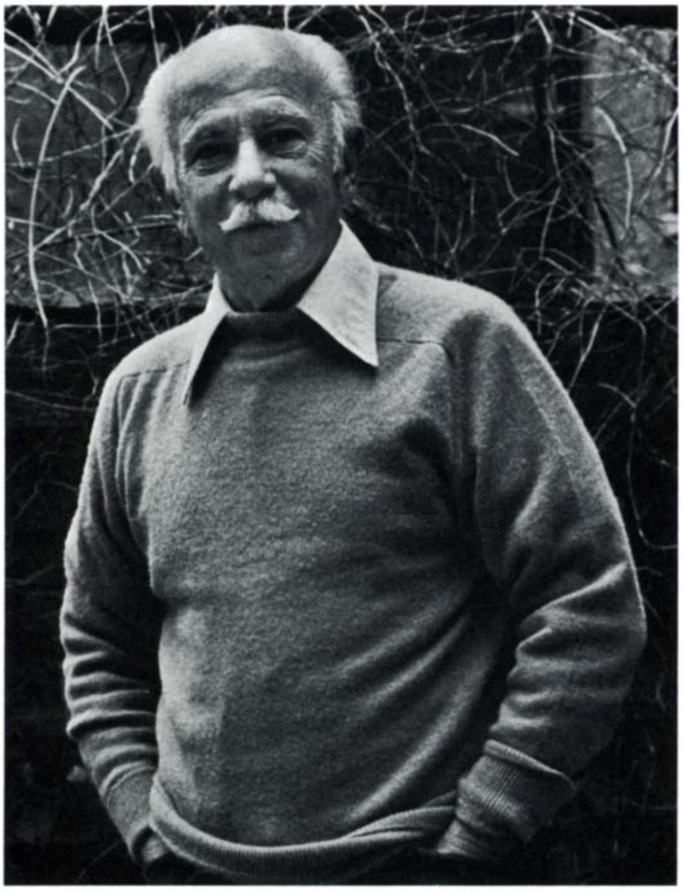
Fine WoodWorking

MAY/JUNE 1981, NO. 28, $3.00

Making Miniatures



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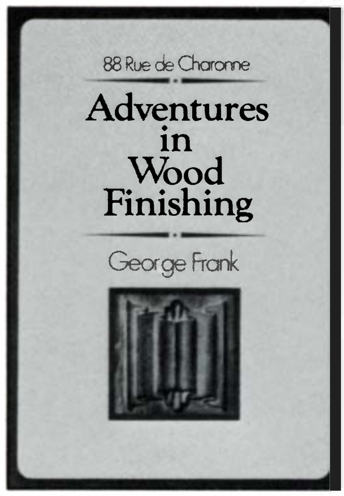

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Cover: Miniature roll-top desk, by Jim Dorsett, and with the radial-arm saw he used to thickness the stock it's made of. Dorsett's model was his own desk, above, and the miniature is structured with working parts exactly like the original. Beginning on p. 58, he tells how he went about designing and constructing this 1/12-scale reproduction, offering an introduction to the craft of making miniatures. Photos: Don and Cindy Massie.

Fine WoodWorking®

MAY/JUNE 1981, NUMBER 28

DEPARTMENTS

ARTICLES

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For those expressing opinions regarding the back cover article, "Decoration vs. Desecration," *(FWW #24, Sept. '80)* and wondering what is being taught at the School for American Craftsmen, we offer the following: Students in our program are exposed to the full range of traditional woodworking techniques, and experience these techniques on a representative range of furniture applications—seating, surface, storage and accessory pieces.

All projects are designed and built by the students, and the problems are broad enough to encourage a variety of aesthetic approaches. Seniors and graduate students orient their activities to prepare themselves for what they want to do upon graduation. A typical group of seniors and graduates includes some interested in design for industry, some in custom work and limited production in small shops, and some intending to teach. The aesthetic directions range from purely functional production furniture to innovative one-of-a-kind pieces to avant-garde pieces bordering on sculpture.

We believe these varied and diverse student activities are mutually stimulating and inspirational, and that a good program should embrace the full range.

—Bill Keyser and Doug Sigler,
Faculty in Woodworking and Furniture Design,
Rochester Institute of Technology, Rochester, N.Y.

Your article on return-air dust collection systems *(FWW #25, Nov. '80)* has solved a particularly difficult problem for me. The editor's note that followed provided the solution to a respiratory problem that has plagued me for years. There, at long last, was a list of manufacturers of dust collectors suitable for the home workshop or small job shop. For all those snuffy-nosed years, this category of dust collectors had somehow evaded me. For others with respiratory problems, I would like to add another name to the list. My pursuit of dust-collector manufacturers led me to the American Fan Company (145 Caldwell Drive, Cincinnati, Ohio 45216). With the assistance of the Tri-Co Equipment Corporation of Chicago, I purchased American Fan's Model DC-12, 2-HP, 1,000-CFM, velocity 5,000 RPM, 6-in. duct unit that mounts on a 55-gallon drum. The performance of this 86-dB unit exceeds my most optimistic expectations. *L.B. Applegate, Champaign, Ill.*

Re the letter on a dust-evacuation system *(FWW #27, Mar. '81, p. 10)*, when you have wood dust or solvent vapor in an enclosed area, there is danger of an explosion from sparks generated by ordinary fan motors. Use only an explosion-proof fan if the motor is in direct contact with the exhaust air. An alternative is to mount the motor outside the duct and to belt-drive the fan blades, which should also be non-sparking. If racked, a steel housing contacting a rotating steel blade can cause a spark. Aluminum or plastic blades won't.

—Dr. Michael McCann, Center for Occupational Hazards,
5 Beekman St., New York, N.Y. 10022

With regard to Henry T. Kramer's article, "Mitering on the Table Saw" *(FWW #26, Jan. '81)*, I think he has a good method of setting the miter fence. However, I have a method that I believe is equally accurate and somewhat easier to use.

It requires the use of a carpenter's framing square, a tool that should be in every shop. The square is placed with the long leg along the miter fence, which should have an auxiliary board bolted or clamped to it. The protractor is then adjusted

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so that the same reading lines up with the edge of the slot on both legs of the square. The farther out, the more accurate the reading. I use the 12-in. marks on my 10-in. saw.

This method has the added advantage that you can set any angle by using trigonometry to calculate the lengths of the legs of the triangle. Angles of 30° and 60° work out nicely using 13 in. on one leg and 7½ in. on the other. Other angles will require some interpolation between the rulings on the square, but this method is still more accurate than using the scale on the protractor. —*W.E. Prindle, Essex, Conn.*

In many articles on roll-top or tambour-top desks, white (unprimed) canvas is suggested for fastening the tambour slats together. This white canvas shows through even the slightest opening between the slats, especially if the wooden slats are stained a dark color. To eliminate this problem, I first dye the canvas black, iron it and then apply it with glue to the unfinished backs of the stained and varnished tambours. Staining and varnishing must be finished before gluing because the slats stick together if they are finished after gluing up.
—*Charles L. Robers, Waukesha, Wis.*

I've done some investigation into the derivation of the word *spalted* and believe that the adjectival form is from a past participle of the verb *to spalt*, defined in Webster's Third New International Dictionary as a dialect word meaning "to split, to splinter." The problem with this word is not its ultimate origins, but its more recent history. The word ultimately comes from the Proto-Indo-European root *sphel-*, meaning "to break, slit, split, tear apart." Some cognates in other Indo-European languages include the Latin *spolium*, "spoils, arms stripped from an enemy," the Greek *sphallein*, "to cause to fall," and the Sanskrit *sphajati*, "it bursts."

I won't burden you with all of the Germanic cognates, but it does seem that Modern English *spalted* has a family of cousins within English itself. . .among them *spale* or *spall* (dialect, "a chip or splinter," *to spald*, "to splinter, break up," and *spalt* (adjective), "brittle, short-grained wood." Also related are *spoil* and *spill*.

Your article ("Spalted Wood," *FWW* #7, Summer '77), with the adjectival form *spalted*, is the only such occurrence I have found. You'll be glad to know that your use will be entered into our files as evidence of new formation.
—*William C. Hale, Etymologist*
G. & C. Merriam Co., Springfield, Mass.

W.W. Kelly's chair-rung chuck *(FWW* #27, March '81) is nifty. It will securely hold square stock. Insert a piece of saw steel projecting slightly inside to hold the tenon when you reverse the stock to turn the squared end. Also, Woodcraft Supply (313 Montvale Ave., Woburn, Mass. 01888) sells an excellent cone chuck in two sizes to be used in connection with their dowel-making tool. These are expensive, but they do an excellent job of holding and centering chair-rung stock of almost any cross-sectional configuration.

Regarding the two suggestions in the same issue for making tenons on a radial-arm saw and a bandsaw, the rough tenon formed is not "so much the better for gluing." Any tool that cuts across the long fibers of the tenon surface, including the hollow auger, is creating a surface that will not glue well or hold well (whether or not glue is used) since the long fibers have been repeatedly crushed and severed. For the science of

all this, I refer you to Bruce Hoadley. The best tenons are formed by a shaving or slicing cut in the direction of the long fibers. This can be done by whittling with a knife, a spokeshave if no shoulders are present, or on the lathe.

—John D. Alexander, Jr., Baltimore, Md.

Two tricks we use in our shop that others might find useful: One is when roughing square stock on the lathe, make pencil marks about every 3 in. across the stock on one side before turning, then turn until marks are gone. The result is a perfect cylinder. The other is when cleaning a spray gun, take it apart and soak it in a 1-gal. can with lacquer thinner, then take the air hose and put it in the can on very low pressure to get a bubble action. The result is a washing machine for the gun. It works very well. *—David Termini, Silver Spring, Md.*

I began woodworking over 10 years ago and I'm still learning. Formerly, I discouraged beginners from teaching themselves as it is certainly the more difficult route; but the more familiar I become with the field, the more I find that the successful woodworker who isn't self-taught is rare.

This may change with the recent advent of qualified woodworking schools, but my advice would be the same to any graduate therefrom. Concentrate on selling. Design around those skills you're confident you've mastered and around the tools you have or can afford to acquire. Limiting yourself in this way is a challenge that will teach you more than any schooling in a fully equipped shop filled with machines you'll never be able to afford.

There are elegantly simple designs to be conceived by someone who faces the challenge to discover them. You'll know when you've found such a design, for it will say of itself: "I'm so obvious, why wasn't I noticed before?" One often finds inspiration in unusual places—primitive furniture, antique tools, photography books.

If you cannot sell under any circumstances, you're in the wrong trade. Not make money—just sell. Galleries, craft fairs, classified ads and interior decorators are the most likely ways for the beginner to find customers. Be sure of an income from some other source before you begin. I worked in furniture factories and lumber mills and learned things about wood and process I couldn't learn anywhere else.

—Jeremy Singley, East Middlebury, Vt.

In your Jan. '81 issue *(FWW #26)* Thomas Sullivan writes that he does not want to see any more articles about machinery and precision. He should see my $1,600 table saw, whose table is warped enough to be detected by the unaided eye. In this day of squares that are anything but, I feel you do your readers a service by printing technical pieces....

Machines have not determined the standards of perfection. Man has. He uses machines (and hand tools) to achieve it—or to try. A thousandth of an inch is just as "human" as "an eighth of an inch, more or less," if that is what the job takes.

I agree that man is "vastly superior to his machines." He is also superior to his hand tools. A jointer requires as sensitive a touch in use as a bench plane. The same order of intelligence is required to design, build, adjust and use a machine jointer as any hand tool.

Contrary to Sullivan's contention, one-of-a-kind work is not necessarily more pleasing than mass-produced pieces. Quality can be a characteristic of either, and so can the op-

posite. The average consumer looks for quality and could not care less what tools were used or how many pieces made.

Prevalent in our culture is the idea that the more feeling and irrationality and the less reason and logic involved in something, then the more human and artistic it is. The simplistic, the primitive, the crude, the unrefined are admired. Skill, precision and excellence are not "organic" or "meaningful."

Man created wood filler. God had nothing to do with it. In our field, as in others, the important distinction to be made is between ineptitude and competence. Between the bungled and the magnificent. —*James L. Wheeler, Houston, Tex.*

Diane Snow Crocker's article, "Figuring Costs," *(FWW #26,* Jan. '81) drives home key job-costing points, but what she has defined as profit is not profit at all, but what a cost accountant would call the contribution margin (CM), or gross profit. The distinction is not simply semantic. The contribution margin is the revenue in excess of variable costs incurred.

The missing factor is critical—call it overhead, burden or whatever, but don't forget that it is there. It is real, it is an expense, a cost, but it is not directly relatable to a specific job. Regardless of who does the paperwork, an accountant or an entrepreneur woodworker must allocate or assign those non-direct costs in some manner to the job in order to get a realistic picture of total expenses. Some items are too small to post to the job—sandpaper, glue, nails, screws, electricity; other items are too difficult—wear on a drill, depreciation on a drill press, inventory carrying costs, or advertising costs. They must, however, be charged to the job in some manner.

If a lathe is used a predictable number of hours per year, then jobs using the lathe can be "burdened" with the capital cost of owning the lathe. If, as in most shops, usage can't be predicted, then one can figure overhead as a multiple of direct labor cost. My guess is that this is what Crocker has done in showing $22 per hour of labor on her estimate sheet. To do that, overhead costs for a time period are estimated and divided by the number of direct-labor hours expected.

Profit = Selling price – (Fixed [overhead] costs + Variable [direct labor & materials] costs)
Contribution margin = Selling price – Variable costs

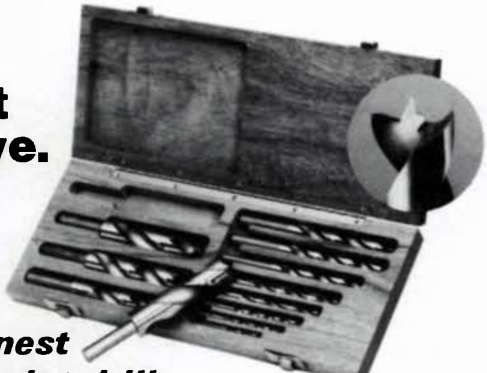
Back to the useful concept of contribution margin. Major overhead or fixed costs continue whether there is work or not. Even in the smallest shops, the rent and utilities must be paid and the cost of owning tools continues.

When business is slow, any revenue in excess of actual direct labor and material costs can be helpful. Cost accountants call these variable costs, because they vary with output—no product produced, no variable costs incurred. During those slow business times, pricing using low contribution margins can encourage sales. In busier times, pricing can be based on larger contribution margins. The caveat is that generally only jobs of relatively short duration and low or very accurately predictable labor costs should be priced with low contribution margins. You don't want your shop to be saddled with a high volume of low-CM, low-profit work when more attractive opportunities present themselves. . . .

Profits can be illusory. Possibly the single largest cause of business failures is the lack of awareness of the true cost of doing business, leading to underpricing. You also don't want to pay income taxes on profits that don't exist.

—*Thomas D. Archer, Huron, Ohio*

A cut above.



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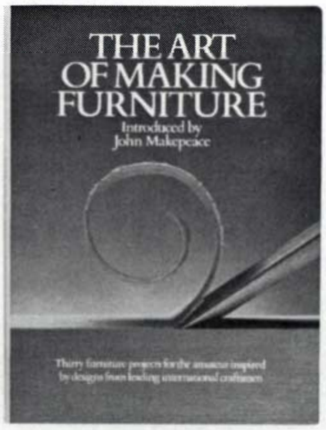

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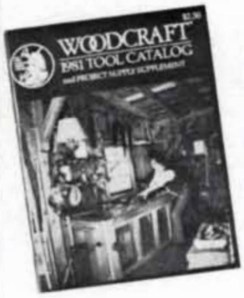

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THE DAPHNES

It was the premier black-tie affair in contemporary woodworking. The first annual presentation of the Daphne award for "outstanding furniture design and superior value," held last March 3 at New York's Waldorf Astoria, was unrestrained in its pomp and celebration. Well-known personality Bess Myerson emceed the event, and the Ray Bloch orchestra backed up the award-winners' walks to and from the podium with upbeat tunes like "Everything's Coming Up Roses." One hundred and fifty furniture designers, manufacturers and hardwood suppliers contained their excitement through the $95-a-plate dinner before learning who would go home with a Daphne—the walnut trophy designed by Wendell Castle for presentation in each of nine furniture categories, plus best reproduction, best innovation and best of show.

The Hardwood Institute, a division of the National Hardwood Lumber Association, sponsored the award to promote the use of hardwood in the furniture industry. It was open to designers and manufacturers of residential furniture made mainly of hardwood. Because it was not only design but value that was being judged, the price of the piece was a factor. The contest was advertised in the trade magazines, but the rules did not exclude the sort of small shop that has been doing custom work and is only beginning to manufacture in small quantities a couple of their more promising designs.

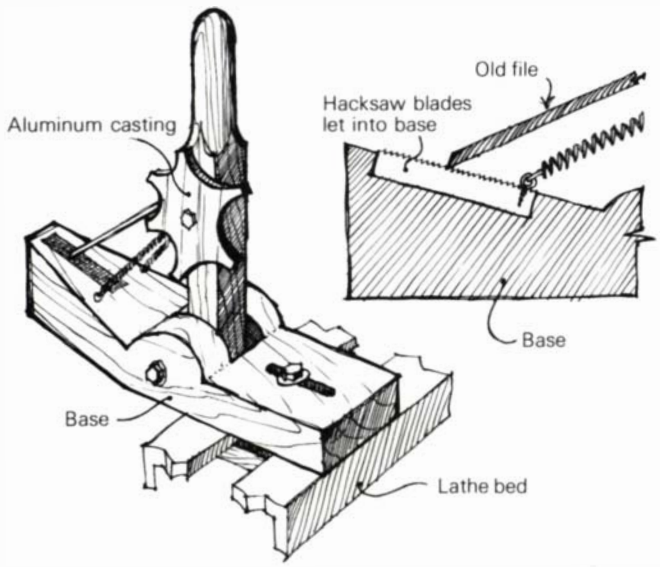
The judges, who were enlisted from the faculties of design schools, the merchandising staffs of furniture retailers and the editors of magazines like *Interior Designs* and *Good Housekeeping*, treated the diverse entrants as equals. Large, long-established companies like Baker and Thonet were pitted against newcomers like Kellar and LaBrasca, two woodworkers in Portland, Maine, whose Daphne-winning rocker in the occasional seating category is being manufactured on order only. From the slides I saw, the better work came from the smaller companies. The winner of best of show bore this out. Union Woodworks' three-legged dining chair, designed by Michael Goldfinger (photo) and John Wall, began as a commission for a client requiring chairs that would sit steady on his uneven slate floor. The back and arms, strip-laminated from $\frac{1}{16}$-in. stock, along with the wide but inconspicuous bracing under the sculpted seat, give the piece a grace and stability you wouldn't expect from a three-legged chair. A small partnership in Northfield, Vt., that has survived doing custom furniture, architectural millwork and the sort of multiples that appear at Rhinebeck each year, Union Woodworks has heretofore been to the major manufacturers what most such shops have been: a countercultural alternative.

Beyond all the pomp, this award represents another crack in the marketing barriers (see. p. 86). The pundits of residential furniture have recognized that woodworkers can seriously compete with the rest of the furniture industry. For details on next year's contest, write the Hardwood Institute, Suite 1920, 230 Park Ave., New York, N.Y. 10017. —*R.M.*

Two steady-rests

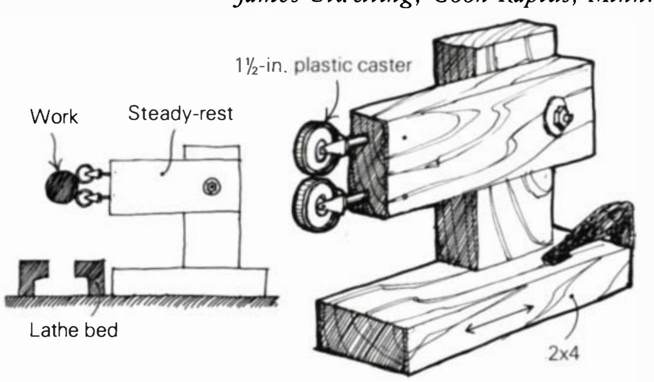
The homemade stabilizer device shown below allows me to turn four-poster beds and architectural columns on my 9-ft. lathe. The stabilizer eliminates the whipping and vibrating that accompany long-stock turning. The brace bolts to the lathe bed at about the midway point. A long upward-pointing handle is hinged to move the cast-aluminum stabilizer back and forth so it can ride against the stock. The stabilizer has several different diameters to fit different-sized turnings. The aluminum, coated with a little beeswax where it rubs, effectively carries away the heat. The brace adjusts against the stock through a spring-loaded device that moves an old file against a stack of hacksaw blades.

—Deloe Brock, Chattanooga, Tenn.



Here is an economical steady-rest made from three sections of 2x4, a carriage bolt and two plastic casters (drawing, below). Cut and join the wood to fit your lathe bed, then drill the bolt hole the same height as the center spindle. The base clamps to the lathe bed and adjusts in or out for large or small work. The roller arm pivots on the bolt to provide a fine-tune adjustment to the changing diameter of the work in progress.

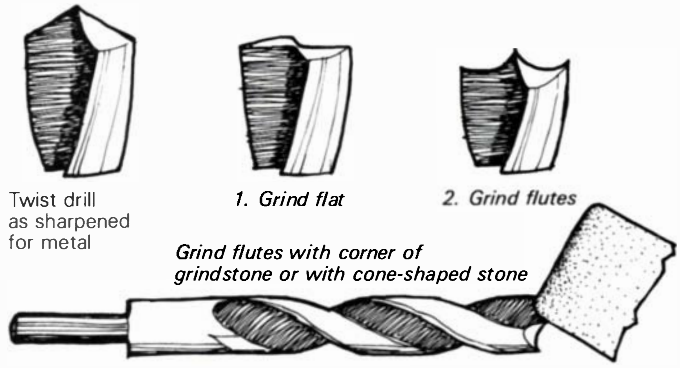
—James Ulwelling, Coon Rapids, Minn.



Modifying twist drills for wood

A worn-out twist drill can be modified to perform much better in wood. First grind the tip flat. Then, using a cone-shaped stone in a hobby grinder or the rounded-over corner of an abrasive wheel, grind two hollows—one on each side of the center. The hollows form a center spur and two outer spurs. Be sure to bevel the hollows so that the back side of the flutes will clear the wood.

In use, the center spur holds the bit stable and keeps it

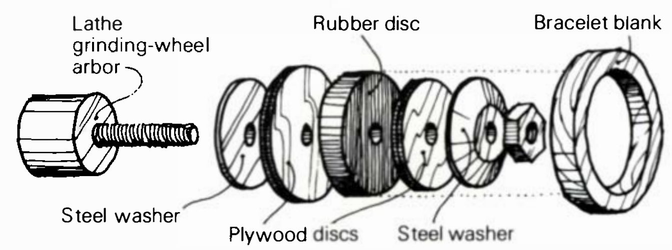


from wandering. The outer spurs cut the wood's fibers in advance of the cutting edge to give straight, clean holes.

—Stanley F. Kayes, Richmond, Va.

Expanding-action bracelet mandrel

Here is an effective mandrel for turning the outside contours of bracelets. You'll need an arbor (made for using buffing and grinding wheels on the lathe), a rubber stopper and a small piece of ¼-in. thick plywood. Turn the rubber stopper to a 5/16-in. thick, 2⅜-in. wide disc. This diameter works well for bracelets, which usually range from 2⅜ in. to 2¾ in. in inside diameter. Turn also two ¼-in. plywood discs—one to a diameter of 3 in., the other to 2½ in. Assemble the mandrel with the arbor's steel washers to the outside and the rubber disc sandwiched between the plywood discs as shown.



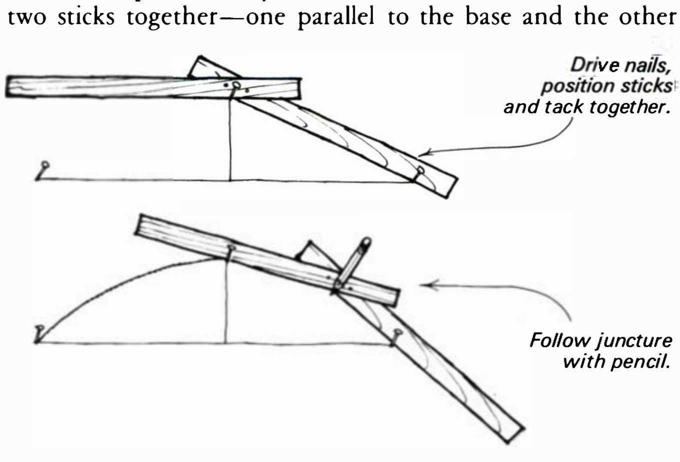
To use the mandrel, cut the inside of the bracelet blank with a circle cutter, bandsaw the outside to rough shape and slip the blank over the rubber disc. Now tighten the nut. The rubber will expand uniformly to exert enough pressure to hold the bracelet. Turn one side of the outside contour, then reverse the blank and turn the other face.

This method could be adapted to napkin rings and other ring-shaped objects by sizing the rubber and plywood discs to the project.

—Max M. Kline, Saluda, N.C.

Drafting a smooth curve

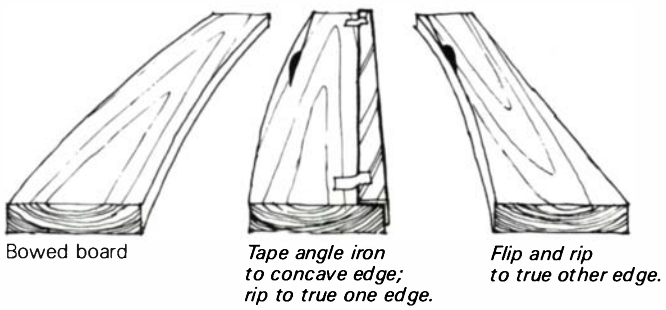
Several years ago a Danish carpenter showed me this method of drawing a smooth curve to fit a given width and height. Start by driving three nails, one at the top and one at each end of the space where you will construct the curve. Now tack two sticks together—one parallel to the base and the other



riding two of the nails: the one at the top and one at one edge. Put a pencil at the juncture of the sticks and let the sticks slide over the nails as you mark the curve. Repeat the same procedure on the other side to complete the curve.
—Thomas Baird, Woodland, Calif.

Straightening curved lumber

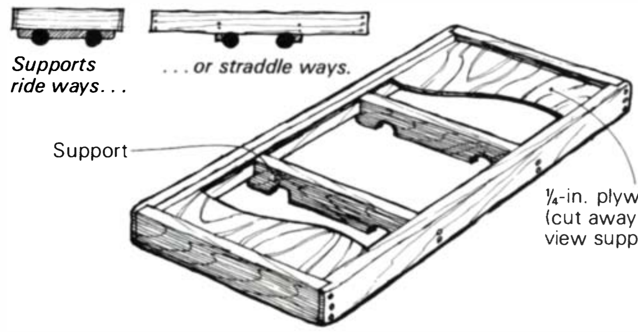
Here's a trick for straightening a bowed board. Tape a piece of angle iron to the concave edge of the board to serve as a guide, as shown below. If the board is thin, block up the angle iron so it won't drag on the table. Pass the board through the saw with the flat edge of the angle iron against the rip fence. Remove the iron, flip the board and pass through the saw again. The result is a straight board with parallel sides. *—Charles F. Riordan, Dansville, N.Y.*



Shopsmith work tray

This handy work tray, designed to use with the Shopsmith, rests on the tool's tubular ways. It holds lathe tools, work arbors, sandpaper or small workpieces. You can drill holes in the tray for the Shopsmith's allen wrench, drill bits, plug cutters or whatever.

Materials and tray size can vary. My tray (drawing, below) is about 18 in. long, 12 in. wide and 1 in. thick. Semicircular cutouts on the tray's supports let the tray ride the Shopsmith's tubular ways. The supports are spaced so that if the tray is turned 90°, the supports straddle the ways.
—Billy Hill, Orange Park, Fla.



Sanding small pieces in the clothes dryer

Here's an alternative to Charles Reed's method of sanding the corners off small pieces of wood (*FWW* #23, July '80). My method does not even require a frame.

I needed radiused edges on both ends of a thousand ½-in. long pieces of ½-in. diameter dowels. I lined the insides of three 5-lb. plastic peanut-butter buckets with 100-grit sandpaper, tossed in about 350 dowels per bucket and secured the lids with masking tape. Then I put the buckets into my clothes dryer along with a couple of heavy towels to aid the

tumbling action. I set the dryer to air fluff and turned it on. In only ten minutes the job was done.

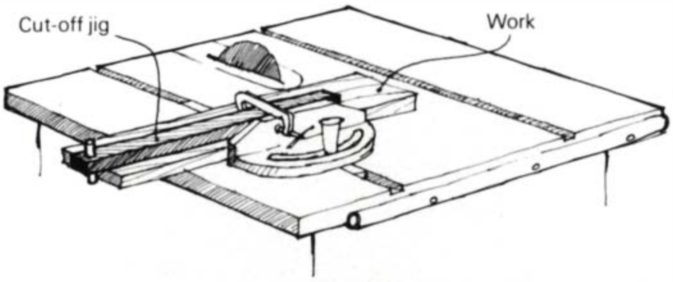
To protect your dryer, be sure to use only "soft" containers, secure the lid, add towels and use a no-heat setting.

—Marilyn Warrington, Tiro, Ohio

Adjustable miter-gauge stop

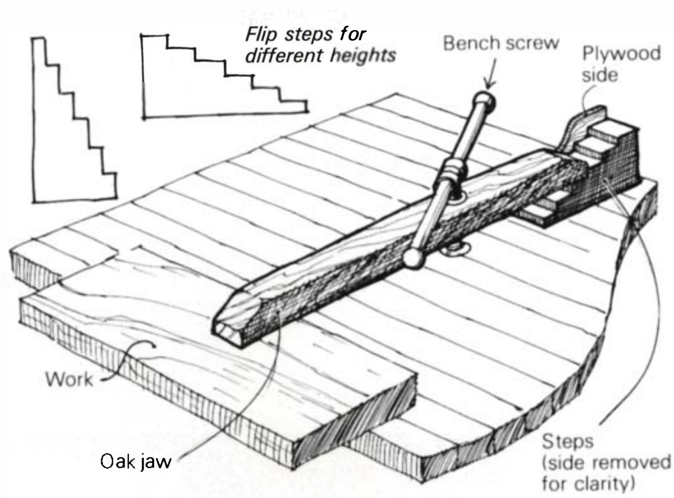
Here is a jig that's easy and fast to make and to use. It's basically a stick with a dowel through it, clamped to the table-saw miter gauge to give precise production-run cutoffs. It works at any angle.

—Alan Miller, Lakewood, Colo.



Horizontal vise

This horizontal vise, installed on a workbench, is indispensable for sanding, routing, carving and planing. For many operations it holds the work better than bench dogs. The vise consists of three simple parts: a bench screw, an oak jaw and a wooden step-block. Mount the bench screw's nut to the bench from the bottom so that the surface will be flat if you remove the vise. Cut the 2-in. thick jaw about 20 in. or so



long. Drill an oversize hole in the jaw about 7-in. from the back and fasten the bench screw through the hole. Bandsaw the step-block from a 4x4. Cut the steps taller one way than the other so you can flip the block and use it both ways. To keep the back end of the jaw from slipping off the sides of the step-block, glue a piece of plywood to each side.

—Pendleton Tompkins, San Mateo, Calif.

Safe jointer hold-down

A few years ago, after nipping a finger in a jointer, I became preoccupied with the safe operation of this machine. I pored through textbooks and catalogs searching for a hold-down/guard device that would be safe, easy to construct and inex-

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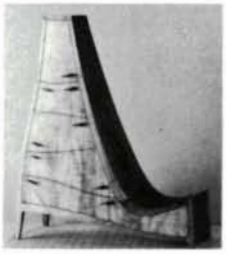

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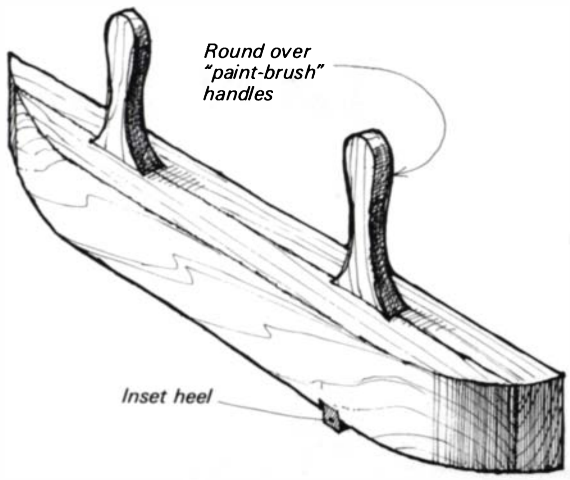


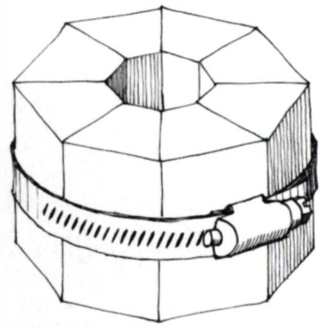
pensive. I looked for a design that would protect both hands, be rigid, provide firm, steady pressure and allow good control of the workpiece. Finding nothing meeting my requirements, I eventually came up with the design shown above.

I keep three different lengths of hold-downs (24-in., 48-in., and 78-in.) to accommodate various lengths of lumber. Dimensions, however, are not critical and you should adapt them to your needs. Start with two lengths of 2x4. Dress the inner faces and cut dadoes into them to accept the "paint-brush" handles. Mate the dadoes and glue up. After the glue has set, square up the piece and cut the dado into the base to accept the ¾-in. heel so it protrudes about ½ in. Now bandsaw the curves in the leading and trailing ends of the unit and sand smooth. These curves allow the jointer's blade guard to open and close with a minimum of blade exposure.

Next set the heel and the handles. If possible wedge the ¾-in. square heel in place rather than gluing it. It may have to be replaced from time to time. Cut the heel and the handle bases a trifle short so they won't protrude and snag on the jointer fence or the workpiece. The hold-down is now ready for very safe surfacing work.

—Bernard Maas, Cambridge Springs, Pa.

Clamping segmented turning blanks

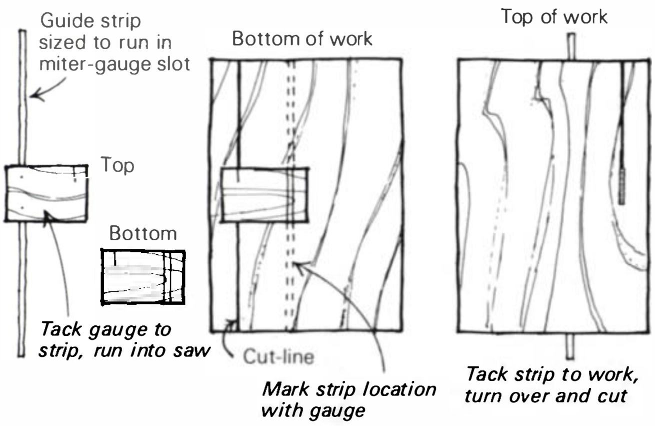


Worm-screw hose clamps make good, inexpensive gluing clamps for segmented turning blanks or other cylindrical gluing jobs. The clamps are available in hardware and automotive supply stores in sizes up to 6 in. in diameter. For larger diameters simply screw two clamps together head-to-tail, or cut the band and install steel wire to extend the clamp's circumference. Marks and dents can be avoided by placing cardboard or wooden pads between the clamp and the work.

—W. L. Chess, Washington, Conn.

Cutting wide panels

A simple wooden strip tacked to the bottom of the workpiece will let you rip panels that are too wide for the rip fence on your table saw. Size the wooden strip to run in the miter-



gauge slot (generally ¾ in. by ⅜ in.), and cut it slightly longer than the cut to be made. To lay out the strip's location on the workpiece, I used a small piece of ⅛-in. thick birch plywood as a distance gauge. Tack the plywood to the strip, then run the assembly into the saw for about an inch. Turn the assembly over and mark on the plywood the strip's location with a pencil line on both sides of the strip. Remove the plywood and you have a gauge that shows the exact relation of table slot to saw kerf.

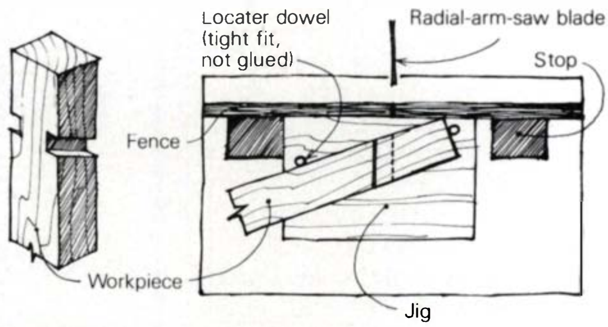
To use the strip, draw an accurate cut-line on the back of the work. Now use the distance gauge to lay out the strip location, and brad the strip to the bottom of the work. Remember to position the strip so that the saw kerf is to the waste side of the cut-line. Turn the assembly over, feed the strip into the table slot and make the cut. If you have done the layout carefully, the cut will be right on. I use a thin-rim plywood blade, which, since the finished side of the work is up, produces a smooth, clean cut.

The procedure is not practical for the first cut on a 4x8 sheet of plywood or for quantity cutting. But it works fine for those 30-in. and 36-in. panels that are so awkward to cut on a small saw. *—William Langdon, Lake Forest, Ill.*

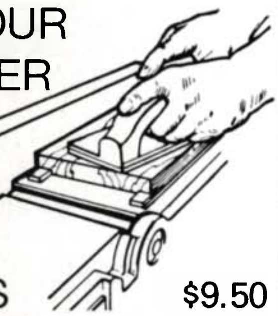
Reversible jig for the radial-arm saw

This reversible jig is useful when you need to cut a number of identical pieces with angled dadoes on opposite sides. The two dowels and the saw fence locate the work. Two stops clamped to the fence define the width of the dado. Once you have cut all pieces on their top sides, flip the jig end-for-end, push the dowels through to the opposite side of the jig, relocate the stops and proceed to cut the bottom dadoes.

—J.A. Hiltebeitel, S. Burlington, Vt.



Methods of Work buys readers' tips, jigs and tricks. Send details, sketches (we'll redraw them) and photos to Methods, Fine Woodworking, *Box 355, Newtown, Conn. 06470.*



I just happened on some 16-in. dia. cherry logs, about 6 ft. long. My last experience drying cherry logs was a disaster. Though I sealed the ends, the logs developed deep checks. I think my mistake was to debark them. After painting the ends, could I put my logs in giant plastic bags to slow down drying and to protect them from insects?

—Robert Kinghorn, Excelsior, Minn.

Your disaster is the result of your trying to do the impossible. The tendency of wood to shrink more in the direction tangential to the growth rings than in the direction perpendicular to the growth rings requires that radial splits occur to relieve the drying stresses.

Cherry sapwood shrinks more than the heartwood, and it dries faster. Taking the bark off makes things even worse. If you are looking to dry big chunks of cherry, leave the bark on and split the logs in half. Lightly coat the split surfaces with wax and paint the ends with glue. Put the logs in a cool place with little temperature fluctuation, and keep your fingers crossed for several years.

Your alternative is to decide what you want to do with the wood and to cut it into pieces about 30% larger than the finished dimensions. All the problems that arise in drying wood get worse as the cross section of the piece increases.

—Paul Fuge

What are the effects of time, long periods of time, on the various glues we use? Also, are there warnings about the extremes of cold, moisture and shock that we should consider when using certain glues? —Philip Houck, Fairfield, Conn.

Depending on the type of adhesive and its mechanism of curing (loss of solvent, chemical reaction, or other), it may be days before full bond strength is developed. Once the cure has attained virtual completion, strength is generally sustained indefinitely under normal conditions.

With properly cured waterproof adhesives (phenol-formaldehyde, resorcinol-formaldehyde, melamine-formaldehyde) moisture should have no effect. Ureas can sustain long periods of high moisture, but not at elevated temperatures. Casein and soybean types can usually withstand short periods of water immersion, but only if the joint is not under stress. With other glues, either the quality of the bond (as with RTV silicones) or the adhesive itself (white and yellow glues) may be degraded by moisture.

With temperature-setting adhesives, strength may be improved by high temperature, while thermoplastic glues are softened by elevated temperatures. Very low temperatures can embrittle some plastic adhesives, making them subject to lower shock-load resistance. At the time of setting, temperatures below 70°F may cause improper curing of some glues (resorcinol, PVA, urea), whereas soybean and casein glues can be applied at 40°F without impairing the cure.

Most adhesives are successful when bond strength equals wood strength. At normal temperatures, properly cured joints can withstand most shock loads (loads of short duration). Under sustained loads, some glues maintain rigidity and strength; yet others (thermoplastic and non-moisture-resistant types) will yield or creep under sustained stress, and will eventually fail. White and yellow glues yield somewhat under stress, which is an asset where joined parts are subject to conflicting dimensional changes, as in dowel joints.

Additionally, starch and animal glues may undergo biological deterioration—molds and fungi—especially in warm, humid conditions. *—R. Bruce Hoadley*

I recently built a gate-leg drop-leaf table of walnut. To the undersides of the leaves I attached a system of battens with screws and glue for added strength. I finished the undersides with Watco, and also applied some to the tops. After a week, I applied a mixture of tung oil and polyurethane to the top surfaces but not to the bottoms.

About two weeks later the leaves began to cup outward; now they are severely warped. How can I overcome the warping problem and straighten out the leaves?

—Dan Hayes, Elkhart, Ind.

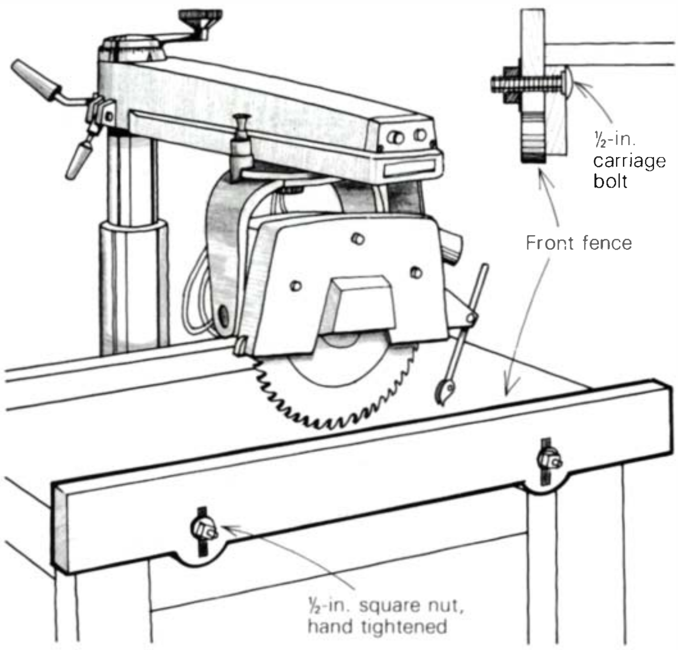
Your problem is caused by the battens that are screwed and glued to the undersides of the leaves and keep the wood from moving. Pretty soon the leaves will split. The best thing is to start over. Don't put any supports on the undersides of the leaves, and whatever the finish you use on the top, treat the undersides of the leaves exactly the same way. *—Tage Frid*

The front fence for the radial-arm saw, as described by Allen L. Cobb (FWW #26, Jan. '81, p. 8) appears to be a very good idea. In addition to saving fingers, it would put the work at the front of the saw (when ripping), where it can be seen and easily controlled by the operator. Could Mr. Cobb provide a sketch or a photo of this device to make it a little clearer?

—Victor H. Cahalane, Clarksville, N.Y.

Here is a rough sketch of the saw fence. My saw is set into the right edge of a 9-ft. storage counter. I installed the fence 25 years ago, and have found it very useful. *—Allen L. Cobb*

Rip fence for radial-arm saw



During the past 20 years I have built a number of pieces of furniture using various crotches, burls and butts as face veneers. In almost every case, cracks and checks have developed in these veneers. What can be done to remedy this, or to avoid it in the future? —Hal Halstead, Woodland, Calif.

Burls, crotches and butt veneers are usually wavy, ripply and brittle, and the grain runs in all directions with soft and hard areas. When these veneers are glued to a ground, any moisture that may have been present in them will dry out after a period of time, causing the veneers to shrink and check along the odd-formed figures.

These veneers are usually flattened by being sprinkled with water, then pressed in a veneer press or between two boards with heavy weights on top. Be sure to place several layers of newspapers over and under the veneers. If after a day the papers are still damp, replace them with dry ones. A couple

Drawing: Ric Lopez

of days in the press should do it. Many craftsmen put a backing on the veneer when it's dry before it can become wavy again. You can glue the burl or crotch veneer directly to a straight-grained, stable veneer such as mahogany. Apply the glue to the veneer only, then put it in the press immediately so the moisture from the glue does not penetrate and expand the burl or crotch veneer. Never use water-base contact cement for gluing veneers. Also, veneered objects should not be placed in areas with very dry heat. —*Peter L. Rose*

With regard to James Rannefeld's article on mosaic doors (FWW *#26, Jan. '81), it seems to me that if wide, solid wood pieces are glued to a plywood core and subjected to great environmental changes, the glueline will eventually fail, unless the glue is applied only to the center portion of each piece to allow for free expansion. The author doesn't state clearly how to cope with the possibility of this happening. If only the center portion is glued, shouldn't the sectional drawing show splines between the stile and the mosaic elements also?*

—*John Briggs, Midvale, Utah*

In my article I have allowed that solid wood will expand and contract across the grain, and suggest for that reason that the mosaic pieces should be relatively small (under 12 in. wide) and connected by a network of splines. The size of each piece can vary. though, depending on the wood species (mahogany, for example, is very stable, oak very unstable), and on the quality of the wood finish, the degree to which it impedes the transfer of moisture between air and wood.

Each mosaic piece should be glued as widely and as uniformly as is practical to prevent the individual pieces from warping and cupping, further straining and degrading the glue bond. We don't spline the mosaic elements to the rails and stiles because if the pieces are properly glued and cross-splined, it is impossible for any of them to dislodge.

—*James A. Rannefeld*

I am intrigued by Dan Dustin's finishing process for green wooden spoons (FWW *#22, May '80, p. 82). I wonder what proportion of beeswax and olive oil he uses to make the creamy mixture. How does he combine the ingredients? How long does the whole finishing process take?*

—*William C. Pellouchoud, Boulder, Colo.*

When carving spoons from green wood, you can tell when the piece is about to check. Work in the shade, and take chances with only the poorest pieces. In time you get a feel for what's best. Carve the least stable woods outdoors on rainy days. Just before you think a piece is going to check, bury it in a pile of wet leaves or shavings or snow or under a wet towel. When the going really gets rough (lilac cut six months ago will check in about five minutes once you start working it), I keep the whole batch in a tub of water, carving a minute or two in each piece and tossing it back into the water until I wind up with a tub full of spoons.

Then I oil the rough-carved pieces as often as they show the need until they won't take anymore. When they've shown a gloss for a week or two they are probably ready to fire.

For the third step, I fire in a mixture of beeswax and olive oil. I have never weighed or measured anything. I just melt the wax and add the oil until the cooled mixture can be softened by friction between the bare hands and the wood. The harder the mixture the better it is, as long as you are able to work it cold.

The spoons are immersed in this mixture at the minimum temperature required to vaporize the remaining moisture in the wood. You will see the surface of the liquid foam and roil. This process tires the mixture and, therefore, more wax must be added with every firing to keep it sufficiently hard. When it appears that all the moisture has been boiled out of the wood, I allow the oven to cool and remove the spoons from the wax/oil mixture just about as soon as I can with my bare hand.

Next, I lay the fired spoons outdoors for a week or two allowing the sun to draw out some of the oil (leaving, it seems, more wax behind). The longer you wait, the easier the spoons are to finish. As a last step, I finish by scraping and sanding, scrubbing well with soap and water and hanging each to dry before each sanding. Finally, I rub in some of the wax/oil mixture and polish with a cloth. —*Dan Dustin*

In 30 years of amateur cabinetmaking I have never learned the secret of applying a uniform color of stain to walnut, cherry, birch and other woods. I have used oil stains and water stains, and still get uneven color. Can you help?

—*R.S. Nelson, Albuquerque, N. Mex.*

Applying liquid stain, especially undiluted, to unsealed wood can cause uneven coloring. The reason is that different pieces of wood and even different areas of the same board can absorb colorants to a greater or lesser degree. I know of two ways to solve the problem.

The first is to brush on the stain in several applications, each one thinned down. Skip the darker areas on the following coats, and work on the lighter, less absorbent areas. Blend light and dark sections until you get a uniform color.

The second method is to seal the wood initially with thinned-down coats of finishing product (lacquer or varnish) before applying the stain. Put on the seal coat, let it stand for a few minutes and then wipe the surface with a cloth to get it as dry as possible. Before the seal coat can harden, apply the first coat of stain. No need to thin the stain unless you want to lighten its color. Make sure that the stain and the sealer material are compatible. Water stains won't take to a surface sealed with petroleum-base varnish or oil. —*Don Newell*

A physician friend was visiting me when your question arrived. I asked him how he would answer such a question. He smiled and said, "If the man wants uniform color, he should paint his wood." While his remark might seem a little strong, he was not entirely wrong. A craftsman uses wood because of its endless variety of grain, markings and color. Factories, spawning furniture on the assembly line, are concerned about uniformity. The latest, cheapest, surest and most shameless method is to bleach the wood to a neutral, paper-like uniformity, and on top of such gelded wood they build up a finish with pigmented lacquers and glazes. One may as well use wood-grained contact paper, or a plastic laminate. They are always uniform. —*George Frank*

What are the working qualities of black willow (Salix nigra)*? It appears to be rather like pine, fuzzy under the dull plane iron, light, prominently figured. Will it warp badly? Will it accept glue fairly well? There must be some reason why this rather common wood is not more used in cabinetmaking.*

—*Harriet Hodges, Rural Retreat, Va.*

Black willow is a moderately low-density hardwood (specific gravity is 0.36), similar in density to white pine and yellow poplar. It is a diffuse to semi-diffuse hardwood, with relatively small vessels, producing a fairly fine texture and reasonably even grain. The heartwood pigmentation is variable, typically light tan with uneven streaks of dark brown.

Although reasonably strong and tough for its weight, it lacks surface hardness, and thus hasn't been popular as a primary furniture wood. It dents more easily than oak, maple,

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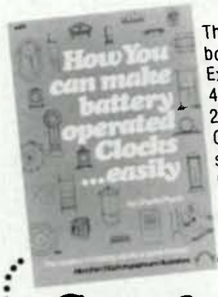

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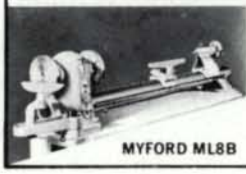

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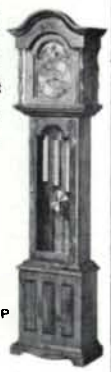

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birch, ash, cherry or walnut. Its low density makes it easy to cut with most tools. However, it does not take a smooth surface well, probably because of its tendency to develop reaction wood. It won't turn or sand to a smooth surface compared to other hardwoods.

Black willow apparently glues readily without any difficulties. For its density, it has fairly high transverse shrinkage properties, and especially high rates of tangential to radial shrinkage (S_T = 8.7% S_R = 3.3%; S_T/S_R = 2.6%). Therefore, depending on the orientation of the growth rings or grain distortion due to defects, or the presence of reaction wood, warp could be a serious problem. I have not known of its use as a routine cabinet wood, although it is used as core stock for veneered panels, and as framing and other secondary components. *—Bruce Hoadley*

Follow-up:

Re refinishing church doors *(FWW #25*, Nov. '80, p. 30), I think it is not only the material you use that gives you trouble, but also the way you are finishing the doors. The most important parts of the door (to the finisher) are the top and bottom edges. These have to be well sealed to make them weatherproof. I always carry a small mirror with me to check the bottom edges, and in 99% of all cases this is where the trouble starts.

I suggest you do as follows: Remove the doors to your shop and cover the open doorway with plywood. Strip the doors with a good remover, wash them with lacquer thinner, sand (no steel wool whatever), stain and varnish. We use Sherwin-Williams Marvethane for a sealer and second coat, sanding between with 240-grit finishing paper. Let the finish harden for a week before re-installing the doors. Be sure to give the end-grain edges top and bottom double passes when spraying. Using this method, the finish on your doors should last five to eight years. *—Jan Hieminga, Westwood, N.J.*

I was really amazed to see someone (Sandy Cohen) go to such great lengths to obtain a lubricant for woodscrews *(FWW #26*, Jan. '81, p. 30). I simply use grease; a white or yellow lithium grease is best. A small tube goes a long way, and it won't attract rodents into the shop as tallow might.
—Kit Housego, Milton, Wash.

I recommend silicone spray as a better lubricant than lamb tallow. The silicone won't attract insects or stink the way greasy animal fat will. *—Wallace Veach, Baton Rouge, La.*

Here's another recipe for a lubricant: Melt some beeswax in a double boiler and add a little mineral oil. The amount of oil added will determine the consistency, from hard to soft. Once I was laying an oak floor and having trouble with bent nails. I bored a hole in the end of the hammer handle and filled it with this oil/wax preparation, mixed to a paste consistency. I dipped each nail point about ¼ in. into this goop before driving, with considerably improved results.
—E.D. Groves, Mississippi State, Miss.

To Simon Watts' advice about making jigsaw puzzles *(FWW #26*, Jan. '81, p. 30), I would add the following: Use 3/16-in. basswood plywood, available from Constantine's, made specifically for this purpose. Glue the picture to the plywood with contact cement, and use a roller to get rid of all

the air bubbles. If it is warped at all, turn the concave side of the plywood up. This prevents binding the blade and ensures firm support under the cutting point. The warp will disappear as the puzzle is being cut.

Cut out the pieces with a fine blade. I use a Rockwell #40-184, which has 20 teeth per inch. Use as high a blade speed as possible for the smoothest cut. Cutting done, keep the puzzle intact, and sand the back side to remove the fuzz. You can cut up to three puzzles at one time by taping them together with clear tape. In the best puzzles, all the pieces fully interlock. *—Earl K. Moore, North Granby, Conn.*

Readers want to know:

I am interested in building a portable sawmill on the frame of a pick-up truck. If anyone has experience in the construction of one of these or something similar, or knows of a source for plans, I would appreciate some advice.
—Duane Hyatt, Portales, N. Mex.

I've acquired an old cast-iron table saw labeled Baker & Sons, Toledo, Ohio. From all appearances it was manufactured around 1900. It has a 1-in. arbor, takes a 16-in. blade and has all its attachments. Altogether, it weighs close to 800 lb. The problem is that it's disassembled, and I need some help getting it together. Does anyone have any information or knowledge about this machine? *—R.W. Mascle, Wolcott, N.Y.*

Readers can't find:

I'm looking for plans for physician's office furniture and equipment. *—Bruce Campbell, Flemington, N.J.*

. . . a front trunnion (original part #TCS-204) for a Delta 10-in. table saw, Model 1060. Rockwell says parts are no longer available. *—Evar F. Carlson, Belfair, Wash.*

. . . plans or measured drawings for an Early American adjustable music stand with turned pedestal.
—Donald L. Cook, Park Ridge, Ill.

. . . plans or design sketches for a variety of artist's easels.
—Pat O'Lynch, Pasco, Wash.

. . . a supplier of an auger-bit extension for a bit brace.
—Robert Mucklow, Ft. Pierce, Fla.

. . . brass or bronze hardware for an adjustable music stand and for a drafting table. *—Greg Kriebel, Gales Creek, Ore.*

. . . a wholesale source for Shaker tape to be used for weaving chair seats. *—James Bigelow, Possum Trot, Ky.*

. . . instructions or an owner's manual for an Emrick Universal Woodworking Machine (ca. 1950).
—C. John Crawford, Woolrich, Pa.

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Drawing on the Right Side of the Brain by Betty Edwards. *J.P. Tarcher Press, 9110 Sunset Blvd., Los Angeles, Calif. 90069, 1979. $8.95, paperback; 207 pp.*

To design a project, one must take the visions within the mind and draw them on paper. Designing then becomes a process of critically modifying and developing one's drawings of the project. Consequently, the essence of learning how to design is learning how to draw. Though not written specifically for woodworkers, this book will help designers, including woodworkers, to improve their drawing skills and, accordingly, their designs.

Edwards offers perhaps the clearest summary of current thought on the division of mind between the right and left hemispheres of the brain. Because drawing is a right-hemisphere activity largely ignored by our left-brain oriented culture, she contends that drawing is a natural skill that most of us can easily do if we learn to acknowledge our right hemispheres. This book improves drawing skills by leading readers through exercises that open them to the experience of the non-verbal, non-temporal, synthesizing and intuitive right hemisphere. She writes, "The potential force of the creative, imaginative side of your brain is almost limitless, and through drawing you can come to know this powerful self and make it known to others."

Used in many art schools for some time, these exercises are not particularly new. What's so useful is their clear presentation within the context of right/left brain theories. The exercises teach the student how to initiate and to recognize the shift from left mode to right mode by such simple activities as drawing in mirrored images and copying upside-down portraits. One is amazed to discover new and powerful capabilities within.

Riding this wave of excitement, Edwards asks readers to examine the symbol systems in which they've been stuck since they last drew in childhood, such as the third-grade image of a house on a hill with two trees and smoke coming out of the chimney. Then she guides them into traditional aspects of drawing—using negative space, perspective, proportion and shading. Gradually the excitement becomes confidence, then real skill, a skill "which will release you from stereotypic expression, opening the way for you to express your individuality—your essential uniqueness—in your way, using your own particular drawing style."

This book has another important dimension for woodworkers. As taxpayers everywhere are severely reducing school budgets, forcing the elimination of "non-essential" art and shop classes, woodshop teachers need the theoretical basis offered here to argue that balanced persons need to develop both brain hemispheres and that woodshop classes offer invaluable right-brain activities. "The right-hemisphere mode is intuitive, subjective, relational, holistic, time-free.... Most of our educational system has been designed to cultivate the verbal, rational, on-time left hemisphere, while half of the brain of every student is virtually neglected."

Finally, this book is worth more than its price in information and several times its price in joy. People who glance over it in the store usually buy it; you probably have a friend with a copy. After absorbing its first few pages, you'll want your own copy to underline and scribble in. And fortunately, the publisher fills mail orders quickly. —*Chuck Boothby*

The History and Practice of Woodcarving by Frederick Oughton. *Stobart & Son Ltd, London, 1969; available from Woodcraft Supply Co., 313 Montvale Ave., Woburn, Mass. 01881. $8.95, hardcover; 188 pp.*

Frederick Oughton, a British carver and teacher, has written widely on woodworking, carving in particular. In this book, his intention is to teach, not only woodcarving techniques but also what to do with those skills once they are acquired. Throughout the book he urges student woodcarvers not to be bound by tradition but to use their imaginations to explore both themselves and the medium. Oughton has little patience with the "archaic atmosphere" that woodcarvers still breathe, with those who "have gone on producing replicas of past carvers who... were capable only of producing replicas of past carvings." He ascribes this to an emphasis on sheer technique at the expense of cultivating the "inner eye."

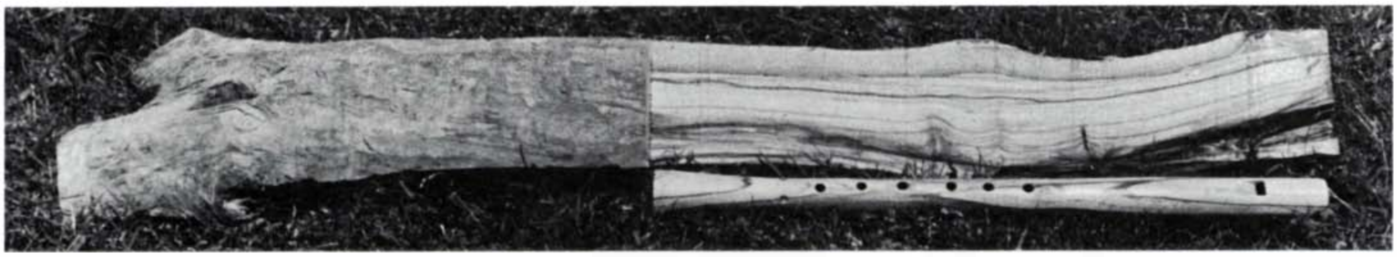
Although fairly short, the book contains a mass of well-organized, useful material: the selection, use and care of woodcarving tools; woods; carving techniques; finishes and how to transfer two-dimensional designs to the wood. There are also sections on contemporary and traditional design and some historical background. Scattered throughout the book are numerous photos of carvings from all over the world together with graphic designs suitable for adaptation as carvings. The writing is lively, sometimes humorous and always informative. The quality of the printing, layout and paper is not outstanding but then neither is the price. The lack of an index is a drawback. I recommend the book to anyone wanting to get started in woodcarving, and it should certainly be on the shelves of school and public libraries. —*Simon Watts*

Chuck Boothby, a teacher, lives in Moorestown, N.J. Simon Watts, of Putney, Vt., is contributing editor to this magazine.

Olivewood Recorder

by Trevor Robinson

The olivewood recorder and the log from which it came.



I once saw a recorder made of olivewood, and right away decided to make one. The wood has a striking figure with dark brown streaks against a yellowish background. It is hard, heavy and close-grained—just the thing, it seemed, for wind instruments. The only problem was where to get some. None of the dealers I knew listed olive in any form.

Time passed and I forgot about olivewood until a summer when I was going to be traveling with my family in Italy and southern France, where, I suddenly realized, olive trees grow in profusion. To acquire a piece of olivewood suitable for a recorder should be as easy a getting a piece of pine in Maine. I was not disappointed. Every little farmyard seemed to have its olive tree. In some areas groves of them extended up the hillsides in all directions. I started making inquiries—where could I find a dealer who handled olivewood? My simple request got only a surprised reply—no one ever cut down olive trees. They live for hundreds of years. I never actually heard that they were sacred and that it would blasphemous to saw one up, but I began to get that impression.

Finally in Florence we were talking to some new acquaintances, and I brought up my frustrated desire. This time the answer was more encouraging: "You should go and see Rino Cellai." Rino Cellai turned out to be the proprietor of an extensive lumberyard. He told me I could go and pick out whatever olivewood I wanted from a shed in the yard. Full of enthusiasm after so much disappointment, I hurried over there and was disappointed all over again. Certainly there was a big stack of olivewood—all sawn into boards ¼ in. thick—not what I needed for a recorder. Rino Cellai spoke no English, and my Italian was slight, but I tried to find out why this was the only dimension sold and if there was any chance of getting turning squares. The answer to the second question was easy—"No." The answer to the first question, while not helpful to me, was interesting. It turned out that Rino Cellai was the supplier of olivewood for use on the instrument panels of expensive cars. I knew that Jaguars used walnut, but I didn't know that in a Maserati or Lamborghini I might see olivewood from Rino Cellai. "Well," I concluded, "that's the end of the olivewood project. Let's go on and enjoy the rest of this vacation."

Two weeks later we were driving through southern France, with olive groves extending for acres on all sides, when my wife had an inspiration. "Look," she said, "there's a pile of firewood beside that farmhouse, and since the only kind of trees they have here are olives, don't you suppose . . ."

I stopped the car instantly, I hurried up to the house and tried to explain to the surprised farmer that if his firewood was *olivier*, I would like to buy a log of it. Imagine your reaction if some foreigner, hardly making himself understood, should suddenly appear and ask to buy a piece from your woodpile. That was his reaction, too. He threw up his hands and told me to help myself, *gratuit*. It took a while to go through the pile, but finally I chose a splendid log about 5 in. in diameter and close to 3 ft. long. I tied it to the roof rack and exultantly drove off.

It didn't take long to realize that U.S. Customs was not going to look at that log in the same way that I did. Olive trees do live for hundreds of years, and they look it. The bark was coarse and fissured, covered with patches of fungus and lichen, possibly harboring worms and insects. The only way to get it into this country would be to clean it up. I found a hardware store and bought a hatchet, with which I hewed away at the olive log, eventually getting all the bark off and smoothing out the cracks so that it came at last to resemble a modern wood sculpture.

Several uneventful days intervened—if I overlook the expression on the chambermaid's face when I carried the log into our hotel room in Paris. Then came departure time. We were sailing back to the U.S. on board the *France* that year, and baggage was to be labeled either "Hold" or "Cabin." To most people the hold would have seemed the right place for a piece of firewood to cross the Atlantic, but it had occurred to me that, deprived of its bark and next to the engine room, my log might be checked beyond hope on arrival. I labeled it "Cabin" so that I could keep an eye on it. Once on board, I put the log in our shower, where I could keep it moist. Stewards see a lot of strange things, and ours took this in stride without the slightest hesitation.

At last we stood with our baggage on the pier, waiting for customs inspection. Inspectors see a lot of strange things too, I suppose, but olive logs are not common. The first inspector fetched another one to a conference. Then they both left and returned with a third who represented the Department of Agriculture. Together they went over the log in great detail, searching for undesirable wildlife but perhaps also partly looking for a hidden compartment full of diamonds or heroin. It helped my case that I had another package of nicely sawn turning squares of pearwood, and the inspectors were convinced finally that I was a legitimate woodworker and that the log was safe to admit. Once home, I split it and put it aside to season some more.

Years later I got around to making my olivewood recorder. The wood turned nicely, and the recorder looks and sounds beautiful, but I haven't found a satisfactory finish for it. Olivewood is very resinous, and the resin prevents the drying of alkyd and polyurethane varnishes. Two weeks after application they were still sticky and could be completely washed off with paint thinner. Acrylic spray lasts for a while, but eventually the resin bleeds through and takes it off. Every now and then I wipe off the old finish and spray on another coat, but there must be a better way. I find myself wondering how they finish the dashboards on those expensive Italian cars. □

Fine Woodworking *buys readers' adventures. Suitable length is 1,500 words or less—up to six typed pages, double spaced. Please include negatives with photographs.*

Trevor Robinson, a biochemist, lives in Amherst, Mass.

Events

Events listings are free but restricted to workshops, fairs, lectures and exhibitions of direct interest to woodworkers. The next deadline is May 1, for events beginning July 1 to Sept. 15.

CALIFORNIA: **Summer Woodworking Classes**—contemporary and traditional furniture-making, Skip Benson, May 18 to June 18; Windsor chairmaking, Michael Dunbar, June 29 to July 10; woodworking techniques for sculpture, James DeVore, July 27 to Aug. 27; each, $495. Write Skip Benson, California College of Arts and Crafts, 5212 Broadway at College, Oakland, Calif. 94618.

CALIFORNIA: **Summer Workshops**—James Krenov will discuss his tools and techniques, June 22 to July 10 and July 20 to Aug. 7, Mendocino. Details from Creighton Hoke, College of the Redwoods, Summer Program in Fine Woodworking, 542B N. Main St., Ft. Bragg, Calif. 95437.

CALIFORNIA: **The Cutting Edge**—turning class, Bob Stocksdale, May 28, 7 P.M. to 10 P.M., repeated May 29, $35; a day with Sam Maloof, May 23, 10 A.M. to 3 P.M., $35. Also World Timbers Rare Wood Show, May 2-3; Woodcraft Fair (featuring carving and sculpture), June 20-21, Los Angeles store, and June 13-14, Berkeley store (1836 Fourth St.). Contact The Cutting Edge, 3871 Grand View Blvd., Los Angeles, Calif. 90066.

CALIFORNIA: **Woodcarving Show**—work by members of the California Carvers Guild, May 2-3, Balboa Park, San Diego.

COLORADO: **Summer Workshops**—furniture-making, Art Carpenter, June 15 to July 3 ($325); Slimen Maloof, July 6-23 ($325); Sam Maloof, July 24-27 ($125); John Nyquist, July 28 to Aug. 8 ($250). Also basic woodworking, Peter Korn, Aug 10-14 ($75); turning, David Ellsworth, Aug. 17-21 ($125). Write Anderson Ranch Arts Center, Box 2410, Aspen, Colo. 81612.

GEORGIA: **Design for Furniture Makers**—lecture/demonstration/seminar by Jere Osgood, May 29-31, $125. Contact Herb Teeple, The Georgia Woodworker, 5015 Spalding Dr. NE, Atlanta, Ga. 30360.

GEORGIA: **Skills in Contemporary Woodworking**—Saturday seminars, ongoing lecture and demonstration series, $60/month. Contact George Berry Woodworking Studio, 745 Edgewood Ave. NE., Atlanta, Ga. 30307.

ILLINOIS: **Excellence in Woodworking**—exhibition, Oct. 30 to Nov. 1, Hyatt Regency Hotel, Chicago. Contact Marvin Park and Associates, 600 Talcott Rd., Park Ridge, Ill. 60068.

ILLINOIS: **Woodcarvers Show**—May 16-17, Hillside Mall, Hillside.

KENTUCKY: **Conference on Drying Wood**—Spring meeting of the Forest Products Research Society, Ohio Valley section, May 7-8, Country Club, New Albany. Topics include theory of lumber drying, existing and future drying methods, drying as it affects gluing and shrinkage. Members, $30, preregistered or $35 at the door; nonmembers, $40 or $50 respectively. Contact A. Lessheim, Box 219, Bedford, Ind. 47421.

KENTUCKY: **Symposia**—woodturning, June 4-6 and July 20-22; joinery, July 23-25. $150/symposium includes room and board. Write James Hall, Berea College, CPO 758, Berea, Ky. 40404.

MASSACHUSETTS: **Clay, Fiber, Metal, Wood**—exhibit of work by graduating artist/craftsmen from Boston University's Program in Artisanry, June 24 to Aug. 19, Wm. Underwood Co. Gallery, One Red Devil Lane, Westwood (exit 61 from Route 128). Reception June 24, 5:30 P.M. to 7 P.M., is free and open to the public.

MASSACHUSETTS: **Craft Fair**—May 15-17, Worcester Craft Center, 25 Sagamore Rd., Worcester.

MASSACHUSETTS: **Continuing Exhibit of Handcrafted Furniture**—The Society of Arts and Crafts, 175 Newbury St., Boston.

MASSACHUSETTS: **Furniture and Marquetry**—work by Silas Kopf, May 3 to June 6, Dan Muller Gallery, 16 Main St., Northampton.

MICHIGAN: **Metro Wood Carvers Show**—May 10, American Legion Hall, 12 Mile and Rochester Rd., Royal Oak.

NEW HAMPSHIRE: **Jubilee 50**—national craft exhibit, all media, sponsored by the League of New Hampshire Craftsmen, June 20 to Sept. 7, Currier Gallery of Art, 192 Orange St., Manchester.

NEW HAMPSHIRE: **Shaker Crafts**—exhibit of Shaker and Shaker-inspired work, to May 8, League of New Hampshire Craftsmen Gallery, 205 N. Main St., Concord.

NEW JERSEY: **Workshops**—Peters Valley, Layton. 18th-century furniture, Mack Headley, Jr., June 6; "From the Tree to the Gallery," Howard Werner, June 13-14; understanding hand tools, Robert Meadow, June 27; contemporary residential furniture, Sam Maloof, June 20; Chinese influence on contem-

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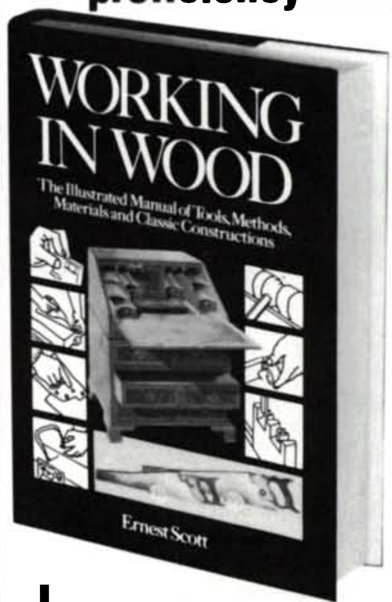

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poraty furniture, Bob March, July 11; using ingenuity to solve design problems, Giles Gilson, July 18. $65, one-day workshop; $75, two-day workshop. Write Sherrie Posternack, Peters Valley, Layton, N.J. 07851.

NEW YORK: **Southtowns Wood Carvers Show**—May 2-3, Hilbert College, 5200 South Park Ave., Hamburg.

NEW YORK: **Rhinebeck Preview**—furniture show, May 28 to June 21, Workbench Gallery, 470 Park Ave. S., New York.

NEW YORK: **Summer Courses**—starting week of May 20, Craft Students League, New York. Beginning woodworking, 8 wk., $82, and 12 wk., $122; advanced, 12 wk., $122; lathe, 8 wk., $82. Demonstration of hand-tool joinery by Maurice Fraser, May 20, 21 and 28, 5:30 P.M. to 8:30 P.M., free. Write the YWCA, 610 Lexington Ave., New York, N.Y. 10022.

NEW YORK: **Excellence in Woodworking East**—trade show and gallery, Sept. 11-13, Madison Square Garden, New York. Deadline, July 1. Write Marvin Park and Associates, 600 Talcott Rd., Park Ridge, Ill. 60068.

NEW YORK: **Northeast Craft Fair**—Dutchess County Fairgrounds, Rhinebeck. June 23-24, trade; June 26-28, public. Write American Craft Enterprises, Box 10, New Paltz, N.Y. 12561.

NEW YORK: **Genius in the Shadows**—the furniture designs of Harvey Ellis, exhibit, to May 2, Jordan-Volpe Gallery, 457 W. Broadway, New York.

NORTH CAROLINA: **Short Courses**—woodcarving, woodworking, April 26 to May 2, May 10-16, May 17-23, May 24-30, July 5-11, July 19-25, July 26 to Aug. 8, Aug. 9-22, Sept. 6-19, Nov. 1-14; Tuition: $70/1 week, $140/2 weeks. John C. Campbell Folk School, Brasstown, N.C. 28902.

NORTH CAROLINA: **Robert Kopf: Wooden Works**—exhibit, to May 17, S.E. Center for Contemporary Art, 750 Marguerite Dr., Winston-Salem.

NORTH CAROLINA: **Country Workshops**—White oak basketry, Louise Langsner, July 20-24, $150; country woodcraft, Drew Langsner, Aug. 3-7, $175; post-and-rung chairmaking, Dave Sawyer, Aug. 17-21, $175; fee includes materials, use of tools, meals. Write Drew Langsner, Rt. 3, Box 221, Marshall, N.C. 28753.

OHIO: **Great Lakes Woodcarving Exhibit**—May 2-3, Cleveland State University Center Bldg., Euclid Ave. and East 22nd St., Cleveland.

OHIO: **Equipment Maintenance and Repair Workshop for Industrial Educators**—June 15-19. Write Richard A. Kruppa, School of Technology, Bowling Green State Universtiy, Bowling Green, Ohio 43403.

OKLAHOMA: **Oklahoma City Wood Carvers Show**—June 12-13, Shepherd Mall, NW 23rd and Villa, Oklahoma City.

OREGON: **Western Woodcarvers Association's Rose Festival Woodcarving Show**—June 6-14, Western Forestry Center, 4033 S.W. Canyon Rd., Portland.

PENNSYLVANIA: **Spring Show**—work by members of Guild X, a professional woodworkers' organization, and other artist/craftsmen, May 17 to June 30 (1 P.M. to 6 P.M. Saturdays and Sundays and by appointment). Guild X Gallery, Bethlehem and Sawmill Rds., Applebachsville, Pa. 18951.

TENNESSEE: **Woodturning Symposium**—with Clay Compton, Rude Osolnik and J.F. Weber, May 21-23. Contact Glenn Medick, 011 Richardson Towers, Memphis State University, Memphis, Tenn. 38152.

TENNESSEE: **Summer Courses**—design and construction of wood objects and furniture, Bob Kopf, June 29 to July 10; exploration of woodturning techniques, Mark and Melvin Lindquist, July 20-24 and July 27 to Aug. 7; designing furniture, Bob Trotman, Aug. 10-14. Write Arrowmont School of Arts and Crafts, Box 567, Gatlinburg, Tenn. 37738.

TEXAS: **Afternoon Seminars**—with Gloria H. Jacobus: cabriole legs, June 6; making a table, June 20. $20/seminar, enrollment limited to 20. Contact Myer Frauman, The Wood Store, 1936 Record Crossing, Dallas, Tex. 75235.

UTAH: **Workshops**—woodwork joinery, May 25-29, and furniture construction, June 1-5, Tage Frid; Windsor chairmaking, basic (June 8-12) and advanced (June 15-19), and antique reproductions with antique tools, June 22-26, Michael Dunbar. Write Brigham Young University, 242 HRCB, Provo, Utah 84602.

ONTARIO: **Ontario Industrial Arts Teachers Association Conference**—May 14-16, McMaster University, Hamilton. Speakers include Wendell Castle, Don McKinley and Stephen Hogbin; also workshops, seminars, displays. Contact Les John, 436 Mount Albion Rd., Hamilton, Ont. L8K 5T3.

ENGLAND: **Woodworkers of Excellence 1981**—exhibit of contemporary work, Queens Hotel, Cheltenham, June 12-14. Sponsored by the White Knight Gallery, 28 Painswick Rd., Cheltenham.

Connections

In Connections, we'll publish membership calls for guild-style organizations, letters from authors compiling directories in which craftsmen might like to be listed, and appeals from readers with special interests looking for others who share them. The deadline for the July/August issue is May 1.

Women furniture-makers and cabinetmakers interested in getting together with others to find out who we are, what kind of work we're doing, and share our experiences and concerns as women woodworkers please contact Debey Zito, 3924 26th St., San Francisco, Calif. 94131.

The Society of American WoodWorkers (SAWW) is a non-profit corporation formed by the organizers of Wood '79 (see *FWW* #20, Jan. '80) for the purpose of promotion, education and advocacy of the independent woodworker, mainly through workshops and conferences (Wood '82 is now in the planning stages). Members of SAWW receive a quarterly newsletter; annual dues are $20. Write Ken Strickland, Visual Arts Dept., State University of New York, Purchase, N.Y. 10577.

Enterprise Marine Corp. sponsors a boatbuilding apprenticeship program based in a working boatyard in Boothbay Harbor, Maine. Apprentices concentrate on traditional boatbuilding methods in wood, working four 10-hour days a week; tuition is $200/month. Details from Dean Puchalski, Enterprise Marine Corp., Box 33, River Rd., Newcastle, Maine 04553.

The Colorado Springs Fine Arts Center is organizing an invitational exhibition of contemporary Western furniture and decorative arts, "Woodworking in the Rockies," to be held from May 8 through June 21, 1982. Craftsmen working in wood and living in Colorado, New Mexico, Arizona, Nevada, Utah, Idaho, Montana and Wyoming are invited to submit slides of their work; the deadline is July 1, 1981. From these slides, artists will be selected and visited in their studios during the summer and fall of 1981. Final selection will be based on these interviews. Submit slides to: Charles Guerin, Colorado Springs Fine Arts Center, 30 West Dale St., Colorado Springs, Colo. 80903.

Builders of high-quality entrance doors: If you are interested in having your work exhibited in a gallery and offered for sale in a nationally distributed catalog, please contact Peter Good, 1966 Tiffin Rd., Oakland, Calif. 94602.

The Northwest Guild of Fine Woodworkers meets on the fourth Wednesday of every month at 7 P.M. at the Wood Joint, 204 3rd Ave. S., Seattle. The guild is open to amateur and professional woodworkers interested in fine work, fellowship and education, and new members are welcome. Contact Bill Huggins, Huggins Woodworks, 5723 285th Southeast, Issaquah, Wash. 98027.

James Krenov will conduct woodworking classes at College of the Redwoods in northern California. The program, which begins in September of this year and can accommodate 22 students, will stress Krenov's own philosophy and techniques. For application forms or further information, write Creighton Hoke, Fall Program in Fine Woodworking, College of the Redwoods, 542B N. Main St., Ft. Bragg, Calif. 95437.

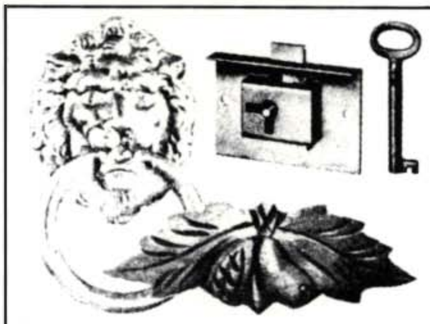
The Art and Restoration Association, an organization of amateurs and professionals interested in restoring furniture, furnishings and other items, meets periodically to share information, publishes a newsletter, and generally promotes and encourages American folk art and furniture preservation. Anyone interested in learning more or in joining the group and attending a meeting in late Spring is invited to send a post card to Denise Johnson, 4722 N. Guilford Ave., Indianapolis, Ind. 46205; membership is limited, but will be on a first-come, first-served basis.

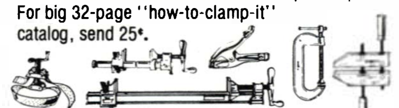
Membership in the newly formed Woodworkers Guild, based in Atlanta, is open to anyone who works with wood who wants to share and increase knowledge and skills, maintain high quality and save money. The guild plans to offer members group tool, shop and health insurance, lectures, professional legal and financial assistance, a newsletter and possibly a credit union. Dues are $7 a year. The first annual show of work by guild members will be held July 4 at the Highland Art and Frame Gallery, 1038 N. Highland Ave., Atlanta. Contact the Woodworkers Guild, Box 5567, Atlanta, Ga. 30307.

Pritam & Eames, a gallery specializing in one-of-a-kind and limited editions of handmade furniture, opens May 23 with a show of work by 30 established woodworkers, including George Nakashima and Wendell Castle. Woodworkers interested in showing at the gallery are invited to write the partners, Bebe Pritam and Warren Eames, at 29 Race Lane, East Hampton, N.Y. 11937.

The Empire State Crafts Alliance, founded in January 1981, aims to foster appreciation of crafts as a cultural, historical and economic resource in the state of New York. The group's projects will include a slide file of work by members, a newsletter and sponsorship of crafts displays at the Great Hudson River Revival (June 20-21, Croton, N.Y.). Charter membership, available to July 1, is $15; write Mary Flad, 9 Vassar St., Poughkeepsie, N.Y. 12601.

I am a musician very interested in renewing high-quality grand pianos and in non-commercial woodworking. I would like to correspond with and meet *Fine Woodworking* readers with a similar background and interest who live in Vermont or upper New York state. Please write Stephen Ch'in, 4328 Sherbrooke St., Westmount, Montreal, Que., Canada H3Z 1E1.





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FOR SALE: Production woodworking business, manufacturing patented wooden hand tool. Net $25,000 to $30,000 yearly working half time; locate anywhere. Will train. $60,000. Brian Burns, Palo Alto, CA. (415) 327-5335.

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LOCAL LUMBER CO. Fancy hardwoods, custom milling and kiln drying. 161 Bowers Hill Rd., Oxford, CT 06483. (203) 888-6509.

A. & M. Wood Specialty Inc., PO Box 3204, Cambridge, Ont., Canada. (519) 653-9322. NEW ITEMS IN STOCK: 4-in. padauk, 1-in. benge, 3-in. lignum vitae, 1-in. Honduras rosewood, 2-in. and 2½-in. curly soft maple, 1-in. curly koa, thuya burl.

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Catalog of wooden toy patterns, wooden toy kits and toymakers' supplies. Send $1 to TOY DESIGNS, PO Box 441-F, Newton, IA 50208.

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Seven pieces lignum vitae, 130 lb., $50, freight collect. Write or call A.W. Suggs, 118 Broad St., St. Pauls, NC 28384. (919) 865-5530.

Pit saw, antique, open type. 6-ft. blade and tiller handle, $190. Crafts Museum, 11458 N. Laguna, Mequon, WI 53092. (414) 242-1571.

Fay & Egan 20-in. table saw #260, completely rebuilt, $2,000. 10-HP, 1-PH motor. Assorted custom blades include carbide dado. Darry Wood, Rt. 3, Hayesville, NC 28904. (904) 389-6428

Hall & Brown 12-in. jointer, V-belt drive, 18-in. by 80-in. table, 6-in. by 40-in. C. I. fence, $1,000. J.W. Young, 204 Young St., Victoria, TX. (512) 573-7811.

Primus improved 9-in. smoothing plane, perfect, unused, $65. A. Gierow, 2240 Maple Dr., Jackson, MI 49203.

American cabinet planer, 26-in. by 8-in. ball-bearing head, four knife, square head, 7½ HP, 3 PH, $2,000. (413) 634-2209, western Mass.

3 lathes, 36 in., 72 in. and 96 in. between centers. All heavy duty and in excellent condition. A.W. Pease, Box 82, W. Townsend, MA 01474.

Early Stanley #45 complete in wooden box (no lid), $175. Boxwood plow, ivory tips (Roberts, p. 93), good condition, $350. Max Peterson (412) 831-9571.

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Complete machine shop use plus house in exchange for ?. Must be responsible, adept person(s) or family. Excellent opportunity. M. Jacobs, 5240 Access Rd., Dayton, OH 45431. (513) 253-4068.

Lathe, Viceroy TDS6 short bed, some accessories, $1,400. Shaper, Rockwell HD with cutters, etc., $800. (609) 465-3627 eves.

Native Pa. black walnut 14 to 21 in. wide, cut a heavy 4/4. Approximately 300 bd. ft. $3 per foot. Box 663, Paoli, PA 19301. (215) 644-7516.

Delta/Rockwell 12-in. straight-bed wood lathe, 380 to 3,500 RPM using countershaft, enclosed base, ¾ HP, excellent conditon, $575. Frank Dorion, Waterbury, CT. (203) 753-7051 evenings.

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Stanley #45 dated 1909, floral casting, original wood box, 19 blades, $225/offer. C. Flowers, 4640 Happy Hollow, Bloomington, IN 47401. (812) 339-5552 eves.

Stanley #43 Millers Patent 1871, $450. Stanley #55, $250. 12 handmade patternmaker's planes from 1920s, $350. W. Johnston, 30056 Fink Ave., Farmington, MI 48024.

Horizontal borer, 1½ HP, 3 PH, hydraulic attachment, $250. David Krouse. (212) 925-3328.

Green wood for bowl turning: cherry, some oak, maple. SASE for info. M. Nelson, Box 46, Clifton, OH 45316.

Bird's-eye maple planks, heavy 4/4, cut 1977-78. $2/ft., less in quantity. I have about 3,000 ft. W. Cory, Box 364, Harvard, MA 01451. (617) 456-8717.

Large bandsaws—30-in. and 36-in. saws in good condition. Machinery located on demand. (201) 592-1733 eves.

Fifty-year-old oak, very beautiful clear-grained, 10 in. by ⅝ in. with chamfered edges. 36-in. lengths only. Large quanity, fairly priced. (201) 592-1733 eves.

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Rockwell lathe and finishing machine (belt/disc sander). Send details. D. Cerretani, RD 1, Box 259, Vestal, NY 13850.

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Wanted: Zapart saw filer, model Z57. Will pay good price. William Lochhead, 12 Park St., Woods Hole, MA 02543. (617) 540-5645.

Accessories for Atlas #1060 drill press, slow speed and quick change. Also, table-raising device, etc. J. Weyman, 814 Linden St., Metairie, LA 70003. (504) 733-1024.

Stanley 750 chisels: I need ½-in. and 1½-in. Will buy or trade my ⅜, ⅝, ¾-in. Wm. Bolf, Rt. 13, Box 120, Frederick, MD 21701. (301) 662-4847.

Stanley planes new and old. All types from Nos. 1 to 444. Also aluminum Stanley planes, old wood planes and woodworking tools. I.E. Bixler, 6943 Cozaddale Rd., Goshen, OH 45122. (513) 625-7406.

Want Shopsmith Model 10ER w/speed changer and jointer. Or speed changer and jointer separate. Also want shaper fence, casters, front table ext. D. Huse, Box 384, Texhoma, OK 73949.

SITUATIONS WANTED

University of Wisconsin (Stout) art major seeking summer woodworking position in or near Wisconsin. Robert Neitzke, 8190 Hillside Rd., Pickett, WI 54964.

Very trainable woodworker seeks apprenticeship in Queen Anne or William & Mary period furniture. Mr. Kasey Flowers, 546 SW Mill, Sheridan, OR 97378. (503) 843-2748. Resume and photos available.

Experienced woodworker seeking to trade work for room and board in small shop outside the United States. Portfolio/resume available. Contact Fred Wildnauer, 1911 S. 7th, Springfield, IL 62703.

Creative craftsman/carpenter and family wish to leave L.A. smog. 11 yrs. varied experience. Will send resume. Francis Pennington, 1414 ¾ N. Hayworth, W. Hollywood, CA 90046. (213) 874-0312.

Carpenter/architect seeks others for design/build collective in rural Mass. Commitment to architectonic values and craft. Joint farm purchase possible. John Mateyko, RR 2, Box 518, Dundee, IL 60118.

Artist woodworker with M.A. in furniture design seeks teaching position. James Campbell, 361 Whetstone Rd., Marquette, MI 49855. (906) 225-0433.

Swedish graduate student wants to work one year in USA. 5 years training, last 2 at Malmsten, described in Krenov's books. I know cabinetmaking, carving, marquetry. Gösta Arvidsson, Tomtebogatan 37, 11338 Stockholm, Sweden.

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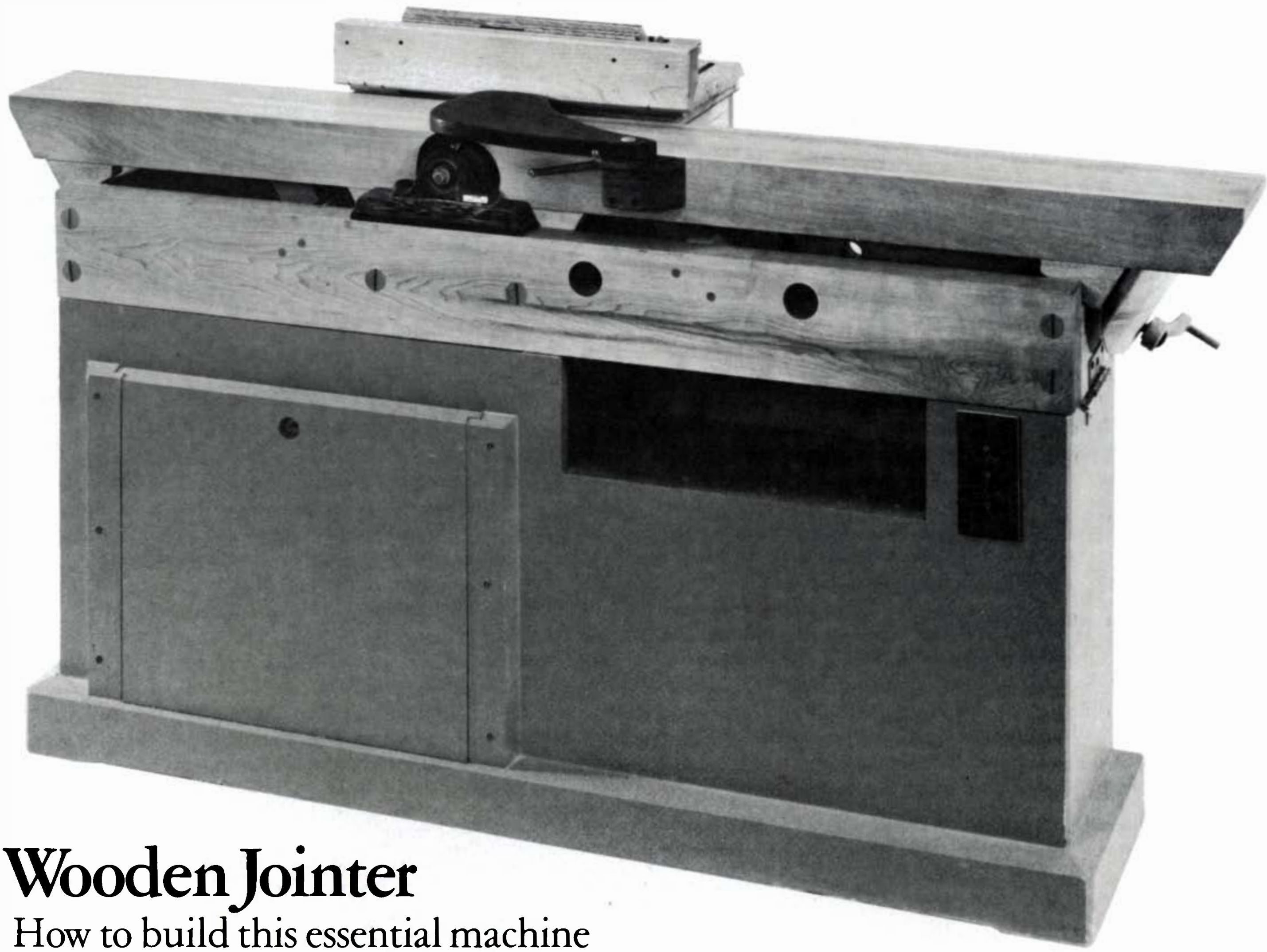


Wooden Jointer

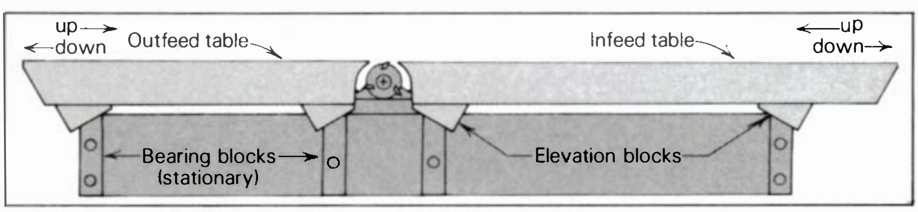
How to build this essential machine

by Galen Winchip

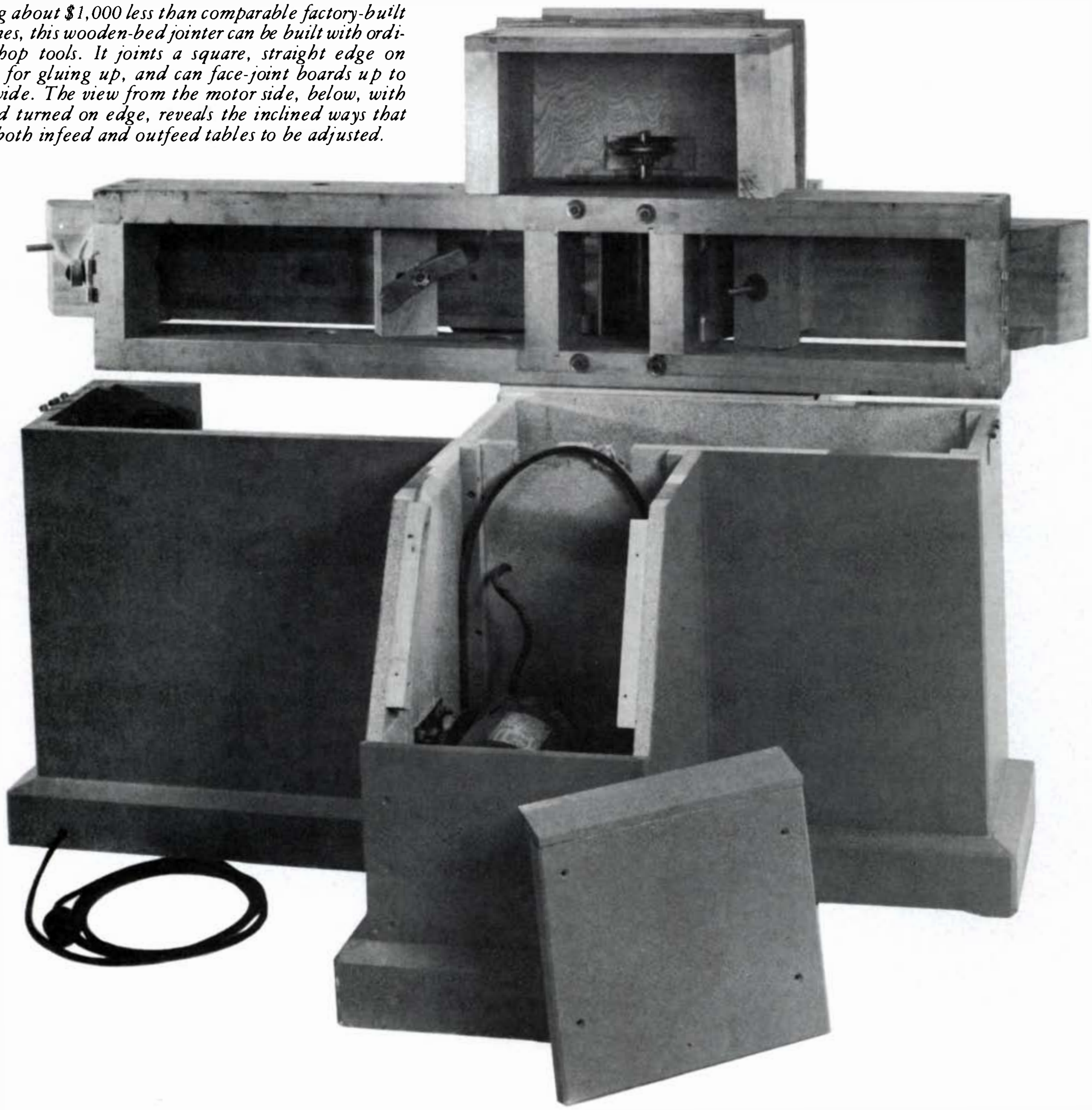
Seven years ago I walked into a local hardware store to buy an odd assortment of stuff. "What are you going to make?" asked the quizzical gentleman waiting on me. "A wooden jointer," I replied, trying to sound confident. He was both astonished and skeptical, and did his best to persuade me to buy the jointer on display in the store. Despite his warning that a jointer is a precision tool and not the kind of thing you just throw together in your shop, I bought the items on my list and thus embarked on my first tool-building venture.

That first jointer worked, but it left several things to be desired. So I determined to make a jointer that would perform as well as a commercial model. I subsequently tested five designs, each one simpler, more reliable and more precise than the one before. Finally, I arrived at the design for the jointer shown here. It requires no exotic, hard-to-find hardware or materials, and it doesn't call for any tricky methods of construction. Its performance rivals that of an industrially produced machine, though its price (about $350) is considerably less, and its feel and appearance are friendlier. I've been using this jointer for about 18 months, taking it from one job site to another, and I'm very happy with its design and with the results it produces.

Like certain of its industrial-duty, cast-iron counterparts, my wooden jointer incorporates four sets of inclined ways or wedge-shaped bearing blocks. As shown below, these provide the means for raising and lowering the tables. The wedges on the bottom of each table (elevation blocks) ride up and down on the stationary ways (bearing blocks) attached to the frame assembly. This system is especially suitable for a wooden jointer because it supports each bed at four points, two at each end, eliminating the possibility of drooping tables and providing very



Costing about $1,000 less than comparable factory-built machines, this wooden-bed jointer can be built with ordinary shop tools. It joints a square, straight edge on boards for gluing up, and can face-joint boards up to 6 in. wide. The view from the motor side, below, with the bed turned on edge, reveals the inclined ways that allow both infeed and outfeed tables to be adjusted.



stable working surfaces. I've jointed a lot of long, heavy stock with this machine, and found it can easily cut a true edge on an 8/4 board, 8 ft. long and 10 in. wide.

The cutterhead is the heart of the machine, so you should get one that is well-balanced and perfectly round (square cutterheads are dangerous) and that has been turned and milled from a single piece of bar stock. It should have a cutting arc of about 3 in. and a hefty shaft, ¾ in. in diameter. Mine was turned and milled by a machinist friend, who got the shaft too small for my liking. I'll soon make a new one with a ¾-in. shaft, which will minimize vibration and increase durability. You can have a machinist do this work for you as I did, or you can buy a cutterhead as a replacement part from a woodworking-machinery distributor. The cutterhead shaft runs in two self-aligning, ball-bearing pillow blocks, which you can get at any well-stocked industrial-supply or farm-supply store.

For driving the cutterhead, use a 1-HP or 1½-HP, 3,600-RPM motor. Select a pair of pulleys that will turn the cutterhead about 5,000 RPM (about 4,000 surface feet per minute).

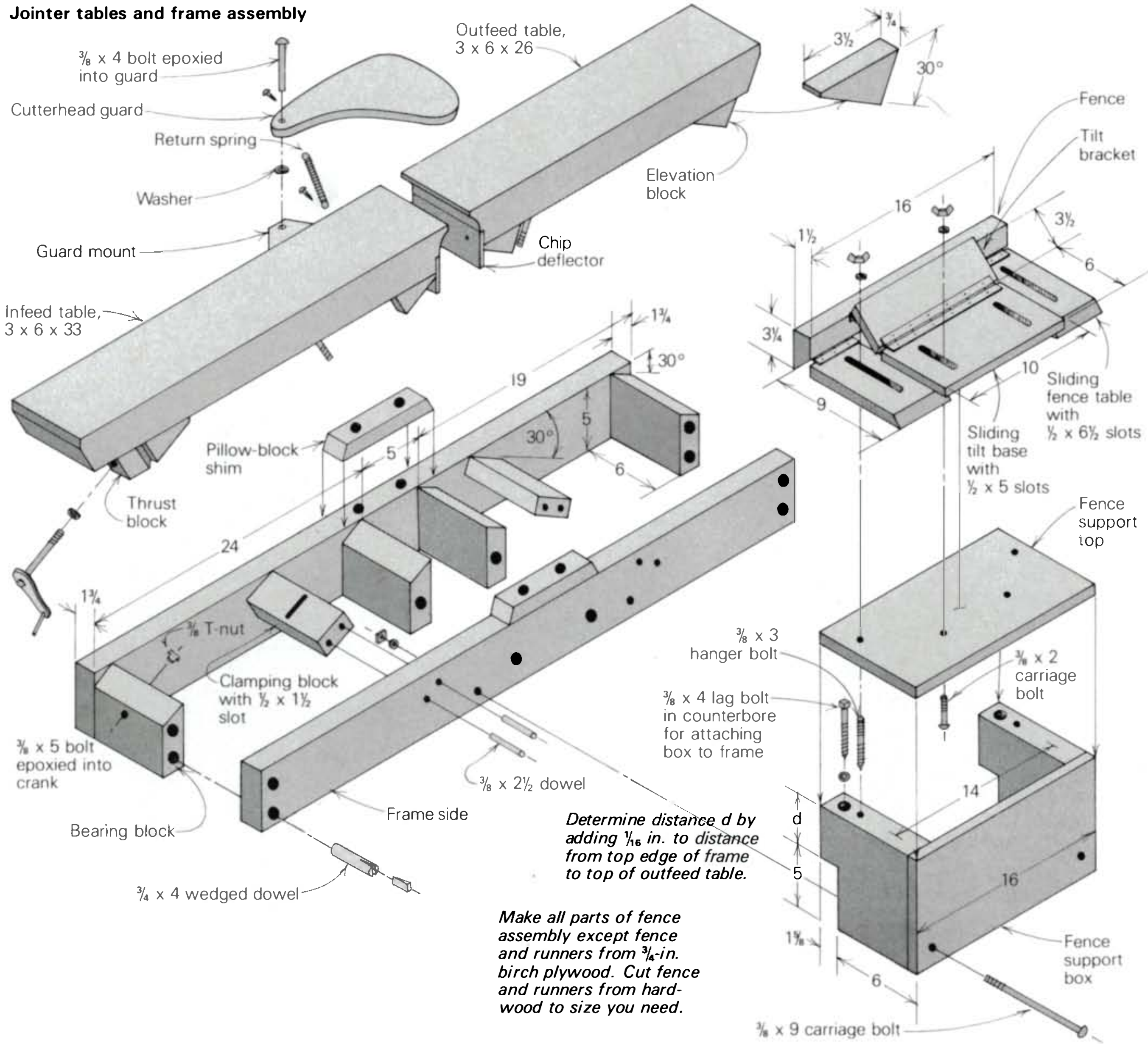
The infeed and outfeed tables are laminated from quartersawn, face-glued boards. I used ¾-in. beech, but maple or another hard, heavy wood would do. Since the finished tables are 3 in. thick, you should rip the laminae to a rough width of around 3¼ in. to allow for a preliminary and a final surfacing of both sides. Use yellow (aliphatic resin) glue, and allow the tables to sit for several weeks before initial surfacing. The gluelines need time to cure thoroughly, and the laminated slabs need time to stabilize.

The tables shown here are proportioned to my own preferences: the infeed table is 10 in. longer than the outfeed because I find this easier for jointing long, heavy stock. But you can make them of equal length, as is common practice, or you can experiment to learn what suits you best. The same holds true for the dimensions of the fence. You can make one fence for the kind of work you do most, or you can make several of different sizes for different jobs. Since you're making your own, you aren't limited by what some manufacturer decides is the average size.

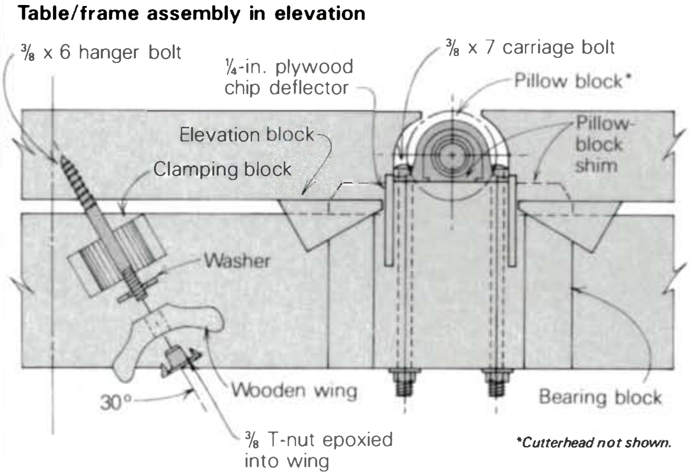
The jointer frame consists of two sides and three sets of blocks—two pairs of bearing blocks and a pair of clamping

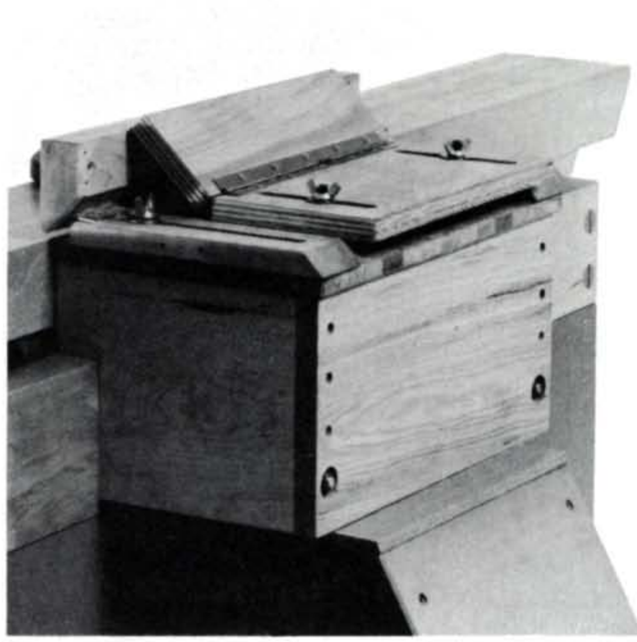
Photos, except where noted: Pete Krumhardt

Jointer tables and frame assembly



Table/frame assembly in elevation

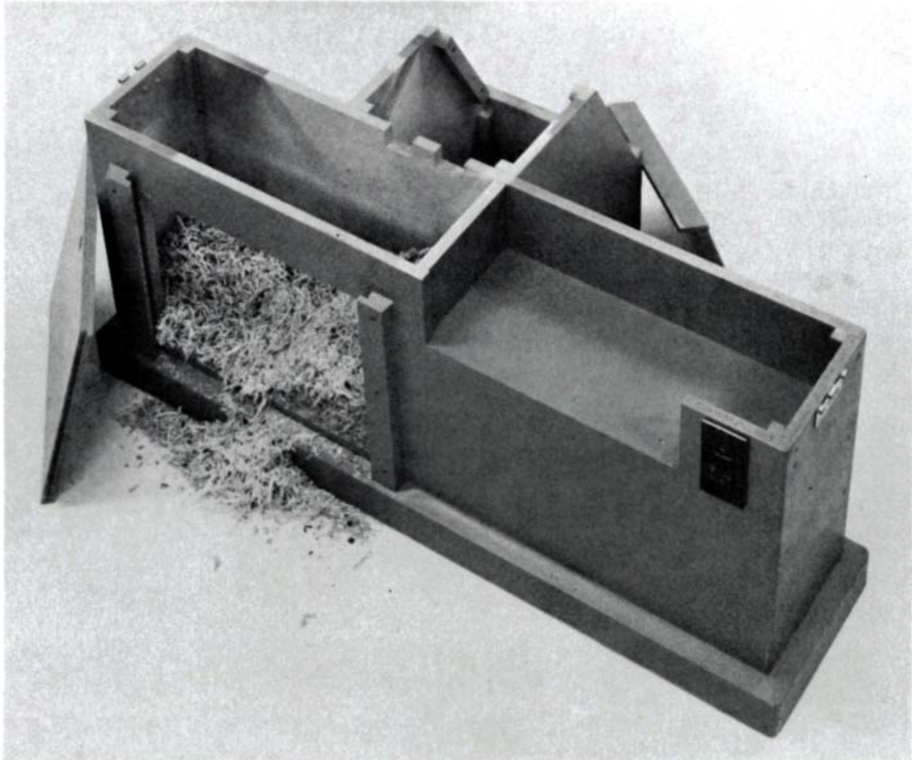




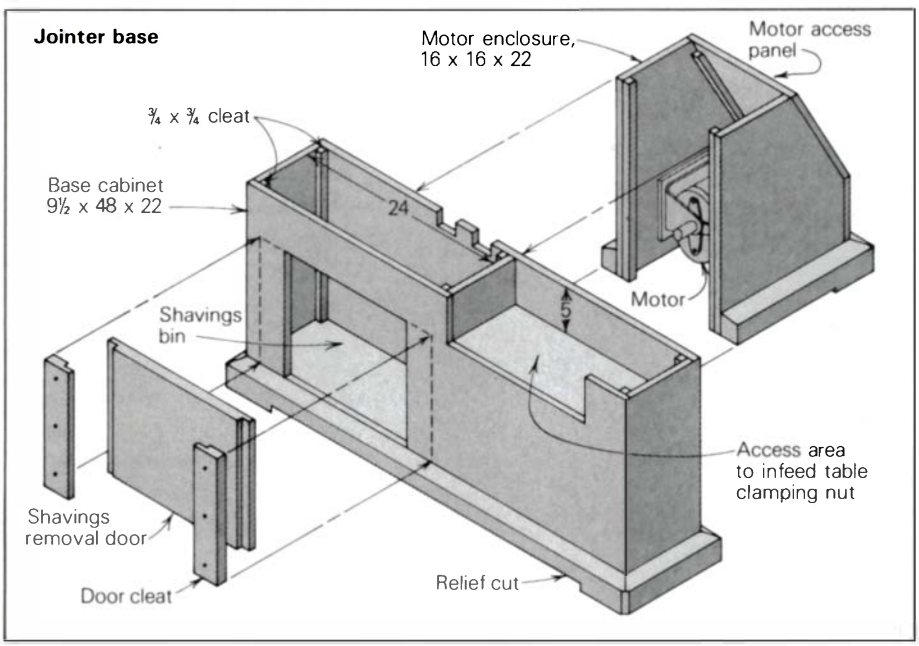
Tilting fence assembly consists of a sliding table, a sliding tilt base, a tilt bracket and a fence, which can vary in size to suit the needs of the operator. Removing the fence-support top gives access to V-belt and arbor pulley.

blocks. The top edges of the bearing blocks are beveled at 30°, and the clamping blocks are slotted for clamping bolts. The clamping blocks, though not beveled, are set at a 30° angle to the top of the frame. The drawing (facing page) dimensions and locates these parts. Make sure when cutting duplicate parts that their dimensions and angles are precisely the same. This can be done by ripping and beveling a single board and then crosscutting identical parts to finished length. All the blocks must be oriented at a true 90° to the frame sides, and the clamping blocks ought to be positioned as close as possible to the center bearing blocks. The outer bearing blocks should be flush with the ends of the frame sides.

To add strength and to help position the parts during clamping, I cut narrow tenons on the bearing blocks and dadoes in the frame sides to house them. But you need not go to this trouble to get similar results—just clamp the frame sides together with the bearing and clamping blocks between, and then tap them into their exact positions with a mallet. This done, tighten the clamps, and bore for dowels through the frame sides into the blocks as shown in the drawing (¾-in. dia. holes for the bearing blocks, ⅜-in. dia. holes for the clamping blocks). The dowels will let you place the parts accurately when gluing up and will reinforce the frame assembly. The ¾-in. dowels are slotted and wedged. Since you're gluing end grain to long grain, epoxy is best; size the end grain before gluing and clamping. When the glue has set, sand the dowels flush with the frame sides.



Particleboard base contains separate compartments for the motor and for chips and shavings. Door to shavings bin slides up and down in rabbeted cleats. Opening in side under the infeed table gives quick access to the wing nut that must be loosened for making changes in depth of cut. The T configuration of the base concentrates the machine's weight on three points, eliminating the need to level it to the floor.



The base, which you'll probably want to make while your table laminations are aging, is of ¾-in. high-density particleboard. Plywood will suffice, but it's more expensive and not as rigid or heavy. With a plan view that resembles a T, the stand is constructed using corner cleats, screws and yellow glue. This type of base has several advantages. One is that the motor is enclosed in a separate compartment, protected from dust and shavings. Another is that the shavings, being contained in a single bin, are easily removed. A third advantage of the T configuration is that the weight of the machine and the base rests on the three extreme points, and thus leveling is never required.

Surfacing the tables is easy if you have access to a thickness planer and a jointer wider than the one you're making. If you can't find a friend who'll let you use his, or a school shop where you can do this work, you'll probably have to pay to have it done at a local millwork or cabinet shop. You could even do it with hand planes, winding sticks and a straightedge, but you must be very patient to get the results required.

Begin by jointing one face of each table, being careful to take light cuts and to avoid sniping the ends. Then run both tables through the thickness planer for several light passes to bring them within ⅛ in. of their finished thickness. Again, be careful to set the planer's bedrolls properly to prevent snipe on the final pass.

Now place both tables upside down on a perfectly flat surface, butt them end to end, and separate them about 2 in. Get two small boards, each about 9 in. long, 2 in. wide and exactly ¾ in. thick, and put one across the outer edge of each table. Place the frame assembly upside down on the two boards, which will hold the frame ¾ in. above the bottoms of the tables. Position the frame and tables relative to one another, and check the spacing between the two tables to make sure there's room for the rotating cutterhead. Apply some yellow glue (or epoxy) to the top edges of the elevation blocks, and slide them into place between the inclined surfaces of the bearing blocks. Since the angles are complementary, the fit should be perfect. When installing the elevation blocks, don't wedge them too tightly under the bearing blocks; just bring the mating surfaces into light, uniform contact. If all eight elevation blocks are not exerting equal pressure against the bearing blocks, the tables will rock.

Securing the tables to the frame is accomplished by two ⅜-in. by 6-in. hanger bolts. The wood-thread ends are screwed at a 60° angle into the table bottoms. The machine-thread ends pass through the slots in the clamping blocks and are retained by homemade wing nuts (optional on the outfeed table). These have wood bodies with T-nuts epoxied into their centers. After the glue holding the elevation blocks in place has thoroughly dried, remove the frame assembly and bore angled pilot holes in the tables for the hanger bolts and screw them into place. Long hanger bolts are used in stairway handrailing; if you can't find any, buy a couple of long lag bolts, cut their heads off and die-cut National Coarse machine threads onto their unthreaded shoulders.

Now you can put the tables onto the wedged ways and clamp them in place with the wing nuts. Loosen each nut slightly and check to see that each table rides freely up and down the inclines and that there is no rock or play anywhere. If you detect any rocking, carefully remove a small amount of wood from the bearing surface of the opposite elevation block and check again.

When the tables fit and slide correctly, return the whole assembly (frame and tables) to your flat reference surface. With both tables resting flat on this surface, tighten the clamping nuts. Now take the whole thing back to wherever you did your initial jointing and surfacing, place your jointer upside down on the borrowed jointer and surface both tables in a single pass. Take a very light cut (1/32 in. or less) and check down the length of both tables at once with an accurate straightedge. If they are truly straight and in the same plane, you can take your jointer back to your shop and continue construction. If not, find the source of the error (it could be in the iron machine), eliminate it and take another light cut the full length of both beds. Remove as little stock as possible, since you may want to surface the tables again in the future, should they warp out of true or their surfaces get badly gouged and pitted.

Surfacing complete, trim the tables to final width and cope an appropriately curved area where each table will extend over the cutterhead. The bandsaw is best for this. Don't cut the arcs so the blade exits on the top surface of the table, but rather so it exits on the end, about 3/16 in. below the top. This will produce a little land that makes the ends of the tables stronger, and leaves the straight lines across the tables intact. Keep the throat opening narrow.

The elevating mechanism for the infeed table consists of a ⅜-in. by 5-in. bolt epoxied into a wooden crank, a thrust block glued to the bottom of the infeed table and a T-nut countersunk into the end bearing block. The ⅜-in. National Coarse bolt has 16 threads per inch. Because the bolt moves the table up and down a 30° incline, and the sine of 30° equals 0.5, one revolution of the crank will move the table 1/32 in. vertically, a handy reference. You could mount a depth-of-cut indicator on one of the bearing blocks.

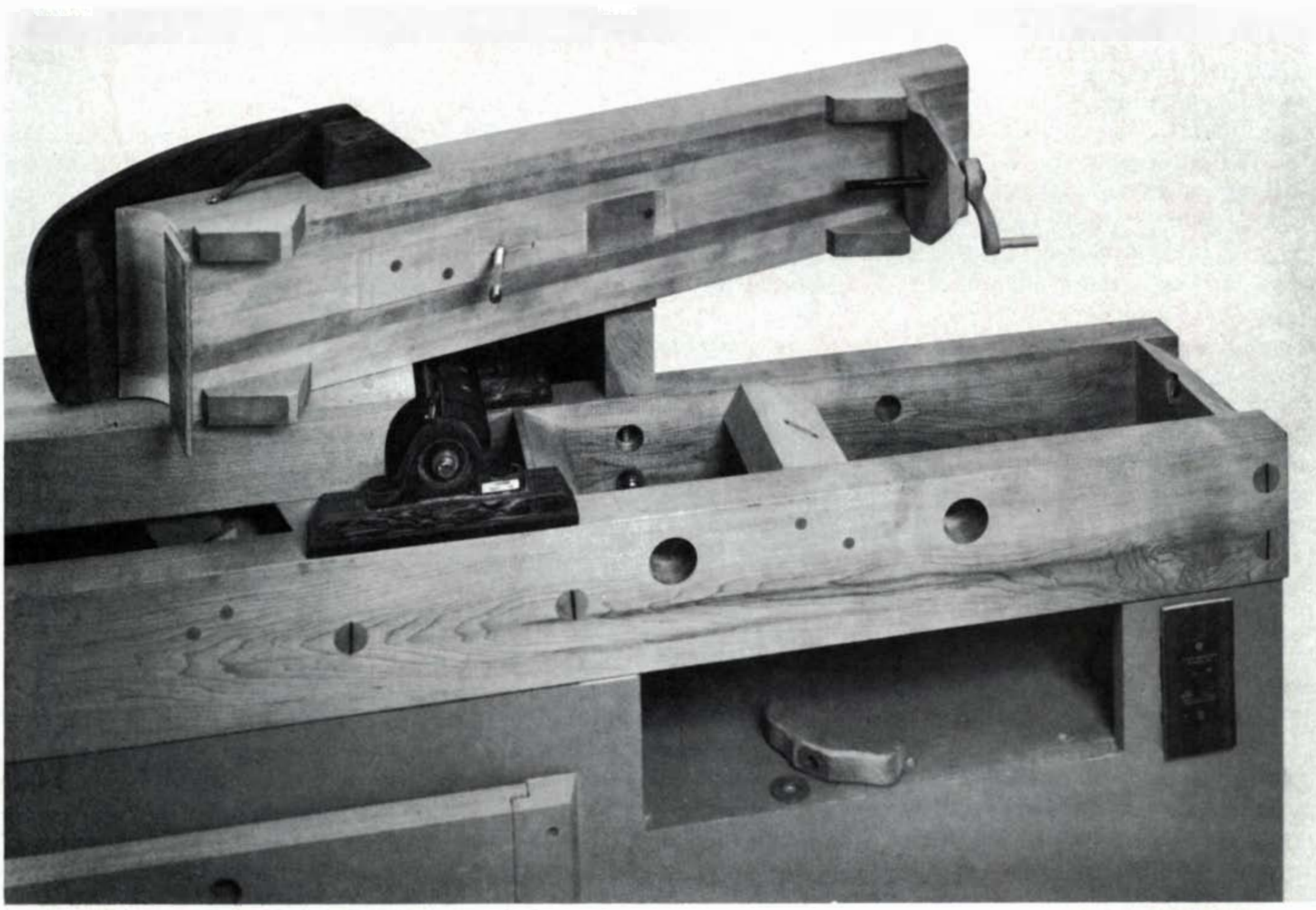
To change depth of cut, back off the clamping nut just enough to free the table, turn the crank to raise or lower it and retighten the nut. Excessive torque isn't necessary to hold the tables securely on their ways. For making the fine adjustments on the outfeed table, I keep the nut snug and smartly strike the end of the table with a wooden mallet to raise it slightly, or strike the end of the frame to lower it—similar to the way you tune a wooden handplane. Since the nut stays tight, you seldom need access to it. Mine doesn't even have wooden wings attached; I use a wrench when it needs adjusting.

To install the cutterhead, first dimension a pair of pillow-block support shims, which will hold the cutterhead at the proper height. Fiddle with the thickness of each shim to level the cutterhead with the tables. Screw the shims into place, replace the cutterhead and pillow blocks and mark the centers for four holes to be drilled through the shims and frame sides. The diameter of the holes should be slightly larger than the ⅜-in. carriage bolts that will hold the pillow blocks in place. These bolts may have to be retightened from time to time, because seasonal shrinkage might loosen them. For safety, use self-locking nuts.

The fence assembly is mounted on a three-sided hardwood box. Its sides are notched to fit over the edge of the frame side, and it is held in place by two carriage bolts and two lag bolts. The plywood top of the fence-support box should sit about 1/16 in. higher than the level of the outfeed table. This clearance allows the fence table to slide freely across the jointer beds.

The fence itself can be made to any reasonable size, though its dimensions need not change those of the sliding fence table or the hinged tilting bracket and base. To make the table and tilting brackets, get some good ¾-in. birch plywood, and cut the three pieces to the sizes shown in the drawing on p. 46. Then cut two slots in the sliding table and two in the tilting bracket base. For hinging the parts together, you can cut a continuous hinge into three lengths or use three pairs of butt hinges. You may want to attach hardwood sled-type runners to the sides of the sliding table, as I have done. These will wear longer than plywood and will look better. Depending on the diameter of your arbor sheave, you might have to cove out an area on the underside of the fence support top to keep the belt from rubbing the wood. The fence table is locked in place by two wing nuts screwed onto ⅜-in. hanger bolts that extend through the table slots. The tilting bracket base is secured also by wing nuts screwed onto carriage bolts that extend through the fence table.

The cutterhead guard must be made of a sturdy hardwood (I used padauk). You may alter its standard shape as you please, so long as it moves easily away from the fence when stock is pushed against it and so long as it covers the unused portion of the rotating knives. The guard has a ⅜-in. bolt epoxied to it, and this bolt pivots in a hole in a mounting block that is screwed to the sides of the infeed table. A washer on the bolt between the mounting block and the bottom of the guard will ensure that the guard swings just clear of the jointer beds. A small tensioning spring holds



A look underneath the infeed table shows the positions of elevation blocks, clamping stud (hanger bolt) and thrust block, which contains elevation screw and crank. In the jointer frame underneath, you can see the inclined bearing blocks (ways), the slotted clamping block and the large wooden wing nut. The unfilled holes in the side of the frame remain from author's earlier experiment with a different means of securing the table to its ways. They have nothing to do with the existing arrangement.

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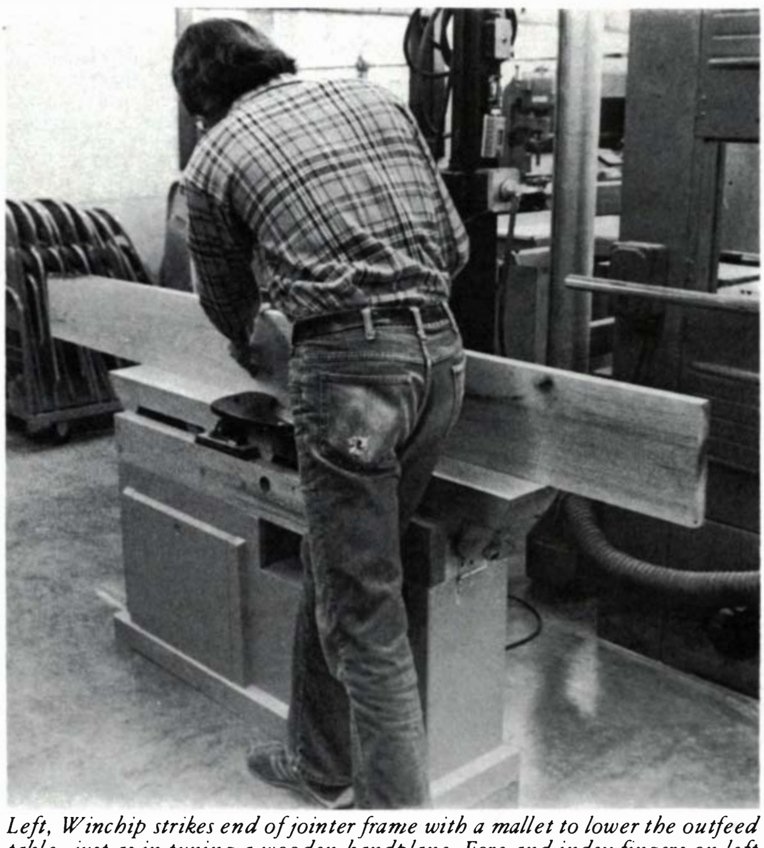


Left, Winchip strikes end of jointer frame with a mallet to lower the outfeed table, just as in tuning a wooden handplane. Fore and index fingers on left hand detect the slight movement of elevation block as it travels minutely down the ways. Above, he joints the edge of an 8-ft., 5/4 red oak board.

the guard against the fence and against the stock being jointed.

I finished the machine with Watco oil and waxed the tops of the tables and the sliding surfaces on the wedged ways. The base I painted grey. No finish, however, makes wood completely impervious to moisture—I had to make slight adjustments in the outfeed table as its thickness changed minutely with the seasons. To correct any rocking or droop that might develop, insert paper shims between the bearing and elevation blocks. To spring-joint boards for gluing up panels, you could shim up the two inner elevation blocks on the outfeed table so that it slopes down from the cutterhead. A couple of pieces of notebook paper would be about right. Remember that the orientation of the outfeed table (both its angle and its height) determines whether the jointed edge will be slightly concave or slightly convex. If the table is high in relation to the knives, the jointed surface will be convex; if low, it will be concave. Also, it's a good idea to check the tables occasionally for proper alignment. Crank the infeed table up to the exact height of the outfeed table and then lay your straightedge across both beds. If there's any deviation from a true plane, remedy the error with paper shims between the bearing and elevation blocks.

Having spent quite a few years working in university wood shops, I'll be first to admit that industrial-duty machine tools offer greater built-in precision than shop-made machines. But the differences are small, and the advantages of being able to build your own machines are great. My first woodworking machines were home-workshop quality and were far inferior in terms of precision and stability to the shop-built ones I now use. Experience has taught me that good work depends as much on the skills of the craftsman and his sensitivity to factors that affect accuracy as on the built-in precision of his machinery. I have often observed students getting less than satisfactory results using good tools simply because they believed that machines should do accurate work in spite of the operator. The truth is, of course, that the operational skills and intuitive understanding of the craftsman are necessary to the precise work cabinetmaking demands. □

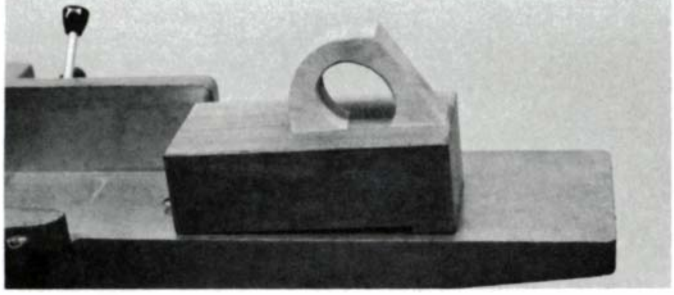
Galen Winchip, 29, is a professional woodworker and industrial-education instructor in Ames, Iowa.

Jointer safety

Some of the nastiest woodworking accidents result from careless or improper use of the jointer. A cutterhead rotating at 5,000 RPM looks seductively harmless; with its knives blurred into invisibility, all you see is a shimmering steel cylinder. Yet jointers regularly gobble up fingers, thumbs and sometimes hands. Surgical restoration is almost impossible—repairing tissue lost to a jointer is like trying to remake an original board from a pile of shavings. Such a nightmare can be avoided by being careful every time you use the jointer.

Before switching the machine on, make certain that the knives are firmly tightened in place. A loose knife can grab the work or come flying out of the cutterhead at high speed. Never use a jointer unless the cutterhead guard is in place. Even with the guard in place, large chips can be hurled from the machine with enough force to injure eyes. So always wear your safety goggles when jointing stock. Some jointers are equipped with a rabbeting table, and you must remove the guard to use this feature. But a jointer is not the best machine for rabbeting. It's better to use your table saw or spindle shaper or router. They do this job more safely and more efficiently. Though most jointers will cut as deeply as ¼ in. or more, you shouldn't take a cut any deeper than ⅛ in. in a single pass. You risk injury from kickback when taking too deep a cut, and you put unnecessary strain on the motor.

When jointing the edge of a board, keep your fingers well away from the table surface. When face-jointing stock, even



thick stock, always use a push-block. Stock shorter than 12 in. should not be machine-jointed, so if your finished pieces will be less than a foot long, joint the longer board before you cut it up. For jointing stock thinner than ½ in., you should make a massive push-block, like the one shown below made by John Alcock-White for jointing one face of the ⅜-in. stock he laminates for bandsaw boxes. The block should be as wide and as long as the stock being jointed, and 4 in. to 6 in. thick.

Used over a long time for repetitive operations, the jointer's incessant drone can lull the operator into inattention. In such a semiconscious state, an accident is liable to happen. So be especially vigilant when your work is boring and perfunctory.

Posture and stance are also important. Learn to feed stock across the tables without overreaching and losing your balance. Adopt a posture that will allow you to exert consistent downward and horizontal pressure on the stock. This not only contributes to safety, but also affects the results of your work. When feeding, allow the machine to cut at its own pace. Don't force work into the cutterhead, or try to hurry the board across the tables. A slow to moderate feed rate is best, though pausing or creeping along during a cut can score the surface of the wood and overheat the knives.

The knives should be kept sharp, and should all be maintained at the exact height. You can touch up the edges periodically with the judicious use of a slipstone, but when knives are knicked or dulled beyond reason, you should have them reground. Instruct the person doing this to remove the same amount of steel from each knife. Improperly ground knives will put the cutterhead out of balance, which causes vibration and can lead to an accident, and will definitely bring about premature bearing failure. When sharpening, maintain the original bevel angle. If you try to hone or grind a secondary bevel on the edges, the result will be increased noise and vibration, and decreased cutting efficiency.

Constant alertness, common sense and a knowledge of cutterhead dynamics are the best safeguards against accidental injury. Used properly, a machine jointer makes a woodworker's task immeasurably lighter and introduces a high degree of precision into the work. For more on using jointers, see *FWW* #19, Nov. '79, p. 93, and p. 18 of this issue. *—J.L.*

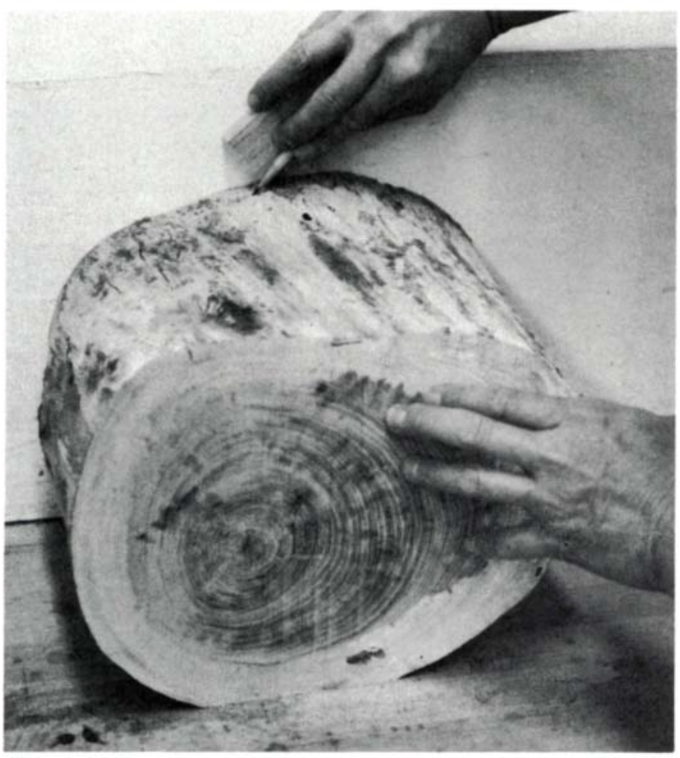
A Not-So-Classic Rosette for Classical Guitars

by Al Ching

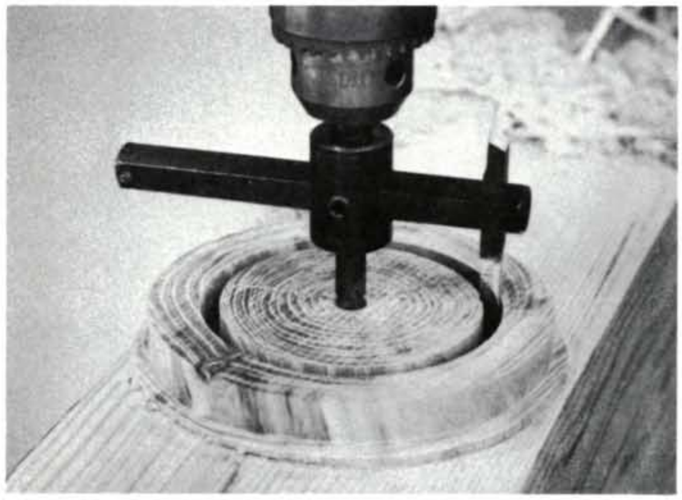
Classical guitar construction is so steeped in tradition, the luthier has relatively few opportunities to exhibit his originality. The profile of the peghead and the design of the rosette are two prominent features available for a signature. Historically, the rosette, the decorative border around the soundhole, is a mosaic comprised of tiles made from the end grain of tiny sticks. I have always admired the end-grain pattern of whole logs. A rosette made from a single piece of end grain became a logical departure for the classical guitar I am building.

My rosette was made in four steps: First I took a slab from a small log. Then I used an adjustable circle cutter in the drill press to outline the rosette. (A circle cutter can be a nasty tool—keep your hands clear of it, use it at the lowest possible RPM, feeding lightly, and be sure to secure the work.) Next I cut the slab to the required thickness. I then finished off the resulting "doughnut" with contrasting strips of wood, bordering the inner and outer circumferences. At this point the rosette was complete and ready for inlay into the soundboard. □

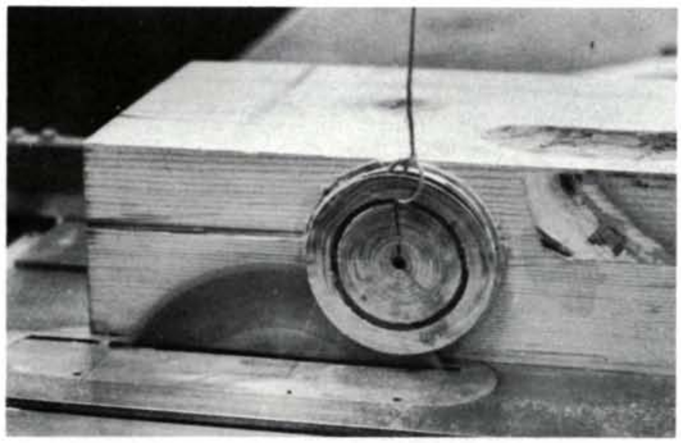
Al Ching is professor of art at California State University, Fullerton. For more on guitar embellishment, see p. 52.



1. *A spacer block and pencil are used to mark the thickness of the slab to be bandsawn from the log. Log end has already been faced by an initial cut and flattened on the side parallel to the longest axis of the end grain. This makes for a steadier and safer workpiece when put through the band saw. The flat was produced with an adze, jointer plane and winding sticks.*



2. *Adjustable circle cutter defines inner circumference of rosette; outer circumference has already been cut. If either one of these cuts produces tear-out, try regrinding the cutter to the opposite angle. Slab has been glued to a large, square beam and is thick enough for two rosettes, about the depth limit of the circle cutter.*

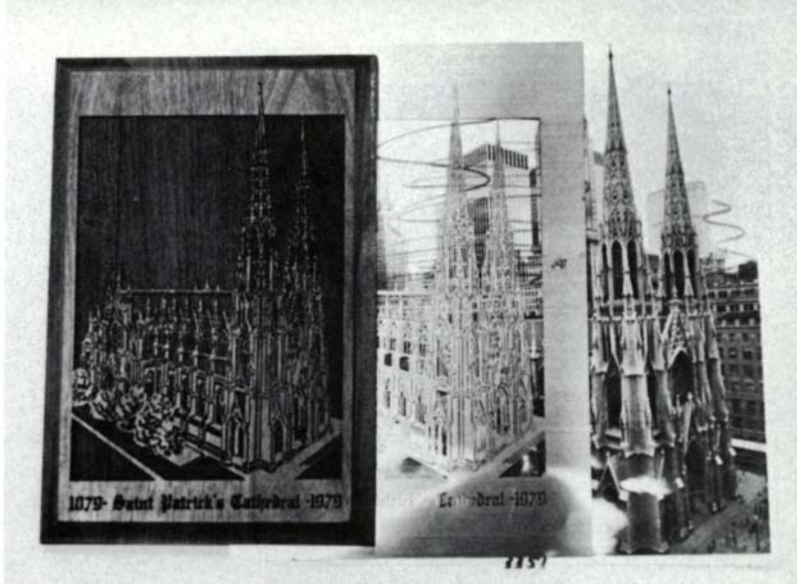


3. *A first pass through the table saw cuts more than halfway through the rosette. Beam is flipped, end for end, and a length of string is looped through the part of the rosette already cut. The other end of the string is held lightly between thumb and forefinger (not wrapped around the latter) as the second and final pass, above, is made through the saw. For a truer rosette and safer operation, this final cut should be made with one person holding the string and another doing the sawing. To save the center/waste portion of the rosette to use as inlay material on other parts of the guitar, tape it to the rosette in about four places. Instead of being 'swallowed' by the saw, the rosette and center portion will be lifted as a unit with the string.*

4. *Rosette inlaid in spruce soundboard. The rosette is California live oak banded with Macassar ebony and birch. The soundboard is clamped to a particleboard work board, a portion of which can be seen below the soundhole. Photos: Al Ching.*

Woodworking Lasers
How photons make wood disappear

by John Kelsey


Brass stencil, center, transmits delicate lines of photo to plaque.

Most gift shops sell solid walnut knickknacks with finely engraved pictures on them, pictures whose background has been abruptly dropped a sixteenth of an inch below the surrounding surface. Examining such a letterholder or paperweight, you might guess the artwork has been routed with an infinitesimal bit—the detail is too delicate and too clean for any ordinary tool. The smallest features show no trace of the sideways pressure a carving tool would have to exert. The picture ignores grain direction. Yet its recessed background reveals the varying density of the grain structure, as if wire-brushed. You can only scratch your head, until you discover a label saying the object has been laser engraved.

The woodworking laser can zap a clean kerf mere thousandths of an inch wide. Depending on the beam's power and the time it lingers, the kerf can go right through a piece of wood or it can bottom out partway through. It can follow a straight line or a curve, starting and stopping anywhere. It's a coherent beam of invisible infrared light, coherent meaning that all the photons move in phase and at a single frequency. It's generated by electrically and optically manipulating a thin, gaseous mixture of carbon dioxide, nitrogen and helium sealed inside a long, glass tube. When focused on a tiny spot, it's as hot as the sun's surface. At 6,000° C, wood in the beam's path simply vaporizes, becoming a whiff of organic gas lightly peppered with mineral ash. The spot is so quick and intense that adjacent wood doesn't even char.

Like all magic the laser has a catch, principally the size and complexity of its apparatus. A pinhole through the wood isn't much use, but the laser is far too large just to pick up and draw along a layout line. Turning the spot into a useful cut requires moving the laser beam by optical means or mechanically moving the wood past it, or a combination of the two, plus a way of extinguishing the beam or shielding the wood wherever you don't want it to disappear. You end up with an agglomeration of machinery, optical and electrical gadgetry twisting through cubic yards of space and costing more than $150,000. Nonetheless, at least one whole industry—laser engraving—has been created with this tool, and in a number of industrial applications it does a better or cheaper job than conventional cutters. And now the laser-engraving industry is developed far enough to be offering its talents. You can use the process without having to own a laser.

Laser engraving was invented by John Macken of Santa Rosa, Calif. A physicist, he's founder and president of Optical Engineering Inc. (Lasercraft), which today has more than 200 employees. Ten years ago, Macken and his brother, Don, were working in their garage nights and weekends to devise instruments for laser research. The beam is invisible and at these energies will vaporize flesh as easily as wood. Thus a laser experimenter has to know whether the apparatus is working before putting his hand or his eye in the way. The Mackens used to find out by sticking a scrap of wood into the beam's path. Fooling around, Don put some window screen in front of the wood, and there it was: deep squares where the laser had passed through the screen, untouched wood where the wires had interfered. He recalls thinking, "Gee, we must be able to use this."

That inspiration developed into a brass stencil in lieu of the window screen, and a way of quickly moving lots of brass-masked wood under the beam. Where the laser hits the brass, it is reflected harmlessly. Where it passes through, the wood's just gone.

In Lasercraft's process, the design is first made into a black-and-white drawing, then photographically etched through thin sheets of brass the way printed circuits are made. The design can be as complex as hands can draw and can include lettering, except all of its elements must be connected. A number of masks are made for each design, then they're all fastened onto finished wooden objects. Laser engraving is the last stage of fabrication—the object has already been cut and joined, sanded and finished with lacquer. Lasercraft does those chores in a conventional woodworking factory it owns in nearby Healdsburg, which consumes 60,000 board feet of No. 2 Arkansas walnut every month.

The masked workpieces are mounted near the edge of a horizontal turntable six feet across, which spins rapidly beneath the aperture where the laser beam emerges. The beam itself—actually multiple beams totaling 1,000 watts, to cut a swath instead of a line—is generated inside tubes that run along the floor underneath the turntable. Mirrors bend it up a vertical column and down onto the rotating work. The table moves incrementally inward as it turns. A propane flame burns near the action to flash the waste gases, and also to lightly char the engraved background, for decorative effect. There's a duct to suck up the exhaust, a power supply squatting nearby, and lots of cables, pipes and hoses. The assemblage looks like a gigantic jigsaw wed to a record player. But with the masked wood speeding past your chin, you don't really see anything. You can't see the beam because it's infrared, you can't see it vaporize the wood because it's all but instantaneous. You can see only a narrow, intermittent column of white-hot sparks, as from a

Laser engraving produces fine detail, recessed background. Left, paper-clip holder by Lasercraft. Right, Turntables move work under laser beam.

grinder. They're molecules of wood leaving the workpiece and catching fire in the propane flame, en route to the exhaust duct. Pretty soon the whole batch of work has passed beneath the laser. Lasercraft has six machines like this. In the next room is a larger, 10,000-watt machine only recently debugged. Here the turntable has become a broad conveyor and the fixed beam has become an array that scans.

Lasercraft's ingenious method is best suited to flat workpieces, the whole of which move beneath the beam. One of its competitors, a firm called Laserworks with offices also in Healdsburg and a factory in Florida, combines a moving beam with moving stock in a much smaller machine. Its system is said to be able to engrave on curved surfaces such as the outside or bottom of a bowl, or to be brought to bear on the middle of a large panel without having to scan the whole panel. Besides selling their own lines of engraved products, both firms will now do laser engraving to order, on stock fabricated in their own plants or supplied by the customer, for a price that depends on volume and complexity but seems to run upwards from ten cents per square inch, plus art preparation. Lasercraft will also consider licensing its system, as it's already doing in the international market. Laserworks, on the other hand, offers to tailor and sell a complete, 375-watt laser system for a flat $150,000.

Besides laser engraving, the die-board industry, which produces paper packaging, is rapidly adopting lasers. Flatten out any lightweight cardboard carton and you'll see the problem confronting the rule-and-die maker. Cartons are folded from single sheets of card that have been printed, cut to shape and embossed with fold lines. The cutting and embossing are done by pressing the printed sheets against a pattern of steel rules—some sharp, for cut edges; some blunt for folds—set on edge and held in place between blocks of $\frac{3}{4}$-in. maple-veneer plywood. For each different carton in the world, somebody has had to measure and cut a whole lot of odd-shaped but precise plywood blocks. It's conventionally done by skilled craftsmen with jigs and table saws. In a laser system, the pattern is fed into a computer for conversion to x-y coordinates, in order to govern the travel of a moving table. On the table is a plywood blank and over it a laser beam, which starts and stops by means of a metal shutter. When the whole pattern has been traversed, all the lines cut to exact width, the steel rules just drop into place. I spoke with a die maker in Atlanta who's also an amateur woodworker. He feeds patterns for his wooden toys into the computer and the laser spits out the parts he needs. The same setup would make wooden jigsaw puzzles, and one Midwest plant is using something similar to mass-produce marquetry inlay.

Woodworking lasers have two main limitations. First is power. It takes about 50,000 watt-seconds of energy to vaporize a cubic inch of wood. Thus a big, 1,000-watt laser takes 50 seconds to eat the cubic inch, whether it's one big hole, or a rip cut 0.010 in. wide in stock that is 1 in. thick and 100 in. long. If the same cut were made in the same time through $\frac{1}{20}$-in. veneer, a 50-watt laser would do. Power output governs the size of the apparatus as well as its cost. You can't get more than 80 watts of laser energy per meter of generating tube, so the more power, the longer the tube has to be. It now costs about $90 per watt to build the laser part of the machine, not to mention wood-moving apparatus, exhaust, et cetera. The whole apparatus puts out less than one-tenth of the energy you put in: a 1,000-watt laser sucks about 15 kilowatts from the wall plug.

Second, it's hard to keep the cut parallel at depths much over an inch. While the adjacent wood helps keep the beam focused, waste heat and gases can't be drawn quickly enough from the bottom of a deep kerf. The wood chars, the narrow line becomes a ragged burn. Also, because wood isn't uniformly dense, it doesn't engrave to a uniform depth, whence the striated background of laser-engraved pictures, even in such mild wood as walnut. The background in Douglas fir would be hills and valleys corresponding to growth rings.

Although the idea of whittling great lumps of wood with a hand-held laser beam will remain a fantasy, the next development is probably laser crosscut saws. Coupled to a scanning computer, a laser saw might be able to find and remove defects from raw planks, yielding the maximum number of pieces of optimum size for whatever was being produced. And while lasers aren't likely to become standard equipment any time soon, at least one amateur woodworker has a used one in his home workshop. He's Mike Sasnett, an engineer who works for a laser manufacturer. Sasnett uses it to make jewelry and to engrave small boxes, although he admits—like most of the techno-junkies and machine addicts among us—that most of the time his expensive toy just sits there. □

EDITOR'S NOTE: To acquire your own laser or to contract for laser engraving in commercial quantities, contact Optical Engineering Inc. (Lasercraft) at 3300 Coffey Lane, Santa Rosa, Calif. 95401 or Laserworks at 715 Alexander Valley Rd., Healdsburg, Calif. 95448. If you'd like to try engraving on a few pieces, or want to discuss something experimental, contact Mike Sasnett at Sunshine Engineering, 375 Anita Ave., Los Altos, Calif. 94022.

Small-Scale Cabinetmaking

With measured drawings for a roll-top desk

by James H. Dorsett

Four years ago I built a scale model of the Stanley-Whitman house in Farmington, Conn. It's a post-and-beam structure with a framed overhang, built in 1660. While I could have built a believable model using the plywood shell that is standard in miniature house construction, I chose instead to research and to replicate the framing of the original—stick by stick, joint by joint, from the sills up to the ridge pole.

Miniatures such as this have universal human appeal. As children, we don't have to be taught to enjoy dollhouses or model trains, and as adults only the most prosaic of us have outgrown a fascination with toys. We just develop more sophisticated tastes, appreciating greater realism in the objects we fancy. The more faithfully a model follows its full-scale original, the greater our wonder in beholding it. It is, after all, the contrast with the real world, pronounced in a miniature's detail, that captures the eye and stirs the imagination. And it is the execution of these minute details that most challenges the craftsman and rewards his efforts.

Scale cabinetmaking has become more than an increasingly popular hobby. The greater demand from collectors, and with it the higher prices they are willing to pay for commissioned pieces, have made modelmaking more attractive to serious woodworkers. Encountering the craft of making miniatures for the first time, the full-scale cabinetmaker will recognize similarities as well as differences between working full size and working to scale. To illustrate the shared and unique elements of miniature cabinetmaking, I will describe the construction of the 1/12-scale roll-top desk shown below, including plans that could serve to help reproduce the original, down to the carving on the drawer pulls. This example will show how the scale modeler selects materials, buys, adapts and improvises tools, and devises special techniques to produce precisely detailed replicas in miniature. But first some discussion of the scale modeler's ethos is necessary.

In the past a dollhouse or a piece of doll furniture was judged for its visual impact, not for its structural integrity or its replicative accuracy. During the past ten years, as interest and sophistication in the craft have grown, there has been more attention to the fidelity of the replication to the original. Yet there are all kinds of miniatures being built, and a useful distinction can be made between *simulations*, essentially furniture for dollhouses, and *replications*, miniatures that conform to a particular scale and to the standards of construction and design of particular periods and prototypes. While various scales are currently used, ranging upward from 1/2 in.:1 ft., the de facto standard has become 1 in.:1 ft. This 1/12 scale, like HO scale in model railroading, combines the advantages of a reasonable level of achievable detail with an economy of space and material costs.

Though the movement has been toward more accurate replication, the other pole—simulation for affective impact—continues to help define the range of approaches the craftsman may take in designing and constructing a miniature piece. Simulation creates in the viewer the belief that the miniature is real, for if it is successful, he will perceive all of the form and detail that exist in the original, whether or not they are actually built in the miniature. The viewer will believe that joinery systems undergird the surface of the piece, that doors swing and that drawers may be opened. On the other hand, replication's primary appeal is for the craftsman himself. Alone in his shop, he feels challenged to incorporate in the miniature details of cabinetry that may never be seen. He takes pride in the quiet integrity of his piece, and can, with an audience, show that his piece works.

Every miniature combines simulation and replication. In the best pieces there is a sensitive balance between the two. It is not only that materials reach a point of intractability, but also that the degree of perceived detail reaches a point of diminishing returns. Even if techniques, tools and materials allow the craftsman to model the detail of a shell or

This desk may look like the real thing, but it is only 4 in. high and 5 in. long. Built to 1/12 scale, it exactly replicates the full-size original, incorporating all its structural and decorative details. The measured drawings beginning on p. 60 show how to construct the miniature, or they can help in reproducing the original desk at full scale.

Photos: Don and Cindy Massie

foliated carving, the viewer's eye need see only the primary and some secondary motifs to be convinced of the carving's quality and authenticity. To do more would look cluttered. Also, the scale cabinetmaker may deviate from exact replication in order to maintain the sense of proportion in the original piece. The heavy cabriole leg of a Chippendale chair, for instance, may be carved undersize on the miniature because the bulk of the precisely proportioned leg might overwhelm the visual balance of the miniature. Thus the aesthetic sense of the craftsman is the final arbiter between simulation and replication.

The tension between simulation and replication is not essentially a difference between greater or lesser levels of craftsmanship. Considerable skill, though often of different sorts, is required to do each well. Compare the dioramist—an architectural scale modeler who uses multiple vanishing points and other modes of artifice—with the tool-and-die maker, who must work to close tolerances. Both sets of skills mingle in the work of the experienced miniaturist.

The selection of materials for a miniature is critical to the success of the project, and points to the necessity of balancing replication with simulation. No matter how painstakingly accurate the planning and the execution of the construction of a piece may be, improperly chosen materials can ruin its effect. And the reason is plain. While dimensions lend themselves to scale reduction, texture often does not. Two materials that can quickly destroy the illusion created by the miniature are wood and fabric. Wood grain in particular is inherently resistant to scale reduction. Exactly replicating the materials of the original piece does not yield a successful miniature.

A successful miniature begins with a complete understanding of the original to be copied. In this respect the scale cabinetmaker is like his full-scale counterpart. The poorly designed and poorly made miniature typically reveals the builder's inadequate knowledge of full-sized furniture. Only beyond this common starting point do the differences between the scale modeler and full-scale cabinetmaker become apparent. The differences include design decisions, material selection, tool choice and use, and special techniques for achieving effects comparable to those in the full-scale craft.

I constructed the 1/12-scale roll-top desk illustrated here as the design model for an article that appeared in *The Scale Cabinetmaker* 3:4 (Summer 1979, pp. 23-28). The structure and detail of the original were no mystery to me; it is my own office desk at which I have worked for years. I rescued it from the attic of a Kansas lumberyard and rebuilt it entirely. The design of the miniature began with a set of sketches and measurements of the original—useful in building either a full-size duplicate or a scale model. For several reasons, I chose to replicate the original as closely as tools and skills would allow. First, I wanted to see if a tambour curtain could be designed and built in scale that would articulate over the S-curves of the desk sides in the same way and with the same look as in the original. Second, I wanted to illustrate the use of machinist's slotting saws for cutting the mortise-and-tenon joints in the desk's rail-and-stile base and top panels.

Having decided to reproduce the frame joinery of the original, I decided to match the other joints as well—the dovetails in the drawers and the tongues and grooves in the pull-out writing boards. Actually, I excluded from the model only one feature of the original—the spring-loaded latching bars that lock the drawers shut when the tambour curtain is lowered. Originally I intended to make this hardware item as well, but in the end I let the challenge pass.

The original roll-top desk has quartersawn oak in its framing members and drawer fronts and plainsawn oak in the panels. But for use in the miniature, oak with its open pores and flaring grain is inappropriate. Miniatures require a medium-hard, close-grained, finely textured wood. For that reason, many miniaturists use satinwood, pearwood, holly, boxwood and cherry. Walnut, while widely used, varies considerably as a satisfactory material, according to its growth rate. Walnut from semi-arid regions is more likely to yield usable material for models than are faster-growing eastern varieties. Basswood is probably the most widely used material for miniatures because of its availability and low price. It is easily worked and offers the appearance of a wide range of full-scale grains from bird's-eye maple to quartersawn oak. However, while it serves as a ground for simulating a variety of wood grains, its short fiber and surface fuzz make tight joint lines and surface preparation a serious problem.

The scale cabinetmaker has the same jealous regard of his materials as does the full-scale woodworker, squirreling away select stuff against future need: pieces of crotch and burl, or boards with special grain. From such a pile I chose some quartersawn cherry for the desk. It was cut from a heavy branch rather than from a trunk section, where annual rings produce too broad a grain. The ray fleck in the cherry provides a believable substitute for the distinctive look of quartered oak. Lighter-colored boards I set aside for the pigeonhole unit; darker wood I used in framing the main carcase, and boards with a more pronounced figure I ticketed for panels.

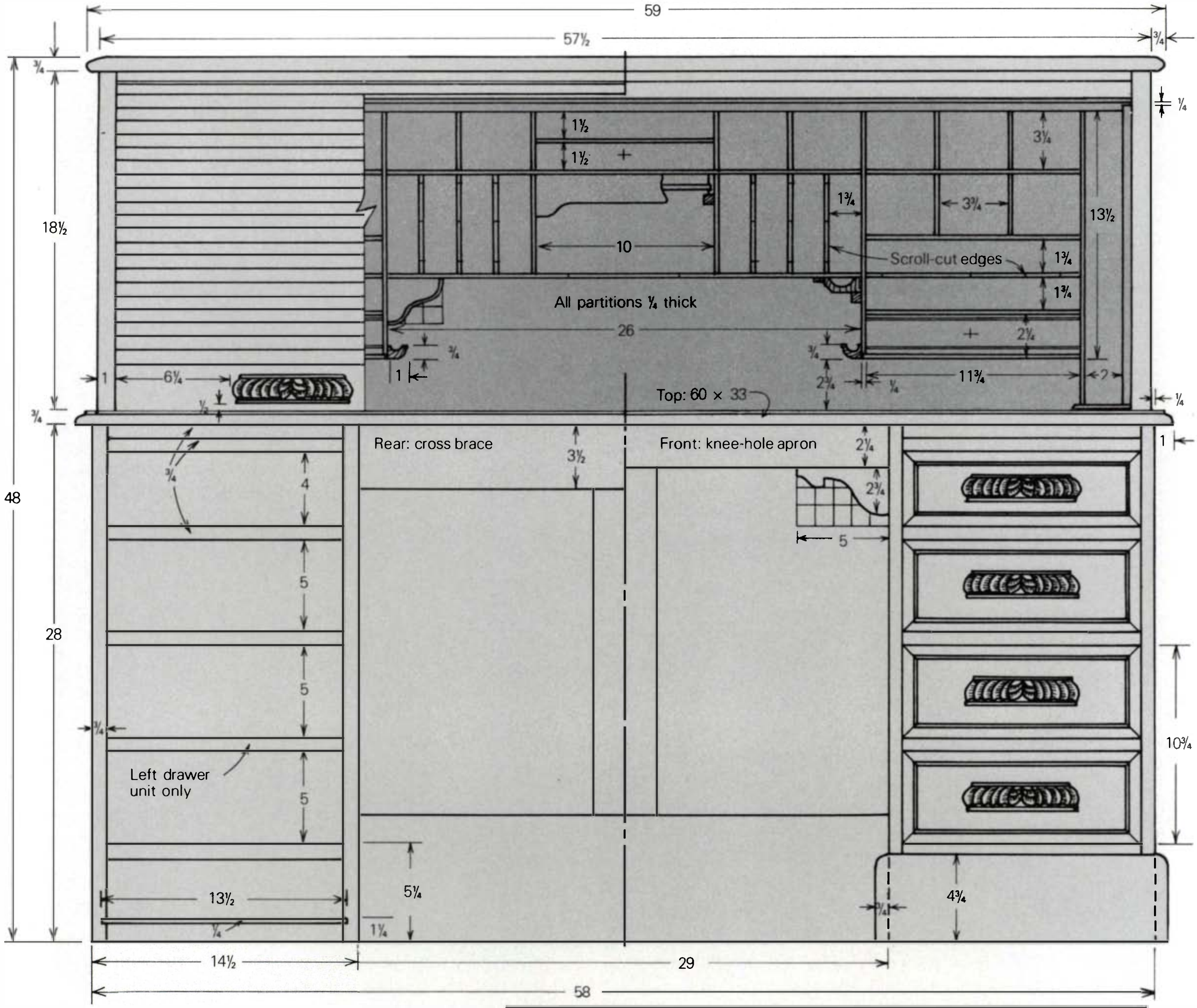
I might have used commercially produced hardwood boards. However, such material is typically flatsawn, and therefore yields too few boards with useful figure. And it is commonly supplied in fractional rather than in scale thicknesses. If in a 1/12-scale project the modeler wishes a board that is a scale 1 in. thick, commercial material offers him either 5/64 in. or 3/32 in. thick. Since in 1/12th scale, one inch is 0.0833 in., the commercial stock is either 0.011 in. too thick or 0.005 in. too thin. So the scale cabinetmaker is better off ripping and sizing his own stock. The materials in the desk are precisely scaled to the materials in the prototype with one exception: the entire cubby unit was built of scale 1/4-in. thick material even though some of the vertical and horizontal dividers in the prototype are 1/8 in. thick. With scale lumber, a piece that is 0.0104 in. thick simply has no structural stability, and could not be used.

Tools and workbench techniques also change as scale reduction takes place. Some full-size shop tools are useful in preparing materials—table saw, bandsaw, jigsaw, jointer and thickness planer. However, beyond the useful limits of these tools, the maker of miniatures is forced by the inadequacies of the marketplace to become inventive in his search for functional precision tools. While it is possible to build an excellent miniature with a jackknife, as one outstanding craftsman indeed does, precision tools of high quality do increase the chances of achieving good results. The hobby industry produces some good-quality hand and power tools—knives, handsaws, clamps, power hand grinders, belt and disc sanders, and jigsaws. However, many hobby tools are either overengineered toys or underengineered tools. For example, small (4-in.) table saws with tilting arbors appear to incorporate all the features of a full-sized shop machine, but their

(text continued on p. 64)

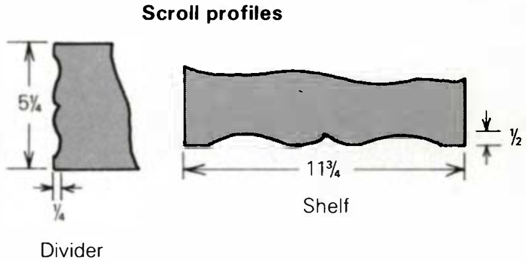
Roll-top desk: front elevation

Plans are 1½ times the size of the miniature.

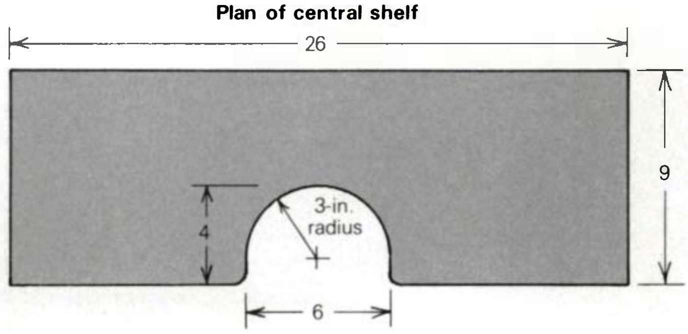


Typical of early 20th-century factory-made office furniture, the original desk was designed for machine production. If you use these drawings to make the piece full size in your own shop, you might want to improve upon the existing joinery. The main vertical dividers in the pigeonhole unit could be dadoed or routed for dovetail housings to receive the shelves. Likewise, the main shelves could be routed to receive the minor dividers. To secure the writing surface (desk top) to the drawer units, cut square, wedged tenons on the stiles at the four corners, and mortise the desk top to receive them.

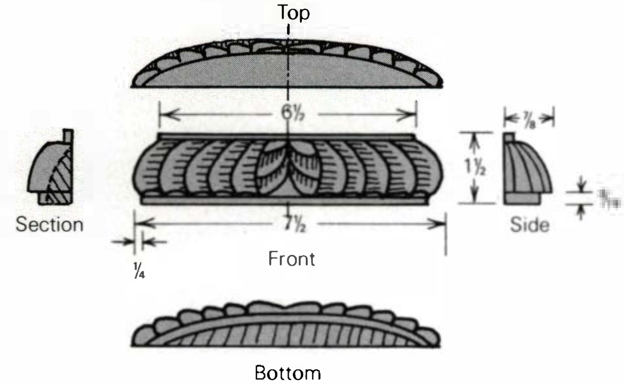
Scroll profiles



Plan of central shelf

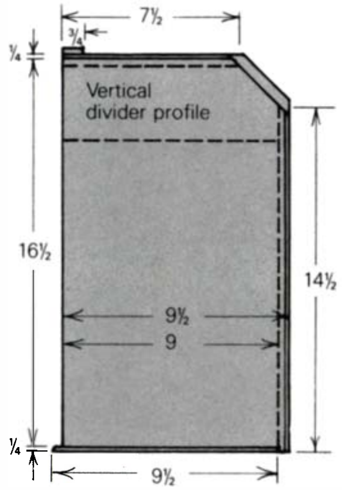


Drawer-pull detail

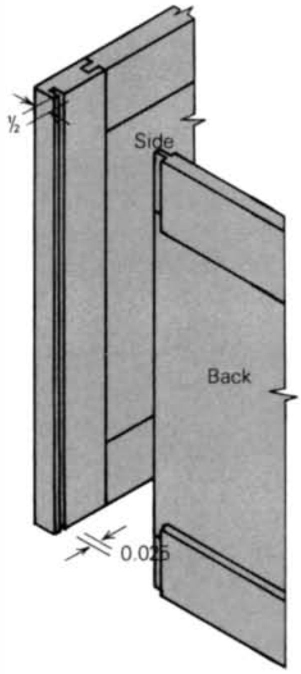


Drawings: Jim Dorsett

Pigeonhole unit: side elevation

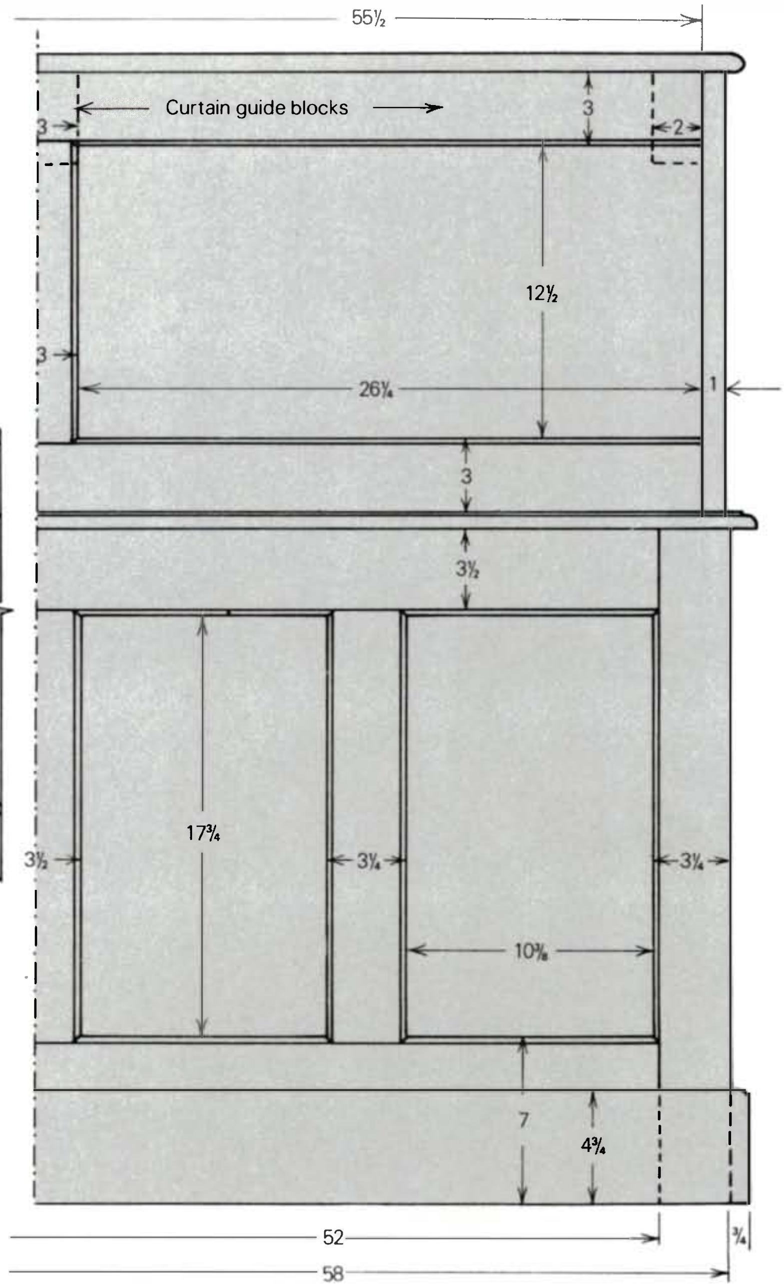


Joinery of upper case (rear)

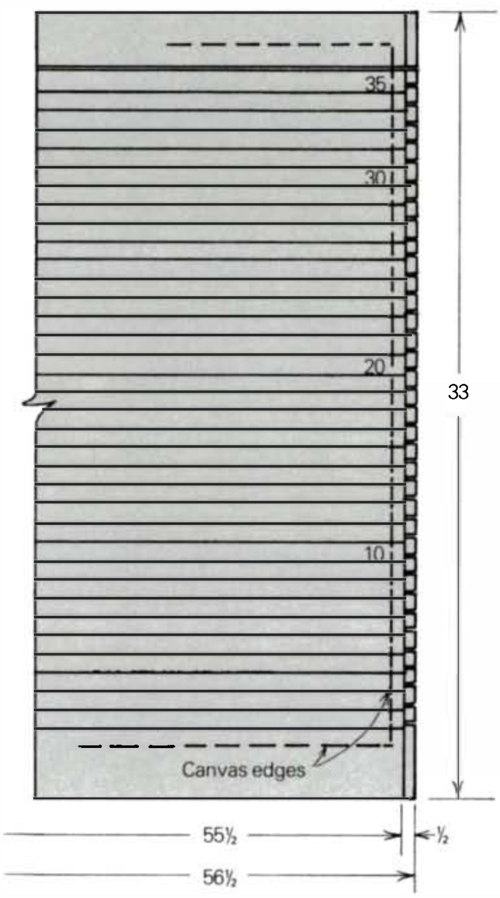


In a full-size adaptation, increase the strength and overall integrity of the upper case unit by adding stiles to the rear frame, instead of grooving the stiles of the side frames to house the rear panel directly.

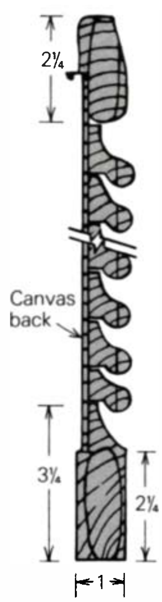
Rear elevation



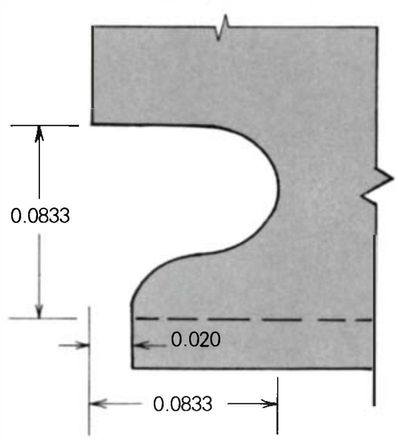
Tambour-curtain detail



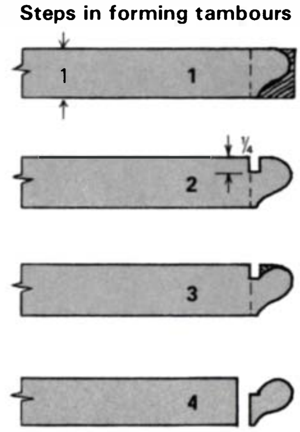
Curtain in section



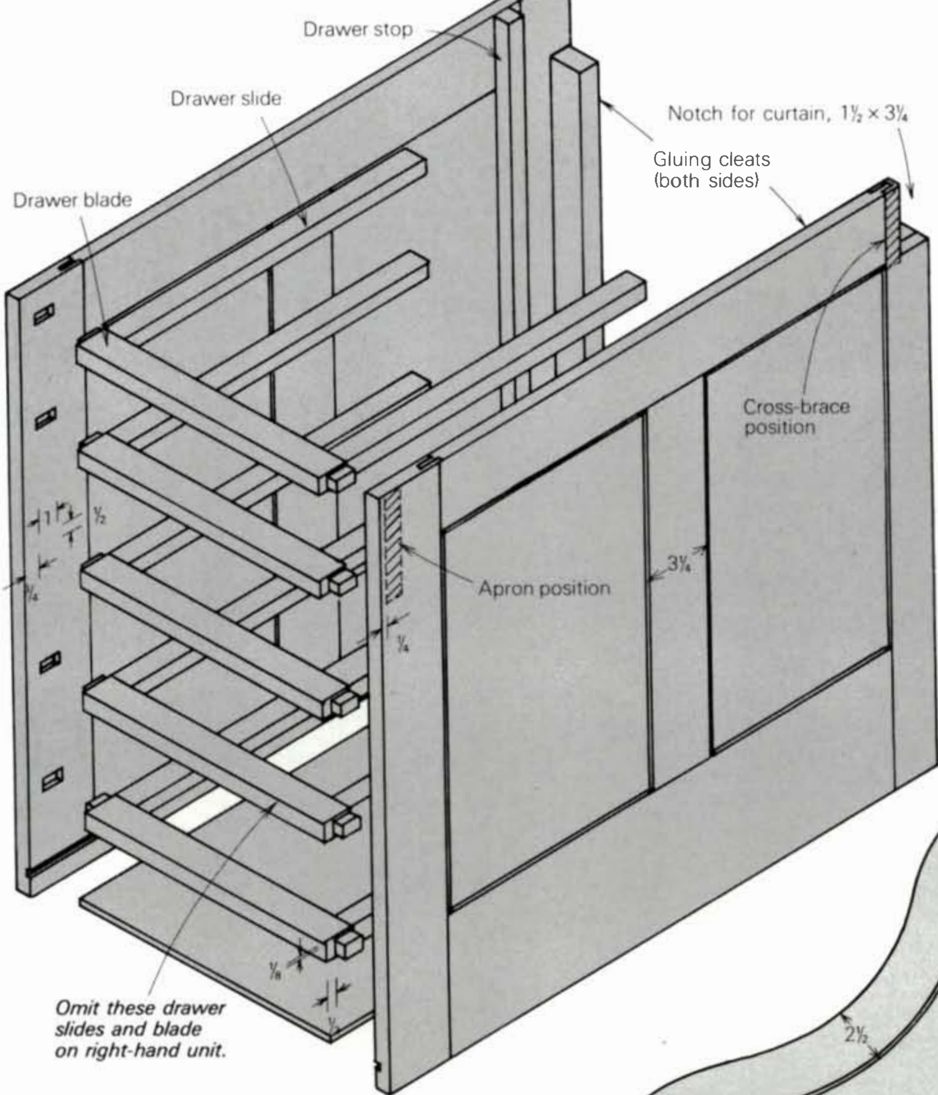
Cutter for miniature tambours



Steps in forming tambours

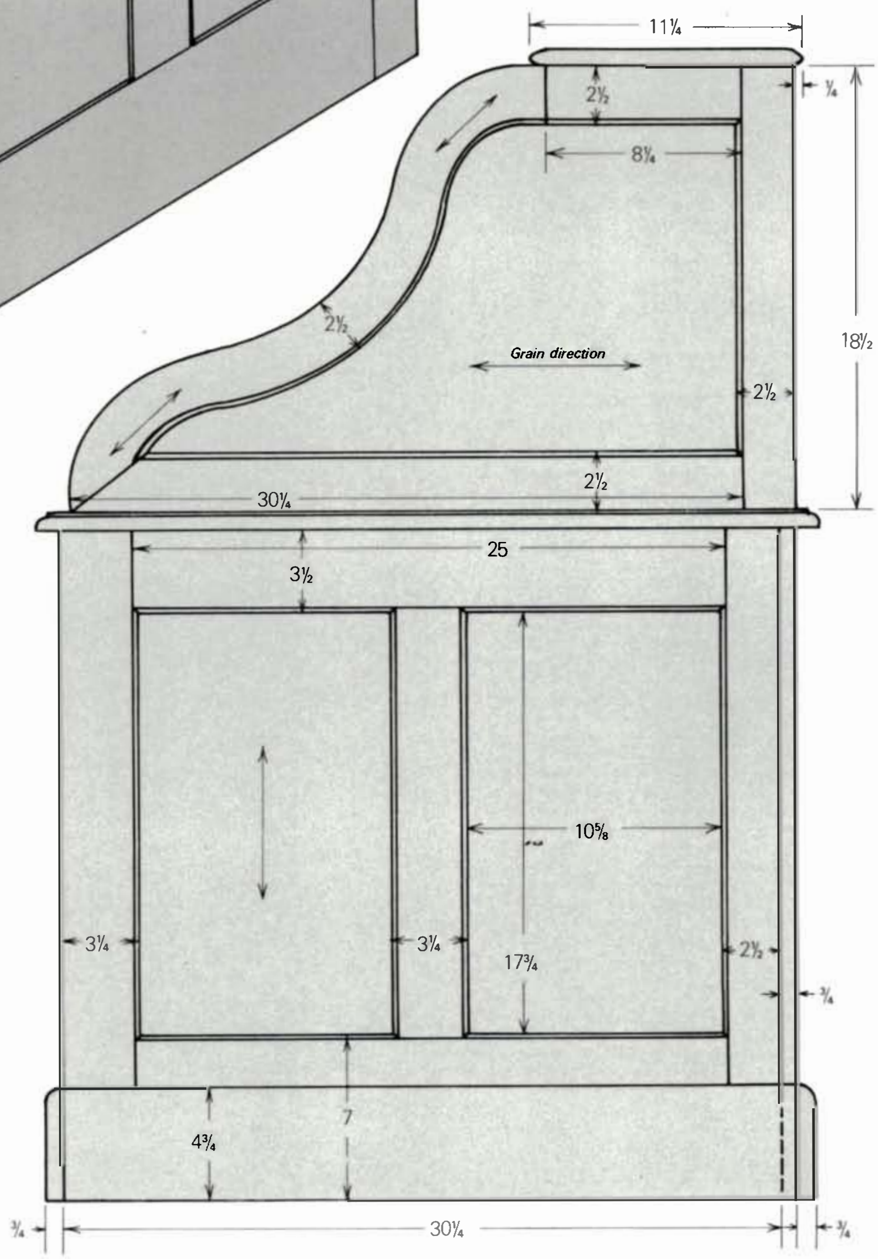


Case assembly for left-hand drawer unit

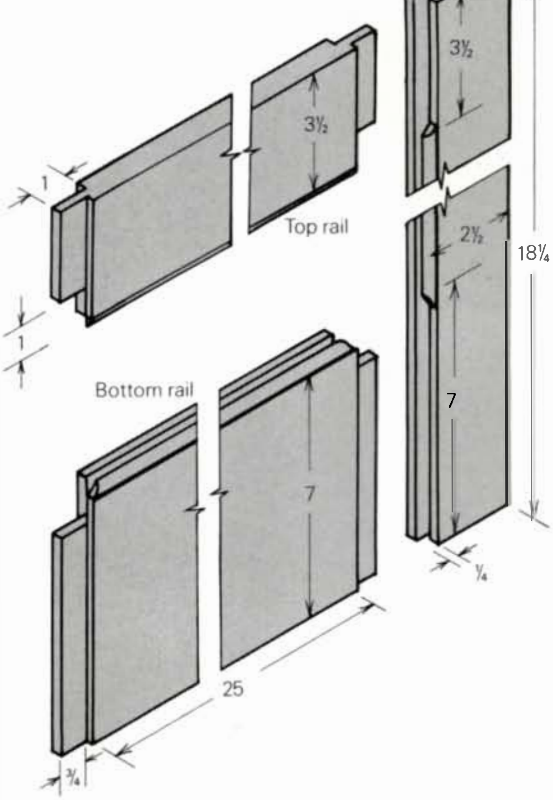


You can improve the case joinery of the original by increasing the length of the tenons on the frame rails and muntins. Double tenons on the drawer blades will make the drawer units stronger. In finding means for attaching the drawer guides to the inside of the case, be sure to take wood movement into account.

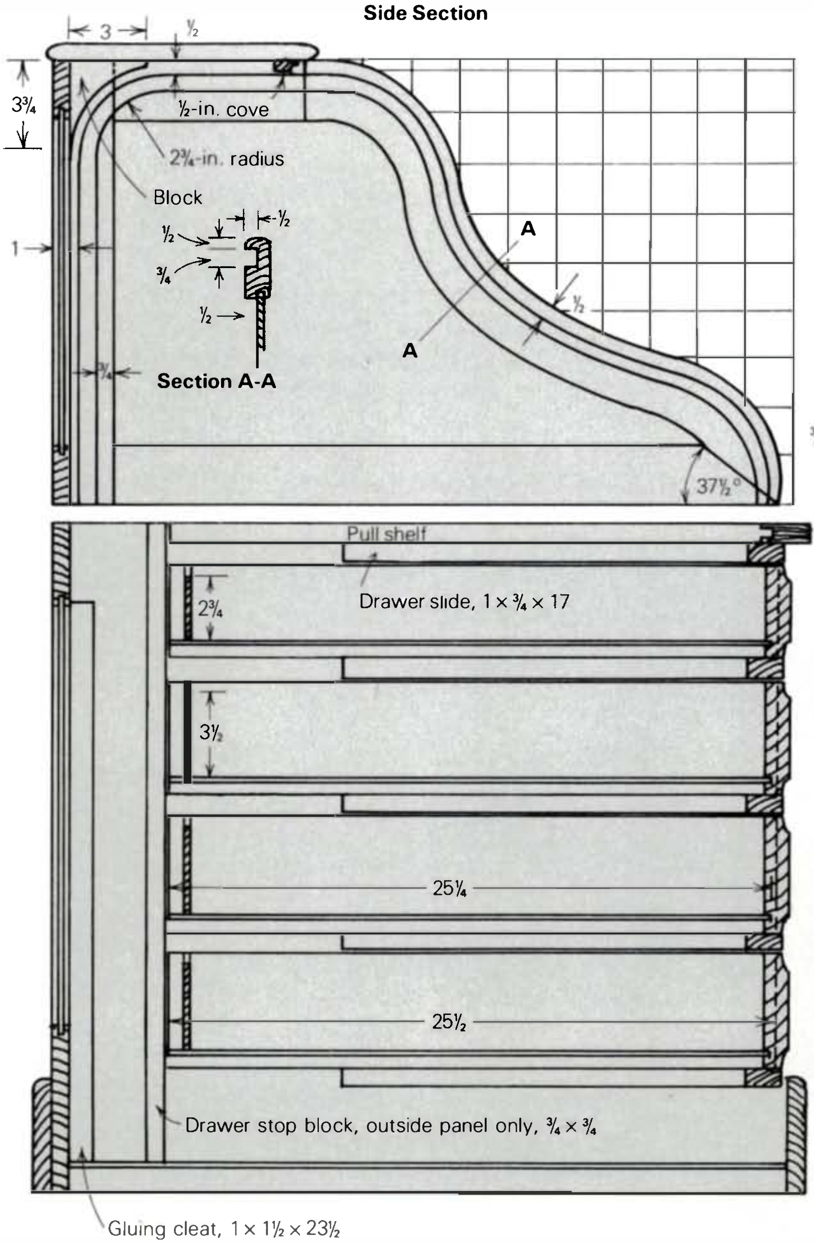
Side elevation



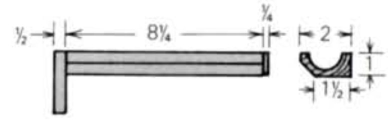
Frame assembly for drawer unit



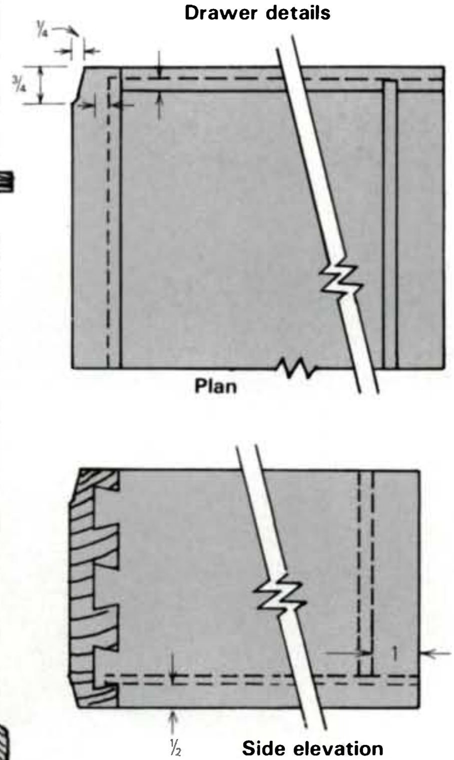
Side Section



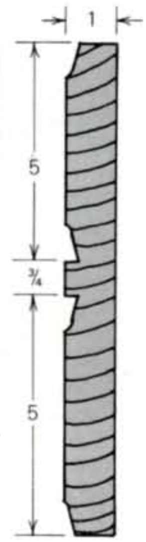
Pencil drawer



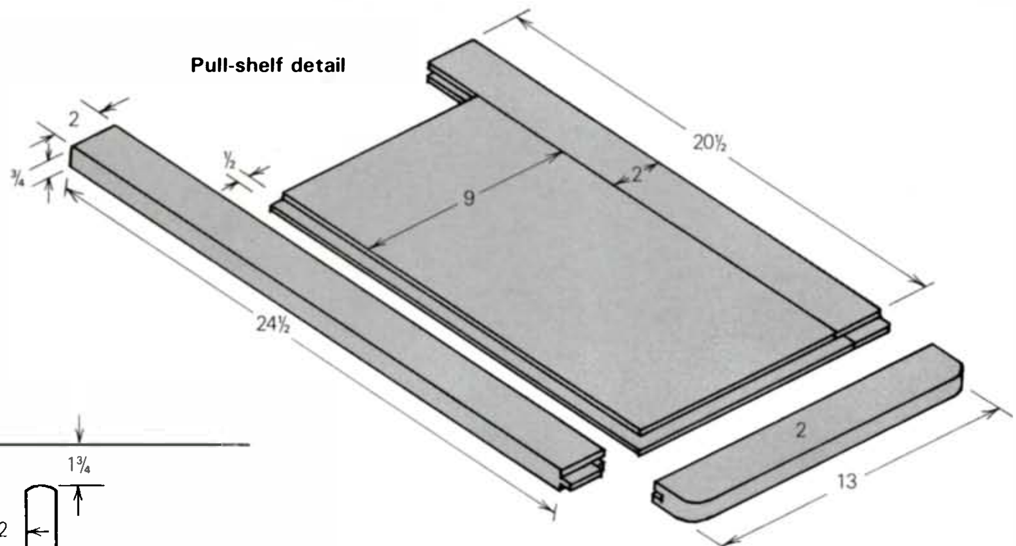
Drawer details



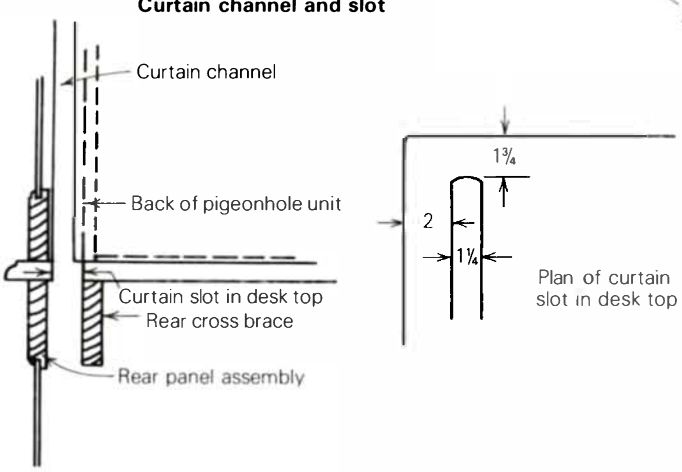
Section of file-drawer front (right side only)



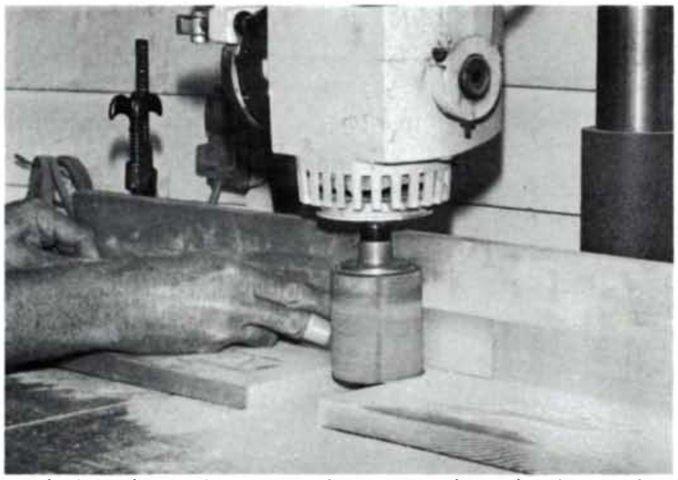
Pull-shelf detail



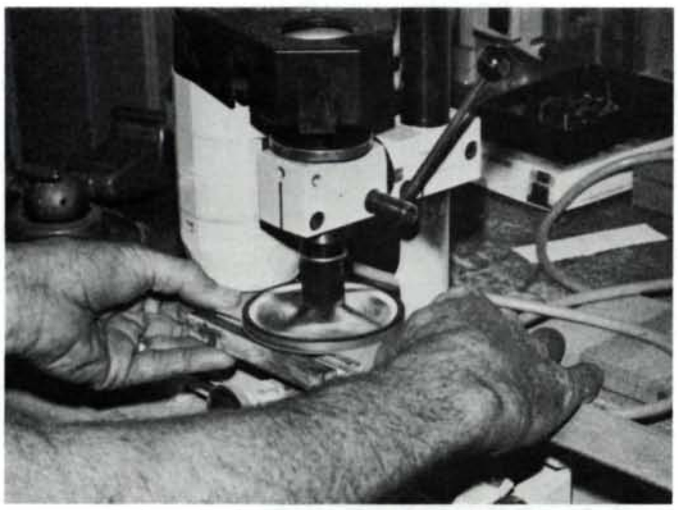
Curtain channel and slot



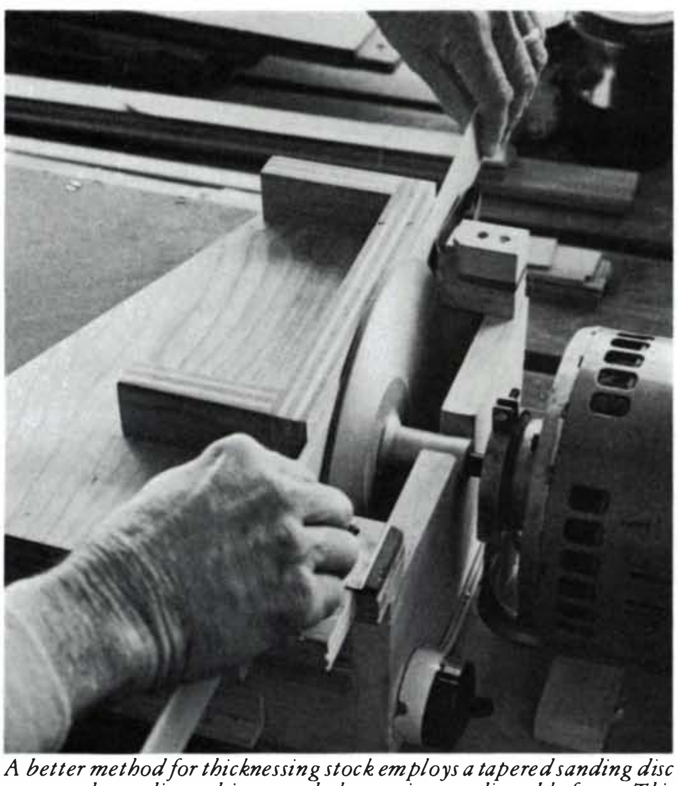
If building full size, don't glue the grooved breadboard to the tongued pull-out shelf. Secure it in the center with a small bolt and captured nut. The counterbore for the bolt head can be plugged. This arrangement will let the wood expand and contract across the grain without cracking.



To thickness his stock to precise dimensions, the author first sands to rough thickness using a drum sander mounted in his radial-arm saw and feeding the boards between the rotating drum and the fence.



For final finishing, he chucks a sanding disc in his Unimat drill press and draws the stock between the disc and the milling table beneath.



A better method for thicknessing stock employs a tapered sanding disc mounted on a direct-drive mandrel opposite an adjustable fence. This device will give accurate results, thicknessing 1½-in. wide planks to tolerances of 0.003 in. edge to edge.

blades, bearings, fences, work surfaces and power lack the degree of precision and durability that is desirable.

Probably the most adequate and widely used power tools produced for the scale modeler are small machine lathes (Unimat, Sherline, Taig, Machinex). Yet even here the tools were not designed for the woodworking miniaturist. They are essentially down-sized versions of full-sized machine lathes, useful in metalturning. Still, offering such auxiliary capabilities as drill press, table saw, milling machine and disc sander, the small machine lathe is affordable, and essential.

Beyond the limits of available, useful hand tools, improvisation must be practiced at the miniaturist's workbench. Dental burrs and chisels become molding cutters and wood chisels. Jewelry-supply houses are another source of precision hand tools, from pliers to gravers. Small mills from tool-and-die supply houses become routing bits, and a machinist's depth gauge serves as a try square.

Measuring instruments vary with the degree of precision required by the project. Several high-quality 1-in. scale steel rules are available, marked off in scale increments of ¼ in., similar in function to the 1-in. architect's scale. Where finer measuring increments are required, scale dimensions are translated into decimal inches, and a machinist's 100th rule, dial caliper and micrometer are used. Unless your favorite form of masochism is the division of fractions, avoid the use of 1/16 scale in building miniatures. Given a scale dimension of 23½ in., for instance, it is much simpler to mark off the scale distance with a 1-in. scale instrument than to contend with a distance that is almost, but not exactly, 1 61/64 in. on a 1/16-in. rule. If greater precision is needed, the measured distance with a dial caliper is 1.9583 in.

Several tools required in the desk project illustrate the miniaturist's need to improvise. The basic problem in miniature projects is the need for precisely sized and thicknessed lumber. This desk called for scale lumber in the following sizes: ¼ in. (0.0208 in.), 5/16 in. (slightly undersize at 0.024 in. to fit the groove made with a 0.025 in. slotting saw), ½ in. (0.0416 in.), ¾ in. (0.0625 in.) and 1 in. (0.0833 in.). Short of investing in a planer that will work to these thicknesses, there are two alternative approaches. The more tedious and less satisfactory approach involves rough-sanding the lumber down to approximate thickness with a drum sander mounted against a 90° fence of a radial-arm saw. The semi-finished boards are then sanded down to final thickness with a flat disc mounted over a milling table in a Unimat drill press.

A better solution employs a thicknessing sander, as made by Jim Jedlicka *(The Scale Cabinetmaker* 4:4, Summer 1980). This tool, designed with the scale cabinetmaker in mind, employs an 8-in. tapered (2°) disc and is powered by a flea-market motor. In thicknessing 1½-in. wide boards, it is accurate to within 0.003 in. (edge to edge). In contrast with the chipping and splintering that often result with jointer knives on uneven or knotted grain, the disc grinds off the surface of thin stock without marring or chipping.

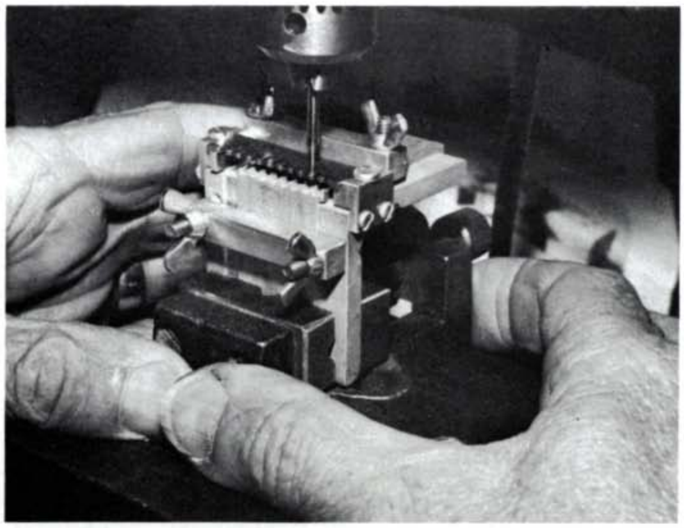
A second problem—cutting the system of tenons and grooves in the panel framing—I solved by using machinist's slotting saws. A 1½-in. dia. by 0.025-in. blade on a mandrel with a ⅜-in. arbor was mounted in a Unimat drill press over a table, which was in turn mounted to the lathe's cross slide. With a hardwood fence covering the blade, the height of the blade above the table could be controlled with the drill press and the depth of the cut with the longitudinal feed screw of the lathe. The setup produces joints that are crisp and precise. Blades are typically available in diameters ranging upward from ¾ in. and in thicknesses from 0.010 in. to 0.030 in.

The tambour curtain posed yet another problem. Because there is no commercial source for scale molding cutters, I had several options when special molding faces were required, as found on the beaded edges of the desk's stiles and rails or the S-profile of the tambours. Although some commercial moldings are available and can be adapted to a range of needs, these are typically supplied in basswood only. The desk moldings could have been cut with ball-and-cone dental burrs (as indeed the pencil shelves and drawers in the cubby unit were made), but hand-shaping of the finished profiles would have been required, destroying some of the crisp uniformity I wanted. So I chose another method. The needed molding profile is lathe-turned in mild steel. Flutes are milled on the end of the turned steel and dressed with pattern files, and then it is case-hardened. The resulting tool is not meant for production runs, but it does provide an adequate solution to a recurring problem in the craft.

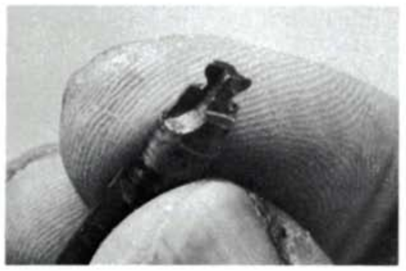
Assembly always poses a variety of jigging and clamping difficulties, most of which are familiar to the full-scale woodworker. Sometimes the solution is unique to the particular piece being assembled. For that reason most miniaturists keep on hand an array of clamping tools—rubber bands, bulldog and alligator clips, C-clamps, spring clamps, handscrews, jeweler's ring clamps, clothespins and others. In assembling the desk base unit, for example, I often used two kinds of clamps—flat, magnetic holding jigs for clamping the flat panel sections, and violinmaker's clamps for holding the assembled pedestal. The jig consists of a flat, steel plate with pieces of 90° aluminum angle along two sides. Clamping is done with a number of small, square magnets, which hold the glued assembly in place. Violinmaker's clamps with their screw-tightened, cork-faced blocks provide a firm, but gentle, means of holding a carcase assembly during gluing.

The majority of miniaturists use either polyvinyl (white) or aliphatic resin (yellow) glue in assembly. Some of the high-viscosity, slow-set cyanoacrylates offer promise as general-purpose glues in modeling but are still relatively new. Regardless of the type of adhesive used, the woodworker's typical problem of pre-finish glue spotting is compounded in miniature cabinetry by the size of the workpiece. Pre-assembly sealing of the wood is a common solution, and excess glue is avoided. The desk was assembled with white glue, but a flexible polyvinyl fabric glue was used to attach the tambours to the linen back. The finish consists of a light wash of cherry stain and several light, rubbed coats of satin spray lacquer. Because the cherry will darken with age, the stain was optional. An equally desirable sealer might have been several coats of cut shellac (rubbed in). Sealer is used on a miniature to provide a finish without the type of surface buildup that will obscure the crispness of detail (or what one craftsman has called the appearance of "having been dipped in black molasses and drip-dried during a monsoon").

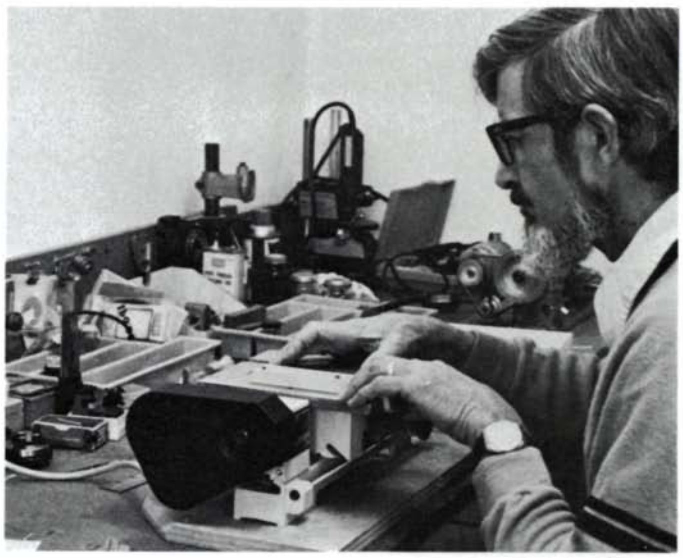
Had the function of the desk been only to fill out the illusion of an entire miniature setting, other design options could have been considered. The effect of the raised desk curtain could have been simulated with the application of only a few slats across the top of the open desk front. The structure of the pedestals could have been simulated through a system of flat, butt-joined boards to which fascia "rails" and "stiles" would be glued. If carefully assembled and finished in this way, the joint lines could be made invisible and the appearance of the piece would be identical to that of the miniature employing mortises and tenons. Assuming that the miniature would never be subjected to the same stresses from use or changing humidity as would the full-sized desk, the simulated model should have proven quite durable and quite convincing. But I would have known the difference. □



Dovetail jig, patterned after its full-size counterpart and used in conjunction with a Dremel drill press and small tapered mills, cuts the joints for the drawers.



To cut moldings for limited runs, Dorsett equips his Dremel drill press with a shop-made cutter, left. To make a cutter, he turns the desired profile on a small bar of mild steel and then mills flutes in the sides. Once dressed and sharpened, the cutter is case-hardened.



For producing crisp and precise mortises, grooves and tenons, Dorsett uses a machinist's slotting saw mounted on a mandrel and driven by a horizontal miller. Fence and table register the stock.

Jim Dorsett, 51, of Pembroke, Va., is editor and publisher of The Scale Cabinetmaker, *a quarterly journal for miniaturists ($15 a year from Dorsett Publications, Inc., Box 87, Pembroke, Va. 24136).*

North Bennet Street Industrial School

Learning cabinetry the traditional way

by John Lively

"Around 1795 John and Thomas Seymour used to have their cabinet shop here," said George Fullerton, pointing down a narrow alleyway off Union St. in Boston's North End as we strolled back from lunch. "There were a lot of cabinetmakers in Boston in those days, and even right up into the 1920s, but few survived the Depression and World War II." As the senior instructor at North Bennet Street Industrial School's cabinet and furniture-making program, Fullerton, 78, has spent the last 30 years of his life trying to rescue that waning tradition of hand craftsmanship. With his associates, Phil Lowe and Lance Patterson, he trains students to design and build furniture in several 18th-century English and American styles—Queen Anne, Chippendale, Sheraton, Hepplewhite, Seymour and Phyfe—and their important regional variations.

Founded in 1881, North Bennet Street is the nation's first industrial arts academy. Students choose to study here for a number of reasons. Some feel that traditional pieces are more commercially successful than contemporary ones, and they want to make careers of reproducing and restoring antiques. Others don't necessarily plan to become period-furniture specialists, but think the most effective way to learn cabinetmaking and design is to gain an intimate knowledge of established forms and techniques before striking off in their own directions. Yet others are moved simply by the strong conviction that classical examples are the best to follow, believing that good designs, like good lumber, should be well seasoned.

On the fourth floor of an old brick building (the school hasn't moved since its founding), with a view of the Old North Church, the woodshop occupies six rooms—two bench rooms, a drafting room, a machine room, a finishing room and a faculty office. The large bench room has its own hollow-chisel mortiser, grinder, drill press, jigsaw and table saw for trimming pieces to final fit. All other machine tools are confined to a single room, which is equipped with a thickness planer, a jointer, a bandsaw, a table saw, a mortising machine, a drill press and three lathes. Given the maximum enrollment of 30 students, whose ages range from 18 to 55 or older, the space and equipment are more than adequate.

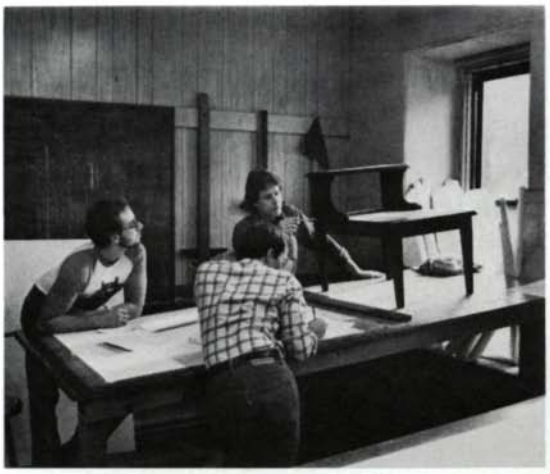
There are no formal class sessions at the North Bennet Street School, and no universal grading periods. Whenever there's a vacancy, the next student in line on the waiting list (about 12 months long) enters the program. Structured more like an intensive apprenticeship than an academic curriculum, the 18-month course begins with the student learning to square a block of wood with a hand plane. By the end of the program, each student will have completed several challenging projects and will have become proficient at building chairs, tables and casegoods. "The native skill many of these students have really amazes me," Fullerton said. "I often walk over to a beginner's bench where he might be carving the crest rail for a Chippendale chair, and he's doing such a good job of it that I'd swear he's been a carver somewhere before. But, of course, he hasn't. I'm very fortunate in having such good students."

At North Bennet Street School, students learn traditional design and technique. Above, Hank Ouellette carefully pares the rear leg flush with the side rail on his cherry Queen Anne side chair, assembled dry.

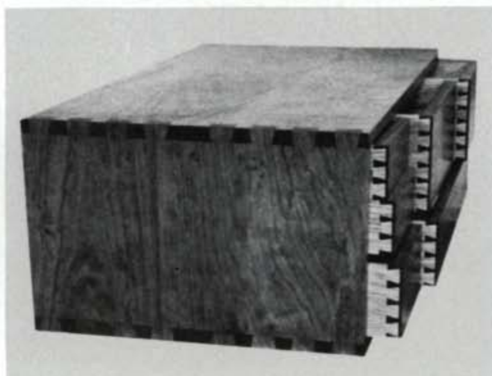
The work of new students is supervised closely, both in its planning and construction phases. More advanced students carry on with considerable independence, relying on one another, as well as on staff members, for advice, guidance and assistance. One student told me: "You know, some of the other students here, especially those about to graduate, are the harshest critics of all. They don't let you get away with anything." In the absence of the conventional classroom, with its hypothetical answers to equally hypothetical questions, information at North Bennet Street is conveyed at the time the student needs it, in an actual, practical context. Lessons learned this way are not easily forgotten; they become part of the nervous system, because they are communicated in practice, rather than in the abstract.

After learning to use hand planes and chisels, the new student makes an oilstone box, then turns a mallet, practices cutting dovetails and, to complete his novitiate, makes a tool chest to prescribed dimensions that will nestle neatly beneath

Carl Mesrobian carves the crest rail for a Chippendale arm chair. Using notched clamping blocks in conjunction with vise dog and handscrew gives him free access to the entire length of the rail.



In the drafting room, instructor Phil Lowe shows two beginning students how to render plan and elevation views of joinery details. For their first drawing assignment, students usually begin with a simple piece such as the end table shown here.



To signal the end of their novitiates, students construct tool chests like the one at left, little tours de force of dovetailed casework. Made to prescribed dimensions, the chests fit neatly out of the way beneath workbenches. Above, senior instructor George Fullerton eyes the joinery and checks the progress of a more advanced project, Catherine McGarty's butternut drop-leaf table. Boards leaning against bench in rear will be glued up to make the oval top.

the bench he'll work at for the next 15 or 16 months. After that he chooses his own projects, in advancing degrees of difficulty, beginning each one in the drafting room, where he prepares full-scale measured drawings. It was in this room, by the way, that E. F. Schultz learned to do the kind of drawing that accompanies his article on blockfront furniture in the July '80 issue (#23) of this magazine. "Drawings are the language of the trade," Fullerton tells his students. "You've got to have a clear vision of things, have them settled in your mind and then proceed with speed to the end result. You can't afford to make design decisions at the bench or work out the mechanics of a joint. That's all done on paper well in advance of the actual work." The furniture designs themselves are taken from actual pieces, from those on display in the Karolik collection at the Boston Museum of Fine Arts and from those illustrated in well-documented books. Sometimes students work with both sources for a single project.

Himself a native Boston cabinetmaker, Fullerton knows well the cold facts of making a living as a craftsman. He was apprenticed in the first decade of this century to the cabinetmaking firm of Mellish and Byfield in Charleston, Mass. When his apprenticeship was over, he was advised to fill out his knowledge of the trade by traveling about, hiring on at cabinet shops up and down the East Coast for journeyman's wages. During the 1930s he worked in the custom shop at Paine's Furniture Co. in Boston, and before taking up teaching in 1952, he served for many years in a union post, and had the good fortune to meet most of the cabinetmakers in the New England and New York areas. With a mind almost encyclopedic in its hoard of furniture-making lore, Fullerton insists upon precision and fidelity in both work and language. "How long does it take a student to learn how to carve this sort of gadrooning?" I asked, fingering the apron of a Chippendale game table. "Actually, that's nulling, not gadrooning," he replied, "and a good student can pick it up pretty quickly." With such a teacher, it's no wonder. □

EDITOR'S NOTE: In addition to the cabinet and furniture-making program, North Bennet Street offers diploma-granting courses in camera repair, carpentry, jewelry making and repair, locksmithing, offset printing, piano technology and watch repair. For information, write Admissions, North Bennet Street Industrial School, 39 North Bennet Street, Boston, Mass. 02113.

A Single Bed

Basic design develops joinery skills

by Kenneth Rower

This bed, built for my son, was made to fit a mattress 7 in. by 39 in. by 75 in. It can be viewed as a particular design or as a general method of making a bed out of heavy stock and one wide board. There is much room for variation without changing the construction. While the piece shown is for those who like rectangles, certainly the tops of the posts and the headboard could be shaped to taste, and the legs could be tapered or turned from square stock. A theoretical adaptation for stacking twin beds is shown in the drawing on the facing page.

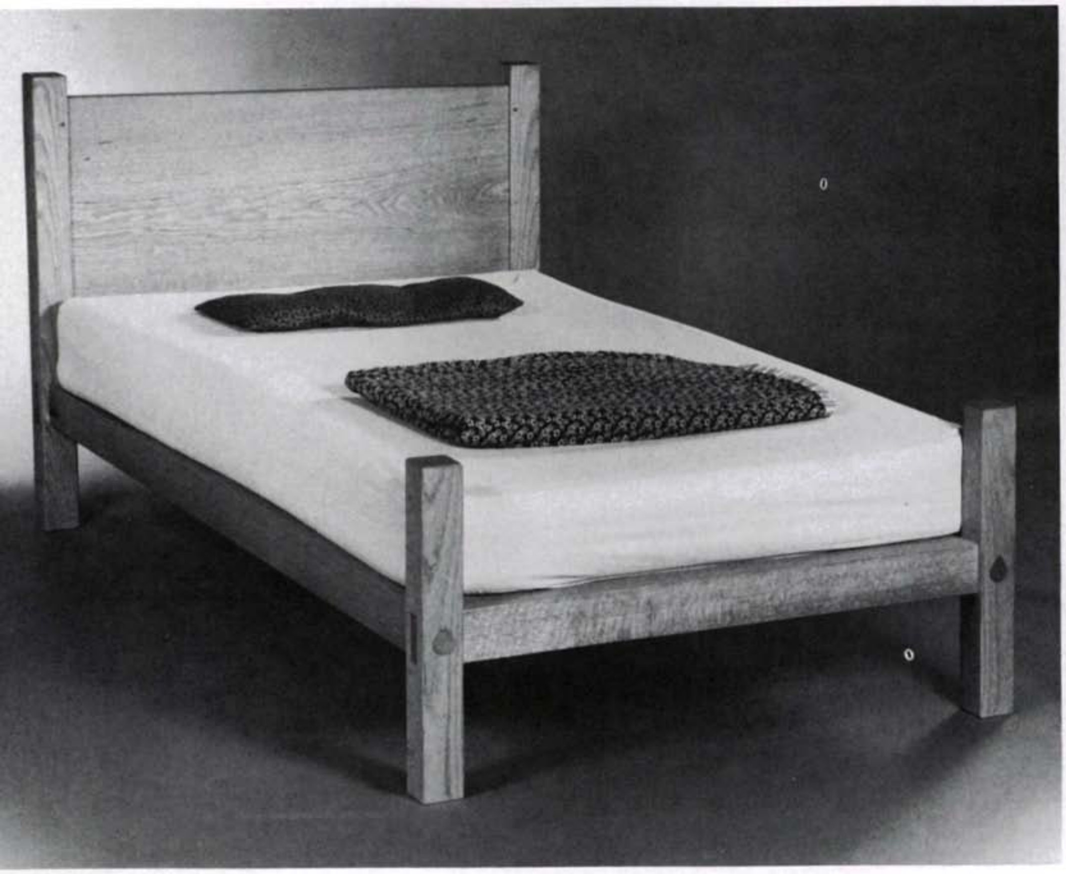
Rails and posts are the same thickness, but the rails are set back about ½ in., thus emphasizing the separateness of the posts, and yielding integral ledger strips on the insides of the rails, needing only to be rabbeted to carry the platform. The shoulders at the ends of the long rails are unequal, the inner being housed ¼ in. in the posts to assist the bolted stub tenons. The short rails bear no load, are not rabbeted and do not have a housed shoulder.

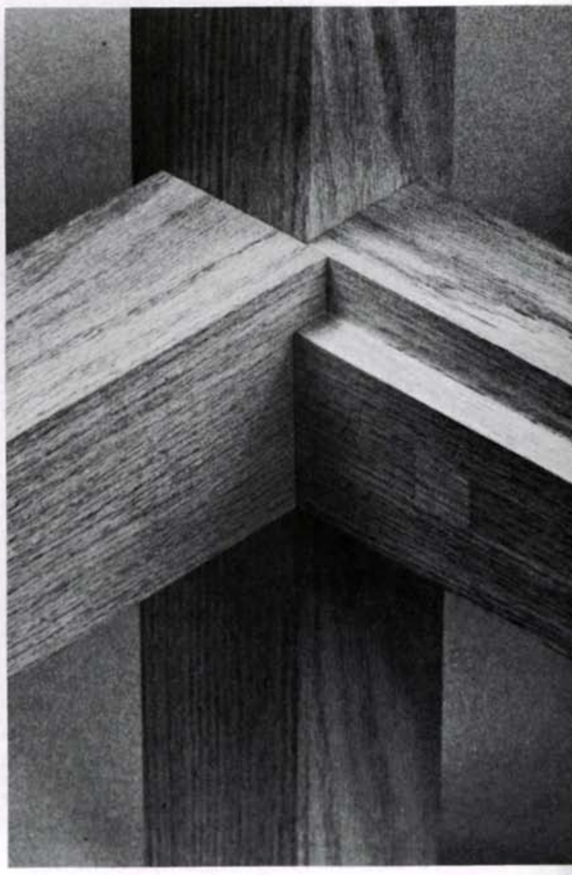
The platform is of pine boards laid the short way and fitted loosely edge to edge. Other materials could equally well be used, for greater or lesser flexibility, and the rabbets could be altered to accommodate a different arrangement, for example a grid of boards running both ways.

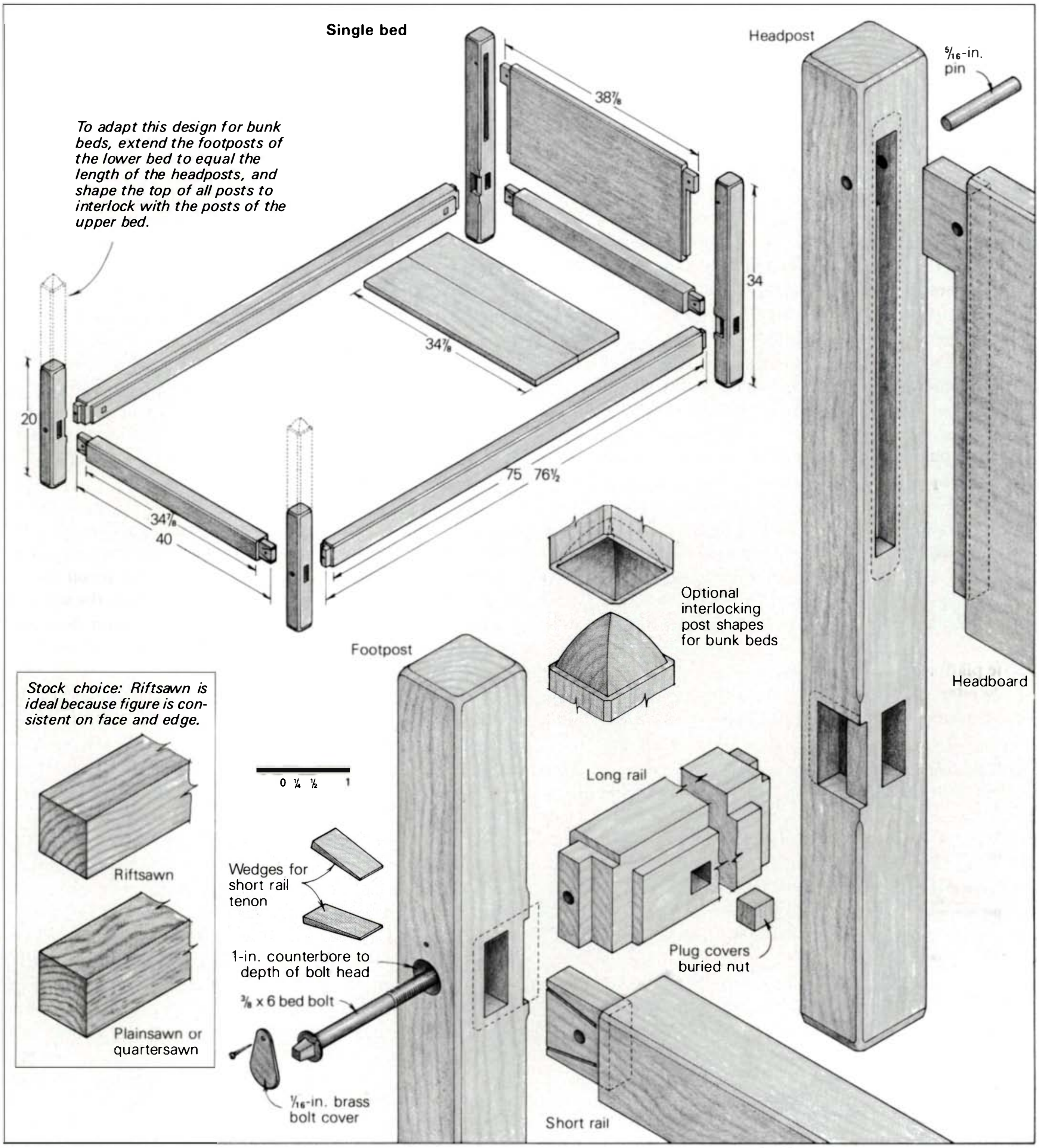
In cutting out the rails and posts, consider which surfaces will be seen to relate, and arrange grains accordingly. For example, the front surfaces of the head posts will be seen with the front surfaces of the foot posts. The most convenient stock to work with, especially for the posts, is the rift cut (see inset in drawing), since all faces of a piece show about the same linear pattern. Plain or quartersawn stock, which shows bolder patterns that differ markedly on adjacent faces, can nevertheless be thoughtfully organized.

There are several kinds of mortise-and-tenon joints to be cut. To make the very long tenons at the headboard, true up one face and one edge of the stock. Square the ends exactly to the overall length including tenons. Gauge the tenon cheeks from the trued face and gauge the shoulders from the squared ends. Saw or plane grooves across the grain just on the waste sides of the shoulder lines, cutting to the depth of the cheek lines. Remove the waste and finish up with a rabbet plane. Then saw away part of the tenon to yield a long haunch. Make the other half of the joint by chopping the blind mor-

Child's bed, here in red oak, can be varied in size and adapted for bunk beds by lengthening the footposts and shaping them, along with the headposts, to interlock with the feet of a top bed, as shown in the drawing on the facing page. This clean, sturdy design incorporates various mortise-and-tenon joints, (as in the detail, right) housed, wedged and drawbolted for strength. Photos: Richard Starr.







tise first, then chopping or routing the groove. While the mortise should be as tight as possible, the groove should be a good deal longer than the haunch to allow for expansion of the headboard, and the shoulder below the haunch should be long enough to allow for contraction.

The mortises for the outside-wedged tenons can be made accurately with the aid of a guide block to chisel the desired slopes at the ends (see *FWW* #19, Nov. '79, p. 95). For a plainer appearance, blind tenons could be used here.

Notice that in laying out mortises, the gauge should bear on the inner faces of the posts, which have been previously trued and squared to one another. Thus, post sections may vary somewhat without significantly affecting the joinery.

The order in which the parts are made does not matter, but it may be easier to bore for the bolts while the posts are free and before they are mortised for the short rails. First, working plumb, counterbore and bore the holes in the posts. Then clamp the posts to the long rails and use the holes to guide the bit into the end grain of the rails. If necessary, take away the post to finish the hole. Then, leaving the bit in the hole, draw a line on the inner face of the rail to show the actual path the bit has taken. Remove the bit and bore the crossing hole to house the square nut. As there is some danger of boring too deeply, it is prudent to stop a little short, square up the hole with a chisel, try the nut, then deepen as required. When all is well, and with the joint bolted up, shim around the nut to keep it from shifting, and dry-fit a plug. It remains to complete the bolt holes through the short-rail tenons. Clamp up the end frames, mark the tenons from each side, then remove. Bore the holes a little oversize, lest eventual shrinkage pinch a bolt.

Matching the shoulder-to-shoulder lengths of the headboard and the headrail requires care. When testing the assembly, remember that because of moisture loss through freshly cut surfaces, post faces can deform after being mortised, and in order not to be misled, check these surfaces for truth before trying the matched pieces in place. The shoulder-to-shoulder length of the footrail, meanwhile, may differ a trifle without harm.

Before final assembly of the end frames, shape all arrises with a chamfer or radius, including those underneath. Children do crawl under beds, and planed oak can cut. The chamfer is perhaps more interesting to look at and to finger, the radius friendlier and more comfortable to lean against. The corners of the post tops can be worked with a finely set block plane, or they can be sanded with paper on a block. These corners can also be left sharp, straight from the chamfering of the arrises, for a pure if rather dangerous-looking detail.

During assembly, if the tenons make good friction fits in their mortises, very little glue is desirable. Put glue only on the tenon, and then only on the first inch or so next to the shoulder. Don't put glue on the haunches of the headboard: they must be free to shrink upward toward the fixed points at the top. The lower rail will keep the bottom tight. It is not necessary to glue the wedges, and more than a drop of glue can cause them to seize before they are driven home.

Simple bolt covers can be made of 1⁄16-in. sheet brass, using dividers, drill, hacksaw and file, or patterned ones can be obtained, along with the bolts, from Ball and Ball (463 W. Lincoln Hwy., Exton, Pa. 19341) or from Horton Brasses (P.O. Box 95, Cromwell, Conn. 06416).

To adapt the design for stacking twin beds, make all posts the same height, and carve all the post tops and one set of bottoms to make a gravity-locking joint. One way is shown in the drawing. A master set of male and female parts should be cut first to ease the job of fitting the actual posts. When the beds are stacked, additional racking strain on the joints of the lower bed would indicate widening the rails. Some compromise may be required here between acceptable sway and visually acceptable rail width. There seems no practical way to have matched bunk beds while preserving the interesting difference in height between headposts and footposts.

As for access, if the lower bed is placed head to foot with respect to the upper, steps for climbing will be found at 12 in. (footrail), 33 in. (headboard), and 48 in. (footrail). The second interval could prove too great for some children. Another approach would be to orient the beds normally and fit a two-step ladder between the lower edge of the upper footrail and the upper edge of the lower footrail, establishing 12-in. intervals for the climb. The ladder legs should be mortised in at the top end. Since mortises would be unsighty in the lower footrail when the beds were apart, the lower end of the ladder could be located by buttons fitted to the rail and shaped similarly to the post tops. □

Kenneth Rower makes furniture in Newbury, Vt.

Fumed Oak Finish

Old-time process still has advantages

by Sam Allen

If you've ever tried to match the finish on a piece of antique oak furniture, it may have been a frustrating experience. That's because many oak pieces (Mission furniture, for example) were finished by fuming, a process difficult to duplicate using modern stains. The color of fumed oak ranges from a light honey to a medium dark brown. Exposing the wood to ammonia fumes darkens the wood by changing it chemically. Ammonia reacts with tannic acid in oak to produce the color change. Mahogany, chestnut and walnut can also be fumed. As long as the tannic acid content of the wood is the same, the color will be uniform from piece to piece.

Even if you don't restore antiques, you may want to try fuming on your oak projects. Fuming has many advantages. Since it works a chemical change in the wood, it doesn't hide the figure characteristics. No brushing is involved, so irregularities such as streaks, lap marks, stain buildup in corners or on carvings and intricate moldings are completely eliminated. And because the ammonia vapors penetrate the surface of the wood, the color change goes deeper than a thin coating.

The main disadvantage of the process is that ammonia fumes irritate the eyes and nose and cause coughing and choking. For this reason, fuming should be done outside or in a well-ventilated room. The process also requires an airtight container to enclose the piece being finished, which may pose a problem for large furniture.

When you are building a project to be fumed, try to use boards with uniform color. If you can, choose all your lumber from the same tree; it will then fume to the same color. But this is usually impossible. You can sort the boards by numbering them and fuming a small piece of each, keeping track of the results. Then you can select the pieces that most closely match. If you must use dissimilar pieces of oak, the lighter ones can be darkened by sponging on a weak solution of tannic acid before fuming. This will raise the grain, so sand the wood as you would for water stain. Experiment on a sample piece to get the correct amount of tannic acid. About 5% acid to 95% water is usually a good starting solution.

Fuming—Fuming an entire object is not hard to do. Start by finding an airtight container. For a small object, a Tupperware-type box with snap-on lid will work well. For larger pieces, you can construct a plastic tent. Build a framework of 2x4s or 2x2s and cover it with the type of black plastic sheeting used in the garden to keep down weeds. Seal the seams with heating-duct tape. Don't use clear or translucent plastic because sunlight hitting one area of the project and not another will affect the reaction time and make the color uneven.

Next, add ammonia to the container. The best ammonia to use is 26% ammonia, or aromatic spirits of ammonia. Aromatic spirits—the kind used to revive people who have fainted—is available at drugstores in small bottles. If you need only a small amount, this is the easiest to find. If you'll need large quantities, the 26% ammonia sold by chemical supply houses will be cheaper (check the Yellow Pages). Ordinary household ammonia can be used, but the process will be slower. If you use household ammonia, be sure to get the type without detergent, coloring or perfume.

Place the ammonia in several saucers and space them around the inside of the tent. Small objects that need to be fumed on both sides can be propped up on wooden pyramids that come to a sharp point. The small contact area of the pyramid point won't leave a visible mark. Never use metal to support the work. Steel in contact with the wood during the fuming process will sometimes cause a blue-black mark on the wood. Keep this in mind when you are preparing a project—don't install any metal hardware before fuming. Exposed nailheads will create a mark, but nails set below the surface are usually no problem.

The subject of nails brings up another consideration. Ordinary wood putty won't be colored by the fuming process, so don't fill holes until after the fuming is done. Then color the putty to match the finish.

As fuming proceeds, peek occasionally at the wood. Remove the project when the color is slightly lighter than the color you want. After coming out of the tent, the wood will darken slightly since the reaction continues for a while. It usually takes about 24 hours to get a medium dark brown.

When you are restoring an antique, though, you may want to fume only a few small areas, not the entire piece. One way to do this is to glue some cotton in the bottom of a glass jar and add a few drops of ammonia to the cotton. Don't add too much or the ammonia will drip onto the work. Put the mouth of the jar on top of the spot to be refinished. Keep a close watch on the color and stop the ammonia treatment just before the spot reaches the same color as the surrounding finish. Let the wood air out thoroughly and check the color. If it's still too light, put the jar on the spot again for a little while.

Another touch-up technique is not really fuming—the ammonia is applied directly to the wood with a brush. This process will raise the grain if you use water-base ammonia. To avoid raising the grain, use aromatic spirits of ammonia, which is alcohol based. It will behave like a spirit stain. Wet the wood first and sand as you would for a water stain. Let the ammonia stay on the wood until the color is close to the surrounding finish, then wipe it off with a damp cloth. Ammonia evaporates quickly, so you'll have to apply it repeatedly to keep the area wet. Covering the spot with a jar lid or something similar will retard evaporation. Check the color when the wood is thoroughly dry and repeat the application if necessary.

Finishing—You can apply shellac, varnish or lacquer over fumed oak, but if you want to duplicate an original antique finish, the surface coating should be wax. Old-timers frequently made their own wax by shredding beeswax into turpentine. The mixture was set aside until the wax was thoroughly dissolved, then turpentine or wax was added until the consistency was like thick cream.

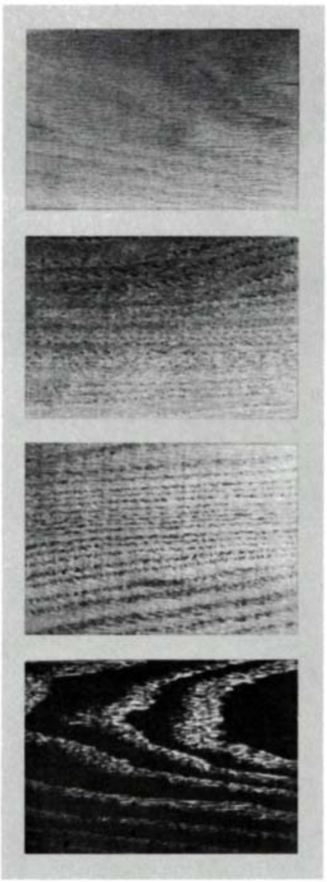
If you don't want to make your own wax, you can use a commercial paste wax such as Trewax. The wax will fill the pores of the wood. The natural tan color of the wax will usually harmonize well with the color of the wood. If you find that the wax is too light or if it goes white after drying, you can add a little burnt umber pigment in the same manner as described below for making black wax.

Black wax on fumed oak used to be a very popular finish. With this finish the pores stand out prominently because they are filled with black wax. This type of finish was generally used on quartersawn oak. To make black wax, liquefy paste wax by warming its container in a pan of hot water. Heat the water first, then remove it from the stove before placing the can of wax in it. When the wax is liquefied, add lampblack or some other color. To be compatible with the wax, tinting colors should be of the universal type (see *FWW* #27, March '81, pp. 65-67). Let the wax harden again and apply it to the work. The wax will accumulate in the pores as you rub it in, but the coating on the other areas will be so thin that the pigment won't cover the color underneath. You can get the same effect if you are using a finish other than wax by rubbing in Silex wood filler colored with lampblack.

Ebonizing—Ebonizing is another way to finish that uses the tannin content of oak. Ebonized oak is black with white pores. First, put some household vinegar in a glass jar; drop in a handful of steel nails and let the mixture sit about a week. The vinegar is ready when it is grey and cloudy looking. Prepare the wood as you would for a water stain, then brush on the vinegar, which will turn the oak bluish black. Apply several coats of the vinegar, letting it dry between coats.

When the oak is dark enough, brush on some liquid ammonia. This will neutralize the acid left on the wood by the vinegar. At this point the wood should be deep black with a slight purple tinge. Next apply a thin coat of sealer. The purple tinge will disappear and the oak will be a beautiful black. All of the characteristics of the wood will still be visible in the blackened surface. That is why this process is superior to simply painting or staining the wood black.

Now apply white wood filler to make the pores stand out white, and finish as you choose. Because of the contrast of white pores against a black surface, the pores become dominant visually, so select boards that have interesting pore patterns. To emphasize them even more, you may want to brush the boards with a wire brush before applying the vinegar solution. Since oak is so hard, lightly brushing it will not scratch the surface; it will only clear out the pores. □



Ammonia reacts with tannins to darken oak; old-time finishes bring out the figure. Oak samples, top to bottom, are unfinished, fumed with natural wax, fumed with black wax, and ebonized.

Sam Allen, 29, designs and builds furniture in Provo, Utah.

Decorative Joinery

Leading the eye around the piece

by John E. N. Bairstow

The most important element in the craftsman's repertoire is the wooden joint. Although its functional development has been extensive, fascinating possibilities remain unexplored for using the joint in a decorative capacity. Historically, decoration has more often been supplementary, applied to the piece of furniture, rather than integral with its construction. Carving, inlay and marquetry have been used extensively in various forms, while joinery, although potentially the most interesting element, remains quiescent. Few historical examples exist where the method of construction plays a major visual role in the finished work. Thus the designer has become accustomed to creating an attractive piece of furniture using shaped and decorated parts, while sticking to standard joinery beneath.

I choose to start designing a piece of furniture by considering the decorative possibilities of its joinery. This approach makes it possible to use fairly simple forms, and to create the initial visual impact through the joint. Most standard carcase joints, the dovetail and the finger joint, for instance, rarely relate well to the form of a piece of furniture because they concentrate all the interest along the corners. This is fine if you are close to the piece and can appreciate the proportion and accuracy of the joints, but if you are viewing it from more than a few feet, then the most striking thing will be the overall form and not the beauty of the detail. By designing decorative joints that extend beyond the locality of each corner, it is possible to stimulate that first impression at the joint yet bring the viewer's eye around the rest of the piece.

Each of the joints discussed on the following pages is an elaboration of a basic joint, in most cases the finger joint. I do not set out to design a decorative joint with a particular machine or process in mind, but I do try to produce them all with equipment usually available to the designer/craftsman. Small-workshop machines, particularly the router, are versatile, and we should look to them to help carry out creative processes rather than sticking to their conventional functions.

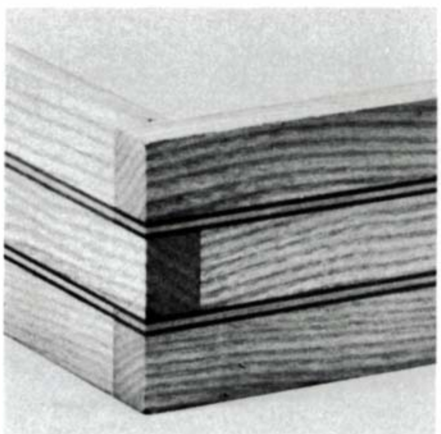
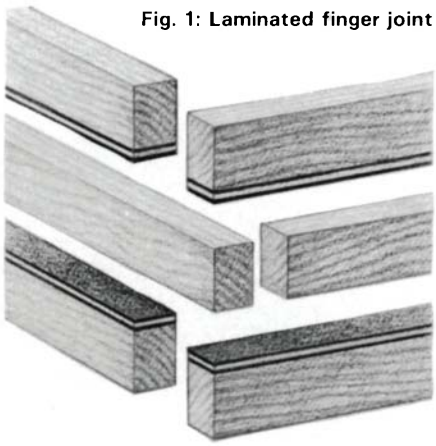
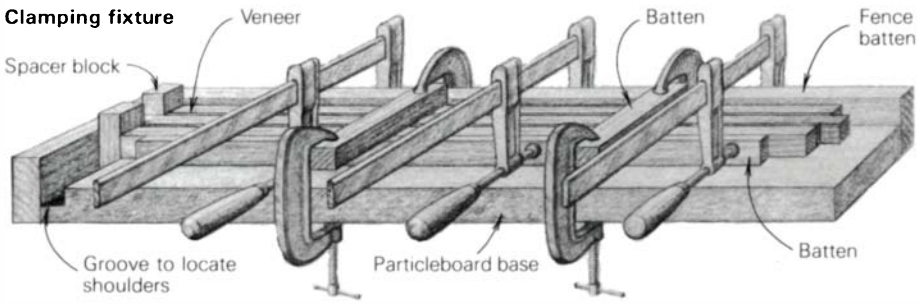
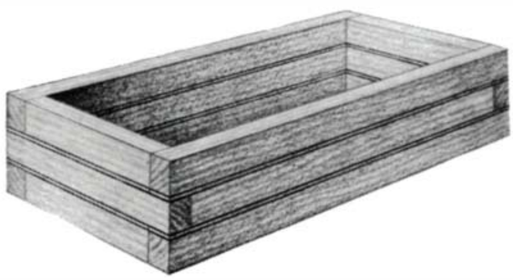


Fig. 1: Laminated finger joint



Clamping fixture





Make this joint by first laminating veneer to a wide board to form the stripe. Then rip the board into strips the width of the thickness of your carcase. Alternate these strips with unveneered strips to form the panels of the carcase, using the fixture shown to glue up the parts in their proper relative position.

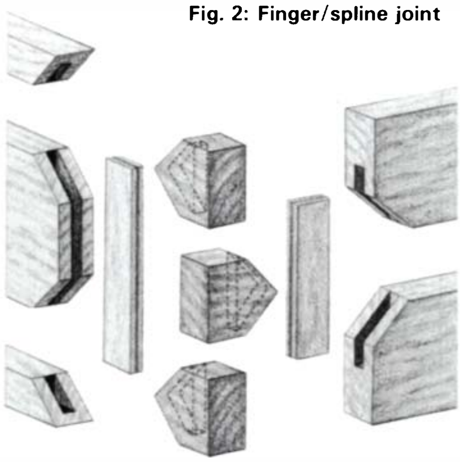
The first joint, illustrated at left, is probably the simplest both visually and constructionally. To make it, begin by laminating veneer to the face of a wide board to produce the stripe in the panel. The thickness of this board, including the veneer combination, will be the width of the laminated fingers in the joint and is therefore an important dimension. When the glue is dry, rip the board into strips, the widths of each will be the thickness of the panel. Each panel (case side) is made from a combination of these strips and of unveneered strips. They are crosscut to alternate lengths; the shorter ones determine the inside dimension of each side of the finished carcase, and the longer ones determine the outside dimension.

When all the strips have been prepared, a simple fixture is required to glue up the panel while maintaining the staggered formation at the ends. It may be difficult to get each strip to lie flat with only side pressure of the clamps. I have used a press that provides both vertical and horizontal pressure, although it is possible to surface and thickness-plane these panels after glue-up without affecting the joint, provided that the grain of all the strips runs in the same direction.

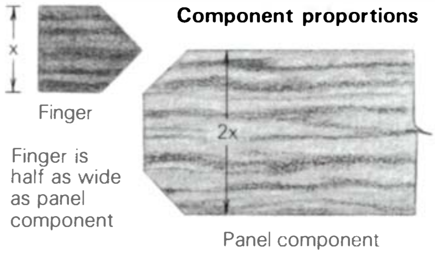
Photos: John Bairstow

Make this joint by first shearing off the corners of the components on a guillotine miter box, shaper or table saw. Then slot the components with a router, a shaper or a table saw, and assemble using plywood splines. A veneer strip can be added between the panels, as shown in the drawing at right, to visually link the corners of the carcase.

Fig. 2: Finger/spline joint



Component proportions

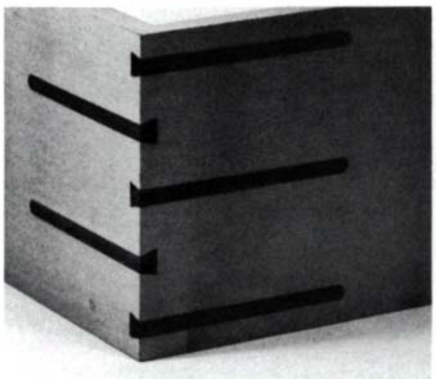


The second example, illustrated above, is again basically a finger joint, but its construction is entirely different from the previous one. Visually, the joint is confined to the corner, which is something I try to avoid. This drawback can be overcome by gluing up the panels with veneer between the components, so that thin lines connect the V-shaped "fingers" from corner to corner.

Cut your stock to the required length, width and thickness. The length is the distance between shoulders of the constructed panels (the inside dimensions of the carcase). The width of each component is twice that of the finger in the joint. If you want to use contrasting lines to visually link the corners, apply them to the edges at this stage. The thickness of these veneers should be included in the width of the components. Next, cut off the corners of each component at 45°. To achieve the accuracy this joint requires, I recommend using a guillotine miter box and making a pattern to clamp to the top of each piece against which you can locate the guillotine blade. Alternately, you can clamp all the components together face to face and remove the corners in one operation on the spindle shaper or tilting-arbor table saw. The contrasting fingers can also be cut in one of these ways. The panels are glued up with the aid of a fixture like that shown on the previous page for constructing the first joint. With the panels assembled, groove their ends, as well as the end of each finger, for the plywood spline. You can cut the grooves using a router, shaper or table saw; in the latter two cases, cut the groove before gluing the outer components to the panel, and finish by hand. A jig is required to hold the fingers while carrying out this operation.

The third joint, shown at right, employs dovetail pins to lock a miter joint in both directions. You can vary the length and width of these pins for decorative effect. Prepare each panel to the correct length, width and thickness and construct the carcase using a simple miter at each corner. Depending on the size of the carcase, the dovetail slots are cut using either a router table (or shaper) with a dovetail cutter, sliding the carcase over it, or a portable router in conjunction with a simple jig to guide the router over the carcase.

After you have cut the slots, make sliding dovetail pins to fit into them by cutting one angle on the jointer and then cutting to rough width at the opposing angle on the table saw. I next secure each pin to a block and run it through the shaper, though the pin could as well be hand-planed to final fit. The slots can end square or be rounded off. If you prefer the latter, you can round the pins to match on the disc sander.



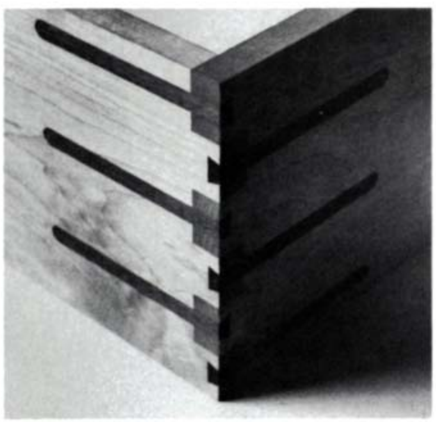
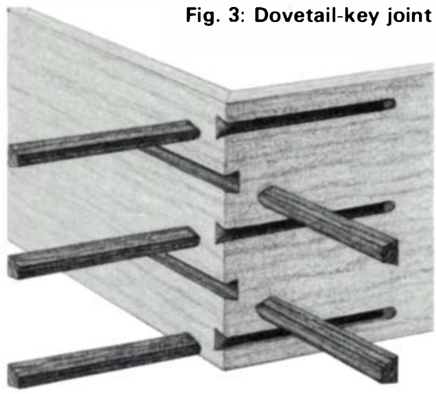


Fig. 3: Dovetail-key joint



This joint is basically a miter into which you rout dovetail slots to fit dovetail keys. The size of the keys can vary. The photo, lower left, shows this same feature used in a finger joint.

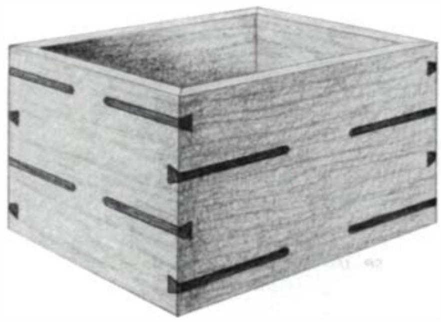
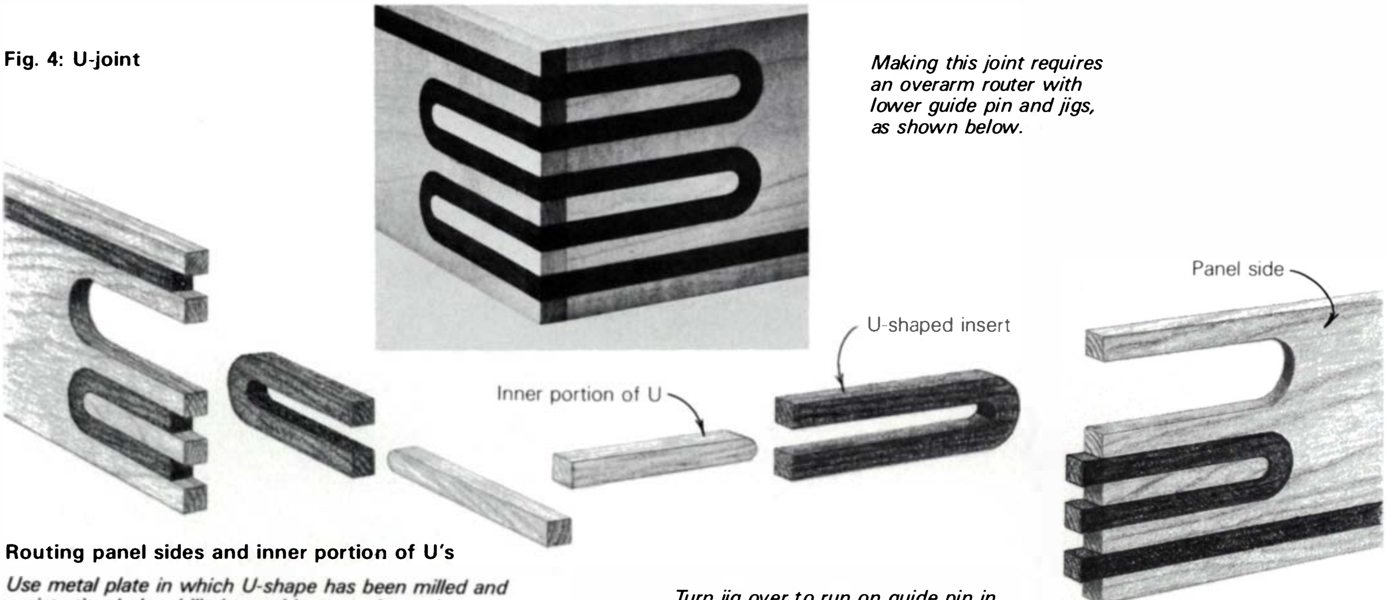


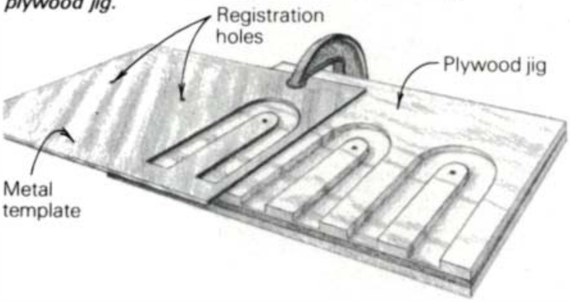
Fig. 4: U-joint

Making this joint requires an overarm router with lower guide pin and jigs, as shown below.

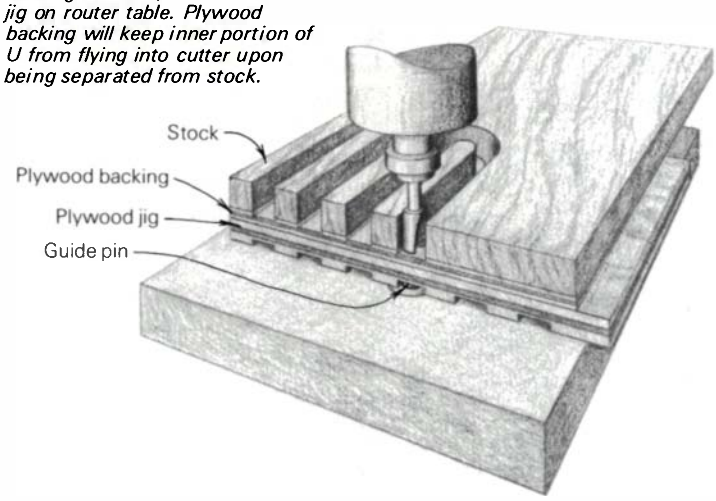


Routing panel sides and inner portion of U's

Use metal plate in which U-shape has been milled and registration holes drilled to guide router in cutting plywood jig.

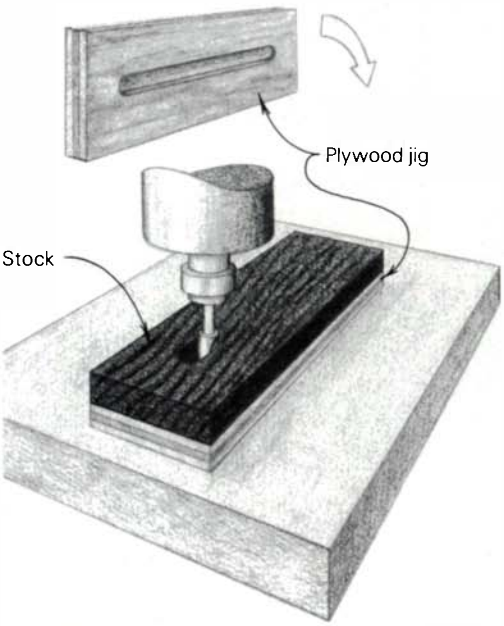


Turn jig over to run on guide pin in overarm router. Tack-glue a plywood backing to stock, and screw stock to jig on router table. Plywood backing will keep inner portion of U from flying into cutter upon being separated from stock.

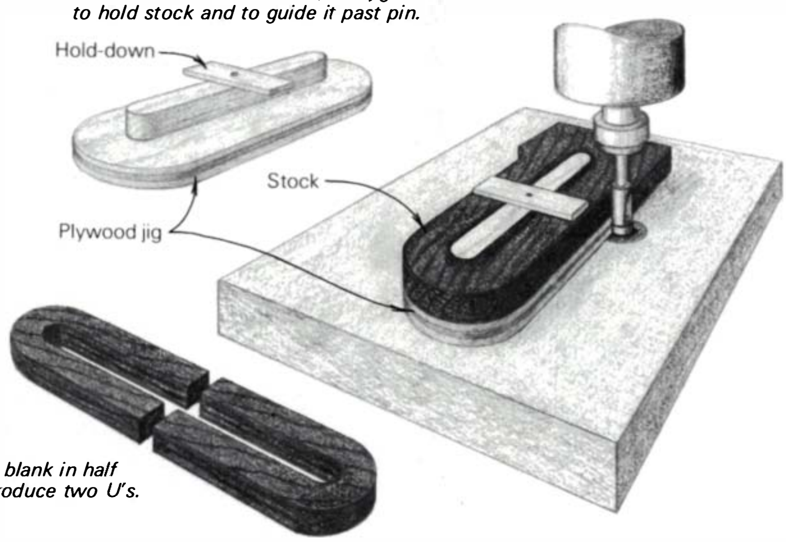


Routing U-shaped inserts

To rout inner contour of U, first make jig by cutting a slot, the same width as the inner portion of the U and twice the length, in one face of a piece of plywood. Turn this over to run on guide pin of overarm router, mount stock to other face, and rout.



To rout outer contour of U, use jig as shown to hold stock and to guide it past pin.

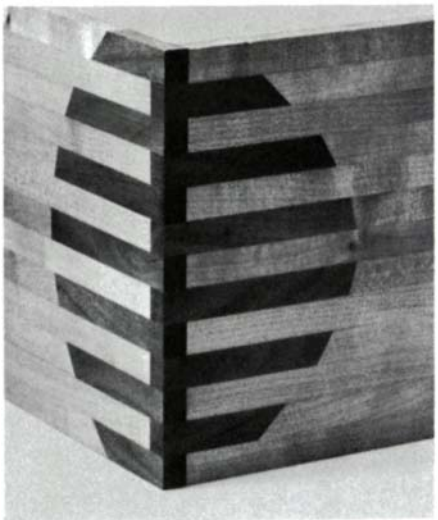


Saw blank in half to produce two U's.

Possible variations on the joint

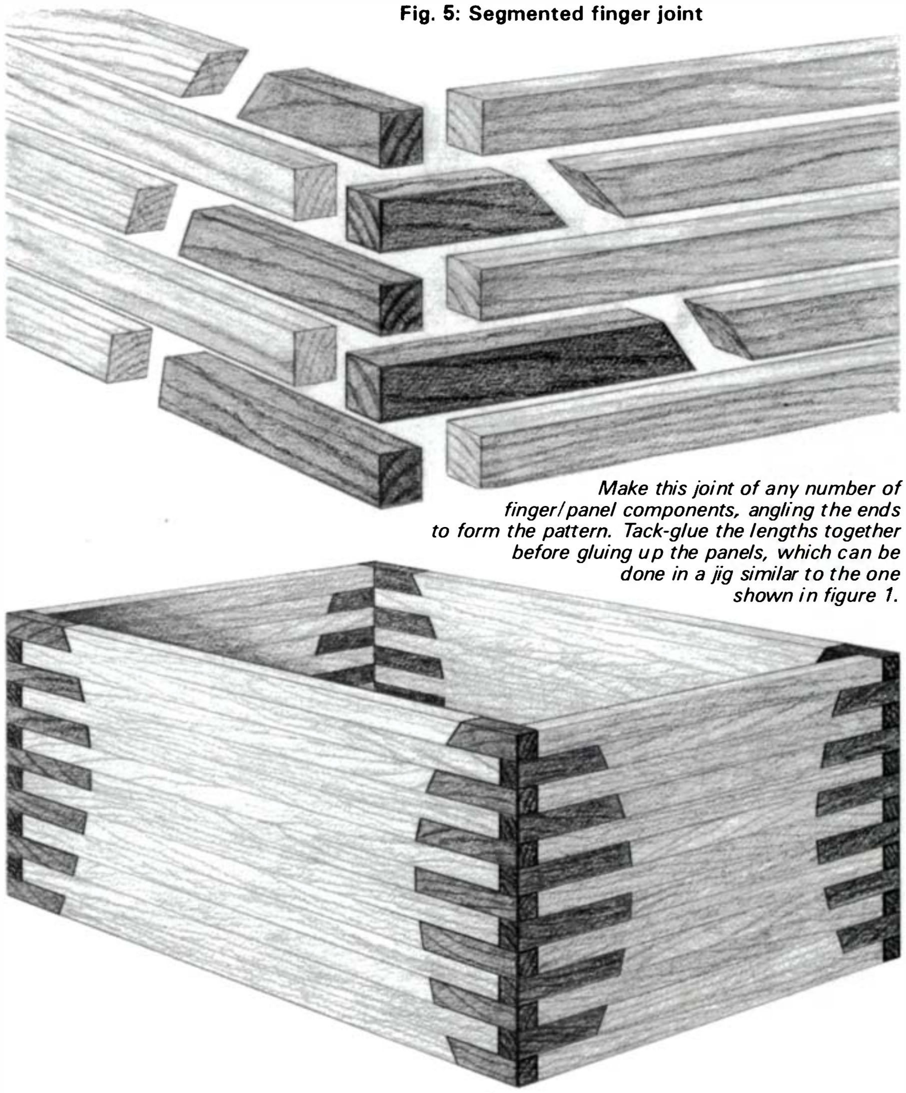
Probably the most successful of all my decorative finger joints is shown on the facing page. It uses contrasting inserts to create a pattern that flows around the corner, continually leading the eye to and away from the joint. It is possible to link all the joints of a carcase by taking the line the length of the panel. The joint requires the overarm router with the aid of a jig constructed using a metal template. On the milling machine, cut one U-shape into a metal plate and drill the centers for the radii of the remaining U-shapes. From this, rout the plywood jig with all the necessary U-shapes. To retain the inner part of the U, which would otherwise fly into the cutter upon being separated from the stock, glue a thin plywood backing to the stock before routing. Allow for this thickness when setting the cutter depth. Secure the stock to the reverse side of the jig, and place the jig over the guide pin in the overarm router table. Make the initial cuts with a cutter smaller in diameter than the guide pin, to waste most of the stock. After routing, the plywood backing can be pried off the stock and the inner portion of the U's retained. To make the U-shaped inserts, rout the inner contour in an oversized blank (large enough to accommodate two U's, which will later be sawn apart), then use this negative space to locate the blank on a jig that guides the router around the outside contour.

When all the components have been made, it remains only to glue them back into the voids in the panels. The inserts are of such length that the joint is created in this operation. Because the contrasting U also forms a finger in the joint, visual continuity is interrupted by the end grain. This can be overcome by mitering each insert, leaving the end grain of the light wood only. This reduces the gluing area of the joint but not enough to jeopardize its strength.



The final joint, above and right, is the most time-consuming to produce, but the many variations possible make the effort worthwhile. The length and cutoff angle of the fingers can create any pattern the designer wishes. Basically, each panel is made from a number of strips with the alternate ones creating the pattern. Each strip is milled to the dimension of the finger in the joint. The decorative pieces are then cut to length and the required angle cut on a guillotine miter box. In this example, each consecutive strip varies by an angle of 15° to produce the curved effect. The contrasting pieces are tacked together with glue, end to end, which holds them until the panels are constructed. The end of each plain strip forms the shoulder of the joint, so the length of the strips should be finished to the inside dimension of the carcase. Each panel can then be glued up as for the joint shown in figure 1, p. 72.

Fig. 5: Segmented finger joint



Make this joint of any number of finger/panel components, angling the ends to form the pattern. Tack-glue the lengths together before gluing up the panels, which can be done in a jig similar to the one shown in figure 1.

These are just five of the many joint variations I have designed—all give a decorative effect when used on anything from small boxes to the largest of cabinets or tables. There are many other ways to use joints decoratively, and no matter how bizarre any idea may seem, it might be quite effective put to proper use. I always make a sample of any joint I design to assess its visual effect, experience the problems it will give in production and decide how it can be efficiently made. Of course, these joints take longer to produce than conventional ones, but the advantage is that any decoration needed in a piece of furniture is already built in. □

John Bairstow designs and builds furniture in Loughborough, England.

Cutting Box Joints on the Radial-Arm Saw

Sliding jig moves workpiece into blade for safe, precise cuts

by Ken Mitchell

Sooner or later, the owner of a radial-arm saw will want to use this machine for some operation that will tax both patience and ingenuity. My challenge arose when I wanted to make a substantial number of box (finger) joints for drawers, quickly. The obvious method—clamping the work on edge to the fence, running the blade parallel to the table, and lowering (or raising) the arm for successive cuts—soon proved impractical. If you have ever tried this method, which most owner's manuals recommend, you'll know that it is slow and deplorably imprecise.

Resolving to find a better way, I decided that the blade should remain fixed and that the stock should be raised in precise increments for each cut. The first requirement in working this out was finding a way to guide the work along the table for each pass into the dado head. Table saws have miter-gauge slots for guiding the stock into the cut, and I reasoned that such an arrangement could be worked out for a radial-arm-saw table. To make this guide slot, I first attached skirts to the sides of the table, and to these I screwed a guide rail parallel to the front of the table. As shown in figure 1 (facing page), the slot is created by a spacer glued along the bottom inside face of the guide rail. This spacer holds the rail a consistent ¾ in. away from the front edge of the table.

Next I designed a sliding jig for holding the stock on edge while it is being fed into the dado blade. The jig's travel across the table is guided by a bar that rides in the slot. To make the work go faster, I made the jig big enough to hold eight pieces of ¾-in. by 6-in. stock, which meant that I could cut the joints for four boxes at once. The jig (figure 1) consists of a plywood base, a guide bar that rides in the slot, a fixed fence, an adjustable fence and a stop block (for determining the depth of cut) that travels along a slotted rail and is secured at the appropriate setting with a wing nut.

To make the jig, first dimension the base to a size that is suited for your project and glue and screw the guide bar in place. Install the fixed fence on the base with glue and countersunk wood screws through the base. Make sure you brace the fence with blocks as shown, and be certain that the fence is precisely perpendicular to the base. The adjustable fence is made so it can slide toward and away from the fixed fence, sandwiching the stock in between. The distance between the two fences depends upon the thickness of the stock and the number of pieces being cut at one time. So it can

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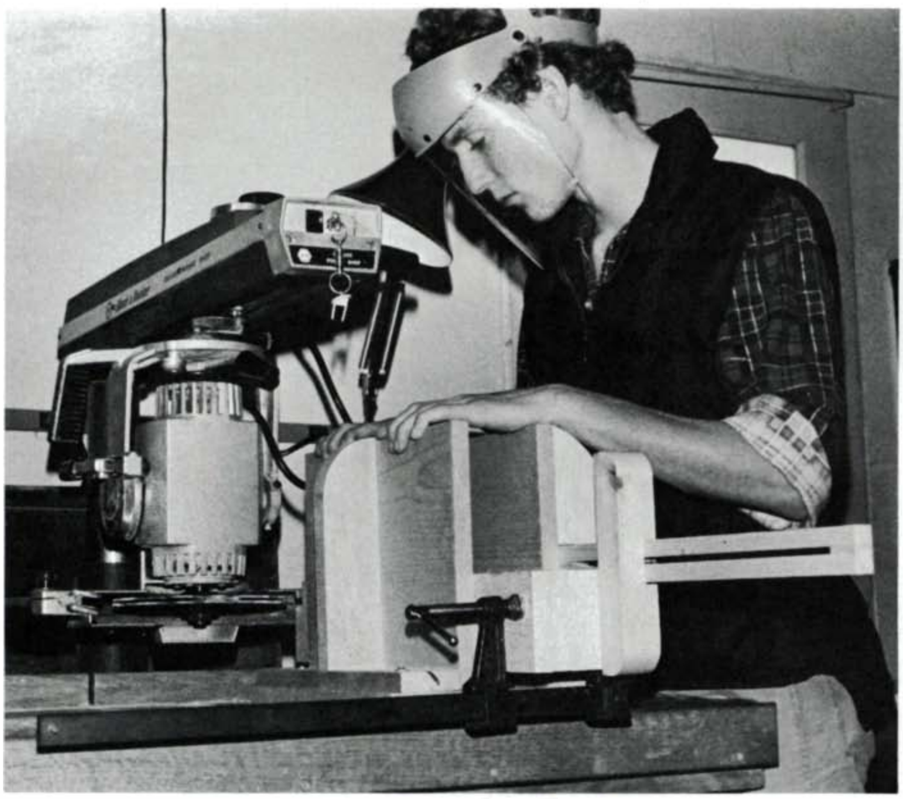
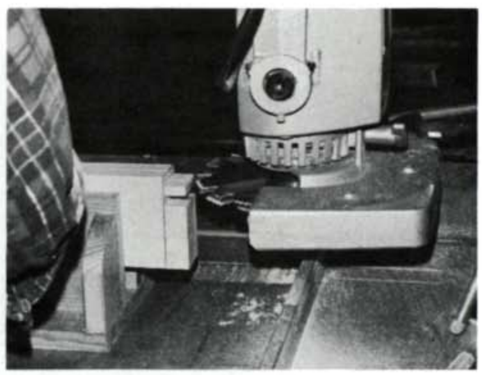
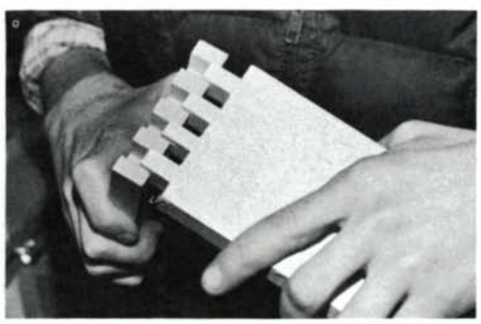
Ken Mitchell, 49, an amateur woodworker, is an engineering supervisor for AT&T in San Francisco, Calif.



With the stock aligned and clamped together between the two fences on the sliding jig, the work is passed through the blade. The jig is guided by a bar that rides in a slot at the front of the table. The adjustable stop block is secured in place along the slotted rail and determines the depth of cut. Photos: Ken Mitchell.



Here the stock is positioned for making a third pass into the blade. Successive fingers are cut by stacking precisely thicknessed shims under the stock, thus elevating it in precise increments.



These crisp finger joints were cut quickly and accurately on a radial-arm saw, using the author's modified saw table and special jig for feeding the work into a stationary blade.

slide right and left, the adjustable fence has a base with a slotted hole at each end, through which ¼-in. hanger bolts protrude. The fence is fixed in position by tightening wing nuts down on the hanger bolts.

The slotted rail for the stop block is screwed to the fixed fence. Don't glue it, as you may want to add longer or shorter rails for different projects. The stop block should be almost the same height as the fences. Dado the block so it will slide along the rail and bore it for a ¼-in. hanger bolt.

Now that you have a means of holding the stock on edge and feeding it accurately into the blade, the next step is choosing the size of the fingers to be cut. The depth of cut will determine the length of the fingers, which should be just slightly longer than the stock is thick. With all pieces cut to final length, clamp opposite sides of the drawer or box together with ends flush. With the depth of cut scribed on one board, move the stock horizontally in the jig between the fences until the tip of the blade is aligned with the mark, as shown in figure 2. Now tighten the adjustable fence snug against the stock and bring the stop block into contact with the ends of the boards and secure it in place.

You must decide on the thickness of the fingers and proceed to cut a number of shims, which will be placed under the stock to elevate it for each successive cut. For ¼-in. thick fingers, the shims must be exactly ½ in. thick. For ⅜-in. thick fingers, the shims must be ¾ in. thick. The width of the shims is slightly less than the distance between the fences, and their length is the same as that of the fences. Shims that are too short and too narrow could allow the stock to wobble in the jig. In addition to the shims that are twice the thickness of the fingers you want to cut, you'll need one or two that are the exact thickness of the fingers. Take care to thickness the shims to the exact width of the cut made by the dado blades mounted on your arbor. Don't assume because the chippers are supposed to be ⅛ in. thick that your blades cut in precise ⅛-in. increments. Make a sample cut with your blades and thickness your shims according to the width of this cut. If you don't have a thickness planer, you can rip the shims oversize and finish them with a hand plane, or you can rip them to final thickness if your saw is capable of fine adjustments.

Begin by cutting the sides that have fingers on their top edges (figure 3). With the saw carriage secured on the arm, the blade parallel to the table and the depth of cut established by the stop block, lower the column until the blade lightly touches the top edge of the stock. Return the jig; then slide a ¾-in. shim under the stock, switch on the saw and pass the stock through the blade. This produces a ⅜-in. pin (finger) on the top edge of the box sides. For the second cut, insert another ¾-in. shim on top of the first shim, replace the stock and pass it through the blade. For each cut, repeat this procedure, adding as many shims as the width of the stock requires. If tear-out is a problem, back the stock with a piece of scrap.

The other two sides must be notched on their top edges to receive the pins just cut. I insert a ⅜-in. shim under the stock for this first cut (figure 4) and then make all the subsequent cuts by adding ¾-in. shims, as I did previously.

I've used this system frequently and have found that it produces close-fitting joints. And it's fast, especially once you've established a rhythm in performing the discrete little parts of the process. Another virtue is that the slot at the front of the table can be used for other purposes. I've made a number of cut-off and mitering jigs that ride in this slot, and they give more accurate results than rotating the arm on the column and pulling the saw into the work. The point is that a radial-arm saw will perform more accurately if the blade is stationary than it will if you move the carriage along the arm. □

Fig. 1: Modified saw table and box-joint jig

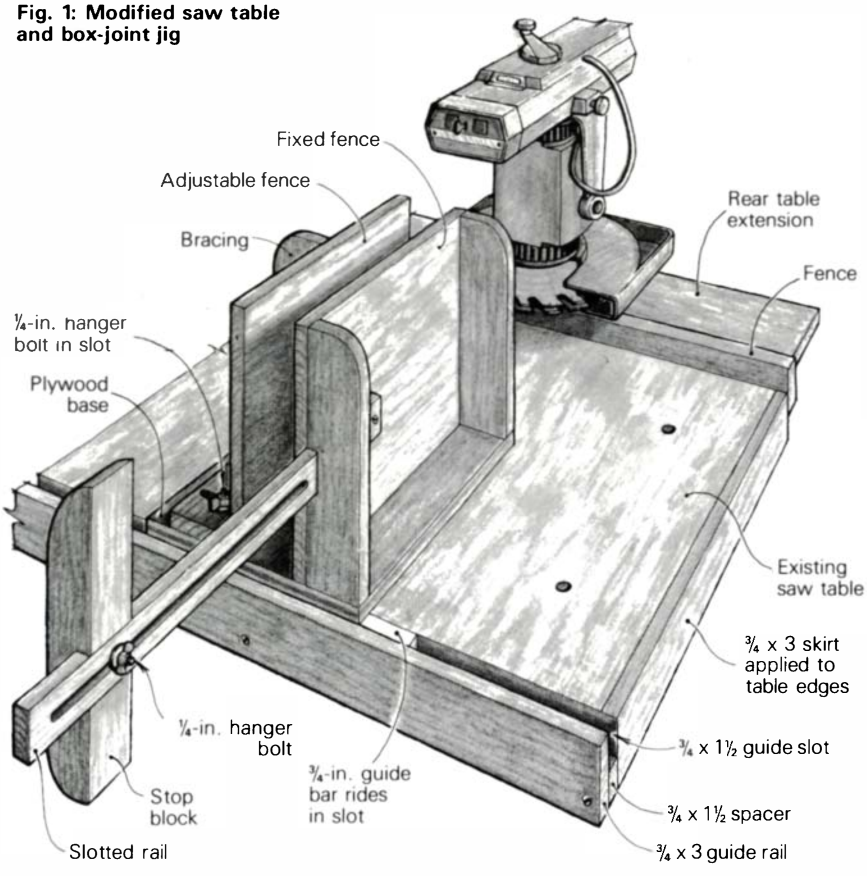
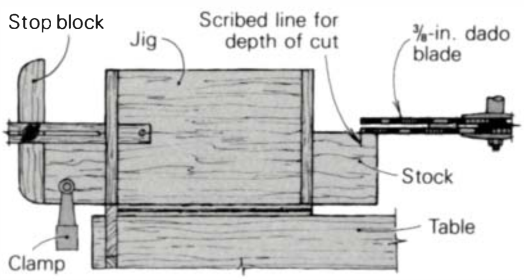
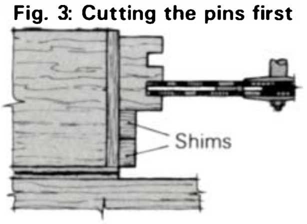


Fig. 2: Setting up the blade and jig



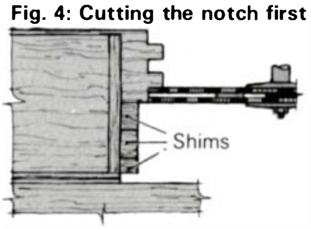
Lower column until blade touches the top edges of the stock, then align tip of blade with scribed line for proper depth of cut.

Fig. 3: Cutting the pins first



Make initial cut by inserting ¾-in. shim under stock. Add a second ¾-in. shim for the second cut, a third one for the third cut, and so on.

Fig. 4: Cutting the notch first



Cut notch at top edge of stock by inserting ⅜-in. shim beneath stock. For all following cuts, add ¾-in. shims under stock.

Coopered Columns

Joining and turning large staved constructions

by John Leeke

Since leaving my father's woodworking shop ten years ago, I have made my living building furniture and cabinets and restoring houses. Occasionally I do rough carpentry for a regular customer, but I would rather stick to finish work. So I was something less than excited when I was asked to repair a porch. My attitude improved quickly when I learned that the house was listed with the National Register of Historic Places. A typical example of a 19th-century mill owner's house, the Goodall House in Sanford, Maine, is a mansard-style mansion with a Colonial Revival porch built in a simple classical style. One of the 9-ft. columns had rotted and needed to be replaced. I hadn't done any lathe work as large as this required, but thought that my small shop just might be able to handle it. Had I known then that in the end I would replace more than a dozen columns, I might not have taken the job.

Now I'm happy I did, for making columns has been profitable for my small enterprise. It took me 38 hours to build the first 9-ft. column. A subsequent run of six columns for the same house required 32 hours per column, and a recent run of six columns for another job took 26 hours for each. These figures include the time I spent developing techniques and making the special jigs and clamps that I'll describe below. The actual production time on the last run of columns was 20 hours apiece. At that rate I can make large columns that are comparable in cost, and at least equal in quality, to those produced by millworks and large manufacturers, even though I use only ordinary, small-shop machinery and tools.

The old columns were 13 in. in diameter and were built up stave-fashion like a wooden bucket. Made of cedar, their lapped tongue-and-groove joints had loosened over the years, even in columns not yet rotted. I decided to join mine with splined miters, and chose resorcinol-formaldehyde exterior glue to keep the joints together. Instead of cedar, I used pine.

Cutting the staves—To begin, I made full-scale drawings of the column in section and elevation (figure 1). The sectional drawing shows the finished diameters of the shaft and the dimensions of the 12 staves. The elevation drawing shows the shaft, plinth, base, bead mold and capital, as well as the curvature of the entasis, the barely perceptible swelling of the shaft towards the middle. In deciding upon 12 staves, I considered the higher cost for fewer staves of thicker stock against the extra labor involved in making more joints with thinner stock. Because a greater number of staves makes the column more stable, I used 12 of them, and as in the original columns, I oriented the annual rings at random.

I cut the rough stock to within 1 in. of finished length, which made it much easier to mount the coopered blank on the lathe. The width of the rough stave blanks was also cut oversize to allow for warping due to relieved stresses in the plank. After jointing one face and one edge on each, I leaned the staves up in a corner of the shop for a few days to allow the stresses to equilibrate. I jointed them again just before cutting the bevel on their edges. The staves must be stable and straight, and should not warp after the bevels are cut, as this would alter the angle of the beveled edge.

For a 12-stave column the bevel is 75°. The accuracy of this cut is important because joints must have uniform contact their entire length. If a cumulative error of 1° is tolerable in the whole ring of staves, then each bevel cut must be within ¹⁄₂₄ of a degree. To achieve this degree of accuracy I use the compounding-of-the-errors method. To do this, set the tablesaw blade to cut an angle slightly larger than 75° and the fence to cut about ³⁄₁₆ in. larger than final width. Then take a set of twelve staves, 10 in. long, and saw one bevel on each. On the first cut leave the blade low enough so the waste remains attached and doesn't get wedged between the blade and the insert (figure 2). Remove the waste by hand and cut the other bevel. Clean the sawdust off of the staves, set them on end on a true flat surface, and butt the edges tightly against one another. Usually a gap of about ⅜ in. will appear (figure 3). Now reset the sawblade higher and for a slightly smaller angle, and the fence to a slightly narrower width. Pass the staves through the saw again and check as before. Repeat this operation, making minute adjustments in the blade and fence until the gap is closed. Then measure the diameter of the blank across the opposite faces. It should still be somewhat larger than required. With repeated checking and small adjustments to the width of cut, the diameter can be brought to the correct measurement. It usually takes me a couple of hours to get the saw set for this one cut. Once I am satisfied with the setting, I saw the run of staves.

The splines are ¼ in. by ⅝ in. To make sure that the joints would close, I cut the grooves (figure 4) just slightly deeper than needed and wide enough for each spline to be pushed into its slot with my thumb. If the grooves are so narrow that the splines must be tapered or forced into place, final assembly will be very difficult because the glue will swell the splines slightly, making the fit even tighter.

Gluing—I begin by gluing up pairs of staves; then I glue two pairs together to make a third of the column. Finally, I glue the one-third sections together to make the whole shaft. In all the gluing operations I use a clamp every 12 in. when possible and keep the ends of the staves flush to make it easier to mount the shaft on the lathe. When clamping it is best to tighten or loosen each clamp a little at a time.

Gluing up pairs of staves is fairly simple. I made special fixtures with blocks to match the angles of the staves where they meet the clamp jaws. Two sets of clamp heads on each fixture speed handling throughout the production run (photo, top, next page). The one-third sections require clamping pressure from above, as well as from the edges. This is applied by using a frame in which a ½-in. lag bolt is screwed into a hori-

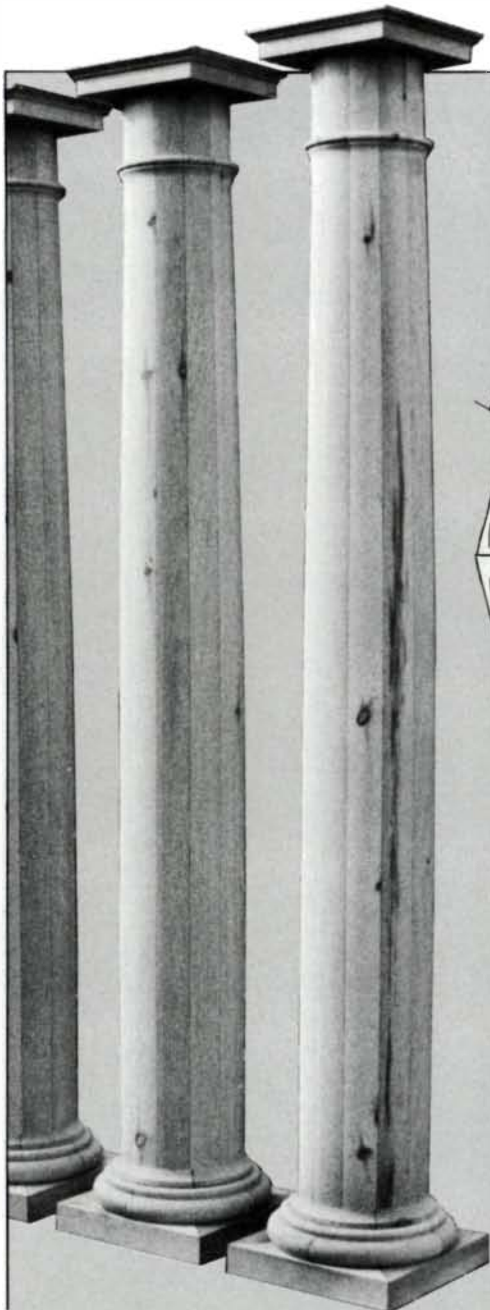
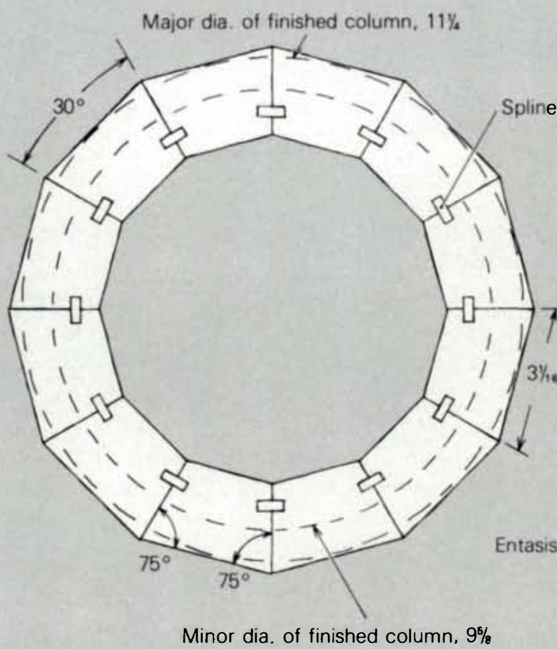
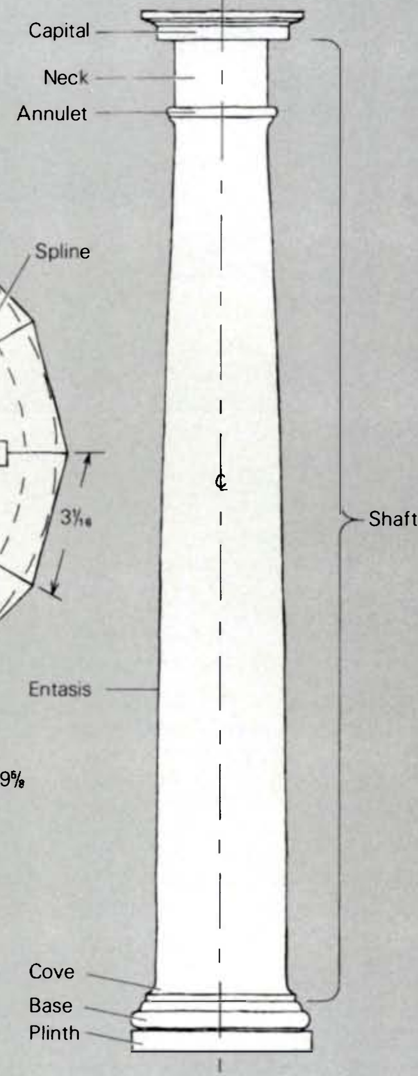


Fig. 1: Column in plan and elevation





Like their classical prototypes, the coopered and turned porch columns, left, gradually bulge at their middles. This increased diameter, called entasis, corrects the illusion of concavity created by a straight taper from bottom to top. The bases and plinths are made from spline-mitered frames, which are turned on a faceplate and applied to the bottoms of the shafts.

Fig. 3: *To set precise bevel angle of blade, begin with arbor tilt slightly larger than 75° and lock fence for cut 3/16 in. larger than final width. After cutting 12 sample staves, a gap should result. By decreasing the angle of the blade and the width of cut in small amounts, the gap is finally closed and an accurate setting obtained.*

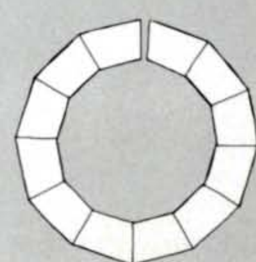


Fig. 2: Cutting the staves

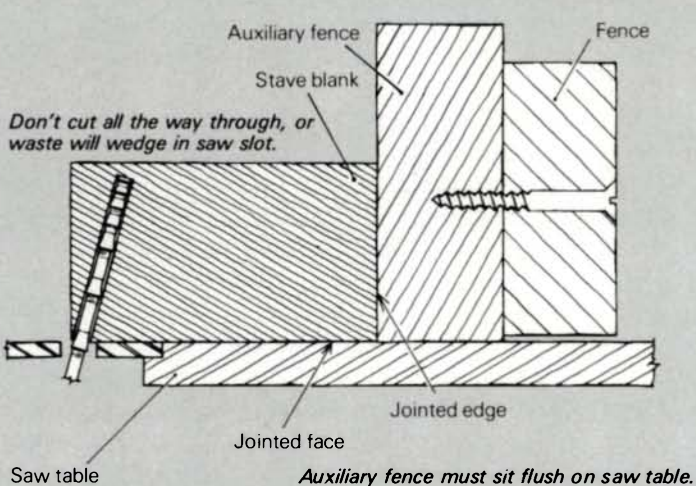
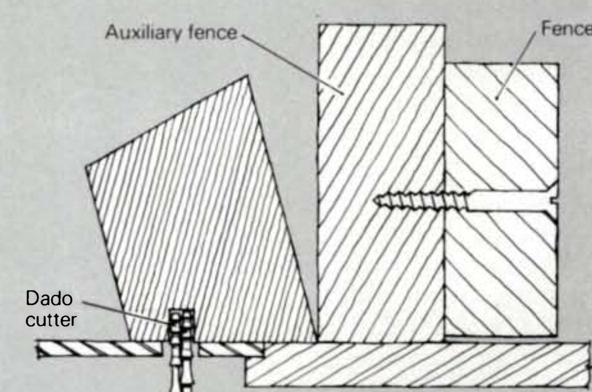
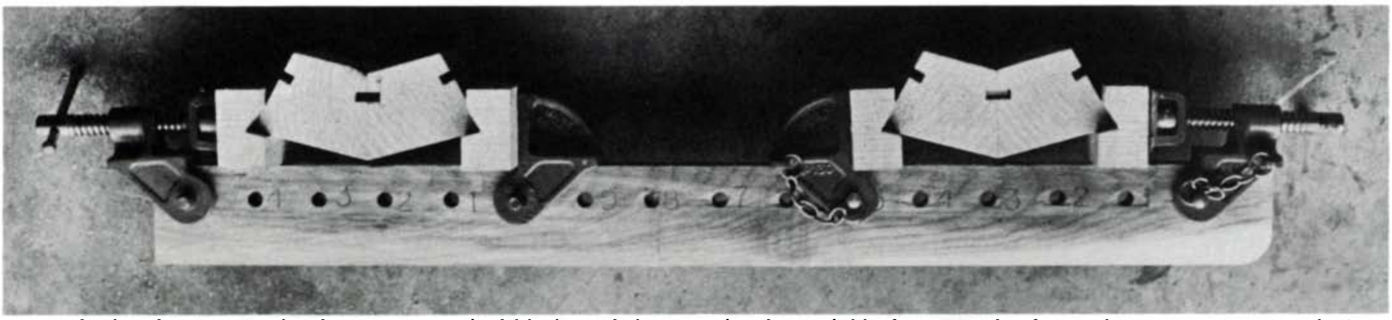


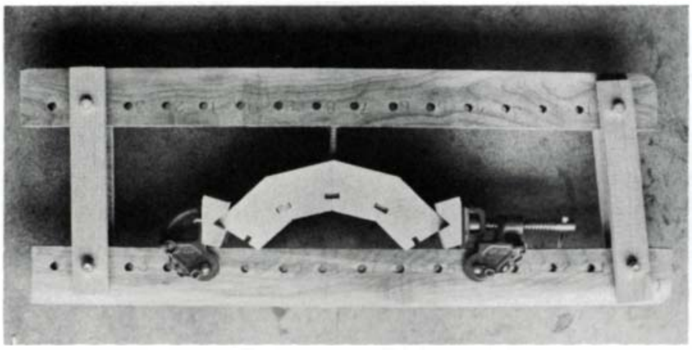
Fig. 4: Grooving the staves



Photos: John Leeke; drawings: Christopher Clapp



Pairs of splined staves are glued up using notched blocks and clamping heads (available from Woodcraft Supply Corp., 313 Montvale Ave., Woburn, Mass. 01888). Using two sets of clamps per bar makes handling easier and gluing faster.



To glue up a one-third section of a column, pressure atop the center joint is applied by a hanger bolt with a knurled face, which is screwed into the top crossmember of a clamping frame. Dry-clamping is necessary to get the adjustments right so the joint will close properly when horizontal pressure is applied by the clamps.

zontal clamp bar, which is fastened to the lower clamp bar with ⅜-in. machine bolts and four ½-in. by 2-in. pieces of hardwood (photos, above left and right). The joints of the frame are left somewhat loose so that vertical pressure from the lag bolt can be applied directly over the glue joint. When pairs of glued-up staves are put into the lower clamp bar and the rest of the clamping frame assembled around the staves, the joint is left open at the inside. This gap closes as the screw is tightened and pressure builds up against the lag bolt, flexing the upper horizontal member. If the joint does not have enough pressure when the gap is closed, loosen the clamp and turn the lag bolt down to make the gap bigger. Once each lag bolt is set, it should be correct for the rest of the run. The lag bolt has a knurled pattern filed into it so that it will not slip off the joint. After the clamps are tightened, the width of the section should be checked. Also, check the angle of the two edges with a bevel. If the angle is wrong, more or less pressure can be applied with the clamps to correct it.

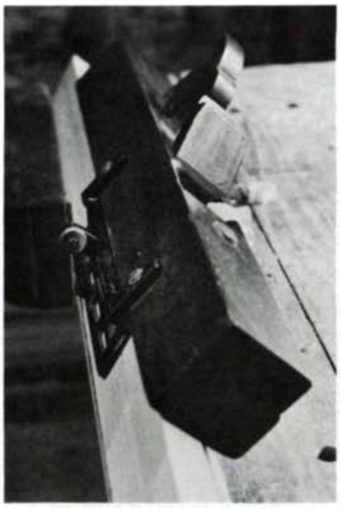
After the one-third sections come out of the clamps, the angles should be checked again. Any irregularity along the beveled surface should be corrected with a jointer plane equipped with an adjustable angle fence.

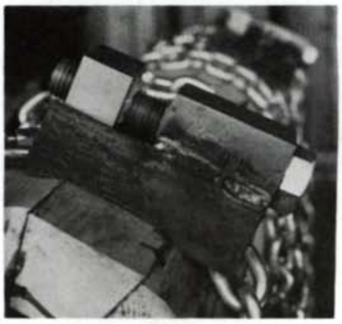
For assembling the thirds into the whole shaft, I first developed a rather clumsy system of forged rings and wedges. This worked well for the first single column, but by the time all of the rings and wedges were set in place and driven up tight I was nearing the end of the glue's closed assembly time. I replaced the forged rings and wedges with clamps made from length of ⅜-in. chain and tightened with 1-in. machine bolts. Each clamp head consists of five parts—a bored steel block through which the bolt passes and to which one end of the chain is welded; a steel nut with a hook machined onto its bottom side so it can grab a link of chain; two steel flanges that are welded to the sides of the bored steel block; and the 1-in. by 6-in. bolt. Pressure is exerted by tightening the bolt with a wrench, drawing the ends of the chain together. The links will press into the wood quite a bit, but this causes no problem since the outer part of the column is wasted in turning.

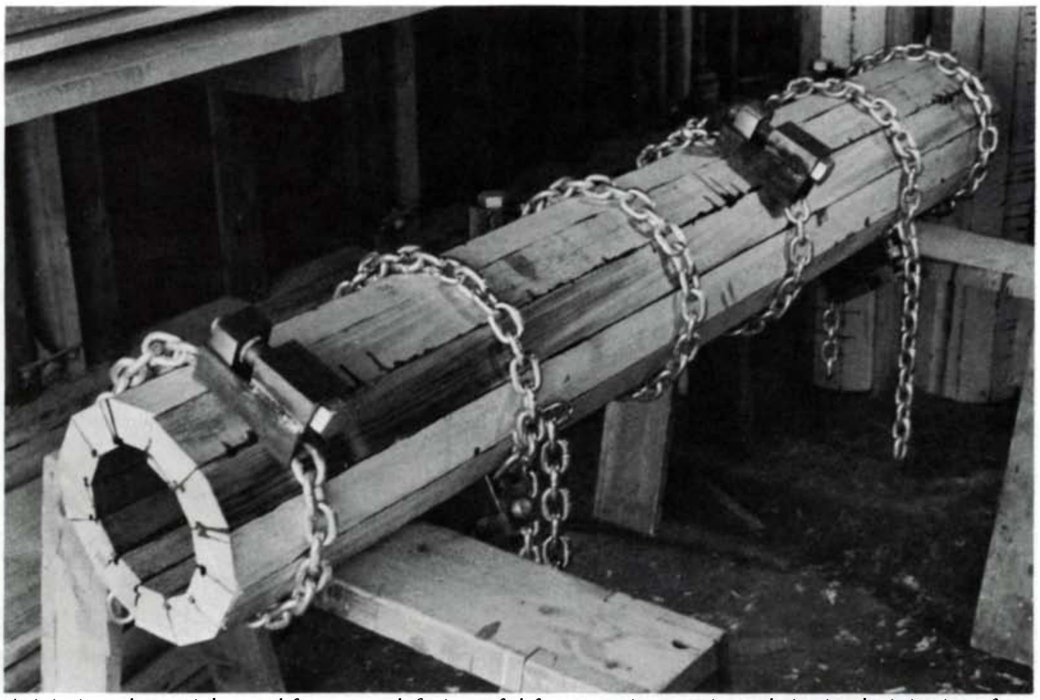
On the first couple of shafts, I dry-clamped to make sure everything fit well. Then I spread glue on two joints and set two one-third sections together in semicircular holders. I put glue on the two remaining joints and set the top one-third section on. It took a little jiggling and coaxing with a mallet to get the splines lined up. I placed the heads of the chain clamps on alternate joints around the columns. The semicircular holders made it easy to rotate the columns while clamping.

Setting up the lathe—Few lathes will handle a 9-ft. spindle between centers. To give mine this needed capacity, I hacksawed the ways away from the headstock and mounted the two components the required distance apart on a long, wide bench. You may not want to saw your lathe in half, but if you want to turn long pieces, it's not as destructive an act as you might initially think. The headstock can be bolted firmly in place, the tailstock can still travel back and forth along the detached ways, and the distance between centers is limited only by the size of your shop. It's also quite convenient to have a highly portable headstock for faceplate turning.

I don't particularly like to have large, heavy objects moving at high speeds in my shop. I was concerned about the ability of my lightweight lathe to handle such large stock, so I decided to reduce the rotational speed of my lathe. I made a 22-in. idler pulley out of plywood with a bronze bearing in its center. I glued to the side of it a 4-in. disc, and V-grooved both for belts. The drive belt runs from the motor pulley around the 22-in. pulley; the 4-in. pulley in turn is connected by a belt to the 3-in. mandrel pulley (figure 6, p. 82). This







A jointing plane with metal fence, top left, is useful for correcting any irregularity in the joint interface. Leeke prefers the hand plane over his power jointer for this operation. For gluing and clamping the one-third sections into a full cylinder, Leeke devised and fabricated chain clamps like the one at left from ½-in. chain, steel plate, solid mild steel (for the tapped hook block) and a 1-in. bolt for tightening the chain. The clamp heads are staggered around the column, above, to help equalize the pressure and keep the column's diameter from being squashed into an ellipse.

slowed the lathe down to 100 RPM. I devised a sliding carriage that allowed me to use my router to do the cutting as the stock turned at a slow speed (figure 5, next page). The router (base removed) is equipped with a ½-in. cove-cutting bit and is mounted on a cradle-like block with a 4-in. dia. hose clamp. The cradle is screwed to the plywood carriage. The near end of the carriage is guided by a guide bearing that rides against the edge of a ¼-in. plywood or Masonite pattern board. A rabbeted wooden retainer or metal bracket helps keep the carriage from riding up off the pattern. The far end of the carriage slides underneath an elevated keeper board, which is screwed into the bench top.

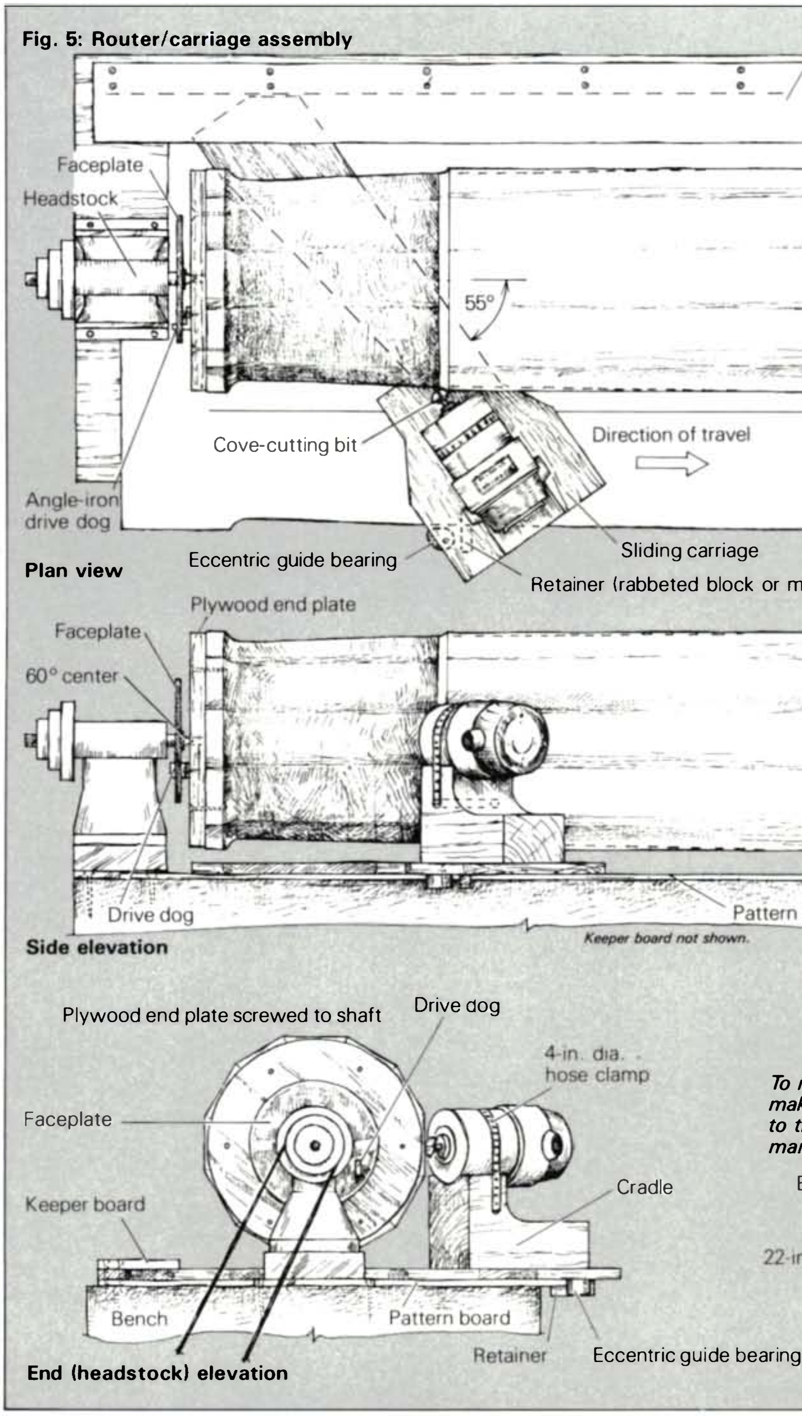
Mounting the column—I mounted the columns on the lathe by screwing plates made of ¾-in. hardwood plywood to the ends of each one with 2-in. sheet-metal screws. The screws should pass through the end plate and into the inner one-third of the column wall. These plates have a ⅜-in. hole at the center and were turned and accurately sized to the finished diameter at each end of the column. The column is mounted on the lathe between 60° centers and driven by an angle-iron dog screwed to the plywood head plate, as shown in figure 5 (next page). The dog rides loosely in a slot on the faceplate, which I wrench tightly onto the mandrel as I sometimes use it as a brake during turning to keep the column from rotating too fast. Using this method of driving the shaft, the head plate does not have to be exactly perpendicular to the axis between the centers. In fact, it can be off quite a bit and the column will still turn true because it is held rigidly only between the two 60° centers. This works better than just screwing the faceplate directly to the end plate.

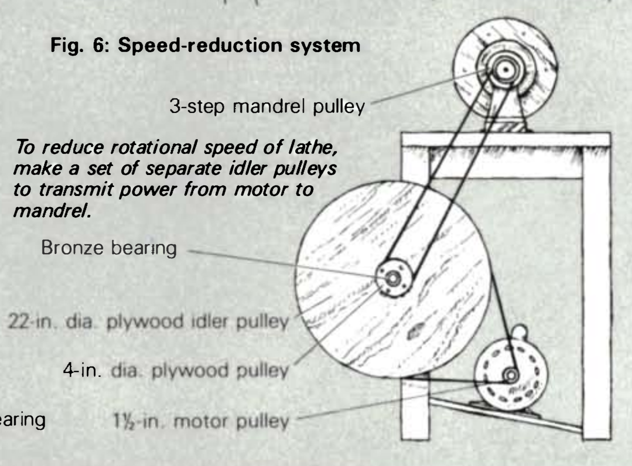
Making the pattern—Specific rules and formulas for developing the proportions and shapes of classical columns can be found in old pattern books, though you may simply reproduce existing columns as I have done. The shaft of the column has a curved outline (entasis), a cove and a fillet at the bottom and an annulet or neck molding near the top. To make the entasis, and to make all the columns in a run the same, a guide template (pattern) is used. To lay out the entasis, mark radius measurements of the finished shape at equal intervals along the pattern perpendicular to a line that is parallel to the axis of the lathe. Connect the ends of these, cut out and smooth the shape with spokeshave and file, and screw the pattern to the bench as shown in figure 5. For long runs, coat the pattern lightly with varnish to preserve the surface, and then wax it.

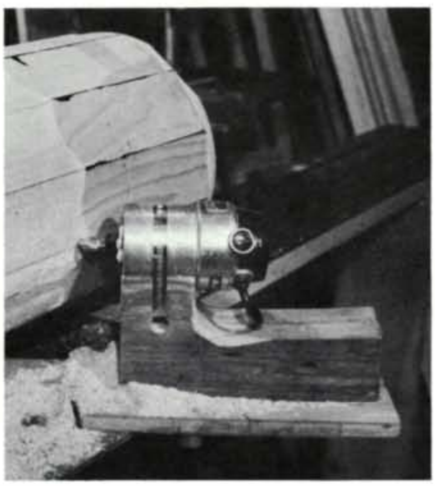
Turning—Prepare for turning by properly attaching and adjusting the eccentric guide bearing on the sliding carriage. To do this, draw a line on the pattern board that is perpendicular to the axis of the lathe. Now, for optimal cutting angle, slant the sliding carriage at about a 55° angle to the perpendicular, as shown, and bring the router bit into contact with the center of one of the column staves. Clamp the carriage to the pattern board, turn the guide bearing until it contacts the edge of the pattern and then tighten the screw. (Figure 5 shows where to position the guide.) Its eccentric shape will allow you to make fine adjustments in the depth of cut. Now unclamp the carriage, and you're ready to begin turning.

While turning use extreme caution. You have to keep track of two machines, and the exposed router bit is a real hazard. Ear protectors, goggles and a dust mask are essential. I also wear a leather glove to protect my left hand from the downward spray of chips.

Run the lathe for a while to make sure everything is operating correctly before turning on the router. Hold the router assembly firmly against the edge and top of the pattern board

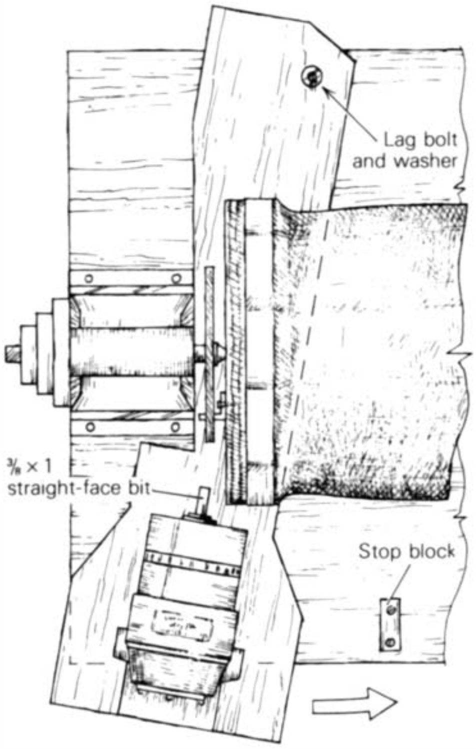






Routing from headstock to tailstock, with the router carriage canted at 55°, causes the cove-cutting bit to push itself away from the cut instead of digging into it. At left and center, the staved shaft is being roughed into round in a single light pass. At right, the completed shaft is sanded using a belt sander turned upside down and slid along the column as it turns.

Fig. 7: Cutting the base



To produce a perfectly flat, perpendicular bottom, the router carriage is bolted to the bench at its far end, and the router is pivoted into the work (drawing, left), cutting through the base plate into the shaft. The carriage is clamped into position and the column is rotated by hand. The straight-face bit is set to cut one-third of the way through the column wall (photo, below), and the cut is finished with a handsaw, which is guided by the inside wall of the groove.

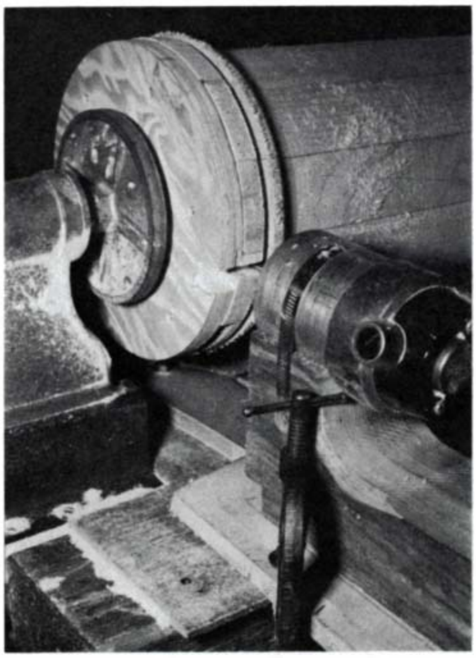
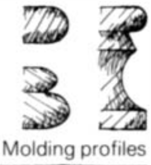
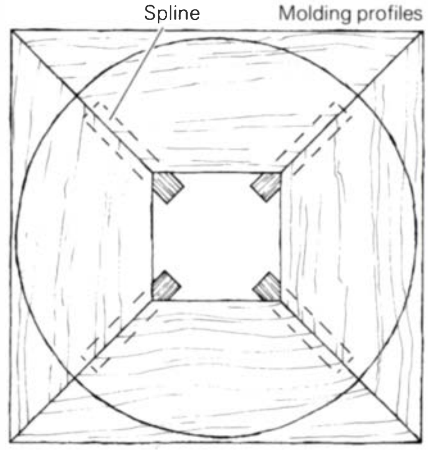


Fig. 8: Plinth and base
Leave square for making plinth. For making base, bandsaw a rough circle, mount on faceplate, turn round and turn molding.





with the left hand. Then turn the router on and position the right hand as shown in the photo, facing page, far left. With the guide pressed against the edge of the pattern, start from the left end, and round off the entire shaft in one pass. The cut should be made by sliding the carriage slowly towards the tailstock. When the router bit is cutting on the right side of its center axis and the router assembly is moving towards the tailstock, the bit tends to push itself out of the cut, instead of digging in, and is easier to control. Avoid sliding the carriage from right to left, because this could damage the workpiece or cause injury.

Once the column is cylindrical, you're ready to turn it to its finished diameters. Adjust the eccentric guide bearing for a deeper cut, and begin to waste the bulk of the wood with short cuts, beginning about 10 in. from the tailstock and routing to the right. Then move to the left 10 in. from the beginning of the previous cut and rout again to the right. Continue along the entire column, roughing it to within 1/16 in. of its finished diameter. The final cut is made in one long, uninterrupted pass from left to right, having made a last adjustment in the eccentric guide bearing.

The column's neck and base moldings are not featured on the pattern. I marked out their positions and leave unwasted stock for them when making the rough and final cuts. Then I clamp a tool rest to the bench atop the pattern board and form the moldings with scraping tools sharpened to a rough-ground edge.

The router bit leaves a rough surface that must be sanded. I use a belt sander, sliding it upside down along the top of the pattern board, with the sanding belt working against the column as it turns. Making one pass with a 40-grit belt and another with an 80-grit belt will leave a surface that is good for painting.

In order for the column to stand up straight, the bottom must be cut so that it is exactly perpendicular to the axis of the shaft. Make this cut with a ⅜-in. by 1-in. straight-face bit in the router. The depth of cut should be set to one-third the thickness of the column wall. Bolt the far end of the sliding carriage to the bench top, and clamp a stop block to the pattern board as shown in figure 7. Use the indexing pin of the headstock to lock the column in position. Holding the carriage down firmly on the pattern board, pivot the router toward the column, cutting through the plywood end plate and into the base of the shaft. When the carriage contacts the stop block, switch off the router, and clamp the carriage to the pattern board. Switch the router back on, release the indexing pin and slowly rotate the column by hand. This will produce a very accurate cut around the base of the shaft. Turn the column away from you while cutting, or the faceplate may unscrew. Take the column off the lathe and remove the plywood end plate. Using the inside wall of the groove for a guide, cut off the waste on the end with a handsaw.

Bases—I make the separate round bases and square plinths with splined-miter joints (figure 8). I make the bases by first roughing them into shape on the bandsaw and then truing them up on a faceplate, after which I turn the various molding profiles with scraping tools. On one run of columns, I needed extra-wide stock on the bottom for a cove molding. I trued the bottom of the columns before turning them and fastened on a 1½-in. thick base with screws and sealed it with butyl caulk, which allows the column to expand and contract.

To increase efficiency in the future and to expand the range of my work, I plan to develop an automatic travel for the sliding router carriage and a system for gluing up all the staves at once, instead of having to glue up each blank piecemeal. I am also working on a method for making tapered and bent-stave columns and on plans for a large router fixture that will let me produce fluted columns. □

John Leeke, 31, assisted by his 10-year-old son Jon, works in Sanford, Maine.

Robert Yorgey's Hand-Carved Turnings

Making do with what you have

by Richard Starr

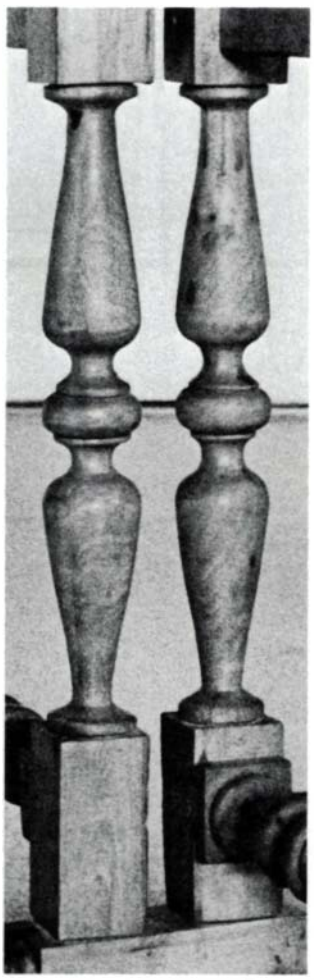
When Robert Yorgey shows his drop-leaf tables at a craft fair, people stop to admire the neatly turned legs and stretchers. But Yorgey didn't use a lathe to form the pretty vase and ring shapes; he carved them by hand. At 85, he's been at it for thirteen years.

"My granddad was a woodworker," says Yorgey. "Maybe I inherited something from him. He used to make the wooden screws and gears for the old forges, the old steel-rolling mills. That was back in the 1850s and 60s. He died around 1906—I was about 10 years old.

"My first encounter with woodworking was when I was 12 or 13. I attempted to make a boomerang, having read about them in some book. It was supposed to return to the thrower. Result was, when I threw it, it kept going. If I were superstitious, I'd believe it was coming back in my carvings now."

Yorgey lives near Reading, Pa., on the farm he has worked for most of his life. "When I sold the farm to my son in 1968, I called it 'I retired,' but I really didn't. I kept on working. I don't believe in that retirement business." Though still busy, he found time to take up woodworking.

One of his early projects was a magazine rack illustrated in William Klenke's book, *Things to Make and How to Make Them*. The rack had four short, delicately turned legs. "I had Klenke's book, but the only hitch was, I didn't have a lathe. Klenke didn't tell me one thing: how to do it with hand tools." Yorgey describes himself as being of "tough Pennsylvania Dutch stock." True to this, he carved the turned shapes with a chisel, a gouge, a coping saw, a Surform and a good deal of careful measurement. The results were convincing and pleasing. He was encouraged to try a more complex piece from Klenke's book: a gate-leg table.



Graceful symmetry of Yorgey's table legs in dogwood belies its lathe-less origins.

"Listen, my first table I made all by hand. There was a walnut log up in the woods, 7 ft. long by 7 in. It was lying over and was pretty dry and I got it in the old summer kitchen, and I sawed it with a handsaw. Full length. It took me about two days to saw one trip through. I sawed it out in about 2-in. planks." He ripped the planks into 2x2s for the eight legs and six stretchers. Each piece was "turned" by hand using carving tools, with the work held in a vise.

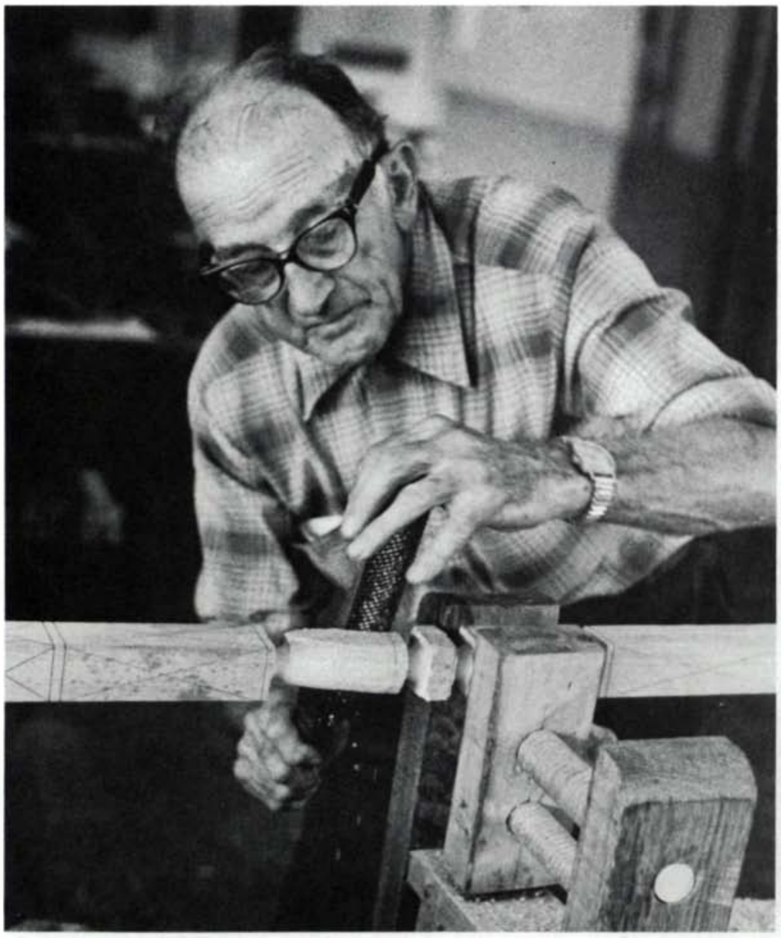
Yorgey has made 22 gate-leg and trestle-style drop-leaf tables in a variety of local woods—cherry, walnut, butternut and dogwood—all with hand-turned parts. Each tabletop has its own corner shape. "I try to put different corners and colors in each table so I can say it's pretty near one of a kind." He carves the rule joint between the main top and the drop-leaf by hand and judges the quality of the table partly by how well this joint fits. "See, this one I didn't get quite as good as those; I don't get them all perfect. These latest ones I got pretty good because I had a little more experience."

With experience came the need to diversify. "I don't know what branched me off to the vises. I guess I wanted a challenge. The gate-leg tables weren't enough of a challenge for me." Yorgey cuts the wooden screws and nuts for his vises by hand. He uses a short piece of metal tape-measure as a flexible layout ruler, and carves the threads with a V-gouge. To make the nuts, he drills a hole in a block of wood, then saws the block in half through the hole. After gouging out the threads, he glues the block back together. Though Yorgey developed his own threading technique, it closely resembles the procedure described by Hero of Alexandria almost two thousand years ago. When simple vises were no longer challenging enough, Yorgey designed and built a vise whose moving jaw floats on a pair of opposite-threaded screws that are coupled together by wooden gears. Improved variations are now in the works.

Yorgey was invited to demonstrate his unique style of non-lathe turning at the March and June '79 turning symposia in Newtown, Pa. (*FWW* #19, Nov. '79). Surrounded by 20 growling lathes, he quietly chipped out screws and table parts, attracting a good deal of amused, though respectful, attention. "They were ribbing me about taking too much time and patience doing this. So I had to get back at them. I told them, 'I'm the original. You fellows are all copiers!'" Yorgey's message has a certain authenticity to it: perhaps the lathe was originally developed to mimic hand-carved objects. When he was reminded that the lathe is a very ancient tool, Yorgey replied, "Before the lathe were my tools."

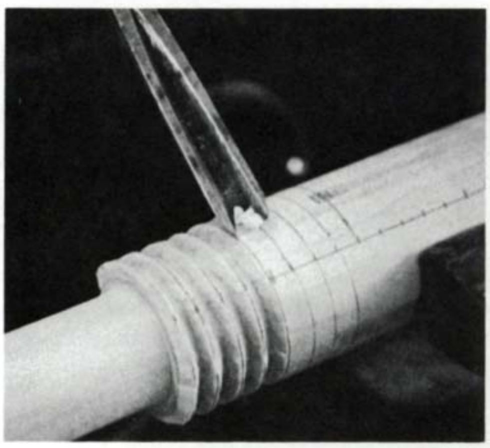
Robert Yorgey came to his craft late in life; perhaps that explains the joy with which he works. But why the unusual methods? "You just want to try to see what you can do with what you have," he says. "Here's another reason; maybe you'll agree with me and maybe you won't. I went through the Depression and I guess that knocked a little patience in me, and a little endurance too." □

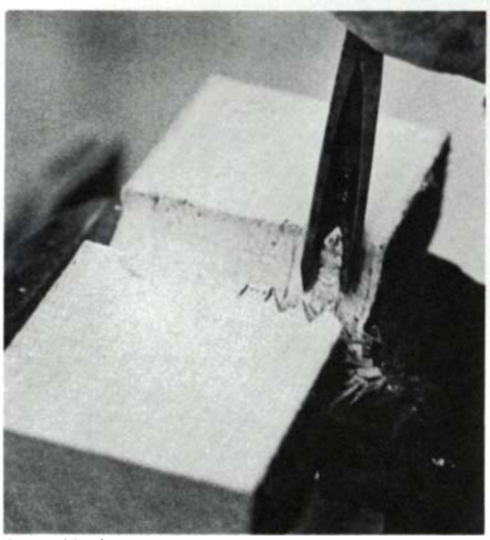
Richard Starr is Fine Woodworking'*s New England correspondent. He lives in Thetford Center, Vt.*

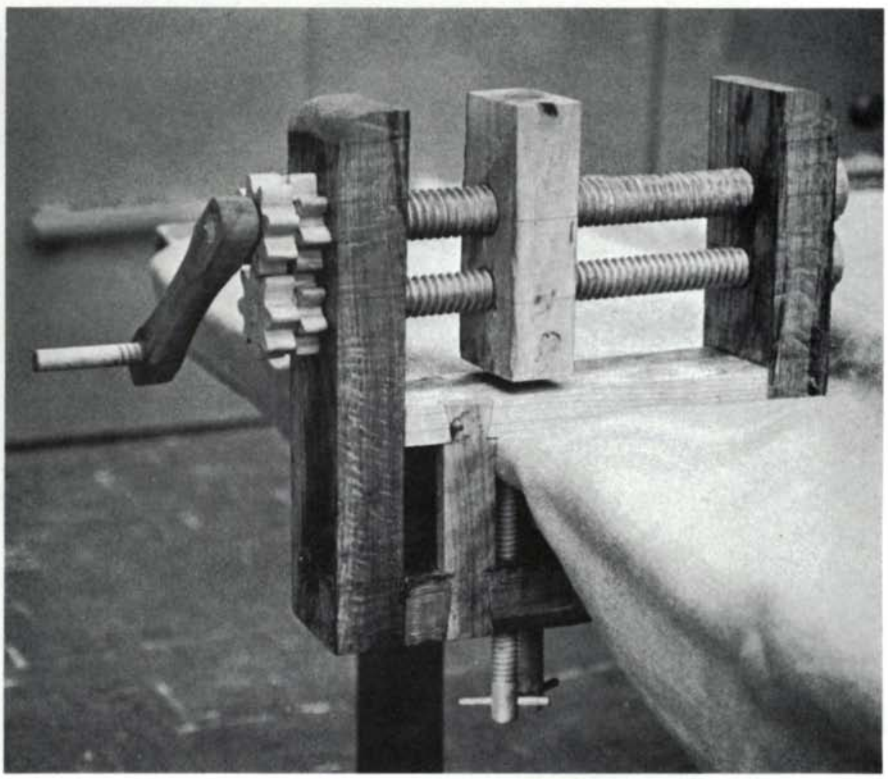


With the work held in twin-screw vise, Yorgey shapes a leg with a Surform.

Yorgey at home with four of his gate-leg tables.







Yorgey lays out his screw threads with a flexible ruler and carves them with a V-gouge (above, left). The result is a spiral with a pitch of four to the inch. Nuts are similarly roughed out with gouge and mallet, left, but the stock must be drilled and halved first and the threads must meet when the halves are re-assembled. The finished twin-screw vise, above, is a monument to skill, patience and leisure time. Crank mounted on top screw is geared to opposite-threaded lower screw. Rear jaw has two threaded holes and moves on the screws as the crank is turned. Because simple wooden gears would be too coarse to work smoothly and finer gears would be too fragile, Yorgey mounted two gears on each screw, one-half tooth out of phase. The effect is as smooth as single gears with twice as many teeth, but is far stronger.

Photos: Richard Starr

New Showpieces

And new cracks in the marketing barriers

Contemporary furniture-making is more than craft, but it's not quite art in the usual sense. Thus it's often been judged too pricey to sell alongside crafts or factory furniture, too functional to show with paintings and sculpture, and too erratic in supply to market to architects and interior designers. The designer/craftsman struggles uphill, building his business by the slow process of recommendation and referral, by seeking out those few galleries that specialize in fine furniture, and by being the odd man out at retail/wholesale craft fairs. But all of a sudden last fall and winter...

• In California, the Oakland Museum broke the art barrier by surveying the state's woodworkers and choosing furniture by 20 of them for a two-month exhibition. The public came in droves and loved it. Since the curators put the furniture on a par with painting and sculpture, we're treating it that way too—a critical review with photographs starts below.

• In Atlanta, a new marketing firm called American Art Inc. spent 18 months pushing craftsmen's portfolios at architects and interior decorators, thus generating enough interest to risk a major show. Last November, American Art brought 90 pieces of fine woodworking and wrought iron to a downtown showroom, and the gamble paid off: $50,000 in sales, and commission business still coming in—details on p. 89.

• In Manhattan, the Workbench furniture store broke the retail barrier by opening a permanent gallery where contemporary work can be shown and sold without any markup over the craftsman's price. As the flagship of a 35-store chain, Workbench wants the prestige more than it needs the profits. The owners plan one-man or small group shows throughout the year. For photos of a recent show, see p. 90-91.

In California...

by Morris J. Sheppard

For those who work wood as a means of artistic expression, few things could be more encouraging than to find at a major art museum a show devoted exclusively to handmade furniture. The recent show (Dec. 16 to Feb. 15) at the Oakland Museum, entitled California Woodworking, displayed a variety of styles and techniques in a spacious, well-lit gallery. My space here is much more limited, so I'll confine my remarks and the accompanying photos to the pieces I found most interesting or most instructive. Strikingly apparent, and unexpected in California, is the way many pieces refer to earlier styles. It's exciting to see designer/craftsmen exploring our heritage. But to succeed as contemporary work, historically derived pieces must go beyond reproduction. A tradition, like an old family, must constantly renew itself, otherwise it dies out.

This problem shows itself in Philip O'Leno's dining table in walnut and oak (facing page, top). From the cloud-lift stretchers to the contrasting pegs and tenons (left proud and whittled) I immediately noticed the strong influence of Greene and Greene (*FWW* #13, Sept. '78). In fact, O'Leno's table is almost identical in structure to one the Greenes designed in 1906 for the Robinson House in Pasadena. Its large, expandable top is supported by a strongly architectural base of tenoned members, a style reminiscent of Japanese temple joinery. The shape of the top pleasantly echoes the cloud shape of the crosspieces. O'Leno's table has impressive mass, perhaps more than is needed, but his clean, confident technique lets it occupy its space with authority.

Where O'Leno changed the Greene brothers' design it is not, to me, for the better. In the original, the ends of the extension supports slope inward, yielding a lift that counterbalances the ground-hugging runners. In O'Leno's version, this contour has degenerated into an incongruous S-curve, while his runners are much more massive and vertically oriented, taller than they are wide. The stretchers above them, with arcs taken from their bottoms, now appear weak and meaningless in contrast. The result is still a strong and friendly family table, but O'Leno needs to go further along his chosen road to command interest.

A more successful and more outrageous historical reference is Garry Bennett's desk of zebrawood and mahogany with aluminum legs (facing page, center), whose shape is taken from French furniture from the middle of the 18th century. The surface of the legs and skirts is ground in a cross-hatch manner that subtly mimics the parquetry veneer common on pieces of that period (which, by the way, also often used metal decoratively). However, a late-20th century sensibility is obviously at work in this desk. As to its construction, there is little traditional woodworking—the thing is mostly bolted and welded, the mahogany drawers made with nailed rabbets. An unusual touch is the way Bennett filletted the inside corners of the legs with resin painted bright chartreuse. With the strong orange stain on the drawer faces, he has created a striking and light-hearted polychromy. Bennett has put a lot together here, in a piece that sits with

Staff

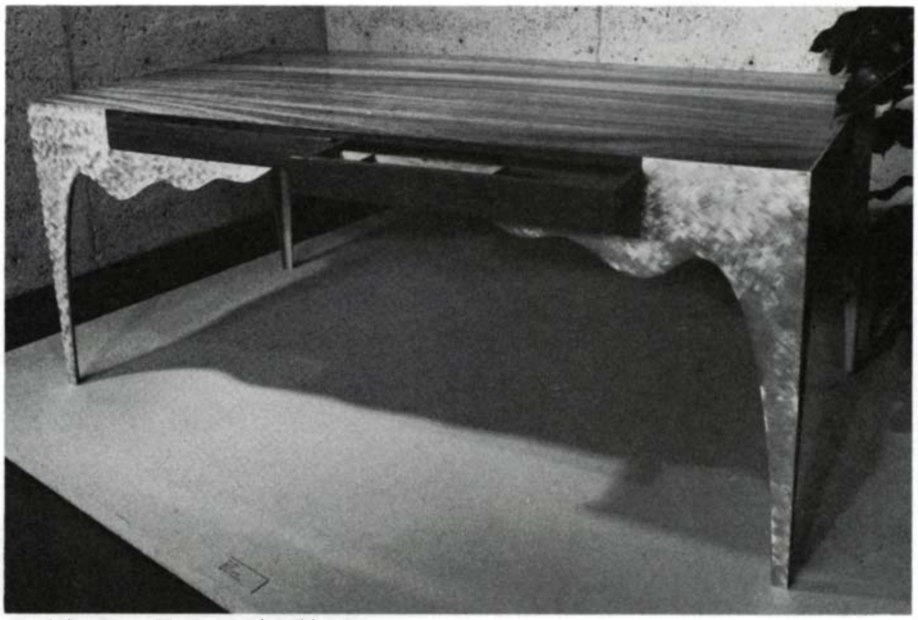
The Oakland curators put the chairs up off the ground, enhancing their sculptural aspects but preventing a good look from the rear.

Dining table by Philip O'Leno of Albion; detail, right.

all the panache of the originals that it teases. Humor and elegance together is a neat trick to pull off.

De Stijl, meaning "The Style," was the name adopted by a group of Dutch modernists working in the 1920s and 30s who attempted to arrive at a new basis for design in the spirit of simplicity and geometrical order. The furniture designer Gerrit Rietveld and the painter Piet Mondrian were two of its leaders. In Bob Wilhite's living-room set (bottom right) we see the same play of line and plane, angularity and syncopated rhythm, but gone is Rietveld's Cartesian intersection of right angles following the x, y and z axes. Here all the horizontals are tilted at precarious angles, delicately balanced against each other, and nowhere do the three axes of space meet together. In fact, the way Wilhite has constructed his pieces, from lengths of maple with ¼-in. square strips of ebony let in at one edge, nothing meets at all—the maple holds the dominant ebony lines apart from each other. It is as if he has modeled some tensegrity structure whose rigid compression members never intersect. Tensegrities are noted for their lightness and deceptive strength, and Wilhite echoes this fact in his table, whose slender members support a heavy glass top fully ⅞ in. thick. This is very stark furniture, neither inviting nor comfortable. Such intellectual sophistication is not what everybody would want to live with, but I find the pieces fascinating objects that change as you walk around them. It's gutsy stuff, done with purpose and direction.

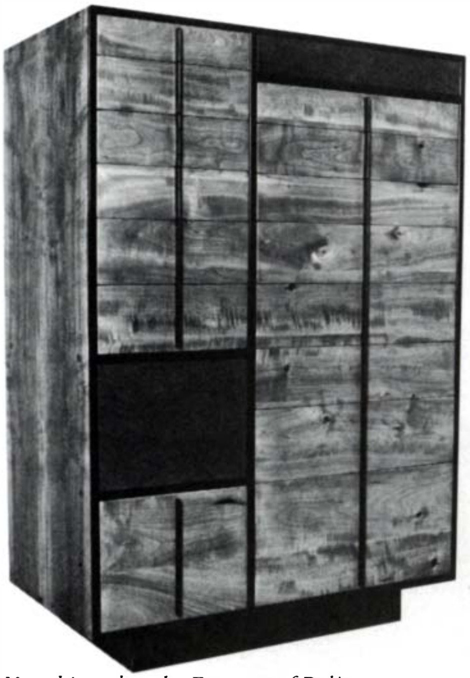
Also reaching back to De Stijl, especially to Mondrian's paintings, is Arthur (Espenet) Carpenter's Mondrian



Desk by Garry Bennett of Oakland.

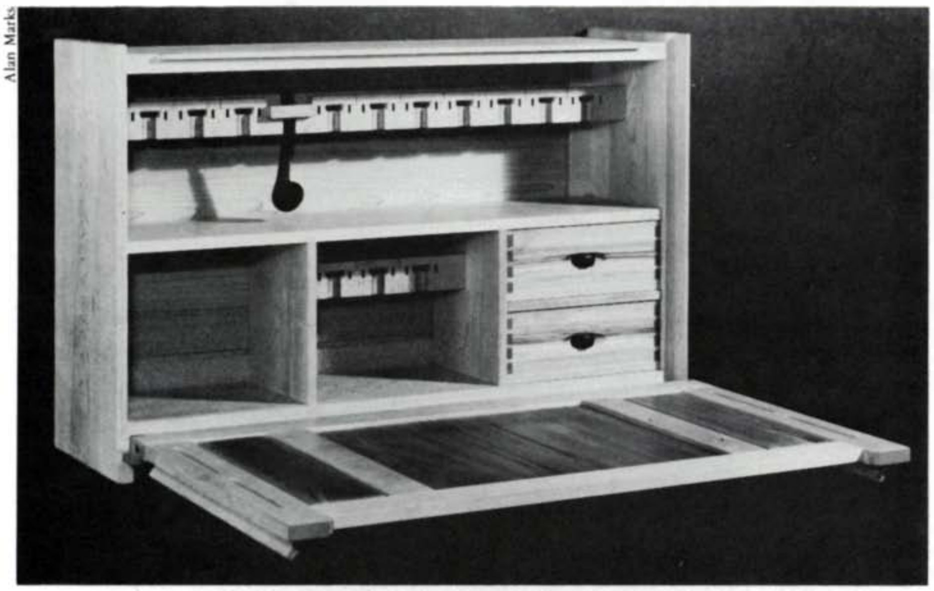
Living-room set by Bob Wilhite of Los Angeles.

Photos, except where noted: Andrew Partos

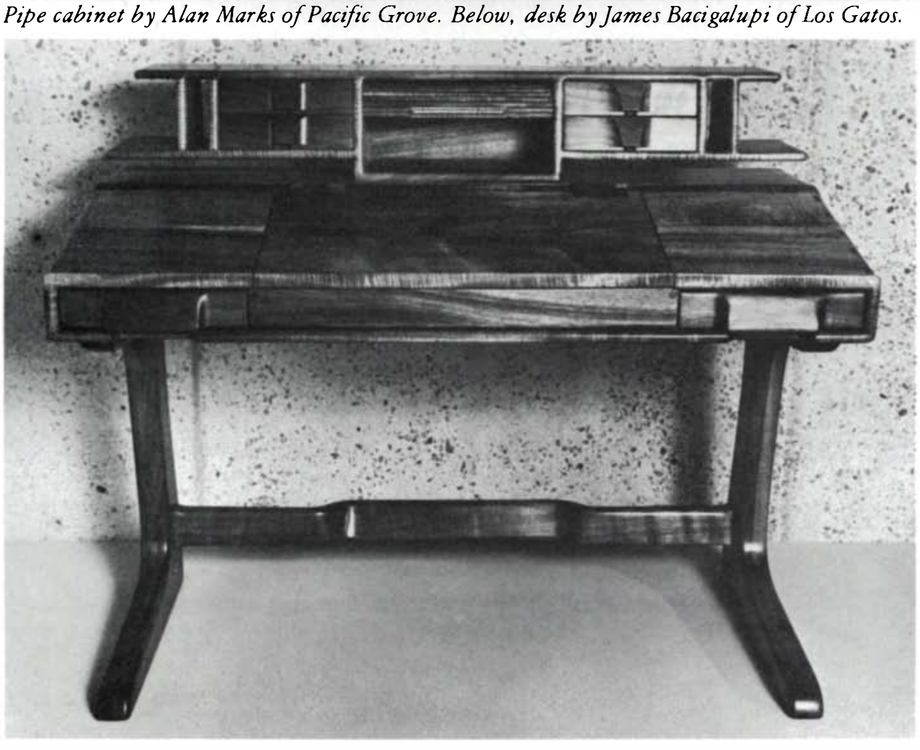


Mondrian chest by Espenet of Bolinas. *Chest by Don Braden of Oakland.*

Alan Marks



Pipe cabinet by Alan Marks of Pacific Grove. Below, desk by James Bacigalupi of Los Gatos.



chest (far left). It's a dovetailed walnut case with square edges, drawer fronts of tan madrone, and vertical ebony pulls. Two of the drawers have no pulls, working with a touch-latch action, and are faced with plastic-covered felt, one red, the other blue. The plastic is smooth and flat but shows a painterly parchment-like mottling of color from the felt beneath. The case's edges are trimmed with the same plastic, in black. This thing could easily be corny and in lesser hands this type of transition from painting to furniture facade a dated disaster, but it's not. Espenet brings to it his masterly sense of proportion and a refined sensibility. He keeps it contemporary because it's not a Mondrian. It's Espenet exploring a particular vocabulary of form in his own way, with his own materials. I can even appreciate the brightly colored felts that line the drawers, although I wish the drawers would slide a little more smoothly.

Of the two works by Alan Marks, a side chair and a pipe cabinet, the cabinet (left) is by far the more successful. It's a straightforward, beautifully crafted piece with ingenious spring-loaded wooden clips to hold pipes. Joinery and surface here are first-rate, with the planed maple taking a superb sheen; the whole is as neat as a pin. A few touches, like the reversal of the raised sides of the door panels—the central panel raised on the outside, the end panels raised on the inside—are appreciated. But in a piece so direct everything has to be just so, and I wonder about the lack of relationship between the door's stiles and the divisions within the cabinet itself. You see both at once when it's open, and it just doesn't sing.

The difficulty of making a style your own is apparent in Don Braden's chest (top right). Braden works in what has become known as the "California Roundover" style and he displays its typical aspects, i.e., a router-dovetailed case with edges formed by the ubiqui-

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Morris J. Sheppard, 36, has made his living for the past 16 years as a designer and builder of fine contemporary furniture. His 4,000-sq.-ft. studio in Los Angeles employs two full-time cabinetmakers in addition to himself, plus two part-time interior designers. He holds a bachelor's degree in design from New York's Pratt Institute, is an avid student of traditional furniture, and has lectured on the history of furniture.

tous ⅜-in. rounding-over bit. Aside from the splashy wood grain, the success of the design depends on the rightness of the proportional break-up of the front. The twin horizontals of the pulls across the middle, which is disturbed by an apparently unintentional change in the plane of the drawer faces from left to right, provides the only hint of a plan. I'm told the scheme derives from dynamic symmetry, but it's not evident. The shortened pull on the door at the lower right doesn't help either. Compare this facade to Espenet's chest and it will be clear that understanding and control of the division within a rectangle are missing here. A thin frame glued cross-grain to the inside of the tall door at lower right is questionable construction also.

Another "California Roundover" design is Jim Bacigalupi's koa desk (previous page, bottom). The wood grain is of primary interest. In some ways this works against him. The desk would be more harmonious if Bacigalupi had been able to make the whole top from one panel, cut up. The different pieces he used for the sides and the center destroy the visual flow. I like the break in the stretcher between the legs, but the legs themselves seem blocky and less than graceful, maybe because he used the same rounding-over bit here as on the case, when the legs' greater thickness seems to call for a larger radius.

The containers of Michael Graham, using forms found in plumbing pipe, are deft and intriguing. Flawlessly and ingeniously crafted of walnut and rosewood, they serve a minimal function, but delightfully. I especially like his Spiral Pipe Form (photo, back cover), a stunning rhythm of semicircular shapes. Opening one of its three long, curved drawers, which just seem to keep on coming out the pipe, is guaranteed to produce a smile.

In all, I walked away from this show impressed by its vitality and general professionalism. The level of craftsmanship was high, although I wonder why nobody except Marks wants to dovetail drawers together—it's really the best way, and it adds an enriching visual detail as well. Nonetheless, the show's diversity evidences a vital and growing field, and the positive and stimulating reaction of the viewing public augurs well for our craft's future. □

In Atlanta. . .

American Art Inc. (56 East Andrews Dr. NW, Atlanta, Ga. 30305) is the brainchild of woodworker Robert Falwell, potter Stephen Jepson and businessman/craft collector Robert Farrar. They formed the firm 18 months ago, when Falwell and Jepson began to despair of ever having enough time to do their work and sell it too. Luckily, Farrar was ready for a career switch, and he's been the firm's full-time staff ever since. Says Falwell, "I was trying to work my way up from the craft fairs. Then I realized that the people who wear Gucci shoes, who could afford my best work, don't even go to craft fairs. I decided that I'd better start over at the top and work down."

The top, to Falwell, was the contract furniture market—that expensive species of furniture manufactured for sale through architects and interior designers. So, Falwell and Jepson assembled slides and photographs of work by themselves and their friends, and Farrar started knocking on architects' doors, offering their stuff as an alternative to contract furniture and accessories. "It was new to the architects, they were interested, and they wanted to know more," Farrar recalls. The trio pooled their cash to open an office and a retail gallery catering to the collector, and began seeking craftsmen to represent. At last count, their files contained the portfolios of 300 artisans in all media, heavily concentrated in wood, and they're interested in seeing still more slides.

"Consulting is the heart of it," says Farrar. "We sit with the architect and the client to look over portfolios, to find the correct craftsman for the job they have in mind. Then we put the client and the craftsman together, let them cement the sale." Adds Falwell, "The thing is, if these guys are spending $5,000 for an office desk, they don't want to wait, they want it now. The furniture craftsman has to be ready to fill orders quickly, and willing to build pieces and show them on speculation. Many craftsmen are afraid of the risk, but I get 80% of my business that way. It's the only way to survive, unless you like doing millwork."

Cabinet with drawers by John Paul Dodd of Rochester, N.Y., figured gum, birch and plywood, sold for $2,400.

After a time, it became clear that having photographs and a small gallery wasn't enough. They had to bring the actual work to their clients. A small, three-day show in Atlanta in late 1979 was a moderate success, so the partners decided to go for broke with a major furniture show under the banner "American Art at its Best: Wood and Iron." Falwell called all the woodworkers and blacksmiths he knew, persuading almost 50 of them to lend more than 90 pieces of furniture and sculpture, all on speculation. Farrar rented a truck and made two long sweeps around the Northeast, Midwest and South, picking up the work, taking it to Louisville to exhibit during the furniture industry's September machinery show. That was a bust, since only one piece sold, but a predictable bust because Farrar hadn't been knocking on doors in Louisville. Undaunted, they reopened the show in Atlanta in late November for a three-week run in a huge, glass-walled showroom. And here, their year of legwork paid off: $15,000 worth of work was sold on opening night, another $35,000 before the show closed. In all, twice what they'd hoped. Suddenly, American Art Inc. was becoming known as a principal source for quality arts and crafts in the Southeast.

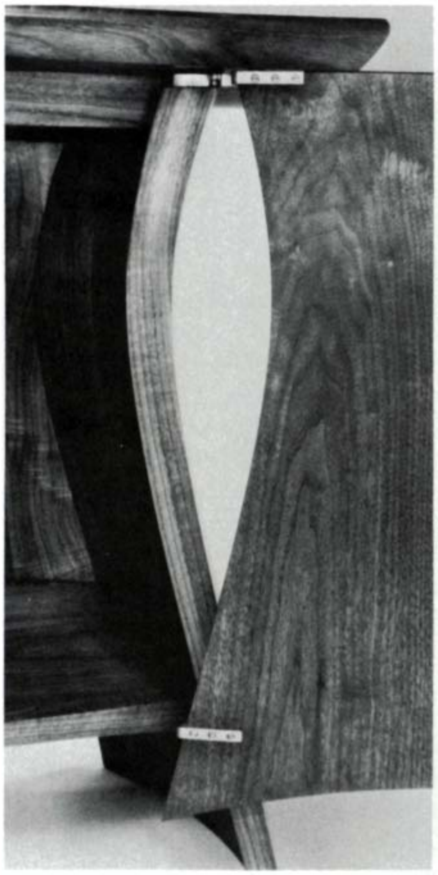
Still, it's a shoestring business with more potential than money. Farrar is a businessman first, but he also figures that keeping the artist working is most important. If something has to give to land a job, Farrar says, it's usually the firm's 30%. But he believes that painting and sculpture are dormant, that high-quality crafts are the real arts of our time, and that he's in early on a good business. —*J.K.*

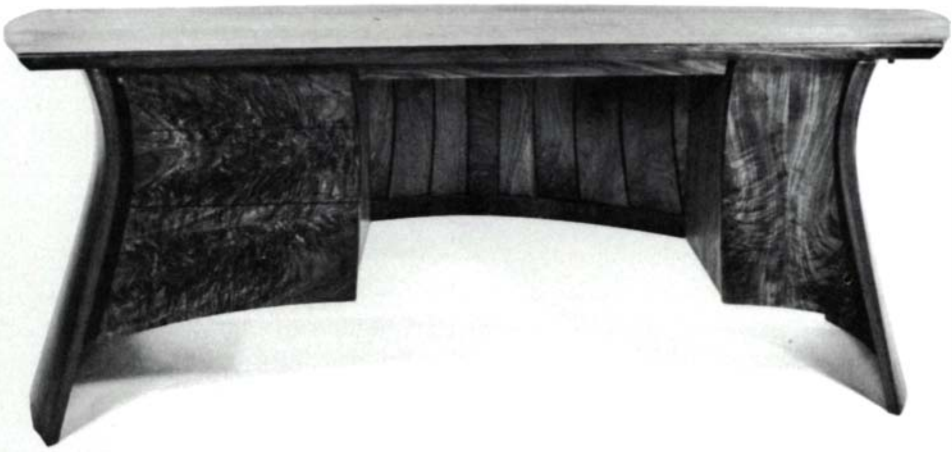
Photo: Woody Packard

In Manhattan . . .

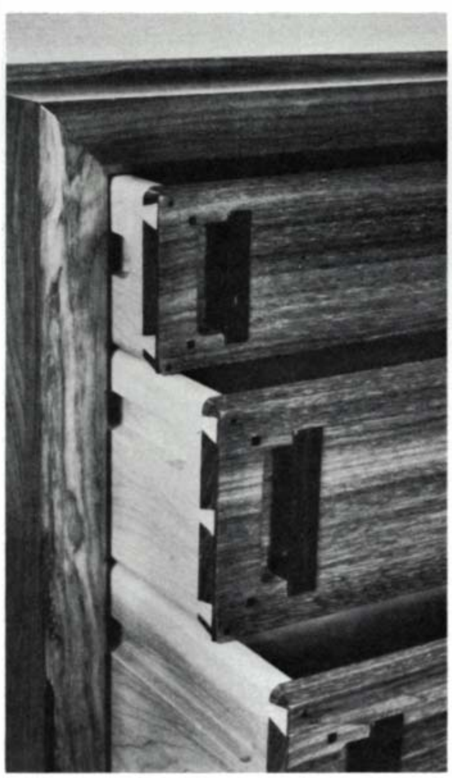
Late last year, the Workbench gallery brought to Manhattan 29 pieces of furniture made by 19 students, faculty and alumni of Boston University's Program in Artisanry for a six-week show. The pieces we liked best are shown below. The Boston University program aims to equip graduates for professional careers as craftsmen; for information, write 620 Commonwealth Ave., Boston, Mass. 02125. The Workbench gallery aims to bring the best contemporary furniture to the New York market; to find out about showing there, write Bernice Wollman, 430 Park Ave. South, New York, N.Y. 10016.

On the back cover: Wall mirror with shelf by Alphonse Mattia, assistant professor at Boston University. Like some of his students, Mattia is often pushing at that blurry line between furniture and sculpture. Unlike many others along the art frontier, Mattia isn't willing to give up function. Rather, he wants to augment traditional cabinetmaking with a larger aesthetic view. The shelf and beam supporting his mirror frame are koa, the frame itself is maple and the L-shaped bracket that's tusk-tenoned to the shelf is alder, lacquered bright red. Mattia also etched dashed lines into the mirror's reflective backing and filled the dashes with red lacquer—an intriguing way of "reflecting" structure.





Steven Turino's desk, above and detail, left (80 in. by 29 in. by 30 in. high), is solid walnut, its compound-curved end panels made of steam-bent staves coopered together. The drawer fronts also curve gently in two planes, but there he laminated 1/8-in. resawn walnut on a plywood form, thus getting the most from a highly figured board. The overlapping boards on the front of the desk are flat, although their curved edges pick up the shape of the desk's ends. The hinges are handmade; the finish is a mixture of one part linseed oil, two parts varnish and three parts turpentine, well rubbed. Turino, 23, made the desk during his second year at Boston University. It sold for $2,800.



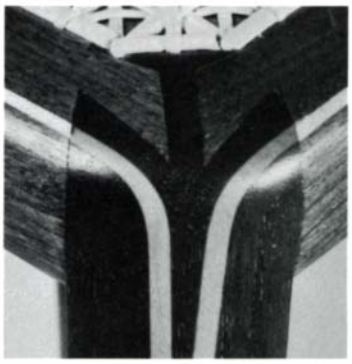
Back cover and details, right—Jon Everdell admires the California furniture made by Charles and Henry Greene early in this century *(FWW* #12, Sept. '78), and he's also fond of geometric progressions. Both influences, plus the graceful curves of traditional furniture, are apparent in his padauk chest, which sold for $3,000. Its drawers are side-hung, with four tiny ebony squares setting off each pull. The sabot feet are ebony sawn 1/8 in. thick and glued directly to the padauk; the ebony continues in a narrow line up the front corner to the third drawer—a pleasant accent that also conceals a glue line. The case back is plywood. Everdell, 32, took up woodworking six years ago, graduated from B.U. in 1979, and works at the New Hamburger Cooperative on Emily St. in Cambridge, Mass. He makes casegoods for kitchens and offices, and is slowly moving into limited production of fine furniture.

Photos: Doug Long, Photocraft

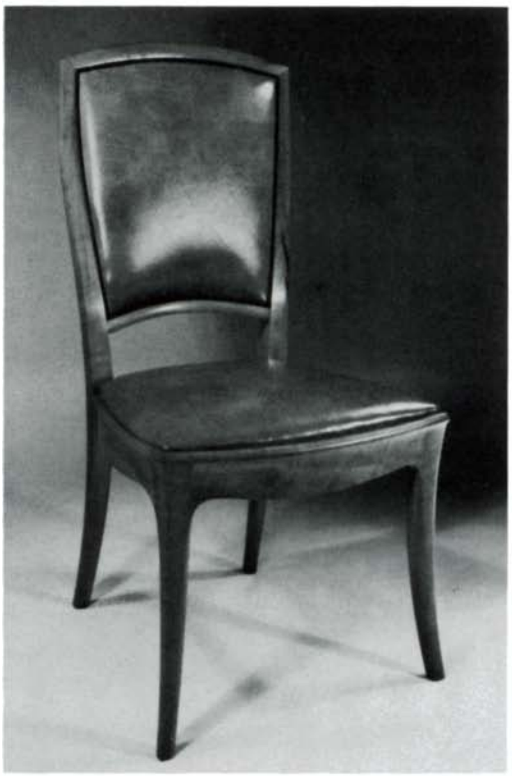
James Schriber of New Milford, Conn., built his coffee table, above (64 in. by 23 in. by 17½ in. high), as a break from work on a large desk of similar design. The top and vertical slabs are padauk, the curved rail is a maple lamination dyed black, the dovetailed panel is a coopered curve. The prominent joinery is neatly done, but Schriber agrees it would have been better if the top's cutout had followed the wood figure. But then, it would also have been nice to have padauk boards 15 in. wide. Priced at $800, the table didn't sell. Schriber, 28, finished at Boston in 1978 and now is one of three partners in Full House Inc., a firm that designs, builds and furnishes renovations, additions or whole houses. About half his business is commissioned furniture, half architectural woodworking.

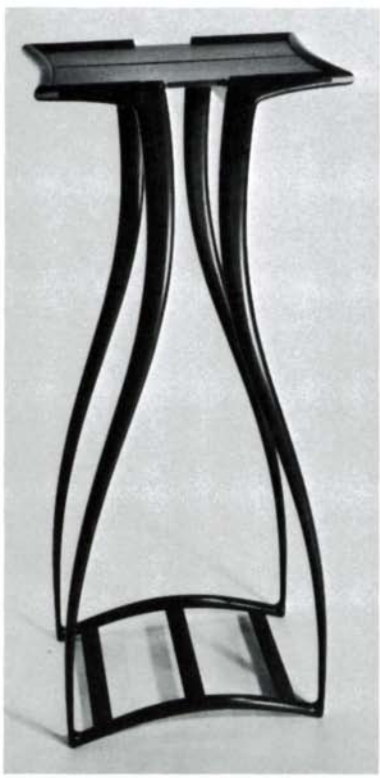
Before he went to Boston University, Timothy Philbrick of Narragansett, R.I., apprenticed with a period furniture-maker. As in all his work, this background is evident in Philbrick's pearwood chair, bottom left, (40 in. by 20 in. by 20 in.; seat is 17½ in. at front, 17½ in. deep); the finish is four thin coats of padded lacquer followed by two thin coats of tung oil. His work is popular, for at age 28, three years out of school, Philbrick has all the business he can handle and can even choose which commissions he'll accept. The chair is from an edition of three; the first two brought $1,500 each.

Boston University alumnus Richard Tannen, 32, of Watertown, Mass., showed his production plant stand (bottom center), in walnut with maple splines (40 in. by 15 in. by 10½ in.). The slender S-curves of its legs, which echo the lines of traditional furniture, are bandsawn and shaped with router jigs; the finish is a light coat of Watco oil followed by sprayed lacquer. Tannen makes his living by building hardwood furniture on commission, supplemented by a little teaching and limited production of items like the plant stand. Workbench sold three of them at $350 each.

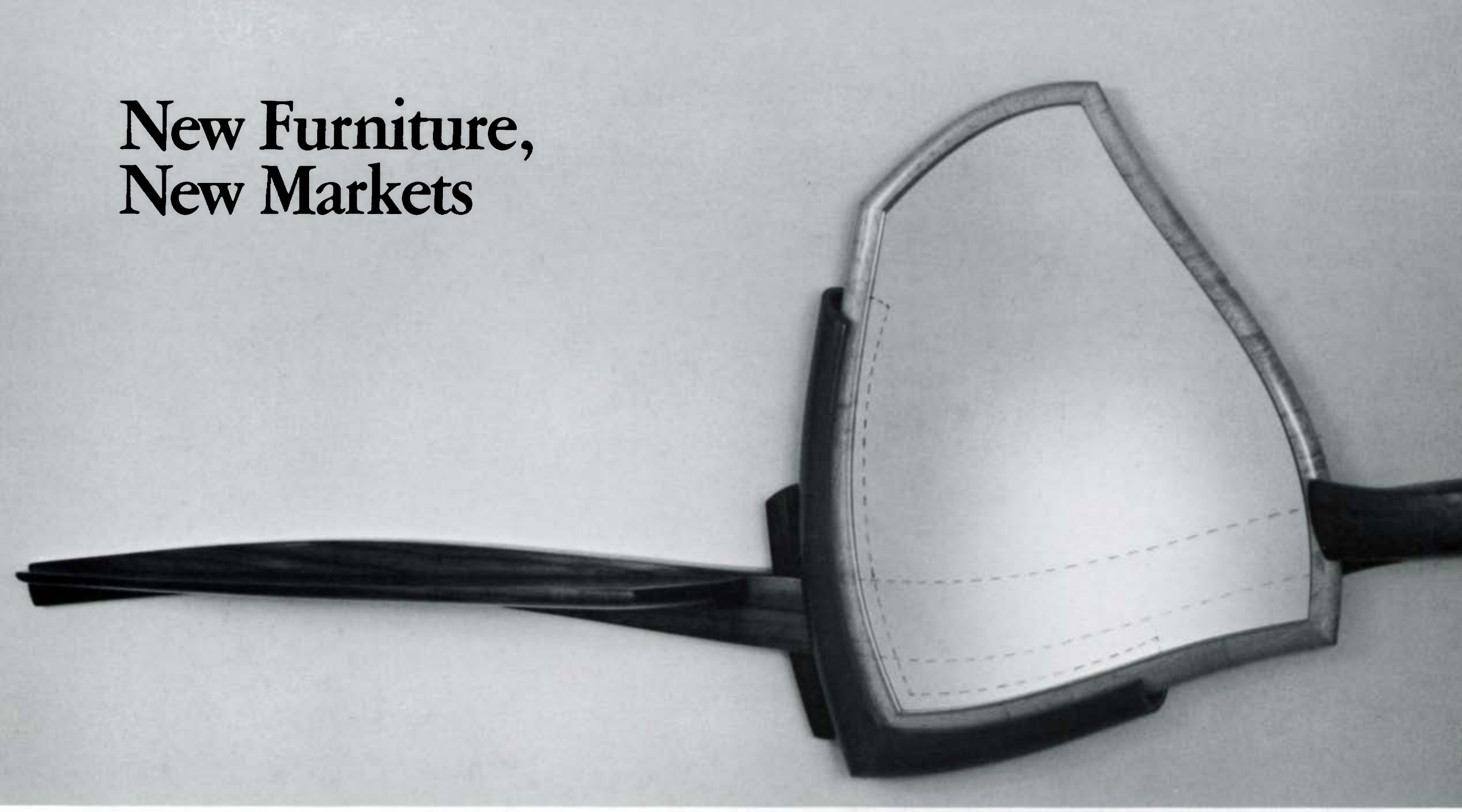


Perhaps to distinguish their furniture from factory production, the Boston craftsmen seem to relish detailing that machines can not duplicate. Thomas Loeser's stool (26 in. by 13 in. by 13 in.), below right, is an example. He built it his first year at school, to answer a problem requiring mortise-and-tenon joinery in furniture to support a living thing. The legs began as square lengths of walnut, each of which Loeser ripped at 45° in order to insert a thick maple laminate, then ripped and laminated again. Shaping the leg produced the gently curving lines (detail, inset). Loeser didn't anticipate the degree to which finish would darken the maple's end grain, interrupting the flow of the lines. The seat is hand-woven cane. At $500, the stool did not sell.





New Furniture, New Markets



Wall mirror by Alphonse Mattia, koa and maple, 78 in. by 34 in. by 9 in. deep. Photo: Doug Dalton.

Contemporary woodworkers find it natural to explore the artistic space between function and sculpture, but difficult to place their hybrid creations in either the furniture store or the art gallery. This past winter, art furniture got a foot in both doors. The mirror and chest shown here were displayed at a popular Manhattan furniture store; the pipe-form container was in an exhibit at a major California art museum. Details and more photographs start on page 86.

Chest of drawers by Jon Everdell, padauk and ebony, 56 in. by 37 in. by 21 in. deep. Photo: Doug Long.

Spiral Pipe Form by Michael Graham, walnut and rosewood, 48 in. by 24 in. by 20 in. deep. Photo: Andrew Partos.