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December 1996, No. 121

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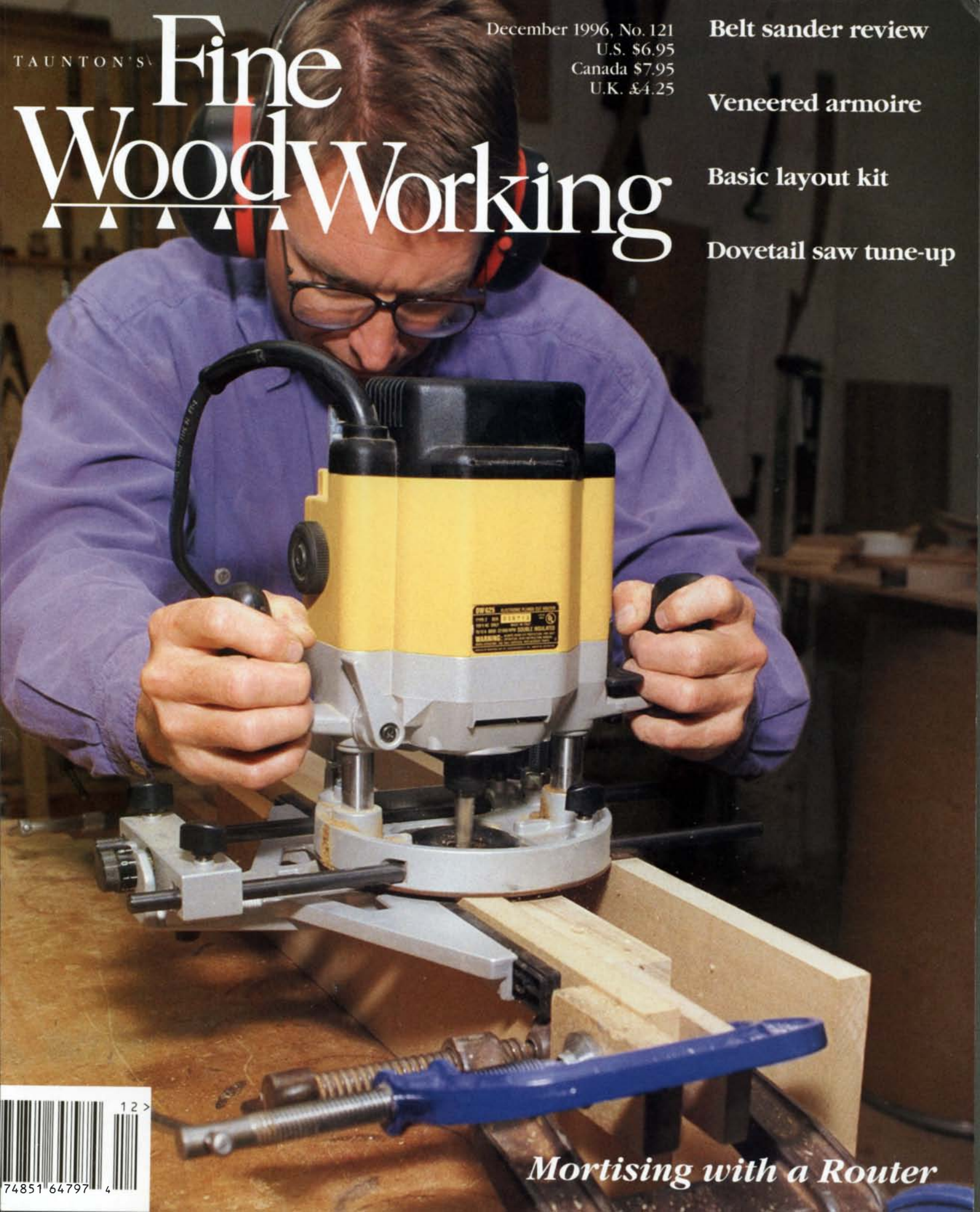
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Basic layout kit

Dovetail saw tune-up



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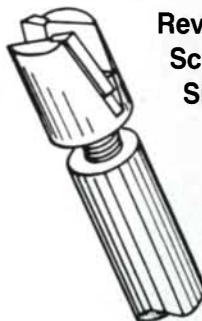


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A router is made to order for cutting mortises quickly and accurately. Gary Rogowski discusses several approaches, as well as fixtures that make the job easier, on p.72. Photo: Vincent Laurence



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Solving a highboy dilemma—I am preparing to build a highboy, like the one in curly cherry made by Randall O'Donnell (see *FWW* #117, #118, #119). I was distressed to see Mr. O'Donnell's solution to cross-grain construction where the sides and back of the lower case meet the vertical grain of the legs. He says he expects the sides to crack, but that he doesn't care. I'd appreciate a proposed solution to this cross-grain problem for those of us who do care.

—Craig Connell, Greenwich, Conn.

RANDALL O'DONNELL REPLIES: The caring or not caring about cracks is a matter of personal perspective. I remember reading something in *Fine Woodworking* #23 by Eugene Landon, who said, "It delights me when they crack. It makes them more authentic." At the time, I thought he might be nuts. Now I've grown to respect his antiquarian's perspective completely. Artistic merit, proportion, carving, turning, patina and the personal touch of hand tools are of primary concern. While structural flaws are certainly undesirable, cracks in the case side do not affect the soundness of the piece.

As far as practical solutions go, you could maintain a constant environment of 38% relative humidity and 70°. That, of course, is pretty hard to do. You could glue the middle tenon only in the case

side and incorporate elongated holes with a screw and washer on the inside for the top and bottom tenons (or elongated holes in the tenons with standard rived pins). You could also use quartersawn lumber and 1/8-in. veneers for the case sides or just use quartersawn boards (if you could find ones that are 17 in. wide). In all joinery, grain orientation should be carefully considered, but even quartersawn boards move.

Looking for oil-based glazes—In the last article of the series on the highboy (see *FWW* #119, pp. 52-58), Randall O'Donnell mentions that after applying an aniline dye, he applied an oil-based glazing stain, which he says evens out the base color and gives the look of "100 years of patina."

Could you please provide a little more information on this product?

—Mike Leonardo, Clovis, Calif.

EDITOR REPLIES: Mr. O'Donnell uses glazing stains made by H. Behlen & Bros. (4715 State Highway 30 N., Amsterdam, NY 12010; 800-545-0047). The company will provide the name of a distributor, or you may order the glazes by mail from Woodworker's Supply (800-645-9292).

Behlen isn't the only company that makes glazes. For more on where to get them and how to use them, see *FWW* #116, pp. 75-79.

Harvesting trees in the tropics—I wasn't into the October issue for more than five minutes when I came up against the letter from the deplorably myopic Robert Johnson (see *FWW* #120, p. 6). He doesn't seem to realize that the trees in the tropical rain forests are being burned because they have absolutely no value to the abysmally poor people who are clearing the land.

They are wasting the forests to get marginal cash crops from the nutrient-poor soil for two or three years. Then

Writing an article

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they move on and burn more of the forest to plant again. That's what is making this material endangered, not the infinitesimal amount that finds its way into chests and coffee tables.

If, however, these woods were in demand by furnituremakers—large or small—the trees would have value. Instead of being burned, the trees would be harvested and sold for greater economic benefit. The great cherry forests of Pennsylvania are an example of how a resource can be harvested and renewed. They have been “mined” for 200 years and still provide a plentiful supply of both wood and oxygen.

—David W. McSurdy, Collegeville, Pa.

Origins of the hollow-chisel

mortiser—I enjoyed the historical reference by Bernie Maas in his comparison of hollow-chisel mortisers (FWW #118, pp. 74-79). I wish more was written on machine tool history. However, his credit to Parks with the invention of the hollow-chisel mortiser enticed me to find my copy of *Round Bits...Square Holes* (Greenlee Bros. & Co., 1962), which details the history of the Greenlee Co. and its founders, Robert and Ralph Greenlee.

According to the company's history, the twin brothers invented the hollow-chisel mortiser while in Chicago in 1874. Two years later, they exhibited the machine that bores square holes at the Philadelphia exposition.

—Randy Benway, Horicon, Wis.

Springback answer was too pat—I

have built several pieces of furniture that use bent-wood laminations. Based on my experience, I must take exception to Bill

Clayden's letter in which he states that the amount of springback in glue-ups of curved members is independent of the thickness of the individual plies (see FWW #119, p. 10). This is just not true. If I cut strips that are only 1/32 in. thick and glue them together on a 6-in. radius, I get no springback. If I do the same with 1/4-in.-thick strips, I get lots of springback. Also, the radius of the bend will determine the amount of springback.

I've been reading *Fine Woodworking* since 1987. I was delighted to find a publication that covered the type of woodworking I wanted to do. Since then, I've made my dream come true: designing and building furniture on a full-time basis.

—David A. Petersen, Austin, Texas

BILL CLAYDEN REPLIES: Mr. Petersen has misunderstood my conclusions. Taking the example in the comment, if a bent component of final thickness of 1/2 in. were laminated from two plies 1/4 in. thick, the springback would be one-fourth of the deflection in the bending form, which is “lots.” If the same 1/2-in. component were laminated from 16 plies 1/32 in. thick, the springback would be 1/16² or one-two hundred fifty-sixth of the amount of deflection. For practical purposes, that is no springback. Thus, Mr. Petersen's observations are consistent with my formula.

My original article to *Fine Woodworking*, which was condensed from a longer article, was further edited and the fact that I had made a number of measurements of springback to verify my simple prediction was omitted. However, I can assure Mr. Petersen that within the accuracy of workshop equipment, the formula works.

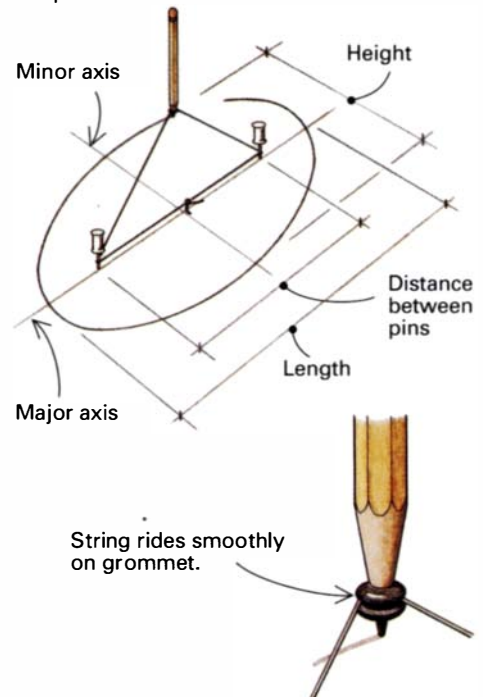
A precise method to draw ellipses—Your item on drawing an ellipse (see FWW #119, p. 16) shows an excellent and very simple method. However, I notice trial and error is recommended as the way to adjust the location of the push pins and the length of the string. These two things can be calculated very easily to give the exact ellipse that you want.

First, determine the length and height of the desired ellipse. The total distance between the push pins will be given by this formula: $D = \sqrt{L^2 - H^2}$ where L equals total length and H equals total height.

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Drawing an ellipse

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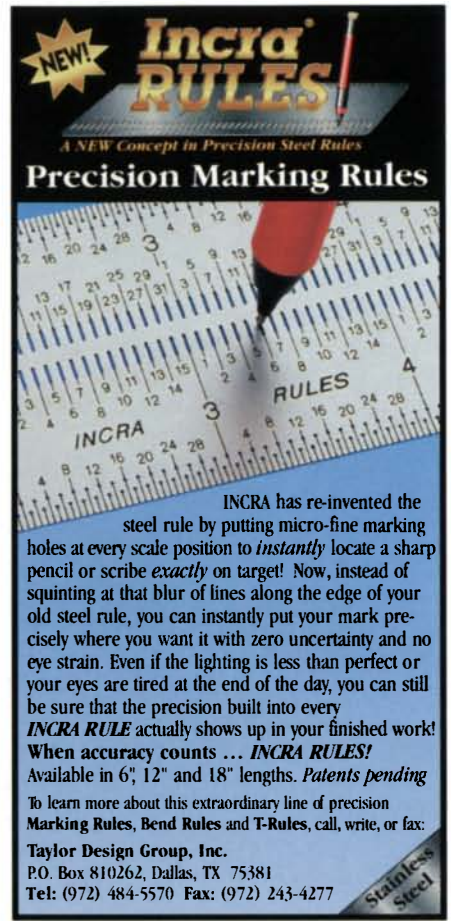





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 1994

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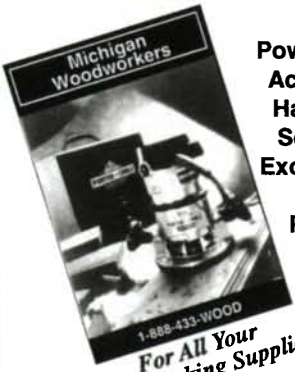
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axis (see the drawing on p. 8), cut a piece of string several inches longer than the total length of the ellipse, and form a big loop using a slip knot. Tension the loop with the pencil, slip the knot to make the correct size loop and then tie off the knot so it can no longer slip. The loop of string should be tied so that when it is stretched with the pencil, the loop is exactly half the total length of the ellipse plus half the distance between the pins.

Use a low-stretch string for the job, and when drawing, keep the tension on the pencil the same all the way around. A tiny grommet on the pencil point will help the string slide. They are readily available from hobby stores and electronic stores like Radio Shack.

—Frank Fitzpatrick, Sayville, N.Y.

A wish for better tool manuals—Over the years, *Fine Woodworking* has evaluated many tools. I've found the information very valuable, and the tools I bought based on those reviews have been very satisfactory.

My complaint is the lack of information supplied by many manufacturers in the manuals supplied with the tools. I have manuals for Sears Craftsman, Bosch, Freud, Delta and the Leigh Dovetail D3. When I got the Leigh manual, it made me realize how inadequate all the others are.

My request: When you review a tool, please include a critique of the manual that accompanies it. Perhaps that will encourage the manufacturers to publish manuals that are truly helpful to those of us who may be using a tool for the first time.

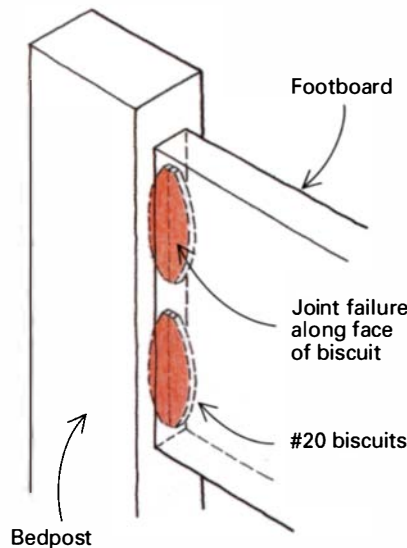
—Ralph E. Lee, Grass Valley, Calif.

Favoring dowels over biscuits—I've used tens of thousands of plate-joinery biscuits over the years, and I think they've been given better press than they deserve.

I build a lot of beds that have stressed joints between the headboard or footboard and the corner posts (see the drawing above). For several years, I used two #20 biscuits for this joint. Then I started to have broken beds coming back. The failure was always the same: a shear failure of the glue joint between the face of the biscuit and the face grain on the inside of the slot. I saw problems on a few out of every 100 beds.

Beds too much for biscuits

Biscuits joining bedposts to the headboard and footboard sometimes fail along biscuit faces (shaded in red). When retrofitted with 3/8-in. dowels, the joints hold.



Four or five years ago, I switched to dowels. I use four 3/8-in. by 1 1/2-in. fluted dowels. When a broken bed comes back, I retrofit it with dowels (without charge). I've never seen a doweled bed break, not even a retrofit.

I have been very happy with biscuits in edge-to-edge glue-ups. The strength they add is probably superfluous to a good glueline, but the excellent registration they provide is a big help.

—Bruce Cohen, Boulder, Colo.

Take care with insert tooling—In his article about shaper cutters, Lon Schleining discusses safety improvements for modern insert tooling (see *FWW* #118, pp. 44-47). We are writing to bring attention to a fatality that we investigated this past year.

A 32-year-old, experienced woodworker was fatally injured on the job when a steel tool knife was propelled from a rosette cutter. The cutter was installed in an overarm router. The knife penetrated a polyacrylic shield and then penetrated and exited the victim's chest, subsequently ricocheting off the wall before finally landing.

The knife was about 1 5/8 in. sq. and was part of a cutter-head assembly that had previously been used on a drill press at much lower cutting speeds. It was custom-designed and built for the drill press, not

the router. At the time of the incident, the router was set for 20,000 rpm. The maximum permissible speed was not indicated on the cutter head, and there were no written procedures for using it.

The knife was held in the 4 3/4-in.-dia. cutter head by flat shims and set screws, which could not counteract the centrifugal forces generated by the high-speed rotation. A lack of effective guarding was another factor.

The fatality might appear to be a random event of low probability. But the fact that the knife became a lethal projectile was not an accident but the result of a number of predictable factors that could have been controlled if anticipated.

The National Institute for Occupational Safety and Health would appreciate any information on fatal or serious injuries associated with insert tooling. Send the information to Dr. William Halperin, Director, Division of Safety Research, NIOSH, 1095 Willowdale Road, Morgantown, WV 26505.

—Susan Shepherd, Massachusetts
Department of Public Health and
Dr. Bonita Malit, NIOSH

It's Prony, not pony, brake—The developed horsepower of a motor, often measured using a Prony brake (not a pony brake) is, as its name suggests, the actual steady-state usable horsepower output of the motor. It is not, as Burton Mobley states, "the instantaneous power developed when the motor is brought up to speed and stopped suddenly" (see *FWW* #120, p. 8).

The brake is not used to stop the motor but to produce a steady measurable load upon it. The motor speed will vary with the load, and by adjusting the brake, it is possible to measure the power actually put out by the motor at any speed. Knowing the speed, certain dimensions of the brake and the reaction force of the brake (measured by weights or a spring balance), the power can be calculated.

Developed horsepower will always be less than the apparent power (the volt-ampere product).

—Lewis F. Garber, Temple City, Calif.

Real origins of cast steel—Because you do not often dispense completely incorrect information, I thought you

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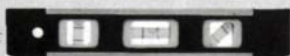
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might be interested in the correct answer to the question "What is cast steel" (see *FWW* #120, p. 22).

Cast steel was the product of the ingenuity and persistence of English clockmaker Benjamin Huntsman. Huntsman, of Sheffield, England, began producing cast steel commercially in 1751.

Steel is iron containing .5% to 1.4% carbon. Traces of phosphorus from the coal used in English iron-making made steel that was brittle and useless. But in the 18th century, Sweden, with little coal, made iron using only charcoal. This iron could be converted to high-quality steel.

Before 1750, bars of Swedish iron about 5/8 in. thick were heated in charcoal to bright red for several days. The iron absorbed some carbon, changing the outer layer to steel and giving it a blistered appearance.

Several bars of blister steel could be forged together to give a more uniform material called shear steel, but it was still unsuitable for the clock springs that clockmaker Huntsman wanted. He

reasoned that a better product would result if the blister steel could be melted. But this required a stronger container and higher temperatures than anything known at the time.

After years of experimentation, he perfected a clay crucible that held from 10 lbs. to 60 lbs. and a furnace that could reach 1,600° C, hotter than a glass-making furnace. After the steel was melted, it was cast into 3-in.-sq. bars, hence the name cast steel.

A century later, Bessemer introduced his process in which air was blown through low-melting, high-carbon pig iron. But the quality was not suitable for edge tools, at least not initially. The cast-steel label persisted so that buyers would know they were getting high-quality steel for tools.

Today's cast steel bears no resemblance to the old Sheffield product. It is used to cast machine parts and will not hold a cutting edge.

I own more than 100 Addis cast-steel woodcarving chisels, more than a century

old. They are not as tough as modern chisels, but in my opinion, they hold an edge much better than today's chisels. My sources for this information include K.D. Roberts *Some 19th Century English Woodworking Tools* (Bond Press, 1980) and *Sheffield Tools* by K.C. Barraclough (Moorland Publishing, 1976).

—Kenneth Williamson,
Mount Holyoke College, S. Hadley, Mass.

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.

—Scott Gibson, editor

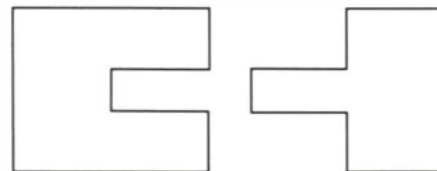


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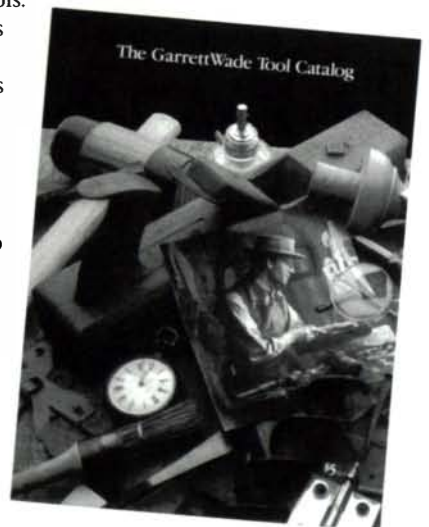
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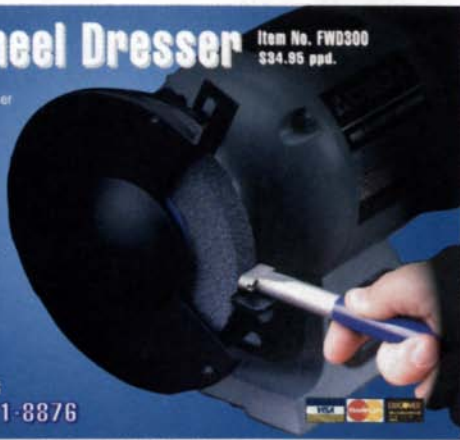
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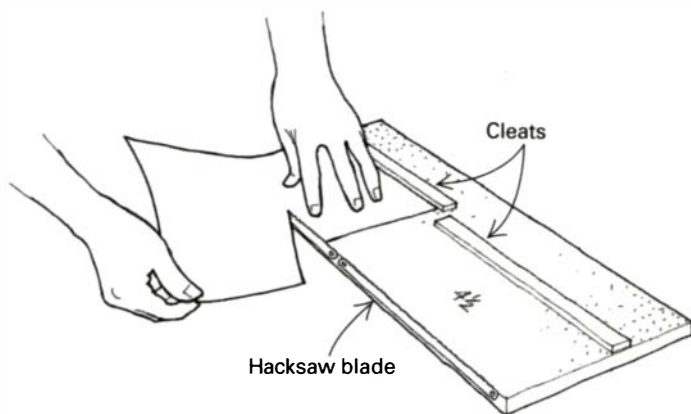
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READER SERVICE NO. 10

Sandpaper cutting fixture revisited

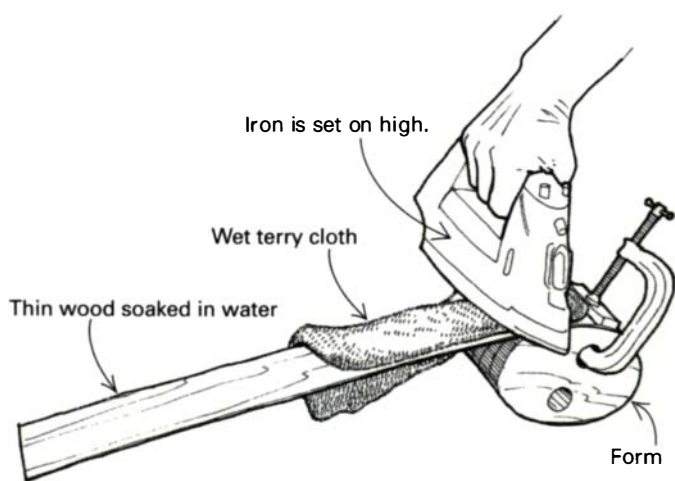


Here's a sandpaper cutting fixture that is similar to the one presented by Anthony Guidice (*FWW* #116, p. 14). It has a few refinements that make it quicker to use and more versatile. Take a piece of scrap plywood, approximately 10 in. by 24 in., and screw down two cleats about 12 in. long, as shown in the sketch. One cleat should be 4½ in. from the edge and the other 5½ in. This allows you to cut a piece of sandpaper in two either horizontally or vertically. Now screw a used hacksaw blade opposite each cleat along the edge of the plywood with the teeth slightly over the edge.

To use, let the fixture hang over the edge of your workbench. Butt the sheet of sandpaper against the 4½-in. cleat, hold the sandpaper in place with one hand and tear down with the other. The sandpaper will be torn accurately into a half-sheet that's ready for use. To make a quarter-sheet for most palm sanders, tear again with the paper butted against the 5½-in. cleat.

—Lee Holdren, Bellevue, Wash.

Bending wood with a clothes iron

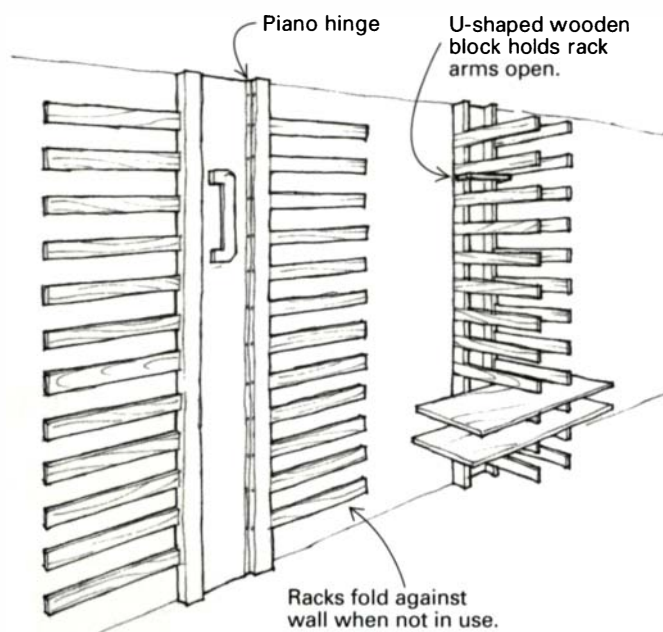


You can use any one of several methods to bend thin wood for bent-wood boxes. But things get more difficult with thicker material (about ¾ in.). Recently, I found a way to bend thicker stock using an ordinary clothes iron, eliminating the need for a steambox.

Start by soaking the wood overnight in water. Clamp it to your

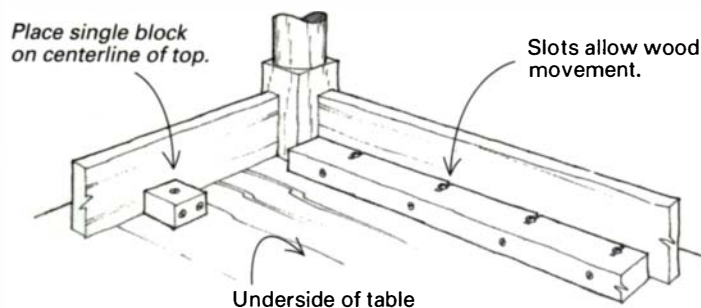
form, place a wet terry cloth over the wood and, using a clothes iron set on high, iron the wood around the form. The iron will force steam into the wood. Keep the cloth wet, take your time and concentrate on getting the shape right. As you bend the piece around the form, the wash cloth and the iron act as a caul to prevent tearout of the outer fibers. —Gary H. Johnson, Dalton, Ga.

No-space drying racks



The advantage of these drying racks is that they lie flat against the wall when not in use, so they occupy none of your shop's valuable real estate. The racks consist of two comb-like arms that pivot on piano hinges. A U-shaped wooden block fits over the arms and locks them in the drying position. Two racks, side by side, can hold long workpieces. —Michael Dugan, Bohemia, N.Y.

Fastening a tabletop



This tabletop fastening technique is quick, convenient and looks better than buttons or clips. Cut 1-in.-thick wood strips, and screw the strips into both the table apron and top, as shown. Use two fastening approaches to accommodate wood movement. On the

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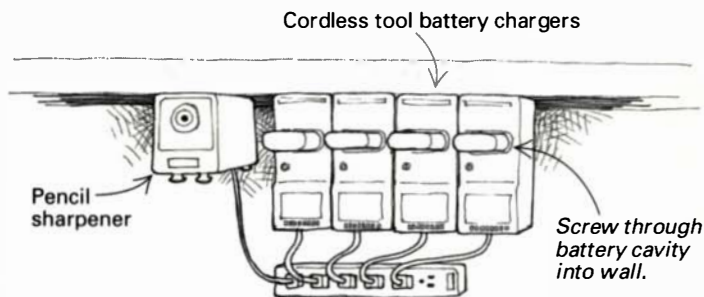
Quick, accurate settings are a snap with rock-solid miter and bevel detents.

The new Bosch 10" slide compound miter saw cuts down any thought of compromise. With all the best features of any saw rolled into one, it's sure to be the envy of the neighborhood you're building.



ends of the table, use short blocks rigidly screwed to the centerline of the tabletop. On the sides of the table, use longer strips slotted with a series of 1/2-in.-deep sawcuts. Screw the strips to the apron rails, and then attach the top with pan-head, sheet-metal screws inserted about the midpoint of the slot. Don't cinch these screws down. They should be loose enough to move when the top expands and contracts. —Walter L. Owens, Bloomington, Ind.

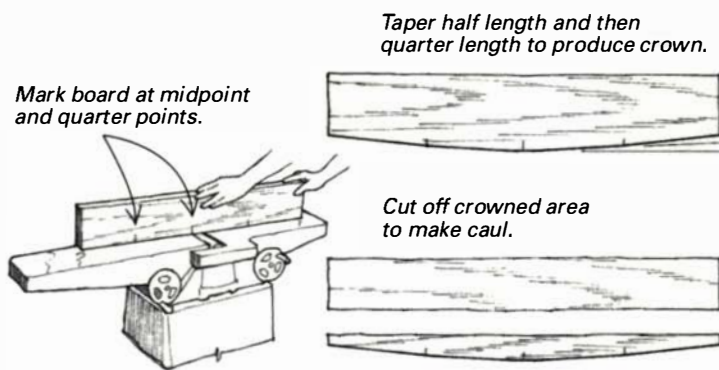
Wall-hung battery chargers



When I finally got tired of my bank of battery chargers taking up benchtop space, I hung them on the wall below a cabinet. This arrangement frees up your workspace, prevents dust from settling inside the chargers, allows one-handed battery insertion and puts the indicator lights where I can see them.

Before mounting a charger to the wall, remove the baseplate to make sure you're not drilling through anything electric. Pilot and countersink screw holes through the charging cavity for proper battery seating. The arrangement works so well I added an electric pencil sharpener next to the bank. —K. Hertik, Bohemia, N.Y.

Making crowned caul strips



When you need to glue solid-wood edging to plywood, a crowned caul will let you do the job with a minimum of clamps. Properly made, the caul will apply consistent pressure along its length when a clamp is applied to each end. Cutting the subtle curve in the caul can be tricky, though. Here's how to do it simply and quickly on your jointer.

Select a springy, tough wood like ash. Cut a piece as long as you want the caul and about 6 in. wide. Make sure both edges are par-

allel. Visualize the amount of crown you want, say, 1/4 in. over a 3-ft. length. Set the jointer to cut half this depth, 1/8 in. in this example. Divide one edge of the workpiece in half and that space in half again to give four equal sections along the length. Mark a pencil line at these divisions on both sides of one edge.

To cut the crown, use the jointer to cut four tapers on the workpiece: two one-half the length and two one-fourth the length. Place the workpiece on the jointer with the middle line on the outfeed table right behind the cutter, and push through. The jointer will take a progressively deeper cut to taper half the workpiece at 1/8 in. Now repeat this tapering process starting at the one-fourth division line. This will cut another 1/8-in. taper but only on the last quarter of the workpiece. Reverse the workpiece, and repeat the process to cut two tapers on the other end. The result will be a crown that is 1/4 in. proud of the ends. Take the workpiece to the tablesaw, and rip from 1 in. to 2 in. off the crowned edge to produce the caul. The thicker the caul, the more pressure it will apply.

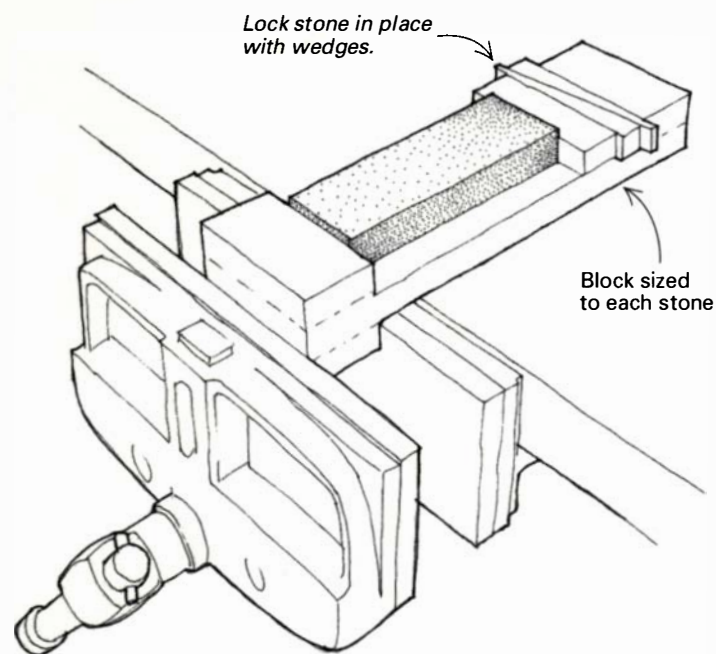
—Jim Richey, Katy, Texas

EDITOR'S NOTE: The method above was inspired by a submission sent in by Caleb Carlson of Sandpoint, Idaho.

Quick tip: Dried out masking tape often can be renewed by putting it in a microwave oven for 10 to 15 seconds.

—Robert M. Vaughan, Roanoke, Va.

Stone hook



For years, I have collected sharpening stones from yard sales and happily used them in my workshop. Because no two stones are the same size, I built a simple device that I can adapt to hold stones of different length and width. I call it a stone hook, and the design

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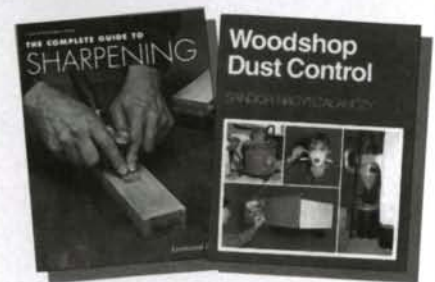


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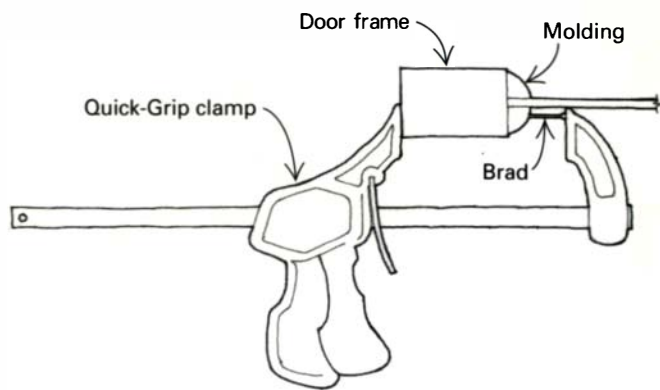
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READER SERVICE NO. 153

November/December 1996 21

is based on a bench hook. The device is a simple wooden block fitted with a fence at each end. A pair of wedges lock the stones into the block against a spacer piece sized for each stone. Wedge the stone into the block, and then clamp the block onto the workbench with the bench vise. —James Scalone, San Diego, Calif.

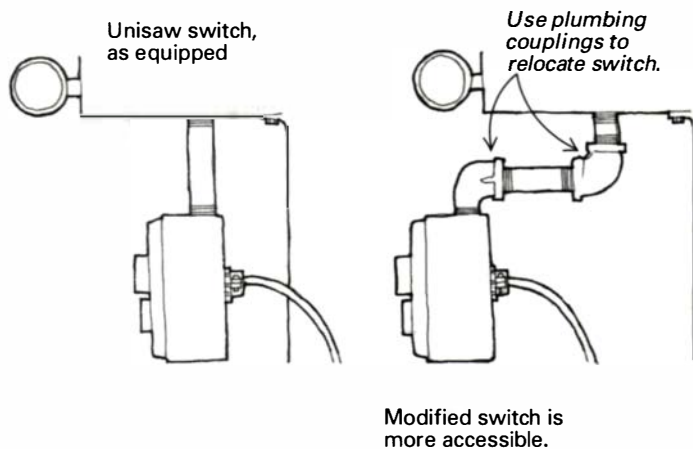
Using Quick-Grip bar clamps as brad setters



For setting the brads in the back of a picture frame or securing the glass-retaining molding in a display cabinet, try a Mini Quick-Grip bar clamp.

Remove the outboard jaw protector, and then press the brad into place by squeezing the pistol grip. Drill pilot holes for the brads to prevent splitting. This method is much better than trying to tap the brads into place with a hammer, where one errant blow can shatter the glass. —John Adams, Maumelle, Ark.

Easy-to-reach Unisaw switch



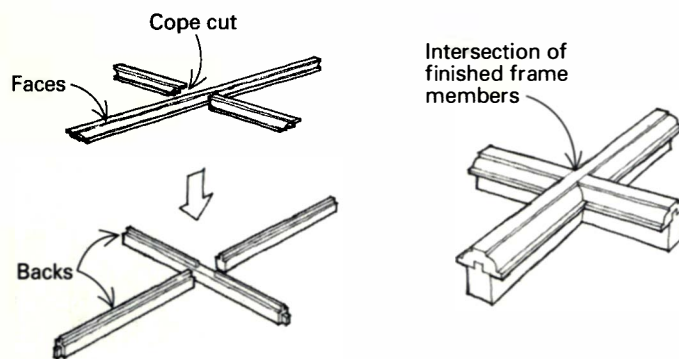
Here is a simple modification I made to my Delta Unisaw that provides much better access to the on/off switch. The factory-delivered Unisaw has its switch suspended below the table on a 3/8-in. by 4-in. pipe nipple. One end of the nipple screws into the bottom of the saw's cast-iron table, the other into the switch housing. To start or stop the saw, you must grope under the table and back about 8 in. from the edge.

By adding several elbows and a 1-in. nipple, I brought the switch

near the front of the saw where it's plainly visible and accessible. The wire doesn't go through the pipe, so there's no wiring change.

—Ron Kent, Kailua, Hawaii

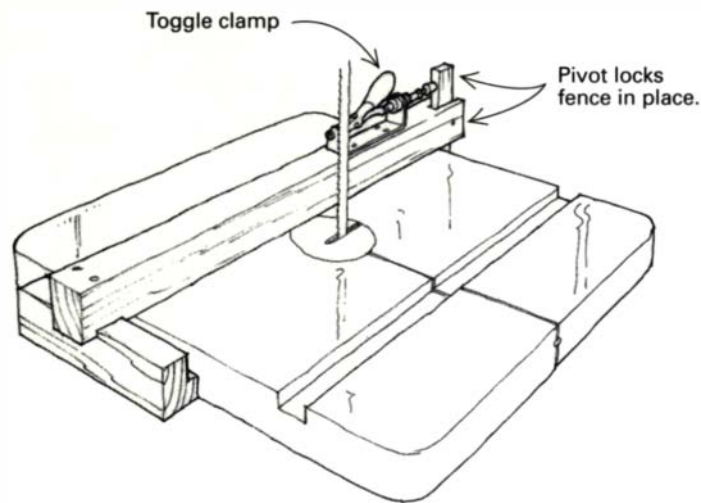
Making multipaned windows



This is a way to use commonly available matched stile-and-rail router bits to simplify the complex joinery in multipaned windows. The key is to make up the frame parts in two pieces: faces and backs. Shape the faces with the stile-and-rail bits, making cope cuts for the joints where face pieces intersect. Cut and shape the back pieces on the tablesaw. Now glue the faces to the backs, interlocking the butt joints to produce a strong and straight frame.

—Yves Barbaroux, La Varenne Saint Hilairy, France

Shopmade bandsaw fence



This bandsaw fence, made from scrap hardwood, locks in place with an ordinary horizontal toggle clamp. Size the components to fit your table and cutting requirements. It is easy to fine-tune the locking pressure with the threaded adjustment provided on the toggle clamp.

—Larry Griech, Ridgway, Pa.

Quick tip: An ordinary carriage bolt makes a surprisingly effective glue spreader. Squeeze a bead of glue on each joint face, and use

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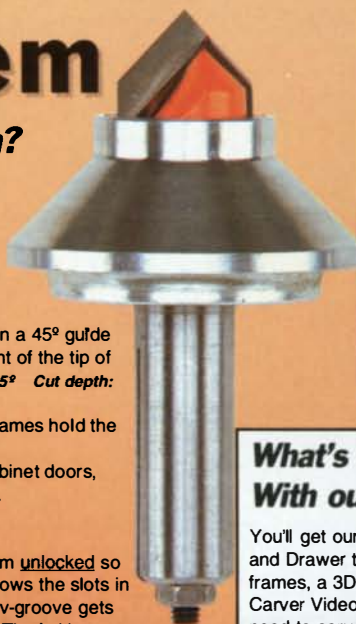
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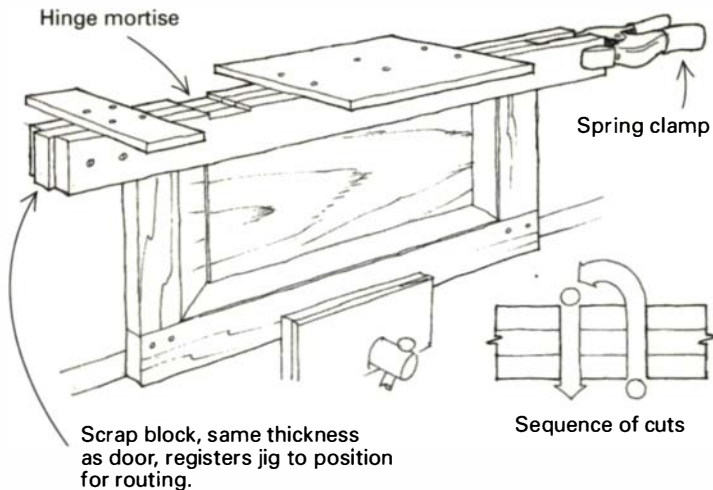
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the bolt's threads to distribute the liquid evenly, like a notched trowel metering out adhesives for floor tiles. After a quick rinse, the threads are clean for the next use. —Hank Schoch, Fruita, Colo.

Cutting hinge mortises



Periodically, I build Colonial-style kitchen cabinets with flush-mounted doors. One kitchen can have at least 20 or so doors with

relatively small butt hinges mortised into the edge of each door. To cut the hinge mortises, I use a router and a simple jig made from scrap. It consists of two arms spaced apart by a block the same thickness as the door frame. This spacer block also serves as a stop block in positioning the jig on the doors. I attach two 1/2-in. plywood fences to the top of the arms. The distance between the fences determines the size of the hinge mortises. Calculate this distance by adding the base of the router plus the width of the hinge minus the width of the mortising bit. Secure the jig to the door with a spring clamp.

To use the jig, put a door in the bench vise. Place the jig on the door with the stop block placed snugly against one end, and clamp it in place with the spring clamp. Set your router to a depth slightly less than the thickness of the hinge.

Reduce tearout by cutting the first and second passes, as shown in the drawing at left, and then clean out the remainder in the middle. Reverse the door in the vise, clamp the jig to the other end and cut the second mortise.

This jig is so easy to build that I don't bother to make it adjustable. I just keep one on hand for each size hinge I use.

—Jeff Lind, South Berwick, Maine

Methods of Work buys readers' tips, jigs and tricks. Send details, sketches (we'll redraw them) and photos to Methods of Work, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506. We'll return only those contributions that include an SASE.

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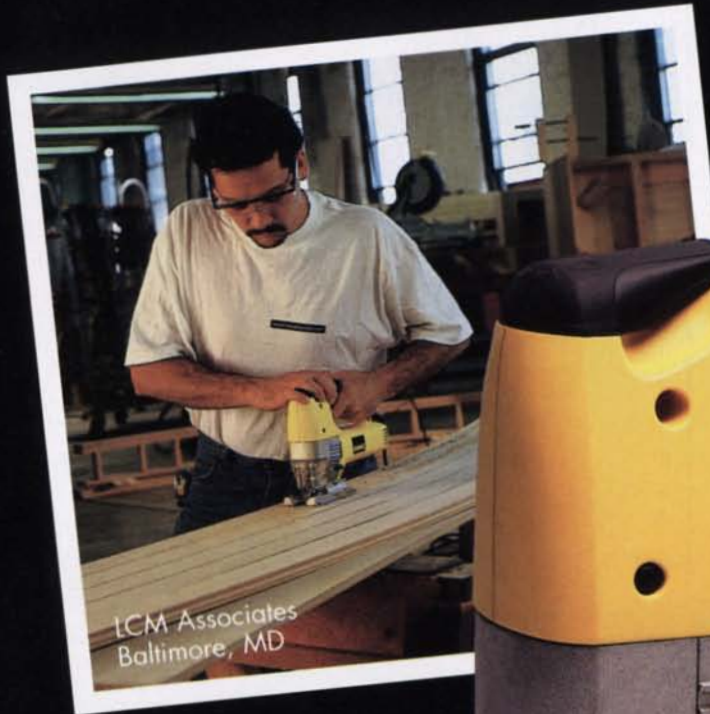
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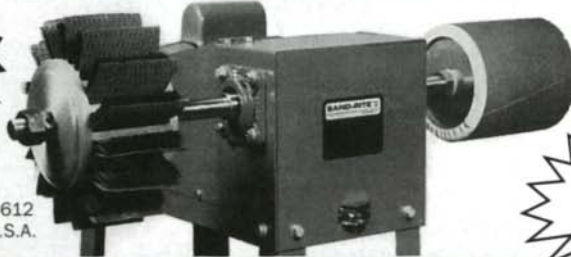
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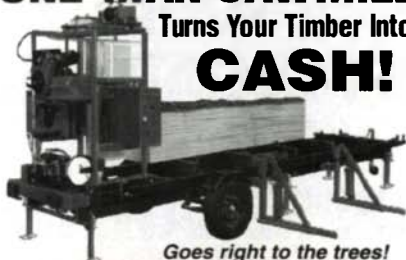
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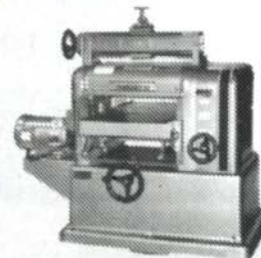


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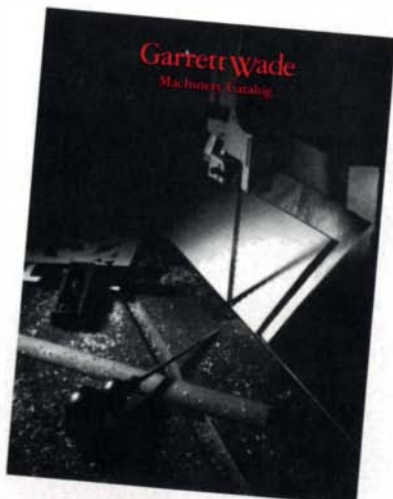
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Cottonwood for drawer sides and backs?

Cottonwood is abundant and cheap in many parts of the United States. Is it an acceptable substitute for basswood or aspen for use as drawer sides and backs? I'm more concerned with stability than aesthetics.

—Andy Westerhaus, Burnsville, Minn.

Jon Arno replies: Cottonwood is not a good choice for drawer sides or any other application where stability is a critical factor. There are several species marketed as cottonwood, but they all have very bad reputations for warping, cupping, bowing and twisting. Furthermore, their poor reputations are well-supported by some basic wood statistics.

A wood's tangential to radial (T/R) shrinkage ratio is a pretty good indicator of how it will fare as it dries. A ratio much in excess of 2:1 indicates potential instability. All cottonwoods leave this arbitrary cutoff point well in the dust.

Aspen, sometimes called popple, belongs to the same genus as cottonwood (*Populus*). As a result, its reputation has at times suffered unjustly. Big tooth aspen, *P. grandidentata*, performs about as poorly as its cottonwood cousins, but quaking aspen, *P. tremuloides*, has statistics almost identical to cherry and is quite stable. It's also inexpensive, easy to work and has a subtle maple-like figure, making it an excellent choice for drawer sides.

With regard to stability alone, basswood would seem one of the best choices for drawer sides and backs. Although it has extremely high volumetric shrinkage, its T/R shrinkage ratio is exceptionally low. As a result, it develops very little drying stress. And the walls of its wood cells are so thin and pliable that it tends to absorb what little drying stress there is without distorting. Unfortunately, basswood is so soft that drawer sides made from it tend to wear out prematurely.

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

Parts for Atlas machinery

I have access to a rather well-aged, 1947 Atlas 10-in. tablesaw and was wondering whether Atlas is still in business. If not, can parts still be obtained? Did Atlas build quality

tablesaws? Were they considered precision tools, or were they more for rough work?

—Paul K. Horne, San Angelo, Texas

Robert Vaughan replies: At the time, Atlas woodworking equipment was on a par with Sears-Roebuck's best-quality homeowner woodworking equipment. It was designed more for precision, light-duty work than for ripping 8/4 oak all day long. Atlas machines were used most often by hobbyist woodworkers.

Atlas woodworking machinery has not been made for 20 years or more, but the remaining inventory and rights to the name were bought by Clausing Industrial, Inc. (P.O. Box 877, Goshen, IN 46527-0877; 219-533-0371).

Unfortunately, Clausing no longer has tablesaw parts, but it does continue to carry some lathe parts. Your best bet probably would be a flea market. [Robert Vaughan is a contributing editor to *Fine Woodworking*.]

Keeping glue from spoiling a finish

What's the best way of preventing glue from getting into the wood pores when I'm doing a glue-up? Any glue that gets smeared into the pores will prevent stain or finish materials from penetrating the wood, resulting in a blotchy, unacceptable finish. I've thought of clamping the piece dry first, waxing the areas that excess glue might touch, disassembling and then gluing up. Later, after the glue has dried, I could pop it right off and then remove the wax with a solvent. Is this a good strategy? —Bruce Chapin, Walden, N.Y.

Lynette Breton replies: The best strategy for dealing with glue squeeze-out depends on the kind of glue you're using and whether you are edge-gluing flat panels or dealing with areas of an assembly that would be difficult to clean, such as where an apron meets a leg. With glued-up flat panels, any planing, scraping or sanding done to prepare the surface for finishing should take care of the squeeze-out. With complex assemblies, it's a different story.

Using the right amount of glue is the most important thing you can do to avoid squeeze-out. Apply enough glue so the squeeze-out forms small beads that

don't run or drip. With practice, you'll get better at striking a balance between too much and not enough.

Using a wet rag to clean up yellow glue is not a great idea, especially if you're staining, because the glue can get into the pores of the wood, as you've noted. It's better to let the glue harden just enough so you can remove it with a putty knife (about 15 to 20 minutes). If the glue gets too hard on a flat surface, I use a sharp glue scraper, which looks just like a heavy-duty paint scraper. In corners and other tight areas, I use a chisel.

Unlike yellow glue, polyurethane glue and epoxy should be allowed to dry completely. I remove the dried beads of glue from flat surfaces with a glue scraper and get it out of corners with a chisel. Polyurethane sands and scrapes easily. Epoxy, however, gets very hard when dry, so when working in tight corners, the wax method you suggest is probably a good idea. Personally, I would resort to wax only when absolutely necessary, because I want to avoid introducing solvents as much as possible.

If you lightly wet the work with water to raise the grain before the last sanding grit, defects you have missed will often show up, giving you the opportunity to plane, scrape or sand them away before finishing.

Another option for really tough glue-ups is to tape off the joints and finish the work before gluing. I've done this successfully on several occasions. [Lynette Breton teaches at the Center for Furniture Craftsmanship in Rockport, Maine.]

Chip-free melamine cutting

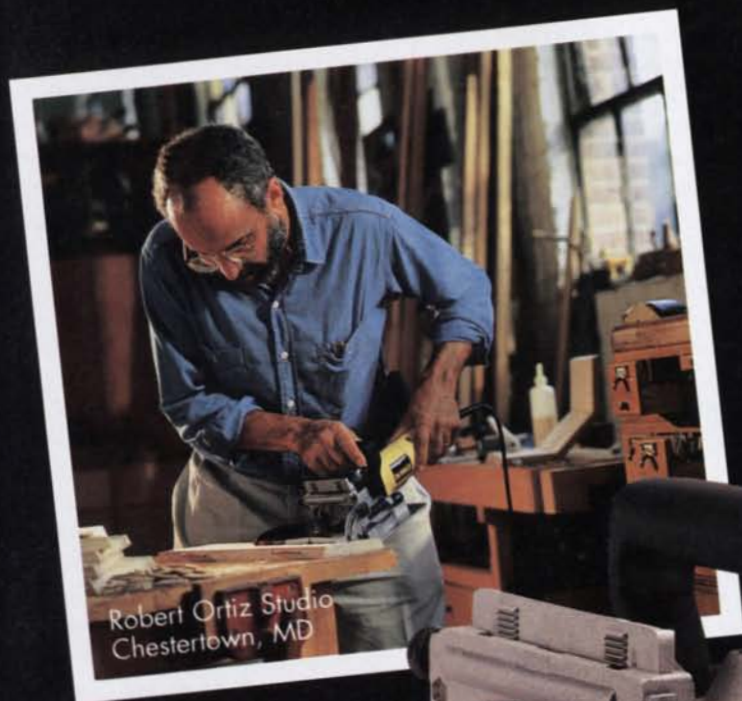
I want to build bookcases from melamine, but I'm wondering how I can cut the material without getting chipout along the edges. Because the 4x8 sheets are terribly heavy, my plan is to use a good carbide-tooth blade on my circular saw, rather than try to manipulate these sheets across my tablesaw. I'm planning to cut the sheets on sawhorses using an aluminum-angle straightedge. Is there a better technique?

—Ronald Porter, Ferndale, Wash.

William Duckworth replies: I can appreciate your wanting to use a circular saw with the aluminum fence for cutting

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up the sheets of melamine. I don't enjoy dealing with those heavy panels, either.

If you do use the circular saw, however, I would caution you not to expect the best results. A hand-held circular saw will simply have too much wobble to give you a really clean cut.

A better strategy would be to rough cut the panels to a manageable size with your circular saw and then make the finish cuts on the tablesaw.

I've used melamine a great deal. For years, I used a 60-tooth, triple-chip blade to cut it. By slowing down the feed rate, I could get pretty good results, but I still had some noticeable chipout. Then I bought a new blade made especially for melamine and got virtually chip-free cuts. The melamine blade has 80 teeth, an alternate top bevel profile and an extremely steep bevel angle.

[William Duckworth is an associate editor of *Fine Woodworking*.]

Replacing worn bandsaw blade-guide bearings

I have a 12-in. Shopmaster bandsaw, which was manufactured in Minneapolis, Minn., in the 1940s. The rear bearings in both the upper and lower blade-guide assemblies have worn out. Can you help me locate either the manufacturer or another company that stocks this bearing/shaft unit?

—D. Enger, Fallbrook, Calif.

Robert Vaughan replies: The Shopmaster company you seek is no longer in business. A number of other companies with that name still exist, but they make other products.

The back guide bearings you need are probably standard-sized ball bearings pressed on a small steel shaft. These can be identified by your local power transmission supplier (look in the yellow pages for one near you). The supplier will need accurate measurements of the bearing itself (not the shaft), so bring the whole unit with you to the shop.

In the event the back guide bearings don't use standard-sized ball bearings, then you'll need to have a shaft made that takes off-the-shelf ball bearings. Someone who has a small metal lathe should be able to help you out. Otherwise, you'll have to take the project to a machine shop, which could be expensive.

Woods for lining a humidior

A friend asked me to build a humidior for his cigars. The plans call for Spanish cedar as an inner lining. Here in southern New Jersey, we have white cedar and what we call upland, or red, cedar. Would either of these work, or would you suggest something else?

—George R. Snyder, West Creek, N.J.

Jim Plukas replies: As both a cigar lover and humidior maker, I would not recommend substituting another wood for Spanish cedar. You may have heard wine described as having an oaky finish after aging in an oak barrel; premium, hand-rolled cigars undergo a similar process. They are aged and then shipped in boxes lined with Spanish cedar. Using another wood would negate the effect of this careful aging and shipping.

The Spanish cedar in your humidior should be left unfinished so the mild aroma of the wood can enhance the flavor of the cigars and also absorb the moisture supplied by the humidistat, which is used to maintain the humidity level within the humidior.

Until a few years ago, it was relatively hard to find Spanish cedar, but now it is more readily available. I've bought it from both A & M Wood Specialty (519-653-9322) and Certainly Wood (716-655-0206). [Jim Plukas is a custom furniture maker in Rochester, N.Y.]

What are universal colors, and where can I get them?

In your book Fine Woodworking on Finishing and Refinishing, the article "Coloring with Penetrating Oils" mentions universal colors, which can be added to oil for tinting woods.

I have called all over creation and have failed to find them. Can you refer me to a source for these pigments or their equivalents?

—Stephan Vitas, Washington, D.C.

Jeff Jewitt replies: The universal colors discussed in that article are more correctly called universal tinting colors (UTCs). These are made from pigments that are ground into a vehicle (generally a mixture of glycol ether and acrylic) that is compatible with a wide variety of finishing materials, including both oil-based and water-based products and, to a lesser extent, lacquer. They are best used

in water-based products. Because some of them contain water, only small amounts can be used in lacquer. They should not be used with shellac.

If you want to tint an oil finish like Watco, you can use UTCs, which are available in 1.5-oz. tubes from Highland Hardware (800-241-6748). You also can get them from most professional paint stores. Or you can use artist's oil paints or Japan colors. Both of these are available in a wider selection of colors than UTCs, and they disperse much better in the Watco. Besides that, they're generally available at your local art-supply house. [Jeff Jewitt repairs and restores furniture in North Royalton, Ohio.]

Air-drying walnut

I recently had the good fortune to buy a large walnut log, which I had sawn into mostly 5/4 lumber. I removed the bark from the edges, cleaned the sawdust off the boards and then stacked them with 3/4-in. stickers spaced 1 ft. apart.

Because I live in a fairly dry climate, I put a plastic covering over the lumber and placed a humidity gauge inside. When the humidity rises to about 90%, I open up the plastic until the humidity drops. But I have no idea what range of humidity I should be trying to maintain. I'd like to get this beautiful wood dried with as little degradation as possible.

—Jay Edmonds, Salt Lake City, Utah

Redmond Manierre replies: Here in Virginia, I've never had to resort to wrapping a stack of lumber with plastic. Some species, like osage orange and apple, are very dense and susceptible to checking if dried too quickly. These woods might benefit from such a treatment if they weren't cut in the dead of winter, when their drying rate is very slow.

Because your walnut has been drying for a few months, I'd concentrate more on letting the stack adjust to the ambient humidity of its surroundings, while trying to shield it from the ravages of the elements. Remove the plastic entirely, and cover the top with enough plywood to leave a generous overhang, say, 2 ft. all around. (Weight it down well, or you'll be retrieving it from your neighbor's yard.)

Then wrap the sides and ends with a layer of burlap or 50% shade cloth (available from gardening-supply houses

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334	QUIKSAND W/STKIT, DUSTLESS	76	7469	CUTOUT TOOL	68
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DW421	5" DSTLS RNDM ORB SANDER, VELCRO	74
DW422	5" ROS 2AMP SANDER W/DUST COLLECT	79
DW423	5" VS DUSTLS RANDOM ORBIT SANDER	93
DW430	3" X 21" DUSTLESSBELT SANDER	169
DW431	3" X 21" DSTLS BELT SANDER VAR SP	183
DW441	6" RIGHT ANGLE ROS SANDER, DSTLS	128
DW443	6" ROS SANDER VAR SP, VELCRO	138
DW610	1 1/2 HP ROUTER, 9 AMP	147
DW615	1 1/4 HP PLUNGE ROUTER, VAR SP	163
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DW705	12" MITER SAW W/CARB BLADE	358
DW936	18V CORDLESS SAW KIT	248
DW972K2	NEW 12V CRDLS KIT W/ BATTERY & CS	188
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and home centers). This will prevent rain or snow from blowing into the stack, keep the sun from scorching the wood and provide a breathable barrier that will slow the rate of evaporation without halting it altogether.

Also, be sure the ends of the boards are sealed. At my sawmill, all the logs are sealed as soon as they're harvested with a wax-emulsion paint called Anchorseal, which is available by calling U-C Coatings Corp. (716-833-9366).

[Redmond Manierre is the proprietor of Landmark Logworks.]

Compatibility of lacquer over oil

I'm about to finish a set of cherry kitchen cabinets. I applied a mixture of paint thinner and linseed oil to a sample and then sprayed on nitrocellulose lacquer. I like the depth the oil gave the cherry. Will I have adhesion problems later? The sample is fine so far.

—Charles Amen, Streamwood, Ill.

Chris Minick replies: Oil under lacquer is one of my favorite finishes for walnut, and I'm sure it looks great on cherry, too. Oil brings out a wood's figure and color, and the lacquer protects it from damage.

Rather than linseed oil, though, I use a Danish oil finish like Watco or Defctoil. Danish oil finishes are really long-oil varnishes, which means they dry harder and, more important, cure quicker than linseed oil. Typically, I allow the Danish oil to dry for three or four days. Then I lightly scuff-sand the wood and apply a nitrocellulose lacquer topcoat. I have used this system for years and have not seen any adhesion problems.

But linseed oil takes a surprisingly long time to cure. Seven to 10 days is not uncommon, especially if your shop is on the cool side or if there is a lot of oil in the wood. Topcoating the oiled wood before the oil has completely cured will lead to adhesion problems.

[Chris Minick is a finishing chemist and woodworker in Stillwater, Minn. He is a contributing editor to *Fine Woodworking*.]

Buckling of cross-grain string inlay

I built a solid-cherry dining room table that's 11 ft. long with all three extensions in place. With no extensions,

the table is 6 ft. long. I made the classic mistake of inserting a strip of inlay against the grain. Now, a year later, my clients called to let me know that the inlay is buckling. Apparently, it's even happening on the 20-in. extensions. Do you have a remedy? —Vic Germaniuk, Kaministiquia, Ont., Canada

Garrett Hack replies: It is too bad, but certainly not unexpected, that your inlay bandings are buckling. As stable as cherry is, the 20 in. width of the leaves is too great a distance to inlay across the grain. Fortunately, with some patience and careful work, you should be able to replace the strip with another band of inlay that moves with the table as the moisture levels fluctuate throughout the year.

First you need to rout or chisel out the old inlay, leaving the groove sharp and clean of glue. Then install new inlay whose grain runs parallel with the grain of the tabletop.

The easiest way to make the new pieces is to crosscut them from a wide board dressed to ¼ in. or so, assuming your groove is between ⅛ in. and ⅜ in. deep. I would use a crosscut box on the tablesaw with a sharp 80-tooth crosscut blade. Setting the blade a few degrees off square and flipping the board every pass will make strips with a slight bevel that will fit snugly into the groove. Take the time to make an accurate setup, and then make some trial cuts. This will mean less fitting later and a more uniform inlay line.

Set the strips in place by starting at one end and gluing one in after the other, fitting the ends as you go. When the glue has set, level the strip with a sharp plane held at a skew to the inlay, moving down the length of the table. Follow up with a hand scraper.

[Garrett Hack designs and builds furniture in Thetford Center, Vt.]

Knockdown hardware for an entertainment center

I'm designing a large entertainment unit that will have to be disassembled to be moved. I plan to use frame-and-panel construction for the sides and back, which will connect at three points. I'd like to use fasteners that are not visible on the outside of the case. I've considered bed-rail fasteners, but they

seem like overkill. I've also thought about using fasteners I've seen that fit in biscuit slots but come apart. What do you recommend?

—Randal Wimberlen, Wilmington, Del.

Niall Barrett replies: Before committing to a solution, ask yourself a few questions: How much stress will the piece be under during use? How often will it need to be taken apart? (If it just needs to be transported and then installed permanently, screws might be an appropriate solution.) Also be sure you have the tools and skills necessary to install the fasteners properly.

If this piece must break down completely, have no fasteners showing and use fasteners that are reasonably simple to install, then you really don't have many hardware options. I've used both the methods you're considering with good results—but you have to be aware of any construction's limitations.

The knockdown biscuit fasteners you mention, called Lamello KDs (available from Select Machinery, 64-30 Ellwell Crescent, Rego Park, NY 11374; 800-789-2323), rely on the glue that holds them in the slot for strength. I use epoxy most often, but I also have had some success with polyurethane glues. Although I've never had one of these fasteners fail, I still think that they make a rather tenuous attachment. Consequently, I limit my use of them to parts that will be fitted once or twice and then installed permanently. Also, although it's possible to install these fasteners without the proprietary installation tool sold by Lamello, it's problematic at best. Even with the tool, it can be a fussy affair.

Bed-rail fasteners (available from most mail-order suppliers) are probably a better choice for the particular situation you've described. They are relatively easy to install, quite strong and come in many different styles and sizes, so I don't think they would be overkill.

Something else to consider before settling on the hardware to connect the main carcass pieces is how any interior partitions will attach to these knockdown pieces. What kind of joinery will you use to support shelves, for instance, or divide the interior vertically?

Perhaps the best advice I can give you is to consider carefully what degree of

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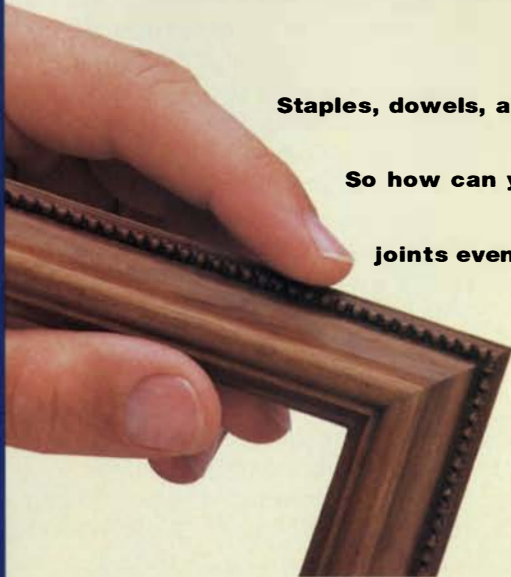
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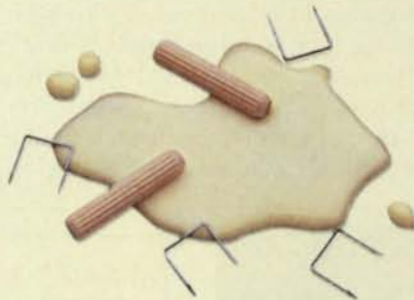
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knockdown is absolutely necessary. Often, just being able to remove the base and crown is enough. Hardware may not even be the answer: I've seen many large old case pieces held together with loose joinery (such as tusk tenons and wedges) and cleverly fitted parts.

In any case, you should figure out how you're going to break down your entertainment center first, purchase any necessary hardware and then design the piece around the construction requirements of the hardware. [Niall Barrett builds furniture and cabinetry in Narrowsburg, N.Y.]

Drying and finishing spalted maple

Awhile back, I found several maple logs that had been in the mud for a long time but were still well-preserved, so I had them sawn into boards. As you might expect, the spalting is dramatic. I now find myself the owner of several hundred board feet of beautiful, spalted maple. How should I dry this lumber?

And what finish should I use to maintain the wood's present colors?

—Daniel Ida, Reedsburg, Wis.

Jon Arno replies: Although it is beautiful, spalted wood is not so fragile as to require special treatment. It doesn't make much difference whether you air-dry the wood or have it kiln-dried, but air-drying will take awhile longer. Meanwhile, the fungi responsible for the wood's beautiful, marble-like veins of color will continue to propagate and devour the wood until it becomes dry enough to force them into dormancy, which is somewhere around 18% moisture content.

Although temperatures within a drying kiln may get high enough to kill the fungi and sterilize the wood, the spores of these decay-causing organisms are so prevalent in the atmosphere that even kiln-dried wood will become reinfected if its moisture content is allowed to creep above this critical level.

The long-term moisture content of wood used in interior applications

generally remains in the 10% to 15% range, so there is virtually no risk of waking up the little devils. However, using spalted wood for exterior projects is not advisable.

As for preserving the color of the wood, the pigments in spalted wood are not particularly fugitive. The application of penetrating oil, wax, varnish or lacquer may cause subtle changes in the color or heighten the contrast. But they're not important in a protective sense, other than for their ability to retard the wood's exchange of moisture with the surrounding air.

Spalting is simply an attractive form of blue staining, a condition normally viewed as a defect, and one that is virtually impossible to bleach out or hide. The flip side of this is good news for fans of spalted wood: Its color is there to stay.

Do you have a question you'd like us to consider for the column? Send it to Questions & Answers, Fine Woodworking, PO Box 5506, Newtown, CT 06470-5506.



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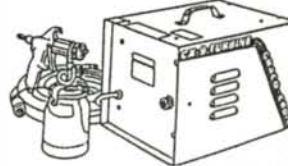
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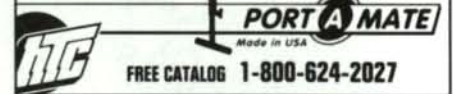
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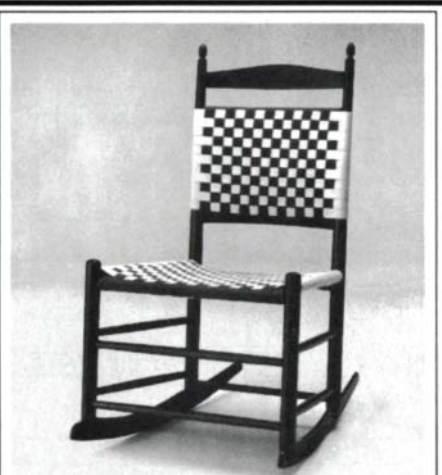


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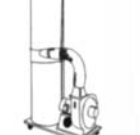
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DELTA

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46-541: Lathe: Call for promo prices

43-375: Shaper: Call for special

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40-601: Scroll Saw - CALL!

31-730: Belt/Disc Sander - CALL!

37-350: 8" Jointer w/sander - CALL!

34-446: 10" Cont. Saw: \$618

34-446: 10" w/Unifence - CALL!

28-283: 14" Bandsaw - CALL!

17-500: 16-1/2" Drill Press - CALL!

43-355: Shaper NEW!

33-990: 10" Radial Arm Saw: \$729

36-755: Tilt arbor saw NEW!

22-500: Plate Joiner - NEW! CALL!

22-500: 12" planer NEW! CALL!

40-540: 20" VS Scroll Saw - CALL!

37-390: 6" Jointer w/sd CALL!

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Model 9862

In head-to-head comparisons, Porter-Cable's new 12 volt cordless drill put the screws to all the rest. Against seven different drills in seven different categories, Porter-Cable came out first in five out of seven and a close second in the other two. With more torque, higher performance and longer life.

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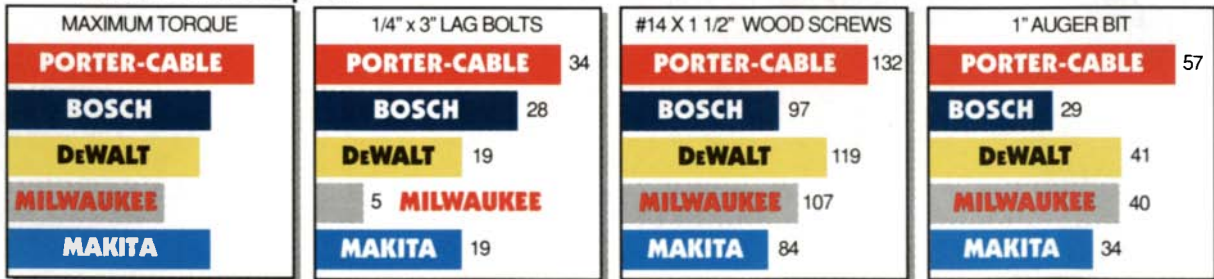
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100	7/8 hp Router	103
1700	HeatGun	81
2620	3/8" Drill 4.5 amp	86
2621	3/8" Keyless Drill	86
310	Laminate Trimmer	143
312	Offset Trim Router	157
332	RO Sander	65
345	6" Saw Boss	103
361	3X24 Belt Sander	188
363	4X24 Belt Sander	198
410	Betterly™ Underscribe	147
411	Betterly™ MiterFold	164
447	7-1/4" Framers Saw	133
5008	12" Dovetail Jig	76
511	Door Lock Kit	138
5116	16" Dovetail Jig	256
556	Biscuit Joiner	132
693	1.5hp Plunge Router	168
6931	Plunge Base	72
695	Router Table w/motor	221
696	Router Table only	127
7116	24" Dovetail jig	292
7499	Drywall Cutout	62
7518	Vari Sp 3 hp Router	266
7519	3 hp Router	237
7536	2 hp Router	203
7537	2 hp D-Handle Rter	212
7538	3 hp Plunge Router	241

7539	VS Plunge Router	264
7549	Jig Saw	127
7800	Drywall sander	326
7810	Vacuum	239
9118	3 1/4" Planer Kit	213
9314	Trim Saw Kit	156
96645	Screwgun w/case	128
97310	Type 2 Trimmer Kit	184
97335	5" RO Sander	117
9743	7-1/4" Saw Kit	139

PORTER+CABLE



9444	NEW 25 pc Profile Sander Kit	112
444	Profile Sander only	84
347K	7" Circular Saw RH with case	127
743K	7" Circular Saw LH with case	127
97355	5" Random Orbit Sander w/case & dust hood	147
97366	6" Random Orbit Sander w/case & dust hood	153

NEW Porter-Cable NAILGUNS!!!

BN125	1 1/4" Brad Nailer	95
BN200	2" Brad Nailer	142
FN200	2" 16g Finish Gun	164
FN250	2 1/2" 16g Finish Gun	219
DA250	2 1/2" angle Finish gun	245
NS100	1/4" crown Stapler	95

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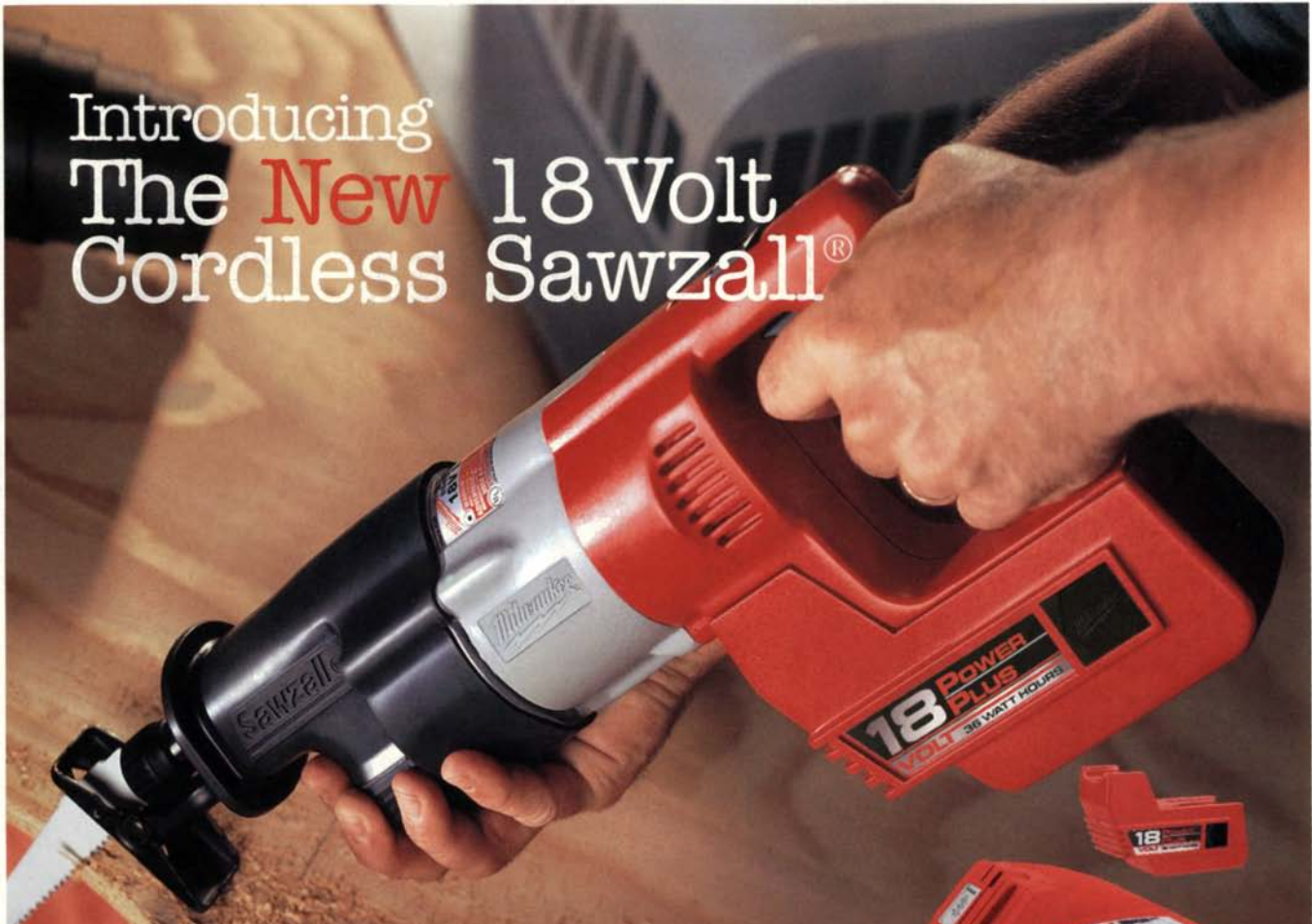
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550-1645
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MILWAUKEE TOOLS		
Model	Description	List Sale
9068	1/2" Impact Wrench with case	457 269
5455	7 1/8" Polisher 1750 rpm	230 162
6078	7 1/8" 13 amp grinder	295 159
0230-1	3/8" Drill 3.5 amp	231 128
5936	Belt Sander 4 x 24 w/bag 10 amp/295	275
6747-1	Drywall Gun 0-2500 rpm 5 amp	205 109
6016	1/4 sheet Palm Grip Sander	99 56
6017	6016 Sander with dustbag	101 58
6008	1/2 sheet 12,000 orb/min 5 amp	230 126
8975	Heat Gun 570° & 1000°	102 59
8977	Variable Temp. Heat Gun	137 82
8980	8975 Heat Gun w/case, & acc.	155 94
3102-1	Plumbers n angle Drill Kit	401 229
5660	Router 1-1/2 HP 10 amp	357 198
6256	Variable speed Jig Saw 3.8 amp	278 149
6266-6	NEW Top Handle Jig Saw	315 165
6527	Super Sawzall with case	343 169
6537-22	6527 w/ quick lok blade change	224 175
6528	above Sawzall with wired cord	339 185
6516-21	NEW cordless Sawzall	550 325
6125	5" Random Orbit Sander	219 125
0406-1	9.6V Drill Kit with 2 batteries	315 159
0408-6	12V Drill w/keyless chuck & 2 batt/380	172
0502-21	NEW 12V Drill Kit w/ 2 batteries	346 225
0231-1	3/8" Drill 0-1700 rpm	170 89
0224-1	3/8" Drill 4.5 amp magnum	236 132
0225-1	Same as 0224-1 w/keyless chuck	236 132
0234-1	1/2" Drill 5.4 amp mag 0-850 rpm/255	129
0236-1	0234-1 drill with steel case	288 149
0235-1	Same as 0234-1 w/keyless chuck	255 129
0244-1	1/2" Drill 5.4 amp mag 0-600 rpm/255	129
0222-1	3/8" Drill 3.5 amp 0-1000 rpm	213 119
0228-1	3/8" Drill 3.5 amp 0-1000 rpm	207 118
0375-1	3/8" close quarter Drill	255 148
0379-1	1/2" close quarter Drill	288 165
6539-1	cordless Screwdriver 190 rpm	139 78
6540-1	6539-1 with bits & case	175 95
6546-1	cdless Screwdriver 200 & 400 rpm/150	86
6547-1	6546-1 w/bits 1/4" chuck, & case/185	105
5399	1/2" D-handle Hammer Drill Kit	356 194
1676-1	HoleHawg with case	541 309
6507	Original SawZall with case	278 149
6508	Above Saw with wired cord	264 152
6517	6.5 amp Sawzall with case	296 159
6175	1/4" Chop Saw 15 amp	415 279
6010	Orbital Sander 1/2 sheet	235 129
5397-1	3.8" var. speed Hammer Drill Kit	275 145
5371-1	1/2" var. speed Hammer Drill Kit	360 194
5377-1	5371-1 with keyless chuck	360 194
3107-1	1/2" var. speed right angle Drill	411 234
3300-1	1/2" var. speed right angle Drill	378 199
5680	Router 2" HP w/ 1/4" & 1/2" collets/367	165
6145	4-1/2" Grinder 10,000 rpm	179 94
6142	6145 with case & accessories	224 125
6749-1	Drywall Gun 0-2500 rpm 5.4 amp/235	135
6755-1	Drywall Gun 0-4000 rpm 5 amp	183 99
6767-1	Screw Shooter Kit	252 142
5353	Eagle 1-1/2" Rot. Hammer w/ csi/406	575
6365	7-1/4" Circular Saw 13 amp	229 125
6367	above Saw - double insulated	224 128
6366	6365 with fence & carbide blade	237 129
6368	6365 w/fence, carbide blade, & cs 259	142
6377	7-1/4" Worm Drive Saw	345 194
6369	7-1/4" Circular Saw with brake	280 152
6490	10" Mitre Saw	496 265
6491	6490 w/ carbide blade & bag	594 328
6494	10" Compound Mitre Saw	585 315
0422-1	12V Hammer Drill w/ 2 batt	441 229
0431-1	12V Drill w/ 2 batteries	441 229
6496	NEW 10" Slide Compound Saw	1050 569

PANASONIC CORDLESS		
Model	Description	List Sale
EY618CRKW	9.6V Drill Kit with 2 batteries, 1 hour charger, & case	307 169
EY618EQK	9.6 volt Drill with 15 minute charger, case, & ironman battery	315 169
EY610CRKW	12 volt Drill Kit with 2 batteries, 1 hour charger, & case	379 188
EY610COKW	Same as EY610CRKW but has 15 minute charger	409 209
EY610EQKW	12 volt Drill kit with 2 ironman batteries, 15 min. charger & cs.	379 199
EY610ISQK	12V 1/2" Drill with 15 minute charger, diagnostic battery, & case	438 249
EY350EQKW	NEW 4-3/8" 12V Metal Cutting Saw Kit	500 289

FREUD SAW BLADES		
Model	Description	List Sale
LUB2M10	Cut-off 10"	60 93 47
LUB4M10	Combo 10"	50 78 42
LUB8M10	Super Cut-off 10"	80 115 59
LM72M10	Ripping 10"	24 69 38
LU73M10	Cut off 10"	60 84 45
LU87M10	Thin Kerf 10"	24 72 44
LU88M10	Thin Kerf 10"	60 88 49
LU85M15	Mitre Saw blade 15" 108	175 99
LU91M10	Compound Mitre Blade 60"	88 54
LU98M10	Ultimate 10"	80 128 68
LU89M10	Ferrous metal 10"	72 104 58
F410	Quiet Blade - 10"	40 95 49
F810	Quiet Blade - 10"	80 135 74
TK303	7-1/4" Finishing - 40 tooth	38 25
TK906	10" Combo - 50 tooth	53 32
SD306	6" Dado - Carbide	215 115
SD308	8" Dado - Carbide	230 119
SD506-6	Super Dado-carb. w/cs&shims	292 145
SD508-8	Super Dado-carb. w/cs&shims	344 168
FB107	piece Router bit set 1/4" - 1"	92 59
94-1005	pc Router bit door system w/cs	320 169
BF3	NEW Router Table w/ fence & legs	495 289

MAKITA TOOLS		
Model	Description	List Sale
6172DWE	3/8" variable speed Drill Kit 7.2V with 2 batteries	222 109
5090DW	3-3/8" Saw Kit 9.6 volt	280 148
DA391D	3/8" angle Drill 9.6 volt	166 109
DA391DW	3/8" angle Drill Kit 9.6 volt	341 179
ML900	9.6 volt flashlight	341 179

NEW CORDLESS DRILLS WITH 2.0 AMP HIGH CAPACITY BATTERIES		
Model	Description	List Sale
6213DWAEE	12V 3/8" Drill Kit w/2 batt.	325 185
6233DWAEE	14.4V 3/8" Drill Kit w/ 2 batt.	358 199

SUPER CORDLESS SPECIALS		
Model	Description	List Sale
6073DW	7.2V cds Drill Kit. Variable speed & clutch. Complete w/ battery, charger, & case	99
T220DW	9.6 volt Stapler Kit. Complete with battery, charger, & case	99

BOSTITCH AIR NAILERS		
Model	Description	List Sale
NB05-1	Stick Nailer	Super Sale 339
NB0C-1	Coil Nailer	Sale 339
NR45	Coil Roof Nailer 3/4" - 1-3/4"	845 369
N60FN-2	Finishing Nailer 1-1/4" - 2-1/2"	557 335
N60FN-2KN60FN-2	w/ case, oil, & nails	618 345
T505A-1	Decking Sheathing Stapler	618 355
MIFS	Flooring Stapler 15 gauge	902 529
S325X-1	Finish Stapler - 1/2" - 1-3/8"	245 155
B325X-1K325X-2	w/ case & oil	269 165
BT35-2K	Brad Tracker 5/8" - 1-3/8"	254 155
BT35-2K	BT35-2 with case, oil, & brads	279 165
BT50-2K	Brad Tracker 1-3/16" - 2"	297 189
BT50-2K	BT50-2 w/ case, oil, and brads	335 209
PC5000-E	Power Crown Stapler	242 159
CWC100	1 HP Pancake Compressor	440 289

FREUD NEW Teflon Coated Red Blades		
Model	Description	Teeth List Sale
LU98R010	Ultimate 10"	80 128 69
LM72R010	Ripping 10"	24 78 44
LU84R010	Combo 10"	50 89 52
LU89R010	Super cut-off 10"	80 114 65
LU85R015	Miter saw blade 15"	108 179 105
LU87R010	Thin kerf 10"	24 72 48
LU88R010	Thin kerf 10"	60 88 52
LU91R008	Compound miter 8-1/2" 48"	79 49

FREUD POWER TOOLS		
Model	Description	List Sale
EB100	Edge Banding Machine	409 215
FJ85	NEW Top Handle Jig Saw	229 125

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DW995K	1/2" Drill Kit	Sale 222
DW997K	1/2" Drill/Hammer	Sale 249
DW936K	Saw Kit	Sale 249



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ACCU-MITER		
Model	Description	List Sale
18-34	Professional Mitre Gauge	149 145

JDS AIRTECH AIR CLEANERS		
Model	Description	List Sale
350	12"x24"x28" 1/5 HP - 350 CFM	245
8-12	20"x24"x44" 1/3 HP - 800,1200 CFM	469
10-16	20"x24"x44" 1/3 HP - 1000,1600 CFM	659

PORTA NAILER		
Model	Description	List Sale
401	Porta Nailer complete	295 209
501	Face Nail complete	295 209
1,000	Genuine Porta Nails - 1000 qty.	16.50
5,000	Genuine Porta Nails - 5000 qty.	74.95
10,000	Genuine Porta Nails - 10000 qty.	129.95

BIESEMEYER FENCES		
Model	Description	List Sale
B-50	50" Common Saw Fence	443 325
T-SQUARE 52	52" Homeshop Fence	360 269
T-SQUARE 40	40" Homeshop Fence	335 249
T-SQUARE 28	28" Homeshop Fence	325 239

BOSCH		
Model	Description	List Sale
1584VS	Top Handle "CLIC" Jig Saw	292 139
1587VSC	1587VSC Saw with case	Sale 149
1587VDS	above saw w/ dust collection	317 178
1584VS	"CLIC" Barrel Grip Jig Saw	288 139
1584VDS	above saw w/ dust collection	306 178
Bosch Metal Case for above Jig Saws	34	24
Bosch 30 blade assortment for Jig Saws		28.99

Super Special		
Model	Description	List Sale
1584VS or 1587VDS	with steel case and 30 Bosch blades	Sale 175

1942	Heat Gun 600°-900° temp	132 78
1289D	1/4 sheet Sander	113 68
1003VSR	3/8" Drill 0-1100 rpm	167 78
1194VSR	1/2" var. speed Hammer Drill	272 155
1194VSRK	above Hammer Drill w/ case	303 169
1195VSR	3/8" var. speed Hammer Drill	247 139
1608LX	5.6 amp Laminate Trimmer w/ guide	189 110
1608T	5.6 amp tilt base Trimmer	189 115
1608U	Underscribe Laminate Trimmer	239 139
1609K	Laminate Installers Kit w/ 1609 Trimmer	355 199
1609XK	Deluxe Installers kit	425 234
1604XA	1-3/4 HP 2-Handle Router	269 142
1604AK	Same as above w/case & acc.	337 185
1606A	1-3/4 HP D-handle Router	300 179
327D0VS	3"x21" v/spd Belt Sander w/bag/301	165
1613EVS	2 HP v/spd Plunge Router	369 199
1615EVS	3 HP v/spd Plunge Router	536 289
1614EVS	1-1/4 HP v/spd Plunge Router	295 169
3054VSRK	1/2" cordless drill kit	323 185
137D0EVS	6" Random Orbit Sander	446 245
B1650K	Biscuit Joiner	Sale 169
B7000	Corner Detail Sander	126 68
B7001	Corner Detail Sander v/spd.	Sale 89.95
B4050	In Line Jig Saw	206 119
3272K	3-1/4" Planer with case 4.2 amp/205	119
1347AK	4-1/2" Grinder w/ case & acc.	172 105
1348AE	5" Grinder 8.5 amp	237 135
11304	"The Brute" Breaker Hammer	1249
11305	Demolition Hammer 10 amp	1328 739
11314EVS	Demolition Hammer	921 539
11232EVS	1-1/2" Spline Hammer Drill	820 525
11224VSR	7/8" SDS Rotary Hammer Drill	404 229

NEW BOSCH TOOLS		
Model	Description	List Sale
1634VSK	NEW Recipro Saw 10.5 amp	335 189
1276D	NEW 4" x 24" Belt Sander	379 219
1276DVS	NEW 3" x 24" v/spd Belt Sander	379 219
1276DVS	NEW 4" x 24" v/spd Belt Sander	408 229
3300K	NEW 12V Drill Kit w/ 2 batteries	285 169
3310K	NEW 12V T-Handle Drill Kit with 2 batteries	345 178
3110K	NEW 9.6V T-Handle Drill Kit with 2 batteries	318 185
3161K	NEW 14.4 volt Drill Kit	354 195
3107DVS	NEW 5" Random Orbit Sander	165 98
3107DVS	NEW 5" Random Orbit Sander	195 115
372DVS	NEW 6" Random Orbit Sander	256 149
B3915	NEW 10" Slide Compd Saw	1050 589
11230EVS	NEW SDS-max 1-1/2" Rotary Hammer	910 519
11231EVS	NEW SDS-max 1-3/4" Rotary Hammer	1363 785
11223EVS	NEW SDS-max 2" Rotary Hmr/1595	915
11311EVS	NEW Demolition Hammer	variable speed 1328 759

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SKIL TOOLS		
Model	Description	List Sale
HD5825	6-1/2" Worm Drive Saw	313 172
HD2735-04	12 volt cordless Drill Kit	260 148
HD2736-04	2735-04 with keyless chuck	269 148
1605-02	Biscuit Joiner with case	234 135
5510	5-1/2" Circular Saw	196 119
5860	8-1/4" 60° Worm Saw	

DELTA BENCH TOP TOOLS		
Model	Description	List Sale
23-700	Wet/Dry Grinder	206 149
23-680	6" Bench Grinder 1/4 HP	80 69
23-800	8" Bench Grinder 1/2 HP	134 115
11-950	8" Drill Press	176 128
31-460	4" Belt/6" Disc Sander	198 135
31-340	1" Belt/8" Disc Sander	270 189
31-080	1" Belt/5" Disc Sander	113 85
40-560	16" 2 speed Scroll Saw	230 165
11-990	12" Bench Drill Press	255 184
11-090	32" Radial Bench Drill Press	405 305
43-305	1/2" Bench Router/Shaper	398 299
22-540	12" Bench Top Planer with extra knives	557 369

36-220	10" Compound Miter Saw	294 199
14-650	Hollow Chisel Mortiser	380 239
33-060	"Side Kick" Miter saw	541 399
14-070	14" Floor Drill Press	405 319
20-140	14" Cut-off Saw	299 229
37-070	6" var. speed Bench Jointer	351 245
36-275	8-1/4" Builders Saw	358 259
36-210	10" Compound Miter Saw	344 225
36-040	8-1/4" Compound Miter Saw	190 135
36-070	10" Miter Saw	217 165
34-182	Toning Jig	113 75
34-555	Sliding Table	487 325

NEW TOOLS BY DELTA		
31-780	NEW Oscillating Spindle Sander	253 188
23-710	NEW Sharpening Center	217 169
28-185	NEW Bench Band Saw	213 175
37-190	NEW 6" Deluxe jointer	603 489
36-250	NEW 10" Side Compound Saw	441 329
31-695	NEW 6" Belt/9" Disc Sander	441 329
40-650	NEW Q3 18" Scroll Saw	600 479
40-540	NEW 16" var/spd Scroll Saw	249 179

DELTA STATIONARY		
31-280	Sanding Center w/ stand	1250 789
17-900	16-1/2" Floor Drill Press	490 399
34-080	10" Radial Box	981 779
33-990	10" Miter Arm Saw	981 779
33-055	8-1/4" Sawbuck comp with legs	846 639
36-540	10" Table saw	229 169
34-670	10" Motorized Table Saw	492 395
32-100	Stationary Plate Jointer	351 269
36-905	30" Unifence	346 245
36-906	50" Delta Unifence	444 319
36-755	10" Tilt Arbor Saw	1019 799
33-890	12" Radial Arm Saw	1509 1199
34-444	10" Contractor's Table Saw	615 449

DELTA REBATES!		
Prices shown are before rebate!		
\$25.00 rebate		
46-700	12" Wood Lathe	575 479
\$50.00 rebate		
28-275	14" Band Saw 3/4 HP	649 549
28-280V	14" Band Saw w/enc stand 1 HP	790 690
34-445	10" Table Saw with 30" unifence	839 739
22-675	NEW DC380 15" Planer	1175 975
43-355	3/4" Shaper 1-1/2 HP	849 749
\$75.00 rebate		
37-154	DJ15 6" Jointer	1289 1189

DEWALT TOOLS		
DW321K	NEW Jigsaw Kit	300 169
DW364	7-1/4" Circ. Saw w/brake, 13 amp	294 159
DW306K	8.0 amp Recip Saw w/cs w/spd	291 164
DW610	1-1/2 HP 2 handle Router	266 152
DW411	1/4 sheet Palm Sander, 1.7 amp	88 58
DW705	12" Compound Miter Saw	734 359
DW704	12" Miter Saw	570 325
DW100	3/8" Drill, 4 amp, 0-2500 rpm	118 68
DW280K	NEW Screwdriver kit complete	222 124
DW673K	Laminate Trimmer kit	364 205
DW402	4-1/2" Grinder 6 amp	166 89
DW682K	Biscuit Joiner with case	448 199
DW625	3 HP Electronic Pipe Router	520 275
DW625 router comes with DW6966 fine depth adjuster and 8-piece template guide set!		
DW621	NEW 2 HP Plunge Router	400 218
DW675K	3-1/8" Planer with case	292 164
DW431	3 x 21 var. speed Belt Sander	338 184
DW420	Palmgrip Random Orb Sander	124 69
DW421	above Sander with dust collector	144 74
DW423	NEW Palm Random Orb Sander variable speed	170 94
DW444	6" Random Orbit Sander	266 139
DW443	DW444 with hook & loop pad	266 139
DW935K	14.4V 5-3/8" Trim Saw kit	444 237
DW935K Saw comes with 2 batteries!		

DEWALT CORDLESS DRILLS		
DW952K	3/8" v/spd w/ two 9.6V batteries	284 139
DW972K	2-3/8" v/spd w/ two 12V XR batt	362 189
DW904	12 volt flashlight	29.95
DW972K-2 drill & DW904 flashlight Sale 205		
DW991K	2-3/8" v/spd w/ two 14.4V XR batteries	415 225
DW994KQ	1/2" variable speed w/ one 14.4V XR battery	458 235
DW994KQ-2	DW994KQ drill kit w/ 2 batt. Sale	259 184
DW996K	1/2" v/spd Hammer drill w/ one XR battery	396 245
Above drill kits come w/charger & steel case!		
DW991KS-2	DW991K drill, DW935 saw, & case	349

NEW DeWalt 18 volt Cordless Tools		
DW995K	1/2" Drill Kit	428 229
DW997K	1/2" Drill + Hammer Drill Kit	454 249
DW936K	Saw Kit	458 249

WAPVACUUMS		
Model	Description	List Sale
766DF	10 gallon turbo vacuum	845 465
766DFD	"Dry"wall'er" 10 gal turbo vac.	915 549
766DFR-DAS	Same as above w/air start	950 589

CLAYTON OSCILLATING SPINDLE SANDERS		
140	Portable sander w/4-1/2" spindle	625 559
146	Portable sander w/9" spindle	685 609
100	Floor mount sander w/4-1/2" spnd	785 709
106	Floor mount sander w/9" spindle	845 759

DREMEL TOOLS		
3955	Moto Tool Kit with bits & case	134 75
3956	Super Moto Tool Kit w/ acc.	152 85
1672	16" Scroll Saw - 2 spd "Best buy"	302 174
1695	16" var. speed Scroll Saw	408 229
290	Electric Engraver with point	25 16
1731	5" Discit" x 30" Belt Sander	189 114

JORGENSEN ADJUSTABLE HANDSCREWS		
Item#	Jaw Length	List Sale
#3/0	6"	17.05 9.90
#2/0	7"	18.30 10.70
#0	8"	20.35 12.10
#1	10"	23.30 12.90
#2	12"	26.75 14.90
#3	14"	33.85 18.55
#4	16"	44.05 24.65

JORGENSEN STYLE 37 2-1/2" Throat 1/4"x3/4"		
Item#	Jaw Length	List Sale
3706	6"	10.85 6.20
3712	12"	12.05 6.80
3718	18"	13.25 7.60
3724	24"	14.55 8.15
3730	30"	16.20 9.05
3736	36"	17.70 10.20

JORGENSEN STYLE 45 5" Throat 1-3/8" x 5/16"		
Item	Jaw Length	List Sale
4512	12"	34.50 20.75
4518	18"	36.35 22.30
4524	24"	38.50 23.65

JORGENSEN STEEL "I" BAR CLAMPS		
Model	Size	List Sale
7224	24"	35.75 20.30
7236	36"	38.35 22.35
7248	48"	42.15 24.45
7272	72"	48.50 29.60

PONY CLAMP FIXTURES		
Model/Description	List Sale	Lots
50 3/4" Black Pipe Clamps	15.45 8.10	92.50
52 1/2" Black Pipe Clamps	12.65 6.95	74.50

MK TILE SAWS		
Model	Description	List Sale
MK770	1/2 HP - 7" blade	795 579
MK366	3/4 HP - 7" blade	795 589
MK880	1 HP - 8" blade	986 859

Piranha Carbide Tooth Saw Blades by B & D				
Model #	Diameter	#Teeth	List	Sale
73-715	5-1/2"	16	14.39	8.30
73-716	6-1/2"	18	14.39	8.30
73-717	7-1/4"	18	14.60	7.99
73-737	7-1/4"	24	18.06	9.50
73-757	7-1/4"	40	32.87	17.49
73-718	8"	22	20.95	11.25
73-759	8-1/4"	40	46.88	26.95
73-719	8-1/4"	22	20.63	12.45
73-740	10"	32	34.63	18.85
73-770	10"	60	70.37	36.95
73-711	10"	50	68.33	36.95

DURA III- ADJUSTABLE STILTS		
Model	Description	List Sale
DI422	14"-22" extension	270 205
DI830	18"-30" extension	286 222
D2440	24"-40" extension	304 239

SIOUX TOOLS		
8030	3/8" variable speed Drill	263 145
8000	3/8" variable speed close quarter Drill	211 125
8005	Same as 8000 but is 0-2500 rpm	221 139
6907	5" Air Random Orbit Sander	228 132
790	NEW lightweight 5" Sander	235 135

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Model	Width	Spans to Rung	Attaches to Rung	Sale
10-14-02	14"	2 rung	2 rungs	83.95
10-20-02	20"	3 rung	2 rungs	92.95
10-20-03	20"	3 rung	3 rungs	101.95

ALUMINUM ARTICULATED LADDERS			
TYPE IA - 300 # RATING			
Model	Length	Weight(lbs.)	Sale
MT-14	7'	43#	159.95
M8-16	8'	46#	189.95

FIBERGLASS STEP - TYPE 1 - 250# RATING			
6004	4'	13#	57.95
6005	5'	16#	68.95
6006	6'	18#	72.95

FIBERGLASS STEP - TYPE 1 - 250# RATING			
6004-S/w/pal shelf	4'	15#	63.95
6005-S/w/pal shelf	5'	18#	73.95
6006-S/w/pal shelf	6'	20#	80.95

FIBERGLASS STEP - TYPE 1A - 300# RATING			
6204	4'	14#	65.95
6205	5'	18#	76.95
6206	6'	20#	89.95

ALUMINUM FLAT STEP TYPE 11- 225# RATED EXTENSION				
Model	Size	Length	Weight(lbs)	Sale
D1224-2	24"	21'	33#	179.95
D1228-2	28"	25'	42#	209.95
D1232-2	32"	29'	53#	239.95
D1236-2	36"	32'	62#	266.95

ALUMINUM FLAT STEP TYPE 1 - 250# RATED EXTENSION				
D1324-2	24"	21'	39#	195.95
D1328-2	28"	25'	50#	226.95
D1332-2	32"	29'	62#	257.95
D1336-2	36"	32'	77#	318.95
D1340-2	40"	35'	85#	359.95

ALUMINUM FLAT STEP TYPE 1A - 300# RATED EXTENSION				
D1520-2	20"	17'	37#	189.95
D1524-2	24"	21'	45#	220.95
D1528-2	28"	25'	56#	246.95
D1532-2	32"	29'	66#	289.95
D1536-2	36"	32(250# rating)	79#	339.95
D1540-2	40"	35(250# rating)	89#	369.95

FIBERGLASS FLAT STEP TYPE 1A - 300# RATED EXTENSION				
D6116-2	16"	13'	34#	199.95
D6120-2	20"	17'	40#	219.95
D6124-2	24"	21'	53#	254.95
D6128-2	28"	25'	60#	298.95
D6132-2	32"	29'	74#	379.95

FIBERGLASS FLAT STEP TYPE 1A - 300# XTRA HEAVY DUTY EXTENSION				
D7116-2	16"	13'	37#	249.95
D7120-2	20"	17'	43#	269.95
D7124-2	24"	21'	58#	309.95
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D7132-2	32"	29'	79#	

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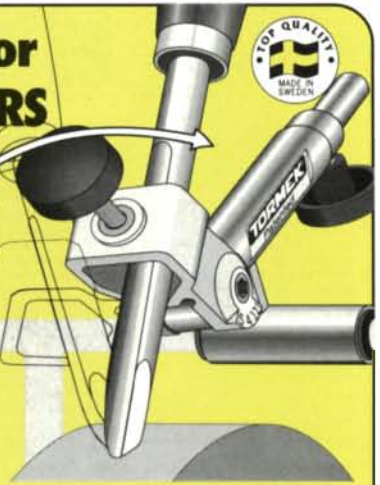
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Choosing a Belt Sander

Look for variable speed, a powerful motor and, above all, comfort

by Sven Hanson

I used to work with a craftsman who had been trained by the cabinetmaker James Krenov. He scoffed at my belt sander, good-naturedly dismissing the machine as a rank amateur's cheating version of a handplane. Then he bought some beautiful walnut planks encrusted with mud and who knows what else from the barnyard where they had dried. He realized that any blade he used on the planks would be ruined by the gritty mud or an unseen nail. I told him it was time to try a belt sander, and I loaned him one of mine. The next day, he bought his own.



Bosch 7350

Avg. discount price: \$170
Motor axis: In-line
Weight: 7.1 lbs.
Amps: 5.0
Belt speed: 550-1,100 surface feet per minute (sfpm)
Platen size & construction: 3 in. by 6 in., steel/cork
Ease of belt installation: Very good, easy-to-grasp lever
Tracking adjustment: Very good
Noise level: 100 dB
Accessories: Frame, stand, fence



Comments: This sander's low profile, removable front handle and narrow body make it ideal for fitting into tight spaces and sanding right up to obstructions. Easy-to-grasp belt-tension release lever. Variable-speed control in trigger. Longest platen. Solid and quiet.

If a belt sander isn't part of your tool inventory, it should be. They come in all sizes, from detail sanders with belts measuring 1 in. wide by 21 in. in circumference to big worm-drive machines with 4-in. by 24-in. belts. Most pros choose simple, heavy machines that use 4-in. by 24-in. belts. These big belt sanders are ideal for surface preparation and other work on the bench, but they are hard to handle in other situations. For that reason, many woodworkers also have 3-in. by 21-in. belt sanders.

These machines are small and lightweight, so they are easier to use overhead or in narrow workspaces. A 3-in. by 21-in.

sander combined with a random-orbit palm sander is a professional tag team for surface preparation. And good-quality belt sanders in this size are available for less than \$200.

I looked at seven professional-grade belt sanders and used them in my shop and on the job. The characteristics of each are listed in the summary boxes that appear with this article. I soon discovered that even though the belts had the same measurements, the sanders varied widely in weight, power, shape, ease of operation and balance. Over several months, I learned what mattered and what didn't in belt sander design.

Belt speed and amp rating

There are two things to take into account when considering belt sander power: belt speed and amp rating. The more amps a motor draws, the more work it can do. For most tools, having a powerful motor is essential. Some tools, like drills, need power to turn under a heavy load. That's not the case with belt sanders, because good sanding technique calls for a light touch. With belt sanders, the speed the belt turns (measured in surface feet per minute, or sfpm) is a more accurate indicator of the machine's efficiency than the amp rating of the motor alone. The faster the belt turns,



DeWalt 431

Avg. discount price: \$185
Motor axis: Transverse
Weight: 7.5 lbs.
Amps: 5.2
Belt speed: 475-1,100 sfpm
Platen size & construction: 3 in. by 5 in., steel/cork
Ease of belt installation: Very good, nice lever
Tracking adjustment: Fair
Noise level: 93 dB
Accessories: Frame, stand, fence



Comments: Innovative European design, with top handle. Wide range of speeds, with control on left side of handle at the back. One of the flattest steel/cork platens and best out-of-the-box sanding. Dust bag removes to expose front roller.



Hitachi SB75

Avg. discount price: \$180
Motor axis: Transverse
Weight: 10.8 lbs.
Amps: 8.7
Belt speed: 1,180 sfpm and 1,475 sfpm
Platen size & construction: 4³/₈ in. by 4¹/₂ in., steel/rubber
Ease of belt installation: Fair, skinny, stiff lever
Tracking adjustment: Fair
Noise level: 94 dB
Accessories: Stand



Comments: Widest, heaviest, fastest and most powerful sander reviewed. Two speeds controlled by slide switch at back. Nice balance. Round dust-collection port is well-located for hose connection. Upgrade to a graphite platen.



Makita 9900B

Avg. discount price: \$180
Motor axis: Transverse
Weight: 10.1 lbs.
Amps: 7.8
Belt speed: 1,180 sfpm
Platen size & construction: 4 in. by 4¾ in., steel/cork
Ease of belt installation: Thin lever
Tracking adjustment: Good
Noise level: 99 dB
Accessories: Graphite platen

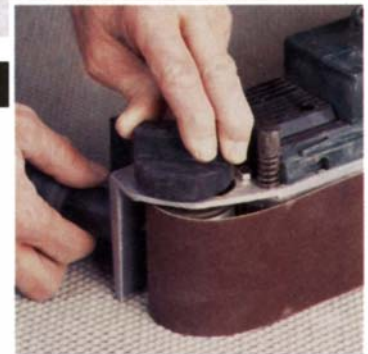


Comments: Classic muscle machine for continuous service. Big bearings where they count and extra-long, 16.5-ft. power cord. The belt-tension release lever flops around while sanding. Needs upgrade to a graphite platen.

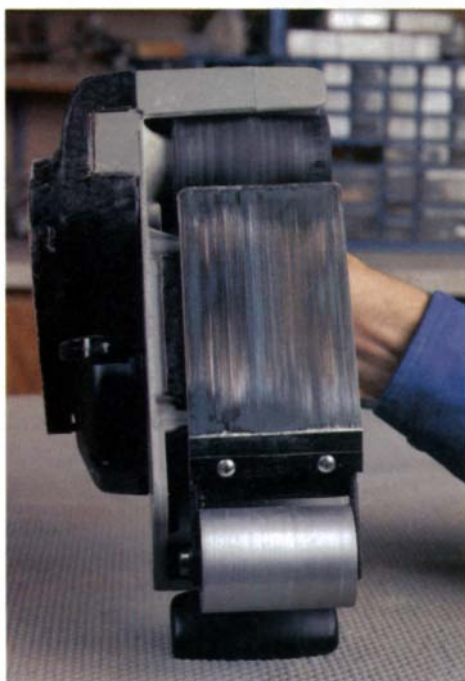


Metabo 775

Avg. discount price: \$329
Motor axis: Transverse
Weight: 10.7 lbs.
Amps: 5.5
Belt speed: 1,300 sfpm
Platen size & construction: 3 in. by 4¾ in., graphite/aluminum
Ease of belt installation: Excellent twist knob
Tracking adjustment: Good, small knob near back
Noise level: 95 dB
Accessories: Frame



Comments: Single speed limits versatility, but this sander is a pleasure to use. Large twist knob makes releasing belt tension easy. Vacuum hose adapter inside dust bag. Best off-the-shelf platen. Solid German engineering.



the more aggressively the machine sands.

For many of the jobs a 3-in. by 21-in. belt sander is called upon to do, comfort, lightness and versatility are more important than raw power. In choosing a sander, I'd narrow down the field to the machines that felt good in my hands and had the features I wanted. Then I would choose the machine with the largest motor. Generally speaking, a more powerful motor will run faster and last longer. But there's a price to pay—more powerful motors are bigger and heavier. For instance, the Hitachi sander draws the highest number of amps of the sanders I surveyed (8.7). It also has

Tuning a wavy platen improves sanding quality. This platen was hammered and filed flat to improve sanding performance. The leading edge was sharpened, and the platen was honed on sandpaper.

the fastest belt speed (1,475 sfpm). And it weighs in at 10.8 lbs., a disadvantage when working on vertical surfaces or overhead.

A flat platen equals a flat surface

The real work of belt sanding takes place on the bottom of the sander, on the pad between the rollers called the platen. It's the most important factor in the quality of the surface the sander produces. A flat platen produces a smooth, flat surface; a warped or uneven platen will sand unevenly.

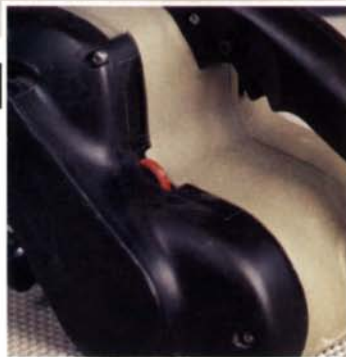
Bigger platens mean flatter sanding. Most of the platens are about 3 in. wide by 4½ in. long. Bosch has an innovative way of increasing the platen length. An auxiliary shoe extends right up to the front roller.

Most of the sanders I reviewed didn't sand a flat surface when used right out of the box. Their platens were made of thin steel plate over a cork pad, and such platens are rarely flat. These platens have a large sur-



Porter-Cable 352VS

Avg. discount price: \$162
Motor axis: Transverse
Weight: 10.5 lbs.
Amps: 7.0
Belt speed: 850-1,300 sfpm
Platen size & construction: 3 in. by 4¾ in., steel/cork
Ease of belt installation: Tiny stiff lever
Tracking adjustment: Good
Noise level: 102 dB
Accessories: Graphite platen



Comments: Large, heavy sander with good balance. Wide range of speeds, controlled by a dial near the rear handle. Orientation of dust port requires taping the bag or hose in place. All-metal drive train.



Ryobi B321

Avg. discount price: \$150
Motor axis: In-line
Weight: 7.9 lbs.
Amps: 6.0
Belt speed: 755-1,148 sfpm
Platen size & construction: 3 in. by 5 in., steel/aluminum
Ease of belt installation: Very good
Tracking adjustment: Very good
Noise level: 95 dB
Accessories: Frame, stand, fence



Comments: A selector dial in the front handle of this machine allows right-handers to change the electronic speed control while sanding. Easily attaches to the accessory sanding frame or stand. Good instruction sheet.

face area in proportion to their thickness and tend to undulate in use.

You can increase sanding performance by tuning the platen—as one of the manufacturers did before sending its sander for review (see the bottom photo on the facing page). If you want to do what they did, check the flatness of the platen with a straightedge. Pay particular attention to the diagonals, and flatten the high spots with a file. The manufacturer also had sharpened the bend at the front of the platen, hammered the platen flat and honed it on 220-grit sandpaper.

The Metabo sander produced the best finish right out of the box because its platen is made of graphite-impregnated cotton over a base of aluminum. This platen is stiff and flat, and it reduces friction to let the belt run faster and cooler.

The powerful and heavy Makita sander had the poorest sanding quality out of the

box. As an experiment, I installed the \$4 graphite platen Makita sells as an accessory. With that simple change, the sander produced a finish equal to that of the Metabo. It's a must-do upgrade for the Makita, and I recommend it for any sander with a steel/cork platen. The Makita graphite platen readily adapts to fit most sanders, or you can buy a graphite-platen upgrade kit from one of the big mail-order houses.

Choose a sander that feels good in your hands

You'll be forming a partnership with your belt sander. Expect to spend long hours together. The key to good results is finding one that fits comfortably in your hands.

Motor orientation affects balance—

The majority of these sanders have transverse motors mounted at 90° to the centerline of the machine, with the center

of gravity directly over the platen. Bosch and Ryobi made a radical departure by mounting the motor on the centerline of the sander, with the center of gravity over the rear roller. The two designs have slightly different balance points.

The sanders with in-line motors are longer, narrower and lower than the transverse models. This lets you reach into a cranny where a transverse sander won't fit—a potential lifesaver for forgotten details or solving tricky job-site problems. The handles on these sanders are widely spaced front to back, but you need to use both hands. I often run my big transverse-motor sander with one hand. I couldn't do this with the in-line motor sanders; they need a hand on the front to keep both rollers on the work.

I tried the belt sanders on a narrow strip of wood to check their side-to-side balance. All were a little heavy to the left,



The way the motor is mounted has a big effect on handling. The Hitachi sander (above left) is typical of a transverse mounted motor. The center of gravity is over the platen. The Bosch sander (above right) has its motor mounted on the centerline, with the center of gravity toward the rear roller.



which is the side where the drive pulleys are mounted. The transverse sanders balance at a point about $\frac{3}{4}$ in. to the left of the centerline, and the in-line sanders balanced only $\frac{1}{4}$ in. to the left. This may seem like a small difference, but in some situations, it's significant. On narrow stock, a transverse motor requires the operator to tilt the sander to the right to compensate for the off-center balance point. The in-line sanders require little or no compensation.

Variable speed increases control—Most of the sanders I surveyed had a variable-speed control. This is valuable when sanding a surface that has both rough and smooth sections. By varying the speed, I can aggressively cut the rough spots and then slow the belt to remove less material in the places that are relatively smooth. This eliminates having to change from a coarse-grit belt for the high spots to a finer grit to surface the whole board.

The Ryobi has the most convenient method for changing speed. Its speed is variable from 755 sfpm to 1,148 sfpm by turning a dial on the right side of the front handle. It's easy to operate while sanding, but the location favors right-handers. The DeWalt speed control is on the back handle, but it's situated so that you have to take your finger off the trigger to turn it. The Hitachi has two speeds (1,180 sfpm and 1,475 sfpm); the high/low switch is near the heel of the machine. The Makita and Metabo sanders have only one speed, but you can get around this. For less aggressive sanding, change to a finer belt, or slow down the belt by pulsing the switch.

Metal, paint, adhesives and plastics usually sand better at speeds lower than the speeds suitable for sanding wood. If you work in these materials, a variable-speed belt sander will be more useful than a fast-turning sander with only one speed.

Changing the belts—My favorite belt-changing mechanism is Metabo's easy-acting knob. A quarter turn retracts the front pulley for fast belt changes. Makita's thin lever is hard to grasp, especially on a cold morning. It waves around after the belt is installed and tensioned. I thought it was loose or broken, but others tell me it's common on that machine. Ryobi and Bosch machines have large plastic lever grips, which are easy on the hands.

Beyond the basic belt sander

Some sanders offer accessories like vacuum cleaner hook-ups and special stands and frames that can increase the sander's effectiveness and versatility.

Connect the sander to a vacuum—I've never knocked myself out to keep a clean shop, but a belt sander throws so much dust that it requires some kind of dust-collection system. The little bags supplied with the sanders gather only a small portion of the dust the machines generate. When I work in a home or office, where I'm especially careful about dust, I use duct tape to secure the hose of my vacuum cleaner to the sander's dust-collection port. On sanders with round dust-collection ports, such as Bosch and Porter-Cable, this is easy. The DeWalt and Makita sanders have square ports, which require an adapter (sold as an accessory) or more duct tape. The Metabo port is also square, but unzipping the dust bag reveals a round hose adapter for easy hose connections.

There's a greater payoff to using a vacuum system than merely keeping a cleaner workspace. Removing the dust lets the belt sand the wood instead of merely rolling dust around, producing a better surface faster. And flowing air keeps the motor and belt cooler.

A sanding frame makes a flatter surface—A sanding frame is a rectangular metal frame that fits around the outside of the sander (see the center photo). The underside of the frame is faced with smooth fabric or bristles. Like the long sole of a jointer plane, the frame gives the tool a larger reference area to prevent localized bumps and hollows.

Bosch, DeWalt, Metabo and Ryobi belt sanders have their own proprietary sanding frames. To attach the frame, special recesses and threaded inserts are built into the housing. It takes only a few minutes to install the frame and adjust the depth of cut to suit the job.

At first, dragging a frame over the surface of the wood felt awkward, but a straight-edge proved that it was worth the trouble. I was surprised to find the sanding frame produced a measurably flatter surface than my old faithful 4-in. by 24-in. sander. If you're planning to do much surface preparation, choose a sander that can accept a sanding frame. They cost from about \$60 to \$80, depending on the manufacturer.

More versatility with a bench-mounted sanding stand—I rigged up a crude fixture in a rush some years ago to hold my running belt sander on the bench as a stationary sander. When I used the sanding stands sold as accessories for some of the sanders, I knew I'd found something better. These stands are lightweight and portable. They're ideal for using a belt sander on the job site for shaping and sharpening. The Bosch and Ryobi stands hold the sander upside down and come with a fence for setting angles for sharpening. The DeWalt stand holds the sander perpendicular to the benchtop and has a small adjustable table (see the top photo at right). All the stands have built-in clamps for snugging to a benchtop. These plastic stands are stronger, lighter and get a better grip on the sander than my shop-built version. They cost about the same as a sanding frame.

What to buy

When I began this survey, I thought amps, cord length and sanding quality would be



A sanding stand adds another level of versatility to a belt sander. Most stands hold the sander upside down, but this DeWalt stand holds the sander vertically. The adjustable table is good for sharpening.



For a flat surface, use a sanding frame (above). This Bosch frame increases the plane of reference and prevents bumps and hollows (below).



the most important factors in picking a sander. But the sanders that fit and balanced in my hands were the ones I reached for most often.

The Bosch and Ryobi, both in-line machines, look like twins from a distance. They both have weights and amp ratings of less than average, and they can fit into places that the higher and wider transverse sanders can't go. They have good balance, and the distance between the handles makes steering easy.

Both sanders provide built-in attachment points for sanding stands, fences and sanding frames. Their round dust-bag attachments fit most vacuum systems. Both manufacturers work hard at making their accessories available at reasonable prices.

The sanders are closely matched in features and feel. The Ryobi (\$150) has a wonderful speed control in the front handle and an extra amp of power. The Bosch (\$170) has a slight edge in sanding quality and speed range. It also has a longer cord.

For transverse machines, the Makita (\$180), Porter-Cable (\$162) and Hitachi (\$180) sanders scored at the top of the chart for fastest belt speed and greatest weight. If I were going to a desert island with a generator, a crate of power tools and a job to get done, I'd take one of these. They're big, powerful and built to last. The relatively heavy Metabo (\$329) also fits in this class. It has some great features and high-quality parts, but I don't think that warrants its relatively high price.

I think all the sanders have their good points, but the DeWalt (\$185) is my favorite. It felt good in my hands, and it produced one of the best finishes out of the box. The light weight and top-handle design make it possible to use the sander in odd positions or one-handed. I'll grant that the front dust bag/front roller cover looks odd, but it works well and pulls off to expose the front roller. This is a big plus for sanding into corners, scribing, shaping and sharpening. The top-quality sanding frame and vertical stand and fence extend this sander's capabilities.

Belt sanders can crank out a lot of work, but they require a lot of energy and attention from the user. I'm a big fan of mail-order buying, but this is one tool that requires hands-on shopping. It's worth driving a little farther and spending a little more money to find a tool that feels good. □

Sven Hanson builds custom furniture and cabinets in Albuquerque, N.M.



Stickley-Style Legs

A router bit and two jigs yield quarter-sawn figure on all four sides

by Patrick Nelson

Quarter-sawn oak is synonymous with Craftsman furniture. The wood's wild ray figure is both beautiful and distinctive. Unfortunately, Mother Nature saw fit to put it only on opposing faces of a board. So on a table leg, for example, the sides adjacent to a quarter-sawn face should be flatsawn and without figure.

However, if you look closely at much of the furniture built by the Stickleys in the early 1900s, you'll see what looks like a freak of nature: quarter-sawn figure on all four sides of square table legs (see the photo at left). This figure is the result of a unique leg design used in Stickley factories.

The Stickleys used two techniques. One was to cover the flatsawn faces with quarter-sawn veneer. The other technique mated four quarter-sawn boards with trapezoidal profiles. The base of each trapezoid was one face of the leg, and the two adjacent sides were angled at 45°. On one angled side, there was a small perpendicular notch; on the other side was a complementary

tooth. Mating tooth to notch on adjacent pieces lined up the four joints perfectly.

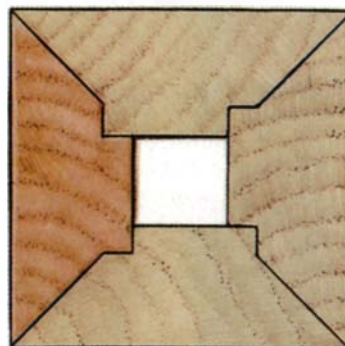
One modern bit does the trick

The shaper bits used to mill the original Stickley design are not commonly available today, but the widely available lock-miter router bit can be used to make these Stickley-style legs. The bit is beveled at 45°, like a large chamfer bit, with a pair of opposing teeth in the middle of the cutting surface. It cuts a profile that's quite similar to the one used by the Stickleys. I bought my bit from Grizzly Imports (P.O. Box 2069, Bellingham, WA 98227; 800-541-5537). They're also sold by a number of other router-bit manufacturers.

The lock-miter bit actually has some advantages over the shaper cutters used by the Stickleys: This bit produces a joint with a larger glue-surface area, only one is needed to cut both sides of the joint, and just one setup is required. Adjusting the lock-miter bit height and the position of the fence to get that setting is just trial-and-

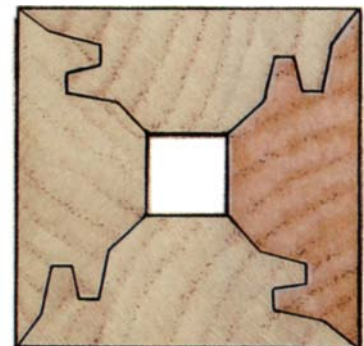
Freak of nature? No, just a bit of technical wizardry. Quarter-sawn figure occurs naturally only on opposing faces of a board, but the legs on many Craftsman pieces show it all around. The author used one router bit and two jigs to make the leg shown above.

Quarter-sawn figure on all four sides



Stickley method

On original Stickley pieces, the leg was made up of four pieces. Each of these pieces had two complementary profiles cut into it using two shaper setups.



Author's version

The author's version of the Stickley leg is made up of four identical pieces. The edge profile on each piece mates with the face profile on an adjacent piece.

First jig, first pass

One jig positions workpiece flat on table to cut the profile on edge of stock.

Inside edge rides against shaper or router-table fence.

Offset between two pieces of plywood is width of leg.

Pine end cap

Screws hold end cap in place. Screw in workpiece is positioned out of the way of the bit.



Rout the edge profile first. Maintain a steady feed rate, and keep pressure against the fence. Each profile is cut in a single pass.

Second jig, second pass

Second jig positions workpiece vertically to cut the profile on the inside face.

Profile cut in first pass

Plywood pieces flush at edge

Inside face of leg

Pine end cap



Rout inside face of leg stock. The piece should be edge up with its outside face against the jig (above). After the second pass, the piece has matching profiles on its edge and inside face (right).

GLUING UP

1. Apply glue to just two pieces of each leg at a time. Then, after you have the two halves assembled, apply glue to the remaining faces, and bring the two halves together.



2. Tack battens down center of each side. These battens will help concentrate the clamping pressure.



3. Tack one end of a bungee cord to the end of a batten.



error. You can get pretty close right from the start, though, by centering one of the teeth on the stock. And once you have the setting right, the actual routing takes just a few minutes.

I mount the bit in my shaper rather than in a router table. The shaper's slower speed is less intimidating than a router with a bit of this size. But if you don't have a shaper, the technique would work using a powerful, variable-speed router set at its slowest speed. The key to the technique is the pair of jigs I made to hold the workpieces as they're fed through the bit (see the drawings on p. 55).

One jig for each pass

The first jig holds the workpiece flat against the table and exposes the edge of



4. Wrap cord tightly around the assembly. Tack the bungee cord at the other end.

the workpiece to the router. The jig is made of two pieces of plywood with pine end caps. The end caps start out as rectangular pieces but take on the lock-miter profile after the first pass. Screws driven through the end caps, far enough back to be out of the bit's way, hold the workpiece in place (see the top drawing on p. 55). The distance from the edge of the narrower piece of plywood, against which the workpiece butts, to the edge of the wider piece, which rides against the fence, is the width of the leg. It's easy to make the legs any size you want.

Stock from $\frac{3}{16}$ in. thick on up to 1 in. or $1\frac{1}{4}$ in. (depending on the make of the bit) can be used with the lock-miter bit, but the thickness of the parts of the jig and the stock you're using for the pieces that will

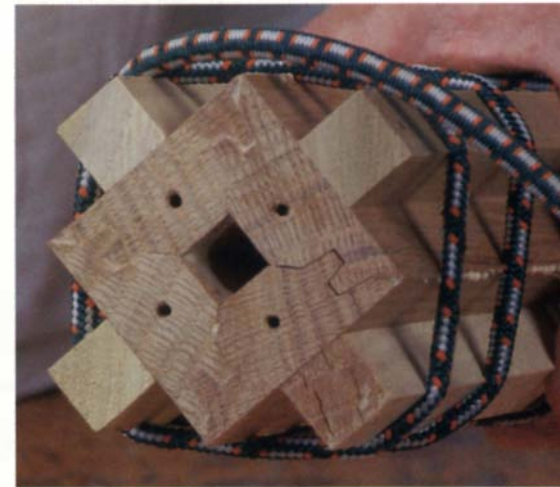
make up the leg must be identical. I dimensioned stock to the thickness of the shop-grade plywood (nominally $\frac{3}{4}$ in.) that I used for the jig. It was easier than building up each layer of the jig from multiple pieces of plywood or milling the pieces of the jig from solid wood. I also crosscut the leg stock and jig stock at the same time, so their lengths are identical.

The second jig looks similar to the first one. But the two pieces of plywood are the same size, and they are flush on their edges (see the bottom drawing on p. 55). The workpiece is held vertically against the edges of the plywood. This way, the inner face of the workpiece is presented to the router bit.

After the workpiece has passed through the router bit in this second jig, the work-



5. Tap along the battens to make sure the joints are seated.



6. The wrapped assembly is set aside to let the glue cure. After a few hours, the leg can be unwrapped and the ends trimmed. This eliminates the screw holes and any slight gaps at the ends where the clamping pressure isn't as great. The leg is now ready to use.

piece will have identical profiles on one edge and on the inside face. Each leg is made up of four such pieces, one edge of each piece mating with the face of the adjacent piece, all the way around the leg. I always make the legs several inches longer than they will be on the finished piece of furniture so that I can trim off the ends after the leg has been assembled.

These legs can be used on many different kinds of furniture, and the process of making a leg is the same, regardless of size or what the leg will be used for. □

Patrick Nelson designs and builds furniture professionally in Fulton, Mo. David Mount, an amateur woodworker in Two Harbors, Minn., assisted in the writing of this article.

Antiquing Hardware

Readily available, inexpensive hinges and pulls can be turned into classy accents for your furniture



Brass that's not brassy. After soaking in lacquer thinner overnight to remove a protective coating, this brass hardware was suspended in an ammonia chamber until it mellowed to a soft, greenish gold.

Just as you can choose a stain to get the exact wood color you want and a finish for a certain sheen, you also can pick the finish for your hardware. The finishes can be bold and bright or subdued and understated.

Here are two techniques for making custom fin-

ishes for hardware. One is for antiquing zinc-coated steel hardware; the other is for antiquing brass. Not every piece of furniture calls for antiqued hardware, but for some custom pieces, one of these techniques will give you just what you're looking for. —*Vincent Laurence, associate editor*

Patinating brass

by Gary Rogowski

Bright, shiny brass appeals to many people. But for my one-of-a-kind, custom pieces, I want the hardware to be like the woodwork itself—simple, not showy. So I take the bright brass hardware available at the local hardware store and mellow it so it looks like it's been around for a few years (see the photo on the facing page). The best part is that this patination process takes just a few hours.

Most store-bought hardware has a protective finish on it to preserve its sheen. I remove it by letting the hardware soak in lacquer thinner overnight. Swirling the hardware around in the jar a few times helps ensure that all the finish is removed. After the finish is gone, fish the hardware out of the lacquer thinner with thin scraps of wood or chop sticks. If you use your hands, wear rubber gloves (see the top photo at right) because fingerprints will show up as smears on the patinated hardware.

Then I put the hardware directly into an ammonia chamber. This is simply a glass jar (peanut butter jars are ideal) into which I pour about an inch of industrial-strength (28%) ammonia. This ammonia is available from large chemical- and janitorial-supply companies. Look in the yellow pages for a local source because shipping a hazardous substance like this can be very expensive.

Be careful when working with this ammonia. Although furniture makers have used it for years to fume oak for Mission-style furniture, you should still proceed with caution. Use a cartridge-style respirator with an ammonia cartridge, safety glasses (goggles would be better) and gloves.

I suspend the hardware above the ammonia on light-gauge wire, being careful not to let the hardware touch the sides of the jar, the ammonia or another piece of hardware (see the center photo at right). Any contact will result in an uneven finish that you'll have to remove with a Scotch-Brite pad and steel wool. Screws that can't be attached to the hardware itself (hinge screws, for example) can be driven into a small scrap of wood with a hole drilled near its end. I hang the piece



Lacquer thinner removes the protective coating. Most store-bought hardware has a coating to preserve its sheen. You have to remove this before you can fume the brass.



Above, but not in, the ammonia—Suspend the hardware on light-gauge wire, and keep the pieces from touching the jar or each other.



Remove the plating with abrasives. A Scotch-Brite pad followed by 0000 steel wool effectively removes plating without leaving deep scratches in the brass.

of wood on the wire, too. Keep the lid twisted loosely on the jar so your whole shop doesn't reek of ammonia.

Several hours in the chamber will give the brass a nice, light patina. Keeping it there overnight will make it quite dark. Experiment to determine what works for you. It's a good idea to keep a set of control pieces, each exposed to the ammonia for a different length of time, so you can have some reference samples. You can also use them to show clients.

Some brass hardware has a thin plating beneath the lacquer, which you'll only discover after an initial treatment with ammonia. It shows up as a splotchy surface. If that's the case, remove the plating with a Scotch-Brite pad and 0000 steel wool, and then return the hardware to the ammonia chamber (see the bottom photo on p. 59).

Finally, to fix the patina, I either spray a light coat of lacquer, or I wax the hardware (see the photo at right). This keeps the tone of the hardware exactly the way I want it.

Gary Rogowski is a contributing editor to Fine Woodworking magazine.



Waxing the hardware preserves its patina.



Old hardware, in a hurry—Stephen Winchester takes shiny, zinc-plated hinges and other hardware and turns them a dull black, making them look almost hand-forged. The whole process takes only an hour or two.

Patinating steel

by Stephen Winchester

Shiny zinc hardware is fine for outdoor or utilitarian furniture. And you can't beat the price. A pair of 2½-in. by 1¼-in. hinges sells for only \$2.59 in my local hardware store. But for traditionally styled cabinets or fine furniture, which is the kind of work I do most of the time, shiny hardware just doesn't cut it. I could use more expensive hardware, but with a little resourcefulness, I've found a way to make these hinges look like they've been around for a century or two (see the photo at left).

The first step in transforming zinc-coated utility hinges (or other zinc-coated steel hardware) into antique iron is to remove the zinc coating. For this I use muriatic acid, which I dilute 50% with water and place in a shallow plastic container. Add the acid to the water, and be careful not to let it splash. Muriatic acid is commonly available in hardware stores, at lumberyards and pool-supply stores.

But just because it's readily available doesn't mean it's harmless. Use muriatic acid outside or in a well-ventilated area, and protect your eyes. Goggles and acid-proof gloves are a good idea.

Put the zinc-coated hardware into the muriatic acid (see the photo at right). If there are screws, don't forget to include them. The mixture will start to smoke immediately. So stand back, and do not breathe the fumes (it's best to do this outside). After a few minutes, swish the hardware and acid around a little to make sure all the zinc is off. The hardware will probably smoke some more.

When the hardware has stopped smoking, set the plastic container in a sink or tub, and rinse it thoroughly with cold water (see the center left photo). Let the water overflow the container for a minute or so to be sure the acid is completely removed. Then dump the container, and dry the hardware.

To darken the now-bare steel, you have to heat it to red-hot. I put the hardware in a tin can and nestle it in the coals of my wood stove. A charcoal grill would most likely work as well, or you could simply heat each piece with a propane torch. The wood stove doesn't provide consistent heat, but that probably contributes to an authentic-looking, uneven finish (see the center right photo). When the whole can is glowing, pull it out of the fire, and set it down on a fireproof surface to cool.

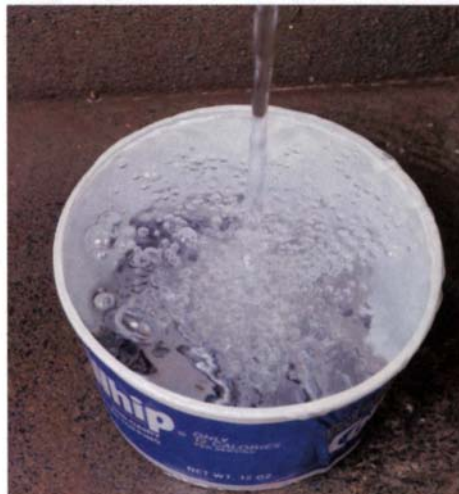
After the hardware has cooled just enough so that you can touch it, remove the surface scale with an old toothbrush (see the bottom left photo). Then, to give the hardware some protection against rust and to give it a bit of a patina, apply a generous amount of wax to the larger pieces, and tumble the screws around in a wax-impregnated rag (see the bottom right photo). There's no need to buff out the wax later. It just sort of sinks into the warm steel.

It's always a good idea to test a sample before putting all the hardware for a project through this patinating process. I've seen hinge pins and other pieces dissolve in the acid and melt in the heat. I'm not sure why, but I've had good luck with Stanley hinges. But the pins melted out of a pair of National hinges. □

Stephen Winchester is a professional furnituremaker and cabinetmaker. He lives in Gilmanton, N.H.



Remove the zinc-plating with muriatic acid. The mixture will smoke, so stand back and don't breathe the fumes.



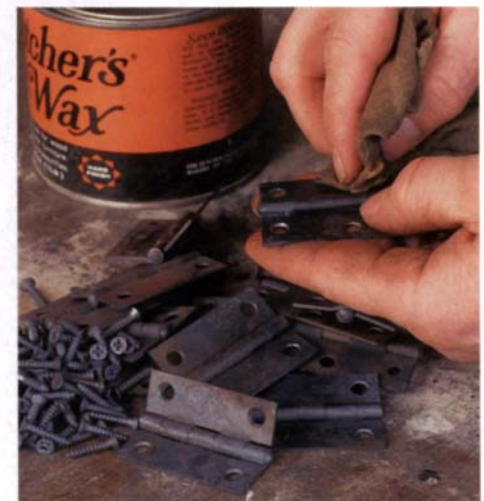
Rinse the hardware thoroughly for a minute or two in cold water.



Heat the hardware to red hot. Then let it cool until you can touch it.



Brush off the scale. An old toothbrush works well for this job.



Finish the hardware with wax. There's no need to buff it out.

Building a Veneered Armoire

Simple joinery helps speed construction; veneered curves give it a classic style

by Gregg Domek

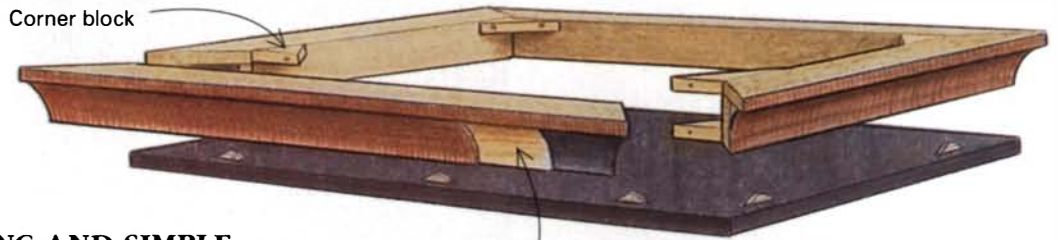


I've been commissioned to build more than a dozen armoires in the past several years, and not one was made to serve the purpose for which this furniture style was designed—holding clothes. Instead, I've built them to house televisions, audio equipment and computers. I've also made armoires as dry bars and as drop-down writing desks. Clients like these armoires because they hide a lot of clutter, and I can scale the design to fit any room. I made the one shown in the photo on the facing page to store audio/visual equipment in a master bedroom. It has plenty of space for a large television and a number of electronic components.

The joinery for this project is simple and straightforward, glued and biscuitted or screwed in most cases (see the drawing on the facing page). Building cabinets brings home the bacon for my family, so I'm interested in making strong joints quickly. The dimensions for this armoire are not set in stone. You can modify this design and still end up with a handsome and useful piece of furniture.

The construction of this armoire, as with most of my work, is unusual in that I don't use solid hardwood. Also, I use plastic plumbing pipe as the core material for curved elements (see the inset drawing at right). The entire cabinet, including the columns and the crown molding, is made from the same flitch of makoré veneer (also called African cherry). Last year, I used about 15,000 sq. ft. of veneer and less than 400 bd. ft. of lumber. When I

Veneering curved columns—The author wraps veneer over a plastic pipe and inserts the assembly into a metal stovepipe form. The technique yields curved components that match the veneer in the rest of the case.



Corner block

CASE-WORK JOINERY IS STRONG AND SIMPLE

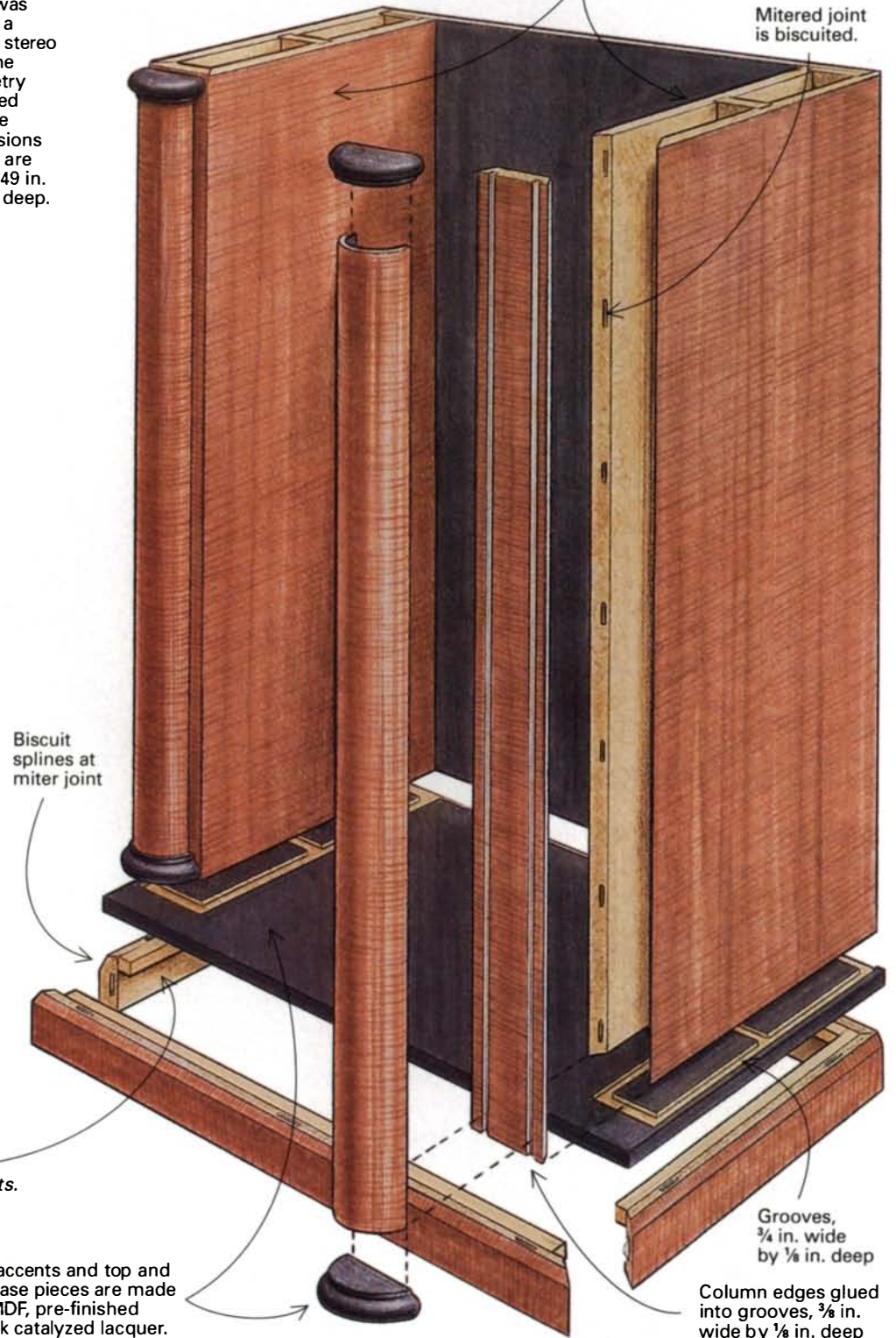


This armoire was made to store a television and stereo equipment. The interior cabinetry was constructed separately. The overall dimensions of this cabinet are 78 in. high by 49 in. wide by 26 in. deep.

Two layers of veneer over 6-in. ABS plastic pipe

Pre-assembled vertical members are veneer over a 3/4-in. high-density particleboard core.

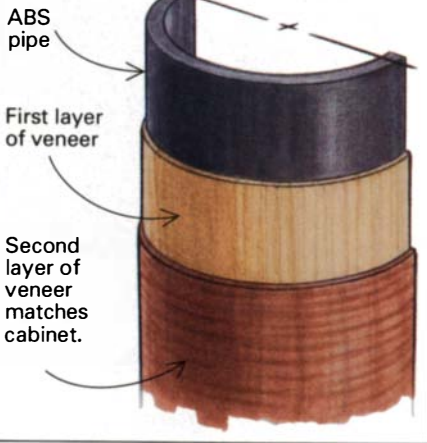
Mitered joint is biscuitted.



Making columns and crown molding

Columns and cove-shaped crown molding are veneer over cores of black ABS plastic pipe.

Leave 1/8 in. past centerline to fit in cabinet groove.



ABS pipe

First layer of veneer

Second layer of veneer matches cabinet.

Biscuit splines at miter joint

Secure baseboard assembly to underside of case with glue and screws through 1 1/2-in.-sq. cleats.

Column accents and top and bottom case pieces are made of 1-in. MDF, pre-finished with black catalyzed lacquer.

Grooves, 3/4 in. wide by 1/8 in. deep

Column edges glued into grooves, 3/8 in. wide by 1/8 in. deep

VENEERING THE PANELS

Jig for jointing the edges of veneer—
By trimming two edges at the same time, the author achieves a perfectly matched seam.

moved to coastal Washington state from Arizona several years ago, I learned very quickly what a difference in climate can mean. Here, veneered pieces are a lot more stable than those made from solid lumber. I also prefer the visual effects I can get with veneer—furniture perfectly uniform in grain and color.

Choose the veneer carefully before laying it up

Veneering case work is pretty straightforward, once the design details have been worked out. I break down the design into separate parts (see the drawing on p. 63) and glue up all the veneer before assembly. I choose all the pieces of veneer for the sides of the case, the doors and the back from the same part of the flitch, and then I mark all the seams for a book-matched pattern.

Rout the edges for tight seams—After choosing all the pieces and trimming them roughly to size with a razor knife, I place them in a router jig I devised to trim the edges for tightly joined seams (see the photo above). Basically, the jig is a plywood panel with a routed slot down the middle. The jig holds two pieces of veneer parallel to one another while I cut the edges with a laminate trimmer. I use a $\frac{3}{4}$ -in., straight plunge-cutting router bit that rides in the routed slot. Because I cut both pieces of veneer at the same time, little imperfections in the jig make no difference. I get nearly perfect seams every time.

Some veneers will chip or tear out on one edge as the seam is cut. With problem veneers, I put one piece of veneer at a



time in the jig, always feeding the router into the veneer against the direction of the rotating bit. This method takes longer, but you'll avoid sloppy seams.

After trimming the veneer, I tack two pieces together with small pieces of masking tape on the back side. I space the tape as needed to hold the pieces together as I flip the face side up. Then I apply veneer tape to the seam. When the tape is dry, I remove the masking tape from the back side of the veneer, which will be glued to the core.

Engineered wood products make the best cores—I use only medium-density fiberboard (MDF) or high-density particleboard as core material for flat panel components. When gluing up the veneer for large pieces, like case-work panels and doors, I prefer urea formaldehyde (plastic resin) glue, because it provides a strong bond that doesn't creep. And this glue allows more open working time to position pieces in the veneer press. I use a flip-top vacuum press (see the photos on the facing page).



Urea formaldehyde glue for large panels in the veneer press—To apply glue to large, flat surfaces, the author pours it on and rolls it out with a paint roller. He covers the veneer with a protective panel of 1/4-in. MDF faced with vinyl. The vinyl won't stick to any glue squeeze-out.



of the waste first, veneer that oversized piece and trim it down later.

Use epoxy for the first layer of veneer—With both the cove-shaped crown molding and the half-round columns, I glue up a backing layer of veneer first, using a two-part epoxy (PVA glues will not work with ABS plastic pipe). The epoxy makes a really strong bond between wood and plastic, and it fills any voids or imperfections in the surface of the pipe. I spread an even coat of epoxy on the veneer, as shown in the photo at left on p. 66.

The first layer of veneer is technically not crossbanding because the grain runs in the same direction as the decorative second layer. But it's important not to skip this step. The first layer evens out the curved surface; any epoxy that bleeds through under pressure can be sanded smooth easily.

For the second layer, I use white or yellow PVA glue. The second layer will alleviate any problems the epoxy would otherwise cause in the finishing process. When gluing each layer, I use a piece of waxed paper between the veneer and the caul to keep any glue that bleeds through from sticking.

Make a caul for the crown from another piece of pipe—For gluing the cove-shaped crown, I use a second piece of ABS pipe as a clamping caul (see the top right photo on p. 66). I cut out a section from the pipe, lengthwise, about 2 in. wide. The caul and the core piece are both cut from 6-in.-dia. plastic pipe, but both have enough flexibility in them that

For veneering smaller pieces, I sometimes will use regular polyvinyl acetate (PVA) glue. Both yellow and white varieties work well.

Curved pieces require innovative solutions

I used to turn down work if the designs included curved elements like the decorative columns and large cove molding on this armoire. Even if I could find solid lumber suitable for making these elements—often not available in

many wood species—I still had the problems of stability and of matching the color of the lumber to the veneer.

The unorthodox but effective method of gluing veneer over a core of plastic pipe solved all that. I use a standard black ABS (acrylonitrile butadiene styrene) pipe, which is available at most plumbing-supply dealers. I laminate the half-round column on a full piece of pipe, and then I cut out the waste after all the veneering is done.

With the cove molding, I rip out some

VENEERING THE CROWN



Epoxy veneer to plastic pipe. The author smooths out glue for the first layer of veneer. He likes straight-grained fir because it bends easily to the curve of the pipe.



A second piece of pipe makes a caul. Although outside and inside diameters of the same size pipe are different, the plastic is flexible enough to give even pressure on the veneer.

the difference between the outside and inside radius doesn't matter. With a $\frac{3}{4}$ -in. scrap set on edge and clamped under firm pressure, you can get good results.

I always glue the veneer to a core piece that's larger than the finished dimension to allow some slack for cleaning up the edges. Once both layers of veneer are glued firmly to the core piece, I glue that into an L-shaped form of MDF or particleboard, using a bead of epoxy where the pipe contacts each leg of the form. This form defines the size and shape of the crown and holds the curved piece rigidly in place. Once the glue has set, I

can trim the molding to size with the tablesaw (see the photo at right). This gives me a good edge, clean and straight, over which I add veneer to the top edge that will show.

Stovepipe and strap clamps make a form for the column—The method I devised for gluing the veneer to the outside surfaces of the columns is shown in the photos on the facing page. Spreading the glue with a paint roller ensures an even coat on every layer. For a gluing form, I use regular metal stovepipe wrapped around the plastic pipe, and I



Trim the crown to size after veneering. To make the crown molding, the author glues the plastic cove to an L-shaped particleboard form after veneering. When the glue dries, he trims the molding to size.



VENEERING THE COLUMNS



Photo: author



Gluing veneer to columns—Galvanized stovepipe, left open so it's flexible, works well as a bending form for gluing veneer to convex surfaces (left). Strap clamps along the length will provide even pressure. Waxed paper prevents the good veneer face from adhering to the padding scraps. After the columns are veneered, the author glues them into grooves cut into the front face pieces of the vertical case members.

pad the interior with several layers of scrap veneer to even out the pressure. Be sure that the stovepipe caul is a few inches longer than the piece being veneered, just to make sure the veneer is clamped along its entire length. I place strap clamps around the caul every 3 or 4 in. The force of using a screwdriver to tighten the worm gears in the clamps will pull the caul together with plenty of pressure. A socket-head driver isn't necessary.

Thermal bond glue for edges

I discovered another product that saves time and money: glue that comes in rolled

sheets. It's activated by the heat of a household iron. I buy the rolls in 12 in. widths (Therm O Web/Colortech, 770 Glenn Ave., Wheeling, IL 60090; 800-323-0799) and cut pieces to size as I need them. I use this for all edge details, like doors, shelves, the flat edge left after trimming the crown molding and the 45° bevel along the top edge of the baseboard.

On MDF cores, I use one layer of glue with the veneer. Because particleboard cores are more porous, I double up the pieces for a good bond (each layer is .003 in. thick). Handling glue sheets and pieces of veneer separately may take some

getting used to. But the results make it worthwhile. The bond is as good as you would get by clamping the pieces together with PVA glue. I set my iron on medium-high to generate enough heat to melt the glue. I've never had a glue joint fail, and I've been using this method for several years. I know there are purists who will scoff at some of my choices of materials and techniques, but I stand by the results: cabinets as nice as the day is long. □

Gregg Domek owns and operates Concepts in Design, a custom cabinetmaking business in Seattle, Wash.



The Birches

From alder to ironwood, this family of trees has a suitably hard wood for almost any job

by Jon Arno

The brilliant autumn foliage of the paper birch is a common sight in northern forests. Like all members of the birch family, paper birch has a light color and fine texture, but unlike

the others, it produces very little high-quality lumber or veneer. Though easy to work, paper birch is softer and less lustrous than other members of the family.

For me, the thought of birch conjures up pleasant memories of autumn canoe trips in the great north woods with my college buddies. I remember crisp days, clear blue skies and our canoe moving across the still waters. We slipped past the graceful white trunks of paper birch trees on the shore, their brilliant yellow foliage standing in sharp contrast to the dark green spruce trees.

The paper birch is an unforgettable component of our northern forests, and its value to American Indians and early European traders was immense (see the bottom photo on the facing page). Of all our native birches, this colorful species is the one most often used for landscape plantings. But paper birch is only one member of a large family. When it comes to the production of birch lumber and

high-quality veneer, it's a minor player. Actually, the two dominant lumber sources in the family are yellow birch and sweet birch.

Woodworkers take considerable pains to distinguish between red and white oak and soft and hard maple. The birches tend to be lumped together, yet the woods produced by the birch family are more varied in terms of density and working

characteristics than any other botanical family native to North America, save the walnuts.

The birch family (Betulaceae) has astonishing range. At one extreme is red alder (*Alnus rubra*), native to the Northwest. It's almost as soft as white pine. Its fine texture, pleasant pinkish-tan color and easy working characteristics make it a popular lightweight wood for millwork and cabinetmaking.

At the other extreme is hop hornbeam (*Ostrya virginiana*), better known as ironwood. Like all members of the birch family, hop hornbeam is very finely textured, but it stands apart from its kin in two respects. The horizontally oriented cells of hop hornbeam, called rays, are slightly larger than the rays in the other birches. On a cellular level, this gives hop hornbeam a woven, almost fabric-like, consistency. It is very difficult to split. Hop hornbeam is as hard as some of the hickories and exceptionally resistant to abrasion. These features made it a favorite wood in the 19th century for wagon-wheel hubs and mallet heads, but this brutally hard wood is probably too dense to be a viable cabinet wood.

A birch for every occasion

Birch is plentiful, and the supply is readily renewable. It grows easily in cool, moist climates, and the wind-borne seeds quickly restock cut-over or burned forest lands. Most species are short-lived, but they grow quickly. A great deal of birch comes from smaller trees and is milled into moldings or used to churn out stock turnings, such as dowels, glue pegs and spindles. However, many species are capable of attaining adequate size to be efficient producers of both veneer logs and saw logs.

Worldwide, the birch family contains more than 100 species, and most of them are sold as lumber, even if only in small quantities. These woods all share characteristics favorable to woodworkers. Their fine, uniform texture allows them to be planed, shaped or turned without difficulty. They all have a very low tendency to splinter when crosscut, and they hold routed or carved details exceptionally well.

The birches are far less susceptible to friction burns caused by dull cutters or improper feed rates than cherry or maple. Their even grain needs no fillers for a smooth finish. Birches accept virtually all



Flame-grained sweet birch is anything but dull, unlike the grain highlights of most species of birch. Irion Company Furniture Makers in Christiana, Pa., darkened this cupboard with aniline dye and glazing stain to accentuate the grain.

Photo: Gerald Martin

Photo: David Goldmark



The leathery outer bark of the paper birch is used to skin traditional canoes. American Indians and early European settlers used every part of the birch tree for building canoes and snowshoes as well as for making medicines and sweeteners. They called the paper birch "mother tree."



Red alder



Paper birch (also called white birch or canoe birch)



River birch (also called red birch)



Yellow birch (also called shaggy birch)



Sweet birch (also called black birch or cherry birch)



Flame-grained sweet birch



Hop hornbeam (also called ironwood)

Worldwide, the birch family contains more than 100 species, and most of them are sold as lumber, even if only in small quantities.

adhesives and finishes without difficulty.

The birch family also shares a few limitations. Birch doesn't have very good weathering properties. It's susceptible to beetles and borers, and it doesn't possess the kind of ring-porous anatomy found in highly figured woods such as oak or ash. But this is not to say that all birch lumber is bland or lacking in figure (see the top photo on p. 69).

Despite the many characteristics shared by the birches, this family is nonetheless extremely diverse. Like a well-balanced Olympic boxing team with at least one contender in every weight category, there is a birch with just the right weight and strength for almost any application.

Lightweight birches—Red alder rivals yellow poplar, aspen and even white pine as an easy-to-machine, easy-to-finish and remarkably stable secondary wood. Alder

actually shrinks less than yellow poplar and is substantially less prone to warping than yellow poplar or aspen (see the chart on the facing page).

Alder has two serious drawbacks. First, it's soft and not very durable. Second, fast-growing alder tends to contain reaction wood, which chips out when planed and gets woolly when sanded. Reaction wood can be identified by its dull-gray tinge.

Middleweight birches—In the middleweight category, paper birch (*Betula papyrifera*) ranks between domestic black cherry and black walnut in hardness. It's the whitest and blandest of the birches and has none of the stability, figure or attractive color of either cherry or walnut. Paper birch is inexpensive and machines well, so it's often used for turned parts such as knobs, spindles, dowels and pegs.

The wood of the shaggy dark-barked southern river birch (*Betula nigra*) is almost identical to that of paper birch. Although the tree is capable of attaining heights of 80 ft. and diameters in excess of 2 ft., it tends to branch out and produce knotty, low-grade lumber. But for small projects or turned parts, it is every bit as good as paper birch. When bought in a #1 or #2 common grade, it's hard to find a less expensive hardwood.

There may be other surprises in the piles of lower grade birch lumber. All birches are susceptible to attack by fungi, and boards showing stain are given a lower grade, even when knot-free. The stain is considered a defect in the lumber trade, but if it's vivid enough, it will yield a spalted figure with a special marble-like appearance. When you can find it, this spalted material is an outstanding choice for bowls and other decorative turnings.

Heavyweight birches—Yellow birch (*Betula alleghaniensis*) falls within the density range of the red oaks. This is the species most often used in commercially made birch cabinets and as the face veneer on cabinet-grade birch plywood. The subtle but flowing figure and creamy white color is accented by soft gray highlights. The wood is only slightly softer than hard maple, which yellow birch closely resembles.

In terms of working properties, yellow birch and hard maple are so similar they're interchangeable. But yellow birch is slightly less lustrous than maple. The ray flecks are comparable in color to the rest of the wood and not as pronounced as they are in maple. The two can be easily distinguished by examining the end grain with a hand lens (for more on this, see *FWW* #85, p. 74), but once you've worked with both, the lens is seldom necessary. They give off noticeably different scents when machined.

The birch family's second contender in the heavyweight category is sweet birch (*Betula lenta*). This Appalachian native, sometimes called black birch or cherry birch, is second only to yellow birch in annual harvest. Unfortunately, the trade seldom bothers to segregate the two.

Sweet birch is harder than yellow birch. It has the same average specific gravity as white oak and is rugged enough for virtually any furniture project. The sweet smell makes it a joy to work. Even well-seasoned wood fills a shop with its scent. The sap of this species is used for making birch beer; the bark and twigs are the source of wintergreen.

The highlights in yellow birch lean toward gray or, at best, a soft tan; those in sweet birch are a decidedly warmer orange-brown. Both woods sometimes rival maple in producing curly figure, but sweet birch's orange highlights produce what is commonly called flame grain. Of all the figures in birch, this is truly the connoisseur's choice.

Unlike the careful grading and marketing the trade lavishes on the choice figure of bird's-eye or tiger-stripe maple, fancy flame-grain birch seldom receives special handling at the mill. At the retail level, the bad news is you have to sort through the pile to find it. The good news is that it seldom sells at a premium. □

Jon Arno is a woodworker and wood consultant in Troy, Mich.

How the birches compare to other common woods

Species	Specific gravity	Volumetric shrinkage	T/R shrinkage
White pine (<i>Pinus strobus</i>)	0.34	8.2	2.90
Aspen (<i>Populus tremuloides</i>)	0.35	11.5	1.91
Red alder (<i>Alnus rubra</i>)	0.37	12.6	1.66
Yellow poplar (<i>Liriodendron tulipifera</i>)	0.40	12.7	1.78
Black cherry (<i>Prunus serotina</i>)	0.47	11.5	1.92
Paper birch (<i>Betula papyrifera</i>)	0.48	16.2	1.37
Black walnut (<i>Juglans nigra</i>)	0.51	12.8	1.42
River birch (<i>Betula nigra</i>)	0.55	13.5	1.96
Yellow birch (<i>Betula alleghaniensis</i>)	0.55	16.8	1.30
Hard maple (<i>Acer saccharum</i>)	0.56	14.7	2.06
Red oak (<i>Quercus rubra</i>)	0.56	13.7	2.15
White oak (<i>Quercus alba</i>)	0.60	16.3	1.87
Sweet birch (<i>Betula lenta</i>)	0.60	15.6	1.39
Hop hornbeam (<i>Ostrya virginiana</i>)	0.63	19.4	1.18

Source: USDA Forest Products Laboratory

Specific gravity is the ratio of a wood's weight to the weight of an equal volume of water. A wood with a high specific gravity will be heavier, harder and usually stronger and tougher to machine than a wood with a low specific gravity.

Volumetric shrinkage is the percentage of change in the volume of a block of green wood when oven dried to 0% moisture content.

Tangential to radial (T/R) shrinkage. As the wood dries, it shrinks in two dimensions: tangentially (parallel to growth rings and perpendicular to grain) and radially (perpendicular to growth rings). A ratio of those changes in dimension from green to dry is a way to express the overall tendency of a wood to distort. The higher the number, the more a wood will change dimensionally with changes in humidity.

Members of the birch family appear in red type.



Mortising with a Router

*Auxiliary fences,
fixtures and
templates help
ensure quick,
consistent results*

by Gary Rogowski

I cut my first set of mortises by hand. It was a fabulous learning experience. I found that chopping through red oak was like digging postholes in dry clay. I had to resharpen my chisel after each mortise, but I learned. I also bought a router.

A router is the quickest and most accurate tool for cutting mortises. Its versatility and speed is unmatched, and it can be used in a variety of setups, both upright and upside down in a router table. In minutes, a router cuts mortises that would take hours by hand. And you can reproduce your results with a minimum of hassle or setup time. When I have mortises to cut these days, the router is my first choice. Either a fixed-base or a plunge router can produce excellent results.

Choosing the right bit

There are a variety of bit sizes and types that can be used for mortising (for more on router bits, see *FWW* #116, pp. 44-48). Two shank sizes are commonly available: 1/4 in. and 1/2 in. Either will work, but bits with 1/2-in. shanks flex less under load, give a better cut and are less likely to break.

I don't bother with high-speed steel (HSS) bits because they need to be sharpened too often. Carbide-tipped bits cost two to three times more but they last much longer. Solid-carbide bits are great, too, but they're even more expensive.

Straight bits come in two flavors: single flute for quick removal of material and double flute for a smooth finish. Because you'll find double-fluted bits in most tool catalogs, you'll get more size options.

The flutes of a spiral bit twist around the shank. This gives a shearing cut that is even smoother than one from a double-fluted straight bit. Spiral bits are available both in solid carbide and carbide-tipped steel. They spiral up or down.

An up-cut spiral bit cuts quickly while pulling most of the chips out of the mortise. However, it also will tend to pull the workpiece up if it's not securely fastened. The up-cut spiral also can leave a slightly ragged edge at the top of the mortise where wood fibers are unsupported. Because the edges of a mortise are usually covered by the shoulders of a tenon, this kind of tearout generally isn't a problem.

A down-cut spiral bit pushes the work and the chips down. The result is a cleaner mortise but one that can become clogged with debris.

I have used mostly double-fluted straight bits and a carbide-tipped up-cut spiral bit.

Recently, though, I bought a solid-carbide up-cut spiral, which cuts even better.

Using a fixed-base router

If the only router you have is a fixed-base router, you're not out of luck. It will just take a little more attention to detail and skill to get good mortises than it would with a plunge router.

A straight fence attached to the router is essential for accurately guiding the cut. Adding a long wooden auxiliary fence to your router's stock fence will give the router more stability. A second fence, clamped to the router base and on the oth-

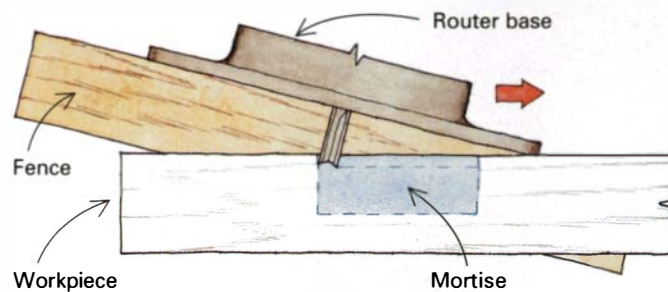
er side of the workpiece, is a good idea, too (see the photo below). This fixes the position of the router laterally, so it can't accidentally slip to one side or the other during the cut. Combined with end stops, a double fence will virtually ensure accurately located mortises. The only thing left to set is the depth, and here you have a choice of methods.

Multiple depth settings—One way of mortising with a fixed-base router is to take just a little bite with each pass, gradually lowering the bit until you're at full-depth. The biggest drawback with this approach



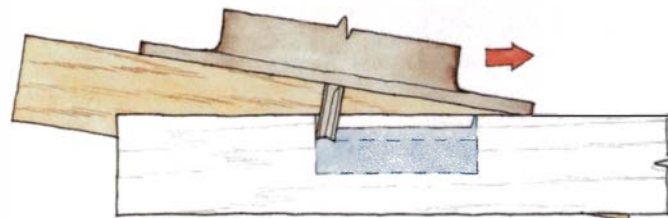
Two fences keep a router in line. When routing to full-depth with a fixed-base router, you want to make sure it doesn't veer out of the mortise.

Mortising with a fixed-base router: You will get a cleaner mortise by setting the bit to full-depth right from the start. Cut the mortise in several passes with the router tipped at an angle.



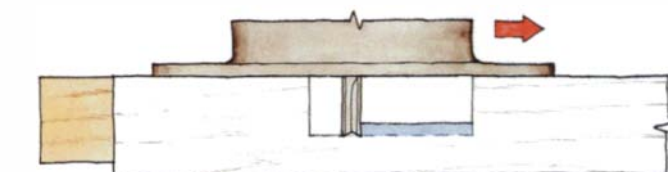
First pass

The first pass, with the router held at an angle, should remove about 1/8 in. to 1/4 in. of material.



Second pass

The angle of the router is lowered for the second pass, but bit depth remains the same. This and each successive pass removes from 1/8 in. to 1/4 in.



Last pass

The last pass is made with the router flat against the workpiece and the bit straight up and down.

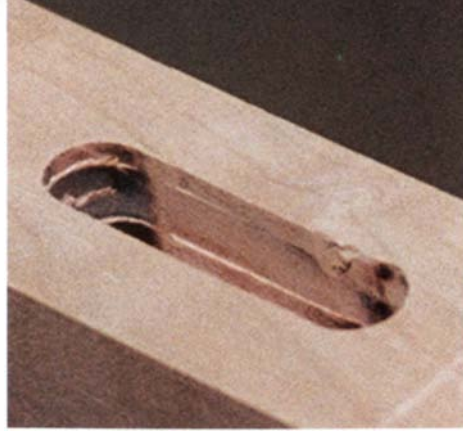
is that it's hard to get a smooth-walled mortise. The reason is that the motor and, consequently, the bit may not stay centered in the base as you adjust the depth of cut.

With most routers, adjusting the bit height requires that you turn the motor in the base housing. When you do, the bit moves in relation to the fence, only slightly, but enough to give the walls of the mortise a stepped, rough surface (see the photo at right). Exceptions are DeWalt, Black & Decker and Elu routers, which employ a rack-and-pinion adjustment system that keeps the collet and bit centered at a fixed distance from the fence.

One depth setting—One way around this stepping problem is to set the bit at full depth right from the start. To mortise, you just move the router at an angle to the workpiece so you introduce a little more of the bit to the wood with each pass (see the drawing and photo on p. 73). The router is tilted, resting on one edge of its base, until the final pass is made. An extra-wide auxiliary fence is advisable, and a second fence clamped to the router base on the other side of the workpiece is essential.

Router-table mortises

Why would anyone want to cut mortises on a router table? Well, for narrower stock,



Multiple depth settings create steps. To adjust the bit height on most fixed-base routers, you have to twist the motor in its base. This often results in stepped, sloppy sidewalls.

a router table provides plenty of support. When routing narrow pieces from above, a hand-held router can become tippy and unstable. The edge of a door stile, for example, just doesn't offer very much support for a router base. With a router table, you have both the table and the fence against which to register the workpiece, and you only have the weight of the workpiece to control. For small table legs or cabinet doors, mortising on the router table is worth trying.

When mortising on a router table, use the fence to position the mortise from side to side and stops to establish the ends of the

mortise. As you face the table, the work should move from right to left. This feed direction will help keep the work tight against the fence. Start with the workpiece against the right-hand stop, and lower the work into the bit. Because most bits don't cut in the center, it helps to lower and simultaneously move the work along just a little to avoid burning. Move the workpiece from right to left across the bit until it hits the other stop.

If you're using a plunge router, you can set the turret stops for incremental cuts, make three passes and finish up at full-depth. But if you're using a fixed-base router, you'll have a problem getting a smooth-walled mortise if you adjust the bit height between passes—just as you would when using the router upright.

My solution to this problem is to use shims made from 1/4-in. hardboard, like Masonite, notched around the bit, to elevate the workpiece above the table (see the bottom photo). In this way, I can set the bit at full height and just remove a shim after each cut, gradually working down until the workpiece is on the table and the last cut is made.

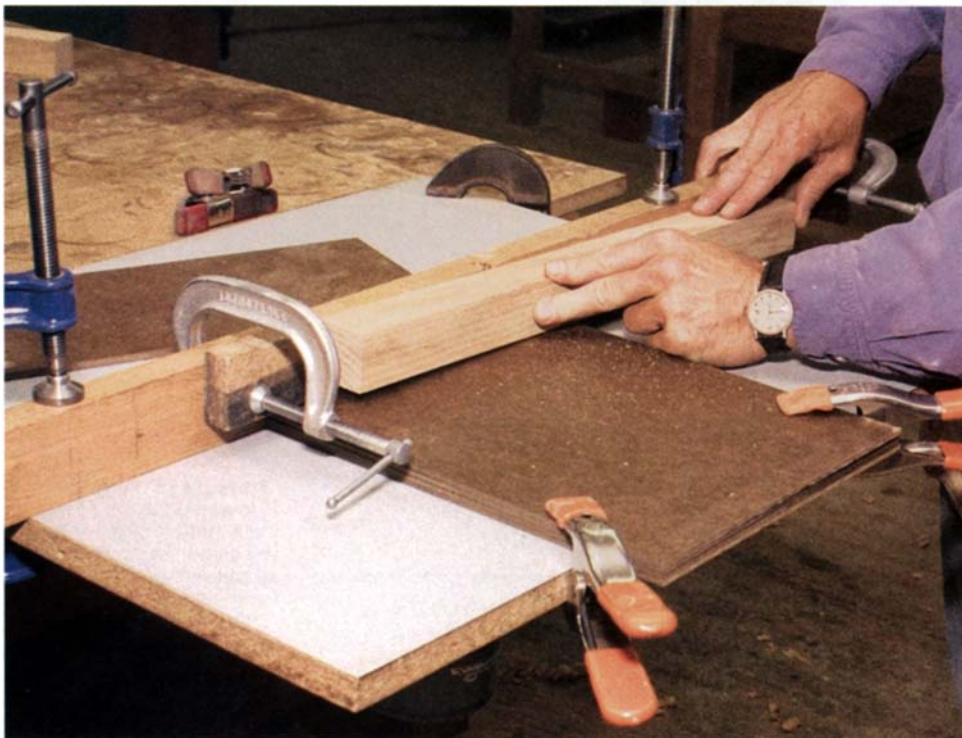
Mortising with a plunge router

The best tool for mortising is the plunge router used on top of the work. This is the job it was designed for. There are many different kinds of fixtures that can be used with the plunge router. Two that I use frequently, a U-shaped box and a template with a fence, are discussed below.

There are several schools of thought as to how to plunge the bit into the work. One method is to plunge a full-depth hole at each end of the mortise and then make a series of cleanup passes between those two holes. The drawback to this method is that you may get some burning as you plunge to full depth because most bits don't have center-cutting capability.

Alternately, you can make a series of successively deeper, full-length passes, always moving left to right with the bit lowered and locked in place each time. For me, making full passes without locking the plunge mechanism on each pass works best. I keep the router moving. Try each of these methods to see which one works best for you.

Using a stock router fence—The simplest method for mortising with a plunge router is to mark the mortise ends on the workpiece and to set the last turret stop for



With hardboard shims, you set the bit just once. By removing one shim after each pass, you can take safe, manageable bites without having to change the router's depth setting. Increments of either 1/4 in. or 1/8 in. are possible.

the full depth of the mortise.

To adjust the bit's position, place the router on a marked-out workpiece, and lower the bit so it's just touching the surface of the work. Rotate the bit so its cutting edges are in line with the width of the mortise. Adjust the fence so it's flush against the side of the workpiece and the edges of the bit are within the layout lines. Then clamp the workpiece firmly to the bench, and rout away. Keep in mind, though, that the router will be tippy on narrow stock.

You can try to bring the bit just up to the end marks of the mortise with each pass, but it can be difficult to see them with all those chips flying around. Another way to accomplish this is to line up the edges of the bit at both ends of the mortise and make a pencil mark at the outside edge of the router base (see the top left photo). These marks are a lot easier to see than layout lines at the ends of the mortise.

If you're concerned about cutting beyond the layout lines, just clamp on stops to limit router travel. It only takes a second. Clamp the stops directly onto the workpiece once you've determined the length of the mortise (see the top right photo).

Mortising with the U-shaped box—One of the most versatile router-mortising fixtures that I've come across is a simple U-shaped box (see the drawing on p. 76). I first saw one of these boxes in a magazine article by Tage Frid. Since then, I've made a number of them dedicated to particular pieces of furniture.

But having one fixture that handles a variety of different-sized parts is really useful, too. The one in the photo at right is made of 3/4-in.-thick medium-density fiberboard (MDF). Its sides are rabbeted for the bottom (this helps align it during assembly). I also made the bottom longer than the side walls so I could clamp it down easily to any work surface.

The best way to deal with multiple identical mortises is to clamp an end stop to the side wall of the fixture (see the photo on p. 76). This way, each new piece will automatically be fixed in the right spot. Stops to index the mortise length also can be clamped onto the fixture. I prefer clamping these on rather than using an adjustable stop—I don't want to risk the stop being nudged out of place.

When placing the workpiece in the fixture, always make sure the piece is sitting flat on the fixture bottom and tight to the inside wall and end stop. Clamp the work-



Layout lines are much easier to see when they're not hidden. The pencil marks show where the router base should stop, and the tick marks indicate that you're getting close.



Stops are foolproof. Clamp or screw stops in place to limit the travel of the router, front and back. You won't have to worry about trying to see layout marks when the chips are flying.

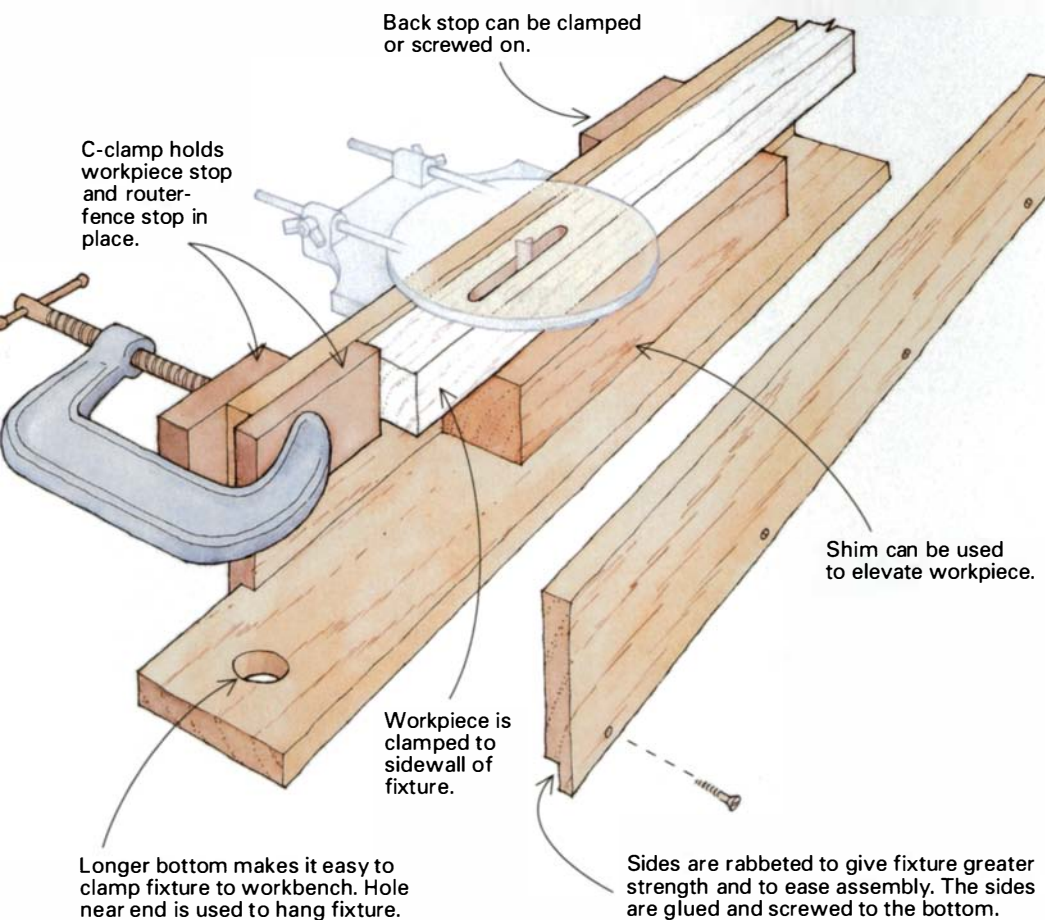


One fixture cuts many mortises—This simple U-shaped box is one of the most versatile mortising fixtures you can build.

Measure once, and clamp a stop in place. The less measuring you have to do, the fewer errors you're likely to make. The stop on the inside of the fixture positions the workpiece. The one on the outside is a fence stop, which establishes one end of the mortise.



U-shaped mortising fixture: This router fixture is simple to make and incredibly versatile. It can be made to accommodate a wide range of work and only takes a few minutes to set up for a mortising operation.



piece securely. Spacers can be used underneath pieces to bring them higher in the fixture or to push a piece away from the sidewall. Make sure the spacers are milled flat and support the workpiece well. Be sure that the clamps holding the work don't get in the way of the router.

To improve stability, attach a wooden auxiliary fence to the one that comes with the plunge router. Then position the bit in the right spot. Remember to hold the fence tightly to the wall, and be sure to move the router so the fence will be drawn up against the wall of the fixture by the rotation of the bit.

Dedicated mortising fixtures are extremely useful when you plan to reproduce a number of cuts on a regular basis. I made an angled fixture to cut the mortises for a stool I build at least once a year. The end stop locates each leg in the proper spot. A spacer block positioned against the stop locates the second set of mortises in the legs. Stops screwed to the outside of the fixture wall limit the length of travel of the fence and, therefore, produce mortises that are the correct length.

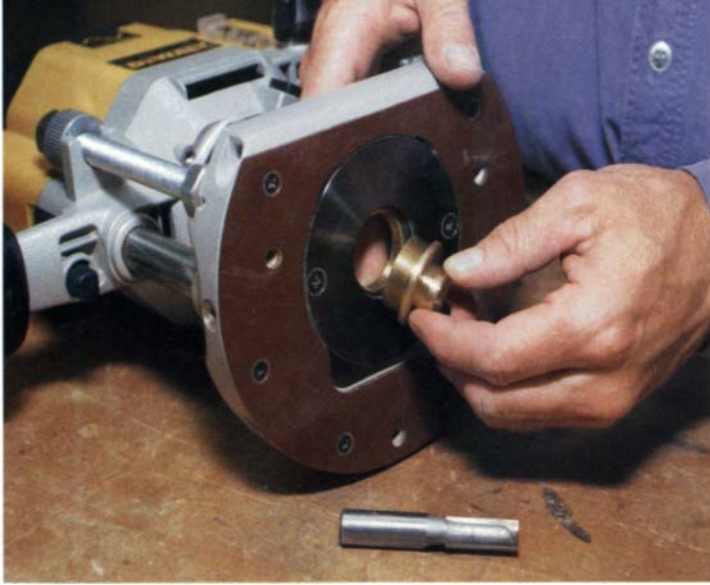
Templates and template guides—A template guide is a round metal plate with a thin-walled rub collar that extends out from its base (see the top photo on the facing page). The guide is screwed to the router base, and a router bit fits through it without touching the inside wall of the collar. The outer wall of the rub collar is guided by a straight edge or template as the router cuts (see the bottom photo on the facing page).

Templates that are made of hardboard, plywood or MDF include a slot to guide the rub collar as it makes the cut. The template is clamped to a workpiece with its slot centered over the mortise. I make up a template for a mortise when I'm doing a job I expect to repeat.

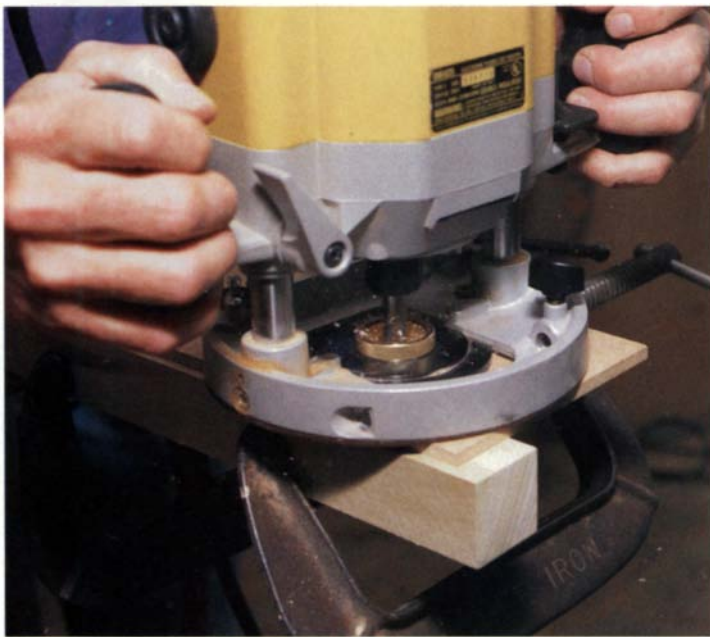
To make a template, nail a piece of 1/4-in. hardboard about 5 in. wide and 10 in. long to a piece of wood approximately 2 in. sq. and a little longer than the hardboard (see the drawing on the facing page).

The wood block is the fence, and the hardboard gets a slot cut in it that is exactly the width of the rub collar. Cut the slot in the template on the router table. To be sure the slot is parallel with the fence—which ensures that the mortise is square to the stock you're routing—tack the hardboard back a little bit from the edge.

Set up the router table with a straight bit

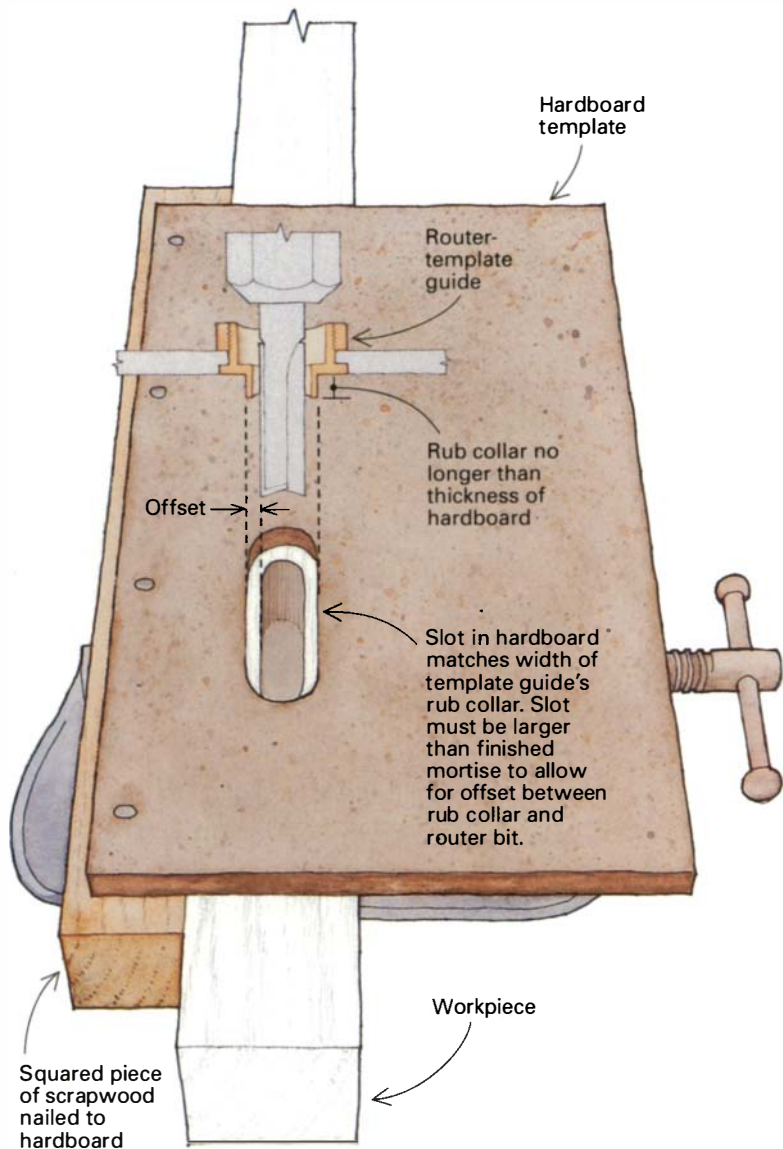


A template guide screws to the router base. The guide's rub collar follows a slot cut in the template.



Stops are built in. A template prevents side-to-side movement of the bit and automatically sets the length of the mortise.

Using a template and guide to mortise: Routing mortises with a hardboard template and router-template guide is quick and virtually foolproof. The size of the slot in the hardboard determines the size of the mortise. The template is clamped to the workpiece, and the assembly is then clamped to the bench.



that matches the outside dimension of the rub collar. The template slot is pencil-marked on the hardboard. The diameter of the template guide is greater than that of the bit you'll use when mortising. So you'll need to add the distance from the outside of the rub collar to the edge of the router bit to each end of the slot in the template (see the drawing above). Typically, this offset is between $\frac{1}{16}$ in. and $\frac{1}{8}$ in.

Before cutting the slot in the hardboard template, take a minute to determine the setback from the edge of the workpiece to the edge of the mortise. Then set the routable fence accordingly. I like to double-

check that the fence is in the right spot. So I make a nibble cut at the end of the template, and then measure the distance from that point to the fence. This method ensures that you get the correct distance. Once you have it, plunge the template down onto the bit as close to the center of the slot as possible, and then slide the template back and forth just up to the pencil marks at each end.

Templates like these are versatile. For example, a template made to cut a mortise $\frac{3}{4}$ in. from the edge of a table leg also could be used to cut the same sized mortise $\frac{1}{2}$ in. from the edge. How? Simply by

inserting a $\frac{1}{4}$ -in. shim between the template fence and the workpiece.

Once you have made the template and clamped it to the workpiece, position the plunge router with the template guide on the work. Set the bit depth, taking into account the thickness of the template. An up-cut spiral bit will pull most of the debris out of the mortise as the cut is made. Compressed air can help clear a mortise that's really packed with chips. □

Gary Rogowski designs and builds furniture in Portland, Ore. He is a contributing editor to Fine Woodworking.

Weaving Shaker Tape Seats

*Inexpensive cotton tape
makes a strong, comfortable seat*

by Glenn A. Carlson



Everything you need to weave a seat—Most of what you see above are basic shop tools, except the wooden weaving needle and the surgical clamp. With these tools, the author wove the new chair seats at right; the older chairs behind them are from the collection at the Hancock Shaker Village in Massachusetts.



I make Shaker chairs for a living. I also serve as the resident chairmaker at Hancock Shaker Village in Pittsfield, Mass., where I periodically teach people to weave chair seats. My students are often surprised to discover how easy the technique is to master.

The early Shakers made their chair tape from wool. Later, they switched to cotton. I prefer cotton tape to other woven seat material because it's durable, comfortable, easy to apply and available in a variety of colors. (Two sources of cotton tape are Connecticut Cane and Reed; 860-646-6586 and H.H. Perkins; 203-389-9501.) This is the

same material that the military uses for belts and backpack straps, so it's durable.

The tools are basic

You can weave a seat with only a few basic tools (see the photo above). You may already have most of them in your shop. There are likely to be two exceptions: a steel surgical clamp and a wooden weaving needle. You could weave a seat without either of these tools, but they'll make the job a lot easier.

The surgical clamp, also called a hemostat, is a cross between a pair of scissors and a Vise-Grip. You can use it to grab and

pull the cotton tape, or you can double the tape over the nose of the tool and push it through a tight space. You should be able to buy one at a surgical-supply or a fish-tackle shop for \$5 to \$10. A wooden needle also can be used to thread the tape. I fabricated mine from a discarded chair slat.

Wrap the warp first

Applying Shaker tape is relatively simple. First you wrap one piece of tape around the seat rungs from front to back. This is called the warp. On an average-sized chair, the warp is approximately 20 yds. long. The second piece of tape, called the weft,



Measuring tape length—The author first wraps a piece of the cloth tape one full revolution, front to back (far left). Then he measures the distance between the back posts to calculate the number of rows that will fit over the back rung.

One tack secures the warp (near left). The warp is one continuous piece of cloth tape stretched over the front and back rungs of the chair seat.



3

Rows do not overlap. Each row of tape should butt firmly to the one next to it. No wood should show through when the seat is done.

is woven through the warp from side to side. When weaving two colors of tape, always use the darker color for the warp because it covers the front rung where the seat will soil the most.

To calculate length, wrap the tape around the seat frame, front to back, one full revolution, and mark that length on the bench. Measure the distance between the back posts, or legs. If you're using $\frac{5}{8}$ -in.-wide tape, every 5 in. of rung will need eight rows of tape to cover it. For 1-in. tape, every inch of rung equals one row of tape. Pull the required amount of tape from a roll, adding an extra row or two to be safe.

Tack one end to the seat frame at the

back of the left side rung, using no. 3 upholstery tacks, $\frac{3}{8}$ in. long (see the bottom right photo on p. 79). I always drive tacks into the rungs on the inside edge so the metal heads won't wear through the cloth tape over time. Bring the tape around the front rung, under the bottom and back up over the top of the back rung.

Repeat this process a few times, wrapping loosely. Then pull all the excess through. Keep wrapping this way until you use up most of the material. Before wrapping the last row or two, clamp the tape to the front rung, and then go back to the first row and pull each row tightly enough to take up the slack (see the top right photo). Later, the



4

Getting rid of slack—The author clamps the end of the warp in place. Then he goes back to the first row to pull the tape securely. After that, he pulls the rows tightly to one another and adds another row or two to cover the back rung.

weaving process will tighten the warp more. Use your fingernails and a tack puller (with sharp edges filed dull so they won't tear the cloth) to compress each row slightly between the back posts. Add an extra row or two if you have the room, but don't overlap the material. Turn the chair over, and tack the material to the side rung near the back post (see the bottom left photo). Cut off any excess.

Because the chair seat is wider at the front, you'll have to fill in the triangular gaps at the front corners of the frame (see the bottom center photo). Use short pieces, 1 or 2 ft. long, and tack each piece to the side rungs, top and bottom. Start each piece



5

Tack the end of the warp to the underside of the side rung, near the back. The goal is to hide all the tacks from view when the seat is finished.



6

Fill in the corners with short pieces. The chair seat is wider at the front, so the triangular gaps on either side must be filled in with separate pieces of tape.



7

The foam serves a dual purpose. It cushions the seat for a softer feel, and it strengthens the two layers of tape so that they stretch as one when weighted down.

at the top, and finish it on the bottom, as much toward the back as possible. It makes no difference if the number of filler strips is the same on each side. What counts is that the wood rungs are covered with the cloth tape. Be sure to compress the tape to fit in as many rows as possible.

Fill the center with foam

Cut a 1-in.-thick, high-density foam pad slightly smaller than the seat frame, and push it into the space between the top and bottom layers of the warp (see the bottom right photo on the facing page). Choose an opening roughly one-third of the way across the seat. Use one hand to push the foam into place and the other hand (on the underside of the seat) to help pull it along. The foam acts as a cushion and helps the top and bottom layers of tape work together to support a load.

Weave the weft last

Start the weaving with one long piece of tape, called the weft, that stretches between the left and right rungs of the chair frame (see the top photo at right). Calculate the yardage you'll need using the method of wrapping and measuring described for the warp piece. Always add an extra row or two for good measure. Because the seat frame is larger at the front, the test wrap should be measured a little front of center so the calculated length will not be too short.

To weave in the weft, start at the back of the chair and work forward. But before beginning the weaving process, place a piece of cloth-backed, double-faced tape along the back two-thirds of each side rung. This will prevent the Shaker tape, over time and use, from sliding backward on the trapezoid-shaped seat frame. Pull the backing paper off gradually as you weave toward the front of the seat to expose more adhesive. The Shakers solved this problem by gluing cloth to the side rungs. The cloth was part of a packet filled with straw or wood shavings designed as a cushion. I don't think they'd object to using foam and double-faced tape instead.

With the chair upside down on the working surface, feed one end of the tape in from the right side, under two widths of cotton tape in the warp and then over two. You'll end at the left rear corner. Tack the new length of tape under the existing warp piece to the back rung in the left rear corner.

Turn the chair upright. Thread all the material through your hands to find the top and bottom of the tape so that you don't



The weft is next. After weaving the tape front to back, the author adds the weft—the side-to-side rows. He starts at the back of the chair.

get it twisted. Weave the first row on the top of the chair seat, under two, over two. Flip the chair, and weave through the bottom layer. Turn the chair upright again. Be sure to tuck the end of the tape into the seat to make it ready for the next layer of weaving. Then pull the long length of tape all the way through. The waxed paper backing on the double-faced tape will make the Shaker tape slide more easily.

Using the tack puller and your fingers, straighten the row, and push it toward the back of the chair seat. Pull the Shaker tape tightly, removing any slack, and secure it to the double-faced tape.

Continue weaving the seat toward the

chair front. Weave over the tacks holding the warp filler strips in place. Weave under the filler strips as soon as you can because that will help to strengthen the weave.

If you need to fit one more row when you reach the front of the seat and it appears there's not enough room for a width of tape, simply compress the last six or eight rows with your fingers. Turn the chair upside down, pull the final length of weft through at the front corner, and tack it to the front rung, under the warp (see the bottom right photo). □

Glenn A. Carlson makes Shaker chairs and lives in Norfolk, Conn.



Surgical clamp reaches into tight spaces. It can be used to push or pull the tape. Doctors use this tool, so do fly fishermen. A clamp costs less than \$10.



End the weft on the bottom. One tack to the underside of the front rung, after all the rows have been pulled tightly and adjusted for neatness, finishes the job.

Hanging Butt Hinges, Unconventionally

Three unusual applications for this most basic kind of cabinet hardware

by Stephen Lamont

Several years ago, I moved to Devon, England, with my wife and son to study with an excellent craftsman and teacher named Christopher Faulkner. He taught me the basics of furnituremaking, one by one. I remember spending hours painstakingly cutting the mortises for my first set of butt hinges on a tool cabinet that I still use.

As with most of what I learned back then, the process of installing

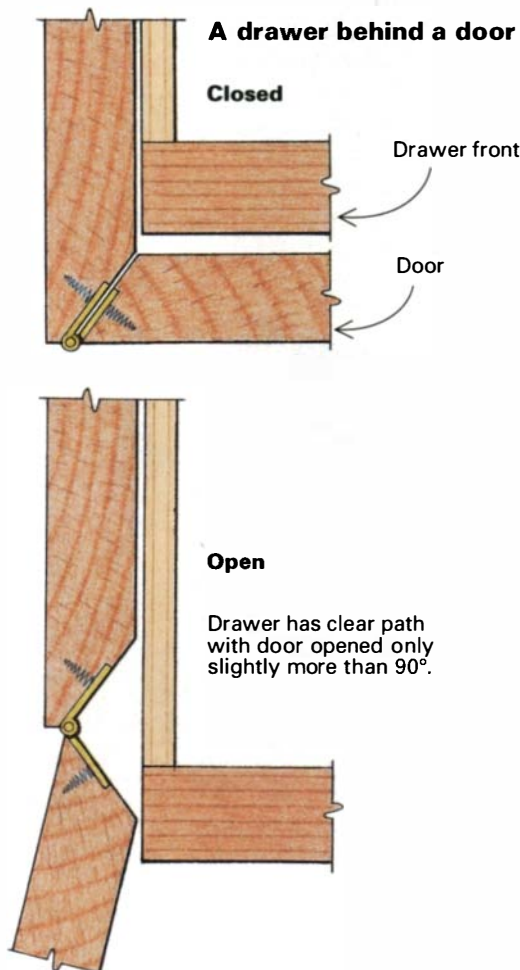
those hinges was pretty exciting. Yet, in some ways, it's even more so now because of some of the unusual design details that have come up in my work. Practical or esthetic considerations sometimes lead to different approaches to installing hinges. □

Stephen Lamont works as a craftsman at the Edward Barnsley Educational Trust in Hampshire, England.

HANGING DOORS IN FRONT OF DRAWERS

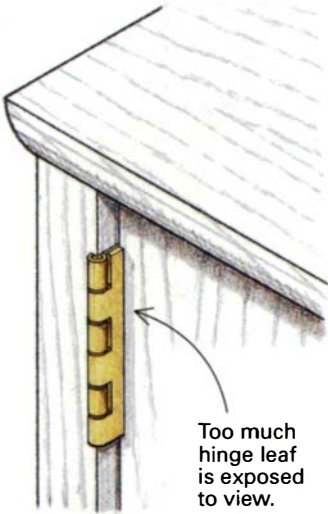
I received a commission a few years ago to build a stereo cabinet. The clients had a collection of audio tapes and compact discs, and they wanted room for more. So I had to design a bank of drawers with in the cabinet, behind the doors. With a conventional butt-hinge installation, the inset door would have to open a full 180° for the drawers to clear the hinge stile. That would make the simple task of pulling out a tape or compact disc impractical and inconvenient.

My solution to this problem was to bevel both the door stile and the mating surface of the cabinet. It's the location of the hinge pin that determines the path of a swinging door. The bevels effectively moved the hinge pin away from the path of the drawer so that the door could swing clear of it when opened only a bit more than 90°, as shown in the photo at right.



DOORS SET IN FROM THE CABINET FACE

Sometimes, the design of a cabinet will require that the doors be set back from the front face of the carcass. In such cases, you could mortise the hinge into the carcass as



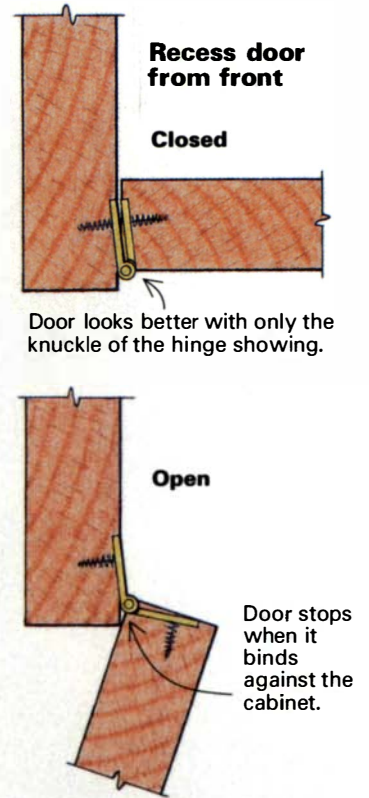
you would if the door were flush with the front. This locates the pin all the way out to the front edge of the carcass, so the door swings freely and opens all the way. But doing that would make the hinge look unsightly; too much of the leaf would be exposed, as shown in the drawing at left.

A more attractive solution is one I learned from a book by Ernest Joyce, *The Technique of Furniture Making* (published as *Encyclopedia of Furniture Making* in the United States by Sterling Publishing Co., New York, N.Y.). It's a little complicated and more difficult to cut the mortise because you have to cut it in at an angle. The key here is to make sure the pivot point of the hinge is in line

with the front of the door. Mortise the knuckle entirely into the door stile at the front, and mortise the leaves equally into the edge of the door stile and the cabinet side at the back, as shown in the drawing at right.

There's one drawback to this method: It limits the door travel. Depending on how far back the door is hung, its face will bind on the inside front edge of the cabinet. And because the door travel is restricted, this application would not work with cabinets that have drawers.

Before mortising hinges on an angle, I'd recommend practicing on some scraps until you feel confident enough to start digging into a finished cabinet.

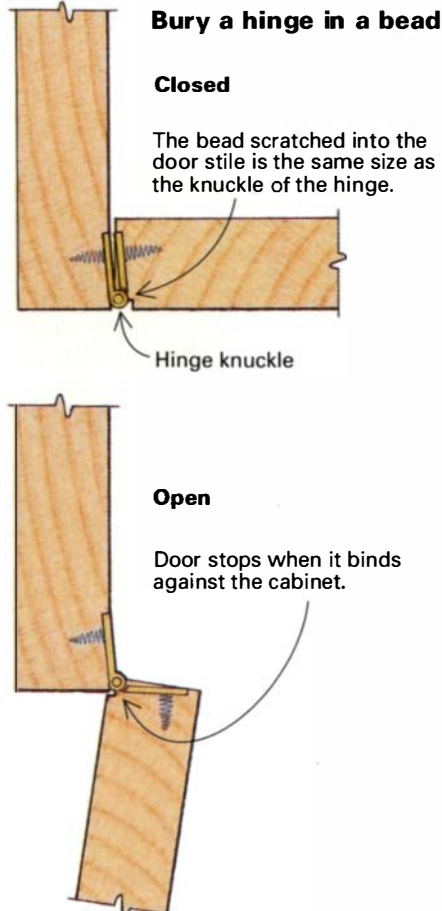


BEADED STILES MATCH THE KNUCKLES

Several years ago, when I first came to the Edward Barnsley workshop in Hampshire, England, for a six-month study program, I learned another unusual technique for installing butt hinges. It's one that I particularly like.

Just as with the method described above, the leaves are cut in at an angle, but the door fits flush with the front face of the cabinet (see the top drawing at right). What makes this method unique is that you scratch a bead into the door stiles at precisely the same diameter as the knuckle of the hinge. So when the hinge is installed, it seems to melt into the cabinet.

This is a lovely detail, but just like the technique above, the door will bind when it's opened a little more than 90°. This method is especially well-suited for use in a corner cabinet like the one shown in the photo at right.





Layout essentials—An accurate try square and a marking knife are basic tools for laying out furniture joinery.

A Basic Layout Kit

Well-made furniture and cabinets start with accurate layout tools

by Horst J. Meister

I was 15 years old when I built my first cabinet. Shortly before my mother's birthday, I overheard her tell my father that she would really like to have a little cabinet for her sewing room. The very next Saturday, I locked myself in the garage with a generous supply of redwood boards, a bent aluminum yardstick, a box of dowels, glue, a crosscut saw and three Snickers candy bars.

The finished piece fell a little shy of my expectations. Believing that square corners were a very desirable feature in furniture, my dad gave me a try square for my 16th birthday. Soon, my woodworking projects improved to the point that people other than my mother liked what I made.

A good try square, a ruler and a marking knife are the fundamental layout tools that few serious woodworkers can get along without. Add a marking gauge or mortising gauge, a bevel gauge, a protractor, and a set of dividers and trammels and you'll have a basic layout kit. Why spend the money? Good-quality layout tools will last a lifetime, and flawed measurements will plague a project through every stage. Even small errors are a detraction if they occur in a prominent place.

I have obtained excellent results in woodwork using some of the machinist's layout tools that are standard equipment in the tool-and-die industry. And they often cost less than comparable tools specifically designed for woodworkers. They're not as pretty as the best woodworker's tools. However, good looks don't get the job done—accuracy does.

Start with a try square or an engineer's square

The try square is a very simple device. It's just a thin metal blade permanently set at 90° to a thicker wood or metal handle. Its uses are many: You can check the squareness of milled stock, mark square shoulders, lay out joinery or check the accuracy of the miter gauge on your tablesaw or the fence on your jointer. Without a good try square, you can't make anything square. A number of companies make try squares specifically for woodworkers. They vary in price and appearance, but you don't need to spend a lot of money.

For super accuracy and durability, consider using an engineer's square with a 12-in. blade (see the top photo). The handle and blade are hardened and then silver-soldered together. These squares can't get out of alignment unless you subject them to serious abuse, like pounding on them with a large hammer. In the 12-in. size, most brands are guaranteed to be square to 0.0025 in. ($\frac{1}{400}$ in.) or less. Chinese engineer's squares are not as good as U.S., English, German or Japanese squares.

Combination squares (see the photo at right) have their uses. Because the blade is adjustable, it can fit into a tight place or reach that extra inch a try square can't. Despite these advantages, they're not entirely suitable for use as a try square for two reasons. First, the bearing surface of a standard 90° combination-square head is



Engineer's squares are sturdy and accurate. They're useful for checking machine fences and blades because their wide handles make them stable on edge.



Use a bevel gauge for layout tasks beyond 90°. With few variations, the design has remained the same for a hundred years. The Starrett No. 47 on the left has been in production since 1891.



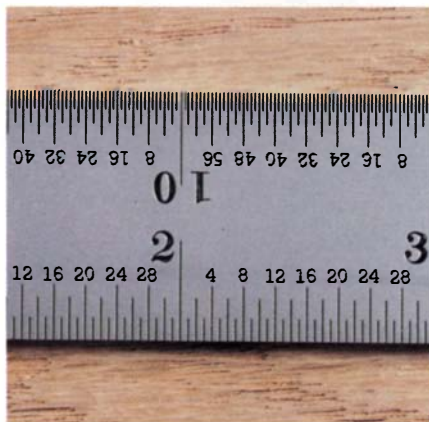
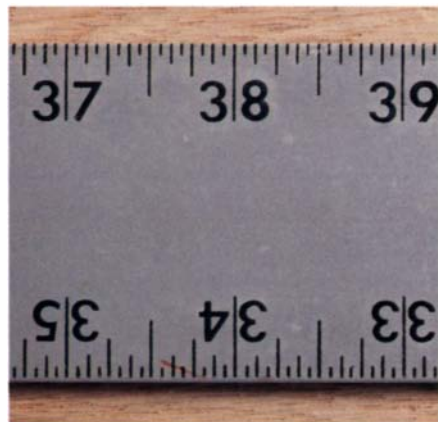
Combination squares just don't measure up. The handle is shorter than that on a try square, giving less support when marking a line.

Flawed measurements will plague a project through every stage.

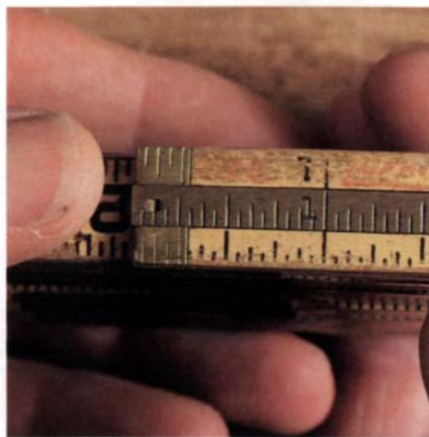
shorter than that of an engineer's or try square's handle, which is typically 80% as long as the blade. The extra length gives better leverage against cutting pressure on the blade while marking. The relative shortness of the combination square's head makes it easier for you to push the blade off the desired line. Second, the blade and head on a combination square will wear against each other over time and eventually go out of square.

Next, an accurate metal ruler

A good ruler should have fine, crisp graduations that are cut into the metal and contrast with their background. Aluminum rulers with usable graduations are available for a reasonable price at most hardware stores. However, aluminum is a soft metal, which is easily scratched or bent. When used for scribing lines, sharp marking knives will nick the edge of an aluminum ruler.



Choose a ruler for its longevity and accuracy. The painted graduations on the soft aluminum ruler (left) will not fare well with use, but the etched graduations on the steel ruler (right) are more precise and will last a long time.



Where exactly is 1 3/8 in.? Time and use have taken their toll on this steel tape measure (left) and this folding rule (right). Not designed to last, the graduations have worn from the edges of both. The tape measure's hook bends easily, and the rivets wear loose. Use a precision ruler when accuracy counts.

For a few dollars more, you can buy a machinist's ruler, which is a far superior tool (see the top right photo below). Available in lengths from 6 in. to 48 in., these scales are made of hardened stainless steel and have very accurate graduations. Starrett, Brown & Sharpe, Rabone Chesterman and Mitutoyo rulers have finely cut graduations accurate to within a few thousandths per foot. A set, consisting of a 6-in., an 18-in. and a 36-in. ruler with fractional graduations, will handle most measurement tasks.

Steel measuring tapes are convenient, reasonably priced and handy. However, they're not accurate enough for cabinet work. The rivets that fasten the sliding hook to the end of the tape wear with use, making the tape less and less accurate (see the bottom left photo). Most measuring tapes have painted graduations that may wear off. And folding rules have many of the same drawbacks, most notably painted graduations and joints that can bind on sawdust or small shavings. Precision rulers have few of these limitations, but they can't measure long distances.

For marking, use a knife not a pencil

Pencil lines are too wide for accurate layout work, and the graphite tends to smear. Scoring the wood with a knife makes a precise mark that won't smudge or wear out. There are a number of different marking-knife designs on the market. I don't see much reason to choose one design over another as long as the knife leaves a clean, accurate cut, and it's comfortable to use. The blade should be thin and very sharp at its tip so it can be held tightly against the blade of a square. Then the line can be knifed right along the edge.

Strive to make your layout marks in exactly the same manner each time. Hold the marking knife at the same angle relative to the ruler and the wood each time you mark the work. A knifed line should be deep enough to see easily. Yet it should be as light as possible to keep the knife blade from following the grain rather than the ruler.

Many furnituremakers leave dovetail layout lines on drawer sides or cabinet faces as a sign the piece was made by hand. But ordinarily, you wouldn't use a marking knife on surfaces that will be exposed after assembly. Your best bet is the traditional carpenter's pencil with the lead sharpened to a knife-edged chisel point. The pencil's chisel point draws a cleaner line than the conical point on a standard pencil. And the pencil's rectangular body won't roll off your bench.

Some woodworkers prefer using an awl



An awl point breaks wood fibers across the grain; a sharp knife cuts them.

Use a protractor to scribe any angle but a right angle. Without superfine etched graduations on the head, finding an angle will be hit or miss. Cheap protractors can misguide you by several degrees.

rather than a marking knife. Even when it's sharpened to a fine needle point, though, an awl suffers from a tendency to follow the wood's grain and crush fibers, not cut them (see the top right photo). Marks scratched with an awl tend to be fuzzy, especially in soft woods.

Marking and mortising gauges

There are different kinds of marking gauges, but they all work on the same principle. The basic marking gauge consists of a steel cutter mounted on a beam that fits in a fence. A setscrew or wedge fixes the beam to the fence at whatever distance is desired. Marking gauges can have pins, small blades, even discs for cutters. Gauges that have blades are called cutting gauges.

Marking gauges are used to scribe a line parallel to an edge. Set the pin or knife to the distance to be marked, and then tighten the fence to the beam with the setscrew or wedge. Hold the fence against the edge of the material with the pin touching the wood. Because the tool is guided by the edge of the work, any line that's cut with a marking gauge is certain to be parallel to that edge as long as the fence is held firmly against the work while the line is being cut.

The pin of a factory sharpened gauge makes a fuzzy, irregular mark. Filing the tip to an oval-shaped knife edge makes it cut better (see the center photo at right). A pin filed to a slight angle helps draw the fence against the workpiece. For cutting across the grain, a cutting gauge does an even better job than a marking gauge (see the photo at right). Even when the pin of a marking gauge is sharpened as described above, it can hop or tear out when marking across the grain. The alternating rings of soft summer and hard



Good lighting, a magnifying glass and careful filing will greatly improve the performance of a pin gauge. The pin may be filed to a small knife edge, which won't tear the wood as much.



The larger blade of a cutting gauge will produce a cleaner cut across the grain.



The author draws his shopmade disc gauge toward him. The cutter (inset) does not spin freely, but when it dulls, it is easily turned to a fresh edge.

Woodworking dividers, when properly sharpened, will scribe a clean line across and with the grain (below).



winter wood cause the gauge to do this. A cutting gauge's knife doesn't have this problem, but it needs a light touch to keep it from making a deeper cut than you need.

I prefer a marking gauge with a small disc for a cutter. Fastened to the end of the beam, the disc is about the size of a dime and has a bevel on the side facing the fence. A disc cutter combines the advantages of both pin and knife. It will mark equally well across and with the grain. The bevel pulls the fence against the stock as you draw the tool along the work, and the line it cuts is clean, straight and sharply defined without being too deep.

A mortise gauge is simply a marking gauge with two independently adjustable cutters. It's used to make two parallel layout lines. To use one, first set the distance between the pins to the width of the mortise, and then set the beam to the mortise location on the workpiece. The two cutters outline the width of the mortise with one stroke of the gauge.

A bevel gauge or protractor for angles

A protractor is used to measure and determine angles. It has a radial scale calibrated in degrees and an arm that pivots on the center point of the scale's radius. A protractor can be set to any specified angle in its range, and the protractor's arm is then used to draw the set angle onto the stock. A good machinist's combination square set comes with a very accurate protractor that has a vernier caliper that allows you to measure angles as small as $\frac{1}{4}^\circ$.

A protractor is useful for determining exact angles, but a bevel gauge is the preferred tool for checking, comparing and transferring angles (see the center photo on p. 85). Bevel gauges are similar to protractors in principle, having a handle and a sliding blade that can be adjusted to any angle, but they don't have a scale.

Dividers and trammels for circles and arcs

Woodworking dividers are used for scribing small circles and arcs (see the bottom left photo). The best dividers have a joint tensioned with a bow spring and a fine-pitch adjusting screw. For best results, sharpen one of the divider points to a sharp needle; this is the point you will use as the axis to pivot from. Sharpen the other point to an oval knife shape, as on the marking gauge, with the flat side of the knife shape at right angles to the main axis of the dividers. Sharpened in this fashion, dividers will cut an arc as cleanly as a marking knife (see the bottom right photo).

A trammel is nothing more than two sharp steel points (or a steel point and a pencil point) mounted in heads that slide on and clamp to a long beam. Trammel heads equipped with an eccentric point allow you to finely adjust the radius after they have been clamped to the beam. The trammel's great advantage over dividers is that the radius of the circles it can draw is limited only by the length of the beam. To draw an arc with a 10 ft. radius, simply mount the trammel heads on a beam that is as long.

Besides drawing arcs and circles, both dividers and trammels can be used to lay out complex geometric shapes with a high degree of accuracy. If you need to lay out a hexagon, for example, you can do it with dividers. Just draw a circle with the desired radius, and without changing the setting of the points, step the dividers around the circumference to divide it into six equal parts. Then connect the intersection marks with straight lines. You now have a pretty good hexagon. □

Horst Meister is a toolmaker and woodworker who lives in Riverside, Calif.



Using Wood Putty

Store-bought or homemade, putties can hide defects in wood and mistakes in workmanship

by Chris Minick

In my early woodworking days, a can of wood putty was just as vital as my table-saw. It seemed as though every project had at least one major putty patch. And regardless of how well I matched the putty color to the wood, a dark blotch always appeared when I stained the piece.

Those experiences taught me two valuable lessons: Store-bought wood putty is never the right color, and the putty always shrinks, even when the label says it won't. My woodworking skills have improved over the years, and obvious defects in my work have decreased to tolerable levels. But that doesn't mean I don't use wood putty anymore. I've just gotten a lot better at hiding the putty splotch.

The kind of putty I use de-

pends on the type of repair I'm making and the kind of finish I intend to apply later. I'll often make my own rather than rely on store-bought versions.

The binder determines the type of putty

Wood putty or wood dough (not to be confused with wood-pore filler) is a thick, pasty material designed to fill nicks, holes or other defects in raw wood. The ultimate wood putty dries quickly, sands easily and takes stain well. Most brands have some of these characteristics, but I've yet to find one that satisfies all the requirements.

I classify wood putties in three broad categories based on their binder resins: lacquer-based, oil-based and latex or water-based putties. Lacquer putties (like Bondex Plastic

Wood) and latex putties (like Behlen Wood-Fil) are probably the handiest varieties for the woodworker, but each has its own peculiarities.

If quick drying time is important, lacquer-based putties are the obvious choice. After hardening, they are compatible with most finishes. On the downside, they tend to shrink and crack more than other types of putty, and they take stain poorly.

Latex putties don't have many of the problems associated with putties made from lacquer. Like lacquer-based putties, latex putties dry quickly. But they don't shrink much, have excellent compatibility with finishes, sand easily and accept stain fairly well. They're also easy to tint (see the top left photo on p. 90). They've become the standard in my shop. I've found that latex

Wood putties by type

1. *Water-based putties dry fairly quickly and take stain reasonably well.*

2. *Two-part mixtures make hard and durable repairs quickly, but they absorb stain very poorly.*

3. *Floor putties are the author's favorite. They are sold only in large quantities.*

4. *Oil-based putties are good for minor fill jobs, like finish-nail holes in trim work. These putties stay flexible and never dry completely.*

5. *Lacquer-based putties sometimes shrink and crack as they dry.*

6. *Dry-powder putty can be mixed with water, stain or clear finishes. You mix only what you need.*



Custom colors from store-bought putty—The author used dry pigments and liquid tints to make this color. He dampened the wood with mineral spirits first to approximate a clear finish.

putties sold to wood-flooring installers stain better and shrink less than the ones sold to woodworkers. But these putties are hard to find and usually are sold only in quarts or gallons—more than a lifetime supply for many woodworkers. To find these putties in your area, look in the yellow pages under “Floor Materials and Supplies.”

I stopped using oil-based putties in my shop a few years ago after a walnut desk finished with lacquer developed white spots over the puttied areas. Even after three days of drying, the oil interfered with the finish. You can use oil-based putty successfully under an oil finish, but it will remain soft. These nondrying and nonshrinking putties are useful for patching small nicks in finished pieces. I know several custom cabinet-makers who use them for those inevitable installation dings.

Two-part fillers perform some tasks better

Two other putties I've found useful in my shop aren't really

wood putties at all—auto-body filler (the stuff used to repair rusty cars) and epoxy glue. Chemically, Bondo body filler and the related Minwax High Performance wood filler are two-part styrene polyester fillers. Both can be used to make structural repairs in wood, set quickly and are totally nonshrinking. Best of all, the repair machines like wood. These fillers will not take stain, so they're best used under paint or in a hidden area.

Two-part epoxy adhesive also makes a good shrink- and crack-resistant putty. The slower setting epoxies work better because the extra cure time allows trapped air to rise to the surface. Although most epoxies can be colored with universal tinting colors (UTCs), powdered pigments or fresco colors made for artists work better. UTCs contain solvents that may not be compatible with some adhesives. I have used colored epoxy to fill cracks around knots. I've also used epoxy to glue loose knots in place. You

Make a putty repair disappear

The human eye has the uncanny ability to pick out regular shapes like circles or straight lines from a random background, while at the same time seeing minor color variations as a single tone. Military camouflage designers have used this to their advantage for years. Break up the lines, add a little color and you can make a tank disappear. I use a trick with putty based on the same principle (see the photos below). This procedure works best on open-grained woods like walnut and oak. Closed-grained woods like maple and birch take a little more practice.

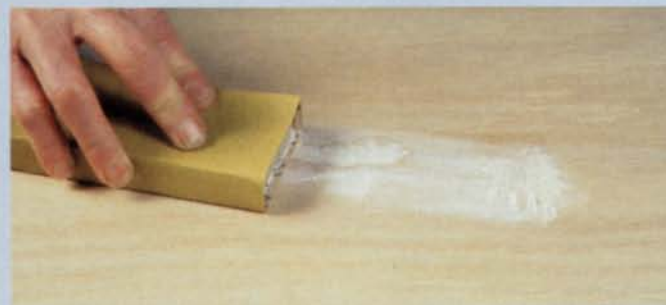
I start by burnishing a piece of 2-in.-wide clear sealing tape over the defect. The tape prevents the grain pores surrounding the patch from filling with putty. Next I cut around the defect in an irregular shape, cutting through



1. Cover the repair area with sealing tape. To illustrate his technique, the author drills two holes. One will be filled conventionally; the other repair will be camouflaged.



2. Cut and remove a football-shaped patch. With a sharp razor, he cuts an irregular shape around the hole to be repaired. He will fill that and the other hole with latex putty.



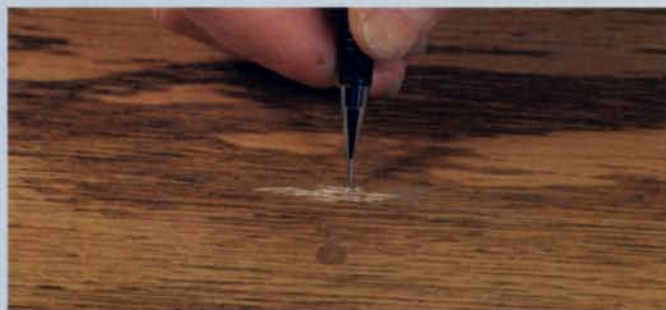
3. Sand putty before removing tape. Once the putty has dried, he uses a sanding block to remove the excess.

the tape and removing that patch. Where possible, I follow the natural grain lines of the wood. I like to scrape some wood from the cutout with a sharp razor knife to give the patch some depth for the putty to fill. For a ¼-in.-dia. hole, I typically cut out a football shape about 2 in. long by ¼ in. at the widest point. I putty the hole with the tape still in place.

When the putty is dry, I sand it down, remove the tape and sand the patch flush. At this point, I apply a base coat of stain to the entire piece because I usually double stain my projects (a ground stain followed by a toning stain). After that has dried, I etch some fake grain marks into the wood grain adjacent to the patch. I pay particular attention to spacing and depth. Any sharp scribe will work for cutting grain lines. I've outfitted a mechanical pencil with a sharp needle tip, and I use it exclusively for this purpose. Finally, I apply a second coat of stain that most often hides the patch completely. —C.M.



4. Remove the tape. The author sands the putty one more time to bring it flush to the surface of the wood after the tape has been peeled off.



5. Scratches give the patch a third dimension. After the first base coat of stain, the author etches grain lines into the surface of the putty repair with a sharp scribe.



6. Compare the results. The round hole is a lot more obvious at a glance than the irregular patch above it.



Shopmade putty. The author uses either shellac or hide glue as a binder and mixes it with fine sawdust. The color match is nearly perfect, and the repair virtually disappears.

can buy UTCs at most paint stores and fresco colors at art-supply outlets.

Shopmade putty for a better finish

Most woodworkers have made wood putty from sawdust and white or yellow polyvinyl acetate glue. Putty made with these glues works pretty well, but it usually doesn't take stain worth a darn. Even unstained, the repair tends to stand out once the finish goes on. To solve that problem, I make sawdust putty in my shop using either shellac or hide glue as the binder.

The procedure couldn't be easier. For projects that will get a clear finish and no stain, I mix fine sanding dust—the finer the better—with shellac until the mixture forms a thick paste, as shown in the photo above. It works just as well as any store-bought putty. Once this is dry, I sand the patch flush and seal the entire project with a thinned coat of shellac. Because the sealer coat and the

binder in the putty are both shellac, the repair virtually disappears. One drawback with using a shellac paste is that it won't take stain evenly.

For projects that will be stained, especially with aniline dyes, I use the same procedure except that I substitute hot hide glue for the shellac. After the defect has been filled, I seal the workpiece with a size made of diluted hide glue, thinned with water to the consistency of milk and applied with a brush. Once that has dried, I sand the surface lightly and then apply the stain. Hide glue absorbs stain amazingly well. The entire piece, including the patch, comes out the same color.

Hiding defects and wood-working mistakes can be frustrating. When all else fails, I ask an artist friend to paint a fake knot over the offending blemish. This method produces the most invisible repair, but it's a bit hard on my ego. □

Chris Minick is a contributing editor to *Fine Woodworking*.

Soup up a Dovetail Saw

*Refile teeth
and reduce set
for better cuts*

by Mario Rodriguez



Thinnest and straightest. The author's modified saw cut the center kerf. To the left is the kerf made by a Japanese saw, and to the right is the kerf of an off-the-shelf Western-style dovetail saw.



1. Eliminate every other tooth. Start at the heel of the blade between the first two teeth. Position the back edge of the file vertically, perpendicular to the blade. Begin the cut with about a quarter of the file's length past the blade. Push forward and slightly toward the toe, simultaneously filing away the front tooth and recutting the face of the rear tooth. Three strokes should take out the whole front tooth. Repeat until you reach the toe of the saw. The inset photo shows what the freshly cut teeth should look like.

As a novice woodworker, I always marveled at those impossibly narrow-necked dovetails on 18th-century furniture. A chisel wouldn't have fit into such tiny openings, so it was obvious that the craftsmen didn't pare the joints. They must have cut them right the first time. I couldn't imagine cutting such tight kerfs and straight lines with any saw I owned.

A little later in my quest for perfect dovetails, I tried Japanese saws. They always cut beautifully and left a thin kerf, but I never warmed up to them. I worried about ruining their fragile but costly blades, and I couldn't get used to cutting on the pull stroke.

Now, years later, I use the same types of European-style dovetail saws I started with. But I don't use a saw before modi-

fying the shape and set of its teeth, as the photos on this and the following two pages show. The result is an American hybrid that cuts straight, whisper-thin kerfs.

The trouble with new dovetail saws

When I buy a new saw, I find that it's usually in no shape to cut dovetails. The most common problems are too many

teeth, too much set and an inappropriate tooth pattern.

Too many teeth—One problem with dovetail saws is the number of teeth they have. Most dovetail saws have between 18 and 26 teeth per inch (tpi). Many woodworkers think that the more teeth a dovetail saw has, the smoother it will cut. That's not necessarily true. The more teeth a saw has, the



2. Remove the set. Put the blade on an anvil or similar surface, and gently hammer out the set. Light taps will do the trick. Remember, you're just flattening a thin sawblade, not working horseshoes.

more strokes it will take to reach the dovetail baseline. The more strokes it takes, the more the cut is likely to wander. On my modified saws, I've found that between 9 tpi and 12 tpi is about ideal.

Converting a saw with a lot of teeth is pretty straightforward: Just file away every other tooth. You may never have sharpened a saw, let alone altered the number of teeth, but it's actually a lot simpler than it sounds. A saw vise is helpful, but the blade can also be held in a regular woodworking vise or a machinist's vise, with wood strips on either side of the blade to grip and protect it. For both dovetail and tenon saws, I use a double, extra-slim taper saw file. These files are available at many hardware stores.

Too much set—A bigger problem with a new saw is the set, the amount the teeth are bent away from the blade. Set allows the saw to cut a kerf wider than the blade is thick. This keeps the saw from binding or kinking. But most new saws have so much set that it's impossible to keep the saw cutting to a precise line. For that reason, I start out by eliminating all the set on my dovetail saws. For a saw destined to cut dovetails in pine, I don't need any set. For a saw that I'll use on harder woods, I'll put back a little set. Tools that are used to make this adjustment (called saw sets) are available by mail and from antique-tool dealers.

Wrong tooth pattern—The third problem is the tooth con-



3. Set the teeth. For a dovetail saw used mostly on hardwoods, the author uses the minimum setting (the highest number) on the saw set. For a dovetail saw used mostly on softwoods or thin stock, he doesn't add any set.



4. Joint the teeth. Eliminating teeth and removing the set can create teeth of varying heights. Use a 10-in. mill file to take the tops of the teeth down until they are all at the same height.

5. Sharpen the teeth. Keep the back edge of the file straight up and down, and file straight across the blade. Take light passes until you've brought each tooth to a sharp point, as in the inset photo. File all the teeth from the same side.



6. Deburr the teeth. Filing the teeth will create burrs on the far side of the blade that can cause your saw to catch, drag or wander slightly. To remove these burrs, just pass a coarse stone lightly across the blade.

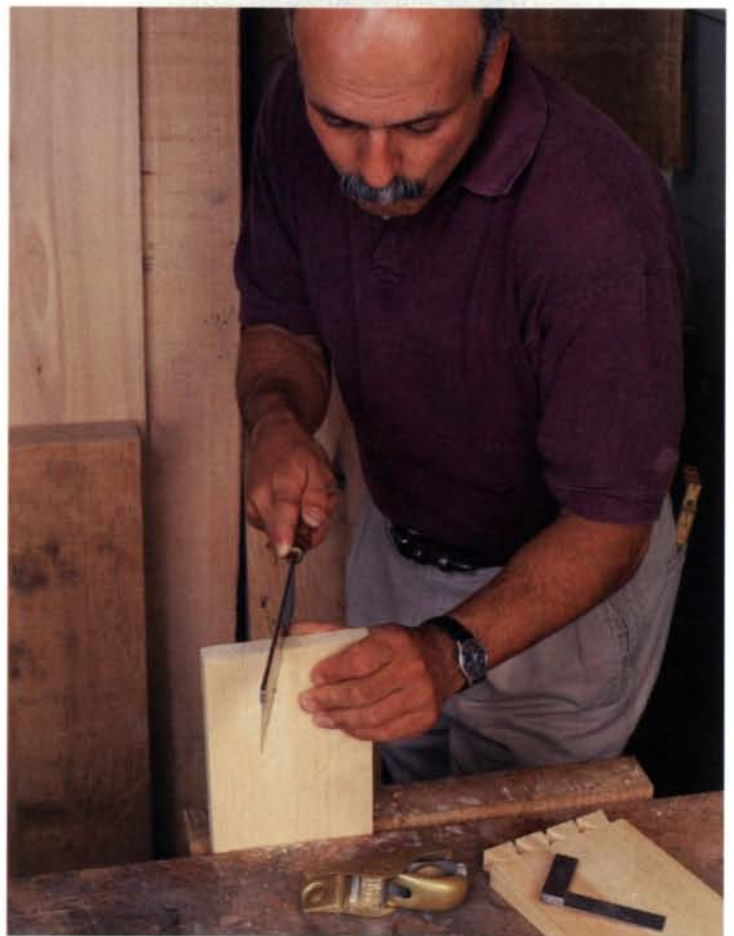


figuration. The teeth on dovetail saws are in a crosscut pattern: The teeth are angled back slightly for a better cut across the grain. But dovetails are cut predominantly with the grain. So it made sense to me that a rip pattern, in which the leading edge of each tooth is perpendicular to the blade, might work better. When I eliminate the extra teeth, I file the leading edge of the remaining teeth straight up and down.

Practice first

If you're nervous about drastically altering the fancy, imported backsaw that cost \$65, consider first overhauling a cheaper saw with a turned handle. Stanley makes a good one that retails for about \$10. If you're happy with the results, then you can redo your pride and joy. □

Mario Rodriguez is a contributing editor to Fine Woodworking magazine.



7. Take the saw for a test drive. While using a slow, full stroke, notice whether the saw wanders (could be an uneven set) or wants to snag (possibly uneven tooth height). If you've prepared the saw carefully, it should cut true to a marked line, take few strokes to get to the baseline and leave a thin kerf.

Woodworking Libraries

Five craftsmen

Fresh out of college and working as a carpenter in the Boston area, I was making barely enough money to pay the rent. Still, I'd frequent the Harvard Square bookstores. There, I picked up Ernest Joyce's *Encyclopedia of Furniture Making*, the first of Tage Frid's books on woodworking and many others. After four years of *Phenomenology and Existentialism* and its ilk, it was refreshing to read how to fold a bandsaw blade, cut dovetails and tune a plane.

When I discovered George Nakashima's *The Soul of a Tree*, I was floored by his sketches, the photos of the lumber he used and those tables. Krenov's *The Impractical Cabinetmaker* had a similar effect. It resonated powerfully because he articulated my attraction to the material and process better than I was able to myself at that point. After reading that book, there seemed to me no higher calling than to make beautiful, useful objects of wood. I was moved.

Many woodworkers have been drawn to the craft because of a book. And many a woodworker's education has come largely from the printed page. So I asked five woodworkers to discuss the books that have affected them, the books they rely on still and the books they'd recommend.

—Vincent Laurence, associate editor

■ **Harriet Hodges:** While learning to turn and to make chairs, I always looked to books as teachers, preferring their unobtrusive instruction. Though I realize how helpful it is for someone to say, "No, not that way" and grab my skew, I find that with the right books in my library, I can accept correction humbly at the lathe and sneak to see if Richard Raffan concurs.

One always needs passions bolstered and refined. Mine for the handmade, the old way, were upheld by Eric Sloane. I scorned the electric cord. Sloane's book, *A Museum of Early American Tools*, is a fine introduction to old hand tools. In it, I learned the difference between a scorp and a spokeshave. If you can, also buy Salaman's *Dictionary of Woodworking Tools*, which illustrates all manner of spokeshaves, witchets and floor planes.

Richard Starr's *Woodworking with Your Kids* is an ideal first book for the person drawn to hand tools but without antiquarian obsession. The photos are of children demonstrating various techniques and proudly displaying the fruits of their efforts. A powerful message here, "If that 12-year-old can make *that* guitar with nothing but *those* tools, so can I."

A step up from Starr into a wider range of tools and processes is Herman Hjorth's *Principles of Woodworking*, first published in 1930. It's a shop handbook with many pictures of boys in ties working industriously. I have seen many introductory texts, but none beats Hjorth's for orderly and clear presentation on the complete range of subjects a novice woodworker needs to know, such as hand tools, sharpening, use and care of machines, and finishes. James Krenov's books are inspiring and can be helpful if one wants to explore the subtleties hand tools make possible.

Design is interwoven with technique. Essential for thinking about both are David Pye's *The Nature and Aesthetics of Design* and *The Nature and Art of Workmanship* as well as Soetsu Yanagi's *The Unknown Craftsman*. Pye defines and illustrates the craft of risk and the craft of certainty, effectively defining this continuum along which we all must choose our place.

Yanagi discusses folk art. A section discusses a brushstroke painted thousands

of times by a Korean potter. The book bolstered my determination to repeat a process until I perfected my control. I haven't yet, and the temptation is strong to try new designs, but I persist. All three books will support your desire to perfect skills and gird you against taunts that you are static or uncreative in your beginning years. For firing one's mind to possibilities, treat yourself to Edward Pinto's *Treen and Other Wooden Bygones*, a treasure chest of hundreds of pieces.

Take a look at the first pieces of which you were so proud. You will probably wince—and then wonder about the piece



Harriet Hodges

you're making now. How do you bring the eye along as quickly and rigorously as possible? Browse through old design books and decorative-arts magazines from the 1940s and 1950s. Study what presents itself as absurd, dated, ugly—1950s table legs? Pay attention to those pieces that still appeal to you, that appear timeless. Why? Somewhere in the answer is the key to your own aesthetic.


To learn to see lathe work, try Richard Raffan's *Turned-Bowl Design*. It gives many sensitive illustrations of why one curve works and another one doesn't. For learning to see in general, for learning the components of good design, I still turn to a wonderful chapbook with whimsical

discuss the books that have influenced and inspired them

drawings (alas, it's out of print, but generally available at larger libraries) called *Good and Bad Taste* by Odd Brochmann. The purpose of a design book is not to impose an aesthetic but to help build one.

R. Bruce Hoadley's *Identifying Wood* and *Understanding Wood* belong nearby, unless you want to learn the hard way how sycamore behaves when tightly constrained around a mirror.

For basic facts about wood, John Alexander's *Make a Chair from a Tree* is essential. Billed as a chairmaker's manual, it's really a fine book on green wood and



The purpose of a design book is not to impose an aesthetic but to help build one.

the nature of wood movement. Yes, you can make a chair with this book at hand. But you'd do well to keep it open while working on your first table. The illustrations remind you, for instance, in what plane most shrinkage takes place. (If you want to know why, see Hoadley.)

Make a Windsor Chair with Michael Dunbar was also helpful to me. Although I learned a different technique, Dunbar's book gives a good idea of the steps involved and the equipment needed. Other important books for the Windsor chairmaker are the two volumes of Charles Santore's *The Windsor Style in America*. These are exquisite picture books. For the last word in scholarship on

Windsors, save up for Nancy Goyné Evans' *American Windsor Chairs*. It was 30 years in the making and costs \$125. (Neither Santore nor Evans say much about technique.)

Turning Wood with Richard Raffan is required reading for anyone wanting to know how to turn. One could learn to turn well with this book alone, so clear are the instructions and so well-designed the exercises. His emphasis is on repetition for skill and fast production, but good design is inherent in his pieces. He assumes you want to learn to use the skew, but he doesn't neglect the scraper. I also like Michael Darlow's approach in *The Practice of Woodturning*. He examines the lathe and its tuning in great detail. He treats the bewildering array of fitments and chucks offered the turner, an area where one should travel slowly. If I were getting started in turning, I'd buy this book second—or first, if you're already pretty good and want carefully detailed studies of tool angles and bevels and analyses of lathe speeds for specific diameters and processes.

Ultimately, reading is no substitute for experiential understanding. But reading interspersed with effort and failure speed learning.

Harriet Hodges raises sheep and makes Windsor chairs on her farm in Craig County, Va. She is the indexer for Fine Woodworking magazine.

■ **Mario Rodriguez:** As an apprentice in New York City in the 1970s, I attended a training program in which I was taught how to read blueprints, build concrete forms, frame and finish a room, build cabinets, and install and finish drywall. In the final year of my apprenticeship, I had an instructor who was a fifth-generation master woodworker. His class was my introduction to hand-tool woodworking. Here, I learned to sharpen tools, use a plane and lay out and execute exacting joinery entirely by hand. The text was Charles Hayward's *Woodwork Joints*. I loved to browse through this book. It was woodworking from another world. In addition to the basic mortise and tenon, half-lap and breadboard end, there were

unusual variations that would put even an experienced woodworker through some major contortions. I was fascinated as well as challenged.

These days, I teach from the Hayward book. Aside from some unfamiliar English phrases and odd terms, the book is easy to read, filled with great line drawings and is as relevant today as it was in 1970.

The mechanics of a craft are one thing we can get from books, and Hayward's text does that with aplomb. But just as important, a book can help impart the values of craftsmanship and can be a source of motivation and inspiration.



Mario Rodriguez

Novices and experts alike will find a good dose of these in John Brown's *Welsh Stick Chairs*. It addresses the why rather than the how and has the feel of a journal, much like Krenov's *A Cabinetmaker's Notebook*. Brown provides no exact patterns, measured drawings or sources of materials for his chairs. Instead, he describes his techniques vaguely, explaining all the while that he's describing how he builds his chairs not how you should build yours. His shop has no electricity. His only heat comes from a small wood stove, and his light is the sun. Without the distractions and intrusions of the 20th century, he works at his full powers. Books like Brown's provide a

little respite in our hectic lives and remind us of why we pursue our craft.

Mario Rodriguez teaches woodworking at the Fashion Institute of Technology in New York City and at Warwick Country Workshops in Warwick, N.Y. He is a contributing editor to Fine Woodworking.

■ **Christian Becksvoort:** Not long out of forestry school, I found myself already disillusioned with the work and wondering where to go and what to do next. I'd taken a government job, and all the bureaucracy and waste left me hungry for something more visceral and meaningful. Along came Eric Sloane's *A Reverence for Wood*. Sloane's practical knowledge of how Early Americans and



Christian Becksvoort

American Indians used different species and his understanding of wood movement and seasoning impressed me.

All of a sudden, things my father, a German-trained cabinetmaker, had been saying for years, took on new meaning. I started to see antiques as something other than just old furniture. I began to develop an understanding and appreciation for fine workmanship. *A Reverence for Wood* has been a source of inspiration that's helped guide my outlook for more than 30 years.

A few years later, as a novice furnituremaker, I was lent a copy of *The Nature and Art of Workmanship* by David Pye. I was told it was a must-read. At the time, it didn't have a major effect on me because it was more of a philosophical

treatise than a technical manual, and I needed hard information. Yet David Pye's words stayed with me, and some 20 years later, I developed a sudden urge to reread it. It was out of print, but a friend in England obtained a used copy for me.

The second reading was like a door opening. Suddenly, all those things I had tried to articulate for years became clear. For instance, although I have no qualms about using a belt sander, I stubbornly insist on cutting dovetails by hand. It is, after all, the workmanship of risk that makes woodworking such a challenge. David Pye defines that better than anyone else. Fortunately for all of us, *The Nature and Art of Workmanship* is back in print.

The first technical book I obtained was the classic industrial arts tome *Cabinetmaking and Millwork* by John Feirer. At somewhere close to 1,000 pages, this book usually has the answers I need. A similar book, but with an English point of view, is Ernest Joyce's *Encyclopedia of Furniture Making*. Another English gem is Charles Hayward's *Woodwork Joints*. The book provides illustrations of and recommended uses for almost every conceivable joint, and it explains how to cut them.

Knowing Your Trees by G.H. Collingwood and Warren D. Brush is a must for anyone interested in trees. Robert L. Butler's *Wood for Wood-Carvers and Craftsmen* is an important book that explains the essentials of drying wood.

From a design point of view, John G. Shea's *The American Shakers and Their Furniture* was one of my biggest influences. At the time, it was the only book that had photos and measured drawings of actual Shaker pieces. The aesthetic appealed to me instantly.

Books that I continually consult for reference include the *Wood Handbook: Wood as an Engineering Material* (Agricultural Handbook No. 72), published by the U.S. Forest Products Laboratory, and *Understanding Wood* by R. Bruce Hoadley. And although it's not a book, strictly speaking, there's an information packet that I have found useful in designing and dimensioning furniture. It's called *Humanscale 1/2/3*, and it's published by the MIT Press.

Christian Becksvoort is a professional furnituremaker in New Gloucester, Maine, and a contributing editor to Fine Woodworking magazine.

■ **Ernie Conover:** I'm lucky for I grew up in a house full of books. My parents were craft-oriented, and although it was difficult finding books on crafts in the '50s and '60s, my parents seemed to have a knack for ferreting them out. One of my earliest childhood memories is of visiting Kay's Bookstore in Cleveland. Kay's specialized in used technical books, and regardless of how arcane the discipline, you could almost always find a tome on the subject there.

I never did especially well in school. But I could read, and if a subject interested me, I'd devour texts on it. Most of the woodworking books I read in those days were British. The books of Charles Hayward could always be found on my father's shelves. These books provided

Tage Frid's books are a cornucopia of first-rate illustration and photography. They helped me hone my skills.



much of my general woodworking knowledge. I was particularly taken with another British book called *The Practical Woodturner* by Frank Pain. In his scavenging of old book stalls, my father also gleaned *The Lathe and Its Uses* by J. Luken (published in 1868). These books have provided a great deal of my knowledge about turning.

The first time I read these books, it was with an almost academic interest. Later, after seeing Dick Bailey, a fourth-generation English woodturner, in action, I reread them with a passion. Seeing Bailey was the touchstone I needed to bring those texts to life.

In the 1970s, at the beginning of my professional career, *Fine Woodworking*

magazine burst on the scene. It was like raw meat thrown to sharks. I devoured it, as did thousands of other nascent woodworkers. Suddenly, there was a contemporary woodworking forum. One of the first books published by The Taunton Press, the publisher of *Fine Woodworking*, was *Tage Frid Teaches Woodworking*, which grew into a three-volume set. Even though the Hayward books are rich on text, they're weak on illustration (photos are practically nonexistent). Frid's books, by contrast, are a cornucopia of first-rate illustration and photography. They helped me hone my skills. Another book I picked up at this time was *The Encyclopedia of Furniture Making* by Ernest Joyce. I turn to it still to solve difficult woodworking problems.



Ernie Conover

In 1991, I was asked to review *The Essential Woodworker* by Robert Wearing. It proved to be a serendipitous experience. Once again, I was a boy reading British text, but now with decent photos and illustrations. Just as important, though, Wearing's book addressed the struggling neophyte, working alone, without a teacher. It's an excellent primer.

Ernie Conover is the primary instructor at Conover Workshops in Parkman, Ohio. He is the author of The Lathe Book and The Router Table Book (The Taunton Press).

■ **Alphonse Mattia:** Splish, splash, glump! Overboard go my beautiful books on American and European designers:

Gaudi, Mollino, Chareau, Ruhlmann, the amazing Bugattis and Charlotte Perriand. *Kanban: Shop Signs of Japan* by Levy, Sneider and Gibney is next. I love those stylized literal objects that symbolize the goods or services of the shops they adorn—but the first books to go must be the ones I use as visual references.

I am escaping, rowing to a secluded tropical island: beautiful views, no heating bills and a nicely outfitted studio. All I needed to bring were my favorite hand tools, personal items and the 80 lbs. of inspirational, technical and spiritual books that I couldn't be without. However, water seeping into my launch forces drastic measures—more books must go.

Kersplash! I bid good-bye to *The Art of Furniture* by Ole Wanscher, 5,000 years of furniture history from dynastic Egypt to the 1960s in concise, readable capsules. Albert Sack's *The Fine Points of Furniture*, a good, better, best study of regional styles and John Kirk's *The Impecunious Collector* are next, even though these favorite historical sources are good ways to hone building and seeing skills.

While history is sinking, I'll have to part with another favorite, *Cabinetmakers and Furniture Designers* by Hugh Honour. It's a wonderful study of 50 furniture designers and makers who have had a major role in the evolution of furniture design. And Edward Cooke's *New American Furniture: The Second Generation of Studio Furnituremakers*, the only book that seriously covers the contemporary field since the 1970s.

Still leaking. I'll have to start in on my technical stuff. *The Encyclopedia of Furniture Making* by Ernest Joyce was an important book for me early on and remains valuable. The revised edition by Alan Peters is very good, but I prefer the old edition: I like the way Joyce calls clamps *cramps*. Into the briny depths go the three volumes of *Tage Frid Teaches Woodworking*. George Frank's *Adventures in Wood Finishing* and Charles Hayward's *Woodwork Joints* are next.

Under duress, I must release my copy of *Der Möbel Bau* by Spannagel, hoping, as it slips beneath the surface, that somehow it might swim to shore for someone else's edification. It's an incredible German publication, recently revised, with the most beautifully drawn technical illustrations of every conceivable furniture type, system and detail. Though written in German, the drawings are clear enough

that you can make out the smallest details. Splash! Swim, *Der Möbel Bau*, swim!

I only have my inspirational books left, and the boat is still taking on water. *Ways of Seeing* and *About Looking* by John Berger and *The Nature and Art of Workmanship* by David Pye are sent to the depths. Joseph Campbell's *The Power of Myth* and *The Hero with a Thousand Faces* are next. Carol F. Pearson's *The Hero Within* follows. These books help us discover ourselves and understand our journeys as artists. Robert G. Henricks' translation of Lao-tzu's *Te-Tao Ching* would be the last to go—it's a Bible of sorts. These books go down like the Titanic, slipping silently into the powerful swirling vortex (clockwise, mind you, because I'm south of the equator) created



Alphonse Mattia

by their own weighty significance.

Then I remember that these books are only symbols of knowledge. I've read them (or at least looked at the pictures) and assimilated what I could at the time. I haven't really lost them. And I still have my single most important book. It's the one book every artist should have, the record of my development and the map of my journey. Never complete because it describes an ongoing and nonlinear process that branches out and reconnects. Ultimately, that sketch book is the most valuable book of all. □

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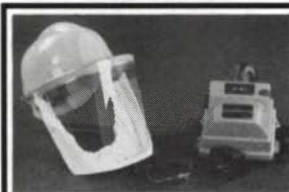
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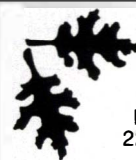
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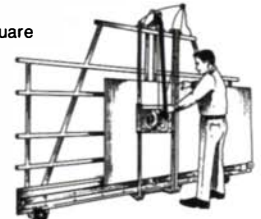
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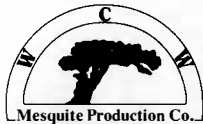
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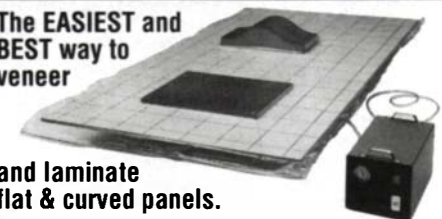
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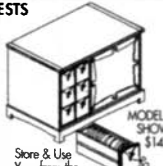
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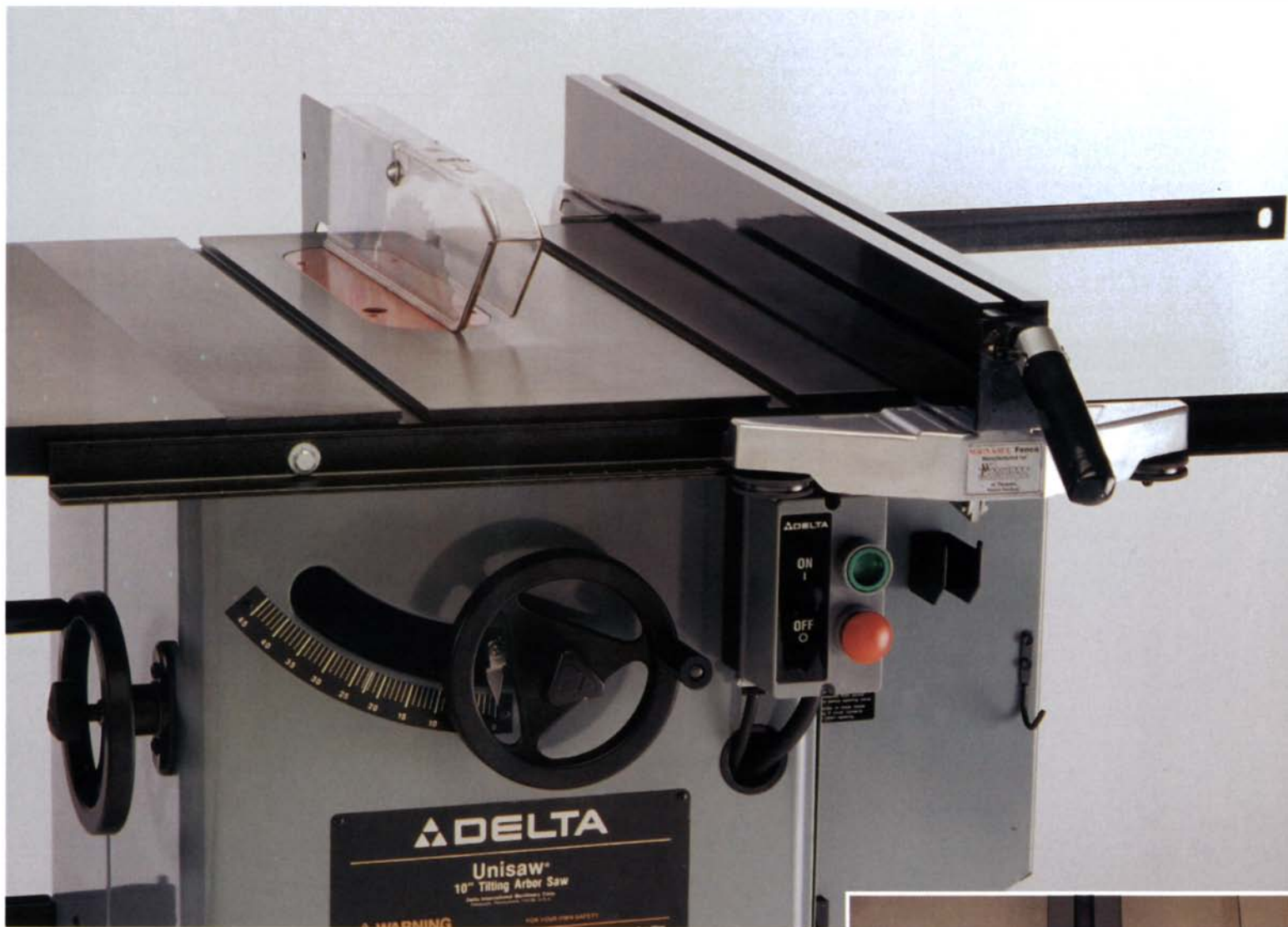
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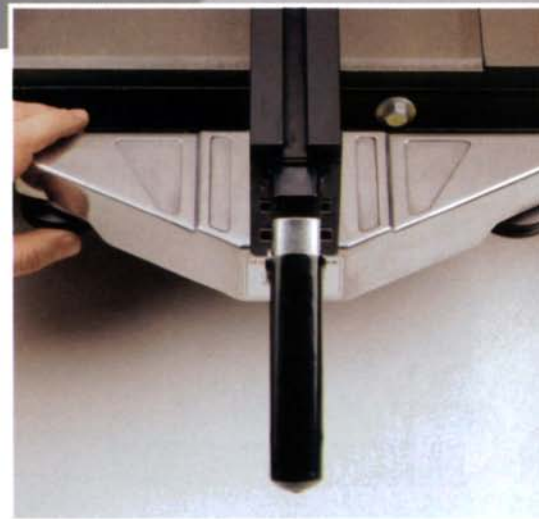
Woodstock International now offers an after-market tablesaw rip fence to compete with the likes of the Biesemeyer, Excalibur and Vega. The Shop Fox fence I reviewed (see the photos above and at right) was ready to go right out of the box. It is finely crafted and machined, and it's accompanied by a clearly written and nicely illustrated manual.

I had the notion that the fence would slip right into the fittings on my Delta Unisaw after I yanked off the old Jet-Lock fence. 'Twasn't so. You'll find that mounting the Shop Fox may take some tinkering. The mounting holes in the rails lined up with those on the saw, but the fence wouldn't clear the table even when the vertical ad-

justment was maxed out. The bolts that were provided didn't match the thread type on my saw.

By filing out the rail slots to gain additional vertical adjustment and switching from hex-head to Allen-key cap screws, I finally had enough table clearance. The manual advises drilling and tapping a set of new holes, and the fence includes both drills and tap. It wasn't my idea of a good time.

Once I got the rails in place, my frown turned into a smile. The fence slid on like silk, and ball-bearing wheels let the fence glide back and forth with ease. And the factory settings were dead-on. An easy snap of the lock handle socked the fence



New rip fence from Woodstock International—The Shop Fox fence takes a little tinkering to install but is well-built and operates smoothly.

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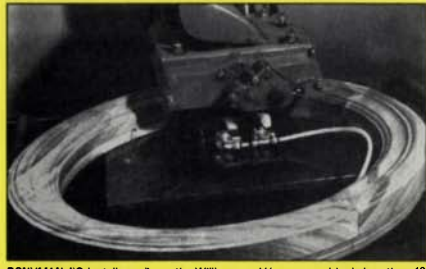
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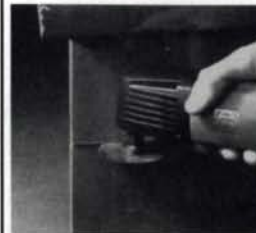
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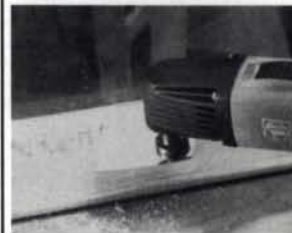
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down tightly without a wiggle.

On the down side, the tail of the fence slammed into the Uniguard on my saw (the old Jet-Lock fence was engineered to clear it). Consequently, I don't get as much travel to the left of the blade as I once did. But I rarely rip on that side of the blade.

The Shop Fox's head is considerably wider than that of the Jet-Lock fence. To accommodate the original 24-in. ripping capacity, the fence's rails are some 4 in. longer. If space is a consideration, then this is something to keep in mind.

More important, the rails are lengths of angle iron with squared ends. In a busy shop, these ends may well snag someone—something I discussed with the product designers. They hadn't considered the problem. But once aware of it, they felt as strongly as I did about it. They seemed ready to engineer appropriate modifications into the rails to ensure user safety.

Overall, the Shop Fox fence, once installed, comes off as a solid product. My students, having suffered through our ancient Rockwell Jet-Lock, give it a thumbs-up. But keep in mind that the fence is not a one size fits all. You may have some serious adjusting to do before you can get it up and running.

Suggested retail price for the fence is \$275, with another \$60 for extended rails. Anti-kickback wheels also are available. For more information, contact Woodstock International (P.O. Box 2309, Bellingham, WA 98227; 360-734-3482). —Bernie Maas

Clam Clamp for tight joints in trim

Trim carpenters who learned how to install mitered door and window casing one piece at a time should watch Jim Chestnut work. The Connecticut finish carpenter figured out some years back that he got much better results by gluing up his casing first and then installing the complete assembly. His system for trimming out doors and windows is fast, efficient and results in tight miters that stay together.

The trick is a special miter clamp that gives a glued and biscuited miter joint a chance to set up. Although Chestnut had a collection of iron clamps made for the job, he thought they could be better designed. Chestnut, an inveterate tool tinkerer, set out to make an improved version and the result is his nickel-plated and stainless-steel Clam Clamp. It works.

Each leg of the L-shaped clamp (see the photos at right) contains a row of four pins. When the clamp's handle is turned, the pins engage the outside edges of the casing and force the joint together. In no time, Chestnut has a casing that can be nailed to a door or window as a single unit. Miters can even be clamped in place.

The sharp pins leave small holes on the edges of the trim that must be filled later. Pins can be backed out so that they don't engage the work. So stain-grade trim can be clamped up with two pins on each leg instead of four.



Clamps for mitered trim—Clam Clamps assemble glued, biscuited miter joints for door and window trim firmly and quickly.

The clamps aren't cheap (\$45 plus shipping), but anyone facing the prospect of trimming even a few rooms of doors and windows would find them a bargain. They'll help produce a better job in less time. Contact Chestnut at Box 320094, Fairfield, CT 06432; (800) 966-4837. —Scott Gibson

Oxford waterborne urethane spar finish

A waterborne replacement for spar varnish—Oxford's spar finish looks like high-grade varnish but can be applied in a fraction of the time.



At one coat a day, a traditional high-class varnish job takes about two weeks to apply. It's exacting work, so it's no wonder that every few years someone comes up with a finish that is supposed to look like varnish but requires a lot less labor to apply. I've witnessed a number of ill-fated experiments with such finishes. They might be easy to apply or last for years, but they have lacked the rich amber glow of traditional varnish.

Recently, I tried Oxford spar finish (see the photo at left), a user-friendly, waterborne varnish. It looks as much like traditional oil varnish as anything I've seen, and it's a lot easier to apply.

The water base takes the curse out of varnishing. You don't need solvent wipes, tack rags or heroic cleaning of expensive brushes. I got a very good finish by simply wiping the sanded surface with a damp high-quality paper towel and practically slapping on the finish with a cheap polyester brush.

In the can, Oxford has the skim-milk look of waterborne clear finishes, and it has an orange tint to better imitate the amber color of tung-oil varnish. It doesn't flow on as well as traditional varnish, but it is remarkably self-leveling. My coarse brush left a lumpy surface with small bubbles, but I resisted the urge to go back to

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Harold Steiner, Phoenix, AZ

A: Lacquer certainly should be considered. However, Wood•Kote has recently introduced a new product, Jel'd•Poly•Kote™. This product has been well received by woodworkers and hobbyists for small projects. Jel'd•Poly•Kote™ combines the protection of polyurethane with the wipe-on convenience of our stain. The finish is simply applied with a cloth. It can



be re-coated in 1 or 2 hours and no sanding is required between coats. Up to six coats can be applied in one day. People who live in condominiums or apartments will especially appreciate Jel'd•Poly•Kote's easy clean up.

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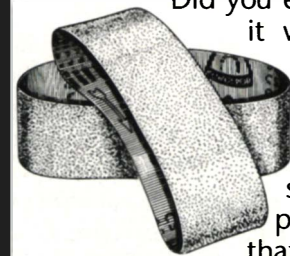


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smooth it out. In about 10 minutes, the finish lost its cloudiness and was almost as smooth as glass.

Cleaning up is ridiculously simple. I just rinsed off the polyester brush in the kitchen sink and left it in the dish rack.

Laboratory and real-life tests by the manufacturer show Oxford spar finish stands up to the weather about as well as medium-grade traditional varnish. So the finish should last about five years if you follow the traditional varnishing schedule for marine and other tough environments.

I showed my test panel to knowledgeable friends, and most couldn't tell the difference between the Oxford varnish and top-grade, \$35-a-quart tung-oil spar varnish. But there is a difference. The traditional varnish has more gloss and a greater apparent depth. It looks a little brighter and has a slight golden hue. It also took two-and-a-half weeks to achieve. Oxford spar finish is \$17.99 per quart. For more information, contact Target Enterprises, P.O. Box 1582, Rutherford, N.J. 07070; (800) 752-9922. —*Aimé Fraser*

Duluth bags for real gear

Tough bags for traveling cabinet-makers—Duluth bags offer plenty of room for tools, lunch and just about anything else.



I've always admired traditional wood-working chests, but they've never been a practical solution for me. I teach regularly at two schools, do on-site restoration work and lecture. So I lug everything from class rosters to hand tools wherever I go. I need a presentable satchel that wears well and doesn't cost a fortune.

I found what I wanted at the Duluth Trading Co., which produces a wide selection of soft-sided tool bags, bucket liners, work-site briefcases, tool rolls and aprons.

I ordered the Gatemouth tool bag (\$39.99) and the Contractor's briefcase (\$49.99). Both are made of 600 Denier polyester fabric called Duckwear that re-

sembles a thick canvas (see the photo above). Pockets and compartments are piped and bar-tacked for long wear, and there are plenty of extra-strength hook-and-loop fasteners and heavy-duty zippers. I stuffed the Gatemouth with a large chisel roll, two dovetail saws, two block planes, a shoulder plane, a camera, a smoothing plane, a combination square and an assortment of marking gauges, bevels and knives. I still had plenty of room left over.

Designed by former tradesmen, these bags are thoughtfully laid out and well-crafted. Contact the Duluth Trading Co. at 5200 Quincy St., Mounds View, MN 55112; (800) 505-8888. —*Mario Rodriguez*

VertiLathe: lathe on a drill press

The VertiLathe is a hardware kit that allows you to use your drill press as a lathe for small work like tool handles or drawer pulls. It's designed to handle stock up to 4 in. dia. by 6 in. long. Pieces up to 12 in. can be turned by working on half the stock and then flipping it end for end.

The hardware is neatly made and easy to set up. To drive the stock, chuck the spur or screw center in the drill press. The drill-press table is set for the correct distance, and the drill-press quill is lowered and locked to hold the stock.

The vertical turning position seems better suited to making scraping cuts than shearing cuts. As I worked near the tail-stock, the drill-press table started to get in the way of the tool handle.

For \$44.95, you get a tool rest, a baseplate with a live center and two drive centers. For more information, contact G.H. Devine, 306 Albany Ave., Kingston, NY 12401; (914) 338-7621. —*Dennis Preston*

Star Tools picks up Enlon warranties

Star Tools has picked up warrantee and spare parts work for Enlon, the now-defunct tool distributor. Randy Shepherd, a former Enlon employee and now vice president and general manager of Star, said his company would honor Enlon's tool guarantees by shipping parts to customers who can show proof of purchase. Tools also can be shipped to Star (at owner expense, both ways) for repair under terms of Enlon's warrantee, he said. Star will continue to sell most of Enlon's line under its own label. Star is at 9825 Pioneer Blvd., Santa Fe Springs, CA 90670; (888) 678-8777. —*S.G.*

Bernie Maas is an art professor at Edinboro University in Edinboro, Pa. Scott Gibson is editor of FWW. Aimé Fraser is an assistant editor of FWW. Mario Rodriguez is a teacher, woodworker and contributing editor to FWW. Dennis Preston is a Connecticut woodworker and a former assistant editor of FWW.

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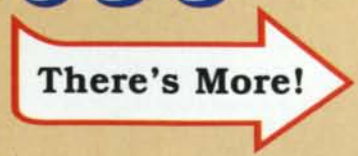

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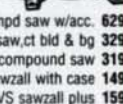
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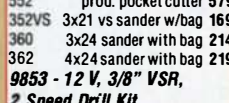
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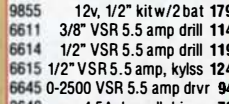
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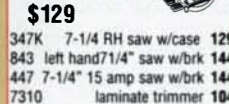
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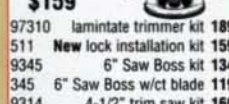
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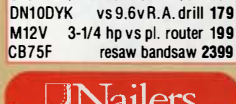


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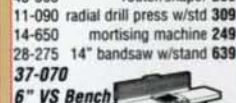
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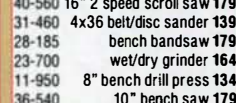
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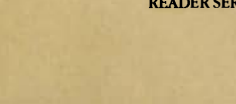
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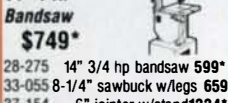
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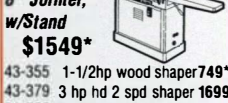
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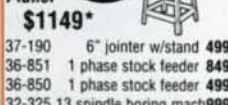
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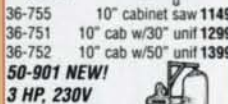
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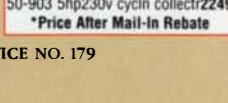
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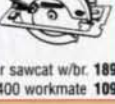
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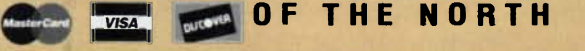
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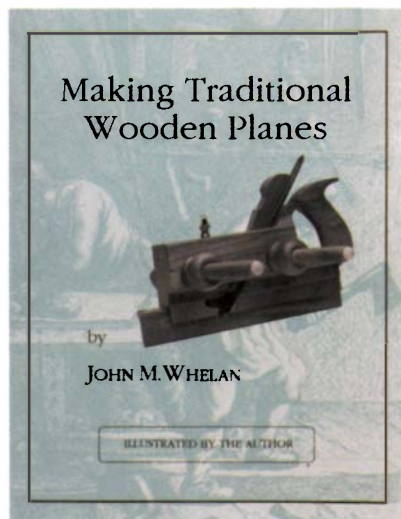
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READER SERVICE NO. 179

Making Traditional Wooden Planes
by John M. Whelan. *Astragal Press, 5 Cold Hill Road, Suite 12, Mendham, NJ, 07945-0239 (201-543-3045); 1996. \$19.95, paperback; 128 pp.*



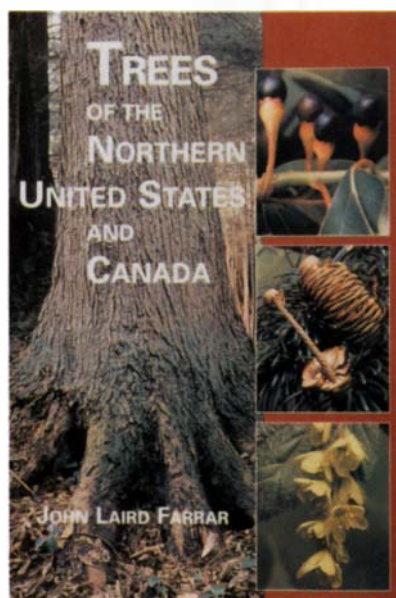
A wooden plane is a good first project. But even the most basic plane can be challenging. *Making Traditional Wooden Planes* by John Whelan, a talented toolmaker and tool historian, is a helpful guide to get you started. He explains the tools and techniques needed to build 20 different kinds of planes. They range in complexity from a simple smooth plane to an ebony plow with a brass depth stop and tagua ivory tips. Along the way, his insights into the history of these tools will give you a greater appreciation for the skills of previous generations of craftsmen who made their own planes.

Each chapter focuses on the construction of a specific plane, from choosing the right wood and grain orientation, to cutting the throat, shaping the iron, fitting the wedge and tuning the plane. With each new plane project, Whelan describes more advanced techniques such as hardening and tempering irons, cutting throats for skewed irons, making brass fittings and planemaker's tools, inlaying boxwood at points of wear and making screw arms and fences.

The drawings that are provided are clear and useful, but there are not nearly enough to follow Whelan's explanation of the more difficult techniques. I would have found a series of photographs

showing how to cut a plane's throat or how to make and shape an iron to a plane's sole most helpful, but there are no process photographs. Despite its visual flaws and with so few books available on making wooden planes, this is one worth having. —Garrett Hack

Trees of the Northern United States and Canada by John Laird Farrar. *Iowa State University Press, 2121 S. State Ave., Ames, Iowa 50014 (800-862-6657); 1995. \$39.95, hardback; 516 pp.*



This tree identification manual offers a wealth of scientific detail in an attractive and user-friendly volume.

The author has ingeniously organized more than 300 tree species into 12 simplified groups based on leaf shape and arrangement on the twig. Using the simple identification key, conveniently printed inside the front and back covers, you quickly can place a tree into its correct group. Color bars on the page edges guide you to the proper group.

A full double-page spread is devoted to each major species. Each includes color photographs and excellent drawings of key features, as well as detailed descriptions of leaves, twigs, cone flowers, fruits, bark, wood and, often, a range map. The descriptive material requires little botanical knowledge and is clearly explained in the concise introductory "Reader's Guide" section.

This book will be valuable to the

professional forester and teacher as well as the amateur naturalist, student or hobbyist. For those located in the northern tier of the States or in Canada, this would be my book of choice for identifying trees. —Bruce Hadley

Measure Twice, Cut Once: Lessons from a Master Carpenter by Norm Abram. *Little, Brown and Co., 200 West St., Waltham, MA 02154 (800-759-0190); 1996. \$17.95, hardback; 206 pp.*

If America had such a thing as a carpenter laureate, Norm Abram would be it. In print and on television, he offers affable and unpretentious advice on everything from building furniture to making screen doors.

Abram writes that he wants *Measure Twice, Cut Once* to be a book that will "inform and inspire people who are curious but not very experienced." The publisher says it's "the essential guide for anyone who has ever put hammer to nail." These goals aren't the same, and the book seems to suffer from this confusion in purpose. In the end, it's basically a collection of short essays describing the contents of Abram's toolbox, along with some brief carpentry lessons and a little history about his father.

If the essays are clear, they also can be plodding. A jackknife is "a traditional tool with blades that fold into slots in its handle." Then there is this aside about pliers: "Pliers have two jaws and we refer to the tools in the plural—colloquially, we even say, 'Bring me a pair of pliers,' requesting one tool, not two." You have to wonder who would find this information essential.

His best writing is about his father, Louis L. Abram, who died in 1995 at the age of 70. The two worked together on carpentry jobs until the very end. Norm's accounts of what he learned have a presence and a personality that could have been put to good use elsewhere in the book. *Measure Twice* is too short on the insight and reflection that would make for more inspiring reading.

—Scott Gibson

Charles Rennie Mackintosh edited by Wendy Kaplan. *Abbeville Press, 488 Madison Avenue, New York, NY 10022*

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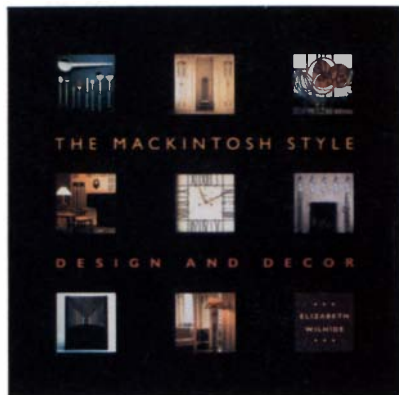


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(800-278-2665); 1996. \$60, hardback; 384 pp. **The Mackintosh Style: Design and Decor** by Elizabeth Wilhide. Chronicle Books, 275 Fifth Street, San Francisco, CA 94103 (800-722-6657); 1995. \$29.95, hardback; 160 pp.



There seems to be a revival of interest in the craftsmen and architects of the late 19th century. In November, the Metropolitan Museum of Art in New York City will host a comprehensive exhibit of

Charles Rennie Mackintosh's work. The man famous for graphically bold chairs and repeating square design elements has been further memorialized in two beautiful and well-researched books.

Charles Rennie Mackintosh, a collection of comprehensive essays, was published to accompany the exhibit. This hefty, lavish book does an admirable job of presenting the many facets of this fascinating artist, exploding popular myths and providing insight into his work.

Although the bulk of the book deals with Mackintosh's work as an architect, there's a compelling analysis of Mackintosh furniture in the "Art and Design" section. The discussion focuses on the interplay of geometric and organic forms, ornamentation and the blending of masculine and feminine design elements.

At half the price—and half the weight—*The Mackintosh Style* is a better book for those with a specific interest in furniture. With its focus on interior design, it presents exquisite photos that reveal more about his furniture than do those in

the other book. Author Elizabeth Wilhide discusses flaws in Mackintosh's famous high-backed chairs with a refreshing candor. She says they were weak and uncomfortable, explaining that Mackintosh designed more for graphic effect. She also says Mackintosh's designs elude categorization. Though influenced by the Arts-and-Crafts movement, his work was clearly too ornamental and with paint obscuring wood grain, too "dishonest" to fit that label. Aesthetic, Japanese, Modernist and Art Nouveau styles are all evident in his designs.

Both books make it clear that Mackintosh should be better recognized for his role in the dramatic changes taking place in design at the turn of the century.

—David Mukamal Camp


Garrett Hack is a furniture maker and designer in Thetford Center, Vt. Bruce Hoadley is a contributing editor to FWW. Scott Gibson is the editor of FWW. David Mukamal Camp is a custom furniture maker in La Cienega, N.M.

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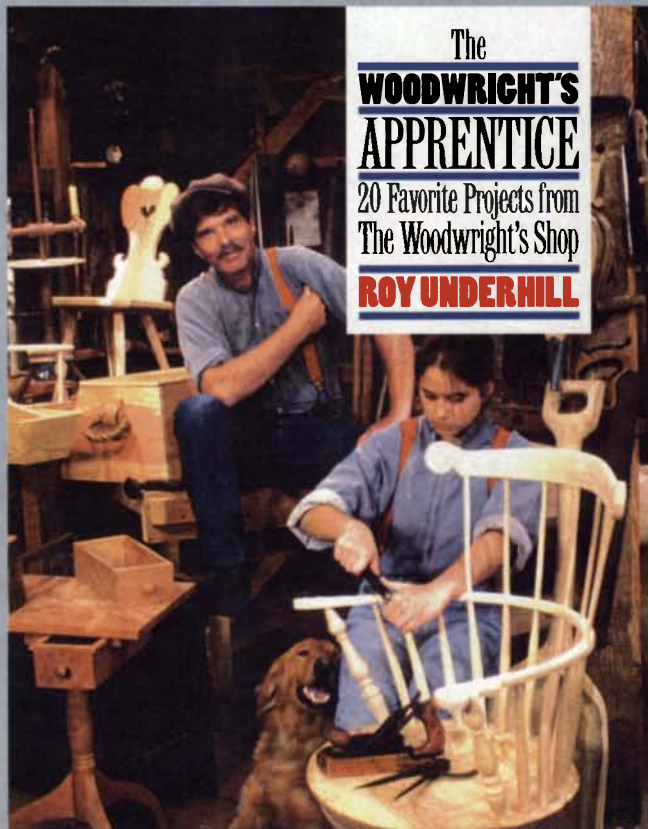
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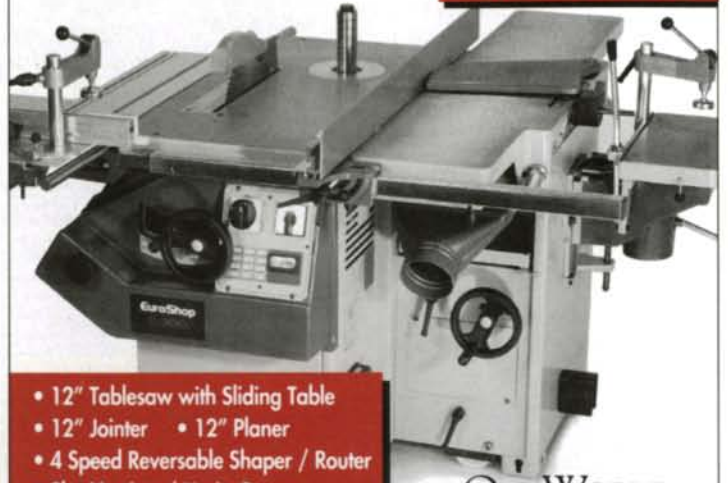
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Listings of gallery shows, major woodworking fairs, lectures, workshops and exhibitions are free but are restricted to happenings of direct interest to woodworkers. Only workshops sponsored by not-for-profit groups are listed. We list events (including entry deadlines for future juried shows) that are current with the time period indicated on the cover of the magazine, with overlap when space permits. We go to press three months before the issue date of the magazine and must be notified well in advance. For example, the deadline for events to be held in March or April is January 1; for July and August, it's May 1, and so on.

ALASKA: Meetings-Alaska Creative Woodworkers Association meets at 7:00 p.m. on the fourth Monday of each month at the Anchorage Museum. (907) 345-3077.

ARIZONA: Show-Arizona Woodworking Show, Nov. 22-24. Arizona State Fairgrounds, Agriculture Center, 1826 W. McDowell Road, Phoenix. For more information, call (800) 826-8257.

ARKANSAS: Meetings-Woodworker's Association of Arkansas meets the first Monday of each month at 7:00 p.m.; Central Arkansas Woodcarvers meets the second Tuesday at 7:00 p.m. and the fourth Tuesday at 6:30 p.m. J.T. Shannon Lumber Co., Woodworkers Center, 6200 Sears Drive, Little Rock, 72209. (501) 565-1510.
Meetings-Ozark Woodturners meets the third Saturday of each month in Mountain Home. For more information, call Michael Komblum at (501) 424-5893.

CALIFORNIA: Show-California Design, Jan. 23-Feb. 28. Contract Design Center, San Francisco. For more information, contact California Contemporary Craft Association, P.O. Box 2060, Sausalito, 94966. (415) 461-0321.
Show-San Francisco Bay Area woodworking show, Nov. 8-10. San Mateo Expo Center, Fiesta Hall, 2495 S. Delaware St., San Mateo. For more information, call (800) 826-8257.

COLORADO: Juried exhibition-12th annual Woodworkers Guild of Colorado Springs exhibition, Oct. 19-Nov. 30. Colorado Springs Pioneers Museum. For more information, call (719) 633-5015.

CONNECTICUT: Show-Woodworkers Guild of Connecticut's ninth annual fall members show, Nov. 2-24. Robert Allen Keeney Memorial Cultural Center, Wethersfield Historical Society, 200 Main St., Wethersfield. For more information, call (860) 529-7161.

FLORIDA: Meetings-South Florida Woodworking Guild meets every second Monday at 7 p.m. Constantine, 1040 East Oakland Park Blvd., Ft. Lauderdale. For further information, contact Woody McLane at (305) 565-2729.
Meetings-Central Florida Woodworkers Guild meets the second Thursday of each month. Woodcraft Supply, 246 E. Semoran Blvd., Casselberry. For more information, contact Bob Elliott (407) 695-8960.
Meetings-Tallahassee Woodcrafters Society meets the second Tuesday of each month. Contact Walt Behrle at (904) 668-6653 or Austin Tatum at (904) 386-6876.
Meetings-St. Petersburg Woodcrafters Guild meets the fourth Thursday of every month at 7 p.m. Montgomery Electric and A/C, 1200 19th St. N., St. Petersburg, 33713. Contact Don Montgomery at (813) 898-0569.

Call for entries-12th annual fine furniture show, sponsored by Woodcrafters Club of Tampa, Feb. 6-17. Florida Expo Park, Tampa. Deadline: mid-January (Florida residents only). For further information, call Lois Dinsmore at (813) 962-8333.

GEORGIA: Meetings-Woodworkers Guild of Georgia meets the second Monday of every month. Southern College of Technology, 1100 S. Marietta Parkway, Marietta. For more information, call (404) 299-3972.

ILLINOIS: Classes-Ongoing woodworking classes, all levels. Elston Woodworking School, 2228 N. Elston Ave., Chicago, 60614. (312)342-9811.
Show-Belleville Wood Carvers Club Midwestern wood carvers show, Nov. 2-3. Belle-Clair Exposition Hall, 200 S. Belt East, Belleville. For more information, call Don Lougey at (618) 233-5970.
Meetings-Fox Valley Woodworkers Club meets at 7:30 p.m. on the first Tuesday of every month in Batavia. For more information, call (708) 469-9517.

IOWA: Call for entries-The Octagon's annual Clay, Fiber, Paper, Glass, Metal & Wood exhibition, March 9-April 20. Deadline: Jan. 3. For information, call (515) 232-5331.

KENTUCKY: Meetings-Kyana Woodcrafters meets the first Thursday of each month. Bethel United Church of Christ, 4004 Shelbyville Road, Louisville, 40207. (502) 426-2991.

MAINE: Meetings-Guild of Maine Woodworkers meets the first Wednesday of every month. Call (800) 805-5100.

MARYLAND: Classes-Woodworking classes, May thru December. Glen Echo National Park, 7300 MacArthur Blvd., Glen Echo, 20812. (301) 492-6266.

MASSACHUSETTS: Classes-Woodworking classes, most of the year. Contact Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.
Workshops-Joinery, cabinetmaking, more. Hancock Shaker Village, Box 927, Route 20, Pittsfield, 01202. (413) 447-9357.
Classes-Year-round intensives in woodworking and wood carving. Horizons New England Craft Program, 108 N. Main St., Sunderland, 01375. (413) 665-0300.
Exhibitions-Contemporary studio furniture by Rhode Island School of Design graduates and instructors, thru Nov. 8. The Society of Arts and Crafts, 101 Arch St./Summer St., Boston, 02110 and thru Nov. 10 at 175 Newbury St. (between Dartmouth & Exeter), Boston, 02116. For more information, contact Arlene Chung at (617) 266-1810.

MICHIGAN: Meetings-Metro Carvers of Michigan meets second Tuesday of each month (except July and August) at 7:30 p.m. Helen Keller High School, 1505 N. Campbell Road, Royal Oak. (810) 771-1040.
Show-Fruitbelt Woodcarvers Show, Nov. 2-3. Cook Energy Information Center, I-94, Bridgman (exit 16, 3 1/2 miles north on Red Arrow Highway). For more information, call Dolly Krieger at (800) 548-2555.
Show-Metro-Detroit Woodworking Show, Dec. 6-8. Novi Expo Center, Hall A, 43700 Expo Center Drive, Novi. For more information, call (800)826-8257.

MINNESOTA: Meetings-Minnesota Woodworkers Guild meets the third Tuesday of each month at 7:15 p.m. Demonstrations presented each month. Contact Richard Gotz at (612) 544-7278.

NEBRASKA: Meetings-Omaha Woodworkers Guild meets at 7 p.m. the third Tuesday of every month. Westside Community Center, Omaha. For more information, contact John Cahill at (402) 334-5550.

NEW HAMPSHIRE: Classes-Various woodworking classes. The Hand & I, P.O. Box 264, Route 25, Moultonboro, 03254. (603) 476-5121.
Auctions-Antique and craftsman's tool auctions, year-round. Contact Richard A. Crane, Your Country Auctioneer, 63 Poor Farm Road, Hillsboro, 03244. (603) 478-5723.

NEW MEXICO: Show-Bent-wood laminations, Nov. 8-22. Kent Galleries, The Contemporary Craftsman, 130 Lincoln Ave., Santa Fe, NM, 87501. For more information, contact Kimberly Kuhnigk at (505) 988-1001.

NEW YORK: Meetings and classes-New York Woodturners Association meets bi-monthly. YWCA, 610 Lexington Ave. (53rd St.), New York City. Contact Howard Alalouf (914) 337-0226.

Classes-Traditional and contemporary woodworking with Maurice Fraser, Bill Gundling, Jack Van Deckter and Susan Perry. The Craft Students League at the YWCA, 610 Lexington Ave., New York City. (212) 735-9731.
Meetings-Long Island Woodworker's Club meets the first Wednesday of every month, September thru June. Brush Barn, 211 Jericho Turnpike, Smithtown. (516) 360-1216.
Show-Second Handmade home show, Nov. 15-19. Lexington Avenue Armory at 26th St. For more information, contact Richard Rothbard at (800) 834-9437.
Show-Woodcrafters of the Valley show, Feb. 8-9. Utica Memorial Auditorium, 400 Oriskany St. W., Utica. For more information, contact Community Relations Department, Heritage Home (315) 797-7392.
Classes-Intermediate woodworking and furniture design, Jan. 28-May 13 (Tuesdays). Purchase College, State University of New York, 735 Anderson Hill Road, Purchase, 10577-1400. For more information, call (914) 251-6500

NORTH CAROLINA: Meetings-North Carolina Woodturners meets the second Saturday of each month. For more

information, contact the North Carolina Woodturners, P.O. Box 1833, Hickory, 28603. (704) 324-5960.

Classes-Carving, whittling, bent willow furniture, thru December. Southern Highland Craft Guild's Folk Art Center, Milepost 382 of the Blue Ridge Parkway, East Asheville, 28815. (704) 298-7928.

Classes-Carving, plane making, lap-strake boatbuilding, more, thru December. North Carolina Maritime Museum, 315 Front St., Beaufort, 98516. (919) 728-7317.

Call for entries-Gallery Americas Southern Furniture exhibition. Deadline: Jan 1. Open to artists from southern states. Send an SASE to George Melone, Gallery Americas, Historic Carr Mill, Carrboro, 27510. (919) 929-1002.

OHIO: Meetings-Cincinnati Woodworking Club meets from 9:00 to noon on the second Saturday of January, March, May, September and November. Reading High School, 801 E. Columbia Ave., Reading. For more information, contact Cincinnati Woodworking Club, 10125 Montgomery, Cincinnati, 45242.

Meetings-Woodworkers of Central Ohio meets on the second Saturday of November, February, April and June. For more information, call Chuck at (614) 457-3704.

OREGON: Meetings-Cascade Woodturner's Association meets every third Thursday. For more information, contact Cascade Woodturners, 11575 S.W. Pacific Highway, #104, Tigard, 97223. (360) 887-3903.

Show-Oregon Woodworking show, Nov. 15-17. Portland Expo Center, Hall C, 2060 N. Marine Drive, Portland. For more information, call (800) 826-8257.

PENNSYLVANIA: Call for entries-Best essay on how to build an Albany sleigh, cash prize of \$400. Deadline: Nov. 1. For more information, contact Carriage Museum of America, P.O. Box 417, Bird-In-Hand, 17505. (717) 656-7019.

Exhibition-Fifth annual Antique Tool Discovery Day, Nov. 9. Mercer Museum, 84 S. Pine St., Doylestown. For further information, contact the Curatorial Department at (215) 345-0210.

Show-Philadelphia Museum of Art craft show, Nov. 7-10. Pennsylvania Convention Center, Exhibit Hall D, 12th & Arch Streets. For more information, call (215) 684-7862.

TENNESSEE: Workshops-Turning, carving and more, year-round. For more information, contact Arrowmont School of Arts and Crafts, P.O. Box 567, 556 Parkway, Gatlinburg, 37738-0567. (615) 436-4101.

Classes-Lumber selection and more. For more information, contact Tennessee Valley Authority, 17 Ridgeway Road, Box 920, Norris 37828-0920. (615) 632-1656.

TEXAS: Meetings-Woodturners of North Texas meets the last Thursday of every month, 7:30-10:00 p.m. Paxton Beautiful Woods Store, 1601 W. Berry St., Fort Worth, 76110. (817) 927-0611.

Meetings-North Texas Woodworker's Association meets the third Tuesday of each month. For more information, contact Bruce May, P.O. Box 831567, Richardson, 75083. (214) 271-0125.

Show-Rio Grande Valley Woodcarvers show, Jan. 17-18. McAllen Civic Center, McAllen. For more information, contact Dorothy Chapapas, Rural Route 2, Box 150, McAllen, 78504. (210) 581-2448.

Show-Dallas/Ft. Worth woodworking show, Dec. 13-15. Fair Park-Grand Place, 1300 Robert B. Cullum Blvd., Dallas. For more information, call (800) 826-8257.

WASHINGTON: Juried show-The Kitsap County Woodcarvers 11th annual show and sale, March 15-16. Westside Improvement Club, Bremerton. For more information, call (360) 373-6173.

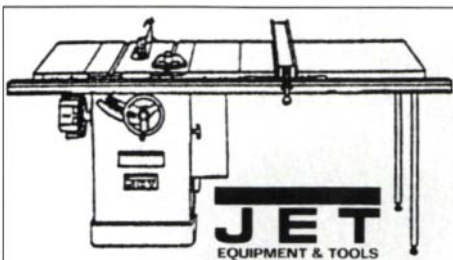
Show-Seattle woodworking show, Nov. 1-3. Seattle Center, Exhibition Hall, Mercer St. at 3rd Ave. N., Seattle. For more information, call (800) 826-8257.

CANADA: Association-Canadian Woodturners Association, Markham, Ont. For more information and to receive newsletter, call (905) 479-0755.

Meetings-West Island Woodturners Club (Montreal) meets every Tuesday, thru May. For more information, contact Dennis Brown, 8817 Cure Legault, Lasalle, Que., H8R 2V9. (514) 366-6071.

Show-Atlantic Wood Show, Nov. 15-17. Exhibition Park, Halifax, N.S. For more information, call Craig Blois at (902) 895-6890.

Association-Superior Woodworking Association meets 7:00 p.m. the last Monday of each month. Confederation College, Ont. Contact Vic Germaniuk at (807) 767-5964.



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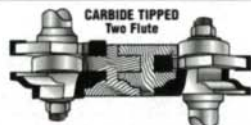


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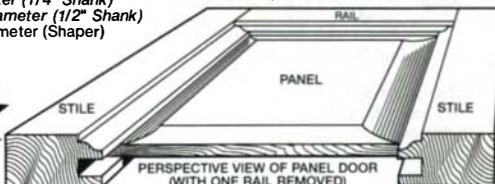
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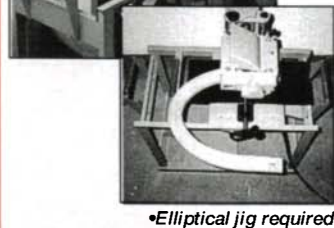
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Delta Sidekick 6-1/2"x40T"x5/8"	\$149	\$ 89
Sears 8-1/4" & Delta 8-1/4"x60T"x5/8"	\$170	\$ 99
Hitachi 8-1/2"x60T"x5/8"	\$179	\$109
DeWalt 8-1/2" & Ryobi 8-1/2"x60T"x5/8"	\$179	\$109
Delta 9"x80T"x5/8"	\$204	\$119
Ryobi-Makita & all 10"x80T"x5/8"	\$207	\$129
DeWalt, Makita, B&D, Hitachi 12"x80T"x1"	\$229	\$139
Ryobi-Makita 14"x100T"x1"	\$266	\$179
Hitachi 15"x100T"x1"	\$277	\$189

For good general purpose cuts use Woodworker II 30T & 40T or Woodworker I. Use small stiffener where possible.

BUY 1 BLADE OR DADO AT 10% OFF SALE PRICE, OR
BUY 2ND BLADE AT 20% OFF (EQUAL OR LESSER VALUE)
15% OFF DADO AS SECOND CHOICE.

WOODWORKER II - 6"-7 1/4" to 14"

With this one ALL PURPOSE blade you can RIP & CROSSCUT 1"-2" ROCKHARDS and SOFTWOODS resulting in a SMOOTH AS SANDED surface. PLY-VENEERS of OAK and BIRCH will crosscut with NO BOTTOM SPLINTER at moderate feed rates.

• DOUBLE HARD and 40% STRONGER C-4 CARBIDE	• Ends cutting 1/16" oversize to allow for RESURFACING
• Ends blade changing	• BUY AND SHARPEN 1 BLADE INSTEAD OF 3
• Ends scratchy saw cuts	
• Ends second-step finishing	

5/8" holes, boring thru 1-1/4" add \$7.50. Larger at Time Basis—Shipping \$4.50

WOODWORKER II	LIST	SALE	10%	20%
14"x40T"x1"	\$215	\$149	\$134	\$119
14"x30T"x1"	\$195	\$139	\$125	\$111
12"x40T"x1"	\$183	\$129	\$116	\$103
12"x30T"x1"	\$162	\$119	\$107	\$ 95
10"x40T"x1/8" or 3/32"	\$156	\$119	\$107	\$ 95
30T 1/8" or 3/32"	\$135	\$ 99	\$ 89	\$ 79
9"x40T	\$146	\$109	\$ 98	\$ 87
30T	\$125	\$ 99	\$ 89	\$ 79
*8-1/4"x40T 3/32"	\$136	\$ 99	\$ 89	\$ 79
8"x40T 3/32"	\$136	\$ 99	\$ 89	\$ 79
30T	\$115	\$ 89	\$ 80	\$ 71
*7-1/4"x30T 3/32"	\$112	\$ 89	\$ 80	\$ 71
*6"x40T 3/32"	\$136	\$ 69	\$ 62	\$ 55

*NEW for Sears & Makita Table Saws **New For Saw Boss

I just purchased your WOODWORKER II 3/32 blade, and I AM TICKLED PINK with it. My RYOBI BT 3000 saw acts like it had a 3 H.P. motor in it. Cuts so much easier and quieter and smoother. Don't need my jointer or sander now.

P. Rose, PA

After installing your blade and 5 in. stiffener the vibration in my saw went down another 20%. I ran several pieces of hardwood through the saw, both crosscut and ripping, and was amazed at the smoothness. It was like cutting butter, maybe smoother. I have never had a saw blade that cut this smooth.

I also am going to send you my old Craftsman blade to sharpen. I'm not satisfied with our local sharpening. Now, how to justify another one of your blades....because I don't ever want to be without one.

Rich Price

WOODWORKER I - 7 1/4" - 14" FOR TABLE and RADIAL SAW

This trim and crosscut ALL PURPOSE blade gives scratch-free polished cuts on all materials RIP or CROSSCUT UP TO 2".

- ALL 60T AND 3/32" THIN KERF 30° ATB and 5° face hook on 10" diameter and under. 12" and 14" are 20° ATB 1/8"K.
- DOUBLE HARDER and 40% STRONGER carbide.
- THIN KERF: Saves 1/3 wood loss on each cut, radial or table. Feeds easy when used for moderate rip and crosscut on table saw. Reduces "JUMP IN" for better "PULL CONTROL." Practically eliminates bottom splinter on RADIAL CROSSCUT.
- Totally stops ALL bottom and top splinter on ply veneers in push-cut mode on RADIAL.
- Our STIFFENER STRONGLY RECOMMENDED AGAINST outside blade for best cuts. Made and serviced in U.S.A. for your benefit.

	LIST	SALE
14"x60T"x1" 1/8"K	\$224	\$159
12"x60T"x1" or 5/8" 1/8"K	\$198	\$139
10"x60T"x5/8" 3/32"K	\$162	\$129
9"x60T"x5/8" 3/32"K	\$156	\$119
8"x60T"x5/8" 3/32"K	\$150	\$109



NEW!

8-1/4"x60T"x5/8" 3/32"K	\$150	\$109
7-1/4"x60T"x5/8" 3/32"K	\$150	\$109

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 WOODS Magazine test, Sept. '93, pg. 45

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 C-4 Carbide Tips-4 on each chipper with special negative face hooks. Shims & 3/32 chipper.

	LIST	SALE	10%	15%
6" D. 5/8" Bore NEW	\$299	\$269	\$242	\$229
8" D. 5/8" Bore	\$321	\$289	\$260	\$245
10" D. 5/8" & 1" Bore	\$389	\$349	\$314	\$297
12" D. 1" Bore	\$499	\$449	\$404	\$382

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DURALINE HI-A/T FOR TABLE & RADIAL SAWS ALL FLAT FACE

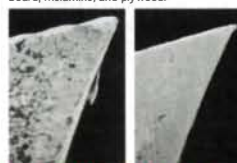
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8"x80T"x1/8" & 3/32" K	\$202	\$169	14"x80T"x1"	\$232	\$197
9"x80T"x1/8" & 3/32" K	\$207	\$179	14"x100T"x1"	\$266	\$226
10"x80T"x1/8" & 3/32" K	\$207	\$159	16"x80T"x1"	\$262	\$223
12"x80T"x1-1/8"K	\$212	\$181	16"x100T"x1"	\$294	\$243

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Oak from London's Roman past



Pristine Roman oak—Archeologists unearthed ancient oak timbers in London's financial district. Builders discovered the wood while excavating for a skyscraper. The timbers were part of a seawall, quays and abutments for a bridge.



The oak has darkened and hardened with age. Those who have worked with the wood liken it to an African hardwood. Some turners say it cuts like plastic.

As London prepares to mark the new millennium, no one expected to find any wood from the city's early Roman structures. But that's exactly what archeologists unearthed recently at a London construction site: huge oak timbers originally hewn and joined by the Romans. Fifty metric tons of the wood, still in remarkably good shape, is being sold to help pay for a monument to London's Roman past.

The wood was discovered during excavations for a new skyscraper in the financial district. Just north of London Bridge and 15 ft. underground, builders came upon some large squared timbers. As British law dictates, all construction stopped, and archeologists took over the building site.

After 24 weeks of digging in the basement of the building (see the photo at left), archeologists from the Museum of London had laid bare an area 25 yds. long, criss-crossed with walls and cribs built of huge oak timbers. Some were 24 in. by 24 in. by 18 ft. long.

Though the site is 100 yds. from the banks of the Thames River, the structures proved to be part of a seawall, a quay and some abutments for what could have been the first bridge in London. Through sophisticated dating, the time of construction was placed around A.D. 63 when the Romans were fortifying their occupation of Londinium. Over the intervening centuries, the Thames River changed its course, and the timbers were buried in mud. Though waterlogged and darkened with age, the timbers are so well-preserved that the marks of the Roman builder's tools are still visible.

The timbers were hewn from huge prime oaks. Given their size and weight, they must have been cut near the waterfront. The closely spaced growth rings show that when the trees were cut, they grew in a dense virgin forest. The trees were 200 to 300 years old when felled.

After the museum finished the dig, the developers promptly removed the ancient timbers and continued their construction. Jim Campbell, an amateur archeologist who lives outside London stepped in and got the company to donate the wood for a sculpture. Campbell has commissioned John Farnham to design and build it, and the city has provided a plot of land along

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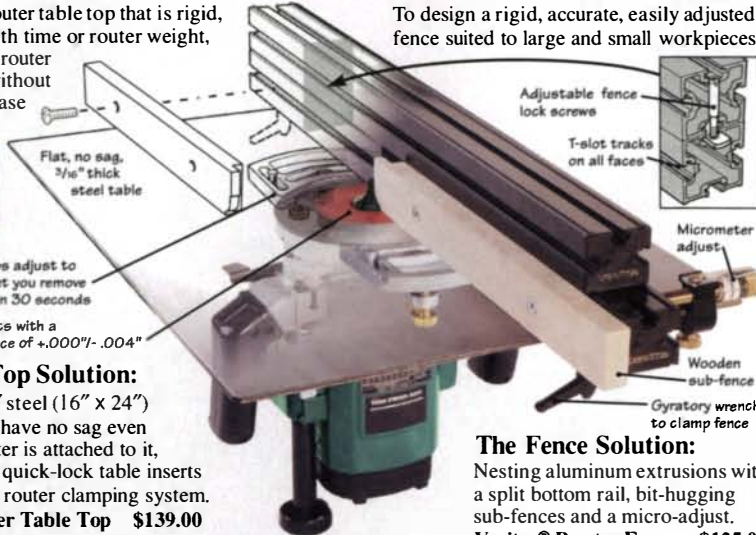
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WOODSMITH MAGAZINE

the Thames River Walk, which is not far from the excavation site.

Most of the wood will be sold at about \$15.50 per board foot. The oak has darkened and hardened over the centuries (see the bottom photo on p. 126).

According to Campbell, the wood has lost much of the graininess associated with oak. It's unusually shiny, almost iridescent; a light coat of wax rubs out to look like a more substantial finish. Turners say the wood cuts more like plastic than oak, and Campbell likens it to an African hardwood in density and working properties.

The timbers are drying slowly. Campbell says that once resawn into 1-in.- or 2-in.-thick planks, they will air dry in a few months without undue checking or splitting. Thicker blocks cut for turning tend to develop radial checks.

—Aimé Fraser, assistant editor

Fenced burls

Walnut burls are so valuable that thieves are raiding California walnut orchards in broad daylight, cutting down mature trees in the prime of their productive lives.

The orchards are open to the road and neatly mown, offering thieves easy access. Passers-by don't think twice when they see several people working around the trees with chainsaws and loading up the back of a pickup truck. A few hours of work can land a thief up to \$5 a pound for a choice burl (a big piece weighs about 300 lbs.). If the thief has the connections to export the burl to Italy, he might get as much as \$10,000 for the wood.

Three or four thefts a week are reported in the San Joaquin Valley, and local law officials have a hard time stopping them. Says Detective Bill Harper of the Stanislaus County Sheriff's department, "We've talked to local dealers, and we know who the thieves are. But once the burl is off the property, it's impossible to identify it as stolen goods."

Harper hopes a new ordinance will make it easier to catch burl thieves. The ordinance gives police the right to stop any vehicle carrying burls and demand documents stating where the wood was cut, the date it was taken, the destination and the amount of money that changed hands. —A.F.

Motorcycle mill



Kawasaki 350cc bandsaw mill. Kelly Barton of Ulster, Pa., built this mill with parts from a motorcycle and a forklift. The black walnut log is from Barton's woodlot. It's 30 in. dia. by 11½ ft. long, nowhere near the mill's maximum capacity.



Barton feeds the saw by hand. Blade speed and sharpness, the type of wood, moisture content and the width of the cut affect the speed of travel.

Designing and building the things we needed to get the job done was standard operating procedure on the little dairy farm where I grew up. I enjoyed it so much that engineering became my career, and later in life, I developed an obsession with craftsmanship that blossomed in my father-in-law's woodworking shop.

I soon found that planing lumber was my favorite part of working with wood. In time, my steady operation of the planer depleted my father-in-law's considerable supply of rough boards. Clearly, we needed much more, so I decided to build a bandsaw mill (see the photo above).

The sawblade is driven by a 350cc engine from a Kawasaki motorcycle. The motorcycle's six-speed transmission provides a range of cutting speeds. Engaging the highest gear gives a blade speed of 6,000

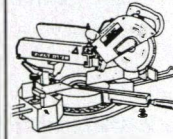
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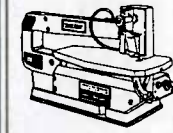
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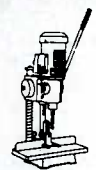
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ft. per minute, almost double the speed of most off-the-shelf bandsaw mills.

The saw runs on a trolley made from the front end of a forklift, and I push it over the workpiece by hand (see the bottom photo on p. 128).

Additional features include a drum brake for emergency stops, cooling water for the blade (in the red jerrican over the idler wheel), a winch for loading logs and a hydraulic jack that can lift one end of a log to compensate for taper. As shown, the saw can handle logs up to 12 ft. long, but I re-

cently extended the saw rails to support logs up to 22 ft. long.

The motorcycle was left over from adolescence. The steel and hardware for the saw bed were discarded by a local paper mill, and the front end of the forklift was donated by a family friend. Total capital investment for the saw was about \$650, and most of that went for the trolley wheels and tune-up parts for the motorcycle.

I still like the planer, but it's even more satisfying to watch logs become boards.

—Kelly Barton, Ulster, Pa.

Raves about jatoba

Jatoba (pronounced ZHA-toe-bah) has been on the market for at least a dozen years, but it's still a foreign species to many woodworkers. That seems to be changing.

Bryant Niebur, manager of Crosscut Hardwoods in Portland, Ore., says jatoba sales have really taken off.

"Jatoba is my biggest seller right now," says Niebur. He attributes that to its moderate price, about \$4.25 per board foot for 4/4 lumber. (Nationally, the retail price ranges from \$3 to \$5 per board foot.)

Most jatoba ends up as flooring, but some of it is turning up in furniture, particularly outdoor furniture, because it withstands the elements.

Jatoba (*Hymenaea courbaril*) is a very dense wood, with a specific gravity of .91, says Andy Poynter of A&M Wood Specialty in Cambridge, Ont., Canada. That makes it heavier than teak. "Although it's called Brazilian cherry, it has no relation to cherry," adds Poynter. Jatoba's color ranges from salmon-red to orange-brown; it looks a lot like mahogany.

Rick Paid, president of Rare Earth Hardwoods in Traverse City, Mich., says his company was one of the first to market jatoba in the United States.

"It mills crisply. It's a very hard wood but milling it is a pleasure. You need sharp tools to start, but it doesn't dull up your tools (like teak)." He buys all of his jatoba from plantations in Brazil where, he says, there's an active replanting program in effect to sustain the resource.

Ordinary yellow glue can be used on jatoba, according to Paid, and no special prep work is needed. The wood finishes nicely with tung oil.

—Anatole Burkin, associate editor

Wake up and smell the coffee



An aromatic Georgian coffee set. Albert Martin's turned coffee pot was built in sections. The gluelines, three in the spout and two in the body, are nearly invisible.

Albert Martin of New South Wales, Australia, caught a glimpse of a silver coffee pot in the movie *Rob Roy* and decided that turning a working coffee pot from a local wood would be his next challenge. Martin first held a turning tool just three years ago. Even then, he took on projects more experienced turners avoided.

The hollow pot has a wall thickness of 1/4 in., and it holds just over a pint of liquid. Martin says the most difficult part of the

project was boring the carved spout so it could pour. He drilled the spout in sections, which he purposely broke along the grain to hide the gluelines. Martin also turned a cup to go with the coffee pot (see the photo above).

The set is purely ornamental. It's made from aromatic camphor laurel, a tree whose leaves provide oil for cough drops and cold remedies. The smell is delightful, he says, but not in coffee. —A.F.

Notes and Comment

We welcome news stories, anecdotes about the triumphs and pitfalls of woodworking, tales of government regulators, photos of unusual work—anything you think other woodworkers would like to know about. We pay for material we use. Send submissions to Notes and Comment, Fine Woodworking, P.O. Box 5506, Newtown, CT 06470-5506.

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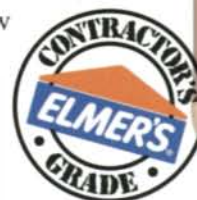
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Embroidery in wood



When Massachusetts furniture-maker Kristina Madsen visited the South Pacific for the first time and saw the work of native carvers, she knew she'd have to go back to learn something of their craft. She won a Fulbright grant and studied with master carver Makiti Koto of Fiji for nine months in 1991 and 1992. He taught her the delicate freehand intaglio carving popular in the region.

Her work today reflects a variety of influences, including traditional European methods. The carving in this pearwood chest of drawers is inspired by traditional Victorian lace patterns. Madsen, who also darns, first carved a portion of the pattern and then washed over it with pale gesso. She lightly sanded the piece and then added another layer of carving.

This two-step process creates a rich texture and depth. To complete the drawers, she lined them in silk.

