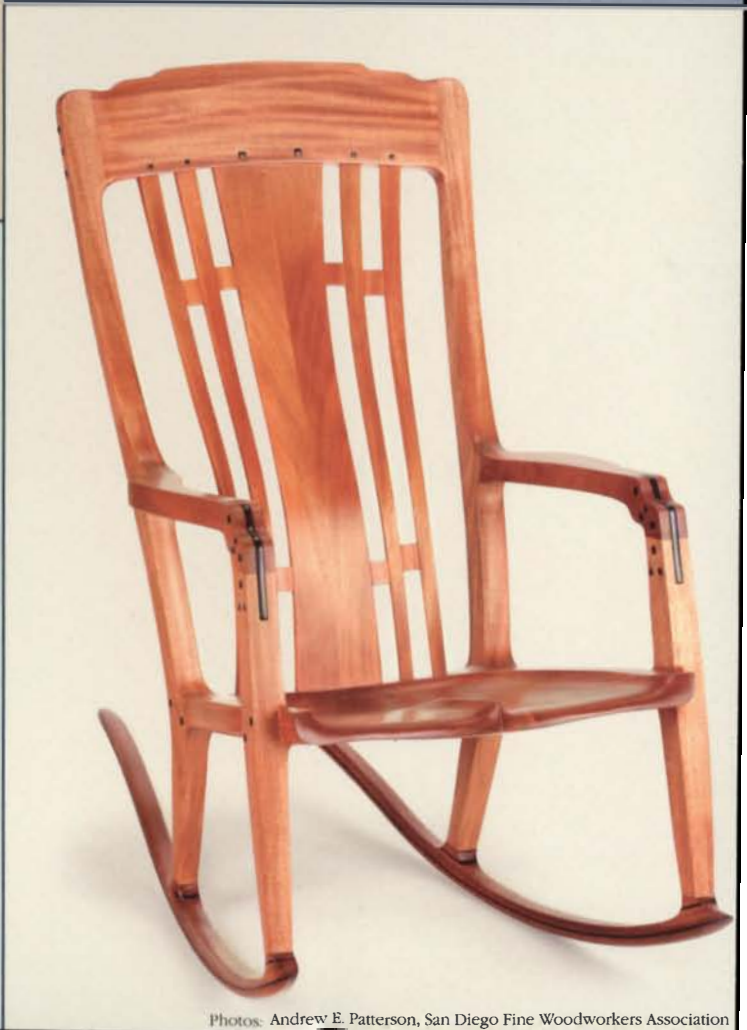
# WINNING DESIGNS IN WOOD

The annual Design in Wood Exhibition, organized by the San Diego Fine Woodworkers Association, brings together a diverse collection of woodworkers, and the quality of craftsmanship is typically impressive. For five years *Fine Woodworking* has been a cosponsor of the event. This year we presented the Best in Show award to Alice and Edward Suszynski for their chandelier in walnut and quartersawn oak (top left). Other pieces that won awards during the exhibition include (clockwise from bottom right): a rocking chair in mahogany and ebony by Ken Minasian; a nightstand in mahogany, olive and ash veneer, and bamboo by Cindy Vargas; and a table in ebonized poplar and maple by Terry Holzgreen.



Photos: Andrew E. Patterson, San Diego Fine Woodworkers Association