Nov./Dec. 1984, No. 49, $3.50

Fine WoodWorking

Nifty Puzzles

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Heritage.

The Light Carver Arm Chair.

Simple but sturdy.

Simple because the tools and methods of the colonial cabinetmakers were simple. Sturdy because that's the only way they knew how to build a chair. This type of Carver chair found favor by the Colonial hearth during the 1680s. Its predecessors were most likely brought over on the Mayflower.

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Behind Our New Name Is Our Old Reputation.

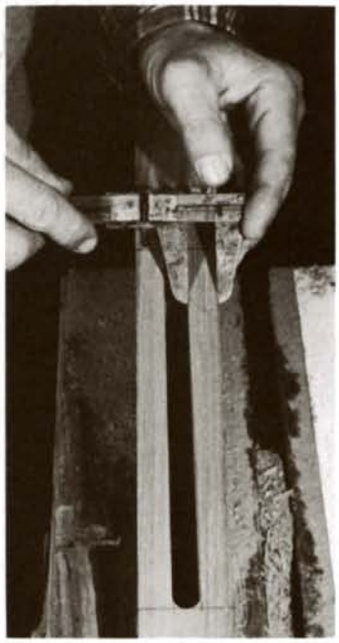
DELTA

Fine WoodWorking®

November/December 1984, No. 49

Cover: A strong, hand-cut bridle joint helps the beginner build a dining table. See p. 68 for this basic mortise-and-tenon.

With a deft touch and nerves of iron, you can add rich detail to turnings. On p. 81, Stephen Paulsen shows how on his tiny bottles.



Tight joints and imagination are the key to doors that keep out wind and rain with style. Learn about elegant entries on pp. 42-48.

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Departments

Articles

Normally I am not given to writing magazine editors—in fact, I've never! But after receiving the September/October issue today, I just had to drop you a note. I am what you would call a closet woodworker, being that I live in an apartment. What work I do do has to be done with hand tools—power tools are out. While I cannot use many of the items and topics covered, I always find tidbits that are a help to me.

You have simply outdone yourselves with the present issue. The color on the cover is beautiful, as is [the color] spread throughout the volume. My congratulations to all of you, and my thanks for making your publication such a continuing success. *—Adrian John O'Connell, Meriden, Conn.*

Hey—after years of publishing a very distinctive-looking and fine journal, you have now "gussied" it up to look like a Sears catalog. If you want to include some color plates on the inside, okay. But put the outside cover back in black-and-white. It had a lot of character and was distinguished by that fact.

—W.O. Krutz, Hood River, Ore.

I couldn't believe the first color issue of *FWW* magazine would feature a painted chest on its cover. Ladies and gentlemen of the editor's staff, are there no woodworkers among you? I don't paint the violins I build! If I paint one red, will you feature it? What's wrong with the color of fine wood?

I have always felt that the *FWW* black-and-white cover had dignity and class. Now it looks like all the other magazines, which need color and flash to sell. Do I sense a hint of *FWW* trying to appeal to the mass market of the home artsy-craftsy movement?

A painted-chest feature? You gotta be kiddin'!

—Robert P. Deason, San Diego, Calif.

I am continually amazed at the letters expressing dissatisfaction with some of the recent changes in format. While I personally don't care for all the various subjects, they certainly express important ideas which we should at least be aware of.

I am one of the fortunate people who have a complete set of *Fine Woodworking.* I do not lend any of the issues to anyone. I would rather photocopy an article than risk loss of the whole issue. It is rare indeed that I fail to get new ideas on how to improve and to do my craft better—even from people who make things that are of no particular interest to me.

—Edward Gladstone, West Hartford, Conn.

You didn't fool me. When you first ran a few articles in color (*FWW* #41) I knew you would be adding more and more color, but I didn't imagine how great *FWW* would look in full color. The sketches and diagrams—music boxes, tambours, and edge-joining—all seem to come to life. They make you want to head straight for the shop, but with such terrific color pictures you can't even put the magazine down—the cover is a masterpiece. I think you have the best-looking, most interesting magazine I have ever seen.

—Herbert Akers, Rockville, Md.

I was surprised at the irate Inca owner (*FWW* #46, p. 8) and his bitter complaints. I am no great brain, but I do read, and I think that Garrett Wade's description of this tool is honest. I don't feel that "caveat emptor" applies in this case, but I do understand why you printed the letter.

—Bob Whalen, Springfield, Va.

I get straight-shank cabinetmakers' screwdrivers by making them from worn-out Phillips-type drivers. There usually are several in the bottom of any toolbox, or you can ask your auto mechanic. Carefully grind away what's left of two opposing drive tangs, joint the end, and you have a screwdriver just like that described by Michael Podmaniczky on p. 59 of *FWW* #48. *—Henry J. Retzer, Beltsville, Md.*

Rather than working with the corrosive chemicals suggested by David Carnell (*FWW* #47, p. 60) to produce airflow test smoke, some of your readers might find it more convenient to use ordinary beekeepers' smoke generators (available for $20 or so from farm supply firms) or smoke candles from Superior Signal Company, PO Box 96, Spotswood, N.J. 08884. Superior's number 1A smoke candle will generate 4,000 cu. ft. of gray to white smoke in 30 seconds; the 1984 list price is $15.20 per dozen. The number 2B candle will generate 8,000 cu. ft. of smoke in a one-minute burn and the current price is $17.20 per dozen. *—Greg Thiel, Fort Thomas, Ky.*

Considering the small degree of difficulty involved in making tambours (*FWW* #48), they can add immensely to the attractiveness of a piece. A friend showed me a method of clamping that certainly saves headaches. When the slats are ready for gluing to a canvas back, place them face down and close together. Spread just enough glue on the canvas (yellow glue works fine) to cover the first four or five slats. Lay the canvas over the slats, and with a hot iron, iron the back of the canvas; this sets the glue and you're ready to continue. Spreading the glue on the canvas helps prevent seepage between the slats. *—Michael Turi, Eureka, Calif.*

In making tambours, make sure you wash and dry the canvas before gluing to pre-shrink it. If you don't, the water in certain glues will shrink it for you. *—A. Smith, Sudbury, Mass.*

Finally, a craftsman admits to the world—at least to the woodworking world—that mistakes, slip-ups or plain goofs do exist. Better yet, Max Hunsicker (*FWW* #47, p. 98) even gives solutions that can shortstop pieces on the way to the trash can. And Jere Cary, in his book *Building Your Own Kitchen Cabinets,* has several sections where he admits to goofs and gives solutions for saving costly material.

As for the rest of the experts—if they want me to buy their books, they should try a bit of honesty and humility and remember that there are really only three sure things in woodworking: wood shrinks; wood swells; and woodworkers, even the elite, goof sometime in their careers.

—James E. Gier, Mesa, Ariz.

I wish I'd read Ian Kirby's article on veneering in *FWW* #47 before I built my veneer press and made a 30-in. by 48-in. oval table. Several of his tips would have prevented problems I had. I have a terminal case of bubbles under my book-matched mahogany veneer and I sanded the veneer transparently thin in one place. I believe I went wrong [by using] a notched trowel instead of a paint roller to apply the glue and by not checking carefully for bubbles when the glue had dried. Then I used 60-grit paper on an orbital finishing sander, thinking it wouldn't be too aggressive . . . wrong.

To repair the sand-through, I used a steam iron—without steam. It softened the yellow glue enough for me to peel the veneer off with a sharp putty knife. It took some fitting to replace the damaged section and I still haven't repaired the bubbles. But thanks for the knife-and-syringe repair method.

In Kirby's last paragraph on pressing veneer, he is incorrect in checking for overtightness with a straightedge on the top edge of the caul. If the bottom of the caul has a crown, as soon as it's clamped the top will have the crown and the bottom will be straight. This bending is what provides pressure first in the center, then on the outside edges. Also, I used

3-in. wide transparent tape, which holds even stubborn burls but still provides sight of the joint. This was very helpful in my multi-piece tabletop and it peels off easily without water.
—Michael O'Banion, Westminster, Md.

Regarding John Marcoux's article "Triangular Sensibility" in the September issue. He espouses the freedom he has found to use dowels for constructing triangular forms, stating "I found that I liked what happened when I heeded a fundamental design rule: form follows function." He later says, "All these tables support my long-held and stubborn conviction that people will buy furniture that's strong, well designed and reasonably priced." How about functional as well?

Neither the table pictured on p. 37 nor the one on p. 40 would permit a human being to comfortably sit down to write a letter or eat a sandwich, due to the triangular crossbraces that obviously get in the way of one's knees. Indeed, these structures may be sturdy and cheap to build, but their usefulness has been sacrificed to the dogma of the triangle.

As a designer and builder of furniture, I'd be hard pressed to allow one of these pieces to occupy valuable floor space in my home. *—Lyle Erman, Santa Barbara, Calif.*

All push sticks for a tablesaw should be made from plywood, preferably five-ply at least 1 in. thick. Or glue two ½-in. pieces of plywood together. Once at the mill where I worked, an oak push stick ¾ in. thick broke along an invisible crack in the grain. I thank the Lord I wasn't injured.
—Jon Brooks, Nashville, Tenn.

Re Elton Schooling's letter on pouring lead in *FWW* #48, p. 4. Instead of pouring molten lead into the base of candlesticks to give stabilizing weight, use fine bird shot, which can be obtained at most sporting good stores. This lead shot comes in many different sizes and is sold in 25-lb. bags. The finer the shot size, the more weight you can put in the base. A No. 9 shot would be about right. In order to keep the shot in place and to stop it from rattling around, just add glue after the base has been filled with shot.
—Ben A. Spann, Lakewood, Colo.

Roger Holmes has written an excellent article for beginners (*FWW* #48) and it looks like the start of a fine series. He has missed one point in the technique of edge-joining two boards that is worthy of mention, however.

Once the boards are ready for joining, they should be laid out side by side and marked. Then the boards should be taken two at a time, folded together with the edges to be joined next to each other, and edge-planed as though they were a single board. Now any slight variations from square are compensated for by the two edges being complementary. Full attention can be paid to the length of the boards without the second distraction of squaring the edges. The only shortcoming I have noted in this technique is that if the angle is too far off square, the boards tend to slide when clamped up.
—F.R. Remski, Oceanport, N.J.

In your July/August issue on p. 14, Paul Stempien asked about a binding agent for storing sawdust for use in his woodstove. I use two or three bushels of hardwood sawdust each year to start the logs in my fireplace. I mix the sawdust with melted wax and press it into disposable cups. To do this, first melt a 1-lb. cake of wax (canning paraffin sold in supermarkets) in a double boiler. Be careful—the vapor is explosive. Then mix with about a peck (a grocery bag filled to within 4 in. of the top) of loose sawdust. The mixture won't look or feel wet, but will bind when pressed into a waxed-paper or styrofoam cup with hand pressure.

To use, put a filled cup on the grate, pile on logs, slip a little paper under the grate, and light the paper. The paper will start the cup, the cup will start the logs. This is much cheaper than buying the fire-starter sticks sold in stores, and works as well or better.
—Richard B. Gingrich, Lansing, Mich.

On behalf of many of your readers who make traditional pieces of furniture using classical joinery, appreciation is hereby expressed for Eugene Landon's fine Hepplewhite card table in *FWW* #47. The illustrations are excellent and clearly understandable even to those who have not studied drafting. Few of us would be such purists as Mr. Landon, though, who insists upon using ancient materials to be "authentic." Take hide glue, for example. Sure it allows disassembly at some future date, but why not build forever using a modern adhesive like resorcinol or urea formaldehyde? Also, the curved side rails: a stack of marine-grade plywood segments laminated with a cross-linking adhesive would never fail in the manner described by the author. *—T.A. Sharp, Sanibel, Fla.*

Thank you for Harold Scott's work on the reproduction of fine early American furniture (*FWW* #47). It was, however, like throwing a very small mouse to a hungry lion.

I look forward to each issue of *Fine Woodworking*. It is my companion on the many business trips I take each month. There is that area of fine American furniture built back in the Golden Age—1760 to the early 1800s—which I would love to see much more of and which I draw inspiration from.
—Ronald Jackson, Overland Park, Kan.

On p. 74 of *FWW* #47, R.W. Swinyard illustrates how he removed the waste from a high-chair tray with a router. I've built some similar lap trays, but I utilized a technique that eliminates the need to hand-chisel the bridges used to support the router. After routing the outline of the wasted area with a core-box bit and a template, my solution was to plunge-cut into the center of the tray with a mortising bit, then rout in ever-increasing concentric circles. This way, there is always stock to support half of the router base as you work out from the center toward the edge of the tray. Final sanding is all that's required to clean up the surface.
—Jim Egelston, Kent, Wash.

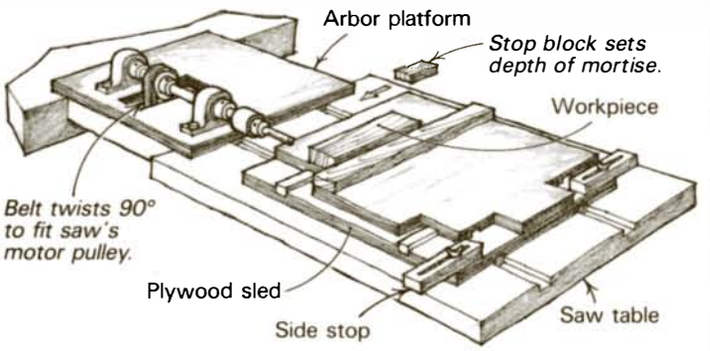
I am a high-school woodworking instructor (for sixteen years) and have both the Hegner and Excaliber scroll saws in my shop, and I'd like to add to Silas Kopf's article in *FWW* #47. If a blade breaks on a Hegner, the upper arm pops up and the underside of your wood is subject to some dents from the broken blade hitting it. On the Excaliber, if your fingers are anywhere near the top of the cut, the broken blade in the upper chuck will tattoo the tops of them.

I, too, like the larger table on the Excaliber, but it is in need of some refinement. It's very difficult to make internal cuts on larger pieces of wood. A slot in the tabletop, as on the Hegner, would help and would also make installation of the blade much easier. It's a little harder to get used to changing blades on the Hegner, but with patience and practice, my ninth graders have no problems.

In looking at both machines, the Excaliber's biggest advantage is its large table (but that has some serious drawbacks); the table tilts in both directions. The cost is lower, but because of the shipping costs from Canada, it may not be that big of a bargain. If my students have a choice of which saw to use, the Hegner is the winner nine times out of ten. To me, that's a true test of each machine! *—George Harlow, North Bend, Ohio*

edited and drawn by Jim Richey

Slot mortiser



This low-cost slot mortiser utilizes my Sears saw table and motor. The arbor platform sits snugly in a space between the saw table and a catching table I built behind the saw. Short rails under the platform fit the miter-gauge slots to keep the platform from shifting. The V-belt on the arbor twists 90° and slips over the saw's motor pulley (the direction of twist determines which way the arbor will turn), and then the weight of the motor keeps the belt taut.

The sliding table consists of two plywood sleds that allow forward-and-back and side-to-side motion. Hardwood runners are attached to the lower sled, top and bottom. The top sled has two sets of grooves, so it can be repositioned atop the lower sled for end-grain mortising, at 90° from the position shown in the sketch. Various stop blocks limit the mortiser's travel and control mortise depth. To adjust for mortising stock of various thicknesses, shim the work or the arbor platform.

—Joel Katzowitz, Marietta, Ga.

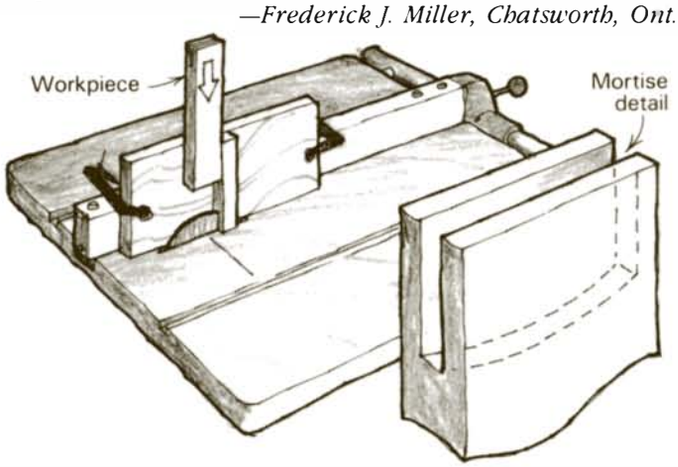
Stationary jig for cutting open mortises

The jig shown below is used to cut open bridle-joint mortises in frame members. It solves many of the problems inherent with sliding jigs, which tend to be complicated to make and adjust, and sometimes wobble during the cut. The only disadvantage is that the jig leaves a slight concavity at the bottom of the mortise, as shown in the sketch. This space doesn't show in the finished joint, however, and since it's end grain, the missing wood isn't critical to joint strength.

Make the jig by screwing a hardwood fence to an 8-in. wide piece of ¾-in. plywood. Clamp the jig to the rip fence so that the frame member to be mortised will be centered over the saw arbor. Adjust the rip fence so that the sawblade is the proper cheek thickness from the jig.

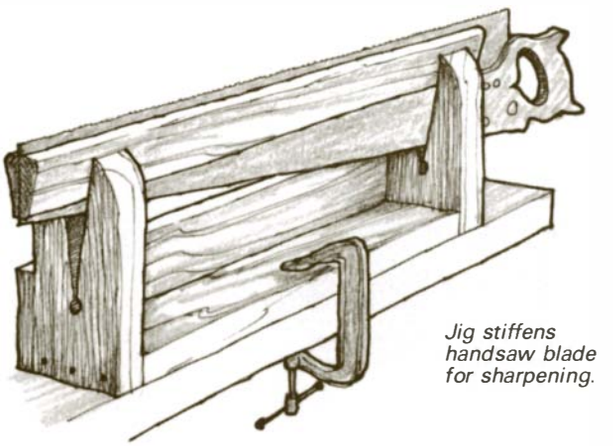
To cut the mortise, hold the workpiece firmly against the plywood, with its back edge tight to the hardwood fence. Plunge the work down the fence onto the blade. Draw it up, flip it and cut the other cheek. On narrow stock, this will complete the mortise. For wider stock, chisel out the waste.

—Frederick J. Miller, Chatsworth, Ont.



Simple saw vise

Sometimes, far from home, your handsaw suddenly encounters a hidden nail. Do you haul the saw back to your shop to resharpen, or do you apply an extra few pounds of elbow grease? Neither solution is very satisfactory. Instead, why not fashion a simple saw vise from a few scraps and resharpen your saw right on the job? All you need are three pieces of 2x4 and a couple of lengths of hardwood 1x2s. There are no critical dimensions, so just use what you have.



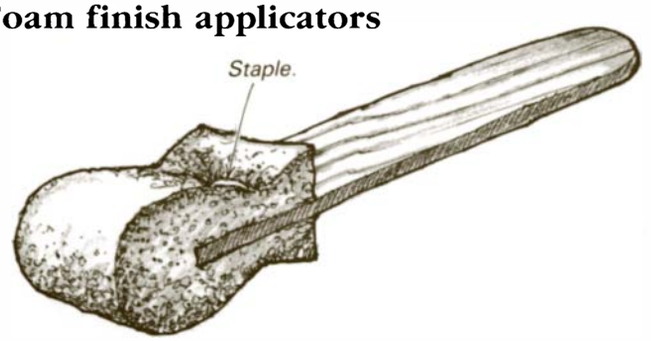
For most handsaws, an 18-in. long jig is about right. The height of the uprights depends on where you plan to set up the jig; I aim for the sawteeth to be at elbow height for comfortable sharpening. Cut long, matching V-notches in the top of each upright, as shown in the sketch, and drill a hole at the point of the V to reduce the chance of splitting.

Now bevel two 22-in. hardwood 1x2s so that, sandwiched together, they match the angle of the V-notch.

To use the jig, hold the wedge strips on either side of the blade about ½ in. down from the teeth, and tap the blade and strips down into the notches. A tap from below will release the whole thing.

—Jim Koch, Stamford, Conn.

Foam finish applicators



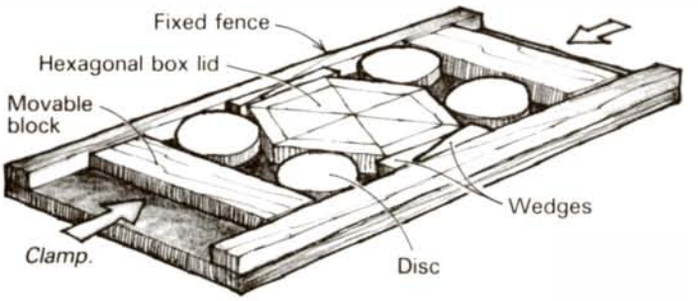
You can easily make throwaway finish applicators from urethane foam, which is commonly sold in fabric and upholstery shops. Cut the foam to a 1x1x2 size, split it down the middle and staple it to a scrap of thin wood for a handle. You can then trim the free end with scissors to suit the job.

—David E. Price, Baltimore, Md.

Quick tip: To keep glue from sticking to forms and jigs, we use a car wax such as Du Pont Rain Dance or Treewax Four Seasons. Car wax doesn't seem to penetrate and discolor the work the way softer waxes do. Of course, seal the form first with lacquer or shellac. *—Peterman Lumber, Fontana, Calif.*

Clamping hexagonal box tops

I enjoy making small hexagonal boxes because they are a greater challenge to construct and are more visually interesting than square boxes. Gluing up six pieces for the tops, however,



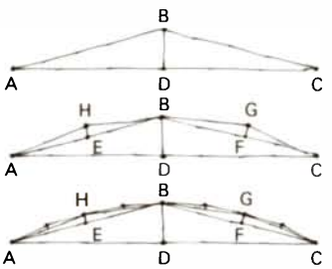
presents a problem. The jig pictured here solves things by securely holding all the pieces with one bar clamp.

The jig consists of a plywood tray with two parallel fences fastened to the long edges. The operating width of the tray is adjusted by means of two pairs of wedges, as shown. The bar clamp spans the two clamping blocks, and four wooden discs redirect the pressure at the proper angles.

—Steven Barnhill, Gunnison, Colo.

Drawing giant, shallow arcs

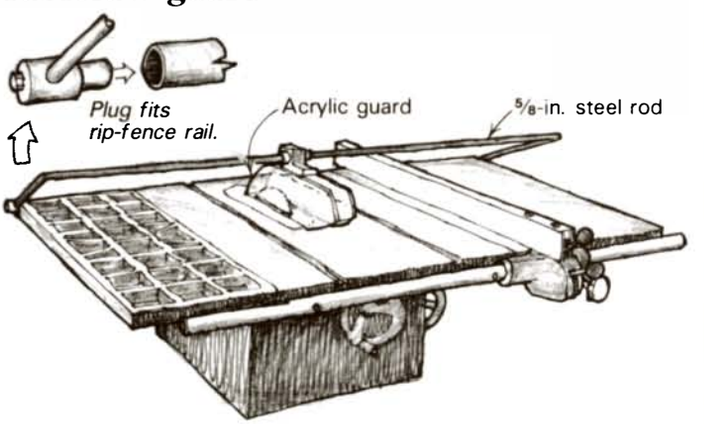
Drawing a large-radius arc through three points isn't easy if you don't have room to use a rope as a compass. Here's a method I worked out while arranging some permanent chairs.



If A, B and C are points on the circle, first connect these points and drop a perpendicular from B. At the midpoints of AB and BC draw two perpendicular lines and measure along them a quarter of the distance BD. Repeat the operation with the new outside lines, this time measuring a quarter of the distance FG. Continue the process until you have a close approximation of the true arc. It will be surprisingly accurate—especially if the arc is only a small portion of the circumference (i.e., BD is small compared to AC). *—Christopher Yonge, Lothian, U.K.*

Quick tip: Stain will collect in sanding scratches that have been overlooked, darkening them more than the surrounding wood. If you wipe the wood with mineral spirits first, it will show up the scratches long enough for you to resand. Even if there are no scratches, wetting and wiping is a good way to remove sawdust (which is what I was doing when I discovered this trick). *—G Theodore Odom, Angleton, Tex.*

Tablesaw guard

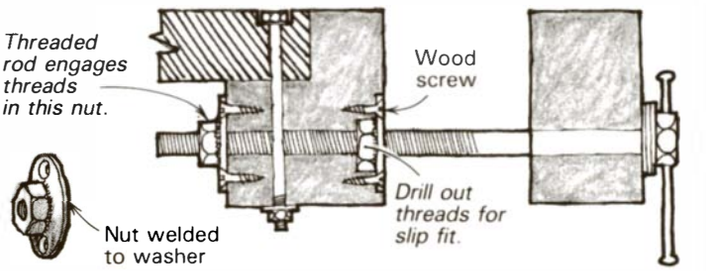


Unlike most other tablesaw-blade guards, which after a couple of frustrating experiences are left hanging on the wall, this guard is quite usable. The guard's main advantage is that it remains in place for most operations, including dado and molding cuts. If it's not needed for an operation, the guard swings out of the way in seconds, or can easily be removed completely from the saw. The inexpensive guard also acts as a hold-down—a safety bonus.

Make the guard shield from ¼-in. thick clear acrylic. The guard frame is a length of ⅝-in. cold-rolled steel bent into a U shape. Turn two metal or wooden plugs and attach them to the arms of the frame as shown in the sketch. The plugs should be sized to pivot easily in the holes in the ends of the back rip-fence rail. The frame fits on the saw by springing slightly so that the plugs snap into the holes.

—K.L. Steuart, Ladysmith, B.C.

Bench vise improved

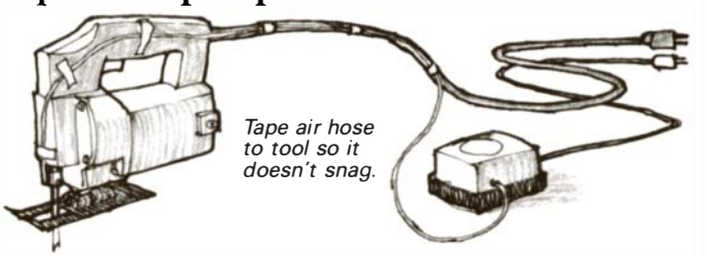


Joe Laverti's homemade bench vise (*FWW* #37, p. 24) is a fine idea. But because the heavy steel screws project from the bench, the vise is a potential leg-bruiser. From my school days, I remember a shop teacher hurrying down the aisle between the benches and smacking his leg into an open vise. He was badly injured and the memory has never left me. With a couple of modifications, as shown in the sketch, Laverti's vise can close up like a regular vise and thus be safer.

My vise uses two threaded rods. At the front end of these, I welded a nut and drilled through it to install peened-over bars for handles. *—Al Glantz, Winthrop, Wash.*

Quick tip: When I use a plug cutter in an electric drill, I have a simple jig that prevents the cutter from walking around on the stock. I drill some cutter-size holes in a piece of scrap, then clamp it to the stock. The jig also serves to start the cutter right on target. *—James L. Wheeler, Houston, Tex.*

Aquarium pump clears sawdust



Small diaphragm-type aquarium air pumps will supply a jet of air to keep sawdust away from pattern lines when scroll-sawing and the like. Fit the pump with a length of plastic tubing and tape the tube in place on the tool, aimed so it blows away the dust. The small pumps, which cost less than a good router bit, can be purchased at any aquarium supply store. Heavier pumps are also available and would serve with larger tools. *—Michael H. Marcus, Portland, Ore.*

Double scratch stock

A scratch stock is a simple but effective tool for cutting molding patterns on odd-shaped workpieces. But when you scrape against the grain, as is often necessary on curved members such as tripod table feet, the tool chatters and can leave a

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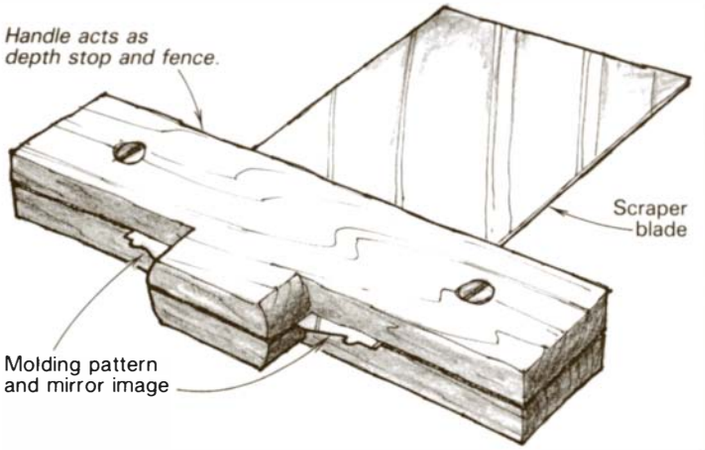


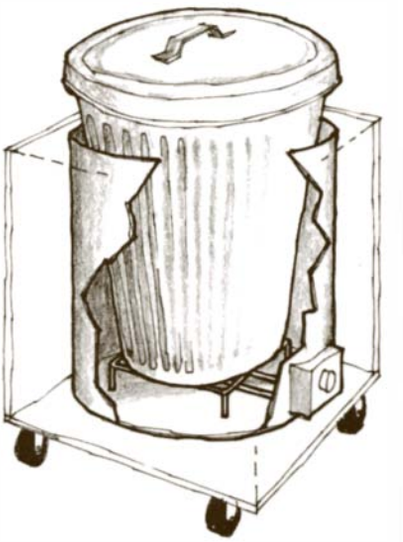
rough surface. This double scratch stock solves the problem.

Grind or file mirror images of the desired pattern on a cabinet scraper, as shown. File the edge to 45°, turn the burr, then fix the blade in a hardwood block that will act as depth stop and fence. Adjust the scraper blade for the proper depth of cut and tighten the screws to lock the blade in place. When you run into contrary grain, simply switch to the other side.

—John S. Pratt, Avondale Estates, Ga.

Quick tip: I sharpen my turning tools on aluminum oxide sandpaper, glued to the face of a 10-in. aluminum disc mounted outboard on my lathe. It's only a step away when I want to touch up a tool. Each sheet of sandpaper lasts a couple of weeks, and it gives me a flat bevel, which I prefer to a concave one. *—A.R. Hundt, Tasmania, Australia*

PEG vat from scavenged water heater



To make an inexpensive heated unit for impregnating green wood with PEG, I went to a nearby plumbing supplier and scavenged an old electric water heater from their "boneyard." I removed the outer shell and cut the top off the tank, leaving an open, 20-in. deep tank. I placed a metal rack in the tank to support the PEG pail and protect the heating element. I enclosed the heater in an insulated plywood box fitted with large casters.

To use the vat, I place a heavy-duty, PEG-filled rubber garbage pail in the tank, fill the tank with water (like a double boiler) and turn on the thermostat. The heater works great, and my only expense was the garbage pail. *—Mark Pleune, Suttons Bay, Mich.*

Methods of Work buys readers' tips, jigs and tricks. Send details, sketches (we'll redraw them) and photos to Methods, Fine Woodworking, *Box 355, Newtown, Conn. 06470. We can acknowledge contributions only when the final decision has been made. We'll return those that include an SASE.*

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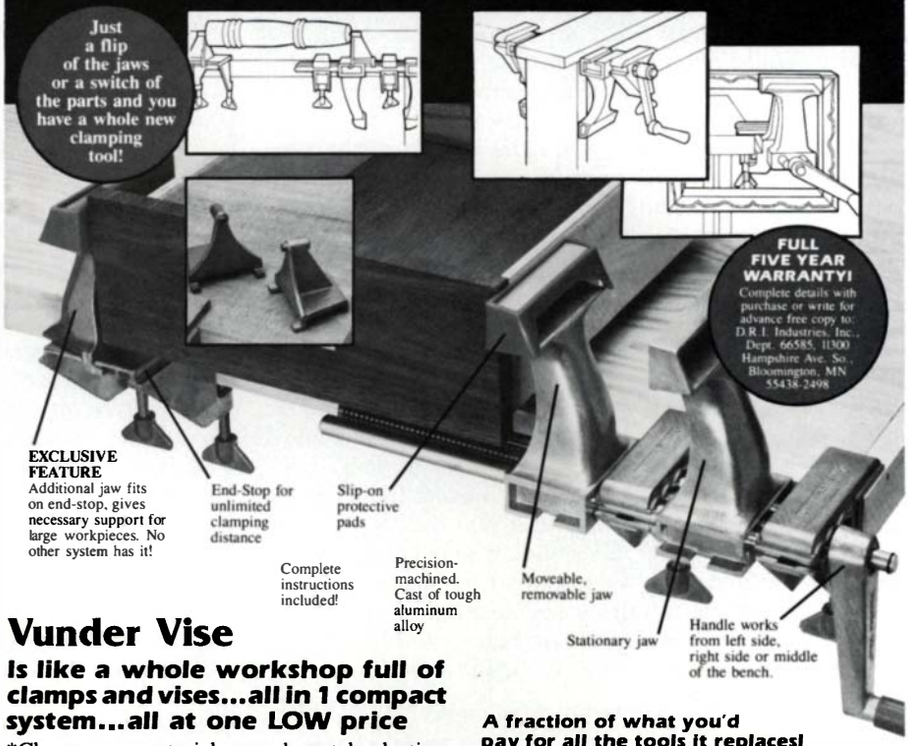

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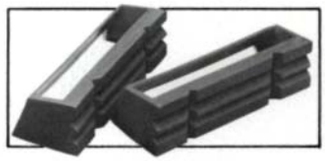

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Production spindle-turning

I need to turn 200 maple handles, and may need another batch in the future. Do you have any tips for short-run production of spindle turnings? I don't want to invest in any automatic gadgets for my lathe.

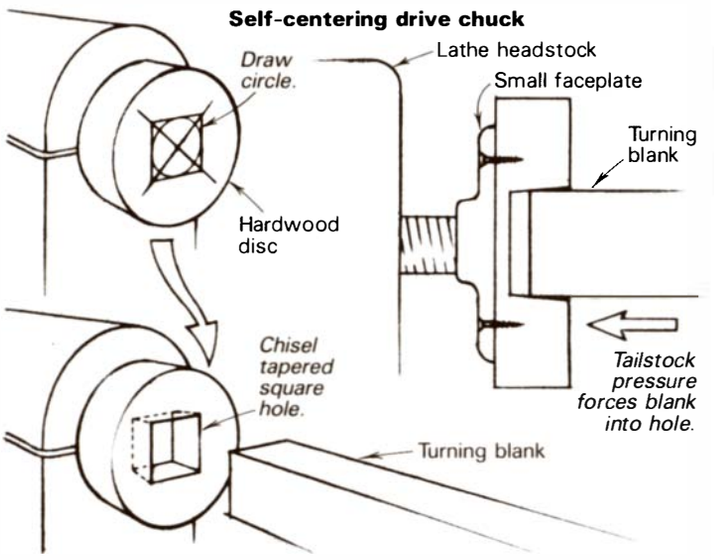
—Robert Howe, Bennington, Vt.

Mac Campbell replies: There are a number of things that make short production runs of spindle turnings easier and faster. Since they also help in general lathe work, they're well worth the investment required to set them up.

To begin with, make sure your lathe has enough power—1 HP minimum for production work. If possible, get a ball-bearing tailstock center and buy or make a tool rest at least as long as the spindles you'll be turning. I made up 18-in. and 24-in. rests from angle iron.

Most of your regular tools are okay, but get a *big* roughing gouge. The extra mass is steadier, dissipates heat better, virtually eliminates vibration, and is easier and faster to use. I had a blacksmith make mine from a piece of 3-in. by ⅜-in. thick truck leaf spring. It has the usual U-shaped section, but straighter wings than most roughing gouges. The blade is 14 in. long, and the 1½-in. dia. handle is 16 in. long.

A duplicating gauge will prove really handy. It's a bar that mounts behind the work, parallel to it. On the bar is a series of fingers that rest against the spinning stock. You set each finger to the diameter you want, and when you've reached it, the finger has nothing to rest on anymore and drops past the turning. You can buy the gauge at Sears for about $50, or make the one described in *FWW* #25, pp. 24-26.



You'll need a self-centering drive chuck. On a small faceplate, mount a hardwood disc about 4 in. in diameter and 1 in. thick. With the lathe turning, mark a circle near the center of the disc with a pencil. If your turning blanks will be, say, 1½ in. square, mark a 1½-in. dia. circle. Remove the disc from the faceplate, and using the circle as a guide, chisel a square hole almost all the way through the wood, making it (for a 1½-in. square turning blank) just slightly larger than 1½ in. at the top, tapering to just under 1½ in. at the bottom. Remount the wood on the faceplate and leave it there.

Cut your turning blanks uniformly, and center-punch one end of each blank for the tailstock. I keep a punch ground to match the taper of my ball-bearing tailstock.

For future production runs of the same piece, you'll need a set-up pattern. Rough-turn a handle close to, but just shy of, final dimensions to allow room for smoothing. With the handle still on the lathe, adjust the fingers of the duplicating gauge so they fall just past the turning. Mark the locations of the fingers by holding a pencil against the rotating blank and remove it from the lathe. With this pattern you can reposition the gauge fingers for future production runs.

[Mac Campbell makes furniture and turns wood in Harvey Station, N.B.]

Pierced-tin designs

I make reproductions of 19th-century pie safes. The door and sides of the cabinet have tin panels decorated with elaborate designs pierced through the metal. I'd like to know how these designs were punched in the old days. Did makers use some kind of die?

—Wylie McVay, Richmond, Va.

Philip B. Kelly replies: For those not familiar with them, pie safes allowed ventilation while oven-hot pies were cooling, but kept flies away. In the early 19th century, most pie-safe panels were made by the local tinsmith because the farmer/cabinetmaker didn't have ready access to the necessary tools or materials. Full-size paper patterns were published in tinsmith pattern and supply books as early as the 1850s. The tinsmith pierced the tin with sharp, pointed punches of various shapes, placing the sheet of tinplate flat on the end grain of a section of tree stump and piercing the holes one at a time.

As demand for these pierced panels increased, mechanical piercing devices such as the flat multiple punch and rotary punch plate were developed. I'd suspect that most pie safes made after 1890 have mechanically produced panels. These are easy to identify: the pattern is exactly the same in each panel—including broken or missed holes.

[Philip B. Kelly is a tinsmith in Lancaster, Pa.]

Repairing shellac finishes

I have an Ingraham shelf clock that is finished with a heavily applied black finish. Wood alcohol and lacquer thinner both soften it. I'd like to repair small areas of the finish that are damaged, but in the past I've had problems matching thick finishes like these. What materials and techniques should I use?

—Bob Stillman, Coeur d'Alene, Idaho

Gregory J. Landrey replies: Your 19th-century Ingraham clock, built in Bristol, Conn., most likely has a shellac finish that's turned dark over the years. To blend in the damaged areas, try a shellac colored with an aniline dye. If the old finish is opaque, a ground pigment like lampblack may give the right effect. You'll have to experiment to get the right color. (Dry fresco colors are available from Wood Finishing Supply Co., Inc., 1267 Mary Dr., Macedon, N.Y. 14502.) Apply the tinted shellac at a consistency no less than a 2-lb.-cut (a proportion based on mixing 2 lb. of shellac flakes to a gallon of alcohol) with a fine-tipped brush. It will take a number of applications to raise the damaged area just slightly above the level of the surrounding finish, so be patient. After you've built up enough shellac and allowed it to dry, you'll have to level the repair with the surrounding finish. The easiest way is to rub with 00 or 000 steel wool wrapped around the tip of a cotton swab.

[Greg Landrey is an associate furniture conservator at Winterthur Museum in Winterthur, Del.]

Coloring tung-oil varnish

Can oil colors be added to a tung-oil varnish?

—George M. Elrod, Huntsville, Ala.

Otto H. Heuer replies: Yes. Artists' oil colors usually are pigments ground in linseed oil. You can buy them in tubes at an art supply store. If you add too much of these oils to a glossy tung-oil varnish, however, you'll reduce the gloss. This is especially noticeable with any of the earth colors (yellow ocher, raw umber, burnt sienna, etc.) because their pigment particles are opaque. Some of the modern pigments such as

Drawings: Karen Pease

alizarin crimson and thalo blue contain vivid dyes that allow deep colors with good transparency. Buy top-grade paint, not student-grade (which is stretched with various fillers) and you'll get the best results. I usually pour a small amount of the clear varnish into a small paper cup and add the color pastes. I always experiment on scrapwood to make sure the color is right.

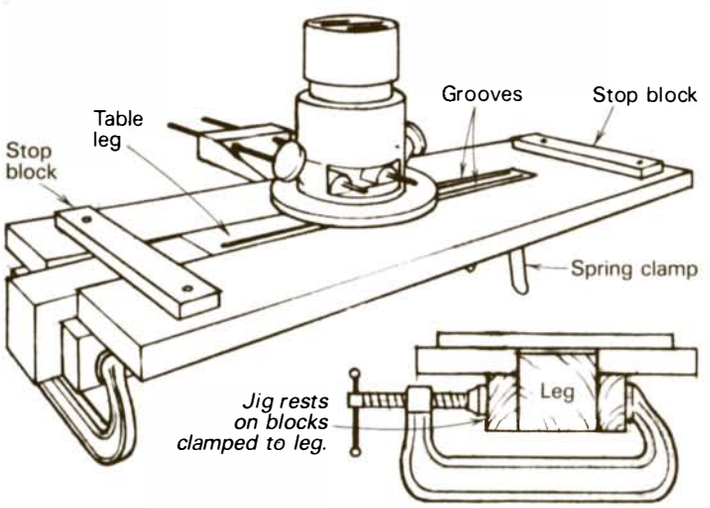
[Otto Heuer is a finishes consultant in Waukegan, Ill.]

Grooves with a router

I'm making a cherry table with square, tapered legs. I'd like to have stopped grooves, about 3/16 in. wide by 1/16 in. deep, parallel to the edges. What's the best way to cut them?

—E.F. Bell, Medford, Ore.

Simon Watts replies: Your best bet is a router. Use a small veining bit, which cuts a semicircular groove. Build a plywood jig that fits over the tapered leg. This will give you a good bearing surface for the router base. To guide the router fence, taper the long edges of the jig to match the leg taper. Fasten stop blocks at each end of the jig as shown so that the router base bumps into them and stops the cut at the right point.



Since the leg tapers, setting up the jig requires some fussing. Clamp the leg in a vise (the folding workbenches from Sears or Black & Decker are great because they can clamp irregular shapes). Line up the jig so the surface of the plywood is flush with the leg's tapered surface. Clamp scrap blocks on one end of the leg and a spring clamp on the other, to support the jig.

There are other ways to tool up for this job. Tage Frid's router-mortising fixture in *FWW* #30, p. 91, would work very well, and be useful for other jobs, too.

[Simon Watts builds furniture and boats in Berkeley, Calif.]

Identifying maple

I have trouble identifying different woods of the same species. Is there a rule of thumb to differentiate, for example, hard maple from soft maple?—James W. Welcome, Saugerties, N.Y.

R. Bruce Hoadley replies: It's often difficult to identify woods in the rough lumber form. Separating soft maple and hard, or sugar, maple is especially difficult. Pith flecks (medium- to dark-brown longitudinal streaks) are quite common in soft maple, and usually sparse or absent in hard maple. Also, soft maple commonly has mineral streaks or a gray, almost dirty-looking coloration. These characteristics aren't always present, however, or always reliable indicators. The only sure way to identify the wood is to examine a cross-grain slice under a microscope. Hard maple has rays that are noticeably wider than those of soft maple.

[R. Bruce Hoadley is professor of wood science at the University of Massachusetts at Amherst.]

Filler on oak

I like the smooth surface I get when I use a paste wood filler on oak. But there's a lot of labor involved in removing the wood filler from details. Are there any shortcuts?

—Jimmy A. Bartholomew, Lodi, Wis.

Don Newell replies: There isn't much you can do to shortcut the filling procedure. You've got to get the filler into the pores, and you've got to get it off the surface when it's dry.

Use a toothbrush to remove the filler from details before it hardens. For flat surfaces, I prefer to scrape the filler off. A wide chisel or plane blade works fine. When the filler has dulled down, scrape the surface clean, holding the scraper almost vertical to the surface. This gets all the filler off the surface, but leaves the pores filled level. After the filler has dried hard, lightly sand off any residue that the scraper missed.

I recommend using a filler that's made from varnish or alkyd resin (such as Sears). Linseed-oil-based fillers are worthless because they never dry hard.

[Don Newell is a finishes chemist and consultant in Farmington, Mich.]

Wax origins

What's the difference between carnauba and candelilla waxes, and where do they come from?

—R.I. Armstrong, South Canterbury, New Zealand

George Frank replies: Carnauba wax and candelilla wax are both extracted from the leaves of trees. Carnauba comes from the leaves of a palm tree that grows in Brazil (*Copernicia cerifera*). The candelilla plant (*Euphorbia antisyphilitica*) grows in Mexico.

The higher the melting point of a wax, the higher the shine it can produce on wood. Beeswax melts around 65°C, candelilla around 80°C and carnauba around 85°C. There isn't much difference between carnauba and candelilla except color. In France, I bought both waxes in a relatively unrefined form. The carnauba looked like grey-green rocks, the candelilla like butter-colored rocks. I preferred the carnauba. In the United States, the waxes are more highly refined, and both look like butter-colored soap flakes.

[George Frank is a retired European master wood finisher.]

Shaper cutters on a router

I'd like to mount a 1/2-in. spindle in a Makita plunge router so I can use 3-wing shaper cutters. Would shaper cutters be safe to use at 20,000 RPM to 25,000 RPM?

—Boyd Thompson, Jackson, Miss.

Graham L. Campbell replies: I'd strongly advise against installing a shaper spindle in any hand-held router. First, it isn't safe. A shaper cutter intended for 10,000 RPM could fly apart on a 25,000-RPM tool. Second, a router isn't designed for this type of continuous heavy work, and you're liable to damage it. There's nothing wrong with using a router table for occasional light-duty jobs, but a router is no substitute for a shaper. It's not surprising that many of the routers that come into our service centers with the base assembly removed have bearing or armature problems. If you insist on turning your router into a shaper, don't be surprised if the tool has a shortened life.

[Graham Campbell is technical department supervisor with Makita U.S.A. Inc.]

Preparing bone for inlay

I'd like to use bone for inlay, but can't find any information on this. What type of bone is best? How should it be prepared and worked? *—Ara Zovickian, Stockton, Calif.*

Jeffrey Lock replies: Bone fresh from the butcher is best. The bones to use are the center sections of the front-leg bones of a steer, as these have thick walls. The most important step

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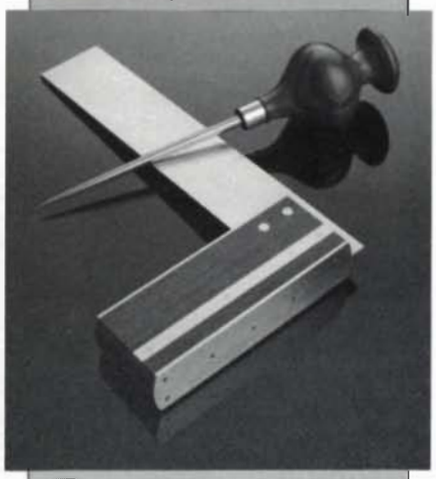

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in the preparation is to remove all the marrow—if any remains, the bone will rot and stink and may discolor. To extract the marrow, first saw off and discard the knuckles. Then boil the bone sections in water for two to four hours. Throw in an onion—it speeds marrow elimination and helps to bleach the bone. After all the marrow has been cooked away, hang the bone in the sun for two weeks to dry and bleach. It's ready to work if you get a fine, dry powder when you saw into it.

Work the bone much as you would a dense wood. You can saw and chisel it (the chisels should be very sharp and ground to a 30° to 35° angle for edge strength). It can also be sanded and polished to an ivory-like finish.

[Jeff Lock makes custom planes in Tallmadge, Ohio.]

Readers can't find:

. . . a manual and parts list for a Sears Craftsman 18-in. jigsaw, model #103. *—Willard Johnson, Clearbrook, Minn.*

. . . parts for a Bush-Bilt scroll saw.

—Ralph Becker Jr., West Mifflin, Pa.

Readers want to know:

Is there a shaper that can use cutters with a ½-in. or ¾-in. arbor hole *and* router bits with a ¼-in. shaft?

—Harold Lewis, Hilo, Hawaii

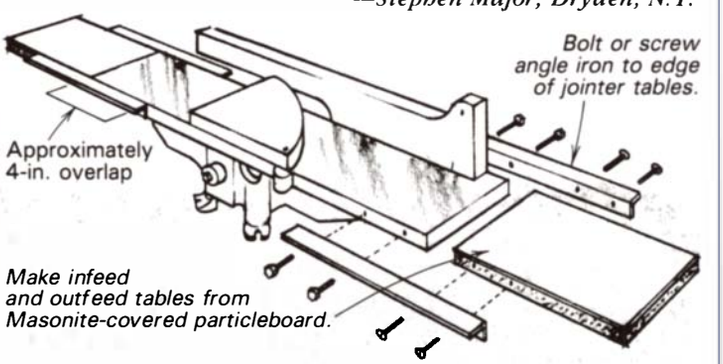
Follow-up:

Re extending the length of jointer tables (*FWW* #39, p. 34). It was tough to joint long boards on my little 4-in. jointer, so I built the simple bolt-on table extensions shown in the drawing.

First, fasten four lengths of angle iron to the edges of the existing tables. You can use nuts and bolts, or you can tap threads into the table edges and mount the angle iron with machine screws. Allow the angle iron to overlap the tables about 4 in. or so.

Attach the tables (I used particleboard faced with Masonite) between the extending angle irons with wood screws, carefully aligning the extension tables with the original tables.

—Stephen Major, Dryden, N.Y.

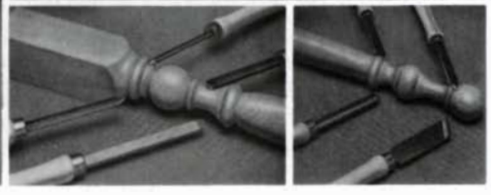


Sources of supply:

—Portable power tools for large-timber construction are available from Mafell-Maschinenfabrik, c/o Merritt-P.M.I., PO Box 363, Lockport, N.Y. 14094.

—Upholstery supplies can be ordered from the National Guild of Master Upholsterers, 7728 44th Ave. West, Mukilteo, Wash. 98275.

Send queries, comments and sources of supply to Q&A, Fine Woodworking, *Box 355, Newtown, Conn. 06470.*



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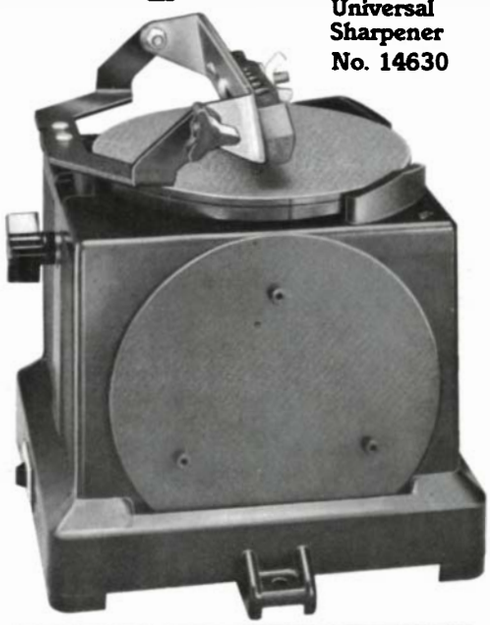

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Sterling Publishing Company recently sent us a boxful of paperback books for review. Since books make good Christmas presents, here's a brief look at a bunch of them:

There are two lathe books, a revised edition of Peter Child's classic, *The Craftsman Woodturner* ($12.95), and Bruce Boulter's new *Woodturning in Pictures* ($12.95). Once a production turner, Child has gradually phased over to full-time teaching and tool-selling. His book, which includes numerous projects, first came out in 1971 and has been updated by the addition of a few new tools and chucks. Child's advice is thoroughly good, and the text is laced with wry humor. Boulter, in his introduction, says that he turns the same way today that he was taught as an apprentice thirty years ago. Where Child focuses on high-tech tools and cutting techniques, Boulter unashamedly reaches for a scraper now and then. I don't think his text is as good as Child's, although Boulter's advice on sharpening is very sound. Almost without exception, however, I preferred Boulter's project designs. Child's have an uninspired, schoolroom look, while Boulter's attain an elusive refinement, a flow of line and ornament that depends more on the artist's eye than on mere technique.

Better Than New ($8.95), by Albert Jackson and David Day, is a guide to renovating furniture, first published by the British Broadcasting Corporation to accompany a television series. The drawings are neat and clean, and numerous clever tips give life to the text. There's also a good section on reupholstery. But most of the furniture repairs consist of grafts and splices, which are not only tedious to read about but even harder to do. Be forewarned, too, that the book is unspeakably British (for example, in England the hand tool dominates, and readers are instructed to cut dadoes with a tenon saw and chisel). With that caution, I'll recommend it—it's worth the price.

I was glad to see that Sterling has reprinted *Blizzard's Wonderful Wooden Toys* ($9.95). When I favorably reviewed the book in *FWW* #43, the only publisher I knew of was the BBC.

Planecraft ($9.95), by John Sainsbury, is mostly a reprint of Charles Hampton and E. Clifford's book of the same name, originally published in 1934 by the makers of Record planes. It tells you, tediously, all about Record planes and about how to make almost any joint with some kind of plane. Stanley is virtually ignored, however, and contemporary planemakers and electric planes tag along at the end.

E.J. Tangerman's *Carving Birds in Wood* ($6.95) borrows so many of its illustrations from eight of his earlier books that it's almost a reprint. I can't imagine a woodcarver who hasn't heard of Tangerman. This book is more of the same.

Encyclopedia of English Period Furniture Designs ($14.95) is a reprint of a reprint, consisting of 350 pages of drawings of furniture with labels but no text. The artist, José Claret Rubira, ably captures the *spirit* of the various periods from Tudor-Stuart through Sheraton and American Colonial, but, unfortunately, the book is of little use to a woodworker. The perspective drawings distort the proportions, and are inconsistent. The full view of a piece may show a leg with four turned beads, for example, while the "detail" of the same leg shows five!

Patrick Spielman's *Router Handbook* ($9.95) is ambitiously aimed at *all* owners of our third-most-popular (after saws and drills) power tool. At the low end, Spielman's projects include a virtually useless routed spoon, a heart-shaped picture frame, and some wooden switchplates. Yet if you stick it out, the book proves to be an exceptionally good one, full of tips, jigs and practical experience. Any router owner will find real meat here, and for the prospective buyer, Spielman gives excellent advice about choosing a router in the first place.

You'll find most of these books at your local bookstore, or you can order from the publisher at Two Park Ave., New York, N.Y. 10016. ***—Jim Cummins***

Black Folk Art in America 1930-1980 by Jane Livingston and John Beardsley. *Available from the Corcoran Gallery of Art, 17th St. and New York Ave. NW, Washington, D.C. 20006, 1982. $20, paperback; 186 pp.*

Every town possesses at least one folk artist—an old man with a yardful of peculiar junk whirligigs, a woman whose house is a billboard of religious exhortation. The most gifted produce wonderful stuff, like that shown on this issue's back cover. These pieces comprise part of the work of 20 black American folk artists included in this book, published as a companion to the exhibition of the same name mounted in 1982 by the Corcoran Gallery. The text also chronicles the artists' lives, which are inseparable from the art, and as interesting. Most took up carving or painting late in life—Jesse Aaron (maker of the bulldog on the back cover), for example, began when he was 82. Many were prompted by an inner voice; others by dreams or visits to distant places. Leslie Payne, whose fish is also on the back cover, built nearly full-size airplanes from junk, then took neighborhood children on imaginary trips. Not all the work is as heartwarming, but it's all very good. And the photos are well worth the book's price tag. ***—Roger Holmes***

The Complete Manual of Wood Finishing by Frederick Oughton, adapted by A.W. Marlow. *Stein and Day, Scarborough House, Briarcliff Manor, N.Y. 10510, 1983. $18.95, hardcover; 288 pp.*

It's always with great trepidation that I pick up a book entitled *The Complete Guide. . . .* Frederick Oughton is a bit more modest than his publicists, however, stating in his introduction that the book is intended as a bench manual for professionals and amateurs.

Oughton begins with a summary of the history and development of surface treatments of European furniture, and discusses the importance of the "twin roots of design and surface embellishment" and their relationship to contemporary wood finishing. In many ways the historical background for each area covered is the strongest part of the book. An abundance of useful information also complements the formulas and technical details on each of the expected topics: surface preparation, staining, oil and wax finishes, French polishing, and varnishing. And a welcome inclusion is the inventory of furniture collections where people can view original surfaces—Oughton quite rightly maintains that it is very hard to describe what a finish should look like and that even good photographs deceive when it comes to judging tactile qualities.

Unfortunately, other decorative and less commonly used finishing techniques—gilding, paint graining, stenciling, pickling, distressing, cellulose lacquering and finish repair—are sketchily discussed. And terminology is often confusing, particularly in the formulas. Extinct vernacular names of components garnered from old texts are intermixed with material names and products that, although modern, are known by different names in England and North America. Even more dangerous is at least one error I found involving health hazards: The glossary states that pyrogallic acid, mentioned in one formula, is otherwise known as pyrogallol and is nontoxic and harmless. In reality, pyrogallol is 1,2,3-trihydroxybenzene and is poisonous—skin contact should be avoided.

This book might appeal to experienced finishers who can use their own experience to fill in the gaps, or to people who have an interest in the history of the art of wood finishing. But if you buy it, save room on your bookshelf for further "complete" books on wood finishing. ***—John Perkins***

John Perkins lives in Halifax, N.S.

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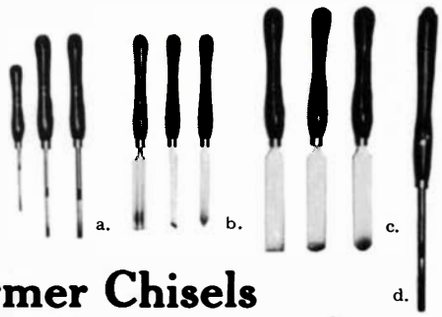

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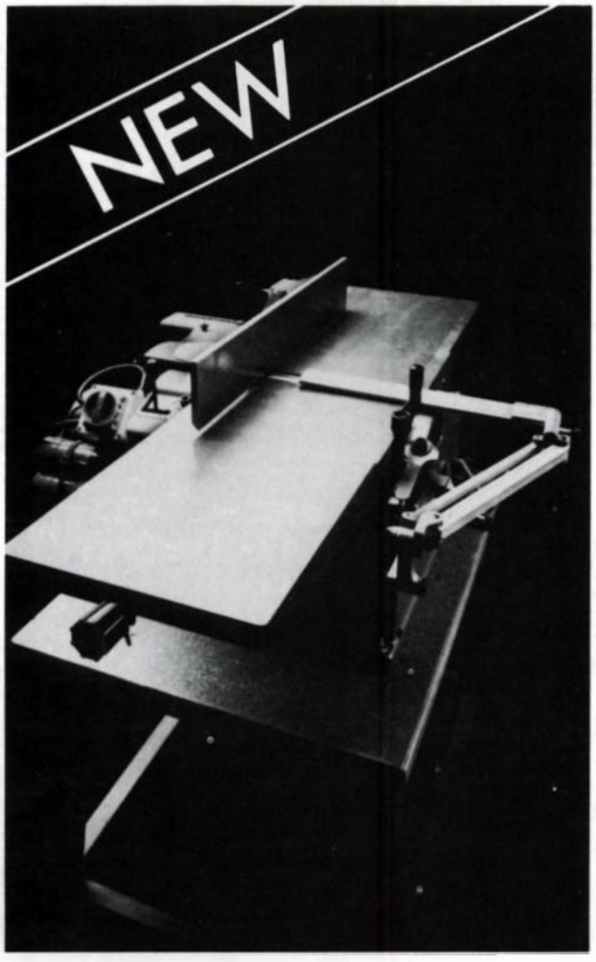

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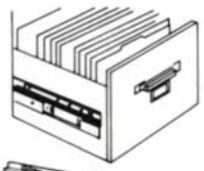

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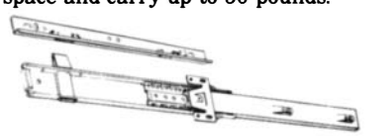

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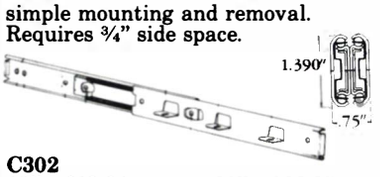

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No. 7248	48"	20.75	18.70 ea
No. 7260	60"	22.65	20.55 ea
No. 7272	72"	24.55	22.25 ea
No. 7284	84"	26.55	24.10 ea

JORGENSEN CLAMPS (Med Duty)

No. 3712	12"	6.15	5.60 ea
No. 3724	24"	7.55	6.80 ea
No. 3736	36"	9.20	8.35 ea

JORGENSEN HAND SCREWS

No. 3/0	3"	$9.30	$8.40 ea
No. 0	4½"	10.90	9.85 ea
No. 1	6"	12.40	11.15 ea
No. 2	8½"	14.80	13.35 ea

JORGENSON BAR CLAMPS (5"reach)

No. 4512	12" Open	17.05	15.35 ea
No. 4524	24" Open	19.05	17.15 ea
No. 4536	36" Open	21.20	19.20 ea

JORGENSON & PONY CLAMPS

No. 3325	3 Way Edging	$5.40	4.90 ea
No. 1623	3" Hold down	7.20	6.40 ea
No 3202HT	2" Spring	2.15	1.90 ea

9X11 Non-Loading Silicon Carbide

Grit	A WEIGHT	Pack of 100
400, 360, 320, 280, 240 220, 180, 150, 120		$19.60

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B7075	3x21 Belt Sander	$118.95
B7100	3x24 Belt Sander	148.50
B7200A	4x24 Belt Sander	167.90
D1010	⅜" Var. Sp. Drill	89.50
D1015A	⅜" Screwdriver/ Drill	111.95
D1310	½" Drill	89.95
D1320R	2 Sp. ½" Rev. Drill	99.95
E3700A	Drywall Screwdriver	77.95
JS-60	Jig Saw	99.95
JSE-60	Electronic Jigsaw	125.90
L-120U	3⅝" Planer	81.25
L1323ALS	3¼ Planer	129.95
LS-35	Finishing Sander	46.95
L-580	6⅛" Planer	189.00
R-150	1 HP Plunge Router	88.00
R-330	2 H.P. Router	139.70
R-500	3 HP Plunge Router	165.00
RA-2500	10" Radial Saw	449.95
S500A	3x5½ Finishing Sander	43.95
SU-6200	Finishing Sander ½ Sheet	89.50
TR-30	Laminate Trimmer	78.95
TS-251U	10" Miter Saw	189.95
TS-251U	w/ Accessories	199.95
W630	7¼" Circular Saw	99.50
W730	8¼" Circular Saw	109.75

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0228-1	⅜" VSR Drill	$ 99.95
0234-1	½" VSR Drill	108.50
0375-1	⅜" Rev. Angle Drill	139.75
1107-1	½"VSR D Handle	147.50
1660-1	½" SSR Compact	174.65
5397	Hammer Drill Kit	177.50
5660	1½ HP Router	142.00
5680	2 HP Router	208.50
5935	4"x24" Sander	219.95
6014	½ Sheet sander	125.50
6145	4½" Angle Grinder	107.50
6255	VR.Sp.Jigsaw	149.95
6287	H.D. Jigsaw Kit	225.00
6367	7¼" Circular Saw	119.95
6460	10¼" Circular Saw	249.75
6507	sawzall w/case	119.50
6543-1	¼" Screwdriver	137.50
6749-1	Magnum Screwdriver	123.50
6750-1	H.D. Drywall screwdriver	119.50
6753-1	Drywall Screwdriver	79.95

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11-072	32" Radial Drill	$379.95
22-651	13" Planer	1250.00
28-140	10" band Saw	349.75
28-243	14" Band Saw	518.50
31-205	8" Table Saw	149.50
33-150	Sawbuck	525.00
33-990	10" Radial Arm Saw	489.95
34-010	Miter Saw	158.95
34-410	10" Contractors Saw	725.00
34-695	10" Homecraft Saw	295.00
34-710	10"Tilting Arbor Saw	474.50
37-609	6" Jointer	370.00
43-122	Wood Shaper	539.95
46-140	11" Lathe	399.95

All Rockwell includes motors

FREUD SAW BLADES 10" = ⅝" Bore

No.	Carbide Tipped Size	Teeth	Use	12" = 1" Bore Price
LU72M10	10"	40	General	$35.00
LU73M10	10"	60	Cut-Off	36.00
LU73M12	12"	72	Cut-Off	76.90
LU78M10	10"	80	Plastic	83.50
LU82M10	10"	60	Cut-Off	38.00
LU82M12	12"	72	Cut-Off	85.95
LU84M10	10"	40	Comb.	36.00
LU84M11	10"	50	Comb.	38.00
LU85M10	10"	80	Cut-Off	64.00
LM72M10	10"	24	Ripping	38.00
TR100	3 blades & dado set			264.95
DS306	6" Dado			97.50
DS308	8" Dado			118.50

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9x11 Aluminum Oxide C Weight

Grit	Pk of 100
150. 120. 100	$21.95
80	23.70
60	28.90
50	32.05
40	38.30

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1179	⅜"VAR. Sp. Drill	69.95
1180	⅜" VSR Holgun	99.95
1311	½ VSR Drill	119.75
1575	⅜" VSR Scrudrill	119.50
1940	⅜" Cordless Drill w/98060 Charger	118.50
1975	⅜" Cordless Screwdriver w/98060 charger	129.50
2034	Drywall Screwdriver	91.50
2054	VSR Screwdriver	155.00
2931	Cordless Screwdriver w/98060 Charger	159.95
3027-09	7"Circular Saw	79.95
3030	7¼" Circular Saw	119.95
3034	7¼" Circular Saw	118.65
3035	8¼" Circular Saw	129.50
3051	7¼" Wormdrive Saw	158.25
3091	10" Miter Saw	189.95
3103	2 Sp. Cut Sawkit	99.95
3105	Var. Sp. Cut Sawkit	109.50
3107	Var. Sp. Orbital Cut Sawkit	119.50
3123	Port. Band Sawkit	305.00
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3310	1½ H.P. Router	139.50
3330	1 H.P. Router	99.95
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P100F	12" Planer	1045.00
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PSM8	8" Circular Saw	141.90
SB-110	4x24 Belt Sander w/dust bag	183.00
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SB8T	3x24 Belt sander 2-Sp w/dust bag	149.95
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TR-8	1 H.P. Plunge Router	126.95
TR-12	3 H.P. Plunge Router	175.00
W6V	Screwdriver	94.50

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		50	1.07 ea	.94 ea
		40	1.10 ea	.96 ea
3"x24"	120	100	1.20 ea	.93 ea
Assortment of 10 16.95	80	60	1.22 ea 1.26 ea	.97 ea 1.12 ea
		50	1.31 ea	1.15 ea
		40	1.34 ea	1.18 ea
4"x24"	120	100	1.68 ea	1.46 ea
Assortment of 10 21.95	80	60	1.73 ea 1.78 ea	1.51 ea 1.64 ea
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3030 7¼"Circ	155.00	119.95	10.00	109.95
3051 7¼" Wormdrive	232.00	158.25	20.00	138.25
3103 Cut Saw	163.00	99.95	10.00	89.95
3105 Cut Saw	170.00	109.50	10.00	99.50
3107 Cut Saw	183.00	119.50	10.00	109.50
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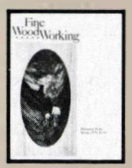

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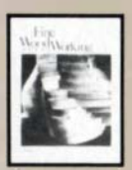
4 Workbench. A. W. Marlow. A cabinetmaker's [illegible]ok. Water and wood [illegible]s. Exotic woods [illegible]ving. Ornamental turn [illegible]itar rosettes. Shaped tambours. Heat treating.



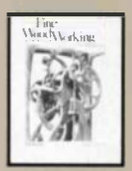
5 Stacking. Design considerations. Carcase [illegible]ruction. Plywood. Pa[illegible]arquetry cutting [illegible]od. Measured drawing[illegible]ine tracery. Guitar joinery. Bowl gouge.

6 Wood threads. The scraper. Bent laminations. Dry kiln. Expanding tables. Two sticks layout method. Stacked plywood. Two tools to make. Pricing work. Serving cart design.

7 Lute roses. Glues. P[illegible]vl turning. Doweling W[illegible] Esherick. Spalted [illegible]ued pine furniture[illegible]ain. Cooperative sho[illegible]ding a tray. Index. Baltimore exhibit.

8 Chain-saw lumbering. Steam bending. Triangle layout system. Painted furniture exhibition. Wooden clamps. Two tools to make. Two projects. Dowel maker. Measuring wood moisture.

9 Tall chests. Designing dining tables. Entry doors. Drawer bottoms. Carving exercises. Health hazards. Routed edge joint. Shaker round stand. Mounting marquetry. Small turned boxes.



10 Wooden clockworks. Hammer veneering. Claw-and-ball feet. Hot-pipe bending. A two-way hinge. Laminated turnings. Circular saws. Louvered doors. Small workbench.

11 Turning spalt[illegible] wood. Spinning [illegible] Drawer assembly. So[illegible]. Leather inlay. P[illegible]anging a door. Parsons[illegible]s. Dulcimer peg box. Pencil gauges. Tool cabinets.

12 Greene and Gre[illegible]e. Dust-collection [illegible] horse workbench. [illegible]g. Tambours. S[illegible] and pigments. Spindle [illegible]ng gouges. Whetstones. Cockleshell carving.

13 Relief carving. Scientific instruments [illegible]oration of stock. Lam[illegible]s. Tung oil finish[illegible]esks. End-boring jig. [illegible] models. Machine maintenance. Lumber grading.

14 George Nakashima. Margon's drawings. Tapered lamination. Improving planes. Box-joint jig. Incised lettering. Bolection turning. Air-powered tools. Ammonia finishing.

15 The shape of a violin. The mortise-and-[illegible] joint. W.A. Keyser. [illegible]s. Free-wheel le[illegible]treadle lathe. Milk pa[illegible]ish. Routed signs. Cooperin[illegible]. Carved shells.

16 Edward Barnsley. Locking the joint. Spiral staircase. Harvesting green wood. Vacuum press. Five more chairs, critique. Hollow turnings. Workbench. Circular stairway.

17 Working with heavy timbers. Sawmilling. Bending compound curves. Furniture from photos. Make a shaper. Routing for inlays. Finishing materials. Library steps. Frederick Brunner.

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34-114	ROUNDING OVER	WITH BEARING GUIDE		3/8		30.03	24.02
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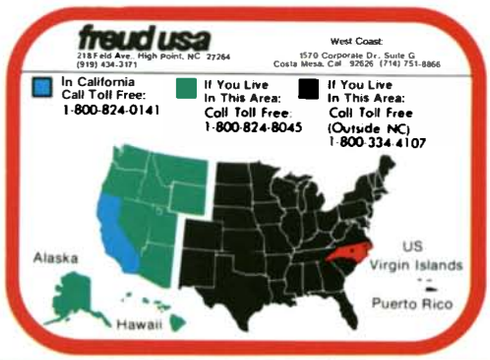


Fine WoodWorking November/December 1984

Wooden Puzzles

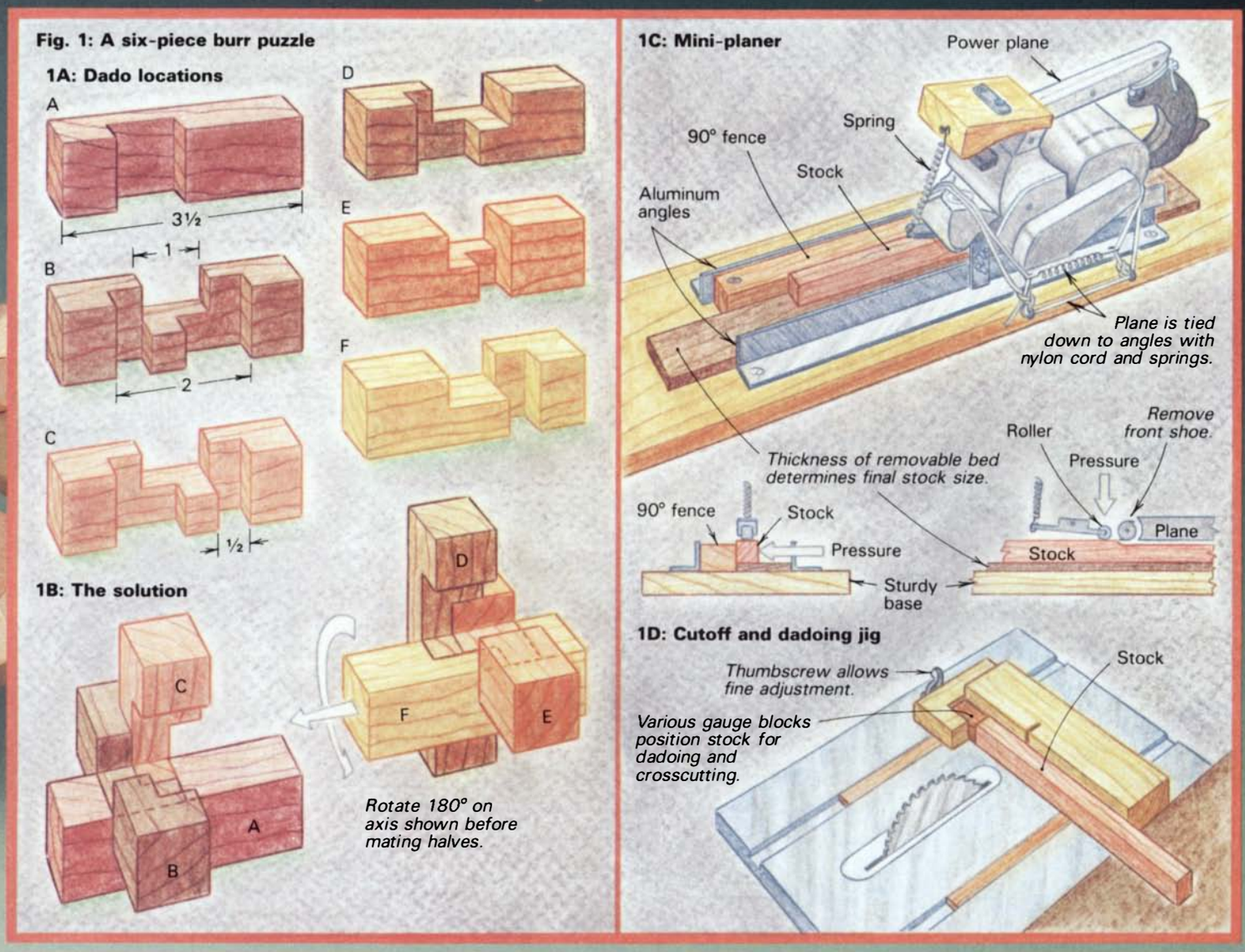
Easy to make, but tough to solve

by Stewart T. Coffin

Many years ago, while engaged in the home enterprise of making canoe paddles, I found myself with the problem of what to do with piles of odd-shaped wood scraps. What emerged from this (with some help from my three children) was an intriguing little puzzle of 12 notched sticks. This in turn led to other ideas for new and unusual geometric puzzles—some 70-odd at the latest count—which soon grew into a thriving family business. Recently, with my labor force gone thither and shop space crowded out by other projects, I've been encouraging others to try their hand at this fascinating craft. This article should be enough to get any woodworker started—those who become addicted will find more of the same in my book, *Puzzle Craft.*

Puzzles don't have to be especially complicated or difficult to make to be absorbing. We found that the one that consistently brought the most amusement at craft fairs was our buttonhole puzzle, also known as the "idiot stick." (We used to make them from scraps of exotic wood, but a popsicle stick would do instead.) It's no more than a short length of hardwood with a loop of string that's just slightly too short to pass over the end of the stick. It ties through a buttonhole, just like a price tag, and the idea is to get it off in one piece. I know of a few of these sticks that are still attached to the same jacket or

Photo: White Light



sweater we put them on ten years ago, but whether the clothing's owners are still working out the solution or not, I can't say. (I have to admit that the first time somebody tied one on me, I had to cut the cord.) For readers who find such teasers more frustrating than interesting, the solution is given at the end of this article.

Some of my puzzles have been licensed to manufacturers, but most were engineered so I could make them in limited production in my small shop. I started with only an 8-in. tablesaw and a belt sander. Later I found a thickness planer to be indispensable, but because of the small scale of the work, I made mine from a portable power plane mounted over a fixed bed, as shown in figure 1C. Eventually I added two more tablesaws—one just for ripping and one for making notches—and, finally, a bandsaw.

Among all interlocking puzzles, the six-piece burr (the center puzzle on the facing page) is one of the most ancient. Many people are apt to dismiss it on sight as being too trivial, but while some variations of the burr puzzle have numerous solutions and are therefore fairly easy to solve, others such as the one shown in figure 1, which has just one solution, can be quite taxing.

When making a burr, as with most other puzzles, the woodworking is simple and straightforward, but all cuts must be extremely accurate or the puzzle will be sloppy. To check measurements, you'll want at the very least a good set of vernier calipers, or, better yet, a micrometer. Keep in mind that wood shrinks and swells with changes in humidity. Don't aim for too tight a fit on a dry winter day or the puzzle will lock solid in summer. Saws must be set up square and true and kept very sharp—a hollow-ground (no-set) plywood blade will do fine.

Domestic woods such as cherry, walnut and white oak can be used, but my preference is Honduras mahogany because it's more stable. Among the more exotic tropical woods, Brazilian rosewood is my first choice.

Thickness the sticks to exactly 1 in. square. I first rip the stock to $1\frac{1}{16}$ in. square. To bring the sticks down to final dimension, I set the planer to skim off the sawmarks on two adjacent faces, then reset it to final size and skim the other two.

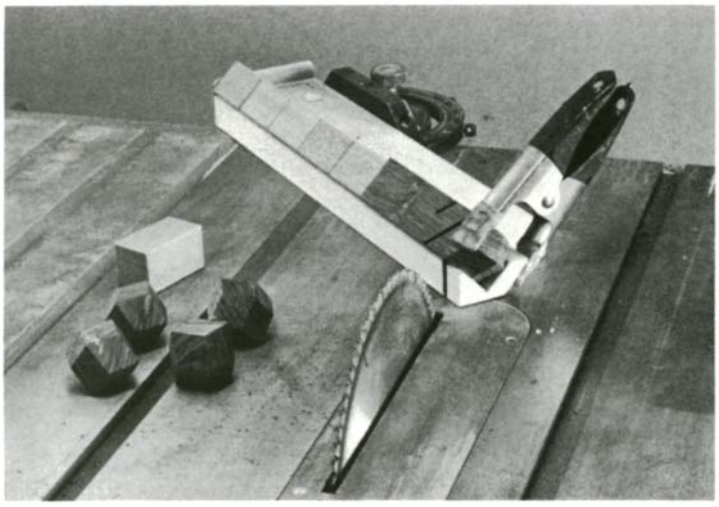
Next I cut the sticks to their $3\frac{1}{2}$-in. finished length. I never mark sizes on the stock, because that would be a time-wasting and inaccurate step when such close tolerances are required. Instead, I rely on a jig to ensure accuracy and speed. The setup shown in figure 1D holds the stick exactly square to the blade, and positions it to length by means of a removable gauge block. The same setup, with different gauge blocks, ensures that the notches are in the right place. I cut them with a dado set shimmed out with paper to 0.002 in. oversize.

When I've cut the pieces, I test the fit and give them a very light sanding to ease the corners, making the parts much more inviting to handle. To keep the appearance crisp, I lightly chamfer the ends of the sticks with a flat file. Then I dunk each piece

Coffin's 'Octahedral Cluster' puzzle, apart and assembled. The basic 12-sided block is made on the tablesaw jig shown below.

in thinned lacquer and immediately wipe it off with a clean rag. With oily woods such as rosewood, no lacquer is necessary.

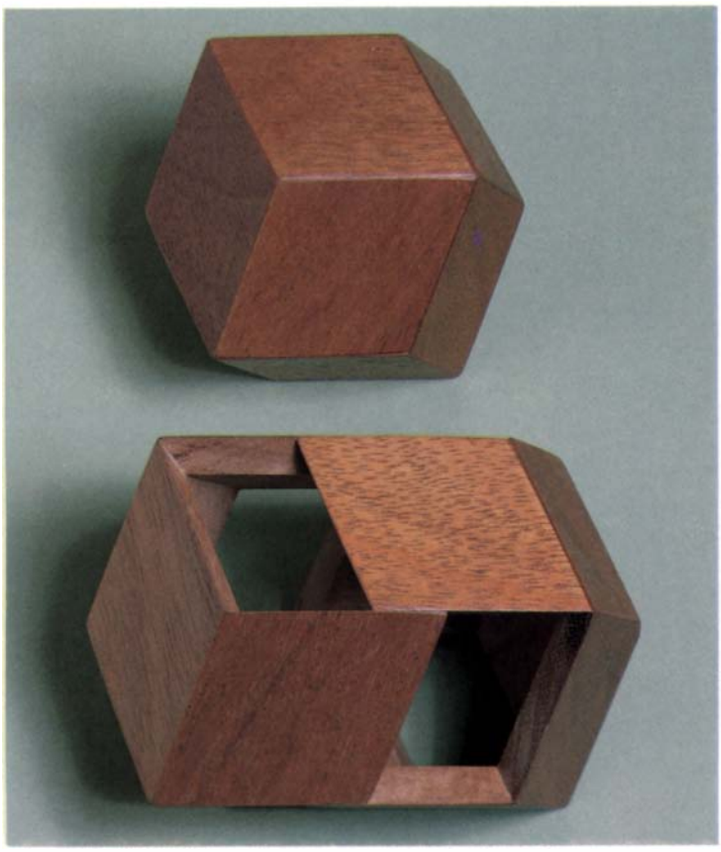
The burr puzzle is an *orthogonal* puzzle—its geometry is based on the cube. Another sort of puzzle is the *rhombic-dodecahedral* type ("R-D," for short), whose geometry is based on a figure with 12 sides. The jig shown in the photo below easily makes 12-sided blocks. It's simply a V-cradle set at 45° to the sawblade. Place a 1½-in. square stick in the cradle, with its end against the stop at the far end of the V. Push the jig through the sawblade, rotating the stick after each pass, to cut off its four corners. Then advance the stick by means of a gauge block. (The length of the block depends partly on the width of your sawblade's kerf—try $2\frac{5}{16}$ in., and adjust to suit.) Cut about halfway through the stick from all four sides; at the last cut, a 12-sided block will result. Then trim the stick's corners, advance it with another gauge block and repeat the process.



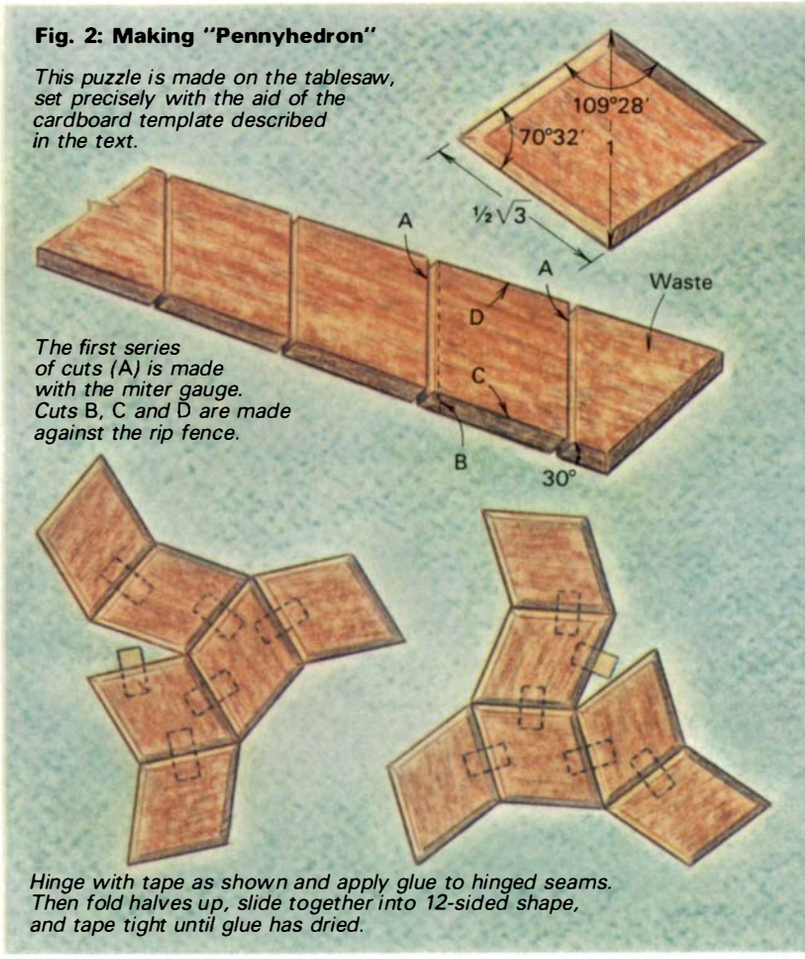
This V-cradle jig makes solid 12-sided blocks as described in the text. Such blocks can be glued together to make the author's 'Octahedral Cluster' puzzle, shown at the top of the page. The clamp is necessary only for the final cut.

You can glue these little rhombic dodecahedrons together to make various puzzles, such as my "Octahedral Cluster," shown in the photos above. But even if you don't plan to ever make the cluster, the little blocks make good Christmas-stocking stuffers, and are pretty to have around. I used to sell them for 35¢ each, and there's a man up in Toronto who's bought about a thousand of them. I'm not sure why.

Some of the corner-waste pieces from those blocks led to another puzzle: When my children were quite small, they used to spend hours in my shop, gluing together scraps to make "puzzles" for their friends. One time, daughter Abbie, merrily gluing corner scraps in different ways, chanced on a fascinating arrangement. As shown in the photo at the top of the facing page, the puzzle has mirror-image halves of six sides each, which fit together to make an R-D, obviously with no difficulty whatsoever. Taking it apart, however, is another matter. Most people will grasp randomly with the thumb and forefinger of each hand and pull. But the puzzle will never come apart that way, because you're always grasping both pieces in each hand. Only by an unnatural three-finger grip with each hand can the puzzle be disassembled. If made carefully, the planes of dissection are practically invisible. My kids made and sold these for a few years at $3 apiece for large ones and $1 for little ones. They used to



The mirror-image halves of 'Pennyhedron' easily slide together to form a hollow rhombic dodecahedron, but getting them apart again requires a three-finger grip that takes most people a while to figure out. Figure 2 shows how to make the puzzle.



put a penny inside, and therefore named it "Pennyhedron." I think we ran out of scraps and they got interested in other things at about the same time, so production ceased.

"Pennyhedron," which consists of 12 identical rhombic panels, is not difficult to make. Prepare a strip of ¼-in. lauan plywood (or other wood of uniform thickness) about 2½ in. wide and 3 ft. long. You will crosscut this strip at a slight angle—as shown in figure 2—into 12 pieces with the sawblade tilted to 30° and the miter gauge adjusted to the correct angle. This yields one good diagonal cut (A) on each piece. The drawing shows the work as done on a saw whose blade tilts to the right; if your saw tilts to the left, your workpiece will be the mirror image of mine. The other three cuts are simply made against the rip fence as described below. The exact profile of each finished side is shown in figure 2.

It's impossible to set the miter gauge by measuring the angles, but a large-scale cardboard template will do the job. Make a triangle with a baseline of 24 in., and two other equal sides of $20\frac{25}{32}$ in., as near as you can measure. These are the proportions of half the shape, with the baseline equal to the short diagonal of the piece (the ratio is $1 : \frac{1}{2}\sqrt{3}$). To set the miter gauge, raise the blade to full height, press one of the short sides of the template against it, and adjust the miter gauge so it aligns with the other short side of the template. Then tilt the sawblade to 30°, lower it to a safe height and make the first series of cuts, a little farther apart than the strip is wide. Next set the rip fence to a little less than the width of the strip (with the blade tilting *away* from the fence, of course, so as not to trap the work) and run the good diagonal cut against the fence to cut the second diagonal. Then cut the other two sides with the same setting.

At craft fairs, we found that people frequently asked what age group a particular puzzle was suited for. This opened the door for one of our favorite tricks: My youngest daughter, Margie, then about seven or eight, would be mingling with the crowd. I would take our most complicated-looking puzzle apart and say, "Anyone who can put this together can take it away." Most adults hung back in fear of embarrassment, leaving an opportunity for Margie to emerge from the crowd, quickly assemble the puzzle, tuck it under her arm and smugly walk away. The crowd always realized that the joke was on them. Children of that age learn very quickly, which leads me to one final tale.

I had licensed one of my designs to a manufacturer, who in turn had contracted with a factory to mold 20,000 of them in plastic. Production was no problem, but the factory couldn't find anyone to put the pieces together for packaging, and was about to jam up solid with puzzle parts. So I made a deal with them and told them to ship the pieces to my factory. My "factory" turned out to be some picnic tables set up on the lawn, and the work force consisted of all the kids in the neighborhood. They all learned quickly, and not one dropped out, especially when I paid them 2¢ per puzzle assembled. The youngest worker was six years old. We finished the job in ten days. □

Stewart Coffin first wrote on wooden puzzles in FWW *#17, and is now making canoes and puzzling out designs for ultralight paddles.* Puzzle Craft *is available from him at 79 Old Sudbury Rd., Lincoln, Mass. 01773, for $10. To put the buttonhole puzzle on, pull the fabric through the loop of string until the far end of the stick can slip through the buttonhole. Then pull the stick until the string tightens. Reverse the steps to remove it.*

Drawings: Lee Hov

A Doormakers' Gallery

A

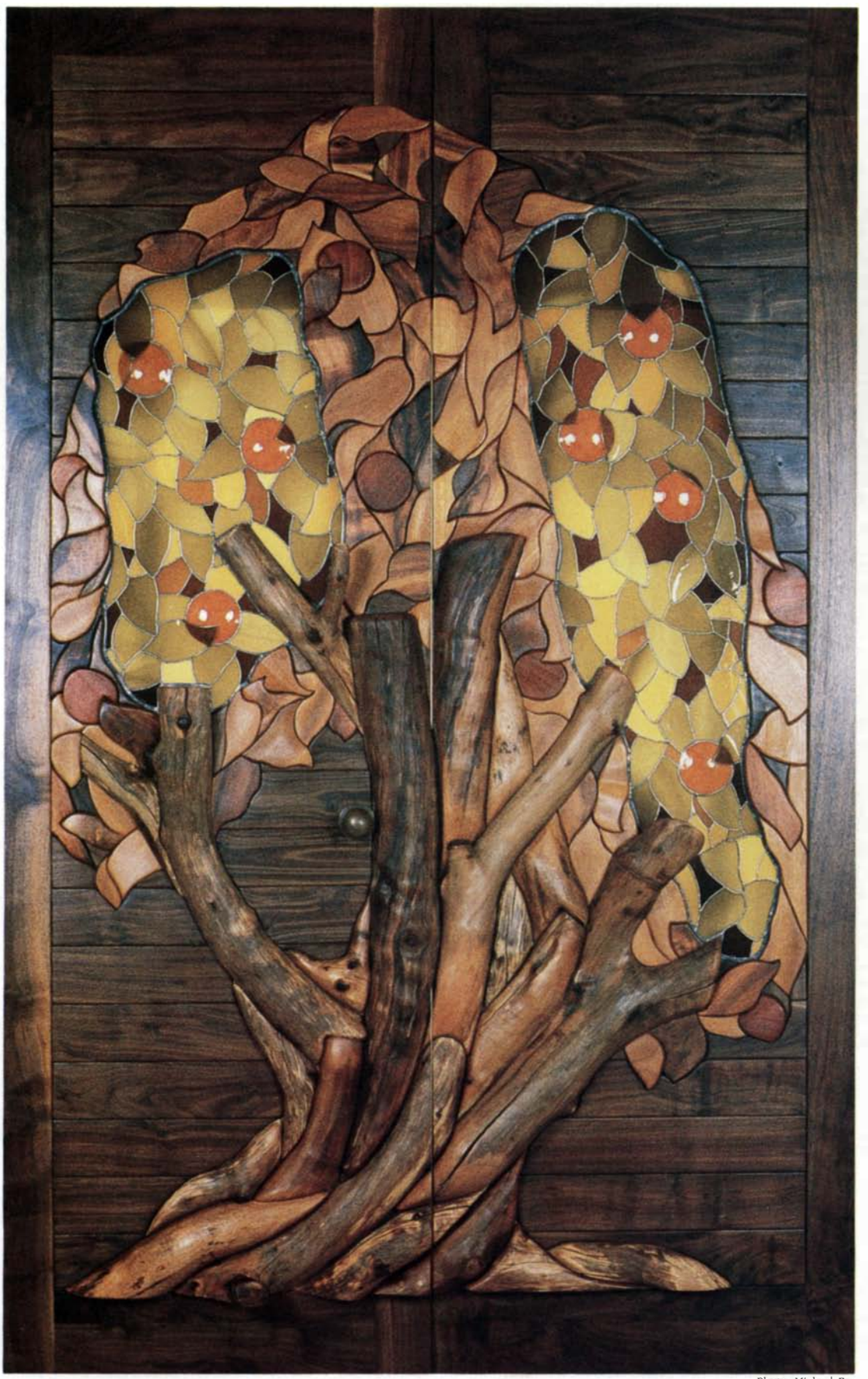


Photo: Michael Bry

A door says a lot about the space behind it. Build it yourself, and it also says a lot about you.

The doors shown here give some idea of what's possible when the basic doormaking techniques in the article that follows are mixed with a little imagination and careful craftsmanship. Who says a door has to be traditional?

A: "These double doors combine techniques of frame-and-panel and solid-core construction. Each door's mortised-and-tenoned frame surrounds a ½-in. plywood panel. The tree trunk is made of resawn madrone branches glued and screwed to the plywood. The stained glass, which I designed, was fabricated by Mike Meszaros. It fits in a rabbeted opening in the plywood. The walnut background boards are screwed to the plywood." Dimensions of each door: 96 in. by 30 in.

B: "I joined the black-walnut frame on this door with mortise-and-tenon joints, and rounded the panel openings with a router. The stylized floral relief, of purpleheart, padauk, zebrawood and Indian rosewood, is screwed to an arched cherry panel. The plugged screw holes are practically invisible." Dimensions: 80 in. by 30 in.

—Al Garvey, Fairfax, Calif.

C: "The koa panels of this exterior door were ripped in irregular patterns on the bandsaw and reglued with ash strips between the pieces. Vermilion circles ¼ in. thick are let into the oak frame. The joinery is twin mortise-and-tenon." Dimensions: 80 in. by 36 in.

—Bill Irwin, Paboa, Hawaii

D: "Each of these mahogany doors has more than sixty pieces. I laminated the arches from ⅛-in. strips. The frame joints are haunched mortise-and-tenon, with splines joining the curved frames to the rails. H-shaped bolection

B

Photo: Al Garvey

C

Photo: Bill Irwin

D

Photo: Woody Hirzel

moldings surround the panels. The stained glass is by Colony Glass." Dimensions of each door: 80 in. by 60 in.

—David Knobel, Olympia, Wash.

E: "The entire door is made from two 8-ft. by 3-ft. redwood slabs, 2½ in. thick. I couldn't lay out the 8-in. wide stiles without hitting a knot, so I cut around the knot, put a corresponding bump on the opposite stile, and ruffled the carving between these points. Through mortise-and-tenons join the frame." Dimensions: 82 in. by 42 in.

—Miles Karpilow, Emeryville, Calif.

E

Photo: Ernie Friedlander

Building Doors

Frame-and-panel makes elegant entries

by John Birchard

Michael Knouff

When the proportions are right, a traditional frame-and-panel door, like Birchard's 80-in. by 32-in. raised-panel door in cherry, is a graceful architectural element.

For a woodworker, a door is like a painter's blank canvas: a well-defined space waiting to be filled with something beautiful. Doors provide me with some of my best opportunities for creative and rewarding woodworking. Making a door for your own home is not only satisfying, it also isn't very difficult.

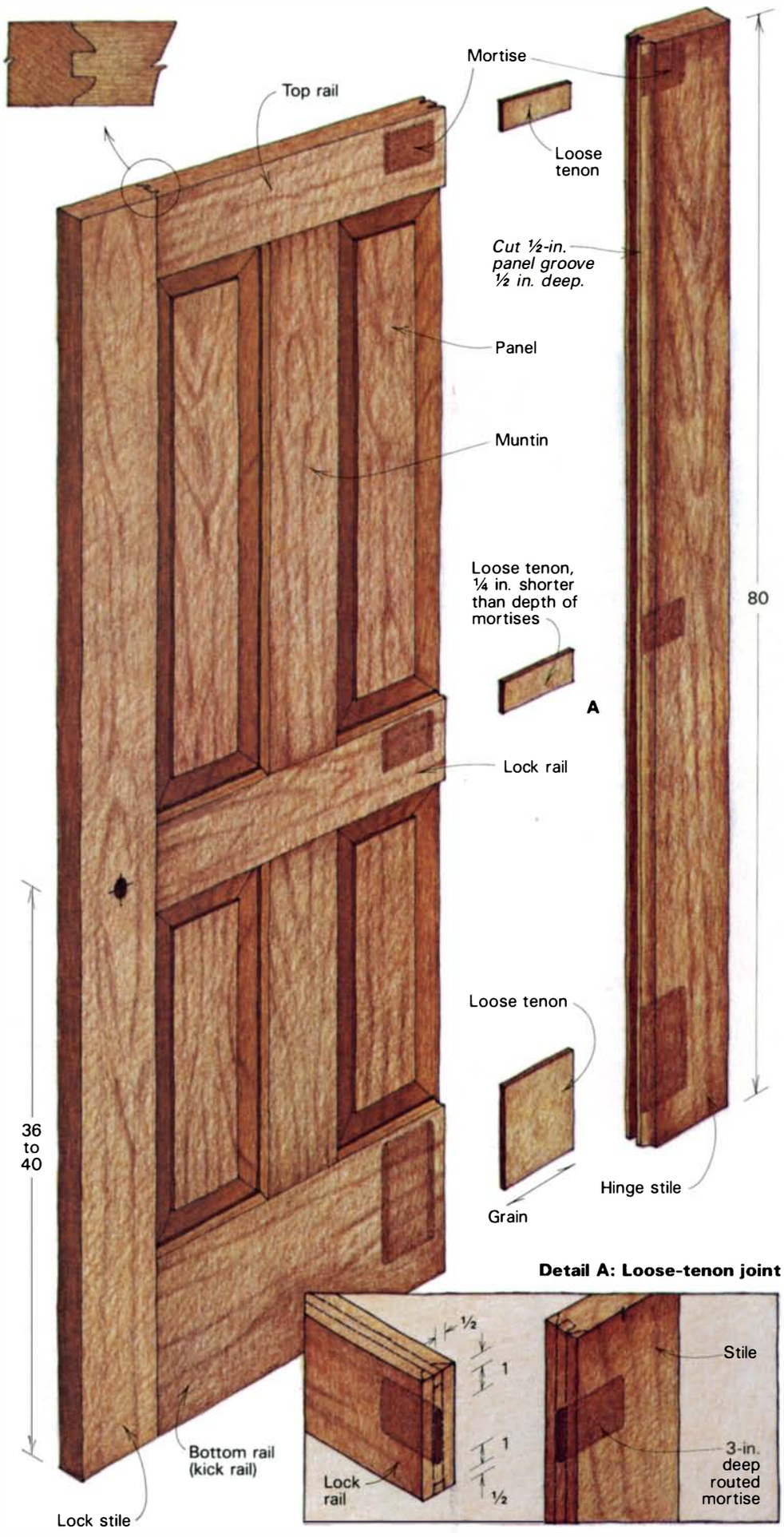
Doormaking is ideally suited to the small shop. I have only 500 sq. ft. of work space, but that hasn't stopped me from building as many as 12 doors at a time. I don't have room for a stroke sander or other large machines, and I get along fine without them. If time is no object, a door can be built with only hand tools and a tablesaw, but an assortment of basic power tools speeds the task and allows construction methods not possible with hand tools.

A shaper is handy for doormaking, but it isn't essential unless you're planning a production run or making doors with many panes of glass. The shaper is indispensable, however, for cope-and-stick construction (see box, p. 48).

There are two basic types of wooden doors used in residential construction: flush doors and frame-and-panel doors. Built-up flush doors can be as simple as boards joined edge to edge, with nailed-on battens for strength. The most common type of flush door, however, is the hollow-core interior door that hangs in countless tract houses. It consists of a lauan veneer over a cardboard lattice and a light wooden frame. Exterior flush doors are often a veneer skin over a solid core of boards or man-made boards. A thick solid-core door is heavy, and a big one may require strap hinges instead of butt hinges.

I prefer to make solid-wood frame-and-panel doors. Frame-and-panel construction consists of rails, stiles and muntins joined to make a frame. Grooves milled in the framework hold wooden panels in place. This construction results in a strong, du-

Fig. 1: Frame-and-panel door construction



Drawings: Frances Ashforth

rable door that's often lighter in weight than a solid-core door, and it minimizes the problems caused by wood movement that plague solid-core exterior doors. The panels in a frame-and-panel door are free to move in their grooves, and can expand and contract without affecting the overall width of the door.

There are countless variations on the basic four-panel door shown in figure 1. Changing panel proportions and varying the shape and arrangement of the framework are just the beginning. Panels can be flat, raised or carved, inlaid with other wood or with brass, or replaced by clear or stained glass. The framework can be carved or beaded—the possibilities are endless.

Design—When I design a door, I consider its size and location, the type and quality of lumber to be used, the joinery, ornamentation, and, of course, the price.

In the United States, the standard height for a residential door is 80 in., but custom doors sometimes exceed this. Exterior doors are commonly 30 in. to 36 in. wide and 1¾ in. thick. Single exterior doors wider than 42 in. present special problems because they're so heavy; for wide openings, therefore, double doors are better. Interior doors are commonly 24 in. to 32 in. wide and 1⅜ in. or 1½ in. thick.

If you're making a door for an old house, existing jambs may vary from the standards and also will probably be out of square. If the latter is the case, make the door slightly oversize and plane it to fit.

In new construction, the doors are most often made after the house has already been completely designed and framed up. If, on a lucky chance, I'm called in before the designs are final, I try to locate the exterior doors in sheltered areas. A door on the south side of a building should have a projecting roof or overhang to protect it from sun and rain. If, as is often the case, a door must be exposed to the elements, I choose a weather-resistant wood such as teak or mahogany, and employ as much glass in the design as possible. I try to design panels for an exterior door as narrow as possible. A large expanse of wood moves more with the weather and is more likely to cause problems.

I design most of my frame-and-panel doors with 5-in. or 5½-in. wide stiles. Most locksets have a 2⅜-in. or 2¾-in. backset (the measurement from the center of the doorknob to the edge of the door). So a lockset with a 2¾-in. backset will be centered in both a 5½-in. stile and the width of the lock rail, I usually make the

top and lock rails the same width as the stiles. For visual weight and strength, the bottom or kick rail is usually twice as wide as the other rails.

Doorknobs should be 36 in. to 40 in. from the floor. Since I usually place the center of the lock rail 36 in. from the floor, this means boring through the lock-rail tenon. I've never had a joint fail because of this.

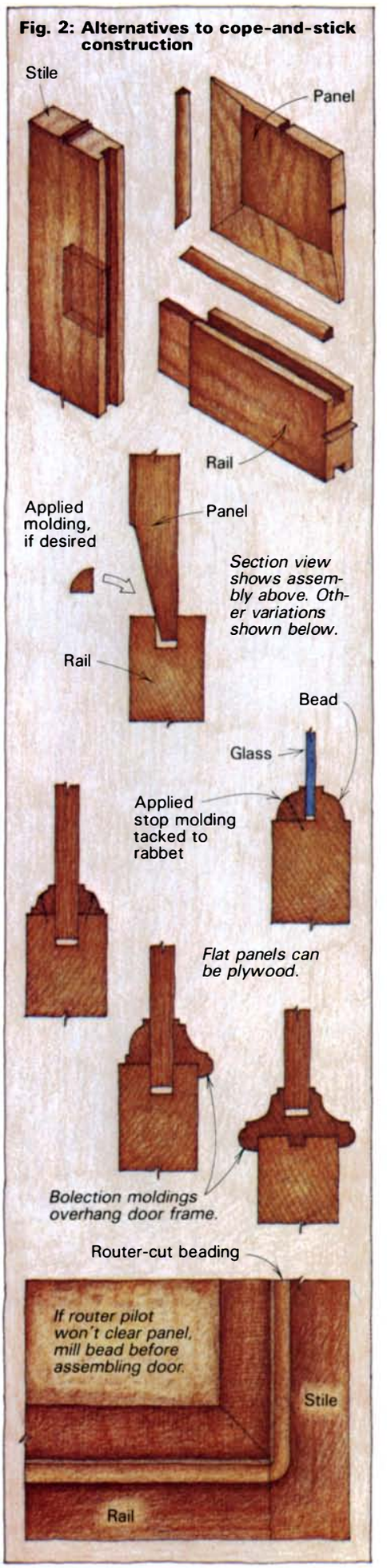
Good door lumber has to be straight and clear. Avoid plainsawn boards or boards with wild grain—they're more likely to cup, warp or twist. This can cause real problems in a door. Quartersawn boards are the best choice because they're more stable. I usually buy roughsawn 8/4 stock so that I can joint any small defects out of the stiles and still end up with stock 1¾ in. thick. My favorite woods are teak because of its beauty and weather-resistance, redwood because it's easy to work and inexpensive where I live, and cherry because it finishes so nicely. Walnut, mahogany and fir are also nice door woods, but harder to work. Oak is popular, but I avoid using it for exterior doors because it blackens with age.

Joinery and layout—Some type of mortise-and-tenon joint (blind, through, wedged, pinned or haunched) is best to join stiles and rails. Traditionally, rails that are wider than 8 in. or so are joined with a twin mortise-and-tenon to minimize the effects of wood movement. In a frame-and-panel door, the greatest load is concentrated on the joint between the top rail and the hinge stile, so it's particularly important to make this joint strong.

I often use cope-and-stick construction. (The molding on the frame edge is called the stick, and the process of cutting it is called sticking. Likewise, its female counterpart on the rail ends is the cope, and the process is called coping.) Since a traditional tenon will interfere with coping the rail ends on the shaper, I've developed the loose-tenon joint shown in figure 1, detail A. I think that it's at least as strong as a blind tenon, and easier to make. I sometimes use dowel joints in combination with cope-and-stick construction, but only on lightweight interior doors. I don't recommend dowel joints for exterior doors.

I'll explain how to make a cope-and-stick frame-and-panel door with the loose-tenon joint. If you don't have a shaper, you can cut the panel grooves and beading with a router. Or you can apply molding as shown in figure 2, or eliminate it altogether.

Fig. 2: Alternatives to cope-and-stick construction

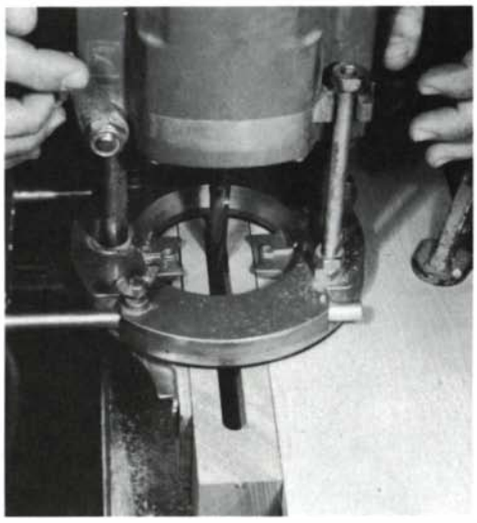


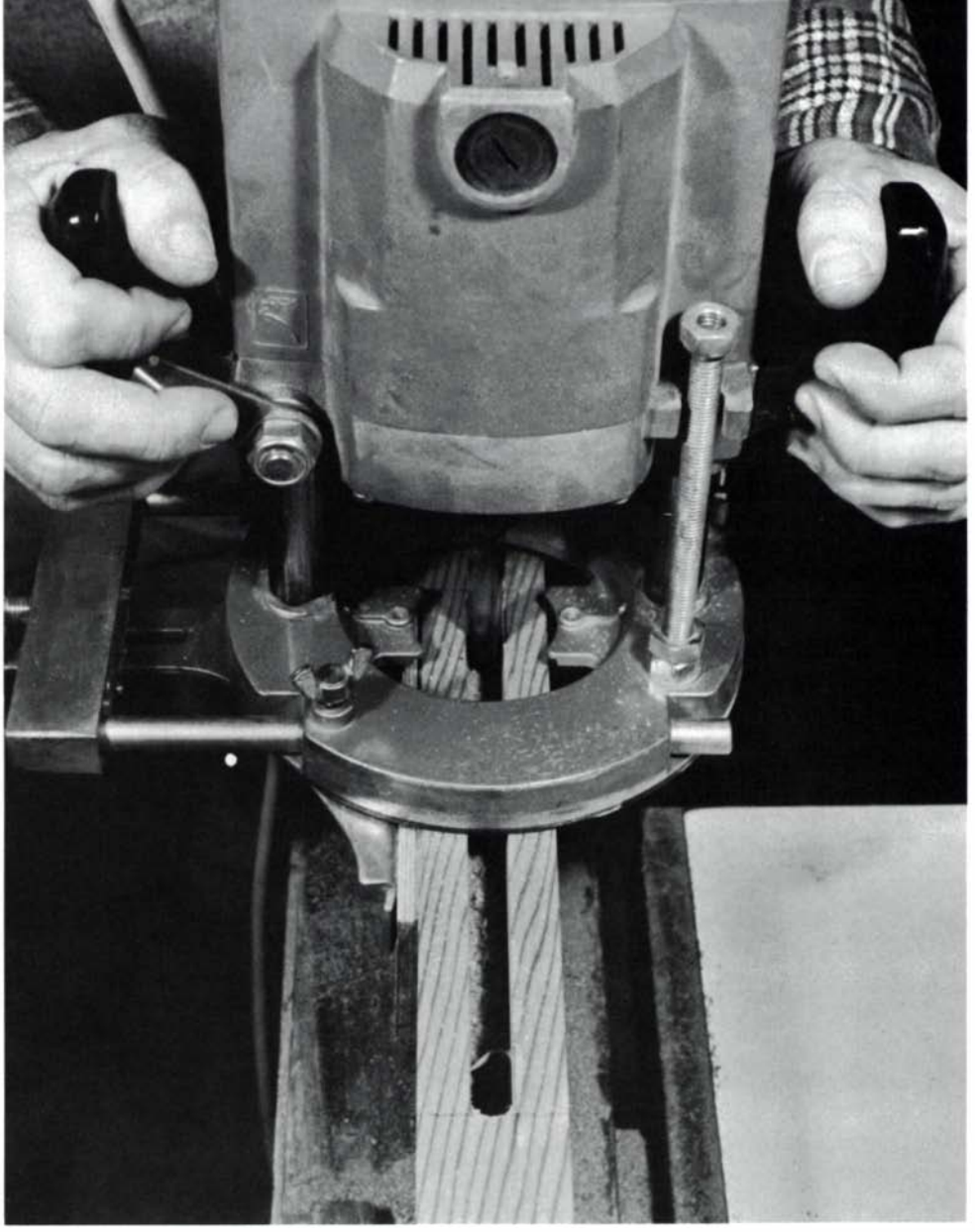
I begin by ripping the frame pieces about ½ in. wider than their finished size, then jointing one edge and one face. Next I plane all the wood to thickness, then rip to finished width. If I don't have stock wide enough for the kick rail, I glue it up. All parts must be square and straight.

The length of the rails depends on whether you cope and stick the joints or not. For example, let's take a door 36 in. wide with 5½-in. wide stiles. If I don't cope and stick, I'll cut the rails 25¼ in. long—door width minus the combined width of the stiles, plus ¼ in. For cope-and-stick construction, I add to this measurement the amount that the coping overlaps the sticking on the stiles. The extra ¼ in. makes the door 36¼ in. wide to allow for any irregularities in the jamb, and so I can clamp the door without worrying about scarring the edges. When I hang the door, I'll plane it to fit. (For traditional mortise-and-tenon joints, allow for the length of the tenons when figuring rail length.) I cut all the frame members to length with a cutoff jig on the tablesaw, using a 60- or 100-tooth carbide blade. These cuts must be perfectly square in both directions. If they're not, the joints won't be tight or the door will be twisted.

Once I've cut all the frame pieces to length, I lay out the door on my assembly table and mark where the rails join the stiles. Then I line up the stiles next to each other, inside edges up. I mark the locations of the mortises with a square and a marking gauge, centering the mortise on the stiles. I usually start the mortises about 1½ in. from the top and bottom of the door, and 1 in. from the other rail edges so the tenons won't interfere with the ½-in. deep panel grooves.

I cut the mortises with a plunge router before doing any slotting or shaping on the stile or rail edges so that there's a flat surface for the router base to slide on. Drilling a ½-in. dia. hole 3 in. deep at one end of each mortise eases the plunge of the router bit into the wood, and makes the bits last considerably longer. I cut 3-in. deep blind mortises by making several passes with a 4-in. long, ½-in. dia. spiral fluted bit, checking the router-fence adjustment often to make sure that the mortise is exactly centered in the thickness of the stile. Next I rout mortises in the rail ends, holding the pieces in the bench vise while mortising. A length of 2x6 clamped to the benchtop helps stabilize the router, and raises the work high enough off the





Plunge-routed mortises begin with a ½-in. hole drilled at one end to ease the bit's entry (above). Several passes with a ½-in. fluted router bit cut a mortise in the stile (right) and the rail end (below) for a loose tenon. A 2x6 clamped to the bench provides support for the router base.

bench so that the router fence clears the vise.

To make the loose tenons, I plane a board to ½-in. thickness, rip it to the correct width, and cut the tenons ¼ in. shorter than the total depth of both mortises. The tenons should be a friction fit in their mortises. The router-cut mortises have radiused corners, but I don't feel that it's necessary to round off the edges of the loose tenons. The gaps at the mortise ends won't affect the strength of the joint. It's also very helpful to be able to slide the rail up and down a little during assembly.

With the joints cut, I'm ready to cut the panel grooves and the decorative beading along the inner edges of the stiles, rails and muntins. For a raised panel, I usually make the grooves ½ in. wide and ½ in. deep, but for a 1¾-in. thick door, I sometimes make them ⅝ in. wide.

On the shaper, I cut the cope first on the ends of the rails and muntins. Then I cut the stick the full length of each frame member. Alternatives to coping and sticking are shown in figure 2. One of the easiest is to dry-assemble the frame, then rout the beading around the panel openings with a pilot-bearing bit and rout the panel groove with a slotting cutter. Make sure that the bit's bearing rides on a true surface, not on the beading. The corners of a routed panel groove will have to be cleaned out with a chisel.

One nice feature of cope-and-stick joints is that the beading appears to be mitered where the stiles and rails intersect. This gives a nice sharp look to the corners, which in many designs is more appealing than the rounded corners produced by beading an assembled door with a router.

When the framework is finished, I cut the panels to size. To determine raised-panel thickness, I usually add ½ in. or more to the width of the panel groove (i.e., a ½-in. wide groove gets a panel 1 in. thick at its thickest section). To determine panel size, I dry-assemble the framework and measure from the bottoms of the panel grooves. I make the panels about 3/16 in. smaller than this measurement to allow for cross-grain wood movement. The panels are never glued in place—they need to float in the grooves.

I raise panels on the shaper, but this can also be done on the tablesaw or with a router (see *FWW* #23, pp. 55-58, and #44, p. 56). I sand and finish the panels completely *before* gluing the door so that I can apply finish to the edges that will be fit into the grooves. It's also a good idea to apply finish to the insides of the panel grooves, but be careful not to get any on the glue joints.

Assembly—I use plastic resin glue (urea-formaldehyde resin) on all my doors. It's water-resistant and slow to set up, which gives me more assembly time. I assemble most of my doors flat on a Formica-topped table that has access on three sides, but sometimes I clamp one stile in the bench vise and work up from there. The most important thing about assembly is to check for square and make sure that everything—especially the panels—fits perfectly before applying any glue. Be sure to put clamps on both sides of the door to keep it flat. After the glue has cured, I

hand-plane the frame to flush the joints and to remove surface blemishes. Between planing and the final sanding, I trim the edges and the top of the door with either an electric hand-planer or a straight-fluted router bit like the one I use for mortising. A straightedge clamped to the door guides the router. Before trimming the top or bottom, I bevel the stile corners with a block plane so that the router or planer doesn't tear out grain at the end of the cut.

I install the top hinge 7 in. from the top of the door and the bottom hinge 11 in. from the bottom, with a middle hinge, if used, centered between the two. I cut the hinge mortises by defining each end of the mortise with a chisel cut, setting the router fence for the width of the hinge, and hogging between the chisel cuts. Then I square up the corners with a chisel.

If possible, I hang the door and do any final fitting before applying the finish. A door hung during the dry season can be expected to swell. I compensate for this by allowing a little extra clearance between the door and the jamb. Except for the hinges, I install hardware after finishing.

Finishing—Paint is the best protection for an exterior door, but it obscures the natural wood. I don't recommend straight, unthinned varnish on the surface of exterior doors because varnish degrades quickly and is difficult to renew. Straight oils aren't protective enough either. If a door is well sheltered from the sun, a finish of equal proportions of spar varnish, boiled linseed oil and mineral spirits will protect the wood if periodically renewed. Be especially sure to finish the door's top and bottom edges and any exposed end grain. For a hand-rubbed look, I flow on one coat, wait a few minutes and then wipe off the excess. Before the first coat has dried, I scrub on a second coat with 00 steel wool. After wiping off the excess, I let the finish dry overnight. I repeat this several times. This finish is easy to renew. Just flow on a new coat and wipe off the excess—the mixture soaks in where it's needed.

A properly made and properly hung door should give its maker a satisfying feeling of accomplishment, and its owners a lifetime of service. □

John Birchard is a professional woodworker in Mendocino, Calif. Black-and-white photos by the author. For more about doors and how to hang them, see FWW *#9, p. 48; #11, pp. 74-75; and #26, pp. 56-57.*

A shaper makes it simple

If you're making more than a few doors, a spindle shaper is a good investment. It can cut interlocking cope-and-stick joints which speed the making of frame-and-panel doors, give the appearance of mitered beading, and produce a stronger glue joint. And for doors with lots of sash work, a shaper is essential.

The shaper has a high-speed vertical spindle that protrudes through a hole in the middle of a table. A fence guides the stock. Cutters fit on the spindle singly, or they can be stacked in combination with spacers and bearings to make all sorts of different moldings, grooves or raised panels.

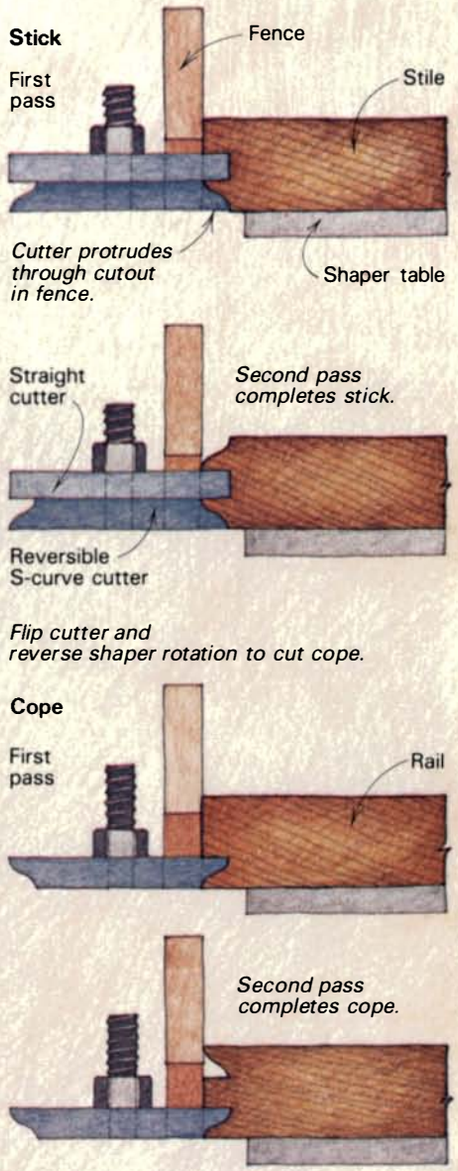
One way to tool up for a cope-and-stick joint is to buy a cope-and-stick cutter set. This is sometimes called a door-lip set, and it consists of two matching sets of cutters: one to cope the rail ends, and one to mold, or stick, the entire length of the stiles and rails. One pass mills the panel groove and beads both edges. These carbide cutter sets are convenient, but at more than $300 they're expensive.

It's cheaper to stack several high-speed steel cutters to get the profile you want. I prefer high-speed steel cutters to carbide ones because in addition to their being less expensive, I can regrind and resharpen them myself on a carborundum wheel. One of my favorite shaper cutters is the Powermatic #6178048 (available from Woodshop Specialties, Cold River Industrial Park, Quality La., Rutland, Vt. 05701). It's a reversible S-curve that can be used to stick the edges of the stiles and rails, and then flipped over to cope the rail ends. Using the Powermatic in combination with straight cutters, as shown in the drawing, I can get a panel groove on the stick or a matching stub tenon on the cope. If you use a reversible cutter, you'll need a reversing switch on your shaper so that you can flip the cutter from stick to cope cut.

As with most machines, shaper set-up is extremely important. You shouldn't alter the spindle height between cuts, or the door parts won't line up. Remember also that the stock needs to bear against the shaper fence after it's passed over the cutter as well as before. Position the fence so that some part of the original stock surface remains to bear on the fence during the last cut. If this isn't possible, you can build up the outfeed fence to contact a cut surface. The gap in the fence for the cutter can be a problem, particularly for end-grain coping on narrow pieces. To guide narrow stock past the gap, I let a piece of wood into the fence to span the gap at the height of the stub tenon.

It's easy to spend thousands of dollars on a shaper and thousands more on carbide cutters, but I didn't. For much less than the cost of one heavy-duty machine, I bought two ½-in. Sears Craftsman shapers and outfitted them with 1-HP motors and heavy-duty pulleys. These small shapers can't do everything a big machine can, but they're fine for cope-and-stick work. Having two machines cuts down on set-up time. —*J.B.*

Cope and stick with reversible shaper cutter

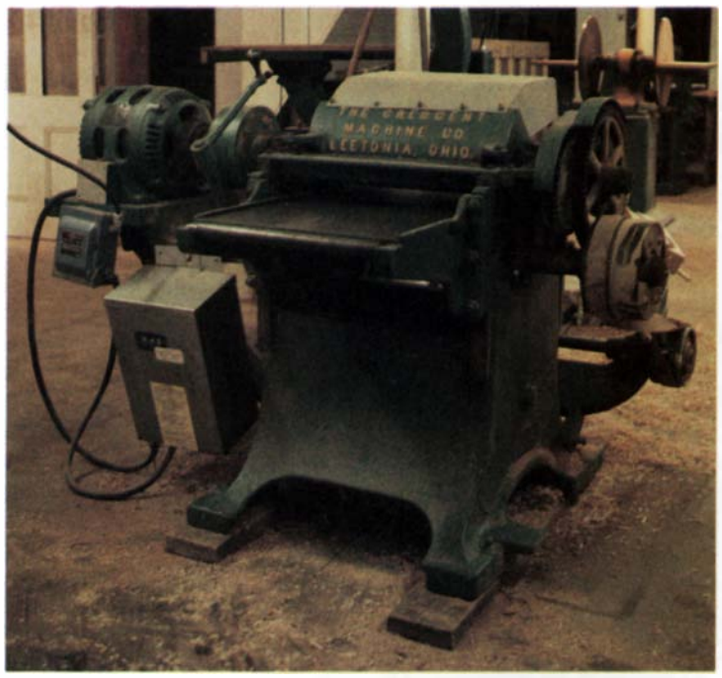


Vintage Machines

Searching for the cast-iron classics

by Tom Howell

Inspecting a roomful of vintage, cast-iron woodworking machines gives a fascinating glimpse into American industrial history. Engraved with colorful phrases like "hand-built on the banks of the Wabash," these behemoths exhibit the proud, hands-on craftsmanship and attention to detail rarely found today. To me, the finest general-purpose woodworking machines ever made were those produced between 1930 and 1960.



Large cast-iron woodworking machines like this 1930s planer may be obsolete by today's industrial standards, but they can give a small shop top-notch performance at scrap-iron prices.

I have equipped my factory, where we build woodworkers' benches, with more than 40 of these machines. Most people who see them in operation—from hobbyists to full-time professionals—seem overwhelmed by their size and power, and by nostalgia for a bygone era when meticulous labor, cheap materials and over-engineering were the rule. Romanticism aside, cost is what matters most: my vintage machines deliver about 95% of the performance of new industrial tools at about 20% of the cost. For example, one new industrial-quality tablesaw model sells for $8,000 to $9,000. I bought an equivalent, used, cast-iron model for $1,000, spent about $500 restoring it, and ended up with a high-quality saw for about the cost of a trade-tool-quality saw. And my saw won't wear out every couple of years, or depreciate in value. While such bargains can be hard to find, similar comparisons can be made for other tools most needed by woodworkers, especially jointers, bandsaws and planers. If you want something special, like a 30-in. planer, but don't have bundles of cash, old machines are the only way to go.

The cast-iron classics aren't for everyone, of course. Economically, they make the most sense for professionals who continually do the kind of heavy sawing, planing and shaping for which these machines were designed. For the commercial shop just starting out, buying used industrial machines is an economical road to top-notch equipment. I wouldn't rule these beauties out for the hobbyist, though. If you find decent old equipment at a fair price and have room for it, there's no reason why it can't be used for lighter work. Just restoring a machine can be rewarding, particularly for the tinkerer who has the same affection for old tools that some people have for vintage cars. But if you're not mechanically inclined, you'd be better off sticking to consumer- or trade-quality tools, which also represent some excellent used bargains. The Sears tablesaws of the '40s and '50s are, in my opinion, among the best light-duty machines ever made.

Thousands of vintage machines are lying dormant in factories, warehouses, salvage yards and other crannies of industrial America, especially near wood-manufacturing centers. Tracking them down may take a little time, though. For a start, find out which school systems, utilities, prisons, government installations or construction companies in your area regularly hold sales. Of late, electric utilities have become an excellent source—some are unloading tons of woodworking equipment bought to make concrete forms for nuclear plant projects since canceled. Many good bargains come through large, poorly advertised government disposal sales. The best way to get on the mailing list for these sales is to buy something, even something small, at an auction or sale—you'll soon be on everyone's list. A trip to the junkyard may turn up serviceable old machines bought as scrap from people unwilling or unable to repair them. Also check publications. The *Classified Exchange,* a monthly national newsletter (available for $20/yr. from Box 34908, Memphis, Tenn. 38184), lists hundreds of older machines. Visit nearby woodworking shops and plants for equipment that has been taken out of service. Auctions are great fun, but set limits on what you will bid, or else you might suffer bidding fever.

Finally, if you prefer a dependable sellers' warranty, search out a reputable dealer in used production-woodworking machines. Most have on-site restoration facilities and will give a one-year warranty or a one-year buy-back or trade-in, although

the best bargains are machines that are not in peak condition.

If you go shopping for old machinery, you should allow enough time to check each machine carefully, and be willing to spend a little money to get the quality, production capacity and investment value offered by good vintage equipment. Throughout this evaluation, your primary concern should be how much time and money it will take to get the machine into your shop in accurate, running condition. Try to anticipate all costs—everything from paint and transportation (which usually is at least 2% to 5% of the machine's price) to new blades and cutterheads. Even if you enjoy fiddling with machinery, you should realize that restoration work will cut down on your woodworking time. You probably won't be able to find parts either, and will have to pay a machine shop to make them. You may have to replace motors, rewire your shop, install three-phase power or upgrade your dust-collection system. And remember that some of these tools may be too big for your shop (I have one tablesaw with a table as big as a queen-size bed).

Before doing a detailed evaluation, make a quick survey of the machine's general condition to see if it is even worth serious study. Be critical. For every ten machines you look at, figure on rejecting nine, due to price, condition or other factors.

One quick way to sort prospects is to consider weight—buy machinery the way you buy potatoes, by the pound. These machines are about 95% cast iron, and that's what you're buying. The remaining 5% includes bearings, shafts and motors, which have to be periodically replaced anyway. In general, don't pay more than $.30 per pound for defunct machine frames requiring a great deal of restoration, or more than $1 per pound for a completely rebuilt machine with a sellers' warranty. New machines usually are more than $3 per pound. If you can't get the old machine for less than half the cost of a new one, forget it.

If the machine looks promising, make a detailed analysis of its condition. First of all, the machine body should be 100% cast iron, not steel or sheet metal. Cast iron is very heavy (a woodworking machine can't be too heavy) and will absorb vibration, thereby increasing safety and accuracy. It does have one fault, however: it cracks easily, and such cracks are difficult to repair. I'd reject any machine with a crack that goes through the metal or that is wide enough to stick a piece of paper in. A crack that's at least an inch long and wider at one end than at the other is liable to grow if the machine is subjected to much vibration. Rust less than 1/16 in. deep usually isn't a problem.

Identifying specific brands is easy. The makers cast their name, the city of manufacture and the serial number into the base of each unit—an iron-clad guarantee of a machine's authenticity. The first two digits of the serial number usually indicate year of manufacture; for example, "49-103" would indicate the hundred and third machine built in 1949. If the manufacturer is still in business (many of them aren't anymore), the serial number may help you obtain blueprints and other information, such as the name of the original owner. You're likely to find about 50 brands in your search for vintage machines (see box, below left, for several). The one I've encountered the most is one of the best, Yates-American. Still operating in Beloit, Wis., today the company manufactures only custom molders and surfacers averaging about $80,000 apiece, but it does have some parts for its old bandsaws, lathes, tablesaws and planers.

Once you're satisfied that the cast-iron base is in good shape, check the electrical system, which may include one or more motors, a starter, wiring and controls. Each motor should have a nameplate, stating its type, RPM and voltage. A majority of industrial machines are three-phase, 440-volt, though some may be 220-volt. Most homes are wired for single-phase, 110-volt current. Converting equipment from three-phase to single-phase is expensive and in many cases it may not be worth it. Besides, three-phase motors are much more efficient, so you're better off installing three-phase power in your shop, if possible. If you can't get three-phase or can't afford the conversion, consider buying a phase converter, which turns ordinary single-phase current into three-phase. (For more on three-phase current, see *FWW* #24, pp. 57-58, and #26, pp. 10-16.)

Next check the starter. If your shop is large enough to be regulated by the federal Occupational Safety and Health Administration (OSHA), you must replace any manual starters with more expensive magnetic starters—not a bad idea even in a small shop. In the event of a power failure, a tool with a magnetic starter won't restart until it's reset; with a manual starter, a stalled machine will restart as soon as power is restored, and could send pieces of wood flying all over the shop. Make sure that the controls work. Also figure out how much wire you'll need to install the machine. With some big machines, you may have to add a larger electrical service and more breakers and panels. Brace yourself for higher electric bills—big machines built in the days of cheap energy really consume the kilowatts.

After checking the electrical components, give the machine a good old-fashioned going-over. Think about where the stress points on a machine are—shafts, gears, fences and adjusting devices—and inspect these areas for warp, wear and cracks. Use your hands as well as your eyes; often you can feel play and wear in something like a shaft better than you can see it. If you can fit the edge of a business card between gear teeth or if teeth are missing, it's a sure bet the machine has been used heavily and will need work. Have a straightedge handy to check all tables and beds for flatness; grinding a table down can be expensive. If you find a machine that runs, insist on operating it yourself. Bring wide, warped boards to test planers, or tough hardwoods to test saws. Run the machine for as long as the owner will let

Vintage makes

Some of the makers of large cast-iron woodworking machinery are still in business, though their product line may have changed over the years. Here's a rundown on twelve such companies and the type of tools they made.

Yates-American, 2280-T Kennedy Dr., Beloit, Wis. 53511; all stationary tools.

Diehl Machines, 981 S. Wabash St., Wasbash, Ind. 46992; saws.

Delta (Rockwell), 400 N. Lexington Ave., Pittsburgh, Pa. 15208; all stationary tools.

Mattison Machine Works, 545 Blackhawk Park Ave., Rockford, Ill. 61108; all stationary tools.

Newman Machine Co., 5077 Jackson St., Greensboro, N.C. 27403; planers.

S.A. Woods (div. of Yates-American), 100 Rockton Rd., Roscoe, Ill. 61073; surfacers.

Porter-Burke Machinery Co., 730 Plymouth Ave. NE, Grand Rapids, Mich. 49505; all stationary tools.

Powermatic, McMinnville, Tenn. 37110; all stationary tools.

Oliver Machinery Co., 450 South St. NW, Grand Rapids, Mich. 49504; saws.

Tannewitz Inc., 3944 Clay Ave. SW, Grand Rapids, Mich. 49508; saws.

DeWalt, 715 Fountain Ave., Lancaster, Pa. 17604; saws.

Beach Mfg. Co., Post St., Montrose, Pa. 18801; sanders.

you. As you operate it, think about safety. A dangerous machine is an asset to no one. Plan on installing proper guards on every moving part, belt or chain. Also, old blades and cutters may be cracked and dangerous, so inspect them carefully or count on buying new ones.

Check the bearings, which usually will be worn and often are hard to replace. Most machines built before World War II have babbitt bearings, which is fine but lowers resale value. If the bearings are damaged or leak grease or oil, consider whether they can be repaired easily (see *FWW* #38 for an article on how to repair babbitt bearings). If the machine has ball bearings, bring them up to speed to see if they chatter or get hot. Some machines have six large bearings—at $50 apiece for replacements, you're talking about a quick way to spend $300. Some bearing sizes are no longer made, so you might have to enlarge the machine fittings to accept standard-size bearings. Look at the machine's grease fittings (there could be two dozen)—if they're plugged, dry or corroded, you can bet the machine hasn't been serviced regularly.

Some dealers or manufacturers may stock parts for the machine, but don't get your hopes up. Fortunately, old machines are unabashedly low-tech and don't have all that many moving parts, so almost any custom machine shop can make the parts that you need, but you'd be wise to get at least three bids on each job.

Regardless of how good a machine looks, though, if it won't meet your specialized needs, don't buy it. If you're in business, a good used machine should be able to pay for itself in three years or less. But whether you're an amateur or a professional, I think you'll find that these machines are a joy to work with. □

Tom Howell, president of Tennessee Hardwood Company, gives tours daily at his plant, 800 W. Main St., Woodbury, Tenn. 37190. Three-phase power converters are available from Ronk Electrical Industries, 106 E. State St., Nokomis, Ill. 62075; Arco Electric Corp., PO Box 278, Shelbyville, Ind. 46176; and Cedarberg Industries, 5408 Chicago Ave. S, Minneapolis, Minn. 55413.

Used machines and abused buyers

by Chuck Seidel

As one who couldn't make a living as a woodworker, I went to work selling industrial woodworking machinery. Since I've had the benefit of being both buyer and seller, I'd like to offer a few tips for those shopping for used equipment.

First and foremost, let the buyer beware! Every day I visit furniture plants, cabinet shops and other woodworking operations, and it is astonishing how much junk is offered for sale. Less than 10% of what I see is suitable for purchase; the rest is either broken down or worn out, obsolete, or too specialized for most shops.

Although it's unreasonable to expect the average buyer to know as much about machinery as a dealer does, there are some rules of thumb that may save you grief.

Beware of auctions. Auctions may seem like great places for bargains, but they often bring premium prices for equipment (why do you think sellers love to hold them?). Also, unless you can buy large quantities of equipment (without caring too much what kind it is), the time and expense involved in attending the auction—not to mention the cost of transporting the machinery back to your shop—may turn an apparent bargain into an expensive item.

Also remember that many people who attend auctions are canny and experienced buyers who will bid up to a reasonable price and then drop out, leaving novices to bid up to stratospheric levels. Unless you know what you're doing, you can get burned.

Beware of machinery over 15 years old. Though it may be romantic to think "they made 'em better in the old days" and "a good machine is a heavy machine," in reality many old machines are a pain in the neck. The 24-in. vintage planer you "stole" for $1500, and which "needs a little work," may not be such a bargain when you discover that the company went out of business in 1920 and parts haven't been made for years. You may be even more chagrined when you get a $350 bill for transporting that 4,000 lb. of antique cast iron five blocks.

It's wrong to dismiss today's machines as inferior to products of the past. Ask any old hand to compare changing belts on his new Timesavers wide-belt sander with changing the drums on his old Solem. The former is a two-minute job; the latter can mean hours of wrestling chunks of steel and crawling around inside the machine.

By and large, today's industrial machines have superior bearings and motors, are more efficiently designed, and are quieter and safer. They may not be as heavy as their predecessors, but they're heavy enough. A lot of old machines are dinosaurs, and about as efficient.

Ask yourself whether you are in the woodworking business or the machinery-restoration business. You should also question if you can afford to spend a week of production time trying to get a machine going, keeping in mind that the time and money required increase in proportion to the age of the machine.

Know what you are buying. There are thousands of machinery manufacturers, many with product lines decades old. If you're unsure of what you're buying, get the model and serial numbers of the machine and its motor. A call to a local dealer may help you avoid an expensive pitfall.

A case in point is a buyer I heard of who was congratulating himself on finding a wonderfully preserved, vintage 12-in. tablesaw. It looked almost new and sounded great. But when he got it home, he discovered that it had a tilting table and couldn't be adjusted to make a square cut.

Never buy a machine you can't see under power and under load. Look for signs of abuse—if a machine doesn't look good, it probably isn't. Examine the motors and wiring. Few people do this, but this precaution makes sense when you consider, for example, that a new motor for a Unisaw costs more than $600. Older machinery most likely has had its motors replaced, often with motors unsuited to the equipment. Old wiring tends to become brittle and may break or short out, leaving you with an expensive rewiring bill.

The best rule, however, is that no matter what you do, proceed carefully and with circumspection. Believe it or not, the most common machines—tablesaws, jointers and shapers—are the hardest to find, especially if economic conditions are good. When products are selling well, shops want to hang on to every bit of production capacity they have, running these useful tools until they're just about shot. I guarantee that if you walk into the largest, most mechanized furniture factory in the world, you'll find an old tablesaw or two stuck off in a corner somewhere.

If you can't afford to buy new equipment, be prepared to spend some time finding good used machinery. There are bargains out there, but if they were easy to find, they wouldn't be bargains. □

Chuck Seidel is a woodworker and sales representative for a Dallas, Tex., machinery dealer.

Three Tips for Mounting Hardware

Hinging a Jewelry Box

by Sam Bush

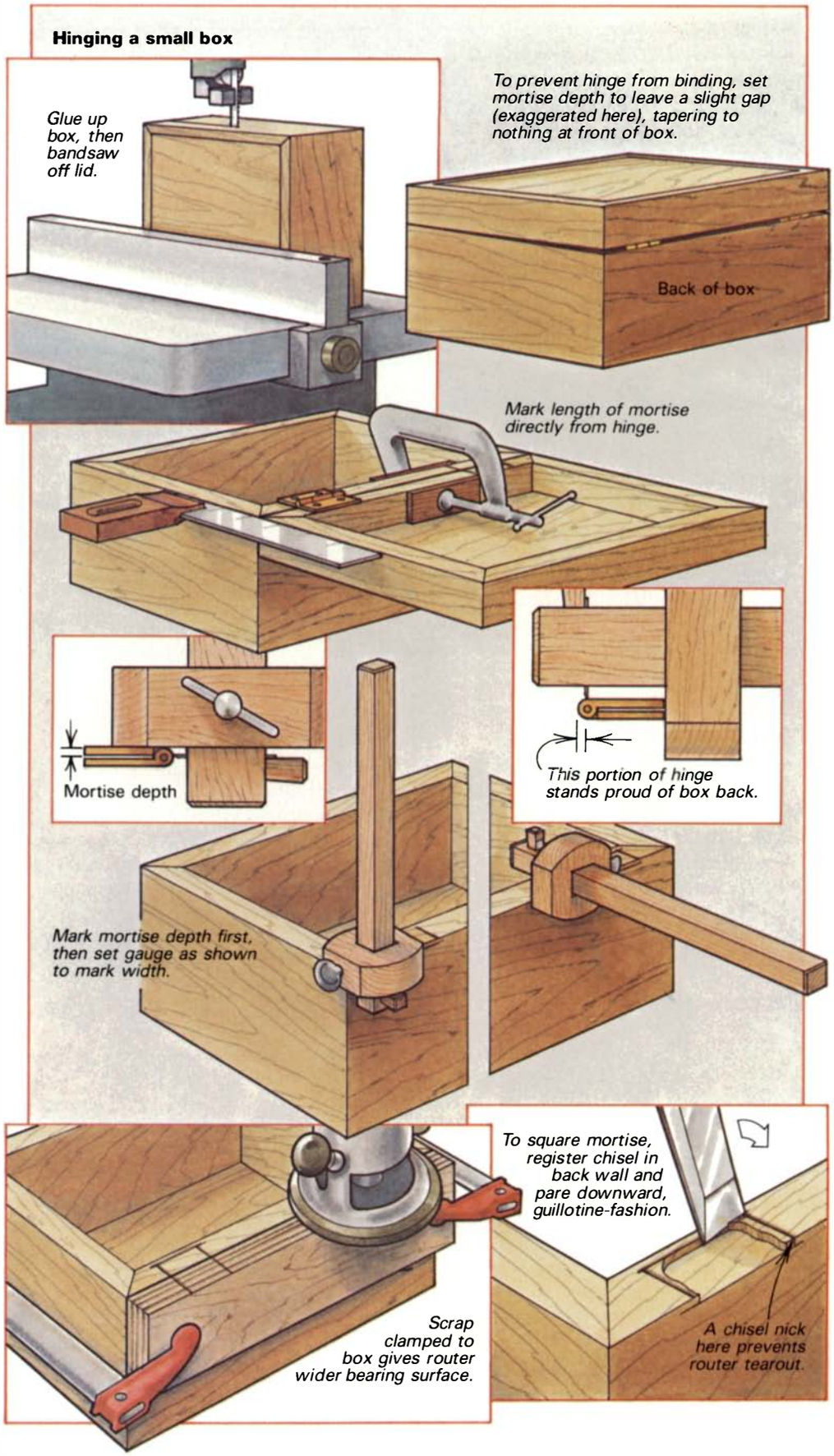
Mounting hinges on a small box can be frustrating. It's exacting work that comes at the end of the project, when you'd like to be done. Here are a few ideas I find helpful for hinging a box of the card-file type, where lid and box must align well.

I prefer using unswaged brass butt hinges because they're attractive and readily available. It's handy if the hinge-leaf width is the same as the box-side thickness, since this avoids having a closed mortise with a fragile back wall. Two hinges are enough for boxes up to 12 in. long; for longer boxes, I might use three.

For high-quality work, mortise the hinge leaves into both the box and the lid. A little off the pace but still okay is to mortise the entire hinge into only the box, screwing the top leaf right to the lid so it stands proud of the surface. Either way, clamp the lid to the box as shown in the drawing so the ends accurately line up, and lay out the hinges by eye, adjusting so they're equidistant from the ends. Now mark the length of the mortises with a knife drawn against the ends of the hinges or by just nicking and then using a square.

If the mortises are to be cut with chisels, lay out the depth and width with the marking gauge set as shown. Depth lines should be inside and out if the mortise is open. Chisel cautiously, with the tool's bevel facing up so that the chisel's flat back will leave a flat mortise. Be careful not to go *too* deep, or you'll end up with bound hinges that spring the lid open at the front.

I prefer to cut the mortises with a mortise bit in a router and clean them up with a chisel. I set the router for depth and its fence for width right from the hinge, then test it on a scrap. If I'm making a double mortise, I cut the scrap in half and close it over the barrel of the hinge to test the



Drawings: David Dann

depth. Single or double, it's the barrel, not the leaf thickness, that governs depth. I make the mortise a touch shallow, which leaves a tiny gap at the back of the box but ensures that the front will close nicely.

When routing the mortises, be sure you're going *in between* the end lines, not off to one side. It's a good idea to nick the grain at the right end of each mortise with a diagonal chisel cut so the exiting router bit doesn't break it out. Generally, the router is well supported by the side and end of the box, but you could clamp on a piece of wood, parallel and straight-edged, to improve the bearing surface, at the expense of some clumsiness and having to reset the router fence. Squaring up the mortise with a chisel is easy if you lay the chisel against the routed back wall and pivot it down into the corners, guillotine-fashion. This cut is with the grain, so not too hard. Make a cut or two on the end knife lines, and the mortises are done.

At this point, the hinges theoretically fit right into the mortises and are ready for screws. Drill tiny lead holes for the screws, or you'll surely twist off a soft brass screw head—an incredible nuisance. The holes should be smaller than the screw diameter and as deep as the screw length. Also, they need to be *on-center,* since the tapered screw-head seating in the tapered hinge hole will otherwise pull the hinge off-location. An accurate center punch is nice for locating lead holes, but I prefer an awl, partly out of stubbornness but also so I can use the hinge's tapered seating to my advantage.

For example, when mounting the hinges on the box, which I do first, I mark the holes a *tiny* bit off-center to the inside to draw the hinge leaf in tight. Then I drill and install the top screws one at a time, closing the box after each one to check the alignment. If things aren't right, I influence the lid toward perfection by *slightly* off-centering the next screw. This is especially helpful on the lid of a single-mortise type box.

If, after all this, there's still an alignment problem, the addition of thin wooden liner strips, projecting only ⅛ in. and rounded at the top, usually solves it and gives nice friction to the closure, too. Why didn't I say this in the beginning? I like this detail so well, I often make boxes with lift-off lids and skip the hinges altogether! □

A longtime instructor, Sam Bush runs a specialty woodwork business in Portland and is head of the Guild of Oregon Woodworkers.

Gauge Speeds Knife-Hinge Installation

by Larry Brusso

I think that knife hinges are the most attractive way to hang a fine cabinet door, and they're appropriate on any well-made piece of furniture, contemporary or traditional. I make straight knife hinges for overlay doors and L-shaped ones for flush doors. Installed properly, they give a door a satisfying, friction-free swing.

Unlike most commercial knife hinges, which have leaves riveted together by the pin, mine separate into two parts. This lets me use a simple gauge to position them precisely. Knife hinges look best if they're mortised into both the cabinet and the door and positioned so the pin is half covered by the door's edge. The pin leaf of the hinge is mortised into the top and bottom of the carcase. It's extremely important to get the pins in the top and bottom in the same plane and in the same relationship to the carcase sides. If you don't, the door on which you lavished so much attention will hang like an old garden gate. I find it inconvenient to cut mortises in an already assembled cabinet, so I clamp up the case dry and use the gauge shown to position the pin leaves. Then I knife their outlines, disassemble the case and chisel the mortises. The case can be glued up with the pin leaves in place.

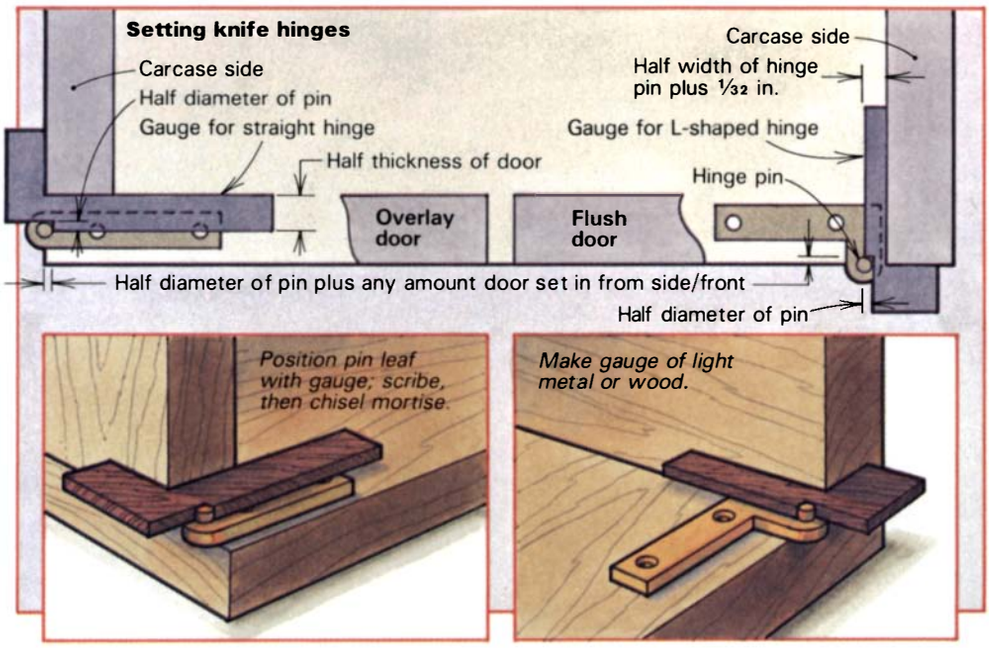
To fit an overlay door once the pin leaves are installed, first trim the door about ⅛ in. shorter than the opening and position it so its hinge edge, with the door in the closed position, butts against the pins. Then mark each pin location on the door's edge by knifing a line on each side of it. Set the bottom door leaf first by lining up its hole with the two knife marks. Position the leaf lengthwise so the hole is half covered by the door's bottom corner, then knife around the leaf and cut its mortise. Install the top door leaf similarly, but position it lengthwise so the hole is slightly less than half covered. That way, you can lengthen the mortise a little at a time until the edge of the door lines up with the edge of the carcase.

To hang the door, screw the bottom door leaf in place, but leave the top one off. Slip the bottom leaf over its pin, holding the door as if it were open. Tilt the door toward you slightly and hold the top door leaf on its pin with your fingertip. Now tilt the door back, carefully sliding the leaf into the mortise. Check the door's alignment and lengthen the mortise as necessary before driving the screws.

The same procedure works for flush doors hung on L-shaped hinges, save for two differences. To mark for the door leaves, you have to snake the door inside the cabinet and position it such that its front edge butts against the pins. And both hinges have to be set correctly on the first try because you can't adjust the mortise length to move an L-shaped hinge. □

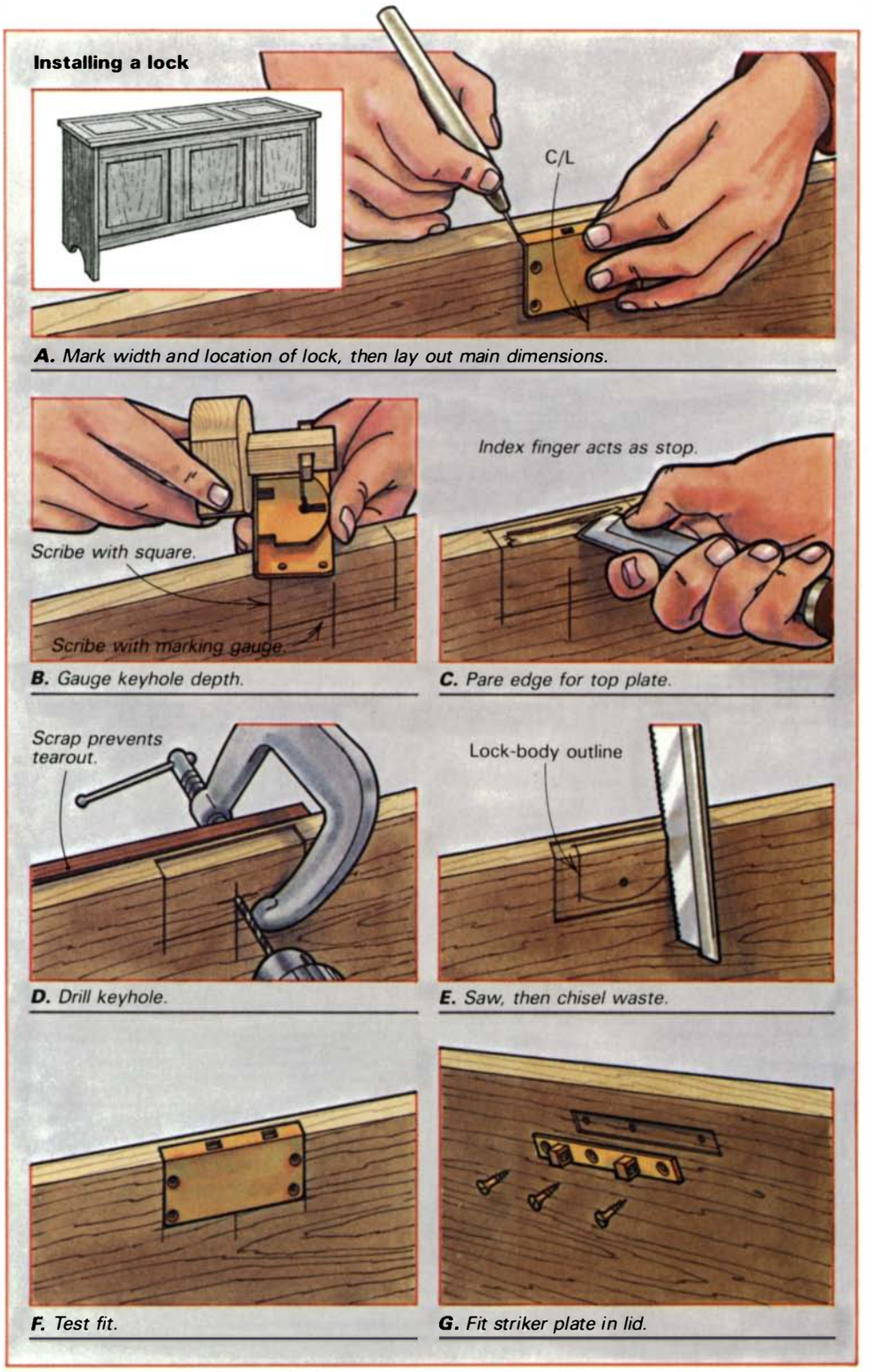
Larry Brusso, of Pontiac, Mich., makes and sells knife hinges. FWW *#41, p. 67, shows how to make knife hinges.*

(continued on next page)



Locking Up a Chest

by Simon Watts



A. *Mark width and location of lock, then lay out main dimensions.*

B. *Gauge keyhole depth.*

C. *Pare edge for top plate.*

D. *Drill keyhole.*

E. *Saw, then chisel waste.*

F. *Test fit.*

G. *Fit striker plate in lid.*

In olden days when chests doubled as strongboxes, a sturdy lock was essential. Some chests were even fitted with multiple locks whose keys were guarded by different people, ensuring that the case could not be opened without witnesses. Although you may not need *quite* that much security, locks are still handy for keeping chests, jewelry boxes and toolboxes from being casually explored. This series of drawings shows how to mark out and set a chest lock.

Begin by marking the centerline of the top front edge of the chest with a pencil. Square this line across, continuing it down the inside face. Place the lock on this centerline and mark the wood on both sides with a knife (**A**). Knife these lines square across the edge and down the inside of the chest. Now set a marking gauge to the width of the top plate of the lock and gauge a line along the upper edge of the chest to show where wood must be removed. Reset the gauge and mark the lower edge of the lock plate on the inside of the chest. Mark also the center of the keyhole by setting a gauge to the vertical distance between the center of the keyhole and the top surface of the lock plate (**B**).

Now deepen the gauge marks with a chisel and pare the waste for the top plate, using your thumb and index finger as a stop to prevent the chisel from slipping and cutting too far (**C**). Drill out the keyhole a fraction bigger than the key, using a wood backing to prevent tearout (**D**). Set a gauge to the thickness of the back plate and scribe a line on the top-plate mortise, then chisel to the scribed line to mortise the back plate.

Mark the outline of the body of the lock with a pencil (no great accuracy is required here since the lock's plates hide this part) and remove the waste with saw and chisel (**E**). Try the lock in place (**F**) and chisel where needed to fit the body so the lock plates are snug in their mortises. If necessary, shape the keyhole with a small rattail file to fit the key. I screw the lock in place, engage the striker plate in it and turn the key to lock it in place. Some plates have projecting tangs that position the striker in the lid when it is gently closed (**G**). If yours doesn't, put the screws in the striker points-up, close the lid and bear down lightly. When you mortise the striker into the lid, leave it a fraction proud so the lid contacts the chest at this point only.

The final step is to attach the pierced brass escutcheon plate. This is either screwed or nailed with escutcheon pins to the face of the chest over the keyhole (some locks have a keyhole-shaped brass insert set into the face). Fit this type of lock only to a chest with a lid that's of frame-and-panel, plywood or veneer construction. Otherwise the wood's seasonal shrinking and swelling will move the striker out of alignment and the lock will fit properly only during the season in which you installed it. □

Simon Watts is a woodworker and author of Building a Houseful of Furniture *(Taunton Press, 1983).*

Marquetry Mystery

A story assembled piece by piece

by Kit Williams

When I was a boy, an old man lived near us who was a marvelous craftsman—among other things, he repaired the Queen's porcelain. He worked in practically medieval fashion and did everything by hand. "Never rely on rulers or measurements," he said. "The most important part of a job is figuring out where to begin. Decide where to put the first piece and fit everything else to it, and you'll never go wrong." I've followed his advice to this day, and it helped inspire the marquetry panels and paintings shown here, which illustrate my second book.

In my first book, *Masquerade,* the clues to the location of a jewel-encrusted hare buried somewhere in England were hidden in the book's story and paintings. Whoever put the clues together and found the hare kept it. The response was overwhelming. Not only did people try to solve the mystery, they sent me all kinds of things the book inspired them to make—I got *Masquerade* woodcarvings, jigsaw puzzles, poems, riddles, jewelry and much more. People seemed to be bursting with creativity, but needed an excuse to let it out. This gave me the idea for a second book, the title of which is hidden in its story, paintings and marquetry.

All you have to do is discover the title, then express it without using the written word—knit it, bake it, make it of wood, whatever. It's a simple title and hundreds have already gotten it right. The winning entry will be the one that delights me most. The winner will receive a mahogany box

This is the lid of the prize box Kit Williams made to contain the only titled copy of his new book. A secret compartment beneath the jeweled queen bee reveals the title.

Brown oak and mahogany background veneers frame this painting. The sections making up the bee abdomens are sand-shaded.

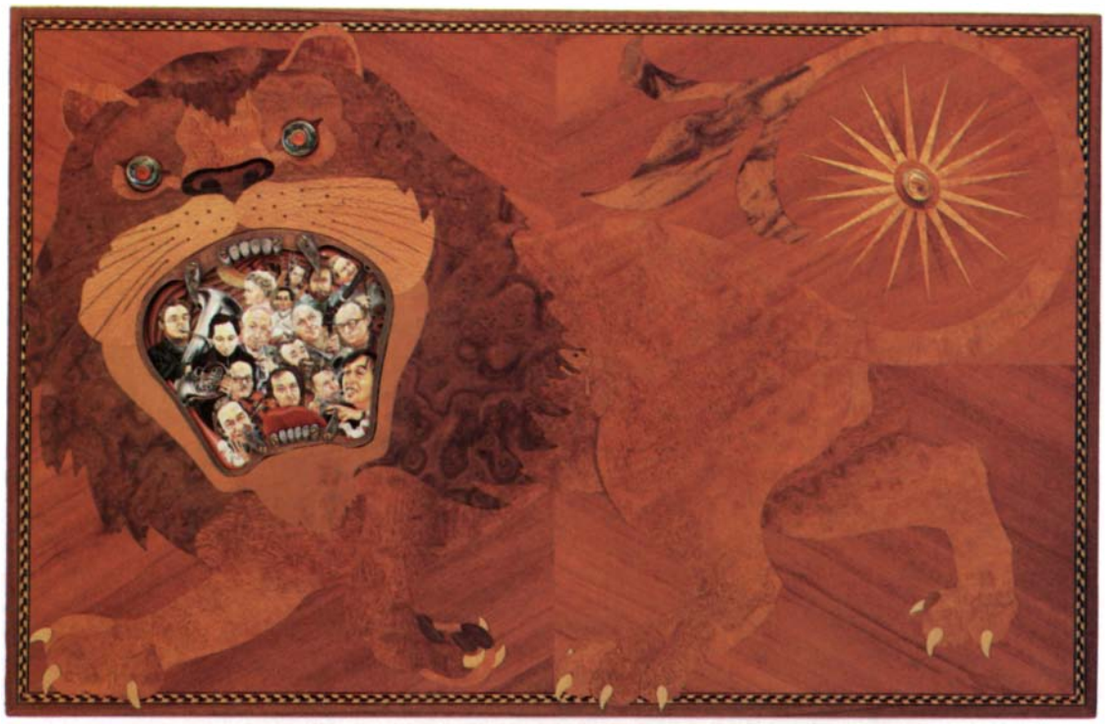
containing the only titled copy of the book. The lid, shown on p. 55, contains a secret compartment that reveals the book's title when opened. I plan to hold an exhibition to show off all the other entries, and to publish a book of the nicest ones, many of which will be better than the prize, I'm sure.

I started doing marquetry about 15 years ago in order to frame some unusually shaped paintings. The joinery required was beyond me; marquetry, where the shape could be cut out of plywood and the veneer laid on, seemed an ideal solution. I also liked the idea of extending the painting onto the frame. I had no idea how to begin, so I bought a marquetry picture kit, discarded its picture pattern and used the veneer to make the design I wanted. I was pleased with the result, and have been doing marquetry frames ever since. I usually do the painting first, then make the frame. The story for the book developed as I did the painting and framing.

The technique I use differs from traditional marquetry, where the veneers are fretsawn according to a pattern, taped together to form the picture and laid as a sheet. This seemed too rigid to me. I want the lines to flow readily and the feeling to be more spontaneous than seems possible with a fretsaw. So I glue background veneers to a sheet of ½-in. marine plywood, using Cascamite (urea formaldehyde) glue and a small veneer press. Then I inlay the smaller pieces of the picture into the background with acetone glue (the type sold for sticking model airplanes together), which sets up quickly enough to be pressed with just a finger. My method is similar to intarsia, where pieces are inlaid into a solid-wood background, but it allows me to use various backgrounds in one picture and to avoid time-consuming excavations for the inlay.

I inlay figures like the bees on the facing page piece by piece, rather than cutting out the whole bee and pressing it into place. Excavating for the small inlays is easy. Position a piece, such as a bee head, on the background and trace around it with a surgeon's scalpel. Then score the area to be removed, push the tip of the scalpel under the scored bits and pop them out. The glue under the bits adheres to the plywood, so the inlay and thin coating of acetone glue will be even with the background. Then cut out and inlay the next piece, perhaps the bee thorax or eye, and so on.

The natural colors of the wood seem a perfect complement to the subjects of my paintings, so I don't color the woods as many traditional marquetarians do. Sometimes I'll sand-shade pieces, like the abdomens of the bees. The paintings, which are done on linen or Egyptian cotton and mounted on marine ply, rest in rabbets so they're about ⅛ in. beneath the surface of the marquetry frame. The edges of the opening are veneered, too, so you won't see the ragged plywood next to the painting. □



Williams' marquetry lion has swallowed the members of the London Symphony Orchestra.

Williams often extends a painting into the marquetry frame. Here, mahogany strips outline the bird's-eye maple background veneer. The raven is made of various woods, including rosewood, walnut and walnut burl. Williams laid the background first, trimmed it with a surgeon's scalpel guided by a metal straightedge, then added the strips and the raven.

Kit Williams' book is published by Alfred A. Knopf, 201 East 50th St., New York, N.Y. 10022, and is priced at $10.95.

Tubular Table

A router makes the legs round

by Patrick Warner

I've always liked the light and airy configurations of steel tubing in contemporary stools, tables and chairs, but I prefer the look and feel of wood. Using simple joinery and a router, I combined the best of both worlds and came up with the end table shown here.

The construction is straightforward. The end frames are assembled, doweled, then routed round. I used rectangular stock so that after routing, the vertical pieces would appear to bend into the horizontal ones. If you're not interested in this illusion, you can start with square-section stock, and eliminate the rabbeting step (**4**) shown in the drawing. I aligned the end-frame pieces with a routed glue joint for gluing up (**1**), then bored and drove in the dowels after the glue had set (**2**). A simple dowel joint would work just as well; the glue joint alone won't. (I also used the routed glue joint in the top because I like the way it looks. By gluing strips of dark wood on the edges before milling, I made the decorative joint you see in the photo.)

The corner joints are vulnerable to racking stresses in light end frames like these, so I added stretchers to strengthen them. The stretchers can be located almost anywhere along the legs, but bore the relief holes and mortises for the stretchers before rounding the end frames (**3**). Holes for the screws that attach the end frames to the top should be counterbored and oversized to allow the top to expand and contract with humidity changes. Bore these holes before rounding, too. I made the top overhang the base so the screws would be well clear of the rounded edges.

After gluing, doweling and mortising the end frames, plane their faces flush. Then rout the inside surfaces as shown in the drawing (**4**). The piloted rabbet cutter establishes the curve that makes the frame appear to bend around the corners. The straight cutter follows, bearing on the rabbet to clear the rest of the waste.

Curve the outside of each corner by a similar method, but pilot the first cut against a template (**5**). The cutter I use is a TA 170 overhead flush-bearing carbide trimmer, which is sold for $13.50 by OCEMCO, 1232 51st Ave., Oakland, Calif. 94601. The template shown (which can be made of Masonite or plywood) produces an outside curve concentric with the inside one, but you can use whatever curve appeals to you. After the corners have been routed, each frame will be square in section. Figures **6** and **7** show how to round the frames with a flush-piloted, ⅝-in. radius rounding-over bit. When routing the straight sections, be careful around the screw holes and mortises—if the bearing slips into the holes, the piece will be ruined.

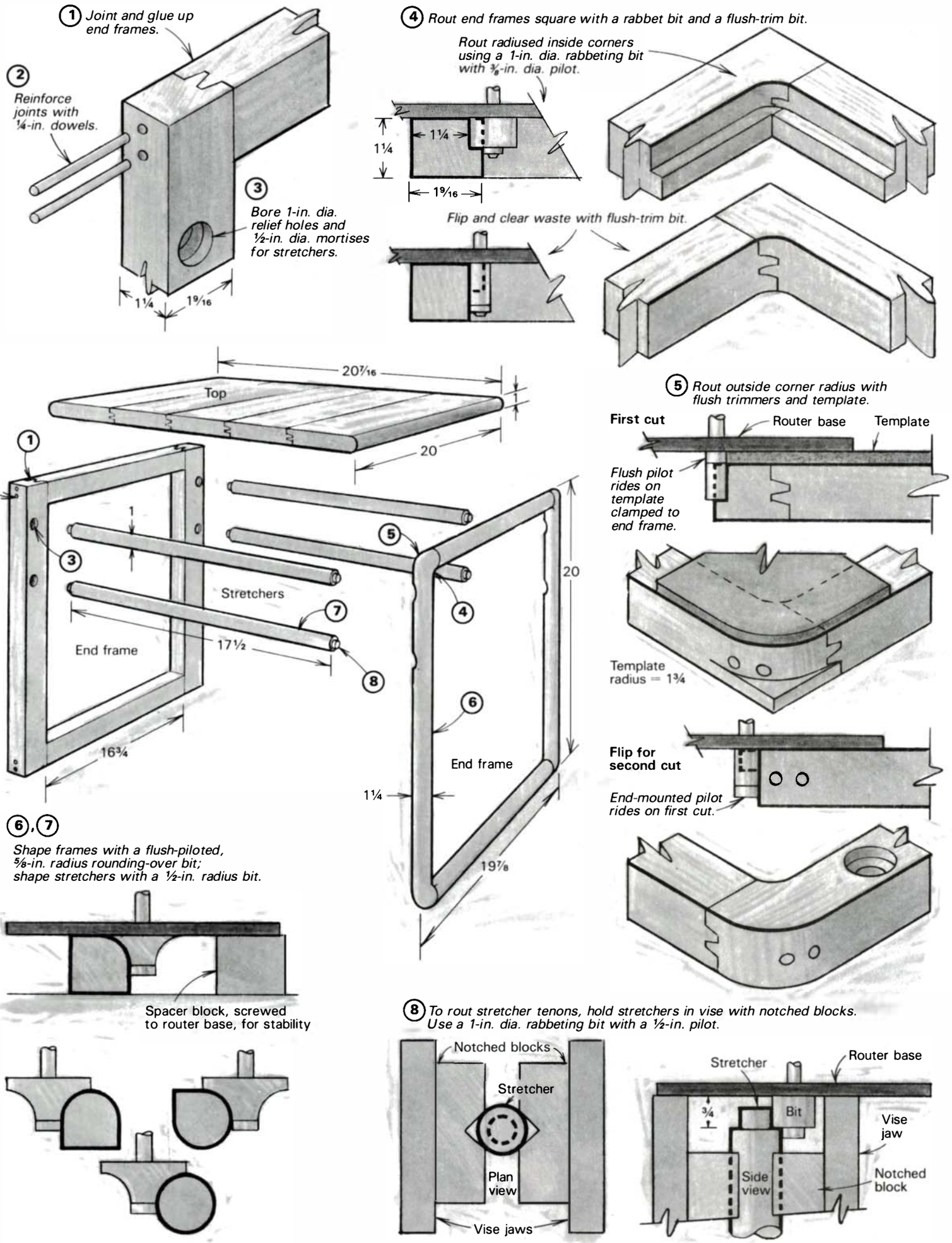
Round the stretchers from 1-in. square stock with a flush-piloted, ½-in. radius rounding-over bit. Cut the stock at least 5 in. longer than needed to give you an end to hold or clamp while routing. I routed the tenons using a rabbet bit with an end-mounted pilot (**8**).

I like a Watco Natural oil finish, wet-sanded during oiling with 400- to 600-grit wet-or-dry sandpaper. I follow this up with a light coat of wax four or five days later when the oil has stopped bleeding. □

The tubular legs of this white oak table were routed round after assembly.

Photo: Ernie Cowan and Scott Campbell

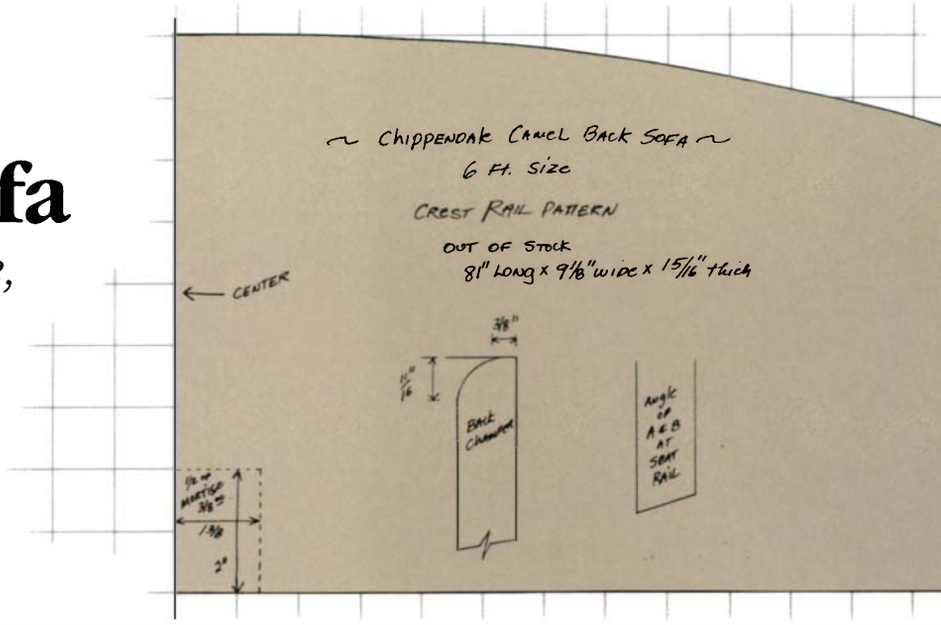
Patrick Warner is a designer/furniture-maker in Escondido, Calif.


1 Joint and glue up end frames.
2 Reinforce joints with ¼-in. dowels.
3 Bore 1-in. dia. relief holes and ½-in. dia. mortises for stretchers.
1¼
1⁹⁄₁₆
4 Rout end frames square with a rabbet bit and a flush-trim bit.
Rout radiused inside corners using a 1-in. dia. rabbeting bit with ⅜-in. dia. pilot.
1¼
1¼
1⁹⁄₁₆
Flip and clear waste with flush-trim bit.
20⁷⁄₁₆
Top
1
20
1
2
3
Stretchers
End frame
17½
5
4
6
7
8
20
End frame
16¾
1¼
19⅞
6, 7
Shape frames with a flush-piloted, ⅝-in. radius rounding-over bit; shape stretchers with a ½-in. radius bit.
Spacer block, screwed to router base, for stability
5 Rout outside corner radius with flush trimmers and template.
First cut
Router base
Template
Flush pilot rides on template clamped to end frame.
Template radius = 1¾
Flip for second cut
End-mounted pilot rides on first cut.
8 To rout stretcher tenons, hold stretchers in vise with notched blocks. Use a 1-in. dia. rabbeting bit with a ½-in. pilot.
Notched blocks
Stretcher
Plan view
Vise jaws
Stretcher
Router base
¾
Bit
Vise jaw
Side view
Notched block

Chippendale Sofa

Templates for the basic frame, and some design options

by Norman L. Vandal



Any professional woodworker has to keep an eye on the market. Over the years I've earned a living making things that simply weren't available anywhere else, everything from period architectural components to period planes for restorers who wanted to stick their own moldings.

Many of my furniture customers come to me because of the double jeopardy of buying antiques: originals are not only very high in price, they may also be in very poor condition. In January 1983, for instance, a Philadelphia camelback sofa sold at Christie's, New York, for the record price of $264,000, even though it had some serious problems—amputated leg bottoms had been pieced in, the rear legs had been cut off and refastened, and the stretchers had been replaced. Keeping all this in mind, I thought it a good idea to add a camelback sofa to my designs.

I wanted to stay faithful to the lines and solid joinery of the originals, so I studied Chippendale sofas in museums and period-furniture books. Surprisingly, my best source turned out to be copies of *The Magazine Antiques*. Dealers like to sell furniture stripped of its upholstery to ensure buyers that it's original, and many of the ads showed the entire frame and the joinery. I saw that period cabinetmakers varied the shape of the legs, front seat rail and crest rail without changing the shape of the basic frame much. I figured that I could do the same for my customers, and build a good frame to sell for a little over a thousand dollars, which compares favorably in price with factory "reproductions," and, in my opinion, greatly surpasses them in quality.

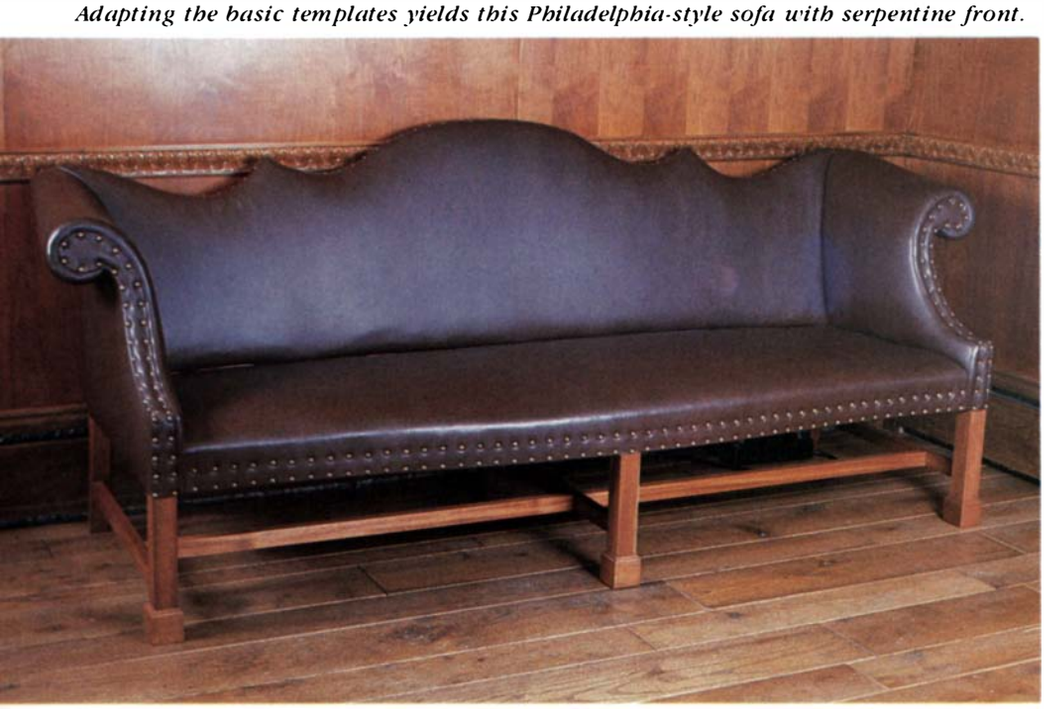
Templates and variations—Joinery details are shown on the facing page. Sofas are not as difficult to make as they may look. Unlike upholstered chair seats, which are always trapezoidal, sofa seats are rectangular. Thus a measured drawing of the frame's end view shows many parts in true dimension. With these parts as a starting point, I worked out a reliable set of templates, shown throughout this article, for the angled parts. The templates take care of the tricky problems, ensuring that everything will go together and stand square.

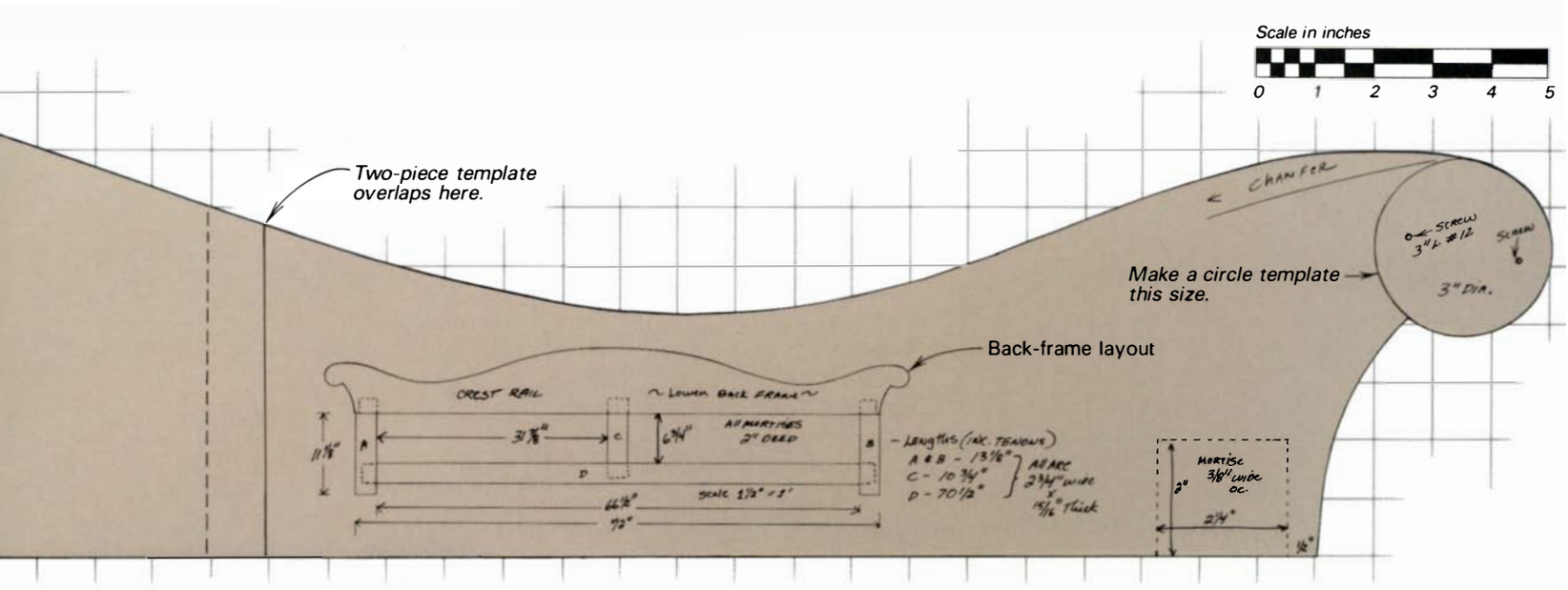
When building a sofa, you first make the end frames, which include the legs, end rails and side stretchers. Then you connect these with the seat rails, center and frame stretchers, and back frame, and finally you add the arms. In period sofas, there are variations in the arm roll and its supports, and I selected the system I felt worked best. The templates given here are for a New England style sofa with Marlborough legs, which can be blocked or left plain. Straight-leg sofas were the most numerous, exemplifying the Chinese influence in the Chippendale style. Yet the molded leg and the cabriole leg shown on p. 65 work just as well. For the Philadelphia look, as shown at left, the variations are simple: Marlborough legs, peaks on each side of the crest, and a serpentine front seat rail. You'll also find templates for the crest rail, vertical arm supports, and upholsterers' bar (the upright member underneath the arm at the back—it gives the upholsterer a surface around which to pull and tack the material).

Scale up the templates to full size, either by following the grid lines or by photo-enlarging them. I made the templates from heavy cardboard so I could cut them out and trace the parts directly from them. As you can see in the drawings, on my templates I've carefully laid out mortise and tenon dimensions and other useful information.

You don't need templates for the front and rear seat rails—just mark them out

Adapting the basic templates yields this Philadelphia-style sofa with serpentine front.

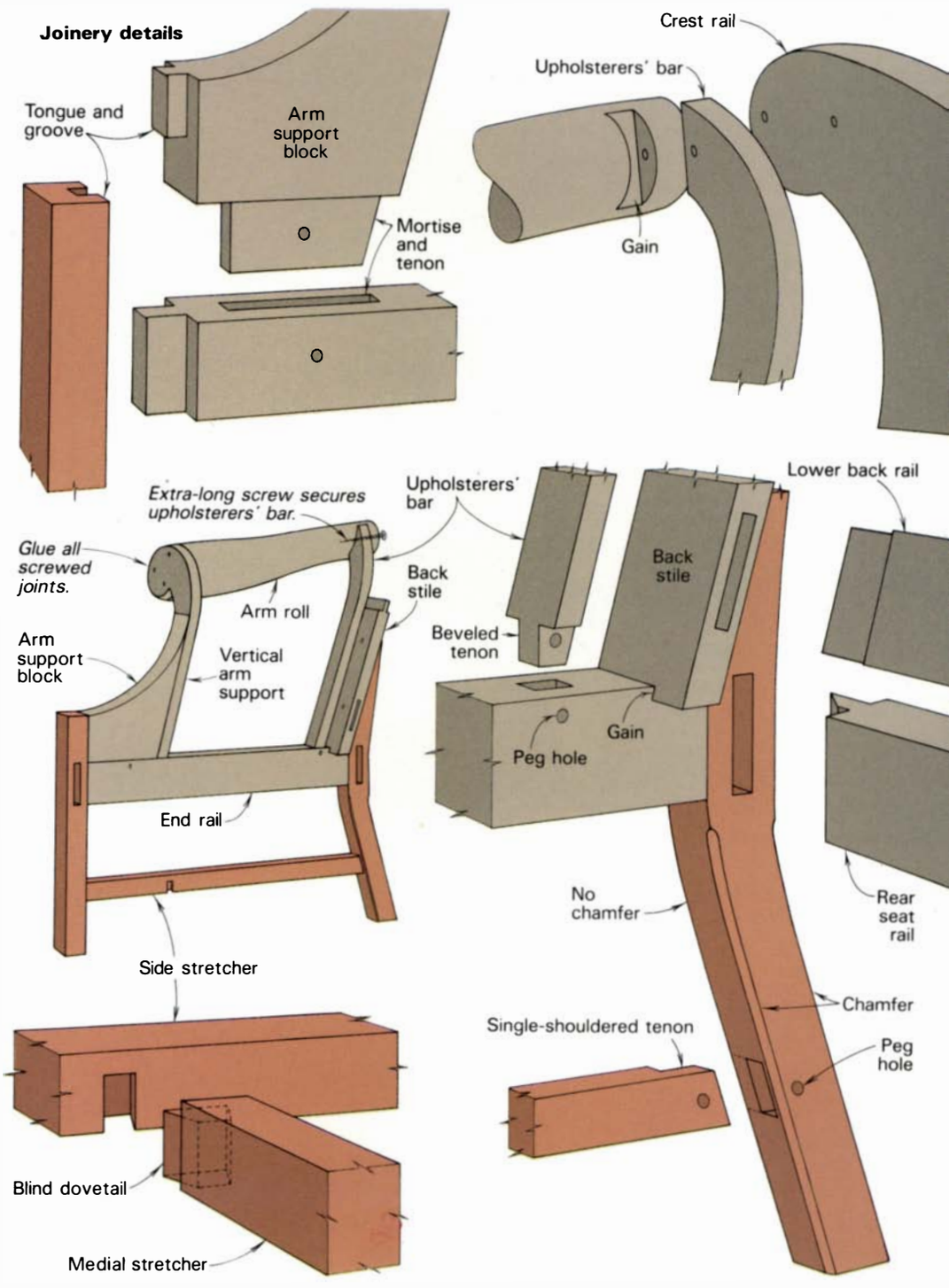




directly on the stock. (If you plan a serpentine front seat rail, of course, you'll have to work out a full-scale top-view template for the curve.) The center legs, front and back, fall exactly in the middle of the rails. As shown in the photo on p. 63, the front seat rail is one piece; the rear seat rail is two pieces, each tenoned into the back center leg, which needs to be full length to support the center of the back. In addition to the low stretcher between the center legs, an upper stretcher prevents the frame itself from spreading. This frame stretcher (which will be hidden by the upholstery) is tenoned off-center into the seat rails, so as not to weaken the legs. Locate it toward the bottom of the rails, where it will not interfere with the setting of upholstery springs. Original sofas didn't have springs, just webbing, but your upholsterer may suggest that the modern method is better. For more on upholstery and whether to agree with your upholsterer or not, see p. 64.

The tenons on the side stretchers have only one shoulder, at the outside. I make the center stretcher the same way, and offset the mortises in the center legs so the stretcher will be centered.

Materials—Most of the frame will be hidden by upholstery, and period cabinetmakers knew this full well. Legs, which showed, were top-grade wood. Mahogany predominated in Philadelphia; cherry was peculiar to Connecticut. Walnut was used in high-style pieces from all areas, and you'll find that the finest sofas, with formal Marlborough legs or ball-and-claw feet, are always mahogany or walnut. But secondary woods are another matter. I've seen seat frames made of maple and oak, and even chestnut in some New England examples. The back frames are usually of a softer wood, sometimes pine, although yellow-poplar or basswood holds the



Drawing: Karen Pease

tacking better. If you can find it, soft maple is an excellent wood for the frame. Whatever you use, test some scraps, and avoid any wood you can't easily drive a tack into, or one that won't hold it well.

Arm rolls are always a soft wood, and pine or poplar is suitable. The vertical arm supports should be hardwood, but avoid woods such as oak or ash because they may split when the upholstery is tacked on. Curly maple would be my first choice here (somebody once suggested plywood, but it doesn't hold upholstery tacks well).

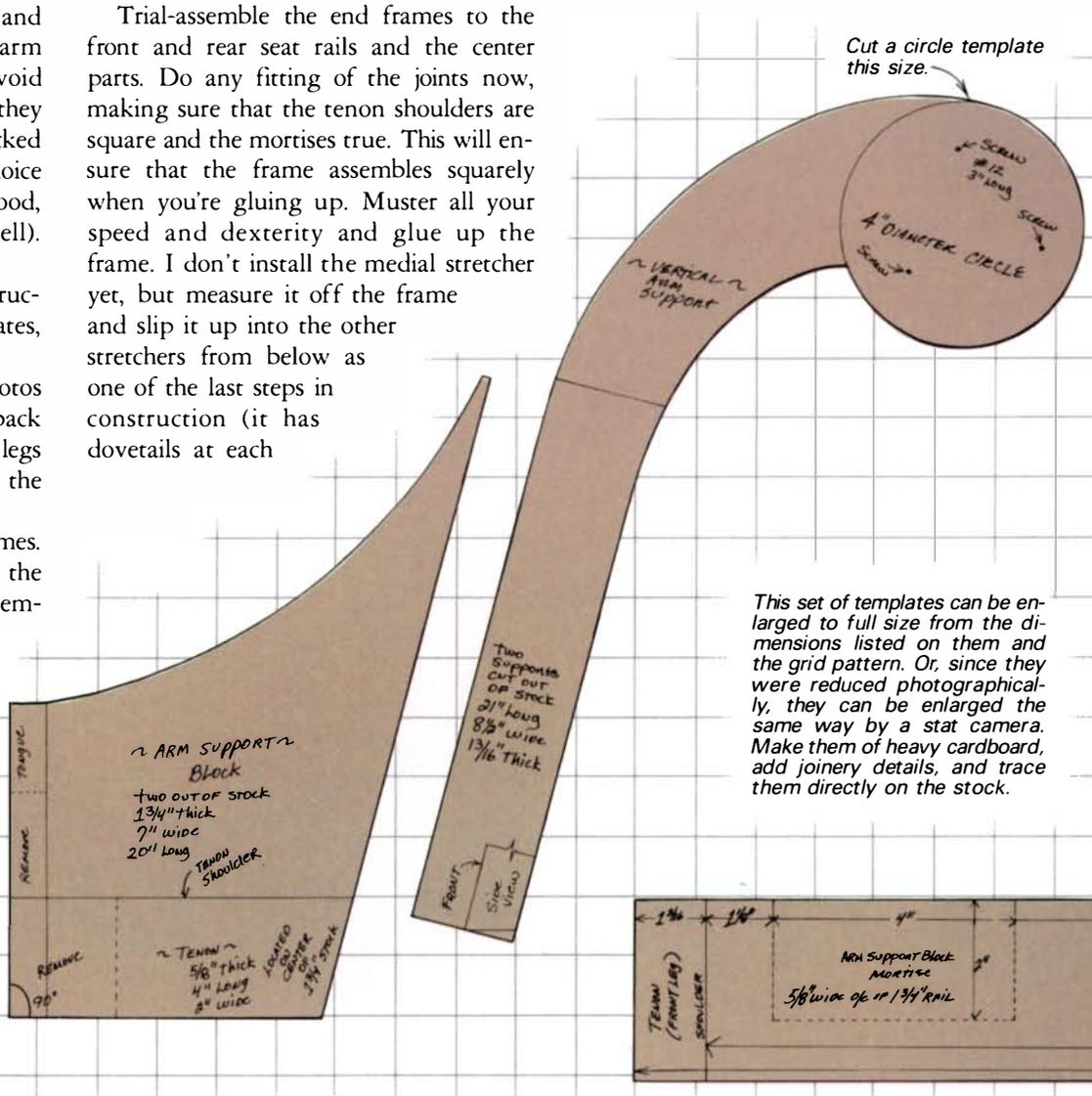
Construction—Many of my construction notes are shown on the templates, but here are some additional hints.

The tablesaw jigs shown in the photos below will help when cutting the back legs to shape. They ensure that the legs will match each other exactly and that the straight sections will be true.

Begin construction with the end frames. Before test-assembling them, cut all the joints shown on the end-rail and leg templates, and shape the legs and side stretchers. Then permanently assemble the end frames. The arm rolls, their support blocks and the vertical uprights will all be added later. Secure the tenons with pegs.

Trial-assemble the end frames to the front and rear seat rails and the center parts. Do any fitting of the joints now, making sure that the tenon shoulders are square and the mortises true. This will ensure that the frame assembles squarely when you're gluing up. Muster all your speed and dexterity and glue up the frame. I don't install the medial stretcher yet, but measure it off the frame and slip it up into the other stretchers from below as one of the last steps in construction (it has dovetails at each

Stock sizes and joinery details are shown on most templates. Sizes for straight pieces are listed in table at lower left corner of page.



This set of templates can be enlarged to full size from the dimensions listed on them and the grid pattern. Or, since they were reduced photographically, they can be enlarged the same way by a stat camera. Make them of heavy cardboard, add joinery details, and trace them directly on the stock.

Other dimensions:

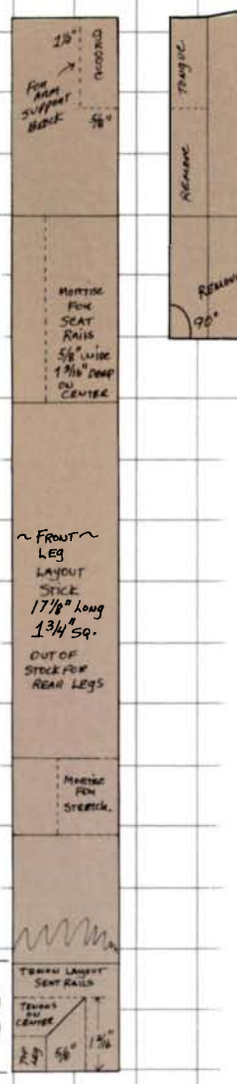
Rear seat rails: stock, 35 7/16 x 3 x 1 3/4; 33 3/8, shoulder-to-shoulder; tenons, 7/8 long at center leg (butt), 1 3/16 long at end legs (mitered).

Front seat rail: stock, 71 1/8 x 3 x 1 3/4; 68 1/2, shoulder-to-shoulder; tenons, 1 3/16 long (mitered); center-leg mortise, 1 3/4 long, 5/8 wide (through, centered).

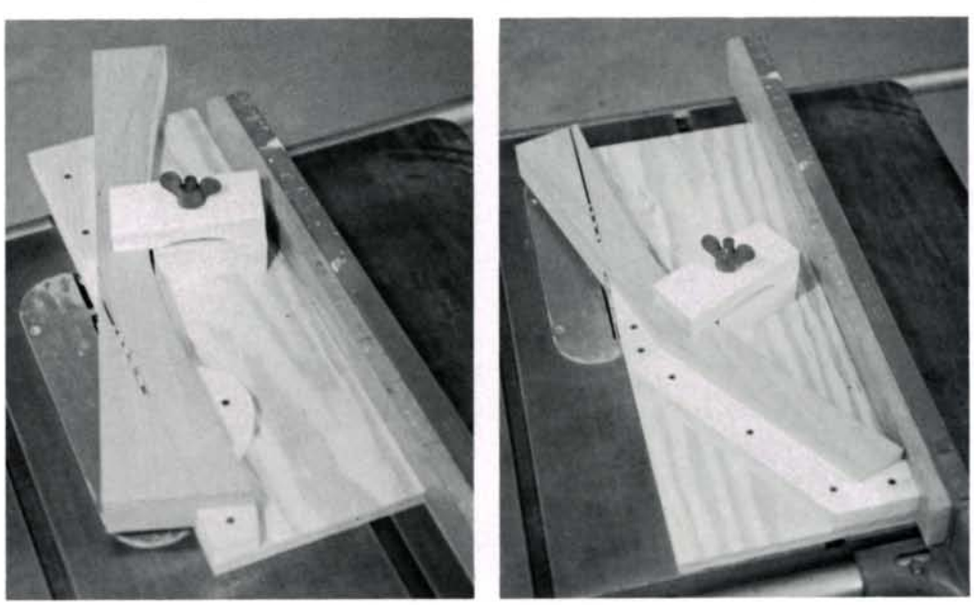
Center and side stretchers: stock, 24 13/16 x 1 1/4 x 15/16; 22 13/16, from shoulder to long point of rear shoulder.

Medial stretcher: stock, 72 x 1 1/4 x 15/16; scribe to fit.

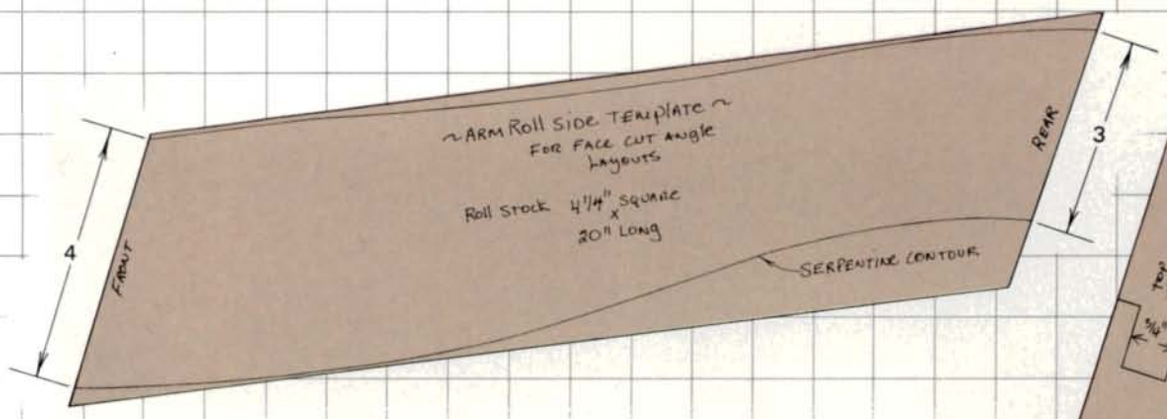
Frame stretcher: stock, 24 x 1 3/4 x 1 1/2; scribe to fit during trial assembly.



Leg template also shows top of leg and mortises.

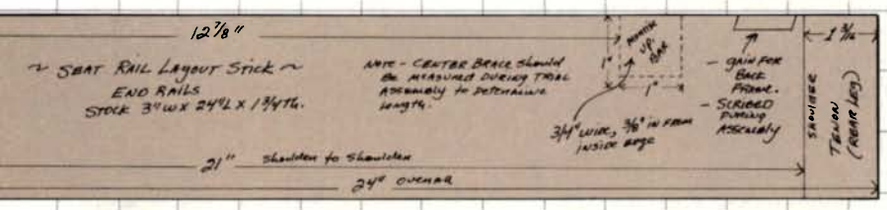


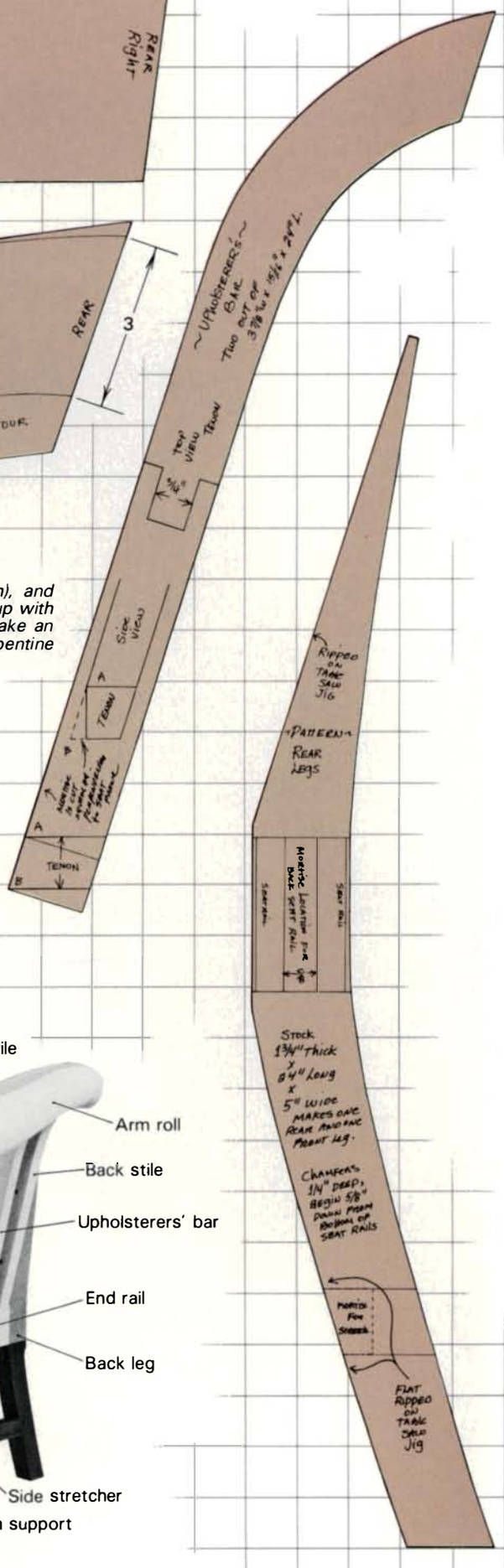
Tablesaw jigs position each rear leg exactly the same, ensuring that the frame will stand square.

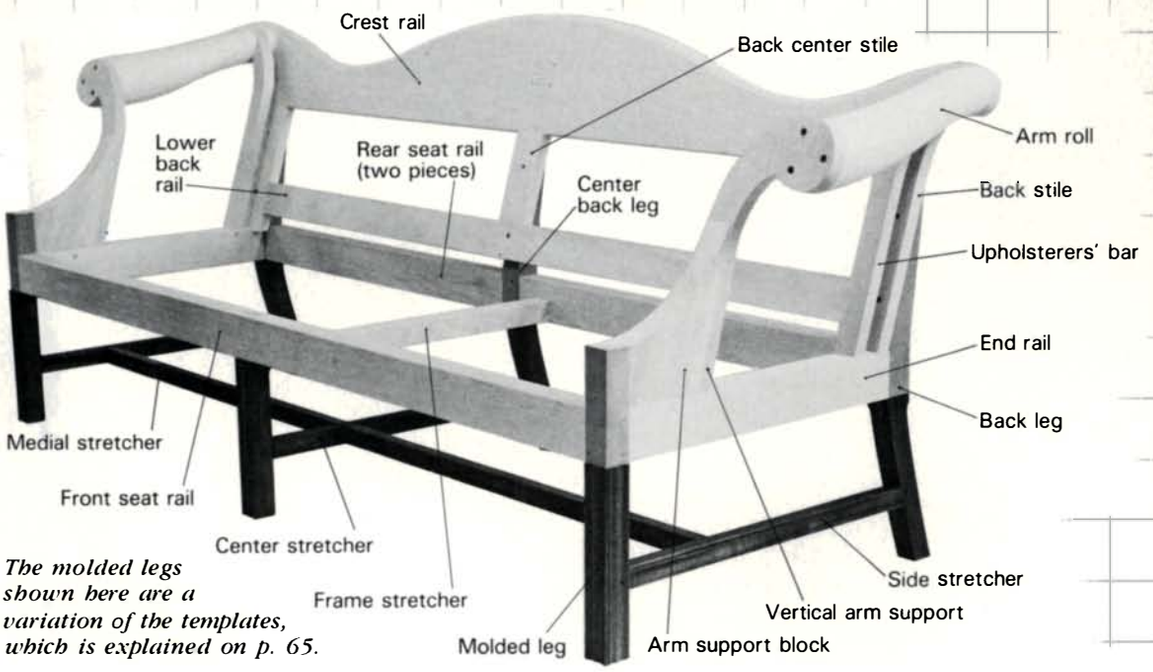


Laminate arm-roll stock from 8/4 and 4/4 lumber, then trace the above templates to lay out the compound end angles. Lay the top-view template on the laminated block, trace it (and its mirror image on the other arm), and then trace the side view to line up with the corners of the top view. Make an additional template for the serpentine side curves.

Before assembly, cut joints as shown on templates, except where noted.







The molded legs shown here are a variation of the templates, which is explained on p. 65.

end and a lap joint in the middle). Next make the back frame—the specifics are shown on the crest-rail template. I prefer a single board for the crest rail, as on the originals, but you could glue it up. Size the materials, cut the joints, test-assemble, then glue the frame together. Peg the joints and cut the crest profile with a saber saw.

Glue the back frame to the leg uprights, and, when dry, fasten it securely with #10 or #12 wood screws, driven through the softer wood into the hardwood legs. (Period cabinetmakers usually used clinched nails, and for this reason the legs on many of the original frames have split.)

With this much of the frame assembled, you can go on to the front arm supports, which consist of a curved vertical upright and a support block. I first cut the support block's straight edges, either with the tablesaw leg jig or with the saw's miter gauge. The block's joints into the leg post and the end rail are critical: a tongue-and-groove at the front leg allows you to slide the block down until its tenon fits in the end-rail mortise. If these joints are not precise, the arm will soon fail. I cut the tenon and the tongue on the tablesaw with the rip fence as a guide, sawing them in length and thickness to fit. Then I bandsaw the block's top curve.

Bandsaw the curved uprights and bevel the bottom edges so they set flat on the end rails. Glue and screw the uprights to the blocks, then fasten the assembled units to the frame with glue and pegs.

For the arm rolls, I always use clear pine, laminated from two pieces of 8/4 stock and one piece of 4/4. Period cabinetmakers used solid pine blocks, but nowadays these are hard to get. The arms meet their supports at compound angles,

Getting a frame upholstered

by Bob McCarthy

First, the bad news: a good upholstery job can cost as much as $1500, and you may have trouble finding a shop that will do it right. Now the good news: if the job is done right—and I'll tell you how to be sure that it is—it will easily last 15 years.

The period sofa: Upholstery and woodworking have both changed a lot since 1780. A true reproduction sofa frame would not have screws, modern glues or upholsterers' bars. There wouldn't be a machine mark anywhere, nor any trace of sandpaper. And a period upholstery job would have no springs or cushion, and would be stuffed with Spanish moss or horsehair. To most people, such a sofa would be very uncomfortable.

Yet modern upholstery methods can recreate the period look—taut, crisp lines—and provide comfort at the same time. As you read on, keep the following basics in mind: A Chippendale camelback sofa should be padded very tightly and never overstuffed. The back should not be padded too thickly or it will push the occupant forward. The seat should slope slightly from front to rear to hold a cushion, if used, in place. Do not allow staples anywhere; someday your sofa will be reupholstered, and staples are difficult to remove without breaking them, which leaves razor-sharp studs sticking up.

Finding the right shop: Many shops specialize in reupholstering and are not qualified to tackle a bare frame, but any large city probably has a shop that can do your job right. Ask a nearby museum for recommendations, check with interior decorators, and keep looking.

Request a list of references from the shop, then take the time to go and look at some of their work. A good shop will cooperate with you in making your sofa what it should be—they will allow you to specify materials and methods, and will put the agreement in writing.

Springs: Springs weren't used in upholstery until the mid 19th century, but they lend support critical to appearance and comfort. Well-tied springs should last for years; webbing alone simply will not, which is why I recommend springs even though they aren't authentic. For the seat, I would insist on coil springs, hand-sewn to the webbing and hand-tied together. For the back, I'd ask for Marshall spring units (light, muslin-covered springs).

Padding: Instead of horsehair, cotton batting commonly is used today. Period materials are hard to acquire, will increase your costs, and won't show anyway. Make certain that muslin is used to hold all padding in place.

Seats: If you want a traditional fabric, you should specify a tight seat, which means one with no cushion. This will look best, and avoids the problem of a cushion that won't stay put, but of course it wears faster. If you want a contemporary fabric, then a single thin cushion wouldn't look bad. The cushion's box (the distance between the edge pipings) should be no more than 3 in. Cover the cushion on both sides so it can be flipped over. Zippers on the back prevent you from flipping it four ways, but are hard to talk upholsterers out of. Use down filling if you can afford it.

Fabric: A 6-ft. camelback sofa with a cushion requires 10 yards of 52-in. wide fabric. A material without a pattern can be "railroaded," that is, run horizontally, thus saving some material.

Documentation for period fabrics can be found in old advertisements and, sometimes, from remnants uncovered during reupholstery. Period fabrics are readily available, and I've listed a few of the best suppliers here. If you have a business letterhead, try to get wholesale prices. Still, be prepared to spend $20 to $50 a yard. It's poor economy to save on fabric or its support, as these are the most obvious features of a piece. Damasks were popular on period sofas (a damask is a woven-pattern material, usually with floral motifs, whose design is accentuated by alternating glossy and dull surfaces). Period damasks were wool or silk. Many fine reproduction damasks are available today, in wool, silk or synthetic blends. Another good fabric choice would be wool moreen, a heavy fabric of a solid color embellished with a subtle embossed design. If you're fortunate, you may even find a decorator with some leftover fabric (designers often buy excess material as insurance against running short of a particular dye lot). I've bought such bolt-ends for a quarter of their normal price.

Have the upholsterer pad the rolls slightly to accentuate crisp curves. Ideas for piping, decorative brass tacking and other traditional variations can be seen in antiques books and museums.

If all attempts at locating a qualified local upholsterer fail, do not despair. Learning upholstery is not all that difficult. There are many books on the subject in libraries and bookstores. Few tools are required—mostly patience.

Sources: For traditional fabrics, try Colonial Williamsburg, Box CH, Williamsburg, Va. 23187; Historic Charleston Reproductions, 105 Broad St., Charleston, S.C. 29401; Brunschwig & Fils, Inc., 410 East 62nd St., New York, N.Y. 10021; Cowtan & Tout (chintzes), D&D Building, 979 Third Ave., New York, N.Y. 10022; and Stroheim & Romann, 155 East 56th St., New York, N.Y. 10022. For contemporary fabrics, contact Gretchen Bellinger Inc., 330 East 59th St., New York, N.Y. 10022; and Hasi Hester, 138 South Robertson Blvd., Los Angeles, Calif. 90048. □

Bob McCarthy upholsters period pieces and teaches adult-education courses on the subject. He lives in Columbia, S.C.

both front and back. It's best to cut these angles before shaping the arms. Trace the angles from the side-view and top-view templates on the blanks, taking care that the left and right arms will be mirror images, then cut the angles. You could set up a bandsaw for these cuts, but I find a fine-toothed handsaw easier.

Test-fit the blanks, truing up their ends with a low-angle block plane if necessary. With the blanks in place, trace the circles of the crest rail and the arm supports on their ends as far as you can reach with a pencil. Then remove the blanks and use the two circle templates to complete the end shapes. Bandsaw as much waste as possible, then carve the rolls to shape. I use a drawknife, spokeshave, carving tools and planes.

Preparing for upholstery—On period frames, fabric was tacked directly on the part of the frame it was covering. Most modern upholsterers prefer to pull their material through narrow openings in the frame and tack it down on the back side. On our sofa, the lower back rail is higher than the seat rail, and provides such an opening there. The upholsterers' bar shown on p. 61 provides another opening at the junction of the sides and back frame. Although these bars aren't authentic, they add strength, and a frame with bars *is* easier to upholster.

The bar fits into a gain in the arm, also shown on p. 61. Fair the edges of the bar to the shape of the arm and ease them so as not to strain the fabric. Then relieve all the other sharp milled edges of the frame with a file so the fabric will lie over them smoothly.

The top edge of the crest rail should be rounded toward the front of the sofa. I scribe a line ¾ in. down the face, then round over the edge to this line with a drawknife and spokeshave. Don't bring the top back edge to a sharp point.

After finishing the legs, I seal the entire frame with a coating of two parts boiled linseed oil and one part turpentine. This helps keep dimensional stability, and it also improves the frame's appearance. One of my customers, upon receiving his completed frame, liked the look of it so much that he put off the upholstery job for six months. People like that make the extra touches worthwhile. □

Norm Vandal makes period furniture in Roxbury, Vt. He explained how he makes period molding planes in FWW *#37. Black-and-white photos by the author.*

Variations on a theme

The Chippendale sofa frame I've designed is a foundation that can accept many stylistic variations. For instance, I made the classic Philadelphia-style sofa shown in the photo on p. 60 with Marlborough legs, a serpentine seat rail, and peaks on each side of the crest. The sofa frame shown in the photo on p. 63 is a simpler, New England design with molded legs.

Some of these modifications can be accomplished with very few changes in the basic templates. A serpentine front rail, for example, requires a curved template and affects the length of the two stretchers in the center. That's all—everything else can remain the same. Some variations call for more work. If you'd like to change the slope and splay of the arm roll, obviously you'll have to change the template for the vertical arm support as well as the length of the arm-roll templates and their end angles. The arm support block would probably be affected as well.

In the leg designs shown below, I'm recommending that you choose 1⅞-in. stock for the front molded leg. This allows you to reduce the size of the leg post above the carving to 1¾ in., the same size as the post on the Marlborough leg. On my sofas, I do it a little differently, because I like to keep the front and back legs the same overall width. I start with 1¾-in. stock, reduce the post to 1⅝ in., then vary the end-rail length, front-seat-rail shoulder distance and stretchers to accommodate the smaller post. If you'd like to try this yourself, you'll need to work out gains, chamfers and other minor changes at the front corners so the parts fit neatly. The arm-roll length also shortens by ⅛ in., but this takes care of itself during truing-up.

All the following variations are found on original period pieces.

Legs: Straight, square; straight, molded; tapered, square; blocked-foot Marlborough, plain or carved; ball-and-claw cabriole (no stretchers). Some pieces have eight legs, but six-legged sofas are more common.

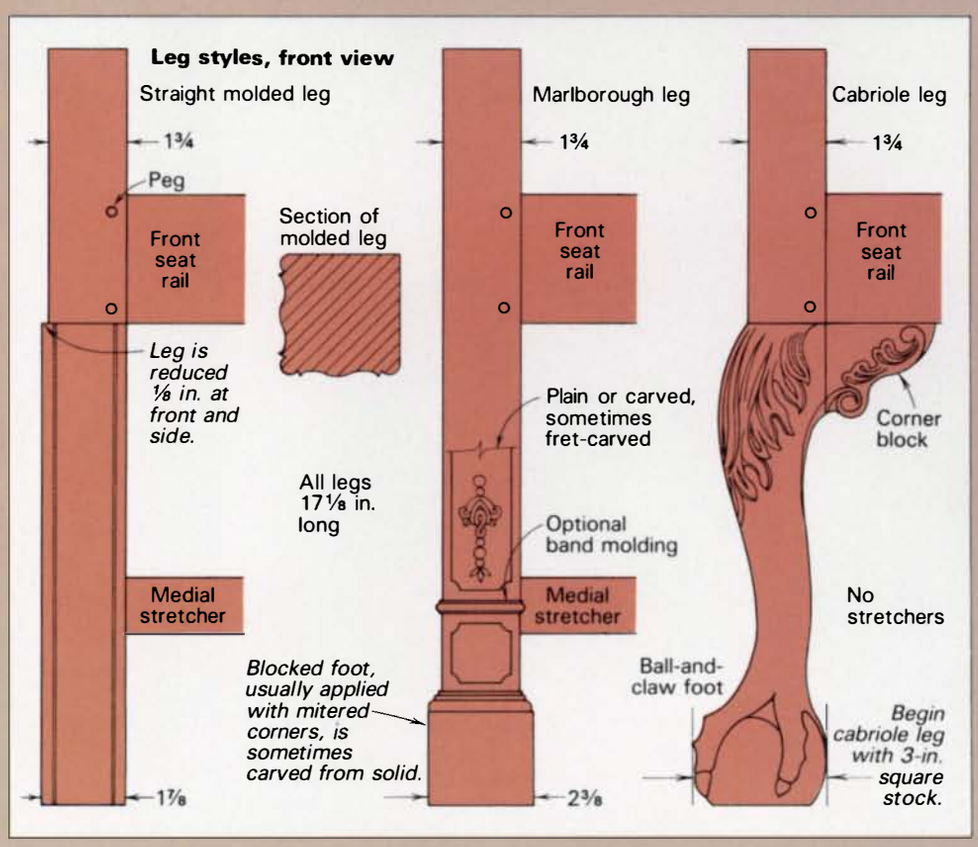
Seat rails: Straight; serpentine curved; exposed and ornamented. A 6-ft. length is common; other lengths are options.

Crest rail: Single-hump; peaked to each side of hump; varied in curve.

Arm rolls: Straight, tapered, cylindrical; serpentine; varied in slope and/or flare.

Stretchers: Plain; beaded-edged; relief-carved or with open fretwork.

You'll note that I show no stretchers between the back legs, yet you might see them on many period sofas. Rear stretchers take great abuse from climbing children if the piece is placed near the center of the room. Also, they make it difficult to clean under the sofa. They're not needed structurally, and I prefer to leave them out, but the choice is up to you. —*N.V.*



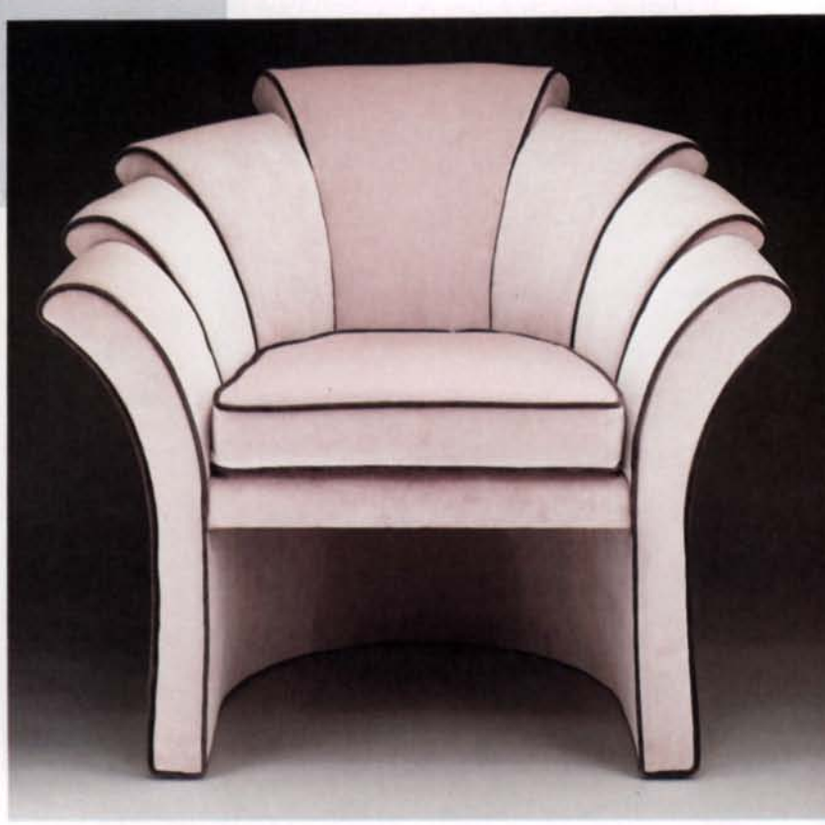
Three easy chairs

Lee Trench's chair shows bloodwood and wool over its ash innards.

While I enjoy looking at all sorts of daring but unsittable chairs, when I want to kick back with a beer and a ball game, I look for comfort. These chairs, shown last summer in Boston, are all easy on the backside yet elegant. Lee Trench's chair, above and at left, was in the Boston University Program in Artisanry show. She built the frame, and Rick Soeiro of Cambridge upholstered it with hair, rubberized hair and cotton batting over jute webbing. Zigzag springs support a down-and-foam seat cushion. Boston's Society of Arts and Crafts exhibition featured Gregg Seiler's chair, shown below. Seiler, also a BU student, drew on Art Deco precedents and Soeiro's talents for the velour-upholstered chair. Also at the Society's exhibition was Jack Larimore's China Gothic chair (below left), which looks 1930s Moderne and is a snug sitdown. *—Roger Holmes*

Rick Echelmeyer

In Jack Larimore's chair, poplar verticals connect a plywood platform on the floor to a laminated-in-place plywood rail/arm. Upholstery is burlap, thin foam, wool mohair and leather.

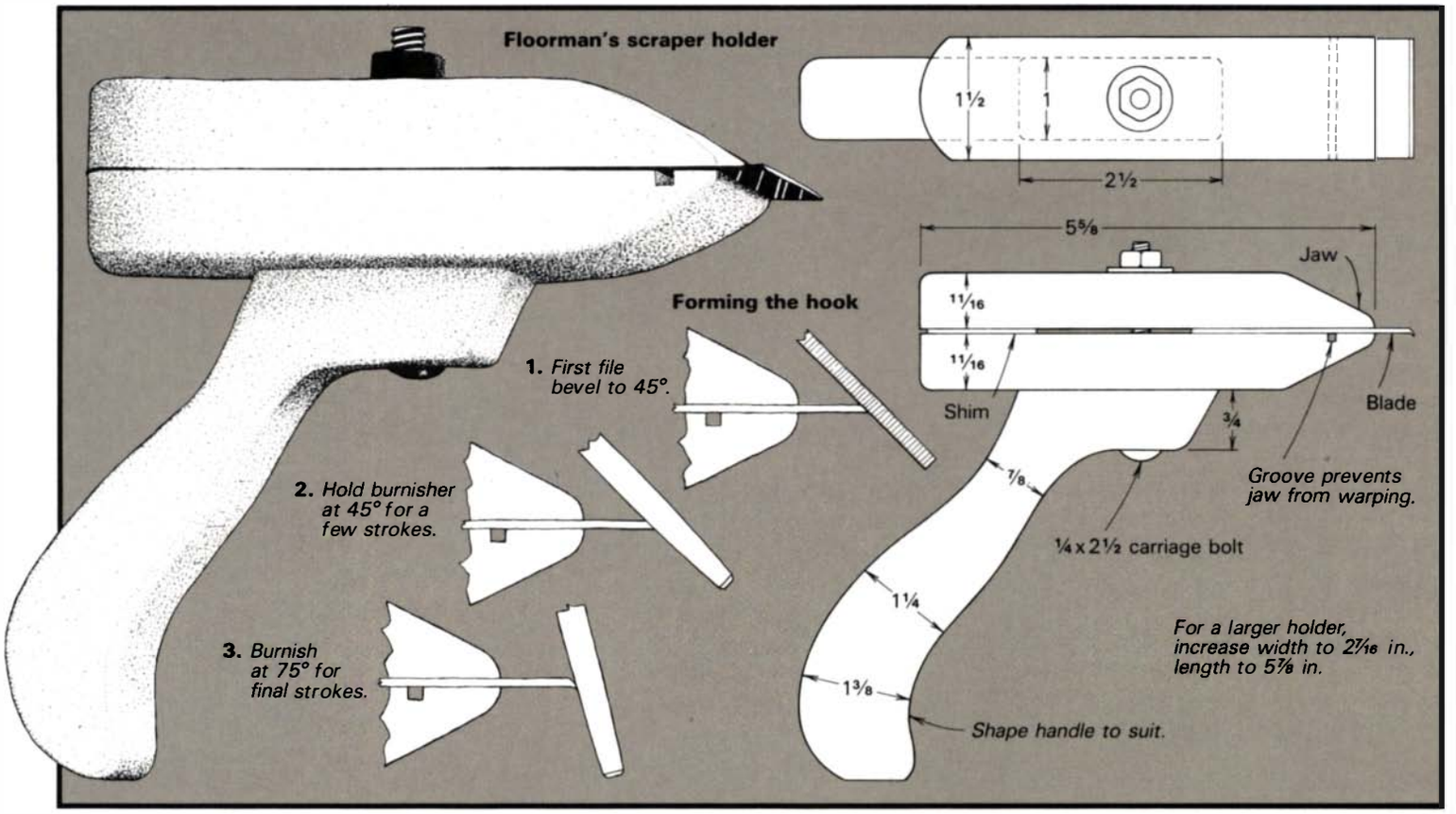


Ash frame of Gregg Seiler's chair is upholstered with velour over muslin and cotton batting. The seat is sprung, the back webbed.

Photos: Dean Powell, except where noted

Make a Hook Scraper

by Tom Vaughn



The phrase "laid, scraped and finished" was still part of the tradesman's lingo in 1948 when I started installing parquet flooring. Needing an efficient tool to smooth large surfaces, as well as the tight corners formed by baseboards and stairs, workmen made special hook scrapers, like the one shown here. In principle, this hook scraper works the same as a regular cabinet scraper, but its pronounced hook works better than a cabinetmakers' small burr for scraping big areas, and the wooden holder makes it less tiresome to use. A thin shim at the back of the jaws directs the pressure to hold the blade at the very tip.

You can make the holder out of any hardwood, though maple is my favorite. The drawing shows a small holder, but you could make the jaws up to 2 7/16 in. wide and 13/16 in. thick. Shape the handle any way you wish and glue it to the bottom jaw. Blades can be made by cutting up a regular scraper blade or an old backsaw. A trick for cutting the hard steel used in these tools is to score a line on opposite sides of the blade with a carbide-tipped machinists' scriber, then clamp the steel in a vise and smack off the waste with a hammer. It should break cleanly. You can also cut steel with a tungsten-carbide blade in a hacksaw.

To form the hook, mount the blade in the holder so it protrudes about ½ in. With the holder on its side and braced by your knee atop a toolbox or an 18-in. high bench, file a 45° bevel on the top face. Work it until you have a sharp edge and can feel a wire burr on the back side. Remove the weak part of the burr by passing it over a board or the edge of your toolbox.

Now you're ready to burnish the hook. I burnish with a tapered-triangle steel (like a butchers' steel and available at many woodworking supply stores), but any smooth, rounded, hardened steel object like a screwdriver shank will work. With the holder still on its side, start with the burnisher at the far end of the blade and draw it up toward you. Hold the burnisher at 45° to the blade for three or four hard pulls, then progress to 75° for a few more passes. You should have a nice hook now.

To use the scraper, grasp it as you would a handsaw, hold it at about 30° to the surface and draw it briskly toward you. It should pull a small shaving, not crumbs. Light scraping—the inside corner of a carcase, for example—can be done one-handed, but for heavier work, press downward with your other hand against the back of the jaws. Continual burnishing will bend the hook over so much that it won't cut well. You can file a new hook, or renew the old one for a while by inserting the point of a small oval burnisher (sold by jewelers' and gunsmiths' supply houses) under the hook and restraightening it. □

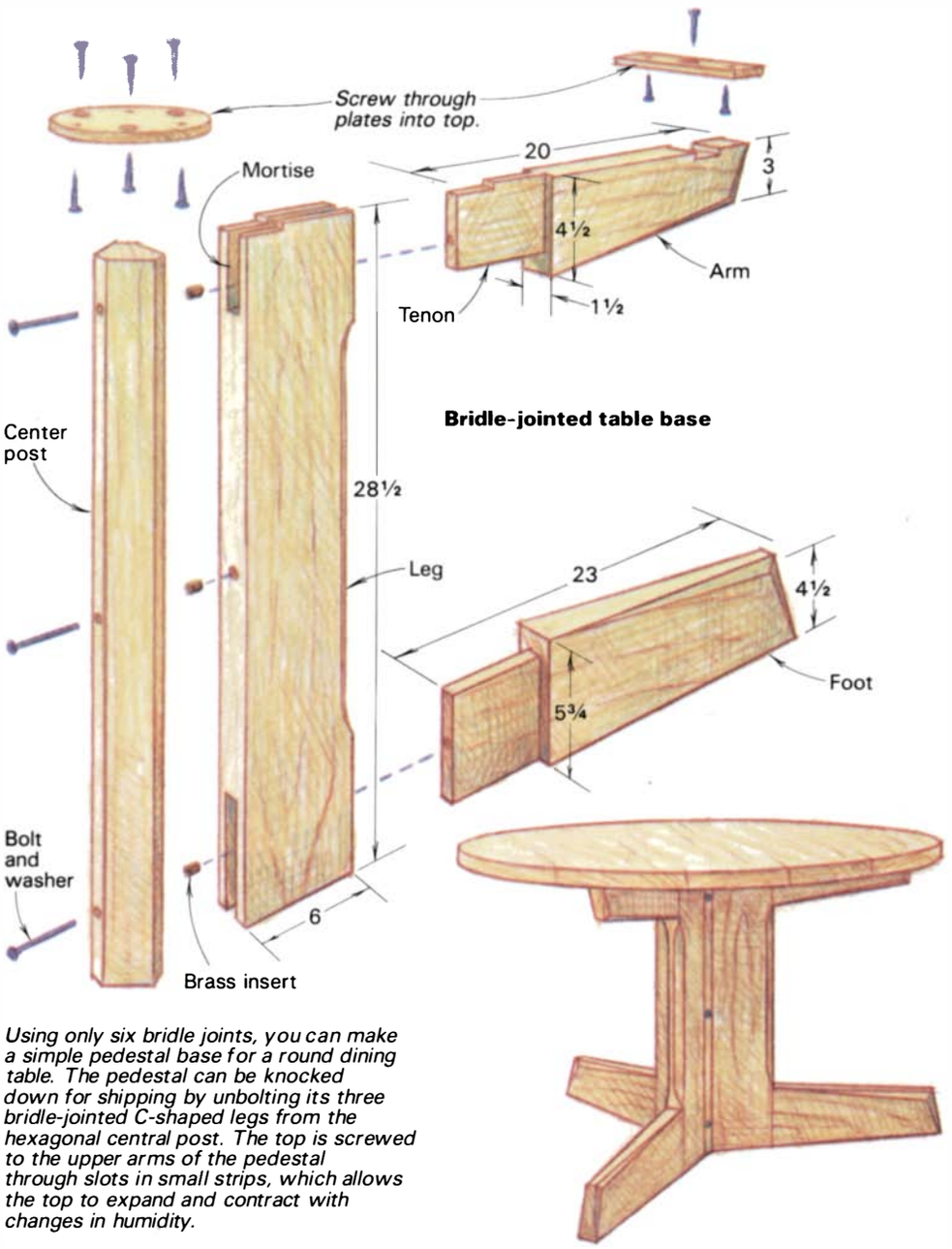
Thomas Vaughn is a commercial cabinetmaker in Phoenix, Ariz. He has worked at Colonial Williamsburg and at the National Park Service in Yorktown, Va.

Drawing: Shearon D. Vaughn

Starting Out

Cutting a bridle joint

by Roger Holmes



Bridle-jointed table base

Using only six bridle joints, you can make a simple pedestal base for a round dining table. The pedestal can be knocked down for shipping by unbolting its three bridle-jointed C-shaped legs from the hexagonal central post. The top is screwed to the upper arms of the pedestal through slots in small strips, which allows the top to expand and contract with changes in humidity.

The mortise-and-tenon is one of the most basic and versatile woodworking joints. It can be as plain as the rung-to-leg joints in any stick chair, or as complicated as some of the three-dimensional, jigsaw-puzzle joints used in Japanese house carpentry. A mortise-and-tenon can be used almost any time you need to join the end of one piece to the edge of another. They're such effective joints that it's hard to find a piece of furniture without at least one, even if only a dowel in a hole.

The bridle joint (shown above) is one of the simplest garden-variety mortise-and-tenons. Its open-ended mortise doesn't have the mechanical (unglued) strength of an enclosed mortise, but modern glues and the joint's ample gluing surface make up the difference. And a bridle joint can be made more quickly and easily. Both tenon and mortise can be cut almost entirely with a saw, eliminating the excavation that would be required to clear out an enclosed mortise (see p. 73).

When I was figuring out the base for the round pine dining table shown here, bridle joints seemed ideal. A pedestal eliminates obstruction under the table, and the C-shaped, bridle-jointed frames are sturdy enough to support the tabletop, Thanksgiving turkey and a dozen or so elbows. And the six bridle joints are all the joinery needed for the entire base. (See the first part of this series in *FWW* #48, pp. 46-51, for how to join boards for a top.)

I cut the bridle joints with a bandsaw and backsaw, then used a chisel and shoulder plane to clean up and fit them together. If you don't have a bandsaw, you can do all the sawing with a backsaw and a bowsaw or handsaw (see p. 70). A shoulder plane is a handy tool, but if you're reluctant to dish out $40 or so for one, you can trim the shoulders with a chisel.

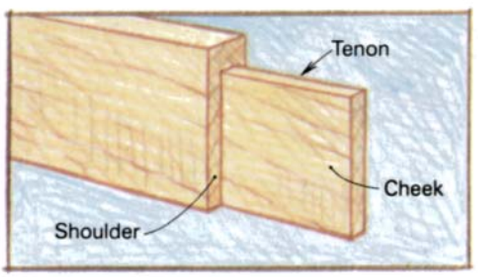
When I knew roughly what sort of table I wanted, I designed it on the workshop floor with a piece of chalk. I drew an elevation (side view) of half the top and one frame full-scale, then fiddled with the proportions until they looked good. If you start with the drawing shown here, sketching a full-scale elevation will help fix the project in your mind. You can change the dimensions and shapes, but I think you'll find the table too shaky if you make the arms, legs or feet much less than 4 in. wide or 1¼ in. thick. The feet will get in the way if they extend beyond the top's circumference. I made the top 4 ft. in diameter, but I think the table would look better with a 5-ft. top.

When your plans are chalked out, cut three sets of arms, legs and feet for the C-shaped frames. Cut all the parts to width and length, but don't shape them yet—it's a lot easier to cut joints in rectangular stock. Next plane the parts flat and to thickness—mine were 1½ in. thick. Try to make them all the same thickness, but don't get bogged down if there's 1/16 in. or so variance—the parts can be planed flush after the frames are glued up. Mark the flattest face of each piece, plane the edges straight and square to it, then mark the most accurate edge (I use a little squiggle on the good face, joined to a V on the good edge). The tolerances needn't be up to edge-joining standards, but the closer the better. Don't worry about making the ends exactly square; a good sawcut is fine.

Laying out—Like any mortise-and-tenon, bridle joints require accurate, organized marking out. To avoid errors, mark all the joints at once, before cutting. You'll

Marking the shoulders

Knife the tenon shoulder lines around each arm and foot. Hold the square's stock against only the good edge or face as you go.



need to mark wherever a sawcut must be made. As the drawings above and below show, I marked the shoulders with a square and knife, and the cheeks with a mortise gauge, which is just a marking gauge with two pins that scribe both cheeks at once. When laying out each joint, always reference the square and marking gauge from *only* the marked good face and good edge of each part.

For the pedestal, I arranged the parts for each frame on the bench: good-face marks up, good-edge marks to the top of the arm, the bottom of the foot and the inside of the leg. Mark one end of each leg for reference, then identify both parts of each joint with the same number or letter.

Lay out the tenons first. To reduce error, I avoid measuring wherever possible by scribing dimensions directly from the parts being joined. Here, all the tenons are as long as the legs are wide, so I laid one foot across its leg in the position it would be joined, and marked the shoulder position on the edge with a pencil. Using this foot as a guide, I marked the shoulders on the remaining feet and arms. (If the tenons are $\frac{1}{32}$ in. or so shorter than the leg width, clamping will be easier and the surfaces can be planed flush after assembly.)

When you've marked all the tenon lengths, scribe the shoulder lines using a try square and a sharp pocket knife or utility knife. I've devised a little ritual to ensure that I'm scribing only from the good face and edge: First I scribe across the good face, holding the stock of the square against the good edge. Then I scribe across each edge, holding the stock against the good face. Finally I scribe across the second face, holding the stock against the good edge. The lines should connect around the piece. If they don't, the good face is probably twisted. If they come close, don't worry about it—you can take care of the discrepancy when you fit the joint. If they're way off, I'd replane the face, or pick another board and start over.

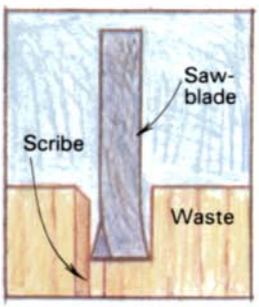
Lay out the ends of the mortises next. I made the tenons about 1 in. narrower than the full width of the arm and foot—the length of the mortise equals the width of the tenon, so there's less mortise to saw out. Pencil the mortise length on the good faces of the legs, then extend the line across the edges with a try square and knife.

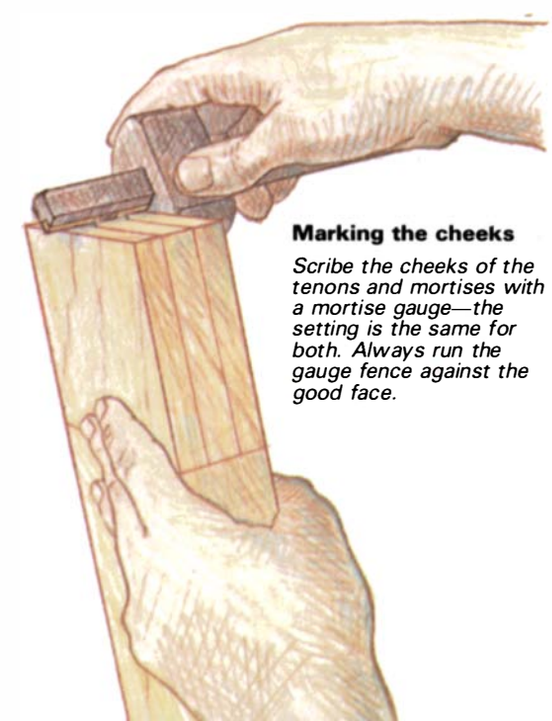
The cheeks of the tenons and the mortises can be scribed with a marking gauge or a mortise gauge. When the mortised and the tenoned pieces are the same thickness, I make tenons about three-fifths that thickness. If the tenon is much thicker, the width of the mortise will make its walls too thin and liable to break. Cutting and cleaning up the mortises will be easier if you make the tenon thickness match a standard auger-bit and chisel size—I made the tenons for the C-shaped frames $\frac{5}{8}$ in. thick.

Set the mortise gauge and scribe around the edges and ends of the pieces, from shoulder line to shoulder line. When setting up a mortise gauge, I set the distance between the pins, then adjust the fence so that the mortise will be centered on the edge. An easy way to set the fence is to gauge from both faces of the piece, tapping the fence until pin marks made from each face coincide. Scribe all the tenons and mortises with this gauge setting. (At the same time, scribe several offcuts from the frame pieces to use when setting up the bandsaw for cutting the joints.) Make sure you run the fence against the good faces so the

Cutting the cheeks

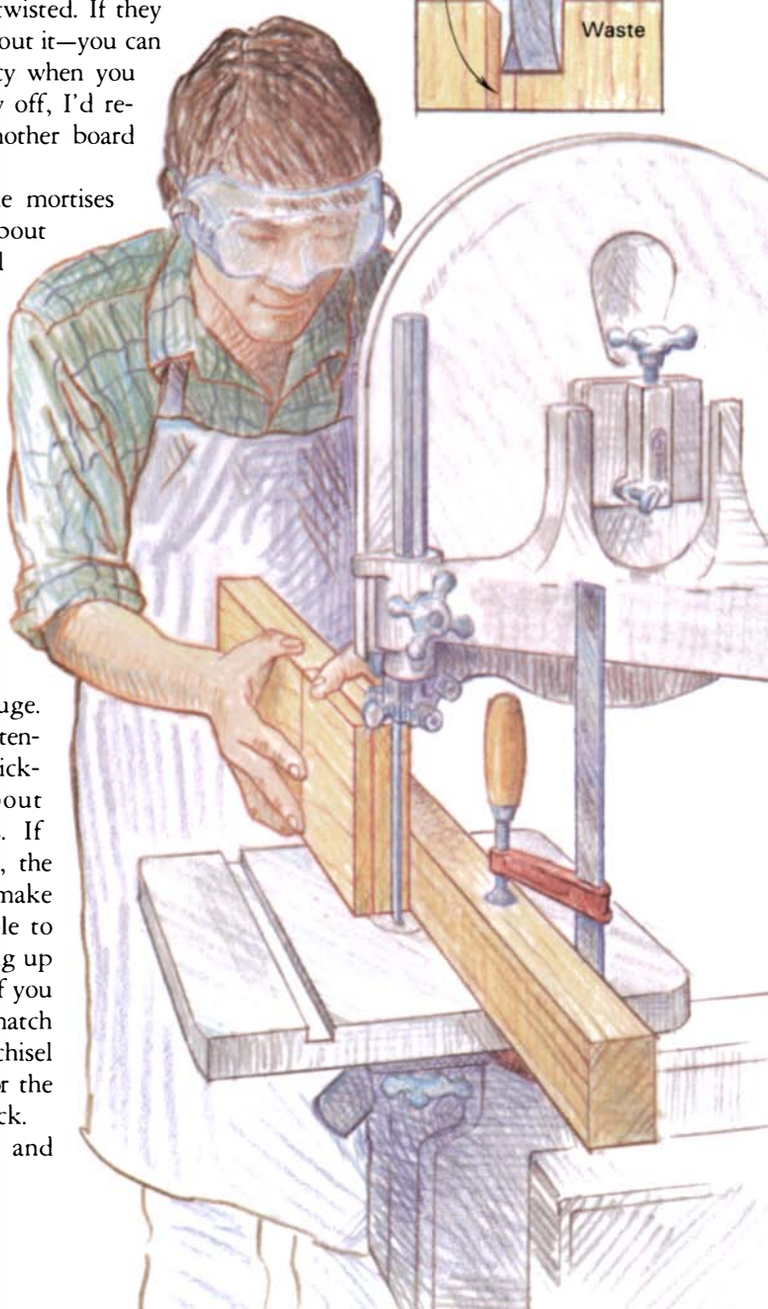
Bandsaw the tenon cheeks against a straight, squared-up fence. Make sure the sawkerf is in the waste, and try to saw right to the scribe, leaving half of it on the tenon. (After boring the mortises, saw them the same way.)





Marking the cheeks

Scribe the cheeks of the tenons and mortises with a mortise gauge—the setting is the same for both. Always run the gauge fence against the good face.



pieces will be aligned even if their thicknesses vary slightly. If you scribe with a one-pin marking gauge, set up once for each cheek and gauge only from the good faces. Gauging from both faces will produce mortises and tenons of varying thicknesses—a big headache.

Cutting the cheeks—Bandsawing the cheeks of the mortises and the tenons is easy, safe, and, if you set up and saw carefully, accurate. Pieces this large are best cut with a ½-in. or ¾-in. wide blade, though a ¼-in. will do if you feed slowly. Whichever blade you use, make sure it's sharp; there's no joy in burning your way through six inches of pine. My saw doesn't have a rip fence, so I attach a 2-ft. long, straight piece of pine, about 1½ in. by 3 in., to the table with two clamps.

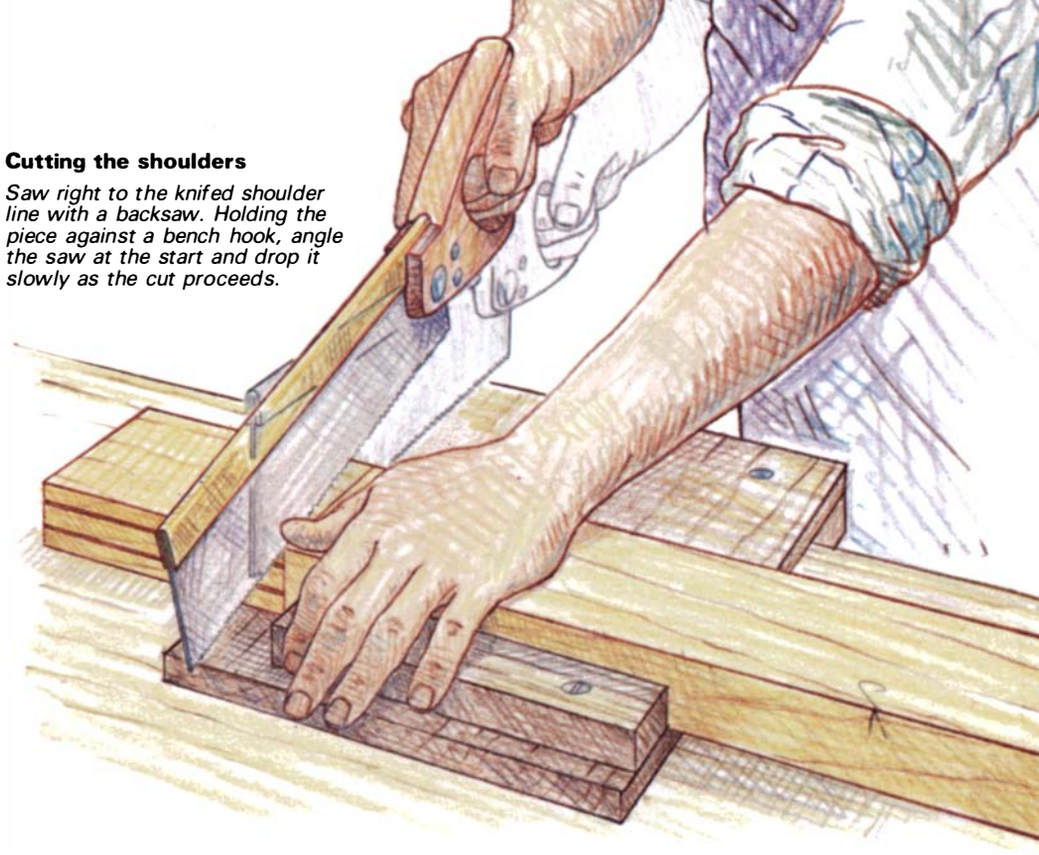
Set up for the tenons first, starting with the cheeks farthest from the fence. Mount the fence parallel to the blade and position it so that the sawkerf falls in the waste and the cut leaves half the scribe line on the tenon, as shown in the drawing on p. 69. (Remember to place the good face against the fence when setting up and cutting). Use the scribed scrap pieces to check the setup, then saw away on the real thing. Set up and make the second-cheek cuts in the same way. Remember, the closer you are to splitting the gauge lines, the less work you'll have fitting the joints later.

The cheek cuts for the mortises are set up and bandsawn the same way. Before cutting the cheeks, I bore a hole through the piece at the end of the mortise so the waste will come away cleanly at the completion of the second-cheek cut. I use a brace and ½-in. auger bit to bore about halfway through from each edge. A drill press will work, too, but doesn't deliver the same cheap thrill I get when the holes meet in the center.

If the cheek cuts leave half the scribe line around the mortise and the tenon, the joint should slip together snugly without much fitting. The bandsaw isn't a preci-

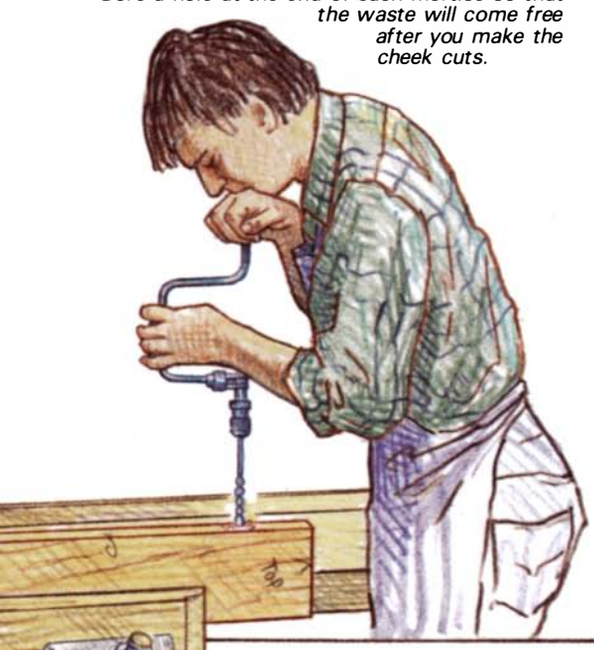
Cutting the shoulders

Saw right to the knifed shoulder line with a backsaw. Holding the piece against a bench hook, angle the saw at the start and drop it slowly as the cut proceeds.



Boring the mortises

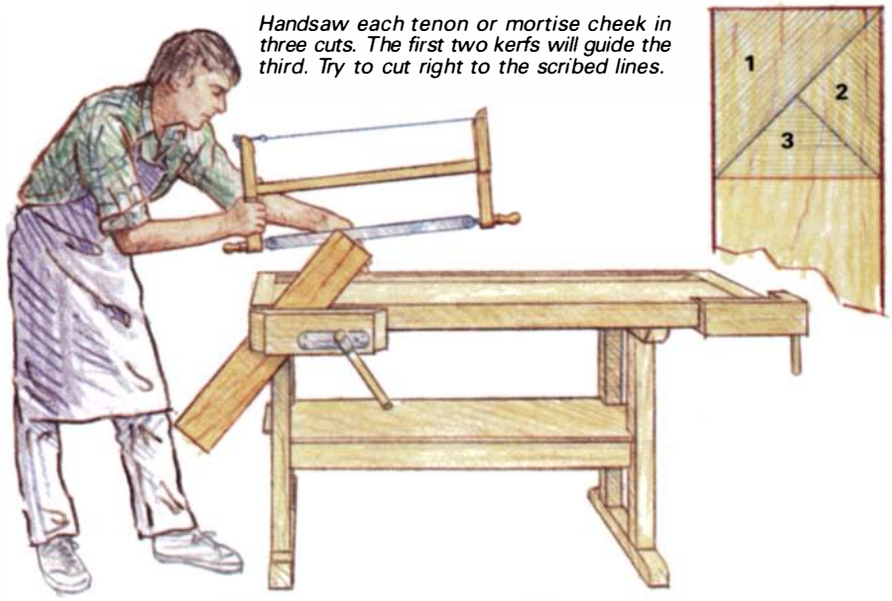
Bore a hole at the end of each mortise so that the waste will come free after you make the cheek cuts.



Handsawn cheeks

You can cut the bridle-joint cheeks with a bowsaw (shown at right) or a crosscut handsaw. A handsawn cheek requires three cuts: two diagonal and one parallel to the shoulder line, guided by the first two kerfs. It's faster to make the cuts in pairs, working both cheeks simultaneously. For the angled cuts, tilt the workpiece so you can see the scribe marks on the edge and end at the same time. Saw right to the marks, leaving half the scribe outlining the mortise or the tenon. Use your thumb as a fence to start the cut, then lengthen the stroke. With practice, slight adjustments to keep the saw on the marks will become second nature.

Handsaw each tenon or mortise cheek in three cuts. The first two kerfs will guide the third. Try to cut right to the scribed lines.



sion tool, however, so I usually adjust the second-cheek cut according to how the scrap tenon fits the scrap mortise. Better too tight than too loose; it's easier to shave the tenon down than to build it up.

When all the mortises have been sawn, square up the bored-out ends with a ½-in. or ⅝-in. chisel. Chop straight down or undercut slightly. There usually isn't much wood to remove, so I push the chisel rather than bashing it with a mallet. Holding the chisel as shown in the box on p. 73 affords good control from the bottom hand and plenty of power from the top.

What can be done by bandsaw can also be done by hand—not as quickly, maybe, but just as well. The cheeks of mortises and tenons on most furniture are small enough to be cut with a backsaw, but for the pedestal frames, you need a bowsaw or handsaw that can cut to a depth of 6 in. in the ends of the parts. I think that a bowsaw with a 1-in. wide blade gives more control than a handsaw, but I knew a joiner who cut perfectly good tenons—cheeks and shoulders—with a handsaw. Suit yourself; either saw takes practice. The box on the facing page outlines the basics.

Shoulders—I cut the tenon shoulders with a backsaw. It's possible to set up a tablesaw or radial-arm saw to make these cuts, but if there aren't many to do, it's just as fast to cut them by hand.

Accurate work like this demands a sharp saw. You'll also need a bench hook for holding the arms and legs while cutting the shoulders. It's easy enough to make a hook: just nail a 1x2 on each end of opposite faces of a piece of plywood or solid wood. As shown in the drawing at the top of the facing page, the bottom strip catches the edge of the bench and your own weight keeps the workpiece in place against the top strip.

Starting the shoulder cut accurately is important. The points of the sawteeth should be flush to the knife line. I use my thumb as a fence to position the blade. Start the cut at the far edge, at an angle to the face. As the cut deepens, lower the saw gradually until the stroke extends the full width of the piece and parallel to its face. The knife line is very fine, so you can't split it like a scribe line. The wood fibers, however, will break off cleanly at the line as the cut progresses, and a close look will tell if you're veering away from the line. The cut is also self-jigging: the kerf you've already cut will help guide the saw along the uncut line. Don't hurry; make the strokes regular and smooth. With practice, you'll be able to tell by feel if the saw is perpendicular to the face or not. At first, though, you'll just have to bend down and check the angle by eye. Save the waste from the cheeks to use for clamping pads when you glue up.

After cutting the shoulders, rip the tenons to width by hand or on the bandsaw (remember, tenon width equals mortise length). I mark the width with a pencil, holding it so I can run my fingers like a fence along the tenon's edge, ensuring that the line will be parallel to the edge.

Fitting the joints—If every cut has been right on the money, the tenons should slide snuggly into the mortises, the shoulders fit without gaps. My joints, however, always need some trimming to fit right. A shoulder plane comes in very handy for this work. The rectangular steel body of the plane, usually ¾ in. or 1 in. thick, fits comfortably in one hand. The edges of the blade are flush with the sides of the body, which is ideal for planing right up to the cheek or shoulder of a tenon.

It's easier to fit the tenon to the mortise than vice versa. If the tenon is too thick, pare off the excess with a shoulder plane and a bench plane. With the shoulder plane, I take a few shavings off one cheek, hard against the shoulder, then plane the rest of the cheek down to that level with a jointer plane. Try inserting the tenon again and take more off the other cheek if necessary. Be careful to remove an even layer of wood from each cheek so they will remain parallel and make full contact with the mortise cheeks.

A loose tenon is more of a nuisance. It's

Fitting the shoulders

Clean up and adjust the shoulders with a finely set shoulder plane. To avoid chipping the far edge, reverse the plane and pull it toward you.

possible to glue on a piece of veneer to fill out the tenon's thickness, or you can clamp the slightly flexible walls of the mortise down on the tenon. If the tenon is rattling around in the mortise, cut another one. The extra practice won't do any harm, and if you're using pine, it's cheap enough that you shouldn't flinch as the mistake hits the firewood pile.

Even if the tenon shoulders have been perfectly cut, a pass with a finely set shoulder plane will smooth whatever roughness is left by the saw. Often more doctoring is required to make both shoulders tight to the mortised piece. If the knifed shoulder line is visible, plane down to it, then work by trial and error, assembling the joint and marking the high spots with pencil for removal. To avoid chipping the edge of the piece at the end of the cut, turn the plane around and pull it toward you to complete the cut. I don't usually check the shoulders for squareness as I go along, but when the shoulders are tight, I check the assembled pieces with a framing square. If they don't form a right angle, a couple of shavings off one end of the shoulders usually will fix things.

It doesn't matter how much you plane off the shoulders when making these C-shaped frames; no one will notice if one leg or arm is shorter than another. But if you're making a four-sided frame, such as for a door, you must make the shoulder-to-shoulder lengths of the rails equal, otherwise the frame won't be square.

Finishing up—Before gluing up, I tapered the arms and feet and cut the chamfers. The shape of the frame can be altered as you wish. I played around with various curves for the inside edges before deciding on the simple solution shown in the drawing on p. 68. Layout goes faster if you make cardboard templates, particularly if anything is curved. I traced around tapered templates for the arm and foot, bandsawed the waste and planed off the sawmarks. Leave the ends square for clamping, then trim and chamfer them after gluing up.

The first time I made one of these frames, I cut the arm and foot chamfers with a hand plane and the leg chamfers with a spokeshave. The job got done, but it took a long time. Prodded by a friend, I later tried a drawknife. Much to my surprise, it was not the crude implement I had expected, but a tool as capable of taking thin, controlled shavings as of lopping off great chunks of wood. The next set of chamfers took a third as long.

If you drawknife the chamfers, spend some time practicing on scrapwood before slicing into the real thing. You'll get used to the tool and discover pleasing proportions for your chamfers. The main prerequisite for successful drawknifing is a sharp blade. I sharpen mine like a carving tool: a large bevel on one side and a small bevel on the other. The small bevel helps you control the tool, which is important because a drawknife has no sole to govern its depth of cut. (I hold the blade still and move the stones over it; you may prefer the reverse. See *FWW* #48, p. 47, for more sharpening tips.) A slicing cut increases control and produces the cleanest surfaces. You can

Chamfering

A sharp drawknife makes fast, accurate work of chamfering. Work to pencil lines or by eye. Sharpening the blade with two bevels (long on the top, short on the bottom) increases control for fine cuts.

chamfer freehand or to penciled guidelines. If you're after precision, finish with a plane and a spokeshave.

Gluing up the frames is a snap. Squirt glue on the tenon and mortise cheeks and spread it around with a long, thin stick. The glue film needn't be thick; just make sure that all surfaces of the cheeks are covered to ensure a good bond. (If you aren't too quick with the stick or you're gluing up in hot weather, use a white glue, like Elmer's Glue-All, instead of a quick-setting yellow glue, like Titebond.)

Slide the tenons into the mortises, pushing the tenon hard up against the end of the mortise. I pull the shoulders tight with pipe clamps, which doesn't require much pressure, then take these off and clamp across the cheeks with quick-action clamps or C-clamps, using the offcuts from the cheeks for clamping pads. Thicker pads will distribute the pressure better and produce a thinner glueline. A thick glueline might be unsightly on a door, where the edges show, but it doesn't really matter here.

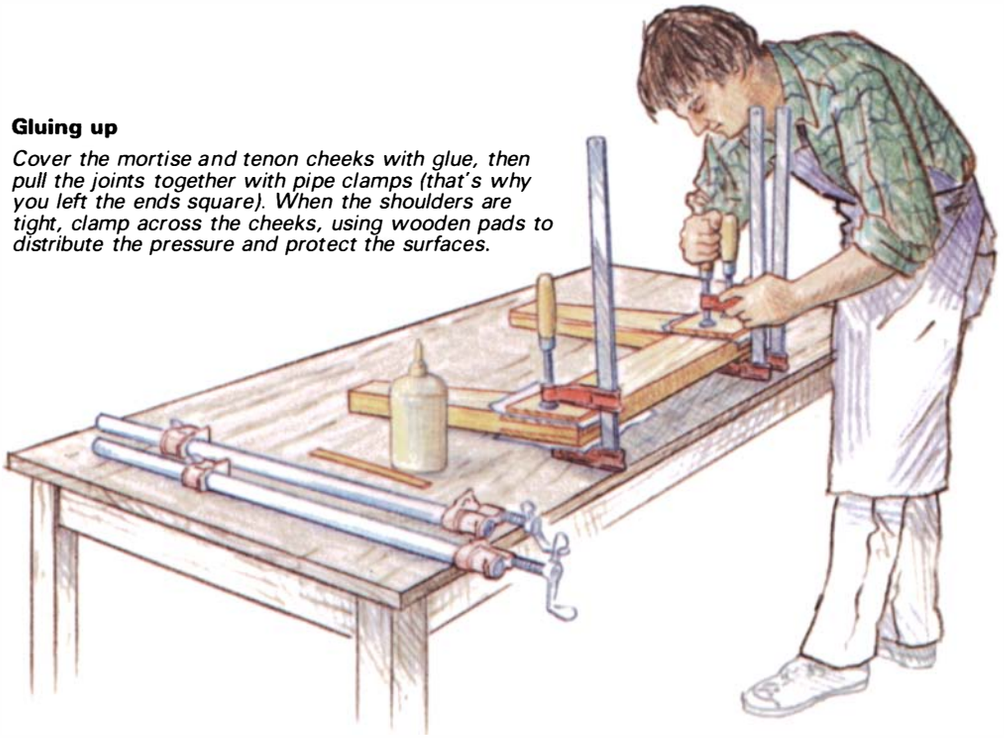
When the glue has cured, plane the faces of the frames flush with a jointer plane—there can be quite a bit to plane off a misaligned joint, but no one will notice if one frame is a little thinner than another. Next trim and chamfer the ends of the arms and feet. The three frames should all be the same size, with the outside edges of the arms and feet square to the outside edge of the leg. Stack the frames face to face to find the shortest one, then plane it square if necessary, checking with a framing square. Plane the other two to match, checking each against the first rather than checking with a tape measure and square. It's surprising how discrepancies that can hardly be seen can readily be detected with the fingertips.

I attached each of the frames to a central hexagonal post with three bolts. If you'll never need to disassemble the pedestal, you could glue the frames to the post. I cut the post on the tablesaw, setting the blade at 30° to rip the corners off a 2¾-in. square. The post takes some fussing to fit. I planed three faces 1⅝ in. wide; the others finished narrower.

Bore the bolt holes in the post, offsetting the three holes at each location. Clamp the post to each leg in turn, marking through the holes onto the leg's edge, then bore pilot holes. You could lag-bolt the legs to the post, but the bolts will strip out after too many disassemblies. I used 5/16-in. dia. machine bolts and brass inserts, which have wood threads on the outside and machine threads on the inside. You can buy the inserts from Woodcraft Supply. (See *FWW* #47, p. 8, for an easy way to insert these.)

I bandsawed the top round, spokeshaved the edge smooth (a rasp or file would do, too) and chamfered the arrises with a drawknife. The base is screwed to the top through small wooden strips and a wooden center plate let into the arms. Single screw holes are fine in the center plate, but slotting the holes in the strips will help allow the top to move with changes in humidity.

I don't like the look of varnished pine, so I just paste-waxed the table. This doesn't provide a great deal of protection, so we scrub it down regularly with a potato brush and hot, soapy water. I wouldn't say the table has patina, but it wears its scars well and I don't worry when a guest spills wine or the baby bashes it with his spoon. □

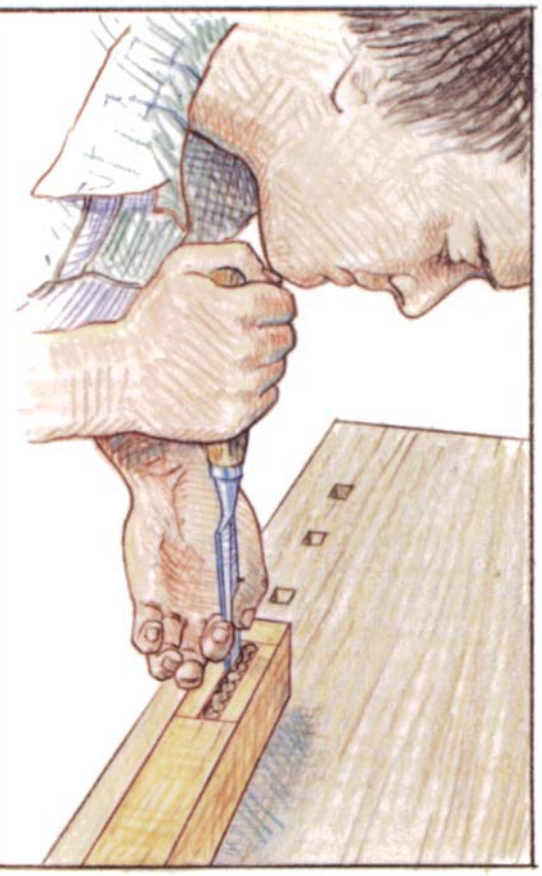


Gluing up

Cover the mortise and tenon cheeks with glue, then pull the joints together with pipe clamps (that's why you left the ends square). When the shoulders are tight, clamp across the cheeks, using wooden pads to distribute the pressure and protect the surfaces.

Enclosed mortises

Many mortise-and-tenon joints require an enclosed mortise, rather than the open mortise of the bridle joint. Lay out the mortise using the same marking-gauge setting as for the tenon. I clear the bulk of the waste by boring a series of adjoining holes with a bit the same width as or slightly smaller than the mortise width. Bore about 1/16 in. deeper than the tenon length. Then slice down the cheeks with a wide, sharp chisel, splitting the gauge line. The only tricky part is keeping the chisel straight. Clean up the mortise bottom with a narrow chisel, so the tenon doesn't bottom out.



Roger Holmes is an associate editor at FWW. *This is the second in a series of articles for beginning woodworkers.*

The Finish Crack'd

Conservator's fix for a fractured film

by Gregory J. Landrey

What a face lift does for an aging movie star, finish restoration can do for a piece of furniture. In my work as a conservator at the Winterthur Museum, I use a variety of restoration methods on many period pieces. But the technique I'll describe here will work just as well on grandma's favorite dresser as on a collector's treasure.

When the 200-year-old mahogany dressing table shown above arrived in my shop this past summer, it had an extremely degraded varnish finish, exhibiting the yellowing, crazing and film shrinkage that can occur with time. Since the crackle pattern (a result of oxidation and subsequent contraction of the finish layer) extended through only the top part of the film, we decided that the finish was restorable. Crazing generally doesn't develop with thin-film finishes, such as French-polished or contemporary oil finishes, but it's fairly common with the thick, hard, resinous films characteristic of period varnishes and modern shellacs, lacquers and polyurethanes. The method I used to restore the table's finish—cleaning the film, abrading off the degraded portion, and polishing the remaining finish—is an acceptable conservation procedure because it preserves the original finish, leaving the patina of the wood undisturbed. The same process can be used on any reasonably thick finish in need of cosmetic repair.

Several factors contribute to finish deterioration: chemical instability, solvent loss, humidity, temperature, wear and tear, poor care, and, perhaps most damaging, exposure to light. Both natural and artificial light accelerate finish breakdown, which is why valuable furniture should be displayed in areas with moderate light levels, out of direct sunlight.

In dealing with an eroded finish, you have two choices: strip off the old finish and apply a new one, or repair the existing film. If a significant amount of the finish is gone, extremely discolored or seriously water-damaged, refinishing is probably called for. But, when possible, conservators prefer to save the old finish, doing only what is necessary to repair any damage and to retard further deterioration. The objective is not to make the piece look brand-new, but to let it age comfortably, preserving the whispered history of days gone by. This requires a fair amount of patience and even more finesse, but in most cases it takes less time, space and money than complete refinishing would.

Types of finishes—To determine the best way to repair a damaged finish, be it period or modern, you must first consider the original finishing materials and the finisher's intent. Through the centuries, a great many finishes have been concocted to enhance the beauty of wood, and to protect it from the ravages of moisture, sunlight, insects, and everyday wear. The earliest finishes in America were oils such as linseed, poppyseed and walnut, and waxes such as beeswax. These did little to protect the furniture, however, and often dulled its appearance. On period furniture—furniture built prior to 1830 and the advent of commercially available finishing products—three major types of finishes were commonly used: fixed-oil varnishes, spirit varnishes and essential-oil varnishes. Eighteenth-century cabinetmakers most often applied some type of fixed-oil varnish, consisting of a drying oil, usually boiled linseed, and a resin, such as copal, sandarac or amber. In the 19th century, spirit varnishes were more widely used, with alcohol as the common vehicle, and sandarac, copal, mastic or shellac the usual resin. An inexpensive essential-oil varnish, actually a type of spirit varnish, consisted of turpentine and rosin, a pine resin also known as colophony. Applying a spirit varnish over a previous, sometimes incompatible, finish was also common practice.

What effect were these early finish chemists after? According to Isaac Byington, a late-18th-century carpenter/cabinetmaker from Bristol, Connecticut, the ideal was "a varnish which stands water and shines like glass." In stylish homes, illuminated only by candlelight and subjected to constant fireplace soot, a high-gloss furniture finish was highly desirable.

Most of today's finishes can be divided into two types: solvent-release and reactive. Shellac, nitrocellulose lacquer and some acrylics fit into the solvent-release group. The reactive finishes are drying oils, such as tung and boiled linseed, and polymerizing varnishes, such as alkyd resin and polyurethane. For conservation purposes—the touch-up of finish losses on period pieces, for example—solvent-release finishes are preferred because they retain solubility and are therefore reversible. This reversibility is important in restoration work, since due to inevitable degradation, further repair may later be necessary. Chemically reactive finishes polymerize, making them difficult to remove.

In addition to these various finish formulas, many cleaners and polishes have been devised over the years to keep furniture glowing—everything from linseed oil and beeswax to a whole range of commercial polishes and waxes. Finishes still degrade, however. In fact, polishes that don't provide a good moisture barrier or that chemically bond to the finish can even accelerate degradation.

Finish identification—With such a variety of possible surface films, the first step in restoration is to determine the type of finish on the piece, since this will limit what cleaners can be used. I begin with a visual inspection, looking obliquely at the surface in good light to detect scratches, variations in color, and changes in gloss

Photos: Herbert Crossan, courtesy of the Henry Francis du Pont Winterthur Museum

indicating worn areas. For the dressing table, examining the broken film under the microscope (a 15X hand lens works fine, too) gave me an idea of the thickness of the film and the extent of the crazing. The pattern of the cracks can give clues, too. The regular fissures in the table's finish suggested a spirit varnish. Lacquer, on the other hand, breaks down in irregular fissures or long, rectangular checks; shellac, in an island configuration. I also found an earlier finish (later identified as an oil varnish) on the drawer lips, indicating that the thick spirit varnish had been applied well after the table was built. In addition, I knew that the piece had been polished yearly with linseed oil during its first eight years at Winterthur.

At Winterthur, we sometimes have our analytical laboratory test samples of an unknown finish by infrared spectrometry or other related techniques. On this piece, the accumulation of varnish, oil, dirt and cleaning solvents, coupled with ultraviolet disintegration, made lab analysis difficult. Despite these problems, Dr. George Reilly, head of Winterthur's analytical lab, compared the finish with known samples and determined that it contained a damar or mastic resin, commonly used in varnish for oil paintings.

Even if you don't have access to a lab, you can still do some simple testing to identify a finish. The strategy I often find most helpful is to test a small, inconspicuous area of the finish with progressively stronger solvents. This may reveal more about the class of finish, and can also tell you what solvents are safe to use in cleaning (safe for the finish, not for you—be sure to wear gloves and a vapor mask). On the table, I began with a cotton swab dampened with reagent ethyl alcohol. Gentle rubbing succeeded in softening the film, confirming that it was a spirit varnish. A weak hydrocarbon such as mineral spirits will soften or dissolve many turpentine- or petroleum-distillate-based finishes such as fresh damar, wax and some oil finishes. Lacquer thinner will dissolve a nitrocellulose film. Strong halogens such as methylene chloride will soften many oils, alkyd resins and polyurethanes. If you can't dissolve the film, it's likely that it is an extremely oxidized, chemically reactive film.

Obviously, if your goal is to completely strip a finish, this solvent-testing will tell you what will work. And if you're debating whether to completely refinish or not, you might first want to try either of two processes some restorers have experimented with: reapplication or amalgamation. In reapplication, the piece is washed down with the weakest solvent that will remove the finish, and the solution is collected and then reapplied. In amalgamation, a badly crazed finish is softened with the appropriate solvent, then moved around with a pad or brush to level the film. The trouble with both methods is that you succeed only in "turning over" the finish, introducing contaminants to the wood and disturbing the patina. Because not all the solvent evaporates, you're also liable to end up with a softer finish. In addition, you'll still have a chemically degraded film. I've rarely seen either procedure done satisfactorily, even on inexpensive furniture, and I certainly wouldn't try either on a valuable piece.

Cleaning—Once you've identified the degraded finish, the next step is to clean it. This is a four-part process: touch-up of areas that have lost finish entirely, removal of dirt, reduction of the crazed portion, and rubout of the remaining finish.

To protect bare wood from the water and solvents used later on, scratches or nicks in the finish must be sealed. Because they're reversible, shellac and nitrocellulose lacquer are commonly used for touch-up. For period pieces, I prefer shellac, as it closely approximates a spirit-varnish finish; on a contemporary piece, I'll often use brushing lacquer instead. I touched up scratches on the dressing table with a thin coat of 2-lb.-cut clear shellac applied with a fine-tip artists' brush. Often a repaired scratch will appear too light after the entire surface has been cleaned and polished with wax. When this happens, I remove the polish in that area and apply a second coat of shellac toned with an alcohol-soluble stain, or with artists' dry-earth pigments if opacity is desired. When matching the color, it's better to err on the dark side, as the eye will pass over such a mark more readily than over a light one.

Surface dirt can consist of dust, fibers, soot, salt, fungi and grease. Besides muddying appearance, dirt attracts moisture that will increase oxidation and mold growth. Thus for aesthetics as well as long-term preservation of the furniture, dirt must be removed. I first vacuumed the table to pick up loose particles, then lifted most of the dirt with a cotton pad dampened with a 5% solution of mild soap and water (I use Vulpex soap, available from Conservation Materials Ltd., Box 2884, 340 Freeport Blvd., Sparks, Nev. 89431). It's best to work on a small section at a time, allowing it to air-dry thoroughly.

Usually you'll need an organic solvent to soften or remove old polishes such as linseed oil and beeswax. Mineral spirits will remove most waxes and some oils, and I gave the table a thorough rubdown with Stoddard solvent, an odorless mineral spirit (also available from Conservation Materials Ltd.). A word of caution: Again, knowing the composition of the finish is important—*don't* use min-

eral spirits for cleaning an oil finish.

If the finish isn't badly crazed, you can skip the remaining cleaning steps and go straight to polishing. The dressing table, however, required the full treatment.

Because the crackle pattern extended only about halfway through the finish film, I could abrade off most of the degraded portion without disturbing the rest. On the flat surfaces, I used 320A- to 400A-rated wet-or-dry silicon carbide abrasive paper, dusting some fine pumice between the dry paper and the finish to reduce the paper's harshness. It takes a patient hand to keep from going through the finish, but not all the crazing needs to be removed, just enough so that the remaining finish reflects light more evenly. As you go along, look for accumulation of sanding dust and pumice in the film's cracks: when most of the crazing has been eliminated, the dust won't have a place to collect. To prevent damage along the edges, I made a sanding block from a piece of pine with rounded corners, to which I glued ⅛-in. cotton padding. Then I rubbed down the curved areas of the legs, drawer moldings and top edges with 0000 steel wool.

To reproduce the high-gloss finish popular on such high-style pieces, I finished up by rubbing out the surface with rottenstone, a fine abrasive favored by 18th-century finishers, using mineral spirits as a lubricant. (I don't use the traditional oil lubrication for rottenstone because I prefer not to risk leaving any oil behind when restoring this type of finish.) A final rubbing with a cotton pad dampened with mineral spirits removed the residual rottenstone.

Polishing—After cleaning, all that remains is to polish the piece to brighten the finish and to protect the rubbed-out surface. There's an assortment of commercially available polishes to pick from.

Linseed oil, though popular, is not a good choice. Even a thin film of linseed oil will darken with age and attract dust, particularly in crevices. It's not a good moisture barrier either, and it polymerizes fully, becoming extremely difficult to remove if necessary later. Lemon oil, an innocuous non-drying oil, will saturate the color of the piece but do little to protect it. It too is a dust magnet. Tung oil, although sometimes a highly desirable finish, presents some problems as a polish. Pure tung oil lacks the luster and gloss a high-style period piece should have, and like linseed oil, it will bond to the finish and become quite difficult to remove. Watco oil, which contains a significant amount of linseed oil, won't penetrate an existing finish film sufficiently to dry thoroughly to a hard, protective layer.

Carnauba and microcrystalline paste waxes are, in my opinion, the best polishes. Chemically inert, they're compatible with most finishes, and they're effective moisture barriers. Buffed to a hard, dry film, they won't trap dust. Although a wax may whiten when subjected to excessive heat or moisture, it can easily be removed with mineral spirits and a new coat applied.

I most often use brown Behlen Bros. Blue Label paste wax or Renaissance microcrystalline wax (available from Garrett Wade and Conservation Materials, respectively). Because of the relatively dark finish on this dressing table, I chose the brown wax, applying it sparingly with flannel cloths and buffing it out. Sometimes it's also necessary to use a stiff brush on some sections to work the wax into the remaining irregularities in the film. It takes a fair amount of elbow grease to get an even luster, but the wax will last, and with proper care the restored finish shouldn't need any additional cleaning or polishing for years to come. □

Greg Landrey is an associate furniture conservator at Winterthur Museum in Winterthur, Del. This article was prepared with the assistance of Michael Palmer, wood anatomist at Winterthur. For more on period finishes, see FWW *#33, pp. 71-75, and #35, pp. 54-57; for contemporary finishing, see #17, pp. 72-75.*

Making Snowshoes

Cold-bending the Indian way

by Henri Vaillancourt

Red paint adds a decorative, personal touch to the lacings of these finely woven snowshoes. The mesh keeps the shoe from sinking into soft snow, but the Indians' sophisticated interlocking design makes this practical device beautiful as well.

For centuries, North American Indians have been using woodbending techniques to turn native hardwoods into snowshoes, canoes and other tools they need for survival. Their nomadic life meant they had to shape and bend wood quickly, without any elaborate steaming, sawing or jigs, and the cold-bending method they devised is as useful today as their snowshoes and canoes are.

The snowshoes are, in fact, one of the Indians' most brilliant inventions, and making a pair is a good way to learn about harvesting and bending green wood. I've always been fascinated by the self-sufficiency of the Indians in the harsh environment of Canada and the northeastern United States. Unfortunately, as youths abandon the ways of their parents, the old skills are in danger of dying out. During the past eight years, I've spent considerable time with various Canadian tribes, learning and recording some traditional snowshoe-making techniques. Here I'll describe the methods used by the Attikamek Indians in central Quebec, who still make a traditional snowshoe with a flat, somewhat angular toe, along with the type of harness once widely used in the northeastern United States and adjacent Canada. Even today winter travel for these people is not a frivolous sport but a rugged necessity—without snowshoes, the Indians would be unable to travel through deep snow to get food or firewood.

The Attikameks' snowshoe is one of the most versatile. It tracks well in open country and is maneuverable in rough or brushy areas. The broad, somewhat square front end gives the shoe a good grip on steep slopes. Since each pair is handmade by eye, no two pairs are exactly alike. Each maker shapes the front and crossbars and weaves the shoe to suit his own personality and tastes. The pair shown above, for example, has a more rounded front and is much larger than the pair shown on p. 80.

To make the snowshoes, the Indians cut down a live tree and then repeatedly split it into riven sections larger than the components of the finished shoes. Using an ax, the maker hews the riven sections into rectangular staves, which he shaves smooth. To make the pieces easier to bend, he whittles the major bending points to thin them, then flexes the stave against his foot or knee until it's pliable enough to be bent and shaped freehand.

The Indians have a choice of four hardwoods that can be split, shaped and bent while green to make frames. Because of its strength and durability, yellow birch is preferred; the softer white birch is the next best. I've found, however, that my local New England birches are brittle and hard to bend. Black ash bends well but wears out quickly, especially in wet or crusty snow. Maple is a durable alternative, but it's difficult to work. White ash, which doesn't grow in Attikamek country, is common in the U.S. Northeast and makes good snowshoes, as does hickory.

The most workable trees are in the 6-in. to 12-in. diameter range. Look for a tree that's straight-grained, fast-growing and free from knots. Remember, you'll be splitting the wood, not sawing it, and the straighter the grain, the better the tree will split and the more unbroken long fibers it will have. A good indication of straight grain is the straightness of the fissures or vertical grooves in the bark of some trees. You can also strip off a length of bark to expose the grain. Fast-growers usually display bushy tops and horizontal or drooping branches. These trees have wider growth rings and a higher percentage of fibers to low-density earlywood vessels, so they're stronger than slow-growers. The Indians often chop out a chip from the tree's base to check the growth rings: rings about ⅛ in. apart mean that the

Photo: White Light

wood will be easy to cold-bend; closer rings indicate that it will be more brittle and harder to bend.

After you fell the tree, cut an 8-ft. log from the butt end. Split the log in two with wooden wedges, mallets and an ax, then into quarters, eighths or sixteenths, depending on the size of the trunk. You should end up with pieces about 2 in. wide on the bark side. Hew and shave these pieces into rectangular staves, 1 in. by ¾ in., as in figure 1. The Indians hew the staves with an ax or a chainsaw, as shown on the facing page. They use a crooked knife for smoothing, but you might be more comfortable with a drawknife, spokeshave or plane. Dress the staves evenly along their length to ensure symmetrical bending. Following the grain closely, so as not to cut across the long fibers, will minimize fracturing during bending. As no tree is perfectly straight, the dressed stave usually waves or twists, but this unevenness disappears when the snowshoe is given its final form.

To make shoes for an average-size man, cut the staves about 7½ ft. long (figure 2A). Make a pencil mark 6 in. from each end of the stave where the ends will come together to form the tail—the 6-in. length allows an inch or so to be trimmed off the finished, assembled tail. Make another mark halfway between the two tail marks for the center of the toe. Now draw two more lines 2 in. on either side of this center mark to set the width of the square toe and the placement of the front bends. You should also draw another mark on each side of the stave halfway between the centerline and the tail marks, where a temporary brace will be set while the bent frames dry.

To make it easier to bend the square toe, take a knife and shave the inside face of the stave, the pith side, for about 8 in. on either side of the centerline. The finished thickness should be about ⅜ in. to ½ in. Also shave the stave on either side of the tail marks, but this time on the outside (bark side), as the bend here will be in the opposite direction.

Rather than steaming or boiling the green wood to limber it, you repeatedly bend the stock against your foot or knee. Do the tail sections first. Put your foot near the tail mark, on the bark side of the stave, and flex the stave gently back and forth enough to limber the wood, so it can be bent into the tail shape. You may have to shift your foot several times to produce a smooth curve. Depending on the wood and the skill of the maker, the limbering process can take from 30 seconds or less to several minutes. You'll find that the wood will largely spring back to its original shape when you release it, but that's all right. Limbering bends the stave more than necessary for the finished frame, to make it easier to pull the frame into its final shape.

When you've limbered both tails, bend the sides in the same way, but this time put your knee on the pith side. Bend the stave for 9 in. or 10 in. either side of the brace marks. Flex the stave slightly before moving your knee up or down the stave—too much bending while keeping the pressure in only one position would result in irregular, angular curves. If, in spite of all precautions, the curves are uneven, you can shave the straight sections again to make them more flexible and then rebend them. Like the tails, the sides should be somewhat overbent.

To bend the toe, place your knee at one of the marks on either side of the centerline. Flex the stave back and forth a number of times until you form a sharp bend at that point. Bend the other side of the toe the same way. Splintering often occurs during this process, but the stave is thick enough for you to trim off any slivers after the frame has dried. You could also bind the splinters in place with thread to prevent deeper cracking.

To bend the stave into its final form, place your foot on the flat part of the toe section and pull the two ends of the stave upward until you can insert a stick, or spreader, approximately 14 in. long at the halfway marks (the exact length of this stick depends on the shape desired). Next bend the two sides around this stick and bring the ends together to form a tail. Match the pencil marks indicating the start of the tail and tie the ends securely with twine. Now check if the frame is symmetrical. If it looks uneven, use your knee on the inside or outside of the frame and bend the stave until the curves look right. Bend a second frame to match the first, and tie the pair together with twine to keep them from warping as they dry.

The Indian method of cold-bending takes a fair amount of skill, so those unwilling to practice would be better off using a bending form. Make one from 1-in. boards or plywood cut to the shape of the inside of the snowshoe frame and mounted on a wooden backing somewhat larger than the form. Even though the Indians bend wood cold, I would advise beginners to use hot

Fig. 1: Hewing the staves

Split a 6-in. to 12-in. dia. green tree in half, then in quarters. Continue to split each piece until you have a pie-shaped wedge about 4 in. wide on the bark side. Remove the heartwood from the wedge, then split the remaining sapwood in half along the line shown. The Indian method of trimming and shaping each stave from the riven stock is shown in the photos on the facing page.

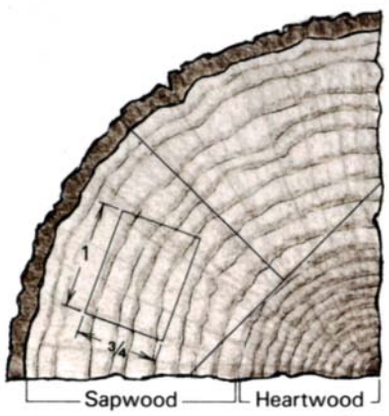
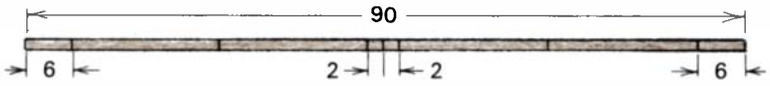


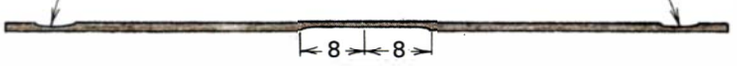
Fig. 2: Attikamek pattern

A: Marking a stave



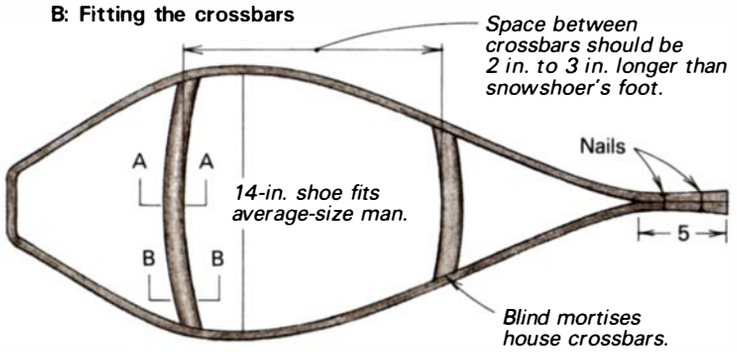
Marks set width of toe, midpoint of stave and length of tail.

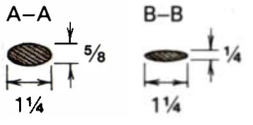
Recesses at ends are for shaping tail. Tips can be left full thickness because they will be trimmed after ends are fastened together.



Thin area near toe to make bending easier.

B: Fitting the crossbars

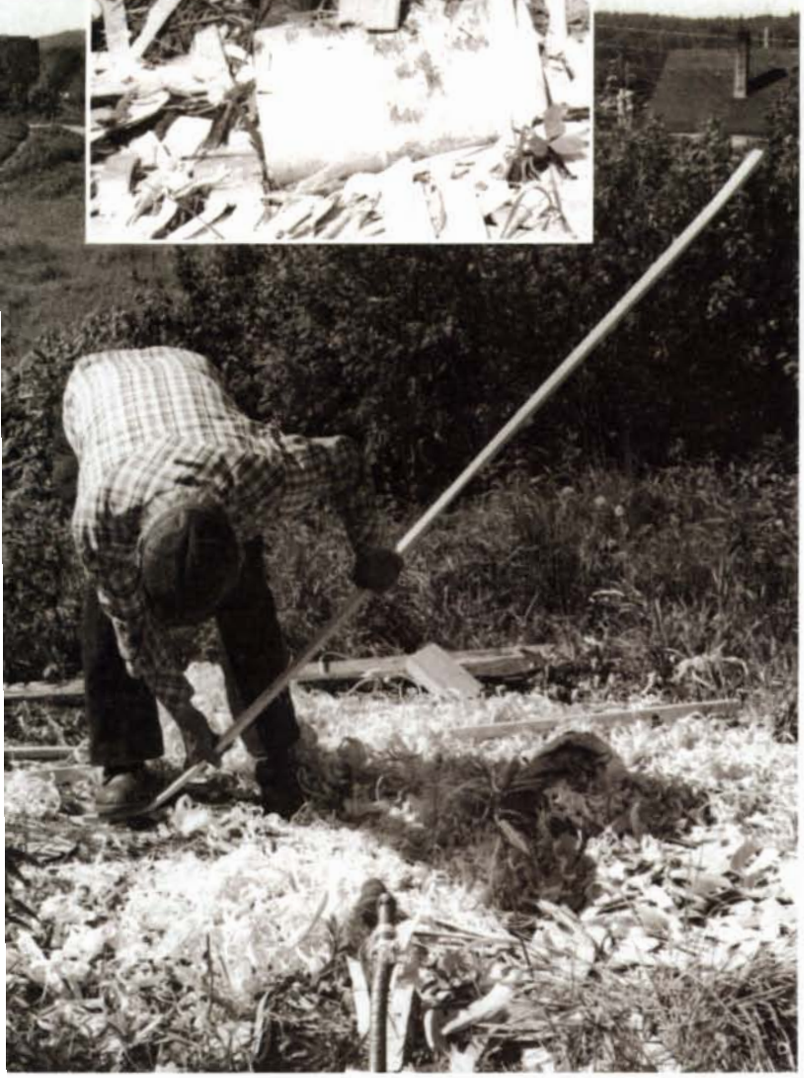




Note that crossbars thin as they go from center of shoe to frame.

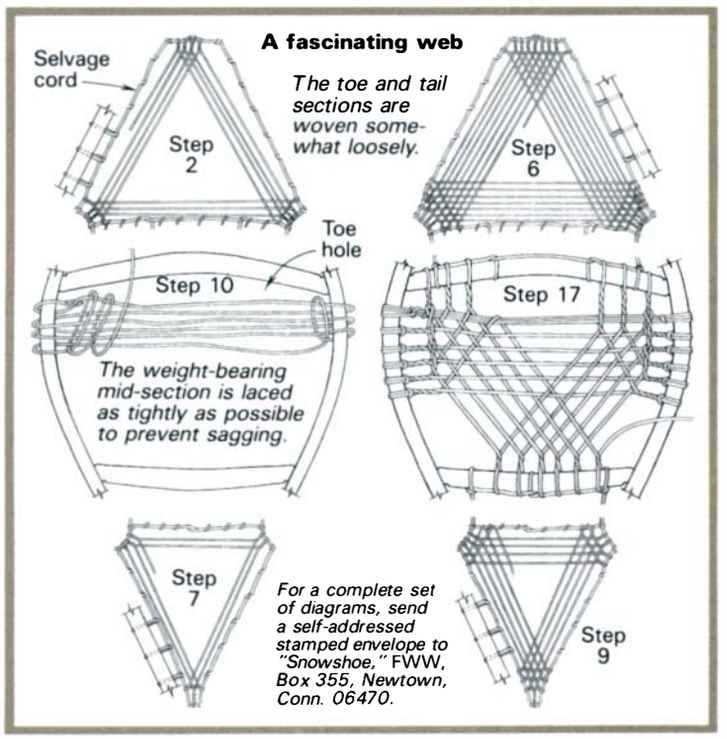
Lee Hov

Sweat, not steam, is the key to this low-tech method of bending green wood. An Indian needs only a knife, an ax and his body. After splitting a stave out of a live tree, Moise Flamand, an Attikamek from Quebec, hews it with his ax (top left). Then, using his hand as a vise, he shaves the piece with a crooked knife (above). Stepping on the end of the stave, he flexes the piece until it's limber enough to bend (bottom left). To make the sharper front bends, he shaves the area thinner, then uses his knee as a fulcrum for bending the wood (below).



Black-and-white photos: Henri Vaillancourt

A temporary horizontal spreader establishes the characteristic snowshoe shape as the ends of the staves are pulled together. Twine holds the tails together until the green frame has dried.



water for the entire bending process—it will make the wood more pliable and easier to handle. Either stand the stave in a pot of boiling water, or hold it over the pot and give the section to be bent a liberal dousing with a ladle for a minute or two. You could also douse the stave with hot water as you wrap it around the form. Then hold it in place with wooden blocks nailed to the backing. First nail a block to hold the toe section, and then simultaneously bend both sides of the stave around the form and fasten them with more blocks. Finally, force the tails together and hold them in place with additional blocks.

After the bent frames have dried for several days, clinch-nail the tail with two nails (any type of nail will do). Next cut the blind mortises for the two crossbars as shown in figure 2B. The two Attikamek crossbars are oval in section and bowed—toward the front and toward the back, respectively. Shaved from the same wood as the staves, they're about 1¼ in. wide and ⅝ in. thick at the midsection, tapering to ¼ in. at the tenons, which have no shoulders. The distance between the bars should be several inches greater than the length of the user's foot.

Next drill the frame for a rawhide or twine selvage cord, which will anchor the weaving in the toe and tail sections. Bore these holes (from 1/16 in. to ⅛ in. in diameter and spaced ⅛ in. to ¼ in. apart) in pairs through the frame from the outside. Place the first pair one above the other about 1½ in. from the ends of the crossbars, and successive pairs on 1½-in. to 2-in. centers. To countersink the cord and protect it from wear, chisel a ⅛-in. deep groove between the holes on the outside edge of the frame. Pass the cord through each pair of holes and knot it on the inside before carrying it to the next pair. You should also loop and run the selvage around the crossbars.

Once the selvage cord is attached, the shoe is ready for weaving. The Attikamek still cut lacings for snowshoes from raw moose or deer hides, but you could substitute untanned cow or calf skin. For those who don't wish to work skins, woven nylon cord from the hardware store is a fair substitute. The ⅛-in. dia. cord is good for both the midsection and the end weave.

The Indians usually leave their snowshoes unfinished, but if you wish, you could give the pair a coat of good spar varnish after you complete the lacing. Some makers, especially those who often travel on wet snow, also varnish the lacings.

To make a harness, the Indians pass a pliable leather strap through the weave near the toe hole of the center section and fasten it around their foot. This harness holds the ball of the foot down, but leaves the heel free to lift. The leather strapping used in commercial harnesses is too stiff for this style harness. Very soft leather is needed, but if you can't get it, you can substitute ¾-in. lampwicking or cotton clothesline.

For snowshoeing, Indians ordinarily wear soft moose or caribou skin moccasins over several pairs of wool socks or liners of wool blanketing or felt. The heelless moccasins don't abrade the lacings, and I find that they let me "feel" the snowshoes and harness. You can readily sense if the harness is poorly adjusted, and how the snowshoe is behaving in relation to your foot. This lets you adjust your stride and balance in subtle ways that are difficult to explain but quickly learned. □

Henri Vaillancourt lives in Greenville, N.H., and is an authority on the traditional crafts of the Northern Woodland Indians. His book, Making the Attikamek Snowshoe, *will be available in spring 1985 from The Trust for American Cultures and Crafts, Box 142, Greenville, N.H. 03048. The Trust also makes video tapes on Indian technology, including snowshoe-making.*

Chatterwork

A risky path to a faceted finish

by Stephen Paulsen

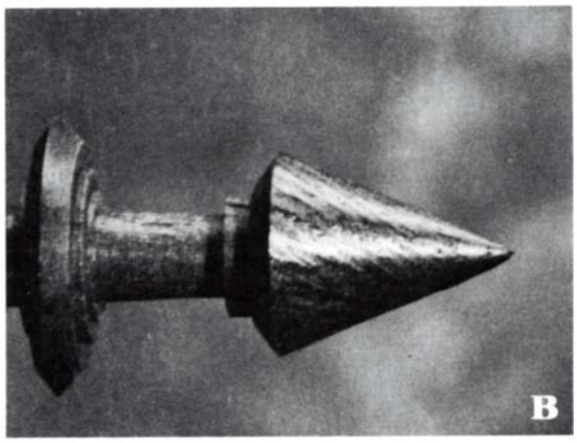
For the past six years, I've been perfecting a technique for decorating small spindle turnings with three-dimensional surface texture. I call it chatterwork. It's an efficient way of producing mandala-like patterns that resemble those cut on a 19th-century Holtzapffel lathe, or the meticulously carved surfaces of David Pye's turned containers on the back cover of *FWW* #13. Chatterwork can be done on any lathe, and takes minutes instead of hours, although it looks as if a lot more time was involved. Since this technique also cuts sanding time, it's economically feasible for production turning.

While I can imagine many applications for chatterwork, from drawer pulls to dowel caps and decorative inlays, I use it mostly on the stoppers for my glass-lined wooden scent bottles. Hard, heavy, dense woods—ebony, brazilwood, rosewood and African blackwood—are best for chatterwork because they hold the sharpest detail.

You may already have inadvertently

Chatterwork graces the lids and insides of Paulsen's tiny boxes, and the spired stoppers of his glass-lined wooden scent bottles.

Photos this page: White Light

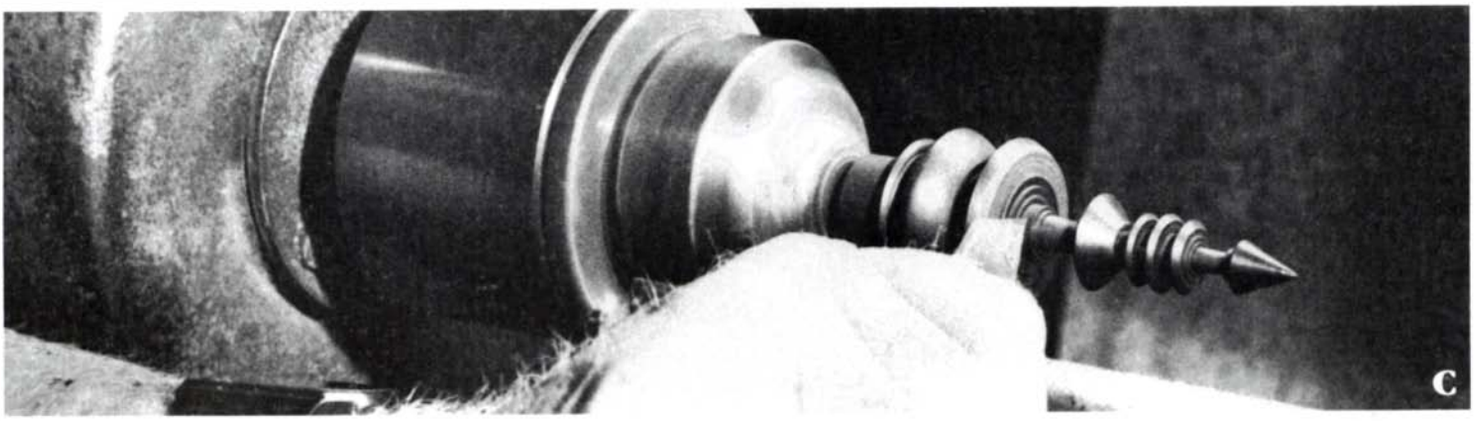


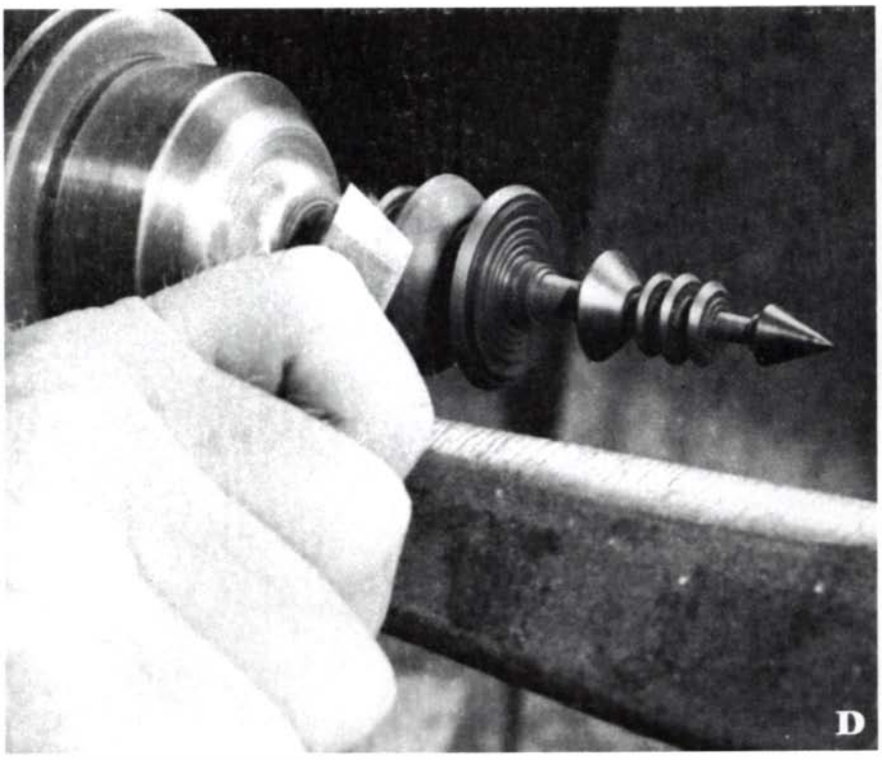
*A light shearing cut with the skew (**A**) creates a spiral flute pattern on the pointed finial (**B**).*

*The edge and corner of a parting tool makes concentric circles of chatterwork (**C**).*

*A skew decorates the spherical barrel of the stopper (**D**).*

*Burnishing with a pointed stick of the same wood species as the spindle (**E**) polishes and highlights the pattern.*





produced crude chatterwork on your own turnings. Here's how it happens: A slender spindle can flex as it spins, and tool pressure pushes it into an elliptical rather than circular path around its axis. At high speed, the flexing wood vibrates against the tool's edge, which leaves marks on the surface of the wood. Chatter can also be caused by a tool that's dull or held at the wrong angle, but this type of blemish hardly leaves a decorative surface.

I control chatter by carefully reducing the diameter of the spindle so it can flex easily, then I delicately manipulate the work with a razor-sharp tool to make it chatter. Chatterwork is workmanship of extreme risk—I'm practically daring the spindle to break, and often it obliges. Little explosions of exotic wood, pieces and splinters flying, are part and parcel of the technique. Needless to say, eye protection is essential.

I work on a small Duro lathe equipped with a ¾-in. Jacobs chuck on the headstock spindle. For most of my turning, I use a ½-in. skew, and a ½-in. wide parting tool ⅛ in. thick. I also make small parting tools out of ¼-in. square steel key stock (normally used for keying pulleys to motor shafts). I only use a tool for a few quick cuts before regrinding, so the key stock holds an edge long enough to suit me. My homemade parting tools are designed to cut a very small amount of material at a time, to minimize resistance between tool and work. I rarely use these special parting tools for the actual chattering procedure.

Nothing affects final results more than tool sharpness. I grind all my tools to one of two basic angles: 60° for parting tools and 75° for skews. I keep a two-wheel grinder next to the lathe, with the parting-tool angle set on one wheel and the skew angle on the other. Because I resharpen so often, I don't have time to reset tool rests. I prefer a fresh razor burr straight from the medium wheel, so I never hone or whet a tool by hand.

Good light is essential for proper reading of the chattered surface, so my lathe sits under a combination of fluorescent and incandescent lights, including a flex-arm desk lamp on the ways. Behind the lathe, I've tacked a Masonite panel, painted white to reflect light on the spindle.

Here's how I begin a stopper. From a 7-in. long, 1-in. square blank mounted between centers, I rough out four stoppers without cutting them apart. For a headstock center, I clamp a pointed ¼-in. dia. steel dowel in the chuck. With the tailstock tightened enough for the steel dowel to drive the spindle, I turn a ½-in. dia. tenon on the tailstock end of the piece. Then I flip the stock end-for-end, and clamp the tenon in the chuck. After roughing out four stoppers, I part through the spindle. This leaves one stopper attached to the tenon in the chuck, and the other three, each with its own tenon, on the rest of the blank, which I set aside.

Before removing too much material near the headstock, I turn the stopper to its final shape. Since there's no tailstock support, the piece is already somewhat flexible and beginning to chatter, particularly at the unsupported end. In fact, the form and the finished texture are occurring simultaneously because I'm often producing a changing progression of chattered surfaces as I'm turning the shape. Each moment, the changing texture of the piece suggests changes in my original design. Does a dramatic development in the texture merit a revision of form? When has each section of the turning reached its ideal state? There's an interesting tension as the work develops.

When I'm satisfied with the shape, I sand the areas that won't have decoration. I don't cover an entire piece with chatterwork—it looks best when contrasted next to a smooth surface. I sand as little as possible. Preserving the sharp edges of a turning gives a vitality that's lost in a heavily sanded piece.

Here I'll explain three chatterwork patterns I use on a stopper. Experience has taught me what patterns I'm likely to get with, say, the edge of a skew or the corner of a parting tool, but there are lots of variables and I'm often surprised by the results. Experimentation is the only way to learn what patterns are possible.

For chatterwork, I run the lathe between 1400 RPM and 2200 RPM. Since the stopper spindle is already very thin near the pointed finial, there is usually plenty of flex there. I make a light shearing cut with the edge of a sharp skew—just one quick pass—along the conical profile. This makes a nice spiraling flute pattern. If the tool bites too deeply, the work will explode into useless fragments. After each cut, I turn off the lathe and inspect the work. If the first attempt doesn't yield a pleasing surface, I try another cut. This time I'll force a slightly greater flex by applying light downward pressure on the spindle as the cut progresses. If I'm still not getting enough flex, I use a parting tool to reduce the diameter of the stopper slightly on the headstock side of the finial.

I decorate the stopper's disc with a series of concentric circles of radial flutes (or facets). With the edge and corner of a sharp parting tool, I begin at the center of the disc where the finial emerges, and lay in concentric circular ridges. Slight pressure toward the headstock deflects the spindle and initiates the chatter as I cut each circle. Again, each cut takes only a few seconds, and I stop the lathe after every cut or two to inspect the work. During these pauses I regrind the cutting edge—at least every fourth or fifth cut. I keep the ring-chatter cuts shallow, and always plan enough thickness to the disc to allow me to shear off the chattered surface and begin a second or even third series of chatter cuts if I'm not satisfied. Often I have to reduce the thickness of the spindle to give more flex. Fluted rings are fairly easy. You should be able to cut them on the first or second try.

On the spherical barrel, I make a pattern that resembles the texture of beaten metal. I get this effect by making a smooth cut with a sharp skew just as if I were reducing the diameter. Since the stem diameter was reduced after the shape was completed, the skew now chatters over the surface instead of reducing the diameter. The chatter is shallow, but noticeable. With one pass down the headstock side of the barrel and a mirror-image pass down the tailstock side, amazing patterns can emerge.

After I've chattered a surface, I burnish it before going on to the next one. This accentuates the texture, polishes the high points, and reveals any errors. My burnisher is simply a ¼-in. square stick, 12 in. to 18 in. long, of the same species as the spindle being burnished. I sharpen each end to a point. (The ends are quickly blunted, so it's handy to have several burnishers sharpened in advance before each turning session.) One pass over the spinning chatterwork does it.

When I'm finished, I examine the piece for flaws, moving the light around the work to highlight the surface. Sometimes light sanding is necessary. Then I apply Watco with cheesecloth or other lint-free fabric while the stopper is still on the lathe, and I polish with a clean, dry cloth. I part the piece at the stem and set it aside. When the finish is dry, I buff the stopper on a linen wheel or wool bonnet lightly dressed with pure carnauba wax. □

Stephen Paulsen earns his living producing scent bottles, jewelry boxes and small containers in Goleta, Calif.

Shipping Furniture

Crated crafts arrive intact

by Robert Erickson and Liese Greensfelder

Although constructing a shipping crate doesn't require the same meticulous attention to detail as making furniture, transporting valuable and sometimes delicate work to anxious clients calls for careful packaging. Even if you're not in business, you'll want to provide special protection for that cradle you're shipping across the country for your new grandchild, or that Chippendale chair you're sending to a friend as a wedding present. I learned the hard way when an elm table I'd made was deeply scratched in transit last year. When I asked about insurance, the shipping agent answered, "Your insurance is the strength of the crate you build." My crate that time was a 1x4 frame with a cardboard liner and a plywood top and bottom. It must have been packed at the bottom of the pile—a crossmember on the top frame broke and pushed down onto the tabletop. I blamed the shipper and the shipper blamed me.

To find out how a professional builds a strong crate, I visited Enclosures International Corp., an art and antiques shipping company in San Francisco. Roy Korobi, the shop foreman, told me how he would package a rocking chair, but the principles can be applied to any item. Basically, he builds a wooden box with $\frac{5}{16}$-in. plywood pieces reinforced with 1x3 framing, then he adds padded supports to keep the chair from moving around inside. Crates for bigger, heavier objects are made with larger structural components.

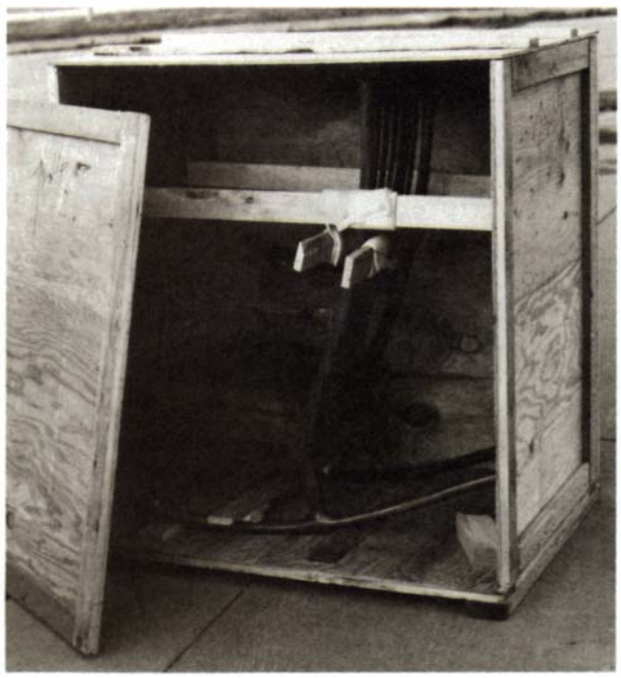
The first step in building your own crate is to determine the necessary dimensions, keeping in mind that Interstate Commerce Commission shipping regulations require at least a 1-in. clearance all around between the piece of furniture and the crate. That way, the crate can flex a little without damaging your furniture.

You'll need six panels for each crate. Exterior-grade $\frac{5}{16}$-in. CD plywood is strong enough for most purposes. You could use $\frac{3}{8}$-in. plywood, but it's heavier and shippers charge by weight. To make edge frames for the sides and bottom, nail pine or fir 1x3s to the plywood with $1\frac{3}{8}$-in. long, 16-gauge drywall nails. For the top, two long pieces nailed across the plywood offer more protection than the edge frame. In nailing the frames, workers at Enclosures do their hammering on steel-topped tables so that the nails are clenched as they're driven through the panels. A small steel plate under the nailing surface would also work.

To assemble the box, butt-joint the sides and drive 6d box nails through the framing strips. Drive 8d box nails through the bottom framing to join the bottom to the sides. For easy fork-lift access, nail 2x4s to the two sides of the bottom. "Using a fork lift demands more caution in warehouse movement than using a hand truck," says Korobi. In other words, if freight handlers can use a fork lift, your crate may be treated better.

Assemble the box such that you can install braces around the object after it's put into the crate. For a rocking chair, Korobi suggests putting the bottom, top and three sides together, leaving one side open. Then add bracing and padding as shown in the photo at left. For extra protection, line the box with 1-in. polystyrene sheets (polystyrene usually is available from "Packaging Materials" companies listed in the Yellow Pages). To monitor the stresses a box is exposed to, I use shock meters called Shockwatch Labels (available for $2 to $9 from Media Recovery Inc., 1435 Round Table Dr., Dallas, Tex. 75247). These are small, red, adhesive-backed paper strips containing buttons that change color when "broken" by a calculated stress.

Despite my bad experience with a light crate, several well-known craftsmen use



What's inside? Shippers don't have any idea, so your crate had better be strong enough to survive a trip through the Twilight Zone. For maximum protection, assemble the box with one side open, insert the object and add foam-wrapped pine braces to keep it from moving, then screw on the last side for easy disassembly.

Photos: Robert Erickson

heavy-duty cardboard boxes for shipping light pieces of furniture. George Nakashima, for example, packs his chairs in such cartons. Thos. Moser Cabinetmakers of New Gloucester, Maine, ships their Windsor chairs in cardboard boxes fit inside a light 1x4 lumber frame. The frame absorbs the bumps and bounces, as well as any weight placed on the crate. No attempt is made to restrain the chair in the box.

Once you've prepared your crate or carton, pick a carrier who will safely transport your furniture and deliver it punctually. The three best methods of transporting single pieces of furniture are common carrier, air freight, and art and antiques shipping companies.

Common carrier, or truck, is the usual means. Delivery time from Omaha to San Francisco, for example, is one to two weeks, and the shipping cost for a crated, 100-lb. rocking chair is $80 to $100.

Air freight is faster and more expensive than common carrier. The same rocker shipped via air freight from Omaha to San Francisco would cost about $200, but delivery time would be one to three days.

Wendell Castle says it isn't economical for him to make crates for shipping his furniture, so he turns the job over to a company that specializes in handling art and antiques. The company packages, ships and delivers the furniture, and carries its own insurance. Says Castle, "If a claim is filed, insurance companies don't question the packaging made by professional crate builders, whereas if we do it, they'll nitpick over the construction of the box."

Humidity can be a problem in furniture transport and storage. Castle once had to refinish a piece because a museum had stored it wrapped in plastic and condensation destroyed the finish. Certain art and antiques transport companies offer humidity and temperature control. For one such company, crating costs for a rocking chair range from $90 to $120, plus shipping charges, which are similar to common-carrier charges.

The size limitations imposed by the U.S. Postal Service, United Parcel Service and other package delivery services generally rule them out as furniture shippers. The Postal Service and UPS will only accept packages that weigh less than 70 lb. and measure no more than 108 in. (length plus girth). Amtrak won't handle any box exceeding 75 lb., or 36 in. in any dimension. A piece sent by Amtrak from Omaha to San Francisco, for example, would cost $18.50 for 75 lb. and take two days. The blanket-wrap system used by moving-van companies costs about the same as common carrier, but movers usually require a 500- to 1,000-lb. weight minimum. With orders less than 1,000 lb., a typical delivery time from Omaha to San Francisco is 30 days.

Any shipper should be able to give a firm quote or at least a cost estimate over the phone, based on an accurate description of the merchandise. Also, he should have insurance and pickup service, and allow you to pay the shipping costs after the goods have been delivered and inspected.

If your furniture is expensive, the shipping company may require a bill of sale to prove your stated replacement costs. Be sure to have copies available. Remember, insurance is essential. If you are ever told, as I was, that "your packaging is your insurance," look for another shipper, even if you have to drive to the next town. □

Robert Erickson is a furnituremaker near Nevada City, Calif. His wife, Liese Greensfelder, is a writer and agricultural consultant.

Freight facts

by Marc S. Standig

Freight costs can be part of an item's price, or an extra charge that often appears in obscure language such as F.O.B. (freight on board). Here are some basic terms to help you, whether you're a consignor (shipper) or a consignee (receiver).

F.O.B. destination: The seller pays the freight charges.

F.O.B. shipping point: The buyer pays the freight charges.

C.O.D.: Carrier collects purchase price, freight costs and a collection fee.

Freight collect: The buyer pays the shipping charges upon delivery.

Single shipment charge: A $5 to $10 charge for a single pickup for a bundle weighing less than 500 lb. There may also be a minimum delivery charge for such small items.

Advise of delivery: The carrier notifies the buyer before attempting delivery. There may be a charge for this.

Inside delivery: The truck driver carries the merchandise into the buyer's home or business. The charge is about $2.52 per 100 lb., $19.75 minimum.

Demurrage: A charge levied against the buyer or seller for excessively delaying a driver picking up or delivering.

Bill of lading: A document issued by the carrier that states the receipt of goods and shipping terms agreed to.

The cost of shipping small items via the U.S. Postal Service, United Parcel Service or a similar service usually is $3 to $25. Trucking company charges can easily exceed $35. The total freight charges will depend on the commodity, its weight, the distance traveled and the type of carrier (rail, air or truck). The hundreds of commodity classes are based on factors such as what the material is, if it's a raw material, component or finished product, and how it's packaged.

Oak lumber, for example, is in commodity class 55, so to ship bundles weighing less than 500 lb. from Wilkes-Barre, Pa., to Providence, R.I., will cost about $13.87 per 100 lb. For more than 500 lb., the cost per 100 lb. falls to $10.87. As the shipping distance increases, so does the cost per pound. To ship the same bundles from Wilkes-Barre to Los Angeles will cost $31.45 and $25.16 per hundred-weight, respectively.

Regardless of how freight charges are figured, there are ways to save money. Ask the vendor for advice—he may have special arrangements with several carriers. If you allow the vendor to delay shipment until he has several orders for a certain area rather than ship a single small item, the freight charges may be less. And you may be able to save up to 20% of the freight charges by picking up the goods at the freight company's dock.

Have the vendor indicate on the bill of lading when you will be able to accept delivery. Otherwise, if the trucker finds no one at home, the company can impose a "redelivery charge" for another trip, which can almost double the regular shipping charge.

If you believe that your shipment has been lost, contact the vendor to determine its weight and how it was shipped, by whom and when. Then have the shipper trace the order. If your order arrives damaged, you can either refuse delivery or accept it. If you accept it, note the condition of the goods on the delivery ticket. □

Marc Standig is marketing director for Lewisohn Sales Company, North Bergen, N.J.

St. Louis Show

Gateway city draws Midwest's best

by Paul Bertorelli

Ron Diefenbacher's padauk writing desk won first place in Hibdon's show. The piece is 38 in. high and can be used standing or sitting. Detail at left shows the gouge marks Diefenbacher left as a decorative touch inside the bandsawn and carved locus of each leg.

Last June, Hibdon Hardwood in St. Louis invented a refreshing alternative to displaying furniture in stuffy galleries and overcrowded craft fairs. They swept out their warehouse (an old movie theater on the city's south side), filled it with furniture by 17 midwestern makers, then invited St. Louisans to come have a look.

The result was one of the best-attended shows I've been to this year and one that had something for everyone. For the woodworkers, author James Krenov, lured away from his teaching duties in California, spent the weekend critiquing the work before awarding prizes to the pieces he liked best. For the 1,000 visitors who attended, the show was a genuine revelation. A few had been to Hibdon's first Midwest Wood Furniture Show, but many seemed amazed that high-quality, one-of-a-kind furniture is being made at all, even if the prices provoked a gasp now and again.

High prices or not, a few pieces did sell and a couple of commissions were promised. Hibdon's generous promotion and good organization were the stars of the show, though. Besides getting out invitations and pre-jurying slides, the Hibdon folks bought everybody dinner after the show closed. And they convinced local newspapers to cover the event—not an easy task in an election year when reporters are off covering the political circuit. Such publicity helps the cause, but I think the real value of this show was its therapeutic effect. A peculiar kind of loneliness afflicts people who labor long hours in small shops making wood furniture. The St. Louis show offered a weekend respite, a chance to recharge idea batteries and exchange a tale or two over a cold beer. □

Paul Bertorelli is FWW*'s editor. For information on Hibdon's next show, write them at 17th and Chouteau, St. Louis, Mo. 63103.*

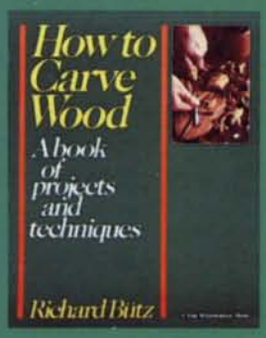
Photos: Randy Hyman

This palm-tree table drew a few giggles, an effect not entirely unintended by its maker, Tim Curtis, of St. Louis. The table's glossy, turquoise-stained maple top is meant to suggest a swimming pool's shimmering surface. The tree trunks are bent laminated walnut; the leaves, aniline-dyed ash.

Kansas City's John Kriegshauser made this cherry dining chair especially for the Hibdon show. The legs were bandsawn, then shaped with a spokeshave.

The iris-like action of a camera shutter inspired John Noel's stack-laminated table, shown at left below. Noel, of Kansas City, Mo., lacked a lathe big enough to turn the 59-in. top, so he enlisted the aid of a patternmaker. The table is made of boire. Charles Lippert's end table, below right, is of black-lacquered cherry and fiddleback maple veneer over a solid-spruce core. Lippert, who works in St. Louis, studied woodworking at Leeds Design Workshops in Easthampton, Mass.

Holiday Gifts for Woodworkers



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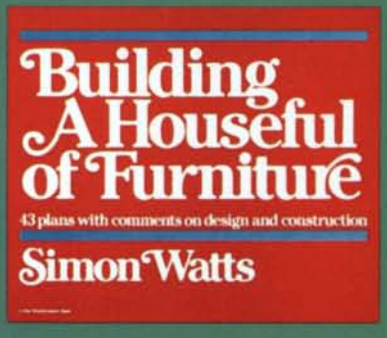

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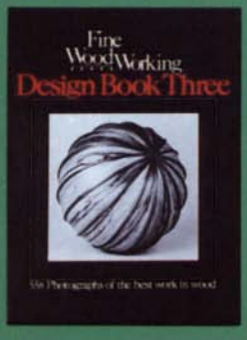

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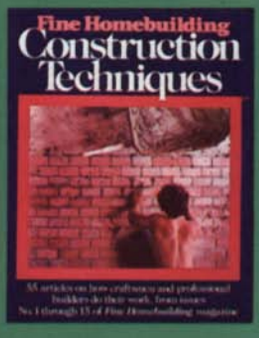

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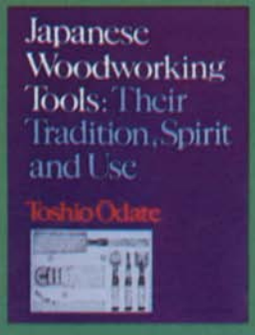

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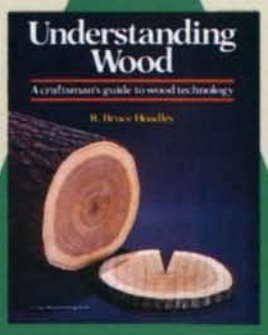

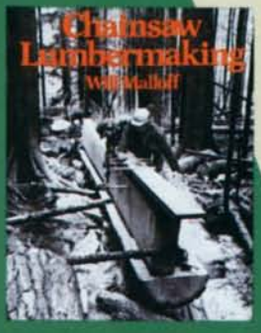

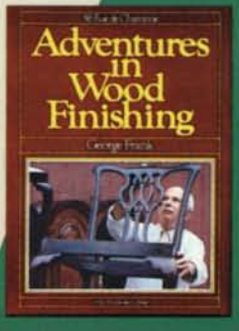

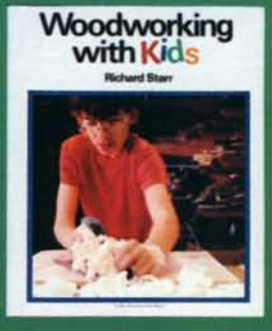

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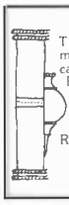

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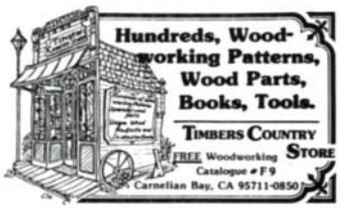

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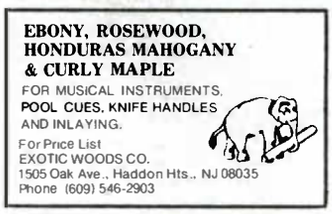

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ARIZONA: **Competition**—Handicrafts (age 16 and under), 1984 State Fair, Oct. 19–Nov. 4. 1826 W. McDowell, Phoenix. (602) 252-6771.

CALIFORNIA: **Workshops**—Shaker boxes, John Kassay, three Thursdays beginning Nov. 29; beginning carving, Thursday evenings, Nov. 8–Dec. 6; cold-molded boatbuilding, weekends, Nov. 17–Dec. 15. Hands On Wood, 2621 Sutter St., San Francisco, 94115. (415) 567-2205.
Demonstrations/workshops/seminars—Numerous at The Cutting Edge stores. San Diego, (619) 695-3990: Tablesaw tuneup, Nov. 3; tool swap meet, Nov. 10; Leigh dovetail jig, Nov. 17; doweling, Nov. 24. Los Angeles, (213) 390-9723: Woodworking basics for women, Nov. 10; tablesaw tuneup, Nov. 10; a day with Sam Maloof, Nov. 17; Christmas craft market, Dec. 8.
Fair—Goodfellow Christmas Crafts and Gourmet Food, Nov. 23–25. San Mateo County Exhibition Center. Contact Goodfellow Catalog Press, PO Box 4520, Berkeley, 94704. (415) 428-0142.
Juried exhibition—Sonoma County Woodworkers Association Artistry in Wood '84, Nov. 17–25. Burbank Center for the Arts, Hwy. 101 River Road exit, Santa Rosa. (707) 823-2822.
Workshops—Numerous courses. Ganahl Lumber School of Woodworking, 1220 E. Ball Rd., PO Box 31, Anaheim, 92805. (714) 772-5444.

COLORADO: **Juried exhibition**—Colorado Artist-Craftsmen, Nov. 30–Dec. 23 (Colo. residents only). Arvada Center for the Arts and Humanities, Arvada. Contact Box 4382, Denver, 80204.

CONNECTICUT: **Show**—Holiday Crafts Festival I and II, Dec. 7–9 and 14–16, respectively. Hartford Civic Center, Hartford. Contact American Crafts Expo's, Box 368, Canton, 06019. (203) 693-6335.
Exhibition—16th Annual Celebration of American Crafts, Nov. 8–Dec. 23. Creative Arts Workshop, 80 Audubon St., New Haven, 06511. (203) 562-4927.
Workshops—Wood techniques, James Schriber, Sept. 25–Nov. 6; bent laminations, Josh Markel, Nov. 3–4; green-wood chairmaking, Drew Langsner, Nov. 17–18; traditional basketmaking, John McGuire, Nov. 17–18. Brookfield Craft Center, Box 122, Brookfield, 06804. (203) 775-4526.
Exhibition—"Inspired by Folk Expressions," Sept. 23–Nov. 18. Brookfield Craft Center Gallery, Rt. 25, Brookfield, 06804. (203) 775-4526.
Seminar—"Marketing Your Craft," Oct. 27. Middlesex Community College, Middletown. Send SASE to Anita Malone, 670 Wintergreen Ave., Hamden, 06514. (203) 789-7865.
Juried show—"The Great Salt Box," Oct. 7–28. Saltbox Gallery, 37 Buena Vista Rd., W. Hartford.

DELAWARE: **Juried exhibition**—25th Contemporary Crafts Exhibition, Jan. 18–Mar. 3, 1985. Delaware Art Museum, 2301 Kentmere Parkway, Wilmington. Application and slide deadline Oct. 26, 1984. Contact Lial Jones, Delaware Art Museum, 2301 Kentmere Parkway, Wilmington, 19806.

WASHINGTON, D.C.: **Exhibition**—Crafts about "American Politics and the Presidency," Sept. 7–Nov. 4. Renwick Gallery, Smithsonian Institution.

FLORIDA: **Seminar/workshop**—Woodturning with Russ Zimmerman, Dec. 8, Miami; Dec. 15, Winter Park. Contact Tampa Woodworkers, (813) 949-4625.

GEORGIA: **Show**—"New Furniture" by Dan Rodriguez, Oct. 11–Nov. 1. Signature Shop & Galleries, 3267 Roswell Rd., Atlanta, 30305. (404) 783-5869.

ILLINOIS: **Demonstrations**—Inca, Nov. 3, Dec. 1. O'Hare Expo Center, Rosemont. Hardwood Connection, 420 Oak St., DeKalb, 60115. (815) 758-6009.
Juried exhibition—"Varied Treasures," Nov. 24. Rice Center, Illinois Benedictine College, Lisle. Contact Kathy Valle, PO Box 1046, Lisle, 60532. (312) 960-4718.

IOWA: **Exhibition**—3rd Annual Members' Work, Nov. 23–25. Old Brick, Market & Clinton, Iowa City. Contact Eastern Iowa's Wood Artisans' Guild, PO Box 2863, Iowa City, 52244. (319) 643-2692.

KANSAS: **Demonstrations**—Tablesaw, bandsaw, jointer/planer, Oct. 18–20, Nov. 16–17. Woodworkers' Tool Cabinet, 843 South Poplar St., Wichita, 67211. (316) 681-3004.

MAINE: **Design competition**—Products for production by sheltered workshops. Deadline Nov. 1. Contact Sheltercraft, Inc., 58 Exchange St., Portland, 04106.
Juried show—Maine woodworkers, sponsored by Kennebek Valley Woodworkers Association, Nov. 11–Dec. 16. Art gallery, University of Maine, Farmington. Contact Roy Slamm, (207) 643-2346.

MARYLAND: **Juried fair**—Holiday Craft Fair, Dec. 4–6. University of Maryland, College Park. Deadline Nov. 15. Contact Mary Shaffer, (301) 454-4754.
Exhibition—Workworkers' Guild of Washington, Oct. 20–Dec. 24. Appalachiana, 10400 Old Georgetown Rd., Bethesda. Contact Lili Lihn, 21 West 86th St., New York, N.Y. 10024. (212) 873-5421.

MASSACHUSETTS: **Seminars**—Various, including Thomas Moser, Nov. 7. The Woodworkers' Store, 2154 Mass. Ave., Cambridge, 02140. (617) 497-1136.
Lectures/demonstrations—Wendell Castle, Nov. 17; furniture conservation, Robert Walker, Dec. 1; tool demonstrations, Jan. 12, 1985. Woodcraft Supply Corp., 41 Atlantic Ave., Box 4000, Woburn, 01888. (617) 935-5860.
Fair/workshops—5th Annual Fair of Traditional Crafts, Nov. 3–4; extensive winter schedule of workshops. For calendar, contact Old Sturbridge Village, Sturbridge, 01566. (617) 347-3362.
Exhibition—"Equinox Exhibit" featuring furniture by Peter Dean and Andrea Medalie, Sept. 22–Oct. 22. Program in Artisanry Gallery, George Sherman Union Bldg., 775 Commonwealth Ave., Boston. Contact S. Locke, (617) 353-3662, 353-2240.

MICHIGAN: **Show**—Woodworking '84, Michigan Woodworkers Guild, Oct. 24–27. Somerset Mall, Troy. Contact John Rocus, (313) 996-9183.

MISSOURI: **Workshops/classes**—Rubbing out and hand polishing, preparing a finish, Oct.; using hand planing, sharpening hand tools, introduction to hand tools, Nov. The Finishing School, 1629 N. 2nd, St. Charles, 63301.
Show—Excellence in Woodworking, Oct. 20. Armory Bldg., 701 E. Ash St., Columbia. Contact Gerald Jones, c/o Midwest Woodworkers' Association, 31 Cumber-

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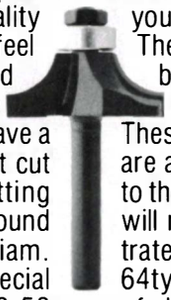
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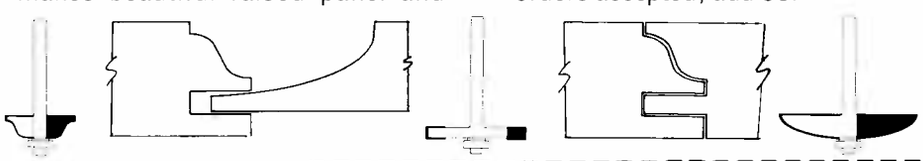

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land Rd., Columbia, 65203. (314) 874-2250.

MONTANA: **Show**—6th Annual Woodworking Show, Oct. 12–Nov. 7. The Artifacts Gallery, Bozeman. (406) 586-3755.
Show—Contemporary furniture by Forrest and Meredith Tate, Nov.–Dec. Danforth Gallery, Livingston. Contact Meredith Tate, Box 203, Gallatin Gateway, 59730.

NEVADA: **Juried exhibition**—KNPR Craftworks Market, Oct. 27–28. 5151 Boulder Hwy., Las Vegas, 89122. (702) 456-6695.

NEW HAMPSHIRE: **Exhibition**—Handcrafted furniture, Oct. 29–Jan. 18, 1985. League of New Hampshire Craftsmen, 205 N. Main St., Concord. (603) 224-3375.
Juried exhibition—League of New Hampshire Craftsmen 10th Annual, Oct. 25–Nov. 25. Currier Gallery of Art, 192 Orange St., Manchester. Contact Kathleen Soldati, 205 North Main St., Concord, 03301. (603) 224-3375.

NEW JERSEY: **Juried exhibition**—Westfield Craft Market, Oct. 26–28. N.J. State Armory, Westfield.
Workshop—Japanese woodworking tools and techniques, Toshio Odate, Oct. 20. Brookdale Community College, Newman Springs Rd., Lincroft. Contact Dr. Gabriel Longo, (201) 842-1900.

NEW MEXICO: **Demonstrations**—Japanese tools and joinery, John Burt, Oct. 27; traditional furniture woodcarving, Gunther Worrlein, Dec. 8; both at 615 Mission NE, Albuquerque. Wooden plane making, Bruce Peterson, Nov. 10; 1129 Goff SW, Albuquerque. Contact William Pike, (505) 265-4077.
Crafts show—"Ideas in Wood" sponsored by Albuquerque Woodworkers Association, Nov. 9–Dec. 2. KiMo Theater Gallery, 419 Central Ave. NW, Albuquerque.

NEW YORK: **Exhibition**—Furniture by Tage Frid, Sept. 13–Oct. 28. Gallery at Workbench, 470 Park Ave. So. at 32nd St., N.Y.C., 10016. (212) 481-5454.
Workshop—Japanese hand tools, Oct. 20–21, Nov. 17–18. The Luthierie, 2449 W. Saugerties Rd., Saugerties, 12477. (914) 246-5207.
Demonstration/course—Woodworking, Sept. 19–Jan. 9, 1985. Craft Student League, YWCA, 610 Lexington Ave. at 53rd St., N.Y.C. (212) 755-2700.
Juried show—Holiday Craft Marketplace, Dec. 15–16. Rockland County Community College, Suffern. Contact Quail Hollow Events, PO Box 825, Woodstock, 12498. (914) 679-8087.
Exhibition—1984 Annual Marquetry Society of America, Nov. 3–Dec. 1. Constantine's Show Rooms, 2050 Eastchester Rd., Bronx. Contact William J. Rondholz, 51 Carlton Ave., Jersey City, N.J. 07306.
Exhibition—Wood and Tool Expo, Nov. 16–27. Constantine Building, 2050 Eastchester Rd., Bronx. Contact Glenn Docherty, (212) 792-1600.
Show—10th Harvest Crafts Festival, Nov. 16–18. Nassau Coliseum, Uniondale, Long Island. Contact Creative Faires, Ltd., PO Box 1688, Westhampton Beach, 11978. (516) 288-5225.
Fair—Rehab '84, products and services for the restoration, rehabilitation and maintenance of older buildings, Nov. 9–11. New Scotland Avenue Armory, Albany. Contact Historic Albany Foundation, Inc., 44 Central Ave., Albany, 12206.
Exhibition—"Grainger McKoy: Recent Work," Oct. 31–Nov. 24. Coe Kerr Gallery, 49 East 82nd St., N.Y.C., 10028. Contact C. Gallant, (212) 628-1340.

NORTH CAROLINA: **Juried show**—High Country Christmas, Nov. 23–25. Civic Center, Asheville. Contact Elizabeth Kdan, c/o High Country Crafters, 29 Haywood St., Asheville. (704) 254-0070.
Course—Woodcarving, Helen Gibson, Nov. 4–17. John C. Campbell Folk School, Rt. 1, Brasstown, 28902. (704) 837-2775.
Show—Southern Furniture Market, Oct. 18–26. 210 E. Commerce St., Highpoint. Contact Southern Furniture Mkt. Ctr., Box 828, Highpoint, 27261. (919) 889-6144.
Workshop—Advanced oak drying, Nov. 7–9, Greensboro. Contact Paul Bois, 27 Mondale Ct., Madison, Wis. 53705. (608) 238-7097.

OHIO: **Show**—National Furniture Invitational, through Oct. 28. Sylvia Ullman American Crafts Gallery, 13010 Larchmere-Woodland, Cleveland. (216) 231-2008.
Lectures/seminars—Japanese woodworking tools, Toshio Odate, Nov. 9–11; dovetail joinery, Mark Duginske, Nov. 17–18. Center for Wood Design and Craftsmanship, Continuing Education, Univ. of Akron, Akron, 44325. (216) 375-7575.
Exhibition—American Contemporary Works in Wood, through Oct. 28. The Dairy Barn Southeastern Ohio Cultural Arts Center, Athens. Contact Ellen Gerl, (614) 592-4981.
Show—4th Annual Artistry in Wood, Nov. 18–19. Hara Arena, 1001 Shiloh Springs Rd., Dayton. Contact Walter Grether, 265 Burgess Ave., Dayton, 45415. (513) 275-4582.

OREGON: **Shows**—Wooden toys, Nov. 23–25; holiday woodcarving, Dec. 7–9. Western Forestry Center, 4033 SW Canyon Rd., Portland, 97221. (503) 228-1367.

PENNSYLVANIA: **Exhibition**—Wildlife Art Expo 1984, Oct. 20–21. 103rd Engineers' Armory, 33rd and Market Sts., Philadelphia.
Show—Woodworking World Philadelphia, Nov. 9–11. George Washington Motor Lodge, King of Prussia. Contact Woodworking Association of North America, 35 Main St., Suite 6, Plymouth, N.H. 03264. (603) 536-3876.
Juried show—3rd Annual Pennsylvania National Arts & Crafts, May 3–5, 1985; deadline Dec. 15, 1984 (open to all U.S. residents). Send SASE to Kay Kishbaugh, Pennsylvania National Arts & Craft Show, PO Box 11469, Harrisburg, 17108, or call (717) 697-3834.
Shows—Furniture of Wendy Stayman, Silas Kopf, Peter Pierobon, Oct. 14–Nov. 25; furniture transfigured, Dec. 2–Jan. 21, 1985. Snyderman Gallery, 317 South St., Philadelphia. (215) 238-9576
Exhibition—Furniture by John Dunnigan, through Nov. 19. Swan Galleries, Rittenhouse Square, 132 South 18th St., Philadelphia, 19103. (215) 568-9898.

SOUTH CAROLINA: **Show**—Furniture by Sam Maloof, through Nov. 4. Greenville County Museum of Art, Greenville. (803) 271-7570.
Show—"Artistic Sass/Primary Art" by Dan Rodriguez, Dec. 5–15. 14 Greenwood Dr. #6, Hilton Head Island. Contact Dan Rodriguez, 200 South Ave., Comer, Ga. 30629. (404) 783-5869.

TENNESSEE: **Workshop/exhibition**—Woodworking related to the garden, Oct. 12–Dec. 8. Arrowmont School, Box 567, Gatlinburg, 37738. (615) 436-5860.
Juried show—National Knife Collectors, Nov. 30–Dec. 2. Hyatt Regency Hotel, Knoxville. Contact Smokey Mountain Woodcarvers Club, c/o Jack Phillips, 6713 Trousdale Rd., Knoxville, 37921.
Tours—Tennessee Hardwood Factory. Daily M–F, 800 Main St., Woodbury. (615) 563-2223.

TEXAS: **Exhibition**—"Local Treasures," Dec. 4–Jan.

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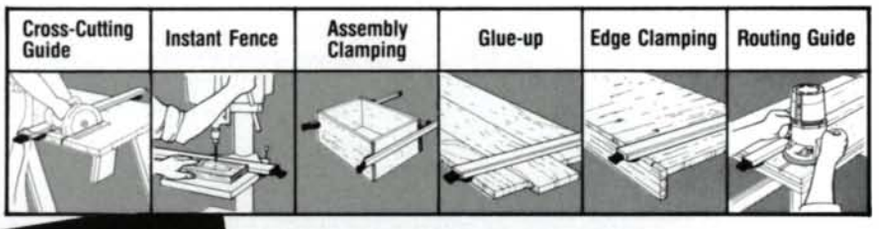

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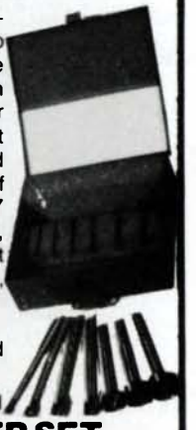

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13, 1985. Institute of Texas Cultures, 801 South Bowie St., San Antonio. Deadline Oct. 17, 1984. Contact Austin Woodworkers, Rt. 1, Box 112, Manchaca, 78652. (512) 282-0493.
Exhibition—"Lone Star Sampler Invitational," Nov. 2–31. Texas Commerce Bank, 712 Main St., Houston.
Juried fair—Houston Festival's Annual Crafts and Arts Exposition, Mar. 23–31, 1985. Deadline Dec. 1, 1984. Contact Barbara Metyko, Houston Festival, 1964 W. Gray, Suite 227, Houston, 77019. (713) 521-0993.

VERMONT: **Exhibition**—Rare tools and machines, ongoing exhibit. The American Precision Museum, Windsor. (802) 674-5781.
Exhibits/workshops—Series at Vermont State Craft Center at Frog Hollow, Middlebury, 05753. (802) 388-3177.

VIRGINIA: **Show**—International Creative Marquetry, Oct. 2–28. Library, Virginia Wesleyan College, Norfolk.
Fair—Lynchburg Fine Arts Center Fall Craft Fair, Nov. 2–4. The Radisson Hotel, Lynchburg. Contact (804) 846-8451.
Show—11th Annual Artistry in Wood, Nov. 24–25. Deadline Oct. 31. Marymount College Student Center, 2807 N. Glebe Rd., Arlington, 22207. Contact Charles Schafer, (703) 256-2779.
Juried fair—9th Annual Richmond Craft Fair, Nov. 8–11. Richmond Arena, Richmond. Contact Jan Detter, (804) 649-0674.

WASHINGTON: **Exhibition**—Sculpture, furniture, constructions, through Oct. 27. WhatCom Museum, 121 Prospect St., Bellingham, 98225. (206) 676-6981.
Workshops/seminars—Various. Northwest School of Wooden Boatbuilding, 251 Otto St., Port Townsend, 98368. (206) 385-4948.
Workshops—10-ft. pram, Simon Watts, Oct. 22–27, Nov. 5–10; scrimshaw, Kelly Mulford, Nov. 3; 15-ft. sailing dinghy, Simon Watts, Nov. 5–17; oarmaking, Rich Kolin, Nov. 4, 11; cold-molding, Del Saul, Nov. 18, 25. The Center for Wooden Boats, 1010 Valley St., Seattle, 98109. (206) 382-2628.

WISCONSIN: **Lecture/workshop**—Japanese woodworking design, Toshio Odate, Nov. 30; Japanese woodworking: tools and techniques, Dec. 1–2; dovetail joinery: design and technique, Mark Duginske, Dec. 8. University of Wisconsin, Marathon Center, Wausau, 54401. Contact Kathi Rhoades, (715) 845-9602.

NOVA SCOTIA: **Workshop**—Stephen Hogbin, Nov. 16–18. Sponsored by Atlantic Woodworkers Association, Halifax. Contact Richard Tyner, (902) 466-3306, 466-7170.

ONTARIO: **Lecture/tour**—"Restoration of Spadina House," Oct. 27. Casa Loma Campus, George Brown College, 160 Kendal Ave., Toronto.

Connections

In Connections we'll publish membership calls for guilds, authors' queries, and appeals from readers who want to share special interests.

Grants available, up to $1,000, for research or publication projects about early American industries that relate to homes, shops, farms or seafaring. Deadline for application is Mar. 15, 1985. Write Charles F. Hummel, EAIA, c/o Winterthur Museum, Winterthur, Del. 19735.

French woodworkers: I'd like to hear from other independent woodworkers who share my interest in contemporary furniture. Elisabeth Beaupere, 4 rue de la Passardiere, Donville 50350, France.

Computers in woodworking: I'm using my new MacIntosh to make detailed drawings of my projects and would like to hear from others similarly inclined. Stan Scheiding, 823 West "O" Ave., Nevada, Iowa 50201.

English Chinese furniture: I'm collecting photos, drawings and essential dimensions with a view to possible publication. I'd be grateful to hear about any examples. Ralph Hampton, Grenestede Farm, Kingston, Hazelbury Bryan, Sturminster Newton, Dorset, England.

Book: Constance Stapleton, 2439A Old National Pike, Middletown, Md. 21769, is looking for craftspeople for a book about crafts that are rooted in particularly American traditions, regional or national.

The Daniel's Planer, a machine from the dawn of the industrial age, was manufactured in Worcester, Mass., in about 1836. The Hagley Museum has one, and they'd like to hear from anyone with another or with any further information about the line. Preston Thayer, Hagley Museum, Greenville, Wilmington, Del. 19807.

Australia and New Zealand woodworkers interested in being in a regional register can write to W. Cyril Brown, 223 Kirk Rd., Point Lonsdale, Victoria, 3225, Australia.

Craftspeople: National Craft Showroom seeking to represent craftspeople at the wholesale level. The deadline for application is Jan. 11, 1985. Contact National Craft Showroom, Department W, 11 East 36th St., New York, N.Y. 10010. (412) 279-3732.

South Central Indiana Woodworkers Guild will be holding an organizational meeting Nov. 28 in Bloomington. Contact Ted Stahly, (812) 876-4960.

Bay Area Woodworkers Association meets the third Thursday of every month and invites anyone interested. Write BAWA, Box 421195, San Francisco, Calif. 94142.

Shasta Woodworkers Association invites new members. Write Box 205, Shasta, Calif. 96087.

Maine and New Hampshire woodworkers, amateurs and professionals: Want to join our guild? John Leeke, RR 1, Box 847, Sanford, Maine 04073.

Foothill Woodworkers Association is open to professional and amateur woodworkers. Write Dennis Hayes, 10310 Banyon St., Alta Loma, Calif. 91701.

Minnesota Woodworkers Guild is looking for new members. Write the guild at Box 8372, Minneapolis, Minn. 55408.

Hawkeye Woodcrafters is interested in new members. Write Dwight Mulch, 2636 South Main St., Burlington, Iowa 52601.

Topeka woodworkers: Want to join our group? Write Cleo McDonald, c/o Topeka Public Library, 1515 W. 10th St., Topeka, Kan. 66604.

East Tennessee Woodworkers Guild holds bimonthly meetings. Contact Grover Floyd, (615) 690-2973, or James Hooper, (615) 573-9752.

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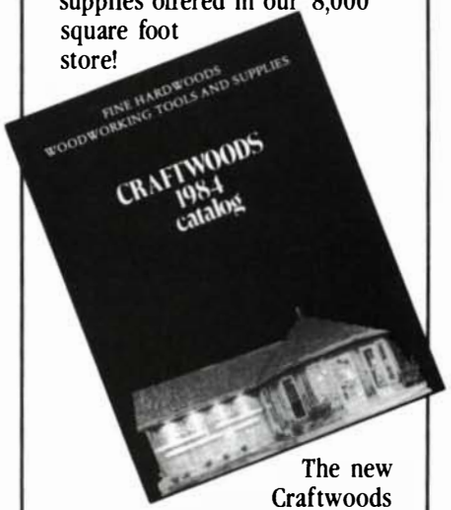

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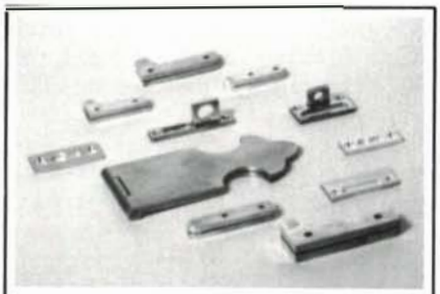

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Restoring the ring to the Old North Church

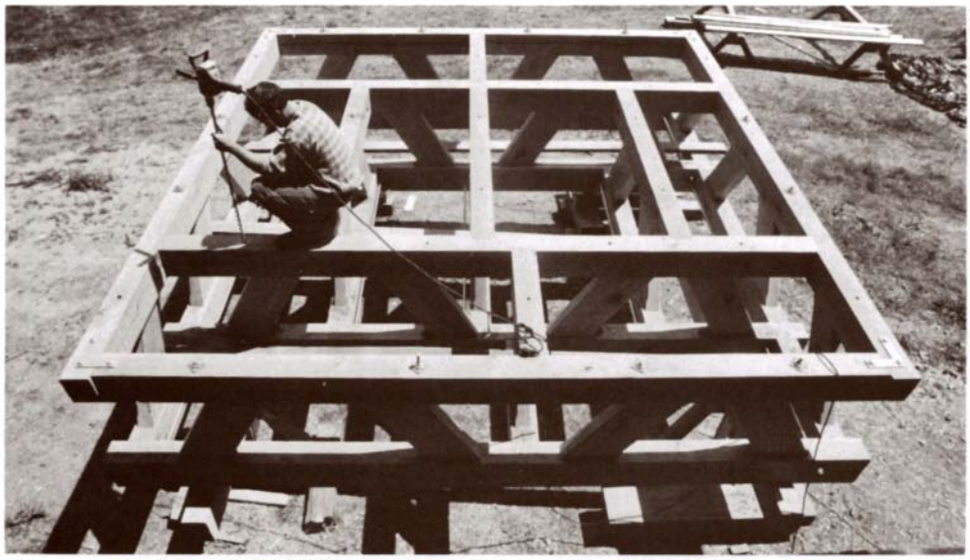
As a professional timber framer, Ed Levin spends his days building wooden houses and barns for clients who appreciate the finer points of joining massive beams with fist-size mortise-and-tenons. Levin loves the work and is always on the lookout for challenging projects.

A year ago, when listening to an evening public radio program called *All Things Considered,* Levin heard a report about the restoration of the belfry of Boston's historic Old North Church. The stout timber frame carrying Old North's eight bells had succumbed to winter upon winter of rain and snow and was so rotted that it could barely support the bells, let alone stand up to the rigors of change ringing, the long bouts of patterned tolling for which the bells had been installed in 1745.

Intrigued, Levin offered his expertise to the committee overseeing the repairs, and plopped himself into a minor controversy. "The bell ringers wanted a steel frame because it would be more rigid," says Levin. "The preservationists were aghast. The original frame was wood and that's what they wanted for the new one."

The preservationists eventually won, despite a recommendation for steel from the White Chapel Bell Foundry, the London firm that had cast the original bells and that served as technical consultant for the repairs. White Chapel agreed to design a wooden frame if Levin would make it of iroko, a teak substitute. Now, iroko is one of your nastier woods, dense and full of oils that gag fungus and bugs and that keep the lumber from shrinking and swelling much. Ideal stuff for a bell frame, but not exactly a staple of New England carpentry. Levin countered with American white oak, and the White Chapel folks said sure, as long as it's dry. "I said 'you pay my phone bill and I'll find dry white oak.'"

A few thousand feet of white oak 4x12s and 6x11s dried to 20% is easier specified than found. Four days of searching turned up nothing but bemused sawyers. "One fellow down south," recalls Levin, "told me dry oak timbers would be harder than Pharaoh's heart, even if I did find them." A mill in Ohio, however, offered an encouraging tip. They had sawn hundreds of white oak timbers for the Navy in 1972; if any remained, they certainly ought to be dry. Wondering just what the Navy wanted with that much timber, Levin called the Naval Shipyard in Boston and found out that the Navy had bought the oak to replace deck and hull planking on its oldest ship, the U.S.S. *Constitution,* which is berthed in Boston harbor. Don Turner, who heads the ship's maintenance crew, let Levin pick through the remaining cache, provided he replaced what he took with new stock. Ironically, the timber was stacked within sight of Old North's steeple.



Tom Wolfe

To resist the enormous racking forces of three tons of swinging bells, timber framer Ed Levin built the Old North Church's new bell frame of heavy white-oak beams. The beams are mortised and bolted together.

Compared to locating the wood, building the frame was relatively simple. Working from White Chapel's drawings, Levin fabricated the frame at his Canaan, N.H., shop, then knocked it down and trucked it to Boston, where a crane lifted it piece by piece into the belfry. The trickiest technical hangup involved drilling holes. As the photo above shows, the frame consists of two horizontal grids connected by 32 diagonal braces mortised and bolted to the grids. Holes for the bolts—some as long as 4 ft.—had to be drilled through the braces at right angles to the grids, and the bit wanted to follow the grain direction of the struts. "Of course, the first time we tried it, the bit went snaking out the side of the brace," Levin says. A wooden jig, a steel-rod extension brazed onto an auger and a lot of practice finally got the job done.

As the work progressed, Levin realized that the frame was by far the most rugged timber structure he'd ever built. When he watched the bells being tested last fall, he found out why it had to be. The bells weigh a total of three tons, but they exert up to two and a half times their weight in horizontal load when they swing through their arcs. "It was incredible," says Levin. "When I went outside and looked up, the weathervane on the steeple was flopping around like the needle on a seismograph."

Old North's bells are now pealing regularly for the first time since about the turn of the century. Plans are being drawn to fit the tower with sound baffles so the bell ringers can practice their art without raising the neighbors' ire. Meanwhile, Levin is back at timbering houses. Though not his most profitable job, the belfry work was surely the most fun. "We ate lunch up in the lantern where Paul Revere looked for the lights, and it's unquestionably the best view of the city of Boston."

—Paul Bertorelli

A bitter lesson from sugar maple

Back in 1962, when I was an undergraduate at Dartmouth College, my wife and I became friendly with an elderly German couple who ran a boarding house near Hanover, N.H. One day we got to talking wood, and the old man showed me a lovely 9-ft. long by 15-in. wide piece of roughsawn bird's-eye maple, the kind of board that can come only from huge old New England maples. The board had been in his attic for decades, and despite water stains from a leaky roof, it was absolutely flat. He allowed as how he'd never use it, but that his neighbor wanted it. I allowed as how we needed furniture and it would make a nice coffee table. He gave me half the board.

Till then my woodworking had been limited to a pine chest made in seventh-grade shop class, so I went to see Walker Weed, a fine craftsman who ran the college's Hopkins Center workshop. I told him I wanted to make a coffee table, just plane it and put on four legs.

He ran it through the thickness planer, taking three shallow cuts on one side only. The bird's-eyes were thicker than fleas on a dog. He asked about the other side, but I told him to leave it rough because I

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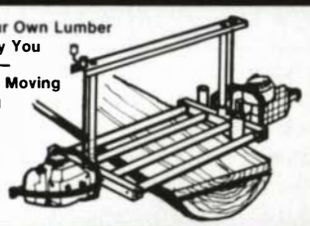

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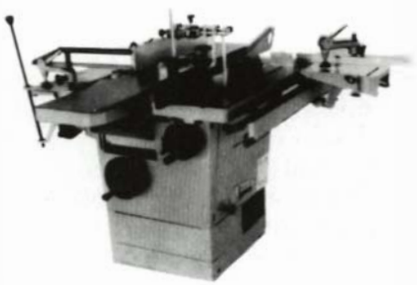

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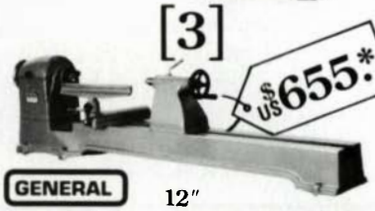

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wanted a thick top. "Liable to warp on you," was all he said. I told him it wouldn't matter. I guess he figured I'd learn more from making the mistake than from him saving me from it.

Once home again, I turned four legs and sanded and varnished the top until it shone like a mirror, but I left the bottom rough. Within days the top was so cupped you couldn't stand a tall glass near the edge. "Maybe it'll flatten with time," I thought. I tend to ignore problems and hope they'll go away—this one didn't.

Years passed, and the plank flattened barely enough to hold coffee cups and beer bottles. But despite the cupping and the ravages of food, drinks and kids, the bird's-eye looked great. I got into wood, and learned about differential shrinkage and why you don't finish just one side of a board. I even made a flat coffee table, but we kept the bird's-eye, thinking it would come in handy someday.

One year a friend raised us a couple of pigs and in return I made a maple bench for his wife's loom. I glued up a maple top, but it looked too plain. Then I remembered the bird's-eye. I dragged it out, removed the finish and sanded the rough side smooth. Then I dampened the concave side and put the board on my workbench. An hour later it was just as flat as when Walker Weed had seen it 18 years earlier. And this time I finished both sides. How those bird's-eyes winked back at me! I kept the bench for a week, to savor the top and to see that it stayed flat, which it did. I guess it's flat to this day.

—Buster Welch, Winnipeg, Man.

Maritime woodworkers show their stuff

The fledgling Atlantic Woodworkers Association in Halifax, Nova Scotia, recently hit on a way to sidestep the squabbling that usually accompanies the jurying of a members' show—they gave everyone in the group a vote. Members presented their work to their peers, and if less than two-thirds of those present approved a piece, it was excluded.

As it turned out, only one piece was rejected, so the show last June displayed a healthy cross section of members' work. None of it was super-sophisticated and some was downright folksy. Pieces that caught my eye were a fine Windsor chair by Jeff Amos; a large oak trestle table and chairs by Robert Stevenson; elegant little teak and rosewood jewelry boxes by Allan Matthews; and Laura Moss' Buddhist prayer altar with a finely carved door, shown at right. Moss' cabinet is Honduras mahogany, and the bird is basswood with a gold-leafed beak.

Formed three years ago, the A.W.A. is open to residents of Nova Scotia, New Brunswick and Prince Edward Island, but the group draws the bulk of its 75 members from Nova Scotia and most of its activities center in Halifax. In addition to holding shows, the A.W.A. publishes a monthly newsletter, organizes monthly meetings and sponsors various workshops. Members also band together to purchase materials, which helps keep freight and handling charges down and eases the effects of the Canadian dollar's recent slump. In fact, a group of A.W.A. members saved $2 per board foot on a recent $2500 order of lumber and veneered plywood from the United States.

Robert Stevenson

Laura Moss' 20-in. high Buddhist altar from the Atlantic Woodworkers show.

Such cooperation is one of the advantages of area craftspeople banding together. Members can also educate and help each other, as well as achieve a public visibility that few individuals could manage alone. If you'd like to know more about the A.W.A., write to the group at PO Box 3501, Halifax South, N.S., Canada B3J 3J2.

—Simon Watts

Blade mystery solved

It was a simple enough ad, a challenge—where did this sawblade come from and what's it for. We didn't have a clue, but Robert Herman Klamt III of Orange, Calif., set us straight:

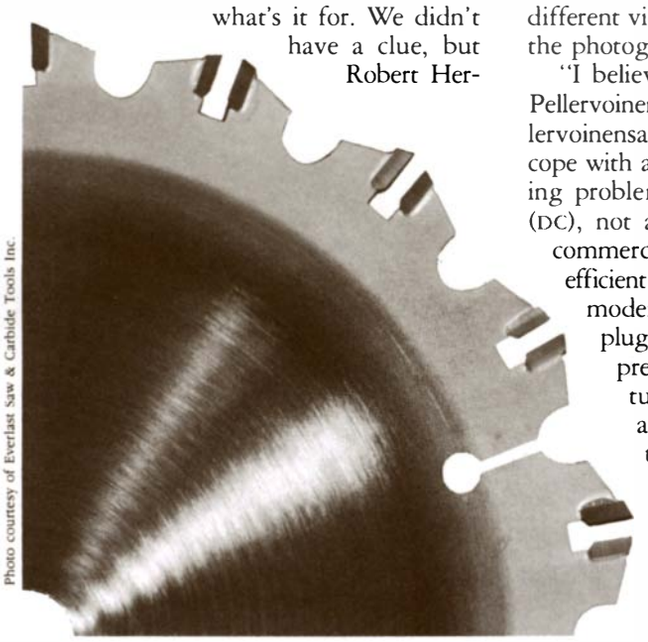

Photo courtesy of Everlast Saw & Carbide Tools Inc.

"Not only can I explain the provocative 'blade' picture, I can give you two different views, which could be resolved if the photograph showed more detail.

"I believe this may be one of the first Pellervoinen sawblades, made by the Pellervoinensawwerke, Helsinki, Finland, to cope with a peculiarly Finnish woodworking problem. Finland uses direct current (DC), not alternating current (AC), in its commercial power system. When the efficient series-wound motors that power modern woodworking machines are plugged into DC, it's impossible to predict which way the motor will turn. The direction of rotation, as everyone knows, is largely determined by the rotor angle relative to the stator when power is applied. In short, the motor will turn clockwise (CW) half the time and counterclockwise (CCW) half the time.

"The ingenious Pellervoinen blade was designed for this unique situation—one tooth cuts in the CW direction, the other in the CCW direction. This allows the Finns to be good sawyers in otherwise difficult circumstances.

"As the speed of a series-wound motor is limited only by air friction against its moving parts, however, use of this blade has its dangers. My father knows of one case where a Pellervoinen was used some 3,000 meters above sea level, in the small Finnish town of Lemminkainer. The air is much thinner there and the drag forces are low, so the saw ran much faster than at sea level. So fast, in fact, that the blade disintegrated the first time it was used.

"Fracturing along the semicircular stress risers, located between the pairs of teeth, the blade broke into 20 almost equal fragments, which rocketed outward in the plane of the blade's rotation and tore a series of evenly spaced slots in the workshop walls, floor and ceiling.

"The building, already stressed by the deep snow on its roof, simply tore along 'the dotted line' and fell into two perfectly

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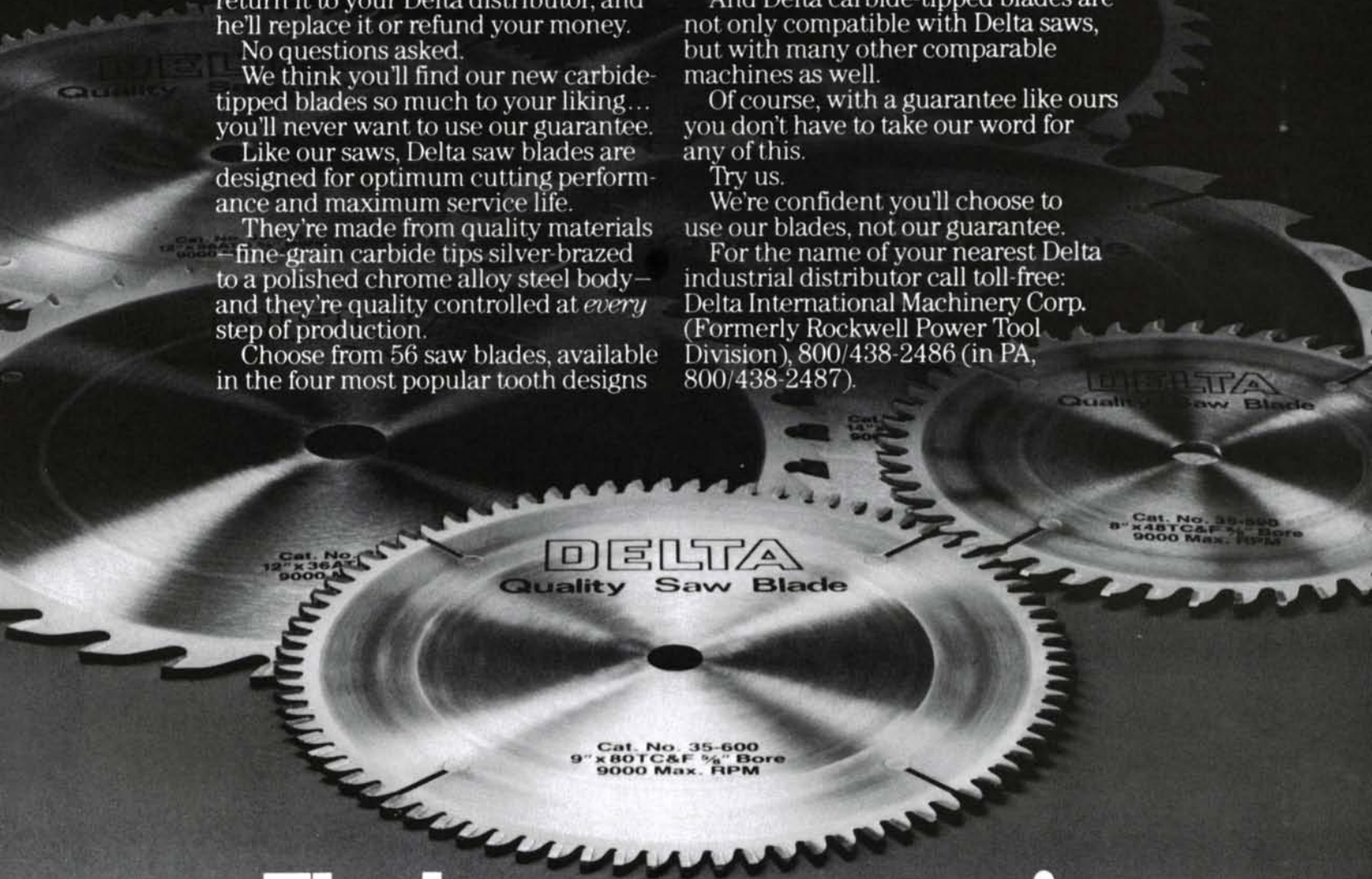

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severed halves. Fortunately, the owner was not injured, but he sued the company for mental anguish.

"If not for cutting wood, the saw could be for making music. In the Fischbachau district of Bavaria, southeast of Munich, lived a well-known family of percussionists named Piesner. Wolfgang Dieter Piesner (1896-1938) was also a physicist. While at the University of Göttingen, he invented several unusual percussion instruments, including one like this—the Piesner Polyharmonic Gong.

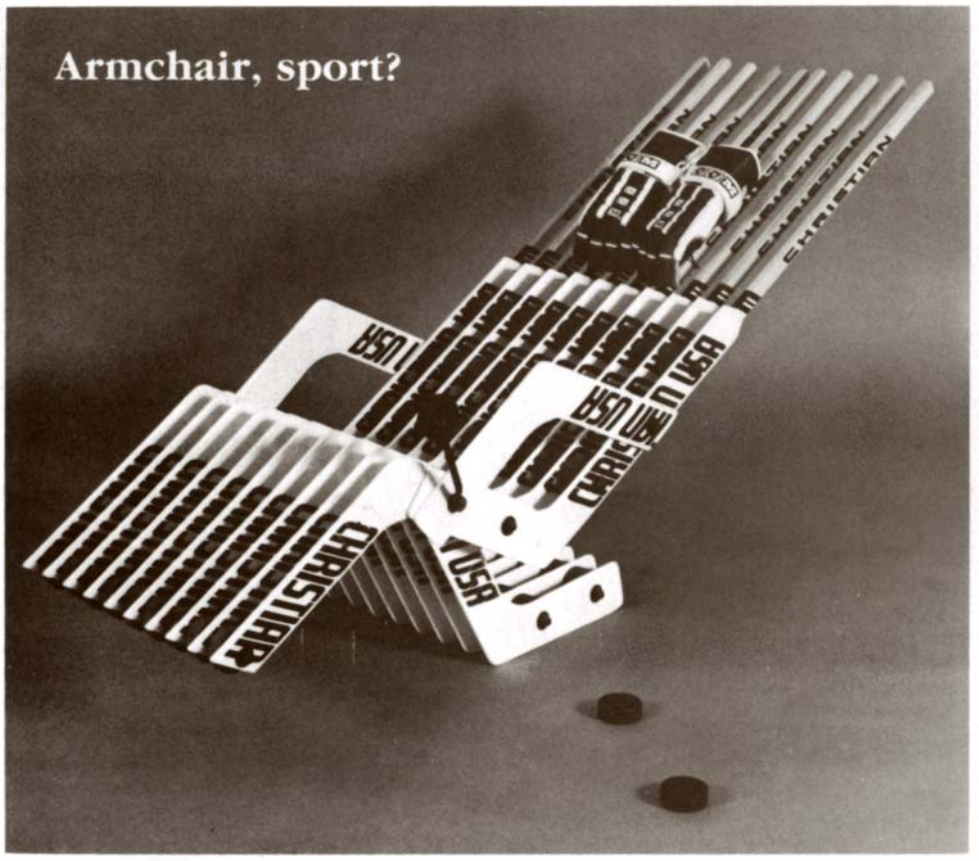
"Simple physical theory tells us that the natural frequency of a circular element like a cymbal or a gong is a function of its diameter to the inverse third power—the larger the diameter, the lower the natural frequency of vibration. Piesner added a series of 20 (on earlier models, 3 to 6) small tuning forks, all set to slightly different frequencies, around the periphery of the main gong. Small mass elements were added to the tips of each tuning fork so each could be tuned exactly by grinding off minute amounts of material.

"When struck, the gong produced a deep, simple tone, upon which was superimposed a series of much higher, different tones—not unlike the sound of the front bumper of a 1936 Ford hitting hard concrete after a seven-story drop.

"In either case, rotation-indeterminate blade or polyharmonic gong, these artifacts are real collectors' items. Thanks for such an interesting ad. It shows that woodworking (and music) can be fun."

Crediting Klamt's ingenuity rather more than his grasp of the facts, we checked with Everlast Saw and Carbide Tools, Inc., of Brooklyn, N.Y., who placed the ad. A company spokesman said the blade was experimental, an attempt to double the time between sharpenings—when the teeth facing one direction became dull, the blade could simply be reversed. The experiment was not a success, but the company felt the ad would highlight their willingness to tackle woodworking problems creatively. □

Ingo Harney



David Hertz's entry in the 'Unofficial Olympic Sports Furniture Show.'

This summer everything from bread to underwear seemed to be officially tied to the Summer Olympics in Los Angeles, so it wasn't too surprising to find a team of furnituremakers ready on their marks for the "Unofficial Olympic Sports Furniture Show," sponsored by the Whiteley Gallery, 111 N. La Brea Ave., Los Angeles. All you needed to enter was imagination and some real sports equipment. The finishers in the August show included Heidi Wianecki's "Surfboard Coffee Table"; Steve Galerkin's "Bowling Alley Table," complete with four pins for legs; and David Hertz's "Hockey Stick and Puck Chaise Lounge," made from 32 goalie sticks, 118 hockey pucks, and a couple of padded gloves for a headrest. □

Chilling news

Freezing your cutting tools will increase their resistance to wear—and that means less sharpening and longer tool life, according to Tom Sweeney of Phoenix, Ariz. Don't start packing the Frigidaire with plane irons and chisels, though, because the temperatures required are down around -300°F. Sweeney, the owner-manager of the Phoenix Cutting Edge store, learned about the process from Jim Rhode, owner of the 3X Company, a small Phoenix firm specializing in freeze-treating metals for industry. Sweeney figured that there was no reason why small-shop and hobbyist woodworkers shouldn't benefit from the process, too.

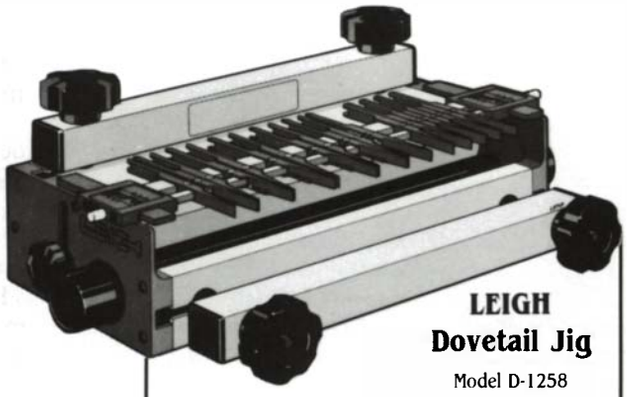
Freeze-treating metals to increase wear resistance isn't new. Decades ago Swiss watchmakers tried storing heavy-wear watch parts in high mountain caves for up to two to three years. After cold storage, the parts were tougher and more stress-free, though no one could explain why. More recently, toolmakers have improved wear resistance by packing steel in dry ice or giving it a quick dunk in liquid nitrogen, but both processes improve only the surface of the steel and the results don't survive the first sharpening. Treatment at about -300°F penetrates the entire piece.

Aerospace research pushed cryogenics, the science of low temperatures, into supercooled realms and out of the lab into the marketplace. For six years, 3X has treated machine tools, oil-drilling and logging gear, and a slew of parts for industry. Wear resistance has been increased two- to six-fold. For example, the steels commonly used in good woodworking tools show an improvement in wear resistance of more than double, with no increase in hardness or brittleness.

Treatment consists of placing the metal in a dry chamber that looks much like a big freezer unit. The air in the chamber is circulated through a helium pump, lowering the temperature in a very slow, controlled drop to below -300°F. The process, including thawing out, takes about 120 hours. Nothing touches the tool and its size remains the same. You'll sharpen exactly as before treatment, but not as often. And, according to Sweeney, the treatment will be affected only if the steel is burned, in the same way that temper is lost.

Sweeney cites impressive lab results and even more impressive testimonials: A Phoenix firm using treated chainsaw chains now sharpens once a week rather than daily, and the chain doesn't stretch in use. A northern Arizona sawmill using treated planer blades now resharpens after 24 hours' running time rather than after four to five hours.

Carbide tools can also be treated. Car-



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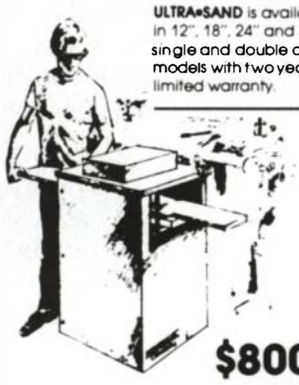

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bide itself isn't affected, but freezing relieves the stresses in the binder that holds the carbide particles together. Chipping and the catastrophic fracture are reduced, and, claims Sweeney, treatment makes the blade plate tougher and it runs truer.

Metallurgists can't explain why supercooling increases wear resistance, but they can describe what it does to the composition of the steel. Like a cake mix, steel is a combination of materials that often don't get mixed together completely. Freezing, according to Sweeney, homogenizes the mix, giving it a tighter, finer grain that increases its resistance to abrasion.

Sweeney has arranged with 3X to make the process available to individuals as well as industries. Cost is about $1.00 per ounce for woodworking tools. A set of 12-in. jointer-planer blades would cost between $5 and $8; a scraper blade, about $1. Any tool can be treated, but plastic and wooden handles must be removed, since freezing would crack them. For more information, contact Sweeney at The Cutting Edge, 10844 N. 23rd Ave., Phoenix, 85029, or the 3X Company, 1815 North 25th Dr., Phoenix, 85009.

—Roger Holmes

A bouquet of chains

If love and care don't make your trees flourish, you may be able to beat the bloom onto them.

Chains were the traditional tool for this bark-busting persuasion, which was practiced by medieval monks who flogged trees to punish them for being sterile, writes Hugh Westrup in a *Canadian Science News* report. The origins of the practice are unclear, but it worked—the trees often flowered soon after taking their licks.

Though they may not know about the monks, modern silviculturists continue the practice—albeit more genteelly. Instead of chains, they use a knife or chainsaw to nick a section of the phloem, the tree's nutrient-carrying vessels, to induce earlier or faster blooms. Getting trees to flower and thereby quickly produce seeds is important to breeders and geneticists anxious to see the results of their work.

Westrup says attacking the trees is a way of "bringing on puberty at an early age" without having to wait 10 to 40 years for the tree to mature. Others say the flowering is the tree's way of coping with stress, or a "last-gasp syndrome," as a hurt tree struggles to reproduce itself.

But, alas, in their quest to trick mother nature, scientists are replacing this colorful but violent path to plumage with drugs. Trees, like humans, have hormones, and a shot of the right stuff can do wonders, painlessly. *—Dick Burrows*

Woodworker in Wonderland

It may have been billed as a trade show, but the International Woodworking Machinery and Furniture Supply Fair USA sounded more like a factory when I got there last August. Acres of giant saws, sanders, shapers and routers designed to handle tons of wood more deftly than most people can deal a deck of cards were all whining away in the belly of Atlanta's Georgia World Congress Center.

As I rode down the escalator, the guy next to me said he felt he was seeing "the wave of the future. I have to lay off five five-dollar-an-hour guys, buy a machine and hire a thirty-dollar-an-hour guy, and hope he doesn't get a cold." He was right—these machines were so powerful and efficient that my Craftsman tablesaw began to seem more than a little obsolete.

But my first gee-whiz reaction was wrong. Sure, there were aisles full of $13,000 tenoners and $16,000 lathes, beeping computers and robots with spray-paint guns. But there were also goodies for the hobbyist or the small- to medium-size shop.

Everyone needs sawblades, and there were more saw displays than I cared to count, complete with helpful company reps to lead you through the maze of teeth and gullets. In fact, most of the booths resembled three-dimensional catalogs. If you were looking for a certain drill or router bit or a shaper cutter for a special job, there were hundreds to pick from. If you wanted to do a little comparison shopping, most of the major manufacturers of small-shop planers, tablesaws, bandsaws, pneumatic sanders and powered hand tools were there, as well as the manufacturers of those neat dovetail jigs you've seen advertised.

For hand-tool aficionados, Freud USA presented an interesting new line of wooden planes, including a hefty, well-balanced jointer, and Italian carving and bench chisels. I liked the compact Wirth Machine, demonstrated by Woodworker's Supply of New Mexico, which makes short work of mortises, tenons and dovetails. Bosch Power Tool Corp. had a neat idea for on-site work—modified tablesaw extensions on which you can mount a router or a saber saw.

Formica Corp. technicians showed how routing panels with ColorCore-covered oak edges produces a surprisingly attractive wood/Formica combination. Another neat trick was a sandblasting unit and stencils that cut designs in the ColorCore.

If you were in the mood for a carnival, you could simply enjoy the spectacle—screaming routers, video-tape machines, a blizzard of free plastic shopping bags trumpeting most of the major tool suppliers in the world, a waving mechanical gorilla, and a mountain of free samples, press releases and catalogs.

Apparently, though, most people did more than look at the displays by 1,000 companies from the United States and 17 other countries during the four-day show—they were buying. "It's been a good show," was the word at almost every booth. Not surprising when more than 30,000 customers, about 5,000 more than expected, show up. *—Dick Burrows*

Chips and Whips and political seals

Only two weeks before the Democratic National Convention was to open in San Francisco, the people in charge asked me to carve the Great Seal of the United States—that eagle-and-arrows affair you see on the back of every one-dollar bill—for the convention podium.

Dorene Gould

Al Croutch (left), Sherilyn Tharp and Jon Lopez sealed the job in 14 days.

With courage born of ignorance, I agreed to tackle the seal, even though I knew I could never do a job like that alone. I'd already enjoyed making a 2-ft. gavel for the convention chairman. The mallet had to be redwood (this *is* California, after all), so I created a free-form sculpture only vaguely resembling a traditional gavel, using a twisted redwood root that allowed me to get both the head and the handle out of a single piece of wood. But the redwood was so flimsy and its grain so squirrelly that I had to glue in myrtle plugs to help hold it all together and to fill the voids left when rocks and pockets of rot were eliminated. When I was through, I had a hardwood hammer with a softwood sheath around it. If you were to rank the woods of the world suitable for constructing a giant hammer, redwood would be near the bottom of the list, somewhere between punky cedar and balsa wood. But that's another story; now I needed help.

As director of the Hands on Wood

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The Taunton Press Box 355, Newtown, CT 06470

school in San Francisco, I have a terrific pool of talent in my thirty expert woodworking teachers. Carver Sherilyn Tharp agreed to drop everything and do most of carving. Al Croutch, our sign carver, volunteered to do the letters and numbers on the seal. I'd handle the other details myself.

On a Xerox machine I enlarged the design from a tiny seal in a history book to a 12-in. circle. With rub-off type I outlined the letters and numbers around the circle, then I enlarged the pattern to 24 in. and rubber-cemented it to an edge-jointed disc of 8/4 mahogany. I routed away the areas to be relieved, and turned the project over to Al for the letter-carving. It was Wednesday night, just eight days before the deadline. Al came through like a champ. Cutting right through the glued-on pattern, he hand-carved the inscription "Democratic National Convention, San Francisco, 1984" in less than eight hours.

Thursday evening Sherilyn started a five-day marathon of flying chips. When I called her every day to see how she was doing, she always had the same confident reply: "No problem." I knew she had the most demanding part of the job, so it made me feel good that she was able to handle it with such calm good humor. With the precision of an engraver and the speed of a sushi chef, she completed the detailed relief carving in record time.

Meanwhile, I tried to knock off the little details like buying paint and figuring out how to attach the carving to the podium. Nothing is ever as easy as it first seems. If you want something to look red, white and blue on TV, you can't use red, white and blue paint. I ended up using orange, beige and blue. Attaching the seal to the podium seemed easy until I found I had to drill through bullet-proof armor!

The seal was to be mounted at 2:00 PM Thursday. At noon on Wednesday the beautifully carved circle arrived at my place. I used a soldering iron to burn in the eagle's feathers, did a little selective staining to heighten the contrast in the clear mahogany areas, and then started painting. By using artists' acrylics and a hair dryer, I managed to get everything dry by midnight. At 1:00 AM I applied one coat of matte varnish, which would protect the carving without producing a shiny surface that would drive cameramen crazy.

The varnish was still a little tacky in the morning, but by afternoon I was able to deliver the seal and screw it to the podium by running drywall screws through holes I had pre-drilled in the armor.

I think the seal looked pretty good up there in front of all those people. If you missed it during the convention, you can see it at the Oakland Museum, where it's on loan from the Convention Committee.

—Jon Lopez, San Francisco, Calif.

Giant door dwarfs project designer William Barnes Davis.

Circle the wagons

One can only guess what beasts roam the Texas plains or haunt the dreams of the Lone Star State's inhabitants, but an exclusive housing estate outside Austin has a gateway that's a match for even the most awesome intruder. The behemoth door shown here is only one of a pair made by the Barnes Davis Co. of Dallas for the portal of The Vineyard on Lake Travis.

If the photo doesn't overwhelm you, ponder these statistics: Each Honduras mahogany door is 16½ ft. tall, 20 ft. wide and 8 in. thick, and weighs in at 8,000 to 10,000 lb. Shepherded through the shop by designer William Barnes Davis, the doors have required the attentions of 13 woodcarvers, 4 clay modelers, a metalworker, and project artist David Wilson for more than 14 months. And they're not quite finished. Each door has a metal framework sandwiched between two layers of 2¾-in. thick mahogany planks held with brass strapwork and copper rivets. The four carved faces are all different, though the basic layout is the same.

The doors will make the 200-mile trip to Austin on flatbed trucks—no doubt turning a few heads along the way. Installed, the doors will be flanked by 107 running feet of 22-ft. tall, 5-ft. thick stone walls. When a Vineyarder wishes to venture in or out of the estate, the appropriate door will roll back on a stout rail and disappear into the wall. □

Notes and Comment

Got an idea you'd like to get off your chest? Know about any woodworking shows, events or craftsmen of note? Just finished a great project? If so, we'd like to hear about them. How about writing to us? And, if possible, send photos (preferably with negatives) to Notes and Comment, Fine Woodworking, *Box 355, Newtown, CT 06470.*

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Collection of Roger Brown

BLACK FOLK ART

Every once in a while, it's good to be reminded that woodworking need not rely on a workshop full of tools and elaborate techniques. The exhibition "Black Folk Art in America 1930-1980," which ended a three-year tour of the United States in July at Chicago's Field Museum, proved abundantly that a sharp pocket knife and a keen imagination are all that some require. (See p. 20 for more on folk art.)

Shown here: 'Chicken George,' by William Dawson, 1977; carved and painted wood, 18½ in. high. 'Bulldog,' by Jesse Aaron, 1969; cedar, fiberglass and bone. 'Fish,' by Leslie J. Payne, 1970s; painted wood and metal, 45¼ in. long.

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