February 1990, No. 80
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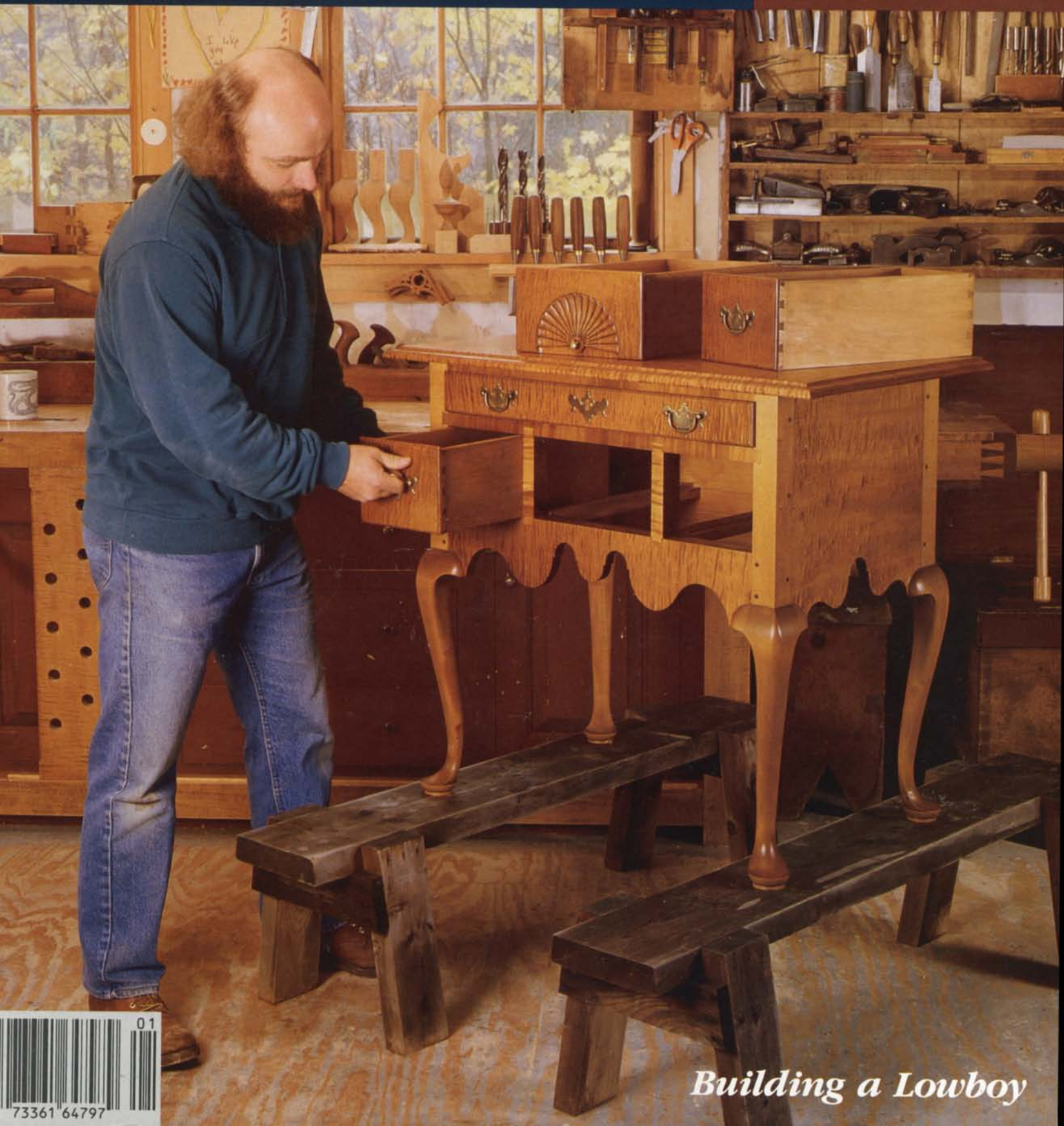
Building a Nightstand

A Norwegian Bench

Routing Rule Joints

Angled Dovetails

Chemicals in the Shop



Building a Lowboy

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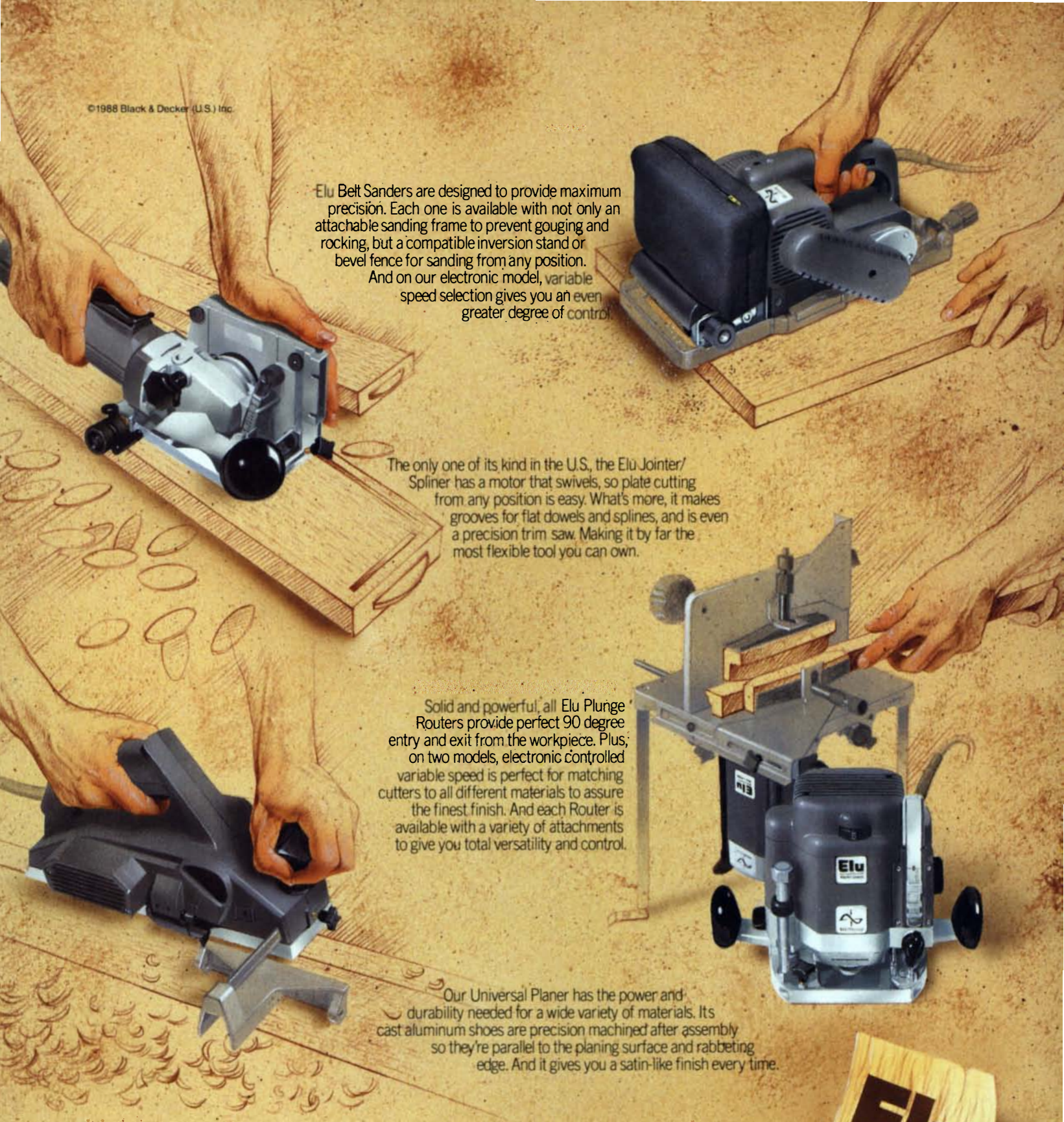

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Fine WoodWorking
January/February 1990

Ever wonder why a drop-leaf joint is called a rule joint? The carpenter's rule above should clear it up. Mac Campbell tells how to make a rule joint on p. 48. Cover: Norm Vandal finishes up his Queen Anne dressing table (see article on p. 68).

Fine Woodworking is a reader-written magazine. We welcome proposals, manuscripts, photographs and ideas from our readers, amateur or professional. We'll acknowledge all submissions and return those we can't publish. Send your contributions to *Fine Woodworking,* Box 5506, Newtown, Conn. 06470-5506.

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DEPARTMENTS

ARTICLES

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Feedback on Multi-Router and Leigh jigs—I was most interested in the recent reviews of the JDS Co. Multi-Router and the Leigh dovetail jig (*FWW* #78). I do not represent either company, but I would like to make several observations, since I wrote the latest manuals for the Multi-Router and the Leigh jig.

The Multi-Router article reminds me of how a Chevrolet enthusiast describes a Ford. The description has something to do with viewpoint. For example, the reviewer stated that the heart of the Multi-Router is a router. While the Multi-Router does incorporate a router, I think the heart is the milling machine type of operation which permits the moving of two tables, horizontally and vertically, while following a template shape. Furthermore, this type of operation requires a mind-set different from that for standard shop machines. For example, tablesaw rip cuts usually reference the workpiece's edge against the fence's edge. However, with the Multi-Router, the workpiece is marked with a centerline that is then aligned to centerlines of both tables.

Instead of saying that the table is riddled with holes (visions of Bonnie and Clyde's car), I would say that the table has holes for stop buttons which allow for setting the workpiece at angles of 22.5°, 30°, 45°, 90° and 180°. Unused holes in no fashion affect any cutting operation.

There isn't that much eyeball-alignment. I can change to different cutters, templates and workpiece thicknesses, as well as recalibrate the machine to a new configuration in a few minutes. Cutter depth, lengths of mortises or dovetail pins are easily set. For tenons, you need only realign the two tables via the stylus pin and raise or lower the vertical table against the adjustable height scale. There are very simple formulas for using the scale. For instance, to determine a tenon center in a board, subtract the tenon thickness from the workpiece thickness and divide by two. Take this value and adjust the vertical table against the zero scale. I don't think that is too difficult, and it is accurate.

Box joints are wonderfully quick and easy to make. In fact, it is easy to batch-cut several boards at one time. Like eating potato chips, it's difficult to stop making them.

I make furniture and I like to use quality machines for my work. The Multi-Router permits the quick and accurate cutting of some very useful joints: mortises and tenons that are straight, angled, round, side by side or stacked; dowels that are part of the workpiece and dowel holes; mitered dovetails; and miter joints with floating stub tenons, to name a few. It is a machine that adapts well to creative or production uses.

My only comment about the Leigh dovetail jig review is that the statement about having to tighten or loosen six knobs each time the jig is used was inaccurate. There are eight knobs on the jig (any machine has knobs), but they are not tightened or loosened for each use. Once the jig is set for use, the repetitive workpieces are secured by tightening two knobs.

I think new-machine reviews require special insight. Most of us are familiar with our own chosen machinery and it can be difficult to objectively evaluate both the obvious and subtle variations and nuances of machinery, and do so in a limited amount of time. —*Bill Stankus, DeWitt, N.Y.*

Help with wood allergies—In response to Lane Jonap's letter (*FWW* #79) on seeking help for wood allergies, I'd like to say that there is no reason to give up anything you love just because of allergies. You simply have to be extra cautious. First of all, what *kind* of dust mask are you using? If it's the inexpensive surgical-type mask, it's not going to protect your lungs from the extra-fine particles. I've been using a double-sided, charcoal-filter type, which costs about $35, and make certain I change the filters regularly. Also, after working in my shop, I *always* vacuum and mop up (with damp cloths) afterward, making certain my mask is on before I start cleaning and every inch of space gets cleaned. If you can afford it, hire someone to do this for you. You might also want to wear long-sleeve shirts, buttoned at your wrists, to prevent skin contact with the dust.

Finally, *never* wear your work clothing outside of the shop. Change into clean street clothes *after* you have totally cleaned the space you've been working in. I keep clean clothes in a plastic bag.

If this doesn't do the trick, then take an over-the-counter antihistamine before you work with wood. I have to do this especially during the spring and fall when pollen counts are high. If, however, you are using power tools, for your safety make certain the antihistamine is an "anti-drowsy" formula (it will say so right on the box).

This may seem a lot to do, but if you love wood, you will do it. I've had allergies since I was born, so it's just a way of life with me. By the way, allergies can *disappear* just as quickly as they appear, too. So don't give up hope.

—*Mrs. Adèle A. Châtelain, Philadelphia, Pa.*

Correction on the Lee Valley ad—In your November/December issue, Lee Valley Tools Ltd. ran an advertisement for our Stone Pond sharpening aid. The advertisement contained an error. The flatness of the tempered glass lapping plate was indicated as plus or minus 0.001. It was intended to read 0.10. Readers with questions can contact us at 1080 Morrison Drive, Ottawa, Ont., Canada K2H 8K7.

—*Leonard G. Lee, Ottawa, Ont., Canada*

More on Scotch-Brite pads—Regarding 3M Scotch-Brite fine-grade pads that are recommended for work with Corian, here at our shop we have tried this product on wood-fluted columns in the finish room between coats with much better success than using 0000 steel wool. We're also experimenting with the pads for sanding cross-grain on edges of raised panels for doors.

—*David T. Hilsinger, Mechanicsburg, Pa.*

Tuning-up your tablesaw—Every woodworking publication seems to have been on a tablesaw tune-up kick this summer, but your article (*FWW* #78) is clearly one of the best. However, I'd like to make one additional suggestion not mentioned anywhere.

My saw is a Sears 10-in. cast-iron hand-me-down, circa 1946. I finally discovered that the face of the blade arbor was not square to the axis, giving the impression of a warped blade and quite a "sing."

Not wanting to really strip down the whole works, I stoned

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the face with the motor running until it tested square. Substantial improvement was made quite easily and the saw is a lot more pleasant to use. Checking the arbor face with a dial indicator is easier than remounting the blade to check progress.

Additionally, it would be nice if manufacturers included instructions for setting up. *–Hugh G. Johnson, Syosset, N.Y.*

More on squaring blades–In discussing squaring the blade, the article on tablesaw tune-up (*FWW* #78) made no mention of first checking to see if the blade itself is flat and true, and rotates without wobble. It can be checked visually by lightly holding a pencil against the miter gauge with the lead point just touching the blade below the tooth gullets. Then rotate the blade by turning the belt by hand. If you really want an accurate saw, square the blade only with one that runs dead-true on the arbor.

I also want to mention an important additional check–and possible adjustment–that the author didn't stress enough. After the blade has been aligned parallel to the miter gauge slots (done with the blade vertical), check if it stays parallel to the slots when tilted. Don't be surprised if it doesn't. I don't know how common this problem is, but it occurred on my old Craftsman 10-in. tablesaw. I discovered that the horizontal pivot line of the saw's cradle was not perfectly parallel to the top surface of the saw's table. In this situation, the blade is tilted and it will go out of parallel with the miter gauge slots. The remedy is to shim the high trunnion down from the table until the blade remains parallel to the miter gauge slots regardless of whether it is vertical or tilted. Use metal shims only, not paper or cardboard, as you want them to be dimensionally stable.

–Richard A. Martinson, St. Cloud, Minn.

...I have a couple of points to add to the tablesaw article (*FWW* #78) that are not in the woodworking area. I spent 40 years as a journeyman machinist and have lots of experience in metalworking. On p. 71 the article recommends peening the guide bar as a way of adjusting the miter gauge, but this may have some results the person doing it may not realize. When you peen one side of a piece of steel, you upset the surface that stretches the side you peened. Then the surface on that side is longer than the other side. Consequently, the bar is no longer straight, but has a bow in it. You now have two choices: either straighten the piece by bending or peen the other side so it comes back straight.

Instead of peening you sometimes can use a center punch and make small marks up and down one side; this won't change the straightness too much. But check it for straightness before you fit it to the slot no matter how you do it.

On lining up tools, I prefer a dial indicator to make adjustments. It takes the guesswork out of it. Indicators are a good tool to have and they can be purchased for a reasonable price if you shop around. *–Allen W. Havens, Edmonds, Wash.*

Woodworker switches from ivory–I have read a number of letters in recent issues of *FWW* concerning the use of ivory, and I agree that we should not be using elephant ivory. I would like to point out that the ivory used in my boxes on the back cover (*FWW* #76) is fossil ivory. According to Oppi Untracht in his book *Jewelry: Concepts and Technology,* this ivory comes from prehistoric, extinct mammoths and mastodons that lived until the ice age, and the remains of which have been found in the northern permafrost lands of Siberia, Alaska and the Yukon. The term "fossil ivory" is misleading, as the

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material is not truly fossilized, but rather has simply been frozen for thousands of years. It was an important source of ivory for piano keys in the 19th century, but has since become too scarce for commercial use.

In order to avoid confusion as to the source of the ivory that I use in my work, I have discontinued the use of ivory of any kind and now use Micarta, a man-made material, in its place.

–Ken Altman, Silverton, Ore.

Plastics in shop–I enjoyed Craig Deller's informative article, "Versatile Varnish" in *FWW* #77. However, as a professional chemist and avid woodworker, I find myself compelled to make several comments.

Deller asserts that his "ethics will not allow (him) to use a urethane–no plastics in (his) shop...," but he goes on to laud the advent of modern varnishes based on "synthetic alkyd resins." Plastic is, in fact, an accepted common term for *any* synthetic resin, and would encompass both the polyurethanes he denigrates and the alkyd resins he favors. The important issue is the *performance* and *properties* of the finish, not whether it is a "synthetic" or "natural" material. If Deller doesn't like the looks, durability, toxicity or some other property of polyurethane finishes, that's fine. Let's just judge products on their objective merits, not on some subjective scale of "ethical" purity.

Another minor point in the article: methylene chloride is a halogenated hydrocarbon solvent, not a caustic. Caustics are strong bases, such as sodium hydroxide, the main ingredient of lye. Solvents such as methylene chloride act by dissolving the resins in finishes, whereas caustics would more likely act by chemically reacting with, and degrading, the resin.

–Thomas Blinka, Columbia, Md.

Calling small workshops–Scott Landis, author of *The Workbench Book*, is seeking *ingenious, compact workshop designs* for inclusion in a new Taunton Press book. Your setup needn't be fancy, just clever, functional and designed for a small space–such as a basement, shed or closet, or even the trunk of a car or the cockpit of a boat.

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–John Lively, publisher

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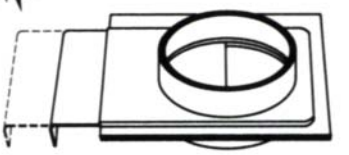

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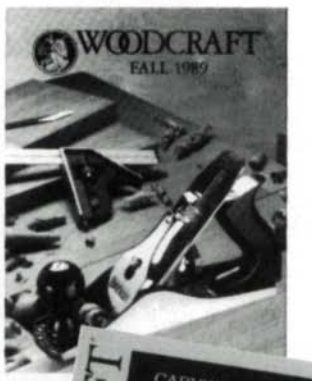

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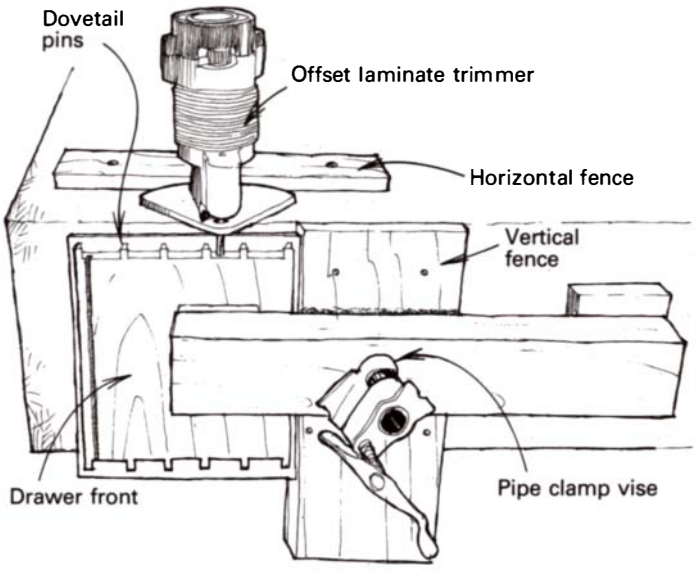
edited and drawn by Jim Richey

Dovetailing with a laminate trimmer



The most time-consuming part of dovetailing drawers is the tedious tap-tap-tapping with mallet and chisel to cut the half-blind pins in the drawer fronts. So, when I was faced with making eight mahogany drawers with a ¼-in. overlay on the fronts, I decided to cut these pins with an offset laminate trimmer that I'd recently acquired. The method I devised takes advantage of the offset trimmer's unique features: It provides excellent visibility of the bit, it is small and lightweight and it has an offset center of gravity. The resulting pins are speedily and easily cut without looking as if they were mass-produced with a jig.

First, I laid out the tails on the drawer sides using the two dovetail marking tools described in *FWW* #53 on p. 51, and then bandsawed them out. Because the backs were joined with simple through dovetails, I marked the pins from the tails and bandsawed them.

After marking the pin locations for the half-blind dovetails on the drawer fronts, I clamped one of the fronts to the side of my worktable using a special setup and pipe clamp vise, as shown in the above drawing. Two fences are key to the setup. The vertical fence is fastened to the side of the workbench and registers the drawer front to ensure that it's perfectly square with the top of the table. The horizontal fence is screwed to the tabletop and acts as a guide to run the base of the router against. This fence is set parallel with the edge of the table and just far enough away from the edge to leave the proper lip on the drawer front. To cut the pins I chucked a 3/16-in. straight router bit in the trimmer and adjusted the drawer front in the vise so that the depth of cut was right to the line representing the thickness of the side piece. I turned on the trimmer and carefully wasted the areas between the pins by routing right up to the scribed lines. Very little trimming with a chisel was necessary to clean up the joint when the routing was complete.

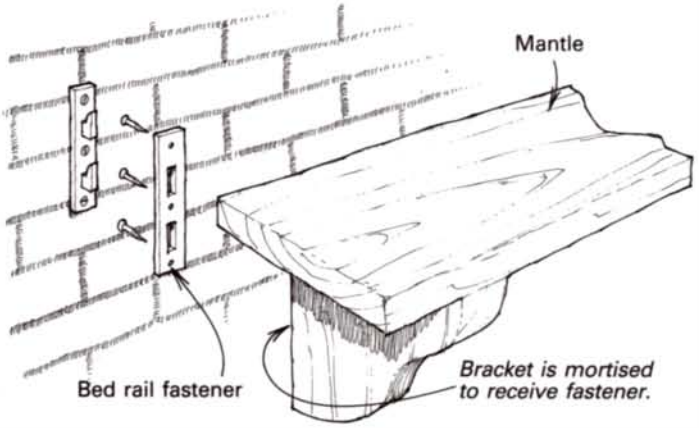
The offset trimmer is particularly well suited for this kind of work because its center of gravity is over the table, not over the bit. For safety's sake, be sure to use a face shield and goggles to keep the blizzard of little wood flakes out of your eyes.

—John E. Janbaz, Amarillo, Tex.

Quick tip: Here are two ways to cushion metal vise jaws. Drafting table cover material, available at art supply stores, can be fastened to the jaws with spray adhesive or rubber cement. Or, you can cut a pad from the material used for removable magnetic signs for car doors. The magnetic material will stick to the metal jaws and provide sufficient cushioning to protect your work.

—Jay Wallace, Ashland, Ore.

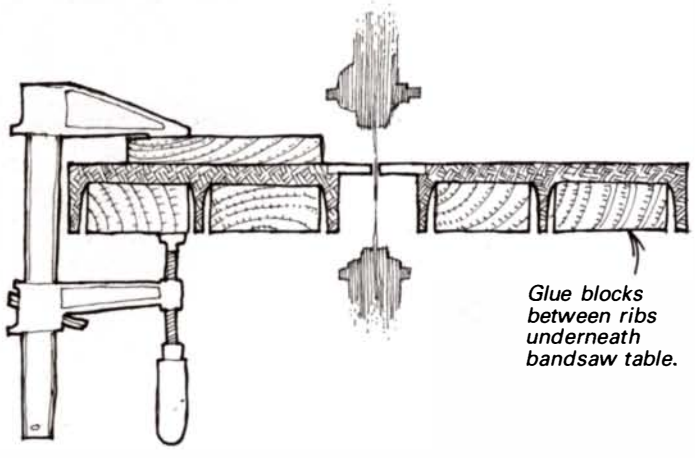
Hanging a mantle with bed rail fasteners



Fastening a wooden mantle to a masonry fireplace is a knotty problem that's usually solved by anchoring a baseboard to the masonry and building the mantle in place. A better solution is to build the entire mantle in your shop, and then hang it on the fireplace with high-quality bed rail fasteners. The heavy steel fasteners, commonly available from mail-order hardware stores, are strong enough for even the heaviest mantle and allow you to remove the mantle later if needed. Screw the male component to the masonry using masonry anchors, and mortise the mating portion to the mantle bracket deep enough so the mantle can pull up flush to the brick. This technique can also be adapted for fastening heavy bookcase or stereo units to walls. Just make sure you screw the male component to a stud.

—Joe Collier, Mulberry, Tenn.

Making bandsaw table clamping easier



A corollary of Murphy's law says that whenever you want to clamp a fixture to your bandsaw or drill-press table, a rib underneath will be in the way. When I finally got tired of fighting Murphy on this one, I cut blocks of wood and epoxied them into the odd-shape cavities between the ribs underneath the table. The blocks, which are slightly thicker than the depth of the cavities, let me put clamps wherever I want without worrying if I'll have a flat, solid perch.

—Marc Vaïs, Montreal, Que., Canada

Keeping paint from skinning

Over the years, I've read some complicated methods for keeping a partly filled can of paint or varnish in usable condition. This method is simple and I know it works because I've used it for 30 years.

Start with a sheet of good-quality magazine paper. I use an old issue of *National Geographic*. Put the paint can lid on the paper

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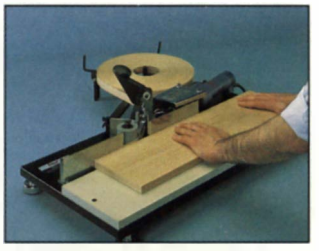

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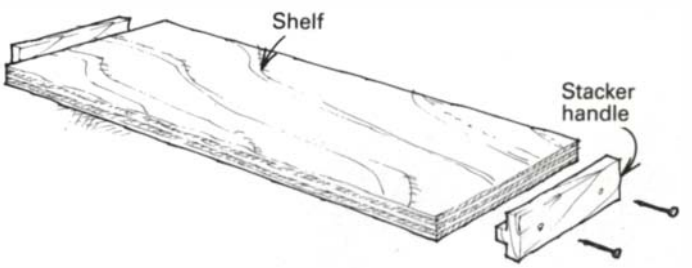
and trace around it with a pencil. If you cut 1/16 in. outside the pencil line, your paper circle will be just smaller than the inside of the can. Make sure the paper fits inside the can; if it is even a little too large, the trick won't work. Bend the paper so it can be lowered into the can, and then release it. The paper should open up flat on top of the liquid.

When you want to use the material, simply break the seal around the paper with a knife or screwdriver, remove the paper and discard it. It's a good idea to mark the paint level on the outside of the can before resealing the lid so you won't have to shake the can and disturb the paper seal to find out how much paint you have. *—Tim Hanson, Indianapolis, Ind.*

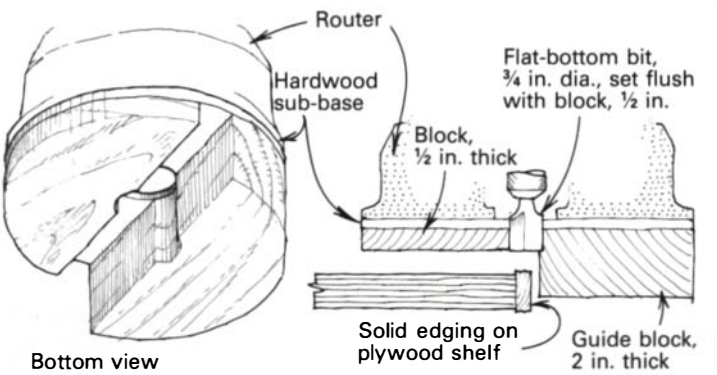
Stacker handles for shelf finishing



I cut 8-in.-long T-shape stacker handles from scrap and nail one to each end of shelves before applying finish. The handles let me finish both sides of the shelf at once, and then stack the shelves while they dry. They also make it easy to wipe off excess stain or oil without adding fingerprints to the finish.

—R. Charles Boelkins, Conyers, Ga.

Router jig for flush shelf edging



Here is a router jig for trimming edge moldings flush with a flat surface. I have used this jig for trimming the edging on tables and countertops, but its most useful role is trimming solid-wood edging on plywood to be used as adjustable shelves for bookcases.

The jig consists of two wood blocks screwed to a hardwood router sub-base. A ¾-in.-dia. flat-bottom router bit is set to cut flush with the ½-in.-thick block that rides on the surface of the plywood shelf. A 2-in.-thick block acts as a guide to run along the front of the shelf edging. Run the router over each face of the shelf to trim the edging flush with the plywood surface.

To save time when edging the shelves, I rip a ⅞-in.-wide, solid-wood strip that's about ⅛ in. thicker than the plywood. Then, I glue up a sandwich with the solid-wood strip between two of the shelves. You don't have to be very precise in aligning the edging and plywood because the extra ⅛-in. thickness will be

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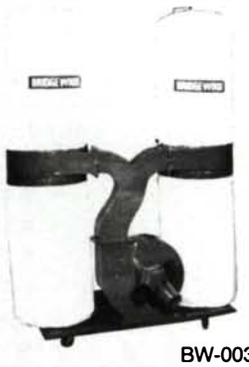

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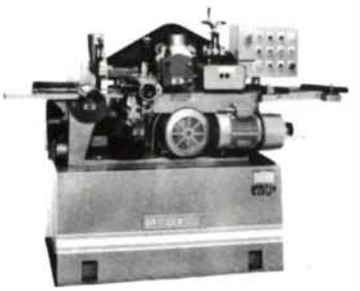

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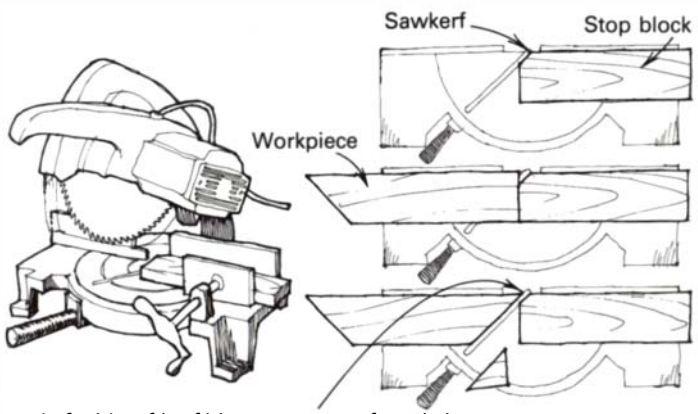
trimmed off later. When the glue has cured, rip through the center of the edging stock on the tablesaw to separate the shelves, and then joint the face of the edging strips. To complete the shelves, attach the edging jig to the router and set the bit for a flush cut. *–Lynn Mickelson, Seattle, Wash.*

Quick tip: The best pair of safety glasses I've seen are made for welders and are available in welding supply houses. They have clear tempered glass lenses, side screens and metal frames with ear hooks to prevent them from sliding off your nose when you bend over. *–Sam Savage, Needham, Mass.*

Stop blocks for mitered corners



Left side of kerf bisects corner of workpiece.

One of the reasons I purchased a motorized miter box saw was so I could cut 45° miters for picture frames. Lacking an extension table or fence to which I could clamp a stop block, I was marking the piece and then cutting it to length by nipping at it with miter cuts. This trial-and-error method was very tedious and unreliable. Then, I discovered that if I first cut the pieces to length with square cuts, I could clamp a stop block on the waste side of the blade to perfectly position the stock for the miter cut.

The stop block is clamped so the left side of the blade's kerf bisects the square corner of the molding (shown below left). It usually takes a few trial cuts to locate the stop block, but if you don't go all the way through with these cuts, you can manage the setup with a single test piece. Then, after cutting all your workpieces to length, you simply bump their square ends against the block, hold tight and cut.

–Allan Walton, Seattle, Wash.

Quick tip: If you must interrupt your work while using quick-setting epoxy or other two-part glues, you can often save the batch of glue by placing it in a freezer. This doesn't always work, but it's worth a try.

–Ron Fink, Burnaby, B.C., Canada

Motorcycle rim strip

Quick tip: Large rubber rings, called motorcycle rim strips, are handy for clamping, wrapping bundles of wood and other uses around the shop. The rim strips are available in a variety of

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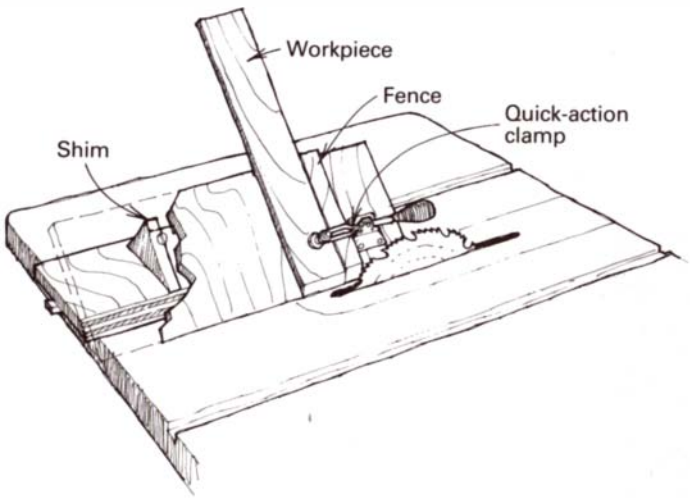
sizes from J.C. Whitney, Box 8410, Chicago, Ill. 60680, for less than 50 cents each. *–Rick Kjarval, Chicago, Ill.*

Mitered box jig



When making small boxes with mitered corners, I find it very time-consuming to set the tablesaw to the required dead-accurate 45° cut. Hence, I made this little jig, and with it, I can cut the miters quickly, accurately and, most of all, safely–and with the blade set at 90°.

Make the base and slanted platform from seven-ply birch plywood. Cut the two inside supports as close as possible to 45° on the tablesaw. Fasten these two supports to the base with screws and glue. Then, attach the slanted platform to the supports, but do not glue them and use only one screw. This will allow you to shim the slanted platform to fine-tune the angle later if needed. Screw a vertical fence onto the slanted platform, square to the platform's long edge, and a guide rail to the bottom of the base to run in the saw's miter gauge slot. Finish the jig with two or three coats of polyurethane to repel moisture. Finally, screw an adjustable, quick-action clamp to the jig to hold the material firmly during the cut. This clamp is essential. For safety's sake, do not attempt to use the jig without it.

To calibrate the jig, make a trial cut with scrap lumber and check it with a 45° square. Adjust the platform with shims between the supports and the slanted platform until the cut is exact. For even finer tuning, cut four identical pieces and miter all their ends. Assemble the four pieces to ensure all four corners are dead on. If not, shim the platform again, this time with thin paper. Tighten both screws the same amount each time.

Now you're ready to make boxes. I use masking tape to roll the box together, both for trying the fit and also for holding the corners while the glue sets. *–Ken Wall, Sand Springs, Okla.*

Quick tip: Sawcuts, both with hand tools and power tools, can leave splintered, chipped and fuzzy edges. For clean, sharp cuts, try this old carpenters' trick: Carefully score the good side of the line with a utility knife and a straightedge before sawing. The score line has to be just deep enough to sever the wood's surface fibers. *–Michael Q. Anderson, Albuquerque, N.M.*

Another way to spread contact cement

I have limited occasion to lay plastic laminate, so I don't keep the necessary tools around. When I need to spread a little adhesive, I use a serrated spreader cut from the side of a milk carton

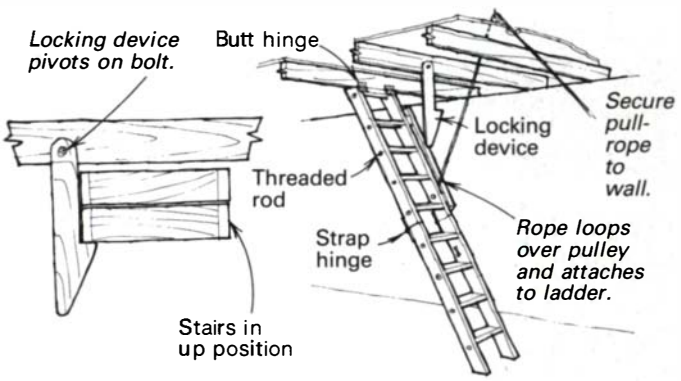
or other readily available source of fairly stiff plastic. I cut the serrated edge with my wife's pinking shears. If this particular use of pinking shears is questioned at your house, feel free to point out that I've been doing it for 15 years with no ill effects.

—John Stockard, Milledgeville, Ga.

Quick tip: A full-face shield may provide excellent protection while working at the lathe, but it quickly attracts dust while sanding parts. To reduce this problem, wipe the face shield with an anti-static cloth, like the kind that is available from photo supply stores.

—Mac Campbell, Harvey Station, N.B., Canada

Shop-built folding attic stairs



When I needed more space in my shop, I decided to use the attic. I couldn't afford to give up any floor space, so permanent stairs were out. And, since I didn't want to cut the ceiling joists, a requirement for manufactured disappearing stairs, I decided to build by own version of disappearing stairs.

The basic layout of the stairs is shown in the sketch. I cut the stair runners and the treads from 2x4 stock and ran a length of ⅜-in. threaded rod under each tread to hold the stair units together and strengthen the treads. The two stair units are joined with strap hinges. The top unit is attached to a ceiling joist with standard door butt hinges.

By unhooking the rope and moving the locking device, shown in the drawing, over to one side, I can lower the ladder and extend it to the floor. Then, by pulling on the rope, I can raise the ladder and fold it up. As it approaches the ceiling, the ladder nudges the locking device over until it swings back and locks the stairs in place. Then, the rope is secured to a hook on the wall to ensure that the stairs can't come down accidentally. Because the locking device is 7 ft. above the floor, you don't have to worry about small children gaining access to the attic.

—Charles Topp, Charlotte, N.C.

Quick tip: Here's a neat way to drive small finish nails into tight places. Push the nail through the corner of a piece of corrugated cardboard, about 1 in. wide by 3 in. long. Position the nail with the cardboard and you can hammer away without danger of marring the work or mashing your fingers. Before you drive the nail home, tug the cardboard loose.

—Jim Vasi, Williamsville, N.Y.

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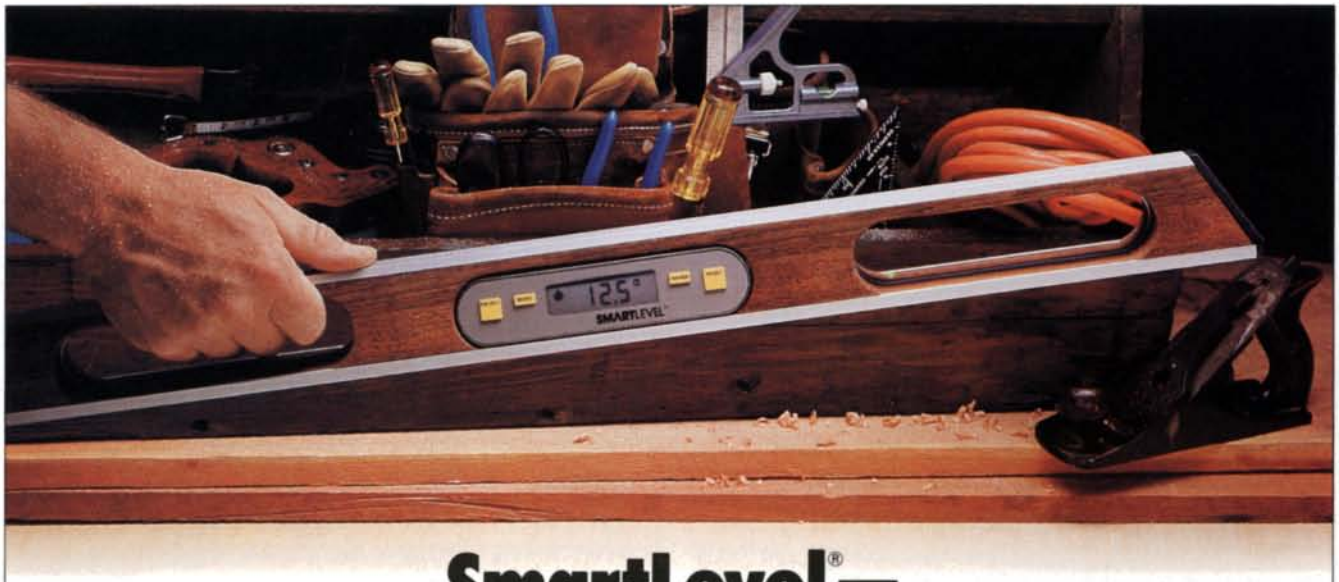

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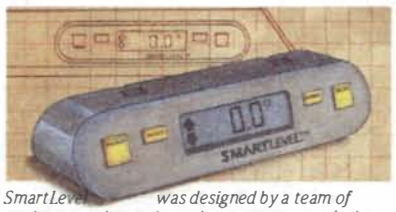

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The shocking truth about static electricity

Whenever I run the old stroke sander in my shop, I get constant shocks from static electricity: I sand with my right hand and can see a spark jump between it and the belt. I wear a rubber glove and it helps, but the charge builds until I touch metal. What can I do to prevent this problem?

—Robert Beisler, Brownsville, Vt.

My shop-vac and dust collection system develop so much static electricity and give me so many nasty shocks that I actually dread using them. Is there a way I can alleviate the problem of both? ***—Julian A. Hessel, Highlandville, Mo.***

Edward Cowern replies: The problem of static electricity in the workshop is mainly due to low humidity in the air. Static is especially troublesome in winter, when the outside temperatures are low. A rule of thumb is the colder it is outside, the lower the humidity is inside a heated shop. As a result, static charge builds up easily and causes shocks when the electricity discharges through contact. The problem is even worse if a shop's dust collection system exhausts air outside the building. This builds an additional requirement for fresh air coming in, and the fresh, cold air will have low humidity once it's been heated indoors.

The second thing that causes the static electricity problem is motion between two things. In the case of the stroke sander, it is the motion between the fabric belt and the pulleys that causes the buildup of electricity. In the case of the shop vacuum, it is the motion of the air through the plastic hose. There are two places where the charge can build up. One is in the machine the dust collector is connected to and the second is on the person who is operating it. Fortunately, grounding the frame of the machine will eliminate the buildup of the static charge. All fixed machinery, such as a tablesaw, jointer, planer, etc., should have its frame grounded to a water pipe or at the very least, to the ground conductor or conduit sheath of the machine's electrical wiring. Sometimes this is not possible, especially if the machine is electrically double insulated, as is a shop-vac.

Beyond grounding the machine, the best cure for static problems is to try to keep the humidity in the shop from getting too low. This can be done by using bag-type dust collectors that recirculate the same air within the building after the dust has been removed. These collectors will also reduce your heating bill. Other ways of adding moisture to the air, such as using humidifiers, are worth considering. Another thing you can do is wear shoes that bleed off the static charge rather than allow it to accumulate. For example, leather-soled shoes would be better than rubber-soled shoes, especially gum-rubber-soled shoes. Shoe companies that make safety shoes do offer them with "electrostatic dissipating soles" that may help.

[Ed Cowern is an electrical engineer and president of EMS, a company that distributes Baldor electric motors.]

An old look for new brass

In my furniture restoration business, I often replace the broken or missing original hardware with new, shiny brass reproduction hardware. This is serviceable, but the results look far from authentic. Is there any way to age the brass so it looks old? In particular, is there a chemical treatment that will give me that "English bronze" look?

—Gary Fortino, Hallandale, Fla.

Michael M. Dresdner replies: Before you can begin aging brass, you must strip the protective finish from the new hardware, which is most often lacquer coated to prevent tarnishing. Thoroughly clean each piece in lacquer thinner or paint remover. The aging process is a two-part operation. First, mix a solution of liver of sulfur (also called sulfurated potash) in water. The proportion is ½ oz. of liver of sulfur per gallon of water. Liver of sulfur will dissolve easier if you use warm water. Next, mix a solution of 2 oz. of copper sulfate in 1 gal. of warm water. There's a stern caution here: copper sulfate is very poisonous, so keep both the powder and the mixed solution away from kids and pets. Liver of sulfur and copper sulfate are available from Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Road, York, Pa. 17402.

To age the brass hardware, dip the piece first in one solution and then the other without rinsing in between. Use a string or hook to dip the brass and wear gloves to avoid getting the solutions on your skin. If the first dipping sequence doesn't darken the metal enough, repeat the sequence; the brass will get darker each time. When the brass is dark enough for your liking, rinse the hardware in water and then dry it. When the process is completed, I like to highlight certain areas of the hardware piece, like the spine of a hinge, with a bit of 0000 steel wool, to give it that well-handled look.

[Michael Dresdner is a Contributing Editor for *FWW* and an instrumentmaker and finishing consultant in Perkasie, Pa.]

Searching for a teak replacement

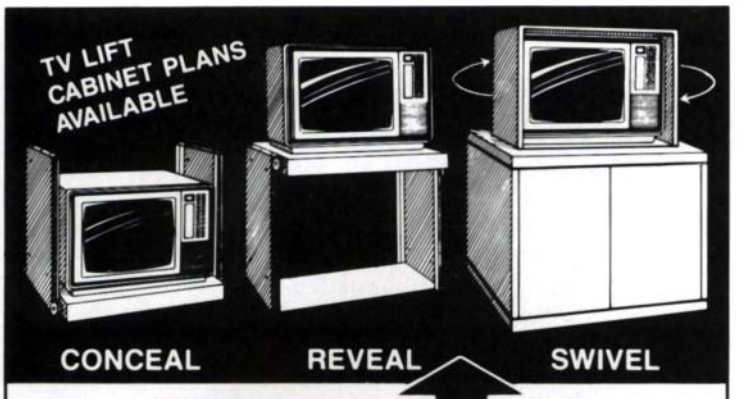
My company has been manufacturing small teak boxes for the past 11 years. Our customers have become quite concerned about the destruction of the rain forests: They think teak is being carelessly exploited for commercial purposes. Our teak supplier assures us that this is not the case and that the teak we purchase comes from Indo-Chinese tree plantations. Regardless of whether or not this is true, we'd like to find a domestic hardwood that's a suitable teak substitute. Our boxes incorporate a sliding dovetail joint, so the replacement wood should be stable and naturally oily, as well as attractive. ***—Judy Maggio, Rockford, Ill.***

Jon Arno replies: Growing concern for the destruction of tropical rain forests is well founded, but your supplier is most likely correct. Teak adapts well to plantation management and is now being extensively cultivated within its natural range and even in the new-world tropics. This is in contrast to two woods unsuitable for plantation growing: mahogany, which is highly susceptible to insect attack when densely planted, and rosewood, which grows extremely slowly. Teak is expensive and demand for it is strong, especially in shipbuilding, but relative to most other tropical timbers, it is becoming more of a cultivated crop than an exploited, wild species.

Unfortunately, for your purposes, I cannot think of a commercially available, domestic wood substitute that would even remotely compare to teak across a broad spectrum of features. While the United States has many attractive hardwoods that are roughly comparable to teak in density and could be used in the manufacture of sliding dovetail boxes, none of them possess teak's phenomenal stability or naturally oily, self-lubricating benefits. For comparison, the following table provides the density (specific gravity) and shrinkage values of a few species you may wish to consider:

Species	*Specific Gravity (oven dry weight/ green volume)*	*Average Volumetric Shrinkage (green to oven dry) (%)*
Cherry (P. serotina)	0.47	11.5
Birch (B. nigra)	0.49	13.5
Walnut (J. nigra)	0.51	12.8
Red oak (Q. rubra)	0.56	13.7
Pecan (C. illinoensis)	0.61	13.6
Teak (T. grandis)	0.57	6.8

As the higher percentages of volumetric shrinkage shown above indicate, none of the other woods listed come even close to being as stable as teak. Perhaps the nearest domestic competitor in this respect would be catalpa (C. speciosa), which has a volumetric shrinkage of only 7.3%, but I did not include it in the table because its specific gravity is only 0.38 and it is, therefore, a



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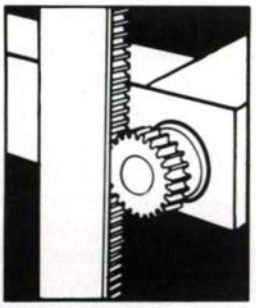

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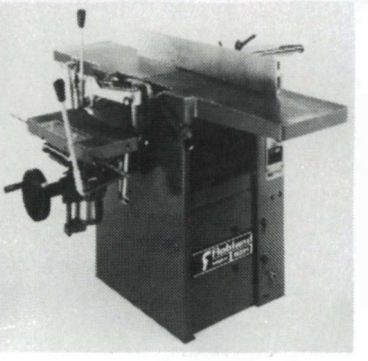

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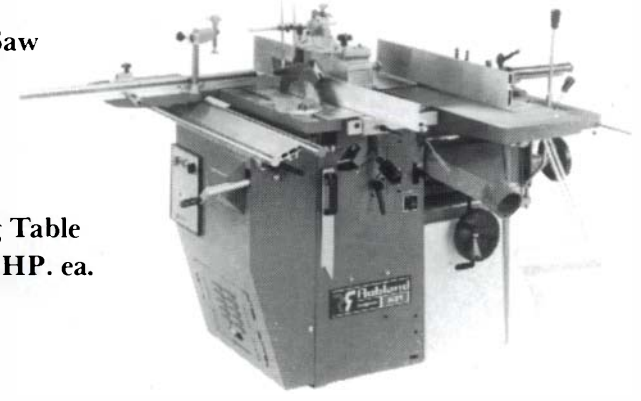

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little too weak for your application. Also, the only important domestic timber which is naturally oily is bald cypress (T. distichum), but it is a softwood. All things considered, if you must have a domestic substitute, perhaps your best choice would be cherry. It is reasonably stable, attractively figured and its amber red color is at least distantly comparable to teak.

[Jon Arno is a woodworker and amateur wood technologist in Schaumburg, Ill.]

Making your own hide glue

As a Peace Corps volunteer in West Africa, I've had to make due with locally available goods that aren't always so great. For instance, they sell white glue here that's not only poor in quality, but ridiculously expensive. Can I make my own hide glue for woodworking, using the hides of local animals?

–Jim Power, Accra N., Ghana, West Africa

George Mustoe replies: It is possible to make several varieties of useful, homemade glue, but if you really want to use hide glue, here is a crude description of the process. Start with raw material in the form of hides, hoofs, tendons, fish skins and connective tissues. Cut these into small strips and thoroughly wash them in water. Next, you must remove the bulk of the undesirable substances by trimming away any visible fat. Then, soak the raw material in a mixture of powdered lime and water to dissolve the non-glue proteins. I have no idea how long this "curing" step takes. After rinsing the scraps again in plain water, wash them in slightly acidic water (perhaps mix a little vinegar in plain water) to neutralize the lime. Rinse once more in plain water following the acid rinse. This sequence is used in glue factories, but possibly you could skip the acid neutralization if you were thorough in the subsequent water rinsing.

Now, boil the scraps in plain water to liquify the remaining fats and dissolve protein from the animal tissue. Skim away the floating fat and then boil away all excess liquid. Upon cooling, the material should be of a thick, gel-like consistency. In fact, what you've made is a crude form of gelatin, the active ingredient in hide glue. Ideally, the final gelatin should contain 16% to 45% protein that, when heated, will dissolve to a syrupy liquid that's not too thin or watery.

Hide glue is liquid when heated, but a solid gel at room temperature. When applied to a joint, its adhesive ability comes slightly from the gel formation, but mostly from evaporation. The resulting bond is very strong, but not water-resistant. Otherwise, the adhesive properties come largely from the nature of the proteins contained within the gelatin. This is measured by determining the viscosity of the gelled mixture, and the glue industry produces many grades of hide glue, depending upon the intended use of the product. In general, high viscosity correlates to high bond strength, but the thickness of the hide glue depends on the amount of water that's mixed with the gelatin.

As you probably know, hide glue is usually sold as a granulated powder which must be soaked in water for 30 minutes or so and then gently heated until the mixture dissolves to a gravy-like consistency. The glue can be freshly prepared as described and kept in a gel form, but you've got to watch out for bacterial decomposition. The shelf life of the gelled glue can be extended by adding a bit of disinfectant, but I've been told that adding a clove of garlic also retards spoilage.

All things considered, I can't guarantee the success of the hide glue made following this recipe because there are too many variables. For many years, hide glue has been produced industrially

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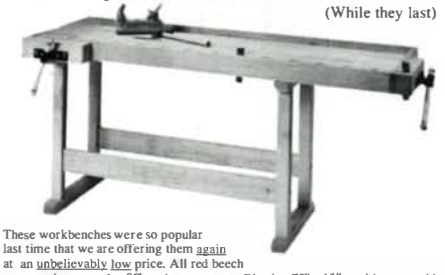

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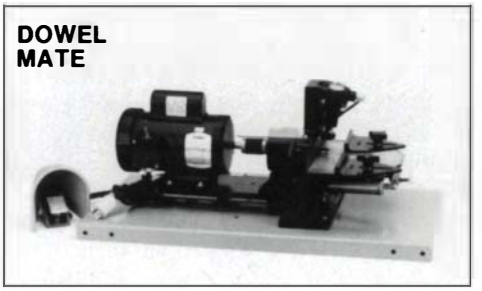

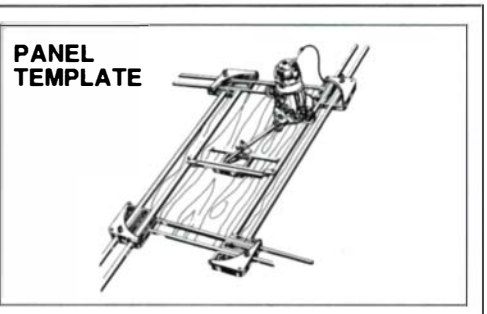

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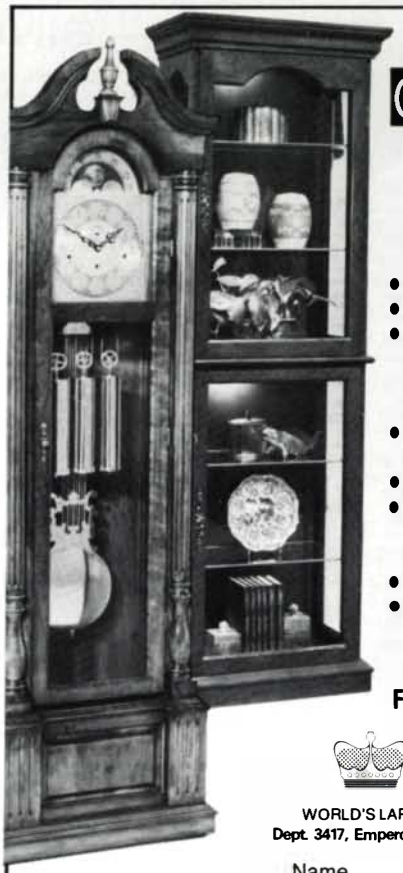

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and I can't find any reference to how it was done in earlier centuries. The biggest problems are removing most of the undesirable components from the animal scraps: the fat and non-glue proteins. If you can manage to make a good, thick gelatin, you may be on the way to an adequate homemade wood glue.
[George Mustoe is a geochemistry research technician at Western Washington University in Bellingham, Wash.]

Coping with "biscuit pucker"

I started using plate joinery biscuits as blind splines in tabletops because it seemed a brilliant way to keep boards aligned during glue-up. At least I thought so until I recently examined a tabletop that had been scraped and sanded flat before finishing and noticed biscuit-shape impressions about every 12 in. along the gluelines, revealing the location of every biscuit! What's going on here?

–John G. Skewes, Kensington, N.H.

Hugh Foster replies: The problem you've encountered is commonly referred to by woodworkers as "biscuit pucker." Plate joinery biscuits are pressed flat when they're manufactured. When the glue-covered biscuits are inserted in a joint, they swell in thickness from the moisture in the yellow or white glue. The swelling causes the biscuit to take up any slack in the slot that was cut by the plate joiner, thus making the joint tight and strong. This swelling can also cause problems if slots are cut too close to the surface of the stock or if very thin stock is plate joined. In the nearly five years that I've been using plate joinery in my woodworking, the only time I've run up against this problem was when I tried to biscuit-join two pieces of ⅜-in.-thick stock. Biscuit expansion apparently created biscuit-shape protrusions to appear on both faces of the thin boards.

While your letter isn't specific, I'm guessing that your biscuit pucker problems were caused by cutting slots too close (less than ¼ in.) to the face of your tabletop boards. You may have gotten in trouble by putting two rows of biscuits side by side in ¾-in. stock—one centered row is adequate. After glue-up, you probably scraped the excess glue off and then belt-sanded the top to make it flat and clean, never having noticed the very slight protrusion where the biscuits had puckered. Then, as the wood shrank, the biscuit protrusions that were sanded away earlier also shrank, causing depressions in the surface.
[Hugh Foster is an English teacher, furnituremaker and author. He lives in Manitowoc, Wis.]

Reader Exchange

...I am looking for a source of supply for good folding leg hardware for an all-wood card table I plan to build. All the commercially available hardware I've tried is too flimsy.

–Waldo Larson, 14186 Grangeville Blvd., Hanford, Cal. 93230

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–T.A. Mashburn, Jr., Box 206, Lewisburg, W.V. 24901

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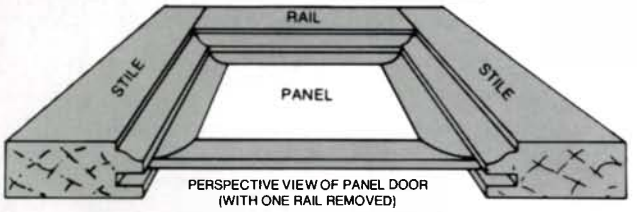

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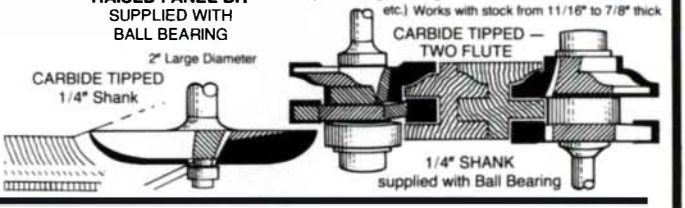

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C / Garrett Wade Has Discovered Some Very Interesting Bandsaw Blades.

1/16" "Super Narrow" Blades

You may have never seen a blade like this 24 tpi, in a raker style, these give smooth cuts while making incredibly tight turns. We strongly recommend our "Cool Blocks" for these delicate blades, because they can be set closer to the blade without danger of overheating or destroying the teeth as normal metal guides can.

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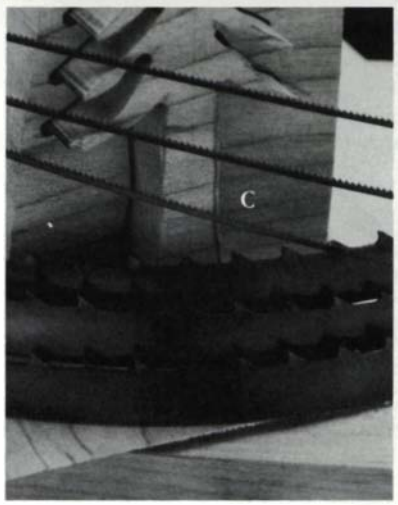

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33K12.01	1/16" Scroll	$13.50
33K12.02	¼" Cabinet.	$10.00
33K12.03	½" Cabinet.	$10.75
72" Blades (Shopsmith)		
33K13.01	1/16" Scroll	$12.20
33K13.02	¼" Cabinet.	$ 9.40
33K13.03	½" Cabinet.	$ 9.95
73½" Blades (Inca 10½")		
310.160	1/16" Scroll	$12.80
310.161	¼" Cabinet.	$ 9.70
310.162	½" Cabinet.	$10.30
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Speed-Bloc Finishing Sander Model 330 **54.**

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555	NEW! plate joining machine	165.
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352	3"x21" dustless belt sander	125.
360	3"x24" dustless belt sander	175.
362	4"x24" dustless belt sander	185.
503	3"x24" wormdrive belt sander with bag	349.
314	4½" Trim saw	125.
315-1	7¼" Top handle saw	105.
548	Heavy duty bayonet saw	165.
7548	VS, var. orbit, d-handle jigsaw	125.
7648	VS, var. orbit jigsaw	125.
9627	2-Spd. Tiger saw w/case	125.
9629	Var, spd Tiger saw w/case	130.
7523	Pos. clutch screwdriver	139.
7542	TEKS Driver	119.
7545	VSR Drywall driver	109.

SKIL

12 V. VSR Cordless Drill Kit Model 2735:04 **119.**

77	7¼" worm drive saw	135.
5825	6½" Worm drive saw	139.
5510	5½" Trim saw	92.
5790	10¼" Circular saw	225.
5865	8¼" Worm drive circular saw	149.

FREUD

90-100	15 pc. router bit set	149.
94-100	5 pc. router cabinet set	159.
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DB-050	50 pc. comb. drill bit/brad pt. set	49.
DS-306	6" dado	95.
DS-308	8" dado	107.
EC-900	5 pc. door making shaper cutter set	269.
FB-100	16 pc. Forstner bit set	149.
LM72M008	8"x24T rip	32.
LM72M010	10"x24"T rip	36.
LU87M010	10"x24"T Thin Kerf	35.
LU88M010	10"x60T Thin Kerf	42.
LU82M010	10"x60"T TCG	42.
LU84M008	8"x40" 4&R Combination	39.
LU84M011	10"x50T 4&R combination	37.
LU85M008	8"x64T ATB fine cut-off	49.
LU85M010	10"x80T ATB fine cut-off	59.
LU85M014	14"x108T ATB fine cut-off	98.
PS203	7¼"x24T ATB gen. purpose	16.
PS303	7¼"x40T ATB gen purpose	23.
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Milwaukee

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0239-1	1/2" drill, keyless chuck	135.
0224-1	3/8" Magnum holeshooter	109.
0234-1	1/2" Magnum holeshooter	105.
0375-1	3/8" close-quarter drill	125.
0379-1	1/2" close-quarter drill	149.
1676-1	Hole-hawg kit	230.
3002-1	Electricians rt. ang. drill kit	175.
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6014	1/2 Sheet pad sander	109.
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6226	2 speed bandsaw w/case	249.
6246	Single speed jigsaw	125.
6256	Variable speed jigsaw	140.

Milwaukee

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6377	7¼" wormdrive saw	155.
6405	8¼" circular saw	120.
6539-1	Cordless screwdriver	59.
6543-1	VSR Screwshooter	145.
6750-1	VSR Drywall driver	89.
6754-1	VSR Magnaum drywall driver	115.
6798-1	Adj. clutch screwshooter	105.

HITACHI

½" Plunge Router Model TR12 **169.**

F20A	3¼" Plane	99.
TR6	Laminate trimmer	95.
TR8	¼" Plunge router	119.
CR10V	VS, Var. orbit recipro saw	119.
DRC10	3/8" Cordless drywall screwgun	85.
D10D	3/8" 9.6 v. cordless driver/drill	110.
W6V1	0-4000 drywall screwgun	69.

HITACHI

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FREIGHT INCLUDED

C10FA	Deluxe 10" miter saw	289.
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P100F	12" Planer	1059.*

RYOBI

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Model AP10
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R150K	1 HP plunge router kit	99.
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S500A	Finishing sander, 1/6 sheet	36.
TS251U	10" Miter saw	185.
TS380	14" Miter saw	345.
RE600	3 HP Electronic VS Plunge Router	195.
JP155	6 1/8" VS Joint Planer	330.

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DELTA

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BOSTITCH

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3/4 HP Twin Tank Hand-Carry Air Compressor Model AM39-HC4 **275.**

David White Instruments

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Makita

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DP4700	1/2" Drill	109.
6012HDW	2-Spd. cordless driver/drill kit	119.
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9207SPC	7" Electronic sander/polisher	139.
3612BR	1/2", 3HP Plunge router	187.

Makita

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9401	4"x24" Dustless belt sander	165.
9900B	3"x21" Dustless belt sander	139.
LS1020	10" Miter saw	249.

Elu BLACK & DECKER

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3304	1hp electronic plunge router	189.
4023	3x21 belt sander	195.

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3051	7¼" Worm drive saw	139.
7790	12" DeWalt cont. radial arm saw	899.*
7770-10	10" DeWalt cont radial arm saw	699.*

AEG

Drywall Screwdriver 0-4000 rpm Model SCR2E-2 **95.**

HBSE75S	3x21 VS Belt Sander	155.
EZ502	Cordless screwdriver	59.
EZ506	3/8" Cordless drill screwdriver	120.
OFS50	1 HP plunge router	169.

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LEIGH

D1258-12	12" Dovetail jig, blind & through	259.
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BOSCH

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1582VS	VS, Var. orbit jigsaw	118.
3238VS	VS, Var. orbit std. duty jigsaw	95.
1654	7¼" Builders circular saw	99.
1500	16 guage shears	205.
1942	Heavy duty heat gun	69.
3268	Std. duty heat gun	59.
3258	3¼" Power plane	119.
1600	2½ HP, D-Handle router	245.
1604	1¾ HP Router	119.
1606	1¾ HP, D-Handle router	130.
90300	3¼ HP Production router	329.
1609K	Laminate trimmer installer's kit	169.
1609	Off set base laminate trimmer	119.
91064	3/8" Mighty Midget VSR drill	99.
1631K	2-spd Panther recipro saw	119.

BOSCH

3 HP Plunge Router Model 1611 **198.**

1608T	NEW! tilt base laminate trimmer	89.
1632VSK	VS, Var. orbit Panther recipro saw	129.
1530	14 gauge nibbler	269.
91066	1/2" Mighty Midget VSR drill	109.
1158VSR	3/8" VSR drill	59.
1196VSR	3/8" Hornet II hammer drill	109.
1198VSR	1/2" VSR hammer drill	125.
11203	1½" Rotary hammer	409.
11212VSR	3/4" VSR bulldog SDS rotary hammer	185.
11304	Brute breaker hammer	1299.*
11305	Demolition hammer	659.
1272D	3"x24" dustless belt sander	169.
1273D	4"x24" dustless belt sander	179.
1273DVS	4"x24" VS, dustless belt sander	189.
3270	3"x21" dustless belt sander	129.
1347	4½" mini grinder	85.

DELTA

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17-900	16.5" Drill press	259.*
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DELTA

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Junior	Std. hand joining machine	CALL
Top -10	Deluxe hand joining machine	CALL
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READER SERVICE NO. 15

NEW

See Sam Maloof at work, at home, on tape.

Sam Maloof has been called one of the fathers of contemporary American craft furniture. As the many woodworkers who have attended his workshops can attest, Maloof is the most inspiring woodworker you'll probably ever meet.

Our video crew spent a week with Maloof in his shop and beautifully crafted home, which is filled with furniture of his own design. In *Sam Maloof: Woodworking Profile* you'll see firsthand the environment he lives and works in, his attitude toward craft reflected in the work he collects, the way he thinks about design, and the ingenious techniques he's developed. Maloof's 40-plus years of experience comes through as he builds his unique pieces, including his often imitated rocker (the only contemporary piece in the White House collection).

You'll come away with plenty of practical information that will help you adapt Maloof's designs and techniques in your work.

You'll discover:

- how the bandsaw and router can sculpt joints that are visually and structurally strong
- how to laminate, shape and position rockers for a well-balanced rocking chair
- what's special about Maloof's finished designs and how comfort and beauty tie together

60 minutes, $29.95
#060045 (VHS)
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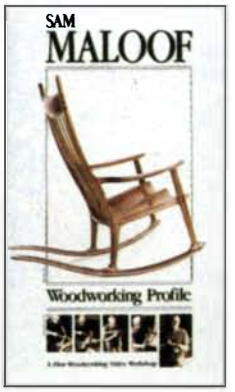
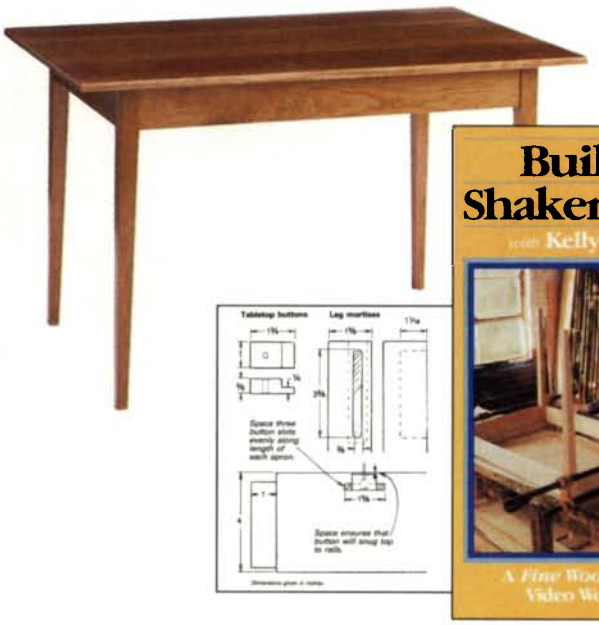
Sam Maloof poster FREE with purchase

When you purchase *Sam Maloof: Woodworking Profile* you'll receive, FREE, this color poster (not available with rentals). It's suitable for framing, and we'll send it rolled in hard cardboard so it'll arrive in good shape. Available for purchase at $9.95 each.
22 in. by 36 in., *#068006*



NEW

A great project starts with plans. (But we don't stop there.)



Here, in our first project video, *Build a Shaker Table with Kelly Mehler*, you'll learn the process of making a leg-and-apron table, from stock preparation to final scraping and sanding.

But you'll learn much more than how to build a dining table of lasting value. You'll also get good, solid information you'll use on furniture projects time and time again.

An illustrated booklet provides a clear step-by-step outline of Mehler's procedures. It also includes measured drawings, a materials list and tips on setting up a shop for furniture making.

By watching Mehler, you'll learn how to:

- choose, mill and glue up boards according to grain configuration for an attractive tabletop
- taper legs on the jointer
- rout mortises and tenons for sturdy leg-and-apron joints

60 minutes, includes an illustrated booklet, $29.95
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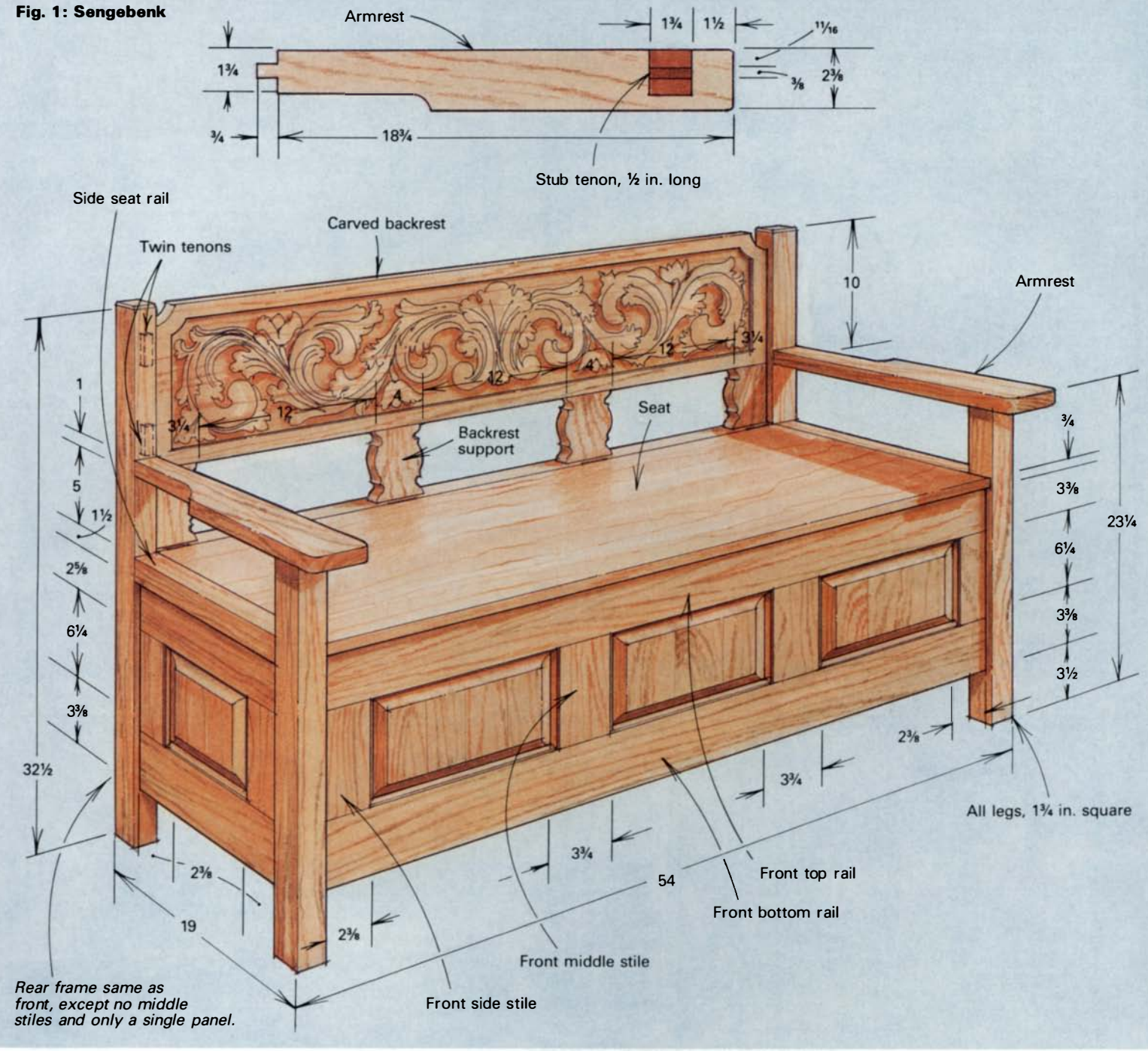
READER SERVICE NO. 153

READER SERVICE NO. 38

Fig. 1: Sengebenk

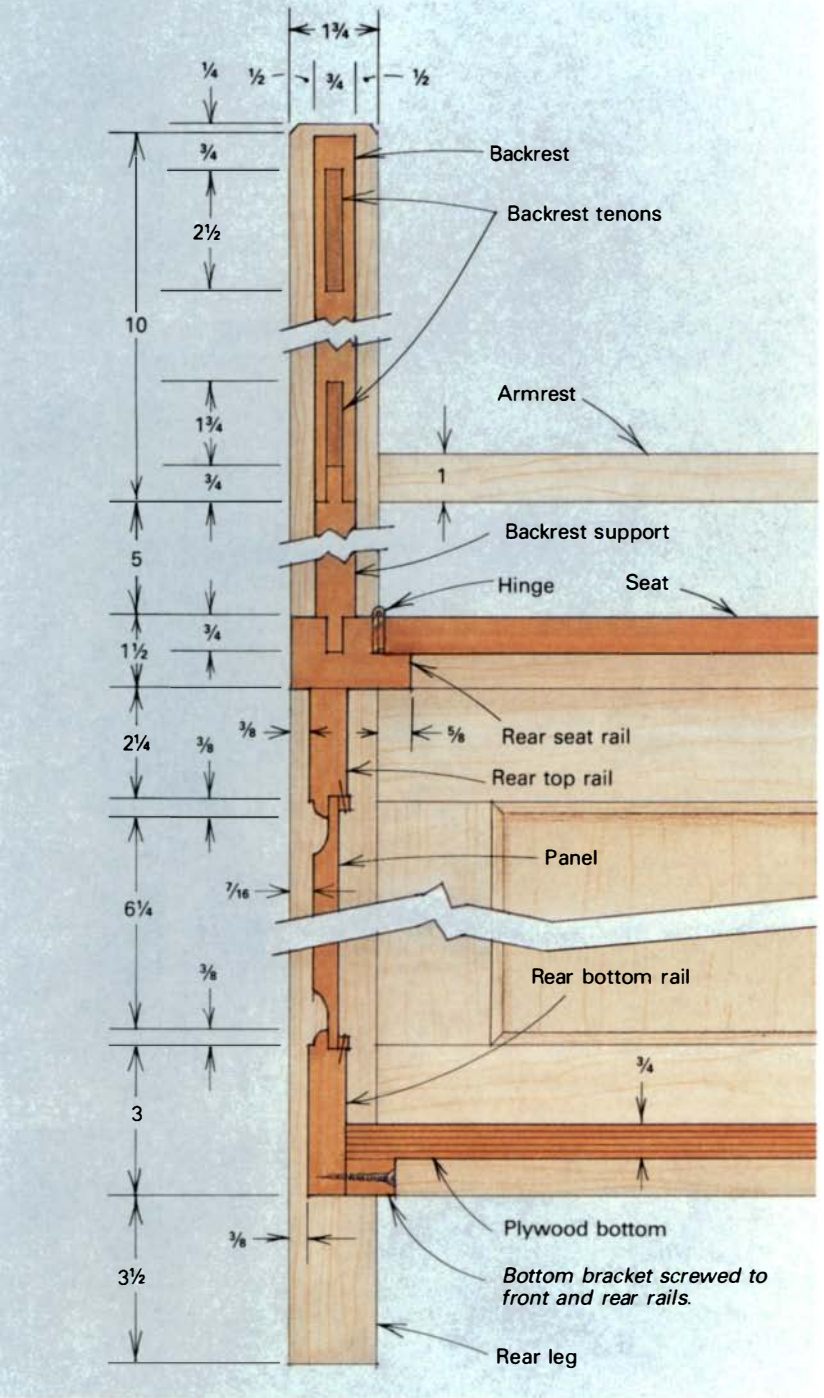


Building a Sengebenk

A Norwegian bench with built-in storage

by Else Bigton and Phillip Odden

Fig. 2: Cross section through rear of Sengebenk



Traditionally, the sengebenk was an important part of the Norwegian kitchen. During the day it was a seat and at night it became a child's bed. The bench is also a space-saving piece of furniture: Its lid opens to reveal a storage chest. The sengebenk shown was built by Else Bigton from her favorite wood, butternut. The acanthus leaf relief on the back was carved by her husband, Phillip Odden.

The sengebenk is a traditional piece of Norwegian furniture used for sitting, sleeping and storage. Because old Norwegian farm houses were small, much of the furniture was designed to be multi-purpose. The sengebenk was usually placed in the kitchen, against the wall next to a trestle table. In the daytime, the bench served as a seat for people working or eating at the table, and at night it became a bed for one or more children. Traditionally, the backrest would flip over to the front via a hinge in the middle of the armrest, to prevent children from falling out of bed. In addition, the bench's seat lifts up to store the bedding inside.

Beyond its customary application, the sengebenk can make a very practical addition to any home; it can be made as long as needed to suit your space, and the addition of a cushion can make it a very comfortable place to sit. Plus, the lift-up seat storage compartment is handy for holding blankets, clothing or anything you might keep in a regular chest. The sengebenk isn't a difficult piece to build and requires only basic mortise-and-tenon joinery and frame-and-panel construction. All the part dimensions are given in the bill of materials on p. 45. The backrest, shown in the photo above, features a traditional Norwegian-style carving (described in the sidebar on p. 46), which can be a nice relief carving project for anyone with basic carving skills, but the bench is also attractive with a plain back.

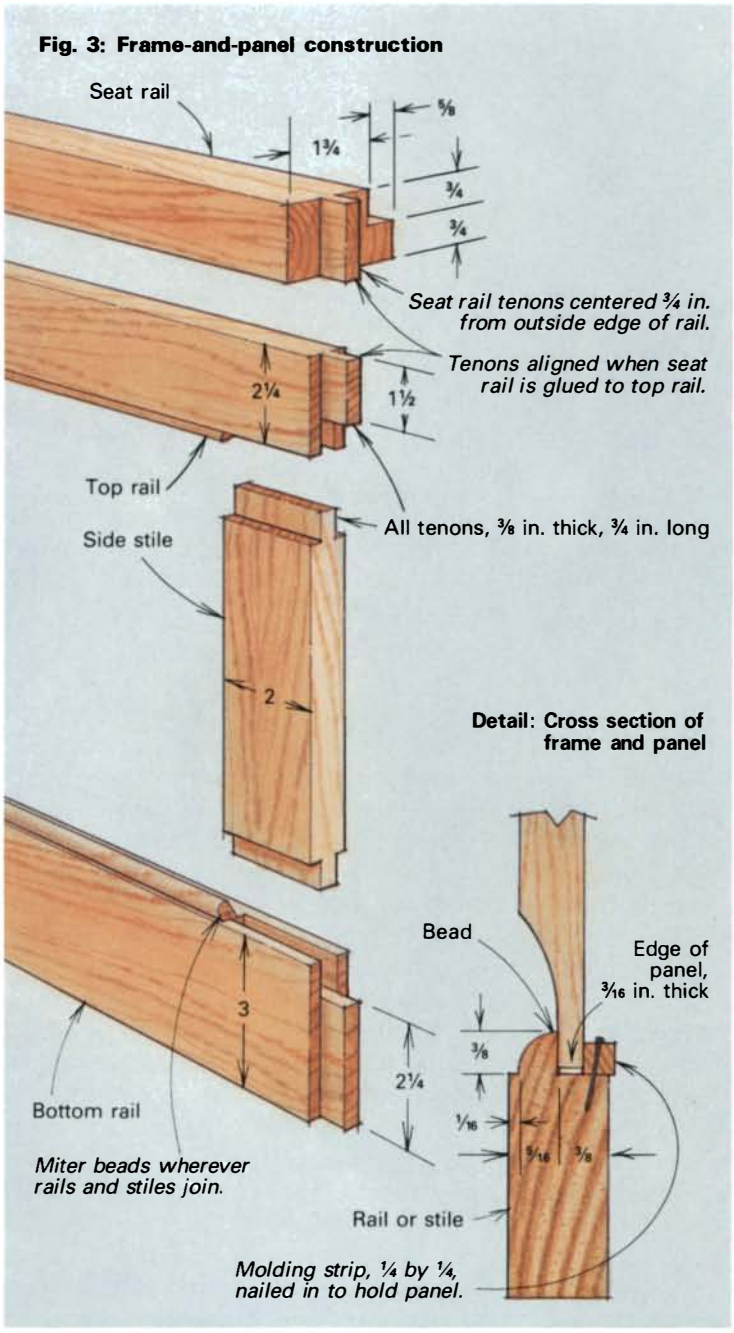
Developing plans and dimensions—Like much of the other furniture my husband Phillip and I build together in our shop in northwestern Wisconsin, I will build a sengebenk when commissioned by a specific client. The first thing I do is determine the proportions of the piece to suit my client. A comfortable height for the seat can be approximated by measuring the client's favorite chair; and the length of the sengebenk will be determined by the spot in the house that the piece will occupy.

Once I know the important dimensions, I make a scale drawing to work out proportions, including the height of the backrest and height of the arms above the seat. Then, I make a full-size drawing to establish the proportions of the panels and the frames, as well as to confirm all dimensions and construction details. For the bench shown in the photo above, I decided on three panels in the front, for visual interest, and single panels in the rear and on the sides. The size of the side panels is affected by the depth of the bench and the height of the seat. Phillip and I design the decorative pattern to be carved on the front of the backrest, and draw it full size. Finally, I make a cutting list specifying the length, width and thickness of all the necessary parts by taking measurements directly from the full-scale drawing.

As with most of my furniture, I build the sengebenk out of butternut, one of my favorite woods. It carves like a dream, is attractive and is readily available locally. After I make my cutting list, I select lumber for the frames, panels, legs, arms and seat, and thickness plane all the stock.

Constructing the frames and panels—I prepare all the frame parts for the front, rear and sides of the bench seat, and then make the panels and fit them into the frames. First, I rip all the frame stock to width, leaving enough for shaping the edges later. Then,

Drawings: Joel Katzowitz



A simple shopmade shooting board allows a chisel to be used for very precise, angled trimming. Here, the shooting board is used for mitering the beads on a rail where one of the side stiles will join via a mortise-and-tenon joint. After mitering, the chisel is used, freehand, to trim the bead at the point to the depth of the rabbet.

each piece is crosscut to length, which includes leaving extra length for a ¾-in.-long tenon on each end of all rails *and* stiles. To give the frames some detail, I cut a quarter-round bead on the inside edges of all the frame members. Instead of using the cope-and-stick method, which requires a special set of matched shaper cutters to simultaneously mold the edges and joints, I use standard straight and roundover cutters to shape a bead and rabbet on each edge, and I cut the required mortises and tenons later. The bead on the front edge of each frame piece is cut with a ⅜-in.-radius cutter (see the detail in figure 3 at left). Then, a straight cutter forms a ⅜-in. by ⅜-in. rabbet on the back edge. The rabbets hold the panels, which will be inserted from the back of the assembled frame and fastened with molding strips. For short frame members, such as the side rails and stiles, it's safer to cut the beads and rabbets on double-width or double-length pieces, and then cut them to final width or length after shaping. This keeps your fingers farther from the cutter during shaping, out of harm's way.

Once the frames are shaped, I spread all the pieces on the workbench and pair up the parts with matching grain and color and pick the best looking parts for the front of the bench. I mark all the parts with a cabinetmaker's triangular proofmark, so I'll know which parts are paired and how they'll be oriented; the top of the triangle always points toward the top on vertical parts. I also number the frame sets, so I'll know instantly where each piece goes.

The next step is cutting the mortises and tenons on the ends of all frame members. The tenons on the stiles fit into mortises on the rails; the rail tenons fit mortises in the legs (see figure 1 on p. 42 and figure 3 at left). I usually cut the tenons with a tenoning jig on the tablesaw, although you can cut them by hand (see *FWW* #66, p. 70). For the mortises, I use my old cast-iron foot-pedal-operated mortising machine, carefully centering the mortises in the width of the stock. Once again, in lieu of a machine, you can chop the mortises by hand or with a router jig—whatever works for you. When you chop the mortises at the ends of the rails, the width of the rail tenons is reduced by the depth of the mortise, but this is fine; the length of the corresponding leg mortises takes this into account.

After the mortises and tenons have been cut and fit, I trim the beads in the corners of the joints using the shopmade shooting board and a chisel, shown in the photo at left. The shooting board is made from two pieces of scrapwood, glued together into an L-shape (when viewed from the end), with the end cut to exactly 45°. The frame piece is clamped into the shooting board, which acts as a fence to guide the chisel for a perfect 45° trim cut. Each bead is trimmed so that the point of the miter comes down to the edge of the mortise, or shoulder of the tenon. I then use a chisel to pare the bead down to the rabbet, so the area where the frame members join together is flat and square. After all the trimming is completed, I trial assemble the frames dry to make sure that everything fits together properly and that all the joints will draw up tightly.

Making the panels is next. I glue up each of the three front and two side panels from short lengths of ½-in.-thick stock, so that the grain in the finished panels will run vertically. The exception is the single rear panel, for which it's easier to run the grain lengthwise. After the panels are glued and dried, I rip and crosscut each panel to its basic dimensions listed in the bill of materials on the facing page, and then trial fit each one in the dry-assembled frame. Each panel is trimmed to fit loosely in its frame opening, to allow for future expansion and contraction. The edges of the panels are then raised, using a three-wing raised panel cutter on the shaper. The gradual curve of the cut-

ter adds visual definition to the panel, and reduces the thickness on the edge to 3/16 in.

Backrest and seat assembly—Because the backrest will be carved, I carefully select straight stock with tight grain. Because the bench backrest is joined cross-grain to the rear legs, I try to find boards that show edge-grain on their faces. Boards cut this way (radially) expand and contract only about half the amount of flat-grain cut (tangentially) boards. I do a little test carving on each board to ensure that the wood carves well and doesn't splinter much. I also mark the grain direction on the boards before gluing them, aligning the grain to run in the same direction. This makes it easier to carve across one board into the other. I then clamp the boards together and let the glue dry overnight. After cutting the ends of the backrest square and to length, I notch the top corners with a coping saw, and then cut two 2½-in.-wide tenons on each end, as shown in figures 1 and 2 on pp. 42-43. Making a pair of narrower tenons instead of a single wide one prevents the backrest from splitting, a possibility from even minimal expansion and contraction. At this time, the backrest is carved, as described in the sidebar on the following page.

There are four supports below the backrest that attach to the sengebenk's frame. Each support is 6½ in. long; the middle supports are 4 in. wide and the side supports are 3¼ in. wide. Full-width, ⅜-in.-thick, ¾-in.-long tenons are centered on both ends of each support. After tenoning, cut each support to the profile shown in figure 1 on p. 42. Next, chop the four mortises in the lower edge of the backrest to accept the support tenons, as shown in figure 1. Center these mortises 5/16 in. from the back side of the backrest so the supports are flush in back. The two end mortises cut into the backrest tenons, which get trimmed to 1¾ in. wide. The bottom tenons on the supports fit into mortises that will be made later in the rear seat rail.

I glue up the seat now, again from edge-grain boards if possible. To make sure the seat will stay flat, I fit two dovetail stretchers on the underside of the seat. First, I glue together all the boards for the seat, save a single 1-in. board at the front edge. Then, I clamp a fence to the underside and, using a dovetail bit in the router, I cut a slightly deeper than ⅜-in. slot in from the front, to within 2½ in. of the seat's back edge. I move the fence over and make several widening passes, until the slot measures 1⅜ in. wide at the top. This is repeated for the other stretcher slot. After cutting the two stretchers from 1-in.-thick stock, rout the male dovetail on the bottom of both strips with the same dovetail bit, this time held in a router table. Make the female dovetails just a hair deeper than the male dovetails so the stretchers will slide in easily, but still fit fairly tight. Next, I chisel away about ⅜ in. of the dovetail on the underside of each stretcher end, so that the dovetail will be hidden and the solid-wood seat has room to shrink and swell. After sanding the stretchers, I drive them in place, and then glue on the 1-in. piece at the front of the seat.

The seat is surrounded on three edges by the seat rails—two on the sides and one in the rear. The rails are made from 2⅜-in. by 1½-in. stock, with a rabbet cut on one edge, as shown in figure 3 on the facing page, to provide a lip that supports the hinged seat. The ends of all the seat rails receive ⅜-in.-wide tenons, centered ⅞ in. from the outside face of each rail. The top edge of the rear seat rail also receives four ¾-in.-wide mortises, centered ⅞ in. from the rear face of the rail, to accept the bottom tenons on the four backrest supports. After mortising, glue the seat rails on top of their corresponding frame rails, positioning them by lining up the tenons on the ends. Finally, dry-assemble the sengebenk

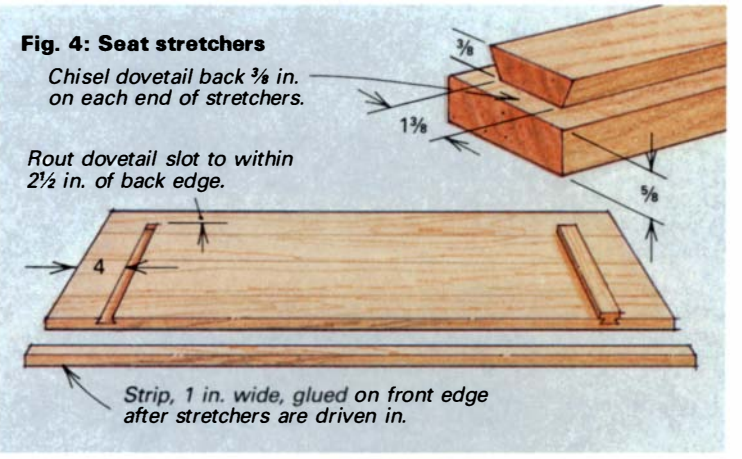


Fig. 4: Seat stretchers

and try the seat in place, trimming its ends with a handplane so that it doesn't fit too tightly between the side seat rails.

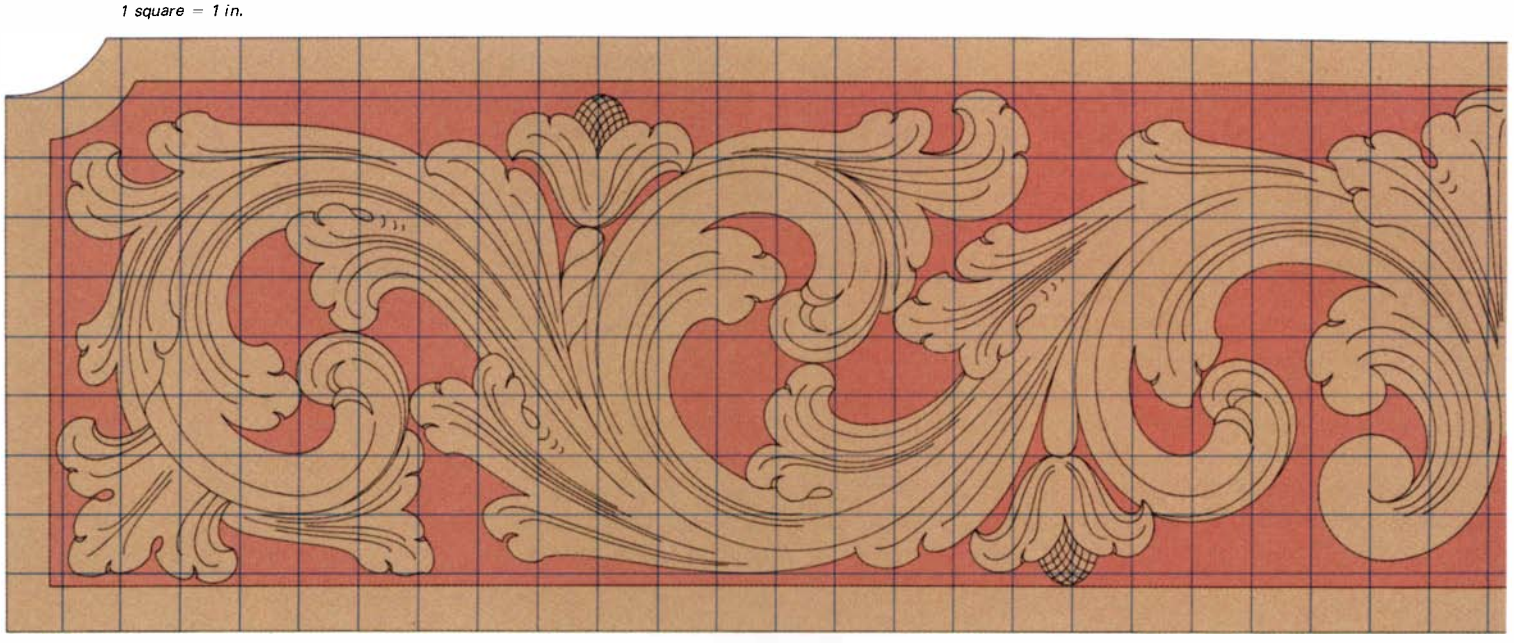
Legs and armrests—The front and rear legs of the bench are made from 1¾-in.-square stock. The top of each 22¾-in.-long front leg has a ½-in.-long stub tenon that fits into a mortise on the underside of the armrest. All four legs have mortises on two sides to accept the tenons on the ends of the frame rails. Chop all the mortises ⅜ in. wide and make them 13/16 in. deep, to allow extra clearance for ¾-in.-long tenons. The mortises for the top and bottom frame rails are centered ¾ in. from the outside face of the leg. Mortises for all the lower rails are 2¼ in. long and start 3½ in. from the bottom of each leg; the front top rail mortise is the same length, but starts 14 in. from the bottom. All the remaining top rail mortises house not only the frame rail tenons, but the tenons on the seat rails as well. These mortises also start 14 in. from the bottom of each leg, but are 3¾ in. long.

A 1-in.-long mortise for each armrest is now chopped in the

Bill of Materials

No.	Description	Dimensions (T × W × L)
2	Front legs	1¾ × 1¾ × 22¾*
2	Rear legs	1¾ × 1¾ × 32½
3	Front top and bottom rails and rear bottom rail	¾ × 3⅜ × 52**
1	Rear top rail	¾ × 2⅝ × 52**
2	Rear seat rail	1½ × 2⅜ × 52††
2	Side bottom rails	¾ × 3⅜ × 17**
2	Side top rails	¾ × 2⅝ × 17**
2	Side seat rails	1½ × 2⅜ × 17††
4	Front and rear side stiles	¾ × 2⅜ × 8¼**
2	Front middle stiles	¾ × 3¾ × 8¼**
4	Side stiles	¾ × 2⅜ × 8¼**
3	Front panels	½ × 13½ × 7†
1	Rear panel	½ × 7 × 46½†
2	Side panels	½ × 7 × 11½†
1	Backrest	¾ × 10 × 52††
2	Backrest side supports	⅝ × 3¼ × 6½††
2	Backrest middle supports	⅝ × 4 × 6½††
2	Armrests	1 × 2⅜ × 19½#
1	Seat	¾ × 17¼ × 50¼
2	Dovetailed seat stretchers	1 × 2 × 14¼
1	Bottom (plywood)	¾ × 16¾ × 51¾
2	Bottom brackets	1 × 1 × 50½

* Length includes ½-in.-long tenon on one end.
** Width includes ⅜-in.-deep shaping on edge(s). Length includes ¾-in.-long tenons on both ends.
† Rough width and length, prior to trimming to fit.
†† Length includes ¾-in.-long tenons on both ends.
# Length includes ¾-in.-long tenon on one end.



Carving the bench's backrest

The relief carving on the seat back of the sengebenk is a traditional acanthus leaf motif commonly found on decorative furniture and architectural work in Europe and America. My design for the sengebenk, shown above, consists of three symmetrical curls and flowers on each half of the design, and a center crest. To ease the carving process, as shown in the above drawing and on the facing page, you can break the work into three major stages: A. laying out the design; B. roughing out the shapes of the acanthus leaves and flowers; C. refining the forms and adding veins and other details.

Although you can use any carving tools, the best way to create shapes in the relief is to use tools with edges that correspond in size and shape to those in the design. The tools I use to carve the backrest include: an 18mm, #1 skew chisel; a 2mm, #1 spoon skew chisel; 10mm and 16mm, #5 gouges; a 14mm, #7 gouge; 6mm and 10mm, #8 gouges; 4mm and 8mm, #12 60° V-parting tools; a 5mm, #21 dog-leg chisel. Most of these tools are available from Woodcraft Supply, Box 1686, Parkersburg, W.V. 26102; (800) 225-1153. All of these tool numbers are in the Swiss numbering system; you can find comparable tools from other suppliers, but tools manufactured in other countries will have different numbers.

After the surface of the backrest has been planed smooth and flat, transfer the acanthus pattern, which is shown above and on the facing page, to the wood by carefully redrawing it on a full-size grid of 1-in. squares. Then, transfer the lines to the wood by tracing with carbon paper. Draw one side first, and then flip the patten over and trace the other, symmetrical side.

Begin carving following the steps described on the facing page. As you carve, let your cuts flow in a continuous, curving line, and let the tool's bevel rub along the wood to keep the depth of cut consistent. After the piece is rough carved, resharpen your tools and begin the fine carving. The goal is to make the carved elements look as though they were created with one continuous cut.

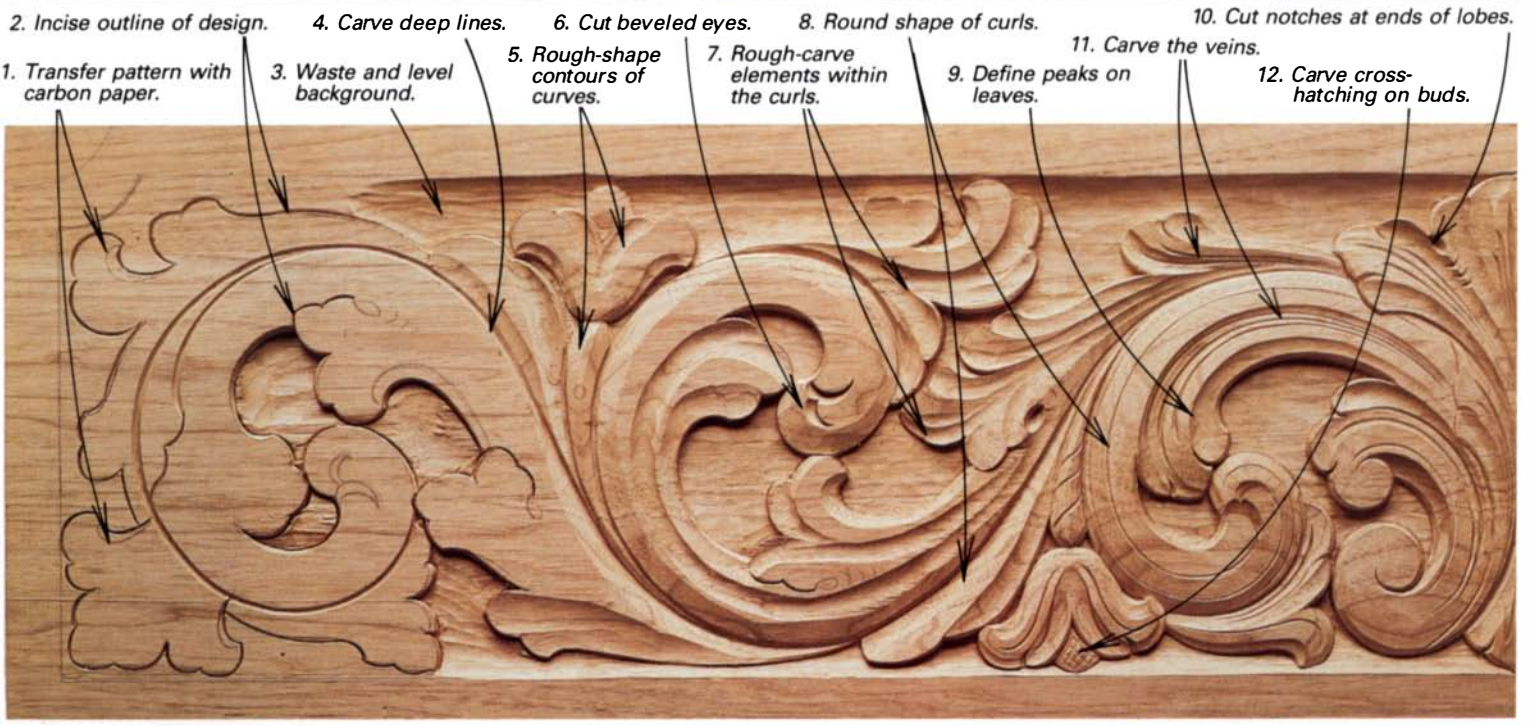
For best results, keep the edges of your carving tools razor sharp. I hone my tools often, first with a soft Arkansas oil stone, and then with a hard Arkansas stone. I also hone a slight bevel on the inside of some of my tools. I prefer to use WD-40 as a lubricant, which makes sharpening easier. Using a lubricant also floats away the metal fragments and keeps the stone clean and cutting well. After honing, I buff the tool edges on a leather wheel charged with buffing compound and chucked in the drill press. Buff lightly, though, or you will round the tool's edge. *—P.O.*

front of each rear leg. This mortise starts 22¼ in. from the bottom. Finally, two mortises on the sides of each rear leg are chopped to fit the backrest's twin tenons. To finish the legs, slightly round all the edges, except where the seat rails join, with a handplane, sandpaper or with a small-radius roundover bit in the router.

Next, I rip the 1-in.-thick arms of the sengebenk 2⅜ in. wide. Before shaping the arms, chop the ⅜-in.-wide mortise on the underside to accept the front leg tenon. Also, cut the ⅜-in.-wide tenon on the back end of each arm, to join it to the rear leg. Then, the arms are shaped to the profile in figure 1 on p. 42 and the top edges are rounded over, as you did with the legs.

Gluing and finishing—When all the previous operations are complete, I disassemble the frame and sand all the parts of the sengebenk, except for the carving. I round over any sharp edges and finish-sand all surfaces down to 220-grit.

Everything should now be ready for final assembly. I usually glue up the sengebenk in several steps to make sure I can get everything together before the glue sets up. First, glue the front legs and frame together, applying glue to both the mortises and tenons. Then, clamp the frame, checking it to make sure everything is square and flat after the clamps are tightened. The process is repeated with the rear legs and frame and the carved backrest as well. Finally, I glue the side frames and the armrests to the front and rear assemblies.



A. The first step in carving the acanthus design is to transfer the carving pattern to the wood with carbon paper (step 1). Incise the outline of each design element (step 2). Use both straight-edge and curved-edge tools, selecting the edge that best fits the shape of the section of line you're working on. Hold the tool plumb, to avoid undercutting, and use a mallet to pound the edge about ⅛ in. into the wood. Next, waste the background using #8 gouges and the #1 plain skew and spoon skew (step 3). Repeat the last two steps until the background is about 3/16 in. deep, and use gouges to smooth and level background areas. The background around the edges of the design gradually tapers up to the surface of the board, creating a sort of frame around the edges of the seat back. Define the deep lines on the design (step 4) with the large V-parting tool.

B. Now, with the parting tool and the #1 skew, rough-shape the contours of the individual curls (step 5). Define the two eyelid shapes at the end of each curl (step 6) using a #7 gouge. Make the first cut vertically, as you did when incising the design, and then remove the crescent-shape piece with a second, angled cut. Rough-carve the individual elements within the curls next, using the #8, #7 and #5 gouges (step 7). Use the skew to rough-shape the "bud" on each of the five flowers in the design.

C. Next, the #1 skew is used to round the curls by cutting a series of faceted surfaces (step 8). The skew also defines the transitional peaks (step 9) between details that were rough carved with the gouges (as described in step 7). When the major carving is done, use the #7, 14mm and #8, 10mm gouges to make the notches that define the lobes of each element (step 10). Then, carve in the veins of the plant with the 4mm, #21 V-parting tool (step 11). These veins are cut deeper and wider at the tip of each element, and taper off toward the base of the element. In areas where there are many veins, they converge but never meet. Also use the #21 V-parting tool to carve the cross-hatching on the flower buds. The last thing to do is slightly bevel all the sharp edges with the skew.

Most of our furniture is finished with "natural" Deft oil, which is available from most hardware stores. The oil is easy to apply to both the smooth surfaces of the bench and into the details of the carving, and I like the rich color it brings out in the butternut. The panels are finished separately and put in after they're dry. Each panel is held in its frame by four ¼-in. by ¼-in. molding strips, mitered on their ends and tacked in place with brads. Two bottom brackets, screwed on the inside of both front and rear bottom rails, support the chest bottom, which is cut out of ¾-in. plywood and notched in the corners for the legs.

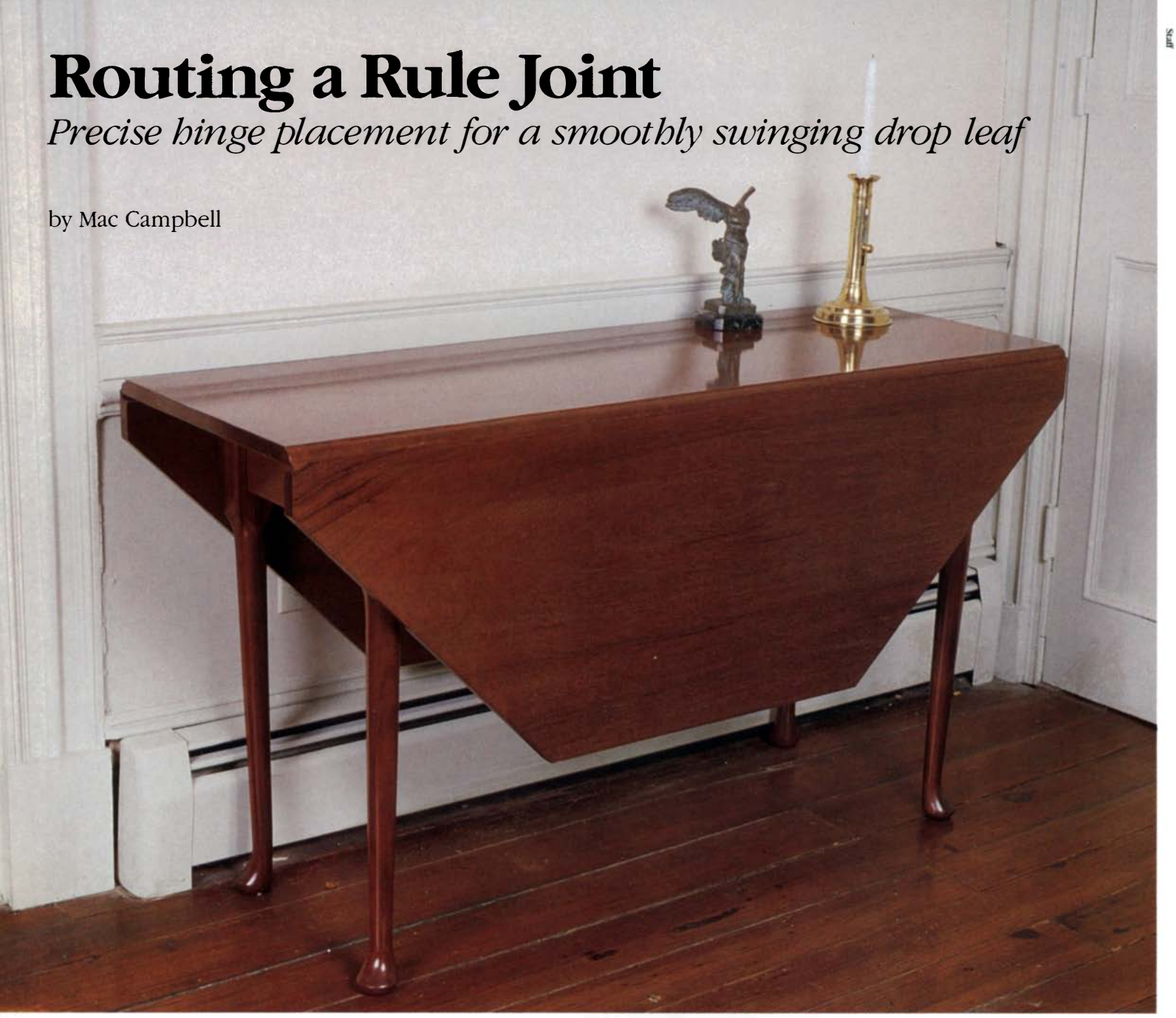
The only remaining step is to attach the seat to the rear seat rail, which is done with four ¾-in.-wide, 1½-in.-long butt hinges, all centered on the backrest supports. Chisel out shallow mortises for the hinges on the seat first and then screw them on. Next, put the seat in place and mark the rear seat rail. I then chisel out the mortises in the seat rail and screw on the hinges. I've found that using hinges with removable pins makes attaching the seat a lot easier because you don't have to hold the seat up while you drive the screws. □

Else Bigton and Phillip Odden are cabinetmakers and woodcarvers who own Norsk Woodworks in Baronnett, Wis. They teach carving classes annually both at their shop and at the Norwegian American Museum in Decorah, Ia.

Routing a Rule Joint

Precise hinge placement for a smoothly swinging drop leaf

by Mac Campbell



A rule joint is the traditional method for shaping the mating edges of a tabletop and a drop leaf. The cove on the leaf rests on the roundover of the tabletop to help support the raised leaf; when the leaf is down, the rule joint forms a decorative molding.

A drop leaf dramatically increases or decreases a table's size quickly and easily, while at the same time eliminates the hassle of storing loose table leaves. Drop leaves are adaptable to either modern or traditional tables, but the key to making this design tool work well is the traditional rule joint.

The principle of a rule joint is very simple: The tabletop has a shouldered roundover cut along its edge, and the hinged leaf has a corresponding cove cut along its edge. When the leaf is raised, the cove rests directly on the roundover so the weight of the leaf, plus serving dishes, elbows or any other objects that might get placed near the joint, is carried by the joint itself and not just the hinge screws. When the leaf is down, the rule joint forms a decorative ovolo molding along the edge of the table. A cross section of this molded edge resembles the brass joint on a traditional carpenter's rule, hence the name rule joint.

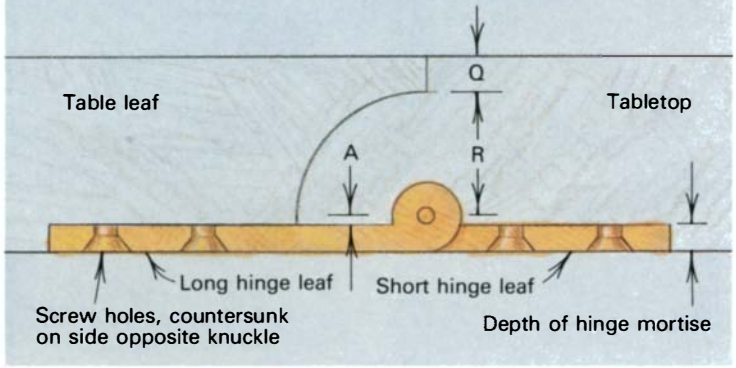
To operate properly, a rule joint requires a specially designed hinge (see figure 1 on the facing page). One side of the hinge is longer than the other to span the radius of the cove on the table leaf. Screw holes are countersunk on the reverse side from the knuckle, the opposite of a normal hinge. In use, the hinge knuckle is mortised into the underside of the tabletop so the center of the hinge pin can be placed at (or near) the center of the arc of both the roundover and the cove.

Theory versus reality—Before getting into how to cut and fit a rule joint, it is worth looking at the areas where the theory of the joint, and the reality of making it work, part company. Certainly, you can make a rule joint exactly as shown in figure 2A on the facing page, with the roundover's arc traveling through exactly 90°, so the arc's center is on the underside of the tabletop. On a ¾-in.-thick top with a ⅛-in. quirk, for example, this would require a ⅝-in. radius cutter for the roundover. However, with this arrangement, the tabletop and extension leaf will rub throughout their full range of motion. At the very least, this abrasion will wear and scratch the finish on these parts, especially if any small crumbs or debris get caught in between the pieces, and the damage will seriously detract from the decorative molding formed by this joint. Also, if the leaf should distort due to seasonal humidity changes, the fit can become so tight it will be unworkable. In addition, because the hinges are mounted on the bottom surface of the leaf,

Fig. 1: Table hinge

Q, height of quirk
R, radius of roundover
A, height of hinge pin center above face of hinge leaf

To determine the depth of the hinge mortise, add the height of the quirk, the radius of the roundover and A, the height of the hinge pin center above the hinge leaf, and subtract the total from the thickness of the tabletop.



the leaf does not hang straight down, but swings in slightly toward the table base. If the joint is constructed as in figure 2A, this extra tilt will open up a gap between the edge of the leaf and the table and spoil the continuity of the edge.

The solution to these problems is to slightly alter the layout of the joint and the placement of the hinge pin as shown in figure 2B at right. Again, assume you have a ¾-in.-thick top and an ⅛-in. quirk; if a ½-in.-radius roundover is used instead of one with a ⅝-in. radius, the center point of the roundover will be moved up ⅛-in. from the bottom of the tabletop. Reducing the radius and raising the center point of the hinge in this way significantly affect the joint by raising the edge of the leaf when the leaf is down, so that it overlaps the roundover. This overlap eliminates the open gap caused by the leaf's tilt in the down position. In addition, raising the center point of the hinge pin lets you recess the hinges into the bottom surface of the top and leaf. Although recessing the hinges is not necessary—many older tables have their hinges surface-mounted with only the knuckles recessed—it does give the table's underside a more finished look.

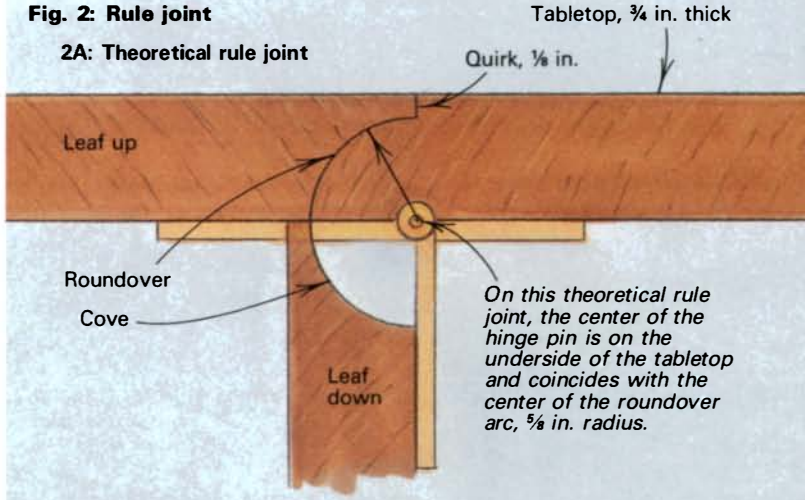
Another minor alteration in the placement of the hinge pin solves the problem of the parts rubbing on each other as the leaf is raised or lowered. If the hinge pin's center is moved 1/32 in. toward the leaf, the leaf will still close tightly to the quirk at the surface of the tabletop when it is up, but will gradually draw away from the roundover as it is lowered (see figure 2B). This also allows a little leeway for seasonal distortion, but still retains the joint's load-carrying capacity.

Cutting a rule joint—Before putting tool to wood, you must obtain the hinges. When selecting hinges, the critical factor is that the distance from the knuckle to the nearest screw hole on the long hinge leaf must be greater than the radius of the joint so the hinge leaf can span the cove that was cut on the table's drop leaf (see distance R in figure 1). Hinges on old tables were usually made of iron, since they can't be seen on the finished table, but you can get brass drop-leaf hinges from Paxton Hardware Ltd., 7818 Bradshaw Rd., Upper Falls, Md. 21156 or Lee Valley Tools, Box 6295, Station J, Ottawa, Ont., Canada K2A 1T4, and several other supply houses.

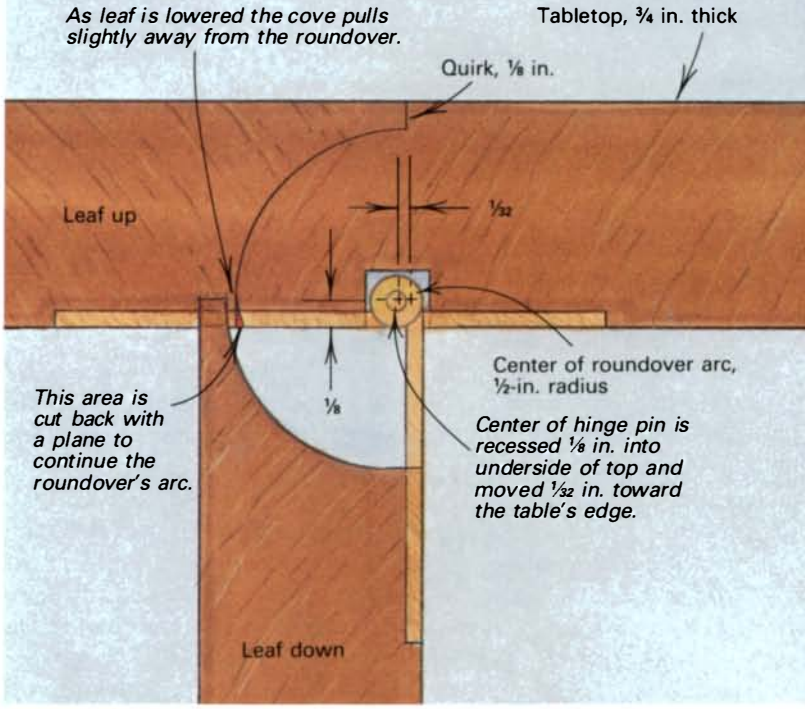
A rule joint can be cut entirely by hand (for more on this see *FWW Techniques 3*, The Taunton Press, 1981), but it is much easier to use power equipment. I use a hand-held router for cutting the cove and the roundover and for recessing the hinges. To cut the roundover on the tabletop, I use a bearing-guided roundover bit, and to cut the cove on the leaf, either a bearing-guided cove bit or

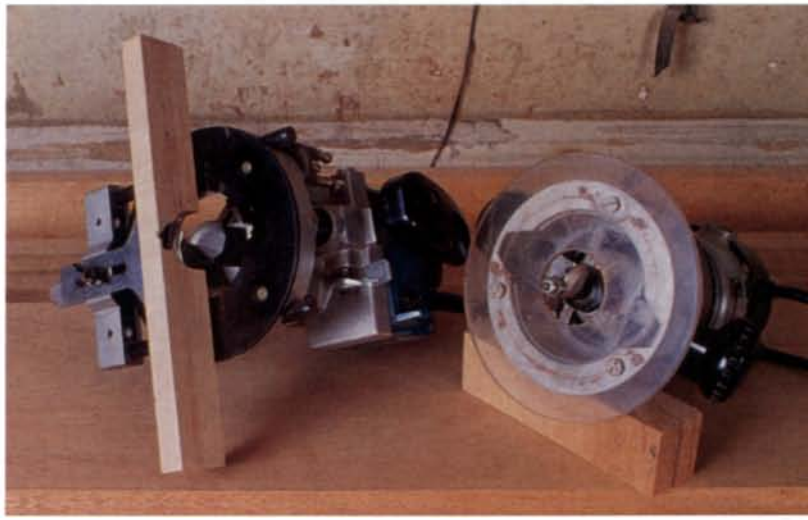
Fig. 2: Rule joint

2A: Theoretical rule joint



2B: Practical rule joint





Shown above are two setups for routing the cove on the extension leaf. Whenever possible, the author uses a bearing-guided cove bit, as shown on the right. However, because he was unable to find a cove bit with a radius larger than ½ in., he uses a ¾-in.-radius core-box bit with a guide fence clamped onto the router base, as shown on the left, for thick tabletops.

Photos except where noted: Scott Landis; drawings: Roland Wolf

A few passes with a block plane are required to round over the flat portion of the table's edge left uncut by the roundover bit.

a core-box bit, as shown in the photo on the previous page. Because I couldn't find a bearing-piloted coving bit with a radius larger than ½ in., I was forced to turn to the core-box bit when I needed a ¾-in. cove for a 1¼-in.-thick tabletop. To cut a cove with the core-box bit, mount a fence on the router with an arc cut out of the fence, so that half of the bit's cutting edge is exposed, and run the fence along the leaf's edge. I have mated pairs of cutters in ½-in. and ¾-in. radii. By varying the size of the quirk and the depth of the hinge mortise, these two radii work for most tabletop thicknesses. For a ¾-in.-thick top, I use a ½-in.-radius set of cutters, and leave a ⅛-in. quirk; for a 1¼-in. top, I use the ¾-in.-radius set, and leave a quirk of about ¼ in.

Begin by jointing the mating edges carefully, as you would for a glue joint; these edges are used to guide the router cuts, so your final fit will be only as good as the original edge-to-edge joint. Bear in mind that some wood is removed so the leaf can overlap the top. For this reason, it's best to work the joint and recess the hinges before final-sizing the top and leaves. This is essential to end up with a continuous curve on the edge of a round or oval table.

Once you have your hinges and decide on the radius of the arc and the size of the quirk, you're ready to begin. When using a router to cut the joint, it's not necessary to actually lay out the joint on the wood; instead, you can just rout the roundover on the table and fit the cove on the leaf to it. Make several passes to cut the roundover, lowering the bit a little each pass until you've reached the desired depth based on the height of the quirk. The final pass should be very light (around 1/32 in.) to give the smoothest possible surface. While you're at it, cut the same profile on a piece of scrap to use as a sanding block for cleaning up the cove on the leaf. It's not necessary to leave the quirk on the sanding block.

Next, change bits and cut the cove on the leaf, again making several passes. If you're using a core-box bit, make sure the fence clamped to the router base leaves exactly half the bit exposed so you get a true 90° cove. As you approach the final depth, hold the leaf up to the edge of the table and check the fit. The top surfaces of the table and leaf should be flush when the cove is resting on the roundover. Again, cut a duplicate cove profile on a piece of scrap for a sanding block. After both profiles are cut and fitted, smooth away any machining marks with 150-grit paper wrapped around the sanding block. Remove as little wood as possible to avoid loosening the fit.

The two pieces should now snugly fit together when the leaf is up. However, as the leaf is lowered, it will not rotate smoothly through its arc because of the uncut area near the bottom edge of the table where the pilot bearing of the roundover bit ran on its last pass (see figure 2B on the previous page). This uncut area must be rounded over to at least continue the arc of the router cut. I prefer undercutting it slightly more than that, so when the leaf is down, any small debris that falls into the crack will fall all the way through. I usually shape this area with a block plane, as shown in the photo at left, and finish up with a scraper and sandpaper.

Laying out and fitting the hinges—Now you're ready for the heart of the process: fitting the hinges. To lay out the hinge locations, place the tabletop and leaves upside down on the bench, and clamp them together along the rule joints. For joints up to about 4 ft. long, I usually use two hinges, each placed one quarter of the joint length in from the end. For longer joints, I often use three hinges: one centered and the others a little less than a quarter of the total distance from each end. After marking the location of each hinge, place one of the hinges upside down (so the knuckle won't interfere) at each mark in turn, and draw pencil lines along the sides of the hinge on both the tabletop and the leaves. Don't mark the ends of the hinge leaves at this time; you must first determine the exact placement of the hinge knuckle. To do so, unclamp the top and leaves.

As pointed out earlier, the center of the hinge knuckle should be 1/32 in. from the center of the roundover arc measuring toward the edge of the tabletop. Set a marking gauge to this measurement (15/32 in. for a ½-in.-radius roundover) and scribe a line on the underside of the tabletop at one of the hinge locations. Carefully place a hinge on this scribe line with the hinge's short leaf pointing toward the center of the table and the center of the hinge pin exactly over the scribed line. Scribe along the end of the short hinge leaf with a sharp scratch awl. Now, with the marking gauge's fence against the table's edge, reset the gauge to this scribed line, and mark the end of the hinge leaf at each hinge location. To finish the layout, reclamp the tabletop and leaves together, place a hinge, upside down, exactly on the lines you just marked out and scribe the location of the long end of the hinge on the table leaf. Again, separate the pieces, set your marking gauge to this line and mark at each hinge location. You now have a complete layout for the hinges and you're ready to rout the recesses for them.

The depth that the hinges are to be recessed is critical to the correct placement of the hinge pin, so you must first measure the exact distance from the face of the hinge to the center of the hinge pin (distance A in figure 1). Add this measurement A to the radius of the roundover and the height of the quirk, and then subtract that total from the thickness of the tabletop to give you the depth of the hinge mortise.

The hinge mortises can be cut with a number of different methods, but I prefer a router because of the precise depth control. Using a ¼-in. bit, set the router to the depth you calculated earlier. Because the placement of the hinge is so critical, mount a fence on the router base to stop the cut just as you get to the scribe line at the end of the hinge mortise (see the photo on the facing page). You could set up a jig to register the router side to side, but I prefer to rout the mortises freehand, stopping just short of the layout line on each side of the mortises and cleaning them out with a chisel later.

Rout and clean out all the hinge mortises, and then clamp the tabletop and leaves together again and check each mortise for fit with an upside-down hinge. Trim with a chisel where necessary. Now, you have only to rout a deeper mortise to recess the hinge knuckle.

Once again, separate the top and leaves. Select a router bit at least as wide as the hinge knuckle. The bit may be as much as 1/16 in. wider without hurting anything, because a tight fit side to side isn't important, although adequate depth is. Set the depth of cut equal to the depth of the hinge mortise plus the height of the hinge knuckle above the face of the hinge. Then, clamp a fence on

the router so the distance from the fence to the center of the bit is equal to 1/32 in. less than the radius of the joint's arc. Carefully rout a recess for the hinge knuckle in each mortise in the tabletop, and square off the ends of these mortises with a chisel. A plunge router is useful for this operation, but not essential since the bit diameter and depth of cut are small and the fence on the router base provides the needed stability when starting the plunge cut with a regular router.

Clamp the leaves and the top together, and test fit a hinge into each mortise. I've found enough variation in overall size and screw hole placement from one hinge to the next to warrant numbering the hinges and the mortises to make sure the same hinge goes into the same mortise each time. With all the hinges in their mortises, set a screw in one of the holes closest to the knuckle of each hinge. Don't drill all the pilot holes yet, in case minor adjustments must be made later. At this stage, I use steel screws that are the same diameter and 1/8 in. shorter than the ones used in the final assembly. This helps to ensure that the holes aren't stripped out when removing and replacing the screws. Using the preliminary steel screws is especially important when finishing up with brass screws because the steel screws can be driven and removed with less danger of breakage.

With one screw in each leaf of each hinge, carefully turn the whole assembly over and, with the top resting on the bench, raise and lower each leaf. It is possible that everything will work perfectly, but it's more likely that there will be a few stiff spots. The easiest way to locate the points where the joint is binding is to slip a piece of carbon paper in the joint when the leaf is down, and then raise and lower it a couple of times. Do this along the length of the joint, and then remove only a little wood at the carbon-marked spots with sandpaper or a cabinet scraper. Repeat this procedure as often as necessary until the joint works smoothly. Now, you can mark the ends of the top and leaves and, if necessary, disassemble them and trim them to length or, in the case of a curved or round top, bandsaw the final shape of the table. Then, reassemble the parts and set the rest of the screws, again using slightly short steel screws.

With the hinges fully installed, set the whole assembly right-side up on the bench, and use a long level or straightedge to make sure the top and leaves are perfectly flat. If the table base and leaf supports (see the sidebar below) are already built, you can place the top assembly on this. Because there will probably be slight variations where the leaves meet the top, use a cabinet scraper or a handplane (or, when nobody is looking, a belt sander) to smooth the joint between the two; then, rout a decorative profile on the table's edge if it gets one. Finally, sand the whole top in preparation for applying the finish.

To ensure proper hinge placement, Campbell uses a fence when routing the hinge mortises.

Your rule joint is now complete. Remove the hinges and finish the top and leaves separately. When the finishing process is complete, reinstall the hinges with the proper screws and make a final check of the action of the leaves. Depending on your original fit and the thickness of your finish, there may be a trace of rubbing. If so, it can usually be relieved by going over the joint with steel wool. A light coat of wax should eliminate any squeaks.

There is one more thing to consider when designing a drop-leaf table. The wood for the leaves must be as stable as possible, since the leaves just hang, completely unrestrained against movement. If they are to be made from one or two wide boards, try to pick a very stable wood, and avoid reaction wood or wood cut from an area of the tree near knots or other defects. No matter how attractive the figure, these pieces are more likely to distort over time. Clear, straight-grain mahogany or walnut are the ideal choices. If you are laminating from narrower stock, try to alternate the direction of the annular rings so any cupping will produce a washboard effect, but leave the overall line of the leaf flat. □

Mac Campbell operates Custom Woodworking in Harvey Station, N.B., Canada, specializing in furniture design and construction.

Supporting a drop leaf

Once you've mastered the intricacies of the rule joint, you still need a way to support the leaf in the raised position. Though the solutions are limited only by your ingenuity, there are three basic systems that have been developed through the years: gate leg, pull out and swing arm.

The gate-leg support is probably the best known of the three. In this system, a table leg is attached to an arm that is hinged in some way to the table frame. To operate it, hold the leaf in the raised position with one hand, while you swing the leg out under it with the other. The movable leg may be one of the four main legs, as in the table shown in the photo on p. 48, or an extra leg tucked in behind one of the main legs. In either case, it is usually attached to the table skirt with a wooden hinge.

The hinge, which is little more than a rotating finger joint, is relatively simple to make. The layout for the hinge is shown in figure 3 on the following page. Draw a circle on the edge of each piece so that it is tangent to both faces and the end of the piece. Next, draw diagonals from the corners of the piece so they intersect at the circle's center and continue to the edges of the piece. With a square, carry three lines down both sides of each piece: The line where the diagonals meet the edges indicates the back of the chamfer, the line that is carried down from the point where the diagonals intersect the circle will be the centerline of the chamfer and the line that designates where the circle is tangent to the edges of the board is where no wood should be removed when rounding over the knuckle.

Next, I lay out the knuckles for the hinge, so each knuckle is about as high as the board is thick. Make the saw cuts be-

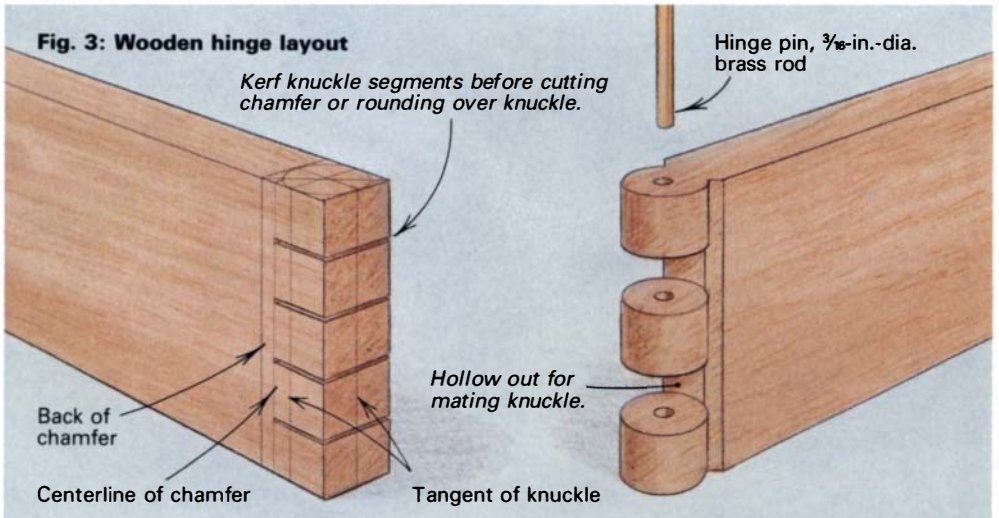


Fig. 3: Wooden hinge layout

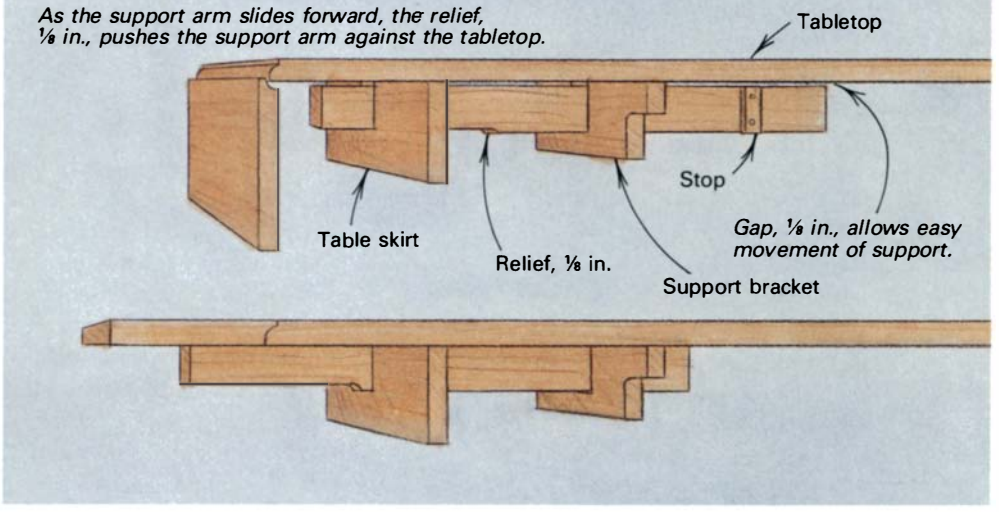


Fig. 4: Pull-out support arm

As the support arm slides forward, the relief, 1/8 in., pushes the support arm against the tabletop.

A hinged swing arm supports a drop leaf that extends a cabinet top. A small wedge glued to the extension leaf lets the arm swing freely through most of its arc and, when used with an adjustable stop, provides a way to fine-tune the level of the leaf.

tween the knuckles, but don't chisel them out yet. First, cut the chamfers and round over the ends of the boards to form the knuckles' shape. I use a chisel and a rabbet plane to cut the cross-grain chamfer; and to prevent tearout, I score a line with the marking gauge along the pencil line at the back of the chamfer. This chamfer can also be cut with a backsaw and chisel or with the tablesaw tilted to 45°. The ends of the boards may be rounded now as well, using either a small plane or a roundover bit in a router.

After both mating pieces have been chamfered and rounded, chisel out the alternate knuckles just as you would for a dovetail. Once the waste is removed, hollow out the base of each cut to provide clearance for the mating knuckle to fit into.

When all the shaping is completed, assemble the hinge with the two pieces at right angles to each other. Carefully line up the knuckles and, using a drill press, make a hole for the hinge pin. I use a 3/16-in. uncoated brass brazing rod for a pin, and peen a head on what will be the upper end. Drilling from both the top and bottom of the hinge toward the middle minimizes any misalignment. Insert the pin in the hole and try the action of the hinge. There are usually a couple of tight spots to clean up; shave a little here and there until the action is smooth. Make sure the knuckles on the moving arm don't project past the inner face of the fixed arm as the hinge opens; this will cause the hinge to bind once installed on the table.

If a gate-leg support doesn't fit your design, the most common alternative is a pull-out support. This support rides in a slot cut in the skirt, and by using the skirt as a fulcrum, transfers the weight of the leaf to upward pressure on the bottom of the tabletop. For ease of action, relieve the bottoms of the pull-out arms except where they actually bear on the skirt (see figure 4 above). For heavy leaves, use two or three pull outs and connect them with crosspieces to form a pull-out frame.

The final alternative for supporting a drop leaf is the swing arm, as shown in the photo above. This is ideal when extending the top of a cabinet with a drop leaf because the arm is simply hinged to the cabinet side and swung out when needed. I used brass hinges on the swing arm in the photo, but a wooden hinge can be substituted by setting individual knuckles to the cabinet side at the top and bottom of the swing arm and using separate short hinge pins. In this case, the long grain of the swing arm should run perpendicular to the side of the cabinet to keep the grain from splitting at the base of the hinge knuckle. The problem with this approach is that if the wood of the swing arm contracts during the dry times of the year, the hinge will loosen and the leaf will sag.

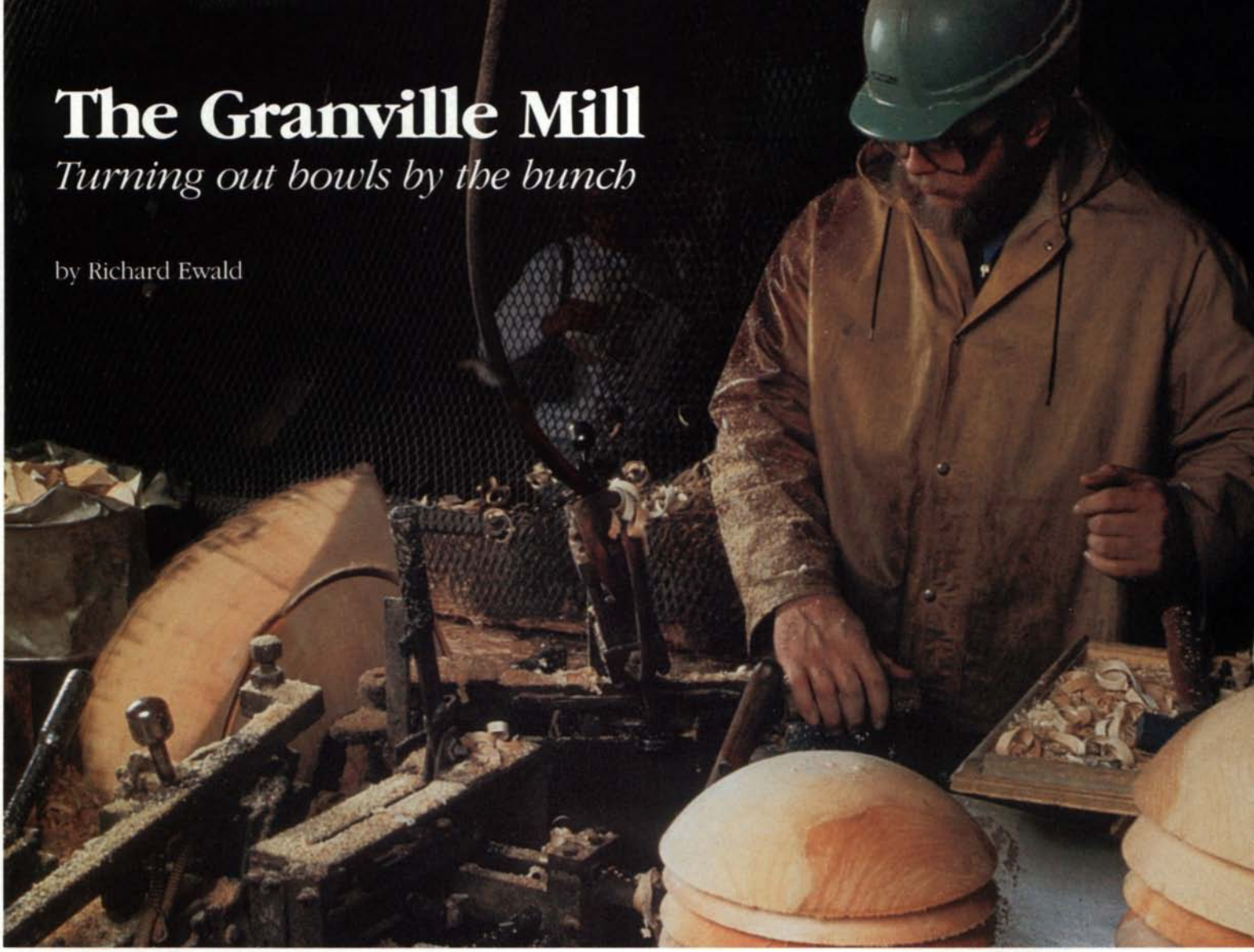
The swing arm can also be used on tables, but because of the large torque it exerts on the skirt to which it is attached, this support system should be used only for small, relatively lightweight leaves. A spreader installed between the table skirts where the arms are hinged will help resist the tendency for the skirts to deflect. For this type of swing arm, cut a wooden hinge as described for the gate leg.

All of these support systems have one potential problem in common: since the rule joint prevents the leaf from being raised above the level of the tabletop, the support system drags along the bottom of the leaf as it's pulled into position. My solution in all cases is to screw a small wedge to the bottom of the leaf where it will rest on the support. By screwing the wedge to the leaf through a slot, or adding an adjustable stop, as shown in the photo above, you can regulate where the support rests on the wedge and thereby compensate for any sag or wear that will develop over time. In addition, this wedge system lets you cut the gate leg or swing arm just a hair low, making it much easier to move into position. *—M.C.*

The Granville Mill

Turning out bowls by the bunch

by Richard Ewald



Stuart Boudwell begins removing the bowl blank from a chunk of maple mounted on a bowl lathe that was built when the plant was founded in the 1860s and that has been in continuous production ever since.

A mechanical bowl machine can be a depressing sight for one-of-a-kind bowl turners. Theoretically, with the pneumatic-powered concentric cutters of a lathe, like the one shown above, you can turn a maple log into a roughed-out 22-in. bowl in about two minutes. In the next three minutes, you could be looking at five more bowls, all from the same chunk of wood, and each 2 in. smaller in diameter than the one that preceded it, like the bowls shown in the right photo on p. 55. In practice, it takes a little longer than that at Granville Manufacturing. But not much.

A short article in a Boston, Mass., newspaper about the 132-year-old bowl manufacturing plant in Granville, Vt., aroused my curiosity as to how the company produced a bowl every two minutes. It was late spring when I drove from my home in southern Vermont through the sparsely populated Rochester Valley into the north-central part of the state. I arrived at the Granville Mill and watched what may be the most crudely efficient and simple woodworking machine ever devised for making bowls.

A three-man crew has no problem averaging 350 bowls per eight-hour shift. Subtracting a half-hour for lunch, that breaks down to almost 47 bowls an hour, or a bowl about every minute and a quarter. With a projected total production this year of 150,000 bowls, Granville is probably the country's leading manufacturer of one-piece hardwood bowls. Looking at numbers like this over a period of more than 130 years, it's not difficult to believe that more one-piece wooden bowls have been turned on this spot than anywhere else.

This may sound very efficiently modern and high tech, but the bowl operation at Granville Manufacturing still has more of the flavor of a backwoods sawmill than a contemporary woodworking shop. Sixteen-foot maple and yellow birch logs are rolled into the shop, a long, dark tunnel of a workspace, where the tools include a 5-ft. chainsaw and hatchets. Piles of bark and damp shavings avalanche across the coarse concrete floor. Stuart Boudwell, who has shaped more than a half-million bowls in some nine years on the lathe, regularly stops working to politely answer the questions of the 3,000 to 4,000 annual visitors. At the lathe, Boudwell wears a green hard hat and a yellow slicker as he works in a chunky rain of chips and sweet maple sap. With a little tinkering now and again, he manages to keep things running just fine.

Kick starting the business—Granville's three operations include a quartersawn clapboard mill, an over-under sawmill making quartersawn spruce for piano sounding boards and violin tops, and the bowl shop. Although operations are going smoothly today, the business was suffering as it entered the 1980s. Several fires destroyed equipment and parts of the mill. The quality of the bowls had slipped. Big trees had become scarce and expensive; it takes about 175 years to grow a tree big enough to yield a 22-in. bowl. The business had become something of a captive to its own "old-timey" image. A hundred years ago, there was a greater demand for large wooden kitchen bowls for making bread and for mixing and serving food, and a minor market still exists in kosher kitchens. But

Left: With a backhand knife, a worker removes the stub that remains after turning the outside of a bowl, while Boudwell begins the next cut that will form the inside of one bowl and the outside of the next smaller bowl. Above: the curved arm and tip of the cutting knife determine a bowl's size. The rectangular back plate that locks the arm to the lathe is hidden behind the blank.

most of the business shifted away from kitchen and restaurant suppliers to upscale gift shops and Granville hadn't made the transition. Granville Manufacturing needed a kick in the pants.

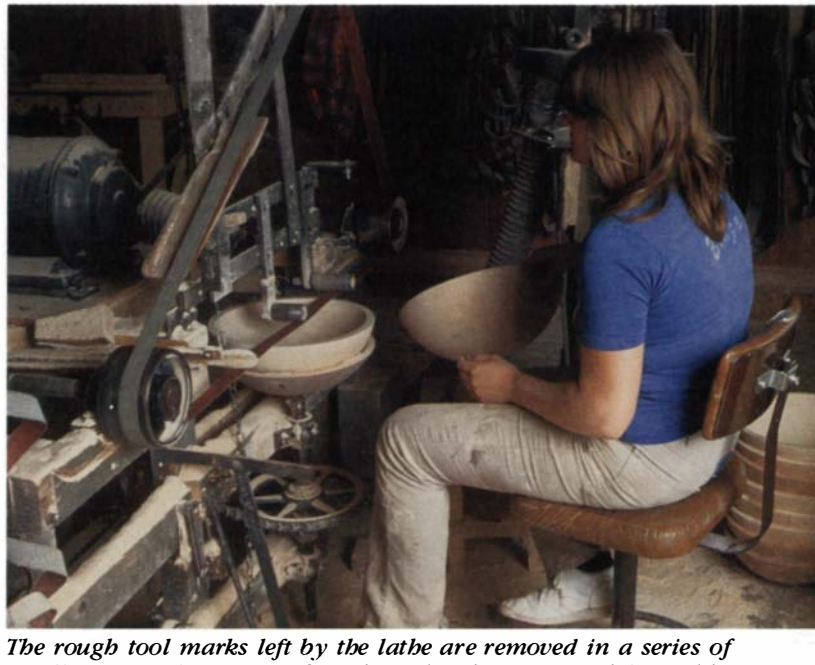
That swift foot arrived in 1981 when "retiring" business executive Bob Fuller and his family took over Granville. Fuller was formerly with Johnson & Johnson; his wife, Carol, had some experience with marketing in the New York City retail clothing industry. Fuller is a tall, outgoing fellow who is obviously excited about his second career and the opportunities to turn the mill operations around.

The heart of these operations is the bowl making, which begins with a stack of green logs piled outside the mill. Here, Merrill Johnson, 70, cuts 18-in. to 22-in. sections with a 5-ft., deck-mounted electric chain saw. To prevent the logs from drying out, Johnson frequently sprays them with water. After cutting the logs, he then rolls each section over and chalks out two or three straight lines on the endgrain, avoiding the heartwood and imperfections in the wood. A 5-ft. circular saw on a traveling carriage cuts each section longitudinally along these lines into two or three chunks each with an internal flat plane and a round, barked exterior. The flat side of each chunk is mounted on the lathe's screw-centered faceplate and an additional screw is driven into the chunk from the back of the plate.

Roots in the 19th century—The lathe that turns out today's bowls is the same lathe built when the plant was founded sometime in the 1860s by the brothers R. N. and Daniel Hemenway, of nearby Warren, Vt. And it's been reinvented by every Granville Manufacturing maintenance man since then. The lathe used to be hydraulically powered by the White River, which runs just behind the shed. Now an amazingly quiet 10-HP motor does the job. Old babbitt bearings have been replaced by ball bearings, and except for the shaft, all other mechanisms are pneumatically powered. These are the only significant changes the machine has undergone in more than 130 years, and as efficient as the lathe is when it runs true, it seldom does for long. The fallibility of this antique rescues the whole turning process from becoming merely another machine-based production setup. Constant human judgment and dexterity are required, and the piece being worked is always at risk.

Woodworkers and bowl makers sometimes speak of the buried shape within a tree, which is slowly revealed by removing all the wood except the shape itself. This lathe does not entail that kind of gradual hollowing out to discover a contour. It's more like the rapid surgical excision of an imposed form. A sharp cutting edge swings into the workpiece like a squared-off gouge on the end of a massive grapefruit knife, shaping the inside of one bowl and the outside of the next smaller bowl at the same time, as shown in the photos above. This is repeated with a succession of knives of diminishing but concentric radii until only a small and partial sphere remains screwed to the faceplate.

Turning the bowls—Pumping one foot on a clutch like a race-car driver, Boudwell starts the first hooked knife into a fresh chunk of maple in a tentative manner, as shown in the photo on the previous page, well aware from experience that the eccentric edges on the chunk's outer shell could fly off once they are undercut.



The rough tool marks left by the lathe are removed in a series of sanding operations. A worker places bowls on a revolving table, which automatically belt sands the edge of each bowl.

Sometimes he'll stop the lathe completely and chop these hazards away with a hatchet. The clutch controls both the feed rate of the arm and the speed of the spindle. The first knife leaves an outer shell connected to the first bowl by the equivalent of a 1-in. dowel about ⅜ in. long. A smart smack with the palm of a hand separates the shell, and each new bowl from then on.

While Boudwell retracts the first knife, an assistant swings in a backhand knife from the other side and shaves the little nub off the bottom of the bowl. A pneumatic clamp makes changing knives as easy as switching cassettes in a tape deck. Then, Boudwell is ready for the next pass, shown in the left photo on the top of the facing page, that shapes the inside of the first bowl and the outside of the second bowl. When he notices that the wood is ripping or tearing or bowls are coming out thick or thin, Boudwell calls on the shop maintenance specialist, Michael Eramo. There's no factory rep to call when this quirky antique goes awry. Eramo is responsible for all the equipment in each of Granville's shops, but he spends nearly half of each day in the bowl mill, making knives completely from scratch, sharpening cutting edges and truing up the lathe.

Each knife has three parts: a rectangular back plate that is locked into the lathe, a curved arm that represents the contour of the bowl and a cutting edge at the tip that's ⅜ in. to 7/16 in. wide, which has more in common with a saw tooth than a chisel or a gouge (see the top, right photo on the facing page). When Eramo came on the job in 1985, tearing and pulling was a big problem. He reversed the cutting edge, putting the tip up. Perfecting the size and clearance of the ears and the rake of the tooth took him three months of experimentation, but eventually it reduced production losses from 40% to just 17%. A tip might last three weeks, with sharpening maybe twice each day.

Eramo trusts his eye to get the right curve to the arm and the proper elevation to the tip and then lets the first pass of the new arm reveal the accuracy of his setting. Because each knife must be parallel to the preceding knife for the bowls to have a uniform ⅝-in. wall thickness, the slightest eccentricity is immediately apparent. While the larger bowls may run closer to 11/16-in. wall thickness, Eramo has found that too many bowls are lost to checking if the walls are any thicker or thinner.

The bowls are moved in stacks from the lathe to a drying room. Until very recently, all of Granville's bowls were dried outside in unheated sheds. It took some six weeks in the summer and about four months in the winter to get the bowls down to the desired 12% moisture content (MC). Now they are stacked in an upstairs room kept between 60°F and 80°F. A small household humidifier is always pumping away. The more controlled drying conditions reduce losses during drying to about 4% and allow Granville to get the bowls through the drying process in 10 to 14 days year-round.

Yankee ingenuity—The sanding room is another testimony to seat-of-the-pants machine design. A combination of Rube Goldberg-like contraptions sand the edges, the insides and the outsides of the bowls as they are moved from one station to the next, as shown in the bottom photo on the facing page and the two left photos below. Machine operators smooth the spinning, oscillating bowls with 60-grit and 120-grit sanding belts.

Granville puts a finish on only a very small percentage of the bowls it sells, using mineral oil with a 5% paraffin content. The Granville name goes only on those bowls sold in its own store. The rest are wholesaled and wind up with the retailers' imprints. On the balance sheet, the bowl operation doesn't bring in as much as the clapboard mill. Fuller says he loses money on the smaller bowls, breaks even on the 11-in. bowls and makes money on the larger sizes with a 15-in. bowl retailing for $50, a 17 in. for $75 and a 20 in. for $110.

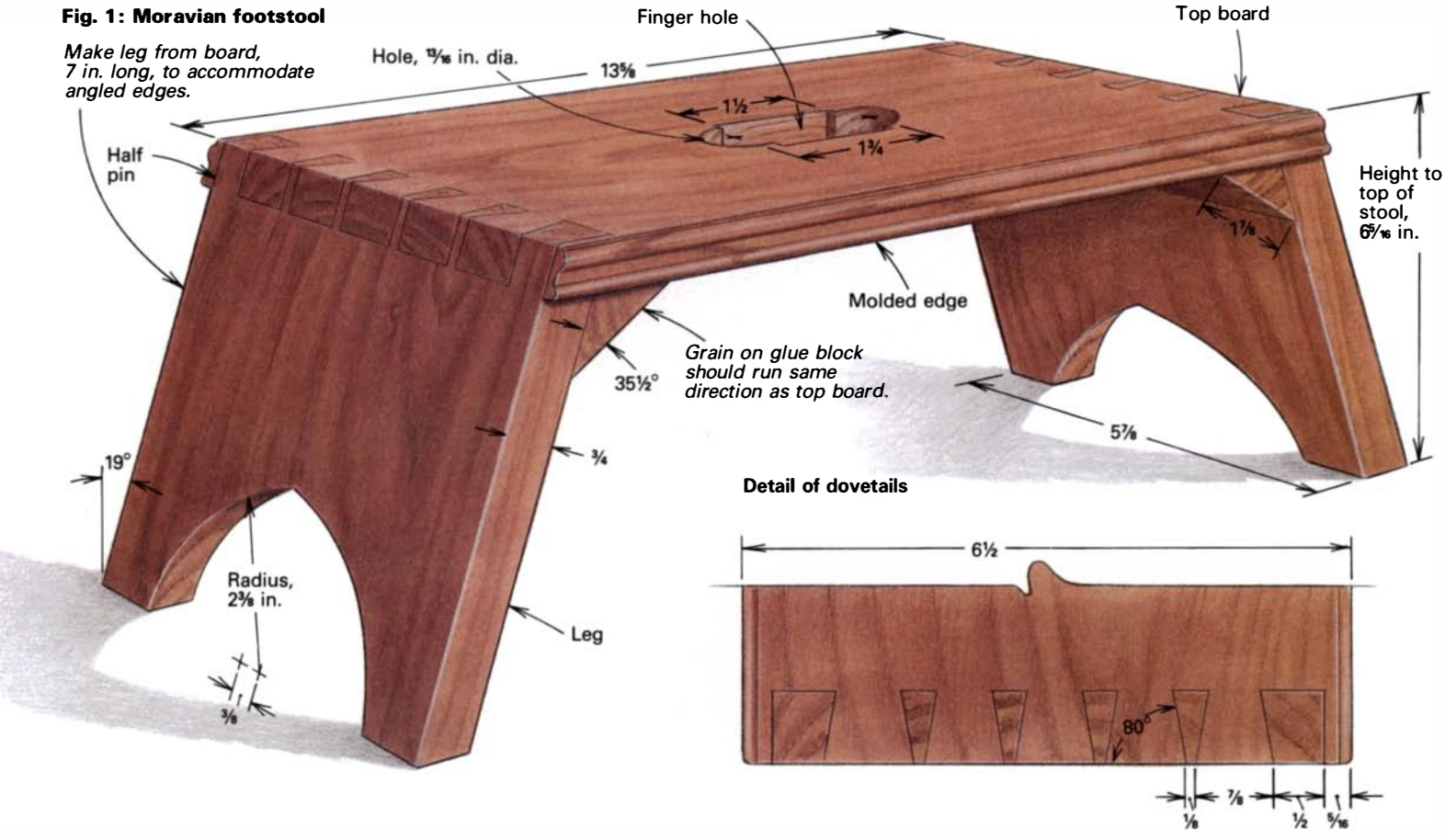
When I visited Granville in May, Bob Fuller was distracted. He couldn't get logs for the clapboard mill and the bowl lathe was shredding bowls like they were classified wooden CIA memos. But when I went back one damp, cold day in September, I found him expansive and voluble. The yard was piled high with logs. A second bowl lathe was on the production line and a third was being built. A "producing crafts village" was being planned, along with a video for visitors. A glass viewing wall was going up next to the bowl lathes. Michael Eramo had slowed the feed rate on the oldest lathe, and good bowls were coming off in the kind of quantities that make a chief executive officer smile. He took the afternoon off to play golf and to dwell for a while on cups, not bowls. □

Richard Ewald is a freelance writer in Westminster West, Vt.

The operators control the pressure of the belt sanders with various levers and pedals as they sand the inside (above left) and outside (above right) of each bowl.

The bowl lathe at Granville can turn as many as seven bowls from a single block of wood in as little as six minutes. The nested bowls in the foreground were all cut from the same block of birch.

Photos: Paul Bertorelli



A Moravian Footstool

Angled dovetails for strength and beauty

by David Ray Pine

Cutting angled dovetails isn't any more difficult than cutting dovetails that meet at right angles, even though they look as if they would be. And angled dovetails can make very strong and attractive joints, as in the footstool shown in the drawing above. The stool is a reproduction of one that was very popular in the old Moravian town of Salem, N.C., in the late 1700s. The single-board top is joined to the two legs with through dovetails so the legs splay at 19° from perpendicular. This sturdy little stool is an excellent example of joinery that's been applied correctly to meet a specific function both visually and structurally. Visually, the angled dovetails present themselves nicely on the obtuse corner of the stool. Structurally, the splay of the legs keeps the stool from racking side to side and the shape of the tails cut on the top resists the outward force on the angled legs as weight is applied to the top of the stool.

All you need to build this stool is one ¾-in.-thick hardwood board, 30 in. long by 6½ in. wide. This will be the finished width of the top. The legs will be ripped down to 5⅞ in. wide after they're crosscut from the board. The ⅝-in. difference in width between the top and legs allows a 5/16-in. overhang for the molded edges on the top (see figure 1 above). For crosscutting the top and legs to length, tilt the sawblade to 19°. The angles on the opposite ends of the top both splay away from the upper face so that when the top is viewed from the edge, it's a trapezoid. Conversely, the opposite ends of each leg should angle in the same direction, forming a parallelogram when viewed edgewise. If the finished length and height of your stool is critical, cut the parts a bit long, 1/32 in. for legs and 1/16 in. for the top, so you can cut the pins and tails to protrude 1/32 in. past their mating surfaces when the joint is pulled up tight. Cutting the parts a little long is a common practice with dovetails because it's much easier to plane the ends of the pins and tails flush with the faces of the boards after glue up than it is to plane the faces flush with slightly undercut pins and tails.

Drawing: Bob La Pointe

The first step in making 90° dovetails is scribing a line around the end of each piece with a marking gauge set to the length of the tails and pins. But, with angled dovetails, a standard marking gauge won't work because the ends of the workpieces aren't square with the fence of the gauge. If you're only cutting one or two joints, you can use a square to scribe lines on the boards' faces and an adjustable T-bevel to transfer the angle across the edges. However, since I build these stools 6 or 12 at a time, I made a marking gauge specifically for 19° angle dovetails on ¾-in.-thick stock. By making the gauge with an obtuse angle (109° for the stool), I can use it to scribe the acute side as well by holding the beam of the gauge down on the surface of the board and running the inside corner of the gauge's angle along the acute angle on the end of the board (see the top photos at right). If you make a marking gauge for angled dovetails, don't forget that the depth of the pins and tails is measured along the angle so it will be greater than the thickness of the stock. My gauge for the footstool actually scribes a line 27/32 in. from the end of the board to allow for the angle plus 1/32 in. for the pins and tails to extend as mentioned earlier. Joining boards of two different thicknesses requires two gauges that have scribing points at different distances from the angle.

Next, lay out the ends of the pins on the legs just as you would a 90° joint, with a half-pin at each edge and the other pins evenly spaced between. Square the pin lines down to the scribed length, and then saw them with a backsaw, stopping at the scribed lines. If you love handwork, or only have a few joints to cut, you can chop out the waste between the pins with a mallet and chisel. As with any dovetail, chisel from both sides toward the center, to avoid splitting out the grain on the board's face, and slightly undercut toward the center of the board. Here's another place where I use a fixture to speed the work for the stools. I made a "pitchboard," which presents the pins at 19° to my bandsaw blade, so I can saw most of the waste away, as shown in the bottom photo at right. In this way, I have only to chisel out the triangular piece left alongside each pin and pare the bottoms of the tail sockets cleanly to the scribed lines. Be sure to make the ramp of your pitchboard long enough so that you can also use it to bandsaw the tails on the stool's top, which is the next step.

After the pins are done, lay out for the tails by standing the pins on the inside of the top board with the wide end of the pins on the scribed line. Now, trace around the pins with a knife, and square the lines from the pins across the end of the board. You can saw the tails out by hand for just a few joints, but if you're making multiples and you already have the pitchboard, you can use it to bandsaw the waste from between the tails. In either case, finish up the tails by paring to the scribed stop lines with a chisel and the joint is ready for assembly. Depending on how confident you are about your dovetail skills, you may need to test-fit the joints and fine-tune them.

All that's left are the finishing touches. Cut the molding profile on the edges of the top with a molding plane or shaper and lay out for the finger hole. Drill two 13/16-in.-dia. holes, 1¾ in. apart, and then with a coping saw or scroll saw, cut out a 1-in. by 1½-in. rectangle to connect them, as shown in figure 1. Draw and bandsaw the 2⅜-in.-radius gothic arch on the bottom of each leg and clean up the cut using a drum sander or by hand-sanding.

Now you can glue up the dovetails. Spread glue on all mating surfaces and, bracing the legs of one end piece against a stop fixed to the workbench, drive the top onto the pins with a rubber mallet. The original Moravian footstools, which this stool was patterned after, had triangular glue blocks nailed behind each joint for added reinforcement. Unfortunately, the grain of the blocks ran cross-grain to the stool's top and legs, leading to problems when the stool's boards expanded or contracted. On the reproductions that I build for Old Salem, I cut the blocks so their grain coincides with that of the stool, and glue and clamp them in place immediately after assembling the stool. Clamping from the base of the triangle to the outside corner of the stool ensures that when the glue sets, both legs will be at the prescribed 19° angle at which the triangles are cut. However, because angled dovetails are so mechanically strong, you might want to assemble your stool before gluing it up and give it a weight test. If your joints are well made, you may decide that the glue blocks are unnecessary. □

A shopmade marking gauge makes it easy to scribe lines for the pin and tail depth. Two blocks are glued and screwed together at the angle of the stool's joint and a nail scribes the line. The gauge's obtuse angle makes it possible to mark the same distance from the end on both sides of the board.

The author bandsaws most of the waste from between the pins using a pitchboard to support the leg at a 19° angle. The pitchboard can also be used to saw the tails on the stool's top board by removing the stop block that's screwed halfway up the ramp.

David Ray Pine builds period reproductions in Mt. Crawford, Va., and is the only person licensed by Historic Old Salem, Inc. to make this footstool for resale. However, a full-scale plan for the Moravian footstool, drawn by Carlyle Lynch, is available for personal use from T. Bagge Merchant, the museum store in Historic Old Salem, 626 S. Main St., Winston-Salem, N.C. 27101.

Chemical Hazards of Woodworking

What you don't know can hurt you

by Theodore J. Fink, M.D.

These products, representative of those found in many woodworkers' shops, all contain hazardous substances. While they all have warning labels of potential dangers, many reveal the contents only as petroleum distillates, which can include a number of dangerous solvents.

All too often woodworkers are needlessly exposed to toxic levels of various chemicals. Sometimes this happens because workers ignore warning labels, but frequently it's because they just don't know enough about the chemical products they use to appreciate the risks involved and take adequate precautions. Toxic chemicals are found in a variety of woodshop supplies, including adhesives, paints and varnishes. By presenting an overview of the basic principles of chemical toxicity, I hope to drive home the single most important lesson for woodworkers: protect yourself—it is infinitely better to prevent an illness or injury than it is to treat it after it occurs.

The chart in figure 1 on pp. 60-61 should help you identify the products containing potentially harmful chemicals, clarify the risks associated with the most common toxins and choose safer alternatives. The following discussion of chemical hazards and how toxins are absorbed into the body will also help you understand the information presented in the chart.

Hazards of organic solvents—Toxicity refers to a chemical's, or solvent's, ability to produce a harmful effect on a biological system, in this case, your body. These harmful chemicals, called toxins, often target specific tissues. Benzene, for example, attacks the blood-forming elements in bone marrow. Any chemical can produce a toxic effect. Some do so with a single, brief contact, often called an acute exposure; others require chronic exposure: repeated or prolonged contact. The crucial point is that there are no harmless chemicals, only relatively safe ways of using them.

All chemicals can produce both acute and chronic effects. Acute effects generally happen quickly and the illness lasts only a short time. If exposure is low enough, the effects are reversible. More intense acute exposures can cause permanent damage, even death. Chronic effects, on the other hand, may not be apparent until after weeks, months or even years of repeated exposures, and they are usually permanent and irreversible. Some people do not realize that they are being harmed because early symptoms of these effects can vary greatly depending on the type of substance, exposure level and individual sensitivity.

Both acute and chronic effects may be localized or affect the entire system. A local reaction would be something like redness or blistering of the skin at the point of contact. A systemic reaction occurs when the chemical is absorbed into the bloodstream. Harmful effects may occur anywhere in the body, but the toxins in solvents most often affect the central nervous system (CNS). Generally, the chemicals depress the CNS, but some substances, like xylene, may produce agitated hyperactive behavior. Symptoms of depression of the CNS can include dizziness, headache, nausea, confusion, sleepiness, incoordination or irrational behavior.

In the workshop, these symptoms not only decrease productivity, but also lead to higher injury rates. However, the damage can be more far-reaching. The brain has very limited regenerative capacity, so once any neurologic deficit is established, it usually becomes permanent. Very high chronic exposure to solvents can cause dementia, resulting in impairments of judgment, insight, orientation and memory. This raises a question that is currently being studied: Can repetitive, low-level exposures cause premature aging and reduce mental and physical abilities? Until there is an answer, it is wise to minimize exposure to solvents.

How chemicals get into the body—Chemical toxins can be absorbed into the blood system through the respiratory and digestive tracts as well as through the skin. Many solvents are very volatile and quickly transform into vapors, so inhalation is the main method of absorption. The lung tissue exposed to vapors during inhalation is enormous, totaling about two acres of surface area in the

lungs' air sacs. Relative volatility of various solvents, determined by measuring the vapor pressure (VP) of the evaporating liquid in millimeters of mercury (mm Hg), is shown in the chart on the following two pages. The more volatile a solvent, the higher the VP, and the more quickly it will fill a room with vapors. Bear in mind that the VP measurements shown were made at 68°F; any increase in temperature will also increase the volatility.

On the body, a thick outer layer of skin generally forms an effective barrier to most materials. Despite this, many of the organic solvents in wood finishing products, such as methylene chloride or isopropyl alcohol, can penetrate the skin and cause dermatitis and exacerbate the absorption. Also, chemicals are absorbed quickly through cuts and abrasions or areas inflamed by eczema or psoriasis.

Workshop chemicals, like those shown in the photo on the facing page, gain entry to the digestive system in two ways. Consumption of food, drink or cigarettes brought into the shop and contaminated by chemicals is the most common process. A not-so-obvious method involves the lungs. The inner walls of the respiratory tract are protected by a thin fluid layer, which is moved upward by small, constantly moving hairs (cilia). Once the inhaled particles reach the throat, they are swallowed, and then any chemicals in the particles are absorbed by the stomach and intestines. This situation can easily develop when you don't wear a dust mask while sanding out finishes.

Chemical classifications—Organic solvents can be combined into groups of similar chemical structures and solvent characteristics, which simply means you can generally use a solvent within a group as a substitute for another solvent from that same group. The groups of solvents that woodworkers encounter most frequently include aliphatic hydrocarbons, chlorinated hydrocarbons, aromatic hydrocarbons, alcohols and ketones, as outlined in figure 1.

Aliphatic hydrocarbons are often petroleum derivatives, such as naphthas, paraffins, mineral spirits, n-hexane and kerosene. From the chart, you can see that n-hexane, found in adhesives, varnishes and seed-oil extracts, is not only extremely flammable, but can cause peripheral nerve damage resulting in weakness of hands and feet. One of the safest solvents for woodworkers is odorless paint thinner, which is mineral spirits or VM&P (varnish maker's and painter's) naphtha with the aromatic hydrocarbons removed.

Chlorinated hydrocarbons are identified by the "chloro" or "chloride" in their names. These are good solvents for many paints and varnishes because they are nonflammable, but most are now known to be very toxic, cause damage to the liver and contain carcinogens. For example, methylene chloride, a common ingredient in paint strippers, not only forms carbon monoxide in the body, but it was recently shown to cause cancer. As a result, the government banned its use in cosmetics and further restrictions are expected soon.

Aromatic hydrocarbons show up in a variety of products, from lacquer thinners and strippers to adhesives and tung oils, and present special hazards as a class. The most toxic, benzene, causes destruction of the blood-forming elements and may wipe out these cells, causing aplastic anemia (bone marrow destruction), or result in leukemia. You are not likely to encounter benzene due to current governmental restrictions; however, some of the older products on the back of your shelf may contain this solvent, and these should be disposed of properly through your local environmental agencies. Toluene and xylene have been widely used as benzene substitutes, and although not as hazardous as benzene, they can still cause serious toxic effects, as shown in the chart.

Among the safest and most important classes of solvents are alcohols, which are found in many types of finishes and other products. Methanol or wood alcohol, which is by far the most toxic of this group, can damage the optic nerve and cause blindness. Ethanol, or grain alcohol, is the least toxic alcohol and has about half the depressant effect on the brain and spinal cord as isopropanol (isopropyl or rubbing alcohol).

Ketones are commonly used in quick-drying finishes and have become more widespread with the increased popularity of vinyl resin finishes. Of the many ketones, three commonly cited on labels are acetone, methyl ethyl ketone and methyl isobutyl ketone. Methyl n-butyl ketone, which you might find in an old product, has generally been banned because it can cause severe nerve damage, the symptoms of which appear gradually over weeks or months and consist of numbness, tingling and weakness in hands and feet. The safest solvent of the ketone group is acetone; however, it is extremely flammable and a real fire or explosion hazard.

Other hazardous materials—Adhesives represent another large group of potentially hazardous materials, as illustrated in figure 2 on p. 62, and should be treated with caution. Some are dangerous because of the flammability of their solvents, such as nitro cellulose cement with 39% acetone and contact cements with various volatile hydrocarbons. Other common adhesives that have lower toxicity are white glue, also known as polyvinyl acetate (PVA), yellow glue (modified PVA/aliphatic resins), hide glue, hot-melt glue (hydrocarbon resin: 50%, ethylene vinyl or acetate copolymer: 45%, wax: 5%) and wet casein glue. These may, however, cause skin irritation or skin allergies. And casein dust, from mixing dry powders, may irritate the upper respiratory tract.

Limiting toxic exposure—Always choose the least-toxic solvent that will get the job done, and always follow the manufacturer's recommendations for safe use. Product labels are now more detailed than ever and should always be your first source of toxicity information. All warnings on labels, such as "use in well-ventilated

(continued on p. 62)

Further reading

Artist Beware by Michael McCann. Watson-Guptil Publications, New York, NY; 1979.

A large variety of good information is available from the Center for Safety in the Arts, 5 Beekman St., New York, NY 10038.

Chemical Hazards of the Workplace by Nick Proctor and James Hughes. J. B. Lippincott Co., Philadelphia, PA; 1978.

Handbook of Organic Industrial Solvents (LC-TG-07-683) by Alliance of American Insurers, 1501 Woodfield Rd., Suite 400 W., Schaumburg, IL 60173; 1987.

Industrial Toxicology by Phillip Williams and James Burson. Van Nostrand Reinhold Co., New York, NY; 1985.

"A Distinct Pattern of Personality Disturbance Following Exposure to Mixtures of Organic Solvents," *Journal of Occupational Medicine,* Vol. 31, No. 9, (Sept. 1989), by Lisa Morrow, Ph.D., et al.

"Neurobehavioral Effects of Solvents," *Journal of Occupational Medicine,* Vol. 30, No. 2, (Feb. 1988), by Edward L. Baker, M.D., et al.

Occupational Diseases by U.S. Department of Health, Education and Welfare, U.S. Government Printing Office, Washington, DC; 1977.

Organic Solvent Neurotoxicity (Publication No. 87-104); March 31, 1987 and *Pocket Guide to Chemical Hazards* (Publication No. 85-114); September, 1985, by U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health (NIOSH), 4676 Columbia Parkway, Cincinnati, OH 45226.

Solvents in Museum Conservation Labs by Center for Safety in the Arts, 5 Beekman St., New York, NY 10038; 1985.

Threshold Limit Values and Biological Exposure Indices for 1987-88 by American Conference of Governmental Industrial Hygienists (ACGIH), 6500 Glenway Ave., Building D-7, Cincinnati, OH 45211; 1987.

FIG. 1: HAZARDOUS CHEMICALS USED IN WOODWORKING

Solvent (synonym)	Where Used	Toxicity [1] * TLV (Threshold Limit Value) in PPM	Flammability [2] * Combustability FP (Flash Point) in Degrees F	Volatility * Vapor Pressure in mm Hg
Aliphatic Hydrocarbons				
n-Hexane (Skellysolve-B)	Spray adhesives and fixatives, fast-drying cements, rubber and contact cements, inks, varnishes, seed-oil extracts, diluent	50	-7	124
Petroleum naphtha	Plastic wood filler, wax, lacquer thinner, petroleum distillates	100	-50	40
VM&P naphtha (varnish maker's and painter's)	Quick-drying thinner, degreaser, varnish, lacquer thinner, petroleum distillates	300	20-55	2-20
Mineral spirits	General-purpose thinner, degreaser, brush cleaner, petroleum distillates, plastic wood filler, varnish, tung oils	200	86-105	0.8
Kerosene	Petroleum distillates, solvents, thinners	None	100-165	Varies
Chlorinated Hydrocarbons				
Methylene chloride (dichloromethane, methylene dichloride)	Paint and varnish removers, furniture refinishers, contact cement, aerosols, urethane foam, adhesives, paint	50**	None [3]	350
Aromatic Hydrocarbons				
Benzene (benzol, cyclohexatriene)	Paint stripper, petroleum distillates, lacquer thinner	10	12	75
Toluene (toluol, methyl benzene)	Petroleum distillates, polyurethane lacquer thinners, inks, adhesives, spray products, modified tung oil, furniture refinishers, strippers, plastic wood putty	100	40	22
Xylene (xylol, dimethyl-benzene)	Petroleum distillates, dewaxer, degreaser, substitute for benzene	100	81	9
Alcohols				
Ethanol (denatured, ethyl or grain alcohol)	Shellac, spirit stain, resorcinol	1000	55	43
Methanol (wood or methyl alcohol, wood spirit)	Paints, varnishes, lacquers, dyes, furniture refinishers, strippers, wood hardener	200	52	97
Isopropanol (isopropyl or rubbing alcohol)	Plastic wood fillers, lacquer thinner, surface cleaner	400	53	33
Ketones				
Acetone (dimethyl ketone, 2-propanone, ketone propane)	Strippers, wood fillers, lacquer thinner, wood hardener, diluent for epoxy and polyester resins and plastic cements, cleaner	750	1.4	266
Methyl ethyl ketone (MEK, 2-butanone)	Lacquer thinner, plastic wood filler, plastic cements, spray can products	200	21	70
Methyl n-butyl ketone (MBK, 2-hexanone)	Fast-drying finishes, plastic wood fillers, aerosols, lacquers, nitrocellulose, resins, oils, waxes, varnish and lacquer removers	5	77	3
Methyl isobutyl ketone (MIBK, hexone)	Plastic wood fillers, spray can products, plastic cements	50	73	15
Others				
Gum turpentine/wood turpentine	Waxes, finishes, tung oils, general-purpose thinner, brush cleaner, degreaser	100	95	5
Methyl cellosolve*** (Glycol ether, 2-methoxy ethanol, many others	Degreasers, cleaners (water based), lacquer thinners, dyestuffs, some latex paints, spray products, epoxies	5	107	6
Diglycidyl ether*** (DGE, 2-epoxypropyl ether)	Epoxies (especially liquid), some other plastic resin systems	0.1	147	.09

1. Toxicity–highly toxic: less than 101 PPM; moderately toxic: 101 to 500 PPM; slightly toxic: more than 500 PPM
2. Flammability–extremely flammable: less than 21°F; flammable: 21°F to 99°F; combustible: 100°F to 150°F
3. No FP, but flammable when vapors reach 14% to 22% by volume of air at 77°F.

*See further discussion of these values in sidebar on p. 63.
**Indicated for change based on its cancer status.
***First in a large class of chemicals that have similar uses and hazards.

Usual Route of Absorption L = Lung S = Skin	Comments	Organs Affected	Symptoms
L, S	Can damage PNS and cause CNS depression.	Skin, URT, CNS, PNS	Irr., peripheral neuropathy, numbness and weakness of hands and feet, headache, nausea, loss of balance, weight loss, fatigue
L, S	Mixture of aliphatic hydrocarbons may contain benzene.	Eyes, skin, URT, CNS, lungs	Irr., narcosis, derm.
L, S	One of the least toxic.	Skin, CNS, lungs	Irr., derm., narcosis
L, S	Try to use odorless paint thinner or mineral spirits with reduced aromatics.	Skin, CNS, lungs, eyes	Irr., derm., narcosis
S	–	Skin, lungs, URT, CNS	Irr., narcosis, lung hemorrhage, chemical pneumonia
	Try to avoid as a class. May produce phosgene gas and other toxins when heated or exposed to ultraviolet radiation. Most are suspected carcinogens.		
L, S	Forms carbon monoxide in blood and stresses heart. Reaches maximum levels 3 to 4 hours after exposure. Organic vapor cartridge not approved for use with methylene chloride. Suspected carcinogen. Often used with methanol, which increases toxicity.	Skin, URT, CNS, CVS, liver	Irr., narcosis, numbness of limbs, heart palpitations, headache, shortness of breath, angina, heart attack
	Try to avoid as a class.		
L, S	Do not use: Carcinogen, absorbed through skin.	Skin, CNS, blood, chromosomes, liver, kidneys	Derm., narcosis, leukemia, aplastic anemia
L, S	Recently identified by EPA as top air pollutant and is targeted for regulation.	CNS, liver, URT, kidneys, skin, eyes	Irr., derm., narcosis, muscular weakness, liver and kidney damage
L, S	May cause CNS excitation.	Skin, URT, CNS, liver, GI, blood	Irr., narcosis, derm., stomach pain, incoordination, staggering gait
	One of the safer classes.		
L	Least toxic in class.	Eyes, nose, skin, CNS	Irr., headache, drowsiness, fatigue
L, S	Use ethanol when possible. Toxic effects due to the metabolic products formaldehyde and formic acid, occurring primarily from ingestion or repeated high-level exposure. No approved filtering medium.	Eyes, skin, CNS	Blurred or double vision, loss of peripheral vision, optic nerve damage, blindness, narcosis
L, S	One of least toxic in class.	Eyes, skin, CNS	Irr., headache, drowsiness
L	Least toxic in class. Principal hazard is fire and explosion.	Skin, URT, CNS, eyes	Irr., narcosis, derm.
L	–	Skin, URT, CNS	Irr., narcosis, derm.
L, S	Can cause PNS damage after 4 to 8 weeks' exposure.	Skin, URT, CNS, PNS	Numbness and weakness of hands and feet, narcosis
L	–	Skin, URT, CNS	Irr., narcosis, derm.
L, S	Use mineral spirits or odorless paint thinner when possible.	Skin, eyes, URT, lungs, CNS, kidneys, bladder	Irr., derm., sensitization, pulmonary edema, narcosis, convulsions, kidney and bladder damage, fever
L, S	Do not use: Absorbed rapidly through skin, causes birth defects in animals, penetrates many gloves. Check with manufacturer for appropriate protection.	Skin, eyes, URT, CNS, kidneys, liver, reproductive system, blood	Headache, irr., narcosis, renal failure, pulmonary edema, fatigue, anemia
L, S	Do not use: Absorbed rapidly through skin, causes birth defects in animals, affects bone marrow, penetrates many gloves. Check with manufacturer for appropriate protection.	Skin, eyes, CNS, reproductive system	Irr., allergies

Abbreviations:
CNS–central nervous system
CVS–cardiovascular system
derm.–dermatitis
GI–gastrointestinal system
Irr.–irritating to eyes, skin and/or URT
PNS–peripheral nervous system
URT–upper respiratory tract

FIG. 2: ADHESIVES

	Hazardous Solvents or Materials	Comments	Organs Affected	Symptoms
Nitro cellulose cement	Acetone (39%)	See figure 1.	–	–
Casein (dry powder)	Strong alkalis	Irritating dust possible when mixing powders.	URT, lungs, eyes	Irr.
Plastic resin glues (urea-formaldehyde) and resorcinol	Formaldehyde	Out-gases formaldehyde, a suspected carcinogen. Avoid breathing powder and fumes. Wear appropriate gloves. Fumes may arise from machining plywood. Formaldehyde has a TLV of 1 PPM.	Skin, eyes, URT	Irr., bronchospasm, pulmonary irr., derm., nausea, vomiting
Epoxy hardeners and resins	Aliphatic amine, diglycidyl ethers	Main toxicity is due to extremely alkaline amine curing agents, which are highly caustic. Uncured liquid resins are irritants and sensitizers. See figure 1.	Skin, URT, eyes	Irr., burns, allergies
Instant glues and accelerators	Cyanoacrylate, freon	Bonds skin, which requires solvent (acetone) to separate.	Skin, URT	Irr., pulmonary edema, headaches
Acrylic plastic glues	Methyl methacrylate	TLV is 100 PPM.	Skin, URT, eyes	Irr., mucous membrane irr.
Contact cements	Aliphatic and chlorinated hydrocarbons	All are toxic, solvent based and most are highly flammable. See figure 1. Nonflammable cements contain 1-1-1 trichloroethane (methyl chloroform).	Skin, CNS, CVS, eyes, liver	Headache, irr., derm., CNS depression, narcosis, more. See figure 1.

area," should not be taken lightly. For more detailed information on the safe use and storage of a particular product, request a material safety data sheet (MSDS), which is outlined on the facing page. The new United States and Canadian right-to-know laws require employers make MSDSs available to employees working with potentially hazardous materials. MSDSs are also available from either the product manufacturer or the local distributor.

Since chemical toxicities usually occur through inhalation and skin contact, it is important that such exposures be minimized to prevent injury. Provide adequate ventilation by exhausting fumes away from you to the outdoors with a source of fresh replacement air. This can be facilitated by placing a fan to your side, blowing across the work area toward the means of exhaust. A fan blowing from behind can actually create a low-pressure area directly in front of your body, drawing the toxic fumes toward you.

In addition to ventilation, most manufacturers recommend using a respirator, which is available in a variety of styles from a low-cost disposable mask to a full-coverage self-contained breathing apparatus that has numerous filtering media designed to handle specific toxins and concentrations. Consult the package, MSDS or manufacturer for the protection appropriate for your situation. Many solvents can be effectively filtered through activated charcoal. However, check with manufacturers first, because there are no approved filters or cartridges for certain solvents, such as methanol and methylene chloride. There also aren't any that will protect you from very high concentrations of chemicals, such as from a spill, which cause cartridges to saturate quickly. Even when exposed to low concentrations of contaminants, activated cartridges have a limited life span. Again, consult the manufacturers for the cartridges' life span, keep track of the time you wear them and seal them in a plastic bag when not in use because exposure to air decreases their useful life span.

Effective function of a respirator depends on proper fit, which can be checked by placing your hands over the cartridges, sucking in and holding your breath. If there is an air leak, the mask will return to its original shape. The Occupational Safety and Health Administration (OSHA) requires more formal fit tests and employers should check with their respirator supplier for more details. Because beards prevent masks from sealing tightly to the face, OSHA usually requires bearded employees to wear an "air-powered" respirator, which supplies filtered air under pressure to a mask or hood. Home or self-employed bearded users can try smearing their beards with petroleum jelly for a tighter seal. If the chemical you use is also an eye irritant, use a full-face respirator that covers the eyes.

To prevent direct skin contact, wear gloves specified by the chemical manufacturer. This is important even when using a nontoxic finish because it may require using a solvent, such as mineral spirits, to remove the finish from your hands. Barrier creams, also a skin protection method, are less effective and should only be used to resist occasional splashes rather than direct contact. Try to avoid using solvents to clean your hands and be sure to wash with plenty of soap and water after handling any solvents.

All of these precautions are meant for healthy adults. You may need to take extra precautions if you have heart disease, lung problems, chronic illnesses or disabilities, or take medication. For example, methylene chloride is known to cause heart attacks and should be particularly avoided by someone with coronary heart disease. Children and the elderly also are at greater risk from solvents and chemicals. Children under 13 should not work with solvent-containing materials. At greatest risk is the fetus. From before conception through cessation of breast feeding, women should avoid exposure to all chemicals. Also, chemical exposures should be avoided by men prior to conception to reduce the risk of genetic abnormalities.

All woodworkers should consult their physicians anytime they experience any of the previously mentioned symptoms. Always be prepared to help physicians make a diagnosis by telling them the chemicals you use and that you are exposed to wood dust. And even if you have no symptoms, have regular checkups. □

Dr. Fink is an internist in Shelburne, Vt., a consulting physician for Digital Equipment Corp. and an amateur woodworker.

Reading a manufacturer's safety sheet

by Charley Robinson

A material safety data sheet (MSDS) provides helpful information for working safely with potentially hazardous chemicals. Employers must have an MSDS for products that contain hazardous ingredients, but you should be able to obtain one from chemical suppliers or a manufacturer's technical or customer service department. Some companies are now including an 800 hot-line number on the product label that you can call for additional information.

All MSDSs must contain certain information. OSHA has suggested a format, as shown below, but many manufacturers develop their own style. Generally, information is organized in sections and is self-explanatory. The following terms and information will help you further understand the MSDS.

Identity: The product trade name, chemical name and usual synonyms.

Section II—Hazardous ingredients: Each hazardous ingredient comprising more than 1% of the total, or more than 0.1% if carcinogenic, must be listed, except those ingredients the manufacturer claims are a trade secret. Any known health hazards of secret ingredients must be disclosed in a later section. Many ingredients, especially trade secrets, have never been studied, so their risks are unknown. Ingredients, such as formaldehyde, that can produce toxic effects at levels less than 0.1% must be indicated. This section indicates OSHA-permissible exposure levels (PEL) and short-term exposure limits (STEL), which are OSHA-enforced. Also, the threshold limit values (TLVs), updated annually by the American Conference of Governmental Industrial Hygienists (ACGIH), are included. All of these values are expressed in parts per million (PPM). The PEL and TLV numbers indicate the airborne contaminant levels that most healthy, adult workers may be repeatedly exposed to for 8 hours a day, 40 hours a week without adverse effect. The STEL number is the maximum concentration of contaminant that a worker should be exposed to for a specified time, usually 15 minutes.

Section III—Physical data: An essential piece of information is the vapor pressure (VP), which indicates the force exerted by the evaporated vapors on the atmosphere directly above the liquid, usually in millimeters of mercury (mm Hg). The greater the vapor pressure, the more volatile the liquid.

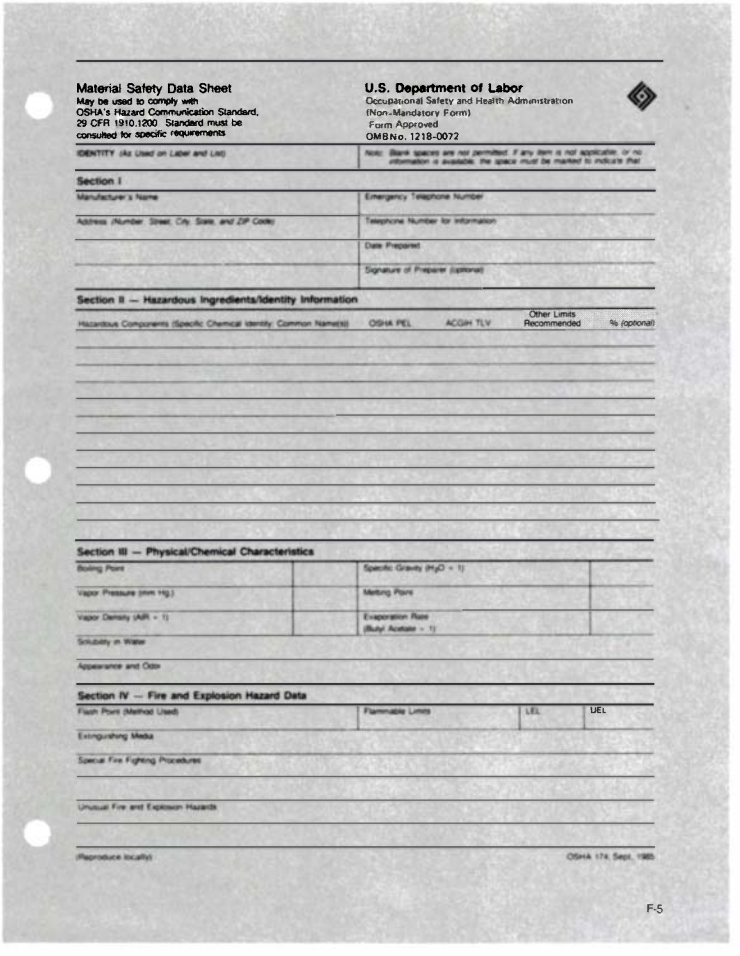
Section IV—Fire and explosion hazards: The flash point (FP) is the lowest temperature at which vapors above a volatile combustible substance ignite in air when exposed to flame. Materials with a FP below 100°F are dangerous because a spark or static electricity can cause a fire or explosion. No FP means the material is nonflammable. The appropriate fire extinguisher and special fire hazards, such as spontaneous combustion from linseed oil-soaked rags, should also be specified here.

Section V—Reactivity data: A chemical's stability, its likelihood of reacting with other materials and all special cautions to be taken, as shown on the form, are revealed here. Don't mix chemicals without reading this section.

Section VI—Health hazard data: This section usually specifies how chemicals normally enter the body, the acute effects of exposure, signs and symptoms of exposure, and emergency and first-aid procedures. A manufacturer must identify all ingredients classified as a carcinogen by OSHA, the International Agency for Research on Cancer (IARC) or the National Toxicology Program (NTP).

Section VIII—Control measures: Because of manufacturers' concerns for liability, protective measures are often geared to the worst possible circumstances, such as a large spill. A manufacturer might suggest, for example, using a self-contained breathing apparatus when any approved respirator would suffice for limited exposure. □

Charley Robinson is Assistant Editor at FWW.



Material Safety Data Sheet
May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name | Emergency Telephone Number

Address (Number, Street, City, State, and ZIP Code) | Telephone Number for Information

Date Prepared

Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)

Section III — Physical/Chemical Characteristics

Boiling Point		Specific Gravity (H_2O = 1)	
Vapor Pressure (mm Hg.)		Melting Point	
Vapor Density (AIR = 1)		Evaporation Rate (Butyl Acetate = 1)	

Solubility in Water

Appearance and Odor

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL

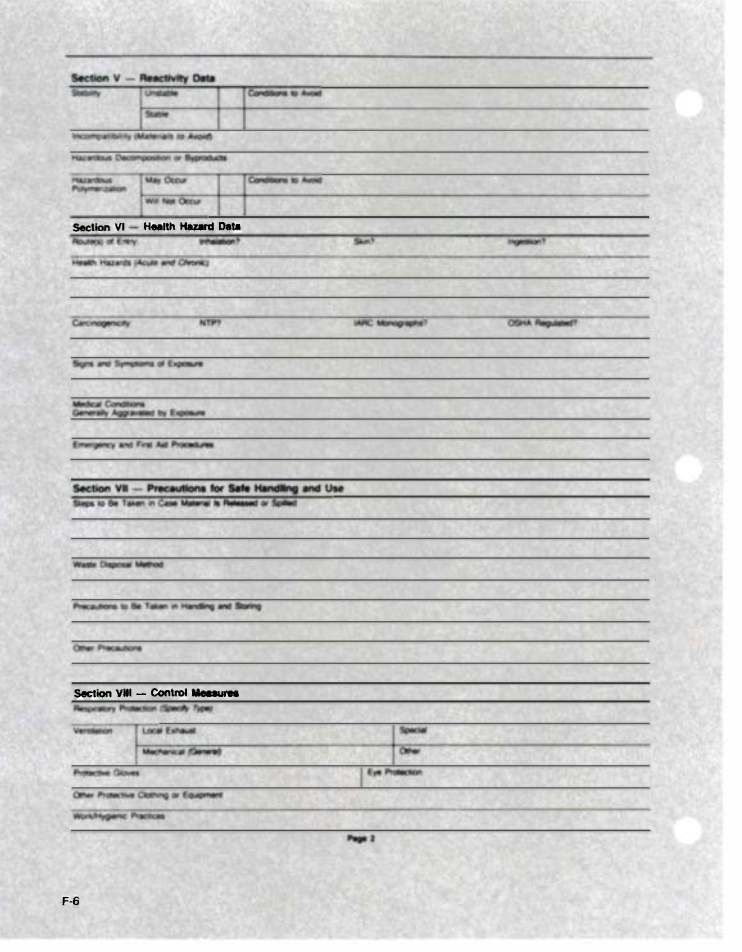
Extinguishing Media

Special Fire Fighting Procedures

Unusual Fire and Explosion Hazards

(Reproduce locally) OSHA 174, Sept. 1985

F-5



Section V — Reactivity Data

Stability		
	Unstable	Conditions to Avoid
	Stable	

Incompatibility (Materials to Avoid)

Hazardous Decomposition or Byproducts

Hazardous Polymerization		
	May Occur	Conditions to Avoid
	Will Not Occur	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? Skin? Ingestion?

Health Hazards (Acute and Chronic)

Carcinogenicity: NTP? IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure

Medical Conditions Generally Aggravated by Exposure

Emergency and First Aid Procedures

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled

Waste Disposal Method

Precautions to Be Taken in Handling and Storing

Other Precautions

Section VIII — Control Measures

Respiratory Protection (Specify Type)

Ventilation		
	Local Exhaust	Special
	Mechanical (General)	Other

Protective Gloves	Eye Protection

Other Protective Clothing or Equipment

Work/Hygienic Practices

Page 2

F-6

With its sturdy 10-in.-long blade and large, comfortable handles, the straight-blade drawknife is ideal for removing lots of wood quickly. It's a choice tool for shaving all types of furniture parts.

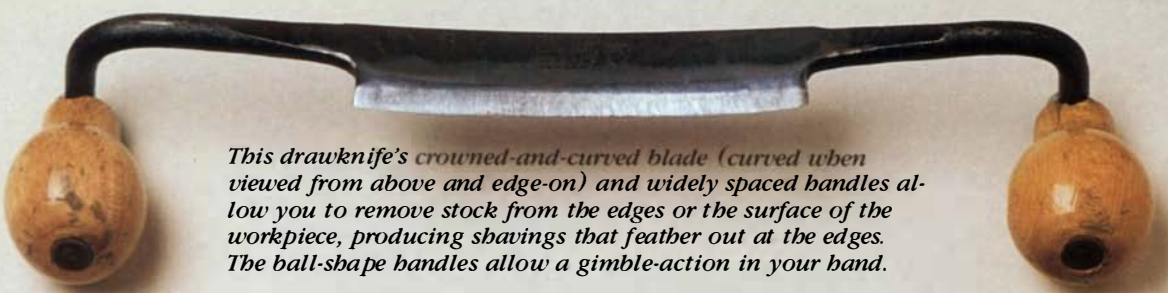
Drawknives and Spokeshaves

Using these versatile shaping tools

by Richard Starr

This crowned-blade drawknife has an 8¾-in.-long blade with a gently curved edge. The profile creates a shearing action that makes pulling the tool through a cut easier.

A 4-in.-long straight blade with round handles makes this small drawknife easy to control for carving and sculpting.



This drawknife's crowned-and-curved blade (curved when viewed from above and edge-on) and widely spaced handles allow you to remove stock from the edges or the surface of the workpiece, producing shavings that feather out at the edges. The ball-shape handles allow a gimble-action in your hand.

Concave spokeshaves, with their negative profile blades, are great tools for shaping a spindle or for putting a rounded edge on a tabletop or carcase.

This straight spokeshave has a flat sole and a 2-in.-wide blade that uses two knurled screws on top to adjust the depth of cut and the parallelism of the blade to the sole.

Instead of moving the blade up and down for a finer or heavier cut, this straight spokeshave adjusts via the wing screw on top, which pivots the front portion of the sole.

For hand-shaping a concave surface on a table leg or hollowing out a seat, the convex spokeshave is a very handy tool.

Drawknives and spokeshaves have always been tried-and-true tools for riving and shaping green wood for folk crafts and rustic furniture. But they're also great tools for many jobs in fine furniture or cabinet shops because you can shave wood with efficiency and a fluidity of motion that makes you feel as if the tool is an extension of your own hands. Drawknives excel at all sorts of jobs that require fast stock removal, such as roughing out tapered legs prior to handplaning them smooth. Spokeshaves are better suited for chamfering the edge of a tabletop, rounding the armrest of a chair and other finer shaping or smoothing jobs. Regardless of what kind of woodworking, carving or sculpture you do, I'll bet there are plenty of uses for both tools in your shop.

Comparing a drawknife to a spokeshave is like comparing a chisel to a plane. The drawknife's bare blade allows you to control the thickness of the shaving, but as with a chisel, you must carefully guide the tool to keep the cut smooth and prevent the blade from digging in. Once you master a drawknife, you'll be able to hew away huge quantities of wood, as well as slice off thin shavings. Unlike a drawknife, a properly set spokeshave can't dig in too deeply or split the wood because its blade is enclosed in a sole—like a handplane. And the distance that the blade protrudes beyond the sole dictates the depth of cut. Spokeshaves can do much the same work as drawknives, but they are somewhat easier to use. Further, with certain specialized spokeshaves that have shaped soles, you can create effects that would be difficult with any other tool. Even if you have already used a drawknife or spokeshave, there are many different styles you should be aware of, as well as safe methods when using the tools and techniques for sharpening them. Let's look at drawknives first.

Drawknives—A hundred years ago, dozens of specialized drawknives were made for many trades, including boatbuilding, timber framing and coopering. The various drawknives differed mostly in the size and shape of the blade and the shape and position of the handles. Many of these knives are still manufactured today, and they are readily available from most mail order tool supply companies. Also, you can often find good, older tools at flea markets, auctions or antique tool dealers.

The handles on drawknives are designed to make specific jobs easier (see the photos on the facing page). Cylindrical handles, found on many larger drawknives, fill your whole hand and help you get a good grip to control a large blade while hogging off a lot of wood. Smaller drawknives often have ball-shape handles that aren't practical for heavy work, but really shine for carving. The grip is like a ball-and-socket joint: You can quickly swivel the blade into almost any position, even push the tool instead of pull it, to deal with changing grain direction. Regardless of style, all handles must be securely fastened to the knife. It's best if the tangs come all the way through the handle and are bent or peened over, preferably through a metal cap or washer on the end of the handle. A ferrule where the blade joins the handle reinforces a heavy drawknife and prevents the handle from splitting.

Another consideration in choosing a drawknife is the position and angle of the handles with respect to the blade. This relationship affects your hand position and, therefore, your comfort and control while using the tool. A drawknife must fit your work style just like a good shoe fits your foot: You should try a knife in every position you expect to use before you buy it. For all-around work, bent handles offer a more natural hand position as you draw the knife toward your belly. However, if you are inclined to use the tool with the bevel down, as I am, deeply bent handles may point upward and be uncomfortable to hold and tiring to use. If you work a lot of green wood, you may prefer handles that are level with the blade. They provide better control with heavy cuts because the tool is less likely to twist upward as you pull. Carvers and sculptors often choose drawknives with so-called "dropped" handles, where the handles are below the plane of the blade. These offer more control in precision work because the hand position allows you to twist the blade up and down easily.

Blade designs—The shape of the blade determines the cut the tool will take. A straight-edge drawknife is a good all-purpose tool, useful for shaping and surfacing. A crowned blade appears straight when you look edge-on, but curves forward when viewed from above. This blade can take a wide shaving that gets thinner at the edges and leave a smooth surface relatively free of marks from overlapping cuts. Another design is the crowned-and-curved blade, which dips in the middle when viewed edge-on. Like a crowned blade, a crowned-and-curved blade takes shavings with feathered edges, but it is better for shallow carving and hollowing a surface, for say shaping the backrest of a seat. Another kind of drawknife, the inshave, has a thick, U-shape blade that's great for hollowing out a solid-wood chair seat.

Working safely with a drawknife—Although it may appear dangerous at first glance, a drawknife's long, exposed blade is relatively harmless, if you follow a few simple precautions. I've been teaching woodworking to children for more than 20 years and I have no problem putting a drawknife in a kid's hands. The tool is actually much safer than a carving knife. Most drawknife cuts occur on the back of your free hand when you lift the tool off the wood to brush away shavings or to adjust your work; therefore, the first rule is to be extra careful when one of your hands is not on a handle. Put the tool away as soon as you are done with it, preferably in a rack made from a scrap strip of ¾ stock with crosscut slots about 1½ in. apart to hold each knife blade down. The rack protects the blades and separates the tools. Also, never leave a drawknife in a jumble of tools. It's a bad risk for your hands and not so good for the blade either.

Beginners often worry that they will cut their bellies as they shave toward their bodies. However, this isn't a problem as long as you keep your body at a reasonable distance from the work. If you hold your work in a shaving horse, make sure your knees are clear of the drawknife's path. When using very small drawknives, grind the corners of the blade edge blunt, to prevent cut thumbs.

Using a drawknife—Unlike a handplane's or spokeshave's housed blade, a drawknife's long, open blade allows many different cutting possibilities. The easiest way to take a shaving is to angle the drawknife's blade and pull with the blade skewed relative to the workpiece. In this manner, shavings come off in corkscrews, and the shearing action is less likely to tear the wood than if you pulled the blade straight through. To cut dense woods with roed or curly grain, it's best to take a slicing cut, moving the knife sideways while pulling it, as though you were slicing bread. Place your stronger hand on the handle near the leading edge of the blade and draw the knife across the wood as you pull. It's a natural and comfortable motion, and using the entire length of the blade keeps the edge from dulling in only one area.

A drawknife's blade can be used with the bevel up or down. For most work, I prefer keeping the bevel down, facing the wood, because I can easily adjust the depth of cut by rotating the handle ends up or down. However, the blade can be hard to control and tends to come out of the work when the drawknife

is pulled hard. If this occurs, flip the tool over and work with the bevel up, away from the stock.

Pulling a drawknife makes the best use of your muscles, hence the name *draw*knife. But many times you'll want to push it instead. Pushing lets you exert more force by putting your weight behind the drawknife, especially if the stock is held vertically or at a steep angle. Although pushing a drawknife with precision may take a little practice, it's worth mastering. If you shape curved surfaces, as when carving a wooden spoon, changing grain directions may require alternating cuts in several directions.

If the grain in the workpiece is straight and clear, you can split off large chunks of wood by starting a deep cut, and then twisting the blade by raising the ends of the handles (see the left photo below). This uses the back edge of the blade as a fulcrum and gives you considerable leverage. If a split starts running out of control, you can stop it by shaving the waste above the split or pushing the drawknife and shaving back toward the open end of the split. When shaving green stock, be sure your stock is well secured in the vise or shaving horse.

Sharpening drawknives—As with all other tools, drawknives work best when they are kept razor sharp. Unfortunately, even a straight drawknife blade can be difficult to sharpen because the non-removable handles tend to get in the way. Probably the easiest way to keep a drawknife cutting smoothly is to touch up the edge every once in a while with a hand stone. I prefer a round Norton axe stone (Norton Co., 1 New Bond St., Worcester, Mass. 10615-0008), which has a groove around its edge that keeps your fingers clear of the blade. To sharpen, hold the knife like a fiddle, with the bevel up and one handle nestled in your shoulder, as shown in the right photo below. Since the middle of the blade does the most work, you need not sharpen the whole length of the blade every time you touch it up. Touch up the back of the blade as well, especially when it's pitted or nicked. It's worth noting that while the backs of most drawknife blades are dead flat (like a chisel), some woodworkers prefer to dub a small counterbevel (5° to 10°) on the flat side. This counterbevel can make the tool a little easier to control when working bevel up, and it makes the edge easier to touch up because you don't have to stone the entire flat side unless it's really bad. When the edge has its share of nicks, it's time to regrind the bevel. Drawknife blades, like chisels and plane irons, are single-beveled tools ground at an angle on one side and usually flat on the other. This bevel is typically between 30° and 40° on a new drawknife, and I usually maintain this angle and the original shape of the blade when I regrind.

Unfortunately, when grinding the edge of a full-size drawknife, the handles usually won't clear the motor on a bench grinder. One solution is to dress the wheel's face at an angle so you can grind with the handles out of the way. Just don't create a sharp peak on the face of the wheel, which may cause the wheel to fracture in use. A stationary belt grinder, or a belt sander held upside down in a vise, also works very well, especially on curved or crowned blades that are a challenge to grind to shape. I start with a 60-grit belt, and then hone with the axe stone and finish with a cloth buffing wheel charged with emery compound.

Spokeshaves—In my school shop, kids who have trouble learning to control a drawknife, or lack the strength to do heavy work with one, can usually accomplish the task more easily (but not as quickly) with a spokeshave. A sharp and well-adjusted spokeshave can skim a crisp, even shaving almost automatically, leaving a clean, smooth surface. Spokeshaves can be used for many shop tasks, from chamfering, trimming a door and wood sculpting, to more traditional tasks, such as shaving spindles. The tool is usually smaller and lighter than a drawknife because the blade is shorter, thinner and removable, not to mention replaceable.

Left: A large, straight-blade drawknife is tops for quickly hogging away large amounts of stock, especially in green wood. With a workpiece secure in the shaving horse, the author twists the knife as he pulls it through the cut, using leverage to split off the waste. Above: Holding the drawknife in his arms like a fiddle, Starr uses a round axe-sharpening stone to touch up the edge.

A spokeshave is actually a very short plane with handles on its sides. The blade is enclosed in the body of the tool, protruding through the sole just far enough to take a shaving. A single screw usually holds the cutter in place. To adjust the depth of cut, you loosen the screw and tap the blade in or out, for a lighter or heavier cut. Some spokeshaves feature a lever cap, which presses down on the blade just behind its edge, that stiffens the blade to prevent chattering, like the cap iron of a handplane. Spokeshaves made by Stanley and Record have two adjusting screws on top that make setting the depth of cut a matter of simply turning the screws on top.

Different kinds and shapes—Like drawknives, spokeshaves traditionally were specialized tools that are still available in a variety of styles and shapes. Most spokeshaves have straight blades anywhere from 1 in. to 2 in. or more in width, with either straight handles or raised handles shaped like gull wings. Straight handles make it easier to take heavier cuts while keeping the sole flat on the work. Raised handles keep your hands clear when shaving on a flat surface, but the tool has a tendency to chatter and roll as you cut. Therefore, place your thumbs on the front of the tool just above the blade, to stabilize the tool.

My favorite straight spokeshaves have adjustable throats, for more sensitive control of the cut. Unlike a smoothing plane's adjustable throat that doesn't change the depth of cut when it's set, an adjustable-throat spokeshave increases the thickness of the shaving as you open the throat and expose more blade. Conversely, closing it down yields a very fine cut, which is great for curly grained woods. With this single control, you can adjust the cut without moving the blade up and down. I really appreciate this feature when, for instance, I chamfer the edges of a round stool, as shown in the top photo at right. As I work around the circle, I can set a deep cut when working parallel to the grain, and then adjust for a very fine shaving when I come around to the endgrain.

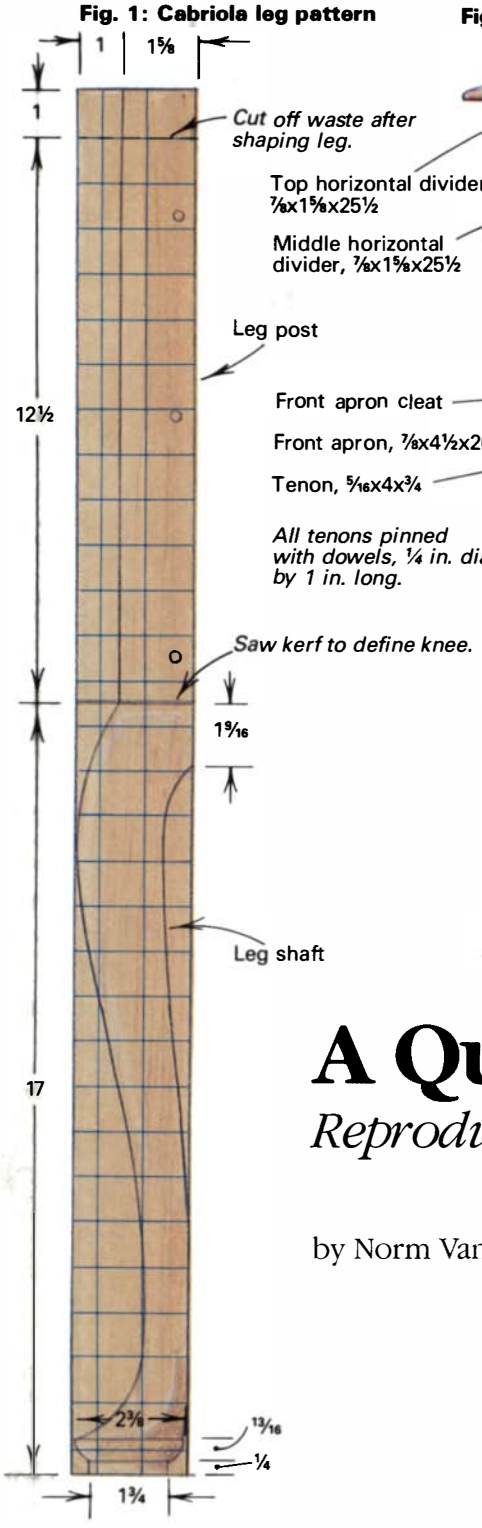
Spokeshaves also come with concave- and convex-shape blades. The hollow or half-round spokeshave is concave across the blade. The tool does a nice job of cleaning up the facets left after roughing out the workpiece with a drawknife, producing a smooth, evenly rounded surface on a spindle or rounded chair part, as shown in the bottom photo at right. Unfortunately, the short sole makes the tool hard to control and the blade has a tendency to dig in and tear the edge-grain when, for instance, rounding the edges of a tabletop or carcase side. The radius spokeshave has a convex-shape blade with about a 3-in. radius, and is good for shaping shallow grooves and cleaning up other concave surfaces, such as the seat of a chair that's been scooped out with an inshave. Like the hollow spokeshave, the radius shave can be hard to control and is especially subject to chatter if it's not really sharp and pressed down firmly during cutting.

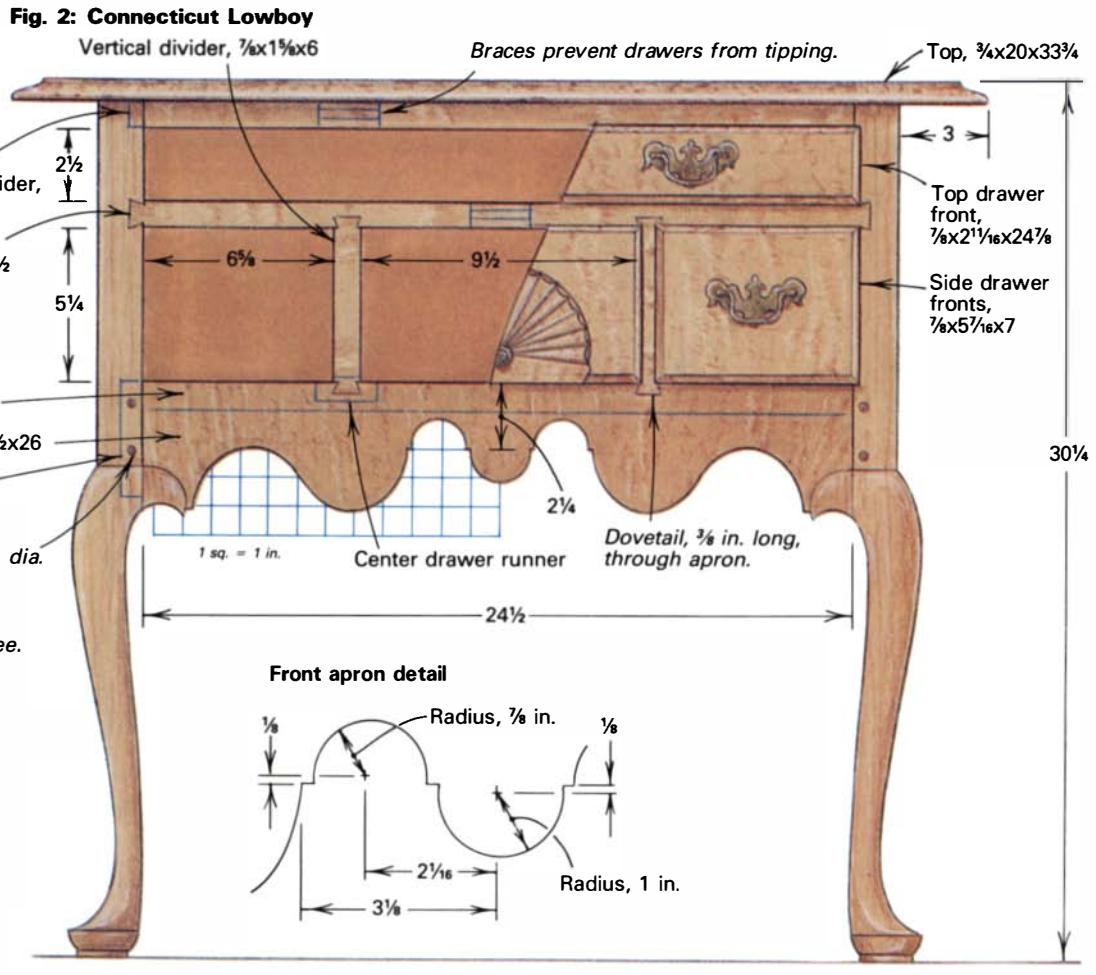
Modifications—It's possible to modify adjustable-throat spokeshaves for better performance and cutting control. First, remove the D-shape adjustable sole and, with a flat file, slightly undercut the throat, and round and smooth the inside edges. This reduces the tool's annoying tendency to jam with shavings. For finer adjustments, and shavings of even thickness across their width, the throat must be ground evenly across the sole. Mount the blade in the shave and temporarily pin the adjustable sole back in, without the springs. Then, adjust the blade's edge so it is parallel with the adjustable sole when viewed from the front, and check the throat opening for evenness all the way across. If it is not even, use dividers to scribe a line on the adjustable sole, and then file to the line. Finally, reassemble the spokeshave with the springs in place. Each time you replace the blade after sharpening, adjust the throat to its smallest setting, lock the blade in place slightly above and parallel to the sole, and then adjust the throat setting for the desired cut.

A straight spokeshave is a great tool for quickly beveling the underside of a tabletop or, as shown above, a stool seat. The author first marks the grain direction, and then cuts the bevel by either pushing or pulling the tool. The half-round spokeshave is the perfect tool for rounding and smoothing the surface of a chair leg after it's been roughed out with a drawknife (right). The edge of the spokeshave blade is ground to a slightly larger radius than the sole.

Sharpening a spokeshave—Sharpening the blade on a straight spokeshave is identical to sharpening a small plane blade. If you have problems holding the small blade during grinding, use a pair of locking-jaw pliers. Sharpening the blade on a half-round or radius spokeshave is a tougher matter. Besides the difficulty of sharpening the curved edge, the profile of the blade doesn't even match the sole because the blade passes through the sole at an angle. Fortunately, you don't need to grind a perfect match. Instead, grind so that the blade's curve is more gradual than the sole's, so that the blade protrudes only at the center of the sole, which produces shavings with feathered edges. Dress an old grinding wheel to fit the shape of the curve and occasionally check the blade profile by setting the blade in the tool and sighting from the front. □

Richard Starr is a teacher and the author of Woodworking with Kids, *published by The Taunton Press, 1982.*





A Queen Anne Dressing Table

Reproducing an 18th-century lowboy

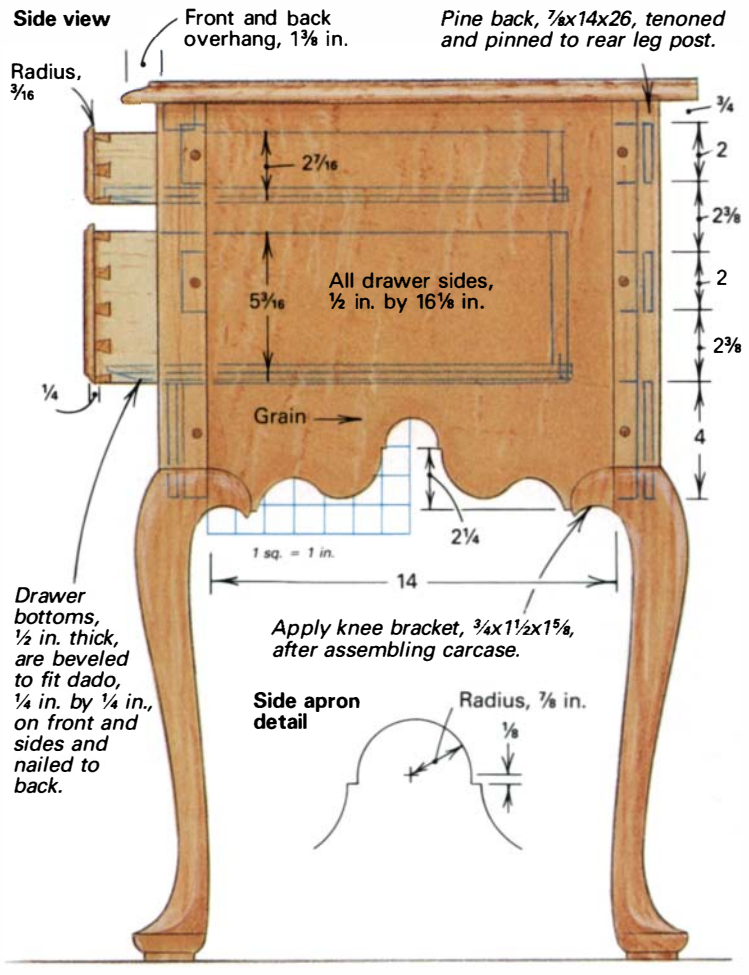
by Norm Vandal

The Queen Anne dressing table is a rather special woodworking project. The piece itself is beautiful, a lovely example of the fine lines and proportions that characterized the period. And it is a perfect exercise in all aspects of 18th-century cabinetmaking skills, including mortise-and-tenon carcase construction, sculptured cabriole legs with turned-pad feet, shell carving and drawer dovetailing. When you've completed a dressing table, you've really made a table *and* a small chest of drawers, so you will have mastered many of the skills needed to produce other period pieces.

Queen Anne dressing tables actually date back to the first half of the 18th century. They were extremely popular during this period because they are attractive and multifunctional, capable of serving not only as a dressing table, but also as a side or serving table and a basic work surface. Most people today call this furniture form a lowboy, although that term didn't appear until the end of the 19th century, when it was mentioned in the August, 1899, issue of *House Beautiful*. Frequently made as companions to matching high chests, called highboys, Queen Anne dressing tables were scaled-down versions of the base on highboys, with all the same features and basic proportions, hence the term lowboy.

The delicate and graceful nature of the lowboy's form suggests it is a feminine piece. Designed to be placed against a wall, its top is seldom molded on the back edge, as it invariably is at the front and sides. Additionally, the backboard is usually made of a secondary wood, such as pine or chestnut, and is obviously intended to be hidden. The lowboy I've designed adheres closely to the essential elements of the Queen Anne period. So while the result isn't an authentic reproduction, it could well have been an

Drawings: Lee Hov



Although not a true replica, this lowboy incorporates the features found on Queen Anne pieces made in Connecticut during the 18th century. The ogee-scrolled apron is reminiscent of the acorn drops found on earlier William and Mary pieces, while the cast brass hardware, typical of later Chippendale styles, was also frequently found on later Queen Anne furniture.

18th-century New England piece. The lines of my dressing table are quite similar to pieces typically made in Connecticut, although cherry would probably have been the preferred wood instead of the tiger maple I used. Acorn drops, vestiges of the William and Mary period, have been omitted and the apron has a deep, ogee-scrolled profile. The top drawer also reflects the period preference over earlier three-drawer arrangements. The fan carving, sometimes referred to as a sunburst, is really a stylized shell, another trademark of Queen Anne furniture.

Making the cabriole legs—The cabriole legs, which extend the full height of the dressing table, greatly enhance the structural integrity of Queen Anne pieces, but they have one serious drawback: the grain on the leg posts runs in opposite directions to that on the case sides. Seasonal expansion and contraction of the case sides resulted in cracks on many Queen Anne and Chippendale highboys and lowboys. However, to maintain the authenticity of the piece, I have joined the case frame in the traditional manner.

Proceed by milling the leg blank square, making it large enough to accommodate the offset leg post and the curve of the leg shaft, shown in figures 1 and 2 on the facing page. Cut the blank clean and square at both ends, leaving an extra inch on the leg post end. This keeps the lathe drive center from damaging the finished leg post and prevents scrapers, planes and sanding blocks from diving off the end of the stock, thereby altering the shape of the post. Any imperfections are easily removed by cutting off the extra inch after the leg is completed.

Begin laying out the legs by making a full-size template for the legs based on the dimensions given in figures 1 and 2. Then, draw layout lines in pencil across the blank to mark the leg's main transitions: the top of the foot, the top of the knee (the bottom of the leg post), the length of the shoulder where the knee bracket will attach and the exact finished length of the leg, plus the extra inch at the top of the post. Clamping the four leg blanks together will speed up the layout and ensure that all the legs will be identical. Use a marking gauge to lay out the width of the leg posts. The incised gauge lines are more accurate and easier to follow than pencil lines, which are easily smudged and too thick for precision.

Trace the curve of the leg on the blanks while holding the template so the back of the leg post and the back of the foot are flush with one edge of the blank. Reposition the template on the adjoining face, aligning the back of the template with the same corner, and trace again. The intersecting corner forms the inside of the leg, so orient the pattern to present the best figure on the leg's front.

For the turned-pad foot, draw diagonals from corner to corner on both ends of the blank and mark the center with an awl or punch. Consult the leg detail in figure 1, and then use a pencil compass to draw the major diameter of the foot, 2⅜ in., and the smaller pad, 1¾ in., on the bottom of the blank. Make the lines dark, so they can be seen while the stock is rotating on the lathe. This will enable you to turn the feet to the correct diameters without using calipers.

Before mounting the blank on the lathe make a single crosscut, as shown in the detail in figure 1, into each of the two adjacent outside faces of the blank to separate the top of the knee from the post, which is not cut to size until after the leg is carved. The crosscut makes a clear stopping point for carving the cabriole leg and the oversized post will be easier to clamp in the vise and turn on the lathe. The full-dimension blank will not only be better balanced on the lathe, but it will prevent the drive center from being dangerously close to the edges, as it is with a fully sawn post. Also, the leg post is less likely to become marred during carving. Now,

following the template pattern you traced earlier, bandsaw the leg shape out of the square blank. Cut the inside and outside contours on one face first, save the waste and then tape it back on the blank to bandsaw the other face.

Study the detail of the leg given in figure 1 for the general shape and dimensions to complete the legs. To begin, center the bandsawn leg on the lathe, with the foot at the tailstock end, and turn the major diameter of the foot. Next, mark the height of the foot pad on the cylinder, and then turn the pad to size, shaping the sides of the foot to the correct profile. I scrape the pad with a parting tool because it's difficult to cut with a gouge or skew in such a small area. Use the tip of a skew chisel to make a shallow groove at the top of the foot as a reference point for carving the foot and the ankle. You can also turn a small shoulder above the incised line, which rounds off the arris at the back of the ankle and causes the three other thin corners to flake off. With the skew, shape the curved profile of the foot and turn a crisp corner between the upper part of the foot and the pad. Then, sand the foot on the lathe.

Shape the lower leg, from the knee to the top of the foot, using a drawknife, followed by a spokeshave, a patternmaker's rasp and cabinet scrapers. This may be done right on the lathe or by clamping the leg in a vise. Pare the back of the ankle a bit beyond the bandsawn line for a more graceful definition. I bandsaw the leg post, keeping the sawn face as smooth as possible, and then use a scraper to smooth its surface. A knife cut at the top of the knee helps maintain crisp definition between the knee and the post. With a chisel, pare the sawmarks off the knee and smooth it with a patternmaker's rasp and a file, but leave the shoulder crisp where the knee bracket will be applied. Finish up smoothing and shaping the leg by sanding. The inside curve of the leg, underneath and behind the bracket, is simply pared with a chisel and carving gouges, and need not be sanded.

Case and drawer construction—Although sugar, or hard, maple is the most common native hardwood used in Queen Anne furniture, most Connecticut lowboys were made from cherry, a wood that was favored either because of its availability or because it is easily finished to resemble the more stylish imported mahogany. I chose tiger maple as the primary wood for this piece because of its incredible beauty, in spite of the difficulty of carving the fan in such wild grain. For the sides and top I was fortunate to have available full-width tiger-maple stock. The back was made from a single, wide pine board and all internal drawer parts, as well as the cleats and drawer runners, were also made from pine.

The central drawer runners are mortised into the back of the carcase and rest on a cleat nailed to the back of the front apron. A brace mortised into the back of the carcase and into the middle horizontal divider keeps this drawer from tipping when opened.

I made the sides and the back out of one-piece, 14-in.-wide boards; if you need to glue up the sides, do not use more than two boards for authenticity. Cut tenons on the sides and back, as shown in figure 2 on pp. 68-69 and figure 3 on the facing page, and chop their respective mortises in the legs. The mortises are located so the outside of the leg posts will be flush with the sides and back. Make a cardboard template (I prefer oak tag) from the dimensions in figure 2, and then clamp the side pieces together to bandsaw the scallops on the bottom of both sides. After test-fitting the joints, you can begin work on the front of the case.

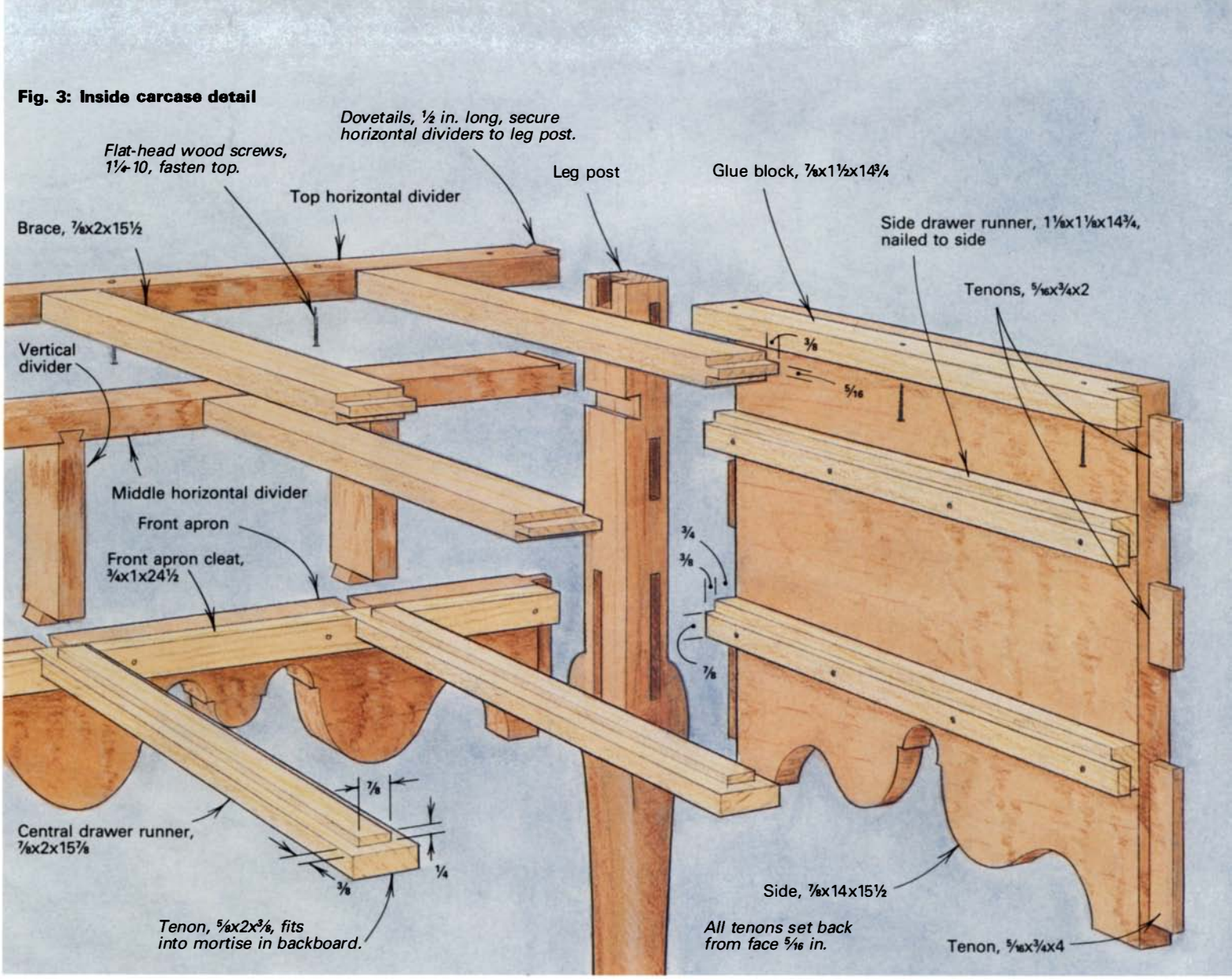
The front apron is tenoned into the leg posts in the same way as the side and back panels. Prepare the apron stock as shown in figure 1 on p. 68, and cut the tenons on both ends. Then, use a cardboard template to lay out the scalloped profile and bandsaw it as you did the side panels. After making the front apron, joint and plane the two horizontal dividers and cut the dovetails on both ends. The shoulder-to-shoulder length of the horizontal dividers is identical to the shoulder-to-shoulder length of the front apron. The top divider is dovetailed into the endgrain at the top of the leg posts, which holds the case together. I've seen rectangular tenons used to install this member, but dovetails are probably stronger here and were more common. (For more information on cutting sliding dovetails, see *FWW* #79, pp. 54-57.) Scribe the dovetail pockets from the horizontal dividers themselves and cut them into the front leg posts. As you proceed, check the joints for accuracy so they will fit perfectly. Lay out and cut the pockets for the vertical dividers on the top of the apron and the underside of the lower horizontal divider.

I usually wait until after the piece is assembled to cut the two short, vertical dividers to length. This way I can measure the required length directly from the piece and have more room to install the central drawer runners and the front apron cleat that supports them. The two central runners for the three bottom drawers are mortised into the backboard, as shown in the photo below, and sit on a cleat nailed to the inside of the front apron, as shown in figure 3 on the facing page. Pockets in the cleat keep the runners in position. The outside runners are nailed directly to the case sides. In addition, two braces mortised into the top horizontal divider and the backboard, and another brace mortised into the middle divider and the backboard, shown in the photo at left, prevent the top and center drawers from tipping when pulled out. The outside runners for the top drawer prevent the two outside bottom drawers from tipping. Lay out and cut all of the mortises for these braces and runners in the horizontal dividers, the backboard and the apron cleat. Then, dimension the three braces and cut the tenons.

Now you can begin to assemble the case. I like to start by gluing the two back legs to the backboard, and the front apron and horizontal dividers to the front legs. Make sure that the front section is square; the back should be squared automatically by the shoulders on the wide backboards. The back and front assemblies will sandwich the rest of the case. With the back placed flat on the workbench, test-fit the sides in the rear legs and insert the three braces into the mortises in the backboard. Then add the glued-up front assembly to complete the sandwich. If everything fits well, disassemble the case and put it together again with all joints glued and clamped. After the glue has set, pin the tenons for the sides, back and front apron in the leg posts.

Rabbet a piece of 1⅛-in.-square pine to form the four L-shape drawer runners that are nailed directly onto the case sides, as

Fig. 3: Inside carcase detail



shown in figure 3. These runners support the top drawer and one side of both outside bottom drawers. Make the two T-shape central runners that serve all three bottom drawers as detailed in figure 3. They are glued and slipped in place once the cleat has been nailed to the front apron, and their rear tenons are fitted to their respective mortises in the backboard. Now cut the two vertical dividers to length, dovetail both ends and glue them in place.

The drawer construction for this lowboy is typical of the period, as shown in figure 2 on pp. 68-69. Its sides and the top of all drawer fronts are rabbeted to overlap the front of the case, and all the edges are lip-molded the same as the shell front drawer shown in figure 4 on p. 73. While the drawer sides join the back with through dovetails, the front is joined with half-blind dovetails. The underside of the ½-in.-thick bottom is beveled along the front and sides, like a raised panel, to fit into a ¼-in. dado in the front and sides. The bottom slides under the drawer back and is nailed to the back's bottom edge. I size the drawers to allow 1/16-in. clearance between the drawer and the opening on the top and each side.

Do not assemble the central bottom drawer until after the shell carving is finished. You can prepare all the rabbets, the lip molding and the dovetailing, but the unattached drawer front is much easier to carve.

Applied knee brackets—The knee bracket serves to balance the protruding knee of a sculptured cabriole leg and visually separates the leg from the apron, easing the transition between the curved knee and the flat apron. It also reinforces whatever scroll work or scalloped carving is employed in the design of the apron. An applied bracket, as used on this lowboy, is glued to the corner formed by the protruding leg shoulder and the face of the apron. As shown in figures 1 and 2, the bracket usually terminates in a point or a scrolled bead, pointing down and away from the apron. Sometimes an applied bracket runs the full length of the apron, between the knees of the legs at both ends. However, this type of bracket is commonly found on tea tables or sometimes on the ends of a lowboy or highboy base, and the bottom edge of this full-apron knee bracket is generally scrolled.

The size and proportion of the knee bracket are important to the overall design of a piece of furniture, so make the drawings and templates for the bracket as you develop the rest of the design. Begin making the knee brackets after the legs have been fully shaped, sanded and attached to the apron. Some people prefer to apply the bracket to the leg and carve it before the leg is joined to the rest of the piece. Although the individual legs are easier to hold on the bench, I prefer to fit the bracket to the leg and the apron after the two adjacent surfaces have been permanently joined.

I make all the knee brackets for a piece of furniture out of one piece of wood. This large stock is easy to grasp when bandsawing the bracket profiles, and it enables me to keep my fingers away from the blade. The thickness of the bracket stock is easily determined by measuring the distance that the knee protrudes beyond

The knee bracket is firmly held for carving by a drywall screw through a scrap block that is clamped in a bench vise (left). A small groove carved on the back of the knee bracket (center) traps excess glue and prevents squeeze-out on the face of the apron during glue-up. The tool marks from the gouge even up the underside of the joint between the knee bracket and the leg and further add to the authenticity of this piece (right). The face of this joint is smoothed with files and sandpaper to match the contour of the leg.

the face of the apron. I usually add another 1/16 in. to 1/8 in. to this measurement to account for any variation between the other knees on the piece. The width of the bracket stock is determined by the width of the brackets, as indicated in figure 2. Make the stock at least 4 in. or 5 in. longer than the total height of all your brackets to provide a handle when you saw the last bracket. Try to match the bracket stock to the legs in both color and grain pattern and run the grain in the bracket in the same vertical direction as the grain in the leg. You may need to go through a bunch of stock to find a piece that will match a highly figured wood like tiger maple, but then again, knee brackets don't amount to very much material.

To determine the shape of the knee bracket, hold the stock against the apron and the vertical leg shoulder and trace the contour of the knee. Trace all the brackets against their respective knees, and number the brackets and leg shoulders accordingly. Make a template from your front-view drawing and use it to transfer the outline to the bracket. Then, bandsaw the bracket from the stock and use a chisel to shape the curve on the outside of the bracket. A thin drywall screw holds the tiny knee bracket to a small carving platform, which is clamped in a vise, as shown in the left photo above. Smooth the curve with a file and finish the bracket with sandpaper.

Before gluing the bracket in place, cut a shallow groove on its back, about 1/8 in. from the top edge, as shown in the center photo above. This groove will trap any excess glue and eliminate squeeze-out onto the apron when the bracket is applied. Spread glue on the surface behind the groove and on the other vertical face, which attaches to the leg. Do not apply glue to the apron or leg. Then, press the glued-on bracket in position for a couple of minutes, until it doesn't fall off. If you've made a tight-fitting shoulder, the bracket should stay without any fastenings or clamping. When the glue has set, use a chisel to pare the joint between the bracket and the leg, and sand it smooth. A gouge can be used to smooth the concave area of the joint on the underside of the bracket, as shown in the right photo above. Textures are important in period furniture reproductions, so you needn't make this surface machine perfect.

Carving the shell—One of the most important characteristics of Queen Anne case furniture is the judicious use of carved motifs. Shells, or shell-like fans or sunbursts were most popular and often carved on the drawer fronts of highboys and lowboys. No better decorative element could have been drawn from nature to lend emphasis to the graceful lines of Queen Anne furniture.

The surface of the hub is flush with the face of the drawer front, while the recessed area below the hub is carved to the depth of the front apron. The quickest and most accurate way to determine the depth of this recess is to set the drawer face in its opening and scribe a line on the bottom edge of the drawer front along the face of the apron.

Laying out the fan on the drawer front is done in stages as the carving progresses. Begin by locating the center point, from which the fan's radii are drawn, on the vertical centerline of the drawer front, 11/16 in. above the bottom edge. Using a small divider with a sharpened leg, scribe the 1-in.-dia. center hub. The scribed line will help guide the carving chisels. Scribe the fan's 6½-in. diameter onto the drawer face, and then scribe a 6⅛-in.-dia. circle inside the larger one to represent the width of the arc termini of the rays. The rays terminate in arc segments of ¾-in.-dia. circles and are ⅝ in. wide where they contact the circumference of the fan. Because the fan's center point is located above the bottom edge of the drawer, the fan covers more than 180°, as shown in figure 4 on the facing page, but it terminates at the edge of the lip molding.

There are 17 rays, and the odd one is centered on the vertical centerline of the drawer front. After you have located the central ray, set your dividers to ⅝ in. and lay out the other rays. Use a ¾-in.-dia. round template made of lightweight metal, such as aluminum flashing, to lay out the arcs of the ray termini. Notice that the rays are S-shape in cross section to mimic the undulating contour of concave shell carvings. Carving the rays is simplified if the entire ray area is first relief-carved to a uniform contour, as shown in figure 4. Shape this area with shallow-radius gouges, and smooth it with coarse sandpaper.

Each ray must now be defined on the contoured field. Simply draw the rays on the surface using a pencil and a flexible straightedge as a guide. The rays are spaced a bit less than 1/8 in. apart at the

hub, and this can be determined by eye or laid out with dividers.

Fan carvings do not require a huge assortment of carving chisels; gouges can be used to shape convex surfaces as well as concave surfaces. To begin carving the rays, first incise a shallow groove along the layout lines using a straight chisel. Then, use a V-parting tool to begin to define the rays. The V-parting tool is useful only during the early stages of the carving. I use a combination of straight chisels and gouges to create the convex lobes, although any tool that works well for you is appropriate.

Lightly define the arc termini with a gouge of the correct sweep or incise them carefully with an X-Acto knife. Do not cut too deeply, but just enough to define a crisp edge. The convex lobes must be carved so that they end neatly at these termini, and various chisels and gouges will get the job done.

When all the rays are fully carved, sand them lightly with tiny pieces of folded, 120-grit paper. Shell carvings need not be sanded perfectly smooth, and, in fact, a few carved facets will add to the semblance of authenticity. I try to make my carvings as smooth as possible using chisels and gouges; I sand very little because it quickly dulls a crisp edge and diminishes the lively character of a carving. Burnishing can be effective, especially in the grooves of this fan carving. Rub these areas with a flat stick of hardwood sharpened to a knife edge, and renew the edge as it becomes dull from abrasion.

Finally, use a sharp knife to incise the circumference of the fan and carve the arc termini to meet it. The layout line will enable you to remove the chips cleanly. When the carving is complete, finish assembling the drawer and test it for fit. (Mack Headley offers more on carving a scallop shell in *FWW* #61, pp. 47-51.)

Installing the top—This lowboy has a top that is made from one 20-in.-wide board of exquisite tiger maple. This is an exceptionally large dimension for any native hardwood, so two boards are usually glued together. Again, three boards are almost never seen on period pieces and should be avoided on a reproduction.

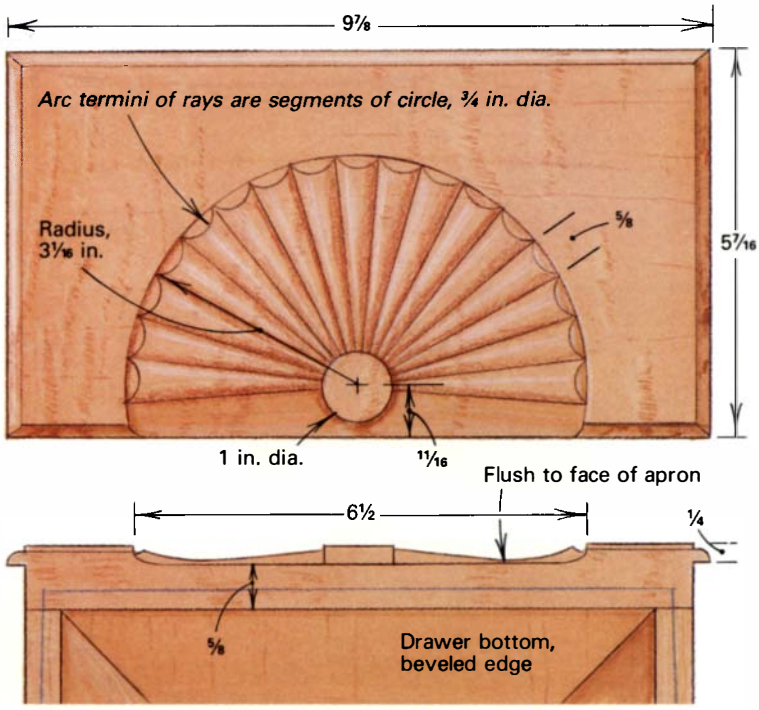
The ogee-shape edge of the top can be cut with a router or roughed-out on a tablesaw and carved by hand. Because the shape does not conform to any standard router bit, a little experimentation will be necessary if you decide to use that method. You could also make several passes at various depths and distances from the edge with a ½-in. core-box router bit to shape the concave portion. The rest of the contour can be shaped with a block plane and scraped and sanded smooth by hand. The top is fastened to the base with 10, 10-1¼ flat-head wood screws, which are driven through the top horizontal divider and the glue blocks that are attached to the case sides, as shown in figure 3 on p. 71.

Finishing—The choice of finishing materials and application methods will determine, more than anything else, how a piece will look. The techniques I offer reflect my own attitudes toward making Queen Anne furniture and represent the fruit of many trials and errors. I strongly suggest that you experiment with whatever finish you plan to use before applying it to a piece of furniture, and keep a written journal of these experiments and their results.

I find it easiest to handplane, scrape or sand the furniture components before they are assembled. Period furnituremakers probably did the same, particularly since sandpaper was a precious commodity. They expended little energy in smoothing tool marks or surface imperfections where they wouldn't show, as on the underside of a tabletop or the inside of a chest of drawers.

To me, wood coloration is a two-step process. The first step produces a base color, which homogenizes the various parts of a piece into a unified whole and serves as a foundation for stains

Fig. 4: Carved drawer front



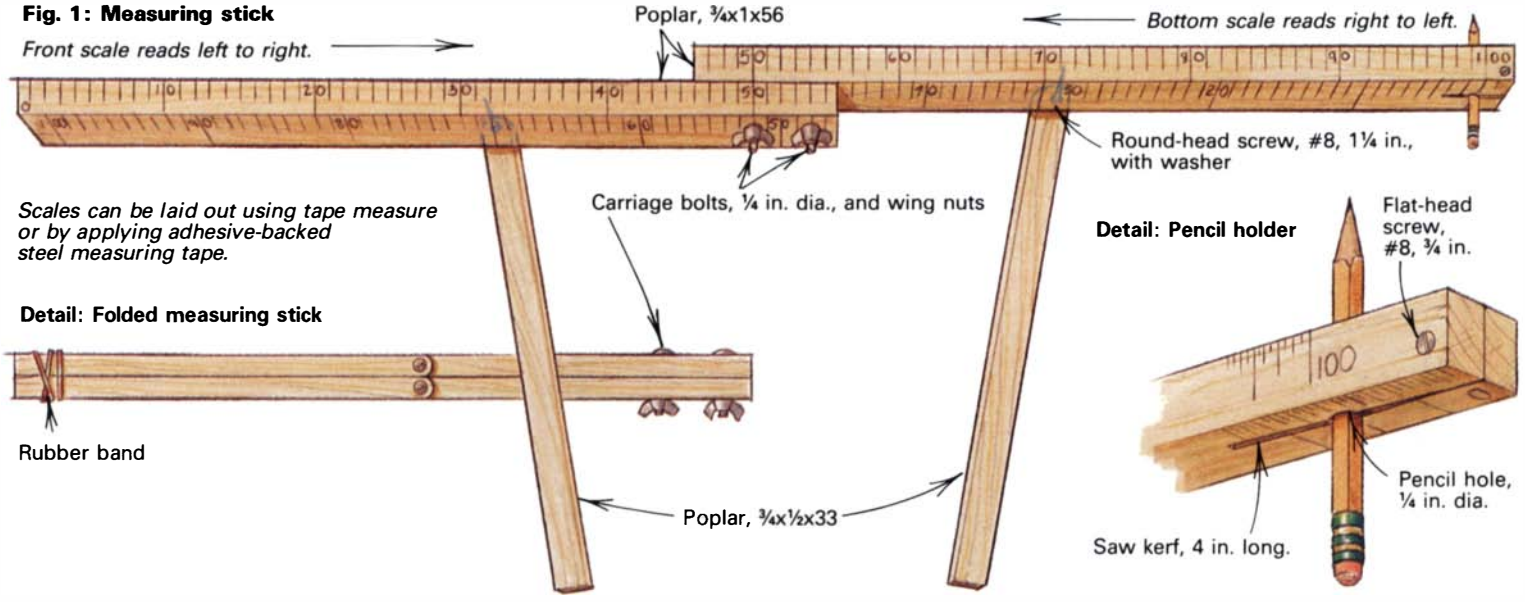
and paints applied in the second step. Aniline dyes produce a good base color: they penetrate well, without masking the wood's natural figure. Although it is particularly difficult to color maple so that it looks antique, I've had good success by first applying Lockwood's Early American Maple (available from W.D. Lockwood and Co. Inc., 83 Franklin St., New York, N.Y. 10013), an amber aniline dye, as a base color.

After the dye is fully dry, lightly sand the raised grain with 220-grit (or finer) paper. You will have to reburnish the fan carving and maybe touch up the lobes with 400-grit sandpaper. Then coat the piece with graining liquid (available from Stulb, Box 297, Norristown, Pa. 19404) and rub it off immediately, leaving residue in cracks and corners to tone down the aniline dye and add some artificial aging to the piece.

For a top coat, I want an easy-to-repair hard surface film that can be built up with three or four coats. I used to mix my own oil-and-varnish solutions, but I've found Minwax Antique Oil Finish (available from The Woodworkers' Store, 21801 Industrial Blvd., Rogers, Minn. 55374-9514), a mixture of linseed oil, varnish, tung oil and mineral spirits, to be effective right from the can. Applied with a brush or rag, it becomes tacky in a few minutes and can be buffed to a glossy sheen. At least three coats are required to produce a good finish. The only drawback of this product is its short shelf life, so buy it fresh and in small quantities. Drawer sides, backs and bottoms are sealed with a single coat of a mixture of two parts boiled linseed oil and one part turpentine.

Hardware—Casting was the most practical method of producing back plates and escutcheons and it is still the preferred method for the best and most historically accurate hardware. I use authentic cast hardware from Ball and Ball, 463 W. Lincoln Highway, Exton, Pa. 19341: four brass pulls (#C9-036 antique), one brass escutcheon (#C9-036E antique) and one ⅝-in.-dia. brass knob (#G17-136 antique). □

Norm Vandal is a Consulting Editor for FWW *and a professional woodworker in Roxbury, Vt. He is writing a book on Queen Anne furniture for The Taunton Press, to be released in the fall of 1990.*



Installing Crown Molding

A measuring stick and some tricks

by William Lego

Hanging crown molding is 95% a one-person job, as Yogi Berra might say. With no helper, however, the procedure can be a bit hazardous to the homeowner's furnishings. And measuring a 16-ft. span by yourself while balancing on a ladder becomes a more significant problem with each passing birthday. In this article, I'll share a few proven techniques that have eliminated the need for a helper and saved me many measuring trips up the ladder.

First of all, I made a measuring stick so I could do most measuring solo while standing on the floor. The stick is in sections so it will fit in my car; it can be made in one piece, but would be more cumbersome. My two-piece model is 56 in. long in storage mode and 102 in. when assembled for use. Wing nuts hold the two halves together. To convert from one mode to the other, simply remove the wing nuts, turn one of the limbs end for end and retighten the wing nuts. A rubber band secures the handles to the two main sections when the device is not being used.

Making the stick—Rip two poplar strips for the main limbs and two strips for the handles, as shown in figure 1 above. Overlap the main limbs 10 in., clamp them in position and drill ¼-in. holes for the ¼-20 carriage bolts that hold the two limbs together. I laid out my scales using a tape measure as a guide while I copied the ⅛-in. calibrations and numbers on the limbs. However, you can also use two adhesive-backed steel measuring tapes, which read from both the left and right, from Woodworker's Supply of New Mexico, 5604 Alameda Pl. N.E., Albuquerque, N.M. 87113; (800) 645-9292. These tapes are available in 12-ft. lengths and produce a much more professional-looking device at a modest cost and considerable time savings. I located the right-to-left scale on the side of the stick that faces down in use and the left-to-right scale on the side opposite the handles, as shown above.

The handles are screwed loosely onto the main limbs with 1¼-in., #8 round-head screws with washers to allow movement. Drill a ¼-in. hole at the 100-in. mark on the right end of the stick to hold a pencil. Then, saw a kerf and drill a hole for a ¾-in., #8 recessed flat-head screw, as shown above, to clamp the pencil in position.

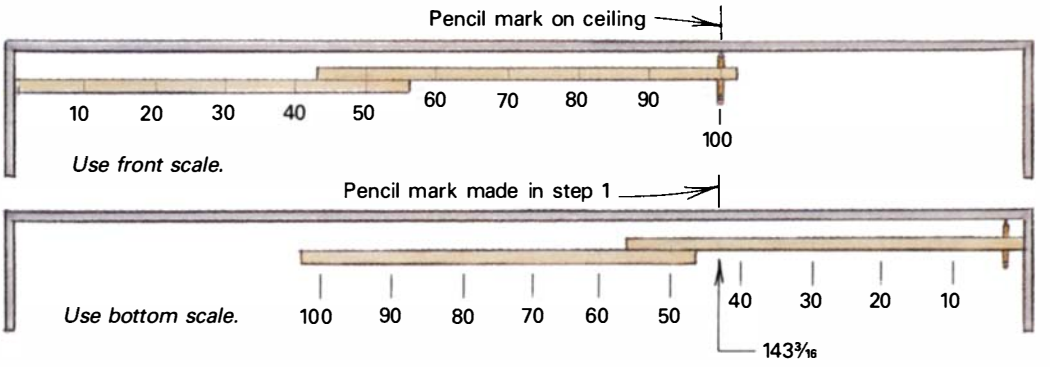
The stick in action—To measure from inside corner to outside corner, butt one end of the device against the inside corner and locate the outside corner on the pertinent scale. If the span is more than 102 in., mark the ceiling at 100 in. with the attached pencil. The line will be hidden once the molding is installed. Then, measure from the pencil mark to the outside corner and add 100 in.

For those inside corner to inside corner crown molding runs between 102 in. and 202 in., I butt the left end of the device to the left wall and make a pencil mark on the ceiling at the 100-in. mark (see figure 2 on the facing page). Then, I butt the right end of the device to the right wall and read the measurement at the pencil mark, using the scale beginning at the right wall. This dimension plus 100 in. gives me the width of the room. Because crown moldings generally run 16 ft. (192 in.), my measuring stick will handle most of my measuring needs.

Fig. 2: Using the measuring stick

Step 1: Butt stick to left wall and make a pencil mark at 100 in.

Step 2: Butt stick to right wall and add 100 in. to the measurement that aligns with pencil mark on the right-to-left scale.



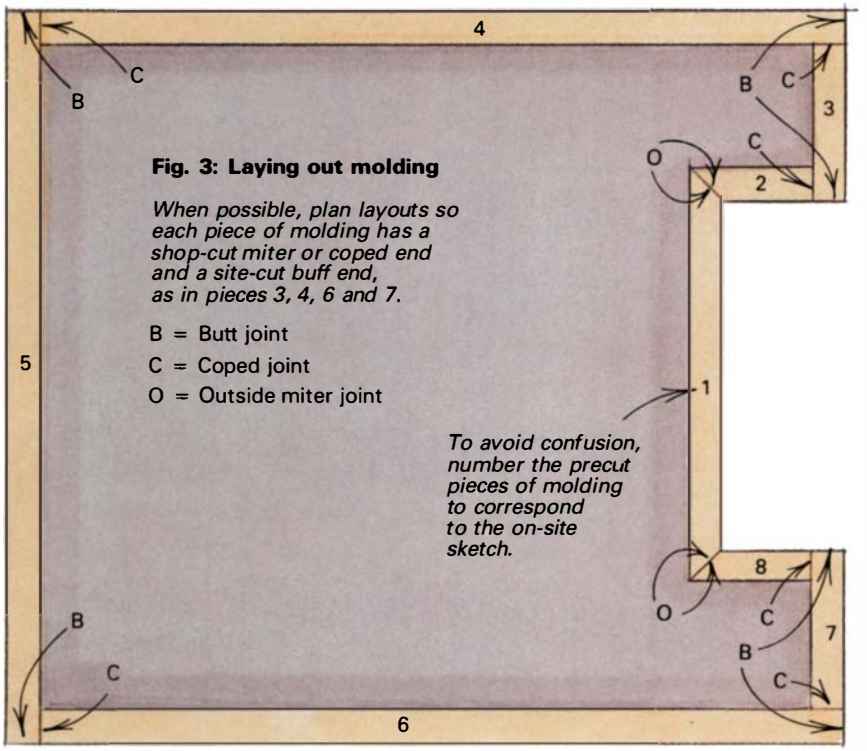


Fig. 3: Laying out molding

When possible, plan layouts so each piece of molding has a shop-cut miter or coped end and a site-cut buff end, as in pieces 3, 4, 6 and 7.

B = Butt joint
C = Coped joint
O = Outside miter joint

To avoid confusion, number the precut pieces of molding to correspond to the on-site sketch.

Fig. 4: Portable compound miter box

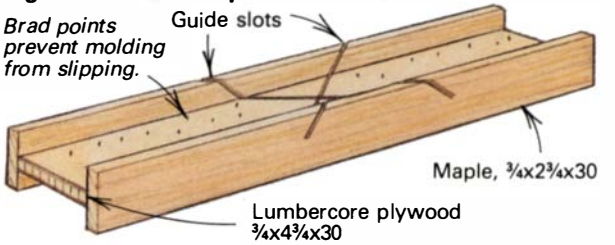
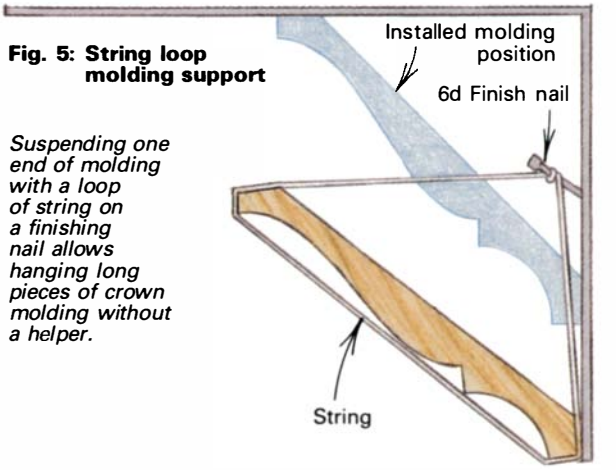


Fig. 5: String loop molding support

Suspending one end of molding with a loop of string on a finishing nail allows hanging long pieces of crown molding without a helper.



Cutting molding—Coping moldings and attaching little returns to provide a finished appearance on moldings that dead-end in awkward places can be delicate business. I see so many finish carpenters squatting on the floor, squinting at their cut marks while operating their miter boxes for these jobs. But you don't see chefs stooping on floors for the most intricate aspects of preparing a soufflé. And dentists have elaborate chairs to position the patient so their work will be easier. For cutting molding, I've made an on-site table that puts the work at a more comfortable level and eliminates bending for tools.

Whenever possible, I cut joints ahead of time in my shop. By minimizing on-site joint cutting, I have more time to install the moldings before running out of daylight or interfering with the customer's supper hour. Precutting moldings does require some premeasuring, which I do when preparing a job estimate. I take rough measurements on the floor, coding all the pieces on my room layout, as shown in figure 3 above, and then add 6 in. for cutting the joints. If the pieces are laid out so each one has a coped or mitered end and a square butted end, I can cut the butted end on-site to the exact length. Pieces that require coped or mitered joints at both ends, shown in locations 1, 2 and 8 in figure 3, can be measured on the first visit and cut to length in the shop. Sometimes I cope one end in the shop and cut the miter on-site. In any case, I always take an extra 16-ft. length of crown molding for every two rooms on the job, in the event I need to recut a piece.

Going through the mental or physical gyrations to correctly position crown molding, upside down and backward, in the miter box is enough to daunt even the stoutest enthusiast. With the simple miter box shown in figure 4 above, I cut crown molding up to 4⅝ in. wide, face up and laid flat. First I cut two 18-in. pieces of molding to the desired compound angle in a standard hand- or electric-powered miter box and then test fit these pieces to be sure the angles are correct. After constructing the miter box, as shown in figure 4, stack the two pieces of molding and nail them together to form a broad guide face for handsawing the compound-angle slots. For less play in the sawkerf, cut the guide slots with the saw you will use with the box. Small brads, driven from the underside to just penetrate the top surface of the miter box, keep moldings from slipping during the cut.

Stringing up the molding—I have found that a nail and a loop of string can effectively replace a helper when installing crown moldings. Drive a 6d finishing nail into the wall at one end of the molding, as shown in figure 5 above. Be sure to put the nail high enough on the wall so that it will not prevent you from tacking the molding in place; you may need to bend the nail toward the ceiling to avoid the molding. Put one end of the molding through a loop of string hung over the nail. Then, nail from the other end of the molding, working back toward the loop, which can be detached and reused. The nail remains forever behind the molding. □

William Lego is a carpenter and woodworker in Rockford, Ill.

Drawings: Staff

The etrog box is used to hold the etrog—a citrus-like fruit—during the Jewish holiday of Succot. This box, made by Catriel Sugarman from ebony and silver, has Hebrew letters on top that recite from the Bible, "And you shall take the fruit of the goodly tree."

Precious Containers

Building an etrog box with silver and ebony

by David Rubin

Since ancient times, wood has been held in high esteem by Jewish craftsmen, who used it to build furnishings and containers for their religious celebrations and ceremonies. But it's only in contemporary times that craftsmen have begun to combine rare woods and precious metals, like the silver and ebony in the box shown above made by Jerusalem craftsman Catriel Sugarman. The box is designed to hold the etrog, a citrus-like fruit that resembles a lemon in size, color and fragrance. During the Jewish holiday of Succot, a blessing is made over four plants native to Israel: the palm branch, willow leaves, myrtle leaves and the etrog.

Catriel's box is constructed with Gabon ebony frames that hold silver panels that are pierced with filigree designs depicting the intertwining branches of the etrog tree. The frame members are mortised and tenoned together and doweled to the base, which is cut with a scroll saw from solid wood. The curved ends of the box are stave constructed, and then turned on the lathe and doweled to the solid wood base. The top, which opens with a silver hinge, holds another silver filigree panel. The decorations along the edges of the top are Hebrew letters scroll sawn from ebony.

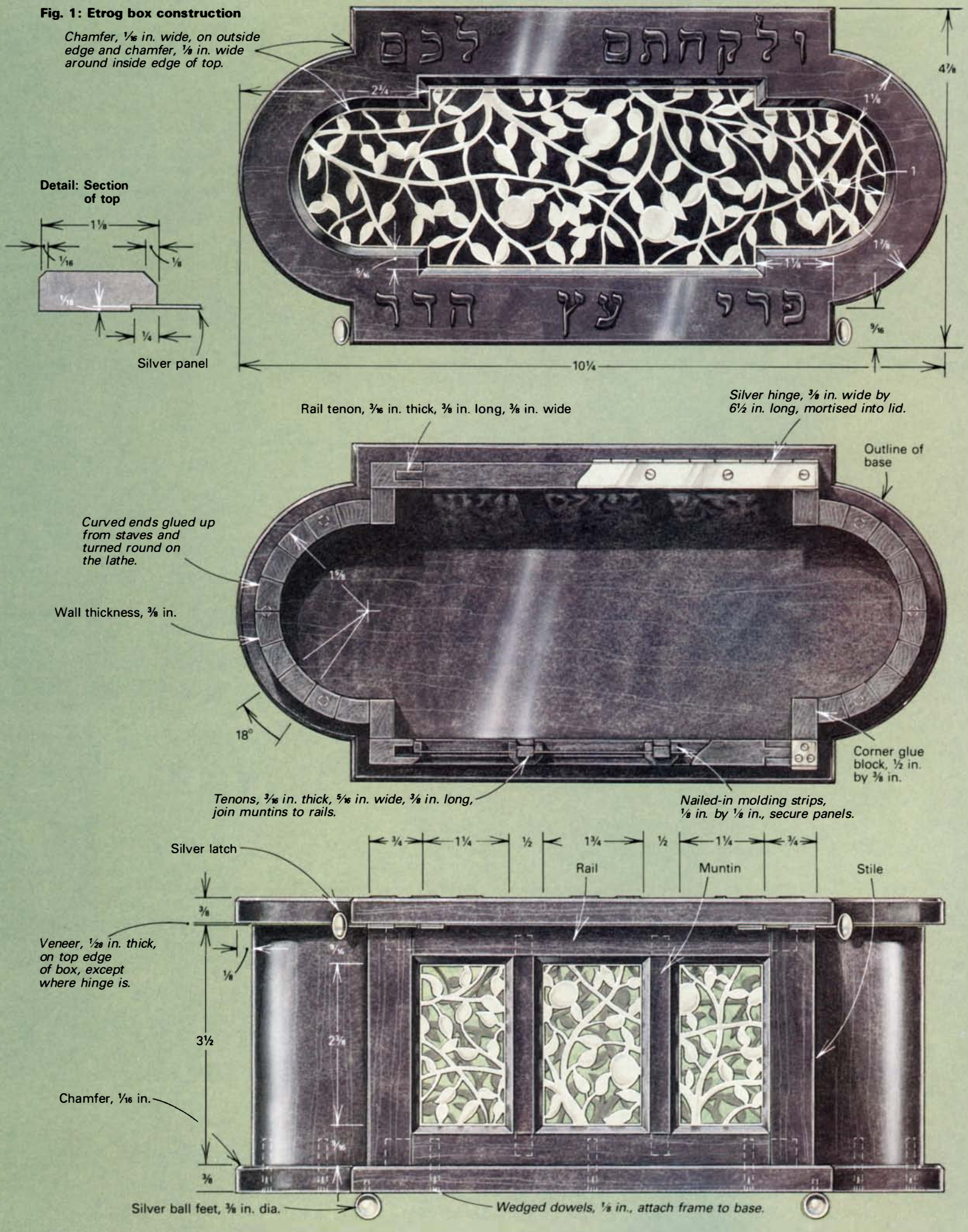
Although the etrog box is primarily intended for a religious purpose, it's an attractive container that can be built for other uses, perhaps to hold jewelry. Even if you've never done any metalworking before, fabricating the silver parts isn't difficult, and this might present a good opportunity to learn some of the basic jewelry-making techniques involved. Cutting the filigree in the silver panels is very similar to sawing a pierced fretwork pattern in wood, and fitting the panels into the frames is the same as with any wood frame and panel.

Constructing the box—Straight-grain ebony is used to make the top, bottom and sides of the box. The first task is to make the frames for the front and rear. After milling the stock to thickness and cutting it to width and length, cut tenons on both ends of all the rails and muntins, which divide the frame to hold three panels. Cut the tenons, either on a tablesaw or with a handsaw, slightly oversize to allow for hand fitting later. The tenons fit into matching mortises roughed out on a drill press and chiseled out.

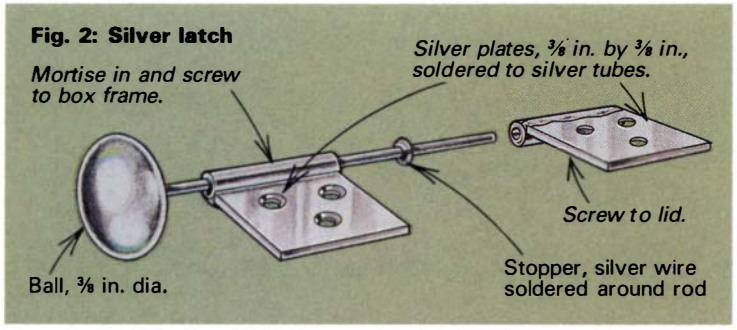
To create a recess for the silver panels, rabbet the back edges of the frame parts with a dado blade on the tablesaw. To chamfer the inside edges of the hard ebony frames after assembly, a jeweler's file works well to bevel crisp inside edges.

To form the round ends on the box, ebony staves are ripped on both edges with an 18° bevel. Twenty staves, each about 3¾ in. long, are then glued into a cylinder, which is secured with a small band clamp until the glue dries. Next, temporarily glue two plywood discs on the ends of the cylinder, and mount the cylinder between lathe centers. Turn the outside round and true, and then carefully saw off one disc and round the inside of the cylinder, using a scraper, with the assembly fastened onto a faceplate. After sanding the inside and outside smooth, the open end is squared off and trimmed on the lathe, using a parting tool, to a final length of 3½ in. The cylinder is

Fig. 1: Etrog box construction



Drawings: David Dann



then bandsawn in half, producing two identical half-round ends.

Because wide ebony boards are rare, the 4⅞-in.-wide top and the bottom of the etrog box are glued up from narrow ebony boards. These are ripped on the tablesaw with a 60-tooth blade to get a smooth gluing surface without having to joint each strip. After drying, the excess glue is scraped off and the panels are surfaced to final thickness. The outside profiles of both panels are bandsawn to the same pattern, shown in figure 1 on the previous page. The inside of the top is then cut out, either on the scroll saw or with a sabersaw fitted with a fine-tooth blade. The rabbet for the silver panel, on the bottom inside edge of the resulting top frame, is shaped with a rabbeting bit in the router. Also, the back lower edge of the top receives a shallow rabbet for the piano-style hinge that attaches the top. Next, 1/16-in.-wide decorative chamfers are laid out on the outside edges of both top and bottom and then shaped. As with the chamfers on the inside edges of the frame, Catriel uses a jeweler's file, but you can also use a piloted chamfering bit in the router. The top's inside edges receive a ⅛-in.-wide chamfer.

Assembling the box—The first step in putting the box together is gluing ⅜-in. by ½-in. corner blocks to join the inside ends of the side panels to the outside corners of the curved ends, creating the stepped corners of the box. The blocks are glued to the curved ends first, using a concave caul cut from scrapwood, so that even clamping pressure can be applied, and then the sides are glued to the blocks. After this has dried overnight, the body is cleaned of excess glue and finish sanded. A thin coat of shellac seals the wood against dirt and glue stains. The bottom is then drilled for the dowel pins that will secure it to the sides. The 3/16-in. ebony dowels are turned true on the lathe. A thin kerf is sawn on the end of each dowel and, once the dowels are driven and glued in, tiny ebony wedges are carefully hammered in to lock the dowels in place. After trimming the dowels' ends, the bottom is sanded flat. Finally, a 1/28-in.-thick piece of veneer is cut out and glued to the entire top edge of the box, except for the band along the back edge where the hinge will be screwed on later. The veneer hides the endgrain of the semicircular ends and gives the edge a clean, continuous look.

To finish the box, sand it down to 600-grit. Then, apply three coats of shellac, rubbing the surface between coats with 0000 steel wool.

Silver panels—Now that the woodwork is done, it's time to make the silver filigree panels and other silver parts. The design, shown in figure 1, is copied onto tracing paper with a sharp pencil. The paper is glued onto a piece of 18-gauge sterling silver sheet stock, available from a jewelry supply house. Holes drilled into the open spaces provide access for a jeweler's saw, fitted with a #3/0 blade, which is used like a fretsaw to cut out the pattern. After sawing out all the parts, smooth and slightly round all the cut-out edges with a jeweler's file, and then sand them to 1000-grit. When the sanding is complete, polish the panels to a bright finish on a buffing wheel charged with jeweler's rouge. Finally, the silver panels are installed in their frame rabbets with ⅛-in. by ⅛-in. molding strips, nailed in place with small brads. Be sure to drill pilot holes for the brads, or otherwise you'll split the thin, hard wood.

The hinge and latch for the top are similarly constructed from parts cut from thin silver sheet and silver soldered together. Two latches at the front edge of the top (see figure 2 above) are also constructed from silver parts as shown, and the box rests on four silver balls, which are soldered to short lengths of silver rod that fit into holes in the box's bottom. If you lack experience with silver fabrication techniques, you can have a friend or jeweler make it for you or substitute a stock brass hinge and a different latch.

The Hebrew letters that decorate the top are first laid out on paper, which is then glued to a strip of 1/16-in.-thick ebony. With a jeweler's saw, cut out the letters just like you did the silver panels. Then, the edges are filed and the letters are sanded smooth. After they are shellacked like the box, the letters are glued in place on the top with yellow glue.

Finish the entire box with two coats of a hard wax and buff it with an old nylon stocking. Because you can see through the filigree, the inside of the box remains unlined and is finished the same way as the outside of the box. When the box is completed and one etrog fruit is placed inside, as is traditional, the fragrant scent of the fruit will often infuse an entire room with its pungent aroma. □

David Rubin is a writer living in Glendale, Wis.

The Judaica of Catriel Sugarman

Think of Jerusalem and religion comes to mind. Stand on the street corner near the walls of the old city and within 10 minutes you can observe various priests, rabbis and the occasional Moslem kadi.

But stroll down the block and in an old building near a corner of the old city, you'll find the workshop of Catriel Sugarman, a designer and craftsman of fine Judaica: crafted objects used in Jewish religious ritual. Although Jews have been making Judaica from a variety of materials since biblical times, these pieces have, traditionally, never been made from rare woods. In contrast, most of Catriel's Judaica, examples of which are shown on the facing page, are done primarily in exotic hardwoods, including ebony, rosewood, imbuya, peroba rosa, jacaranda and pink ivory. The pieces often include decorative elements, such as fretwork in gold or silver, and inlays of mother of pearl and abalone.

Catriel, who enjoyed woodcarving as a child, brought his love of woodworking with him when he moved from Syracuse, N.Y., to Jerusalem in 1968. He first worked as a carpenter, and later taught woodworking at a local school before opening his own shop in 1981. He designs most of the items, does some of the woodwork and specializes in decoration and inlay work. Gary Showalter, an immigrant from Atlanta, Ga., does much of the construction, joinery and finishing, and native Israeli Hani Prolivar, trained as a silversmith, crafts the metal portions of the items that the shop builds.

Typical of Judaica that Catriel Sugarman builds is this charity collection box, which has a slot for money just below the domed top. The 14-in.-high piece is made of cherry, with decorative inlays and details of ebony and mother of pearl.

Together with his two associates, Catriel creates a diverse collection of wooden boxes and accessories for Jewish holidays and ceremonies, including spice boxes for the Havdalah ceremony, charity boxes, noisemakers used during the Jewish holiday of Purim, dreidels, which are tops used in games played during Hanukkah, and mezuzahs, which are special cases, usually fixed to the door post of a Jewish home, designed to hold a small parchment scroll inscribed with passages from the Old Testament. Last year, Catriel made a set of six mezuzahs from ebony inlaid with mother of pearl and detailed with sterling silver, depicting the architecture in the old neighborhoods of Jerusalem.

Once a design idea is approved by a client, a technical drawing is made and details, such as inlay and metalwork, are added. It may take anywhere from a few weeks to a few months to see a piece from design to completion. The process typically includes basic millwork, joinery, lathe work, metalwork and inlay. Some of the turning is done on a treadle-powered Holtzapffel ornamental lathe (circa 1865). The Holtzapffel lathe, recently restored by Catriel and his associates, is used to make the more complicated turned parts and ornaments, such as spiral finials or columns. Catriel says: "As we become more familiar with the Holtzapffel lathe, we'll include additional ornamental turning in our pieces. The buildings, architecture and light of Jerusalem will always be our major source of inspiration for designs."

Pieces are commissioned or sold to a relatively small number of Judaica collectors throughout the world. Last December, an etrog box, like the one described in the article on pp. 76-78, designed and made by Catriel was sold at auction by Sotheby's, New York. This event was indicative of the international recognition the shop's works have received, since it's uncommon for a work of Judaica made by a living artist to be auctioned at Sotheby's. —*D.R.*

A Hebrew calendar, with a scroll used to count the days between Passover and Pentecost, is shown above. The calendar's 14-in.-wide case is made from rosewood, while the scroll handles and finials are turned ebony. Gilted silver filigree adds decoration. The spice box, below, made by Catriel, shows the influence of Jerusalem's architecture. The 11-in.-high architectural box, designed to hold spices for the ceremony marking the end of the Jewish Sabbath, is made from inlaid Gabon ebony with guilded silver details.

Photos: courtesy of Catriel Sugarman

Weighing in at only 30 lbs., the 6 ⅛-in. Ryobi JP-155 jointer at right, can be tucked under the arm and carried to a job site, or stowed out of the way to save space in a cramped workshop.

The Delta DJ-15, far right, is a full-size, 300-lb., 6-in. jointer. Its parallelogram table supports replace the usual inclined dovetail ways.

Two New Jointers

Innovative approaches to a standard shop machine

by Bernie Maas

Jointers are pretty generic. There are green ones and gray ones and they all have infeed and outfeed tables, a cutterhead and a fence. But two new 6-in. jointers that recently came into our university woodshop made me do a double take: Ryobi's JP-155, a companion to the popular AP-10 planer, and Delta's DJ-15, the 6-in. member of the new Invicta series. However, these two tools are on opposite ends of the pricing spectrum: The Ryobi retails for $618 and the Delta for $1,288; but this price difference doesn't so much reflect a difference in quality as it does a difference in market orientation. The Ryobi is lightweight and meant to be portable, while the Delta is a full-size jointer designed to be a permanent fixture in the shop.

Ryobi JP-155—Compact and under 30 pounds, the JP-155 (see the photo above) is perfect for amateurs' home workshops and pros who haul equipment to various job sites. Although we found the 28-in. table adequate for most work, accessory extensions that increase the capacity to handle large jobs, such as doors, are available. The most impressive part of this machine is the electronic, variable-speed, 10.5 amp motor that tops out the two-knife cutterhead at 16,000 RPM. Because of this high speed, we've been able to feed virtually every grain configuration (knots, reversals, you name it) into this jointer—from pine to cocobolo—and *never a tearout*! In addition, the JP-155 sports a 2½-in. chip exhaust. When it's connected to an everyday shop-vac, operation is fairly dust free.

To evaluate the JP-155 for durability, I turned it over to my students for two semesters. No problems—only normal blade wear. The students became so comfortable with it that they went to the trouble of hauling it out of its storage cupboard and setting it up instead of using the 8-in. Rockwell workhorse that's been a familiar fixture in the shop for years.

Changing knives usually puts knots in my stomach. Ryobi's thoughtful engineering takes most of the teeth-gnashing out of this job. In the first place, two knives are easier to set than three. Secondly, a cutterhead lock holds the knives firmly at top dead center. And thirdly, the lock bars, which are shaped so they wrap themselves under the knives, are slotted to receive the heads of lifter screws. As these screws are turned in and out, they raise and lower the lock bars that in turn force the knives up and down. Working a screwdriver in tandem with Ryobi's plastic feeler block makes knife setting a 10-minute breeze.

On the downside, the Ryobi isn't equipped for rabbeting and its outfeed table isn't adjustable. Positioning the fence is sometimes a bit sticky—a minor annoyance that the company says it has improved on newer models. Finally, with its router-style motor, the JP-155 is loud. Close your eyes and you can imagine yourself on a runway at O'Hare, so you'll want to wear earmuffs.

Delta Invicta DJ-15—In contrast to the lightweight Ryobi, the Delta Invicta (see the photo on the facing page) weighs in at close to 300 lbs. This industrial-grade machine is powered by a ¾-HP motor and is quiet and smooth when running.

If you're familiar with Delta jointers, the first thing you'll notice that sets the Invictas apart from their predecessors are lever-controlled infeed and outfeed tables. Gone are the "crouch-down"

handwheels and "squint-to-read-'em" depth scales. When I first saw these levers in a showroom, I was skeptical about whether they would provide enough control, but using the tool made me a believer. Raising and lowering the tables is smooth and precise thanks to springs that counterbalance the tables' weight. And since you can adjust the infeed table without crouching down, the depth-of-cut scale is placed so it can be read from a standing position. The dual centimeter/inch depth scale is a nice touch, but the depth indicator itself blocks the scale so it's hard to read and additional numbered graduations would help. When I questioned the wisdom of using plastic for the tables' locking-clamp handles, Delta's product manager, Steve Holley, told me that the fiber-reinforced polycarbonate handles had a field failure rate of zero.

Delta's engineers are doing quite a bit of chest-thumping when describing their novel "parallelogram-action" table support system (see figure 1 below). Infeed and outfeed tables don't slide up and down along the usual inclined planes, but raise and lower in an arc that keeps them close to the cutterhead. The result is improved chip breaking and chip capture. The parallelogram system is "set for life" at the factory. However, things happen in a shop that'll knock permanent settings out of whack, so I was a little concerned to find that fine-tuning the table supports is not covered in the owner's manual. But Delta's Holley says this adjustment is user-serviceable. Although he couldn't explain why it wasn't discussed in the manual, he assured me that someone at the company's Tech Support department at the Memphis, Tenn., headquarters would be glad to walk or talk a DJ-15 owner through the process. (The Tech Support department can be reached at 800-223-PART; in Tenn., 901-238-PART.)

A minimum/maximum positive lock allows preset finish cuts and pre-fixed rabbet depths. The mechanism is simple; knurled screws, threaded through the jointer's cast base, act as stops when they bear against small cast-iron blocks fastened to the underside of each table. By adjusting these screws, the upper limit of the infeed table can be set so you can quickly return to a fine finish cut of 1/32 in. and for coarse cuts, the table's lower limit can be fixed to never exceed 1/8 in.—an excellent safety feature for a school shop!

I have my doubts about the DJ-15's extra-long infeed table. Apparently, Delta's design engineers felt that most woodworkers prefer to have an extra 6 in. of support at the infeed end for dealing with bulky stock. But there are two schools of thought here. I'd prefer the extra length on the outfeed because the greater the contact between the stock and rear table, the straighter the edge, or flatter the face, is going to be.

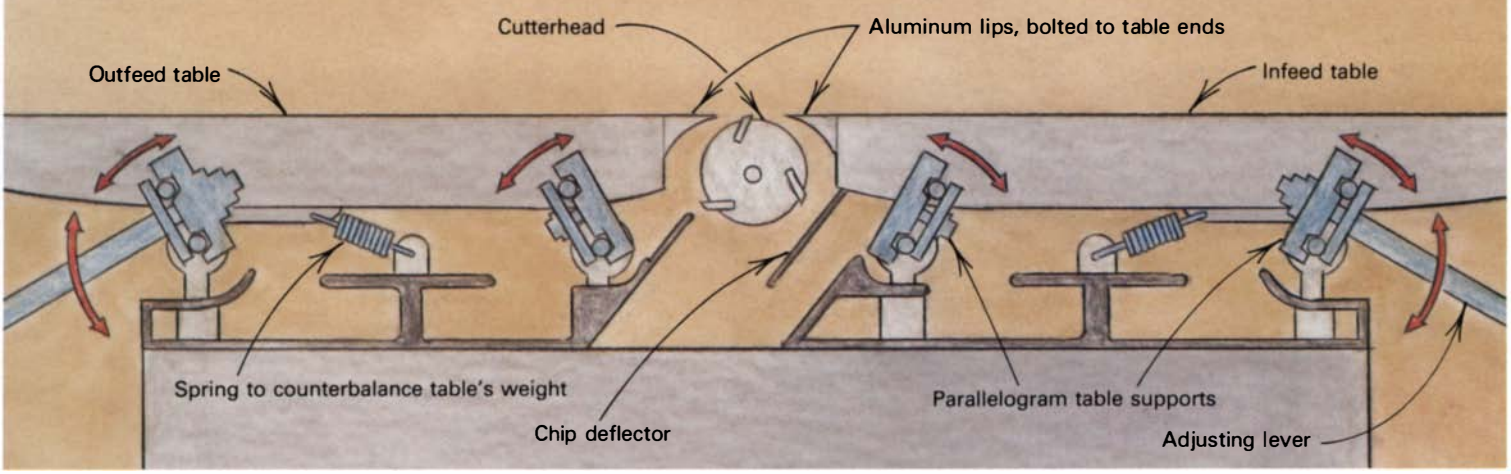
The DJ-15 has a pair of replaceable aluminum lips bolted to the ends of the tables on either side of the cutterhead. The product literature claims that the lips compensate for wear, which seems strange to me because jointers don't exhibit any particular wear at these two points. According to Holley, these lips might protect the knives if they are set too high or happen to come loose, but I suspect that it's an easy way to bring the table ends close to the cutting arc without casting the tables to this arc.

Standard equipment includes jack screws to take some of the sweat out of knife setting, a rabbeting ledge and a double-jointed, tilt-in/tilt-out, three-stop fence. Options include dust control ports and a 24v magnetic switch. An additional cutterhead assembly, including bearings, housing and a set of three knives, can be purchased as an accessory and installed in place of the original cutterhead to avoid downtime during sharpening. Lastly, whoever packed this machine really piled on the protective grease. It only took 20 minutes to put the machine together; it took a heck of a lot longer to soak off the gunk. □

Bernie Maas teaches woodworking at Edinboro University in Edinboro, Pa.

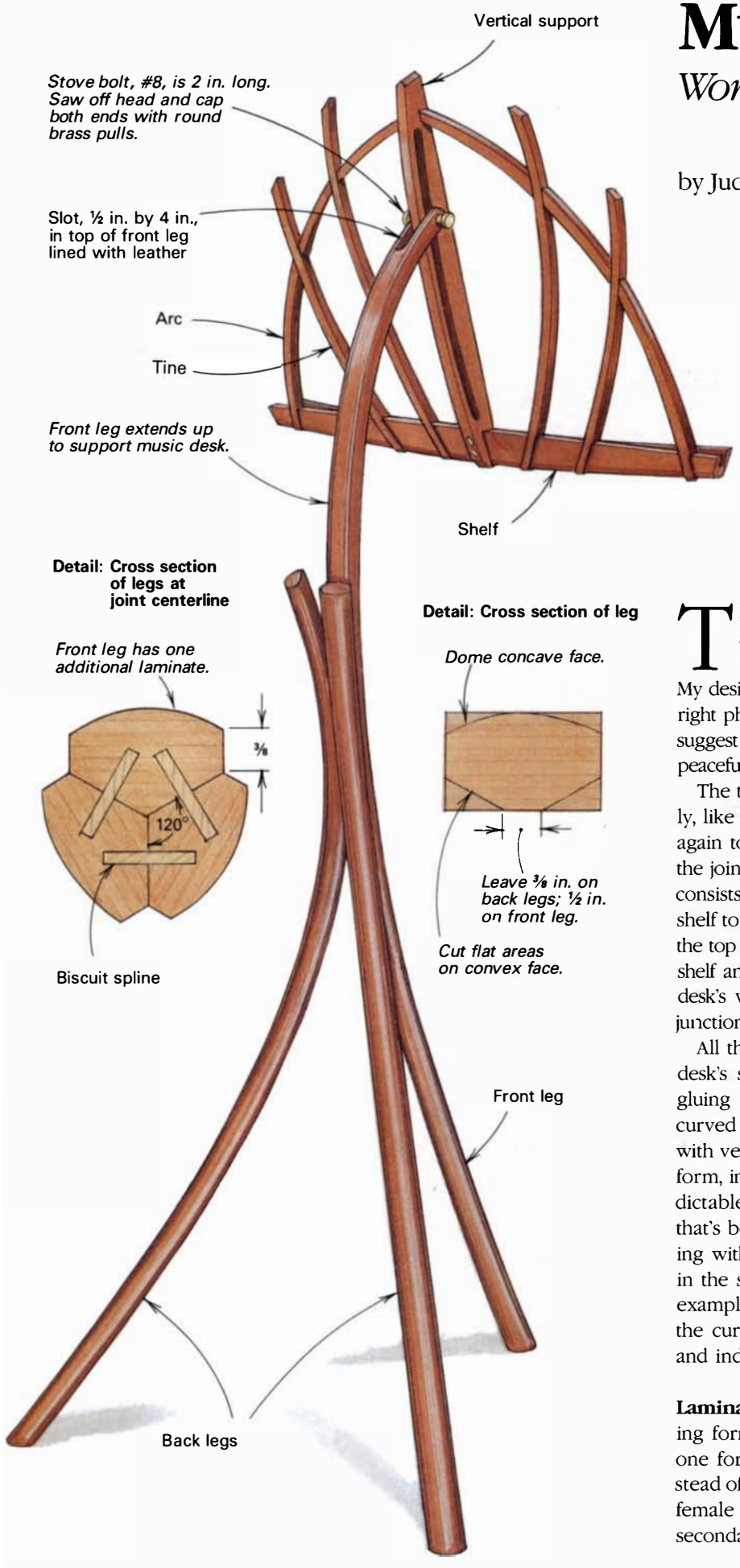
Parallelogram table supports on the Delta DJ-15

The table supports act in unison and remain parallel to each other as the lever is used to raise and lower the table.



Drawing: Roland Wolf

Fig. 1: Music stand



Making a Music Stand

Working with laminated curves

by Judith Ames

The practical requirements of a music stand are simple: a stable base and a small desk to support sheet music. Beyond that, there's very little to restrict the creativity of the designer. My design for the music stand, shown in the drawing at left and the right photo on p. 86, is based on the repetition of simple curves to suggest the pleasant rhythms and patterns of music, or perhaps the peaceful motion of blades of grass blowing in the wind.

The three legs curve up from the floor and come together briefly, like intertwined melodies in a musical score, and then separate again to continue on their own paths; the back legs stop just above the joint, the front leg rises up to support the music desk. The desk consists of a shelf to hold the music, a vertical support that joins the shelf to the front leg, two arcs that connect the ends of the shelf with the top of the vertical support and the four tines that rise up from the shelf and intersect the arcs. A slot routed near the back edge of the desk's vertical support provides height and tilt adjustments in conjunction with the slot in the top of the front leg.

All the parts of the music stand are bent laminations except the desk's shelf and vertical support. Bent lamination is a process of gluing a stack of thin strips together while clamping them to a curved form. This bending method results in consistent curves with very little springback when the pieces are removed from the form, in contrast to steam bending, which can be somewhat unpredictable depending on the grain and quality of each piece of wood that's bent. Despite the consistency of the bent laminations, working with curves still presents challenges usually not encountered in the safe and secure world of straight lines and 90° angles. For example, building this music stand requires forms for laminating the curves, jigs to hold the curved parts while they're machined and individually fitting the curved parts together.

Laminating the curved parts—You need four different laminating forms for gluing up the curved parts: one for the back legs, one for the front leg, one for the arcs and one for the tines. Instead of sandwiching laminations between carefully fitted male and female forms, I just cut about 10 extra lamination strips from a secondary wood to use as caul strips when clamping the lamina-

After eight hours the clamps are removed from one of the laminated legs. Note the unglued laminations that Ames uses as cauls to clamp the glued-up laminations to the form.

tions to the form (see the photo above).

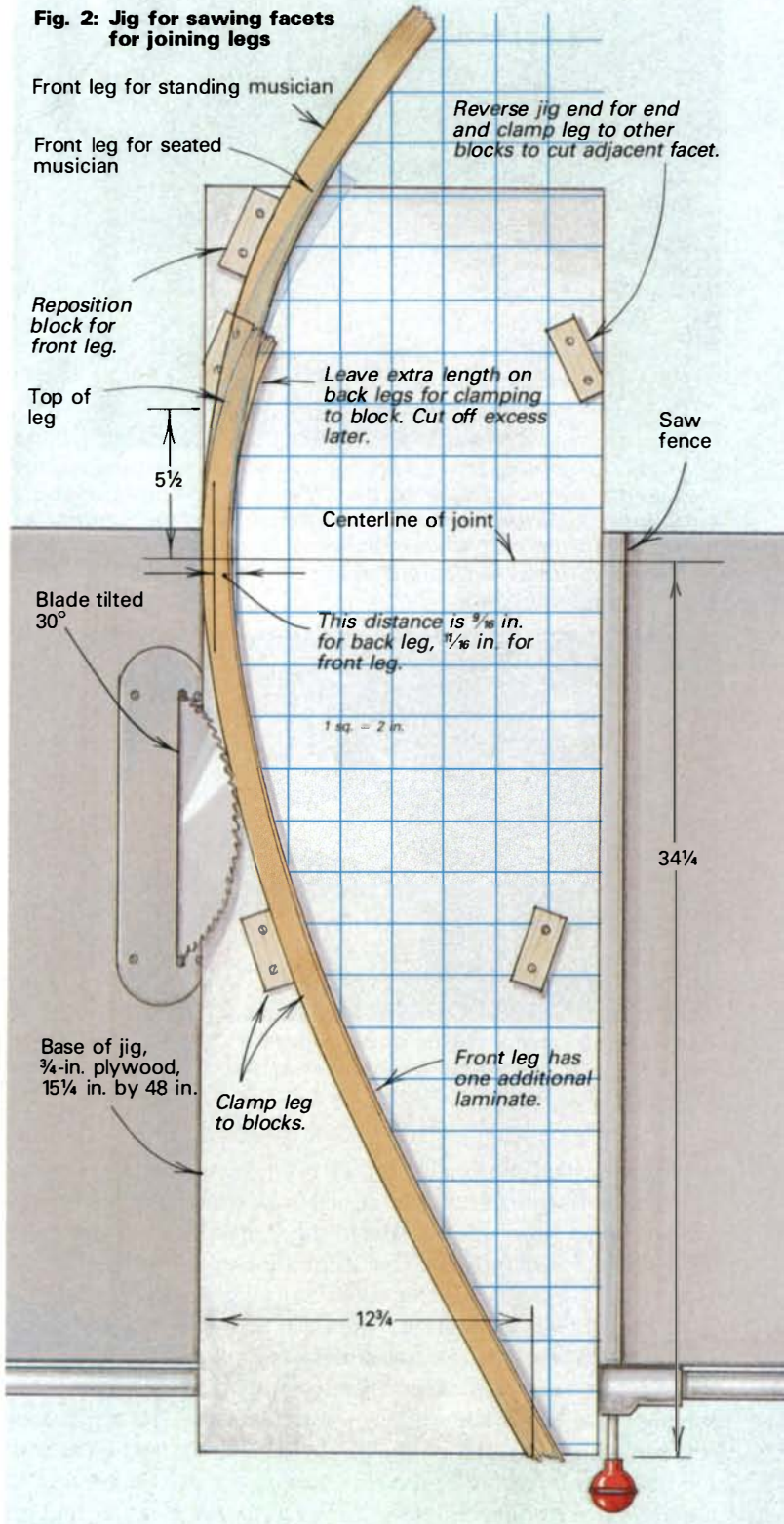
To make the forms, glue and screw pieces of particleboard together face to face until the stack is about 1 in. thicker than the width of the pieces to be laminated. Each form should be about 1 ft. longer than the laminates that'll be glued up on it. Draw the desired curve on top of the particleboard stack and bandsaw to within 1/32 in. on the convex side of the line. The curves for the tines and arcs can simply be drawn with a compass; the tines have an 18-in. radius and the arcs an 11¼-in. radius. To duplicate the leg curves, use the grid pattern in figure 2 at right. The lower portion of the front and back legs are identical but they differ above the joint area. Mark the centerline of the leg joint on the form so you'll have a permanent reference for this all-important point. After bandsawing the curve, eliminate any wobbles from the form's curved face by working to the line with a horizontal edge sander or a rasp, taking care to keep the face square with the top and bottom of the form. Then, bandsaw a parallel curve 3 in. behind the working face so you can span the form with medium-size bar clamps, shown in the photo above. Finally, screw the form to a baseboard and coat the entire assembly, as well as the caul strips, with paste wax so glue will not adhere.

Because the music stand is so delicate, I recommend using a dense hardwood, like maple or cherry. Select straight-grain pieces for strength and to help hide the laminations. The bill of materials at right gives dimensions for the laminate stock, number of laminations for each part and the dimensions for each laminated part after it's been squared up for shaping. The arcs and tines are glued up twice as wide and long as their finished size. These curves are then bandsawn lengthwise and crosscut in half to give you four pieces from just the one glue-up.

Before ripping the lamination strips, mark a V on one side of the stock so you can keep the laminations in sequence while gluing. Rip the laminations on the tablesaw, using slow even pressure to keep the cut smooth, and, after every other pass, run the sawn face over the jointer to keep it flat and true.

In preparation for gluing up the laminations, assemble plenty of clamps and dilute some yellow glue with one part water to eight

Fig. 2: Jig for sawing facets for joining legs



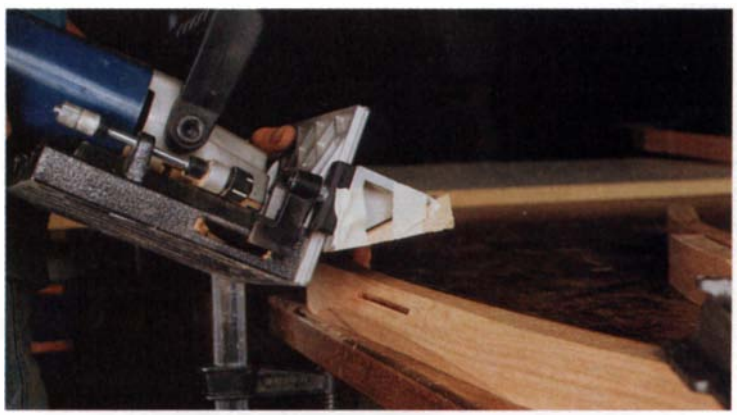
Bill of Materials

No.	Description	Stock size (in.)	Laminations, ⅛ in. thick†	Finished size (in.)
4	Tines, 18-in. radius*	1 × 1⅜ × 30	3	⅜ × ½ × 15
2	Arcs, 11¼-in. radius*	1 × 1⅜ × 4	3	⅜ × ¼ × 16
1	Front leg (sitting)	2½ × 1⅝ × 53½	9	1⅛ × 1½ × 53
1	Front leg (standing)	2½ × 1⅝ × 60	9	1⅛ × 1½ × 59½
2	Back legs	2¼ × 1⅝ × 46½	8	1 × 1½ × 46
1	Vertical support	½ × 1½ × 13½	None	Same
1	Shelf	1½ × 1⅝ × 18½	None	Same

* Arcs and tines are laminated twice as wide and long, and then resawn on the bandsaw and crosscut to length.
† Rip about 10 extra lams of each size to use as clamping cauls.

Drawings: Kathleen Rushton

The facets for joining the legs are cut on the tablesaw by clamping the legs one by one to a jig. Position the leg on the jig by aligning the joint's centerline, which is transferred from the laminating form to each leg, with a corresponding line on the jig. The jig is reversed and the leg is clamped to the blocks on the opposite edge to cut the adjacent facet.



Taping a 15° wedge to the plate joiner's 45° angle attachment gives you the 60° angle needed to cut the slots in the facets where the legs come together.

parts glue, which allows a little more clamping time and makes the glue easier to spread. Lay out the laminates in sequence side by side on scrap plywood and spread the thinned glue evenly over their surfaces with a paint roller. Turn the pieces over and spread glue on the other side also. Of course, avoid spreading glue on the surfaces that will be the inside and outside of the glued-up curve. Quickly stack the laminates in sequence against the form and add the waxed scrap laminations. Then, clamp the strips to the form, starting in the center and working toward the ends. The laminations should be pressed down on the baseboard and clamped every couple of inches to ensure a smooth, continuous curve. Remember to transfer the centerline of the leg joint onto the glued-up leg and remark this point whenever necessary throughout all the subsequent machining; you'll need it to accurately saw the joint facets.

After eight hours remove the clamps and scrape off the excess glue. The laminations will shift slightly during glue-up so you should square up one edge of each piece by running it over the jointer while holding the convex face against the fence with a pushstick. Then with the trued edge down, thickness-plane the legs to 1½ in. and the arc and tine curves to 1¼ in. Bandsaw the arcs and tines in half lengthwise and plane the resulting halves to ½ in. thick.

Machining the legs—The cross-sectional detail in figure 1 on p. 82 shows the two adjacent facets that form a 120° angle on each leg where they join. The tablesaw jig, shown in figure 2 on the previous page and the top photo at left, registers the legs so all the facets are cut at exactly the same part of each leg's curve, ensuring that the facets are identical. The centerline, transferred from the laminating forms to the legs, is now used to locate the legs on the jig. When cutting the facets on the front leg, you'll have to unscrew the jig's upper clamping blocks and relocate them to accommodate the difference in the top part of the curve.

Refer to figure 2 for the dimensions of the jig's base, and use the grid pattern for marking the joint's centerline on the jig and gauging the placement of the legs. Align the leg's centerline with the corresponding line on the jig and screw the clamping blocks to the base. Then, reverse the leg and repeat the procedure to locate the blocks on the other edge of the jig. Now, clamp a leg to the blocks and with the sawblade tilted to 30° make test cuts, adjusting the fence until the angled cut just reaches the center of the vertical face of the leg. This cut is made on both back legs, and then the jig is turned end for end and the adjacent facet is cut on each leg while the leg is clamped to the blocks on the jig's opposite edge. Relocate the upper blocks and cut the facets on the front leg.

To index and strengthen the joint between the three legs, I use a plate joiner to cut a slot in each facet for a biscuit spline. A 15° wedge taped to the plate joiner's 45° angle attachment registers the slot at the proper angle (see the bottom photo at left). Clamp the leg securely to the workbench, and cut a slot that's centered vertically and horizontally in the facet; then, turn the leg over and cut a slot in the other facet.

Now, before shaping the legs, bandsaw the front leg's top to length, sand it to a dome shape and rout the ½-in. by 4-in. slot to hold the vertical support. Figure 2 gives dimensions from the centerline to the top of the front leg for either a standing or sitting musician. I cut the slot on the router table with a ½-in.-dia. straight bit. Run the leg's convex side down on the table and make three or four passes, raising the bit each pass until it cuts clear through. On the last pass go a bit farther so that the end of the slot is clean and straight. To increase the friction for holding the position of the desk later, line the slot with 1/16-in.-thick leather. Shape a block to fit snugly in the slot along with the leather and use it to hold the leather until the glue dries. With the block still in place, drill the ⅛-in. hole through the leg for the machine screw that clamps the desk in the slot.

Both the concave and convex faces of the legs can now be shaped to their final profiles (see the detail in figure 1 on p. 82). Use the tablesaw setup shown in the photo on the facing page to cut the flat areas on the convex face that are parallel with the joint facets. With the blade still tilted 30°, raise it until it cuts into an auxiliary fence clamped to the rip fence. Then, make test cuts to set the fence so the angled cut comes about 3/16 in. short of the vertical center of the face. Keeping the piece against the fence and in contact with the cutting edge of the blade, run each leg past the blade. Repeat the pass a couple of times on each surface to be sure you've trimmed as much as possible. Then, remove the sawmarks from the flat areas by hand-sanding with a block, carefully preserving the hard edges formed by the angled cuts.

To dome the concave face of each leg, I use a 1¼-in.-radius piloted roundover bit in a router table. However, because I don't want a complete roundover, I draw the desired arc on one of the leg's ends, which I then hold up to the bit and adjust the bit's height until it will cut very close to the line. Be sure to first run a test cut on the same width stock to see if you like the results. The flat area that's left at the center (where the bearing ran) is blended into the gentle arc by hand-scraping. Finally, sand the legs to 150-grit, smoothing the domed faces yet maintaining the hard lines where the curved faces meet the flat sides.

Now you're ready to glue the legs together; all three legs go

together at the same time. Spread a very thin coat of yellow glue on all the mating surfaces, including the biscuits and slots. Go easy though: You don't want excessive squeeze-out. Glue one biscuit into each leg and then start them all at the same time into the mating slots in the adjacent legs. Squeeze the joint with your hands so the legs come together evenly. To provide firm, even pressure while the glue dries, tightly wrap a bicycle inner tube around the legs, beginning 3 in. above the joint and extending 3 in. below it. After about 30 minutes, remove the inner tube and carefully scrape away the worst of the squeeze-out. Let the joint dry for another hour before cleaning it with a chisel and 150-grit sandpaper.

To level the legs on the floor, bandsaw a hole in a 4-in. square of ½-in. plywood through which the leg will fit. Stand the tripod base on a flat surface, place each leg, one by one, through the cutout and scribe a line on each along the top of the plywood. With a handsaw, cut the legs on the line so they will sit flat. The base is now complete.

Building the music desk—The basic structure of the music desk is the inverted T formed by dadoing the vertical support into the back of the shelf. The dimensions for these two parts are given in the bill of materials on p. 83 and figure 3 below. To rout the adjusting slot in the vertical support parallel to the bandsawn curve of its back, I use a single-point guide fixture clamped to the router table, as shown in the left photo on the following page.

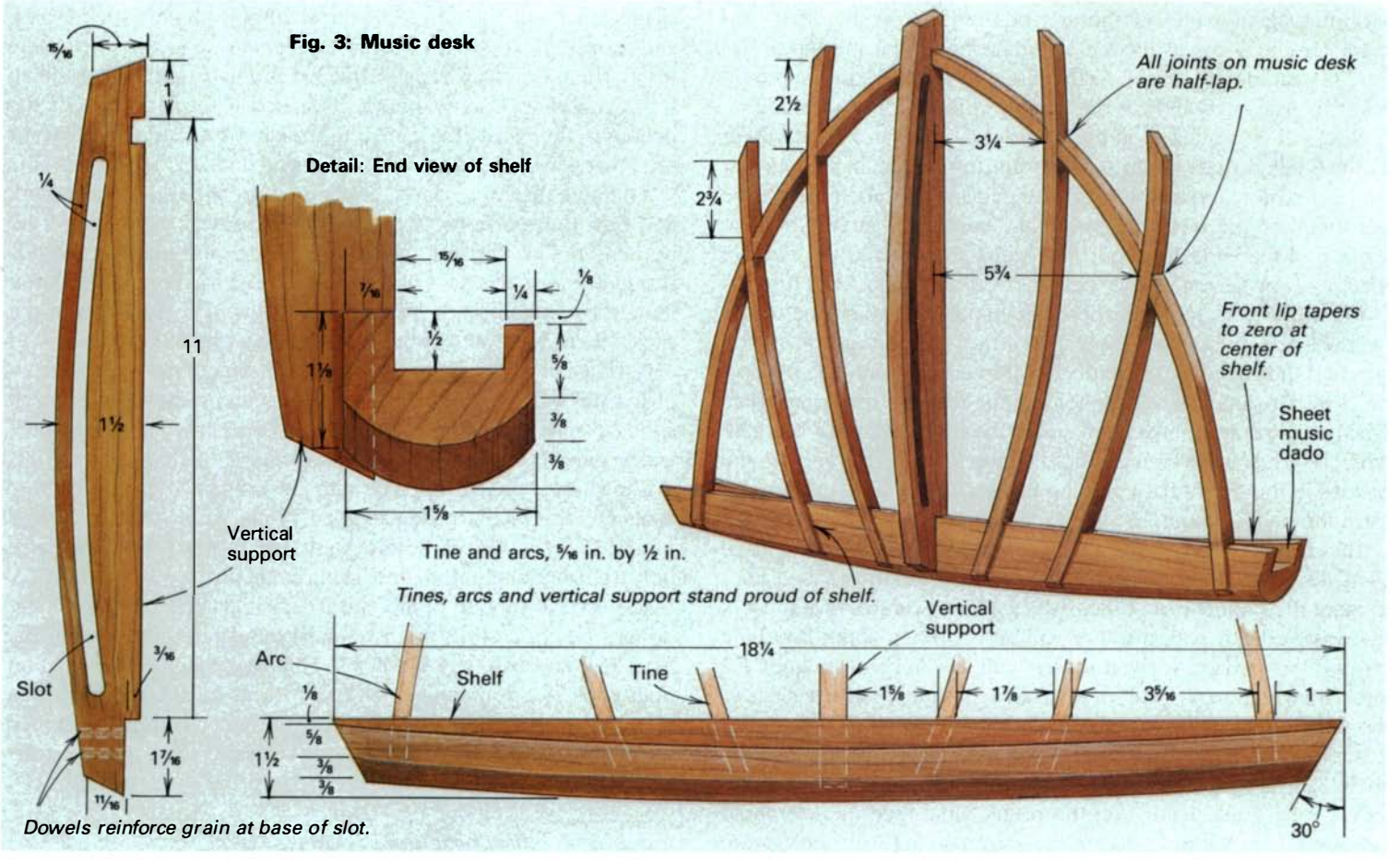
The fixture is simply a piece of plywood with a ¾-in.-dia. dowel for the guide pin and a slot for the bit to protrude through. Clamp the fixture to the router table so the pin is 5/16 in. from the edge of a ¼-in.-dia. bit, which is set to cut 3/16 in. deep. Hold the vertical support's curved back against the guide pin and plunge it onto the rotating bit. Be sure to keep the curve pressed against the same point on the guide pin as you push the piece from right to left, and lift it off the bit when you're near the slot's end. Make three passes,

The convex face of each leg is shaped on the tablesaw using the setup shown above. The blade is tilted 30° and raised up into an auxiliary fence. Trim the corners of each leg's face by running the leg against the fence while maintaining maximum contact with the blade's cutting edge. Repeat the pass until the flat area you're cutting is uniform along the curve.

increasing the bit's depth by 3/16 in. each pass. On the final pass, when the bit cuts through the workpiece, start and stop the bit a little closer to each end to establish crisp ends on the slot. A note of caution: Any plunge cut can be dangerous. Hold the piece firmly and keep the work moving right to left: If you change direction, the router bit will try to grab the workpiece and pull it out of your hands.

Mill the shelf stock to the dimensions given in the bill of materials. Then, on the tablesaw, cut the 15/16-in.-wide dado, which will hold the sheet music, the full length of the shelf. Readjust the dado blade to cut the cross-grain dado in the center of the shelf's back for the vertical support. Before proceeding with shaping the shelf, you must first individually cut and fit the other parts of the desk to

Fig. 3: Music desk



With a shopmade single-point guide fixture clamped to the router table, Ames routs the adjusting slot parallel with the back curve of the vertical support.

With the tines clamped in place, the author scribes along their edges. Next she hand-saws kerfs inside the scribed lines and then routs the dadoes.

Photo: Mark Van S

The gentle curves of this cherry music stand, made almost entirely of bent laminated parts, combine to create a piece of furniture that harmonizes with the music it supports.

the shelf and to each other. Fitting these parts isn't difficult, but it must be done in the correct order as I will describe.

The first step is to fit the arcs to the shelf, but to do this you'll need to locate where you want the miters at the tops of the arcs to come together. Place the sheet music dado on the edge of a piece of plywood on which you've drawn a line perpendicular to that edge. The shelf should be back-side up and centered on the line. Now, measure 11 in. from the top back edge of the shelf and make a mark that intersects the perpendicular line; this is the high point where the arcs meet on the vertical support. Lay one of the arcs so its convex edge intersects the 11-in. mark on the plywood and crosses the shelf 1 in. from the end. Now, use a sharp knife to scribe along the sides of the arc for the dado in the shelf, and mark for the miter at the top by referring to the perpendicular line. Repeat the procedure for the arc on the other side, and then miter the top ends and cut the dadoes in the back of the shelf.

Next, cut the half-laps on the lower end of the arcs and fit them to the shelf dadoes. Then the bottom, front edge of the vertical support is notched and fit into the dado in the shelf. Assemble the shelf and the vertical support, and scribe and cut the dado at the top of the vertical support to receive the mitered top ends of the arcs. Now, assemble the shelf, the vertical support and the arcs (without glue) to form the desk's frame and place it face down. Measure at a right angle from the vertical support and mark the arcs and the shelf where the tines will intersect them (see figure 1 on p. 82 for dimensions). By holding the tines on the appropriate lines with spring clamps, you can scribe the location of the half-laps, as shown in the center photo above. Then scribe and cut the dadoes in the shelf's back and the rabbets on the arcs and tines to form the half-lap joints.

The method I use for cutting these small dadoes is to first make ¼-in.-deep kerfs, with a Japanese saw, just inside the scribed lines to mark the boundaries of the dadoes. Then, I can remove most of the waste quickly with a router without worrying about it pulling beyond the sawkerf. A small router with a 3-in. base designed for laminate trimming is ideal for this job. I carefully rout very close to the line and perfect the final fit with a hand chisel.

After fitting all the arcs and tines, you can finish shaping the shelf. Bandsaw the bottom curve and sand it smooth. Then, use the single-point guide fixture on the router table (see the left photo above) to trim the front rim of the shelf parallel with the bottom curve. When trimmed, the rim's low point should be flush with the bottom of the sheet music dado at the center of the shelf; the low rim at the center makes for easy page turning, but because the rim rises at each end, it holds the corners of the sheet music open. It's a good idea to trim the rim in two passes to help you get the feel of it on the final cut; just move the fixture's pin closer to the bit for the final pass. When the rim is just right, cut the ends of the shelf so they slope in at a 30° angle. Sand the trimmed rim by hand and make a sanding block that fits inside the sheet music dado to clean it up.

Finally, dome the bottom of the shelf by sanding freehand on a horizontal edge sander or a belt sander clamped to the workbench. Use an 80-grit belt and draw the desired curve on the shelf's front and back. Holding the shelf at each end, rock it back and forth until you've sanded an even curve up to the line on the front. Then, draw the arc's profile on the ends and roll the shelf forward and back as you rock from end to end, to smooth the bottom to the profile. Be careful to maintain the hard edges. Repeat the process with a 150-grit belt, and then hand-sand to 220-grit.

Assemble the entire music desk one more time so you can mark and trim the top ends of the tines and vertical support and the bottom ends of the arcs and tines. The arcs and tines are slightly proud of the shelf's back and this detail is carried through by trimming their bottom ends about 1/16 in. below and parallel with the shelf's domed bottom. All the parts are disassembled and sanded to 150-grit. Glue the vertical support and the arcs to the shelf first, applying yellow glue sparingly to each joint and clamping with small spring clamps. After 45 minutes, unclamp the joints and clean off the excess glue. Then, glue the tines in place.

I finish-sand the entire piece with 220-grit paper and apply three coats of oil. I use a product called Profin, available from Daly's Inc., 3525 Stone Way N., Seattle, Wash. 98103, which is a mixture of polyurethane, tung oil, thinner and drying agents.

The vertical support of the music desk is clamped in place at the desired height and tilt by tightening round brass pulls (available from Ball and Ball, 463 W. Lincoln Highway, Exton, Pa. 19341) on both ends of a 2-in.-long stove bolt with its head cut off. I flatten opposite sides of the pulls with a few blows of a hammer; flattened pulls look more interesting and are easier to grasp between the thumb and forefinger to tighten or loosen the shelf. □

Judith Ames builds furniture in Seattle, Wash.

Shattered Glass

A novel approach to designing a tabletop

by Spider Webb

Glass can add visual impact to many different pieces of furniture. As a glazier, it was only natural that I began to experiment with ways to combine various types of glass with my woodworking. Eventually, I included the interesting textures created by shattered tempered glass. In my tabletops, the shattered pane is sandwiched between two ¼-in.-thick pieces of glass and the entire assembly is framed with 2x3 oak. The table, shown in the photo below, is 13 in. high, 24 in. wide and 54 in. long, and is made from quarter-sawn white oak with snakewood splines. I used clear glass in the top, bronze-tinted glass in the center and LOF golden vertical #208 glass (one-way mirror), available from most glass wholesalers, in the bottom.

Building the table—After determining the size of your coffee table, cut the front, back and side rails to length. For the table in the photo, I cut two ¼-in.-wide by ¼-in.-deep rabbets, ½ in. apart, on both ends of all the rails to accept the ½-in.-long snakewood splines. To hold the ¾ in. of glass, I cut 13/16-in.-deep dadoes the length of all the rails. This leaves 1/16 in. on all sides so the glass can move once it is inserted into the frame. After cutting the rails, test-fit the frame for accuracy.

Next, cut the four legs to the desired length, and then measure and drill holes in the legs and underside of the frame for 1-in.-long, ½-in.-dia. dowels to join the legs to the frame. I cut ¼-in. by ¼-in. slots, ¾ in. down all sides of the legs and 1¼ in. from the end of the underside of the frame to receive ½-in.-thick triangular braces. Mill ¼-in. tenons to fit into the legs and bottom of the table.

Dry-assemble the frame, and then drill a ⅛-in. hole in one side rail so you can later shatter the center glass. I center this hole in the dado in the middle of one side because I like the pattern created when the glass shatters: the lines branch out like a tree.

Before glue-up, I round the corners of the legs with a ¼-in. roundover bit in the router. Then, I disassemble the frame and sand all the pieces. The next step is to glue up the table. I use G-2 slow-curing epoxy, available from The Wooden Boat Shop, 1007 N.E. Boat St., Seattle, Wash. 98105. After cleaning the squeeze-out with acetone, I let the frame dry for several days and then stain the oak with Benite sand-and-fill stain, available from Daly's Inc., 3525 Stone Way N., Seattle, Wash. 98103. Although it's a bit more expensive than most, I think it's four times as good.

Then, cut the panes of glass to fit the frame and thoroughly clean them. After dry-fitting the glass in the frame, I run a thin bead of clear silicone caulking around the inside of the top dado, and then glue up the frame around the glass. The caulking seals the top piece of glass so coffee and other liquids don't leak into the middle of the table.

The final step is to shatter the glass through the ⅛-in. hole previously drilled in the center of the side rail dado. When I first began making these tables, I tried using a nail to break the center glass, but usually ended up breaking the top or bottom glass because the nail bent too easily when hit with a hammer. From all my trials and errors, I've found that a flat, hardened punch works the best because it doesn't bend. To shatter the glass, lightly hit the punch with a hammer; be careful not to chip the glass, however, because it won't shatter from that spot and you'll have to make another hole. When the center glass has shattered and branches out like a tree, your table is complete. □

Spider Webb is a hobbyist woodworker who owns University Glass in Seattle, Wash.

The author has made shattered-glass tabletops from many types and textures of glass. Here, bronze-tinted glass was sandwiched between two other panes of glass, framed with oak and then shattered from a single point on one edge so the cracks branch out like a tree.

Photo: Anil Kapahi

Building a Nightstand

A small table with an oriental flair

by Gary Rogowski

A nightstand shouldn't be so plain that it puts you to sleep. I designed the cherry nightstand in the photo below as part of a bedroom set, but I think the resulting table stands alone quite nicely. The cloud-rise pattern on its rails along with the rosewood pull on the drawer give the nightstand a look reminiscent of Chinese furniture. The basic design can be adapted for an end table, but keep in mind that if you change proportions in one area, other dimensions will need to change as well.

Since it was designed as a nightstand, the first parameter for establishing dimensions was the 20-in. height of the bed's mattress, to which the stand would be a partner. I decided on a height of 23 in., and then proportioned the stand's width and depth to complement this height and allow enough space on top for a lamp, book and cup. The flaring legs add visual weight to the base of the nightstand, while the cloud-rise pattern on the rails softens this effect and lightens the load. The rails are inset from the legs to provide depth and shadow play, and the overhanging top is beveled to give the entire piece definition and a certain oriental grace. The rosewood drawer pull is the final touch and gives the stand its own personal character.

Photo: Jim Piper

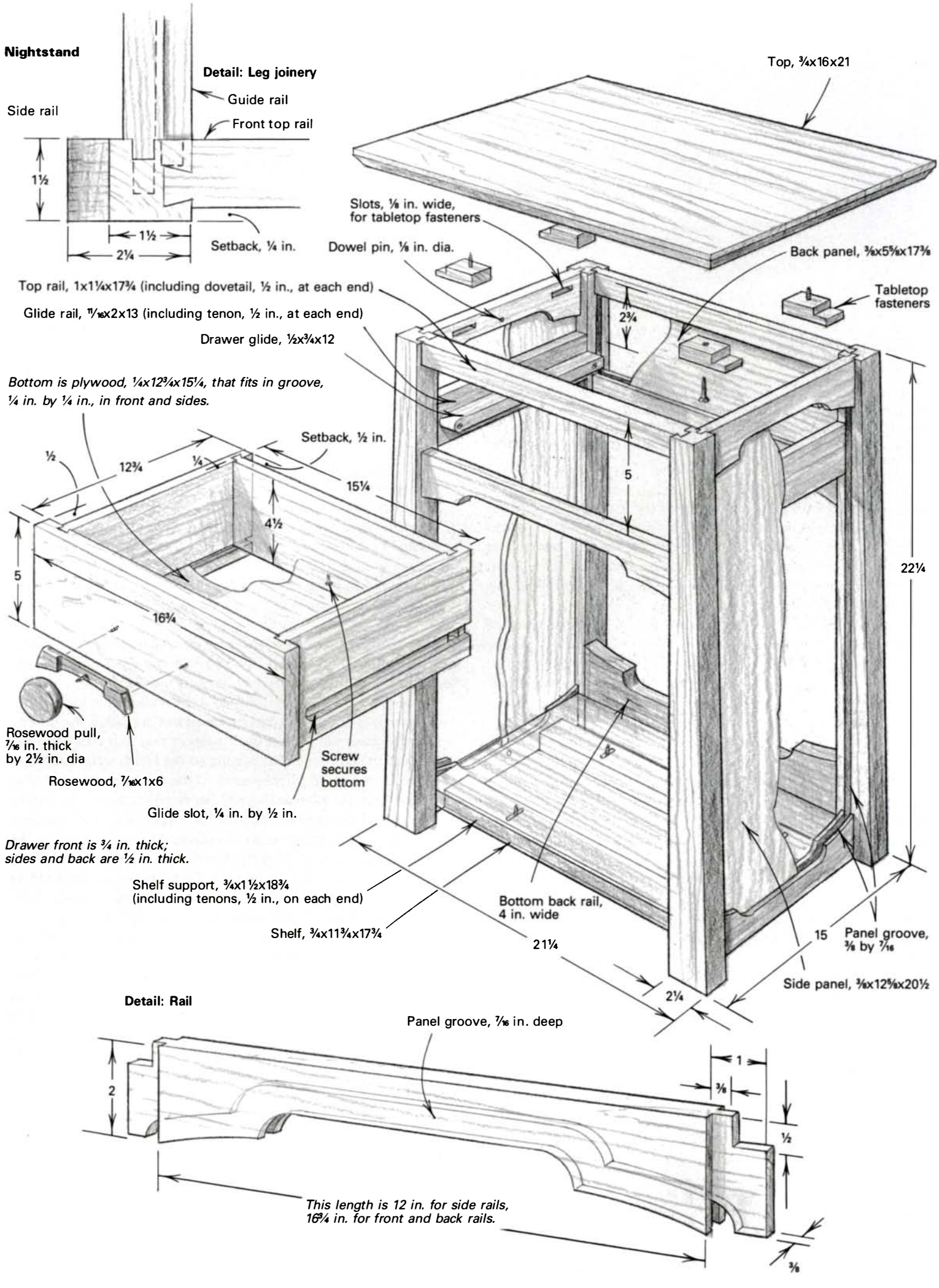
Although designed as a nightstand, this little cherry table would serve just as well as an end table alongside a couch or chair in any room in the house.

The nightstand is constructed following the same methods I use for larger cabinets or chests. The carcase frames are joined with haunched tenons in routed mortises and the panels that fill these frames are glued up from solid cherry. The bottom shelf and the nightstand's top, which are also solid wood, are mounted as shown in the drawing to allow for seasonal expansion and contraction. The drawer parts are all joined with sliding dovetails and the ¼-in. plywood bottom is slid into grooves in the sides and front and screwed to the bottom of the drawer's back. Although simple in design, the nightstand is a challenge to build because of its joinery and details.

Joining the carcase—The nightstand requires about 4 bd. ft. of ⅝ cherry for the legs and about 18 bd. ft. of ¼ cherry for everything else including the drawer parts. I mill the parts for the entire piece about ⅛ in. oversize and let them sit for about a week in the shop, so they can warp or cup if they're going to, before final dimensioning. The 1½-in. by 2¼-in. legs are then milled and crosscut to length, and all the mortises and panel grooves are routed in them before the outside face is tapered. Similarly, the rails are milled to size and the tenons tablesawn on their ends before the cloud-rise pattern is bandsawn. The top rails, drawer glide rails and side panels can be milled now as well. The panels are only ⅜ in. thick, so I resaw them from full ¼ stock and sticker them so the interior and exterior moisture contents can equalize for a few days before I glue up the book-matched boards. The nightstand's ¾-in. top and its bottom shelf can be glued up somewhat oversize at this time.

I use a plunge router with a ⅜-in.-dia. bit to cut all the mortises, and then chisel the ends of the mortises square to accept the square tenons. You could round the tenons to fit the radius of the router bit instead, but on a joint this small I figure the more gluing surface the better. The mortises should be about 1/16-in. deeper than the tenons to ensure the tenons don't bottom out and to provide space for excess glue. When the mortises are complete, cut the tenons on the ends of the rails on the tablesaw. First, cut the shoulders with the rail flat on the table and the miter gauge set to 90°. Then, make a simple tenoning jig to hold the rail vertically as you run it along the rip fence and trim the tenons to fit the mortises. Finally, bandsaw the tenon to create the haunch. I'm partial to haunched tenons because the haunch allows the tenon to run full width to resist twisting, while the main portion of the tenon can extend deeply into the leg or stile without weakening this member.

The top rails above the drawer in the front and back of the



Drawing: Roland Wolf

With the side frame clamped to the workbench, Rogowski routs the panel groove with a bearing-guided slotting bit. A ½-in.-thick board is laid atop the shaped rail to fill the setback between the inside surfaces of the rail and leg, providing a consistent surface for the router base.

nightstand are dovetailed into the top of the legs. I cut these dovetail-shape mortises and tenons with a dovetail bit on my router table. The mortises are cut first, and then the fence is moved over so it exposes only a small portion of the bit to cut the tenon on the ends of the top rails (see the top and center photos on the facing page showing drawer construction).

When all the mortises and tenons are cut, dry-assemble the frame to check for fit and to see that the tenon shoulders pull up tightly. Disassemble the parts and fine-tune the tenons if necessary. At this time you can also shape the rails. Because the same cloud-rise pattern is repeated at the end of each rail throughout the piece, I make a full-size template from ¼-in.-thick Masonite and use it to draw the shape on the rails. I bandsaw just outside this line, attach the template to each rail with double-stick tape and trim to the template with a flush-trim bit on my router table. I stop just short of the end of the curves to prevent tearout and finish up with very light cuts with the router. Clean up the final shape and remove the router marks with a spokeshave or file and then sand the curves smooth.

Next, dry-assemble the legs and the shaped side rails to form the side frames. However, leave out the drawer glide rails because they'll be in the way as you rout the panel groove on the internal edges of the frames. Clamp the frame to the workbench and use a ¼-in. slotting bit to cut a 7/16-in.-deep groove centered in the edge of the rails. The bearing of the slotting bit follows the curve of the rails but you'll need to place a ½-in.-thick board on the rails, as shown in the photo above, to bring the rail's surface flush with the legs. The panel is ⅜ in. thick, so I reset the bit's depth and make two passes to cut a ⅜-in.-wide groove. Repeat this procedure to rout the groove on the back legs and rails for the small back panel that covers the drawer opening. After the panel grooves are cut, disassemble the frames and draw the taper on the outside surface of each leg. Then, bandsaw close to the line and clean up the face on the jointer.

Making the panels and gluing up the carcase—Now, turn your attention to the panels. Glue up the side panels and cut them and the back panel at least 1 in. longer and wider than the inside dimensions of their respective frames. After the glue is dry, plane the panels ⅜ in. thick. Then, lay the appropriate frame on its panel and trace around the inside edge of the frame to define the panel's shape. Add 5/16 in. around the entire perimeter of this line so the panel will fit into the groove, and then bandsaw the panels to size. I check the fit of the panels in the grooves and handplane the panels to fit snugly. Then, I finish-sand them and apply the first of three coats of a mixture of equal parts Danish oil and polyurethane varnish. I wait a day in between coats and finish both sides of the panels the same. Prefinishing the panels ensures that no unfinished wood peeks free of the frame if the panel shrinks during an especially dry season. It's also much easier to wipe on and rub out the finish before assembly.

After the third coat of finish on the panels is dry, you're ready to assemble the side frames. Use just a little glue on the tenons to prevent excess squeeze-out onto the legs or panels, and brush a more liberal coat of glue into the mortises, especially at the mouth of the joint. Don't forget to glue in the drawer glide rails. After the frame is glued up and clamped, check to see that it's flat and hasn't been twisted out of shape by clamping pressure. When the frame is dry, pin the panels in place with ⅛-in.-dia. dowels drilled from the inside of the top and bottom rails and centered in the middle of the panel (see the drawing on the previous page). These dowels keep the panels centered and prevent them from rattling too much if they shrink in dry weather.

The front and back rails can now be glued into the side frames to form the carcase. In order to simplify the glue-up as much as possible, set aside the dovetailed top rails and back panel. It's not necessary to glue these parts in place at this time because the panel can be slid in place and the rails glued into their mortises after the rest of the carcase is glued up. I get the clamps ready, one for each of the rails that I'm gluing in place, plus a couple extra to square up the clamped-up carcase if necessary. Because it's difficult to clamp to the tapered legs, bandsaw angled clamping blocks and tape them to the tapered surfaces so the clamps won't slip.

Lay one of the side panels flat on the workbench with the mortises up, and glue the front and back rails that are below the drawer, the back bottom rail and the shelf support rails into their mortises. Then, with the other side panel laying on the bench with its mortises up, spread glue and fit all the tenons of the five rails into their mortises, and force the joints home with bar or pipe clamps. Then, place the nightstand upright on a reliably flat surface and, if all four legs don't make contact, clamp diagonally across the front and back of the carcase frame to square them up. Test-fit the top rails into the dovetail mortises to see that the carcase hasn't been distorted out of square in the horizontal plane by uneven clamping pressure. Now, you can insert the back panel and glue in the top rails.

With the base of the stand assembled, the top of the stand and the bottom shelf can be ripped and crosscut to size. I rout slots in the upper side rails with a ⅛-in. slotting bit for the tabletop fasteners that hold the solid top in place. The bit's depth must be set properly so the fasteners will hold without too much strain or slop, so I first cut a practice piece to check this setting. I bevel the edges of the top, as shown in the drawing, and then I apply three coats of my oil/varnish mix to the glued-up carcase frame and to the top and the bottom shelf. When the finish dries, I fasten the top and the bottom shelf in place.

Constructing the drawer—One of the nice things about using sliding dovetails to join the drawer sides to the front, is that I can use the same setups to join the back of the drawer to the sides. The secret to a good-fitting sliding dovetail is accurately milling the parts. The drawer sides and back must all be the same thickness and their ends and edges must be square with the planed faces. I use a ¾-in.-thick front with ½-in.-thick sides and back. Rip

the drawer parts 1/16 in. over their finished width so any chip out resulting from routing the dovetails can be jointed smooth. Crosscut the back a little long so you can cut it to fit after you've routed its mortises in the sides. Before routing, carefully hand-sand all surfaces with a sanding block because surface-sanding the mortised parts after routing them will spoil the fit of the dovetails' shoulders.

The top and center photos at right show the two setups for routing the mating parts. Before routing the dovetail mortises, I like to rout or dado ¼-in.-wide slots centered where the mortises will be so the dovetail bit doesn't have to remove so much wood in a single pass. Then I rout the mortises with the fence set for a ½-in. setback. I hold a scrap block in front of and behind the drawer part to reduce the possibility of the bit tearing out the edge as it enters or exits the cut.

After cutting the mortises, unclamp one end of the fence and move it into the spinning bit so it cuts into the fence. When only a small portion of the side of the bit is exposed, as shown in the center photo at right, reclamp the fence. I've found that I get the best fit by lowering the bit just a hair when I cut the tenons. However, to avoid a chance of lowering the bit too much and losing all reference to the original height, you can use a thin paper shim under the ends of the workpieces as you cut the male portion of the dovetails. To set the fence for a snug-fitting dovetail, make a test pass on both sides of an off-cut from the drawer sides that has been sanded to the same thickness as the drawer parts. The test dovetail should slide into the mortise without excessive pressure, but without any slop. When you've got the fit just right, cut the tails on the front ends of the sides, and then slide them into the mortises in the drawer front and measure between the sides to get an exact measurement for the length of the back. Trim the back to length and rout the tails on both ends. Now, joint the edges of the parts to remove sawmarks or chip out, and rout the grooves for the drawer glides in the sides. Finally, rout the bottom grooves in the sides and front, and rip the back piece narrow enough that the bottom will slide beneath it.

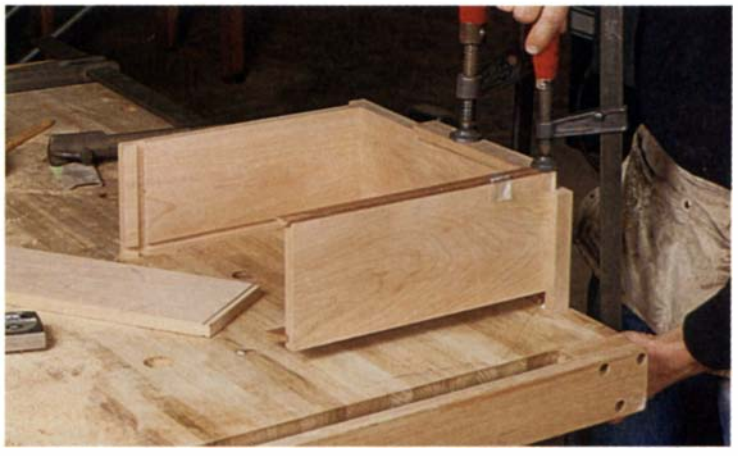
I shellac my drawer parts on all sides, except the drawer face, before gluing them together, taking care not to get any finish into the joints. Shellac is a quick finish to apply and by adding a few drops of your favorite scent, the drawer will smell much sweeter than an oil-finished drawer. The outer face of the drawer front is finished with the same oil and varnish mixture used on the rest of the nightstand.

When gluing up the drawer, spread glue only in the mortises to avoid excessive squeeze-out. Begin by gluing the sides into the front one at a time with the drawer front standing right-side up near the edge of the bench, as shown in the bottom photo at right. Start the dovetail into the mortise and then press it home with a bar clamp spanning from beneath the bench to the top of the drawer side. Keep the side moving once you start or it will freeze up and you'll need a great deal of force to break it free. Have a piece of ¼-in. plywood handy to check the alignment of the bottom grooves. When both sides are in place, turn the drawer around and clamp the back into the side mortises. Then, slide the bottom into the side grooves and screw it to the bottom of the back.

The two drawer glides are screwed to the drawer glide rail, as shown in the drawing on p. 89. The glides must be about ¾ in. wide to span the ½-in. setback between the rails and the drawer sides, plus extend into the ¼-in.-deep grooves in the drawer sides. To install the glides, predrill and countersink screw holes in them and then, with the glides in the side grooves, slide the drawer into the carcase. Pull the drawer out little by little while holding the back end of the glide against the drawer glide rail from below, and screw the glides to the rails as you go. Then, wax the glides and grooves for a smooth, sliding action.

I always save designing my drawer pulls for last because I like to see the completed piece from all directions and play with a number of options. I make models in cardboard or alder and paint them black, to provide contrast, and then try them on the drawer face until I find a design that is complementary to the piece and easy to handle. The drawer pull for the nightstand is made of rosewood and screwed to the drawer face from inside the drawer with brass oval-head screws and finish washers. □

In the photo above, the author cuts the dovetail mortise on the drawer front. He holds a scrap block against the workpiece to prevent chip out and as he proceeds through the cut, he moves the scrap to the back edge. A ¼-in.-deep groove, visible on the free end of the workpiece, is cut to remove most of the waste from the mortises prior to a single pass with the dovetail bit. In the photo below, the dovetail tenon on a drawer side is being cut. The fence has been moved to cover most of the bit, leaving just enough of it exposed to result in the right size tail after making a pass on each side of the workpiece.



The sliding dovetails on the drawer sides are pressed into the mortises in the drawer front with a clamp, as shown above. Then, the drawer is reversed and the back is pressed into the side mortises.

Gary Rogowski designs and builds furniture in Portland, Ore. This summer he will be teaching a course on stool building at Anderson Ranch Arts Center, Box 5598, Snowmass Village, Colo. 81615; (303) 923-3181.

Canadian Woodcarving Exhibition

An international display of talent

by Sandor Nagyszalanczy

When someone says "woodcarving," I think many people imagine the little frogs and Indian heads that kids whittle with pocket knives at summer camp. That kind of prejudice is probably why so many visitors at a first-class woodcarving exhibit tend to walk around with their jaws agape—victims of the realization that a block of inert wood can be transformed into something beautiful and vibrating with what I call "the breath of life." There were many gaping jaws at the 13th Canadian International Wood Carving Exhibition (CIWCE) last summer, and the top-prize-winning carvings, shown on the facing page, weren't the only pieces worth seeing; the overall quality of carving was very good indeed.

Held in Toronto annually, the CIWCE is one of hundreds of attractions at the Canadian National Exhibition (CNE, which is Canada's equivalent of a world's fair) held in late August/early September. Some call the CIWCE the greatest woodcarving show on earth and, although several other shows are vying for the title, the exhibit displayed a remarkable breadth of carving styles and subject matter. The dozens of classes of entries range from standard carving categories, like in-the-round human figure and relief, miniature and decoy carving, to unusual classes, such as dinosaurs in-the-round, carved walking sticks and agricultural relief carvings, to categories not often included at carving exhibitions, such as wood burning and marquetry. Although most of the entries are from Canada and the United States, the show received more than 800 entries from 250 plus carvers all over the world. The work is mostly done by amateurs, although a fair number of entries are submitted by part-time and full-time professional carvers.

The CIWCE awards more than 50 prizes to the best carvings, including more than $15,000 in cash, gift certificates, tools and trophies donated by the show's three dozen benefactors. The Ontario Wood Carvers Association, which co-sponsors the exhibit with the CNE, lined up the prizes, set the rules for the competition and selected the judges. Besides the usual Best of Show and first place, second place, etc., the CIWCE features some unusual awards, such as the one for the best carving of a forestry subject (sponsored by the Ontario Forestry Association) and four Demers awards (sponsored by Gerald Demers, who owns Canadian Carver Craft Shop in northern Ontario). The Demers trophies, which are themselves carvings, are for the best North American Indian, Man At Work, Family Group and Outdoorsman. While the awards encourage a healthy competition, the recipients of the highest awards can expect to win more than prizes; it's said that the recognition that comes with winning a Best of Show can considerably raise the value of a carver's work.

The top prize winner at the CIWCE was Neil Cox, a professional carver from Ingersoll, Ont. The only disappointment he might have faced would have been not finding a bag big enough to carry home all his awards: Besides taking Best of Show and four other awards for his "Canadian Woodsman," shown on the facing page, Cox also won nine other awards for carvings ranging from human figures to aquatic wildlife to abstract. Cox, whose considerable carving talents have been enhanced by diverse studies, such as marble carving in Italy, employs modern technology to aid his carving process. As an example, for "Canadian Woodsman" he used a home video camera to photograph his model from every angle, as well as to take action shots of the fringed jacket blown by a fan. He then used the video's stop action feature to freeze and advance the images, until he could isolate the particular moment of action embodied by the carving. For additional authenticity, Cox's model for the carving was a black powder enthusiast who was also well versed in the history of the early 1800s—the period this carving represents.

In addition to his concern for accuracy, Cox infuses each of his pieces with imagination. Every carving is based on a very detailed story about the moment captured in the carving. This carving captures a Canadian woodsman, who was acting as a guide for a group of settlers, just as he reached a ridge top, looked over the other side and signaled to the group that it was all right to proceed.

Besides the carvings on display, the exhibit featured a number of ongoing demonstrations of woodcarving, wood burning and marquetry. While I was there, Ontario woodcarver Tom Gallagher demonstrated carving techniques on a large figure of two polo players on horseback. In preparation for this and other carvings, Gallagher uses a computer to accurately scale all the proportions for his figures. First, he uses anatomical charts to reference average body measurements, such as the length of a horse's leg from the ankle to the knee or the distance between the eyes of an average-size man. These dimensions are entered into the computer, and then after picking the scale for the carving, Gallagher produces a printout of scaled sizes he can use to lay out his carving. For the polo players piece, Gallagher glued up a large blank (2 ft. by 3 ft.) from narrow strips of walnut. After what he described as "a short prayer service," Gallagher roughed out the forms with a chainsaw, and then proceeded with carving chisels and gouges.

One of the goals of the CIWCE is to bolster interest in carving, and judging by the almost 200,000 people who toured the exhibit during its duration, that goal was fulfilled. Ruth Badzo, a Toronto woodcarving instructor, told me that two days into the show, her carving classes were already overbooked. Her work isn't in vain: Out of her 50 students with entries in the show, 45 won ribbons, including Margaret Walker, whose piece is shown on the facing page. □

Sandor Nagyszalanczy is Associate Editor for FWW. *For more information about entering the 1990 CIWCE, contact: Orysia Gay, Attractions Coordinator, CNE, Exhibition Place, Toronto, Ont., Canada M6K 3C3; (416) 393-6240, after February 19.*

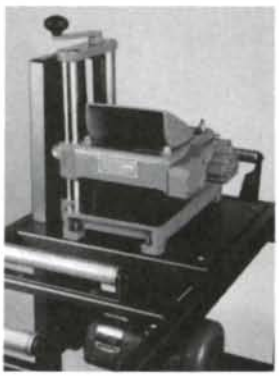
Above: "Canadian Woodsman," by Ont., Canada, carver Neil Cox, won Best of Show, as well as four other top awards at Toronto's 13th Canadian International Wood Carving Exhibition. The 30-in.-tall basswood sculpture is a Canadian frontiersman in the early 1800s.

Below: French Canadian Edouard Beaudoin spent more than 400 hours building and carving his 88-in.-tall black ash grandfather clock. Beaudoin, who makes furniture professionally, won the Special Award for Furniture prize with his clock.

" 'Tis in a strange bar late and the lady caressing his thigh is not the wumin of his dreams" is the unusual title of this 25-in.-high carving by Minnesota carver Fred Cogelow (above). According to Cogelow, the dual figures–the front mask carved in black walnut and the other figure in butternut–represent "inner and outer selves," and are part of a series of carvings exploring that theme. Cogelow, three-time winner of Best of Show at the CIWCE, won first runner-up to Best of Show and won Best Relief overall with the piece.

A retired professor who once taught outdoor education, Margaret Walker chose a clump of mushrooms as the subject for her relief carving "Honey Mushrooms," below left, which took first place in the Flowers and Plant Life Relief category. The piece, including the frame, is carved from 4-in.-thick basswood.

A veterinarian by trade, self-taught woodworker Lyn Alexander's piece "At The Waterhole" won first prize for First Year Carver In-The-Round and fourth place in the overall In-The-Round Carvings category. The 8-in.-tall basswood horse is only Alexander's seventh woodcarving.



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34-985	⅙ H.P. stock feeder	698	489
32-100	"NEW" stationary plate jointer	645	445
36-040	"NEW" 8¼ compound mitersaw	216	155

MILWAUKEE TOOLS

0399-1	"NEW"12V cdlss var/spd drill w/batt., charger & case	280	155
0395-1	9.6V cdlss. drill w/cse	264	149
0219-1	9.6V cdlss. drill w/cse	277	165
0385-1	7.2V cdlss. drill w/cse	174	115
0224-1	⅜" drill 4.5A magnum	189	112
0234-1	½" drill 4.5A mag 0-850 rpm	199	107
0244-1	½" drill 4.5A mag 0-600 rpm	199	107
0222-1	⅜" drill 3.5A 0-1000 rpm	174	97
0228-1	⅜" drill 3.5A 0-1000 rpm	164	95
0375-1	⅜" close quarter drill	208	115
0379-1	½" close quarter drill	243	139
6539-1	Cordless screwdriver 190 rpm	113	69
6540-1	Cdlss. screwdriver w/bits & cse	154	99
6546-1	Cdlss.screwdriver 200 & 400 rpm	120	75
3102-1	Plmbrs rt angle drill kit	330	189
3002-1	Electricians rt angle drill	320	185
5399	½" D-hdle ham drill kit	304	185
1676-1	H.D. Hole Hawg w/cs	415	224
6511	2 sp SawZall w/case	214	125
6405	8¼" circle saw	219	129
6750-1	Drywall gun 0-4000 4.5A	154	89
6507	TSC SawZall w/case	229	129
6170	14" chop saw	430	249
6012	Orbital sander 3⅝"x7⅜"	189	109
6014	Orbital sander 4½"x9¼"	199	115
6305	6¼" cordless circle saw	299	175
8977	Var. temp heat gun	114	75
5397-1	⅜" v. spd. hammer drill kit	232	139
5371-1	½" v. spd. hammer drill kit	318	179
3107-1	½" v. spd. rt angle drill kit	340	195
6754-1	Drywall gun 0-4000 4.5A	179	119
6747-1	Drywall driver-0-2500	154	95
0230-1	⅜" drill 0-1700 rpm	179	105
3300-1	½" v. spd. magnum rt angle kit	299	179
5660	Router 1½ H.P.—10 amp	299	189
5680	Router 2 H.P.—12 amp	350	225
5455	⅞" polisher 1750 rpm	209	125
6215	16" chain saw	280	179
8975	Heat gun	89	59
6365	7¼" circular saw	195	114
6366	7¼" circ saw w/fence & bld	204	119
6368	7¼" circ saw w/fence, bld & cse	233	129
0216-1	2 spd cordless drill Hi-torque	222	129
0235-1	½" drill keyless chuck mag	209	119
6016	¼ sheet pad sander	79	52
6145	4½" grinder 10,000 rpm	154	95
6142	6145 w/cse & access.	192	113
6749-1	Drywall gun 0-2500 4.5A	189	125
6377	7¼" worm drive saw	295	165

FREUD SAW BLADES

⅝" Bore—Industrial Grade

CARBIDE TIPPED SAW BLADES

Item No.	Description	Diam.	Teeth	List	Sale
LU72M010	Gen. Purp. ATB.	10"	40	58	39
LU81M010	Gen. Purp. TrCh	10"	40	65	43
LU82M010	Cut-off	10"	60	77	45
LU84M011	Combination	10"	50	65	42
LU85M010	Super Cut-off	10"	80	96	57
LM72M010	Ripping	10"	24	57	38
LU73M010	Cut off	10"	60	70	44
LU87M010	Thin kerf	10"	24	60	39
LU88M010	Thin kerf	10"	60	74	44
LU89M010	Ultimate	10"	80	107	79
LU89M010	Non-ferrous metal	10"	72	87	65
PS203	Gen'l Purp.	7¼"	24	25	19
PS303	Plywood	7¼"	40	36	25
OS306	6" Dado - Carbide			184	105
OS309	8" Dado - Carbide			196	115
F0	1¾"x⅝" Biscuits 1000-Qty.			32	27
F10	2¼"x¾" Biscuits 1000-Qty			32	27
F20	2⅝"x1" Biscuits 1000-Qty.			34	29
FA	Assorts Biscuits 1000-Qty			34	29
WC104	4 pce. chisel set w/cse ¼"-1"			54	39
WC106	6 pce. chisel set w/cse ¼"-1"			73	52
WC110	10 pce. chisel set w/cse ¼"-1½"			119	79
FB100	16pce forstner bit set ¼"-2⅛"			284	155
94-100	5 pce router bit door system			288	155
JS100	Biscuit Jointer w/case			300	159
CE82	Planer w/cse. carb blds. & guide			218	129
FT2000	3¼ H.P plunge router			299	185

MAKITA CORDLESS

Model		List	Sale
6070DW	⅜" var. spd. rev. drill, 7.2v	123	75
6071DWK	⅜" var. spd. rev. drill w/removable batt. 7.2v	190	109
5090DW	3⅜" saw kit, 9.6v	243	135
5600DW	6¼" circular saw, 10.8v	317	169
6010DWK	⅜" cordless drill kit, 7.2v	155	95
6010SDW	⅜" cordless drill, 7.2v	103	65
DA3000DW	⅜" angle drill, 7.2v	238	130
8400DW	Hammer drill kit, 9.6v	258	149
4390DW	9.6 volt cdls. recip saw kit	218	124
4300DW	Jig saw kit comp., 9.6v	220	125
6010DL	⅜" drill w/flashlight, 7.2v	198	115
6710DW	Cordless screwdvr kit, 7.2v	186	105
6012HDW	2 spd. driver drill w/clutch & case, 9.6v	224	115
6092DW	V/spd. drill, kit complete	237	120
6093DW	V/spd drill w/clutch---complete	248	125
6891DW	Drywall gun 0-1400, 9.6v	225	119
632007-4	9.6 volt battery	49	30
632002-4	7.2 volt battery	42	28
5007NBA	7¼" saw w/elec. brake	228	124
5008NBA	8¼" saw w/elec. brake	276	155
8D4510	¼ sheet pad sander	80	49
9900B	3"x21" belt sander w/bag	254	139
9924DB	3"x24" belt sander w/bag	268	145
9045B	½ sheet finish sander	216	125
9045N	½ sht fin. sand. w/bag	219	125
4200N	4¾" circ. saw 75 amp	213	119
5201NA	10¼" circ. saw 12 amp	560	295
4301BV	Orb. v/sp jig saw 3.5 amp	274	149
JR3000WL	2 sp recip saw w/cse	220	122
JR3000V	Vs. recip saw w/case	224	121
LS1020	New 10" miter saw	440	239
9820-2	Blade sharpener	354	199
410	Dust collection unit	480	269
3705	Offset trimmer	255	145
1900BW	3¼" planer w/case	198	109
1100	3¼" planer w/case	381	209
9207SPC	7" sander-polisher	262	149
3601B	1⅜ H.P. router	242	139
3700B	½ H.P. trimmer	180	109
9501BZ	4" grinder, 3.5 amp	137	69
B04530	6" round sander	95	59
B04550	¼" sheet pad sander w/bag	85	55
DA3000R	⅜" angle drill	256	145
DP4700	½" v/sp w/rev. 4.8 amp	198	119
HP2010N	¾" v/sp hammer drill w/cse	285	165
2708W	8¼" table saw	474	255
2711	10" table saw w/brake	800	479
GV5000	Disc sander 5"	109	69
6800DB	2500 rpm 3.5 amp, drywall	140	89
6800DBV	0-2500 rpm 3.5 amp, drywall	154	95
6801DB	4000 rpm 3.5 amp, drywall	140	89
6801DBV	0-4000 rpm 3.5 amp, drywall	154	95
2030N	12" planer/jointer	2970	1825
2040	15⅝" planer	2470	1525
1805B	6½" planer kit w/case	646	359
JV1600	var. speed jig saw	220	129
JV2000	var. speed orb. jig saw	242	135
5005BA	5½" circular saw	211	119
9503BH	4½" sander-grinder	153	89
6404	⅜" drill 0-2100 rpm, 2 amp.	102	65
6510LVR	⅜" drill rev. 0-1050 rpm	137	79
6013BR	½" drill rev. 6 amp	240	135
5402A	16" circular saw - 12 amp	605	328
3612BR	3 H.P. plunge router	376	189
9401	4"x24" belt sander w/bag	302	165
3620	1¼ H.P. plunge router w/cse	182	105
4302C	V/spd. orb. jig saw	287	155
5077B	7¼" Hypoid saw	248	138
LS1440	14" Miter saw	624	425
2414	14" cut-off saw AC/DC	350	205
5007NB	7¼" circ saw 13 amp	209	114
3612B	3 HP plunge router sq/b	376	195

SKIL SIZZLERS

Model		List	Sale
5510	(551) 5½" circ saw	112	95
5625	(552) 6½" circ saw	175	124
5656	(553) 7¼" circ saw	132	119
5665	(554) 8¼" circ saw	204	145
5750	(807) 7¼" circ - drop foot	198	142
5765	(808) 8¼" circ - drop foot	216	149
5790	(810) 10¼" circ - drop foot	400	269
5825	(367) 6½" worm saw	229	148
5865	(825) 8¼" worm saw	250	164
4580	Vari - orbit jig saw w/cse.	144	105
3810	10" Miter saw	363	219
595	3"x21" sander w/bag 5.5A	197	125
7575	¼" palm sander	52	49
7313	3x18 belt sander 4.5A	72	65
77	7¼" worm drive saw	230	139
5350	2½ HP circ. saw	80.99	74
5250	2¼ HP circ. saw	58.99.	64

XTRA SPECIAL BY SKIL

2735-04	12v V.Spd. Cordless Drill comp. w/cse & 2 Batt.	210	135

LEIGH DOVETAIL JIGS

D1258-12—List 314.00—Sale 265.00
D1258-24—List 375.00—Sale 305.00
LEIGH INSTRUCTIONAL VIDEO—SALE 29.00!!

HITACHI TOOLS

Model		List	Sale
TR6	Trimmer	177	95
TR8	Plunge router, 1½ H.P.	219	119
TR12	Plunge router, 3 H.P.	354	169
C10FA	10" dlxe. miter saw	490	269
C8FB	8½" slide compound saw	859	469
FREUD LU91M008	- 8½" c/bld 48 tooth	58	45
C15FB	15" miter saw	745	399
FREUD LU85M015	- 15" c/bld 108 tooth	181	115

DELTA TOOLS

34-444	Table Saw Complete w/1½ H.P. motor & stand	595.00
34-445—34-444	Table Saw complete w/30" Unifence	779.00
33-150	8¼" Saw Buck	485.00
28-283F	14" Band Saw w/enclosed stand & ¾ H.P. motor	685.00
70-200	NEW 20" Drill Press	719.00
17-900	16½" Floor Drill Press	369.00
40-601	18" Scroll Saw w/stand and blades	675.00

DELTA #34-080 10" MITER BOX
XTRA SPECIAL 199.00 List 289.00

PIRANHA By Black & Decker

CARBIDE TOOTH SAW BLADE

Model#	Diameter	#Teeth	List	Sale
73-716	6-1/2	18	13.10	7.10
73-756	6-1/2	36	28.96	16.30
73-717	7-1/4	18	13.14	7.10
73-737	7-1/4	24	16.36	9.00
73-757	7-1/4	40	29.72	16.35
73-758	8	40	42.04	24.15
73-759	8-1/4	40	42.86	24.60
73-719	8-1/4	22	18.96	10.60
73-739	9	30	31.48	16.25
73-769	9	60	66.58	35.90
73-715	5-1/2	16	13.00	7.30
73-704	7-1/4	18	19.50	12.49

THE SPECIAL BLACK AND DECKER PIRANHA BLADE PRICES ARE BACK!!!

Model#	Diameter	#Teeth	List	Sale
73-740	10	32	33.20	15.95
73-770	10	60	61.46	29.95
73-711	10	50	65.08	29.95

JORGENSEN STEEL I-BAR CLAMPS

Model	Size	List	Sale
7224	24"	25.82	16.75
7236	36"	27.71	17.79
7248	48"	30.44	18.85
7260	60"	33.90	22.45

ADJUSTABLE HANDSCREWS BY JORGENSEN

Item No.	Jaw Length	Open Cap	List	Sale	Box of 6
#3/0	6"	3"	14.83	8.50	47.60
#2/0	7"	3½"	15.94	9.50	51.00
#0	8"	4½"	17.74	10.25	58.40
#1	10"	6"	20.29	12.39	68.10
#2	12"	8½"	23.29	14.25	78.00
#3	14"	10"	29.53	18.30	101.75
#4	16"	12"	38.38	23.75	139.95

STYLE 37 2½" Throat ¼"x¾" JORGENSEN

Item No.	Jaw Length	List	Sale	Box of 6
3706	6"	8.86	5.99	33.95
3712	12"	9.81	6.49	36.75
3718	18"	10.83	6.99	39.70
3724	24"	11.83	7.59	43.10
3730	30"	13.19	8.59	48.75
3736	36"	14.43	9.49	53.95

PONY CLAMP FIXTURES

Model		List	Sale	Lots of 12
50	¾" black pipe clamps	12.48	7.50	80
52	½" black pipe clamps	10.41	6.00	65

STYLE J. ADJUSTABLE HANDSCREW KITS

Model	Length Jaws	List	Sale
J04	4	7.10	5.39
J06	6	8.13	5.89
J08	8	9.12	6.59
J10	10	10.66	7.29
J12	12	13.21	8.59

BOSCH

Model		List	Sale
1581VS	Top hdle. jig saw	239	129
1582VS	Barrell grip jig saw	225	123
	Bosch metal case for above jig saws	34	28
	Bosch blade assortment for jig saws 30 of Bosch's best selling blades	23.99	
1942	Heat gun 650°-900°	99	69
3268	Heat gun 600° & 1000°	89	65
1272	3"x24" belt sander	279	165
1272D	3"x24" B.S. w/bag	299	168
1273	4"x24" belt sander	295	169
1273D	4"x24" B.S. w/bag	315	179
11-212VSR	Bulldog ¾" SDS rotary	339	189
1196VSRK	⅜" v/spd hammer drill	215	110
1198VSR	½" v/spd hammer drill	229	129
1608	5.6 amp lam trimmer	140	89
1608L	Same as above w/trimguide	145	92
1608T	5.6 amp tilt base trimmer	159	99
1609	5.6 amp offset base trimmer	205	122
1609K	Lam installers kit w/1609	295	163
	Offset base, trimmer tilt base, trimguide, ¼" collet, collet nut, wrenches, hex keys and case		
1601	1 H.P. Router 25,500 rpm	165	105
1602	1½ H.P. Router 25,000 rpm	199	125
1603	1½ H.P. D handle router	223	135
1604	1¾ H.P. 2 hdle. router	219	118
1604K	Same as above w/cse & access	269	159
1606	1¾ H.P. D hdle. Router	243	139
3258	3¼" planer w/blade guard	210	129
3270D	3"x21" belt sander w/bag 5A	225	135
1273DVS	V/spd. 4x24 belt sander	339	189
1611	3 H.P. plunge router	349	195
1611EVS	"NEW" 3 H.P. elec. v/spd. plunge router	410	234
1651	7¼ circ. saw drop foot	179	99
1654	7¼ circ. saw pivot base	179	99
1632VSRK	Recip. saw 8.4A orb. v/spd.	225	135
3050 VSRK	"NEW" 9.6V v/spd. cdls. drill w/cse. & 2 batteries	235	129

BOSTITCH AIR NAILERS

Model		List	Sale
N80C-1	Utility coil nailer	730	435
N80S-1	Stick nailer	760	435
T36-50	Sheathing & decking stapler	550	334
N12B-1	Coil roofing nailer	725	435
N60FN-2	Finishing nailer	595	365
T31	Brad nailer	245	159

ELU BY BLACK & DECKER

Model	Description	List	Sale
3338	2¼ H.P. var/spd plunge router	387	265
3337	2¼ H.P. plunge router	356	245
3304	1 H.P. var/spd plunge router	261	185
3375	3⅛" universal planer 7.2 amp	280	195
3380	Biscuit jointer/spliner 5.0 amp	485	325
4024	3x21" var/spd belt sander	289	205
3303	1 H.P. plunge router	210	159
4023	3x21" belt sander 5.2 amp	261	195
4029	4x24" belt sander 9.2 amp	469	319

SENCO AIR NAILERS

Model		List	Sale
SFN1	Finishing nailer 1" - 2"	377	267
SFN2	Finishing nailer 1½" - 2½"	571	385
SN2	General purpose 1⅞" - 3"	621	445
M2	General purpose 1⅜" - 2"	475	349
SN4	General purpose 2" - 3½"	685	469
LS2	Pinner ⅝" - 1"	351	255
SKS	Stapler ⅝" - 1½"	351	245
LS5	Pinner, 1"-1½"	399	289
PW-RFR	Roofer, 1½"-1¾"	351	245

WORKMATES By Black & Decker

79-032	#200, 23#	103.00	75.00
79-033	#300, 28#	117.00	79.00
79-034	#400, 35#	152.00	99.00

JET TOOLS

Model	Description	List	Sale
JBS-14MW	14" band saw, 1 H.P.	482	385
JTS-10	10" table saw w/stand, 1½ H.P.	554	459
JTS-12	12" table saw w/stand, 1½ H.P.	630	509
JWS-18	½"spindle sharper w/stand, 1 H.P.	479	375
JJ-4	4" jointer, ½ H.P.	310	275
JJ-6	6" jointer, ¾ H.P.	465	379
JWP12	12½" bench planer, 2 H.P.	569	389
JSG-6	6" x 48" belt & 12" disc sander, 1½ H.P.	634	475
DR1012	10" bench drill press, ⅓ H.P.	179	175
DR1458	14" bench drill press, ½ H.P.	279	259
DR1758	17" bench drill press, ½ H.P.	319	285
DR1458F	14" floor drill press, ¾ H.P.	369	325
DR1758F	17" floor drill press, ¾ H.P.	395	339
DR2501F	20½" floor drill press, 1 H.P.	655	525

RYOBI SPECIALS

Model	Description	List	Sale
R500	2¼ H.P. plunge router	326	148
TS25IU	10" miter saw	392	175
TS25IUS	10" miter w/acc. kit & B & D 73-770 carbide blade	435	219
AP10	10" surface planer 13 amp.	820	358
RA200	8¼" radial arm saw	515	235
RE600	3 H.P. plunge router	398	195
R150K	1 H.P. plunge router w/cse	206	99
BE321	3"x21" v/spd. belt sander	259	125

PORTER CABLE

690	1½ H.P. router 8 amp	225	120
691	1½ H.P. router D hdle	245	135
536	1½ H.P. speedmatic router	310	195
518	3 H.P. 5 speed router	560	335
520	3 H.P. 15 amp router	510	315
309	3.8 amp lam trimmer	135	85
695	1½ H.P. router/shaper	310	195
696	H.D. shaper table	170	119
351	3"x21" belt sander w/o bag	225	125
352	3"x21" belt sander w/bag	235	129
360	3"x24" belt sander w/bag	310	175
361	3"x24" belt sander w/o bag	290	169
362	4"x24" belt sander w/bag	325	185
363	4"x24" belt sander w/o bag	310	179
315-1	7¼" top hdle 13 amp circsaw	195	115
9315-1	315-1 comp. w/cse. & carb. bld.	225	129
617	7¼" pushhandle 13 amp	195	115
9617	617 comp. w/cse. & carb. bld.	225	129
314	4½" trim saw 4.5 amp	215	124
9548	X HD bayonet saw w/case	290	179
9629	Recip saw v/sp 8 amp	235	135
9627	Recip saw 2 speed 8 amp	225	125
666	⅜" H.D. v.spd drill 0-1200 rpm	185	122
621	⅜" H.D. v spd. 0-1000 rpm	155	95
320	Abrasive plane 3 amp	160	99
9118	Porta plane 7 amp kit	335	185
7545	0-2500 drywall gun 5.2 A	169	99
7540	0-4000 5.2 amp gun	165	98
505	½ sheet pad sander	195	109
7511	⅜" v spd. drill 5.2 amp	185	109
7514	½" v spd. drill 0-750	195	119
537	1½ H.P. D hdle router	325	199
7548	Top hdl jig saw 4.8 amp	230	125
7648	Barrel grip jig saw 4.8 amp	225	135
330	Speed block sander ¼ sht	97	55
555	Plate biscuit jointer w/cse.	299	165
345	6" saw boss 9 amp	170	99
5060	"Stair Ease" stair templet	194	125
5061	"Stair Ease" hard wood	204	135
100	⅞ H.P. router	165	99
5008	Dovetail template kit	99.50	79
5009	Mortise & Tenon jig	54.95	49
7308	laminate slitter	190	129
5116	omni-jig	395	269
9647	TIGER CUB recipro saw	195	119
9850	12 volt cordless drill w/cse.	230	129
8500	Extra 12v battery	48	33
	NEW Tools By Porter Cable!		
7399	5.6 amp drywall cutout unit	120	75
7310	5.6 amp lam trimmer	145	89
7312	5.6 amp offset base lam trimmer	209	119
7319	5.6 amp tilt base lam trimmer	165	105
97310	LAM TRIM KIT W/STD. BASE. TILT BASE, OFFSET BASE. SLITTER BASE. GUIDE & CSE	330	185
7334	3.7 amp 5" random orbit sander 6000 rpm	205	119
693	1½ H.P. plunge router	280	165
97750	½" v/spd hammer drill w/cse	260	169
6931	Plunge router base	120	75

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Fine WoodWorking®

Index to issues 74 through 79

This alphabetized index to Fine Woodworking *covers departments and articles published between January 1989 and December 1989. We will publish an index once each year in our January issue. These indexes supplement, but do not replace, our cumulative indexes to issues 1 through 50 and to issues 51 through 65, which were published as separate booklets and are still available for purchase. Each reference consists of an issue number, a colon and page numbers for that issue. A hyphen between the page numbers means the discussion of the topic is unbroken on the named page; commas between page numbers indicate an intermittent discussion. The index to issues 74 through 79 and the previous booklets were prepared by Harriet Hodges of New Castle, Va.*

Events

Listings of gallery shows, major craft fairs, lectures, workshops and exhibitions are free, but restricted to happenings of direct interest to woodworkers. We list events (including entry deadlines for future juried shows) that are current with the time period indicated on the cover of the magazine, with overlap when space permits. We go to press three months before the issue date of the magazine and must be notified well in advance. For example, the deadline for events to be held in March or April is January 1; for July and August, it's May 1, and so on.

ALASKA: **Juried exhibit**–International Turned Objects Show, Jan. 6–Feb. 25. Anchorage Museum, Anchorage. Contact Sarah Tanguy, International Sculpture Center, 1050 Potomac St. N.W., Washington, DC 20007. (202) 965-6066.

ARIZONA: **Exhibit**–Furniture Makers, Jan. 2–31. The Hand and the Spirit Gallery, 4222 N. Marshall Way, Scottsdale, 85251. (602) 949-1262.
Seminars–Woodcarving seminars, Jan. 8–13; Feb. 1–3; Mar. 1–3, 5–7. Contact Dave Rushlo Woodcarvers Supply, 2530 N. 80th Pl., Scottsdale, 85257. (602) 994-1233.

CALIFORNIA: **Exhibit**–Turned wood by Robyn Horn, Jan. thru Feb. del Mano Gallery, 11981 San Vicente, Los Angeles, 90049. (213) 476-8508.
Juried show–"California Woodworking 1990," Jan. 12–Feb. 9. Open to California woodworkers. Contact Bill Docking, 3501 Teton Dr., Fullerton, 92635. (714) 526-7100.
Workshops–Various workshops including Japanese woodworking, joinery and sharpening. Contact Hida Tool Co., 1333 San Pablo, Berkeley, 94702. (415) 524-3700.
Show–Decor Art Buyers Caravan show, Jan. 20–22. Long Beach Convention Center, Long Beach. Contact Paul Karel, 408 Olive St., St. Louis, MO 63102. (314) 421-5445.
Workshop–Design, Operation and Maintenance of Saws, Feb. 26–27. Wood Machining Institute, Box 476, Berkeley, 94701. (415) 943-5240.
Exhibit–"Hands On! Objects Crafted in our Time," thru May. Craft and Folk Art Museum, 5800 Wilshire Blvd., Los Angeles. (213) 937-5544.

COLORADO: **Classes**–Woodworking and related classes, year-round. Red Rocks Community College, 13300 W. 6th Ave., Lakewood, 80401. (303) 988-6160.

CONNECTICUT: **Exhibit**–In Sono: post-modern architectural furniture by David Barth, thru Jan. 7. In Brookfield: various woodworking workshops beginning Jan. 20. Contact Brookfield Craft Center, Box 122, Route 25, Brookfield, 06804. (203) 775-4526.
Exhibits–"A Celebration of Color," thru Jan 6; Tommy Simpson's woodwork, thru Jan. 6. The Elements, 14 Liberty Way, Greenwich, 06830. (203) 661-0014.
Juried exhibit–Society of Connecticut Craftsmen annual exhibition, Mar. 11–Apr. 8. Mattatuck Museum, Waterbury. Slide deadline: Jan. 26. Open to CT craftsmen. For info., contact SCC, Box 615, Hartford, 06142. (203) 267-8475.

DELAWARE: **Program**–Grants-in-aid from the Early American Industries Assoc. to assist individuals with research and studies, including areas of woodworking. Application deadline for 1990 awards: Mar. 15. Contact Charles Hummel, Winterhur Museum, Winterhur, 19735.

DISTRICT OF COLUMBIA: **Exhibit**–Diversity in Turning, thru Jan. 20. Sansar, Tenley Mall, 4200 Wisconsin Ave. N.W. (202) 244-4448.
Show–Woodworking World show, Feb. 16–18. The DC Armory. For info., contact WANA, Box 706, Plymouth, NH 03264; (800) 521-7623, in NH (603) 536-3768.

FLORIDA: **Show**–An Art of Deception: American Wildfowl Decoys, Dec. 24–Feb. 17. Orlando Museum of Art, Orlando. Contact Susan Flamm, Museum of American Folk Art, 444 Park Ave. S., New York, NY 10016. (212) 481-3080.
Juried festival–21st annual spring arts festival, Apr. 7–8. Gainesville. Slide deadline: Jan. 10. Contact Spring Arts Festival, Box 1530, Gainesville, 32602. (904) 372-1976.
Juried show–5th annual fine handcrafted furniture show, Feb. 7–18. FL State Fair, Tampa. Entry deadline: Jan. 12. Open to FL residents only. For info., contact Vernon Blackadar, 11451 Browning Rd., Lithia, 33547. (813) 689-2989.
Show–Woodworking World show, Feb. 23–25. Jacksonville Memorial Hall, Jacksonville. For info., contact WANA, Box 706, Plymouth, NH 03264. (800) 521-7623, in NH (603) 536-3768.

GEORGIA: **Juried show**–37th Arts Festival of Atlanta, Sept. 15–23. Piedmont Park, Atlanta. Entries deadline: Jan. 3. For info., contact the Arts Festival of Atlanta, 501 Peachtree St., Atlanta, 30308. (404) 885-1125.
Juried exhibition–International Woodworking Fair Design Competition, Aug. 24–27. Deadline for entries: Jan. 15. Challengers Award competition deadline: June 1. Contact Shirley Byron, International Woodworking Machinery and Furniture Supply Fair, 8931 Shady Grove Court, Gaithersburg, MD 20877.
Workshops–Japanese woodworking by Toshihiro Sahara. One Saturday each month, year-round. Contact Sahara Japanese Architectural Woodworks, 1716 Defoor Pl. N.W., Atlanta, 30018. (404) 355-1976.

ILLINOIS: **Seminars**–Woodworking seminars, Jan. thru Mar. In the Chicago area. For info., contact Wood World, 1719 Chestnut Ave., Glenview, 60025. (708) 729-9663.

INDIANA: **Workshops**–Second Saturday woodworking workshops, thru Apr. Edward B. Mueller Co., 3940 S. Keystone, Indianapolis, 46227. (317) 783-2040.

IOWA: **Juried fair**–20th Art in the Park, May 19–20. Main Ave., Clinton. Entries deadline: Mar. 31. Contact Clinton Art Assoc., Box 132, Clinton, 52732. (319) 259-8308.

MAINE: **Exhibit**–Holiday exhibit, thru Jan. 7. Nancy Margolis Gallery, 367 Fore St., Portland, 04101. (207) 775-3822.

MASSACHUSETTS: **Workshops**–Various woodworking workshops. Jan., Feb., Apr. Four consecutive Saturdays. Contact Andover Historical Society, 97 Main St., Andover, 01810. (508) 475-2236.
Exhibition–Twenty Years of Contemporary Craft, thru Jan. 19. The Society of Arts and Crafts, 101 Arch St., Boston. Contact Pamela Shaffer, (617) 266-1810.
Exhibit–An Education in Craftmanship, thru Jan. 4. Vault Gallery of The Boston Co., 1 Boston Pl., Boston. For info., contact Sally Miller, North Bennet Street School, 39 N. Bennet St., Boston, 02113. (617) 227-0155.
Exhibition–Fantasy and Whimsy, thru Jan. 13. Boston. Mixed-media exhibition featuring Paul Sasso, Bill Accorsi, Lee Schutte and others. Contact The Society of Arts and Crafts, 101 Arch St., Boston. (617) 266-1810.
Juried exhibit–Shaker Workmanship '90, July thru Oct. Hancock Shaker Village. Entries deadline: Jan. 15. Will include Shaker and Shaker-inspired items. For details, contact Cheryl Anderson, Hancock Shaker Village, Box 898, Pittsfield, 01202. (413) 443-0188.
Show–Lathe-turned furniture, Jan. 20–Mar. 4. Boston Museum of Fine Arts. Contact Ten Arrow Gallery, 10 Arrow St., Cambridge, 02138. (617) 876-1117.
Workshop–Wood identification workshop, Jan. 23–26. Conducted by R. Bruce Hoadley. Univ. of MA, Amherst. Contact Alice Szlosek, Continuing Ed., Room 608, Goodell Building, Univ. of MA, Amherst, 01003. (413) 545-2484.
Juried exhibits–Woodturners of the Northeast 1990, Feb. 10–Mar. 17. Annual May craft fair, May 18–20; entries deadline: Feb. 14. Contact Worcester Center for Crafts, 25 Sagamore Rd., Worcester, 01605. (508) 753-8183.

MICHIGAN: **Exhibit**–Furniture by Wendell Castle, thru Feb. 4. Detroit Institute of Arts, Detroit. Contact Paul Anbinder, Hudson Hill Press, 230 5th Ave., Suite 1308, New York, NY 10001. (212) 889-3090.
Show–Woodworking World show, Feb. 2–4. Stadium Arena, Grand Rapids. Contact WANA, Box 706, Plymouth, NH 03264. (800) 521-7623, in NH (603) 536-3768.

MONTANA: **Juried show**–The Good Wood show, Mar. 16–18. The Metra on the fair grounds, Billings. Contact Bob Lund, Montana Woodcarvers Assoc., 2039 Walter Rd., Billings, 59105. (406) 248-5373.

NEW HAMPSHIRE: **Classes**–Classes in fine arts and studio arts, beginning Jan. 15. Manchester Institute of Arts and Sciences, 114 Concord St., Manchester, 03104.

NEW YORK: **Exhibition**–International Art Horizons, New York '89, Dec. 27–Jan. 14. Art 54 Gallery, Soho. Contact International Art Horizons, Department PR, Box 1091, Larchmont, 10538. (914) 633-6661.
Workshops–Hand tool workshops with Robert Meadow, Jan. 13–14 and Feb. 10–11. The Luthierie, 2449 W. Saugerties Rd., Saugerties, 12477. (914) 246-5207.
Show–Woodworking World show, Jan. 19–21. Hofstra Univ., Hempstead. Contact WANA, Box 706, Plymouth, NH 03264. (800) 521-7623, in NH (603) 536-3768.
Juried shows–American Crafts Festivals, June 30–July 8 and Aug. 25–Sept. 3. Both at Lincoln Center, NYC. Entries deadline for both: Jan. 25. Contact American Concern for Artistry & Craftsmanship, Box 650, Montclair, NJ 07042.
Juried fairs–Arts & crafts fairs, May 26–28, Ulster County Fairgrounds, New Paltz; Sept. 1–3, Ulster County Fairgrounds, New Paltz; Nov. 16–18, Albany County Civic Center, Albany. Entries deadline for all: Feb. 1. Quail Hollow Events, Box 825, Woodstock, 12498. (914) 679-8087.
Classes–Woodworking classes at all levels, beginning week of Feb. 5. Free demo (dovetails & bowl turning) Jan. 29. Contact The Craft Students League, 610 Lexington Ave. at 53rd St., New York, 10022. (212) 735-9732.
Juried show–Lilac art show, May 19–20. Rochester. Deadline: Feb. 9. Contact Arts for Greater Rochester, 335 E. Main St., Suite 200, Rochester, 14604. (716) 546-5602.
Juried show–Clearwater's 1990 Great Hudson River Revival, June 16–17. Westchester Community College, Valhalla. Entries deadline: Feb. 23. For info., contact Joan Silberberg, RFD 2, Pudding St., Carmel, 10512.
Juried exhibit–Northeast fine crafts exhibit, Mar. 11–May 31. Schenectady Museum & Planetarium. Entries deadline: Feb. 26. Contact Marlene Scholl, Nott Terrace Heights, Schenectady, 12308. (518) 399-8381.

NORTH CAROLINA: **Classes**–Ladderback chairmaking, Jan. 8–12; Windsor chairmaking, Jan. 29–Feb. 2 & Feb. 12–16; advanced Windsor chairmaking, Feb. 26–Mar. 2. For info., contact Drew Langsner, Country Workshops, 90 Mill Creek Rd., Marshall, 28753. (704) 656-2280.
Show–Winterfest art & craft show, Feb. 8–11. Asheville Mall, Asheville. Contact Gail Gomez, High Country Crafters, 46 Haywood St., Asheville, 28801. (704) 254-7547.
Juried show–8th annual Showcase of Woodcarvings, Feb. 24–25. Woodlawn Holiday Inn, Charlotte. For info., contact Showcase of Woodcarvings, 1418 Armory Dr., Charlotte, 28204. (704) 336-2584.

OHIO: **Show**–Woodworking World show, Jan. 12–14. Columbus. Contact WANA, Box 706, Plymouth, NH 03264. (800) 521-7623, in NH (603) 536-3768.

OKLAHOMA: **Show**–Woodworking World Show, Mar. 9–11. Myriad Exhibition Hall, Oklahoma City. Contact WANA, Box 706, Plymouth, NH 03264. (800) 521-7623, in NH (603) 536-3768.

OREGON: **Classes**–Basic through advanced woodworking classes, beginning Jan. 8. Portland. Certificate program and part-time training in woodworking available. Contact the Oregon School of Arts and Crafts, 8245 S.W. Barnes Rd., Portland, 97225. (503) 297-5544.
Competition–Table, Lamp & Chair Design regional competition, Apr. 29–May 12. Deadline for entries: Apr. 6. Contact Lynda Anderson, 2701 N.W. Vaughn St., Suite 608D, Portland, 97201. (503) 224-9178.

PENNSYLVANIA: **Show**–American woodworkers, thru Jan. 6. The Society for Art in Crafts, 2100 Smallman St., Pittsburgh, 15222. (412) 261-7003.
Competition–Fish Images: A competition, May 5–June 10. Entries deadline: Feb. 1. Luckenbach Mill Gallery, 459 Old York Rd., Bethlehem, 18018. (215) 691-0603.
Workshops–Various woodworking workshops, beginning Feb. 24. Olde Mill Cabinet Shoppe, 1660 Camp Betty Washington Rd., York, 17402. (717) 755-8884.
Workshop–Hardwood lumber grading and inspection workshop, Feb. 26–Mar. 2. Contact Agricultural Conference Coordinator, 306 Agricultural Administration Building, University Park, 16802. (814) 865-8301.
Juried show–Studio Days '90, Sept. 21–30. Open to DE, DC, MD, NJ, PA, VA, WV. Entries deadline: Apr. 30. Contact Chester Spring Studio, Chester Springs. (215) 827-7277.

SOUTH CAROLINA: **Exhibit**–American Wildfowl Decoys, Dec. 24–Feb. 17. Gibbes Art Gallery, Charleston. For info., contact Museum of American Folk Art, 444 Park Ave. S., New York, NY 10016. (212) 481-3080.

TENNESSEE: **Juried exhibit**–From Here to There: Vehicles for New Forms/New Functions, Feb. 24–May 19. Deadline for entries: Dec. 30. Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, 37738. (615) 436-5860.

TEXAS: **Show**–Woodworking World show, Mar. 2–4. Pasadena. Contact WANA, Box 706, Plymouth, NH 03264. (800) 521-7623, in NH (603) 536-3768.

VIRGINIA: **Show**–Woodworking World show, Jan. 5–7. Norfolk Scope, Norfolk. Contact WANA, Box 706, Plymouth, NH 03264. (800) 521-7623, in NH (603) 536-3768.

WASHINGTON: **Shows**– 10th annual box competition and container show, thru Dec. 31. Children's furniture and toys, thru Dec. 31. Vignettes handmade furniture, Jan. 4–28. Contact the Northwest Gallery, 202 First Ave. S., Seattle, 98104. (206) 625-0542.
Classes–Boatbuilding classes, beginning Jan. 6. Contact Northwest School of Wooden Boatbuilding, 251 Otto St., Port Townsend, 98368. (206) 385-4948.
Workshop–Timber framing with Tedd Benson, Feb. 18–24. Contact Tibercraft Homes, 85 Martin Rd., Port Townsend, 98368. (206) 385-3051.

WISCONSIN: **Exhibition**–Reseated, Mar. 4–May 13. Featuring works that use the chair as medium, subject matter and/or object. Contact Reseated, Exhibitions Dept., JMKAC, Box 489, Sheboygan, 53082. (414) 458-6144.
Juried show–18th annual Festival of the Arts, Apr. 8. Stevens Point. Entries deadline: Jan. 30. Contact Brenda Gingles, Festival of the Arts, Box 872, Stevens Point, 54481. (715) 341-7543.

CANADA: **Workshop**–Woodturning with Jason Marlow, Feb. 19–21. Contact Tools 'n Space Woodworking, 338 Catherine St., Victoria, B.C., V9A 3S8. (604) 383-9600.
Show–The Canadian Workshop show, Feb. 23–25. International Centre, Toronto. Contact Roger Staines, 41 Leeswood Crescent Agin Court, Ont., M1S 2P4. (416) 292-2784.
Meetings–Canadian Woodturners Assoc. meetings, throughout the year. Second Tuesday of each month. Contact Bob Stone, Box 8812, Ottawa, Ont., K1G 3J1. (613) 824-2378.

ENGLAND: **Exhibit**–Touring craft exhibit, featuring woodworking, Jan. 24–Mar. 25. Crafts Council Gallery, 12 Waterloo Pl., London, SW1Y 4AU. 01-930-4811.

GERMANY: **Show**–Craft Today USA, thru Feb. 25. Museum fur Kunsthandwerk, Frankfurt. Contact American Craft Museum, 40 W. 53rd St., New York, NY 10019. (212) 956-3535.

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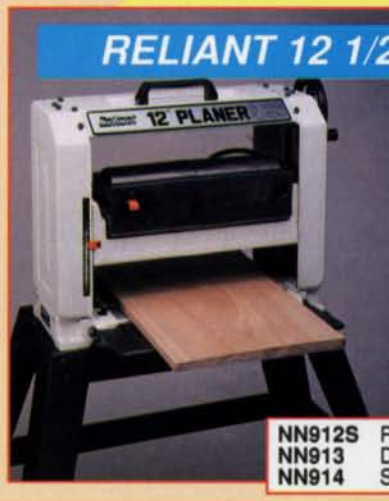

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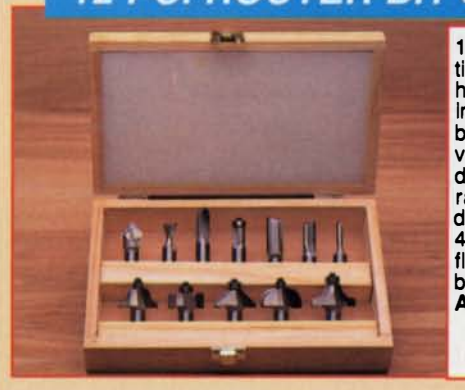

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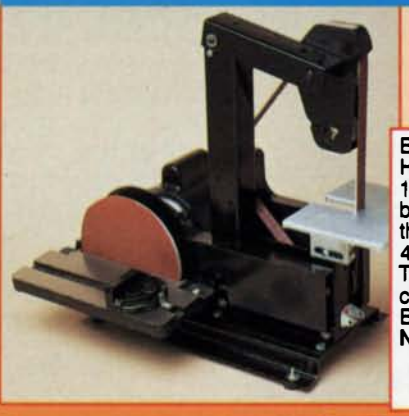

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You Can Make Money From Your Arts and Crafts by Steve and Cindy Long. *Mark Publishing, 15 Camp Evers Lane, Scotts Valley, Cal. 95066; 1988. $14.95, paperback; 231 pp.*

Unless you're lucky, constructing pieces always turns out to be easier than finding buyers and selling the pieces at fair prices. The Longs have written an easy-to-follow book on the craft-show approach to marketing your own work, but reading this book will not change you into a rich person overnight! They've created a book packed with step-by-step suggestions. If some don't seem right for you, there are plenty of other suggestions that will sound good and will probably work well for you.

The Longs begin with the big picture of what being on the craft show circuit entails. This includes a discussion of the values of marketing your own work, in person. They then launch into some of the gritty, and fun, aspects of being your own boss. If you can't get started without someone else's push, then forget about even trying.

Most of us have read books and articles on selling our work at craft shows and have been disappointed. Here, the authors, who are woodworkers, have written about their first-hand experiences in making and marketing crafts through this method. Their trade is making small wooden toys that they sell for less than $20. The economical price of their work leads to one of their few philosophic points that I disagree with. They emphasize a sort of speeding up the clock, in which they try to greet, show and sell as quickly as possible. Craftsmen with work that is more expensive and of interest to fewer people might want to slow down the clock, taking time to greet people, encouraging them to browse and explaining how the crafts are made. This slower pace can make customers interested in the more expensive items feel comfortable about what they bought, and it can also give them time to get instructions on how to care for their handmade purchase.

While the "you can make money" concept sounds a little heavy-handed, I think it's honest. The Longs are very direct about approaching craft shows in a business-like way. They give advice about how your booth should look and how you should look and act. They specifically recommend typing your applications to shows! The book contains the best summation of "closing a sale" that I've ever read. Even if all this sounds too intense, I think the potential craft show participant should take note. A craft show is a time-limited opportunity to show, sell and meet the public. There's plenty of pressure and no place to hide—it can be rather overwhelming at times. Being an outgoing and friendly craftsman/salesman is a critical part of the show. Outgoing people can more easily attract customers, sell their products and collect names as possible future buyers, as well as get customers' advice on what they like.

The book has a positive tone and at the same time is honest about the physical and mental challenges of selling your work at craft shows. Smooth writing and good cartoon illustrations of each major point make the book easy to read. It's so packed with information that the reader who uses it as a workbook will want to keep good notes in the margins. However, a book of this size and quality deserves an index in addition to the comprehensive table of contents already included in the front of the book. *—Skip Sven Hanson*

How to Teach Whittling and Woodcarving by Willard Bondhus and James Beving; illustrations by Phyllis Anderson. *Almar Press, 4105 Marietta Drive, Binghamton, N.Y. 13903; 1985. $7.95, paperback; 104 pp.*

Sooner or later most woodcarvers with any experience are asked to teach. This may be a request from an interested admirer for personal instruction, an invitation to instruct a club or youth group or an offer to teach at the local community college or university. For any of these situations, this book can help prepare you for some of the challenges of organizing effective classes. Both authors have drawn from their considerable teaching experience to help the instructor understand students and their motivations and assist them in developing their skills.

And yet there's something lacking. Perhaps it's the choice of projects they recommend for students. From my experience in teaching woodcarving, the projects the authors list as introductory, like the whittled snake or moccasin, appear rather tricky for most beginners and don't give them a lot to show for their time when finished. Other projects seem too advanced for most beginning students. Because of this, I think many students will get discouraged and find the projects boring. Perhaps that's why the authors have found it necessary to address such topics as "Why do people drop out of my class?" or "How to handle the 'I can't do it' student."

Oddly, too, there's no mention of specific carving techniques. It is presumed that you already know how to carve—as well you should if you're considering teaching others. And yet I would have found it valuable to learn how the authors present specific carving techniques to their pupils. On the other hand, the subject of tool sharpening is handled very well and contains a good deal of useful information.

If you're ever called upon to teach a woodcarving class, you may find this book useful—especially the section on class preparation. But don't expect too much from it. *—Richard Bütz*

Skip Sven Hanson builds custom furniture in Albuquerque, N.M. Richard Bütz of Blue Mountain Lake, N.Y., is a professional woodcarver and the author of several carving books.

Photo: ©Dick Busher, 1989

Photo: Jim Piper

A panel of judges for the Table, Lamp and Chair design competition in Portland, Ore., praised Seattle, Wash., furnituremaker Mark Yinger's "Airt" chairs, left, for their comfort and balance. The maple and bubinga chairs won Best Chair award. Best Table award went to Ken Moran, Portland, Ore., for his maple and ebony hall table with contrasting ebony and maple inlays (above). "A bold statement" is how the judges described Mark Hanson's writing desk, below. Its sculptural mahogany base and leather top framed by hexagonal "patches" of spalted western maple were bold enough to capture Best Hors Concours (Best Other Design) award.

Photo: Joseph Felzman

Table, lamp and chair designers take a dare

A distinguished and diverse panel of five judges came to Portland, Ore., from various parts of the United States last May to survey 100 entries in the second annual Table, Lamp and Chair regional design competition sponsored by the Women's Architectural League of Portland.

After the initial walk-through, where the judges had their first opportunity to touch, sit in, and look at and under the entries, they asked the event's coordinator, Lynda W. Anderson, "How rigorous do you want our evaluation of the show to be?" She answered that they should call upon their national experience and judge on those standards and not just on regional standards. In doing so, the judges found much to praise, but they also chose to withhold one of the two Judges' Choice awards "as an incitement and a challenge" to the designers to rise to higher levels next year.

The competition was directed specifically at furniture and lamp design with a focus on innovation and craftsmanship. And although there was no restriction as to the materials used, five out of the seven award-winning pieces were made mostly of wood.

Hyun-Joo Paek, a student at Cornish College of the Arts in Seattle, Wash., won in the student category with his maple chair; Ken Moran of Oregon Fine Joinery in Portland, earned the Best Table award for his hall table shown above in the top, right photo; Best Chair went to Mark Yinger, a Seattle designer/builder, for his "Airt" chairs shown above in the left photo; Mark Hanson, a Portland furniture de-

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34-782	3hp unisaw w/Bies	1699	32-100	plate jointer NEW!	369	50-181	2hp dust collector	609	37-350	8" jointer w/stand	1369	34-429	10" tilting arbor saw	899	40-150	15" bench scroll saw	139
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34-751	1-1/2hp 1ph unisaw	1299	34-994	1 ph stock feeder	949	31-380	4"x132" edge sander	1299	46-204M	12" wd lathe w/stand	1089	33-890	12" radial arm saw	1199	31-460	4" belt/6" disc sander	149
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4024	3X21 elect.VS belt sndr.	199
40900	1hp router acces. kit	135

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5/0	4" handscrew	8
7224	24" I-bar clamp	17
7236	36" I-bar clamp	18
7248	48" I-bar clamp	20
7260	60" I-bar clamp	23

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3047-09 7-1/4" Super Saw Cat $169

2687	3/8"VSR cdls drill kit	129
1703	10" mitersaw w/ct blade	179
3048-09	8-1/4" super sawcat	179

JET

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1290D	1/2 sheet finish sander	139
920VSRK	9.6V cordless w/case	109
921VSRK	9.6V cordless w/clutch	135

1581VS VS Top Handle Jig Saw $128

1582VS	barrel grip jig saw	124
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1611-220V	3-1/2hp router	259

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Makita

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9638VRC	9.6 v cdlss dr kit NEW	109

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R501	2-1/4hp plunge router	158
RE600	3hpVS elec plunge rter.	198
BE321	3X21 VS elec belt sander	128
BS360NR	12-1/2" resaw bndsaw	1499
BS50N	9" resaw bandsaw	969

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0244-1	1/2" VSR Magnum drill	109
0385-1	3/8 VSR 7.2 V crdlss kit	109

6507 VS Sawzall With Case $129

6508	VS sawzall w/case	129
5397-1	3/8" hammer drill kit	139
5375-1	1/2" Mag. hammer kit	169
6256	VS jig saw	139
6142	4-1/2" grinder kit	114

6368 7-1/4" Saw w/CT Blade Case & Fence $135

6750-1	HD VSR screwdriver	89
6540-1	cordless screwdriver kit	89
6753-1	0-4000 VSR screwdriver	79
0375-1	3/8"close quarter drill	139
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N86C-1	coil nailer NEW	499
N100S-1	6d-20d nailer	479
N60FN	1-1/4" to 2-1/2" fin. nlr	339
T28-5	1-3/16" finish stapler	269
T31-1	5/8" to 1" brad tacker	149
CWC100	1hp 4gal. compressor	299

Nails and Staples Priced to Sell!

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362	4X24 sander w/bag	189
503	3X24 wormdrive w/bag	345
504	3X24 wormdrive sander	335
330	Speed bloc finish sander	59
505	1/2 sheet finish sander	114

9850 3/8" Cordless 12V Driver/Drill Kit $129

518	3 hp 5 speed router	339
690	1-1/2hp router	129
691	1-1/2hp D-handle router	139
537	1-1/2hp Speedmatic rter.	205
696	router shaper table	119
695	router table w/router	209

9345 6" Saw Boss Kit $124

345	6" saw boss	98
9314	4-1/2" trim saw kit	144
9315-1	7-1/4"saw w/casect bl.	129
9647	NEW tiger cub w/case	119
7548	VS top-handle jig saw	129
7648	VS barrel grip jig saw	139
9118	Porta-plane kit w/ct cutter	199
5116	NEW Omni-Jig	269

9629 V.S. Tiger Saw With Case $135

621	3/8" VSR drill	99
7514	1/2" VSR drill	115
659	4000 VSR drywall	79
7545	2500 VSR drywall	105

6931 Plunge Router Base $79

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97310	NEW laminate trimmer kit	189
7312	NEW offset laminate trim.	124
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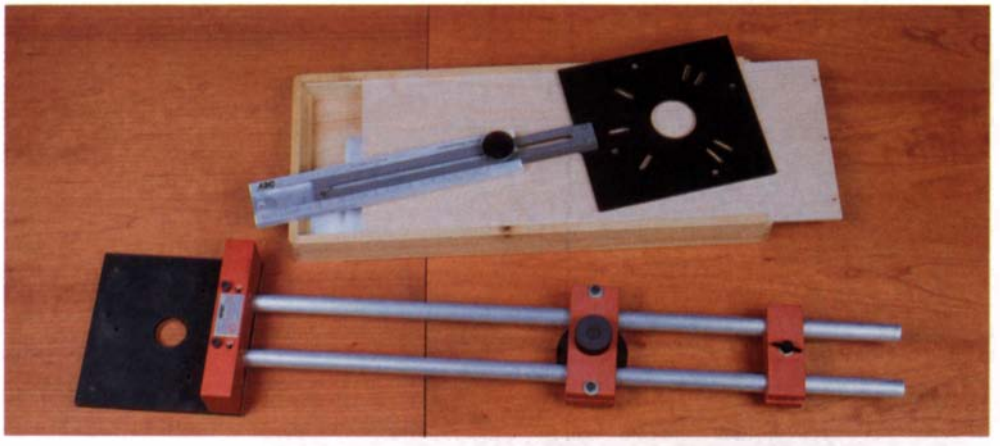
signer, received the Best Hors Concours (Best Other Design) for his sculptural writing desk, shown in the bottom, right photo on the previous page; a Judges' Choice award went to Ruth E. Schwartz, a University of Oregon student, for her small painted and stenciled storage desk.

The panel of judges included: Ziva Freiman, Stamford, Conn., senior editor of interior design for *Progressive Architecture* magazine; Wendy Maruyama, Berkeley, Cal., head of the woodworking and furniture program at California College of Arts and Crafts; Michael Monroe, Washington, D.C., director, Renwick Gallery of the National Museum of American Art, Smithsonian Institution; Joseph Vincent, San Francisco, Cal., furniture designer and founding partner of the interior architecture and product design firm of Andrew Belshner/Joseph Vincent; and Terence D. West, Grand Rapids, Mich., director of industrial design at Steelcase, Inc.

The upcoming competition is open to design professionals or students in Washington and Oregon, and will be held from April 29 to May 12. Deadline for entries is April 6. For information, contact Lynda W. Anderson, 2701 N.W. Vaughn St., Suite 608D, Portland, Ore. 97201; (503) 224-9178.

–Ed Reinstein, Portland, Ore.



Both router jigs above promise precisely accurate circle cutting. The ARC, top, has a dovetailed telescoping beam, while the RT-87, bottom, relies on parallel aluminum bars.

Product review

Two circle-cutting router jigs: The ARC by Hardwood Design Tools Inc. and the RT-87 by Success Engineering and Manufacturing, *Hardwood Design Tools Inc., 231 Foster Ave., Charlotte, N.C. 28203; Success Engineering and Manufacturing, Box 25648, Cleveland, Ohio 44125.*

Routing circles commonly means building a trammel jig, which is often nothing more than a piece of plywood, with mounting holes for a router at one end and a point, often a nail or screw, at the other to pivot in the circle's center. Here are two durable, adjustable jigs that will speed up and simplify circle cutting with a router.

The ARC, shown on top in the photo above, has a 6-in. by 7-in. aluminum router-mounting plate that's slotted to accept most three- and four-hole router bases. The mounting plate is screwed to a telescoping beam, composed of two flat aluminum bars that are dovetailed to one another like a drawer slide. In use, the beam is screwed to the workpiece at the center of the desired arc through one of two holes at either end of the beam's female portion. One of these holes is for 16-in. to 25½-in. radii and the other is for 4½-in. to 15-in. radii. The desired radius is set by clamping the two bars together with a plastic-knob lock-screw. To avoid making a screw hole in the finished surface, either work with the good face down or clamp a waste block to the work's center and add an equally thick block to the jig's base.

When I tried the ARC, it pivoted freely, as long as the mounting screw was not overly tight, and the cuts were repeatedly concentric and square to the work's face. Resetting the radius, which was aided by calibrations on the beam, was quick and easy. The close tolerances of the dovetailed beam prevented sloppiness, but permitted easy sliding action. Priced at about $125, the ARC jig could be a good addition to your shop if circular cutting with the router is routine.

Shown on bottom in the photo above is the RT-87, a precisely engineered jig for routing circles. The beam consists of two parallel, round, aluminum bars that are long enough to rout circles with up to a 30-in. radius. Longer bars can be specially ordered. The beam bars are tenoned into a machined block of anodized aluminum that is screwed to the router-mounting plate. Also made from anodized aluminum is the mounting plate, which has a canvas-phenolic rub plate screwed to its underside. The center pin is inserted in an aluminum disc, which resembles a lathe faceplate, with a shaft that fits into a teflon bearing in the center carriage. The carriage is a split aluminum block that clamps around two ball-bearing sleeves through which the two parallel bars glide.

To set up the jig, remove the center pin disc from the carriage, insert the pin in a pre-drilled center hole in the workpiece and fasten the disc to the work with three screws. Then, the jig's carriage is lowered back onto the disc's shaft and secured with the large lock knob. The bars are slid through the carriage and locked at the correct radius with two Allen head cap screws. As with the ARC, screw holes in the workpiece can be avoided by working from the underside or adding a center scrap block. For resetting the jig to a specific radius, a movable stop block is provided.

The RT-87 operated smoothly, and repeatedly yielded precisely square cuts in solid wood, plywood and medium-density fiberboard (MDF). The mounting plate only has three holes to attach the router, so you may have to drill it out to fit your router. Is all the engineering worth $350? I think not for the amateur, but it probably is for production shops that continuously manufacture a variety of large circular components.

–Rich Preiss, Charlotte, N.C.

EDITOR'S NOTE: Since the review, Success Engineering and Manufacturing has added the RCT-101 to its product line. The mounting plate and center carriage are nearly identical to those on the RT-87, except that they're made from a new "ultra high molecular weight polyethylene (UHMWPE)" instead of aluminum. The new jig comes without bars, but is threaded to accept inexpensive, ½-in. ID steel pipe, like that used for pipe clamps, so your cutting capacity is limited only by your pipe length. The RCT-101 costs about $140, which includes the company's new "IMAGIPLATE," a slotted, universal router base adaptor.

A revolving door

I have built several challenging projects in my many years of furniturmaking and cabinetmaking, but none was as demanding as building the full-size revolving door, shown on the following page. Part of the problem was just handling an enclosure that's nearly 8 ft. in diameter in my puny, 400-sq.-ft. shop on Maui, Hawaii. Commissioned by a large hotel in Waikiki, the revolving door was made from black walnut, with curved glass panels and brass hardware.

Believe it or not, making the doors was the easiest part of the project: Straightforward mortise-and-tenon construction with rabbets to hold glass panels. After the four frames were joined perpendicular to one another, they were fit on a shaft, as paddles might be assembled to make a paddlewheel.

The more difficult part of constructing the entire project was the circular enclo-

INDEX TO ADVERTISERS

sure in which the spoke-like doors revolve. I had to build two quarter-circular walls that would attach to the building's exterior wall, and a cap that acted as a ceiling and a housing for the revolving door hardware. The walls required eight horizontal rails, which defined the radius of the enclosure and held the curved glass panels. The problem here was to build the rails so the curved walls wouldn't be affected by seasonal wood movement, which could change the radius of the enclosure and interfere with the revolving doors. To avoid this problem, I laminated a stack of 16 layers of ¾-in. plywood, about 4 in. wide and 30 in. long, for each rail.

After the rail blanks were glued and squared up, I mounted each in a pivoting jig on the bandsaw and cut it to the correct outside radius. I then made a curved fence and bandsawed the inner curve. Next, I followed a method that was described in *Tage Frid Teaches Woodworking, Book 3: Furnituremaking* (The Taunton Press, 1985), and built male and female cauls for gluing ⅛-in.-thick walnut veneers to the faces of the curved plywood rails. I built another jig to cut the ends of the curved rails at the correct angle to butt against the solid-walnut stiles and reinforced each joint with 12 plate joinery biscuits to maximize glue surface. I figured that I would gain lateral strength later by bolting the walls to the stone floor and to the cap.

Building the cap was pretty straightforward. I first made a round inner framework covered with kerfed plywood, and then glued ⅛-in. walnut veneers to the outer faces. The moldings were cut into segments and then pieced in place. When all the woodwork was completed, I colored the wood with an aniline dye stain, and then finished it with a two-part catalytic epoxy urethane.

The revolving door hardware came from the Crane Fulview Door Co. in Chicago, Ill. The company supplied me with a gearbox (speed control which limits the door to 12 revolutions per minute or less), shaft, push bars, floor pivot bearing and weather stripping. I adapted the hardware, which was originally made for a metal revolving door, to fit my wood door. The brass plates and grab bars were fabricated locally, but I had to have the ¼-in.-thick curved glass panels for the enclosure specially made at a glassworks in Pennsylvania and shipped to Maui.

Crating and shipping the completed door from Maui to Waikiki, on the big island of Oahu, posed a few problems. I built five crates to house the various parts of the door. The crated cap alone weighed more than 500 lbs. and measured 1x8x8 ft. This crate was slid vertically into the back of my pickup and acted like an airplane's rudder in the gusty trade winds accompanying me on the half-hour ride to the dock. Within several days, I was nervously supervising the unloading of the crates at the hotel in Waikiki. Installing the door required setting the pivot bearing, on which the shaft holding the doors rotates, into concrete, bolting the curved walls to the stone floor and lifting the 7½-ft.-dia. cap into place. For this latter task I commandeered the assistance of 10 construction workers, who looked like human pillars, to hold the cap in place while I set the fasteners.

Photo: Peter Naramore

This walnut-veneered door, an entrance to a Waikiki, Hawaii, hotel, has glass from Butler, Pa., and hardware from Chicago, Ill.

It took a full two weeks to attend to all the installation details, such as building the copper roof that covers the outside of the top of the cap, and the nerve-wracking job of installing all the heavy, curved glass panels. Finally, after nearly three months of work, I stood back and enjoyed the sight of the hotel's grand opening just hours after I'd picked up my tools.

–Peter Naramore, Maui, Hawaii

George Fullerton 1903-1989

George Fullerton, 85, a master craftsman and senior instructor of cabinetmaking and furnituremaking from 1951 to 1985 at the North Bennet Street School (NBSS) in Boston, Mass., died July 21, 1989 of pneumonia. He leaves a legacy of craftsmanship not only in his own work, but also in the numerous fine craftsmen that he trained and in the training program at NBSS that continues his initiative.

Apprenticed at 17 with Mellish & Byfield, a 150-year-old Charleston, Mass., union shop, Fullerton's training had the European influence of the English, Scottish and Swedish craftsmen under whom he served. But because he studied under several masters, his training was much broader than the traditional European apprenticeships. He was a dedicated, hardworking student, advancing rapidly through his four-year training program. A journeyman's trip to cabinetmaking shops in Connecticut, the Carolinas, Alabama, Texas and Michigan broadened his education. Fullerton then went to work in a custom furniture shop in Boston, Mass., until World War II, when he became a construction officer in the Navy. After the military service, he spent two years teaching woodworking at the Cardigan Mountain School in Canaan, N.H., and then he returned to trade work for Irving-Casson Co., in Cambridge, Mass., before joining NBSS.

Starting at NBSS in 1951 with 10 students, Fullerton took the elementary woodworking program to the level of fine furnituremaking, developing a course that taught traditional furniture design. His teaching was based on his personal working experience and on the traditional qualities of economy of labor and materials, proven design and construction, and the skilled use of hand tools to produce beautiful, high-quality, detailed furniture. He had empathy for the period furnituremakers he so admired and therefore was able to understand their constraints, see the good and bad of their work and learn from both. His personal standards were high, as were his expectations of others. Although sensitive to others, he didn't hesitate to admonish bad craftsmanship.

Throughout his life, Fullerton shared his intrigue for wood as a diverse medium. He always instilled in his students a deep appreciation of hand tools and their capabilities in skilled hands. He taught the value of studying traditional ways and the truly satisfying enjoyment of fine furnituremaking. In his 35 years of teaching, he has opened the doors to skill development, personal growth and happiness for many. As one of his former students, I owe a great debt to George and am pleased that his passion for craftsmanship will live on in those who studied with him. Thank you George!

–Lance Patterson, Boston, Mass.

Notes and Comment

Do you know something we don't about the woodworking scene in your area? Please take a moment to fill us in. Notes and Comment pays for stories, tidbits, commentary and reports on exhibits and events. Send manuscripts and color slides (or, black-and-white photos—preferably with negatives) to Notes and Comment, Fine Woodworking, ***Box 5506, Newtown, Conn. 06470-5506.***

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GRAPHIC EXAMPLES

Although his turned vessels often embody classic forms, Giles Gilson, a Schenectady, N.Y., designer and maker, delights in incorporating modern materials in his pieces and finishing them with exotic lacquers. Gilson employs acrylic lacquers, commonly used for custom paint jobs on show cars, for much of his wood finishing, and some of these finishes have unusual light-reflecting properties, creating beautiful iridescent color effects. The walnut vessel, shown right, has what Gilson calls "vanishing graphics." The linear design is pearlescent lacquer that only shows up when viewed from certain angles. "Graphic Reversal," shown below left, was sprayed top to bottom with black and white opaque lacquers, and then the graphic design was masked off and the same paints sprayed in reverse. A transparent turquoise toning color was then applied. Gilson's 21-in.-high feathered sculpture, below right, is made from walnut, rosewood, ebony, brass, black acrylic, aluminum and stainless steel.

Photos: Rick Siciliano