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Departments

- 6 Contributors
- 8 Letters
- 18 Methods of Work
Lifting mechanism for sheet goods;
Avoiding planer snipe on short stock
- 26 Notes & Comment
(Almost) nothing from something;
Creativity with a purpose
- 36 Tools & Materials
Hammer 16-in. jointer-planer; Latest
products from summer tool shows
- 94 **Current Work** NEW
A gallery of our
readers' woodworking
- 100 Rules of Thumb
The right wood for the job
- 108 Questions & Answers
Rust on machinery; Paint for
bookshelves; Curved back splat
- 120 Master Class
Leather as a writing surface
and design detail
- 137 Finish Line
Polyurethane

On the Cover:

World-renowned turner Richard Raffan has been a key figure in the development of wood turning as an art form. In this issue he offers time-tested techniques on developing lathe skills using only a skew chisel. See p. 84



Photo: Anatole Burkin



From rough to ready, p. 88



A primer on sealers, p. 52



Japanese planes demystified, p. 68

Articles

46 Drum Sanders for the Small Shop

A review of seven thickness sanders priced from \$500 to \$2,500

BY ROLAND JOHNSON

52 A Primer on Sealers

How and why you can benefit from these often misunderstood products used under clear finishes

BY JEFF JEWITT

56 A Round Kitchen Classic

Learn the basics of bent lamination as you build this cherry table

BY THOMAS J. CALISTO

64 Dust-proof Your Contractor's Saw

A shopmade plywood back plate and simple undermount box collect dust at the source

BY DICK McDONOUGH

68 Japanese Planes Demystified

Tuning up a new wooden plane teaches you how to maintain the tool for life

BY CARL SWENSSON

73 Learning to plane on the pull stroke

74 Prevent Injury to Your Hands, Wrists and Forearms

Strategies to keep you in the shop and out of the doctor's office

BY TOM LEROY

78 Keeping Plank Doors Flat

Five solutions, from standard to stylish

BY CHRISTIAN BECKSVOORT

84 Skew-Chisel Basics

Improve your lathe skills by turning rows and rows of beads using only a skew chisel

BY RICHARD RAFFAN

88 From Rough to Ready

A one-man system for preparing more stock in less time

BY ROGER A. SKIPPER

93 Rolling carts for moving lumber



A round kitchen classic, p. 56



Dust-proof your contractor's saw, p. 64

Contributors

Carl Swensson ("Japanese Planes Demystified") was a tennis pro in the San Francisco Bay area back when one could still buy a wooden racket and a white tennis ball. Plagued by a bad knee and desiring to do something more creative, he considered other career options. He returned to school to study woodworking. After school, he returned home to Baltimore, Md., to set up shop. Swensson has built everything from Buddhist temple doors to ladder-back chairs. He's currently designing an improved version of that classic bodger's tool, the shaving horse.



Kevin Rodel (Master Class) and his wife, Susan Mack, have operated the Mack & Rodel Studio in Pownal, Maine, since 1986. Their company produces furniture in the Arts and Crafts style. Rodel is currently working on a Taunton Press book tentatively titled "The Craftsman Legacy," to be published in the fall of 2002.



As a physical therapist, **Tom LeRoy** ("Prevent Injury to Your Hands, Wrists and Forearms") doesn't shy away from woodworking, but he is careful about his working habits. In the summer of 2000, LeRoy and his wife bought some property in coastal Maine that had once been a Boy Scout camp, on which they are building a house. He is also converting one of the old Scout buildings into a new, spacious shop. Self-taught, he's been woodworking for eight years. His original motive for taking up the hobby was to make improvements to a period-style house he and his family were living in at the time. In their spare time, LeRoy and his family like to hike the trails of the Down East islands near their home.

Dick McDonough ("Dust-proof Your Contractor's Saw") majored in history at Eastern Michigan University, graduating in 1965. A two-year Army tour in Korea led to a career that included



assignments in South Vietnam and Belgium. He's now a finish carpenter in Flint, Mich., specializing in restoring and remodeling antique houses. You can also find him teaching at a local community college, in

addition to giving classes in his own workshop and at a woodworking store.

Roger A. Skipper ("From Rough to Ready") has worked in many fields since leaving the Navy in 1973, where he worked as an electronics technician. He has been a building contractor, a lumberyard manager and a construction consultant, and he owned and operated his own yard for 12 years. He says being "debt-free" gives him the freedom to switch careers when he gets bored. And he recently did just that, dropping almost everything to go to college at last, as an English major. He still offers custom drying services in his 3,000-bd.-ft. kiln, makes mandolins and is finishing his first novel, a "redneck-coming-of-age story."



For the past two years **Thomas J. Calisto** ("A Round Kitchen Classic"), a mechanical engineer by day, has been applying his woodworking talents to the benefit of another passion: sailing. So far,



he has put in more than 200 hours building a small sailboat. He figures he has another 40 hours or so before the boat can see a christening. Calisto held a marginal interest in woodworking from an early age, but it didn't dawn on him that he could actually build furniture until he met the father of a college buddy who built Queen Anne reproductions. When the light bulb came on, he had the good fortune to be attending one of the few colleges in this country (in North Carolina, to no great surprise) that still offered a woodworking curriculum.

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Letters

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Read about wood-working's past

Next month at this time, *Fine Woodworking* subscribers will receive the first special issue in the magazine's history.

The seventh issue of the year, it will be larger than usual and will commemorate our 25 years of providing woodworkers with the best technical information possible about their craft.

We hope you have as much fun reading the silver-anniversary issue as we have had putting it together. It will be a little different than our usual fare, although many of your favorite columns will appear. We'll give you the inside history of our 25 years, of course, but mostly the articles will be about 25 years of woodworking: how tools have changed; how and why turning has dramatically mushroomed in two-and-a-half decades; why the dovetail has such special status in our craft; the furniture designs that have endured among small-shop woodworkers; why you are probably not using the same finishes that you were in 1975; a tour through the shop and mind of one of the nation's funniest woodworkers; and an extraordinary gallery of some of the landmark pieces of furniture that have appeared in our pages. We've also asked students and friends of some of the more famous woodworking masters to write about what makes them such good woodworkers and teachers.

Jim Richey, the editor of *Methods of Work*, has chosen his 25 favorite tips from the more than 1,800 that have appeared. Staff editors have chosen the best questions and answers from our

Q&A department. And I've chosen my favorite letters from among those sent in by our passionate and sometimes ornery readers. There will also be a special foldout section featuring photos of our 145 covers. And much more.

Our editors have spent most of the summer and fall carefully pulling together the upcoming special issue. But the real work, the real information, the real passion have come—as they have throughout our 25 years as the premier woodworking magazine—from our readers. Every author is a woodworker, and that's what has kept us vital and informative all of these years.

—Timothy D. Schreiner, editor

Disagrees over history of the spokeshave

While I realize that history is not the main focus of your magazine, I felt as though some of these issues could be clarified, particularly that of the spokeshave. If Mike Dunbar's (*FWW* #143, p. 98) contact has documentation to back up the notion about spokeshaves originating as lastmaker's tools, it would be something that eluded most tool historians for the past 80 years or more, William L. Goodman and Henry Mercer among them. The notion of the spokeshave being named because sections of wood called "spokes" were shaped with this tool to make shoemaker's lasts sounds perfectly absurd. I have seen numerous 16th-century references to this tool, usually belonging to coopers. See W.L. Goodman, "Woodworking Apprentices and their Tools in Bristol, Norwich, Great Yarmouth, and Southampton, 1535-1650," *Industrial Archaeology* 9, No. 4

(November 1972), pp. 376-411. I have never seen, in any 16th- or 17th-century document, a reference to the word "spoke(s)" meaning anything other than parts for a wheelwright's work, either for cart wheels, or for woolen and linen wheels. Typically, sections of usable

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Nov. 11: Several authors (including Mario Rodriguez, Niall Barrett and Toshio Odate), *FWW* Editor Tim Schreiner and Taunton Press woodworking books editor Helen Albert will be at The Woodworkers Club in Norwalk, Conn., to celebrate *FWW*'s 25th anniversary. The day will include lectures, demonstrations and book signings from 10 a.m. to 6 p.m. Call (203) 847-9663 or visit www.woodworkersclubnorwalk.com.

Jan. 21-24 and 25-28: We will again co-sponsor with Colonial Williamsburg our annual conference on working wood in the 18th century. This year's conference will be held in two back-to-back sessions, both concentrating on the design, construction and finishing of chairs. Several authors and editors will take part in the sessions. Space is limited, so move quickly if you want to attend. For info, call (800) 603-0948.

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wood are called “bolts” in this period, or “stuff.” Of course, Dunbar is quoting another author and uses the vague phrase “in the past” as if the entire past were a cohesive entity.

For a reasonable summary about spokeshaves, see *With Hammer in Hand: The Dominy Craftsmen of East Hampton, New York* by Charles F. Hummel (University Press of Virginia for the Henry Francis du Pont Winterthur Museum, 1968), pp. 141–42. Hummel points out that the spokeshave was known as early as the 16th century, and yet it does not appear in the major 18th-century sources such as Diderot, Roubo, etc. When it finally appears in print in the 19th century it is with blockmakers, who made blocks and pulleys for ships. Whatever its use, it was known by the name “spokeshave” by the early 16th century.

—Peter Follansbee, *Plymouth, Mass.*

Chair-joinery article was half right

In his article on compound-angle joinery (*FWW* #143, pp. 60–65), Will Neptune gets it only half right. An engaging reality of late baroque and rococo seating furniture is the fact that side seat rails must twist to properly join with flared back stiles.

As Neptune points out, this creates a somewhat tricky joint but not as complicated as he makes it. A quick survey of any group of period chairs will reveal that side seat rail tenons do not cant at an angle from the plane of the rail. Angling the grain of the tenon not only reduces its strength but runs counter to the workmanship of the period. The efficiency and flow of 18th-century work is difficult to appreciate without fully immersing oneself in it. Mixing 20th-century practices with 18th-century modes of thinking and work does a disservice to both. The key here is the ultra-simple marking gauge.

Whenever humanly possible, the period craftsman struck all joinery, mortises and tenons with this tool, which was permanently set to the width of his mortise chisel. As Neptune shows, the outside surface at the back end of the seat rail is planed off to be flush with the flare of the back stiles. This is not done from a drawing or layout, rather by assembling the side rail to the initially cut front-leg assembly and offering up the end of the

rail to the fully assembled back. This allows for directly marking the flare of the back onto the end grain of the seat rail. Once the wind is planed into the rail, the marking gauge has a proper surface to run against for striking the tenon. The front face of the mortise is struck likewise. The only adjustment that must be made is to account for the offset of the emerging mortise and tenon on the rear of the back stile. This is a simple matter of drawing a cross section of the joint, including the angle of the seat trapezoid. A slight adjustment of the marking gauge for the rear of the leg is all that is necessary.

With chairs outside of Philadelphia that do not employ a through-tenon, the mortise is struck only on the inside face of the back stile and the angle accounted for by eye. If this angle is not exactly correct, shaving a bit off one side or other of the tenon is permissible because it does not reduce strength. A flush-fitting tenon shoulder, pulled tightly against the face of the back stile by the draw pin, ensures full structural integrity. It goes without saying that immersion in historic work practices and mastery of the simple tools of the period—jack plane, marking gauge, tenon saw and mortise chisel—result in an organic efficiency that cannot be duplicated with jiggered power machinery.

—Michael S. Podmaniczky,
senior conservator—furniture,
Winterthur Museum, Winterthur, Del.

Hand-tool advice was wrong

It's not often that I write to a magazine, but after reading Anthony Guidice's "Four-squaring with hand tools" in *Rules of Thumb* (*FWW* #142, p. 96) I got out my pen. Although I share and appreciate Mr. Guidice's enthusiasm for hand tools, some of his statements are clearly wrong, others misleading.

His contention that planes made by Lie-Nielsen are the only ones that work properly is simply ridiculous. I'm sure many craftsmen who have used Norris, Spiers, E.C.E. and other well-made planes would agree with me. Lie-Nielsen's planes are merely exorbitantly priced Stanley replicas, not brilliant new designs. As for "grandpa's old, rusty plane," I'll put my rescued and restored Stanley 608 and Preston smooth planes up against anything Lie-Nielsen makes.

Next, Mr. Guidice states that a scrub plane is the only plane that can flatten a board and that a jack plane "won't work." Yet he then describes how he uses jack and jointer planes afterwards to "take off the high spots" left by the scrub. Ignoring the obvious fact that a board with high spots is not flat, he suggests that a jack is the preferred tool for removing high spots created by the scrub plane but "won't work" for removing the natural high spots on a rough board to flatten it. The fact is that a scrub plane, while good at removing a lot of waste quickly, cannot possibly render a board flat because of the convex leading edge of the cutter. A jack or jointer, with a straight-edged cutter, does a very good job of flattening a board.

In the section on jointing, Mr. Guidice advises to "take long passes with the jointer plane until the edge is straight and square," as if this were a simple task that everyone should be able to learn easily. He strongly discourages the use of "jigs, a fence or any other nonsense" and apparently feels that good hand-eye coordination is all that's needed to somehow sense that you're making a square cut. This is simplifying the technique to an obscene degree and is very misleading. Edge-jointing without reference aids is probably the most difficult of all hand-tool skills to master. The human body has no mechanism for locking in a perfect 90° setting. In 25 years of woodworking I've jointed several thousand edges, and without a reference I can't possibly tell whether the sole of the plane is exactly square to the face of the board while I'm doing it.



I'm not sure of Mr. Guidice's intent in writing this article. If he's trying to demystify hand-tool work, then he's done a reasonably good job of explaining some techniques. If, however, he's trying to encourage people to give it a try, I can assure you those folks will be sorely

Writing an article

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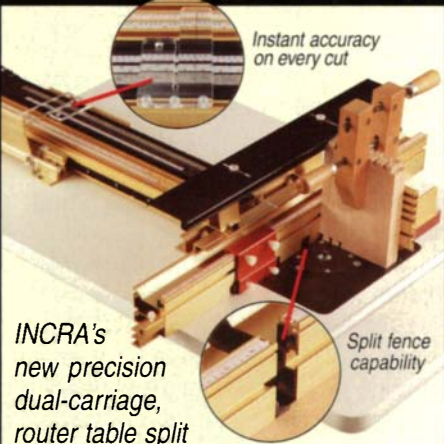
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disappointed. Believing that you must have expensive planes or hard-to-find (European-style bowsaw) equipment is bad enough. Much worse is to make the purchases, then find out that the learning curve is very much higher than you've been lead to believe. The techniques that Mr. Guidice describes are quite difficult to master. To tell anyone, novices or experts, that 95% of hand-tool problems can be solved by using good-quality, well-sharpened tools, and that the rest is just a matter of "a little practice" is a gross oversimplification. I regret that a magazine of your stature promotes this type of irresponsible "instruction."

—Eddie Cochrane, Greer, S.C.

ANTHONY GUIDICE REPLIES: I use handplanes every day in my shop and have taught the exact methods shown in the article to hundreds of students, and they work quickly and well. I dislike these argue-back-and-forth things, but my editor asked for a reply, so here goes:

1. Lie-Nielsen planes work better than any other planes, antique or otherwise. I didn't say anything about wooden planes (E.C.E., Ulmia, etc.); although the Lie-Nielsens will outperform the best of these as well. Lie-Nielsen planes are relatively inexpensive when you consider that it takes far too much time to make a junk plane into something that works. And then it still won't work as well. How much is your time worth?

2. By "flat" I mean the board won't rock on the bench. The twist, warp and other problems have been planed out of it. This is a common error; most folks don't know what a scrub plane is or does.

3. It is perfectly possible to plane with a jointer plane by eye to about 90°. If you need to edge-join two boards, you plane them both at the same time. If you don't need to edge-join them, ultimate precision doesn't matter. If this type of hand-eye coordination weren't possible, it would be impossible to shoot a rifle accurately. Right-angle clamps, jigs and tricky grips used to keep a jointer plane level are utter nonsense.

4. German bowsaws are easy to find. Nothing else saws as fast or as accurately.

5. Students are disappointed only when they are confused by overcomplicated, unnecessary dogma—not by using correct

tools and techniques to get fine results quickly. Most woodworking teachers are a little too much like lawyers: They're trying to make it look hard, not easy.

Lots of what is written and taught about woodworking is just gilded baloney. What I teach works. If you don't believe it, I'm just as sorry as I can be. If thousands of people believe a wrong idea, it's still wrong.

The snide underlying message

You affixed a "tongue in cheek" headline to the letter from Gordon Munger (*FWW* #144, p. 8). However, his subliminal message came through loud and clear:

"We don't need any laws and regulations telling people how they can't maim and kill themselves. Safety is something for a bunch of sissies, not for real John Waynes like us."

One has only to go out and look at the legions of people who have been blinded, crippled and killed to realize that laws governing safety in the workplace are an evolutionary and belated response to centuries of neglect. It is currently very fashionable to make snide allusions to the premise that government is an evil entity with nothing to do except pass redundant laws for the purpose of taking away people's freedom.

When the world becomes populated by people who are careful, considerate and intelligent, I will be delighted to scrap all laws. Until then, instead of resenting safety regulations, imperfect as they might always be, let us be grateful that we finally have some limitations in place to protect health, life and limb in the work environment.

—Joseph Brooks, Kerrville, Texas

A plan is a valuable thing

The article "Building Without Plans" (*FWW* #141, pp. 70-73) has prompted me to write these few words of wisdom. I have taught woodworking, drafting and design since 1976 and have always advocated the use of plans. Presently I am teaching in a program where we teach not only the craft of woodworking but also sketching, modeling, drafting, CAD and design.

A plan gives the designer/craftsman a much-needed direction, especially when building complicated products. A well-

trained eye can recognize proportion problems and will know how to solve them, but an untrained eye can only recognize that there is something that "looks funny."

Anyone would severely limit themselves if, as one of the components of planning, they were unable to read or generate drawings. Sketching multiple ideas on paper is a great place to begin, but it only gives a limited amount of information. Modeling is also a valid method of attaining good design; however, it can be time-consuming and cumbersome.

A scaled drawing has a multitude of benefits. It is far easier and faster to erase a line on a drawing than it is to recut a board of a full-scale model or product. The scaled drawing (or model) is the only way to view proportion. Anyone can easily arrive at these proportions using standardized proportioning systems and an architect's or engineer's scale. In addition, while formally putting your ideas on paper, a person mentally constructs the product, making important decisions along the way, such as construction details, assembly procedures, finishing schedules and embellishment possibilities.

The ability to draw and visualize a three-dimensional object from a two-dimensional representation is a skill, much as cutting a dovetail is a skill. All skills take practice to develop. The higher our level of skills in all areas of woodworking, drafting and design, the more efficient and productive we will be.

—David Barresi, Reidsville, N.C.

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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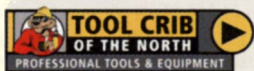
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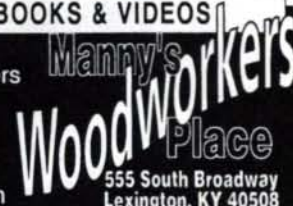
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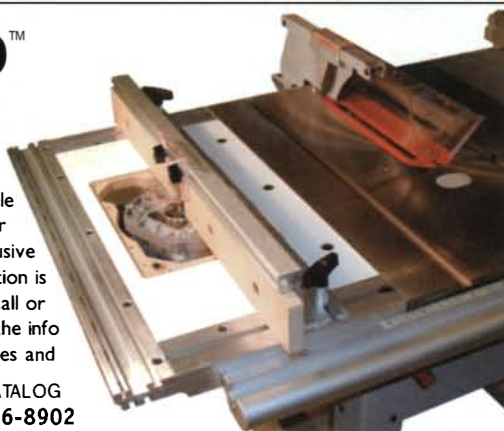
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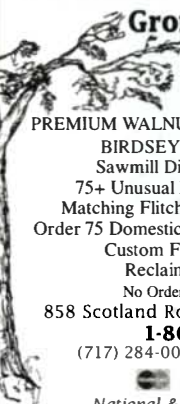
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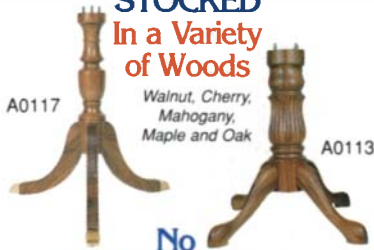


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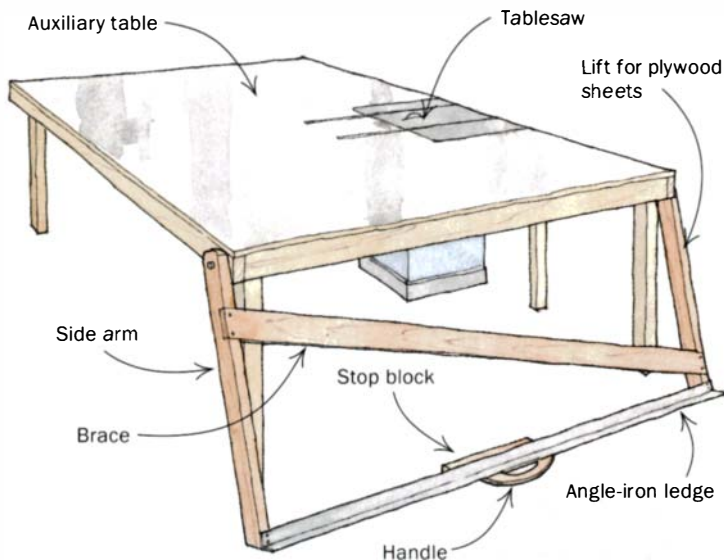
Methods of Work

EDITED AND DRAWN BY JIM RICHEY

Lifting mechanism for sheet goods

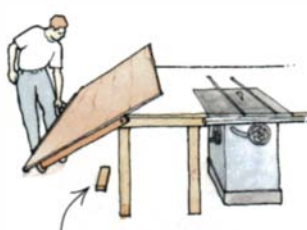
Working in a small shop has its advantages and disadvantages. One disadvantage is that there is not always someone around to help with the heavy lifting.

I added a larger auxiliary top to the tablesaw to make it easier to handle full sheets of plywood, but getting the plywood onto the saw was still a problem. To solve that difficulty, I outfitted the saw table with a lift that allows one person to raise a sheet of plywood onto the saw easily and with less risk of damage.



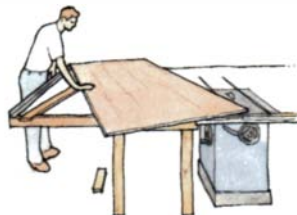
The construction is simple. Cut two 2x4 side arms approximately 1 in. longer than the height of the table. Drill and attach the side arms, one to each side of the auxiliary table, so that they will pivot (I used 1/2-in. bolts with washers and nuts). Cut a length of 2x2 angle iron long enough to span the side arms. Screw a 1/2-in. plywood handle to the underside of the angle iron and then secure the angle iron to the bottom of the side arms to provide a ledge for

Load sheet onto angle-iron ledge.



Stop block

Pull up level with table and slide plywood onto table surface.

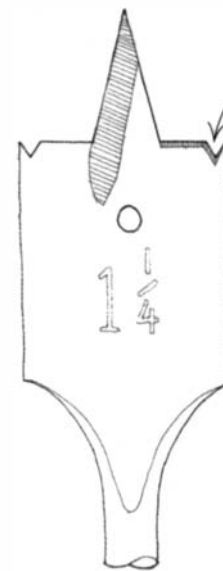


the sheet goods. Let a 1x4 diagonal brace into the 2x4s, to keep the lift from racking. Screw a 2x4 stop block to the floor so that the lift stays approximately 1/4 in. off the floor and at a slight angle away from the table. This will keep the lift from binding when under a load and keep a sheet of plywood from tipping back toward you after you place it on the lift.

To use the lift, set a sheet of plywood on the angle-iron ledge and lift the sheet level with the table. Then simply push the sheet onto the table and slide it into place for ripping workpieces to size.

—Garett S. Craft, Rantoul, Ill.

Improving the performance of spade bits



File notches in cutting edges of spade bit to cut a cleaner hole.

Woodworkers often overlook the lowly spade bit, but it does have some advantages. It certainly is the cheapest bit and the easiest to sharpen. And if you need a nonstandard size or a tapered hole, you can easily grind a bit off the sides.

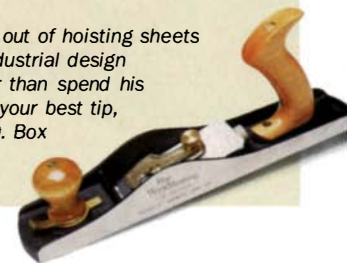
It does not drill a clean hole, you say? Well, just file a notch on each edge of the blade, as shown in the sketch. Essentially you are making spurs to sever the wood fibers cleanly on the wall of the hole. As you drill, go slowly when the flat of the bit first contacts the work. You will find that the wall of the hole will be crisp and clean—maybe even cleaner than with those other fancier bits.

—Tim Hanson, Indianapolis, Ind.

Quick tip: When working with sheet goods, I trim the pieces to an approximate size with a handheld circular saw. Then, before I make any final cuts, I put down a piece of 2-in. masking tape,

A reward for the best tip

Garett S. Craft won an engraved Lie-Nielsen handplane for his winning tip that takes the grunting out of hoisting sheets of plywood. Craft worked part-time in his father's cabinet shop in Rantoul, Ill., while he studied industrial design at the nearby University of Illinois. After graduating in 1997, he came back to work full-time rather than spend his days sitting in an office. He likes the freedom to take off and go fishing once in a while. 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.



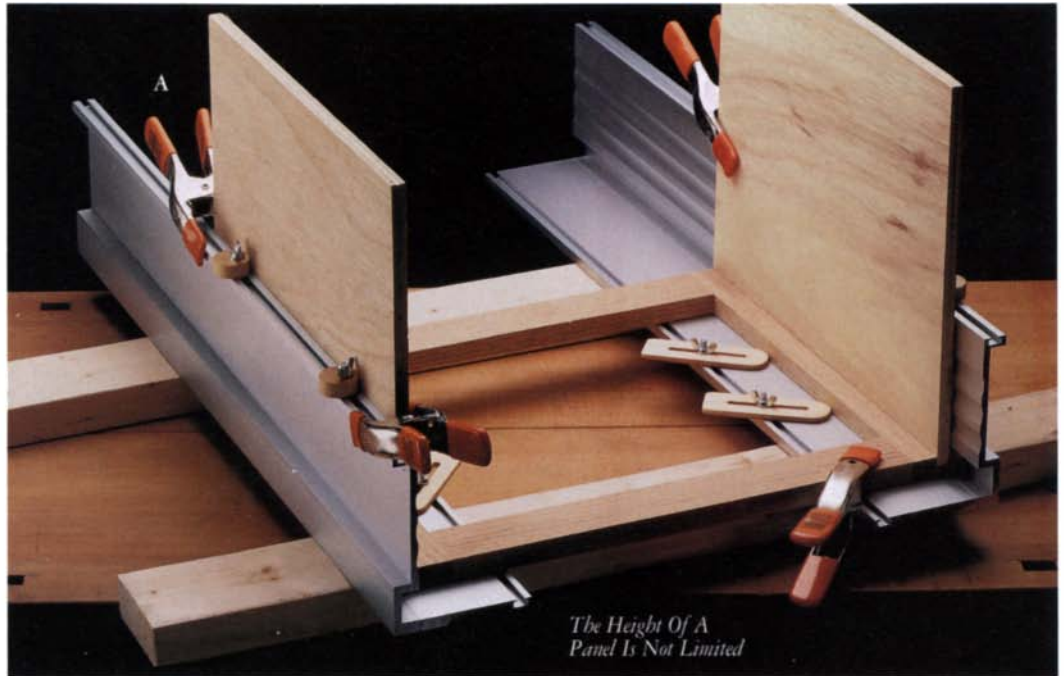
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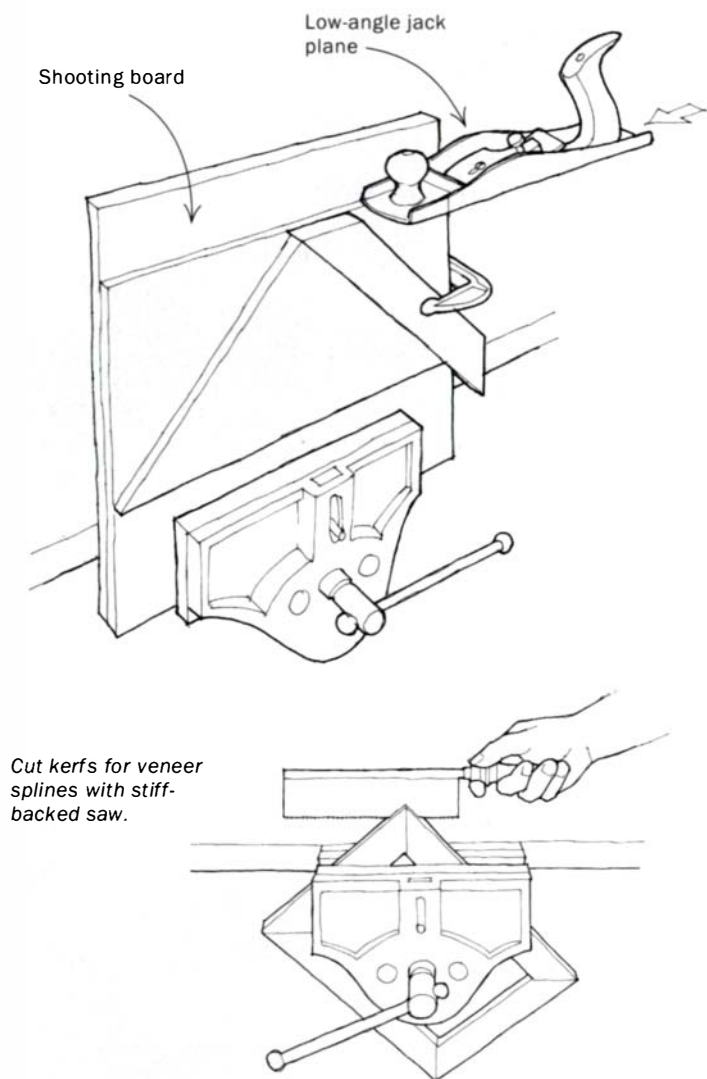
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Methods of Work (continued)

affixed directly to the wood. I can then mark my final cut line on the tape. The tape all but eliminates tearout.

—Craig Duff, Del Rio, Texas

Painless miter joints



Cut kerfs for veneer splines with stiff-backed saw.

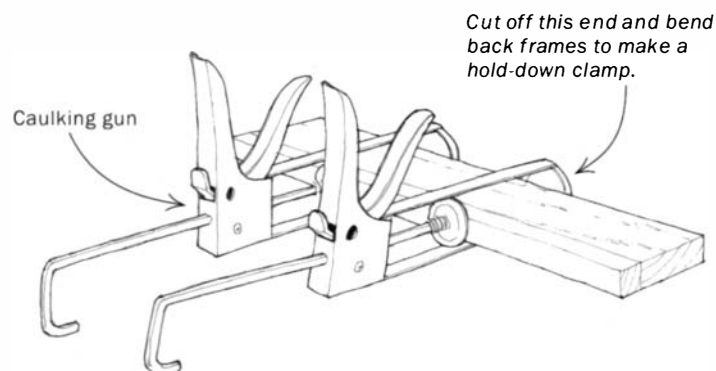
Making strong, tight miter joints can be a daunting job. Miter joints are inherently weak, hard to clamp and—for me—difficult to cut accurately. Notwithstanding those obstacles, I've discovered a couple of tricks to cut tight, strong miter joints quickly and easily.

First of all, I rough-cut the mitered members on my chopsaw. Then I move each frame member to a shooting board, where I can quickly produce a dead-accurate polished miter with a low-angle jack plane, as shown in the sketch. I seal the end grain with a thin coat of glue, let it absorb into the end grain, then add a little more glue and assemble the joint. If I've done a good job shooting my miter cuts, the whole thing almost holds itself together with just the tack of the glue. I then add one of those nifty little pinch clamps to each corner—the kind that are applied by hand. (The ding that the pinch clamp makes is eliminated in the next step.) Masking tape also works well to pull the miter joints together.

After the glue has thoroughly set, I carefully clamp one corner of the frame in my vise at 45°. Using a stiff backsaw or dovetail saw I cut a kerf in the joint to accept one or two reinforcing splines. I cut spline material from veneer, apply glue, insert the spline in the kerf and clamp across the kerf. Once the glue has set, I plane or sand off the protruding portion of the spline.

—Andrew Dizon, San Diego, Calif.

Quick clamp from a caulking gun

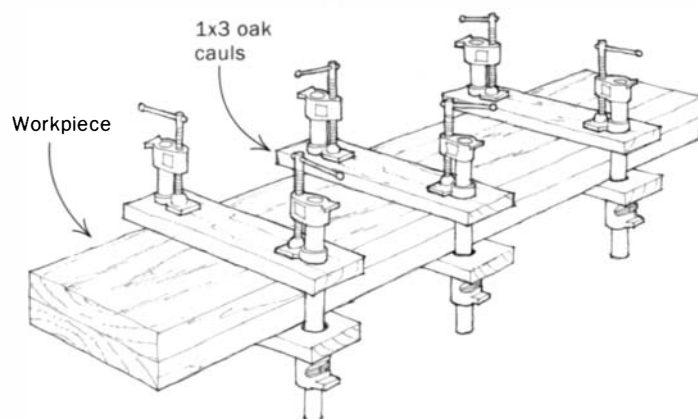


The widely available caulking gun (we call it a sealant gun in England) makes a quick, cheap clamp. Simply remove the tube of caulk, place the item to be clamped between the plunger and the frame and tighten the gun. Add a little block of wood in the nose area if you wish. Most caulking guns will work, but some of the fancier models have a pressure-release feature that makes them unusable for clamps.

By cutting off the nose of the frame and bending the remaining frame ends, you can utilize the gun's clamping mechanism as a hold-down or clamp in a wide variety of jigs and fixtures.

—Alan Carter, Shauford, Winchester, England

Laminating boards with pipe clamps



When I needed to laminate two wide boards to make thicker stock for chair legs, I devised a simple fixture to apply clamping pressure across the entire width of the boards. To make it you will need several pairs of pipe clamps and an equal number of stout hardwood (I used 1x3 oak) cauls. Cut the cauls longer than the

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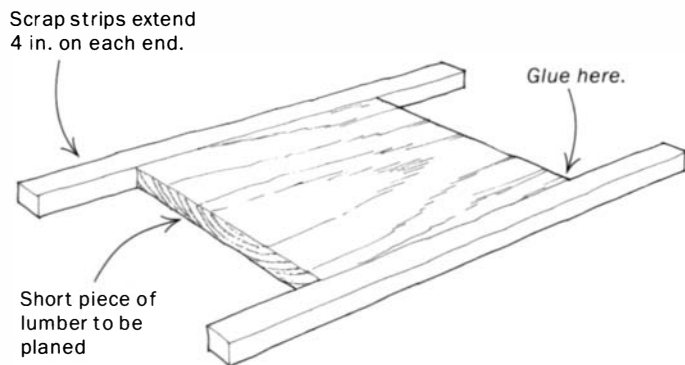
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Methods of Work (continued)

widest boards you will be laminating. Drill holes at each end of the cauls to fit the outside diameter of the pipe, and clamp the assembly, as shown in the sketch on p. 20. —*Susan Cosmos, Piru, Calif.*

Avoiding planer snipe on short stock

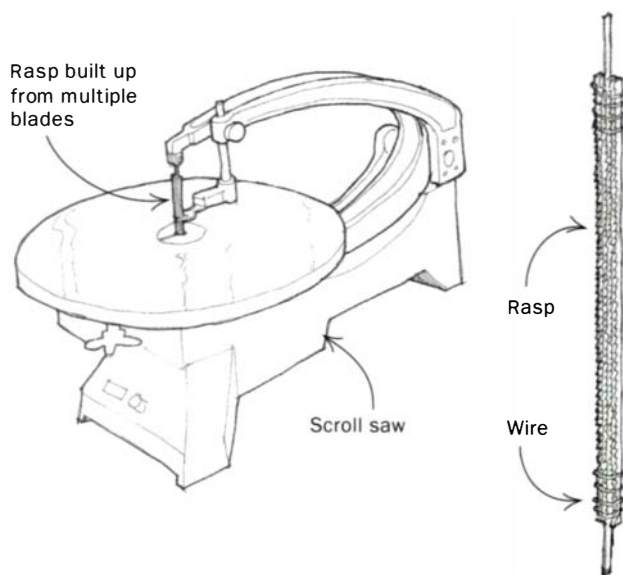


When you need to put a short piece of wood through the thickness planer, here's how to eliminate snipe at each end of the workpiece. Cut 1-in.-wide wood strips about 8 in. longer than the workpiece, and glue one strip to each edge, as shown above.

Now run the workpiece through the planer, taking thin cuts until it is the desired thickness. Any snipe will appear at the ends of the strips, not in the workpiece. Use yellow glue. Cyanoacrylate glues (like Hot Stuff) will make a mess of your jointer blades when you clean up the edges after sawing away the strips. This technique works equally well with a jointer.

—*Roger Russell, Anderson Island, Wash.*

Scroll-saw rasp made from sawblades



This miniature power rasp fits into a stationary scroll saw or jigsaw and is useful for touching up and squaring joint members such as tenons. Start with five coarse scroll-saw blades, a length of fine wire and epoxy. With pliers, snap off both ends of all four blades

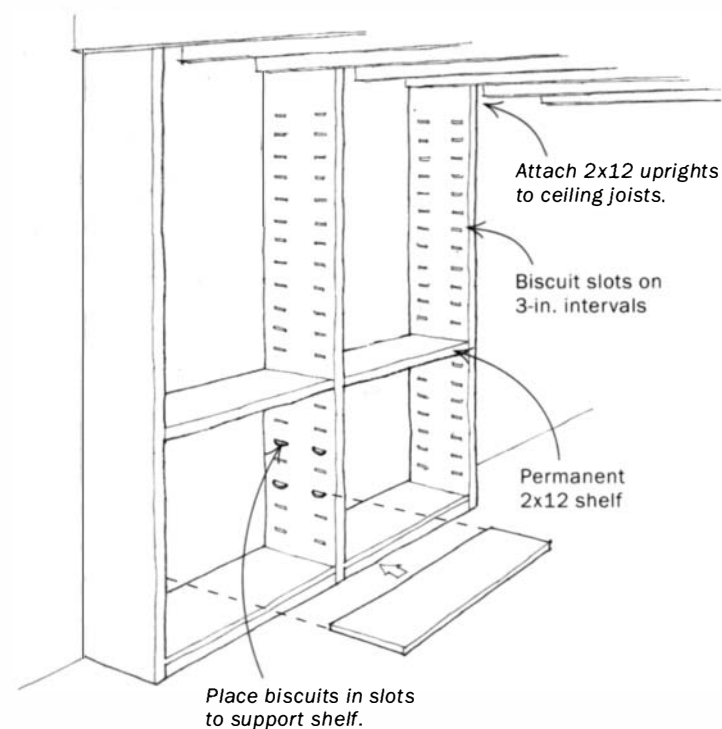
at the last tooth. Build a sandwich with two of the shortened blades on each side of the center (unbroken) blade. Coat the last ½ in. of each blade with epoxy, place the blade assembly face-down on a flat surface to align the teeth and wrap the ends tightly with the fine wire.

After the epoxy hardens, install the rasp in your scroll saw or jigsaw. It may be helpful to clamp a narrow block of wood on the saw table behind the rasp to provide support at the back of the blades.

—*Walter Sheard, Horseheads, N.Y.*

Quick tip: Clear cellophane packing tape is great for clamping solid-wood edging to plywood. It can be stretched to apply an amazing amount of pressure. —*Thomas Love, Delmont, N.J.*

Using biscuits for adjustable shelf supports



When I needed adjustable, sturdy utility shelves in my basement, I came up with the ideas of attaching the vertical members to the floor joists overhead and using biscuits for the shelf supports. I used 2x12 lumber for the uprights and permanently attached one 2x12 shelf to them. These permanent shelves link all of the uprights and give some rigidity to the structure. Other construction details are shown in the sketch.

For the adjustable shelves I cut an array of biscuit slots at 3-in. intervals on the surface of the uprights before installing them. I used a jig to ensure that every upright would have identical slot spacing. I set the biscuit joiner at maximum depth and used #20 biscuits—that way there is more of each biscuit in the slot than there is sticking out of the slot. To install a shelf, I simply pop four biscuits in the slots and place the shelf on top of them. I tested my design first and found that one shelf could easily support my weight of 185 lbs.

—*Robert S. Gehret, Hampstead, Md.*

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Notes & Comment

(Almost) nothing from something

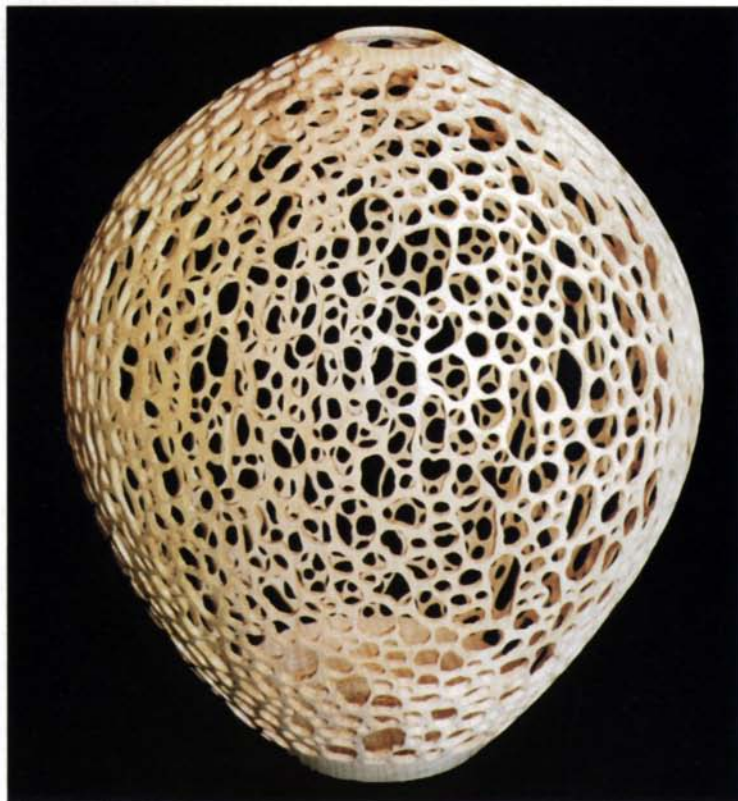


Ron Pessolano's goal seems to be how much wood he can remove and still have something to show for his efforts. His sculptures, which appear almost too delicate to touch, are created on a converted 19th-century lathe using tools mostly of the artist's design and making. The pierced effects are done with a miniature sabersaw

and small router called a Micromark. The work is "pretty simple in theory. In practice every piece is an experiment in difficulty, challenge and, hopefully, satisfaction." Other examples of Pessolano's work can be seen at artizenuniverse.com; he can be contacted at (413) 245-9549.

—Mark Schofield is assistant editor.

Transparent beauty. Made of ash, the vase (above) is $\frac{1}{8}$ in. thick, 8 $\frac{1}{4}$ in. dia. and 9 $\frac{5}{8}$ in. high. Made of ash and bird's-eye maple, the see-through bowl (right) is $\frac{1}{8}$ in. thick and 13 $\frac{1}{2}$ in. dia.



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The first in a series of veneering videos, this one focuses on the construction of a veneered checkerboard, a suitable project for the beginner. The video itself is clear and well paced, covering all the material that is necessary to complete the project—veneer and tool selection, taping and seam-preparation techniques, saw sharpening, clamping and pressing, trimming and cleanup, as well as finish-sanding.

Pollaro's presentation is confident, and the work proceeds smoothly enough to offer considerable encouragement to the novice. He also explains and demonstrates various methods of gluing down veneer, such as clamping with cauls and vacuum-press veneering.

In future videos I'd like to see Pollaro cut loose and really show his talents. He is clearly a capable craftsman who has plenty to share with budding woodworkers. If I have any complaints, it is that watching this tape is a little like watching Julia Child make toast.

But if it's a basics-from-the-master approach you desire, the video will serve as a good introduction to this woodworking specialty. A \$20 materials kit is also available from Flamingo Veneers.

—Mario Rodriguez is
a contributing editor.

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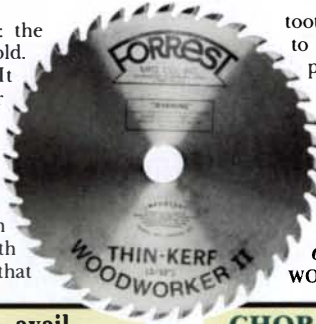
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Creativity with a purpose



Pick a push stick. All of these student-designed push sticks vary in artistic style but share the functional characteristic of having a disposable sole and heel held on with hot-melt glue.

For my money, there is nothing more satisfying than designing and making a really useful jig. Being a high school woodworking teacher for the last 21 years, I introduce my students to the craft by challenging them to design and build a push stick that is functional yet elegant and eye-catching. I chose this approach because it not only gives them an appreciation for practical design but also shows them that the art of

wood can be fun and rewarding. All of the push sticks above have seen more than 10 years of heavy use. It is a testament to the creativity and skill of the student builders that they are still in such good shape. To all my past students: a sincere thanks and appreciation for all you have taught me.

—Paul Ruhlmann teaches at Buckingham Browne & Nichols School in Cambridge, Mass.

Chairs of industrial strength

For the second year in a row, David Gilmartin, owner of Gilmartin Studios in Atlanta, Ga., received the gold award from *Design Journal's* 1999 Awards for Design Excellence. His entry, the AVOS Armchair (below), was chosen from more than 1,600 entries and captured the residential seating category based on its design, functionality and style.



What's unique about Gilmartin's AVOS Armchair is the type of wood used. It, just like his 1998 ADEX award winning Gilmartin Chair, is made of a custom-grade PS 183 marine plywood. With only pin knots, the 13-ply-per-in. Douglas-fir layers are laminated with waterproof glue. Standard PS 183 plywood has only the two outer layers as Douglas fir.

This specialty plywood, dubbed N-type by the government, was first developed for use in the construction of World War II C-30 cargo planes. Further development of N-type plywood in the 1950s and 1960s led to the production of PS 183. Today it is used in boat construction and as flooring on Grumman buses and train cars. The strength-to-weight ratio of this plywood is higher than steel.

The AVOS Armchair is on display at the Mint Museum of Art in Charlotte, N.C., and the Gilmartin Chair is part of the permanent collection of the Brooklyn Museum of Art.

—Chris Baumann is the editorial assistant.

Wood webs

"Wood webs" highlights useful and interesting woodworking web sites. If you have a site you would like to share, send the address to mschofield@taunton.com.

alan.net/prg/index.html

This site is dedicated to the exchange of information among professional strippers and refinishers. Don't be put off by the rather fierce home page designed to scare away amateurs. Anyone with dedicated knowledge and experience to share is welcome. The fee is \$65 a year, but the first month is free. The current membership numbers about 200.

www.americanfurnituredesign.com

Here you'll find about 200 designs, each priced around \$20. The projects include children's toys, a rolltop desk and more advanced pieces requiring lamination and veneering. The site also includes advice on finishing and wood movement.

www.hardwoodcouncil.com

Aimed at builders with topics such as how to install hardwood flooring on a concrete slab, the site also offers useful tips for furniture makers, including finishing techniques and installing built-ins.

Woodworking exhibitions

We frequently receive information regarding forthcoming woodworking exhibitions. Lack of space and a lengthy printing schedule make including all of these impractical.

We publish such time-sensitive information in the Events section of our web site, www.finewoodworking.com. Please send such information to fw@taunton.com for the attention of the web editor or mail it to *Fine Woodworking* Web Editor, 63 S. Main St., P.O. Box 5506, Newtown, CT 06470.

Stories and photographs concerning shows that have already taken place, and winners of prizes and awards, should be sent to Mark Schofield, assistant editor, either by mail at the above address, or by e-mail to mschofield@taunton.com.



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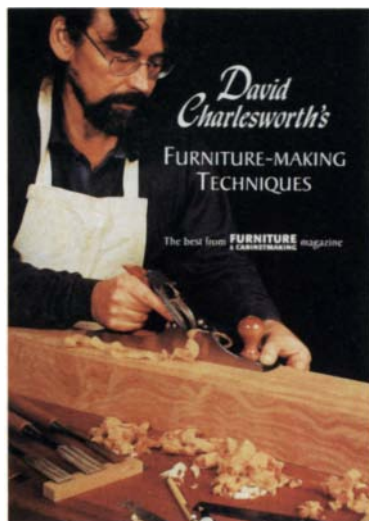
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A quiet approach to woodworking



David Charlesworth's Furniture-making Techniques. *Guild of Master Craftsman Publications Ltd., England; 1999. Distributed in the U.S. by Sterling Publishing, New York, \$17.95, softcover; 122 pp.*

With its emphasis on the author's personal philosophy and approach to woodworking, this book aims to appeal to all levels of woodworkers. It's the careful and practiced approach of someone who thoroughly revels in the day-to-day rituals of working with wood.

There is not a single aspect of his work that David Charlesworth leaves to chance. Yet throughout the book the author generously relates tales of his own mistakes and mishaps, hoping to point out his own fallibility and shortcomings to readers and students while providing encouragement and illuminating the way for them.

Don't misunderstand; he's not a craftsman so caught up in his tools and tricks that he never gets around to building anything. On the contrary, his furniture is quite beautiful and superbly made. I sense that his greatest satisfaction comes from launching an apprentice's career. Discussing a former student's early success,

he (almost) sounds like a proud father, not a colleague.

Although Charlesworth is quite well known and widely read in England, his is not a "celebrity" book. The entire work seems to spring from his bench, and reading the articles is like standing shoulder-to-shoulder with him, catching the "nuggets" as they spring forth. —M.R.

Notes & Comment

We welcome news stories, anecdotes about the triumphs and pitfalls of woodworking, photographs of unusual work—anything that you think other woodworkers would like to know about. We pay for the material we use. Send submissions to Notes & Comment, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506 or e-mail them to mschofield@taunton.com.

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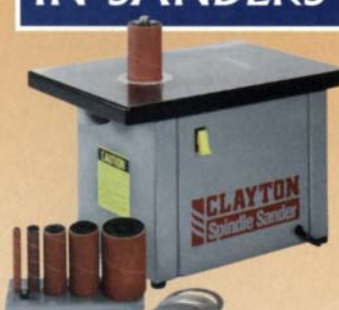
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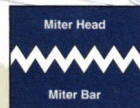
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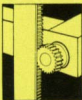
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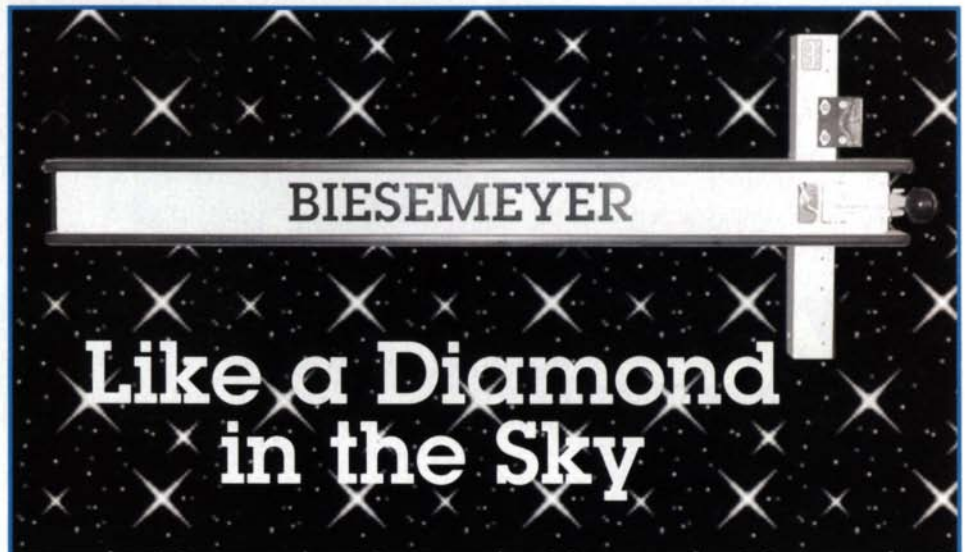


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Tools & Materials

Hammer 16-in. jointer-planer: a solid machine with a few bugs



Switching from planing to jointing takes only a couple of minutes. In planing mode, the jointer tables are swung up and out of the way.

Some combination machines have poor reputations for compromises. It's assumed that if a machine can do many things, it can't do any one thing well. With minor exceptions, though, I have not found this to be the case with the Hammer A3-41 16-in. (410mm) jointer-planer. It really manages to combine two top-flight tools into a single (relatively) compact unit.

Hammer is an Austrian maker of combination woodworking machines, new to the U.S. market. The company, which is a subsidiary of Felder, aims to fill the niche between high-end consumer and small industrial machines.

The fit and finish of the jointer-planer I reviewed were pretty good, though not spectacular. The tables were extremely flat—the outfeed table had a dish of only 0.002 in. The table height adjustments worked very smoothly and easily. At the same time, the paint came off rather easily: A board slid over the top of the dust chute came away with aqua-colored streaks. And what can I say about the paint job, which combines aqua, purple and bright yellow? For some reason, the Europeans go for those garish colors.

The cutterhead holds three self-setting knives. But the knives that come with the

machine are chrome steel, intended for milling softwoods. Not knowing this at the time, I used them to mill hardwoods, and the knives wore out within a few days. I was not happy to learn that I had to order the optional high-speed steel knives, which cost \$52.

The truly fantastic feature is the table alignment and height-adjusting mechanism. Mating guideways are machined to high tolerances in the tables and supports, yielding a maximum table flex claimed to be within 5/100mm, or 0.0002 in. to 0.0003 in. In practice, this should make the tables nearly impossible to knock out of alignment. So far, the machine has lived up to this expectation. One afternoon, I milled a fair amount of 4-in.-thick cherry stock, including an 8-ft.-long and 16-in.-wide plank weighing around 200 lbs. At the end of the day, the plank and the tables were both perfectly flat.

Though workable, the jointer fence has some problems. Because it attaches to a rail on the end of the outfeed table, you can put the machine right up against a wall, a plus in a small shop. On the other hand, the long, extruded-aluminum fence is somewhat flexible. Though the fences have a factory tolerance of 15/100mm (0.006 in.) across the width, the two I've examined have not been that flat.

Converting between jointing and planing takes only a couple of minutes. One must, however, crank the height-adjusting handle about 90 turns to switch from jointing to planing.

On an unfortunate note, all was not perfect from day one. My machine, as delivered, had a badly cupped fence, a planer table with a ridge down the center, and it needed a fair amount of tuning before it cut flat boards. Hammer took close to three months to replace the fence and planer table, despite several promises for quicker service. Does my experience with Hammer make it a company to avoid? Not at all: I've spoken with other Hammer owners, who have no complaints, suggesting that my experience was an exception from an otherwise good company.

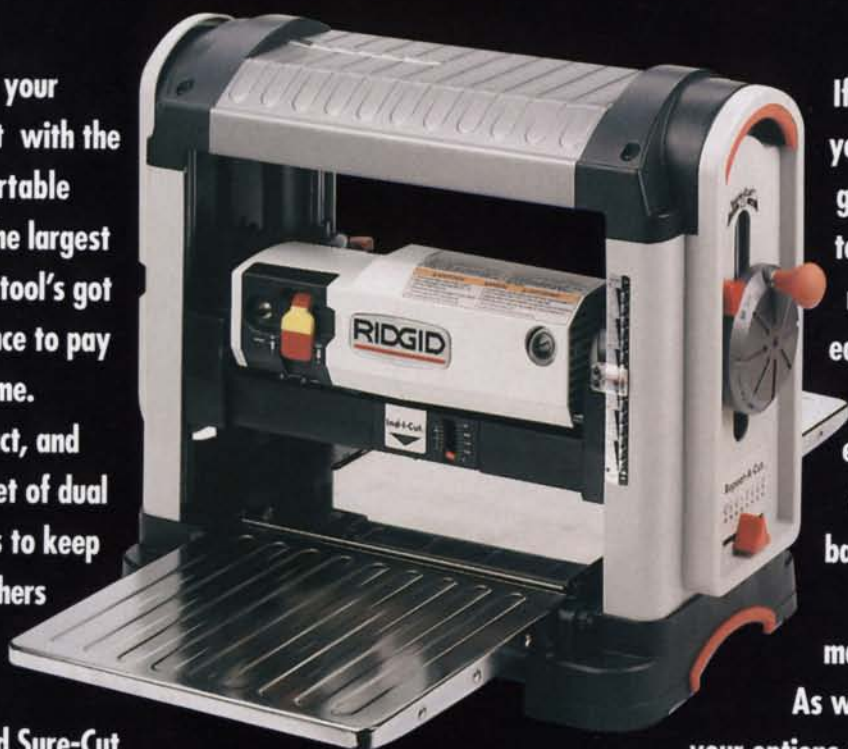
The A3-41 lists for \$4,990. For more information, contact Hammer USA (800-700-0071; www.hammerusa.com).

—Strother Purdy

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15 amps of power, in fact, and complete with an extra set of dual edge, quick change knives to keep you humming while the others are down with nicks or getting sharpened. The planer's 4-post design and Sure-Cut mechanism isolate the cutterhead to minimize annoying "snipe" and produce superior finishes.



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Orbital detail sander can get into tight places



Bosch's detail sander comes as a kit. Sanding pads of different grits and profiles are included.

There's a lot to like about the Bosch 1294VS detail sander. It's light, powerful, comfortable to hold and produces only minor vibration. This sander is a true orbital, not a sander that pivots in an arc. The tool has good overall performance doing the job detail sanders were designed for—getting into tight spots.

The sander has a triangular-shaped shoe that can be mounted three different ways. When the front corner of the sandpaper wears, the sanding shoe can be rotated to expose a fresh corner. Sandpaper is held via a hook-and-loop system.

I also like the probe-shaped sanding attachments Bosch calls pad extenders. Designed to reach into otherwise inaccessible crevices, two extenders are included; one flat and one oval-shaped.

The variable speed is a handy feature when the machine is used for tasks better suited to slower speeds, such as polishing.

Having gone to all the trouble to build in dust collection, you'd think Bosch would supply a collection bag of some kind, but a bag to fit the sander is not available. That's because, according to Bosch, the unit can't move enough air by itself to collect dust. It's best used with a shop vacuum. But it can be run without one as well; just wear a dust mask.

At around \$150, the tool isn't cheap, but overall, it seems like a solid machine.

—Lon Schleining

The latest products from the summer tool shows

As usual, there was plenty to see at the National Hardware Show in Chicago and at the International Woodworking Fair in Atlanta, both held in August. At both shows, manufacturers rolled out their latest products for retailers, the press and the public to see. Here's a quick look at some of the products that caught our attention.

SawStop finger-saving device wins award at IWF

It's about time someone invented a table-saw safety rig that doesn't get in the way and actually stops the blade before it can do any serious damage. The SawStop, invented by Steve Gass, a woodworker and physicist, uses an electromechanical device that stops a sawblade should fingers—or hot dogs—accidentally touch the spinning blade.

The SawStop electronically senses when flesh makes contact with the blade and immediately sends a signal to a box, which jams a plastic rod into a gullet of the blade, then retracts the blade, too. All of this hap-

pens in milliseconds. As demonstrated in Atlanta using hot dogs, a typical tablesaw accident will result in a shallow cut (about ½ in.) instead of an amputation. Wood, plastics or wood products do not affect the device. All of SawStop's components are neatly tucked away under the saw.

Unfortunately, SawStop is not available as a retrofit. Rather, the company is offering the technology to tool manufacturers that would have to redesign current table-saws. Gass says the device would add only \$50 to \$100 to the cost of a new saw. He has been busy talking to most of the major tool companies.

SawStop was awarded one of seven Challengers Distinguished Achievement Awards at the IWF show. It's the most innovative safety device we've seen in a long time.

From Makita: redesigned planer, four new routers and a new cordless system

Makita has redesigned its 12-in. planer, adding some nice features missing from the previous model. The model No. 2012NB comes with a cutterhead lock to minimize snipe, carrying handles and a flat top for resting stock. There's also a larger paddle-type on/off switch and a more ergonomic height-adjusting lever.

Makita also added four routers to its line, all with 11-amp, 2¼-hp motors that include an electronic soft-start feature. At 81 decibels, Makita claims its routers are the quietest in their class. The collets accept bits with both ¼-in.-dia. and ½-in.-dia. shanks. And all of these routers maintain speed electronically, even as the load changes.

And Makita's new line of 24-volt tools is now available, powered by an innovative battery and charger system called the MakStar System. MakStar includes 3.0 amp-hour and 1.7 amp-hour nickel-metal-hydride batteries. While the batteries are charging, a forced-air cooling system with a built-in fan keeps them from overheating, ensuring maximum battery life and minimum charging time.

The 24-volt cordless line has eight tools: a 7½-in. sliding compound-miter saw; 8½-in. compound-miter saw; 7¼-in. circular saw; ½-in. drill-driver; ½-in. hammer



SawStop could save your finger. The SawStop senses when flesh touches the blade and, within milliseconds, stops the rotation.

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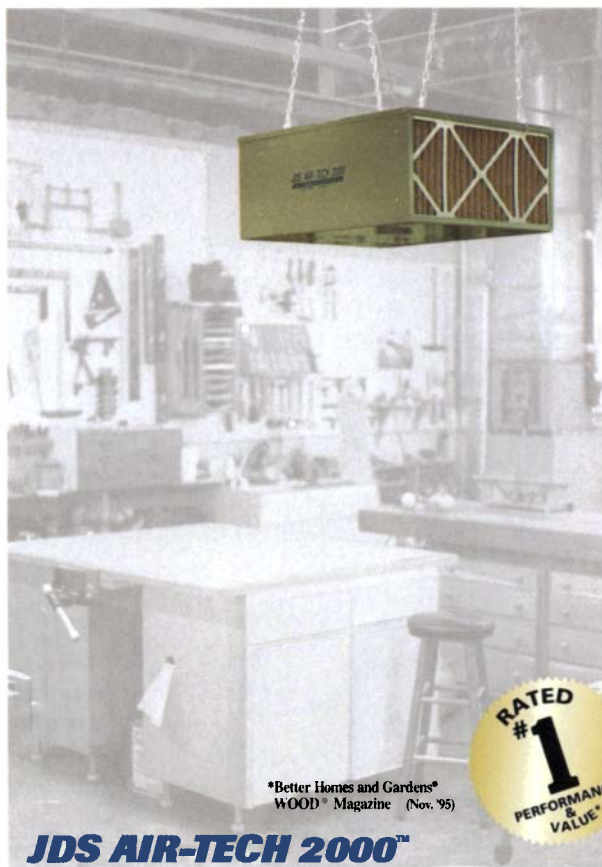


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Asturo HVLP gun runs off a compressor. The upper knob regulates the fan pattern; the one below adjusts the fluid volume; and the knob at the base of the handle controls air pressure.

Asturo may be an unfamiliar brand name to most Americans, but the company has been producing spray guns for the European market since 1925. Asturo high-volume low-pressure (HVLP) guns are now available in the United States. They're designed to be used with standard air compressors, not turbines.

I tried a midpriced model, the siphon-feed Asturo BRI/A, and was impressed with the tool's fit and finish as well as its performance. The gun will put down a glass-smooth, finely atomized coat of finish. Asturo estimates the transfer efficiency to be about 65%.

The gun's controls also impressed me. All of the parts you see are made of metal, and the controls are easy to grasp. An unusual feature of the gun is the air-pressure regulator, a knob located at the base of the handle. Adjustments to the air pressure may be made without having to go back to the compressor, which should be set at about 25 to 30 psi. I was able to use the gun with a 20-gal. 3-hp compressor.

A variety of needle/nozzle combinations are available to suit most finishing needs. The BRI/A costs \$265 and is available from Homestead Finishing Products (216-631-5309; www.homesteadfinishing.com).

—A.B.

Summer tool shows (continued)



Porter-Cable's spindle sander oscillates. The tool can be used freehand or mounted in a router table.

drill-driver; SDS plus rotary hammer; ½-in. impact wrench; and ¼-in. impact driver.

From Jet: benchtop spindle sander and cabinet saw

Jet's benchtop spindle sander comes with a ½-hp motor and a 14½-in.-square cast-iron table that tilts up to 45°. Spindles are available in diameters of ¼ in., ½ in., ¾ in., 1½ in. and 2 in.

Jet also now has a 1¾-hp cabinet saw that runs on 120 volts and can be had for under \$1,000. The saw's top and extension wings are cast iron, and the machine is outfitted with the 32-in. Exacta fence.

Bench planes from Clifton

It used to be that every month or so someone came out with a new dovetail jig. Lately it seems that the hot market is in handplanes. Clifton, known for its line of classic shoulder planes, has just introduced five new bench planes, Nos. 3 through 7. These heavy-duty planes have two-piece back irons (also known as cap irons) that help eliminate chatter.

The planes are available from Highland Hardware (800-241-6748; www.highlandhardware.com).

Bosch plunge router redesigned

Many woodworkers use a plunge router inverted in a router table. But fighting with the plunge mechanism and spring tension when setting the height can be awkward and frustrating. Bosch engineers listened to these complaints and redesigned the 1619EVS, which has toolless lockout switches to disable the plunge lock and plunge spring. For handheld work, the router boasts new handles that are easier

to grip and provide better balance for the hefty machine.

Sanding tables from Delta

Delta has two new downdraft sanding stations. Both models have built-in motors, dust curtains and rubber grommets to protect stock. The smaller model comes with a ½-hp motor and a 24-in. by 24-in. table; it sells for about \$500. The larger model has a 1-hp motor and a 31-in. by 31-in. table and sells for about \$750.

Handheld spindle sander

Porter-Cable's major new product is an oscillating spindle sander that can be used freehand, with a fence or mounted in a router table. The model No. 121 will sell for about \$250.

Vise-jaw caps

The Wilton Tool Group is selling magnetic plastic jaws for vises. Called Multi-Grip Vise Jaws, they add a softer surface to the metal jaws of most 3-in. to 6-in. vises. That way the jaws are less likely to mar the surface of your wood.

Quick Grip with more squeeze

The Quick Grip, made by the American Tool Co., now has a version with a lot more muscle. But it doesn't need steroids to get pumped up. Instead, this clamp marries the one-handed feature of the Quick-Grip with the clamping strength of a screw clamp. To use it, just slide the jaws together, snug them up with the pistol grip and turn the screw handle to create a clamping pressure that can exceed 600 lbs.

—Tom Begnal and Anatole Burkin



Delta's downdraft table will come in two sizes. Both ½-hp and 1-hp models will be available.

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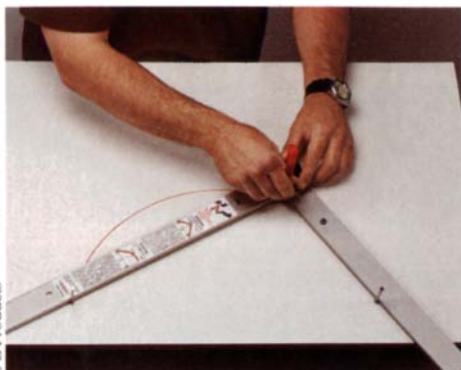
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E-Z Products

E-Z Arch simplifies the drawing of curves. The telescoping arms have a locking knob in the center, where they are hinged.

Some methods and tools are easier demonstrated than explained by words. That's true of the concept and use of the E-Z Arch tool. The tool relies on the brick mason's trick for drawing arches, which requires that you know only the chord length and height of an arch. Lay out the

chord length and pound in a nail at each end. Then mark the height of the arc at the midpoint.

Next, arrange two straight sticks, one end touching the nail and the other end on the mark at the midpoint. Nail the two sticks together where they cross at the top. Hold a pencil right at the apex and slide the assembly along the two nails at the chord points to draw a fair curve.

The E-Z Arch takes the place of the two sticks. The tool has a pair of hinged, telescoping arms and can be locked to any angle. I found the tool to be quite handy around the shop, not only as a drawing aid but also as a nice 4-ft. straightedge and a giant-sized adjustable T-bevel.

The tool, which comes in several sizes, is available directly from the manufacturer, E-Z Components Inc. (888-468-8011). The 48-in. model costs \$65; the 36-in. version sells for \$60; and the 24-in. tool is \$55.

—L.S.

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—A.B.



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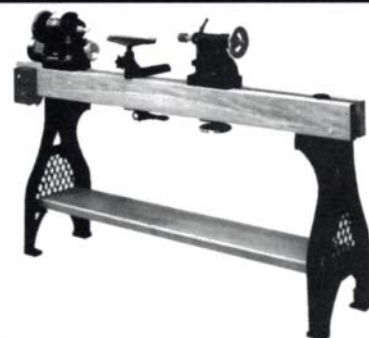
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I've always known that featherboards made for safer woodworking, but most are a pain to set up, so I've avoided them. When I was given a pair of Bench Dog featherboards to try, I didn't give them much thought. But I soon found myself using them just about every time I went to the router table.

The bright orange plastic featherboards are equipped with bolts attached to T-handles. The bolts engage in T-slots provided on Bench Dog router tables and fences. When used with such a router table, I found the featherboards very easy to attach and adjust and very secure in use. After a while, mounting them became an intuitive part of the set-up process. The featherboards come with an aluminum bar, which allows them to be used in a miter slot on a tablesaw or bandsaw.

Bench Dog hasn't reinvented the featherboard, but the company has made it much easier to use. Because of that, I use them more frequently, and I believe I am a safer woodworker for it.

—Michael Pekovich

Strother Purdy is a woodworker and writer in Bridgewater, Conn.; Lon Schleining is a woodworking teacher and stairbuilder in Long Beach, Calif.; Anatole Burkin is the managing editor; Tom Begnal is an associate editor; Michael Pekovich is the associate art director.

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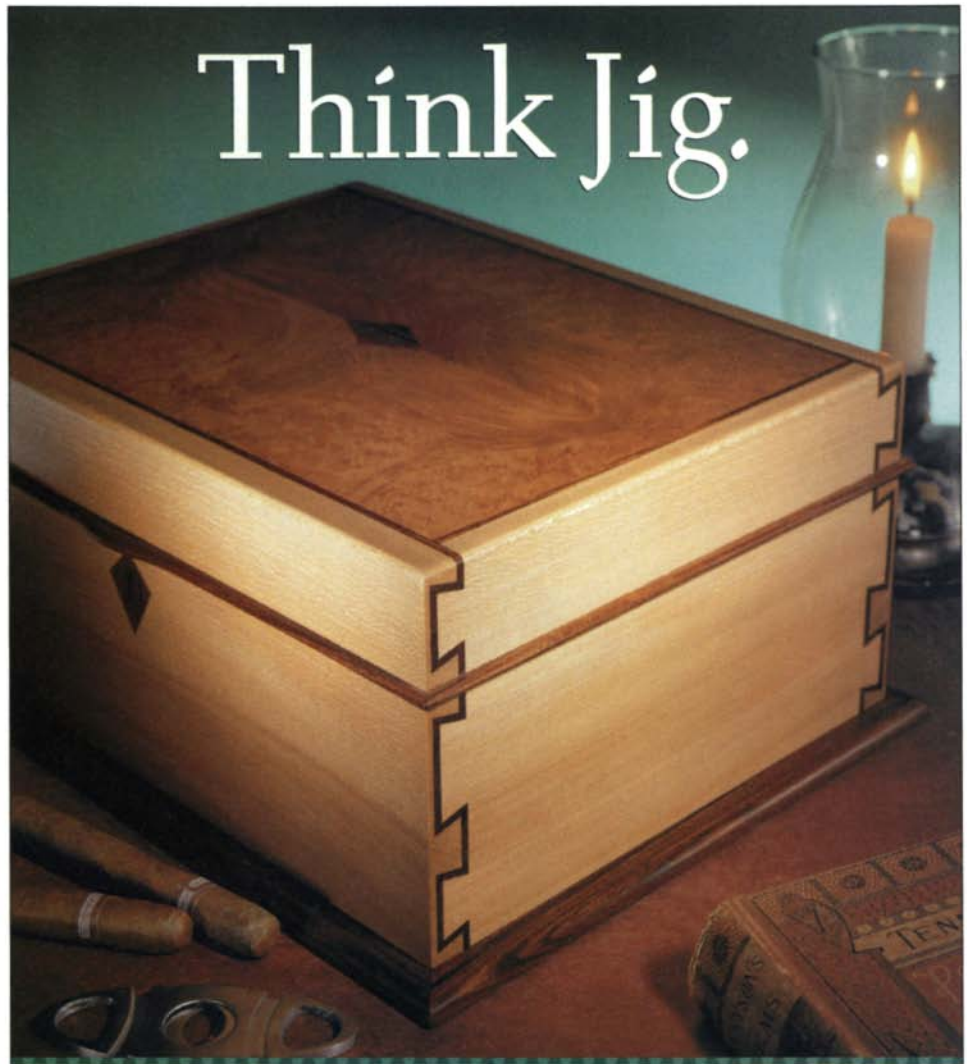
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Drum Sanders for the Small Shop

A review of seven thickness sanders
priced from \$500 to \$2,500

BY ROLAND JOHNSON



To get a finished surface on wood, I use whatever it takes: handplanes, scrapers, sanding blocks, belt sanders or any combination thereof. But for really big jobs, I take a truckload of milled lumber down to the local cabinet shop and have it run through a wide-belt sander.

I'd love to own one of those machines, but they cost as much as a new car. So I've been

looking closely at drum sanders, which are affordable. Besides sanding stock smooth, drum sanders can take stock down to thinner dimensions than thickness planers.

And drum sanders, because they exert only gentle pressure on stock, will mill out cup from a board. Stock too short for a planer can be thickness-sanded. Wild figure and reversing grain don't present a problem. And because these machines must be hooked up to a dust collector, they produce a minimum of airborne dust.

Drum-style thickness sanders are available for as little as \$500. They're called drum sanders because an abrasive strip is wrapped around a cylinder or drum. Compared to wide-belt sanders, with complex belt-tracking and tensioning devices, drum sanders don't have as many parts; hence their lower cost.

Changing abrasive strips on a drum sander takes longer than replacing the closed-loop belt on a wide-belt machine (see the photos on p. 50). But it's not a big deal and takes about as long as changing the blade on a bandsaw. Also, because there is less sanding material on the drum (compared to the surface area of a wide belt), sandpaper wears out sooner. Grits range from 36, for thicknessing, up to 220, for fine finish sanding.

I recently spent a week in the *Fine Woodworking* shop using a number of drum sanders and comparing their features. The machines included units made by Delta, Grizzly, Performax, RB Industries (RBI), Ryobi and Woodmaster. Drum sanders are produced in two different styles: cantilevered (or open sided) and closed frame.

Cantilevered machines offer wide capacity, low price

Cantilevered sanders, such as the Delta 31-250, Performax 16-32 Plus and Ryobi WDS 1600, are modestly priced and have a sanding capacity twice the width of their sanding drums.

CANTILEVERED SANDERS

Cantilevered drum sanders offer lots of capacity for a modest price. Stock up to twice the width of the drum may be sanded in two passes.



	Delta 31-250	Performax 16-32 Plus	Ryobi WDS 1600
Average price	\$799	\$920 (with casters shown, add \$80)	\$582 (includes stand)
Max. stock thickness	4 in.	3 in.	3 in.
Max. stock width	36 in.	32 in.	32 in.
Min. stock length	4 in.	2¼ in.	2¼ in.
Drum motor	Marathon, 1.5 hp	Leeson, 1 hp	1 hp
Conveyor speed	1 to 12 fpm (feet per minute)	0 to 10 fpm	2 to 10 fpm
Weight	190 lbs.	143 lbs. (with stand)	125 lbs. (with stand)
Phone	(800) 438-2486	(800) 334-4910	(800) 525-2579

With their small motors, cantilevered sanders are best suited for light dimensioning and finish sanding, fine for small shops or recreational woodworkers.

The Performax 16-32 Plus and the Ryobi WDS 1600 machines offer up to 32 in. of sanding width when wide stock is rotated and a second pass is taken. The Delta 31-250 handles 36-in.-wide stock.

All these machines live up to their promise. Sanding in two passes, however, requires a different drum-to-table alignment

than when working narrow stock that fits under the drum in one pass. Realignment takes several minutes. All of the owners' manuals cover the procedure, and it's slightly different for each machine.

When sanding stock narrower than the drum, the drum should be kept parallel to the table. For two-pass sanding of wider stock, the drum or table is re-adjusted to increase the gap slightly between drum and table on the outboard side. If this isn't done, the outer edge of

the drum leaves a noticeable (about ½ in. or less) groove on stock. Of course, gapping the drum will produce a small bulge in stock, but it is so slight that you don't even notice it.

One of the complaints regarding drum sanders is that the abrasive strips are prone to stretching and bunching. If the strip bunches up during aggressive sanding, it may tear. Most such problems, I believe, are the result of operator error. If you properly tension and align the abrasive and don't take

overly aggressive passes, you will rarely have problems. It's important to check the abrasive strip regularly. If it gets loose, rewrap it. All of the cantilevered machines employ spring-loaded clips in both ends of the drum to secure the abrasive. Additionally, a spring attached to one of the clips keeps constant tension on the strip because it does stretch during use.

Delta's sander hit the market this year—The Delta 31-250 has a fixed sanding drum

Setting sanding depth

Unlike small planers that can munch up to $\frac{1}{4}$ in. of material in one pass, drum sanders take delicate nibbles of $\frac{1}{32}$ in. or less. Don't rely on the depth scale to set up the first pass, or you risk jamming the machine and tearing the abrasive strip. Each company offers tips on how to set its machines, but there's a faster way. My method assumes that a board has been machined to a consistent thickness. If stock is of unknown uniformity, follow the manufacturer's instructions to avoid problems.

With the machine off, adjust the opening between the conveyor and the drum until the workpiece just passes under the pinch roller. Then start the drum and the conveyor, adjusted to the slowest feed rate. Feed the stock and crank the height-adjustment knob until the sandpaper just touches the workpiece.

On the next pass, set the depth to take off a little more, and speed up the feed rate. Make depth settings in small increments and listen to the motor. Obviously, the bigger machines will handle bigger cuts. Slower feed rates result in more stock removal. Faster feed rates prevent burning on dense woods when sanding with finer grits. Don't change the feed rate midway through the pass; otherwise, the stock won't be sanded evenly.

mounted in a formed and welded steel frame. Four jackscrews synchronized by a toothed belt raise and lower the cast-iron table. Turning a pair of adjustable nuts at the top of the jackscrews on the open end of the machine changes the drum-to-table alignment.

The Delta also has the unique feature of a two-speed drum. By loosening the motor-mount bolts, the belt can be moved to a different set of pulleys, dropping the drum speed by approximately 30% and providing more power for stock removal when using coarse abrasives.

A 120-grit abrasive belt used for the conveyor holds stock securely, without slippage. I did find that carelessness on my part led to inadvertent scratch marks on stock. Sliding a finely sanded piece sideways on any of the abrasive-type conveyors can mar the workpiece.

Changing abrasive strips on the Delta is simple. The clips are accessible and easy to operate with your fingers. An abrasive change takes only a couple of minutes.

Performax popularized the cantilevered sander—Performax first appeared in the mid-1980s and offered a drum-sander conversion for radial-arm saws, a unit that's still in production. The success of that first sander has led to the development of a whole group of drum sanders—both cantilevered and closed frame—and continual improvements.

The Performax 16-32 Plus has a fixed table. The drum moves in a cast framework that is substantial and fully adjustable for wear. To tilt the drum (actually, the entire upper portion of the machine) for sanding of extra-wide stock, four bolts are loosened; then a fine-tune adjusting knob, which tensions the framework, is turned to raise or lower the outboard end of the

CLOSED-FRAME SANDERS

A closed-frame machine is inherently stiffer than a cantilevered tool and will suit the heavier demands of a small, professional shop.



Grizzly G1066

Average price	\$1,095
Max. stock thickness	4 $\frac{1}{4}$ in.
Max. stock width	23 $\frac{1}{2}$ in.
Min. stock length	9 in.
Drum motor	5 hp
Conveyor speed	11 fpm (fixed)
Weight	430 lbs.
Phone	(800) 523-4777

drum. The power-feed conveyor on the Performax is 120-grit abrasive and does a good job.

The Performax comes with a cleverly designed tool that grips the clip on the motor side of the drum, which, because of a tight fit, is difficult to reach. With the tool, changing abrasive strips is easy.

Ryobi followed in the footsteps of Performax—The Ryobi WDS 1600 emulates the Performax in design but doesn't have all the features of the original. The Ryobi uses a nonabrasive conveyor that does a good job of gripping stock. However, the conveyor moves only when

the drum is running, which makes setting the initial depth a bit awkward (for more on setting the sanding depth, see the story at left).

Adjusting the drum to accommodate wide or narrow stock points out the major difference between the Ryobi and the Performax. Instead of a fine adjustment knob, the Ryobi relies on shims (two 0.010-in. shims are provided) to reset the gap between the drum and conveyor at the open end. The table can be shimmed at the open end of the sander and then brought to parallel with the drum. To achieve a wider gap, remove one or two of the shims and



Performax ShopPro 25	RB Industries 426	Woodmaster 2675
\$2,049 (with casters shown, add \$80)	\$2,399	\$2,344
4 in.	4 in.	5¼ in.
25 in.	26 in.	26 in.
2¼ in.	4 in.	7 in.
Leeson, 1.5 hp	Baldor, 3 hp	Leeson, 5 hp
0 to 10 fpm	2 to 20 fpm	0 to 16 fpm
275 lbs.	650 lbs.	590 lbs.
(800) 334-4910	(800) 487-2623	(800) 821-6651

retighten the Allen-head screws. To return the drum and table to parallel, the process is reversed.

The Ryobi has a difficult-to-reach clip on the motor side of the drum, which makes changing abrasive strips difficult. By jamming a wedge under the drum, I was able to keep it from turning while attaching the strip to the second clip. (By the way, the Performax tool won't work on the Ryobi unless you modify Ryobi's spring clip.)

The closed-frame machines are workhorses

For busy shops, closed-frame sanders, such as the Grizzly G1066 (23½-in. capacity), Per-

formax ShopPro 25 (25 in.), RBI 426 (26 in.) and Woodmaster 2675 (26 in.), may make more sense than the lighter-duty cantilevered machines. Closed-frame machines are stiffer and can handle more powerful motors, and that translates to more aggressive and faster sanding.

The Performax is well designed—The Performax ShopPro 25 has a smaller motor than the other closed-frame machines I tested, so it's not going to remove stock as quickly as the others. But because the Performax plugs into an ordinary 120-volt circuit, and the machine is designed with mobility

in mind, it's well suited for a small shop. The Performax also comes with extension tables for additional infeed and outfeed support, something the other machines don't have.

The closed-frame Performax uses a pair of thick, threaded rods and gears to raise and lower the table. The machine has the best access to both of the abrasive-strip clips. Using a special tool, changing abrasive strips is very easy.

RBI and Woodmaster share many good features—The RBI 426 and Woodmaster 2675 are smooth-running sanders with plenty of power. They're

heavy and would do fine as stationary machines, although mobile bases are available for them. They both require a 220-volt power supply.

The RBI has a ⅝-in.-thick Blanchard ground steel table. The Woodmaster uses a 10-gauge steel platen. The tables on both machines are supported by four jackscrews that are synchronized by sprockets and chain. Although both machines were delivered properly tuned, adjustments can be made, if necessary, by fiddling with the chain and jackscrew sprockets.

Both machines have two-ply monofilament, rough-top conveyor belts, the same belts used



Changing abrasive strips: It's not always a simple task

All drum sanders use spiral-wound abrasive strips. Attaching the strips can range in difficulty from easy to awkward, depending on the machine.

CANTILEVERED MACHINES



Cantilevered machines use clips to hold the spiral-wound abrasive strip in place. One end of the drum has a clip under spring tension to take up slack should the abrasive strip stretch.



Performax supplies a special tool to hold the clip in place while the abrasive strip is installed. The Delta doesn't need a tool; the Ryobi could use one.

CLOSED-FRAME MACHINES



Tap a spring clip in place to start the abrasive strip on the Grizzly. When wrapping the drum, the abrasive strip must be held under tension. The task requires two people.



Access is good inside the Woodmaster, and that makes abrasive-strip changes easy. A hook-and-loop system keeps the strip in place.



The RBI has less working room under the hood. Hook and-loop abrasive strips are also used.

on wide-belt sanders. Conveyor speed is adjustable, from a crawl up to 16 fpm (feet per minute) on the Woodmaster and 20 fpm on the RBI. The Woodmaster has a reversing switch for the conveyor motor, a useful feature when setting up initial depth of cut or if stock gets jammed because the depth of cut was set too deep.

Both the RBI and the Woodmaster use hook-and-loop systems for fastening the abrasive strip to the drum. An adhesive-backed hook strip is attached to the drum, and the abrasive strip is loop-backed.

Changing abrasive strips on the Woodmaster is a snap. Once the machine's large top cover is off, there's plenty of maneuvering room. It takes practice to get the strip started because the hook-and-loop material doesn't allow minor changes in the angle of the strip as it is wrapped around the drum. Woodmaster recommends a wrap or two of filament packing tape on the lead end of the abrasive to keep it tight to the drum.

Abrasive-strip changes are a bit more difficult with the RBI because the working space is constricted. I ended up pinching my fingers between the drum and the dust-pickup chute a few times. The machine also uses a narrower abrasive strip, which means more revolutions around the drum. RBI recommends the use of filament packing tape on both ends of the drum. In general, the hook-and-loop systems seem to work very well.

Grizzly's machine sports two drums—The Grizzly G1066 is unique in that it has two drums, which allow the use of two different grits of abrasive. It's a big machine and has plenty of power. It's also half the price of the other large machines tested. To keep the price so low, however, certain choic-

es had to be made in the engineering and use of materials. The chain-and-sprocket system of raising and lowering the table uses lighter-duty components than the competition. The table on the Grizzly consists of a welded steel frame with a particleboard platen. The feed rate is not adjustable; it runs at a constant 11 fpm. The Grizzly is not as refined as the others machines, but stock came out of the machine flat.

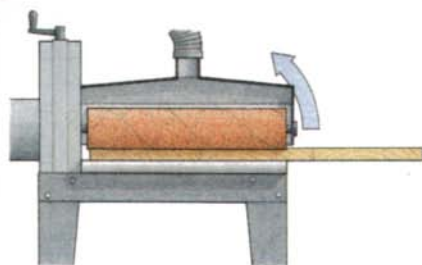
Changing abrasive strips on the Grizzly is awkward. A loose spring clip must be hammered in place over the end of the abrasive strip to lock it to the drum. If the hammer blow is not dead on, the clip may fly across the shop. If you hit it too hard, it snaps. (Extras are provided.) To wrap the drum, a second person is needed to keep tension on the strip (there's a spring-loaded mechanism at work) while the first person turns the drum. For a one-man shop, this could pose a problem. Once the abrasive is wrapped, a strip of filament tape holds it in place. There is no hook-and-loop backup. The second drum (out-feed side) comes wrapped with felt to make up for the difference in stock thickness after it passes by the first (coarser-grit) drum. Abrasive installation is the same.

I tore the filament tape on the Grizzly's drum while I was sanding wide stock. When the filament tears, the sanding strips unravel and self-destruct. But I think this problem can be mitigated. The instructions have you place the tape a few inches in from the edge of the drums, where the abrasive strips end. But with the tape located right above the edge of the conveyor, it's all too easy for stock to make contact with the tape. By cutting slightly longer abrasive strips and taping them to the very edge of the drums, contact with stock may be avoided.

ADJUSTING DRUM ALIGNMENT FOR WIDE STOCK



To prevent lap marks, angle the drum when sanding wide stock.



On a cantilevered machine, the drum is set parallel to the table when sanding stock up to the width of the drum. For wider stock, the drum is tilted slightly to increase the gap on the open side.



Performax provides a threaded knob to adjust the drum alignment.



By turning a pair of jackscrews, Delta's table may be realigned to the drum.



Ryobi employs shims to change the angle of the drum to the table.

That's how the Woodmaster and RBI are set up.

There are many good machines to choose from

I came away from this review surprised at how well *all* of the machines sanded. Some of the drum sanders had better features than others, such as more power, greater ease in changing the abrasive strips or more sturdy overall construction. But there seems to be a

machine for shops (and budgets) large and small.

Of the closed-frame machines, the Woodmaster 2675 gets my top vote. It is robustly built, smooth and quiet in operation, offers easy abrasive-strip changing and includes a reversing conveyor. I would, however, replace the dust-chute bolts with threaded knobs for quicker access.

The RBI is every bit as industrial as the Woodmaster and has

the advantage of a ground, cast-iron table. My only complaint is that changing abrasive strips in the confined space is awkward. And for smaller shops, the Performax does everything well.

Of the cantilevered machines, I think Delta's 31-250 stands out. I like the ease of table adjustment and the heavy weight of the tool. Performax machines, however, have a proven track record and are available in many different sizes, to suit

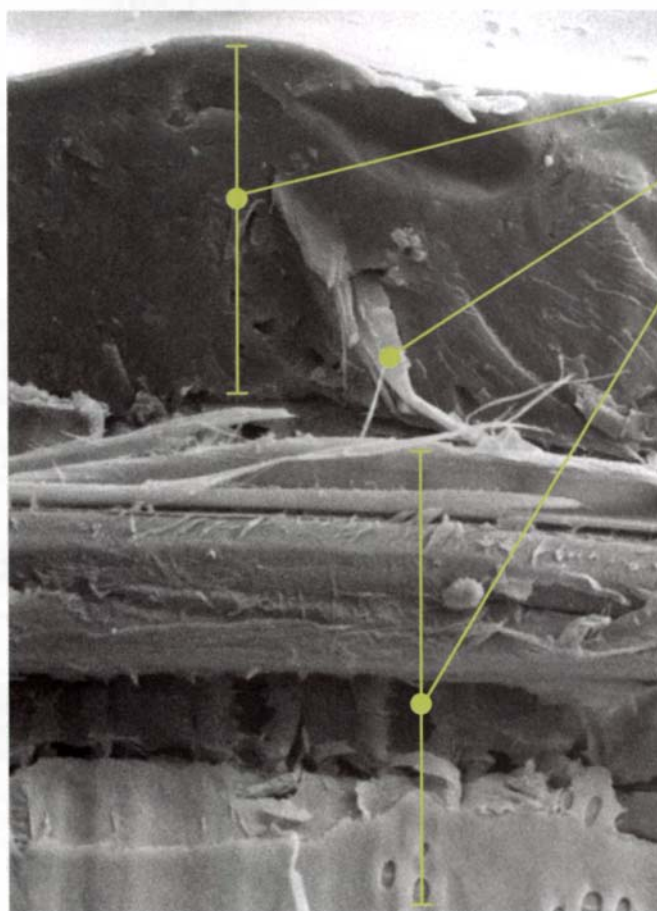
many budgets. For the price, the Ryobi WDS 1600 seems to be a good value. □

Roland Johnson owns a cabinet shop in Sauk Rapids, Minn.

Editor's note: General has a new 24-in. dual-headed drum sander, model No. 15-250 M1, which sells for \$1,359. We learned about it too late to include in this review, but we will be looking at it in a future issue.

A Primer on Sealers

How and why you can benefit from these often misunderstood products used under clear finishes



SEALER COAT

ENCAPSULATED
WOOD FIBER

EDGE OF POPLAR BOARD

A close-up view shows what a sealer can do. At left is a cross section of an edge of poplar lumber that has been coated with a sealer, before the sealer was sanded smooth. Appearing as a darker band across the top third of the image, the sealer coat encapsulates loose fibers on the surface of the wood. What appears as a small hill or bump at the very top of the image (made with a scanning electron microscope at 400x magnification) is a protrusion in the surface of the sealer caused by the captured wood fiber appearing slightly below and to the right. Once the sealer coat has been sanded, these small hills and valleys disappear, providing a smooth base for topcoats to follow.

BY JEFF JEWITT

Finishers call on sealers to perform two basic functions in the finishing process: to solve problems, such as a contaminated surface, and to speed things up by providing a flat base for subsequent topcoats. Most woodworkers understand what sealers do in the simplest sense—they seal the surface of the wood. Yet there remains a great deal of confusion about what that really means, when to use a sealer and which one to use in a given circumstance.

The first coat of any finish seals the wood, because it dries to a film (however slight) that allows you to build subsequent coats of finish on top of that. So theoretically, any finish can serve as its own sealer. And in many cases, a thinned version of the same finish you plan to use as a topcoat is a perfectly adequate sealer.

However, sealers also perform a number of other functions, and to address special needs manufacturers have developed some products that work better than thinned finishes.

When faced with a contamination problem or to prepare for topcoats, finishers turn to any one of several specialty sealers. Sanding sealer, vinyl sealer, shellac and glue-sizing are the four most common choices. Of these four products, only shellac is adequate as a final finish. None of the other three can exist as finishes in and of themselves. They are used only underneath other topcoats.

Sanding sealer tends to be soft

Sanding sealers are available as lacquer based, varnish based or water based, and the first two of these varieties are the most com-

monly used. More often than not, they are simply thinned versions of lacquer or varnish to which zinc stearate has been added. Zinc stearate is a white powder that is soft, fluffy and soapy feeling, but in finishes it appears translucent. In fact, it is called a “soap” by finish formulators. Zinc stearate makes hard-to-sand finishes such as solvent-based lacquer and most varnishes easier to sand down to a level surface so that subsequent coats of finish lay on evenly.

The ability of sealers to make topcoats lay on smoothly is referred to by finish manufacturers as “good holdout.” Holdout is an important feature to look for when you’re finishing thirsty woods such as pine and poplar, figured woods such as curly maple and other porous woods such as oak, ash, mahogany and walnut.

The downsides? There certainly are a few. Sanding sealers are softer and less durable, because of the addition of zinc stearate, particularly in their resistance to moisture. So you should use these sealers with discretion in places where moisture resistance is an issue, such as cabinetry to be installed in a kitchen or bathroom. Also, you must sand them after application, or they won’t do the job they are designed to do.

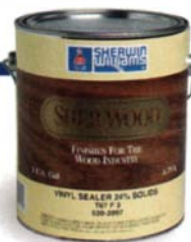
Some finishes such as polyurethane will not bond well to sanding sealer, and the catalysts used in high-performance lacquers and conversion varnishes will react adversely with the zinc stearate.

Vinyl sealer can be used between coats of different finishing products

These specialty sealers are available only in commercial, fast-drying versions meant to be sprayed on, but it is possible to apply them by brush or rag if you work quickly. Don’t confuse vinyl sealers with vinyl/alkyd-based varnishes, sometimes sold as a one-step sealer/finish to which the vinyl is added primarily to impart fast-dry qualities.

The prime ingredient in most vinyl sealers is polyvinyl butyrate, which endows the sealers with some rather unique qualities. Not only do vinyl sealers have excellent holdout—just as sanding sealers do—but they also are highly resistant to moisture and possess excellent adhesion properties. These adhesion qualities make

VINYL SEALER



One common use for vinyl sealer. Professional finishers often use vinyl sealer on furniture that has been coated with an oil-based glaze, because it adheres well to different finishes.



SANDING SEALER

Finish formulators call it soap. This lacquer sanding sealer (shown below being brushed on) contains zinc stearate, an additive that facilitates sanding by lubricating the surface of the sealer coat.



vinyl sealers a good choice to use when you need to “tie” or adhere different finishing products together. For example, professionals routinely use vinyl sealers between applications of oil-based glazes or paste wood fillers and solvent-based lacquers and conversion varnishes. The vinyl also will prevent natural oils and other chemicals (knots bleeding sap) in certain woods from causing finish problems. Teak, rosewood and cocobolo are some of the woods that contain chemicals that will prevent oil-based products from curing. While some folks claim you can avoid this problem in the finish by first wiping the oil from the surface with a solvent such as acetone, my experience has been dicey with this technique. I prefer to seal in the oils with vinyl sealer. Unfortunately, vinyl by itself doesn’t sand very well, so vinyl sealers usually contain other resins to make them sand out more easily.

Shellac is easy to find and apply

This natural resin has some of the same attributes as vinyl sealer, but it’s more readily available and easier to apply. Shellac will seal off surface contamination and naturally occurring chemicals in the wood that prevent the curing of oil-based products. Shellac also provides good holdout for other finishes applied over it, as long

SHELLAC



Shellac is still the best candidate for some jobs. Sealing off a contaminated surface, such as that on this chemically stripped chair, is one of several tasks that shellac performs well.



as you use a dewaxed variety. When used under a water-based finish, shellac will prevent some of the raised grain you'd normally expect. Whether you mix your own (a 2-lb. cut works well as a sealer) or use the premixed, canned variety, most shellac imparts a warm, amber color that will optically offset the sometimes-cool tones of water-based finish resins.

Downsides of shellac are similar to those of sanding sealer. It's a less durable finish than lacquers or varnishes, so it can become a weak link in the total finish system.

Glue-sizing is typically used to seal end grain

Glue-sizings are available in premixed water-based versions, such as a recently introduced product made by Franklin. These are based on a water-soluble vinyl resin called polyvinyl alcohol that lacks the overall durability of the resins in solvent-based sealers.



GLUE-SIZING

Appropriate for painted surfaces. End grain on lumber and the porous edges of manufactured panels (such as this routed sample of MDF) are good places to use glue-sizing. The left half of the routed edge shown was coated first with glue-sizing, then with an oil-based white primer. The sized surface is much less porous.



Glue-sizings are used primarily to seal end grain and to promote even staining on wood. They're also marketed as a preconditioner for medium-density fiberboard (MDF) that will be painted. Though they are not sold as such, I've had good success using them to lock in chemicals, such as those in aromatic cedar and cocobolo, that prevent oil-based products from curing.

When, where and why to use a sealer

Opinions and die-hard habits among professional finishers may vary, but most agree that there are a few very good reasons to use a sealer.

To provide a barrier coat—Waxes, polishes and silicone residues encountered when refinishing furniture can cause contamination problems such as fisheyes, which are small craters in the finish film (see the top photo on the facing page). You can remove wax by wiping stripped surfaces several times with naphtha or mineral spirits, but silicone is impossible to remove completely. It has a tenacious ability to remain in the pores of wood.

To remove fisheyes, immediately wipe off any wet finishing product (oil-based stains will develop fisheyes, too) and wash down the piece with mineral spirits or naphtha. Then scrub it well with TSP (trisodium phosphate) or a TSP-substitute and the green colored Scotch-Brite nylon pad. After that, apply a freshly made coat of dewaxed shellac to seal in the contamination.

To make a flat base for topcoats—If your goal is a sophisticated built-up finish, you'll need to sand at least the first coat of finish. When the first coat has absorbed into the wood and hardens, it is normal that a slightly rough or irregular surface will result. At this point some sanding is in order so that subsequent coats of finish will lay on smoothly and evenly. The problem is that some finishes don't sand well—most varnishes and lacquer gum up when you sand them—which is a good reason to use a sealer first. With the addition of stearates, sanding sealers overcome this problem. Some finishes sand perfectly fine, such as many water-based products and oil-based polyurethane, so sanding sealers aren't needed for these products.

To promote adhesion—In some finishing scenarios, there may be questionable adhesion between the wood and the finish or between different finishing products. Sealers are routinely used in such cases to promote adhesion. In the case of stripped furniture, a sealer coat of a 2-lb. cut of dewaxed shellac will allow any finish to flow out and grab properly. Although manufacturers of polyurethane say not to use it over shellac, they are referring to the premixed, canned variety of shellac that has wax in it. Polyurethane will adhere just fine to dewaxed shellac.

In other cases, you might run into adhesion problems when oil-based paste wood fillers and glazes are used between coats of finish. Manufacturers of high-performance solvent-based lacquers and varnishes al-



WHAT TO DO WHEN YOU SEE FISHEYES

Fisheyes are small craters caused by silicone residue. The preventive treatment is a three-step process. Wash the surface first with a rag soaked in naphtha or mineral spirits, follow that with a washcoat of trisodium phosphate (TSP) and then seal it with dewaxed shellac.



Naphtha



Trisodium phosphate (TSP)



Dewaxed shellac

most always recommend vinyl sealers for this purpose, while shellac works well for water-based finishes.

To control stain migration—Sealers work wonders in situations where stains may possibly migrate up into a finish coat. This happens when the finish and stain share the same thinner. It isn't a problem with oil- and water-based pigment stains, because the binders in these are not dissolved by the next coat of finish. It happens typically when water-based finishes are applied over water-soluble dye stains, particularly when the dye is very dark. A barrier

coat of dewaxed shellac will prevent the solvents in the water-based finish from pulling up the dye into the finish.

In conclusion, some recommendations

A sealer will never take the place of diligent finishing practices such as proper brushing techniques or good surface preparation. It won't get rid of brush marks or sanding scratches, and overuse of a steared sanding sealer can actually cause more problems than it solves. I believe that a sealer is often used when it's not really needed.

In marketing literature, you'll see the term "self-sealing" used to promote a finishing product. This is mostly marketing mumbo-jumbo, because any finish can be used as its own sealer, as long as it has adequate holdout and sands easily enough. Almost all water-based finishes, catalyzed varnishes and lacquers, oil-based polyurethane and many of the fast-dry varnishes now being sold fit into that category. A specialty sealer is required only in situations I've described previously.

If you want the most durability from your finish, and you don't have a problem with contamination, adhesion, moisture or migrating stain, use a thinned version of your finish as its own sealer. You won't run into any compatibility problems, and you don't have to buy a separate product. To get a smooth base, you'll have to apply several coats of thinned finish and then cut it back with sandpaper before you get a good base for the final coats. At the worst, you'll spend a little more time and use a bit more sandpaper, but the gain in overall durability may be well worth it. □

Jeff Jewitt is a professional finisher who writes frequently for Fine Woodworking.

SEALERS PREVENT BLEED-THROUGH

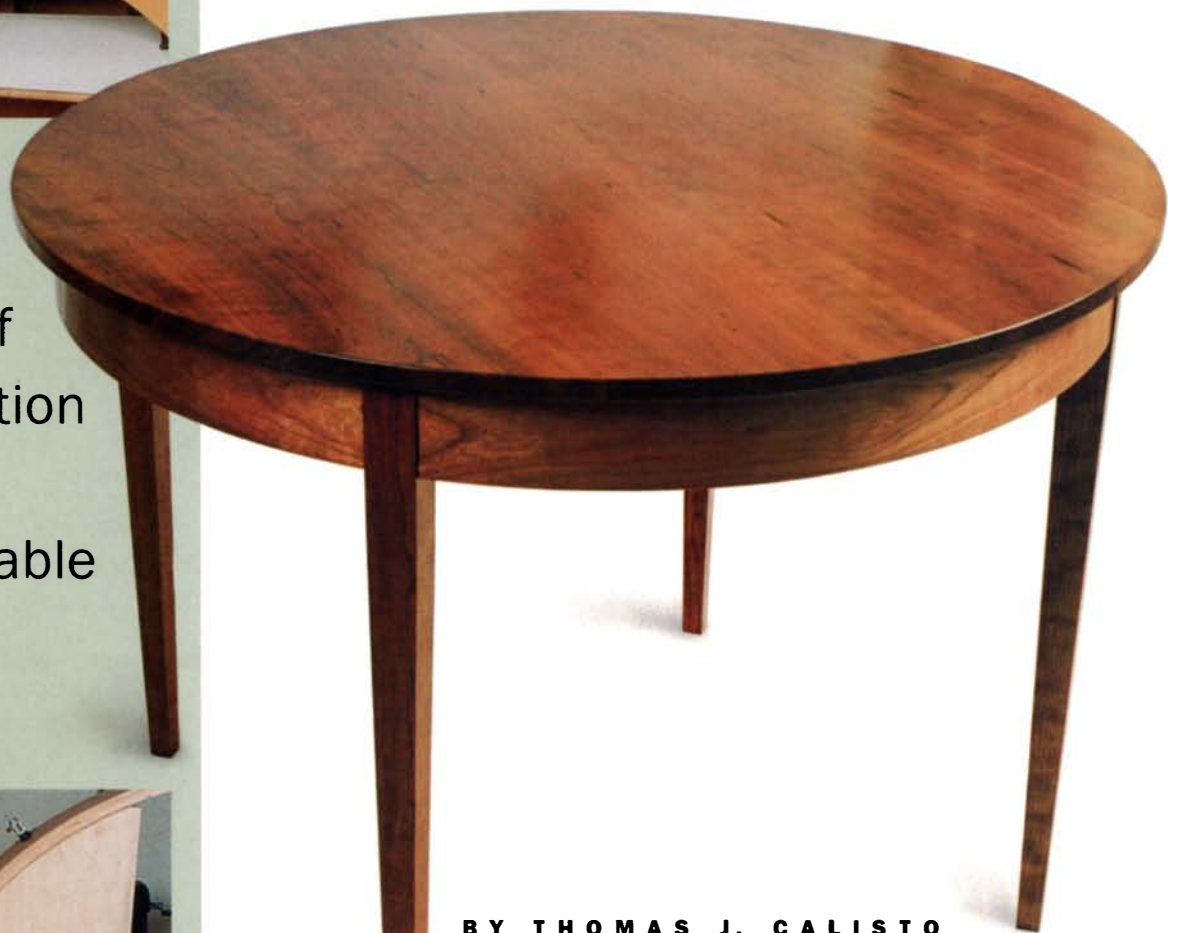


Keep the color from bleeding. After the black dye stain had dried, the right side of this sample was sealed with shellac. After the shellac dried, the entire sample was coated with a water-based sanding sealer. By viewing the sanded surface, one conclusion is clear: the shellac kept the dye from migrating into the subsequent finish coat.

A Round Kitchen Classic



Learn the basics of bent lamination as you build this cherry table



BY THOMAS J. CALISTO

When I was about 10 years old I saw a guy on television demonstrate how to cut through-dovetails. Fascinated by the program, I had to try it myself. I borrowed my father's jigsaw and went outside to hack up some pine shelving. I cut my first set of through-dovetails that day. The dovetails weren't pretty, but they were a great leap from nailed butt joints. I have since refined my joinery skills enough to build some furniture, so when my wife wanted a new kitchen table, I knew what my next project would be.

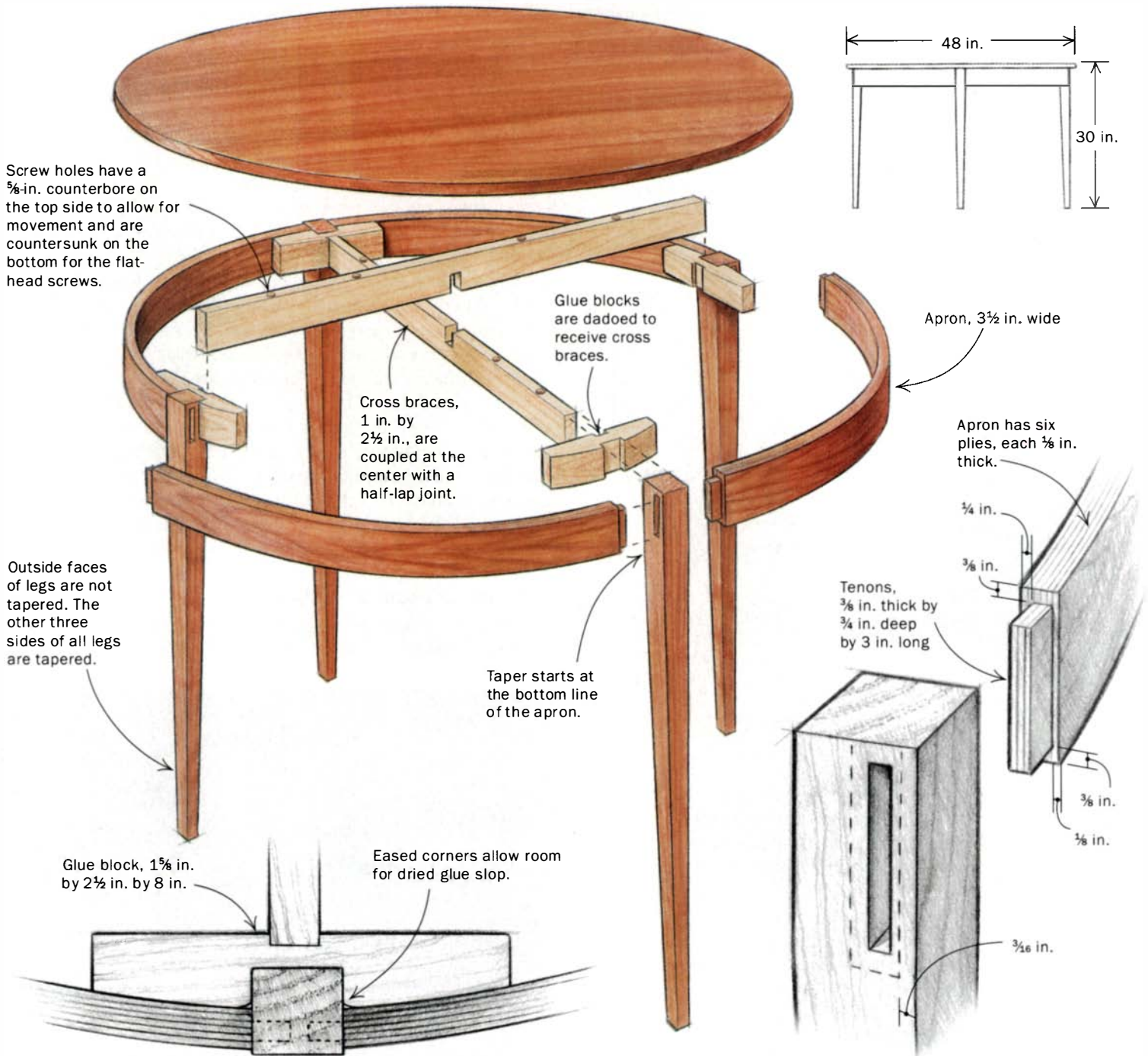
Most of the furniture I've built has been inspired by Shaker pieces. I like this style, but we were looking for something with a few more curves. We searched through magazines and some design books before settling on a table based on one we found in Thomas Moser's book, *Measured Shop Drawings for American Furniture* (Sterling, 1988). The table has a round apron that makes it unique, and I knew it could be scaled down to fit our kitchen.



A bending form and a shopmade tenoning jig served this author well. Including the time spent making the jigs, this project took him about 40 hours to complete.

STRONG JOINERY IS HIDDEN FROM VIEW

A curved apron and tapered legs distinguish this practical and elegant table. With mortise-and-tenon joinery where apron meets leg, backed up by beefy glue blocks and cross braces, this table is strong yet lightweight.



Construction of this table is straightforward with two exceptions: the laminated curved apron and the joinery involved in connecting the apron quadrants to the legs (see the drawings above). While the curved apron adds a little complexity to the construction, it is well within the scope of anyone who has basic joinery skills and some patience. The tenoning jig that I developed for this project greatly simplified the joinery (see the photos and drawing on p. 62). As with most furniture projects, it helps to draw the important views full scale. The full-scale plan view came in handy

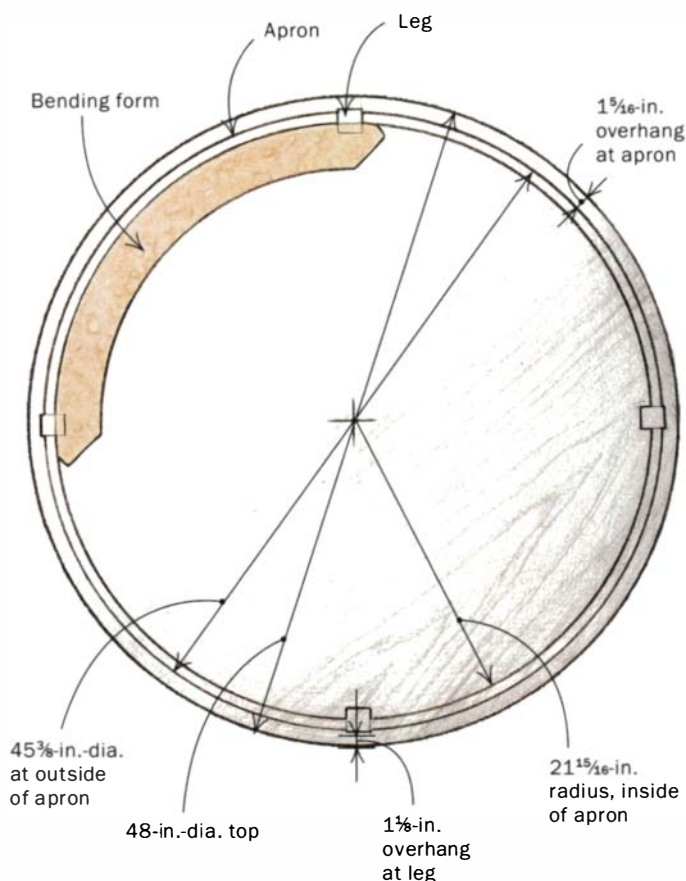
when I needed to construct the bending form and the tenoning jig for the curved apron pieces and later when I had to mark the curved aprons for length.

Start with the easy part: the top

Choose the lumber for color and grain patterns and proceed with the glue-up. Leave enough waste on the length of each of the boards so that you can easily avoid any knots or other trouble spots when the time comes to cut the table to size. The top can be

A BENDING FORM FOR THE CURVED APRONS

This particleboard bending form has an outside curve that matches the inside radius of the apron quadrants. The curve of the form is larger than the finished length of the quadrants to allow some leeway when gluing up the bent laminations. Sanding sealer and wax applied to the form keep the glue from sticking to it.



cut to its round shape by using a circle-cutting attachment on the bandsaw or by using a plunge router mounted on a scrap of plywood. The router method will take several passes, but riding on a pivot point guarantees a perfect circle (see the photo at right). Either way, the edges will need to be cleaned up with a little sanding. I like to follow that with a $\frac{1}{8}$ -in. radius roundover bit to break the sharp edges. Later on, after the table has been finished, the top will be attached to the base with screws through elongated holes in the undercarriage cross braces.

A curved bending form is a must

Whether you make the curved apron with clamps or use a vacuum press, you'll have to spend some time up front making a bending form (see the drawing above). I made one exactly to the correct radius, so that the outside curve of the form matches the inside

Around and around he goes. Cutting circles in large pieces is easier if you use a router, and you're guaranteed a perfect circle, which you may not get with a wandering bandsaw blade.

curve of the apron. My experience has been that you get a little springback after pulling glued-up laminations off the form, but not enough to matter. The mortise-and-tenon joinery will pull slightly sprung pieces back into shape.

Lay out the curves onto a sheet of $\frac{3}{4}$ -in.-thick particleboard or medium-density fiberboard (MDF). The arc length of the form must be longer than the length of a single apron quadrant. The glued-up apron laminations should be oversized in both width and length so that you can trim them neatly down to size after the glue has dried. Clamping the apron plies on the form is easier if the form has flats that act as feet. By standing the form upright, both sides are accessible for placing clamps.

After laying out the curves on the first piece of the form, cut out the arcs on the bandsaw, staying proud of the lines, or use a router. Fair the curves to the layout lines. Using the first piece as a template, trace the pattern onto other pieces of particleboard or MDF, and build up layers one at a time, using glue and nails. Trim any overhang on each piece with a flush-trimming router bit, and repeat the process until the form is six layers thick. When the form is complete, make sure that the face is square to the edge.

I chose particleboard for the form because it is inexpensive and easily shaped. One problem with particleboard, though, is that the edges are very porous, and the pores need to be filled to create a smooth surface on the outside of the form. A little putty and some sanding sealer will fill the porous edges fairly quickly. After the sealer dries, apply two coats of paste wax to the bending form to keep the glued-up apron quadrants from sticking to it.

The apron is a bent lamination

Before I had a bandsaw, I did several bent laminations using the tablesaw to cut the laminates and was amazed at how much wood



is wasted as sawdust. A good handsaw with a sharp blade is the far better tool for resawing. Starting with rough 5/4 stock, I'm able to get as many as seven plies from each board.

For the laminate pieces, use either 5/4 or 4/4 stock, with nice, straight grain and no knots. Granted, most of the material will be hidden, but the wood needs to bend easily and not be at risk of self-destructing in the planer. With this table, each apron quadrant began as a 5/4 blank about 4 1/4 in. wide by 35 in. long. I surfaced one side flat on the jointer, then resawed the blank into 1/8-in.-thick

plies. In theory, there should be enough material from each blank to make an entire apron quadrant. However, when planing stock this thin there is always a risk of pieces getting chewed up in the planer, so I recommend that you prepare an extra blank. Even if all of the pieces survive intact, you'll still need some extra pieces to serve as clamping cauls during the glue-up.

Gluing up the apron quadrants—Although the glue-up is not difficult, it's a good idea to try a dry run first. Select six apron plies



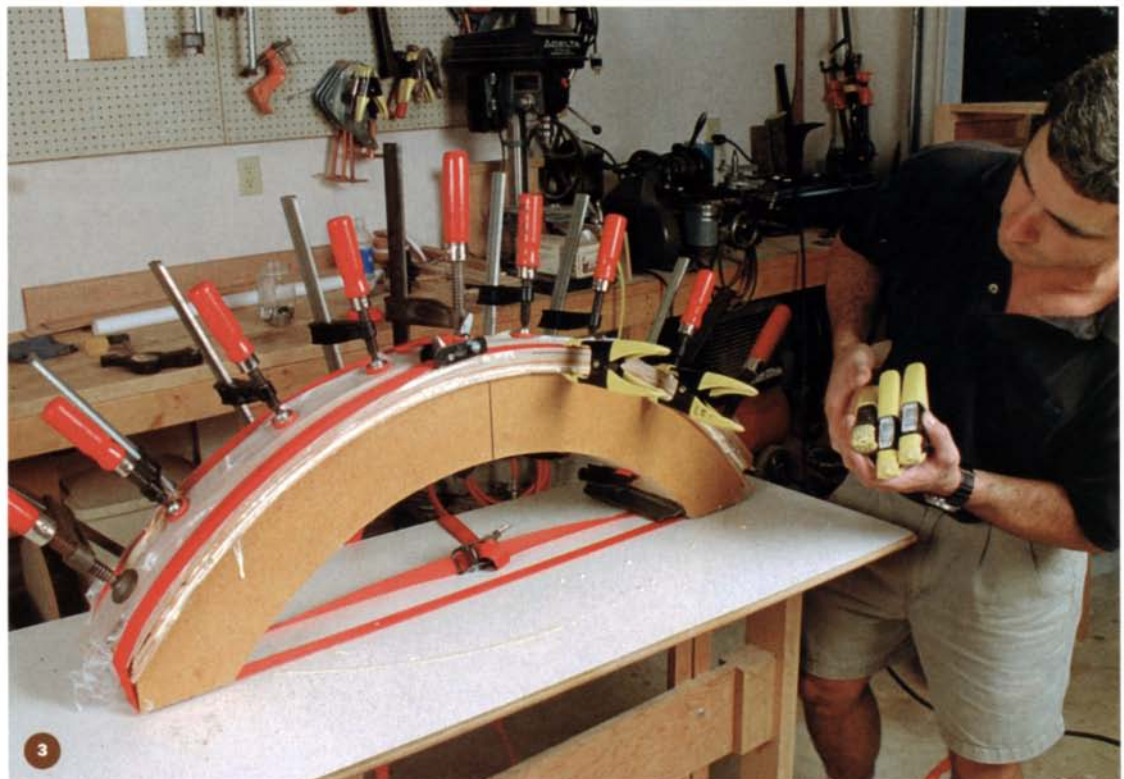
LAYING UP CURVED APRONS

For the aprons, solid lumber was resawed, planed and glued back together. The author cut the plies for the apron laminations on the bandsaw, then passed them through a planer to create a smooth surface and consistent thickness.

1 A small foam paint roller spreads glue evenly and quickly. With all but the two outside surfaces getting coated, each apron lamination calls for gluing 10 surfaces before it can be clamped onto the bending form.

2 The clamping sequence. Place the cauls on top of the plies with plastic wrap between them. Place the first clamp in the middle and move out toward the ends.

3 You can never have too many clamps. Work as quickly as possible. The goal is to achieve even pressure across the face of the apron. If the result is not gap-free, add more cauls and clamps. Band clamps will help bring all of the plies together—especially at the edges.



Rip and joint the apron edges. After removing each quadrant from the bending form, clean up one edge on a jointer to establish a straight surface, then rip each piece to width. When ripping curved pieces on a tablesaw, keep the convex side of the workpiece in contact with the tabletop right at the point where the wood engages the blade, and keep the blade height to a minimum to lessen the danger of kickback. One final pass on the jointer will remove sawblade marks.



and a minimum of four scrap plies to use as clamping cauls. The cauls are important because they distribute the clamping pressure more evenly.

Center the plies and then the cauls on the form and place a clamp in the middle, at the top. Next, clamp the ends loosely to the form. With the ends loosely held, begin placing clamps in the middle and work toward the ends. After snugging up the clamps, check to ensure that the plies haven't shifted excessively and are tight to one another across the entire surface.

The dry run should give a feel for the placement and number of clamps required to achieve even pressure across the face of the apron. If the result is not gap-free, try adding more cauls and clamps. Band clamps do a good job of bringing all of the plies together—especially at the edges, where any gaps will be obvious.

After a successful dry run, it is time for the glue-up (see the photos on p. 59). I have used regular yellow glue in almost all of the bent laminations that I've done. Rigid glues (such as epoxy) may be a better choice, but I haven't had any failures yet, and springback is not an issue with this project. Apply an even coat of glue to all sides of all six plies with a foam roller, except for the two outer surfaces of the apron. Set the plies on the form and place the cauls on top of the plies with a layer of plastic wrap between them. Clamp the laminates just as you did during the dry run. Allow each laminated apron section to cure for at least 24 hours before removing the clamps.

Cleaning up the apron quadrants—After removing the clamps, use the side of the bending form as a straightedge to draw a pencil line along the length of the inside of each apron quadrant,

just below the edge. This mark will provide a reference when jointing the edge. Scrape off most of the glue squeeze-out and joint that edge until it is clean and parallel to your pencil line, then rip each apron to width.

I rip the aprons to size with a tablesaw, then clean up the sawblade marks with one final pass on the jointer (see the photos above). A safer alternative is to rip the pieces to width on a bandsaw; however, this will not give as clean a cut. If you use a table saw for the ripping operation, be extra careful. Be sure to place the convex side of the apron down and maintain contact between the saw top and the apron right where the blade first enters the wood. Once the aprons are cut to width, use the full-scale drawing to mark the ends for cutting them to length (see the photo below).



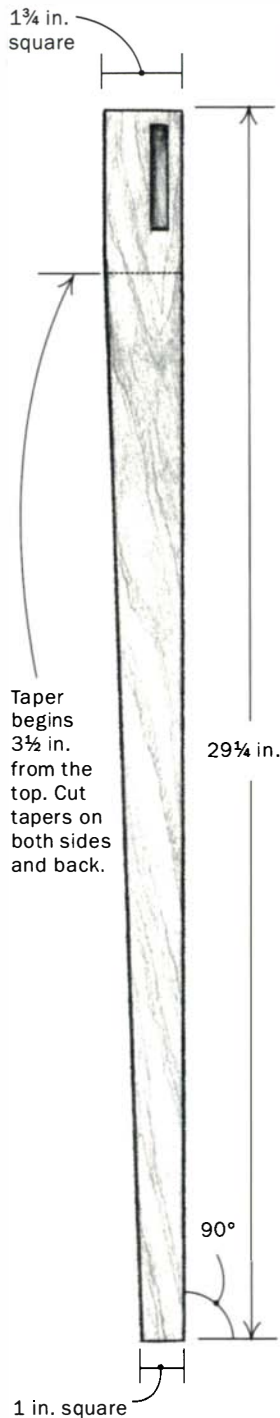
Full-scale drawings come in handy. Use same-sized drawings to mark the cutoff length of the aprons and to build the bending form and the tenoning jig.

Mortise the legs before tapering them to shape

Mill the legs into 1¼-in.-square by 29¼-in.-long blanks. While they're still square, before tapering them, cut the ¾-in.-wide mortises. This can be done many ways, but I use a router and square up the corners with a chisel. The legs on this table are tapered on three sides—left, right and back—all but the front side showing into the room. In section, the legs are 1¼ in. square at the top and 1 in. square at the bottom (see the drawing on the facing page). At 29¼ in. high, with the taper starting 3½ in. from the top (right at the bottom edge of the apron), that means each left and right tapered side has to lose about ¾ in. of material at the foot, and the back side loses ¾ in. of waste at the foot.

I built a jig for cutting tapers on these table legs because it seemed like a safer alternative (see the photos on the facing page). With this jig, the

TAPERING THE LEGS



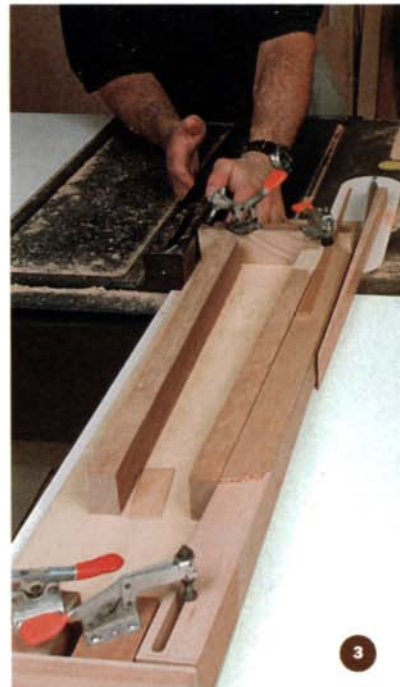
The legs for this table are tapered on three sides—left, right and back—all but the front side that shows into the room. You could cut these tapers with an adjustable tapering jig, or you could use a bandsaw and a jointer. I prefer my dedicated jig, to ensure that all of the cuts are consistent and fairly safe to execute. The fences are fixed, and the legs are held firmly in place with toggle clamps. Here's how this jig works:

1 The first taper. Set the saw fence 8 in. from the blade, which is the width of the jig. This setting does not change. Clamp a leg blank into the side that is set to remove $\frac{3}{8}$ in. of material, and rip the first taper.

2 The second taper. Move the leg blank to the other side of the jig, clamp it in place, turn around the jig and rip the second taper.

3 The third taper. Turn the leg blank 90°, clamp it in place and rip the third and last taper. You can use scrap wedges of the cutoffs as necessary to secure the leg blank firmly in the jig.

4 Cleanup. The sawn surfaces are cleaned up with a light pass over the jointer.



fences that define the tapers are glued and screwed into permanent positions, and the legs are held in place by toggle clamps. Also, the jig is plenty wide, which helps keep fingers away from the sawblade—unlike what you often find with those adjustable aluminum tapering jigs.

Construct a jig to cut the tenons

I pondered how to cut the tenons on the curved apron quadrants, then I realized that my router table would be the perfect machine

for the job. I made a jig out of plywood scraps that holds the apron securely in place (see the drawing and photos on p. 62), so that the ends of the aprons meet the router-table top in the same relationship as they meet the leg.

Time given to making this tenoning jig is well spent. This setup transforms what would otherwise be a difficult task—cutting tenons on the ends of curved aprons—into a simple one. The radius of the curve matches the inside radius of the apron pieces. The L-shaped base sits flat on the router-table top and rides against

a fixed fence. Equip the router with a 1/2-in. upcut spiral bit, then adjust the fence and router to produce a 1/8-in. by 3/4-in. rabbet cut into the front (convex) face of the apron.

Use the cutoffs from the apron quadrants as set-up pieces before committing to the actual aprons. After verifying the setup, clamp an apron onto the jig and make the first cut across the face. Without adjusting the fence setting, add a 7/8-in.-thick spacer between the jig and the fence. Run the apron through again and check the fit in one of the leg mortises.

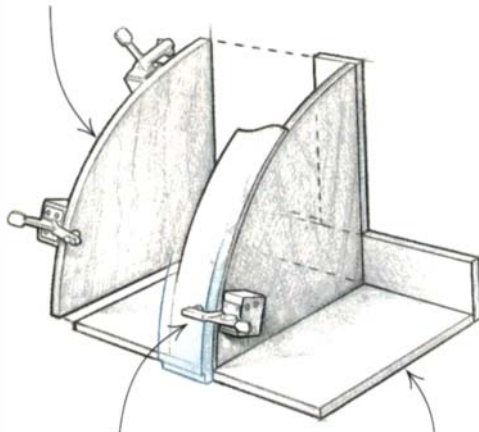
This setup should provide an exact fit—assuming that the bit and

the spacer are accurately sized. But when working wood, these tolerances are not always easy to achieve, so a little shimming or shaving may be in order.

If the fit is too tight, plane a little off the spacer; if the fit is too loose, shim it out by adding a strip of masking tape to the spacer. The goal is to achieve a snug, sliding fit. Because the cutter remains fixed in relation to the fence, any discrepancies in the thickness of the aprons will not affect the size of the tenons: They will all end up being consistently the same 3/8-in. thickness. After milling the tenons on all of the aprons, the tenons need to be cut

CUTTING TENONS ON CURVED APRONS

Curves match inside radius of apron.



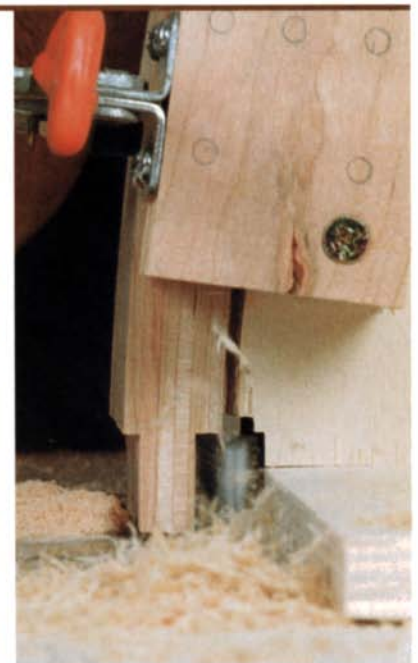
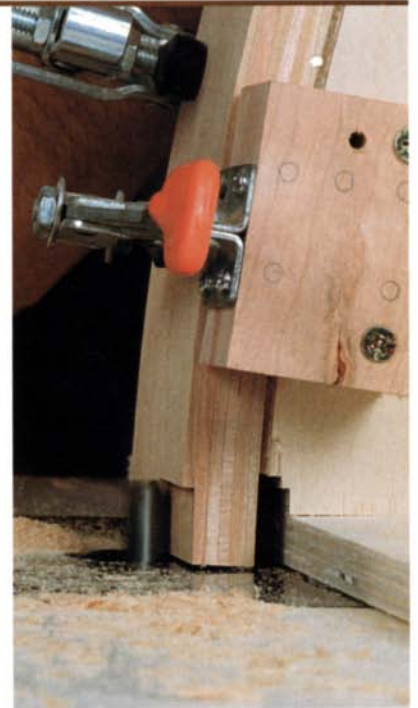
Toggle clamps hold workpiece tightly to jig.

Large base steadies the jig.

Constructed of scraps of plywood, the outside curve of this jig matches the inside curve of the apron pieces. It holds them firmly in place, square to the work surface, making it easy to cut all of the tenons using a router table.

1 The first pass. After setting the router bit to the proper height, use a fixed fence to slide the jig past the bit to cut the outside rabbet.

2 The second pass. Without moving the fence, insert a spacer block of wood between the fence and the jig and make the cut. The spacer guarantees a consistently sized tenon regardless of discrepancies in apron thickness.





Gluing up the base assembly. Use a flat, level surface to lay out and glue up the legs to the aprons. Any misalignments need to be adjusted before tightening the band clamps.



Tweaking the alignment. By hanging one leg joint over the edge of the worktable, the aprons and legs can be drawn flush together with a deadblow hammer before the clamps are fully tightened.

to width. I trim them to width with a dozuki backsaw and clean up the cuts with a chisel.

Test the fit before glue-up

To ease tension during glue-up, I strongly recommend another dry run. As you might expect, some of the tenons may need a little tweaking with a shoulder plane until all of the joints draw up completely. Mark an identifying number on each one as you go.

Assemble the table base upside-down on a flat sheet of plywood or melamine (see the left photo above). Band clamps bring all of the joints together nicely. Before tightening down the clamps and leaving the assembly to cure overnight, clean up any excess glue, then make sure that the base is flat against the plywood and that the legs are perpendicular to the surface. If you need to tweak the alignment, move the table so that one leg joint hangs over the edge of your workbench. Then simply use a deadblow hammer to bring the aprons and legs flush (see the right photo above).

An undercarriage for securing the top

After the base assembly cures, clean up the top edges with a jointer plane, then begin constructing the undercarriage, which stiffens the base and provides a means to attach the tabletop. The

undercarriage consists of a frame made from two cross braces of 1-in. by 2½-in. hardwood (I used maple) joined in the center with a half-lap joint. The cross braces are attached to the base in dadoed glue blocks that span the leg-to-apron joints (see the detail drawing on p. 57).

I did most of the sanding on the base pieces before gluing them up, so the table needed only a quick once-over by hand with 220-grit sandpaper. After sanding, I removed any dust from the surface and applied four coats of Garret Hack's oil-varnish mixture (*FWW* #122, pp. 48-51)—equal parts linseed or tung oil, varnish and turpentine—followed by a coat of paste wax. If I include the time spent making the bending form and tenoning jig, I put in about 40 hours on this project. □

Thomas J. Calisto is a mechanical engineer. He spends many of his mornings and weekends in his shop in Durham, N.C.



Dust-proof Your Contractor's Saw

A shopmade plywood back plate and simple
undermount box collect dust at the source

BY DICK McDONOUGH



Whenever I'm doing a lot of ripping and crosscutting with my saw, I generate a blizzard of airborne sawdust. So to prevent all of that sawdust from filling my shop (and lungs), I mounted a small plywood box under the saw cabinet and connected the box to my dust collector. And to prevent dust from blowing out through the wide-open back of the cabinet, I covered most of the open area with a piece of plywood.

Now when I fire up my dust collector, I'm able to collect 95% of the dust generated by the tablesaw. My shop is considerably cleaner. And so, too, is my dust mask.

In my case, the dust box is mounted to a Delta 10-in. contractor's saw. But the basic idea here is adaptable to just about any contractor-type saw.

Gaps must be filled first

Before starting on the box, I filled the gaps in the joint between the top of the cabinet and the underside of the table with 1/4-in. by 1/4-in. nonadhesive-backed weather stripping (available at hardware stores).

If you see gaps where the top of the stand meets the underside of the cabinet, fill them with 3/16-in. by 1/2-in. adhesive-backed weather stripping. After loosening the bolts that hold the saw cabinet to the stand, slip the weather stripping under the bottom edge of the cabinet, pressing the adhesive surface all along the joint line. When the cabinet is lowered onto the stripping, you end up with a nice seal.

Ramps keep dust off ledges

At the inside bottom edge of the cabinet, the sides bend in to create a horizontal sur-

face for mounting the cabinet to a stand or base. Also, some commercially made stands have a top surface with an opening in the center to let the dust fall through. In both cases, four ledges are created around the bottom of the cabinet.

Unfortunately, these ledges are a perfect place for unwanted sawdust to accumulate and become a nuisance. To solve the problem, I screwed an angled scrap of wood to each of the four ledges. These "ramps" allow the dust to fall off the ledges easily and down into the dust box.

Dust box directs dust to the hose

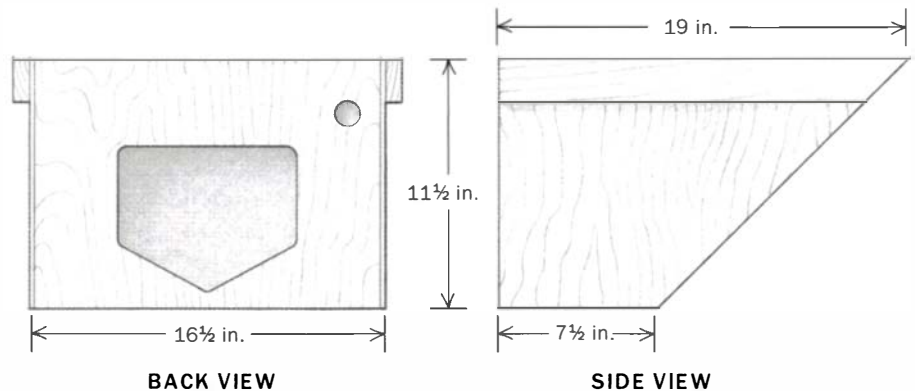
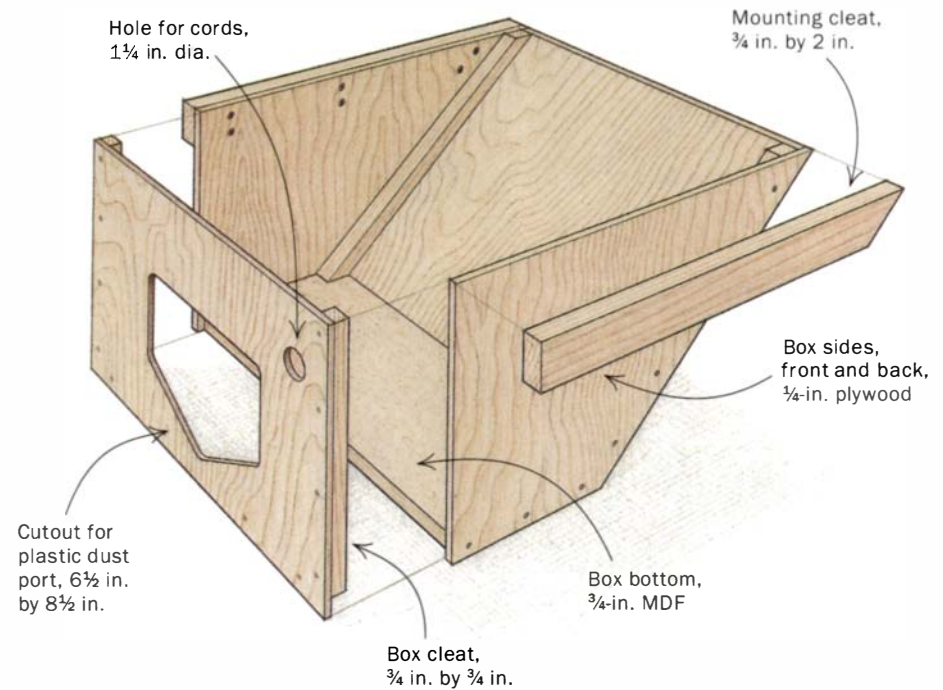
I could have connected my dust-collector hose to a port mounted directly on the bottom of the saw cabinet. But because I often remove the hose and temporarily attach it to other machines, I wanted the port to be easily accessible. So by adding a box under the saw cabinet, I was able to mount a plastic dust port (with a 4-in. outlet) that sticks straight out the back. That way I can get at the port with little effort. And to attach the hose, I just slip it onto the port and tighten an automotive hose clamp.

The box itself is mostly 1/4-in.-thick plywood, with a 3/4-in.-thick medium-density fiberboard (MDF) bottom and a few pine cleats. Tapering the sides of the box helps direct the dust into the port.

There's nothing fussy about joining the parts for the dust box. Once the opening in the back piece (for the dust port) has been cut out with a sabersaw, you just nail or screw the parts in place. Start by attaching the four box cleats. Position them flush with the edges of the front and back pieces

A SIMPLE BOX DOES THE JOB

A tapered box funnels tablesaw dust straight into a dust collector.
(Dimensions based on a Delta 10-in. contractor's saw.)



No fancy joinery required. The author uses ring-shank nails to join the dust-box parts.



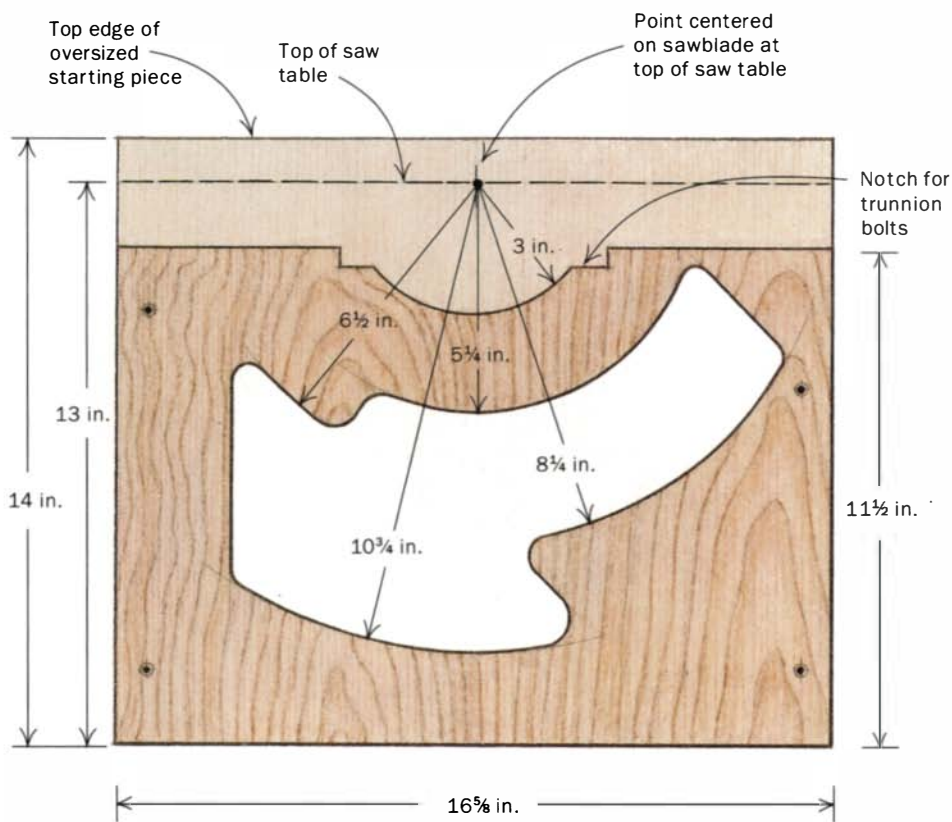
The dust port goes on back. A plastic dust port provides an easily accessible attachment point for the dust-collector hose.



Jack it up. An old scissors jack holds the dust box in place when driving home the sheet-metal screws.

A BACK PLATE IMPROVES EFFICIENCY

Mounting a plate to the back of the saw cabinet helps contain the dust.
(Dimensions based on a Delta 10-in. contractor's saw.)



Transfer the mark. Slip the back plate under the top of the saw to transfer the center point of the arc from the saw to the plate.

start by marking this point on the back edge of your saw.

It will be easier to lay out the opening on the back plate if you cut the plate to a height that equals the distance from the top of the stand to the top of the saw table, plus about 1 in. Don't worry about that extra material. For now, you want the top edge of the plate to extend above the table.

At this point, it's okay to cut the back plate to its final width. Simply measure from one side of the saw to the other and cut the plate to the measured dimension. Then draw a couple of straight lines across the plywood to represent the location of the top and bottom surfaces of the tablesaw. Now you can place the top edge of the plate against the top of the saw table and transfer the location of the center point of the arc from the table to the upper line just drawn on the plywood. Make sure the ends of the plywood are flush with the sides of the saw cabinet.

Once the arc center point has been marked on the back plate, you're ready to scribe the cutout for the belt and the motor mount. First, take measurements directly from the back of the saw. Second, transfer these points to the back plate. And third, use these points to set the compass and scribe the various arcs on the plate.

Start by marking the points for the belt. To do that, raise the blade to its highest point and measure from the center point on the back of the saw table to the top of the belt. Subtract $\frac{3}{16}$ in. or so for clearance, and mark this point on the back plate.

and attach them with ring-shank nails. After that, cut the bottom to size and bevel its front edge to match the taper of the sides. Then nail the $\frac{1}{4}$ -in.-thick plywood sides to the bottom. To complete the box, nail through the sides and into the box cleats in the back and front.

Mounting the dust box to the stand is a pretty simple step. The mounting cleats are screwed flush with the top edge of the sides. And after drilling a $\frac{1}{4}$ -in.-dia. access hole for the power cords, the plastic dust port is screwed to the back. The dust port is available from Woodworker's Supply (800-645-9292; part No. 894-738). Then the mounting cleats are attached to the stand by driving sheet-metal screws through the stand and down into the cleats. On some saws you might have to screw through the sides of the cabinet into the side of each mounting cleat.

Back plate helps keep dust in the box

The dust collector works most efficiently when the back of the saw cabinet is at least partially covered. From my experience, if

the back is totally uncovered, some of the dust manages to find its way out through the slot for the handwheel or the sawblade slot in the tablesaw insert. So to help cover the open back of the cabinet, I added a back plate made of $\frac{1}{4}$ -in.-thick plywood.

The back plate mounts directly to the back of the saw. But it's not quite as simple as cutting the plywood to size and screwing it in place. Because the drive belt and motor mount extend out the back of the saw, some of the plate must be cut away.

Figuring out what portion to remove could be tricky, because the belt and motor mount must be able to move up and down when you're changing the height of the sawblade. Then, too, the belt and motor mount swing in an arc from 0° to 45° . But if you take a few minutes to do some layout, it's a pretty straightforward procedure.

Looking straight at the back of the saw, you can see the arc of travel that's followed by the belt and motor mount. This arc has a radius with a center point that aligns dead-on with the center of the sawblade and the top of the saw table. So it's a good idea to



Measure the belt in the raised position. Take the first measurement with the sawblade in its highest position.



Scribe the arcs. Establish the upper and lower edges of the cutout by scribing the arcs with a compass.



Cut out the opening. To achieve a nice radius, drill $\frac{3}{4}$ -in.-dia. holes in the corners before cutting out the opening with a sabersaw.

Next, lower the belt all the way to its lowest point and take another measurement. Only this time, measure the lowest point on the belt and *add* $\frac{3}{16}$ in. for clearance.

Now you can measure and mark for the motor-mount cutout. It's the same basic dance step. Measure from the center point on the back of the saw table to the top of the mount, subtracting a bit for clearance. To complete the layout, measure to the lower edge of the mount, adding the usual $\frac{3}{16}$ -in. fudge factor.

Once all of the points have been marked on the plate, simply swing a compass to draw each of the arcs.

Next, mark where these arcs start (blade at 0°) and stop (blade at 45°). With the blade at 0° , measure from the left side of the saw to get end points for the belt and motor mount. You'll want to allow for clearance here, too. Then do the same with the blade at 45° .

One more thing. On my Delta, to allow the back plate to fit tightly against the back of the cabinet, I needed to make a cutout for the back end of the trunnion. It's just a bit more measuring and scribing with the compass. I also had to make a couple of straight clearance cuts to fit around the trunnion mounting bolts.

Once all of the arcs have been scribed, the top edge of the back plate can be trimmed even with the top end of the cabinet sides.

All that's left to do is cut out the marked openings with a sabersaw. But first drill $\frac{3}{4}$ -in.-dia. holes at the corners of the open-

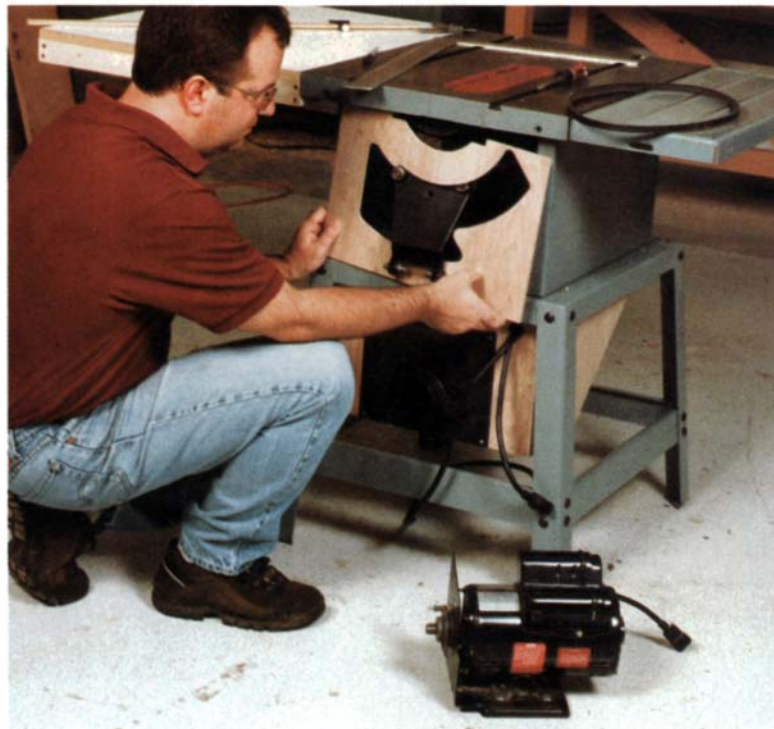
ings. That way the corners end up with a nice radius.

After that, you can slip the plate into position on the back of the cabinet. You might have to loosen the bolts that mount the saw cabinet to the base so that you can raise the cabinet enough to get the plate in place. And to be able to mount the back to some saws, it's necessary to make a couple of horizontal cuts, so you end up attaching two pieces.

Check the clearance of the cutout by raising, lowering and pivoting the blade. If

everything looks okay, go ahead and mount the plate to the back of the saw with a few sheet-metal screws. Once the back plate has been added, you can clamp the dust-collector hose to the port. Then turn on the dust collector, fire up the saw and make some cuts. You'll recognize a difference right away. More dust will be in the collector, where it belongs, than in the air you breathe. □

Dick McDonough is a finish carpenter and woodworking teacher in Flint, Mich.



Add the back plate. With the motor removed to allow for easier access, slip the plate in place and secure it with a few sheet-metal screws.



To the uninitiated, Japanese planes raise many questions. Why use a wooden plane when less-fussy metal tools are available? Why use a plane that requires lots of prep work? And why does the tool require a pull, not a push, stroke?

Good questions all. Truth be told, I use both Western and Japanese planes. Metal Western planes make some jobs easier, such as flattening rough lumber, because of their greater heft and easy-to-grip knobs and handles. But when it comes time for fine handwork, I find Japanese planes to be superior over Western planes. Japanese planes come in more sizes and can even be ordered to the size you want. As with Western planes, Japanese planes require prep work and regular tune-ups. But on the plus side, shaping the sole of a wooden plane takes a lot less effort than lapping a metal tool. Because they are lightweight and cut on the pull stroke, Japanese planes are very sensitive to the touch. And finally, their thick irons are easier to sharpen because they are less prone to rocking on a benchstone.

There's a mystique to these tools, perhaps because the secrets traditionally are passed down from master to student. A teacher certainly helps. But if you enjoy the challenge and satisfaction that comes from hand-cut joinery, you can learn to set up a Japanese plane. Along the way you will pick up an appreciation for the tool. I once heard someone say that when you buy a new Japanese plane, you're really getting a Japanese plane kit. That's not too far from the truth.

Because Japanese planes have wooden bodies, a new one should be treated like the wood selected for your next project. Let the plane body (called a *dai*) acclimate in your shop, the first step in conditioning. Try to leave it alone for two to three months, with the iron and chipbreaker removed. But if you can't wait that long, leave it at least a week before beginning to work on it.

Some plane makers suggest that the body be soaked in linseed oil to help seal it. I've compared bodies treated this way against others that were not oiled and have come to the conclusion that it

really makes no difference. The wooden body, oiled or not, is sensitive to changes in relative humidity.

A novice may spend several hours going through the conditioning procedure. Greater speed comes with practice. With experience, a new plane can be set up in about half an hour to an hour. These are the steps in the most-efficient order (depending on the maker, a new tool may require all or only some of these steps):

Japanese Planes Demystified



Tuning up a new wooden plane teaches you how to maintain the tool for life

BY CARL SWENSSON

1. Correct, if necessary, the edge profile and angles of the iron.

2. Flatten the back (hollow-ground side) of the iron.

3. Sharpen the iron's bevel.

4. Flatten and sharpen the chipbreaker.

5. Tune the sole.

6. Fit the iron to the plane body.

7. Fit the chipbreaker to the iron and plane body.

8. Check the sole a final time.

Remove the iron and check the bevel angle

Like classic wooden planes made in the West, the irons of Japanese planes are removed and adjusted using a small hammer. Strike the chamfer (create a chamfer if your plane doesn't have one) on the upper back edge of the body (see the top photo on p. 70).

The iron's factory bevel is about 25°. When installed in the body, the relief angle (behind the bevel) should be between 5° and 10°. If

the relief angle is greater than that, the cutting edge will be thin and hence weak. Too small a relief angle may cause the tool to ride up on the bevel. If necessary, regrind the bevel with a coarse stone or a slow-speed grinding wheel, being mindful not to introduce a skew into the edge. Don't hone the bevel with finer stones yet.

Flatten the back of the iron

As with a Western plane iron, the back of a Japanese iron must be flattened. Because the back of the iron comes with a hollow grind,



Remove the iron and chipbreaker by tapping the back of the wooden body with a hammer. The thumb exerts outward pressure on the chipbreaker and senses when it breaks free. The grip also prevents the chipbreaker from passing over the cutting edge of the iron and damaging it.

the job is easier because you don't have to remove as much metal. Flattening, however, may also require a slight reshaping of the iron using a small hammer and anvil, which is not as scary as it sounds (see the photos below). Hammers and anvils with rounded edges are available for this task. Japanese irons are made of laminated steel, with hard, tempered steel along the edge and softer steel behind it, which helps absorb vibration and allows the iron to be shaped safely by hammering.

To see whether the iron needs reshaping, rub the back across a flat, 800-grit stone using even, light pressure, then examine the scratch pattern for low areas. If there are any, rest the iron on an anvil (with the bevel side facing you) and tap the low areas lightly. Because the edge is brittle, tap only on the soft, gray metal behind the lamination seam using the corner of the hammer.

The blows should push out the low spots on the opposite side. Place the iron back on the stone and make a few more light passes with the iron at a slightly different angle. The new scratch pattern will contrast with the first set and indicate whether the low spots were raised. If the metal didn't budge, tap harder and a little

closer to the edge but never on the hard steel lamination. Check your progress frequently, and stop as soon as the scratch pattern seems even. Eventually, a narrow flat land forms along the edge. It need only be about $\frac{3}{32}$ in. wide.

Lap the back through successive grits, up to a 6,000-grit or 8,000-grit finish stone. When making the final passes on the finish stone, work it only slightly wet and let the paste build up. This polished flat land will get smaller with repeated sharpenings. After months or even years, depending on the plane use and sharpening technique, the land will get narrower until only a sliver remains. To recreate it, go back to the hammer and anvil and reshape the iron as before. Take care to tap along the entire length of the bevel and avoid the tendency to tap too much or too hard on the corners. Doing so may produce a horseshoe-shaped iron.

Sharpen the bevel

Before sharpening the bevel, compare the width of the iron's edge to the width of the plane's mouth. If necessary, grind the iron just a hair narrower than the mouth opening. Begin working the bev-

FLATTENING THE IRON



Japanese vs. Western plane irons. The thicker body of a Japanese iron (right) is easier to hone by hand because it provides a more stable surface on the benchstone.

Place the iron on an anvil and hammer lightly to reshape it. Because the iron is a lamination of hard and soft steel, it will bend without damage, as long as the edge (hard steel) is not struck.



The striking edge of the hammer should have a slight radius. Small, lightweight hammers used for shaping the iron may be purchased from companies that sell Japanese tools (see Sources on the facing page).

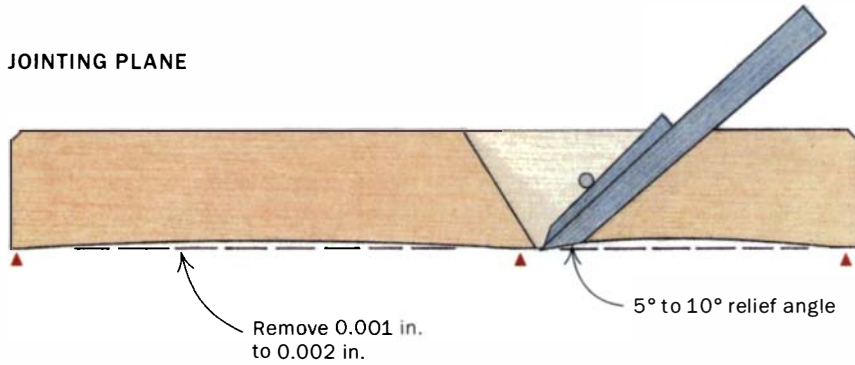


SOLE PROFILES

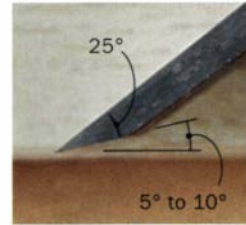
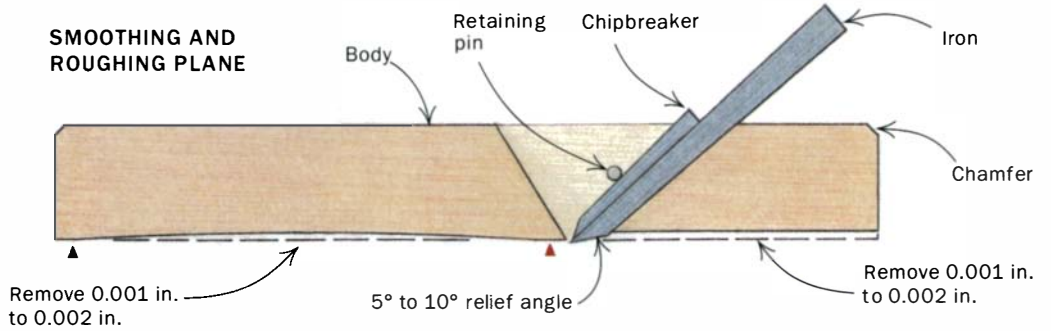
Japanese handplanes produce very little friction because only small sections of the sole make contact with the workpiece.

▲ CONTACT POINTS

JOINTING PLANE



SMOOTHING AND ROUGHING PLANE



Check the relief angle behind the bevel. The iron's factory bevel is 25°. The relief angle should be between 5° and 10°.

The chipbreaker has a 75° microbevel. This steep edge breaks wood fibers cut by the iron.

el on an 800-grit stone. To keep the stone from developing dips, use the entire stone. To prevent rocking, skew the iron slightly to the direction of travel. A skewed position effectively makes the bevel wider and easier to control. I don't recommend sharpening jigs because the sensitivity and hand coordination learned in sharpening is good training for using hand tools.

When a burr forms along the length of the edge, switch to the next-finer stone. When the scratches from the previous stone are gone, move up to the finish stone. After honing the bevel, flip the iron and, with light pressure, hone away the burr.

Work the chipbreaker

The chipbreaker is forged with a slight hollow, like the iron, and is flattened using the same procedure. After the primary bevel (25° to 30°) is done, use the finish stone to put a secondary (micro) bevel of about 75° on the chipbreaker. The steeper bevel will break the wood fibers during planing. Next, place the chipbreaker on top of the iron, just behind the edge. Squeeze them between your fingers, hold them up to a light and examine from the rear. Light must not peek through the front edge.

Shape the plane's sole

Unlike Western planes, the soles of Japanese planes are not supposed to be dead flat. Certain areas are flat while others are relieved, creating a wavelike shape to the sole. This shape makes it easier to keep the sole in tune because only small amounts of material need to be removed for a tune-up. With a new plane, examine the body for twist. For this I use a pair of winding sticks.

A number of tools can be used to work the sole: a cabinet scraper, a chisel (with a scraping motion) or a small plane if the body is severely twisted. Never use sandpaper. Grit can become

embedded in the sole. When it dislodges, the iron may be nicked. Correct for twist first and remove as little material as possible.

Next, condition the sole (see the top photos on p. 72). Start by making a shallow relief cut on each side of the mouth. Removing this section makes it easier to shape the rest of the sole. Two basic sole profiles are used: one for rough and smooth planing and another for jointing (see the drawings above). The depth of the relieved areas should be between 0.001 in. and 0.002 in. A feeler gauge may be used to measure the relief angle. With only a little practice, your eye will become accurate enough to judge the



The back of a Japanese iron is hollow-ground, which means only a small portion needs to be honed away. An even reflection of light indicates that the back edge is flat.

SOURCES OF SUPPLY

Japanese planes and accessories are available from these sources:

HIDA TOOLS AND HARDWARE

1333 San Pablo Ave.,
Berkeley, CA 94702
(800) 443-5512
www.hidatool.com

JAPAN WOODWORKER

1731 Clement Ave.,
Alameda, CA 94501
(800) 537-7820
www.japanwoodworker.com



Use winding sticks to check the body for twist. Flatten the sole with a plane or scraper.

With a chisel, make a shallow relief cut on each side of the mouth. This area needs to be recessed anyway, and with the wood removed, it will be easier to shape the sole accurately.

Next, shape the sole. Use a scraper or a scraping plane to create a very shallow recess between the front edge and mouth of the sole.

SHAPING THE SOLE



relief. A freshly shaped sole will be crisp at the front edge. Leave it alone. A rounded edge or chamfer will encourage the plane to ride up on loose shavings or sawdust instead of pushing them away.

Fit the iron to the body

A Japanese plane iron is tapered about 2° throughout its thickness. A corresponding groove is cut into the wooden body. The iron is held in place by a wedging action of iron against wood, not the chipbreaker (see the photos below). The fit will be too tight on a

new plane. It is up to the user to fine-tune the wedge by removing wood along the ramp where the iron rests and possibly also along the groove.

First remove the metal retaining pin with a pair of pliers. Check the width of the iron against the width of the groove with a ruler or dial caliper. I aim for a clearance of no more than 1/32 in. If needed, widen the sides of the groove using a narrow chisel or file.

Next, liberally mark over the bevel side of the iron with soft pencil, permanent marker or calligraphy ink. Insert the iron into the body and lightly tap it home four or five times using a small hammer. Then remove the iron. The black marks left behind signify high spots on the ramp. Use a chisel to scrape or pare away the high spots; take whisker-thin cuts. Repeat this process as many times as needed until the cutting edge barely protrudes below the sole. If too much material is removed, the fit may become too loose. To remedy the problem, glue a paper shim under the iron and refit, if necessary. My students are often surprised by how little wedging action is really necessary to hold an iron in place during planing. Resist the urge to make the fit so tight that it requires anything more than light taps of the hammer to set the iron.

New planes sometimes come with no appreciable mouth opening. If needed, widen the opening with a chisel. A finish plane's opening should be no wider than the thickness of a piece of paper.

Fit the chipbreaker

Measure the mouth opening and compare it to the width of the chipbreaker. If necessary, widen the opening so that the chipbreaker will not bind. Insert the pin and tap the fitted iron into position. With four or five light taps of a small hammer, install the

FITTING THE IRON



Check the width of the groove for the iron. If necessary, use a chisel to widen it about 1/32 in. more than the iron to prevent jams.



To fit the iron to the sole, shave the ramp with a chisel. Black pencil marks indicate high points, left after test-fitting an iron coated with graphite.



Stop trimming the ramp when the iron can be tapped into a working position. The iron is firmly wedged against the ramp. It's not held in place by the chipbreaker.

FLATTENING AND FITTING THE CHIPBREAKER



Check that the chipbreaker is flat. Position the chipbreaker over the iron and tap on the corners to see whether it rocks.



Flatten (or roll over) the corners of the iron to correct for rocking. Use the same hammer and anvil used for bending the iron.



Hammering the chipbreaker may not be enough. The metal retaining pin may have to be filed down until the chipbreaker fits.

chipbreaker. The edge of the chipbreaker should seat just a hair behind the edge of the iron. Chances are the chipbreaker won't go in far enough and will have to be flattened and refitted (see the photos above). Remove it and the iron.

The chipbreaker rests atop the iron on three points: along the cutting edge and on two back corners. Place it over the iron and tap lightly on the chipbreaker's back corners. If the chipbreaker is not flat, it will rock, causing a rattling sound.

The next move depends on how the chipbreaker fits inside the plane. On a new tool, the fit often is too tight. If so, place the chipbreaker on the anvil and flatten the back corner that seemed high when you checked for rock. Both may have to be hammered if the fit is still too tight. (If a chipbreaker is too loose, do the opposite and bend over the corners on an anvil.)

If you've hammered the corners nearly flat and the chipbreaker still hangs up on the pin, put away the hammer. Find a file and go to work on slimming the retaining pin. File evenly so that the entire chipbreaker remains in contact with the pin when assembled.

Make a final check of the sole

By now it's probably self-evident that Japanese woodworking and instant gratification are mutually exclusive. But if all has gone well, a reward is not far off. With a straightedge, check the sole one more time. Sometimes, when the iron and chipbreaker are firmly fitted, the plane body may bulge just behind the mouth. The bulge may be relieved with a scraper, with the iron and chipbreaker in place. Finally, use a chisel to cut a slight chamfer on the sharp ramp behind the iron's bevel. The chamfer will reflect light and make it easier to see the edge when making depth adjustments. Set the iron by tapping it with a hammer while sighting down the sole. The angle of the iron may be adjusted slightly by tapping the sides as needed. Always examine the chipbreaker's position after adjusting the iron.

Take care of your plane

A stable environment, without extreme changes in heat and humidity, goes a long way toward keeping a wooden plane true. While this is not always practical, try to keep the plane out of direct

sunlight. When the plane is not in use, back off the irons so that the wood doesn't get compressed and lose its ability to hold the iron.

Setting up a Japanese plane teaches one how to maintain it. For those with patience, the reward is a good understanding of how the tool functions. And the skill and sensitivity learned may spill over into the use of other tools as well. □

Carl Swensson designs and builds furniture in Baltimore, Md. He is also a teacher in Eastern and Western hand-tool techniques.



Learning to plane on the pull stroke

Pulling, instead of pushing, a handplane may seem as foreign as driving on the left side of the

road. It takes some getting used to, no doubt about it.

Begin by placing the heel of your right hand (reverse the process if you're left-handed) on the front section of the body, near the center, and grip the sides of the body. With your left hand, grab the iron between the thumb and forefinger and place the other fingers on the back of the block.

Using both hands, pull the plane across the work, keeping downward pressure on the heel of the right hand. Pull at an easy pace. As the front of the plane approaches the end of the stock, speed up the motion and whisk the plane off the board in a straight line. Because the sole is concave, a slow movement at the end of the stroke would cause the plane to dive and take too deep a cut.

Because of less weight and less momentum through the cut than a heavier metal plane, the Japanese plane tells you more about the wood you are planing. With practice and sensitivity, this helps your technique and results, especially when working difficult grain.

Prevent Injury to Your Hands, Wrists and Forearms

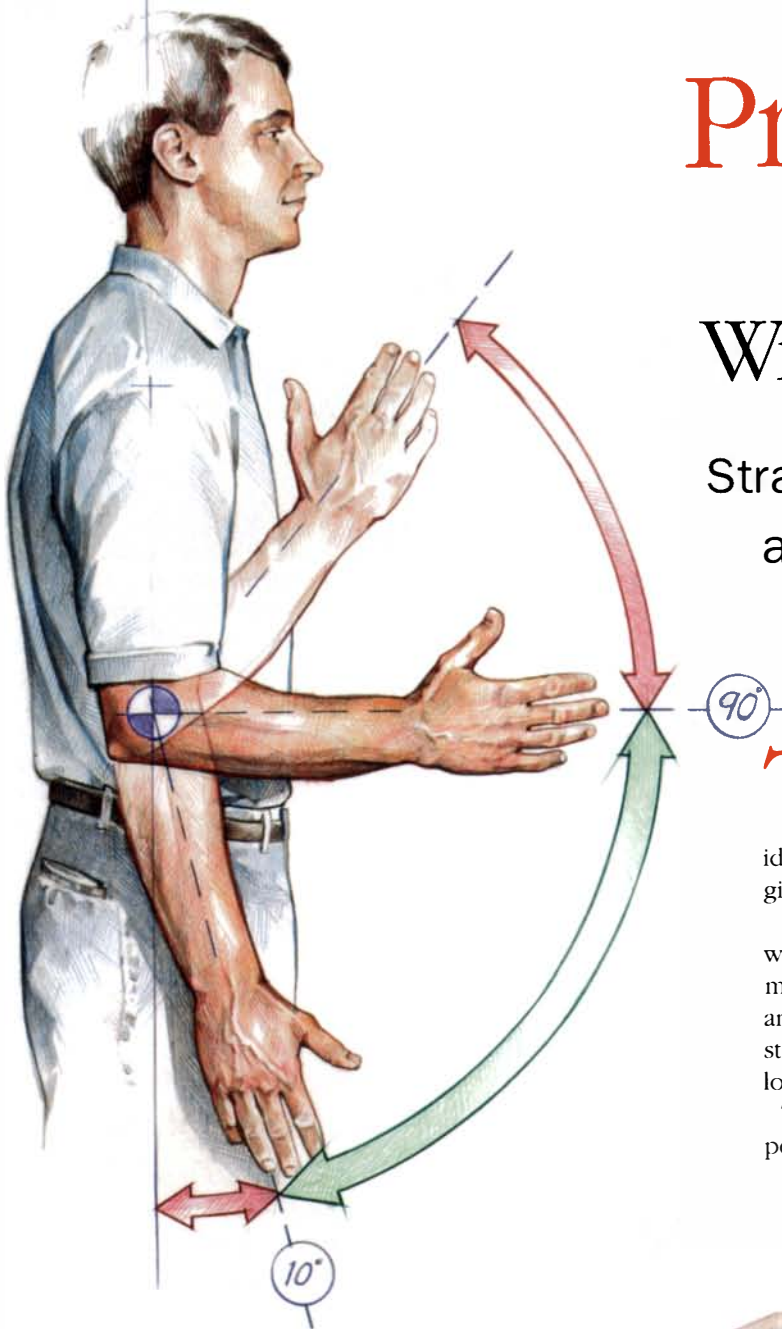
Strategies to keep you in the shop
and out of the doctor's office

BY TOM LEROY

The term *handmade* is a good description of the work that most of us do in the shop. Our hands are the connection between our tools and the wood we work, enabling our ideas of detail and our notions of style to be transformed into tangible products.

I'm a physical therapist, and I recently evaluated a cabinetmaker who complained about needing a cup of coffee to get going in the morning. I made an off-the-cuff remark about caffeine's effects, and he responded in a crusty, Yankee manner, "I don't drink the stuff. I just wrap my fingers around the hot mug for 10 minutes to loosen them up."

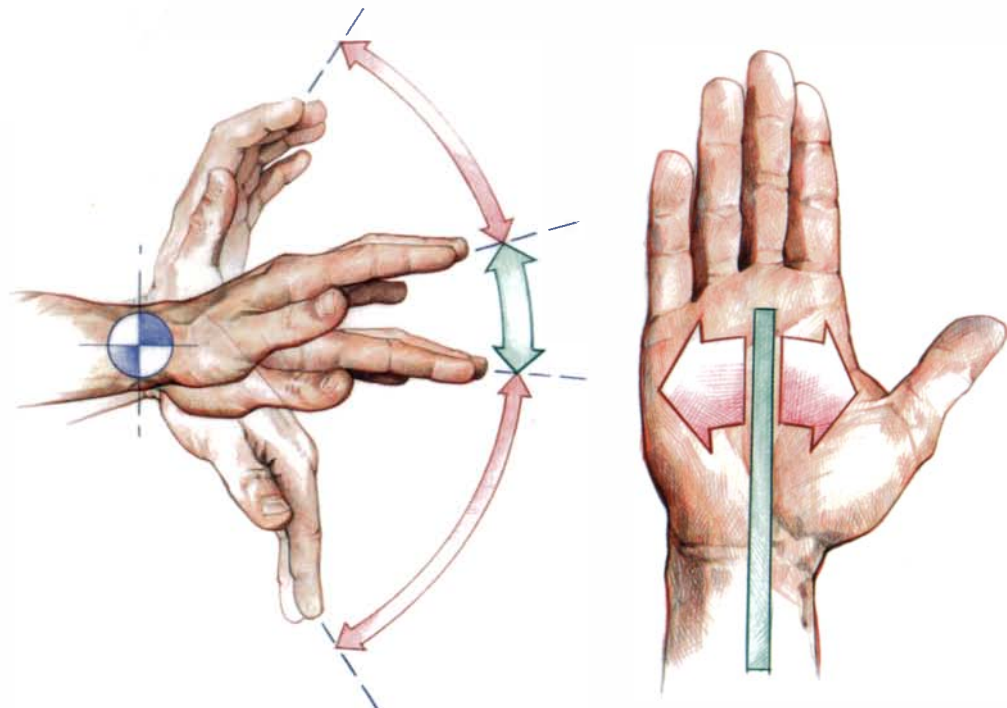
To lessen the chance that you'll develop this kind of coffee dependency, in this article I'll discuss the risk factors of hand, wrist



Watch the angles

Most people are careful to keep their backs straight while they lift heavy objects, but many of those same people are oblivious to maintaining healthy positions of arms and hands. Regarding the area from elbow to wrist, here are three guidelines to follow whenever possible:

- The elbow should be bent between 10° and 90°—no more, no less (above).
- Don't bend the joint of wrist-to-hand forward or backward more than 20° (near right).
- Don't bend the hand significantly away from the midline (far right).



The hand is a precision instrument



Striking a tool with your palm is the wrong thing to do. Take the time to find a mallet or a hammer—even a block of scrapwood—to prevent a debilitating and painful injury.



and forearm injuries and suggest a few simple ways to minimize them. Hand sizes, flexibility and the tasks they perform vary significantly, so approach this information as you would a design article. Look for general principles and apply what is appropriate to your specific situation. Don't be afraid to modify your tools or your methods of work. The idea is to keep proving the old adage: "The eye of a craftsman works twice as hard as his hands."

Hands aren't hammers

Human hands are incredibly complex instruments, capable of remarkable precision, but using them as a hammer or a mallet invites injury. I cringe when I see a chisel being advanced by the strike of an open hand. Instead of hand-hammering joints, try gripping the head of a deadblow hammer or a small block of dense hardwood. These alternatives allow you to fit the joint without marring the workpiece or your hand. Another option is to use a round-headed wood mallet—there's a good reason why they've been around for so long. And remember to make a point of keeping these tools within easy reach. When the safer way is the easier way, it's a no-brainer.

Angles matter

One important but less-than-obvious detail is the position your arms assume when working wood. For example, when I use an in-line grip saw (Japanese or gent's style) and secure a board vertically in a vise, my hand is bent at the wrist, down toward the floor. This could lead to what's called an *overuse injury* if done with too much repetition. Don't get me wrong—I still use these types of saws, but I modify either my position, the angle of the saw or the orientation of the board in the vise.

Another common example involves the handles on plunge

routers. If the router grips and elbow-height are even, a vertical grip is appropriate. But when the router is above elbow height, the grips should angle toward the operator; and when the handles are below the elbow, the grips should angle away. Similarly, angling flat carving stock toward me limits the amount my wrist bends to meet the wood. This is the same principle behind a drafting table. The above examples have all involved the wrist. What follows are some guidelines to keep in mind concerning the area from elbow to wrist.

Get a grip

Our fingers have strong muscles to bend and straighten them; however, they're not supported as well in side-to-side motions. Flattening the hand and using the fingers as a featherboard to push stock against a fence can easily damage the lateral stabilizing ligaments of the fingers. Eventually, such damage can cause the fingers to sway permanently out of alignment and, in doing so, decrease their function. Save your fingers from

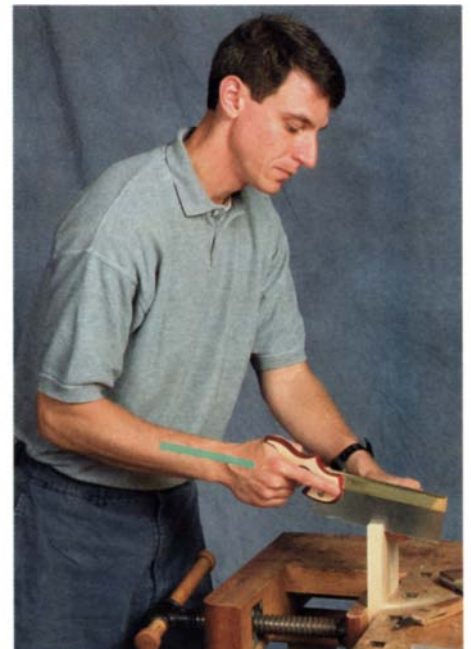
degeneration as well as amputation; use a featherboard.

Examining chisel handles can shed some light on gripping a tool. A mortising chisel is typically used in a vertical position, grasped by the nondominant hand and powered by a mallet. The handles tend to be of a larger diameter to minimize how much you have to bend your fingers. Often the handles are gently tapered to fit our conically shaped grip—wider at the index finger, narrower at the little finger. Some are elliptical in cross section, with the larger

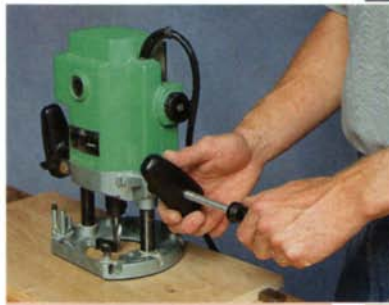
A bent wrist can lead to injury



To avoid a wrist injury while using a handsaw, change the tool or the position of the workpiece. The goal is to maintain the position of your hand in a straight line with your forearm.



Angle the tool's handle when possible



Some plunge routers have adjustable handles that help you maintain a correct and comfortable grip. If you can't adjust the handles, the next best approach is to change the height of the workpiece.



diameter perpendicular to the cutting edge. This allows your hand to feel whether the tool is twisting as it's driven into the stock.

Carving chisels are used vertically, horizontally and in every position in between. More finite, precise control is required with these tools, so more often than not the handles are narrower to allow the fingers to encircle the tool fully. Some current manufacturers provide faceted handles that aid the user in turning the tool as it slices, resulting in a cleaner cut. New carving chisels often sport handles that are narrower at the top and bottom and thicker in the middle. This allows the tool to fit in the hand better, whether it's being used toward or away from the carver. I miss having a positive stop on the handle nearest the blade—a feature you don't always find in new chisels. This stop allows the fingers to register

against something and decreases the exertion needed to counteract a tool slipping within the hand's grasp. You often find this type of finger stop on older paring chisels.

Lift with less gripping

A look at bench planes illustrates the principle of grip-lessened lifting. When we bought our house, I discovered a wood-bodied Stanley No. 29 under the main staircase—a good tool, but the horn of the rear tote was broken off. I used it to surface a few boards and found my forearm aching. I switched to my No. 5—with its rear horn intact—and the ache went away. The horn functions as a hook so that the large muscles of the arm can lift the plane, requiring less effort from the finger muscles. Likewise, I prefer the older mushroom-style front knobs because they seem to require

WARM-UP EXERCISES

Stretching muscles before you work, as well as during your workday, will help prevent injuries.

CHEST STRETCH

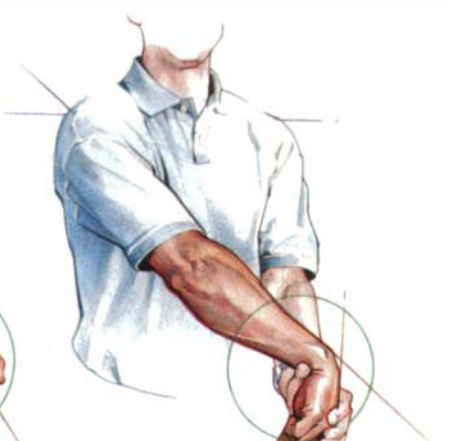
- Clasp your hands behind your back.
- Squeeze your shoulder blades together, trying to lift your hands away from your back.
- Hold for 20 seconds.

WRIST FLEXORS



With your elbow straight and palm up, gently grasp your hand with fingers straight. Bend your wrist toward the floor. Hold for 20 seconds.

WRIST EXTENSORS



With your elbow straight and thumbs down, gently curl your fingers and bend the wrist away from you. Hold for 20 seconds.

less gripping effort when repeatedly lifting a plane. This same concept applies to any tool frequently lifted. A tight-fitting O-ring rolled onto the top of a mortising-chisel handle can make a difference in preventing fatigue.

Some gloves hurt more than they help

Cold temperatures cause the blood vessels in our arms and hands to constrict, increasing the risk of developing overuse injuries. But putting on gloves to keep your hands warm is not always the best idea. Many studies show that gloves can decrease grip strength. This results in a tool more apt to slip and a muscular system less able to counter that tendency. I often suggest antivibration gloves when using tools, such as palm sanders, that generate significant vibration. However, I prefer the fingerless type, in which the palm material dampens the vibration while the fingers can maintain optimal function. Vibration, like cold, is a significant risk factor for injuries such as carpal tunnel syndrome.

A balancing act

I've been pleased to see more tool reviews discussing an important aspect of tool design—balance. A well-balanced tool allows you to concentrate on the outcome of the work the tool is performing, not on how clumsy or uncomfortable it feels in your hand. It's a sign of progress that more tools are being designed with ergonomics in mind, but be careful: Ergonomics also seems to be an overused label for marketing purposes—the equivalent of “new and improved.”

Certain styles of tools can give you problems no matter how you grip them. For example, a spray gun with its fluid reservoir above the trigger is inherently more tipsy in a side-to-side motion than a spray gun with the reservoir below the trigger. This tendency to wobble requires that you use forearm muscles to counteract the twisting, which wastes energy. Similarly, drilling pilot holes and using screw lubricants make it easier to drive a screw with less force. This translates into spending less energy having to stabilize the



Where hand meets tool



On larger tool handles (left) the thumb and fingers should overlap, but fingertips should not touch the palm. These fingerless gloves (above) don't inhibit grip strength while a gel padding dampens vibration to the palms.

tool with your forearm. Another low-tech example is to substitute a brace for a screwdriver, thereby placing the work burden on larger and stronger arm muscles.

The lesson to be learned here: Work smartly with tools that fit your style. And keep in mind that *you* need to be balanced as well as your tools. See the drawings on the facing page and below for simple stretches to elongate the muscles frequently used and abused. Make an effort to stretch more frequently when you're learning a new skill or when practice hasn't yet honed your neuromuscular system. And be extra cautious when the task at hand stretches out over several hours. □

Tom LeRoy is a certified physical therapist in Brunswick, Maine.

TENDON EXERCISE



Start with your hand in the open position (left). Curl your fingers into a hook (above), then return to the open position.



Make a flat-finger fist, then return to the open position.



Make a full fist, then return to the open position. Repeat the entire exercise three to five times without holding.

Keeping Plank Doors Flat

Five solutions, from standard to stylish



BY CHRISTIAN BECKSVOORT

Working strictly with solid wood, I take frame-and-panel doors almost for granted. To me it's a no-brainer: Isolate the wood movement of a large panel in a small frame that tends to keep the panel flat. Historically, frame-and-panel doors were a clear improvement over plank doors, and I haven't had much reason to return to the less stable form of construction. So when a student approached me recently with a project that involved two small slab doors, I had to stop and think.

After mulling it over, I came up with the standard solutions for stabilizing these doors. I covered battens, dovetailed keys, bread-

board ends and hidden breadboard ends, all of which she rejected. She was looking for a clean look with cleats that were invisible.

To get another point of view, we called over Andrew Garton, the head instructor for the 12-week intensive course at the Center for Furniture Craftsmanship in Rockport, Maine. His idea was new to me and yielded cleats that were totally hidden. My student was finally satisfied. This article covers all five of the options we explored, including the invisible method. □

Christian Becksvoort is a contributing editor.

Battens are the traditional favorite



Traditionally, plank doors were kept flat with horizontal battens or cleats on the inside of the door. These in turn were held in place with nails clinched over (or “killed,” hence the phrase “dead as a doornail”). Some barn and storm doors are still constructed this way. After the mid-1800s, screws often replaced the clinched nails. If the door was made of several boards, usually with tongues and grooves, a diagonal cleat was added to prevent sagging. A 2-in.-thick cleat will keep a ¾-in. door under control.

The advantage of the simple board-and-batten method is that it works on any size door, from small cabinets up to large passages. The disadvantage is that the cleats look clunky and can interfere with shelves inside a cabinet. Because this door tends to look primitive, it was not much used on furniture after 1850.



Quick chamfer with a block plane. The edges are relieved for decorative effect and to downplay surface irregularities and seasonal gaps.



Fitting splines to grooves. The advantage of spline-and-groove construction is that it requires only one saw or router setup, but tongue-and-groove construction is also commonly used. To allow seasonal movement, no glue is used.



Drilling for the battens. After the first hole has been drilled, an awl pins the batten in place. The author uses a combination drill/countersink to save a step and to ensure the alignment of the two operations.



Attaching the battens. Brass screws add a decorative touch and allow for some wood movement.

Dovetailed keys hide on the inside



An elegant method of keeping doors flat is to use dovetailed keys. Dovetailed slots are cut horizontally across the inside top and bottom of the door, roughly two-thirds of the door's thickness. Matching dovetailed keys are then slid into the slots and attached in the middle. The slots can be cut with a backsaw and a router plane. An easier method is to use a router and fence.

The major advantages of dovetailed keys are that they look clean and are flush with the inside of the door. Dovetailed keys are best suited for small doors. A full-sized kitchen cabinet door, made of a single slab of cherry, for example, will move $\frac{1}{4}$ in. seasonally. A gap that big is unacceptable. Also, these keys are not thick enough to stabilize anything but a small or narrow slab. Passage doors are out of the question.

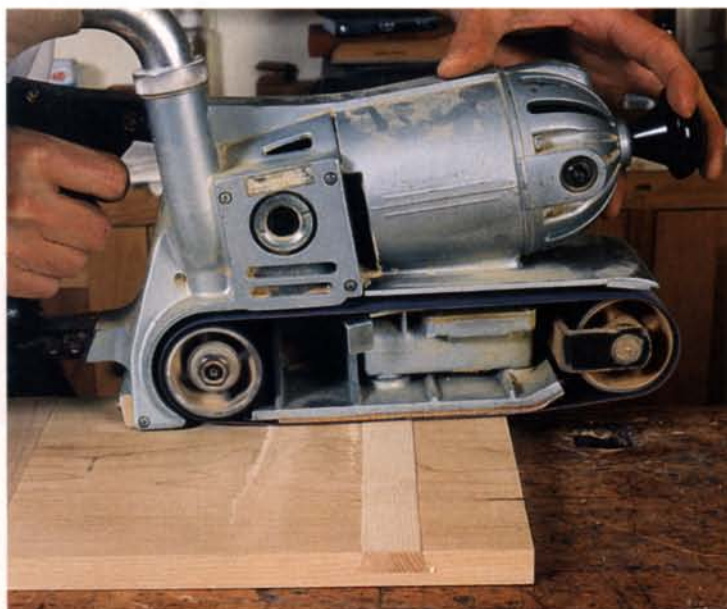
One way to rout the dovetailed slots. There is enough width simply to run the workpiece along the fence. Beware of the cutter emerging from the front of the piece.



The author also cuts the keys on the router table. A thin strip is left above the key to ride against the fence. An auxiliary fence protects the rip fence from the bit.



Trim the key until it's snug. The excess left above the key will be removed later.



The author sands the keys flush. A belt sander requires some skill but produces quick results.



One nail holds the key in place while allowing seasonal changes. Leave the keys a bit long, and then trim them flush.

Breadboard ends work on doors, too



Think breadboard ends, and tabletops immediately come to mind. However, this technique of keeping tabletops and cutting boards flat also works on doors. By cutting a long tenon or a series of individual tenons at the top and bottom of the door and then fitting breadboard ends, a plank door can be kept relatively flat. A single pin will hold the end in place and allow the plank to move.

I've seen this procedure used on a

variety of furniture styles. One example is the folding lid on a Queen Anne or Chippendale slant-top desk. The Shakers utilized it on small or narrow slab doors.

Like most of these stabilizing methods, breadboard ends work best on smaller doors. On wider surfaces, the amount of wood movement will be visually accentuated by the difference in width between the slab and the cross-grain ends.

THE "SPEED TENON"



This method works great for breadboard ends. After running the end of the plank along the rip fence to cut the tenon shoulders, run the plank into the side of the blade to create the cheeks. The rip

fence now acts as a stop. The ends of the tenon are cut the same way, but the workpiece is held against the miter gauge for additional support and accuracy.

After cutting the long mortises in the breadboard ends, trim the tenons to fit. A shoulder plane smooths and pares the cheeks.



Clamp the ends in place and drill for the pin. Each end is pinned in the center to secure it while allowing for seasonal movement.

4 Hidden breadboard ends show only at the edges



A twist on the traditional method is to use hidden breadboard ends. By altering the construction of these end cleats, they can be made to disappear on both the inside and outside of the door. The technique is actually simpler than the visible breadboard method. Grooves are cut in both the top and bottom edges of the door. The grooves ought to be one-half the thickness of the door, and two to four times the door thickness in their depth. Cleats (or ribs, if you will) are cut to fit the grooves, dropped in place and then anchored in the middle. To make sure that the cleats stay tight at both ends, they should be made with slightly concave bottoms. Clamps are used to pull the curved surfaces down against the bottoms of the grooves, and then the cleats are glued or pinned in place.

Even though this technique is not visible from either the inside or outside, the cleats can still be seen along the top, bottom and edges. This was not good enough for my student. She wanted nothing less than perfection.



Cutting the grooves. An auxiliary fence is taller and gives additional support.



Cut the cleats to fit the grooves, then plane their bottom edges slightly concave. Later, when they are pulled down into their grooves, the cleats will make firm contact at both ends.



Clamp down the cleats into their grooves, and drill for their retaining pins. A contrasting wood is used here for the pins, but the pins could be disguised by choosing the same wood used in the door.



Finishing up. Insert the pins, take off the clamp and plane the cleats flush with the ends and edges of the plank.



The student's cabinet design called for an elegant solid door with no sign of any stabilizing cleats. Andrew Garton solved this problem with an ingenious modification of the hidden breadboard end technique: Take the partially hidden cleats and move them completely inside the plank.

The doors for the student's project were to be small, $\frac{1}{2}$ in. by 7 in. by 10 in. We thought of two ways to create the voids for the hidden cleats: One employs a router; the other a tablesaw.

In the first procedure, the door starts about $\frac{1}{4}$ in. thicker than final size, to allow for saw kerfs and planing and sanding. A skin is resawn off one side. The bandsaw marks are removed

from both pieces by sanding or planing. Then, stopped slots are routed about $\frac{1}{2}$ in. from the top and bottom of the thick piece. The slots are $\frac{5}{8}$ in. to $\frac{3}{4}$ in. wide, extend almost to the edges of the door and leave only about $\frac{1}{16}$ in. of material at the bottom. Wood cleats are fitted to the slots but left $\frac{1}{4}$ in. short to allow the



A student's quest for perfection. Laura Smith, a student at the Center for Furniture Craftmanship in Rockport, Maine, got the stable but seamless plank doors she needed for this cabinet.

For those seeking perfection: invisible cleats

door to move seasonally. A spot of glue centers each cleat in its slot. Finally, the skin is glued back on.

Problem solved, we thought.

But the student had another curve to throw us: She wanted book-matched doors. So we did some more mulling and suggested resawing both doors out of one thick plank—the first door, a ¼-in.-thick skin and the second door—then gluing it back together in the same stack after the cleats were in place in both doors. When dry, the piece was resawn through the center of the ¼-in. skin and planed and smoothed to final thickness, yielding two book-matched doors with interior, invisible cleats.

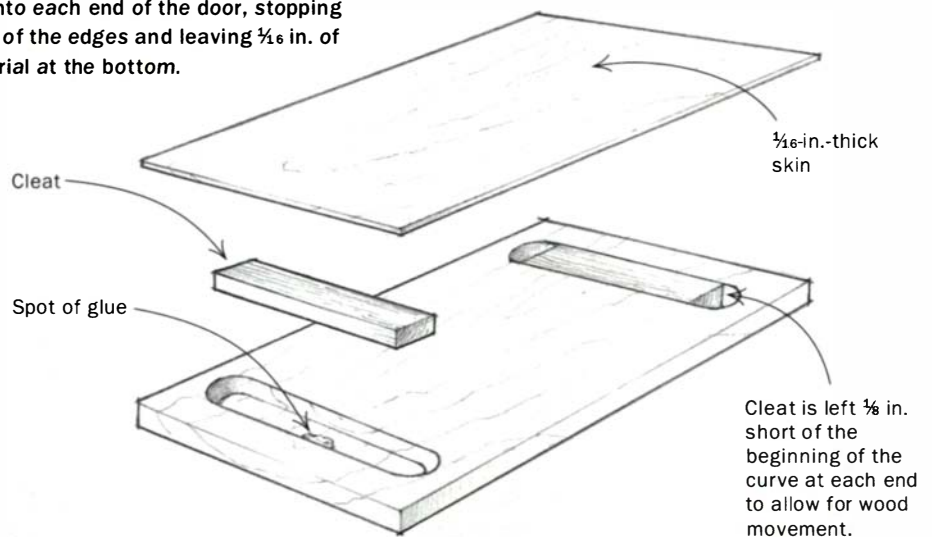
While we were at it, we came up with an alternative method for creating the hidden voids in the doors, one that doesn't require blind, stopped router cuts. A skin can be removed from both sides of the door using a bandsaw, and the core can be cut up on a tablesaw to create the slots. The door should start out about ½ in. wider and longer to allow for saw kerfs and smoothing.

The core is cut up and reglued to yield ¾-in. voids near the top and bottom. Next, one of the skins is reattached to its side of the door. When dry, the strips are glued into the voids. Plan ahead and plane the strips at the same time you plane the cores. Finally, the last face of the door is glued on.

These “crypto-cleat” methods demand extra work. However, they just might satisfy a woodworker who is seeking perfection.

ROUTER METHOD

Saw off a skin and rout a blind, stopped slot into each end of the door, stopping short of the edges and leaving ¼ in. of material at the bottom.



TABLESAW METHOD



Resaw a skin off each side. Then cut up the core and throw away two of the cutouts to yield two voids. Also, make the two cleats.



Apply glue and tape the core in place. A wide vise acts as a clamp. Sand or plane the glued-up core and the cleats flat before the next step.



After gluing one skin back on, add the cleats. Trim each cleat to a tight fit but short on the ends. A spot of glue will lock it in place and allow for seasonal wood movement.



Glue on the last skin and trim the door. When gluing on the skin, use clamping cauls to ensure even pressure.

Skew-Chisel Basics

Improve your lathe skills by turning rows and rows of beads using only a skew chisel

BY RICHARD RAFFAN



Good control comes with practice. Cutting repetitive beads with a skew chisel teaches the basic essentials of turning.

Many people buy a lathe with a specific job in mind. Furniture makers want to turn chair stretchers, drawer knobs or bun feet. Hobbyist woodworkers might want to turn parts for a grandchild's cradle and make bowls. But sadly, many novice turners have their enthusiasm so dampened by the tool catching and digging into the wood and ruining the job that they give up turning almost before they've started.

No matter what you want to turn on your lathe, a few days spent turning

grooves and beads between centers using a skew chisel will teach you the basic essentials of turning wood. The exercise will help you develop control and gain a feel for how little force is required to remove wood if a sharp edge is presented at the proper angle. Master the skew chisel, and other turning tools become comparatively easy to use.

Begin with a sharp tool

I grind a skew chisel with a very slight radius along the edge. Initially this was due



to ineptitude, but about 25 years ago I found several advantages to this grind, not least of which is that catches are less severe than when using a traditional straight edge.

Some skew chisels are rounded on the short-corner side so that they slide more readily along the average slightly pitted tool rest. The corners of the chisel can be rounded using a belt or disc sander.

I sharpen my chisels using either an electric grinder or a belt sander. My grinder has two wheels—36 and 80 grit. Use silicon-carbide wheels when sharpening high-speed-steel lathe tools. A grinder will put a concave or hollow-ground bevel on the tool. My belt sander is equipped with a 100-grit belt and will produce a convex bevel. Whichever method you use, don't grind a secondary bevel; it will make the tool difficult to control. Grind the tool on both sides and remove the burr with a benchstone.

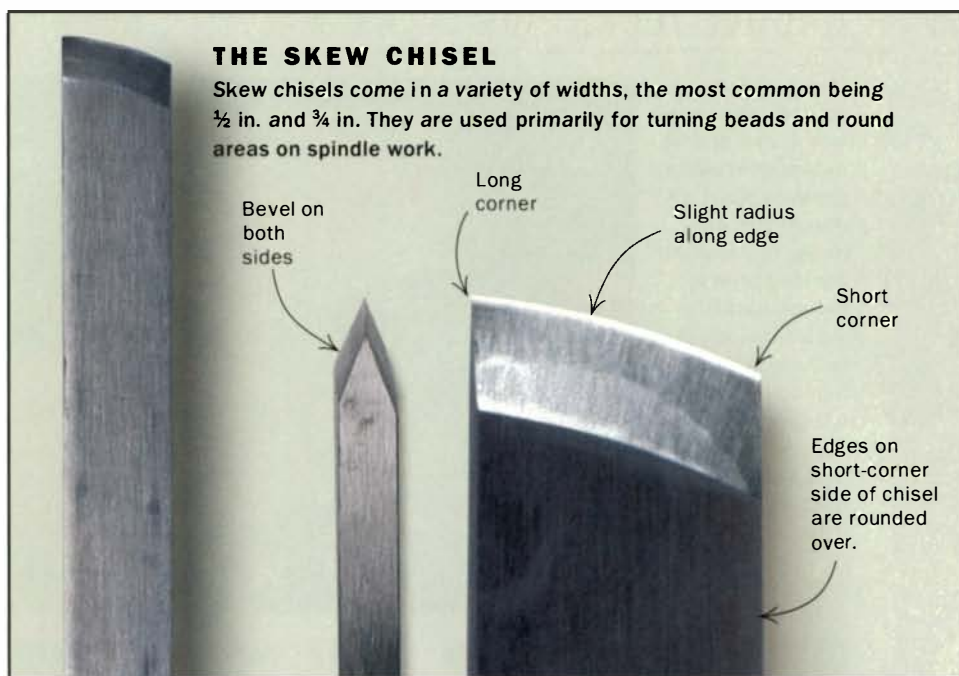
Practice on scrap or fresh cuttings

A construction site can provide plenty of acceptable lumber for practice exercises. Framing-lumber cutoffs may be had for the asking. Wood destined for the fireplace is also suitable. Choose straight-grained wood about as long as your tool rest. Adjust the tool rest to about center height and orient the stock so that the grain is parallel to the lathe's axis. Before turning on the lathe, spin the stock by hand to see that it clears the tool rest. Set the lathe speed from 1,500 rpm to 2,000 rpm. And don't forget to wear a face shield. Use a gouge, and turn the blanks into cylinders. (On small section squares you can complete the entire exercise using just the skew chisel.)

Cut a row of evenly spaced grooves

Turning grooves develops fine tool control. You need to pin the tool firmly to the rest with the long point down, then pivot the long point into the wood so that it enters the wood through an arc (see the photos on p. 86).

You can use either an underhand grip or an overhand grip (see the photos at right). I prefer an underhand grip: I hook the forefinger of my left hand under the tool rest, which allows me to pull the chisel firmly to the rest so it cannot easily move either sideways or forward as the point of the skew enters the wood. Other turners prefer an overhand grip, where the fingers are wrapped over the chisel's shank, and the



Two ways to hold the tool

There are two basic grips that may be used with the skew chisel. Try them both, and pick the one that gives you the most control. Whichever you choose, the tool addresses the stock in the same manner.



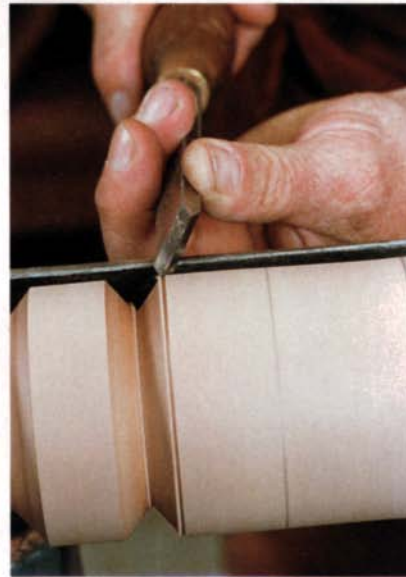
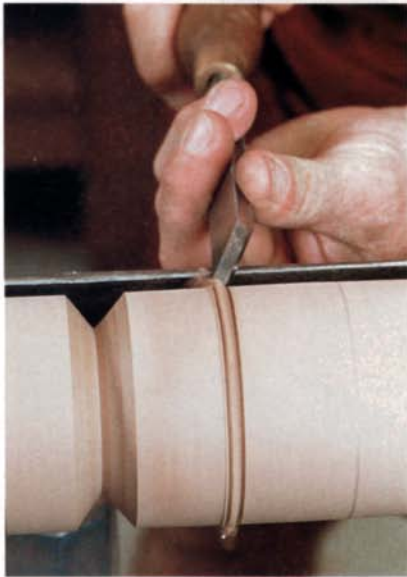
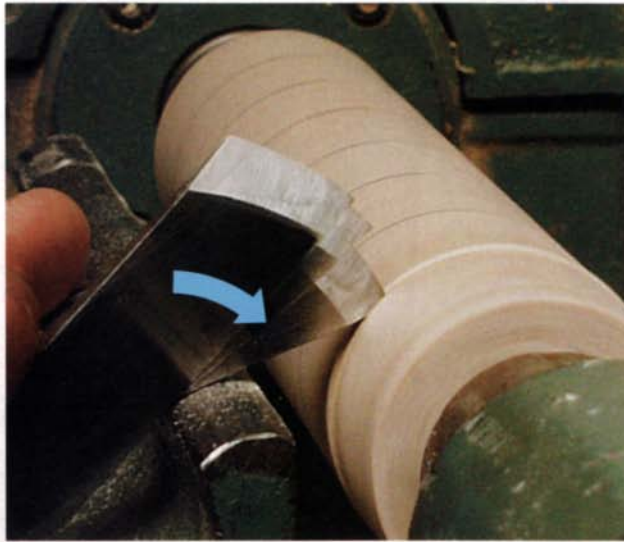
Underhand grip. The forward hand grips the shank from underneath, with the forefinger hooked under the tool rest.



Overhand grip. The forward hand wraps around the top of the shank, and the tool rest supports the heel of the hand.

GROOVE TECHNIQUE

Begin with a turned cylinder of wood, and pencil in the location of grooves. Start with the skew chisel on the tool rest with the long point facing down and the edge perpendicular to the axis of rotation. To start the cut, swing the tool in an arc into the workpiece. Don't push it as you would a pool cue.



Next, rotate the tool slightly to widen the V-cut. Let the point of the long corner of the skew chisel do all the work. Don't move your body or switch the grip.

What you want to avoid. If any portion of the skew's edge other than the point makes contact with the stock, a classic catch is the result.



heel of the hand leans against the tool rest. Don't push the tool forward as you would a pool cue. The idea is to align the bevel in the direction you want to cut, then pivot the tool into the wood on that line. Start by bringing the long point into the center of your groove 90° to the axis. Then cut in from either side to widen the groove.

You don't need to move your body very much or switch your grip during the cut. Swing your lower hand (the one gripping the chisel handle) through a small arc and roll the tool, first to one side, then to the other. The tool requires only the slightest movement to make the cut. The bevel should not contact the wood on this cut. Only the point should contact the wood. If any portion of the cutting edge other than the point makes contact with the stock, you'll have a classic spiral catch, where the tool suddenly digs in. Use the upper hand (the one nearest the tool rest) to keep the tool firmly planted on the rest.

Wider beads are easier to turn than narrow ones, so begin by spacing the grooves about 1½ in. to 2 in. apart. Resist cutting two grooves and then making a bead right away. Get on top of one technique before moving on to the next. Ideally, you should turn several dozen grooves on a number of spindles before attempting beads.

Now it's time for the beads

Bring the skew chisel to the wood with the long corner up and with the tool shank 90° to the axis. This cut is made by rolling the tool with the lower hand while the upper hand (on the rest) ensures the edge doesn't kick back as it keeps the tool pinned firmly to the rest. This grip works well cutting to the right because the thumb provides pressure high up the blade. But you can see that if this grip is adapted to cut to the left, the thumb now acts as a fulcrum, and there's no stabilizing pressure to guard against a kickback at the top of the tool. Catches are much more likely.

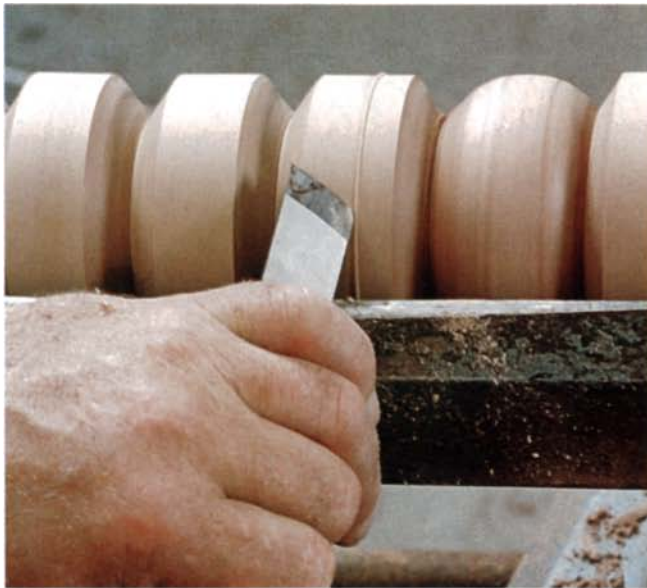
In general, an overhand grip, with your fingers hooked over the blade, gives you more control when cutting beads, although you cannot see what's happening as well as when using the underhand grip. Whichever grip you use, the motion to cut a bead must be smooth and without pause. It should take only a second or two to roll one half of a bead. Always start at the fattest portion of the bead (see the photos on the facing page).

BEAD TECHNIQUE

Whether you choose an over-hand or under-hand grip, the movement of the tool is the same. Begin by placing the tool's bevel against the rotating work. The short corner of the tip faces in the direction of cut.

Roll with it. Rotate the tool toward the groove with the forward hand.

Smooth operator. Stop the rotation once the tool has reached 90° and the edge is vertical and facing the groove. The entire movement should be smooth and take only a couple of seconds.



I prefer a slicing cut, using the leading portion of the edge just behind the short corner, but you need a very firm grip on the tool to avoid catches. You may, however, cut using the point of the short corner, keeping the edge clear where only the bevel side contacts the wood as the point shapes the bead. This latter approach is less prone to catches, and the finish off the tool is more than adequate. Although the work surface won't be as smooth as with the slicing cut, a dab of 120-grit paper will remove any irregularities. You'll need to learn both techniques if you are going to turn any end grain, as on a drawer knob or similar chuck-mounted project.

As you work toward center with the long corner up, it can be difficult to see the cut proceeding. So at that point, withdraw the tool, flip it over, and work with the long corner down, again ensuring that only the bevel side contacts the wood.

Once you have made one set of grooves or beads, continue practicing by reducing the diameter to a smooth cylinder so that you can begin the process all over again.

Handling thin stock



When cutting beads on delicate stock, support the workpiece from behind with one hand (note thumb against side of tool) and move the other hand farther up on the tool handle.

As the spindle becomes thinner, it will flex unless your cuts become lighter or you use your fingers to equalize the pressure of the tool against the wood. If your fingers get too hot, you are clearly pushing too hard.

With these exercises you'll soon be turning very slim spindles, at which time most other aspects of wood turning will seem comparatively simple, and big, fat spindles a dolly—that's Aussie, for very easy. □

Richard Raffan is a wood turner and author from Canberra, New South Wales, Australia.

From Rough to *Ready*

A one-man system
for preparing more stock in less time

BY ROGER A. SKIPPER

I'm a woodworker and a writer. I also enjoy eating regularly, so I have found other ways to supplement my income. A few years ago, I built a 3,000-bd.-ft. lumber kiln. Because many of my clients are basement woodworkers who have no practical way to turn rough lumber into finished stock, I am often asked to dress their stock as well as dry it. No problem. No problem, that is, if you have a 16-in. jointer and a rip saw. I don't.

When forced to dress 3,000 ft. of lumber at a clip, from wide and twisted material to long and crooked, I found that standard small-shop methods were unwieldy and slow. So I developed methods that streamline the process and also work well for a small shop on a shoestring budget. And these procedures are valuable for dressing any large amount of lumber, from 100 bd. ft. to thousands. The system combines efficient materials-handling, a few shop-made sleds and accessories and a logical order of operations. Here's how I do it.

Plane first

I tackle the planing operations first. Most of the lumber I dry has been cut on a portable mill. My biggest problems are the overall range of thicknesses and single boards with tapering thicknesses. Because my planer's maximum bite is about $\frac{1}{8}$ in., it doesn't take much taper to stall a board midway through the cut. It is also frustrating to watch your valuable time trickle away as a board too thin to reach the knives plods to a halt again and again. I sort the lumber as it comes rather than constantly adjust the planer. Find an average thickness of the lumber you are going to

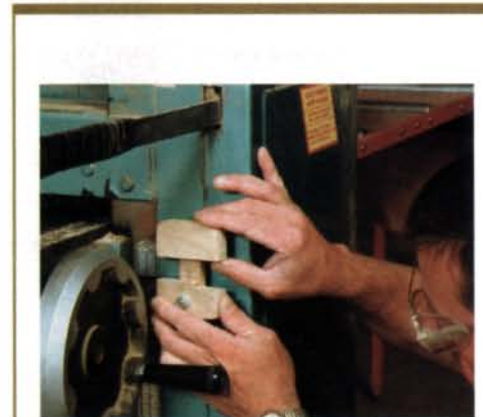
plane, and set your planer to take a medium cut from that measurement.

Go/no-go gauge—A two-sided thickness gauge will save you countless hours and aggravation. Measure the thickest part of the plank. If it's between the gauges, send it through the planer. If not, throw it back into either the too-thick pile or the too-thin stack. Also make a separate pile of twisted or bowed lumber for later processing.

As you feed the stock, flip any crowned lumber so that the concave side is down. This ensures that the edges will be of similar thickness and that the thin spot will end up in the center of the board. If it is fed in with the concave side up, the board will be unstable, and the pressure of the rollers will dominate on one side, with the planer biting deeply into the other edge. This often produces a board that is unusable for half its width.

Bark edges, common on rough lumber, often contain dirt and other debris that is bad for the knives, so I keep a drawknife handy to strip away bark. I constantly watch for hazards, such as loose knots or rotten areas, and cut them away with a small radial-arm saw. Broken ends that come to a point can get wedged under the planer and also must be cut away.

I am a one-man band, so I handle the outfeed side, too. I stack the planed lumber on rolling carts, close to the outfeed table. At the completion of the pass, I move the stack of lumber back to the starting point and offbear onto another set of wheels. With my radial-arm saw nearby, and my in-feed and outfeed stacks on both sides, I



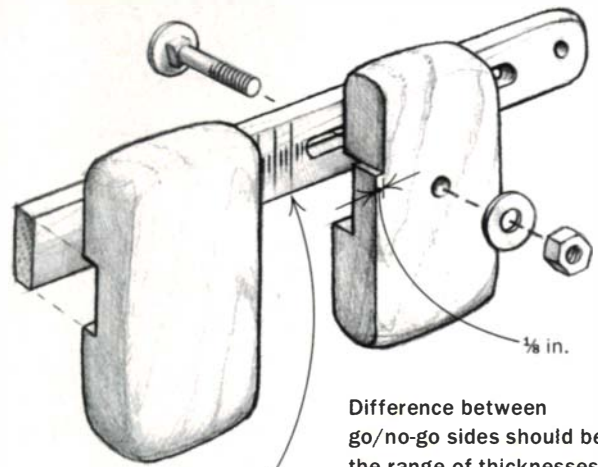
A small go/no-go gauge identifies boards that fall within the planer's $\frac{1}{8}$ -in. cut. Many sawmills don't deliver boards of uniform thickness. Valuable time is wasted when a tapered board binds in the planer or a thin board won't feed. Too-thick and too-thin boards are put aside for later passes.



PLANING

Efficient stock preparation without a 16-in. jointer and a rip saw. The author planes first, moving easily around an ergonomic workstation. A nearby radial-arm saw chops off problem areas, infeed and outfeed piles are readily accessible, and boards that are twisted or too thick or thin are stacked close by to be dealt with later.

TIMESAVING GO/NO-GO GAUGE



Graduated by $\frac{1}{16}$ in.

Difference between go/no-go sides should be the range of thicknesses that the planer can handle at a particular height setting, in this case $\frac{1}{8}$ in.

PLANING THICK, TWISTED BOARDS

This board is worth saving but is too wide for the author's jointer. The author uses leveling strips for thick boards that can withstand the pressure of the planer's feed rollers and aren't twisted too severely to line up with the 1¼-in.-high strips.



The leveling-strips method for twisted lumber. The plank is placed on a flat surface, and shims are placed under the high corners to even them out. Hardwood strips (¾ in. thick) are then screwed onto the sides, using 1¼-in. multipurpose screws. The strips offer three possible hole positions at each location.

The strips prevent the board from rocking as it passes through the planer, yielding one flat side. Then the strips are removed, and the board is flipped over and planed to a uniform thickness. The screw holes are ripped off the edges later.



can work through my piles without having to move around much and without being out of reach of the planer's off switch.

How to plane twisted and bowed lumber

Twisted and bowed stock will not yield full-thickness material. The more pronounced the bow or twist and the longer the length of the piece, the thinner the finished material. I cut these planks into 4-ft. pieces, sacrificing length to maintain thickness. Narrow lumber is simply leveled on one side on my 6-in. jointer, then planed to thickness. But all twisted planks wider than 6 in. are handled on the planer, with the help of the following accessories.

Leveling strips for heavy stock—Wider lumber, if only moderately twisted and if heavy enough to resist the pressure of the feed rollers, can be milled flat using leveling strips (see the photos at left). Lay the plank on a workbench or other flat surface, shim under the high corners to level the board overall, and lay a couple of ¾-in.-thick strips along the sides. Attach the strips with 1¼-in. screws. This gives a level surface to pass over the planer bed and will result in a flat surface on top. Then remove the strips, turn over the piece and plane it just enough to clean the board. The screw holes go in only about ½ in. on each side and can be ripped away.

Bowed lumber can be handled using the same method, with the concave side down.

Warning: Don't yield to the temptation to insert a row of screws in each strip and use only the necessary ones, allowing the others to protrude. These screws can come loose and become missiles and blade-destroying foreign matter. Remove all screws not in use.

Although this process is not a quick one, it allows the salvage of valuable lumber that would be wasted without access to a wide jointer. Twisted lumber is often highly figured and worth saving.

A sled for thinner or severely twisted stock—I developed this leveling sled to support severely twisted or thin stock that would be compressed by the planer's feed rollers (see the photos and drawing on the facing page). The sled consists of a stiff table with adjustable leveling supports placed every 6 in. I crosscut twisted lumber to 4 ft. or less, so I built a 4-ft.-long sled.

PLANING THIN OR SEVERELY TWISTED BOARDS

The planing sled is time-consuming to set up, but some boards are worth it. Butt the board against one side and one end of the sled and snug up and hand-tighten the end supports. Then snug up the rest of the supports and hand-tighten their fasteners. Note: This sled only accepts stock that is 4 ft. long or less, and the stock must be cut to a 6-in. increment in length so that its end is supported.



Remove the board temporarily. And tighten down all of the bolts.

Adjustable leveling supports are attached to the cross members every 6 in., measured from the rear fence. They are slotted for the bolts and notched to clear the center strip.

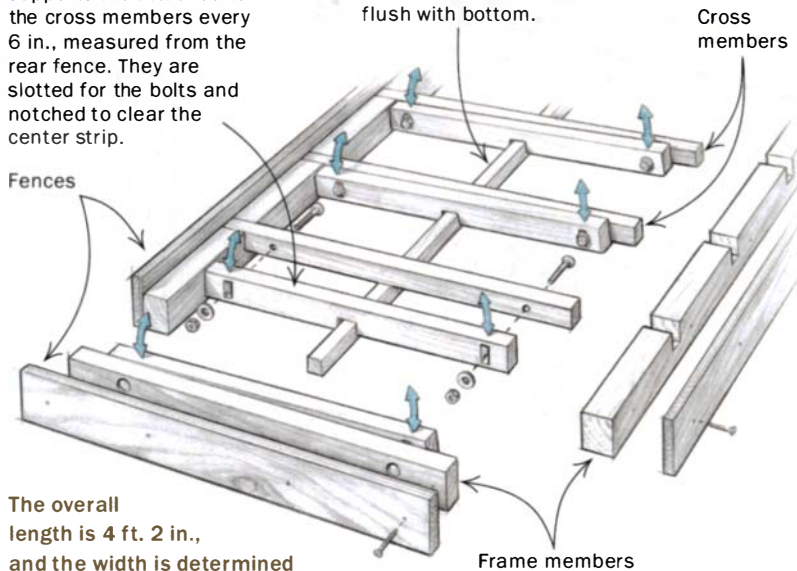
Center strip is screwed to cross members and flush with bottom.

Cross members

Fences

The overall length is 4 ft. 2 in., and the width is determined by the size of your planer. The solid frame is built first, joined with glue and screws. Then the adjustable supports are added, and the plywood fences screwed on.

Frame members



The entire sled goes through the planer. Multiple passes will probably be necessary to produce a flat side.

Lay down the board with one side and one end butted against the plywood fences on the edges of the sled, then adjust the supports to fit it underneath. The twisted lumber must be crosscut to a 6-in. increment so that the front end of the board lands on one of the adjustable supports; otherwise, the planer's feed rollers will force down the front end of the board and snap up the back end.

Run the sled through the planer until the

top surface of the board is flat. Then remove the lumber from the sled, flip it over and plane it to a uniform thickness.

When all of your stock is flat, you are ready for ripping.

Sled ensures a straight edge

My idea for a shopmade ripping sled came from observing the operation of a small rotary mill. Logs are loaded onto a sliding carriage that passes by a fixed blade. The

straight sliding action is the key to producing the straight ripped edge.

My tablesaw operation works on the same principle. I made a runner to slide in the T-slot of my saw table and attached it to the bottom of a carriage board. The front of the lumber is held in place by jamming the end into several sharp multipurpose screws. I hold the back of the board in place by hand as I push it past the blade. I originally put an elaborate T-slot on the top

RIPPING A STRAIGHT EDGE ON CROOKED BOARDS

The author's shop-made ripping sled rides in the miter slot on the table-saw. Hand pressure at the back of the board and screw tips protruding at the front of the sled secure the work-piece as it moves past the blade. Again, infeed and outfeed piles are easily accessible and placed on rolling carts.



PIVOTING STOP



Engage the pivoting stop before loading a board. The small wood stop will keep the sled from sliding forward toward the blade while the board is being pressed onto the screw tips. The stop is simply trapped against the edge of the saw table and the front rail of the fence system. When the board is loaded, the sled is drawn backward to release the stop, which will then pivot out of the way when the sled moves forward. Screws left protruding on each side keep the stop from flipping over the top in use.

of this sliding carriage, with a sliding clamp to hold down the lumber. But I found this clamp to be overkill.

Building the ripping sled—My sled had to be 16 ft. long; yours should be as long as the longest stock you use. Almost any length will require rolling infeed and outfeed support. I use 4/4 pine for the carriage board. Only the miter-slot runner will ride on the support rollers, but the carriage board is stabilized by the saw table.

The sled moves quickly and could jump out of the miter slot and into the spinning blade in an instant. To hold down the table during use, I recommend attaching a wider strip to the bottom of the runner, to fit into the wide part of the T-shaped miter slot.

A T-shaped hardwood runner will stand

up to home-shop use. But I use a more heavy-duty version built up from three 1/8-in.-thick aluminum strips, with 7/8-in. fender washers fixed loosely to the bottom. The bottom strip is interrupted for each washer, allowing it to sit flush. The washers are held only loosely by screws to allow them to wiggle around the sawdust that builds up in the miter slot.

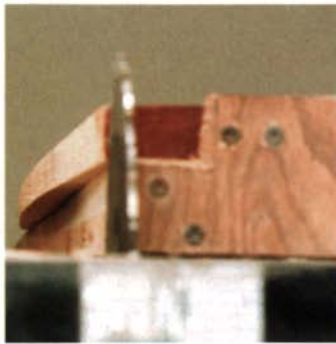
Attach the runner to the carriage board so that a bit of the board will be trimmed off the first time past the blade. The edge of the sled will indicate exactly where the sawblade passes. In use, you will be able to see and feel the overhanging portion of a board that will be cut off, and position the board for optimal ripping.

Snap a line on the carriage board for aligning and attaching the runner. Because

a chalkline is slightly fuzzy, and it is critical that this runner be straight, strike a sharp pencil line down the center of the chalkline, using a long straightedge. Fasten the runner to the board, countersinking the screw heads. When the runner is fastened, adjust your roller tables so that the bottom of this runner, not the bottom of the carriage, passes smoothly from the saw table to roller table. Good adjustment here will allow easy rolling later. The table will probably slide hard at first but will loosen up with use. A little paraffin wax helps.

All that remains is to put in the head block, a piece of plywood with screw tips protruding on the inside; a pivoting stop to keep the table from drifting into the blade while a board is being loaded; and return handles. The stop is a simple piece of Plex-

The edge of the sled is trimmed flush with the blade, so it is easy to tell how much material will be removed. You can see and feel the overhang and thus optimize the amount being ripped away.

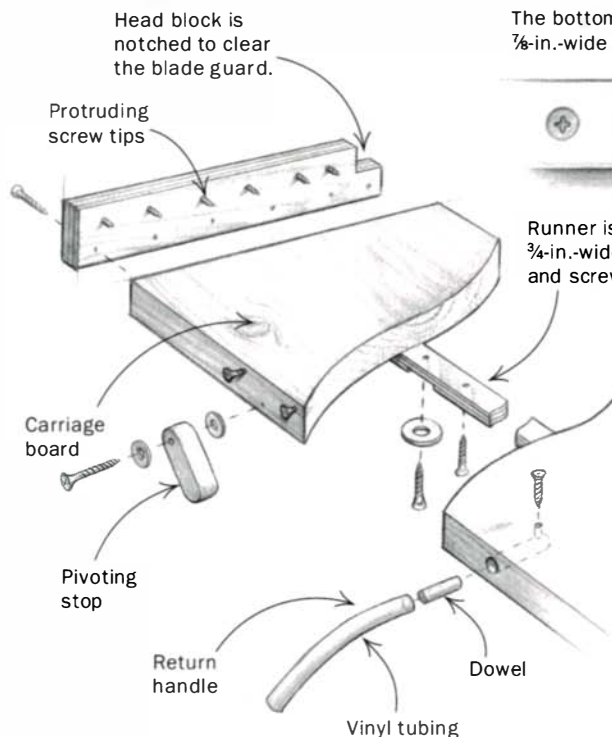


RUNNER DETAIL

The bottom aluminum strip is interrupted for $\frac{7}{8}$ -in.-wide washers, screwed loosely in place.



Runner is made of three $\frac{1}{8}$ -in.-thick by $\frac{3}{4}$ -in.-wide aluminum strips, stacked and screwed on.



The main component of the sled is the carriage board, made of a stable species 1 in. thick by 12 in. wide by any length needed. Aluminum makes a heavy-duty runner. The slightly wider washers keep the runner in the miter slot during use.

iglas or wood with a couple of screws added to keep it from flipping over the top. The return handles are pieces of vinyl tubing used to pull the table back to its infeed position after a pass. A series of these handles allows one to be handy wherever you end up. I installed rigid return handles on my first version of this sled, but a few painful encounters with these convinced me that flexible handles were better.

Using the ripping sled—Do yourself a favor and get a blade designed for ripping. The ease and speed of cut will make the purchase worthwhile.

Latch the sled in the rearward position. Lay a board to be straightened on the carriage, allowing whatever you wish to cut away to hang over the edge. Push the

board forward into the screws in the head block. Pull the sled backward a couple of inches to release the pivoting stop, then smoothly feed both the stock and sled through the saw as you hold down the rear of the board against the carriage. Push the sled past the blade a safe margin before removing the stock.

Severely crooked boards can be cut in half lengthwise, reducing the crook by a factor of two.

These stock-preparation methods aren't costly or elaborate, but they work very well. They'll get your next major project off the ground more quickly. □

Roger A. Skipper is a lumber processor, construction consultant and instrument maker in Oakland, Md.

Rolling carts for moving lumber

The heart of the rolling cart is a pair of heavy-duty swiveling casters. I purchased mine from the Northern Tool & Equipment catalog. For easier rolling, use wheels that are at least 6 in. dia., and size the weight capacity to reflect the loads you intend to carry. I got my heavy-duty casters for a little more than \$20 each. I opted for steel wheels, which roll



well on my concrete floor. If you are working on a wood floor, as is the case with the local lumber company that is using my system, rubber wheels are available for about the same price.

Use a section of 2x10 or 2x12, and screw plywood skins onto the top and bottom. Attach the casters with carriage bolts.

Don't think that you can use this method in your parking lot. It is a smooth-floor system only. Also, be aware of the concentrated weight exerted by each caster, and make sure your floor can handle the load.

Wheel pairs are easy to store. Two-caster assemblies take up far less space than a complete four-caster frame would.



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Michael Seward

Made in about 30 hours, this bar stool (24 in. deep by 24 in. wide by 30 in. tall) features a cherry seat, curly maple legs and walnut wedges and pegs. Seward said the most challenging part of this project was cutting the compound-angle shoulders on the round tenons that join the square tapered legs to the seat. The finish is hand-rubbed oil and varnish.



Sarah Christian

Christian designed this jewelry box (13 $\frac{3}{16}$ in. deep by 19 $\frac{3}{16}$ in. wide by 10 $\frac{5}{8}$ in. high) as she built it, working around the figure in the bird's-eye maple top. "The very top has a grayish, swirly figure that looked like clouds and forest hills in a Japanese landscape painting," she said. Bubinga and wenge are the other woods used in the piece. The finish is an oil-polyurethane mix.



Timothy Waite

A few years ago, relatives gave Waite several wide, live-edge cherry boards, which he used to build this stereo cabinet (22 in. deep by 26 in. wide by 61 in. high). "All of the boards had cracks running the length of their centers," Waite said, so he split them lengthwise and reverse book-matched each pair. "The unique void created by the live-edge joint," he said, "not only adds visual interest but also provides ventilation for the audio equipment stored within." The case is accented with black walnut details and finished with Danish oil and wax.





Timothy Simonds

Simonds, who once studied under marquetry master Silas Kopf, asked Diane Lawrence to draw the layout of the iris-motif panel from photos he took in his garden. The marquetry that resulted incorporates more than a dozen species of wood. The main carcass wood is Gonçalo alves. The sideboard is 20 in. deep by 70 in. wide by 39 in. tall.

Joe Amaral

This instrument cabinet was built at the College of the Redwoods before Amaral graduated this past spring. It is made of jarrah, European pear, holly stringing, faux tortoiseshell, bone, fossilized ivory and bronze. Amaral invested more than 750 hours of work in this piece.



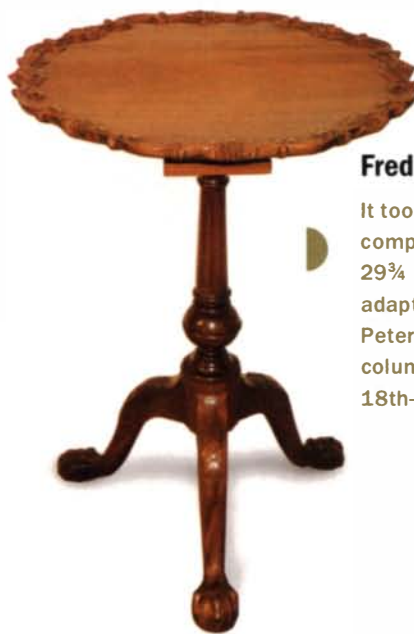
Bill Bellano

A recent graduate of Springfield High School in Springfield, Pa., Bellano made this spice cabinet when he was a senior studying under George M. Trout Jr. The cabinet (10 in. deep by 16 in. wide by 20½ in. tall) is made of mahogany and finished with a cherry stain. The dovetailed drawers were all hand-cut.



Peter Shepard

The sideboard, 21 in. deep by 54 in. wide by 39 in. high, is made of bubinga and accented with ebony. To accommodate several sets of silver, Shepard lined all of the drawers with Pacific cloth and outfitted them with flatware racks. The finish is tung oil and shellac. Photo by Dean Powell



Fred L. Stanley

It took Stanley, of Abingdon, Va., 80 hours to complete this mahogany table (22 in. dia. by 29¾ in. high). The design for the piecrust top is adapted from an 18th-century table attributed to Peter Scott in Williamsburg, while the fluted columns and ball-and-claw feet draw from various 18th-century designs. The finish is a French polish.



Harry Williams

Many visitors to Williams' home, just below the Hollywood sign in California, have been fooled by the realism of his carvings. His work ranges from a peopled ship in a bottle to hutches to the occasional movie prop. Photo by Cally W. Caizzo

Matt Putnam

As his final project at the William Sayre Woodworking School in western Massachusetts, Putnam decided to take on the reproduction of an antique linen press. His press, 22 in. deep by 51½ in. wide by 83 in. tall, is made of both solid and veneer mahogany, quartersawn white oak (for the drawer sides and bottoms), ebony and satinwood. While the cornice on the original press featured a starburst inlay flanked by two conch-shell inlays, Putnam's inlays are of the palmetto tree and crescent moon, to honor the flag of South Carolina, his home state. Photo by Lisa Clayton



Tony O'Malley

The first version of the "Shall We Dance" music stand (shown here in walnut and white oak) was made using a pile of thin strips left over from a long-forgotten job. Bent laminations form the front and back legs, and a single steam-bent strip joins them to form the sides of the stand. Each stand, 18 in. wide by 54 in. high, is made of a single quartersawn board, yielding consistent quartersawn grain throughout. The finish is rubbed oil-polyurethane. Photo by J.P. Hamel

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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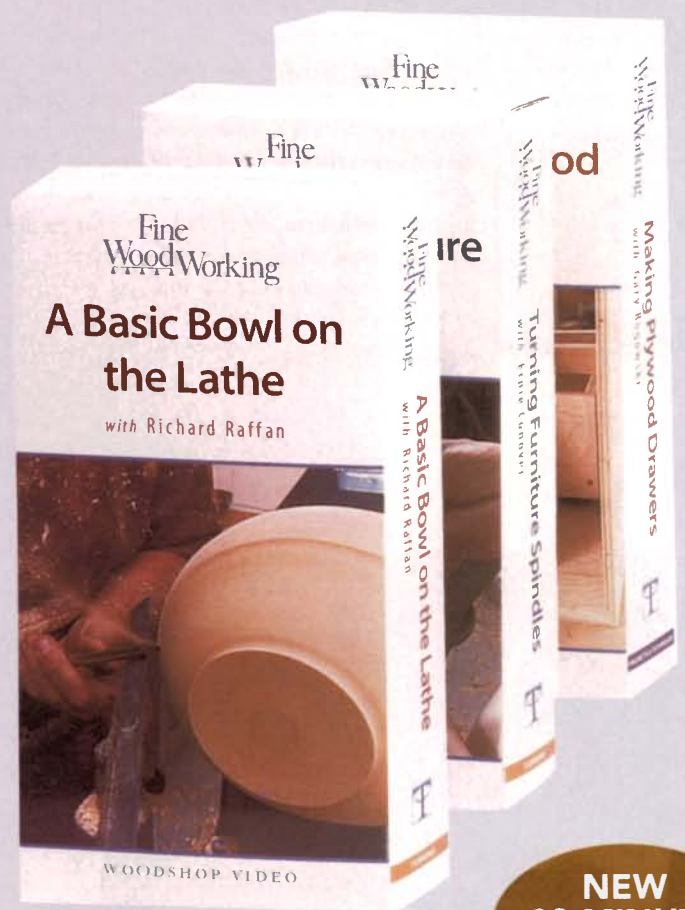
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The right wood for the job

Deciding which wood to use is typically the second step in the complicated process that results in a piece of furniture. We decide what we want to make, then choose materials. But this secondary step is of primary importance. There are good reasons to avoid certain woods in certain circumstances. Properties differ from one species of wood to another, making one type more suitable for a particular use than another.

A Windsor chair is a good example of how to take advantage of the properties of various woods. Customers regularly ask me to make a Windsor chair out of a single wood. I refuse. A good Windsor is made of three different woods. I point out that 200-year-old, three-wood Windsors are plentiful, and most are still as tight as the day they were made. On the other hand, single-wood factory chairs crumble within a decade. Early American chair makers understood that the chair parts serve distinct mechanical functions, and they chose materials accordingly.

A Windsor's undercarriage requires stiff parts that can withstand 200 squirming pounds. Because

crucial joints require a harder wood working against a softer one. For example, the spindle tenons are faceted and left slightly oversized. When driven into their corresponding holes in the softer seat, they deform the wood, creating an incredibly durable joint. Pine, poplar or bass will conform to the tenon and grip it. A wood that is as hard as the spindles, such as cherry or maple, will not.

Look beyond fashion

In the 80s I was usually asked to make all-walnut chairs. In the 90s it was all cherry. Woods go in and out of



Maple, yellow birch (from left)

the legs are turned, the wood must also hold crisp details. Mahogany or walnut may take the detail but won't have sufficient strength. A coarse-grained wood like oak is strong enough but will not turn as crisply. Maple and yellow birch fill both requirements.

I further explain that a Windsor chair's back is engineered like a suspension bridge. It is anchored at both ends, with a tough, flexible web between. The arm, bow and long spindles form a back that is like a partially coiled spring in that it flexes and absorbs stress. The back must be made of a species that is tough and flexible. Oak, ash and hickory are good choices. The stumps and short spindles support the back and, like the legs, need to be made of a wood that is rigid and turns well—again, birch or maple.

The seat anchors the back and the undercarriage. The Windsor's



Hickory, oak, ash (from left)

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Eighteenth-century Windsor chair makers chose their materials carefully, building chairs that have lasted 200 years. The Windsor's undercarriage, arm, stumps and short spindles must withstand stress yet hold crisp turning details; maple and yellow birch work well. The seat is made of a comfortable wood that is soft enough to accept faceted tenons—pine, poplar, bass. The thin bow and long spindles must be tough and flexible; oak, ash and hickory are common choices.



Pine, poplar, bass (from left)

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Rules of Thumb (continued)

favor. But fashion alone is frequently a poor reason to choose a wood for a project. Traditional uses exist because they have passed the test of time. Those who ignore them are asking for trouble. The following are some of the major reasons to choose one wood over another.

Strength—You want your project to last and be passed on to future generations. Above all, you do not want it to break or fall apart, because this does a number on your ego and reputation. The wood you choose should be sufficiently strong to withstand the piece's intended use. Furniture that bears the weight of the human body—chairs, beds, step stools, library stairs—normally is made of hardwoods.

Wear is another long-term concern. A pine surface in daily contact with human hands, elbows and feet will not hold up as well as durable hardwood.

Many pieces of furniture use more than one type of wood. While a desk is best made of a wood that will wear well, interior components are often made of softer woods that are less expensive and easier to work with.

Stability—Just as you do not want your piece of furniture to break, you do not want it to warp or pull itself apart. Some woods are more stable than others, meaning they are less likely to experience these problems. Woods such as mahogany and walnut are noted for their stability, while beech, hard maple and white birch have bad reputations based on their relative instability.

Stability is important for wide, unrestrained surfaces such as table leaves. It would not do for this surface to warp. However, it is also a concern in case construction, where wood movement could tear apart a piece and cause joints to open or drawers to bind.

Appearance—Wood species vary in their appearance. Some woods have

Dimensional stability. Walnut and mahogany are known for their dimensional stability, a very desirable property.

a pronounced figure and, when used in the right place, can produce dramatic results. Mahogany, walnut and many exotics offer bold figure. Some trees of otherwise even-colored wood—such as maple or birch—can also produce spectacular figure.

On the other hand, some woods—such as white birch, bass and poplar—are clear and bland. This property allows them to stain well or even masquerade as another species.

Color is another consideration. Some species are light, and others dark. You may want to select a wood that matches your decor or a client's. Many exotics have brilliant colors rather than the white, tan and brown typical of native woods. Contrasting woods can be used in a single piece of furniture to achieve a desired effect.

Appearance and fashion are significant factors, obviously. But a species' appearance should not overshadow the more paramount concerns of strength and stability.

Workability—Working wood requires effort, and some woods are harder to work than others. This is a definite concern if you do a lot of handwork. In the old days, cabinetmakers charged extra for furniture made out of maple as opposed to walnut or mahogany. Machines have equalized this problem somewhat, but hard-to-work woods will cause more wear and tear on blades and equipment, if not us.

The relative ease of working and joining pine and poplar has made them traditional favorites for interior components such as drawer sides, bottoms and slides.

Availability—It seems obvious that you can't make a project out of a wood that you can't get. But you may not want to choose a wood that is in limited supply—one that forces you to run from yard to yard to gather a sufficient quantity. There may be a similar species that is more readily available.

Price—With the price of hardwoods ranging from \$4 a board foot on up, the cost of materials is always a concern. If you or a client has a firm budget, you may want to substitute something less expensive for the wood of choice. Using butternut rather than walnut is an example. We recently made a run of handscrews for my school's shop. For the sake of appearance, I suggested cherry for the jaws, but I told the staff member we sent to the lumberyard to use his discretion. I was a lot happier when he bought 8/4 yellow birch at \$4 per foot rather than the cherry at \$6.

So-called "secondary" woods are usually less expensive and are used in areas that don't show. For example, pine was often used for cabinet backboards because wide boards were easy to come by and relatively inexpensive.

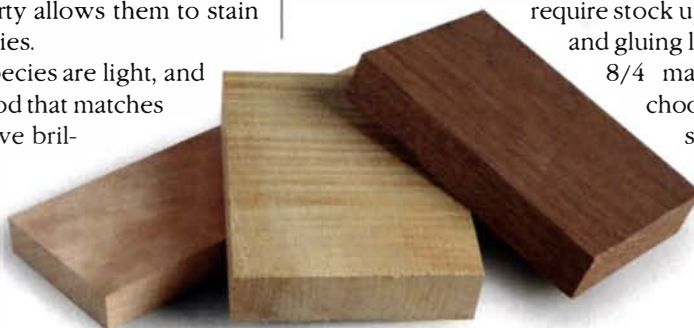
Dimensions—The length, width or thickness of the woods available at your lumberyard can also impact your decision. If you need wide boards for a tabletop, and the yard has nothing greater than 6 in. or 8 in., you may want to choose a comparable wood that is available in wider boards. Bedposts can require stock up to 16/4. Rather than jointing and gluing long posts from two lengths of 8/4 material, you may prefer to choose a wood that is available in sufficient thickness.



Secondary woods. Inexpensive and easily worked, pine and poplar are used for interior components in furniture such as drawer parts and backboards.



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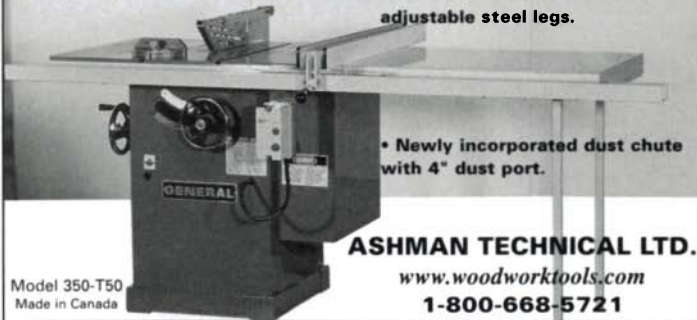
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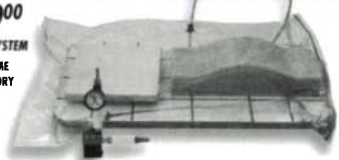
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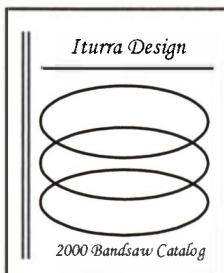
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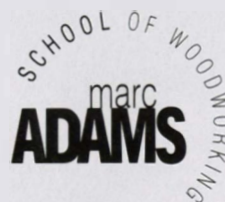
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Rust on machinery

I rubbed paraffin wax on the cast-iron top on my new tablesaw when I first got it, but the top tarnished and is starting to rust anyway. What can I do about this?

—Rob Davies, Toronto, Canada

Lon Schleining replies: Cast iron is notorious for tarnishing quickly anytime it gets the least bit damp. And paraffin wax is a relatively poor lubricant and water repellent compared with more modern materials. The good news is that it is easy

to have your cast iron looking like new in just a few minutes and even easier to keep it looking that way indefinitely.

The first order of business is to remove the tarnish, rust and wax. I would use a rubber sanding block and some 400-grit wet-or-dry sandpaper or fine-grit synthetic steel wool. Wear rubber gloves and use a small amount of mineral spirits to help cut through the wax. It should take only a few minutes of rubbing until the surface is smooth and shiny again. Wipe down the tabletop and miter slots

with a clean rag and keep adding clean mineral spirits until all of the dirt, wax and rust have been removed.

I quit using paraffin wax on my tools the day I discovered TopCote, a dry, silicone-free surface lubricant and water repellent manufactured by Bostik. It doesn't build up a sticky residue like paraffin wax inevitably does, the lubrication lasts almost indefinitely, and most importantly, it really keeps moisture out. Spray a liberal coat on the surface, let it dry for a few seconds and buff with a paper towel. I repeat this every few months. TopCote and other similar silicone-free products are available in popular woodworking catalogs.

By the way, this method of removing rust and protecting the surface will work for all the metal tools in your shop.

Finally, to keep your saw looking like new for the rest of its life, make a simple cover for it. Cut a sheet of 1/8-in. or 1/4-in. plywood to the size of your top. The last thing I do before I leave the shop in the evening is lower the tablesaw blade, move the rip fence out onto the extension table and place the protective plywood cover over the cast-iron table. One parting thought on the plywood cover: mark it clearly so you don't mistakenly cut it up into drawer bottoms. Not that I've ever done that.

[Lon Schleining is a woodworker in Long Beach, Calif.]

CLEANING AND PROTECTING CAST IRON

Remove the rust. Scour the surface with mineral spirits and synthetic steel wool or 400-grit wet-or-dry sandpaper. Wipe off the surface with a clean cloth and repeat as necessary.

Apply a protectant. After allowing the residual mineral spirits to flash off, apply a silicone-free coating such as TopCote. This will protect the tabletop and make it a slicker surface for workpieces.

Make a plywood cover for the surface. Every night before leaving the shop, lower the blade and cover the saw with plywood to help keep the surface rust-free.

Paint for bookshelves

My house renovation includes many built-in bookcases, to be finished off-white to match existing trim. The paints available across the counter dry hard enough for this purpose after only a year or so and seem to stick to books, which is really irritating. Spraying is out of the question in my house. Is there a brushable paint available for bookshelves?

—Karl Chamberlain, Las Vegas, Nev.

Chris Minick replies: This may surprise you, but most factory-finished painted furniture is not painted at all—at least not with hardware-store-variety paints. Furniture makers usually apply specially formulated pigmented coatings when a painted appearance is desired. Pigmented furniture coatings are engineered to have abrasion-resistance and print-resistance

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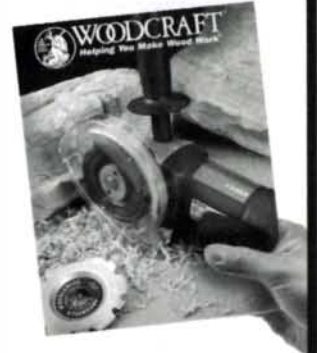
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properties similar to standard clear furniture finishes. Thus the softness and sticking issues you mentioned are avoided.

Pigmented furniture coatings can be purchased from suppliers that cater to the professional finishing trades (look in the phone book). A pigmented furniture coating is the ideal choice for your bookshelf project. Unfortunately for you, these coatings are designed to be sprayed.

However, a brushed-on hardware-store paint will work almost as well if you use a few simple finishing tricks. Here they are:

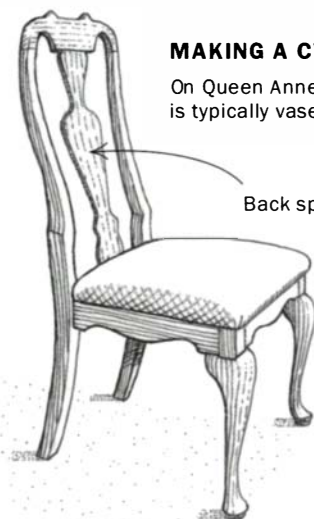
1. Prime the surface. Primers dry harder, fill defects better and sand easier than paint. As a bonus, fewer paint coats are needed over a primed surface. Shellac-based Zinsser BIN is an excellent primer under paint. Two coats of BIN lightly sanded will provide a good, hard base.

2. Select a good-quality paint. That old adage “you get what you pay for” holds true for paint, too. Interior trim enamel is a good choice for furniture. Trim enamel is a little harder than regular paint because trim needs to withstand abrasion and resist smudges better than walls.

3. Apply thin coats. Paint dries from the top down. When applied too thick, the paint forms a surface skin that traps solvent-laden, semidry paint underneath. It may take several weeks for the trapped solvent to evaporate through the skin and the paint film to fully harden. Multiple thick paint coats are the main cause for the soft, spongy surface you describe.

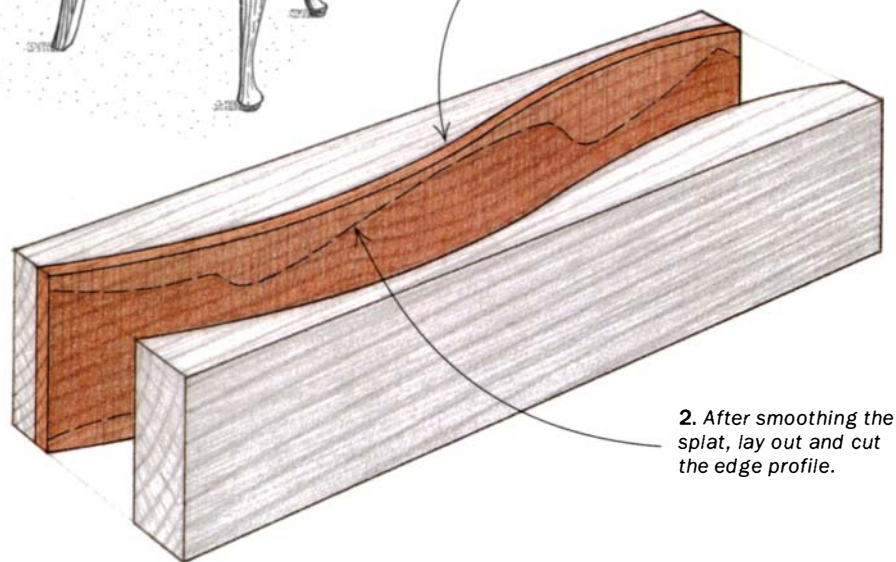
Obviously, “thin” is a subjective measurement. When I paint furniture I keep my paint-coat thickness to about 10 mils per coat (the thickness of three sheets of notebook paper). A 10-mil coat of paint will dry hard overnight.

4. Allow sufficient dry time between coats. Each coat must be completely dry before another coat can be applied. Otherwise trapped solvent will keep the paint film soft. “Dry to the touch” is not the same as “dry hard.” Twenty-four hours between coats is sufficient under ideal conditions, but most of us do not have ideal conditions for paint drying in our shops. So judge the drying progress for yourself. Lay your hand on the painted surface; if the surface feels cooler than the surrounding air, the paint



MAKING A CYMA-CURVED CHAIR SPLAT

On Queen Anne chairs, the gentle S-curved back splat is typically vase-shaped.



coating is not dry. Prime the wood, apply thin coats of good paint and let it dry—simple advice that will lead to the perfect paint job.

[Chris Minick is a finish chemist and a contributing editor.]

Curved back splat for chair

I am building a set of dining-room chairs. After the back legs pass the seat and become the chair back, they form a lazy S shape. I want to use a 6-in.-wide vertical panel down the center of the back of the chair. The panel should have the same curvature as the back legs. How do I create this curved panel?

—Bill Brox, Floradale, Ont., Canada

Mike Dunbar responds: The vertical extensions of the rear legs that frame the back of a chair are called stiles. A vertical panel that fills the void between the stiles and supports the sitter’s back is called a splat. And the gentle S-shaped curve you describe is known as a cyma curve.

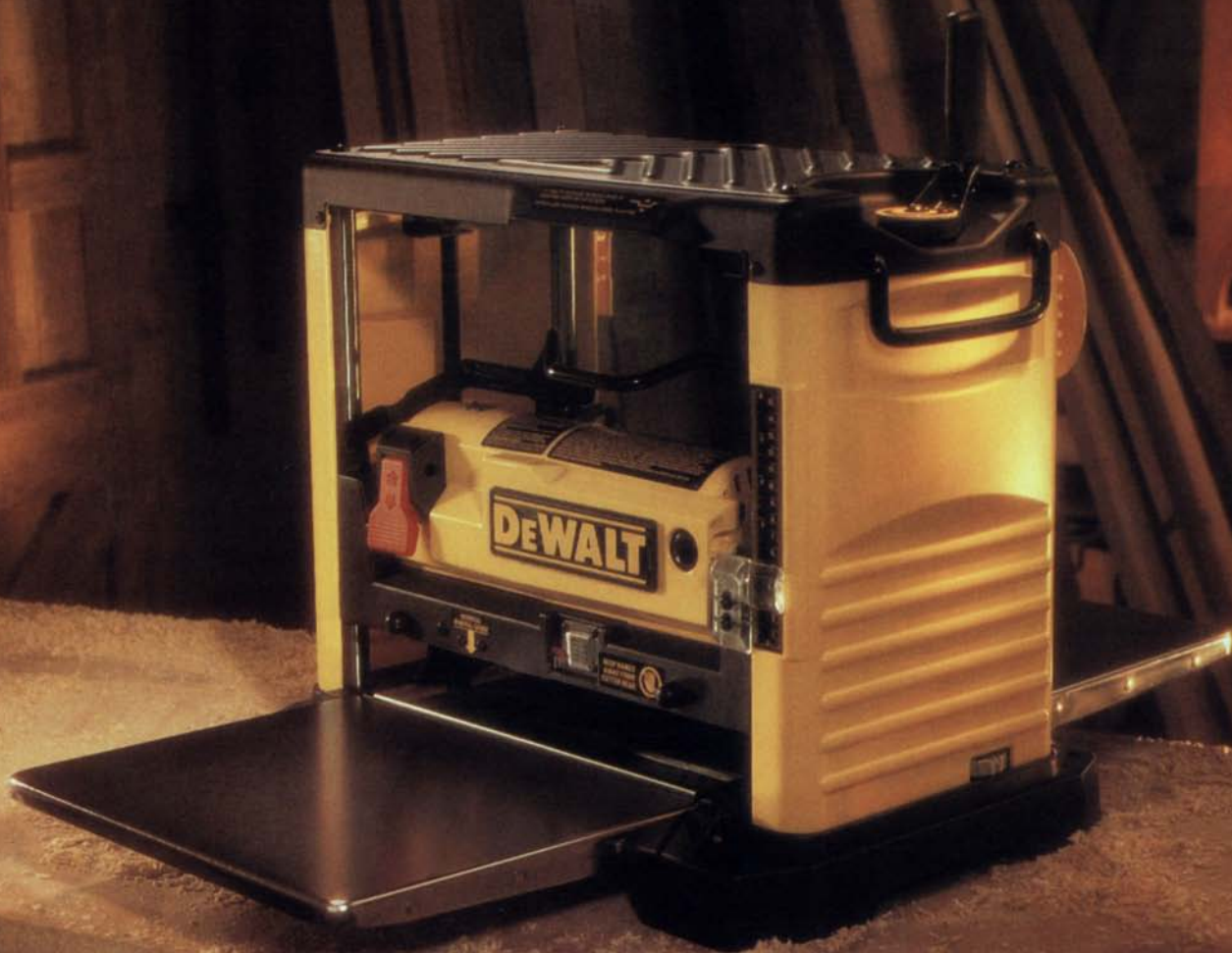
Although your chair may be a more

recent design (or your own), your description of it makes me think of Queen Anne chairs, which are known for S-shaped stiles and splats. Queen Anne chairs were ergonomically designed, with the cyma curve following the contours of the human back.

Seen from the front, splats frequently have a decorative shape. Although you do not mention such a profile on your chair, on Queen Anne chairs the splat was usually vase-shaped, said to be vasiform.

To shape your splat, trace the S-shape on the edge of the stock you are using and cut away the waste with your bandsaw. Shape and smooth the splat with a spokeshave and scraper. Windsor chair makers and instrument makers use small, round-bottomed planes, called compass planes, that fit in the palm of the hand. One of these might be useful. If your splat has a decorative profile, cut this on the bandsaw after completing the shaping and smoothing.

For a good description of the process of fitting a cyma-curved splat to a chair,



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consult Norm Vandal's book *Queen Anne Furniture* (The Taunton Press, 1990). [Mike Dunbar teaches Windsor chair making in Hampton, N.H.]

Aligning pilot holes and countersinks

How can I get countersinks aligned with their pilot holes?

—Willie Christy, Kingston, Jamaica

Bernie Maas replies: You're having difficulty maintaining alignment between pilot holes and the superimposed countersinks. Because of this, as screws are being driven home, mating pieces squirm out of line. Using one-step countersink/drill bits would solve the problem, but many of us either don't have these or don't have the right size.

Keeping a countersink perfectly aligned is difficult, but there are ways to make it easier. You don't mention the type of bits that you're using for the pilot holes. For precision, use bits that are specifically designed for boring wood, such as brad-



Accurate countersinking in wood. The first rule is to use a bit that is designed for wood. Avoid multilipped countersinks. The combination drill/countersink at left will guarantee a countersink that is concentric with the hole. The Weldon-style countersink (center) and single-lipped type also work well in wood, but the workpiece should be clamped to a drill-press table so it won't shift between drilling and countersinking operations.

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LU91M010	Cmpnd Mtr 10" 60"	88	54
SD308	8" Carbide Dado	230	119
SD506	6" Carbide Super Dado	279	154
SD508	8" Carbide Super Dado	344	175

MAKITA TOOLS		
Model	Description	List Sale
5090DW	3-3/8" Saw Kit 9.6 volt	213 139
DA391D	3/8" angle Drill 9.6V	142 95
DA391DW	3/8" angle Drill Kit 9.6V	216 139
6095DWE9.6	volt Drill Kit w/2 batt	240 125
6095DWE12	6095DWE w/flashlight	263 135
6095DWBLE	NEW 30th Anniversary 9.6 volt Drill Kit with light	250 145
632007-4	9.6 volt Battery	55 32
632002-4	9.6 volt Battery	45 29
ML902	7.2 volt Flashlight	Sale 9.95

18 VOLT MAKITA TOOLS		
Model	Description	List Sale
6343DWAEE	1/2" Drill Kit	458 255
5820DWA	3/4" Circular Saw Kit	458 255
DK1016	1/2" Drill & 6-1/2" Saw combo kit	698 389
DK1021BL	18 volt Combo Kit. Includes drill, 6-1/2" Circ. Saw, Recipro Saw, and flashlight	Sale 579

CORDLESS DRILLS WITH 2.0 AMP HIGH CAPACITY BATTERIES		
Model	Description	List Sale
6233DWAEE	12V 3/8" Drill Kit	293 169
6233DWAEE	14.4V 3/8" Drill Kit	358 205

9900B	3"x24" Belt Sander w/bag	322 165
9924DB	3"x24" Belt Sander w/bag	333 169
N1900B	3-1/4" Planer with case	268 142
1912B	4-3/8" Planer	360 215
N9514B	4" Disc Grinder 4.6 amp	106 65
DA3000R3/8"	Angle Drill	328 185
9401	4" x 24" Belt Sander w/bag	416 239
5007NBK7-1/4"	Circ Saw w/case	238 125
LS1011	10" Slide Compound Saw	807 429
3612C	3 HP Plunge Router	503 265
LS1040	10" Compound Miter Saw	474 249
LS1013	10" Dual Compound Slide Miter Saw	1087 529
BO5010	5" Random Orbit Sander	121 69
LS1220	12" Compound Miter Saw	678 335
9227C	7 1/2" Polisher	338 195
2702	8-1/4" Table Saw	538 305
2703	10" Table Saw	568 319
LS1212	12" Cmpnd Slide Miter Saw	999 759
5057KB	7-1/4" Circ. Saw for Hard board	649 329

SENCO AIR NAILERS		
Model	Description	List Sale
SFN30	Finishing Nailer w/case	459 249
SLP20	Pinner w/cs 5/8 - 1-5/8"	422 189
SKS	Stapler 5/8 - 1-1/2"	390 259
SN65	Framing - Full Hd 2 - 3-1/2"	709 359
SN600	NEW Framing 2 - 3-1/2"	699 339
SFN40	Finish Nailer 1-1/4 - 2-1/2"	569 329

BOSTITCH AIR NAILERS		
Model	Description	List Sale
BN90S-1	Stick Nailer	Sale 255
RN45	Coil Roof Nailer 3/4 - 1-3/4 845	339
NE0FN-2K	Finishing Nailer w/case	557 239
BT3S-2K	Brad Tacker 5/8" - 1-3/8" with case, oil, & brads	279 125
MIRFS	Flooring Stapler 15 gauge	902 539
S32SX-1K	Finish Stapler 1/2" - 1-3/8" with case & oil	269 135

JORGENSEN ADJUSTABLE HANDSCREWS				
Item#	Length	Capacity	List Sale	Box of 6
#0	8"	4-1/2"	20.35	12.95 69.95
#1	10"	6"	23.30	14.50 79.95
#2	12"	8-1/2"	26.75	16.25 92.50
#3	14"	10"	33.85	20.25 114.95

PONY CLAMP FIXTURES			
Model	Description	List Sale	Lots
50	3/4" Black Pipe	15.45 8.50	94.00
52	1/2" Black Pipe	12.65 6.95	97.00

PANASONIC CORDLESS		
Model	Description	List Sale
EY6431NQKW	1/2" 15.6V drill kit with two 3 amp-hr Ni-Mh batteries, 45 minute charger, & case	372 205
EY6431FOKW	1/2" 15.6V drill kit with two 2 amp-hr Ni-Cad batteries, 30 minute charger, & case	342 189
EY6407NQKW	1/2" 12V drill kit with two 3 amp-hr Ni-Mh batteries, 45 minute charger, & case	339 189
EY6406FOKW	3/8" 12V drill kit with two 2 amp-hr Ni-Cad batteries, 30 minute charger, & case	305 169
EYC133	5-3/8" 15.6V Wood Cutting Saw and Drill Kit	650 379
EY3790B	12V Lantern	Sale 19.95
EY3793B	15.6V Lantern	Sale 19.95

BIESEMEYER FENCES		
Model	Description	List Sale
B-50	50' Common. Saw	443 325
T-SQUARE 52	52' Homeshop	360 275
T-SQUARE 40	40' Homeshop	335 255
T-SQUARE 28	28' Homeshop	325 245

HITACHI TOOLS		
Model	Description	List Sale
C8FB2	8-1/2" Slide Compound Saw	1169 449
C10FS	10" Slide Compound Saw	1627 579
C15FB	15" Miter Saw	1346 859
EC12	2 HP, 4 gallon Compressor	561 259
CR13VA	NEW Recipro Saw-11 amp	239 165

STABILA LEVELS		
Model	Description	List Sale
25010	10" die cast Torpedo Level	Sale 21
24640	24" Level w/hand holes	Sale 48
24670	48" Level w/hand holes	Sale 59
03100	Compact Laser Level with remote	Sale 359

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Model	Description	List Sale
DW124K	1/2" right angle Drill	590 329
DW321K	Top Handle Jigsaw Kit	300 164
DW364	7-1/4" Circ. Saw w/brake	294 155
DW378G	7-1/4" Framer's Saw	210 149
DW610	1-1/2 HP 2 handle Router	266 149
DW411K	1/4 sheet Palm Sander w/cs88	58 169
DW682K	Biscuit Joiner with case	448 169
DW705	12" Compound Miter Saw	734 339
DW621	2 HP Plunge Router	400 199
DW677K	3-1/4" Planer with case	268 155
DW272	Drywall Gun, 0-4000, 6.3 amp	160 95
DW276	Drywall Gun, 0-2500, 6.5 amp	160 99

DEWALT CORDLESS DRILLS		
Model	Description	List Sale
DW972K-2	3/8" variable speed w/ two 12V XR batteries	362 169
DW991K-2	3/8" variable speed w/ two 14.4V XR batteries	415 199
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DW991KS-2	DW991K drill, DW935 trim saw, 2 XR batteries & case	Sale 345

DEWALT 18 VOLT CORDLESS TOOLS		
Model	Description	List Sale
DW933K	Jigsaw Kit	468 275
DW938K	Recipro Saw Kit	520 269
DW995K-2	1/2" Drill Kit w/ 2 batt	Sale 258
DW997K-2	1/2" Drill/Hammer Drill Kit	454 259
DW995KS-2	DW995K Drill, DW936 Saw and case	Sale 399

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Model	Description	List Sale
DW006K	1/2" Drill/Hammer Drill Kit	560 299
DW007K	6-1/2" Circular Saw	560 299
DW008K	Reciprocating Saw	560 299

DEWALT BENCH TOP TOOLS		
Model	Description	List Sale
DW708	12" Slide Miter Saw	Sale 599
DW788	20" Scroll Saw	Sale 449
DW733	12" Planer w/extra blades	Sale 399
DW744	10" Portable Table Saw	Sale 499

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1660791	5 HP Model 66 Table Saw	2690 2199
1270100	3 HP Model 27 Shaper	2899 2299
1791237	Hollow Chisel Mortiser	887 649
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LT8-300P	Level Transit - 26x	869 649
4810-3	ML600 Visible Beam Laser	Sale 879
4700-2	Auto 900 Visible Beam Laser	Sale 1049
ALP8-22	Automatic level - 22x with tripod and rod	Sale 345
AL8-26	Automatic Level - 26x	854 299
ALP8-26	AL8-26 with tripod & rod	Sale 359

BOSCH		
Model	Description	List Sale
1587AVSC	Top Handle "CLIC" Jig Saw Kit with case and Progressor blades	Super Sale 155

point bits. Choosing a countersink should be done similarly. The Weldon line is a good pick because the bits are designed for wood. Single-lipped countersinks also give excellent results. Stay away from the multilipped variety; they are designed for metal and often chatter in wood.

To drill straight holes and accurate countersinks, your best bet is the drill press. If you use a fence and a hold-down in conjunction with the drill press, your alignment should be close to perfect.

The wood is also a factor. Wood with a consistent grain will be predictable. On the other hand, if you're working a wood such as oak, with combination of open and closed grain, or fir, with extremes in hard and soft grain, results may be erratic because the bit bounces from spot to spot seeking out the path of least resistance.

Finally, remember that the object of the operation is not necessarily to bore holes and countersinks that are concentric but to screw mating parts together so they remain in a predetermined alignment. This is done simply by first aligning the

mating parts and then securely clamping them together. Use glue when possible. Don't release the clamps until the glue has set up. With the two parts affixed securely to each other, the screws will conform to the wood, and the alignment will be retained. If you rely solely on the screws to draw the mating parts together, you're asking for trouble.

[Bernie Maas is a professor of woodworking at Edinboro University in Pennsylvania.]

Dragging a plane backward
In the metal trades, we were taught never to back-drag a file or hacksaw across the workpiece because it contributes substantially to the dulling of those tools. Does the same go for a handplane?

—Lee R. Spears, Delta, Alaska


Mario Rodriguez replies: No, I don't think pulling your handplane back over your workpiece will significantly dull or damage the blade's edge. I typically set

my blade for a light cut, which requires steady downward pressure to produce a shaving. So I would have to apply substantial downward pressure when pulling the plane backward to get the blade to rub hard against the wood's surface and become dull.

Another common concern among woodworkers is whether a blade is dulled or damaged when the plane is set right-side up on the workbench instead of on its side. If the benchtop is clean and free of debris, a handplane should be fine standing upright.

I think, generally, that woodworkers should be less concerned about preserving a delicate edge and spend more time developing an effective sharpening regimen that will deliver a razor-sharp edge whenever they need it. [Mario Rodriguez is a contributing editor.]

Send your questions to Q & A, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506 or e-mail it to fwqa@taunton.com.

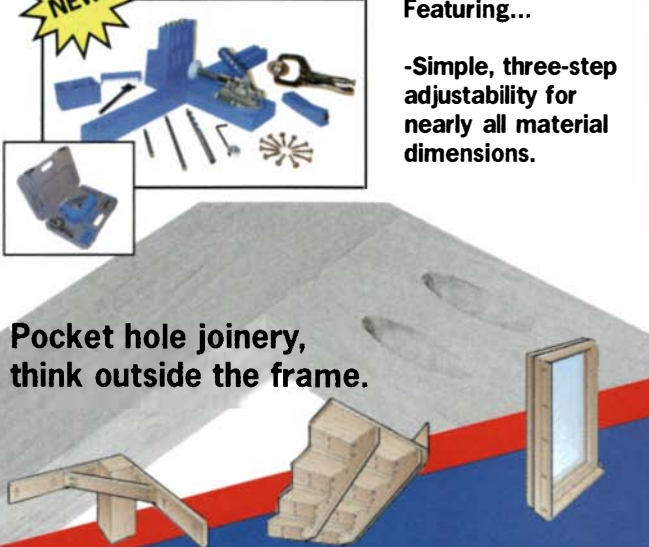
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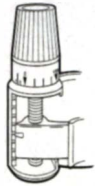
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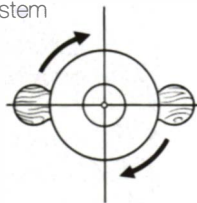
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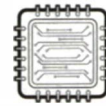


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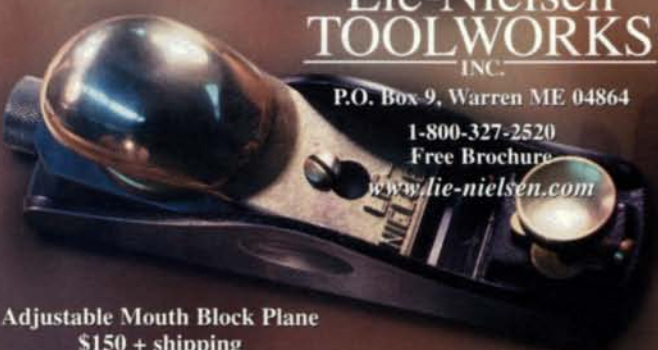
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Master Class

Leather as a writing surface and design detail



This prairie-style desk was inspired by the Ward Willets house, built by Frank Lloyd Wright. The author built the desk with quartersawn white oak. The writing surface contains three leather-covered panels. Smaller leather-covered panels are used throughout as part of the design.

BY KEVIN RODEL

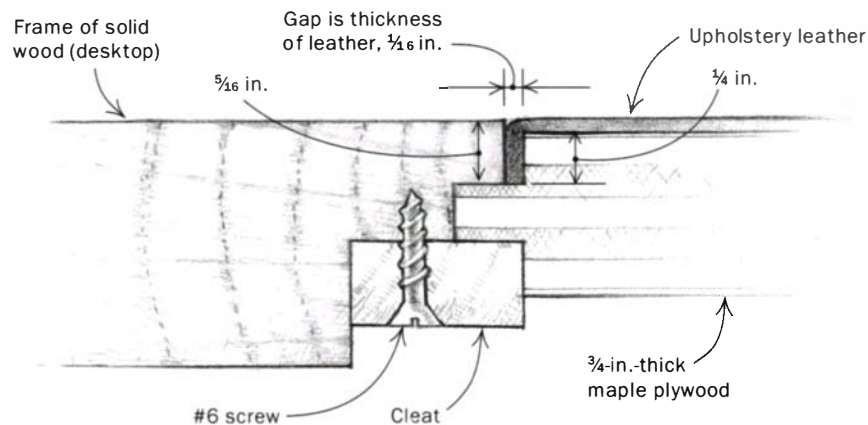
I like to incorporate different craft materials into my designs. Handmade tile, art glass, inlay work or leather all are appropriate to the Arts and Crafts style. When I designed my prairie-style desk, it just cried out for leather-covered panels. The large and small panel areas allow the vertical and horizontal structural elements of the desk to stand out, unencumbered by massive planes of solid wood.

Although I had never worked with leather, I was not about to let that minor detail derail my plans. My biggest concern was how to glue the leather to a substrate. Before going ahead with the project, I practiced on scrap. I tried a spray-on adhesive, which bonded well but was difficult to keep off the good face of the leather. Then I experimented with contact cement. That was too stressful, because once the leather is down, it cannot be shifted. I



DESKTOP DESIGN

The leather-covered panel is flush with the framework. Cleats screwed to a rabbet on the underside of the frame hold the panel in place.





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Master Class (continued)

finally settled on yellow glue diluted with water. The mixture of two-thirds glue to one-third water by volume gives me extra time to make adjustments and shift material, holds the leather extremely well when set and doesn't turn the leather into a stiff sheet of cardboard.

Choose the leather first

Leather comes in a variety of grades and colors. It's important to choose the leather carefully, for grade and for color, so that it integrates with your design and choice of woods. That's why I've established a relationship with one supplier. I've visited the shop and seen the samples and know what I'm getting. I use upholstery-grade, full-grain, aniline-dyed cowhide. In this particular piece, I used an antique, wine-colored leather, which worked well with the client's existing room decor.

My supplier sells only full hides of this grade, and I spend about \$500 per hide to

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get a good-quality, soft leather. Fortunately, I can get two desks out of one hide. If you don't need a full hide, it may be difficult to find the higher-quality leathers. Before starting the project, shop around to see what's available, either locally or through mail order.

The leather-covered panels are flush to the rest of the tabletop, which produces a comfortable work surface and helps protect the leather should an object be slid across the desk. A slightly raised surface is more prone to damage.

Build the frame and cut plywood panels to fit

Plywood makes a good substrate for leather. I use ¾-in. maple veneered plywood, which has a smooth surface. For smaller parts, such as the decorative panels on this desk, I use solid wood. Leather stretches, so any expansion and contraction won't be a problem with small panels.

Leather varies in thickness. The type I

WORKING WITH LEATHER



Measure the size of the panel plus the wraparound, and make a cardboard template of that size. Trace the outline onto the leather using a soft pencil. Keep firm pressure on the template to prevent the leather from stretching.



Leather's expensive, so cut carefully. A metal straight-edge works as a cutting guide (left). Use a sharp knife and cut over a sacrificial surface, such as a sheet of plywood. Notch each corner where the folds will meet (right). Take care not to cut away any more leather than necessary; otherwise, the plywood will show through.



Mask the tongue of the plywood panel to keep it glue-free. Then spread a layer of diluted yellow glue (two-thirds glue, one-third water) over both the leather and plywood panel. The author uses a scrap piece of wood as a squeegee.

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buy is about $\frac{1}{16}$ in. thick. You must take that thickness into account when dimensioning the panels. I aim for a snug fit, so the panels are $\frac{1}{8}$ in. narrower than the frame in both width and length.

I mill and glue up the desktop frame first. The underside is stepped to allow for a cleat and the tongue of the leather-covered panel (see the drawing on p. 120).

Once the top frame has been completed (glued but without finish applied), cut a plywood panel (or panels) to fit cleanly into the first, or deepest, rabbet in the underside of the frame. Then mill the tongue on all four edges of each panel. The panels, when fitted to the frame, should sit below the frame by only the thickness of the leather.

Make a template for cutting the leather

Figure out the size of the leather required by measuring the panel. The leather wraps around the rabbet, so be sure to add extra for that. I make up a cardboard template sized for the leather cutout.

Once the leather is set onto the glue-covered panel, use a veneer roller to press it in place. Start from the panel center and work out to the edges. It's important not to press too hard with the roller, or you may leave tracks. If you do get tracks, massage them out with your hands. Take care not to get any glue on the exposed leather surfaces. After several hours the glue should be sufficiently set to remove the panel. You are now free to finish the project by any method you prefer.



WORKING WITH LEATHER (continued)



Using a veneer roller, press the leather firmly onto the plywood. Begin in the center and work toward the edges.



Press the leather over the edges and into the corners. The leather may stretch. If there's excess, trim with a knife, pressing firmly into the corner of the rabbets.



Place the leather-covered panel into the rabbeted frame. One set of rabbets seats the panel; the other set houses cleats to keep the panel in place, flush with the frame.



Seat the panel using a mallet. The frame helps seat the leather while the glue sets.

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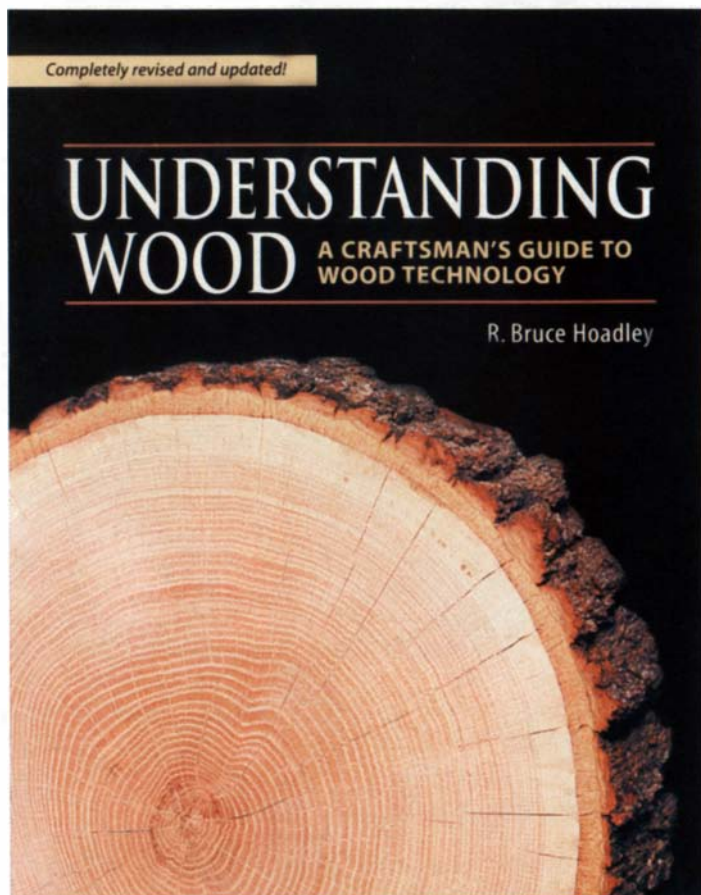
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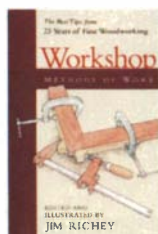
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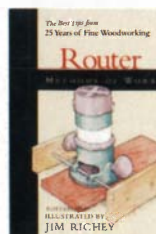
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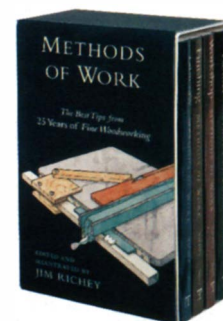
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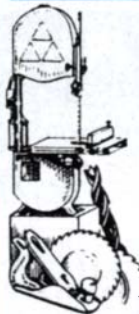
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INDEX TO ADVERTISERS

Use reader service card - inside back cover.

Reader Service No.	ADVERTISER, page #	Reader Service No.	ADVERTISER, page #	Reader Service No.	ADVERTISER, page #	Reader Service No.	ADVERTISER, page #		
152	A&I Supply, p. 39	82	Eagle America, p. 109	229	Laughing Loon Custom Canoes, p. 129	200	Scherr's Cabinet & Doors, p. 104		
80	Adams Wood, p. 16	201	Eagle Tools/EuroShop, p. 31	47	Launstein Hardwoods, p. 33	187	Shaker Workshops, p. 25		
12	Airware America, p. 128	25	Eagle Woodworking, p. 130	172	Lee Valley/Veritas, p. 41	58	Shopbot Tools, Inc., p. 45		
104	Allred & Associates, p. 130	53	Ebac Lumber Dryers, p. 130	184	Lee Valley/Veritas, p. 41	33	Slim's Power Tools, p. 130		
	Amazon.com, p. 126	123	Ecogate, Inc., p. 103		Leigh Industries, p. 45	121	Smithy, p. 41		
8	American Furniture Designs, p. 129	35	Econ-Abrasives, p. 25		LeNeave Supply Company, p. 127	176	Southern Union State, p. 133		
255	American Turbine, Inc., p. 14		Electrophysics, p. 30	85	Librawood, p. 131	27	St. James Bay Tool, p. 130		
232	Anderson Ranch Arts Center, p. 15		Engraving Arts, p. 131	105	Lie-Nielsen Toolworks, p. 118		Statement of Ownership, p. 104		
257	Apollo Coat, p. 99		Enviro-Safety Products, p. 129	254	Lignomat Moisture Meters, p. 35	226	Sunhill Machinery, p. 109		
69	Apollo Sprayers, p. 35	34	E-Wood, p. 131	101	Logosol, p. 103				
153	Ashman Technical Ltd., p. 103	39	Exaktor Precision WW Tools, Inc., p. 21		Londonderry Brasses, p. 103	112	3M Corporation, p. 17		
17	Auton Company, p. 33			19	Luthiers Mercantile Intl., p. 42	108	Talarico Hardwoods, p. 128		
			1st Cuts Band Saw Systems, p. 133	31	M.L. Condon Lumber, p. 41	160	Target Enterprises, p. 118		
49	Ball & Ball, p. 99	154	Farallon Industrial Knives, p. 41	64	MacBeath Hardwood Company, p. 132	207	Tech Mark Inc., p. 7		
96	Bauhaus Apprenticeship Inst., p. 129	214	Farris Machinery, p. 129	238	Makita U.S.A., p. 125	148	Tech-Wood Inc., p. 132		
168	The Beall Tool Co., p. 129	131	Felder USA, p. 23	67	Manny's Woodworker's Place, p. 14	27	Tenryu America, Inc., p. 21		
88	Bellas Artes, p. 133	73	Festo Tooltechnic/Toolguide Corp., p. 104		Martin Donnelly Antique Tools, p. 131	98	Thewindsorinstitute.com, p. 130		
166	Bench Dog, p. 15		Fine Woodworking Slipcase, p. 14	95	Mass Bay Wood Products, Inc., p. 128	91	Thomas Golding School, p. 128		
170	Berea Hardwoods, p. 31		Fine Woodworking Video, p. 98	52	McFeely's Square Drive, p. 44	2	Timberking, p. 39		
171	Berea Hardwoods, p. 35	216	Flamingo Specialty Veneer, p. 133	113	MEG Products, p. 131	139	The Tool Chest, p. 131		
183	Better Built Corp., p. 21		Forrest Manufacturing, p. 27	23	Mercury Vacuum Presses, p. 109	261	Tool Crib of the North, p. 13		
190	Biesemeyer Mfg., p. 33	38	Frank Mittermeier, Inc., p. 128	264	Mesa Vista Design, p. 132	253	Tool Crib of the North, p. 21		
210	Blue Moon Exotic Wood, LLC, p. 128	219	Freud, p. 117	199	Microplane, p. 45	250	Tool Crib of the North, p. 29		
228	Blue Ridge Hardwood, p. 128	14	Fuji Industrial Spray Equip., p. 103	122	Mid-Maine Hardwoods, p. 132	252	Tool Crib of the North, p. 35		
230	Boeshield T-9r, p. 131	50	Furniture Inst. of Mass., p. 131	110	Misugi Designs, p. 33	102	Tools On Sale, p. 113		
278	Bosch, p. 115	240	G & W Tool Company, p. 21	248	MLCS Ltd., p. 14	54	Tremont Nail Company, p. 132		
133	BrandNew, p. 128	173	Garrett Wade Company, p. 19	217	Modine HVAC & R, p. 129	55	Tropical Exotic Hardwoods, p. 132		
41	Bridge City Tool Works, p. 44	79	Gifkins Dovetail, p. 133	118	Mule Cabinetmaker Machine, p. 99	151	Tyler Tool Company, p. 31		
26	Bristol Valley Hardwoods, p. 128		Gilmer Wood Company, p. 131	103	Murray Clock Craft Ltd., p. 133				
244	Brookside Veneers Ltd., p. 25	48	Goby's Walnut Wood Products, p. 131		Museum of Woodworking Tools, p. 132	180	Universal Laser Systems, p. 31		
		167	Good Hope Hardwoods, p. 129		Noah's, p. 132	University of Rio Grande, p. 130			
221	Cab Parts, p. 118	56	Gorilla Glue, p. 116	218	North Bennet Street School, p. 131	220	Vac-u-clamp, p. 103		
	Cabinetparts.com p. 133	116	Grand River Wood, p. 129	212	Northend Hardwoods, p. 7	107	Vacuum Pressing System, p. 11		
234	Calif. Contemporary CraftGuild, p. 128	4	Groff & Groff Lumber, p. 15	117	Norwood Sawmills, p. 132	224	Viel Tools Inc., p. 39		
51	Cambium Press, p. 130		Guitar Making, p. 130	44	Nyle Standard Dryers, p. 11	6	Virutex.com Inc., p. 131		
245	Cape Fear Heart Pine, p. 129	132	Hammer USA, p. 34			128	W. Moore Profiles, p. 30		
247	Carbide.com, p. 30	182	Hardwood Warehouse, p. 130			159	Waterlox Chemical & Coating, p. 127		
3	Certainly Wood, p. 132	114	Harris School of Fine Woodworking, p. 132			129	West Penn Hardwoods, p. 128		
70	The Chippendale School of Furniture, p. 130	57	Hearne Hardwoods, Inc., p. 127			181	Western Dovetail, p. 133		
231	Classic Designs by Matthew Burak, p. 7	62	Hida Tool & Hardware, p. 42			127	Western Tool Supply, p. 118		
42	Clayton Machine Corp., p. 30	32	Highland Hardware, p. 127			18	Wetzler Clamp Company, p. 128		
188	Cohasset Colonials, p. 39	227	Historic Woodworks, p. 128			242	WGB Glass, p. 25		
	College of the Redwoods, p. 132	28	Horton Brasses, Inc., p. 127			86	Wilke Machinery Co., p. 16		
45	Colonial Times Clock Company, p. 131	46	HTC Products, Inc., p. 11			130	Williams & Hussey, p. 99		
198	Compliant Spray Systems, p. 45						Williamsburg Institute, p. 34		
169	Conover Lathes, p. 42	251	Inkra Rules, p. 29			65	Winkler Wood Products /Malka'i, p. 129		
22	Conover Workshops, p. 131	147	International Hose Supply, p. 116			13	Wood River Veneer, p. 129		
236	Cormark International, p. 131	36	Irion Lumber Co., p. 131			197	The Wood Works Book & Tool Co., p. 128		
99	CPH International, p. 133	265	Iturra Design, p. 104			59	Wood Write Ltd., p. 128		
84	Creative Accents, p. 132	134	J.B. Dawn, p. 133			144	Woodcraft Supply, p. 109		
192	Custom Wood Turnings, p. 130	94	Jack Goosman, p. 130				Woodcraft Supply, p. 112		
150	The Cutting Edge, Inc., p. 132	259	Jamestown Distributors, p. 11			146	Woodcraft Supply, p. 121		
		115	Japan Woodworker, p. 99				Woodfinder by Woodrose, p. 16		
156	Dakota Alert, Inc., p. 16	260	Jasper Audio, p. 129			142	Woodjoy Tools, p. 128		
185	Dakota County Technical College, p. 41	215	JDS Company, p. 39			10	Woodmaster Power Tools, p. 103		
43	Dana Robes Wood Craftsmen, p. 132	24	Jet Equipment, p. 2, 3			11	Woodmaster Power Tools, p. 109		
195	David Warren Direct, p. 133	75	Jointech, p. 116				Wood-Mizer, p. 33		
74	DCT Holdings Corp., p. 131						Woodpeckers, p. 11		
66	Delta Machinery, p. 139	258	KatieJig, p. 41				Woodpeckers, p. 127		
241	Denray Machine, p. 44	263	Kay Industries, Inc., p. 99				Wood-Ply Lumber Corp, p. 129		
203	DeWalt, p. 24	136	Kayne & Son, p. 133				61	WoodRat, p. 21	
206	DeWalt, p. 43	20	Keller & Company, p. 15				124	Woodsmith Store, p. 11	
204	DeWalt, p. 101	249	Klingspor's Corporation, p. 11					WoodsmithStore, p. 133	
205	DeWalt, p. 111	63	Kreg Tool Company, p. 114					76	Woodworkers Discount Books, p. 39
106	Diamond Machining Technology, p. 14	138	Kremer Pigments, p. 130					143	Woodworker's Hardware, p. 16
137	Diefenbach Benches, p. 131							237	Woodworker's Source, p. 130
209	Diefenbacher Tools, p. 129	135	L.R.H. Enterprises, Inc., p. 123						The Woodworking Shows, p. 106, 107
149	Dimestore Cowboys, p. 131	162	Laguna Tools, p. 15					120	Worcester Center for Crafts, p. 118
223	Dimitrios Klitsas, p. 133	163	Laguna Tools, p. 25					7	World Timber Corp., p. 132
256	Dremel, p. 32	161	Laguna Tools, p. 123					194	Yankee Hardwood Specialties, p. 128
	Dust Bee Gone, p. 133	164	Laguna Tools, p. 127					71	Yestermorrow, p. 7
1	Dust Boy, Inc., p. 44								

Polyurethane: *much scorned, much used*

Polyurethane is the Microsoft of the finishing world. Some love it, some hate it, but an awful lot of folks use it. In truth it is neither devil nor angel but simply a very versatile finish that is worth learning a bit more about.

There are several different finishes that go by the name urethane or polyurethane (the terms are interchangeable), and that alone creates a certain amount of confusion. They boast different appearance and application characteristics, and each has its advantages and disadvantages.

The one common thread among them is durability. They all contain some sort of polyurethane resin that gives these finishes their name and imparts improved heat, chemical and abrasion resistance.

Woodworkers have been brushing oil-based polyurethane onto furniture for years and generally regard it as a big improvement over “old world” varnish. Like varnish, it is somewhat amber in color, brushes

on nicely and dries rather slowly. However, it is a bit grayer than pure varnish, and some critics feel that thick coatings get too cloudy or plastic-looking. What is certain is that polyurethane has varnish’s ability to ward off water, chemicals and stains but adds better resistance to heat and scratches. It is appropriate for any wooden object, even those that get heavy abuse like kitchen or bathroom cabinets, countertops, tables and vanities.

Polyurethane gel is too thick to brush on but is less messy and makes a very convenient wipe-on finish. The durability of any finish is, in part, affected by its thickness. Because we tend to wipe finishes much thinner than we brush them, the wipe-on gels are less durable. So polyurethane gel is best used for low-wear projects, such as jewelry boxes, bookcases and even occasional tables that won’t get too much abuse.

In many ways, water-based polyurethane has more in common with other water-based finishes than it does with other polyurethanes. Unlike the amber-colored oil-based versions, it is completely clear or very slightly bluish gray. As a result, water-based polyurethane will not “warm up” the

color of wood, but it also won’t discolor white paint, pickled finishes or very blond woods. Like all water-based finishes, it dries very fast, smells very little and is non-flammable. It is tough enough for most high-wear applications, including household furniture and even kitchen cabinets. However, I would hesitate to use it for bars or countertops that are likely to get hot coffee pots placed on them or on vanities prone to getting strong solvents, such as nail-polish remover, spilled on them.

Applying polyurethanes

There is no “right way” to apply polyurethanes. If an application method works for you, it is as legitimate as any other. Personally, I’ve found that the following techniques work best with particular types of polyurethane.

Wiping—Both liquid and gel oil-based polyurethanes lend themselves to this simple, virtually foolproof technique. I do not recommend trying this with water-based polyurethane, because its fast drying time makes it difficult to get an even coat. Start by donning a pair of thin, throwaway vinyl or latex gloves. The finish is not particularly harmful to your skin, but it sure is sticky, and the quickest way to clean up is to peel off the gloves and toss them.

You’ll need to stir liquid polyurethane before you use it, but you



Cloudy but clear. This water-based polyurethane has a skimmed-milk appearance in the can but retains the natural color of the wood better than the other two types of polyurethane.



Tested by time. Oil-based polyurethane is the original version, but numerous formulas have been developed.



No running here. Gel-based polyurethanes are less messy to use but can only be wiped on, not brushed or sprayed.



Wipe it on and work it in. A gray abrasive pad is used to apply the first coat of oil-based polyurethane.

can use a gel just as it comes. The application technique is the same for both types. Dip a very fine nylon abrasive pad (such as the 3M Scotch-Brite brand gray or white pad) into the finish and scrub it onto the prepared and sanded wood. You’ll find the pad holds more finish than a rag and applies it more evenly. There is no need to thin the finish for the first, or any, coat, because the pad will allow you to push even thick liquids and gels into the wood’s pores. Once you have covered an area, wipe off any excess before

Finish Line (continued)

it dries with a thick paper towel or a soft cloth. Leave only a thin, even film on the wood. Let each coat dry overnight, and reapply the same way. Add as many coats as you like at one per day.

One or two coats will give you a thin, natural-looking “woody” appearance and minimal protection. Five or six coats will give you a thicker, more finished look and more protection as well. How many coats you apply depends on how harshly the piece will be used and the look you prefer. I often use this wipe-on method for the first coat, even if I am planning to brush on subsequent coats.

Brushing—Wiping on finishes is great, but it lets you apply only one very thin coat at a time. To add finish more quickly, nothing beats a high-quality brush. For oil-based polyurethane, I prefer a 2-in.-wide natural china bristle brush with a tapered end. The brushing technique is similar to that for applying varnish (see Finish Line, *FWW* #143, p. 122).

Water makes natural hair splay, so for water-based polyurethane, use a nylon bristle brush, presoaked in water. Brush on a thin, even coat, but do not go back. Water-based polyurethane dries too fast to even out by rebrushing. Going back over it will create air bubbles and will cause the finish to be choppy and uneven. Lay it down and leave it alone. But before you decide to brush water-based polyurethane, read the following section on paint pads.

Apply at least three coats, one per day, of either oil- or water-based polyurethane. If you wait more than three days between

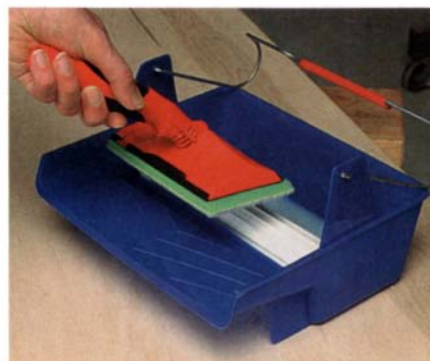
Stroking it on.
A good-quality natural bristle brush is the best tool for applying a thicker layer of oil-based material.



coats, lightly sand the surface with 320-grit paper to improve adhesion. Otherwise, sand only as needed to remove any dust nibs or irregularities between coats.

Paint pads—For water-based polyurethane, paint pads work better than brushes, especially on large, flat surfaces. A paint pad is a flat rectangle with a handle on one face and thousands of tiny nylon bristles on the other. Its short nap and large surface area let you lay down a thin coat of polyurethane over a wide area quickly with virtually no bubbling problems, drips or brush marks.

Stir the polyurethane gently, pour some into a flat tray and dip the pad into the surface. Gently scrape off the excess finish. The nap should be fully wet but not dripping. Touch it down onto the wood's surface and move it with the grain. After each pass, immediately go back only once and smooth it out by stroking again in the same direction. That should level it and remove any bubbles.



Loading the pad.
The best method of charging a painting pad is to use a specifically designed tray with a roller built into it.

Broad coverage.
The paint pad covers a large area relatively quickly but is best used for water-based finishes on large, flat areas.



For curved or carved areas, where a flat paint pad simply won't work, use a brush.

Spraying—Water-based polyurethane is sold ready to spray with no thinning, but it is a good idea to strain the finish first. You'll need a spray gun that's equipped with a stainless-steel fluid tip and passageway, because plain steel will rust. Most lacquer guns come with 0.070-in. (1.75mm) fluid tips, and they will work in a pinch, but I've found that water-based materials spray best through smaller 0.040-in. (1mm) fluid tips.

Spray each coat very thin, just enough to wet the wood. If you spray until the liquid is fully smooth and shiny, you are likely to end up with runs, sags and drips. Just after you spray, each coat will look somewhat rough, like orange peel. Don't despair, and don't make it wetter. Leave it alone, and it will level considerably overnight. Spraying polyurethane requires a leap of faith, but if you have practiced on scrapwood, you are prepared for this. Spray no more than two coats per day.

Oil-based polyurethane sprays well through almost any size and type of fluid tip, but because it dries slowly, it has a tendency to sag and run on vertical surfaces. To avoid that, thin the polyurethane about 25% with acetone instead of mineral spirits. Spray a very light mist onto the wood and let it dry for about 10 minutes. This will give the acetone time to evaporate and will leave a slightly thickened tacky film on the wood. Now go back and spray a very thin wet coat and let it dry overnight. The dried mist coat will help the wet coat hang without sagging.

Three or four coats of either water-based or oil-based polyurethane will be enough for a medium-wear surface. With either type, sand between coats only if you need to for smoothness or if you've waited more than three days to apply another coat.

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A Furniture Maker's Twist on Royalty



"William"

Paul Henry, a woodworker and armchair historian in Carlsbad, Calif., had completed "William" before realizing that a theme was developing. He made "Mary" to match "William" in size but gave her a lighter, more feminine look. Both are carefully proportioned in the classic format: The upper case is a golden rectangle, the waistline is three squares wide, and the lower section is a perfect square. These and other members of European nobility were on display recently at the David Zapf Gallery in San Diego.



"Mary"

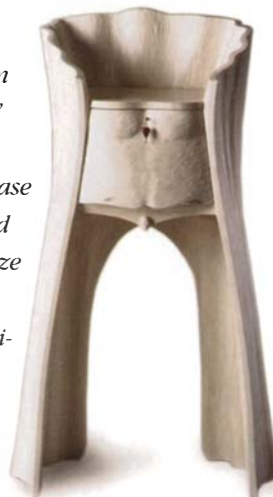
"Cromwell"

A finial assembled from gears and machine parts gives this eucalyptus clock (79 in. tall) just the hint of a crown. "If Cromwell did not have his finger on the cultural pulse, at least he kept time until the Restoration of Charles II and must therefore be a clock."



"Elizabeth I"

Carved to mimic the collar and cloak worn by the "virgin queen," the interior of this bleached basswood case (43 in. tall) is finished blood red "to symbolize the contrast between Elizabeth's vital interior life and her cold, carefully cultivated exterior persona."



"Pepin the Short"

Designed in a vocabulary appropriate to his time, "Pepin the Short" is made of quartersawn white oak and features a Gothic arch and linenfold panels. "Pepin's" tapered sides emulate the vertical lift of a Gothic cathedral.

