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Woodworking

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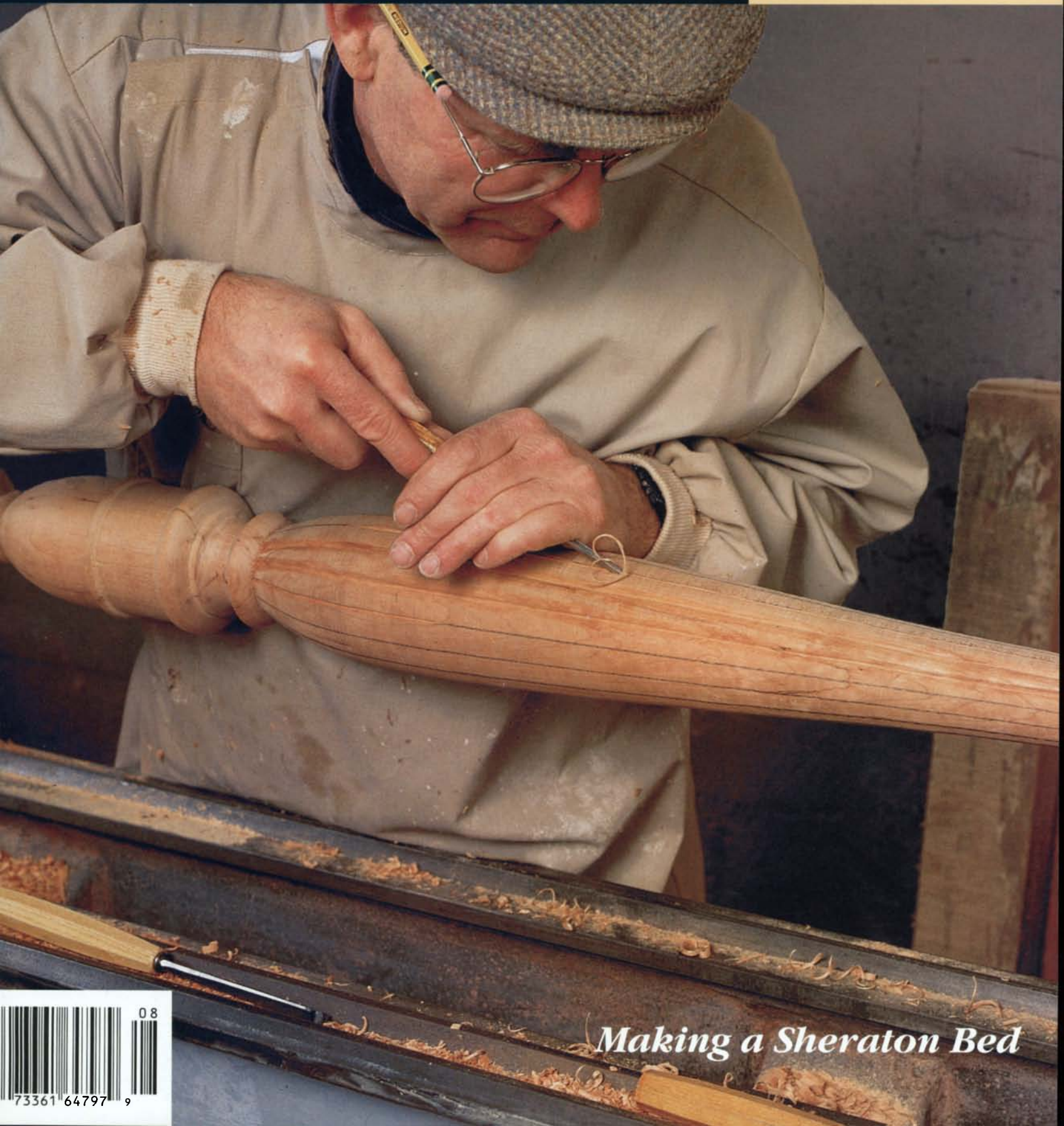
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On the Cover: The turned posts on a Sheraton bed help give this piece of furniture its graceful lines. Philip Lowe describes how the posts are turned and reeded on a lathe on p.42. Photo: Charley Robinson

Another look at choosing tablesaws—
It was with much dismay that I read Robert Vaughan's article "Choosing a Tablesaw" (*FWW* #112, pp. 74-77). Although the article was very biased toward the saws that cost over \$1,500 (classified as "class A" saws), we take particular exception with his comments about buying via mail order.

The article says that "a mail-order house will sell you a machine, but the company sure can't service it." This, probably, was the most uneducated of the comments in the article. Where has Mr. Vaughan been for the last 10 years? We are a mail-order house, and we can provide service faster and better than just about any local dealer in the country.

We have parts in stock and can ship them the same day. If a motor burns out, we can rewind a replacement motor in a day in our own shop. If the casting turns out to be warped, we can regrind it in house on our large surface grinder. We also have trained servicemen who know our machines inside and out. How many local dealers and home centers are able to provide service like that?

Fine Woodworking magazine, in our opinion, probably has more experienced readers in terms of woodworking and machine usage than other similar magazines. Insulting this audience by making comments like "imported copies...appeal to occasional woodworkers" only validates the fact that Mr. Vaughan has emerged from a bomb shelter after an absence of 10 years and is oblivious to the changes in our industry.

—S. Balolia, president, Grizzly Imports, Inc.

The objective of "Choosing a Tablesaw" is unclear to those of us at JET Equipment & Tools. Rather than providing factual data, the article is a collection of sweeping statements that are inaccurate and misleading.

Statements such as the following are all too general to make any clear point, but are obviously intended to damage the reputation of all importers: "expect some compromises in quality," "the problems usually start with the motor or motor controls" and "parts and service records are spotty, with some importers better than others." Last, but not least, we are concerned about the statement that implies importers are liars in advertising: "many of the motors are advertised as totally enclosed, fan cooled (TEFC), but they aren't."

The first reference made to the JET JCS-10 saw (shown in the top photo on p. 76) tells the readers to look for compromises in the quality of this saw. However, this saw was not developed to compete with Delta's Unisaw, as stated by the author, but rather the Delta model #36-755 saw. The specifications and quality of the JET JCS-10 saw are equal to, and in many cases better

than, the Delta model #36-755. The JET JCS-10 has an extra 5-in. rip to the right of the blade, a double V-belt drive instead of a single belt and weighs 65 lbs. more. Also, the saw pictured has an aftermarket fence and is missing the left extension wing, which is standard on the stock JET model. We fail to see the compromises.

The caption under the contractor-type tablesaw shown at the bottom of p. 76 is also very misleading. This saw was not designed for "occasional woodworkers." It has enjoyed critical acclaim from several other notable woodworking magazines.

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We might suggest that Mr. Vaughan take a closer look at the current models of tablesaws on the market and draw his conclusions only after some real tests.

—Robert R. Skummer, president and CEO,
JET Equipment & Tools

Revisiting tests on joinery strength—
John Wagner's article on joint strength in (*FWW* #111, pp. 58-61) confirmed what I have suspected for some time: the biscuit joint is at least as strong as those made with a mortise and tenon or loose tenon. Nevertheless, Brungraber and Taylor conclude that the biscuit joint is inferior. I found some of their reasons puzzling.

In analyzing the two-biscuit joint failure, they speculate that the biscuits failed well before the glue in the end-grain-to-edge-grain butt joint. This is very hard for me to swallow. Without a control joint (glued butt joint without biscuits) to support their assertion, I can't buy it.

They also surmise that freeze-thaw or wet-dry cycles will diminish the biscuit joint's strength. This argument is contingent upon their previous assertion that the glue in the end-grain butt joint is largely responsible for the biscuit joint's strength. Though yellow glue is pretty good stuff, few conscientious users would depend on it alone for a butt joint.

I agree with Brungraber that the tenacity of the mortise and tenon makes it the most appropriate joint for timber framing. A door, however, is a horse of another color, and I can't agree with the objection to biscuit joinery. Surely, normal use, or even abuse, would not stress a door to such a point. Reading between the lines, I suspect that Brungraber and Taylor are traditionalists loath to concede the empirical superi-

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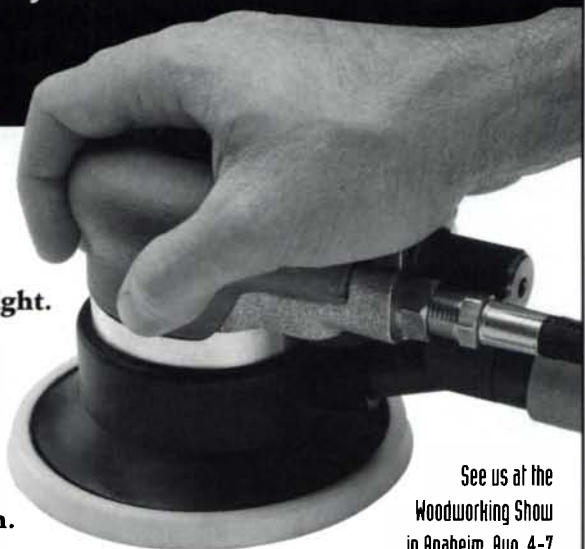
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ority of the biscuit joint. Biscuits, of course, have no application to timber framing, but I'm willing to bet that Grant Taylor is already subjecting a prototype door joined with biscuits to rigorous, long-term testing.
—Stephen C. Wiswall, Meredith, N.H.

Some of the statements in your article on joint strength are contradictory and suggest a lack of understanding of the terms used and the forces involved. This type of joinery would not fail, as shown, in compression. Compression would serve, to a point, to make the joint tighter rather than weaker. The failures shown are all due to excessive tensile stress. There were two forces acting on the test joint: the force acting on the inner corner is, in fact, compressive, and the force acting on the outer corner is tensile. This is the typical stress pattern seen on alternate corners when a door is racked. In the case at hand, either the glueline or the base material will fail. One would expect the glueline at the end grain to fail consistently. Obviously, this is not the case and is most probably due to the dowel, tenon or biscuit reinforcement.

This unfortunate confusion of terminology, while significant, does not negate the value and significance of the experiment and the very useful information obtained.

—Raymond E. Straile, Blandon, Penn.

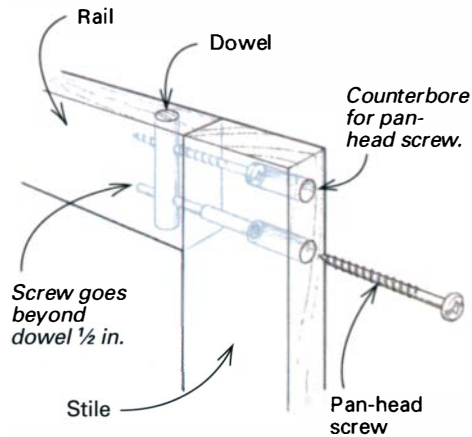
I have subscribed to *Fine Woodworking* for several years, and I enjoy the magazine very much. Each issue is absorbed as soon as it arrives. Once in a while, however, I catch something that should not have occurred. Such is the case in John D. Wagner's article. Unfortunately, common usage these days equates force and pressure. These terms are not synonymous. Pressure is defined as force per unit area.

Please don't take umbrage at these nit-picks. I am a retired electrical engineer who has written a lot of reports over a long working lifetime, and I have always tried to impress the importance of saying things correctly on younger personnel as I reviewed their work. Habit is strong, and I now have the time to write letters.

—Robert S. Smith, Silver Spring, Md.

I read with interest the article on wood-joint strength and was surprised the testers wasted their time with the lag-bolt joint; its weakness is well-known. However, it can be modified very simply to make it one of the strongest joints.

Improving dowel joints



Drill a hole for a dowel in the edge of the rail (see the drawing above). The placement should be such that the lag bolt or, my favorite, a pan-head sheet-metal screw, can pass through the dowel with about 1/2 in. protruding past it. Once the dowel is in place, the stile is counterbored for the fastener; then a pilot hole is drilled through the rail and the dowel. I wax the fastener's threads and drive it in.

This is, of course, a wood version of the draw-bolt joint, a favorite of millwrights setting up wood frames to resist heavy stresses. I also have used a nut set in the rail to take a machine bolt. Both versions are fast and very strong. The dowel can be sanded so that it's almost invisible, and the counterbore hole can be plugged or filled. In the event a panel or glass pane or whatever must be replaced in the frame, the joint can easily be taken apart. I never use glue as auxiliary security just because of that feature.

—James L. Stephens, Marietta, Ohio

Air-drying with simple kiln—Reading Clark Sellars' question and Jon Arno's an-

swer regarding seasoning lumber (*Fine Woodworking* #110, p. 32) prompts me to add my two-cents worth about a closely related subject, the treatment of partially or totally air-dried lumber.

I have been able to pick up red oak, cherry and walnut at bargain prices. But my first attempts to use it in cabinetry several years ago proved without a doubt that air-dried lumber, especially in western New York, is unfit for furniture due to the high equilibrium moisture content, generally 12% to 15%.

I made this mountain into a molehill by building a drying kiln. Readers should not be turned off by this idea. For less than \$350, my kiln was up and running and was built in one day. It consists of an insulated box made of 1x3 in. crating lumber covered with 1-in. rigid insulation. I added a mid-sized dehumidifier, a small electric fan for air circulation and a shielded, 150-watt light bulb for heat. My kiln is located on the second floor of my shop. At 4 ft. wide by 4 ft. high and 12 ft. long, the kiln will accept about 350 bd. ft. of stickered air-dried lumber. Moisture content drops to 7% in about a week at a cost of about 10 cents per bd. ft. (not including initial construction cost).

—Fred Soules, Elba, N.Y.

Tricks from a patternmaker—I'm offering a couple of old patternmaker's tricks that might help Leonard Feldberg. He wished for a double-ended tack to prevent wood pieces from sliding as he tried to clamp them (*FWW* #111, p. 4). If you "rub the joint," that is, slide the two pieces back and forth to expel the air trapped in the glue joint, you produce a near vacuum and sometimes don't even need a clamp. Or toenail your two boards/blocks on the outer edges. My favorite nail is 1 in. by 17 ga., easy to drive in and only needs to barely enter the lower board.

An old-timer who showed me many tricks kept a snuff box of coarse sand on his back shelf. He would select several grains of sand and set them in the wet glue before placing the top board to be glued.

The closest solution to what Leonard was looking for may be using a 1/2-in. by

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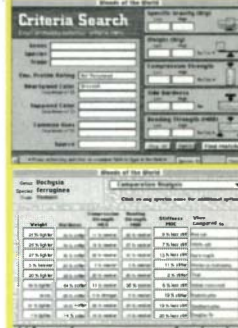
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The unknown for the patternmaker is the engineering change, a redesign of a part that forces the patternmaker to cut into the pattern to change the design. I always had a phobia about leaving anything hard that I would mill, drill, saw or carve into at a future date.

—Lloyd Brennecke, Bartonville, Ill.

Double-ended tacks are available—

The good news for Leonard Feldberg (*FWW* #111) is the double-ended tack he's looking for already is available from the Herrington mail-order house (3 Symmes Drive, Londonderry, NH 03053; 800-622-5221). The company's Swan's Way Earthquake Kit (designed to keep pictures straight during an earthquake) sells for \$19.95, plus \$4.95 for shipping. It includes 20 nails, a magnetized insertion tool and a small level. An additional 100 nails can be ordered for \$29.95. I measured the nails at .047 in. dia. and .53 in. overall.

—Jim Nagy, Piney Point, Md.

Following up on waterstones—

This concerns William Tandy Young's article on the upkeep of waterstones (*FWW* #111, pp. 80-83). Storing waterstones in water-filled 5-gal. buckets is a potentially dangerous practice if young children are in the home. Five-gallon buckets filled with water are notorious for drowning toddlers. Use a lid.

—Gregory Harvey, Beavercreek, Ohio

I have found that a kitchen drain board (mine is a Rubbermaid) makes a good base for a sharpening station. It is economical because it holds several sharpening stones, and it doesn't require finishing. Because it is made of a rubber-like material, it won't let the stones slide around, and it rinses off easily.

—Quincy Wargo, Pasadena, Calif.

A more appetizing finish for butcher block—

Having used a butcher block for years, reading Dave Seroy's letter and Pat O'Daly's response (*Fine Woodworking* #111, p. 24) made me lose my appetite. Stripper? Acetone? TSP? Yuck! The thought of cutting up mushrooms on that surface turned my stomach.

Our butcher block came from a butcher's store and had several deep wells in it. We routed it level, giving us a clean, unfinished surface. From our research and our

experience, we knew vegetable oil would go rancid. Tung oil was rejected for a reason we cannot remember. We did not even consider polyurethane, not wanting to eat polyurethane chips.

Mineral oil won because it would not affect the food in any way. We poured mineral oil on it several times a day for several days until the wood could not absorb any more. The surface was not "sticky for a long period of time," as O'Daly suggested it might be. After five years of constant use, our block still looks beautiful—no stains from squashed blueberries, no blemishes at all except for a burned ring where someone (I won't say who) set an espresso pot, hot from the stove. Someday, we will sand it off, but in the meantime, it's patina. For regular cleaning, we wet the block and liberally sprinkle coarse kosher salt on it, scrub it with a green, plastic scouring pad and rinse it. If you feel festive, wipe it with lemon juice.

—Ellen Heizmann, Surry-Media, Pa.

A solution to paint-can blues—

Walt Gaus for President! And I thought I was the only person who could not, for the life of me, figure out what in the world the inventor of the unsealable paint can was thinking about (*FWW* #111, p. 4). Walt will be happy to know that the containers he is hoping for already exist. Trouble is, no one has had sense enough to put paint in them to begin with.

Empty plastic soda bottles work well. Choose a size to fit your leftovers. I especially like the squeezable-plastic ketchup bottles: shake 'em up, flip the lid, squeeze a bit of latex onto a brush tip or a sponge, and you're ready to heal wall dings. Try that with your paint can. By the way, now that motor oil comes in plastic "cans," why not clear plastic?

—Richard Davidson, Asheville, N.C.

A tip on caning chairs—

I found the article on chair caning (*Fine Woodworking* #111, pp. 45-47) quite interesting. Although I learned caning more than 40 years ago, I don't believe I have ever seen a magazine article on the subject.

One detail that was not mentioned, but can cause extreme frustration if not taken into account, is that there are natural flaws in the cane that allow it to be woven in only one direction.

Cane, like wood, has a grain and in addition, has a surface discontinuity every several feet where the leaves of the rattan plant were joined to the stalk. Weaving must be done in the direction that allows these imperfections to slide smoothly through rather than snag on strands of cane previously placed.

The six layers described in the article are exactly as shown in most instruction

books. However, I was taught that putting in a diagonal before the second vertical layer (reversing the sequence of steps 3 and 4) was helpful in keeping things aligned. In simple pieces, such as the square seats shown, it really doesn't make much difference. In more complex pieces, such as the back of a cane rocker (in which the frame is curved in multiple directions), putting a diagonal layer in as early as possible is very helpful.

—Jay J. Wait, Shorewood, Ill.

Builders of pews not mentioned—

Because our firm has been involved in the production of church furniture since 1928, we certainly enjoyed "Furniture Fit for Worship" (*FWW* #111, pp. 84-86). At the same time, we feel somewhat slighted not being acknowledged as the builders of St. Lawrence's pews.

—Alan Byrnes, Product Manager, Woerner Industries Inc. Rochester, N.Y.

Hot glue for wrapping handles—

I have tried a variety of ways to wrap tool handles. As the years go by, my hands are less and less able to grip small handles. The problem has always been keeping the wrap in place (I wrap with either cotton or nylon clothesline rope). The wrap wouldn't stay in place for any length of time.

The solution was hot glue. It's secured by laying a good-sized bead of glue at the beginning of the wrap and embedding the end of the rope. Follow this with a strip of glue along the shaft. Wrap the shaft, letting the glue squeeze up between the individual wraps, thereby embedding the rope in the glue. The wrap is made into a nonslip, uniform surface. While the glue is still hot, press any excess into the rope grooves with a wet finger. Be sure to wet that finger, or a burn will result.

—Dean A. Barlow, Clarksville, Md.

Another vote for automotive finishes—

Thanks for a great article on auto finishes for wood (*FWW* #111, pp. 62-65). I have been using acrylic auto finishes on guitar bodies for the last three years with great results. The two brands I use are Sherwin-Williams and House of Color.

Want a see-through blue maple table or metallic-green chair? Call the auto-paint supply store and have them send it over. I've used Sherwin-Williams vinyl sanding sealer under the colors and Sherwin-Williams clear acrylic over the colors and have had great luck. The clear has an ultra-violet-light barrier coat, so it doesn't yellow. It also has a higher solids content than nitrocellulose lacquer, hardens faster and harder and wet-sands and rubs out better and faster than nitrocellulose lacquer. I'm sold on an acrylic lacquer finish for new instruments but still have to use nitrocellu-

lose on acoustic and vintage instruments. The only disadvantage with the acrylics is the cost, about twice that for nitrocellulose. I soon forget about that with the superior results and ease of final rub out.

—Ron Lira, Oklahoma City, Okla.

That's what metal detectors are for— Every time I read an article about sawmill operators not wanting to cut backyard logs because of nails or embedded metal (see *FWW* #112, pp. 30-31), I wonder if these folks are unaware of the use of metal detectors. My sawyer uses one on every log he cuts, and believe me, it works.

I recently had him resaw 5,000 bd. ft. of longleaf pine beams, which I had cleaned. We found many nails with the metal detector and removed them. We did not find a single nail with the saw.

—Jimmie S. Harp, Houston, Texas

Making a veneered table—I enjoyed the article on veneer matching (*FWW* #111, pp. 40-44) by Frank Pollaro. But the article did not go far enough. I want to know what he uses for a veneer press. And does he use the same pattern on the opposite side for stability (I know he said a less-expensive veneer could be used)? What glue does he use? —Edward F. Mullikin, Roanoke, Va.

FRANK POLLARO REPLIES: I use a vacuum press for all my veneering. However, I did have an 8-ft. by 8-ft. custom bag made by Vacuum Pressing Systems (553 River Road, Brunswick, ME 04011; 207-725-0935). I do not find it necessary to make the pattern on the bottom of the table the same as it is on the top. However, I can't see that it would hurt.

I use two glues for veneering: Elmer's white glue and Unibond 800, a modified urea formaldehyde glue (also available from Vacuum Pressing Systems). The glue on the table in the article is Unibond. I use it for *all* larger glue-ups.

More hardware sources—Since the last issue of *Fine Woodworking* was published, we've learned of several additional sources of high-quality hardware to go along with those already listed in "Decorative Hardware Sources" (*Fine Woodworking* #112, pp. 68-73):

Chris Efker/Craftsman Hardware, P.O. Box 161, Marceline, MS 64658; (816) 376-2481. Catalog and price list are \$4.

George Gordon, Cabinetmaker, 3850 Monroe Ave., P.O. Box 144, Pittsford, NY 14534; (716) 586-5160. Photocopied catalog and price sheet are free.

Suffolk Brass, Thurston, Bury Street

Edmunds, Suffolk, IP31 3SN, England; 011-44-359-230888.

Michael's Furniture Supplies, 575 3rd St., London, Ont. N5V 2C1, Canada; (519) 451-7270. Catalog and price sheet are \$2.50, refundable with any order over \$25.

—Vincent Laurence, associate editor

Errata—American Saw & Manufacturing Co. was cited as a manufacturer/supplier of scroll-saw blades (*Fine Woodworking* #111, p. 74). The company wrote to us to say it doesn't manufacture or supply these blades. Other sources of supply were listed with the article.

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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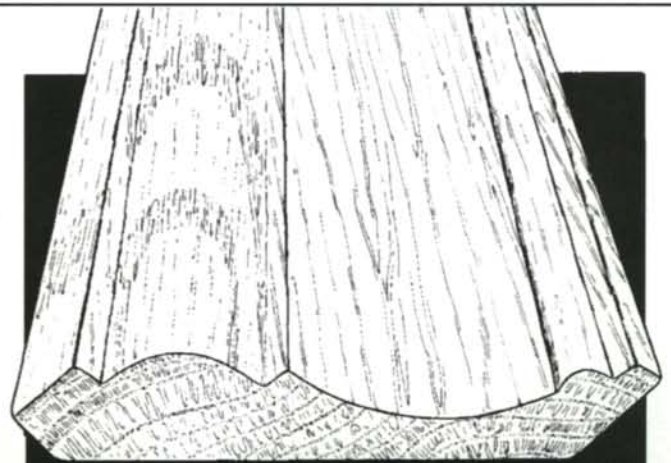
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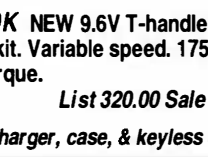
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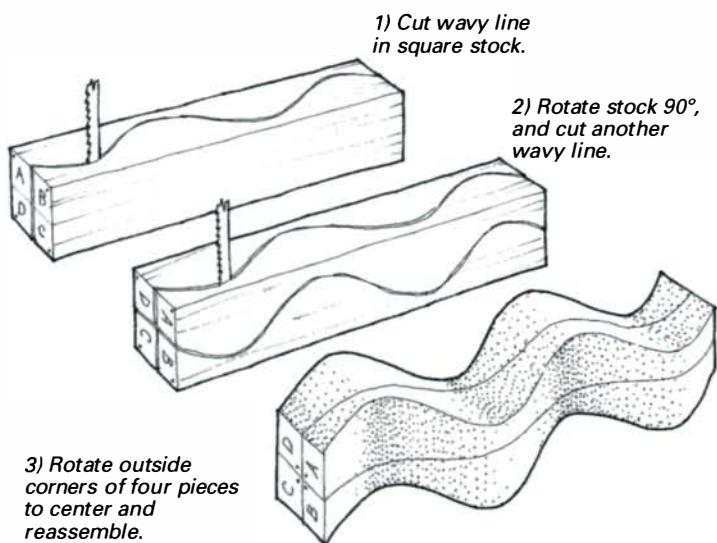
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When you reassemble the pieces correctly, the four outside corners will be together at the center. The outer form of the stick will be a continuous undulating curve. Glue the four pieces together, and clean up the curves with a drum sander.

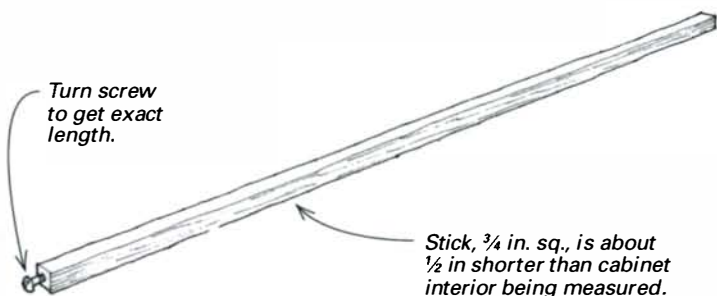
To get a square hole through the center of the piece (to allow for a lamp cord, for example), chamfer each of the four corners of the workpiece before bandsawing. I learned this technique from Rick Shirley of Kansas City, Mo.

—Kirt Kirkpatrick, Albuquerque, N.M.

Quick tip: Here is a nontoxic way to clean pitch and other residue from a sawblade. Sprinkle baking soda on the blade, spray with water and let the mixture sit for 15 minutes. Then scrub the teeth with an old toothbrush to remove the loosened residue.

—Mark Sloan, Farmington, Conn.

Feeler gauge for inside measurements



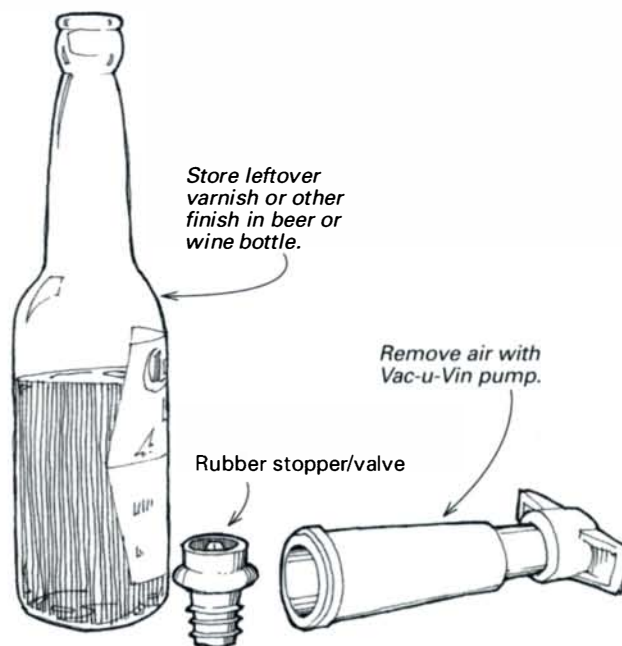
Here is a simple, accurate method for taking those awkward inside measurements, the kind you need to fit a shelf in a cabinet, for example.

Cut a scrap of 3/4-in.-sq. wood about 1/2 in. shorter in length than the inside dimension of the cabinet. Drive a round-head screw into the end grain of one end. You now have a feeler

gauge, adjustable with a screwdriver to the exact length needed. Once you have the correct length, there is no need to measure—just set the cut length directly from the gauge.

—Gary P. Westmoreland, Apple Valley, Calif.

Preserving finish with a wine vacuum

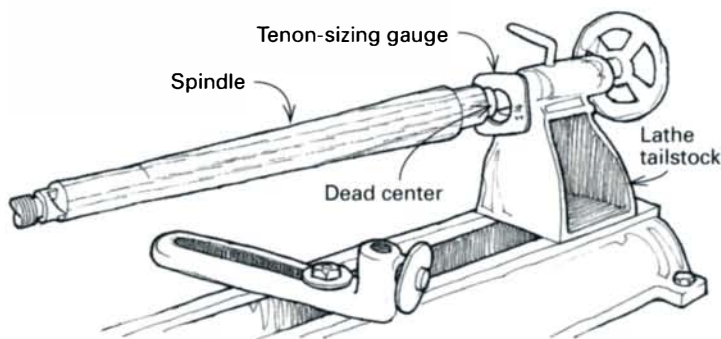


The traditional solution for keeping small leftover quantities of varnish or tung oil from skimming is to decant the finish to a smaller container to minimize the air space. Another approach, which is just as effective, is to transfer the varnish to a wine or beer bottle and apply a vacuum. Systems for evacuating the air from a wine bottle, such as Vac-u-Vin, cost less than \$15 and combine a rubber stopper/valve with a hand pump.

Before using the pump, clean and rinse the bottle, and put it in a microwave for a minute to dry it out. Transfer the leftover varnish to the bottle, insert the stopper, give it eight to 10 strokes, and then label and date the bottle.

—Dave Robinson, Ann Arbor, Mich.

Sizing round tenons on the lathe



The turned legs on the stools I have been building require an exact 1 1/4-in.-dia. tenon on one end. The usual approach to sizing tenons is to turn them slightly oversize using a caliper gauge. Tenons are then trimmed to size gradually by dismantling the stock from the lathe and testing the tenon in the hole until it fits.

To streamline this routine, I drill a hole in a slip of thin ply-

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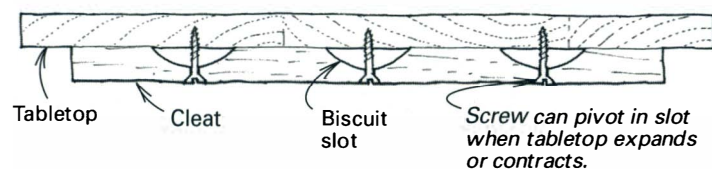
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wood with the same Forstner bit I use to drill the mortise. Then, before mounting the workpiece, I hang this slip in the gap between the lathe's tailstock and dead center. The slip hangs there out of the way until I need to check the tenon size by stopping the lathe and trying the gauge on the tenon. There's no need to dismount the stock. —Warren W. Miller, State College, Pa.

Biscuit slots accommodate wood movement

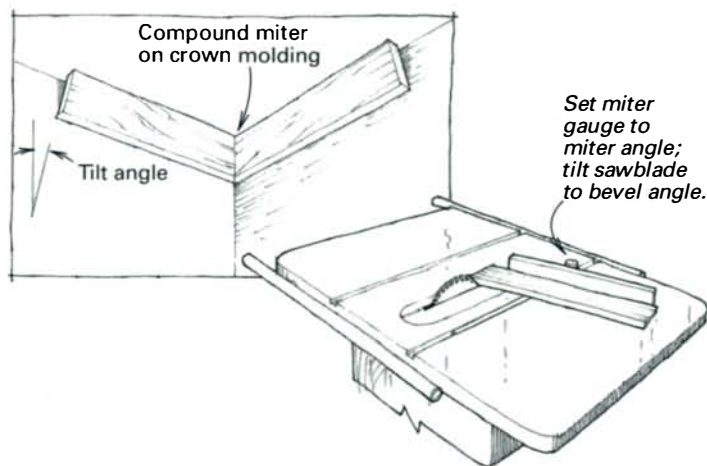


Use your biscuit joiner to make concealed screw slots that will allow wood movement. The screws will swing in the slots allowing a solid-wood tabletop or panel to expand or contract with humidity changes.—Davis G. Durham Jr., Landenberg, Pa.

Quick tip: To prevent clamp slippage when clamping up curved workpieces, attach a small piece of two-sided adhesive mounting tape under the clamp swivel. The tape won't slip, and its foam core will serve as a cushion to protect your project.

—Dick Dorn, Oelwein, Ia.

Use a calculator to figure compound angles



There are two ways to cut the compound miters on crown molding accurately. One way is to place the molding in the miter saw at exactly the same tilt angle as it will be when installed. With this method, you set the saw's miter gauge at 45°, and leave the blade tilt at 90°. Because most saws have a limited throat depth, this approach isn't practical for wide molding.

Another way is to lay the molding flat on its back and cut a compound miter. A compound miter requires you to set the saw's bevel and miter angles to odd calculated values that depend on the tilt of the molding away from vertical. If you have a scientific calculator you can calculate both angles easily using the formulas below:

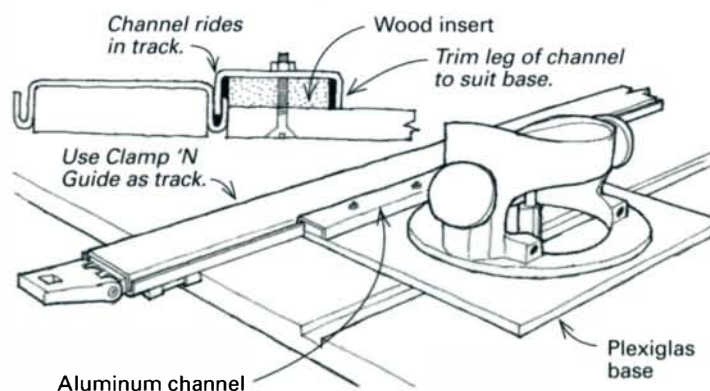
$$\text{Miter angle} = \tan^{-1}(\sin \text{ tilt})$$

$$\text{Bevel angle} = \tan^{-1}(\sin \text{ tilt} / \tan \text{ tilt})$$

Don't be scared by the trigonometric terms. If you own a Texas Instrument calculator or one of a similar style, you can plug in the functions and numbers directly using the keys (they should be marked pretty much the same as they appear in the

formulas). Calculate the values in the parentheses, and store them. Then apply the rest of the function to them to get the angles you need. —L.B. Magnusson, Paradise, Calif.

Guide for routing dadoes



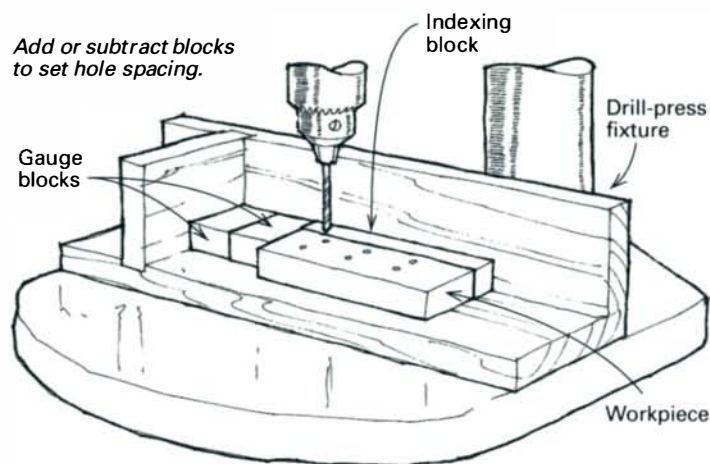
I had been looking for an easy-to-build jig to hold my router against a Clamp 'N Tool Guide (Griset Industries, Inc., P.O. Box 10114, Santa Ana, CA 92711; 800-662-2892). So when I read Skip Lauderbaugh's article, "Compact Tool Makes Dadoes a Snap" (*Fine Woodworking* #110, p. 86), the lights came on. Though I did not have the space for Skip's wall-hung jig, I saw within it the answer to my router-guiding problem.

That evening, I went out to the shop and gathered an aluminum channel that fit the Clamp 'N Tool Guide quite well and a leftover piece of Plexiglas. I cut off a 14-in. length of the channel and trimmed one leg, as shown. Then I milled a piece of oak to fit between the plastic and the channel. I assembled the parts temporarily with double-faced tape to keep everything in registration. Then I added three flat-head screws to hold things together permanently. In just a couple of hours, I was ready to cut my first dado.

Later, I realized that this idea would work equally well for a circular saw. So I made a similar fixture for my circular saw, substituting 1/4-in.-thick Masonite for the Plexiglas base.

—Jack Zabel, Cedar Falls, Ia.

Using blocks to duplicate hole patterns



Here's an exact and reproducible way to drill rows of evenly spaced holes. The technique uses a drill press and a fixture that combines indexing blocks, a fence and gauge blocks.

Cut the indexing blocks the same width as the distance be-

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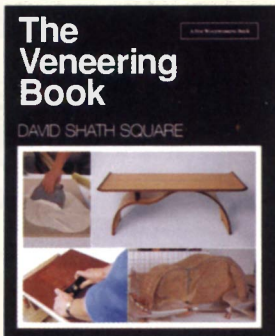
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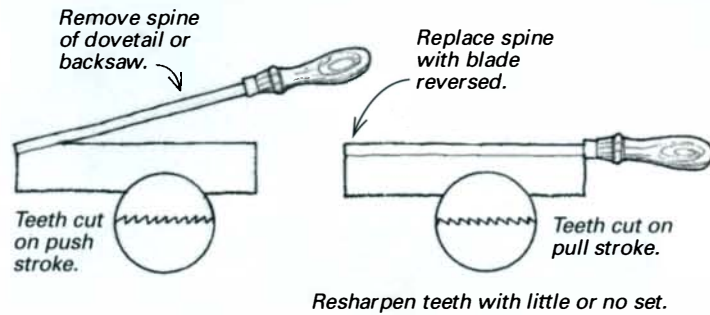
tween the rows of holes you want. Place a block between the fence and your work, align the drill bit with the first hole and then drill the holes in series, removing and adding the gauge blocks as you go. Be sure to blow away any sawdust, which would reduce the accuracy.

—Michel Theriault, Ottawa, Ont., Canada

Quick tip: When you need to enlarge a tablesaw dado by just a bit, tape a piece of paper to the fence, and run the piece through again. Different-thickness papers will vary the adjustment in the dado. The results are much more accurate than trying to move the fence.

—Jack Kegley, Charlottesville, Va.

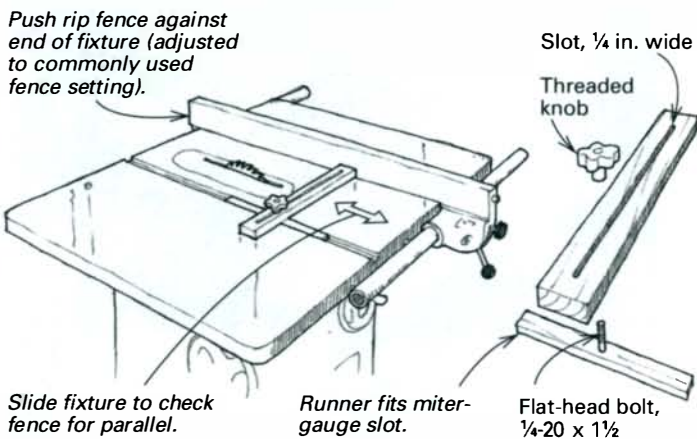
Modified dovetail saw works on the pull stroke



Take an ordinary fine-toothed dovetail saw, and clamp it in a vise close to its spine. Gently tap the handle up to remove the blade. Then reverse the handle, so the blade cuts on the pull stroke. Tap the spine back on the blade, and clamp the spine between the vise jaws. Sharpen as usual, but with little or no set. The result is not an authentic Japanese saw, but it is similar to a Chinese coffin-maker's saw and a lot easier to sharpen.

—Joe Santapau, Yardley, Pa.

Quick fence-reset fixture for the tablesaw



Forty-five years ago, I worked in a large shop where I cut out parts for store cases, 50 or so per tablesaw setup. In some instances, we had to mill special orders to slightly different dimensions and then return to the original saw settings. This required tedious machine changeovers, particularly setting and resetting the fence. In my home shop last year, I belatedly came up with an idea that would have been very valuable to me nearly a half-century earlier.

It is a very simple fixture, consisting of two hardwood bars that form an adjustable cross. I sized the bottom bar to fit the tablesaw miter-gauge slot and routed a slot in the top bar. It slides

back and forth over a bolt and can be locked in place with a knob. To use the fixture, I push it into the miter-gauge slot, move the upper bar against the rip fence and tighten the knob. It's a good idea to check fore and aft on the fence to make sure it is parallel to the blade. To reset the fence to the original setting, I just pop the jig into place and slide and lock the rip fence against it.

—George S. Graham, Branford, Fla.

Strength table for wooden threads

I have noticed that most authors in *Fine Woodworking* will chose a T-nut or metal insert when they need threads in wooden parts. There are situations, however, where installing a T-nut is awkward, or the strength of metal threads is not needed. In these situations, I just tap the threads directly into the wood. Any reasonably sharp metal-cutting tap is satisfactory. To provide a snug thread, I like to use a tap drill nearer to the root diameter of the thread, instead of those used for tapping metals.

Thread Size	Tap (metal)	Tap (wood)	Ultimate load (lbs.)
8-32	#29	#31	130
10-24	#25	#29	150
1/4-20	#7	#11	200
5/16-18	1/4	5/16	240
3/8-16	5/16	19/64	290

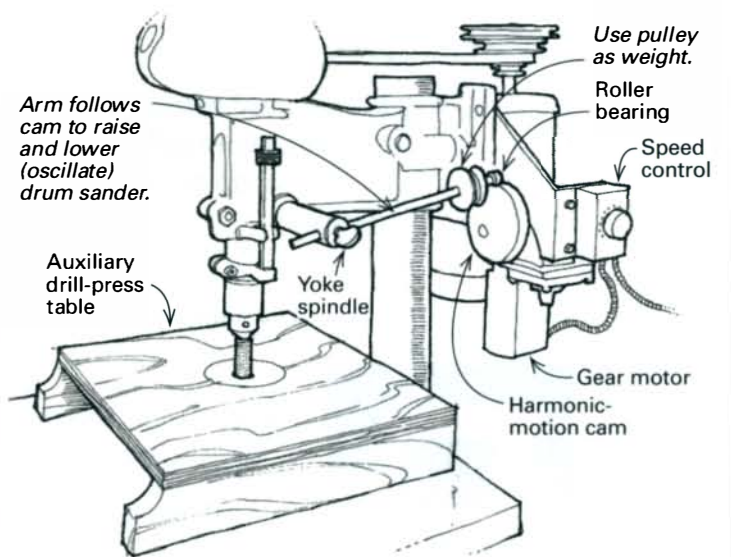
The table above shows the tap drill I use and the strength for threads tapped into wood. The ultimate load values have been calculated in pounds for a 1/2-in.-long thread in black cherry, using a nominal shear strength of 500 lbs. per sq. in. parallel to the grain. Shear strength perpendicular to the grain is greater than parallel, so this table gives a good idea of minimum strengths.

—Clyde R. Seitz, East Aurora, N.Y.

Quick tip: Remove the maker's label on your tape measure, and glue a circle of plastic laminate in its place with contact cement. You will always have something to write on.

—Kurt Schabell, Rockford, Ill.

Oscillating spindle sander uses a drill press



The oscillating spindle-sander attachment for a drill press described in *FWW* #109 appears to be a good substitute for a benchtop sander. I built a similar, less-expensive version that

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I've been using for more than 20 years. The attachment uses a gear motor to drive a harmonic-motion cam (a circular disc rotating off center), which raises and lowers the quill by means of a follower arm. I made the cam from 1/2-in.-thick Garolite, a dense thermoset plastic, which looks like tempered Masonite. Aluminum or even hardwood could be substituted. The follower is a steel rod that fits in the feed-yoke hole in the drill press. It is fitted with a roller bearing that rides the cam. Sandwich the bearing between thin brass washers, and hold it in place with a slotted-head machine screw. Fasten a weight to the rod (I used a cast-iron pulley) to counteract the spindle-return spring so that the follower rides firmly against the cam as it revolves.

My gear motor is a forerunner of the current Dayton model 2Z803, 1/15 hp, 100 rpm. I reduce the motor to a workable rpm with a speed control. Other slow-speed or variable-speed motors could be used. No matter what motor is used, the only ingenuity required in this setup is in devising a mount for the motor that puts the cam in the right position for the follower arm.

—William E. Slaby, Royal Oak, Mich.

Holding multiples with hot glue

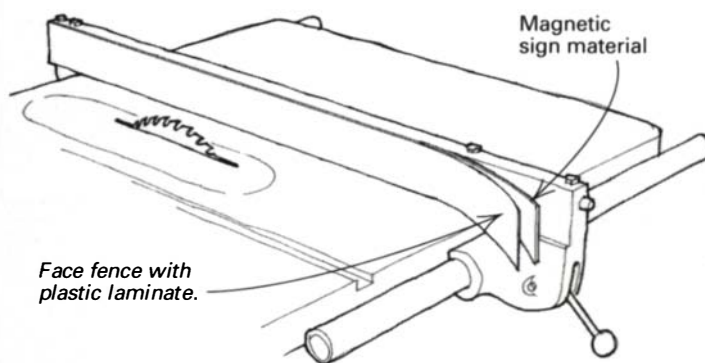
When I want to cut several identical pieces with my bandsaw, I secure the laminations with a crisscross of hot glue at the corners or across the ends. This is much quicker and cleaner than brads or double-faced tape. If the glue residue isn't removed in the cutting, just scrape it off.—Greg Byington, Brownsburg, Ind. and Carroll Caddel, Plano, Texas

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blankets over the work and then add a layer of regular blankets for insulation. While the blanket is on, we make sure the assembly is not left unattended.

—Michael Sykes, Raleigh, N.C.

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To prevent thin stock and plastic laminate from slipping under a rip fence, buy a scrap of magnetic sign material, and use spray glue to attach it to a strip of laminate that's the length of your fence. Stick the strip to the face of your rip fence, and slide it down, flush with the tabletop. —Rod Barnard, Seattle, Wash.

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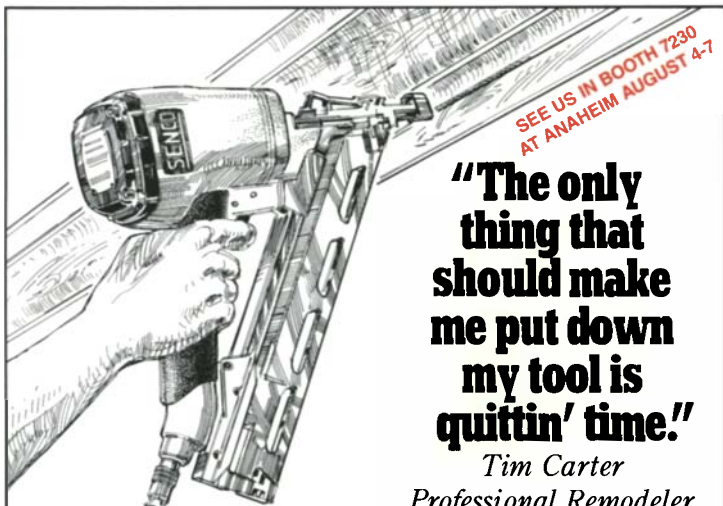
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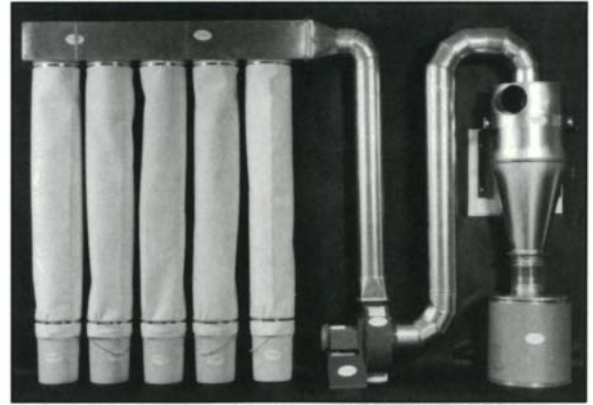
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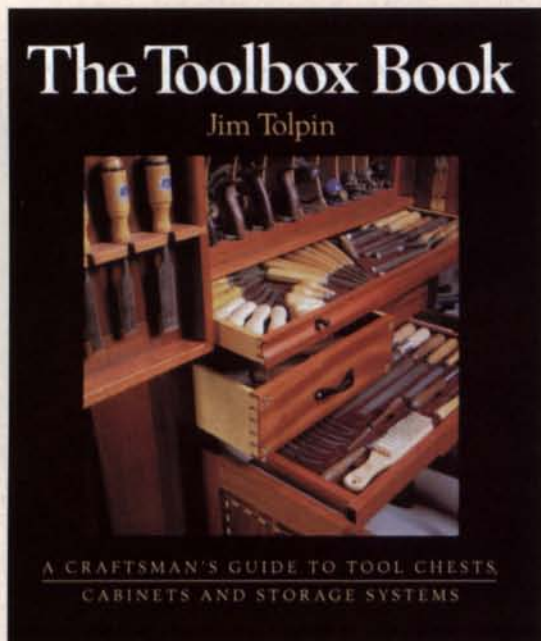
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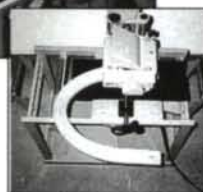
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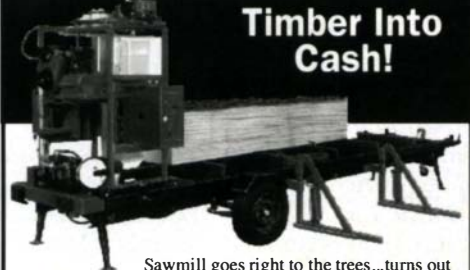
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READER SERVICE NO. 149

Debugging infested wood

I have pieces of wood infested with insects that I'd like to kill. Is there a chemical that I can enclose with the wood in a strong plastic bag that would penetrate the wood and take care of the problem? I don't have a fumigation chamber in my area, and a fumigation company would be costly.

—David Foos, Studio City, Calif.

Jon Arno replies: It's conceivable that nothing more than a few squirts of an aerosol insecticide in a tightly sealed plastic bag would suffice to kill whatever is infesting the wood. But there are some serious disadvantages to this approach. First, it might not work, depending on what it is that has infested the wood. Second, you will definitely succeed in impregnating the wood with potential toxins that you'll be exposed to later when you work with the wood. Unless the pieces of wood are too large to make it practical, I think the better solution is to use heat as the sterilizer.

Exposure to a sustained temperature of at least 180°F for two to six hours, depending on the thickness of the wood, is generally all that is needed to sterilize it. If you elect to try this approach, set the oven at a slightly higher temperature (190°F to 200°F), put the wood on a rack in the center and place a pan of water on the bottom of the oven to help maintain humidity. The higher the humidity the better because the required temperature needed for sterilization is lower. Higher humidity levels also reduce the wood's exposure to drying stress. While this technique may alter the appearance of some species, especially those containing water-soluble pigments, it is far less intrusive than introducing chemicals that could not only affect the working properties of the wood but also prove to be toxic.

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

Keeping rust off tools

I own an insulated but unheated two-car garage shop. The doors have been sealed with R-49 insulation, and I use the shop strictly for woodworking. My problem is that I've noticed small rust spots forming on tools and machines. The humidity is seldom as low as 30% to 35%. How do I get the humidity down when small consumer dehumidifiers don't work below 65°, and I will only occasionally heat my shop?

—Jim Boles, Savage, Minn.

Rick Groff replies: If you use an unvented heater to warm your shop while working, such as a kerosene or LP gas heater, and have the space well-sealed, you will add to the humidity level. In addition to heat, moisture is a by-product of combustion. Condensation also will occur when the warm air comes in contact with the cold surfaces of your tools and equipment.

My suggestion is to heat your shop during the winter months. When the shop's not in use, set the thermostat back to conserve fuel. You can use either a small furnace or self-contained heater. Make sure to pull your combustion air from outdoors. Some gas furnaces are already set up for sealed combustion. If you don't have natural gas available, opt for LP gas. Insulate the shop well, and eliminate drafts, but don't forget that you need a certain amount of oxygen to stay awake and alert. When you're enjoying the comfort of a heated shop, you also will thank yourself for improving the life span and condition of your equipment. You can factor the cost into your overhead.

[Rick Groff installs heating and cooling systems in Neffsville, Pa.]

Repairing a veneered tambour

The canvas from a tambour on an old desk top has split. The tambour is oak veneer on the outside, then canvas, then slats on the inside. The veneer is 1/16 in. thick and is in strips 3/4 in. by 44 in. After reading books on the subject of veneer, I found that you could get the veneer off by soaking it in water or placing wet cloths over it. I was able to get one section apart very

easily with this method. One part remains. I have enough experience with woodworking to know that I should be able to put this tambour back together. How do I go about it?

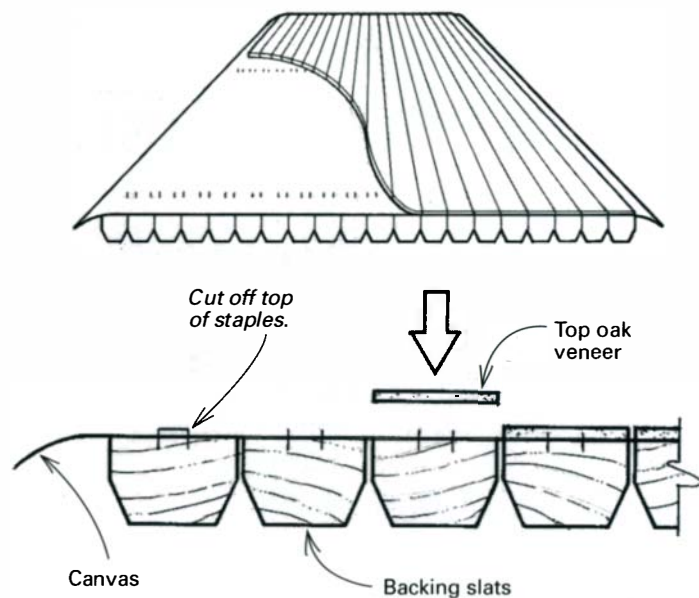
—Robert Girndt, Katy, Texas

Jeff Jewitt replies: In my restoration business, I have never run across the type of tambour construction that you mention in your letter. Most tambours are constructed with canvas glued to the back of the veneer, rather than the sandwich that you describe. Taking apart the top with water is fine, but use distilled water because the metal salts in tap water may discolor the oak. The addition of heat will accelerate the dismantling process. I use an old clothes iron set on low and place wet rags between the iron and the veneer.

Reusing the old veneer is fine, as long as it is not deteriorated. If you need to replace any piece, I would use white oak. And I would resaw it on a tablesaw or with a bandsaw because the veneer appears to be thicker than usual. If you cannot resaw your own, standard veneer of approximately 1/32 in. may be too thin, so you may have to glue two pieces together, or look for a woodshop that will cut the thicker veneer for you.

In reassembling the top, I suggest using the following procedure. Number all the top oak pieces and bottom pieces, so you can put them back in the same order. Purchase 12-oz. to 16-oz. canvas from a fabric supplier (look in the phone book under "textiles"). It would be a good idea to take a piece of the old canvas with you to match. Use prepared liquid hide glue such as the premixed brand by Franklin.

Repairing a veneered tambour



Rather than glue up the whole assembly at once, I think it would be far easier to glue each back slat and top veneer piece one at a time. The problem is to keep the top and backing slats from squirming out of position as you apply clamping pressure. To overcome this, place the first backing slat on a table, and apply some glue to the top. Cut a piece of the new canvas, allowing approximately 4 in. to 6 in. excess on all sides. Place the canvas over the top of the slat, and using a staple gun, drive a staple into the canvas.

Hold the gun loosely so that the staple does not seat firmly; you want the crown of the staple protruding about 1/32 in. (see the drawing above). Drive one staple at each end and in the middle. Then cut off the top of the staple with wire cutters. Apply glue to the oak veneer, and place it on top of the canvas, aligning it at the ends. When you apply clamps, the veneer will

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bite into the sharp points of the staples and will not squirm out of alignment. Let the glue dry several hours before removing the clamps. Repeat this sequence until you are done, trim the excess canvas and let the piece cure for at least 24 hours.

An alternative to the above procedure (and one that's far quicker) would be to use a vacuum-veneering bag. This allows you to glue up the entire assembly at one time. To keep the top square, make a bottom caul with two slats nailed at right angles. Place all the slats down, apply glue, then canvas and glue again. Then place the oak veneer on top, holding the edges with tape. Place a top caul over the whole assembly, and slide it into the vacuum bag. You can buy your veneer from Certainly Wood (11753 Big Tree Road, Route 20A, East Aurora, NY 14052; 716-655-0206) or from Constantine (2050 Eastchester Road, Bronx, NY 10461; 800-223-8087).

[Jeff Jewitt restores antique furniture in North Royalton, Ohio.]

Replacing lacquer with tung oil

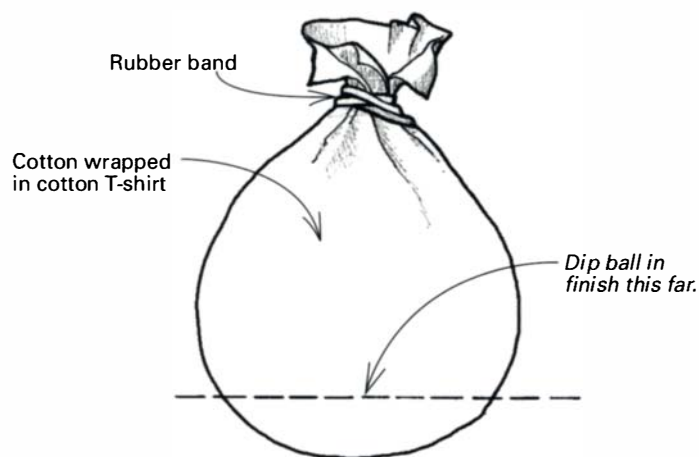
I have a cherry jewelry box finished with lacquer. Unfortunately, I dropped the box in a gravel parking lot and chipped the lacquer finish. The wood wasn't dented or marred, but the lacquer has several 1/4-in. or so chips. How can I refinish the damaged areas?

—John Kinne, Kootenai, Idaho

Tom Wisshack replies: Without actually seeing the box, it's hard to give a precise answer. But I can tell you that getting a flawless repair will be difficult if the lacquer has been built up to a fairly substantial depth. And often, the edges of a lacquer chip are white because the finish has been fractured. Without a complete furniture touch-up kit and fairly extensive knowledge, you'd be pretty disappointed with the results.

Instead, I'm going to encourage you to refinish your box and apply a completely different kind of finish. Personally, I don't like lacquer because to my eye it doesn't seem to "fit" the wood surface it's applied to. Strip the lacquer off your jewelry box with a good-quality paint and varnish remover, and then give it a scrub with medium steel wool and denatured alcohol. Go over it a final time with an alcohol-saturated cloth, so no trace of finish or residue is left on the wood. When it's dry, sand it with a hand-held sanding block and 320-grit sandpaper. Then follow up with 400-grit until the wood grain and color come into focus. Dust your project, and prepare for the finish.

Making a finisher's ball



I recommend using Formby's low-gloss tung oil. Apply a liberal coat to the entire box with a soft-bristled brush. After five minutes, remove the surplus oil with an old cotton T-shirt. Let the piece dry overnight. Subsequent coats can be applied with a wood finisher's ball, which is a piece of cotton T-shirt stuffed with cotton and tied with a rubber band (see the drawing above).

Dip the ball into the tung oil, and apply a light coat to one surface at a time, with the grain of the wood. When you're done, the strokes should be feather light; no application marks should be visible. Repeat this process, with overnight drying in between, four to six times. Wait for several days after the last coat, and give your jewelry box a final rubdown. Saturate a cotton cloth with mineral oil, and sprinkle it with a small amount of rottenstone abrasive powder. Give each surface a vigorous rub along the grain. Be careful around sharp corners, or you could rub through the finish. Test the surface from time to time by removing the paste from an area with a soft cloth. A satiny sheen as smooth as glass should be the result.

When the box is done, remove all traces of oil and rottenstone with soft cloths. I'm sure you'll be happy with the hand-rubbed tung-oil finish you've achieved.

[Tom Wisshack is an antique-furniture historian and finishing consultant in Galesburg, Ill.]

Color matching veneer to air-dried stock

I am building a rocking chair from black walnut that was salvaged from a tree cut on my property a number of years ago. I purchased walnut veneer for a curved portion on the back of the chair. My problem: The colors of the two kinds of walnut don't match. What stain can I use to correct the problem?

—F.W. Feekin, Taylors, S.C.

Jeff Jewitt replies: You're probably looking at the difference between air-dried and kiln-dried walnut. Air-dried walnut is a deeper chocolate color, with reddish undertones, and kiln-dried walnut is usually much cooler in color, with grayish undertones. Veneer is much like kiln-dried lumber, but it is lighter in color because it is boiled for as long as five days before slicing.

The color of the veneer can be matched to the rest of the chair using water- and alcohol-soluble dyes. This is the technique we use in our restoration business. Remember that the best results in matching a color are by using a layering technique. Build to the color you are trying to match in layers of color rather than trying to hit the color all in one shot.

First, wet a veneer sample and the air-dried sample with distilled water, so you can better visualize the color you need to duplicate. I warmed up the color of the veneer sample you sent me by applying a dilute honey-colored dye. I then applied a very dilute red-mahogany dye to get some of the red undertones.

When the wood dried, I began to apply finish, beginning with the sample of air-dried wood. The finish included sealer and topcoat. After that, it was a matter of finalizing the color of the veneer to this finished piece. Shellac was used as the sealer because alcohol-soluble dyes mix in well and allow me to shade coats for the final color match. I got the color I wanted by applying a dark shellac. Another way would be to add a dark-brown, alcohol-soluble dye to orange shellac. You can then topcoat the veneer with the finish that you used on the air-dried part of the rocker. If you choose an oil-based varnish, shellac or lacquer, be sure to allow for a slight deepening of color from the finish. You'll probably need to experiment on lots of scraps to get the feel for this technique.

Alcohol- and water-soluble dyes and shellac are available from a number of companies, including Woodcraft (210 Wood County Industrial Park, P.O. Box 1686, Parkersburg, WV 26102-1686; 800-225-1153) and Garrett Wade (161 Avenue of the Americas, New York, NY 10013; 800-221-2942).

[Jeff Jewitt restores antique furniture in North Royalton, Ohio.]

How deep will dye go?

Water-soluble dyes are said to penetrate deeply into the wood, but what is deep? Is it .005 in., or .030 in. or what? I've heard this a number of times, but no one is specific. I have a project in mind that would involve dyeing hard maple, face and edge

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grain, to a depth of .030 in. Is this possible, or is there some other method for an amateur woodworker?

—Ralph S. Easley, Cincinnati, Ohio.

Chris Minick replies: The depth of penetration of dye into a piece of wood is one of those things you get a feel for. Experience has taught me that softwoods absorb more stain than hardwoods. But I must admit that until you asked the question, I had never actually measured the depth of dye penetration into any kind of wood. To satisfy my curiosity and to make sure I've been correct all these years, I set up a quick experiment in my shop.

I selected three boards: yellow pine, basswood and hard maple. Each test sample was jointed flat, sanded to 180-grit and then colored with a water-soluble dye. The dye was mixed according to package directions—1 oz. of powder to 1 qt. of water. The test boards were kept visibly wet with the solution for about 30 minutes, dried with paper towels and allowed to sit overnight. Each board was then crosscut into several strips, and the dye penetration was measured with the aid of a high-powered microscope. On average, the depth of penetration was 7 to 10 mils (.007 to .010 in.) in yellow pine, 3-4 mils in hard maple and about 12 mils in the basswood.

I repeated this test with an oil-soluble dye and found penetration depths were about half that amount. It appears you will have a hard time dyeing hard maple to a depth of 30 mils in your shop. Perhaps you should consider using commercial "through-dyed" veneers instead. These veneers are produced by a heat and pressure process similar to that used for making pressure-treated lumber. The veneers are normally about 1/28 in. thick and are available by mail from Constantine (2050 Eastchester Road, Bronx, NY 10461; 800-223-8087).

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

Finishing the underside of a tabletop

I recently bought a drop-leaf dining table that I like very much. The table was made in Connecticut in 1952. The wood on the underside is very dry. On the underside of the leaves, the wood has chipped in a few places. Is there a way to preserve the wood by applying something to the underside of the table and leaves that would stop any further chipping?

—Heather Kendon, Tualatin, Ore.

Tom Wisshack replies: You didn't mention the kind of wood your table is made of or whether it's solid wood or veneer. First, in case the top and bottom are faced with veneer, you'll have to glue the loose areas, and replace whatever is missing. I'm assuming, though, that the table is made of solid wood.

It's not unusual for the underside of leaves on older tables to be unfinished, which does make them somewhat prone to drying out. It's a myth, however, to think that you can replenish the wood's natural oils by applying salad bowl or other oil-type finish. Though finishes of this kind come under the heading of penetrating oils, it's not likely that any of them will go deep enough into the wood to offer any protection or replenish the lost oils. I wouldn't use such a finish on the raw wood because it could cause irreversible darkening. It's wiser to use a finish that at some point in the future could be removed without affecting the wood in any way.

I'd recommend removing the finish from the underside of your table leaves (if there is finish present) with a good-quality paint and varnish remover. Follow up with a denatured alcohol scrub to remove any residue and to leave the wood free of any dirt or grease. Then apply shellac. Buy a can of premixed white shellac (I use Wm. Zinsser Co. shellac, which is available in most hardware or paint stores). Shellac is sold in different "cuts," which refers to how much dry shellac is added to a gallon of alcohol. To a 3-lb. cut of shellac, add about 50% denatured alcohol, and apply the shellac in three coats, letting each coat dry

about an hour. Shellac, though it cannot add moisture to your wood, will stabilize it and help prevent the atmosphere from taking its toll. To this shellac foundation, you can apply most finishes as a topcoat (polyurethane is an exception).

[Tom Wisshack is an antique-furniture historian and finishing consultant in Galesburg, Ill.]

Replacing a faulty switch

My problem is the faulty switches that are installed on some Taiwanese machines, such as tablesaws, jointers, planers and the like. Isn't there an American company that I can buy a quality switch from for my machines?

—Frank Rice, Kingsford, Mich.

Edward Cowern replies: I'm not aware of any domestic switch manufacturers that would have switches directly interchangeable with those used on Taiwanese woodworking machines. I think the best approach would be to complain to the importer, and try to get a no-charge replacement. If the importer balks, see how much a replacement switch would cost. I think most of the problems stem from quality control on the switches, and the new ones might last as long as the machine. This would be the easiest way to go.

Many offshore manufacturers are very concerned about the perceived quality of their tools and might be willing to provide a replacement at no charge just to make a customer feel more at ease with the product. However, if you do want to change and upgrade simultaneously, then you could use a domestic, manual motor switch like those made by Cutler Hammer (Eaton Corp., 4201 N. 27th St., Milwaukee, WI 53216; 414-449-6000). It would be necessary to route the power cord and motor wiring to the switch. There's also a possibility on larger machines of using a magnetic starter. This would give a little extra safety protection to the machine.

[Ed Cowern is an electrical engineer in Wallingford, Conn.]

Identifying a Stanley level

I recently acquired a wooden level that I would like to refurbish. The brass plate on the level is inscribed as follows: "Stanley Rule and Level Co., New Britain, Conn. USA." There is a "3" stamped in the wood between vials. The level is painted black, but the paint looks to be original. A combination of screws holds the brass end plates on, but those that look original are steel. Would steel have been used in this situation? It seems strange, as does the use of paint on the body of the level.

—Russ Vollmer, Pensacola, Fla.

John Walter replies: The level you have is a Stanley Model No. 3. Stanley usually marked its levels by stamping the number in the wood. Sometimes, model numbers were stamped in the brass top plate, or in the brass end caps. Some Stanley levels have no model numbers. The No. 3 was manufactured from 1859 to 1969. It was made of cherry and came in lengths from 18 in. to 30 in. long. Stanley never painted levels prior to the 1930s, and then they were done in bright colors such as red or orange. It's doubtful your level was painted black at the factory. It would have been lacquered originally.

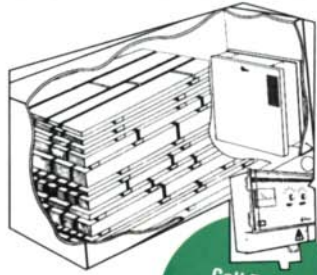
Stanley did indeed use steel screws for the cover plates and end caps, just as English manufacturers used on their levels and heavy brass bit braces. Your level is a descendant of what originally was a Hall & Knapp Co. product. Augustus Stanley purchased this well-known maker of levels and try squares in 1857. [John Walter is a dealer in antique and traditional woodworking tools and is the publisher of *The Stanley Tool Collector News* in Marietta, Ohio.]

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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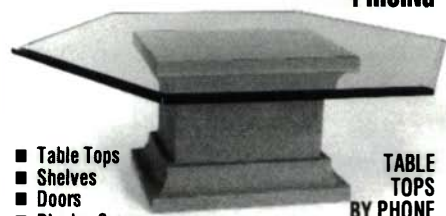
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23-980	10" Bench Grinder 1 HP	255	239
11-950	8" Drill Press	199	135
14-040	14" Drill Press	382	345
28-160	10" Hobby Band Saw	210	135
31-050	1" Belt Sander 2.0 amp	104	75
31-460	4" Belt/6" Disc Sander	198	129
31-340	1" Belt/8" Disc Sander	268	204
31-080	1" Belt/5" Disc Sander	134	89
40-560	16" 2 speed Scroll Saw	266	178
23-580	5" Bench Grinder 1/5 HP	68	49
11-990	12" Bench Drill Press	276	184
11-990	32" Bench Drill Press	399	305
43-505	1/2" Bench Router/Shaper	399	289
36-220	10" Compound Miter Saw	350	219
33-060	*Side Kick* Miter saw	510	389
14-070	14" Floor Drill Press	450	349
40-640	20" Bench Scroll Saw	466	295
36-090	10" Sidekick Miter Saw	293	225
37-070	6" var. speed Bench Jointer	337	258
20-150	14" Abrasive cut-off saw	375	219
28-180	10" Bench Band Saw	232	158
46-700	12" var. speed Wood Lathe	548	449

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37-190	NEW 6" Deluxe Jointer	554	479
36-275	NEW 8-1/4" Builders Saw	444	265
36-210	NEW 10" Compound Miter Saw	438	255
36-070	NEW 10" Miter Saw	284	165
36-540	NEW 10" Table saw	210	169
36-630	NEW 10" Contractor Saw II	700	579
34-555	NEW Sliding Table	459	345

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36-755	10" Tilting Arbor Saw 2 HP	1264	1015
33-990	10" Radial Arm Saw	818	695
37-280	6" Motorized Jointer	488	389
50-179	3/4 HP 2 stage Dust Collector	483	358
50-181	2 HP Dust Collector	835	659
34-670	10" motorized Table Saw	511	395
34-985	1/6 HP Stock Feeder	723	539
33-890	12" Radial Arm Saw 1-1/2 HP	1829	1495
43-355	1/2" & 3/4" Shaper 1-1/2 HP	964	795
17-900	16-1/2" Floor Drill Press	462	399
34-080	10" Miter box	Xtra Special	194
33-055	Sawbuck complete w/legs	865	625
32-100	Stationary Plate Jointer	645	255
36-040	8-1/4" Compound Miter Saw	224	149
40-601	18" Scroll Saw w/stand & blades	1003	819
28-560	16" Band Saw 1/2 HP 3 wheel	487	465
70-200	20" Drill Press	1011	809
36-905	30" Delta Unifence	385	249
34-897	50" Delta Unifence	525	299
28-245	14" Band Saw w/open stand 1/2 HP/19	598	
22-661	13" Planer w/ 2 HP motor w/stand 1513	1215	
37-154	DJ156 Jointer w/ 3/4 HP motor	1451	1215
36-380	10" Table Saw - XL10	525	419
34-444	Table Saw complete with 1-1/2 HP motor & stand	812	649
28-283	14" Band Saw w/ enclosed stand	910	779
34-445	34-444 Saw with 30" unifence	1200	829

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Model	Description	Hook Tth. List	Sale
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35-616	Crosscut 10"	12" 60	55 44
35-617	Combo 10"	15" 60	54 43
35-619	Slide Cmpd/Rad Arm 10"	6" 60	63 49
35-624	Super Outf 10"	10" 80	78 59
35-031	Professional Grade 10"	15" 40	22 15

EXCALIBUR Fences & Tables			
TT45R24L9	24" Fence	369	309
TT45R50L12	50" Fence	399	325
EXSLT30	Sliding Table - 40" crosscut	599	485
EXSLT60	Sliding Table - 62" crosscut	745	595

BIESEMEYER FENCES			
B-50	50" Commer. Saw Fence	345	298
T-SQUARE 52	52" Homeshop Fence	279	238
T-SQUARE 40	40" Homeshop Fence	259	208
T-SQUARE 28	28" Homeshop Fence	249	198

FORREST BLADES			
WW10407125	10" Carbide blade - 40 tooth	156	99
WW10607100	10" Carbide blade - 60 tooth	162	109
DK08243	"Dado King" - 8" Carbide blade	299	259

JORGENSEN CLAMPS			
Model	Opening	List	Sale
3410	10"	15.95	11.95
3416	16"	17.20	12.75
3422	22"	18.40	13.25
3428	28"	20.00	14.50

ADJUSTABLE HANDSCREWS			
Item#	Jaw Length	Opening Capacity	Box of 6
#0	8"	4-1/2"	19.76
#1	10"	6"	22.63
#2	12"	8-1/2"	25.95
#3	14"	10"	32.88
#4	16"	12"	42.76

STYLE 37 2-1/2" Throat 1/4"x3/4" Bar			
Item#	Bar Length	List	Box of 6
3706	6"	10.65	62.50
3712	12"	11.80	67.25
3718	18"	13.00	74.50
3724	24"	14.25	82.50
3730	30"	15.88	85.85

STYLE 45 5" Throat 1-3/8" x 5/16" Bar			
Item	Bar Length	List	Box of 6
4512	12"	33.17	19.95
4518	18"	34.97	21.45
4524	24"	37.02	22.75

PONY CLAMP FIXTURES			
Model	Description	List	Sale
50	3/4" Black Pipe Clamps	14.87	7.80
52	1/2" Black Pipe Clamps	12.40	6.70

STEEL "I" BAR CLAMPS			
Model	Size	List	Box of 6
7224	24"	34.36	19.50
7236	36"	36.88	21.50
7248	48"	40.54	23.50
7272	72"	46.64	28.50

SKIL			
Model	Description	List	Sale
1605-02	Biscuit Joiner with case	221	139
2735-04	12 V cordless Drill kit with 2 batt	249	144
2736-04	2735-04 w/keyless chuck	269	148
5825	6-1/2" Worm Drive Saw	257	165
5660	8-1/4" 60" Circular Saw	238	149
5510	5-1/2" Circular Saw	166	119
5860	8-1/4" 60" Worm Saw	282	174
5790	10-1/4" Circ. Saw 15 amp	472	318
5657	7-1/4" Circ Saw - pivot foot	205	118
5525	6-1/2" Circ Saw - big capacity	173	115
3400	10" Table Saw - Bench Top	270	189

SKIL WORM DRIVE SAW SPECIAL
77 Famous 7-1/4" Worm Drive Saw.....Sale 144
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Model	Description	Teeth	List Sale
LU72M010	General Purpose 10"	40	69 39
LU82M010	Cut-off 10"	50	93 45
LU84M011	Combo 10"	60	78 42
LU85M010	Super Cut-off 10"	80	115 59
LMT2M010	Ripping 10"	24	69 38
LU73M010	Cut off 10"	60	84 45
LU87M010	Thin Kerf 10"	24	72 39
LU88M010	Thin Kerf 10"	60	88 45
LU85M015	Mitre Saw blade 15"	108	175 99
LU91M010	Compound Miter Blade	60	88 54
LU98M010	Ultimate 10"	80	128 68
LU89M010	Non-Ferrous metal 10"	72	104 58
F410	Whisper Blades 10"	40	95 49
F810	Whisper Blades 10"	80	135 74
TK206	10" Framing - 24 tooth	39	25
TK303	7-1/4" Finishing - 40 tooth	38	22
TK306	10" Finishing - 40 tooth	47	29
TK903	7-1/4" Combo - 30 tooth	33	19
TK906	10" Combo - 50 tooth	53	32
SD306	6" Dado - Carbide	215	112
SD308	8" Dado - Carbide	230	119
SD506	6" Super Dado carbide w/ case	292	155
SD508	8" Super Dado carbide w/ case	344	168
WC110	10 piece Chisel set w/ case 1/4" - 1-1/2"	143	92
FB107	7 piece Forstner bit set w/ case 1/4" - 1"	92	58
FB100	16 piece Forstner bit set w/ case 1/4" - 2-1/8"	338	189
94-105	5 piece Router bit door system w/ case	320	159

FREUD POWER TOOLS			
Model	Description	List	Sale
EB100	Edge Banding Machine	409	209
EDS132	13V Cordless Drill Kit w/ 2 batteries	415	209
JS102	NEW Biscuit Jointer w/adj fence & cse355	179	179
TR215	8-1/2" Slide Compound Miter Saw	688	369
JS100	Biscuit Jointer w/ case & 1000 biscuits	334	164
FT2000E	3-1/4 HP Plunge Router var. speed	410	205

FT2000E comes with FREE FT2010 Guide.

HITACHI TOOLS			
Model	Description	List	Sale
C8FB	8-1/2" Slide Compound Saw	400	575
FREUD	LU81M008 8-1/2" carb. blade 48 tooth	Sale	54
C10FS	NEW 10" Slide Compound Saw	1595	825
C7BD	7-1/4" Circular Saw with brake	258	135
M12V	3 HP variable speed Router	476	239
TR12	Plunge Router 3 HP	389	188
SB-75	3 x 21 Belt Sander w/ bag - 2 speed	278	155
P12R	12-9/32" Planer	1470	789
P12RA	12-9/32" Planer 6-1/8" Jointer	1940	989
C10F	NEW 10" Miter Saw	432	255
P20SB	3-1/4" Planer 3.4 amp	179	95
C15FB	15" Mite Saw	1320	675
G12SA	4-1/2" Volt cordless 6.9 amp	160	89
DS10VAK	12 volt dds Drill Kit w/ 2 batteries	393	199

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NV45AB	Coil Roofing Nailer 7/8" - 1-3/4"	750	419
NV83A	Coil Nailer 2" - 3-1/4"	750	419
N5008AA	7/16" Stapler - 16 ga. 1" - 2" lgh	580	325

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2200	Pump Jack	79	58
2201	Pump Jack Brace	30	20
2203	Pump Jack guard rail holder	31	21
2204	Work Bench & rail holder combo	53	39

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SM-PR2	2 FT Level with sensor	120	88
SM-PR4	4 FT Level with sensor	150	105
SM-PR6	78" Level with sensor	180	139

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HBSE75S	3" x 21" var. speed Belt Sander	309	178
ABSE15S	1/2" cds 12V Drill complete w/cse	403	178
FSPE100X	NEW Barrel Grip Jig Saw w/ case	274	159
BSPE100X	NEW Top Handle Jig Saw w/ case	286	159
TXE150	6" var/spd Rand Orb Sander	304	139
SKS300	10" Compound Miter Saw	1019	599

DREMEL TOOLS			
3950	Moto Tool Kit with bits & case	134	79
3952	Super Moto Tool Kit with accessories	152	95
1672	16" Scroll Saw - 2 speed "Best Buy"	302	174
1695	NEW 16" var. speed Scroll Saw	408	229

FEIN			
Msx636	Oscillating Triangle Sander	Sale	185
Msx625	NEW Air Triangle Sander	Sale	189

PONY			
LPN672	Air Palm Nailer with glove	Sale	94.99

DUO-FAST AIR NAILERS			
BB-4440	Brad Nailer 1/2" - 1-1/4"	336	199
LFN-764	Finish Nailer 1" - 2"	564	339
RCN-60/225	Coil Roofing Nailer	740	459
CN-350	Framing Nailer - Full Head	704	455
CN-325	Framing Nailer - Clip Head	670	429

ACCU-MITER			
18-34	Professional Miter Gauge	149	145

WISE GRIP Quick Grip Clamps			
Model	Description	Size	List Sale
00506	Quick Grip clamp	6"	22.60 15.50
00512	Quick Grip clamp	12"	27.25 18.65
00518	Quick Grip clamp	18"	29.50 20.65
00524	Quick Grip clamp	24"	31.95 21.75
00536	Quick Grip clamp	36"	36.30 24.95

BLACK & DECKER			
Model	Description	List	Sale
1166	3/8" Drill 0-2500 rpm 4 amp	118	68
2600	3/8" Drill rev. 0-1200 rpm 4.5 amp	167	98
1180	3/8" Drill rev. 0-1200 rpm 5 amp	207	119
1349-09	1/2" Timberwolf Drill 2 speed	551	309
2037	Drywall Gun 0-4000 5.0 amp	184	95
2038	Drywall Gun 0-2500 rpm 5 amp	184	95
2054	Tek Gun 0-2500 5.0 amp	287	159
2750	4-1/2" Grinder 10,000rpm 6 amp	156	89
79-033	Workmate 300		

DEWALT

Model	Description	List	Sale	Model	Description	List	Sale
DW250	4.5amp Drywall Gun, 0-4000 rpm, rev.....	169	94	DW100	3/8" Drill, 4 amp, 0-2500 rpm, rev.....	118	68
DW254	4.5 amp Drywall Gun, 0-2500 rpm, rev.....	169	94	DW280K	NEW Screwdriver kit complete.....	207	124
DW944K-2	3/8" 9.6V cordless drill kit w/2 batteries.....	283	165	DW318K	Top Handle Jig Saw with case.....	277	159
DW945K-2	3/8" 12V cordless drill kit w/2 batteries.....	309	179	DW402	4-1/2" Grinder 6 amp.....	158	92
DW364	7-1/4" Circ. Saw with brake, 13 amp.....	285	158	DW614	NEW 1-1/4 HP Plunge Router.....	290	145
DW306K	8.0 amp Recip Saw with case var. speed.....	291	164	DW615	1-1/4 HP Electronic Plunge Router.....	290	164
DW610	1-1/2 HP 2 handle Router.....	274	149	DW624	3 HP Plunge Router.....	441	245
DW411	1/4 sheet Palm Sander, 1.7 amp.....	57	58				
DW705	12" Compound Miter Saw.....	706	359				
DW704	12" Miter Saw.....	570	325				
DW420	NEW Palmgrip Random Orb Sander.....	120	69				
DW421	above Sander with dust collector.....	138	79				
DW930K	NEW 12 volt 5-3/8" Trim Saw kit.....	370	199				
DW444	NEW 6" Random Orbit Sander - PSA pad.....	266	149				
DW443	NEW DW444 with hook & loop pad.....	266	149				
DW673K	NEW Laminate Trimmer kit.....	364	215				

SUPER SPECIAL

DW682K Biscuit Joiner with case..... Sale 219

SUPER SPECIAL

DW935K NEW 14.4 volt 5-3/8" Trim Saw kit Sale 239
Includes FREE DW9054 24 tooth carbide blade

RYOBI

Model	Description	List	Sale	Model	Description	List	Sale
JP-155	6-1/8" Jointer/Planer.....	700	305	TSS220	8-1/2" Slide Compound Saw.....	966	455
TS-254	10" Miter Saw.....	440	209	TS5200	NEW 8-1/2" Slide Compound Saw.....	900	419
RE600	3 HP Plunge Router var speed.....	500	228	TS260	10" Compound Miter Saw.....	486	239
R75	NEW 1-3/4 HP Plunge Router.....	158	95	TR30U	3/4 HP Trimmer.....	174	68
RE175	NEW 1-3/4 HP var/spd Plunge Router.....	210	124	DS1000	Detail Sander.....	90	44
BE321	3" x 21" var. speed Belt Sander.....	310	148	DS2000	NEW Detail Sander - 2 speed.....	112	64
SC160	16" Bench Scroll Saw.....	282	135	DC500	NEW Detail Carver.....	120	64
SC162VS	NEW 16" var. speed Scroll Saw.....	298	169	RS112	Palm grip Random Orb Sander.....	90	55
TFD172VRK	9.6 volt cordless Drill Kit w/2 batteries.....	330	139	RS115	4-1/2" v/spd Random Orbit Sander.....	136	74
TFD222VRK	12 volt cordless Drill Kit w/2 batteries.....	365	155	AP12	12" Bench Planer.....	884	395
TF100	Flashlight uses 7.2, 9.6, or 12V battery.....	9.95		JS45	Top Handle Jig Saw variable speed.....	98	59
JM100K	Biscuit Joiner with case.....	475	218	TDS4000K	12V Drywall Gun Kit.....	420	129
BT3000	10" Table Saw with stand.....	1125	529	RA202	8-1/4" Bench Radial Arm Saw.....	800	389
				BS900	9" Bench Band Saw.....	340	165
				IDV28	28 Gal. Industrial Dry Vac.....	225	119
				BMM240024	volt Mulching Mower.....		
				W660C	7-1/4"Circ Saw 13 amp.....	184	79
				ML618	NEW Mini Lathe variable speed.....	418	225

SUPER SPECIAL

OSS450 NEW Oscillating Spindle Sander...Sale 159

PANASONIC

Model	Description	List	Sale	Model	Description	List	Sale
EY6205EQK	Same as EY6205BC but comes with 2 batteries.....	368	192	EY6181CRKW	NEW 9.6V PREDATOR Compact Drill Kit.....	305	165
EY6207EQK12V	1/2" Drill w/ keyless chuck var. speed w/ 15 min. charger, case, & Ironman battery.....	420	229	EY6100CRKW	NEW 12V PREDATOR drill kit with 2 batteries, 1 hr charger, & case.....	358	188
EY6282EQK	Var. spd 9.6 volt Drill with 15 min. charger, case, and NEW Ironman battery.....	315	169	EY6100CQKW	Same as EY6100CRKW but has 15 minute charger.....	420	198
EY62821DKW	9.6 volt Drill Kit w/2 batteries.....	395	162	EY6100EQK	NEW 12V PREDATOR drill kit w/NEW Ironman battery, 15 min. charger, & case.....	375	199
				EY6100EQKW	Same as EY6100EQK but with 2 Ironman batteries.....	473	225

Ironman Battery - Battery has 40% more life and 20% more torque!

WERNER LADDERS

Introducing a full range of Werner brand ladders at discounted prices! Werner ladders - A name you can stand on.

FIBERGLASS STEP - TYPE 1- 250# RATING

Model	Width	Spans	to Rung	Sale
6004	4'	2 rung	2 rungs	55.95
6005	5'	2 rung	2 rungs	66.95
6006	6'	3 rung	3 rungs	69.95

FIBERGLASS STEP - TYPE 1A- 300# RATING

Model	Width	Spans	to Rung	Sale
6004-S w/pail shelf	4'	15#	15#	61.95
6005-S w/pail shelf	5'	18#	18#	71.95
6006-S w/pail shelf	6'	20#	20#	76.95

FIBERGLASS STEP - TYPE 1A- 300# RATING

Model	Width	Spans	to Rung	Sale
6204	4'	14#	14#	63.95
6205	5'	18#	18#	75.00
6206	6'	20#	20#	86.95

ALUMINUM LADDER JACKS

Must be installed on Type 1 or Type 1A ladders only

Model	Width	Spans	to Rung	Sale
10-14-02	14"	2 rung	2 rungs	76.95
10-20-02	20"	3 rung	2 rungs	83.95
10-20-03	20"	3 rung	3 rungs	93.95

Buy any 3 ladders (can be assorted) deduct additional 5% Prepaid Freight and best prices too!

ALUMINUM FLAT STEP TYPE 1- 250# RATED EXTN.	Model	Size	Working Length	Weight(lbs)	Sale
D1316-2	16'	13'	26'	26#	134.95
D1320-2	20'	17'	32'	32#	159.95
D1324-2	24'	21'	39#	39#	183.95
D1328-2	28'	25'	50#	50#	204.95
D1332-2	32'	29'	62#	62#	244.95
D1336-2	36'	32'	77#	77#	295.95
D1340-2	40'	35'	85#	85#	324.95

ALUMINUM FLAT STEP TYPE 1A- 300# RATED EXTN.	Model	Size	Working Length	Weight(lbs)	Sale
D1516-2	16'	13'	31#	31#	159.95
D1520-2	20'	17'	37#	37#	179.95
D1524-2	24'	21'	45#	45#	209.95
D1528-2	28'	25'	56#	56#	234.95
D1532-2	32'	29'	66#	66#	274.95
D1536-2	36'	32'(250# rating)	79#	79#	305.95
D1540-2	40'	35'(250# rating)	89#	89#	354.95

FIBERGLASS FLAT STEP TYPE 1A- 300# RATING

Model	Width	Spans	to Rung	Sale
D6116-2	16'	13'	34#	189.95
D6120-2	20'	17'	40#	209.95
D6124-2	24'	21'	53#	239.95
D6128-2	28'	25'	60#	284.95
D6132-2	32'	29'	74#	364.95

FIBERGLASS FLAT STEP TYPE 1A- 300# XTRA HEAVY

Model	Width	Spans	to Rung	Sale
D7116-2	16'	13'	37#	219.95
D7120-2	20'	17'	43#	259.95
D7124-2	24'	21'	58#	290.95
D7128-2	28'	25'	66#	324.95
D7132-2	32'	29'	79#	389.95

DAVID WHITE

Model	Description	List	Sale
LP6-20	Sight level package - 20x.....	310	205
LP6-20XL	LP6-20 w/9056 tripod & 7620 rod.....	375	265
L6-20	Meridian Level - 20x.....	290	188
LT8-300L	Level Transit - 26x.....	695	439
LT8-300P	above Level w/optical plummet.....	821	518
LT6-900L	Level Transit - 20x.....	389	254
LTP6-900	above Level with tripod & rod.....	601	385
ALTP6-900	Automatic Level - Transit - 18x.....	638	395
	above level w/9066 tripod and 7620 rod.....	708	495
AL6-18	Automatic level - 18x.....	449	315
ALP6-18HD	above level w/tripod and rod.....	570	385
ALP8-20	NEW Automatic level 20x with tripod & rod.....	710	429
AL8-22	Automatic Level - 22x.....	599	399
AL8-26	Automatic Level - 26x.....	854	569
ALP8-26	above Level w/9075 tripod and 7620 rod.....	977	645
ML100I	NEW Laser Level.....	1099	945
ML100	NEW Laser Level w/detector.....	1249	1075

AIRY AIR NAILERS

Model	Description	List	Sale
0241SK	Brad Nailer 3/8" - 1-9/16".....	180	98
	Same as Senco SLP-20.....		
0250SK	Brad Nailer 3/4" - 2".....	296	164
0626SK	1/4" Crown Stapler 3/8" - 1".....	194	104
EZ-1	New Multi-Purpose Nailer & Stapler.....	180	98
	Above nailers come with case, fasteners, oil, and wrenches		
0565T	Angle Finish Nailer 1" - 2-1/2".....	386	205
8290	Framing Nailer 2" - 3-1/2".....	475	319

Airy nailers use Senco brand fasteners

PORTA NAILERS

Model	Description	List	Sale
401	Porta Nailer complete.....	265	205
501	Face Nailer complete.....	265	205
1000	Genuine Porta Nails 1000 Qty.....	15.89	
5000	Genuine Porta Nails 5000 Qty.....	71.50	
10,000	Genuine Porta Nails 10,000 Qty.....	121.85	

Most Tools In This Ad Shipped Federal Express for \$9.00!

SEE NEXT PAGE FOR MORE SPECIALS!

PORTER CABLE

ROUTERS				SANDERS				DRILLS				BISCUIT JOINER			
Model	Description	List	Sale	Model	Description	List	Sale	Model	Description	List	Sale	Model	Description	List	Sale
690	1-1/2 HP Router 10 amp.....	260	138	351	3"x21" Belt Sander without bag.....	280	154	7556	1/2" Right Angle 330/700rpm Drill w/cse.....	385	224	550	Pocket cutter with case.....	330	179
9690	690 Router w/steel case.....	305	145	352	3"x21" Belt Sander with bag.....	290	159	666	0-1200 rpm 3/8" var. speed Drill 4 amp.....	230	128	5554	1000 Assorted Biscuits.....	29	
691	1-1/2 HP Router D handle.....	285	155	352VS	3" x 21" Belt Sander var. speed w/case.....	305	169	7557	3/8" variable speed angle Drill.....	295	195	5553	1000 #20 Biscuits.....	29	
695	1-1/2 HP Router/Shaper.....	400	223	360	3"x24" Belt Sander with bag.....	365	198	97751	1/2" var. speed Hammer Drill w/case.....	270	155	5552	1000 #10 Biscuits.....	29	
696	Heavy Duty Shaper Table.....	230	129	361	3"x24" Belt Sander without bag.....	345	189	2620	3/8" HD var. speed Drill 0-1000 rpm.....	185	88	5551	1000 #0 Biscuits.....	29	
100	7/8 HP Router.....	190	109	362	4"x24" Belt Sander with bag.....	380	205	6611	New 3/8" Drill 0-1000 rpm 5.5 amp.....	220	122				
5008	Dovetail Template kit.....	130	85	363	4"x24" Belt Sander without bag.....	360	195	6614	New 1/2" Drill 0-750 rpm 5.5 amp.....	230	125				
5009	Mortise & Tenon Jig.....	75	48	503	3"x24" Belt Sander w/bag Worm Drive.....	582	359	9852	New 6614 with keyless chuck.....	230	125				
693	1-1/2 HP Plunge Router.....	320	174	504	3"x24" Belt Sander Worm Drive.....	565	349	9853	12 volt 3/8" Drill w/cse 0-400/0-1000 rpm.....	280	154				
6931	Plunge Router Base.....	125	77	7400	7" Vertical Grinder 12 amp.....	260	145	9853K	9853 Drill Kit with extra battery.....	Sale	164				
5116	16" Omni-Jig.....	470	258	7401	7" Polisher 8 amp.....	270	149	9855	12V 1/2" Drill w/cse 0-350/0-1000 rpm.....	335	188				
7116	24" Omni-Jig.....	635	294	7403	6" Power Paint Remover 8 amp.....	290	165	8500	12 volt battery for above Drills.....	69	45				
7310	5.6 amp Laminate Trimmer.....	165	95	7402											

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MAKITA

CORDLESS			
Model	Description	List	Sale
6070DW	3/8" var. speed rev. Drill 7.2 volt.....	128	64
6071DWK	with removable battery 7.2 volt.....	216	125
5090DW	3/8" Panel Saw 9.6 volt.....	270	145
6010DWK	3/8" Drill Kit 7.2 volt.....	182	105
4390DW	9.6 volt Recipro. Saw Kit.....	258	148
ML900	Incandescent Flashlight 9.6 volt.....	37	37
6172DWE	7.2V 3/8" var. spd Drill Kit w/ 2 batt	220	109
T220DW	Cordless Stapler Kit 9.6 volt.....	370	198
DA391DW	3/8" angle Drill Kit 9.6 volt.....	312	179
6012HDWE	9.6V 2 speed Drill Kit w/ 2 batteries	243	135
6093DW	9.6V var./speed Drill Kit complete	283	135
6093DWE	6093DW Drill Kit with 2 batteries	270	139
6095DW	6093DW Kit with keyless chuck.....	291	135
6095DWE	6095DW Drill Kit w/2 batteries.....	270	139
6095D	6095DW Drill only and case.....	Special	79
6201DWE	9.6V Drill Kit with 2 batteries.....	298	155
6211DWE	12V "Mac Pak" Drill Kit w/2 batteries	330	169
6011DWE	12 volt Drill Kit w/2 batteries.....	330	165
632007-4	9.6 volt Battery.....	47	30
632002-4	7.2 volt Battery.....	39	28

SAWS			
Model	Description	List	Sale
5007NBA	7-1/4" Circ. Saw w/electric brake.....	263	135
JR3000V	Var. speed Recip. Saw w/wcase.....	252	135
9820-2	Blade Sharpener.....	394	209
24101BV	Orb var. speed Jig Saw 3.5 amp.....	292	158
4214B	14" Cut-off Saw AC/DC.....	403	225
4320	Var. spd economy Jig Saw 2.9 amp	156	98
LS1030	10" Mitre Saw.....	428	229
2708W	8-1/4" Table Saw.....	585	298
2711	10" Table Saw with brake.....	1067	569
5077B	7-1/4" Hypoid Saw.....	281	155
5007NB	7-1/4" Circular Saw 13 amp.....	232	124
5007NBK	5007NB Saw w/ plastic case.....	Sale	129
LS1211	New 12" Slide Compound Saw.....	1550	865
LS1011	10" Slide Compound Saw.....	Sale	525

ROUTERS / PLATE JOINERS			
Model	Description	List	Sale
3606	2 Handle Router 1 HP.....	180	109
3621A	1-1/4 HP Plunge Router w/case.....	220	135
3901	NEW Plate Joiner w/case.....	382	219

GRINDERS			
Model	Description	List	Sale
N9514B	4" Grinder 4.6 amp.....	111	65
N9501B	4" Grinder 4.0 amp with case.....	168	99

DRILLS			
Model	Description	List	Sale
6402	3/8" Drill 0-1200 rpm 5.2 amp.....	199	112
6404	3/8" Drill 0-2100 rpm 2.8 amp.....	112	65
6510LVR	3/8" Drill 0-1200 rpm 3.5 amp.....	168	98
6302	1/2" Drill 0-550 rpm 5.2 amp.....	228	129
6A13BR	1/2" Drill 550 rpm 6 amp.....	280	149
DA3000R	3/8" angle Drill 0-1400 rpm.....	314	179
HP2010N	1/2" v/spd Hammer Drill w/cse.....	335	199

DRYWALL GUNS			
Model	Description	List	Sale
6820V	0-4000 rpm 5.2 amp.....	171	99
6802BV	0-2500 rpm Screwdriver 4.8 amp.....	223	135

SANDERS			
Model	Description	List	Sale
BO4530	6" Round Sander.....	117	68
BO4550	1/4 sheet Pad Sander w/bag.....	98	52
9900B	3"x21" Belt Sander w/bag 7.8amp.....	344	175
9924DB	3"x24" Belt Sander with bag.....	329	184
9401	4"x24" Belt Sander with bag.....	378	229
GV5000	5" Disc Sander.....	123	79
9207SPC	7" Sander-Polisher 1500-2800 rpm	350	189
BO5001	NEW 5" Random Orbit Sander.....	120	69

PLANERS			
Model	Description	List	Sale
2012	12" portable Bench Planer 12amp.....	959	625
N1900B	3-1/4" Planer with case.....	244	129

BOSCH

ROUTERS			
Model	Description	List	Sale
1608	5.6 amp Laminate Trimmer.....	168	99
1608LX	same as above w/trimmer guide.....	191	110
1608T	5.6 amp tilt base Trimmer.....	191	104
1609	5.6 amp offset Base Trimmer.....	239	145
1609K	Laminate Installers Kit w/1609.....	343	189
1608U	Underscribe Laminate Trimmer.....	227	145
1609KX	Same as 1609K&Underscribe base	405	234
1601A	1 HP Router 25,000 rpm.....	191	119
1604A	1-3/4 HP 2 handle Router.....	250	142
1604AK	same as above w/case & access.....	318	185
1606A	1-3/4 HP D handle Router.....	295	184
1613	1-3/4 HP Plunge Router.....	316	169
1613EVS	2 HP v/spd Plunge Router.....	359	199
1614	1 HP Plunge Router.....	245	149
1614EVS	1-1/4 HP v/spd Plunge Router.....	283	159
1615	3 HP Plunge Router.....	430	245
1615EVS	3 HP var. spd Plunge Router.....	505	285
B1650K	NEW Biscuit Joiner.....	Sale	155

SAWS			
Model	Description	List	Sale
1587VS	NEW Top Handle "CLIC" Jig Saw.....	292	149
1587DVS	above saw with dust collection.....	295	194
1584VS	NEW "CLIC" Barrel Grip Jig Saw.....	285	149
1584DVS	above saw with dust collection.....	295	189
BC	Bosch metal case for above Jig Saws.....	32	
BBA	30 of Bosch's best Jig Saw blades.....	28.99	
1632VSRK	Recip Saw 8.4 amp Orb var spd.....	225	159
1655	7-1/4" Circular Saw.....	210	125
B4050	NEW In Line Jig Saw.....	199	115

SUPER SPECIAL
1584VS or 1587VS with steel case and 30 Bosch Blades..... Sale 189

GRINDERS			
Model	Description	List	Sale
1347AK	4-1/2" Grinder with case & access.....	185	109
1348AE	5" Grinder 8.5 amp.....	225	129
B9250	NEW 5" v/spd Grinder - 8.5 amp.....	263	159

SANDERS			
Model	Description	List	Sale
1272D	3"x 24" Belt Sander with bag.....	375	209
1273D	4"x 24" Belt Sander with bag.....	380	215
1273DVS	Var. speed 4"x24" Belt Sander.....	415	225
3270DVS	3" x 21" v/spd Belt Sander w/bag.....	270	165
3283DVS	5" Random Orbit Sander.....	169	98
3283DVSX	above sander w/discs and case.....	199	118
1370DEVS6	6" Random Orbit Sander.....	427	234
1289D	1/4 sheet Sander with bag.....	107	68
B7000	NEW Corner Detail Sander.....	122	68
B7001	NEW Corner Detail Sander -var/spd.....	156	95

DRILLS			
Model	Description	List	Sale
1195VSR	3/8" var. speed Hammer Drill.....	229	135
1194VSR	1/2" var. speed Hammer Drill.....	282	155
1194VSRK	Same as above with case.....	313	169
11212VSR	"Bulldog" 3/4" SDS Rotary w/cse.....	390	209
11304	"The Brute" Breaker Hammer.....	2240	1199
11305	Demolition Hammer 10 amp.....	1199	739
3050VSRK	9.6 volt cdis Drill Kit w/2 batteries.....	288	149
3051VSRK	3050VSRK with keyless chuck.....	299	149
3054VSRK	12V Cordless Drill Kit w/2 batteries	330	185
3300K	NEW 12V Drill Kit w/ 2 batteries.....	348	199
3310K	NEW 12V T-handle Drill Kit w/2 batt.....	348	199
3110K	NEW 9.6V T-handle Drill Kit w/ 2 batt	320	185
1021VSR	3/8" Drill 4.8 amp 0-1100 rpm.....	203	112
1023VSR	1/2" Drill 4.8 amp.....	227	119
1942	Heat Gun 600° - 900°.....	125	78
11310EVS	Demolition Hammer.....	879	535
11222EVS	NEW 1-1/8" SDS Rotary w/cse.....	849	409
11220EVS	1-1/2" Spline Hammer Drill.....	889	489
1420VSR	Drywall Gun 4.8 amp 0-4000 rpm.....	179	98

NEW SDS Max Rotary Hammer Drills			
Model	Description	List	Sale
11230EVS	NEW SDS-max 1-1/2" Rtry Hmr.....	885	525
11231EVS	NEW SDS-max 1-3/4" Rtry Hmr.....	1336	809
11232EVS	NEW SDS-max 2" Rotary Hmr.....	1548	929
11311EVS	NEW Demolition Hammer var/spd.....	1289	739

3M SANDING CENTER

3M Quality abrasives at low prices!

SANDING BELTS

Open Coat, Resin bond

Grit	Box/10	Case/50
120x	16.30	77.40
100x	16.30	77.40
80x	16.75	79.50
60x	17.40	82.65
50x	17.40	82.65
40x	18.60	88.35
36x	19.25	91.40

Grit	Box/10	Case/50
120x	17.50	83.00
100x	17.50	83.00
80x	18.00	85.50
60x	18.65	88.50
50x	19.25	91.40
40x	20.35	96.60
36x	20.90	99.30

Grit	Box/10	Case/50
120x	28.90	137.20
100x	28.90	137.20
80x	29.40	139.65
60x	30.25	143.50
50x	30.80	146.30
40x	31.90	151.50
36x	33.00	156.75

Grit	Box/10	Case/50
100x	7.25 ea.	
80x	7.25 ea.	
60x	7.70 ea.	
50x	8.00 ea.	
40x	8.40 ea.	
36x	8.75 ea.	

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PURPLE SANDING BELTS

Reversible for twice the life!

Grit	Box/5	Case/25
120DP	9.30	39.50
100DP	9.30	39.50
80DP	9.45	40.00
60DP	9.60	40.80
50DP	9.60	40.80

Grit	Box/5	Case/25
120DP	9.60	40.80
100DP	9.60	40.80
80DP	10.20	43.35
60DP	10.50	44.60
50DP	10.50	44.60

Grit	Box/5	Case/25
120DP	15.60	66.00
100DP	15.60	66.00
80DP	15.75	66.95
60DP	16.50	70.00
50DP	16.80	71.40

Model	Quantity	Sale
8500B	Box of 50	11.65
8500C	Case of 600	98.95

Model	Quantity	Sale
8560B	Box of 20	16.95
8560C	Case of 160	119.95

PRODUCTION SANDPAPER

9" X 11" Sheets

Grit	Sheets	Sale
220A	100	22.50
180A	100	22.50
150C	100	30.00
120C	100	30.00
100C	100	30.00
80D	50	19.00
60D	50	21.95
50D	50	24.00
40D	50	26.00
36D	50	28.50

Grit	Sheets	Sale
600A	50	22.00
500A	50	22.00
400A	50	22.00
360A	50	22.00
320A	50	22.00
280A	50	22.00
240A	50	22.00
220A	50	22.00

Grit	Sheets	Sale
280A	100	24.00
240A	100	24.00
220A	100	23.50
180A	100	23.50
150C	100	30.50
120C	100	30.50
10		

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MAGAZINES
for fellow enthusiasts

Buying Lumber

*Know what to look for
and what to avoid*

by Vincent Laurence

I remember cruising the aisles of a home center, while still in college, looking for wood to make a stereo rack. I was making the move from pine 1x12s on cinder blocks, and I wanted to do it right. But something *wasn't* right with the hardwood lumber at the home center. It was stacked upright, all surfaced and plastic-wrapped. In its packaged uniformity, the lumber had all the appeal of shrink-wrapped chickens lined up in a supermarket cooler.

Today, there are few things I enjoy more than pawing through stacks of walnut, cherry or bird's-eye maple. Even roughsawn boards are enough to set me building projects in my head. For me, the wood itself is a big part of the reason for woodworking.

But you have to find the wood first. Then you need to know what you're looking for—and what to avoid. There are a lot of different places to find wood, each with its advantages and disadvantages. And wood is available in many forms: air dried and kiln dried, quartersawn and flatsawn, roughsawn and planed. Quartersawn and flatsawn are defined in the glossary on pp. 38-39 and are discussed later in this article.

Given the opportunity, I always buy roughsawn. Lumber that's already been planed, especially 1-in. stock, may be too thin if I have to resurface it after I get it back to my shop. If you don't have a jointer and planer, you can often find a local professional woodworker who will surface your lumber for a fee. I've also known woodworkers who've taken woodworking courses at a local high school just to gain access to its woodworking equipment.

Wood is seldom defect-free. Lumber producers have developed grading systems to classify lumber quality (see the box on p. 39 for





Choosing lumber is part of the pleasure of woodworking. Coming across wide stock, like this poplar board, is like stumbling on a gem in the rough. Hardwood lumberyards (above) generally have a broader selection than local sawmills.

an explanation of lumber grading). That information is helpful in a general way, but the small-shop woodworker is better off knowing about particular defects—which are acceptable, which are not—and what to do about them.

Where to find it

Wood for building furniture is available from a lot of different places. I've disassembled pallets. I've picked up burls left by the side of the road when a tree's been taken down. I've even taken logs out of the firewood pile. But mostly, I buy wood from lumberyards and sawmills.

Lumberyards—Lumberyards—not building-supply dealers—are the obvious place to start looking. These places deal primarily in hardwood lumber, though most also sell sheet goods like plywood or medium-density fiberboard (MDF). Hardwood lumberyards generally carry kiln-dried rather than air-dried stock, sometimes roughsawn and sometimes planed. Planed lumber costs more because more labor has gone into it. If you want your lumber planed, most lumberyards will do it for you for a price.

To find a local lumberyard, look under "lumber" in the yellow pages. The places that specialize in hardwood lumber usually will say so in their advertisements. Ask other woodworkers or your local woodworking store about good yards, too. Lumberyards generally have a wide selection of both local, nonlocal and exotic species (see the photo above). Many will order something for you



Photo: Boyd Hagen

Hidden beauty—Lumber that's been outside a while, especially if it's left uncovered, will turn gray. To see the true color of the wood, cut or plane away a little of the weathered surface. But ask first.

A lumber-buyer's glossary

Board foot (bd. ft.): A unit of measurement equivalent to 1 in. by 12 in. by 12 in.

Bow: A curve along the face of a board from end to end, like a ski.

Casehardening: A defect caused by improper drying, which results in a board with latent stresses and possible honeycombing. A casehardened board cannot be resawn without problems.

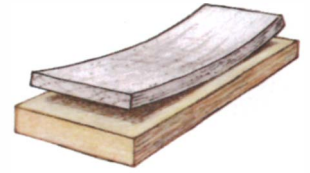
Checking: Cracks resulting from uneven drying. They may be at the ends of a board or throughout the board as a result of casehardening.

Crook: A curve along the edge of a board from end to end.

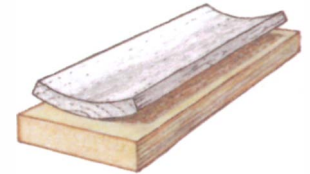
Cup: A concave face on a board.

Equilibrium moisture content (EMC): A board is at equilibrium moisture content when it neither takes up nor gives off moisture in the surrounding environment.

Flatsawn: Sawn parallel to a tangent of the tree's growth



Bow



Cup

rings. Flatsawn lumber shows face grain, with oval, U- and V-shaped patterns.

Flitch: A slice of the tree from bark to bark.

Four-quarter (4/4): Lumberyard/sawmill jargon for 1-in. stock. And 6/4 (pronounced *six-quarter*) is 1½ in., 8/4 is 2 in. and so on.

Grain: The predominant ori-

if it's not in the yard. Some yards require minimum orders, but even if they don't, buying 100 bd. ft. usually entitles you to a price break. The next price break may be at 300, 500 or 1,000 bd. ft.

Check out several yards, and weigh selection, attitude and price. I've been treated wonderfully on many occasions by the staff at a big yard near where I live, but I've also had to deal with surly, unhelpful staff. If you're not buying what they consider a significant amount, the staff may not consider your business worthwhile.

Lumberyards buy from a number of different suppliers. The beautiful cherry you see today may not be available next week, so buy plenty while you have the opportunity. One final item: Some yards sell primarily to furniture manufacturers or large-volume shops and don't want you to pick through their stacks. Explain that you need certain boards for the project you're about to begin, and tell them that you'll restack everything neatly when you're done (be sure to deliver on that promise). If they still won't let you pick your own lumber, go elsewhere.

Sawmills—Generally, sawmills are more friendly than big lumberyards. You can get to know the guy who's sawing your wood, ask him to be on the lookout for something special or have him saw something just for you. Prices at a mill tend to be lower than at lumberyards, too—sometimes dramatically so. Besides, you're supporting a small business and buying a local product. To find them, look in the yellow pages under "sawmills," or just ask around.

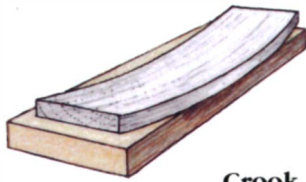
About the only downside to buying from a mill is that the wood

selection is limited to what's available locally. In addition, the wood may not have been kiln-dried, so you may have to acclimate the wood for a while before using it. Ask the mill owner if the wood is kiln-dried or air-dried.

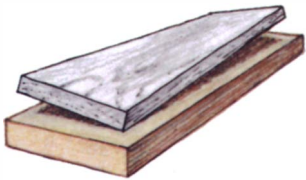
Some mills, like lumberyards, aren't interested in your business. They're perfectly happy making baseball-bat blanks, pallet stock or whatever is their bread and butter. Still, it's worth checking out. A Vermont woodworker I know got all his figured maple for pennies on the dollar from a mill that sold all its plain maple to furniture manufacturers. The furniture manufacturers just didn't have any use for that irregular stuff, and the mill was happy to get rid of it.

Woodworking stores—I haven't bought lumber from a woodworking store, primarily because I haven't been able to get over the sticker shock. These businesses, which sell tools and books as well as lumber, generally look like boutiques and have prices to match. Usually, their lumber is already surfaced to make it more appealing. It is attractive, but if it starts warping while on display (which often happens), the ¾-in. board you take home likely will have to be taken down to ⅝ in. or even ½ in. before it's flat again. High prices and surfaced wood also have kept me from buying wood from building-supply companies or home centers.

Other sources—Check the classifieds. I once bought more than 100 bd. ft. of walnut at \$1.25/bd. ft. from a guy who was being transferred by his company. There are lots of ways to find wood.



Crook



Twist

ly to a moisture level of 6-8%.

Pith, pith tracks: The pith is the very center of the tree. A pith track is the hollow or pappy cross section of the pith that's exposed when a tree is cut into boards at its center.

Quartersawn: Quartersawn lumber is made by sawing a tree into quarters and then sawing boards so the growth rings run perpendicular to the face of the board. It's dimensionally more stable than flat-sawn boards and often reveals beautiful fleck in species such as oak (red and white), cherry and sycamore.

Rough lumber: Unplaned lumber.

Sapwood: The outer rings of a tree, through which the sap flows. Sapwood always is light colored in contrast with the heartwood.

Twist: Wood that looks like it's spiraling.

Wane, wany: Wane is where the natural edge of the tree tapers so that it shows up on the edge of a board. —V.L.

entation of cells in wood. Grain direction can be seen in the growth rings of a board.

Honeycomb: Large checks all the way through a board and evident on its surface, which indicate casehardening. The checks are a result of improper drying.

Kiln dried (KD): Wood that has been dried in a kiln, usual-

Many woodworking tool stores have bulletin boards listing tools and wood for sale. Industrial arts teachers may have recommendations. Even your local chamber of commerce may know who's selling lumber nearby.

What to look for, what to avoid

Wood is an organic material. It's not uniform. That's its curse and its beauty. Some of wood's "defects" are spectacular, like burls and bird's-eyes. Others, like loose knots or knotholes, checks, pith and bark pockets are less desirable and must be worked around. Count on buying at least 30% more than you think you need.

Defects and what to do about them—Some defects are fatal. Others aren't. Sapwood, for instance, while not considered a defect by grading organizations, is avoided by many woodworkers because its lighter color doesn't match the heartwood. You can work around it by putting it on the inside of a case piece or on the underside of a table. Or you can just live with it. Some woodworkers make sapwood part of a design.

Boards with pith tracks (see the glossary for unfamiliar terms) aren't a problem as long as they're thick enough to allow the pith to be planed off. I've filled pith tracks on the edge of a board with five-minute epoxy darkened with artist's oil colors. The pith ended up looking just like a sound pin knot.

A sound knot is not a problem if you're looking for a rustic feel, if you can incorporate it into your design, or if it's at the end of a

Lumber grading: what do you really need to know?



Hardwoods and softwoods are graded differently and by a number of organizations. Even the names assigned to various grades differ from organization to organization. But let's concentrate on the most widely recognized rules for grading hardwood lumber, which come from the National Hardwood Lumber Association (P.O. Box 34518, Memphis, TN 38184-0518; 901-377-1818). The following NHLA publications explain all you could want to know about grading: *An Introduction to Grading Hardwood Lumber* (\$2), *An Illustrated Guide to Hardwood Lumber Grades* (\$5) and *Rules for the Measurement and Inspection of Hardwood and Cypress* (\$7).

The fundamental premise in grading hardwood lumber is that any given board is going to be cut into defect-free furniture components. With this in mind, lumber graders calculate how many potential clear components (or cutting units) are in a given board. Three things count in determining grade: the minimum size allowed for the clear sections, how few of these sections there are, and what percentage of the board's total area consists of these sections. The basic principle is that the larger the clear sections and the fewer of them, the higher the grade.

The best way to get the lumber you need is to see what a mill or lumberyard is selling as No. 1 common or selects. Get what you can use from these lower grades, and spring for higher-grade lumber only when you absolutely need long, wide, clear boards.

The grades: The best lumber grade is FAS (firsts and seconds). Firsts and seconds are really two grades, but they're only sold together. Firsts must yield at least 91 $\frac{2}{3}$ % clear cuttings on the worst face. Seconds must yield 81 $\frac{2}{3}$ % clear cuttings on the worst face. FAS boards must be at least 6 in. wide and 8 ft. long, and the minimum size of clear cuttings that count toward the specified yield is 3 in. by 7 ft. or 4 in. by 5 ft.

The two next-best grades, FAS1F (FAS one face) and select, are graded using both faces. For both, the best face must meet FAS requirements, and the other face must be No. 1 common. FAS1F boards, like FAS boards, must be at least 6 in. wide and 8 ft. long. Selects can be just 4 in. wide by 6 ft. long.

No. 1 common lumber must be between 66 $\frac{2}{3}$ % and 83 $\frac{1}{3}$ % clear. The smallest No. 1 board can be 3 in. wide by 4 ft. long. Minimum clear-cutting size is 3 in. by 3 ft. or 4 in. by 2 ft.

No. 2A and No. 2B lumber usually is grouped together. Boards must be at least 3 in. wide and 4 ft. long. Minimum clear-cutting size is 3 in. by 2 ft.

No. 3A, No. 3B and "below grade" lumber generally is not considered furniture grade. —V.L.



Tools for buying lumber (above): leather gloves, tape measure, notepad. A block plane and alcohol help reveal grain and color.

Buy your wood where you can pick your own (right). But whatever you don't take should be restacked the way you found it.



board. Even a knot that's in the middle of a board is not a problem if you can take components from both sides of it.

End checking is normal, but you'll lose the checked portion of the board plus at least an inch or so. Extensive face checking most likely means the wood's casehardened, which is a serious defect. You won't want the board.

Cup or crook in a board isn't a problem. Because the deformation is in one plane, a jointer should take care of it quite easily. If you buy a cupped or crooked board, be sure that it's sufficiently thick or wide, so it will be useable once it's flattened or straightened. Cutting boards into smaller pieces before milling and using the jointer will take care of mildly bowed boards. Twisted boards are best avoided.

Grain, figure and color—Quartersawn lumber will move less than flatsawn lumber, so it works better in situations where tolerances are critical. A door frame is a good example. Quartersawn lumber is more work for the sawyer, however, so it's more expensive. For the same reason, it's also sold separately from flatsawn stock of the same species.

Figured woods are beautiful but generally difficult to work. Bird's-eyes in particular want to pull right out of the board when being planed. Curly woods also will tear out if you're not careful. Still, I buy figured woods and love them. You can identify most kinds of figure in the rough by looking for irregularly fuzzy patch-

es on the faces of the boards. (See *FWW* #99, pp. 63-66 for a more complete discussion of figured woods.)

Try to get boards from the same tree when you can. How can you tell? Color, grain density and figure are clues. Also, look for knots in the same location and similar profiles if the boards are flichtsawn. For straight-edged boards, dimensions are a good clue. If you run across three or four that look alike and are all 97¼ in. long, ranging from 6 in. to 8 in. in width, that's a pretty good indication they're from the same tree. Often, you can figure out the order in which the boards were cut.

What to bring to the lumberyard or mill

When I buy lumber, there are a few items I always bring (see the photo at left above). They include leather work gloves, a tape measure and a rough cut list, broken down by thickness and the sort of grain I'm looking for in each component. I bring a calculator for figuring ballpark board footage and a pad to keep track of boards, board footage and how much I'm spending. A pad is also helpful for sketching, so I can figure out whether I can get the components I need from particular boards.

I try to remember to bring a block plane (if I forget, I use my knife), so I can expose a bit of smooth wood on rough planks, as shown in the photo on p. 38. This is especially important if the lumber's been stored outside for a while; walnut will turn a gray that's almost white, and maple turns a dark gray. I like to know



what sort of color I can expect after the wood's been planed. (Before cutting or planing, it's a good idea to ask someone at the yard or mill if it's okay to cut or plane the wood.)

I sometimes bring a rag and a small can of denatured alcohol. The alcohol gives an instant preview of what the wood will look like finished. And I usually bring a handsaw for cutting long boards down to size.

At the yard, I try to be as independent as I can. Once a worker at the yard takes down a stack or two of wood with a forklift, I restack the pile as I'm going through it, and I stay out of the way. The less of a pain you are to the yard staff the more welcome you'll be.

After I've loaded my lumber and paid up, I tie an old red T-shirt to the end of the longest board and head off into the sunset. And if I've spent more than I'd planned, which is usually the case, I just remember James Krenov's maxim in *The Fine Art of Cabinetmaking*, "A good rule is to buy as much as you can sensibly afford of any wood that excites you and then, quickly, buy a little bit more." □

Vincent Laurence is an associate editor of *Fine Woodworking*.



Ordering wood sight unseen

by Ken Textor



Ordering lumber from faraway dealers is a good way to buy wood that isn't available locally. The prices are comparable, even with shipping, and there are many woods you just can't get any other way. I've ordered dozens of species from all over North America for more than 15 years, and I've learned that there are three steps in getting what you want: specify, specify, specify.

You want what? The first time I ordered poplar I was asked, "That yellow poplar or white poplar you want?" Later, I found out that yellow poplar is also known as tulipwood, tulip poplar and canary wood. Learn all you can about the species you want, including its many names, before you call a dealer.

The next thing you must specify is the grade. This can be a real quagmire. If the dealer uses the National Hardware Lumber Association's grading standards, you're all set. But if his system's unconventional (many are) or if you haven't done business with this dealer before, you're better off just asking for clear planks. That's not an official lumber designation, and it will cost more, but it's generally understood to mean no knots, bark pockets, splits, gouges or the like.

Also, even though some dealers may be insulted, tell them you can't use seriously warped, cupped or twisted stock.

Once you've agreed on the specifications, find out what the total price is and what you're paying per board foot. Write it down along with the description of the lumber that you and the dealer have settled on, and send the dealer a confirming fax or letter with all that information on it. As for payment, most dealers these days prefer one of the major credit cards.

The wood's in the mail: I've had lumber arrive looking as if it was dragged behind the truck, not shipped in it. It's a good idea to ask the dealer how he'll package your wood. Make suggestions if you're not satisfied with his reply.

These days, lumber shipments are usually sent by UPS or a similar courier service. If the load exceeds size or weight requirements, the dealer probably will choose a common carrier. Some common carriers only will deliver to the shipping terminal nearest you, so ask if this is the case. Once, I assumed that the freight carrier would deliver to my door. Late one Friday afternoon, I received a surprising phone call. "You've got 500 bd. ft. of hickory here," the terminal dispatcher told me. "You've got 48 hours to pick it up." I managed to get my wood before the terminal closed for the weekend, but not without difficulty. □

Ken Textor is a writer, boatbuilder and sailor in Arrowsic, Maine.

Making a Sheraton Bed

The challenge is in the posts

by Philip C. Lowe



Turned posts are the most dramatic feature of a Sheraton bed. The posts can be turned in one piece, as the author did here, or turned in two or more pieces, which are glued together later.

Beds often are very simple, even if they look as complicated as the Sheraton bed in the photo on the facing page. The joinery isn't complicated, and there aren't many parts. In fact, once you've made the posts for this bed, the hard work is behind you. Think about the posts as different circular-shaped moldings stacked on top of one another. The posts can be made in one piece, as I do, or made in several pieces, which are glued

together later. The posts also can be made without decorative reeding, which cuts out many hours of work on the project and still results in a pleasing design.

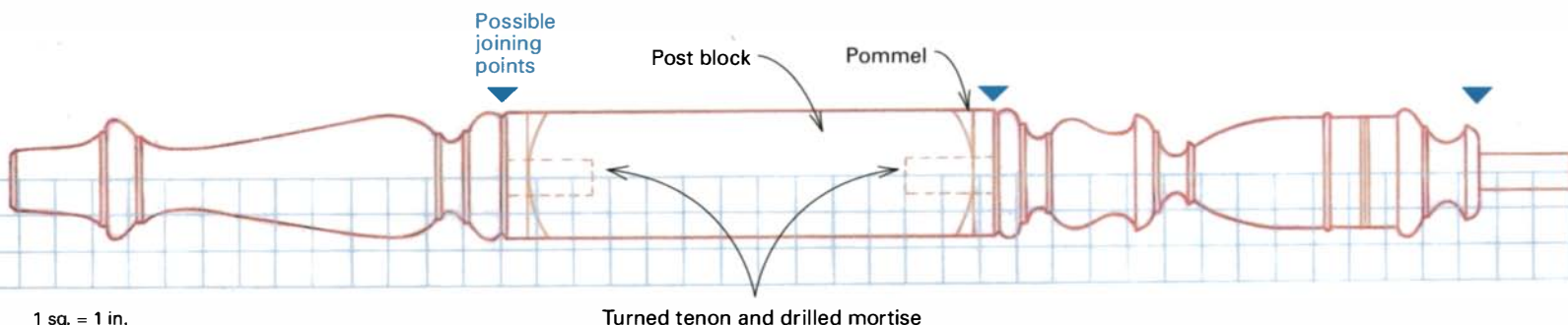
I always make full-scale drawings for pieces that I'm about to make. For this bed, I have to draw only one of the posts, half the shape of the headboard and the joinery detail for the rail-post connection. I use the drawing to make a story stick (a scrap of wood where dimensions and pro-

files are marked), so laying out the bed posts is both easy and accurate.

Mounting the blank

The bedpost blanks are milled to 3½ in. sq. from 16/4 stock and rough cut to length, leaving a couple of inches at each end for mounting in the lathe. Turning the full-length blanks is no problem on my lathe, with its 10-ft.-long bed. But if you don't have this luxury, you will have to turn the

Sheraton bed: Posts can be turned from a single length of wood or made in pieces and glued together later.



1 sq. = 1 in.

Turned tenon and drilled mortise



A Sheraton-style bed is easy to make, despite its complicated appearance. Reeding is time-consuming, but optional, and the joinery is straightforward. On this bed, the author skipped the reeding on the less-prominent headboard posts.



Use a story stick to lay out accurate and consistent turning details. And the story stick is a handy reference when turning because the shape and diameter of each post section is drawn right on it.

post in sections, and join them together by boring a hole in one part and turning a mating tenon on the adjoining member. The joints should be cemented with yellow glue or epoxied for extra strength. I've marked a few joining points, as shown in the drawing below. As a rule, the best place to join these parts is at a fillet above or below a cove, torus or ogee shape.

I mount the blank at the headstock end with a faceplate and plywood disc drive

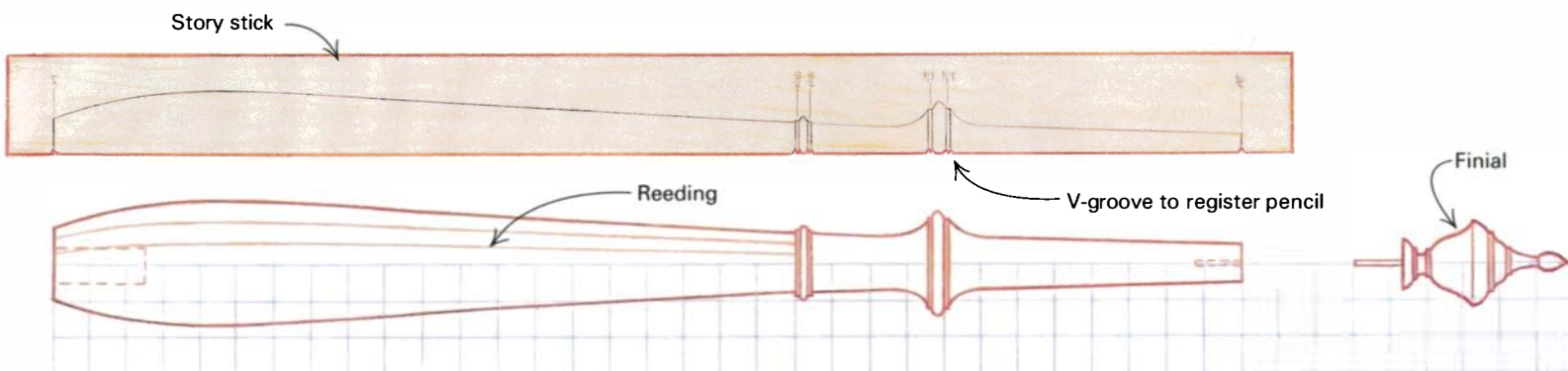
center, which provides a more positive drive than a spur center. This arrangement also lets me add an indexing wheel (see the box on p. 45) and makes it easy to re-mount the blank.

The drive center is a circular piece of $\frac{3}{4}$ -in.-thick plywood screwed to the faceplate. The plywood has a square hole the size of the turning blank cut out of its center. To mount the blank, one end is slipped into the square hole, and the ball-bearing

center in the tailstock is slid into position at the opposite end and locked in place.

Turning the posts

The first step is to locate the post block, which is the non-turned section of the post into which the side and end rails are mortised. I scribe shoulder lines around the post, and with a backsaw, cut kerfs on all four corners at the shoulder points. The kerfs prevent the square edges of the post



A scribe lays out evenly spaced reeds. With a pencil set to the center of the lathe and its base riding on the lathe bed, a scribe accurately draws layout lines for reeds on the top of the bedposts.



Drilling holes for bed bolts. Holes bored through the bedposts serve as guides when drilling rails for the bed bolts. The nut is hidden in a mortise in the side of the rail.



block from chipping when I turn the adjacent sections. After turning the post to the largest possible cylinder above and below the post block, I lay out and turn the pomels (the curved shoulders at the top and bottom of the post block).

To lay out the elements of the posts, I make up two story sticks or rods, one for the section above and one for the section below the post block. On the story sticks, I draw half the profile of the post and mark the diameter of each design element. I cut notches into the edge of the story stick with a skew chisel to make sure the pencil references are made from the same spot when each of the four posts is laid out.

I usually hold the story stick against the revolving blank to scribe the post. Another method is to mark the post with the story stick, as shown in the photo at right on p. 43. Then turn on the lathe, and hold the pencil point at the mark to extend the reference line completely around the post.

I shape the bottom of the post first, turning the cylindrical blank down to the diameters indicated on the story stick with a parting tool. I check each blank's diameter with calipers. Then I shape the curves and hollows with skews and gouges, leaving the cove or scotia cuts for last. Because the

coves create the smallest diameters, leaving these cuts until the end helps to reduce vibration while turning the rest of the post.

The upper section of the post is turned in the same fashion, except I add a steady rest, as shown in the photo on p. 42, to help prevent the post from vibrating and being thrown out of round when turning. After I've turned this section to as accurate a cylinder as possible, I locate the steady rest at the bulbous section of the reeded portion of the post. With the steady rest in place, the upper section is turned to shape, again leaving the coves till last.

Once I've turned the posts to shape, I sand them, starting with 120-grit and working up to 220-grit. Between each sanding, I wet the post and let it dry to raise the grain. I sand everything but the section of post to be carved with reeds because the sanding grit would get in the pores of the wood and dull my carving tool.

Reeding the posts

Because it takes about four hours to carve the reeds into each post, clients frequently choose to save money by eliminating the reeding entirely or by having just the posts of the footboard reeded, as shown in the photo at left on p. 43. Usually, these posts

are prominently displayed near the middle of the room, and the headboard posts are generally pushed against a wall.

I've found the easiest way to lay out and carve the reeds is right on the lathe. To do this, though, you need an indexing wheel to hold the post in position for scribing the layout lines and carving the reeds. This is a standard feature on some lathes, but not mine, so I added one, as discussed in the box on the facing page.

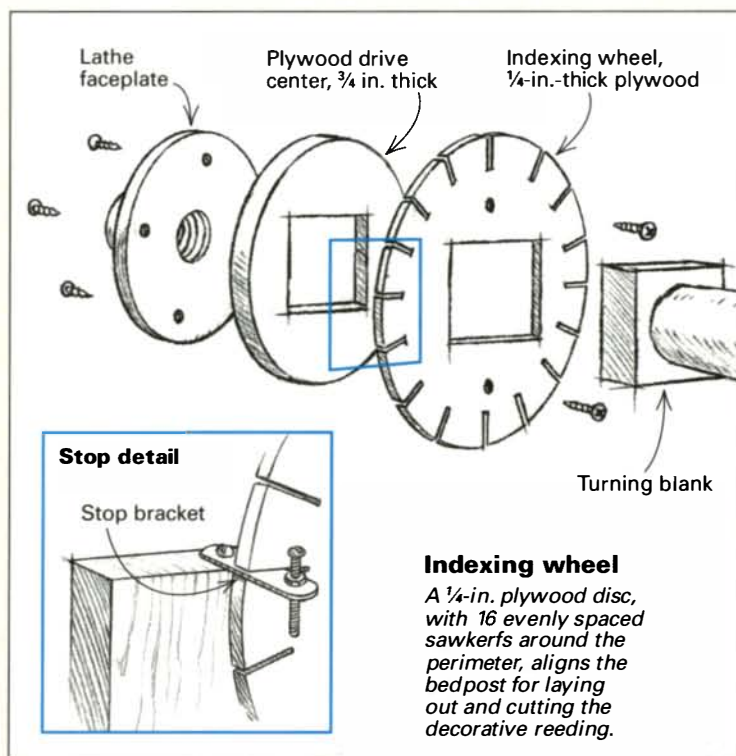
I also made a scribe for drawing the layout lines. The scribe rides on the lathe's bed and has a pencil set to the center height of the lathe. I mark one reed, as shown in the photo above right, rotate the post and mark another until the post is completely laid out. I use a V-carving tool to carve lines into the post and a series of straight and back-bent gouges to carve the reeds to their half-round shapes. When carving is complete, I sand the reeds.

Putting it all together

After taking the post from the lathe, I drill a hole in the top of the post for a pin that will hold the finial in place and lay out and cut the mortises. There are two on each post block to accept the tenons for the rails and two more in each headboard post.



Indexing wheels for the lathe



The holes for the bed bolts are staggered, so the bolt for the end rail doesn't interfere with the bolt for the side rail. These 3/8-in.-dia. holes have a 1-in.-dia. counterbore to bury the head of the bolt. I bore the holes on the drill press, starting with the 1-in.-dia. counterbore and then the 3/8-in.-dia. bolt hole, aligning the bit with the center point of the counterbored hole.

I hand drill the bolt holes into the ends of the rails, using the holes in the posts as a guide, as shown in the photo at left on the facing page. Mortises for the nuts are cut into the sides of the rails, so they intersect the bolt holes. □

Philip Lowe designs, makes and restores fine furniture in Beverly, Mass.

Turning a bedpost

VIDEO
TAKES

Philip Lowe makes a reeded post for this Sheraton bed in a 28-minute video tape (VHS only). To order, send \$10 to The Taunton Press, Order #011046, P.O. Box 5506, Newtown, CT 06470, or call (800) 888-8286.

The faceplate and plywood drive center that I use to turn my bedposts make the perfect mounting system for an indexing wheel. My indexing wheel is made by cutting a hole in the center of a 10-in.-sq. piece of 1/4-in.-thick plywood. The hole fits the turning blank.

After laying out the required number of divisions (16 for the bedposts) on the plywood with a compass, I bandsawed the plywood into a 10-in.-dia. circle. And I cut out the center square on the jigsaw.

Around the perimeter of the disc at each division line, I made a bandsaw cut 1 in. in from the edge of the disc. The indexing wheel is now ready to be slipped over the end of the post



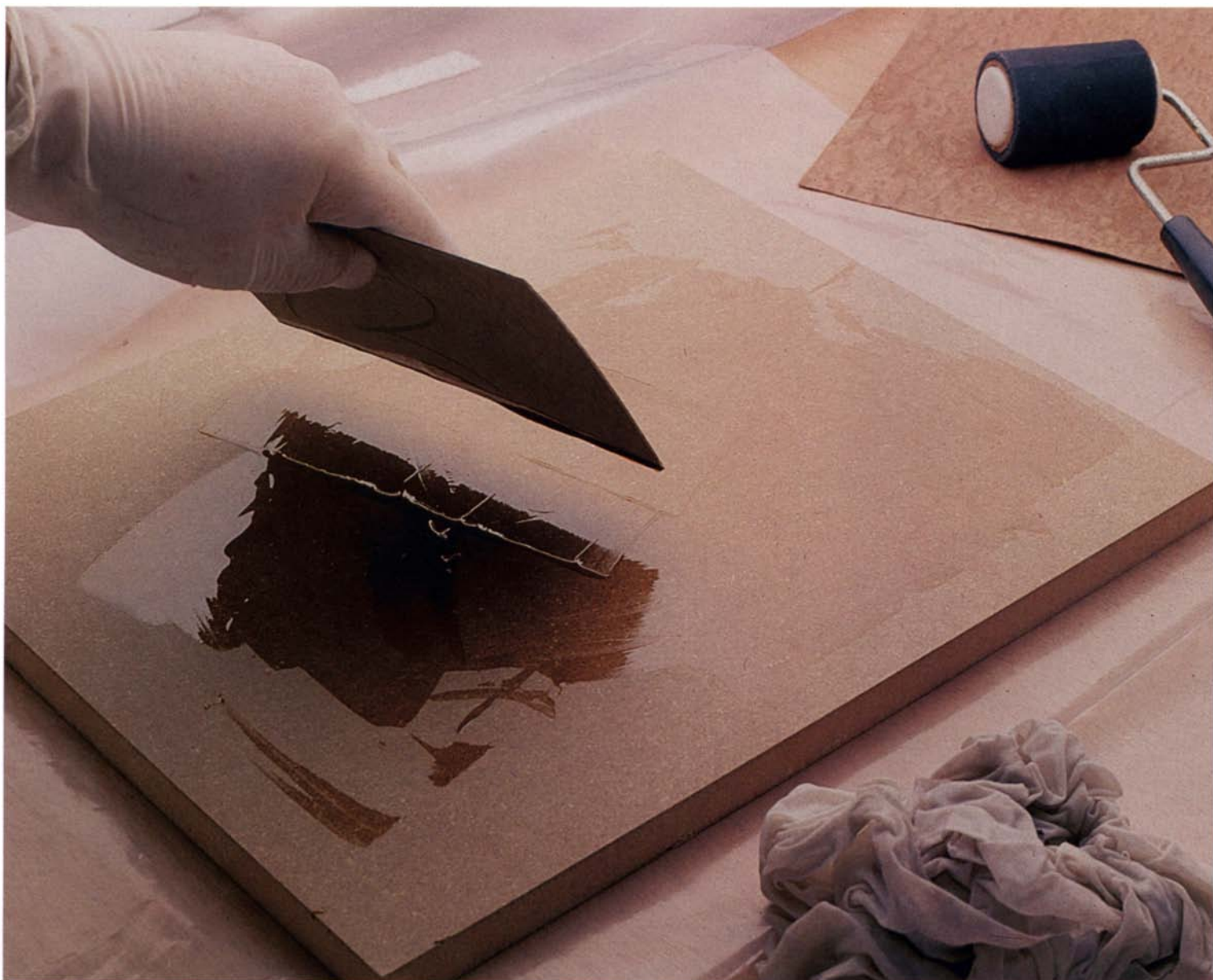
Accurate indexing for reeding. *A disc of 1/4-in. plywood makes an indexing wheel for laying out reeding on the bedposts. The stop is a piece of bandsaw blade mounted even with the lathe center.*

and then screwed to the faceplate and disc drive (see the photo at left).

The stop that engages the kerfs on the indexing wheel is simply a discarded piece of bandsaw blade with the teeth ground off. This stop is held even with the centerline of the lathe by an L-shaped plywood bracket, as shown in the drawing above.

To scribe lines or carve the reeding, I pivot the stop into a sawkerf to hold the post in position. To mark or carve the next and each consecutive line, I slide the stop back and rotate the post to the next sawkerf in the wheel. I slide the stop into place and scribe or carve the next division line.

—P.L.



A good choice for vacuum veneering. The author likes polyurethane glue because it saturates the veneer and fills the voids. A scrap of plastic laminate and a foam roller spread the glue into a thin, even coat.

Polyurethane Glue

This one-part alternative to epoxy fills gaps and sands easily

by Niall Barrett

I tried polyurethane glue for the first time a few years ago when I was making some laminated, exterior doors. I had used epoxy in similar situations in the past. Epoxy is a great glue, strong and waterproof. But laminating takes a lot of glue and epoxy can get very messy—to say nothing of the fumes it gives off as it cures.

Although I didn't know much about polyurethane adhesives, I thought they'd be worth a try. When I looked into it, I found that polyurethane glue has some real advantages over both epoxy and yellow glue. But these adhesives do have some characteristics of their own, and it takes some practice to get the hang of using them. Experimentation is a must.

Two brands, Gorilla Glue and Excel, are available as woodworking glues in the

United States. These glues have an impressive list of qualities. Like epoxies, they are waterproof. Unlike epoxies, they're one-part glues, ready to use out of the bottle. Clamping pressures required to bond parts are low.

Polyurethane glues expand as they cure. This expansion, actually a foaming, forces the glue into wood fibers and forms a fine, closed-cell structure. The expansion also provides some gap filling, enough to fill the joint cosmetically and keep moisture out. But be careful, the glue that fills gaps doesn't provide structural strength.

When cured, these glues don't creep. They retain enough elasticity to eliminate the glue fatigue that results from shrinking and swelling joints. And these glues sand easily. When sanded, the hardened glue becomes porous and takes stain readily. Instead of melting from the heat of friction, like polyvinyl acetate (PVA) glues (yellow and white glues) and epoxies, polyurethane glues turn into a powder that won't clog sandpaper or dull tools. These glues contain few, if any, solvents.

Where these glues work best

I originally thought polyurethane glue should be used only when I needed a waterproof bond. But I find myself reaching for it more often. Except for instances when I need structural gap filling, I feel confident replacing epoxy with polyurethane glue in my shop.

In situations where it's difficult or impossible to use clamps, polyurethane glue is ideal because it requires low clamping pressure. You can literally hold things together with tape or string while the glue sets. Edge-gluing with this adhesive is a little easier because when correctly applied, the glue doesn't allow boards to slide around much.

I like this glue especially for veneering. It saturates the veneer and fills any voids, practically eliminating any splintering and lifting of wood fibers. I pour some in the center of the substrate, scrape it out to the edges with a scrap of plastic laminate and then go over the glue with a foam roller. If it looks as if there's not quite enough glue there, it's probably just right (this is generally true of polyurethane glue—you'll use a lot less glue than you're used to).

If you're using a vacuum press, make sure to wrap the workpiece well in plastic to protect the bag. The glue may not come off a vinyl bag, and it absolutely won't come off a polyurethane bag. Remember, too, that polyurethane glue expands as it cures, so you must have pressure over the entire veneer surface as the glue dries.

It's not yellow glue

Manufacturers claim cure times that range from one to 12 hours. Although this is faster than most epoxies, in practice polyurethane adhesives take considerably longer than yellow glue to set up. Claims for shelf life range from one to four years in a sealed container, and six to 12 months after opening. My advice is to store the glue in small, tightly sealed containers. Squeeze out as much air as possible from the container after use, and buy only what you can use in a few months.

Isocyanates, the key components of polyurethane glues, are highly reactive to moisture. Exposure causes a cross-linking of the molecules in the adhesive. Because these glues cure in the presence of moisture, the optimum range for wood moisture content is between 8% and 20%. If your shop is like mine in the winter, wood moisture content drops below 8%, ideal conditions for glue failure.

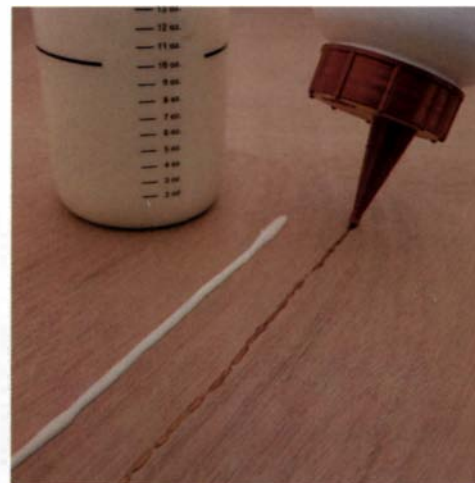
To remedy this, I mist one side of the joint before applying glue and bringing two surfaces together. When veneering, I wipe the substrate with a wet rag and wait until the surface looks dry before applying the adhesive. I can't stress enough that you need moisture to activate this glue. Trying to glue bone-dry material with this glue just won't work.

Polyurethane likes a slightly roughened surface, a little tooth. This is quite different from using yellow glue, where two mating surfaces are, ideally, clean and smooth. If the surfaces to be glued look too smooth, rough them up a little with sandpaper.


One thing yellow glue excels at is plate joinery. Polyurethane glue doesn't. The reason is that yellow glue swells the pressed-wood biscuits, locking the biscuits in place. Because polyurethane glue isn't water-based, the biscuits won't swell, and the joint may not be as strong.

Labels can be misleading when it comes to cleaning up wet polyurethane glue. I find that mineral spirits are too weak, and I question the use of denatured alcohol, which could react chemically with the wet glue. I've found that acetone or lacquer thinner works fine. This glue is so easy to remove when cured, however, that I wonder how often wet cleanup is really necessary. The exception is your hands. The glue leaves a stubborn brown stain, so I use disposable latex gloves when I'm working with it.

Some people will be sensitive to the isocyanates in the glue. So before using it, it would be prudent to get a copy of the Material Safety Data Sheet from the manufacturer, and read about potential hazards.



Apply less than you're used to. A common mistake when learning how to use polyurethane glue is using too much. If you're used to applying a healthy bead of yellow glue (left) in your shop, cut back when applying polyurethane glues (right).



Sources of supply

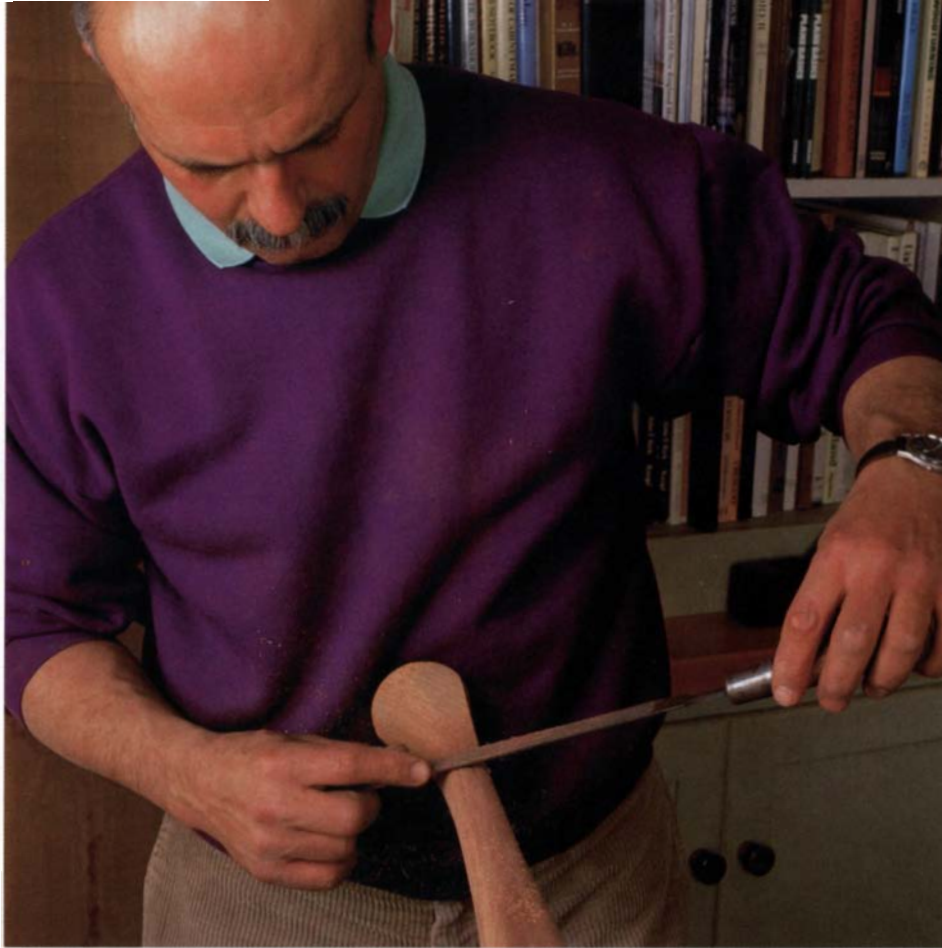
Excel polyurethane wood glue
Distributed by AmBel Corp., PO Box 819,
125 Cottonport Ave., Cottonport, LA
71327; (800) 779-3935

Gorilla glue
Distributed by Gorilla Glue, PO Box
42532, Santa Barbara, CA 93140-2532;
(800) 966-3458

It costs more, but it's all relative

Most people that I've talked with about polyurethane glue complain about its high cost. Excel is about \$17 for 25.4 oz.; Gorilla Glue is \$19.95 for 18 oz. To me, though, this criticism seems unjustified. In my experience, a little bit of polyurethane glue goes a long way. And I think we need to rethink our attitude. Even if the glue was a lot more expensive, you have to ask what percentage of a job is really tied up in the cost of glue. Not much. If polyurethane glue helps you move faster or allows you to do jobs you wouldn't ordinarily tackle, I say it's well worth the investment. □

Niall Barrett is a furniture maker in Narrowsburg, N.Y., who recently went to work for AmBel, the distributor of Excel glue.



Rasps and files are the author's choice for shaping wood. There's no tearout on figured woods, and a file can produce a surface very nearly ready to finish.

Files, Rasps and Rifflers

A woodworker's guide to these effective shaping tools

by Mario Rodriguez

Rasps and files have all but disappeared from most woodworkers' toolboxes. Why? Well, there are a number of reasons. Routers and drum sanders do a lot of the shaping that rasps and files used to do. Because it's easy to damage files and rasps, many woodworkers consider them more of a pain than they're worth. And it can be hard to figure out what kind of file or rasp you need. What, for instance, is the difference between a second-cut patternmaker's rasp and a bastard-cut mill file?

But much is to be gained by adding rasps and files to your tool kit: greater speed and control in shaping curved or sculptural elements and dramatically reduced sanding time. By using a succession of rasps and files, I can start sanding at 180- or 220-grit. And because individual teeth are doing the cutting, rather than a single

blade, there's no danger of tearout. Rasps and files are the fastest, most efficient tools for removing lots of material quickly, for fairing curves and for shaping furniture parts. Using rasps and files may be new to many woodworkers, but once you've started, you sure won't miss all that sanding.

The care and cleaning of these tools isn't complicated, as the story on p. 50 explains. And a basic kit of the most useful files and rasps doesn't have to be expensive and can be assembled gradually (see the story on the facing page).

What are rasps used for?

Rasps actually can be considered a type of file, but unlike files, rasps have individual cone-like teeth, which are made by a punch



Filed, not sanded. The author put a coat of shellac on this cabriole leg after shaping it with a file, but without sanding it. Only minor tool marks are still visible.

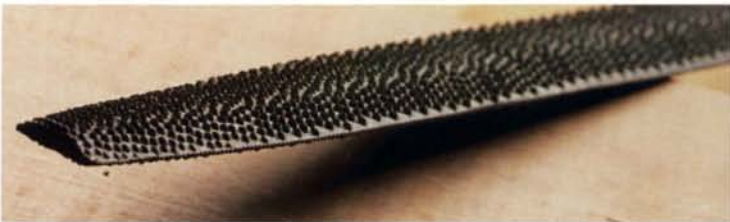


Photo: Boyd Hugen

Rasp teeth (above) are formed individually when the steel blank is struck by a punch. The tooth and gullet are formed simultaneously. The two best rasps sold today are the Nicholson #49 and #50. The #49 (right) removes a lot of wood quickly. The #50 leaves a smoother surface.



striking the soft steel blank (see the center photo above). These teeth are large and pointed, with deep gullets that keep the rasp from clogging. Each tooth and its gullet are formed with a single blow from the punch. This process is called stitching.

On some imported rasps, the teeth are hand-stitched, resulting in a slightly random pattern. Some woodworkers claim that these rasps produce a smoother cut with less chatter, but the hand-stitched rasps that I've used were no better than standard rasps that cost substantially less.

A rasp is the best tool for any sculptural shaping. It's designed to remove bandsaw-blade marks or the facets left by a spokeshave, and it's used to produce smooth, fair curves. You should always use the longest rasp that your task will permit. In the same way

A basic selection of files and rasps

Here are a few of the rasps and files that I use most in my shop. I selected them for their usefulness, versatility, durability and value. Naturally, you can get started with less and add to your kit later. With a few notable exceptions, most of these files can be purchased for \$5 to \$10. The exceptions are Nicholson rasps, which typically run \$30 to \$40 each; the Grobet detailing file (about \$25); and a good set of rifflers, which can cost \$100 or more. Avoid the cheap riffler sets because they wear quickly and perform poorly right from the start.



- 1) **#49 Nicholson patternmaker's rasp:** For heavy cutting and rough shaping of sculptural furniture elements, such as cabriole legs or broadly curved pieces, such as table aprons.
- 2) **#50 Nicholson patternmaker's rasp:** For a finer cut and smoother surface after using the #49. The smoother surface left by the #50 will more readily reveal dips, bumps and other minor imperfections.
- 3) **8-in. bastard-cut round file:** I use this file for shaping and fairing tight inside curves and for shaping replacement molding-plane blades.
- 4) **10-in. bastard-cut mill file:** Will leave a very fine surface on wood, but I use it primarily for truing cabinet scrapers.
- 5) **6-in. second-cut mill file:** Good general-purpose shop file. Excellent for cleaning up exposed end grain. I also use it frequently for deburring metal edges on machines, hand tools or jig and fixture materials.
- 6) **10-in. second-cut, half-round file:** Used for cleaning up after the #50 rasp.
- 7) **8-in. second-cut, half-round file:** I use this for smoothing the surface left by the 10-in. half-round file. Because it's shorter, it leaves a finer surface, even though it's the same grade.
- 8) **Grobet detail file:** All-purpose detail file. This is probably the most-used file in my kit. I use it for all sorts of detail work.
- 9) **Set of file rifflers (one end coarse, the other fine):** For detailed shaping of carved ornaments, such as ball-and-claw feet, for sculptural drawer pulls and for tool handles. —M.R.

Care and cleaning of rasps and files



File card cleans rasps and files. Clean rasps and files cut more aggressively. File cards generally have a brush side and a wire side.

Rasps and files are heat-treated to make them about as hard as a woodworking chisel (Rockwell hardness rating of Rc60 to Rc68). This makes them effective cutting tools on wood, aluminum, brass and other nonferrous metals. And some files even can be used on soft (or annealed) steel. But because they've been hardened, files and rasps must be kept apart to prevent them from rubbing or banging together. Careless treatment might chip or dull the teeth and shorten file life. I store mine on a wall-mounted rack, like chisels. The blades are kept apart, and I can spot the one I need at a glance. I've also seen them stored in drawers, where slots or dividers keep the tools separated.

With use, files and rasps will clog. They can be cleaned with a file card (see the photo above). This is a small, flat, wooden paddle with stiff wire needles on one side and short plastic bristles on the other. Occasionally, when stubborn debris becomes lodged in the teeth, I'll run a wire finishing nail along the teeth. The nail's tip quickly will wear down to conform to the file's teeth and will dislodge any clogged material without damaging the file.

Files don't last forever. When a file starts to slide over your workpiece instead of cutting, it's best to get rid of it, and buy a new one. A dull file will only become a source of frustration as well as a big waste of your time. A sharp file cuts easily and leaves a smooth surface in its wake.

—M.R.

that a plane with a long sole is used to level and flatten a board, a longer rasp does a better job of smoothing dips or bumps in curved work than a shorter one will.

Rasps are classified by shape, group and cut. Woodworker's rasps range in length from 6 in. to 14 in. and are flat, half round or round in section, tapering slightly along their length. Half-round rasps are the most common. Rasps may have square, tapered or pointed ends.

Woodworking rasps fall into three main groups (listed in descending order of coarseness): wood rasps, cabinet rasps and patternmaker's rasps. Within these groups, rasps are further categorized, in descending order of coarseness, as bastard cut, second cut and smooth cut. In the United States, the best rasps are made by Nicholson (a division of Cooper Tools, P.O. Box 728, Apex, NC 27502; 919-362-7511). Nicholson's #49 and #50 rasps (the #49 is a second-cut patternmaker's rasp, and the #50 is a smooth-cut rasp) do all the rough-shaping work I expect from a rasp (see the bottom photo on p. 49). For a list of recommended rasps and files, see the box on p. 49.

Also, keep in mind that a shorter rasp will produce a finer finish than a longer rasp of the same cut. That's because the tooth spacing on rasps is proportional to the tool's length, closer together on shorter rasps, farther apart on longer rasps. An 8-in. second-cut rasp will leave a smoother surface than a 10-in. second-cut rasp. This rule of thumb is true for files as well (see the top left photo on the facing page).

Using a rasp—It takes practice to learn how to use a rasp properly. First, put a handle on your new rasp. I don't believe that tale about someone jamming the tang through his palm, but a handle does make a rasp easier and more comfortable to use. A handle also provides the necessary length and grip for you to develop a smooth, rhythmic stroke.

The way to hold a rasp or file is with one hand on the handle and the other on the tip of the rasp between thumb and forefinger (see the photo below). If holding the tip is uncomfortable for you,



For best control, use two hands. Grasp the file or rasp handle with one hand, and hold the steel tip between thumb and forefinger of the other hand.

wrap masking tape around it to provide a cushion.

Angle the rasp about 30° to the workpiece and push forward, applying light pressure. Lift the rasp off the workpiece on the return stroke. Remember, you're shaping wood, not grating cheese. If you want to remove stock more aggressively, apply more pressure. If you want a finer surface, lighten up, or switch to a finer rasp or a file. This stroke will produce the best results in the shortest time with the least wear and tear on the tool.

Files

Although rasps cut quickly, even the finest will leave a rough surface. The next step in shaping is filing, which can leave a surface that's nearly ready for finishing (see the top photo on p. 49).

Files are classified by size, shape and cut. Files range in length from 4 in. to 16 in. and come in a variety of shapes and cross sections, each designed to perform a different task. There are square, flat, half-round, triangular and round files. Half-round files,

Tooth spacing is proportional to size. Both of these files are bastard cuts, but the teeth on the thinner, 8-in. file on the left are closer than on the 10-in. file on the right.



Double-cut (left) and single-cut files. All grades of files are available as single or double cut. Double-cut files require more pressure, but they'll cut faster than single-cut files.



which are rounded on one side and flat on the other, are probably the most useful to woodworkers. Both sides have teeth, so you can use the flat side for convex and flat surfaces and the half-round side for concave work. Flat files also are useful for shaping long sections with curved profiles, such as cabriole legs. Round files are handy for shaping tight, inside curves.

All files are either single cut or double cut (see the bottom left photo above). Single-cut files have a single set of parallel teeth, extending the length of the file. Double-cut files have two sets of intersecting teeth, creating diamond-shaped teeth, which leave smoother finishes than single-cut files. A single-cut file with a rectangular profile is called a mill file. A double-cut file with the same profile is called a flat file.

There are three grades of coarseness for files, and they are the

Grobet detailing file is indispensable. Its half-round profile provides a flat side for flat and convex work and a gently curved side for concave work.



same as for rasps: bastard cut, second cut and smooth cut. And like a rasp, a file's length affects the coarseness of cut. Theoretically, each of these grades is available both single cut and double cut, but the double cut is more common. Most of the files I use are double cut.

One file that I use all the time doesn't fit neatly into any category. It's called a detailing file and is made by Grobet, a Swiss company. It's a double-ended (no tang), half-round file with a bastard cut at one end and a second cut on the other (see the photo above). This file costs about \$25 and is available from Woodcraft (210 Wood County Industrial Park, P.O. Box 1686, Parkersburg, WV 26102-1686; 800-535-4482). Although it's technically a double-cut file (the rows of teeth intersect), each row of teeth is made up of short sections, offset slightly, to minimize clogging.

Rifflers

Rifflers are slender S-shaped tools with rectangular, oval, triangular and pointed heads. They can be either rasps or files (both are available) and are used primarily for small-scale detail carving. Both ends have teeth, and the most useful offer a coarse end and a fine end on the same tool. Rifflers are usually about 7 in. long and often come in sets of around eight. I use them all the time to remove tool marks and to sharpen carving details.

Hold a riffler like a pencil. If you want more control or a heavier cut, press on the end of the head.



Using rifflers—Rifflers are held in one hand like a pencil (see the photo above). Sometimes the forefinger of the other hand applies light pressure to help control the cutting action.

The heads on rifflers are so small and the teeth so fine that it's almost impossible not to use a short back-and-forth stroke when cutting with them, but you should use the longest stroke you can to take full advantage of the length of the head. □

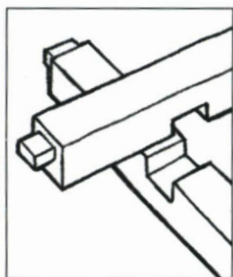
Mario Rodriguez is a contributing editor to Fine Woodworking.



A Hall Table That's Both Traditional and Contemporary

Half-lap joinery adds strength and rigidity

by Peter Korn



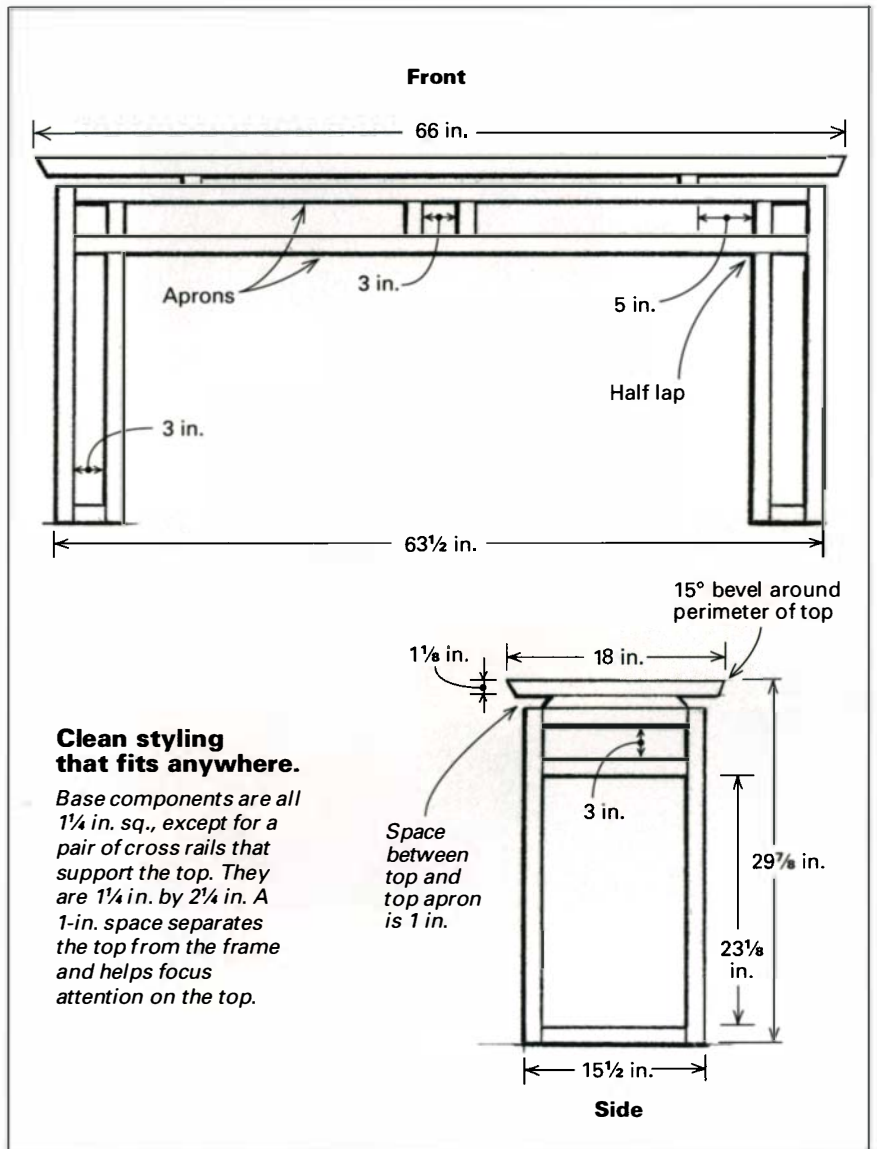
I suspect I'm not the only one who's drawn to narrow tables that sit in a hall or behind a sofa. There is something inherently graceful in their spare form. And I'm a little nostalgic about a rosewood table—elegantly proportioned with a carved apron—that stood in my parents' home when I was growing up.

When I decided to build a hall table for my own home, I settled on a straightforward design. The table has an ebonized base and a top elevated above the base by an inch (see the photo above). Because it lacks carving, inlay or other ornamentation, its success depends

on the quality of the joinery, the surface preparation and the finish.

I wanted to focus attention on the top. So by dyeing the base black, I made it recede visually, effectively bringing the top into the foreground. For the same reason, I recessed the top's connection to the base to create a floating effect. With all this emphasis on the top, you might expect that I would have used a highly figured, exotic wood. I didn't. I chose a relatively serene piece of cherry. As an object meant for daily domestic use, the table expresses the beauty of the ordinary. The quieter wood seemed to be more appropriate.

The base of the table is built entirely from 1¼-in.-sq. soft maple. It's assembled with 44 mortise-and-tenon joints, and where the



lower aprons cross the inner legs, there are four half-lap joints, as shown in figure 1 on p. 55.

Building the base

Before building any project, I draw it out full-scale to clarify any complex joinery and prevent layout errors.

Because there are only four half laps in the table, a combination of hand and machine work was the quickest and most enjoyable way to get excellent results. I made the half laps by following the series of steps shown in the photos on p. 54. These half laps add racking resistance and rigidity to the table.

I prefer handwork where appropriate, but faced with 44 identi-

cal mortises, I decided the better part of valor was to use my slot mortiser for these joints. A plunge router and mortising fixture also would work quite well.

To make the tenons, I cut the shoulders first with a sliding cross-cut box on the tablesaw. Then I sawed the cheeks with a shop-made jig that holds the work vertically and slides along the rip fence. I completed the tenons by sawing them to width against a fence on the bandsaw.

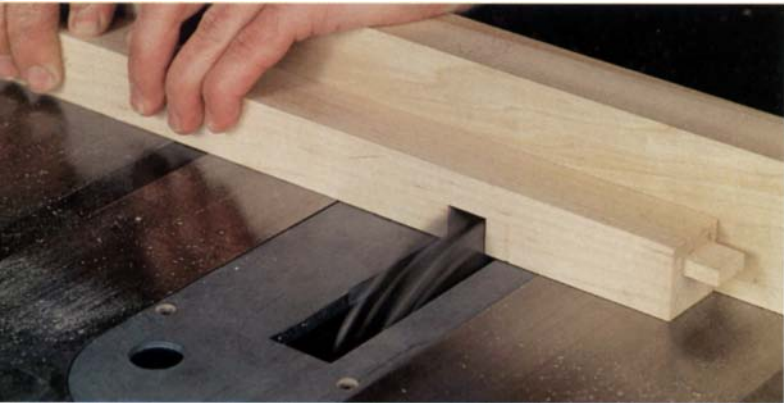
The table's top is supported by two cross rails, which started out as 1 1/4-in. by 2 1/4-in. blanks. I bandsawed a 45° angle up from the rails' intersections with the upper aprons (see figure 1 on p. 55) to give the top the appearance of floating above the base.

MAKING HALF-LAP JOINTS



Use one piece to mark the other for a tight joint. Extend the layout lines halfway down each side to mark the sides of the joint.

To avoid tearout, the author cuts a shallow groove on the waste side of the joint. The groove has one straight side at the shoulder.



Dado blade removes bulk of waste. The author uses two miter gauges screwed to a common fence for accuracy and stability. The dado blade is set to cut the full depth of the half lap.

Chop out remaining waste. The author starts paring the shoulder by using a mallet and a razor-sharp chisel that's narrower than the joint. He chops the waste from the center of the shoulder and then gradually pares to the outside edges.



To attach the top, I bored a single recessed hole (for a round-head screw and washer) in the center of each of the two support rails. Then I made a slotted screw hole near each end of the support rails. Slotted screw holes allow the top to expand and contract with changes in humidity. The fixed screws in the center of each rail ensure that any movement is divided equally between front and back.

I glued the base together in three stages, as explained in figure 2. I started with the inner legs, short center stiles and the two aprons; finished up the front and rear assemblies; and finally, connected the front and rear assemblies with the short side pieces. Before each assembly, I scraped and sanded any faces that would be hard to reach later.

After the glue had set, I planed and scraped the joints flush. Once I had the base assembled and all joints flush, I sanded the whole assembly with 120-grit paper, wet the wood to raise the grain and then sanded again with 220-grit. I raised the grain because I used a water-based aniline stain to ebonize the base, and I didn't want to sand through the stain to knock down the grain.

Making the top

I assembled the top out of pieces cut from a single cherry board so that the color and grain would match well. By inserting a biscuit every 10 in. or so, I kept the joints in the top fairly flush during glue-up. After giving the glue a few hours to set up, I cut the top to width and length on the tablesaw, with a 15° bevel around the perimeter.

Finish preparation: Plane, scrape and sand

Wood grain displays its greatest depth and clarity when it's been sliced cleanly with a sharp handplane. The surface of the wood reflects light straight back to the eye. Conversely, abrading wood can leave small scratches, which tend to dull or obscure the grain. This is especially true of coarser sandpaper, which can leave deep scratches that are difficult to eliminate.

Unfortunately, wood doesn't always respond cooperatively to planing. Knots, swirly grain and figured lumber all present challenges that are far more easily addressed by scraping and sanding with fine sandpaper. The exact steps I take depend on the individual boards I'm working with, but generally, I'll start with a plane, proceed to a scraper and then sand with fine paper.

When planing a surface in preparation for a finish, I want the most polished surface I can get, so I adjust my smoothing plane's frog so that the mouth is just 1/32 in. wide. Minimizing the opening greatly reduces the possibility of tearout. Also, by grinding the blade to a slightly convex shape, I don't leave edge marks on the wood, and I can prevent the corner of the blade from catching and gouging the surface.

For this tabletop, I followed up my planing by scraping the top and then sanding, beginning with 150-grit. I didn't scrape the underside, sides or ends of the top—each for a different reason: the underside because I'm trying to get away from that level of preciousness in my work; the sides because the plane had already left them virtually perfect; and the ends because scraping end grain doesn't work well. I also sanded the bottom, sides and ends with 150-grit. And I wet all the surfaces of the tabletop to raise the grain and then sanded with 220-grit.

Finishing

I ebonized the base by applying several coats of black, water-soluble aniline dye. Because water raises the grain, it's a good idea to make a preemptive strike: Wet the table base with water a second time to raise the grain again, and then sand with 320-grit paper af-

Fig. 1: Table joinery

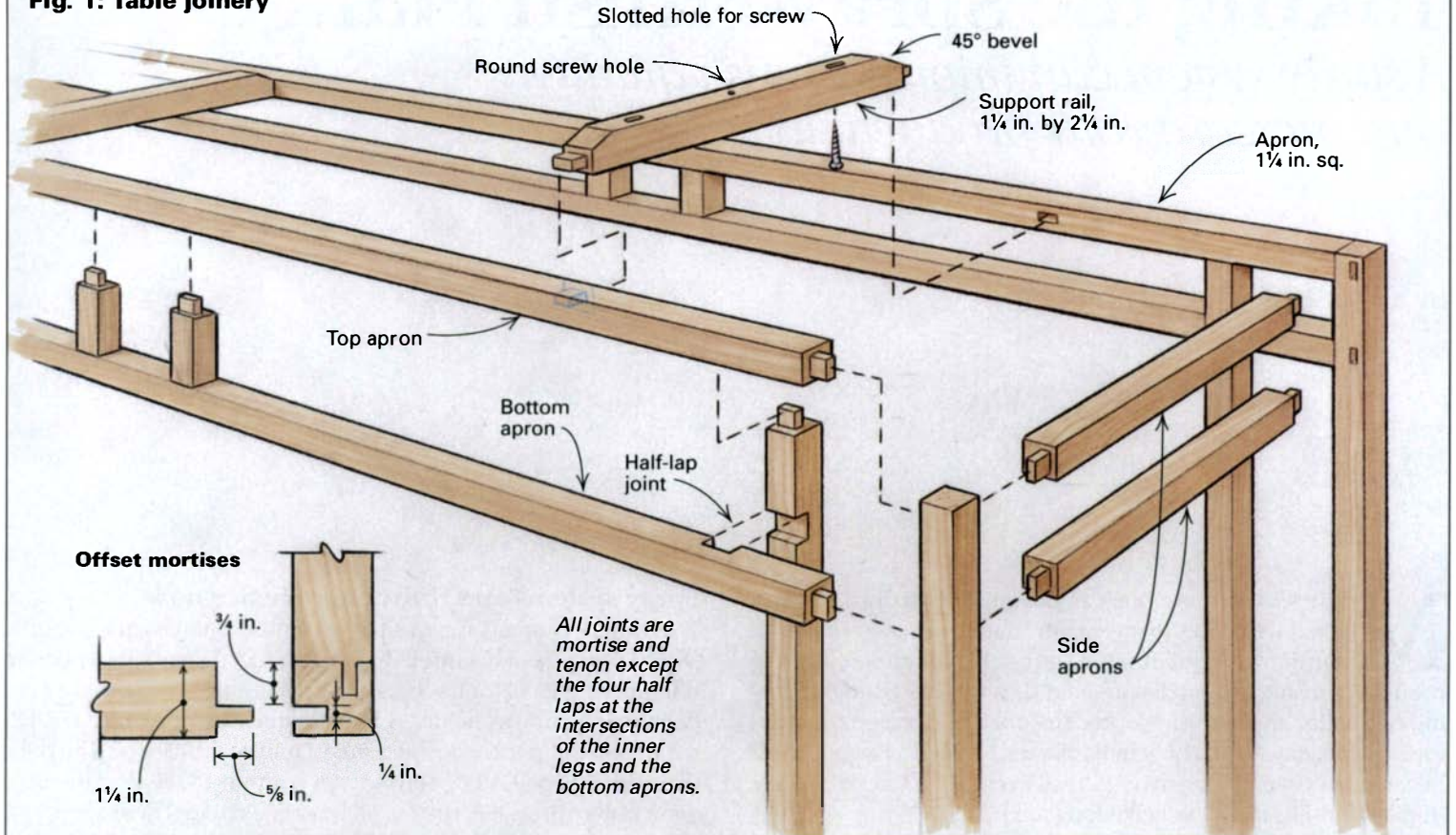
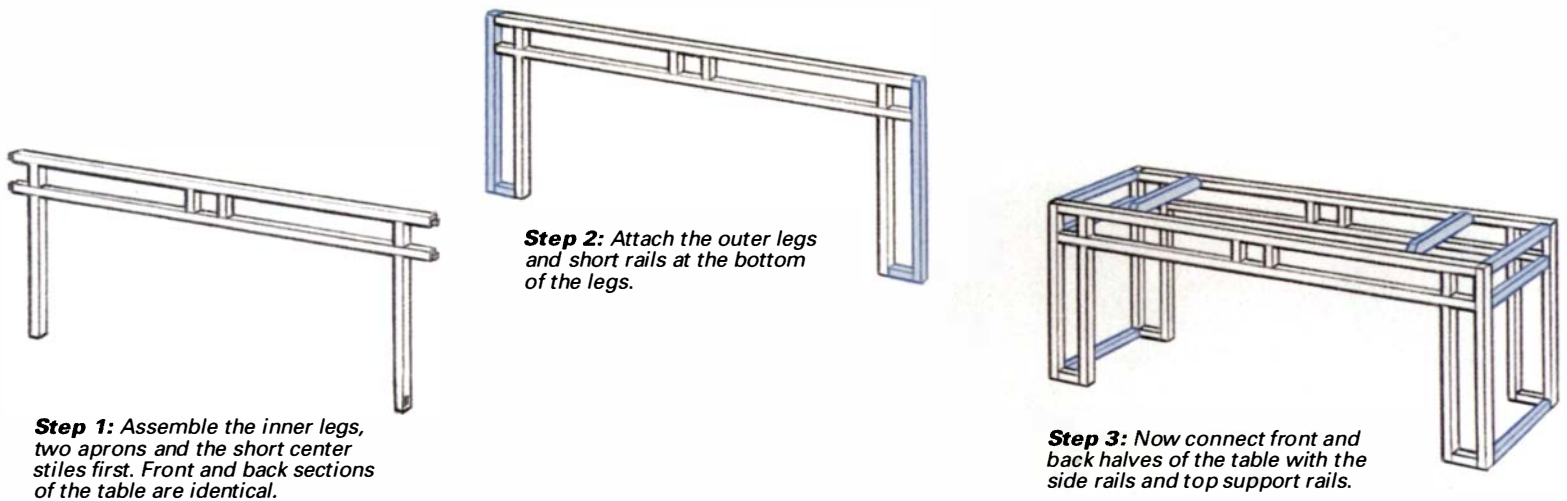


Fig. 2: Gluing up parts. This table is glued up in three stages (each new step is shaded in blue).



ter the table has dried. After that, follow the manufacturer's instructions for mixing and applying the dye. It takes two or three coats, with drying time in-between, to get a rich, deep black.

After the wood was ebonized, I applied three coats of an oil and varnish mixture, applying the first coat with a cotton rag and then wiping it dry after a few minutes. I applied the second and the third coats in the same way, but I wet-sanded the second coat with a sheet of 400-grit wet-or-dry sandpaper and wet-sanded the third coat with a sheet of 600-grit.

Be careful not to sand the corners of the wood, or you could sand right through the stain. If this happens, the best solution is to touch-

up the light spots with an indelible black magic marker. It works.

I used the same oil and varnish mixture on the cherry top. This finish doesn't offer the degree of protection from abrasion and liquids that a straight varnish would, but I prefer the look of an oil and varnish mixture. It dries in the wood, not on it, so the wood retains a seductive visual and tactile appeal. □

Peter Korn makes furniture and teaches woodworking at the Center for Furniture Craftmanship in Rockland, Maine. He is the author of the book Working with Wood: The Basics of Craftmanship, published by The Taunton Press.

Taking the Spray-Finish Plunge

A spray system can improve finish quality and increase your productivity

by Andy Charron

My first shop was a one-car garage. What space I had was filled with tools that were absolutely necessary to make furniture. That left out a dust collector and a finishing room. As a result, getting dust-free finishes was frustrating. Brushing on shellac and varnish worked fine for small projects, but as I took on bigger jobs and built more pieces, I turned to wipe-on oils because they weren't as fussy to use. Eventually, I needed more durable finishes that didn't take long to apply.

A spray system was the answer. Spraying on finish is fast and easy. You can get into places where brushes and rags are useless (see the photo below). Spray finishes look superb, too. The coating is more uniform and the finishes between pieces is more consistent. But once I was committed to changing to spray finishes, I knew I had some research to do (see the story on p. 58 in this issue).

Spray systems and finishes are better now

The variety of spray systems has increased dramatically over the last 10 years. Manufacturers have introduced small, inexpensive units that are ideal for hobbyists and small shops. Also, there have been many improvements in high-volume, low-pressure (HVLP) spray systems, particularly in terms of transfer efficiency. The price of an entry-level HVLP spray system is around \$200, and there's a wide variety of systems in the \$200 to \$500 range. These spray systems aren't much more expensive than many power tools.

Waterborne finishes have improved as well, and as a result, the need for dangerous, solvent-based finishes has decreased. Water-based finishes are nonflammable, which means that you no longer need a spray booth to get started. Having a clean spray area, a respirator and good ventilation (I use an exhaust fan) will suffice.



Spraying gets finish in nooks and crannies. One reason Andy Charron switched to spraying is that it gets finish where other applicators won't. Here, he sprays water-based sealer on the latticework of a poplar headboard.

Spraying has benefits over other methods of finishing

1) Spray finishes are forgiving. Because a sprayed finish is built up in thin layers, small scratches and marks stay better hidden under a sprayed translucent finish than under an oil finish. Surface preparation is still important, though. This is especially true when spraying paints or opaque stains.

2) Spray finishes are fast. You can spray 30 stools or 1,000 small wooden blocks in an hour. And because the sprayer breaks the finish into small particles, each coat dries in a hurry.

Many varnishes, water-based products and sprayed lacquers will dry to the touch in minutes. Some of them can be sanded and re-coated in a few hours. Dust has a short time (while the coat is tacky) to settle on the work, which reduces the need for sanding between coats.

3) Spray finishes are versatile. Basically, any finish that can be applied by brush or by rag can be sprayed. If you use an explosion-proof booth, you can spray shellac, lacquer and other solvent-based materials. If you

And a spray system won't leave you with a pile of oily rags that can catch on fire.

Brush-on and wipe-on finishes are slow and exacting

In my furniture business, I brushed on varnishes for only a short time. Varnish was just too slow to brush and too slow to dry. And I needed excellent lighting to brush, sand and rub out the varnish.

I did stick with wipe-on oils for a while. Oil didn't require any special equipment, and I could oil in less-than-ideal conditions. I wasn't building up a thick surface film (like a varnish), so I worried less about dust and lint getting trapped in the film. Oil finishes soon became a key in my marketing strategy, too. Most of my customers liked the phrase, "authentic, hand-rubbed finishes."

Oil finishing does have drawbacks. The protection offered by an oil finish is minimal (see *FWW* #104, p. 85), and an oil finish needs more maintenance than other topcoats. Surface imperfections, like scratches, stand out more than they would under a film finish. And oil finishes are time- and labor-consuming. Depending on the temperature and humidity, an oil finish can take several days to apply. It also involves a great deal of work. It's hard to get thrilled about rubbing out multiple coats of oil on 400 wooden clock frames.

Any spraying disadvantage can be overcome

As attractive as spray finishing is (see the box below), it does have a few weaknesses. Setting up a safe, efficient system takes up shop space and costs money. Besides a gun, you will need a source of air (either a turbine or compressor), hoses, filters and connectors.



Clean finish, clean gun—To get blemish-free finishes, the author filters the finish before he sprays, and he cleans the gun afterward. He often tints his paint basecoats with pigment, so the topcoat covers better.

Because spraying releases finish mist into the air, you will also need a spray area that has fresh-air circulation. If you spray solvent-based finishes, you'll need to check with your local building inspector before you set up a booth. But if you spray water-based products exclusively, you won't need explosion-proof fans and fixtures.

Unlike most brush-on and wipe-on finishes, spray finishes must be filtered and then thinned to the correct viscosity (see the photo at left). Not thinning enough can lead to lumpy finishes and "orange peel." Using too much thinner creates problems, too, like drips and sags on vertical surfaces. And it will take longer to build to the right film thickness. The result is you won't be able to get nice, glossy clear coats, and paints won't hide the underlying surface or provide good color depth. Too much thinner also lengthens the drying time, so dust becomes a problem.

Finally, keeping your spray gun clean is critical. Although cleaning does involve some effort and time, it doesn't take any longer to clean a spray gun than it does a brush.

Ultimately, spraying reduces finishing costs

Although some of the finish does get wasted through overspray, you can still lower your material costs. I've had to reject far fewer pieces that I've sprayed than those that were finished by brush or rag. And spraying saves labor costs. In the first month, I more than offset the initial expense of the equipment (about \$800). Now my business couldn't survive without a spray system. □

Andy Charron runs a cabinetmaking shop in Long Branch, N.J.

don't have a booth, you can still spray water-based finishes. With some spray systems, you can apply water-based contact cement, which works great for laminate work.

4) Spray finishes can be precisely controlled. Spray-gun adjustments combined with proper spray techniques give you good control over how and where the finish is applied. A brush transfers nearly 100% of the finish to the work, but you have to be diligent at keeping the coat even and at the right thickness.

Even though the transfer efficiency of a spray gun is lower than a brush (between 65% and 85%), you can adjust air pressure, fan size and fluid flow to ensure light, even coats. Also,

because the atomized material flows together uniformly, there are no brush or lap marks.

5) Spray finishes are relatively easy to apply. Spray finishing is fairly basic. You can learn how to spray a simple case or frame in less time than it takes to master brushing or wiping on a finish. With a bit of practice, you can spray stains and dyes to get uniform coverage and consistent color depth. After some more practice, you can use tinted clear finishes to do special techniques, such as shading or sunbursts. Because spraying allows a greater range of finishes, your projects will look more professional.

6) Spray finishes are consistent in quality. Without a



Spray guns increase production. Charron compares the number of clock frames he sprayed (left) vs. those painted with a brush.

doubt, the best reason for investing in a spray system is the overall higher quality of finish that you can achieve.

A spray-on finish is far superior to brush-on or wipe-on finishes. The problems caused by

brushing, such as runs, drips and air bubbles, are reduced with spray equipment. And brush marks are gone. You can spray an entire piece, no matter what its size or shape, with light, even coats of finish. —A.C.



Use a booth when spraying solvent-based finishes, such as nitrocellulose lacquer. Here, the author uses a Binks high-pressure spray gun, which has a 1-gal. paint pot. These guns produce excellent results but lots of overspray.

Mention the names Delta, General or Powermatic to a bunch of cabinetmakers, and everyone in the group will know you're talking about woodworking machinery. Mention DeVilbiss, Mattson or Sharpe to the same crowd, and you'll likely get some blank stares. Those companies are just three out of dozens that make spray-finishing equipment. Chances are, though, many woodworkers just don't know as much about choosing a spray system as they do about buying a tablesaw. Considering that a high-quality spray system costs as much as a decent tablesaw (\$700 or more), it pays to be well-informed before you buy.

Andy Charron explains why he switched to spray finishing in his shop (see the story on p. 56 in this issue). I'll present some equipment options—high-pressure spray guns (see the photo at left), high-volume, low-pressure (HVLP) systems and airless spray guns. But first, it would be helpful to know a little about spray-gun anatomy.

How a spray gun works

The basic principle behind a spray gun is relatively straightforward. A stream of liquid finish is forced into an airstream, which breaks the liquid into tiny droplets (atomization) and carries them to the target surface. It sounds simple, but in reality, a collection of precision parts must work in concert to pull the whole thing off.

In a standard high-pressure system, air flows from the compressor hose through a series of valves and baffles in the body of the gun and out through an air cap. The valves and baffles control the maximum atomization pressure at the air cap. The volume of air used by the gun as well as the spray pattern is governed by the size and placement of the holes in the air cap (see the drawing on p. 60).

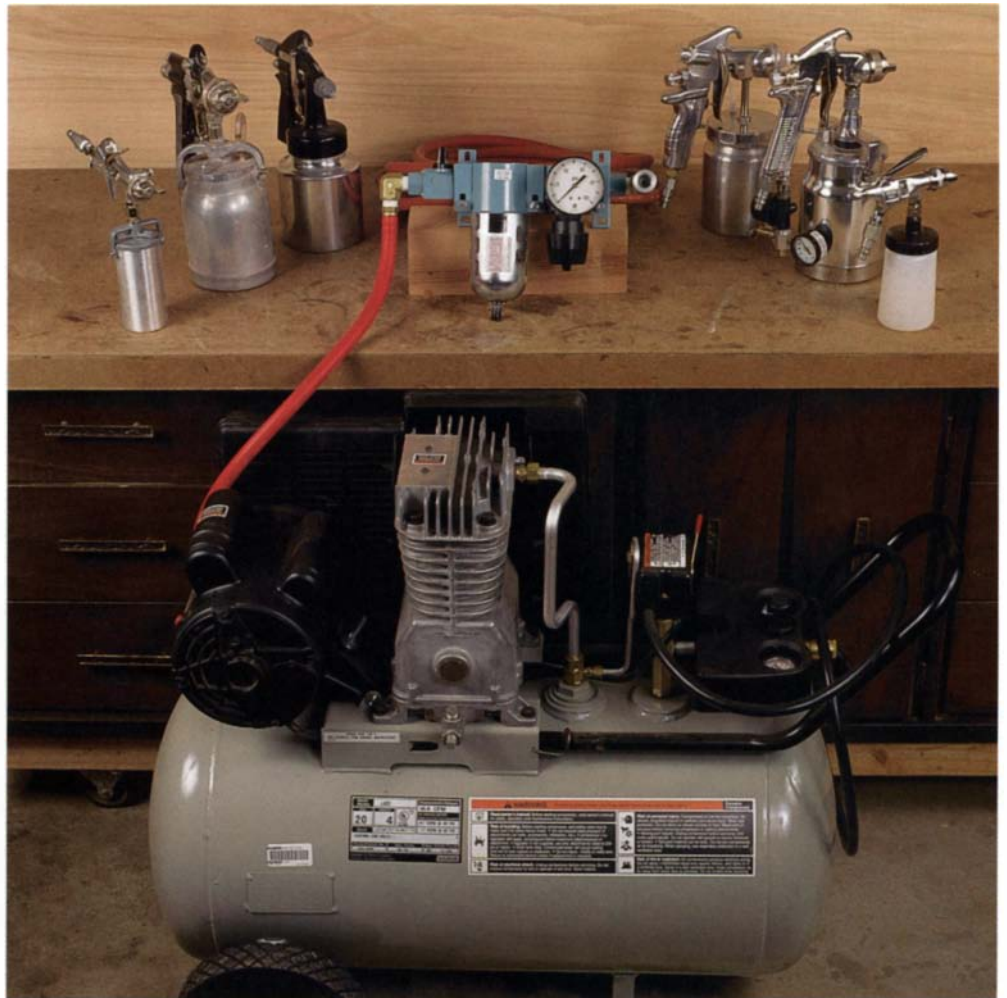
A standard air cap for furniture finishing

Which Spray System Is Right for You?

What's good and not so good about four kinds of sprayers

by Chris A. Minick

An air compressor can power a high-pressure or conversion-air HVLP spray system. With either type, you'll need an oil and water filter separator, a regulator, an air hose and couplers. Choices for guns (from left): conventional touch-up, external and internal mix, two HVLP units and conversion-air touch-up.

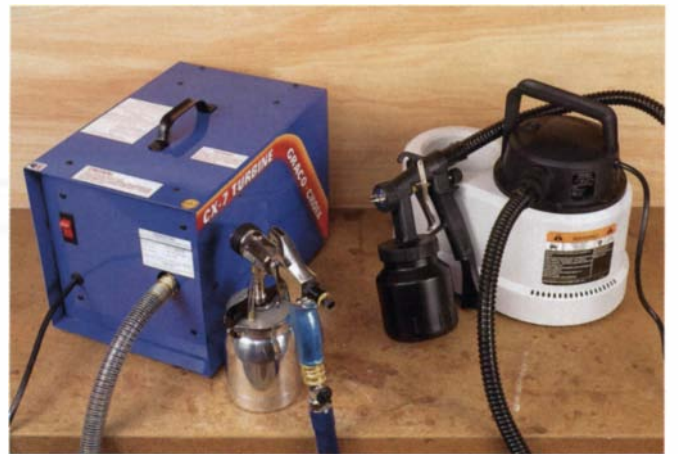


produces a tapered (fan) pattern 9 to 11 in. long. Typically, the gun uses about 8 cubic feet per minute (cfm) of air at 50 psi.

Pulling the trigger extracts the needle from the fluid tip, which opens the orifice and allows the finish to enter the airstream. The size of the orifice and the viscosity of the finish control the amount of material sprayed. I've found that a 1mm orifice is ideal for finishing furniture. The fluid tips and needles are sold in matched sets (fluid setups). Most spray-system manufacturers have technical-service departments that will help you choose the right one.

Once the finish exits the tip, high-pressure air from the air cap blasts the stream into tiny droplets. The droplets can range from about 15 microns in dia. to 70 microns or more. The size depends on the fluid viscosity and on the equipment. Once the atomized finish is deposited, it flows together to form a smooth film. Generally, the smaller the droplets, the better the finish.

Turbine-driven HVLP systems are compact, but the hoses are cumbersome. Both the two-stage Graco/Croix unit (left) and the Wagner single-stage model spray efficiently and are portable.



Gun composition affects the kind of finishes you can spray—A gun that has an aluminum cup and fluid passages is compatible with hydrocarbon-solvent-based finishes like nitrocellulose lacquer and oil-based varnish. But within a matter of hours, the same gun will be corroded beyond repair if it is used to apply a finish that contains a chlorinated solvent, such as methylene chloride (which is the main ingredient in many paint strippers). Even nonflammable solvent cleaner will corrode aluminum parts. Similarly, the alkaline portion of waterborne finishes can damage bare aluminum parts if the gun is not cleaned immediately after use.

As a corrosion-fighting alternative to aluminum, some low-cost units combine plastic cups and dip tubes with brass fluid-handling parts. But brass wears quickly,



Airless spray systems work well with latex paint and most varnishes, but they don't apply other finishes well. If not the right viscosity, the finish will be poorly atomized and leave a coarse, blotchy surface.

particularly if the gun is used to spray pigmented finishes like paint. The pigments act like the abrasives used in sandblasters.

Mild-steel components (especially fluid tips and needles) are also common in inexpensive spray guns. Though steel is compatible with most finishes, it has a nasty tendency to rust. One solution is to buy a gun that has a stainless-steel cup and fluid-handling parts, but that type is pricey. Those guns make sense for industrial users, but they are overkill for small shops. As an alternative, some spray guns come with stainless-steel fluid passages and a Teflon-lined aluminum cup. The Teflon lining protects the cup from corrosion and makes for easy cleanup.

High-pressure spray equipment

Early in this century, high-pressure spray equipment was developed in response to the automotive industry's need for high-speed finishing. Spray components have changed little since that time (see the top photo on p. 59). A full system consists of three main parts: a compressor (with attendant hoses, tank and pressure regulator), an oil and water separation device, and a spray gun.

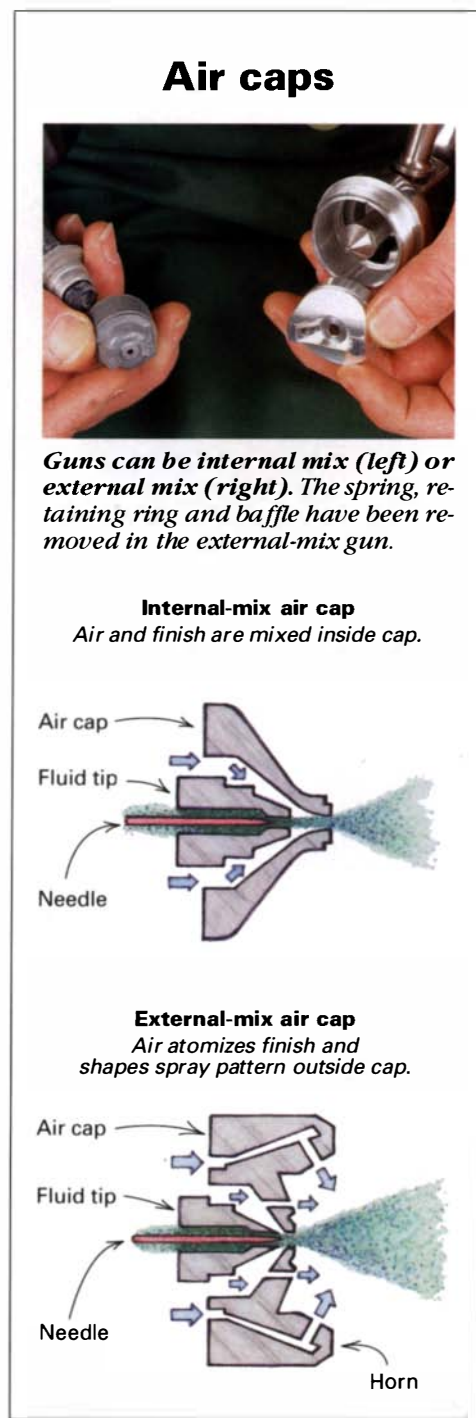
The air compressor is the heart of the spray system; both the horsepower rating and tank size affect spray performance. A 3-hp compressor with an air output of 10 cfm and a 20-gal. air tank is really the minimum size.

When air is compressed, water vapor in the air condenses to a liquid. If not removed, the water that passes through the spray gun will cause all kinds of finishing problems. So an oil and water separator is a critical part of any compressor-driven spray system. The separator also removes residual oil that's used for lubrication of the compressor.

Internal mix or external mix—High-pressure spray guns are available in two types: internal and external mix (see the photo and drawings at right). The mix designation is based on where the airstream is introduced into the fluid stream.

Most internal-mix guns (air and fluid are mixed inside the air cap) produce a coarsely atomized spray. Although this spray is unsuitable for applying lacquers or other fast-drying finishes, it is ideal for applying thick, difficult-to-spray materials, like adhesives and pore fillers. Internal-mix guns consume modest amounts of air and can be powered with a 1-hp or 2-hp compressor. But they are limited to spraying slow-drying varnishes and paints.

By contrast, external-mix guns (air and



fluid are mixed outside the air cap) are versatile. They're the most common spray guns used in woodworking shops. Hundreds of fluid tip/needle/air-cap combinations are available to allow the spraying of virtually any liquid at almost any pressure. External-mix guns can be fed from a 1-quart siphon cup attached to the gun or pumped from a 1-gal. remote pressure pot when greater quantities are needed.

External-mix spray guns have two drawbacks. They use lots of air, so they require at least a 3-hp (4 hp or 5 hp is preferable) compressor. And they aren't very efficient at putting the finish on the work. Only about 35% of the finish actually lands on the target; the rest ends up as overspray.

High-pressure spray guns only make sense in a shop that has a good spray booth.

More finish ends up on your project with HVLP

High-volume, low-pressure (HVLP) spray equipment has been around a while. In the late 1950s, I painted models and birdhouses with an HVLP painting attachment that came with my mother's canister vacuum cleaner. HVLP equipment is more sophisticated now, but the underlying concept remains unchanged. To atomize the finish, HVLP systems use high volumes of air rather than high pressure. Unlike conventional spray guns, HVLP guns produce a soft spray pattern. The benefits are increased transfer efficiency, low overspray and almost no bounce-back. Simply put, HVLP spray guns put more finish on the project and less on everything else in the shop and in the environment.

Spray-equipment manufacturers have taken two very different approaches to HVLP. Some have developed turbine-driven systems and others have developed conversion-air HVLP systems, which are driven by a standard air compressor.

Turbine-driven HVLP spray systems are portable—Turbine HVLP systems use a fan (like those used in vacuum cleaners) to generate from 45 cfm to 110 cfm of air at pressures between 2 psi and 7 psi. You can buy turbines in three power levels: one, two or three stage. The center photo on p. 59 shows a two-stage turbine and a single-stage unit. Each stage, or fan section, in the turbine adds approximately 40 cfm and 2 psi of air output.

Unlike a compressor, a turbine blows out a continuous stream of warm, dry air at a constant pressure. This eliminates the need for pressure regulators and air dryers (separators). But warm air can be a problem. The metal handles of some spray guns can get uncomfortably hot.

Also, dried drops of finish tend to accumulate on the fluid tip; eventually, the finish glob breaks free and deposits itself on the freshly sprayed surface. On the positive side, turbine systems are compact, store easily and operate on 110v current.

The more stages a turbine has, the wider the viscosity range of the spray finish. When I sprayed with a one-stage turbine (a Wagner Finecoater), I had to thin the finish to get proper atomization. Thinning is the kiss of death for some waterborne finishes. When I sprayed the same finish with a two-stage turbine (a Graco/Croix CX-7) there was sufficient power to spray without thinning. I didn't try a three-stage tur-

bine. Designed for multiple guns and high production, they're a bit pricey for me (more than \$1,000).

Conversion-air HVLP spray systems are versatile—Conversion-air HVLP systems convert compressed air (under high pressure) to a high volume of air (at low pressure) by passing it through baffles and expansion chambers in the gun body. A decent gun costs \$250 or more. Conversion-air guns have the reputation of being air hogs. But the latest conversion-air spray guns will operate off most 3- or 4-hp compressors. If your shop already has a compressor, it may power a conversion-air HVLP gun.

A big advantage that conversion-air systems have over turbines is that the atomization pressure at the air cap can be adjusted (between 2 and 10 psi with most guns) to accommodate a wide range of coating viscosities. I compared the two types of HVLP systems side by side (see the box below). The conversion-air system consistently produced a finer atomized finish, a higher delivery rate and a noticeable decrease in overspray.

Conversion-air spray guns work best when connected to $\frac{3}{8}$ -in. air hoses. The quick-connect fittings on the hose and the spray gun must be matched (connectors are available at most auto-paint and com-

*Considering that
a high-quality
spray system costs
as much as a decent
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before you buy.*

pressor repair shops). Use a $\frac{3}{8}$ -in. coupler; a $\frac{1}{4}$ -in. coupler will negate the advantage of the larger hose.

Airless spray systems

Airless systems usually are associated with house painting rather than furniture finishing. But airless spray systems are common in large furniture factories. These commercial units operate at pressures approaching 4,000 psi. However, high pressure, high delivery and high efficiency come with a high price tag—upward of \$1,500 for an entry-level unit.

Consumer-sized airless units (see the bottom photo on p. 59) still have a place in the shop. I like them for applying latex

paint and oil-based varnish on certain projects. The motor size of an airless gun determines its price and its versatility. A 110-watt gun is powerful enough to spray unthinned latex paint. But with a 45-watt unit, the paint has to be thinned significantly. A motor rating of 85 watts or more usually is adequate for spraying furniture.

Unfortunately, airless spray guns produce a coarse spray pattern. So only slow-drying paints and varnishes should be applied with them. Lacquers, including waterborne varieties, tend to dry before the droplets flow together. The result is a rough texture (orange peel).

Even with these limitations, however, an airless spray system can help get you started spray finishing—and for a reasonable price (around \$200). One of the best things about an airless spray unit is that it doesn't use a cumbersome air hose. It just needs an extension cord.

The choice is yours

If you're considering a spray system for your shop, take a good, hard look at conversion-air HVLP spray systems. As a bonus, you'll have an air compressor to do other things in the shop. □

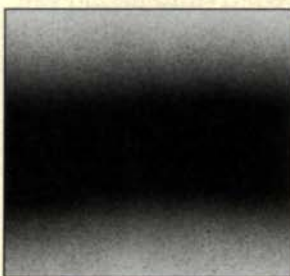
Chris Minick is a finishing chemist and woodworker in Stillwater, Minn. He is a contributing editor to Fine Woodworking.

Evaluating spray patterns

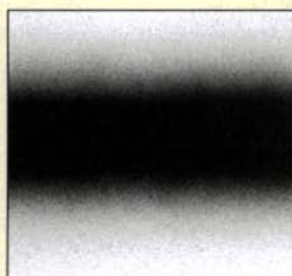
I couldn't resist comparing the performance of the spray systems in this article. I used a gloss, water-based lacquer (tinted black) in each spray gun. This is a demanding test when you consider I didn't adjust the viscosity. Spray patterns reveal where atomization was poor (large spots on borders) and where fan adjustments were limited (wide dispersion band). In general, high-pressure and conversion-air HVLP systems delivered fine atomization and more uniform spray patterns. Turbine HVLP and airless systems produced coarser spray patterns.

—C.M.

Fine and uniform

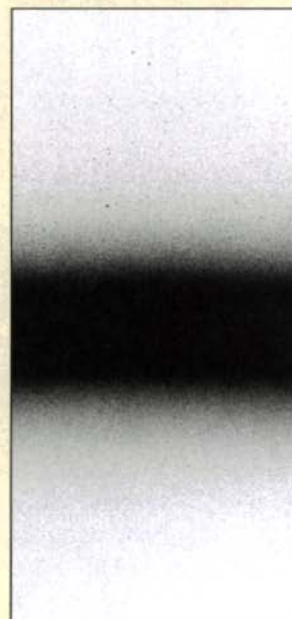


Conventional high-pressure spray (from Cal-Hank touch-up gun).

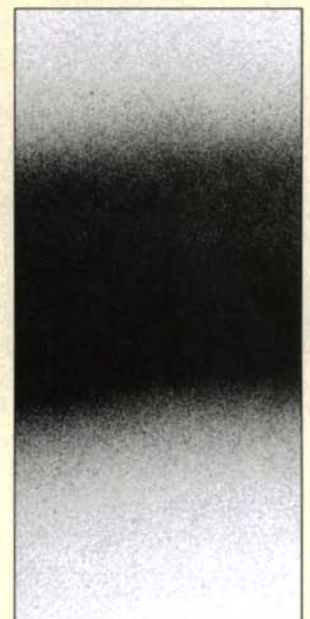


Conversion-air HVLP spray (from DeVilbiss touch-up gun).

Coarse and splotchy



Turbine HVLP spray (from Graco/Croix gun). Finish was thicker than recommended viscosity.



Airless spray (from Wagner gun). Finish was thinner than recommended viscosity.

Shelving, Plain and Simple

Strong, versatile and easy to make, these shelf units use inexpensive materials

by M. Felix Marti



A versatile design for a variety of uses. These shelves can be sized to fit any location.

As unassuming as these shelves are, they have many of the features that I like most in furniture. They're lightweight, sturdy and use simple, effective joinery. The design I use evolved partly from childhood memories of shelves in our house and partly from the built-in storage-shelf system that I now install in houses. Plastic laminate glued to both sides of medium-density fiberboard (MDF) or particleboard makes the shelving stiff. Tight-fitting dado joints and front and rear uprights at right angles to each other make the assembly strong and resistant to racking.

Laminate shelf stock first, and then cut to size

I glue the plastic laminate to a sheet of $\frac{3}{8}$ -in. particleboard or MDF. Melamine could be a less-expensive and, perhaps, a less-stiff alternative, but I have not used it for my shelves. A cabinet-component manufacturer is a good source of laminated stock if you don't want to make it yourself.

With a new shopmade throat plate in my tablesaw, I cut the shelves to size using a Forrest Duraline HI-A/T blade made specifically for cutting double-sided laminated stock (Forrest Manufacturing Co.,

Front and rear uprights, oriented at right angles to each other, provide lateral stability.



Inc., 461 River Road, Clifton, NJ 07014; 800-733-7111). There is virtually no chipping on the down side of the shelf stock.

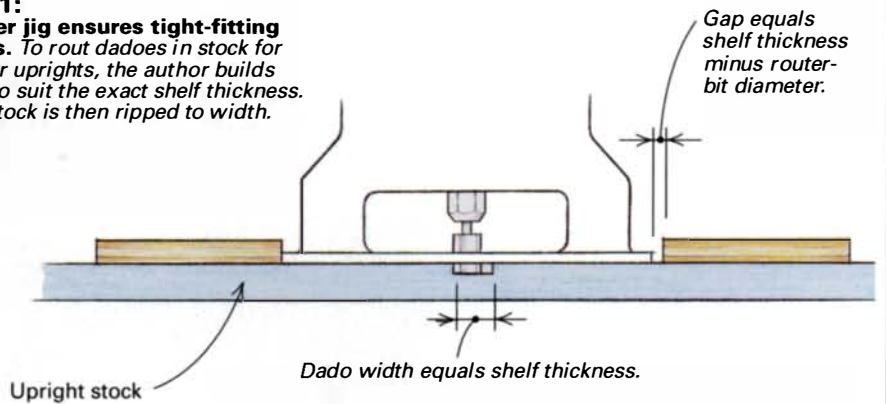
Dado material for corner uprights

I lay out the shelf spacing on a 9-in.-wide oak board. This width will yield four 2-in.-wide upright corner posts with allowance for kerfs and some cleanup. Using a $\frac{1}{2}$ -in. down-shear bit in my router and the jig shown in figure 1 on the facing page, I plow $\frac{1}{4}$ -in.-deep dadoes across the full 9-in. width. The down-shear bit makes a clean cut, and careful jig construction yields a dado so tight I have to tap the uprights onto the shelf stock. Then I rip this board into pieces a little wider than 2 in., which I feed on edge through a planer to produce uniform finished widths. Finally, I round over the corners and edges.

Assemble shelves and uprights

I now fit the shelf into the dadoes of the upright pieces, so the shelf is flush with the edge of the upright. I drill through the corner uprights using a tapered bit and counterbore. I use a 2-in. particleboard (not drywall) screw to fasten the pieces together. The deeper thread of the particleboard screw makes a strong joint. An

Fig. 1:
Router jig ensures tight-fitting joints. To rout dadoes in stock for corner uprights, the author builds a jig to suit the exact shelf thickness. The stock is then ripped to width.



oak plug glued into the counterbore finishes this simple connection.

For the shelf-nosing stock, I plane a wide board a hair thicker than the thickness of the shelves and cut it to length. On my router table, I round over the ends and edges of this board for the front nosing and rip the rounded edge to a 1/4-in. thickness. I round over this fresh edge on the router table and rip the next 1/4-in. piece, alternating between router table and tablesaw until I have enough nosing for the job.

I glue and staple the nosing to the shelf edges using a narrow-crown pneumatic stapler. The nosing is applied as shown in figure 2. To me, the effect is a fully nosed shelf let into the uprights. A scraper flushes the nosing to the shelf surface. Using dry stock for the nosing guarantees that it won't shrink away from flush later.

By maintaining sharp planer knives and feeding stock slowly on the router table, I've just about eliminated any sanding. To complete the job, I apply a penetrating oil finish and fill the small wounds left by the staples with a crayon-type putty stick.

Try different materials or knockdown construction

I could get very different results by using the same basic idea and unusual materials. Marble or glass could be epoxied into dadoes in wood or metal uprights, or different woods could be used for the shelves and uprights (although I'd be concerned about shrinkage in the shelf thickness, which would reduce the effectiveness of the dado joint). For a knockdown version, I'd use threaded inserts in the shelves and machine screws instead of particleboard screws. Buttons would conceal the screws.

I'm pleased with the low cost, appearance and strength of these units—happily, so is my wife, who has surrounded her weaving studio with them. □

Felix Marti is a designer and builder in Ridgway, Colo.

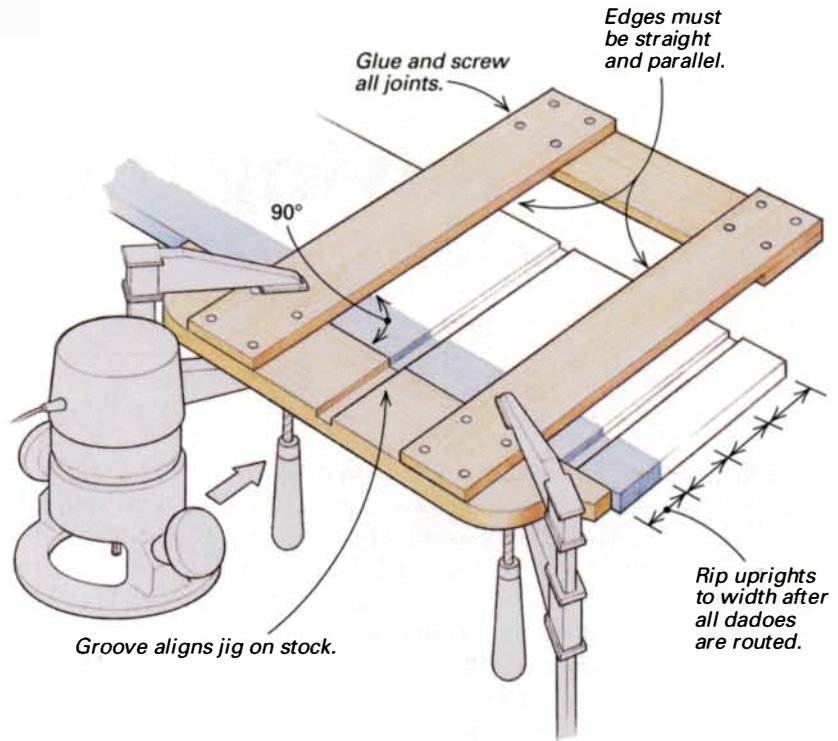
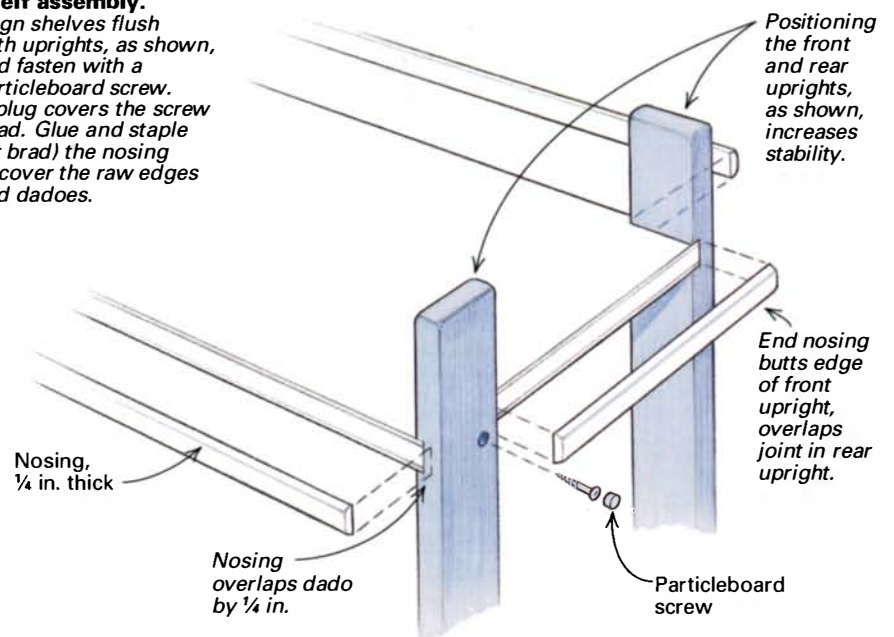


Fig. 2:
Shelf assembly. Align shelves flush with uprights, as shown, and fasten with a particleboard screw. A plug covers the screw head. Glue and staple (or brad) the nosing to cover the raw edges and dadoes.





Buying the Best

When is a top-of-the-line hand tool worth the extra cost?

by Scott Gibson

My grandfather's toolbox didn't have much in it besides a hammer, a couple of wrenches and a spool of baling wire. His small workbench was squeezed in front of the Chevrolet in their cinder block garage. He would have found it hard to believe that anyone not committed to an institution would spend \$165 for a jack plane or \$50 for a small try square. Plenty of people would agree with him. Even woodworkers who use these tools every day might have trouble swallowing those prices when there are plenty of other tools that supposedly do the same job for a lot less money.

I used to see it that way, too. I figured that the jack plane I already had, a Union No. 5 of unknown age, was fine and that my newest 6-in. square, at about \$25, was as accurate as it needed to be. Still, I have long wondered what tools like Lie-Nielsen planes or Bridge City squares and sliding bevels might be like. The ads and catalogs show hand tools of seductive beauty. I was finally prompted to try some of these tools by something a woodworker said. In preparing to trim a strip of veneer along the edge of a board, he said he reached for his Lie-Nielsen block plane. Not any old block plane, his Lie-Nielsen.

Could it really make that much of a difference? Probably not, I thought, suspecting the comment was really more about tool elitism than anything else. But I wondered enough to get a block plane from Lie-Nielsen and the low-angle jack plane the company also makes. I got my hands on a Bridge City try square, its T15 model and borrowed one of its adjustable bevels. Then I set about comparing these tools to the ones that I had been using for years. I wanted to know two things: Were these tools really that much better than what I already had, and would they make any real difference in the

quality of my work? I also visited both of these companies. When paying for pricey tools, I wanted to think I was getting more than a stake in a widget factory. Some of these tools really are worth the price. Others don't look like the right investment for me. It all depends on why you really buy tools—to use, to look at or some combination of the two.

Where Lie-Nielsens come from

At Moody's Diner, just a few miles down the road from Lie-Nielsen Toolworks in Warren, Maine, you can still get a cup of coffee for 38 cents, including tax. Pie is extra. Thomas Lie-Nielsen's plane factory, like Moody's Diner, is part of the jumble of motels, snack bars and gift shops catering to the tourist trade on the road between Wiscasset and Camden. Lie-Nielsen's 6,000-sq.-ft. plant is part machine shop and part foundry. Eighteen employees turn out roughly 7,000 planes a year. The first thing you see inside the front

door isn't a receptionist's desk. It's a workbench where each of the company's 15 planes is laid out, along with scraps of wood. Visitors are welcome to put a piece of wood in the vise and try any plane that appeals to them.

Lie-Nielsen, 40 and energetic, takes the stairs two at a time. He shares an office with two other employees. He's been making planes for about 14 years, ever since he left his job in 1981 as a tool buyer for Garrett Wade in New York City. When a supplier told Garrett Wade that it would stop making its edge-trimming block plane, Lie-Nielsen saw an opportunity to go back to Maine and become a plane maker.

He had no formal training as a machinist or foundry worker. But he set himself up in a West Rockport woodshed (not fancy enough to be called a workshop, he says) and began figuring

*I got paper-thin
shavings, not
chunks of wood.
The plane left behind
a surface that was
ready for finish:
glassy smooth,
almost polished.*



These planes are cousins, not twins. A Union No. 5 plane (rear) and a low-angle jack plane from Lie-Nielsen show similarities but big differences, too. The Lie-Nielsen delivers high performance at a high price. The Lie-Nielsen blade (see inset photo) is thicker than the Union's.

out how to make the plane. It was complicated. The first castings were done by a friend nearby. In six months, Lie-Nielsen delivered 100 planes to Garrett Wade. He slowly taught himself the skills he needed, and the business grew from there.

Almost all of his planes are modeled after ones the rest of the world stopped making many years ago: a skew block plane similar to a Stanley #140, No. 1 and No. 2 smooth planes, a 10-in.-long chisel plane, a scraping plane. Most of the planes have bodies made of manganese bronze. Later this year, he hopes to introduce a No. 4 smooth plane, a standard-sized bench plane. That would put him head-to-head against a number of other mainstream manufacturers.

Everything in a Lie-Nielsen plane, with the exception of the cast-iron bodies on four models, is made in the Warren plant: adjusting screws, irons, cherry handles (see the photo at right). Lie-Nielsen is trying to cross-train employees to reduce the company's reliance on his own production know-how. But there are still operations, like hardening plane irons in a liquid salt bath, that he hasn't given up. Quality control is rigid. There are no Lie-Nielsen seconds—what can't be sold is melted down for another try.

Okay, but how do they work?

I doubt there's a tool in my shop I use more often than my Record low-angle block plane. It's sweet. The jack plane I own does what the block plane won't. Because of its length, a jack plane spans greater distances than a block plane and is an all-around heavier tool. Taken together,

there aren't a lot of planing jobs these two won't do.

The Lie-Nielsen block plane is a little smaller than my Record, so it fits in my hand more comfortably (see the top photo on p. 66). Mechanically, the two planes are similar but not identical. The Record has an adjustable throat, which the Lie-Nielsen lacks, and the cap irons differ slightly in how they work. One real difference is the blades, on the jack plane as well as the block plane. The Lie-Nielsen blades are thicker and seem to hold an edge longer. The difference in cost—\$75 for the Lie-Nielsen and about \$50 for the Record—would make it easy to buy the Lie-Nielsen if I had the choice to make over again.

There are far more differences between the two jack planes, as shown in the photo above. The blade in the Union No. 5 (a typical metal-bodied bench plane like a Stanley or a Record) is set at 45° and goes in bevel side down with a lever cap to keep it in place. There's a lateral adjustment to square the blade in the throat.

The Lie-Nielsen jack plane is a different animal. Its blade is set at 12° to the sole, bevel up, with no chipbreaker. There is no lateral adjustment (the blade is precisely milled to fit in the body of the plane), and the throat opening is adjustable. This jack plane is based on the Stanley No. 62, which was used to smooth the end grain of butcher blocks.

Hard, curly maple is just about the most ornery wood I know. I've never had a lot of luck planing this stuff by hand with either a block plane or a jack plane. The undulating figure makes for easy tearout and chipping just where you don't want it. I've



Production runs are very small. Molten manganese bronze is poured into sand molds at Lie-Nielsen Toolworks to form plane bodies.

always found it easier to get the dimensions close to where they want to be and then sand. And sand. That was until I unboxed the Lie-Nielsen plane and ran it down a 1½-in.-wide piece of curly with an especially heavy wave. I got paper-thin shavings, not chunks of wood. And the plane left behind a surface that was ready for finish: glassy smooth, almost polished (see the bottom photo). This is how planing should be. You want to plane for no other reason than the feel of the tool slicing through the wood.

The Union plane, even after a good sharpening, just couldn't match that performance. Although the surface of the planed wood was relatively smooth, there were those telltale peck-outs that I've come to associate with hand tools on curly maple. Close, but no cigar. The comparable results were essentially the same on cherry and pine.

I wanted to hate this tool. I liked to think of it as a trophy for tool junkies. But I didn't have the Lie-Nielsen in my hands for more than five minutes before I wanted to buy it. At \$165, it isn't cheap. But for anyone working difficult woods by hand, this plane is easily worth the cost.

Bridge City Tool Works

Company founder John Economaki eventually would like to make every tool a woodworker needs that doesn't have a power cord attached to it. For now, Bridge City makes layout tools—straightedges, marking gauges, squares, trammels and adjustable bevels. His company sells somewhere between 30,000 and 50,000 tools a year. His product line has doubled in the last three years, and he plans to introduce five new tools a year for the foreseeable future.

He now runs three shifts at his Portland, Ore., plant and still can't keep up with demand. Just about everything he sells is back ordered; you could wait as long as nine months for some of the 42 tools in his catalog. After several financially punishing years in the early '90s, Economaki wants to take his company public this year by selling up to 400,000 shares of common stock.

Economaki is a 43-year-old former shop teacher from Iowa who moved to Portland in 1973 for his first teaching job. A video and, later, a workshop by furnituremaker Sam Maloof changed his life. After teaching for six years, he turned pro as a furnituremaker. Then, in 1982, a severe allergy to wood dust made it hard to continue working in the shop. So he turned to tool-making. He started with a scratch awl and a square that he had originally designed as a project for his ninth-grade shop class (the ones he bought for the class were all out of square).

Economaki thinks cheap tools are a waste of natural resources. He believes that the quality of American hand tools

dropped like a stone after World War II when American factories rushed to supply the rest of the planet with manufactured goods. "It was all sort of adequate," he says with a shrug.

His company's motto is "quality is contagious." To Economaki, that means the overall quality of his tools should encourage woodworkers who use them to do their best work. The excellence of a Bridge City square, for instance, just leads to better work. And, he says, his squares are dead-on accurate. To Economaki, it's all about value, "If you're serious about woodworking, you should be buying serious tools."

The squares, marking gauges and other tools are built in 13,300 sq. ft. of second-floor space in a 1902 wood-frame factory that's anything but pretentious. Computer-controlled milling machines do the heavy work, but each tool makes the rounds of workbenches where assembly, fitting and polishing are done by hand (see the bottom photo on the facing page). Bridge City does sell seconds but only if the imperfections are cosmetic. I like Bridge City tools for the way they work and for the way they look, but I'd have a hard time spending the money for most of them. The reason? To me, the difference between an accurate but moderately priced tool and a much more expensive version from Bridge City seems largely cosmetic. But they are nice.



The Lie-Nielsen is smaller. Its low-angle block plane (left) is smaller than a Record and contoured for a more comfortable fit.



That's curly maple. The Lie-Nielsen jack plane can get paper-thin shavings from a piece of curly maple, a wood whose wavy grain makes chips and peck-outs all too common.

High performance at a high cost

The Bridge City TS 1.5 try square is similar in size to a Sorby square I bought a few years ago for about \$25. At the time, I thought the Sorby was quite an extravagance. According to the Bridge City catalog, the TS 1.5 is just right for making boxes or drawers. Accuracy is guaranteed to within .002 in. over the length of the blade. It's beautifully made, with a thick brass blade and a dark wooden handle.

The handle material on Bridge City tools, as it turns out, is something of a sore point among some Bridge City fans. Some of them complain that handles are no longer made of rosewood. Economaki stopped using rosewood in his regular production-run tools three or four years ago (some new tool releases still get it) for a variety of reasons. The substitute is called Juara wood, as if it were some kind of wood species. It is, sort of. As the catalog explains, Juara is really strips of maple, birch or beech laminated together and impregnated with phenolic resin and dyed to a pleasant, rosewood-like color. The stuff is probably indestructible, and Economaki pays twice as much for it as he does for rosewood. It sure doesn't offend me.

Well, what does a square do, anyway? It lays out a line square to an edge, or it's used to check that two surfaces are square to each other. As far as that goes, the Bridge City square and the Sorby square



Careful packaging, guaranteed accuracy. The Bridge City try square is made of heavy brass and a laminated wooden handle. It comes with a certificate of accuracy.



Adjustable sliding bevels in three grades. The Bridge City bevel (bottom) is built to last, with a price tag to match. The other two are from Stanley, one old (top) and the other recent.

both do the same job. Both seem to do it accurately. The Bridge City square is more comfortable to hold because the handle isn't as wide as the one on the Sorby. And it's certainly better looking. But as far as I can tell, there's no difference in useful accuracy between the two. I can't claim my four-year-old Sorby is within .002 in. (which means the blade won't be out more than $\frac{1}{500}$ in. over its length). But when I draw parallel lines on a board with both the Sorby and the Bridge City squares to test accuracy, the results look the same to me.

I'm not going to lose much sleep if my own square is a couple thousandths of an inch off. That level of accuracy seems beside the point when I'm working on something like a tenon for a door rail, especially in a nice softwood like pine. Neither my handsaw nor my tablesaw will cut a line that accurately. And gluing up the door frame in clamps would take out .002 in. of slop. It's a different story when using a square to check that sawblades or jointer fences are set accurately. In that case, I want to know the square I'm using is right on. Even so, I didn't end up feeling that I had to own a Bridge City square. As handsome and accurate as it is, I get the same performance and nearly the same aesthetics from a tool that costs roughly half as much. For me, the Bridge City square isn't a good buy.

Bridge City adjustable bevel

There may be a better case for buying Bridge City's 7-in. adjustable sliding bevel. A friend of mine loaned me his (he told me twice to be careful with it) and said he'd never had anything that held an angle as well. Like most Bridge City tools, this one is made with heavy brass-wear plates and has a solid, reliable sort of heft. I have several sliding bevels but none as pretty as this tool (see the photo above right).

The bevel I use most of the time is a very old Stanley, with what looks like a walnut handle and a brass lever that tightens the blade. It's beat up, but I can set an angle one-handed, which I can't with the Bridge City tool. I paid a couple of bucks for it at a barn sale and wouldn't trade it for a Bridge City bevel if only because I've had it for a long time.

A newer and smaller Stanley bevel that I also own would be a much better reason to consider a Bridge City bevel. Even though the difference in price is big (the Bridge City is \$69), the Stanley frustrates me every time I pick it up. It has an uninspiring wooden handle, and the wing nut that tightens the blade is uncomfortable to use and interferes with the work. It would be worth the \$69 not to have to use it again. So if I were starting from scratch and didn't have a sliding bevel, I'd consider the Bridge City tool. But not now. I'm left with the feeling that there are less-expensive alternatives for bevels that perform just as well.



Tools are made one step at a time. Modern milling machines at Bridge City take care of the heavy work, but tools spend more time making the rounds in small batches for hand fitting and polishing.

Not everyone, of course, buys tools for purely practical reasons. I don't either, really. Tools can be appealing just because they feel right in your hand or because they're plain beautiful. I've bought tools for those reasons, and I hope I do again. And Economaki may have something when he says the quality of a person's tools will be reflected in his work. Aesthetics alone, though, usually aren't enough for me. If I'm going to spend a lot of money for a tool, I want it to earn its keep with the work it does, not necessarily with the way it looks. If money were no object, I'd enjoy working with nothing but top-drawer hand tools, no matter what task they performed. Life being what it is, I can make do without some of them. □

Scott Gibson is the editor of *Fine Woodworking* magazine.

Strategies for Clamping

Work on a flat surface, and test-fit everything first

by Jim Tolpin



My partner and I weren't expecting much trouble when we set out to clamp up our first spiral staircase. Each of the two laminations making up the staircase consisted of six layers of 1/2-in. red oak. We were well into gluing the oak strips and clamping them to the bending form when I realized that we were using a lot of clamps. To make matters worse, portions of stringer we'd already clamped were opening up. We needed more clamps—and fast. I kept gluing and clamping while my partner jumped into his truck and hit up every boat shop, cabinet shop and contractor in town for clamps.

The stair did go together, but the experience proved to me that it's best to have all

Check the assembly for square. A set of trammel points on a bar accurately compares diagonal measurements.

the necessary materials on hand *before* getting started. It's also important to make a dry run to see if any problems crop up, whether you're assembling a simple project or a complex staircase.

A flat assembly table and the right glue

To ensure successful glue-ups, I use dry, stable stock and keep my shop reasonably warm and dry. I also set up a clamping station that is level and flat. I cobbled together a worktable from particleboard and

strips of softwood lumber and put a couple of T-stands on it. Clamps tighten freely when they're resting on T-stands. And because the clamps (and assembly) don't have to be lifted off the table to tighten the clamps, T-stands also help prevent an assembly from becoming distorted. The worktable doesn't have to be anything fancy. As long as you level the surface by shimming wherever necessary, you can get by with a couple of straight 2x4s on edge across two sawhorses.

The right type of glue also is crucial to a successful glue-up. In most cases, yellow glue (aliphatic resin) is fine. If the structure is complex and threatens to take more than five minutes to assemble, I'll use a urea-formaldehyde glue (such as Weld-

Fig. 1: Clamping a frame. Clamps should be applied parallel to the rails to keep the frame flat.



Make sure clamps are perpendicular to the joints' shoulders to keep the frame square.

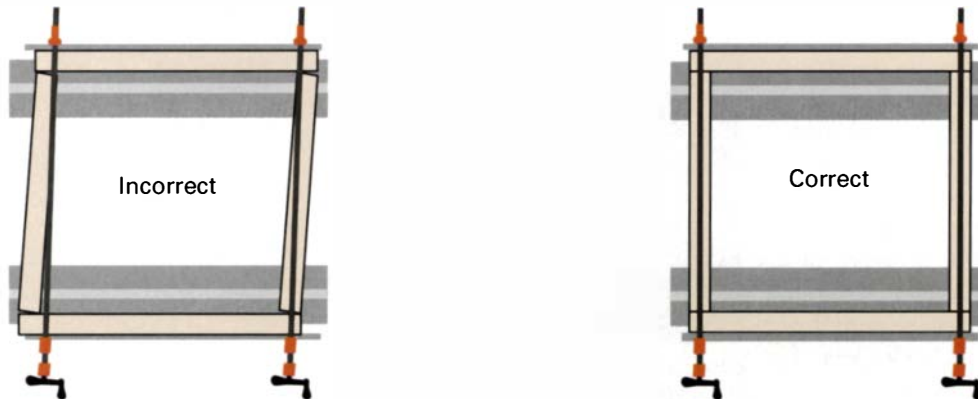
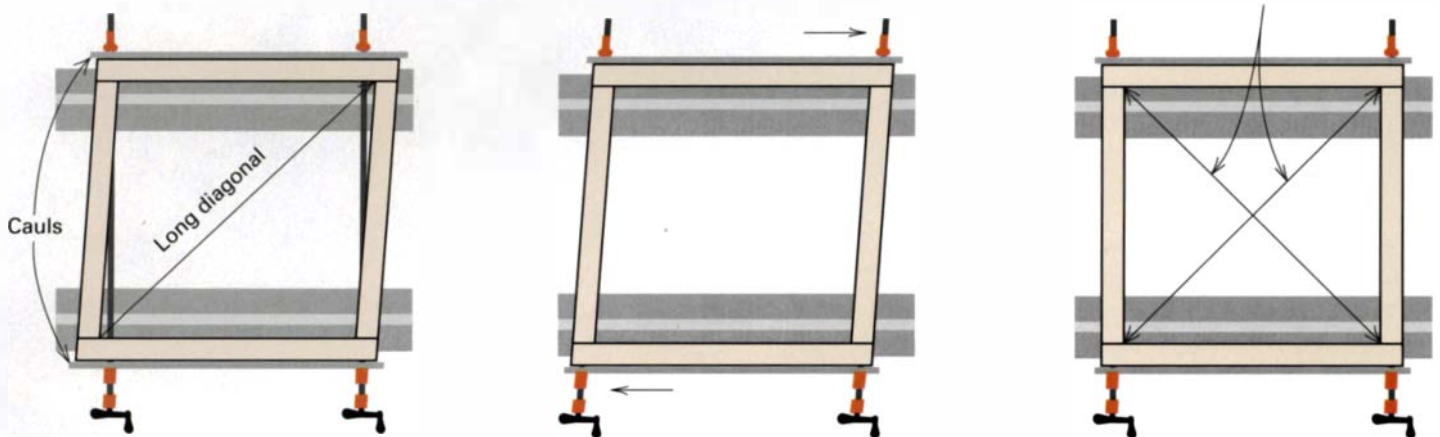


Fig. 2: Correcting an out-of-square frame. When one diagonal is longer than the other, the frame is out of square.

1) Determine long diagonal.

2) Shift clamps in direction of long diagonal...

3)...until diagonals become equal.



wood plastic resin glue), because it has an open time of about an hour. Certain oily tropical woods (teak, for example) may require epoxy or one of the newer polyurethane glues, such as Gorilla Glue or Excel. Experiment with various adhesives and woods on sample glue-ups. Don't use a glue for the first time on a real project. For more information on adhesives, see *FWW* #96, pp. 44-50.

Dry-assemble before glue-up

After spending days or weeks milling stock, shaping components and cutting joinery, it's natural to want to slather on the glue and start clamping. Slow down. I take the time to dry-fit each joint individually and check for square (or whatever the

angle is supposed to be) and for flatness across the face of the joint. If anything is out of whack, I make the necessary adjustments before the glue's flowing and the clock's ticking. Then I dry-assemble the entire structure to check the dimensions and to make sure there's no distortion when all joints are pulled up tight.

I spread a thin, even film of glue on all mating surfaces. I want the greatest possible glued surface area, and I don't want to rely on clamping pressure to spread the glue. A throwaway acid brush gets glue into hard-to-reach spots like mortises.

Once the assembly is glued up and in its clamps, I mark the time on the assembly in chalk, so I'll know how long the glue has been curing. If I have other assemblies to

glue up, I'll move the just-clamped assembly immediately. If I don't need the space, I'll just leave it on the T-stands until the glue has set fully—a couple of hours at room temperature usually is fine for yellow glue. Check the label for cure times of other adhesives.

If I do need to move the assembly, I take care not to distort it. For a box or carcass, I'll brace it with sticks to hold it square, and then I'll set it on another flat, level surface. I lean frames against a wall, keeping them as vertical as possible and making sure that none of the upright clamps are left unsupported.

Once the glue has begun to set, I do not move the assembly. Partially set glue bonds can break easily, and though the

joint usually will retake, it will be compromised and considerably weaker.

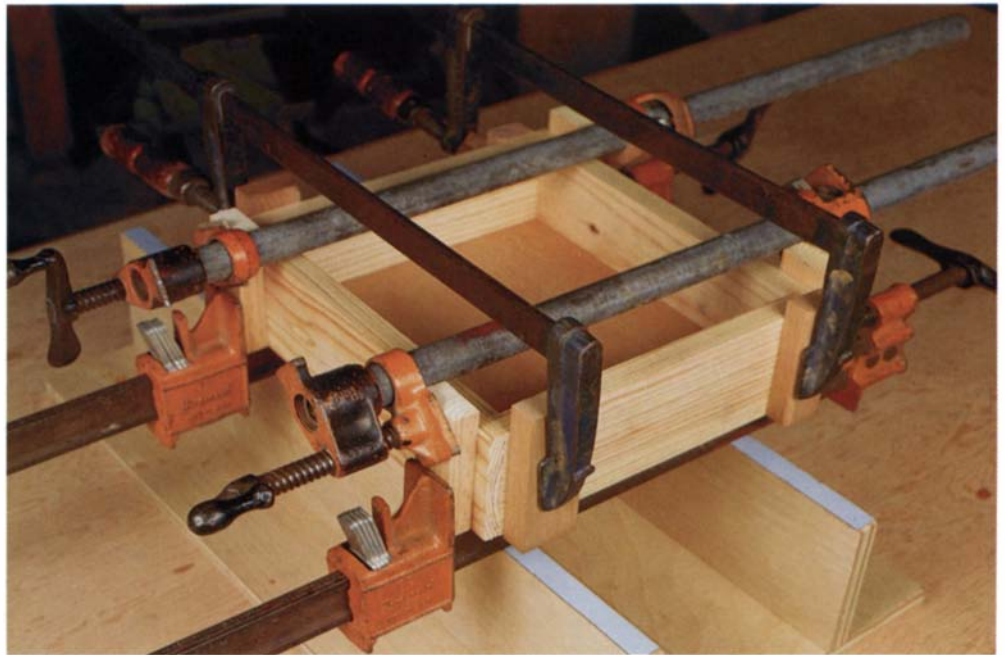
Tips for frame assemblies

I lay frame assemblies, face frames, frame-and-panel doors or cabinet sides, face up on pipe or bar clamps laid across T-stands. I clamp mortise-and-tenon, biscuit and dowel joints in line so that the two components being joined are drawn together. I apply enough pressure across the rails to force out a small bead of glue at the shoulders of the joints. If the rails start to bow, I ease up on the clamps and make sure the bars are perpendicular to the shoulders of the tenon and parallel to the rails. Otherwise, clamping pressure can force the joint out of square (see figure 1 on p. 69).

When a center stile runs into the rails, I apply a clamp with extended jaws under and perpendicular to the previously applied clamps (see the photo on p. 68). I could also use a standard pipe clamp over the frame, but I prefer to leave the exposed face clear of clamps. This lets me see whether joints are flush and tight and makes it easy to scrape excess glue from the face when it becomes rubbery.

Checking and adjusting frames for square—To find out whether a frame is square, I compare corner-to-corner measurements. Instead of reading numbers off a tape measure, I use a set of trammel points (see the photo on p. 68). I set one point against an inside corner of the frame and slide the other point along the bar until it touches the inside of the opposite corner. Then I lock the second point in place, lift the bar and check the other diagonal. If the points touch the corners, the frame is square. If they don't, I loosen the clamps I've applied across the rails and shift them slightly in the direction of the longer diagonal (see figure 2 on p. 69). When I reapply pressure, the clamps will tend to pull the whole frame assembly toward square. I recheck the diagonals and continue adjusting clamps until the diagonals match.

Before leaving the assembly to dry, I recheck that each joint is flush and tight. A C-clamp may help to tweak a joint that's not quite flat or parallel by drawing the joint toward the clamp bar. If I do that, I use a caul to distribute the clamping force across the joint and to protect the wood. Double-faced tape holds the caul in place.



Clamp box in two directions. To reach over the pipe clamps running in one direction, the author uses deep-throated speed clamps.



Trammel points and bar work to check square on carcasses, too. The author uses a clamp across the longer diagonal to draw the case to square.

Clamping joints that aren't supposed to be square—For joints that meet at angles other than 90°, it's just as important that the shoulders of one component meet tightly with the surface of the other. That means clamping pressure needs to be exerted perpendicularly to the shoulder.

To do that, I cut one end of a caul at an angle and use a C-clamp to pull the joint closed (see the top left photo on the facing page). The cauls can slide under pressure from the clamps, so I put sandpaper (held

in place with double-faced tape) between the caul and the furniture part.

Clamping bridle or lap joints—When clamping bridle or lap joints, I apply most of the pressure to the faces of the joints, forcing the cheeks tightly against one another. To prevent marring the exposed surfaces, I use softwood cauls between the clamp heads and stock. If a caul covers a section of a joint that might exude glue, I'll insert waxed paper under the caul.

Dealing with mitered frames—To prevent a miter joint from slipping, I hammer a couple of 3/4-in. brads about halfway into one side of the joint and clip off the heads (see the bottom right photo). Then I press the joint together firmly by hand, forcing the brads into the other half of the joint.

To clamp up a frame with mitered corners, I set the wet assembly directly on my T-stands. Next I add clamps, first to the underside and then across the top, all bearing on a set of corner cauls that help to distribute the clamping pressure without getting in the way (see the top right photo on this page).

Clamping procedures for boxes and carcasses

The trick to getting tight, strong joints in boxes and carcasses is to find ways to distribute clamping pressure evenly over the full length of the joints. When clamping up a small box, I place a pair of cauls at each corner (see the top photo on the facing page). They help to distribute pressure over the length of the joint and in both directions, forcing all the bearing surfaces of the joint tight.

If I'd joined the box with dovetails instead of rabbets, I would have modified the cauls to bear only on the faces of the tails, notching the cauls to clear the slightly protruding pins.

Mitered corner boxes—For a box with mitered corners, I generally use band clamps. As a rule, I leave about 2 in. between bands. To keep the corners from being damaged, you either can use the plastic corner protectors that come with some band clamps or make your own from wood scraps.

Large carcasses—Clamping large carcasses is no different from clamping small ones—just a little trickier. Clamping pressure has to be distributed over the full length of the joints. To do this, I use 2x2 cauls, which I sometimes plane so that they're slightly convex. This exerts pressure on the center of the joint, which may be impossible to reach with clamps.

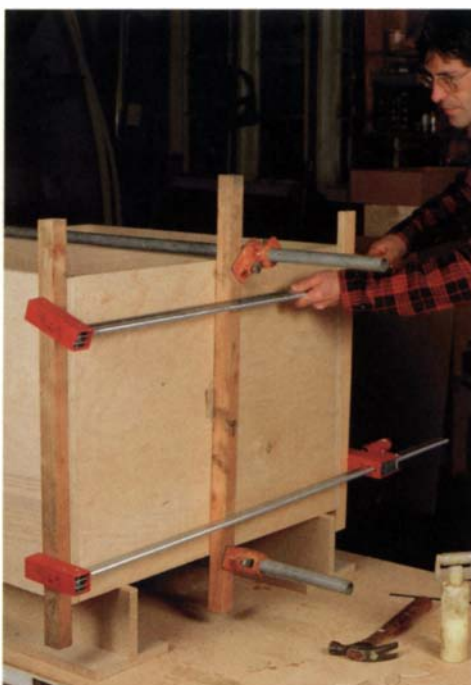
When clamping a partition into its dado, it's especially important to get some clamping pressure near the center of the joint. I've even stuck sandpaper under the center area of the caul—whatever it takes



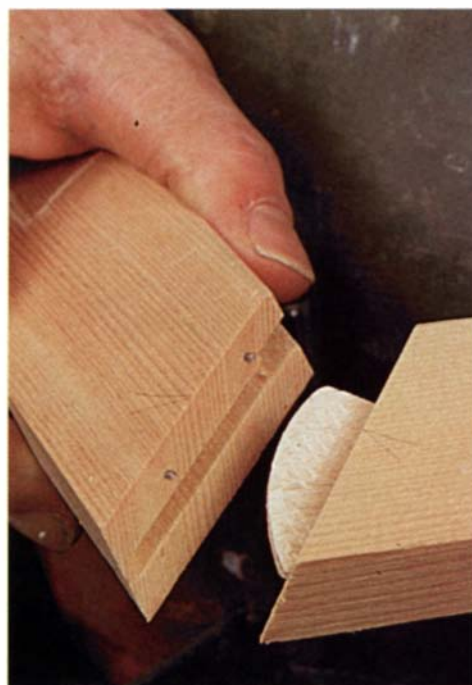
Caul clamps angled joint. By cutting an angle on the end of a plywood caul, the author can exert clamping pressure perpendicularly to the joint, drawing it tight.



Notched cauls allow clamping of mitered frame. This simple plywood caul provides a bearing surface for clamps in two directions without getting in the way.



Big box calls for convex cauls. Cauls planed slightly at each end help maintain clamping pressure along the joint. Sandpaper is used to shim the caul a bit more.



Clipped brads keep miter joint from slipping. Brads are tacked halfway into one side of the joint, clipped off and pushed into the other side to keep it from sliding.

to close the center of the joint as tightly as the ends (see the bottom left photo).

Checking and adjusting a carcass for square—Carcass assemblies can be clamped out of square, so I also use tram-mel points to check the diagonals. If I have to rack the case back into square, I apply a clamp across the corners with the longer diagonal measurement (see the bottom photo on the facing page). I make up a notched caul with a face perpendicular to

that diagonal to provide seating for the clamp heads. Double-faced tape holds the cauls in place while I fool with the clamps. To prevent the case from shifting back out of square, I tack a couple of cross braces across the front edge of the panels (or the back if the front is a finished edge), creating bracing triangles. A face frame or a back panel keeps the carcass square. □

Jim Tolpin is a woodworker and writer in Port Townsend, Wash.

Through Mortise-and-Tenon Joinery

Cut mortises first for clean, accurate results

by Jim Richey



Work carefully when joinery is exposed. The author cuts mortises first and then marks the tenons to reduce tearout on the face side.

It's hard to hide mistakes in through mortise-and-tenon joints. Both the tenon and the mortise are there for anyone to see. I found it tough to get crisp, chip-free mortises that were uniform and had clean, square corners. Then, not too long ago, I came across a drawing of a simple bench made from 1x12 stock, like the one shown in the photo below. I wanted to build several of them, but the joint that held the bench together was a wedged through mortise and tenon. The bench was an incentive. I worked on my technique and experimented with prototypes until I could cut this joint quickly and accurately.

In a through mortise and tenon, the tenon goes all the way through its mating piece and shows on the other side. Wedges are often added to spread the end of the tenon and lock the joint together. It's a strong, attractive joint.

I can cut the mortises by hand, but when I'm faced with making a lot of them, I like to use a machine. In my shop, that means using either the drill press or the router. I prefer using the drill press because it's quiet and setup is fast and accurate. I can easily see the cut in progress.

When I'm boring holes for a through mortise, I try to minimize tearout where the bit exits the stock. If possible, I'll select the side where tearout will be the least noticeable; then I'll lay out and cut the mortise from the opposite side. If tearout is unacceptable on either side, then I'll use a router and a jig. For this bench, though, I decided I could live with some minor tearout on the back side because this area is fairly well-hidden.

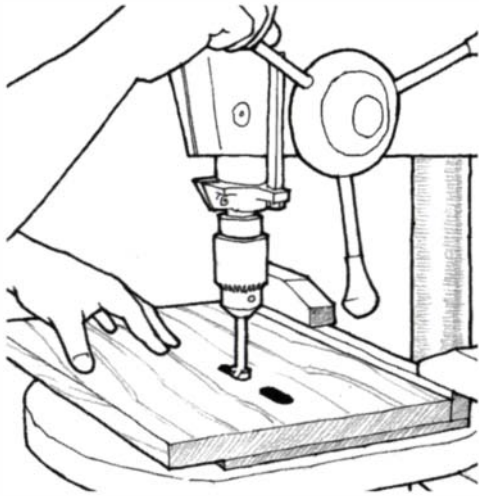
Cut the mortises first

The usual approach is to build from the "inside out." That is, cut the tenons first, and then use the tenons as a template to mark the mortise locations. The problem is that you drill the mortises from the back, which virtually guarantees some tearout on the face of the piece, no matter how careful you are. I prefer the "outside-in" approach—cut the mortises first by drilling from the face side, and then mark the tenon locations from the mortises.

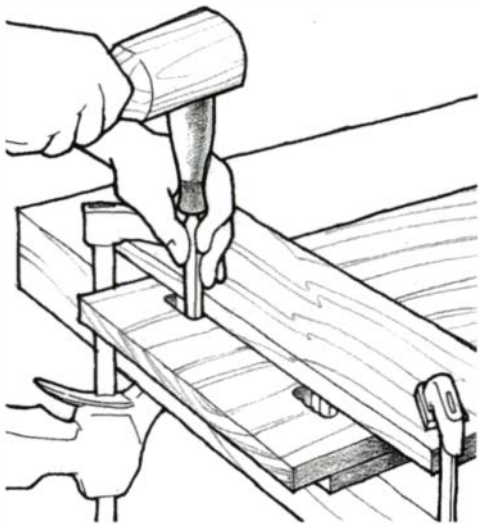
To do it this way, I set up my drill press with a Forstner bit and a fence to register the workpiece (see step 1 of the drawings on the facing page). Forstner bits are best for this operation because they make such clean cuts. Just remember that the bit diameter should be equal to or slightly smaller than the tenon thickness. You can

CUTTING THROUGH MORTISES

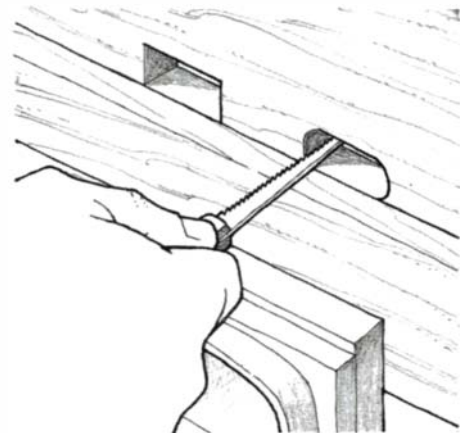
Step 1: Back up workpiece with clean scrap; use a Forstner bit to remove most of the waste. Set depth stop so bit just cuts through stock.



Step 2: Guide chisel with a straight piece of scrap, and pare remaining waste from walls of the mortise.



Step 3: A shopmade saw used like a rough file squares the corners. Carefully work the saw into the corner.



always enlarge a mortise that's too narrow.

To minimize tearout, I set the drill-press depth stop so that the bit just goes through the workpiece or leaves a paper-thin layer of material on the bottom of the mortise. It's best to back up the workpiece with a clean piece of scrap.

I drill the first hole at one end of the mortise. Then I nibble away the remaining waste by sliding the work face down on the fence and drilling successive holes every $\frac{1}{4}$ in. or so until I reach the other end. Toward the bottom of each hole, I slow down and use light pressure on the drill-press arm.

Shopmade saw cleans out corners

After roughing out the mortise on the drill press, I trim up those little waves on the sides and any remaining waste on the bottom of the mortise with a sharp chisel. This can be done by eye, but you'll get better results if you clamp a straight piece of $\frac{3}{4}$ -in.-thick scrap across the workpiece to serve as a guide (see step 2 at left). You can use the guide to square up the corners by working toward the corner from one direction and then swinging the guide 90° and working in from the other. If you use a chisel to square up the corners, be sure to work in from both sides of the workpiece, or you'll tear out some really nasty chipping on the back side.

The way I square up the corners is to saw them out with a small, stiff saw (see step 3 below left). I made my saw by filing teeth into the back of a carbon-steel paring knife. But you could also modify a wall-board saw by hammering the teeth flat, filing the sides of the blade to remove all set and then filing the teeth straight across like a rip saw.

I lay the saw against the wooden guide clamped to the workpiece and saw to the corner of the mortise. I use the saw as a rough file to square out the corners (there will be minor tearout on the back side).

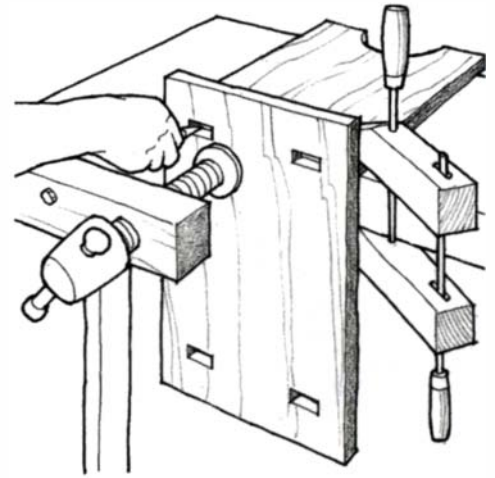
Lay out and cut the tenons

I mark the tenon directly from the mortise using a small knife or pencil sharpened to a chisel point. Because the tenon thickness is the full stock thickness, only the width must be marked (see step 4 above right). I use a square to extend this line down the face of the stock (see step 5) and a marking gauge to scribe the tenon length. The tenon should extend completely through the mortised stock with an extra $\frac{1}{32}$ in. or so. This will be trimmed flush later, after the wedges have been glued in place.

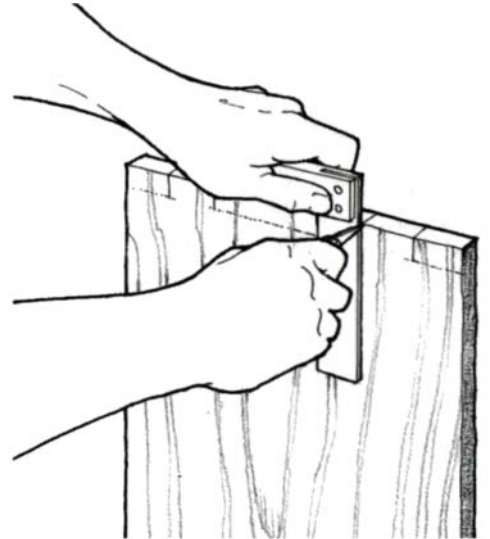
I bandsaw the tenons using the cutting sequence shown in step 6 at right. If all

MAKING THE TENONS

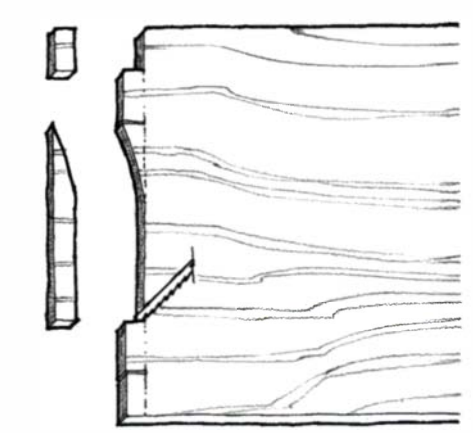
Step 4: Transfer mortise location to tenon stock. Use a knife or sharp pencil to mark out the tenon width.



Step 5: Extend tenon layout lines down the face of the stock with a square.



Step 6: Mark the length of the tenons with a marking gauge or knife, and then cut to the line on a bandsaw.



goes well, the tenons will fit snugly into the mortises on the first try. This never happens for me, though, so some fitting is usually required. Filing either the mortise or the tenon usually will take care of a too-tight fit. If you have some gaps, don't worry. Small shims cut from the same stock will hide them.

Cutting wedges and assembly

After fitting the mortises and tenons, I cut the wedge slots in the tenons. A thin-kerf

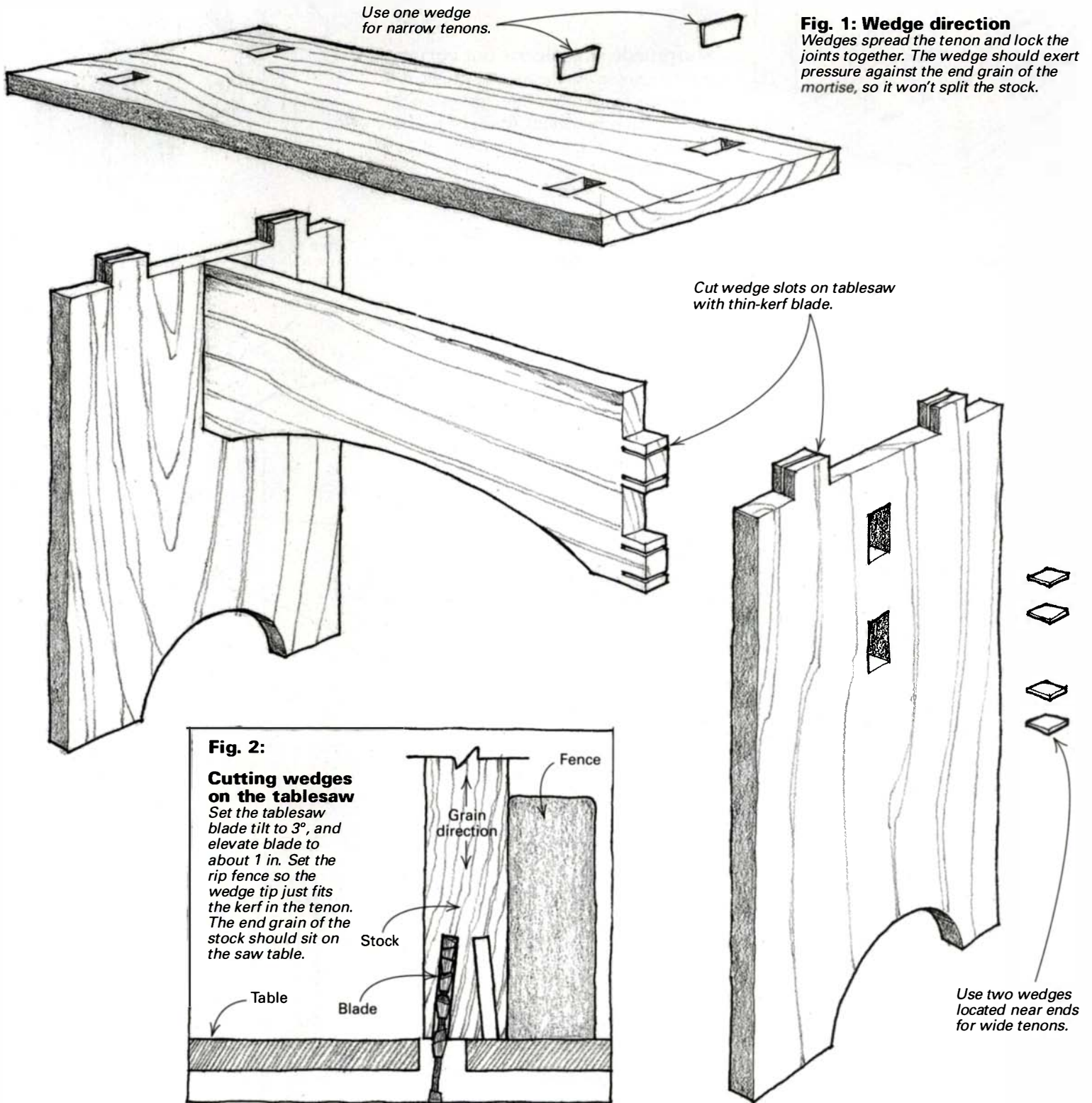
cutoff blade in a tablesaw will produce a clean slot that's about the right width. Depending on the size of the tenon and its direction in the mating stock, I use one or two wedges to spread the tenon and create a tight joint.

Wedges should always exert pressure against the end grain of the mortise to keep the workpiece from splitting. I locate the slots as shown in figure 1 below.

I saw the wedge material by ripping the stock, on edge, on the tablesaw, as shown

in figure 2 below. I angle the blade at 3°, and adjust the fence until the point of the wedge will just fit into the kerfs I've sawed into the tenons. I cut the wedge material to length, and now I'm ready to assemble the joint. After clamping everything together, I drive the wedges home with a bit of glue on the leading edge. □

Jim Richey works wood in Katy, Texas, and is the "Methods of Work" editor for Fine Woodworking.





A compression chuck holds a bowl securely at its rim while its foot is turned.

Compression Chuck for a Lathe

Shop-built chuck holds bowls tightly, so you can turn a foot

by Dale Ross

A nicely finished foot on the bottom of a turned bowl is one feature separating the work of a pro from that of a beginner. A well-proportioned foot lifts the bowl and gives it a classic look typical of pottery. Turning a foot also eliminates the mounting screw holes on the bottom of the bowl.

The biggest problem with creating a foot or finished bottom is not how to shape it, but how to hold the bowl in the lathe. Turning the foot is the last thing I do, so the outside and inside waste of the bowl has already been cut away and sanded, leaving no place for mounting screws. That's where my shop-built compression chuck comes in, making it possible to remount the bowl and complete the foot. The real advantage of this system is that once the chucks are made, they can be used over and over again. My set of four chucks will handle bowls ranging from 4 in. to 14 in. dia. The chucks are easy to make and inexpensive, too, because they're made from plywood and mahogany or poplar scraps.

How a compression chuck works

A compression chuck consists of a flexible jaw plate pressed to a curved baseplate by a platen, as shown in the drawing on p. 77 and the bottom photo on this page. A handwheel is screwed to the outboard end of a threaded rod that passes through the lathe's headstock. Tightening the handwheel draws the platen toward the



The parts are simple. A compression chuck consists of a platen, jaw plate, baseplate and handwheel (from the left), all connected with a threaded rod. Tightening the handwheel flexes the jaw plate, so it grips the edges of a bowl.

headstock and squeezes the jaw plate between the baseplate and the platen, constricting the jaws of the chuck. As the jaws close in, they grab and hold the rim of a bowl.

The jaw plate has a series of evenly stepped ridges to accommodate bowls of varying diameters. The compression chuck shown in the top photo on this page is 11 in. dia. and will accommodate bowls from about 9 in. dia. to 10 $\frac{5}{8}$ in. dia.



The baseplate is turned from plywood. A template on a lathe bed helps the author shape a camber in the baseplate (colored yellow in the drawing on the facing page).



A series of steps in the jaw plate of the compression chuck accommodate a range of bowl sizes (the jaw plate is red in the drawing on the facing page).



The platen is turned with a crown to match the dish in the baseplate. The curved platen (green in the drawing on the facing page) flexes the jaw plate.

Making the baseplate

The baseplate is two pieces of plywood glued together, turned and hollowed out, as shown in the drawing. For an 11-in.-dia. chuck, glue and screw together two pieces of $\frac{3}{4}$ -in.-thick by 12-in.-sq. plywood. Once the glue dries, remove the screws, mark the center and bandsaw the plywood to as large a disc as possible. Temporarily mount the disc to a faceplate, and turn the outside edge true. Then cut a mortise into what will become the back side of the baseplate to match your faceplate (I used a 6-in.-dia. faceplate).

Better yet, leave a faceplate on each chuck. I make extra faceplates from 1-in.-thick aluminum plate, bandsawn round, drilled and threaded to my lathe shaft size. After screwing the aluminum faceplate onto the lathe shaft, I true it round and flat with high-speed steel tools.

To finish up the baseplate for the chuck, remove it from the lathe, and remount it on a faceplate screwed into the turned mortise. On the face of the baseplate, cut a shoulder, and then dish out the face of the plywood, as shown in the top photo. Go about $\frac{5}{8}$ in. deep, taking care not to hit the mounting screws. Try to achieve a nice, fair camber. Finally, drill a $\frac{1}{2}$ -in.-dia. hole through the center of the baseplate for the mounting bolt and threaded rod.

To help get the shape right, bandsaw a curved template out of $\frac{1}{4}$ -in.-thick plywood (I use a set of trammel points). The offcut will be the template for turning the platen, so hang on to it.

Turning the jaw plate

The jaw plate is the part that actually does the gripping. It's made of two pieces: a thin, flexible plywood backing and an outer ring of solid stock turned to form steps that grip the edge of a bowl. Evenly spaced sawkerfs around the perimeter of the jaw plate allow it to flex as it's squeezed between the platen and baseplate.

For the backing, use $\frac{1}{8}$ -in.-thick Baltic birch for chucks of 11 in. and less in diameter and $\frac{1}{4}$ -in.-thick Baltic birch for larger chucks. For the outer ring, glue up $8\frac{1}{4}$ poplar or mahogany into a 12-in. square, and bandsaw it round. After flattening the back of the solid disc and drilling a small hole through its center, I glue it to the plywood backing, but only around the perimeter. When I cut the final step in the blocking, the center section will fall away without a lot of unnecessary lathe work.

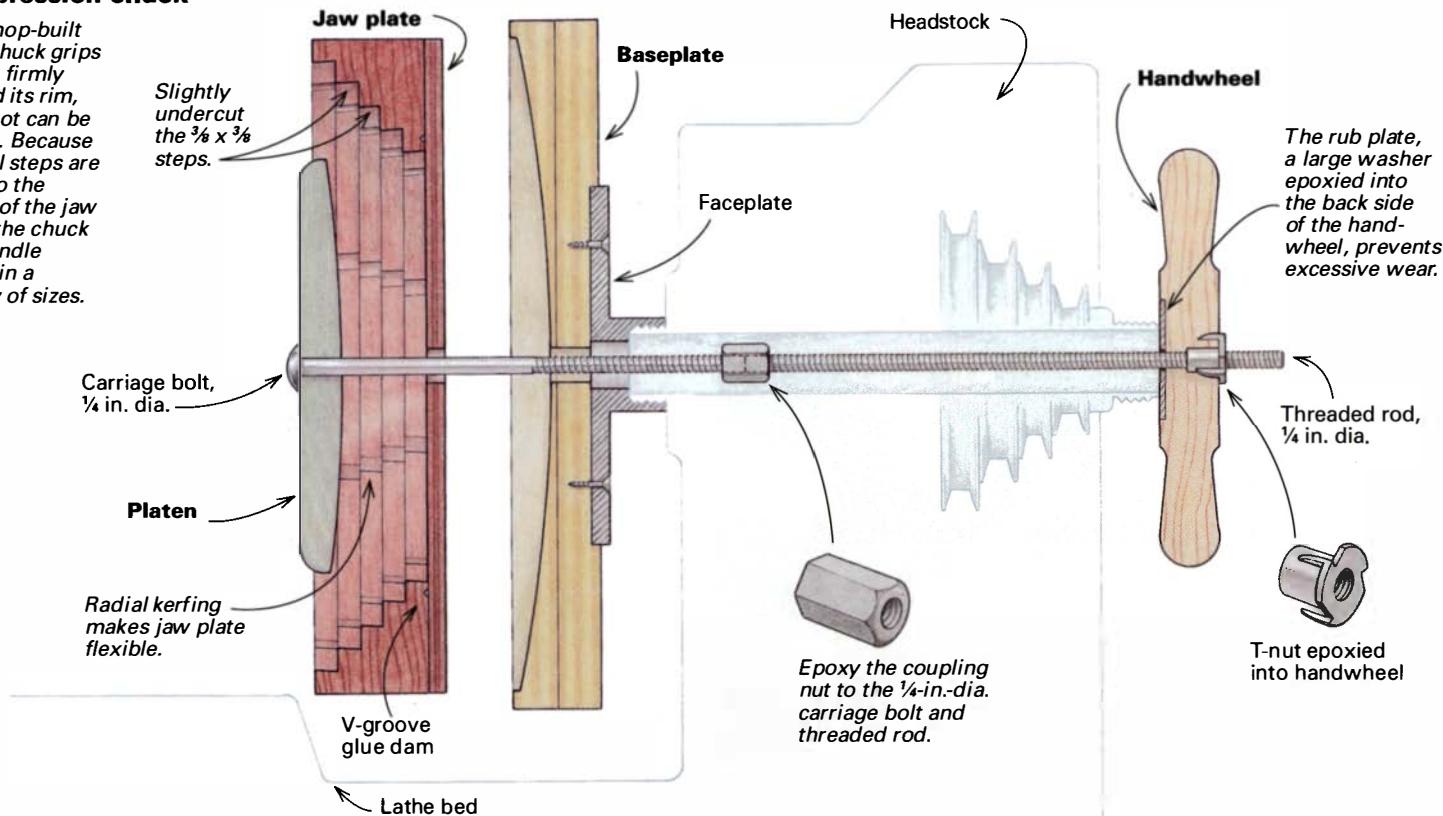
One thing that helps keep the center section from being glued to the plywood is a V-groove cut into the back of the disc that serves as a glue dam. The V-groove is cut just outside of where the last step will fall, as shown in the top drawing on the facing page. Apply glue only to the solid wood, outside the stop groove, and glue the solid-wood disc to a slightly larger plywood disc.

Drill a small center hole through the plywood using the previously drilled hole through the solid wood as a guide. This will locate the faceplate on the back side of the plywood. Mount the glued up disc on your lathe, and turn the outside diameter to match the inside diameter of the shoulder turned into the baseplate. Now turn the steps to form the jaws into the face of the solid wood, taking care on the last step not to cut into the plywood (see the center photo). Slightly undercut the sides of each step for a better grip. I make the steps the same width as my parting tool ($\frac{3}{8}$ in.), so I can cut each step quickly and accurately without measuring. The screws from the faceplate hold the unglued center area in place while turning. Once off the lathe, this center area of the hardwood disc should come right out.

Radial sawcuts, $\frac{1}{4}$ in. wide (cut from the perimeter of the disc to within 3 in. of the center) divide the disc into eighths and allow the jaws to flex during compression (see the bottom photo on p. 75). If the jaws seem too stiff, make the radial cuts a little longer. A $\frac{1}{2}$ -in.-dia. center hole provides clearance for the threaded rod.

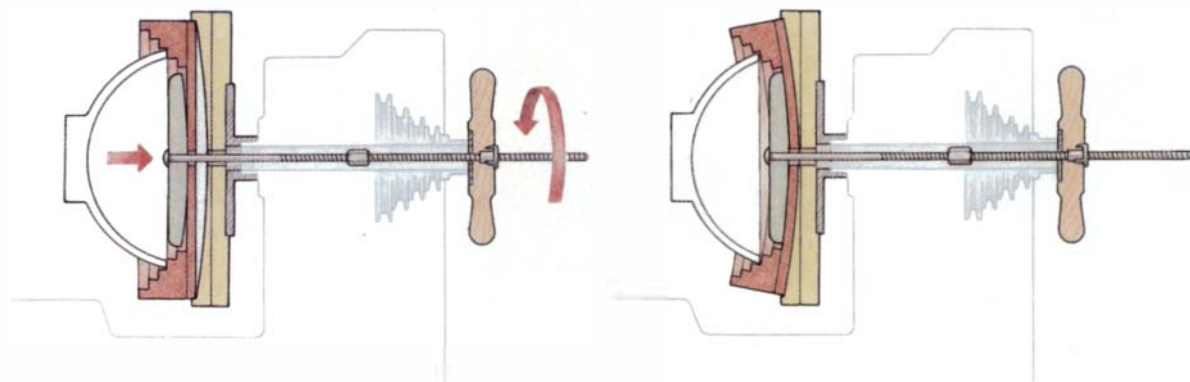
Compression chuck

This shop-built lathe chuck grips a bowl firmly around its rim, so a foot can be turned. Because several steps are cut into the inside of the jaw plate, the chuck can handle bowls in a variety of sizes.



How it works

With the handwheel loosened, the bowl slides easily into the flexible jaw plate. As the handwheel is tightened, the jaw plate is compressed by a curved platen and captures the outer rim of the bowl.



The platen and handwheel

The platen is turned from another piece of $\frac{3}{4}$ -in.-thick Baltic-birch plywood. Mount a bandsawn, round piece of plywood on the lathe. Turn a crown into the face, matching the camber of the dished-out baseplate. Here's where the other half of the template comes in handy (see the bottom photo on the facing page).

Drill a hole, and insert a $\frac{1}{4}$ -in.-dia. carriage bolt from the flat side of the platen. Attach a length of $\frac{1}{4}$ -in.-dia. threaded rod to the end of the bolt with a coupling nut, and then epoxy the joint. The bolt/rod combination should be long enough to pass through the platen, jaw plate, baseplate, lathe headstock and handwheel, as shown in the drawing.

The handwheel, which tightens the jaw plate around a bowl, is turned from hardwood. Epoxy a large washer to the inside face of the handwheel to act as a rub plate. This washer must have an inside-diameter hole large enough to allow the threaded rod to pass through it and an outside diameter large enough to cover the end of the lathe's spindle. Insert a T-nut into the outside face of the handwheel so that it can screw onto the threaded rod. Put the whole rig together on the lathe, and then hacksaw off any extra

threaded rod. Leave enough of the threaded rod to engage the nut in the handwheel completely when the jaws are fully relaxed.

Using the compression chuck

With the chuck mounted on the lathe and the lathe's spindle locked, hold the bowl into the closest-fitting step of the chuck. For in-between sizes, I tape small pieces of $\frac{1}{8}$ -in.-thick plywood to each jaw of the next larger step with double-faced tape, but this is rarely necessary. Tighten the handwheel securely while holding the bowl solidly to the bottom of the step.

The closer a bowl's shape gets to perpendicular at the rim, the less secure the bowl is in the chuck. In this situation, I bring the tailstock up and sandwich the piece in with a long, blunt insert in the revolving center, allowing room for the tool-rest base, as shown in the top photo on p. 75. A center cone, which needs to be cleaned up with a sharp chisel, remains after turning. With light cuts and moderate spindle speed, I can turn a foot on a variety of bowl sizes without any problems. □

Dale Ross is a professional turner in North Yarmouth, Maine.

Patternmaker's Vises

The most versatile work-holding device ever bolted to a bench

by Benjamin Wild



Emmerts are classics. Specialized vises, like this Emmert No. 1, were designed for busy patternmakers during the industrial boom years at the turn of the century. Vise jaws hold irregularly shaped workpieces (above) and swivel to improve access to the work (right).



More than 20 years of woodworking and patternmaking taught me that the ideal vise is one that I can forget about while I'm working. I don't want to fight with a vise or spend much time setting it up. A vise should hold the work firmly, without marking it, and allow me to work in a comfortable position. I started my career as a patternmaker using the special vise that goes with the trade. Since then, I've tried every other type of vise on the market. No other vise comes as close to the perfect work-holding device as a patternmaker's vise.

The patternmaker's vise was developed specifically to meet the demanding needs of a specialized job. A patternmaker turns out wooden models (such as plane bodies, gears or tablesaw tops) that are used, in turn, to create molds for casting parts in metal. The models often assume odd shapes and sizes and are difficult to hold—hence the development of a special vise.

You don't have to be a patternmaker to appreciate this type of vise. It's better than other vises at holding the work firmly so that the woodworker and the tool have ready and easy access to virtually any part of the piece. I now teach woodworking, and I often see my students struggling with improperly held work. The result usually is inaccurate work or a botched job. The beauty of a patternmaker's vise is that it can hold a variety of different sizes and shapes in almost any position.

The vise attaches to the front of the workbench like a conventional bench vise. But from this position, the vise can be rotated 360° or lifted 90°, so the jaws are parallel to the benchtop, all with the wood clamped firmly in the jaws. The jaws can be angled up to about 5° from side to side to hold tapered objects. An accessory tilt plate will pivot up to 30° perpendicular to the vise for more severely angled work or for gripping pieces angled in two planes.

In addition to this versatility, the vise has two sets of jaws. In the

normal position, the jaws are the same as in any other woodworking vise. But rotate the vise 180°, and a pair of metalworking jaws, similar to a machinist's vise, are brought to the top (see the top photo on p. 80). The vise also has dogs built into both front and back jaws to hold round, curved or odd shapes (see the top photo on p. 81). Or the front jaw dogs could be used with bench-mounted dogs to grip objects beyond the capacity of the vise.

For clamping simple square pieces of limited size, any conventional vise will suffice. But a patternmaker's vise is so versatile that even mundane jobs become easier. You'll soon find yourself rotating and tilting your work for best access rather than twisting and turning your body to conform to the constraints of your bench and vise (see the bottom photo on the facing page). Once you've used a patternmaker's vise, you'll have a hard time going back to a conventional one. Fortunately, these vises are still available, from used Emmerts to newly manufactured imitators, at prices ranging from \$250 to more than \$1,500.

The Emmert vise

The Universal patternmaker's vise was first manufactured by Joseph F. Emmert in 1891. At that time, American factories were in full swing, creating a huge demand for the patterns necessary for casting the parts for all those wonderful cast-iron woodworking machines, as well as other equipment, that we covet so much today. These patterns assumed almost any shape, often were quite large and had to be worked to exacting tolerances. Emmert vises have been in use for more than 100 years, and they are still the benchmark, even though the company has been out of business for some time.

The original Emmerts came in two sizes, the No. 1 with jaws 7½ in. by 18 in. that opened 15 in. and weighed in at 87 lb. (see the photos on the facing page). A smaller No. 2 vise had 5-in. by 14-in. jaws that opened 12 in. and weighed a mere 56 lb.

What happened to the Emmert Co.?

"If these things are so good, why doesn't everyone have one, and why did the Emmert Co. go out of business?" you might ask. For the same reason that I'm no longer actively making patterns. Most of the work that used to be done by patternmakers is done by welding, sent out of the country or done with computers and automated milling machines. And the materials are now plastics and ceramics worked to ever finer tolerances. Almost gone are the days of handworking patterns of clear mahogany, cherry and pine.

The closing of the traditional patternmaker's shops, meant not only that the market for Emmert vises was dwindling, but also that competition was increasing as thousands of used Emmerts hit the market. Some bad management decisions and new competitors also had a hand in the demise of the Emmert Co.

What's available today

Ever since the original Emmert Co. closed, woodworkers who have wanted the versatility of these fine tools have had limited options. But thanks to the rising demand for woodworking tools, new sources have developed and old sources have come to light for patternmaker-style vises. American Machine & Tool Co. (AMT), Veritas Tools Inc. and The Kindt-Collins Co. all offer some version of a patternmaker's vise.

All of these vises work much like the old Emmert. They all tilt, angle and spin. They all require about the same effort to install. They all have metalworking jaws on one side, and they all hold the work firmly. They all have built-in dogs to hold things between the jaws or between the front jaw dogs and dogs set into the workbench. But there are differences. Choosing the right vise for you



Modern version uses alloy casting. Made by Veritas Tools, this Tucker vise uses a zinc-aluminum alloy instead of cast iron, making it strong and light. A quick-release feature can be operated by a foot pedal (above). The vise's cork-lined jaws protect delicate workpieces (left).



Vise handles metal, too. Rotate this American Machine & Tool Co. vise 180°, and you'll have a pair of jaws for metalworking (above). A set of jaw inserts, which are lined with soft rubber (right), prevents dings in soft material.



really depends on the type of woodworking that you do, how heavy your work is and how much money you're willing to spend.

The AMT vise

The AMT vise (American Machine & Tool Co., Fourth Ave. and Spring St., Royersford, PA 19468-2519; 800-435-8665) is a copy of the Emmert No. 2 vise. The specifications are almost identical: 5-in. by 13¾-in. jaws that open 12 in. and an overall weight of 55 lb. for the cast-iron and steel unit (see the photos at left).

The primary differences between the two are that the machining is not as good on the AMT as it is on the original, the cast iron is a little softer and the 1⅜-in.-dia. handle fits sloppily in its 1-in.-dia. hole. In spite of the rough casting, though, everything seems to work well enough. In addition to the standard pivot plate, AMT offers a set of soft jaws as an optional accessory (\$20 for the pair). The soft jaws are 3-in. by 6-in., rubber-faced aluminum plates that magnetically attach to the face of the jaws to protect your work, as shown in the bottom photo at left. I found the soft jaws helpful, particularly for small work.

Although I'm used to working with the bigger No. 1 vise, I liked this little AMT vise and would be tempted to buy it if I knew I would never need the size and strength of the larger one. At \$250, it's the most reasonable entry into owning a patternmaker's vise, unless you find a real bargain on a used Emmert, which usually sells for \$350 and up depending on size and condition.

The Veritas Tool vise

Veritas Tool Inc. (12 East River St., Ogdensburg, NY 13669-1720; 800-667-2986) introduced the Tucker vise in 1991, exactly 100 years after Emmert patented his vise. With jaws that are 4 in. by 13 in., the Tucker is only slightly smaller than the Emmert No. 2, but the 12-in. jaw capacity is the same (see the photos on p. 79). The Tucker operates much like an Emmert, but there are some differences and a few added features.

The Tucker is much lighter than the Emmert, which gave me some concerns about its durability. But the zinc-aluminum alloy used to cast the Tucker is not only much lighter than cast iron, it's stronger and less brittle. The other readily noticeable difference is machining. The finish is a highly refined, smooth surface similar to that found on the unmachined surfaces of machinist's tools.

The Tucker vise has some advantages over the Emmert and, in my opinion, some disadvantages. It has a quick-release mechanism, so the front jaw can slide open or closed easily without having to turn the handle. In addition to a top release button, a foot pedal allows the spring-loaded jaw to be popped open when both hands are full (see the top photo on p. 79).

The built-in dogs have a flat side and a round side to offer a variety of clamping surfaces. The jaws of the Tucker are cork-lined, which is great for protecting your work, but could be a pain if the cork lining gets damaged and needs to be scraped off. This is likely because even the metalworking jaws, which tend to get more abuse, are cork-lined. The directions are complete, and installation is easier than it appears. The exploded view of the vise makes it look as complicated as the control panel of a Boeing 747.

One thing I did discern from the mounting instruction's exploded drawing was that the Tucker has a lot more parts than the Emmert. Although I did not have a chance to use the vise for an extended period, I would be concerned that with so many parts, it might be easier for the vise to get out of alignment.

The big drawback to the Tucker vise is that the angle feature is not all that convenient to use. The other vises use a quick-acting cam lock to hold the vise at an angle. However, the Tucker requires a separate, large Allen wrench (provided) to make this ad-

justment. Because of the smaller size of the Tucker, when it's rotated 90° to the vertical position, the end of the vise is only about 2 in. above the bench.

The end of the next smallest vise, the AMT, when in the same position, is 4 in. above the benchtop. This extra height raises small work up to a better working position. Also, the Tucker doesn't have a pivot plate, which is good for holding odd-shaped pieces.

At \$500, the Tucker might seem a little dear, but overall, this is a quality-machined product that works extremely well.

The Kindt-Collins vise

Although The Kindt-Collins Co. (12651 Elmwood Ave., Cleveland, OH 44111; 800-321-3170) master universal patternmaker's vise has been on the market for more than 20 years, it's been a relative secret. That may be because of its price: \$1,555. Kindt-Collins continues to sell vises primarily to corporate patternmaker's shops and the government.

The Kindt-Collins is an improvement over the old Emmert. The angle and other adjustments work much more smoothly because all the working parts are machined and hand-fitted (see the photos at right). The surfaces of the large woodworking jaws (18 in. by 7 in.) are ground flat, and the metalworking jaws are ground, hardened and serrated. The tilt plate also is ground flat and fits perfectly into its groove in the back vise jaw, as shown in the bottom photo at right. The front jaw rides smoothly on a double-lead Acme thread and opens a full 16 in. A nice paint job makes the vise look as good as it works.

The Kindt-Collins vise has much thicker castings than the Emmert, so the Kindt-Collins can hold the heavy castings that patternmakers sometimes work on, but you'll probably have to bolt your bench to the floor. In fact, weighing in at about 170 lb., the vise alone may tip over some workbenches.

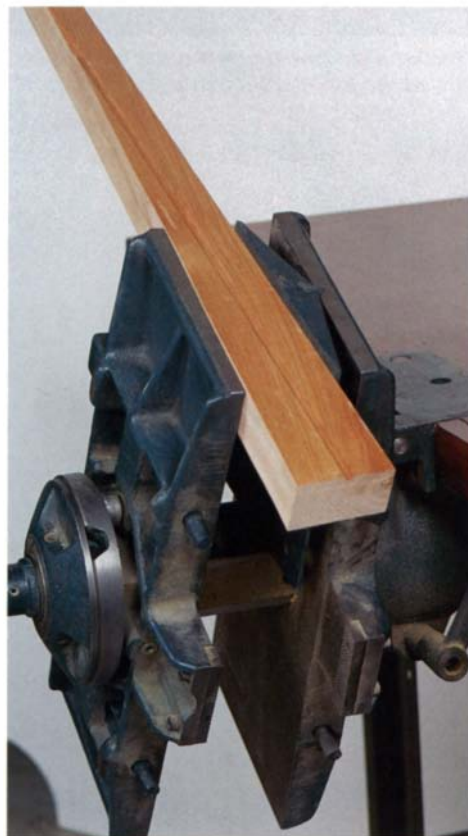
Although the extra heft makes the vise stronger, the increased bulk gets in the way when working near the jaws on smaller pieces. Because of its heavy-duty construction, the Kindt-Collins is obviously marketed to industry. The company must assume that these pros know what to do with this vise because it came without any mounting directions or hardware. The only other disadvantage of this vise is that it is about three times the price of the next cheapest model. In spite of the heavy price, the Kindt-Collins vise represents a good value for the user who needs the ultimate in holding power.

An Emmert in the future?

Along with these vises, I also had a chance to try out a new Emmert vise, as shown in the top photo on p. 78. That's right, a new Emmert. Back in 1984, Bob Kinslow of Hagerstown, Md., acquired the rights to the Emmert name, as well as remaining inventories, patterns and some production machinery. He has been struggling ever since to combine these ingredients into a going concern and has managed to put together a few of the vises. But recent health problems have dealt his efforts a serious blow.

If Kinslow can get things up and running, he speculates the selling price for a No. 1 (the only size he'll be producing) will be about \$675. Until then, if you want an Emmert, keep your eyes open at flea markets or used tool shops in your area. One thing is for sure: Anyone who still calls himself a patternmaker is not likely to be selling his vise. □

Benjamin Wild worked as a patternmaker for 16 years. He is currently teaching construction trades for the City School District, Rochester, N.Y., and is the coordinator of the apprenticeship program for Rochester Carpenters Local 85.



Cadillac of vises. With a price tag of more than \$1,500, the Kindt-Collins vise isn't for everyone. Machined, hand-fitted parts explain its ease of operation, and the vise handles big, unwieldy objects (above). A tilt plate that fits between the jaws (left) allows the jaws to hold tapered stock firmly.



Carved Moorish gates make a dramatic entrance to Braverman's California shop. The gate has through tenons reinforced by iron hardware. Braverman carved the panel above and the door panel shown below. His wife, Kiyo, did the antique finish on both panels.

Tomas Braverman Blends Old World into New Work

Hand-carved details and traditional styling distinguish this artist's furniture and doors



by Alec Waters

Enter the shop of Tomas Braverman, and you'll see Spanish-Colonial and Mexican-style furniture parts scattered about. Glance around, and you might see an elaborately carved piece built in the style of Renaissance Europe (see the bottom photo on pp. 84-85). Looking closer, you will notice several old, American-made machines and a collection of templates and jigs hanging from the ceiling joists. Even the woodpile, with its fitches of claro walnut, 16/4 planks of oak and stacks of clear Honduras mahogany, is eclectic in nature.

There are few clues to tell you what year it is. But despite the uncertainties, three things about Braverman's shop are crystal clear: Nothing is modern, everything is carved and the emphasis is on Hispanic styles. For an artist who specializes in carved designs that have an Old-World flavor (see the photos at left), he has a shop that suits him perfectly.

Braverman is one of only a handful of craftsmen in the United States who design and carve furniture and doors in traditional Spanish styles. His crisp, detailed panels shown at right, usually carved in high relief, look three-dimensional and alive. The carvings add lightness and movement to even the heaviest of pieces. To go with the fine carvings, Braverman uses only choice woods, and his frames and carcasses are put together with impeccable, traditional joinery.

Deriving inspiration from diverse influences

Formally trained as an artist and potter, Braverman attended the University of California in Los Angeles in the 1960s. Later, he studied art in Spain and Japan. Braverman met his wife, Kiyoko, while at UCLA. Kiyoko is Japanese and speaks fluent Spanish, which is fitting because much of his inspiration comes from those cultures.

Working summers as a carpenter to put himself through



Where designs are born—Key to Braverman's success is his attention to design. He patterned his showroom after a Spanish-Colonial hacienda. The oak cabinets and walnut table are good examples of Braverman's craftsmanship.

A shop reminiscent of an earlier age. Using chisels, gouges and other hand tools, Braverman sculpts a Baroque panel made of mahogany.



Choice materials are at the core of Braverman's pieces. While Braverman (right) studies grain and figure of some stock for carving, his assistant, Ed Koda, lays out furniture components.

Surfaces are handplaned to add texture and an aged look. Here, Ed Koda, a master craftsman in his own right, planes some walnut panels.



Bringing out the figure—Ed Koda wets claro walnut with mineral spirits to see how it will appear when finished.

school, Braverman found that he had a real affinity for wood.

Combining his trade with his artistic abilities, he began building furniture. His first pieces were for himself. Then he built pieces for family and friends. Word of mouth spread his work throughout the Los Angeles area. Soon, pieces were being commissioned by celebrities and entertainers in Hollywood. Famous clients include Robert DeNiro, Larry Hagman, Anne Archer, Robert Wagner and Steven Spielberg. Besides furniture, Braverman has also carved church pieces, gates, bas-relief sculptures and doors (see the top photo on the facing page).

Although Braverman once employed six workers, he now works with only one other—

shop foreman Ed Koda, who has been devoted to the business for 12 years. Koda mills most of the stock and prepares panels for Braverman to carve. Koda also assembles many of the carcasses, and does much of the handplaning (see the photo at right), which is no small undertaking. Braverman insists that all surfaces be handplaned to add a faceted texture that's in keeping with classical pieces of furniture.

A collaboration of design and carving

During a visit to Seville, Spain, Braverman met a masterful but unknown carver named Antonio Rodriguez Garcia. After seeing Garcia carve, Braverman persuaded the master to teach him Baroque carving. "Carving as pure as Garcia's is a lost art," he says. "I enjoy carving in the Hispanic styles and want to continue its traditions." Thanks to that visit, Braverman returned to Seville for two months every year for 10 years to learn more about Spanish decorative carving.

Braverman excels at designing pieces. His furniture and doors always match their surrounding architecture and landscape. For example, a studio/showroom built next to his Topanga, Calif., shop allows customers to discuss designs and look at samples of his work. The adobe building, nestled in the hills over Santa Monica, blends Spanish, Portuguese and Mexican details, like the tile roof, carved door and shutters that look onto the





Photo: Tomas Braverman

Doors that belong—Braverman built these oak doors for a Rancho Santa Fe, Calif., home. The carved rosettes and arch-shaped frame members blend with the surroundings.

cobblestone courtyard. Although built in 1970, the whole setting looks like it's been there for hundreds of years. "It makes a wonderful place to bring clients," says Braverman.

Hardwoods mean hard work

Braverman likes to carve hardwoods, like walnut and mahogany. One of his favorite woods is oak—for a carver, that's unusual. He prefers California bottom oak and Japanese white oak. Both have dense growth rings and uniform texture. Because the more ornate carvings will have from $\frac{3}{8}$ in. to 2 in. of relief, he picks thick stock, usually $\frac{8}{4}$ or more, for panels. After he inspects a board's end grain, he checks the face (see the bottom photo on p. 83) to see that the grain is straight and won't interfere with his gouges and chisels. For panels that won't be carved, he chooses highly figured pieces, like crotch wood (see the photo at left on the facing page).

For strength and simplicity, Braverman mostly uses mortise-and-tenon joinery. But he also uses sliding dovetails, splined miters and butterfly keys when an assembly calls for it. For doors, Braverman likes to use wedged-through,

Braverman excels at designing and carving big works. This 16-ft.-long Florentine-style breakfast, with its elegant proportions and relieved surfaces, waits to be finished. An in-progress walnut gate (foreground) rests on sawhorses.

pinned or mitered-and-mortised tenons. To form the heavy rail tenons and deep stile mortises, Braverman and Koda rely on big machinery.

New prospects in the Pacific

Braverman has two shops. The old shop (see the top photo on p. 82) is in Topanga. The new shop, still being built, is in Anahola, Hawaii, on the island of Kauai. It is in Anahola that Braverman plans to continue building one-of-a-kind furniture pieces, doors and occasional sculptural works. "I have some work in Honolulu," Braverman says, "and I'm visiting neighboring islands to build up my client base." Meanwhile, Ed Koda is keeping the West-Coast shop running. Koda bids on work in and around Los Angeles. He and Braverman work independently on the small jobs. But when either one lands a big commission, they collaborate, which is an ideal arrangement for two craftsmen with such complementary talents.

Kiyo is also key to the success of the business. Besides raising the two Braverman children, she does all the sanding, staining and hand-rubbed finishing. She mostly uses wipe-on oils and lacquer because they add an aged patina, which is what her husband is after. "Without Kiyo and Ed," says Braverman, "I could not devote the essential time it takes to design and carve fine work." □

Alec Waters is an associate editor for Fine Woodworking.



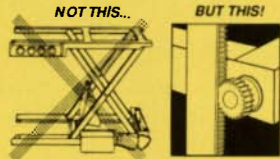
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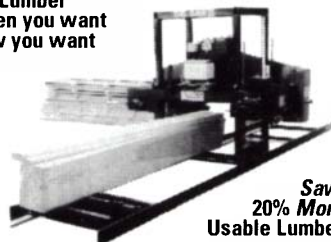
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Wood Magazine test, Sept., '93, pg. 45.



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Delta	9" x 80T x 5/8"	204 119
Ryobi-Makita & all	10" x 80T x 5/8"	207 129
DeWalt, Makita, B&O & Hitachi	12" x 80T x 1"	229 139
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Dear Mr. Forrest:

What a pleasure it is to find a product that is even better than expected. I am a long time owner of a **Woodworker I (10"-60T)** which I use with your 4" stabilizer. It has consistently produced **cross cuts on my radial arm saw which look polished** and are far superior than any produced using any other blade I have tried, but it is not good for ripping. When I recently purchased a new Delta 10" Contactor's Saw, I tried it with a couple of premium blades, including a specialized rip blade, as my principal use was ripping 1" oak planks. Although everything checked out, and the blade was sharp, I was not satisfied.

Fortunately, I ran into one of your magazine ads and, despite the price, I purchased a new **Woodworker II (10"x1/8"-40T) with a 5" stabilizer**. The first thing I did when I opened the package was to nick my finger on one of the teeth. **Have never seen a saw blade so sharp!** I immediately had to test the new blade, now wearing gloves for the installation (doesn't take me long to look at a horseshoe).

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As soon as I realized what a terrific tool my new WW II was, I immediately sent you the old WW I and the rip blade for re-sharpening. I have been using it for about six years, so maybe it has worn a bit.

Sincerely, Hank Meltzer Richardson, Texas

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12" x 30T x 1"	T62	119
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30T 1/8" or 3/32"	T36	99
9" x 40T	T46	109
30T	T26	99
*8-1/4" x 40T 3/32"	T36	99
8" x 40T 3/32"	T36	99
30T 3/32"	T16	89
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**NEW 6" x 40T 3/32"	T36	89

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Note: Fine Woodworking Editorial Nov./Dec. 1988 No. 73, pg. 65, S.N.

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Jim Forrest, President and designer microscoping cutting edge.

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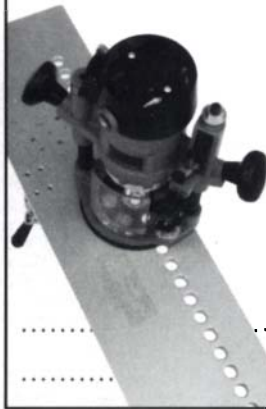
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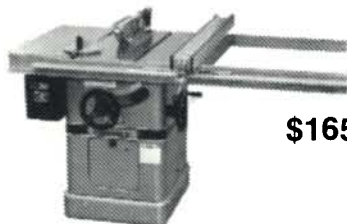
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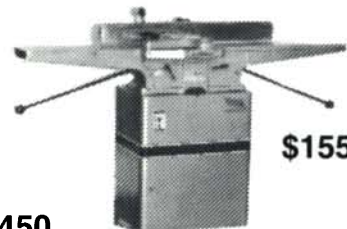
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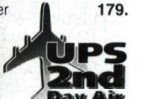
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READER SERVICE NO. 62

Stephan grinder lets you see edge as you grind

I don't begrudge the time it takes to sharpen a chisel or plane blade as long as I can count on the results. I've been happy with my way of doing things, but I was curious about the Stephan grinder I'd seen on the cover of a Woodcraft catalog. It was supposed to let you see the edge you're grinding, *as* you're grinding—a unique feature among grinders (see the photos below).

I borrowed the grinder from Woodcraft and used it in my shop for a month or so

last spring. It worked as advertised, revealing the beveled cutting edge of the tools I was grinding.

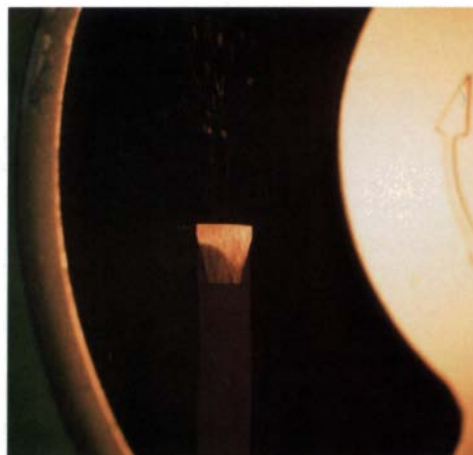
The grinder costs \$350 and is a sturdy, compact, tabletop unit with a 2,600-rpm motor and a built-in light. The grinder comes with a slotted, steel disc, coated with 120-grit Carborundum powder (80-grit and 180-grit discs also are available). The tool is held against the bottom of the disc. The slots let you see the edge you're grinding

and reduce heat buildup, helping to prevent burned tool edges. A hood covers the steel disc to prevent injury, but a window in the hood allows viewing.

I started off with a few small chisels and progressed to larger ones and then to small plane blades. From start to finish, the grinding process took no more than one minute, and with a little practice, I got it down to about 20 seconds. This grinder is fast! But speed isn't everything.

I found it nearly impossible to get a perfectly square edge or consistent bevel holding the chisel freehand, without a tool rest. Although cutting angles can vary slightly and edges don't have to be perfectly square on small chisels, it can be critical on plane blades and larger chisels. I corrected small grinding errors during honing, but any time I saved while grinding was lost during the honing process—and then some.

I found this grinder more suitable for carving and turning tools, where the lack of a rest is relatively unimportant. Still, a woodworker would have to do a lot of turning or carving to justify this pricey machine. For the time being, I think I'll stick with my 10-in., 1,725-rpm bench grinder. For more information, contact Woodcraft (210 Wood County Industrial Park, P.O. Box 1686, Parkersburg, WV 26102-1686; 800-225-1153). —Mario Rodriguez



It's fast, but doesn't have a tool rest. The Stephan grinder uses a horizontally mounted, Carborundum-impregnated steel disc to grind tool edges. Slots in the disc make the tool visible as you grind.

American firm now produces waterstones

Western woodworkers have been sharpening their tools with waterstones from Japan for years. Until last year, there was no American company that produced them. Last spring, Norton Co. introduced a set of synthetic waterstones. I leaped at the chance to try them.

Rather than produce stones in many grits (such as the King brand 600, 800, 1,000, 1,200 and so on), Norton offers only four stones. Together, they make up a complete set (\$129.95). Numbered using the traditional Japanese abrasive scale, there's a 220 (\$16.95), a 1,000 (\$21.95), a 4,000 (\$39.95) and an 8,000-grit stone (\$65.95), as shown in the photo at right.

The Norton stones are wider than most Japanese stones. This is a great help when honing Western tools, which have longer blades than their Japanese equivalents. The stones can be re-flattened readily with sandpaper and glass (for a complete dis-



American-made waterstones are available in four grits. The Norton Co. has introduced a set of four waterstones in grits of 220, 1,000, 4,000 and 8,000.

cussion of waterstone maintenance, see *FWW* #111, pp. 80-83). Flattening the Norton stones by using a coarser stone to true the finer ones in the set was a little iffy, though, because the Norton stones varied widely in surface hardness.

How do the stones rate individually?

When I tested a set last fall, I found the 220 stone a fast-action, metal-removing unit. It cut much more efficiently than the Japanese "green carbide" stones that fall into the same general grit range. Its surface was soft, however, requiring that it be re-trued often during rigorous use.

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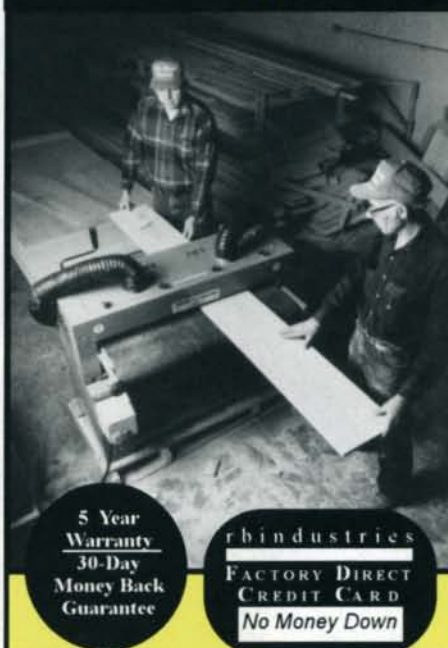
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I found the 1,000 harder than the 220 but still a bit too soft. It cut quickly but produced a thick slurry in short order, which dried up rapidly as I used the stone.

The Norton 4,000 is equivalent to the Japanese "middle stone." Many Western woodworkers don't bother using middle stones, but the 4,000 is crucial to the Norton system because of the huge difference in abrasiveness between the Norton 1,000 and the 8,000. The 4,000 stone stayed wet in use. This was welcome because the stone quickly became loaded during honing, and the excess surface water kept the stone from clogging completely. If you spend lots of time at the 4,000 during a sharpen-

ing, you may have to stop occasionally to clear the surface of excess material.

The 8,000 stone was the most satisfying stone in the set I used. It didn't require frequent rewetting during use, and I got fine results without having to prep the stone's surface with a nagura stone, as is necessary with most finishing stones. Tools glided smoothly on the Norton 8,000 without any chatter. The polish obtained with the Norton wasn't as bright as I've gotten with other brands but was perfectly suitable for my Western tools.

Were these stones ready for prime time? Not quite, I'd say. They seemed like works in progress and begged some further re-

finements. This was especially true of the 1,000- and 4,000-grit stones. The set I tried—produced in the summer of 1994—was an admirable initial effort, though. And since then, Norton has improved the stones, making both the 220 and 1,000 stones a little harder than those in the set I tried. If you're just interested in checking out one or two of the Nortons, I'd recommend the 220 or the 8,000. Those two were already nearly as good as anything else in their respective categories. The Norton stones are available from Garrett Wade (161 Avenue of the Americas, New York, NY 10013-0459; 800-221-2942).

—William Tandy Young

From planer to finish room with one grit

If there exists such a thing as lovable sandpaper, 3M has created it. Standard sandpaper has two nasty flaws, and they're both virtually eliminated in 3M's Microfinishing Film discs (see the photo below). First, grits are sized more accurately. All sandpaper-grit denominations indicate where the majority of the grit ranks in size. Some abrasive particles are larger and cut more deeply than the nominal size. Other grit is smaller—it's just expensive filler going along for the ride. For the Microfinishing "papers," the silicon-carbide grains are sorted using a more accurate screening process, which allows the "sandpaper" to cut both smoother and faster.

The second problem 3M has eliminated is the backing used on most sandpaper. Resin adheres the grit to a polyester film, which supports the grit more firmly and evenly than cloth or paper. The grit also

wears more slowly, which is important for machine sanding, and the backing resists tears or punctures. What's more, the discs are waterproof, so you can wet-sand with them. If they become clogged, you can clean the discs with soap and water or mild solvents.

But what matters most to me is how these discs sand. On well-planed wood, I can begin and end the sanding process with a 60-micron (about the equivalent of a standard 220-grit) disc on my random-orbit sander—true one-step sanding!

3M makes Microfinishing Films in grades from 9 micron (about 1,000-grit) to 180 micron (180-grit). Distributors in my area sell a pack of 25 5-in. hook-and-loop backed 60-micron discs (#268L) for under \$20. They're worth the price. For the name of a dealer near you, call 3M's Super Abrasives Division at (800) 533-6419. —Skip Hanson



3M's Microfinishing Film discs work better and faster than standard sandpaper. These discs, which have a polyester backing, last much longer than paper-backed discs and can be used for wet-sanding.



Looks like lacquer, protects like poly. General's new finish is durable and stain-resistant.

New finish looks great, stands up to abuse

I recently built a couple of Arts-and-Crafts-inspired tables to go with the Danish Modern and turn-of-the-century American furniture we've collected over the years. The tables were destined for the family room, where I knew they'd be subjected to the normal sort of abuse a family with a couple of teenagers can provide. For that reason, I wanted a finish that would be very durable and stain-resistant. But I didn't want a finish that looked like a thick layer of plastic sitting atop the wood.

I found what I was looking for in General Finishes' Polyurethane & Acrylic Blend (see the photo above). It's a water-based product that dries almost as fast as lacquer and builds to a great finish in a day. I kept my shop around 70° (humidity was a little below 35%) and put down a coat an hour with no problem. I used a foam brush and was pleasantly surprised not to have trou-



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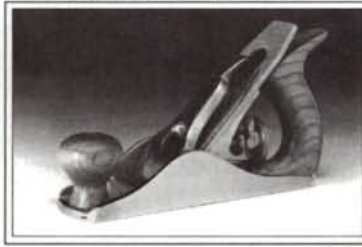
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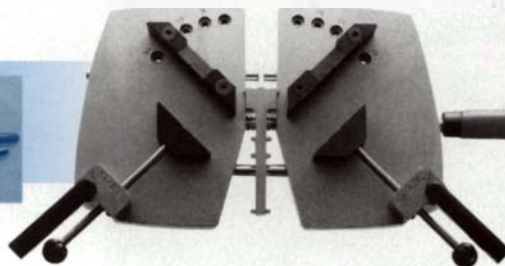


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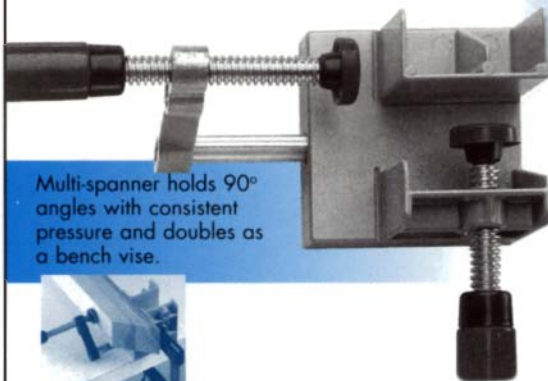
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ble with bubbles or foaming in corners. And the finish leveled out quickly.

I sanded between coats, using 400-grit wet-or-dry paper for the first two coats, then 600-grit, then a gray 3M pad and, finally, between the fourth and fifth coats, a white 3M pad. The resulting finish looks great, feels like silk and has already stood the spilled-juice test. Most of the woodworkers who have seen the table thought that it was sprayed—just the effect I wanted. General Finishes' products are sold through Woodcraft (800-225-1153) and The Woodworkers' Store (800-279-4441). A quart runs about \$15. —Jim Chiavelli

Briefly noted

Boggs' spokeshave now available from Veritas

Chairmaker Brian Boggs designed and manufactured a spokeshave reviewed in this column about two years ago (*FWW* #99). The reviewer called it "nearly perfect in form, feel and function" but pricey at \$110. The tool is now being manufactured for Boggs by Veritas Tools (P.O. Box 1720, Ogdensburg, NY 13669; 800-667-2986). And the price has come down to \$95.

Miter-gauge fit kit

The manufacturer calls it the Tru-Fit miter-gauge system. I call it about time. For \$11.95 (plus shipping), you can buy a bit for drilling out your miter bar and enough rubber grommet, hex-head Allen screws and Cool Block material for five inserts. You drill the holes in your miter bar, insert the grommets, push the Cool Block material in one side and screw the Allen screws in from the other.

The Allen screws are recessed, and the Cool Block material protrudes just enough to take up any slop between your miter bar and slot. A hex-head wrench and instructions are also included. The Tru-Fit miter-gauge system is available from Woodcraft (800-225-1153) and from Garrett Wade (800-221-2942). —V.L.

On the horizon

Hydrocote announces new Danish oil

A noncombustible, "virtually odorless" Danish oil finish? That's what Hydrocote Finishing Products is claiming. Other touted advantages are greater coverage, quicker drying time and lots more.

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Drill-press foot feed saves time, easy to install

Boring a lot of holes on the drill press can be a time-consuming affair. Even with a back fence to position the workpiece, there's likely to be lots of repositioning to get the bit squarely on target, especially when one hand is busy holding the feed lever. If only you could use both hands to position the workpiece....



Foot-feed frees your hands. With both hands free for the workpiece, you can work faster and more accurately.

A new foot feed lets you do just that (see the photo below). Called the "3rd Hand" by its inventor and manufacturer, Gene Paules, the foot feed works by means of a cable that connects a pedal at the base of the drill press and the feed lever. Set-up time is less than an hour, but it requires drilling and tapping two 1/4-20 holes. If you don't have the bit and tap, don't worry. Paules will supply them for \$5. The iron used for the castings on a typical drill-press base taps very easily.

I used the foot feed (I can't get used to calling it 3rd Hand) for drilling some shelf-pin holes, boring out a bunch of mortises and a few other jobs. For individual holes, the time savings isn't that great, but for the mortises and shelf-pin holes, it's significant. It took only a minute or so to drill out each mortise (after setting the back fence and the depth stop). I was building just one table, but in a production situation this thing would pay for itself in a day.

The 3rd Hand foot feed sells for \$149 plus \$6.75 shipping in the continental United States (\$10 to Canada, Alaska or Hawaii). An economy model is also available for \$119.

The foot feed comes without the pedal and foot bar, both of which can be made easily of wood (plans are included). Paules offers a 30-day free-trial return privilege. For more information or to order, contact Gene Paules' company, GP Designs Inc. (24 Willard Road, Shelton, CT 06484; 203-929-8158). —Vincent Laurence

Where to find it

Ordering table legs by mail

Need a table leg in a hurry? Well, you're in luck. Three companies sell shaped legs: Smith Woodworks & Design, Classic Designs by Matthew Burak, and Adams Wood Products. Smith sells turned Shaker-style dining-table legs in cherry and in maple (\$16.46 and \$15.55 each, respectively); the other two companies sell a great variety of styles.

Burak sells table legs in a half-dozen or so different styles, a range of sizes and even sells stretchers and aprons. Woods include cherry, maple, oak, walnut, mahogany and, on a special-order basis, tiger maple. Prices range from \$18 a leg for a plain, tapered (Hepplewhite) coffee-table leg in maple to \$85 for a carved Queen Anne dining-table leg in tiger maple.

Adams sells everything from billiard-table legs to reeded tulip-style table bases with Duncan Phyfe legs. Along the way,

you'll also find a wide variety of table legs, Shaker candle-stand bases, upholstered chair and sofa legs, a few furniture kits, four-poster bed legs and more. To me, prices seemed good.

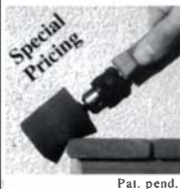
For more information, you can reach Smith at 101 Farmersville Road, Califon, NJ 07830; (908) 832-2723; Burak at P.O. Box 279, Danville, VT 05828; (802) 684-2156; and Adams at 974 Forest Drive, Morristown, TN 37814; (615) 587-2942. —V.L.

Mario Rodriguez, a furniture maker and woodworking teacher in Warwick, N.Y., is a contributing editor to FWW. William Tandy Young is a professional cabinetmaker and conservator working in Stow, Mass. Skip Hanson is a carpenter, woodworker and writer in Albuquerque, N.M. Jim Chiavelli is the publisher of FWW. Vincent Laurence is an associate editor for FWW.

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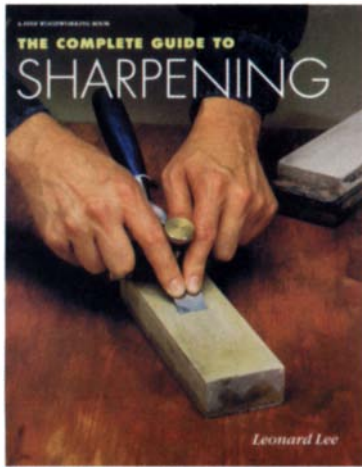
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The Complete Guide to Sharpening by Leonard Lee. *The Taunton Press, 63 S. Main St., P.O. Box 5506, Newtown, CT 06470-5506; 1995. \$34.95, hardback; 245 pp.*



As a self-taught craftsman, I've been confused and frustrated by sharpening. Conflicting opinions abound on sharpening and honing angles and stones, as well as on techniques and equipment. Leonard Lee's presentation cuts through the noise with a clear, understandable logic.

The first five chapters deal with the meaning of sharpness, the physics of severing wood fibers, metallurgy, abrasives and equipment. The material covers the four factors of sharpening: the material to be worked, the

metal in the tool, the technique of the user and the suitable use of abrasives. In chapter six, he gets into actual sharpening procedures, and for the next 12 chapters, he applies those basic procedures to the needs of specific groups of hand and power tools: planes, carving and turning tools, knives, scrapers, saws, axes and adzes, drill bits, scrapers, and power blades and cutters. All are thoroughly covered.

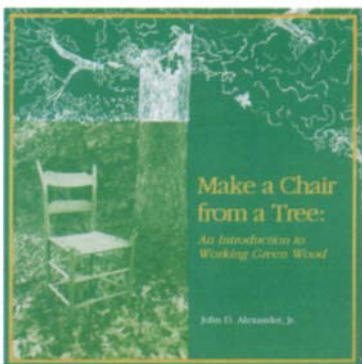
The diagrams and photography round out the text in a very satisfying way. Of particular interest are comparison micrographs of chisel edges worked to various levels of refinement on different stones. An appendix covers the photographic analysis of chip formation. It's incredible to get such a close look at wood being cut.

There are many helpful sidebars, which keep the text lively and interesting, such as a visit to a Japanese chisel factory, a description of how to wedge an ax handle and information on skewing, mechanical advantage and even homemade gauges.

I now have the confidence to sharpen my tools to the appropriate angles and to modify my cutting edges so they perform better. This contributes to a new atmosphere in my shop. My tools are getting edgy.

—C. Michael Vogt

Make a Chair from a Tree: An Introduction to Working Green Wood by John D. Alexander Jr. *The Astragal Press. Distributed by John D. Alexander Jr., 1406 Light St., Baltimore, MD 21230-4515; 1994. \$22.45, paperback; 133 pp.*



This manual on making a post-and-rung chair is really a primer on green woodworking, which should be everyone's introduction to joinery. An understanding of principles for working green wood make a sound base for all woodwork.

Failures come quick and cheap. The simple implements are satisfying to use, yet they require sharpening skills basic to all edge tools.

Alexander's clear explanations of wood orientation and movement make this a valuable addition to any shop. A novice will soon find that the book falls open to p. 80 where mortise-and-tenon joints are shown sawed apart (that the tenon is round

doesn't affect the principle). Or p. 63, where rays and growth rings are clearly shown. Or p. 93, detailing why a post-and-rung chair holds together, its parts clamped by wood action alone.

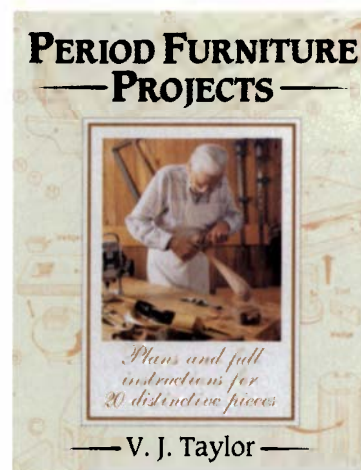
In the course of building a chair, Alexander thoroughly treats shaving horses, hollow augers, axes, froes, drawknives, braces and dowel pointers. The elemental principles are clear and rigid. If the rules are obeyed, your construction holds for 100 years; dismiss them and furniture fails promptly.

This enlarged edition of *Make a Chair from a Tree* is nearly identical to the first. The 12 new pages add notes on tool use, selection and sharpening and provide details on an English shaving horse with an adjustable riser, shaped holding blocks for a bench vise, a quick, cheap kiln, and new notes on bending and mortising posts. There's also a new bibliography and a new list of suppliers.

There are some small disappointments. The index, bad to begin with, is now worse in that it does not include the new material. A few illustrations are muddled. The new shaving horse and the vise blocks can be constructed from the information provided, but it's not easy. But these are cavils. This book falls squarely under "essential volumes."

—Harriet Hodges

Period Furniture Projects by V.J. Taylor. *David & Charles. Distributed by Sterling Publishing Co., 387 Park Ave. South, New York, NY 10016-8810; 1994. \$29.95, hardback; 160 pp.*



Period Furniture Projects details 20 pieces of mostly English, antique furniture, which range from chairs and tables to chests and beds. When I first thumbed through this book, I found the drawings and the photos very appealing. I waited for a peaceful moment to study it more thoroughly, and that's when the book's shortcomings became apparent.

Because the disassembly of this antique furniture was not feasible, the joinery details represent the author's conjecture. On close inspection,

some of them just seem wrong. Taylor's unconventional interpretation of the chair back's joinery and the crest rail shown on the George III Elbow Chair and the Chippendale chair would make assembly awkward.

The joinery details for the center stile on the frame-and-panel Linden Chest are difficult and clearly atypical, whether using period or contemporary tools. The tilt mechanism of the Tripod Tilt-Top Table will not work as shown. The top edge of the bird cage must be rounded off, so the top can pivot without binding. These are a few examples to watch out for, but there are others. If you use the book to build some of these pieces, be cautious, and go over the drawings thoroughly.

On the plus side, the photos are top-quality. They are provided by some of the best auction houses and are quite revealing in themselves. The book does have scads of good information, especially in the appendix on techniques. *Period Furniture Projects* is a good title for this book, but it falls short, mainly due to poor interpretation of construction details.

—Philip C. Lowe

C. Michael Vogt is a furniture builder in Saratoga Springs, N.Y. Harriet Hodges builds Windsor chairs in New Castle, Va., and is the indexer for *Fine Woodworking*. Philip C. Lowe designs and builds period furniture in Beverly, Mass.

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Listings of gallery shows, major craft fairs, lectures, workshops and exhibitions are free, but restricted to happenings of direct interest to woodworkers. 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 p.m. on the fourth Monday of each month at the Anchorage Museum. No meetings in July. For more information, call (907) 345-3077.

ARKANSAS: Meetings-Woodworker's Association of Arkansas meets the first Monday of each month at 7:00 p.m. at Woodworker's Supply Center, 6110 Carnegie, Sherwood, 72117. For more information, call (501) 835-7339.

CALIFORNIA: Workshops-Woodworking for women. Furnituremaking with hand tools using traditional joinery, weekends. San Francisco. Contact: Debey Zito (415) 648-6861. **Workshops**-Classes on woodfinishing and decorative painting for furniture and cabinets. For schedule, write Studio 1829, 1829 Stanford St., Santa Monica, 90404. (310) 453-0230. **Workshops**-Shaker bench, sofa table, Mission lamp table, Adirondack chair, more. Saturdays and Sundays. No experience necessary. Private instruction available. For more information, contact the Woodworkers Place at (818) 952-3177. **Workshop**-Woodworking and carving. Martin Pierce Furnishings, 5433 W. Washington Blvd., Los Angeles. For more info, call (213) 939-5929.

Symposium-American Association of Woodturners 9th National Symposium, July 6-8. University of California, Davis. For more information, call (612) 484-9094.

Workshops-Various workshops including Japanese woodworking, joinery and sharpening. For more info, contact Hida Tool Co., 1333 San Pablo, Berkeley, 94702. (415) 524-3700.

Exhibition-Design in Wood, thru July 4. Del Mar Fair, Del Mar. For more information, call (619) 792-4207.

Show-California Carvers Guild 18th annual woodcarving show, Sept. 16-17. Coast High School, Cambria. For info, contact CCG Museum & Gallery in San Simeon. (805) 434-2677.

COLORADO: Classes-Woodworking and related classes, year-round. For more info, write Red Rocks Community College, 13300 W. 6th Ave., Lakewood, 80401. (303) 988-6160.

Workshops-Beginning thru advanced woodworking workshops, thru August. For free catalog, call or write Gail Fredell, Program Director, Anderson Ranch Arts Center, PO Box 5598, Snowmass Village, 81615. (303) 923-3181.

Classes-Traditional hand woodworking, year-round. Contact: Tom Larkin, Shadow Mountain School of Woodcarving, 32037 Stenzel Drive, Conifer, 80433. (303) 674-8560.

CONNECTICUT: Exposition-38th Annual Guilford Handcrafts Exposition, July 20-22. Contact: Guilford Handcrafts Exposition, PO Box 589, Guilford, 06437. (203) 453-5947.

Call for entries-Woodworking Show, Oct. 1-31. Deadline: July 15. For information, send an SASE to Gallery-12, 29 Whitfield St., Guilford, 06437. (203) 458-1196.

Call for entries-1995 Holiday Festival of Crafts. Deadline: Sept. 1. For further information, call or write 17th Annual Guilford Handcrafts Holiday Festival, PO Box 589, Guilford, 06437. (203) 453-5947.

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 at 7:30 p.m. Woodcraft Supply Corp., 246 E. Semoran Blvd., Casselberry. For more information, contact Roger Lovell at (407) 841-6155.

Meetings-Palm Beach Country Woodturners, monthly meetings. For more info, call Steve Blank (407) 747-7035.

Meetings-St. Petersburg Woodcrafters Guild meets the fourth Thursday of every month at 7 p.m. at Montgomery Electric and A/C, 1200 19th St. N., St. Petersburg, 33713. For more info, contact Don Montgomery at (813) 898-0569.

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) 8892-2487.

Workshops-Japanese woodworking by Toshihiro Sahara. One Saturday each month. For further information, contact Sahara Japanese Architectural Woodworks at (404) 355-1976.

ILLINOIS: Exhibition-Illinois Valley Woodland Expo: The Pleasure, Profit and Products of Good Woodland Stewardship, Aug. 26. Marshall-Putnam County Fairgrounds, Route. 29, Henry. For more info, contact Prairie Rivers Resource Conservation and Development (309) 364-3979.

INDIANA: Classes-Carving, designing furniture, marquetry, veneering, joinery, turning, chairmaking, thru October. Marc Adams School of Woodworking, Route 2, Box 121A, Franklin, 46131. (317) 535-4013.

Classes-Hands-on wood working classes with Michael Van Pelt. Superior Woodworking Supply, Inc., 922 Ft. Wayne Ave., Indianapolis, 46202. (317) 635-5747.

MAINE: Workshops-Two-week basic and intermediate furnituremaking courses. Faculty includes Peter Korn, John McAlevey, Terry Moore and Charles Durfee. For more information, contact the Center for Furniture Craftsmanship, 125 W. Meadow Road, Rockland, 04841. (207) 594-5611.

Show-Fourth Annual Guild of Maine Woodworkers, Aug. 3-6, Maine Festival, Thomas Point Beach, Brunswick. For more information, contact Karl Grose (207) 443-2843.

Show-Bridgton Historical Society Annual Cabinetmakers Show, July 8-9. Naramissic, Ingalls Road, South Bridgton. For more information, call (207) 647-3699.

MARYLAND: Show-Shaker Forest Festival, Sept. 9-10, 16-17, 23-24. Seneca Creek State Park off Clopper Road, Gaithersburg. Contact: Connie Paulovich, Shaker Forest Festival, 275 Pleasantview Drive, Midland, PA 15059. (412) 643-8604.

MASSACHUSETTS: Classes-Woodworking classes thru-out most of the year. Contact: Boston Center for Adult Education, 5 Commonwealth Ave., Boston, 02116. (617) 267-4430.

Instruction-Full-time program in fine furniture construction. Complete facilities. For more info, contact Wm. B. Sayre, Inc., One Cottage St., Easthampton, 01027. (413) 527-0202.

Show-Boxes, Aug. 26-Oct. 1. The Society of Arts and Crafts, 175 Newbury St., Boston, 02116. (617) 266-1810.

Classes-July summer intensives, woodworking, turning, carving, furniture design, finishing, hand tools and more. One Cottage Street School of Fine Woodworking, One Cottage St., Easthampton, 01027. (413) 527-8480.

Workshops-Toolmaking for woodworkers, the first three weekends of each month. Registration limited to two students per weekend. For info, contact Ray Larsen, Genuine Forgery, 1126 Broadway, Hanover, 02339. (617) 826-8931.

Workshops-Summer intensives. Faux finishing, chair basics, more. Horizons, The New England Craft Program, 108 N. Main St., Sunderland, 01375. (413) 665-0300.

Workshops-One-week woodworking and related workshops throughout the year. Contact: The Heartwood School, Johnson Hill Road, Washington, 01235. (413) 623-6677.

Classes-Ongoing classes and one day seminars, beginning through intermediate woodworking. Classes and seminars begin September. For information or brochure, call Michael Coffey at (413) 527-8480.

Workshop-Woodcarving shore birds and duck decoys, Aug. 23. Worcester Center for Crafts 25 Sagamore Road, Worcester, 01605. (508) 753-8183.

MICHIGAN: Workshops-Woodwrighting, more. Tillers International, 5239 South 24th St., Kalamazoo, 49002. For more info, call (616) 344-3233.

MINNESOTA: Classes-Woodcarving classes year-round. For information, contact the Wood Carving School, 3056 Excelsior Blvd., Minneapolis, 55416. (612) 927-7491.

Meetings-Minnesota Woodworkers Guild meets the third Tuesday of each month at 7:15 p.m. Demonstrations are presented each month at different locations. For more information, contact Richard Gotz at (612) 544-7278.

Exhibition-Virtual Rurality, an exhibition of the woodcarvings of Fred Cogelow. The Depot Museum, Duluth, thru Oct. 7. (218) 727-8025. The Minnesota State Fair, St. Paul, Aug. 24-Sept. 4. (612) 642-2440.

Show-The Twin Cities Woodworking Show, Oct. 13-15, Minnesota State Fairgrounds, Education Building, Snelling & Commonwealth Aves., St. Paul, 55108. For more information, call (310) 477-8521.

MISSISSIPPI: Classes-Various woodworking classes. For more information on the classes, contact Allison Wells School of Arts & Crafts, Inc., Canton. (800) 489-2787.

MISSOURI: Exhibitions-Hand in Hand: Designs in Wood by Furniture artists, thru Aug. 26. Anheuser Busch Gallery at the Center of Contemporary Art, 524 Trinity, St. Louis, 63130. For more information call (314) 725-6555; A la Carte: Furniture for Dining by Regional Craftsmen, July 7-Sept. 2. Craft Alliance Gallery 6640, Delmar, St. Louis, 63130. For more information call (314) 725-1151.

MONTANA: Show-The Good Wood Show, Sept. 22-24. Elk's Club, 934 Lewis Ave., Billings. For info, contact Dick Torbert, 1119 11th Ave., Laurel, 59044. (406) 628-7447.

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 334-5550.

NEW HAMPSHIRE: Classes-Fine arts and studio arts. For info, contact Manchester Institute of Arts and Sciences,

114 Concord St., Manchester, 03104. (603) 669-2731.

Classes-Various woodworking classes. For more info, contact The Hand & I, PO 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.

Workshops-Week-long Shaker-style furniture and chair-making workshops, year-round. For more info, contact Mary Sweet, Dana Robes, Wood Craftsman, Lower Shaker Village, Enfield, 03748. (603) 632-5385.

Classes-Make a Windsor chair with Michael Dunbar. For information, contact Michael Dunbar, PO Box 805, Portsmouth, 03802. (603) 431-4676.

Exhibition-Fine Finish: Handcrafted Wood Furniture, Sept. 18-Oct. 27. The New Hampshire Craftsmen League Gallery, 205 North Main St., Concord. For more information, call (603) 2324-3375.

NEW JERSEY: Show-Peters Valley Craft Fair, July 29-30. Peters Valley Craft Center, 19 Kuhn Road, Layton, 07851. For more information, call (201) 948-5200.

NEW MEXICO: Classes-Woodworking classes. For more information, contact North New Mexico Community College, El Rito, 87520. (505) 581-4501.

Classes-Fine woodworking classes. For more information, write Santa Fe Community College, Santa Fe, 87502, or call (505) 438-1361.

Exhibition-Santa Fe Furniture Expo, thru July 2. Sweeney Center, Santa Fe. For more information, call The Mayfair Group, Inc. at (505) 255-4271.

NEW YORK: Classes-Traditional 18th-century woodworking techniques with Mario Rodriguez. For more info, contact Warwick Country Workshops, PO Box 665, Warwick, 10990. (914) 986-6636.

Meetings and classes-New York Woodturners Association meets bi-monthly. YWCA, 610 Lexington Ave. (53rd. St.) New York City. For more info, contact Howard Alalouf (914) 337-0226.

Classes-Woodworking, traditional and contemporary; turning and finishing with Maurice Fraser and Bill Gundling. All levels. The Craft Students League at the YWCA, 610 Lexington Ave., New York City. For further information, call (212) 735-9731.

Classes-Introduction to Woodworking, thru July 26. For more information, contact the Division of Continuing Education, SUNY, 735 Anderson Hill Road, Purchase, 10577-1400. (914) 251-6500.

Show-Marriage in Form: Kay Sekimachi & Bob Stocksdale, July 12 thru Oct. 8. American Craft Museum, New York. For more information, call (415) 329-2605.

Show-Crafts Festivals '95, July 7-9 and Aug. 11-13. Bestor Plaza, Chautauqua Institution, Chautauqua. For more information, contact Kay Collins, Festivals Director, Chautauqua Crafts Alliance, PO Box 389, Fredonia, 14063-0389.

Show-10th Annual Autumn Crafts Festival, Sept. 2-3. Lincoln Center for the Performing Arts, New York City. For more information, call (201) 746-0091.

Show-Westchester Crafts Show, Sept. 23-24. Westchester County Center, Central Ave. and Route 119 at the Bronx River Parkway, White Plains. For further information, call (914) 232-6583.

Show-The Syracuse Woodworking Show, Sept. 22-24. On-center, Hall A, 800 S. State St., Syracuse, 13202. For more information, call (310) 477-8521.

NORTH CAROLINA: Meetings-North Carolina Woodturners meet the second Saturday of each month. For more information, contact North Carolina Woodturners, PO Box 1833, Hickory, 28603. (704) 324-5960.

Call for entries-The Chair Show, October thru Nov. 36. Juried exhibition. Folk Art Center, Asheville. Deadline: Aug. 7. For more information, contact Katherine Duncan, Southern Highland Handicraft Guild, PO Box 9545, Asheville, 28815. (704) 298-7928.

Classes-Bent laminations, basic woodworking, design and more, thru September. Penland School of Crafts, Penland, 28765-0037. (704) 765-2359.

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 the Cincinnati Woodworking Club, 5974 Gaines Road, Cincinnati, 45247.

Workshops-Windsor chairs, taught by Joe Graham. For more information, contact Lenox Workshops, 1192 Webster Road, Jefferson, 44047. (216) 576-0311.

Show-The Siskiyou Woodcraft Guild's 8th annual summer show and sale of fine woodwork, July 28-30. Pioneer Hall, Ashland. For more information, call Daniel Sheret at (503) 899-8106.

Workshops-Various workshops held throughout the year. Conover Workshops, 18125 Madison Road, PO Box 679, Parkman, 44080. (216) 548-3491.

Show-The Greater Cleveland Woodworking Show, Sept. 29-

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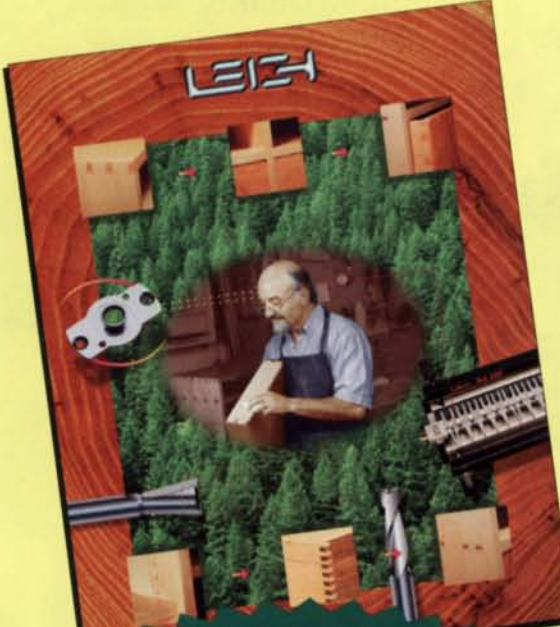
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Oct. 1-1-X Center, West Hall, 6200 Riverside Drive, Cleveland, 44134. For more information, call (310) 477-8521.

OKLAHOMA: Show-Eastern Oklahoma Woodcarvers Association 19th annual woodcarving Show, July 7-9. Tulsa Promenade Shopping Mall, 4107 South Yale Ave., (41st at Yale), Tulsa, 74135. (918) 749-8909.

OREGON: Meetings-Cascade Woodturner's Association meets every third Thursday. For information, contact the Cascade Woodturners, 115 75 S.W. Pacific Highway, #104, Tigard, 97223. For more information, call (360) 887-3903.

Classes-Oregon School of Arts and Crafts, 8245 S.W. Barnes Road, Portland, 97225. (503) 297-5544.

PENNSYLVANIA: Call for entries-Second annual Wharton Esherick Museum woodworking competition and Exhibition. Deadline: Aug. 1. Contact: Wharton Esherick Museum, PO Box 595, Paoli, 19301-0595. (610) 644-5822.

Classes-Windsor chairmaking, weekly and weekends. Contact Jim Rendi, Philadelphia Windsor Chair Shop, PO Box 67, Earlville, 19519. (215) 689-4717.

Call for entries-The Hazleton Art League. Deadline: July 20. For more information and application, write to Jayne Persico, 50 N. Vine St., Hazleton, 18201, or call (717) 454-3789.

Meetings-Black Hills area woodworkers interested in organizing for purposes of sharing information and working toward a show. To be on mailing list, call (605) 343-1878.

Classes-Furnituremaking, joinery, chip carving, restoration, woodturning and more, thru December. For schedule and exact dates of classes, contact the Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Road, York, 17402, or call (717) 755-8884.

Symposium-AllTURNatives: Form & Spirit, Aug. 4-6. Philip and Muriel Berman Museum of Art at Ursinus College in Collegeville. For more information, contact the Wood Turning Center, PO Box 25706, Philadelphia, 19144 (215) 844-2188.

Workshops-Week-long woodcarving workshops, thru November. Sawmill Center for the Arts, PO Box 180, Cooksburg, 16217. (814) 927-6655.

Classes-Bowl turning with David Ellsworth. Three-day weekend workshops in private studio. Beginner to intermediate. Classes limited to 4 students. July 21-23, 28-30. For more information, contact David Ellsworth, Fox Creek, 1378 Cobbler Road, Quakertown, 18951. (215)536-5298.

Show-Delaware Valley Woodworking Show, Sept. 15-17. Valley Forge Convention Center, Pennsylvania Hall, N. Gulph Road & First Ave., King of Prussia, 19406. For more information, call (310) 477-8521.

SOUTH DAKOTA: Classes-Various classes and workshops for beginning and experienced woodworkers. Iron Mountain Wood Shop, 4302 S. Highway 79, Rapid City, 57701. (605) 343-1878.

TENNESSEE: Workshops-Turning, carving, coopering and more. Workshops held throughout the year. Arrowmont School of Arts and Crafts, PO Box 567, 556 Parkway, Gatlinburg, 37738-0567. (615) 436-4101.

Workshops-Woodturning, utensil carving, dulcimer making, wood and the turned vessel, thru July. For more info, contact Tennessee Technological University, Appalachian Center for Crafts, 1560 Craft Center Drive, Smithville, 37166. (615) 597-6801.

Classes-Lumber selection, grading, stacking, drying, kiln operation, forest management, logging, sawmilling. Tennessee Valley Authority, 17 Ridgeway Road, Box 920, Norris 37828-0920. (615) 632-1656.

TEXAS: Meetings-North Texas Woodworker's Association meets the third Tuesday of each month. Contact Bruce May, North Texas Woodworker's Association, PO Box 831567, Richardson, 75083. (214) 271-0125.

Classes-Woodworking classes year-round. Bowl turning basics to advanced furniture and cabinetry. For more information, write to the Woodshop, Inc. Woodworking School, 1225 West College, Suite 612, Carrollton, 75006, or call (214) 466-3689.

Meetings-Woodturners of North Texas meets the last Thursday of every month, 7:30-10:00 p.m. For more information, contact the Paxton Beautiful Woods Store, 1601 W. Berry St., Fort Worth, 76110. (817) 927-0611.

Classes-Carving classes every Thursday, 6:00-9:00 p.m. Classes are taught by Don Schol. For more information, contact the Paxton Beautiful Woods Store, 1105 Sixth St., Carrollton, 75006. (214) 245-1192.

Meetings-Smith County Woodworkers Club meets at 7:00 p.m. on the second Monday of each month at Mason Machinery in Tyler. For more information, contact Bob Miller, 165904, FM 2964, Whitehouse, 75791.

VERMONT: Courses-Yesterday Design and Building School, Route 1, Box 97-5, Warren, 05674. (802) 496-5545.

VIRGINIA: Call for entries-Beads on Target, Oct. 26-Nov. 25. Contemporary beadwork. Deadline: July 8. For more information, contact Friends of the Torpedo Factory Art Center, 105 N. Union St., Alexandria, 22314. (703) 683-0693.

Classes-Fundamentals of woodworking, router techniques, bowl turning and more. Classes offered year-round. Call or write for class schedule: The Woodworkers Club, 216 Dominion Road, N.E., Vienna, 22180. (703) 255-1044.

WASHINGTON: Workshops-Build a sea chest, small boat construction, handplane repair and construction, paddle carving, woodturning. Northwest School of Wooden Boat Building, 251 Otto St., Port Townsend, 98368.

WISCONSIN: Workshops-Furniture design, cabinet construction, picture frames, planing, finishing, guest speakers, thru December. The Wisconsin Woodworkers Guild. For more information, call Matthew Bohlmann at (414) 258-3132.

CANADA: Workshops-Traditional Windsor chairmaking. Weekly courses. For more info, contact David Goodwin, Village Chairmaker, Sparta, Ont., N0L 2H0. (519) 775-2751.

Association-Canadian Woodturners Association. Markham, Ont. For info and quarterly newsletter, call (905) 479-0755.

Meetings-West Island Woodturners Club (Montreal) meets every Tuesday, September thru May. Contact: Dennis Brown, 8817 Cure Legault, Lasalle, Que. H8R 2V9. (514) 366-6071.

Show-The 12th Annual Wood Show, Aug. 1-13. Durham Arena, Durham. For more information, contact The Wood Show, Box 920, Durham, Ont., N0G 1R0. (519) 369-6902.

Association-Superior Woodworking Association meets 7:00 p.m. the last Monday of each month. Confederation College, Thunder Bay, Ont., Dorion Building, Room 145. Contact Vic Germaniuk at (807) 767-5964.

Workshops-Furniture and clock case design with Bruce Luckhurst, Sept. 1-3. West Dean College, West Dean, West Sussex PO18 0QZ. Contact: Alexi Stewart on 01243 811 301.

SCOTLAND: Workshops-Ongoing workshops. For more information, contact the Myreside International School of Antique Furniture Restoration, Myreside Grange, Gifford, East Lothian, EH41 4JA. (062 081) 0680.

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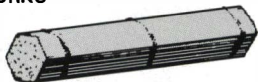
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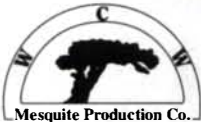


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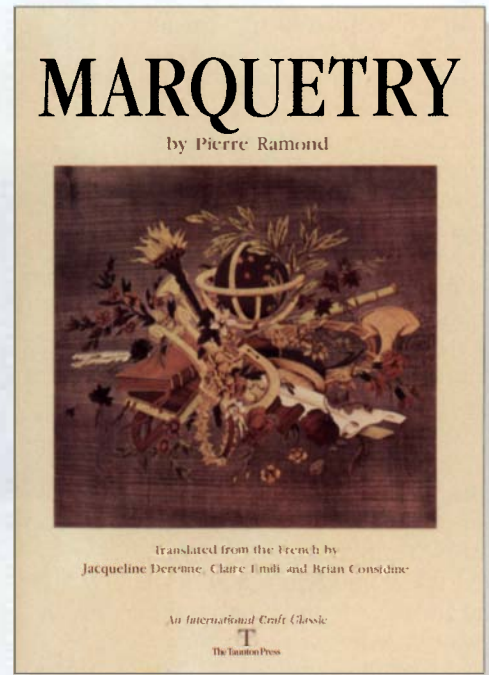
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Recycling a lost treasure

On Aug. 24, 1992, Hurricane Andrew came through town like a freight train. The storm devastated South Dade County in Florida, including my home, my shop and my fruit tree grove right along with the rest of Homestead. An estimated 65% of all trees in the south end of the county, a 20-mile swath just south of Miami, were blown down or left standing dead. Although South Florida isn't known for its fine native hardwoods, there is one certain exception, a true enigma. It's *Swietenia mahagoni*, our native mahogany, which is considered the finest cabinet wood in the world. Its combination of beauty, stability and workability has no rivals, and Hurricane Andrew made tons of it available (see the photo at right).

Native only to three big islands (Cuba, Jamaica and Hispaniola) and the southern tip of Florida, Cuban mahogany was cut to the point of such scarcity that an embargo banning its import and export was adopted in the 1940s. Timber merchants then turned to the Central and South American mainland and focused on the much more plentiful *Swietenia macrophylla*, which is still supplied in large quantities. Cuban mahogany became known only in legend. Comparing Cuban mahogany to other mahogany is like comparing satin to burlap; Cuban mahogany is much finer, denser and takes on an iridescent copper patina.

After the hurricane, I patched up my house, put together a makeshift crew and set out to salvage as much mahogany as the situation permitted. Conditions were terrible. Usable roads were bumper to bumper. Mahogany trees had been planted in Dade County fairly extensively along rights-of-way and as ornamentals in yards from about 1910 onward. For the most part, they stood the storm well. Large limbs and



Hurricane Andrew's silver lining—Michael Tisdale with some of the Caribbean, or Cuban, mahogany he salvaged near Homestead, Fla., after 1992's hurricane. The wood will add up to as much as 14,000 bd. ft. of lumber.

uprooted trees that did get blown down had to be salvaged from a tangled mess of fences, power lines, other trees, vines and tons of debris from destroyed homes.

To make things exciting, we had to stay ahead of clearing crews that had the task of removing all debris. They used grinders that could take a whole tree and reduce it to mulch in a matter of seconds. Helplessly watching a beautiful mahogany log as old as Miami itself being ground to mulch was a heartbreaking sight.

It went on at a good pace for a couple of months, always working just ahead of the chippers. All in all, I collected about 100 tons of mahogany, which should yield be-

tween 10,000 and 14,000 bd. ft. of lumber. Boards will occasionally be 20 in. wide and 8 ft. long. But the vast majority of it will be in the 4 to 6 ft. range and 6 to 12 in. wide. I'll sell it for \$12 to \$16 per bd. ft. About 20% of this mahogany tends to have some beautiful figure because of its often stressful growing conditions.

This has been one of the most satisfying experiences of my life. I call this Operation Zombie Hardwoods. A Haitian who saw us bring in a downed tree and mill it up said: "It is a Zombie. You find him dead and bring him back to life."

—Michael Tisdale, 14390 S.W. 248 St., Homestead, FL 33032; (305) 258-0116



Warning about spalted wood. Colonies of fungi that cause bold streaking may have nasty side effects.

A warning on spalted wood

A piece of lumber that has turned the corner and headed for full-blown rot passes through a stage of peculiar beauty. Thriving colonies of fungi create streaks of color, turning plain lumber into spalted prizes for door panels, boxes and bowls (see the photo at left). But a woodworker writing in the British magazine *Woodturning* warns that spalted wood has a dark side.

Alec Jardine says he developed all manner of allergic reactions to the strains of fungi that cause structural decay in wood. Turning spalted wood on a lathe, he says,

releases fungal spores into the air by the carload, and "their microscopic size makes them impossible to detect." His symptoms included sore, puffy eyes and a stuffed up nose. The problems disappeared when he started using laboratory-quality dust filters supplied by a pathologist friend. Now, he just avoids the stuff.

Jardine's experiences got him interested in knowing more about the dangers of exposure to fungus. He found information on fungi-induced health problems ranging from skin problems and nasal and bron-

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chial difficulties to something called extrinsic allergic alveolitis (or farmer's lung), which resembles emphysema. "There are fungi," Jardine writes, "that can become systemic and infect the human brain."

The article was spotted by David Carse of Hinesburg, Vt., who sent it along to us. "I don't know about the rest of the country," Carse says, "but up in this neck of the woods, the craft fair and gallery fine furniture crowd have been leaning heavily toward the use of spalted maple. You can hardly see a cherry desk, chest or table without some part of it being of spalted maple."
—Scott Gibson, editor

Landmark furniture show

It was billed by its organizers as the largest public showing of artisan-made furniture and home furnishings in the United States since World War II. But few of the people behind the first Philadelphia Furniture Show dreamed that it would be as successful as it clearly was.

Thousands attended the April 21-23 show to see furnituremakers from across the United States—172 booths in all. A few weavers, wood turners and fabric craftspeople also exhibited their work. But most

booths contained custom-made furniture.

Show organizers Joshua Markel and Bob Ingram said the market for studio furniture and furnishings is potentially much larger than it is now. With a broader base of patronage, they said, craft furniture could become a significant cultural and economic factor. Several furnituremakers left the show saying that they had sold enough work to keep them busy for months.

—Tim Schreiner, managing editor,
Home Furniture magazine

A clock for Christa McAuliffe

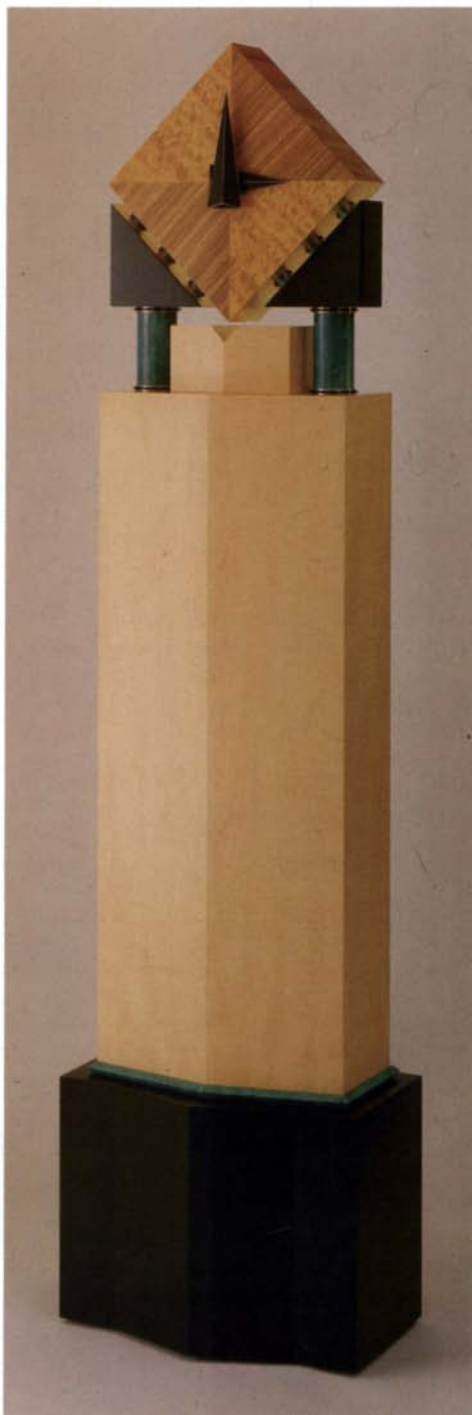
The Christa McAuliffe Planetarium in Concord, N.H., is the state's official memorial to McAuliffe, the Concord social studies teacher who was killed in the Challenger space shuttle disaster in 1986. The planetarium gets about 110,000 visitors a year, and this 8-ft., 2-in. clock (see the photo at right) helps keep them, and the planetarium, right on schedule.

The clock was made by Fred Puksta of Peterborough, N.H., who titled the work "One Moment in Time." It took Puksta, an artist and designer, three years to line up the 21 private and corporate sponsors. Puksta had offered to seek financing to protect the planetarium's "fragile operating budget."

The body of the clock is made of curly maple veneer. It sits on a base of black-dyed boxwood veneer, separated by solid-copper molding. The head of the clock sits on two black boxwood triangles that are supported by two copper columns. The head is accented with copper and stainless steel. The face of the block is made of alternate veneers of satinwood and zebra-wood. Black aluminum hands keep the time. "At first glance," Puksta writes, "the sculpture's coloring and scale are reminiscent of space craft. The sculpture's ability to tell time has many interpretations regarding the age-old relationship between time and space."

Puksta spent more than five years on the project. The clock was dedicated on Jan. 23 and set for "universal time," what used to be called Greenwich mean time. —S.G.

In memory of Christa McAuliffe. Fred Puksta's 8-ft., 2-in. clock is a tribute to the Concord, N.H., teacher who died in the Challenger space shuttle disaster in 1986. The clock keeps Universal Time at the McAuliffe Planetarium.



A government program to save history

In the 1930s and early 1940s, the United States government created a number of public works programs that helped plenty of people limp through the Great Depression. Most of the work went into things like roads, parks, airports and dams.

There also was the Historic American Buildings Survey (HABS). The idea was to employ architects, engineers, surveyors and photographers to record historic American buildings while they still existed. Squads were sent all over the country to record data, take photos and render exact drawings of historic structures.

The survey didn't end with the Depression. The project continues today, with most of the work being done in the summer by student interns. An average of 500 buildings are added to the survey each year, and approximately 31,000 structures have been cataloged to date.

The value of the program becomes more obvious as time goes on. Many of the recorded buildings have succumbed to fire or other forces (floods, hurricanes and so forth), but their images are preserved forever. For many of the buildings, there are elevations, floor plans, sections and hundreds of details. The drawings are chock full of molding-section details, sketches of wrought-iron hardware—even the placement of rose-head nails on board-and-batten doors.

These drawings are a treasure trove for building historians, architects, builders and architectural woodworkers. They provide all the information needed to duplicate many of this country's architectural masterpieces. It's hard to imagine another source of information that could be quite as exact in providing details that really make a difference. I often refer to my small collection of drawings when I have ques-

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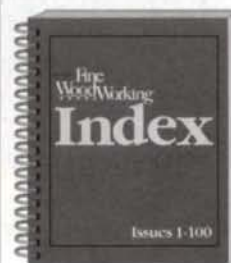
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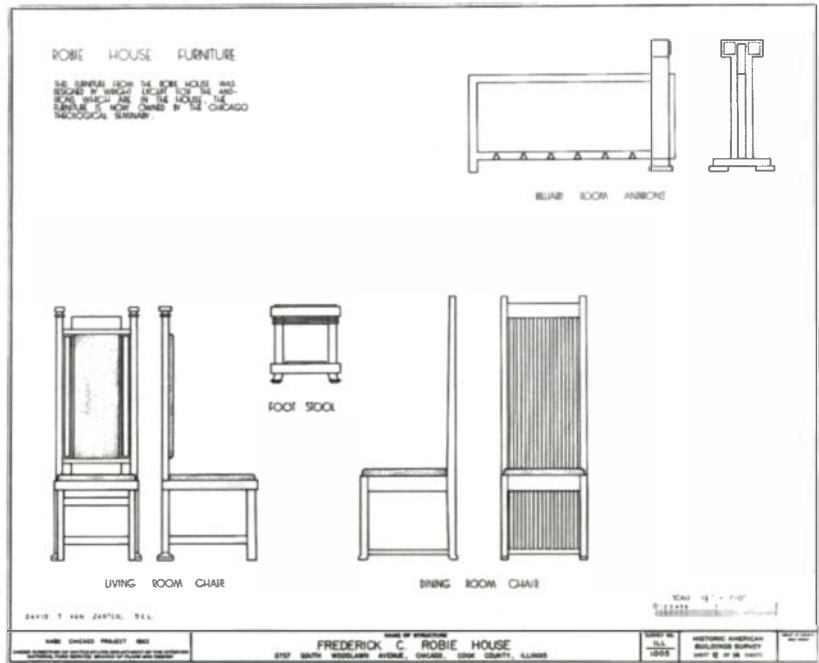
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tions on period moldings, interior trim, roofing details and other construction information. The collection is primarily architectural, but it doesn't stop there. There are a limited number of furniture drawings, including some that exactly depict the details of some of America's most famous furniture designers, old and new. Drawings, for instance, cover work by Frank Lloyd Wright and Shaker furniture-makers (see the drawing at right).

The Library of Congress makes this remarkable collection available to the public. Anyone who's interested can get ordering information from HABS/HAER, Prints and Photographs, Division of the Library of Congress, Room 337, James Madison Building, First and Independence Avenue, S.E., Washington, DC 20540-4840. Also, a listing of all surveyed buildings (and related objects) is contained in the HABS/HAER directory, which you can find in any federal depository library (call your local library to find the nearest one), as well as in many architectural and university libraries.

—Mario Rodriguez, contributing editor



Drawings of furniture and houses—A unique government program has captured details of classic American architecture and furniture. These scale drawings are for furniture in Frank Lloyd Wright's Robie House.



Northwest meets Southeast: Duane Pasco's carved red cedar totem pole in a new Disney hotel in Florida.

Totems for Disney

How would you decorate the 10,000-sq.-ft. lobby of a Western-theme hotel in central Florida? Okay, it's not your everyday design problem. But when Disney faced that problem with its Wilderness Lodge Hotel in Orlando, planners decided two 55-ft.-tall totem poles would do the trick.

They went looking for qualified carvers, and Duane Pasco of Poulsbo, Wash., was the only one of a half-dozen bidders who could promise to bring the job in on schedule. Pasco was soon at work on the largest totem poles he had ever carved (see the back cover). With the help of assistants Pat Huggins, Scott Jensen and Loren White, he delivered six months later.

The poles are made from four old-growth red cedars, each about 5 ft. dia. at the base. The sections were spliced in the middle to form the two poles. The big cedars had to be hollowed out and, as was expected, there was considerable heart-rot inside. Pasco reinforced the centers by splicing in new wood. When he was finished, he had half-cylinders that were about 4 in. thick on each edge and about 1 ft. thick in the center.

Pasco's wife, Katie, writes: "The goal in designing the totem poles was to use legend and lore that was common among many tribes of the Northwest Coast but not necessarily specific to any one tribe. This was easy to accomplish because the figures and the stories they represent remain fairly consistent. Characters on the

Disney poles are pan-coastal in nature, with a particular attempt to portray figures not associated with inherited stories or family crests. Disney was trying to create a new hotel in the tradition of great Western lodges at Yosemite, Yellowstone and Banff. The poles help reinforce this western theme rather than show a strictly Pacific Northwest theme."

Pasco and his assistants began cutting away material with chain saws. But soon, they were working with tools capable of much finer detail: adzes, knives and other traditional carving tools. Photos documenting the process show beautifully textured surfaces over the entire length of the totem poles. After the poles were carved, they were finished with Thompson's Water Seal and then painted. The installation, which took place in January 1994, took five days. The poles are flanked by stone walls and tied to steel I-beams. —S.G.

Notes and Comment

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Totems for Disney

There's nothing ordinary about an old-growth red cedar tree 5 ft. across at the base. Then again, there wasn't anything ordinary about the commission Duane Pasco landed: a pair of 55-ft.-high carved totem poles, which took Pasco and three assistants six months to make. For more, see "Notes and Comment" on p. 114.