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Fine Woodworking

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25

YEARS

October 2000

No. 144

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Jefferson's
writing desk**

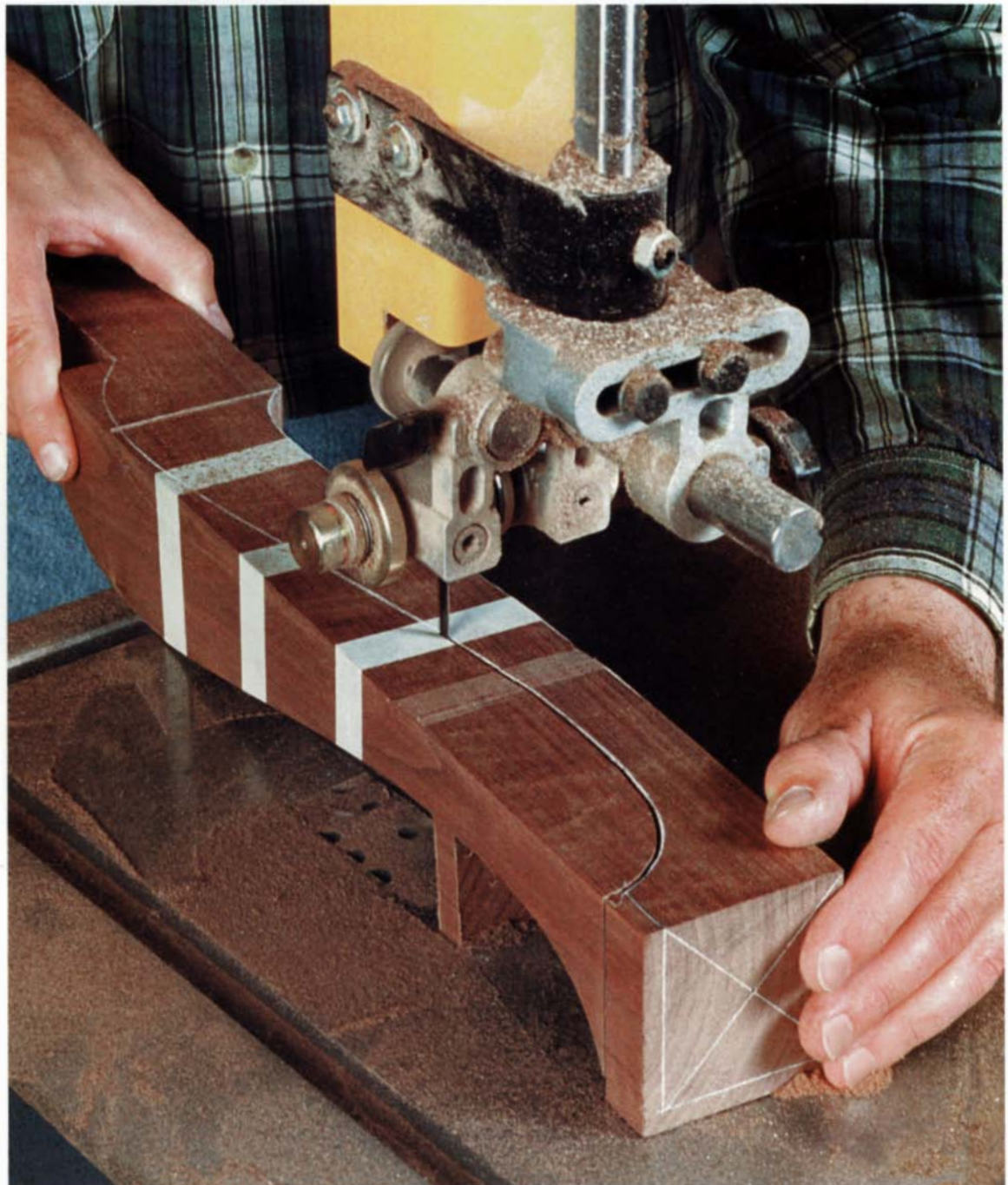
**Tips on planing
tricky grain**

**Finisher's guide
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**How to shape
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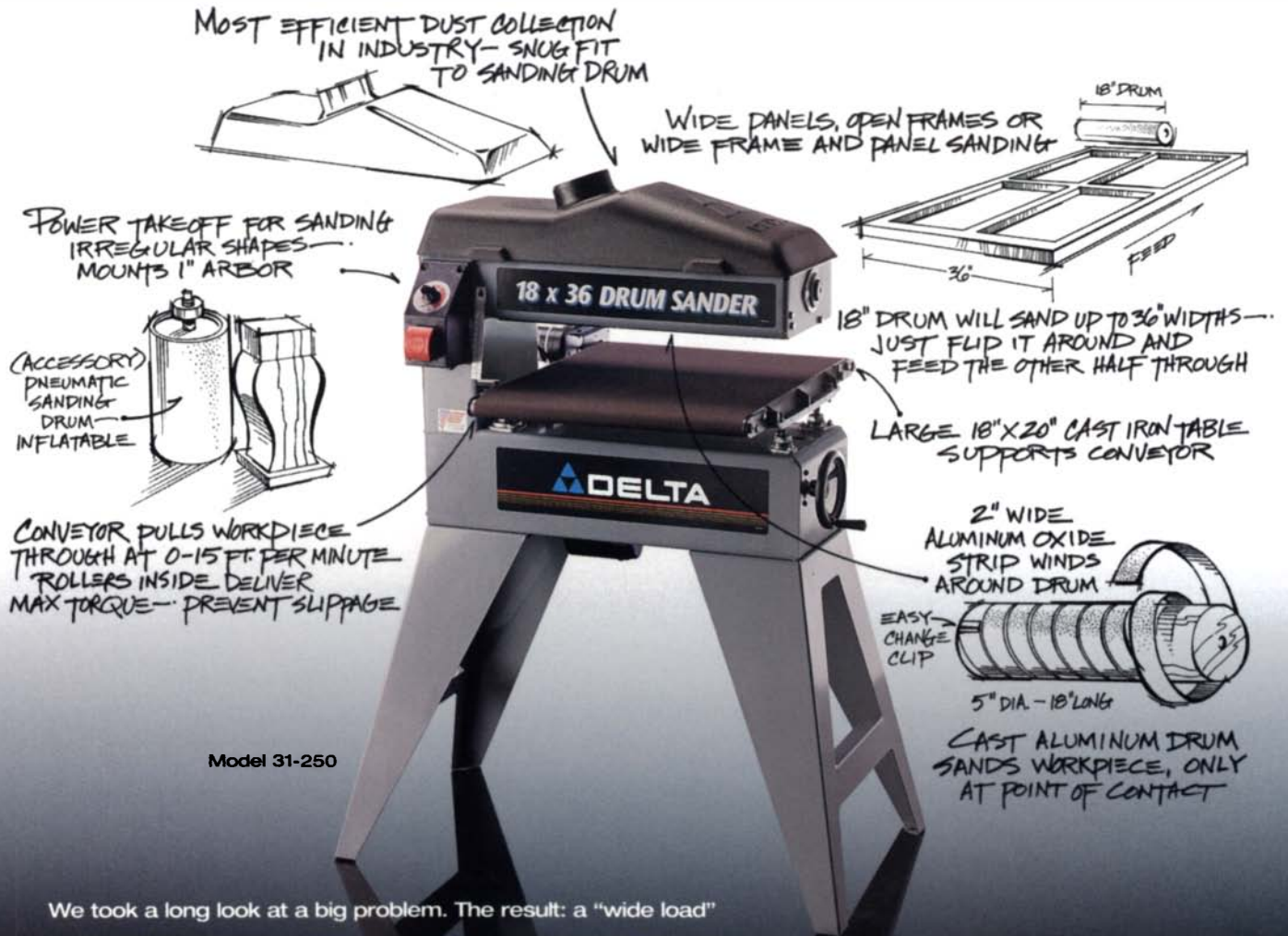
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Lonnie Bird specializes in 18th-century furniture and has made countless

reproductions during his 20-year woodworking career. His technique for making graceful cabriole legs is surprisingly simple. See p. 44

Photo: Matthew Teague



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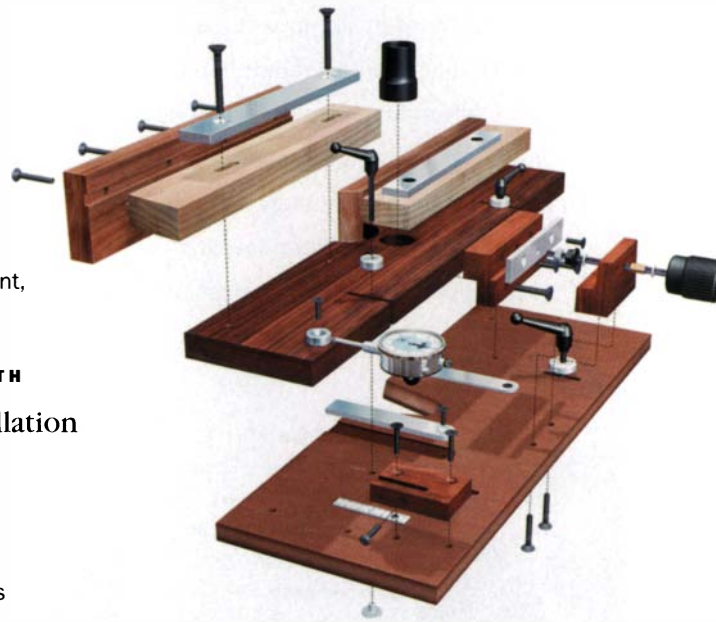
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These tablesaw add-ons handle crosscutting tasks up to full-panel width

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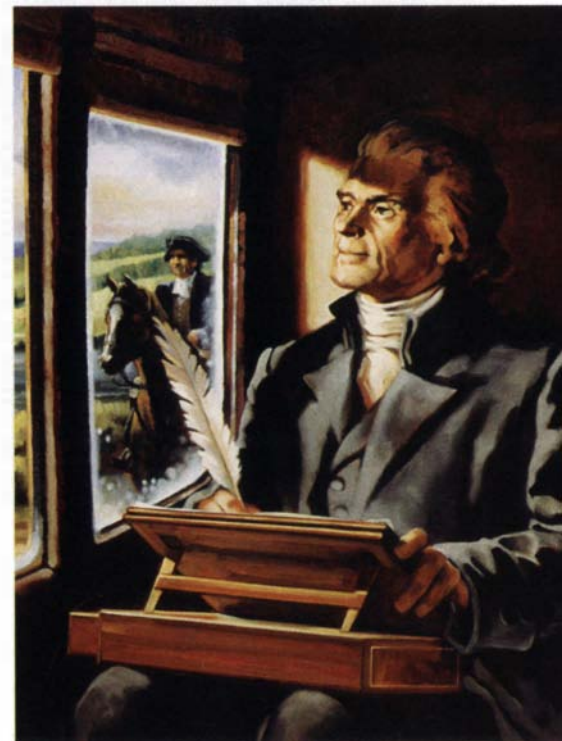
A master of period furniture teaches a diverse group the ins and outs of one of America's finest cabinets

BY ALLAN BREED

89 Micro-Adjustable Router Fence

Joiner's fence lets you creep up on a perfect fit

BY PAT WARNER



Thomas Jefferson's writing desk, p. 64

Contributors

Kelly Mehler (“Large-Capacity Sliding Tables”)

moved to Berea, Ky., in 1976 to study industrial arts at Berea College and stuck around afterward to set up shop as a furniture maker. Berea’s reputation for custom craftsmanship has drawn a steady stream of tourists past his storefront workshop for 20 years. Lately, when he’s not on the road teaching and demonstrating, he has been revising *The Tablesaw Book*, which he wrote in 1993 for The Taunton Press. Occasionally, he even finds time to work in the garden with his wife at their log house in the foothills of the Appalachians.



John Marckworth (“A Guide to Drawer Slides”) worked in computers “before they became so profitable,” then switched gears and started a woodworking shop in his basement. His one-man business hasn’t had an IPO, nor does he envision that



happening, but Marckworth doesn’t have any regrets. He has plenty of work building furniture and custom cabinets in the Port Townsend, Wash., area.

Self-confessed museum enthusiast and frequent *Fine Woodworking* contributor **Lon Schleining** (“Thomas Jefferson’s Writing Desk”) has traveled from his home in California to the Smithsonian Institution five times during the past year. He’s gone there, in part, to study the Jefferson Desk, one of the pieces featured in a book he’s researching and writing for The Taunton Press. The book is due out in the fall of 2001.



Allan Breed (“Nine Amateurs Build Newport Secretaries”) developed his eye for period furniture as an auction-attending teenager. After a stint in the furniture restoration department at Boston’s Museum of Fine Arts, he went into business for himself in 1976 and has been reproducing period furniture ever since. As a lecturer for museums and auction houses, he

specializes in the tools and methods of 17th- and 18th-century American furniture makers. And he is a consultant to furniture collectors.



J.K. (Keith) McMurtrey (“Dial Calipers”) came to woodworking by way of his love of music. In 1988 he took his first job in a luthier’s shop, where he made a bass guitar that he could use to

play in a band. He came to that job after five years as a tool-and-die maker in the automotive industry and six years as a machinist in the aerospace industry. He now serves as a shop supervisor for a guitar maker in North Carolina, where his dial calipers are indispensable for the detailed jigs that he designs and makes.

Curtis Buchanan’s (Master Class) gift for telling an engaging story is barely recognized in his home town of Jonesborough, Tenn. (pop. 3,000), which is also home to the National Storytelling Festival, an event that attracts some 12,000 listeners from around the world each October. Buchanan builds his Windsor chairs in the small, timber-frame shop he built behind his house.

He works almost exclusively with hand tools, bending the rule only for a bandsaw and a lathe. He occasionally gives chair-making workshops and is an instructor in a program that teaches greenwood furniture making to counter slash-and-burn agriculture.



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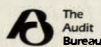
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Letters

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We're excited about the 25th-anniversary issue, which will add a seventh issue to our usual bimonthly publication.

The issue will be sent to subscribers and newsstands in November.

From the time you see the cover—a painting commissioned by us from an award-winning artist—you will know that this issue, celebrating two-and-a-half decades of craftsmanship, is unique. Inside, we'll have articles, profiles and essays on the high points of the last 25 years of woodworking.

You also have a chance to be in this special issue. We're looking for anecdotes and interesting woodworking stories and are asking woodworkers to answer (in 25 to 100 words) one or all of our short essay questions. We'll pick our favorite answers for the issue and post some of the others on our web site.

—How did you discover the craft of woodworking, and what has it meant to you over the years?

—Who taught you the most valuable lesson about woodworking?

—What kind of woodworking were you doing 25 years ago (1975), what was your experience level then, and what are you doing now?

—How did you discover *Fine Woodworking* magazine, and what has it meant to you over the years?

Send your answers, with your name and address, to *Fine Woodworking* Essays, 63 S. Main St., Newtown, CT 06470, or send them via e-mail to: fw25th@taunton.com.

—*Timothy D. Schreiner, editor*

Kudos for Current Work

As a charter subscriber, I congratulate you on the great new gallery of readers' furniture, Current Work. The color and pleasure of beautiful works of art might almost be analogous to the centerfold of another famous magazine. The effects are similar! Maybe you, too, can put this feature smack in the center.

—*Mark Patton, Dubuque, Iowa*

Is my tongue safely in my cheek?

I would like to join the pack of safety hounds baying at your heels. Photographs of folks using handplanes without eye, ear or dust protection are bad enough. But the thing that really chills my blood are the photos of people holding wood chisels in their bare hands. This is far too close to that razor edge.

The only way to safely pick up a chisel is as follows: First, install a grinder. Have the installation inspected and certified for safety. Run a fire hose to within arm's reach of the grinder. Don a hardhat, dust protection, face shield, welder's jacket, farrier's apron, steel-toed boots and welder's gloves. Now pick up the chisel and grind a minimum of a 1/16-in. roundover on the edge and corners. Lay the chisel aside for at least 24 hours to cool. During this cooling period, put away equipment, dust, vacuum and disinfect everything. Now you may pick up the chisel without gloves. Just keep that edge pointed away from all parts of your body.

—*Gordon Munger, Portland, Ore.*

Gluings-and-clamping article hit the mark

I am writing in praise of your recent article "Gluings and Clamping Strategies"

by Lon Schleining (*FWW* #141, pp. 44-50). The article was straightforward and practical. Gluing and clamping may be one of most challenging tasks I face daily. This article provided excellent tips. Please pass along my thanks to Mr. Schleining for a terrific article.

—*Kevin Davidson, Peoria, Ariz.*

Disagreements over router recommendations

I am sending you this letter of thanks for your recent article "Routers for Router

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Aug. 24-27: *FWW* founder Paul Roman and Editor Tim Schreiner will kick off our 25th-anniversary celebration at IWF2000 (International Woodworking Machinery & Furniture Supply Fair) in Atlanta at the Georgia World Congress Center. Managing Editor Anatole Burkin will scour the booths to find new tools. Info: (770) 246-0608; www.iwf2000.com. If you cannot attend, look for Burkin's daily "live" reports at www.finewoodworking.com.

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Letters (continued)

Tables" (*FWW* #142, pp. 86-89). I followed the directions and recommendations stated by the author, Patrick Warner. I chose to use the Porter-Cable model 690 in my router table, which is an extension-wing table mounted to my Delta 10-in. tablesaw. I also replaced the thumbscrew on my router with the aftermarket locking lever as suggested by the author.

The router performs flawlessly in the table adaptation, and I have simplified the changing of router bits even further by incorporating a quick-change collet device now available from one of your advertisers. Thank you very much for publishing this informative article.

—Douglas P. Webster, Newark, Calif.

There are many reasons why a plunge router [in a router table] is a better option [than a fixed-base router]. I have been using a DeWalt 621 plunge router in my router table for two years with great success. I couldn't imagine putting up with the hassles Mr. Warner goes through

to change bits and make adjustments. The plunging mechanism will not clog with dust while inverted. It also allows you to instantly drop the bit safely below the table surface, without fear of the router dropping out of its base. The depth stops and micro dial on plunge routers make for quick, accurate adjustments. The large tightening knob on the DW621 requires little torque and has never slipped.

Many good plunge routers share the same features as the DW621. I would urge anyone who's about to invest in a router and table not to dismiss the very versatile plunge-style router. Remember, your router doesn't have to stay in the table.

—Justin Allan, Annapolis, Md.

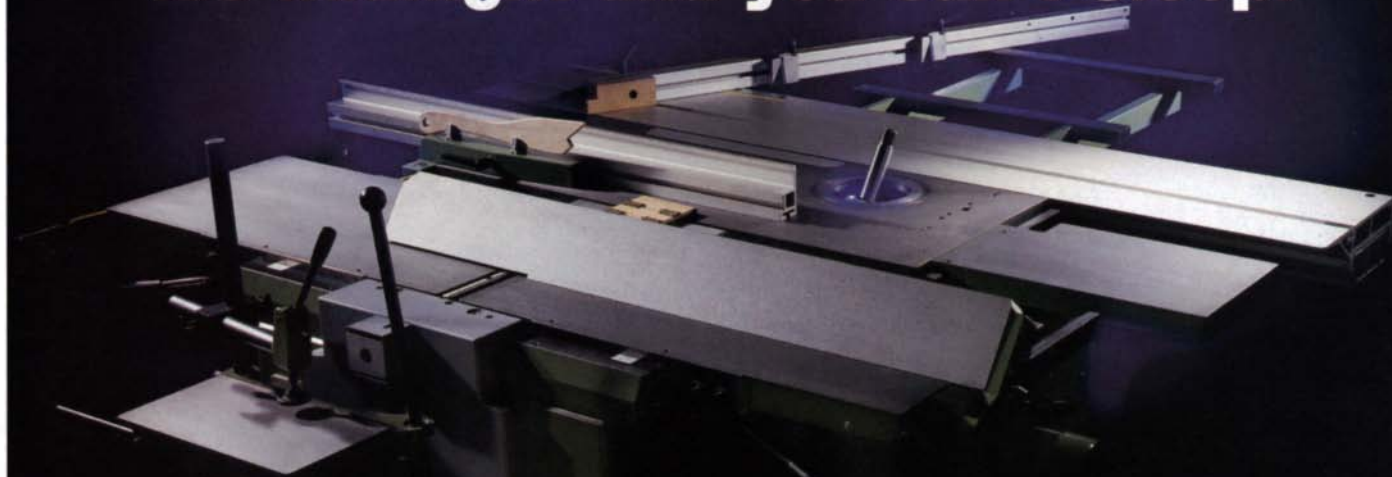
Given Patrick Warner's experience in woodworking and with routers specifically, I concede that he must be right. I just can't figure how! I opened his article expecting him to condemn the Porter-Cable model 7518 as an under-the-table router. Instead, he sings a song of praise. I own one, and have had two

motor-housing units replaced and one base unit replaced because dust and particles found their way into the spirals and subsequently scored the housing and the spirals. So serious was the scoring that the base unit would not adjust on the housing unit. Tool Crib of the North fixed the tool both times (thank you Porter-Cable, at company expense). After the second motor housing was replaced, I attached a Delta dust collector to my router table and used my air hose to remove dust before moving the motor cylinder. Guess what? After the first use, the housing was scored again. That was it. I used sandpaper to take the scoring out of the housing and stored the unit in my

Writing an article

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Letters (continued)

cabinet for infrequently used tools. I went back to Tool Crib and purchased a Porter-Cable plunge router (3-hp unit). It is not nearly as nice to use under the table, just as Mr. Warner explained. But I've not been back to the repair shop. There is more. Two plastic motor shrouds have been broken on the model 7518 after a broken 1/4-in. bit fell through the tabletop and through the air-breather holes on the motor housing near the collet. Seems to me an engineer could make those holes just small enough to prevent common bits from falling in when they break.

—Ken Christianson, Fargo, N.D.

Happy to see more hand tools

I subscribed to your magazine for about the first 10 years and stopped in the mid 80s when you seemed more interested in machine work than handwork. I understand that the machinery companies are probably your big advertisers, but I would appreciate your efforts to focus as much attention to hand woodworking articles as possible.

I got a trial issue (#142) and was very pleased to read articles like end tables made with hand tools (pp. 49-55), tuning up a coffin plane (pp. 106-110), sunlight on wood (pp. 44-45), the wood feature on sweet gum (pp. 56-59) and the gallery of readers' work (pp. 90-93).

I'm subscribing again in hopes of a more balanced publication than when I stopped reading your magazine a decade-and-a-half ago.

—Martin Gates, Micanopy, Fla.

Ingenious workbench

In reference to the December 1999 article "New-Fangled Workbench" (FWW #139, pp. 98-101), I would say right up front that author John White is a genius.

He has taken a few pipe clamps and designed a workbench with more versatility than any workbench I have seen in 30 years of perusing woodworking publications of all kinds. He certainly shows original thinking of genius level.

The beauty is the simplicity of its

design, but realizing maximum utility at an unbelievably low cost.

The word "fangled" (I think it should be "finagled") is a bad choice of words that does not convey the simplicity of the design and smoothness of operation.

I can't wait to build mine. Thank you, John White.

—Wallace A. Hurd, Fairhope, Ala.

About your safety

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

—Timothy D. Schreiner, editor

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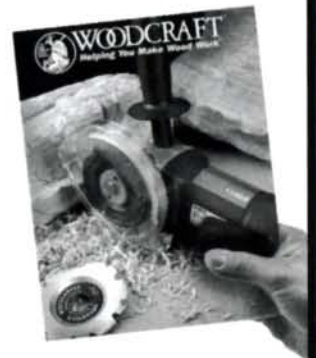
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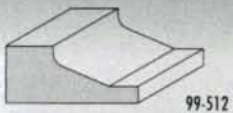


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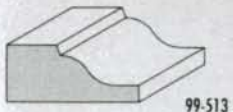
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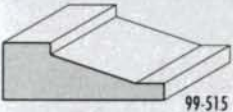
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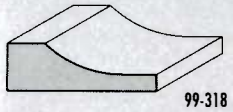
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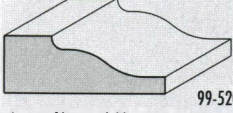
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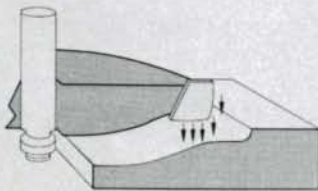


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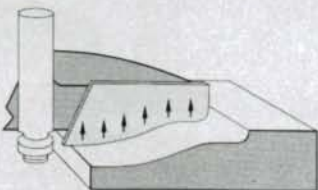


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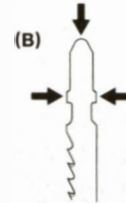
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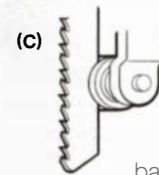
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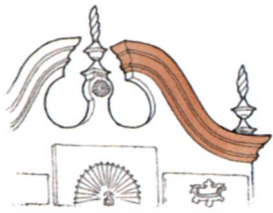
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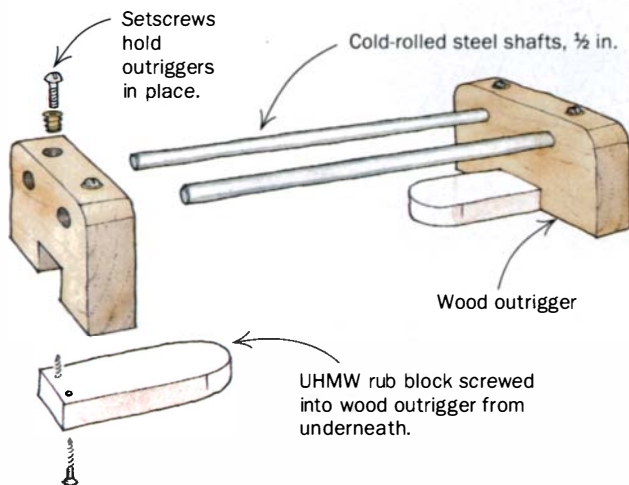


Shaping curved molding

For the past two years I've been working on a Queen Anne highboy similar to the one described by Randall O'Donnell in *FWW* #117-119. When the time came to work on the gooseneck pediment molding, I found that his approach (requiring custom-made router bits) was too expensive for my one-off project. So I came up with this inexpensive, easy-to-build router carriage that will follow curved or straight stock and shape complex, curved molding in a few steps using ordinary router bits.

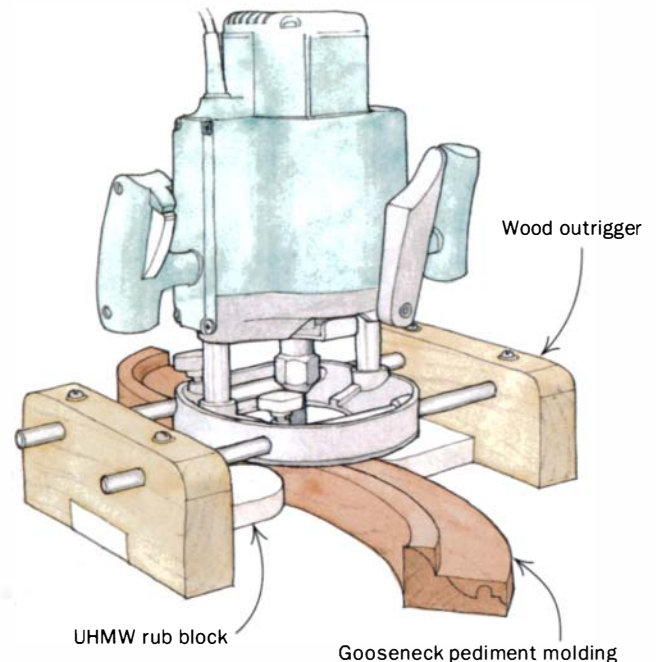
The carriage consists of two mahogany outriggers fitted with round-nosed ultra-high molecular weight (UHMW) polyethylene rub blocks. (UHMW is available from most mail-order woodworking tool suppliers.) My plunge router rides between the two outriggers on a bridge made from ½-in. cold-rolled steel shafts.

Because the guide rods that came with my router were metric and slightly too short, I enlarged the holes in the base to fit the new



½-in. guide rods. I cut the outriggers to size, stuck them together with double-faced tape and carefully drilled holes through the pair to receive the new guide rods. Then I notched the outriggers and attached the UHMW rub blocks in the notches with screws.

To use the carriage, I cut two molding blanks with a bandsaw to rough shape, stuck them together with double-faced tape and sanded the pair to a uniform width. With the blanks prepared, I stuck them to my benchtop with double-faced tape. With the carriage placed over one blank, I adjusted the rub blocks to fit the material's width, then locked the outriggers into position with setscrews. I then made a dry run to be sure there was no binding along the way.



Shaping the molding was simply a matter of making a series of cuts with various bits to define the profile. The rub blocks will follow either a curved or a straight section. The bit can be adjusted up or down or moved side-to-side on the guide rods to make any cut your imagination and your selection of cutters will allow.

I recommend that you shape curved and straight sections at the same time with each setup. A bit of hand scraping and sanding will probably be necessary when the routing is done. If you're careful, the miters between curved and straight profiles will match perfectly.

—Richard C. McLean, Scio, Ore.

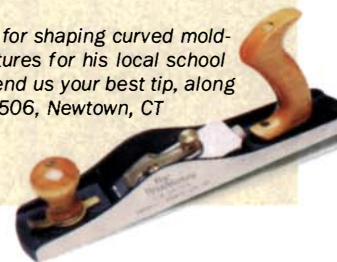
Fence-setting jig

There are times when you need the fence and the miter-gauge slot on a router table or a shaper to be perfectly parallel with each other, such as when you are coping the end grain of rails in paneled-door construction. This jig (see p. 20) lets you make small, incremental adjustments to the fence while ensuring that the fence remains parallel to the miter-gauge slot.

Start with a squared-up board about 4½ in. wide and 20 in. long. Cut the board lengthwise at about 6°. Attach one side of the board to a 2-in.-wide strip of ¾-in. plywood that has been pushed into the miter-gauge slot in a vertical position. Now remove a semi-circular area where the jig lines up with the cutter. Draw marks ½ in. apart on one side of the taper and draw a reference

A reward for the best tip

Richard C. McLean won an engraved Lie-Nielsen handplane for this issue's winning tip, a carriage for shaping curved molding. He plans to retire soon, after working for nearly 40 years repairing antiques and building fixtures for his local school district. McLean has been inspired only recently to build reproductions of 18th-century furniture. Send us your best tip, along with any photos or sketches (we'll redraw them) to *Methods of Work*, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506.



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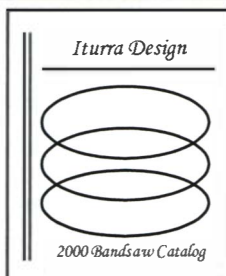
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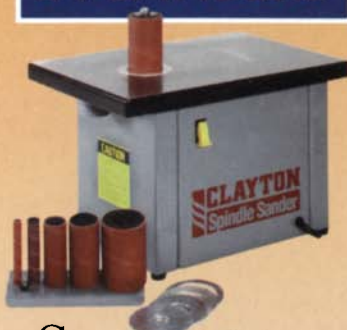
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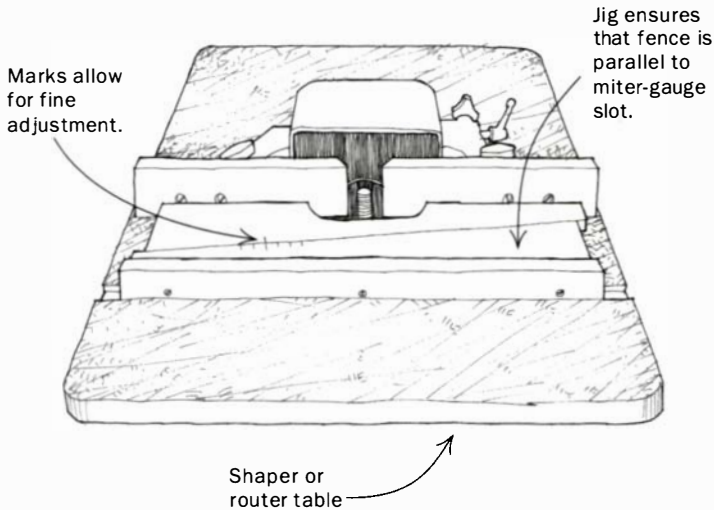
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Methods of Work (continued)



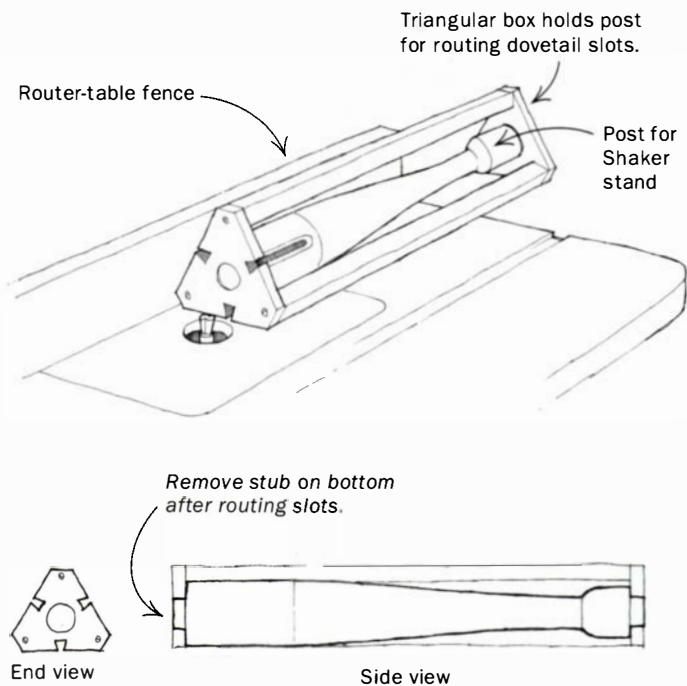
mark on the other. A movement of $\frac{1}{2}$ in. left or right should translate to just under $\frac{1}{16}$ in. in movement forward or backward in the fence. With this jig and the reference marks, it is easy to set the fence to make progressively finer cuts.

—Bjarn Sorensen, Tempe, Ariz.

Quick tip: Wood filler made with sanding dust and polyurethane glue gives a much better color match and takes the stain better than filler made with yellow glue. Clamp wax paper and a scrap of wood over the repair to prevent the filler from foaming out.

—Jack Kashtan, Sacramento, Calif.

Routing dovetails on turned posts



When I finally decided to make Christian Becksvoort's round Shaker stand (*FWW* #110, pp. 70-73), I used a different technique

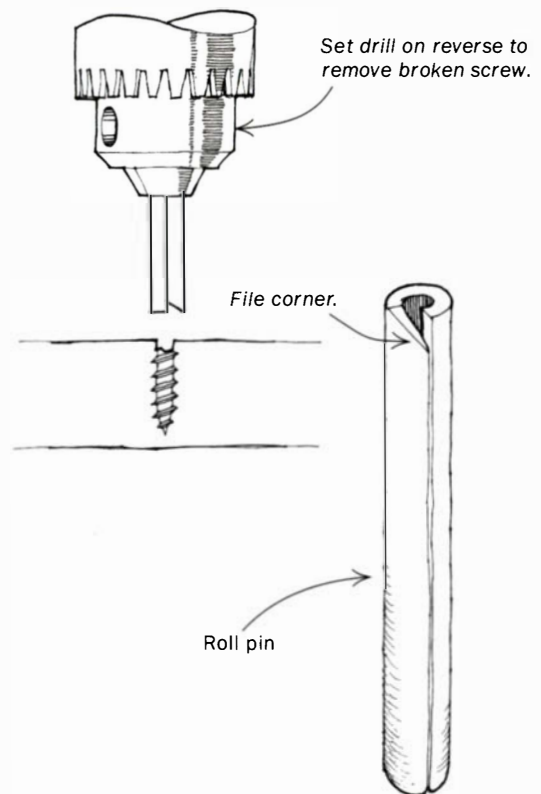
for cutting the sliding dovetails into the base of the post. The usual approach is to index the post between centers on the lathe and build a box above the lathe ways that allows a sliding router to cut the dovetails. Being a one-armed woodworker, I didn't feel comfortable with this approach.

Instead, I made a fixture that is basically a triangular box. The post is locked into the box by stub tenons turned on both ends of the post that fit tightly into holes in the triangular ends of the fixture. I cut the dovetails by sliding the fixture along the router-table fence, then I remove the stub tenon on the bottom of the post.

To cut the slots, I used three router bits: A $\frac{3}{4}$ -in. straight bit to mill a flat (the base of the turned post protrudes slightly from the triangular box before you make this cut), a $\frac{1}{2}$ -in. straight bit to hog out the bulk of the waste and, finally, a dovetail bit to rout the dovetail slot. It is essential to use a stop block to control the length of the router-bit cuts. This jig is less trouble than a lathe jig and just as accurate and convenient, even for woodworkers who have two arms.

—Leslie Davis, Tottenham, Ont., Canada

Roll-pin screw extractor



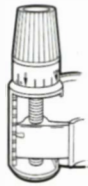
Have you ever tried to drill out the stub of a broken screw from your prized project, gone off center with the drill and ruined the surrounding wood? Or tried to dig it out with an awl? Or bought an expensive left-hand drill bit to try to back out the broken piece?

Here is a cheap and easy way to avoid these nightmares. Take an ordinary hardware-store roll pin and file off one corner at the seam to make the pin into a left-hand drill bit. Install the pin in your drill, set the drill on reverse and drill around the broken screw. Roll pins are commonly available in sizes of $\frac{1}{8}$ in., $\frac{3}{16}$ in. and

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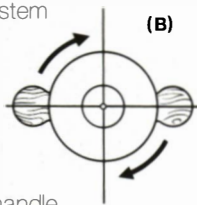
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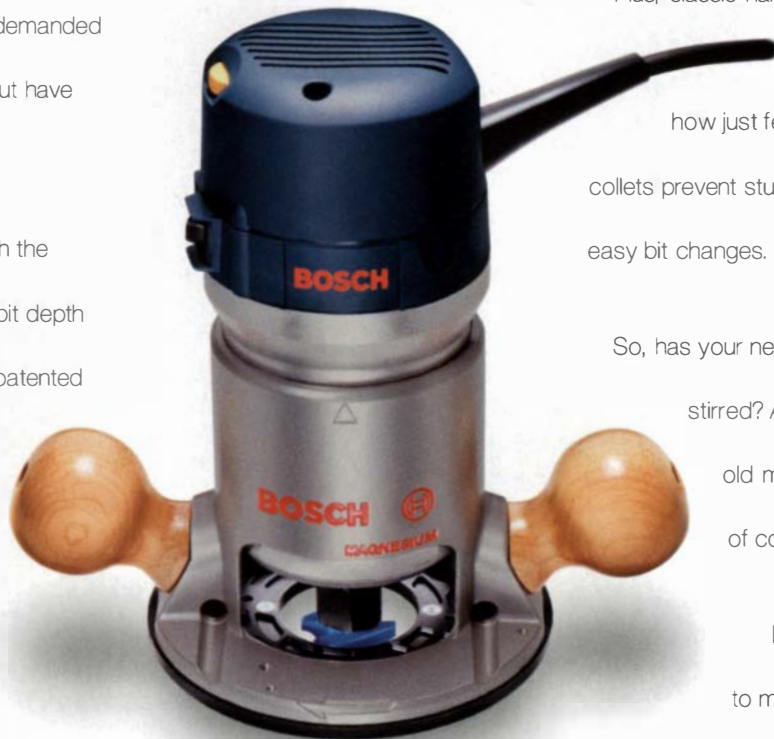
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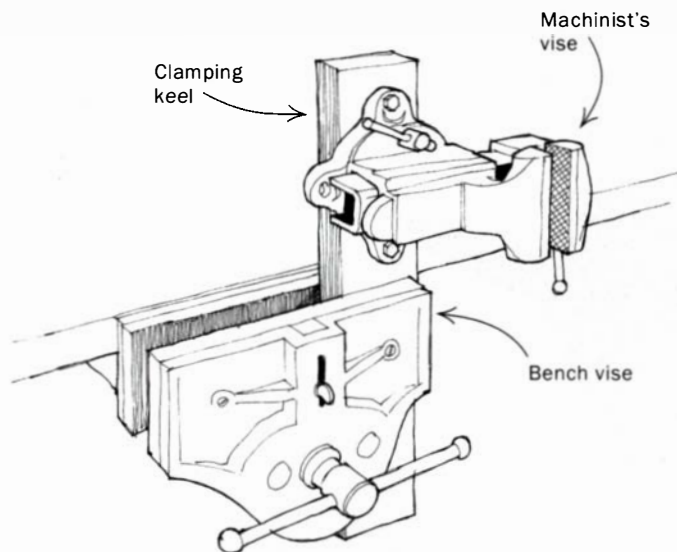


Methods of Work (continued)

¼ in. The ¼-in. pin will drill a nice, clean hole that you can fill with a plug. The smaller sizes will usually drill down about halfway onto the screw shank, then catch it and back it out completely.

—William Tiemeyer, Cincinnati, Ohio

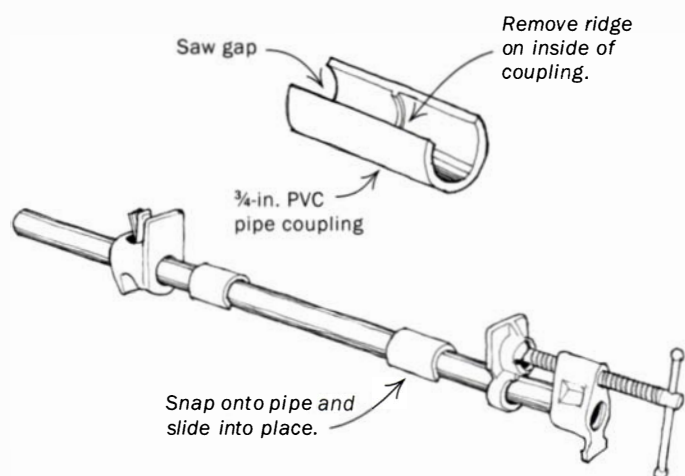
Clamping keel for a machinist's vise



When I needed to change the clamping orientation of some panels I was sanding, I attached a 2x4 keel to my machinist's vise, clamped it in my bench vise and reoriented the workpiece as shown in the sketch. This dual-vise arrangement worked so well that I've used it for other jobs. It provides an endless variety of holding angles, is quick to set up, costs nothing and makes good use of my machinist's vise, which needed a good dusting anyway.

—James J. Rankin, Easton, Pa.

Pipe-clamp stain protectors



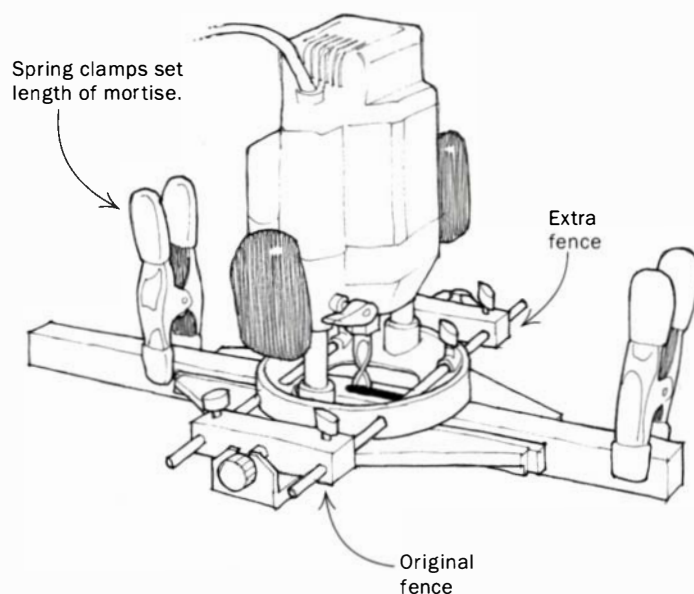
Tired of having your pipe clamps stain your work where the pipe contacts a glue joint? Here is a way to avoid the problem. Purchase several schedule-40 PVC pipe couplings for ¾-in. pipe or ½-in.

pipe, depending on the size of your pipe clamps. Be sure to get the white PVC fittings: The beige ones won't work.

With a bandsaw or a hacksaw, cut away approximately one-third of the coupling to leave a gap in the circumference. Remove the small ridge inside the coupling with a small sanding drum or a sharp chisel and mallet. Sand the rough edges and snap two of the protectors onto each pipe between the clamp ends. Slide the protectors into position where they are needed.

—Jay E. Rubel, Atlanta, Ga.

Two-fence router mortising



By adding an extra fence to your router, you can cut mortises quickly and accurately, and you virtually eliminate the risks of the router wandering or tipping into the cut. Start with a router that has a substantial fence equipped with a threaded micro-adjustment mechanism. Buy a second fence and attach it to the rails, extended through the router base so that it faces the original fence. Sandwich the workpiece snugly between the two fences, and make the necessary micro-adjustments to align the bit with the desired mortise location. Trial cuts on a scrap piece can best confirm the correct alignment. Attach spring clamps to the workpiece to limit the router's travel, and set the length of the mortise.

To cut the mortise, raise the bit from the work, turn on the router and move it back and forth in the plunge cut until you reach the desired depth. I prefer a spiral up-shear bit for mortising because it clears the chips better than a straight bit does.

This dual-fence arrangement works well when I have to make a series of in-line mortises for Shaker or Mission-style furniture. When mortising close to the end of a workpiece, such as the top of a leg, clamp two legs together in the vise end-to-end to provide more support for the router. —Mandy Kotzman, LaPorte, Colo.

Quick tip: To eliminate that gummy, sticky feeling when sharpening a chisel on a waterstone, add a couple drops of paint thinner to the water. Presto! The blade will glide smoothly over the stone.

—R. J. Fowler, New Westminster, B.C., Canada



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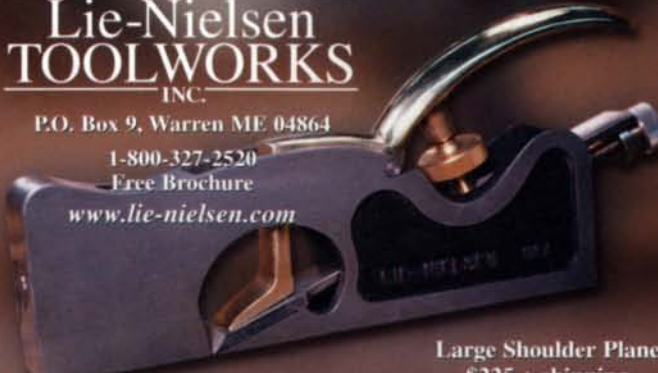
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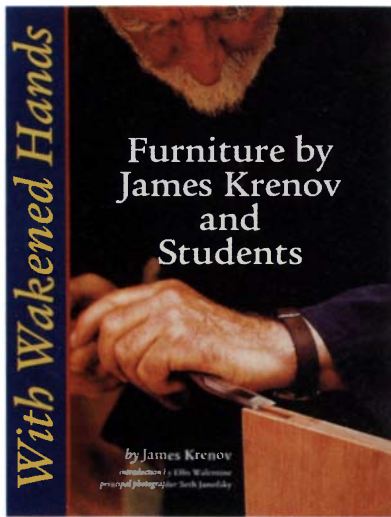
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Notes & Comment

Krenov showcases student furniture



With Wakened Hands—Furniture by James Krenov and Students by James Krenov. Cambium Press, Bethel, Conn. (800-238-7724); 2000. \$39.95, hardcover; 125 pp.

The cabinets James Krenov has built over the last 45 years—and the four books he published between 1975 and 1981—have earned him a place among the most influential furniture makers in the world. But in recent years he's devoted at least as much energy to something else: For the last two decades Krenov has been teaching furniture making at the College of the Redwoods, a community college in Fort Bragg, a small town on the California coast north of San Francisco. Students from across the country and around the world compete to make the pilgrimage to Fort Bragg and spend nine months in a class of 23 learning Krenov's approach to the craft.

The program attracts very talented students and imparts a rigorous education in hand-tool and machine use while providing an immersion in Krenov's philosophy of design and craftsmanship. One thing his school can't provide is assurance that the students will be able to make a go of it as cabinetmakers, and this has always bothered Krenov. His new book, *With Wakened Hands*, is an attempt to accomplish what he describes as his "last task on the planet"—to find a public for work by his students.

I don't know if the book will succeed in

finding that public and stimulating sales, but it does make a beautiful presentation of some very impressive work by those who have studied under Krenov. The photography, nearly all of it by Seth Janofsky (himself a former Krenov student with some fine cabinets in the book), is consistently of high quality. The shots of finished work are clean and functional, dependably capturing the angle that tells the most about the piece. The book's design, too, is clean and uncluttered and together with the photography creates a strong, clear presentation of the furniture.

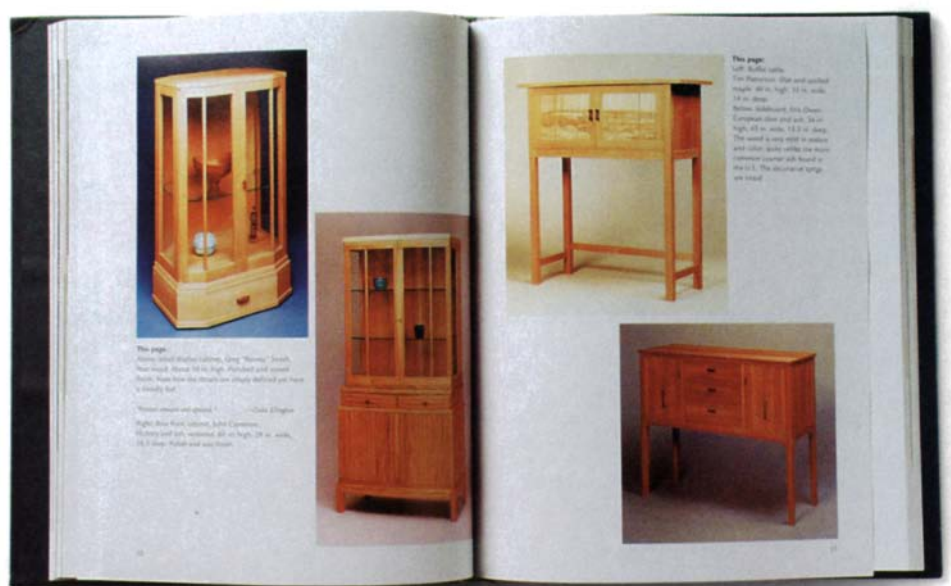
The book contains work by some 63 students (out of a total of about 340 who have gone through the program since its inception in 1981) and a handful of new cabinets by Krenov himself. Those who have claimed over the years that work by Krenov's students looks just like Krenov's will have their opinion both confirmed and refuted by *With Wakened Hands*. The furniture in the book divides neatly in half, with one half bearing a strong resemblance to Krenov's work and the other half being only loosely connected or seemingly not connected at all. One thing that ties all of the pieces together is impeccable craftsmanship, and this is high tribute to a program that often accepts students with little or no background in the field. Most of the work also exhibits subtle detailing and a

refined sense of design. Among the many fine pieces, there are a dozen or more truly outstanding ones here, enough to make the book worth buying even if you have little interest in the school.

The loosely connected essays Krenov has written to accompany the photos provide a brief tour of the program and its philosophy. Although there are characteristic flourishes of Krenovian insight and self-revelation, the text never reaches the depth of the writing in his early books. It is a bit like being shown around by flashlight: With glances in a number of directions, you eventually get a pretty fair idea of the program's overall shape and character, but you never see the whole thing illuminated. The photos of student work, however, are the heart of the book, as they should be.

At one point Krenov, who turns 80 this year, describes his own workshop at the school as "a little hideout in one far corner of the building. There is a sign on the door that says, Please knock. There is a great deal of knocking, which I enjoy. There I am tucked in the corner, an old guy, and I am still needed. ... I am not on the scrap heap." Indeed, he is not. The school and the work of its students comprise one more major achievement for Krenov.

—Jonathan Binzen is a freelance writer and editor.



Krenov students find a home for their work. After years of teaching, Krenov is attempting to achieve what he calls his "last task on the planet," finding an audience for his students' work.



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Notes & Comment (continued)

FWW gives award at Philadelphia show

Minnesota woodworker Richard Helgeson, 45, won Best New Artist in Wood at this year's Philadelphia Furniture and Furnishings Show. The award, sponsored by *Fine Woodworking*, was judged and presented by Tim Schreiner, editor of the magazine. Helgeson was a carpenter and remodeler until he discovered furniture making and design 10 years ago. He studied furniture making at Rycotewood College in Thame, England, and returned to open his own shop in St. Paul. He has won several awards at the annual Northern Woods Exhibition in the Twin Cities. The Philadelphia show, in its sixth year, attracted 250 juried exhibitors and about 10,000 attendees. Virginia woodworker Michael Maxwell won the \$500 Value and Versatility award for his original designs. North Carolina artisans David Merrifield and Angie Bell won the Best of Show award for their intricate metal and wood cabinets.



Tim Schreiner

Best New Artist in Wood. Richard Helgeson's bedside tables, made of dyed quilted maple, beech and anodized aluminum, were among the many pieces he had on display at the Philadelphia show.



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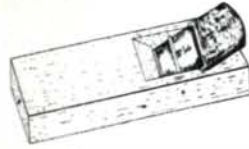
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READER SERVICE NO. 6

The Furniture Society meets in Toronto

The Furniture Society recently held its fourth annual conference in Toronto. I had the chance to attend the first half of the three-day show and was quite impressed with the caliber of the speakers, the crowd and the furniture. The conference featured an exhibit of members' work and an extensive array of lectures and panel discussions, as well as hands-on demonstrations.

The crowd was a mix of almost 400 makers, designers and furniture aficionados, with tastes that leaned toward the artistic but varied from industrial to traditional. Nowhere was the diversity more apparent than at the "slide wars" that finished out the first day's events and where anyone present was allowed to show their work. The response was supportive, and I got the sense that The Furniture Society was establishing exactly what they set out to establish—a community to foster and promote studio furniture.



Hands-on demonstration. Among the many lectures and discussions, Garrett Hack demonstrates using a scratch-stock for the crowd.

Next year's conference is scheduled for July 2001 in Tempe, Ariz. Those interested in joining The Furniture Society or attending the 2001 conference can contact the society at (804) 973-1488.

—Matthew Teague is an associate editor.

Wood webs

It's no longer a novelty to buy tools, wood or plans over the Internet. And thanks to a variety of web sites entering the fray, it's now getting a lot easier for woodworkers to sell their work over the Internet as well. Here are three sites worth a look:

www.custommade.com

Looking to connect with customers via the Internet? For less than \$100 you can set up a no-frills home page showing a couple pieces of furniture and have an e-mail link and a web link to your own site, if you have one. Yearly membership is only \$20.

www.functionalarts.com

Representing several dozen juried furniture makers, this site is a true e-gallery: It manages all sales, forwards a 30% deposit to the furniture maker on orders placed, takes care of shipping and keeps 30% of the sale price. User-friendly and customer-oriented, the site shows furniture and related accessories only.

www.guild.com

Also an e-gallery but for fine arts (jewelry, paintings, sculpture, etc.), not just fine furniture, the site incorporates all the features of a conventional art gallery to attract patrons—paid membership, special exhibitions, a catalog, gift shop and book store.

—Tony O'Malley is a furniture maker, editor and writer in Emmaus, Pa.



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An advertisement for the ECOGATE dust collection system. It features a close-up of a dust collector with a circular opening and a sensor. The text "Fully automatic dust collection system" is written in a curved path around the opening. The word "ECOGATE" is prominently displayed in large, bold letters. Below the image, there is a detailed description of the system's functionality and contact information.

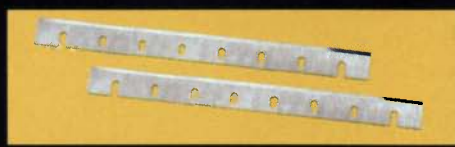
The ECOGATE System is a revolutionary idea in dust collection. When a machine is turned on, a sensor signals the controller to open the appropriate gate and turns on the dust collector. When the machine stops, the gate closes. Our larger model monitors the usage of all machines in your shop and continually optimizes the amount of power supplied to your dust collector. And that generates dramatic savings. We are going to demonstrate the ECOGATE System at IWF 2000 in Atlanta (on August 24th through the 27th). Our booth number is 26421.

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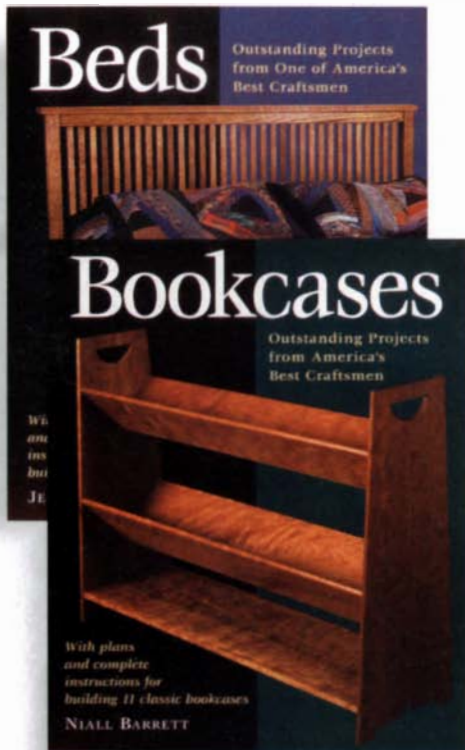
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READER SERVICE NO. 254

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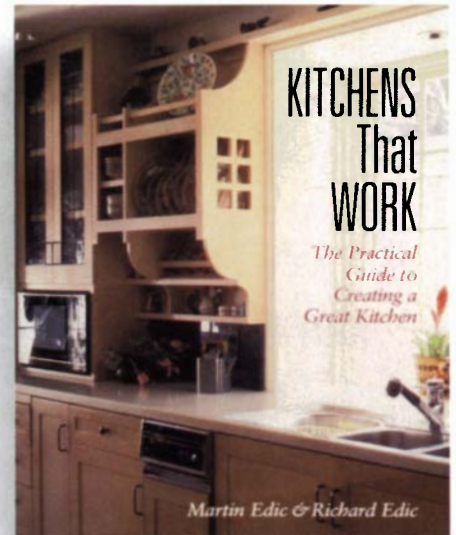
Bookcases

Outstanding Projects from America's Best Craftsmen

by Niall Barrett

Bookcases contains 11 attractive projects, covering a range of styles and levels of difficulty. Plus a chapter on general construction strategies, how to determine practical shelf lengths, and methods of hanging shelves.

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82 DRAWINGS, ISBN: 1-56158-303-0, PROD # 070431,
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Kitchens That Work

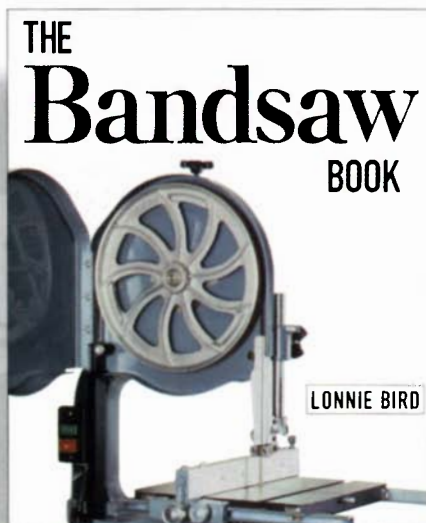
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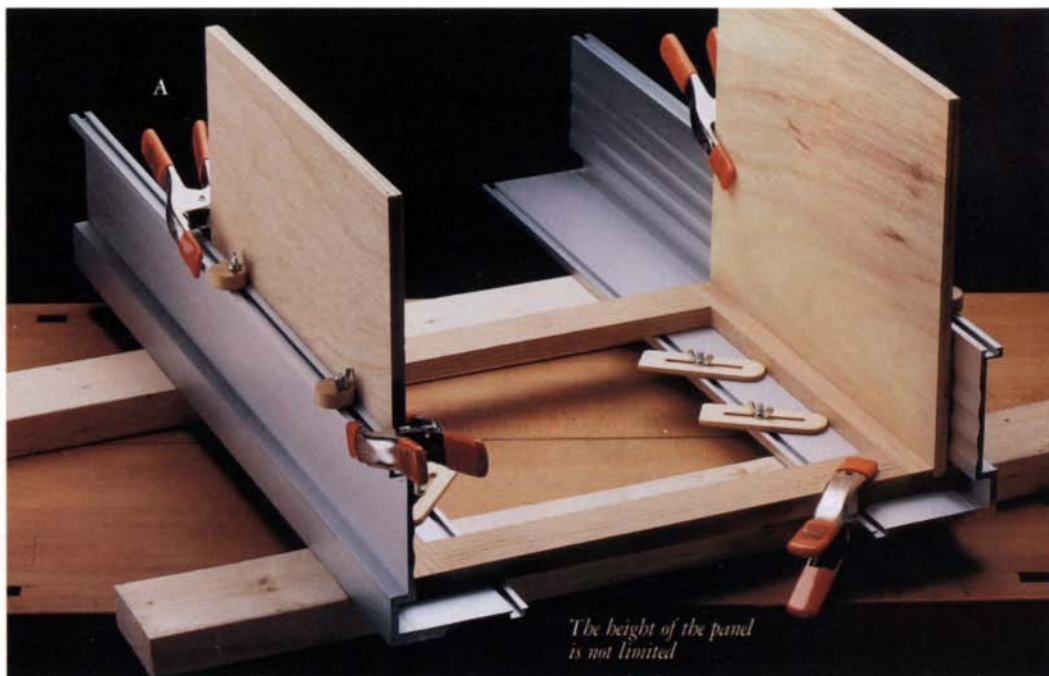
Garrett Wade Gives You a Hand

A / Our Universal Assembly Jig Is Ideal – It's A Cabinetmaker's Third Hand

Our long experience with this tool reinforces our appreciation of its incredible range of application – in the shop or on the job site. *It allows true, one-man case assembly work with machine square accuracy, and gives you confidence where it would otherwise be virtually impossible.*



Shown in assembled model as well as the parts that come with the kit.



The height of the panel is not limited

When assembling cabinets, face frames, drawers or boxes, you really need something to hold the stock in place while checking squareness and during glue-up. The Universal Assembly Jig fits the bill perfectly. Unique to this Jig is the built-in offset in the corner that makes it exceptionally useful for kitchen cabinets. Detailed instructions show you exactly how to fabricate beautiful, finished square corners with this innovative tool.

This Jig can also be used to hold very long pieces vertically, like bookshelf sides (of virtually any height) while you fasten them in place. This practical lack of a height restriction gives the Jig exceptional additional utility.

Extra-heavy (8 lbs.) extruded, anodized (non-staining) aluminum, it is a massive 3/8" thick and 30 1/2" long. Sides measure 4 1/2" and 6". Two Adjustment Cams and two Position Clamps are included. Other clamps needed are common shop clamps (spring clamps, bar or pipe clamps etc.).

One Assembly Jig will do the job, but two are much more handy, and more economical. We highly recommend this tool. Patented.

14B01.01	Assembly Jig (each)	Regular	Sale
14B01.10	Set 2 Assembly Jigs	\$ 89.95	\$139.95

B / Scale Model – An Ingenious Cabinet Building System

Developed by two old-world German cabinetmakers living in New Jersey, the Donmar-Wiesing cabinet building method is an ingenious system, and was the inspiration for the Universal Assembly Jig. This 1/4" scale model, along with its instructions, illustrate this unique technique. Once you learn this method, you can apply it to any type of casework – furniture, desks, chests etc. Everyone from the most experienced casework builder to the novice woodworker will gain new skills quickly.

05N19.01	Casework Scale Model	\$24.95
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C / Premium Float Glass – An Accurate Affordable Surface Plate

Ordinary black silicon carbide sandpaper pasted to a very flat surface can accurately true the soles of hand planes and quickly flatten the backs of chisels and plane blades. Plus, you can use the same technique to resurface your stones

Traditionally, surface plates made of iron or stone, were quite expensive – and heavy. In contrast, "Float Glass" is an industrial product that is extremely flat, parallel sided, stable and reasonable in cost. Not to be confused with ordinary glass. Premium "Float Glass" is made by floating molten glass on a molten tin bath. Both Plates are 1/2" thick and 4" wide. Sizes shown are overall length. Edges are beveled. (Sandpaper not included.)

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D / Traditional Wood Coloring Techniques For Quick Antiquing

Bichromate of Potash is one of the most important chemicals historically used in woodworking. Rather than dyeing the fibers or using pigment particles, it reacts with the natural tannin in the wood. The depth of color achieved is stunning. Oak (with its rich golden browns) and Mahogany (with its rich "Georgian" reds) are two woods which respond very well.

See the review in *Fine Woodworking Magazine*, Feb. 2000 issue, page 130.

It comes as a powder and can be mixed with warm water in varying strengths to produce varying color intensities. (Note: Bichromate of Potash is Toxic. Read instructions carefully and use a mask and gloves when handling.) Natural Van Dyke Crystals have also been a favorite for centuries – not only to color but to shade or darken selected areas on wood surfaces. Just add warm water to the desired strength.

99P61.08	Bichromate (8.8 oz)	\$13.25
99P61.34	Van Dyke (8 oz)	\$11.95

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READER SERVICE NO. 222

Tools & Materials

Expand the capabilities of your router table



Turn a router table into an inverted pin router. The Veritas pin-router arm is perfect for intricate template work.

Lee Valley's new Veritas pin-router arm offers a small shop the capabilities of a pin router at an affordable price. If your woodworking involves the repetitive cutting or shaping of contoured parts, a pin router is the tool of choice.

The pin-router arm is made of solid extruded aluminum and has a throat capacity of 12 in., which allows for routing to the center of 2-ft. material. Although it is designed for mounting to the Veritas steel router table by means of two arm clamps (supplied), it is easily mounted to any router table. To avoid drilling into my tabletop, I mounted the arm to a piece of medium-density fiberboard (MDF), which

I then clamped to my table. I would like to see one more mounting hole at the back of the arm, which would create a triangular bolt pattern, a more beefy configuration.

The arm is aligned concentric with the router collet by the use of a supplied centering pin. I was easily able to align the unit quickly within 0.02 in. of concentric by following the instructions. Even more accurate alignment was possible when I took the time to tap the MDF mounting plate gently in the desired direction.

To get in and out of enclosed regions of a workpiece easily without drilling access holes, Veritas offers a router-bit jack, which raises and lowers the router via a foot paddle while allowing you to keep both hands on the workpiece. It's not necessary to order the jack, but I think it unleashes the true potential of the pin-router arm, and I recommend it, too.

If you are going to build a new router table for the pin-router arm, I suggest making the tabletop approximately 38 in. to 42 in. tall to make it more ergonomic for template work. I also suggest incorporating some type of dust collection.

The Veritas pin-router arm sells for \$125, and the Veritas router-bit jack costs \$57.50. For more information, call Lee Valley Tools (800-871-8158) or visit the company's web site (www.leevalley.com). —Rob Tobias

Aftermarket safety switch for woodworking machines

It's not often that the power goes off unexpectedly in my shop. But big storms happen. And I've stalled the motor on my tablesaw more than once by pushing thick stock through too fast. Unless I turn off the saw's switch, it suddenly will come on the moment power is restored, which is a safety hazard. A new accessory, the Sensing-Saf-Start, brings woodworking machine switches up to the standards of the Occupational Safety and Health Administration (OSHA), which requires that equipment not automatically restart after a power interruption.

The Sensing-Saf-Start is wired between the outlet and a machine's on/off switch (some machines come with this safety feature already included; check your owner's manual). If power is interrupted, the switch prevents a machine from restarting until the user presses a reset button. It takes only a few minutes to install the switch, and it works as advertised. Units are available for both 120- and 240-volt (single-phase) tools and cost about \$75. For more information, call the manufacturer at (916) 933-2699. —Anatole Burkin



An extra measure of safety. If power is interrupted, the Sensing-Saf-Start switch must be reset before a tool will run.

Tool briefs

Sears beefs up Craftsman pro line

Sears unveiled a number of woodworking tools this summer for the recreational and professional markets. Of note are a 13-in. portable planer (\$389.99), a mortising machine (\$199.99, without bits and chisels) and two variable-speed drill presses. Sears also showed an upgraded version of its 10-in. cabinet saw, which



Sears introduces a 13-in. planer. The new benchtop planer will retail for under \$400.

now comes with a 3-hp motor and 52-in. fence rails. On top of that, Sears lowered the price from \$1,499 to \$1,299. The cabinet saw is available by catalog only; call (800) 377-7414 for a copy.

Pro cordless line

The pro line of Craftsman cordless drills now offers choices ranging from 9.6 to 24 volts. All drills have 24 clutch settings and two speeds. They range in price from \$119.99 to \$269.99. The pro-line tools are made to recharge 300 cycles (as opposed to 150 cycles for the standard line), and tool life is expected to be three times that of the standard line.

An innovative sander

The Craftsman tool that has everyone's attention is a German-made electric

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Crank Ergonomics We positioned the blade elevation crank with plenty of hand clearance to make blade-height adjustments quick and easy. Accurate blade-angle adjustments are also easy thanks to the large, adjustable bevel scale and the graduated bevel crank (each revolution equals a 2° adjustment).

Switch Ergonomics The large, easy-access on/off switch eliminates fumbling around when you're ready to start or stop cutting operations.

Powerful & Space Efficient The 1 3/4 hp TEFC Induction motor provides the power you need to cut the toughest hardwoods. And unlike other saws in the category, we put the motor inboard and out of your way, making it easy to store the saw against the wall when not in use.

Easy Dust Collection The DW746 is equipped with a dust collection port making it easy to connect your saw to your vacuum or dust collection system.

Sliding Table Accessory Option Unique, high-capacity/high-accuracy sliding table cross-cutting system delivers 30" of cross-cutting capacity at 90°, and makes large, angled cross-cuts quick and easy. When not in use, this unit stores away without leaving any cumbersome mounting hardware in your way. A solid ground, cast-iron table, industrial slides and a precision mitering guide deliver the quality and accuracy you demand.

Full Range of Accessories



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Dyed-in-the wood product

A new Italian wood product is catching the eye of turners who work everything from large vessels to miniatures. Called Colorply, the material comes in more than half a dozen colors and patterns. It is made of dyed obeche or poplar veneers glued into various patterns.

I turned a 4-in. by 12-in. by 12-in. red and black (called Scarlet Night) chunk of Colorply into a bowl using ordinary turning tools (see the photo below). Working the material produces very small chips and a lot of fine dust. It's recommended that a dust mask or respirator be used when working with Colorply.

As with most bowl turning, a bowl gouge and some scrapers were used on this piece. I also experimented with a ring tool and some of the Stewart tools. The bowl gouge gave the best finish because of its consistently rubbing bevel. The ring tool

also worked well because the smaller chip size helped keep the ring free of debris.

Sanding the material was a breeze; I went through the grits easily. I tried two finishes: water based and then oil based. The water-based finish left a milky residue, which clouded the colors. After sanding it off, I tried a clear oil-based finish, which made the colors stand out. Colorply is for interior use only; the dyes will fade when exposed to ultraviolet light. And the manufacturer does not warrant the product against cupping, warping or splitting.

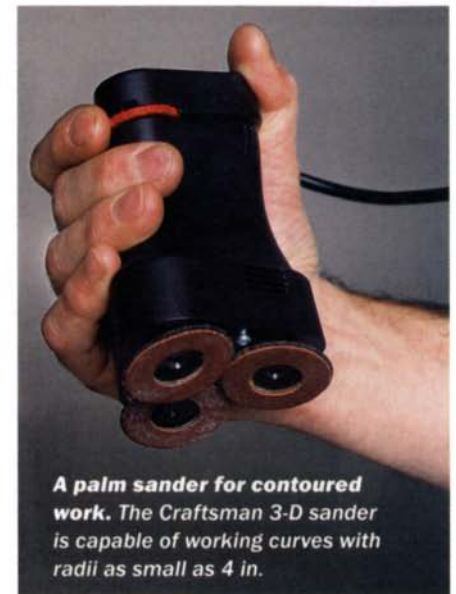
Colorply isn't cheap; the large block I turned cost \$136. Brookside Veneers sells Colorply in many sizes, including small blanks for pens, which cost as little as \$3.50 each. For more information, contact Brookside at (609) 409-1311 or visit its web site at www.veneers.com.

—Michael Fonner



Colorply can be cut, turned and finished like regular wood. The material is made of dyed veneers glued into various patterns.

Tool briefs (continued)



A palm sander for contoured work. The Craftsman 3-D sander is capable of working curves with radii as small as 4 in.

handheld sander. Called the 3-D Sander, it can handle flat, convex or concave surfaces. It is built with three independently pivoting discs that conform to radii as small as 4 in. The 1.1-lb. unit will retail for \$49.99.

—Asa Christiana

Ridgid fine-tunes woodworking line

Ridgid doesn't have any major new machines to offer woodworkers this year, but the company is fine-tuning some current products.

For example, the JPO600 6-in. jointer will get a 1-hp motor (upgraded from $\frac{3}{4}$ hp) and a new base that requires less assembly time and offers improved dust collection.

Ridgid also introduced a new mobile base, the Herc-U-Lift, which is built with a single, large, easy-to-lock pedal. The base will fit a number of Ridgid and Craftsman tablesaws. It is standard equipment on Ridgid's TS2424 deluxe 10-in. tablesaw.

The company's air cleaners are also being improved. The Ridgid AF300 stationary air filter has had its air-delivery rate beefed up to 685 cfm (from 300 cfm), and the portable unit has been raised to 240 cfm (from 200 cfm).

Ridgid Tools are available exclusively at Home Depot stores. For more information, call 888-4-RIDGID or visit them on-line at www.ridgid.com.

—A.B.

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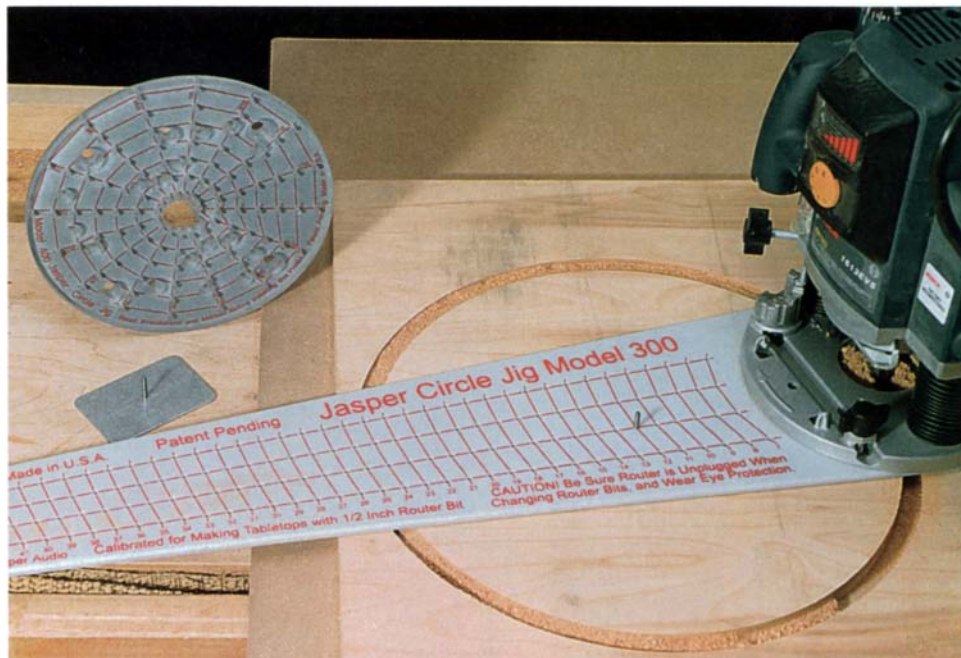
Perfect cutouts with a plunge router

Whether you're making large tabletops or cutting holes, arcs or mortises, Jasper Audio circle jigs do an admirable job with little fuss and a high level of accuracy. It's not hard, of course, to make a circle-cutting jig, but what's nice about the Jasper jigs is that they come predrilled with pivot points in 1/16-in. increments, and that can save you a lot of time over the long haul.

The jigs fit most plunge-router base plates. The jigs must be used with a sacrificial piece of medium-density fiberboard (MDF) below the workpiece.

Several models are available; some cut circles as small as 1 in., others cut holes as big as 52 3/4 in. There's even an accessory pivot plate that mounts to stock using double-faced tape, eliminating the need to drill a hole in the workpiece.

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Plunge-router circle-cutting jigs. Jasper jigs come in a variety of sizes; pictured are the models 300 (attached to router) and 400 and an optional no-drill (it uses double-faced tape) pivot plate.

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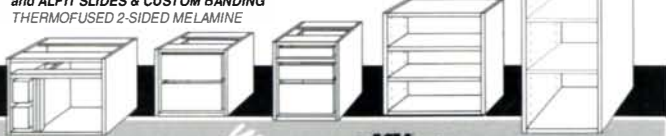
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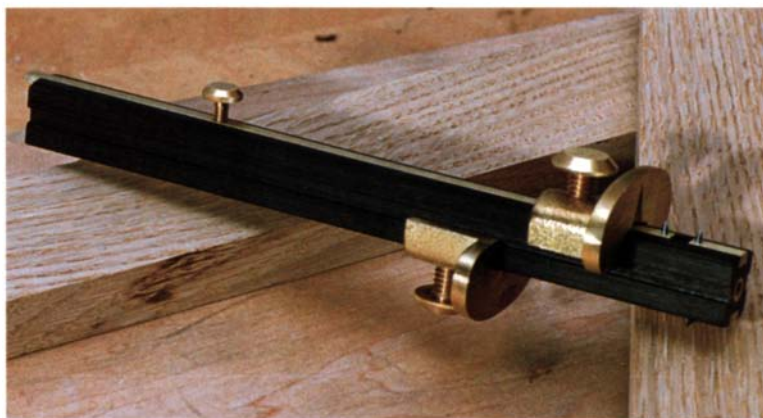
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Attractive marking gauge that's comfortable to use

A lot of people seem to be finding a niche in the specialty tools business, and that's good news for woodworkers who favor old tools that are increasingly hard to find. The latest entry is the Simpson Machine Tool Co., which manufactures a marking gauge based on an 1866 Phillips model. The gauge has two sliding fences cast from manganese bronze, and the body is of an

ebonylike material called Arricawood, a laminate of black hardwood and resin. The gauge is attractively designed and, with its large, knurled brass thumbscrews, is comfortable to use. It sells for \$50 and is available in a number of catalogs.

For more information call (888) 306-0633 or visit the manufacturer's web site at www.SMTCo.com. —A.B.



Marking gauge is based on an 1866 design. The Simpson Machine Tool Co.'s marking gauge is made of manganese bronze, brass and resin-impregnated wood.

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Rob Tobias is an instructor at the Thaddeus Stevens College of Technology in Lancaster, Pa.; Anatole Burkin is the managing editor; Michael Fonner runs Kings Corner Woodworking in Weare, N.H.; Asa Christiana is an associate editor.

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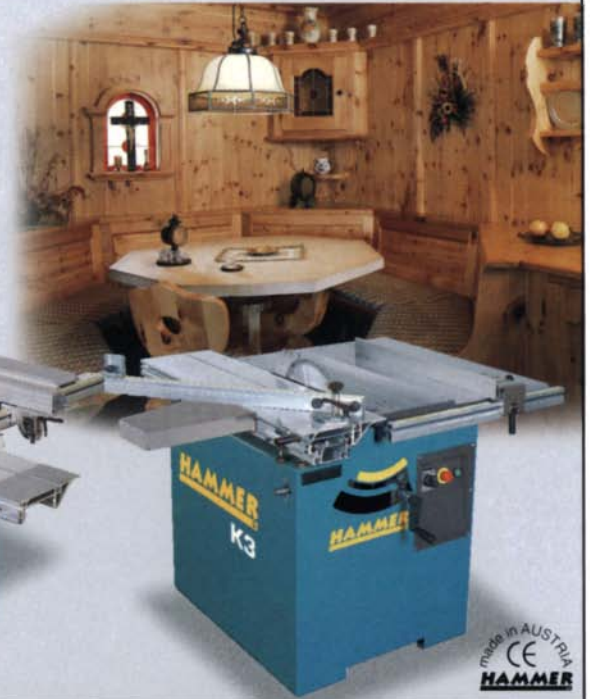
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Shaping Cabriole Legs

Careful layout helps make graceful legs with smooth curves

BY LONNIE BIRD

During the 18th century, cabriole legs were integrated into every form of furniture—chairs, casework, tables and even beds. Today, nothing symbolizes 18th-century furniture more; the cabriole leg has become the icon that distinguishes furniture of this period from all other styles. It is also rather simple to make.

Surprisingly, cabriole legs exhibit tremendous variation in form. In fact, furniture historians can often determine the origin of an antique based solely on the form and detail of its cabriole legs. Regional furniture makers sculpted legs with features particular to the region in which they lived. For example, Pennsylvania legs are robust with a pronounced curve, while legs of New England origin often display a slender, subtle curve.

The feet of period legs also vary in both style and execution. The pad, or spoon, foot is most common. It's also the least time-consuming to make because its circular form is easily turned on a lathe. The slipper foot is a slender version of the pad foot. Because it's elongated, it must be carved rather than turned.

Pennsylvania furniture often features the unique trifold, or

three-toed, foot with a relief-carved stocking that begins at the toes and terminates midway up the ankle. Like many elements of 18th-century furniture, trifold feet can vary tremendously, from ill-formed to beautifully refined—differences that most likely illustrate the skill and training of the craftsman who carved them.

Undoubtedly the most familiar design is

the claw-and-ball foot, which first emerged in the mid-18th century and quickly became popular as a sign of status and wealth. A careful examination of antique furniture shows that the claw-and-ball foot reflects regional differences more so than any other style of foot. Newport furniture styles, for example, have feet with long talons that are often undercut; the feet of



WHAT MAKES A WELL-PROPORTIONED LEG?

It is easy to make cabriole legs that are poorly proportioned. When making templates and shaping legs, be sure that your curves never develop into flat areas or appear overstated. After the curves on the template have been refined and established, make a practice leg and double-check your proportions, before it's too late.



TOO STRAIGHT



TOO MUCH CURVE



JUST RIGHT

DIFFERENT TEMPLATES FOR DIFFERENT LEGS

New York pieces are square and boxlike; Philadelphia claw-and-ball feet appear tense and powerful. Additionally, a closer study reveals numerous variations of the carving within a specific region. No doubt this is a reflection of the skill and interpretation of individual carvers.

18TH-CENTURY FEET



Trifold foot



Slipper foot



Pad foot

Even though the compound curve of a cabriole leg can appear difficult to make, in reality making a cabriole leg is quite easy. That's because the curve is bandsawed on the stock on two adjacent surfaces. After sawing, the curve is smoothed and refined with hand tools.

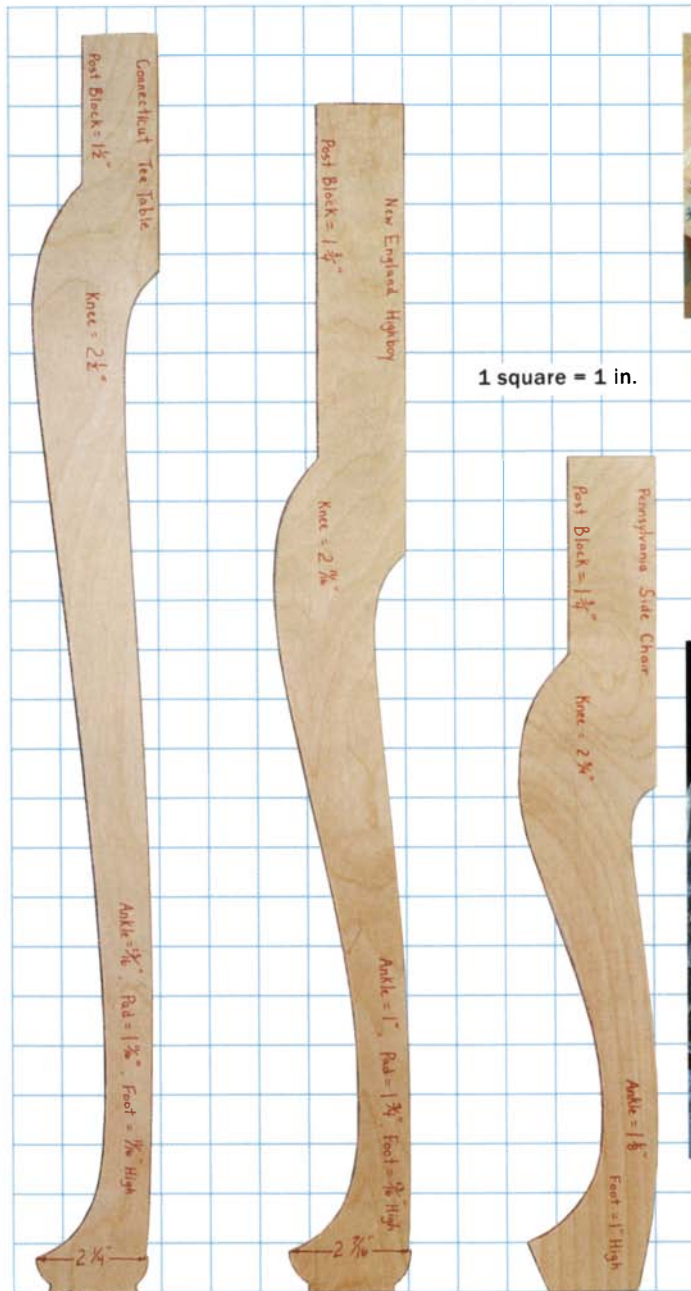
In contrast, designing and drawing a leg with balance, proportion and a graceful, flowing curve can be quite a challenge. A visit to a major museum will reveal numerous outstanding examples of cabriole legs, but in fact, many antiques have cabriole legs with disproportionate feet, ankles or knees. Other legs simply lack a refined, fluid curve. For these reasons it's important to study the best examples when looking for inspiration and direction.

Establish the general proportions

Begin by establishing the parameters of the knee, foot, ankle and post block. Generally speaking, the width of most knees are within a range of 2½ in. to 2¾ in. It's most important to size the knee so that it's proportionate to the piece of furniture on which it will be used.

The foot is proportional to the knee (or sometimes slightly smaller). Ankles typically range in size from ¾ in. on a slender leg of a tea table to 1½ in. on a tall chest. The pad of the foot is ⅓ in. to ⅓ in. high, and the height of the entire foot is ⅓ in. to ⅓ in.

Remember that these are guidelines for a pad foot. Trifold and claw-and-ball feet are



The author draws all curves by hand on ¼-in. plywood, then cuts out the shape using a bandsaw. He smooths high and rough spots with rasps and files until he achieves a clean, flowing curve.



larger and heavier than pad feet, and consequently they require a heavier ankle to appear proportionally correct. The post block is typically ¾ in. to 1 in. smaller than the knee. Sizing the post block is critical; if it's too small, the knee will appear swollen. If the post block is too large, the knee may have a weak appearance.

It is very helpful to study good examples of cabriole legs from the numerous books

available on period-furniture collections. Study photographs that have been taken "straight on"; isometric views can mislead you into thinking that the leg is heavier than it actually is.

The finest leg examples have smooth, continuously flowing lines that lead your eye from the post block to the foot without irregularities. It's best to avoid examples with stiff, straight lines. The lines, including

those on long, slender legs, should always curve, even if subtly.

Make a template

When designing a cabriole leg, begin by drawing a full-sized template for tracing onto the leg stock. I use ¼-in. birch veneer plywood for making these templates because the plywood is stiff and the light color and smooth texture make a suitable surface for drawing.

Once the dimensions for the foot, ankle, knee and post block have been established, concentrate on drawing the curves that define the front and back of the leg. These curves are the most essential to a successful cabriole leg.

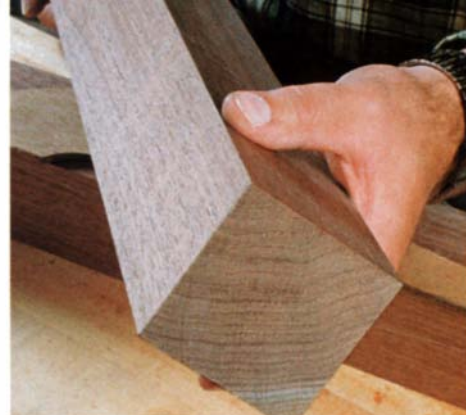
The post block intersects the knee at an angle of approximately 45°. From there the line travels in a convex curve through the knee. Below the knee is a transition point, where the line curves inward to become concave. A cabriole leg appears most graceful when the transition point is located just below the knee. A leg with a low transition point tends to appear awkward and less refined.

The line at the back of the leg begins at a point behind the knee. It somewhat follows the line at the front of the leg, although the curve is less pronounced. As the lines flow downward, they converge at the ankle, then quickly broaden at the top of the foot.

When sketching the curves I find it helpful to sight down the line to examine the transition point and check for smoothness of the curve.

When you're satisfied with the drawing, bandsaw the template exactly to the line and smooth the edges with a file. Then model the leg on a piece of inexpensive stock, such as poplar. This allows you to view the design as a three-dimensional form. After viewing the model, I often make further refinements, first to the leg and then to the template.

Experience has taught me not to make quick decisions when judging the model. In fact, I usually stand it on the bench and leave it there for a few days while working on other projects. Occasionally I stop and view it from various angles. Sometimes I make two models, with minor variations in



Diagonal grain is best for legs. By orienting the end-grain patterns along the diagonal of the blank, you are left with straight grain on each face.

the size of the foot or ankle, and stand them side by side for comparison.

Choose leg stock wisely

Once you're satisfied with the model, select stock and begin working on the legs. Avoid using glued-up stock; the opposing grain, color and gluelines distract from the completed leg. In fact, stock selection can play a major role in the overall success of

LAYING OUT STOCK

1. Lay out the leg. With the template held in place, draw out the pattern on adjacent faces of the leg.

2. Transfer the pad width. Use a square set to the widest point of the pad.

3. Mark out the leg at both ends. Transfer the pad dimension to both the top and bottom of the blank.

4. New centers are off center. Use the square to locate the centers of the pad width, not the center of the blank.



BANDSAWING THE BASIC SHAPE

the leg. If the annual rings on the end of the stock run from front to back, the grain on the face of the stock will complement the curves of the leg. Rings that run side to side compete visually with the leg contours. For the greatest strength, especially at the ankle, use only straight-grained stock.

The next step is to joint two adjacent faces of the stock 90° in relationship to each other. Then plane the stock to a thickness that allows room for tracing the template. Finally, cut the leg stock 1 in. longer than the final length. The extra length provides room for the drive center of the lathe.

Transfer the layout and bandsaw the stock

After milling the leg stock to size, trace the template back-to-back onto two adjacent faces. If the length of the leg exceeds the top of your bandsaw, leave a square section above the ankle to support the leg when you bandsaw the adjacent face. (I call this area the support block.) Also, leave the top of the post block square to position the drive center of the lathe.

Leave the foot square, too. Remember, the foot is circular and can be shaped easily on the lathe; leaving it square facilitates the turning process.

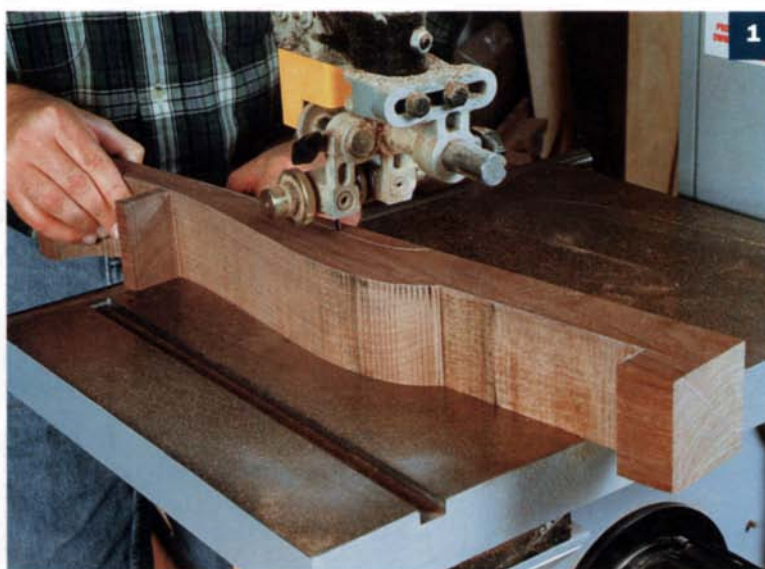
When sawing the first face, save the offcut at the back of the leg because it has the drawing for the second face. It can be repositioned with masking tape.

Before bandsawing, mount the appropriate blade on your bandsaw. For a typical cabriole leg, a ¼-in., 4- or 6-pitch, regular-tooth blade works well. The narrow width easily follows the tight turn at the ankle, and the tooth pattern cuts cleanly.

Begin by sawing the short, straight cuts at the intersection of the post and support blocks. This way you can saw the curve without trapping the blade at the end of the cut. Next, start at the foot and saw the curves of the leg. If you follow the layout lines precisely, you'll avoid extra handwork later. As you reach the end of the curve, reduce the feed pressure and ease into the corner to avoid overshooting the intersection and ruining the post block. Tape the offcut at the back of the leg into position and saw the second face. Afterward, saw off the support block.

Turn the foot on the lathe

Before mounting the leg in the lathe, you'll have to locate the centers precisely on the



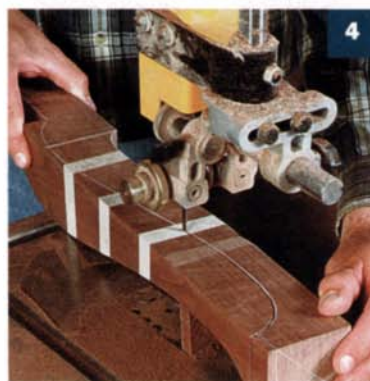
1. Bandsaw the leg. Begin by cutting to the line on parallel faces of the leg, making sure to leave a full-width bridge on the outside face.



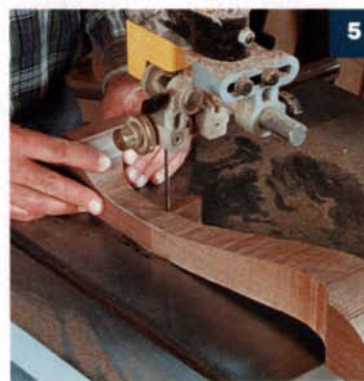
2. Save the offcut. After bandsawing the inside face, be sure not to throw away the offcut.



3. Tape it up. Reposition the offcut and use masking tape to secure it in place.



4. Bridge lends support. The bridge helps guide the cut as you finish the leg.



5. The last cut. When the leg has been cut to shape, trim away the bridge.

ends of the stock. If the foot is the same size as the leg blank, you can simply mark diagonal lines on each end. However, the foot diameter typically is slightly smaller than the knee, and the foot is positioned so that it lies toward the front of the leg, which gives the leg a more pronounced curve. To find the center, lay out a square on each end of the leg that corresponds to the foot diameter, then mark diagonal lines within the square.

To avoid striking the drive center with a turning tool, mount the leg in the lathe

with the foot at the tailstock. Then position the tool rest and turn the leg by hand to check that it clears the rest.

Begin by rounding the foot with a gouge. Be careful not to spoil the curve of the leg by cutting into the ankle when turning. Then make a shallow V with a skew at the top of the foot. This provides a clear line to work toward later when shaping the leg. Turn the pad to diameter with a parting tool and gauge it with a spring caliper. Finally, shape the contour of the foot. I use a ⅜-in. gouge and roll the foot contour as I

TURNING THE PAD



1. Blank is mounted off-center. Position the leg in the lathe using the pad centers you drew out earlier.

would when turning a bead. The foot contour begins at the V and ends at the pad. Before removing the leg from the lathe, sand it lightly.

Shape the leg

With the turning completed, focus on shaping the leg. Begin by removing slight irregularities in the surface from bandsawing; then remove the sharp corners and blend the surfaces. On a typical cabriole leg with a pad foot, the ankle is round but the remainder of the leg is square with rounded corners. Be careful not to remove wood too quickly, especially at the ankle. You can gauge the ankle with a spring caliper to check your progress and to keep sets of legs uniform.

Secure the leg in a pipe clamp and mount



2



3

2. Forming the pad. A gouge rounds the pad at its widest dimension. Check frequently with calipers until you reach final width.

3. Establish a line at the top of the pad. Draw a pencil mark at the top of the pad, then use a skew chisel to cut a shallow line at that height.



4

4. Round from the bottom up. Working up from the bottom of the pad, use a gouge to ease the transition from the top.

the pipe clamp in a vise. I shape the leg with a #49 Nicholson rasp, but you can also use a spokeshave. I prefer the rasp because it cuts quickly and will reach into the sharp curve at the ankle. As an added benefit, the rasp doesn't tear out difficult woods, such as curly maple. Hold the rasp askew so that it bridges any high spots and cuts them away. Remove the leg from the clamp occasionally and sight down the curve for dips or bumps. This first step will

progress quickly if you followed the line precisely when bandsawing the leg.

Next, begin rounding the leg corners. To keep the corners uniform, you may find it helpful to chamfer each corner first, then round off the corners of the chamfer. Start with the front of the leg and shape the knee, moving upward toward the post block. Then shape downward from the knee toward the ankle. As you shape, continually alternate the surfaces of the rasp;



Carving the foot by hand

All 18th-century pad feet that I've examined are round, presumably because they were turned on a lathe. But even if you don't have a lathe, you can produce an attractive pad foot; you'll just need to be prepared to spend a little extra time at it.

When you bandsaw the leg blank, go ahead and bandsaw the foot outline as well. This will create a square pad foot that provides a guideline for shaping by hand. Next, locate the center of the foot by marking diagonal lines. Then draw the circumference of the pad with a compass or template.

To shape the foot, remove the four corners with a chisel and rasp. A carving gouge with a curvature to match the foot contour is also helpful in achieving a pleasing appearance. Finally, smooth and blend the surfaces with a file.



Templates help lay out the pad. Use a circle template to position the circle at the bottom of the pad.

SHAPING THE LEG



- 1. Spokeshave cleans up bandsaw tracks.** With the leg placed in a clamp and held in a vise, a spokeshave is used to smooth out any rough spots the bandsaw may have left.
- 2. Rasping off the corners.** Begin shaping the leg by easing the corners with a rasp.
- 3. Shape the top of the pad.** At the bottom of the leg, use a rasp to smooth the transition to the pad.
- 4. Cut to the line.** When shaping the leg, make sure you don't round over the cup at the bottom. Use a chisel to build a small shoulder along the line cut at the lathe.

use the flat surface for the convex areas of the leg, and the convex surface of the rasp for the concave curves of the leg.

To rasp away the corners of the leg, hold the rasp at a skewed angle and follow the leg contour. After shaping the front corner, progress to the back and finally the two side corners. Keep in mind that the corners at the sides of the leg remain sharp where they intersect the knee block. Use a chisel at the foot to blend the curves of the leg in-

to the V cut you made at the lathe. Once you're satisfied with the shape of the leg, smooth it; first with a file, then with a card scraper. A bit of light sanding completes the process.

Remember that these are guidelines for a typical cabriole leg with a pad foot. Because all legs have intrinsic variations depending on their origin, you'll want to compare the leg you're shaping to a photograph of one you're reproducing. For ex-

ample, not all legs have round ankles; a leg with a claw-and-ball foot typically has an ankle that is somewhat square, with rounded corners. If you take your time working out the pattern, shaping the legs goes smoothly and quickly. Learning to make cabriole legs opens you up to a whole new style of furniture. □

Lonnie Bird teaches furniture making at the University of Rio Grande in Ohio.



Lay out by eye. The circle at the top of the foot is penciled in by eye.



Establish a shoulder. Use a carving gouge to establish the curve on one corner, then use a chisel to cut away the small shoulder at the bottom of the pad.



Rasping a round pad. Rasps and files help round the pad down to the bottom of the leg. Once the bottom has been shaped, sight down the leg and clean up the top profile.

◀ OIL BASED
WATER BASED ▶

Extra work that's worth it. A filled-pore finish adds at least a day (and sometimes more) to a project. Traditionally, only horizontal surfaces such as tabletops are filled. From raw wood through to a filled and finished surface, these samples illustrate that, when dry, oil- and water-based fillers are virtually indistinguishable. The difference is in how and when you apply them.



Paste Wood Fillers

Oil or water based: how and when to use each type

BY JEFF JEWITT

All hardwoods have a unique surface texture created by the size and distribution of the pores, or vessels, that conduct sap in the living tree. When wood is milled into lumber, these vessels are cut at an angle, producing tight or open grain on the surface of the wood.

Tight-grained woods, such as cherry and maple, have pores that are too small to see. But open-grained woods, such as ash, mahogany, oak and walnut, have larger pores that create a more pronounced surface texture. When finishing these open-grained woods, you have the option of filling the pores with a paste wood filler if your goal is to



achieve a refined, elegant, glass-smooth look to your furniture project.

Paste wood fillers are available as either oil-based or water-based products, and they can do more than simply make the finished surface level. They can be colored to blend with or provide a contrast to the rest of the wood. You can buy the filler in a clear or neutral-beige color for use on unstained woods or in darker factory-mixed shades. You can also tint your own for a specific custom color (see the story on p. 53), as long as you use a colorant that is compatible with the oil- or water-based filler that you decide to use.

OIL-BASED FILLERS

Oil-based products offer more choices

At what stage in the finishing sequence you apply the filler will change the look of the finished piece. With oil-based fillers you have several choices. You can apply the filler to bare wood, to stained wood or to wood that has already been sealed, but you can't apply stain over oil-based filler without inviting problems. Water-based stains aren't compatible, and oil-based stains might soften the filler so much that it never fully dries.

A neutral color will blend well with lighter woods, though the oil in the filler will darken them slightly. You can add any oil-based stain or concentrated coloring (such as artist's pigments or Japan colors) to the filler before you apply it. This technique will impart some color to the wood in addition to that deposited in the pores. If you stain and seal the wood before applying filler, you can maintain more control over the final color of the finished piece.

Oil-based fillers come two ways—as a thick paste that needs to

Get rid of the sanding dust. A good vacuum works better than a tack cloth or compressed air.



A light coat of shellac helps control the final color. By sealing the wood first with a light coat of shellac (diluted to a 1-lb. cut), you can prevent the filler from staining the bare wood.



Brush on filler against the grain. A stiff bristle brush forces the paste into the open pores.



A rubber squeegee can be the secret to your success. As it scrapes the surface clean, removing excess filler, the squeegee compacts the remaining filler tightly into the open pores of the wood.

be thinned with mineral spirits (or turpentine or naphtha), or as a premixed variety that can be used right out of the can. If the filler contains a varnish binder, it will dry faster—usually within one day. Some oil-based fillers require three or four days to cure.

If you want to seal the wood first, you can use any sealer you prefer, but oil, lacquer, shellac and thinned varnish work best. A thin coat will partially seal the wood and allow some of the filler color to stay on the surface. A thicker coat will completely seal off the wood surface, limiting the filler only to the open pores. If you do apply a sealer first, you should lightly scuff-sand it with 320-grit paper before adding filler.

Traditionally, filler is applied only to flat, horizontal parts of furniture, not to surfaces such as aprons, carvings and turned legs. Before applying filler, make sure the pores are clear—vacuum or blow off any dust or debris from the surface. Use a stiff bristle brush to lay it onto the surface of the wood, and then work it into the open pores. With a rubber squeegee, credit card or piece of stiff cardboard, immediately scrape off the excess filler, going with the grain. I use a disposable plastic pan for the excess filler and periodically wipe the squeegee with a clean rag. The filler hazes over as the thinner on the surface evaporates, signaling that you can



Use burlap for a final wipe. A quick, vigorous rubdown will remove marks left by the squeegee and any traces of excess filler remaining on the surface of the wood.

wipe off any remaining filler from the surface of the wood with a piece of burlap or cheesecloth. Wad it up and wipe across the surface, perpendicular to the grain. If you wipe with the grain, you may pull some of the uncured filler out of the pores.

Follow the cross-grain wipe with one in a figure-eight pattern, then inspect the surface in backlighting to see if there's still some filler on the surface. If the excess is too difficult to remove with the dry burlap, moisten a rag with naphtha or mineral spirits to get it off. When you're satisfied with the surface, let it cure for at least a day or more, as the directions on the label suggest. If the weather is cold or damp, extend the drying time.

After the filler has cured, sand it with 320-grit paper in the direction of the grain. Go lightly: Most fillers stay a little soft because of the large amount of oil used in their manufacture. The sandpaper will load and gum up quickly, so change to fresh paper often. Then wipe the surface with a tack rag or a clean cloth.

You can apply any oil- and solvent-based finishes over dried oil-based paste wood filler. If you plan to use a water-based finish, apply a coat of shellac over the filler to prevent adhesion problems. If you use lacquer, the solvents in the lacquer can soften the dried filler and wrinkle it. To avoid this problem, seal the surface first

with shellac, especially if you're brushing on the lacquer. For a sprayed lacquer finish, mist on the first several coats lightly and let them dry before applying full, wet coats.

Oil-based fillers are easier to apply, offer more creative options for matching a finish and are easier to control. But water-based fillers are easier to clean up, are nonflammable and are more compatible with finish topcoats. Also, the clear versions, which are similar to using a clear finish to fill the pores, shrink very little.

WATER-BASED FILLERS

Apply water-based products to bare wood

The composition of water-based fillers is similar to that of oil-based varieties, except that the solvents and binders have been replaced with water, glycol ether and an acrylic resin that is compatible with water. These fillers dry quickly, and because the glycol ether will attack most finishes used as sealers, it's best to apply water-based filler directly to bare wood.

Water-based fillers should be stirred thoroughly before using. Most are fairly thick and can be thinned by adding small amounts (no more than 10%) of water, until they have the consistency of thick latex paint. Because of the fast drying time, you can work only on small areas at a time before the filler starts to set. As with an oil-based filler, the pores must be clean of sanding dust. Also, have lots of clean rags and some clean water nearby before you start.

Using a synthetic bristle brush, apply the filler liberally to the surface of the wood and then immediately scrape off the excess with a squeegee or a white Scotch-Brite pad. Let the filler dry. Later, you can sand the excess filler level with the surface of the wood. Any large, dried clumps can be removed with a rag moistened with water. Let the filler dry for at least three hours. Hot, damp weather will extend the drying time, but the filler is ready to sand when it powders easily as you sand it. If the sandpaper gums up, let the filler dry longer.

Sand off the excess filler with 220-grit paper. You can use an electric palm sander, but be sure to hold it flat on the surface. If you're nervous about using a power tool, then sand off the filler by hand. Periodically wipe off the dust. Inspect the surface in backlighting as you go. You're finished when the surface is clean, but you can still see filler in the pores. If necessary, you can wipe the surface lightly with a water-dampened rag to help you see it bet-



Stirred, not shaken. Water-based filler should have the consistency of thick latex paint.



Don't worry about being neat. Water-based fillers set up fast and dry in a matter of hours. So work fast and wipe off the excess filler with an abrasive cloth.



Sand it by hand or with a machine. A random-orbit sander loaded with 220-grit silicon-carbide paper quickly removes excess filler from the surface of the wood.



A brief window of opportunity. You can stain water-based filler only with an alcohol-based stain or one that contains glycol ether, and you must do so within a day after the filler has been applied.

ter. If you sanded through the filler to expose open pores, or if you missed a spot, just apply more filler with a small cloth and then re-sand when it's dry.

When the surface is filled to your liking, you can stain before the filler has fully cured—usually within a day. Use only alcohol-based stains, or any stain containing glycol ether. Oil-based and straight water-based dye stains will not work, but you can add alcohol to a water-based stain to get it to bite into the filler. Some commercial water-based pigment stains do contain glycol ether to make them

work. When you wipe on the stain, work quickly and avoid overworking the surface because the solvents may soften the filler in the pores and lift it out. One good thing about water-based fillers: They're compatible with all finishes, so you can topcoat them with the finish of your choice. □

Jeff Jewitt restores furniture, sells finishing supplies and writes frequently for this magazine. His latest book for The Taunton Press is Great Wood Finishes (published this year).

Adding color to filler



You can mix your own custom-colored oil- or water-based filler, as long as you use a colorant that's compatible with the filler. Dry pigment powders, artist's oil colors, universal tinting colors (UTCs) and Japan colors all work with oil-based fillers. You can also use an oil-based stain if you are applying the filler to bare wood and want to color the wood and apply filler at the same time. Because the stain will thin the filler, you may have to adjust your thinning ratio if you're mixing filler from a thick paste. If you use artist's oil colors, it helps to mix the color first with a bit of mineral spirits. For coloring water-based fillers, you can use dry pigment powders, UTCs or artist's acrylic colors. UTCs are available at most well-stocked paint stores and in many woodworking specialty catalogs. They're sold under the Cal-Tint or Tints-All names. Always add a small amount of color at a time.

Planing Difficult Grain

BY MARIO RODRIGUEZ

In the course of building furniture, most of your material will have nice, straight, uninspiring grain that's easy to look at and easy to plane. And most of the time you're grateful for its tame nature. But the wood that makes your heart race and your palms sweat is the stuff with swirling iridescent figure; a blistering surface that seems to be alive and filled with light. That's the kind of wood that can transform a mundane little nightstand into a minor masterpiece.

If your previous attempts at taming these stubborn surfaces with a bench plane produced only a swath of tearout, you probably resigned yourself to sanding. Well, don't pull out the belt sander yet. There is a better way. With a handplane you can save time, energy and a cloud of dust. And it's not as hard as you might think.

Most woodworkers express some disbelief when I claim that by practicing good technique and employing a small selection of planes and scrapers, I virtually eliminate sanding—or at least reduce the unpleasant task by as much as 80%—no matter how figured the wood might be. Instead of starting my sanding routine at 80 grit and tediously advancing to 320, I begin at 180 or 220 grit.

When I work highly figured wood, my objective is not to surface the material completely using a handplane and avoid sanding altogether. Realistically, I employ handplanes and scrapers right up to the final stages of surface preparation and then resort to sandpaper to remove any minor tearout and light plane tracks. Using this method, I'm able to achieve a uniformly smooth surface, ready for finishing.

To be successful with this approach, it's important to have a well-tuned plane (conditioned sole, fitted chipbreaker and easily adjustable) with a well-prepared blade (sharp, properly beveled and ground square). You also need to practice good



With a well-tuned plane and the right approach, tackling tricky figure doesn't mean sanding all day



technique (stance, grip and stroke), even when faced with some wild figure. With this approach, sanding shouldn't take long at all.

Select and prepare your planes

Most of the time, the boards I work with have been run through a planer, so I'm able to do the bulk of the surface preparation with a single No. 4 smoothing plane. But when you have a board that's too wide

for your planer or one that has wide crotches or is especially figured, which would get chewed up in the planer, you have to thickness it by hand. In these situations, you would no sooner prepare the surface with a single plane than you would play 18 holes of golf with a single club. Milling (and surfacing) lumber by hand is physically demanding and time-consuming. Different planes are employed at various stages to minimize the effort and

produce the best results.

Each plane has a single task or function that it performs better than others. Aside from their physical appearance, planes differ in their weight and the width of their mouth opening. Basically, more weight and a smaller mouth opening help a plane achieve a finer, smoother surface in difficult grain.

On rough lumber, I use a No. 40½ scrub

Bench-plane tune-up



Coaxing even passable performance out of a plane requires a rigorous but simple tuning process. And to handle tricky grain, a plane must be impeccably tuned.

To take a consistent shaving, a plane's bottom must be dead flat. This can be achieved by lapping the plane on a flat surface, such as ½-in.-thick glass or a slab of machined aluminum, covered with aluminum-oxide paper. Once the plane's sole has been covered uniformly with scratches from the coarse grit, proceed to finer and finer grits. Eventually, the sole will read flat and exhibit a nice, reflective surface.

After flattening the sole of the plane, break any sharp edges with a file to prevent scoring the work surface if the plane is inadvertently tipped (these scratches are often mistaken for plane tracks).

The chipbreaker stiffens the blade, reducing vibration and chatter. For the chipbreaker to function, shavings coming off the board must travel smoothly along the back of the blade, over the chipbreaker and up through the throat. If there is a gap between the blade and the chipbreaker, it will capture the shaving. Or if the chipbreaker's edge is blunted, the shaving won't travel up through the throat. In either case the plane will choke and refuse to take a shaving.

The first step is to feather the leading edge with a flat file. Then polish it with fine wet-or-dry sandpaper and wax. Look for gaps between the edge of the chipbreaker and the back of the blade, and file down any high spots. Once the chipbreaker is in good shape, set it ¼ in. from the edge of the blade.

With the blade assembly removed (if necessary), loosen the screws holding the frog to the plane body and move the frog forward. Once the blade assembly

has been replaced onto the frog, the mouth opening should be reduced. When repositioning the frog, remember that the mouth opening must be greater than the thickness of the shavings, or they won't fit through the opening.

For any blade to perform well, it must be razor sharp. For quick but dependable results, I use a slow-speed grinder (1,725 rpm) outfitted with an 80-grit Carborundum wheel. I support the blade on a tool rest to prepare the edge with a 25° primary bevel. The slow speed of the grinder ensures that I won't burn the edge, and the coarse 80-grit wheel takes care of the task quickly.

I like to grind a camber (a slight convex curve) along the blade's edge. This light curve dramatically reduces the appearance of plane tracks on the wood's surface by cutting back the corners of the blade slightly. I then hone a 2° secondary bevel using Japanese waterstones, progressing from 800 to 1,200 to 4,000 and finally to 6,000. I easily maintain the camber of the edge by applying gentle pressure to one side of the blade and then to the other. Finally, I lap the back of the blade to remove any scratches.

Once the plane is back in shape, set the blade square and for the thinnest of shavings; anything more will cause tearout in figured wood.



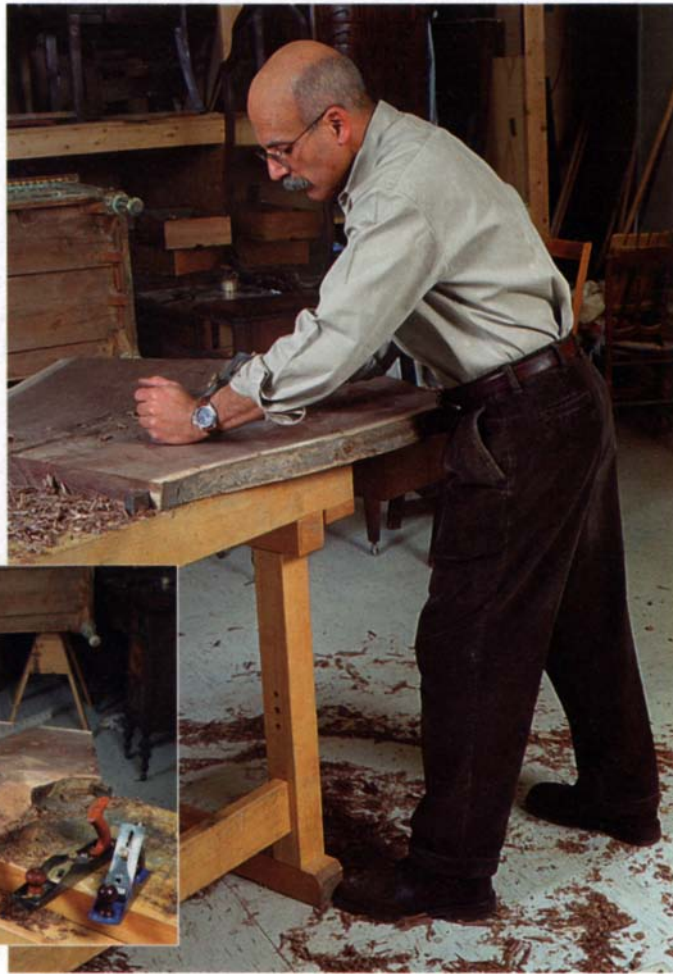
Truing a plane. To flatten a plane's sole, the author glues aluminum-oxide sandpaper onto the bed of his jointer (top), then works the plane back and forth until the scratches cover the entire sole (bottom).



Adjusting the frog. To get an especially thin shaving, loosen the screws on the plane's frog and move it forward, adjusting until the blade has only the slightest opening.

POSITION IS EVERYTHING

Work comfortably. With feet at shoulder width and the workpiece stabilized at a comfortable working height (right), you'll find that the plane will actually telegraph the blade's performance to your hands. To flatten a surface, find a relaxed stance and use a long straightedge to locate high spots that need more planing.



plane to remove material aggressively and to render the board flat. Next, I use a No. 5 jack plane to remove the scalloped plane tracks and tearout left by the scrub plane. After the jack plane, I might use a No. 6 fore or No. 7 jointer plane to get the board dead flat and straight. Finally, I use a No. 4 smoothing plane to achieve a clean and perfectly flat surface.

A well-tuned smoother is critical—Because I depend on the smoothing plane to deliver the final surface, its performance must be impeccable. The plane must glide easily over the wood while removing tissue-thin shavings. It must also respond to small adjustments and hold its settings.

Any smoothing plane can be modified or adjusted to perform well on figured wood. When properly tuned, the common Record or Stanley will do much better than you might imagine. But if you're looking for even more effortless planing and are willing to put out a substantial one-time in-

vestment, try one of the higher-end smoothers (see the story on p. 61). Regardless of the plane you choose, be sure that it is well tuned (for more on tuning up a handplane, see the story on p. 55).

I always retrofit my planes with premium-quality blades, made by either Hock (888-282-5233) or Lie-Nielsen (800-327-2520). The blades from these two manufacturers are made to rigorous standards, using thick metals, high-quality alloys and exacting heat-treating processes. These blades typically have longer-lasting edges.



Put one of them in a plane, and I am sure you will notice an immediate difference in the plane's performance.

Practice good technique

One of the secrets of getting a good performance from your plane is to maintain complete control of the tool. The more physical effort you put into planing, the less control you have over the tool—and the less knowledge you have of what the tool is doing. A finely tuned plane will telegraph exactly what it's doing to the wood, through the sole, right up the handles to your hands. You can clearly feel the kind of surface it's leaving behind.

Make proper adjustments to the blade

—The most effective way to control the tool is to adjust the blade so that it projects uniformly across the entire cutting edge. The objective is to produce a paper-thin, full-width shaving of uniform thickness. If the blade's edge projects unevenly, it will cut more heavily on one side and possibly choke or jam the plane. And it will leave conspicuous plane tracks in its wake.

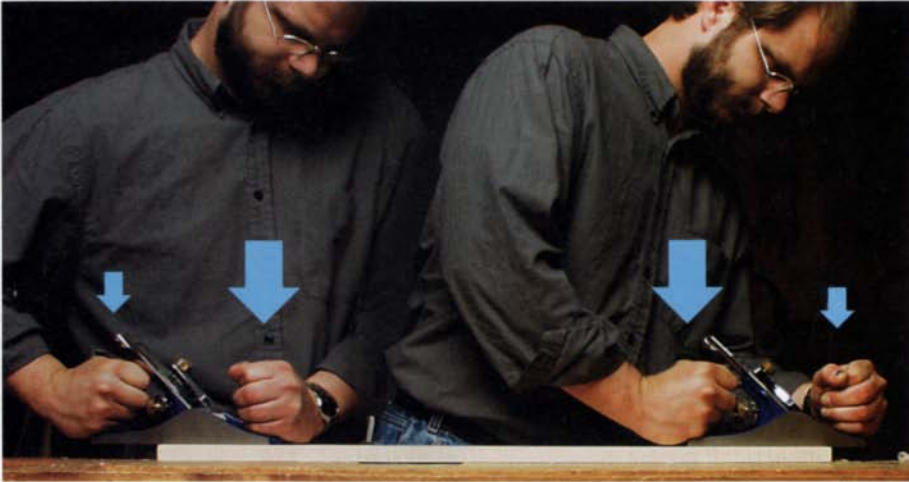
Most people think the blade's edge must be clearly visible. But you're better off developing a feel for the blade setting. I rarely sight down the plane's sole for a visual reading and instead rely on my fingertips—carefully strummed over the edge from behind—to guide me. The blade should barely project below the sole. If the plane fails to produce a shaving, advance the blade a little at a time.

Stand in a comfortable position

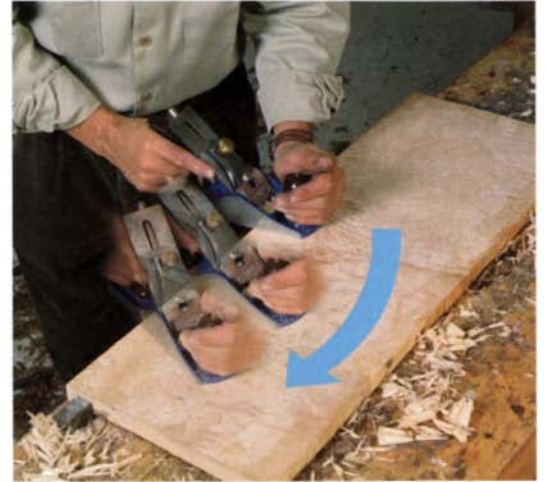
—With the plane tuned up and the blade properly adjusted, it's time to go to work. The workpiece should be positioned at or near waist height. The idea is to find a height that allows you to extend your reach fully without cramping your shoulders or straining your back. As I mentioned, planing is a physically demanding activity, so find a

Souped-up plane. While a sharp, standard iron will do the trick, a thicker replacement iron will make it easier.

HOW TO HOLD AND MOVE A PLANE



Smooth strokes. On average grain patterns, begin planing by pressing down on the front of the plane. As you proceed, shift pressure to the back of the plane.



A sweeping cut. For difficult figure, such as bird's eye, set the blade for a thin cut and take skewed, arching passes.

comfortable position—you may have to hold it for a while.

It's usually easiest to work near the front edge of the bench. I sometimes allow a couple of inches to overhang for better accessibility. But don't overdo it. Too much overhang may cause the workpiece to tip slightly, dissipating the pressure of the plane's cut.

Once the work has been secured to the bench, place your feet about shoulder-width apart. If you're leading with your left foot, your right foot should be 90° to it for stability. As you advance the plane's stroke, your weight shifts in that direction.

Planing should not be rushed or frantic.

Inspect your work frequently and think about the next step. If you're using the right tool and it has been properly prepared, the work will proceed nicely, and the surface will improve noticeably.

Grip the plane correctly—Try to keep the plane blade continuously engaged with the wood, no matter where the tool is on the board. Maintain constant and uniform pressure against the workpiece throughout the entire plane stroke. This is how the plane cuts best, and any change will affect the shaving and the surface.

By gripping the front knob and pressing down firmly upon the wood, you should

produce an even, continuous shaving and leave a smooth surface without chatter marks. But as you approach the far end of the workpiece, let up on the front knob and transfer the pressure to the rear handle, propelling the plane forward instead of downward. This maneuver prevents the plane from taking a slightly heavier cut as the unsupported blade runs off the edge of the board, which could result in a board that is noticeably thinner at one end.

Try to plane with the grain

I compare planing against the grain with running your hand up the back of your head. Your hair grows down the back of

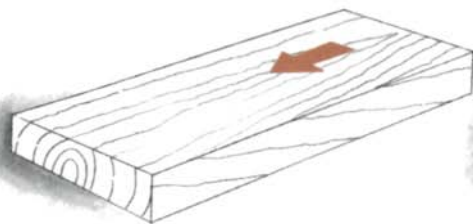


I RARELY SIGHT DOWN THE PLANE'S SOLE FOR A VISUAL READING AND INSTEAD RELY ON MY FINGERTIPS—CAREFULLY STRUMMED OVER THE EDGE FROM BEHIND—TO GUIDE ME.

On easy, straight-grained woods, you can get away with a slightly more aggressive cut, but as the grain gets trickier, the cut should get finer.

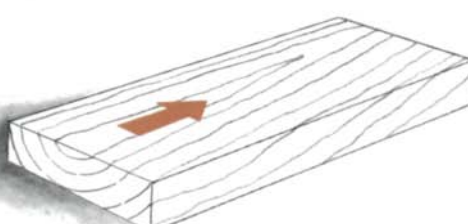
WITH THE GRAIN

When the end grain on the board is convex, plane into the peaks.



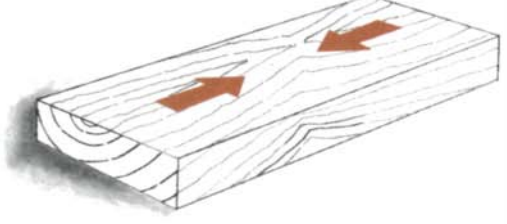
AGAINST THE GRAIN

If the end grain curves in a concave, downward pattern, plane away from the peaks.



IF THE GRAIN CHANGES

When the grain changes direction, take shorter strokes, approaching from each end.





MANAGING DIFFICULT BOARDS

When I arrange the boards for a piece of furniture, I am not concerned with grain direction but with orienting the boards to give the best appearance. Even if you do figure out the grain direction on two individual boards, when those boards are joined together, their grain might

run in different directions. Grain can also change direction within a board. I planed this large walnut crotch without knowing what it looked like underneath the surface. The key is to visualize what might be going on with the grain, then use educated guesses to help you proceed. After planing this slab, John White, *FWW's* shop manager, cut into a few tricky patches to help illustrate how certain grain patterns are best handled.

KNOTS

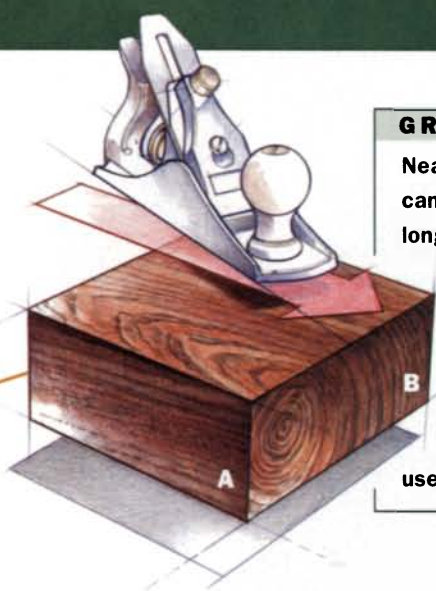
Small knots like this one can often be planed using a heavy bench plane set for the lightest of shavings, but sometimes tearout is inevitable.

When this happens, I grab a small, low-angle block plane rather than a scraper, because a scraper can leave a perceptible dip in the board. Using the low-angle block plane, I take quick passes and light cuts in a circular motion, the same motion used for scrubbing floors.

END GRAIN

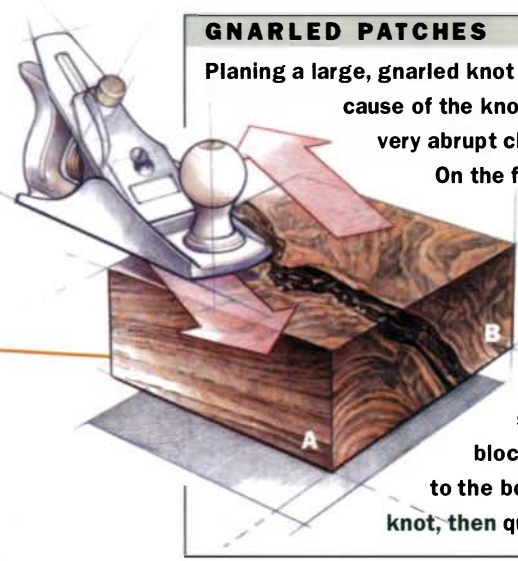
I used light strokes at 90° across the board. At the crotch, the grain seems to fan out, so I used a circular slicing cut with the blade set for a very light cut. The trick was to get and keep the board flat and straight while I cleaned up the surface. I proceeded slowly and evaluated the surface often. The only reason why I needed to use a card scraper was to clean up the slight but inevitable plane tracks.





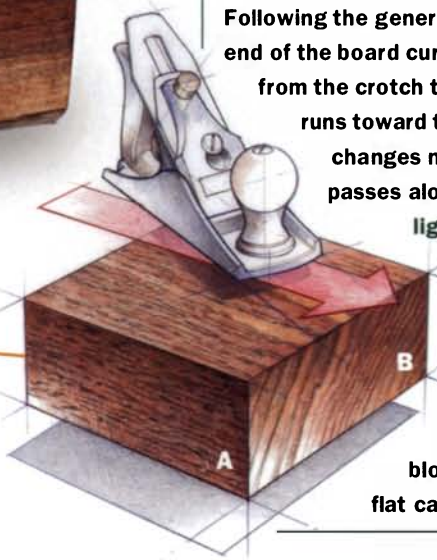
GRAIN CHANGES

Near the center of the plank you can expect a grain change. I used long, straight passes on the straight grain but a block plane in the tight, tricky spots. With a nimble, little block plane I was able to navigate the tight spots much easier than if I had used a larger bench plane.



GNARLED PATCHES

Planing a large, gnarled knot is always difficult because of the knot's hardness and the very abrupt changes around the knot. On the far side of the knot (A), I planed toward the trunk. But on the opposite side (B) I went in the opposite direction. On the knot itself, I used short strokes with a small block plane—I lowered it onto the board, smoothed only the knot, then quickly raised the plane.



STRAIGHT GRAIN

Following the general rule for handplaning—if the crown on the end of the board curves upward, plane into the peaks—I planed from the crotch toward the trunk. The grain on this patch runs toward the trunk and along the wany edge but changes near the center of the plank. I took straight passes along the wany, bark edge of the board but lightened up slightly as I approached the center of the plank, where I thought the grain might begin to change direction. Trying to figure out exactly where the grain changes is nearly impossible, so I was prepared for slight tearout in spots. To clean up these rough patches, I used a block plane and circular strokes, followed by a flat card scraper.



Quick strokes for finicky work. Taking short strokes with a skewed low-angle block plane is a good way to handle tricky areas where the grain changes direction.

your head, and your hand, run in the opposite direction, disturbs and upsets your hair's natural arrangement. It's the same thing with wood. The proper direction would be away from the ends.

On the surface of a board, you can often recognize the peaks formed by the grain. If the end grain curves in a convex pattern, you should plane down into the peaks. If the end grain curves downward (concave pattern), you should plane up and away from the peaks.

Now these rules certainly oversimplify a complicated subject, and they're meant only as a basic guide. The patterns and clues I just described are not always easy to decipher. On crotch, burl or even curly wood, these signs may not be of much help. On highly figured pieces, the grain swirls in different directions.

Ultimately you'll have to rely on the surface quality left by the plane, the cutting sounds made by the plane and the resistance encountered as you pass the plane over the workpiece to tell if you should change direction. All of these tangible clues will tell you whether the plane is cutting with the grain or against it.

In addition to reading these visible clues, you must employ strategies for navigating the swirling grain, as shown on pp. 58 and 59, as well as remedial techniques for repairing any damage to the surface.

Use a scraper to repair any damage

No matter what type of plane you have or how well you've learned to read the grain,

you'll cause a certain degree of unintentional damage, such as tearout, to your workpiece. As the scope of the job becomes narrower, the tools called upon must also become smaller; smaller tools with smaller blades are used to work smaller areas of wood. These tools are also more manageable, allowing you to work very specific problem areas without disturbing completed areas.

The best tool for removing minor blemishes is a handheld flat card scraper. For a few reasons I prefer this tool over a rigid-

blade scraper supported in a plane-type body. The card scraper is light and flexible, which allow me literally to turn on a dime. I can always see exactly where I'm working. I can turn it 360°, responding to even the smallest blemish or grain change. And I can instantly change the cutting angle and the depth of cut.

I thoroughly enjoy this part of the job. The nimble scraper is versatile enough to handle the sudden changes in grain direction that are the consequence of convoluted grain. It is invaluable in removing any trace of plane tracks, overlooked machine marks, metallic stains left by clamps and isolated patches of tearout.

I also enjoy seeing the lacelike cascade of fine shavings produced by a sharp scraper rolling across wood.

Sanding is the final step

Even though sanding is my least favorite part of the job, I take it very seriously and



The nimble scraper. A handheld card scraper honed with a fine burr makes easy work of tricky areas where the grain changes direction.

SANDING METHODICALLY



The final touch. Once the planing and scraping have been completed, a washcoat of denatured alcohol makes any tearout apparent. Clean up what you can with a scraper, then sand with a padded backer block. The author uses compressed air to clean up between grits.



approach it methodically. First you must evaluate the surface to determine what grit sandpaper you should start with. If, overall, you think 180 grit would do, but there are a few rough areas that require 150 grit, then start with 150 grit. The idea is to produce a surface of uniform smoothness that reflects light and reveals the wood's characteristics uniformly.

Each grade of sandpaper scores the wood surface with scratches of uniform size. As the sanding progresses, and you switch from a coarse sandpaper to a finer

grit, the resulting scratches become finer and the surface becomes smoother. But as the paper wears, it releases abrasive particles. If errant particles from a coarser grit get trapped between the wood surface and the next finer grit sandpaper, they disfigure the wood surface with random scratches. These singular scratches may pass casual scrutiny but will be glaring when the piece is finished.

To prevent this, blow the surface clean with compressed air (a shop vacuum could be used instead) and then wipe it down

with a solvent such as denatured alcohol. The alcohol flushes the wood surface, making it easier to remove any grit left behind by the paper, and the wet surface highlights any problems that may have been overlooked. When the entire surface is dry, wipe it down with a clean rag, then progress to the next sanding grit. Proceed through finer grits until the surface has a mirrorlike sheen when you view it at a slight angle. □

Mario Rodríguez is a contributing editor.

Premium-grade smoothing planes



These semicustom smoothing planes—a Lie-Nielsen No. 4 (800-327-2520), a Reed smoother (available from antique tool dealers) and a coffin smoother by Clark and Williams (501-253-7416) are designed and produced to perform demanding work to a very high standard. Other specialty toolmakers with lines of quality planes are Robert Baker (207-351-1050), Kelly Toolworks (706-376-4804) and St. James Bay (800-574-2589). These planes are ready to use straight out of the box, needing nothing more than a few passes of the blade's edge over a waterstone before being put to work. But be prepared to pay for this kind of quality—the starting price for one of these tools is around \$200, but they can run much higher.

Dial Calipers

Bring a machinist's accuracy to your woodworking

BY J. K. McMURTRY



1

After spending 11 years as a machinist, the first day I showed up for work in a woodshop, I brought three full toolboxes with me, not knowing what I'd need. As it turned out, I didn't need most of them. But to this day, 12 years later, I'd be lost without my dial calipers because they remove the guesswork from taking measurements. My fellow workers, with their trusty tape

measures clipped to their belts, were doubtful, but once they saw what dial calipers could do, they were won over.

You can use calipers the same way that some people use a combination square—for laying out joinery. You can also use this tool to measure the inside diameter of a hole or the outside diameter of a dowel or a round tenon. You can measure the width and depth of a dado

A VERSATILE TOOL

Four basic caliper functions. These photos illustrate the most common uses for dial calipers.

- (1) Outside measurements are found between the stationary and sliding jaws.
- (2) The depth rod shows the depth of an open mortise.
- (3) The calipers can be used to find the inside diameter of a drilled hole.
- (4) Step measurements are taken with the end of the slide.



2

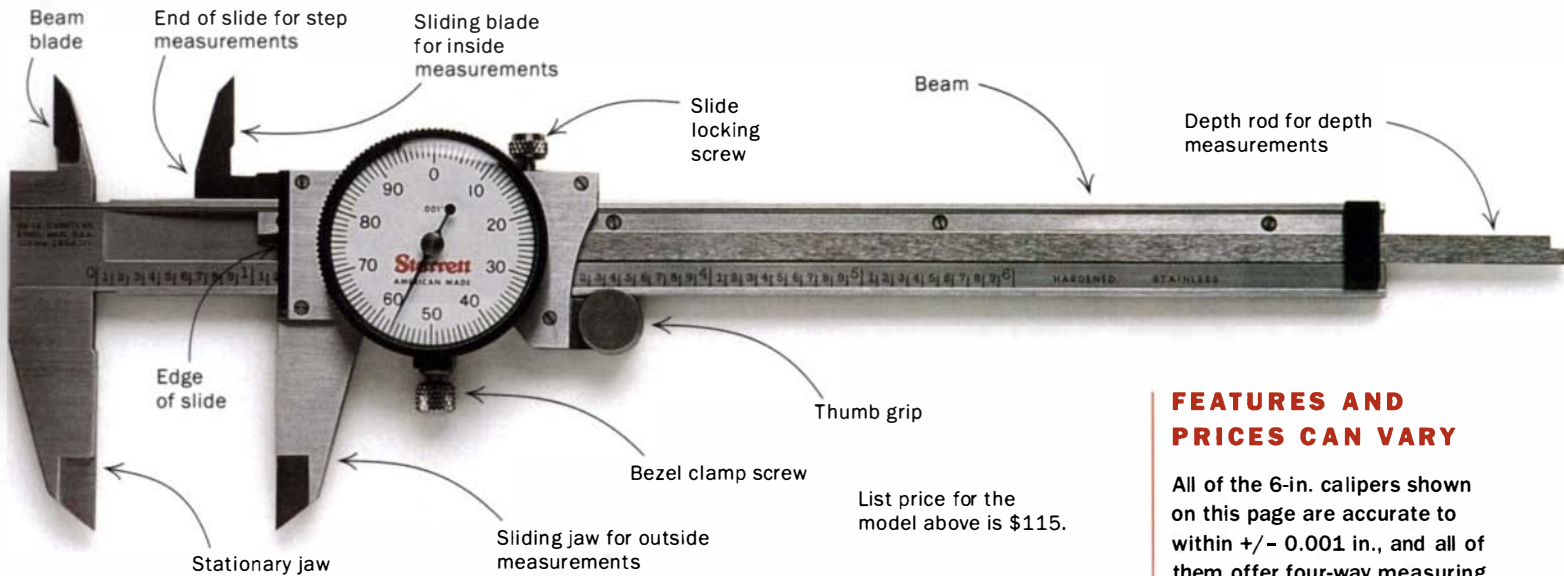


3



4

PARTS OF THE TOOL



List price for the model above is \$115.

or a rabbet. You can check for variations in thickness along the length of a workpiece or among similar pieces. You can read the exact size of a mortise so you can make the right size tenon. You can measure the root diameter of a screw to select the right drill bit for a pilot hole. Not sure what size bit you have in your hands? The dial calipers will tell you in an instant, with an accuracy unmatched by any other woodworking tool.

How to read them

Learning how to read dial calipers is easy—the hard part is training your mind to think in the language of decimals rather than of fractions. Conversion charts that show the decimal equivalent of fractions are a big help. Many of these charts (often available for free in hardware stores) also show the decimal sizes of numbered and lettered drill bits.

Other versions exist, but a good pair of dial calipers breaks the inch down into 1,000 divisions. Each mark on the dial represents one thousandth ($\frac{1}{1,000}$ or 0.001) of an inch. There are 100 marks on the dial—one hundred thousandths ($\frac{100}{1,000}$ or 0.100). If you start at zero on the

dial and rotate the sliding jaw until the pointer completes one full turn, the edge of the sliding jaw will align with the line for the number 1 on the beam. This indicates that you've moved the calipers $\frac{100}{1,000}$ in. Those of you who remember eighth-grade math might say that's the same as $\frac{1}{10}$ in. True, but when you use calipers, you don't care about tenths or hundredths: All measurements are expressed in thousandths for simplicity and consistency. For example, $\frac{1}{4}$ in. (0.250) is $\frac{250}{1,000}$ in.

To take a reading, first look at the location of the sliding jaw on the beam, then read the pointer on the dial. The most common error made when reading dial calipers is to misinterpret the position of the sliding jaw on the beam. The numbers (representing hundreds of thousandths) are between the lines, so you see the number before you see the line marking its position.

Calibrate your calipers before you use them

Calibrate the tool first by closing the jaws. In other words, move the sliding jaw toward the stationary jaw until they touch. The pointer on the dial should

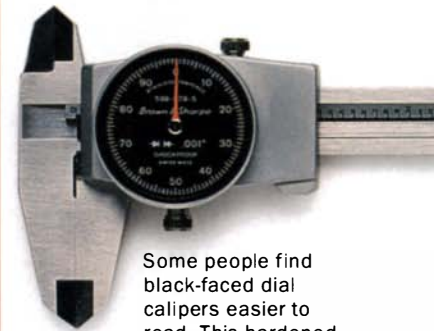
read zero, and the edge of the slide should line up with the zero mark on the beam. If not, open the jaws, wipe them off with your fingers to remove any dust or debris and close them again. If they're still not "zeroed," then loosen the bezel clamp screw (usually located at the bottom of the dial) and move the dial until the pointer reads zero. Lock it in place by tightening the bezel clamp screw. Your calipers are now ready to take measurements.

Survey any catalog that sells different types and brands, and you'll notice that some calipers feature three-way measurements, and others have a four-way capacity, which means the tool can take outside, inside, depth and step measurements. For a standard 6-in. measuring range, you can buy a good-quality tool for \$75 to \$100. Some of the newer digital or electronic calipers that include a liquid-crystal display for the readout can cost twice as much. You can also buy a plastic version for less than \$25. Even the least expensive set of calipers is better than none at all. □

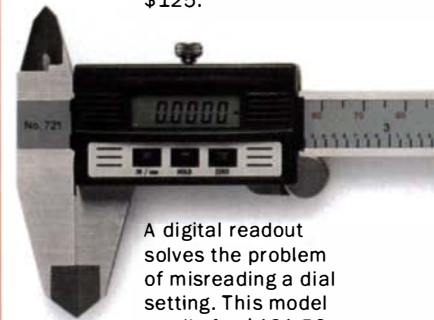
J.K. McMurtrey is a shop supervisor for a guitar manufacturer.

FEATURES AND PRICES CAN VARY

All of the 6-in. calipers shown on this page are accurate to within ± 0.001 in., and all of them offer four-way measuring capacity.



Some people find black-faced dial calipers easier to read. This hardened stainless-steel model sells for \$125.



A digital readout solves the problem of misreading a dial setting. This model retails for \$161.50.



This model, made of fiberglass-reinforced plastic, proves that you don't need to spend a lot of money on dial calipers. It sells for \$24.



Thomas Jefferson's Writing Desk

Build the Revolutionary War relic used to write
the Declaration of Independence

BY LON SCHLEINING



book rest. A mortise in the underside of the lid houses the arms and allows the lid to close completely. The single drawer has compartments for an ink well, writing quills, nibs, pen knife and paper.

I finally found rough dimensions for the piece in an out-of-print book about the desk, *Declaration of Independence Desk: Relic of Revolution* by

Silvio Bedini (Smithsonian Institution Press). Using rough dimensions and photos I found in the book, I was able to reproduce the drawings for the desk, then build a replica of the desk itself. Though it looks very simple, the desk turned out to be one of the most interesting and challenging woodworking projects I've built. It is deceptively intricate with lots of tiny parts—just my kind of project.

Drawings reproduced from photos

The first task in building the desk was to reproduce the working drawings. I began by drawing the perimeter of the piece full size. Then, using photos—both my own and from the book—I slowly filled in the details. I made an enlarged copy of a photograph and then transferred the known dimensions—such as the width of the desk—to the copy. Using dividers and an inch scale, I was able to figure out other dimensions. Though the result is not 100% accurate, it's pretty close.

When scaling from photographs, you have to take distortion into account. The camera foreshortens the object, making it larger in the

front and smaller as it becomes more distant, so a little bit of guesswork is involved. One other useful trick with photos is to photocopy them. Enlarging the photos a little at a time, I was able to get full-scale copies, which made measuring details like the dovetail spacing much easier.

Shopmade plywood-core panels provide stability

The original desk is made of mahogany, except for a small satinwood inlay around the drawer front and a matching inlay on the back of the case. Most of the material is $\frac{3}{8}$ in. thick, but the drawer parts are much more delicate, as thin as $\frac{1}{8}$ in.

I could have slavishly duplicated the chest, imperfections and all, but I decided instead to incorporate modern materials, tools and techniques—such as using plywood-core veneered panels.

Countless changes in humidity caused the original desk's solid flatsawn mahogany panels to cup so badly that the screws holding the hinges appear to have been torn loose and repaired numerous times. It would be much easier to make these panels out of solid wood, as Randolph did—and it's an option you may want to consider—but I decided to deal with wood movement by making built-up panels consisting of a plywood core and bandsawn mahogany veneer. I figured the plywood core would stabilize the panels.

It's simple enough to buy sliced veneer, but I

In the spring of 1776, 33-year-old Thomas Jefferson had an idea. His frequent 200-mile coach rides from his home near Charlottesville, Va., to the Continental Congress in Philadelphia, Pa., could be more productive, he thought, if he could do some reading and writing on the way. After sketching his idea for a portable lap desk that would hold his supplies, he gave the drawing to Benjamin Randolph, a Philadelphia cabinetmaker. In July 1776, when the desk was brand new, Jefferson used it to write the Declaration of Independence.

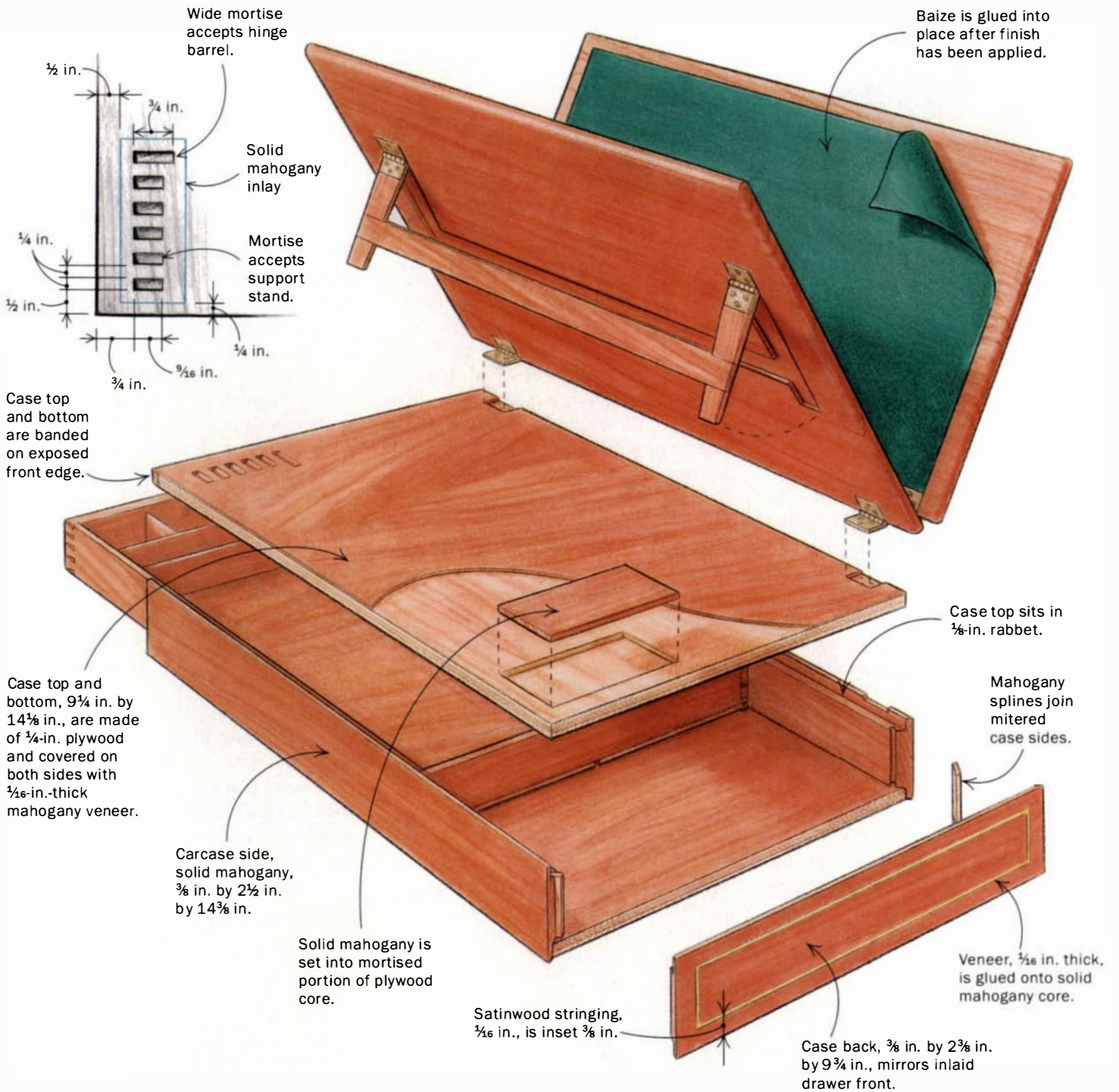
This tiny writing desk, weighing only 5 lbs., is the result of Jefferson's ability to invent the obvious; a portable desk where he could keep all of his reading supplies and write comfortably. Jefferson used the desk for 50 years. The desk accompanied him wherever he went. In 1825, just a few months before his death, Jefferson gave the desk to his grandson Joseph Coolidge. Soon after Coolidge's death in 1880, his children gave the desk to the federal government for safekeeping.

The moment I saw Jefferson's little lap desk in the Smithsonian National Museum of American History, I knew I had to build one. On numerous visits to Washington, D.C., I peered endlessly at the original, taking several rolls of photos and filling a notebook with sketches. Crafted out of mahogany, the desk has exquisitely small dovetails in the drawer, tiny screws fastening the hinges and a small satinwood inlay for decoration. When opened, the desk offers a comfortably slanted, baize-covered writing surface. (Baize is a feltlike fabric used to cover billiard tables.) The lid's support stand fits into different notches so that Jefferson could change the angle of the top when he wished. Folded halfway, it becomes a



Revolutionary laptop. Thomas Jefferson wrote much of the Declaration of Independence on this small mahogany desk. The original (at left) is in the Smithsonian Institution. The closed version at the top of the page is the author's replica.

INTRICATE JOINERY IN A SMALL PACKAGE



wanted more control over the thickness and grain pattern. To make your own veneer, you need a bandsaw and a benchtop surface planer. I cut the veneer a little thicker than 1/8 in. on a 14-in. bandsaw with a riser block, which allowed a full 10-in.-wide cut. If your bandsaw won't support a cut this wide, simply cut two 5-in. pieces and glue them together. When setting up the bandsaw, be sure to take drift angle in-

to account (for more on making shopmade veneers, see *FWW* #143, pp. 44-49).

Joint or plane one face of the mahogany, make the bandsaw cut, then surface the face of the board once more. The veneers will be smooth on one side but rough on the other. The veneer is too thin and flexible to run through the planer on its own, so tape the veneer—smooth side down—onto a piece of melamine, using double-faced

tape. The whole assembly can be run through the planer, which will give you a clean surface on both sides.

Gluing the veneer to the core—The first job of gluing up the panels is to cap the plywood edges and inlay areas that will be mortised out for the desk support stand and the notches in the top of the carcass panel. I ran all of the grain in the same di-

Edge-banding is the key to seamless veneering

rection so that it would look like a single, solid piece of mahogany, end grain and all. First mill some mahogany to the thickness of the Baltic birch plywood core. For the long edges, rip strips about 1/4 in. wide. Carefully cut some pieces of end-grain edging about 1/4 in. wide. This edging—quite fragile when first cut—gets reinforced when the veneer is glued in place. By cutting the banding out of the same piece of wood you use for the veneer, the color and grain pattern should be pretty close.

Rout out the areas where the mortises will go and glue in mahogany pieces, carefully outlining the backing areas on the outside of the veneer so you'll know what goes where after the veneer has been glued on. Glue the mahogany into the mortise, then use a cabinet scraper to flush it to the plywood core.

The plywood is sandwiched between layers of veneer, and all of the panels are glued up at once. To save time, use a roller to apply glue to both the plywood and the veneer. With one layer of melamine between the panels, stack more layers of melamine, sandwiching the panels to help distribute clamp pressure evenly. Once the glue has set, the veneer can be trimmed flush with the edges.

Straightforward carcass construction

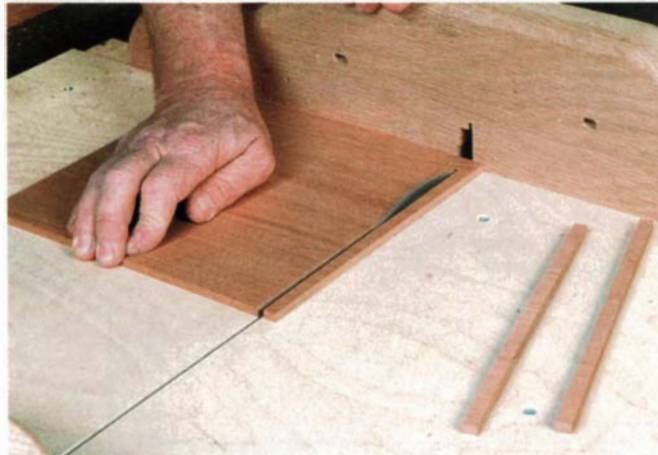
The carcass for the original desk consists of five boards joined with rabbit joints and a few brads. The grain orientation of the top and bottom panels is across the width of the desk. The end is mitered and has satinwood stringing matching that of the drawer front on the opposite end of the desk. The miter joints in the original probably have hidden dovetails, but I used splined miter joints instead.

Again, I opted to glue up veneered panels for the top and bottom of the carcass, although in the original these solid mahogany panels are nailed to rabbets in the sides of the desk and seem to have stayed flat just fine. If you glue up plywood-core panels, you must inlay mahogany where the notches are in the top panel. Because only one edge on each of the panels shows, only that edge needs banding.

Inlay the satinwood detail—At about 1/16 in. wide, the stringing on the end piece looks like it was set into a slot in the original. But I approached it as a marquetry project. Using a razor knife and straight-



Making veneer on the bandsaw. Slicing veneer isn't hard as long as your bandsaw is tuned up and working well. A new blade, a riser block, an auxiliary fence set to the drift angle and a nice, easy feed pressure will help you achieve a very satisfying cut.

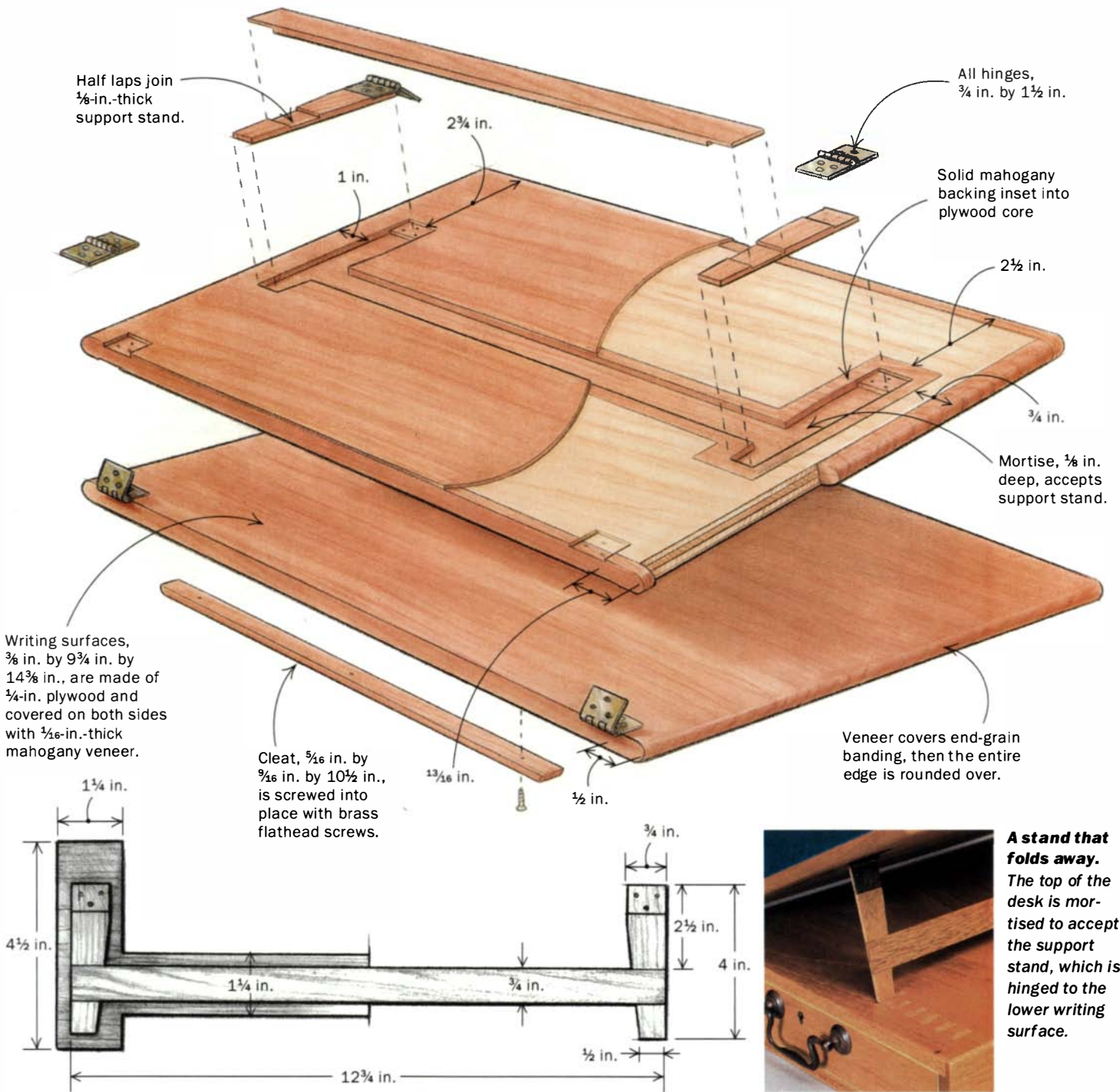


Cutting the plywood band. For a seamless edge that will look like solid wood, cut banding from the end grain of the same mahogany board you used to cut the veneer.



Gluing the banding in place. The perimeter of the plywood is banded with mahogany prior to gluing the veneer. The end grain is fragile at this point, but the glued-on veneer will provide reinforcement.

PLYWOOD CORE STABILIZES HINGED WRITING SURFACES



edge to cut the pieces, glue up the veneer with the stringing in place. Then glue the veneer back on to the substrate, in my case a piece of solid mahogany.

Rabbets and hidden splines hold the case together—The spline cuts are easily made using a tablesaw sled. Place the carcass parts flat on the sled and angle the blade at 45°. Use a stop block to register

the cut, and make sure that the cut is entirely hidden in the rabbet. I cut solid mahogany spline material so that the grain runs the same direction as the sides of the carcass, allowing for expansion and contraction all in the same direction and at the same rate.

Assembling the carcass—Because the plywood-core panels minimize wood

movement, you can glue the top and bottom to the sides of the carcass. If you're using solid wood panels, I would suggest that you use just small brads without glue; this will allow the wood to move just a bit and should keep the desk from tearing itself apart.

Glue up the carcass first, then fit the drawer to the opening. Be sure the carcass is flat when you glue it up. Either set it on a



A stand that folds away. The top of the desk is mortised to accept the support stand, which is hinged to the lower writing surface.

Solid wood is inlaid in areas to be mortised



Inlay the plywood core. Because the top of the carcass and the writing surfaces will be mortised to accommodate the support stand, the plywood is mortised and inlaid with solid wood. After using a Forstner bit to remove the bulk of the material, a straightedge jig helps guide a laminate trimmer to clean up the edges.



Roll on the glue. Use a roller to apply glue to both the veneer and the plywood core, making sure that there is 100% coverage on both.



Mortising for the support stand. The lower writing surface of the desk is mortised to accept the support stand. After material has been hogged out with a router, a chisel is used to square up the corners.



flat surface or use winding sticks on the surface to sight along the top surfaces.

It's a challenge to build and fit the drawer

The drawer in the original is a traditional, dovetailed box with a solid wood bottom. It's an especially challenging job, just as it must have been then, because the sides

and partitions are so thin— $\frac{3}{16}$ in. for the sides and $\frac{1}{8}$ in. for the partitions.

Start by fitting the drawer sides and front into the carcass, allowing for a bit of expansion over time. The dovetails in this drawer are so small that even an $\frac{1}{8}$ -in. chisel is too large. (I ground an old chisel down to a little less than $\frac{3}{32}$ in. for the job.) Lay out and cut the dovetails, fit the bottom of

the drawer into a groove and tackle the partitions last (for more on making drawers, see *FWW* #117, pp. 45-49).

The thin drawer partitions are held in place with V-grooves and mitered points, which act as tenons. These are easier to cut than you might think. Mitered points can be cut on a miter saw, and the grooves are easily made on the tablesaw with a cross-cut sled and the blade set at 45° .

A delicate touch is required to make and install the support stand

Made of $\frac{1}{8}$ -in.-thick material, the support stand is a very delicate assembly. Cut out the pieces and run the half-lap joints and hinge mortises on the tablesaw crosscut sled, then smooth the cuts with a scraper.

The support stand is housed in the lid when the writing surfaces are closed. Carefully position the support stand in the spot it will occupy in the panel recess, then trace around it with a sharp pencil. I used a laminate trimmer with a $\frac{3}{16}$ -in. straight bit to cut the mortise, but a router would work as well.

To help guide the laminate trimmer, use a simple jig consisting of a small piece of plywood with a straightedge glued along one face. With the small straight bit in the laminate trimmer, trim the jig so that its edge is at the edge of the cut. With this jig, the bit cuts exactly along the edge of the plywood. It's easy to clamp the jig along the pencil line, starting and stopping the cut as needed. The round corners of the mortise can be squared up with a chisel.

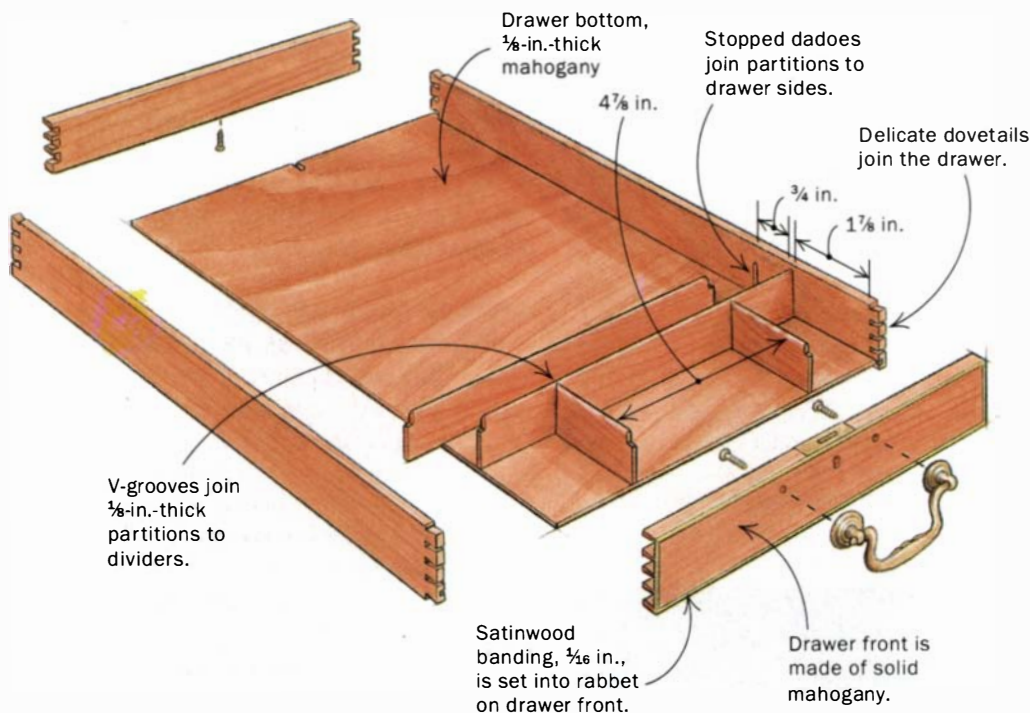
This small desk takes a lot of hardware

For such a small piece, there is a considerable amount of hardware to mount—six hinges, a mortised lock and the handle. You can mortise for all of the hinges at one time, using the same straight router bit you used to cut mortises for the support stand. Then square up the corners and trim the edges with a knife and chisel.

To find the depth for the hinge mortises fastening the bottom writing surface to the carcass, hold the hinge leaves closed but parallel. Half of this measurement, not the thickness of the leaf, is the right depth for this hinge mortise. For the other hinges—fastening the support stand and holding the upper writing surface to the lower one—only mortise to the depth of the hinge-leaf thickness itself.

The hinges used in this project need very

DELICATE DOVETAILS AND MORE



small screws. But wood screws, even small ones, have a smooth shank, then taper from there to the end of the screw. This means that there are only very shallow threads for the lower 1/8 in. To make matters worse, the support stand is only 1/8 in., so it's impossible to use conventional wood screws to mount the hinges. Though unconventional, I used solid-brass, slotted machine screws (#2 by 56 tpi by 1/4 in. long). First drill 1/16-in. pilot holes, then use an awl to enlarge the holes slightly. The machine screws have a remarkable amount of holding power, even in the thin support stand. I shortened the screws for

the support stand by holding them with pliers against the grinding wheel of a bench grinder.

The lock mortise is pretty straightforward to cut with a router and chisels. Just make sure that you cut the mortise for the lock and drill for the drawer pull *before* you assemble the drawer.

Antiquing the hardware—The drawer pull came polished, the hinges came plain, and the mortise lock was brushed. I wanted it all to look the same, so I decided to antique all of the brass. I soaked the hardware in lacquer thinner to take off the lac-

quer, then used Brass Darkening Solution from Crown City Hardware (626-794-1188) to make everything the same color. It took only about 30 minutes and worked amazingly well, leaving everything a uniform dark brown. By polishing slightly with 0000 or synthetic steel wool, you can bring the surface finish back up to whatever polish you like.

After all of the hardware is in place and adjusted, remove it to sand and finish the entire project.

Hand-rubbed varnish is an ideal finish for the laptop

Though you can just as easily scrape, plane or sand the surfaces of this laptop for finishing, I sanded by machine during the building process with a belt sander and 120-grit paper, then sanded by hand using a felt block with 120 grit and then with 150 and 220 grit.

The finish for the desk should have a satin sheen—not too glossy and not too dull. All you need to get a nice, durable, hand-rubbed finish is high-gloss spar varnish, thinner (I used turpentine), 400-grit wet-or-dry sandpaper, some rags and a little elbow grease. Simply rubbing gloss varnish onto the raw wood, then wiping off the excess with a rag will provide the protection and sheen that closely match the 225-year-old original, not the glossy sheen you'd expect from a high-gloss varnish. Gloss works best as a wipe-on finish because it has greater clarity and will not hide the wood grain as a semigloss or eggshell finish would.

Wearing gloves and using the wet-or-dry sandpaper, rub all of the surfaces with var-

Satinwood stringing mimics drawer banding



Detailing the drawer. Satinwood banding is applied to a small rabbet on the drawer front. Tape holds the banding in place until the glue dries.



Slice and rejoin veneer. On the back carcass panel, instead of inlaying the satinwood stringing, approach it as a marquetry project. Use a small knife to cut the veneer into sections.

nish thinned by one-third. Cover the entire surface and sand until you produce a slurry, which acts as a pore filler.

With the varnish still wet, wipe the surface with a soft cotton rag and buff until the surface is slick and smooth. Polish again with a clean, dry cloth after a few minutes to make sure no wet spots remain. The next day, lightly sand it dry with 320-grit paper. Repeat the process with unthinned varnish each day until you build up three or four coats. Each coat will produce slightly more luster. Rubbing gloss varnish this way produces a lovely hand-rubbed sheen that's hard to beat.

Applying the baize can be tricky

The cloth used on the writing surface looks a lot like felt, but it's actually a woven fabric. It's called baize and is available in a wide range of colors from billiard supply houses. Make sure you mark the back of the cloth.

Apply the cloth to the writing surface after the finish has been applied and the hinges are in place but before mounting the book stop. This way the top and bottom writing surfaces can be laid out flat on the bench.

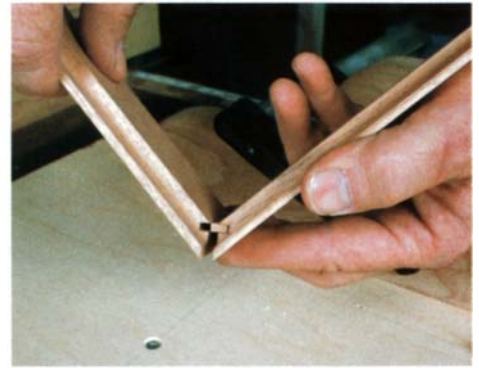
Using blue masking tape, carefully mask off a wood border of about 1/2 in. around the cloth, then cut out a piece of cloth about 1 in. oversized. I used 3M Super 77 spray adhesive in an aerosol can, applying the adhesive to both the writing surface and the back of the cloth. Use only a light coat on the fabric so that the adhesive doesn't bleed through. After about 30 seconds of drying time, begin laying the cloth onto the working surface, smoothing out the wrinkles as you go.

Now comes the tricky part. Using a razor-sharp utility knife and a straightedge, carefully trim the cloth to size, trying not to cut too deeply into the wood but making sure you cut all the way through the fabric. As the cuts are made, pull up the extra fabric and masking tape.

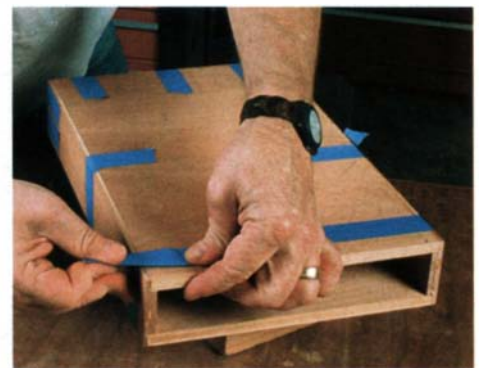
Only about the size of a stack of legal pads, this project combines traditional joinery with modern tools, materials and techniques, resulting in a replica of the lovely little writing desk that played such a large part in U.S. political history—a "Relic of Revolution," indeed. □

Lon Schleining sells full-sized plans of this project on his web site: www.woodbender.com.

Miters and rabbets join the carcass



Splined miter cuts. The carcass is assembled with miters and reinforced with splines. With the ends of the stock cut to 45°, the spline slots can be cut on the crosscut sled at the tablesaw. To allow for uniform expansion, cut spline material to fit with the grain going the same direction as the sides of the carcass.



Tape up the mitered carcass joinery. Tape helps hold the joints in place before the clamps go on. After applying tape to the outside of the mitered joints, flip the assembly and coat the mitered ends with glue.



Assembling the carcass. Once glue is applied to all the joints, tape helps hold the carcass assembly in place. Once the assembly is clamped up, use winding sticks to check the flatness.

Tying Down Lumber

How to keep your mahogany off the highway



BY GARY WILLIAMS

If you live in an area where you hear daily traffic reports, you're probably familiar with the phrase "ladder in the roadway." Christmas trees, couches and mattresses also find their way onto the pavement from time to time and so, unfortunately, does good lumber. Keeping these things with the vehicle for the entire trip home is a challenge often met by throwing yards and yards of rope or twine over them and hoping for light winds.

As with most things in woodworking, there are tricks to keeping lumber from taking flight, and most of the tricks are simple. When it comes to tying down, the tricks I've found most useful are these:

- Use several short ropes, not one long one.
- Learn three knots.

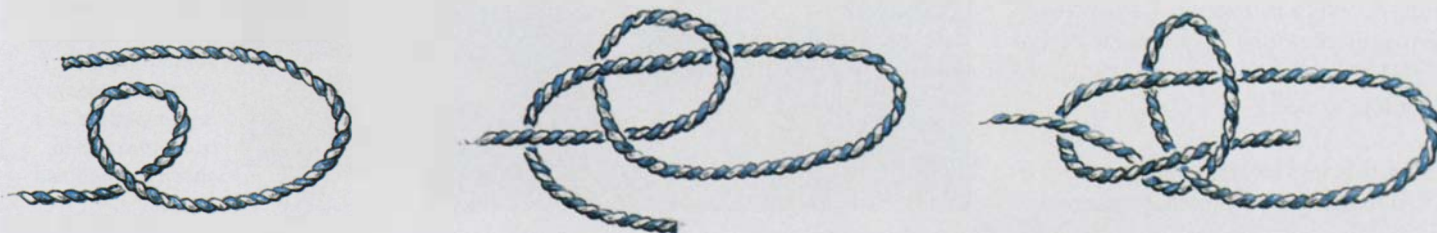
When my ropes need replacing, I buy about 50 ft. of $\frac{3}{8}$ -in. braided or three-strand nylon (don't use polypropylene rope—the

cheap yellow stuff—because it won't hold a knot) and cut it into four equal lengths. A 12-ft. piece of rope is long enough to get over most things that will fit in my little truck, with enough left over for some knots. Several short ropes give redundancy that one long piece doesn't offer. The load is cinched down and tied off in at least two separate places; should one rope or knot fail, the others are still on the job. They also get you on the road sooner because you're not feeding a mile of rope through every loop and hook.

The three most useful knots are a bowline, a slipknot and a half hitch. Together, these three basic knots are usually called a trucker's hitch and provide a sure, simple means of cinching down the load and quick release when you are safely in the driveway. □

Gary Williams is a technical writer and woodworker in San Diego.

THE BOWLINE KNOT





1. Start with a bowline, tied to the rack. Then lead the line over the load and back.



2. Tie a slipknot near the top of the load.



3. Bring the end down under a hook or bar on the truck and back up through the loop of the slipknot.

THE BASIC TIE-DOWN

A tight, snug stack. The load must be held down snugly on both sides. With a narrow stack, start by tying off on the outside. Take the rope over the load, under the rack on the inner side and back over the top to the outside. Make sure the line isn't lapped over itself on top of the load so that it's free to move as you cinch down.

Not a good idea. A wide stack can be dangerous. The rope, stretched horizontally, can't exert sufficient pressure to keep the middle boards from sliding out in a hard stop.



4. Then pull down hard. Try to move the lumber sideways; if it moves, pull harder on the rope.



5. Pinch the rope together to hold things tight.



6. Then grab another loop of the loose end and tie a half hitch. This locks the tie-down. Because you made the half hitch with a loop, you can untie it simply by tugging on the end.

COMBO STACK: TYING PLYWOOD AND LUMBER TOGETHER



When carrying a mixed load, it's safest to tie down the plywood first. Pad the edges with carpet scraps or cardboard to avoid damage.

After tying down the plywood, lay two loose ropes across it and stack the lumber on the ropes, approximately in the center of the truck.

Toss the ends of each rope over the stack so the ones from the right end up on the left and vice versa.

Tie off the lines on both sides using trucker's hitches. Make them loose at first, then cinch them tightly.



A Guide to Drawer Slides

Whether hidden, under-mount or side-mount, your choice depends on the project

BY JOHN MARCKWORTH



Ever since man abandoned the hollow log for storage and began building furniture, drawers and drawer making have defined the quality of both cabinet and cabinetmaker. If you don't believe that, just watch customers in a furniture or kitchen showroom. One of the first things they do is yank open a drawer, the equivalent of kicking the tires at a car lot.

Traditional and high-end furniture designs still call for piston-fit drawers that slide on wooden runners. They are time-consuming to fit and, even when executed with skill, may become sticky or sloppy due to extreme changes in humidity. That's one reason why drawer slides were invented. Depending on the project, mechanical

HIDDEN SLIDES

A clip mounted under the drawer front engages the slide's runner (the movable portion). The fixed portion of the slide is screwed into the side of the case.



Tandem by Blum

Drawer sides must not be thicker than $\frac{5}{8}$ in. One size clip fits all. The clip has tool-free height adjustment. The drawer bottom must be recessed $\frac{1}{2}$ in. from the sides.

Quadro by Hettich

Clips must be matched to the drawer thickness. Three clip sizes are offered: $\frac{1}{2}$ in., $\frac{5}{8}$ in. and $\frac{3}{4}$ in. Elongated mounting holes allow for height adjustment. The drawer bottom must be recessed $\frac{1}{2}$ in.

Dynamic by Mepla

One size clip with tool-free height adjustment fits drawers up to $\frac{3}{4}$ in. thick. The drawer bottom must be recessed $\frac{3}{8}$ in. (10mm).

UNDER-MOUNT SLIDES

If one or both sides of a drawer are built at an angle other than 90°, mount one or two slides underneath the drawer on the cabinet's base or on a horizontal divider.



The best slides for mounting under a drawer. Ball-bearing slides, commonly used as side-mounts, are the author's choice for under-mounting. But their load ratings will be lower when used this way.

drawer slides may be a good choice for custom furniture and cabinetry.

Drawer slides have a lot going for them. They cut down on the time it takes to build furniture. They can support greater loads. Drawers can be opened without tipping. Also, slides are unaffected by the seasons, and the best of them are virtually hidden and won't detract from the look of a finely crafted piece of furniture.

Hidden slides are for fine furniture

Exposed drawer hardware has the kind of beauty that makes engineers smile, but woodworkers generally look upon them with considerably less affection. Fortunately, there are slides that mount under the drawer, hidden from sight. Among the top choices are Blum's Tandem, Mepla's Dynamic and Hettich's Quadro slides. All are self-closing, and most have micro-adjusters that can raise or lower the drawer front for fine-tuning after installation. They are made to handle loads of about 75 lbs. to 100 lbs., good for most applications,

from kitchen cabinets to entertainment centers to bedroom furniture. They are available in three-quarter or full-extension models and tend to be among the more expensive slide options on the market.

Hidden slides may limit your design options. Drawer sides, for example, can be no thicker than $\frac{5}{8}$ in. or $\frac{3}{4}$ in., depending on the model of slides. And drawer bottoms must be recessed from the sides to provide a nook for the runners (the movable parts). Clips on the underside of the drawer hold the drawer fast to the runners and make drawer removal a snap. For hidden slides to operate smoothly, drawers must be built to fairly tight tolerances ($\frac{1}{2}$ in. sloppy layout here and there can make a difference)—closer than what I've become

accustomed to with other types of mechanical slides. Despite these requirements, I've grown to like hidden slides. Customers appreciate them, too.

Under-mount slides solve unusual problems

Under-mount (also known as center-mount) drawer slides are mounted under the centerline of the drawer. Because only one slide is generally used, the drawer may be prone to racking when fully extended or overloaded. The best under-mount slides are of the captured ball-bearing design. (The same ball-bearing slides are also used in side-mount applications.) Wooden under-mount runners are also available, but I don't recommend them because they don't have the smooth action of the ball-bearing slides.

Under-mount slides are ideal for situations in which one or more drawer sides are purposefully not square (see the right photo above). (Hidden and



SIDE-MOUNT SLIDES

For utility drawers or applications where heavy loads are encountered, side-mount slides are commonly used.

Ball-bearing slides can handle big drawers. Whether the load is 50 lbs. or 500 lbs., you can find suitable ball-bearing slides for the job.

Simple, economical roller slides for utility drawers. When matched to the color of a drawer, these slides are unobtrusive.



side-mount slides require square construction.) Under-mount slides can be used in pairs to improve the load-bearing capacity of a drawer. In such a situation, I mount the slides as close to the sides of the drawer as possible. Be sure to plan carefully for the load the drawer will carry—the stated load rating may decrease by more than 50% when ball-bearing slides are mounted under the drawer.

Side-mount ball-bearing slides are designed for heavy loads

Ball-bearing slides have the smooth, positive action of hidden slides and are easier to install. But they are visible when the drawer is open. Ball-bearing slides are available in three-quarter extension, full extension and over-travel (usually 1 in. extra travel past full extension), as well as extralong lengths and with heavy load ratings (some can carry 500 lbs.). The slides require ½ in. to ¾ in. clearance on each side of the drawer. Ball-bearing slides are among the most versatile of drawer slides and a favorite for commercial installations or for projects that have heavy load requirements, such as kitchen drawers designed to hold canned goods or heavy cookware.

Roller slides work well for utility drawers

Roller slides are used mostly on commercially produced furniture and cabinetry because of their low cost, simple design and straightforward operation. Each slide consists of two parts. The drawer-mounted piece has a fixed nylon or ball-bearing wheel at the back, and the cabinet-mounted piece has a corresponding wheel at the front. The slide interlocks on one side, and the two wheels run along channels formed by the opposing part.

Pain-free slide installation

GENERAL GUIDELINES

Using a tape measure, pencil and square to mark each slide's location in a cabinet invites errors. I employ a "pattern method for dummies," which works even on bad days and guarantees accuracy better than ⅛ in., the tolerance required for most drawer slides.

Lay out the drawer using a story stick, which is a piece of scrap the same height as the cabinet interior. Mark the drawer dimensions and the location of hardware on the story stick. Be sure to note whether the drawers are inset or overlay, because this will affect the depth of the slides. Also, pay attention to the clearance between drawers: the requirements are given in the instructions. Mark the story stick accordingly. Use the story stick to position drawer-guide jigs accurately inside the cabinet.

When ordering slides in bulk, you may have to buy screws separately. Order the correct style of screw from the manufacturer; incompatible screws may cause the moving parts of slides to jam. Use a self-centering drill bit when predrilling mounting holes. Most slides have a combination of round and elongated mounting holes. Use the elongated holes for the initial mounting, adjust as needed, and secure the slide by placing screws through the round holes.

For Euro-style frameless cabinetry, drawer slides are mounted directly to the sides of the cabinet. For traditional face-frame cabinets, I usually install blocking (a wooden spacer) behind each slide. The blocking, which runs the full length of the slide, is unobtrusive because I use the same material used on the cabinet interior. Blocking can be adjusted for either inset or overlay drawer faces. As an alternative to wood blocking, plastic or nylon spacers are available in ⅛-in. (or metric equivalent) thickness increments. Use proportionally longer screws with these. The spacers work, but I

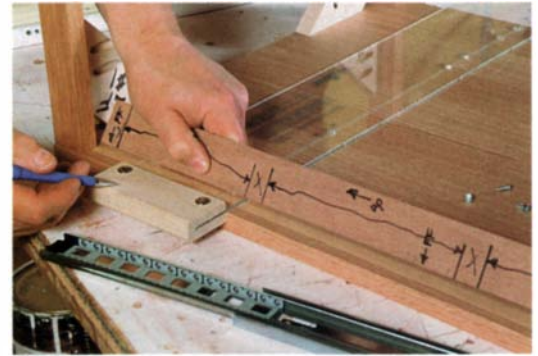
Most makes require ½ in. clearance on each side.

Some roller slides incorporate a "self-closing" feature—a short, downward-angled section at the back of the runner that pulls the drawer into the cabinet the last inch or so with no effort on your part. The downside of this

design is that the slides wear out sooner because fewer parts carry the load. Roller slides are not suitable for heavy loads, and their design allows for a fair amount of rack (side-to-side movement) when extended. They're okay for utility applications such as kitchen drawers.

From production cabinetry to custom furniture, modern drawer slides can provide a fast and reliable method of dealing with the hallmark of the cabinetmaker's art: the drawer. □

John Marckworth is a woodworker in Port Townsend, Wash.



Mark the location of drawers and slides on a story stick. Used in tandem with a jig, the story stick ensures accurate placement of the slides inside the cabinet.



Pilot holes should be centered. Self-centering bits guarantee accurate placement.

prefer wooden blocking, which can be fine-tuned with a pass across a jointer and provide a rock-solid mounting surface.

And yet a third alternative is nylon or metal sockets, which mount to the cabinet back and attach to the rear of slides. I don't use sockets because they are more difficult to position accurately than blocking and don't provide the same kind of strength.

Even the best installation may require some fit and fiddle at the final stage, especially with flush drawers and narrow reveals. If the drawer is a bit too narrow for the opening, shim the slides out from the cabinet using a piece of paper or cardboard.

HIDDEN SLIDES

The runners of hidden slides cannot be removed. Drawers are held on top of the runners by hooked tabs at the back corners and a pair of clips under the front, behind the face. Aim for tolerances of $\frac{1}{2}$ in. when working with these slides.

Installing the slides on the sides of a cabinet is fairly straightforward, much like other side-mount hardware. Use a piece of plywood scrap, cut to the height of the slide location (transfer marks from the story stick), place the slide on top of it and then screw it in place. Proceed from top to bottom, cutting the plywood as you go. Commercial jigs are also available for predrilling mounting holes.



Use a piece of scrap plywood to position the slides inside the case. Also, set the slides back from the edge of the case, as per the manufacturer's instructions.



Hidden slides require clips, which go underneath the drawer. The author uses a boring guide from Blum to predrill the mounting holes at the proper angle.



The rear of the drawer is bored out using a jig, too. The holes are for hooks located at the tail ends of the runners.



The drawer sits on top of the runners. Notches are cut in the back to clear the runners.

UNDER-MOUNT SLIDES

Under-mount slides are installed under the centerline of a drawer. You really don't need a story stick to install them. Simply mark a centerline on the divider and the underside of the drawer bottom. Then place the slide halves over the marks and screw them in place. Thick drawer bottoms, usually $\frac{5}{8}$ in. minimum, must be used to provide enough material for the screws to take hold, and this may add a lot of unnecessary weight to a drawer. Under-mount slides must be mounted to a fixed shelf, a divider or a stretcher. Plastic or wooden guides, attached to the carcass (under the corners of drawers), are required to keep the drawers from tipping.



Locate the slide along the centerlines of the cabinet divider and the drawer. The slide screws into the drawer bottom, so use material that's at least $\frac{5}{8}$ in. thick.



Place guides under the corners of the drawer. A variety of plastic guides are available. The wooden ones are shopmade.

BALL-BEARING AND ROLLER SLIDES

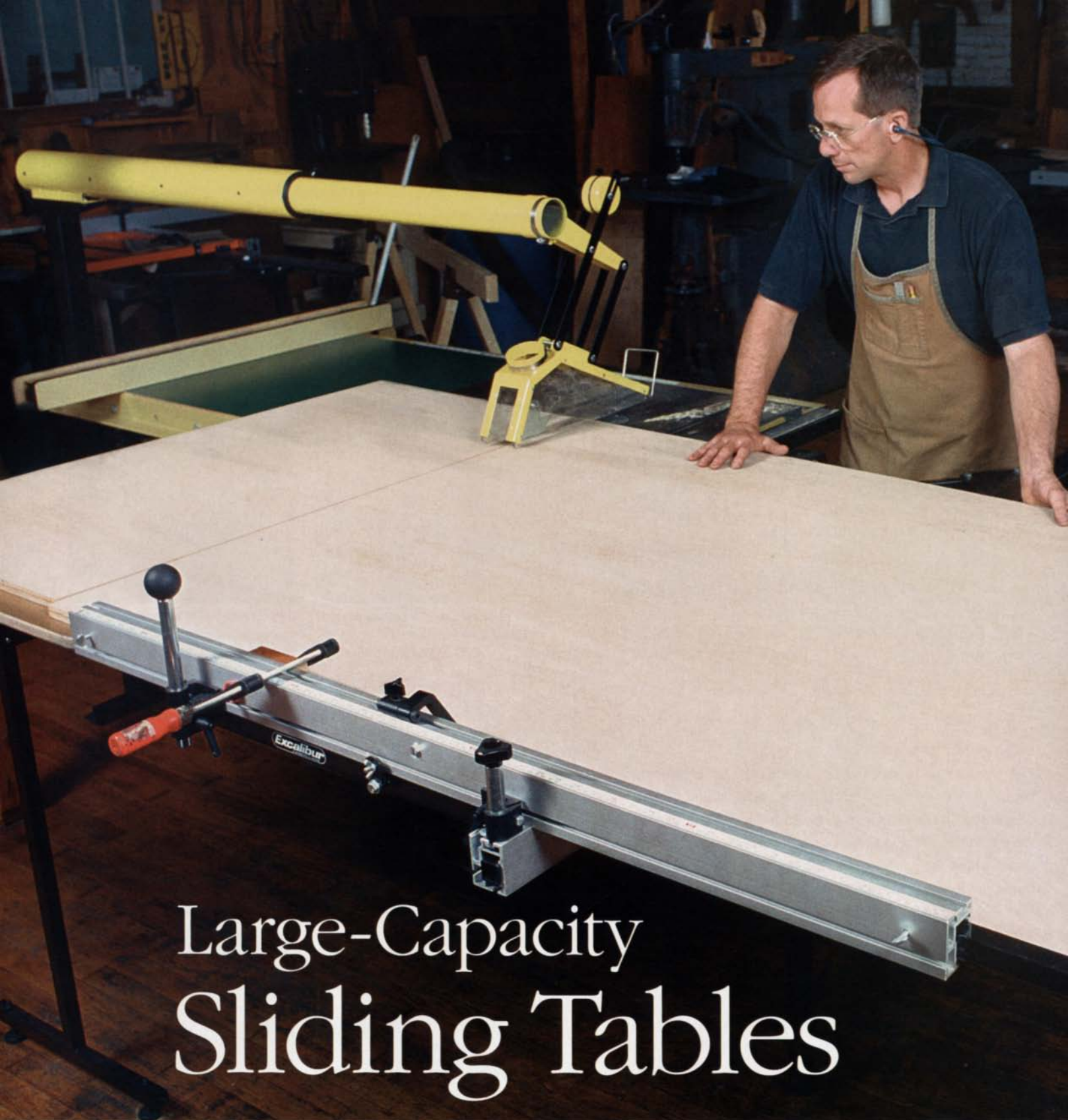
Ball-bearing and roller slides may be positioned on the case using the same plywood-scrap/story-stick method mentioned in the section on hidden slides (above). Some companies offer jigs made specifically for their products—this type of jig can be more efficient when doing large runs of drawers. When screwing ball-bearing slides to the sides of a drawer, place the drawer and slide half on a flat surface to ensure that the slide ends up flush with the side. With roller slides, the drawer runner, which is usually L-shaped, wraps around the bottom and side and is held with screws.



Ball-bearing slides are installed flush with the bottom edge of the drawer sides. Use a flat surface such as a workbench when installing them.



Roller slides are easy to position. The L-shaped runners wrap around the undersides of drawers.



Large-Capacity Sliding Tables

These tablesaw add-ons handle crosscutting tasks up to full-panel width

BY KELLY MEHLER



From the beginning of my career as a furniture maker, I have felt that American tablesaws were missing a major component: a sliding table. Older saws in this country had them, and in Europe they still do. Without one we are forced either to build crosscutting sleds of various sizes and functions or accept sloppy results. Granted, there have been improvements on the miter gauge, but the best still push the work along the table surface and can't handle large workpieces.

Once you experience the effortless feel of a sliding table carrying the workpiece past the blade, you will see the light. All crosscutting—not just large work—becomes easier to handle.

Add-on sliding-table attachments will not create a true sliding tablesaw. They can't match the accuracy of a sliding table that is built into the saw and runs close to the blade, such as that on a European saw. But for the woodworker who has already invested in an American-style tablesaw and needs crosscut capacity up to full-panel width (48 in.), one of the three large models examined in this article may be a good choice. Prices range from \$500 to \$950. There are other add-on units available with smaller cutting capacities and smaller price tags, but I narrowed the focus here to the larger models. I looked at the Exaktor EX-40, the Excalibur EXSLT40 and the Robland Sliding Table Attachment.

Sliding tables make crosscutting safer, placing the user to the left of the blade and supporting heavy, long and wide pieces.

These tables can cut large miters and handle most crosscutting operations, from dadoes to tenons. These models can accurately crosscut 4x8 sheet goods but work best with some side support, especially the Robland, which has the smallest table. I found that a hold-down, which comes with the Exaktor and Robland and is available as an accessory for the Excalibur, is necessary to keep work from lifting or shifting.

The fences are similar on all three models. Each is attached to the table at two points: a right hold-down point that is fixed but pivots, and a left hold-down clamp that slides forward and back to hold the fence at various angles. All of the sliding tables incorporate an adjustable stop to locate the fence at 90°.

All models are added to a tablesaw after removing the saw's left extension wing. The Exaktor and the Excalibur will fit contractor-type saws. And all will require cutting off part of most rip-fence systems, such as the Biesemeyer, unless the whole fence system is remounted farther to the right. On the other hand, the sliding-table manufacturers point out that these sliding units minimize the need for the 52-in. fence systems when cutting wide panels.

It's important to note that a right-tilting tablesaw is more appropriate for sliding tables, because crosscutting is done to the left of the blade.

Two from Canada

The Excalibur and the Exaktor are similar in name, price and design. Both are made



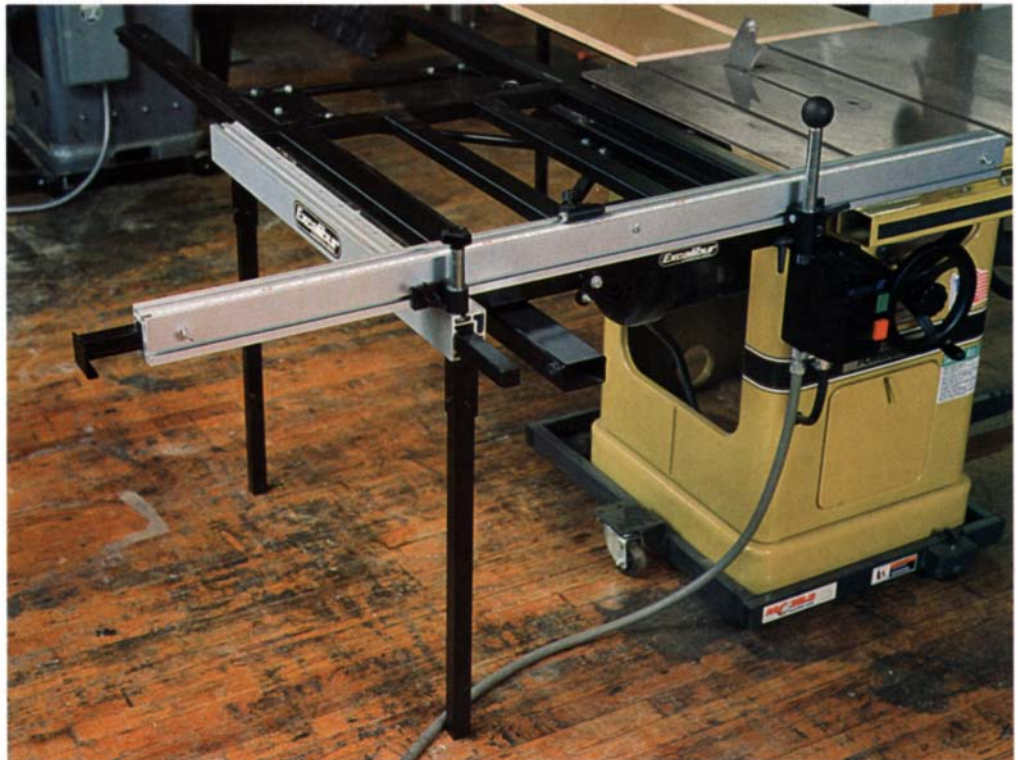
Is your saw missing a sliding table? One of these add-on units certainly will outdo your miter gauge and probably replace a few of your crosscut sleds. Difficult cuts such as large miters and multiple matching dadoes will be easier. However, the units examined here force you to choose between accuracy and the ability to support large stock.

EXCALIBUR EXSLT40/60

Price:	\$499/\$695
Stroke:	49 in./62 in.
Table size:	26 in. by 31 in./32 in. by 31 in.
Fits saw styles:	Cabinet, contractor
Assembly/installation time:	6 hours
Ease of alignment:	Difficult
Overall accuracy:	Moderate
Fence stability:	Good

Comments: Table is more accurate with panels than with small parts. Comes with one stop, no hold-down, but a hold-down and extra stops are available.

The Excalibur EXSLT40 and the similar Exaktor excel at handling large panels and boards. The Excalibur comes more fully assembled than the Exaktor (facing page), and its fence is easier to remove for ripping.



The Excalibur and Exaktor fences lock solidly. The clamping handles are easily accessible and easy to tighten. The angle scale on both fences is located on the extruded-aluminum outside rail, far from the pivot point, allowing fine graduations.



The flip-down stop on the Excalibur is located and locked along the fence's scale first. Then it's flipped down for use. The Exaktor's is almost identical.



A table lock is handy. Both the Excalibur and Exaktor tables lock in place, which is helpful when loading large panels. A quick pull on the table unlocks it without having to reach underneath for a lock lever.

in Canada. Both tables ride on guide rails—square tubes—that are supported by a metal framework and legs. As a result, both units have a much larger footprint than the third model, the Robland sliding table.

We tested the 49-in. Excalibur and Exaktor models, which can crosscut a 48-in.-wide panel but don't clear the blade at the end of the cut. This means the operator has to be more aware of the blade when removing the workpiece. But both manufacturers offer very similar models with 62-in.

strokes, enough to carry a full sheet past the back of the blade. The Robland comes in only one version, with a 60-in. stroke, enough to carry a 48-in.-wide panel past the back of a 10-in. blade.

On both the Excalibur and Exaktor, the outside guide rail is supported by two legs, while the inner rail sits on a bracket bolted to the saw table. Bearings hug the outside rail, while the right side of the table glides on plastic strips above and below the inside rail.

Both have an extruded-aluminum bar attached to the left (outside) rail with a scale attached to measure the fence angle. The fence's left hold-down slides in this aluminum channel. Both sliding tables allow the fence to be mounted at the front or rear of the table, with the rear position yielding the full cutting capacity.

Both tables are constructed of steel tubes welded together. Because of the space between these tubes and the slight variations in their levels, the Excalibur and Exaktor

EXAKTOR EX-40/60



Price:	\$545/\$595*
Stroke:	49 in./62 in.
Table size:	33 in. by 31 in. (both models)
Fits saw styles:	Cabinet, contractor
Assembly/installation time:	7 hours
Ease of alignment:	Difficult
Overall accuracy:	Moderate
Fence stability:	Good

Comments: Table is more accurate with panels than with small parts. Comes with two stops and hold-down.

*Exaktor also offers a \$98 kit that upgrades EX-40's stroke to 62 in.

The Exaktor includes more accessories and a number of innovative details. Its fence extension bar (left) has more of the T-slotted extrusion on it to hold a stop or an improvised work support.



A workpiece hold-down is a necessity for accurate cutting. The Exaktor's hold-down clamp requires some practice. It's easy to apply too much pressure and thus flex the fence backward.



A quick-release bracket can replace the solid one on the Exaktor. This option is free if requested at the time of purchase. And one more of these brackets would make for a quick switch to a shaper.



Another innovative extension rod. Another rod/extrusion combo can be mounted on the front or back of the table, allowing the Exaktor's fence to pivot past 90° and 45°.

achieve better accuracy with panels and long work than they do with small parts.

Both tables can be locked in place, making it easier to load large panels and creating a large extension wing for ripping. Both fences are substantial aluminum extrusions. I found the Excalibur to be flat to within 0.001 in. along its 54-in. length. The Exaktor fence, longer at 64 in., was within 0.001 in. along most of its length, dipping to 0.007 in. near one end. This dip was toward the back of the fence, away from the

workpiece side, and was within Exaktor's 0.010-in. tolerance.

While the Exaktor and Excalibur both included fairly clear instructions, installation took almost a full day for each. It took about an hour longer to assemble the Exaktor because many small parts, primarily on the table, were not preassembled as they were on the Excalibur. But the most time-consuming part of installation for these two units was alignment. Each table's framework must be adjusted and readjust-

ed in three ways: (1) The attachment bracket is set so that the right side of the sliding table is level with the saw table; (2) the support legs are raised or lowered to make the left side of the sliding table level with the right side; and (3) the framework between the guide rails is adjusted to get the table running parallel to the blade. A dial indicator is very helpful for this process.

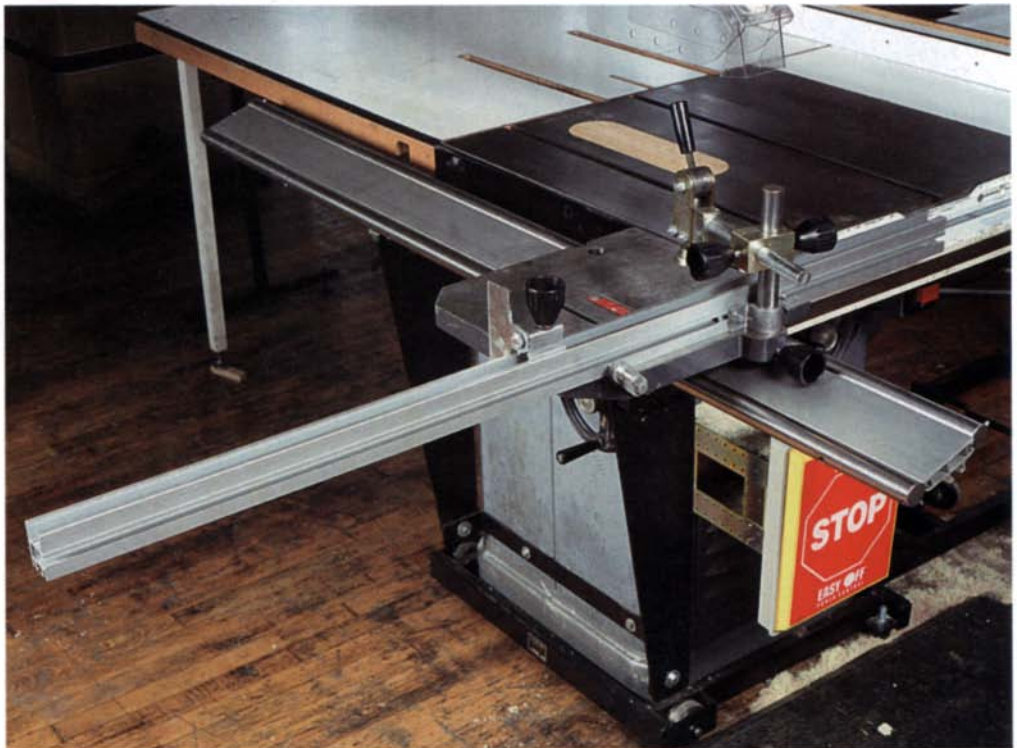
Where they differ—The Exaktor has the advantage of stainless-steel guide rails. The

ROBLAND

Price:	\$795 (\$945 with longer table)
Stroke:	60 in.
Table size:	14 in. by 14½ in. (larger version 31½ in. long)
Fits saw styles:	Cabinet only
Assembly/installation time:	2 hours
Ease of alignment:	Moderate
Overall accuracy:	Good
Fence stability:	Moderate

Comments: Most accurate with smaller wood parts; panels/sheet goods require extra support.

Size works for and against the Robland. It has the smallest footprint of the three models, taking little more space than the extension wing it replaces. Its table is cast iron but is the smallest of the three, offering the least workpiece support.



The Robland's angle scale gets you in the neighborhood. Miter angles can only be read roughly on the red scale inset into the table. The hold-down on the Robland is the stockiest of the three models. Large knobs fit the hand well, and the height is easy to adjust.



Wide work needs extra support on this narrow unit. The Robland, as well as the other models in some cases, requires side support for long panels and boards.



A sliding rail system. The Robland is the only model that delivers its full crosscut capacity with the fence mounted in front of the table (its only position). A stiff leg is added to support the heavy table and the work. The rails can also be slid to the rear.

Excalibur has painted rails, which eventually wear through and become bumpy. A friend who owns an Excalibur solved this by scraping off the paint on his rails.

The Exaktor has a rail extension on the left that allows the fence to be slid to angles beyond 45° and 90°. And it offers a quick-change attachment bracket, making it easier to remove the system from the saw. The quick-change bracket is a free option, with an extra bracket half available for \$19 for attachment to a shaper, for example.

The Excalibur's fence is the easiest to remove of all three units, including the Robland, a handy advantage when switching to ripping cuts.

The Exaktor EX-40, at \$545, is available direct from the manufacturer (800-387-9789), while the Excalibur EXSLT40 retails for about \$499 in catalogs. However, the Exaktor includes a work hold-down and two flip-down stops, while the Excalibur comes with one stop and no hold-down. The Excalibur's hold-down and an extra

stop are available as accessories, but they will add \$60 to the price tag.

The Exaktor EX-40 can be upgraded to the 62-in. stroke by purchasing a \$98 kit that includes a larger rail set and an extra support leg. The Excalibur is available in the larger size (EXSLT60), but only as an entire unit.

One from Belgium

The Robland Sliding Table Attachment, which is distributed in North America by

Laguna Tools (800-234-1976), is quite different from the other two sliding tables discussed here. For starters, the Robland attaches only to the saw itself, needing no support legs in its standard configuration. It has a narrow, sturdy rail assembly and a small, cast-iron table. The Robland's compact structure is the key to most of this unit's strengths and weaknesses.

With no large framework and no support legs on the floor, the Robland sliding table is easy to align and not very likely to get bumped and knocked out of true. The saw can be moved across a shop floor without throwing off the sliding table's alignment. Also, the operator can walk the work through the cut.

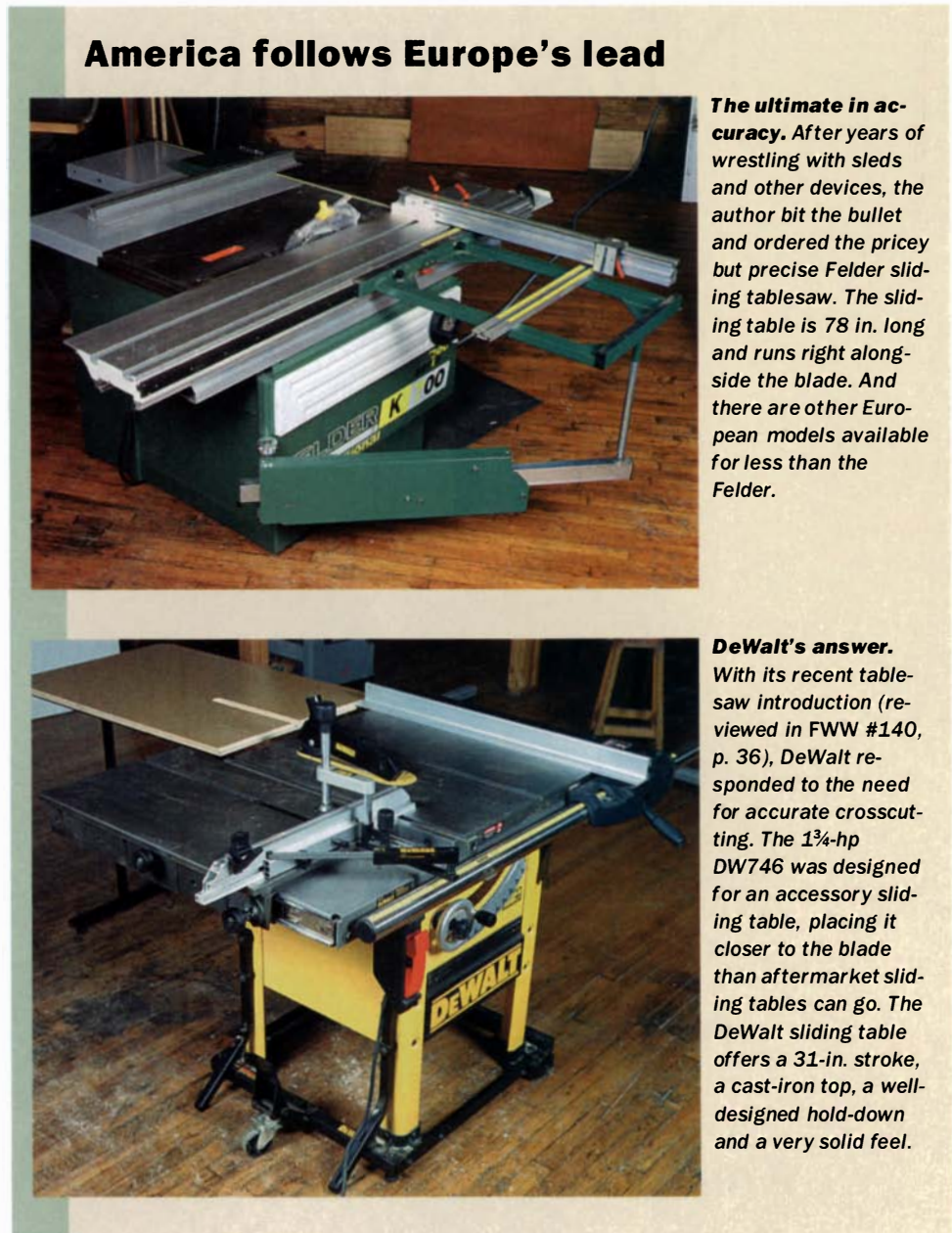
Installation took only two hours for the Robland, with very little assembly required. And alignment was made easier by means of micro-adjustment screws and an eccentric bearing. While the instructions were the least informative of the three, a quick call to the 800 number listed in the booklet cleared up my questions.

The Robland's sliding system is the sturdiest of the three, with heavy-duty bearings riding on solid-steel guide rods. (These round guides collect less sawdust than the square tubes on the Excalibur and Exaktor.) Together with a cast-iron table and the solid attachment to the saw, the Robland system is very stout. Of the three units reviewed here, I was able to get the most accurate cuts with the Robland, especially with smaller workpieces.

The standard table is very small, and the company says most people choose the optional larger table (17 in. longer), which adds \$150 to the \$795 price tag. But the longer table is still much narrower than those on the Excalibur and Exaktor models and needs the most side support when cutting long pieces or sheet goods. The smaller table was flat to within 0.001 in., while the longer version had a minimal rise along its center, running from 0.005 in. to 0.008 in. out of flat.

The fence comes with a heavy-duty hold-down and one stop. The hold-down has large knobs that fit the hand well and make adjustments easy. But the fence's advantages end there.

The Robland fence's major shortcoming is the small wing nut used to clamp it in place from underneath. This wing nut had to be turned with a wrench to clamp the fence tightly enough. The problem can



America follows Europe's lead

The ultimate in accuracy. After years of wrestling with sleds and other devices, the author bit the bullet and ordered the pricey but precise Felder sliding table saw. The sliding table is 78 in. long and runs right alongside the blade. And there are other European models available for less than the Felder.

DeWalt's answer. With its recent table-saw introduction (reviewed in FWW #140, p. 36), DeWalt responded to the need for accurate crosscutting. The 1¾-hp DW746 was designed for an accessory sliding table, placing it closer to the blade than aftermarket sliding tables can go. The DeWalt sliding table offers a 31-in. stroke, a cast-iron top, a well-designed hold-down and a very solid feel.

be addressed, though, by replacing the small wing nut with a larger version or a large clamp lever. A tight hold-down point is especially important with this fence, because its pivot point and hold-down point are the closest together of the three, making the fence more susceptible to bumps and knocks.

Also, this fence is the shortest and lightest extrusion of the three, although it was flat to within 0.001 in. It has no extension to hold a stop or a work support, and it is the most difficult fence to remove.

Different strokes ...

If most of your work is with panels, I recommend the Exaktor sliding table, even though I would be happy with the Excal-

ibur as well. Both have large tables and can support wide workpieces. The Exaktor gets the slight edge with stainless-steel rails and a quick-release bracket.

If you work primarily with solid wood, I recommend the Robland. It is the most accurate, a plus for joinery, and you don't have to worry about it going out of alignment if the saw is moved or bumped. It is suitable for all crosscutting except large panels and long, heavy boards, which put too much pressure on its fence system and are not amply supported by its table. You will have to pay for the extra accuracy of the Robland, especially if you go for the larger table. □

Kelly Mehler is a woodworker in Berea, Ky.

Nine Amateurs Build



Newport Secretaries

A master of period furniture teaches a diverse group the ins and outs of one of America's finest cabinets

BY ALLAN BREED

Nine men met at a prep school in our nation's capital in June 1998: a retired aerospace engineer; a software developer; an art teacher; a door installer; a Lockheed-Martin failure-analyst; a former NASA architect; a master locksmith; a retired CIA agent; and a guy who moves nuclear reactors for the Navy. They carried heavy cases of specialized tools into a deserted classroom. Their mission would take a year, maybe two, to complete. No, this was not some clandestine military construction project. These men were amateur woodworkers who had decided to build Newport secretaries and asked me to guide them through the process.

I had raised an eyebrow when this group contacted me and proposed that I should be their teacher. I live in Maine, and they said they would fly me down to D.C. one weekend a month. I raised another when I heard the piece they wanted to build. They hadn't

chosen just any cabinet. This was the Big One: a Goddard-Townsend secretary. The one that could overpower a living room. A piece of sculpture twice the size of a refrigerator. In a field where there are no framed diplomas that quantify your knowledge and your competence as a cabinet-maker, completing this masterpiece, considered by some to be the greatest piece of American furniture, would constitute proof enough.



The group of nine, a subset of the Washington Woodworkers Guild, had thought out their unusual proposal with great precision. We would meet in 12 weekend-long sessions, spread out over a year. My contract stipulated that “all drawings must be provided at the first class session. Partial drawings will be required at least one month prior to the first class for students to prepare for the first class.” In addition, I was to provide “a detailed, comprehensive course outline and fully coordinated course schedule.”

But for all their planning, had they picked the right guy to do the teaching? They had heard about me through an old article in *Home Furniture* magazine that described the commission I got to reproduce the famous Nicholas Brown Desk and Bookcase when it was sold at auction for \$12.1 million in 1989. So they knew I was familiar with Newport secretaries. But had they considered that my teaching of hands-on woodworking up until that point totaled one day of dovetailed-box making? I had frequently taught classes on the connoisseurship of American furniture, but those were lectures to groups of collectors.

Somewhat intimidated by the combination of my inexperience as a teacher and their detailed contract, I drew up some documents of my own. I wrote a 124-point procedure consisting of entries like: “21. Shape base molding from bottom blade.” And: “80. Turn circular pediment moldings.” From these procedures grew my “fully coordinated class schedule: In first class: dovetail case; dado for writing surface, gallery base, dustboards and blades. Second class: have writing surface, gallery base, blades and base molding dovetailed and fit. Make pattern for drawer fronts, make drawer fronts.”

Before the first weekend was out, my schedule was scrap paper. When I saw the wide range in the levels of woodworking experience in the class and the varying amounts of time people could devote to the project each month—not to mention the amount of banter and kibitzing that filled each day of the class—I realized there was no use carefully mapping out the syllabus, no predicting when we’d do what. The target for completion of the secretaries was redefined; any time between the first class and the post-Clinton era would be acceptable.

Nine guys with tools in common

An average class would begin with me flying to D.C. Friday night. I’d stay with one of the guys, meet his wife and view the shop, the

tools and the other furniture (these guys have made a lot more furniture for their homes than I have for mine). Saturday morning we’d meet the rest of the class in Georgetown at the Maret School, just uphill from the Swiss embassy and a trebuchet toss from the medieval gothic spires of the National Cathedral. (One of the students, Bob Ferguson, teaches art at the school and had arranged for us to use the art classroom as our furniture-making facility.)

An infatuation with the tools of the trade linked all of the members of this group. As we drank our coffee in the parking lot outside the shop, the day would begin with some numerically encoded tool talk.



The guys and their guru. From left: Rich Ramos, John Davis, Norm Willis, Frank Jessup, Allan Breed (seated), Bob Ferguson, George Slack, Bob Smith. (Missing from photo: Carlos Cintron, Frank Scarce.)

“I got a mint 92 with a Sweetheart blade and a four-and-a-half body for five bucks on the way in.”

“Really? I hit that place yesterday and got all the good stuff,” came the reply, and we’d all laugh.

A passing remark was made one morning about someone wanting an old Atlas lathe. Soon after that, John Davis vanished. Several hours later he returned with just such a lathe on the bed of his pickup. He had bought one for himself some months earlier and had known where to score another. The shop emptied, and the class gathered around the truck as John stood by in triumph. A couple of the guys wanted the lathe. I ended up settling the matter by acting as auctioneer.

If I merely alluded to a tool I had, there were notes taken and

Carving and camaraderie. After the first few classes, most of the work done in class was carving.

orders placed. I mentioned a Starrett protractor one day, and a Starrett order for six was phoned in. I praised back-bent gouges, and two German carving-tool catalogs showed up, and orders were made. I let slip one Saturday that I found a 2-in. chisel useful for rounding beads and hollows, and the next morning Frank Jessup arrived with a box of them from Woodcraft Supply. He had stopped by the store after class and filled orders for several others at \$57 a pop. If the secretaries didn't get built, it wouldn't be for lack of tools.

This was all foreign to me. I like tools well enough, and I like a bargain, but I've always tended to make do with what I had, buying another tool only when there was no way around it. With this group I nearly went hoarse repeating my new mantra, "Don't buy a tool until you need it!" It was useless. The tool contagion was all-powerful. Then one day I bought a No. 6 fore plane from Frank Jessup. I didn't really need it; I just figured maybe I should have one. So I had joined them.

Teaching techies to trust their eyes

Once tool time in the parking lot was over, we would pack into the 25-ft. by 30-ft. shop and stake out bench space. Tool rolls were untied and unrolled, lamps were set up to get the raking light I insisted on for carving. I circulated from student to student. Some demanded more time than others, and all had different problems and questions. But there was a real thread through the class. This was a group rich with advanced degrees in engineering, computers, technology. My approach to woodworking is very intuitive, seat-of-the-pants, whatever-works-is-the-right-way. This was more of a calipers-and-templates bunch.

Here is a typical exchange between one of the techies and me about the size of the fillet that runs between the lobes of a shell:

"Al, how does this look, depthwise?"

"Well, that's pretty good. You only really need enough depth to create a shadow."



Not satisfied, he persisted, "You don't specify it in the print; would it be 1/8 in.?"

"That's a good start; you can always go deeper later if you need to."

"How deep do you make yours, do you think?"

"Well, probably about like that. Maybe a little deeper, just enough so you can get a good, rounded convex shape beside it."

"Would you use an 8-14 gouge for that?"

"I don't know. Show me an 8-14. Just use the biggest one you can manage for the particular cut. If the result looks good, use it. Your eye is the final judge."

An exchange of this type could go on indefinitely, because teaching carving is more subjective than scientific. A good carving is a collection of nuanced forms that only the eye can judge. The members of this digitally calibrated group dreaded a phrase I often repeated: "You decide when it looks right."

On to the next student, carving end grain. I said, "Wet it with a sponge, and it'll carve like flat grain." Amazement at the simplicity. That was easy.

Another student was struggling painfully with a shell carving in a highly figured block of dense mahogany.

"Use a file or a scraper or go straight across the grain like this," I said. I used a gouge to cut perpendicular to the grain, then I sat down and carved a while to demonstrate how it could be done and to show him some options. When I



Flame on. George Slack carves a flame finial, using the lathe as a vise.

looked up, everyone was standing and watching. Questions were asked, and in my answers I tried to emphasize that there are various methods available and that none is the “right” one.

The class becomes a club

On Sundays we’d meet back at the shop, with the cathedral bells pealing in the background. I spent one Saturday night in the far suburbs at John Davis’ house. On the way into town the next morning, John and I hit the Georgetown flea market. He snagged a copy of the Downs book on the furniture in the Winterthur collection, paying \$5 for a \$130 book. I found nothing.

Rich Ramos, who drove down from New Jersey each weekend and spent Saturday nights in a cheap hotel, was coffeed up and ready to go. Frank Jessup mentioned that he had recently bought 70 sheets of plywood. They were irresistibly cheap, and he figured they’d come in handy sometime. He asked if anyone needed a couple dozen sheets.

Carlos Cintron, the locksmith, had to pick the lock on Frank’s Volvo so that Frank could retrieve the keys. Afterward, Carlos set up his video camera, and I turned and carved a finial for the camera. John, less experienced in turning than casework, convinced me to turn six finial urns for him. He was making two secretaries, one for each of his two daughters. As I was turning them, my gouge slipped, destroying one of the finials. This was good; it lent some credence to my claim that I frequently make mistakes.

Carlos videotaped every class, and told locksmithing stories. His best story? That would be the one about a \$5,000 bribe he was offered years ago. He was rekeying locks in a large hotel and office complex, and two guys offered to pay him for the

master key. The date? August 1972. The place? The Watergate Hotel. For once, woodworking talk subsided as we imagined how history might have been changed if Carlos had pocketed the money and handed over the key.

As class progressed, some of the guys jumped ahead of the others. This turned out to be advantageous, allowing those who worked more slowly to ask questions and look at the work of the faster ones. The students were continually helping each other, with generosity and plenty of needling.

A wonderful group dynamic developed among these disparate students. Perhaps it was because they were amateurs in the root sense of the word—they loved this thing I was teaching them. And so did I. We spent the mornings working side by side as cabinetmakers. On the ride to lunch we talked about cabinetmaking. We stood in line talking about cabinetmaking and discussed it over



Hands-on instruction. The author demonstrates carving the lobe of a shell for Rich Ramos.

our sandwiches. And then we returned to the shop, and everyone got back to it with a vengeance. I kept wondering whether we’d run out of cabinet-making conversation, but it never happened.

The long road home

I saw enthusiasm wax and wane as the year went by, but progress continued. In the early classes, the room was littered with large planks as carcass dovetails were cut and blocked drawer fronts were shaped. When the cases were glued up and became unwieldy, they went home to stay, and smaller parts were brought to classes.

The desk interior was a project in itself and bogged down some people. The tolerances are very close, and the tiny partitions had to be handplaned, beaded and mitered. By month six, many of the guys were still a long way from completing the 185-piece puzzle of the desk section. By the ninth month, four upper cases were underway. The doors were straightforward to build but tricky to hang, and setting the locks and catches for them was finicky, too.

On the secretaries overall, the carving was the hardest part, and it seemed the progression of shells, feet and pediment rosettes being carved in class would never end. I carved shell petals and difficult wavy parting-tool borders. Along the way we discussed sharpening, animal glue, fluting and reeding, turned moldings and the versatility and simplicity of the scratch stock.

By the last couple of classes, George Slack had finished his piece and was working on a lowboy. Four or five of the other secretaries



Shaving the shell. Bob Smith works on the center shell on the lid of his secretary.

Where the work really happened

BY JONATHAN BINZEN

Although the monthly doses of education and entertainment they received from their classes with Allan Breed sustained the class members as they built their secretaries, the grunt work occurred at home alone. After the first two or three classes, once the dovetailed cases they built were too big to cart back and forth, class members typically brought carving to class. That worked well, because the carved



Bob Ferguson

parts were both the most portable and the most vexing.

As they worked out carving details in class, back home the secretaries—and the space, time and equipment required to make them—grew more imposing. In the course of the project, Norm Willis doubled the size of his basement shop. And at one stage he wound up storing the upper case of his secretary in the basement bath-



John Davis

were mostly complete; escutcheons were being bent with the aid of Bob Ferguson, who has a deft touch with a torch.

Some of the guys had yet to complete the upper cases, but I felt they'd learned enough to do it alone with some help from their peers and maybe a few phone calls to me.

Near the end of the last class, John Davis, who had asked me to carve for him at a few tricky spots along the way, asked for a last V-cut around the convex shell for the lid. I turned him down. I tried to convince him that he could do it. This was a scary bit of carving, because the shell is dead center in the piece—the bull's eye—and



Frank Searce

room. His collection of carving tools also grew, rising from 2 to 49 before his piece was finished.

Bob Ferguson, who hosted the class at Georgetown's Maret School, where he teaches art, discovered that one central challenge of building a secretary is the sheer volume of parts to be made and fitted. The project, he said, "would never go away. No matter how many full-page lists I would write and finish off, I'd always come up with another full-page list." Ferguson managed to keep track of all those parts



Bob Smith

while building his piece in a 10-ft.-square storage room at the school.

John Davis, meanwhile, worked in his relatively commodious L-shaped basement shop but pushed its limits by choosing to make a pair of secretaries—one for each of his two daughters.

The class contracted Irion Lumber Co. of Wellsboro, Pa., to provide matched sets

of mahogany for the secretaries. Irion put together a set of boards for each secretary, with the boards carefully selected and marked for every part of the cabinet. The class was very happy with the wood, although the stacks of rough lumber posed logistical challenges in the smaller shops.



George Slack

Slowly but surely the stacks shrank, and the lumber turned into furniture. And just as surely, class members developed as cabinetmakers. Ferguson, whose secretary is beautifully carved, said, "You change a lot in two years. You look at a part of the secretary and think, 'I carved that a year and a half ago. Does it hold



Frank Jessup

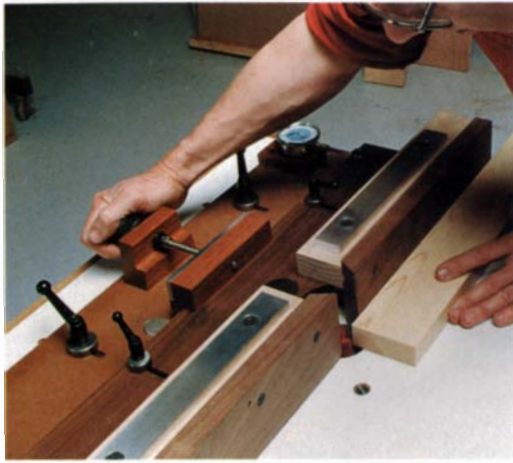
up?' You've learned so much in the meantime that you end up going back and redoing it." □

Jonathan Binzen is a freelance writer and editor.

the cut is very difficult. You must carve a constant serpentine, and there is little room for error.

"You can do it!" I cried. I reminded him how to use his hand as a guide and told him to take a deep breath and just go for it. This was a test for both of us. I was sure he could do it if he relaxed. By this time a few guys were watching. Someone brought out a camera. John picked up the parting tool, took a breath and then made the cut without a twitch. It was perfect. □

Allan Breed lives in Maine and builds period furniture in Rollinsford, N.H.



Micro-Adjustable Router Fence

Joiner's fence lets you creep up on a perfect fit

BY PAT WARNER

To get on with the business of table routing, you need a stand, a flat router-table top and an adjustable fence. The stand and top do nothing but support the work. The fence, on the other hand, is the key to precision and efficiency. The fence is almost always in play and needs constant adjustment to handle the router table's ever-changing responsibilities.

As my hair whitens, I look for less frustrating and more efficient ways of spending my time. My fence did not result from an accident or a guess but from a lot of experimentation and testing. It is a precision joiner's fence that can be made for around \$80, and it should save you countless hours of shop time for years to come. The fence can handle bits up to 2 $\frac{3}{8}$ in. dia. but can't handle the largest bits, such as panel-raisers. You can position the fence solidly and lock it anywhere in its travel in 5 or 10 seconds, and it can be adjusted by thousandths of an inch.

Once you index the bit to the edge of your workpiece, the cutting depth can be set quickly and precisely. The micro-adjustment mechanism allows you to make slight changes in a rabbet, dado, mortise or other joint while sneaking up on a tight fit. For material-hogging bits, successive passes can be made in precise increments. And climb-cutting (to prevent tearout) is safer because a very light cut is easy to produce.

The fence moves in a straight line on two $\frac{1}{4}$ -in. by 1-in. aluminum guide bars and is micro-adjusted accurately along the dial indicator's 1 in. of travel. The fence's travel is also monitored with a 3-in. Starrett rule. Two small clamp levers lock the micro-adjustment section of the fence.

The base is slotted for larger clamp levers that screw into T-nuts under a router-table top. These slots allow for another 1 $\frac{1}{8}$ in. of rough adjustment. A

second set of T-nuts in the table will double the amount of rough adjustment.

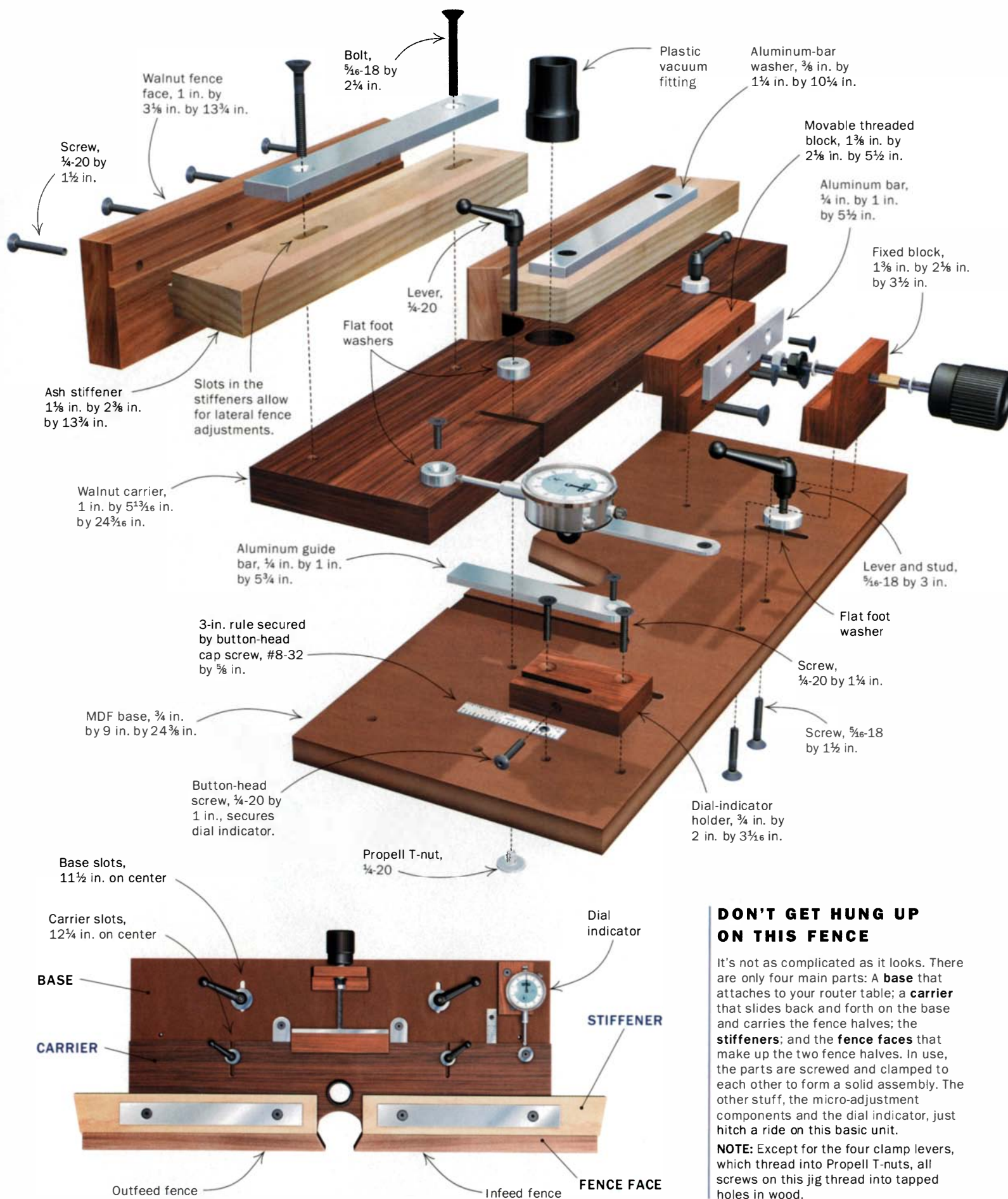
The fence creates a vacuum funnel to collect sawdust. And the outfeed fence can be shimmed out for edge-jointing.

Making the fence

This is not a particularly difficult piece to make, but you must assemble this fence in a specific order, or you'll be starting over. If it's any consolation, my first one was less than perfect. I recommend buying one set of hardware but enough of the less-expensive materials to allow for two attempts. This fence assembly has four main components: the base, the



This precision router fence attaches to your router table. A micro-adjustment screw and a dial indicator let you creep up on the perfect joint. The outfeed fence can be shimmed out for edge-jointing.



DON'T GET HUNG UP ON THIS FENCE

It's not as complicated as it looks. There are only four main parts: A **base** that attaches to your router table; a **carrier** that slides back and forth on the base and carries the fence halves; the **stiffeners**; and the **fence faces** that make up the two fence halves. In use, the parts are screwed and clamped to each other to form a solid assembly. The other stuff, the micro-adjustment components and the dial indicator, just hitch a ride on this basic unit.

NOTE: Except for the four clamp levers, which thread into Propell T-nuts, all screws on this jig thread into tapped holes in wood.

carrier, the fence faces and the fence stiffeners. Add the micro-adjustment system and the dial indicator, and you are basically there.

Begin with the MDF base—Use a router or bandsaw to cut out the V-shaped cutter/vacuum path in the medium-density-fiber-board (MDF) base. Bevel the walls of this channel 60° to facilitate chip extraction.

Plunge-rout the two slots for the clamp levers. Next come the shallow dados that will hold the aluminum guide bars. Use your router table to make the template for these 1-in.-wide, 1/8-in.-deep dados. To create parallel dados, run the same side of the template against the fence each time.

Center the template along the length of the base and line it up with the edge. Use a bearing-guided bit to cut the dados. Drill the two holes for the fixed end of the micro-adjustment assembly. The rest of the holes in this base will be located from the components you'll make next.

Use a straight-grained piece of walnut for the carrier—I chose walnut for the carrier because the wood is relatively stable and can be resurfaced easily.

Rout two matching dados with the same template you used on the base. For clearance, cut them 0.005 in. to 0.010 in. deeper than the dados in the base. Next cut the two stopped slots into the back of the carrier for the small clamp levers, spaced 12 1/4 in. on center. Drill the 1 1/2-in. hole for the vacuum port (on the centerline, 2 5/16 in. from the front edge). Now cut the deep semicircle into the front edge, where the cutter will reside. For a better chip pathway to the vacuum port, relieve the underside with a 3/8-in. cove

cutter. Finally, cut the stopped dado for the Starrett rule. I have seen the widths of these rules vary by up to 1/64 in., so match the dado width to your own rule.

Fence faces are screwed to the stiffeners—I used 1-in.-thick walnut for the fence faces, more for the wood's stability than for its durability. It's a good idea to make some spares because these parts will wear out. Cut a 60° bevel on the ends that will be near the router bit. Drill and countersink them for the 1/4"-20 screws. Cut a groove in the back of each fence face (7/16 in. wide by 3/16 in. deep) centered along the screw-hole line. These grooves will mate with tongues in the ash stiffeners, locating the fence faces just off the surface of your router table, to allow for sawdust clearance.

The stiffeners can be cut 12 in. long to square off with the end of the fence faces, but I make them longer than the faces for decorative purposes. Plunge-rout the two 3/8-in.-wide stopped slots in the outfeed stiffener. Cut 5/16-in.-wide slots in the infeed stiffener. Screws will pass through the aluminum-bar washers and these

Routing the matching dados



1 **A template ensures accuracy.** A 3/4-in. MDF template makes it easy to rout the matching shallow dados (1). To rout the stopped dados in the base, center the template along the front edge of the base and clamp it. Use a top-bearing-guided (or pattern maker's) bit to cut the shallow dados. Do the same thing in the walnut carrier (2). This time, however, the dados run completely across this narrower component. Make these dados a bit deeper than 1/8 in. for clearance. With the aluminum guide bars in place, the carrier and base should fit together and slide easily (3).



slots to hold the two fence halves to the carrier. The outfeed slots are wider to allow the outfeed side to be shimmed out approximately 1/32 in. for edge-jointing.

Next, machine centered tongues to fit the grooves in the fence faces. Make them a tight fit. For chip clearance, position the height of the tongues so that the bottoms of the fence faces will be just above the surface of your router table. Fit the faces to the stiffeners, and transfer the centers of the holes in the faces through to the stiffeners. A transfer punch does this job more precisely than any improvised solution, such as a brad-point drill, and a cheap set of punches will make a handy addition to your shop. Drill the 1 3/4-in. pilot holes in the tongues of the stiffeners and tap them for the

SOURCES OF SUPPLY

REID TOOL SUPPLY (800-253-0421)

Clamp levers, knob, dial indicator and other assorted hardware

BRUSS FASTENERS (800-536-0009)

Propell T-nuts

DEWALT (800-433-9258)

Plastic vacuum fitting (1 1/2 in., part No. 328592-00)

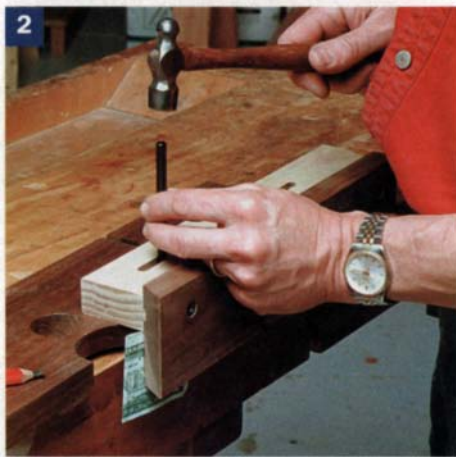
L.S. STARRETT (978-249-3551)

3-in. Starrett rule, part No. C604R-3

A complete parts list, with all Reid part numbers, is available on our web site: www.finewoodworking.com

Position the fence halves

Allow room for adjustment. With the fence faces about 1 in. apart, butt the outfeed fence against the carrier and transfer-punch through the outer side of each slot in the stiffener to locate the tapped holes below (1). Note that the outfeed slots are wider to allow this side to be offset for edge-jointing. Do the same with the in-feed fence, but shim it out from the carrier 0.006 in. to 0.008 in. first, to allow room for slight adjustment later (2). A folded dollar bill makes the perfect shim at each end. Drill the tapped holes in the carrier, cut and drill the aluminum-bar washers, and fasten the fence halves in place (3).



¼-20 screws (for more on tapping threads in wood, see my article in *FWW* #126, p. 63). Screw together the fence faces and stiffeners.

Position the infeed and outfeed fences—Center the assembled fence parts, 1 in. apart, on the front of the carrier. Butt the outfeed fence against the carrier and clamp it down. Shim the infeed fence 0.006 in. to 0.008 in. away from the carrier and clamp it (a dollar bill makes a handy 0.004-in.-thick shim). The extra play will make it easier to align the infeed side with the outfeed side. I put ⅜-in. and ⅙-in. transfer punches through the respective slots in the stiffeners to locate the tapped holes in the carrier. Transfer the centers through the outside ends of all four slots, to allow each half to be slid outward for larger router bits when you use the fence. Remove the fence halves, and drill and tap the carrier.

Assemble the micro-adjustment system—The micro-adjustment assembly consists of a fixed hardwood block with a bearing in it and a movable hardwood block faced with a bar of aluminum for more thread purchase. Any chunk of steel or aluminum will suffice; for the blocks I used jatoba, but any hardwood will work. The aluminum bar is bolted to a rabbet in the movable block, but the threaded hole will be located later, after the fence has been assembled. Center and fasten this block to the carrier. Now fasten the fixed block to the base.

Attach the dial indicator—The dial indicator for this fence measures 1 in. of travel. The indicator is attached to a hardwood block, which serves as a holder. Form a slot in the block for the bracket on the rear of this particular indicator. Drill a 1¼-in. hole through the slot for the ¼-20 by 1-in. button-head screw. Tap 1 in. of threads, then bore out the thinner side of the slot to ¼ in. for clearance. Drill and countersink the block in two places so that you can fasten it to the base. Locate the rule and the dial indicator after the assembly has been completed. The stop for the plunger is a thick, machined washer. Drill and tap for its cap screw and attach it.

Finishing up

Transfer the centers of the ⅝-in. fence bolt holes in the carrier to the aluminum-bar washers, centering each bar over its pair of bolt holes. Drill and countersink 2¼-in. holes in the aluminum. Now assemble and fasten the fence halves to the carrier.

Round the ends of the aluminum guide bars to fit the stopped ends of the slots in the base, as I do, or leave the ends square and square off the end of each slot. Drill and countersink the guides for the machine screws that fasten them to the base. Drill and tap the base for these screws and attach the guide bars.

Now drop the fence assembly onto the guide bars and slide the backs of the fences against the base. Use the ends of the slots in the walnut carrier to mark the holes in the base for the two T-nut inserts. The smaller lever clamps will reside in these slots. Remove the fence assembly and drill small holes through the base to the bottom side for location. Flip the base, and drill and counterbore the bottom for the T-nuts.

Reattach the fence assembly to the base, again butting the fence faces against the base. Insert the small clamp levers and lock down the assembly. You can now locate the holes for both the Starrett rule and the dial-indicator holder.

Drill a ⅝-in. hole in the Starrett rule on the first ½-in. mark. You'll

Add the rule, the dial and the micro-adjustment assembly

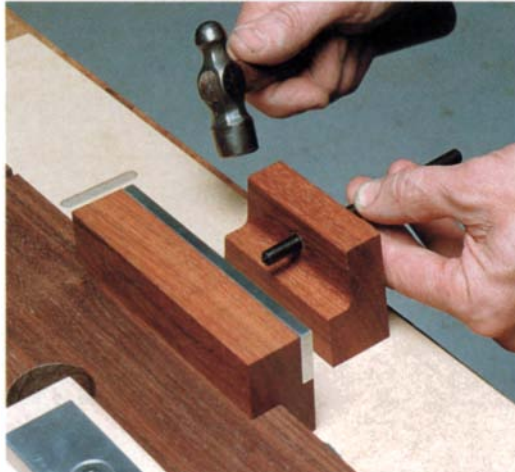


Slide the rule into the slot in the carrier up to its 1-in. mark. Use the hole you drilled in the rule to lay out the tapped hole in the base.



Align the dial indicator with its stop on the carrier. Push the unit forward until 0.020 in. to 0.040 in. of travel is left. Transfer its holes with a center punch and drill and tap the base.

Locate the micro-adjustment assembly. Transfer the hole in the fixed block on the base to the movable block on the carrier. Drill and tap the movable block.



need carbide to get through the tempered steel. Slide the rule under the carrier to the 1-in. mark and locate the hole for the button-head screw. If you don't have a $\frac{3}{32}$ -in. carbide bit, you can hold down the rule with double-faced tape.

With the dial indicator fastened to its holder, locate the unit so that the indicator's plunger is centered on the stop (you attached it earlier) and only 0.020 in. to 0.040 in. of travel is left in the indicator. Transfer the holes in the holder to the base and drill and tap the base for the rule and the dial indicator.

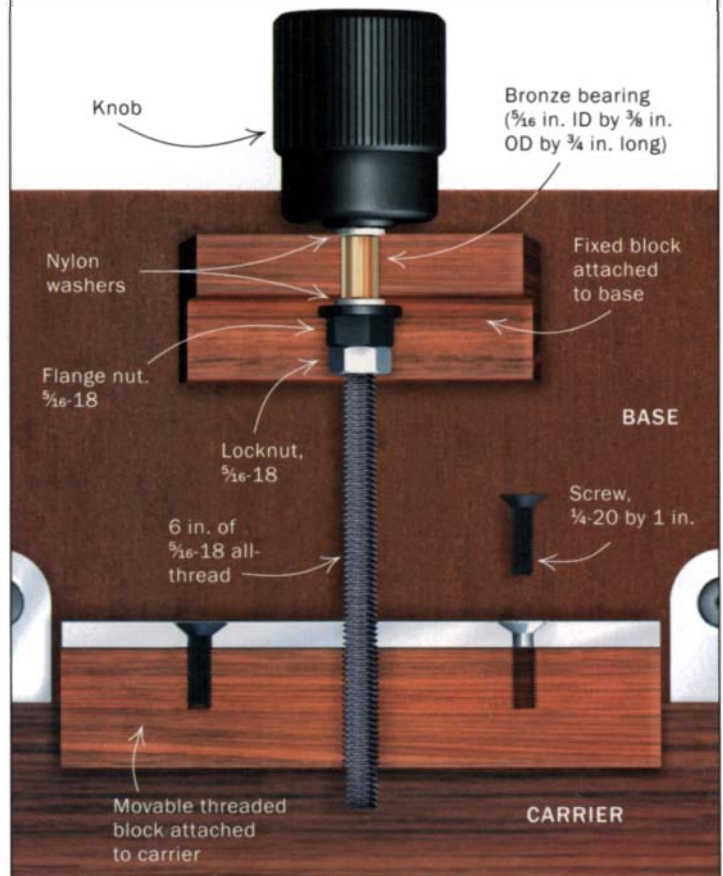
With the fence reassembled, insert the bronze bearing in the fixed block and transfer its center through to the aluminum bar in the movable block. Drill ($\frac{1}{4}$ in.) and tap the movable block for the adjustment screw.

Screw the knob onto its threaded rod with a drop of Loctite or other glue to hold it in place. Insert the knob screw through the fixed block with a nylon washer on both sides. Spin down the flange nut and locknut; allow no slop. With the carrier riding on its guides, thread the screw into the movable block. Drive the fence all the way to the 1-in. mark on the rule and lock it down. Last, press-fit the plastic vacuum fitting into its 1½-in. opening.

To attach the entire assembly to your router table, center the fence opening on your router table and clamp down the base. Lo-

MICRO-ADJUSTMENT ASSEMBLY

The knob-and-spindle assembly runs through a bronze bearing in the fixed block and screws into threads that are tapped into the aluminum and wood of the movable block.



cate and drill the holes in the tabletop for the larger T-nuts, which are for the larger set of clamp levers.

Using the fence

To get up and routing, lock the base to your router table, attach your vacuum hose and insert your chosen cutter.

Loosen the aluminum-bar washers and align the fence halves with a long straightedge, moving their inside edges close to your router bit. Then tighten down each side.

Release the smaller clamp levers for micro-adjustments and lock them down before cutting. Make some test cuts. If the fences aren't exactly perpendicular to your tabletop, square them up by placing paper shims under the stiffeners.

There are few frills on this tool. All components work together, with clamps and washers designed to flatten the parts and create a stable assembly. The drive mechanism is relatively inexpensive, and you can save another \$30 if you decide to omit the dial indicator and 3-in. rule. □

If you encounter difficulty building this jig, you can e-mail Pat Warner for advice: pat@patwarner.com. John White, Fine Woodworking's shop manager, helped with this article.

Current Work

The annual Design in Wood competition held at San Diego's Del Mar Fair brings in more than 300 entries and after 19 years has become one of the best single exhibitions of woodworking in the country. We decided to share many of this year's winners with you in Current Work. For future issues, we'd like to see photos of your work. Send entries to Current Work, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470. For more details, visit our web site: www.finewoodworking.com.



Gary Rawlins

Master Woodworker's Trophy

Inspired by the Shaker work of Abner Allen, Rawlins originally designed this cabinet (6 in. deep by 15 in. wide by 35 in. high) for his final project at a college in England. The case is made of wenge, the panels and drawers of tulipwood and the handles of ebony. With through-tenons and an asymmetrical drawer design, the piece took 10 years to complete. Rawlins worked on it whenever he had spare time and looked upon it as an exercise of his talents.



William Nelson

First Place, Wood Turning, Embellished/Mixed Media

Nelson, a member of the American Association of Woodturners, finds the technical challenges of turning most appealing. His trademarks of precision and thinness are evident in this egg box (1¾ in. dia. by 3 in. high). The outside is boxwood, with a thickness of ¾ in. The joint rings are Gabon ebony, and the inside is Chac Te Koke. The boxwood stand is 3½ in. high. The finish is gloss polyurethane.

Richard Otsubo

Best of Show

This incredibly realistic hen and drake on a pond required eight months of work for Otsubo, who has been carving for only six years. The piece, carved in tupelo wood, was chosen from among the 19 category winners as Best of Show, an award sponsored and judged by *Fine Woodworking*.

Otsubo, a former nurseryman who retired a year ago, carves with various knives, a Foredom rotary tool and a dentist's grinder. He took to carving quite naturally, but he says the painting was very difficult to learn.





Craig Bradley

First Place, Traditional Woodworking, Furniture

A furniture maker and instructor at Palomar College, Bradley modeled this Chippendale chest of drawers (21 in. deep by 38 in. wide by 31 in. high) after an 18th-century version that appears in Albert Sack's *Fine Points of Furniture*. Bradley's chest is based on a serpentine chest made in Massachusetts during the 1770s. The case and drawers are made of Honduran mahogany; the top is African mahogany.



Michael Maley

First Place, Musical Instruments

Maley has been making harps for the past 10 years. This one (18 in. wide and 61 in. high) was made from maple boards that had been sitting around his shop for years. The most challenging part of this project was figuring out how to handle the wide, barky planks, because they were bigger than any of his machines.

Ryan Guthier

First Honorable Mention, Traditional Woodworking, Furniture

The latest of Guthier's line of Arts and Crafts furniture, this Morris chair (34 in. wide by 38 in. long by 39 in. high) and ottoman are made of Honduran mahogany and detailed with faceted ebony plugs. The finish is Sam Maloof's old recipe of varnish, turpentine and oil.



Seth Janofsky

First Place, Veneering and Marquetry

Janofsky originally made these door panels as alternates for the sideboard that appeared in issue #137 of *Fine Woodworking*. Though he opted for something simpler on the sideboard, these panels were the starting point around which Janofsky designed this white oak and maple cabinet (15 in. deep by 38 in. wide by 44 in. high). The marquetry and inlay are padauk and American sycamore.



Ed Zbik

First Place,

Wood Turning, Face Work

This hollow form, 12 in. dia. by 10 in. high, is made of walnut. Turned from a piece of sapwood, it took Zbik between six and eight hours to complete. The piece is surprisingly light because the entire form is turned to a uniform $\frac{3}{32}$ in.



Bruce Friederick

First Place and People's Choice Award, Model Building

Built at full scale, this all-wood replica of Friederick's bicycle is so carefully detailed that most of its parts actually work—the wheels spin, the steering wheel steers, the chain turns on the sprocket. Made mostly of maple and purpleheart, the avid cyclist and turner spent 700 hours completing this replica.

Natalie Bouffard

First Place, Made for Children

Bouffard built this cradle (25 in. deep by 46 in. long by 53 in. high) for her daughter, due just a week after the San Diego show. Bouffard began wood-working as a hobby only six years ago but has taken on a number of commissions since then. This maple cradle is steam-bent and uses mortise-and-tenon joinery throughout.



Don Comer

First Place, Wood Turning, Center Work

Comer has concentrated on wood turning since 1993. A retired aerospace engineer, Comer's design background heavily influences his work. This lidded hollow vessel (2¾ dia. by 14¾ in. high) made of bloodwood has an aerodynamic, flowing shape. The spiraling base is made of bleached maple.



Peter Schlech

First Place, Contemporary Woodworking, Furniture

A longtime boatbuilder, Schlech has focused more on furniture making in the last few years because, he says, "it presents a little more of a challenge." This writing desk (30 in. deep by 60 in. long by 31 in. high) is made of sapele—both solid wood and veneer—and accented with ziricote.

Tips for photographing your furniture

1. Use 35mm color print (negative) film of moderate speed (ISO 200-400).
2. Clean and dust the furniture.
3. No matter how you light the furniture, it will appear more three-dimensional if each plane has a different brightness. Take care, however, to avoid excessively bright highlights or dark shadows.
4. To be sure the photos will be free of distortion, avoid the use of wide-angle lenses, and photograph with the camera positioned even with the center of the furniture both vertically and horizontally.
5. Photograph the furniture from several angles. Include some head-on shots, as well as some shots that show both the front and side of a piece.
6. Keep the background simple. A cluttered or otherwise distracting background may draw the viewer's attention away from the subject.

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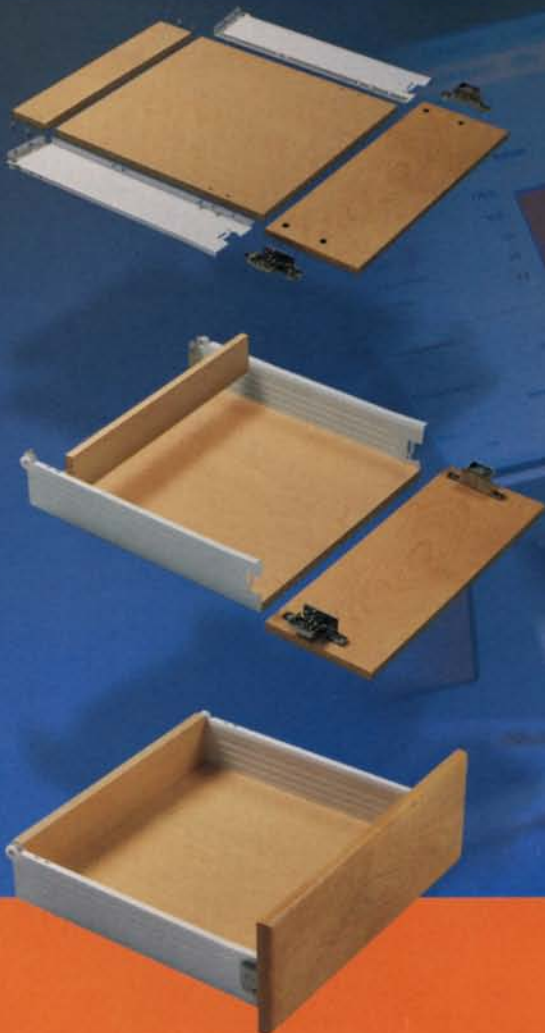
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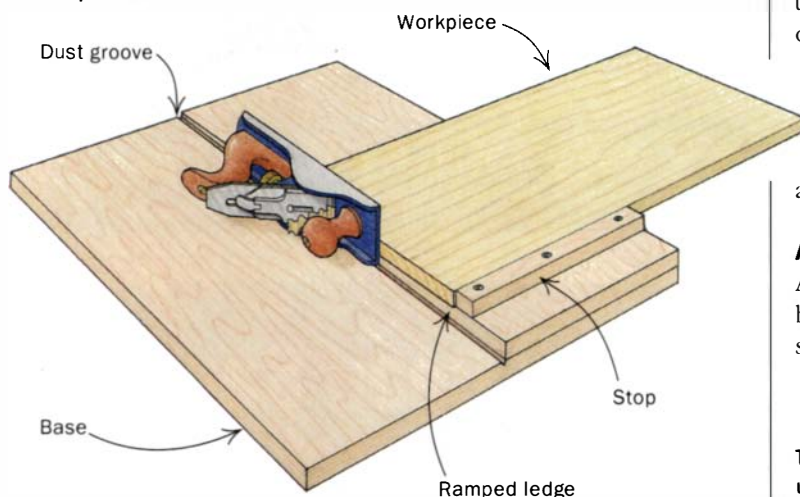
Shooting boards aim for tight joints

Whether you are making a single piece of furniture or doing a production run, you want your stock true, and you want to get it that way quickly and surely. This type of woodworking is done well using machines. But if you want to cut down on dust and decibels, or if you are short on budget or space, you should be using shooting boards.

A shooting board is a device that, used in conjunction with a handplane, will produce exact and true edges, perfect for gluing or for use in a piece of furniture. There are three basic types: the

THE JOINT AND SQUARE

This shooting board joints the edges and squares the ends of a board. The ledge is ramped to distribute wear over the entire width of the plane blade.



joint and square, the miter and the donkey's ear. Each is easy to make and does its job easily, quickly and accurately. Before the development of jointers, sanding machines and miter saws, shooting boards were a fixture in every woodworking shop, whether big or small, whether doing custom or production work.

The joint-and-square shooting board joints the edges and squares the ends of boards. The miter shooting board trues up flat miters, such as those used in a picture frame. The donkey's-ear board cleans up standing miters: the type used in baseboard or the bracket base on a chest of drawers.

Anatomy of a shooting board

All shooting boards have three parts in common: a base or bottom board on which the plane rides on its side; a ledge that elevates the work to the middle of the plane blade; and a stop that helps hold the workpiece in the required position.

Lauan or birch plywood is a good material for the base because it is not likely to warp. To make room for dust that might collect against the ledge, a shallow groove in the base or a chamfer on the bottom edge of the ledge is a good idea. Still, regularly sweeping or blowing dust off the base is a good practice.

The ledge should be made of a stable wood such as pine. On the miter board and the donkey's ear, the ledge is uniform in thickness. And if you use it only occasionally, the ledge on the joint-and-square board can be made this way as well. However, a lot of use on a shooting board of this simple design will wear only one place on your plane blade. This will require frequent grinding to keep the cutting edge straight. It is much better to ramp the ledge so that wear is distributed over the entire cutting edge, as shown in the drawing at left.

The stop on both the joint-and-square and donkey's-ear shooting boards is at a right angle to the edge of the ledge. However, on the miter board the stop is triangular, presenting a 45° angle on both sides.

The dimensions of the shooting board will depend on the size of the job for which it will be used. For example, a small job will need only a small shooting board.

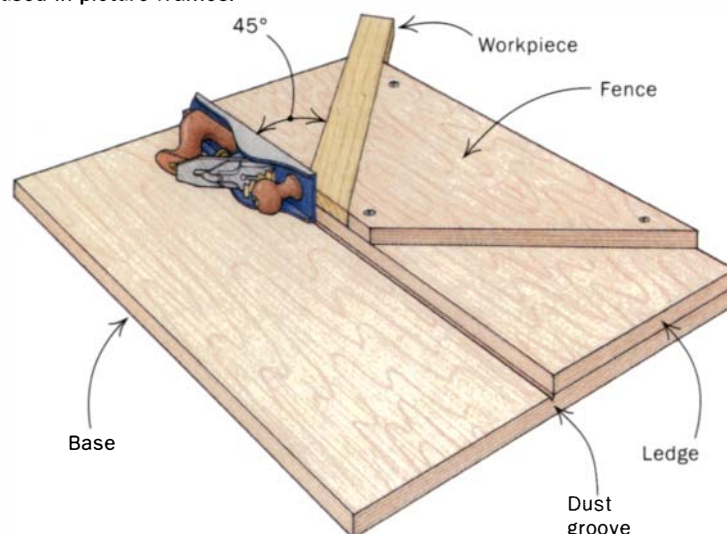
The other half of the operation is the handplane. This, too, should match the size of the job. For small work you might use a block plane. For large jobs such as architectural trim, a No. 7 or even a No. 8 jointer plane may be preferred. You will find a No. 5 jack plane satisfactory for most furniture work.

A dedicated plane is a good idea

A regular bench plane will need to be reset for use with a shooting board. I keep a Bedrock No. 605 fully tuned for this purpose. Its sole is lapped flat, and its frog is moved forward to create a very

THE MITER

This shooting board is used to fine-tune flat miters, such as those used in picture frames.



narrow mouth. The blade of a plane used on the surface of a board is often slightly crested. However, shooting is done on the edges of a board, so the plane's cutting edge must be ground straight all the way across. Keep the edge razor sharp and set the plane to

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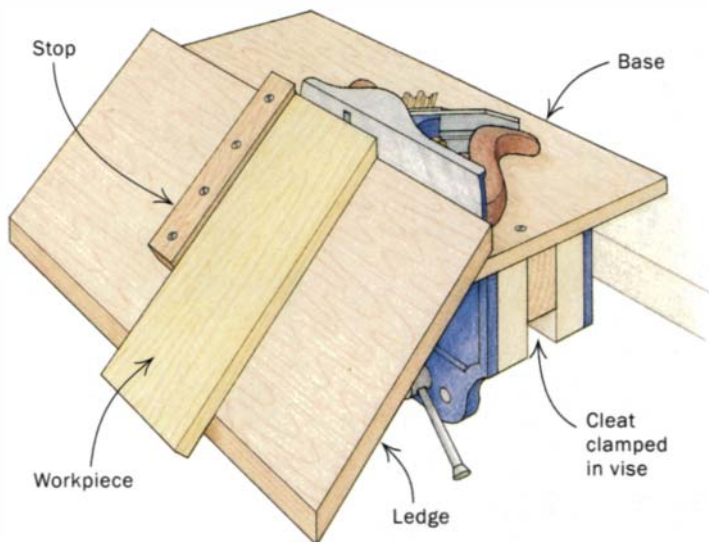
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Rules of Thumb (continued)

take a medium-thick shaving. If the plane is set too fine, you take more passes and work longer; too deep and you will choke the plane and tear out the end grain. Begin the cut by placing the front of the plane's sole on the workpiece. Also, after shooting an edge,

THE DONKEY'S EAR

This shooting board fits standing miters to each other. It has a vertical cleat that is held in a vise.



test it with a square. If it is out of true, use your plane's lateral adjustment lever to shift the cutting edge. A coat of paste wax on the base helps the plane slide more easily.

On all shooting boards, keep the edge you are trimming close to the stop; this way there is no chipout on the far side. However, allow just enough overhang so that the plane blade does not shave the ledge.

Achieving good results requires practice

The joint-and-square board is used for preparing parts such as drawer sides and drawer ends before joining and fitting them, situations in which you have a stack of parts that you are truing at once. Joint both long edges of each part. The plane's sole will ensure that the edges are straight. Next, test the ends with a square. Using either a scratch awl or striking knife, trace a line as close as you can to the end. Place the stock on the shooting board and trim to this line. Test again for square.

The miter and donkey's-ear boards are typically used to fit parts to a project. Cut both mitered ends and try them on your project. If there is a gap, note or mark where the high spots are. Place the miter on the shooting board and trim the high spots. Test again and trim (if necessary) until you have a perfect fit.

Using a shooting board is handwork, and as such requires developing some skill. But the finished project is only half the fun of woodworking. The rest is getting there—in other words, using and developing skills.

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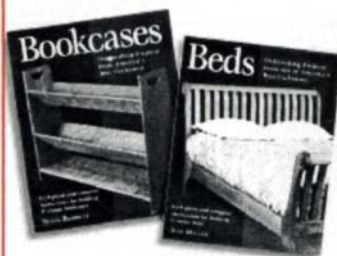
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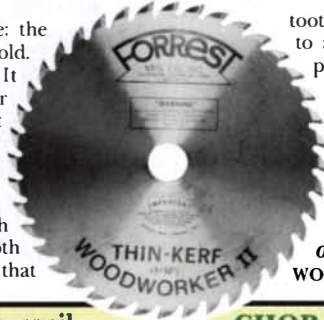
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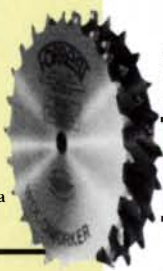


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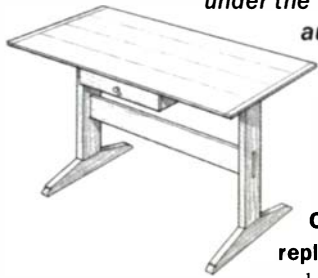
Q & A

Adding a drawer to featured trestle table

I plan to build the trestle table with breadboard ends featured recently in *Fine Woodworking* (#141, pp. 74-81). However, I would like to add a drawer under the tabletop. Does the

author have any advice on how to do so?

—Bob Lomax, Lincoln, Neb.



Charles Durfee replies: I assume that you already have a plan

for building the drawer itself, hopefully using solid wood construction and dovetail joinery. There are a couple of ways to, should I say, hang this cat. One is to use metal slides. Accuride and

Knap & Vogt (KV), among others, make good-quality ball-bearing units, generally called “pencil drawer” or “keyboard” slides. They include brackets that mount on the underside of the tabletop and fasten to the drawer sides. These will work very nicely and are simple to install.

If you would rather keep the mechanical, metal look out of your table, it is possible to suspend a drawer using all-wood construction. One way is to hang brackets from the tabletop and add a ledger strip running front to back. In the drawer sides, mill a matching groove. The drawer brackets are attached to the tabletop with screws and wood cleats. These cleats will restrain your tabletop’s natural seasonal movement unless you elongate the holes for the screws used to fasten them to the top.

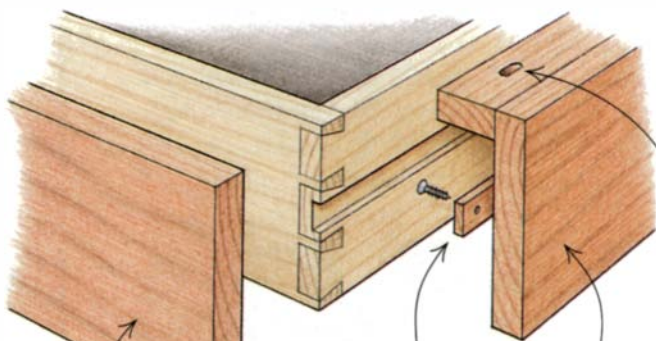
This method is a little more straightforward in theory than in practice. All of the parts have to be in perfect alignment for the drawer to work smoothly. It can be done, but it sometimes takes some fuss to get right.

An alternative all-wood approach is to make a case for the drawer—with a top, bottom and two sides—all hung from the tabletop. This should be put together with dovetail joints, with the grain running side to side, around the case. This grain direction has two advantages: It will be aligned with the tabletop, and it will present face grain along the front edges of the case. The drawer could be inset flush with the case or made with a drawer front that overlaps the case. An inset drawer would need a stop in the rear of the case.

[Charles Durfee is a furniture maker in Woolwich, Maine.]

HANGING A DRAWER UNDER A TABLETOP

Other than using manufactured slides, there are two basic ways to attach a drawer to a tabletop: with brackets or with a drawer case.



An overlapping drawer face hides the brackets.

BRACKET METHOD

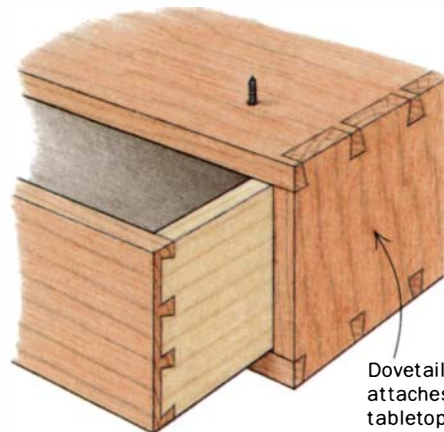
This is the simplest approach in theory but may be more fussy in practice, because the ledger strips and matching grooves must be carefully aligned for smooth action.

Elongated screw holes allow for wood movement in tabletop.

Ledger strip (3/16 in. by 1 in. by drawer depth) fits loosely into a groove in the drawer side.

CASE METHOD

The grain direction is a plus in this approach. It is aligned with the tabletop, and it presents face grain along the front edges, making an inset drawer face an attractive option.



Dovetailed case attaches to the tabletop.

Watco oil replacement

Perhaps 10 years ago I made my wife some wooden kitchen equipment and finished it with Watco oil. At that time Watco oil was a very thin liquid. The finish has lasted all these years despite washing. Obviously, modern Watco is not the same product. Is there any finish available for wooden kitchen items that will give the look and feel of wood and still be a barrier to other oils and water?

—John Stockard, Milledgeville, Ga.

Chris Minick replies: I agree with you.

The old Watco oil formulation worked better than the new version, but the old formulation is gone forever. Instead of lamenting the loss, do something about it. Make your own. This statement is not as flippant as it may sound. It is relatively easy to make your own wipe-on/wipe-off finish. Merely add boiled linseed oil to an oil-based brushing varnish, then dilute the mixture with solvent to the proper working consistency.

The old one-third, one-third, one-third formula credited to Sam Maloof is a good starting point. Add 1 cup boiled linseed oil to 1 cup oil varnish, then dilute with 1 cup mineral spirits. Drying oils and oil-based varnish are infinitely intermixable, so the exact proportions of drying oil, varnish and solvent are not

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critical. However, some trade-offs are involved. More oil in the mix results in better wiping properties but longer drying times and less protection.

The equal-portion formula is a little too heavy on oil for my tastes, so I've altered the proportions to suit my method of work. My wipe-on finish formula consists of 4 oz. boiled linseed oil, 8 oz. varnish and 5 oz. mineral spirits.

You'll have to decide for yourself which properties are important to you. Mix up a few batches with different ratios of oil, varnish and thinner, then test them on scrap. Eventually you'll find an ideal formula that suits your finishing needs. For an exploration of kitchen-safe finishes, see *FWW* #129, pp. 66-69. [Chris Minick is a contributing editor.]

Preventing dado-blade kickback

I really enjoyed your article explaining tablesaw kickback in the December issue (FWW #139, pp. 70-71). I'm curious, though, as to how to prevent kickback when using a dado blade.

Obviously the splitter would have to be removed for this operation.

—Jim Phillips, Airdrie, Alta., Canada

Lon Schleining replies: The short answer can be found in Kelly Mehler's sidebar to the kickback article you mentioned. He suggests setting a fin-shaped piece of wood into the wooden throat plate, slightly lower than the depth of the cut. As long as the riving knife, as it's called on European tablesaws, is aligned with the side of the dado blade closest to the rip fence, the knife need not be any thicker than a single sawblade. This will prevent kickback, even when cutting a dado. The idea behind a riving knife is that literally anything that prevents the piece from rotating away from the fence will effectively prevent the kind of kickback the article addresses.

It's obvious to you that the guard would have to be removed because you, like most U.S. woodworkers, are more familiar with North American-style guards. European guards are different, using a floating riving knife that raises, lowers

and tilts with the blade. The height of the knife is adjustable. Normally it would sit slightly above the blade height. For blind or dado cuts, it is lowered slightly below the cutting depth. There is no cut I can think of, including using a crosscut sled, that would require removing the riving knife from a Felder or an Inca saw.

It's no wonder many owners of North American saws put the guard in a drawer and leave it there, putting themselves at risk. Unfortunately, these outdated guards interfere with common cuts.

[Lon Schleining teaches woodworking at Cerritos College in Long Beach, Calif.]

Calculating pulley speeds

Is there any way to use pulleys to reduce the speed of my 1,725-rpm motor to 1,400 rpm?

—Hayo Broers, Farmingdale, N.Y.

Asa Christiana replies: There is a formula for the relationship of motor speed, pulleys and cutterhead speed. Divide the drive-pulley diameter (D) by the cutterhead-pulley diameter (C) to get a pulley ratio. Multiply your motor speed by the pulley ratio to get cutterhead speed:

$$D/C \times \text{motor rpm} = \text{cutterhead rpm.}$$

In your case, you have the speeds but not the pulley sizes, so plug in what you have and start doing the algebra:

$$D/C \times 1,725 = 1,400.$$

Divide both sides by 1,725, and you get:

$$D/C = 0.8116 \text{ (rounded up).}$$

What you need to find now are a set of pulleys that get you near this ratio. (Be sure to measure each pulley diameter where the belt engages it, not at its outermost rim.) A 5½-in. drive pulley, for example, matched with a 6¾-in. arbor/spindle pulley gives a ratio of 0.8148. Plug this back into the basic equation:

$$0.8148 \times 1,725 = 1,405.5 \text{ rpm.}$$

That's probably close enough for the task at hand, especially when you

ANTIKICKBACK FIN FOR DADO CUTS



Safer dadoing. The riving knife, or fin, is set into a wooden throat plate and is located even with the right side of the dado cut, just lower than the blade height. The riving knife should contact the shoulder of the dado cut that is closest to the rip fence, preventing the workpiece from rotating away from the fence and kicking back.

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consider that measuring the pulley diameters at the correct point is an inexact science.

[Asa Christiana is an associate editor.]

Recycled red pine

I'm using some old red pine floorboards for making furniture. They were salvaged from a farmhouse built about 150 years ago. The boards are, on average, 6 in. wide by 1¼ in. thick. They have a beautiful red patina. I'd like to find out more about this wood before I cut any more. —John Borley, Toronto, Canada

Jon Arno replies: Red pine (*Pinus resinosa*) is the most abundant and widespread of the yellow or "hard" pines native to the Great Lakes region. Its other common name, Norway pine, stems from the fact that it was plentiful in the vicinity of Norway, Maine, when that area was logged during the 19th century. Like all yellow pines, the appearance of this wood is characterized by a rather sharp transition between its soft, earlywood

tissue and the much denser latewood. This makes the annual rings stand out, giving the wood a somewhat loud and racy figure on the flatsawn surface.

With respect to our many other native pines, red pine is sort of a middle-of-the-road species. It is denser than the western yellow pines, such as ponderosa and lodgepole. And the western species tend to be creamy yellow in color, while red pine is more of a warm pinkish tan. On the other hand, red pine is not as hard, resinous or coarse-textured as most American southern yellow pines. As a result, it has pretty good working characteristics. Oddly enough, it was not the primary species used for making Colonial New England furniture. Eastern white pine (*P. strobus*) was the preferred



This red pine floorboard is one of many salvaged from a 150-year-old farmhouse in Canada. The tight annual rings, typical of old-growth timber, and warm patina make these boards a real find for a modern furniture maker.

species for that purpose, while red pine served more as a construction timber.

Red pine is probably our best domestic substitute for making reproductions of European cottage-style furniture. If you like the quaint and unpretentious look of that style, you've come across a real bonanza.

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

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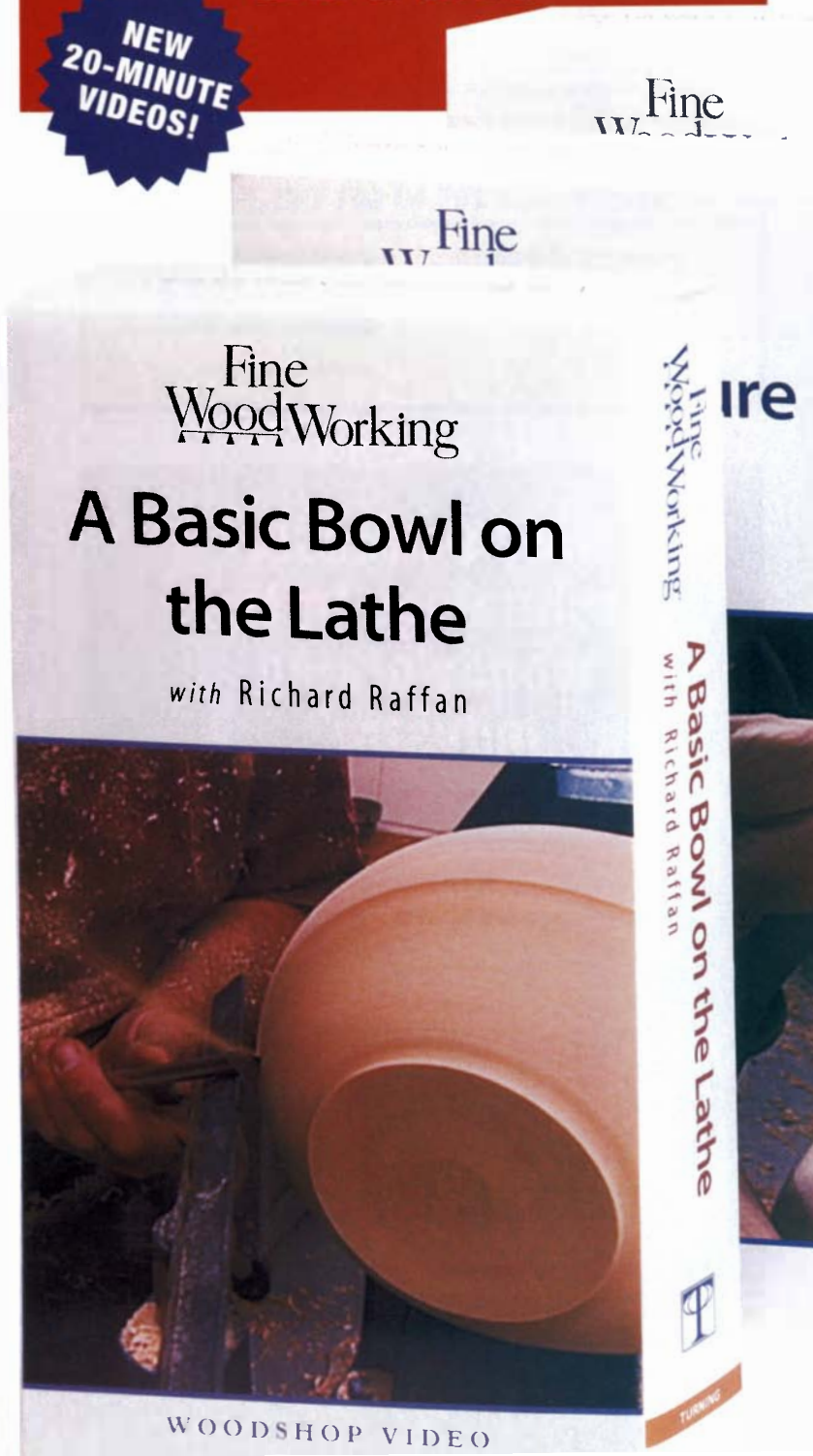
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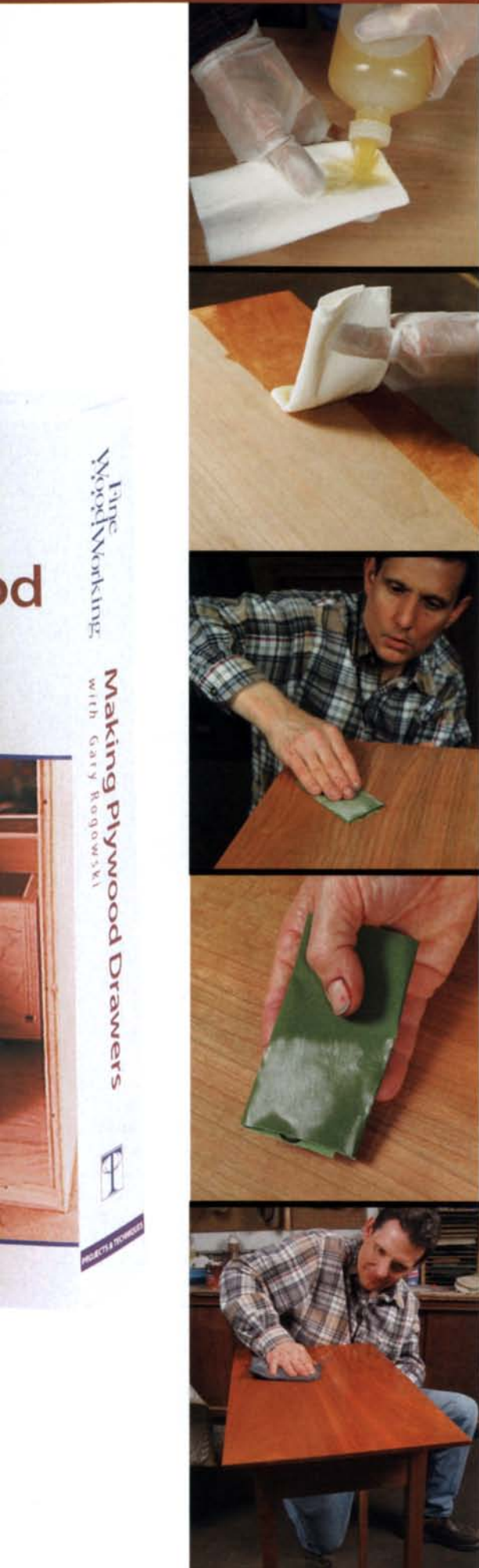
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Master Class

Carve a softwood seat

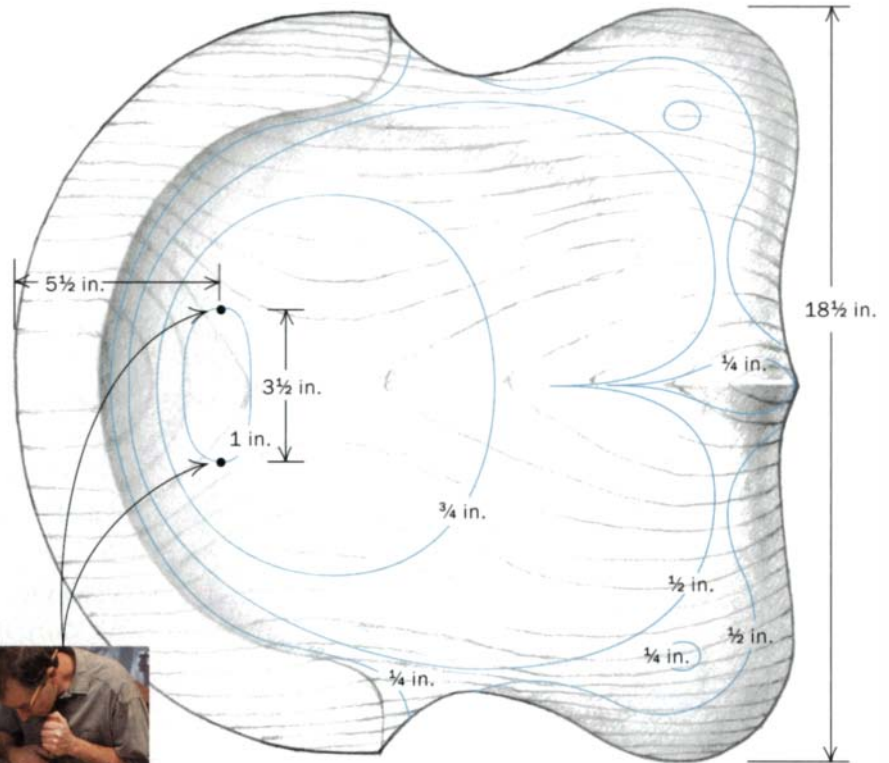


BY CURTIS BUCHANAN

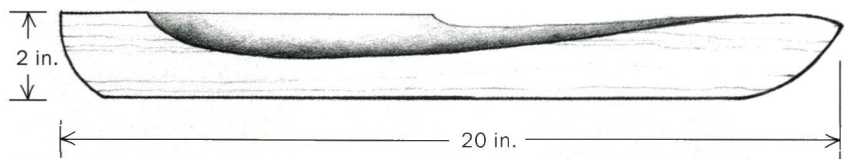
I specialize in Windsor chairs because it gives me the opportunity to work almost exclusively with hand tools. It's easy to get hooked on a quiet, dust-free shop and lulled by the pace of life set by hand tools.

There are various challenges to making Windsors, but carving the seats is the most frustrating. Once the unfamiliar tools have been mastered, the difficulty is in creating a complex contoured shape with very few reference points. To turn a flat, square blank into a seat with a nice, deep saddle that will hold a sitter comfortably, it's useful to have a topographical map of the seat, like the one shown at right.

I begin a seat with a single piece of east-



Quick depth gauge. Two holes drilled 1 in. deep provide the main points of reference for carving out the seat.



Tools for carving a seat

- **Gutter adze**—Used for the roughest initial shaping. It removes stock very quickly and leaves a deeply scalloped surface.
- **Inshave**—Essential for secondary shaping of the seat, it can also be used for all shaping if you lack an adze. A versatile tool that leaves a finely scalloped surface.
- **Drawknife**—The best tool for beveling the edges of the seat, it excels in cutting across end grain

and can make a clean cut while removing a large amount of wood.

- **Bottoming shave**—A cross between an inshave and a spokeshave, it smooths out the marks left by the inshave and further refines the shape.
- **Scrapers**—Both flat and curved scrapers are used to produce the final smooth surface. After the scrapers, only a very light sanding is required.



The tools in question. You don't have to spend a fortune on tools to get started. Clockwise from top center are inshave, goose-neck scraper, two bottoming shaves, gutter adze, drawknife and card scraper.

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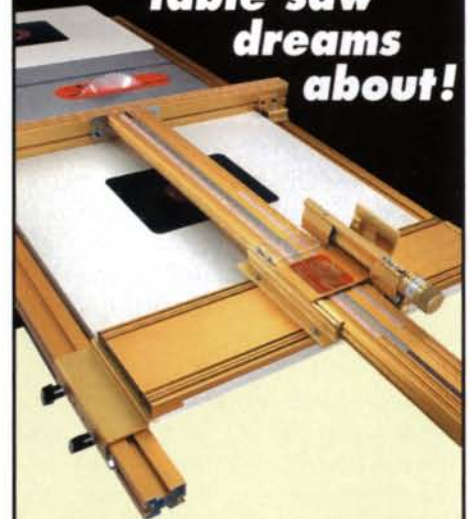


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Master Class (continued)

ern white pine. I run the grain front to back unless the seat is extremely wide, in which case I run the grain side to side. Gluing up a seat blank is fine, but the fewer joints, the better. The more pieces you join to make the blank, the more difficult it is to get the grain alignment necessary for ease of shaping and good looks.

After planing the blank, draw the outline of the seat. Then drill two stopped holes at what will be the most deeply scooped-out parts of the seat. These holes provide a depth gauge you'll use while carving.

Begin by excavating an oval-shaped section at the deepest part of the seat. I do this first quick removal of stock with a gutter adze. The main thing to remember when using this tool is to stand with your feet solidly planted and spread far enough apart so that an errant swing will go between your legs. Swing the adze across the grain or diagonal to it. Cutting along the grain could easily split out a chunk of wood right through the spindle deck. After you gain some depth, you can make some cuts with the grain, as long as you are cutting downhill.

When you have roughed out the oval section, use the adze to start chopping two troughs toward the front of the seat. They will divide at the front of the seat, leaving a high ridge—theommel—between them.

This completes the rough hogging out and leads to the inshave, which will perform most of the rest of the shaping work on the top of the seat. The inshave also refines the work the adze did, replacing the adze's deep scallops with a lightly scalloped surface of its own.

Like the adze, the inshave cuts well when pulled in a path diagonal or perpendicular to the grain. A very smooth cut can be achieved by skewing the tool while pulling it straight toward you to create a slicing action. When cutting in an area where maximum control is needed, lock your elbows and shoulders and use your body to pull the knife and your wrists for fine adjustment.

The blade of a typical inshave curves in a semicircle. The cooper's inshave I use is one I had made from an old drawknife. Its blade has tightly radiused corners and a flat area between them. I use the corners to hog out material and the flat section for smoothing.

The next seat-shaping tool is the draw-

EXCAVATE THE OVAL



Swing the adze one-handed. The gutter adze (left) takes care of rough stock removal in a hurry. Start by carving an oval area at the deepest part of the seat. Keep your feet spread wide so there's no chance of hitting them if the adze glances off the workpiece.



Inshave for smoothing and shaping. An inshave refines the shape roughed out by the adze and replaces the adze's deep scallops with a pattern of smaller ones.

REFINE THE TOP OF THE SEAT



Slice the bevels with a drawknife. Bandsaw the front of the seat, leaving the back square to aid in clamping. Then bevel down the front of the seat. Pull the drawknife toward you with a slicing motion and work the shape in facets.



Where the bevel meets the dish. Go back to the inshave to smooth the drawknife work and to blend the beveled areas with the dished center of the seat.



A smooth shave. Bottoming shaves, which can be wooden-bodied or metal, follow the inshave and create a smooth, flowing surface.



The versatile gooseneck. Use a gooseneck or French curve scraper to give the concave areas of the seat a final smoothing.



Flex the flat scraper. A standard scraper can be flexed to clean up shallow dished areas as well as convex ones. Rounding the corners of the scraper will prevent dig-ins.

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SHAPE THE SEAT BOTTOM



Beveling the bottom. With the top of the seat dished and beveled, use the drawknife to bevel around the perimeter of the bottom. To simplify clamping, bore the leg mortises before the back is beveled.



Dulling the knife. At the front of the seat, where the bottom bevel meets the top bevel in a knife-edge, clean up and slightly round the juncture with a spokeshave.



Back bevel. After beveling the underside of the front of the seat, bandsaw out the shape of the back. Then use the drawknife to create a steep bevel around the back of the seat.



Spokeshave fairs the back bevel. A spokeshave works well to clean up after the drawknife, creating a smooth, steep curve in the end grain at the back of the seat.

knife. Use it to bevel down the sides and front of the seat. Before you begin drawknifing, however, bandsaw out the front shape. Leave the back square for now so that it can be easily clamped in a vise.

To do the drawknifing, lock the seat vertically in a front vise. As you use the drawknife, skew it and use a slicing motion. This gives more control and demands less power.

After drawknifing the front edge, go back to the carving bench and use the inshave to blend in the top of the seat with the drawknifed sides. As you carve, you will begin to map out changing grain direction in your mind, developing an intuitive sense of when the path of cut needs to be altered.

At this point, the shape of the seat has been established. It's now a matter of removing the inshave marks and tweaking the shape. A bottoming shave makes quick work of this task.

Old bottoming shaves occasionally surface at flea markets for \$15 or \$20. These are metal tools with varying sweeps. Cut the handles off halfway, and you have a tool that will perform very well. There are some very nice wooden-bodied bottoming shaves being made today; they are rather expensive, but they work wonderfully. I use both these types, and I also modified a Record No. 151 spokeshave us-

ing files and a belt sander, producing a very satisfactory tool.

Two scrapers take over when the bottoming shave is finished: a flat one with the corners ground off and a gooseneck. By flexing the flat scraper you can smooth everything except the very back contour. The gooseneck is used for tight-radius

curves like those at the back of the seat. When scraping next to the gutter, be sure to cut only in the direction of the long wood fibers or you will pull out a chip.

Finally, I use 150-grit sandpaper. If you have done your job well and not moved from one tool to the other too soon, it will take two or three minutes and only a third of a sheet of sandpaper. If the sanding reveals areas that need more scraping, then return to the scraper. Work that would take an exorbitant amount of time with sandpaper can be accomplished in seconds with the scraper.

With the top almost finished, clamp the seat upright in the front vise to bevel the seat bottom. You need a strong vise to hold the seat steady. Using a drawknife, bevel back from the front edge. Cut the bevel so that it joins the top bevel in a knife edge, and then use a spokeshave to clean up the bevel and slightly round over the knife edge.

Back at the bandsaw, cut the back of the seat to shape. Then you can bevel the back with the drawknife and clean up with a spokeshave. This brings you to the sides, where the top, bottom, front and back meet. Use the drawknife to clean up the bandsawn cove, being careful to keep the blade perpendicular to the seat. Take light cuts in from both directions to avoid digging a deep V rather than a round cove.

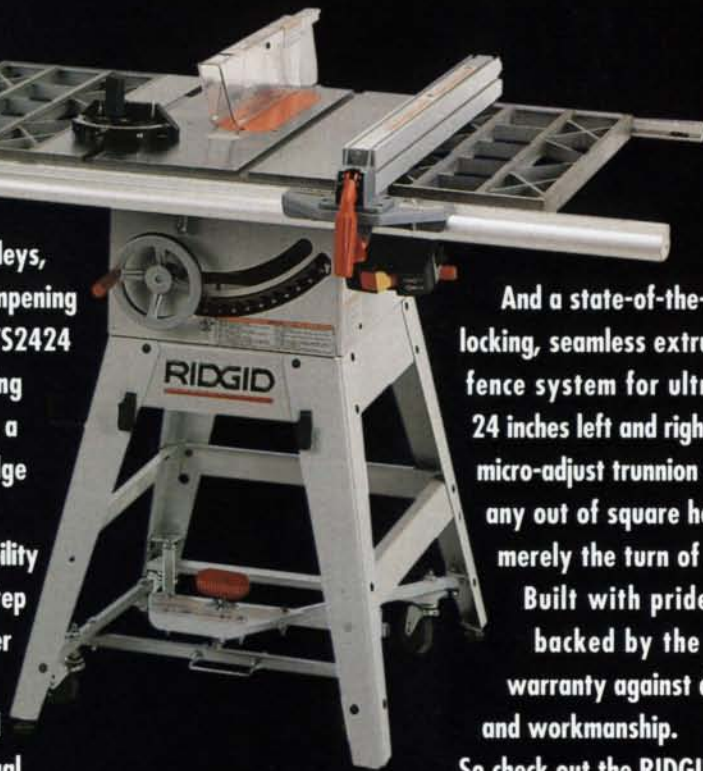




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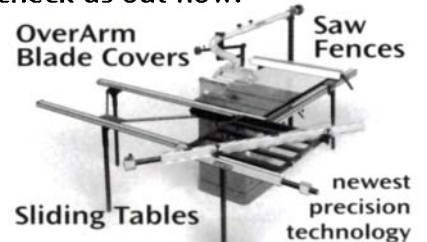
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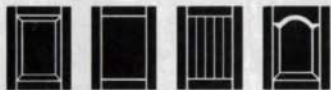
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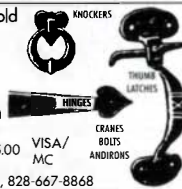
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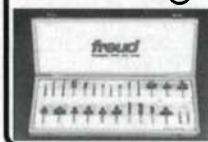
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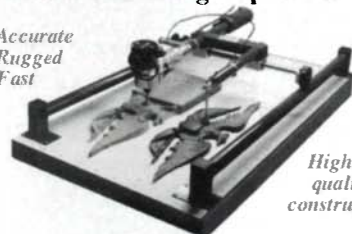


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Toning, shading and glazing: three professional techniques available to amateurs

The next time you visit a furniture store, examine the finish on some expensive pieces of furniture. Notice how the finish on a large dining table draws your eye to the center of the tabletop. Take note how carvings stand out from their background and how the overall color of each piece in a collection exactly matches all of the others. Three simple finishing techniques—toning, shading and glazing—are responsible for all of these effects, and you can achieve these effects without investing hundreds of dollars in equipment. Glazing is done by hand with a brush and a rag. Toning and shading are spray techniques, but don't fret if you don't have spray equipment. Toning and shading lacquers in aerosol cans are available through many woodworking catalogs and from paint stores that cater to professional finishers.

Toning, shading and glazing techniques can add drama to a single piece of furniture and unify several pieces of furniture to make

Toning is especially useful for correcting a stain job that was not quite right. For example, if the stain on a project looks a little too red, you can apply a light coat of green toner over the sealed-in stain to make the project appear brown. Likewise, a blue toner will eliminate that ugly orange cast found in many maple stains. Brown toners reduce the overall brightness of a stain. And perhaps the best use for toning is to control blotching in blotch-prone woods. I rarely stain pine, cherry or birch. Instead, I usually seal the raw wood then tone over the sealer to achieve a desired color.

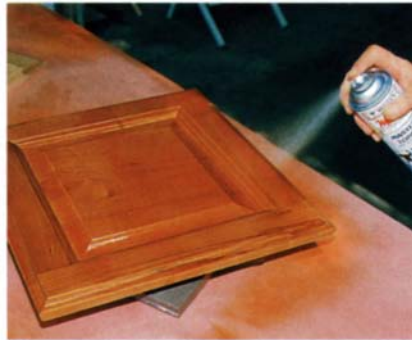
Most professional finishers use nitrocellulose lacquer as the finish base for their toners, and the ready-made aerosol toners you can buy are almost always lacquer-based. But I prefer to make shellac-based toners. There's no good reason to choose one over the other; I've just gotten used to the handling characteristics of my shopmade shellac toners. Typically, I tint a 1-lb. cut of dewaxed

shellac with an alcohol-soluble dye. I make my toners rather dilute and gradually build up the color on the wood with multiple coats rather than trying to change it all with one coat. I've found through hard experience that it is much easier to spray on another coat or two of toner to reach the proper color than it is to strip off a heavy coat that is too dark.

Toning is great for changing the overall color of a piece of furniture, but unfortunately, it also eliminates most of the visual contrast inherent in wood.

That's where shading and glazing come in handy. These two techniques selectively add color to the wood and enhance the visual interest of the piece.

TONING DISPENSES AN EVEN COAT OF COLOR



The first step is to seal the surface. After the sealer dries, scuff-sand for better adhesion and a smoother finish, then follow with an even coat of toner over the entire surface. Once you have the color you want, clear-coat over the toner.

them all appear to be the same color. Although the application methods and finishing materials are different for these techniques, they all share one common trait: Toning, shading and glazing are never done on raw wood. Rather, these subtle color-manipulation techniques are performed after the wood has been sealed but before the finish topcoat is applied.

Toning

Of these three techniques, toning is the easiest to master. If you own spray equipment or have ever painted anything with an aerosol paint can, you already know how to apply toners. The object is to apply an even coat of color over the entire surface, unifying the various pieces of wood used in a project into one, even color tone. A toner is nothing more than a clear finish that has been tinted with a dye or a pigment. Dyes make better toners because they're more transparent. Pigmented toners tend to look muddy. Toner are easy to make in the shop. Simply dissolve the appropriate colored dye into the finish of your choice and spray it on the project.

Shading

Shading and toning utilize the same materials and techniques; the only real difference is the amount of area covered with the tinted lacquer or shellac. When only selected areas of a piece are colored, the technique is called shading. Essentially, this technique is used to add a little drama, or pizzazz, to a piece of furniture.

My favorite shading trick is called a sunburst. Luthiers have been putting sunbursts on the backs of guitars for years. A yellow, orange, red and maroon sunburst is surprisingly easy to produce. First, stain the raw wood with an intense lemon-yellow non-grain-raising dye stain, then seal it with a nitrocellulose lacquer sealer or dewaxed shellac. After that dries, spray on successively heavier coats of a shader made by dissolving cordovan-colored leather shoe dye into a 1-lb. cut shellac solution. With a sunburst you want to end up with overlapping bands of color, which is easier to

Finish Line (continued)

accomplish if you can place the object on a turntable and spray it while you're turning it.

Some finishers prefer to start a sunburst from the outside edge of a piece and work toward the center, but I prefer to work from the inside out to the edge. I start my first pass about a quarter of the way from the center to the edge of a round piece and lay down a thin layer of colored shellac. The thin, cordovan-colored layer and the yellow base layer combine to produce an orange band of color. Then I repeat this spray technique to produce the other color bands, indexing out slightly with each pass to produce a smooth gradient of color from bright yellow to dark maroon.

Sunbursts look great on boxes, bowls and other small projects, but they look really gaudy on large tabletops. However, tabletops and other large expanses of monotone colored wood can benefit from less garish shading. Commercially finished tabletops are usually colored with a shader that is just slightly darker than the overall color of the top. Typically, the center of the table is darker than the edges. The overall effect is to draw your eye toward the center, the area of highest interest in most tabletops. Shading drawer fronts and doors will similarly add a visual interest to them.

Glazing

Glazing is an operation that strikes terror in your heart the first time you try it. It seems counterintuitive that anything good can come from smearing brown gooey stuff onto beautiful wood. However, glazing is a great way to enhance the appearance of turned spindles, raised panels and decorative carvings. You can use ordinary oil-based pigment stain as a glaze, but commercially prepared glazing mediums work better. I prefer oil-based glazes

SHADING LIMITS THE AMOUNT OF COLOR



Shading is a simplified form of toning. For these lazy *Sussans*, the author started with a yellow dye stain, sealed that in with a clear coat, then sprayed on various layers of shellac tinted with an alcohol-based leather shoe dye.

to the latex type because the oil-based glazes take longer to dry, giving me more time to manipulate the glaze to my satisfaction.

Make sure that the surface has been thoroughly sealed, then brush on a thin coat of glaze over the entire area. You needn't be too fussy when brushing on the glaze because most of it will be wiped off anyway. Using a clean cotton rag, wipe the glaze from the high spots, leaving more of it in the crevices of turnings, carvings, raised panels and decorative moldings. Then soften the transition between glazed and unglazed areas by blending the two with a dry china bristle brush.

The idea behind glazing is to leave a little "mud" in the cracks to give the piece some depth and the warm look associated with the patina on aged furniture. How much glaze you leave on the piece is a matter of taste. If you don't like what you see after you are finished glazing, simply remove more of the glaze with a rag soaked in the appropriate solvent—mineral spirits for oil-based glazes, water for latex glazes. Heavy glaze buildup in deep fissures takes a long time to dry, so once you're satisfied with the way it looks, allow at least 24 hours before topcoating it with a clear finish.

Not surprisingly, different colored glazes yield different visual results,

but a can of burnt-umber glaze and another one of medium reddish-brown color will handle 95% of the glazing tasks in an average workshop. Experimenting with unusual color combinations sometimes leads to interesting finishes. For example, applying a white glaze over a darkly stained open-grained wood produces a whitewashed pickled look that was popular a decade ago. A reddish-brown glaze over wood painted gold will produce a convincing imitation of brass. The possibilities are endless. You can experiment and have fun with different glazes.

GLAZING HIGHLIGHTS AREAS OF COLOR



When applying a glaze, neatness doesn't matter. Brush on glaze over a sealed or toned-and-sealed surface, wipe off most of it, then use a dry china brush to blend the glazed and unglazed areas. After allowing at least a day to dry, cover the glazing with a clear finish.

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School for Secretaries

Some guys really take their hobby seriously. Two years ago, nine amateur woodworkers who met through the Washington, D.C., Woodworkers Guild decided it was time to try making Newport secretaries. None of them had ever built such a piece, and between them they had very little carving experience. But they all liked the idea of a challenge, so they chose to build copies of a majestic six-shell Goddard-Townsend secretary. To guide them through the process, the group hired one

of the country's foremost period furniture makers, Allan Breed (in the foreground of the photo above). This past April, with half the secretaries finished, or nearly so, and half still underway, the class and their teacher met for a photo. The class agreed the piece had provided the serious challenge they'd been after. What they hadn't quite anticipated was something their peers and their teacher provided: some serious fun. For more on the class and their secretaries, see the article on p. 84.

